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OF

ARTS AND SCIENCES.

CONTAINING

An EXPLANATION of the TERMS, and an ACCOUNT OF THE SEVERAL SUBJECTS,

B 1808

IN THE

LIBERAL AND MECHANICAL ARTS,

AND THE

SCIENCES, HUMAN and DIVINE.

Intended as a COURSE of ANCIENT and MODERN LEARNING.

By E. CHAMBERS, F.R.S.

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Floriferis ut apes in saltibus omnia libant,
Omnia nos— LUCRET.

WITH THE

SUPPLEMENT,

AND

MODERN IMPROVEMENTS,

Incorporated in one ALPHABET.

By ABRAHAM REES, D.D.

vol. 4

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Q.

Q, A consonant, borrowed from the Latin or French, for which the Saxons generally used *cp*, *cw*; and the sixteenth letter of the alphabet.

The name of this letter is *cue*, from *queue*, Fr. *tail*; its form being that of an O with a tail.

The *Q* has this peculiar to it, that it is always followed by an *u*, and is, therefore, reckoned among the mutes.

The *Q* is formed from the Hebrew ק, *koph*; which most other languages have borrowed; though some of them have rejected it again, particularly the Greeks, who now only retain it as a numeral character, called *κοππα επισημον*.

In effect, there is that resemblance between the *Q* and the *C*, in some languages, and the *K* in others, that many grammarians, in imitation of the Greeks, banish the *Q* as a superfluous letter. Papias even affirms, that all the Latin words now wrote with a *Q*, were wrote among the antient Romans with a *C*; but we want better authorities for this. For, though that may hold in many cases, insomuch that some write indifferently *quur*, or *cur*; *cum*, or *quum*; *quotidie*, or *cotidie*, &c. yet does it not thence follow, that they ever wrote *cis*, *cæ*, *cid*, for *quis*, *quæ*, *quid*. What inscriptions authorize such a reading?

Far from this, the ancients sometimes substituted *Q* for *C*; and wrote *quojus*, *quoi*; for *cujus*, *cui*, &c.

Varro, however, and some other grammarians, as we are told by Censorinus, &c. would never use the *Q*. The truth is, its use or disuse seems to have been so little settled, and agreed on, that the poets use the *Q* or *C* indifferently, as best suited their measures; it being a rule, that the *Q* joined the two following vowels into one syllable; and that the *C* imported them to be divided.

Hence it is, that Lucretius uses *cuiret* for three syllables, in lieu of *quiret*; *acua*, for *aqua*; and that Plautus uses *relicuum*, for *reliquum*; as in *quod dedi*, *datum non vellem*, *relicuum non*; where the *cuum* must be two syllables, otherwise the trochaic verse will be lame of a foot.

In the French, the sound of the *Q* and *K* are so near akin, that some of their nicest authors think the former might be spared. Ramus adds, that, till the establishment of royal professors in the university of Paris, under Francis I. they always used *Q* in the Latin the same as in the French; pronouncing *kis*, *kalis*, *kantus*, &c. for *quis*, *qualis*, *quantus*. See K.

Some very learned men make *Q* a double letter, as well as *K* and *X*. According to them, *Q* is evidently a *C* and *U* joined together. It is not enough that the sound is the same, but they see the traces of the *CU* in the figure of the *Q*; the *U* being only laid obliquely, so as to come within the cavity of the *C*; as C ⊲.

To confirm this, they say the ancients wrote *qi*, *qæ*, *qid*. Though Jos. Scaliger, Littleton, &c. think this no proof of the point; for in Gruter's inscriptions we find not only the *Q*, but also the *C*, put for *QU*; as *Cintus*, *Quintus*; *sicis* for *siquis*, &c. Yet nobody ever imagined the *C* a double letter.

Q, among the *Ancients*, was a numeral letter, signifying 500; as in the verse,

> Q velut *A cum D quingentos vult numerare.*

A dash over it, as Q̄, denoted it to signify five hundred thousand.

Q is also used as an abbreviature in several arts. *Q. pl.* in physicians bills, stand for *quantum placet*, or *quantum vis*, as much as you please of a thing; *q. s.* for *quantum sufficit*, or as much as is necessary.

Q. E. D. among *Mathematicians*, signifies *quod erat demonstrandum*, which was to be demonstrated.

Q. E. F. *quod erat faciendum*, which was to be done.

Q. D. is also frequently used, among *Grammarians*, &c. for *quasi dictum*, as if it were said, &c. or as who should say.

Q, in the proper names of the Romans, signifies Quintus, or Quintius. Upon the French coins this letter denotes that they were struck at Perpignan.

QUAB, in *Ichthyology*, the name of a Russian fish, which some report to be at first a tadpole, then a frog, and at last a fish. Dr. Mounsey, who made many enquiries concerning these pretended changes, apprehends that they are all fabulous. He had opportunity of seeing the fish itself, and found that they spawned like other fishes, and grew in size, without any appearances to justify the report. He adds, that they delight in very clear water, in rivers with sandy or stony bottoms, and are never found in standing lakes, or in rivers passing through marshy or mossy grounds, where frogs chuse most to be. Phil. Transf. vol. xlv. p. 175.

QUACHILTO, in *Ornithology*, the name of a very beautiful Brasilian bird, of the moor-hen kind, called also *yacacintli*, and *porphyrio Americanus*. It is of a fine blackish purple colour, variegated with white; its beak is white while young, but becomes red as it grows older, and has a naked space at its basis, resembling, in some sort, the coot; its legs are of a yellowish green; it lives about the waters, and feeds on fish, yet is a very well tasted bird. It imitates the crowing of a common cock, and makes its music early in the morning. Marggrave's Hist. Brasil.

QUACK, in *Medicine*. See Empiric.

QUADRA, in *Building*, any square border, or frame, encompassing a basso-relievo, pannel, painting, or other work.

The word is also used, erroneously, for a frame, or border, of any other form; as round, oval, or the like.

QUADRAGESIMA, a term sometimes used for the time of LENT; because consisting of forty days.

Hence some monks are said to lead a *quadragesimal* life; or to live on *quadragesimal* food all the year.

QUADRAGESIMA *Sunday*, is the first Sunday in Lent; so called because it is about the fortieth day before EASTER.

On the same account, the three preceding Sundays are called QUINQUAGESIMA, SEXAGESIMA, and SEPTUAGESIMA.

QUADRAGESIMALS, *quadragesimalia*, denote *Mid-lent* contributions, or offerings.

It was an ancient custom for people to visit their mother-church on *Mid-lent* Sunday, and to make their offerings at the high altar; and the like was done in Whitsun-week. But as these latter oblations, &c. were sometimes commuted for by a payment of *pentecostals*, or *Whitsun-farthings*; so were the former also changed into a customary payment, *quadragesimals*, *denarii quadragesimales*; and sometimes *Lætare*, *Jerusalem*, from a hymn so called, sung on that day, beginning *Jerusalem, mater omnium*, &c.

QUADRANGLE, in *Geometry*, a quadrangular, or quadrilateral figure; or a figure which has four sides, or four angles.

To the class of *quadrangles*, or *quadrangular figures*, belong the *square*, *parallelogram*, *trapezium*, *rhombus*, and *rhomboides*.

A square, &c. is a regular *quadrangle*; a trapezium, an irregular one.

Quadrangular figures are not proper for fortification; the flanks, and flanked angles, being too small.

QUADRANGULARIS *piscis*, the *square-fish*, in *Ichthyology*, the name of a fish, which, in its most usual size, is about fifteen inches long, four inches high in the middle, and three inches and a half over; the forehead is square, a little hollow, and, by the eminency of the eye-brows, two inches and a half over; the nose blunt, and not very steep, with two holes in the place of nostrils, and the mouth very small; the back is a little convex toward the tail, and on the sides a little obtusely angled; as is also the belly, which is plain and flat, and a little rising toward the tail; it has five fins, two near the gills, two near the tail, and the tail-fin, which is considerably long. Part of the head and tail are covered with a soft skin, the rest of the body with a kind of crust, adorned all over with little round knots, reduced for the most part into hexagonal figures, and subdivided into equilateral triangles. Grew, Muf. Reg. Soc. p. 110.

QUADRANS, in *Antiquity*, the fourth part of the as, or pound.

QUADRANS, in our *Customs*, is the fourth part of a penny, or a farthing.

QUADRANT, *quadrans*, in *Geometry*, an arch of a circle containing 90 degrees, or one-fourth of the entire periphery.

Sometimes, also, the space, or area, included between this arch and two radii, drawn from the centre to each extremity thereof, is called a *quadrant*, or more properly, a *quadrantal space*; as being a quarter of the entire circle.

QUADRANT also denotes a mathematical instrument, of great use in navigation and astronomy, for the taking of altitudes, angles, &c.

The *quadrant* is variously contrived, and furnished with different apparatus, according to the several uses for which it is intended; but they have all this in common, that they consist of a *quadrant*, or quarter of a circle, whose limb is divided into 90 degrees; and that they have a plumbet suspended from the centre; and are furnished with pinnulæ or SIGHTS, through which to look.

The principal, most usual, and useful *quadrants*, are, the *common* or *surveying quadrant*, the *astronomical quadrant*, *Davis's quadrant*, *Hadley's quadrant*, *horodictical quadrant*, *Gunter's quadrant*, *Sutton's*, or *Collins's quadrant*, and the *sinical quadrant*.

QUADRANT, *the common*, or *surveying*, (represented *Tab.* III. *Surveying*, *fig.* 46.) is made of brass, wood, or other matter, usually twelve or fifteen inches radius. Its circular limb is divided into 90°, and each of those subdivided into as many equal parts as the space will allow, either diagonally, or otherwise. On one edge, or semi-diameter, are fixed two immoveable sights; and in the angle, or centre, is hung a thread, with a plummet. To the centre is likewise, sometimes, fixed a label, or moveable index, bearing two other sights, like the index of a telescope. And, in lieu of the immoveable sights, there is sometimes fitted a telescope; though this more peculiarly belongs to the astronomical *quadrant*.

On the under side, or face, of the instrument, are fitted a ball and socket; by means whereof it may be put in any position, for use.

Besides the essentials of the *quadrant*, there is frequently added on the face, near the centre, a kind of compartiment, called the *quadrat*, or *geometrical square*; as in the figure. This, in some measure, making a distinct instrument of itself, see its description and use under the article QUADRAT.

The *quadrant* is to be used in different situations, according to the dimensions to be taken. To observe heights and depths, its plane is disposed at right angles to the horizon; but to take horizontal distances, the plane is disposed parallel thereto.

Heights and distances, again, may be taken two ways; viz. by means of the fixed sights and plummet; and by the label.

QUADRANT, *use of the surveying. To take the height or depth of an object with the fixed sights, and plummet.* Place the *quadrant* vertically, and the eye under the sight next the arch of the *quadrant*: thus direct the instrument to the object, v. gr. the top of a tower, till the visual rays thereof strike through the sights upon the eye.

This done, the portion of the arch intercepted between the thread and the semidiameter, whereon the sights are fastened, shews the complement of the object's height above the horizon, or its distance from the zenith; and the other portion of the arch intercepted between the thread and the other semidiameter, shews the height itself of the object above the horizon.

The same arch likewise gives the quantity of the angle made by the visual ray, and a horizontal line, parallel to the base of the tower.

Note, to observe depths, the eye must be placed over that sight next the centre of the *quadrant*.

From the height or depth of the object in degrees thus found, which suppose 35° 35′; and the distance of the foot of the object from the place of observation carefully measured, which suppose 47 feet; its height or depth in feet, yards, &c. is easily determined by the most common case in trigonometry.

For we have here, in a triangle, one side given, viz. the line measured, and we have all the angles; for that of the tower is always supposed a right angle; the other two, therefore, are equal to another right angle; but the angle observed is 35° 35′; therefore the other is 54° 25′.

The case, then, will be reduced to this; as the sine of 54° 25′, is to 47 feet, so is the sine of 35° 35′, to a fourth term, viz. 33½ feet; to which add the height of the observer's eye, suppose 5 feet; and the sum 38½ feet, is the height of the tower required.

QUADRANT, *the farther use of the, in taking of altitudes of objects, both accessible, and inaccessible*, see under the article ALTITUDE.

QUADRANT, *use of the, in taking heights and distances by the index and sights.* To take, e. gr. a height, as that of a tower whose base is accessible. Place the plane of the instrument at right angles to the plane of the horizon, and one of its edges parallel thereto, by means of the plummet, which, in that case, will hang down along the other. In this situation turn the index, till, through the sight, you see the top of the tower; and the arch of the limb of the *quadrant* between that side thereof parallel to the horizon and the index will be the height of the tower in degrees; whence, and from the distance measured as before, its height in feet, &c. may be found by calculation, as in the former case; or, without calculation, by drawing from the data, on paper, a triangle similar to the great one; whose base is the distance, and its perpendicular, measured on the scale, is the height of the tower.

QUADRANT, *use of the, in measuring horizontal distances.* Though the *quadrant* be a less proper instrument for this purpose, than a theodolite, semicircle, or the like, because angles greater than *quadrants* cannot be taken hereby, yet necessity sometimes obliges persons to have recourse to it.

The manner of its application herein is the same with that of the semicircle; all the difference between the two instruments consisting in this, that the one is an arch of 180°, and can therefore take an angle of any quantity; and the other is only an arch of 90°, and is therefore confined to angles of that quantity. See, therefore, SEMICIRCLE.

QUADRANT, *astronomical*, is a large *quadrant*, usually made of brass or iron bars, having its limb curiously divided, diagonally or otherwise, into degrees and minutes, and even seconds, if possible; with plain sights fixed to one side of it; or, instead thereof, a telescope, and an index moving about the centre, carrying either plain sights, or a telescope.

These *quadrants* are of principal use in taking observations of the sun, planets, or fixed stars.

The ancients used only plain sights; but the moderns have found it of great benefit to use telescopes instead of them.

This *quadrant* (see *Tab.* IV. *Astronomy*, *fig.* 84.) may be

moved round horizontally, by turning a perpetual screw fitted into the pedestal; for as this screw is turned about by means of a key, at the same time it causes the axis to turn, by the falling in of its threads between the teeth of a strong thick circle on the said axis. Behind the *quadrant* is fixed, at right angles to its plane, a strong thick portion of a circle, greater than a semicircle, having one semicircle of the outside thereof cut into teeth. There is likewise another strong thick portion of a circle, somewhat greater than a semicircle, behind the *quadrant*, which is moveable upon two fixed studs, at right angles to the former portion; so that the plane of this portion may be parallel, inclined, or at right angles to the plane of the *quadrant*. On the side of this portion, which is made flat next to the other fixed portion, is a contrivance with a screw, and perpetual screw, such that in turning the screw, the threads of the perpetual screw may be locked in between the teeth of the fixed circular portion; and by this means the *quadrant* fixed to any point, according to the direction of the plane of the fixed portion. And when the *quadrant* is to be moved a little in the foresaid direction, this may be done by turning the perpetual screw with a key. The outside of the above mentioned moveable circular portion is cut into teeth, and about the centre thereof the axis is moveable, according to the direction of the plane of the said portion. In this axis slides a little piece, carrying a perpetual screw, whose thread, by means of a trigger, may be locked in between the teeth of the moveable circular portion. And so when the axis is set in the pedestal, the *quadrant* may be fixed to any point, according to the direction of the plane of the said moveable portion. Therefore by these contrivances the *quadrant* may be readily fixed to any required situation, for observing celestial phenomena, without moving the pedestal. There is a piece sliding on the index, upon which the moveable telescope is fastened, carrying a screw and perpetual screw; so that when the telescope and index are to be fixed upon any point in the limb of the instrument, this may be done by means of the screw which locks the threads of the perpetual screw in between some of the teeth cut round the curve surface of the limb of the instrument; and when the index and telescope are to be moved a very minute space backwards or forwards along the limb, this is done by means of a key turning a small wheel, fastened upon the aforenamed piece, which is cut into a certain number of teeth, and whose axis is at right angles to the plane of the *quadrant*; for this wheel moves another (having the same number of teeth as that) which is at the end of the cylinder, on which is the perpetual screw; and thus the perpetual screw is turned about; and so the index and telescope may be moved a very small space backwards or forwards along the limb. The number of teeth into which the curve surface of the limb is divided must be as great as possible, and the threads of the perpetual screw falling between them very fine; for upon this the exactness of the instrument very much depends. *Quadrants* of this kind are commonly two feet radius, and made altogether of brass, except the pedestal and perpetual screws; the telescopes have each two glasses and cross-hairs in their foci.

The use of this instrument is obvious. Being adjusted as above, and turned horizontally round on its axis, till, through the moveable telescope, the object be seen to fall in with the point of intersection of the cross-hairs; the degrees cut by the index give the altitude required.

A large *quadrant* (with a telescopic sight) fixed in the plane of the meridian to a wall, is thence called a MURAL *arch*, and is found to be the most accurate, expeditious, and commodious instrument, for the chief purposes of astronomy. The particular construction of this instrument, and the method of graduating it, with the curious apparatus lately invented by Mr. Bird, and applied to this purpose, would require a more ample and minute account than the nature of this work will allow; we shall, therefore, refer to the writers cited under MURAL *arch*.

Mr. Gersten has given us a description of a new astronomical *mural quadrant*, which he says is free from many of the usual inconveniencies attending the use of such instruments. See Phil. Transf. N° 483. sect. 18.

QUADRANT, *Davis's*. See BACKSTAFF.

The theory of this *quadrant* is very intelligible; for the line AC (*Tab. Navigation, fig.* 6.) being horizontal, the arc *f*GC is equal to the height of the sun above the horizon; but the arc *f*GC = the arc BE + GC; and the arc *df* = 90° = the altitude and zenith distance taken together; consequently the zenith distance = arcs *fd* + CF = IB + CF.

When the horizon is obscured by hazy weather, *Davis's quadrant* is of no use; and this often occasions melancholy consequences. Means have, therefore, been sought after to remedy this defect. Mr. Hadley has recommended and described a spirit level for this purpose. Mr. Leigh proposes a water-level to be fixed to the *quadrant*; and he likewise has given the description and use of an apparatus to be added to this instrument, consisting of a mercurial level, which he prefers, no doubt justly, to a water-level. See Phil. Transf. N° 430, &c. or Martyn's Abr. vol. viii. p. 357, &c. 360, &c.

It has been observed, that one great objection against this instrument is the trouble and time lost in sliding the sight-vane up or down, which sometimes cannot conveniently be done without taking the *quadrant* from the eye, whereby an opportunity may be lost of making the observation. But this defect is easily removed by having a long index or ruler fitted to the *quadrant*; one end moving round the centre to which the horizon vane is fixed, and having the sight vane fixed to the other end. By this contrivance the sight vane may be readily raised higher, or lowered, by the motion of the index about its centre, which may be done without taking the instrument from the eye.

QUADRANT, *Gunter's*, is a kind of *quadrant* (represented *Tab.* IV. *Astronomy, fig.* 85.) invented by our countryman Edm. Gunter.

This, beside the graduated limb, fixed sights, and a plummet, as in the other *quadrants*, has, likewise, a STEREOGRAPHICAL *projection* of the sphere on the plane of the equinoctial, with the eye placed in one of the poles; by which, besides the common uses of other *quadrants*, several useful questions in astronomy, &c. are easily solved.

QUADRANT, *use of Gunter's*. 1. *To find the sun's meridian altitude for any given day; or the day of the month for any given meridian altitude.* Lay the thread to the day of the month in the scale next the limb; and the degree it cuts in the limb is the sun's meridian altitude.

Thus, the thread being laid on the 15th of May, cuts 59° 30′, the altitude sought. And, contrarily, the thread being set to the meridian altitude, will shew the day of the month.

2. *To find the hour of the day.* Having put the bead, which slides on the thread, to the sun's place in the ecliptic, observe the sun's altitude by the *quadrant*; then, if the thread be laid over the same in the limb, the bead will fall upon the hour required.

Thus, suppose on the 20th of April, the sun being then in the beginning of Taurus, I observe the sun's altitude by the *quadrant* to be 36°, I place the bead to the beginning of Taurus in the ecliptic, and lay the thread over 36° of the limb, and find the bead to fall upon the hour-line marked 3 and 9; accordingly, the hour is either 9 in the morning, or 3 in the afternoon. Again, laying the bead on the hour given (having first rectified, or put it to the sun's place) the degree cut by the thread on the limb gives the altitude.

Note, The bead may be rectified otherwise; viz. by bringing the thread to the day of the month, and the bead to the hour-line of 12.

3. *To find the sun's declination from his place given, and contrariwise.* Set the bead to the sun's place in the ecliptic; move the thread to the line of declination ET, and the bead will cut the degree of declination required. Contrarily, the bead being adjusted to a given declination, and the thread moved to the ecliptic, the bead will cut the sun's place.

4. *The sun's place being given, to find his right ascension; or contrarily.* Lay the thread on the sun's place in the ecliptic, and the degree it cuts on the limb is the right ascension sought. Contrarily, laying the thread on the right ascension, it cuts the sun's place in the ecliptic.

5. *The sun's altitude being given, to find his azimuth; and contrariwise.* Rectify the bead for the time (as in the second article), and observe the sun's altitude; bring the thread to the complement of that altitude; thus the bead will give the azimuth sought, among the azimuth lines.

6. *To find the sun's amplitude either rising or setting, when the day of the month or sun's place is given.* Let the bead, rectified for the time, be brought to the horizon; and there it will shew the amplitude sought.

7. *To find the hour of the night, from some of the five stars laid down on the quadrant.* 1. Put the bead to the star you intend to observe, and find how many hours it is off the meridian (by article 2.); then, from the right ascension of the star, subtract the sun's right ascension converted into hours, and mark the difference; which difference, added to the observed hour of the star from the meridian, shews how many hours the sun is gone from the meridian; which is the hour of the night.

Suppose, e. gr. on the 25th of May, the sun being in the fourth degree of Gemini, I set the bead to Arcturus; and, observing his altitude, find him to be in the west, about 52° high, and the bead to fall on the hour-line of two

two afternoon; then will the hour be 11 hours 50 minutes paſt noon; or 10 minutes ſhort of midnight.

For 62°, the ſun's right aſcenſion, converted into time, makes 4 hours 8 minutes; which, ſubtracted from 13 hours 58 minutes (the right aſcenſion of Arcturus), the remainder will be 9 hours 50 minutes; which, added to 2 hours, the obſerved diſtance of Arcturus from the meridian, ſhews the hour of the night to be 11 hours 50 minutes.

Quadrant, *Hadley's*, the common name for the juſtly eſteemed *quadrant*, invented by the late John Hadley, Eſq. This *quadrant*, which at firſt ſhared the fate of many other ingenious inventions, to be neglected by ignorant and obſtinate men, even though highly uſeful to them in their profeſſion, has at laſt made its way, in ſpite of habit and prejudice, and is now generally uſed.

The firſt idea of this excellent inſtrument ſeems to have been ſuggeſted by Dr. Hooke; for Dr. Sprat, in his Hiſtory of the Royal Society, p. 246, mentions the invention of a new inſtrument for taking angles by reflection, by which means the eye at the ſame time ſees the two objects both as touching the ſame point, though diſtant almoſt to a ſemicircle; which is of great uſe for making exact obſervations at ſea. This inſtrument is deſcribed and illuſtrated by a figure in Dr. Hooke's Poſthumous Works, p. 503. But as it admitted of only one reflection, it would not anſwer the purpoſe. This was at laſt effected by Sir Iſaac Newton, who communicated to Dr. Halley a paper of his own writing, containing the deſcription of an inſtrument with two reflections, which ſoon after the doctor's death was found among his papers by Mr. Jones, who communicated it to the Royal Society, and it was publiſhed in the Philoſophical Tranſactions, N° 465, anno 1742. See Martyn's Abridg. vol. viii. p. 129, &c. How it happened that Dr. Halley never mentioned this in his life-time is very extraordinary; more eſpecially as John Hadley, Eſq. has deſcribed, in N° 240, anno 1731, an inſtrument conſtructed on the ſame principles, which is now in general uſe among the ſkilful ſeamen of moſt maritime nations. See Phil. Tranſ. abr. vol. vi. p. 139. Mr. Hadley, who was well acquainted with Sir Iſaac Newton, might have heard him ſay, that Dr. Hooke's propoſal could be effected by means of a double reflection; and, perhaps, in conſequence of this hint, he applied himſelf, without any previous knowledge of what Sir Iſaac Newton had actually done, to the conſtruction of his inſtrument. Mr. Godfrey of Penſylvania had recourſe to a ſimilar expedient; and, therefore, ſome gentlemen of that colony have aſcribed the invention of this admirable inſtrument to him. Martyn's Abr. Phil. Tranſ. vol. viii. p. 366, &c.

Hadley's *quadrant*, as it is now conſtructed and uſed, conſiſts of an arch ABC (*Tab. Navigation, fig.* 16.) which is an octant, or eighth part of a circle, though a ſextant, or ſixth part of a circle, renders it more uſeful; an index D, with its Vernier's ſcale; a ſpeculum E; two horizontal glaſſes F and G, with their adjuſters; two ſkreens K, K; and two ſight vanes H, I. The octant conſiſts of the two radiuſes or bars AB, AC; the arch or limb BC; and the two braces L, M, which ſtrengthen and prevent it from warping. The arch contains only the eighth part of the circumference of a circle, or 45 degrees, which is divided into 90 primary diviſions, each of which repreſents degrees, and numbered 0, 10, 20, 30, &c. to 90, beginning at each end of the arch for the convenience of numbering both ways, either for altitudes or zenith diſtances. Every degree is ſubdivided into two or three parts, and theſe, either by the method of diagonals, or by Vernier's diviſion or ſcale (which is much better) are ſo divided as to ſhew one or two minutes.

The index D is a flat rod or bar, moveable round the centre of the inſtrument; that part of the index which ſlides over the graduated arch BC having either a ſharp edge to cut the diagonal diviſions, when ſo divided, or having upon it a Vernier's ſcale. From the bottom of the index turns up, againſt the back of the inſtrument, a piece of braſs, with a ſcrew in it, ſerving to faſten the index againſt any diviſion. The index, when moved along the arch, ſhould be taken hold of by the bottom part, and not by the middle. For the conſtruction of the Vernier ſcale, ſee Vernier.

In order to underſtand its uſe in this inſtrument, we may obſerve, that Hadley's *quadrants*, being generally of eighteen inches radius, have each degree on the limb divided into three parts, of twenty minutes each, and the breadth of the Vernier ſcale equal to ſeven degrees; and as theſe ſeven degrees are divided into twenty-one parts on the limb, each of twenty minutes, the ſcale is divided into twenty equal parts; conſequently each diviſion on the ſcale is larger than each diviſion on the limb by one twentieth part of a diviſion on the limb, or one twentieth of twenty minutes; that is, each diviſion on the ſcale exceeds each on the limb by one minute of a degree; conſequently in whatever place the Vernier's ſcale ſtands, one of its diviſions will always ſtand againſt, or cloſe to a diviſion on the limb. The middle line of the index D, which is the moveable radius of the *quadrant*, gives the index or pointer of the Vernier ſcale, which is uſually its middle line, having ten diviſions, or minutes, on each ſide, and numbered 5, 10 to the right, and 15, 10 to the left; that is, the firſt 10 minutes of the ſcale are reckoned in order from the middle line or index to the right, and the latter 10 minutes are to be reckoned from the left-hand end of the ſcale towards the right, and end at the middle line. If the middle line or index of the Vernier ſtood againſt 48°, one diviſion, and leſs than half of another diviſion; and on examining the right-hand ſide of the ſcale, the ſeventh diviſion ſtood againſt a diviſion on the limb, the index in this caſe is reckoned to ſtand againſt 48° 27′. If the index of the ſcale ſtood againſt 34°, two diviſions, and more than half of another, and on examining the left-hand ſide of the ſcale, it was found that the ſixteenth diviſion thereof ſtood againſt a diviſion on the limb, it is to be read 34° 56′; and ſo of others. The exact coincidence of the diviſions on the limb and ſcale is beſt diſcovered by a magnifying glaſs, or double convex lens.

The ſpeculum of the *quadrant* is a piece of flat glaſs, quickſilvered on one ſide, and ſet in a braſs box with the ſurface of the ſpeculum perpendicular to the plane of the inſtrument, againſt whoſe centre ſtands the middle of the glaſs, its ſurface coinciding with the middle line of the index. As the index ſlides along the arch, the poſition of the ſpeculum is altered, it being fixed to the index. The uſe of the ſpeculum is to receive the rays from the object obſerved, and reflect them on the horizon-glaſſes, which are ſmall pieces of looking-glaſs placed on one of the radiuſes, with their faces turned obliquely to the ſpeculum. The glaſs F has only its lower part quickſilvered, and ſet in braſs-work; the upper part being left tranſparent, to ſee the horizon through it. In the middle of the glaſs G is a tranſparent ſlip, through which the horizon is to be ſeen. Both theſe glaſſes are ſo mounted, as to have their poſitions ſet truly by their adjuſters at the back, if the frame of the inſtrument ſhould be warped.

The ſkreens are two pieces of coloured glaſs ſet in frames, and intended to prevent the ſun's rays from injuring the eyes of the obſerver. When they are uſed with the glaſs F, they are to be where the figure ſhews them; but when uſed with the glaſs G, they are to be ſet at the hole *r* above G. The ſight-vane at H is uſed with the glaſs G in back-obſervations, when the face is turned from the object; and the ſight-vane I, which has two holes, is uſed with the glaſs F in fore-obſervations, or when the face is turned towards the object.

Quadrant, *Hadley's, to rectify or adjuſt.* 1. *For the fore-obſervation.* Bring the index D cloſe to the button *b*, that the middle of the Vernier's ſcale may ſtand againſt 0 degree; look through the right-hand hole in the vane I, and direct the ſight through the tranſparent part of the glaſs F, to obſerve the horizon. Now if the horizon-line, ſeen both in the quickſilvered part, and through the tranſparent part, ſhould coincide, or make one ſtraight line, then is the glaſs F truly adjuſted; but if one of the horizon-lines ſtands above the other, ſlacken the ſcrew in the middle of the lever behind the glaſs F, and turn the ſcrew at the end of the lever, backwards or forwards, as there is occaſion, until the horizon-lines coincide; faſten the ſcrew in the middle of the lever, and then is the horizon-glaſs adjuſted.

2. *For the back-obſervation.* Turn the button *b* on one ſide, and ſet the middle line of the index D as many degrees before 0 degree, as is twice the dip of the horizon, according to your height above the horizon; hold the plane of the inſtrument vertically, with the arch downwards; look through the hole in the vane H; and if the horizon-line, ſeen through the tranſparent ſlit in the glaſs G, coincides with the image of the horizon ſeen in the quickſilvered part of the ſame glaſs, then is the glaſs G in its proper poſition: if not, ſlacken the ſcrew-pin in the middle of the lever behind the glaſs G, and looking through the vane H, as before directed, turn the ſcrew at the end of the lever backward or forwards as it is wanted, until the horizon-line coincides; then tighten the middle ſcrew, and the glaſs G is adjuſted. In ſetting this glaſs by the oppoſite horizon, the head ſhould be held a little backward, not to intercept the light from behind. The horizon ſeen from behind will be inverted; that is, the water will appear above, and the ſky below; and if the two horizon-lines croſs one another, the inſtrument is not held upright.

Quadrant, *Hadley's, to take the ſun's altitude with.* 1. *By the fore-obſervation.* Fix the ſkreens K above the horizon-glaſs F, uſing either, or both of them, according

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to the strength of the sun's rays, by turning one or both of the frames of these glasses close against the plane or face of the instrument; then the face being turned towards the sun, hold the *quadrant* by the braces L, M, or by either radius, as is found most convenient, so as to be in a vertical position with the arch downwards; put the eye close to the right-hand hole in the vane I; look at the horizon through the transparent part of the horizon-glass F; at the same time move the index D with the left-hand, until the image of the sun, seen in the quicksilvered part, falls in with the line of the horizon, taking either the upper or under edge of the solar image; swing your body gently from side to side, and if the edge of the sun used be observed not to cut, but to touch the horizon-line, like a tangent, the observation is well made; then shall the degrees on the arch, reckoned from that end next your body, give the altitude of that edge of the sun which was brought to the horizon.

If the lower edge was observed, then 16 minutes added to the said degrees, gives the altitude of the sun's centre; but if the upper edge was used, the 16 minutes must be subtracted.

2. *By the back-observation.* Put the stem of the skreens K into the hole next the horizon-glass G, using them, as before said, according to the strength of the sun's rays; then the back being turned to the sun, hold the instrument by the radius C and brace L, in a vertical position with the arch downwards; put the eye close to the hole in the vane H, look for the horizon through the transparent slit in the glass G; with the right-hand move the index D, until the image of the sun, seen in the quicksilvered part of the glass G, stands in the horizon-line, seen through the transparent slit, using either the upper or under edge of the sun; swing your body gently to the right and left, to try if the sun's edge runs along the horizon; if it does, the observation is well made, and the degrees reckoned from that end of the arch farthest from your body, will give the altitude of that part of the sun which was observed.

If the sun's lower edge was observed, then 16 minutes subtracted from the before found degrees, will give the altitude of the sun's centre; but if the upper edge was observed, then the 16 minutes are to be added.

In either of these observations, if the altitude of the centre could be observed, there would then be no need of using the 16 minutes.

To find the sun more easily in the horizon; turn your back to the sun, and look through the vane I and glass F, down on the middle of the shadow of your head; move the index forward, till the reflected image of the horizon before you is brought down to the place you look on, in the glass F; and the index will then be set pretty near to the altitude, and so fitted to find the sun more readily, either in the fore or back-observation.

The fore-observation is rather most convenient, especially in great altitudes, because there is a much larger scope above and below the altitude wanted, than there is in the back observation, which, on account of the obliquity of the speculum and horizon glasses, is more contracted in its use; and indeed the back-observations need never be used for the sun, when there is a clear horizon forwards, or under the sun; when this is hazy and ill defined, then it is best to use the back-observation, if the horizon is clear that way; and therefore it is proper that the horizon-glass G should be always in readiness, by having it well adjusted; but because the former method is not readily attained by beginners, we shall annex another, which is somewhat more convenient.

Another way to adjust for the back-observation. Take the altitude of the lower edge of the sun by the fore-observation, as near to noon as can be; then put the skreens into the hole near the vane H, and turning your back to the sun, and holding the instrument properly, taking care not to move the index, look for the horizon-line through the transparent slit of the glass G, and if the horizon-line touches the upper edge of the sun's image in the glass G, it is properly adjusted: if they do not touch, turn the glass by the lever behind it, till they do.

This operation must be done quickly, before the sun sensibly alters in altitude; and may be frequently repeated to make the fore and back-observations agree.

QUADRANT, *Hadley's, to take the altitude of a star with.* 1. *By the fore-observation.* Look directly up at the star through the vane I, and transparent part of the glass H, the index D being close to the button *b*; then will the image of the star, by reflection, be seen in the silvered part right against the star, seen through the other part: move the index forward, and as the image descends, let the centre of the *quadrant* descend also to keep it in the silvered part, till it comes down on a line with the horizon, seen through the transparent part; and the observation is made.

2. *By the back-observation.* Through the vane H, and the transparent slit in the glass G, look directly at the star; at the same time move the index till the image of the horizon behind you, being reflected by the great speculum, is seen in the quicksilvered part of G, and meets the star; and the index will then shew the degrees of altitude.

If the altitude of the star is pretty great, some other stars, beside that wanted, may appear by the light passing by the great speculum, and falling on the glass G; the light of these will dance with the motion of the instrument, but the true star will remain about the middle of the glass at rest, and so the others cannot be mistaken for the true one.

Every altitude observed at sea must be corrected: two corrections are common to the centre of every object; and three to the moon, for the DIP of the horizon, the REFRACTION, and the PARALLAX; for which purpose tables are provided. See Tables requisite to be used, with the Astronomical and Nautical Ephemeris, 1766; and Robertson's Navigation, book ix. p. 303.

Hadley's *quadrants*, within a few years past, having been applied to take the necessary observations for finding the longitude at sea, it has been found that such observations required a degree of accuracy, of which the instruments, constructed in the common way, were not capable. And expert mariners having complained of these defects, different workmen have applied sundry articles to the *quadrants* to remedy the inconveniencies complained of; some of which are,

1st. A screw to the lower end of the index, to regulate its motion when brought by the hand to a division nearly shewing the contact required; and a magnifying glass to read off the divisions between the limb and the Vernier.

2d. A small tube, or telescope, instead of the sight-vanes, to direct the line of sight in a position parallel to the plane of the *quadrant*; which tube was screwed into a ring fixed to a square stem that slid in the socket made for the sight-vane, and by the help of a screw in its bottom (at the back of the *quadrant*) the stem could be raised or lowered so as to move the axis of the telescope to point to any part of the horizon-glass judged fittest for the observation.

3d. The extending the arch from an octant to a sextant, or sixth part of a circle, whereby angles exceeding 90 degrees may be observed; as is sometimes wanted in taking the angular distance between the moon and sun, or moon and star: also, for the convenience of holding the instrument easily in such observations, a stout handle was fixed to the back, which was a very necessary addition.

But other errors or inconveniencies still attended these instruments, namely,

1st. The speculum being liable, in the ordinary way of fitting it, to be bent; and consequently the same observation would have different measures, according as the object happened to be reflected from different parts of the speculum. This has lately been rectified by a new manner of setting the speculum in its frame.

2d. The adjustment of the horizon-glasses.

Both these glasses are to stand perpendicular to the plane of the instrument; and when o on the index stands against o on the arch, the plane of the fore-horizon-glass is to be parallel to the plane of the speculum; and the plane of the back-horizon-glass is to be at right angles to the speculum. A new method of adjusting these glasses has been lately discovered, very accurate in principle, and ready in practice; particularly for the back-observation, which hitherto has been but little used on account of the difficulty of adjusting its horizon-glass; which has lately been happily removed by the ingenious Mr. Peter Dollond, optician to his majesty; and he also thought of the method of preventing the index speculum from being bent in its frame. By his adjustments, angles of any magnitude under 180 degrees may be taken; viz. by the fore-observation all under 120°, with a sextant; and by the back-observation, all between 90 and 180 degrees. Phil. Trans. vol. lxii. art. 14. p. 95, &c.

3d. Although Mr. Hadley at first directed that the line of sight should be parallel to the plane of the instrument; and for preserving it so, proposed, that in the telescope should be fixed two parallel wires, which in using should be parallel to the *quadrant*, and the contact of the objects should be observed in the middle between the two wires; yet these circumstances not being sufficiently attended to; therefore the two parallel wires are now placed in the focus of the eye-glass, and divide the diameter of the field of view into three equal parts; and when the telescope is adjusted parallel to the plane of the instrument, it will remain so during the observation.

4th. As every glass mirror has two reflexions, viz. one from the face, and one from the silvered back; these

double reflexions not only cause some confusion among the reflected rays, but considerable errors might arise should the face and back of the glass be not parallel planes: none of these could happen from a plane mirror which has but one reflexion; and, therefore, the upper part of the index speculum has its back rough ground and blacked; whereby this part will reflect the rays only which fall on its face; and these sufficiently strong when the object observed is bright; but when otherwise, the object may be observed from the lower part of the speculum, which is silvered; the line limiting these two parts is parallel to the plane of the *quadrant*. This improvement was directed by the reverend Mr. Maskelyne, astronomer royal. Phil. Trans. vol. lxii. art. 15, p. 99, &c.

The methods how these several adjustments are to be made, together with some other particulars relating to the use of the instrument, are fully treated of in the book which accompanies the sale of Mr. Dollond's *quadrants*.

We shall here add, that one great inconvenience which mariners have to struggle with at sea is the frequent want of an horizon, arising from the haziness of the atmosphere, and tremulous motion of the surface of the water. To remedy this many methods have been proposed; among which Serson's whirling speculum or top (see HORIZONTAL *speculum*, and Phil. Trans. vol. xlvii. part ii. p. 352.) was, for some time, thought a proper instrument, but it has been found imperfect. See *Davis's* QUADRANT.

Some artists, says Mr. Robertson, use the following method: into a wooden, or iron, circular box, of about two and a half, or three inches diameter, and about half an inch deep, pour about a pound or more of quicksilver; and on this lay a metal speculum, or piece of plain glass, whose diameter is about one-third of an inch less than that of the box; this will float in the quicksilver, and shew the image of the sun very steady. This apparatus being slung in jimbals, will preserve a tolerable good horizon. The speculum or glass should be homogeneous, and have parallel sides. There are some workmen who can work the two planes of a piece of glass, so that they shall be demonstratively parallel. Or, the fine surface of the quicksilver will answer the purpose of itself. In all observations with these artificial horizons, a piece of coloured glass should be fixed before the vane that is used to preserve the eye; and the skreens K may be taken off.

QUADRANT, *Hadley's, theory of.* It is a first principle in optics, that the angle of incidence, whatever be the inclination of the incident ray, is equal to the angle of reflection, i. e. if the angle of incidence DBA be 30°, the angle of reflection DBC will be also 30°. It is also plain, that if while the radiant A (*Tab. Navigation, fig.* 17, and *fig.* 18.) remains in the same place, the mirror EF, by revolving round B, moves into the position *fe*, then the alteration in the angle between the incident and reflected ray will be double to the angle shewing the change of position in the mirror. Suppose the mirror changes 10° from the radiant, then the perpendicular BD goes 10° farther from the radiant A into the position B*d*; and the incident angle *d*BA is 40°, and the reflected angle *d*B*c* is 40°; so the angle ABC is altered from 60° to 80°; a difference of 20° for 10° change of position in the mirror. Suppose again the mirror to change, in position, 10° towards the radiant A, then the perpendicular is changed into B*d*, 10° nearer to the radiant; and the angle DBA of 30° becomes *d*BA of 20° = *d*B*c*; so that the angle AB*c* is 40°, whereas ABC was 60°; that is, by altering the position of the mirror 10°, the angle ABC was altered 20°. It may be otherwise demonstrated, that with a Hadley's *quadrant*, the angle of elevation under which an object is seen, is equal to twice the arch which the index has passed over. The instrument or angle ACB (*fig.* 19.) is 45°; *ab* is a reflecting glass fixed parallel to CB; CD is the index, with a reflecting glass at G, so fixed as to be parallel to *ab*, when CD coincides with CB; S the sun; SG a solar ray reflected from G to F, and from F to E, the place of the eye; and HFE the horizontal line at the time of the observation. Then will the angle of elevation IGS be equal to twice the angle BCD; for the angle of reflection DGF = the angle of incidence SGC = CGL. And the angle of reflection *b*FE = the angle of incidence *a*FG = FLE (*ab* being parallel to LE) = FEL. But IGC = HPC = PCE + PEC (the external angle being equal to the two internal and opposite) = PCE + FLE = PCE + GCL + CGL. Or IGC = IGS + SGC = PCE (or GCL) + GCL + CGL = 2BCD + CGL. Consequently IGS = 2BCD. See Robertson's Navigation, book ix. p. 295, &c. p. 390, &c.

Mr. Michell has recommended Hadley's *quadrant* for surveying, and especially the surveying of harbours, and also for piloting ships into harbours. Phil. Trans. vol. lv. art. 10, p. 70.

Mr. Wales, in captain Cook's Voyage, applied it to measuring the quantity eclipsed in an eclipse of the sun; in which operation it answers the purpose of a micrometer, to a great degree of certainty. See an account of the improvements suggested in the construction of these instruments, and also of the various uses to which they may be applied, in Magellan's Description des Octants & Sextants Anglois, &c. 4to.

Other *quadrants* have been contrived since, by some ingenious artists, all of which have their merit; but the particulars of their constructions are too many for this place; and perhaps, on the whole, nothing preferable to Mr. Hadley's invention has yet been found.

QUADRANT, *horodictical*, is a pretty, commodious instrument; thus called from its use in telling the hour of the day.

Its construction is so simple and easy, and its application so ready, that we shall describe both, for the use of some who may want other conveniencies.

QUADRANT, *construction and use of the horodictical.* From the centre of the *quadrant* C (*Tab.* IV. *Astron. fig.* 86.) whose limb AB is divided into 90°, describe seven concentric circles at intervals, at pleasure; and to these add the signs of the zodiac in the order they are represented in the scheme.

2. Applying a ruler to the centre C, and the limb AB, mark upon the several parallels the degrees corresponding to the altitude of the sun when therein, for the given hours; connect the points belonging to the same hour with a curve line, to which add the number of the hour. To the radius CA fit a couple of sights, and to the centre of the *quadrant* C, tie a thread with a plummet; and, upon the thread, a bead to slide.

If, now, the bead be brought to the parallel wherein the sun is, and the *quadrant* be directed to the sun till a visual ray pass through the sights, the bead will shew the hour.

For the plummet, in this situation, cuts all the parallels in the degrees corresponding to the sun's altitude. Since, then, the bead is in the parallel which the sun then describes, and through the degrees of altitude to which the sun is elevated every hour there pass hour-lines, the bead must shew the present hour. Some persons who are not very nice, represent the hour-lines by arches of circles, or even by straight lines; and that without any sensible error.

QUADRANT, *sinical*, is an instrument of use in navigation. It is represented *Tab. Navigation, fig.* 20. and consists of several concentric quadrantal arcs, divided into eight equal parts by radii, with parallel right lines crossing each other at right angles.

Now any of the arcs, e. gr. BC, may be accounted a *quadrant* of any of the great circles of the sphere, chiefly of the horizon and meridian: if, then, BC be taken for a *quadrant*, e. gr. of the horizon, either of the sides, e. gr. AB, may represent the meridian; and the other, AC, will represent a parallel, or line of east and west; and all the other lines parallel to AB will also be meridians; and all those parallel to AC, will be east and west parallels, or east and west lines.

Again, the eight spaces into which the arcs are divided by the radii, represent the eight points of the compass in a quarter of the horizon; each containing 11° 15′.

The arc BC is likewise divided into 90°, and each degree is subdivided into 12′, diagonal-wise.

To the centre is fixed a thread, as AL; which being laid over any degree of the *quadrant*, serves to divide the horizon.

If the *sinical quadrant* be taken for a fourth part of the meridian, one side thereof, AB, may be taken for the common radius of the meridian and the equator; and then the other, AC, will be half the axis of the world. The degrees of the circumference BC will represent degrees of latitude, and the parallels to the side AB, assumed from every point of latitude to the axis AC, will be radii of the parallels of latitude, as likewise the sine-complements of those latitudes.

Suppose, then, it be required to find the degrees of longitude contained in 83 of the lesser leagues, in the parallel of 48°. Lay the thread over 48° of latitude on the circumference, and count thence the 83 leagues, on AB, beginning at A; these will terminate at H, allowing every small interval four leagues, and the interval between the broad lines twenty leagues. Then tracing out the parallel HG, from the point H to the thread; the part AG of the thread shews that 125 greater, or equinoctial leagues, make 6° 15′, allowing twenty leagues to a degree, and three minutes for one league; and therefore, that 83 lesser leagues AH, which make the difference of longitude of the course, and are equal to

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the radius of the parallel G I, make 6° 15′ of the said parallel.

If the ship sail an oblique course, such course, besides the north and south greater leagues, gives lesser leagues easterly and westerly; to be reduced to degrees of longitude of the equator. But these leagues being made neither on the parallel of departure, nor on that of arrival, but in all the intermediate ones, we must find a mean proportional parallel between them.

To find this, we have on the instrument a *scale of cross latitudes*. Suppose, then, it were required to find a mean parallel between the parallels of 40° and 60°. With your compasses take the middle between the 40th and 60th degree on the scale: this middle point will terminate against the 51st degree, which is the mean parallel required.

Use of the sinical Quadrant. There are formed triangles upon this instrument similar to those made by a ship's way, with the meridians and parallels; the sides of which triangles are measured by the equal intervals between the concentric *quadrants*, and the lines N. and S. E. and W.

The lines and arcs are distinguished, every fifth, by a broader line; so that if each interval be taken for one league, there will be five between one broad line and another: and if every interval be taken for four leagues, then there will be twenty leagues, which make a sea degree, from one broad line to the other.

Now, suppose a ship to have failed 150 leagues north-east, one fourth north; which is the third point, and makes an angle of 33° 45′, with the north part of the meridian. Here are given two things; viz. the course, and the distance failed; by which a triangle may be found on the instrument, similar to that made by the ship's course, and her longitude and latitude; and hence may the unknown parts of the triangle be found.

Thus, supposing the centre A to represent the place of departure; count, by means of the concentric arcs, along the point the ship failed on, as A D, 150 leagues from A to D; then is the point D the place the ship is arrived at, which note. This done, let D E be parallel to the side A C; and then there will be formed a right-angled triangle A E D, similar to that of the ship's course, difference of longitude, and latitude: the side A E gives 125 leagues for the difference of latitude northwards; which makes 6° 15′, reckoning twenty leagues to a degree, &c. and the side D E gives 83 lesser leagues answering to the parallels; which being reduced, as shewn above, gives the difference of longitude. And thus is the whole triangle found.

Quadrant, *Sutton's*, sometimes also called *Collins's pocket* Quadrant. One of the best of Mr. Sutton's *quadrants* (represented *Tab.* IV. *Astronomy*, *fig.* 87.) is the stereographic projection of one quarter of the sphere between the tropics, upon the plane of the equinoctial, the eye being in the north pole.

This is fitted to the latitude of London. The lines running from the right hand to the left are parallels of altitude, and those crossing them are azimuths: the less of the two circles bounding the projection is one fourth of the tropic of Capricorn; the greater, one fourth of that of Cancer. The two ecliptics are drawn from a point on the left edge of the *quadrant*, with the characters of the signs upon them; and the two horizons are drawn from the same point. The limb is divided both into degrees and time; and, by having the sun's altitude, the hour of the day may be here found to a minute.

The quadrantal arcs, next the centre, contain the calendar of months; and under them, in another arc, is the sun's declination.

On the projection are placed several of the most noted fixed stars between the tropics; and next below the projection is the quadrat, and line of shadows, being only a line of natural tangents to the arcs of the limb; and by help thereof, the heights of towers, &c. may be taken with considerable exactness.

Use of Sutton's or Collins's Quadrant. *To find the time of sun-rising or setting, his amplitude, azimuth, hour of the day, &c.* Lay the thread over the day of the month, and bring the bead to the proper ecliptic, either that of summer or winter, according to the season (which is called rectifying); then, moving the thread, bring the bead to the horizon; in which case the thread will cut the limb in the time of the sun's rising or setting, before or after six; and, at the same time, the bead will cut the horizon in the degrees of the sun's amplitude.

Again, observing the sun's altitude with the *quadrant*, and supposing it found 45° on the 24th of April; lay the thread over the 24th of April; bring the bead to the summer ecliptic, and carry it to the parallel of altitude 45°. In which case the thread will cut the limb at 55° 15′, and the hour will be seen among the hour-lines to be either forty-one minutes past nine in the morning, or nineteen past two in the afternoon.

Lastly, the bead among the azimuths shews the sun's distance from the south, viz. 50° 41′.

But note, that if the sun's altitude be less than what it is at six o'clock, the operation must be performed among those parallels above the upper horizon; the bead being rectified to the winter ecliptic.

Quadrant, in *Gunnery*, called also the *gunner's square*, is an instrument serving to elevate or point cannons, mortars, &c. according to the places they are to be levelled or directed to.

It consists of two branches, made of brass or wood; one about a foot long, eight lines broad, and one line in thickness; the other four inches long, and of the same thickness and breadth as the former. Between these branches is a *quadrant* divided into ninety degrees, beginning from the shorter branch, and furnished with a thread and plummet. See its figure represented in *Tab.* II. *Gunnery*, *fig.* 14.

The use of this instrument is easy; nothing more being required but to place the longest branch in the mouth of the cannon or mortar, and elevate or lower it, till the thread cuts the degree necessary to hit a proposed object. See *Pointing of a* Gun.

Sometimes, also, on one of the surfaces of the long branch, is noted the division of diameters, and weights of iron bullets; as also the bores of pieces. See Caliber.

Quadrant *of altitude*, is an appendage of the artificial globe; consisting of a lamina or slip of brass, the length of a *quadrant* of one of the great circles of the globe; and divided into ninety degrees.

At the end, where the divisions terminate, there is a nut riveted on, and furnished with a screw, by means whereof the instrument is fitted on to the meridian; and is moveable round upon the rivet, to all points of the horizon. See its figure in *Tab. Astronomy*, *fig.* 61.

Its use is to serve as a scale in measuring of altitudes, amplitudes, azimuths, &c. See the manner of its application under the *Use of the* Globe.

QUADRANTAL, in *Antiquity*, a vessel in use among the Romans for the measuring of liquids.

It was at first called amphora; and afterwards *quadrantal*, from its form, which was square every way, like a die.

Its capacity was eighty libræ, or pounds of water, which made forty-eight sextaries, two urnæ, or eight congii.

Quadrantal *space*, in *Geometry*. See Quadrant.

Quadrantal *triangle*, is a spherical *triangle*, one of whose sides at least is a quadrant of a circle; and one of its angles a right angle.

QUADRANTATA *terræ*, in our *Ancient Law Books*, is used for a quarter of an acre; now called a rood.

QUADRAT, *quadratum*, called also *geometrical square*, and *line of shadows*, is an additional member on the face of the common Gunter's and Sutton's quadrants; of some use in taking altitudes, &c. See Quadrant, and *Tab.* IV. *Astronomy*, *fig.* 85.

The *quadrat* more distinctly exhibited in *Tab.* III. *Surveying*, *fig.* 46. has each of its sides divided into a hundred equal parts, commencing from the extremes; so that the number 100 falls on the angle, representing tangents to the arc of the limb.

The divisions are distinguished by little lines from 5 to 5, and by numbers from 10 to 10; and the divisions being occasionally produced across, form a kind of lattice, consisting of 10000 little squares.

The proportion here is, as radius is to the tangent of the angle of altitude at the place of observation (i. e. to the parts of the *quadrat* cut by the thread) so is the distance between the station and the foot of the object, to its height above the eye. See Altitude.

Use of the Quadrat, *geometrical square*, or *line of shadows*.

1. The quadrant being vertically placed, and the sights directed to the top of the tower, or other object whose height is required; if the thread cut the side of the *quadrat* marked *right shadows*, the distance from the base of the tower to the point of station is less than the tower's height. If the thread falls on the diagonal of the square, the distance is just equal to the height. If it fall on that side marked *versed shadows*, the distance exceeds the height.

Hence, measuring the distance, the height is found by the *rule of three*; inasmuch as there are three terms given. Indeed, their disposition is not always the same; for when the thread cuts the side of *right shadows*, the first term in the *rule of three* ought to be that part of the side cut by the thread; the second, the side of the square; and the third, the distance measured. If the thread cut the other side, the first term is the whole side of the square;

ſquare; the ſecond, the parts of the ſide cut by the thread; and the third, the diſtance.

For an inſtance of each. Suppoſe, e. gr. in looking at the top of a ſteeple, the thread cut the ſide of *right ſhadows* in the point 40, and that the diſtance meaſures 20 poles, the caſe then will ſtand thus: as 40 is to 100, ſo is 20 to a fourth term, which I find to be 50; the height of the ſteeple in poles. Again, ſuppoſing the thread to fall on the other ſide, in the point 60, and the diſtance to meaſure 35 poles; the terms are to be diſpoſed thus: as 100 is to 60, ſo is 35 to a fourth term, viz. 21, the height required. See ALTITUDE.

Uſe of the QUADRAT *without calculation.* The preceding caſes may be performed without calculation, where the diviſions of the ſquare are produced both ways, ſo as to form the area into little ſquares.

Thus, ſuppoſe, 1. The thread to fall on 40 in the ſide of *right ſhadows*, and the diſtance be meaſured 20 poles: ſeek among the little ſquares for that perpendicular to the ſide which is 20 parts from the thread; this perpendicular will cut the ſide of the ſquare next the centre, in the point 50, which is the height required in poles.

2. If the thread cuts the ſide of *verſed ſhadows* in the point 60, and the diſtance be 35 poles; count 35 parts on the ſide of the *quadrat* from the centre; count alſo the diviſions of the perpendicular from the point 35 to the thread, which will be 21, the height of the tower in poles.

Note. In all caſes, the height of the centre of the inſtrument is to be added. See ALTITUDE, and SHADOW.

QUADRAT, in *Aſtrology*, called alſo QUARTILE, an aſpect of the heavenly bodies, wherein they are diſtant from each other a quadrant, or ninety degrees. See ASPECT.

QUADRAT, in *Printing*, is a ſort of ſpace; that is, a piece of metal, caſt like the letters, to be uſed occaſionally in compoſing, in order to form the intervals between words, at the end of lines, &c. See PRINTING.

There are *quadrats* of divers ſizes, as *m quadrats*, *n quadrats*, &c. which are reſpectively of the dimenſions of ſuch letters.

QUADRATA *legio*, among the Romans. See *Square* LEGION.

QUADRATIC *equation*. See EQUATION, and REDUCTION *of equations*.

QUADRATING *of a piece*, among *Gunners*, is the ſeeing that a piece of ordnance be duly placed, and poiſed in its carriages; and that its wheels be of an equal height, &c.

QUADRATO, or QUADRO, in the *Italian Muſic*, is a name given to the note B, when it comes in the natural or diatonic order, and is thus marked ♮. It is a ſemitone minor higher than the B mol, or ♭, and in reſpect of that may be called *ſharp*. See FLAT and SHARP.

QUADRATO-CUBUS, QUADRATO-QUADRATO-CUBUS, and QUADRATO-CUBO-CUBUS, are names uſed by Diophantus, Vieta, Oughtred, and others, for the fifth, ſeventh, and eighth powers of numbers. See POWER.

QUADRATO-QUADRATUM, or *Biquadratum*, the fourth power of numbers; or the product of the cube multiplied by the root.

QUADRATRIX, in *Geometry*, a mechanical line, by means whereof we would find right lines equal to the circumference of circles, or other curves, and of the ſeveral parts thereof.

Or, more accurately, the *quadratrix of a curve* is a tranſcendental curve deſcribed on the ſame axis, the ſemi-ordinates whereof being given, the quadrature of the correſpondent parts in the other curve is likewiſe given. See CURVE.

Thus, e. gr. the curve AND (*Tab. Analyſis, fig.* 21.) may be called the *quadratrix* of the parabola AMC, ſince it is demonſtrated, that APMA is $= PN^2$, or $APMA = AP \times PN$, or $APMA = PN \times a$, a conſtant quantity, &c.

The moſt eminent of theſe *quadratrices* are, that of Dinoſtrates, and that of Mr. Tſchirnhauſen for the circle; that of Mr. Perks for the hyperbola.

QUADRATRIX *of Dinoſtrates*, is a curve AM*mm* (*Tab. Analyſis, fig.* 22.) whereby the quadrature of the circle is effected, though not geometrically, but mechanically: it is thus called from its inventor Dinoſtrates.

Its geneſis is thus: divide the quadrantal arc ANB into any number of equal parts; in N, *n*, &c. by a continual biſection—divide the radius AC into the ſame number of parts in the points P, *p*, &c. Draw radii CN, C*n*, &c. Laſtly, on the points P, *p*, &c. erect perpendiculars PM, *pm*, &c. The curve formed by connecting theſe lines is the *quadratrix of Dinoſtrates*.

This curve may be deſcribed by continued motion; if we ſuppoſe the radius CN by its extreme N to deſcribe uniformly the arc AB, and at the ſame time a ruler PM, always parallel to itſelf, to move uniformly along AC, in ſuch a manner that when the ruler PM arrives at C, the radius CN may coincide with CB; and thus the continual interſection of CN with the ruler PM will deſcribe the *quadratrix* AMD.

Here, from the conſtruction, ANB : AN :: AC : AP; and therefore, if $ANB = a$, $AC = b$, $AN = x$, $AP = y$; $ay = bx$. See QUADRATURE.

QUADRATRIX *Tſchirnhauſiana*, is a tranſcendental curve AM*mm*B (*fig.* 23.) whereby the quadrature of the circle is likewiſe effected; invented by Mr. Tſchirnhauſen, in imitation of that of Dinoſtrates.

Its geneſis is thus conceived: divide the quadrant ANB, and its radius AC, into equal parts, as in the former; and from the points P, *p*, &c. draw the right lines PM, *pm*, &c. parallel to CB; and from the points N, *n*, &c. the right lines NM, *nm*, &c. parallel to AC. The points A, M, *m*, &c. being connected, the *quadratrix* is formed; wherein ANB:AN :: AC:AP. And, therefore, if $AB = a$, and $AC = b$, $AN = x$, and $AP = y$; $ay = bx$. See QUADRATURE.

This curve may be alſo deſcribed by continued motion, if two rulers, NM and PM, perpendicular to each other, be made to move uniformly and parallel to themſelves, the one along the quadrant of the circle AC, and the other along the radius.

QUADRATUM *cubi*, QUADRATO-QUADRATO-QUADRATUM, and QUADRATUM *ſurdeſolidi*, &c. are names uſed by the Arabs for the ſixth, eighth, and tenth powers of numbers. See POWER.

QUADRATURE, *quadratura*, in *Geometry*, the act of ſquaring; or of reducing a figure to a ſquare; or finding a ſquare equal to ſome other figure propoſed.

Thus, the finding of a ſquare containing juſt as much ſurface or area as a circle, an ellipſis, a triangle, or other figure, is called the *quadrature* of a circle, of an ellipſis, a triangle, or the like.

The *quadrature* of rectilinear figures comes under the common geometry; as amounting to no more than the finding their areas, or ſuperficies; which are, in effect, their ſquares.

Squares of equal areas are here eaſily had, by only extracting the roots of the areas thus found; and on ſuch root as a ſide conſtructing a ſquare. See the particular methods of finding the areas or ſquares, under each particular figure, as PARALLELOGRAM, TRAPEZIUM, TRIANGLE, &c.

The *quadrature of curves*, that is, the meaſuring of their area, or the finding of a rectilinear ſpace equal to a curvilinear ſpace, is a matter of much deeper ſpeculation; and makes a part of the higher geometry.

Though the *quadrature*, eſpecially of the circle, be a thing many of the firſt-rate mathematicians, among the ancients, were very ſolicitous about, and Archimedes ſeems to have been the firſt who has actually given the *quadrature* of a curvilinear ſpace, in finding the *quadrature* of the parabola; yet nothing, of this kind, has been done ſo conſiderable, as in and ſince the middle of the laſt century; when, viz. in the year 1657, Sir Paul Neil and lord Brouncker, and afterwards, in the ſame year, Sir Chriſtopher Wren, geometrically demonſtrated the equality of ſome curvilinear ſpaces to rectilinear ſpaces.

Soon after this, others, at home and abroad, did the like in other curves; and, not long afterwards, the thing was brought under an analytical calculus, the firſt ſpecimen whereof, ever publiſhed, was given by Mercator in 1688, in a demonſtration of lord Brouncker's *quadrature* of the hyperbola, by Dr. Wallis's reduction of a fraction into an infinite ſeries by diviſion.

Though it appears, by the way, that Sir Iſaac Newton had before diſcovered a method of attaining the quantity of all quadruple curves analytically, by his method of FLUXIONS, before the year 1668.

It is conteſted, between Sir Chriſtopher Wren and Mr. Huygens, which of the two firſt found the *quadrature* of any determinate cycloidal ſpace. Mr. Leibnitz afterwards found that of another ſpace; and Mr. Bernoulli, in 1699, diſcovered the *quadrature* of an infinity of cycloidal ſpaces, not only ſegments, but alſo ſectors, &c.

QUADRATURE *of the circle*, or *the finding a ſquare equal to a given circle*, is a problem that has employed the mathematicians of all ages, but ſtill in vain.

It depends on the ratio of the diameter to the periphery, which was never yet determined in preciſe numbers.

If this ratio were known (which would imply the circumference's being expreſſed by ſome affection of the diameter; and, of conſequence, that it were equal to a right line) the *quadrature of the circle* were effected: it being demonſtrated, that the area of a circle is equal to a rectangular triangle, whoſe two ſides, comprehending

the right angle, are the radius, and a right line equal to the circumference. So that, to ſquare the circle, all that is required, is, to rectify it.

Many have approached very near this ratio. For an account of what has been done in this way, ſee DIAMETER.

Strict geometry here failing, authors have had recourſe to other means; and particularly, to a ſort of curves, called *quadratrices*: but theſe being mechanical curves, inſtead of geometrical ones, or rather tranſcendental inſtead of algebraical ones, the problem is never fairly to be ſolved thereby.

Hence, recourſe has been had, by others, to analytics. And the problem has been attempted by three ſorts of algebraic calculations. The firſt gives a kind of tranſcendental *quadratures*, by equations of indefinite degrees. The ſecond, by vulgar numbers, though irrationally ſuch; or by the roots of common equations, which for the general *quadrature*, or its ſectors, is impoſſible. The third, by means of certain ſeries, exhibiting the quantity of a circle by a progreſſion of terms. See SERIES.

In ſearching, e. gr. for a right line equal to the circumference of a circle, we find, that the diameter being put 1, the circumference will be $\frac{4}{1}-\frac{4}{3}+\frac{4}{5}-\frac{4}{7}+\frac{4}{9}$, &c. making an infinite ſeries of fractions, whoſe numerator is always 4, and the denominators in the natural ſeries of the uneven numbers; and all theſe terms, alternately, will be too great, and too little.

If the ſum of this ſeries could be found, it would give the *quadrature of the circle*; but this is not yet done: nor is it at all probable, that it ever will be done. That, however, is not yet demonſtrated; nor, of conſequence, is the *quadrature of the circle* yet demonſtrated impoſſible.

To this it may be added, that as the ſame magnitude may be expreſſed by ſeveral different ſeries, it is poſſible, the circumference of the circle may be expreſſed in ſome other ſeries, whoſe ſum may be found. We have two infinite ſeries; expreſſing the ratio of the circumference to the diameter, though indefinitely, as above. The firſt, diſcovered by Sir Iſaac Newton; where the radius being put 1, the quadrant is $1-\frac{1}{6}-\frac{1}{40}-\frac{1}{112}$, &c. The ſecond, diſcovered by Mr. Leibnitz; where the radius being 1, the quadrant is $1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\frac{1}{9}$, &c. The inveſtigation of each of which ſeries, by the *calculus integralis*, is as follows:

Sir Iſaac Newton's QUADRATURE *of the circle*; or the inveſtigation of his ſeries, for ſquaring the circle. If the radius of the circle AC $=1$ (*Tab. Analyſis, fig.* 24.) CP $=x$, $y=\surd(1-x^2)$ and $\surd(1-x^2)=1-\frac{1}{2}x^2-\frac{1}{8}x^4-\frac{1}{16}x^6-\frac{5}{128}x^8-\frac{7}{256}x^{10}$, &c. to infinity; then (d expreſſing the DIFFERENTIAL or fluxion) will $y\,dx = dx-\frac{1}{2}x^2dx-\frac{1}{8}x^4dx-\frac{1}{16}x^6dx-\frac{5}{128}x^8dx-\frac{7}{256}x^{10}dx$, —, &c. to infinity; $\int y\,dx$ (or the fluent of $y\,dx$ or $y\dot{x}$) $=x-\frac{1}{6}x^3-\frac{1}{40}x^5-\frac{1}{112}x^7-\frac{5}{1152}x^9-\frac{7}{2816}x^{11}$, to infinity.

When x becomes equal to the radius CA, the ſpace DCPM is augmented into a quadrant. Subſtituting, therefore, 1 for x, the quadrant will be $1-\frac{1}{6}-\frac{1}{40}-\frac{1}{112}-\frac{5}{1152}-\frac{7}{2816}$, &c. *in infinitum*. Which ſame ſeries will meaſure the entire area of the circle, the diameter being 1.

Mr. Leibnitz's QUADRATURE *of the circle*. Let the tangent KB (*Tab. Analyſis, fig.* 25.) $=x$, BC $=1$; and the ſecant AC, infinitely near another CK, and the little arch KL be drawn with the radius CK: then will AK $=dx$, KC $=\surd(1+x^2)$. Now ſince the angles at B and L are right angles; and, by reaſon of the infinitely ſmall angle KCL, the angle BKC = KAC; we ſhall have

$$KC : BC :: KA : KL$$

$$\surd(1+x^2) : 1 :: dx : \frac{dx}{\surd(1+x^2)}$$

Farther, $CK : KL :: CM : mM$

$$\surd(1+x^2) : \frac{dx}{\surd(1+x^2)} :: 1 : \frac{dx}{1+x^2}$$

Therefore the ſector CM$m=\frac{1}{2}dx:(1+x^2)=\frac{1}{2}(dx-x^2dx+x^4dx-x^6dx+x^8dx-x^{10}dx$, &c.) whence, by the integral calculus, we find the ſector BCM (whoſe tangent KB $=x$) $\frac{1}{2}x-\frac{1}{6}x^3+\frac{1}{10}x^5-\frac{1}{14}x^7+\frac{1}{18}x^9-\frac{1}{22}x^{11}$, &c. *in infinitum*. And therefore if BM be the octant of the circle, or an arc of 45°, whoſe tangent KB or x is equal to the radius or 1, the ſector will be $\frac{1}{2}-\frac{1}{6}+\frac{1}{10}-\frac{1}{14}$, &c. *in infinitum*. The double, therefore, of this ſeries, $1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\frac{1}{9}-\frac{1}{11}$, &c. *in infinitum*, is the quadrant of the circle; or if the diameter be $=1$, the entire area of the circle.

In order to exhibit more diſtinctly and at large the uſe of FLUXIONS, according to the modern method of notation, in finding the areas of curves, we ſhall premiſe the two following caſes.

Caſe 1. Let ARC (*Tab.* III. *Analyſis, fig.* 71.) be a curve of any kind whoſe ordinates Rb, CB are perpendicular to an axis AB. Imagine a right line bRg, perpendicular to AB, to move parallel to itſelf from A towards B; and let its velocity, or the fluxion of the abſciſſe Ab, in any propoſed ſituation of that line, be denoted by bd; then will the rectangle bn, expreſs the FLUXION of the generated area AbR, which (if Ab $=x$, and bR $=y$) will be $=y\dot{x}$: whence, by ſubſtituting for y or $\dot{x}$ (according to the equation of the curve) and taking the fluent, the area itſelf will become known.

Caſe 2. Let ARM (*fig.* 72.) be any curve whoſe ordinates CR, CR are all referred to a point or centre; and conceive a right line CRH to revolve about the given centre C, and a point R to move along the ſaid line, ſo as to deſcribe the curve line ARM. If this point were to move from Q, without changing its direction or velocity, it would proceed along the tangent QS (inſtead of the curve) and deſcribe areas QsC, QSC about the centre C, proportional to the times in which they were deſcribed; becauſe, having the ſame altitude CP, they are as the baſes Qs and QS. Conſequently, if RS be taken to denote the value of $\dot{z}$ the fluxion of the curve line AR, the correſponding fluxion of the area ARC will be juſtly repreſented by the uniformly generated triangle QCS; which, expreſſing CP by s, will be $=\frac{QS\times CP}{2}=\frac{s\dot{z}}{2}$: whence the area itſelf may be determined. But ſince, in many caſes, the value of $\dot{z}$ cannot be computed (from the property of the curve) without trouble, the two following expreſſions, for the fluxion of the area, will be found more commodious, viz. $\frac{sy\dot{y}}{2t}$ and $\frac{y^2\dot{x}}{2a}$; where $t=$ RP and $x=$ the arc BN of a circle, deſcribed about the centre C, at any diſtance $a=$ CB. Theſe expreſſions are derived from that above in the following manner; viz. $\dot{z}:\dot{y}::y$ (CR) $: t$ (RP); therefore $\dot{z}=\frac{y\dot{y}}{t}$; conſequently $\frac{s\dot{z}}{2}=\frac{sy\dot{y}}{2t}$. Moreover, becauſe the celerity of R in the direction of the tangent is denoted by $\dot{z}$, that in a direction perpendicular to CQ (whereby the point R revolves about the centre C) will, therefore, be $=\frac{CP}{CR}\times\dot{z}=\frac{s\dot{z}}{y}$; which, being to $\dot{x}$ the celerity of the point N about the ſame centre as the diſtance or radius CR (y) to the radius CN (a), we ſhall, by multiplying extremes and means, have $\frac{as\dot{z}}{y}=y\dot{x}$, and, conſequently, $\frac{s\dot{z}}{2}=\frac{y^2\dot{x}}{2a}$. In the examples ſubjoined, the letters x, y, z, and u will be uſed to denote the abſciſſe, ordinate, curve-line, and area reſpectively.

QUADRATURE *of a right-angled triangle*. Let the baſe AH (*fig.* 73.) $=a$, the perpendicular HM $=b$, and let AB (x) be any portion of the baſe, conſidered as a flowing quantity, and BR (y) be the correſponding ordinate. Then, the triangles AHM and ABR being ſimilar, we ſhall have $a:b::\dot{x}:y=\frac{bx}{a}$. Whence $y\dot{x}$ (the fluxion of the area ABR) $=\frac{bx\dot{x}}{a}$; and its fluent (ſee *Inverſe method of* FLUXIONS) or the area itſelf $=\frac{bx^2}{2a}$, which, when $x=a$ and BR coincides with HM, will become $\frac{ab}{2}=\frac{AH\times HM}{2}$ = the area of the whole triangle AHM. See *Menſuration of* TRIANGLES.

QUADRATURE *of a circular ſector*. Let AOR (*fig.* 74.) be the ſector; AO or OR, its radius, $=a$, the arc AR, conſidered as variable by the motion of R, $=z$, and R$r=\dot{z}$; the fluxion of the area will be $\frac{a\dot{z}}{2}$ = the triangle ORr: whence the area itſelf is $=\frac{az}{2}=$ AO $\times\frac{1}{2}$AR: that is, the area of any circle is expreſſed by a rectangle under half the circumference and half the diameter. See CIRCLE.

QUADRATURE *of a ſemicircle*. Let the ſemicircle be AREH (*fig.* 75.); its diameter AH $=a$, AB $=x$, and BR $=y$, &c. and we have y^2 (BR^2) $=ax-x^2$ (AB$\times$BH), and, conſequently, $\dot{u}$ $(y\dot{x})=\dot{x}\sqrt{ax-xx}$ $=a$

$= a^{\frac{1}{2}} x^{\frac{1}{2}} \dot{x} \times \overline{1 - \frac{x}{a}}\Big|^{\frac{1}{2}}$; which expreſſion being reſolved into an infinite SERIES, we ſhall have $\dot{u} = a^{\frac{1}{2}} x^{\frac{1}{2}} \dot{x} \times \overline{1 - \frac{x}{2a} - \frac{x^2}{8a^2} - \frac{x^3}{16a^3} - \frac{5x^4}{128a^4}}$, &c. $= a^{\frac{1}{2}} \times \overline{x^{\frac{1}{2}} \dot{x} - \frac{x^{\frac{1}{2}} \dot{x}}{2a} - \frac{x^{\frac{5}{2}} \dot{x}}{8a^2} - \frac{x^{\frac{7}{2}} \dot{x}}{16a^3}}$, &c. Whence, the fluent of every term being taken, there will ariſe $u = a^{\frac{1}{2}} \times \overline{\frac{2x^{\frac{3}{2}}}{3} - \frac{x^{\frac{5}{2}}}{5a} - \frac{x^{\frac{7}{2}}}{28a^2} - \frac{x^{\frac{9}{2}}}{72a^3} - \frac{5x^{\frac{11}{2}}}{704a^4}}$, &c. $= x\sqrt{ax} \times \overline{\frac{2}{3} - \frac{x}{5a} - \frac{x^2}{28a^2} - \frac{x^3}{72a^3} - \frac{5x^4}{704a^4}}$, &c. $=$ the area ABR. When $x = \frac{1}{2}a$, the ordinate BR will coincide with the radius OE; in which caſe the area becomes $= \frac{1}{2}a\sqrt{\frac{1}{2}aa} \times \overline{\frac{2}{3} - \frac{1}{10} - \frac{1}{112} - \frac{1}{576} - \frac{5}{11264}}$, &c. $= \frac{a^2\sqrt{\frac{1}{2}}}{2} \times \overline{0{,}6666 - 0{,}1 - 0{,}0089 - 0{,}0017 - 0{,}0004}$, &c. $= 0{,}1964\,a^2$; which, multiplied by 2, gives $0{,}3928\,a^2$ for the area of the ſemicircle, nearly. In order to obtain a more converging ſeries, let the arc AR be $= \frac{1}{3}$ AE $= 30°$, and the ſine BR (being half the chord of double the arc or half the ſide of a hexagon, i. e. half the radius) will be $= \frac{1}{2}$ AO; and AB (x) = AO − OB = AO − $\sqrt{\text{OR}^2 - \text{BR}^2}$; which, radius being 1, will be $= 0{,}1339746$ nearly: ſubſtitute this quantity, with the value of a in the above ſeries, $\sqrt{ax^3} \times \overline{\frac{2}{3} - \frac{x}{5a} - \frac{x^2}{28a^2}}$ − &c. and we ſhall have $\overline{0{,}0693505} \times \overline{0{,}6666666 - 0{,}0133975 - 0{,}0001603 - 0{,}0000042 - \&c.} = 0{,}0693505 \times 0{,}6531046 = 0{,}0452931 =$ the area ABR: which, added to the area OBR ($=$ OB $\times \frac{1}{2}$BR $= \sqrt{\frac{3}{4}} \times \frac{1}{4} = 0{,}2165063$) gives $0{,}2617994$ for the area of the ſector AOR; the treble of which, or $0{,}7853982$ (AR being $= \frac{1}{3}$ AE) will be the content of the whole quadrant AOE; which number, found by taking only four terms of the ſeries, is true to the laſt decimal place.

QUADRATURE *of the lunes.* Though a definite *quadrature* of the entire circle was never yet given; yet there have been various portions of it ſquared. The firſt partial *quadrature* was given by Hippocrates of Chio; who ſquared a portion called, from its figure, the *lune*, or *lunule.* See LUNE, where the *quadrature* is ſhewn.

This *quadrature* has no dependence on that of the circle; but then it only extends to the entire lune, or its half: if you would ſquare any portion thereof at pleaſure, the *quadrature* of the circle comes in the way.

Yet ſome of the modern geometers have found the *quadrature* of any portion of the lune at pleaſure, independently of the *quadrature* of the circle; though ſtill ſubject to a certain reſtriction, which prevents the *quadrature* from being perfect, and, as the geometricians call it, abſolute and indefinite.

In 1701, the Marquis De l'Hôpital publiſhed a new manner of ſquaring the parts of the lune taken different ways, and under different conditions: though this, too, is imperfect in the ſame manner as the other.

QUADRATURE *of the ellipſis.* The *ellipſis*, alſo, is a curve whoſe preciſe *quadrature* in definite terms is not yet effected. We have here, therefore, as before, recourſe to a ſeries.

Let AC (*Tab. Analyſis, fig.* 26.) $= a$, GC $= c$, PC $= x$. Then will

$$y^2 = c^2(a^2 - x^2) : a^2$$
$$y = c\sqrt{(a^2 - x^2)} : a.$$

But $\sqrt{(a^2 - x^2)} = a - \frac{x^2}{2a} - \frac{x^4}{8a^3} - \frac{x^6}{16a^5} - \frac{5x^8}{128a^7} - \frac{7x^{10}}{256a^9}$, &c. *in infinitum.* Therefore $y\,dx = c\,dx - \frac{cx^2\,dx}{2a^2} - \frac{cx^4\,dx}{8a^4} - \frac{cx^6\,dx}{16a^6} - \frac{5cx^8\,dx}{128a^8} - \frac{7cx^{10}\,dx}{256a^{10}}$, &c. *in infinitum.* And $\int y\,dx$, or the fluent of $y\,dx$, i. e. $y\dot{x} = cx - \frac{cx^3}{6a^2} - \frac{cx^5}{40a^4} - \frac{cx^7}{112a^6} - \frac{5cx^9}{1152a^8} - \frac{7cx^{11}}{2816a^{10}}$, &c. *in infinitum.*

If then for x be put a; the quadrant of the ellipſis will be $ac - \frac{1}{6}ac - \frac{1}{40}ac - \frac{1}{112}ac - \frac{5}{1152}ac - \frac{7}{2816}ac$, &c. *in infinitum.* Which ſame ſeries exhibits the entire area of the ellipſis, if a denote the entire axis.

Hence, 1. If $\sqrt{ac} = 1$; the area of the ellipſis $= 1 - \frac{1}{6} - \frac{1}{40} - \frac{1}{112} - \frac{5}{1152} - \frac{7}{2816}$, &c. *in infinitum*: whence it is evident that an ellipſis is equal to a circle whoſe diameter is a mean proportional between the conjugate axes of the ellipſis.

2. Hence, alſo, an ellipſis is to a circle whoſe diameter is equal to the greater axis, as ac to a^2; that is, as c to a, or as the leſs axis to the greater.

Hence, laſtly, having the *quadrature* of the circle, we ſhall likewiſe have that of the ellipſis, and on the contrary. Thus, let the ellipſis propoſed be AEB (*Tab.* III. *Analyſis, fig.* 76.); its tranſverſe axis AB $= a$, the conjugate 2CE $= c$; and by the property of the curve (ſee ELLIPSE, art. 15.) we have y (DR) $= \frac{c}{a}\sqrt{ax - xx}$; and, therefore, $\dot{u}\,(y\dot{x}) = \frac{c}{a} \times \dot{x}\sqrt{ax - xx} =$ the fluxion of the area ARD. But $\dot{x}\sqrt{ax - xx}$ expreſſes the fluxion of the correſponding ſegment ADn of the circumſcribing ſemicircle, whoſe fluent is given (ſee QUADRATURE *of a ſemicircle*); which being denoted by A, that of $\frac{c}{a} \times \dot{x}\sqrt{ax - x^2}$ will, conſequently, be $= \frac{c}{a} \times$ A. Hence the area of the ſegment of an ellipſis is to the area of the correſponding ſegment of its circumſcribing circle, as the leſſer axis of the ellipſe is to the greater; whence it follows, that the whole ellipſis muſt be to the whole circle in the ſame ratio.

QUADRATURE *of the parabola.* For the parabola we have a *quadratrix* or tranſcendent curve, which gives its ſquare.

But it may be likewiſe had thus: let the curve ARMH (*fig.* 77.) be the common parabola, in which y^2 (BR^2) $= ax$ (AB $\times a$, the parameter) ſee CONIC *ſection.* Whence we have $y = a^{\frac{1}{2}}x^{\frac{1}{2}}$, and $\dot{u}\,(y\dot{x}) = a^{\frac{1}{2}}x^{\frac{1}{2}}\dot{x}$; and, therefore, $u = \frac{2}{3} \times a^{\frac{1}{2}}x^{\frac{3}{2}} = \frac{2}{3}a^{\frac{1}{2}}x^{\frac{1}{2}} \times x = \frac{2}{3}yx = \frac{2}{3} \times$ AB $\times$ BR. Hence a parabola is $\frac{2}{3}$ of a rectangle of the ſame baſe and altitude.

The value of the area may alſo eaſily be found in terms of y. Thus x being $= \frac{y^2}{a}$, we have $\dot{x} = \frac{2y\dot{y}}{a}$, and $\dot{u}\,(y\dot{x}) = \frac{2y^2\dot{y}}{a}$: whence $u = \frac{2y^3}{3a} = \frac{2y}{3} \times \frac{y^2}{a} = \frac{2y}{3} \times x = \frac{2}{3} \times$ AB $\times$ BR. See CONIC *ſection.*

QUADRATURE *of the hyperbola.* For this, too, we have a *quadratrix*, invented by Mr. Perks.

The analytical *quadrature* was firſt given by N. Mercator of Holſtein, the firſt inventor of infinite ſerieſes. But Mercator finding his ſeries by diviſion, Sir Iſaac Newton and Mr. Leibnitz improved upon his method; the one ſeeking them by the extraction of roots, the other by a ſeries preſuppoſed. See HYPERBOLA.

Mercator's QUADRATURE *of the hyperbola between its aſymptotes.* Since in an hyperbola within the aſymptotes, $a^2 = by + xy$; or if $a = b = 1$ (which may be ſuppoſed, ſince the determination of b is arbitrary).

Then will $\dfrac{1 = y + xy}{1 : (1 + x) = y}$.

That is (the diviſion being actually performed)

$$y = 1 - x + x^2 - x^3 + x^4 - x^5 + x^6, \text{ \&c.}$$
$$y\,dx = dx - x\,dx + x^2\,dx - x^3\,dx + x^4\,dx - x^5\,dx + x^6\,dx, \text{ \&c.}$$
$$\int y\,dx = x - \tfrac{1}{2}x^2 + \tfrac{1}{3}x^3 - \tfrac{1}{4}x^4 + \tfrac{1}{5}x^5 - \tfrac{1}{6}x^6 + \tfrac{1}{7}x^7, \text{ \&c.}$$

in infinitum.

QUADRATURE *of the cycloid.* Since in this curve (*Tab. Analyſis, fig.* 27.) we have

AQ : QP :: MS : mS.

Let, then, AQ $= x$, AB $= 1$; then will MS $= dx$, PQ $= \sqrt{(x - xx)}$, and mS $= dx\sqrt{(x - xx)} : x$. But it is ſhewn, that $\sqrt{(x - xx)} = x^{\frac{1}{2}} - \frac{1}{2}x^{\frac{3}{2}} - \frac{1}{8}x^{\frac{5}{2}} - \frac{1}{16}x^{\frac{7}{2}}$, &c. *in infinitum.* Therefore, $dx\sqrt{(x - xx)} : x =$ (the numerators of the exponents being diminiſhed by two units in the diviſion by x) $x^{-\frac{1}{2}}dx - \frac{1}{2}x^{\frac{1}{2}}dx - \frac{1}{8}x^{\frac{3}{2}}dx - \frac{1}{16}x^{\frac{5}{2}}dx$, &c. *in infinitum.* Whoſe ſum $2x^{\frac{1}{2}} - \frac{1}{3}x^{\frac{3}{2}} - \frac{1}{20}x^{\frac{5}{2}} - \frac{1}{56}x^{\frac{7}{2}}$, &c. *in infinitum*, is the ſemiordinate of the cycloid QM refered to the axis AB. Hence, QMdx, or the element QMSq of the cycloidal ſpace AMQ $= 2x^{\frac{1}{2}}dx - \frac{1}{3}x^{\frac{3}{2}}dx - \frac{1}{20}x^{\frac{5}{2}}dx - \frac{1}{56}x^{\frac{7}{2}}dx$, &c. *in infinitum.* Whoſe ſum $= \frac{4}{3}x^{\frac{3}{2}} - \frac{2}{15}x^{\frac{5}{2}} - \frac{1}{70}x^{\frac{7}{2}} - \frac{1}{252}x^{\frac{9}{2}}$, &c. *in infinitum*, expreſſes the ſegment of the cycloid AMQ.

If then mS $= g$G $= dx\sqrt{(x - xx)} : x$ be multiplied into GM $=$ AQ $= x$, we ſhall find the element GMHg of the area AMG $= dx\sqrt{(x - xx)}$. Which being the ſame with the element of the ſegment of the circle APQ, the ſpace AMG will be equal to the ſegment of the circle APQ; and conſequently, the area ADC equal to the ſemicircle ABP.

Hence, ſince CB is equal to the ſemiperiphery of the circle, if that $= p$ and AB $= a$, the rectangle BCDA $= ap$; and the ſemicircle APB, and conſequently, the external cycloidical ſpace ADC $= \frac{1}{4}ap$. Therefore the area of the ſemicycloid ACB $= \frac{3}{4}ap$, and AMCBPA $= \frac{1}{2}ap$. Conſequently, the area of the cycloid

cycloid is triple of the generating circle. See CYCLOID.

The area ASRA (*Tab.* III. *Analysis*, *fig.* 78.) included by the common cycloid ASM and its generating semicircle ARH, may be otherwise determined in the following manner. Let the radius AO or RO be $= a$, the sine BR $= y$, the cosine OB $= x$, and the arc AR ($=$ RS by the property of the CYCLOID) $= z$. Then AB being $= a - x$, its FLUXION will be $-\dot{x}$, whence $\dot{u}$, that of the area ARS, is $= -z\dot{x}$. To find the fluent of which, make $w = -zx$ ($=$ the fluent, if z was constant) then $\dot{w}$ being $= -z\dot{x} - x\dot{z}$, we shall have $\dot{u}$ ($= -z\dot{x}$) $= \dot{w} + x\dot{z}$. But $\dot{z}$ (AR fluxion) : $\dot{y}$ (BR fluxion) :: radius : cosine of the angle ARB, or its equal ROB (see Simpson's Fluxions, vol. i. art. 35. p. 26) :: OR (a) : OB (x). Therefore, by multiplying extremes and means, we obtain $x\dot{z} = a\dot{y}$; whence by substitution $\dot{u}$ ($= \dot{w} + x\dot{z}$) $= \dot{w} + a\dot{y}$; and consequently, by taking the fluent, $u = w + ay = -zx + ay =$ AO$\times$BR$-$BO$\times$AR $=$ the area ARS. Hence it follows, that the area (AEFA) when RB coincides with the radius FO, is barely $=$ AO$\times$FO $=$ AO^2: and that the whole area AMHFA is truly defined by $-$ARH $\times$ $-$OH, or by ARH$\times$OH; that is, by four times the area of the generating semicircle.

QUADRATURE *of the logistic, or logarithmic curve.* Let the subtangent PT (*Tab. Analysis*, *fig.* 28.) $= a$, PM $= x$, P$p = dx$; then will

$$y\,dx : dy = a$$
$$y\,dx = a\,dy$$
$$\int y\,dx = ay.$$

Wherefore the indeterminate space HPMI, is equal to the rectangle of PM into PT.

Hence, 1. Let QS $= z$; then will the indeterminate space ISQH $= az$; and, consequently, SMPQ $= ay - az = a(y-z)$; that is, the space intercepted between the two logistic semiordinates is equal to the rectangle of the subtangent into the difference of the semiordinates.

2. Therefore the space BAPM is to the space PMSQ as the difference of the semiordinates AB and PM is to the difference of the semiordinates PM and SQ. See LOGARITHMIC *curve.*

QUADRATURE *of the logarithmic spiral.* Let CBAC (*Tab.* III. *Analysis*, *fig.* 79.) be the area proposed: let the right line AT touch the curve at A, upon which from the centre C let fall the perpendicular CT: then, since by the nature of the curve, the angle TAC is every where the same, the ratio of AT (t) to CT (s) will be constant: and, therefore, the fluent of $\frac{s}{t} \times \frac{y\dot{y}}{2} = \frac{s}{t} \times \frac{y^2}{4} =$ the required area.

QUADRATURE *of the spiral of Archimedes.* Let CRR (*fig.* 80.) be the curve, whose area CRgC is required. Let AC be a tangent at the centre C, about which centre, with any radius AC ($= a$) suppose a circle Agg to be described: then the arc or abscisse Ag corresponding to any proposed ordinate CR, being to that ordinate in a constant ratio (e. g. as m to n) we have (Ag) $= \frac{my}{n}$; therefore $\dot{u} = \frac{y^2\dot{x}}{2a} = \frac{my^2\dot{y}}{2an}$; consequently $u = \frac{my^3}{6an} =$ the area CRRgC. See SPIRAL *of Archimedes.*

QUADRATURE *of Descartes's curve,* which is defined by the expression, $b^2 : x^2 :: b-x : y$.

Since, $b^2y = bx^2 - x^3$

$$y = (bx^2 - x^3) : b^2$$
$$y\,dx = (bx^2\,dx - x^3\,dx) : b^2$$
$$\int y\,dx = x^3 : 3b - x^4 : 4b^2.$$

QUADRATURE *of all curves comprehended under the general equation,* $y = \sqrt[m]{(x+a)}$.

Since $y = \overline{(x+a)}^{\frac{1}{m}}$

$$y\,dx = dx\,(x+a)^{\frac{1}{m}}.$$

To render the element integrable, suppose

$$(x+a)^{\frac{1}{m}} = v.$$

Then will $x + a = v^m$

$$dx = mv^{m-1}\,dv$$
$$y\,dx = mv^m\,dv$$
$$\int y\,dx = \frac{mv^{m+1}}{m+1} = \frac{m}{m+1}(x+a)\sqrt[m]{(x+a)}.$$

Let $x = 0$: the remainder will be $\frac{m}{m+1}\,a\,\sqrt[m]{a}$. Whence, the area of the curve $\frac{m}{m+1}(x+a)\sqrt[m]{(x+a)} - \frac{ma}{m+1}\sqrt[m]{a}$.

See on the subject of this article Wolfii Elementa Matheseos, tom. i. pars 2. sect. 2. cap. 2. and Simpson's Fluxions, vol. i. sect. 7. p. 121, &c.

QUADRATURE, in *Astronomy*, that aspect, or situation of the moon, when she is ninety degrees distant from the sun.

Or, the *quadrature* is when she is in a middle point of her orbit, between the points of CONJUNCTION and OPPOSITION; which happens twice in each revolution, viz. in the first and third quarter.

When the moon is in her *quadrature,* she exhibits that phasis which we call the half-moon, i. e. she shines with just half her face; and is said to be bisected, or dichotomized.

In the moon's progress from the syzygies to her *quadrature,* her gravity towards the earth is continually increasing by the action of the sun; and her motion is retarded for the same reason. Her motion then, in her orbit, is slowest as her gravity to the earth is greatest when in the *quadratures.*

In her recess from the *quadratures* to the syzygies, the gravity continually decreases, and the velocity increases. The ratio is thus: as radius is to the sum, or difference of one and a half the cosine of double the distance of the moon from the syzygy, and half the radius; so is the addition of gravity in the *quadratures* to the diminution or increase thereof in any other situation. See SYZYGY.

Hence the moon's orbit is more convex in the *quadratures,* than in the syzygies; and hence the circular figure of the moon's orbit is changed into an oval, whose greater axis goes through the *quadratures*; and hence, also, the moon is less distant from the earth at the syzygies, and more at the *quadratures.*

It is no wonder, therefore, that the moon should approach nearer the earth when her gravity is diminished; that access not being the immediate effect of this diminution, but of the inflexion of the orbit towards the *quadratures.*

In the *quadratures,* and within thirty-five degrees thereof, the apsides of the moon go backwards, or move *in antecedentia*; but they move forwards in the syzygies. See APSIDES.

The moon's orbit undergoes various alterations in each revolution. Its eccentricity is the greatest when the line of the apsides is in the syzygies; and the least, when in the *quadratures.*

Considering one entire revolution, the nodes move slower and slower as the moon approaches the *quadratures,* and they rest when she is therein; but, considering several revolutions, the nodes go back faster in the *quadratures.*

The inclination of the plane of the moon's orbit increases as the nodes go from the syzygies, and is greatest when the nodes are in the *quadratures.* See MOON and NODES.

QUADRATURE *lines,* or *Lines of* QUADRATURE, are two lines frequently placed on *Gunter's* SECTOR.

They are marked with the letter Q, and the figures 5, 6, 7, 8, 9, 10; of which Q signifies the side of a square, and the other figures the sides of polygons of 5, 6, 7, &c. sides. S there stands for the semidiameter of a circle; and 90 for a line equal to ninety degrees in circumference.

QUADRATUS, in *Anatomy,* a name applied to several muscles, in respect of their square figure; as the PALMARIS, and PRONATORS.

There is also a QUADRATUS *femoris,* a member of the muscle quadrigeminus, arising from the apophysis of the ischium, and maintaining an equal breadth and bulk to its insertion just below the great trochanter. See *Tab. Anat.* (*Myol.*) *fig.* 7. *n.* 25.

It is fixed by one extremity along that obtuse line which runs from under the acetabulum, toward the lower part of the tuberosity of the ischium; from whence it runs directly towards the great trochanter, and is inserted in almost all the lower half of the oblong eminence in that apophysis, but chiefly in the small rising tuberosity in the middle of that eminence.

This assists, with the other muscles of the QUADRIGEMINUS, to turn the thigh outwards.

QUADRATUS *genæ*, or *maxillæ inferioris,* called also *montanus*, and (on account of its breadth) *platisma myoides,* is a square muscle lying immediately under the skin of the neck, thence called also SUBCUTANEUS. It arises thin and membranous from the upper part of the spines of

the vertebræ of the neck, and the ſkin of the ſuperior parts of the cucullaris, and pectoral muſcle; whence, ſpreading over the neck, it becomes fleſhy, and is inſerted partly into the os hyoides, and partly into the under edge of the lower jaw. It adheres firmly to the panniculus carnoſus, from which it is not ſeparated without difficulty; and therefore was not anciently diſtinguiſhed from it. It ſerves to pull the lower jaw downward, and awry.

QUADRATUS *lumborum, ſive lumbaris externus*, a ſmall, oblong, flat muſcle, irregularly ſquare, narrower at its upper than at its lower part, lying along the ſides of the vertebræ lumborum, between the laſt falſe rib and the os ilium. It is fixed below to the external labium of almoſt all the poſterior half of the criſta of the os ilium, to the ligamentum ſacro-iliacum, and a little to the os ſacrum, by a fleſhy plane, the fibres whereof run obliquely backward; from thence it runs up between the ſacro-lumbaris and pſoas, by both which it is partly hid, and is inſerted in the extremities of all the tranſverſe apophyſes of the loins by oblique tendinous digitations. It is alſo fixed by a broad inſertion in the twelfth rib, on the inſide of the ligament which lies between it and the longiſſimus dorſi, by which that rib is connected to the firſt vertebra of the loins. Winſlow.

QUADRATUS *muſculus*, in *Anatomy*, is alſo a name given by Winſlow to the muſcle of the lips called by Albinus and Cowper DEPRESSOR *labii inferioris*.

QUADRELS, in *Building*, a kind of artificial ſtones, perfectly ſquare; whence their name. They are made of a chalky, or whitiſh and pliable earth, &c. dried in the ſhade for at leaſt two years.

They were formerly in great requeſt among the Italian architects.

QUADRIGA, formed from *quatuor, four*, and *jugum, yoke*, in *Antiquity*, a car, or chariot, drawn by four horſes, harneſſed abreaſt.

Various are the accounts we have of the author of the *quadriga*. Cicero makes it the invention of Minerva. Hyginus attributes it to Erichthonius IV. king of the Athenians; which ſentiment Virgil alſo follows in his Georgics, lib. iii. ver. 113. Æſchylus gives Prometheus the honour thereof. Tertullian, De Spectac. lib. ix. ſays, it was invented among the Argians, by Trochilus, in honour of Juno; and at Rome, by Romulus, in honour of Mars, or Quirinus. Ado of Vienne, Chronic. act iii. will have it to have been invented by one Procidus, about the time of the eſtabliſhment of the kingdom of Athens. Laziardels, Hiſt. Univerſ. Epitom. lib. xxiv. ſays the ſame of Triptolemus. Laſtly, if there be not opinions enough already, Herodotus gives us another; and ſays, the Greeks borrowed it from the Libyans. Pliny tells us, that his ſeal was a *quadriga*, lib. xvi.

On the reverſes of medals we frequently ſee Victory, or the emperor, in a *quadriga*, holding the reins of the horſes; whence theſe coins are called, among the curious, *nummi quadrigati*, and *victoriati*. See BIGATI.

QUADRIGA, in *Surgery*, otherwiſe called CATAPHRACTA, is a ſtrong bandage made uſe of in fractures of the ſternum. It is compoſed of a double-headed roller, about ſix Paris ells long, and three or four fingers broad. See Heiſter's Surgery, part iii. chap. 4. § 14.

QUADRIGEMINUS, in *Anatomy*, a muſcle, or rather an aſſemblage of four muſcles, ſerving to turn the thigh outward.

The firſt of the conſtituent muſcles of the *quadrigeminus* is the pyriformis; the ſecond and third are the gemini; and the fourth is the quadratus femoris. See each deſcribed under its proper article.

QUADRILATERAL, in *Geometry*, a figure whoſe perimeter conſiſts of four right lines, making four angles; whence it is alſo called a *quadrangular* figure.

If the ſeveral angles be right, the figure is a *rectangular quadrilateral*. If oblique, an *oblique angular quadrilateral*.

If the ſides of a *quadrilateral* be equal, and the angles right, the figure is a *ſquare*.

If the ſides be equal, but the angles unequal, the figure is a *rhombus*.

If the angles be equal, and the ſides unequal, the figure is a *rectangle*.

If only the oppoſite angles and ſides be equal, the *quadrilateral* is a *rhomboides*.

If the oppoſite angles and ſides be unequal, the *quadrilateral* is a *trapezium*.

The two oppoſite angles of any *quadrilateral* figure inſcribed in a circle, always make two right angles.

QUADRILL, *quadrilla*, a little troop or company of cavaliers, pompouſly dreſſed and mounted; for the performance of carouſals, juſts, tournaments, runnings at the ring, and other gallant divertiſements.

The word is borrowed from the Italian, being a diminutive of *ſquadra, a company of ſoldiers ranged in a ſquare*: for *ſquadrare* is, properly, *to diſpoſe any thing ſquare*; whence their *quadriglia*, the French *ſquadrille* and *quadrille*, and our *quadrill*. The French formerly wrote *ſquadrille*, and *eſquadrille*.

A regular carouſal is to have at leaſt four, and at moſt twelve, *quadrills*.

Of theſe *quadrills*, each is to conſiſt of at leaſt three cavaliers, and at moſt of twelve.

The *quadrills* are diſtinguiſhed by the form of their habits, or the diverſity of their colours.

QUADRILLE, a well-known game at cards; and which has been, in ſeveral caſes, the object of mathematical computations. See Mr. De Moivre's Doctrine of Chances, 3d edit. p. 97, &c.

QUADRIPARTITION, the dividing by four; or a taking of the fourth part of any number, or quantity.

Hence *quadripartite*, &c. ſomething divided into four.

QUADRIREME, *quadriremis*, a galley, or veſſel, with four oars on a ſide; the invention of which was attributed by the ancients to the Carthaginians.

QUADRISETÆ, the *four-haired flies*, a term uſed by the writers in natural hiſtory to expreſs thoſe flies of the ſeticaude or hair-tailed kind, which have four hairs or briſtles growing from the tail, as the others have three, two, or one.

QUADRIVIUM, the centre of four ways, where four roads meet and croſs each other. By ſtatute, poſts with inſcriptions are to be ſet up at ſuch croſs ways, as a direction to travellers, &c. 8 & 9 W. III. c. 16.

QUADRUGATA *terræ*, in *Old Law Records*, denotes a team-land; or ſo much as can be tilled by four horſes.

QUADRULA, in *Natural Hiſtory*, a word ſometimes uſed in the ſame ſenſe as teſſela, and ſpoken of the cubic pyrites. Sometimes it is uſed alſo as the name of thoſe little ſpangles of ſhining matter that are mixed among ſand. Theſe are generally fragments of talc; and are of various colours, white, yellow, and blackiſh.

Solinus has uſed the word *quadrula* to expreſs the fragments of yellow talc that are found in that ſand called *ammochryſos*, or golden ſand. He miſtakes theſe ſhining particles for maſſes of real gold, and makes the ſand itſelf a kind of precious ſubſtance ranked among the gems, and brought from Perſia; but in this he does not agree with the reſt of the ancients.

QUADRUPED, in *Natural Hiſtory*. The eſſential character of *quadrupeds* is, that they have a hairy body and four feet, and that the females are viviparous, and give ſuck to their young.

Quadrupeds are diſtinguiſhed, by the number of their feet, from other animals, which have only two feet, as birds; from thoſe which have no feet, as fiſhes and reptiles; and from thoſe which have more than two feet, as inſects.

Ariſtotle diſtributes *quadrupeds* into three claſſes; denominating thoſe whoſe feet are terminated by a hoof in one piece, *ſolipedes*; thoſe which have a cloven hoof he diſtinguiſhed by the name of forked or cloven footed; and thoſe whoſe feet are digitated he called *fiſſipidæ*. With this general diviſion he contented himſelf, without deſcending to a methodical diſtribution of each claſs into their ſeveral orders, genera, &c. Geſner, Aldrovand, Jonſton, and many other naturaliſts, have adopted the diſtribution of Ariſtotle: but we are indebted for the regular ſyſtematic arrangement of *quadrupeds* to Mr. Ray, who publiſhed his Synopſis Methodica Animalium Quadrupedum et Serpentini generis, &c. in 1693. According to this writer, *quadrupeds* are divided into thoſe which are hoofed, *ungulata*; and thoſe which are clawed, or digitate, *unguilata*. See an abſtract of his Synopſis under ANIMALS; which we ſhall here illuſtrate more at large.

QUADRUPEDS, *Hoofed*, are either,

I. *Whole-hoofed, ſolipeda*, μωνοχηλα, μωνυχα, *ſolidungula*; as the horſe, and aſs, the onager or wild aſs, the mule, and the zebra of Africa, or the fine ſtriped Indian or African aſs, almoſt like a mule in form and ſtature.

Of the whole-hoofed kind, Ariſtotle has obſerved, that no one hath two horns (he might have ſaid any horns); no one hath the talus, or aſtragalus; nor have the males any appearance of teats.

II. *Cloven-footed*: and that either, 1. Into two diviſions only; as the διχηλα, or biſulcate kind; which are again ſubdivided into ſuch as are,

Firſt, *Ruminant*, μηρυκαζοντα, that is, ſuch as chew the cud; and theſe either have hollow and perpetual horns, as the bull, ſheep, and goat kind; or deciduous horns, as the hart and deer kind, which uſually ſhed their horns annually.

Of the *bull kind* are reckoned theſe: the common *bos* or bullock, of which the male is *taurus*, the female *vacca*; the

the German *urus*, *urochs*, or *aurochs*; the *bison*; the *bonasus*; the *bubalus*, or *bufalo*; and the *bos Africanus* of Bellonius, Obs. lib. ii. c. 50. which he takes to be the *bubalus* of the ancients.

Of the *sheep kind*, besides the common sort, are reckoned the Arabian *ovis laticauda*, whose tail is sometimes of thirty pounds weight; the *ovis strepsiceros Cretica Bellonii*; the *ovis Africana*, with short hair instead of wool; and the *ovis Guineensis*, or *Angolensis*, of Marcgrave, Hist. Brasil. lib. vi. c. 10.

Of the *goat kind* are, besides the common *capra domestica*, the *ibex*, or German steinbock, found on the tops of the Alps; the *rupicapra*, French chamois, or German gems; the *gazella Africana*, or antelope; the *gazella Indica*; the *gazella Africana* with shorter, annulated, and bent horns; the *capra sylvestris Africana Grimmii*; the *capra Mambrina*, or *Syriaca* of Gesner; the *bucephalus*, or *moschelaphus Caii* in Gesner; the *tragelaphus Caii* in Gesner; and the *tragelaphus* of Bellonius.

Of the *hart* or *deer kind* are reckoned, the *cervus*, ἐλαφος, or red deer; the *cervus platyceros* or *palmatus*, the fallow deer; *alce*, or the elk; *rangifer*, the rein deer; the *axis Plinii*, according to Bellonius; the *capra Plinii*, the *cuguacu-ete*, and *cuguacu-apara* of Marcgrave; the *caprea Groenlandica*.

Secondly, Of animals whose feet are divided into two parts only, and which do not chew the cud, there is only the hog and swine kind. Under this head, besides the common swine, are reckoned the wild boar, or swine; the *Guineensis Marcgravii*; the *porcus Indicus*, or *babyroussa*; the *tajacu* or *aper Mexicanus moschiferus* of Dr. Tyson, called, by Marcgrave, *tajacu caaigoara*; by others, *quauhtla coymatl*, and *quapizotl*; and by Acosta, and some others, *zaino*.

2 There are some *quadrupeds*, whose hoof is cloven into four divisions, and these seem to be not ruminant; as the rhinoceros, the hippopotamus, the tapijerete of Brasil, the capy-bara of Brasil, and the animal moschiferum.

Quadrupeds, *Clawed* or *digitate*. Of this kind, there are, first, a sort whose claws are not divided or separated, but adhere to one another, and are covered with one common skin, but with obtuse nails, sticking out round the margin of the foot; as the elephant, which is anomalous, and not clearly referable to this kind, or to that of cloven-footed *quadrupeds*.

A second species of this *digitate* kind of *quadrupeds*, which has only two claws, is the camel; and though these have no horns, they both ruminate, and have also the four stomachs of horned ruminant animals.

Of the camel there are two sorts; one having but one bunch on the back, the other two.

To this kind also belong the Peruvian *glama*, which some have reckoned among the sheep kind; as also the *paco*, the *ovis Indica*, or *Peruviana vulgo*, which is much less than the *glama*.

A third species of this *unguiculate* kind, includes such animals as the Greeks called Πλατυωνυχα, and Ανθρωπομορφα, which have the foot divided into many claws, with broad nails on them; as the ape and monkey kind.

Of these, some have no tails, and are called *simiæ*, or *apes*: others have tails, and are called monkeys, *cercopitheci*; and such as have either long or short tails, if they are of a larger size, are called *papiones*, or baboons. There are great numbers and varieties of this species of *quadrupeds*; of which naturalists have described these, viz. the *orang outang*, or *homo sylvestris* of Dr. Tyson, described by him in a particular discourse; the *guariba* of Brasil, *Marcgravii*; the *cagui* of Brasil, greater and lesser; the *cay* of the same region, described by Lerius; the *caitaia* of the same country; the *cercopithecus barbatus Guineensis*, two or three sorts of it; the *cercopithecus Angolensis major*; the *cercopithecus non barbatus Clusii*; the *cercopithecus Clus.* called *sagouin*. Lastly, if apes and monkeys have their snouts very prominent, like dogs, they are called *cynocephali*.

A fourth species of this *unguiculate* kind is, when though the claws are many, yet are not covered at the end with broad flat nails, like monkeys or apes; but are rather like the talons of hawks, &c. crooked, and sharp-pointed.

These, in respect of their teeth, may be divided into such as have many dentes primores, or incisores (that is, cutting teeth) in each jaw, of which there are two sorts; a greater, which either have a short, round head, as the cat kind; or a lesser sort, having a long slender body, with very short legs, as the weasel or vermin kind. There are also some of this species of *quadrupeds*, which have only two large remarkable teeth in each jaw: these are the hare kind; and these live only upon herbs, grass, &c.

Of the *cat kind* of *quadrupeds* are reckoned to be the lion; the tyger; the *pardalis*, whose male is *pardus*, and female *panthera*; the leopard; the *lupus cervarius*, or lynx; the *catus pardus*, or cat-a-mountain; the common cat; and the bear.

Of the *dog kind* are reckoned the wolf; the *lupus aureus*, or jackall; besides the common dog, of which kind they enumerate, the mastive, or mastiff; the *canis venaticus Graius*, *Græcus*, or *Scoticus*, the greyhound; *Graius Hibernicus*, or the Irish greyhound; the *canis venaticus sagax*, *indagator*, *sectator ferarum*, &c. the hound; *canis venaticus Hispanicus*, or *aviarius*, the spaniel for land or water; *vertagus*, or tumbler; *canis* Οικουρος, or *domesticus*, the house-dog; *canis melitæus*, or the lap-dog; *canis Getulus*, or *Islandicus*, the shock: and of all these sorts there are many varieties of mongrels, and hybridous breeds.

Other species of the dog kind are, the fox; the animal *zibethicum*, or civet-cat, as it is corruptly called, but by its teeth and snout is plainly of the dog tribe; the *American coati*, or *rackoon*, or *rattoon*; the *yzquiepatl*; the *carigueya*, *maritacaca*, *carigoy*, *ropoza*, or *opossum*; the *taiubi*; the *taxus*, or *meles*, the badger, grey, or pate; the *lutra*, or otter. To these some add the *phoca*, sea-calf, or seal; the *equus marinus*, morse, or sea-horse, mistaken by some for the *hippopotamus*; the Dutch call him *walrus*, the Danes and Icelanders *rosmarus*; lastly, the *manati*, or *vacca marina*, the sea-cow.

Of the *vermin*, or *weasel kind* of *quadrupeds*, is, first, the *mustela vulgaris*, the common weasel, in Yorkshire called *foumart*, or *fitchet*, γαλεη: the *viverra Indica*, called *quil* and *quirpele*; another sort called *mungo*, and *mungathia*, of a reddish grey: the *mustela*, *ermine*, or *stoat*, and *mustela sylvestris*, the ferret; *putorius*, the pole-cat; *martes*, or *foyna*, the martin, or martlet; *mustela zibellina*, the sable: lastly, the *genetta*; and the *ichneumon Bellonii*.

Of the *hare kind* of *quadrupeds* are, first, *lepus*, or the common hare; *cuniculus*, the rabbet, or coney; *tapeti*, or Brasil coney, and the *aperea* of Brasil; the *hystrix*, or porcupine, and the *hystrix Americanus*, or *cuanda* of Brasil; castor, fiber, or the beaver; *sciurus vulg.* or squirrel; the Virginian, Zeylandic, Barbary, and American flying squirrel; *mus domesticus*, major and minor, the common rat and mouse: to these also may be referred *mus major aquaticus*, the water-rat; the musk-rat, *mus avellonarum*, major and minor; the dormouse or sleeper, *mus Noricus*, *Cricetus*, *Alpinus*, *seu marmotta*; the *cavia cobaya*, or *cuniculus Americanus*, the Guinea-pig; the *aguti*, and *paca* of Brasil; the *mus Norwegicus*, or *leming*; the *glis Gesneri*, or the *rell*; the *mus Indicus*, &c.

Quadrupeds, *Anomalous*. To these several kinds, the following anomalous ones must also be added:

1. Such four-footed viviparous animals, as have a longish snout, with their feet divided into many claws, and toes, and having teeth; as the *echinus terrestris*, or common urchin, or hedge-hog; *erinaceus Indicus albus*; *tatu* or *armadillo prima* of Marcgrave; *tatuete* of Brasil, or the second species of the *armadillo*, according to Marcgrave; *tatu apara*, his third species of *armadillo*; *tatu mustelinus*, *Soc. Reg. Mus.* the weasel-headed *armadillo*; *talpa*, the mole, warp, or moldwarp; and the *mus araneus*, shrew, hardy shrew, shrew-mouse.

2. *Quadrupedous* and viviparous animals with a longish snout, having their feet divided into many claws or toes, but without teeth; as the *tamandua guacu* of Brasil, *Marcgravii ursus formicarius Cardani*, the great ant-bear; the *tamandua* of Brasil, or Marcgrave, the lesser ant-bear.

3. *Anomalous flying quadrupeds*, with a shorter snout, and their feet divided as above; being of the bat-kind, or flitter-mice, of which there are of several sizes, and different forms.

4. There is one very anomalous animal, which has but three claws on each foot; and that is the *ai*, or *ignavus* of Marcgrave, the sloth or sluggard.

5. Viviparous and sanguineous *quadrupeds*, breathing with lungs, but having only one ventricle in the heart; as the *rana aquatica*, the frog, or frosh; *rana arborea*, *seu ranunculus viridis*, the small tree or green frog; *bufo*, *sive rubeta*, the toad; *testudo*, the tortoise, in Greek χελωνη; of these there are land and water ones, and many different species in foreign parts.

6. *Oviparous quadrupeds*, with a long tail stretched out horizontally. Such are the lizard kind; as *lacertus omnium maximus*, the crocodile; *cordylus*, *sive caudiverbera*, *uromastrix Græcis*, larger than the green lizard; *tapayaxin Novæ Hispaniæ* or *lacertus orbicularis* of Hernandez; *lacertus vulgaris*, the common eft, swift, or newt; *lacertus viridis*, the green lizard; *lacertus fucetanus Aldrovandi*, at Rome and Naples called the *tarantula*;

lacertus Indicus, called *senembi* and *iguana*; *lacertus Brasiliensis*, called *tejuguacu*, and *temapara* by Marcgrave; the *taraguira*, *ameiva*, *taraguico Azcuraba*, *Americima*, *Curapopeba*, *Teiunhana*, &c. of Marcgrave; the *lacertus Indicus*; the *scincus*, or *crocodilus terrestris*; the *seps*, or *lacerta chalcidica*, a kind of footed serpent; *stellio*, the swift, or spotted lizard; *salamandra*, called the *salamandra aquatica*, the water-eft, *lacerta volans Indica*; and the *chamæleo*, or camelion.

This system of Mr. Ray obtained very generally among naturalists, till, in the year 1735, Linnæus first published his system. This was followed by several others, varying in the arrangement of the animal kingdom, even to the last edition of 1767. Under the class, which he denominates MAMMALIA, he comprehends not only all the animals which we call *quadrupeds* (the lizard genus, or rather the reptiles pedati excepted) but also the cetaceous order, or whales, cachalots, and porpesses: justifying this arrangement of whales with *quadrupeds*, from the agreement of these animals in the structure of the heart, in the respiration by means of lungs, in their having moveable eye-lids and ears, in being viviparous, furnished with teeth, and other particulars, by which they differ so materially from fishes, as more than to counterbalance their living with them in the same element. The mammalia are divided into seven orders, the distinctions of which are principally established on the difference in the numbers, situation, and form of the three kinds of teeth, viz. the primores or incisores, called fore-teeth, or cutting-teeth; the laniarii or canini, called dog-teeth, canine or lacerating teeth; and the molares, double teeth or grinders. But Linnæus does not entirely neglect the feet. See the characters of the several orders under PRIMATES, BRUTÆ, FERÆ, GLIS, PECORA, BELLUA, and *Cete* or WHALE. This part of the Linnæan system, including a few species described in the Appendix of the third tome, and in the Mantissa of 1771, contains about two hundred and thirty species.

Mr. Pennant, in his Synopsis of *Quadrupeds*, and Professor Martin, in his Elements of Natural History, by including some animals that were unknown to Linnæus, and giving the rank of species to several that were considered by him as varieties, have extended the number of mammalia to two hundred and eighty-nine species. Mr. Klein, in 1751, published a new system of *quadrupeds*, intitled *Quadrup.* Dispositio brevisque Hist. Natur. in which he distributes them into two orders, the first comprehending those whose feet are terminated by one or more hoofs, and the second those which are digitated; and each of these orders is subdivided into five families or classes. In his first order he follows the general arrangement of Mr. Ray, which he has considerably improved: but in the second, by a servile regard to a method founded on the number of toes, he has combined very opposite animals; the camel and the sloth, the mole and the bat, the glutton and apes. M. Brisson, in 1756, published another system, in which he has arranged animals by the number or defect of their teeth; beginning with those that are toothless, such as the ant-eater, and ending with those that have the greatest number, such as the opossum. By this arrangement, some *quadrupeds*, very distant from each other in their manners, are too nearly connected. We shall say nothing of M. Buffon's History of *Quadrupeds*, though it contains much valuable information, because he seems to have disregarded systematic arrangement. Mr. Pennant has introduced some useful alterations in his History of *Quadrupeds*: this ingenious naturalist has followed Mr. Ray in his greater division of animals into *hoofed* and *digitated*; but, after the manner of Mr. Klein, he has formed separate genera of the rhinoceros, hippopotamus, tapiir, and musk. The apes are continued in the rank in which Mr. Ray placed them, and are followed by the maucaucos. The carnivorous animals are arranged according to the system of Linnæus, omitting the seal, mole, shrew, and hedge-hog. The herbivorous or frugivorous *quadrupeds* occupy the class assigned them by Mr. Ray, to which he has allotted likewise the shrew, the mole, and the hedge-hog. The fourth section of digitated *quadrupeds* consists of those which are absolutely destitute of cutting teeth, such as the sloth and armadillo. The fifth section is formed of those which are destitute of teeth of every kind, such as the manis and ant-eater. The third and fourth orders or divisions which Mr. Pennant has added, are the *pinnated* and the *winged quadrupeds*: the first comprehends the walrus, the seals, and (in conformity to preceding writers) the manati. But these, he observes, seem as the links between the *quadrupeds* and the cetaceous animals. The bats are *winged quadrupeds*, and form the next gradation from this to the class of birds. See Pennant's Hist. of *Quadrupeds*, ed. 8vo. 1781. Preface.

QUADRUPEDS, *alated.* Among the many fabulous things with which natural history has been loaded, stories of flying *quadrupeds* seem to claim a very high rank; the gryphon, the *quadruped* dragon, and a great many other imaginary animals, having been introduced so seriously among the descriptions of real animals, that too many have been taught to believe them. Scheuchzer, in his Physica Sacra Jobi, has done much toward discountenancing such relations; and Hyacinthus Gemma, who has written expressly De Fabulosis Animalibus, has added much on the same occasion; yet all is not done. The world have late histories of lemmas and basilisks, which never existed but in the imagination of the relator, or in the subtle contrivances of the fabricator; as is evidently the case in the basilisks, which we find in the museums of the curious, and which are all made out of the wry-fish. And the generality of readers are so fond of any thing that is marvellous, that these things are sure to be remembered, while perhaps all the truths in the book are forgotten.

Upon the whole, the standard of the flying or *alated quadrupeds* seems to be properly enough reducible to this: that the words flying and *alated* are not synonymous terms, and that there are three kinds of flying among the *quadruped* class. The first absolute and swift, flying as perfect as in birds: this peculiarly belongs to the bat, which is the only *alated* or winged *quadruped*, properly speaking. 2. An imperfect flying by means of certain membranes serving as wings, but imperfectly, and not turning quick, or enduring long flights; such is the flying of the lizard, which is not properly an *alated* animal. And lastly the imperfect flying of the squirrel kind, which even in that species called, by way of eminence, the *flying squirrel*, is not properly flying, but only long leaping; the creature being able to turn but very little out of a right line, and only to suspend itself during a short time in a leap from a high place to a lower. Phil. Trans. N° 47. p. 34.

QUADRUPLATORES, among the Romans, were informers, who had the fourth part of the confiscated goods for their pains.

QUADRUPLE, a sum or number multiplied by four, or taken four times.

QUADRUPLE is particularly used for a gold coin, worth four times as much as that whereof it is the *quadruple*.

The *quadruple* of the Spanish pistole is a piece of four pistoles, called also the *double doubloon*.

The *quadruple* of the louis d'or is a piece of gold coined in the reign of Louis XIII. in 1641. The legend on one side is CHRISTUS VINCIT, REGNAT, IMPERAT; and on the middle of this side it has a cross with four crowns, and cantoned in four fleurs de lys: on the other side it has the legend, LUDOVICUS DECIMUS TERTIUS DEI GRATIA FRANCORUM REX, with the head of Louis XIII. Its value under this king was twenty livres.

QUÆ *est eadem*, in *Pleading*, is used to supply the want of a traverse. 2 Lill. Abr. 405. In a *clausum fregit* such a day, the defendant pleads the plaintiff's licence to him to enter on the same day, and that *virtute cujus unde* he entered; he need not say, *quæ est eadem transgressio*.

QUÆ *plura*, a writ that anciently lay where inquisition had been made by an escheator, of such lands or tenements as any man died seised of, and all was supposed not to be found by the office or inquisition.

This writ was to inquire what more lands or tenements the party died seised of. But it is now made useless, by taking away the court of wards and offices post mortem.

QUÆ *servitia.* See PER *quæ servitia*.

QUÆRENS *non invenit plegium*, a return made by the sheriff upon a writ directed to him with this clause, viz. *Si A. fecerit B. securum de clamore suo prosequendo*, &c. F. N. B. 38.

QUÆSTA, in our *Ancient Writers*, denotes an INDULGENCE, or remission of penance, exposed to sale by the popes.

QUÆSTIONARII, in our *Ancient Law Books*, were people who went about with indulgences from door to door, desiring charity either for themselves or others. Matt. West observes, 1240, that the king, *Terram suam per papale quæstionarios, depauperari*, &c. *permisit*.

QUÆSTUS, in *Law*, is that estate, or those effects, which a man hath by acquisition, or purchase; in contradistinction to *hæreditas*, which is what he hath by descent. See ACQUEST, and GOODS.

Glanv. lib. vii. *aut habet hæreditatem tantum*, *vel* quæstum *tantum*, *aut hæreditatem &* quæstum.

QUAHVITLA, in *Botany*, a name used by some authors for the tree from which the resin commonly called *gum copal* is procured.

QUAIL, *coturnix*, or TETRAO *coturnix* of Linnæus, in *Ornithology*, the least of all the birds of the gallinaceous kind. They have, however, the genius of the cock kind, and may be bred to fight like our game cocks.

This

This was an old custom among the Athenians, and is still kept up in some parts of Italy, and in Asia.

Quails are birds of passage, some entirely quitting our island, others shifting their quarters from one county to another, and sheltering themselves among the weeds near the sea-side; with us they frequent the corn-fields, and sometimes the meadows. They begin to sing in April, and they make their nests in the month of May, building on the ground, and seldom lay more than six or seven whitish eggs, marked with ragged rust-coloured spots.

Quails are to be taken by means of the call, during their whole wooing time, which lasts from April to August. The proper times for using the call are at sun-rising, at nine o'clock in the morning, at three in the afternoon, and at sun-set; for these are the natural times of the *quail's* calling. The notes of the cock and hen-*quail* are very different, and the sportsman who expects to succeed in the taking them, must be expert in both; for when the cock calls, the answer is to be made in the hen's note; and when the hen calls, the answer is to be made in the cock's. By this means they will come up to the person, so that he may, with great ease, throw the net over them, and take them. If a cock-*quail* be single, on hearing the hen's note he will immediately come; but if he have a hen already with him, he will not forsake her. Sometimes, though only one *quail* answers to the call, there will three or four come up; and then it is best to have patience, and not run to take up the first, but stay till they are all entangled, as they will soon be.

The *quail* is a neat cleanly bird, and will not run much into dirty or wet places; in dewy mornings they will often fly instead of running to the call; and in this case, it is best to let them go over the net, if it so happens that they fly higher than its top, and the sportsman then changing sides, and calling again, the bird will come back, and then will probably be taken in the net.

The calls are to be made of a small leather purse, about two fingers wide, and four fingers long, and made in the shape of a pear; this is to be stuffed half full of horse-hair, and at the end of it is to be placed a small whistle, made of the bone of a rabbit's leg, or some other such bone; this is to be about two inches long, and the end formed like a flageolet, with a little soft wax. This is to be the end fastened into the purse, the other is to be closed up with the same wax, only that a hole is to be opened with a pin, to make it give a distinct and clear sound. To make this sound, it is to be held full in the palm of the hand, with one of the fingers placed over the top of the wax; then the purse is to be pressed, and the finger is to shake over the middle of it, to modulate the sound it gives into a sort of shake. This is the most useful call; for it imitates the note of the hen-*quail*, and seldom fails to bring a cock to the net, if there be one near the place.

The call that imitates the note of the cock, and is used to bring the hen to him, is to be about four inches long, and above an inch thick; it is to be made of a piece of wire turned round and curled, and covered with leather; and one end of it must be closed up with a piece of flat wood, about the middle of which there must be a small thread or strap of leather, and at the other end is to be placed the same sort of pipe, made of bone, as is used in the other call. The noise is made by opening and closing the spiral, and gives the same sound that the cock does when he gives the hen a signal that he is near her.

QUAKERS, in *Ecclesiastical History*, a religious sect, who made their appearance in England about the middle of the seventeenth century. George Fox, an illiterate person, born at Drayton, in Leicestershire, in the year 1624, by trade a shoe-maker, was the first who publicly preached the doctrine of this sect. He proposed but few articles of faith, dwelt mostly on morality, and preached mutual charity and the love of God, and a deep attention to the inward motions of the Spirit. He would have a religion and worship simple, and without ceremonies; making it a principal point to wait, in profound silence, for the influence and direction of the Holy Spirit.

This teacher met with great success in propagating these doctrines; and the uncommon fervency with which he and his friends preached, so affected the minds of many of their hearers, that they frequently broke out into tears and *trembled*, for which, in derision, they were called *Quakers*. This denomination is likewise said to be partly owing to an exhortation addressed to Gervas Bennet, Esq. a justice of peace in Derbyshire, by Fox and his companions, who, when they were called before him in the year 1650, desired him, with a loud voice, and a vehement emotion of body, to *tremble* at the word of the Lord; but, as a term of mutual love, which ought to subsist amongst Christians, they called themselves *Friends*. An eager zeal at first led some of them, who were off their guard, into several extravagancies; and one of them, viz. James Naylor, is said to have had the impiety to suffer himself to be called the son of God, son of Justice, and king of Israel, by a few deluded followers, who strewed garments before him, and hailed him, at his entry into Bristol, with Hosanna, son of David! He had his trial for the same, and was whipped, and otherwise severely punished, for blasphemy; and so far from being countenanced in these proceedings by his brethren, he was, in the early part of his delusion, admonished, and at length excommunicated by them; and he afterwards condemned publicly his own conduct.

The doctrines of the *Quakers* being in many respects different from those generally held, together with their disusing the customary compliment of the hat, and the usual salutations, subjected them to grievous sufferings, such as imprisonment, whipping, fines, and premunire, in this kingdom; and four of them were hanged in New England. Their refusing to pay tythes, &c. and to frequent the established worship, and their holding public meetings of their own (at that time contrary to law), were the chief crimes laid to their charge; and when these failed, their persecutors were sure to find occasion against them, by tendering to them the oath of allegiance, which, in common with all other *oaths*, their principles would not admit of their taking. Besides these penalties they were ridiculed in writing, and exposed on the stage; but they despised both the press and the prison, and, notwithstanding all opposition, they became a regular body, with stated laws and polity, which they retain, with great œconomy, to this day.

At length the peaceable demeanour of this people induced the legislature to grant them relief. They had shared, with other dissenters, the benefits of the proclamation for liberty of conscience, and of the act of toleration. The profession of belief enjoined upon the *Quakers* by this act is as follows: "I, A. B. profess "faith in God the Father, and in Jesus Christ his eter- "nal son, the true God, and in the Holy Spirit, one "God blessed for evermore; and do acknowledge the "Holy Scriptures of the Old and New Testament to be "given by divine inspiration." But they were particularly eased by an act of 1 W. & M. cap. 18. which allowed to their affirmation (except in a few cases) the validity of an oath. This indulgence was confirmed by subsequent acts: thus, in 1695, they obtained, by a temporary act, that their solemn *affirmation* should be accepted in all cases where an oath is required by law; except in criminal cases, upon juries, and in places of profit and trust under the government, in this form: "I, A. B. do declare, in the presence of almighty God, "the witness of the truth of what I say," &c.

This act was afterwards continued, and at last made perpetual. But this form not being such as was desired, and having, in reality, all the essentials of an oath, they applied to the parliament for an alteration, which they obtained, anno 1721; when the following form was settled to their general satisfaction; viz. "I, A. B. do sin- "cerely, solemnly, and truly declare and *affirm*." Which is the form now used, in the same manner, and under the same limitation with the former. 8 Geo. 6. cap. 6. 22 Geo. II. cap. 46. Any person deposing, upon his solemn *affirmation*, a known falshood, incurs the penalty of wilful and corrupt perjury. 8 Geo. cap. 6. By the same act, *Quakers* are allowed, instead of the oaths of allegiance and supremacy, to make a DECLARATION *of fidelity*. In consequence of these statutes, &c. provision being also made for the easy recovery of tythes, and other ecclesiastical demands, from them, they are at present generally unmolested in the exercise of their profession. However, long before this happy change in their condition, they were constrained, by the vexations and persecutions they suffered in their native country, during the reign of Charles II. to look about for some distant settlements, where they might shelter themselves from the storm; and with this view they began to disseminate their religious principles in various countries. Attempts of this nature were made in Germany, Prussia, France, Italy, Greece, Holland, and Holstein, but with little success. The Dutch, however, were at length persuaded to allow a certain number of them to settle in Holland, where they still continue to reside. Multitudes of them also went over to America, and formed settlements there, not long after the first rise of their sect; and it afterwards happened, by a singular concurrence of events, that this new world became the chief seat of their prosperity and freedom. William Penn, son of the famous vice-admiral of that name, who embraced *Quakerism* in the year 1668, received, in the year 1680, from Charles II. and from the English parliament, the grant of an ample, fertile, but uncultivated province in America, as a reward for the eminent services of his father. This illustrious *Quaker* carried over with him into his new dominions a con-

considerable colony of his friends and brethren; and founded a republic, whose form, laws, and institutions, resembled no other known system of government; whose pacific principles and commercial spirit have long blessed it with tranquillity and opulence, and which, till the irruption of the late unhappy contest, continued in a prosperous and flourishing state. The *Quakers* predominate in this colony, both by their influence and their numbers; but all those who acknowledge the existence and providence of one Supreme Being, and shew their respect to that being, either by external worship, or at least by the regularity of their conduct, are admitted to the rights and privileges of citizens in this happy republic. The large province, that constitutes its territory, was called Pensylvania, from the name of its proprietor; and its capital city was named Philadelphia, from the spirit of union and fraternal love that reigned at first, and is still supposed to prevail, more or less, among its inhabitants.

As for the opinions of the *Quakers*, they hold Christ to be the light, which lighteth every man, and that whoever will soberly and seriously turn into himself, with a sincere desire to know and practise his duty, will not fail to find there a sufficient director, a ray from the fountain of light, illuminating the understanding, and assisting to distinguish good from evil; and that so far as they follow the directions and convictions of this light, they are infallible, and become holy and acceptable to God. They say that opinions, or speculations, or notions of what is true, or subscriptions of articles, or formulas of faith, how soundly soever worded, do not make a man a true believer or a Christian; but a conformity of mind and practice to the will of God, according to the manifestation and dictates of this divine principle of light within them. Hence it has been said, that the fundamental doctrine of *Quakers*, whence all their other tenets are derived, coincide with the opinion of the ancient MYSTICS.

They acknowledge the holy three that bear record in heaven, Father, Word, and Spirit; but they reject the school-terms, trinity, distinct persons, hypostases, &c. as not scriptural, and conveying ideas too gross.

They believe all that is recorded in the New Testament concerning the nativity, life, sufferings, death, resurrection, and ascension of Christ; and their best and most approved writers have been very explicit in their acknowledgement of the reality thereof.

They own the Scriptures to be given by divine inspiration, and to be the outward rule of faith and practice; but they refuse to call them *the Word of God*, as being a denomination properly attributed to Christ alone. They add, that what makes them the more scrupulous in this respect is, that people are hereby led to think, that if they have the Scriptures they have all necessary help and information, and so look for no farther Word or Light.

To this purpose Barclay, their celebrated apologist, observes, that they are not to be esteemed the principal ground of all truth and knowledge, nor yet the adequate primary rule of faith and manners. But they are a secondary rule, subordinate to the spirit, from which they derive all their excellency and certainty; and, therefore, the spirit is more originally and principally the rule.

The only advantage, in their opinion, resulting from a perusal of the holy Scriptures is, that the mind is hereby excited to listen to the dictates of the internal word, and to go to the school of Christ, who teaches within them. They also maintain, that all who are destitute of this written word, if they duly attend to the inward teacher, who always speaketh when the man is silent, will sufficiently learn from him every thing that is necessary to be known and practised in order to their final happiness; and, therefore, that the kingdom of Christ comprehends the whole race of mankind.

They believe in a future state of rewards and punishments; and, disclaiming the doctrines of predestination, and unconditionally imputed righteousness, hold that *good works*, done through the influence and assistance of the Holy Spirit, are necessary for salvation. They also profess, that as man by obedience to the principle of Light, with which he is enlightened, refuses "to obey "any suggestion or temptation of the evil one," and so is "free from actual sinning and transgressing of the law "of God," he is "in that respect *perfect*;" "yet that "this perfection still admits of a growth, and there re"maineth a possibility of sinning, where the mind doth "not most diligently and watchfully attend upon the "Lord."

As to public worship, in the words of one of their writers, "they judge it the duty of all to be diligent in the as"sembling of themselves together, and when assembled "to wait upon God; and, abstaining from their own "thoughts and imaginations, to feel the Lord's presence, "and know a gathering into his name indeed, where he "is in the midst of them, according to his promise. "And as every one is thus inwardly gathered, the secret "power and virtue of life is known to refresh the soul, "and the same motions and breathings of God's spirit "are felt to arise; from which, as words of declaration, "prayer, or praises, arise, the acceptable worship is "known, which edifies the church, and is well pleasing "to God. Yea, though there be not a word spoken, "yet is the true spiritual worship performed, and the "body of Christ edified." Barclay's Apol. prop. ii. sect. 6.

As they allow of no praying or preaching which does not proceed from the inward and immediate motion of the spirit, formal singing, which their great advocate says has no foundation in Scripture, and is liable to much abuse, forms no part of their worship; and for artificial music, he observes, either by organs or other instruments, or voice, we have neither example nor precept in the New Testament. The worship by preaching, praying, and singing, for which he pleads on behalf of his sect, is such as proceedeth from the spirit of God, and is always accompanied with its influence; being begun by its motion, and carried on by the power and strength thereof; and so is a worship purely spiritual.

As to ministry and ordinances, they deny that any are to be used of man's will or wisdom, or other than what the inward principle directs them to: accordingly they set apart no persons for the ministry; but, without distinction of quality or sex, all who are of sober life, and approved conversation, and believe themselves called or moved thereto, are permitted to speak in their assemblies. These, after a time of trial, in order to give proof of the soundness of their doctrine, and the consistency of their conversation therewith, are acknowledged as ministers; but no minister of this people receives any pecuniary emolument for his or her services in the church; nevertheless the expences of those who travel in the work of the ministry, are generally defrayed by the brethren amongst whom they come.

Our Saviour's injunction about *baptism* they understand, in a figurative sense, of a conversion and change of the heart, and wholly reject the outward sign. Water-baptism they hold was no more than a type or figure, now useless in a dispensation that is spiritual and inward. The same they hold of the *supper*, alledging, that both were types or significations of the approaching dispensation, and alluded to the rites and ceremonies practised under the Jewish law, which was fulfilled by the coming of Christ. They add, that the communion of saints consists only in a participation of the divine principle shewing itself in an unity of spirit.

They hold the injunction of Christ, Matt. v. 34. respecting *oaths*, to be absolute, and to comprehend all judicial oaths. His command of universal love, and patience under injuries, they conceive to forbid all *war*; and therefore they refuse to join in a practice which they deem antichristian.

They are remarkable in their speech and apparel, using the singular number to one person of whatever rank or degree, calling the days and months by numerical names, and rejecting the usual ornaments of dress as inconsistent with the simplicity of a Christian life. They also condemn the practice of putting on mourning for the dead.

They hold marriage to be of divine appointment, but will not be married in the usual form by the clergy; and the legislature hath indulged them in regard to this scruple. All marriages amongst them are proposed to the monthly meeting for their concurrence, without which they are not allowed; so that no clandestine marriages are heard of amongst them. The permission of the monthly meeting being obtained, they take each other in marriage, in a public meeting for worship.

As to *discipline and polity*, the affairs of the communion are managed by rules established with common consent, and this principally at their meetings, whereof they have many kinds; as monthly; quarterly; yearly; meeting for sufferings; and meetings of ministers and elders.

The monthly meetings are, in general, composed of several single congregations, or particular meetings. The business of the monthly meetings comprises the care of the poor (the *Quakers* every where maintaining their own); allowing and recording marriages; recording births, burials, and sufferings; granting certificates of unity to those who travel as ministers, and of membership to all who change their places of residence. Here also notice is taken of disorderly conduct, appointments are made to visit the delinquents, who, if unreclaimed by the endeavours of their brethren, are by these meetings disunited from the society. Here appointments are also made to confer with such persons as incline to join them. From these meetings, answers to certain queries are sent, in writing, to the quarterly meetings. The subjects

ſubjects of enquiry are, the preſervation of love and unity; the education of youth; the adherence of the members to the principles of their profeſſion; juſtice in dealing; clearneſs from paying tythes, or receiving impropriate ones; from defrauding the king of his revenue, or bearing arms, or being concerned in privateers or armed veſſels, or dealing in prize goods, as ſuch; the attendance of their religious meetings; and the general care to maintain good order.

The quarterly meeting for each county conſiſts of repreſentatives from the monthly meetings therein. Its buſineſs is to digeſt the accounts received from the monthly meetings, and to prepare a general account to be ſent to the yearly meeting in the like form of anſwers to queries. To this meeting any perſon, thinking himſelf aggrieved by the judgment of the monthly meeting, may appeal for redreſs. It is proper to remark, that theſe people do not ſuffer their members to go to law with each other; but enjoin that all differences among themſelves be ſettled by arbitration.

The yearly meeting is held in London. It conſiſts of repreſentatives from the ſeveral quarterly meetings, approved miniſters, elders, and the members of the meeting for ſufferings. This aſſembly makes rules for the government of the ſociety; orders collections for general ſervice; hears appeals from the judgment of quarterly meetings, and finally confirms or reverſes it; gives advice and directions to the inferior meetings, and to the body at large. The yearly meeting is held in that called Whitſun-week; not, ſay they, from any ſuperſtitious regard to that time, but becauſe it is the moſt convenient ſeaſon that can be fixed upon.

The meeting for ſufferings conſiſts of correſpondents, appointed by the ſeveral places correſponding with the yearly meeting. In this meeting alſo approved miniſters have a ſeat. Its original inſtitution was to provide for the numerous exigencies of the times of perſecution; and it now adminiſters advice to thoſe who are proſecuted for non-payment of tythes, &c. and ſolicits their relief from proſecution. This meeting meets weekly in London, and hath the general care of the ſociety's affairs during the intervals of the yearly meeting; keeps the ſociety's ſtock, and hath the care of the expenditure thereof; which is for publiſhing books to give away, wages of a clerk, and defraying the expence of the paſſages of miniſters who viſit their brethren beyond ſea.

Beſides the meetings already mentioned, there are ſelect meetings of miniſters and elders. The care of reviſing manuſcripts intended to be publiſhed, on behalf of the ſociety, is committed to the meeting of miniſters and elders, which meets every week in London.

The women have diſtinct monthly and quarterly meetings, in which they attend to the wants of the poor of their own ſex.

The *Quakers* have always been peaceable and inoffenſive ſubjects of the governments under which they live; which their principles forbid them to reſiſt: nevertheleſs they think it lawful to remonſtrate whenever their civil or religious liberties are invaded. They hold ſlavery to be incompatible with the doctrines of Chriſtianity, and accordingly are not concerned in the ſlave-trade, and have aboliſhed amongſt them the practice of keeping ſlaves.

The doctrines of the *Quakers* are laid down in a well written apology, addreſſed to king Charles II. by Robert Barclay; and are alſo explained in the numerous writings of William Penn, Iſaac Penington, and others of their ſect. Their hiſtory, written in Low Dutch by William Sewell, and ſince tranſlated into Engliſh, traces them from the beginning to the year 1717. A hiſtory of this people was alſo publiſhed by Gerard Croeſe, anno 1695; but that author is by them accuſed of having miſrepreſented facts, and in many reſpects done them injuſtice. They alſo complain that the learned Dr. Moſheim, in his Eccleſiaſtical Hiſtory, has not ſhewn his uſual accuracy and candour in the account he has given of them; having, as they alledge, greatly miſrepreſented their principles and practices; in which he has been followed by Dr. Formey, and by John Weſley, in a late extract of that celebrated work.

The Editor is indebted for the compilation of this article (very few additions excepted) to a gentleman of the profeſſion deſcribed in it; whoſe judgment and liberality every reader muſt, he is perſuaded, approve and commend.

QUAKING *graſs*, in *Botany*. See Grass.

QUALE *jus*, was an ancient writ judicial, which lay where a religious perſon had judgment to recover land; before execution was made of the judgment.

This writ was iſſued forth to the eſcheator between judgment and execution, to enquire whether the religious perſon had right to recover, or whether the judgment were obtained by colluſion between the demandant and tenant; to the intent that the true lord might not be defrauded.

QUALIFICATION for *killing game*, for *jurors*, *juſtices*, *members of parliament*, and *electors of members*, ſee Game, Jury, Justices, and Parliament.

QUALIFICATOR, in the *Canon Law*, a divine appointed to qualify, or declare the quality of, a propoſition brought before an eccleſiaſtical tribunal; chiefly before the inquiſition.

The *qualificators* of the office are not judges; they only give their ſentiments on the propoſitions preſented to them. They are the inquiſitors that judge.

QUALITY, *qualitas*, that affection of a thing whence it is denominated ſuch; or that which occaſions a thing to affect our ſenſes in this or that manner, and gives it this or that denomination. Accordingly *quality* is ſaid to be an attribute, from which no ſubſtance is exempt. See Mode.

Thus, that power in fire, whatever it be, whereby it excites in us the ſenſation of heat, ſince it is that whence the fire is denominated hot, is called the *quality* of fire.

The word *quality*, *qualitas*, is ſaid to have been firſt introduced into the Latin by Cicero: till his time the Romans ſtudiouſly avoided uſing a term which denoted an abſtract; and in lieu thereof only conſidered the concrete, ſignified by *quale*. The like is obſerved of the ancient Greeks, who did not uſe ποιότης, but ποιον.

Quality, it is to be obſerved, is an ambiguous term; and has been applied to ſome things which ought rather to have been looked upon as ſtates of matter, or aſſemblages of ſeveral *qualities*; as life, health, beauty, &c.

There are, alſo, other attributes, as ſize, ſhape, motion, and reſt, uſually reckoned among *qualities*, which might more conveniently be ranked among the primary modes of the parts of matter; ſince from theſe ſimple attributes all the *qualities* are derived.

The ancient ſchool-philoſophers diſtinguiſh *quality* in the general, which they call *metaphyſical* and *predicamental quality*, into *eſſential* and *accidental*. The moderns, more uſually, divide it into *ſpiritual* and *corporeal*.

Qualities, *ſpiritual*, or Qualities *of the ſoul*, are affections of the mind, conſidered as in this or that habitude or diſpoſition. Of theſe they make two kinds; the one belonging to the underſtanding, the other to the will: of the former kind are knowledge, opinion, certainty, doubting, &c. Of the latter, are all the moral virtues and vices.

Qualities, *corporeal or phyſical*, are what we chiefly conſider under this denomination, and to which the definition above laid down is accommodated.

Philoſophers are divided as to the nature of theſe *qualities*, or what they are in the body. The general language of the Peripatetic ſchool is, that they are things diſtinct from the bodies themſelves; and are ſuperadded to them, or flow from their ſubſtantial forms: on which principle, they hold *qualities* to be real, and denominate them *accidents*; ſuppoſing them to be inherent in ſubſtances, though not in the relation of parts, but to be ſuſtained thereby as in a ſubject, and incapable of ſubſiſting without them. In effect, the Thomiſts define *qualities* to be accidents following or ariſing from the form; in the ſame manner as quality is an accident following or ariſing from the ſubſtance.

The moderns abſolutely explode the notion of *qualities* diſtinct from the body; and inſiſt, that the powers whereby bodies excite in us the ideas of ſuch *qualities* are no other than the mechanical affections of the bodies themſelves, viz. the figure, magnitude, motion, &c. of the parts whereof they conſiſt.

The principal conſiderations inſiſted on by the retainers to real *qualities* are, that theſe powers may be actually ſeparated from the ſubſtances they inhere in; as we ſee in light, heat, &c. That from theſe very *qualities*, conſidered as ſo many determinations, there ariſes a very great diverſity in bodies; and that bodies, according to the diverſity of their *qualities*, affect our ſenſes very differently.

The adherents to the experimental way, on the contrary, account for all the *qualities* of bodies from mechanical cauſes.

Thus all the phenomena of a clock, the motion of its wheels, its hands, &c. whereby it ſtrikes the hour, points the minute, day, moon's age, &c. do all evidently ariſe from the ſingle ſpring; which we never imagine to have any particular powers whereby it ſhould be enabled to make ſuch diſcoveries; nor any other principle but that one of elaſticity. Again, when the ſmith who firſt invented locks and keys, had made his firſt lock, it was only a piece of iron, forged into a particular ſhape; and when, afterwards, he made a key to it, that alſo, conſidered in itſelf, was nothing but a piece of iron of a determinate

conſiderable colony of his friends and brethren; and founded a republic, whoſe form, laws, and inſtitutions, reſembled no other known ſyſtem of government; whoſe pacific principles and commercial ſpirit have long bleſſed it with tranquillity and opulence, and which, till the irruption of the late unhappy conteſt, continued in a proſperous and flouriſhing ſtate. The *Quakers* predominate in this colony, both by their influence and their numbers; but all thoſe who acknowledge the exiſtence and providence of one Supreme Being, and ſhew their reſpect to that being, either by external worſhip, or at leaſt by the regularity of their conduct, are admitted to the rights and privileges of citizens in this happy republic. The large province, that conſtitutes its territory, was called Penſylvania, from the name of its proprietor; and its capital city was named Philadelphia, from the ſpirit of union and fraternal love that reigned at firſt, and is ſtill ſuppoſed to prevail, more or leſs, among its inhabitants.

As for the opinions of the *Quakers*, they hold Chriſt to be the light, which lighteth every man, and that whoever will ſoberly and ſeriouſly turn into himſelf, with a ſincere deſire to know and practiſe his duty, will not fail to find there a ſufficient director, a ray from the fountain of light, illuminating the underſtanding, and aſſiſting to diſtinguiſh good from evil; and that ſo far as they follow the directions and convictions of this light, they are infallible, and become holy and acceptable to God. They ſay that opinions, or ſpeculations, or notions of what is true, or ſubſcriptions of articles, or formulas of faith, how ſoundly ſoever worded, do not make a man a true believer or a Chriſtian; but a conformity of mind and practice to the will of God, according to the manifeſtation and dictates of this divine principle of light within them. Hence it has been ſaid, that the fundamental doctrine of *Quakers*, whence all their other tenets are derived, coincide with the opinion of the ancient MYSTICS.

They acknowledge the holy three that bear record in heaven, Father, Word, and Spirit; but they reject the ſchool-terms, trinity, diſtinct perſons, hypoſtaſes, &c. as not ſcriptural, and conveying ideas too groſs.

They believe all that is recorded in the New Teſtament concerning the nativity, life, ſufferings, death, reſurrection, and aſcenſion of Chriſt; and their beſt and moſt approved writers have been very explicit in their acknowledgement of the reality thereof.

They own the Scriptures to be given by divine inſpiration, and to be the outward rule of faith and practice; but they refuſe to call them *the Word of God*, as being a denomination properly attributed to Chriſt alone. They add, that what makes them the more ſcrupulous in this reſpect is, that people are hereby led to think, that if they have the Scriptures they have all neceſſary help and information, and ſo look for no farther Word or Light. To this purpoſe Barclay, their celebrated apologiſt, obſerves, that they are not to be eſteemed the principal ground of all truth and knowledge, nor yet the adequate primary rule of faith and manners. But they are a ſecondary rule, ſubordinate to the ſpirit, from which they derive all their excellency and certainty; and, therefore, the ſpirit is more originally and principally the rule.

The only advantage, in their opinion, reſulting from a peruſal of the holy Scriptures is, that the mind is hereby excited to liſten to the dictates of the internal word, and to go to the ſchool of Chriſt, who teaches within them. They alſo maintain, that all who are deſtitute of this written word, if they duly attend to the inward teacher, who always ſpeaketh when the man is ſilent, will ſufficiently learn from him every thing that is neceſſary to be known and practiſed in order to their final happineſs; and, therefore, that the kingdom of Chriſt comprehends the whole race of mankind.

They believe in a future ſtate of rewards and puniſhments; and, diſclaiming the doctrines of predeſtination, and unconditionally imputed righteouſneſs, hold that *good works*, done through the influence and aſſiſtance of the holy Spirit, are neceſſary for ſalvation. They alſo profeſs, that as man by obedience to the principle of Light, with which he is enlightened, refuſes "to obey "any ſuggeſtion or temptation of the evil one," and ſo is "free from actual ſinning and tranſgreſſing of the law "of God," he is "in that reſpect *perfect*;" "yet that "this perfection ſtill admits of a growth, and there re"maineth a poſſibility of ſinning, where the mind doth "not moſt diligently and watchfully attend upon the "Lord."

As to public worſhip, in the words of one of their writers, "they judge it the duty of all to be diligent in the aſ"ſembling of themſelves together, and when aſſembled "to wait upon God; and, abſtaining from their own "thoughts and imaginations, to feel the Lord's preſence, "and know a gathering into his name indeed, where he "is in the midſt of them, according to his promiſe. "And as every one is thus inwardly gathered, the ſecret "power and virtue of life is known to refreſh the ſoul, "and the ſame motions and breathings of God's ſpirit "are felt to ariſe; from which, as words of declaration, "prayer, or praiſes, ariſe, the acceptable worſhip is "known, which edifies the church, and is well pleaſing "to God. Yea, though there be not a word ſpoken, "yet is the true ſpiritual worſhip performed, and the "body of Chriſt edified." Barclay's Apol. prop. ii. ſect. 6.

As they allow of no praying or preaching which does not proceed from the inward and immediate motion of the ſpirit, formal ſinging, which their great advocate ſays has no foundation in Scripture, and is liable to much abuſe, forms no part of their worſhip; and for artificial muſic, he obſerves, either by organs or other inſtruments, or voice, we have neither example nor precept in the New Teſtament. The worſhip by preaching, praying, and ſinging, for which he pleads on behalf of his ſect, is ſuch as proceedeth from the ſpirit of God, and is always accompanied with its influence; being begun by its motion, and carried on by the power and ſtrength thereof; and ſo is a worſhip purely ſpiritual.

As to miniſtry and ordinances, they deny that any are to be uſed of man's will or wiſdom, or other than what the inward principle directs them to: accordingly they ſet apart no perſons for the miniſtry; but, without diſtinction of quality or ſex, all who are of ſober life, and approved converſation, and believe themſelves called or moved thereto, are permitted to ſpeak in their aſſemblies. Theſe, after a time of trial, in order to give proof of the ſoundneſs of their doctrine, and the conſiſtency of their converſation therewith, are acknowledged as miniſters; but no miniſter of this people receives any pecuniary emolument for his or her ſervices in the church; nevertheleſs the expences of thoſe who travel in the work of the miniſtry, are generally defrayed by the brethren amongſt whom they come.

Our Saviour's injunction about *baptiſm* they underſtand, in a figurative ſenſe, of a converſion and change of the heart, and wholly reject the outward ſign. Water-baptiſm they hold was no more than a type or figure, now uſeleſs in a diſpenſation that is ſpiritual and inward. The ſame they hold of the *ſupper*, alledging, that both were types or ſignifications of the approaching diſpenſation, and alluded to the rites and ceremonies practiſed under the Jewiſh law, which was fulfilled by the coming of Chriſt. They add, that the communion of ſaints conſiſts only in a participation of the divine principle ſhewing itſelf in an unity of ſpirit.

They hold the injunction of Chriſt, Matt. v. 34. reſpecting *oaths*, to be abſolute, and to comprehend all judicial oaths. His command of univerſal love, and patience under injuries, they conceive to forbid all *war*; and therefore they refuſe to join in a practice which they deem antichriſtian.

They are remarkable in their ſpeech and apparel, uſing the ſingular number to one perſon of whatever rank or degree, calling the days and months by numerical names, and rejecting the uſual ornaments of dreſs as inconſiſtent with the ſimplicity of a Chriſtian life. They alſo condemn the practice of putting on mourning for the dead.

They hold marriage to be of divine appointment, but will not be married in the uſual form by the clergy; and the legiſlature hath indulged them in regard to this ſcruple. All marriages amongſt them are propoſed to the monthly meeting for their concurrence, without which they are not allowed; ſo that no clandeſtine marriages are heard of amongſt them. The permiſſion of the monthly meeting being obtained, they take each other in marriage, in a public meeting for worſhip.

As to *diſcipline and polity*, the affairs of the communion are managed by rules eſtabliſhed with common conſent, and this principally at their meetings, whereof they have many kinds; as monthly; quarterly; yearly; meeting for ſufferings; and meetings of miniſters and elders.

The monthly meetings are, in general, compoſed of ſeveral ſingle congregations, or particular meetings. The buſineſs of the monthly meetings compriſes the care of the poor (the *Quakers* every where maintaining their own); allowing and recording marriages; recording births, burials, and ſufferings; granting certificates of unity to thoſe who travel as miniſters, and of memberſhip to all who change their places of reſidence. Here alſo notice is taken of diſorderly conduct, appointments are made to viſit the delinquents, who, if unreclaimed by the endeavours of their brethren, are by theſe meetings diſunited from the ſociety. Here appointments are alſo made to confer with ſuch perſons as incline to join them. From theſe meetings, anſwers to certain queries are ſent, in writing, to the quarterly meetings. The

ſubjects

ſubjects of enquiry are, the preſervation of love and unity; the education of youth; the adherence of the members to the principles of their profeſſion; juſtice in dealing; clearneſs from paying tythes, or receiving impropriate ones; from defrauding the king of his revenue, or bearing arms, or being concerned in privateers or armed veſſels, or dealing in prize goods, as ſuch; the attendance of their religious meetings; and the general care to maintain good order.

The quarterly meeting for each county conſiſts of repreſentatives from the monthly meetings therein. Its buſineſs is to digeſt the accounts received from the monthly meetings, and to prepare a general account to be ſent to the yearly meeting in the like form of anſwers to queries. To this meeting any perſon, thinking himſelf aggrieved by the judgment of the monthly meeting, may appeal for redreſs. It is proper to remark, that theſe people do not ſuffer their members to go to law with each other; but enjoin that all differences among themſelves be ſettled by arbitration.

The yearly meeting is held in London. It conſiſts of repreſentatives from the ſeveral quarterly meetings, approved miniſters, elders, and the members of the meeting for ſufferings. This aſſembly makes rules for the government of the ſociety; orders collections for general ſervice; hears appeals from the judgment of quarterly meetings, and finally confirms or reverſes it; gives advice and directions to the inferior meetings, and to the body at large. The yearly meeting is held in that called Whitſun-week; not, ſay they, from any ſuperſtitious regard to that time, but becauſe it is the moſt convenient ſeaſon that can be fixed upon.

The meeting for ſufferings conſiſts of correſpondents, appointed by the ſeveral places correſponding with the yearly meeting. In this meeting alſo approved miniſters have a ſeat. Its original inſtitution was to provide for the numerous exigencies of the times of perſecution; and it now adminiſters advice to thoſe who are proſecuted for non-payment of tythes, &c. and ſolicits their relief from proſecution. This meeting meets weekly in London, and hath the general care of the ſociety's affairs during the intervals of the yearly meeting; keeps the ſociety's ſtock, and hath the care of the expenditure thereof; which is for publiſhing books to give away, wages of a clerk, and defraying the expence of the paſſages of miniſters who viſit their brethren beyond ſea.

Beſides the meetings already mentioned, there are ſelect meetings of miniſters and elders. The care of reviſing manuſcripts intended to be publiſhed, on behalf of the ſociety, is committed to the meeting of miniſters and elders, which meets every week in London.

The women have diſtinct monthly and quarterly meetings, in which they attend to the wants of the poor of their own ſex.

The *Quakers* have always been peaceable and inoffenſive ſubjects of the governments under which they live; which their principles forbid them to reſiſt: nevertheleſs they think it lawful to remonſtrate whenever their civil or religious liberties are invaded. They hold ſlavery to be incompatible with the doctrines of Chriſtianity, and accordingly are not concerned in the ſlave-trade, and have aboliſhed amongſt them the practice of keeping ſlaves.

The doctrines of the *Quakers* are laid down in a well written apology, addreſſed to king Charles II. by Robert Barclay; and are alſo explained in the numerous writings of William Penn, Iſaac Penington, and others of their ſect. Their hiſtory, written in Low Dutch by William Sewell, and ſince tranſlated into Engliſh, traces them from the beginning to the year 1717. A hiſtory of this people was alſo publiſhed by Gerard Croeſe, anno 1695; but that author is by them accuſed of having miſrepreſented facts, and in many reſpects done them injuſtice. They alſo complain that the learned Dr. Moſheim, in his Eccleſiaſtical Hiſtory, has not ſhewn his uſual accuracy and candour in the account he has given of them; having, as they alledge, greatly miſrepreſented their principles and practices; in which he has been followed by Dr. Formey, and by John Weſley, in a late extract of that celebrated work.

The Editor is indebted for the compilation of this article (very few additions excepted) to a gentleman of the profeſſion deſcribed in it; whoſe judgment and liberality every reader muſt, he is perſuaded, approve and commend.

QUAKING *graſs*, in *Botany*. See GRASS.

QUALE *jus*, was an ancient writ judicial, which lay where a religious perſon had judgment to recover land; before execution was made of the judgment.

This writ was iſſued forth to the eſcheator between judgment and execution, to enquire whether the religious perſon had right to recover, or whether the judgment were obtained by colluſion between the demandant and tenant; to the intent that the true lord might not be defrauded.

QUALIFICATION for *killing game*, for *jurors*, *juſtices*, *members of parliament*, and *electors of members*, ſee GAME, JURY, JUSTICES, and PARLIAMENT.

QUALIFICATOR, in the *Canon Law*, a divine appointed to qualify, or declare the quality of, a propoſition brought before an eccleſiaſtical tribunal; chiefly before the inquiſition.

The *qualificators* of the office are not judges; they only give their ſentiments on the propoſitions preſented to them. They are the inquiſitors that judge.

QUALITY, *qualitas*, that affection of a thing whence it is denominated ſuch; or that which occaſions a thing to affect our ſenſes in this or that manner, and gives it this or that denomination. Accordingly *quality* is ſaid to be an attribute, from which *no* ſubſtance is exempt. See MODE.

Thus, that power in fire, whatever it be, whereby it excites in us the ſenſation of heat, ſince it is that whence the fire is denominated hot, is called the *quality* of fire.

The word *quality*, *qualitas*, is ſaid to have been firſt introduced into the Latin by Cicero: till his time the Romans ſtudiouſly avoided uſing a term which denoted an abſtract; and in lieu thereof only conſidered the concrete, ſignified by *quale*. The like is obſerved of the ancient Greeks, who did not uſe ποιότης, but ποιόν.

Quality, it is to be obſerved, is an ambiguous term; and has been applied to ſome things which ought rather to have been looked upon as ſtates of matter, or aſſemblages of ſeveral *qualities*; as life, health, beauty, &c.

There are, alſo, other attributes, as ſize, ſhape, motion, and reſt, uſually reckoned among *qualities*, which might more conveniently be ranked among the primary modes of the parts of matter; ſince from theſe ſimple attributes all the *qualities* are derived.

The ancient ſchool-philoſophers diſtinguiſh *quality* in the general, which they call *metaphyſical* and *predicamental quality*, into *eſſential* and *accidental*. The moderns, more uſually, divide it into *ſpiritual* and *corporeal*.

QUALITIES, *ſpiritual*, or QUALITIES *of the ſoul*, are affections of the mind, conſidered as in this or that habitude or diſpoſition. Of theſe they make two kinds; the one belonging to the underſtanding, the other to the will: of the former kind are knowledge, opinion, certainty, doubting, &c. Of the latter, are all the moral virtues and vices.

QUALITIES, *corporeal* or *phyſical*, are what we chiefly conſider under this denomination, and to which the definition above laid down is accommodated.

Philoſophers are divided as to the nature of theſe *qualities*, or what they are in the body. The general language of the Peripatetic ſchool is, that they are things diſtinct from the bodies themſelves; and are ſuperadded to them, or flow from their ſubſtantial forms: on which principle, they hold *qualities* to be real, and denominate them *accidents*; ſuppoſing them to be inherent in ſubſtances, though not in the relation of parts, but to be ſuſtained thereby as in a ſubject, and incapable of ſubſiſting without them. In effect, the Thomiſts define *qualities* to be accidents following or ariſing from the form; in the ſame manner as quality is an accident following or ariſing from the ſubſtance.

The moderns abſolutely explode the notion of *qualities* diſtinct from the body; and inſiſt, that the powers whereby bodies excite in us the ideas of ſuch *qualities* are no other than the mechanical affections of the bodies themſelves, viz. the figure, magnitude, motion, &c. of the parts whereof they conſiſt.

The principal conſiderations inſiſted on by the retainers to real *qualities* are, that theſe powers may be actually ſeparated from the ſubſtances they inhere in; as we ſee in light, heat, &c. That from theſe very *qualities*, conſidered as ſo many determinations, there ariſes a very great diverſity in bodies; and that bodies, according to the diverſity of their *qualities*, affect our ſenſes very differently.

The adherents to the experimental way, on the contrary, account for all the *qualities* of bodies from mechanical cauſes.

Thus all the phenomena of a clock, the motion of its wheels, its hands, &c. whereby it ſtrikes the hour, points the minute, day, moon's age, &c. do all evidently ariſe from the ſingle ſpring; which we never imagine to have any particular powers whereby it ſhould be enabled to make ſuch diſcoveries; nor any other principle but that one of elaſticity. Again, when the ſmith who firſt invented locks and keys, had made his firſt lock, it was only a piece of iron, forged into a particular ſhape; and when, afterwards, he made a key to it, that alſo, conſidered in itſelf, was nothing but a piece of iron of a determinate

terminate figure; but as these two pieces of iron might now be applied to one another, after a certain manner, and as there was a congruity betwixt the wards of the lock and those of the key, they now each obtained a new capacity; and it became a principal part of the notion and definition of a lock, that it was capable of being made to open or shut by that other piece of iron called a key; and it was looked on as a peculiar faculty and power in the key to be fit to open and shut the lock. And yet by these new attributes there was not added any real or physical entity, either to the lock, or the key; each of them remaining the same piece of iron, just so shaped, as it was before. And, again, when the smith made other keys of different sizes, or with different wards, though the first lock could not be opened with any of those keys, yet that indisposition was nothing new in the lock, or distinct from the figure it had before these keys were made.

Why, then, may we not conceive, as to sensible *qualities*, that though, by virtue of a certain congruity or incongruity in point of figure, texture, or other mechanical properties, the portions of matter they modify are enabled to produce various effects, on account whereof the bodies are said to be endowed with *qualities*; yet these are not, in the bodies endowed with them, any real or distinct entities, or differing from the matter itself of such a determinate bigness, shape, and other mechanical modifications?

Thus, though the modern goldsmiths and refiners reckon it among the most distinguished *qualities* of gold, that it is dissoluble in aqua regia, whilst aqua fortis will not work upon it; yet these attributes are not in the gold any thing distinct from its peculiar texture; nor is the gold we have now of any other nature than it was in Pliny's time, when aqua fortis and aqua regia were unknown.

If another menstruum, of which Mr. Boyle suggests he was possessed, should be brought into use to dissolve pure gold in part, and change it into a different metalline body, there would then arise another new property, whereby to distinguish this from other metals; yet the nature of gold is not at all different now from what it was before the discovery of this last menstruum.

There are bodies neither cathartic nor sudorific, with some of which gold being joined acquires a purgative virtue, and with others a power to produce sweat. Nature herself sometimes produces things that have no relations to others; and art, especially if assisted by chemistry, may cause so many new productions, that no man can tell, but the most familiar bodies may have multitudes of *qualities* he dreams not of, which will hardly be imagined real physical entities.

We all know that the sun hath a power to harden clay, soften wax, melt butter, thaw ice, turn water into vapour, make air expand itself in weather-glasses, contribute to blanch linen, render the white skin of the face swarthy, and mowed grass yellow, ripen fruit, hatch the eggs of silk-worms, caterpillars, &c. and perform many other things, some of which seem contrary to others; yet these are not distinct powers, or faculties in the sun, but only the production of its heat, diversified by the different textures of the body it chances to work on, and the condition of the other substances concerned in the operation. And, therefore, whether or no the sun, in some cases, has any influence at all distinct from its light and heat, we see that all the phenomena mentioned are producible by the heat of common fire, duly applied and regulated.

Some of the ancients, and particularly the Peripatetics, have distinguished *qualities* into *sensible* and *occult*.

QUALITIES, *sensible*, or *manifest*, are those arising from certain modifications of matter, and which become immediately the objects of our senses. Such are all those above mentioned.

Though, in strictness, those only are said to be *sensible qualities*, which affect some one sense alone; as colour does the eye, sound the ear, &c.

These are sometimes, also, called *tangible qualities*, because they only produce their effect, i. e. excite their idea in us, when contiguous, or in contact with the organ.

QUALITIES, *occult*, are certain latent powers arising from the specific forms of things, whereof no rational solution can be given on any principles of physics.

Sensible qualities are usually subdivided into *primary* and *secondary*. See IDEAS.

QUALITIES, *primary*, or *general*, are such as are found in all bodies; or which agree to all matter, considered as matter, and therefore to the elements themselves. Such are extension, figure, motion, rest, solidity, impenetrability, and number.

QUALITIES, *secondary*, or *particular*, are such as result from a composition or mixture of elements, and do not agree to body as body, but as a mixt. Such are light, heat, cold, colour, sound, taste, smell, hardness, softness, fluidity, firmness, roughness, smoothness, opacity, transparency, &c.

According to Aristotle, and the Peripatetics, the primary, or elementary *qualities*, are those of the four elements themselves; viz. heat, cold, moisture, and driness.

The secondary *qualities*, according to the same, are all the rest; which are combinations or assemblages of the former elementary ones; as colour, odour, taste, &c.

To give an idea of Aristotle's method of accounting for these secondary *qualities* from his primary ones, we shall instance in his account of colour. All colours then, says he, are generated of a mixture of the four elementary *qualities*: white, e. gr. is produced when the humidity surmounts the heat, as in old men, whose hair grows grey; black is produced when the humidity dries off, as in walls, cisterns, &c. red, &c.

Among the school-philosophers we meet with other divisions of *qualities*; as *active*, and *passive*; *real*, and *intentional*.

QUALITIES, *active*, are those by virtue whereof effects and operations are actually produced on other bodies duly disposed with respect thereto. Such are the heat of fire, the moisture of water, &c.

QUALITIES, *passive*, are those whereby bodies are disposed to receive the action of others. Such are inflammability in oil, &c.

QUALITIES, *real*, are those which remain in the subject, and only act on things adjacent thereto. As fire in a piece of iron not ignited, &c.

QUALITIES, *intentional*, are those which issue from the subject, and operate at a distance. Such is the light emitted from the sun, &c.

But the moderns are agreed, that either all *qualities* are real, or all alike intentional. So that the distinction is impertinent. See on the subject of *quality*, its various species, and its different properties, Harris's Philosophical Arrangements, chap. viii.

However ignorant we may be of the nature of *qualities*, or of the manner of their operation, yet we know the laws of their intention and remission. Dr. Keil demonstrates, that every *quality* which is propagated *in orbem*, such as light, heat, cold, odour, &c. has its efficacy increased, or abated, in a duplicate ratio of the distances from the centre of radiation, or exertion of the *quality*, reciprocally.

Thus, let A (*Tab. III. Geometry, fig. 77.*) be a centre from whence any *quality* exerts itself round about, according to the right lines A *e*, A *f*, &c. The efficacy of the *quality*, be it heat, cold, odour, &c. will be (at equal distances from A) as the spissitude or density of the rays A *b*, A *c*, A *d*. But the rays within the inner circle, or rather spherical superficies, *b c d* H, when they come to be extended to the other spherical surface, *e f g* K, will be much less close than they were before, and that in the reciprocal proportion of the spaces they take up; that is, if the outer surface be the double of the inner, the rays there will be but half as thick; but since spherical superficies are as the squares of their radii, therefore the efficacy of the *quality* in the inner surface will be to that of the outer, as A *e* square, to A *b* square. *Q. E. D.*

Sir Isaac Newton lays it down as one of the rules of philosophizing, that those *qualities* of bodies which are incapable of being intended and remitted, and which are found to obtain in all bodies wherein the experiment could ever be tried, are to be esteemed universal *qualities* of all bodies. See PHILOSOPHIZING.

QUALITIES, *chemical*. One may distinguish physical *qualities*, with Mr. Boyle, into *first*, *second*, and *third*; to the two last of which may be referred several *qualities* not treated of by the writers of physical systems; and these, for distinction sake, may, some of them, be styled the *chemical qualities* of things; because Aristotle, and the schoolmen, were unacquainted with them; and they have been principally introduced by means of chemical operations and experiments: as fumigation, amalgamation, cupellation, volatilization, precipitation, &c.

By these operations, among other means, corporeal things come to appear volatile or fixed, soluble or insoluble in some menstrua, amalgamable or unamalgamable, &c. and these as well deserve the name of *quality* as several other attributes, to which it is allowed.

To these chemical *qualities* some others might be added, which, because of the use that physicians principally make of them, may be called *medical qualities*, whereby some substances received into the human body, are resolving, discussing, suppurating, abstersive, &c. For though some faculties of medicine, as those of heating, cooling, drying, attenuating, purging, &c. may be conveniently referred to the first, second, or third *qualities*, mentioned by naturalists, whilst others are reckoned occult; yet as several

several of them ought not to be referred to the *qualities* whereto they are often ascribed; so the handling of them may be looked upon as a desideratum, and deserves a distinct place in natural philosophy.

QUALITIES, *cosmical*. See COSMICAL *qualities*.

QUALITY is also used for a kind of title, or degree of eminence, given to certain persons, in regard of their territories, signories, or other pretensions.

Thus the king of Great Britain takes the *quality* of king of France; the king of Poland that of king of Sweden; the king of Sardinia that of king of Cyprus and Jerusalem; the czars of Russia, and kings of Spain, have whole pages of *qualities*. The emperor of China assumes the *quality* of son of the sun.

QUALITY *of curvature*, in *Geometry*, is used to signify its form, as it is more or less inequable, or as it is varied more or less in its progress through different parts of the curve. Newton's Meth. of Flux. and Inf. Ser. p. 75. Maclaur. Flux. art. 369. See CURVATURE.

QUAM *diu se bene gesserit*, a clause frequent in letters patent, or grants of offices, to secure them so long as the person they are granted to shall not be guilty of abusing the same.

Thus, e. gr. we find it in those given to the barons of the exchequer; where it intimates, that they shall hold the same as long as they shall behave themselves well; which is to be restrained to matters of their offices; and signifies no more than the law would have implied, had the office been granted expressly for life. See JUDGE.

A grant therefore, with this clause, is equivalent to a grant for life.

QUAMOCLIT, in *Botany*. See *Scarlet* CONVOLVULUS.

QUANDROS, a name given by writers of the middle ages to a stone to which they attribute great virtues, and which, they say, is found in the head of a vulture.

QUANTITY, *quantitas*, any thing capable of estimation, or mensuration; or, which being compared with another thing of the same kind, may be said to be greater or less than it; equal, or unequal, to it.

Mathematics is the science or doctrine of *quantity*.

Quantity is a general attribute, applied in a very different manner to things of very different nature; whence it is impossible to give any universal definition thereof.

Quantity is applied both to things, and to modes; and this either singularly, to one; or plurally, to several. In the first case it is called *magnitude*, in the latter *multitude*.

Quantity may be reduced to four classes; viz.

QUANTITY, *moral*, which depends on the manners of men, and the free determination of their wills. As the prices and value of things; degrees of dignity and power, good and evil, merit and demerit, rewards and punishments, &c.

QUANTITY, *notional*, arising from the operation of the understanding only. Such as the largeness or narrowness of the capacity of the mind, and its conceptions. In *Logic*, universals, predicaments, &c. In *Grammar*, the *quantity* or measure of syllables, accents, tones, &c.

QUANTITY, *physical*, or *natural*, which is of two kinds: 1. That which nature furnishes us with in matter, and its extension. And, 2. In the powers and properties of natural bodies; as gravity, motion, light, heat, cold, rarity, density, &c.

QUANTITY, *transcendental*, as duration, the continuation of any being, existence, time, &c.

QUANTITY is also popularly distinguished into *continued* and *discrete*.

QUANTITY, *continued*, or *continuous*, is when the parts are connected together, and is commonly called *magnitude*. This, again, is of two kinds; either *successive*, or *improper*, as time.

QUANTITY, *discrete*, is when the parts whereof it consists exist distinctly, and unconnected together; which makes what we call *number* or *multitude*.

The notion of continued *quantity*, and its difference from discrete, appears to some without foundation. Mr. Machin considers all mathematical *quantity*, or that for which any symbol is put, as nothing else but number, with regard to some measure, which is considered as one; for that we cannot know precisely how much any thing is, but by means of number. The notion of continued *quantity*, without regard to any measure, is indistinct and confused; and though some species of such *quantity*, considered physically, may be described by motion, as lines by the motion of points, and surfaces by the motion of lines; yet the magnitudes, or mathematical *quantities*, are not made by the motion, but by numbering according to a measure. Vide Phil. Trans. N° 447. p. 228.

Permanent quantity is farther distinguishable into length, breadth, and depth.

Wolfius seems to give us a more precise notion of mathematical *quantity*, and its two species of discrete and continued. Whatever is referred to unity in the same manner as one right line to another, is what we call *quantity*; or number in general.

If, now, the thing be referred to a given unit, as 3, it is called a determinate number: if to unity in the general, or at large, it is called a *quantity*; which, on this principle, is the same with indeterminate number.

Thus, e. gr. the breadth of a river is accounted a *quantity*: if, then, it be enquired how great it is; to conceive its *quantity*, we take some unit at pleasure, and see the relation of the breadth hereto; and according to the different unit assumed, we express the breadth of the river in a different determinate number.

The breadth of the river, therefore, is *quantity* considered as referred to a vague unit, or to unity at large; but the unit being determined, the thing is understood by a determinate number.

In this sense, algebra is the arithmetic of *quantities*. See on the subject of *quantity*, Harris's Philosophical Arrangements, chap. ix.

QUANTITY *of action*. See ACTION.

QUANTITY *impossible*, and *imaginary*. See ROOT.

QUANTITY *of curvature* at any point of a curve is determined by the circle of curvature at that point, and is reciprocally proportional to its radius. Newton's Meth. of Flux. and Inf. Series, p. 60. Maclaurin's Fluxions, book i. chap. xi. See CURVATURE and EVOLUTE.

QUANTITY *of motion*, in *Mechanics*, is of two kinds; viz. of momentary motion, and of entire motion.

QUANTITY *of entire motion*. The Cartesians define the entire motion as the momentary one, by the factum of the mass, or *quantity* of matter, into the velocity; but since motion is a successive being, and has no parts coexisting together, its *quantity* ought to be estimated by the aggregate of the several parts existing successively; and is therefore equal to the factum of the momenta into the time.

QUANTITY *of momentary motion* is the factum of the velocity into the mass; or it is a measure arising from the joint consideration of the *quantity* of matter, and the velocity of the motion of the body; the motion of any whole being the sum or aggregate of the motion in all its several parts.

Hence, in a body twice as great as another, moved with an equal velocity, the *quantity* of motion is double; if the velocity be double also, the *quantity* of the motion will be quadruple. Hence, the *quantity* of momentary motion coincides with what we call the momentum, or impetus of a moving body. See FORCE.

In the collision of bodies, the *quantity* of momentary motion, which is found by taking the sum of motions tending the same way, or their difference, if they tend towards contrary parts, is not at all changed by any actions of the bodies on one another. See PERCUSSION.

QUANTITY *of matter* in any body, is the product of the density into the bulk; or a *quantity* arising from the joint consideration of its magnitude and density.

As, if a body be twice as dense, and take up twice as much space as another, it will be four times as great.

This *quantity* of matter is the best discoverable by the absolute weight of bodies. See MATTER.

QUANTITY *infinite*. See INFINITE *quantity*.

QUANTITIES, in *Algebra*, are indeterminate numbers, or things referred to unity in general. See NUMBER.

Quantities are properly the subject of algebra; which is wholly conversant in the computation of such *quantities*.

Given quantities are used to be noted by the first letters of the alphabet a, b, c, d, &c. the *quantities* sought by the last, z, y, x, &c. See CHARACTERS.

Algebraical quantities are chiefly of two kinds; *positive*, and *negative*.

QUANTITIES, *positive*, or *affirmative*, are those which are greater than nothing; and which are affected with the sign $+$ prefixed; or supposed to be so.

QUANTITIES, *negative*, or *privative*, are those less than nothing; which are affected with the sign $-$ prefixed.

Hence, 1. Since $+$ is the sign of addition, and $-$ the sign of subtraction; a positive *quantity* is produced by adding any real *quantity* to nothing; e. gr. $0+3=+3$; and $0+a=+a$. And a privative *quantity* is produced by subtracting any real *quantity* out of nothing; e. gr. $0-3=-3$; and $0-a=-a$.

For an illustration. Suppose when you are quite destitute of money, somebody gives you a hundred pieces; you have then a hundred pieces more than nothing; which pieces constitute a positive *quantity*.

On the contrary, suppose you have no money, yet owe a hundred pieces; you have then a hundred pieces less than

than nothing; for you muſt pay a hundred pieces to have juſt nothing. This debt is a negative *quantity*.

Thus in local motion, progreſs may be called a poſitive *quantity*, and regreſs a negative one; becauſe the firſt increaſes, and the ſecond diminiſhes the ſpace paſſed over.

And in geometry, if a line drawn towards any part be accounted an affirmative *quantity*, another the contrary way will be a negative one.

Privative or negative *quantities*, therefore, are equally real with poſitive *quantities*, but oppoſite to each other, ſo as to take away each other's effect, in any operation, when they are equal as to *quantity*. Thus $3-3=0$, and $a-a=0$. However, though $+a$, and $-a$, are equal as to *quantity*, we do not ſuppoſe in algebra, that $+a=-a$; becauſe to infer equality in this ſcience, they muſt not only be equal as to *quantity*, but of the ſame quality, that in every operation the one may have the ſame effect as the other. A negative *quantity* is ſaid to be leſs than nothing, becauſe it is oppoſite to the poſitive, and diminiſhes it when joined to it; whereas the addition of o has no effect. But a negative is to be conſidered no leſs as a real *quantity* than a poſitive. *Quantities* that have no ſign prefixed to them are underſtood to be poſitive. See NEGATIVE *ſign*.

QUANTITIES, *commenſurable*, *compound*, *exponential*, *heterogeneous*, *like*, *rational*, *ſimple*, *tranſcendental*, and *variable*. See the adjectives.

QUANTITIES, *addition of*. 1. If the *quantities* denoted by the ſame letter be affected with the ſame ſign, the numbers prefixed to them are added as in common arithmetic.

2. If they be affected with different ſigns, the addition is changed into ſubtraction; and to the remainder is prefixed the ſign of the greater.

3. *Quantities* denoted by different letters, are added by means of the ſign +; as in the following example:

$$\begin{array}{lcl} 4a+2b-2c-5d-g & \quad & a-b \\ 5a-2b+6c+2d-3g & & \quad c \\ \hline 9a+4c-3d-4g & & a-b+c \end{array}$$

See ADDITION.

QUANTITIES, *ſubtraction of*. See SUBTRACTION.

QUANTITIES, *multiplication and diviſion of*. See MULTIPLICATION, and DIVISION.

QUANTITIES, *combination of*. See COMBINATION.

1. If a poſitive *quantity* be multiplied or divided by another poſitive *quantity*, the reſult is alſo a poſitive *quantity*.

2. If a negative *quantity* be multiplied or divided by a poſitive, the reſult is a negative.

3. If a negative *quantity* be multiplied or divided by another negative, the reſult is a poſitive.

4. If a poſitive *quantity* be multiplied or divided by a negative, the reſult is a negative *quantity*. See MULTIPLICATION, in *Algebra*.

QUANTITY, in *Grammar*, denotes the meaſure and magnitude of the ſyllables; or that which determines them to be called long, or ſhort; or, it is the meaſure of time requiſite for the diſtinct pronunciation of a ſyllable.

This *quantity* is the object of PROSODY; and it is the regard to this that diſtinguiſhes verſe from proſe.

The œconomy and arrangement of the *quantities*, i. e. the diſtribution of long and ſhort ſyllables, make what we call the *number*.

The *quantities* are uſed to be diſtinguiſhed among grammarians by the characters ˘ ſhort, and ¯ long.

The proportion between the long and ſhort ſyllables may be generally fixed the ſame as that between the crotchet and quaver in muſic; viz. as 2 to 1. See TIME.

Syllables are long or ſhort, either by their nature, or by accident; that is, on account of the place where they are put, and the letters that follow them, which is called poſition.

In moſt languages, there are ſome ſyllables whoſe *quantities* vary, as the meaſure requires, which are called common; as in the Engliſh rĕcōrd and rĕcōrd.

Some authors confound the *quantity* with the accent; but the difference is very evident; the former being the length or ſhortneſs of a ſyllable, the latter the raiſing or falling of the voice.

From two *quantities*, viz. long and ſhort ſyllables, ariſe all the varieties of poetic feet, which are very great. Horace alone uſes no leſs than twenty-eight. Yet the Greeks went vaſtly beyond the Romans in this reſpect. In effect, as many ways as two *quantities* may be varied by compoſition and tranſpoſition, from two to ſix ſyllables, ſo many different feet have the Greek poets contrived, and that under diſtinct names, to the number of 124. Though it is the opinion of ſome of the learned, that poetical numbers may be ſufficiently explained from the feet of two or three ſyllables, into which the reſt may be reſolved.

The feet, formed by the ancients of the long and ſhort ſyllables immediately, are the *ſpondee*, conſiſting of two long ſyllables; the *pyrrhic*, of two ſhort ones; the *trochee*, of a long and ſhort ſyllable; and the *iambic*, of a ſhort and long ſyllable.

Thoſe of three ſyllables are the *moloſſus*, conſiſting of three long ſyllables; the *tribrach*, of three ſhort ones; the *dactyl*, of one long and two ſhort ſyllables; and the *anapeſt*, of two ſhort and one long ſyllable.

The Engliſh tongue admits of no feet above two ſyllables, though both the Latin and Greek allow of ſix.

Our heroic verſes conſiſt of five long and five ſhort ſyllables intermixed alternately; though not ſo ſtrictly but that the order may be diſpenſed with. Dryden varies them with admirable beauty; frequently his heroic verſe begins with a long ſyllable followed by two ſhort ones.

The truth is, the *quantity* of the ſyllables is but little fixed in the modern tongues; and there is ſtill leſs regard had to it in the compoſition of modern verſes. The want of feet, or rather the ſhortneſs and uniformity of our feet, makes great difference between the numbers of the ancient and modern verſe. Our poets are fettered; and their fetters are ſo ſhort, conſiſting of but two poor links, that it is no wonder they can make no extraordinary motions.

The ancients ſubſiſted by their *quantities* alone; ſo well were they diſtinguiſhed, and ſuch a variety and harmony did they afford! Our *quantities* make ſuch poor muſic, that we are forced to call in the Gothic aid of rhyme to diſtinguiſh our verſe from proſe.

Yet have attempts been made to ſettle our verſe on the ancient and natural footing of *quantities*, in excluſion of rhyme, and with ſuch ſucceſs too (witneſs the immortal Paradiſe Loſt) as ſeems to leave the practice of rhyming inexcuſable. The French have likewiſe attempted the ſame in their tongue, particularly Jodelet, and after him Paſquier, Paſſerat, and Rapin; but they have all failed.

QUANTITY *of a degree*. See DEGREE.

QUANTITY *of an eclipſe*. See ECLIPSE.

QUANTUM *meruit*, called alſo an ASSUMPSIT, an action upon the caſe, grounded upon a neceſſity to pay a man for doing any thing ſo much as it deſerves or merits.

This valuation of his trouble is ſubmitted to the determination of a jury; who will aſſeſs ſuch a ſum in damages as they think he really merited.

QUANTUM *valebat*, or an implied ASSUMPSIT, is where goods and wares ſold, are delivered by a tradeſman at no certain price, or to be paid for them as much as they are worth in general; then *quantum valebat*, or an action on the caſe, lies, and the plaintiff is to aver them to be worth ſo much; ſo where the law obliges one to furniſh another with goods or proviſions, as an inn-keeper his gueſts, &c.

QUAPACHTOTOTL, in *Ornithology*, a name under which Nieremberg has deſcribed a bird, which, he ſays, imitates the human laugh. He ſays its body is eight inches long, and the tail as many; the beak of a bluiſh black, and bent and crooked; the breaſt grey, and the belly black; the tail of a browniſh black, and the wings, neck, and head, of a yellowiſh brown.

QUARANTAIN, in old *Law-Books*, written QUARENTINE, and QUARANTENA, denotes the ſpace of forty days.

Quatuor carucatas terræ arabilis, continentes in longitudine 8 quarentenas, & 8 quarentenas *in latitudine*. Chart. Withlaſii Reg. Merc. apud Ingulf.

Quarentena *in London. ponetur pro reſpectu habend.* 40 *dies poſt ſummonitionem per breve regis, ut conſulant*, &c. *ſi ſibi viderint expedire*. MS. de Temp. Ed. III.

The term is borrowed from the French *quarentain*; and is ſometimes uſed for the time of Lent.

QUARANTAIN *of the king*, in France, denotes a truce of forty days appointed by St. Louis, during which time it was expreſly forbid to take any revenge of the relations or friends of people who had fought, wounded, or affronted each other in words.

QUARANTAIN, or QUARENTINE, is more particularly uſed for the term of forty days, which veſſels, coming from places ſuſpected of contagion, are obliged to wait in certain places appointed to air themſelves before they come into port.

By the ſtat. 26 Geo. II. cap. 6. explained and amended by 29 Geo. II. cap. 8. the method of performing *quarentine*, or forty days probation, by ſhips coming from foreign countries, is put in a much more regular and effectual order than formerly; and maſters of ſhips coming from infected places, and diſobeying the directions there given,

given, or having the plague on board, and concealing it, are guilty of felony without benefit of clergy. The fame penalty alfo attends perfons efcaping from the LAZARETTOS, and officers and watchmen neglecting their duty, and perfons conveying goods or letters from fhips performing *quarentine*. See PLAGUE.

QUARANTAIN, QUARANTINE, or QUARENTINE, *quarantena*, in *Law*, denotes a benefit allowed by the laws of England to the widow of a man dying feifed of land; whereby fhe may challenge to continue in his capital meffuage, or chief manfion-houfe (fo it be not a caftle), for the fpace of forty days after his deceafe.

If the heir or any other perfon attempt to eject her, fhe may have the writ *de quarantena habenda*; which lies for a widow to enjoy her *quarantain*.

QUARANTAIN is alfo ufed for a meafure or extent of land, containing forty perches.

QUARANTIA, in the Venetian *Polity*, a court of judicature compofed of forty judges.

The Venetians have an old civil *quarantia*, a new civil *quarantia*, and a criminal *quarantia*.

The criminal *quarantia* takes cognizance of all crimes except thofe againft the ftate, which belongs to the council of ten. The new civil *quarantia* judges of appeals made from fentences made by judges out of the city. The old civil *quarantia* takes cognizance of appeals from fentences of fubaltern judges in that city.

QUARE *claufum fregit*. See CLAUSUM *fregit*.

QUARE *ejecit infra terminum*, a writ which lies for a leffee, in cafe he be caft out of his farm before his term be expired, againft the leffor or feoffee, that ejects him.

It differs from *ejectione firmæ*, in that the former lies where the leffor, after the leafe made, enfeoffs another who ejects the leffee; whereas the *ejectione firmæ* lies againft any other ftranger that ejects him.

The effect is the fame in both; viz. the recovery of the refidue of the term.

QUARE *impedit*, a writ which lies for him who has purchafed an advowfon, againft him that difturbs him in the right thereof, by prefenting a clerk thereto when the church is void.

It differs from the affize of darrein prefentment, *ultimæ præfentationis*, which lies where a man, or his anceftors, formerly prefented; this other lying for him who is the purchafer himfelf. Where a man may have the affife, he may have this writ; but not contrariwife.

QUARE *incumbravit*, a writ which lie againft the bifhop, who within fix months after the vacancy of a benefice, confers it on his clerk, while two others are contending at law for the right of prefenting. See PRESENTATION, &c.

QUARE *non admifit*, a writ which lies againft the bifhop for refufing to admit his clerk, who has recovered in a plea of advowfon; on pretence of lapfe, &c.

QUARE *non permittit*, is a writ that lies for one who has a right to prefent for a turn againft the proprietary.

QUARE *obftruxit*, a writ that lies for him, who, having right to pafs through his neighbour's grounds, cannot enjoy the fame, becaufe the owner has fenced it up.

QUARENTINE. See QUARANTAIN.

QUARERA, or QUARATIA. See QUARRY.

QUARREL, *querela*, in *Law*. See QUERELA.

Quarrel feems properly to relate to perfonal actions, or at moft to mixed ones, wherein the plaintiff is called *querens*; and, in all declarations of trefpafs, it is faid, *queritur*.

Yet if a man releafe all *quarrels*, or *querels* (a man's own deed being taken moft ftrongly againft himfelf), *quarrel* includes all actions; and accordingly all actions, both real and perfonal, are hereby releafed.

Quarrels or affrays in a church or church-yard are efteemed very heinous offences, as being indignities to him to whofe fervices thofe places are confecrated; therefore mere quarrelfome words, which are neither an affray nor an offence in any other place, are penal here. For it is enacted by ftat. 5 & 6 Edw. VI. cap. 4. that if any perfon fhall, by words only, *quarrel*, chide, or brawl, in a church or church-yard, the ordinary fhall fufpend him, if a layman, *ab ingreffu ecclefiæ*; and if a clerk in orders, from the miniftration of his office during pleafure. And if any perfon in fuch church or church-yard proceeds to fmite or lay violent hands upon another, he fhall be excommunicated *ipfo facto*; or if he ftrikes him with a weapon, or draws any weapon with intent to ftrike, he fhall befides excommunication (being convicted by a jury) have one of his ears cut off; or having no ears, be branded with the letter F in his cheek.

QUARREL *of glafs*. See QUARRY.

The word is formed, by diminution, from the Latin *quadratum*, or the French *quarré*, *fquare*; or, perhaps, immediately from the Italian *quadrello*, *little fquare*.

QUARRY, a place under-ground, out of which are dug marble, free-ftone, flate, lime-ftone, or other matters proper for building.

For *quarries* of free-ftone, in many places, they firft open a hole in manner of a well, twelve or fourteen feet in diameter; and the rubbifh drawn out with a windlafs in large ofier bafkets, they heap all around; placing their wheel, which is to draw up their ftones, thereupon.

As the hole advances, and their common ladder becomes too fhort, they apply a particular ladder for the purpofe. When they have got through the earth, and are arrived at the firft bank, or ftratum, they begin to apply their wheel and bafkets to difcharge the ftones as faft as they dig through them.

They ufually find fix or feven of thefe different ftrata, or beds of ftones, of different heights, and ferving for different purpofes; though the number, as well as order, wherein they follow, is various.

In many parts of England we find fea-fhells buried in hard ftone, and under great beds of earth.

Near Broughton, in Lincolnfhire, all the *quarries* abound with them. At the eaft end of this town there is a *quarry* of a foft ftone, which they dig through to get at a bed of clay, which is of a peculiar glutinous quality, and hardens like mortar in drying: this is ufed for cementing other ftones together, and in this are innumerable fragments of fhells of cockles, fcallops, fea-echini, and corals; and among thefe fragments there are found fome whole fhells of their natural colours, and often wholly unhurt; though fome of them are bruifed and preffed quite flat by the great weight of earth that lies upon them. On the fouth fide of the town there is a *quarry* of a blue ftone, which was doubtlefs at firft a blue clay of the fame nature with that juft mentioned. This contains in its body vaft numbers of the fame forts of fhells, and of many other kinds; but they are all fo firmly bedded in the ftone, that it is not eafy to get them out whole; but there is this very remarkable, that they only lie in the fuperficial part of the ftone, the ftratum being very thick, but not one fhell found in it beyond the depth of two feet from the furface.

The furface of this ftratum of ftone is not even and fmooth, but is waved and ridged irregularly, like a bed of fnow, or like the waves of the fea in the time of a fmall wind. This has juft the appearance that the furface of a mafs of half hardened matter muft have, if the wind blew fiercely upon it from one quarter; and by the direction of thefe undulations, it is eafy to fee from what quarter the wind blew at that time. In that part of the ftone which forms this undulated roughnefs, there are as many fhells as any where elfe; and thefe lie partly buried and partly ftanding out of the ftone, juft as we fee the frefh water fhell-fifh lie half in and half out of the mud of the bottom of a pond or river that is dried up in fummer.

It is very obfervable, that, in this cafe, as much of the fhell as is within the ftone is perfectly well preferved, and as hard as ftone; whereas that part which ftands out is either wholly decayed, or at the beft of the nature of a rotten fhell, which falls to pieces on being touched with the hands. The part of the fhell within the ftone is ufually converted into a mafs different from the fhell in all things but figure; but that which ftands out always preferves the true texture of the natural fhell, and is made up of many flakes and crufts as the natural fhells of the kind to which it belongs are.

The *quarries* about Broughton feem to have been but little difturbed, and to have been originally the mud which formed the bottom of fome large frefh water lake; for the fhells found in greateft plenty of all there, are frefh water fhells. Thefe feem to have remained in their original mud while turned to ftone; and the other fhells, natives of the fea, which are buried there among them, feem to have been fome of that immenfe number and variety that muft have rolled along the bottom of that bed of waters; and the vifcid nature of the clay detained many of thefe among its own proper inhabitants, and preferved them together in its ftrong ftate.

Befide the parts of animals thefe *quarries* have vegetable matters alfo in them; the leaves and branches of whortles are not uncommon, and pieces of wood turned black and refembling charcoal are alfo found there. Thefe have been preferved in the fame manner with the leaves of fern on the flates of our coal-pits, and the plants and fifh found in hard ftone in many of the German mines. Many of thefe vegetable remains are alfo found in loofe nodules of ftone refembling pebbles; thefe are not lefs eafily accounted for than the reft; for it is not ftrange to conceive, that leaves and pieces of plants might be, in that general confufion, received into lumps of clay, which might afterwards be rolled into roundnefs by the motion of the water, and finally received into chafms of the earth, and there petrified. Phil. Tranf. N° 266, p. 685.

As to the drawing of the ſtone, i. e. the freeing it from the bed, they find that common ſtones, at leaſt the ſofter kinds, as they lie, have two grains; a cleaving grain running parallel with the horizon, and a breaking grain running perpendicular thereto. After uncoping, then, i. e. clearing the earth from off it, they obſerve by the grain where the ſtone will cleave; and there they drive in a good number of wedges, till they have thus cleft it from the reſt of the rock.

This done, they proceed to break it; in order to which, applying the ruler to it at both ends (ten, e. gr. or twelve inches apart, according to the uſes the ſtone is intended for), they ſtrike a line, and by this cut a little channel with their ſtone-ax; and in the channel ſet five or ſix wedges (ſuppoſing the ſtone three or four feet), driving them in very carefully, with gentle blows, and ſtill keeping them equally forward.

Having thus broken the ſtone in length (which they are able to do to half an inch, of any ſize) applying a ſquare to the ſtraight ſide, they ſtrike a line, and proceed as before to break it in breadth.

This method of drawing is found vaſtly preferable to that where the ſtones are broken at random. One load of the former being found to do the buſineſs of a load and a half of the latter.

But it may be obſerved, that this cleaving grain being generally wanting in the harder kinds of ſtones, to break up theſe in the *quarries*, they have great heavy ſtone-axes, wherewith they work down a deep channel into the ſtone; and into this channel, at the top, lay two iron bars, driving their iron wedges between theſe bars.

Some in drawing of ſtone, eſpecially the very hard kinds, make uſe of gunpowder, and with very good effect. In order to which, making a ſmall perforation pretty deep into the body of the rock, ſo as to have that thickneſs of rock over it judged proper to be blown up at once, at the farther end of the perforation they diſpoſe a convenient quantity of gunpowder, filling up all the reſt with ſtones and rubbiſh, ſtrongly rammed in, except a little ſpace for the train. By this means is the rock blown into ſeveral pieces, moſt of them not too unwieldy for a workman to manage.

QUARRY, in *Glaziery*, a pane, or piece of glaſs, cut in a lozenge, or diamond-form.

The word ſeems formed, by corruption, from *quarrel* (which ſee); unleſs we will ſuppoſe it to come immediately from the French *quarré*, *ſquare*.

Quarries, or *quarrels* of glaſs, are of two kinds; viz. ſquare, and long; each whereof is of different ſizes, expreſſed by the number of pieces which make a foot of glaſs; viz. 8ths, 10ths, 12ths, 15ths, 18ths, and 20ths; but all the ſizes are cut to the ſame angle, the acute angle being 77° 19′, in the ſquare *quarries*, and 67° 22′, in the long ones.

QUARRY, in *Falconry*, is the game, or fowl, which the hawk is in purſuit of, or has killed.

QUARRY, among *Hunters*, is ſometimes uſed for part of the viſcera of the beaſt taken; given by way of reward to the hounds.

QUART, q. d. fourth, in *Muſic*, *Fencing*, *Gaming*, &c. See MUSIC, &c.

QUART is particularly uſed for a diminutive meaſure, containing one fourth, or quarter, of ſome other MEASURE. The Engliſh *quart* is a fourth of a gallon, or two pints; the Roman *quart*, or *quartarius*, was the fourth part of their congius.

The French, from whom we borrow the word, beſides their *quart*, or *pot* of two pints, have various other *quarts*, diſtinguiſhed by the whole whereof they are quarters; as *quart de muid*, and *quart de boiſſeau*. See MUID, and BUSHEL.

QUARTAN, in *Medicine*, the name of a ſpecies of intermitting fever, which returns upon the patient every fourth day, including the days of both the paroxyſms, with a cold fit ſucceeded by a hot one. In this nature is endeavouring to relieve herſelf from ſome noxious matter adhering to ſome of the hypochondriac viſcera, and to prevent the injury that might thence happen to the part. The *quartan* is, by authors, diſtinguiſhed into the ſimple and the continual.

The ſimple *quartan* is the moſt regular of all the ſpecies of intermitting fevers; it almoſt conſtantly ſeizes the patient about four or five in the afternoon with a cold fit; but this is not ſo violent as in the quotidian or tertian, nor does it occaſion any of the ſhaking of the limbs: it is, however, very ſenſible, and uſually laſts about two hours. This is preceded and accompanied by a general languor or faintneſs; but is not ſo frequently attended with vomitings as the other intermittents in the time of their cold fit, nor is there any tendency to a diarrhœa; but, on the contrary, the bowels are uſually coſtive, not only on the day of the fit, but on the intermediate ones. The hot fit ſlowly ſucceeds the cold one, and is not ſo violent as in the tertian; but rather is troubleſome from the ſenſation of drineſs it brings on, and is ſeldom ſucceeded by any ſweating. The hot fit uſually continues about four hours, ſometimes ſix, and ſometimes much longer than that in the firſt fits. During the heat the head is vertiginous, and afflicted with a heavy pain, not a very acute one. When the fit is over, the patient returns to tolerable good health again, and remains in that ſtate for two ſucceeding days, ſaving that he has a ſoreneſs in the limbs, and a wearineſs and general laſſitude. The fit afterwards returns at the very hour it firſt came on at, and rarely varies at all from this: when it is obſerved to anticipate its uſual time, there is juſt reaſon to fear its becoming continual. The perſons moſt ſubject to *quartans* are thoſe of a middle or advanced age; it rarely happens to young people unleſs epidemic, and of all other perſons, thoſe are moſt ſubject to it who live a ſedentary life, and are of a melancholy diſpoſition.

Cauſes of it. The general cauſe of a *quartan* is a morbid viſcous matter, lodged in the hypochondriac viſcera, and having communication by that means with the vena portæ. The liver, ſpleen, and glands of the meſentery, are frequently the ſeats of this, rarely the primæ viæ. That theſe viſcera are affected in *quartans*, is evident from the connection theſe diſeaſes have with their other affections, ſuch as dropſies, jaundice, and the like. The occaſional cauſes are very frequently a quotidian or tertian fever improperly treated, obſtructions or omiſſions of habitual diſcharges of blood, whether by bleeding, or by the menſes, or hæmorrhoids; a heavy diet, without ſufficient drink; a ſudden chilling of the abdomen in a humid air, after the body has been violently heated. The principal time for theſe fevers is the autumn, whence they have been called by ſome *autumnal fevers*; and nothing more endangers their frequent return than the abuſe of ſtrong liquors, or of acids, which coagulate the blood.

Prognoſtics. The tenacity of the morbific matter in theſe fevers, though in but a very ſmall quantity, yet renders them very difficult of cure. They often laſt many weeks or months, in ſpite of all medicines, and in ſome ages have been accounted the greateſt ſcandal to phyſicians. When they ſeize a perſon in the ſpring ſeaſon, they are naturally of ſhorter duration; but when they come on in their more uſual ſeaſon, the autumn, they generally hold the patient till the ſpring. *Quartans* are very apt to return upon people at the ſame ſeaſon of the year at which they firſt ſeized them, eſpecially when they have been but injudiciouſly treated in the cure. They are often, indeed, rather ſuppreſſed than cured, and then return uſually at ſhorter periods, and often almoſt immediately on feeding heartily, which is commonly the caſe with thoſe who have been freed from them by the bark injudiciouſly given. It has been already obſerved, that this diſeaſe does not naturally tend to any ſort of evacuation; and when ſuch diſcharges are unnaturally provoked by medicines, as by vomits, purges, and violent ſudorifics, it is eaſily changed into a hectic, or ſome other dangerous chronic malady. A *quartan*, when properly cured, uſually carries off with it all tendency to hypochondriac complaints, to which the patient may before have been ſubject; but, on the contrary, when improperly ſuppreſſed, it too often brings on ſchirroſities of the liver and ſpleen, and of the meſaraic glands, with œdematous ſwellings, hectics, aſthmas, and other complaints.

A violent appetite after the fit of a *quartan*, or a tertian fever, is a ſign that the diſeaſe will be very difficult of cure. Eruptions on the ſkin in the time of *quartans*, uſually preſage the going off of the diſeaſe; and ſometimes hard tumors, and bad ulcers in the legs and feet, come on during the time of the illneſs; theſe generally preſage the going off of the original diſeaſe, but they have in themſelves a worſe complaint in the place of it; and it is obſerved alſo, that œdematous tumors, which have their riſe from ill-cured *quartans*, are much more obſtinate and difficult of cure than any others.

Method of cure. The uſe of the bark is now univerſal in all intermittents, and the ignorant as well as the judicious give it; but there are many authors who are greatly againſt the ſole uſe of it in *quartans*. Stahl ſays, that in this caſe the mucous matter lodged in the hypochondriac viſcera, which is the cauſe of the diſeaſe, ſhould be firſt attenuated and incided by the neutral and digeſtive ſalts, as vitriolated tartar and the like; and with the gums, as ammoniacum and ſagapenum; with the roots of arum and pimpernel; and by diluents, which would alſo take off the obſtinate coſtiveneſs of the bowels. That when the matter is by this means fitted for evacuation, it ſhould be thrown off by purges and diuretics, ſuch as black hellebore, mercurius dulcis, and the tartar pills; and afterwards the cure to be completed by reſtoring the viſcera

to their due tone, by means of bitters and subastringents, as gentian, centaury, and the Jesuit's bark given in small quantities. By this means cures are much more regularly and happily effected than by bark alone. Junker's Consp. Med. p. 373—376.

Bartholine, in his Medical Observations, gives us a very remarkable instance of a cure performed on a person long afflicted with a *quartan*, and who had tried all the common methods in vain. He was advised by some body to drink plentifully of very new beer; he did so, and going to bed, sweat very largely upon it, and was absolutely cured by it.

Quartans have sometimes been cured by mercurials. Med. Ess. Edinb. vol. ii. p. 317.

The *quartan* ague is said to be cured by a medicine composed of euphorbium, resin of jalap, mercurius dulcis, and sugar. See AGUE, and *Intermitting* FEVER.

QUARTANS, *continual*, in *Medicine*, the name given to a species of compound fever, which has the paroxysms of a common *quartan*; but in which the heat never goes wholly off, but continues till the time of the succeeding fit. In all respects, except the regular returns of the paroxysms, this disease greatly resembles a hectic.

Signs of it. Every fourth day there is a regular paroxysm, which begins with a coldness and shivering: this, however, does not return exactly to an hour, as the simple *quartan* does in its fits; but usually the succeeding fit anticipates the time of the former. When the cold fit is over, there comes on a violent day-burning; the heat is much greater the first day than the succeeding ones, but continues in some degree till the fourth day, when the cold fit returns again, and the patient is seldom able to keep long together out of bed in the whole time. There is a continual thirst and driness of the mouth, and the saliva is very little in quantity and very frothy; the appetite is bad, and the patient usually has more inclination to salted and cold foods than any other; the head is disordered rather than aching, and there is a continual desire to sleep, but what sleep the patient has is troubled and unsound, and gives very little refreshment; the urine during the whole course of the disease resembles that of hectical patients, and is reddish and turbid, depositing, after a time, a rose-coloured sediment.

Persons subject to it. This disease is frequently brought upon persons who have had a common *quartan*, by the injudicious treatment of that distemper, and particularly by the taking hot medicines in it before the approach of the fit; the too free use of astringents has also in many cases changed that disease into this. People of a middle or more advanced age are more subject to it than youth; and of these, such are principally seen to be afflicted with it as are of a melancholic habit and sedentary life.

Prognostics in it. This disease, though in itself less dangerous than many others, yet very easily changes, under improper management, into a hectic, and sometimes into a dropsy. This is the case not unfrequently when it is treated with large repeated doses of astringents; on the other hand, when it is treated with vomits and a hot regimen, it easily passes into an acute and dangerous inflammatory fever.

Method of cure. Toward the time of the fit there should be given powders composed of the digestive salts, such as vitriolated tartar, with crabs-eyes, saturated with lemon-juice. So long as the heat continues violent, the person is to be kept quiet, and to drink plentifully of warm and weak liquors; and in the following days, when the heat is observed to be decreased, gentle purges are to be given, with gentle aperients and resolvents, such as the decoctions of dandelion and succory roots; and towards evening a gentle dose of some anodyne, as the storax-pill, and the like. The common violent methods by vomits, bleeding, stimulating purges, and hot alexipharmics, have no place in the cure of this disease; but, on the contrary, violently disturb nature, and add to the complaints. Absorbents in large quantities are also to be avoided, lest the viscid matter, which is the cause of the disease, should be increased by their effects; and when the patient is happily cured, he is not immediately to abstain from medicines, since relapses are very frequent. Digestives and stomachics taken for some weeks after, will serve to prevent them. Junker's Consp. Med. p. 209. 401.

QUARTAN, *double*, is that fever which hath two fits every fourth day. The same name is also given to a fever which returns two days successively, only leaving one day's intermission.

QUARTAN, *triple*, is that which has three fits every fourth day, or that which returns every day like a QUOTIDIAN, only at different seasons of the day; the fourth fit answering to the time of the first, the fifth to the second, &c. See *Intermitting* FEVER.

QUARTARIUS, a measure among the ancients, being the fourth part of a sextary, and nearly equal to a quarter of a pint of our wine-measure.

QUARTATION, in *Metallurgy*, is the separation of silver from gold by means of aqua fortis; which is an operation that has something singular in it.

If silver and gold are mixed together into a mass, and the gold is not less than one third part of the mass in weight, the best aqua fortis poured upon it is not at all capable of dissolving the silver; but if you add more silver to this mass, by melting it again in the fire, with such a necessary addition of that metal alone as should bring the gold in the mass to the proportion of less than one third of the whole, and suffer it to cool, then aqua fortis poured on it will corrode the silver from it: this is also by so much the more strongly performed, as the quantity of gold is less than in the proportion of one third of the whole mass; but experience has taught us, that aqua fortis dissolves silver mixed with gold quickly enough when the gold constitutes but one, and the silver three parts of a mixed mass of them; and in this case, if the solution is not too impetuously performed, the gold usually remains in such a proportion, in the same figure that the whole mass had before the separation of the silver by this menstruum; so that in this case, there is no reason to apprehend the gold's being torn into minute particles, and dissipated in some measure; though this can hardly be prevented when the silver exceeds the three quarter proportion, in regard to the gold in the mass. The artificers, therefore, always make it their study to observe very exactly this proportion of the gold being one fourth part of the mixture; and thence it is that the operation itself has been called *quartation*.

In order to ascertain nearly the proportion of gold and silver in a mass, the assayers rub this mass upon a touchstone, so as to leave a mark upon it; and they then make marks upon the stone with some of those needles, called TOUCH-*needles*, the colour of which they think comes nearest to that of the mass: by comparing the marks of these needles with the mark of the mass, they discover nearly the proportion of the gold and silver in the mass.

The mass of gold and silver to be *quarted* ought previously to be granulated, by melting it in a crucible, and pouring it into a large vessel full of cold water, while at the same time a rapid circular motion is given to the water by quickly stirring it round with a stick or broom. The vessels generally used for this operation are called PARTING-*glasses*. The aqua fortis must be purified for this purpose, and should be so strong as to be capable of acting sensibly on silver when cold, but not so strong as to act violently. If it be very strong, and the vessels well closed, a small quantity of the gold will be dissolved along with the silver, which is to be guarded against. Little heat ought to be applied at the beginning, the liquor being apt to swell and rise over the vessel; but when the acid is nearly saturated, the heat may be safely increased. When the solution ceases, which may be known by the discontinuance of the effervescence, or emission of air-bubbles, the liquor is to be poured off. If any grains appear entire, more aqua fortis must be added, that all the silver may be dissolved. If the operation has been performed slowly, the remaining gold will have still the form of distinct masses, which are to receive solidity and colour by putting them into a test under a muffle, and making them red-hot. If the operation has been performed hastily, the gold will have the appearance of a black mud or powder, which, after five or six washings with pure water, must be melted. The silver is usually recovered by precipitating it from the aqua fortis by means of copper vessels, into which the liquor is poured, or of plates of copper, which are thrown along with the liquor into glass vessels. A considerable heat is required to accelerate this precipitation. Dr. Lewis observes, that when the aqua fortis has been perfectly saturated with silver, no precipitation is occasioned by plates of copper, till a drop or two of aqua fortis is added to the liquor, and then the precipitation begins, and continues as usual. The precipitated silver must be well washed in boiling water, and fused with some nitre, the use of which is to scorify any cupreous particles which may adhere to the silver.

Here we may add, that silver and gold may be parted from one another by the vitriolic acid, as effectually, though not so commodiously, as by the nitrous. If the compound be reduced into grains or thin plates, and boiled in about twice its weight of oil of vitriol to driness, the silver will be so far corroded, as to be easily washed off by a little more of the acid: or if the mass, after the corrosion, be melted in a crucible, the gold will separate and subside, the silver forming a scoria above it. Gold may be purified in the same manner from several other metallic bodies. M. Scheffer says, that this is the most direct way of separating tin from gold. Lewis's Com. Phil.

Phil. Techn. p. 95. 149, &c. See ASSAYING, DEPART, and GOLD.

QUARTELOIS, *carteloïs*, or *corticæ*, furtouts, or upper garments, with coats of arms quartered on them, worn by the ancient knights in their military expeditions.

QUARTER, the fourth part of a whole, or integer divided into four equal portions.

In working of fractions the *quarter* is expressed by ¼; three *quarters* by ¾.

QUARTER, in *Weights*, is a fourth part of the quintal, or hundred weight.

The *quarter* is 28 pounds avoirdupois.

QUARTER is also a dry measure, containing of corn eight bushels striked; and of coals the fourth part of a chaldron.

Quarterium frumenti constat ex octo bussellis. Fleta, lib. ii. This seems to have signified originally the fourth part of a ton in weight, or capacity. See WEIGHT.

QUARTER, in *Law*, QUARTERIUM *anni*, is the fourth part of a year.

Hence the days whereon those *quarters* statedly commence, are called *quarter-days*.

Quarter-days are the 25th of March, called Lady-day; the 24th of June, called Midsummer-day; the 29th of September, called Michaelmas-day; and the 25th of December, or Christmas-day.

QUARTER, in *Astronomy*, the moon's period, or lunation, is divided into four stages, or *quarters*; containing each from seven to eight days.

The first *quarter* is from the new moon to the quadrature; the second thence to the full moon, &c.

QUARTER, in *Heraldry*, is sometimes used for an escutcheon, or coat of arms.

In this sense there are sixteen *quarters* required to prove nobility, in companies, or orders, where none but nobles are admitted.

The word *quarters*, required as a proof of nobility, is derived hence, that they used anciently to put the coats of arms of the father, mother, grandfather, and grandmother, on the four corners of the tomb of the deceased. In Flanders and Germany we frequently see tombs that have eight, sixteen, and even thirty-two *quarters*.

QUARTER is also applied to the parts or members of the first division of a coat that is quartered, or divided into four *quarters*; as in *Tab. Herald. fig.* 45. See QUARTERING.

The king of Great Britain, in the first *quarter*, bears gules three lions passant or, &c. In the second *quarter* he bears azure three fleurs-de-lys, &c.

QUARTER, *franc*, is a *quarter* single, or alone; which is to possess one-fourth part of the field.

This makes one of the honourable ordinaries of a coat. See ORDINARY.

QUARTER, in *Navigation*. A *quarter* of a point, wind, or rhumb, is the fourth part of a cardinal point, wind, or rhumb; or of the distance between two cardinal points, winds, &c.

The *quarter* contains an arch of 11 degrees 15 minutes. The *quarter* is what Wolfius, with regard to the other divisions, calls a secondary point of the second order.

QUARTER *of a ship* is that part of the ship's side which lies towards the stern; or which is comprehended between the aftmost end of the main chains and the sides of the stern, where it is terminated by the *quarter*-pieces. Although the lines by which the *quarter* and bow of a ship are determined, with respect to her length, are only imaginary, yet experience appears sufficiently to have ascertained their limits; so that if we were to divide the ship's sides into five equal portions, the names of each space would be readily enough expressed. Thus the first, from the stern, would be the *quarter*; the second, abaft the midships; the third, the midships; the fourth, before the midships; and the fifth, the bow. Falconer.

QUARTER, *on the*, in *Sea-Language*, may be defined an arch of the horizon, contained between the line prolonged from the ship's stern and any distant object, as land, ships, &c. Thus if the ship's keel lies on an east and west line, the stern being westward, any distant object, perceived in the north-west or south-west, is said to be on the larboard or starboard *quarter*.

QUARTER is also used for a canton, or division of a city; consisting of several ranges of buildings, &c. separated from some other *quarter* by a river, a great street, or by some other boundary.

Such are the twenty *quarters* of the city of Paris. Ancient Rome was divided several times, under its several augmentations, into *quarters*, which were called *regions*; as may be observed in the topographies of Aurelius Victor, Onuphrius Panvinius, Marlian, Pyrro Ligorio, Boissard, and other antiquaries.

In many cities there are commissaries of the *quarter* appointed to look to the policy thereof. The prior of the Caporions accounts himself the chief and colonel of the fourteen regions, or *quarters*, of Rome. Muscarat, p. 134.

QUARTERS, *franchise of*. See FRANCHISE.

QUARTER, in *War*, the place allotted to certain forces to live, lodge, and encamp upon, during a siege, or the like. See CAMP.

The general's *quarter*, called the *head-quarters* of an army, is that where the general lodges and encamps in person. They used to make lines of communication, to join the several *quarters* together.

QUARTERS *at a siege*, are the encampments on the principal passages about a place; serving to stop the avenues, and to prevent relief and convoys.

QUARTER is also used for any lodgment made in the field, or champaign, out of a siege. Thus they say, the general has extended his *quarters* a good way; the enemy coming by made him contract his *quarters*.

QUARTERS, *intrenched*, denote a place fortified with a ditch and parapet, to secure a body of troops.

QUARTERS, *winter*, the place allotted troops to pass the winter season in. Wherein these differ from garrisons, see GARRISON.

Winter-quarters, when cold and moist, are productive of inflammatory disorders, particularly hard coughs, with inflammations of the pleura and lungs. See BARRACKS.

QUARTERS, *winter*, are also used for the time the troops continue in this lodgment; and for the advantage the captains make thereof.

In Spain they have also *summer quarters*.

QUARTER *of assembly* is the place of rendezvous, where the troops are to meet and draw up, to march in a body.

QUARTERS *of refreshment* denote some well-provided, fertile spot, to which troops, that have been much fatigued and harrassed, are sent to recover their strength, or health; even during the season of the campaign.

There are also *quarters* assigned for the hucksters, and their equipage.

QUARTER also denotes the safety and good treatment promised to persons or troops that surrender, and lay down their arms. Thus they say, the enemy begged *quarter*.

The phrase took its rise from the agreement anciently made between the Dutch and Spaniards, that the ransom of an officer, or soldier, should be a quarter of his pay. Hence, to beg *quarter* was to offer a quarter of their pay for their safety; and to refuse *quarter* was not to accept of that composition for their ransom.

QUARTERS, in *Building*, those slight, upright pieces of timber, placed between the punchions and posts; used to lath upon. They are of two kinds, *single* and *double*. The *single quarters* are sawn to two inches thick, and four inches broad; the *double* are four inches square.

QUARTERS in a clock, are little bells, which sound the *quarters* of an hour.

QUARTERS, in *Sea-language*. See QUARTERING the *Men*.

QUARTER, in the *Manege*. To work from *quarter* to *quarter*, is to ride a horse three times upon the first of the four lines of a square; then changing your hand to ride him three times upon the second; and so to the third and fourth, always changing hands and observing the same order.

QUARTERS *of a saddle*, are the pieces of leather or stuff made fast to the lower part of the sides of a saddle, and hanging down below the saddle.

QUARTERS *of a horse*, are the shoulders and fore-legs, called *fore-quarters*; and the hips and hinder legs, called *hind-quarters*.

QUARTERS *of a horse's foot*, are the sides of the coffin, comprehended between the toe and the heel on one side and the other of the foot. The inner *quarters* are those opposite to one another, facing from one foot to the other; and these are always weaker than the outside *quarter*, which lie on the external sides of the coffin.

QUARTER-*cast*. A horse is said to be *quarter-cast* when, for any disorder of the coffin, we are obliged to cut one of the *quarters* of the hoof; and when the hoof thus cut grows anew, it is called *new quarter*.

QUARTERS, *False*, a cleft in the horn of a horse's *quarters*, extending from the coronet to the shoe, which voids blood, and occasions a great deal of pain, and makes the horse lame.

QUARTER-*bill*, in *Sea-language*, a roll or list, containing the different stations, to which all the officers and crew of the ship are quartered, in the time of battle, and the names of all the persons appointed to those stations.

QUARTER-BULLET, a bullet quartered into four or eight parts.

QUARTER-*chord*, in *Mining*, is seven yards and a quarter, which the miner hath cross-ways of his vein on either side, for liberty to lay his earth, stones, and rubbish on, and to wash and dress up his ore.

QUARTERS, *cloſe*, in a *Ship*. See CLOSE-*Quarters*.

QUARTER-*Cloths*, in a *Ship*, are long pieces of painted canvas, extended on the outſide of the quarter-netting from the upper part of the gallery to the gang-way. They are generally decorated with martial inſtruments, or allegorical figures.

QUARTER-DAY. See QUARTER.

QUARTER-DECK of a ſhip is that aloft the ſteerage, reaching to the round houſe. See *Tab. Ship. fig.* 2. *lit.* O. and DECK.

QUARTER, *Fat*, in a *Ship*, denotes the ſame with *broad*. Thus, if the truſſing in, or tuck of a ſhip's *quarter* under water be deep, they ſay, ſhe hath a *fat quarter*.

QUARTER-*Gallery*, in a *Ship*, a ſort of ſmall balcony, with or without balluſtrades, on the *quarter* of a ſhip; which generally communicates with the gallery on the ſtern, by means of a door paſſing from one to the other.

QUARTER-*Guard*. See GUARD.

QUARTER-*Gunner*, is an inferior officer under the direction of the GUNNER of a ſhip of war, whom he is to aſſiſt in every branch of his duty; as keeping the guns and their carriages in proper order, and duly furniſhed with whatever is neceſſary; filling the powder into cartridges; ſcaling the guns, and keeping them always in a condition ready for ſervice. The number of *quarter-gunners* in any ſhip is always in proportion to the number of her artillery; one *quarter-gunner* being allowed to every four cannon.

QUARTERED *Counter*. See COUNTER-QUARTERED.

QUARTERIDGE, money paid quarterly, or by the quarter.

QUARTERING of *Soldiers*. See MARTIAL *Law* and SOLDIERS.

QUARTERING, in the *Sea-language*. When a ſhip under ſail goes at large, neither by a wind, nor before a wind, but, as it were, betwixt both, ſhe is ſaid to go *quartering*.

The term is alſo uſed when a ſhip ſails with quarter-winds.

QUARTERING *the men*, in *Sea-language*, the diſpoſing of the ſhip's company at the time of an engagement in ſuch a manner, that each may readily know where his ſtation is, and what he is to do: as, ſome to the maſter, for the management of the ſails; ſome to aſſiſt the gunners to traverſe the ordnance; ſome for plying the enemy with ſmall ſhot; ſome to fill powder in the powder-room; others to carry it from thence to the gunners in cartridges, *&c.*

The number of men appointed to manage the artillery is always in proportion to the nature of the guns, and the number and condition of the ſhip's crew. They are in general as follow, when the ſhip is well manned, ſo as to fight both ſides at once occaſionally:

Nature of the Gun.

Pounder.	No. of Men.
To a 42	15
32	13
24	11
18	9
12	7
9	6
6	5
4	4
3	3

This number, to which is often added a boy, to bring powder to every gun, may be occaſionally reduced, and the guns nevertheleſs well managed.

The number of men appointed to the ſmall arms, on board his majeſty's ſhips and ſloops of war, by order of the admiralty, are,

Rate of the Ship.	No. of Men.
1ſt	150
2d	120
3d of 80 guns	100
— of 70 guns	80
4th of 60 guns	70
— of 50 guns	60
5th	50
6th	40
ſloops of war	30

The lieutenants are uſually ſtationed to command the different batteries, and direct their efforts againſt the enemy. The maſter ſuperintends the movements of the ſhip, and whatever relates to the ſails. The boatſwain and a ſufficient number of men are ſtationed to repair the damaged rigging; and the gunner and carpenter, whatever may be found neceſſary, according to their reſpective offices. The marines are generally quartered on the poop and forecaſtle, or gang-way, under the direction of their officers: although, on ſome occaſions, they aſſiſt at the great guns, particularly in diſtant cannonading. Falconer. See ENGAGEMENT.

QUARTERING, in *Gunnery*, is when a piece of ordnance is ſo traverſed, that it will ſhoot on the ſame line, or on the ſame point of the compaſs, as the ſhip's quarter bears.

QUARTERING, in *Heraldry*, the act of dividing a coat into four or more quarters, or *quarterings*, by parting, couping, *&c.* i. e. by perpendicular and horizontal lines, *&c.* See QUARTER and QUARTERLY.

The king of Great Britain quarters with Great Britain, France, Ireland, Brunſwick, *&c.*

Colombiere reckons twelve ſorts of *quartering*; but other authors give us more—*viz.* Party per pale, dividing the eſcutcheons from top to bottom. See PALE.—Party per croſs, dividing it from ſide to ſide. See CROSS.—Party of ſix pieces, when the eſcutcheon is divided into ſix parts, or quarters.—Party of ten; of twelve; of ſixteen; of twenty; and of thirty-two; when there are ſo many partitions reſpectively.

Others give the diviſions in another manner: as—Party per croſs—per pale—per chief—per pale inclave—per bend dexter—per bend ſiniſter—per chevron—barry bendy of eight pieces—paleways of ſix pieces—barry of ſix pieces—barry of eight pieces—bendy of ſix—checky—fuſilly, or lozengy—pale bendy, or bendy lozengy—barry bendy lozengy, or bend lozengy—gyronny—barry lozengy counterchanged—waved of ſix pieces—barry nebule of ſix pieces—party per ſaltier—and party per pale in point. See farther under their reſpective articles.

Counter-QUARTERING *a coat* is when the quarters are quartered over-again, or ſubdivided each into four. See COUNTER-*Quartered*.

There are *counter-quartered* coats which have twenty or twenty-five quarters.

QUARTERING is alſo applied to the partitions or compartments themſelves, that is, the ſeveral coats borne on an eſcutcheon, or the ſeveral diviſions made in it, when the arms of ſeveral families are to be placed on the ſame ſhield; on account of intermarriages, or the like.

Colombiere obſerves, that thirty-two is the greateſt number uſed in France; but that the Engliſh and Germans ſometimes extend to forty: as a teſtimony of the truth whereof, he ſays, he ſaw the eſcutcheon of the earl of Leiceſter, ambaſſador extraordinary in France in the year 1639, divided into the number of forty: and ſome, he affirms, do go on to ſixty-four ſeveral coats.

But a multitude of quarters makes a confuſion; and, accordingly, all the writers of armoury exclaim againſt it as an abuſe.—The firſt inſtance of *quartering* whereof we have any account is ſaid to be in the arms of Renatus, king of Sicily, *&c.* in the year 1435, who quartered the arms of Sicily, Arragon, Jeruſalem, *&c.*

William Wickly obſerves, that ſuch *quarterings* are much properer for a pedigree, to be locked up in a cheſt, and occaſionally produced as an evidence for the clearing or aſcertaining of alliances of families, and titles to lands, *&c.* than to be borne as a cognizance.

In blazoning, when the *quartering* is performed per croſs, the two quarters a-top are numbered the firſt and ſecond; and thoſe at the bottom the third and fourth; beginning to tell on the right-ſide. When the *quartering* is by a ſaltier, *&c.* the chief and point are the firſt and ſecond quarters, the right ſide the third, the left the fourth.

QUARTERING is ſometimes alſo uſed for the diſtinguiſhing of younger brothers from elder. See DIFFERENCE.

QUARTERIZATION, QUARTERING, part of the puniſhment of a traitor, by dividing his body into four quarters.

Walſingham in Ric. II. *Auditum & confeſſum turpiſſima ſcelera tractationi, ſuſpendio, decollationi, exenterationi, &* quarterizationi *adjudicavit.*

QUARTERLY, in *Heraldry*. A perſon is ſaid to bear *quarterly*, when he bears arms quartered.

The king of Great Britain bears *quarterly* of four; in the firſt quarter gules, &c. Great Britain; in the ſecond, azure, &c. Ireland, &c.

QUARTER-MASTER, an officer in the army, whoſe buſineſs it is to look after the quarters of the ſoldiers; their clothing, bread, ammunition, firing, &c. Every regiment of foot and artillery has a quarter-maſter, and every troop of horſe one, who are only warrant-officers, except in the Blues. Whereof there are ſeveral kinds; *viz.* The

QUARTER-MASTER *general*, whoſe buſineſs is to provide good quarters for the whole army.

QUARTER-MASTER *of foot*, he who is to provide quarters for a regiment of foot.

QUARTER-MASTER *of horſe*, he who is to provide quarters for a troop of horſe.

QUARTER-MASTER, in a *Ship*, is an inferior officer, appointed by the MASTER of a ſhip of war to aſſiſt the mates in their ſeveral duties; as ſtowing the ballaſt and proviſions

proviſions in the hold, coiling the cables on their platforms, overlooking the ſteerage of the ſhip, and keeping the time by the watch-glaſſes.

QUARTERN, Quarteron, a diminutive of *quart*, ſignifying a quarter of a pint, as a quart does a quarter of a gallon.

Quarter-*Netting*, is a ſort of net-work, extended along the rails on the upper part of a ſhip's *quarter*. In a ſhip of war theſe are always double, being ſupported by iron cranes, placed at proper diſtances. The interval is ſometimes filled with cork or old ſails, but chiefly with the hammocs of the ſailors, ſo as to form a parapet to prevent the execution of the enemy's ſmall arms in an engagement.

Quarter *Point of the Compaſs*. See Point.

Quarter-*Rails*, in a *Ship*, are narrow-moulded planks, generally of fir, reaching from the top of the ſtern to the gang-way. They are ſupported by ſtanchions, and ſerve as a fence to the *quarter-deck*, to prevent the men from tumbling into the ſea by the rolling of the ſhip, particularly in ſmall veſſels.

Quarter-round, in *Architecture*, is a term uſed by the workmen for any projecting moulding in general, whoſe contour is a perfect quadrant, or quarter of a circle, or which approaches near that figure. See *Tab. Archit. fig.* 5.

The architects uſually call it *ovolo*; and Vitruvius, the *echinus*.

General Quarter-sessions of the *peace*, a court that muſt be held in every county, once in every quarter of a year; which by ſtat. 2 Hen. V. c. 4. is appointed to be in the firſt week after Michaelmas-day; the firſt week after the Epiphany; the firſt week after the cloſe of Eaſter; and in the week after the tranſlation of Saint Thomas à Becket, or the 7th of July. This court is held before two or more juſtices of the peace, one of whom muſt be of the *quorum*. The juriſdiction of this court by 34 Ed. III. c. 1. extends to the trying and determining of all felonies and treſpaſſes whatſoever; though they ſeldom, if ever, try any greater offence than ſmall felonies within the benefit of clergy; their commiſſion providing, that, if any caſe of difficulty ariſes, they ſhall not proceed to judgment, but in the preſence of one of the juſtices of the courts of king's bench or common pleas, or one of the judges of aſſize. And, therefore, murderers, and other capital felonies, are uſually remitted for a more ſolemn trial to the aſſizes. They cannot alſo try any new-created offence, without expreſs power given them by the ſtatute which creates it. But there are many offences, and particular matters, which, by particular ſtatutes, belong properly to this juriſdiction, and ought to be proſecuted in this court: as, the ſmaller miſdemeanors againſt the public or commonwealth, not amounting to felony; and eſpecially offences relating to the game, highways, alehouſes, baſtard children, the ſettlement and proviſion for the poor, vagrants, ſervants wages, apprentices, and popiſh recuſants. Some of theſe are proceeded upon by indictment, and others in a ſummary way by motion and order thereupon: which order may, for the moſt part, unleſs guarded againſt by particular ſtatutes, be removed into the court of king's bench, by writ of *Certiorari facias*, and be there either quaſhed or confirmed. The records or rolls of the ſeſſions are committed to the cuſtody of a ſpecial officer denominated the custos *rotulorum*. In moſt corporation towns there are *quarter* ſeſſions kept before juſtices of their own, within their reſpective limits; which have exactly the ſame authority as the *general quarter-ſeſſions* of the county, except in very few inſtances: one of the moſt conſiderable of which is the matter of appeals from orders of removal of the poor, which, though they be from the orders of corporation juſtices, muſt be to the ſeſſions of the county, by 8 and 9 W. III. c. 30. In both corporations and counties at large, there is ſometimes kept a ſpecial or petty ſeſſion, by a few juſtices, for diſpatching ſmaller buſineſs in the neighbourhood between the times of the general ſeſſions; as, for licenſing alehouſes, paſſing the accounts of pariſh officers, and the like. Blackſt. Com. b. iv. p. 268, &c.

Quarter-staff, a long ſtaff, or pole, borne by foreſters, park-keepers, &c. as a badge of their office; and occaſionally uſed as a weapon.

Quarter-wheeling, or Quarter *of converſion*, in the *Military Art*, is a motion whereby the front of a body of men is turned round to where the flank was; this making the *quarter* of a circle.

If it be done to the right, the man in the right-hand angle keeps his ground, and faces about, while the reſt wheel; if to the left, the left-hand man keeps his place, &c.

Quarter-wind, at *Sea*, is a lateral, or ſide-wind; or a wind which does not blow in ſtern, but a little aſide of it.

Properly the *quarter-wind* is that which comes in abaft the main-maſt ſhrouds, even with the quarter of the ſhip.

The *quarter-wind* is the beſt of all winds, as bearing into all the ſails; whereas a wind blowing full in ſtern, is kept off by the ſails of the mizzen.

QUARTILE, an aſpect of the planets when they are three ſigns, or 90 degrees diſtant from each other.

The *quartile* aſpect is marked thus □. See Aspect.

QUARTO, or 4*to*, a book whereof four leaves, or eight pages, make a ſheet.

QUARTO-DECIMANS, Quarto-decimani, an ancient ſect in the church, who maintained, that Eaſter was always to be celebrated, conformably to the cuſtom of the Jews, on the fourteenth day of the moon in the month of March, whenſoever that day fell out.

And hence their name *Quarto decimani*, q. d. Fourteenthers.

The Aſiatics were mightily attached to this opinion, pretending that it was built on the authority of St. John, who was their apoſtle; and pope Victor could never bring them to obedience in this article, though he was upon the point of excommunicating them: but it is more probable he contented himſelf with menaces. See Easter.

Quarto *die poſt*, in *Law*, denotes the fourth day incluſive beyond the return of a writ, in which thoſe that are ſummoned are allowed to make their appearance. See Essoign *day of term*.

QUARTUM *par conſtringens*, in *Anatomy*, a name given by Spigelius and ſome others to the muſcle called by Albinus and Riolanus *orbicularis oris*; and by Cowper and ſome others, *conſtrictor labiorum*.

QUARTUS *hyoidis muſculus*, in *Anatomy*, a name given by Veſalius, Fabricius, and many other anatomiſts, to a muſcle now generally called the *coracohyoidæus*.

Quartus *oculum movens*, in *Anatomy*, a name given by Veſalius to one of the muſcles of the eye, called by ſome *rectus inferior*, and by others *humilis*.

It is the *depreſſor oculi* of Albinus, being one of the *quatuor recti oculi* of that author.

QUARTZ, in *Natural Hiſtory*, is a ſtone of the kind called by authors ſiliceous or vitrifiable. It is frequently found with ores, of which it often forms the matrix; and it is alſo often found where no ores are. Some of theſe ſtones conſiſt of impalpable particles, others have a granulated texture, and ſome have a ſparry or laminated texture. When pure, they are white and opake, or they are colourleſs and tranſparent. When mixed with calces of iron or of copper, they are black or red. This ſtone does not decay in the air, as ſome other ſiliceous ſtones do. According to Cronſtedt, it always forms hexagonal priſms, pointed at one or both ends, when there has been no interruption to its cryſtallization: and this cryſtallized *quartz* is rock-cryſtal, which, like the uncryſtallized *quartz*, is colourleſs or coloured, tranſparent or opake.

Wallerius ſays, that every *quartz* is fuſible by fire: but probably the *quartz* coloured by metallic calces are only fuſible; for M. D'Arcet found that the tranſparent and ſemi-tranſparent *quartz*, and alſo the opake white *quartz* were rendered friable, but were not fuſed by a very violent and long-continued fire; and that by the ſame fire the form and tranſparency of rock-cryſtals were not altered.

Beecher and Hiærne obſerve, that from *quartz* a ſmall quantity of alkali may be obtained by diſtillation, or by frequent extinction of the heated ſtone in water. A ſimilar alkaline matter is ſaid to be obtainable by diſtillation from flints. Dict. Chem. art. *Quartz*, note (*a*).

QUASHING, in *Law*, the overthrowing and annulling a thing.

QUASI-CONTRACT, in the *Civil Law*, an act which has not the ſtrict form of a contract, but yet has the force thereof.

In a contract there muſt be the mutual conſent of both parties; whereas, in a *quaſi-contract*, one party may be bound or obligated to the other, without having given his conſent to the act whereby he is obliged.

For an example: I have done your buſineſs, in your abſence, without your procuration; and it has ſucceeded to your advantage: I have then an action againſt you for the recovery of what I have diſburſed; and you an action againſt me, to make me give an account of my adminiſtration: which amounts to a *quaſi-contract*.

Quasi-crime, or Quasi-delict, in the *Civil Law*, the action of a perſon who does damage, or evil, involuntarily.

The reparation of *quaſi-crimes* conſiſts in making good the damages, with intereſt.

Quasi-modo *Sunday*, *Low Eaſter-Sunday*, or the next Sunday after Eaſter; thus called from the initial words of

of the introit of the mass for the day, *Quasi modo geniti infantes.*

In ancient deeds these words were signified by *q. m. g.*

QUASS, the name of a liquor in Russia, which serves the natives not only for drink, but also for sauce to a number of dishes; and is the basis of the favourite cold soup of the North, which is made by adding cold meat cut in pieces, with cucumbers salted after a peculiar manner, or with onions, or garlick, to a bowl of this subacid liquor. The common Russian *quass* is prepared by putting into a large pot-full of cold water as much rye-flour as will make a thin dough: this is then placed in an oven, moderately heated, for three hours, and afterwards taken out and thrown into a tub of cold water: the mixture is worked with a machine like a chocolate mill till it froths. To this liquor are added two basons of the grounds of old *quass*, leaven, or a piece of their sour bread; and the tub is covered with a cloth, and laid by till the liquor has acquired a sourish taste, which marks its being ready for use.

There is a better sort of *quass*, which is prepared by putting one pood (thirty-six pounds English) of rye, flour or meal, and half that quantity of ground malt, into a tub, to which is fitted a close cover, and pouring upon it a kettle-full of scalding water, stirring the mixture, and then covering it close for an hour: at the expiration of this time, boiling water is added, till the mixture becomes as thin as small beer. The tub is then placed in a cool situation for some hours, the cover being kept half open with a stick; then the liquor is passed through a sieve into a cask, and two basons full of old *quass*, or the substitutes mentioned above, are added, and the vessel placed in a cellar for five or six days, till it acquires the subacid taste, when it is fit for bottling. This liquor is much recommended on account of its antiscorbutic quality. Phil. Trans. vol. lxviii. part ii. p. 627, &c.

QUASSIA, in *Botany*, a genus of the *decandria monogynia* class. Its characters are, that the calyx is five-leaved, that it has five petals, a five-leaved nectarium, and five pericarpia with single seeds. There is only one species.

QUATER-COUSINS, QUATRE-COUSINS, fourth cousins, or the last degree of kindred.

Hence, when persons are at variance, it is said they are not *quater* or *cater-cousins.*

QUATERNA *folia*, among *Botanists.* See LEAF.

QUATOTOMOMI, in *Ornithology*, the name of an American bird of the wood-pecker kind, having a red crest on its head, and two white lines running down the sides of the neck to the breast. It is called by Nieremberg PICUS *imbrifœtus.*

QUATRE-NATIONS, q. d. *Four Nations*, the denomination of a college founded in 1661, by cardinal Mazarin, for the education and maintenance of sixty children, natives of the four countries conquered by Louis XIV. viz. fifteen for Pignerol and Italy, fifteen for Alsatia, twenty for Flanders, and ten for Roussillon.

QUATRICHROMA, in the *Italian Music*, is what we call a *demi-semi-quaver*, thirty-two whereof make a bar in common time. See TIME, and TRIPLE.

QUATUOR *homines prepositi.* See PREPOSITI.

QUATUOR-VIR, in *Antiquity*, frequently written IIII. VIR, a Roman magistrate, who had three colleagues joined with him in the same administration.

To the *quatuor-vir* was committed the charge of conducting and settling the colonies sent into the provinces.

Upon unlucky accidents, and other dangerous affairs, it was usual to create *quatuor-viri*, with commission to take care *ne quid detrimenti respublica caperet, that the republic were not prejudiced.*

There were also *quatuor-viri* appointed to inspect and take care of repairs, &c.

QUAVER, in *Music*, a measure of time, equal to one half of the crotchet, or one eighth of the semi-breve.

The *quaver* is marked by the character .

The English *quaver* makes what the French call *crochue, crotchet*, because of the hook at bottom. See CROTCHET.

The *quaver* is divided into two semiquavers, noted ,

and four demisemiquavers, marked .

QUAVERING, in *Music*, the act of trilling, or shaking; or the running a division with the voice.

QUAVITL, in *Botany*, a name given by some authors to the cocoa-tree. Hern. p. 79.

QUAUHAYOHUATLI, in *Botany*, a name by which some authors have called the tree whose fruit is the cassia fistula of the shops. Hern. p. 87.

QUAUHTZONECOLIM, in *Ornithology*, the American name for a bird, called by most a *quail*, but esteemed by Nieremberg a species of partridge.

It is of the size of the European partridge, and of a brownish colour, and ornamented with a crest upon its head. There are also in America two other species of partridge much allied to this; the one with a yellow body, and black and white head; the other small and brown, and without a crest.

QUAUHYAC *oculensium*, the name of a very large Indian tree, bearing leaves resembling those of the citron. The bark is astringent, heating, drying, and of a strong smell: it restrains a diarrhœa, and excites a sweat. The juice, snuffed up the nose, causes sneezing, purges the head, and thus removes fevers, and pains in the head; for which reasons, it is preserved in families as a popular remedy. Nieremberg.

QUAY, *Kay*, a space of ground paved on the shore of a river, or port, destined for the loading and unloading of merchandize. See KAY, and WHARF.

QUEEN, *regina*, a woman who holds the crown of a realm, singly, and by right of blood.

The word *queen* is derived from the Saxon *cwen, uxor, the wife of any one*, but applied, by way of excellency, to the wife of the king only; whence she was anciently called the *king's queen*; the West Saxons having no other name for a *queen* but the *king's wife.* Asser de Ælfred. rebus, &c. She was also called *lady*, in Saxon *wlefdig*; just as *madame*, or *mademoiselle*, are still used in France, for the wife and daughter of the duke of Orleans.

The name *queen* is also given, by way of courtesy, to her that is married to the king; called, by way of distinction, *queen consort.* In respect whereof the former is called *queen regnant*, or regent.

The widow of a king is also called *queen*, but with the addition of *dowager.*

In the first sense, *queen* is, in all construction, the same with king; and has the same power and prerogative, in all respects, that the king has.

The *queen consort* is inferior, and a person distinct from, and a subject of, the king. In England, though she be a feme covert, yet may she sue, and be sued, in her own name; and may make leases, and grants, &c. as a feme sole.

She has several other prerogatives. Though an alien, she may purchase lands in fee-simple, without either naturalization, or denization; she may present to a benefice; nor is plenarty a bar against her more than against the king. She is also capable of taking a grant from the king, which no other wife can do from her husband; and she may have a separate property in goods as well as lands, and has a right to dispose of them by will. She pays no toll, and shall not be amerced, if she be nonsuited in any action; and may not be impleaded till first petitioned.

To conspire her death, or violate her chastity, is high treason. She has an ancient peculiar revenue, called *queen-gold*; besides a very large dower, with a royal court, and officers, apart.

The *queen dowager*, as the widow of the king, enjoys most of the privileges belonging to her as *queen consort.* But it is not high treason to conspire her death; or to violate her chastity, because the succession to the crown is not thereby endangered. Yet still, *pro dignitate regali*, no man can marry a *queen dowager* without special licence from the king, on pain of forfeiting his lands and goods. She has also this particular, that she loses not her dignity, though she marry a private gentleman. Thus *queen* Catherine, widow of Henry V. being married to Owen ap Tudor, esq. maintained her action as *queen* of England. Much less does a *queen regnant* follow her husband's condition, or is subject to other *queens*; but she is sovereign to her own husband, as *queen* Mary was to king Philip, and *queen* Anne to prince George of Denmark; unless it be otherwise appointed by parliament.

QUEEN *bee*, a term given by late writers to what used to be called the *king bee*, or king of the bees; a large and long-bodied bee, of which kind there is only one found in every swarm, and which is always treated with the greatest respect by the rest.

It is well known that the generation and whole œconomy of bees principally depend upon this female sovereign, and that her presence is absolutely necessary to the prosperity and safety of the whole community; insomuch that the loss of the *queen* proves the certain and total destruction of the swarm or hive, unless the owner supplies them in time with another ruler. Without her presence and direction, the other bees will do no manner of work; they will gather neither wax, nor honey, nor any other materials; nor can they breed and propagate their kind without her. A stock deprived of its *queen*, would yield to

to robbers, or elſe languiſh and pine away, ſo that the whole ſociety would periſh. But as ſoon as a languiſhing ſtock is ſupplied with a *queen*, pleaſure and activity are apparent through the whole hive; the preſence of the ſovereign reſtores vigour and exertion; and her voice commands univerſal reſpect and obedience: of ſuch importance is the *queen* to the exiſtence and proſperity of the other members of this community. As the parent and ſovereign of every ſwarm is a female, the whole government is veſted in one; ſo that where there happen to be more, as there ſometimes are, and eſpecially in ſwarms that are united, confuſion and diſcord prevail, until all, except one, are expelled and ſlain.

As in forming *artificial* SWARMS, and for other purpoſes, it will be neceſſary to diſtinguiſh the *queen* from the other bees, we ſhall obſerve, that ſhe may be known by her ſize, which is much larger than that of the common working bees, and longer than that of the drones; by the form and ſhape of her body, eſpecially of the hinder part of it, which is more taper, and terminates in a much ſharper point than the bodies of the other bees, in order the more readily to reach the bottom of the cells, where the eggs are depoſited for the propagation of the ſpecies (ſee *Generation of* BEES): and alſo by her colour; her upper parts being ſcarce at all different in this reſpect from the honey bees, but her belly and legs are of a very deep yellow, reſembling the pureſt and the richer gold. It is ſaid that ſhe may alſo be diſtinguiſhed by the note of her voice, which is an octave; and by her being one of the laſt which falls with her belly upwards, when the bees of a ſingle ſtock are dropped into an empty hive, in order to be united with thoſe of another ſtock.

Naturaliſts have obſerved, that the *queen* bees are produced in a manner peculiar to themſelves, and different from the drones and working bees. Some have ſuppoſed, that the eggs laid by the *queen* in a hive, and deſtined for the production of *queen* bees, are of a peculiar kind: but though this is not the caſe, as M. Schirach has lately diſcovered, yet there are particular cells appropriated for this purpoſe. Theſe cells are generally near the edges, and at the bottom of the combs, and ſometimes on the ſides of a honey-comb; they are of an oblong orbicular form, and very ſtrong; and are more or leſs numerous in different hives, as occaſion ſeems to require. It has been alſo ſuppoſed, that the matter with which they are nouriſhed is of a different kind and quality from that employed for the nouriſhment of the other bees; that which has been collected out of the royal cells being of a gummy glutinous nature, of a deep tranſparent red, and diſſolving in the fire rather than crumbling to powder.

It has been generally ſuppoſed, that the *queen* bee is the only female contained in the hive; that the drones are the males, by which ſhe is fœcundated; and that the working bees are neutral, or of neither ſex. But M. Schirach has lately eſtabliſhed a different doctrine, which has been alſo confirmed by the later obſervations of Mr. Debraw. According to this writer, all the working or common bees are females in diſguiſe; and the *queen* bee lays only two kinds of eggs, viz. thoſe which are to produce the DRONES, and thoſe from which the working bees are to proceed; and from any one or more of theſe, one or more *queens* may be produced; ſo that every worm of the latter or common kind, which has been hatched about three days, is capable, under certain circumſtances, of becoming the *queen*, or mother of a hive. In proof of this doctrine, new and ſingular as it may ſeem, he alledges a number of ſatisfactory and deciſive experiments, which have been ſince verified by thoſe of Mr. Debraw. In the early months of the ſpring, and in any preceding month, even ſo late as November, he cut off from an old hive a piece of that part of the comb, which contains the eggs of the working bees; taking care, however, that it contained likewiſe worms which had been hatched about three days. He fixed this in an empty hive, or box, together with a portion of honey-comb, &c. or, in other words, with a ſufficiency of food, and building materials, or wax, for the uſe of the intended colony. He then put into, and confined within, the ſame box, a ſufficient number of common working bees, taken from the ſame or any other hive. As ſoon as the members of this ſmall community found themſelves deprived of their liberty, and without a *queen*, a dreadful uproar enſued, which continued generally, with ſome ſhort intervals of ſilence, for the ſpace of about twenty-four hours; during which time it is to be ſuppoſed they were alternately meditating and holding council on the future ſupport of the new republic. On the final ceſſation of this tumult, the general and almoſt conſtant reſult was, that they betook themſelves to work; firſt proceeding to the conſtruction of a royal cell, and then taking the proper meaſures for hatching and feeding the brood incloſed with them. Sometimes, even on the ſecond day, the foundations of one or more royal cells were to be perceived; the view of which furniſhed certain indications that they had elected one of the incloſed worms to the ſovereignty. The operation has been hitherto conducted in the houſe. This new colony may now be ſafely truſted in the garden, if the weather be warm, and have the liberty allowed them of paſſing out of the box; of which they inſtantly avail themſelves, and are ſeen in a ſhort time almoſt totally to deſert their new habitation. In about two hours, however, they begin to re-enter it. We ſhould not neglect to obſerve, that if they ſhould be placed near the old hive, from which they were taken, they will very often attempt to enter it, but are as conſtantly repulſed by their former companions and brethren. It is prudent, therefore, to place them at a diſtance from the mother ſtate, in order to avoid the inconveniences of a civil war. The final reſult of the experiment is, that the colony of working bees thus ſhut up, with a morſel of common brood, not only hatch it, but are found, at the end of eighteen or twenty days, to have produced from thence one or two *queens*; which have apparently proceeded from worms of the common ſort, pitched upon by them for that purpoſe; and which, under other circumſtances, that is, if they had remained in the old hive, there is reaſon to ſuppoſe, would have been changed into common working bees. In the preſent inſtance, the common worm appears to be converted by them into a *queen* bee, merely becauſe the hive was in want of one. Hence we may juſtly infer, that the kingdom of the bees is not, if the expreſſion may be uſed, a *jure divino* or hereditary monarchy, but an elective kingdom; in which the choice of their future ruler is made by the body of the people, while ſhe is yet in the cradle, or in embryo; and who are determined by motives of preference which will perhaps for ever elude the penetration of the moſt ſagacious naturaliſts.

The concluſions drawn by M. Schirach, from experiments of the preceding kind, very often repeated by himſelf and others with the ſame ſucceſs, are, that all the common or working bees were originally of the female ſex; but that when they have undergone their laſt metamorphoſis, they are condemned to a ſtate of perpetual virginity, and the organs of generation are obliterated; merely becauſe they have not been lodged, fed, and brought up in a particular manner, while they were in the worm ſtate. He ſuppoſes, that the worm, deſigned by the community to be a *queen*, or mother, owes its metamorphoſis into a *queen*, partly to the extraordinary ſize of its cell, and its peculiar poſition in it; but principally to a certain appropriate nouriſhment found there, and carefully adminiſtered to it by the working bees, while it was in the worm ſtate; by which, and poſſibly other means unknown, the developement and extenſion of the germ of the female organs, previouſly exiſting in the embryo, is effected; and thoſe differences in its form and ſize are produced, which afterwards ſo remarkably diſtinguiſh it from the common working bees. Schirach's Hiſtoire Nat. de la Reine des Abeilles, &c. 8vo. 1772. Or, for an abſtract, Monthly Review, vol. xlviii. p. 564, &c. Phil. Tranſ. vol. lxvii. part 1. p. 29, &c. See *Sex of* BEES.

This diſcovery is capable of being applied towards forming artificial SWARMS, or new colonies of bees, by which means the number of theſe uſeful inſects might be increaſed, and their produce in honey and wax proportionably augmented. M. Schirach, as well as M. Hattorff, ſeem, however, to have been miſtaken, when they aſſert, that the artificial *queens*, formed or reared in a community conſiſting *only* of working bees, proceed almoſt immediately to lay eggs, and to people the hive, without having had any communication with the drones, and at a time when, as they ſuppoſe, there were no drones in being. It is not neceſſary to admit the idea of the prolific quality of a virgin *queen* bee; as nature has provided drones of different ſizes, for the purpoſe of impregnating the eggs laid by the female and continuing the ſpecies, adapted to different occaſions and circumſtances. See DRONE.

QUEEN'S *bench*. See KING'S *bench*, &c.

QUEEN'S *gilliflower*, or *violet*, in *Botany*. See *Dame's* VIOLET.

QUEEN *gold*, *aurum reginæ*, a royal revenue, belonging to the *queen* of England, during her marriage to the king; and payable by divers perſons (upon ſeveral grants of the king) by way of oblation out of fines, amounting to ten marks, or upwards; viz. one full tenth part above the entire fine, or ten pounds for every hundred pounds fine, on pardons and contracts, or agreements.

This becomes a real debt to the *queen*, by the name of

aurum reginæ, upon the party's bare agreement with the king for a fine, and recording it; without any farther promife, or contract, for this tenth part extraordinary.

QUEEN *of the meadows*. See SPIRÆA.

QUEEN*'s ware*. See POTTERY.

QUE ESTATE, in *Law*, a plea whereby a man entitling himfelf to land, &c. faith, that the fame eftate which another had, he now has from him.

Thus, e. gr. the plaintiff alledges, that fuch four perfons were feifed of lands whereunto the advowfon in queftion belonged in fee, and who did prefent it; and that afterwards the church was vacant; *que eftate*, i. e. *which eftate* he now has; and, by virtue thereof, he prefents, &c. See PRESCRIPTION.

QUE EST MEME, in *Law*, a term ufed in actions of trefpafs, &c. for a direct juftification of the very act complained of by the plaintiff as a wrong.

Thus, in an action upon the cafe, the plaintiff faying the lord threatened his tenants at will in fuch fort, as he forced them to give up their lands; the lord in his defence pleads, that he faid to them, if they would not depart, he would fue them at law. *Que eft méme*, i. e. this being the fame threatening that he ufed, the defence is good.

QUEI, in *Natural Hiftory*, a name given by the Chinefe to a peculiar earth found in many parts of the Eaft.

It is of the nature of an indurated clay, and in fome degree approaches to the talcs, as our fteatites and the galactites do. It is very white and abfterfive, ufed by the women of China to take off fpots from the fkin, and render it foft and fmooth, as the Italian ladies ufe talc of Venice. They fometimes ufe the fine powder of this ftone dry, rubbing it on the hands and face after wafhing; fometimes they mix it in pomatum.

QUEM *redditum reddit*, in *Law*, an old writ which lay where a rent-charge, or other rent, which was not rent-fervice, was granted by fine holding of the grantor. If the tenant would not attorn, then the grantee might have had this writ.

QUEMI, in *Botany*, a name ufed by fome authors for the nigella, or geth.

QUERCERA, in *Medicine*. See EPIALOS.

QUERCUS, the *oak*, in *Botany*. See OAK.

QUERCUS *marina*, the *fea oak*, in *Botany*, the name of one of the broad-leaved dichotomous fea-fucufes.

It is not agreed, among the late botanifts, what was the *fea oak* of Theophraftus; and the moft ancient botanifts, Clufius and Cæfalpinus, fuppofe it to have been a fpecies of the fhrubby coralline; but that feems by no means to have been the cafe, fince Theophraftus fays his *fea oak* had a long, thick, and flefhy leaf, whence we may much more naturally conclude it to have been of the FUCUS clafs.

QUERELA, *quarrel*, in *Law*, denotes an action, or declaration, preferred in any court of juftice. See QUARREL.

In an action where the plaintiff is called *querens*, i. e. complainant, his brief, complaint, or declaration, is called *querela*.

QUERELA *audita*. See AUDITA.

QUERELA *coram rege & concilio*, a writ whereby one is called to juftify a complaint of a trefpafs made to the king himfelf, before the king and his council.

QUERELA *duplex*. See DOUBLE *quarrel*.

QUERELA, *ex gravi*. See EX, &c.

QUERFAA, in the *Materia Medica of the Arabians*, a name given by Avicenna and others to cinnamon, when gathered with the wood of the young branches.

It was a common practice in the early times not to ftrip the fmall bark from medicinal trees, but to cut off the little boughs, and ufe them bark and wood together. This the Greeks called *xlyo cinnamomum*, or *woody cinnamon*; and the Arabians, *querfaa*, *querfe*, or *kerfe*.

QUERIA, in *Botany*, a genus of the *triandria trigynia* clafs. Its characters are, that the calyx is five-leaved; that it has no corolla; and that the fruit is a fingle-celled, three-valved capfule, containing one feed. There are two fpecies.

QUERPO. See CUERPO.

QUERQUEDULA, in *Ornithology*. See TEAL.

QUERRIES, or EQUERRIES. See EQUERRY.

QUERRY, *Gentleman of the*, is an officer appointed to hold the king's ftirrup, when he mounts on horfeback.

QUEST, or INQUEST, an inquifition, or inquiry, made upon oath of an impanelled jury. See INQUEST, and JURY.

The word is formed from the French *quete*, *fearch*; of the Latin *quæfitum*, *a thing fought*.

QUEST, in *Hunting*, the feeking out of hounds, or the venting and winding of fpaniels. See HOUND.

QUESTION, *quæftio*, in *Logic*, &c. a propofition, whofe truth a perfon being inquifitive about, propofes it, by way of interrogation, to another.

Logical queftions are varioufly diftributed: the ordinary divifion is into *firft* or *primary queftions*; as, *Quid eft*, *What is fuch a thing?* And *fecondary*, which arife out of the former; as, *How is it?*

QUESTION, *Quodlibetical*. See QUODLIBETICAL.

QUESTION, in *Law*. The *quæftio de jure* is generally to be diftinguifhed from the *quæftio de facto*.

QUESTION is alfo fometimes ufed for TORTURE.

QUEST-MEN, perfons chofen yearly in each ward, to inquire into abufes and mifdemeanours, efpecially fuch as relate to weights and meafures.

QUESTOR, QUÆSTOR, formed *à quærendo*, *feeking*, *fearching*, or *collecting the revenues of the ftate*, an officer in ancient Rome, who had the care of the public treafure.

The *queftorfhip*, *quæftura*, is very ancient, as having been eftablifhed under the kings, probably in the time of Romulus or Numa, or at leaft under Tullus Hoftilius. Dionyfius and Livy date the original of *queftors* about A. U. C. 269. Plutarch refers the inftitution to the time of Valerius Poplicola, when he allotted the temple of Saturn for the treafury, and granted the people the liberty of chufing two young men for the treafurers. Afterwards, viz. A. U. C. 332, two others were created to take care of the payment of the armies abroad, of felling the plunder and booty, &c. for which purpofe they generally accompanied the confuls in their expeditions; and they were diftinguifhed by the name of *peregrini* from the other *queftors*, who affumed the title of *urbani*. This number continued till the entire conqueft of Italy; and then, A. U. C. 439, it was again doubled. The four that were added refided with the proconfuls and propraetors, in the provinces, where they were employed in regulating the taxes and cuftoms due to the ftate.

In the time of the republic, the fenate appointed *queftors* in each province, to affift the proconfuls, as lieutenants or treafurers, in the adminiftration of the revenues; but, under the emperors, there was properly but one *queftor*, or treafurer-general of the empire: thofe other inferior or fubordinate *queftors* were then called affiftants of the *queftor*, *adjutores quæftoris*.

The *queftor*'s office was originally confined to the army. They paid the foldiery, and took charge of moneys coming by fpoil and plunder, &c.

At length there were new ones erected to refide in the city, and to receive the public money, taxes, tribute, &c. Their number was increafed, as the empire increafed. Sylla augmented it to twenty; Julius Cæfar, to forty: fome being nominated by the emperor, and the others by the people. Under fucceeding emperors their number was not fixed. Of thefe two were appointed for the city, to take care of the public treafure, and to keep the laws and decrees of the fenate; the others pertained to the provinces and the armies.

The *queftorfhip* was the firft office which any perfon could bear in the commonwealth, and might be undertook at the age of twenty-four or twenty-five years. Accordingly, the *queftorfhip* was called the firft ftep of honour, and the *queftors*, who were generally employed in the provinces abroad, affigned to them feverally by lot, no fooner returned from their provincial adminiftration than they took their places in the fenate; and from that time forward, from the rank of equeftrians, or what we commonly call knights, became fenators for life.

There was alfo another kind of *queftors*, called *quæftores parricidii*, whofe office was to inquire into, and take cognizance of capital crimes, after the confuls were denied this privilege.

QUESTOR *facri palatii*, or of the *facred palace*, was one of the firft dignities under the emperors of Conftantinople.

It was this *queftor* that fubfcribed the refcripts of the emperor, and the anfwers to the petitions and fupplications prefented to him. He alfo drew up and figned the laws and conftitutions which the emperor thought fit to publifh; and took care of the adminiftration of juftice. Some compare his function to that of our lord high chancellor. It was ufually one of the jurifconfulti that was charged with this office; it being required, that he fhould know the laws of the empire, be able to prefcribe and fee them executed, and judge of caufes brought by way of appeal before the emperor.

Conftantine was the firft who erected *queftors* of the facred palace.

QUESTUS, or QUÆSTUS. See QUÆSTUS.

QUESTUS *eft nobis*, a writ of NUSANCE, which, by ftat. 15 Edw. I. lies againft him to whom a houfe, or other thing that breeds a nufance, is defcended, or alienated; whereas

whereas before that ſtatute, the action lay only againſt him who firſt levied, or cauſed the nuſance, to the damage of his neighbour.

QUEUE, in *Heraldry*, the tail of a beaſt.

If a lion have a forked tail, he is blazoned by *double-queued*.

QUEUE D'ARONDE, q. d. *ſwallow's tail*, in *Fortification*, a term applied to outworks, when narrower at the gorge than at the face or front; i. e. where the ſides open towards the champaign, and contract towards the gorge. The name is occaſioned by its reſemblance in figure to a ſwallow's tail, which the French call *queue d'aronde*.

Of this kind are ſome ſingle as well as double TENAILLES; and ſome HORN-*works* whoſe ſides are not parallel.

On the contrary, when the ſides are leſs than the gorge, the work is called *contre queue d'aronde*.

QUEUE *d'aronde*, in *Carpentry*, a method of jointing, called alſo DOVE-*tail*.

QUI *tam*, in *Law*, is uſed where an information is exhibited againſt any perſon on a penal ſtatute at the ſuit of the king and the party who is informer, when the penalty for breach of the ſtatute is to be divided between them; and the party informing proſecutes for the king and himſelf. See INFORMATION.

QUIA, in *Logic*. See REASON.

QUIA *dominus remiſit curiam*, in *Law*. See RECTO.

QUIA *emptores*, in *Law*, a denomination given to the ſtatute of Weſtm. 3. 18 Edw. I. which directs, that upon all ſales or feoffments of land, the feoffee ſhall hold the ſame, not of his immediate feoffor, but of the chief lord of the fee, of whom ſuch feoffor himſelf held it: and hence it is held, that all MANORS exiſting at this day muſt have exiſted by immemorial preſcription, or at leaſt ever ſince this ſtatute was made: for no new manor can have been created ſince that ſtatute; becauſe it is eſſential to a manor, that there be tenants who hold of the lord, and that ſtatute enacts, that for the future no ſubject ſhall create any new tenants to hold of himſelf.

QUIA *improvide*, a ſuperſedeas granted in many caſes where a writ is erroneouſly ſued out, or miſawarded.

Such is that granted in behalf of a clerk of the chancery ſued againſt the privilege of the court, in the common pleas, and purſued to the exigent.

QUICK. See MEDLAR.

QUICK *beam*. See SERVICE *tree*.

QUICK *hatch*, in *Zoology*. See GLUTTON.

QUICK *lime*. See LIME.

QUICK *match*, in *Artillery*, is formed of three cotton ſtrands drawn into length, and dipped in a boiling compoſition of white wine vinegar, ſaltpetre, and mealed powder. After this immerſion, it is taken out hot, and laid in a trough where ſome mealed powder, moiſtened with ſpirits of wine, is thoroughly incorporated into the twiſts of the cotton, by rolling it therein: thus prepared, they are taken out ſeparately and drawn through mealed powder, and then hung upon a line to dry. There is alſo *quick* match made of worſted inſtead of cotton. For its uſe, ſee FIRE-*ſhips*.

QUICK *pulſe*. See PULSE.

QUICK *ſand*, in *Sea Language*, denotes a looſe quaking ſand, into which a ſhip ſinks by her own weight, as ſoon as the water retreats from her bottom.

QUICKSET *hedge*. See HEDGE.

QUICKSILVER, a very ponderous fluid mineral, by the chemiſts called *mercury*. For the method of gaining, preparing it, &c. with its properties, uſes, &c. ſee MERCURY.

QUICKSILVER, *Virgin*. See VIRGIN.

QUICKSILVER *water*. See WATER.

QUICK-*work*, in a *Ship*, is a general name given to all that part of a ſhip, which is under the ſurface of the water when ſhe is laden fit for a ſea voyage. The term is alſo applied, occaſionally, to that part of the ſide which is above the ſheer-rail, and which is uſually painted with trophies, &c. on the outſide. Falconer.

QUID, *what*, in the *Schools*, is uſed to denote the definition of a thing.

It is thus called, becauſe the definition anſwers to the queſtion, *Quid eſt, What is it?*

Hence we have two kinds of *quids*; nominal, *quid nominis*; and real, *quid rei*.

QUID *juris clamat*, in *Law*, a writ that lies where I grant the reverſion of my tenant for life by fine in the king's court, and the tenant will not attorn; then the grantee ſhall have this writ to compel him.

This writ ſeems to be obſolete, ſince the fourth and fifth of Anne. See ATTOURNMENT.

QUID *pro quo*, in *Law*, q. d. *what for what*, denotes the giving one thing of value for another; or the mutual conſideration and performance of both parties to a contract.

QUID *pro quo*, or QUI *pro quo*, is alſo uſed, in *Phyſic*, to expreſs a miſtake or cheat of an apothecary, in adminiſtering one medicine for another; or in uſing an ingredient in a compoſition different from that preſcribed.

A northern phyſician, in a printed theſis on *quid pro quos*, owns ingenuouſly, that they are very frequent. He diſtinguiſhes very accurately a great variety of kinds of *quid pro quos*; ſome with regard to the operation; others with regard to the ſubject; and others with regard to their form, or effects. The firſt comprehends the *quid pro quos* of the phyſician; the ſecond, thoſe of the patient; the third, thoſe of the apothecary.

QUIDDENY, QUIDDANY (of the Latin *cydonium*, or *cydoniatum*) a conſerve of quinces, called alſo MARMALADE.

QUIDDITY, *quidditas*, in the *Schools*, a word of the ſame ſignification with *eſſence*.

The name is derived hence, that it is by the eſſence of a thing that it is *tale quid*, ſuch a *quid*, or very thing, and not another. When upon ſeeing, or hearing the name of a thing with whoſe nature, &c. we are unacquainted, we aſk, *Quid eſt, What is it?* we mean no more by the interrogation, but that we deſire to have its nature and eſſence explained by a definition. Whence *quiddity* is uſually defined the eſſence known or expreſſed in a definition.

And hence what is eſſential to a thing is ſaid to be *quiddative*; as *quiddative* knowledge, &c.

QUIESCENT, ſomething at REST.

QUIETISM, in *Eccleſiaſtical Hiſtory*, the ſentiments of the *Quietiſts*, a religious ſect which made a great noiſe towards the cloſe of the laſt century.

Molinos, a Spaniſh prieſt, who died at Rome in the priſon of the inquiſition, paſſes for the author of *Quietiſm*; and yet the Illuminati in Spain had taught ſomething like it before.

A ſect ſimilar to this had appeared at Mount Athos in Theſſaly towards the cloſe of the fourteenth century, under the appellation of *Heſychaſts*, which denotes the ſame with *Quietiſts*. Theſe were a branch of the MYSTICS, or thoſe more perfect monks, who, by a long courſe of intenſe contemplation, endeavoured to arrive at a tranquillity of mind entirely free from every degree of tumult and perturbation. Theſe *Quietiſts*, in conformity to an ancient opinion of their principal doctors (who imagined that there was a celeſtial light concealed in the deepeſt retirements of the mind) uſed to ſit every day, during a certain ſpace of time, in a ſolitary corner, with their eyes eagerly and immoveably fixed upon the middle region of the belly, or navel; and boaſted, that, while they remained in this poſture, they found, in effect, a divine light beaming forth from the ſoul, which diffuſed through their hearts inexpreſſible ſenſations of pleaſure and delight. To ſuch as inquired what kind of light this was, they replied, by way of illuſtration, that it was the glory of God, the ſame celeſtial radiance that ſurrounded Chriſt during his transfiguration on the Mount. Barlaam, a monk of Calabria, from whom the BARLAAMITES derived their denomination, ſtyled the monks, who adhered to this inſtitution, MASSALIANS and EUCHITES; and he gave them alſo the new name of *Umbilicani*. Gregory Palamas, archbiſhop of Theſſalonica, defended their cauſe againſt Barlaam; who was condemned in a council held at Conſtantinople in the year 1341.

The name is taken from a ſort of abſolute reſt, and inaction, which the ſoul is ſuppoſed to be in, when arrived at the ſtate of perfection, which in their language is called *the unitive life*. To arrive at this, a man is firſt to paſs through the purgative way; that is, through a courſe of obedience, inſpired by the fear of hell: hence he is to proceed into the illuminative way, before he arrives at perfection.

The ſentiments of the *Quietiſts*, with regard to God, are wonderfully pure and diſintereſted. They love him for himſelf, on account of his own perfections, independently of any rewards or puniſhments: the ſoul acquieſces in the will of God, even at the time when he precipitates it into hell; inſomuch that inſtead of ſtopping him on this occaſion, B. Angelo de Foligny cried out, *Haſte, Lord, to caſt me into hell: do not delay, if thou haſt abandoned me: but finiſh my deſtruction, and plunge me into the abyſs.*

At length, the ſoul, after long travail, enters into reſt, into a perfect *quietude*. Here it is wholly employed in contemplating its God; it acts no more, thinks no more, deſires no more; but lies perfectly open, and at large, to receive the grace of God, who by means thereof drives it where it will, and as it will.

In this ſtate it no longer needs prayers or hymns, or vows; prayers where the ſpirit labours, and the mouth opens, are the lot of the weak, and the imperfect: the ſoul of the ſaint is, as it were, laid in the boſom, and

between the arms of its God, where, without making any motion, or exerting any action, it waits, and receives the divine graces. It, then, becomes happy: quitting the existence it before had, it is now changed, it is transformed, and, as it were, sunk and swallowed up in the Divine Being, insomuch as not to know or perceive its being distinguished from God himself. Fenel. Max. des Saints.

QUIETISTS, the disciples of Mich. De Molinos; or the adherents to the opinions delivered in the article QUIETISM.

The sentiments of Molinos were contained in a book, which he published at Rome, in the year 1681, under the title of the *Spiritual Guide*; in consequence of which he was cast into prison in 1685, where he was soon obliged to renounce, in a public manner, the errors of which he was accused: and this solemn recantation was nevertheless followed by a sentence of perpetual imprisonment, from which he was in an advanced age delivered by death, in the year 1696. Molinos had a considerable number of disciples in Italy, Spain, France, and the Netherlands. One of the principal patrons and propagators of *Quietism* in France, was Marie Bouvieres de la Mothe Guyon, a woman of fashion, remarkable for the goodness of her heart, and the regularity of her manners; but of an unsettled temper, and subject to be drawn away by the seduction of a warm and unbridled fancy. This female apostle of mysticism derived all her ideas of religion from the feelings of her own heart, and described its nature to others as she felt it herself. Accordingly her religious sentiments made a great noise in the year 1687; and they were pronounced unsound, after accurate examination by several men of eminent piety and learning, and professedly confuted, in the year 1697, by the celebrated Bossuet. Hence arose a controversy of greater moment, between the prelate last mentioned, and Fenelon, archbishop of Cambray, who seemed disposed to favour the religious system of Madame Guyon, and who, in 1697, published a book, cited in the last article, containing several of her tenets. Fenelon's book, by the interest of Bossuet, was condemned in the year 1699, by Innocent XII. and the sentence of condemnation was read by Fenelon himself at Cambray, who exhorted the people to respect and obey the papal decree. Notwithstanding this seeming acquiescence, the archbishop persisted, to the end of his days, in the sentiments, which, in obedience to the order of the pope, he retracted and condemned in a public manner.

QUIETUS, *freed*, or *acquitted*; a term used by the clerk of the pipe, and the auditors in the exchequer, in their acquittances or discharges given to accomptants, which usually conclude with the words *abinde recessit quietus*; which is called a *quietus est*.

A *quietus est* granted to a sheriff discharges him of all accounts due to the king.

QUIJUBATUI, in *Ornithology*, the name of an American species of peroquette.

It is of the size of a lark, and in general of a yellow colour. Its eyes are black, and its beak grey. The edges of its wings are of a dusky green, and its tail long and yellow. It is a very beautiful bird, and very easily tamed.

QUIL, in *Zoology*. See QUIRPELE.

QUILAQUIL, in *Natural History*, the name given by the people of the Philippine islands to a very beautiful species of parrots, which is commonly found wild in the woods there. It is all over of a fine green colour, and is smaller than the common parrots, and has a broad black bill and black legs. It is a very wild bird, and will not learn any thing.

QUILLOBO, in *Botany*, a name given by some to a species of ketmia, called also QUINGOMBO.

QUILTING, denotes the operation of weaving a sort of coat or texture, formed of the strands of rope, about the outside of any vessel, to contain water, &c. as a jar, cask, bottle, &c.

QUINA *folia*, among *Botanists*. See LEAF.

QUINAQUINA. See QUINQUINA.

QUINARIUS, QUINARY, in *Antiquity*, a little Roman coin, equal to half the DENARIUS. See COIN.

The *quinarius* was properly the Roman halfpenny.

Medalists indeed use the term *quinarius* in the general for a medal of any matter, not exceeding the size of our sixpence; but F. Chamillart, in an express dissertation, shews this to be an abuse. The silver coins, current under the republic, he shews, were two: the one weighing a drachm, and called *denarius*, as containing ten asses; the other weighing half a drachm, and called *quinarius*, as containing five asses: which coins continued on the same footing under the emperors.

Hence the origin of the word *quinarius*: and hence, in propriety, it is only the silver medal of the weight of half a drachm that the name belongs to; the Romans having never given it to any other species of the same size therewith. It is only by way of analogy, therefore, that the moderns apply it to the medals of gold, or copper, of the same size with the silver *quinarius*; those of gold being fixed at a value much above, and those of brass much below five asses.

The only relation between these *quinarii* is, that the gold *quinary* is the half of a gold medal, as to weight and value, and the brass *quinary* half a brass medal, as the silver *quinary* is half a silver one.

Hence a series of *quinaries* should seem at least as necessary in the cabinets of the curious, as the series of great medals; they being all equally different species of money, which teach us how many kinds of pieces there were of any metal current in commerce.

Add to this, says our author, that the *quinaries* were of a finer and more finished coin than the other medals, being wrought by the hands of the masters; which seems owing to the nicety required in engraving whole figures in so small compass. He adds, that though *quinaries* are very scarce, yet M. the duke of Maine had almost a complete set of them.

QUINCE *tree*, *cydonia*, in *Botany*. Its characters are these: the flower is composed of five large roundish concave petals, which are inserted in the permanent empalement; the germen is situated under the flower; it hath five slender styles, with near twenty stamina; the germen afterward becomes a pyramidal or roundish fruit, which is fleshy, and divided into five cells, in which are lodged several hard kernels or seeds. Miller enumerates three species. Linnæus has joined this genus, as well as the apple, to the PEAR.

The Portugal *quince* is most esteemed for the delicate flavour of the fruit: they are all easily propagated, either by layers, suckers, or cuttings, which must be planted in a moist soil. Those raised from suckers are seldom so well rooted as the others, and are subject to produce suckers again, in a greater abundance, which is not so proper for fruit-bearing trees.

The cuttings should be planted early in the autumn; and, in dry weather, must be often watered, to assist them in rooting. The second year, they should be removed into the nursery, and set in rows, at three feet distance, and one foot asunder in each row. In two or three years time, they will be fit to transplant where they are to stand, which should always be near a ditch or river, or in some moist soil; where they will produce a greater quantity of fruit than they will in a dry one, and the fruit will also be much larger: but those in a drier soil are better tasted, and are earlier ripe. These trees require little pruning: the chief thing to be observed is, to keep their stems clear from suckers, and to cut off such branches as cross each other, and also all upright luxuriant shoots.

Quince stocks are in great esteem to graft and bud pears on, which, on a moist soil, will greatly improve some sorts, especially those designed for walls and espaliers; for the trees upon these stocks do not shoot so vigorously as those upon free stocks, and therefore may be kept in less compass, and are sooner disposed to bear fruit: but hard winter fruits do not succeed so well upon these stocks, their fruit being very subject to crack, and are commonly stony, especially all the breaking pears, but more especially if they be planted in dry ground; therefore these stocks are only proper for the melting pears, and for a moist soil. The best stocks are those which are raised from cuttings or layers.

As the pear will take upon the *quince* by grafting or budding, and so *vice versa*, we may conclude there is a near alliance between them; but as neither of these will take upon the apple, nor that upon either of these, so we should separate them under different genera. Miller.

The fruit of the *quince* is astringent and stomachic; and its expressed juice, in small quantities, as a spoonful or two, is of considerable service in nauseæ, vomitings, nidorous eructations, and some kinds of alvine fluxes: but its chief use in the shops is in the *syrupus cydoniarum*, or syrup of *quinces*, prepared by digesting three pints of the depurated juice with a dram of cinnamon, half a dram of ginger, and half a dram of cloves, on warm ashes, for six hours, then adding a pint of red port, and dissolving in the strained liquor nine pounds of sugar. An useful restringent marmalade is made by boiling the juice with fine sugar to a due consistence, in the proportion commonly of three pints to a pound. The juice of *quinces* becomes richer, by keeping them for some time, after they are gathered, in a dry airy place. The seeds of *quinces* abound with a mucilaginous substance, which they readily give out to boiling water.

QUINCUNX, *quinque unciæ*, denotes a thing that consists of five twelfth parts of another.

QUINCUNX is chiefly used in *Gardening*, for a plantation of trees, disposed originally in a square; consisting of five trees, one at each corner, and a fifth in the middle; which disposition, repeated again and again, forms a regular grove, wood, or wilderness; and then viewed by an angle of the square, or parallelogram, presents equal and parallel alleys. See ESPALIER.

Or, the *quincunx* is the figure of a plantation of trees disposed in several rows, both length and breadthwise; in such manner as that the first tree of the second row commences in the centre of the square formed by the two first trees of the first row, and the two first of the third, resembling the figure of a *five* at cards. The finest manner of planting trees to form a grove, is in the *quincunx*. It is of this kind of *quincunx* that Cicero speaks, in his Cato Major; and Quintilian, lib. viii. cap. 3.

The modern *quincunces*, Daviler observes, are made like those of the ancients, except for the fifth tree, which is now generally disused; so that, being as it were netted, and their alleys viewed by the side of the rectangle, they form a perfect chequer.

QUINCUNX, in *Astronomy*, &c. denotes a position, or ASPECT of the planets when distant from each other a hundred and fifty degrees, or five signs.

QUINDECAGON, in *Geometry*, a plain figure which has fifteen sides and fifteen angles.

The word is formed somewhat irregularly, from the Latin *quinque*, *five*, and the Greek δεκα, *ten*, and γωνια, *angle*. *Pentedecagon* would be a more regular term.

If the sides be all equal, it is a regular *quindecagon*.

Euclid shews how to inscribe it in a circle, Prop. xvi. lib. 4. And the side of a regular *quindecagon* so described, is equal in power to the half-difference between the side of the equilateral triangle, and the side of the pentagon; and also to the difference of the perpendiculars let fall on both sides, taken together.

QUINDECIM VIR, XV. VIR, a Roman magistrate, who had fourteen colleagues joined with him in the same function.

Under Tarquin the Proud, there were first two magistrates erected to take care of the sacrifices to be performed; these were called *duumviri*. Their number, at length, grew to ten, and then they were called *decemviri*. In the time of Cicero it had reached to fifteen, when they assumed the name of *quindecimviri*: and though their number grew to forty afterwards, yet Servius observes, on the sixth of the Æneid, that their name never after changed, but they still continued to be called *quindecimviri*.

They were the persons who examined the Sibyls' books, and were the interpreters thereof; yet they never did this but by express order of the senate, declared by a senatus consultum. They also presided at the sacrifices, and all other extraordinary ceremonies of religion.

On medals, a dolphin joined with a tripod marks the priesthood of the *quindecimviri*; who, to publish their solemn sacrifices, used, on the eve thereof, to carry a dolphin at the end of a pole, throughout the city; that fish being esteemed sacred to Apollo, as the crow was among birds.

QUINGOMBO, in *Botany*, the name given by the people of Congo to a species of KETMIA, distinguished by Mr. Tournefort by the name of the *ketmia Brasiliensis folio ficus, fructu pyramidato sulcato*, the fig-leaved Brasilian ketmia, with a pyramidal sulcated fruit.

QUINI-SEXTUM, in *Ecclesiastical History*, denotes a council held at Constantinople in the year 692; called also the council in Trullo, and by the Greeks *Penthecte*, q. d. *five-sixth*; as intimating that it was only a supplement of the two preceding councils. Though, in propriety, Fleury observes, it was a council itself.

Marshall observes, that the fifth and sixth general councils having made no canons, relating to the external celebration of divine worship, the government of the church, and the lives and manners of Christians, the Orientals judged it necessary to supply that defect by this; so that the 102 canons falsly attributed to those, were, in reality, made here. See TRULLUM.

QUINNET, in *Mining*, the name of a tool used in the cleaving rocks by means of gunpowder. This is a sort of wedge fitted to the flat side of what is called the *gun*; that is, a cylindric piece of iron, only flatted in one part to receive this, and drilled through. When a proper hole has been made in the rock by the borer, the powder is put in, and then the orifice being stopped by the gun, and that wedged in by this *quinnet*, the powder being fired by a train communicating with the hole drilled through the gun, exerts all its force on the rock, and splits it in several directions at one explosion. Phil. Trans. N° 167.

QUINQUAGENARIUS, among the *Romans*, was an officer in the army who had the command of a company of fifty men.

QUINQUAGENARIUS was also an officer of policy, who had the inspection of fifty houses, or families.

And in the ancient monasteries, *quinquagenarius* was a superior who had fifty monks under his guidance.

QUINQUAGESIMA-SUNDAY, *Shrove-Sunday*. It is thus called, as being about the fiftieth day before Easter. Anciently they used *Quinquagesima* for Whitsunday, and for the fifty days between Easter and Whitsunday; but to distinguish this *Quinquagesima* from that before Easter, it was called the *Paschal Quinquagesima*.

QUINQUANGULAR *leaf*. See LEAF.

QUINQUANNION, *quinquennium*, in the *French Customs*, a respite of five years, which insolvent debtors formerly obtained by virtue of the king's letters, to have time for the payment of their debts.

When the thing intended was only to prevent the sale of their effects at an under-value, the term of one year was ordinarily granted, and this was called the benefit of *annion*.

But when the debtor would avoid the surrendering of his effects, on proving that he was reduced by poverty, losses, &c. to make use of this expedient, the term of five years was granted, and called the benefit of *quinquannion*.

QUINQUATRIA, in *Antiquity*, a name given to the feasts of Minerva, otherwise called PANATHENÆA.

Some think they were termed *quinquatria*, because they lasted five days; but others, with more reason, think it was because they fell out five days after the ides of the month.

QUINQUEFOLIUM. See CINQUEFOIL.

QUINQUENNALIA, in *Antiquity*, games, or feasts founded at Tyre, celebrated every five years, in honour of the deified emperors.

The *quinquennalia* began to be expressed on medals about the middle of the third century. F. Pagi produces a medal wherein are engraven those of the emperor Posthumus; they are not found in any medals of his predecessors.

QUINQUENNALIS, in *Antiquity*, a magistrate in the colonies, and municipal cities of the Roman commonwealth; much the same with ædile at Rome.

They were not thus called from their continuing in their office five years; but because they were elected every fifth year, to preside at the census, and to receive the declaration each citizen made of his effects.

QUINQUENNES, in some old *Historians*, a name given to a certain people of India, among whom the women began to bear children at five years old, and seldom lived to more than eight years. Pliny gives us this account; and Solinus, who repeats it from him, increases the miracle by telling us, that they were a nation of women who had no men among them.

QUINQUE *portus*, the five CINQUE *ports*.

Servitium quod barones quinque portuum *præscriptorum recognoscunt facere ad summonitionem regis per annum, si contigerit per* 15 *dies ad custum eorum proprium; ita quod primus dies computatur a die quo vela navium erexerunt, usque partes ad quas tendere debent, vel ulterius, quamdiu rex voluerit ad custum ejus.* Thorn.

QUINQUEPRIMI, among the *Romans*, the five principal men in the senate of every municipal town.

QUINQUEREMIS, in the *Naval Architecture of the Ancients*, a name given to a galley which had five rows of oars. They divided their vessels in general into monocrota and polycrota: the former had only one tier of rowers; the latter had several tiers of them, from two or three, up to twenty, thirty, or even forty; for such a vessel we have an account of in the time of Philopater, which required no less than four thousand men to row it. See POLYCROTA.

QUINQUEPARTITE *leaf*, among *Botanists*. See LEAF.

QUINQUERTIONES, among the *Romans*, an appellation given to those who had gained the victory in the *quinquertium* or *pentathlon*.

QUINQUERTIUM, among the *Romans*, was the same with the Grecian PENTATHLON, comprehending the five exercises of running, leaping, throwing, darting, and wrestling.

QUINQUE VIR, frequently wrote V. VIR, a Roman magistrate, who had four colleagues joined with him in the same function.

There were various kinds of officers thus denominated. Pomponius the lawyer mentions *quinqueviri* on this and on that side of the Tiber, established for the administration of justice in the night-time, in lieu of the ordinary magistrates, who were not judged proper to run up and down the streets in the dark.

Rosinus tells us, that they were sometimes the *quinque-*

viri who conducted the colonies, and divided the lands assigned to them among the several families.

Sometimes the epulones were five in number; in which case they were called *quinqueviri*. See EPULO.

QUINQUEVIRI *monetarii*, were officers first erected under the consulate of Valerius Poplicola, to moderate the excessive usury, or interest, which creditors or bankers used to exact from the people.

QUINQUINA. See CORTEX *Peruvianus*.

QUINSEY, QUINZY, or QUINCY, in *Medicine*. See QUINZY.

QUINSIEME, or QUINZIEME, in our *Old Law Books*. See FIFTEENTH.

QUINT, a sequence of five cards of the same colour. See SEQUENCE.

QUINTA *essentia*. See QUINTESSENCE.

QUINTAIN, *quintena*, in *Ancient Customs*, a post driven into the ground, with a buckler fixed to it, for the performance of military exercises on horseback, the throwing of darts, breaking of lances, &c.

Matth. Paris describes the *quintain* as a kind of mark, formed like a man from the navel upwards, holding a shield in his left hand, and in his right a sword or stick; the whole so fitted as to turn round on its foot, and so as that a cavalier running a-tilt against it with a lance, if he hit it in the breast, it whisked round, and, unless he were very dexterous, struck him with the sword held in the other hand.

In other places, at the top of a post, was erected a slender beam fitted to turn round a spindle; at one of whose ends was a slope or flat board, and at the other a bag of sand, or dirt. The sport was, with a long staff, or wooden lance, to ride a-tilt at the board, and to be either so skilful or lucky as to escape the blow of the sand-bag.

This some take to be the same with the *arietum levatio*, frequently prohibited in our old synods and episcopal constitutions.

The custom is still retained in Shropshire, and some other counties, among the nuptial solemnities. He that breaks the most poles against the *quintain*, has the prize; which was anciently a peacock, but is now a garland.

Some derive the word from an ancient game called *quintus*; others from a man of the name of Quintus.

The vallus and palus, mentioned in Cæsar, are taken, by Vigenere, for a kind of *quintain*, or wooden man fixed up as an adversary, or man of straw, to prove one's dexterity against.

Mention is made of this exercise in the Code, De Aleatoribus, and in the Paratitles of Cujas on the same. Juvenal speaks of women engaging therein:

Aut quis non vidit vulnera pali? &c.

QUINTAIN was also a right which the lord had to oblige all the millers, watermen, and other young people unmarried, to come before his castle every three years, and break several lances, or poles, against a post, or wooden man, for his diversion.

QUINTAL, in *Commerce*, the weight of a hundred pounds.

The *quintal* admits of some difference in different places, according as the pound consists of more or fewer ounces, and as the ounce is lighter or heavier.

Thus, e. gr. the Paris *quintal*, or hundred, yields a hundred and twenty-three pounds at Montpelier; and the Montpelier hundred only eighty-one pounds at Paris.

The *quintal* of Constantinople is esteemed the heaviest of all those used in the Levant: it contains forty-five ocquas, the ocquas weighing two Dutch pounds nine tenths; so that the *quintal* is equal to a hundred and twelve pounds three quarters of Amsterdam, a hundred and twenty-four pounds of Venice, and a hundred and sixty of Leghorn.

The English *quintal* usually consists of a hundred and twelve pounds avoirdupois, and is divided into four quarters.

QUINTAL was also formerly used for a weight of lead, iron, or other common metal, usually equal to a hundred pounds, at six score to the hundred.

QUINTESSENCE, *quinta essentia*, in *Chemistry*, a preparation consisting of the essential oil of some vegetable substance, mixed and incorporated with spirit of wine.

Thus, on a proper quantity, e. gr. of essential oil of fennel, pouring twelve times the quantity of pure alcohol prepared *per se*, they instantly unite into one similar liquor, which is the *quintessence* of that plant.

The ancients were perfectly unacquainted with the method of dissolving oil in spirit of wine; and even some of the moderns have questioned its reality: but the certainty of the thing is easily proved, from the instance above, and from a thousand others.

If such *quintessence* be several times digested, cohobated, &c. the oil will at length be broken so fine, as, like the spirit itself, perfectly to mix with water; which is one of the most extraordinary effects in all chemistry.

After the like manner is made a *quintessence* of camphor, by only pouring on it spirit of wine.

Quintessences, thus prepared, have great medicinal virtues; as may appear from the pure and potent ingredients used in their composition; which retain, in a great degree, all the virtues of the plants they are procured from: and hence their denomination.

Boerhaave thinks, they might properly be called vegetable sulphurs made potable, and raised to their utmost degree of power and efficacy.

Dry *quintessences* may be made from the liquid ones, by adding to them some more essential oil of the same vegetable from whence the liquid *quintessence* was procured, with a little sugar, all mixed together, and distilled, by a very gentle heat, till all the moisture is come over; the matter remaining is then a dry *quintessence*.

This form is principally useful for travellers, sailors, &c. inasmuch as it renders the *quintessence* portable; so that the quantity, e. gr. of a pin's point, shall be an efficacious medicine.

QUINTESSENCE, in *Alchymy*, is a mysterious term, signifying the fifth, or last and highest essence, or power, of a natural body.

This is supposed to be, as it were, the soul drawn from the gross body and its four elements, by a most perfect distillation; and, by means hereof, the thing is said to be spiritualized, i. e. rendered exceedingly pure, spirituous, and, as it were, incorruptible.

The ancients, who allowed nothing to be real but what has a body, would have the soul of man to be a fifth element, a kind of *quintessence* without a name, unknown here below, indivisible, immoveable, all celestial, and divine. Fenelon.

QUINTESSENCE *of the elements*, is the hermetical MERCURY.

QUINTESSENCE *of wine*, a term used by Glauber to express an essential oil of wine, which he directs to be made by a careful distillation; and which he is very fond of, as having a power to meliorate, improve, and even to specificate the poorer wines into the nature of those from which it was obtained.

This is one of the schemes of Glauber, generally esteemed an impracticable one, though very plausible in theory: but though in general there is a disagreeable flavour in the *quintessence* drawn after his method, which is different from the true flavour of the wine, and spoils the liquor it is added to; yet, by proper care, there is a possibility of succeeding so far as to render this extraneous flavour almost imperceptible, and produce an oil that will mend poor wines extremely, and give a truly vinous flavour to such as are in themselves tasteless. But whatever may be done by this method, may also be done with much more certainty, and much less trouble, by the concentration of wines by freezing. This may be easily practised in the wine countries; and by this means Burgundy, Champaign, and other the most valuable wines, may be reduced into thick extracts and robs, by the means of which wines may be made in England; a very small quantity of these concentrated wines being sufficient to convert the whole of any of the poor tasteless and insipid wines, which are of themselves of little or no value, into the very wine from which the rob was made; and that in such perfection, that the nicest judge cannot find out the difference.

These robs of wine made and preserved upon the spot, would also be of infinite use in the wine countries, as they might be kept to improve the wines of bad years. Stahl, De Concentr. Vin. Shaw's Chem. Ess.

QUINT-EXACT, in *Old Law Books*, the last call of the defendant sued to an outlawry. If he appear not to it, he is, by the judgment of the coroners, returned outlawed; if a feme, waived.

QUINTILE, *quintilis*, in *Astronomy*, an ASPECT of the planets, when they are seventy-two degrees distant from one another, or a fifth part of the zodiac.

QUINTILIANS, *Quintiliani*, a sect of ancient heretics, the same with the PEPUZIANS; thus called from their prophetess *Quintilia*.

In this sect, the women were admitted to perform the sacerdotal and episcopal functions; grounding their practice on that passage of St. Paul to the Galatians, where he says, *That in Christ there is no distinction of males and females*.

In their assemblies, it was usual to see the virgins enter in white robes, personating the prophetesses. The *Quintilians* bore some resemblance to the modern QUAKERS.

QUINTILIS, in *Chronology*. See JULY.

QUINTUS *femoris*, in *Anatomy*, a name given by Fallopius and many others to one of the muſcles of the thigh, now called the PSOAS *magnus*.

QUINTUS *oculorum*, in *Anatomy*, a name given by Veſalius and ſome others to one of the muſcles of the eyes, more expreſſively called by others *obliquus ſuperior oculi*, and *opifex circumgyrationis oculi*.

QUINVA, in *Botany*, a name by which ſome authors have called the amaranth, or cockſcomb.

QUINZY, or QUINSEY, a diſeaſe which ſtops the freedom of reſpiration, and deglutition.

The word is formed from the French *ſquinance*, or Italian *ſquinantia*, or *eſquinancia*; and theſe, again, from the Greek συναγχη, of αγχω, *I ſuffocate*.

The *quinzy*, by phyſicians alſo called ANGINA, conſiſts in an inflammation of the throat, and, particularly, of the muſcles of the larynx or pharynx; which, exactly cloſing the chinks thereof, prevents the air from paſſing in and out of the trachea, and the food from being ſwallowed and conveyed into the ſtomach.

It is defined, by medical writers, to be an inflammatory ſtaſis of the blood about the throat, in which nature ſeems to have aimed at the diſcharging part of the load of a plethora, either by an hæmorrhage of the noſe, or by ſpitting of blood; but effecting neither, the *quinzy* is produced.

Authors have divided the *quinzy* in general into two kinds; the true, and the ſpurious. The true *quinzy* is that in which the tumor is internal, and is attended with an acute fever. The ſpurious, is that in which the tumor ſhews itſelf more outwardly, and is not attended with a fever, or with a fever which is not acute, but rather chronical, and of the catarrhal kind. Mr. Pott obſerves, that the inflammation of the tonſils conſtitutes this diſorder; that if they partially cover the pharynx, it is ſpurious; and if they ſhut it entirely up, it is a complete or true *quinzy*.

The ancients alſo divided the *quinzy* into four other kinds, which they called by as many names.

1. The *cynanche*. In this the tumor neither manifeſts itſelf outwardly nor inwardly, but is attended with a very violent fever.

2. The *paracynanche*. This was the name given it when the tumor appeared externally in the muſcles of the larynx, and was highly inflammatory.

3. The *ſynanche*. In this kind the tumor appears externally alſo, and there is a leſs difficulty of breathing, but a greater of ſwallowing than in the other kinds.

4. The *paraſynanche*. This name denoted an inflammation of the muſcles of the pharynx, attended with a fever.

We at this time diſtinguiſh alſo the *quinzy* into the idiopathic and ſymptomatic. The firſt, where it is itſelf the diſeaſe, and owes its origin only to a plethora. The ſecond, where it is but the accidental ſymptom of an inflammatory fever, or ſome other diſeaſe about the time of its criſis.

Cauſes of the quinzy. The idiopathic *quinzy* ſeldom happens to any, except young people of a remarkably plethoric habit of body; and people are moſt ſubject to it, who have been uſed to frequent bleedings at the noſe, and who live ſedentary lives, and feed high. The moſt frequent cauſes of this diſeaſe are a ſuppreſſion of hæmorrhages by the noſe; the neglect of bleeding, purging, or any cuſtomary evacuation; a ſudden cooling of the body, and eſpecially of the throat and parts adjacent, after exceſſive heat; wet clothes; damp beds; moiſt air; drunkenneſs; an improper uſe of ſtrong ſternutatory powders; acrid or irritating food; loud and long ſpeaking or ſinging, and, in general, whatſoever produces other inflammatory diſorders, as an obſtructed perſpiration, or any thing that heats and inflames the blood; and finally, luxations of the neck.

As to the ſymptomatic *quinzy*, the moſt common of all cauſes of it, is the improper uſe of bleeding in acute fevers, and other inflammatory diſeaſes.

Beſide the common occaſions of this diſeaſe, we have in the Philoſophical Tranſactions an account of a ſtone breeding at the root of the tongue, and cauſing one. The patient was almoſt choaked; and the tumor, which was large outwardly, though not tending to ſuppuration, yet was ready to break within, and ſhewed matter ready to be diſcharged. On breaking it with the finger, there iſſued out above a quarter of a pint of matter, and with it a ſmall ſtone, very hard, and of the ſame nature and ſubſtance with thoſe formed in the kidneys.

This diſorder may alſo proceed from any ſharp ſubſtances ſticking in the throat; or from the cauſtic fumes of metals or minerals taken in by the breath. This diſeaſe is ſometimes epidemic and infectious.

Signs of a quinzy. The firſt ſymptom of this diſeaſe is a difficulty of ſwallowing, joined with a tumor in the throat, and a ſenſation of a pricking pain. To theſe ſymptoms there ſucceed an inflammation and violent heat in the fauces: and in a little time theſe ſymptoms increaſe to ſo great a degree, that the patient becomes unable to ſwallow; the tongue ſwells violently, and the veins appear black and tumid under it; the face becomes red and tumid, and the temporal veſſels are diſtended, and the eyes become ſwelled, and ſeem as if they would ſtart out of the head; then reſpiration becomes very painful, and there is danger of abſolute ſuffocation. The hands become pale and cold to the touch; and the fleſh is at times very hot, and ſoon after very cold again: and in the progreſs of the diſeaſe, the patient is uſually found to be very low ſpirited. The pulſe is quick and hard, with other ſymptoms of a fever. If blood be let, it is generally covered with a tough coat of a whitiſh colour, and the patient ſpits a tough phlegm. There is a conſtant nauſea, or inclination to vomit; and the drink, inſtead of paſſing into the ſtomach, is often returned by the noſe.

Prognoſtics in quinzies. The more violent the attack of this diſeaſe is, the greater is the danger with which it is attended: and it is moſt fatal to young people of a ſanguine temperament. The ſpurious *quinzy* is always more favourable than the true one; and the mildeſt of all the kinds is the paraſynanche, as the cynanche is of all others the moſt fatal. Thoſe who die of this diſeaſe, rather die of convulſions than of ſuffocation. When the matter cannot be diſcuſſed, there uſually happens a ſuppuration; and in this caſe the event is very dubious and uncertain. When the breathing is laborious, with ſtraitneſs of the breaſt and anxiety, the danger is great. An external ſwelling is no unfavourable ſymptom: but if it ſuddenly falls, and the diſeaſe affects the breaſt; or if a *quinzy* is the conſequence of ſome other diſeaſe, which has already weakened the patient, his ſituation is dangerous. A frothing at the mouth, with a ſwelled tongue, a pale, ghaſtly countenance, and coldneſs of the extremities, are fatal ſymptoms.

Method of cure. The food in this diſeaſe muſt be light, and in ſmall quantity; and the drink plentiful, weak, and diluting, mixed with acids. The patient muſt be kept ſtill, and ſpeak little: ſuch a degree of warmth as to promote a conſtant gentle ſweat is proper; and it is peculiarly neceſſary that the neck be kept warm, by wrapping round it ſeveral folds of ſoft flannel. The jelly of black currants, kept conſtantly in the mouth, and ſwallowed gradually, or mixed in the patient's drink, is much eſteemed for complaints of the throat. Where this cannot be obtained, the jelly of red currants, or of mulberries, may be ſubſtituted in its ſtead. Gargles for the throat are very beneficial. They may be made of ſage tea, with a little vinegar and honey; or by adding to half a pint of the pectoral decoction two or three ſpoonfuls of honey, and the ſame quantity of currant jelly. This gargle may be uſed frequently; and if the patient be troubled with tough viſcid phlegm, it may be rendered more ſharp and cleanſing, by adding to it a teaſpoonful of the ſpirit of ſal ammoniac. See GARGARISM.

The practice of bathing the feet and legs in lukewarm water ſhould by no means be neglected: and it is obſerved by an experienced phyſician, that if people were careful to keep themſelves warm, to wrap up their throats with flannel, to bathe their feet and legs in warm water, and to uſe a ſpare diet, with diluting liquors, at the beginning of this diſeaſe, it would ſeldom proceed to any great height, or be attended with any danger. However, when more alarming ſymptoms appear, even in the firſt ſtage of this diſtemper, it will be proper to commence the cure by bleeding freely in the arm, or rather in the jugular vein; and to repeat the operation, if the conſtitution allow it, and the circumſtances require. The body ſhould likewiſe be kept gently open, by giving the patient for his ordinary drink a decoction of figs and tamarinds, or ſmall doſes of rhubarb and nitre, which may be increaſed according to the age and ſtrength of the patient, and repeated till they have the deſired effect. Some recommend, after bleeding, a briſk but cooling purge of the infuſion of ſena ℥ iij. and Glauber ſalts from ℥ ſs. to ℥ j. the operation of which may be haſtened by a clyſter, in which ʒ j. of nitre may be diſſolved, if the fever runs high. This draught may be repeated during the firſt three or four days: but if draughts of this kind cannot be ſwallowed, purging clyſters with nitre in them muſt be daily adminiſtered: and gentle purging ſhould be continued through the whole progreſs of this diſeaſe.

Dr. Buchan obſerves, that he has known good effects from a bit of ſal prunel, or purified nitre, held in the mouth and ſwallowed as it melted; this promotes the diſcharge of the ſaliva, and thus anſwers the end of a gargle, whilſt it abates the fever, by promoting the diſcharge of urine, &c. The throat may likewiſe be rubbed

rubbed twice or thrice a day with a little of the volatile liniment, or flannel dipped in it may be applied to the throat. See LINIMENTUM *volatile*.

In violent inflammations of the throat, bliſtering on the back, neck, or behind the ears, is of great uſe; and in bad caſes, it will be neceſſary to lay a bliſtering plaſter quite acroſs the throat, from ear to ear. When theſe plaſters are taken off, the parts may be kept running, by the application of iſſue ointment, till the inflammation is gone, for fear of a relapſe. With this kind of treatment, a ſuppuration ſeldom happens: however, when the inflammation and ſwelling continue, and a ſuppuration is likely to enſue, it ſhould be promoted by drawing the ſteam of warm water through a funnel, or the like. Soft poultices ought likewiſe to be applied outwardly; and the patient may keep a roaſted fig conſtantly in his mouth. When the tumor is ſo great as entirely to prevent any thing from getting down into the ſtomach, the patient muſt be ſupported by nouriſhing clyſters of broth, or gruel, with milk, &c. But if the breathing, as well as the ſwallowing, be prevented by the tumor, and the danger of ſuffocation is imminent, nothing can ſave the patient's life, but opening the trachea or wind-pipe. See BRONCHOTOMY.

In this diſtemper, beſides high bleeding, ſome recommend a gargariſm compoſed of ſublimate mercury half a drachm, cream of tartar two drachms, diſſolved in a pint of ſpring water. Med. Eſſ. Edinb. abr. vol. ii. p. 431.

We have a hiſtory of an uncommon *angina*, or *quinzy*, by Mr. Monro, in the Medical Eſſays of Edinburgh abridged, vol. ii. p. 400.

When a difficulty of ſwallowing is not attended with an acute pain or inflammation, it is generally owing to an obſtruction of the glands about the throat, and only requires that the part be kept warm, and the throat frequently gargled with ſomething that may gently ſtimulate the glands, as a decoction of figs with vinegar and honey, to which may be added a little muſtard, or a ſmall quantity of ſpirits. This ſpecies of *angina* has various names among the common people, as the pap of the throat, the falling down of the almonds of the ears, &c.

Thoſe who are ſubject to inflammations of the throat, ſhould avoid every kind of intemperance; or have frequent recourſe to purging, and other evacuations. They ought likewiſe to beware of catching cold, and abſtain from aliment and medicines of an aſtringent or ſtimulating nature. They may alſo uſe, as a preventive, a ribband dipped in hartſhorn, or a piece of flannel, conſtantly about their necks. Buchan's Domeſt. Med. chap. xxviii.

QUINZY, *malignant*, or *putrid ulcerous ſore throat*, called *angina aquoſa* or *gangrena*, is a putrid remittent fever, accompanied with an ulcerated ſore throat, or with an inflammation of the mucous membrane. Children are more liable to this diſorder than adults, females than males, and the delicate and relaxed than thoſe who are hardy and robuſt. It prevails chiefly in autumn, and is moſt common after a long courſe of damp, or ſultry weather.

Cauſes of the malignant quinzy. This is evidently a contagious diſtemper, and is generally communicated by infection. Moreover, whatever tends to produce *putrid* or *malignant* FEVERS, may likewiſe occaſion the putrid ulcerous ſore throat, as unwholeſome air, damaged proviſions, neglect of cleanlineſs, &c.

Symptoms of the malignant quinzy. This diſeaſe begins with alternate fits of ſhivering and heat. The pulſe is quick, but low and unequal; the urine is at firſt pale and crude, but, as the diſeaſe advances, it becomes of a more yellowiſh colour; the patient complains of an oppreſſion of the breaſt, his ſpirits are low, and he is troubled with a nauſea, and often with a vomiting or purging. The eyes appear red and watery, and the face ſwells: the tongue is white, and generally moiſt, which diſtinguiſhes this from an inflammatory diſorder. The throat, on examination, appears internally ſwelled, and of a florid red colour, with pale or aſh-coloured ſpots interſperſed, and ſometimes one broad irregular ſpot, of a pale white colour, ſurrounded with florid red, and theſe whitiſh ſpots cover ſo many ulcers. About the ſecond or third day, there commonly appears an effloreſcence or eruption upon the neck, arms, breaſt, and finger; upon the appearance of which, the purging and vomiting, chiefly incident to children, ceaſe. This diſeaſe is often accompanied with a ſlight delirium, the face appears bloated, and the inſide of the noſtrils inflamed. The patient complains of a diſagreeable putrid ſmell, and his breath is very offenſive.

This kind of ſore throat may be diſtinguiſhed from the inflammatory by the vomiting and looſeneſs, with which it is generally introduced; by the foul ulcers in the throat, covered with a white or livid coat; and by the exceſſive weakneſs of the patient, with other ſymptoms of a *putrid* FEVER.

Prognoſtics of the malignant quinzy. The unfavourable indications are an obſtinate purging, extreme weakneſs, dimneſs of the ſight, a livid or black colour of the ſpots, and frequent ſhiverings, with a weak, fluttering pulſe. If the eruption upon the ſkin ſuddenly diſappears, or becomes of a livid colour, with a diſcharge of blood from the noſe or mouth, the danger is very great. But if a gentle ſweat breaks out about the third or fourth day, and continues with a ſlow, firm, and equal pulſe; if the ſloughs caſt off in a kindly manner, and appear clean and florid at the bottom; if the breathing be ſoft and free, and the eyes are lively, a ſalutary criſis may be expected.

Method of cure. In this diſeaſe the patient muſt be kept quiet, and, for the moſt part, in bed; the air of the room being occaſionally purified by opening the windows, and by the vapours of myrrh, roſemary flowers, or vinegar. His food muſt be nouriſhing and reſtorative; as ſago gruel with red wine, jellies, ſtrong broths, &c. His drink ſhould be generous, and of an antiſeptic quality; as red wine negus, white wine whey, &c. All evacuations, as bleeding, purging, &c. which tend to weaken the patient, muſt be avoided in this diſorder: and cooling medicines, ſuch as nitre and cream of tartar, are hurtful. But ſtrengthening cordials are abſolutely neceſſary, and ſhould never be neglected.

At the firſt acceſs of this diſeaſe, eſpecially if there be a nauſea, or inclination to vomit, let the ſtomach be cleanſed by an infuſion of green tea, chamomile flowers, or carduus benedictus; and if theſe do not anſwer the purpoſe, by a few grains of ipecacuanha, or a ſmall quantity, to the amount of a grain or a grain and a half, of tartar emetic. If the diſeaſe be mild, the throat may be gargled with an infuſion of ſage and roſe leaves, adding to a gill of it a ſpoonful or two of honey, and as much vinegar as will make it agreeably acid: but if the ſymptoms are urgent, the ſloughs large and thick, and the breath very offenſive, Dr. Buchan recommends the following gargle: to ſix or ſeven ounces of the pectoral decoction, when boiling, add half an ounce of contrayerva root: let it boil for ſome time, and afterwards ſtrain the liquor; to which add two ounces of white wine vinegar, an ounce of fine honey, and an ounce of the tincture of myrrh. This mixture may not only be uſed as a gargle, but for cleanſing the mouth, before the patient takes any meat or drink. The ſteams of warm vinegar, myrrh, and honey, which are detergent and antiſeptic, conveyed into the mouth through an inverted funnel, are very beneficial. But the principal medicine, and that which is moſt to be depended upon, when the putrid ſymptoms run high, is the Peruvian bark, which ſhould be adminiſtered in ſubſtance, if the patient's ſtomach will bear it: otherwiſe, an ounce of bark groſsly powdered, with two drams of Virginian ſnake-root, may be boiled in a pint and a half of water, to half a pint; to which may be added a tea-ſpoonful of the elixir of vitriol: and a common tea-cupful of this may be taken every three or four hours. The bark may be alſo given with red wine, if the ſtate of the pulſe does not forbid. Bliſtering plaſters, applied in the firſt ſtage of this diſeaſe to the back, throat, or behind the ears, are of peculiar importance and benefit, eſpecially when the patient's pulſe and ſpirits are low.

Dr. Percival recommends two parts of the EMPLASTRUM *ſtomachicum* or è cymino, one part of the EMPLASTRUM *veſicatorium*, and a dram and a half of powdered camphor, to be mixed together for this purpoſe. This mild plaſter, he obſerves, ſufficiently diſcharges the ſerum, and at the ſame time is antiſeptic; and as the ſkin is peculiarly diſpoſed to inflammation, it is preferable to the common bliſtering plaſters. If it be ſpread and warmed, and a thin piece of muſlin be laid on its ſurface, it will irritate leſs, produce leſs ſtrangury, and may be thus ſafely applied even where the ſkin is eryſipelatous.

A cataplaſm of the bark and chamomile flowers, boiled in vinegar, with the addition of a dram and a half or two drams of camphor, laid acroſs the throat, and renewed every four hours, will contribute much to relax and ſoften the glands of the neck, and exhale an antiſeptic vapour, which will be drawn in by the mouth at every inſpiration, and alſo abſorbed from it. In caſes leſs urgent, flannels dipped in ſpirit of wine camphorated and ſharp vinegar, mixed in equal parts, may be applied to the neck, inſtead of this cataplaſm. A pedilave made with the bark and chamomile flowers, boiled in vinegar and water, may be uſed three or four times a day; or flannels wrung out of this decoction may be applied to the patient's limbs. Fixed air, adminiſtered by the mouth, or by way of clyſter, is a very important and uſeful medicine in this diſorder.

If the vomiting is troublesome, the patient may take two table-spoonfuls of the saline julep every hour: and tea made of mint and a little cinnamon, with an equal quantity of red wine, will be proper for his common drink. In case of a violent loosenss, the size of a nutmeg of diascordium, or the japonic confection, may be taken two or three times a day; or oftener, if necessary. In a discharge of blood from the nose, the steams of warm vinegar may be received frequently up the nostrils; and the drink must be sharpened with spirits of vitriol, or tincture of roses. In case of a strangury, the belly must be fomented with warm water, and emollient clysters given three or four times a day. After the violence of the disease is over, the body should be kept open with mild purgatives, as manna, sena, rhubarb, &c.

If great weakness and dejection of spirits, or night sweats, and other symptoms of a consumption remain after this disease, the patient should continue the use of the Peruvian bark, with the elixir of vitriol, and take frequently a glass of generous wine. These, together with a milk diet, and riding on horse-back, are the most likely means for recovering his strength. Buchan's Dom. Med. chap. xxviii. p. 295, &c. Percival's Essays. Huxham, Fothergill, Northcote, &c. on the Sore Throat. See *Putrid* FEVER.

QUIRE *of paper*, of the French *cahier*, the quantity of twenty-four or twenty-five sheets.

QUIRICIA, a name given by some to the stone called QUIRIS by the generality of writers.

QUIRINACIUM *opium*, in the *Materia Medica*, a name given by some to the gum we know by the name of assa fœtida.

QUIRINALIA, in *Antiquity*, feasts celebrated, among the Romans, in honour of Romulus, who was called Quirinus. See QUIRITES.

The *Quirinalia*, called also *stultorum feriæ*, were held on the 13th of the calends of March, i.e. on our 17th of February.

QUIRIS, *quirinus lapis*, a name given, by the writers of the middle ages, to a stone famous among them for its imaginary virtues, but of which they have left us no description.

QUIRISTER, or CHORISTER, *chorista*, a person appointed to sing in the quire, or choir, of a cathedral. See ANTHEM, CHANTOR, CHOIR.

QUIRITES, in *Antiquity*, an appellation given to the people of Rome, chiefly the common citizens, as distinguished from the soldiery.

It took its rise from the *Curetes*, the inhabitants of the Sabine town *Cures*. On this occasion Romulus, and Tatius king of the Sabines, having united their two people, and their two states, into one; upon Romulus's death and deification, the Sabines, outdoing the Romans in number, became masters of the councils; and accordingly appointed, that Romulus should be denominated *Quirinus*, from Cures, a city of the Sabines; or rather from *Quirinus*, the name of a god worshipped in that city.

From the new *Quirinus*, all the people came afterwards to be called *Quirites*; unless we will suppose, that the same authority which denominated Romulus *Quirinus*, from Cures, did also denominate the people *Quirites*, immediately from the Curetes.

Some authors derive the word *Quirinus* from *Curis*; which, in the Sabine tongue, signified a pike, or halbert. Struvius adds, that Romulus was always painted with a pike in his hand.

QUIRK, in *Building*, a piece of ground taken out of any regular ground-plat, or floor.

Thus, if the ground-plat were square, or oblong, and a piece be taken out of a corner, to make a court, or yard, &c. the piece is called a *quirk*.

QUIRPELE, in *Zoology*, the name of a small animal, called by some authors the *Indian ferret*, or *viverra Indica*, and by others *quil*.

Garcias and some authors give very remarkable accounts of the enmity this creature has to serpents of all kinds. They tell us, that when this little creature intends an attack upon one of these animals, it first prepares against danger, by gnawing a quantity of the root of the *lignum colubrinum*, or snake wood; and when it has thoroughly impregnated its saliva, it wets with it first its fore-feet, and with them daubs over its head and its whole body: and that thus prepared, it boldly attacks the snake, and never leaves off till it has killed it. Garcias assures us, that many of the Portuguese have been eye-witnesses of these combats.

It is probable enough, that this creature may attack a snake when thoroughly hungry, knowing its flesh to be good food; but the story of the antidote is to be suspected. See ICHNEUMON.

QUIS, in *Natural History*, a kind of MARCASITE of iron or copper, from which VITRIOL is drawn.

It is more frequently called PYRITES.

QUISQUALIS, in *Botany*, a genus of the *decandria monogynia* class. Its characters are, that the calyx is filiform, and divided into five segments; that the petals are five; and that the fruit is a quintangular drupe. There is only one species.

QUIT-CLAIM, a release, or quitting one's claim or pretensions to a thing.

QUIT-RENT, q. d. *quiet rent*, a certain small rent, payable yearly, by the tenants of most manors, in token of subjection; upon the payment whereof, they are quiet, and free. It includes both *rents* of assise and CHIEF *rents*.

In some ancient records it is written *white rent*, because paid in silver; to distinguish it from rent-corn, rent-pepper, &c.

QUITTANCE. See ACQUITTANCE.

QUITTER-BONE, among *Farriers*, a hard, round swelling, upon the coronet of a horse's foot, or between the heel and the quarter.

Or it is an imposthume breeding between the hoof and coffin-bone, on the upper part, and shewing itself by a swelling on the coronet.

Sometimes it is occasioned by gravel under the shoe, or by a bruise, stab, or a prick of a nail; or from peccant humours descending to that place; or a blow, strain, or over-reach, &c. It occasions the horse to halt much, and the swelling grows visible, and comes to a head in four or five days, and breaks out with matter at a little deep hole, like a fistula.

QUITY, in *Botany*, a Brasilian name used by some authors for the sapindus, or soap-berry tree of the West Indies.

QUO *jure*, a writ that lies for him who has land, wherein another challengeth common of pasture time out of mind: its design is to compel the party to shew by what right or title he challengeth it.

QUO *minus* is also a writ which lies for the king's farmer or debtor in the court of exchequer, against him to whom he selleth any thing by way of bargain, touching his farm, or against whom he hath any cause of personal action; because by the vendee's detaining any due from him, the farmer is made less able to pay the king's rent.

Quo minus is also a writ that lies for him who has a grant of house-bote in another man's wood, against the grantor making such waste, as that the grantee cannot enjoy his grant.

QUO *warranto*, a writ that lies against him who usurps any franchise, or liberty, against the king; as to have waife, stray, fair, market, court baron, leet, or such-like, without good title.

It also lies for mis-user or non-user of privileges granted; and even, according to Bracton, against him that intrudeth himself as heir into land. See INTRUSION.

The judgment on a writ of *quo warranto* (being in the nature of a writ of right) is final and conclusive even against the crown. See INFORMATION.

QUOCOLOS, the name of a stone found in Tuscany, as hard as a flint, somewhat transparent, and, in some measure, resembling marble. In the fire it loses its transparency, and becomes less ponderous, and white; and a strong fire readily converts it into glass. It has no medicinal virtues, but is used at some glass-houses.

QUOD *clerici non eligantur in officio*, is a writ that lies for a clerk, who, by reason of some land he hath, is made, or like to be made, a bailiff, beadle, reeve, or such like officer.

QUOD *ei deforceat*, in *Law*, a writ for tenant in tail, tenant in dower, by the courtesy, or for term of life, having lost their lands by default, against him that recovers, or his heir. Reg. Orig. 171. Stat. Westm. 2. cap. 4.

QUOD *medium*. See MEDIUM.

QUOD *permittat*, in *Law*, a writ that lies where a man is disseised of his common of pasture, and the *disseisor aliens*, or dies seised, and his heir enters; then if the disseisee die, his heir shall have this writ.

QUOD *permittat prosternere*, in *Law*. See *Assise of* NUSANCE.

QUOD *non permittat*. See CONSUETUDINIBUS *&* *servitiis*.

QUOD *persona nec præbendarii*, *&c.* a writ that lies for spiritual persons, when distrained in their spiritual possessions, for the payment of a fifteenth, with the rest of the parish.

QUODLIBETICAL *question*, *quæstio quodlibetica*, a college term for a thesis, or problem, anciently proposed to be debated in the schools, out of curiosity and entertainment, rather than for the settling of any useful point.

The term is formed from the Latin *quodlibet*, *any thing*, *what you please*: and so well satisfied were the public of the impertinencies of these questions, that the term

quodlibet has been ſince retained, to ſignify any little ridiculous quibble.

QUOIL, QUOYL, or COILE, in the *Sea Language*. A cable is ſaid to be *quoiled*, when it is laid round in a ring, one turn over another, on the deck of a ſhip.

The middle of ſuch ring, or *quoil*, is a good place to lay ſhot in: they are more ſafe there, than in lockers along the ſide, where the enemy's ſhot may fall into them.

QUOIL, *Weather*. See WEATHER *quoil*.

QUOIN, or COIN, formed from the French *coin*, of the Latin *cuneus*, *wedge*, aboard a *Ship*, is a wedge faſtened on the deck, cloſe to the breech of the carriage of a gun, to keep it firm up to the ſhip's ſide, and prevent its rolling; and alſo to raiſe or depreſs it.

QUOINS, *Cantic*, are ſhort, three-legged *quoins*, put between caſks to keep them ſteady. See COIN.

QUOINS, in *Architecture*, denote the corners of brick or ſtone walls.

The word is particularly uſed for the ſtones in the corners of brick buildings. When theſe ſtand out beyond the brick-work (their edges being chamferred off) they are called *ruſtic quoins*.

QUOITS, a kind of exerciſe or game, known among the ancients under the name of the *diſcus*. See DISC.

QUOLL, in *Zoology*, a name given by the natives of New Holland to an animal reſembling a pole-cat, with a brown back, ſpotted with white, and the belly of a pure white, in which it differs from others of theſe fetid animals. Cook's Voy. 1770. vol. iii. 626.

QUORUM, a term frequently mentioned in our ſtatutes, and often uſed in commiſſions, both of peace, and others.

It is thus called from the words in the commiſſion, *Quorum* A. B. *unum eſſe volumus*.

For an example: Where a commiſſion is directed to ſeven perſons, or to any three of them, whereof A. B. and C. D. are to be two; there A. B. and C. D. are ſaid to be of the *quorum*, becauſe the reſt cannot proceed without them.

So a juſtice of the peace and *quorum* is one without whom the reſt of the juſtices in ſome caſes cannot proceed.

QUORUM *nomina*. In the reign of king Henry VI. the king's collectors, and other accomptants, were much perplexed, in paſſing their accounts, by new-extorted fees, and forced to procure a then late-invented writ of *quorum nomina*, for the allowance and ſuing out their quietus, without the allowance of the king.

QUOTATION, in *Literature*, a *citation*; or a paſſage rehearſed expreſly in one author from another.

Quotations are uſed to be diſtinguiſhed by inverted commas.

The manner of quoting by book, and chapter, or ſection, is chiefly affected by men of erudition; but it is abuſed: this method ought only to obtain where the whole chapter or ſection is expreſly on the ſubject. On other occaſions, quoting by page is more commodious; except in claſſics, and other ancient writings, whereof there are many editions in different forms; where this method is of little uſe, unleſs the edition be alſo ſpecified.

The *quotations from the Old Teſtament*, found in the New, have occaſioned infinite doubt, diſpute, and criticiſm. The apoſtles are frequently referring to the Old Teſtament, and quoting paſſages and prophecies thence, as fulfilled in our Saviour; yet theſe paſſages thus quoted, are frequently either not found in the Old Teſtament at all, or they are not urged in the New, according to the literal and obvious ſenſe they ſeem to bear in the Old.

A late ingenious author, in an Eſſay upon the Truth of the Chriſtian religion, frankly owns, that the evangeliſts ſometimes apply to the Meſſiah paſſages of the Old Teſtament, which, as they lie in our preſent copies, plainly relate to ſome other perſon, or thing. This is evident, e. gr. in the paſſage, Matthew ii. 15. *Out of Egypt have I called my ſon*; which is quoted from Hoſea xi. where it is plainly underſtood of the coming of the Iſraelites out of Egypt.

This proves to many a heavy obſtacle in the way of Chriſtianity, which the divines, commentators, critics, &c. have long laboured to remove, though by very different means.

Some have recourſe to a double completion; and imagine, that though the prophecies were primarily accompliſhed in other events, yet they might have a ſecondary accompliſhment in the Meſſiah: but others ſet aſide a double completion, except where the prophet himſelf declares as much, this otherwiſe making all prophecy uſeleſs. See PROPHECY.

The generality chuſe therefore to have recourſe to an allegorical, typical, or ſpiritual meaning in the prophecies, &c. and ſuppoſe them to have been thus underſtood among the ancient Jews, thus fulfilled in our Saviour, and thus applied by the apoſtles.

In effect, the Jewiſh rabbins, it is allowed, took great liberty in quoting and interpreting Scripture; and it is ſuppoſed the apoſtles might follow theſe rules in their quotations.

Accordingly, M. Surenhuſius, Hebrew profeſſor at Amſterdam, has endeavoured to retrieve theſe rules, long ſince loſt, in an expreſs treatiſe on this ſubject, publiſhed in 1713. This author obſerves a great deal of difference implied in the different forms of *quoting* uſed by the ſacred writers: as, *It has been ſaid*; *it is written*; *that it might be fulfilled which was ſpoken by the prophets*; *the Scripture ſays*; *ſee what is ſaid*; *the Scripture forſeeing*; *it is not written*, &c. He adds, that the books of the Old Teſtament having been diſpoſed in a different order at different times, and having had different names, it is thence that one book or writer is ſometimes confounded with another.

For the rules of *quoting* and interpreting practiſed among the rabbins, he gives us ten; recovered with much ſtudy from the Talmud, and the ancient Jewiſh doctors: inſtances whereof he gives us in the writings of the apoſtles; and by thoſe rules he endeavours to explain and juſtify all the *quotations* made from the Old Teſtament in the New.

The rules are, 1. Reading the words not according to the points placed under them, but according to others ſubſtituted in their ſtead; as is done by St. Peter, Acts iii. 23. by Stephen, Acts vii. 43. and by Paul, 1 Cor. xv. 54. 2 Cor. viii. 15, &c.—The ſecond is by changing the letters; as is done by Paul, Rom. ix. 33. 1 Cor. xi. 9. Heb. viii. 9. and x. 5. and by Stephen, Acts vii. 43.—The third is by changing both letters and points; as is done by Paul, Acts xiii. 41. and 2 Cor. viii. 15.—The fourth is by adding ſome letters, and taking away others.—The fifth is by tranſpoſing words and letters.—The ſixth is by dividing one word into two.—The ſeventh, adding other words to make the ſenſe more clear.—The eighth, changing the order of the words.—The ninth, changing the order of the words, and adding other words. Both of which are done by the apoſtles.—Laſtly, changing the order of words, adding words, and retrenching words; which is a method often uſed by St. Paul.

Other authors, as biſhop Kidder, M. Le Clerc, Mr. Sykes, &c. ſolve the difficulty another way. That uſual form of *quotation* among the evangeliſts, "That it might be fulfilled which was ſpoken by the prophets," according to theſe authors, means no more than an accommodation of the prophets' words to the caſe in hand.

The word πληρωθῃ, *fulfilled*, does not neceſſarily determine us to ſuch a ſenſe, as if the evangeliſts deſigned to ſpeak of a prediction of future events *accompliſhed*; but may barely expreſs an accommodation of borrowed words. In effect, ſays biſhop Kidder, a Scripture may be ſaid to be *fulfilled* two ways; *properly*, as when that which was foretold comes to paſs; and *improperly*, by way of accommodation, as when an event happens to any place or people like to what fell out ſome time before. And thus it is that St. Matthew ſays, on occaſion of the murder of the innocents, that "then was fulfilled what was ſpoken by the prophet Jeremy, *In Rama was a voice heard*," &c.

This interpretation is confirmed by M. Le Clerc, who obſerves that the Jews, in their language, uſed to ſay, that a paſſage of Scripture was *fulfilled*, as often as any thing happened which it might be applied to: ſo that the evangeliſt Matthew, who was a Hebrew, and wrote, as it is commonly ſuppoſed, in that language, intended no more in the paſſage juſt cited, but that a thing happened, to which one might apply what Jeremy had formerly ſaid on another occaſion.

Accordingly, ſays Mr. Sykes, the evangeliſts, in citing that paſſage of Iſaiah, *Behold, a virgin ſhall be with child, &c.* only uſe it as words of that prophet remarkably agreeing to the miraculous birth of Jeſus, and not as a prophecy of his birth.

It may be added, that this way of ſpeaking was not unknown among the heathen writers. Thus in Ælian, Diogenes Sinopenſis uſed continually to ſay of himſelf, that he fulfilled and underwent all the curſes of tragedy.

QUOTIDIAN, *quotidiana*, in *Medicine*, an intermitting fever, or ague, the acceſs whereof returns every day. See AGUE.

This differs greatly from the continual *quotidian* fever. See *Catarrhal* FEVER.

It is diſtinguiſhed from the double tertian by this, that the *quotidian* regularly obſerves its times of attack and of duration every day; but in the double tertian, the ſingle fits do not correſpond one with another, but only the alternate ones; that is, the paroxyſm of the third day correſponds

corresponds with that of the first, that of the fourth with that of the second, and so on.

Signs of it. This fever usually attacks the patient in a morning, and most frequently about six or seven o'clock. The first symptom is a very violent chilness or coldness, which usually lasts about an hour, and is attended either with a vomiting, or with a diarrhœa, or both. This cold fit is succeeded by a violent hot one, in which there is an intolerable thirst and pain of the head. The whole duration of the fit is usually six hours; and when the heat remits a little of its violence, then sweats usually come on. This returns regularly at the same hour the next day, and so on, unless disturbed by any means; in which case, it anticipates or postpones the accustomed time.

Persons subject to it. This is the least frequent of all the intermittent fevers. Persons of phlegmatic habits are more subject to it than those of any other temperament; and it seizes old people oftener than young, and women much more frequently than men.

Causes of it. The first cause of this disease is a viscous and mucous matter lodged in the primæ viæ. This is often attended with a spissitude of the blood in the vena portæ. The occasional causes which bring on this spissitude of the blood and foulness of the primæ viæ, are a coarse and thick diet, a sedentary life, and a natural turn to melancholy. The causes of this, and of the tertian, seem to be the same, only that in this they are stronger.

Method of cure. The general custom of curing intermittents by vomits and the Peruvian bark alone, is censured by Stahl, and many other writers, as being faulty in two extremes; the vomiting throwing off the offending matter with too much violence, and the bark locking it up in the body. Vomits, when injudiciously given, often give violent reachings, without bringing up any part of the matter of the disease; and the bark, and other astringents, bring on obstinate costiveness, flatulencies, straitness of the breast, and many other disorders, such as the jaundice, dropsy, œdematous swellings, and many other the like complaints, which often succeed the too large or injudicious use of it: for this reason, these authors prefer a regular method, by inciding the tough matter in the primæ viæ, with tartarum vitriolatum, and the like, then giving a gentle emetic; after this, gentle diaphoretics and diluents, such as all warm and weak liquors; and afterwards strengthening the stomach and bowels by bitters and subastringents, among which the bark has its place, though in smaller quantities than when trusted to alone in the usual way. Junker's Consp. Med. p. 360. See *Intermitting* FEVER.

QUOTIDIAN, *Double*, returns twice in twenty-four hours.

QUOTIENT, *quotiens*, formed from the Latin *quoties*, q. d. *how often is such a number contained in such another*, in *Arithmetic*, the number resulting from the division of a greater number by a smaller; and which shews how often the smaller is contained in the greater, or how oft the divisor is contained in the dividend.

In division, as the divisor is to the dividend, so is unity to the *quotient*. Thus the *quotient* of 12 divided by 3 is 4; which is thus disposed, 3) 12 (4 *quotient*.

QUOUSQUE. *Execution with a* QUOUSQUE. See EXECUTION.

QUOYL. See QUOIL.

R.

R, A liquid conſonant, and the ſeventeenth letter of the alphabet.

The grammarians hold it a ſemi-vowel; eſpecially in the Greek, where, in common with the other vowels, it admits an aſpirate, &c. though whether the aſpirate ſhould be ſounded before or after it, is ſome doubt. We find inſtances of each.

Thus ῥεδη the Latins wrote *rheda*; and ῥοδον the Ætolians wrote βροδον; and in Engliſh words derived from the Greek it is followed by an *h*, as *rhapſody*. The ancient Goths, and Teutones, Littleton obſerves, always prefixed *h* to *r*. See H.

The ſound is formed by a guttural extruſion of the breath, vibrated through the mouth, with a ſort of quivering motion of the tongue drawn from the teeth, with the tip a little elevated towards the palate.

The Hebrews allow the *r* the privilege of a guttural; that is, they never double it, which yet is done by the Arabs, Greeks, and Latins, &c.

Perſius calls the *r*, *litera canina*, becauſe the dogs ſeem to pronounce it in ſnarling; yet it ſhould ſeem to have had a ſofter ſound among the Romans than among us, by its being frequently interpoſed to prevent the claſhing of vowels; as in *rarus*, αραιος, *nurus* from νυος, *murex* from μυαξ, *mus muris* from μυς μυος; and this ſoftneſs was ſuch as frequently occaſioned its being dropt as uſeleſs in writing.

Thus, for *Hetruſci* they frequently wrote *Thuſci*, and even *Tuſci*; and for *ſurſum*, *rurſus*, *prorſus*, *ſuſum*, *ruſus*, *proſus*. In effect, there was that agreement between the ſound of the *s* and *r*, that as the Romans avoided the doubling of their conſonants, it was no wonder they here dropped the *r* in ſuch words; the *s* ſupplying the place of both. Hence too it came too paſs, that what they at firſt pronounced *aſa*, *aſena*, *caſmen*, was afterwards *ara*, *arena*, *carmen*; and thoſe firſt named *Fuſii* and *Valeſii* were afterwards called *Furii* and *Valerii*. Cicero tells us, the *Papirii* were firſt called *Papiſii*; and even fixes the time when the change was made, viz. in the year of Rome 415. Feſtus adds, that *olera*, *pignora*, *plurima*, were anciently written *oleſa*, *pignoſa*, *pluſima*.

From the ſame ſoftneſs of the ſound of the *r*, it came to be uſed indifferently with the *l*, in many words; e. gr. *Latiaris* and *Latialis*, *Palilia* and *Parilia*, &c.

Though the *r* more frequently degenerated into *l*; thus *remures* became changed into *lemures*; *interlego*, *perluceo*, into *intelligo* and *pelluceo*; *frater* into *fratellus*, &c. and the ſame is ſometimes done between *n* and *r*, as *æreus*, and *æneus*, &c.

In the notes of the ancients, *R.* or *RO.* ſignified *Roma*; *R. C. Romana civitas*; *R. G. C. rei gerendæ cauſa*; *R. F. E. D. recte factum & dictum*; *R. G. F. regis filius*; *R. P. res publica*, or *Romani principes*; and *R. R. R. F. F. F. res Romana ruet ferro, fame, flamma.*

R was anciently a numeral letter, ſignifying 80; according to the verſe,

Octoginta dabit tibi R, *ſiquis numerabit.*

When a daſh was added at top, as $\overline{\text{R}}$, it ſignified eighty thouſand.

The Greek *r*, ρ́, with a ſmall mark over it, ſignified a hundred; with the ſame mark under it, it denoted 1000 × 100: thus ρ͵ ſignified 100,000.

In the Hebrew numeration ר denoted 200; and with two horizontal points over it 1000 × 200; thus ר̈ = 200,000.

R on the French coins denotes their being ſtruck at Orleans.

R, or ℞, in *Medicinal Preſcription*, ſtands for *recipe*, *take*.

RABATE, in *Falconry*. A hawk is ſometimes ſaid to *rabate*, when, by the motion of the hand of the bearer, the lure, call, &c. ſhe leaves purſuing her prey, or quarry, and recovers the fiſt.

Rabate, in *Commerce*. See Rebate.

RABBET, in *Carpentry*, is a deep groove or channel, cut in a piece of timber longitudinally, to receive the edge of a plank, or the ends of a number of planks, which are to be ſecurely faſtened therein. The depth of this channel is equal to the thickneſs of the plank; ſo that when the end of the latter is let into the *rabbet*, it will be level with the outſide of the piece. Thus, in ſhip-carpentry, the ends of the lower planks of a ſhip's bottom terminate upon the ſtem afore, and the ſtern-port abaft, with whoſe ſides their ſurfaces are even. The ſurface of the garboard ſtreak, whoſe edge is let into the keel, is, in the ſame manner, level with the ſide of the keel at the extremities of the veſſel.

Rabbet-*plane*. See *Rabbet*-Plane.

RABBETING, in *Carpentry*, the planing or cutting of channels, or grooves, in boards.

RABBI, or Rabbin, a doctor of the Jewiſh law.

The word in its original רבי ſignifies *maſter*.

The words *rabbi* and *rabbin* have the ſame ſignification; yet is there ſome difference in their uſe. When we ſpeak abſolutely, and without applying the term to any proper name, we ſay *rabbin*, not *rabbi*. Thus, we ſay, it would be unjuſt to attribute to the ancient *rabbins* all the notions of the modern ones.

On the other hand, when we prefix the term to the proper name of ſome Jewiſh doctor, we ſay *rabbi*, not *rabbin*; *rabbi* Salomon Jarchi is of this opinion.

Yet *rabbi* having no plural, we ſay, the *rabbins* Juda Chiug, and Juda ben Chabin, are the authors of two ancient Hebrew grammars.

The title *rabbi* is ſaid to have been firſt aſſumed, as a diſtinguiſhing title of honour, by men of learning, about the time of the birth of Chriſt; though it had been anciently given to ſeveral magiſtrates and officers of ſtate, and to thoſe who were of ſuperior rank and condition in life. See Eſther, i. 8. Jer. xli. 1. Job, xxxii. 9.

The firſt Jewiſh *rabbi* ſaid to have been diſtinguiſhed with any title of honour was Simeon, the ſon of Hillel, who ſucceeded his father as preſident of the Sanhedrim; and his title was that of *rabban*. The later *rabbies* tell us, that this title was conferred with much ceremony. When a perſon had gone through the ſchools, and was thought worthy of this degree, he was placed in a chair raiſed above the company; and then were delivered to him a key and a table-book; the key as a ſymbol of the authority conferred on him to communicate the knowledge he had acquired, which key he wore as a badge of honour, and when he died, it was buried with him; and the table-book was a ſymbol of his diligence in his ſtudies, and deſire of farther improvement. To theſe ceremonies were added the impoſition of hands by the delegates of the ſanhedrim, and the proclamation of his title. It has been diſputed, chiefly between Vitringa and Selden, whether our Lord had taken the degree and title of *rabbi* in the Jewiſh ſchools; Vitringa maintains the affirmative, and Selden the negative. See Jennings's Jewiſh Ant. vol. i. p. 400, &c.

The Jewiſh writers diſtinguiſh betwixt the titles *rab*, *rabbi*, and *rabban*. As for *rab* and *rabbi*, the only difference betwixt them is, that *rab* was the title of ſuch as had had their education, and taken their degree in ſome foreign ſchool, e. gr. at Babylon; whereas *rabbi* was the title of ſuch as were educated in the land of Judæa, and more honourable than the other. But the higheſt and moſt honourable title was *rabban*; which, they ſay, was never conferred on more than ſeven perſons; viz. on R. Simeon, five of his deſcendants, and R. Jochanan, who was of a different family.

The modern *rabbins* are entitled to a conſiderable reſpect among

among the Jews: they have the firſt places in the ſynagogues; they determine all matters and controverſies of religion, and very frequently pronounce upon civil affairs. They have even a power to excommunicate the diſobedient.

They retain a vaſt number of ſuperſtitious traditions, from the writings of their predeceſſors; which they obſerve as ſcrupulouſly as they do the law of Moſes.

The ancient *rabbins* were infinite dealers in allegories. Their writings are almoſt wholly allegorical, particularly their comments and interpretations of the Scripture.

They had a great number of rules, and forms of interpreting and quoting, which ſome modern writers ſuppoſe to have been followed by the apoſtles, in their interpretation and quotation of the prophecies of the Old Teſtament, in the New. See QUOTATION.

RABBINICAL *character*. See HEBREW.

RABBINICAL *Hebrew*. See HEBREW.

RABBINIST, a follower of the doctrine of the rabbins; a term uſed in contradiſtinction to CARAITE.

Father Simon contends for *Rabbaniſt*, or *Rabbanite*, inſtead of *Rabbiniſt*: in effect, the former readings are apparently preferable to the latter; the word being derived from the Hebrew *Rabbanim*, which is the name of the ſect, and which the Jews uſe to diſtinguiſh their doctors from thoſe of the *Caraite* Jews.

Rabbiniſt, then, ſignifies a Jewiſh doctor who adheres to the traditions of his fathers; not ſimply a rabbin or doctor; for the *Caraites*, who oppoſe thoſe traditions, have their rabbins as well as the other Jews.

RABBIT, *cuniculus*, in *Zoology*, a well known animal of the HARE-*kind*, or the *lepus cuniculus* of Linnæus, with a ſhort tail, and naked ears. In the wild ſtate the colour of the fur is brown; but in a tame ſtate it varies to a black, pied, and quite white; the eyes are of a fine red. In their wild ſtate they inhabit the temperate and hot parts of Europe, and the hotteſt parts of Aſia and Africa.

The female, or doe *rabbit*, goes with young thirty days, and then ſhe kindles; and if ſhe take not buck preſently ſhe loſes her month, or at leaſt a fortnight, and often kills her young and eats them.

In England they begin to breed at a year old, but in ſome places much ſooner; and they continue breeding very faſt from the time when they begin, four, five, ſix, or ſeven times a year being common with them. They have uſually from four to eight in a litter, and hence it is that a ſmall number at firſt will ſoon ſtock a whole warren, if left to breed a little while undiſturbed. The does cannot ſuckle their young till they have been at buck again; this therefore is to be done preſently, elſe there is a fortnight loſt of the time for the next brood, and the preſent brood alſo probably loſt. When the buck goes to the doe, he always firſt beats and ſtamps very hard with his feet, and when he has copulated with her he falls backwards, and lies, as it were, in a trance; in this ſtate it is eaſy to take him, but he ſoon recovers from it.

The buck-*rabbits*, like our boar-cats, will kill the young ones, if they can get at them; and the does in the warrens prevent this, by covering their ſtocks, or neſts, with gravel or earth, which they cloſe ſo artificially up with the hinder part of their bodies, that it is hard to find them out. They never ſuckle the young ones at any other time than early in the morning, and late at night, and always, for eight or ten days, cloſe up the hole at the mouth of the neſt, in this careful manner, when they go out. After this they begin to leave a ſmall opening, which they increaſe by degrees, till at length, when they are about three weeks old, the mouth of the hole is left wholly open, that they may go out; for they are at that time grown big enough to take care of themſelves, and to feed on graſs.

People who keep *rabbits* tame for profit, breed them in hutches; but theſe muſt be kept very neat and clean, elſe they will be always ſubject to diſeaſes. Care muſt be taken alſo to keep the bucks and does apart till the latter have juſt kindled; then they are to be turned to the bucks again, and to remain with them till they ſhun and run from them.

The general direction for the chooſing of tame *rabbits* is, to pick the largeſt and faireſt; but the breeder ſhould remember, that the ſkins of the ſilver-haired ones ſell better than any other. The food of the tame *rabbits* may be colewort and cabbage-leaves, carrots, parſneps, apple-rinds, green corn, and vetches, in the time of the year; alſo vine-leaves, graſs, fruits, oats, and oatmeal, milk-thiſtles, ſow-thiſtles, and the like; but with theſe moiſt foods they muſt always have a proportionable quantity of the dry foods, as hay, bread, oats, bran, and the like, otherwiſe they will grow pot-bellied, and die. Bran and grains mixed together have been alſo found to be very good food. In winter they will eat hay, oats, and chaff, and theſe may be given three times a day; but when they eat green things, it muſt be obſerved that they are not to drink at all, for it would throw them into a dropſy. At all other times a very little drink ſerves their turn, but that muſt always be freſh. When any green herbs or graſs are cut for their food, care muſt be taken that there is no hemlock among it; for though they will eat this greedily among other things, when offered to them, yet it is ſudden poiſon to them.

Rabbits are ſubject to two principal infirmities. Firſt, the rot, which is cauſed by the giving them too large a quantity of greens, or from the giving them freſh gathered with the dew or rain hanging in drops upon them. It is exceſs of moiſture that always cauſes this diſeaſe; the greens therefore are always to be given dry, and a ſufficient quantity of hay, or other dry food, intermixed with them, to take up the abundant moiſture of their juices. On this account the very beſt food that can be given them is the ſhorteſt and ſweeteſt hay that can be got, of which one load will ſerve two hundred couples a year; and out of this ſtock of two hundred, two hundred may be eat in the family, two hundred ſold to the markets, and a ſufficient number kept in caſe of accidents.

The other general diſeaſe of theſe creatures is a ſort of madneſs: this may be known by their wallowing and tumbling about with their heels upwards, and hopping in an odd manner into their boxes. This diſtemper is ſuppoſed to be owing to the rankneſs of their feeding; and the general cure is the keeping them low, and giving them the prickly herb, called *tare-thiſtle*, to eat.

The general computation of males and females is, that one buck *rabbit* will ſerve for nine does; ſome allow ten to one buck; but thoſe who go beyond this always ſuffer for it in their breed.

The wild *rabbits* are to be taken either by ſmall cur dogs, or by ſpaniels bred up to the ſport; and the places of hunting thoſe who ſtraggle from their burrows, is under cloſe hedges or buſhels, or among corn-fields and freſh paſtures. The owners uſe to courſe them with ſmall greyhounds; and though they are ſeldom killed this way, yet they are driven back to their burrows, and are prevented from being a prey to others. The common method of taking them is by nets, called *purſe-nets*, and ferrets. The FERRET is ſent into the hole to force them out, and the purſe-net being ſpread over the hole, takes them as they come out. The ferrets mouths muſt be muffled, and then the *rabbit* gets no harm. For the more certain taking of them, it may not be improper to pitch up a hay-net or two, at a ſmall diſtance from the burrows that are intended to be hunted: thus very few of the number that are attempted will eſcape. The method by the dog, called the LURCHER and TUMBLER, is alſo a very good one.

Some, who have no ferrets, ſmoak the *rabbits* out of their holes with burning brimſtone and orpiment. This certainly brings them out into the nets, but then it is a very troubleſome and offenſive method, and is very detrimental to the place, as no *rabbit* will for a long time afterwards come near the burrows, which have been fumed with theſe ſtinking ingredients.

The teſticle of a *rabbit* is a very good object for examining the ſtructure of this part of generation in animals. The teſticles of various animals are very variouſly compoſed, but all, in general, of veſſels variouſly rolled and folded together; and even the human teſticles are of the ſame ſort, being compoſed ſolely of rolls of veſſels, without any intermediate ſubſtance, only conſiſting of veſſels and their liquors. Phil. Tranſ. Nº 52.

The ſkins of *rabbits* are a great article of commerce, numbers being exported to China: the fur is of great uſe in the hat-manufactory.

RABCHORCADO, in *Ornithology*, the name of an American bird, deſcribed by Nieremberg with many fabulous circumſtances. All that ſeems certainly known is, that its tail is very remarkably forked.

RABDOIDES. See RHABDOIDES.

RABDOLOGY. See RHABDOLOGY.

RABDOMANCY. See RHABDOMANCY.

RABEBOIA, a name given by ſome to the roots of the flammula major.

RABIA *prior*, in *Chronology*, is the name of the third month of the Arabic year, conſiſting of thirty days; and *Rabia poſterior* is the name of the fourth month, conſiſting of twenty-nine days.

RABICH, a name given by Leo Africanus to a tree or ſhrub growing very plentifully in many parts of Africa, the fruit of which is much eſteemed by the natives. He ſays that the tree *rabich* is prickly, and that the fruit is round and like a cherry, but ſmaller, and of the taſte of the jujube.

RABIEL, a name given by ſome authors to DRAGON'S *blood.*

RABIES *canina.* See MADNESS *from the bite,* &c.

RABINET, a name formerly given to a ſmall piece of ordnance, between a falconet and a baſe. Its dimenſions, &c. ſee under CANNON.

RABIRA, a word uſed by ſome of the chemical writers to expreſs TIN.

RABOLANE, in *Ornithology,* a name given by many to the *lagopus,* a bird found on the ſnowy mountains, and called by ſome the *white* PARTRIDGE.

RABRI, a name given by ſome authors to bole armenic.

RACA, or RACHA, a Syriac term, found in the Goſpel of St. Matthew, chap. v. 22. and preſerved in moſt tranſlations.

Father Simon obſerves, that the Greek tranſlator of St. Matthew's Goſpel retained the Syriac *raca,* which he found in the original, becauſe it was very common among the Jews. And St. Jerom, Luther, the Engliſh tranſlators, thoſe of Geneva, Louvain, Port-royal, &c. ſtill preſerve it in their reſpective languages.

F. Bouhours chooſes rather to expreſs the ſenſe thereof in a ſort of paraphraſe, thus: he that ſays to his brother, *homme de peu de ſens, man of little underſtanding,* ſhall deſerve to be condemned by the tribunal of the council, &c.

Moſt tranſlators, except the Engliſh, and F. Simon, for *raca* write *racha*; but the former orthography ſeems the beſt founded; all the Latin copies having *raca,* and all the Greek ones ῥακα, or, with Heſychius, ῥακκα, which is the ſame; all, we mean, but St. Irenæus, and Beza's copy, now at Cambridge, which have ῥαχα. In effect, the origin of the word ſhews it ſhould be *raca*; as coming from the Syriac רקא *raca,* of the Hebrew *rek* רק, *empty, ſhallow.*

RACCOON, in *Zoology.* See RACKOON.

RACCOURCY, in *Heraldry,* ſignifies the ſame as *coupé,* that is, *cut off,* or *ſhortened*; and denotes a croſs, or other ordinary, when it does not extend to the edges of the eſcutcheon, as they always do when abſolutely named, without ſuch diſtinction.

RACE, in general, ſignifies running with others, in order to obtain a prize, either on foot, or by riding on horſeback, in chariots, &c.

Racing was one of the exerciſes among the ancient Grecian games, which was performed in a courſe, containing one hundred and twenty-five paces; and thoſe who contended in theſe foot-races were frequently clothed in armour. Chariot and horſe-races alſo made a part of theſe ancient GAMES.

RACE, in *Genealogy,* a lineage, or extraction, continued from father to ſon.

The word is French, formed from the Latin *radix, root*; as intimating the root of the genealogical tree.

In ſeveral orders of knighthood, as in that of Malta, &c. the candidates muſt prove a nobility of four *races* or deſcents.

In ſome republics the magiſtrates are to prove themſelves of plebeian *race,* to be qualified.

The French reckon their kings by *races*; as, the firſt *race,* the ſecond *race,* the third *race.* We alſo ſay the *race* of the Ottomans, the Arſacidæ, the Ptolemies, &c.

RACE, in *Natural Hiſtory.* See CIBDELOPLACIA.

RACEMIFEROUS, in *Botany,* denotes bearing in cluſters.

RACEMUS, or *cluſter,* in *Botany,* a ſtalk divided or branched into ſeveral foot-ſtalks, ſuſtaining the flowers or fruits ſet together, as the branches of grapes, currants, &c. The firſt of theſe conditions diſtinguiſhes it from a ſpike, the laſt from a panicle.

RACHA. See RACA.

RACHISAGRA, a term uſed by ſome phyſicians for the gout in the ſpine of the back.

RACHITIS, or rather RHACHITIS, in *Medicine,* a diſeaſe affecting the bones of children; more uſually called the RICKETS.

RACING, the riding heats for a plate or other premium.

Horſes for this uſe ſhould be as light as poſſible, large, long, and well-ſhaped, nervous, of great mettle, and good wind, with ſmall legs, and neat ſmall ſhaped feet.

The firſt thing to be conſidered in this ſort of gaming is the chooſing a rider; for it is not only neceſſary that he ſhould be very expert and able, but he muſt alſo be very honeſt.

He muſt have a very cloſe ſeat, his knees being turned cloſe to the ſaddle ſkirts, and held firmly there, and the toes turned inwards, ſo that the ſpurs may be turned outward to the horſe's belly; his left hand governing the horſe's mouth, and his right the whip. During the whole time of the race he muſt take care to ſit firm in the ſaddle, without waving or ſtanding up in the ſtirrups. Some jockies fancy this is a becoming ſeat; but it is certain, that all motions of this kind do really incommode the horſe. In ſpurring the horſe, it is not to be done by ſticking the calves of the legs cloſe to the horſe's ſides, as if it were intended to preſs the wind out of his body, but, on the contrary, the toes are to be turned a little outwards, that the heels being brought in, the ſpurs may juſt be brought to touch the ſides. A ſharp touch of this kind will be of more ſervice toward the quickening a horſe's pace, and will ſooner draw blood than one of the common coarſe kicks. The expert jockey will never ſpur his horſe until there is great occaſion, and then he will avoid ſtriking him under the fore-bowels between the ſhoulders and girth; this is the tendereſt part of a horſe, and a touch there is to be reſerved for the greateſt extremity.

As to whipping the horſe, it ought always to be done over the ſhoulder on the near ſide, except in very hard running, and on the point of victory; then the horſe is to be ſtruck on the flank with a ſtrong jerk; for the ſkin is the moſt tender of all there, and moſt ſenſible of the laſh.

When a horſe is whipped and ſpurred, and is at the top of his ſpeed; if he claps his ears in his pole, or whiſks his tail, it is a proof that the jockey heats him hard, and then he ought to give him as much comfort as he can, by ſawing the ſnaffle backwards and forwards in his mouth, and by that means forcing him to open his mouth, which will give him wind, and be of great ſervice. If there be any high wind ſtirring in the time of riding, the artful jockey will let his adverſary lead, holding hard behind him, till he ſees an opportunity of giving a looſe; yet, in this caſe, he muſt keep ſo cloſe behind, that the other horſe may keep the wind from him; and that he ſitting low, may at once ſhelter himſelf under him, and aſſiſt the ſtrength of the horſe. If the wind happen to be in their back, a juſt contrary method is to be taken with it; the expert jockey is to keep directly behind the adverſary, that he may have all the advantage of the wind to blow his horſe along, as it were, and at the ſame time intercept it in regard to his adverſary.

When running on level carpet-ground, the jockey is to bear his horſe as much as the adverſary will give him leave, becauſe the horſe is naturally more inclined to ſpend himſelf on this ground: on the contrary, on deep earths he may have more liberty, as he will there ſpare himſelf.

In riding up hill the horſe is always to be favoured, by bearing him hard, for fear of running him out of wind; but in running down hill, if the horſe's feet and ſhoulders will bear it, and the rider dares venture his neck, he may have a full looſe. If the horſe have the heels of the reſt, the jockey muſt always ſpare him a little, that he may have a reſerve of ſtrength, to make a puſh at the laſt poſt.

A great deal depends on the jockey's knowing the nature of the horſe that is to run againſt him; for by managing accordingly, great advantages are to be obtained: thus, if the oppoſite horſe is of a hot and fiery diſpoſition, the jockey is either to run juſt behind him, or cheek by joul with him, making a noiſe with the whip, and by that means forcing him on faſter than his rider would have him, and conſequently ſpending him ſo much the ſooner; or elſe keep juſt before him, in ſuch a ſlow gallop, that he may either over-reach, or by treading on the heels of the fore horſe, endanger tumbling over.

Whatever be the ground that the adverſary's horſe runs worſt on, the cunning jockey is to ride the moſt violently over; that by this means it will often happen, that in following he either ſtumbles or claps on the back ſinews.

The ſeveral corrections of the hand, the whip, and the ſpur, are alſo to be obſerved in the adverſary, and in what manner he makes uſe of them; and when it is perceived, by any of the ſymptoms, of holding down the ears, or whiſking the tail, or ſtretching out the noſe like a pig, that the horſe is almoſt blown, the buſineſs is to keep him on to this ſpeed, and he will be ſoon thrown out or diſtanced. If the horſe of the opponent looks dull, it is a ſign his ſtrength fails him; and if his flanks beat much, it is a ſign that his wind begins to fail him, and his ſtrength will ſoon do ſo too.

After every heat for a plate, there muſt be dry ſtraw, and dry cloths, both linen and woollen, ready to rub him down all over, after taking off the ſweat with what is called a ſweat-knife; that is, a piece of an old ſword-blade, or ſome ſuch thing. Some adviſe the ſteeping the cloths in urine and ſalt-petre the day before, and letting them be dried in the ſun for this occaſion. After the horſe has been well rubbed with theſe, he ſhould be chafed all over, with cloths wetted in common water till the time of ſtarting again. When it is certainly known that the horſe is good at the bottom, and will ſtick at the mark, he ſhould be rid every heat to the beſt of his performance; and the jockey is, as much as poſſible, to avoid

avoid riding at any particular horſe, or ſtaying for any, but to ride out the whole heat with the beſt ſpeed he can. If, on the contrary, he has a fiery horſe to ride, and one that is hard to manage, hard mouthed, and difficult to be held, he is to be ſtarted behind the reſt of the horſes with all imaginable coolneſs and gentleneſs; and when he begins to ride at ſome command, then the jockey is to put up to the other horſes; and if they ride at their eaſe, and are hard held, they are to be drawn on faſter; and if it be perceived, that their wind begins to rake hot, and they want a ſob, the buſineſs is to keep them up to that ſpeed; and when they are all come within three quarters of a mile of the poſt, then is the time to puſh for it, and uſe the utmoſt ſpeed in the creature's power.

When the race is over, the horſe is immediately to be clothed up, and rode home; and immediately on his coming into the ſtable the following drink is to be given him. Beat up the yolks of three eggs, and put them into a pint and half of new milk made warm; let there be added to this three pennyworth of ſaffron, and three ſpoonfuls of ſallad-oil, and let the whole be given with a horn. After this he is to be rubbed well down, and the ſaddle place rubbed over with warm ſack, and the places where the ſpurs have touched, with a mixture of urine and ſalt, and afterwards with a mixture of powder of jet and Venice turpentine; after this he ſhould have a feed of rye-bread, then a good maſh, and at ſome time after theſe as much hay and oats as he will eat. His legs after this ſhould be bathed ſome time with a mixture of urine and ſalt-petre.

For the preparation of the horſe before running, &c. ſee Plate.

We ſhall here obſerve, that *horſe-races* were a ſpecies of amuſement known in England in very early times. Fitz-Stephen, who wrote in the days of Henry II. records the great delight which the citizens of London took in the diverſion. *Races* appear likewiſe to have been in vogue in the reign of queen Elizabeth, and to have been carried to ſuch exceſs as to have injured the fortunes of the nobility. Lord Herbert of Cherbury (ſee his Life by Mr. Walpole, p. 51.) enumerates theſe among the ſports which he thought unworthy of a man of honour. "The "exerciſe (ſays he) I do not approve of is running of "horſes, there being much cheating in that kind; nei-"ther do I ſee why a brave man ſhould delight in a crea-"ture whoſe chief uſe is to help him to run away." Jarvis Markham, who wrote on the management of horſes in 1599, mentions running horſes; but at this time there were only private matches made between gentlemen, who were their own jockies, and rode their own horſes. However, in the following reign of James I. public races were eſtabliſhed; and Garterly, in Yorkſhire, Croydon, near London, and ſometimes Theobald's, near Enfield-chace, where the king reſided, were the courſes in which they were performed. The horſes at this time were prepared for running by the diſcipline of food, phyſic, airing, and ſweats and clothing, which compoſe the preſent ſyſtem. The weight alſo which each horſe was to carry was rigidly adjuſted; the uſual weight of the riders being ſtated at ten ſtones, who were put into ſcales, and weighed before they ſtarted. Moſt of the celebrated races in the kingdom were called bell-courſes, the prize and reward of the conquering horſes being a bell. To this purpoſe Camden ſays, that in 1607 there were races near York, and the prize was a little golden bell. Upon this Berenger offers a conjecture, whether the phraſe of *bearing the bell*, which implies being comparatively the beſt or moſt excellent, and correſponds with the expreſſion of bearing the palm among the ancients, as a reward decreed to the ſwifteſt horſe in a race, is not more aptly deduced from this cuſtom, than from the method of tying a bell round the neck of the ſheep, which leads the flock, and is, therefore, accounted the beſt.

About the latter end of the reign of Charles I. it was cuſtomary to have races performed in Hyde Park. See the comedy of the Merry Beggars, or Jovial Crew, written in 1641, in Dodſley's Collection of Old Plays.

Racing was much encouraged by Charles II. after his reſtoration; he gave public rewards and prizes, and appointed races for his own amuſement at Datchet Mead, when he reſided at Windſor. But the moſt diſtinguiſhed ſpot for theſe exerciſes was Newmarket, which was at firſt frequented for the purpoſe of hunting, and ſeems not to have been deſtined to be a horſe-courſe till ſome time before the troubles of the reign of Charles I. when races were diſcontinued; but they were revived ſoon after the Reſtoration. The king attended in perſon, and eſtabliſhed a houſe for his accommodation, and kept and entered horſes in his own name. Inſtead of bells, a ſilver bowl or cup, of the value of a hundred guineas, was allotted for a prize; and upon this royal gift the exploits of the ſucceſsful horſe, and his pedigree, were generally engraved. The ſum of a hundred guineas is now given in lieu of the ſilver bowl.

When William III. was advanced to the throne, he not only added to the plates given to different places in the kingdom, but founded an academy for riding. Queen Anne continued the bounty of her predeceſſors, with the addition of ſeveral plates. George I. towards the end of his reign, diſcontinued the plates, and gave the ſum of a hundred guineas in their room.

In the thirteenth year of George II. an act was paſſed for the ſuppreſſion of races by poneys, and other ſmall and weak horſes, by which all matches for any prize under the value of 50*l.* are prohibited, under a penalty of 200*l.* to be paid by the owner of each horſe running, and 100*l.* by ſuch as advertiſe the plate; and by which each horſe entered to run, if five years old, is obliged to carry ten ſtone; if ſix, eleven; and if ſeven, twelve. It is alſo ordained, that no perſon ſhall run any horſe at a courſe, unleſs it be his own, nor enter more than one horſe for the ſame plate, upon pain of forfeiting the horſes; and alſo every horſe-race muſt be begun and ended in the ſame day. Horſes may run for the value of 50*l.* with any weight, and at any place. 13 Geo. II. cap. 19. 18 Geo. II. cap. 34. Pennant's Brit. Zool. vol. i. p. 6, &c. Berenger's Hiſt. and Art of Horſemanſhip, vol. i. p. 185, &c.

We ſhall here add, that at Newmarket there are two courſes, the long and the round: the firſt is exactly four miles, and about three hundred and eighty yards, i. e. ſeven thouſand four hundred and twenty yards. The ſecond is ſix thouſand ſix hundred and forty yards. Childers, the ſwifteſt horſe ever known, has run the firſt courſe in ſeven minutes and a half, and the ſecond in ſix minutes forty ſeconds; which is at the rate of more than forty-nine feet in a ſecond. But all other horſes take up at leaſt ſeven minutes and fifty ſeconds in completing the firſt and longeſt courſe, and ſeven minutes only in the ſhorteſt, which is at the rate of more than forty-ſeven feet in a ſecond. And it is commonly ſuppoſed that theſe courſers cover, at every bound, a ſpace of ground in length about twenty-four Engliſh feet.

RACK, an engine of torture furniſhed with cords, &c. for extorting confeſſion from criminals.

The duke of Exeter, conſtable of the Tower under Henry VI. with the duke of Suffolk, and others, having a deſign to introduce the civil law into England; for a beginning, the *rack*, or *brake*, allowed in many caſes by the civil law, was firſt brought to the Tower, where it is ſtill preſerved. In thoſe days the rack was called the duke of Exeter's daughter.

It was occaſionally uſed as an engine of ſtate, not of law, more than once in the reign of queen Elizabeth. But when, upon the aſſaſſination of Villiers, duke of Buckingham, by Felton, it was propoſed in the privy-council to put the aſſaſſin to the *rack*, in order to diſcover his accomplices; the judges, being conſulted, declared unanimouſly, to their own honour, and the honour of the Engliſh law, that no ſuch proceeding was allowable by the laws of England. The uncertainty of this puniſhment, as a teſt and criterion of truth, was long ago very elegantly pointed out by Tully (pro Sulla, 23.); though he lived in a ſtate wherein it was uſual to torture ſlaves, in order to furniſh evidence. *Tamen* (ſays he) *illa tormenta gubernat dolor, moderatur natura cujuſque tum animi tum corporis, regit quæſitor, flectit libido, corrumpit ſpes; infirmat metus; ut in tot rerum anguſtiis nihil veritati loci relinquatur.*

Rack, in the *Manege*, a pace wherein a horſe neither trots nor ambles, but ſhuffles, as it were, between both.

The *racking pace* is much the ſame as the amble; only that it is a ſwifter time, and a ſhorter tread.

Rack is alſo a wooden frame, made to hold hay or fodder for cattle.

To Rack *wines*, &c. is to draw them from off their lees, after their having ſtood long enough to clear and ſettle. Hence,

Rack-*vintage*, is frequently uſed for the ſecond voyage our wine-merchants uſed to make into France for racked wines; whence they uſed to return about the end of December.

Rack-*rent*, is the full yearly value of land let by leaſe, payable by tenant for life or years, &c.

RACKET, a kind of bat for ſtriking the ball at tennis; conſiſting uſually of a lattice, or net-work, of cat gut, ſtrained very tight over a circle of wood, with a handle or ſhaft of a moderate length.

The word is formed from the French, *raquette*, which Menage derives from the Latin, *retetta*, a diminutive of *rete*, net; whence alſo *reticum*, and *reticulum*.

Paſquier obſerves, that anciently they uſed no *rackets* at tennis, but played with the palm of the hand; and hence,

hence he conjectures it is that the French call tennis play, *jeu de paume*. He adds, that *rackets* were not introduced till a little before his time.

RACKET is also a machine which the savages of Canada bind to their feet, to enable them to walk more commodiously over the snow; made much in the manner of a tennis-racket.

Its figure is a lozenge, whereof the two obtuse angles are rounded off. It is bound about with very fine thongs of leather, and the meshes of it are much smaller and closer than those of our rackets.

In the middle is fitted a kind of shoe, lined with wool, or hair; to be tied on to the ankle: by which means the feet are prevented from sinking in the snow. *Rackets* oblige the person to take very long steps, and, as we say, to walk a great pace, to keep them from knocking against each other.

RACKING, in *Sea-language*, denotes the fastening of two opposite parts of a tackle together, so as that any weighty body suspended thereby shall not fall down, although the rope, which forms the tackle, should be loosened by accident or neglect. This expedient is chiefly practised when the boats are hung up to the ship's side in the night, in an open road or bay, lest the rope of the tackle should be untied by the inattention of some of the crew, by which accident the boat might be considerably damaged, and probably lost or dashed to pieces. Falconer.

RACKOON, or RACCOON, the URSUS *lotor* of Linnæus, in *Zoology*, the name by which we commonly know an American animal, called *coati* by the Brasilians. It is something smaller than the beaver, and is of the shape of the beaver in the body, and its legs are as short as in that creature. The face, cheeks, and chin are white: the upper part of the body is covered with hair, long, soft, and thick; black at the ends, whitish in the middle, and ash-coloured at the root. Sometimes from this mixture of colour the back appears plainly grey; and Margrave mentions another species, which is of a deep yellow or ochre colour.

The head is very like that of the fox in shape; but that the ears are shorter, roundish, and naked, and it has from the forehead to the nose a dusky line. The eyes are large, and surrounded with two broad patches of black; the nose is black and sharp-pointed; its tail is very bushy and annulated with black. Its feet are each divided into five slender toes; by the help of which it climbs trees as expertly as a monkey, and uses the fore-feet as hands, to reach up its food to its mouth. It is a very cleanly animal; and if there be water near, it always washes its food, be it what it will, before it eats it. It feeds on vegetables, but is also very fond of eggs, and will even seize birds if it can catch them. It is also very fond of sweet things and strong liquors, and will get excessively drunk: at low-water it feeds much on oysters, watching their opening, and with its paw snatching out the fish, and is sometimes caught in the shell. It is very common in the warm and temperate parts of America, in the mountains of Jamaica, and in the isles of Maria in the South Sea, and is a creature easily tamed. It is hunted for its skin; the fur, next to that of the beaver, being excellent for making hats. Ray and Pennant. See TAB. IV. of *Quadrupeds*, No. 52.

RACOW, *Catechism of*, in *Ecclesiastical History*, a system of theology compiled by the most eminent Socinian doctors, and first published at *Racow* in Poland in the year 1609, with a dedication to our king James I. This catechism, or a translation of it, was committed to the flames in England in the year 1653, by order of parliament. A new edition of it, corrected and enlarged, was published at Stauropolis, in 1684. The SOCINIANS or UNITARIANS consider this catechism as the great standard of Socinianism, and an accurate summary of the doctrine of that sect. However, Mosheim observes, that it is, in reality, no more than a collection of the popular tenets of the Socinians, and by no means a just representation of the secret opinions and sentiments of their doctors. Hence he says it never obtained among them the authority of a public confession or rule of faith; and hence the doctors of that sect were authorised to correct and contradict it, and to substitute another form of doctrine in its place. But to this account it has been replied, that it would have been inconsistent with the liberty, for which they argue in the preface to this catechism, to have limited their religious inquiries to this standard, and by treating it as a rule of faith, they would have violated their express declarations, that they dictated to no one, and assumed no authority. Mosh. Eccl. Hist. vol. IV. p. 196, 8vo.

RADIAL *Curves*. See CURVES.

RADIALIS *externus primus et secundus*, two muscles closely united together; appearing, at first sight, like one muscle, lying along the external angle of the radius, between the os humeri and the carpus, being fleshy near the former, and tendinous near the latter.

In many subjects we find these two muscles entirely distinct from one end to the other; and they may, in that state, be named *radialis externus primus*, and *radialis externus secundus*, regard being had to the insertion of their tendons. Sometimes the two fleshy portions adhere closely together, appearing to make but one body, but the tendons are always distinct and separate. The first is inserted above in the crista of the external condyle of the os humeri, below the insertion of the supinator longus. The second is inserted in the same condyle below the insertion of the first, and in the neighbouring articular ligament. From thence the two fleshy bodies run down very close together, and having reached the middle of the outside of the radius, each of them terminates in a long tendon.

The two tendons accompany each other to the extremity of the radius, and having passed under a particular annular ligament, they are divided, as it were, into two cornua, from whence the ancients, who looked upon them as but one muscle, called it bicornis. One of these tendons is inserted anteriorly in the basis of the first metacarpal bone, the other nearly in the same part of the second bone; and the tendon of the first is sometimes double, appearing like another bicornis. Winslow. See EXTENSOR *carpi*.

RADIALIS *internus*, a long muscle, very like in shape to the ulnaris externus, but situated more obliquely. Its fleshy portion is fixed by a short tendon to the outer and upper side of the inner condyle of the os humeri, from thence it passes obliquely toward the radius, and running along about two-thirds of that bone, it forms a long tendon, which continues in the same course; and at the lower extremity of the radius, passes under a particular annular ligament, and under the insertion of the musculus thenar. This tendon is at length inserted chiefly in the inside of the basis of the first metacarpal bone, and also often in the second, and a little in the first phalanx of the thumb; having first passed through the channel of the os trapezium which sustains the thumb. Winslow. See FLEXOR *carpi radialis*.

RADIANT *point*, or RADIATING *point*, is any point of a visible object, whence rays proceed.

Every *radiant point* diffuses innumerable rays all round: but only those *radiants* are visible, from which right lines may be drawn to the pupil; because the rays are all right lines.

All the rays proceeding from the same *radiant* continually diverge; the crystalline collects or reunites them again.

Every ray is supposed to carry with it the species, or image, of the *radiant*.

RADIATED, in *Botany*, an epithet applied to round flat flowers, consisting of a disk, and a single row of longish pointed leaves, ranged all around it in manner of rays, or spokes.

Radiated flowers are properly such as have several semi-florets set round a disk, so as to resemble a *radiant* star: such are daisies, chamomile-flowers, sun-flowers, &c. These are sometimes also called *radiated discous flowers*.

A *radiated* flower has two parts; its middle part, which is called the disk, and which is wholly made up of floscules; and the other part, which is called the circle or border, which is wholly made up of semi-floscules, or else of plain flat leaves; but that is less common. The floscules and semi-floscules both usually adhere to the embryos, and to the thalamus of the flower, being contained in one general cup. These embryos finally ripen into seeds; sometimes furnished with down, sometimes with foliaceous heads, and sometimes without either, and sometimes marginated. Of these seeds some are wrapped round with a kind of case or capsule, others are separated from one another by small perpendicular leaves. See Tab. x. of Botany, Class 14. *Tourn.* Inst. p. 480.

RADIATED *leaf*, among *Botanists*. See LEAF.

The word is also used in speaking of medals, and in heraldry, where the ancient crowns are called *radiated crowns*, *coronæ radiatæ*. See CROWN.

RADIATION, in *Physics*, the action of a body diffusing rays of light as from a centre.

Every visible body is a *radiating* body; it being only by means of its rays that it affects the eye.

The surface of a *radiating* body may be conceived as consisting of radiant points.

RADIATION, *place of*. See PLACE.

RADIATION, or IRRADIATION, is also used by some authors, to express the manner of the motion of the animal spirits; on a supposition, that they are diffused from the brain towards all parts of the body, through the little canals of the nerves, as light is from a lucid body. But,

But, in lieu of a *radiation*, the moderns rather incline to the opinion of the CIRCULATION *of the spirits*.

RADICAL, *radicalis*, in *Physic*, &c. something serving as a basis or foundation; or which, like a *root*, is the source or principle whence any thing arises.

The schools talk much of a *radical moisture* inherent in the seeds of all animals, which nourishes and preserves the vital heat or flame, as oil does a lamp; and which, when exhausted, life is extinguished.

Dr. Quincy observes, that this *radical moisture* is a mere chimera; unless we thereby mean the mass of blood, which is the promptuary whence all the other juices and humours are derived; and which, while it circulates, sustains life, &c.

In *grammar*, we use term, *radical words*, for ROOTS and primitives; in opposition to compounds and derivatives.

RADICAL *numbers*, *numeri radicales*, in the Italian music, are 2, 3, 4, 5, 6, 7, 8, 9, and sometimes 10, which are often met with in musical compositions, to denote the accords of the thorough basses: 2 stands for the second and its duplicates; 3 for the third; 4 for the fourth, &c.

RADICAL *leaf*, among *Botanists*. See LEAF.

RADICAL *sign*, in *Algebra*, the sign or character of the root of a quantity.

$\surd$ is the character of radicality, and expresses the square root;

$\sqrt[3]{}$ the cube root, &c.

RADICATION, in *Physic*, the action whereby plants take root, or shoot out roots.

The French Royal Academy of Sciences have made a great number of curious observations on the germination and *radication* of plants.

RADICLE, *radicula*, *little root*, in *Botany*, denotes that part of the seed of a plant, which, upon its vegetation, becomes a little root, by which the tender plant at first receives its nourishment before the after-root is formed. This is that part of the seed which, in making malt, shoots forth, and is called the come or comb. See PLANTS and PERPENDICULARITY.

RADICULA, in *Botany*. See *Water*-CRESSES.

RADII *breves*. See BREVIS.

RADII *pinnarum*, in *Ichthyology*, the little slender bones supporting the membrane, forming the fins in fishes, and called by Artedi *ossicula radiata pinnarum*, from their running from the base to the summit in the form of rays. See FIN.

Of these *radii* some are prickly, others not. The prickly ones are always hard and rigid, the others are always soft and flexile, whether they terminate single, or are split into two or more branches at the extremity. The prickly ones are always formed of single bones; the others always of two bones, each applied closely and evenly to one another. When the fish is alive, it is not always easy to separate these, but when it is boiled, they are easily parted at the base, and sometimes all the way up. The softer and the more flexile these bones are, the more numerous, transverse, and lucid internodia they have in them. The cyprini give us many instances of this, as also the clupeæ, the coregones, and the esoces. Those which have fewer of these internodia, or transverse lines, are somewhat more rigid, though not aculeate, or prickly: this we see in the pleuronecti and gadi. Beside these *radii*, there are certain other small bones which are of an oblong figure, and serve to sustain the bases of the back-fins, and the fin at the anus. The back-fins, and those at the anus, are not joined by their rays to some one large muscle, or large bone, as the pectoral and ventral fins are; but every *radius*, or bone in these fins, is affixed to an oblong bone, erected perpendicularly between the apophyses of the vertebra and the back of the fin.

RADIOMETER, a name which some writers give to the *radius astronomicus*, or Jacob's *staff*. See FORE-STAFF.

RADISH, *raphanus*, in *Botany*, a genus of the *tetradynamia siliquosa* class. Its characters are these: the empalement of the flower is erect, and composed of four oblong leaves; the flower has four heart-shaped petals, placed in form of a cross, which spread open, and are narrow at their base; it hath four honey glands, one pair on each side the short stamina between them and the style, and the other between each of the long stamina and the empalement; it hath six erect stamina, two, which are opposite, are of the length of the empalement, the other four are as long as the base of the petals, terminated by single summits, with an oblong swelling germen, crowned by a headed stigma; the germen afterwards becomes an oblong, smooth, spungy pod, having an acute point, swelling and almost jointed, having two cells, divided by an intermediate partition, filled with roundish seeds. Miller enumerates five, and Linnæus four species.

There are several varieties of the root of the common garden *radish*, which is the only species cultivated by our gardeners: these are called by them the small-topped *radish*, the deep red, the pale red or salmon, and the long-topped striped *radish*. All these are only varieties arising from the culture. The small-topped is the kind, the seed of which is most saved, and which is most valued about London, because it does not take up much room. They are sown at various seasons, but the earliest is generally at the latter end of October; if these are not destroyed by frosts, they become fit to eat in March. These are commonly sowed about walls, pales, or hedges, where they may have some defence against the cold. The second sowing is commonly about Christmas, if the weather be mild enough to let the ground be worked. These are also to be sown under a shelter, and, if they are not destroyed, will be fit to eat in April; and to have a constant supply, there should be a new-sowing every fortnight, from the middle of January to the beginning of April. The later crops should be sown on a moist soil, and in an open situation. Miller.

Radishes are opening, attenuating, and antiscorbutic, and are much eaten in the spring; but afford little nourishment, and are very windy. They provoke urine, and are good for the stone and gravel. They are but seldom used in the shops.

The parts useful in medicine are the root and seeds, which have been employed in wasting and expelling the stone; in provoking urine and the menses; and in opening obstructions of the liver and spleen.

RADISH, *horse*, in *Botany*, a species of scurvy-grass: for the characters, see SCURVY *Grass*.

Horse Radish is propagated by cuttings or buds from the sides of the old roots. The best season for this work is in October or February; the former for dry lands, the latter for moist; and the ground should be trenched at least two spits deep, or more if it will allow of it. The manner of planting it is as follows: provide a good number of offsets, which should have a bud upon their crowns, but it matters not how short they are; therefore the upper parts of the roots which are taken up for use, should be cut off with the bud to it, which is esteemed the best for planting. Then make a trench ten inches deep, in which the offsets should be planted at about four or five inches distance, with the bud upward; cover them up with the earth taken out of the trench, and order the other trenches in like manner, until the ground is occupied. After this level the ground and keep it clear from weeds, until the plants are so far grown as to overbear and keep them down. With this management the roots will be long and straight, and free from small lateral ones: they will be fit for use the second year after planting. Miller.

Horse-radish impregnates both water and spirit, by infusion and distillation, very richly with its active matter: in distillation with water it yields a small quantity of essential oil, exceedingly penetrating and pungent. As a medicine, *horse-radish* is moderately stimulating, aperient, and antiseptic: it sensibly promotes perspiration, urine, and the expectoration of viscid phlegm, and excites appetite when the stomach is relaxed, without being so liable to produce immoderate heat, or inflammatory symptoms, as the stimulants of the aromatic kind. It is principally used in paralytic and rheumatic complaints, in scurvies and scorbutic impurities of the humours, in cachectic disorders, and in dropsies, particularly in those which follow intermitting fevers. In considerable quantities it promotes vomiting. Lewis.

RADIUS, RAY, in *Geometry*, the semidiameter of a circle; or a right line drawn from the centre to the circumference.

The word is derived from the Greek ῥάβδος, *rod*. Fleta uses the word *radius*, for a *furrow*.

The *radius* is also called, especially in trigonometry, *sinus totus*, the *whole sine*.

It is implied in the definition of a circle, and it is apparent from its construction, that all the *radii* of the same circle are equal.

RADIUS, in the *Higher Geometry*. RADIUS *of the evoluta*, RADIUS *curvedinis*, or RADIUS *osculi*, called also the *radius* of *concavity* and the *radius* of *curvature*, is the right line C M, (*Tab. Analysis*, *fig.* 12.) representing a thread, by whose evolution from off the curve B C, whereon it was wound, the curve A M *m* is formed: or it is the *radius* of a circle that has the same curvature in a given point of the curve, with that of the curve in that point. See CURVATURE and EVOLUTE, under which article the method of finding this *radius* may be seen.

RADIUS *astronomicus*, an instrument usually called Jacob's *staff*, the *Cross-staff* or FORE-STAFF.

RADIUS, in *Optics*. See RAY.

RADIUS, in *Mechanics*, is applied to the spokes of a wheel; because issuing like rays from the centre thereof.

Radius *vector*, in *Mechanics*, is also used for a right line drawn from the centre of force in any curve in which a body is supposed to move by a centripetal force, to that point of the curve where the body is supposed to be. See Central *force*.

Radius, among the Romans, a name given to the iron rod with which the boys rolled the trochus.

Radius, in *Anatomy*, is a long slender bone of the arm, descending along with the ulna from the elbow to the wrist: called also *focile minus*, the *lesser focil*. See *Tab. Anat. Osteol. fig.* 3. *n.* 7. 7. **, &c. *fig.* 7. *n.* 9.

The *radius* is nearly of the same length with the ulna, bigger at one end than at the other, irregularly triangular, a little bent, and situated sideways along the ulna, and has its name from the resemblance it bears to the *radius*, or spoke of a wheel. Anatomists describe in this bone a middle portion, and two extremities. One extremity is small, and like a kind of head set upon a neck; the other is large, resembling a pedestal, or basis; and the bone might therefore be very properly divided into the head, body, and basis.

The head, or small extremity of the *radius*, is very short or low, the top of it is concave, and the circumference cylindrical, and both the glenoide cavity, and whole circumference, are covered with the same smooth, shining cartilaginous crust, and about one quarter of the circumference is broader than the rest. The neck is small, and its situation a little oblique; it ends by a lateral tuberosity, which lies directly under the broad part of the head, being rough in the middle and on one side, and smooth and superficially cartilaginous on the other.

The basis, or great extremity of the *radius*, is much broader than it is thick, and has two broad sides, and one narrow one. One of the broad sides is a little hollow, and pretty even; the other is unequally convex, and divided by longitudinal eminences, or bony lines, into three or four longitudinal channels; but these are much more distinct in fresh bones than in the dried skeleton. The narrow side is hollowed lengthwise, and between it, and the other two, are formed two angles, by which the three sides are distinguished; and opposite to it, the other two meet in a third angle. This narrow side ends in a semilunar cavity, bordered by a smooth cartilage, and lying almost in the same direction with the tuberosity. The broad sides end at their common angle by an obtuse point, or production, which has been called the *styloide apophysis of the radius*, and is in reality a continuation of one of the bony lines already mentioned. The whole basis ends in an oblong, triangular, glenoide cavity, the cartilage of which is continued over the hollow edge of the narrow side. This is an articular cavity, resembling an arch, and ending on one side at the styloide apophysis, and hollowed on the other by the cavity of the narrow side. It appears divided into two portions by a small transverse line; and in the natural state, the hollowed side is lengthened out by a cartilaginous production, which is lost in the dried skeleton.

The middle, or body of the *radius*, is a little incurvated, the concavity lying between the tuberosity in the head, and the semilunar cavity in the basis. It has three sides; one rounded, which is the convex side of the curvature, and two concave; three angles, two of which are obtuse, distinguishing the two concave sides from the convex, and the third acute, lying between the concave sides, opposite to the convex side. In each of these sides there are several muscular impressions. The head and basis of this bone are epiphyses in children, and in some subjects remain such for a long time afterwards. The *radius* is connected with the ulna, os humeri, and carpus. It is articulated with the ulna, at its two extremities, by a double lateral ginglymus, the cartilaginous substance of the head turning in the small sigmoide cavity, and the semilunar cavity in the basis turning upon the small head at the lower extremity of the other bone, and thus the small extremity of one of these bones is joined to the great extremity of the other. It is articulated with the os humeri by the application of the cavity in the top of its head to the small head at the lower extremity of the other bone: by this conformation it would be capable of moving in all directions; but as it is tied to the ulna at both extremities, its motions on the small condyloide head, at the lower extremity of the os humeri, are confined to two kinds; that of rotation, when it turns on the sides of the extremities of the ulna, and that of flexion and extension in common with the ulna; and both these motions may be performed at the same time. Winslow's Anatomy, p. 80.

Cartilages of the Radius. At the basis of this bone there is a particular cartilage, or triangular production, very thin, longer than it is broad, and rather flat than concave. It is fixed by the basis, or shortest side, to the lateral sigmoide notch of the basis of the *radius*; the other side touches the flat extremity of the small head of the ulna, but is not affixed to it. This may properly enough be called the inter-articular cartilage of the wrist. It is tied to the *radius* by very short ligaments, and sliding on the small head of the ulna, it follows all the motions of the *radius*. It is therefore a sort of articular production of the lower side of the basis of the *radius*, and in the natural state fills the void space which, in the skeleton, appears between the end of the ulna and neighbouring bone of the carpus. Winslow's Anatomy, p. 140.

Ligaments of the Radius. Some of the ligaments of the bones of the fore-arm are common to them and to the os humeri, and others to them and the bones of the hand; two however there are which are proper to this part of the arm, the one called the *interosseous ligament of the fore-arm*, the other the *coronary ligament of the radius*; and to these may be added the annular ligaments, which serve only for the passage of tendons, and other ligamentary expansions, which may be called muscular ligaments. The interosseous ligament of the fore-arm is like that of the leg; it is fixed by one edge along the sharp angle of the *radius*, the other along that of the ulna. It is principally made up of two very strong planes of fibres, which cross each other at oblique angles, and leave holes at different distances for the passage of blood-vessels. This ligament ties the two bones closely together, and the two planes serve for the insertion of several muscles.

The coronary ligament of the *radius* is a sort of ligamentary hoop, surrounding the circular circumference of the head of that bone. It is very strong, and is nearly as solid as a cartilage, and the side next the *radius* is very smooth. The capsular ligament of the joint of the elbow runs down from its insertion in the os humeri, and is fixed in the olecranum, round the edge of the great sigmoide cavity, including both the apex of the olecranum, and of the coronoide apophysis.

The true common ligaments, by which the os humeri is connected to the bones of the fore-arm, called lateral ligaments, are the two fasciculi, which, after being inserted in the condyles of the os humeri, are expanded like a goose's foot; that which is fixed in the inner condyle is called the brachio-cubital, the other the brachio-radical.

Of the ligaments by which the bones of the fore-arm are connected to those of the hand, one is like a roundish cord fixed in the styloide apophysis of the ulna, and from thence passes over the os cuneiforme of the carpus; and another pretty broad ligament is fixed on the point of the *radius*, and by its other extremity in the bones of the carpus. From this styloide ligament of the *radius*, along each edge of the basis of that bone, are ranks of ligamentary fibres, lying much in the same direction with the ligament itself, and continued all the way to the styloide ligament of the ulna. There are also several small annular ligaments placed at different distances on the convex side of the basis *radii*, from its styloide apex to its articulation with the extremity of the ulna; these are at least six in number, and some of them are double or triple. The first of these is fixed in the styloide apex; the second in the groove near that apex; the third in the small, narrow, or middle groove; the fourth in the groove next the former; the fifth in the corner of the notch of the basis, at its articulation with the ulna; and the sixth in the extremity of the ulna, near the styloide apophysis. These are all almost wholly covered by the great oblique ligament, and are fixed as strongly in it on one side, as they are in the bones on the other. Winslow's Anatomy, p. 141.

Muscles of the Radius. The *radius* has four proper muscles, besides the biceps, common to it and the ulna; the proper are two pronators, and two supinators.

Radius *articulatus*, in *Natural History*, a name given by Mellius, Gmelin, and some other authors, to a kind of figured fossils, of which there are a great many very different species, some of which have been described by authors among the belemnitæ, under the names of *alveoli belemnitarum*. Mr. Gmelin, who has taken great pains to inform himself, as well of the nature and figure of these stones, from the subjects themselves, as of their history, and the various accounts of them from other authors, observes, that the place where they are most frequent is Sweden, and that there they are no where so common as in the Isle of Oeland. Volkman figures some also which he found in Silesia, and Helwing others which he collected in Prussia: he also found great numbers of them himself in Russia.

They are usually immersed in lime-stone, and though at first sight they may all appear alike, yet, on a careful examination, they will be found to differ very greatly. The most obvious general distinction, established by Gmelin, is, that some of them are straight, and others crooked. The straight ones may be divided into two genera. The first of these comprehends, according to this gentleman,

two species: the first smooth, and with a converging alveolus. The regular and nice configuration of these bodies, shews very plainly that they cannot be of mineral origin, but the several patellæ of which each is composed, the siphunculus of communication, obvious in several, and the shelly matter yet found remaining on many, prove them to have been once *shell-fish* of the univalve or tubular concamerated kind; the description of which, so far as it can be gathered from these remains, must have been this. The shell must have been either cylindric or conic in figure, of a smooth surface, and divided into several chambers or cells; but this so that the septa which form the concamerations are not continued and whole, but in some part of the periphery are cut in, in the shape of a crescent. Through these crescents, which standing altogether make a continued canal, there has passed another shelly body of a cylindric or conic figure, also divided into concamerations; and that in such a manner, that the septa which form the cells are pierced with a small aperture on one side, which grows gradually smaller as the shell extends in length; and finally, through these apertures in the concamerations, there passes another shell pointed at the end, and like the rest divided into its concamerations, and pierced along its middle with a siphunculus. Mem. Acad. Petrop. vol. iii. p. 263.

This shell is therefore a compages of three shelly bodies, inclosed one within another; and it must be supposed, in order to carry an analogy with other shell-fish, that these three shelly bodies have communications with one another, by means of certain slits or perforations. The communication of these, one with another, seems also evident from their being all found in their fossile state, filled with the same stony matter; this has, doubtless, been all received in at the siphunculus of the inner shell, and thence has been thrown into the second, and from this into the third shell, so as to fill up all the concamerations of the outer, as well as of the inner parts. This must have been the case with these; and the several various species that are at this day found fossile, must have owed their origin to as many different species of the shells. The crooked and twisted, or wreathed kinds, which have the siphunculus usually placed near the side, greatly approach in their structure to some of the cornua ammonis.

RADIX, Ῥίζα, *root*. See Root.

Radix is used among some anatomists for the sole of the foot.

Radix *Carlo Sancto*; this root is found in temperate soils, in Mechoacan, a province of America. Its bark is easily separated from it, is of an aromatic smell, and of a bitter and somewhat acrid taste. The root itself consists of very slender fibrils, which are easily separated from each other. The bark is accounted sudorific, and corroborates the stomach and gums: if chewed, it procures an agreeable breath. It is good for scurvies, catarrhs, epilepsies, hastening deliveries, and removing hernias, and the small pox, if taken either in powder or in the form of a decoction. The Spaniards have called it by the name of St. Charles, on account of its uncommon virtues.

Radix *entrochorum*, the *root of the entrochi*, a name given by some authors to a fossile substance, usually found among the entrochi, and seeming to have been the basis from which they have grown. It is plainly a part of the *stella marina arborescens* petrified, as those stones also are. This fossil is rarely found whole, but the fragments of it are very common. When entire, it is about the size of a walnut; the top of it being flat, and in some degree resembling the end of an entrochus, with a central hollow, but not having the least appearance of the rays of those stones. These fossils, though not properly judged of as to their origin, have yet been described by a great number of authors. Agricola, in particular, compares the form of them to a wheel. The body of this kind well resembles indeed the nave of a wheel, the shape of it being conical toward one end, till you come to the top, and then a little flatted, with a hole in it. There is also a like hole in the opposite broad end of the same fossil, seeming fit for an axle to pass through; and there are five hollow stilts, or feet, issuing sideways, at equal distances from the broad bottom, and equally carried on in the same direction, so as not amiss to represent the spokes. At the end of each of these rays or spokes, there is a hollow, of the same nature with those in the middle of the common entrochi, but this is cut across by a seam, or streak of the same stone, which passes directly over its centre, and covers about a third part of it, this goes no farther than the mouth of the hole, but it cuts it into two, and shews it in the form of two eyes. These radii, or spokes, are very seldom found so perfect as here described. Lister mentions them as being formed like crescents at the end, which may very easily happen from the breaking off a part of the terminating part. Phil. Trans. N° 129.

Radix *alba*, a word used by Dioscorides, to express the root of the dracunculus.

Radix, among *Grammarians*. See Radical.

RAD-KNIGHTS. See Redmans.

RADMANS. See Redmans.

RADULA. See Raspatory.

RAFFLING, a sort of game with three dice, wherein he who throws the greatest pair, or pair royal, in three casts, wins the prize or stake.

The word probably comes from the base Latin, *rieflare, to rifle, plunder, take all way.*

The *raffle* is properly the doublet or triplet: a *raffle* of aces, or duces, carries it against mere points.

Raffling is also used when a company of persons club to the purchase of a commodity; and he that throws the highest on three dice takes it.

RAFT, in *Sea-language*, a sort of float formed by an assemblage of various planks, or pieces of timber, fastened together side by side, so as to be conveyed more commodiously to any short distance in a harbour or road, than if they were separate. The timber and planks, with which merchant-ships are laden in the different parts of the Baltic sea, are attached together in this manner, in order to float them off to the shipping.

Raft-*Port*, in a *Ship*, a square hole cut through the buttocks of some ships, immediately under the counter, to receive the planks or pieces of timber which are brought to lade her for transportation; and which, on account of their great length, could not be received aboard otherwise.

RAFTERS, in *Building*, are pieces of timber, which, standing by pairs on the reason-piece, or raising-piece, meet in an angle at the top, and form the roof of a building.

It is a rule in architecture, that no *rafters* should stand farther than twelve inches from one another.

For the sizes or scantlings of *rafters*, it is provided by act of parliament, that *principal rafters* from 12 feet 6 inches to 14 feet 6 inches long, be 5 inches broad a-top, and 8 at the bottom, and 6 inches thick. Those from 14, 6 to 18, 6 long, to be 9 inches broad at the foot, 7 a-top, and 7 thick. And those from 18, 6, to 21, 6, to be ten inches broad at the foot, 8 a-top, and 8 thick.

Single rafters, 6 feet 6 inches long, to be 4 and 3 inches in their square. Those eight feet long must be $4\frac{1}{2}$ and $3\frac{3}{4}$ inches square.

RAG, or Rake, among *Hunters*, denotes a company or herd of young colts.

RAGS. In some counties of England, particularly in Oxfordshire, it is a common thing to use old woollen-*rags* by way of manure upon land. Taylors shreads answer this purpose in some degree; but the old *rags* of cloaths, which have been worn by men and women, are much better, which is owing to the salts they have imbibed from the perspiration of the body they used to cover. Plot's Oxfordshire, p. 250.

Rag-*bolts*, in a *Ship*. See Bolts.

RAGGED *hawk*, in *Falconry*, is a hawk that hath its feathers broken.

Ragged, in *Heraldry*. See Raguled.

RAGGULED. See Raguled.

RAGMAN's-*roll*, or Ragimund's-*roll*. See Roll.

RAGOUT, or Ragoo, a sauce, or seasoning, intended to rouse or recover the appetite when languishing, or lost.

The term is French, but naturalized. It is also used for any high-seasoned dish, prepared of flesh, fish, greens, or the like, by stewing them with the addition of bacon, salt, pepper, cloves, and the like high-flavoured ingredients.

We have *ragoos* of beef, of cray-fish, of giblets, of asparagus, of endive, of cocks-combs, of gammon, of celery, &c.

The ancients had a ragout, called garum.

RAG-*paving*. See Paving.

Rag-*stone*, a name given by our artificers to a kind of stone, which they use for setting an edge upon knives, chissels, and other tools. It is a greyish coloured stone, containing a large quantity of talcky particles, and splits easily into thin flakes. It is a soft stone, and is used only to finish the setting an instrument after the edge has been prepared by grinding or rubbing the tool upon some other stone of a coarser texture. We have this from Newcastle and many other parts of the north of England, where there are very large rocks of it in the hills.

RAGGED-*robin*, in *Botany*. See Campion.

RAGULED, or ragged, in *Heraldry*, is applied to an ordinary, *e. gr.* a cross, whose out-lines are jagged or knotted (*Tab.* II. *Herald. fig.* 48.)

He beareth sable, a cross *raguled*, or, by the name of *Stoway*.

Ragged differs from indented, as the latter is regular, and the former not.

The bearing is very ancient: Julius Cæſar gave for his badge, a boar's head, on a *ragged* ſtaff.

Raguled is ſometimes alſo uſed in the ſenſe of *truncated*, or *couped*, and applied to a branch that is ſawed from the tree; or a ſtock ſawed from its root.

RAGWORT, *othonna*, in *Botany*, a genus of the *ſyngeneſia polygamia neceſſaria* claſs. Its characters are theſe: it hath a radiated flower, compoſed of hermaphrodite florets, which form the diſk, and female half florets, which form the rays or border; theſe are included in one common ſingle empalement of one leaf. The hermaphrodite flowers are tubulous, indented at the top in five parts; the female half florets are ſtretched out like a tongue, and the point has three indentures, which are reflexed. The hermaphodite florets have ſhort hairy ſtamina, terminated by cylindrical ſummits, and an oblong germen ſupporting a ſlender ſtyle, crowned by a ſingle ſtigma. The female half florets have an oblong germen with a ſlender ſtyle, crowned by a large, bifid, reflexed ſtigma. The hermaphrodite florets are ſeldom fruitful, but the female half florets have an oblong ſeed, which is ſometimes naked, and at others crowned with down; theſe ſit in the permanent empalement. Of the othonna Miller enumerates ten, and Linnæus nine ſpecies. There are ſeveral other ſpecies of *ragwort*, which are referred to the genera of Senecio and Solidago.

RAHAS, in *Ichthyology*, a name given by ſome authors to the torpedo, or cramp-fiſh.

RAJA, denoting *king*, an appellation given in Hindoſtan or the empire of the Mogul, to princes deſcended from thoſe that ruled there before the conqueſt of the Moguls; who exerciſe all rights of ſovereignty, only paying a tribute to the Great Mogul, and obſerving the treaties by which their anceſtors recognized his ſuperiority.

There are ſome *rajas* who ſtill retain a more independent ſovereignty in the mountains: the Indians call them *rai*; the Perſians, plurally, *raian*: our travellers *rajas*, or *ragias*. Theſe have under their command ſoldiers, called *rajah-poots*, or perſons deſcended from *Rajahs*, who are a robuſt and brave people, and who enter into the ſervice of thoſe who will pay them. The Great Mogul has ſeveral of theſe *rajahs* in his ſervice.

The chief lords of the Moguls, viz. the vice roys, governors of provinces, and chief miniſters of ſtate, F. Catrou obſerves, are called *ombras*; and the idolatrous *rajas*, or Indian lords who governed petty ſtates before the conqueſt of their country, hold the ſame rank at court with the ombras.

All the difference is, that the children of the *rajas* ſucceed their fathers in the ſhew of the ſovereignty left them; whereas the children of the Mahometan lords loſe all in loſing their fathers.

The Indians account four ages from the beginning of the world; and in the ſecond, which laſted 1296000 years, they hold the *rajas* or kchatrys had their riſe; a noble caſt, though inferior to the Bramins. Vice then, they ſay, began to creep into the world; men only lived to 300 years, and their ſtature was reduced, &c. See Age.

RAIA, in the *Linnæan ſyſtem of zoology*, the name of a diſtinct genus of animals, of the general order of the *nantes*, or of thoſe amphibious animals which breathe by means of gills and lungs, and which have the rays of their fins cartilaginous. The diſtinguiſhing characters of this genus are, that the body is flatted, that the mouth is under the head, and that they have five branchial apertures on each ſide the neck underneath.

In the Artedian ſyſtem of ichthyology, the characters of this genus of fiſh are theſe: they are of the chondropterygious kind: the apertures of the bronchia are five on each ſide, and are ſituated on the breaſt a little below the mouth. The head and the whole body are of a remarkably depreſſed or flatted figure. The ſides are terminated in broad fins, which are in the place of pectoral ones in other fiſhes. The eyes are placed in the upper ſide of the head, and the mouth generally in the lower. There is on each ſide of the head a foramen behind the eyes. And the tail is generally long and ſlender.

Of this genus there are nine ſpecies, five with ſharp teeth and four with obtuſe teeth; the principal are the torpedo, ſkate, ſharp-noſed ray, rough ray, ſting-ray, and thornback. See Ray, &c.

Rays are generally divided by authors into the ſmooth and the prickly. The ſmooth are what we call the *ſkates* and *flairs*; the prickly we call *thornbacks*, and the young ones of both kinds *maids*. But Willughby thinks they are more regularly divided into two orders, the one containing thoſe which have teeth, the other thoſe which have none. Willughby's Hiſt. Piſc p. 68.

RAJANIA, in *Botany*, a genus of the *diœcia hexandria* claſs. Its characters are theſe: it produces ſeparate male and female flowers; in the male flower the perianthium is divided into ſix ſegments, which are oblong and pointed, and ſtand cloſe in the baſis, ſo as to form a ſort of bell, and expand more at their points. There are no petals, and the ſtamina are ſix briſtly filaments, ſhorter than the cup, and terminated by ſimple apices. In the female flower the perianthium is one-leaved, campanulated, and ſtands upon the germen, but afterwards withers away. This alſo is divided into ſix ſegments at the edge. There are no petals, and the germen of the piſtil is compreſſed, and edged with a membrane on one ſide. The ſtyles are three in number, and are of the length of the cup. The ſtigmata are ſimple and obtuſe. The fruit is roundiſh, and has a membrane growing on one ſide, which, in fine, ſpreads almoſt round it; in this is contained a ſingle ſeed of a roundiſh colour. There are three ſpecies.

RAIL, in *Architecture*, is applied variouſly; particularly to thoſe pieces of timber, which lie horizontally between the panels of wainſcot, and over and under them.

The word is alſo applied to thoſe pieces of timber which lie over and under ballusters in balconies, ſtaircaſes, &c.

Alſo, to the pieces of timber that lie horizontally from poſt to poſt in fences with pales or without.

Rail, or *Water*-Rail, in *Ornithology*, the name of the rallus *aquaticus* of authors, which is a bird of a long ſlender body, with ſhort concave wings. The bill is ſlender, ſlightly incurvated, and one inch three quarters long: the upper mandible black, edged with red, the lower orange-coloured: the irides red: the head, hind-part of the neck, the back and coverts of the wings and tail are black, edged with an olive brown: the baſe of the wing is white; the quill-feathers and ſecondaries duſky; the throat, breaſt, and upper-part of the belly are aſh-coloured; the ſides under the wings, as far as the rump, finely varied with black and white bars. The tail is very ſhort, conſiſting of twelve black feathers; the ends of the two middle tipt with ruſt-colour; the feathers immediately beneath the tail white; the legs are placed far behind, and are of a duſky fleſh-colour; the toes very long, and divided to their origin: though the feet are not webbed, it takes the water, will ſwim on it with much eaſe, but is often obſerved to run along the ſurface. It delights leſs in flying than in running, which it does very ſwiftly along the edges of brooks covered with ruſhes. When it runs, it every now and then flirts up its tail, and in flying hangs down its legs. Pennant.

This bird, ſays Mr. Pennant, is properly *ſui generis*, agreeing with no other but forming a ſeparate tribe; though M. Briſſon and Linnæus place it with the land-*rail*, and Mr. Ray with the water hens. It is a well-taſted bird.

Rail, *land*, the Rallus *Crex* of Linnæus, is a migrating bird, with a ſhort, ſtrong, thick bill; always found among corn, graſs, broom or furze. It leaves this kingdom before winter. They have long legs, and a ſingular note reſembling the word crex, often repeated. The feathers on the crown of the head, hind part of the neck, and the back, are black edged with bay colour; the coverts of the wings of the ſame colour, but not ſpotted; the tail is ſhort and of a deep bay, the belly white, and the legs aſh-coloured. They are in greateſt plenty in Angleſea, where they appear about the 20th of April, ſuppoſed to paſs over from Ireland, where they abound. They are found in moſt of the Hebrides, and the Orkneys. Pennant.

RAILS, in a *Ship*, are narrow planks, generally of fir, upon which is ſtuck a moulding. They are for ornament, and are nailed acroſs the ſtem, above the wing-tranſom and counters, &c. They are likewiſe nailed upon ſeveral planks along the ſide: one in particular is called the *ſheer-rail*, which limits the height of the ſide from the fore-caſtle to the quarter-deck, and runs aft to the ſtern, and forward to the cat-head: to this the wales are nearly parallel.

Fiſe-Rails. See Fife.

Rails of the *head* are certain curved pieces of timber, extending from the bows on each ſide to the continuation of the ſhip's ſtem, to ſupport the knee of the head, and the ornamental figure fixed upon it.

RAIN, a very frequent and uſeful meteor, deſcending from above in form of drops of water.

Rain is, apparently, a precipitated cloud; as clouds are nothing but vapours raiſed from moiſture, waters, &c.

And vapours are demonſtratively nothing elſe but little bubbles or veſiculæ detached from the waters, by the power of the ſolar, or ſubterraneous heat, or both.

Theſe veſiculæ, being ſpecifically lighter than the atmoſphere, are buoyed up thereby, until they arrive at a region

region where the air is in a juſt balance with them; and here they float, till by ſome new agent they are converted into clouds, and thence either into rain, ſnow, hail, miſt, or the like.

But the agent in this formation of the clouds into *rain*, &c. is a little controverted; the generality will have it the cold, which, conſtantly occupying the ſuperior regions of the air, chills and condenſes the veſiculæ, at their arrival from a warmer quarter; congregates them together, and occaſions ſeveral of them to coaleſce into little maſſes: and by this means their quantity of matter increaſing in a greater proportion than their ſurface, they become an overload to the thin air, and accordingly they deſcend in *rain*.

Dr. Derham accounts for the precipitation, hence; that the veſiculæ being full of air, when they meet with a colder air than that they contain, their internal air is contracted into a leſs ſpace; and conſequently the watry ſhell or caſe is rendered thicker, ſo as to become heavier than the air, &c.

Others only allow the cold a part in the action, and bring in the winds as ſharers with it: indeed it is clear, that a wind blowing againſt a cloud will drive its veſiculæ upon one another, by which means ſeveral of them, coaleſcing as before, will be enabled to deſcend; and the effect will be ſtill more conſiderable, if two oppoſite winds blow together towards the ſame place. Add to this, that clouds already formed, happening to be aggravated by freſh acceſſions of vapour continually aſcending, may thence be enabled to deſcend.

Yet, the grand cauſe, according to Rohault, is ſtill behind: that author conceives it to be the heat of the air, which, after continuing for ſome time near the earth, is at length carried up on high by a wind, and there thawing the ſnowy villi, or flocks of the half-frozen veſiculæ, it reduces them into drops; which, coaleſcing, deſcend, and have their diſſolution perfected in their progreſs through the lower and warmer ſtages of the atmoſphere.

Others, as Dr. Clarke, &c. aſcribe this deſcent of the clouds rather to an alteration of the atmoſphere than of the veſiculæ; and ſuppoſe it to ariſe from a diminution of the ſpring, or elaſtic force of the air.

This elaſticity, which depends chiefly or wholly on the dry terrene exhalations, being weakened, the atmoſphere ſinks under its burden; and the clouds fall, on the common principle of precipitation.

Now, the little veſiculæ, by any or all theſe means, being once upon the deſcent, will perſiſt therein, notwithſtanding the increaſe of reſiſtance they every moment meet with in their progreſs through ſtill denſer and denſer parts of the atmoſphere.

For, as they all tend toward the ſame point, viz. the centre of the earth, the farther they fall, the more coalitions will they make; and the more coalitions, the more matter will there be under the ſame ſurface; the ſurface only increaſing as the ſquares, but the ſolidity as the cubes; and the more matter under the ſame ſurface, the leſs friction or reſiſtance there will be to the ſame matter.

Thus, if the cold, the wind, &c. happen to act early enough to precipitate the aſcending veſiculæ, before they are arrived at any conſiderable height, the coalitions being few in ſo ſhort a deſcent, the drops will be proportionably ſmall: and thus is formed what we call *dew*.

If the vapours prove more copious, and riſe a little higher, we have a *miſt* or *fog*.

A little higher ſtill, and they produce a *ſmall rain*, &c.

If they neither meet with cold, nor wind enough to condenſe or diſſipate them; they form a heavy, thick, dark ſky; which laſts ſometimes ſeveral weeks.

Hence we may account for many of the phenomena of the weather; *e. gr.* why a cold is always a wet ſummer; and a warm a dry one; becauſe the principle of precipitation obtains in the one caſe, and is wanting in the other. Why we have ordinarily moſt *rain* about the equinoxes; becauſe the vapours ariſe more plentifully than ordinarily in the ſpring, as the earth becomes looſened from the brumal conſtipations; and becauſe, as the ſun recedes from us in autumn, the cold increaſing, the vapours that had lingered above during the ſummer heats, are now diſpatched down, &c. Why a ſettled, thick, cloſe ſky ſcarce ever *rains* till it have been firſt clear; becauſe the equally diffuſed vapours muſt firſt be condenſed, and congregated into ſeparate clouds, to lay the foundation of *rain*; by which means the reſt of the face of heaven is left open, and pervious to the rays of the ſun, &c.

For other phenomena of *rain*, as they relate to the weather-glaſs, ſee BAROMETER.

For a more particular account of the generally received theory for explaining the aſcent of vapours, the formation of clouds, and the fall of *rain*, ſee EVAPORATION.

Beſides the cauſes of *rain* mentioned above, Deſaguliers thinks it owing to the loſs of electricity in the vapours whereof the clouds are formed.

Other writers, in the progreſs of this part of philoſophical ſcience, have conſidered *rain* as an electrical phenomenon: or at leaſt they have ſuppoſed, that the powers of electricity may concur with other cauſes in producing it. See EVAPORATION. Signior Beccaria, whoſe obſervations on the general ſtate of electricity in the atmoſphere have been more extenſive and accurate than thoſe of any other perſon, reckons *rain*, HAIL and SNOW among the effects of a moderate electricity in the atmoſphere. Clouds that bring *rain*, he thought were produced in the ſame manner as thunder clouds, only by a moderate electricity. He deſcribes them at large, and the reſemblance which all their phenomena bear to thoſe of thunder clouds is very ſtriking. He notes ſeveral circumſtances attending *rain* without lightning, which render it probable, that it is produced by the ſame cauſe as when it is accompanied with lightning. Light has been ſeen among the clouds by night in rainy weather; and even by day rainy clouds are ſometimes ſeen to have a brightneſs evidently independent of the ſun. The uniformity with which the clouds are ſpread, and with which the *rain* falls, he thought were evidences of an uniform cauſe like that of electricity. The intenſity alſo of electricity in his apparatus generally correſponded very nearly to the quantity of *rain* that fell in the ſame time. Sometimes all the phenomena of thunder, lightning, hail, *rain*, ſnow, and wind have been obſerved at one time; which ſhews the connection they all have with ſome common cauſe. Signior Beccaria therefore ſuppoſes, that, previous to *rain*, a quantity of electric matter eſcapes out of the earth, in ſome place where there was a redundancy of it; and in its aſcent to the higher regions of the air, collects and conducts into its path a great quantity of vapours. The ſame cauſe, that collects, will condenſe them more and more; till, in the places of the neareſt intervals, they come almoſt into contact, ſo as to form ſmall drops; which, uniting with others as they fall, come down in *rain*. The *rain* will be heavier in proportion as the electricity is more vigorous, and the cloud approaches more nearly to a thunder cloud. He imitated the appearance of clouds that bring *rain* by inſulating himſelf between the rubber and conductor of his electrical machine; and with one hand dropping colophonia into a ſpoon faſtened to the conductor, and holding a burning coal, while his other hand communicated with the rubber. In theſe circumſtances the ſmoke ſpread along his arm, and, by degrees, all over his body, till it came to the other hand that communicated with the rubber. The lower ſurface of this ſmoke was every where parallel to his cloaths, and the upper ſurface was ſwelled and arched like clouds replete with thunder and *rain*. In this manner, he ſuppoſes, the clouds that bring *rain* diffuſe themſelves from over thoſe parts of the earth which abound with electric fire, to thoſe parts that are exhauſted of it; and by letting fall their *rain*, reſtore the equilibrium between them. Signior Beccaria alſo thought, that the electricity communicated to the air, which both receives and parts with it ſlowly, would account for the retention of vapours in a clear ſky; for ſmall disjointed clouds, not diſperſed into *rain*; for the ſmaller and lighter clouds in the higher regions of the air, which are but little affected by electricity; and alſo for the darker, heavy, and ſluggiſh clouds in the lower regions, which retain more of it. He even imagined, that ſome alteration in the weight of the air might be made by this electricity of it: the phenomena of *rain*, he thought, favoured the ſuppoſition, that the electric matter in the air did, in ſome meaſure, leſſen its preſſure: for when the electric matter is actually in the air, collecting and condenſing the vapours, the barometer is loweſt. When the communication is made between the earth and the clouds by the rain, the quickſilver begins to riſe; the electric matter, which ſupported part of the preſſure, being diſcharged. Lettere dell Elettriciſmo. Prieſtley's Hiſt. &c. of Electricity, vol. i. p. 427, &c. 8vo.

As to the general *quantity* of rain that falls, and its proportion in ſeveral places at the ſame time, and in the ſame place at ſeveral times, we have many obſervations, journals, &c. in the Memoirs of the French academy, the Philoſ. Tranſ. &c. an idea whereof may not be unacceptable. See an obſervation neceſſary to be regarded in all experiments of this kind under EVAPORATION.

Upon meaſuring, then, the *rain* falling yearly, its depth, at a medium, is found as in the following table:

Depth

Depth of RAIN *falling yearly, and its proportion in several places.*

	Inches.
At Townley, in Lancashire, observed by Mr. Townley	42½
Upminster, in Essex, by Dr. Derham - - -	19¼
Zurich, in Swisserland, by Dr. Scheuchzer - -	32¼
Pisa, in Italy, by Dr. Mich. Ang. Tilli - - -	43¼
Paris, in France, by M. de la Hire - - -	19
Lisle, in Flanders, by M. de Vauban - - -	24

	At Upminster.		At Paris.	
1700	19 Inch.	.03	21 Inch.	.37
1701	18	.69	27	.77
1702	20	.38	17	.45
1703	23	.99	18	.51
1704	15	.80	21	.20
1705	16	.93	14	.82

From the Meteorological Journal of the Royal Society, kept by order of the president and council, it appears that the whole quantity of *Rain* at London, in each of the years specified below, was as follows: viz.

		Inches.	
1774	- - -	26	.328
1775	- - -	24	.083
1776	- - -	20	.354
1777	- - -	25	.371
1778	- - -	20	.772
1779	- - -	26	.785
1780	- - -	17	.313

Proportion of the RAIN *of the several seasons to one another.*

1708	Depth at Pisa. Inch.	Depth at Upminf. Inch.	Depth at Zurich. Inch.	1708	Depth at Pisa. Inch	Depth at Upminf. Inch.	Depth at Zurich. Inch.
Jan.	6 .41	2 .88	1 .64	July	0 .00	1 .11	3 .50
Feb.	3 .28	0 .46	1 .65	Aug.	2 .27	2 .94	3 .15
Mar.	2 .65	2 .03	1 .51	Sept.	7 .21	1 .46	3 .02
April	1 .25	0 .96	4 .69	Oct.	5 .33	0 .23	2 .44
May	3 .33	2 .02	1 .91	Nov.	0 .13	0 .86	0 .62
June	4 .90	2 .32	5 .91	Dec.	0 .00	1 .97	2 .62
Half Year	21 .82	10 .67	17 .31	Half Year	14 .94	8 .57	15 .35

See Philos. Trans. abr. vol. iv. p. ii. p. 81. &c. and also Meteorological Journal of the Royal Society, published annually in the Phil. Trans.

As to the use of *rain*, we may observe, that it moistens and softens the earth, and thus fits it for affording nourishment to plants; by falling on high mountains, it carries down with it many particles of loose earth, which serve to fertilize the surrounding valleys, and purifies the air from noxious exhalations, which tend in their return to the earth to meliorate the soil; it moderates the heat of the air; and is one means of supplying fountains and rivers. However, vehement *rains* in many countries are found to be attended with barrenness and poorness of the lands, and miscarriage of the crops in the succeeding year: and the reason is plain; for these excessive storms wash away the fine mould into the rivers, which carry it into the sea, and it is a long time before the land recovers itself again. The remedy to the famine, which some countries are subject to from this sort of mischief, is the planting large orchards and groves of such trees, as bear esculent fruit; for it is an old observation, that in years, when grain succeeds worst, these trees produce most fruit of all. It may partly be owing to the thorough moistening of the earth, as deep as their roots go, by these rains, and partly to their trunks stopping part of the light mould carried down by the rains, and by this means furnishing themselves with a coat of new earth. Phil. Trans. Nº 90.

RAINS, *preternatural*. We have numerous accounts in historians of *preternatural rains*, such as the *raining* of stones, of dust, of blood, nay, and of living animals, as young frogs, and the like. We are not to doubt the truth of what those who are authors of veracity and credit relate to us of this kind, so far as to suppose that the falling of stones and dust never happened; the whole mistake is the supposing them to have fallen from the clouds; but as to the blood and frogs, it is very certain that they never fell at all, but the opinion has been a mere deception of the eyes. Men are extremely fond of the marvellous in their relations; but the judicious reader is to examine strictly whatever is reported of this kind, and is not to suffer himself to be deceived.

There are two natural methods by which quantities of stones and dust may fall in certain places, without their having been generated in the clouds, or fallen as *rain*. The one is by means of hurricanes: the wind which we frequently see tearing off the tiles of houses, and carrying them to considerable distances, being equally able to take up a quantity of stones, and drop them again at some other place. But the other, which is much the most powerful, and probably the most usual way, is for the eruptions of volcanos, and burning mountains, to toss up, as they frequently do, a vast quantity of stones, ashes, and cinders, to an immense height in the air; and these being hurried away by the hurricanes and impetuous winds, which usually accompany those eruptions, and being in themselves much lighter than common stones, as being half calcined, may easily be thus carried to vast distances, and their falling in places where the inhabitants know nothing of the occasion, they cannot but be supposed by the vulgar to fall on them from the clouds. It is well known, that in the great eruptions of Ætna and Vesuvius, showers of ashes, dust, and small cinders, have been seen to obscure the air, and overspread the surface of the sea for a great way, and cover the decks of ships; and this at such a distance, as it should appear scarce conceivable that they should have been carried to; and probably, if the accounts of all the showers of these substances mentioned by authors be collected, they will all be found to have fallen within such distances of volcanos; and if compared, as to the time of their falling, will be found to correspond in that also with the eruptions of those mountains. We have known instances of the ashes from Vesuvius having been carried thirty, nay forty leagues, and peculiar accidents may have carried them yet farther.

The *raining* of blood has been ever accounted a more terrible sight, and a more fatal omen, than the other *preternatural rains* already mentioned. It is very certain that nature forms blood no where but in the vessels of animals, and therefore showers of it from the clouds are by no means to be credited. Those who suppose that what has been taken for blood, has been actually seen falling through the air, have had recourse to flying insects for its origin, and suppose it the eggs or dungs of certain butterflies, discharged from them as they were high up in the air. But this seems a very wild conjecture, as we know of no butterfly whose excrements, or eggs, are of such a colour, or whose abode is so high, or their flocks so numerous, as to be the occasion of this.

It is most probable that these bloody waters were never seen falling, but that people seeing the standing waters blood-coloured, were assured, from their not knowing how it should else happen, that it had *rained* blood into them. A very memorable instance of this there was at the Hague in the year 1670. Swammerdam, who relates it, tells us, that one morning the whole town was in an uproar on finding their lakes and ditches full of blood, as they thought, and having been certainly full of water the night before, they agreed it must have *rained* blood in the night; but a certain physician went down to one of the canals, and taking home a quantity of this blood-coloured water, he examined it by the microscope, and found that the water was water still, and had not at all changed its colour, but that it was full of prodigious swarms of small red animals, all alive, and very nimble in their motions, whose colour and prodigious number gave a red tinge to the whole body of the water they lived in, on a less accurate inspection. The certainty that this was the case, did not however persuade the Hollanders to part with the miracle; they prudently concluded, that the sudden appearance of such a number of animals was as great a prodigy as the *raining* of blood would have been; and are assured at this day, that this portent foretold the scene of war and destruction which Lewis the Fourteenth afterwards brought into that country, which had before enjoyed forty years uninterrupted peace.

The animals which thus colour the water of lakes and ponds, are the *pulices arborescentes* of Swammerdam, or the water-fleas with branched horns. These creatures are of a reddish yellow, or flame colour; they live about the sides of ditches, under weeds, and among the mud, and are therefore the less visible, except at a certain time, which is in the end of May, or beginning of June; it is at this time that these little animals leave their recesses to float loose about the water, to meet for the propagation of their species, and by that means become visible in the colour they give the water. This is visible, more or less, in one part or other of almost all standing-waters at this season; and it is always at this season that the bloody waters have alarmed the ignorant.

The *raining* frogs is a thing not less wonderful in the accounts of authors who love the marvellous, than those of blood or of stones; and this is supposed to happen so often, that there are multitudes who pretend to have been eye-witnesses of it. These *rains* of frogs always happen after very dry seasons, and are much more frequent in the hotter countries than the cold ones. In Italy they are very frequent; and it is not uncommon to see the streets of

of Rome ſwarming both with young frogs and toads in an inſtant, in a ſhower of *rain*; they hopping every where between the people's legs as they walk, though there was not the leaſt appearance of them before. Nay, they have been ſeen to fall through the air down upon the pavements. This ſeems a ſtrong circumſtance in favour of their being *rained* down from the clouds, but when ſtrictly examined, it comes to nothing; for theſe frogs that are ſeen to fall, are always found dead, lamed, or bruiſed by the fall, and never hop about as the reſt; and they are never ſeen to fall, except cloſe under the walls of houſes, from the roofs and gutters of which they have accidentally ſlipped down.

To the *raining* of frogs we ought to add the *raining* of graſhoppers and locuſts, which have ſometimes appeared in prodigious numbers, and devoured the fruits of the earth. There has not been the leaſt pretence for the ſuppoſing that theſe animals deſcended from the clouds, but that they appeared on a ſudden in prodigious numbers. The naturaliſt, who knows the many accidents attending the eggs of theſe, and other the like animals, cannot but know that ſome ſeaſons will prove particularly favourable to the hatching them, and the prodigious number of eggs that many inſects lay, could not but every year bring us ſuch abundance of the young, were they not liable to many accidents, and had not provident nature taken care, as in many plants, to continue the ſpecies by a very numerous ſtock of ſeeds, of which perhaps not one in five hundred need take root, in order to continue an equal number of plants.

The *raining* of fiſhes has been a prodigy alſo much talked of in France, where the ſtreets of a town at ſome diſtance from Paris, after a terrible hurricane in the night, which tore up trees, blew down houſes, &c. were found in a manner covered with fiſhes of various ſizes. No body here made any doubt of theſe having fallen from the clouds; nor did the abſurdity of fiſh, of five or ſix inches long, being generated in the air, at all ſtartle the people, or ſhake their belief in the miracle, till they found upon enquiry that a very well ſtocked fiſh-pond, which ſtood on an eminence in the neighbourhood, had been blown dry by the hurricane, and only the great fiſh left at the bottom of it, all the ſmaller fry having been toſſed into their ſtreets.

Upon the whole, all the ſuppoſed marvellous *rains* have been owing to ſubſtances naturally produced on the earth, and either never having been in the air at all, or only carried thither by accident.

RAIN, *freezing*. See FREEZING.

RAIN-*fowl*, an Engliſh name given by many to the common green wood-pecker, or *picus viridis*, from an obſervation that it is always moſt clamorous when *rainy* weather is coming on. The Latins have, for the ſame reaſon, called it the *pluvialis avis*.

RAIN-*water*. See WATER.

RAINS, in the *Sea-Language*, denote all that tract of ſea to the northward of the equator, between 4 and 10 degrees of latitude; and lying between the meridian of Cape Verde and that of the eaſtermoſt iſlands of the ſame name.

It takes its name from the almoſt continual calms, conſtant *rains*, and thunder and lightning, to a great degree, always found there. The winds, when they do blow, are only ſmall uncertain guſts, and ſhift about all round the compaſs; ſo that ſhips are ſometimes here detained a long while, and can make but very little way.

RAINBOW, *iris*, or, ſimply, the *bow*, a meteor in form of a party-coloured arch, or ſemicircle, exhibited in a rainy ſky, oppoſite to the ſun, by the refraction of his rays in the drops of falling rain.

There is alſo a ſecondary, or fainter *bow*, uſually ſeen inveſting the former at ſome diſtance. Among naturaliſts, we alſo read of *lunar rainbows*, *marine rainbows*, &c.

The *rainbow*, Sir Iſaac Newton obſerves, never appears but where it rains in the ſun-ſhine; and it may be repreſented artificially, by contriving water to fall in little drops, like rain, through which the ſun ſhining, exhibits a *bow* to a ſpectator placed between the ſun and the drops; eſpecially if a dark body, e. gr. a black cloth, be diſpoſed beyond the drops.

That the *rainbow* is oppoſite to the ſun, has always been obſerved. It was, therefore, natural to imagine, that the colours of it were produced by ſome kind of reflexion of the rays of light from drops of rain or vapour. The regular order of the clouds was another circumſtance that could not have eſcaped the notice of any perſon. But though mere reflexion had in no other caſe been obſerved to produce colours, and it could not but have been obſerved that refraction is frequently attended with that phenomenon, yet no perſon ſeems to have thought of having recourſe to a proper refraction in this caſe before one Fletcher of Breſlaw, who, in a treatiſe which he publiſhed in 1571, endeavoured to account for the colours of the *rainbow* by means of a double refraction, and one reflexion. But he imagined that a ray of light, after entering a drop of rain, and ſuffering a refraction, both at its entrance and exit, was afterwards reflected from another drop, before it reached the eye of the ſpectator. He ſeems to have overlooked the reflexion at the farther ſide of the drop, or to have imagined that all the bendings of the light within the drop would not make a ſufficient curvature, to bring the ray of the ſun to the eye of the ſpectator. Antonio de Dominis, biſhop of Spalato, whoſe treatiſe De Radiis Viſus et Lucis, was publiſhed by I. Bartolus in 1611, was the firſt perſon who advanced, that the double refraction of Fletcher, with an intervening reflexion, was ſufficient to produce the colours of the *rainbow*, and alſo to bring the rays that formed them to the eye of the ſpectator, without any ſubſequent reflexion. He diſtinctly deſcribes the progreſs of a ray of light entering the upper part of the drop, where it ſuffers one refraction, and after being thereby thrown upon the back part of the inner ſurface, is from thence reflected to the lower part of the drop; at which place undergoing a ſecond refraction, it is thereby bent ſo as to come directly to the eye. To verify this hypotheſis, he procured a ſmall globe of ſolid glaſs, and viewing it when it was expoſed to the rays of the ſun, in the ſame manner in which he had ſuppoſed that the drops of rain were ſituated with reſpect to them, he actually obſerved the ſame colours which he had ſeen in the true *rainbow*, and in the ſame order. The theory of A. de Dominis was adopted, and in ſome degree improved, by Deſcartes. Philoſophers were, however, for a long time at a loſs when they endeavoured to aſſign reaſons for all the particular colours, and for the order of them. Indeed, nothing but the doctrine of the different refrangibility of the rays of light, which was a diſcovery reſerved for the great Sir Iſaac Newton, could furniſh a complete ſolution of this difficulty.

RAINBOW, *theory of the*. To conceive the origin of the *rainbow*, let us conſider what will befall rays of light coming from a very remote body, e. gr. the ſun, and falling on a globe of water, ſuch as we know a drop of rain to be.

Suppoſe, then, ADKN (*Tab.* V. *Optics*, *fig.* 94.) to be a drop of rain, and the lines EF, BA, ON, to be rays of light coming from the centre of the ſun; which, on account of the immenſe diſtance of the ſun, we conceive to be parallel.

Now the ray BA, being the only one that falls perpendicularly on the ſurface of the water, and all the reſt obliquely, it is eaſily inferred, that all the other rays will be refracted towards the perpendicular. See REFRACTION. Thus the ray EF, and others accompanying it, will not go on ſtraight to G; but, as they arrive at HI, they will deflect from F to K; where ſome of them, probably, eſcaping into the air, the reſt are reflected upon the line KN, ſo as to make the angles of incidence and reflexion equal.

Farther, as the ray KN, and thoſe accompanying it, fall obliquely upon the ſurface of the globule, they cannot paſs out into the air, without being refracted, ſo as to recede from the perpendicular LM; and, therefore, they will not proceed ſtraight to Y, but will deflect to P.

It may be here obſerved, that ſome of the rays, arriving at N, do not paſs out into the air, but are again reflected to Q; where being refracted, like the reſt, they do not proceed right to Z; but, declining from the perpendicular TV, are carried to R; but ſince we here only regard the rays as they may affect the eye placed a little below the drop, e. gr. at P, thoſe which deflect from N to Q, we ſet aſide, as uſeleſs; becauſe they never come to the eye. On the contrary, it is to be obſerved, that there are other rays, as 2 3, and the like; which, being refracted from 3 to 4, and reflected to 5, and from 5 to 6, may at length, by refraction at 6, arrive at the eye 7, placed beneath the drop.

Thus much is obvious: but to determine preciſely the quantities of refraction of each ray, there muſt be a calculation; by ſuch calculation it appears, that the rays which fall on the quadrant AD, are continued in lines, like thoſe here drawn in the drop ADKN; wherein there are three things very conſiderable: firſt, that the two refractions of the rays, in their ingreſs and egreſs, are both the ſame way; ſo that the latter does not deſtroy the effect of the former. Secondly, that of all the rays paſſing out of AN, NP, and thoſe adjoining to it, are the only ones capable of affecting the ſenſe, as being ſufficiently cloſe and contiguous, and becauſe they come out parallel; whereas the reſt are diverging, and diſperſed too far to have any ſenſible effect, at leaſt to produce any thing ſo vivid as the colours of the *bow*. Thirdly, that the ray NP has ſhade or darkneſs under it; for, ſince there

there is no ray comes out of the surface N 4, it is the same thing as if the part were covered with an opake body. We might add that the same ray NP has darkness above it; since the rays that are above it are ineffectual, and signify no more than if there were none at all.

Add to this, that all the effectual rays have the same point of reflexion, i. e. the parallel and contiguous rays, which alone are effectual after refraction, will all meet in the same point of the circumference, and be reflected thence to the eyes.

Farther, it appears by calculation, that the angle ONP, included between the ray NP, and the line ON drawn from the centre of the sun, which is the angle whereby the *rainbow* is distant from the opposite point of the sun, and which makes the *semidiameter* of the bow, contains 41° 30′. The method of determining it see hereafter.

But since, beside those rays coming from the centre of the sun to the drop of water, there are many more from the several points of its surface; there are a great many other effectual rays to be considered, especially that from the uppermost, and that from the lowest part of the sun's body.

Since, then, the apparent diameter of the sun is about 16 minutes, it follows, that an effectual ray from the upper part of the sun will fall higher than the ray EF by 16 minutes: thus does the ray GH (*fig.* 95.) which, being refracted as much as EF, deflects to I, thence to L, and at length emerging equally refracted with the ray NP, proceeds to M; and makes an angle ONM, of 41° 14′, with the line ON. In the like manner, the effectual ray QR coming from the lowest part of the sun, falls on the point R, sixteen minutes lower than the point F, on which the ray EF falls; and this, being refracted, declines to S, whence it is reflected to T; where, emerging into the air, it proceeds to V; so that the line TV, and the ray OT, contain an angle of 41° 46′. Again, upon computing the deflexions of the rays, which, like that 23 (*fig.* 94.) coming from the centre of the sun, and being received into the lower part of the drop, we have supposed to be twice reflected, and twice refracted, and to enter the eye by lines like that 67 (*fig.* 96.) we find that which may be accounted effectual, as 67 with the line 86 drawn from the centre of the sun, contains an angle 867, of about 52 degrees; whence it follows, that the effectual ray from the highest part of the sun, with the same line 86, includes an angle less by 16 minutes; and that from the lowest part of the sun, an angle greater by 16 minutes.

Thus, since ABCDEF is the path of the efficacious ray, from the highest part of the sun to the eye in F, the angle 86 F becomes of about fifty-one degrees and forty-four minutes. In like manner, since GHIKLM is the way of an effectual ray from the lowest part of the sun to the eye, the angle 86 M becomes nearly of fifty-two degrees and sixteen minutes.

Since, then, we admit several rays to be effectual, besides those from the centre of the sun, what we have said of the *shade* will need some alteration; for of the three rays described (*fig.* 95. and 96.) only the two extreme ones will have a shadow joined to them, and that only on the outer side. Hence it is evident, that these rays are perfectly disposed to exhibit all the colours of the prism.

For the great quantity of dense or intense light, i. e. the bundle of rays collected together in a certain point, v. gr. in the point of reflexion of the effectual rays, may be accounted as a lucid or radiant body, terminated all around by *shade*. But the several rays, thus emitted to the eye, are both of different colours; that is, they are fitted to excite in us the ideas of different colours; and are differently refracted out of the water into the air, notwithstanding their falling alike upon the refracting surface.

Hence it follows, that the different or heterogeneous rays will be separated from one another, and will tend separate ways; and the homogeneous rays will be collected, and tend the same way; and, therefore, this lucid point of the drop, wherein the refraction is effected, will appear fringed or bordered with several colours; that is, *red, green,* and *blue* colours, will arise from the extremes of the red, green, and blue rays of the sun, transmitted to the eye from several drops, one higher than another, after the same manner as is done in viewing lucid or other bodies through a prism.

Thus, adds Sir Isaac Newton, the rays that differ in refrangibility, will emerge at different angles; and, consequently, according to their different degrees of refrangibility, emerging most copiously at different angles, they will exhibit different colours in different places.

A great number, then, of these little globules being diffused in the air, will fill the whole space with these different colours; provided they be so disposed as that effectual rays may come from them to the eye; and thus will the *rainbow*, at length, arise.

Now, to determine what that *disposition* must be, suppose a right line drawn from the centre of the sun through the eye of the spectator, as the line VX (*fig.* 95.) called the *line of aspect*, or *axis of vision*; being drawn from so remote a point, it may be esteemed parallel to all other lines drawn from the same point; but a right line, falling on two parallels, makes the alternate angles equal.

If, then, an indefinite number of lines be imagined drawn from the spectator's eye to a part opposite to the sun where it rains; which lines make different angles with the line of aspect, equal to the angles of refraction of the differently refrangible rays, e. gr. angles of 41° 46′, and of 41° 30′, and of 41° and 14′; these lines, falling on drops of rain illumined by the sun, will make angles of the same magnitude with rays drawn from the centre of the sun to the same drops. And, therefore, the lines thus drawn from the eye will represent the effectual rays that occasion the sensation of any colour.

That, e. gr. making an angle of 41° 46′, representing the least refrangible or red rays of the several drops, and of 41° 14′, the most refrangible or violet rays, the intermediate colours and refrangibilities will be found in the intermediate space.

Now it is known, that the eye, being placed in the vertex of a cone, sees objects upon its surface, as if they were in a circle; and the eye of our spectator is here in the common vertex of several cones, formed by the several kinds of efficacious rays, with the line of aspect. Now in the surface of that whose angle at the vertex, or eye, is the greatest, and wherein the others are included, are those drops, or parts of drops, which appear red; and in the surface of that cone whose angle is least, are the purple drops; and in the intermediate cones, are the green, blue, &c. drops. Hence, then, several kinds of the drops must appear as if disposed into so many circular coloured fasciæ, or arches, as we see in the *rainbow*. Rohault's System of Nat. Phil. vol. ii. part iii. cap. 17.

This part of the solution Sir Isaac Newton expresses more artfully, thus: suppose O (*fig.* 97.) the eye, and OP a line parallel to the sun's rays; and let POE, POF, be angles of 40° 17′, and 42° 2′. And suppose the angles to turn about their common side OP, with their other sides OE and OF, they will describe the bounds, or verges, of the *rainbow*.

For, if E, F be drops placed any where in the conical surface described by OE, OF, and be illuminated by the sun's rays SE, SF; the angle SEO being equal to the angle POE, or 40° 17′, shall be the greatest angle in which the most refrangible rays can, after reflexion, be refracted to the eye; and, therefore, all the drops in the line OE shall send the most refrangible rays most copiously to the eye, and therefore strike the senses with the deepest violet colour in that region.

And in like manner the angle SFO being = to the angle POF = 42° 2′, shall be the greatest in which the least refrangible rays after one reflexion can emerge out of the drops; and these rays shall come most copiously to the eye from the drops in the line OF, and strike the senses with the deepest red colour in that region.

And, by the same argument, the rays which have intermediate degrees of refrangibility, shall come most copiously from drops between E and F, and so strike the senses with the intermediate colours, in the order which their degrees of refrangibility require; that is, in the progress from E to F, or from the inside of the bow to the outside, in this order, *violet, indigo, blue, green, yellow, orange, red*; though the violet, by the mixture of the white light of the clouds, will appear faint, and incline to a purple.

Here it may be observed, that all the rays but the violet in the line SE will emerge from E in a greater angle than SEO made by the violet, and consequently will pass below the eye; and all the rays but the red in the line SF will emerge from F in a less angle than SFO made by the red, and consequently will pass above the eye; by which means only red will appear in the line SF, and only violet in the line SE.

And, since the lines OE, OF, may be situated any where in the above mentioned conical surface; what is said of the drops and colours of these lines, is to be understood of the drops and colours throughout the whole superficies. Thus is the *primary* or *inner bow* formed.

RAINBOW, *secondary*, or *outer*. As to the secondary, or fainter *bow*, usually surrounding the former, in assigning what drops would appear coloured, we excluded such as lines drawn from the eye, making angles a little greater than 42° 2′, should fall upon, but not such as should contain angles much greater.

For, if an indefinite number of such lines be drawn from the spectator's eye, some whereof make angles of 50°

57′, with the line of aspect, e. gr. OG; other angles, of 54° 7′, e. gr. OH; those drops whereon these lines fall must of necessity exhibit colours; particularly those of 50° 57′.

E. gr. The drop G will appear red; the line GO being the same with an effectual ray; which, after two reflexions, and two refractions, exhibits a red colour. Again, those drops which receive lines of 54° 7′, e. gr. the drop H will appear purple; the line OH being the same with an effectual ray; which, after two reflexions and two refractions, exhibits purple.

Now there being a sufficient number of these drops, it is evident there must be a *second rainbow*, formed after the like manner as the first.

Thus, according to Sir Isaac Newton, in the least refrangible rays, the least angle at which a drop can send effectual rays after two reflexions, is found by computation to be 50° 57′; and, in the most refrangible, the least angle is found 54° 7′.

Suppose, then, O the place of the eye, as before, and POG, POH, to be angles of 50° 57′, and 54° 7′; and these angles to be turned about their common side OP; with their other sides OG, OH, they will describe the verges, or borders of the *rainbow* CHDG.

For, if G, H be drops placed any where in the conical superficies described by OG, OH, and be illuminated by the sun's rays, the angle SGO, being equal to the angle POG, or 50° 57′, shall be the least angle in which the then least refrangible rays can, after two reflexions, emerge out of the drops; and, therefore, the least refrangible rays shall come most copiously to the eye from the drops in the line OG, and strike the senses with the deepest red in that region.

And the angle SHO being equal to POH, 54° 7′, shall be the least angle in which the most refrangible rays, after two reflexions, can emerge out of the drops; and, therefore, those rays shall come most copiously to the eye from the drops in the line OH, and so strike the senses with the deepest violet in that region.

And, by the same argument, the drops in the region, between G and H, shall strike the senses with the intermediate colours, in the order which their degrees of refrangibility require; that is, in the progress from G to H, or from the inside of the bow to the outer, in this order: *red, orange, yellow, green, blue, indigo, violet.*

And since the lines OG, OH, may be situated any where in the conical surface; what is said of the drops and colours in these lines is to be understood of the drops and colours every where in these superficies.

Thus are formed two bows, an *interior* and stronger, by one reflexion; and an *exterior* and fainter, by two; the light becoming weaker and weaker by every reflexion.

Their colours will lie in a contrary order to one another; the first having the red without, and the purple within; and the second, the purple without, and red within; and so of the rest.

Rainbow, *artificial*. This doctrine of the *rainbow* is confirmed by an easy experiment; for upon hanging up a glass globe, full of water, in the sun-shine, and viewing it in such a posture as that the rays, which come from the globe to the eye, may, with the sun's rays, include an angle either of 42°, or 50°; if, e. gr. the angle be about 42°, the spectator, supposed at O, will see a full red colour in that side of the globe opposite to the sun, as at F. And if that angle be made a little less, suppose by depressing the globule to E, the other colours, yellow, green, and blue, will appear successively, in the same side of the globe, also exceedingly bright.

But if the angle be made about 50°, suppose by raising the globule to G, there will appear a red colour in that side of the globe towards the sun, though somewhat faint; and if the angle be made greater, suppose by raising the globe to H, this red will change successively to the other colours, yellow, green, and blue.

The same thing is observed in letting the globe rest, and raising or depressing the eye so as to make the angle of a just magnitude. Newton's Optics, part ii. prop. 9. prob. 4. p. 147, ed. 3.

Rainbow, *dimension of the*. Descartes first determined its diameter by a tentative and indirect method; laying it down, that the magnitude of the bow depends on the degree of refraction of the fluid; and assuming the ratio of the sine of incidence to that of refraction, to be in water as 250 to 187.

But Dr. Halley has since, in the Philosophical Transactions, N° 267, given us a simple direct method of determining the diameter of the *rainbow* from the ratio of refraction of the fluid being given; or, *vice versa*, the diameter of the *rainbow* being given, to determine the refractive power of the fluid.

The principles of Dr. Halley's construction for this purpose, illustrated and facilitated by Dr. Morg[illegible] [illegible]shop of Ely, will be understood from the following view of them. Let SN, *sn* (*Tab.* V. *Optics*, *fig.* 98.) be two of the efficacious rays incident upon a drop of rain; these when refracted to the same point F, and thence reflected to G, *g*, will have the parts within the drop on one side NF, *n*F, equal to those on the other side FG, F*g*, from the nature of the circle, and because the angles of incidence CFN, CF*n*, are equal to the angles of reflexion CFG, CF*g*. And since the parts within the drop are equal and alike situated, they will be similarly situated with regard to the drop itself; and consequently as the incident rays SN, S*n*, are supposed to be parallel, the emergent rays GR, *gr*, will be also parallel. From C the centre, draw the radii CN, C*n*, CF, then will CNF = CFN, be the angle of refraction, and the small arc N*n* is the nascent increment of the angle of incidence BCN; and as it measures the angle at the centre NC*n*, it is double of the angle at the circumference upon the same arc, viz. NF*n*, which is the nascent increment of the angle of refraction NFC. Farther, let the ray SN (*fig.* 99.) enter the lower part of the drop, and be twice reflected within the drop at F and G; then is the ray NF equal to the ray FG, and the arc NF = the arc FG. Draw *fg* parallel to FG, and it will be the reflected part of some ray *sn*, whose obliquity to the drop makes it cross the ray NF in its refraction; then will the part *nf* = *fg*, and the arc *nf* = *fg*, and the small arc F*f* = G*g*. Therefore, 2F*f* = (F*f* + G*g* = the arc FG − *fg* = NF − *nf* =) N*n* − F*f*; consequently N*n* = 3F*f*, i. e. the nascent increment of the angle of incidence is equal to three times that of the angle of refraction. After a like manner it may be shewn, that after three, four, five, &c. reflexions, the increment of the angle of incidence will be four, five, six, &c. times greater than that of the angle of refraction. Hence, in order to find the angle of incidence of an efficacious ray, after any given number of reflexions, we are to find an angle whose nascent increment has the same ratio to the increment of its corresponding angle of refraction, generated in the same time, as the given number of reflexions (*n*) increased by unity has to unity; i. e. as $n+1$ to 1. But these increments are as the tangents of the respective angles directly. For, let ACD, ABD (*fig.* 100.) be the angles of incidence and refraction proposed; and if we suppose the line AC to move about the point A in the plane of those angles, the extremity of it, C, will describe the circular arc C*c*; and when AC is arrived at the situation A*c*, the line BD will be thereby removed into the situation B*d*. Draw *c*D, then is the angle ACD = ABC + CAB, and the angle A*cd* = AB*c* + *c*AB; therefore the excess of A*cd* above ACD, or the increment of ACD, is equal to both the angles CB*c* and CA*c*. But since the angle A*c*C differs infinitely little from a right one, a circle described on the diameter AC shall pass through the points D and *c*; and, therefore, the angles CA*c*, CD*c* (insisting on the same arc C*c* of the said circle) will be equal; and, therefore, the increment of the angle ACD is equal to CB*c* + CD*c* = D*cd*. But the nascent angles D*cd* and DB*c* are as their sines, that is, as their opposite sides BD and D*c* = DC, the angle CD*c* being infinitely small; but BD : CD :: DE : DA (the line BE being parallel to AC) :: tangent of the angle EBD = ACD : tangent of the angle ABD. Therefore the increment D*cd* of the angle ACD is to the increment CB*c* of the angle ABD (generated in the same time) as the tangent of the former to the tangent of the latter directly. Hence the praxis is as follows:

First, *The ratio of the sine of incidence* I *to the sine of refraction* R *being given; to find the angles of incidence, and refraction of a ray, which becomes effectual after any given number* (*n*) *of reflexions*. Suppose any given line as AC (*fig.* 101.) which divide in D; so as that AC : AD :: I : R; and again divide it in E, so that AC may be to AE as the given number of reflexions, increased by unity, is to unity; i. e. as $n+1:1$. Upon the diameter CE describe a semicircle CBE, and from the centre A, with the radius AD, describe an arc DB intersecting the semicircle in B; then drawing AB, CB, and letting fall the perpendicular AF on CB produced; ABC, or its complement to two right angles, ABF, will be the angle of incidence; and ACB the angle of refraction required. For, drawing BE parallel to AF, the triangles ACF and ECB are similar. Now the sine of the angle ABC, or ABF, is to the sine of ACB as AC to AB = AD, i. e. as I to R; therefore if ABF be the angle of incidence, ACF will be the angle of refraction. Moreover, the nascent increment of ABF is to that of ACB (generated in the same time) as CF : BF :: CA : AE, on account of the similar triangles; i. e. as $n+1$ to 1, by construction. The ratio, therefore, of the nascent increment of the angle of incidence ABF to that of the angle of refraction ACB, is that which is required in the angle

angles of incidence and refraction of an efficacious ray, after a given number of reflexions; consequently the angles ABF and ACF, are those required. From this construction we may easily deduce Sir Isaac Newton's rule for finding the angle of incidence ABF. See his Optics, p. 148, 149.

For AC : AB :: I : R; whence $AC = \frac{I}{R} \times AB$; and CF : BF :: $n+1$: 1; therefore $CF = \overline{n+1} \times BF$; or (putting $n+1 = m$) $CF = m \times BF$; and, on account of the right angle at F, $AC^2 - CF^2 = AB^2 - BF^2$, i. e. $\frac{II}{RR} AB^2 - m^2 BF^2 = AB^2 - BF^2$; and, therefore, $m^2 BF^2 - BF^2 = \frac{II}{RR} AB^2 - AB^2$; and, consequently, $\frac{BF}{AB} = \sqrt{\frac{II - RR}{m^2 R^2 - R^2}}$. Hence, because in the first bow, the ray emerges after one reflexion, we have $n = 1$, $m = 2$, $m^2 = 4$, and $m^2 - 1 = 3$; therefore, $\sqrt{3RR} : \sqrt{II - RR}$ :: AB : BF :: radius : cosine of the angle of incidence. In the second bow, where there are two reflexions, $m^2 - 1 = 8$; whence $\sqrt{8RR} : \sqrt{II - RR}$ :: AB : BF. In the third bow, after three reflexions, $m^2 - 1 = 15$; and $\sqrt{15RR} : \sqrt{II - RR}$ :: AB : BF, and so on for any given number of reflexions. Wherefore, supposing the ratio of refraction to be, as Sir Isaac Newton has determined it, viz. as 108 to 81 in the red rays, and as 109 to 81 in the violet rays; we shall have I (in the least refrangible rays) = 108, II = 11664; and R = 81, and RR = 6561, and $I^2 - R^2 = 5103$, $\sqrt{3RR} = 140,3$ and $\sqrt{I^2 - R^2} = 71,4$: therefore,

As $\sqrt{3RR} = 140,3$, whose logarithm is	2,147045
Is to $\sqrt{I^2 - R^2} = 71,4$ - - - - - -	1,853913
So is radius - - - - - - - - - -	10,000000
To the cosine of the angle of incidence, BAF = 30° 37′ - - -	9,706868

Hence the angle of incidence ABF is 59° 23′, in the red rays.

Secondly, *Having given the angle of incidence, and the ratio of* I *to* R, *or of refraction*; *to find the angle which a ray of light emerging out of a refracting sphere, after a given number of refractions, makes with the axis of vision, or an incident ray*; *and, consequently, to find the diameter of the rainbow*. The angle of incidence, and the ratio of refraction, being given, the angle of refraction is given; which angle being multiplied by double the number of reflexions increased by 2, and double the angle of incidence subtracted from the product, the angle remaining is the angle sought.

In order to find the angle of refraction, say

As I = 108, whose logarithm is - - -	2.033424
Is to R = 81 - - - - - -	1.908485
So is the sine of incidence 59° 23′ - - -	9.934798
To the sine of the angle of refraction 40° 12′	9.809859

Then, making the angle CNF (*fig.* 102.) = 40° 12′, NF will be the refracted ray, which at F is reflected into FG, and at G emerges in GR. Produce the incident and emergent rays SN and RG, till they intersect each other at X, and as CF bisects the angle NFG, it will, if produced, bisect the angle SXR. Then CFN = CXN + FNX; but FNX = CNX − CNF, or CFN; therefore CFN = CXN + CNX − CFN; that is, 2CFN − CNX = CXN; or 80° 24′ − 59° 23′ = 21° 1′ = CXN; therefore 2CXN = SXR = 42° 2′, which is the measure of the angle that the incident and emerging rays, which are the least refrangible, contain with each other. If instead of the ratio 108 to 81, we take that of 109 to 81, we shall find the values of $\sqrt{3RR}$, and $\sqrt{I^2 - R^2}$, such as will give the angle of incidence BCN, and the arc BN = 58° 40′, and the angle SXR = 40° 17′, for the most refrangible, or extreme violet rays.

If the ray be twice reflected, viz. at F and G, as in the production of the extreme bow, and emerges at H in the direction HA, intersecting the incident ray SN in Y, we may find the angle AYS thus: produce AH till it meets GX, produced in R; then in the triangle HGR, the external angle HGX = HRG + GHR. But because of equal angles of reflexion at F and G, GHR = FGX, therefore HGX − FGX = HGF = HRG = 2CGF, or CNF. But SXR = 4CNF − 2CNX; therefore in the triangle YXR we have the two internal angles R + X = 6CNF − 2CNX = the external angle at Y, viz. AYN. In this case, to find the angles of incidence and refraction, we have $\sqrt{8RR} : \sqrt{I^2 - R^2}$ :: radius : cosine of the angle of incidence; whence the said angle will be found 71° 50′ = CNX. And as 108 : 81 :: sine of 71° 50′ : sine of 45° 27′ = CNF, the angle of refraction; therefore $\overline{6 \times 45° 27′ - 2 \times 71° 50′}$ = 129° 3′ = AYN; and, therefore, its complement AYS = 50° 57′, the angle required for the least refrangible rays. But for the most refrangible rays, where I : R :: 109 : 81, we have the angle of incidence 71° 26′, and the angle of refraction 44° 47′; and, therefore, the angle AYS = 54° 7′. In the same manner the same angles are accelerated after three or four reflexions.

From the preceding problems we obtain the following results, viz.

I. Rainbow,	Red	42°	2′	The spectator's back being turned to the sun.
	Violet	40	17	
II. Rainbow,	Red	50	57	
	Violet	54	7	

If the angle made by a ray, after three or four reflexions, were required, and therefore the diameters of the third and fourth *rainbow* (which are scarce ever seen, on account of the great diminution of the rays, by so many repeated reflexions) they will be found,

III. Rainbow,	Red	41°	37′	The spectator being turned towards the sun.
	Violet	37	9	
IV. Rainbow,	Red	43	52	
	Violet	49	34	

Dr. Morgan's Dissertation upon the *Rainbow*, among the notes upon Rohault's System of Philosophy, part iii. chap. xvii.

Hence, the *breadth of the rainbows* is easily found: for the greatest semidiameter of the first bow, i. e. from red to red, being 42° 2′, and the least, viz. from violet to violet, 40° 17′, the breadth of the *fascia* or *bow*, measured across from red to violet, will be 1° 45′; and the greatest diameter of the second bow being 54° 7′, and the least 50° 57′, the breadth of the *fascia* will be 3° 10′. And hence the distance between the two will be found 8° 55′.

In these measures the sun is only esteemed a point; wherefore, as his diameter is really about 30′, so much must be added to the breadth of each *fascia* or *bow*, from red to violet, and so much must be subtracted from the distance between them.

This will leave the breadth of the *primary bow*, 2° 15′; that of the *secondary bow*, 3° 40′; and the interval between the bows 8° 25′; which dimensions, deduced by calculation, Sir Isaac Newton assures us from his own observations, agree very exactly with those found by actual mensuration in the heavens. Optics, p. 153, ed. 3.

Rainbow, *particular phenomena of the*. From this theory of the *rainbow*, all the particular phenomena of it are easily deduced: hence we see why the iris is always of the same breadth; because the intermediate degrees of refrangibility of the rays between red and violet, which are its extreme colours, are always the same. See *Apparent* Magnitude.

Secondly, Why it is more distinctly terminated on the side of the red than on that of the violet? there being no efficacious rays in the space adjoining to the red drops, i. e. to the space between the bows, whence it terminates abruptly; whereas, in the space on the side of the violet ones, there are some rays emitted to the eye, which, though too feeble to affect it strongly, yet have this effect, that they soften the violet edge insensibly, so that it is difficult to determine precisely where it terminates.

Thirdly, Why the bow shifts its situation as the eye does; and, as the popular phrase has it, *flies from those who follow it*; *and follows those that fly from it?* the coloured drops being disposed under a certain angle about the axis of vision, which is different in different places: whence also it follows, that every different spectator sees a different bow.

Fourthly, Why the bow is sometimes a larger portion of a circle, sometimes a less? its magnitude depending on the greater or less part of the surface of the cone, above the surface of the earth, at the time of its appearance; and that part being greater or less, as the line of aspect, or axis of vision, is more inclined or oblique to the surface of the earth; which inclination, or obliquity, is greater as the sun is higher: whence, also, the higher the sun, always the less the *rainbow*.

Fifthly, Why the bow never appears when the sun is above a certain altitude? the surface of the cone, wherein it should be seen, being lost in the ground, at a little distance from the eye, when the sun is above 42° high.

Sixthly, Why the bow never appears greater than a semicircle, on a plane? since be the sun never so low, and even in the horizon, the centre of the bow is still in the line

line of aſpect; which, in this caſe, runs along the earth, and is not at all raiſed above the ſurface.

Indeed, if the ſpectator be placed on a very conſiderable eminence, and the ſun in the horizon, the line of aſpect, wherein the centre of the bow is, will be notably raiſed above the horizon (conſidering the magnitude of the circle whereof the bow uſes to be a part). Nay, if the eminence be very high, and the rain near, it is poſſible the bow may be an entire circle.

Seventhly, How the bow may chance to appear inverted, i. e. the concave ſide be turned upwards? to wit, a cloud happening to intercept the rays, and prevent their ſhining on the upper part of the arch: in which caſe, only the lower part appearing, the bow will ſeem as if turned upſide down; which, probably, has been the caſe in ſeveral prodigies of this kind, related by authors.

Indeed the bow may appear inverted from another cauſe: for, if when the ſun is in 41° 46′ high, his rays fall upon the ſmooth ſurface of ſome ſpacious lake, in the middle whereof a ſpectator is placed; and if, at the ſame time, there be rain falling, to which the rays may be reflected from the lake, it will be the ſame as if the ſun ſhould ſhine below the horizon, and the line of view be extended upwards: thus the ſurface of the cone, wherein the coloured drops are to be placed, will be wholly above the ſurface of the earth.

But ſince the upper part will fall among the unbroken clouds, and only the lower part be found among the drops of rain, the arch will be inverted.

Eighthly, Why the bow ſometimes appears inclined? the accurate roundneſs of the bow depending on its great diſtance, which prevents us from judging of it exactly; if the rain, which exhibits it, chance to be much nearer, we ſhall ſee its irregularities; and if the wind, in that caſe, drive the rain ſo that the higher part be farther from the eye than the lower, the bow will appear inclined.

Ninthly, Why the legs of the *rainbow* ſometimes appear unequally diſtant? if the rain terminate on the ſide of the ſpectator, in a plane ſo inclined to the line of aſpect as to make an acute angle on the left hand, and an obtuſe angle on the right, the ſurface of the cone, which determines what drops will appear, will fall upon them in ſuch manner as that thoſe on the left hand will appear farther from the eye than thoſe on the right. For the line of aſpect being perpendicular to the plane of the bow, if you ſuppoſe two rectangular triangles, a right and left, the cathetus of each to be the line of view, and the baſe of the ſemidiameter of the bow, inclined as above; it is evident, ſince thoſe angles of the triangles, next the eye, muſt always be the ſame (viz. 43° in the inner bow), the baſis of the right hand triangle will, in this caſe, appear much longer than that of the left.

Dr. Langwith, in the Phil. Tranſ. N° 375, deſcribes a remarkable *rainbow*, in which he obſerved ſeveral ſeries of colours, which increaſed the bow to a breadth far exceeding what had been determined by calculation. The colours of the primary *rainbow*, he ſays, were as uſual; under this was an arch of green, and then alternately two arches of reddiſh purple, and two of green, and under all a faint appearance of another arch of purple. The order of the colours was, 1. Red, orange, yellow, green, light blue, deep blue, and purple. 2. Light green, dark green, and purple. 3. Green and purple. 4. Green, and faint vaniſhing purple.

M. Bouguer frequently ſaw a phenomenon of this kind, when he was upon the mountains of Peru, where the ſky is often extremely ſerene. Similar appearances have been alſo obſerved by others. Dr. Pemberton has attempted to explain them by means of the Newtonian doctrine of fits of eaſy reflexion and tranſmiſſion; but he goes upon the ſuppoſition that the differently coloured rays have their ſeparate fits, on their arrival at the ſurface of any medium, without any regard to the thickneſs of it; whereas it is plain, that, in ſuch a caſe, all kinds of rays are reflected or tranſmitted promiſcuouſly. It is moſt probable that theſe colours are formed in very minute drops of water or vapour, intermixed with the larger drops, that their formation depends upon the ſame principle with the colours of thin plates, and that they are ſimilar to thoſe of ſeveral kinds of Halos. Dr. Pemberton himſelf obſerves, that it is moſt likely, that theſe additional rings of colours are formed in the vapour of the cloud, which the air, being put in motion by the fall of the rain, may carry down along with the large drops. This, he ſays, may be the reaſon, why theſe colours appear under the upper part of the bow only, this vapour not deſcending very low. As a farther confirmation of this, theſe colours, he obſerves, are ſeen ſtrongeſt when the rain falls from very black clouds, which cauſe the fierceſt rains; by the fall of which the air will be moſt agitated. Phil. Tranſ. abr. vol. vi. p. 140. Prieſtley on Light and Colours, p. 593.

Rainbow, *lunar*. The moon, ſometimes, alſo exhibits the phenomenon of an iris, or bow, by the refraction of her rays in the drops of rain in the night-time.

Ariſtotle ſays, he was the firſt that ever obſerved it; and adds, that it never happens, i. e. is never viſible, but at the time of the full moon; her light, at other times, being too faint to affect the ſight after two refractions, and one reflexion.

The lunar iris has all the colours of the ſolar, very diſtinct and pleaſant; only faint, in compariſon of the other; both from the different intenſity of the rays, and the different diſpoſition of the medium.

In that mentioned, Philoſophical Tranſactions, N° 331. Mr. Thoreſby obſerves, the largeneſs of the arch was not ſo much leſs than that of the ſun, as the different dimenſions of their bodies, and their diſtances from the earth, ſhould ſeem to require; but as to its entireneſs, and the beauty of its colour, it was admirable. This continued about ten minutes before the interpoſition of a cloud hindered its obſervation.

Rainbow, *marine*. The *marine* or *ſea-bow* is a phenomenon ſometimes obſerved in a much agitated ſea; when the wind, ſweeping part of the tops of the waves, carries them aloft; ſo that the ſun's rays, falling upon them, are refracted, &c. as in a common ſhower, and paint the colours of the bow.

F. Bourzes, in the Philoſophical Tranſactions, obſerves, that the colours of the marine *rainbow* are leſs lively, leſs diſtinct, and of leſs duration, than thoſe of the common bow; that there are ſcarce above two colours diſtinguiſhable, a dark yellow on the ſide next the ſun, and a pale green on the oppoſite ſide.

But theſe bows exceed as to number, there being ſometimes twenty or thirty ſeen together: they appear at noon-day, and in a poſition oppoſite to that of the common bow, i. e. the concave ſide is turned upwards, as, indeed, it is neceſſary it ſhould be, from what we have ſhewn in accounting for the phenomena of the ſolar bow.

To this claſs of bows may be referred a kind of *white* or *colourleſs rainbows*, which Mentzelius, and others, affirm to have ſeen at noon-day. M. Marlotte, in his fourth Eſſai de Phyſique, ſays, theſe bows are formed in miſts, as the others are in ſhowers; and adds, that he has ſeen ſeveral, both after ſun-riſing, and in the night.

The want of colours he attributes to the ſmallneſs of the vapours which compoſe the miſt; but we ſhould rather account for it from the exceeding tenuity of the little veſiculæ of the vapour; which being, in effect, only little watry pellicles bloated with air, the rays of light undergo but little refraction in paſſing out of air into them; too little to ſeparate the differently coloured rays, &c. Hence, the rays are reflected from them, compounded as they came, that is, white.

Rohault mentions coloured *rainbows* on the graſs; formed by the refractions of the ſun's rays in the morning dew. Trait. de Phyſ.

Rainbows have been alſo produced by the reflexion of the ſun from a river; and in the Philoſophical Tranſactions, vol. I. p. 294, we have an account of a *rainbow*, which muſt have been formed by the exhalations from the city of London, when the ſun had been ſet twenty minutes, and conſequently the centre of the bow was above the horizon. The colours were the ſame as in the common *rainbow*, but fainter.

RAISE, in the *Manege*, is uſed for working. See Raising.

Raise is likewiſe uſed for placing a horſe's head right, and making him carry well, and hindering him to carry low, or to arm himſelf.

To Raise *a ſiege*. See Siege.

RAISED *airs*. See Air.

Raised *plan*. See Plan.

RAISER, in *Building*, a board ſet on-edge under the foreſide of a ſtep, a ſtair, &c. See Stair, &c.

RAISING, in the *Manege*, one of the three actions of a horſe's legs; the other two being the ſtay, and the tread. The *raiſing* or lifting up of his leg in caprioles, curves, &c. is eſteemed good, if he perform it hardily, and with eaſe; not croſſing his legs, nor carrying his feet too much out or in; yet bending his knees as much as is needful.

Raising *the land*, in *Sea-language*. See *Laying the* Land.

Raising *a purchaſe*, denotes the act of diſpoſing certain inſtruments or machines in ſuch a manner, as that, by their mutual efforts, they may produce a mechanical force ſufficient to overcome the weight, or reſiſtance, of the object to which the machinery is applied.

Raising-*pieces*, or Reason-*pieces*, in *Architecture*, are pieces that lie under the beams, and over the poſts or puncheons: thoſe lying on the brick-work are called plat-bands.

RAISINS, grapes prepared by drying them in the ſun, or in

in the air; to fit them for keeping, and for some medicinal purposes.

Of these there are various kinds: as, *raisins* of Damascus, thus called from the capital city of Syria, in the neighbourhood whereof they are cultivated. They are much used in the composition of ptisans, together with jujubes and dates; they are brought flat, and seeded, of the size of the thumb; whence it is easy judging of the extraordinary bulk of the grape, when fresh. Travellers tell us of bunches weighing twenty-five pounds. Their taste is faintish, and disagreeable.

Raisins of the sun are a kind of *raisins* brought from Spain, of a reddish or bluish colour, seeded, and very agreeable to eat.

There are various other sorts, denominated either from the place where they grow, or the kind of grape, &c. as *raisins* of Calabria, Muscadine *raisins*, &c.

The finest and best *raisins* are those called in some places Damascus and jube *raisins*. These are the fruit of the *vitis Damascena*, and are distinguishable from the others by their largeness and figure; they are flat, and wrinkled on the surface; soft and juicy within, near an inch long, and semipellucid, when held against a good light; they have a sweet, agreeable, and vinous taste; and when fresh, and growing on the bunch, are of the size and shape of the large olive.

The common *raisins* are the fruit of several species of grape, which are better or worse, according as they have been more or less carefully cured. The *raisins* of the sun, or jar-*raisins*, so called, because they are imported in jars, are all dried by the heat of the sun; and these are the sorts used in medicine.

The common way for drying grapes for *raisins* is to tie two or three bunches of them firmly together, while yet on the vine, and dip them into a hot lixivium of wood-ashes, with a little oil olive in it. This disposes them to shrink and wrinkle; and after this they are left on the vine three or four days, separated on sticks in an horizontal situation, and then dried in the sun at leisure, after being cut from the tree. Some *raisins* are dried by the heat of an oven; and the difference between these and such as are dried in the sun, is obvious; the latter are sweet and pleasant, but the former have a latent acidity with the sweetness, that renders them much less agreeable. See CURRANTS.

All the kinds of *raisins* have much the same virtues; they are nutritive and balsamic, but they are very subject to fermentation with juices of any kind; and hence, when eaten immoderately, they often bring on colics. They are allowed to be attenuant, and are given in cases where the humours are too thick and viscid, and they are said to be very good in nephritic complaints; they are, however, too familiar in our foods, to be much regarded at present as a medicine. They are an ingredient, indeed, in our pectoral decoctions, and in some other medicines of that intention; in which cases, as also in others where astringency is not required of them, they should have the stones carefully taken out. They are used in some compositions rather with an intent of taking off the nauseous taste of other ingredients, and for obtunding their acrimony, than of doing any extraordinary service themselves.

RAISIN-*brandy*, a name given by our distillers to a very clean and pure spirit, procured from *raisins* fermented only with water. Thus treated, they yield a spirit scarce at all distinguishable from some of the wine-spirits; for there are as many kinds of wine-spirits as there are of grapes. The coarser the operation of distilling is performed in this case, the nearer will be the resemblance of the wine-spirit; that is, there will be most of this flavour in the spirit, when as much as can be of the oil is thrown up with a galloping heat.

The distillers are very fond of the wine-spirit, with which they hide and disguise the taste of their nauseous malt, and other spirits; and in defect of that spirit, this of *raisins*, made in this coarse manner, will go almost as far. It is indeed surprising how extensive the use of these flavouring spirits is, ten gallons of *raisin*-spirit, or somewhat less of the wine-spirit, being often sufficient for a whole pipe of malt-spirit, to take off its native flavour, and give it an agreeable vinosity. It is no wonder, therefore, that the distillers, and ordinary rectifiers, are so fond of this, as it is a good cloak for their defects, and the imperfection of their processes.

When *raisin-brandy* is intended for common use, the fire should be kept slower and more regular in the distillation; and the spirit, though it hath less of the high flavour of the grape, will be more pleasant and more pure.

RAISIN-*wine*. See WINE.

RAITING, or RATING, the laying of hemp, flax, timber, &c. when green, in a pond, or running water, to season and dispose it for future uses.

RAKE *of a ship*, is so much over her hull as over-hangs at both ends of her keel.

That part of it which is before, is called the *rake forward on*; and that part which is at the setting on of the stern-post, is called her *rake-aft*, or *afterward-on*.

When a ship hath but a small *rake* forward-on, but is built with her stern too straight up, she is called *bluff-headed*.

RAKE *of the rudder*, is the hindermost part of it.

RAKE, among *Hunters*. See RAG.

RAKE, in *Husbandry*, *Gardening*, &c. a well-known instrument, that needs no description.

RAKE, *drill*, in *Husbandry*, an instrument invented by Mr. Vanduffel, for drilling pease, &c. This instrument, which is chiefly calculated for small inclosures of light grounds, is a sort of strong plough *rake*, with four large teeth at *a*, *a*, *b*, *b*, a little incurvated, as represented in *Tab.* II. *Agriculture*, *fig.* 18. The distance from *a* to *a*, and from *b* to *b*, is nine inches. The interval between the two inner teeth, *a* and *b*, is three feet six inches, which allows sufficient room for the hoe-plough to move in. To the piece of timber *c c*, forming the head of the *rake*, are fixed the handles *d*, and the beam *e*, to which the horse is fastened. When this instrument is drawn over a piece of land made thoroughly fine, and the man who holds it bears upon the handles, four furrows, *f*, *g*, *h*, *i*, will be formed, at the distances determined by the construction of the instrument. These distances may be accurately preserved, provided that the teeth *a*, *a* return, when the ploughman comes back after having ploughed one turn, in two of the channels formed before, marked *b*, *b*: thus all the furrows in the field will be traced with the same regularity. When the ground is thus formed into drills, the pease may be scattered by a single motion of the hand at a certain distance from one another into the channels, and then covered with the flat part of a hand-*rake*, and pressed down gently. This instrument is so simple, that any workman may easily make or repair it.

RAKE, in the *Manege*. A horse *rakes*, when being shoulder-splaid, or having strained his fore-quarter, he goes so lame, that he drags one of his fore-legs in a semicircle; which is more apparent when he trots, than when he paces.

RAKE, in *Mining*, is the same with VEIN.

RAKING *of a horse*, is the drawing his ordure with the hand out of the fundament, when he is costive, and cannot dung. In order to do this, the hand must be anointed with sallad-oil, or butter.

RAKING *a ship*, is the act of cannonading a ship on the stern or head, so that the balls shall scour the whole length of her decks, which is one of the most dangerous incidents that can happen in a naval action. This is frequently called *raking* fore and aft, being the same with what is called enfilading by engineers. See ENFILADE.

RAKING *table*, or RAKED *table*, among *Architects*, a member hollowed in the square of a pedestal, or elsewhere. See CAVETTO, and SCOTIA.

RALLUS, in the Linnæan system of *Ornithology*, a genus of GRALLÆ; the characters of which are, that the bill is slender, a little compressed, thicker at the base, and smaller towards the apex, being slightly incurvated; the nostrils are ovated, the feet cloven with four toes, and the body compressed. Of this genus there are ten species; as the RAIL, GRINETTA, &c.

RALLYING, in *War*, the reassembling, or calling together of troops, broken, routed, and put to flight.

RAM, in *Zoology*, the male of the sheep kind. See SHEEP.

RAM, in *Astronomy*. } See ARIES.
RAM, *battering*. }

RAM-*head*, on board a *Ship*, the name of a great block belonging to the fore and main halliards. It hath in it three shivers, into which the halliards are put, and at its head the tyes are reeved into a hole made there for that purpose.

RAMS-HORNS, in *Fortification*, a name given by M. Belidor to the TENAILLES.

RAMADAN, a sort of lent observed by the Mahometans, in obedience to the express command of the Koran, during which they fast the whole day, from the time the new moon first appears, till the appearance of the next new moon, with such extreme superstition, that they not only abstain from eating, drinking, and women, but dare not wash their mouth, nor even swallow their spittle, from day-break till night, or sun-set.

The men, indeed, are allowed to bathe themselves; but it is on condition they do not plunge the head under water, lest some drops enter by the mouth or ears, &c. But as for the women they are strictly forbid bathing. Some are so cautious, that they will not open their mouths to speak, lest they should breathe the air too freely. The fast is also deemed void if they kiss or touch a woman.

man. To make amends, they feast all night, till day-break; though the more rigid begin the fast again at midnight; and usually spend more in this month than in six others.

The *Ramadan* happens at different seasons of the year; and when it is in the summer, is very hard on the labourers. This month once in thirty-three years is in every season of the year, the Turkish month being lunar, and they beginning at the day they can see the moon; whereas the Jews begin their account from the day the moon makes, which is a day before the Turks.

The reason given why the month of *Ramadan* was fixed upon for this purpose is, that on that month the Koran was sent down from heaven. From this fast of *Ramadan* none are excused, except travellers and sick persons; under which latter denomination are all included whose health would be manifestly injured by keeping the fast; but then they are obliged, so soon as the impediment is removed, to fast an equal number of other days; and breaking of the fast is ordered to be expiated by giving alms to the poor.

RAMAG, a word used by some of the chemical writers to express ashes.

RAMAGE, a term used for the boughs or branches of trees. Hence,

RAMAGE-*hawk*, or *falcon*, one that is wild and coy, as having been long among the boughs, preying for itself.

All falcons retain this name till they have left the aery; being so called in May, June, July, and August. These are very rarely reclaimed. See BRANCHER, FALCON, and HAWKING.

RAMAGE *velvet*. See VELVET.

RAMAI, in *Natural History*, a name given by many old writers to bole armenic.

RAMALIS *vena*, a name given by some anatomical authors to the *vena portæ*.

RAMED, a name given by some chemical writers to rhubarb.

RAMESAN, an oriental term for a month of fasting, very religiously observed among the Turks, and otherwise called RAMADAN.

RAMEX, a word used by some as a name for a hernia, or rupture.

RAMIFICATION, the production of boughs or branches, or of figures resembling branches.

RAMIFICATIONS, in *Anatomy*, are the divisions of the arteries, veins, and nerves, arising from some common trunk. See *Tab. Anat. (Angeiol.) fig.* 1. *n.* 18. 18. *fig.* 4. *fig.* 5.

RAMIGRI, a word used by some writers as a name for colophony.

RAMINGUE, in the *Manege*. A horse gets this name that is RESTIVE, and resists or cleaves to the spurs; that is, defends himself with malice against the spurs; sometimes doubles the reins, and frequently yerks to favour his disobedience. See TICKLISH and DOUBLE.

RAMISTS, in the *History of Learning*, the disciples of Peter Ramus, who was born in a small village in Picardy, in 1515, and was one of the most famous professors of the sixteenth century. By attacking the authority of Aristotle, and attempting to substitute in the place of his logic a method of reasoning better adapted to the use of rhetoric and improvement of eloquence, he excited a terrible uproar in the Gallic schools; so that the two first books he published, viz. his Institutiones Dialecticæ, and Aristotelicæ Animadversiones, were prohibited through the kingdom of France, and the author prohibited from any more teaching philosophy. However, Ramus afterwards recovered his credit, so that he obtained the royal professorship of philosophy and eloquence at Paris, in 1551. But his enemies were inveterate in their persecution of him, so that he was obliged once again to withdraw himself from the effects of their resentment. In 1571 he settled at Paris, where he perished in the massacre on St. Bartholomew's day. The disciples of Ramus, such was the astonishing influence of their master's learning and character, prevailed so far as to banish the Peripatetic philosophy from several seminaries of learning, and to substitute in its place the system of their master, which was of a more practical kind, and better adapted to the purposes of life.

RAMMER, or beetle, an instrument used for driving down stones or piles in the ground; or for beating the earth, and making it more solid for a foundation. See BEETLE.

RAMMER *of a gun*, the *gun-stick*; a rod or staff used in charging a gun, to drive home the powder to the breech, as also the shot, and the wad, which keeps the shot from rolling out.

The rammer of a great gun is a cylinder of wood, whose diameter and length are each equal to the diameter of the shot, with a handle fixed to it. See SPUNGE.

RAMOSE *leaf*. See LEAF.

RAMPANT, in *Heraldry*, is applied to a lion, bear, leopard, or other beast, in posture of climbing, or standing upright on his hind-legs, and rearing up his fore-feet; shewing only half his face, as one eye, and one ear.

The term is French; and signifies, literally, *creeping*.

It is different from *saliant*, which denotes a posture less erect, or somewhat stooping forwards, as if making a sally.

This posture is to be specified, in blazoning, in all animals, except in the lion and gryphon; it being their natural situation.

RAMPART, or RAMPIER, in *Fortification*, a massy bank, or elevation of earth about the body of a place, to cover it from the direct fire of the enemy, and of sufficient thickness to resist the efforts of the cannon for many days; and formed into bastions, curtins, &c. See *Tab. Fort. fig.* 5. *lit. yx.*

The word is formed from the Spanish *amparo*, *defence*, or *covering*.

Upon the *rampart* the soldiers continually keep guard, and pieces of artillery are planted there for the defence of the place. Hence, to shelter the guard from the enemies shot, the outside of the *rampart* is built higher than the inside, i. e. a PARAPET is raised upon it with a PLATFORM. Hence, also, earth not being capable to be raised perpendicularly, like stone, the *rampart* is built with a talus or slope, both on the inner and outer side.

The *rampart* is sometimes lined, i. e. fortified with a stone wall within side, otherwise it has a BERME.

It is encompassed also with a moat or ditch, out of which the earth that forms the *rampart* is dug.

The height of the *rampart* should not exceed three fathom, this being sufficient to cover the houses from the battery of the cannon: neither ought its thickness to be above ten or twelve, unless more earth be taken out of the ditch than can be otherwise bestowed. See FORTIFICATION, *according to M. Vauban's first method*.

The *ramparts* of half-moons are the better for being low, that the small fire of the defendants may the better reach the bottom of the ditch; but yet they must be so high, as not to be commanded by the covert-way.

RAMPART is also used, in *Civil Architecture*, for the space left void between the wall of a city and the next houses. This is what the Romans call *pomœrium*, wherein it was forbid to build, and where they planted rows of trees, for the people to walk and amuse themselves under.

RAMPHASTOS, in *Ornithology*. See TOUCAN.

RAMPIN, in the *Manege*. See TOE.

RAMPION, *rapunculus*, or, according to Linnæus, *phyteuma*, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the empalement of the flower is of one leaf, divided into five acute parts, sitting upon the germen; the flower hath one petal, which is starry, cut into five linear segments, which are recurved; it hath five stamina, which are shorter than the petal, terminated by oblong summits; the germen, which is situated under the flower, supports a slender recurved style, crowned by an oblong, twisted, three-pointed stigma, which afterward becomes a roundish capsule, with three cells, filled with small roundish seeds. There are six species.

As these plants do not continue above two or three years, they should be sown every other year to continue the sorts; for they are plants which require little trouble to cultivate, and their flowers make a pretty variety in large gardens; therefore they may be allowed a place amongst other hardy flowers. Miller.

RAMPIONS, *crested*, a species of the LOBELIA.

RAMPIONS, *common esculent*, a species of the CAMPANULA.

RAMPIONS *with scabious heads*. See IASIONE.

RAMPS, in *Fortification*, are gentle slopes made for the cannon to be drawn up and down by, and also for the easy communication of the troops posted in a battery that is raised above the level of the ground on which it is built. The rise of these slopes is about two inches, on twelve of base, or the length of the *ramp's* base is six times the height, and this is general for the draught of carriages; but footways need not be of so gentle a slope, as a rise of one foot in three may answer the purpose; or, instead of *ramps*, stairs may be and commonly are used for the passage of the foot. The breadth of a carriage *ramp* is usually about nine or ten feet, that breadth being sufficient both for the carriage and foot-way; but those for foot-passage only need not be above three or four feet wide. *Ramps* may either rise on the side of an elevated work, or against a saliant angle of that work, or on each side of an entering angle.

RAMSONS, in *Botany*, a name given to the broad-leaved wild allium. See GARLICK.

RAMTRUT, in *Modern History*, the name of a deity worshipped by the Kanazins, a people of Indostan, where he has a celebrated temple, at Onor. The characters under which he is represented more resemble those of a monkey than of a man.

RAMULOSE *leaf*, in *Botany*. See LEAF.

RAMUS, in *Anatomy*, *&c.* a branch of a greater vessel.

RAMUS *anterior* is particularly used for a branch of the subcutaneous vein, passing under the muscles of the ulna.

Ramus posterior denotes a branch of the same vein, running near the elbow.

RAMUS, in the *Anatomy of Plants*, a name given to the first or lateral branches, which go off from the petiolum, or middle rib of a leaf. The subdivisions of these are called *surculi*; and the final divisions of these into the most minute of all, are by some called *capillamenta*: but in general, both these kinds are comprehended under the name of *surculus*.

RAN, in our *Old Writers*, is used for open or public robbery, so manifest that it cannot be denied. Ran *dicitur aperta rapina quæ negari non potest.* Lamb. 125. Leg. Canut. cap. 58. Hence it is to this day vulgarly said of one, who takes the goods of another injuriously and violently, that he has taken or snatched all he could *rap* and *ran*.

RANA, in *Zoology*. See FROG.

RANA *arborea*, the *tree-frog*, in *Zoology*. See RANUNCULUS *viridis*.

RANA *piscatrix*. See SEA-*devil*.

RANA, in *Surgery*. See RANULA.

RANCID, *rancidus*, denotes a fatty substance that is become rank, or musty; or that has contracted an ill smell by being kept close.

The word is particularly understood of old rusty bacon. It comes from the Latin *rancidus*, of *ranceo*, *to be rank*.

RANDIA, in *Botany*, a genus of the *pentandria monogynia* class. The characters are, that the empalement of the flower is permanent, of one leaf cut into five short segments at the brim; the flower is salver-shaped; and the fruit is a single-celled berry with a capsular rind. There are two species.

RANDOM-*shot*, a shot made when the muzzle of a gun is raised above the horizontal line, and is not designed to shoot directly, or point-blank.

The utmost *random* of any piece is about ten times as far as the bullet will go point-blank; and the bullet will go farthest when the piece is mounted to about forty-five degrees above the level range.

The space or distance of the *random* is reckoned from the platform to the place where the ball first grazes.

RANFORCE *ring*. See REINFORCED *ring*.

RANGE, in *Gunnery*, the path of a bullet, or the line it describes from the mouth of the piece to the point where it lodges.

If the piece be laid in a line parallel to the horizon, it is called the *right* or *level range*. See HORIZONTAL *range*.

If it be mounted to 45 degrees, the ball is said to have the *utmost range*; and so proportionably; all others between 00 degrees and 45 degrees being called the *intermediate ranges*. See CANNON, GUN, and PROJECTILE.

RANGE *of a projectile*, *Amplitude of the*. See AMPLITUDE.

RANGE, *Point-blank*. See POINT-*blank*.

RANGE, in a *Ship*, denotes a sufficient length of the cable, drawn up on the deck, before the anchor is cast loose from the bow, to let it sink to the bottom, without being interrupted, that the flukes may be forced the deeper into the ground, by the additional weight which the anchor acquires in sinking. For this reason, the *range*, which is drawn up out of the tier, ought to be equal in length to the depth of the water, where the ship anchors.

RANGER, a sworn officer of the forest, whose business it is to walk daily through his charge, to drive back the deer out of the PURLIEUS or disafforested places into the forest lands; and to present all trespasses done in his bailiwick at the next court held for the forest.

The *ranger* is made by the king's letters, and has a fee paid yearly out of the exchequer, and certain fee-deer. In the Charter de Foresta mention is made of twelve kinds of *rangers*.

RANGES, in a *Ship*, are two pieces of timber going across from side to side; one aloft on the fore-castle, a little abaft the fore-mast; and the other in the beak-head, before the wouldings of the bowsprit.

RANGING, in *War*, the disposing of troops in a condition proper for engagement, or for marching.

In *Building*, the side of a work that runs straight, without breaking into angles, is said to *range*, or *run range*.

RANGLE, in *Falconry*, is when gravel is given a hawk to bring her to her stomach.

RANINÆ *venæ*. See RANULARES.

RANK, a due order, or a place allotted a thing suitably to its nature, quality, or merit.

Kings are persons of the first *rank* on earth. In cavalcades, processions, &c. every person is to observe his *rank*.

RANK, in *Military Discipline*, denotes a series, or row of soldiers, placed side by side; a number of which *ranks* form the DEPTH of the squadron or battalion, as a number of files does the width.

When infantry is drawn up three deep, the first *rank* is called the *front rank*; the second, the *centre rank*; and the third, the REAR *rank*.

To *close the rank*, is to bring the men nearer; to *open* it, is to set them farther apart. To *double the ranks*, is to throw two into the space of one, by which the files are thinned. See DOUBLING.

RANK, in the *Army* and *Navy*, is used for the order of PRECEDENCE: thus, the admiral or commander in chief of his majesty's fleet has the *rank* of a field-marshal; admirals, with their flags on the top-mast-head, *rank* with generals of horse and foot; vice-admirals, with lieutenant-generals; rear-admirals, as major-generals; commodores, with broad pendants, as brigadier-generals; captains of post-ships, after three years from the date of their first commission, as colonels; other captains, commanding post-ships, as lieutenant-colonels; captains, not taking post, as majors; and lieutenants, as captains.

RANK, in respect of *Ships*. See RATE.

RANKS and *Files*, are the horizontal and vertical lines of soldiers, when drawn up for service, &c.

RANK *keel*, in *Ships*. See KEEL.

RANK *modus*, in *Law*. See MODUS.

RANSOM, a sum of money paid for the redemption of a person out of slavery, or for the liberty of a prisoner of war.

In our *Law Books*, *ransom* is also used for a sum paid for the pardoning of some notorious crime.

Horn makes this difference between *ransom* and *amerciament*, that *ransom* is the redemption of a corporeal punishment due to any crime.

When one is to make a fine and *ransom*, the *ransom* shall be treble the fine.

RANT, in the *Drama*, an extravagant flight of passion, overshooting nature and probability.

Lee's tragedies abound with *rants*: yet the wildest of them, it is observed, frequently meet with applause on the stage.

We find instances of *rants*, even in our severest poets. Such, e. gr. is that in the beginning of Ben Johnson's Catiline, where the parricide, in speaking to Rome, says, *I'd plow up rocks, steep as the Alps in dust; and lave the Tyrrhene waters into clouds, but I would reach thy head!*

RANULA, or RANA, in *Surgery*, a tumor under the tongue, which, like a ligature, hinders a child from speaking, or sucking.

The *ranula sub lingua*, is sometimes the same with what we popularly call being TONGUE-*tied*; a defect which is usually caused by a short frænum not permitting the tongue to perform its proper motions. Though, at other times, there is a strong concretion, or rather impostume under the tongue, which is the proper *ranula*, by the Greeks called *βάτραχιον*.

This impostume contains in a bag matter that is sometimes œdematous, at other times melicerous, scirrhous, black, or livid; in which cases the operation of cutting is dangerous: it usually grows to the magnitude of a bean or chesnut. Shaw.

RANULARES, or RANINÆ *venæ*, in *Anatomy*, two veins under the tongue, arising from the external jugular, and running on either side the linea mediana.

These veins are opened with good success in quinzies. They take their denomination from a resemblance of their state to that of little frogs, called in Latin *ranulæ*, because never out of water.

RANUNCULUS, *crowfoot*, and *lesser celandine*, in *Botany*, a genus of the *polyandria polygynia* class. Its characters are these: the empalement of the flower is composed of five oval concave leaves; the flower has five obtuse petals, which have a narrow base; each of these have an open nectarium upon their tails; it hath many stamina, terminated by oblong, erect, twin summits, and numerous germina collected in a head, having no styles, but crowned by small reflexed stigmas; the germina afterward become seeds of uncertain irregular figures, fastened to the receptacle by very short foot-stalks. There are eleven species of this genus cultivated in gardens. Miller. Linnæus enumerates thirty-nine species.

The *ranunculi* are in general hardy plants, and will thrive very well against hedges, and in shady borders, where they require no other care than to take up their roots every other year when their leaves decay, and part them, planting out the off-sets into other borders.

Beside those we have been long used to, there have been some

some of late times brought from Turky and from Persia, which produce semi-double flowers of great beauty, and annually ripening their seeds. There are numbers of varieties, or, as the gardeners call them, new flowers, continually raised from them; many of these are finely scented, and the roots, when strong, produce twenty or thirty flowers on each. The double-flowered *ranunculuses* not producing seeds, they are only to be propagated by parting their roots, taking off the off-sets, which they usually produce in great plenty.

The proper season for planting their roots is in October. The beds in which the Persian *ranunculus* roots are planted, should be made with fresh light sandy earth, at least three feet deep. Common pasture land is the best for this use, which being cut about six inches deep, with the green sward, should be laid in a heap to rot for twelve months, and often turned; to which should be added a fourth part of very rotten neat's dung, and a proper quantity of sea-sand, as the earth is lighter or stiffer: and this should be mixed eight months or a year before it is used. This mixture should be turned often, and the larger stones and clods taken out; but it must not be skreened or sifted very fine, for that has been the occasion of the loss of many roots, both of this and other plants, by cohering into a hard clod with the wet, and rotting the roots.

The beds being prepared should lie about a fortnight to settle, and then drawing straight and transverse lines over the beds, at about six inches distance each way, the plants must be planted regularly, placing the roots exactly in the middle, with their crowns upright at each cross, about two inches below the surface, and the earth carefully drawn over them with a rake. In the end of November the heads will appear, and then about half an inch depth of fresh earth should be added, which will greatly strengthen the plants. And if it should be very severe weather, when the heads appear above this second covering, they should be defended with mats laid over arched hoops. In the beginning of March the flower-stems will appear, when the beds should be cleared of weeds, and the earth between the roots stirred with the fingers; and when the flowering is past, and the leaves are decayed, the roots are to be taken up, and laid by for the October following.

These Persian *ranunculuses* may also be multiplied by seeds, which should be sown annually, and thus new varieties may every year be produced. Miller.

RANUNCULUS, *Globe*, in *Botany*. See HELLEBORE.

RANUNCULUS *viridis*, in *Zoology*, the name of an animal common in many parts of the world, and usually known by the name of the *tree-frog*, or *rana arborea*.

The creature is easily distinguished from the common frog, by its being much smaller, and of a green colour. It usually sits upon the leaves of trees and shrubs, and makes a great noise in an evening; but that is rather like the singing of a small bird than the croaking of a frog.

These creatures have been kept alive many years together in glass vessels, giving them flies and other small insects: and in winter, when these are scarce, they usually become very lean and feeble; but in summer, when they are plentiful, they will grow fat again, as if at their liberty. This is esteemed a poisonous creature. Ray.

RAPA, in *Botany*. See TURNEP.

RAPACIOUS *animals*, in the general, are such as live upon prey.

Naturalists divide birds into *rapacious*, *carnivorous*, and *frugivorous*.

The characteristic notes of *rapacious* birds, which are the ACCIPITRES of Linnæus, are, that they have a great head, and a short neck; hooked, strong, and sharp-pointed beak and talons, fitted for tearing of flesh; strong and brawny thighs, for striking down their prey; a broad thick fleshy tongue like that of man: twelve feathers in their train; and twenty-four flag-feathers in each wing. And the two appendices, or blind guts, are always very short.

Rapacious birds have a membranous stomach; and not a musculous one, or a gizzard, such as birds have which live on grain.

They are very sharp-sighted, and gather not in flocks; but, generally speaking, are solitary; though vultures will fly fifty or sixty in a company.

RAPAX, in *Ichthyology*, a name given by Schoneveldt to the *corvus piscis* of some writers, a species of chub or cyprinus, called *rappe* by the Germans, and by Gesner and others *capito fluviatilis rapax*.

RAPE, *raptus*, in *Law*, a *ravishing*; or the having carnal knowledge of a woman by force, and against her will. If the woman conceived, the law formerly esteemed it no *rape*; from an opinion, that she cannot conceive, unless she consented. But this opinion has been since questioned. Coke on Litt. lib. ii. cap. 11.

This crime, by the Jewish law, Deut. xxii. 25. was punished with death, in case the damsel was betrothed to another man; and in case she was not betrothed, then a heavy fine of fifty shekels was to be paid to the damsel's father, and she was to be the wife of the ravisher all the days of his life; without that power of divorce, which was in general permitted by the Mosaic law.

The civil law (cod. 9. tit. 13.) punishes the crime of ravishment with death and confiscation of goods; including under this crime both the offence of FORCIBLE *abduction*, and also that of forcibly dishonouring; either of which, without the other, is in that law sufficient to constitute a capital crime. And the stealing away a woman from her parents or guardians, and debauching her, is equally penal by the emperor's edict, whether she consent or is forced.

Rape was punished by the Saxon laws, particularly those of king Athelstan, with death; which was also agreeable to the old Gothic or Scandinavian constitution. Instead of this, another punishment was instituted by William the Conqueror, viz. castration and loss of eyes, which continued till after Bracton wrote in the reign of Henry III. But it was then the law, and still continues in APPEALS *of rape*, that the woman should immediately after go to the next town, and there make discovery to some credible persons of the injury she has suffered; and afterwards should acquaint the high constable of the hundred, the coroners and the sheriff, with the outrage: the time of limitation for this purpose was by Stat. Westm. 1. cap. 13. extended to forty days. But there is now no time fixed; for as it is now usually punished by indictment at the suit of the king, the maxim of law takes place, *nullum tempus occurrit regi*: however, the jury will rarely give credit to a stale complaint. During the former period it was also held for law, that the woman (by consent of the judge and her parents) might redeem the offender from the execution of his sentence, by accepting him for her husband, if he also was willing to agree to the exchange, but not otherwise.

In the 3 Edw. I. by the Stat. Westm. 1. cap. 13. the punishment of *rape* was much mitigated: the offence being reduced to a trespass, if not prosecuted by the woman within forty days; and subjecting the offender only to two years imprisonment, and a fine at the king's will. But in the 13 Edw. I. it was found necessary to make the offence of *rape* felony, by Stat. Westm. 2. cap. 34. And by 18 Eliz. cap. 7. it was made felony without benefit of clergy; as is also the abominable wickedness of carnally knowing or abusing any woman-child, under the age of ten years; in which case the consent or non-consent is immaterial, as, by reason of her tender years, she is incapable of judgment and discretion. Sir Matthew Hale is indeed of opinion, that such profligate actions committed on an infant under the age of twelve years, the AGE of female discretion by the common law, either with or without consent, amount to *rape* and felony, as well since as before the statute of queen Elizabeth; but the law has in general been held only to extend to infants under ten. A male infant, under the age of fourteen years, is presumed by law incapable of committing a *rape*; and, therefore, cannot be found guilty of it.

The civil law seems to suppose a prostitute incapable of any injuries of this kind; not allowing any punishment for violating the chastity of her who hath indeed no chastity at all, or at least hath no regard to it. But the law of England holds it to be felony to force even a concubine or harlot; because the woman may have forsaken that unlawful course of life.

As to the material facts requisite to be given in evidence and proved upon an indictment of *rape*, we shall here only observe, that the party ravished may give evidence upon oath, and is in law a competent witness; but the credibility of her testimony must be left to the jury, upon the circumstances of fact that concur in that testimony: e. g. if the witness be of good fame; if she presently discovered the offence, and made search for the offender; if the party accused fled for it; these and the like are concurring circumstances, which give greater probability to her evidence. But, on the other side, if she be of evil fame, and stands unsupported by others; if she concealed the injury for any considerable time after she had opportunity to complain; if the place, where the fact was alledged to be committed, was where it was possible she might have been heard, and she made no outcry; these and the like circumstances carry a strong, but not conclusive presumption, that her testimony is false or feigned. Moreover, if the *rape* be charged to be committed on an infant under twelve years of age, she may still be a competent witness, if she hath sense and under-

underſtanding to know the nature and obligation of an oath; and, even if ſhe hath not, it is thought by Sir Matthew Hale that ſhe ought to be heard, without oath, to give the court information; though that alone will not be ſufficient to convict the offender. And, indeed, it is now ſettled, that infants of any age are to be heard; and if they have any idea of an oath, to be alſo ſworn: it being found by experience, that infants of very tender years often give the cleareſt and trueſt teſtimony. Blackſt. Com. book iv. p. 210, &c.

The civilians make another kind of *rape*, called *ſubornatio*, *rape of ſubornation*, or *ſeduction*; which is when a perſon ſeduces or entices a maid to uncleanneſs, or even marriage, and that by gentle means; provided there be a conſiderable diſparity in age or condition between the parties. In this caſe, the father and mother intend their action reciprocally for the *crimen raptus*, or *ſubornationis*.

The French laws make no difference between the *rape* of violence and that of ſolicitation, or ſubornation; they make both capital. This kind of *rape* our laws call RAVISHMENT.

RAPE of the foreſt, is a treſpaſs committed in the foreſt by violence.

This is mentioned in the laws of Henry I. as one of the crimes cognizable alone by the king.

RAPE is alſo a name given to the wood or ſtalks of the cluſters of grapes, when dried, and freed from the fruit.

The *rape* is uſed in making vinegar, ſerving to heat and ſour the wine: but it is firſt put into a place to ſour itſelf, before it be caſt into the vinegar veſſel; to which end, preſently after the vintage, it is carefully put up in barrels, leſt it take air, otherwiſe it would heat itſelf, and be ſpoiled. There is no other way of keeping *rape*, hitherto diſcovered, but to fill the veſſel, wherein it is contained, with wine or vinegar.

RAPE, *rapa*, is alſo uſed for a part or diviſion of a county; ſignifying as much as a *hundred*.

Though ſometimes *rape* is taken for a diviſion containing ſeveral hundreds. Thus Suſſex is divided into ſix *rapes*, viz. thoſe of Chicheſter, Arundel, Bramber, Lewes, Pevenſey, and Haſtings: every one of which, beſides its hundreds, has a caſtle, a river, and foreſt belonging to it.

The like parts in other counties are called *tithings*, *lathes*, or *wapentakes*.

RAPE, in *Botany*. See NAPUS.

RAPE, *Broom*, *orobanche*, in *Botany*, a genus of the *didynamia angioſpermia* claſs. The empalement is divided into two ſegments, the flower is ringent, and the fruit is a ſingle-celled, double-valved, polyſpermous capſule, with a glandule at the baſe of the germen. There are ſix ſpecies.

It frequently grows to the roots of geniſta or broom, whence it is called *rapum geniſtæ*, or *broom rape*: it is alſo found among corn. The herb preſerved, or its ſyrup, is of excellent uſe in ſplenetic or hypochondriac diſorders; and an ointment prepared of it with ſwine's fat, is good for hard and ſcirrhous tumors.

RAPE, *Wild*, in *Botany*. See MUSTARD.

RAPHA, or RAPHE, in *Anatomy*, the ridge or line which runs along the under ſide of the penis, and reaching from the frænum to the anus, divides the ſcrotum and perinæum in two.

This line is not uſually cut in the grand operation of cutting for the ſtone, becauſe it is both harder than the reſt of the ſkin thereabouts, and alſo becauſe you muſt then cut upon the interſtices of the muſcles, which will make the re-union the more difficult.

RAPHANIS, in *Botany*, the name by which the Attics, among the Greeks, called the radiſh; for the word *raphanos*, or *raphanus*, with them, does not expreſs the radiſh, but the cabbage. The Greeks of all other places concurred in calling the radiſh *raphanos*, and the cabbage *crambe*; and it is owing to this that we have many authors who confound together theſe two plants, though ſo very unlike one another in appearance and uſe. It is generally to be underſtood, that wherever Theophraſtus mentions the word *raphanos*, he means by it the cabbage; and the ſame being obſerved, in regard to all the other Attic writers, the whole danger of confuſion and error will ceaſe.

RAPHANISTRUM, *white flowered charlock, with jointed pods*, in *Botany*, a ſpecies of the *raphanus* or RADISH.

RAPHANUS, in *Botany*. See RADISH.

RAPHIDIA, in the *Hiſtory of Inſects*, the name of a genus of four-winged flies, of the NEUROPTERA kind.

The head of the *raphidia* is of a horny ſubſtance, depreſſed, and furniſhed with two teeth and four feelers. This genus has alſo three ſtemmata, deflexed wings, and a cylindric thorax. The tail is armed with a weapon of a ſlender form, ſharp, horny, and ſimple, not bifid at the extremity. There are three ſpecies.

RAPIER, properly denotes a long, ordinary, old-faſhioned cutting ſword, ſuch as thoſe worn by the common ſoldiers.

The word is formed from the French *rapiere*, of the Greek ῥαπίζειν, *cædere*, *to ſmite*, or *ſtrike*.

In this ſenſe do the French ſtill uſe the term; ſo that among them, to *take the rapier*, is to enter in the army.

RAPIER, in a modern ſenſe among us, uſually denotes a ſmall ſword, as contradiſtinguiſhed from a back-ſword, or cutting ſword.

RAPINE, *rapina*, in *Law*. To take a thing in private, againſt the owner's will, is properly *theft*; but to take it openly, or by violence, is *rapine*, or ROBBERY.

RAPISTRUM, in *Botany*, a ſpecies of the *ſea-cabbage* or CRAMBE.

RAPPE, in *Ichthyology*, a name given by ſome to the *capito fluviatilis rapax* of Geſner, more frequently known by the name of the CORVUS *piſcis*.

RAPSODIST. See RHAPSODIST.

RAPSODY. See RHAPSODY.

RAPTU *hæredis*, an ancient writ which lies for the taking away an heir, holding in ſocage; of which there are two ſorts; one when the heir is married, the other when not. See RAVISHMENT.

RAPTURE, *raptura*, an extaſy, or tranſport of mind. See EXTASY, ENTHUSIASM, RHAPSODY, &c.

RAPUNCULUS, in *Botany*. See RAMPION.

RAPUNTIUM, in *Botany*. See CARDINAL *flower*.

RARE, in *Phyſics*, denotes a body that is very porous, whoſe parts are at a great diſtance from one another, and which contains but little matter under a great deal of bulk.

In this ſenſe *rare* ſtands oppoſed to *denſe*.

The corpuſcular philoſophers, viz. the Epicureans, Gaſſendiſts, Newtonians, &c. aſſert that bodies are *rarer* ſome than others, in virtue of a greater quantity of vacuity included between their pores. The Carteſians hold, that a greater *rarity* only conſiſts in a greater quantity of materia ſubtilis included in the pores. Laſtly, the Peripatetics contend, that *rarity* is a new quality ſuperinduced upon a body, without any dependence, either on vacuity, or ſubtile matter.

RAREFACTION, *rarefactio*, in *Phyſics*, the act whereby a body is rendered *rare*; that is, is brought to poſſeſs more room, or appear under a larger bulk, without acceſſion of any new matter.

Rarefaction is oppoſed to CONDENSATION.

Our more accurate writers reſtrain *rarefaction* to that expanſion of a maſs into a larger bulk, which is effected by means of heat. All expanſion from other cauſes they call *dilatation*.

The Carteſians deny any ſuch thing as abſolute *rarefaction*: extenſion, with them, conſtituting the eſſence of matter, they are obliged to hold all extenſion equally full.

Hence, they make *rarefaction* to be no other than an acceſſion of freſh, ſubtile, and inſenſible matter, which, entering the parts of the body, ſenſibly diſtends them. See this diſproved under VACUUM.

It is by *rarefaction* that gunpowder has its effect; and to the ſame principle alſo we owe our æolipiles, thermometers, &c.

The degree to which the air is *rarefiable* exceeds all imagination: Merſennus, long ago, by means of an intenſe heat, found that air might be rarefied, ſo as to poſſeſs more than 70 times its former ſpace.

Mr. Boyle afterwards found, that air, by its own elaſticity, and without the help of any heat, would dilate itſelf ſo as to take up 9 times its former ſpace; then 31 times; then 60; then 150: at length, by many degrees, he found it would reach to 8000 times, then 10000, and finally to 13679.

Such is the *rarefaction* of common air, from its own principle of elaſticity, and without any previous condenſation; but if it be compreſſed, the ſame author found its greateſt ſpace when moſt rarefied, is to its leaſt when moſt condenſed, as 55000 to 1.

Such an immenſe *rarefaction*, Sir Iſaac Newton ſhews, is inconceivable on any other principle than that of a repelling force inherent in the air, whereby its particles mutually fly from one another.

This repelling force, he obſerves, is much more conſiderable in air than in other bodies, as being generated from the moſt fixt bodies, and that with much difficulty, and ſcarce without fermentation; thoſe particles being always found to fly each other with the moſt force, which, when in contact, cohere the moſt firmly. See AIR.

The members of the French Royal Academy have beſtowed

ſtowed much attention on the different *rarefactions*, or rather the different *rarities* of the air at different heights. M. Mariotte eſtabliſhed this as a principle, from experiments, that the different *rarefactions*, or condenſations, of the air, follow the proportion of the weights wherewith it is preſſed.

Hence, ſuppoſing the mercury in the level of the ſea ſuſpended to twenty-eight inches, which is the weight of the whole atmoſphere; and that ſixty feet height of air are equivalent to a line, or one twelfth of an inch of mercury; ſo that the barometer, at the height of ſixty feet from the ſea, would fall a line; it is eaſy finding what height of air would be equal to a ſecond, or any other line of mercury: for as twenty-eight inches of mercury one twelfth are to twenty-eight inches, ſo is the height of ſixty feet of air to a fourth term, which is the height of air correſponding to a ſecond line of mercury.

And after the ſame manner may the height of air correſponding to each line be found; which will make a geometrical progreſſion, the ſum whereof will be the whole *height of the* ATMOSPHERE; and, of conſequence, a certain part of that ſum will be the height of a mountain, at whoſe top the barometer ſhall have ſunk a certain quantity.

Meſſ. Caſſini and Maraldi, upon meaſuring the heights of ſeveral mountains, found, that this progreſſion of M. Mariotte was defective; that it always gave the height of the mountains, and conſequently the *rarefactions*, leſs than they really were: and from ſome farther experiments M. Amontons found, that the principle will only hold in the mean *rarefactions*, not in the extremes.

RAREFACTIVES, *rarefacientia*, in *Medicine*, remedies which open and enlarge the pores of the ſkin, to give an eaſy vent to the matter of perſpiration.

Such are aniſe, mallows, pellitory, chamomile flowers, linſeed, &c.

RARUM, *non-ſpiſſum*, in the *Ancient Muſic*. See APYCNON.

RASA, a word uſed by ſome authors to expreſs RESIN of any kind.

RASAKETI, a name given by ſome of the chemiſts to *æs uſtum*, or burnt copper.

RASANT, or RAZANT *flank*, in *Fortification*. See FLANK.

The defence of the baſtion is *raſant*.

RASANT *fire*. See FIRE.

RASCETA, a word uſed by the Arabian phyſicians to expreſs the wriſt or ankle.

RASE, *raſarium*, in our old writers, ſeems to have been a meaſure of corn now diſuſed: toll ſhall be taken by the *raſe*, and not by the heap or cantel.

RASE, in the *Manege*. To *raſe*, or glance upon the ground, called in French *razer le tapis*, is to gallop near the ground, as our Engliſh horſes do.

RASH, in *Clock Work*. See RATCH.

RASH, in *Medicine*, an eruption or efflorescence upon the ſkin, thrown out in fevers, or ſurfeits.

RASILIS *ærugo*, in the *Materia Medica of the Ancients*, one of their kinds of verdigriſe. It was prepared in the following manner: they ſet ſome ſharp vinegar over the fire in a ſtrong earthen veſſel, and covered it with a braſs pot inverted, well cleaned, and without any vent-hole. And after ſome time the veſſels were to be ſeparated, and the verdigriſe, which was found concreted on the inſide of the braſs pot, was ſcraped off, and put up for uſe.

RASP, a coarſe ſort of FILE.

RASPATORY, a ſurgeon's inſtrument, wherewith they ſcrape foul, carious, or fractured bones.

RASPBERRY *buſh*, *rubus*, in *Botany*, a genus of the *icoſandria polygynia* claſs. Its characters are theſe: the flower has a permanent empalement of one leaf, which is cut into five ſpear-ſhaped ſegments; it hath five roundiſh petals, which are inſerted in the empalement, and a great number of ſtamina which are alſo inſerted in the empalement, terminated by roundiſh compreſſed ſummits with a great number of germina, having ſmall hair-like ſtyles on their ſides, crowned by permanent ſtigmas. The germina afterward become berries, compoſed of many acini, collected into a head, each having one cell, in which is contained one oblong ſeed. Miller enumerates ten, and Linnæus fourteen ſpecies.

The *raſpberry* buſh is often found wild in ſome of our northern counties, but is cultivated in gardens throughout England for the delicacy of its fruit. There are two or three varieties of this, one with a red, and the other a white fruit, and the third generally produces two crops of fruit annually; the firſt ripens in July, and the ſecond in October, but thoſe of the latter ſeaſon have ſeldom much flavour.

These ſhrubs ſend up great plenty of ſuckers from their roots, and are very eaſily propagated by them; though ſuch plants as are raiſed by layers are preferable. They ſhould be taken up in October, and before they are replanted their fibres ſhould be ſhortened; but the buds, which are at a ſmall diſtance from the ſtem of the plant, muſt not be cut off, becauſe theſe produce new ſhoots the next ſummer. They ſhould be planted two feet aſunder, and ſet in rows, which ſhould be four or five feet diſtant from one another. The ſoil they thrive in beſt is a freſh ſtrong loam. The time for dreſſing them is in October, when all the old wood which produced fruit the preceding ſummer ſhould be cut down below the ſurface of the ground, and the young ſhoots ſhortened to about two feet in length. The ſpaces between the rows ſhould then alſo be dug up, and ſome other rotten dung buried in them. In the ſummer they muſt be kept clean from weeds, and once in three or four years there ſhould be new beds made, and the old ones deſtroyed, for they ſeldom bear well after that time. Miller.

For the dietetic and medicinal uſe of *raſpberries*, ſee SUMMER *fruits*.

RASPECON, in *Ichthyology*, a name given by ſome to the URANOSCOPE, or ſtar-gazer.

RASPHUYS, or RASP-*houſe*, a celebrated work-houſe, or houſe of correction, at Amſterdam. See WORK-*houſe*.

RASSE *coronde*, in *Natural Hiſtory*, a name given by the Ceyloneſe to a peculiarly fine kind of cinnamon, which is the bark of a tree, growing no where but in that iſland. The name they give it ſignifies *ſharp* or *biting cinnamon*. This choice kind is exported annually, in conſiderable quantity, by the Dutch Eaſt India company, who prohibit the mixing any other kind of cinnamon with it, under a very ſevere penalty. Phil. Tranſ. N° 409.

RASTIS, a word uſed by ſome chemical writers as a name for TIN.

RASTOL, or RASOES, a name given by ſome of the chemical writers to copper.

RASTUL, a word uſed by ſome of the chemical writers to expreſs ſalt in general.

RASURA, a word uſed by the pharmaceutic writers to expreſs the ſhavings of woods, or other hard ſubſtances, to make them readily yield their virtues by decoction. Phyſicians alſo uſe it to expreſs the corroſion of acrid humours.

RASURE *in a deed*, in *Law*. See DEED.

RAT, in *Zoology*. See MUS.

RAT, in the *Sea Language*, is uſed to expreſs a part of the ſea, where there are rapid and dangerous currents, or counter-currents.

RAT-*gooſe*, in *Ornithology*, the name of a ſmall ſpecies of wild gooſe, common in ſome of the northern counties of England. See GOOSE.

RAT, *Mountain*. See MARMOTTE.

RAT, *Muſk*. See MUS.

RAT, *Norway* or *brown*, *mus Norwegicus*, is a *rat* whoſe head, back and ſides are of a light brown colour, mixed with tawny and aſh colour; the breaſt and belly are of a dirty white; the feet naked, and of a dirty fleſh colour; the fore-feet are furniſhed with four toes, and a claw inſtead of the fifth: the length from the noſe to the tail is nine inches, and the tail is of the ſame length. This animal is more ſtrongly made than the common black *rat* or MUS *rattus*.

This ſpecies of *rat*, which is the ſame animal that is called in the Eaſt Indies a *bandicote*, now inhabits moſt parts of Europe; whither it is ſuppoſed to have been brought within the laſt century, in ſome of the Indian ſhips. It came into Great Britain about fifty years ago, but has not been known in the neighbourhood of Paris above half that time. They ſwarm in Peterſburg, and are known in Pruſſia; but have not yet reached the oppoſite ſide of the Baltic, as Linnæus takes no notice of this ſpecies. Theſe were probably the *mures Caſpii* of Ælian, which made periodical viſits in great multitudes to the countries bordering on the Caſpian ſea, ſwimming boldly over the rivers, holding by one another's tail. Ælian. Hiſt. An. 17. cap. 17. They burrow, like the water *rat*, on the ſides of ponds and ditches; ſwim and dive well; live on grain and fruits, but will deſtroy poultry and game; increaſe faſt, producing from fourteen to eighteen young at a time; are very bold and fierce; will turn, when cloſely purſued, and faſten on the ſtick or hand that offers to ſtrike them: they have deſtroyed the common black *rat* in moſt places: they inhabit the fields part of the year, but migrate in great numbers into houſes, and do much miſchief. The bite of theſe *rats* is not only ſevere, but dangerous; the wound being immediately attended with a great ſwelling, and healing very ſlowly. Pennant.

RAT, *Norway*, is alfo a name given by fome writers to the *lemming* or *fable* MOUSE.

RAT-*tails*, in the *Manege*. See ARRETS.

RAT-*tailed*. A horfe is thus called that has no hair upon his tail.

RAT-*tailed worms*, in *Natural Hiftory*, a fpecies of fly-worms with long tails, refembling thofe of *rats*, whence they have their name. They are of feveral fizes, and found alfo in different places, but all change into two-winged flies, having very much the refemblance of bees, and commonly called *bee-flies*. See *Tab. of Infects*, N° 49. See DRONE-*fly*.

RATA *pro* RATA. See PRO *rata*.

Onerando pro RATA *portionis*. See ONERANDO.

RATAFIA, a fine fpirituous liquor, prepared from the kernels, &c. of feveral kinds of fruits, particularly of cherries and apricots.

Ratafia of cherries is prepared by bruifing the cherries, and putting them into a veffel wherein brandy has been long kept; then adding to them the kernels of cherries, with ftrawberries, fugar, cinnamon, white pepper, nutmegs, cloves; and to twenty pound of cherries, ten quarts of brandy. The veffel is left open ten or twelve days, and then ftopped clofe for two months before it be tapped.

Ratafia of apricots is prepared two ways; viz. either by boiling the apricots in white wine, adding to the liquor an equal quantity of brandy, with fugar, cinnamon, mace, and the kernels of apricots; infufing the whole for eight or ten days; then ftraining the liquor, and putting it up for ufe: or elfe by infufing the apricots, cut in pieces, in brandy, for a day or two; paffing it through a ftraining-bag, and then putting in the ufual ingredients.

RATCH, or RASH, in *Clock Work*, a fort of wheel having twelve fangs, which ferve to lift up the detents every hour, and to make the clock ftrike.

RATCHETS, in a *Watch*, are the fmall teeth at the bottom of the fufee, or barrel, which ftop it in winding up.

RATE, a ftandard or proportion, by which either the quantity or value of a thing is adjufted.

The *rates* of bread, &c. in London, are fixed by authority. See *Affife of* BREAD.

The *rate* of intereft, as now eftablifhed by law in England, is five per cent. The *rate* of intereft in Italy, is three per cent. In Sweden, fix. In France, five. In Spain, ten. In Barbadoes, ten. In Ireland, twelve. In Turky, twenty. Low *rates* of intereft advance the prices of land.

The *rates* or *fares* of hackney-coachmen, chairmen, and watermen, are fixed by act of parliament. See *Hackney* COACHES, &c.

The *rates* of exchange, factorfhip, &c. are different. See EXCHANGE, FACTORAGE, &c.

RATES, *Books of*. See BOOK and CUSTOMS.

RATE, *Poor*. See POOR.

RATE-*tythe*. When fheep, or other cattle, are kept in a parifh for lefs time than a year, the owner muft pay tythe for them *pro rata*, according to the cuftom of the place.

RATE *of a fhip of war*, is its order, degree, or diftinction, as to magnitude, burden, force, &c.

The Britifh fleet is accordingly diftributed into fix *rates*, exclufive of the inferior veffels that ufually attend on naval armaments; as floops of war, armed fhips, bomb-ketches, fire-fhips, and cutters or fchooners commanded by lieutenants.

Ships of the *firft rate* mount a hundred cannon, having forty-two pounders on the lower deck, twenty-four pounders on the middle deck, twelve pounders on the upper deck, and fix pounders on the quarter-deck and forecaftle. They are manned with eight hundred and fifty men, including their officers, feamen, marines and fervants.

In general, the fhips of every *rate*, befides the captain, have the mafter, the boatfwain, the gunner, the chaplain, the purfer, the furgeon, and the carpenter; all of whom, except the chaplain, have their mates or affiftants, in which are comprehended the fail-maker, the mafter at arms, the armourer, the captain's clerk, the gunfmith, &c. The number of other officers is always in proportion to the *rate* of the fhip. Thus a *firft rate* has fix lieutenants, fix mafter's mates, twenty-four midfhipmen, and five furgeon's mates, who are confidered as gentlemen; befides the following petty officers: quarter-mafters, and their mates, fourteen; boatfwain's mates and yeomen, eight; gunner's mates and affiftants, fix; quarter-gunners, twenty-five; carpenter's mates, two, befides fourteen affiftants; with one fteward, and fteward's mate to the purfer.

Ships of the *fecond rate* carry ninety guns upon three decks; of which thofe on the lower battery are thirty-two pounders; thofe on the middle, eighteen pounders; on the upper deck, twelve pounders; and thofe on the quarter-deck, fix pounders, which ufually amount to four or fix. Their complement of men is feven hundred and fifty, in which there are fix lieutenants, four mafter's mates, twenty-four midfhipmen, and four furgeon's mates, fourteen quarter-mafters and their mates, eight boatfwain's mates and yeomen, fix gunner's mates and yeomen, with twenty-two quarter-gunners, two carpenter's mates, with ten affiftants, and one fteward and fteward's mate.

Ships of the *third rate* carry from fixty-four to eighty cannon, which are thirty-two, eighteen, and nine pounders. The eighty gun fhips, however, begin to lofe their repute, and to give way to thofe of feventy-four, feventy, &c. which have only two whole batteries; whereas the former have three, with twenty-eight guns planted on each; the cannon of their upper deck being the fame as thofe on the quarter-deck and forecaftle of the latter, which are nine pounders. The complement in a feventy-four is fix hundred and fifty; and in a fixty-four, five hundred men: having, in peace, four lieutenants; but in war, five; and when an admiral is aboard, fix. They have three mafter's mates, fixteen midfhipmen, three furgeon's mates, ten quarter-mafters and their mates, fix boatfwain's mates and yeomen, four gunner's mates and yeomen, with eighteen quarter-gunners, one carpenter's mate, with eight affiftants, and one fteward and fteward's mate under the purfer.

Ships of the *fourth rate* mount from fixty to fifty guns, upon two decks and the quarter-deck. The lower tier is compofed of twenty-four pounders; the upper tier, of twelve pounders; and the cannon on the quarter-deck and forecaftle are fix pounders. The complement of a fifty gun fhip is three hundred and fifty men, in which there are three lieutenants, two mafter's mates, ten midfhipmen, two furgeon's mates, eight quarter-mafters and their mates, four boatfwain's mates and yeomen, one gunner's mate and one yeoman, with twelve quarter-gunners, one carpenter's mate and fix affiftants, and a fteward and fteward's mate.

All veffels of war, under the *fourth rate*, are ufually comprehended under the general name of frigates, and never appear in the line of battle. They are divided into the *fifth* and *fixth rates*, the former mounting from forty to thirty-two guns, and the latter from twenty-eight to twenty. The largeft of the *fifth rate* have two decks of cannon, the lower battery being of eighteen pounders, and that of the upper deck of nine pounders; but thofe of thirty-fix and thirty-two guns have only one complete deck of guns, mounting twelve pounders, befides the quarter-deck and forecaftle, which carry fix pounders. The complement of a fhip of forty-four guns is two hundred and eighty men; and that of a frigate of thirty-fix guns, two hundred and forty men. The firft has three, and the fecond two lieutenants; and both have two mafter's mates, fix midfhipmen, two furgeon's mates, fix quarter-mafters and their mates, two boatfwain's mates and one yeoman, one gunner's mate and one yeoman, with ten or eleven quarter-gunners, and one purfer's fteward.

Frigates of the *fixth rate* carry nine pounders; thofe of twenty-eight guns having three pounders on their quarter-deck, with two hundred men for their complement; and thofe of twenty-four, one hundred and fixty men: the former has two lieutenants; the latter, one; and both have two mafter's mates, four midfhipmen, one furgeon's mate, four quarter-mafters and their mates, one boatfwain's mate and one yeoman, one gunner's mate and one yeoman, with fix or feven quarter-gunners, and one purfer's fteward.

The floops of war carry from eighteen to eight cannon; the largeft of which have fix pounders; and the fmalleft, viz. thofe of eight and ten guns, four pounders. Their officers are generally the fame as in the *fixth rates*, with little variation; and their complements of men are from one hundred and twenty to fixty, in proportion to their force or magnitude.

Bomb-veffels are on the fame eftablifhment as floops; but fire-fhips and hofpital fhips are on that of *fifth rates*.

If the dimenfions of all fhips of the fame *rate* were equal, it would be eafy to collect them into one point of view in a table; but as there is no invariable rule for the general dimenfions, we fhall felect thofe of fome of the lateft conftruction in each *rate*.

Rates.

Rates.		Guns.	Length of the keel. Feet.	Length of the keel. Inches.	Length of the lower deck. Feet.	Length of the lower deck. Inches.	Extreme breadth. Feet.	Extreme breadth. Inches.	Depth in the hold. Feet.	Depth in the hold. Inches.	Burthen in tons.
1ſt *rate*,	Victory	100	151	3	186	—	51	10	21	6	2162
2d *rate*,	Barfleur	90	144	$\frac{3}{4}$	177	6	50	—	21	-	1934
3d *rate*,	Arrogant	74	138	—	168	3	47	4	19	9	1644
	Europa	64	139	—	159	—	44	4	19	4	1366
4th *rate*,	Saliſbury	50	120	8	146	—	40	4	17	4	1044
5th *rate*,	Phœnix	44	116	11	140	9	37	$1\frac{3}{8}$	16	-	856
	Venus	36	106	3	128	$4\frac{1}{2}$	35	9	12	4	722
6th *rate*,	Carysfort	28	97	$3\frac{1}{2}$	118	4	33	8	10	6	586
	Dolphin	24	93	4	113	—	32	1	11	-	511
Sloop,	Nautilus	16	80	$7\frac{5}{8}$	98	—	27	2	12	8	316

Ships of the *ſecond rate*, and thoſe of the *third*, which have three decks, carry their ſails remarkably well, and labour very little at ſea. They are excellent in a general action, or in cannonading a fortreſs. Thoſe of the *third rate*, which have two tiers, are fit for the line of battle, to lead the convoys and ſquadrons of ſhips of war in action; and in general, to ſuit the different exigencies of the naval ſervice. The *fourth rates* may be employed on the ſame occaſions as the *third rates*; and may be alſo deſtined for ſervice among the foreign colonies, or on expeditions of great diſtance; ſince theſe veſſels are uſually excellent for keeping and ſuſtaining the ſea. Veſſels of the *fifth rate* are too weak to ſuffer the ſhock of a line of battle; but they may be deſtined to lead the convoys of merchant ſhips, to protect the commerce in the colonies, to cruize in different ſtations, to accompany ſquadrons, or be ſent expreſs with neceſſary intelligence and orders. The ſame may be obſerved of the *ſixth rates*.

The frigates which mount from twenty-eight to thirty-eight guns upon one deck, with the quarter-deck, are extremely proper for cruizing againſt privateers, or for ſhort expeditions, being light, long, and uſually excellent ſailers. Falconer.

RATEEN, or Ratten, in *Commerce*, a thick woollen ſtuff, quilled, woven on a loom with four treddles, like ſerges, and other ſtuffs, that have the whale or quilling.

There are ſome *rateens* dreſſed and prepared like cloths; others left ſimply in the hair; and others where the hair, or knap, is frized.

Rateens are chiefly manufactured in France, Holland, and Italy; and are moſtly uſed in linings.

The frize is a ſort of coarſe *rateen*; and the drugget is a *rateen* half linen, half woollen.

RATEL, in *Zoology*, a name given by the Hottentots to an animal inhabiting the Cape of Good Hope, which lives on honey, and is a great enemy to bees. It has a blunt black noſe; no external ears, but a ſmall rim round the orifice; a rough tongue, ſhort legs, very long claws, which are ſtraight like thoſe of a badger, and guttered beneath: the colour of the forehead, crown, and whole upper part of the body is a cinereous grey; the cheeks, and ſpace round the ears, throat, breaſt, belly and limbs, black; from each ear to the tail extends along the ſides a duſky line, leaving beneath another of grey. Its length from the noſe to the tail is forty inches, and the tail twelve.

This animal preys in the evening, and aſcends to the higheſt parts of the deſert to look about; and will then put one foot before its eyes, to prevent the dazzling of the ſun. The reaſon of its going to an eminence is for the ſake of ſeeing or hearing the honey-guide cuckoo, or cuculus *indicator*, which lives on bees, and, as it were, conducts it to their haunts. Pennant.

RATIFICATION, *ratificatio*, an act, approving of, and confirming, ſomething done by another, in our name.

A treaty of peace is never ſecure till the princes have *ratified* it.

All procuration imports a promiſe of ratifying and approving what is done by the proxy, or procurator: after treating with a procurator, agent, factor, &c. a *ratification* is frequently neceſſary on the part of his principal.

Ratification is particularly uſed, in our *Laws*, for the confirmation of a clerk in a benefice, prebend, &c. formerly given him by the biſhop, &c. where the right of patronage is doubted to be in the king.

Ratification is alſo uſed for an act confirming ſomething we ourſelves have done in our own name.

An execution, by a major, of an act paſſed in his minority, is equivalent to a *ratification*.

RATING. See Rating.

RATIO, in *Arithmetic and Geometry*, that relation of homogeneous things which determines the quantity of one from the quantity of another, without the intervention of any third.

The homogeneous things thus compared, we call *the terms of the ratio*; particularly, that referred to the other, we call the *antecedent*; and that to which the other is referred, the *conſequent*.

Thus, when we conſider one quantity, by comparing it with another, to ſee what magnitude it has in compariſon of that other; the magnitude this quantity is found to have in compariſon thereof, is called the *ratio, reaſon*, of this quantity to that; which ſome think would be better expreſſed by the word *compariſon*.

Euclid defines *ratio* by the *habitude or relation of magnitudes of the ſame kind in reſpect of quantity*. But this definition is found defective; there being other relations of magnitudes which are conſtant, yet are not included in the number of *ratios*: ſuch as that of the right ſine, to the ſine of the complement in trigonometry.

Hobbes endeavoured to mend Euclid's definition of *ratio*, but unhappily: for in defining it, as he does, by *the relation of magnitude to magnitude*, his definition has not only the ſame defect with Euclid's, in not determining the particular kind of relation; but it has this farther, that it does not expreſs the kind of magnitudes which may have a *ratio* to one another.

Ratio is frequenttly confounded with *proportion*; yet ought they, by all means, to be diſtinguiſhed, as very different things. Proportion, in effect, is an identity or ſimilitude of two *ratios*.

Thus, if the quantity A be triple the quantity B; the relation of A to B, i. e. of 3 to 1, is called the *ratio* of A to B. If two other quantities, C, D, have the ſame *ratio* to one another that A and B have, i. e. be triple one another, this ſameneſs of *ratio* conſtitutes *proportion*; and the four quantities A : B : : C : D, are in proportion, or proportional to one another.

So that *ratio* exiſts between two terms; proportion requires more.

There is a twofold compariſon of numbers: by the firſt, we find how much they differ, i. e. by how many units the antecedent exceeds, or comes ſhort of, the conſequent.

This difference is called the *arithmetical ratio*, or exponent of the arithmetical relation or habitude of the two numbers. Thus, if 5 and 7 be compared, their arithmetical *ratio* is 2.

By the ſecond compariſon, we find how oft the antecedent contains, or is contained in, the conſequent; i. e. as before, what part of the greater is equal to the leſs.

This *ratio*, being common to all quantity, may be called *ratio* in the general, or by way of eminence: but it is uſually called *geometrical ratio*; becauſe expreſſed, in geometry, by a line, though it cannot be expreſſed by any number.

Wolfius better diſtinguiſhes *ratio*, with regard to quantity in the general, into *rational* and *irrational*.

Rational Ratio is that which is as one rational number to another; *e. gr.* as 3 to 4.

Irrational Ratio is that which cannot be expreſſed by rational numbers.

Suppoſe, for an illuſtration, two quantities, A and B; and let A be leſs than B. If A be ſubtracted as often as it can be, from B, e. gr. five times, there will either be left nothing, or ſomething. In the former caſe, A will be to B, as 1 to 5; that is, A is contained in B five times; or $A = \frac{1}{5} B$. The *ratio* here, therefore, is *rational*.

In the latter caſe, either there is ſome part, which, being ſubtracted certain times from A, e. gr. three times, and likewiſe from B, e. gr. 7 times, leaves nothing; or there is no ſuch part: if the former, A will be to B as 3 to 7, or $A = \frac{3}{7} B$; and therefore the *ratio, rational*. If the latter, the *ratio* of A to B, i. e. what part A is of B, cannot be expreſſed by rational numbers; nor any other way than either by lines, or by infinite approaching ſeries.

The *exponent of a geometrical ratio* is the quotient ariſing from the diviſion of the antecedent by the conſequent. Thus the exponent of the *ratio* of 3 to 2, is $1\frac{1}{2}$; that of the *ratio* of 2 to 3, is $\frac{2}{3}$: for when the leſs term is the antecedent, the *ratio*, or rather the *exponent*, is a proper fraction. Hence the fraction $\frac{3}{4} = 3 : 4$. If the conſequent be unity, the antecedent itſelf is the exponent of the *ratio*: thus the exponent of 4 to 1, is 4. See Exponent.

If two quantities be compared, without the intervention of a third; either the one is equal to the other, or unequal: hence, the *ratio* is either of *equality* or *inequality*.

If the terms of the *ratio* be unequal, either the leſs is referred to the greater, or the greater to the leſs: that is, either the leſs to the greater, as a part to the whole; or the greater to the leſs, as the whole to a part. The *ratio*, therefore, determines how often the leſs is contained in the greater, or how often the greater contains the leſs; i. e. to what part of the greater the leſs is equal.

The

The *ratio* which the greater term has to the leſs, *e. gr.* 6 to 3, is called the *ratio of the greater inequality*: the *ratio* which the leſs term has to the greater, *e. gr.* 3 to 6, is called the *ratio of the leſſer inequality*.

This *ratio* correſponds to quantity in the general, or is admitted of by all kinds of quantities, diſcrete or continued, commenſurable or incommenſurable: but diſcrete quantity, or number, does likewiſe admit of another *ratio*.

If the leſs term of a *ratio* be an aliquot part of the greater, the *ratio* of the greater inequality is ſaid to be *multiplex*, multiple; and the *ratio* of the leſs inequality, *ſubmultiple*.

Particularly, in the firſt caſe, if the exponent be 2, the *ratio* is called *duple*; if 3, *triple*, &c. In the ſecond caſe, if the exponent be $\frac{1}{2}$, the *ratio* is called *ſubduple*, if $\frac{1}{3}$, *ſubtriple*, &c.

E. gr. 6 to 2 is in a triple *ratio*; becauſe 6 contains two thrice. On the contrary, 2 to 6 is a ſubtriple *ratio*; becauſe 2 is the third part of 6.

If the greater term contains the leſs once, and over and above an aliquot part of the ſame; the *ratio* of the greater inequality is called *ſuper-particularis*, and the *ratio* of the leſs *ſub-ſuperparticularis*.

Particularly, in the firſt caſe, if the exponent be $1\frac{1}{2}$, it is called *ſeſquialterate*; if $3\frac{1}{3}$, *ſeſquitertial*, &c. In the other, if the exponent be $\frac{2}{3}$, the *ratio* is called *ſubſeſquialterate*; if $\frac{3}{4}$, *ſubſeſquitertial*, &c.

E. gr. 3 to 2 is in a *ſeſquialterate ratio*; 2 to 3 in a *ſubſeſquialterate*.

If the greater term contains the leſs once, and over and above ſeveral aliquot parts; the *ratio* of the greater inequality is called *ſuperpartiens*; that of the leſs inequality is *ſubſuperpartiens*.

Particularly, in the former caſe, if the exponent be $1\frac{2}{3}$, the *ratio* is called *ſuperbipartiens tertias*; if the exponent be $1\frac{3}{4}$ *ſupertripartiens quartas*; if $1\frac{4}{7}$, *ſuperquadripartiens ſeptimas*, &c. In the latter caſe, if the exponent be $\frac{3}{5}$, the *ratio* is called *ſubſuperbipartiens tertias*; if $\frac{4}{7}$, *ſubſupertripartiens quartas*; if $\frac{7}{11}$, *ſubſuperquadripartiens ſeptimas*.

E. gr. the *ratio* of 5 to 3 is *ſuperbipartiens tertias*; that of 3 to 5 *ſubſuperbipartiens tertias*.

If the greater term contains the leſs ſeveral times, and, beſides, ſome quota part of the ſame; the *ratio* of the greater inequality is called *multiplex ſuperparticularis*; and the *ratio* of the leſs inequality, *ſubmultiplex ſubſuperparticularis*.

Particularly, in the former caſe, if the exponent be $2\frac{1}{2}$, the *ratio* is called *dupla ſeſquialtera*; if $3\frac{1}{4}$, *tripla ſeſquiquarta*, &c. In the latter caſe, if the exponent be $\frac{2}{5}$, the *ratio* is called *ſubdupla ſubſeſquialtera*; if $\frac{4}{13}$, *ſubtripla ſubſeſquiquarta*, &c.

E. gr. the *ratio* of 16 to 5 is *tripla ſeſquiquinta*; that of 4 to 9, *ſubdupla ſubſeſquiquarta*.

Laſtly, if the greater term contains the leſs ſeveral times, and ſeveral aliquot parts thereof beſides; the *ratio* of the greater inequality is called *multiplex ſuperpartiens*; that of the leſs inequality, *ſubmultiplex ſubſuperpartiens*.

Particularly, in the former caſe, if the exponent be $\frac{2}{3}$, the *ratio* is called *dupla ſuperbipartiens tertias*; if $3\frac{4}{7}$, *tripla ſuperbiquadripartiens ſeptimas*, &c. In the latter caſe, if the exponent be $\frac{3}{8}$, the *ratio* is called *ſubdupla ſubſuperbipartiens tertias*; if $\frac{7}{25}$, *ſubtripla ſubſuperquadripartiens ſeptimas*, &c.

E. gr. the *ratio* of 25 to 7 is *tripla ſuperquadripartiens ſeptimas*; that of 3 to 8, *ſubdupla ſubſuperbipartiens tertias*.

Theſe are the various kinds of *rational ratios*; the names whereof, though they occur but rarely among the modern writers (for in lieu thereof they uſe the ſmalleſt terms of the *ratios*, e. gr. for *duple* 2 : 1, for *ſeſquialterate* 3 : 2); yet are they abſolutely neceſſary to ſuch as converſe with the ancient authors.

Clavius obſerves, that the exponents denominate the *ratios of* the greater inequality, both in deed and name; but the *ratios* of the leſs inequality, only in deed, not in name: but it is eaſy finding the name in theſe, if you divide the denominator of the exponent by the numerator.

E. gr. if the exponent be $\frac{5}{8}$, then $5 : 8 = 1\frac{3}{5}$; whence it appears, the *ratio* is called *ſubſupertripartiens quintas*.

As to the names of *irrational ratios*, nobody ever attempted them.

Same, or *identic ratios*, are thoſe whoſe antecedents have an equal reſpect to their conſequents, i. e. whoſe antecedents, divided by their conſequents, give equal exponents. And hence may the identity of irrational *ratios* be conceived.

Hence, firſt, as oft as the antecedent of one *ratio* contains its conſequent, or whatever part it contains of its conſequent, ſo oft, or ſuch part of the other conſequent does the antecedent of the other *ratio* contain: or, as oft as the antecedent of the one is contained in its conſequent, ſo oft is the antecedent of the other contained in its conſequent.

Secondly, if A be to B as C to D; then will A : B :: C : D; or A : B = C : D. The former of which is the uſual manner of repreſenting the identity of *ratios*, the latter is that of the excellent Wolfius; which has the advantage of the former, in that the middle character =, which denotes the ſameneſs, is ſcientifical; i. e. it expreſſes the relation of the thing repreſented, which the other : : does not. See CHARACTER.

Two *equal ratios*, e. gr. B : C = D : E, we have already obſerved, do conſtitute a proportion: of two *unequal ratios*, e. gr. A : B and C : D, we call A : B the *greater*, if A : B ⌉ C : D; on the contrary, we call C : D the *leſſer*, if C : D ⌉ A : B.

Hence, we expreſs a greater and leſs *ratio* thus: *E. gr.* 6 to 3 has a greater *ratio* than 5 to 4; for, 6 : 3 (= 2) ⌉ 5 : 4 (= $1\frac{1}{4}$). But 3 to 6 has a leſs *ratio* than 4 to 5; for $\frac{3}{6} = \frac{1}{2}$ L $\frac{4}{5}$. Compound *ratio* is that made up of two or more other *ratios*, which the factum of the antecedents of two or more *ratios* has to the factum of their conſequents. Thus 6 to 72 is in a *ratio* compounded of 2 to 6, and 3 to 12.

Particularly, if it be compounded of two, it is called a *duplicate ratio*; if of three, a *triplicate*; if of four, *quadruplicate*; and, in the general, *multiplicate*, if it be compoſed of ſeveral ſimilar *ratios*. Thus 48 : 3 is a *duplicate ratio* of 4 : 1 and 12 : 3.

Additive RATIO. See ADDITIVE.

Alternate RATIO. See ALTERNATE.

Ordinate RATIO. See ORDINATE.

RATIO *modularis*. See LOGARITHM.

Denominator of a RATIO. See DENOMINATOR.

Properties of RATIOS.—Firſt, *ratios* ſimilar to the ſame third are alſo ſimilar to one another; and thoſe ſimilar to ſimilar, are alſo ſimilar to one another.

Secondly, if A : B = C : D; then, inverſely, B : A = D : C.

Thirdly, ſimilar parts P and p have the ſame *ratio* to wholes T and t; and if the wholes have the ſame *ratio*, the parts are ſimilar.

Fourthly, if A : B = C : D; then, alternately, A : C = B : D. And hence, if B = D : A = C; hence, alſo, if A : B = C : D; and A : F = C : G; we ſhall have B : F = D : G. Hence, again, if A : B = C : D; and F : A = G : C; we ſhall have F : B = G : D.

Fifthly, thoſe things which have the ſame *ratio* to the ſame, or equal things, are equal; and *vice verſa*.

Sixthly, if you multiply any quantities, as A and B, by the ſame or equal quantities; their products D and E will be to each other as A and B.

Seventhly, if you divide any quantities, as A and B, by the ſame or equal quantities, the quotients F and G will be to each other as A and B.

Eighthly, the exponent of a compound *ratio* is equal to the factum of the exponents of the ſimple *ratios*.

Ninthly, if you divide either the antecedents or the conſequents of ſimilar *ratios*, A : B, and C : D, by the ſame E; in the former caſe, the quotients F and G will have the ſame *ratio* to the conſequents B and D; in the latter, the antecedents A and B will have the ſame *ratio* to the quotients H and K.

Tenthly, if there be ſeveral quantities in the ſame continued *ratio* A, B, C, D, E, &c. the firſt A, is to the third C, in a *duplicate ratio*; to the fourth D, in a *triplicate*; to the fifth E, in a *quadruplicate*, &c. *ratio* of the *ratio* of the firſt A, to the ſecond B.

Eleventhly, if there be any ſeries of quantities in the ſame *ratio*, A, B, C, D, E, F, &c. the *ratio* of the firſt A to the laſt F is compounded of the intermediate *ratios* A : B, B : C, C : D, D : E, E : F, &c.

Twelfthly, *ratios* compounded of *ratios*, whereof each is equal to each other, are equal among themſelves. Thus the *ratios* 90 : 3 = 960 : 32, compounded of 6 : 3 = 4 : 2, and 3 : 1 = 12 : 4; and 5 : 1 = 20 : 4.

For other properties of ſimilar or equal *ratios*, ſee PROPORTION.

When a *ratio* is given, expreſſed in large numbers, it is often very uſeful to find an approximated value of it in ſmaller numbers. Mr. Huygens and Dr. Wallis have given methods for this purpoſe, but that of Mr. Cotes being the moſt convenient in practice, we ſhall here inſert it. Suppoſe the *ratio* 2,718281828459, &c. to 1, or of 1 to 0,367879441171, &c. were propoſed to be reduced to ſmaller terms, ſo that no leſs numbers ſhall expreſs it nearer. The operation may be as follows:

RAT

Ratios greater than the true.			*Ratios* leſs than the true.		
1	0	× 2	0	1	
2	1		2	0	
3	1	× 2	2	1	× 1
8	3		6	2	
11	4	× 1	8	3	× 1
76	28		11	4	
87	32	× 1	19	7	× 4
106	39		87	32	
193	71	× 6	106	39	× 1
1264	465		1158	426	
1457	536	× 1	1264	465	× 1
21768	8008		1457	536	
23225	8544	× 1	2721	1001	× 8
25946	9545		23225	8544	
49171	18089	× 10	25946	9545	× 1
&c.	&c.		&c.	&c.	

Divide the greater term 2,71828, &c. by the leſſer 1, or the greater 1 by the leſſer 0,367879, &c. and again the leſſer by the remainder, and this again by the laſt remainder, and ſo on (ſee Common *Meaſure* and Fraction): the quotients ariſing will be 2, 1, 2, 1, 1, 4, 1, 1, 6, 1, 1, 8, 1, 1, 10, 1, 1, 12, 1, 1, 14, 1, 1, 16, 1, 1, &c. Theſe being found, two rows or columns of *ratios* muſt be made, the one containing the *ratios* greater than the true, and the other ſuch as are leſs; beginning the computation from the *ratios* 1 to 0, 0 to 1, which are moſt remote from the truth, and from thence proceeding to ſuch as approach continually nearer. Let then the terms 1 and 0 be multiplied by the firſt quotient 2, and write the products 2 and 0, under the terms 0 and 1; then adding, there will ariſe the *ratio* 2 + 0 to 0 + 1, or 2 to 1. Multiply the terms of this *ratio* by the ſecond quotient 1, and add the products 2 and 1 to the terms 1 and 0 in the firſt column, there will ariſe the *ratio* 2 + 1 to 1 + 0, or 3 to 1. The terms of this *ratio* being multiplied by the third quotient 2, and the products 6 and 2 added to the terms 2 and 1 of the ſecond column, will give the *ratio* 8 to 3. Theſe multiplied by the fourth quotient 1, and the products 8 and 3 added to the preceding terms 3 and 1 in the firſt column, will give the *ratio* 11 to 4. Whoſe terms multiplied by the fifth quotient 1, and the products 11 and 4 added to the *ratio* 8 to 3 give the *ratio* 19 to 7; whoſe terms being multiplied by the 6th quotient 4, and the products 76 and 28 being added to 11 and 4, give the *ratio* 87 to 32. And thus we may go as far as we think fit; proceeding alternately from one column to the other. This being done, we ſhall find *ratios* greater than the true, to be 3 to 1, 11 to 4, 87 to 32, 193 to 71, 1457 to 536, 23225 to 8544, 49171 to 18089, &c. And the *ratios* leſs than the true will be 2 to 1, 8 to 3, 19 to 7, 106 to 39, 1264 to 465, 2721 to 1001, 25946 to 9545, &c. And theſe are the principal and primary *ratios*, which continually approximate to the *ratio* propoſed.

But if the whole ſeries of *ratios* greater than the true be required, ſo that no *ratios* greater than the true, and expreſſed in ſmaller terms, ſhall come nearer the truth; and if alſo the whole ſeries of *ratios* leſs than the true, and ſuch, as that no *ratios* leſs than the true, and expreſſed in ſmaller terms, ſhall approach nearer to the truth, be deſired, then other ſecondary *ratios* muſt be inſerted between the primary already found. And theſe take place where the quotients ſurpaſs unity. They may be found by changing the multiplication by the quotient as above directed, into a continual addition of the terms, as often as there are units in the quotient. Thus, the firſt quotient being 2, the terms 1 and 0 are to be twice added to the terms 0 and 1. The ſums will give the *ratios* 1 to 1 and 2 to 1. Theſe laſt terms 2 and 1, the ſecond quotient being 1, muſt be once added to the terms 1 and 0, and the ſums will give the *ratio* 3 to 1. Alſo the terms 3 and 1, the third quotient being 2, are to be twice added to the terms 2 and 1; and the ſums will give the *ratios* 5 to 2, 8 to 3. Theſe laſt terms 8 and 3, the fourth quotient being 1, muſt be once added to the terms 3 and 1, and the ſums will give the *ratio* 11 to 4. Theſe terms 11 and 4, the fifth quotient being 1, muſt be once added to the terms 8 and 3, and the ſums will give the *ratio* 19 to 7. Laſtly, theſe terms 19 and 7, the ſixth quotient being 4, muſt be four times added to the terms 11 and 4. The ſums will give the *ratios* 30 to 11, 49 to 18, 68 to 25, 87 to 32. And ſo we may proceed as far as we think fit. The operation being performed, we ſhall find the whole ſeries of *ratios* greater than the truth to be 1 to 0, 3 to 1, 11 to 4, 30 to 11, 49 to 18, 68 to 25, 87 to 32, &c. and in like manner, the whole ſeries of *ratios* leſs than the truth will be 0 to 1, 1 to 1, 5 to 2, 8 to 3, 19 to 7, &c.

Example of the operation.

Ratios greater than the true.			*Ratios* leſs than the true.		
1	0	× 2	0	1	
2	1		1	0	
3	1	× 2	1	1	
8	3		1	0	
11	4	× 1	2	1	× 1
19	7		3	1	
30	11		5	2	
19	7		3	1	
49	18		8	3	× 1
19	7		11	4	
68	25		19	7	× 4
19	7		87	32	
87	32	× 1	106	39	× 1
&c.	&c.		&c.	&c.	

See Cotes, Harmonia Menſurarum, p. 7, &c.

The ingenious author has not given the demonſtration of his method; but Dr. Saunderſon has ſhewn the reaſon of it, in the fifth book of his Algebra, to which we refer the reader.

By means of this method, the approximated values of the *ratio* of the circumference to the diameter of a circle may be found in ſmall terms. Thus the proportion of the circumference of a circle to its Diameter, being according to Van Ceulen's numbers, when abridged, 314159265359 to 100000000000; dividing the greater by the leſſer, &c. as before directed, we ſhall find the quotients 3, 7, 15 and 1, which will give the following *ratios*, 3 to 1, 22 to 7, 333 to 106, and 355 to 113: the ſecond is that of Archimedes, and the fourth that of Adrian Metius.

This proportion of 113 to 355 approaches very near the truth, only erring by 2 in the ſeventh decimal, when reduced to that form, for 355 : 113 : : 3,1415929 : 1, whereas it ought to be 3,1415927 to 1. To remember this proportion the better, we may make uſe of the following artifice. Take the three firſt odd numbers 1, 3, 5, and write each twice, thus 113355, then will the three firſt figures of this number 113, be the diameter, and the three laſt, 355 the circumference. Theſe approximations are of uſe in many practical parts of mathematics. See inſtances thereof in Huygens's Deſcriptio automati Planetarii among his Poſthumous Works, tom. ii. p. 174. edit. Amſt. 1728, where he deſcribes his method, and demonſtrates it. In muſic, it is the foundation of the different ſchemes of geometrical temperatures. See Temperament.

After all, if we conſider each of the above ſeries ſeparately, we ſhall always find, that the *ratios* expreſſed by larger numbers approach nearer the truth, than thoſe expreſſed by ſmaller numbers. But if we compare the *ratios* of one ſeries with thoſe of the other, it may often happen, that a *ratio* expreſſed in ſmaller numbers ſhall approach nearer the truth, than another expreſſed by greater numbers. For inſtance, let the *ratio* 519529 to 328612, expreſſing the proportion of the ſemi-tone major to the ſemi-tone minor in muſic, be propoſed: The quotients, according to the method here deſcribed, will be 1. 1. 1. 2. 1. &c. Hence the *ratios* greater than the true will be 2 : 1, 5 : 3, &c. and the *ratios* leſs than the true will be 1 : 1, 3 : 2, 11 : 7, &c. Now the *ratio* 3 : 2, though expreſſed in ſmaller numbers, approaches nearer to the truth than 5 : 3; for the exponent of the propoſed *ratio* $\frac{519529}{328612} = 1{,}581$, and $\frac{3}{2} = 1{,}5$; alſo $\frac{5}{3} = 1{,}667$. Hence the exponent of the *ratio* 5 to 3 will exceed the truth by $0{,}086 = 1{,}667 - 1{,}581$; but the exponent of the *ratio* 3 to 2 will be deficient by no more than $0.081 = 1.581 - 1.5$. Again, ſuppoſe the *ratio* of 927707238 to 659826661, expreſſing the chance of the dealer at whiſt having four trumps, were propoſed: dividing the firſt term by the ſecond, &c. the quotients will be 1. 2. 2. 6. 3. 1. 1. 4. &c. which gives the *ratios* greater than the true 2 : 1, 3 : 2, 10 : 7, or 17 : 12, &c. and leſs than the true 1 : 1, 4 : 3, 7 : 5, 52 : 37, &c. And here the *ratio* 7 : 5, though expreſſed in ſmaller numbers, approaches nearer to the truth, than either 10 : 7, or 17 : 12, as will eaſily appear by reducing their exponents to decimals. But no inconveniences of this kind can happen, if we content ourſelves with the principal and primary *ratios*, they being alernately greater and leſs, and continually approaching nearer to the truth. See Whist.

RATIO, in our *Law-writers*, is uſed for a judgment given in a cauſe.

Hence, *ponere ad rationem* is to cite one to appear in judgment, Walſingh. 88.

RATIO *ſtatus*, RAGIONE *di ſtato*. See REASON *of State*.

RATIO *victus*. See VICTUS.

RATIOCINATION, the act of REASONING.

RATION, or RATIAN, in *the Army*, a pittance or proportion of ammunition, bread, drink, or forage, diſtributed to each ſoldier for his daily ſubſiſtence.

Some write the word *racion*, and borrow it from the Spaniſh *racion*; but they both come from the Latin *ratio*. In ſome parts they call it a *reaſon*.

The horſe have *rations* of hay and oats, when they cannot go out to FORRAGE.

The *rations* of bread are regulated by weight.—The ordinary *ration* of a foot-ſoldier is a pound and half of bread per day. The officers have ſeveral *rations*, according to their quality, and the number of attendants that they are obliged to keep.

When the *ration* is augmented on occaſions of rejoicing, it is called a *double ration*.

The ſhips crews have alſo their *rations* or allowances of biſcuit, water, &c. proportioned according to their ſtock. The uſual *ration* at ſea, particularly among the Portugueſe, &c. is, a pound and half of biſcuit, a pint of wine, and a quart of freſh water per day; and each month an arrobe, or thirty-one pounds of ſalt meat, with ſome dried fiſh and onions.

RATIONABILES *expenſæ*, *reaſonable expences*. The commons in parliament, as well as the proctors of the clergy in convocation, were anciently allowed *rationabiles expenſas*; that is, ſuch allowance as the king, conſidering the prices of all things, ſhall judge meet to impoſe on the people to pay for the ſubſiſtence of their repreſentatives.

This, in the 17th of Edward II. was ſettled at ten groats per day for knights, and five for burgeſſes: afterwards, four ſhillings a day for knights, and two ſhillings for burgeſſes; which was then deemed an ample retribution, both for expences, for labour, attendance, neglect of their own affairs, &c. See BURGESS and KNIGHTS *of the ſhire*.

RATIONABILI *parte bonorum*, a writ which lies for the wife, againſt the executors of her huſband, denying her the third part of her huſband's goods, after debts and funeral expences paid.

Fitzherbert quotes Magna Charta, and Glanville, to prove, that, by the common law of England, the goods of the deceaſed, his debts firſt paid, ſhould be divided into three parts; whereof his wife is to have one, his children a ſecond, and the executors a third; adding, that this writ lies as well for the children, &c. as the wife. Such is the general law of Scotland at this day. And whatever may have been the cuſtom of late years, in many parts of the kingdom, or however it was introduced in derogation of the old common law, the ancient method continued in uſe in the province of York, the principality of Wales, and the city of London, till very modern times; when, in order to favour the power of bequeathing, and to reduce the whole kingdom to the ſame ſtandard, three ſtatutes have been provided; the one 4 and 5 W. and M. c. 2. explained by 2 and 3 Ann. c. 5, for the province of York; another, 7 and 8 W. III. c. 38. for Wales; and a third, 11 Geo. I. c. 18. for London; (*ſee* CUSTOM *of London*) whereby it is enacted, that perſons within thoſe diſtricts, and liable to thoſe cuſtoms, may, if they think proper, diſpoſe of all their perſonal eſtates by will; and the claims of the widow, children, and other relations, to the contrary, are totally barred. Thus is the old common law now utterly aboliſhed throughout all the kingdom of England, and a man may deviſe the whole of his chattels as freely as he formerly could his third part or moiety. Blackſt. Com. b. ii. p. 493.

Recto de RATIONABILI *parte*. See RECTO.

RATIONABILIBUS *diviſis* is a writ that lies where two lords have ſignories joining together, for him that finds his waſte encroached upon, within the memory of man, againſt the encroacher, thereby to rectify the bounds of the ſignories: in which reſpect, Fitzherbert ſays, it is of the nature of a writ of right.

RATIONABILIS *dos*, in *Law*, a third part of ſuch lands and tenements as the huſband was ſeiſed of at the time of the eſpouſals, with which his wife was formerly endowed, by the common law, if no ſpecific dotation was made at the church porch. See DOWER and JOINTURE.

RATIONAL, *reaſonable*. See REASON.

RATIONAL *fable*. See FABLE.

RATIONAL *fraction*, or *broken number*, is that equal to ſome aliquot part or parts of unity. See FRACTION.

RATIONAL or *true horizon* is that whoſe plane is conceived to paſs through the centre of the earth; and which therefore divides the globe into two equal portions, or hemiſpheres. See HORIZON.

It is called the *rational horizon*, becauſe only conceived by the underſtanding; in oppoſition to the *ſenſible* or apparent horizon, which is viſible to the eye.

RATIONAL *integer*, or *whole number*, is that whereof unity is an aliquot part. See NUMBER and ALIQUOT *part*.

RATIONAL *mixt number* is that conſiſting of an integer, and a fraction; or of unity, and a broken number.

Commenſurable quantities are defined by being one to another as one *rational* number to another.

For unity is an aliquot part of a *rational number*; and a fraction has ſome aliquot part common with unity: in things, therefore, that are as a *rational* to a *rational* number, either the one is an aliquot part of the other, or there is ſome common aliquot part of both; therefore they are COMMENSURABLE.

Hence, if a *rational* number be divided by a *rational*, the quotient is always a *rational*.

RATIONAL *phyſicians*. See PHYSICIAN.

RATIONAL *quantity* or *number*, a quantity or number commenſurable to unity.

Suppoſing any quantity to be 1, there are infinite other quantities, ſome whereof are commenſurable to it, either ſimply, or in power: theſe Euclid calls *rational quantities*. The reſt, that are incommenſurable to 1, he calls *irrational quantities*, or *ſurds*.

RATIONAL *ratio*. See RATIO.

RATIONAL *ſoul*. See SOUL.

RATIONALE, a ſolution or account of the principles of ſome opinion, action, hypotheſis, phenomenon, or the like. Hence,

RATIONALE is alſo the title of ſeveral books. The moſt conſiderable is the *Rationale of Divine Offices*, by Guil. Durandus, a celebrated ſchool-divine, biſhop of Mende, finiſhed in 1286, as he himſelf tells us. See PRINTING.

RATIONALE alſo denotes an ancient ſacerdotal veſtment, worn by the high-prieſt under the old law; and called by the Hebrews, חשן *hhoſchen*; by the Greeks, λογιον; by the Latins, *rationale* and *pectorale*; and by the Engliſh tranſlators, *breaſt-plate*.

The *rationale* was a piece of embroidered ſtuff worn on the breaſt, about a ſpan ſquare. Du-Cange deſcribes it as a double ſquare of four colours, interwoven with gold, and ſet with twelve precious ſtones in four rows, whereon were engraven the names of the twelve tribes, and faſtened to the ſhoulder by two chains and two hooks of gold. The form of the *rationale* was preſcribed by God himſelf, Exod. xxviii. 15—29.

A *rationale* appears alſo to have been anciently worn by the biſhops under the new law. But authors are in doubt about its form; ſome will have it reſemble that of the Jews; others take it to be only the PALLIUM.

RATIONALIS, an officer mentioned in ſeveral ancient inſcriptions.

Lampridius, in the life of Alex. Severus, uſes *rationalis* as ſynonymous with PROCURATOR.

The *rationales* were intendants or ſurveyors under the emperors; and though Lampridius pretends they were firſt eſtabliſhed by Severus, it is evident there were ſome under Auguſtus.

RATIONARIUM, among the Romans, a book which contained the accounts of the empire. It was otherwiſe called *breviarium*. See BREVIARY.

RATIONIS *Ens*. See ENS.

RATIONIS *Diſtinctio*. See DISTINCTIO.

RATIONIS *os*, in *Anatomy*, the bone of the forehead, otherwiſe called OS *frontis*.

RATLINES, or, as the ſeamen call them, RATLINS, or RATTLINGS, are certain ſmall lines which traverſe the ſhrouds of a ſhip horizontally, at regular diſtances from the deck upwards, and forming a variety of ladders, whereby to climb to any of the maſt-heads, or deſcend from them. Hence the term ſeems to be derived from *rath*, an obſolete word, ſignifying *a hill*. In order to prevent the *rattling* from ſlipping down by the weight of the ſailors, they are firmly attached by a knot, called a *clove-hitch*, to all the ſhrouds, except the foremoſt or aftmoſt; where one of the ends, being fitted with an eyeſplice, is previouſly faſtened with twine-thread or packthread. Falconer.

RATTAN *canes*. See CANE.

RATTEN. See RATEEN.

RATTLE, among the *Ancients*, a muſical inſtrument called by the Romans *crepitaculum*.

Mr. Malcolm takes the tintinnabulum, crotalum, and ſiſtrum, to have been only ſo many different kinds of *rattles*.

The invention of the *rattle* is aſcribed to the famous mathematician

thematician Archytas; whence Aristotle calls it, *Αρχυτου πλαταγη*, Archytas's *rattle*. Diogenianus adds the occasion of the invention; viz. that Archytas having children, he contrived this instrument to prevent their tumbling over things about the house. So that, how much soever some instruments have changed their uses, the *rattle*, we are sure, has preserved its original application.

RATTLE *grass*. See LOUSE *wort*.

RATTLE *net*. See WOLF *net*.

RATTLE-*snake*. See SNAKE.

RATTLE-*snake root*, *senegaw*. See MILK *wort*.

RATTLE-*snake root*, Dr. Witts's, a species of *Prenanthes*. See *Wild* LETTUCE.

RATTLE-*snake weed*, a species of *Eryngium*. See ERYNGO.

Yellow RATTLE, in *Botany*, a species of *Rhinanthus*. See *Yellow* LOUSE-WORT.

RATZE, the name of a small coin, struck at Friburgh, &c. nearly of the same value with the BLARE, which, in France, is worth two sols and a denier.

RAUCA *avis*, in *Ornithology*, the name of a bird described by Nieremberg, as common about the lakes and rivers of America, and of the king-fisher kind, but nearly as large as a duck, and black on the crown, and white on the breast and belly. Its neck is naturally very long in proportion to its body, yet it can occasionally contract and shorten it in a very wonderful manner. It is a native of Mexico, and is esteemed very good for the table. Mr. Ray has placed this among the birds, the accounts of which he is distrustful of.

RAVEL-*bread*, a sort of *bread*, called also *blackwhytlof*, as being of a middle fineness betwixt white and brown.

RAVELIN, in *Fortification*, was anciently a flat bastion, placed in the middle of a curtin.

RAVELIN is now a detached work, composed only of two faces, which make a saliant angle, without and sometimes with flanks; and raised before the curtin on the counterscarp of the place; serving to cover it and the joining flanks from the direct fire of an enemy.

A *ravelin* is a triangular work resembling the point of a bastion, with the flanks cut off. See *Tab.* II. *Fortif. fig.* 21. N° 2. *lit.* i i i. Its use before a curtin is, to cover the opposite flanks of the two next bastions. It is used also to cover a bridge or a gate, and is always placed without the moat.

What the engineers call a *ravelin*, the soldiers generally call a DEMI-LUNE, or half-moon.

There are also *double ravelins*, which serve to defend each other. They are said to be *double* when they are joined by a curtin.

Ravelins, or *half-moons*, are constructed by setting off 50 toises from the re-entring angle O of the counterscrap (*Tab.* VIII. *Fortification. fig.* 55.) on the capital OL of the *ravelin*, or on the perpendicular produced, and from the point L drawing lines to the shoulders A, B; whose parts L M, L N terminated by the counterscarp will be the faces M O, O N, the semi-gorges of the *ravelin* required. Others will have the faces of the *ravelin* to terminate on those of the bastions within three toises of the shoulders, in which case the *ravelins* cover the flanks better than the others. The ditch before the *ravelin* is 12 toises, and its counterscarp parallel to the faces of the *ravelins*, and made in a circular arc before the saliant angle. When the *ravelins* are made with flanks, the faces should terminate those of the bastions, at least 5 toises from the shoulders. These flanks are made by setting off 10 toises from the extremities of the faces, and from the points thus determined, the flanks are drawn parallel to the capital of the *ravelin*. When redoubts or *keeps* are formed in the *ravelin*, this is done by setting off 16 toises from the extremities of the faces, on the semi-gorges from N to b, and from M to a; and from the points b, a, the faces are drawn parallel to those of the *ravelin*: the ditch before this redoubt is 6 toises, and its counterscarp parallel to the faces. This work should be covered in the faces by a wall, a foot or two thick, furnished with loop-holes for the musketry to fire through; and it will serve to secure a retreat for the troops who defend the *ravelin*; they may thus prevent the enemy from making a lodgment in the outward part of the *ravelin*, or at least greatly obstruct their attempts for this purpose. Nor can they be drove from this place, until the enemy has erected a battery, and brought cannon on the *ravelin* to batter the redoubt. When the COUNTERGUARD is placed before the *ravelin*, 40 toises are set off on the capital of the *ravelin* from its saliant angle to the saliant angle of the counterguard, and 10 on the counterscarp of the ditch. For the construction of crown-works before the *ravelin*, see HORN-*work*. Within the *ravelin* are constructed a rampart of about 16 or 20 yards and a parapet of about 6 yards: ramps are also annexed in the slope of the rampart, and a barbet, when it is proper, is constructed in the saliant angle. In wet ditches, where the troops pass from the town to the *ravelin* in boats, it is proper to make, in the gorge of the *ravelin*, a kind of harbour, where the boats may be covered from the fire of the enemy. In dry fosses, there should be ramps or stairs in the gorge of the *ravelin*, to preserve a free communication, if the bridges should be broken down by the enemy's shot. The celebrated general Coehorn, in the *ravelins* which he built at Bergen-op-zoom, contrived a very good defence for the covered way before the faces of the bastions, by making retired flanks in the breasts of the *ravelin*, where one or two cannon might be placed as secure from the enemy's fire as those behind the orillon of a bastion.

RAVEN, *corvus*, in *Astronomy*. See CORVUS.

RAVEN, *corvus corax* of Linnæus, in *Ornithology*, a large bird of the crow-kind, well known throughout the world, as being found in all climates, and all regions. The colour of the whole bird is black, finely glossed with a rich blue; the belly excepted, which is dusky. The *ravens* build in high trees, or upon the ruins of lofty buildings in the neighbourhood of great towns, being held in the same veneration as the vultures are in Egypt, and for the same reason; for devouring the carcases and filth that would otherwise prove a nuisance. They lay five or six eggs, of a pale greenish colour, marked with small brownish spots. There are many fabulous stories of the longevity of the raven, but birds are in general long-lived, and the crow-kind not less so than the rest. The *raven* is a very docile bird, and may be taught to speak as well as to fetch and carry. In clear weather *ravens* are remarked to fly in pairs at a great height, making a deep loud noise, different from the common croaking; and their scent is remarkably good.

The quills of *ravens* are used in tuning the lower notes of a harpsichord, when the wires are set at a considerable distance from the sticks.

It is rare to find this creature white, yet it happens sometimes. Boyle mentions one. There was also one shewn to the Royal Society not long ago. Boyle's Works abr. vol. ii. p. 46.

RAVEN, *night*, an English name for a heron, which flies in the night, and makes a very odd and hoarse noise. It has been applied by some to the bittern, or *ardea stellaris*, but improperly, belonging of right to the *ardea cinerea minor*, or smaller grey heron, called *nycticorax*.

RAVEN, *sea*, or *corvorant*. See CORVUS *Aquaticus*.

RAVINE, in *Field Fortification*, a deep hollow, usually formed by a great flood, or long-continued running of water; frequently turned to good purposes in the field.

RAVIS, the same with *raucedo*. See HOARSENESS.

RAVISHMENT, in *Law*, denotes an unlawful seducing either a woman, or an heir in ward; for which there is a remedy by a writ of *ravishment*, or action of trespass *vi et armis*, *de filio vel filia rapto vel abducto*, in the same manner as the husband may have it *de uxore raptâ et abductâ*, on account of the abduction of his wife. This action lay at the common law; and thereby the husband shall recover, not the possession of his wife, but damages for taking her away: and by statute Westm. 1. 3 Edw. I. c. 13. the offender shall also be imprisoned two years, and fined at the pleasure of the king. Both the king and the husband may, therefore, have this action; and the husband is also intitled to recover damages in an action on the case against such as persuade and intice the wife to live separate from him without a sufficient cause.

Sometimes it is also used in the same sense as RAPE.

RAVISHMENT *de gard*, is a writ which anciently lay, and still lies, for the guardian in socage against him who took from him the body of his ward, or pupil: but then he must account to his pupil for the damages he so recovers. It is expresly provided by statute 12 Car. II. c. 24. that testamentary guardians may maintain an action of *ravishment*, or trespass, for recovery of any of their wards, and also for damages, to be applied to the use and benefit of the infants.

RAUVOLFIA, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the flower has a permanent empalement of one leaf, cut into five parts at the top; the petal is funnel-shaped, the tube cylindrical, and cut at the brim into five parts; it has five stamina, which are a little shorter than the tube, terminated by erect summits; and a roundish germen supporting a short style, crowned by a headed stigma; the germen becomes a globular berry with two cells, inclosing one compressed seed in each. Linnæus enumerates three and Miller two species, natives of the warm parts of America.

RAUTY-*mummy*, or RAUTY-*muddum*, *stone-mummy*, a name given by the people of the East-Indies to a kind of fossile substance, much valued for its medicinal virtues. It

It is of the nature of the ſelenites, and is found upon the high rocks, and ſuppoſed to be generated of the dew which falls from the heavens; but this is an idle opinion, and the formation of it is evidently the ſame with that of the European rhomboidal ſelenites. They beat it to powder, and after boiling it in milk, they give it in caſes of the venereal kind. In a common clap, they give half a ſcruple, night and morning.

RAW *hide*. See Hide.

RAW *ſilk*. See Silk.

RAY, in *Geometry*. See Radius.

Ray, Radius, in *Optics*, a beam or line of light, propagated from a radiant point, through any medium.

Sir Iſaac Newton defines *rays* to be the leaſt parts of light, whether ſucceſſive in the ſame line, or contemporary in ſeveral lines.

For, that light conſiſts of parts of both kinds, appears hence, that one may ſtop what comes this moment in any point, and let paſs that which comes the next; and again, one may ſtop what comes in this point, and let paſs that in the next. Now, the leaſt light, or part of light, which may be thus ſtopped alone, he calls a *ray of light*.

If the parts of a *ray* of light do all lie ſtraight between the radiant and the eye, the *ray* is ſaid to be direct: the laws and properties whereof make the ſubject of optics.

If any of them be turned out of that direction, or bent in their paſſage, the *ray* is ſaid to be refracted.

If it ſtrike on the ſurface of any body, and be driven back, it is ſaid to be reflected.

In each caſe, the *ray* as it falls either directly on the eye, or on the point of reflection, or of refraction, is ſaid to be *incident*.

Again, if ſeveral *rays* be propagated from the radiant equidiſtantly from one another, they are called parallel *rays*.

If they come inclining towards each other, they are called converging *rays*.

And if they go continually receding from each other, they are called diverging *rays*.

It is from the circumſtances of *rays*, that the ſeveral kinds of bodies are diſtinguiſhed in optics. A body, e. gr. that diffuſes its own light, or emits *rays* of its own, is called a *lucid*, or *luminous* body.

If it only reflect *rays* which it receives from another, it is called an *illuminated body*.

If it only tranſmit *rays*, it is called a *tranſparent body*.

If it intercept the *rays*, or refuſe them paſſage, it is called an *opake body*.

Hence no body radiates, i. e. emits *rays*, unleſs it be either luminous, or illumined.

It is by means of *rays* reflected from the ſeveral points of illumined objects to the eye, that they become viſible, and that viſion is performed; whence ſuch *rays* are called visual *rays*.

In effect, we find that any point of an object is ſeen in all places to which a right line may be drawn from that point: but it is allowed, nothing can be ſeen without light; therefore every point of an object diffuſes innumerable *rays* every way. Again, from other experiments it appears, that the images of all objects, whence right lines may be drawn to the eye, are painted in the eye, behind the cryſtalline, very ſmall, but very diſtinct.

And laſtly, from other experiments, that each *ray* carries with it the ſpecies, or image of the radiating point: and that the ſeveral rays emitted from the ſame point are again united in one point, by the cryſtalline, and thus thrown on the retina.

It is the ſpiſſitude or cloſeneſs of the *rays* emitted from a luminous body, that conſtitutes the intenſeneſs of the light. Yet the direction wherein the *rays* ſtrike the eye has a great ſway. In effect, a perpendicular *ray*, ſtriking with more force than an oblique one, in the ratio of the whole ſine to the ſine of the angle of obliquity (as follows from the laws of percussion), a perpendicular *ray* will affect the eye more vividly than an oblique one, in that ratio.

If then the ſpiſſitude of the *rays* be equal, the intenſity will be as the direction; if the direction be the ſame, the intenſeneſs will be as the ſpiſſitude: If both differ, the intenſeneſs will be in a ratio compounded of the direction and the ſpiſſitude.

Hence, firſt, if light be propagated in *parallel rays* through an unreſiſting medium, its intenſity will not be varied by diſtance.

Secondly, if light be propagated in *diverging rays* through an unreſiſting medium, its intenſity will decreaſe in a duplicate ratio of the diſtances from the radiant point, reciprocally.

Thirdly, if light be propagated in *converging rays* through an unreſiſting medium; its intenſity will increaſe in a duplicate ratio of the diſtances from the point of concourſe, reciprocally.

Fourthly, if the breadth of an illumined plane be to the diſtance of the radiant point as 1 to 2,000,000, it is the ſame thing as if the *rays* ſtruck upon it parallel: and hence, ſince the diameter of the pupil of the eye, when largeſt, ſcarce exceeds ⅛ of an inch; the *rays* will fall upon it parallel, as to ſenſe, at the diſtance of 3860 Engliſh feet, which is nearly ſix furlongs. See Light.

The effect of concave lenſes, and convex mirrors, is to make parallel *rays* diverge; converging *rays* become parallel; and diverging *rays* to become more divergent.

The effect of convex lenſes, and concave mirrors, is to make diverging *rays* become parallel; parallel *rays* become convergent, and converging *rays* to converge the more. See Lens.

The *rays* of light are not homogeneous, or ſimilar, but differ in all the properties we know of; *viz.* refrangibility, reflexibility, and colour.

It is probably from the different refrangibility, that the other differences have their riſe; at leaſt it appears, that thoſe *rays* which agree or differ in this, do ſo in all the reſt.

Thus, from the different ſenſations the differently diſpoſed *rays* excite in us, we call them *red rays*, *yellow rays*, &c.

The effect of the priſm is to ſeparate and ſort the different kinds of *rays*, which come blended promiſcuouſly from the ſun; and to throw each kind by itſelf, according to its degree of refrangibility and colour, red to red, blue to blue, &c.

Beſides refrangibility, and the other properties of the *rays* of light already aſcertained by obſervation and experiment, Sir Iſaac Newton ſuſpects they may have many more: particularly, a power of being inflected, or bent, by the action of diſtant bodies; and thoſe *rays* which differ in refrangibility, he conceives likewiſe to differ in this flexibility.

In paſſing by the edges and ſides of bodies, he conceives that the *rays* may be bent ſeveral times backwards and forwards, with a motion like that of an eel; and that thoſe *rays* which appear to fall on bodies, are reflected or refracted before they arrive at the bodies: and adds, that they may be refracted, reflected, and inflected, all by the ſame principle acting in different circumſtances. See Inflection and Light. See alſo Reflection and Refraction.

Again, do not the *rays* falling on the bottom of the eye excite vibrations in the retina; which, being propagated along the fibres of the optic nerve into the brain, cauſe viſion? and do not ſeveral ſorts of *rays* make vibrations of ſeveral bigneſſes, which excite ſenſations of ſeveral colours, much after the manner as the vibrations of the air, according to their ſeveral bigneſſes, excite ſenſations of ſeveral ſounds?

Particularly, do not the moſt refrangible *rays* excite the ſhorteſt vibrations, to make a ſenſation of a deep violet; and the leaſt refrangible, the largeſt, to make a ſenſation of a deep red? and the ſeveral intermediate kinds of *rays*, vibrations of intermediate bigneſſes, to make ſenſations of the intermediate colours?

And may not the harmony and diſcord of colours ariſe from the proportion of theſe vibrations; as thoſe of ſound depend on the vibrations of the air? for ſome colours, if viewed together, are agreeable, as gold and indigo; others diſagreeable. See Colour.

Again, have not the *rays* of light ſeveral ſides endued with ſeveral original properties? It is certain we find, that every *ray* of light has two oppoſite ſides, originally endued with a property, whereon the unuſual refraction of iſland cryſtal depends, and other two oppoſite ſides not endued with that property.

Laſtly, are not the *rays* of light very ſmall bodies emitted from ſhining ſubſtances?

Such bodies may have all the conditions of light: and there is that action and re-action between tranſparent bodies and light, which very much reſembles the attractive force between other bodies. Nothing more is required for the production of all the various colours, and all the degrees of refrangibility, but that the *rays* of light be bodies of different ſizes; the leaſt of which may make violet the weakeſt and darkeſt of the colours, and be the moſt eaſily diverted by refracting ſurfaces from its rectilinear courſe; and the reſt, as they are bigger and bigger, may make the ſtronger and more lucid colours, blue, green, yellow, and red. See Colour and Light.

Nor is any thing more requiſite for the putting of the *rays* into fits of eaſy reflection, and eaſy tranſmiſſion, than that they may be ſmall bodies, which, by attraction, or ſome other force, excite vibrations in the bodies

they act upon; which vibrations, being swifter than the *rays*, overtake them successively, and agitate them so as by degrees to increase and diminish their velocity, and thereby put them into those fits. Lastly, the unusual refraction of island crystal looks very much as if it were performed by some attractive virtue lodged in certain sides both of the *rays*, and of the crystal.

RAY, *common*, in *Optics*, is sometimes used for a right line drawn from the point of concourse of the two optical axes, through the middle of the right line which passes through the middle of the centres of the pupils of the two eyes.

RAYS, *cone of*. See CONE.

RAYS, *deflection of*. See DEFLECTION.

RAYS, *inclination of incident*. See INCLINATION.

RAYS, *optic*. See OPTIC.

RAYS, *reflexibility of*. See REFLEXIBILITY.

RAY, *principal*, in *Perspective*, is the perpendicular distance between the eye and the vertical plane or table, as some call it. See PERSPECTIVE.

RAYS, *pencil of*. See PENCIL *of Rays*.

RAYS, *pyramid of*. See OPTIC *Pyramid*.

RAY, *raia*, in *Ichthyology*. See RAIA.

RAY, *clavated*. See THORNBACK.

RAY, *eagle*. See *Sea* EAGLE.

RAY, *electric* or *smooth*, a species of the raja. See TORPEDO.

RAY, *fuller*, or *rough*, *raja fullonica*, a species of *ray*, deriving its name from the instrument which fullers use in smoothing cloth, the back being rough and spiny. The nose is short and sharp; at the corner of each eye are a few spines; the membrane of nictitation is fringed; the teeth are small and sharp; on the upper part of the pectoral fins are three rows of spines pointing towards the back, and crooked; on the tail are three rows of strong spines, the middle row reaching up part of the back; the tail is slender, and rather larger than the body; the colour of the upper part of the body is cinereous, usually marked with black spots, and the lower part white; the size is equal to that of a skate. At Scarborough, where it is common, it is called the white hans or gullet. Pennant.

RAY, *oblong*. See RHINOBATOS.

RAY, *oculated*. See MIRALETUS.

RAY, *shagreen*, called at Scarborough the French *ray*, is about the size of the skate, but narrower in its form than the common kinds. The upper part of the body is covered closely with small shagreen-like tubercles, resembling the skin of the dog-fish; and from the nose to the beginning of the pectoral fins is a tuberculated space. Pennant.

RAY, *sharp-nosed*, *raia oxyrinchus*, is a species of *ray* with a very long, narrow, and sharp-pointed nose, smooth and thin body, the upper part ash-coloured with many white and a few black spots, the lower part white, thick tail, with two small fins towards the end, and on each side a row of small spines, with another in the middle, running someway up the back, and a very large mouth furnished with many minute sharp teeth bending inwards. This fish makes a snorting noise, and is supposed to be the *bos* of the ancients, which Oppian describes as the broadest among fishes, and fond of human flesh; adding, that the method it takes of destroying men is by overlaying and keeping them down by its vast weight till they are drowned. Pennant.

RAY, *sting*. See PASTINACA *marina*.

RAY, in *our old writers*, a word appropriated to cloth never coloured, or dyed, 11 Hen. IV. c. 6. Blount, Cowel.

RAY *of curvature*, in *Geometry*, is used to signify the semidiameter of the circle of CURVATURE.

RAYCHE, in *Ichthyology*. See RAYTE.

RAYTE, or RYCHE, in *Ichthyology*, a name given by Joannes Cuba, Albertus, and others, to the common skate, or flaire.

RAZANT. See RASANT.

RAZANT *flank*. See FLANK.

RAZANT *line of defence*. See DEFENCE.

RAZE, in the *Manege*. A horse is said to have *razed*, whose corner teeth cease to be hollow; so that the cavity, where the black mark was, is filled up; that is, even, smooth, and *razed*, or shaven, as it were, and the mark disappears. See MARK.

RAZOR-*bill*, in *Ornithology*, the common English name of the ALKA, a web-footed bird with no hinder toes, common on our sea shores.

RAZOR-*fish*, in *Ichthyology*, the CORYPHÆNA *novacula* of Linnæus, having the head and fins barred with bluish lines. See NOVACULA.

RE, in *Grammar*, &c. an inseparable particle, or preposition, prefixed to the beginning of words, to vary, double, or otherwise modify their meaning.

The modificative *re* was first introduced by the Latins; from whom it is borrowed into most of the modern tongues: Priscian derives it from *retro*, backwards; others rather derive *retro* from *re*; others derive *re* from the Greek ῥεα, *easy*; or from ῥεω, *I flow*.

The effect of the *re* is various: usually it signifies *again*, *rursum*, ανα; as in *re*-join, *re*-sign, *re*-sume, *re*-course, *re*-bound, *re*-cite, *re*-hear, *re*-cognize, *re*-compare, *re*-double, *re*-linquish, &c.

Sometimes it stands for *contra*, αντι, *against*; as in *re*-luctance, *re*-cumbent, *re*-cline, &c.

Sometimes for υπερ, *super*, over, as in *re*-dundant; sometimes for πορρω, *longe*, *far*, as in *re*-moving, &c.

RE, in *Music*. See NOTES.

RE, in *Matters of Money*. See REE.

REACH, in *Sea-language*, the distance between any two points on the banks of a river, wherein the current flows in a strait uninterrupted course.

RE-ACTION, in *Physics*, the action whereby a body acted upon, returns the action by a reciprocal one upon the agent.

The Peripatetics define *re-action* to be that which a passive body returns upon the agent, by means of some quality contrary to that received from it, in the same part wherewith the agent acted, and at the same time; as if water, while it is heated by the fire, does at the same time cool the fire.

It was known, even in the schools, that there is no action in nature without *re-action*; and it was a maxim among them, *omne agens, agendo repatitur*.

But the equality of the actions was not known: Sir Isaac Newton established it as one of the laws of nature, that *action and re-action are equal and contrary*; or that the mutual actions of two bodies, striking one against another, are exactly equal, but in contrary directions; or, in other words, that by the action and *re-action* of bodies one on another, there are produced equal changes in each: and those changes are impressed towards directly contrary parts or ways. See *Laws of* NATURE.

Some of the school-philosophers deny any such thing as *re-action*, properly so called, at all; urging, that action arises only from the ratio of the greater inequality; that is, we are only to account for action the excess of action, or what the agent does more than is returned by the patient. But the equality between action and *re-action* sets aside this exception.

READING. See LECTIO.

READING *of a deed*. See DEED.

READINGS, in *Criticism*. *Various* READINGS, *variæ lectiones*, are the different manners of reading the text of authors in ancient manuscripts; where a diversity has arisen from the corruption of time, or the ignorance of copyists.

A great part of the business of the critics lies in settling the *readings*, by confronting the various *readings* of the several manuscripts, and considering the agreement of the words and sense. The various *readings* in the Bible, (see *Hebrew* BIBLES) and in the classic authors, are almost innumerable.

READINGS are also used for a sort of commentary or gloss on a law, text, passage, or the like; to shew the sense an author takes it in, and the application he conceives to be made of it.

RE-AFFORESTED, is where a forest, having been disafforested, is again made a forest. As the forest of Dean was, by an act of parliament in the 20th of king Charles II. See FOREST.

RE-AGGRAVATION, in the Romish *Ecclesiastical Law*, the last monitory, published after three admonitions, and before the last excommunication.

Before they proceed to fulminate the last excommunication, they publish an aggravation, and a *re-aggravation*. Fevret observes, that in France the minister is not allowed to come to *re-aggravation*, without the permission of the bishop or official, as well as that of the lay judge. See EXCOMMUNICATION.

REAL, *reale*, is applied to a being that actually exists; in which sense it coincides with *actual*.

REAL, in *Law*, is opposed to PERSONAL.

REAL *action*, that whereby the plaintiff lays title to land, &c. See ACTION.

Customs are said to be *real*; that is, they determine all inheritances within their extent; and none may dispose of them, but according to the conditions allowed by the customs where they are situated.

REAL *altitude*, *assets*, *character*, *chattels*, *covenant*, *distinction*, *distress*, *estate*, *horizon*, *optic place*, *patronage*, *privilege*, *qualities*, *root*, *services*, *suit*, and *writs*. See the several substantives.

REAL, RIAL, or RYAL, in *Commerce*. See RIAL.

REALGAR,

REALGAR, or REALGAL, *risigallum*, in *Chemistry*, is a composition of sulphur and arsenic; which two substances are capable of uniting together, especially when they are reduced to vapours, and sublimed together. The whiteness of crystalline arsenic is always altered by union with sulphur, and the new compound becomes yellow, inclining more or less to an orange, or even to a red colour, according to the quantity of sulphur united with the arsenic. When the sulphur is only a tenth part of the whole mixture, the sublimate is yellow; and it is then called *yellow realgar*, or yellow arsenic, and in commerce ORPIMENT. When the sulphur is a fifth part of the combination, the sublimate is red, and it is then called *red realgar*, sandarach, red arsenic, &c. As sulphur fixes arsenic a little, the *red realgar* may be melted with a gentle heat; and when it has become solid, it is transparent, and is then called ruby of sulphur, or arsenical ruby. When arsenic and sulphur are thus well combined by sublimation, they cannot be separated without some intermediate substance, because they are volatile; but this separation may be effected by means of fixed alkali or mercury. The yellow and red artificial arsenics are of an acrimonious nature, and reputed poisonous, though not in any great degree. The principal use of these substances is for painting.

In the History of the French Academy, we have an account of a cup brought to Paris by the ambassadors of Siam, and presented there, as a remedy used by that people against all diseases.

Upon an examination, which had like to have cost M. Homberg dear, he found it to be a kind of *realgar*, or red arsenic, much more caustic than ours.

Its use among the Siamese, he takes to have been the same with that of regulus of antimony; viz. to give an emetic quality to the wine drank out of it.

As the dose of medicines is much stronger in the torrid zone than among us (the quantity of ipecacuanha, e. gr. ordinarily taken by the Indians, being twenty times as great as that among us), it is very possible a cup of *realgar*, though enough to poison an European, may prove a gentle medicine to a Siamese.

REALISE, in *Commerce*, a term little known in trade before the year 1719, when those immense fortunes began to be made in France and England, by the business of actions or stock.

By *realizing* is meant the precaution many of those who had gained most, took, to convert their paper into real effects; as lands, houses, rich moveables, jewels, plate; but, above all, into current species. A precaution capable of ruining the state; but the French regency had the wisdom to frustrate it, by taking proper measures to have the money, thus ready to be hoarded up, returned to the public.

REALISTS, *Realistæ*, a sect of school-philosophers, who followed the doctrine of Aristotle with respect to universal ideas, formed in opposition to the NOMINALISTS, who embraced the hypothesis of Zeno and the Stoics upon that perplexed and intricate subject.

Aristotle held, against Plato, that, previous to, and independent on, matter, there were no universal ideas or essences, and that the ideas or exemplars which the latter supposed to have existed in the divine Mind, and to have been the models of all created things, had been eternally impressed upon matter, and were coeval with, and inherent in, their objects. Zeno and his followers, departing both from the Platonic and Aristotelian systems, maintained, that these pretended universals had neither form nor essence, and were no more than mere terms and nominal representations of their particular objects.

Under the *Realists* are included the Scotists, Thomists, and all excepting the followers of Occam.

Their distinguishing tenet is, that universals are realities, and have an actual existence, out of an idea and imagination; or, as they express it in the school-language, *a parte rei*; whereas the Nominalists contend, that they exist only in the mind; and are only ideas, or manners of conceiving things.

Doctor Odo, or Oudard, a native of Orleans, afterwards abbot of St. Martin de Tournay, was the chief of the sect of the *Realists*: he wrote three books of dialectics; where, on the principles of Boethius and the ancients, he maintained that the object of that art is things, not words; whence the sect took its rise and name.

REALITY, *realitas*, in the *Schools*, a diminutive of *res*, *thing*, first used by the Scotists to denote a thing which may exist of itself, or which has a full and absolute being of itself, and is not considered as a part of any other.

Yet a *reality* is conceived as something less than *res*; and accordingly every *res* is supposed to contain a number of *realities*, which they otherwise call *formalities*.

Thus, e. gr. in a man, according to the doctrine of the Scotists, are a number of *realities*; viz. a substance, life, animal, and reason.

Some distinguish *reality* into subjective and objective.

REALM, *regnum*, *kingdom*, a country which gives its head or governor the denomination of king.

The word is formed of the French *royaume*, which denotes the same.

REAR, a term frequently used in composition, to denote something behind or backwards in respect of another; in opposition to *van*, or *avant*, *before*.

It is formed by corruption of the French *arriere*, signifying the same.

REAR, in a *Military Sense*, is used for the hind-part of an army, &c. in opposition to the *front*, or face thereof.

REAR, in *Naval Language*, is a name given to the last division of a squadron, or the last squadron of a fleet, and which is accordingly commanded by the third officer of the said fleet or squadron.

REAR-*admiral*. See ADMIRAL.

REAR-*guard*. See GUARD.

REAR-*half-files*, are the three hindmost ranks of a battalion, when it is drawn up six deep. See FILE-*leaders*.

REAR-*line* of an army encamped, is always twelve hundred feet at least from the centre line, both of which run parallel to the front line, and also to the reserve.

REAR-*rank* is the last rank of a battalion, or squadron, when drawn up, and generally sixteen or eighteen feet from the centre line, when drawn up in open order.

REAR-*up*, in the *Manege*, called in French *cabrer*, is said of a horse that rises upon his hinder legs, as if he would come quite over.

REARED, or *Wale*-REARED. See WALE-*reared*.

REASON, *ratio*, a faculty or power of the soul, whereby it distinguishes good from evil, and truth from falshood.

Or, *reason* is that principle, whereby, comparing several ideas together, we draw consequences from the relations they are found to have.

Some of the latter school-philosophers define *reason* to be the comprehension of many principles which the mind successively can conceive, and from which conclusions may be drawn.

Others conceive *reason* as no other than the understanding itself, considered as it discourses.

Reason, Mr. Locke observes, comprehends two distinct faculties of the mind; viz. *sagacity*, whereby it finds intermediate ideas; and *illation*, whereby it so orders and disposes of them, as to discover what connexion there is in each link of the chain, whereby the extremes are held together; and thereby, as it were, draws into view the truth sought for.

Illation, or inference, consists in nothing but the perception of the connexion there is between the ideas in each step of the deduction, whereby the mind comes to see either the certain agreement or disagreement of any two ideas; as in demonstration, in which it arrives at knowledge; or their probable connexion, on which it gives or with-holds its assent; as in opinion.

Sense and intuition reach but a little way: the greatest part of our knowledge depends upon deductions, and intermediate ideas. In those cases, where we must take propositions for true, without being certain of their being so, we have need to find out, examine, and compare, the grounds of their probability: in both cases, the faculty which finds out the means, and rightly applies them to discover certainty in the one, and probability in the other, is that which we call *reason*.

In *reason*, therefore, we may consider four degrees: first, the discovering and finding out of proofs. See INVENTION.

Secondly, the regular and methodical disposition of them, and laying them in such order, as that their connexion may be plainly perceived. See METHOD.

Thirdly, the perceiving of their connexion (see JUDGMENT); and,

Fourthly, the making a right CONCLUSION.

Reason fails us in several instances: as, first, where our ideas fail.

Secondly, It is often at a loss, because of the obscurity, confusion, or imperfection, of the ideas it is employed about. Thus, having no perfect idea of the least extension of matter, nor of infinity, we are at a loss about the divisibility of matter.

Thirdly, Our *reason* is often at a stand, because it perceives not those ideas which would serve to shew the certain or probable agreement or disagreement of any two other ideas.

Fourthly, Our *reason* is often engaged in absurdities and difficulties, by proceeding upon false principles, which, being followed, lead men into contradictions to themselves, and inconsistency in their own thoughts.

Fifthly, Dubious words, and uncertain signs, often puzzle men's *reason*, and bring them to a nonplus.

Though the deducing one propofition from another be a great part of the office of *reafon*, and that about which it is ufually employed; yet the principal act of ratiocination is the finding the agreement or difagreement of two ideas one with another, by the intervention of a third. As a man, by a yard, finds two houfes to be of the fame length, which could not be brought together to meafure their equality by juxta-pofition. Words have their confequences as the figns of fuch ideas and things agree or difagree with what they really are; but we obferve it only by our ideas.

Hence we may be able to form an idea of that ordinary diftinction of things, into fuch as are *according to*, thofe that are *above*, and thofe *contrary to reafon*.

Thofe *according to reafon* are fuch propofitions, whofe truth we can difcover by examining and tracing thofe ideas we have from fenfation and reflection, and by natural deduction find to be true or probable.

Thofe *above reafon* are fuch propofitions, whofe truth or probability we cannot by *reafon* derive from thofe principles.

Thofe *contrary to reafon* are fuch propofitions as are inconfiftent with, or irreconcilable to, our clear and diftinct ideas.

Thus the exiftence of one God, is according to *reafon*; the exiftence of more than one God, is contrary to *reafon*; and the refurrection of the body after death, above *reafon*.

Above *reafon* may be alfo taken in a double fenfe; viz. above probability, or above certainty.

They who difpute moft againft the power and privileges of human *reafon*, do it becaufe their own *reafon* perfuades them to that belief; and fo, whether the victory be on their or our fide, they are equally defeated.

They feek to terrify us with the example of many great wits, who, by following this *ignis fatuus* (fo they call the only pole-ftar God has given us to direct our courfe by) have fallen into wild and ridiculous opinions, and increafed the catalogue of herefies to fo great a number; but thefe men either followed not their *reafon*, but make it follow their will; or elfe they firft hoodwinked it by intereft and prejudice, and then bad it fhew them the way; or were wanting in thofe neceffary diligences required for fo doubtful a paffage: or if, without any of thefe, the weaknefs of their underftanding had deceived them, the error is neither hurtful to themfelves, nor would be to others, if this doctrine of governing ourfelves by our own *reafon*, and not by authority and example, were generally eftablifhed. Dif. Concern. Hum. Reaf.

It is not the ufe of fuch liberty, but the appropriating it to ourfelves, that is the caufe of all the diforders charged thereon; for thofe who lay a reftraint on other men's *reafon*, have firft made ufe of their own to fettle them, and to make ufe of it in this very reftraining of others. Ibid.

REASON, in *Matters of Religion*, is ufed in oppofition to FAITH.

This ufe of the word, Mr. Locke takes to be in itfelf very improper; for faith is nothing but a firm affent of the mind; which, if it be regulated, as it is our duty, cannot be afforded to any thing but upon good *reafon*, and fo cannot be oppofite to it.

He that believes without having any *reafon* for believing, may be in love with his own fancies; but he neither feeks truth as he ought, nor pays the proper obedience due to his Maker, who would have him ufe thofe difcerning faculties he has given him, to keep him out of miftake and error. But fince *reafon* and faith are by fome men oppofed, it may be neceffary to confider them together.

Reafon, as contradiftinguifhed to faith, is the difcovery of the certainty or probability of fuch propofitions, or truths, which it has got by the ufe of its natural faculties; viz. by fenfation, or reflection.

Faith, on the other hand, is the affent to any propofition upon the credit of the propofer, as coming immediately from God; which we call revelation.

REASON, in *Logic* and *Rhetoric*, denotes a neceffary or probable argument; or an anfwer to the queftion, *cur eft? why is it?*

As if it be inquired, why do the fubject and predicate agree? and it is anfwered, becaufe they are fpoken of the fame thing: this laft enunciation is a *reafon*.

Hence, fay the fchoolmen, becaufe *quia* is the fign or character of a reafon, as *non*, *no*, of a negation, and *eft*, *is*, of an affirmation.

They make three kinds of *reafons*, *rationes*; viz. *ratio ut*, *that*; *ne*, *left*; and *quia*, *becaufe*. For, anfwering to a queftion, *cur*, *why*, we begin with becaufe, *quia*; as, why do you ftudy? that I may become learned; which is the *ratio ut*. Again, why do you ftudy? left I fhould be ignorant; which is the *ratio ne*. Laftly, why is a body tangible? becaufe matter is impenetrable; which is the *ratio quia*.

The *reafon ut* properly denotes the end, or final caufe; and *reafon ne* the beginning: accordingly the one is called the beginning, the other the end; fo that the *reafon quia*, is left the only *reafon*, properly fo called.

REASON, among *Metaphyficians*, is ufed in the fame fenfe with effence; or that whereby any thing is what it is.

This is fometimes alfo called formal *reafon*, as reprefenting the thing under that form or nature under which it is conceived.

REASON, in *Mathematics*. See RATIO.

REASON *of ftate*, *ratio ftatus*, in *Matters of Policy*, denotes a rule or maxim, whether it be good or evil, which may be of fervice to the ftate.

The phrafe is borrowed from the Italians, who firft ufed *ragione di ftato* in this fenfe.

Reafon of ftate is properly underftood of fomething that is neceffary and expedient for the intereft of the government, but contrary to moral honefty, or juftice.

Politicians have a long time difputed about the *ratio ftatus*; whether ftates and governments are tied down to the fame laws of morality with individual perfons; or whether things, otherwife immoral and unlawful, may not be practifed on urgent occafions, by way of *reafon* of ftate?

The queftion is, whether any thing be unlawful, or prohibited a ftate, that is neceffary to the prefervation of that ftate, or whether it be allowed to preferve itfelf on any terms?

REASON, *challenge upon*. See CHALLENGE.

REASON *fufficient of Leibnitz*. See LEIBNITZIAN *Philofophy*.

REASONABLE *aid*, a duty which the lord of the fee anciently claimed of his tenants holding in knight's fervice, or on focage, towards the marrying his daughter, or the making his eldeft fon knight.

This is taken away by ftat. 2 Car. II. See AID.

REASONING, *ratiocination*, the exercife of that faculty of the mind called *reafon*: or, it is reafon deduced into DISCOURSE.

The agreement or difagreement of two ideas does not appear from the bare confideration of the ideas themfelves, unlefs fome third be called in, and compared, either feparately, or conjointly therewith: the act, then, whereby from ideas thus difpofed and compared, we judge this or that to be fo, or not fo, is called *reafoning*. Or, it is that operation of the mind, whereby we infer one thing, i. e. one propofition from two or more propofitions premifed. Or, again, it is the drawing of a conclufion, which before was either unknown, or dark, or doubtful, from fome propofitions which are more known and evident. It is the narrownefs of the human mind which introduces the neceffity of *reafoning*; for if the mere perception and comparifon of two ideas would always fhew us whether they agree or difagree, then all rational propofitions would be matters of intelligence, or firft principles, and there would be no ufe of *reafoning*, or drawing any confequences. But when we are unable to judge of the truth or falfhood of a propofition in an immediate manner, by the mere contemplation of its fubject and predicate, we are then conftrained to ufe a medium, and to compare each of them with fome third idea, that by feeing how far they agree or difagree with it, we may be able to judge how far they agree or difagree among themfelves. Watts's Logic, part iii. chap. 1.

Rohault defines *reafoning* to be a judgment depending on fome antecedent judgment: thus, having judged that no even number can be compofed of five uneven numbers, and that ten is an even number; to conclude, that ten cannot be divided into five uneven parts, is a *ratiocination*, or *reafoning*.

This agrees with father Malebranche's doctrine, one of the great points whereof is, that *reafoning*, on the part of the underftanding, is only a mere *perceiving*.

That ingenious author endeavours to fhew, that, as to the underftanding, there is no difference between a fimple *perception*, a *judgment*, and a *reafoning*, except in this, that the underftanding perceives a fimple thing without any relation to any thing elfe, by a fimple *perception*; that it perceives the relations between two or more things in a *judgment*; and, laftly, that it perceives the relations that are between the relations of things, in a *reafoning*. So that all the operations of the underftanding are no more than mere perceptions.

Thus, e. gr. when we conclude, that 4 being lefs than 6, twice 2 being equal to 4, are of confequence lefs than 6, we do no more than perceive the relation of the inequality between the relation of twice 2 and 4, and the relation of 4 and 6.

The

The manner of proceeding justly in *reasoning*, so as to arrive with the greater safety at the knowledge of truth, makes what we call METHOD.

For the real benefit of logic to *reasoning*, see LOGIC and SYLLOGISM.

RE-ATTACHMENT, in *Law*, a second attachment of him who was formerly attached, and dismissed the court without day, by not coming of the justices, or the like casualty.

Brook makes *re-attachment* either *general* or *special*. *General* is where a man is *re-attached* for his appearance on all writs of assize lying against him: *special*, for one or more certain writs.

REAUMURIA, in *Botany*, a genus of the *polyandria pentagynia* class. Its characters are, that the calyx is six-leaved, that it has five petals, and that the fruit is a single-celled, five-valved, polyspermous capsule. There is one species.

RE-BAPTISANTS, a religious sect, who maintain, that persons irregularly baptized are to be baptized afresh.

The Anabaptists are *re-baptizants*, inasmuch as they baptize those at maturity, who had been before baptized in childhood.

St. Cyprian and pope Stephen had mighty differences about the re-baptization of converted heretics.

Donatus was condemned at Rome in a council, for having re-baptized some persons who had fallen into idolatry after their first baptism.

REBATE, *rebatement*, in *Commerce*, a term much used at Amsterdam for a discount or abatement in the price of certain commodities, when the buyer advances the sum in hand, for which he might have taken time. See DISCOUNT.

Rebate (among us usually called *prompt payment*) is estimated by months, and is only allowed for certain kinds of merchandizes, which, according to the custom of Amsterdam, are,

German wools,	which are sold at	15	months *rebate*.
Ashes and pot-ashes,		18	
Italian silks,		33	
Sugars of Brasil,		18	
Spanish wools,		21	

That is, those commodities are sold for ready money, only deducting or *rebating* the interest of the money, which ought not to be paid till the end of 15, 18, &c. months. This interest, called *rebate*, is usually regulated on the footing of 8 *per cent. per annum*.

The reason of this expedient is, that the merchants having not always wherewithal to pay for their goods in hand, by means of the *rebatement*, such as have, will find their account in it; and such as have not, will be engaged to discharge themselves as soon as possible, for the sake of the discount.

REBATEMENT, in *Heraldry*, a diminution or ABATEMENT of the dignity of the figures or bearings in a coat of arms.

REBELLION originally signified a second resistance or rising of such as had been formerly overcome in battle by the Romans, and had yielded themselves to their subjection.

It is now generally used for a traiterous taking up of arms against the king, either by his own natural subjects, or by those formerly subdued.

Rebel is sometimes also used, in our ancient statutes, for a person who wilfully breaks a law; and sometimes for a villain disobeying his lord.

REBELLION, *commission of*. See COMMISSION.

REBELLIOUS *assembly*, a gathering of twelve persons, or more, intending, going about, or practising, unlawfully, and of their own authority, to change any laws of the realm, or to destroy the inclosure of any park or ground inclosed, banks of fish ponds, pools, conduits, &c. to the intent the same shall remain void, or that they shall have way in any of the said grounds; or to destroy the deer in any park, fish in ponds, coneys in any warren, dove-houses, &c. or to burn stacks of corn, or to abate rents, or prices of victuals. See RIOT, ROUT, and UNLAWFUL *assembly*.

REBHIANG, one of the Hebrew ACCENTS, answering to our comma, and enumerated among their kings and pauses. It is marked by a dot over the middle of a letter. See ATHNACH, SYLLUK, &c.

REBINARE, was to give a second stirring or ploughing to arable land that lay fallow, to prepare it for sowing wheat, &c. or to plough the ground a third time for that purpose. *Tempus* rebinandi *erit post festum Nativitatis sancti Johannis Baptistæ cum terra pullulaverit post carucam.* Fleta, lib. ii. cap. 73.

REBOUND. See RECOIL.

REBUS, a name-device, as Camden Englishes it; or an enigmatical representation of some name, &c. by using figures or pictures, instead of words, or parts of words. Such is that of the gallant mentioned by Camden, who expressed his love to Rose Hill, by painting in the border of his gown a rose, a hill, an eye, a loaf, and a well; which, in the *rebus* style, is read, *Rose Hill I love well.*

The Picards have the honour of the invention of this notable kind of wit; whence the French, to this day, call it *rebus de Picardie.* Camden adds, that the English first learnt it of them in the reign of our Henry III. by means of the garrisons we then had in Calais, Guienne, and other places bordering on Picardy.

Its origin is by Menage, &c. ascribed to the priests of Picardy, who, it seems, anciently, in carnival-time, used every year to make certain libels, entitled, *de rebus quæ geruntur*, being railleries on what intrigues and transactions had passed about the city; wherein they made great use of such sort of equivoques and allusions, breaking and joining words, and supplying them with paintings.

Camden tells us, the *rebus* was in wonderful esteem among our forefathers; and that he was nobody who could not hammer out of his name an invention by this wit-craft, and picture it accordingly.

The sieur Des Accords has made an ample collection of the most famous *rebuses* de Picardie. And Mr. Camden has done something of the same kind in his Remains.

Abel Drugger's device in Ben Johnson's Alchemist, and Jack of Newberry in the Spectator, are known to every body. But the *rebus*, being once raised to sign-posts, grew out of fashion at court.

Yet has *rebus* antiquity on its side, as having been in use in the pure Augustan age: Cicero, in a dedication to the gods, inscribed Marcus Tullius, with a little pea, called by the Latins *cicer*, by us a *chich pea*. And Julius Cæsar, in some of his coins, used an elephant, called *Cæsar* in the Mauritanian tongue. Add to these, that the two mint-masters in that age, L. Aquilius Florus, and Voconius Vitulus, used, the first a flower, the second a calf, on the reverse of their coins.

REBUS, in *Heraldry*, a coat of arms which bears an allusion to the name of the person; as three castles, for Castleton; three cups, for Butler; three conies, for Conisby; a kind of bearings which are of great antiquity.

REBUS is also used by the chemical writers sometimes to signify four milk, and sometimes for what they call the ultimate matter, of which all bodies are composed.

REBUTTER, from *re*, and the French *bouter*, *to repel*, or *bar*, in *Law*, the answer of the defendant in a cause to the plaintiff's sur-rejoinder.

The plaintiff's answer to the defendant's *rebutter*, is called a *sur-rebutter*.

REBUTTER is also when a man warrants any land or hereditament to another, and the person making the warranty, or his heir, sues him to whom the warranty is made, or his heir or assignee, for the same thing: if he, who is so sued, plead the deed or fine with warranty, and pray judgment, if the plaintiff shall be received to demand the thing which he ought to warrant to the party, against the warranty in the deed, &c. this is called a *rebutter*.

Again, if I grant to the tenant to hold *sine impetitione vasti*, and afterwards implead him for waste, he may debar me of the action, by shewing my grant; which is likewise a *rebutter*.

RECANTATION. See PALINODY, or RETRACTATION.

RECAPITULATION, in *Oratory*, &c. a part of the peroration, or conclusion; called also ANACEPHALÆOSIS.

Recapitulation is a summary of the preceding discourse; or a concise, transient enumeration of the principal things insisted on at large therein; whereby the memory of the hearers is refreshed, and the force of the whole collected into one view.

An instance of this may be given in the peroration of Cicero's Manilian: *Quare, cum bellum ita necessarium sit, ut negligi non possit: ita magnum, ut accuratissime sit administrandum; & cum ei imperatorem præficere possitis, in quo sit eximia belli scientia, singularis virtus, clarissima auctoritas, egregia fortuna; dubitabitis, Quirites, quin, &c.*

In order to constitute a good repetition or *recapitulation*, it must be short and concise; it is also convenient to recite things in the same order in which they were at first laid down; but sometimes a repetition is made, by running a comparison between the speaker's own arguments and those of the adverse party, and placing them in opposition to each other; and this method Cicero takes in the conclusion of his third oration upon the Agrarian law. In some cases, when the discourse is very long, and the arguments insisted on have been many, the orator only mentions such things which he thinks of least consequence, by saying that he omits or passes over them, till he comes to what is of greater moment, which he represents more fully. See PRETERITION. Ward's Orat. vol. i. sect. 18.

RECAPTION, *recaptio*, or REPRISAL, in *Law*, is a remedy

medy given to the party himſelf for an injury to his perſonal property. This happens, when any one hath deprived another of his property in goods or chattels perſonal, or wrongfully detains one's wife, child, or ſervant; in which caſe the owner of the goods, and the huſband, parent, or maſter, may lawfully claim and retake them, wherever he happens to find them, ſo it be not in a riotous manner, or attended with a breach of the peace. Thus, e. gr. if my horſe is taken away, and I find him in a common, a fair, or a public inn, I may lawfully ſeize him to my own uſe; but I cannot juſtify breaking open a private ſtable, or entering on the grounds of a third perſon to take him, except he be feloniouſly ſtolen, but muſt have recourſe to an action at law. *Recaption* is unlawful, if it be done with intention to ſmother or compound a larceny. See RESTITUTION *of ſtolen goods*.

RECAPTION alſo is the taking a ſecond diſtreſs of one formerly diſtrained for the ſame cauſe, and alſo during the plea grounded on the former diſtreſs.

Recaption is alſo the name of a writ lying for the party thus diſtrained to recover damages. See REPLEVIN.

RECEIPT, or RECEIT, in *Commerce*, an acquittance or diſcharge; or an act whereby it appears, that a thing has been paid off, or acquitted.

Where the *receipt* is on the back of a bill, &c. it is uſually called an ENDORSEMENT.

Among tradeſmen *receipt* uſually makes the ſecond of the three articles of an account; the *receipt* contains the monies received; the two others the expence, and the return or balance.

RECEIPT, or RESCEIT, in *Law*. See RESCEIT.

RECEIPT *of homage*. See RESCEIT.

RECEIPT *of the exchequer*. See COURT *of exchequer*.

RECEIPT, in *Medicine*. See RECIPE.

RECEIPTS, *auditor of*. See AUDITOR.

RECEIVER, or RECIPIENT, in *Chemiſtry*, a veſſel which is adapted to the neck or beak of an alembic, retort, or other diſtillatory veſſel, in order to collect, receive, and contain the products of diſtillations.

Receivers ſhould be made of glaſs, not only becauſe this matter reſiſts the action of the ſtrongeſt and moſt corroſive ſubſtances, but alſo becauſe being tranſparent, it allows the operator to ſee through it, and to judge by the frequency of the drops, if the diſtillation be too quick or too ſlow, and alſo if the quantity and nature of the ſubſtances that come over be ſuch as are required.

Almoſt all *receivers* are kinds of bottles of different ſizes, of a ſpherical form, the necks of which are cut ſhort, and each of which is pierced with a ſmall hole in its lateral or upper part, to give vent to the air or vapours, which are too expanſive. *Receivers* of this form are called BALLOONS. Some *receivers* are matraſſes with long necks. Theſe are generally adapted to the beaks of glaſs alembics. The long neck ſerves to keep the belly of the *receiver*, where the liquor is collected, at a proper diſtance from the fire.

Receivers have different forms for particular operations. Such are thoſe which have two or three beaks, either to be adapted to other *receivers*, or to admit at the ſame time the necks of ſeveral diſtillatory veſſels, when the intention of the operator is, that the vapours of different ſubſtances ſhould meet in the ſame *receiver*. Such alſo are *receivers* for eſſential oils, obtained from aromatic plants diſtilled with water, which are ſo made, that they are never full, but that the water runs out, and leaves the oil behind. Theſe are a kind of glaſs cucurbits, which contract as they riſe higher; ſo that their neck or upper opening is but nearly of a convenient ſize to receive the beak of the worm. Theſe *receivers* have another opening about the middle of the ſwelling or belly; and to this opening is joined a glaſs tube, which bends and riſes vertically along the outer part of the *receiver*, ſo as to be within two inches and a half as high as the upper opening. At this height the tube bends again towards the ſide oppoſite to the body of the *receiver*, to pour into another veſſel the liquor which ariſes there. It forms the figure of S.

When this *receiver* is to be uſed, it is to be placed vertically under the beak of the worm. During the diſtillation, the liquor riſes to an equal height in the body of the *receiver*, and in the crooked tube; when, therefore, the height of the liquor in the *receiver* becomes greater than the height of the tube, it muſt begin to flow from the mouth of this tube into another veſſel placed on purpoſe to receive it; but as eſſential oils are either lighter or heavier than water, and as they are, therefore, always collected either above or under the water, and as the liquor which diſcharges itſelf through the tube is taken from the middle part of the *receiver*, nothing but water can be evacuated at the mouth of the pipe, while the oil always remains in the *receiver*. With ſuch a *receiver* diſtillation may be performed without the trouble of changing the veſſels. Chem. Dict.

For different forms of *receivers*, ſee *Tab.* II. *Chemiſtry*, *fig.* 26, 27, 28, 29, 30.

RECEIVER *of an air-pump*, is part of its apparatus; being a glaſs veſſel placed on the top of the plate, out of which the air is to be exhauſted. To an AIR-*pump* belong various *receivers*, of various forms and ſizes, and ſerving for various purpoſes.

RECEIVER, *exhauſted*, in *Pneumatics*. See EXHAUSTED.

And for the method of repairing thoſe that are cracked, ſee CÆMENT.

RECEIVER, RECEPTOR, or RECEPTATOR, in *Law*, is uſed commonly in the bad ſenſe, for ſuch as knowingly receive ſtolen goods from thieves, and conceal them.

This offence is only a miſdemeanor at common law: however, by the ſtatutes 3 & 4 W. & M. and 5 Ann. cap. 31. the offender is made acceſſory to the theft and felony. But becauſe the acceſſory cannot in general be tried, unleſs with the principal, or after the principal is convicted, the *receivers* by that means frequently eluded juſtice; to remedy which it is enacted by ſtatute 1 Ann. cap. 9. and 5 Ann. cap. 31. that ſuch *receivers* may be ſtill proſecuted for a miſdemeanor, and puniſhed by fine and impriſonment, though the principal felon be not before taken, ſo as to be proſecuted and convicted. And in caſe of receiving ſtolen lead, iron, and certain other metals, ſuch offence is, by ſtatute 29 Geo. II. cap. 30. puniſhable by tranſportation for fourteen years. See LARCENY. So that now the proſecutor hath two methods in his choice; either to puniſh the *receivers* for the miſdemeanor immediately, before the thief is taken, or to wait till the felon is convicted, and then puniſh them as acceſſories to the felony. But it is provided by the ſame ſtatutes, that he ſhall only make uſe of one, and not of both theſe methods of puniſhment.

RECEIVER, alſo, denotes an officer; whereof there are various kinds, denominated from the particular matters they receive, the places where, or the perſons for whom, &c.

As *receiver* of rents; *receiver* general of the CUSTOMS; *receiver* of the fines, upon original writs in chancery, &c.

RECEIVER *general* of the duchy of Lancaſter, is he who gathers all the revenues and fines of the lands of the ſaid duchy, all forfeitures, aſſeſſments, &c.

RECEIVER *general* of the public revenue is an officer appointed in every county, to receive the taxes granted by parliament, and remit the money to the treaſury.

RECEIVER'S *office*. See *Greenwich* HOSPITAL.

RECENT *fruits*. See FRUIT.

RECEPTACULUM *chyli*, RECEPTACULUM *commune*, or *ciſterna chyli*, in *Anatomy*, a reſervoir or cavity near the left kidney, into which the LACTEAL veſſels do all diſcharge their contents.

This receiver, called alſo *receptaculum Pecquetticum*, from M. Pecquet, a phyſician at Dieppe, in Normandy, who firſt demonſtrated, by inconteſtible experiments, this receptacle, which had been long before diſcovered by Euſtachius, lies under the emulgent and great arteries, between the two origins of the diaphragma. Hither do the lacteal veſſels of the ſecond order, or of the third claſs, according to the diſtribution of Winſlow, bring the chyle after its being diluted and rendered thinner by the lympha in the glands of the meſentery.

The greateſt part of the *receptaculum chyli* lies behind the right portion of the inferior muſcle of the diaphragm, on the right ſide of the aorta, at the union of the laſt vertebra of the back with the firſt of the loins. It is a kind of membranous veſicle, the conformation of which is various in human ſubjects. Sometimes it is of an uniform, long, oval figure, like the veſicula fellis; ſometimes it is divided by ſtrictures into ſeveral ſmall roundiſh bags, more or leſs flatted, and ſometimes it ſurrounds the trunk of the aorta like a collar. It is compoſed of very thin coats, and its cavity is divided by ſmall pelliculæ, or membranous ſepta, the diſpoſition of which is irregular. It is chiefly round the lower part of this receptacle that the laſt lacteal veſſels are inſerted, ſome on the ſides, and ſome behind the aorta; and they are accompanied by numerous lymphatic veſſels.

In a preparation of this part, by filling it with mercury, Mr. Cowper found it to conſiſt of three ſeveral large trunks; two of them more than a quarter of an inch in diameter.

This diviſion is only obſerved in human bodies, in whom Dr. Drake thinks its erect poſition makes it neceſſary, in order to take off the reſiſtance which would ariſe from the preſſure of the chyle and lympha, were it contained in a ſingle receiver. In quadrupeds, its horizontal poſition may make one trunk ſufficient.

Its upper portion is contracted between the aorta and vena azygos, and forms a particular canal, which runs up through

through the thorax; and thence is called the THORACIC *duct*.

RECEPTACULUM *seminum*, or RECEPTACLE *of the seed*, in *Botany*, the name given by authors to the base of the flower and fruit of plants, which connects the other six parts of FRUCTIFICATION. This is also called, by some writers, *thalamus flosculorum*. The flowers stand on this in considerable numbers, and without any pedicles. The disk of the *receptacle* is of various shapes in the various plants; in some it is flat, in others concave, in others convex; in some globular, and in many pyramidal. Its surface is sometimes naked, and sometimes paleaceous. In those plants, in which the surface is naked, it is either absolutely smooth, or furnished with small tubercles, or with a few hairs. In those in which it is paleaceous, it is all over beset with narrow pointed paleæ, which are erect, compressed, and stand between the flowers.

The various appellations of the *receptacle* are as follow; viz. a *proper receptacle*, which belongs only to the parts of a single fructification; and this is called a *receptacle of the fructification*, when it is common both to flower and fruit; a *receptacle of the flower*, when it is a base to which the parts of the flower only are fastened without the germen; a *receptacle of the fruit*, when it is a base for the fruit only, remote from the *receptacle* of the flower; and a *receptacle of the seeds*, when it is a base that fastens the seeds within the pericarpium. A *common receptacle* is that which connects many florets in such a manner, as that the taking away any of them would cause an irregularity.

RECEPTARII, a term of reproach used for such physicians as write pompous receipts for loads of medicines, more consulting the good of the apothecary than the patient; as also for such as give receipts for general medicines, to be used at the discretion of people wholly unacquainted with the nature of diseases.

RECEPTION, *receptio*, in *Philosophy*, denotes the same with *passion*, considered as opposed to *action*.

RECEPTION is also properly used for the manner of treating or entertaining a person; and the solemnities and ceremonies practised on that occasion. See ENTRY.

The *reception* of ambassadors is usually performed with a great deal of pomp.

RECEPTION is sometimes also used for the act of approving, accepting, and admitting a thing. See ACCEPTANCE.

The canon-law only binds where it is *received*: the civil law is received in some countries, not in others.

The French would never *receive* the council of Trent, the Spanish inquisition, nor the dogmata of the ultramontane canonists.

RECEPTION, in *Astrology*, is a dignity befalling two planets when they exchange houses; e. gr. when the sun arrives in Cancer, the house of the moon; and the moon, in her turn, arrives in the sun's house.

The same term is also used, when two planets exchange exaltation.

RECEPTITIOUS *goods*. See GOODS.

RECESSION *of the equinoxes*. See PRECESSION *of the equinoxes*.

RECESSUS, a word used by some medical writers to express an abscess, or aposthumation.

RECESSUS *imperii*, RECESS *of the empire*, a phrase used in speaking of the affairs of Germany; signifying a collection of the votes or determinations of a diet.

At the end of each diet, before it breaks up, they gather together all their resolutions, and reduce them into writing; the act which contains them they call the *recessus imperii*, because made when on the point of retiring.

RECHABITES, a kind of religious order among the ancient Jews, instituted by Jonadab the son of Rechab; and comprehending his family and posterity.

Their founder prescribed them three things: first, Not to drink any wine. Secondly, Not to build any houses, but to dwell under tents. Thirdly, Not to sow any corn, or plant any vines.

The *Rechabites* observed these rules with great strictness, as appears from Jerem. xxxv. 6, &c. Whence, St. Jerom, in his thirteenth epistle to Paulinus, calls them *monachi, monks*. Jonadab, their founder, lived under Jehoash, king of Judah, contemporary with Jehu king of Israel; his father Rechab, from whom his posterity were denominated, descended from Raguel or Jethro, father-in-law to Moses, who was a Kenite, or of the race of Ken; whence *Kenite* and *Rechabite* are used as synonymous in Scripture.

RECHACING, in *Hunting*, the driving back of the deer, or other beasts, into the forests, chaces, &c. which had straggled out into the copses or thickets, &c.

Anciently there were offices of *rechacers* of the deers bestowed by the king on gentlemen, or old hunters, with salaries for the keeping of running dogs to *rechace* the deer into the forests, and then to beat the dogs off, without pursuing any farther.

RECHANGE, in *Commerce*. See RE-EXCHANGE.

RECHANGE is also used at sea for such tackle as is kept in reserve aboard the ship, to serve in case of failure of that already in use. See TACKLE.

The Levantines use the word *respect* or *respit* in the same sense.

RECHARGE *of a fire-arm*, is a second loading or charge. The *recharge* should never be so deep as the first charge, lest the piece, being overheated, should burst.

RECHEAT, in *Hunting*, a lesson which the huntsman winds on the horn, when the hounds have lost their game; to call them back from pursuing a counter-scent.

RECIMUS, among the Romans, a kind of square mantle, or veil, worn by women on their head. Salmasius will have it to have been a sort of gown used by the Roman ladies, and tucked up before with a square pin, of a purple colour.

RECIPE, in *Medicine*, a prescription, or formula, of a remedy, appointed to be administered to a patient. See PRESCRIPTION.

It is thus called, because always beginning with the word *recipe, take*; ordinarily expressed by the abbreviation ℞.

RECIPIANGLE, or RECIPIENT-ANGLE, a mathematical instrument, serving to take the quantity of angles; used especially in the drawing plans of fortifications.

The *recipiangle* was formerly a popular instrument among the French, but little known among us; it is usually very simple, in form of a square, or rather a BEVEL; consisting of two arms or branches, rivetted together, and yet moveable, like a sector on the centre or rivet.

To take an angle with it, they lay the centre of a protractor to the joint, and the degrees cut by the edge shew the quantity of the angle: otherwise the angle made by the two rulers is drawn on paper, and then measured with a protractor.

Sometimes there is a circle divided into degrees added over the centre or rivet, with an index to shew the degrees without a protractor. At other times the underbranch is divided.

To measure a saliant angle with any of the *recipiangles*, apply the insides to the lines that form the angle; for a re-entering angle, apply the outsides, &c.

RECIPIENDO *excommunicato*. See EXCOMMUNICATO.

RECIPIENDO & *faciendo attornato*. See ATTORNATO.

RECIPIENT, in *Chemistry*. See RECEIVER.

RECIPIENT *of an air-pump*. See RECEIVER.

RECIPROCAL, *reciprocus*, something that is mutual, or which is returned equally on both sides, or affects both parties alike.

The end of human society is to afford each other *reciprocal* aid; there are *reciprocal* duties between the prince and his subjects, the husband and wife, &c. There is a *reciprocal* action between the agent and patient.

The *lex talionis* establishes a kind of *reciprocation* of justice.

If two similar triangles be cut by parallel lines, the sections of the sides will be proportional; and *reciprocally*, if the sides be cut proportionably, the triangles are similar.

RECIPROCAL, in *Logic*, is applied to terms which have the same signification, or are convertible; as, *reasonable animal* and *man*.

Schoolmen define *reciprocation* a conversion of the several terms in an enunciation. And terms are said to be converted in an enunciation, when the predicate is put in the place of the subject, and, *reciprocally*, the subject in that of the predicate.

Thus, rationality and risibility are said to *reciprocate*; for we say equally, *a rational is risible*, and a *risible is rational*.

RECIPROCAL, in *Grammar*, is applied to certain verbs and pronouns in some of the modern languages; in regard of their turning or reflecting the noun, or person, upon himself.

Thus the pronoun relative, *himself*, refers Cato to Cato's self.

The abbé de Dangeau defines *reciprocal verbs* to be those whose nominative is plural, and denotes persons acting mutually on one another: as, *Ces quatre hommes s'entrebattoient, those four men fought together*; *Pierre & toi vous vous louez, Peter and you praise one another*, &c.

Reciprocal verbs are a species of those which that author calls *pronominals*, and which he distinguishes into *reciprocal* and *identical*.

RECIPROCAL, in *Poetry*, is applied to verses which run the same both backwards and forwards; called also *recurrents*. See RETROGRADE.

RECIPROCAL, in *Mathematics*, is applied to quantities, which multiplied together produce unity. Thus $\frac{1}{x}$ and

x, y and $\frac{1}{y}$ are *reciprocal* quantities. And $\frac{1}{x}$ is said to be the *reciprocal* of x, which, *vice versa*, is the *reciprocal* of $\frac{1}{x}$.

Reciprocal *figures*, in *Geometry*, are such as have the antecedents and consequents of the same ratio in both figures. See *Tab.* III. *Geom. fig.* 78. Here,

$$A : B :: C : D, \text{ or,}$$
$$12 : 4 :: 9 : 3$$

That is, as much longer as the side A, in the first rectangle, is than the side B of the second rectangle; so much deeper is the side C in the second rectangle, than the side D in the first; and, consequently, the length of one is compensated by the depth of the other.

Also, as the side A is $\frac{1}{4}$ longer than the side C, so the side B is $\frac{1}{4}$ longer than D: wherefore the rectangles must needs be equal.

This is the foundation of that catholic theorem; that the rectangle of the extremes must always be equal to that of the means; and, consequently, the reason of the rule of three, or golden rule.

For, suppose there were given any three numbers, or quantities, geometrically proportional, as A, B, and C; and that it were required to find a fourth, D, proportional to them: since $A : B :: C : D$, therefore $AD = BC$, and, consequently, $D = \frac{BC}{A}$; that is, the fourth term is equal to the quotient of the second, multiplied by the third term divided by the first.

Or, thus in numbers: suppose given 12, 4, and 9; required a fourth proportional. Now as $12 : 4 :: 9 : Q$. But $12\,Q = 4 \times 9 = 36$. Therefore $Q = \frac{4 \times 9}{12} = 3$, by dividing both sides by 12.

And hence it follows, that if any two triangles, parallelograms, prisms, parallelopipeds, pyramids, cones, or cylinders, have their bases and altitudes *reciprocally* proportional, those two figures or solids are equal to one another; and, *vice versa*, if they are equal, their bases and altitudes are *reciprocally* proportionable.

Reciprocal *proportion*, is when in four numbers the fourth is less than the second, by so much as the third is greater than the first; and *vice versa*. See Proportion.

This is the foundation of the inverse, or indirect rule *of three*. Thus, $4 : 10 : 8 : 6$.

Great use is made of this *reciprocal proportion*, by Sir Isaac Newton, and others, in demonstrating the laws of motion.

Reciprocal *theorem*. See Theorem.

RECISSION, in *Law*. See Ademption.

RECITAL, in *Law*, the rehearsal or making mention in a deed or writing of something which has been done before.

A *recital* is not conclusive, because it is no direct affirmation; and by feigned *recitals* in a true deed, men might make what titles they pleased, since false *recitals* are not punishable. If a person by deed of assignment *recite* that he is possessed of an interest in certain lands, and assign it over by the deed, and become bound by bond to perform all the agreements in the deed; if he is not possessed of such interest the condition is broken; and though a *recital* of itself is nothing, yet being joined and considered with the rest of the deed, it is material. And where it is but a *recital*, that before the indenture the parties were agreed to do such a thing, it is a covenant, and the deed itself confirms it. The *recital* of one lease in another, is not a sufficient proof that there was such a lease as is *recited*. But the *recital* of a lease in a deed of release, is good evidence of a lease against the releffor, and those who claim under him. A new reversionary lease shall commence from the delivery, where an old lease is *recited*, and there is none, &c. A. *recites* that he hath nothing in such lands, and in truth he has an estate there, and makes a lease to B. for years; the *recital* is void, and the lease good. In this case, if the *recital* were true, the lease would not bind.

RECITATION, the act of *reciting*, or delivering a discourse, either in the way of narration, rehearsal, declamation, or reading.

RECITATIVO, or Recitative *music*, a kind of singing, which differs but little from ordinary pronunciation: such as that wherein several parts of the liturgy are rehearsed in cathedrals, or that wherein the actors ordinarily deliver themselves on the theatre, at the opera, &c. See Music.

The Italians value themselves on their performance in the *recitative* way. The *recitatives*, or *recitativos*, in our operas, usually tire the audience, because they do not understand the language; but the songs make them amends.

Recitative *style*, is the way of writing accommodated to this sort of music.

RECKONING, in *Navigation*, the act of estimating the quantity of a ship's way; or of the distance run between one place and another.

Or, more generally, a ship's *reckoning* is that account, whereby at any time it may be known where the ship is, and on what course or courses she is to steer to gain her port. See Log-*board*, Log-*book*, and Journal.

This is usually performed by means of the log-line: the manner of applying which, see under its proper article, Log-line.

Yet this is liable to great irregularities. Vitruvius advises an axis to be passed through the sides of the ship, with two large heads propending out of the ship, wherein are to be included wheels touching the water, by whose revolution the space passed over in any given time may be measured. The same has been since recommended by Snellius; but there are few who have written of navigation, but have shewn the insufficiency of this method.

Reckoning, *dead*. See Dead *reckoning*.

RECLAIMING, or Reclaming, in our *Ancient Customs*, the action of a lord pursuing, prosecuting, and recalling his vassal, who had gone to live in another place, without his permission.

Reclaiming is also used in a similar sense, for the demanding of a person or thing to be delivered up, or surrendered, to the prince or state it properly belongs to; when, by any irregular means, it has come into the possession of another.

Reclaiming, in *Falconry*, is the calling of a hawk, or bird of prey, back to the fist.

The spar-hawk, gos-hawk, &c. are *reclaimed* with the voice; the falcon only by shaking the lure. So that the term luring, with regard to the falcon, is more proper than *reclaiming*.

The partridge is also said to *reclaim* her young ones, when she calls them together upon their scattering too much from her.

Reclaiming is also used for taming animals that are wild by nature.

Reclaiming, in a monastic sense. See Religious.

RECLINATE *stalk*. See Stalk.

RECLINATION *of a plane*, in *Dialling*, the number of degrees which a dial-plane leans backwards, from an exactly upright or vertical plane, i. e. from the zenith.

The *reclination* is easily found, by means of a ruler, and a quadrant; for having drawn an horizontal line on the plane by a level or quadrant, and to it another line at right angles, apply a ruler, so that one end of it may hang over, or reach beyond the plane; then will a quadrant, applied to the under-edge of the ruler, shew the degrees and minutes of the plane's *reclination*; accounting from that side of the quadrant that is contiguous to the edge of the ruler.

RECLINER, or Reclining *dial*, is a dial whose plane *reclines* from the perpendicular; i. e. leans from you when you stand before it.

When this reclination is equal to the height of the pole, the dial is said to be equinoctial. See Dial.

Recliner, *declining*, or *Declining* Reclining *dial*, is a dial which neither stands perpendicularly, nor opposite to one of the cardinal points. See Dial.

RECLUSE, among *Religious*, a person close shut up in a very narrow cell of an hermitage, or other religious house; and cut off, not only from all conversation with the world, but even with the house.

The word is chiefly used for such as thus imprison themselves out of devotion, to do penance. It is sometimes also applied to incontinent wives, whom their husbands procure to be thus kept in a perpetual prison in some convent.

Recluses were anciently very numerous: they were then a kind of solitaries who shut themselves up in some little cell, with a vow never to stir out of it.

None were admitted to this oath until they had given sufficient proofs of their abstinence, and had leave from the bishop, or the abbot of the monastery where they were shut up; for the cells of the *recluses* were always to join to some monastery.

The prelate's permission being obtained, they were tried for a year in the monastery; out of which, during that time, they never stirred.

They were then admitted to their vow of stability in the church before the bishop; which being done, and the *recluse* having entered his little cell, the bishop set his seal on the door.

The cell was to be very small, and very exactly closed. The *recluse* was to have every thing within it necessary to life; and even, if he were a priest, an oratory consecrated by the bishop, with a window which looked into the church, through which he might make his offerings

at the mafs, hear the finging, fing himfelf with the community, and anfwer thofe who talked to him. But this window was to have curtains before it, both withinfide and without; fo that the *recluse* might neither fee, nor be feen.

Indeed he was allowed a little garden in his *reclufion*, to plant a few herbs, and take frefh air; adjoining to his cell was that of his difciples, which he was very rarely without; with a window, through which they ferved him with neceffaries, and received his inftructions.

When it was judged proper to have two or three *reclufes* together, their cells were made contiguous to each other, with windows of communication: if any woman would confult them, or confefs to them, it was to be in the church, and in the face of all the world.

Where there were two or three *reclufes* together, they were never to hold any conference, but on fpiritual matters, and to confefs to each other: where there was but one, he was to confefs and examine himfelf.

If the *reclufe* fell fick, his door was opened for people to come in and affift him; but he was not allowed to ftir out on any pretence whatever.

Thefe articles are extracted from the rule, compiled for the *reclufes*, by Grimlaic, a prieft in the ninth century.

There were alfo women *reclufes*, who led the fame life, in proportion. St. Viborade lived a *reclufe* at St. Gall, and was there martyred by the Hungarians in 825.

RECLUSION, the ftate of a RECLUSE; or the cell and other appurtenances thereof.

F. Helyot gives a particular account of the ceremonies practifed in the *reclufion* of a woman, in that of mother de Cambray, inftitutrix of the order of the reprefentation of Notre Dame. A cell being built for her in 1625, adjoining to the church of St. Andrew in Tournay, the bifhop waited for her early in the morning at the church-door. Upon her arrival, proftrating herfelf at the feet of that prelate, he gave her his benediction; conducted her to the grand altar; and there bleffing a mantle, veil, and fcapular, he put them on her, and gave her a new name.

Having here made her vow, and the bifhop having harangued the people in praife of the new *reclufe*, he conducted her proceffionally to her *reclufion*; the clergy all the way finging *Veni, fponfa Chrifti*, &c.

Here the bifhop, bleffing her afrefh, confecrated the *reclufion*, and fhut her up in perpetual confinement.

RECOGNISANCE. See RECOGNIZANCE.

RECOGNITION, *recognitio*, denotes an acknowledgment. The word is particularly ufed, in our law-books, for the title of the firft chapter of the ftat. 1 Jac. I. whereby the parliament acknowledged the crown of England, after the death of queen Elizabeth, to have rightfully defcended to king James.

RECOGNITIONS *of Clement*, in *Ecclefiaftical Hiftory*, a fuppofititious or apocryphal book, afcribed to St. Clement, but really compofed by fome learned and eloquent man in the fecond century. This book is, for the moft part, fays the learned Dr. Lardner, a fiction or romance, in which divers things concerning the Chriftian religion are reprefented in a philofophical manner, in order to render them more agreeable to the Greeks. It is called the Travels and Acts of Peter, from its fubject, as it contains an account of the apoftle Peter's difputes with Simon Magus, and his difcourfes to other people, and his miracles. It is called the *Recognitions*, from Clement's recognifing his father and mother and brethren, who had been long feparated from each other. Coteler. ap. Patr. Apoft. tom. i. p. 484. Lardner's Cred. Gofpel. Hift. vol. iv. p. 786, &c. See *Clementine* HOMILIES.

RECOGNITION, in the *Drama*. See DISCOVERY.

RECOGNITIONE *adnullanda per vim & duritiem facta*, is a writ to the juftices of the common-bench for fending a record touching a recognizance, which the recognizor fuggefts to have been acknowledged by force, and hard dealing; that, if it fo appear, it may be annulled.

Tranfcriptio RECOGNITIONIS *factæ coram juftitiariis itinerantibus*. See TRANSCRIPTIO.

RECOGNITORS, *recognitores*. The jury impanelled upon an affize are called *recognitors*, becaufe they acknowledge a diffeifin by their verdict.

RECOGNIZANCE, or RECOGNISANCE, in *Law*, a bond or obligation of record acknowledged to the king; teftifying the *recognizor* to owe to the *recognizee* a certain fum of money; with condition to do fome particular act, as to appear at the affizes, to keep the peace, to pay a debt, or the like.

It is thus called, becaufe *recognized*, or acknowledged, in fome court of record, or before fome judge, mafter in chancery, or juftice of the peace.

Mere *recognizances* are not fealed, but inrolled; and execution, by force thereof, is of all the recognizor's goods or chattels (except draught-beafts, or implements of hufbandry) and the moiety of his land.

There are alfo *recognizances* for BAIL, others for appearing at the feffions to profecute a felon, others for GOOD *behaviour*, &c.

There are alfo other *recognizances*, of a private kind, in nature of a STATUTE *ftaple*, by virtue of the ftatute 23 Hen. VIII. cap. 6. which are a charge upon real property.

RECOGNIZANCE is alfo ufed, in our *Ancient Statutes*, for the verdict of the twelve jurors impanelled upon an affize; hence called *recognitors*.

RECOGNIZEE, is he to whom one is bound in a recognizance. He that is fo bound is called RECOGNIZOR.

RECOIL, or REBOUND, the refilition of a body, chiefly a fire-arm; or the motion whereby, upon explofion, it ftarts or flies backwards; the caufe of which is the impelling force of the powder, which acts equally on the breech and on the ball; fo that if the piece and ball were of equal weight, and other circumftances the fame, the piece would *recoil* with the fame velocity as that with which the ball is difcharged: but the heavier any body is, the lefs will its velocity be, when the force impelling it continues the fame. Therefore fo many times as the cannon and carriages are heavier than the ball, juft as many times will the velocity of the cannon be lefs than that of the ball; and the fpace through which the cannon *recoils* whilft the ball moves along the cylinder is to the length of the cannon diminifhed by the fpace behind the ball, as the weight of the ball is to the weight of the cannon. Let a twenty-four pounder of ten feet be 6400 pounds weight, and when the ball quits the piece, the cannon will have *recoiled* $\frac{24}{6400} \times 10 = \frac{3}{80}$ of a foot, lefs than half an inch.

The greater the charge, *cæteris paribus*, the greater the rebound. By an experiment made before the Royal Society, and related in the Philofophical Tranfactions, it was found, that cannons, charged to a certain degree, throw the ball from right to left of their own direction; but that the cannons themfelves *recoil* from left to right.

Some of the gentlemen of the French academy doubting the juftnefs of the obfervation, Mr. Caffini, the younger, undertook to repeat the experiment; which he did by means of a machine, as like that ufed in England as he could; and that tried over and over again.

The refult was, that the ball, when the gun had liberty to *recoil*, was always thrown to the right of the point to which it was thrown when the gun was fixed without a poffibility of rebounding; but then the *recoil* was always made the fame way, viz. to the right; and he never found that contrariety of directions between the ball and the rebound, obferved in the Englifh experiment. See Hift. Acad. R. Scienc. A. 1703, p. 120, &c.

The caufe of the phenomenon feems very difficult to affign; for fuppofing the guns of a common make, with the touch-hole on the top, we cannot fo much as guefs what caufe fhould conftantly determine the ball from right to left; unlefs fome very material circumftances be omitted in the recital they have given us of the experiment.

Guns whofe vents are a little forward in the chafe *recoil* moft. To leffen the *recoil* of a gun, the platforms are generally made floping towards the embrafures of the battery. See PROJECTILE.

RECOLATION, a method of fining the decoctions of vegetables, &c. by repeated percolation, or ftraining them feveral times fucceffively through a linen or woollen-bag.

RECOLLECTION, a mode of thinking, whereby thofe ideas, fought after by the mind, are with pain and endeavour found, and brought again to view. See MEMORY and IMAGINATION.

RECOLLETS, a congregation of reformed FRANCISCANS, called alfo *friers minor of St. Francis, of the ftrict obfervance*. They were eftablifhed about the year 1532, when fome religious of the order of St. Francis being willing to keep his rule to the letter, Clement VII. gave them houfes, whither they might retire, and receive fuch as were difpofed to follow them. The fame year he approved the reform; and in 1584 it was carried from Italy into France, where thefe religious had already been eftablifhed, in the towns of Tulles, in Limofin, and Murat, in Auvergne. They had a convent at Paris in 1603; and fince they have erected no lefs than a hundred and fifty in the whole kingdom, where they are divided into feven provinces.

RECOMMENDATI. See AFFIDATUS.

RECOMPOSITION, in *Chemiftry*, the compounding of bodies from their feparated parts, or principles, fo as to compofe the original whole again. This is extremely difficult to effect univerfally, but in fome cafes it may be done, and that fo perfectly, that the *recompofed* body fhall not be diftinguifhable by the fenfes from that which never had been feparated by the fire. If the art of chemiftry were perfect, we fhould thus be able, at leaft in fome

ſome degree, to *recompoſe* all the bodies we divide; but this is far from being the caſe at preſent. We can by no means do this in vegetable and animal bodies, where there is a vaſcular ſtructure, and therefore we are carefully to diſtinguiſh between the regeneration of organized, and that of unorganized bodies.

RECONCILIARI, in our *Law-Books*, &c. A church is ſaid *reconciliari*, to be *reconciled*, when it is conſecrated afreſh, after having been polluted or profaned; as by the poſſeſſion of pagans, heretics, &c.

RECONCILIATION *of penitents*, in *Church Hiſtory*. See POENITENTES.

RECONNOITRE, in *War*, implies to view and examine the ſtate of things, in order to make a report thereof.

The word is French, ſignifying, literally, *to know, recollect*.

We ſay, to *reconnoitre* the coaſts, to *reconnoitre* a port, &c.

A body of horſe was ſent to *reconnoitre* their camp, the ground, the condition of the roads, rivers, &c.

A general ought to go to *reconnoitre*, in perſon, the place to be beſieged, in order to learn its ſituation and avenues, its ſtrength and weakneſſes.

RECONNOITRE is alſo uſed at ſea. To *reconnoitre* a veſſel, a fleet, &c. is to approach near enough to examine the rate and burden of a veſſel, &c. the force it may have aboard, what nation it is of, &c.

To *reconnoitre* a land, or ſhore, is to obſerve its ſituation, in order to find what land it is.

RECORD, *recordum*, in *Law*, an authentic teſtimony of any thing in writing, contained in rolls of parchment, and preſerved in a COURT *of record*.

Records are ſaid to be *vetuſtatis & veritatis veſtigia*. An act committed to writing in any of the king's courts, during the term wherein it is written, is alterable, being no *record*; but that term once ended, and the act inrolled, it is a *record*, and of ſuch credit as admits no alteration, or proof to the contrary.

Lawyers reckon three ſorts of *records*; viz. a *judicial record*, as attainder, &c. a *miniſterial record* upon oath, as an office of inquiſition found; and a *record* made by *conveyance* and conſent, as a fine, or deed inrolled, and the like.

RECORD, *aſſurances by matter of*, in *Law*, are ſuch as do not entirely depend on the act or conſent of the parties themſelves; but the ſanction of a court of *record* is called in, to ſubſtantiate, preſerve, and be a perpetual teſtimony of, the transfer of property from one man to another; or of its eſtabliſhment, when already transferred: of this nature are private acts of parliament, the king's grants, fines, and common recoveries.

RECORD, *court of*. See RECORD, ſupra, and COURT.

RECORD, *debt of*, is a ſum of money, which appears to be due by the evidence of a court of *record*. Thus, when a ſpecific ſum is adjudged to be due from the defendant to the plaintiff, on an action or ſuit at law, this is a contract of the higheſt nature, being eſtabliſhed by the ſentence of a court of judicature. Recognizances, together with ſtatutes merchant, and ſtatutes ſtaple, &c. if forfeited by non-performance of the condition, are alſo debts of *record*; the contract, on which they are founded, being witneſſed by the higheſt kind of evidence, viz. by matter of *record*.

RECORDS, *imbezzling of*. See IMBEZZLE.

RECORD, *matter, muſter, oyer, priſoner upon matter of*, ſee MATTER, MUSTER, OYER, and PRISONER, &c.

RECORD, *trial by*, is uſed only in one particular inſtance; where a matter of *record* is pleaded in any action, as a fine, a judgment, or the like; and the oppoſite party pleads "*nul tiel record*," that is, there is no ſuch matter of *record* exiſting: upon this iſſue is tendered and joined in the following form, "and this he prays may be required of *by the record*, and the other doth the like;" and hereupon the party pleading the *record* has a day given him to bring it in, and proclamation is made in court for him "to bring forth his *record*, or he ſhall be condemned;" and, on his failure, his antagoniſt ſhall have judgment to recover. The trial of this iſſue is, therefore, merely by the *record*. Thus, titles of nobility ſhall be tried by the king's writ or patent only, which is matter of *record*. Alſo in caſe of an action, whether alien, friend, or enemy, ſhall be tried by the league or treaty between his ſovereign and our's; for every league or treaty is of *record*. And alſo whether a manor be held in ancient demeſne or not, ſhall be tried by the *record* of Domeſday in the king's exchequer. Blackſt. Com. book iii. p. 331.

RECORD, among *Fowlers*. A bird is ſaid to *record*, when it begins to tune or ſing within itſelf; or to form its notes, and diſpoſe its organs for ſinging.

The cock thruſh is diſtinguiſhed from the hen in *recording*; the firſt being more loud and frequent in it than the ſecond.

Inſtances have been known of birds beginning to *record* when they were not a month old. This firſt eſſay does not ſeem to have the leaſt rudiments of the future ſong; but as the bird grows older and ſtronger, one may perceive what the neſtling is aiming at. A young bird commonly continues to *record* for ten or eleven months, when he is able to execute every part of his ſong, which afterwards continues fixed, and is ſcarcely ever altered. The term *record* is probably derived from a muſical inſtrument, formerly uſed in England, called a *recorder*, which ſeems to have been a ſpecies of flute, and was probably uſed to teach young birds to pipe tunes. Lord Bacon deſcribes this inſtrument (in his ſecond Century of Experiments) to have been ſtraight, to have had a leſſer and greater bore, both above and below, to have required very little breath from the blower, and to have had what he calls a ſipple or ſtopper.

RECORDARI *facias loquelam*, a writ directed to the ſheriff to remove a cauſe depending in an inferior court, as hundred-court, county-court, court of ancient demeſne, &c. to the king's bench, or common-pleas, &c.

It is thus called, becauſe it commands the ſheriff to *make a record* of the proceedings either by himſelf, or others; and then to ſend up the cauſe.

RECORDER, *recordator*, a perſon whom the mayor, or other chief magiſtrate of any city, or town corporate, having juriſdiction, and a court of *record*, within their precincts, does aſſociate with him, for his better direction, in matters of juſtice, and proceedings according to law. He is uſually a counſellor, or other perſon, verſed and experienced in the law. In ſome towns, which have their particular aſſizes within themſelves, and no mayor, the *recorder* is the judge.

The *recorder* of London is one of the juſtices of oyer and terminer, and a juſtice of peace of the *quorum*, for putting the laws in execution for preſerving the peace and government of the city; and being the mouth of the city, he delivers the ſentences and judgments of the courts therein, and alſo certifies and *records* the city-cuſtoms, &c. He is choſen by the lord mayor and aldermen, and attends the buſineſs of the city, on any warning by the lord mayor, &c.

RECORDER, in *Muſic*. See RECORD, ſupra.

RECORDO & *proceſſu mittendis* is a writ to call a *record*, together with the whole proceedings in the cauſe, out of an inferior court into the king's court.

RECOVERY, in a legal ſenſe, an obtaining of any thing by judgment, or trial at law; anſwering to *evictio* among the civilians.

There is a *true* and a *feigned recovery*.

RECOVERY, *true*, is an actual or real *recovery* of any thing, or of the value thereof, by judgment. As if a man ſue for any land, or other thing, and have a verdict or judgment for him.

RECOVERY, *feigned* or *common*, is a ſort of *fictio juris*, being a certain form or courſe preſcribed by law to be obſerved for the better aſſuring of lands and tenements to us; the end and effect whereof is, to diſcontinue and deſtroy eſtates-tail, remainders, and reverſions, and to bar the intails thereof.

Theſe common *recoveries* were invented by the eccleſiaſtics to elude the ſtatutes of mortmain; and afterwards encouraged by the fineſſe of the courts of law in 12 Edw. IV. in order to put an end to all fettered inheritances, and bar not only eſtates-tail, but alſo all remainders and reverſions expectant thereon.

This *recovery* is either with a *ſingle* or a *double voucher*; and ſometimes a treble or farther voucher, as the exigency of the caſe may require.

In RECOVERY *with a ſingle voucher* there are three parties required; the *demandant*, the *tenant*, and the *vouchee*.

The demandant is he who brings the writ of entry, and may be termed the *recoverer*. The tenant is he againſt whom the writ is brought, and may be called the *recoveree*. The vouchee is he whom the tenant voucheth, or calls to warranty for the land in demand.

RECOVERY *with double voucher* is where the tenant voucheth one, who voucheth another, or the common vouchee.

To explain this matter: ſuppoſe a man deſirous to cut off an eſtate-tail in lands or tenements, to the end that he may ſell, give, or bequeath them; the firſt thing he does is, to cauſe a feigned writ of entry *ſur diſſeiſin in le poſt* to be brought for the lands of which he intends to dock or cut off the intail; and, in a feigned declaration thereupon made, he pretends he was diſſeiſed by him, who, by a feigned fine, or deed of bargain and ſale, is named and ſuppoſed to be tenant of the lands.

This feigned tenant, if it be a ſingle *recovery*, is made to appear, and vouch the bag-bearer of writs of the cuſtos brevium, or cryer, of the common-pleas (where alone theſe common *recoveries* are allowed) who makes default; upon which a judgment is, by this fiction, entered, that the

the demandant shall recover, and have a writ of seisin for the possession of the lands in question; and that the tenants shall recover the value of the lands against the lands of the vouchee; which is an imaginary satisfaction for the heir in tail, though he is to be never the better for it.

Clerk of inrollments of RECOVERIES *and fines*. See CLERK.

RECOUPE, French; formed of *re*, and *couper*, *to cut again*, in *Law*, to rebate, or DISCOUNT.

Thus, if a man have ten pounds issuing out of certain lands, and he disseises the tenant of the land; in an assise brought by the disseisee, if he recover the land and damages, the disseisor shall *recoupe* the rent due in the damages.

RECOUPE also denotes a quick, sharp reply, to a peremptory demand. See REPARTEE.

RECREANT, in our *Old Law Books*, implies cowardly, faint-hearted.

Hence *recreantise*. See CRAVEN and CHAMPION.

Recreant was so reproachful a word, that Glanville would not describe it. *Recreantes equi* is used by Fleta, lib. ii. cap. 2. for dull, jaded horses.

RECREMENT, *recrementum*, in *Medicine*, some superfluous matter separated from some other that is useful.

In which sense, it amounts to much the same with FÆCES, or EXCREMENT.

RECREMENT is sometimes also used to denote such secreted juices in the body, as are afterwards of use to the œconomy; as the lympha, gall, &c. which are thus called, in contradistinction to *excrements*, which are expelled out of the body, as of no farther use.

RECRIMINATION, a posterior accusation brought by the accused against his accuser, upon the same fact.

When two parties have made their mutual complaint at the same time; the business is, first, to determine who shall be the accuser, and who the accused; i. e. on whom shall fall the *recrimination*.

By the French laws, *recrimination* is of no force till the criminal hath been purged legally.

RECRUDESCENCE, *recrudescentia*, in *Medicine*, is a relapse, when a disease that was gone off returns again.

RECRUITS, in the *Military Art*, new men raised to supply the places of such as have lost their lives in the service, or are rendered unserviceable by age or wounds. See LISTING.

RECRUIT-*horses*, are the *horses* brought up for completing the regiments of horse or dragoons every year.

RECTANGLE, in *Geometry*, called also *oblong*, and *long square*, a quadrilateral rectangular figure (MLIK, *Tab.* III. *Geometry*, *fig.* 79.) whose opposite sides ML and IK, as well as MI and LK, are equal.

Or, a *rectangle* is a parallelogram, whose sides are unequal, but its angles right.

To find the area of a rectangle. See PARALLELOGRAM.

If from the same point A, *fig.* 80. be drawn two lines, one whereof, AD, is a tangent to a circle, the other a secant AB; the square of the tangent AD will be equal to the *rectangle* under the secant AB, and that part of it without the circle AC. If two or more secants A *a*, AB, &c. be drawn from the same point A; the *rectangles* under their wholes, and their parts without the circle, will be equal. If two chords intersect each other, the *rectangles* under their segments will be equal.

RECTANGLES, *similar*. See SIMILAR.

RECTANGLE, in *Arithmetic*, is the same with PRODUCT or *factum*.

RECTANGLED, RIGHT-ANGLED, *triangle*, is a triangle, one of whose angles is right, or equal to 90°. See TRIANGLE.

There can be but one right angle in a plain triangle; therefore a *rectangled* triangle cannot be equilateral.

RECTANGULAR, in *Geometry*, is applied to figures and solids which have one or more angles right.

Such are squares, rectangles, and rectangled triangles, among plain figures; cubes, parallelopipeds, &c. among solids.

Solids are also said to be *rectangular* with respect to their situation: thus, if a cone, cylinder, &c. be perpendicular to the plane of the horizon, it is called a *rectangular* or *right* cone, cylinder, &c.

The ancients used the phrase *rectangular section of a cone*, to denote a parabola; that conic section, before Apollonius, being only considered in a cone, whose section by the axis would be a triangle, right-angled at the vertex. See CONIC *section*.

Hence it was that Archimedes entitled his book of the quadrature of the parabola, by the name of Rectanguli Coni Sectio.

RECTANGULAR *barometer*. See BAROMETER.

RECTANGULAR *windmills*. See WINDMILLS.

RECTIFICATION, compounded of *rectus*, *right*, *direct*, and *fio*, *I become*, the act of *rectifying*, i. e. of correcting, remedying, or redressing, some defect or error, in respect either of nature, art, or morality.

RECTIFICATION, in *Chemistry*, is the repeating of a distillation or sublimation several times, in order to render the substance purer, finer, and freer from aqueous and earthy parts.

Rectification is a reiterated depuration of a distilled matter, e. gr. brandy, spirits, or oils, by distilling them over again, to render them more subtile, and exalt their virtues.

That the *rectification* of spirits may, in all cases, proceed with the greatest exactness, a due regard to it must be had even from the first fermenting the substance from which they are to be made, and continued through all the stages of distillation, the low wines, proof spirit, and alcohol. The management of the fermented liquor, to this purpose, is principally the letting it stand to subside after the fermentation is over, and the drawing it off clear and thin, not too rich for the still. The still is not to be overfilled with this. Great care must be taken to prevent its burning, and the faints that run last must be kept separate, not mixed with the rest of the liquor distilled, which is now called the low wines. In the *rectifying* these into proof spirit, great caution must be used that the fire be kept regular, not raised by sudden spirts, which always throw up the oil in large quantities, which is to be left behind. In the succeeding *rectification* of the proof spirit into alcohol, the same cautious management of the fire is necessary; and, in both this and the last, the faints are not to be suffered to run in among the spirit, but to be saved separate. They may be all mixed together at last, and reduced to a spirit fit for burning in lamps; but the keeping out of the *rectified* liquor will keep away the coarsest and most stinking part of the oil of the ingredients.

By these easy means, without any additional trouble or charge, we might be furnished with a spirit greatly exceeding what we commonly meet with. And in general, the art and mystery of our sellers of the several sorts of English brandies, seem to consist in this prudent management, and in the adding a little of the *oleum vini*, or oil of wine lees, to the spirits thus procured pure: this gives the flavour of foreign brandies, and is so extensive in its use, that half an ounce of it is sufficient for a hogshead of pure spirits.

Malt spirit is that which principally requires all this care in the *rectification*, because its oil is more nauseous and offensive than that of any other spirit; but all others will be greatly the better for being treated in the same manner, and it is indeed necessary that they should for some particular uses.

It is remarkable, that no one method of combinatory *rectification*, that is, of the *rectification* performed by means of salt, and other additions (see *Combinatory* DISTILLATION), is suited to all the several kinds of spirits; scarce indeed will any one way serve for any two spirits; but this method, by simple and careful distillation, is equally suited to all. Melasses-spirit, cyder-spirit, wine-spirit, or brandy, rum, and arrack, are all improved by it; and all of them are then known to be perfectly *rectified*, when in the state of alcohol they not only prove totally inflammable in a little vessel floating upon cold water, but when poured into the purest spring-water, they have not the least power of making any change in it, nor leave any marks of oilyness, or that unctuosity, which, on the mixture of the less pure spirits, floats on the top, and in certain lights give the rainbow colours. Shaw's Essay on Distillery.

Fixed salts are *rectified* by calcination, dissolution, or filtration.

Metals are *rectified*, i. e. *refined*, by the *coppel*; and reguluses by repeated fusions, &c.

In a word, all *rectifications* are founded upon the same principle; and consist in separating substances more volatile from substances less volatile; and the general method of effecting this is to apply only the degree of heat which is necessary to cause this separation.

RECTIFICATION *of vitriolic acid.* See CONCENTRATION.

RECTIFICATION, in *Geometry*, is the finding of a right line equal to a curve.

All we need to find the quadrature of the circle is, the *rectification* of its circumference; it being demonstrated, that the area of a circle is equal to a rectangled triangle, whose two sides, comprehending the right angle, are the radius, and a right line equal to the circumference.

To *rectify* the circle, therefore, is to *square* it; or, rather, both the one and the other are impossible. See QUADRATURE *of the circle*.

The *rectification of curves* is a branch of the higher geometry; wherein the use of the new-invented integral calculus, or inverse method of fluxions, is very conspicuous.

tuous. For, ſince a curve line may be conceived to conſiſt of innumerable right lines, infinitely ſmall; if the quantity of one of them be found, by the differential calculus; their ſum, found by the integral calculus, gives the length of the curve.

Thus, if AMO (*Tab. Analyſis, fig.* 18.) be a curve of any kind, whoſe ordinates are parallel to one another, and perpendicular to the axis AH; and the fluxion of the abſciſs AP be denoted by Pp or MR, and Rm be taken to repreſent the correſponding fluxion of the ordinate PM, then will the tangent Mm be the line which the generating point of the curve would deſcribe, if its motion were to become uniform at M; conſequently this line will truly expreſs the fluxion of the ſpace AM. Hence, putting AP $= x$, PM $= y$, and AM $= z$, we have $\dot{z}\ (= \mathrm{M}m = \sqrt{\mathrm{MR}^2 + \mathrm{R}m^2}) = \sqrt{\dot{x}^2 + \dot{y}^2}$; from which, and the equation of the curve, the value of z may be determined. But if all the ordinates of the propoſed curve ARM (*Tab.* III. *Analyſis, fig.* 72.) be referred to a centre C; then, putting the tangent RP, intercepted by the perpendicular CP, $= t$, the arc BN, of a circle deſcribed about the centre C $= x$, the radius CN (or CB) $= a$, &c. (ſee QUADRATURE *of curves, Caſe* 2.) we ſhall have $\dot{z} : \dot{y} :: y$ (CR) $: t$ (RP); and, conſequently, $\dot{z} = \frac{y\dot{y}}{t}$; whence the value of z will be found, if the relation of y and t is given.

I. *To rectify the common parabola*; or to find the length of any parabolic arc AM (*Tab. Analyſis, fig.* 18). Suppoſe the parameter $= a$, the abſciſs $=$ AP $= x$, &c. as above. From the well known property of this curve, $ax = y^2$; and $a\dot{x} = 2y\dot{y}$ (ſee FLUXION); conſequently $\dot{x} = \frac{2y\dot{y}}{a}$, and $\dot{x}^2 = \frac{4y^2\dot{y}^2}{a^2}$, which, ſubſtituted for $\dot{x}^2$ in the general expreſſion for the length of the curve, makes $\dot{z} = \overline{\frac{4y^2\dot{y}^2}{a^2} + \dot{y}^2}\Big|^{\frac{1}{2}} = \frac{\dot{y}}{a} \times \overline{a^2 + 4y^2}\Big|^{\frac{1}{2}}$; which, thrown into an infinite SERIES, becomes $= \frac{\dot{y}}{a} \times \overline{a + \frac{2y^2}{a} - \frac{2y^4}{a^3} + \frac{4y^6}{a^5}}$, &c. i. e. $\dot{z} = \dot{y} + \frac{2y^2\dot{y}}{a^2} - \frac{2y^4\dot{y}}{a^4} + \frac{4y^6\dot{y}}{a^6}$, &c. And the fluent of this ſeries (ſee *Inverſe Method of* FLUXIONS) is $z = y + \frac{2y^3}{3a^2} - \frac{2y^5}{5a^4} + \frac{4y^7}{7a^6} -$, &c. $=$ the length of the curve AM required.

Otherwiſe: the above $\dot{z} = \frac{\dot{y}}{a} \times \overline{a^2 + 4y^2}\Big|^{\frac{1}{2}}$ is $= \frac{\dot{y}}{a} \times \frac{a^2 + 4y^2}{\overline{a^2 + 4y^2}\big|^{\frac{1}{2}}} = \frac{a^2y\dot{y} + 4y^3\dot{y}}{a \times \overline{a^2y^2 + 4y^4}\big|^{\frac{1}{2}}} = \frac{\frac{1}{2}a^2y\dot{y} + 4y^3\dot{y}}{a \times \overline{a^2y^2 + 4y^4}\big|^{\frac{1}{2}}} + \frac{\frac{1}{2}a^2\dot{y}}{a \times \overline{a^2 + 4y^2}\big|^{\frac{1}{2}}} = \frac{1}{a} \times \overline{a^2y^2 + 4y^4}\Big|^{-\frac{1}{2}} \times \overline{\frac{1}{2}a^2y\dot{y} + 4y^3\dot{y}} + \frac{1}{4}a \times \frac{\dot{y}}{\overline{\frac{1}{4}a^2 + y^2}\big|^{\frac{1}{2}}}$. But the fluent of the firſt of theſe two terms is $= \frac{1}{2a} \times \overline{a^2y^2 + 4y^4}\Big|^{\frac{1}{2}} = \frac{y}{a} \times \overline{\frac{1}{4}a^2 + y^2}\Big|^{\frac{1}{2}}$; and the fluent of the laſt of the two terms is $= \frac{1}{4}a \times$ hyp. log. of $y + \overline{\frac{1}{4}a^2 + y^2}\Big|^{\frac{1}{2}}$; therefore $z = \frac{y}{a} \times \overline{\frac{1}{4}a^2 + y^2}\Big|^{\frac{1}{2}} + \frac{1}{4}a \times$ hyp. log. of $y + \overline{\frac{1}{4}a^2 + y^2}\Big|^{\frac{1}{2}}$. But when z and y vaniſh, or become $= 0$, as they do at the vertex, this fluent becomes $= \frac{1}{4}a \times$ hyp. log. of $\frac{1}{2}a$; and, therefore, the ſaid fluent being corrected (ſee *Inverſe Method of* FLUXIONS), gives the true value of z, or the length of the curve AM $= \frac{y}{a} \times \overline{\frac{1}{4}a^2 + y^2}\Big|^{\frac{1}{2}} + \frac{1}{4}a \times$ hyp. log. of $\overline{y + \overline{\frac{1}{4}a^2 + y^2}\big|^{\frac{1}{2}}} - \frac{1}{4}a \times$ hyp. log. of $\frac{1}{2}a = \frac{y}{a} \times \overline{\frac{1}{4}a^2 + y^2}\Big|^{\frac{1}{2}} + \frac{1}{4}a \times$ hyp. log. of $\frac{y + \overline{\frac{1}{4}a^2 + y^2}\big|^{\frac{1}{2}}}{\frac{1}{2}a}$.

Hence, if AC and DC (*fig.* 19.) be the conjugate ſemi-axes of an equilateral hyperbola; and AC $= a$, MP $= 2y$, QM $= x$, then will AP $= x - a$; and $x^2 - a^2 = 4y^2$; therefore $x^2 = 4y^2 + a^2$; conſequently $x = \sqrt{4y^2 + a^2}$. If then qm be ſuppoſed infinitely near QM, we ſhall have Q$q = \dot{y}$, and therefore the element of the area CQMA $= \dot{y} \times \sqrt{a^2 + 4y^2}$. Whence it appears, that the *rectification* of the parabola depends on the quadrature of the hyperbolic ſpace CQMA.

II. *To determine the length of an arc of the common hyperbola.* Let the ſemitranſverſe axis be repreſented by b, and the ſemiconjugate by c, and we ſhall have $\frac{b^2y^2}{c^2} = 2bx + x^2$, from the nature of the curve (ſee HYPERBOLA); and, therefore, $x = \frac{b\sqrt{c^2 + y^2}}{c} - b$: hence $\dot{x} = \frac{by\dot{y}}{c\sqrt{c^2 + y^2}}$, and $\dot{z}\ (= \sqrt{\dot{y}^2 + \dot{x}^2}) = \sqrt{\dot{y}^2 + \frac{b^2y^2\dot{y}^2}{c^2 \times \overline{c^2 + y^2}}} = \dot{y}\sqrt{1 + \frac{b^2y^2}{c^4 + c^2y^2}}$; which, by converting $\frac{b^2y^2}{c^4 + c^2y^2}$ into an infinite ſeries, becomes

$$\dot{y}\sqrt{1 + \frac{b^2y^2}{c^4} - \frac{b^2y^4}{c^6} + \frac{b^2y^6}{c^8} - \frac{b^2y^8}{c^{10}}},\ \text{\&c.}$$

But ſtill we have the ſquare root to extract: in order thereto let it be aſſumed $= 1 + Ay^2 + By^4 + Cy^6 + Dy^8$, &c. Then, by ſquaring, and tranſpoſing, there ariſes

$$\left.\begin{array}{l} 1 + 2Ay^2 + 2By^4 + 2Cy^6 + 2Dy^8, \text{ \&c.} \\ \qquad + A^2y^4 + 2ABy^6 + 2ACy^8, \text{ \&c} \\ \qquad\qquad + B^2y^8, \text{ \&c.} \\ -1 - \frac{b^2}{c^4} \times y^2 + \frac{b^2}{c^6} \times y^4 - \frac{b^2}{c^8} \times y^6 + \frac{b^2}{c^{10}} \times y^8, \text{ \&c.} \end{array}\right\} = 0$$

Hence $A = \frac{b^2}{2c^4}$; $B = -\frac{b^2}{2c^6} - \frac{1}{2}A^2 = -\frac{b^2}{2c^6} - \frac{b^4}{8c^8}$; $C = \frac{b^2}{2c^8} - AB = \frac{b^2}{2c^8} + \frac{b^4}{4c^{10}} + \frac{b^6}{16c^{12}}$, &c. &c. Therefore $\dot{z}\ (= \dot{y}\sqrt{1 + \frac{b^2y^2}{c^4}}$, &c. $= \dot{y} \times \overline{1 + Ay^2 + By^4}$, &c.$) = \dot{y} + \frac{b^2}{2c^4} \times y^2\dot{y} - \overline{\frac{b^2}{2c^6} + \frac{b^4}{8c^8}} \times y^4\dot{y} + \overline{\frac{b^2}{2c^8} + \frac{b^4}{4c^{10}} + \frac{b^6}{16c^{12}}} \times y^6\dot{y}$, &c. And conſequently $z = y + \frac{b^2y^3}{6c^4} - \overline{\frac{b^2}{c^2} + \frac{b^4}{4c^4}} \times \frac{y^5}{10c^4} + \overline{\frac{b^2}{c^2} + \frac{b^4}{2c^4} + \frac{b^6}{8c^6}} \times \frac{y^7}{14c^6}$, &c.

By the very ſame way of proceeding the arc of an ellipſis may be found, the equations of the two curves differing in nothing but their ſigns.

III. *To rectify the ſpiral of Archimedes.* The value of t (AT, *Tab.* III. *Analyſis, fig.* 81.) being denoted by $\frac{by}{\sqrt{b^2 + y^2}}$ (ſee TANGENT *of the ſpiral*, &c.) we have $\dot{z}\ \left(= \frac{y\dot{y}}{t}\right) = \dot{y}\frac{\sqrt{b^2 + y^2}}{b}$; which fluxion being the ſame as that expreſſing the arc of the common parabola (Prob. I.) by inſerting in the expreſſion $\dot{z} = \frac{\dot{y}}{a} \times \overline{a^2 + 4y^2}\Big|^{\frac{1}{2}}$, b for $\frac{1}{2}a$, its fluent will, therefore, be truly repreſented by the meaſure of the ſaid arc, or by $\frac{\frac{1}{2}y\sqrt{b^2 + y^2}}{b} + \frac{1}{2}b \times$ hyp. log. $\frac{y + \sqrt{b^2 + y^2}}{b}$, the value there found, by making the propoſed ſubſtitution.

IV. *To* rectify *the involute of a circle*, whoſe nature is ſuch, that the part PR (*fig.* 82.) of the tangent intercepted by the point of contact and the perpendicular CP, is every where equal to the radius CO of the generating circle. In this caſe $\dot{z}\ \left(= \frac{y\dot{y}}{t}\right) = \frac{y\dot{y}}{a}$, we obtain $z = \frac{y^2}{2a}$, which, corrected by making $y = a =$ AC, becomes $\frac{y^2 - a^2}{2a}$ $\left(\frac{\mathrm{CP}^2}{2\mathrm{CA}}\right)$ the true meaſure of the required arc AR.

V. *The right ſine* CB *of an arc of a circle being given,* (Tab. Analyſis, *fig.* 20.) *to find the arc* AC. Let AB $= x$, CB $= y$, OA $= a$, CE the fluxion of the abſciſs, ED the fluxion of the ordinate, and CD the fluxion of the arc CA $= z$. From the property of the circle, $2ax - xx = yy$, whence $2a\dot{x} - 2x\dot{x} = 2y\dot{y}$, and, therefore, $\dot{x} = \frac{y\dot{y}}{a - x}$, and $\dot{x}^2 = \frac{y^2\dot{y}^2}{\overline{a^2 - y^2}\big|^{\frac{1}{2}}}$, becauſe $a - x$ (OB $= \overline{\mathrm{OC}^2 - \mathrm{CB}^2}\big|^{\frac{1}{2}} =$) $\overline{a^2 - y^2}\big|^{\frac{1}{2}}$. But CD² ($\dot{z}^2$) $= \dot{y}^2 + \dot{x}^2 = \dot{y}^2 + \frac{y^2\dot{y}^2}{\overline{a^2 - y^2}\big|^{\frac{1}{2}}}$, and $\dot{z} = \overline{\frac{y^2\dot{y}^2}{\overline{a^2 - y^2}\big|^{\frac{1}{2}}} + \dot{y}^2}\Big|^{\frac{1}{2}} = \frac{a\dot{y}}{\overline{a^2 - y^2}\big|^{\frac{1}{2}}} = a\dot{y} \times \overline{a^2 - y^2}\Big|^{-\frac{1}{2}}$, which laſt quantity thrown into an infinite ſeries, will give $\dot{z} = a\dot{y} \times \frac{1}{a} + \frac{y^2}{2a^3} + \frac{3y^4}{8a^5} + \frac{5y^5}{16a^7} + \frac{35y^8}{128a^9} + \frac{63y^{10}}{256a^{11}} + \frac{231y^{12}}{1024a^{13}} + \frac{429y^{14}}{2048a^{15}}$, &c. $= \dot{y} + \frac{y^2\dot{y}}{2a^2} + \frac{3y^4\dot{y}}{8a^4} + \frac{5y^6\dot{y}}{16a^6} + \frac{35y^8\dot{y}}{128a^8} + \frac{63y^{10}\dot{y}}{256a^{10}} + \frac{231y^{12}\dot{y}}{1024a^{12}} + \frac{429y^{14}\dot{y}}{2048a^{14}}$, &c. And the fluent of this ſeries is $z = y + \frac{y^3}{6a^2} + \frac{3y^5}{40a^4} + \frac{5y^7}{112a^6} + \frac{35y^9}{1152a^8} + \frac{63y^{11}}{2816a^{10}} + \frac{231y^{13}}{13312a^{12}} + \frac{429y^{15}}{30720a^{14}}$, &c.

&c. = the length of the arc AC. Suppoſing the radius OA = $a = 1$, and the angle COA=30°, then (becauſe the ſine of any arc is equal to half the chord of double of that arc, and the chord of 60° is equal to the radius) the ſine, or ordinate CB ($=y$) will be $= \frac{1}{2}$, and, therefore, the terms of the above fluent being reduced into decimals, and placed under one another, will ſtand thus; viz.

.500000000, &c.
.020833333
.002343750
.000348772
.000059339
.000010923
.000002118
.000000426, &c.

The ſum of which is	.5235987, &c.	= the length of the arc AC;
which × by	12	
gives	6.283185, &c.	= the periphery of a circle whoſe radius is 1;
therefore	3.141592, &c.	= the periphery of a circle whoſe diameter is 1.

VI. *The right ſine, verſed ſine, tangent, or ſecant of an arc of a circle being given, to find the length of the arc itſelf in terms thereof.* Let the verſed ſine A$b = x$ (*Tab.* III. *Analyſis, fig.* 83.), the right ſine R$b=y$, the tangent AT$=t$, the ſecant OT$=s$, the arc AR$=z$, and the radius AO or RO $= a$; and let R$n = \dot{x}$, $nr = \dot{y}$, and R$r = \dot{z}$. Since the angle rnR (= a right angle) = ObR, and rRn (= a right angle − nRO) = ORb, the triangles rRn and ORb are therefore equi-angular; and it will be, Rb (y) : OR (a) :: Rn ($\dot{x}$) : Rr ($\dot{z}$) $= \frac{a\dot{x}}{y} = \frac{a\dot{x}}{\sqrt{2ax-xx}}$ (becauſe, by the property of the circle $\sqrt{2ax-xx} = y$.) Alſo, Ob ($\sqrt{a^2-y^2}$) : OR (a) :: nr ($\dot{y}$) : Rr ($\dot{z}$) $= \frac{a\dot{y}}{\sqrt{a^2-y^2}}$. Theſe two values exhibit the fluxion of the arc in terms of the verſed-ſine and right-ſine reſpectively; but to get the ſame, in terms of the tangent and ſecant, we have (by ſimilar triangles) OT ($= s = \sqrt{a^2+t^2}$) : OA (a) :: OR (a) : Ob $= \frac{a^2}{s} = \frac{a^2}{\sqrt{a^2+t^2}}$: hence A$b = a - \frac{a^2}{s} = a - \frac{a^2}{\sqrt{a^2+t^2}}$; whoſe fluxion is therefore $= \frac{a^2\dot{s}}{s^2} = \frac{a^2 t\dot{t}}{\overline{a^2+t^2}|^{\frac{3}{2}}}$; whence (again by ſimilar triangles) AT ($= \sqrt{s^2-a^2} = t$) : OT ($= s = \sqrt{a^2+t^2}$) :: Rn : Rr $= \frac{a^2\dot{s}}{s\sqrt{s^2-a^2}} = \frac{a^2\dot{t}}{a^2+t^2} = \dot{z}$.

Now, from any one of the four forms of fluxions $\left(\frac{a\dot{x}}{\sqrt{2ax-xx}}, \frac{a\dot{y}}{\sqrt{a^2-y^2}}, \frac{a^2\dot{t}}{a^2+t^2}, \frac{a^2\dot{s}}{s\sqrt{s^2-a^2}}\right)$ here found, the value of the arc itſelf (by taking the fluent, in an infinite ſeries) will likewiſe become known.

But the third form, expreſſed in terms of the tangent, being entirely free from radical quantities, will be the moſt ready in practice, eſpecially where the required arc is but ſmall; though the ſeries ariſing from the firſt form, always, converges the faſteſt.

If, therefore, $\frac{a^2\dot{t}}{a^2+t^2}$ be now converted to an infinite ſeries, we ſhall have $\dot{z} = \dot{t} - \frac{t^2\dot{t}}{a^2} + \frac{t^4\dot{t}}{a^4} - \frac{t^6\dot{t}}{a^6}$, &c. and conſequently $z = t - \frac{t^3}{3a^2} + \frac{t^5}{5a^4} - \frac{t^7}{7a^6} + \frac{t^9}{9a^8}$, &c. = AR. Where, if (for example ſake) AR be ſuppoſed an arc of 30 degrees, and AO (to render the operation more eaſy) be put = unity, we ſhall have $t = \sqrt{\frac{1}{3}} = .5773502$ becauſe Ob $\sqrt{\frac{3}{4}}$: bR ($\frac{1}{2}$) :: OA (1) : AT (t) $= \sqrt{\frac{1}{3}}$)
Whence

$$t^3 \ (= t \times t^2 = t \times \tfrac{1}{3}) = .1924500$$
$$t^5 \left(= t^3 \times t^2 = \frac{t^3}{3}\right) = .0641500$$
$$t^7 \left(= t^5 \times t^2 = \frac{t^5}{3}\right) = .0213833$$
$$t^9 \left(= t^7 \times t^2 = \frac{t^7}{3}\right) = .0071277$$
$$t^{11} \left(= t^9 \times t^2 = \frac{t^9}{3}\right) = .0023759$$
$$t^{13} \left(= t^{11} \times t^2 = \frac{t^{11}}{3}\right) = .0007919$$
$$t^{15} \left(= t^{13} \times t^2 = \frac{t^{13}}{3}\right) = .0002639$$
&c.

And therefore $AR = .5773502 - \frac{.1924500}{3} + \frac{.0641500}{5} - \frac{.0213833}{7} + \frac{.0071277}{9} - \frac{.0023759}{11} + \frac{.0007919}{13} - \frac{.0002639}{15} + \frac{.0000879}{17} - \frac{.0000293}{19} + \frac{.0000097}{21} - \frac{.0000032}{23}$ $= .5235987$; which multiplied by 6, gives 3.141592 + for the length of the ſemi-periphery of the circle whoſe radius is unity.

VII. *To* rectify *the common cycloid.* Let the radius AO (*Tab.* III. *Analyſis, fig.* 78.) of the generating ſemicircle be denoted by a, we ſhall have BR $= \sqrt{2ax-x^2}$; and its fluxion $= \frac{a\dot{x}-x\dot{x}}{\sqrt{2ax-x^2}}$, which, being added to $\frac{a\dot{x}}{\sqrt{2ax-xx}}$, the fluxion of AR, or its equal RS (given by the preceding article), we thence get $\frac{2a\dot{x}-x\dot{x}}{\sqrt{2ax-x^2}} = \frac{\dot{x} \times \overline{2a-x}}{x^{\frac{1}{2}} \times \overline{2a-x})^{\frac{1}{2}}} = \frac{\dot{x}}{x^{\frac{1}{2}}} \times \overline{2a-x}^{\frac{1}{2}}$, for the true fluxion of the ordinate BS of the cycloid. Hence $\dot{z}\ (\sqrt{\dot{x}^2+\dot{y}^2}) = \sqrt{\dot{x}^2 + \frac{\dot{x}^2 \times \overline{2a-x}}{x}} = \dot{x}\sqrt{\frac{2a}{x}} = 2a^{-\frac{1}{2}} \times x^{-\frac{1}{2}}\dot{x}$; and conſequently, by taking the fluent, $z = \overline{2a}|^{\frac{1}{2}} \times \frac{x^{\frac{1}{2}}}{\frac{1}{2}} = 2\sqrt{2ax}$ = the arc AS of the CYCLOID; whence by writing $2a$ for x, the length of the ſemicycloid AM, appears to be equal to twice the diameter AH of its generating ſemicircle. Simpſon's Fluxions, vol. i. ſect. 8. p. 156, &c. Rowe's Fluxions, p. 158, &c. ed. 3.

RECTIFIED *ſpirits*, &c. are ſuch as have undergone the operation of *rectification*, or have been diſtilled over and over, to ſeparate from them any heterogeneous matter, which might have ariſen with them in the former diſtillations.

Hence we ſay, ſpirit of wine twice *rectified*, thrice *rectified*, &c.

It is the rectification that makes the difference between brandy and *rectified* SPIRITS of wine.

RECTIFIER, in *Navigation*, is an inſtrument uſed for determining the variation of the compaſs, in order to rectify the ſhip's courſe, &c.

It conſiſts of two circles, either laid upon, or let into one another, and ſo faſtened together in their centres, that they repreſent two compaſſes, the one fixed, the other moveable: each is divided into thirty-two points of the compaſs, and three hundred and ſixty degrees, and numbered both ways, from the north and the ſouth, ending at the eaſt and weſt in ninety degrees.

The fixed compaſs repreſents the horizon, in which the north, and all the other points, are liable to variation.

In the centre of the moveable compaſs is faſtened a ſilk thread, long enough to reach the outſide of the fixed compaſs: but, if the inſtrument be made of wood, an index is uſed, inſtead of the thread.

RECTIFIER, in the *Diſtillery*, the perſon whoſe employment it is to take the coarſe malt-ſpirit of the malt-ſtiller, and re-diſtil it to a finer and better liquor. The art of the *rectifier* might be entirely ſet aſide, if the malt-ſtiller could make his ſpirit perfect at a ſecond operation; which ſeems very practicable, if the malt-ſtillers could be got to forſake their old track. The great things to be recommended for the improvement of their art, would be, firſt, the brewing in perfection; and ſecondly, the keeping their waſh after the manner of ſtale beer, till it has entirely loſt its malt flavour, and acquired a pungent acid vinoſity; and then, thirdly, leaving out the lees, to diſtil with a well-regulated fire. It is ſcarce to be thought how pure a ſpirit is to be obtained from malt this way; but the great art would be, the finding a way to make malt liquors artificially ſtale, bright, and flavourleſs, though otherwiſe vinous. Shaw's Lectures, p. 223.

RECTIFYING *of curves*. See RECTIFICATION.

RECTIFYING *of the globe* or *ſphere*, is a previous adjuſting of the globe or ſphere, to prepare it for the ſolution of problems. For the method of doing it, ſee *Uſe of the celeſtial* GLOBE.

RECTILINEAR, *right-lined*, in *Geometry*, is applied to figures whoſe perimeter conſiſts of right lines.

[library stamp]

Rectilinear *angle, maps*, and *superficies*. See the substantives.

RECTITUDE, *rectitudo, rectum*, in matters of philosophy, refers either to the act of judging, or of willing; and therefore, whatever comes under the denomination of *rectitude* is either what is true, or what is good: these being the objects about which the mind exercises its two faculties of judging and willing.

Rectitude of the mind, considered as it judges, i. e. *rectitude* of the faculty of judgment, consists in its agreement and conformity to the nature and reason of things, and in its determining and deciding about them according to what their constitutions, properties, uses, &c. really are.

Rectitude of the mind, considered as it wills, called also *moral rectitude*, or *uprightness*, consists in the choosing and pursuing of those things which the mind, upon due inquiry and attention, clearly perceives to be good; and avoiding those that are evil.

RECTITUDINES, in *Law*, rights, or legal dues, belonging either to God, or man. See Right.

RECTO, in *Law*, a writ usually called a *writ of right*; of so high a nature, that whereas other writs in real action are only to recover the possession of the lands, &c. in question, lost by the plaintiff, or his ancestor; this aims to recover both the seisin thus lost, and the property of the thing: so that both rights are here pleaded together; that of *property*, and that of *possession*.

If a man lose his cause upon this writ, he is without all remedy.

There are two kinds of this writ: *breve magnum de recto*, or *breve de recto patens*, a writ of right patent; and *recto clausum*, a writ of right close.

The first is so called, because sent open. It lies only for him that hath fee-simple in the lands sued for, against the tenant of the freehold at least.

Indeed, the writ of right patent is extended, in practice, beyond its original intention; for a writ of right of dower, which lies for the tenant in dower, is patent; and so in several other cases. Fitzherb.

The writ of right close, called also *breve parvum de recto*, is directed to the lord of ancient demesne, or the bailiff of the king's manors; and lies for those who hold lands and tenements by charter, in fee-simple, or in fee-tail, or for term of life, or in dower, if they be ejected out of such lands, or disseised. In such case a man, or his heirs, may sue out the writ of right close, directed to the lord of ancient demesne, commanding him to do him right in his court. This is called a writ *secundum consuetudinem manerii*.

Recto *de advocatione ecclesiæ*, a writ of right, lying where a man has right of advowson in fee to him, and his heirs; and, the incumbent dying, a stranger presents his clerk to the church; and he, not having brought his action of *quare impedit*, nor *darrein presentment*, within six months, has suffered the stranger to usurp upon him. See *Disturbance of* Patronage.

Recto *de custodia terræ & hæredis*, a writ which lies for him whose tenant dying in his nonage, a stranger enters, and takes the body of the heir.

This writ, as to lands holden *in capite*, or by knight's service, is become useless by the stat. 12 Car. II. but not where there is a guardian in socage, or appointed by the last will of the ancestor.

Recto *de dote*, a writ of right of dower, which lies for a woman that has received part of her dower, and proceeds to demand the remnant in the same town against the heir, or his guardian.

Recto *de dote unde nihil habet*, is a writ of right which lies in case where the husband, having divers lands and tenements, has assured no dower to his wife; and she is thereby driven to sue for her thirds against the heir, or his guardian.

Recto *quando* or *quia dominus remisit*, a writ of right, which lies in case where lands or tenements in the signory of any lord, are in demand by a writ of right.

If the lord hold no court, or, at the prayer of the demandant or tenant, send his writ to the king's court, to put the cause thither for that time; this writ issues for the other party, and has its name from the words comprised, which is the true occasion thereof.

Recto *de rationabili parte*, a writ that lies between privies of blood, as brothers in gavel-kind, or sisters, or other coparceners, as nephews and nieces, and for land in fee-simple.

If a man lease his land for life, and afterwards die, leaving issue two daughters, and, after, the tenant for life likewise dies; the one sister entering on all the land, and so deforcing the other, the sister so deforced shall have this writ to recover her part.

Recto *sur disclaimer*, a writ which lies where the lord, in the court of common pleas, does avow upon his tenant, and the tenant disclaims to hold of him; upon which disclaimer the lord shall have this writ.

Recto *folio*. See Folio.

RECTOR of a parish, the parson, or he who has the charge or cure of a parish church.

If the predial tythes of the parish be impropriated, or appropriated, i. e. either in lay hands, or in those of some ecclesiastical community, then, instead of *rector*, the parson is called vicar. In England are reckoned 3485 rectories.

The name *rector* denotes him governor, or ruler, *quia tantum jus in ecclesia parochiali habet, quantum prælatus in ecclesia collegiata*.

Rector also denotes the chief elective officer in several foreign universities, particularly in that of Paris.

Rector is also used in several convents for the superior, or officer who governs the house.

The Jesuits use it for the superiors in such of their houses, as are either seminaries, or colleges.

RECTORY, or Rectorate, *rectoria*, a parish church, parsonage, or spiritual living, with all its rights, glebes, and tythes.

RECTRICES, in *Ornithology*, denote the strong feathers of the tails of birds.

RECTUM, in *Law*. See Recto.

Rectum, in our *Old Law Writers*, is also used for a trial, or accusation.

Commune Rectum, denotes a trial at law, or in the common course of law. *Stare ad rectum*, denotes to stand a trial. *Rectum rogare*, to petition the judge to do right.

Rectum, in *Anatomy*, denotes the third and last of the large intestines, or guts. See *Tab. Anat.* (*Splanch.*) *fig.* 9. *lit. f.*

It is thus called, because it passes straight from the os sacrum to the anus; without making any turns or circumvolutions, as all the other guts do. See Intestines.

RECTUS, in *Anatomy*, a name common to several muscles, on account of the straightness of the course of their fibres, from their origin to their insertion; having particular denominations from the parts to which they minister: such are the *rectus abdominis, rectus femoris, rectus capitis lateralis, major externus, minor externus, major internus, minor internus*, and *rectus palpebræ*.

Rectus *abdominis*, is a muscle of the lower belly, which arises from the sternum, and the extremity of the last two ribs; and goes straight down the fore-part of the abdomen, to be inserted in the os pubis. See *Tab. Anat.* (*Myol.*) *fig.* 1. *n.* 47. *fig.* 2. *n.* 28.

It has veins and arteries, which creep on its inside from the mamillary and epigastric vessels; these communicate together, that the blood may return by the mamillary veins, when the passage is stopped by the epigastric, which are compressed in women with child.

The *recti abdominis* (for Winslow describes two muscles under this appellation) lie near each other, like two large bands from the lower part of the thorax to the os pubis, the linea alba coming between them. Their breadth diminishes, and their thickness increases gradually from above downward. The superior extremity of each of these muscles is fixed to a part of the lower extremity of the sternum, to the three lowest true ribs, and to the first false rib, by the same number of digitations, of which that which is farthest from the sternum is the broadest.

The body of the muscle lies in the vagina formed by the aponeurosis of the broad muscles of the abdomen: exteriorly it is divided into several portions, resembling distinct muscles placed endwise, by transverse tendons termed enervations, which commonly are all above the umbilicus, very seldom below it, and adhere very closely to the vagina. These insertions are pretty irregular: they do not always penetrate the whole thickness of the muscle; and, in that case, they do not at all appear, or but very little, on the inner surface. Sometimes those which are seen on the surface do not run quite cross the whole breadth of the muscle. The lower extremity of this muscle ends in a thin tendon, fixed in the internal labium of the upper edge of the os pubis near the symphysis, and there it touches the tendon of the other *rectus*. Above the umbilicus, these muscles are at some distance from each other, according to the breadth of the linea alba; but below it they come nearer the linea alba, being there narrower; and near their lower extremity, that line is almost entirely hid by their thick edges. Winslow.

Rectus *anterior*, or *femoris*, a muscle called also *gracilis anterior*, as long as the os femoris, and lying directly along the fore-side of the thigh. The greatest part of it is fleshy, and its middle is broader than the two extremities. It has its name *rectus* from the straight diameter in

in which it lies; and its other, *gracilis*, from its thinness and flatness. It terminates above by a pretty strong tendon, which is divided into two branches, one short and straight, the other long and bent; the short branch, running up in a straight line, is inserted in the anterior inferior spine of the os ilium. The long branch is inflected backward over the supercilium of the acetabulum, and runs in the direction of it from the spine, toward the great ischiatic sinus: it is strong and flat, adhering very closely to the bone, and covered by the orbicular ligament and the glutæus minimus; and, according to the common method of dissecting, is therefore usually cut off, and the small branch of the tendon only left observable. From hence the muscle runs down wholly fleshy, and partly penniform, some of its fibres meeting above and separating below. It is narrow at the upper extremity, and grows gradually broader towards the middle, afterwards contracting in the same manner, and at the lower extremity of the os femoris ending in a flat tendon. Through its whole course it lies between the two vasti, and covers the crureus; and its inferior tendon is inserted in the upper edge of the patella, from whence it sends down a small plane of tendinous fibres, which adhere very closely to the convex side of that bone, and having reached the great ligament, seem to be lost therein. Winslow. See *Tab. Anat.* (*Myol.*) *fig.* 1. *n.* 52.

Rectus *musculus*, in *Anatomy*, a name given by Fabricius, in his Treatise of the Eyes, to the muscle, which serves to elevate the upper eye-lid, called by Cowper and others aperiens *palpebram*, and by Albinus levator *palpebræ superioris*.

Rectus *palpebræ*, is a muscle which lifts up the eye-lid: it arises from the bottom of the orbit of the eye, where the optic nerves pierce the cranium; and, passing above the superbus, is inserted by a large tendon into the border of the eye-lid.

Rectus *capitis lateralis*, a pair of short thick fleshy muscles, rising from the superior part of the transverse process of the first vertebra of the neck, whence it ascends, and is inserted into the os occipitis.

Its use is, to move the head laterally towards either shoulder: when they act together, being antagonists, they keep it steady.

Rectus *externus capitis major*, the third of the muscles of the head, arising fleshy and tendinous from the upper part of the double spine of the second vertebra of the neck; and, spreading in its ascent, is inserted into the posterior part of the os occipitis, at a small distance from the crista, being a little covered by the obliquus superior. It serves to draw the head directly back upon the first vertebra.

Rectus *externus minor*, a muscle arising from the hind-part of the first vertebra of the neck; and inserted into the middle of the os occipitis.

It serves likewise to draw the head directly backwards.

These two muscles are otherwise called *renuentes*.

Rectus *internus capitis major*, or Rectus *anticus longus*, a muscle in some degree of a pyramidal figure, lying along the anterior and lateral parts of the vertebræ of the neck, all the way up to the basis cranii. It is fixed to the anterior parts of the transverse apophyses of the third, fourth, fifth, and sixth vertebræ, in a digitated manner; from thence it runs up obliquely inwards, and towards the lateral parts of the bodies of the vertebræ, passes on the fore-side of the first and second, without being inserted in them; and approaching gradually toward the same muscle on the other side, it is inserted near it in the fore-part of the lower side of the apophysis basilaris, or great apophysis of the os occipitis. Winslow.

Rectus *internus minor*, or Rectus *capitis anticus brevis*, a small flat muscle, about the breadth of one finger, situated laterally on the part of the body of the first vertebra. It is fixed below to the basis or root of the transverse apophysis of that vertebra, near the anterior eminence; from thence it runs obliquely upward, and inward, to a transverse impression in the lower side of the apophysis basilaris of the occipital bone immediately before the condyle on the same side, being covered by the anticus longus. Winslow.

These serve to nod the head forwards, being antagonists to the *rectus externus*, or renuens, on the back of the head; and they are hence also called *annuentes*.

Rectus *capitis posticus major*, in *Anatomy*, a name given by Albinus, in his History of the Muscles, to a muscle called *magnus rectus capitis* by Winslow, and described by Vesalius by the name of the *tertius caput moventium*, and by Spigelius and others under that of *rectus major*.

Rectus *capitis posticus minor*, a name given by Albinus to a muscle of the head, called by Riolanus and others *posticus minor*, and by Winslow *rectus parvus*. Vesalius has described it under the name of *quartus caput moventium*.

Rectus *exterior oculi*, in *Anatomy*, a name given by Fabricius and others to one of the muscles of the eye, called by Riolan and others the *superbus*, and by some the *elevator oculi*. It is the *abductor* of Albinus, one of his *quatuor recti*.

Rectus *inferior oculi*, in *Anatomy*, a name given by Fabricius, and some others, to one of the muscles of the eye, called by others *humilis*, and by Albinus the *depressor*. It is one of the *quatuor recti oculi* of that author.

Rectus *interior oculi*, in *Anatomy*, a name given by Fabricius to one of the muscles of the eye, called by Molinet the *bibitorius*; and by Cowper, Albinus, and others, the adductor *oculi*.

Rectus *superior oculi*, in *Anatomy*, a name given by Fabricius to one of the muscles of the eye, called the *attollens* by Albinus, and by others the elevator *oculi* and the *superbus*.

Rectus *in curia*, in *Law*, one who stands at the bar, and no man objects any thing against him.

When a man hath reversed the outlawry, and can participate of the benefit of the law, he is said to be *rectus in curia*.

RECUPERATORES, among the Romans, were commissioners appointed to take cognizance of private matters in dispute, between the subjects of the state and foreigners, and to take care that the former had justice done them.

It came at last to be used for commissioners, to whom the prætor referred the determination of any affair between one subject and another.

RECURRENT, *recurrens*, in *Anatomy*, a nerve arising from the par vagum, and distributing several branches to the larynx, to assist in the formation and modulation of the voice; whence it is also called the *vocal nerve*.

It has its name *recurrent*, from its reascending or running back again from the thorax to the larynx.

There are really two *recurrents*, right and left: the left arises from the trunk of the vagum; the right from a plexus thereof, immediately under the clavicle. They both run up along the trachea, to which they impart some twigs, and end at last in the muscles of the larynx. Their office appears partly hence, that a dog is not able to bark after they are cut.

RECURRING *series*. See Series.

RECURVIROSTRA, in *Ornithology*, a genus of the *grallæ*; the characters of which are, that the bill is long, slender, very thin, depressed, and bending upwards, whence the name; the feet are palmated, and have three toes. There is only one species, which is a very remarkable bird, and named *avosetta* by the Italians.

It is a little larger than the common lapwing, weighing usually about ten ounces; its beak is three fingers breadth long, very slender, black, and flatted, and bending upwards, which is peculiar to it alone; its head is moderately large and very round, and both that and the upper part of the neck is black, but above and beneath each eye is a small white spot; its breast, belly, and throat are all of a snowy whiteness, and its back is variegated with black and white; its wings are also variegated with black and white; its tail is all white; its legs very long and bluish, and naked far above the knees. It is very common in Italy, and is not unfrequently seen about the shores of England.

In flying, these birds carry their necks and long legs quite extended, and make a shrill noise (*twit*) twice repeated, during the whole time; whence they are called by the country people *yelpers*, and sometimes *picarini*. They feed on worms and insects scooped with their bills out of the sand, leaving alternate semicircular marks after the search for food. They lay two eggs, about the size of those of a pigeon, being white tinged with green, and marked with large black spots. Ray and Pennant. See *Tab.* IV. *Birds*, N° 48.

RECUSANTS, persons who refuse to acknowledge the king's supremacy.

Such are the Roman catholics, who hold the pope to be over him; and are hence called popish *recusants*. See Papists and Premunire.

RECUSATION, *recusatio*, an act whereby a judge is desired to refrain from judging some certain cause, on account of his relation to one of the parties; or of some capital enmity, or the like.

By the French laws, kinship within the fourth degree is deemed a legal cause of *recusation*; as also the judge's being godfather, &c. of one of the parties.

By the laws of England also, in the times of Bracton and Fleta, a judge might be refused for good cause; but now the law is otherwise, and it is held that judges or justices cannot be challenged.

RED, in *Physics*, one of the simple or primary colours of natural bodies, or rather of the rays of light.

The *red* rays are those which are of all rays the least refrangible:

frangible: hence, as Sir Isaac Newton supposes the different degrees of refrangibility to arise from the different magnitudes of the luminous particles whereof the rays consist, the *red* rays, or *red* light, is concluded to be that which consists of the largest particles. See COLOUR and LIGHT.

Authors distinguish three general kinds of *red*; one bordering on the blue, as colombine, or dove-colour, purple, and crimson; another bordering on yellow, as flame-colour and orange; and between these extremes is a medium, partaking neither of the one nor the other, which is what we properly call *red*.

Acids generally turn black, blue, and violet into *red*; and *red* into yellow; and yellow into a very pale yellow. Alkalis change *red* into violet, or purple; and yellow into feuillemort, or dead leaf-colour.

Terrestrial and sulphureous matters become *red* by extreme heat; and some, at length, black, as we see in brick, *red* bole, *red* chalk, slate, &c. All these, when vitrified by a burning-glass, become black.

Lobsters become *red* by a moderate fire; and by a violent one, black. Mercury and sulphur mixed and heated over a moderate fire, make a beautiful *red*, called *artificial cinnabar*.

An acid spirit, as lemon juice, being poured on a blue solution of turnsole, turns it into a beautiful *red*. Alkali restores it again to its original blue. Filtrating of some reddish wines takes from them all their *red* colour.

M. De la Hire observes, that a very luminous body viewed through a black one, always appears *red*; as when the sun is seen shining through a black cloud. He adds, that some people who see all the other colours perfectly well, yet have no idea of *red*, and only see it as black.

RED, in *Dying*, is one of the five simple or mother colours of the dyers.

Some reckon seven kinds or casts of *red*; viz. scarlet *red*, crimson *red*, madder *red*, half-grain *red*, half-crimson *red*, lively orange *red*, and scarlet of cochineel. But they may be all reduced to three, according to the three principal drugs which give the colours; which are kermes, cochineel, and madder.

The fine scarlet, called *scarlet of the Gobelins*, is given with agaric, bran-water, woad, and scarlet grain, or kermes. Some dyers add cochineel, and others fenugreek; brightening it with bran-water, agaric, tartar, and turmeric. See KERMES and SCARLET.

Crimson red is dyed with bran-water, tartar, and mestique cochineel. See CRIMSON.

Madder red is dyed with madder; to which some add realgar, or *red* arsenic; others, common salt, or other salts, with wheat flour; or agaric with spirit of wine, with galls, or turmeric. See MADDER.

The *half-grain* is made with agaric and bran-water, half scarlet grain, half madder, and sometimes turmeric.

The *half-crimson* is made of half madder, half cochineel.

As to the *lively orange red*, the stuff must be first put in yellow, then in a liquor made of goat's hair (which has been boiled several times with madder) dissolved over the fire with certain saline liquors, as urine, tartar, &c.

The *scarlet of cochineel*, or Dutch scarlet, as the French call it, is made with starch, tartar, and cochineel; after first boiling it with alum, tartar, sal gemma, and aqua fortis wherein pewter has been dissolved.

Besides these seven *reds*, which are good and allowed colours, there is also a Brasil *red*; which is discouraged, as fading easily.

Of the seven good *reds*, only four have particular casts, or shades: the madder *red*, crimson *red*, lively orange *red*, and scarlet of cochineel.

The casts or shades of crimson are flesh colour, peach colour, carnation rose colour, and apple-tree flower colour. Those of madder are flesh colour, onion-peel colour, and flame colour. Those of orange are the same with those of crimson. Scarlet, besides the shades of all the rest, has some peculiar to itself, as cherry colour, fire colour, &c. See DYING.

RED, in *Painting*. For painting, in oil colours they use a *red* called *cinnabar*, or vermilion; and another called *lacca*. See each in its place.

In limning, and fresco, for a violet *red*, instead of lacca, they use *reddle*, a natural earth found in England; for a brown *red*, they use burnt *oker*, which is a native yellow earth, made *red* by calcination. It is chiefly brought from Oxfordshire; and burnt, by those who prepare it, in large ovens. The marks of its goodness are brightness of colour, and a friable chalky texture, without manifesting any gritty roughness when rubbed betwixt the fingers.

The *common Indian red*, which is of a hue verging to the scarlet, is much used, on account of its standing and warm though not bright colour, in finer as well as coarser paintings in oil. It may be prepared by taking of the caput mortuum or oker left in the iron pots after the distillation of aqua fortis from nitre and vitriol, two parts; and of the caput mortuum or colcothar left in the long necks after the distillation of oil of vitriol, one part; breaking the lumps found among them, and putting them into tubs with a good quantity of water: and having left them to stand for a day or two, frequently stirring them, then lading off as much water as can be obtained clear from them, and adding a fresh quantity; repeating the same treatment till all the salts be washed out, and the water comes off nearly insipid. The *red* powder which remains must then be washed over, and, being freed from the water, laid out to dry. When this is designed for nicer purposes, it should again be washed over in basons.

The *true Indian red* is a native ochrous earth of a purple colour, brought from the island of Ormus, in the Persian gulf; and called, among the authors on these subjects, *terra* PERSICA. At present it is very rarely to be found; but it is certainly very valuable (there being no other uncompounded purple colour in use with oil) as well for the force of its effect, as for the certainty of its standing. In its genuine state, it needs no other preparation than grinding or washing over. It may be easily distinguished from any fictitious kind, by its being more bright than any other oker which can be made to purple; and if it be rendered artificially purple by any addition, the fire will soon betray it; into which the genuine may be put without any hazard of change.

Venetian red is a native *red* oker (see VENETA *bolus*) not much different from the common Indian *red*, but fouler; and may be easily prepared, by mixing common *red* oker with the colcothar or caput mortuum taken out of the aqua fortis pots, and washed over. As it is generally used by the house painters in imitations of mahogany, it requires no other preparation than to be well ground with the oil with which it is used; but when it is used in miniature painting, it should be carefully washed over.

RED, in *Heraldry*. See GULES.

RED, in *Cosmetics*, a fucus or paint wherewith the ladies enliven their cheeks and lips.

There are two kinds of *reds*; the one in leaves, called Spanish *red*; the other a liquor, which is an extract of a scarlet dye.

RED *arsenic*, *chalk*, *deer*, *fish*, *star*, *storax*, *tartar*. See the substantives.

RED, in the *Manufacture of Glass*. See *Red* GLASS.

To make a deep *red* in glass, the following method is that most practised by the glass-men. Take crystal frit twenty pounds, broken pieces of white glass one pound, calcined tin two pounds; mix these well together, and put them into a pot to melt and purify. When these are melted, take steel calcined, scales of iron from the smith's anvil, both powdered very fine, of each an equal quantity; put leisurely an ounce of this mixed powder to the before mentioned metal; mix all well together, and let them stand six or eight hours in fusion to incorporate; take out a proof after this, and if there be too little of the powder, it will appear of a dusky yellow; then more of the powder must be added, and then add three quarters of an ounce of calcined brass, ground to a fine powder; mix them thoroughly together, and the mass will be of a blood *red*; continue stirring the whole together, and frequently taking out proofs of the colour, when it is right, work it immediately, otherwise it will lose its colour and become black. The mouth of the pot must in this process be left open, else the colour will be lost. Neri's Art of Glass, p. 100.

RED, *blown*, in the *Porcelain Manufacture*, a name given to a peculiarly coloured china ware of a spangled *red*, or to the colour alone that spangles it. It is an ornament easily introduced into use in our own manufactories of porcelain ware, and is done in the following manner. The colour is to be prepared of common copperas, calcined to a *red* colour in a charcoal fire, in a crucible, with another luted on the top of it inverted, and with a hole in its bottom. The signal of the calcination being finished, is, when the black clouds cease to come up through the hole, and a fine white thin vapour arises in their place. The vessels are to be then suffered to cool, and the *red* matter in them is to be reduced to a fine powder, while the vessels to be coloured with this are yet wet. The operator is to provide a glass pipe, and covering one end of it with a piece of fine gause, he is to dip this into the powder, and taking it carefully out, with what little is sticking to it, he is to blow against the vessel at some distance from it: thus the finest part of the powder only will reach the vessel, and will be laid on in form of glittering spangles, very small, but all distinct. This is a sort of colouring much esteemed by the

the Chinese themselves, and they have a way of using the common blue in the same manner; but few of the vessels, thus painted, come over to us.

RED *breast*, in *Ornithology*, the MOTACILLA *rubecula* of Linnæus, a well-known bird; the bill of which is dusky; the forehead, chin, throat and breast are of a deep orange colour; the head, hind part of the neck, the back, and tail are of a deep ash colour, tinged with green; the wings darker, with the edges inclining to yellow; and the legs and feet dusky. The song of this bird is remarkably fine and soft, and continues through the greatest part of the winter, spring, and summer. Many of the autumnal songsters seem to be the young cock *red* breasts of that year. Pennant.

Thomson, in his Seasons, Winter, line 246, has admirably described the annual visits of this guest: and the ancient ballad of The Babes in the Wood, recording the affection of this bird for mankind, is universally known.

RED *eye*, *erythrophthalmus*, in *Ichthyology*, the CYPRINUS *erythropthalmus* of Linnæus, called, by some, *rootang*, which, in the German language, signifies the same. It very much resembles the common river bream in shape, but that it is somewhat thicker. The fins are all red, and the whole body of the fish is stained with a very elegant red, but no part of it so much as the iris of the eyes. When the scales are off, the body is of a greenish hue; and it has a yellow spot under the tongue. It much resembles the river mullet in some particulars; but it is of a more beautiful colour, and its eyes are more red. Its largest size seems a foot in length. It is a well-tasted fish; and spawns in April, under cover of the roots of trees. Ray.

This fish is called *rudd* by some English authors; it is also called *rutilus latior*, *rubellio fluviatilis*, and *finscale*. It is very common in many of the rivers of Germany and England; and is in season all the year, except in spawning time, when the male is subject to a great number of *white spots on its head*, and is more rough than at any other season. Willughby.

RED *game*, an English name of a bird, common in the mountainous parts of Yorkshire, and some other of our northern counties. See GOR *cock*.

RED *ink*. See INK and PRINTING.

RED *land*, in *Agriculture*, a term much used by husbandmen, to express a sandy soil of a reddish hue, interspersed for the most part with pieces of sand-stone of the same colour, or somewhat deeper.

There are several varieties of this soil, one of which is almost entirely made up of sand; another with an admixture of clay with the sand, the whole making a loose loamy earth; and a third full of fragments of a poor sandy iron ore, and often containing shining specks of selenitæ.

RED *lead*. See MINIUM and LEAD.

RED *shank*, in *Ornithology*, the name of a water bird, called by authors *gallinula erythropus*, and *callidrys*; the SCOLOPAX *calidris* of Linnæus. It is about the size of the common plover. The back is of a greyish or brownish green, usually spotted with black; its neck grey, and its throat variegated with black and white; the breast is white, with a few loose streaks of black; the wing feathers are variegated with black, brown, and white; the bill is two fingers breadth long, slender, and shaped like the beak of the woodcock; reddish at the base, and blackish lower down; its legs are of a fine beautiful red, and the hinder toe is very short and small. It breeds in the fens and marshes; is found on most of our shores; conceals itself in winter in the gutters; and is generally found single, or at most in pairs. When disturbed, it flies round its nest, making a noise like a lapwing. It lays four eggs, of a whitish colour tinged with olive, and marked with irregular spots of black, chiefly on the thicker end. Ray and Pennant. See *Tab.* IV. *Birds*, N° 51.

RED *start*, in *Ornithology*, the English name of the *ruticilla*, or MOTACILLA *phœnicurus* of Linnæus, a very beautiful bird. The bill and legs of the male are black; the forehead white; the crown of the head, hind part of the neck, and the back, are of a deep blue grey; the cheeks and throat black; the breast, rump, and sides, are red; the two middle feathers of the tail brown, the others red; the wings brown. In the female, the top of the head and back are of a deep ash colour; the rump and tail of a duller red than those of the male; the chin white; the lower side of the neck cinereous; and the breast of a paler red.

This bird appears among us only in the spring and summer, and is observed to come over nearly at the same time with the nightingale. It is so shy, that it will forsake its nest, formed with moss on the outside, and hair and feathers within, in hollow trees and the holes of buildings, if the eggs are only touched. It has a very fine soft note; and is remarkable for shaking its tail, and moving it horizontally as a dog does when fawning. Pennant.

RED *stone poll*. See LINNET.

RED *weed*, in *Botany*, a name given to a plant common in Bermudas, and some other places; and called, by our first travellers to that part of the world, the *Summer Island redweed*. Its berry is of a fine red colour, and affords a tincture little inferior to that of cochineel, and possessing all its virtues in medicine; the only misfortune of this, and some other very fine vegetable colours, is, that they fade soon. The juice of the fruit of the opuntia, or prickly pear, is as fine a dye as can be procured from the cochineel, but it will not stand; the insect feeding on this, however, we find affords a colour of the same nature that will stand. The fruit of the *red weed* is in the same manner liable to be eaten by insects as that of the prickly pear; and it is worthy a trial, whether its colour obtained at second hand from those insects, will not stand as well as the cochineel does, and whether the insects may not be propagated in a sufficient abundance to serve the markets in the same manner. Phil. Trans. N° 40.

RED *wing*, in *Ornithology*, the name of a bird of the turdus, or thrush kind, called also in some places the *wind thrush*, or *swine pipe*; and by Linnæus and others the TURDUS *iliacus*, or *tylas*.

It is a little smaller than the common thrush, and is less spotted. Its back, neck, and head are of the same colour with those of the common thrush; but its sides under the wings, and the feathers which line the wings, are of an orange colour, or dusky red; its belly and breast are whitish, and its throat yellowish, with brown spots: the wings are of a sort of chesnut colour, a little variegated. It feeds on insects, as worms, and the like; and is a bird of passage, coming to us in large flocks about the same time with the fieldfare, and leaving us also when that bird does. When the *red wing* appears on the coast in autumn, it is certain the woodcocks are near. It is not well known where they breed, though some have guessed it to be in the mountains of Germany and Bohemia. They have a bitterish taste, and are less valued than the fieldfare. With us they have a disagreeable piping note; but in Sweden, during the spring, they sing very finely, perching on the top of some tree among the forests of maples. They nest in hedges, and lay six bluish-green eggs spotted with black. Ray and Pennant.

REDANS, or REDANT. See REDENS.

RED BOOK *of the exchequer (liber rubeus scaccarii)* is an ancient record, wherein are registered the names of those that held hands *per baroniam* in king Henry the Second's time. It is a manuscript volume of several miscellany treatises, in the keeping of the king's remembrancer, in his office in the exchequer; and hath some things (as the number of the hides of land in many of our counties, &c.) relating to the times before the Conquest. There is likewise an exact collection of the escuages under king Henry, Richard II. and king John; and the ceremonies used at the coronation of queen Eleanor, wife to king Henry III. &c.

REDDAT. *Precipe quod* REDDAT. See PRECIPE.

REDDENDIS *chartis*. See CHARTIS.

REDDENDUM, in *Law*, a clause in a lease, &c. whereby a rent is reserved to the lessor.

REDDIDIT *se*, is where a man procures bail for himself to an action in any court at law, if the party bailed at any time before the return of the second *scire facias* against the bail, renders himself in discharge of his bail, they are thereby discharged.

REDDITARIUM, an ancient law term for a tarrier, roll, or rental, in which the rents and services of a manor are set down.

REDDITION, *redditio*, a surrendering or restoring. In *Law* it also denotes a judicial acknowledgment that a thing in question belongs to the demandant.

REDDLE, or RUDDLE, a species of MARLE, in *Natural History*, the common English name for the substance called in Latin *rubrica*, and used in painting, and for marking sheep, &c. There are two kinds of it, a harder and a softer.

The first, or harder kind, is but little in use, except among the turners in wood, as it does not mark so easily, requiring to be first wetted, and then pressed hard upon the substance to be marked. This is dug in Lincolnshire, Hampshire, and Sussex; and is a hard and dry earth, of a somewhat pale red, like the common pale red bricks, and is of a very regular and close texture, and always composed of a number of thin laminæ, lying closely and evenly on one another. It is of a rough uneven surface, adheres firmly to the tongue, is not easily broken between

tween the fingers, and ſtains the hands a little; it is of a very aſtringent taſte, and melts pretty readily in the mouth. It is very readily diffuſible in water, mouldering to powder, ſoon after being thrown into it; and makes no efferveſcence with acids.

The ſecond, or ſofter kind, is very common, and put to a number of different uſes. It makes ſimply a very good pale red for the painters, and is very ſerviceable to them in their mixed colours. It is in conſtant uſe in many parts of the kingdom for the marking of ſheep; and when waſhed and ſeparated from its ſandy particles, is, by ſome of our modern druggiſts, ſold under the name of bole armenic.

It is found in many parts of the world: the beſt in England is that from ſeveral parts of Derbyſhire, from whence the colour-ſhops and druggiſts of London are ſupplied; many of the latter thinking this a ſhorter method than the common one of our bole armenic makers, of preparing it from a mixture of tobacco-pipe clay, and the red ochre called Spaniſh brown.

This ſoft, or common *reddle*, is a looſe ponderous earth, of a lax texture, and very friable; and of a pale, but tolerably bright red, of a ſomewhat ſmooth and gloſſy ſurface, ſoft to the touch, adhering firmly to the tongue, eaſily broken between the fingers, and ſtaining the hands. It is of a rough auſtere taſte, very readily breaks, and falls to powder in water, and makes no efferveſcence with aqua fortis. Hill's Hiſt. of Foſſ. p. 48.

Some call *reddle*, *lapis hæmatites*; but the real hæmatites is another thing.

REDEEMABLES, are lands, funds, &c. ſold with a reſervation of the equity of REDEMPTION.

Crown lands are *redeemable* for ever; others only for a certain time.

REDEMISE, in *Law*. See DEMISE.

REDEMPTION, *redemptio*, in *Law*, a faculty or right of re-entering upon lands, &c. that have been ſold, and aſſigned; upon reimburſing the purchaſe-money, with legal coſts.

Bargains wherein the *faculty*, or, as ſome call it, the EQUITY *of redemption*, is reſerved, are only a kind of pignorative contracts.

A certain time is limited, within which the faculty of *redemption* ſhall be exerciſed; and beyond which it ſhall not extend.

REDEMPTION, in *Theology*, denotes the recovery of mankind from ſin and death, by the obedience and ſacrifice of Chriſt, who on this account is called the *Redeemer* of the world. See COVENANT.

REDEMPTIONS, *redemptiones*, in our *Old Law Writers*, denote grievous mulcts impoſed by way of commutation for the head or life of the delinquent.

REDEMPTION *of the national debt*. See FUND.

REDENS, REDANS, or REDANT, in *Fortification*, a kind of work indented in form of the teeth of a ſaw, with ſaliant and re-entering angles; to the end that one part may flank or defend another.

It is alſo called *ſaw work*, and *indented work*. The faces in this flank one another.

Redens are frequently uſed in the fortifying of walls, where it is not neceſſary to be at the expence of building baſtions; as when they ſtand on the ſide of a river, a marſh, the ſea, &c. But the fault of ſuch fortification is, that the beſiegers from one battery may ruin both the ſides of the tenaille or front of a place, and make an aſſault without fear of being enfiladed, ſince the defences are mined.

The parapet of the corridor alſo is frequently *redented*, or carried on by the way of *redens*.

REDHIBITION, *redhibitio*, in the *Civil Law*, an action allowed a buyer, whereby to annul the ſale of ſome moveable, and oblige the ſeller to take it back again, upon the buyer's finding it damaged, or that there was ſome perſonal cheat, &c.

The *redhibition*, or *redhibitory action*, has place in ſeveral caſes, in the body of the civil law. If a horſe was ſold that had the glanders, were broken-winded, or foundered, it was a *redhibitory caſe*; and the ſeller might be obliged to take him again within nine days.

REDIMICULUM, among the *Romans*, a girdle, which going about the neck, divided on the breaſt, and paſſing down each ſide, went round, and kept the robe tight to the body.

REDINTEGRATED *medals*. See MEDAL.

REDINTEGRATION, *redintegratio*, in the *Civil Law*, the act of reſtoring a perſon to the enjoyment of a thing whereof he had been illegally diſpoſſeſſed.

In France, where a perſon is deſpoiled of his property, he claims it again by a *redintegrand*, or action of reſtitution. But the *redintegrand* muſt be demanded within a year and a day, otherwiſe it is precluded.

REDINTEGRATION, in *Chemiſtry*, the reſtoring of any mixt body, or matter, whoſe form has been deſtroyed by calcination, corroſion, ſublimation, or the like, to its former nature and conſtitution.

The *redintegration* of mercury is properly called REVIVIFICATION. Mr. Boyle has an expreſs treatiſe on the *redintegration* of ſaltpetre; where he ſhews, that after reducing it by fluxion into fixed nitre, which is next of kin to ſalt of tartar in all its properties, he could preſently *redintegrate* it, by pouring a ſufficient quantity of ſpirit of nitre on it; i. e. he could re-produce true cryſtals of the uſual form and virtue of ſaltpetre.

It is a ſtrong objection againſt the chemical principles, that we cannot *redintegrate* the body they were procured from, by re-mixing them.

This ſeems to argue, that the body did not properly conſiſt of ſuch elements, or that they were not originally contained in it, but were rather produced by the fire.

REDIRE *ad pacem*, in *Law*, is applied to a perſon, whoſe outlawry is reverſed, and who is reſtored to the king's peace.

REDISSEISIN, in *Law*, a diſſeiſin made by him who once before was found and adjudged to have diſſeiſed the ſame man of his lands or tenements; for which there lies a ſpecial writ, called a *writ of rediſſeiſin*. See POST-*diſſeiſin*.

REDMANS, or RADMANS, in Doomſday and other ancient books, are probably the ſame with rod, or radknights; viz. men who, by the tenure or cuſtom of their lands, were to ride with, or for, the lord of the manor, about his buſineſs.

REDOUBT, or REDOUTE, *reductus*, in *Fortification*, a ſmall ſquare fort, without any defence but in front, uſed in trenches, lines of circumvallation, contravallation, and approach; as alſo for the lodging of corps de garde, and to defend paſſages. See FORT.

They are uſually figures of three, four, five, or ſix ſides, encompaſſed with a ditch, and a bank of earth, which conſiſts of two parts, called rampart and parapet.

In marſhy grounds, *redoubts* are often made of ſtonework, for the ſecurity of the neighbourhood; their face conſiſts of from ten to fifteen fathom; the ditch round them from eight to nine feet broad and deep; and their parapets, which are cut into embraſures and merlons, have the ſame thickneſs. See REDUCT.

The inner ſides of ſquare *redoubts* are uſually between the limits of twelve and thirty-two yards; and when they are to be defended by muſketry, the number of men neceſſary to the defence may be thus determined: half the ſide ſquared gives the number of troops; and twice the ſquare root of a given number of men, ſhews the length in yards of the ſide of a ſquare *redoubt* proper to contain them.

To conſtruct a ſquare *redoubt*. Mark out a ſquare, whoſe ſide is adapted to the number of troops allotted for the defence, as A B (*Tab.* VIII. *Fortification*, *fig.* 56.) for the inſide of the rampart. About this ſquare, at the diſtance of ten or twelve feet, deſcribe another ſquare, whoſe ſide C D is the inner boundary of the parapet; make a parapet of about nine or ten feet thick, whoſe outline is the line E F; leave a berm about three or four feet broad, whoſe ſide is G H; and dig a ditch about ſixteen feet wide, and about ſix or ſeven feet deep, which ſhould be rounded before the angles of the *redoubt*. Make the rampart from four feet to nine or ten feet high; let the parapet be ſix or ſeven feet higher, and let the foot-bank be four feet and a half lower than the crown of the parapet. On that ſide moſt ſecure from the enemy, make a bridge acroſs the ditch, and a paſſage through the rampart, about four or five feet broad when the defence is muſketry, about nine or ten feet broad when cannon are to be uſed; and ſhut up the paſſage by a ſtrong gate. If the *redoubt* is to be defended by cannon, both the rampart and parapet ſhould be at leaſt five or ſix feet thicker. In order to make the fire pretty nearly equal on all ſides, and ſufficient for defending the angles of the work, M. Clairac has contrived to cut the inſide of the parapet into notches, whoſe two ſides, of a yard each, are at right angles to one another, and make half-right angles with the ſides of the work; the manner of which, and its defence, are plainly ſhewn in the figure, where the lines with dots at the ends repreſent the fire three different ways from the ſame ſide.

For the method of conſtructing flanked *redoubts*, ſee FORT.

A *detached redoubt* is a kind of work reſembling a ravelin, with flanks, placed beyond the GLACIS; ſuch as B (*Tab.* VII. *Fortification*, *fig.* 41.) They are made in order to occupy ſome ſpot of ground which might be advantageous to the beſiegers; and likewiſe to oblige the enemy to open their trenches farther off than they would otherwiſe do. Their diſtance from the covert-way ought not to exceed a hundred and twenty toiſes, that they

they may be defended by muſket-ſhot from thence. The gorge *a b* is forty toiſes; the flanks *a c*, *b f*, which are perpendicular to the gorge, ten; and the faces *e d*, *f d*, thirty: the ditch before it is ſix toiſes, ending in ſlopes at both ends; the covert-way, four; the branches of the covert-way about forty-two toiſes long; the faces of the places of arms *y*, *y*, which are perpendicular to the branches, ten; and the other, which is parallel to them, fourteen. The communication from the covert-way to the *redoubt* is five or ſix toiſes wide; and there is a traverſe made juſt at the entrance, and another in the middle when it is pretty long. The parapets of this communication terminate in a ſlope or glacis. Robertſon's Marine Fortif. p. 20, &c. Muller's Fort. p. 43, &c.

Redoubts are alſo ſmall works of the ſame form made in a Ravelin.

REDRESSING, the rectifying or ſetting any thing ſtraight again.

Trees and other plants have a natural faculty of *redreſſing* themſelves, when, by any external cauſe, they are forced out of the perpendicular. See Perpendicularity.

In the moral ſenſe, to *redreſs* grievances, is to reform or remove them.

To *redreſs* a ſtag, among hunters, is to put him off his changes.

REDSEAR. See Iron.

REDUBBORS, thoſe who buy ſtolen cloaths, &c. and, to the end they may not be known, turn them into ſome other faſhion, &c. See Frippery, and Regrator.

REDUCE, in *Chemiſtry*. See Reduct.

To Reduce *a place*, in *Military Language*, is to oblige the governor to ſurrender it to the beſiegers, by capitulation.

REDUCED *chart*. See Chart.

REDUCING *ſcale*, is a thin, broad piece of box, with ſeveral lines and ſcales, of equal parts, thereon; for turning chains and links into acres and rods, by inſpection.

It is uſed by ſurveyors, to reduce maps and draughts from one dimenſion into another: it is ſometimes alſo called the *ſurveying* scale.

REDUCT, Reduit, or Redout, a military term, ſignifying an advantageous piece of ground, intrenched and ſeparated from the reſt of the place, camp, &c. for an army, garriſon, &c. to retire to, in caſe of a ſurprize. See Donjon.

Reduct, in *Building*, a quirk, or little place, taken out of a larger, to make it more uniform and regular; or for ſome other convenience, as for a little cabinet aſide of a chimney, for alcoves, &c.

Reduct, or Redux, among *Chemiſts*, is a powder by which calcined metals and minerals are reduced again to their regulus, or pure ſubſtance.

REDUCTION, *reductio*, in the *Schools*, a manner of bringing a term or propoſition, which before was oppoſite to ſome other, to be equivalent to it.

Reduction is effected by the addition or retrenchment of a negative particle. Thus, to *reduce* this propoſition, *no man is an animal*, to be equivalent to its oppoſite, *every man is an animal*, I drop the negative, and ſay, *man is an animal*. After the like manner might the term *every man* be *reduced*, by adding the negative, and ſaying, *there is no man*.

Reduction *of propoſitions* is uſed in a more general ſenſe, for any expreſſion of one propoſition, by another propoſition equivalent to it.

To a *reduction*, therefore, there are two propoſitions required, the *reduced*, and the *reducing*; which are conſidered as the extremes thereof, and to be connected in the *reduction*, by means of the particle *that is*; which here has the effect of a copula.

As here, *only animals think*; *that is, animals think, and nothing beſide animals thinks*. Where the propoſition preceding the particle is *reduced*, and the ſubject of the *reduction*; that following the particle *reduces*, and has the effect of the predicate of the *reduction*; and the particle *that is* acts as a copula, importing, not barely that the propoſition is expreſſed by another, but by another equivalent one, or, as it were, the ſame.

Reduction *of ſyllogiſms*, is a regular changing or transforming of an imperfect ſyllogiſm into a perfect one. Or, it is a change of a ſyllogiſm in reſpect of form, whereby the neceſſity of the illation, or inference, is made more evident.

Reduction obtains in ſyllogiſms of the ſecond and third figure; as alſo in the indirect modes of the firſt. By it theſe are all brought to the firſt.

There are two kinds of this *reduction*; the one *direct*, or *oſtenſive*, performed merely by a converſion of one or both the premiſes, or by a tranſpoſition thereof; as when *cameſtres* is reduced to *celarent*: the other *indirect*, called *per impoſſibile*, or *ad abſurdum*; whereby the perſon who denies the goodneſs and legitimacy of an imperfect ſyllogiſm, is reduced to aſſert or grant ſomething abſurd and impoſſible, or contradictory to ſome other thing maintained by him.

Suppoſe, e. gr. a perſon granting the premiſes of the following ſyllogiſm, denies the concluſion: *All fraud is prohibited*; *but ſome trading is not prohibited*; *therefore ſome trading is not fraud*. We thus proceed againſt him: if the ſyllogiſm be not good, the antecedent is juſt, but the conſequent falſe; and, therefore, the contrary of the concluſion muſt be true: now I take the contrary of the concluſion, which you thus give, viz. *all trading is fraud*; and of that, with the other premiſe of the former ſyllogiſm, viz. the major, which you likewiſe grant, make a new ſyllogiſm; thus, *all fraud is prohibited*; *all trading is fraud*: *therefore all trading is prohibited*. But this propoſition, *all trading is prohibited*, and the other, *ſome trading is prohibited*, which you granted me in the firſt ſyllogiſm, are contradictories.

Reduction, in *Arithmetic*, is the converting of moneys, weights, or meaſures, into the ſame value in other denominations; e. gr. pounds into ſhillings and pence; or ſhillings and pence into pounds.

The *reductions* of the principal moneys, coins, weights, and meaſures, ancient and modern, foreign and domeſtic, are found under Coin, Weight, Measure, Pound, Foot, &c.

Reduction is of two kinds: 1. *Deſcending*, when a quantity is to be brought from a higher denomination to a lower.

This is done by conſidering how many of the next leſs denomination are contained in the next greater before, and by that number multiplying the greater.

Thus pounds are reduced into ſhillings, by multiplying by 20; ſhillings into pence, by multiplying by 12; and pence into farthings, by multiplying by 4.

Troy pounds are reduced into grains by multiplying by 12, 20, and 24; and avoirdupois hundreds into ounces, by 4, 28, and 16.

2. *Aſcending*, when a lower denomination is to be reduced to a higher.

In order to this, the buſineſs is, to divide the leaſt by ſo many of its denomination as are contained in the next greater: thus 24720 pence, divided by 12, and the quotient by 20, give 103 pounds.

If there remain any thing in each diviſion, it is reſpectively either odd pence, or ſhillings: thus, 6713 pence reduced, give 27*l.* 19*s.* 5*d.* cut off the laſt, the reſt are the pounds required.

To expedite the practice, ſeveral compendious ways of *reduction* have been invented. See Practice.

Thus, yards are turned into ells by ſubtracting a fifth; and into ells Flemiſh by adding a fifth. Ells Flemiſh are reduced into yards by ſubtracting a quarter. Ells Flemiſh reduced to ells Engliſh by multiplying by 6, and cutting off the right-hand figure.

Great pounds of ſilk of twenty-four ounces are reduced to pounds of fixteen ounces by adding one half; and pounds of ſixteen ounces into pounds of twenty-four, by ſubtracting one third.

Reduction *of fractions*. See Fraction.

Reduction *of equations*, in *Algebra*, is the clearing them from all ſuperfluous quantities, bringing down the quantities to their loweſt terms, and ſeparating the known quantities from the unknown ones, till at length only the unknown quantity is found on one ſide, and known ones on the other.

The *reduction* of an equation is the laſt part of the reſolution of the problem.

The end of all algebraical operations is, to have the unknown letter alone in one member of the equation; and in the other, all the known letters, without any mixture of unknown; for, in this caſe, it is evident the value of the unknown quantity is found.

This *reduction* of equations depends upon a right application of the five following axioms: 1. If equal quantities be added to equal quantities, the ſums of thoſe quantities will be equal. 2. If equal quantities be ſubtracted or taken from equal quantities, the quantities remaining will be equal. 3. If equal quantities be multiplied by equal quantities, their products will be equal. 4. If equal quantities be divided by equal quantities, their quotients will be equal. 5. Quantities that are equal to one and the ſame thing, are alſo equal to one another.

If theſe axioms be well underſtood, the *reduction* of equations will appear very plain, and the operations be eaſily performed.

1. *Reduction* by tranſpoſition is performed by transferring a quantity to the other ſide of the equation with a contrary ſign; or by equal addition, if the quantity be negative; and by equal ſubtraction, if affirmative. Thus

 the

the equation $x - 10 = 40$, is reduced by adding $+10$ to each side, and the result will be the same as if -10 had been transposed to the opposite side with the contrary sign; for $x - 10 + 10 = 40 + 10$, is the same with $x = 40 + 10$, the -10 and $+10$ destroying each other. In the same manner $x + 10 = 40$, is reduced to $x = 40 - 10$, by transposing the $+10$ with a contrary sign.

2. *Reduction* is performed by equal multiplication, in case there are fractional quantities; for by multiplying every term in the equation by the denominators of the fractions, it will be cleared of fractions: thus by multiplying every term of the equation $\frac{z}{a} = b$ by the denominator a, we shall have $z = ab$. Again, if $\frac{z^3 + 3a^2}{c} + n + a = z + a$; then by multiplying by the denominator c, we shall have an equal equation free from fractions, viz. $z^3 + 3a^2 + cn + ac = cz + ac$, or $z^3 + 3a^2 + cn = cz$, the ac on each side being rejected.

3. By equal division, as in the equation $ax = c$; for by dividing each side by a, we shall have $x \left(\text{or } \frac{ax}{a}\right) = \frac{c}{a}$. In the same manner, in the equation $az + ez = cb$, by dividing each side by $a + e$, we get the equation $z = \frac{cb}{a+e}$.

4. Equations are cleared of surd quantities by involution: thus, if the equation be $\sqrt{a} = 6$; then by involution or squaring each side of the equation, we have the equation $a = 36$. If both sides be similar surds, or of the same power, all that we have to do is to reject the radical sign: thus, for $\sqrt{a} = \sqrt{d+c}$, we write $a = d + c$, rejecting the radical sign of both.

5. When any single power of the unknown quantity is on one side of the equation, evolve or extract the root of both sides, according as the index of that power denotes, and their roots will be equal. Thus if $zz = 25$, by extracting the root of each side we have $z = 5$. In the same manner, if $aaa = 27$, their cube roots will be equal, viz. $a = 3$. Or, if any compound power of the unknown quantity be on one side of an equation, that hath a true root of its kind; then, by evolving both sides of the equation, it will be expressed in lower terms: for example, $a^2 + 2ba + b^2 = d^2$, by evolving both sides, comes out $a + b = d$.

6. A proportion may be converted into an equation, asserting the product of the extremes to be equal to that of the means; or, any one of the extremes may be made equal to the product of the means divided by the other extreme: thus, if $12 - x : \frac{x}{2} :: 4 : 1$, then $12 - x = 2x$; and by transposing the $-x$, we shall have $3x = 12$, and dividing by 3, $x = \frac{12}{3} = 4$, by the preceding rules.

7. If any quantities be found on both sides of the equation, with the same sign prefixed, they may be taken away from both: thus, for $3x + b = a + b$, we say $3x = a$. Also, if all the quantities of the equation be multiplied or divided by the same quantity, it may be struck out of them all: thus, if $3ax + 5ab = 8ac$, dividing by a, we have $3x + 5b = 8c$; and transposing $5b$ and dividing by 3, we have $x = \frac{8c - 5b}{3}$, according to the first and third rules.

8. Instead of any quantity in an equation, you may substitute another equal to it: thus, if $3x + y = 24$, and $y = 9$; then $3x + 9 = 24$, or $x = \frac{24-9}{3} = 5$.

Solution of simple equations. 1. After an equation is formed (see EQUATION) if you have only one unknown quantity, then, by the preceding rules, bring it to stand alone on one side, so as to have none but known quantities on the other side; by which means you will discover its value.

Example. A person being asked what was his age, answered, that $\frac{3}{4}$ of his age multiplied by $\frac{1}{12}$ of his age gives a product equal to his age: what was his age? Calling his age x, we shall have, by the conditions of the question,

$$\frac{3x}{4} \times \frac{x}{12} = x$$

$$\frac{3x^2}{48} = x$$

and $3x^2 = 48x$ by the second rule,

and $3x = 48$ by the seventh rule,

and $x = \frac{48}{3} = 16$ by the third rule.

2. If there are two unknown quantities, then there must be two equations arising from the conditions of the question; suppose the quantities x and y. The rule is, to find a value of x or y from each of the equations, and then by putting these two values equal to each other, there will arise a new equation involving only one unknown quantity, which must be reduced by the preceding rules.

Example. Let the sum of two quantities be s, and their difference d; let s and d be given, and let it be required to find the quantities themselves. Suppose the quantities to be x and y; then, by the question, $x + y = s$, and $x - y = d$; whence $x = s - y = d + y$; and, by transposition, $2y = s - d$; so that dividing by 2, we have $y = \frac{s-d}{2}$; and by comparing the value of x, viz. $s - y$, we find $x = s - \frac{s+d}{2}$, or $2x = 2s - s + d$, and dividing by 2, the value of $x = \frac{s+d}{2}$, as expressed in the margin.

$$x + y = s$$
$$x - y = d$$
$$x = s - y$$
$$x = d + y$$
$$s - y = d + y$$
$$2y = s - d$$
$$y = \frac{s-d}{2}$$
$$x = \frac{s+d}{2}$$

3. When in one of the given equations, the unknown quantity is of one dimension, and in the other of a higher dimension; you must find a value of the unknown quantity from that equation where it is of one dimension, and then raise that value to the power of the unknown quantity in the other equation; and by comparing it, so involved, with the value you deduce from that other equation, you will obtain an equation that will have only one unknown quantity and its powers: that is, when you have two equations of different dimensions, if you cannot reduce the higher to the same dimension with the lower, you must raise the lower to the same dimension with the higher.

Example. The sum of two quantities, and the difference of their squares, being given, to find the quantities themselves. Suppose them to be x and y, their sum s, and the difference of their squares d. Then,

$$x + y = s$$
$$x^2 - y^2 = d$$
$$x = s - y$$
$$x^2 = s^2 - 2sy + y^2$$
$$x^2 = d + y^2, \text{ whence}$$
$$d + y^2 = s^2 - 2sy + y^2$$
$$d = s^2 - 2sy$$
$$2sy = s^2 - d$$
$$y = \frac{s^2 - d}{2s}$$

$$\text{and } x = s - \frac{s^2 - d}{2s} = \frac{2s^2 - s^2 + d}{2s} = \frac{s^2 + d}{2s}.$$

4. If there are three unknown quantities, there must be three equations in order to determine them, by comparing which you may, in all cases, find an equation involving only one unknown quantity; which may be resolved by the rules for *reduction* of equations already mentioned. From three equations involving any three unknown quantities, x, y, and z, to deduce two equations involving only two unknown quantities, the following rule will always serve: find three values of x from the three given equations; then, by comparing the first and second value, you will find another equation involving only y and z: again, by comparing the first and third, you will find another equation involving only y and z: and, lastly, those equations are to be solved by the second direction.

Example. Suppose

$$\left.\begin{array}{l} x + y + z = 12 \\ x + 2y + 3z = 20 \\ \frac{x}{3} + \frac{y}{2} + z = 6 \end{array}\right\} \text{then } x = \left\{\begin{array}{l} 12 - y - z \\ 20 - 2y - 3z \\ 18 - \frac{3y}{2} - 3z \end{array}\right. \left.\begin{array}{l} \text{1st} \\ \text{2d} \\ \text{3d} \end{array}\right\} \text{value.}$$

$$12 - y - z = 20 - 2y - 3z$$
$$12 - y - z = 18 - \frac{3y}{2} - 3z.$$

These two last equations involve only y and z, and are to be resolved by the second direction. Thus,

$$\left\{\begin{array}{l} 2y - y + 3z - z = 20 - 12 = 8 \\ y + 2z = 8 \end{array}\right.$$
$$\left\{\begin{array}{l} 36 - 3y - 6z = 24 - 2y - 2z \\ 12 = y + 4z \end{array}\right.$$
$$\text{whence } y = \left\{\begin{array}{l} 8 - 2z \text{ 1st} \\ 12 - 4z \text{ 2d} \end{array}\right\} \text{value,}$$
$$\text{and } 8 - 2z = 12 - 4z$$
$$2z = 12 - 8 = 4$$
$$z = \tfrac{4}{2} = 2$$
$$y\ (= 8 - 2z) = 4$$
$$x\ (= 12 - y - z) = 6.$$

This method is general, and will extend to all equations that involve three unknown quantities; but there are often

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often easier and shorter methods, to deduce an equation involving only one unknown quantity, which are best learned from practice. For other examples, see EQUATION.

Solution of quadratic equations. In the solution of any question, where you have got an equation that involves only one unknown quantity, but involves at the same time the square of that quantity, and the product of it multiplied by some known quantity; then you have what is called an adfected quadratic equation, which may be resolved by the following rules: 1. Transpose all the terms that involve the unknown quantity to one side, and the known terms to the other side of the equation. 2. If the square of the unknown quantity is multiplied by any coefficient, you are to divide all the terms by that coefficient, that the coefficient of the square of the unknown quantity may be unit. 3. Add to both sides the square of half the coefficient prefixed to the unknown quantity itself, and the side of the equation that involves the unknown quantity will then be a complete square. 4. Extract the square root from both sides of the equation, which you will find, on one side, always to be the unknown quantity with half the foresaid coefficient subjoined to it; so that by transposing this half, you may obtain the value of the unknown quantity expressed in known terms. Thus, suppose the quadratic equation to be

$$y^2 + ay = b$$

Add the square of $\frac{a}{2}$ to both sides, $\quad y^2 + ay + \frac{a^2}{4} = b + \frac{a^2}{4}$

Extract the root $\quad y + \frac{a}{2} = \pm\sqrt{b + \frac{a^2}{4}}$

Transpose $\frac{a}{2}$, and $\quad y = \sqrt{b + \frac{a^2}{4}} - \frac{a}{2}$.

Here it is to be observed, that the square root of any quantity, as $+a^2$, may be $+a$, or $-a$; and hence all quadratic equations admit of two solutions. Also, since the squares of all quantities are positive, it is evident that the square root of a negative quantity is imaginary, and cannot be assigned. However, the following examples will illustrate the rules for quadratic equations.

Example 1. The sum of two quantities is 32, and their product 240; required the quantities themselves? Suppose them to be x and y: then

$$x + y = 32;\ \text{and}\ x = 32 - y$$

$$xy = 240;\ \text{and}\ x = \frac{240}{y}$$

therefore $\quad 32 - y = \frac{240}{y}$

and $\quad 32y - y^2 = 240$

transpose $\quad y^2 - 32y = -240$

add 16^2, $\quad y^2 - 32y + 256 = -240 + 256$

extract $\surd$, $\quad y - 16 = \pm\sqrt{16}$

and $\quad y = \pm\sqrt{16} + 16 = 20$

$\quad x\ (= 32 - y) = 12.$

Example 2. Three merchants join stocks; the stock of the first was less than that of the second by 13*l.* and the sum of the second and third man's stock amounted to 175*l.* In trading they gained 48*l.* more than their whole stock was; and the first man's share of the gain was 78*l.* required each man's stock and share of the gain?

Suppose	1	x, y, z to represent each man's stock
Then	2	$x + y + z = s =$ the whole stock
	3	$s + 48 =$ the whole gain
By the question	4	$x + 13 = y$
	5	$y + z = 175$
$5 + x$	6	$x + y + z = 175 + x$
2, 6	7	$s = 175 + x$
7, 3	8	$s + 48 = 223 + x$
By the question	9	$175 + x : 223 + x :: x : 78$
$9 \times$	10	$x^2 + 223x = 78x + 13650$
$10 - 78x$	11	$x^2 + 145x = 13650$
11 □	12	$x^2 + 145x + 5256{,}25 = 18906{,}25$
$12 \surd^2$	13	$x + 72{,}5 = \sqrt{18906{,}25} = 137{,}5$
$13 - 72{,}5$	14	$x = 137{,}5 - 72{,}5 = 65$
14, 4	15	$y = x + 13 = 78$
5, 15	16	$z = 175 - y = 97$
Then	17	$65 + 78 + 97 + 48 = 288$ the whole gain
And	18	y's gain $= 93$*l.* 12*s.* and z's $= 116$*l.* 8*s.*

See *Quadratic* EQUATION.

There is another method of resolving quadratic equations by taking away the second term, in the manner directed under TRANSFORMATION *of equations*: thus, if we substitute, in the equation $x^2 - px + q = 0$, $y + \frac{1}{2}p$ for x, we shall have $x = \frac{1}{2}p \pm \sqrt{\frac{1}{4}p^2 - q}$, which expression agrees with the result of the preceding rule.

Solution of cubic equations. The second term of a cubic equation can be taken away, so that it may be transformed to this form $x^3 * + qx + r = 0$. See TRANSFORMATION *of equations*.

Let us suppose that $x = a + b$; and $x^3 + qx + r = a^3 + 3a^2b + 3ab^2 + b^3 + qx + r = a^3 + 3ab \times \overline{a + b} + b^3 + qx + r = a^3 + 3abx + b^3 + qx + r =$ (by supposing $3ab = -q$) $= a^3 + b^3 + r = 0$. But $b = -\frac{q}{3a}$, and $b^3 = -\frac{q^3}{27a^3}$, and consequently $a^3 - \frac{q^3}{27a^3} + r = 0$; or, $a^6 + ra^3 = \frac{q^3}{27}$. Suppose $a^3 = z$, and you have $z^2 + rz = \frac{q^3}{27}$; which is a quadratic, the resolution whereof gives

$$z = -\tfrac{1}{2}r \pm \sqrt{\tfrac{1}{4}r^2 + \frac{q^3}{27}} = a^3,\ \text{and}$$

$$a = \sqrt[3]{-\tfrac{1}{2}r \pm \sqrt{\tfrac{1}{4}r^2 + \frac{q^3}{27}}};\ \text{and}$$

$$x = a + b = a - \frac{q}{3a} = \sqrt[3]{-\tfrac{1}{2}r \pm \sqrt{\tfrac{1}{4}r^2 + \frac{q^3}{27}}} - \frac{q}{3 \times \sqrt[3]{-\tfrac{1}{2}r \pm \sqrt{\tfrac{1}{4}r^2 + \frac{q^3}{27}}}}$$

in which expressions there are only known quantities. This method is commonly called Cardan's rule. See *Cubic* EQUATION.

Again, any cubic equation may be reduced to this form, and the value of x discovered, without exterminating the second term.

$$\left.\begin{matrix} x^3 - 3px^2 - 3qx - 2r \\ + 3p^2x - p^3 \\ + 3pq \end{matrix}\right\} = 0;$$ which, by supposing $x = z + p$, will be reduced to $x^3 * - 3qz - 2r = 0$, in which the second term is wanting. But, from what is advanced above, it follows that $z = \sqrt[3]{r + \sqrt{r^2 - q^3}} + \sqrt[3]{r - \sqrt{r^2 - q^3}} =$ (if you suppose that the cubic root of the binomial $r + \sqrt{r^2 - q^3}$ is $m + \sqrt{n}$) $= m + \sqrt{n} + m - \sqrt{n} = 2m$. And, since $x = z + p$, it follows that $x = p + 2m$. But, as the square root of any quantity is twofold, so the cubic root is threefold, and can be expressed three different ways. See ROOT.

Example. Let it be required to find the roots of the equation $x^3 - 12x^2 + 41x - 42 = 0$.

Comparing the coefficients of this equation with those of the general equation, viz.

$$\left.\begin{matrix} x^3 - 3px^2 - 3q \\ + 3p^2 \end{matrix}\ x\ \begin{matrix} - 2r \\ - p^3 \\ + 3pq \end{matrix}\right\} = 0;$$ you will find $3p = 12$, so that $p = 4$; $3p^2 - 3q\ (= 48 - 3q) = 41$, so that $q = \frac{7}{3}$; and $3pq - p^3 - 2r\ (= -36 - 2r) = -42$, so that $r = 3$. And consequently $r^2 - q^3 = 9 - \frac{343}{27} = -\frac{100}{27}$, and $r + \sqrt{r^2 - q^3} = 3 + \sqrt{-\frac{100}{27}}$. Now the cubic root of this binomial is found to be $-1 + \sqrt[2]{-\frac{4}{3}}$ $(= m + \sqrt{n})$; whence,

1. $x = p + 2m = 4 - 2 = 2$.

2. $x = p - m - \sqrt{-3n} = 4 + 1 - \sqrt{4} = 5 - 2 = 3$.

3. $x = p - m + \sqrt{-3n} = 5 + 2 = 7$.

So that the three roots of the proposed equation are 2, 3, and 7.

Solution of biquadratic equations. The roots of these may be found by reducing them to cubic ones. Thus:

Let the second term be taken away, as directed under TRANSFORMATION *of equations*;

And let the equation that results, be $x^4 * + qx^2 + rx + s = 0$. Suppose this biquadratic to be the product of these two quadratic equations.

$$x^2 + ex + f = 0.$$

$$x^2 - ex + g = 0$$

$$x^4 * \left.\begin{matrix} + f \\ + g \\ - e^2 \end{matrix}\right\} \times x^2 \left.\begin{matrix} + eg \\ - ef \end{matrix}\right\} \times x + fg = 0.$$

Where e is the coefficient of x in both equations, but affected with contrary signs; because when the second term is wanting in an equation, the sum of the affirmative roots must be equal to the sum of the negative.

Compare now the proposed equation with the above

product,

product, and the reſpective terms put equal to each other, will give $f+g-e^2=q$, $eg-ef=r$, and $fg=s$. Whence it follows, that $f+g=q+e^2$, and $g-f=\frac{r}{e}$; and conſequently, $f+g+g-f\ (=2g)$ $=q+e^2+\frac{r}{e}$, and $g=\frac{q+e^2+\frac{r}{e}}{2}$. In the ſame manner you will find, by ſubtraction, &c. $f=\frac{q+e^2-\frac{r}{e}}{2}$, and $f\times g\ (=s)=\frac{1}{4}\times\overline{q^2+2qe^2+e^4-\frac{r^2}{e^2}}$; and, multiplying by $4e^2$, and ranging the terms, you have this equation, $e^6+2qe^4+\overline{q^2-4s}\times e^2-r^2=0$. Suppoſe $e^2=y$, and it becomes $y^3+2qy^2+\overline{q^2-4s}\times y-r^2=0$, an equation whoſe roots are to be diſcovered by the method of reſolving cubic equations.

Then the values of y being found, their ſquare roots will give e (ſince $y=e^2$); and having e, you will find f and g, from the equations $f=\frac{q+e^2-\frac{r}{e}}{2}$, and $g=\frac{q+e^2+\frac{r}{e}}{2}$. Laſtly, extracting the roots of the equations $x^2+ex+f=0$, and $x^2-ex+g=0$, you will find the four roots of the biquadratic $x^4 * +qx^2+rx+s=0$; for either $x=-\frac{1}{2}e\pm\sqrt{\frac{1}{4}e^2-f}$, or $x=+\frac{1}{2}e\pm\sqrt{\frac{1}{4}e^2-g}$.

Or you may find the roots of a biquadratic, without taking away the ſecond term. Suppoſe it to be of this form,

$$x^4-4px^3\left.\begin{matrix}-2q\\+4p^2\end{matrix}\right\}x^2\left.\begin{matrix}-8r\\+4pq\end{matrix}\right\}x\left.\begin{matrix}-4s\\+q^2\end{matrix}\right\}=0$$

then the values of x will be

$$\left.\begin{matrix}x=p-a\pm\sqrt{p^2+q-a^2-\frac{2r}{a}}\\ \text{and } x=p+a\pm\sqrt{p^2+q-a^2+\frac{2r}{a}}\end{matrix}\right\}$$

where a^2 is equal to the root of the cubic equation

$$y^3\left.\begin{matrix}-p^2\\-q\end{matrix}\right\}y^2\left.\begin{matrix}+2pr\\+s\end{matrix}\right\}y-r^2=0.$$

Every equation has as many roots as the unknown quantity of the firſt term has dimenſions, or as the exponent thereof contains units.

All equations have as many affirmative roots as there are permutations of ſigns; and as many negative roots as there are ſucceſſions of them: thus, in the quadratic $x^2+x-6=0$, there is only one ſucceſſion of ſigns, $++$; and one permutation of them, $+-$; hence the equation has two roots, one affirmative $+2$, and the other negative -3. Alſo in the cubic equation $x^3-3x^2-10x+24=0$, there are two permutations of ſigns, $+-$ and $-+$; and only one ſucceſſion, $--$: hence its roots are found to be two affirmative, $+2$ and $+4$; and only one negative, -3.

For the methods of approximating to the roots of equations, by means of their limits and ſerieſes, ſee Approximation and Equation.

See on the ſubject of this article Maclaurin's Algebra, part i. chap. 10, 11, 13. part ii. chap. 8.

Reduction *of intereſt of the public debt.* See Fund.

Reduction *of curves.* See Curve.

Reduction *of a figure, deſign,* or *draught,* is the making a copy thereof, either larger or ſmaller than the original; ſtill preſerving the form and proportion.

The great uſe of the *proportional* compasses is in the *reduction* of figures, &c. whence they are alſo called *compaſſes of reduction.*

There are various methods of reducing figures, &c. the moſt eaſy is by means of the pentagraph, or parallelogram; but this has its defects. The beſt and moſt uſual methods of *reduction* are as follow:

To reduce a figure, as ABCDE (*Tab.* III. *Geometry, fig.* 81.) *into a leſs compaſs.* About the middle of the figure, as *z*, pitch on a point; and from this point draw lines to its ſeveral angles A, B, C, &c. then drawing the line *ab* parallel to AB, *bc* parallel to BC, &c. you will have the figure *abcde* ſimilar to ABCDE.

If the figure *abcde* had been required to be enlarged, there needed nothing but to produce the lines from the point beyond the angles, as *z*D, *z*C, &c. and to draw lines, viz. DC, CB, &c. parallel to the ſides *dc*, *cb*, &c.

To reduce a figure by the angle of proportion. Suppoſe the figure ABCDE (*fig.* 82.) required to be diminiſhed in the proportion of the line AB to *ab* (*fig.* 83.): draw the indefinite line GH (*fig.* 84.) and, from G to H, ſet off the line AB; on G deſcribe the arch HI; ſet off the line *ab* as a chord on HI, and draw GI. Then with the angle IGH you have all the meaſures of the figure to be drawn. Thus, to lay down the point *c*, take the interval BC, and upon the point G deſcribe the arch KL; alſo on the point G deſcribe MN; and upon *a* with the diſtance MN deſcribe an arch cutting the preceding one in *c*, which will determine the ſide *bc*. And, after the ſame manner, are all the other ſides and angles to be deſcribed.—The ſame proceſs will alſo ſerve to enlarge the figure.

To reduce a figure by a ſcale. Meaſure all the ſides of the figure, e. gr. ABCDE, by a ſcale; and lay down the ſame meaſures reſpectively, from a ſmaller ſcale, in the proportion required.

To reduce a map, deſign, or figure, by ſquares. Divide the original into little ſquares, and divide a freſh paper of the dimenſions required, into the ſame number of ſquares; which are to be larger or leſs than the former, as the map is to be enlarged or diminiſhed.

This done, in every ſquare of the ſecond figure, draw what you find in its correſpondent one in the firſt.

Reduction *to the ecliptic,* in *Aſtronomy,* is the difference between the argument of latitude, as NP (*Tab. Aſtron. fig.* 26.) and an arch of the ecliptic NR, intercepted between the place of a planet, and the node N.

To find the reduction. The angle of inclination PNR, and the argument of latitude NP, being given, find, by the doctrine of ſpherics, the arch NR, ſubtract NR and NP from each other, the remainder is the *reduction.*

Reduction *into firſt matter,* is a term which alchemiſts uſe when they find their ſubſtances putrefy, and grow black.

Reduction is more particularly uſed for the converting of a dry matter into a liquid, particularly into water; which by the alchemiſts is held the principle of all things.

The *reduction* of metals into their firſt matter, or principles, according to theſe philoſophers, can only be effected by mercury; nothing elſe being able to looſen the fixed ſulphur of metallic bodies, which binds them together.

Reduction, in *Metallurgy,* is the bringing back metalline ſubſtances, which have been changed into ſcoriæ or aſhes, or otherwiſe diveſted of their metallic form, into their natural and original ſtate of metals again. Cramer's Art of Aſſaying, p. 185.

All metals and ſemi-metals may be reduced by proper management, whatever have been their changes, except only zinc, which having been burnt to aſhes, admits of no *reduction.* But the mixture of gold and ſilver was never yet radically diſſolved by any experiment, whatever ſome may have imagined. Even ſome earths will turn into metals by the admixture and intimate union of a phlogiſton, or inflammable principle; but theſe metals never need any ſuch principle to aſſiſt their *reduction.* See Revivification.

Reduction, in *Surgery,* denotes an operation whereby a diſlocated, luxated, or fractured bone is reſtored to its former place. *Reduction,* or *repoſition,* is always to be performed before any remedy be applied.

REDUIT, in *Military Affairs.* See Reduct.

REDUNDANCY, or Redundance, a fault in diſcourſe, conſiſting in the uſe of a ſuperfluity of words.

Words perfectly ſynonymous are *redundant,* and ought to be retrenched. *Redundancy* neceſſarily makes the ſtyle weak and languid. See Pleonasm.

REDUNDANT *hyperbola* is a curve of the higher kind, thus called, becauſe it exceeds the conic ſection of that name in the number of its hyperbolical legs; being a triple hyperbola, with ſix hyperbolical legs.

Redundant *interval,* in *Muſic,* is uſed for an interval exceeding the truth by a comma.

Some apply *redundant* to an interval exceeding a diatonic interval by a ſemitone minor; but this is more uſually called a ſuperfluous interval. See Interval and Second.

REDUPLICATION, in *Rhetoric,* a figure whereby a verſe begins with the ſame word as the preceding one ends with. See Anadiplosis.

Reduplication, in *Logic,* is a kind of condition expreſſed in a propoſition, indicating or aſſigning the manner wherein the predicate is attributed to the ſubject.

The uſual *reduplicating* words are, *quatenus, as, ſo far as, conſidered as, inaſmuch as,* &c. Hence,

REDUPLICATIVE *propoſitions,* are ſuch wherein the ſubject is repeated, with ſome circumſtance or condition. Thus,

Thus, *Men, as men, are rational; kings, as kings, are subject to none but God.*

REDUVIA, in *Medicine*, a word used by some for a whitlow, and by others for a painful crack, or other disorder about the nails, either of the fingers or toes.

REDUX, in *Chemistry*. See REDUCT.

REE, RE, REIS, or RES, a little Portuguese copper coin, nearly equal to the late French denier Tournois, or to a third part of the English farthing.

The *ree* is both a current and an imaginary money; the Portuguese usually reckoning by *rees*, as the Spaniards by maravedis. See COIN.

REED, *arundo*, in *Botany*, a genus of the *triandria digynia* class. Its characters are these: it is of the grass tribe; the flowers grow in spikes, and are included in a chaff which is oblong and pointed, and opens with two valves; the petals of the flowers are bivalve, having a down at their base, and three hairy stamina; in the centre is situated an oblong germen, with two slender styles; the germen becomes an oblong pointed seed, with long down adhering to the base. There are six species: the common marsh *reed*; the manured *reed*, or *donax* of Dioscorides, sometimes called by gardeners the ever-green *reed*; the Indian variegated *reed* of Theophrastus, with another species of bamboe; the *reed* with a tree-like stalk, and leaves pointed at both ends; and the Eastern *reed* with a narrow leaf and a full stalk, of which the Turks make their writing pens. See BAMBOE, CANE, &c.

The first sort is common by the sides of rivers and standing waters, and is used for making hedges in kitchen gardens, and for other purposes. The second sort, though a native of a warm country, will bear the cold of our severest winters; and if kept supplied with water in dry weather, will grow ten or twelve feet in the same summer. The stalks of this sort are brought from Portugal and Spain, and are used by the weavers, as also to make fishing rods. The third sort is supposed to be a variety of the second: the two sorts of bamboe are of great service to the inhabitants of India, who make most of their common utensils of the stems of these canes, which grow to a prodigious magnitude. See BAMBOE. The leaves of the fourth sort make part of the package of tea chests, being fastened together so as to form a kind of mat. The fifth sort is rare in Europe, though the most common on the coast of Malabar.

The root of the *arundo donax* of Dioscorides, attracts any matter lodged in wounds, if powdered and applied to them with wine; or if it is taken fresh and reduced to powder with an onion, or mixed with honey. Oribas de Morb. Cur. lib. iii. cap. 32. It also removes pains arising from dislocation of limbs, and carries off pains in the hips. The green leaves cut and applied, are said to cure the erysipelas. Poor people boil the flowers in water or in beer, which they mix with honey, and drink, after being filtrated, to cure coughs, oppressions of the breast, and consumptions. The ancients made flutes and other musical instruments of the *reed*. James's Med. Dict.

REED, *Barr*, in *Botany*. See SPARGANIUM.

REED, *Indian flowering*, in *Botany*. See CANNA.

REED, *calamus*, likewise denotes a Jewish measure, otherwise called CANNA.

REED, in the *Manufacture of Tapestry*. See TAPESTRY.

REED, *Ezekiel's*. See EZEKIEL'S *reed*.

REED *mace*, in *Botany*. See TYPHA.

REED *sparrow*, in *Ornithology*. See *Reed* SPARROW.

REEDS, in a *Fire-ship*, are made up in small bundles of about twelve inches in circumference, cut even at both ends, and tied each with two bands. There are two kinds of them; the long, which are four feet; and the short, which are two feet five inches in length. Some of them are singly dipped, i. e. at one end; the rest are dipped at both ends, in a kettle of melted composition. After being immersed about seven or eight inches in this preparation, and then drained, they are sprinkled over with pulverised sulphur upon a tanned hide. See FIRE-*ship*.

REEF (*reef*, Dutch) in *Navigation*, denotes a certain portion of a sail, comprehended between the top or bottom, and a row of eyelet-holes parallel thereto. The intention of the *reef* is to reduce the surface of the sail in proportion to the increase of the wind; for which purpose there are several *reefs* parallel to each other in the superior sails, whereby they may be still farther diminished, in order to correspond with the several degrees of the gale. The top-sails of ships are usually furnished with three *reefs*, parallel to the yard; and there are always three or four *reefs*, parallel to the bottom, on those main-sails and fore-sails, which are extended upon booms; a circumstance common to many of the small vessels. Falconer.

REEF also denotes a chain of rocks, lying near the surface of the water.

REEF *band*, in *Sea Language*, a piece of canvas, sewed across the sail, to strengthen it in the place where the eye-let holes of the *reefs* are formed.

REEFING, in *Sea Language*, the operation of reducing a sail, by taking in one or more of the *reefs*, which is performed by lines, points, or knittles. The top-sails are always, and the courses generally, *reefed* with POINTS, which are flat braided pieces of cordage, whose lengths are nearly double the circumference of the yard. These, being inserted in the eyelet-holes, are fixed in the sail by means of two knots in the middle, one of which is before, and the other behind the reef band. In order to reef the top-sails with greater facility and expedition, they are lowered down, and made to shiver in the wind, which considerably relaxes their tension. The extremities of the reef are then drawn up to the yard-arms by an assemblage of pullies communicating with the deck, termed the *reef-tackle*; and they are securely fastened to the yard-arms by small cords, called EARINGS. The space of sail, comprehended in the reef, is then laid smoothly over the yard, in several folds or doubles; and the whole is completed by tying the points above the yard, so as to bind the reef close up to it. The courses of large ships are reefed either with points or small cords, which are thence called *reef-lines*. In the latter case, the line is passed spirally through the eyelet-holes of the reef, and over the head of the sail alternately, and afterwards strained as tight as possible. It must be observed, however, that the reef-line is sometimes passed round the yard, and sometimes only round the head of the sail; and each of these methods has its advocates. But if it should appear essential to prevent the friction by which a sail is galled between the line and the yard, and as the rope-bands are sufficient to sustain the effort of the sail, it is better to pass the line only round the sail, provided that the turns are inserted through the roband-legs; a circumstance carefully practised by every skilful sailor. The same reason may be alledged in favour of tying the points of the courses in the same manner; i. e. the after-end of the point should be thrust forward between the head of the sail and the yard; and the fore-end of the said point should come aft over the head of the sail, and also under the yard; and thus crossed over the head of the sail, the point should be extended, and the two ends brought over the yard, and tied on the upper side of it as straight as possible.

When a sail is reefed at the bottom, it is done by KNITTLES, which, being thrust through the eyelet-holes thereof, are tied firmly about the space of canvas of which the reef is composed, and knotted on the lower side of the bolt-rope. These knittles are accordingly removed as soon as the reef is let out. Falconer.

REEF-*tackle*, is a rope which passes from the deck to a block at the top-mast-head, and thence to another block at the topsail-yard-arm, where it communicates with another rope, called its *pendant*, that runs downwards through a hole in the yard, and is afterwards attached to a cringle, a little below the lowest reef. It is used to pull the skirts of the reefs close up to the extremities of the top-sail yards, in order to lighten the sail, the weight of which would otherwise render it very difficult to perform this operation. Falconer.

REEL, in the *Manufactories*, a machine serving for the office of *reeling*.

There are various kinds of *reels*; some very simple, others very complex. Of the former kinds those most in use are,

1. A little *reel*, held in the hand, consisting of three pieces of wood, the biggest and longest whereof (which does not exceed a foot and a half in length, and a quarter of an inch in diameter) is traversed by two other pieces, disposed different ways.

2. The *common reel*, or *windlace*, which turns upon a pivot, and has four flights, traversed by long pins, or sticks, whereon the skain to be reeled is put; and which are drawn closer, or opened wider, according to the skain.

Other *reels*, used in particular arts, are explained under their particular articles; as the *reel* used in milling of silk, under the article MILLING; and that in the reeling or winding of silks, under the article of SILK, &c.

REEL *of the log*, in *Navigation*. See LOG.

REELING, in the *Manufactories*, the winding of thread, silk, cotton, or the like, into a skain, or upon a bottom, to prevent its entangling.

It is also used for the charging or discharging of bobbins, or quills, to use them in the manufacture of different stuffs, as thread, silk, cotton, &c.

Reeling is performed different ways, and by different engines.

REEMING

REEMING *irons*, a kind of chissels, broader than ordinary, used for opening the seams of ships, before they are caulked.

REEN *mossa*, a name used by some for the mountain corralloides, or rein-deer moss.

RE-ENTERING *angle*, in *Fortification*. See ANGLE, and FORTIFICATION *according to M. Vauban's first method*.

RE-ENTRY, in *Law*, the resuming or retaking that possession which any one had lately foregone.

As, if I make a lease of land, or tenement, I do thereby forego the possession: and if I condition with the lessee, that, for non-payment of the rent at the day, it shall be lawful for me to *re-enter*; this is as much as if I conditioned to take again the lands, &c. into my own hands, and to recover the possession by my own act, without the assistance of judge, or other process.

REER *county*. See RIER.

REEVE, in *Ornithology*, the name of a bird which is the female of the *avis pugnax*; the male of which, from the long feathers round his neck, is called the RUFFE.

REEVE *of a church* is the guardian of it, or the CHURCH-*warden*.

So *shire-reef* is the SHERIFF, or guardian of a county; and *port-reeve*, the warden of a port, or haven.

REEVING, in the *Sea Language*, is the putting a rope through any hole, as the channel of a block, &c. Hence, to pull a rope out of a block, is called *unreeving*.

RE-EXCHANGE, in *Commerce*, a second payment of the price of exchange, or rather the price of a new exchange, due upon a bill of exchange that comes to be protested; and to be refunded the bearer, by the drawer or indorser. See EXCHANGE.

The occasion of *re-exchange* is, when the bearer of a bill of exchange, after protesting it, for want either of acceptance, or of payment, borrows money on his own promise, bond, or the like; or draws a bill of exchange in the place where the payment was to be made, on the person who furnished the first for which he pays a second exchange; which, being added to the first already paid, the drawer of the first bill is answerable for two exchanges, properly called *exchange*, and *re-exchange*.

The bearer of a protested bill has a right to recover both the one and the other on the drawer. Yet the simple protestation which the bearer makes in the act of protest, that he will take up a like sum at *re-exchange*, for want of his bill being accepted or paid, is not sufficient to entitle him to demand the reimbursement of his *re-exchange*, unless he make it appear, that he has actually taken up money in the place whereon the bill was drawn.

Otherwise, the *re-exchange* will only amount to the restitution of the first exchange, with interest, the expences of protesting, and those of the journey, if there have been any.

If a bill of exchange, payable to the bearer or order, come to be protested, the *re-exchange* is only due upon the drawer for the place where the remittance was made, not for those places where it may have been negociated; at least, the drawer has a right to be refunded his *re-exchange* for those places, by the indorser.

Indeed the *re-exchange* is due from the drawer upon all places where a power of negociation is given by the bill; and upon all others, if the power of negociating be indefinite.

Lastly, the interest of the *re-exchange*, of the expences of the protest, and the journey, are only due from the day of the demand.

It is supposed to be the GIBELINS driven out of Italy by the faction of the Guelphs, and sheltered at Amsterdam, who first established the custom of *re-exchange*, on pretence of the interests, damages, and expences they underwent, when the bills given them for the effects they had been obliged to abandon, were not accepted, but came to be protested.

RE-EXTENT, in *Law*, a second extent made upon lands or tenements, on complaint that the former extent was partially made. See EXTENT.

REFECTION, *refectio*, among *Monks* and *Ecclesiastics*, a spare meal or repast, just sufficing for the support of life.

REFECTION is also used, in *Ancient Authors*, for a duty or service incumbent on any person to provide meals for ecclesiastics, or even for princes.

REFECTORY, or REFECTUARY, *refectorium*, a spacious hall in convents, and other communities, where the monks, nuns, &c. take their refections or meals in common.

The *refectory* of the Benedictines of St. George at Venice, designed by Palladio, is one of the finest in the world. Daviler.

REFERENCE, in *Writing*, &c. a mark relative to another similar one in the margin, or at the bottom of the page, where something, omitted in the text, is added; and which is to be inserted, either in reading or copying. A copyist must be very expert at taking *references*.

References are also used in books, where things being but imperfectly handled, the reader is directed to some other part or place where they are more amply explained.

Dictionaries are full of *references* denoted by *see*, or *vide*. By means of these *references* the dictionary writer settles a correspondence between the several parts of his work, and may give his dictionary most of the advantages of a continued treatise.

Indices or tables are only *references* to the several parts of the work, where the several matters are handled.

REFERENDARY, *referendarius*, in *Ancient Customs*, an officer who exhibited the petitions of the people to the king; and acquainted the judges with his commands.

An officer of this kind, Spelman observes, we had in England, in the time of the Saxons. The like office was afterwards discharged by others, called masters of requests.

REFINING, the art or act of purifying a thing; or of rendering it finer, clearer and purer.

Refining is chiefly used in speaking of metals, sugar, and salt.

The REFINING *of gold* is performed three ways; either with antimony, with sublimate, or with aqua fortis; which last method, much the most usual and least dangerous of the three, is called *departing* or *parting*, the process whereof see under DEPART and QUARTATION.

REFINING or PURIFICATION *of gold with antimony*. The process for this purpose has been already described under the article ANTIMONY, and need not be repeated. We shall here add, that as the antimony is apt to swell in this operation, the crucible ought to be large enough to contain thrice the quantity of metal. But as the crucibles are apt to crack, and to be corroded by the sulphureous matter, Scheffer recommends those which have been steeped several days in linseed oil; then cleared from the oil, so as to remain only of such a degree of moistness, that some borax in fine powder may adhere and be spread all over the inner surface, and afterwards set by to dry slowly: with such CRUCIBLES, he says, he can perform two or three hundred fusions. It is nevertheless advisable, in a case where the vessel is so apt to fail, to take precautions for preserving its contents, in case of such an accident; as inserting it into another crucible, or placing a bason underneath. The separation of metals from gold in this way is really occasioned by the sulphur of the antimony. Sulphur has less affinity to the antimonial metal than to silver, copper, or the other metals commonly mixed with gold; and accordingly, when antimony and alloyed gold are melted together, the sulphur of the antimony unites with and scorifies the alloy of the gold, while the gold falls to the bottom blended with the metal of the antimony, which last may be afterwards dissipated from it by fire, as in the process. Hence it appears, that this purification of gold is a kind of *dry* PARTING; but it succeeds better than the dry parting by sulphur alone, which being very volatile and inflammable, is in great measure dissipated and consumed, when it is employed alone, before it can seize the metals alloyed with gold. The ancient chemists called antimony the *balneum regis*, or the *balneum solis*, and the *lupus metallorum*, from this property which it possesses of purifying gold. However, it may be observed in general, that gold cannot be so effectually purified by substances which operate upon the alloy and not upon the gold, as by those which act upon the gold itself and not on the alloy. A small portion of the gold is commonly retained in the sulphureous scoriæ, together with the silver or other metals with which it had been debased. The scoriæ of the last fusions, in which the sulphur and metal of the antimony have suffered little separation, are therefore to be reserved for the same purposes again. From those of the first, both the gold and silver may be recovered, by keeping them in fusion in a crucible, and blowing off the antimonial matter, in the manner directed for dissipating it from gold.

REFINING *of gold by means of sublimate*. The process is begun like that with antimony; i. e. in the same furnace, with the same coal, the same fire, and the same crucibles.

The gold being melted in the crucible, they cast in the sublimate, not pulverised, but only broken in pieces. As to the proportion; to eight ounces of gold to be refined, they put an ounce or ounce and a half, or even two ounces, if the gold be of twenty-two carats; three ounces, if of twenty carats; and four or six ounces, if it only be from eighteen to twenty carats. In which last case, they part the sublimate into two; putting half at a time,

time, with the gold, into a new crucible; which, when the operation is over, leaves the gold from eighteen to twenty-three carats, according to its finenefs before. After this, they raife it farther by the fire, as follows.

The broken fublimate being put into the crucible with the melted gold, the crucible is immediately covered up to fmother the mineral; which done, the furnace is filled with charcoal, and the head put on. A quarter of an hour afterwards they take off the head, lay the crucible bare, and give the gold air, i. e. blow off all the afhes, and other impurities that may be floating on the liquid gold, with a pair of bellows, the nozzle whereof is crooked.

This they repeat again and again, till all the impurities of the gold being carried off, by virtue of the fublimate, it be found of a bright glittering colour; after which it is taken out of the crucible, and the gold is caft into an ingot. In this way fmall proportions of lead, tin, and other metals may be feparated from gold by fublimate; the marine acid of the fublimate having lefs affinity to the mercury of the fublimate than it has to the others, and accordingly parting from the former to join itfelf to the *latter*.

The method of *refining* by fublimate, is both more complete and cheaper than that by antimony: but they are both exceedingly dangerous, by reafon of their fulphureous and arfenical exhalations; the only difference in their malignity confifting in this, that the poifon of the antimony is flower than that of the fublimate.

Refining *of gold by aqua regia.* As this compound does not at all diffolve filver, the gold may be extracted by it from a mixture of gold and filver, in the fame manner as the filver is extracted by aqua fortis; and as the extraction of the filver by aqua fortis requires the quantity of filver in the mixt to exceed that of the gold, fo the extraction of the gold by aqua regia requires the gold to exceed the filver: the two metals may be fo proportioned, that neither aqua fortis nor aqua regia fhall be able to diffolve either, till an addition is made to the quantity of one or the other metal. When the quantity of gold in the mixt amounts to fo much as a third part of the filver (fee Quartation), aqua fortis leaves always a fmall portion of the filver undiffolved along with the gold; and in like manner, when the quantity of gold amounts to fo much as a third of the filver, aqua regia leaves a little of the gold undiffolved along with the filver: when either metal is in fmall proportion, the other appears to be completely extracted by its proper menftruum.

Aqua regia may be employed to purify gold from platina, filver, and bafe metals, in the following manner. The gold, flatted into thin plates or reduced into grains, is to be put into about thrice its weight of moderately ftrong aqua fortis, and the veffel being fet in a gentle heat, a little fea-falt is to be added; the diffolution will immediately begin, with a confiderable effervefcence, and when the action ceafes, the addition of a little more fea-falt will renew it; the injection of fea falt is to be continued, by a little at a time, till the whole of the gold appears to be diffolved; the quantity of falt requifite is generally about a third of the aqua fortis. The clear part of the folution is to be poured off, and the remainder paffed through a double filter of paper; the undiffolved matter is to be wafhed two or three times with water in the filter, and this liquor poured to the reft. For recovering the gold from the folution, Cramer directs two methods; diftilling off the menftruum, and precipitating the gold by mercury. But in either of thefe ways we cannot be certain of having the gold pure. The purity of the gold is fecured by precipitation with common green vitriol. The vitriol is to be diffolved in cold water, the folution paffed through a filter, and added in large quantity to the folution of gold; the quantity of vitriol before its diffolution fhould be ten or twelve times greater than that of the gold. As the precipitate falls flowly, the mixture is to be fet by for twenty-four hours or more; the liquor, then become clear, though of a deep colour, is to be poured off; the brownifh powder at the bottom, boiled in a little aqua fortis, then wafhed with water, and melted with the addition of a little nitre. Gold, thus purified, appears to be perfectly fine, which cannot be obtained by any other known means than can be practifed in the way of bufinefs: and the procefs is lefs expenfive than that by aqua fortis. Lewis's Phil. Com. Techn. p. 159, &c.

Refining *of gold by cæmentation.* See Cæmentation.

Refining *of gold with lead and afhes,* or by *cupellation.* See Assaying and Testing.

Refining *gold by fulphur.* See *Dry* Parting.

Refining *gold with vitriolic acid.* See Quartation.

Refining *of filver.* There are two ways of *refining* filver; the one with lead, the other with faltpetre. The beft and cheapeft is that with lead; though that with faltpetre ftill obtains in many places, for want of workmen who underftand the procefs of the latter; and principally becaufe it is more quick and expeditious than cupellation. For the proceffes in both thefe methods of *refining* filver, fee Silver.

Refining *of copper* is only performed by giving the mineral matter feveral lotions before the melting it, and then giving it feveral repeated fufions. See Copper.

Refining *of tin* is performed much after the fame manner as that of copper. See Tin.

Though we may diftinguifh two kinds of finenefs of this metal: the one arifing from its fufion; that tin taken firft out of the furnace wherein it is melted, being always purer than that towards the bottom.

The other kind of finenefs is that given the tin by adding fome other metal or mineral to it, to render it more fonorous, as well as brighter: fuch is tin with antimony, pewter, &c.

Refining *of iron* is begun by the melting it. See Iron.

The greater degree of fufion the mineral has, the more the metal is purified: but this firft fufion is not fufficient. To render the iron malleable, and fit it to endure the file, it muft be melted a fecond time in a furnace intermixed with charcoal; a ftrong blaft of air being impelled on the furface of the metal, by which its fufion is remarkably promoted. On difcontinuing the action of the bellows, the iron thickens into a mafs called a *loop*, which is then forged or beaten a long time with large heavy hammers, which are wrought by water. The iron, beat into a thick fquare, is heated in the fire till ready to melt; and at laft reduced on the anvil, into bars of feveral thickneffes. A large quantity of vitreous fcoria feparates both in the fufion and the forging: the rough *caft* iron obtained from fome ores, lofes more than half its weight in being made into bars.

The more the iron is heated in the fire, and the more it is beaten, whether hot or cold, the finer it always becomes.

Steel is only iron *refined* to a great degree by heating it, with fome other ingredients, which clofe up the pores, and heighten the grain thereof.

Refining *of lead* is performed like that of moft other imperfect metals, by frequent melting, ftill fcumming it before it be cold; and cafting in tallow, and other kinds of fat.

They alfo make effays of lead; not to refine it, but to fee if it be pure, and without mixture of any other metal.

Refining *of fugar.* This operation is begun by feveral ftrong lixiviums or leys of lime-water and eggs, fhells and all, mixed and beaten together.

The firft *refining* is performed in the Caribbees, and other places, where the fugar-canes are cultivated; and only ferves to make the brown or coarfe fugars.

When thefe are imported into Europe, the fugar-bakers take them up, and refine them farther, by a fecond operation, or rather a repetition of the firft.

To render the fugar very fine, fit for confections, &c. they give it a third *refining*; wherein they only ufe the whites of eggs, and their fhells beaten together, and thrown into the melted fugar; which is called *clarifying the fugar.* See Sugar.

Refining *of faltpetre.* The falt being put into an earthen or iron veffel, as much fpring water is poured on it as fuffices to diffolve it. The veffel is then put over a gentle fire; and as foon as the water begins to boil, alum powder is thrown into it: the proportion is, one pound of alum to one hundred and twenty-eight pounds of faltpetre; and a little vinegar is added. As it boils, the fcum is to be taken off; and it is to be evaporated till a pellicle appears on it, and then fet to fhoot.

For the *refining* of other matters, as *camphor, cinnabar, fulphur, falt, borax,* &c. fee Camphor, Cinnabar, Sulphur, Salt, &c.

REFITTING, in *Sea Language,* denotes the repairing of any damages, which a fhip may have fuftained in her fails or rigging, by battle or tempeftuous weather.

REFLECTED *ray.* See Ray.

Reflected *vifion.* See Reflex and Vision.

REFLECTING, or Reflexive *dial,* is a fort of dial, which fhews the hour by means of a thin piece of looking-glafs plate, duly placed to caft the fun's rays to the top of a cieling, on which the hour-lines are drawn.

Reflecting *microfcope.* See Microscope.

Reflecting *level.* See Level.

Reflecting *telefcope.* See Telescope.

REFLECTION, or Reflexion, in *Mechanics,* the return, or regreffive motion of a moveable, occafioned by the

the resistance of a body, which hindered its pursuing its former direction.

It is controverted, whether there be any moment's rest or interval between the incidence and the *reflection?* For the affirmative, stand the Peripatetics, and all who conceive the reflected motion to be different from the incident one of the same body. The motion of incidence, according to these authors, is wholly lost, and destroyed, by the resistance of the obstacle struck against; and the moveable is thus rendered absolutely quiescent in the point of contact, till a new motion of *reflection* is produced therein, from a contrary cause.

The Cartesians assert the negative; absolutely denying any rest at all between the incidence and *reflection:* arguing, that if the motion were once destroyed, though but for a moment, there would be nothing to excite it again; but the body would persevere in that new state, as much as if it had been at rest a thousand years.

Accordingly Rohault, and others, define *reflection* to be no other than a change of determination; or a continuation of the former motion in a new direction.

As, say they, a pendulum, when arrived at its greatest sweep, does not stop; so a hard body, striking on another hard one, does not rest, but pursues its motion the contrary way, according to the established law of nature; and this from the immediate influence or impulse of the cause that first moved it. But this doctrine is now generally set aside.

Reflection is conceived, by the latest and best authors, as a motion peculiar to elastic bodies, whereby, after striking on others which they cannot remove, they recede, or turn back by their elastic power.

On this principle, it is asserted, that there may be, and is, a period of rest between the incidence and the *reflection;* since the reflected motion is not a continuation of the other, but a new motion, arising from a new cause or principle, *viz.* the power of elasticity.

It is one of the great laws of *reflection,* that the angle a reflected body makes with the plane of a reflecting obstacle, is equal to that wherein it struck on that obstacle.

For the several laws of motion observed in the *reflections* of bodies, see Percussion.

Reflection *of the rays of light,* in *Optics,* is a motion of the rays, whereby, after impinging on the solid parts of bodies, or rather after a very near approach thereto, they recede, or are driven therefrom.

The *reflection* of the rays of light from the surfaces of bodies, is the means whereby bodies become visible.

And the disposition of bodies to reflect this or that kind of rays most copiously, is the cause of their being of this or that colour.

The *reflection* of light, from the surfaces of mirrors, makes the subject of catoptrics.

The *reflection* of light, Sir Isaac Newton has shewn, is not effected by the rays striking on the very parts of the bodies; but by some power of the body equally diffused throughout its whole surface, whereby it acts upon the ray, attracting or repelling it without any immediate contact.

This power he shews to be the same, whereby, in other circumstances, the rays are refracted; and whereby they are at first emitted from the lucid body.

The arguments he produces to prove this, are as follow.

1. Because the surfaces of polished glasses, which to the eye appear smooth, are yet, in reality, very rugged and uneven (polishing being nothing but the grating, scratching, and breaking off the coarser protuberances, by means of sand, glass, putty, or tripoli). If the rays of light, therefore, were reflected by striking on the solid parts of the glass, the *reflections* would never be so accurate as we find they are, but the rays would even be as much scattered by the most polished glass, as by the roughest. It remains, therefore, a problem how glass, polished by fretting substances, can reflect light so regularly as it does; which problem is scarce otherwise to be solved, than by saying, that the *reflection* of a ray is effected, not by a single point of the reflecting body, but by some power of the whole body, evenly diffused all over its surface, and by which it acts on a ray without immediate contact: for that the parts of bodies do act upon light at a distance, is already shewn under the articles Inflection and Light.

2. If the colours, separated by a prism placed at the entrance of a beam of light into a darkened room, be successively cast on a second prism placed at a greater distance from the former, in such manner as that they all fall alike, or with an equal obliquity, upon it; the second prism may be so inclined to the incident rays, that those, which are of a blue colour, shall be all reflected by it; and yet those of a red colour pretty copiously transmitted. Now, if the *reflection* were caused by the parts of the air or glass, we would ask, why, at the same obliquity of incidence, the blue should wholly impinge on those parts so as to be all reflected; and yet, the red find pores enough to be, in a great measure, transmitted.

3. Where two glasses touch one another, there is no sensible *reflection;* and yet we see no reason why the rays should not impinge on the parts of the glass, as much when contiguous to other glass, as when contiguous to air.

4. When the top of a water bubble, by the continual subsiding and exhaling of the water, grows very thin, there is such a little, and almost insensible quantity of light *reflected* from it, that it appears intensely black; whereas round about that black spot, where the water is thicker, the *reflection* is so strong, as to make the water seem very white. Nor is it only at the least thickness of thin plates or bubbles that there is no manifest *reflection,* but at many other thicknesses gradually greater and greater. For, in one of our author's observations, the rays of the same colour were, by turns, transmitted at one thickness, and *reflected* at another thickness, for an intermediate number of successions: and yet in the superficies of the thinned body, where it is of one thickness, there are as many other parts for rays to impinge on, as where it is of any other thickness.

5. If the red and blue rays, separated by a prism, fall successively on a thin plate of any pellucid matter, whose thickness increases in continual proportion (such as a plate of air between two glasses, the one plane, and the other a little convex) the same plate will, in the same part, *reflect* all the rays of one colour, and transmit all those of the other; but, in different parts, will *reflect* the rays of one and the same colour at one thickness, and transmit them at another; and thus alternately, and *in infinitum.* Now, it can never be imagined, that at one place the rays, which, for instance, exhibit a blue colour, should happen to strike on the solid parts, and those which exhibit a red, to hit on the void parts of the body; and at another place, where the body is either a little thicker, or a little thinner, that, on the contrary, the blue should hit on the pores, and the red upon the solid parts.

6. In the passage of light out of glass into air, there is a *reflection* as strong as in its passage out of air into glass, or rather a little stronger, and by many degrees stronger than in its passage out of glass into water. Now, it seems improbable, that air should have more *reflecting* parts than water or glass: but if that should be supposed, yet it will avail nothing; for the *reflection* is as strong, or stronger, when the air is drawn from the glass by the air-pump, as when it is adjacent to it. If any should here object, on Descartes's hypothesis, that, though the air be drawn away, there is a subtle matter remaining to supply its place, which, being of a denser kind, is better fitted for the *reflection* of light than any other body; besides that we have elsewhere shewn such subtle matter to be fictitious, and that, supposing its existence, and its *reflecting* power, no light could ever have been propagated, but must have been all *reflected* back to the lucid body, immediately after it was first emitted, the following experiment does evidently convict it of falsity.

7. If light, in its passage out of glass into air, strike more obliquely than at an angle of forty or forty-one degrees, it is then wholly *reflected;* if less obliquely, it is in great measure transmitted. Now, it is not to be imagined, that light at one degree of obliquity should meet with pores enough in the air to transmit the greater part of it, and at another degree should meet with nothing but parts to *reflect* it wholly; especially considering, that, in its passage out of air into glass, how oblique soever be its incidence, it finds pores enough in the glass to transmit a great part of it. If any suppose, that it is not *reflected* by the air, but by the outmost superficial parts of the glass, there is still the same difficulty: besides, that such a supposition is unintelligible, and will also appear to be false, by applying water behind some part of the glass, instead of air: for so in a convenient obliquity of the rays, suppose of forty-five or forty-six degrees, at which they are all *reflected,* where the air is adjacent to the glass, they shall be in great measure transmitted where the water is adjacent to it; which argues, that their *reflection* or transmission depends on the constitution of the air and water behind the glass, and not on the striking of the rays upon the parts of the glass, the rays not being *reflected* until they have reached the last part of the surface, and are begun to go out. For if, in going out, they fall upon a surface of oil and water, they proceed, the attraction of the glass being balanced by an equal force the contrary way, and prevented from having its effect by the attraction of the liquor adhering to it: but if the rays, in passing out of this last surface, fall into a vacuum, which has no attraction, or into air, which has

but

but little, not enough to counterbalance the effect of the glaſs; in this caſe, the attraction of the glaſs draws them back, and *reflects* them.

This will appear ſtill more evident by laying two glaſs priſms, or the object-glaſſes of two teleſcopes, the one plane, and the other a little convex, upon each other, ſo as they may neither touch, nor yet be too far apart; for that light, which falls on the hinder ſurface of the firſt glaſs, where the glaſſes are not above $\frac{1}{1000000}$ part of an inch apart, will be tranſmitted through the ſurface and through the air or vacuum between the glaſſes, and will paſs into the ſecond glaſs: but, if the ſecond glaſs be taken away, then the light paſſing out of the ſecond ſurface of the firſt glaſs into the air or vacuum, will not proceed, but will return into the firſt glaſs, and be *reflected*.

Whence it follows, that the rays are drawn back again by ſome force in the firſt glaſs, there being nothing elſe to occaſion their return. And hence too it follows, that the *reflection* is not effected by means of any ſubtle matter contiguous to the hinder ſurface, according to the principles of Deſcartes; ſince that matter ought to *reflect* them when the glaſſes were nearly contiguous, as well as when the ſecond glaſs is quite removed.

Laſtly, if it be aſked, how ſome of the rays come to be *reflected*, and others tranſmitted; and why they are not all alike *reflected*, ſuppoſing the *reflection* owing to the action of the whole ſurface? the ſame great author ſhews, that there are, both in the rays of light, and in the bodies themſelves, certain vibrations (or ſome ſuch property) impreſſed on the rays, by the action either of the luminary that emits them, or of the bodies that *reflect* them; by means whereof it happens, that thoſe rays, in that part of their vibration which conſpires with the motion of the parts of the body, enter the body, are refracted and tranſmitted; but thoſe in a contrary part of their vibration are *reflected*.

Add, that every ray of light, in its paſſage through any refracting ſurface, is put into a certain tranſient conſtitution or ſtate, which, in the progreſs of the ray, returns at equal intervals, and diſpoſes the ray, at each return, to be eaſily tranſmitted through the next refracting ſurface; and between each return, to be eaſily *reflected* by it.

Theſe alternate diſpoſitions, which Sir Iſaac Newton calls *fits of eaſy reflection*, and of eaſy *tranſmiſſion*, he accounts for by ſuppoſing, that they are occaſioned by the vibrations of a ſubtle fluid, in which the ray paſſes, which happening to move faſter than the rays, when a ray is in that part of the vibration which conſpires with its motion, it paſſes through; but when in the contrary part of the vibration, it is beat back again: whence every ray is ſucceſſively diſpoſed to be eaſily *reflected*, or eaſily tranſmitted, by every vibration which overtakes it.

He alſo thought that theſe vibrations might be excited by the mutual action and re-action of light, of bodies and of this medium, at the inſtant of *reflection* or refraction: ſo that, in fact, he ſuppoſes two cauſes of this diſpoſition to be *reflected* or tranſmitted, when rays of light arrive at any new ſurface. One of them is the regular vibration of the etherial medium, affecting them through the whole of their progreſs from the luminous body; and the other the tremulous motion, or irregular vibration of the ſame medium at the ſurfaces of bodies, occaſioned by the action and reaction between light and them: for this laſt cauſe can hardly be ſuppoſed to affect the whole etherial medium equally, and produce the regular returns of theſe fits in every ray.

M. Boſcovich ſuppoſes with Newton, that the fits of *reflection* or tranſmiſſion affect the rays themſelves, in the whole of their paſſage from the luminous body, but that they ariſe from an alteration in their form, by means of the elaſticity of their component parts, having been originally driven from the luminous body by a force which acted more ſtrongly on the hinder parts than on the reſt of the maſs, and thereby put them into a vibratory motion. He alſo ſuppoſes, that the intervals of the fits of eaſy *reflection* and tranſmiſſion may be different in different rays, on the three following accounts. 1. The rays that are differently refrangible have different velocities, at leaſt after refraction; ſo that, though the fits ſhould return at equal intervals, it will affect different rays in different parts of their progreſs. 2. The unequal action between the points that compoſe the ſame particle of light may make a difference in their oſcillations, at the time of changing their medium. And laſtly, rays coming in different inclinations to the new ſurface, the internal motions of theſe points will be in different directions with reſpect to the ſurface, and conſequently the whole maſs of the medium will act upon all the points differently. Boſcov. Theoria, p. 232.

Upon the whole, ſays Dr. Prieſtley, is it not more probable, that the rays of light are tranſmitted from the ſun, with an uniform diſpoſition to be *reflected* or refracted, according to the circumſtances of the bodies on which they impinge; and that the tranſmiſſion of ſome of the rays, under the ſame circumſtances, apparently, with others that are *reflected*, is owing to the minute vibrations of the ſmall parts of the ſurfaces of the mediums through which the rays paſs; vibrations that are independent of action and re-action between the bodies and the particles of light at the time of their impinging, though, probably, excited by the action of preceding rays. As to the tranſmiſſion or *reflection* of certain kinds of light only, producing colours in thin plates, the cauſe may be this; viz. that every particle of the medium has a great number of equal alternate intervals of attraction and repulſion, relatively to the particles of light; but that theſe intervals are of different magnitudes, according as the particles of light are of different colours. Now if the thickneſs of any tranſparent medium in which the particles of matter are uniformly placed is ſuch, that the attracting intervals of the extreme particles, as well as the repelling intervals, coincide with one another, i. e. attracting with attracting, and repelling with repelling, in regard to any one kind of rays, e. g. the red; by the united force of theſe extremes (all the intermediate particles of the medium mutually deſtroying each other's effects) theſe rays will be *reflected*. But where the plate is of an intermediate thickneſs, between this and the next thickneſs, where the attracting intervals coincide, attracting with attracting, and repelling with repelling, the attracting intervals will coincide with the repelling ones, and the repelling ones with the attracting ones, and theſe mutually deſtroying one another's effects, theſe rays will paſs on freely, and be tranſmitted. But as the intervals of attraction and repulſion are different for differently coloured rays, the thickneſs of the plates at which theſe coincidences will, or will not happen, in the differently coloured rays, will be different. So that it appears probable, ſays Dr. Prieſtley, in conformity to a doctrine firſt ſuggeſted to him by Mr. Michell, that the whole myſtery of coloured plates depends upon the attractions and repulſions of the particles of the bodies that compoſe them, affecting different rays in a different manner, according to their thickneſs. Hiſt. &c. of Light and Colours, p. 309, &c. See Colours *of thin laminæ*, &c. and Rings *of colours*.

Sir Iſaac Newton concludes his account of the *reflection* of light with obſerving, that if light be reflected not by impinging on the ſolid parts of bodies, but by ſome other principle, it is probable that as many of its rays as impinge on the ſolid parts of bodies are not reflected, but ſtifled and loſt in the bodies. Otherwiſe, he ſays, we muſt ſuppoſe two kinds of *reflection*; for ſhould all the rays be reflected which impinge on the internal parts of clear water or cryſtal, thoſe ſubſtances would rather have a cloudy colour, than a clear tranſparency. To make bodies look black, it is neceſſary that many rays be ſtopped, retained and loſt in them; and it does not ſeem probable that any rays can be ſtopped and ſtifled in them, which do not impinge on their parts: and hence, he ſays, we may underſtand, that bodies are much more rare and porous than is commonly believed. However, M. Bouguer diſputes the fact of light being ſtifled or loſt by impinging on the ſolid parts of bodies. See Absorbing.

Reflection, in *Catoptrics*, is the return of a ray of light from the poliſhed ſurface of a ſpeculum or mirror, as driven thence by ſome power reſiding therein.

The ray thus returned is called a *reflex*, or *reflected ray*, or a *ray of reflection*; and the point of the ſpeculum, whence the return commences, is called the *point of reflection*.

Thus the ray AB (*Tab.* II. *Optics*, *fig.* 26.) proceeding from the radiant A, and ſtriking on the point of the ſpeculum B, being returned thence to C, BC repreſents the *reflected ray*, and B the *point of reflection*; in reſpect whereof AB repreſents the *incident ray*, or *ray of incidence*, and B the *point of incidence*.

Again, a line CG drawn from any point, as C, of the *reflected* ray BC, perpendicular to the ſpeculum, is called the *cathetus of reflection*, or *cathetus of the eye*: as a line AF, drawn from the radiant perpendicular to the ſpeculum, is called the *cathetus of incidence*.

Of the two angles which the *reflected ray* BC makes with the mirror, the ſmalleſt, CBE, is called the *angle of reflection*: as of the two angles the incident ray makes with the ſpeculum, the ſmalleſt ABD, is called the *angle of incidence*.

If the mirror be either concave, or convex, the ſmalleſt angles the ray makes with a tangent to the point of *reflection*

flection and incidence, are the *angles of reflection* and incidence.

The angle CBH, which the *reflected ray* makes with a perpendicular to the point of *reflection*, is called the *inclination of the reflected ray:* as the angle A B H is called the *inclination of the incident ray.*

REFLECTION, *general laws of.*—I. *If a ray of light be reflected from a speculum of any form, the angle of incidence is ever equal to the angle of reflection.* This law obtains in percussions of all kinds of bodies; and consequently must do so in those of light. See *Laws of* PERCUSSION; see also ANGLE.

It might therefore be here assumed as an axiom: but it is of that importance, and its demonstration so beautiful, that we cannot omit it. Suppose, then, DC (*Tab* V. *Optics*, *fig.* 103.) an incident ray, propagated from the radiant D: here, though the motion of the ray be simple, yet its determination in the line DC, being oblique with respect to the obstacle, is really compounded of two determinations; the one along DE, the other along DG.

The force along DC, therefore, is equal to the two forces along DG and DH. But the obstacle GF only opposes one of the determinations; viz. that along DG (for it cannot oppose a determination parallel to itself, as DE): therefore only the force along DG will be lost by the stroke, that along DH or GC remaining entire. But a body perfectly elastic (such as we suppose the ray of light) will recover by its elasticity the force it lost by the shock.

The ray, therefore, will recover the force DG, or CH: thus retaining both its forces, and both its former determination HC and CF, after percussion, it will be impelled along CF and CH by the same forces as before along DH and DG. By its compound motion, therefore, it will describe the right line CE, and that in the same time as DC; and HE and DH will be equal as being described by the same force. Now, the two triangles DCH and CHE are equal, and consequently their similar angles are equal. Since, then, HCA=HCF; DCA, the angle of incidence, is equal to ECF, the angle of *reflection*. *Q. E. D.*

This law is confirmed in light by an easy experiment. For a ray of the sun falling on a mirror, in a dark room, through a little hole, you will have the pleasure to see it rebound, so as to make the angle of *reflection* equal to that of incidence. See CAMERA *obscura.*

The same may be shewn various other ways: thus, e. gr. placing a semicircle F*i*G (*Tab.* II. *Optics*, *fig.* 26.) on a mirror DE, its centre on B, and its limb perpendicular to the speculum; and assuming equal arcs, F *a* and G *e*; place an object in A, and the eye in C: then will the object be seen by a ray *reflected* from the point B. And if B be covered, the object will cease to be seen.

For the conclusions drawn from this general doctrine of *reflection*, see *the doctrine of* MIRRORS, &c.

II. *Each point of a speculum reflects rays falling on it, from each part of an object.* See *the doctrine of* MIRRORS, &c.

III. *If the eye* C, *and the radiant point* A *change places, the point will continue to radiate upon the eye, in the same course or path as before.*

For if the object be removed from A to C, it will still radiate on its former point of *reflection* B; but there can be but one right line drawn between the two points G and D; and the rays are right lines. Therefore that which was before the ray of *reflection*, will now be the ray of incidence, and since it will be *reflected* under the same angle as that under which it fell, that which was before the ray of incidence, will now be the ray of *reflection*. So that the object removed to C will radiate on the eye placed in A, by the right lines CB and BA. *Q. E. D.*

Hence, an object is seen by the *reflected* ray AB, with the eye placed in A, the same as if the eye were in C, and the object in A.

The truth of this theorem is so easily confirmed by experiment, that some, with Euclid, assume it as a principle; and demonstrate the great law of *reflection* from it. Thus: suppose the angle of incidence a little greater than the angle of *reflection*, then will the angle ABF be greater than that CBE. Wherefore, changing the places of the eye and the object, the angle CBE will become the angle of incidence; and therefore CBE greater than ABF by the supposition. So that the same angle ABF will be both greater and smaller than the other CBE; which being absurd, ABF cannot be greater than CBE. The same absurdity will follow, if you suppose the angle of incidence less than the angle of *reflection*. Since then the angle of incidence can neither be greater nor less than that of *reflection*, it must be equal to it.

IV. *The plane of reflection*, that is, the plane wherein the incident and reflected rays are found, *is perpendicular to the surface of the speculum; and, in spherical specula, it passes through the centre.*

Hence the cathetus, both of incidence and *reflection*, is in the plane of *reflection*.

That the *plane of reflection is perpendicular to the speculum*, is assumed by Euclid, Alhazen, and others, as a principle, without any demonstration; as being evident from all observation and experiment.

V. *The image of an object seen in a mirror is in the cathetus of incidence.* This the ancients assumed as a principle; and hence, since the image is certainly in the *reflected* ray, they inferred, it must appear in the point of concourse of the *reflected* ray with the cathetus of incidence; which indeed holds universally in plane and spherical mirrors, and usually also in concave ones, a few cases only excepted; as is shewn by Kepler.

For the *particular laws of* REFLECTION, *arising from the circumstances of the several kinds of specula, or mirrors, plane, concave, convex, &c.* see them laid down under the article MIRROR.

REFLECTION, *caustic by.* See *caustic* CURVE.

REFLECTION, *point of.* See POINT.

REFLECTION *of the moon*, is a term used by some authors for what we otherwise call her VARIATION, being the third inequality in her motion, whereby her true place out of the quadratures differs from her place twice equated. See MOON.

REFLECTION is also used in the Copernican system, for the distance of the pole from the horizon of the disk; which is the same thing as the sun's declination in the Ptolemaic system.

REFLECTION is also used figuratively for an operation of the mind, whereby, turning as it were back upon itself, it makes itself, and its own operation, its object; and considers or contemplates the manner, order, and laws which it observes in perceiving, reasoning, willing, judging, doubting, believing, &c. and frames itself new ideas of the relations discovered therein.

REFLECTOIRE *curve.* See CURVE *reflectoire.*

REFLEX, REFLECT, in *Painting*, is understood of those places in a picture which are supposed to be illuminated by a light *reflected* from some other body represented in the same piece. See LIGHTS.

Or, *reflexes* may be defined those places which, beside the general light that illumines the whole piece, receive some particular light from their situation with respect to some more illuminated polished body, that reflects part of the rays it receives upon them.

Reflexes are scarce sensible, except in the shadowed parts. The management of the *reflexes* requires great accuracy and skill. All reflected light is supposed to carry with it part of the colour of the body which reflects it; so that those places which receive this light, must have their colour mixed or tinged with that colour. But the same place may receive *reflexes* from different objects differently coloured, and those again receive *reflexes* from others. The painter, therefore, must have a view to every circumstance of the colour, light, and position of each figure; he must consider what effect each has on others, and pursue nature through all the variety of mixtures. See CLAIR-OBSCURE.

REFLEX *vision*, or REFLECTED *vision*, is that performed by means of rays reflected from the polished surfaces of objects to the eye.

Reflex vision is the subject of catoptrics. Under *reflex vision* come all the phenomena of specula or mirrors of all kinds.

REFLEXIBILITY *of the rays of light*, is that property whereby they are disposed to be *reflected*. See REFLECTION.

Or, it is their disposition to be turned back into the same medium, from any other medium on whose surface they fall: hence those rays are said to be *more* or *less reflexible*, which are returned back more or less easily under the same incidence.

Thus if light pass out of glass into air, and by being inclined more and more to the common surface of the glass and air, begins at length to be totally reflected by that surface, those sorts of rays which at like incidences are reflected most copiously, or the rays which by being inclined begin soonest to be totally reflected, are the most *reflexible* rays.

That rays of light are of different colours, and endued with different degrees of *reflexibility*, was first discovered by Sir Isaac Newton; and is shewn by the following experiment. Applying a prism DFE (*Tab.* V. *Optics*, *fig.* 104.), whose angles are each 45°, to the aperture C of a darkened room, in such manner as that the light is reflected from the base in G; the violet rays are seen first reflected into HG; the other rays continuing still refracted

fracted in I, K---After the violet the blue are all refracted, the green, &c. See Colour. Hence it appears, that the differently coloured rays differ in degree of *reflexibility*.

From other experiments it appears, that those rays which are most *reflexible*, are also most *refrangible*. See Refrangibility.

REFLEXION. See Reflection.

REFLUX *of the sea*, the ebbing of the water; or its return from the shore. It is thus called, as being the opposite motion to the flood, or flux. See Tide.

REFORM, a re-establishment, or revival of former neglected discipline; or a correction of some reigning abuses therein.

The term is much used in a monastic sense, for the reducing an order or congregation of religious to the ancient severity of the rule from which it had gradually swerved; or even for the improving on the ancient rule and institution itself, and voluntarily making it more severe.

In this sense the order of St. Bernard is said to be only a *reform* of that of St. Benedict.

To Reform, in a *Military Sense*, is to reduce a company, regiment, or other body of men, either by disbanding the whole, or only breaking a part, and retaining the rest; or sometimes by incorporating them with other regiments. Hence,

REFORMADO, or Reformed *officer*, one whose troop or company is suppressed in a *reform*, and he continued either in whole or half-pay, doing duty in the regiment. A *reformed* captain of foot follows the company, and assists the standing officer as a second; but he still maintains his degree and precedence.

REFORMATION, *reformatio*, the act of *reforming*, or correcting an error, or abuse, in religion, discipline, or the like.

The *reformation of religion*, called by way of eminence, *the Reformation*, was begun by the elector of Saxony, at the solicitation of Luther, about the beginning of the sixteenth century. See Lutheranism.

There were many circumstances which concurred at this time to bring about that happy *reformation* in religion, which rescued one part of Europe from the papal yoke, mitigated its rigour in the other, and produced a revolution in the sentiments of mankind, the greatest as well as the most beneficial that has happened since the publication of Christianity. How far the sale of indulgences, published by Leo X. contributed to this event, we have already shewn under the article Lutheranism. We shall here observe, that the same corruptions in the church of Rome which Luther condemned, had been attacked long before his appearance, and the same opinions which he propagated, had been published in different places, and supported by the same arguments. Waldus in the 12th century, Wickliff in the 14th, and Huss in the 15th, had inveighed against the errors of popery with great boldness, and confuted them with more ingenuity and learning than could have been expected in those illiterate ages in which they flourished. But all these premature attempts towards a *reformation* proved abortive. Many powerful causes contributed to facilitate Luther's progress, which either did not exist, or did not operate with full force in their days; the principal of these we shall here enumerate. The long and scandalous schism which divided the church, during the latter part of the fourteenth and the beginning of the fifteenth centuries, had a great effect in diminishing the veneration with which the world had been accustomed to view the papal dignity. The proceedings of the councils of Constance and Basil spread this disrespect for the Romish see still wider, and by their bold exertion of authority in deposing and electing popes, taught the world that there was in the church a jurisdiction superior even to the papal power, which they had long believed to be supreme. The wound given on that occasion to the papal authority was scarcely healed, when the pontificates of Alexander VI. and Julius II. both able princes, but detestable ecclesiastics, raised new scandal in Christendom. Besides, many of the dignified clergy, secular as well as regular, neglected the duties of their office, and indulged themselves without reserve in all the vices to which great wealth and idleness naturally give birth: and gross ignorance and low debauchery rendered the inferior clergy as contemptible as the others were odious. So that we find, long before the sixteenth century, that many authors of reputation give such description of the dissolute morals of the clergy, as seem almost incredible in the present age. The scandal of these crimes, which very generally prevailed, was greatly increased by the facility with which such as committed them obtained pardon. The exorbitant wealth of the church, the vast personal immunities of ecclesiastics, and their encroachments on the jurisdiction of the laity, and their various devices to secure their usurpations, created much dissatisfaction among the people, and disposed them to pay particular attention to the invectives of Luther. Besides these causes of his rapid progress, we may also reckon the invention of the art of printing, about half a century before his time, the revival of learning at the same period, and the bold spirit of inquiry which it excited in Europe; so that many were prepared to embrace his doctrines, who did not really wish success to his undertaking. In the writings of Reuchlin, Hutter, and the other revivers of learning in Germany, the corruptions of the church of Rome are censured with an acrimony of style little inferior to that of Luther himself. The raillery and oblique censures of Erasmus in particular, upon the errors of the church, as well as upon the ignorance and vices of the clergy, prepared the way for Luther's invectives and more direct attacks. To all which we may add, that the theological doctrines of popery were so repugnant to the spirit of Christianity, and so destitute of any foundation in reason, in the word of God, or in the practice of the church, that this circumstance combined in favouring the progress of Luther's opinions, and in weakening the resistance of his adversaries.

The rise of the *reformation* in Switzerland was at least as early as in Germany; for Ulric Zuingle had, in the year 1516, begun to explain the Scriptures to the people, and to censure, though with great prudence and moderation, the errors of a corrupt church. He had very noble and extensive ideas of a general *reformation*, at the time when Luther retained almost the whole system of popery, indulgences excepted; and he had actually called in question the authority and supremacy of the pope, before the name of Luther was known in that country. In the year 1524, Nuremberg, Francfort, Hamburgh, and several other cities in Germany, of the first rank, openly embraced the reformed religion, and by the authority of their magistrates abolished the mass, and the other superstitious rites of popery. The elector of Brandenburgh, the dukes of Brunswick and Lunenburgh, and prince of Anhalt, became avowed patrons of Luther's opinions, and countenanced the preaching of them among their subjects. The reformers derived great advantage from the transactions of the diet at Nuremberg, which presented to the pope a catalogue of a hundred grievances, which the empire imputed to the iniquitous dominion of the papal see. The progress of the *reformation* in Germany was likewise promoted by the proceedings of the diet, held at Spire in the years 1526 and 1529. See Protestants.

During these transactions in Germany, the dawn of truth arose upon other nations. The light of the *reformation* spread itself far and wide; and almost all the European states welcomed its salutary beams and exulted in the prospect of an approaching deliverance from the yoke of superstition and spiritual despotism. Some of the most considerable provinces of Europe had already broke their chains, and openly withdrawn themselves from the discipline of Rome and the jurisdiction of its pontiff. The reformed religion was propagated in Sweden, soon after Luther's rupture with Rome, by Olaus Petri, one of his disciples, who was countenanced and encouraged by the valiant and public-spirited prince Gustavus Vasa Ericson, to whose firmness and magnanimity it was owing, that from the year 1527 the papal empire in Sweden was entirely overturned, and Gustavus declared head of the church. The light of the reformation was also received in Denmark so early as the year 1521, in consequence of the ardent desire discovered by Christian or Christiern II. for purposes of mere ambition, of having his disciples instructed in the doctrines of Luther. His successor Frederick, duke of Holstein and Silesia, contributed greatly to the progress of the *reformation*, by his successful attempts in favour of religious liberty, at the assembly of states that was held at Odensee, in the year 1527, when he procured the publication of that famous edict which declared every subject of Denmark free, either to adhere to the tenets of the church of Rome, or to embrace the doctrine of Luther; that no person should be molested on account of his religion; that a royal protection should be granted to the Lutherans; and that ecclesiastics of every order should be allowed to marry. But the honour of accomplishing this glorious work was reserved for Christiern III. a prince equally distinguished by his piety and prudence. The religious doctrine, discipline, and worship of this kingdom, were settled according to a plan laid down by Bugenhagius. And the assembly of the states at Odensee, in 1539, gave a solemn sanction to all these transactions, and thus the work of *reformation* was brought to perfection in Denmark.

In France, the auspicious patronage of Margaret, queen of

of Navarre, sister to Francis I. encouraged several pious and learned men, whose religious sentiments were the same with her own, to propagate the principles of the *reformation*, and even to erect several protestant churches in that kingdom. It appears, that, so early as the year 1523, there were many, and even persons of rank, and some of the episcopal order, who had conceived the utmost aversion both against the doctrine and tyranny of Rome. But the wavering and inconsistent conduct of Francis I. rendered the situation of the protestants in this country always precarious, often distressed. Upon the whole, we may observe, that, before the diet of Augsburg, the doctrine of Luther had made a considerable, though perhaps a secret progress in Spain, Hungary, Bohemia, Britain, Poland, and the Netherlands; and had, in all these countries, many friends, of whom several repaired to Wittemberg, to improve their knowledge, and enlarge their views under such an eminent master. At this diet, held in 1530, the Augsburg or AUGUSTAN *Confession* was presented to the emperor Charles V. and after many debates between the friends of liberty and the votaries of Rome, the latter prevailed; and the diet, in compliance with the opinion and remonstrances of Campeggio, the papal nuncio, issued a decree, condemning most of the peculiar tenets held by the protestants; forbidding any person to protect or tolerate those who taught them; enjoining a strict observance of the established rites, and prohibiting any farther innovation, under severe penalties. Those who refused to obey this decree were declared incapable of acting as judges, or of appearing as parties in the imperial chamber, the supreme court of judicature in the empire. The protestants, alarmed at this severity of the decree, assembled at Smalcald, and concluded a league of mutual defence against all aggressors, by which they formed the protestant states of the empire into one regular body; and they resolved to apply to the kings of England, France, and Denmark, to implore them to assist and patronize this new confederacy. After various negociations between the emperor and the protestant princes, terms of pacification were agreed upon at Nuremberg, and ratified solemnly in the diet at Ratisbon, in the year 1532. In this treaty it was stipulated, that universal peace be established in Germany, until the meeting of a general council, the convocation of which, within six months, the emperor shall endeavour to procure; that no person be molested on account of religion; that a stop be put to all processes begun by the imperial chamber against protestants, and the sentences already passed to their detriment be declared void. On their part, the protestants engaged to assist the emperor with all their forces in resisting the invasion of the Turks. Thus the protestants, by their firmness, unanimity, and dexterity in availing themselves of the emperor's situation, obtained terms which amounted almost to a toleration of their religion. But neither the emperor nor the pope were disposed to abide by the unbiassed sense of a general council, assembled, as the protestants wished, within the limits of the empire, but determined to decide their religious debates by the force of arms. After many evasions and delays, it was proposed, in the year 1545, to assemble a council at Trent, which was vigorously opposed by the protestants. The emperor and the pope had mutually agreed to destroy all who should dare to oppose this council. The meeting of that assembly was to serve as a signal for their taking arms; and accordingly its deliberations were scarcely begun, in the year 1546, when the protestants perceived undoubted marks of a formidable union to overwhelm and crush them by one blow. The fathers, assembled in the council of Trent, promulgated their decrees; and the protestant princes in the diet of Ratisbon protested against their authority, and were, in consequence of this, proscribed by the emperor, who raised an army to reduce them to obedience. Thus commenced the war of Smalcald, which was prosecuted with various success on both sides, till, in the year 1552, Charles was surprised at Inspruck by Maurice of Saxony, and was constrained to conclude at Passau the famous treaty of *pacification* with the protestants, which is considered by those of Germany as the basis of their religious liberty; and to promise in six months to assemble a diet, in which all the tumults and dissensions, that had been occasioned by a variety of sentiments in religious matters, should be entirely removed. This diet, though not assembled at the stipulated time, met, however, at Augsburg, in the year 1555, and terminated those deplorable scenes of bloodshed, desolation, and discord, that had so long afflicted both church and state by that *religious peace*, as it is commonly called, which secured to the protestants the free exercise of their religion, and established this inestimable liberty upon the firmest foundations. For, after various debates, the following memorable acts were passed: that the protestants, who followed the confession of Augsburg, should for the future be considered as entirely exempted from the jurisdiction of the Roman pontiff, and from the authority and superintendance of the bishops; that they were left at perfect liberty to enact laws for themselves, relating to their religious sentiments, discipline, and worship; that all the inhabitants of the German empire should be allowed to judge for themselves in religious matters, and to join themselves to that church whose doctrine and worship they thought the purest and most consonant to the spirit of Christianity; and that all those, who should injure or persecute any person under religious pretexts, and on account of their opinions, should be declared, and proceeded against, as public enemies of the empire, invaders of its liberty, and disturbers of its peace.

In the year 1533 Henry VIII. king of England, who, in the beginning of these troubles, had opposed the doctrine and views of Luther with the utmost vehemence, having sued for a divorce from Catharine of Arragon, his brother's widow, at the court of Rome, for almost six years, during which period Clement VII. negotiated, promised, retracted, and concluded nothing, determined to apply to another tribunal for that decree which he had unsuccessfully solicited at Rome. Cranmer, archbishop of Canterbury, by a sentence founded on the authority of universities, doctors, and rabbies, who had been consulted with respect to the point, annulled the king's marriage with Catharine; and Anna Boleyn, whose charms had captivated the king, was acknowledged as queen of England. Clement, apprehensive lest England would revolt from the holy see, determined to give Henry such satisfaction as might still retain him within the bosom of the church. But the violence of the cardinals precipitated him, in 1534, to issue a bull rescinding Cranmer's sentence, confirming Henry's marriage with Catharine, and declaring him excommunicated, if, within a time specified, he did not abandon the wife he had taken, and return to her whom he had deserted. Enraged at this unexpected decree, Henry kept no longer any measures with the court of Rome; his subjects seconded his resentment; an act of parliament was passed, abolishing the papal power and jurisdiction in England; by another the king was declared supreme head of the church, and all the authority of which the popes were deprived was vested in him; the MONASTERIES were suppressed, and their revenues applied to other purposes. Henry, however, with the caprice peculiar to his character, continued to defend the doctrines of the Romish church as fiercely as he attacked its jurisdiction. He alternately persecuted the protestants for rejecting the former, and the catholics for acknowledging the latter. Nevertheless his subjects having been encouraged, by his example, to break some of their fetters, were so impatient to shake off all that remained, that in the following reign, under his son Edward VI. with the general applause of the nation, a total separation was made from the church of Rome in ARTICLES of doctrine, as well as in matters of discipline and jurisdiction. In 1553 his death retarded the progress of the *reformation*; and his sister Mary, who succeeded him, imposed a-new the arbitrary laws and tyrannical yoke of Rome upon the people of England. But the execution of a great number of persons, who were burnt for the protestant faith in the five years of her persecuting and bloody reign, so alienated the people from popery, that queen Elizabeth, her sister, found it no hard matter to deliver her subjects from the bondage of Rome, and to establish that form of religious doctrine and ecclesiastical government, which still subsists in England.

The seeds of the *reformation* were very early sown in Scotland, by several noblemen of that nation, who had resided in Germany during the religious disputes that divided the empire. The first and most eminent opposer of the papal jurisdiction was John Knox, a disciple of Calvin, who set out from Geneva for Scotland in 1559, and in a little while prevailed with the greatest part of the Scotch nation entirely to abandon the superstitions of Rome, and to aim at nothing less than the total extirpation of popery. From that period to the present times the form of doctrine, worship and discipline, that had been established at Geneva by the ministry of Calvin, has been maintained in Scotland with invincible obstinacy and zeal, and every attempt to introduce, into that kingdom, the rites and government of the church of England has proved impotent and unsuccessful. See PRESBYTERIANS.

The cause of the *reformation* in Ireland underwent the same vicissitudes that had attended it in England. When Henry VIII. after the abolition of the papal authority, was declared supreme head of the church of England, George Brown, a native of England, and a monk of the Augustin order, whom that monarch had created, in the

the year 1535, archbishop of Dublin, began to act with the utmost vigour in consequence of this change in the hierarchy. He purged the churches of his diocese from superstition in all its forms, pulled down images, destroyed relics, abolished absurd and idolatrous rites, and by the influence as well as authority he had in Ireland caused the king's supremacy to be acknowledged in that nation. Henry shewed soon after that this supremacy was not a vain title, for he banished the monks out of that kingdom, confiscated their revenues, and destroyed their convents. In the reign of Edward VI. farther progress was made in the *reformation*, but the accession of Mary retarded it, in consequence of which Brown and other protestant bishops were deprived of their dignities in the church. When Elizabeth ascended the throne, the Irish were again obliged to submit to the form of worship and discipline established in England.

The *reformation* had not been long established in Britain, when the Belgic provinces, united by a respectable confederacy which still subsists, withdrew from their spiritual allegiance to the Roman pontiff. The means which Philip II. king of Spain used to obstruct the *reformation*, promoted it: the nobility formed themselves into an association, in the year 1566, and roused the people; who, under the heroic conduct of William of Nassau, prince of Orange, seconded by the succours of England and France, delivered this state from the Spanish yoke: in consequence of which the reformed religion, as it was professed in Switzerland, was established in the United Provinces: and, at the same time, an universal toleration granted to those whose religious sentiments were of a different nature, whether they retained the faith of Rome, or embraced the *reformation* in another form, provided that they made no attempts against the authority of the government, or the tranquillity of the public. See, on the subject of this article, Robertson's Hist. of Charles V. vol. ii. p. 113, &c. vol. iii. p. 44, &c. Mosheim's Eccl. Hist. Eng. ed. 8vo. vol. iii. p. 284, &c. Burnet's Hist. of the Reformation, passim.

REFORMATION, *right of*, *jus reformationis*, is a right which the princes of Germany claim to *reform* the church in their respective territories; as being invested with the spiritual as well as the temporal power.

The *jus reformationis* is annexed to the sovereignty; by this they have the power of conscience, the disposition of ecclesiastical revenues, &c. as they enjoyed the same at the treaty of Munster in 1624.

REFORMATION of *images*, in *Optics*. See ANAMORPHOSIS.

REFORMED *calendar* and *church*. See the substantives.

REFORMED *officer*. See REFORMADO.

REFRACTED *angle*, in *Optics*, the angle contained between the *refracted* ray and the perpendicular.

REFRACTED *dials*, are such as shew the hour by means of some *refracting* transparent fluid. See DIALS *refracted*.

REFRACTED *ray*, or *ray of* REFRACTION. See RAY, and REFRACTION.

REFRACTED *vision*. See VISION.

REFRACTING *telescope*. See TELESCOPE.

REFRACTION, *refractio*, in *Mechanics*, the deviation of a moving body from its direct course, by reason of the different density of the medium it moves in; or a flexion and change of determination, occasioned by a body's falling obliquely out of one medium into another of a different density.

Thus a ball A (*Tab.* VI. *Mechanics, fig.* 103.) moving in the air in the line AB, and falling obliquely on the surface of the water CD, does not proceed straight to E, but deviates, or is inflected, to F. Again, if the ball, moving in water in the same line AB should fall obliquely on a surface of air CD; it will not proceed straight to E, nor yet deflect to F, but to G. Now the deflexion in each case is called the *refraction*; and the two cases are distinguished by means of the perpendicular MI; that BG being called *refraction towards the perpendicular*, or to the *axis of refraction*; and the other BF, *refraction from the perpendicular*, or *from the axis of refraction*.

These *refractions* are supposed to arise hence, that the ball arriving at B, in the first case finds more resistance or opposition on the one side O, i. e. from the side of the water, than it did from the side P, or that of the air; and in the latter more resistance from the side P, which is now the side of the water, than the side O, which is that of the air.

The *great law of refraction*, then, which holds in all bodies, and all mediums, is, that a body passing obliquely out of a medium which resists it more, is refracted towards the perpendicular; and in passing out of a medium which opposes it less into another, which opposes it more, it is refracted from the perpendicular.

Hence the rays of light falling out of air into water are refracted towards the perpendicular; whereas a ball thrown into the water is refracted from it; because water, which resists the motion of light less than air, resists that of the ball more; or, to speak more justly, because water, by its greater attraction, accelerates the motion of the rays of light more than air does; for that this is the true cause of *refraction*, at least in light, shall be shewn under REFRACTION *of light*.

To have a body *refracted*, it is necessary that it should fall obliquely on the second medium. In perpendicular incidence there is no *refraction*.

Vossius indeed, and Snellius, imagined they had observed a perpendicular ray of light undergo a *refraction*; a perpendicular object appearing in the water nearer than in reality it was; but this was to attribute that to a *refraction* of the perpendicular rays, which was owing to the divergency of the oblique rays after *refraction*, from a nearer point.

Yet there is a manifest *refraction* even of perpendicular rays found in *island* CRYSTAL.

Rohault adds, that though an oblique incidence be necessary in all other mediums we know of, yet the oblique must not exceed a certain degree; if it do, the body will not penetrate the medium, but will be *reflected* instead of being *refracted*.

Thus cannon-balls, in sea engagements, falling very obliquely on the surface of the water, are observed to mount aloft again, and frequently to sweep the men from off the opposite decks; and the like happens to the little stones wherewith children make their ducks and drakes.

The ancients confounded *refraction* with *reflection*, and it was Sir Isaac Newton who first taught us the just difference between them.—He shews likewise, that there is a good deal of analogy between them, and particularly in the case of light.

The laws of *refraction* of the rays of light in mediums differently terminated, i. e. whose surfaces are plain, concave, convex, &c. make the subject of dioptrics.

By *refraction* it is, that convex glasses, or lenses, collect the rays, magnify objects, burn, &c. and hence the foundation of microscopes, telescopes, &c.

By *refraction* it is, that all remote objects are seen out of their real places; particularly, that the heavenly bodies are apparently higher than they are in reality, &c.

The *refraction* of the air has many times so uncertain an influence on the places of celestial objects, very remote from the zenith, that wherever *refraction* is concerned, the conclusions deduced from observations that are much affected by it, will always remain doubtful, and too precarious in many cases to be relied upon. See Dr. Bradley, in Phil. Trans. N° 485.

REFRACTION *of light*, in *Optics*, is an inflection or deviation of the rays from their rectilinear course upon falling obliquely out of one medium into another, of a different density.

It does not appear that, before Descartes, any person attempted to explain the cause of *refraction*, which he undertook to do by the resolution of forces, on the principles of mechanics; in consequence of which he was obliged to suppose that light passes with more ease through a dense medium than a rare one: thus the ray AB (*Tab.* V. *Optics, fig.* 105.) falling obliquely on a denser medium at B, is supposed to be acted on by two forces, one of them impelling it in the direction AC, and the other in AD, which alone can be affected by the change of medium: and since, after the ray has entered the denser medium, it approaches the perpendicular BH, it is plain that this force must have received an increase, whilst the other continued the same; for if BE be taken equal to BD, or CA, the consequence of the angle IBH being less than ABC will be, that BH must be longer than BC or AD.

The first person who questioned the truth of this explanation of the cause of *refraction* was M. Fermat, who asserted, contrary to Descartes, that light suffers greater resistance in water than in air, and greater in glass than in water; and he maintained that the resistance of different mediums, with respect to light, is in proportion to their densities. M. Leibnitz adopted the same general idea; and they reasoned upon the subject in the following manner. Nature, they say, accomplishes her ends by the shortest methods; light, therefore, ought to pass from one point to another, either by the shortest road, or that in which the least time is required. But it is plain that the line in which light passes, when it falls obliquely upon a denser medium, is not the most direct or the shortest; so that it must be that in which the least time is spent. And, whereas it is demonstrable, that light falling obliquely upon a denser medium (in order to take up the least time possible, in passing from a point in one medium to a point in the other) must be refracted in such a manner, that the sines of the angles of incidence and *refraction* must be to one another, as the different

ferent facilities with which light is transmitted in those mediums; it follows that, since light approaches the perpendicular when it passes obliquely from air into water (so that the sine of the angle of *refraction* is less than that of the angle of incidence), the facility with which water suffers light to pass through it is less than that of the air; so that the light meets with greater resistance in water than in air. This method of arguing from final causes could not satisfy philosophers. Dr. Smith observes, that it agrees only to the case of *refraction* at a plain surface; and that the hypothesis is altogether arbitrary. Dechales, in order to explain the law of *refraction*, supposes that every ray of light is composed of several smaller rays which adhere to one another; and that they are refracted towards the perpendicular, in passing into a denser medium, because one part of the ray meets with more resistance than another part; so that the former traverses a smaller space than the latter; in consequence of which the ray must necessarily bend a little towards the perpendicular. This hypothesis was adopted by the famous Dr. Barrow, who, as some say, was the author of it. On this hypothesis, it is plain that mediums of a greater attractive power must give greater resistance to the passage of the rays of light than mediums of a less refractive power, which is contrary to fact.

The Bernouillis, both father and son, have attempted to explain the cause of *refraction* on mechanical principles; the former on the equilibrium of forces, and the latter on the same principles with the supposition of etherial vortices; but neither of these hypotheses have gained much credit. M. Mairan supposes a subtle fluid, filling the pores of all bodies, and extending, like an atmosphere, to a small distance beyond their surfaces; and then he supposes that the *refraction* of light is nothing more than a necessary and mechanical effect of the incidence of a small body in those circumstances. There is more, he says, of the refracting fluid in water than in air, less in water than in glass, and in general less in a dense medium than in one that is rarer. M. de Maupertuis supposes that the course which every ray takes, in passing from one medium into another, is that which requires the least quantity of action, which depends upon the velocity of the body and the space it passes over; so that it is in proportion to the sum of the spaces multiplied by the velocity with which bodies pass over them. From this principle he deduces the necessity of the sine of the angle of incidence being in a constant proportion to that of *refraction*; and also all the other laws relating to the propagation and reflection of light.

Dr. Smith (in his Optics, Remarks p. 70.) observes, that all other theories for explaining the reflection and *refraction* of light, except Sir Isaac Newton's, suppose that it strikes upon bodies and is resisted by them, which has never been proved by any deduction from experience. On the contrary, it appears by various considerations, and might be shewn by Mr. Molyneux and professor Bradley's observations on the parallax of the fixed stars, that their rays are not at all impelled by the rapid motion of the earth's atmosphere, nor by the object-glass of the telescope, through which they pass. And by Sir Isaac Newtons theory of *refraction*, which is grounded on experience only, it appears that light is so far from being resisted and retarded by *refraction* into any dense medium, that it is swifter there than in vacuo in the ratio of the sine of incidence in vacuo to the sine of *refraction* into the dense medium. Priestley's Hist. of Light, &c. p. 102, &c. p. 333, &c.

The *refraction* of light, Sir Isaac Newton shews, is not performed by the rays falling on the very surface of bodies; but it is done without any contact, by the action of some power belonging to bodies, and extending to a certain distance beyond their surfaces; by which same power, acting in other circumstances, they are also emitted and reflected.

The same arguments whereby we have proved, that REFLECTION is performed without immediate contact, go a great way towards demonstrating the same of *refraction*: to which may be added the following ones.

1. Because, if when light falls out of glass into air with the utmost obliquity it will be transmitted at, it be then made to fall a little more obliquely, it becomes wholly reflected: for the power of the glass, after it has refracted light emerging as obliquely as possible, supposing the rays to fall still more obliquely, will be too strong to let any of the rays pass; consequently, instead of being *refracted*, they will be all reflected.

2. Because in thin lamellæ, or plates of glass, light is reflected and transmitted several times alternately, as the thickness of the lamellæ increases in arithmetical progression: for here it depends on the thickness of the lamina which of the two the glass shall do, whether reflect it, or let it be transmitted.

3. Because, whereas the power of other bodies both to reflect and refract light are very nearly proportional to their densities; yet unctuous and sulphureous bodies are found to reflect more strongly than according to their mere densities: for as the rays act more strongly on those bodies to kindle them than on others, so do they again, by their mutual attraction, act more strongly on the rays to *refract* them.

Lastly, Because not only those rays transmitted through glass are found to be *refracted*, but also those passing in the air, or in a vacuum near its extremities, or even near the extremes of many opaque bodies, e. gr. the edge of a knife, undergo a similar inflection, from the attraction of the body. See LIGHT.

The manner wherein *refraction* is performed by mere attraction, without contact, may be thus accounted for: suppose HI (*Tab.* IV. *Optics*, *fig.* 56. N° 2.) the boundary of two mediums, N and O; the first the rarer, e. gr. air; the second the denser, e. gr. glass; the attraction of the mediums here will be as their densities: Suppose *p*S to be the distance to which the attracting force of the denser medium exerts itself within the rarer. Let now a ray of light A *a* fall obliquely on the surface which separates the mediums, or rather on the surface *p*S, where the action of the second and more resisting medium commences. All attraction being performed in lines perpendicular to the attractive body, as the ray arrives at *a*, it will begin to be turned out of its rectilinear course by a superior force, wherewith it is attracted by the medium O, more than by the medium N, i. e. by a force wherewith it is driven towards it in a direction perpendicular to its surface: hence the ray is bent out of its right line in every point of its passage between *p*S and RT, within which distance the attraction acts. Between those lines, therefore it describes a curve *a*B*b*; but beyond RT, being out of the sphere of attraction of the medium N, it will proceed uniformly in a right line, according to the direction of the curve in the point *b*.

Again, suppose N the denser and more resisting medium, O the rarer, and HI the boundary, as before; and let RT be the distance to which the denser medium exerts its attractive force within the rarer: even when the ray has passed the point B, it will be within the sphere of superior attraction of the denser medium; but that attraction acting in lines perpendicular to its surface, the ray will be continually drawn from its straight course BM perpendicularly towards HI: thus, having two forces or directions, it will have a compound motion, whereby, instead of BM, it will describe B*m*, which B*m* will in strictness be a curve.

Lastly, After it has arrived in *m*, being out of the influence of the medium N, it will persist uniformly, in a right line, in the direction wherein the extreme of the curve leaves it.

Thus we see how *refraction* is performed, both *towards the perpendicular*, and *from it*.

But note, the attraction of the denser medium, e. gr. N, is continually diminishing as the ray proceeds from B, towards the limit of attraction RT; in regard fewer and fewer parts still come to act; at IH, e. gr. all the parts between that and *p* S attract; but at RT, none but those in the line HI. Note, also, that the distance between *p*S and RT being small, when we consider *refractions*, no notice is taken of the curve part of the ray, but we consider it as consisting of two straight lines, CB, AB, or *m*B, AB.

REFRACTION, in *Dioptrics*, is the inflexion or bending of the rays of light, in passing the surfaces of glasses, lenses, and other transparent bodies of different densities.

Thus a ray as AB (*Tab.* IV. *Optics*, *fig.* 56. N° 2.) falling obliquely from the radiant A, upon a point B, in a diaphanous surface, HI, rarer or denser than the medium along which it was propagated from the radiant; has its direction there altered by the action of the new medium; and instead of proceeding to M, it deviates, e. gr. to C.

This deviation is called the *refraction of the ray*; BC the *refracted ray*, or *line of refraction*; and B the *point of refraction*.

The line AB is called the *line of incidence*, or *ray of incidence*; and, in respect thereof, B is also called the *point of incidence*.

The plane wherein both the incident and *refracted* rays are found, is called the *plane of refraction*; a right line BE drawn in the *refracting* medium perpendicular to the *refracting* surface in the point of *refraction* B, is called the *axis of refraction*: and a right line DB drawn perpendicular to the *refracting* surface, in the point of incidence B, along the medium through which the ray fell, is called the *axis of incidence*.

The angle ABI, included between the incident ray, and the

the *refracting* surface, is called the *angle of incidence*; and the angle ABD, included between the incident ray and the axis of incidence, is called the *angle of inclination*. The angle MBC, which the *refracted* ray makes with the incident, is called the *angle of refraction*; and the angle CBE, which the *refracted* ray makes with the axis of *refraction*, is called the *refracted angle*.

Refraction, *general laws of.* 1. *A ray of light in its passage out of a rarer into a denser medium*, e. gr. *out of air into glass, is refracted towards the perpendicular*, i. e. *towards the axis of refraction.*

Hence, the *refracted* angle is less than the angle of inclination; and the angle of *refraction* less than that of incidence; as they would be equal were the ray to proceed straight from A to M. Hence, also, a ray perpendicular to the *refracting* surface will pass through without being *refracted*, as it cannot be *refracted* to the perpendicular. The physical cause thereof is, that the attraction of the denser medium, which, in an incidence oblique to its surface acting perpendicular to that surface, draws the ray out of its course; this attraction, we say, in a perpendicular incidence, acts in the direction of the ray.

2. *The ratio of the sine of the angle of inclination, to the sine of the refracted angle, is fixed and constant*; viz. if the *refraction* be out of air into glass, it is found greater than as 114 to 76, but less than 115 to 76; that is, nearly as 3 to 2.

This ratio, assigned by Huygens, agrees with another of Sir Isaac Newton, who makes the sine of the angle of inclination to the sine of the *refracted* angle, as 31 to 20; which is, likewise, nearly as 3 to 2. Indeed there is some difference in the quantity of *refraction*, in different kinds of glass; but in physical matters, preciseness is not necessary. In rain water, Descartes found, the ratio of the sine of the angle of inclination, to the sine of the *refracted* angle, as 250 to 187, that is, nearly as 4 to 3; which agrees with Sir Isaac Newton's observation, who makes it as 529 to 396. In spirit of wine, the same great author makes the ratio as 100 to 73; which is not far from the sesquitertian ratio. In air he makes it as 3201 to 3200; and as to air, he shews, that a ray of light, in traversing quite through the atmosphere, is *refracted* the same as it would be, were it to pass with the same obliquity out of a vacuum into air of equal density with that in the lowest part of the atmosphere.

See the following table, in which the proportion of the sines which measure the *refractions* of several bodies; the densities of the bodies, estimated by their specific gravity; and their refractive power, in respect of their densities, are set down in separate columns.

The refracting bodies.	The proportion of the sines of incidence and refraction of yellow light.			The density and specific gravity of the body.	The refractive power of the body in respect of its density.
A pseudo-topaz, being a natural, pellucid, brittle, hairy stone, of a yellow colour.	23	to	14	4.27	3979
Air.	3201	to	3200	0.0012	5208
Glass of antimony.	17	to	9	5.28	4864
A selenites.	61	to	41	2.252	5386
Glass vulgar.	31	to	20	2.58	5436
Crystal of the rock.	25	to	16	2.65	5450
Island crystal.	5	to	3	2.72	6536
Sal gemmæ.	17	to	11	2.143	6477
Alum.	35	to	24	1.714	6570
Borax.	22	to	15	.714	6716
Nitre.	32	to	21	1.9	7079
Dantzick vitriol.	303	to	200	1.715	7551
Oil of vitriol.	10	to	7	1.7	6124
Rain water.	529	to	396	1.	7845
Gum arabic.	31	to	21	1.375	8574
Spirit of wine well rectified	100	to	73	0.866	10121
Camphor.	3	to	2	0.996	12551
Oil olive.	22	to	15	0.913	12607
Linseed oil.	40	to	27	0.932	12819
Spirit of turpentine.	25	to	17	0.874	13222
Amber.	14	to	9	1.04	13654
A diamond.	100	to	41	3.4	14556

Newton's Optics, edit. 3. p. 247.

M. Euler the younger, pursuing a scheme suggested by his father for ascertaining the refractive powers of transparent liquors, made use of two Meniscus glasses, which he put together, when they were plunged in the fluid, the refractive power of which he wanted to determine: the edges of these glasses being ground flat, they immediately cohered, so that none of the fluid could escape; and then they might both together be wiped, and used as one object-glass in a long tube, which he could lengthen or shorten at pleasure; and applying an eye-glass to it, the whole observation he had to make was to measure the exact length of his tube, when he could see through it most distinctly, a turret, which was at a considerable distance from him. Or, when the focal distance was less than a foot, he only observed at what distance from a wall the image of an opposite window was the most distinct. Ac. Berlin. 1762, p. 302.

The refractive power of the fluids which he examined in this manner, he expressed in the following tables.

A ray of light passing from air into	The sine of the angle of incidence will be to that of refraction as	
Distilled water - - - - -	1.3358	To unity.
Rain water - - - - -	1.3358	
Well water - - - - -	1.3366	
French wine - - - - -	1.3453	
French brandy - - - - -	1.3603	
Ditto a stronger kind - - -	1.3646	
Rectified spirit of wine - -	1.3685	
Ditto more highly rectified - -	1.3706	
The white of an egg - - -	1.3685	
Distilled vinegar - - - -	1.3442	
A solution of gum arabic - -	1.3467	
A solution of two scruples of white sugar in an oz. of water - - -	1.3457	
A solution of 2 scruples of rock salt, in ditto	1.3477	
A solution of 2 scruples of salt of urine, in ditto	1.3400	
Oil of Provence - - - - -	1.4651	
Oil of turpentine - - - - -	1.4822	

N. B. The rock salt, and the salt of urine, was purified by a double crystallization.

By a second pair of Meniscuses.

Distilled water - - - -	1.3358	To unity.
Rain water - - - -	1.3358	
Well water - - - -	1.3362	
French wine - - - -	1.3458	
French brandy - - - -	1.3600	
Ditto a stronger kind - - -	1.3618	
Spirit of wine rectified - - -	1.3683	
Ditto more highly rectified - -	1.3705	
Tea - - - - -	1.3376	
Mineral alkali saturated (I suppose with water)	1.3600	
Spirit of nitre - - - -	1.4025	
A solution of 2 scruples of Glauber's salt in an oz. of water - - - -	1.3430	
A solution of 2 scruples of digestive salt of Sylvius in ditto - - -	1.3454	
A solution of 2 scruples of sal ammoniac in do.	1.3488	
A solution of 2 scruples of copperas in ditto	1.3395	
Oil of tartar per deliquium - -	1.3917	
Oil of Provence - - - -	1.4648	
Oil of turpentine - - - -	1.4822	

The *refractive* power of some other fluids found by the second pair of Meniscuses, 18 August, 1761, Reaumur's thermometer being 31 *degrees above the freezing point.*

A ray of light passing from air into	The sine of the angles of incidence will be to that of refraction as	
Well water - - - -	1.3351	To unity.
Four different solutions of nitre, viz. -		
12 grains of depurated nitre to an oz. of water	1.3380	
24 - - - - -	1.3398	
38 - - - - -	1.3450	
to 2 ounces of water	1.3540	
Four different infusions - - -	1.3351	
Of parsley - -	1.3355	
Of nutshells - -	1.3359	
Of saffron - -	1.3363	
Of fish-scales -	1.3353	
Of Zelter water -	1.3353	
Of Eger water -	1.3358	
Anodyne liquor - - - -	1.3650	
Spirit of camphor - - - -	1.3757	
Spirit of Saxon sope - - -	1.4088	

That the refractive power of these fluids, thus determined by M. Euler, may be more easily compared with Mr. Hauksbee's and Sir Isaac Newton's experiments, he reduced the result of their observations into the following tables, exactly similar to his own.

REF

The *refractive* power of certain fluids found by Mr. Hauksbee, see his Experiments, p. 292.

A ray of light passing from air into	The sine of the angle of incidence will be to that of refraction as
Water	1.3359
Spirit of honey	1.3359
——— sal ammoniac	1.3377
Oil of amber	1.3377
Spirit of hartshorn	1.3390
Human urine	1.3419
White of an egg	1.3511
Jelly of hartshorn	1.3541
French brandy	1.3626
Spirit of wine	1.3721
Distilled vinegar	1.3721
Gum ammoniac	1.3723
Aqua regia	1.3898
——— ——— from aqua fortis and sal ammoniac	1.3964
Aqua fortis	1.4044
Spirit of nitre	1.4076
The crystalline humour of an ox's eye	1.4635
Butter of antimony	1.6831
Oil of vitriol	1.4262
Oil of wax	1.4524
Oil of lavender	1.4960
Oil of rosemary	1.4719
Oil of origanum	1.4770
Oil of ginger	1.4799
Oil of oranges	1.4833
Oil of turpentine	1.4833
Oil of savine	1.4857
Oil of flowers of musk	1.4878
Oil of mint	1.4911
Oil of amber	1.5010
Oil of cummin	1.5088
Oil of fennel	1.5114
Oil of cloves	1.5136
Oil of anise	1.5191
Oil of cinnamon	1.5340
Oil of sassafras	1.5443

To unity.

The *refractive* powers of some transparent liquors according to the observations of Sir Isaac Newton. See Optics, p. 247.

A ray of light passing from air into	The sine of the angle of incidence will be to that of refraction as
A yellow pseudo topaz	1.6429
Air	0.9997
Glass of antimony	1.8889
A selenites	1.4878
Glass	1.5500
Crystal of the rock	1.5620
Island crystal	1.6666
Sal gem	1.5455
Alum	1.4577
Borax	1.4667
Nitre	1.5238
Dantzick vitriol	1.5000
Oil of vitriol	1.4285
Rain water	1.3358
Gum arabic	1.4771
Spirit of wine well rectified	1.3698
Camphor	1.5000
Oil olive	1.4666
Linseed oil	1.4814
Spirit of turpentine	1.5625
Amber	1.5556
A diamond	2.4390

To unity.

See Priestley's Hist. of Light, &c. p. 479, &c.

Whence the different *refractive* power in different fluids arises, is not determined. Sir Isaac Newton shews, that in many bodies, e. gr. glass, crystal, a selenites, pseudo-topaz, &c. the *refractive* power is proportionable to their densities; only in sulphureous bodies, as camphor, linseed oil, olive, amber, spirit of turpentine, &c. the power is two or three times greater than in other bodies of equal density; yet even these have the *refractive* power with respect to each other nearly as their densities.

Water has a refractive power in a middle degree between those two kinds of substances, and is, probably, of a middle nature. Salts and vitriols have refractive powers in a middle degree between those of earthy substances and water, and accordingly are composed of those two sorts of substances. Spirit of wine has a refractive power in a middle degree between those of water and oily substances; and accordingly seems to be composed of both, united by fermentation. It appears, therefore, that all bodies seem to have their refractive powers proportional to their densities, or very nearly, excepting so far as they partake more or less of sulphureous oily particles, and thereby have their refractive powers made greater or less. Whence it seems reasonable to attribute the refractive power of all bodies chiefly, if not wholly, to the sulphureous parts with which they abound.

From the observations of M. Euler it appears, that there is no fluid, and probably no transparent substance of any kind, the refractive power of which is less than that of rain water, or distilled water; and betwixt air and rain water there is no substance that has an intermediate refractive power.

After rain water immediately follows *well water*; but there are probably as many varieties in its refractive power as there are different wells. We may, however, conclude, that the ratio of *refraction* from air into well water is contained between the limits of 1.336 to 1, and 1.337 to 1.

Spirituous liquors have a greater refractive power in proportion to their strength; but the ratio of *refraction* from air into any spirituous liquor is never less than 1.34, nor greater than 1.37.

There is, probably, no kind of salt, but what, being dissolved in water, increases its refractive power.

The solutions of salt of urine and of vitriol have the least refractive powers, and those of rock salt and sal ammoniac the greatest; but the ratio of *refraction* from air into any saline solution, preserving the proportion of one ounce of salt to twelve of water, will be contained between the limits of 1.34 to 1, and 1.35 to 1.

Distilled vinegar and the solution of gum arabic have nearly the same refractive power with common French wine; and the refractive power of white of egg is the same as that of rectified spirit of wine.

Mineral alkali saturated, seems to have the same refractive power with very strong brandy.

Spirit of nitre and oil of tartar per deliquium have a medium refractive power between spirituous liquors and oils.

The refractive powers of oils approach the nearest to that of glass, especially oil of turpentine, which had the greatest refractive power of all the fluids on which he had made experiments.

Sir Isaac Newton suspected that different *degrees of heat* might have some effect on the refractive power of bodies, but his method of determining the general *refraction* was not sufficiently accurate to ascertain this circumstance; but happily this method of M. Euler's proved to be well adapted to this purpose.

From his experiments made for this purpose, he infers, that the focal distance of a single lens of glass diminishes with the heat communicated to it; and this diminution of the focal distance is not owing to the increase of bulk in the glass by heat; for the effect of this change is both inconsiderable, and of a contrary nature. There can be no doubt, therefore, but that this alteration in the focal distance is owing to a change in the refractive power of the glass itself, which as well as, probably, that of all other transparent substances, is increased by heat, and diminished by cold.

It may seem surprising that the focal distance of a single lens should decrease with heat, and yet that of the Meniscuses filled with any fluid, should increase with heat; but M. Euler observes, that it by no means follows from hence, that these fluids are affected by heat in a manner different from glass; and, after computing the effect of every circumstance of this complex experiment, of the two glasses and the fluid combined, he concludes, that heat increases the refractive power of water, and of other fluids as well as that of glass.

He farther observes, that as 66 degrees of heat diminished the focal distance $\frac{1}{65}$ part, 33 degrees ought to have diminished it $\frac{1}{130}$ part; whereas the diminution in this case was $\frac{1}{97}$. From hence, says he, one may perhaps conclude, that when it is very cold, the same change in the thermometer has a greater effect on the refractive power of the glass than when it is very hot. But he acknowledges that experiments of this kind are not capable of so much precision as one could wish, and that, perhaps, in reality, the 66 degrees made a change of $\frac{1}{60}$, and the 33 degrees of $\frac{1}{120}$; but he imagined that a great number of experiments, made in different temperatures of the air, might decide this question, especially if object-glasses of a very great focal distance were made use of. See Priestley's Hist. of Light, &c. p. 483, &c.

From the law above laid down, it follows, that one angle of inclination, and its corresponding *refracted* angle, being found by observation, the *refracted* angles, corresponding to the several other angles of inclination, are easily computed. Now, Zahnius and Kircher have found,

that

that if the angle of inclination be 70°, the *refracted* angle will be 38° 50′; on which principle Zahnius has constructed a table of *refractions* out of air into glafs, for the feveral degrees of the angle of inclination; a fpecimen whereof follows:

Ang. of Inclin.	Refracted Angle			Angle of Refraction			Ang. of Inclin.	Refracted Angle			Angle of Refraction		
1°	0°	40	5″	0°	19′	55″	10°	6°	39′	16″	3°	20′	44″
2	1	20	6	0	39	54	20	13	11	35	6	48	25
3	2	0	3	0	59	56	30	19	29	29	10	30	31
4	2	40	5	1	19	55	45	28	9	19	16	50	41
5	3	20	3	1	39	57	90	41	51	40	48	8	20

Hence it appears, that if the angle of inclination be lefs than 20°, the angle of *refraction* out of air into glafs is almoft $\frac{1}{3}$ of the angle of inclination; and therefore a ray is refracted to the axis of *refraction*, by almoft a third part of the quantity of its angle of inclination. And on this principle it is that Kepler, and moft other dioptrical writers, demonftrate the *refractions* in glaffes; though in eftimating the law of thefe *refractions* he followed the example of Alhazen and Vetellio, and fought to difcover it in the proportion of the angles, and not in that of the fines.

The true law of *refraction* was firft difcovered by Willebrord Snellius, profeffor of mathematics at Leyden; who found by experiment that the fecants of the complements, or cofecants of the angles of incidence and *refraction*, are always in the fame ratio. It is vulgarly attributed, however, to Defcartes; who having feen it in Snellius's MS. firft publifhed it in his Dioptrics, without naming Snellius; as we are informed by Huygens. The form in which Defcartes gives this law, is different from that of Snellius, and in general more commodious; but it might have been eafily deduced from it. According to him, the fine of the angle of *refraction* always bears the fame proportion to the fine of the angle of incidence. Indeed, as the rays of light are not all of the fame degree of *refrangibility*, this conftant ratio muft be different in different kinds. The ratio, therefore, obferved by authors is to be underftood of rays of the mean *refrangibility*, i. e. of green rays. The difference of *refraction* between the leaft and moft *refrangible* rays, that is, between violet and red rays, Sir Ifaac Newton fhews is about the $27\frac{1}{2}$th part of the whole *refraction* of the mean *refrangible*; which difference he owns is fo fmall, that there feldom needs to be any regard paid to it.

3. *When a ray paffes out of a denfer into a rarer medium,* e. gr. *out of glafs into air, it is refracted from the perpendicular, or from the axis of refraction.* And hence the angle of *refraction* is greater than the angle of inclination.

Hence, alfo, if the angle of inclination be lefs than 30°, MBC is nearly equal to $\frac{1}{3}$ of MBE; therefore MBC is one half of CBE; confequently, if the *refraction* be out of glafs into air, and the angle of inclination lefs than 30°, the ray is refracted from the axis of *refraction* by almoft one half part of the angle of inclination. And this is the other dioptrical principle ufed by moft authors after Kepler, to demonftrate the *refractions* of glaffes.

If the *refraction* be out of air into glafs, the ratio of the fine of inclination to the fine of the refracted angle is as 3 to 2, or, more accurately, as 17 to 11; if out of air into water, as 4 to 3: therefore, if the *refraction* be the contrary way, viz. out of glafs or water into air, the ratio of the fines, in the former cafe, will be as 2 to 3, or 11 to 17, and in the latter as 3 to 4.

Hence if the *refraction* be from water or glafs into air, and the angle of incidence or inclination be greater than about $48\frac{1}{2}$° in water, or greater than about 40° in glafs, the ray will not be refracted into air, but will be reflected into a line, which makes the angle of reflection equal to the angle of incidence; becaufe the fines of $48\frac{1}{2}$° and 40° are to the radius as 3 to 4, and as 11 to 17 nearly, and therefore when the fine has a greater proportion to the radius than as above, the ray will not be refracted.

4. *A ray falling on a curve furface, whether concave or convex, is refracted after the fame manner as if it fell on a plane which is a tangent to the curve in the point of incidence.*

For the curve and plane furface touching it, have an infinitely fmall part common to them both (each being originally generated by the flux of a point.) But a ray is refracted in fuch a little part; therefore it is the fame as if it were refracted in fuch a plane.

5. *If a right line,* EF *(Tab. V. Optics, fig. 106.) cut a refracting furface,* GH; *at right angles; and if, from any point in the denfer medium, as* D, *be drawn* DC *parallel to the incident ray* AB; *this will meet the refracted ray in* C; *and will be to it as the fine of the refracted angle to the fine of the angle of inclination.*

For $o = x$; but if BC pafs out of a denfer medium into a rarer, $y \,\underline{\triangle}\, x$; and out of a rarer into a denfer, $y \angle x$; therefore, in the former cafe, $y \,\underline{\triangle}\, o$, in the latter $y \angle o$; confequently, in the former, $o + u \angle y + u$; in the latter $y + u \angle o + u$. But in the one cafe $o + u$, and in the other $y + u$, are equal to two right angles; therefore, $o + u$ in this, and $y + u$ in the other, are lefs than two right angles, and, confequently, DC will meet BC. But fince $o = x$, or the angle of inclination, and y is the refracted angle, it is evident that CB is to CD as the fine of the angle o to the fine of the angle y, or in the ratio of the fine of the angle of inclination to the fine of the refracted angle.

Hence, if BC pafs out of glafs into air, it is in a fubfefquialterate ratio to CD; if, on the other hand, it paffes out of air into glafs, it is in a fefquialterate ratio to CD.

Hence alfo, if light pafs out of water into air, CB is in a fubfefquitertian ratio to CD; if out of air into water, in a fefquitertian. See *fig.* 106. and 107.

Refraction *in plane furfaces, laws of.* 1. If parallel rays be refracted out of one tranfparent medium into another of a different denfity, they will continue parallel after *refraction*. The phyfical reafon is, that, being parallel, their obliquity, or angle of incidence, is the fame; but, at equal obliquities, we have fhewn the *refraction* is equal; confequently the parallelifm, which they had before the *refraction*, will be retained after it.

But this may be alfo demonftrated geometrically: thus, if the rays be perpendicular to the refracting furface, they will pafs without any *refraction*; confequently being parallel before their paffage, they will be fo after it. If they fall obliquely, as AB and DC *(fig.* 108.) the angles of incidence o and u, and, confequently, alfo the angles of inclination x and y, will be equal. But the fines of the angles of inclination x and y have the fame ratio to the fines of the refracted angles m and n; therefore the refracted angles m and n, and alfo the angles s and r, are equal; confequently the refracted rays are parallel.

Hence a glafs, plain on both fides, being turned directly to the fun, the light paffing through it will be propagated after the fame manner as if the glafs were away; for the rays, being perpendicular, will pafs without *refraction*. If the glafs be turned obliquely to the fun, the light, after *refraction*, will be of the fame intenfity as before, the intenfity depending on the fpiffitude or clofenefs of the rays, and on the angle wherewith they ftrike the object, or the eye; both which are here unvaried.

2. If two rays CD and CP *(fig.* 109.) proceeding from the fame radiant C, and falling on a plane furface of a different denfity, fo that the points of *refraction* D and P are equally diftant from the cathetus of incidence GK, the refracted rays DF and PQ have the fame virtual focus, or the fame point of difperfion G.

Hence, 1. Since, in rays very near each other, the diftance from the cathetus is the fame as to fenfe, very near rays will diverge from the fame point G, i. e. they will have the fame virtual focus G.

And hence, 2. When refracted rays, falling on the eye placed out of the cathetus of incidence, are either equally diftant from the cathetus, or very near each other, they will flow upon the eye, as if they came to it from the point G; confequently the point C will be feen by the refracted rays as in G.

3. If a ray CD fall obliquely out of a thinner into a denfer medium, having a plane furface, the diftance of the radiant point CK will have a lefs ratio to the diftance of the point of difperfion, or virtual focus KG, than the fine of the refracted angle to the fine of the angle of inclination. But if the diftance of the point of *refraction*, from the cathetus of incidence KD, be lefs than the eleventh or nineteenth part of the diftance of the radiant point CK; and if in the former cafe the tenth, and in the latter the hundredth, part thereof be fo fmall, that it cannot be affigned, or need not be minded, then will CK be to KG, as to fenfe, in the ratio of the fine of the refracted angle, to the fine of the angle of inclination.

Hence, 1. If the *refraction* be out of air into glafs, the diftance of the point of difperfion of rays near the cathetus is fefquialterate of the radiant point; of more remote rays greater than fefquialterate. But if the *refraction* be out of air into water, the diftance of the fame point will be fefquitertian, when the rays are near the cathetus; and when more remote, greater than fefquitertian.

Hence, 2. If the eye be placed in a denfe medium, objects in a rarer will appear more remote than they are; and the place of the image, in any given cafe, may be determined from the ratio of the *refraction*. *Thus, to fifhes fwimming under water, objects out of the water muft appear farther diftant than in reality they are.*

4. If a ray DG fall obliquely out of a denfer into a rarer medium AB, the diftance of the radiant point GK has a

greater ratio to the distance of the point of dispersion KC, than the sine of the refracted angle has to the sine of the angle of inclination. In the other case of the preceding theorem, KG will be to KC, as to sense, in the ratio of the sine of the refracted angle, to the sine of the angle of inclination.

Hence, 1. If the *refraction* be out of glass into air, the distance of the point of dispersion of rays near the cathetus of incidence is subsesquialterate of the distance of the radiant point; that of the more remote rays is less than subsesquialterate.

But, 2. If the *refraction* be out of water into air, the distance of the point of dispersion of rays near the cathetus is subsesquitertian; of those more remote, less than subsesquitertian.

And, 3. The eye, therefore, being placed in a rarer medium, objects, placed in a denser, appear nearer than they are; and the place of the image may be determined in any given case by the ratio of *refraction*. Hence, the bottom of a vessel full of water is raised by *refraction* to a third part of its height, with respect to an eye perpendicularly over the refracting surface; and hence, *fishes, and other bodies, under water, appear nearer than they really are.*

5. If the eye be placed in a rarer medium, an object seen in a denser medium, by a ray *refracted* in a plane surface, will appear larger than it really is. If the object be in a rarer, and the eye in a denser medium, the object will appear less than it is. And, in each case, the apparent magnitude is to the real one in a ratio compounded of the distance of the point to which the rays tend before *refraction*, from the refracting surface DE (*fig.* 110.) to the distance of the eye GL from the same, and of the distance GM of the object AB from the eye, to its distance FM from a point F, to which the rays tend before *refraction*.

Hence, 1. If the object AB be very remote, FM will be physically equal to GM; and, therefore, the real magnitude MB to its apparent one MH, as GL to FL, or the distance of the eye G from the refracting plane to the distance of the point of convergence F from the same plane.

Hence, 2. *Objects under water, to an eye in the air, appear larger than they are; and to fishes under water, objects in the air appear less than they are.*

Laws of Refraction *in spherical surfaces, both concave, and convex.* 1. A ray of light DE (*fig.* 111.) parallel to the axis of a denser sphere, after a single *refraction* in E, falls in with the axis in the point F, beyond the centre C.

For the semidiameter CE, drawn to the point of *refraction* E, is perpendicular to the surface KL, and is therefore the axis of *refraction*; but a ray out of a rarer into a denser medium, we have shewn, is refracted towards the perpendicular, or the axis of *refraction*; therefore, the ray DE will converge to the axis of the sphere AF; and will, therefore, at length concur with it, and that beyond the centre C, in F; because the angle of *refraction* FEH is less than the angle of inclination CEH.

2. If a ray DE fall on a spherically convex surface of a denser medium, parallel to its axis AF; the semidiameter CE will be to the refracted ray EF in the ratio of the sine of the angle of *refraction* to the sine of the angle of inclination; but the distance of the focus, or point of concurrence from the centre CF is to the refracted ray FE, in the ratio of the sine of the refracted angle to the sine of the angle of inclination.

3. If a ray DE fall on a denser spherical convex surface KL, parallel to the axis AF, the distance of the focus from the refracting surface FB must be to its distance from the centre FC, in a ratio greater than that of the sine of the angle of inclination to the sine of the refracted angle. But if the rays be very near the axis, and the angle of inclination BCE be only of a few degrees, the distances of the focus from the surface, and the centre FB and FC, will be nearly in the ratio of the sine of the angle of inclination to the sine of the refracted angle.

Hence, 1. If the *refraction* be out of air into glass; in the case of rays near the axis, BF : FC : : 3 : 2. And in the case of rays remote from the axis, BF : FC > 3 : 2. Consequently, in the former case, BC : BF : : 1 : 3; and in the latter BC : BF ∠ 1 : 3.

And, 2. If the *refraction* be out of air into water; in the former case, BF : FC : : 4 : 3; and in the latter, BF : FC > 4 : 3. Consequently, in the former, BC : BF : : 1 : 4; and in the latter BC : BF ∠ 1 : 4.

Hence, 3. Since the sun's rays are parallel as to sense, if they fall on the surface of a solid glass sphere, or of a sphere full of water, they will not concur with the axis within the sphere; so that Vitellio was mistaken, when he imagined, that the sun's rays, falling on the surface of a crystalline sphere, were refracted to the centre.

4. If a ray DE (*fig.* 112.) parallel to the axis FA, fall out of a denser into a rarer spherical medium, after *refraction*, it will diverge from the axis; and the distance of the point of dispersion, or the virtual focus from the centre of the sphere, FC, will be to its semidiameter CE in the ratio of the sine of the refracted angle to the sine of the angle of *refraction*; but to the portion of the refracted ray drawn back, FE, it will be in the ratio of the sine of the refracted angle to the sine of the angle of inclination.

5. If a ray ED fall parallel to the axis AF on the spherically convex surface KL of a rarer medium, out of a denser, the distance of the point of dispersion from the centre FC, is to its distance from the surface FB, in a ratio greater than that of the sine of the refracted angle to the sine of the angle of inclination. But if the rays DE be very near the axis FA, the ratio will be very nearly the same with that of the sine of the refracted angle to the sine of the angle of inclination.

Hence, 1. If the *refraction* be out of glass into air, in the case of rays near the axis, FC : FB : : 3 : 2. Consequently BC : FB : : 1 : 2. Therefore, in the case of rays more remote from the axis, FC : FB ⊿ 3 : 2.

2. If the *refraction* be out of water into air; in the former case FC : FB : : 4 : 3. Consequently BC : FB : : 1 : 3; in the latter case, therefore, FC : FB ⊿ 4 : 3.

3. Since then the point of dispersion F is more remote from the refracting surface KL, if the rays proceed out of water, than if they pass out of glass into air; parallel rays are less dispersed in the former case than in the latter.

6. If a ray HE (*fig.* 111.) fall parallel to the axis FA, out of a rarer, on the surface of a spherically concave denser medium; the refracted ray EN will be driven from the point of the axis F; so that FE will be to FC in the ratio of the sine of the angle of inclination, to the sine of the refracted angle.

7. If a ray EH fall parallel to the axis FB on the concave surface KL of a spherical denser medium, from a rarer; the distance of the point of dispersion from the refracting surface FB, is to its distance from the centre FC, in a ratio greater than that of the sine of the angle of inclination, to the sine of the refracted angle. But if the rays be very near the axis, and the angle BCE be very small; BF will be to CF very nearly in the ratio of the sine of the angle of inclination, to the sine of the refracted angle.

Hence, 1. If the *refraction* be out of air into glass; in the case of rays near the axis, FB : FC : : 3 : 2; in the case of rays more remote from the axis, FB : FC ⊿ 3 : 2; consequently in the former, BC : FC : : 1 : 2. And hence, in the latter, BC : FC ∠ 1 : 2.

Hence also, 2. If the *refraction* be out of air into water; in the case of rays near the axis, FB : FC : : 4 : 3. In the case of rays more remote from the axis, FB : FC ⊿ 4 : 3; consequently in the first case, BC : FC : : 1 : 3. And hence, in the latter, BC : FC ⊿ 1 : 3.

And hence, 3. Since the point of dispersion F is farther from the centre C, if the *refraction* be in water, than in air; the rays will be less dispersed in the latter case than in the former.

8. If the ray HE (*fig.* 112.) fall parallel to the axis AF, from a denser, upon the surface of a spherically concave rarer medium, the refracted ray will concur with the axis AF, in the point F; so that the distance of the point of concourse from the centre CF, may be to the refracted ray FE in the ratio of the sine of the refracted angle, to the sine of the angle of inclination.

9. If a ray HE fall parallel to the axis AF on the concave surface of a rarer medium out of a denser, the distance of the focus from the centre FC will be to its distance from the refracting surface FB in a greater proportion than the sine of the refracted angle to the sine of the angle of inclination. But if the rays be very near the axis, FC will be to FB in the proportion of these sines.

Hence, 1. If the *refraction* be out of glass into air; in the case of rays near the axis FC : FB : : 3 : 2; in the case of rays more remote from the axis, FC : FB ⊿ 3 : 2. Whence in the former case BC : FB : : 1 : 2.

2. If the *refraction* be out of water into air; in the case of rays near the axis, FC : FB : : 4 : 3; in the case of rays more remote, FC : FB ⊿ 4 : 3. Whence, in the former case, BC : FB : : 1 : 3. For the demonstration of these several laws of *refraction*, we refer to Wolfius's Elem. Mathes. &c. tom. iii. p. 179, &c. See also Lens.

Refraction *in a glass prism.* If a ray of light DE (*fig.* 113.) fall obliquely out of air on a prism ABC; being refracted towards the perpendicular, instead of proceeding to F, it will decline to G, i. e. towards a line HI, drawn perpendicular to the surface AB in the point of *refraction* E. Again, since the ray EG, passing out of the

the glaſs into air, falls obliquely on CB, it will be refracted to M, ſo as to recede from the perpendicular NGO. *And hence ariſe the various phenomena of the priſm.* See Colour.

Refraction *in a convex lens.* If parallel rays AB, CD, and EF (*fig.* 114.) fall on the ſurface of a lens 2 B 3 K, the perpendicular ray AB will paſs unrefracted to K, where emerging into air perpendicular, as before, it will proceed ſtraight to G. But the rays CD and EF falling obliquely out of air into glaſs, in D and F, will be refracted towards the axis of *refraction* (i. e. towards lines HI and LM drawn perpendicular to the refracting ſurface in the points of *refraction* D and F, and decline to Q and P. Again, emerging obliquely out of the glaſs into the ſurface of the air, they will be refracted from the perpendicular, and, therefore, DQ will not proceed to X, but to G; and FP, not to V, but to G: thus, likewiſe, might all the other rays, falling on the ſurface of the glaſs, be ſhewn to be refracted ſo as to meet the reſt about the point G. See Focus and Lens.

Hence the great property of convex glaſſes; viz. *that they collect parallel rays, or make them converge into a point.*

Refraction *in a concave lens.* Parallel rays AB, CD, and EF (*fig.* 115.) falling on a concave lens GBHIMK, the ray AB falling perpendicular on the glaſs at B, will paſs unrefracted to M; where being ſtill perpendicular, it will paſs into the air, without *refraction*, to L. But the ray CD, falling obliquely on the ſurface of the glaſs, will be refracted towards the perpendicular NDO, and proceed to Q; and the ray DQ, again falling obliquely out of the glaſs upon the ſurface of air, will be refracted from the perpendicular RQS, and proceed to V. After the ſame manner might the ray EF be ſhewn to be refracted to Y, and thence to Z.

Hence the great property of concave glaſſes; viz. *that they diſperſe parallel rays, or make them diverge.* See Lens.

Refraction *in a plane glaſs.* If parallel rays EF, GH, IL (*fig.* 116.) fall obliquely on a plane glaſs ABCD, the obliquity being the ſame in all, by reaſon of their parallelism, they will be all equally refracted towards the perpendicular; and accordingly being ſtill parallel at M, O, and Q, they will paſs out into the air equally refracted again from the perpendicular, and ſtill parallel. Thus will the rays EF, GH, and IL, at their entering the glaſs, be inflected towards the right; and in their going out as much inflected to the left; ſo that the firſt *refraction* is here undone by the ſecond; though not ſo as that the object is ſeen in its true place. For the ray BQ, being produced back again, will not coincide with the ray LI, but will fall to the right thereof; and this the more as the glaſs is thicker; however, as to matter of colour, the ſecond *refraction* does really undo the firſt. See Colour.

Refraction *in iſland cryſtal.* See *Iſland* Crystal.

The particular laws of Refraction *in the ſeveral kinds of lenſes,* ſee under Lens.

Refraction, *cauſtics by.* See Curve *cauſtic.*

Refraction, in *Aſtronomy*, or Refraction *of the ſtars*, is an inflexion of the rays of thoſe luminaries, in paſſing through our atmoſphere; whereby the apparent altitudes of the heavenly bodies are increaſed.

This *refraction* ariſes hence, that the atmoſphere is unequally denſe in different ſtages or regions; rareſt of all at the top, and denſeſt of all at bottom; which inequality, in the ſame medium, makes it equivalent to ſeveral unequal mediums. See Atmosphere.

Sir Iſaac Newton has ſhewn, that a ray of light, in paſſing from the higheſt and rareſt part of the atmoſphere, down to the loweſt and denſeſt, undergoes the ſame *refraction* that it would do in paſſing immediately, at the ſame obliquity, out of a vacuum into air of equal denſity with that in the loweſt part of the atmoſphere.

The effect of this *refraction* may be thus conceived. Suppoſe ZV (*Tab. Aſtronom. fig.* 49.) a quadrant of a vertical circle deſcribed from the centre of the earth T, under which is AB a quadrant of a circle on the ſurface of the earth, and GH a quadrant of the ſurface of the atmoſphere; and ſuppoſe SE a ray of light emitted by a ſtar at S, and falling on the atmoſphere at E. This ray coming out of the ethereal medium, which is much rarer than our air, or perhaps out of a perfect vacuum, and falling on the ſurface of the atmoſphere, will be refracted towards the perpendicular; and ſince the upper air, again, is rarer than that near the earth, and grows ſtill denſer as it approaches us; the ray, in its progreſs, will be continually refracted, ſo as to arrive at the eye in the curve line EA.

Suppoſing, then, the right line AF to be a tangent to the arch in A, the ray will enter the eye A, according to the direction of AF. And ſince objects are always ſeen in that line according to the direction whereof the rays enter the eye, the ſtar will appear in AF; that is, in the heavens at Q, which is nearer the zenith than the ſtar really is.

Hence ariſe the phenomena of the crepusculum, or twilight. See Atmosphere.

And hence, alſo, it is, that the moon is ſometimes ſeen eclipſed, when ſhe is really below the horizon, and the ſun above it.

That there is a real *refraction* of the ſtars, &c. is deduced not only from phyſical conſiderations, and from arguments *à priori*, and *a ſimilitudine*; but alſo from preciſe aſtronomical obſervations: thus,

The diſtance of the two ſtars, Spica Virginis and the Lion's Tail, when near the meridian, or even when near the weſt, is conſtantly found 35° 2′; but when the Lion's Tail is riſen in the eaſt 34° 0′ high, Spica Virginis is obſerved to be in almoſt the ſame vertical circle. Add to this an obſervation of the Dutch, who wintered at Nova Zembla in 1596, in the latitude of 76°, from whom the ſun totally diſappeared on the third of November; and again began to appear on the twenty-fourth of January, which was ſeventeen days ſooner than he ſhould have returned, according to aſtronomical calculations; as is obſerved by Kepler in his Aſtr. Opt. p. 138. Some have thought that the Hollanders miſreckoned either their latitudes or their time; but their account ſeems too accurate to admit of ſuch a ſuſpicion. The cauſe of this extraordinary *refraction* was probably the very great condenſation of the air, in that extremely cold region, during a night of above three months continuance. Nor muſt it be omitted, that Charles XI. king of Sweden, being, in 1694, in Tornou, in Weſt Bothnia, in the latitude of 65° 43′, obſerved that the ſun never ſet between the fourteenth and fifteenth day of June, but was viſible in the middle of the night. The following year he appointed two mathematicians, Bilembergius and Spolius, to obſerve the ſame more accurately; who accordingly found, that at Tornou, in the middle of the night between the tenth and eleventh of June, the ſun was $\frac{1}{4}$ of his diameter above the horizon; and on the fourteenth of June, at Kangis, in the latitude of 66° 15′, they found the ſun at midnight two diameters above the horizon. Acta Erudit. A. D. 1697. p. 93.

Hence it is argued, that as light is propagated in right lines, no rays could reach the eye from a luminary below the horizon, unleſs they were deflected out of their courſe, at their entrance into the atmoſphere; it is evident, therefore, that the rays are refracted in paſſing through the atmoſphere. Hence the ſtars appear higher by *refraction* than they really are; ſo that to bring the obſerved or apparent altitudes to the true ones, the quantity of *refraction* muſt be ſubtracted.

And hence, as the ancients were unacquainted with the *refraction*, reckoning upon too great altitudes, it is no wonder they ſometimes committed conſiderable errors.

From the doctrine of *refractions* it appears, that we never ſee the real ſun riſing or ſetting, but only a phantom, or image, thereof; the ſun himſelf being at that time hid below the horizon. So that *refraction* lengthens the day and ſhortens the night, by making the ſun appear above the horizon a little before his riſing, and a little after his ſetting. *Refraction* alſo makes the moon and ſtars appear to riſe ſooner and ſet later than they really do. The apparent diameter of the ſun or moon is about half a degree; the horizontal *refraction* is a little more than this quantity; whence the ſun and moon appear wholly above the horizon when they are entirely below it.

And from the obſervations juſt mentioned, it follows, that the *refractions* are greater nearer the pole, than at leſſer latitudes, cauſing the ſun to appear ſome days above the horizon, when he is really below it; doubtleſs, from the greater denſity of the atmoſphere, and the greater obliquity of the incidence.

M. de la Hire aſſures us, he could never find any difference in the meridian altitudes of the ſtars; ſo that the *refractions* remain always the ſame: though he owns, near the horizon, the different conſtitution of the air, &c. may occaſion ſome variations in the *refractions*.

Stars in the zenith are not ſubject to any *refraction*. Thoſe in the horizon have the greateſt of all. From the horizon the *refraction* continually decreaſes to the zenith; all which follows hence, that in the firſt caſe the rays are perpendicular; in the ſecond their obliquity is the greateſt, and they paſs through the largeſt ſpace of the lower and denſer part of the air, and through the thickeſt vapours; and in the third, the obliquity is continually increaſing.

The horizontal *refraction* being the greateſt is the cauſe of the ſun and moon appearing of an oval form, at their riſing and ſetting; for the lower edge of each being more refracted than the upper edge, the perpendicular diameter is ſhortened, whereas *refraction* does not ſhorten the tranſ-

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transverse diameter: besides, the lower edge suffering the greatest *refraction*, the horizontal sun or moon does not appear a complete ellipsis, but the lower half is part of a more oblong oval than the upper half. Hence also, if we take with an instrument the distance of two stars when they are in the same vertical and near the horizon, we shall find it considerably less than if we measure it when they are both at such a height as to suffer little or no *refraction*; because the lower star is more elevated than the higher. There is also another alteration made by *refraction* in the apparent distance of stars: if two stars are in the same almicantar, or circle parallel to the horizon, their apparent distance is less than the true; for since *refraction* makes each of them higher in the vertical or azimuth in which they appear, it must bring them into parts of the vertical where they come nearer to one another; because all vertical circles converge and meet in the zenith. This contraction of distance, according to Dr. Halley (Phil. Transf. N° 368.) is at the rate of at least one second in a degree; so that, e. gr. if the distance between two stars in a position parallel to the horizon measures 30°, it is at most to be reckoned only 29° 59′ 30″.

The air is condensed, and, consequently, *refraction* is increased by cold; and, therefore, it is greater in cold countries than in hot; it is also greater in cold weather than in hot, in the same country; and the morning *refraction* is greater than that of the evening, because the air is rarefied by the heat of the sun in the day, and condensed by the coldness of the night. *Refraction* is also subject to some small variation at the same time of the day in the finest weather.

Fa. Laval, in 1710, January 22, observed the meridian altitude of the sun to be 70° 25′ 50″; and, on the 23d of June he observed the same to be 70° 26′ 0″; which is 10″ more, that should be less. Having met with some like observations before, he takes occasion to suspect the *refraction* to be varied according to the different winds which blow from the different quarters. When the north-west wind blows, he thinks the *refraction* is the greatest; and adds, from observations made at St. Baume and St. Pilon, that the *refraction*, at twenty-four fathoms above the surface of the sea, is double that at six hundred fathoms. Huygens long ago observed the *refraction* to be changed every hour; though his experiments were made at very little altitudes, and in terrestrial objects.

At the same altitudes, the sun and stars all undergo the same *refraction*; for at equal altitudes the incident rays have the same inclinations; but the sines of the refracted angles are as the sines of the angles of inclination, &c.

Indeed, Tycho Brahe, who first deduced the *refractions* of the sun, moon, and fixed stars, from observation, and whose table of the *refraction* of the stars is not much different from those of Flamsteed and Newton, except near the horizon, makes the solar *refractions* about 4′ greater than those of the fixed stars; and the lunar *refractions* sometimes greater than those of the stars, and sometimes less. But the theory of *refractions* (which we have observed is owing to Snellius) was not fully understood in his age. De la Hire and Cassini find the *refraction* the same in all.

Tycho Brahe will have the *refractions* of the sun to vanish at the altitude of 46°, those of the moon at 45°, and those of the fixed stars at 20°; but Cassini has found, that they reach even to the zenith. Indeed, Tycho represented all the *refractions* less than they are, except the horizontal one, which he made too great; for he makes the horizontal *refraction* in the sun 34′, in the moon 33′, in the fixed stars 30′. De la Hire makes it 32′, and Cassini 32′ 20″ in all the heavenly bodies. Tycho, again, makes the *refraction* of the sun at 33° altitude, to be 55″; but Cassini 1′ 30″.

The following table shews the *refractions* of the heavenly bodies at the several degrees of altitude, according to Newton, Flamsteed, and Bradley.

Apparent alt.	Refractions.			Apparent alt.	Refractions.		
	Newton	Flamst.	Bradley		Newton	Flamst.	Bradley
° ′	′ ″	′ ″	′ ″	° ′	′ ″	′ ″	′ ″
0 0	33 45	33 0	33 0	1 15	21 20	—	—
0 5	—	—	32 10	1 20	—	—	22 15
0 10	—	—	31 22	1 30	19 46	20 17	21 15
0 15	30 24	—	30 35	1 40	—	—	20 18
0 20	—	—	29 50	1 45	18 22	—	—
0 30	27 35	26 38	28 22	1 50	—	—	19 25
0 32	—	—	28 5	2 0	17 8	17 26	18 35
0 36	—	—	27 30	2 10	—	—	17 48
0 40	—	—	27 0	2 20	—	—	17 4
0 45	25 11	—	—	2 30	15 2	15 15	16 24
0 50	—	—	25 42	2 40	—	—	15 45
1 0	23 7	23 22	24 29	2 50	—	—	15 9
1 10	—	—	23 20	3 0	13 20	13 23	14 36

Apparent alt.	Refractions.			Apparent alt.	Refractions.		
	Newton	Flamst.	Bradley		Newton	Flamst.	Bradley
° ′	′ ″	′ ″	′ ″	° ′	′ ″	′ ″	′ ″
3 10	—	—	14 4	21 30	—	—	2 24
3 20	—	—	13 34	22 0	2 11	2 1	2 20
3 30	11 57	11 53	13 6	23 0	2 5	1 55	2 14
3 40	—	—	12 40	24 0	1 59	1 50	2 7
3 50	—	—	12 15	25 0	1 54	1 45	2 2
4 0	10 48	10 39	11 51	26 0	1 49	1 40	1 56
4 10	—	—	11 29	27 0	1 44	1 36	1 51
4 20	—	—	11 8	28 0	1 40	1 31	1 47
4 30	9 50	9 38	10 48	29 0	1 36	1 27	1 42
4 40	—	—	10 29	30 0	1 32	1 23	1 38
4 50	—	—	10 11	31 0	1 28	1 20	1 35
5 0	9 2	8 48	9 54	32 0	1 25	1 17	1 31
5 10	—	—	9 38	33 0	1 22	1 14	1 28
5 20	—	—	9 23	34 0	1 19	1 11	1 24
5 30	8 21	—	9 8	35 0	1 16	1 9	1 21
5 40	—	—	8 54	36 0	1 13	1 7	1 18
5 50	—	—	8 41	37 0	1 11	1 5	1 16
6 0	7 45	7 26	8 28	38 0	1 8	1 2	1 13
6 10	—	—	8 15	39 0	1 6	1 0	1 10
6 20	—	—	8 3	40 0	1 4	0 58	1 8
6 30	7 14	—	7 51	41 0	1 2	0 56	1 5
6 40	—	—	7 40	42 0	1 0	0 54	1 3
6 50	—	—	7 30	43 0	0 58	0 52	1 1
7 0	6 47	6 25	7 20	44 0	0 56	0 50	0 59
7 10	—	—	7 11	45 0	0 54	0 48	0 57
7 20	—	—	7 2	46 0	0 52	0 46	0 55
7 30	6 22	—	6 53	47 0	0 50	0 45	0 53
7 40	—	—	6 45	48 0	0 48	0 44	0 51
7 50	—	—	6 37	49 0	0 47	0 42	0 49
8 0	6 0	5 37	6 29	50 0	0 45	0 40	0 48
8 10	—	—	6 22	51 0	0 44	—	0 46
8 20	—	—	6 15	52 0	0 42	—	0 44
8 30	5 40	—	6 8	53 0	0 40	—	0 43
8 40	—	—	6 1	54 0	0 39	—	0 41
8 50	—	—	5 55	55 0	0 38	0 34	0 40
9 0	5 22	5 2	5 48	56 0	0 36	—	0 38
9 10	—	—	5 42	57 0	0 35	—	0 37
9 20	—	—	5 36	58 0	0 34	—	0 35
9 30	5 6	—	5 31	59 0	0 32	—	0 34
9 40	—	—	5 25	60 0	0 31	0 29	0 33
9 50	—	—	5 20	61 0	0 30	—	0 32
10 0	4 52	4 33	5 15	62 0	0 28	—	0 30
10 15	—	—	5 7	63 0	0 27	—	0 29
10 30	—	—	5 0	64 0	0 26	—	0 28
10 45	—	—	4 53	65 0	0 25	—	0 26
11 0	4 27	4 6	4 47	66 0	0 24	—	0 25
11 15	—	—	4 40	67 0	0 23	—	0 24
11 30	—	—	4 34	68 0	0 22	—	0 23
11 45	—	—	4 29	69 0	0 21	—	0 22
12 0	4 5	3 45	4 23	70 0	0 20	0 19	0 21
12 20	—	—	4 16	71 0	0 19	—	0 19
12 40	—	—	4 9	72 0	0 18	—	0 18
13 0	3 47	3 29	4 3	73 0	0 17	—	0 17
13 20	—	—	3 57	74 0	0 16	—	0 16
13 40	—	—	3 51	75 0	0 15	—	0 15
14 0	3 31	3 13	3 45	76 0	—	—	0 14
14 20	—	—	3 40	77 0	—	—	0 13
14 40	—	—	3 35	78 0	—	—	0 12
15 0	3 17	3 0	3 30	79 0	—	—	0 11
15 30	—	—	3 24	80 0	—	0 9	0 10
16 0	3 4	2 48	3 17	81 0	—	—	0 9
16 30	—	—	3 10	82 0	—	—	0 8
17 0	2 53	2 38	3 4	83 0	—	—	0 7
17 30	—	—	2 59	84 0	—	—	0 6
18 0	2 43	2 29	2 54	85 0	—	—	0 5
18 30	—	—	2 49	86 0	—	—	0 4
19 0	2 34	2 21	2 44	87 0	—	—	0 3
19 30	—	—	2 39	88 0	—	—	0 2
20 0	2 26	2 14	2 35	89 0	—	—	0 1
20 30	—	—	2 31	90 0	—	0 0	0 0
21 0	2 18	2 7	2 27				

The table of Mr. Flamsteed is taken from his Historia Cælestis, vol. i. p. 396, and is the result of his own observations. Sir Isaac Newton's table was first published in the Philosophical Transactions, N° 368, for May 1721; Dr. Bradley's is published in the tables requisite to be used with the Astronomical and Nautical Ephemeris, 1766, and is adapted to a mean temperature of the air at Greenwich; the height of the barometer being 29 $\frac{6}{10}$ inches, and that of Fahrenheit's thermometer 50 degrees, or 30 inches of the barometer, and 55 of the thermometer, which gives the same result: it is deduced from a rule which he invented, and by him adapted to his observations, viz. that the *refraction* at any altitude is to 57″, the *refraction* at the altitude of 45°, as the tangent of the apparent zenith distance lessened by three times the *refraction* taken out of any common table is to the radius. In order to allow for the variations of *refraction* in different temperatures of the air, he has stated another rule, derived also from or confirmed by his own observations, that the true *refraction* is to that expressed by his first rule, or contained in this table, in a direct

ratio

 REF

ratio of the altitude of the barometer to $29\frac{6}{10}$ inches, and in an inverse ratio of the altitude of the thermometer increased by 350 to the number 400.

It is evident that all observed altitudes of the heavenly bodies ought to be diminished by the numbers taken out of this table, particularly the meridian altitudes of the sun and stars, &c. the altitudes of the sun and stars designed for computing the apparent time of the day, and the altitudes of the sun taken for computing his azimuth. Where the utmost degree of accuracy is required, there are other tables and rules formed by Mr. Lyons, and published in the tables just cited.

The *refraction* diminishes the right and oblique ascensions of a star, and increases the descensions; it increases the northern declination, and diminishes the southern.

Refraction, in the eastern part of the heavens, diminishes the longitude of a star; but it increases the same in the western part of the heavens; it diminishes the southern latitude also, and increases the northern.

The *refraction*, therefore, is by no means to be overlooked in astronomy. It is absolutely necessary to the determining of the phenomena of the heavenly motions to any degree of accuracy; so that the ancient astronomy, where no regard was had to it, must of necessity have been exceedingly defective on this very account.

To observe the Refraction *of a star*, &c. 1. Observe the meridian altitude of a star near the zenith; whence the latitude of the place being known, the true declination of the star is easily had, the star being now void of any sensible *refraction*. 2. Observe the altitude of the same star in any other degree, and note the time by a pendulum. 3. For the given time of observation, from the declination of the star compute its true altitude.

This being thus found less than the altitude observed, subtract the one from the other; and the remainder is the *refraction* for that moment, in that degree.

Refraction *of altitude* is an arch of a vertical circle, as S*s* (*Tab. Astronomy*, *fig.* 28.) whereby the altitude of a star SE is increased by the *refraction*.

Refraction *of declination*, is an arch of a circle of declination, as *s*I, whereby the declination of a star DS is increased or diminished by the *refraction*.

Refraction *of ascension and descension* is an arch of the equator D*d*, whereby the ascension and descension of a star, whether right or oblique, is increased or diminished, by means of the *refraction*.

Refraction *of longitude* is an arch of the ecliptic T*t*, *fig.* 29. whereby the longitude of a star is increased or diminished by means of the *refraction*.

Refraction *of latitude* is an arch of a circle of latitude *s*I, whereby the latitude of a star TS is increased or diminished by means of *refraction*.

Refraction, in *Commerce*, is a term sometimes used by merchants, where there has been an oversight in an account, to the prejudice of a person; who thereupon demands restitution of so much, added or omitted by mistake.

You must make me a *refraction* of five pounds forgot in your account. I will deduct or make you a *refraction* of 30*s.* charged inadvertently in my bill.

REFRACTORY, in *Chemistry*. See an explication of the term under Apyrous.

REFRANGIBLE, whatever is capable of being refracted. See Refrangibility.

REFRANGIBILITY *of light*, the disposition of the rays to be refracted.

A *greater* or *less refrangibility* is a disposition to be more or less refracted, in passing at equal angles of incidence, into the same medium.

That the rays of light are differently *refrangible*, is the foundation of Sir Isaac Newton's whole theory of light and colours. The truth of the principle will appear from the following experiments:

1. Let EG (*Tab.* VI. *Optics*, *fig.* 117.) represent the window-shutter of a dark room, and F a hole in it, through which the light is transmitted to the prism ABC, which refracts it towards PT, where it appears in an oblong form; its length being about five times greater than its breadth, and exhibiting the various colours of the rainbow. In *fig.* 118. *agb* represents a second prism, which refracts the light back again to Q, where the image is round; whereas, without the interposition of this second prism, the light would have proceeded to PT, and, consequently, have been oblong as before. In this experiment Sir Isaac Newton took care that the plane *ag* was placed exactly parallel to BC, and also *bg* to AC, that the rays might be equally refracted, though in contrary ways, by both prisms. He also observed, that both prisms must be placed very near to one another; for if their distance be so great, that colours begin to appear in the light, before its incidence on the second prism, those colours will not be destroyed by the refraction of that prism.

2. Having placed one of two boards behind the prism at the window, so that the light might pass through a small hole made in it for the purpose, and fall on the other board at the distance of about twelve feet, a hole being made in it to admit the passage of the incident light, he then placed another prism behind the second board, so that the light which was transmitted through both the boards might pass through that also, and be again refracted before it arrived at the wall. This being done, he took the first prism in his hand, and turned it about its axis so much as to make the several parts of the image, cast on the second board, successively to pass through the hole in it, that he might observe to what places on the wall the second prism would refract them; and he saw, by the change of those places, that the light tending to that end of the image, towards which the refraction of the first prism was made, did, in the second prism, suffer a refraction considerably greater than the light which tended to the other end. The true cause, therefore, of the length of that image was discovered to be no other, than that light is not similar or homogeneal, but that it consists of rays, some of which are more *refrangible* than others; so that, without any difference in their incidence on the same medium, some of them shall be more refracted than others; and therefore, that, according to their particular degrees of *refrangibility*, they will be transmitted through the prism to different parts of the opposite wall.

To make this capital experiment, which Sir Isaac Newton himself justly calls the *experimentum crucis*, let SF (*fig.* 119.) represent a ray of the sun, which, after passing through a hole in the window-shutter F, is received by the prism ABC, close behind which is placed a board DE, with a hole in it at G, to admit any of the rays after they have been separated by the prism; then *de* will represent the other board, placed at a considerable distance from the former, with a hole in it *g*, to receive any part of the light transmitted through the other board. Behind this second board is placed another prism, *abc*, through which different rays of light, falling upon it in the very same place, and with precisely the same angle of incidence, will be refracted higher or lower, on the opposite wall MN. This experiment was conducted with the utmost circumspection and accuracy; and it is observed, that neither the different magnitude of the hole in the window-shutter, nor the different thicknesses of the prism, at the place where the rays passed through it, nor the different inclinations of the prism to the horizon, nor the different matter of the prisms, made any sensible change in the length of the image.

3. In order farther to establish this famous hypothesis of the different *refrangibility* of the rays of light, he held a prism in a beam of the sun, which was transmitted into the room through a hole in the window-shutter, so that its axis might be perpendicular to that beam; and having turned the prism about its axis to make the image ascend and descend, and when it seemed to be stationary between these contrary motions, he fixed the prism so that the refractions of both sides might be equal to each other. In this situation he looked at the hole through the prism, and observed the length of its refracted image to be many times greater than its breadth: the most refracted part of it was violet, the least refracted red, the middle parts blue, green, and yellow, in order. The same thing happened when he removed the prism out of the sun's light, and looked through it upon the hole shining by the light of the clouds beyond it.

4. Considering that if the image of the sun should be drawn into an oblong form, either by a dilatation of every ray, or by any other casual inequality of the refractions, the same oblong image would, by a second refraction, made sideways, be drawn out as much in breadth, he placed a second prism immediately after the first, in an oblique position with respect to it, that it might again refract the light of the beam of the sun's light, which came to it through the first prism; so that in the first prism, the beam would be refracted upwards, and in the second sideways. But he found that the breadth of the image was not increased by the refraction of the second prism, but only its upper part, which in the first prism suffered the greatest refraction, and appeared violet and blue, did again, in the second prism, suffer a greater refraction than the lower part of it, which was red and yellow, and this without any dilatation of the breadth of the image. Thus let S (*fig.* 120.) represent the sun, F the hole in the window, ABC the first prism, and DH the second. If Y represent the round image of the sun, made by a direct beam of light, when the prisms are taken away, PT will be the oblong image of the sun, made by the same beam passing through the first prism only, and *pt* will be the image made by the cross refractions of both prisms together. Sometimes he placed a third prism after the second, and sometimes a fourth after the third;

by

by all which the image might be often refracted ſideways, but the rays which were more refracted than the reſt in the firſt priſm, were alſo more refracted in all the others, and that without any dilatation of the image ſideways; and, therefore, thoſe rays, on account of their conſtancy of a greater refraction, he called the more *refrangible* ones. He obſerves, that all the rays, which are equally *refrangible*, fall upon a circle anſwering to the ſun's diſk. If the ſecond priſm DH (*fig.* 121.) be placed not immediately after the firſt, but at ſome diſtance from it, ſo that the light from the firſt priſm may fall upon it in the form of an oblong ſpectrum qr, parallel to this ſecond priſm, and may be refracted ſideways, to form the oblong image pt upon the wall, it will be found that this image pt is inclined to the image PT, which the firſt priſm would have formed without the ſecond; the blue ends, P and p, being farther diſtant from one another than the red ones, T and t; and, conſequently, the rays which go to the blue end q of the image qr, and which, therefore, ſuffer the greateſt refraction in the firſt priſm, are again, in the ſecond priſm, more refracted than the reſt. Hence it appears, that the blue rays are more refracted than the red ones, and that there is, likewiſe, unequal refraction in the intermediate rays; and upon the whole it appears, that the ſun's rays have not all the ſame *refrangibility*, and, conſequently, are not of the ſame nature. It is alſo obſerved, that thoſe *rays* which are moſt *refrangible* are alſo moſt reflexible. See the proof of this under REFLEXIBILITY. Newton's Optics, p. 22, &c. ed. 3.

The difference between *refrangibility* and reflexibility, was firſt diſcovered by Sir Iſaac Newton, in 1671-2, and communicated in a letter to the Royal Society, dated February 6, 1671-2, and publiſhed in the Philoſophical Tranſactions, N° 80. p. 3075, and from that time vindicated by him, from the objections of ſeveral authors; particularly F. Pardies, M. Mariotte, Fr. Linus, or Lin, and other gentlemen of the Engliſh college at Liege; and at length it was more fully laid down, illuſtrated, and confirmed, by a great variety of experiments, in his excellent treatiſe of Optics.

But farther, as not only thoſe colours of light produced by refraction in a priſm, but alſo thoſe reflected from opake bodies, have their different degrees of *refrangibility* and reflexibility; and as a white light ariſes from a mixture of the ſeveral coloured rays, the ſame great author concluded all homogeneous light to have its proper colour, correſponding to its degree of *refrangibility*, and not capable of being changed by any reflexions, or any refractions; that the ſun's light is compoſed of all the primary colours; and that all compound colours ariſe from a mixture of the primary ones, &c.

The different degrees of *refrangibility* he conjectures to ariſe from the different magnitude of the particles whereof the different rays conſiſt. Thus the moſt refrangible rays, i. e. the red ones, he ſuppoſes to conſiſt of the largeſt particles; the leaſt refrangible, i. e. the violet rays, of the ſmalleſt particles; and the intermediate rays, yellow, green, and blue, of particles of intermediate ſizes. See COLOUR.

For the method of correcting the effect of the different *refrangibility* of the rays of light in glaſſes, ſee ABERRATION and TELESCOPE.

REFRESHMENT, *quarters of*. See QUARTERS.

REFRET, in *Muſic*. See RITORNELLO.

REFRIGERATIVE, in *Medicine*, a remedy which refreſhes the inner parts, by cooling them. Such, uſually, are ptiſans, clyſters, &c.

REFRIGERATORY, *refrigeratorium*, in *Chemiſtry*, a copper veſſel filled with cold water, ſoldered round the capital of an ALEMBIC, to cool and condenſe the vapours raiſed thither by the fire, and to convert them into a liquor, to be diſcharged thence through the beak. See *Tab. Chemiſtry, fig.* 1. E.

The water in the *refrigeratory* is to be changed from time to time, as it begins to grow warm.

Sometimes they content themſelves with wrapping a wet cloth about the head of the alembic, inſtead of a *refrigeratory*; but the more uſual method now is, to ſupply the place of the *refrigeratory* by a worm, or ſpiral pipe, running through a tub of cold water.

Diſtillation chiefly conſiſts in evaporation and *refrigeration*.

REFUGE, *refugium*, in our *Old Cuſtoms*, a SANCTUARY, or ASYLUM.

At Paris there is an hoſpital called the *Refuge*, wherein diſſolute women are ſhut up.

REFUGEES, French proteſtants, who, by the revocation of the edict of Nantes, in 1685, have been conſtrained to quit their country, and retire for *refuge* into Holland, Germany, England, &c. to ſave themſelves from the neceſſity of abandoning their religion.

REFUSAL, in *Law*, is where one hath by law a right and power of having or doing ſomething of advantage to him, and he *refuſeth* it. An executor may *refuſe* an executorſhip; but the *refuſal* ought to be before the ordinary: if an executor be ſummoned to accept or *refuſe* the executorſhip, and he doth not appear upon the ſummons and prove the will, the court may grant adminiſtration, &c. which ſhall be good in law till ſuch executor hath proved the will; but no man can be compelled to take upon him the executorſhip, unleſs he hath intermeddled with the eſtate. Where there are ſeveral executors, and they all *refuſe*, none of them ſhall adminiſter afterwards; but if there is a *refuſal* by one, and the other proves the will, the *refuſing* executor may adminiſter when he will, during the life of his co-executor.

There is a *refuſal* of a clerk preſented to a church, for want of literature, &c. and if a biſhop once refuſes a clerk for inſufficiency, he cannot accept of him afterward, if a new clerk is preſented. In actions of trover and converſion, a demand of the goods, and *refuſal* to deliver them, muſt be proved, &c.

REFUTATION, *refutatio*, in *Rhetoric*, that part of the anſwer made to an opponent, which diſproves what had been advanced by him.

REGAL, *regius*, or *regalis*, ſomething belonging to a king.

Regal is of the ſame import with ROYAL; the former being formed of the Latin *rex*; the other of the French *roy*, *king*.

REGAL *fiſh*. See ROYAL *fiſh*.

REGAL, in *Muſic*. See RIGOLL.

REGAL *ſuit*. See SUIT.

REGALE, in the French *Juriſprudence*, is a right belonging to the king over all benefices in that kingdom.

The *regale* conſiſts in enjoying the revenues of biſhopricks, during the vacancy of their ſees, and of preſenting to the benefices dependent thereon, which become vacant during that time, and till a ſucceſſor have taken the oath of fidelity, and have procured letters patent, to ſecure him from the *regale*.

The enjoyment of the fruits of the ſee is called the *temporal regale*; that of preſenting the benefices, the *ſpiritual regale*.

Some refer the origin of the *regale* to the time of Clovis; and ſay, the clergy granted this privilege to the king upon his defeating the Viſigoths; others alledge, that pope Hadrian I. gratified Charlemagne with it, in a council held at Rome. It is obſerved by others, that the *regale* was originally no more than a ward, or adminiſtration; and that the kings were only depoſitaries of the fruits of the vacant biſhopricks; and appointed œconomi to look to them during the vacancy.

It is added that the kings of the firſt and ſecond race never enjoyed any ſuch privilege; and that it was only introduced in the twelfth century, in favour of inveſtitures.

Whatever was the origin of the *regale*, it occaſioned a very important and warm debate between Lewis XIV. and pope Innocent XI. which began about the year 1678, and was carried on with great animoſity and contention for ſeveral years after. Lewis was deſirous, that all the churches in his dominions ſhould be ſubject to the *regale*. Innocent pretended, on the contrary, that his claim could not be granted with ſuch univerſality; nor would he conſent to any augmentation of the prerogatives of this nature, that had formerly been enjoyed by the kings of France. Lewis ſummoned, for ſettling this diſpute, the famous aſſembly of thirty-five biſhops, and as many deputies of the ſecond order, which met at Paris in the year 1682, and which extended the *regale* to all the churches in France, without exception. In this convocation the ancient doctrine of the Gallican church, that declares the power of the pope to be merely ſpiritual, and alſo inferior to that of a general council, was drawn up in four propoſitions, which were ſolemnly adopted by the whole aſſembly, and were propoſed to the whole body of the clergy, and to all the univerſities throughout the kingdom, as a ſacred and inviolable rule of faith.

REGALE, *regalio*, a magnificent treat, or entertainment, given to ambaſſadors, or other perſons of diſtinction, to entertain or do them honour.

In Italy it is uſual at the arrival of any traveller of eminence, to ſend him a *regale*, that is, a preſent of fruits, ſweetmeats, &c. by way of refreſhment.

REGALIA, in *Law*, the royal rights or prerogatives of a king.

Theſe are reckoned by civilians to be ſix. 1. Power of judicature. 2. Power of life and death. 3. Power of war and peace. 4. Maſterleſs goods, as waifs, eſtrays, &c. 5. Aſſeſſments. 6. Minting of money.

REGALIA is alſo uſed for the ſeveral parts of the apparatus of a coronation; as the ſceptre with the croſs; ſceptre with

with the dove; St. Edward's staff; four several swords; the globe, and the orb with the cross, &c. used at the coronation of our kings.

Regalia *of the church* are those rights and privileges which cathedrals, &c. enjoy by grants, and other concessions of kings.

Regalia is sometimes also used for the patrimony of a church; as, *regalia Sancti Petri*. And, more particularly, for such lands and hereditaments as have been given by kings to the church.

Cœpimus in manum nostram baroniam & regalia quæ archiepiscopus Eborum de nobis tenet. Pryn. lib. Ang.

These *regalia*, while in possession of the church, were subject to the same services as all other temporal inheritances; and, after the death of the bishop, they reverted to the king, till he invested another with them; which, in the reigns of William the Conqueror, and some of his immediate successors, was frequently delayed; and as oft did the bishops make complaint thereof, as appears from Malmsbury, Neubrigensis, &c.

This last author says, that great complaint was made against Henry II. *Quod episcopatus vacantes, & provenientia perciperet commoda, diu vacare voluit, & ecclesiasticis potius usibus applicanda in fiscum redegit.*

Regalia *facere* is used for a bishop's doing homage, or fealty, to the king, when he is invested with the *regalia*. Thus Malmesbury, in Anselm. Regalia *pro more istius temporis faciens principi* vii. *kalend. Octobris Cantuariæ assedit.*

REGALITIES. See Royalties.

REGARD *of the forest*, the oversight, or inspection, thereof; or the office and province of the *regarder*; which is, to go through the whole forest, and every bailiwick thereof, before the holding of the sessions of the forest, or justice-seat, to see and inquire of the trespasses therein, and for the survey of dogs. A court for this purpose is to be holden every third year. See Expeditation, and Forest.

Ad vivendum, ad inquirendum, ad certificandum, &c. See Regarder.

Regard is also used for the extent of the *regarder's* charge, i. e. for the whole forest; or all the ground that is parcel thereof.

REGARDANT, in *Heraldry*, is understood of a lion, or other beast of prey, borne in a posture of looking behind him, with his face towards his tail.

Others apply it to a beast which only shews the head, and some part of the neck, as moving from out of some division of the coat into another. He bears azure, three bends, or, in a chief, argent, charged with a lion *regardant*, gules.

Regardant, *villain*, or Regardant *to the manor*, denotes an ancient servant or retainer to the lord; thus called, because charged to do all base services within the manor, to see the same freed of all filthy and loathsome things that might annoy it, &c. Coke upon Littleton, fol. 120.

REGARDER *of a forest*, Regardator *forestæ*, an ancient officer of the king's forest, whose business was every year, upon oath, to make a regard, i. e. to take a view of the forest limits; also to inquire of all offences and defaults committed by the foresters within the forest, and of all the concealments of them; and whether all the other officers did execute their respective duties or not.

Manwood refers this institution to king Henry II. but Spelman thinks the name, at least, was given since; and that they were the same with those officers called *custodes venationis*.

REGATTA is a name given, at Venice, to a kind of exhibition on the water, in which the gondoliers contest for superiority in the art of rowing their gondolas.

A splendid entertainment, under this appellation, was exhibited on the Thames in 1775.

REGE *inconsulto*, in *Law*, is a writ, issued from the king to the judges, not to proceed in a cause which may prejudice the king, until he is advised. A *rege inconsulto* may be awarded, not only for the party to the plea, but upon suggestion of a stranger, on cause shewn that the king may be prejudiced by the proceeding, &c.

Rege *querela coram*. See Querela.

REGEL, or Rigel, a fixed star of the first magnitude, in Orion's left foot. Its longitude, latitude, &c. see among the rest of the constellation Orion.

REGENERATED *tartar*. See Tartar *regenerated*.

REGENERATION, in *Theology*, the act of being born again by a spiritual birth, or becoming a child of God: or it is that change of heart and life experienced by a person who forsakes a course of vice and sincerely embraces a life of piety and virtue.

When an infidel is converted, baptism is always administered as a sign of *regeneration*.

REGENT, *regens*, a person who governs a kingdom during the minority or absence of a king.

In France, the queen-mother has the regency of the kingdom, under the title of *queen-regent*, while the king is a minor. Some have urged, that women, being incapable of succeeding to that crown, were incapable of the regency; but custom has declared in their favour.

Regent is also used for a professor of arts or sciences, who holds a class, or set of pupils, in a college.

The foreign universities are generally composed of doctors, professors, and *regents*. *Regent* and scholar are relative terms. See Tutor.

Regent is generally restrained to the lower classes, as *regent* of rhetoric, *regent* of logic, &c. those of philosophy are rather called professors.

REGERENDARIUS, among the Romans, an officer who subscribed and kept a register of all petitions presented to the præfect. Pitisc. in voc.

REGESTOLA, in *Ornithology*, a name used, by some authors, for the mattagess, or larger butcher-*bird*, a very small hawk, not exceeding the size of a common thrush, but very fierce and voracious.

REGIA *aqua*. See Aqua.

Regia, *via*. See Via.

Regia, *villa*. See Villa.

REGICIDE, *regicida, a king-killer*. The term is also used for the act itself of murdering a king; of *rex, king*, and *cædo, I slay*.

Regicide is chiefly used with us in speaking of the persons concerned in the trial, condemnation, and execution, of king Charles I.

REGIFUGE, *Regifugium*, a feast held in ancient Rome on the sixth of the calends of March, i. e. on our 24th of February, in memory of the expulsion of their kings, particularly of Tarquin's flying out of Rome on that day.

Some will have the feast to bear this name from the *rex sacrorum, king of the sacrifices*, flying out of the comitia, or place of assembly, as soon as the sacrifice was over, in imitation of the flight of Tarquin the Proud.

Some critics and antiquaries will have *Regifugium* the same with Fugalia; others hold them to be different.

REGIMEN, in *Medicine*, a rule or course of living, with regard to eating, drinking, clothing and the like, accommodated to some disease, and to a particular course of medicine the patient is under.

The word is Latin, and signifies *government* or *rule*.

It is doubted whether the hot or cold *regimen* be most convenient in fevers. The hot *regimen*, which anciently obtained in the small-pox, is now altogether disused.

The *regimen* is very different in different countries. Bartholin says, a slice of bacon, in Denmark, is a usual dish for a person in a high fever. See Diet and Food.

Regimen, in *Chemistry* and *Alchemy*, is the method of ordering and conducting any thing, that it may answer its intention.

Thus, *regimen of fire* is the method of making and ordering fire, and the degrees thereof.

Regimen *of the work*, that is of the philosophers stone, called *the work of patience*, is the rule and conduct to be observed to attain projection.

There are three things, they say, to be chiefly regarded in the *regimen of the work*. The first, to administer a gentle easy heat at the beginning of the coction.

The second, to continue this external heat according to the season of the work, always observing four seasons, as in the common and astronomical year; the beginning being the winter, the progress the spring, then summer, and lastly autumn, which is the time of maturity and perfection of the stone; in all which the heat is to be augmented in proportion to the augmentation observed in nature.

It is to be added, that the work may not be begun in any season; but regard is to be had to the seasons of nature, lest the winter of the work be found in the summer of the year, &c. Which, however, is to be understood of the day wherein the mercury is put in the ovum philosophicum, not of that when it is begun to be set at liberty from the prisons which nature had inclosed it in.

The third is, that in augmenting the fire, the augmentation be not of a whole degree at once, the spirits being unable to bear such violence; but a degree is to be divided into four parts, and one part is to be taken at a time.

All the operations of the first *regimen* are occult and invisible: in the second *regimen* comes putrefaction, which, they say, is the first sensible change, shewing itself by its black colour.

Regimen, or *government*, in *Grammar*, is that part of syntax or construction, which regulates the dependency of words, and the alterations which one occasions in another.

Thus, we say, the *regimen* of a verb active is an accusative, i. e. a verb active governs an accusative; or requires, that the noun, which receives its action, be in the accusative case.

Prepositions have a *regimen*, i. e. they require certain cases in the nouns they are prefixed to; by which they are distinguished from adverbs, which have none.

The *regimen*, or construction of government, is entirely arbitrary, and differs in all languages; one language forming its *regimen* by cases, as the Latins and Greeks; others by particles in lieu thereof, as the English by *of*, *to*, &c. the French, Spaniards, and Italians, by *de*, *a*, *da*, &c.

There are, however, some general maxims, which hold good in all languages; as, 1. That there is no nominative case in any sentence but has a reference to some verb, either expressed or understood.

2. That there is no verb but has its nominative case, either expressed or understood. Indeed, in languages which have proper accusatives, as the Latin, before infinitives there is an accusative, not a nominative case; as, *Scio Petrum esse doctum*.

3. That there is no adjective but has a relation to some substantive.

4. That there is no genitive case but is governed by some other noun; inasmuch as that case always expresses the possessor, which must be governed by the possessed. This rule does not hold so apparently in the modern as it does in the ancient languages; because the particles *of*, *de*, &c. which are the proper signs of the genitive case, are frequently used as prepositions. See GENITIVE.

5. That the *regimen* of verbs is frequently laid on different kinds of relations, according to custom or usage; which yet does not change the specific relation of each case, but only shews, that custom has made choice of this or that, according to fancy. Thus the Latins say, *juvare aliquem*, and *opitulari alicui*, *to help one*. So the French say, *servir quelqu'un*, and *servir à quelqu'un*, *to serve one*. Thus the English say, *fight one*, or *fight with one*. And thus, in Spanish, most of the verbs active govern indifferently either a dative or an accusative. Sometimes, also, the verb admits of several *regimens*; as *præstare aliquem*, or *alicui*; *eripere morti aliquem*, or *aliquem à morte*.

Indeed, the different *regimen* sometimes makes an alteration in the sense; in which, particular regard is to be had to the usage of the language. Thus, the Latin *cavere alicui* signifies *to watch*, or *be careful of the preservation of any one*; *cavere aliquem* signifies *to beware of him*.

There is one very common fault in *regimen*, which our accurate writers should be careful to avoid; viz. the using of two verbs that require different cases together, as only governing one case; as in this example; after *embracing and giving his blessing to his son*; where *embracing* requiring an accusative, and *giving* a dative case, the *regimen* or construction of the first verb with the noun is irregular; *embrace to a son*.

The same may be observed in nouns; as, *I conjured him by the memory and the friendship he bore my father*; where *memory* does not agree with *he bore*.

REGIMENT, in *War*, a body consisting of several troops of horse, or companies of foot, commanded by a colonel, lieutenant-colonel, and major.

The number of men in a *regiment* is as undetermined as that of the men in a troop, or company.

Each *regiment* of foot is divided into companies, but the number of companies is various; though in England our *regiments* are generally ten companies, one of which is always grenadiers, exclusive of two independent companies. *Regiments* of horse are generally six troops, but there are some of nine. Dragoon *regiments* are commonly in war-time eight troops, and in time of peace but six. Each *regiment* has a chaplain, quarter-master, adjutant, and surgeon.

Some German *regiments* consist of 2000 foot; and the *regiment* of Picardy in France consists of 120 companies, or 6000 men.

The French *regiments* of horse are not commanded by a colonel, as the foot are, but by a mestre de camp.

Some observe, that there were no *regiments* of horse before the year 1637. Till then the troops were loose and independent of each other, and not incorporated into a body or *regiment*.

Regiments, it is said, were first formed in France, under the reign of Charles IX. though F. Daniel refers them to the time of Henry II. and in England in the year 1660.

REGIMENTAL *staff*. See STAFF.

REGIMENTALS, the uniform clothing of the army, consisting of a hat, coat, waistcoat, breeches, shirts, stocks, shoes, stockings, spats, spatterdashes, &c.

REGINA *aurarum*, in *Ornithology*, a name given by Nieremberg to a bird called by the Mexicans *cozcacoauhtli*. It has obtained its name from its being able to fly against the strongest winds. It is of the bigness of an eagle, and its whole body is of a blackish purple, variegated with a brownish yellow and deep black; its wings are variegated with black, yellow, and grey; its legs are red; its claws very strong and sharp; and its beak like that of a parrot; it has some rugose skin on the forehead, and about the beak; and its tail is black above, and grey underneath. It feeds on snakes, rats, and other vermin, but will also eat human dung; it flies very high; it is a native of Mexico, and breeds in spring; its feathers are said to be a remedy for many diseases; but the truth of this account is much to be doubted. Ray.

REGINA, *salve*. See SALVE.

REGIO *assensu* is a writ whereby the king gives his royal assent to the election of a BISHOP.

REGION, *regio*, in *Geography*, a country, or particular division of the earth; or a tract of land inhabited by people of the same nation.

The modern astronomers divide the MOON into several *regions*, or provinces, to each whereof they give its proper name.

REGION, in *Physiology*. Authors divide the ATMOSPHERE into three stages, called the *upper*, *middle*, and *lower regions*.

The lowest *region* is that wherein we breathe, and is bounded by the reflexion of the sun's rays, that is, by the height to which they rebound from the earth.

The middle *region* is that wherein the clouds reside, where meteors are formed, &c. extending from the extremity of the lowest, to the tops of the highest mountains.

The upper *region* commences from the tops of the mountains, and reaches to the utmost limits of the atmosphere. In this reigns a perpetual, equable calmness, clearness, and serenity.

REGION, *elementary*. See ELEMENTARY.

REGION, *ethereal*, is used for the whole extent of the universe, including the orb of the fixed stars, &c.

REGIONS *of the sea*. As the naturalists, in their descriptions of the subterranean parts of the globe, distinguish the earth into three *regions* of different depths, in which different temperatures are observed; so in describing the sea, they allow it two *regions*; the one extending from the surface of the water, down so low as the rays of the sun can pierce, and extend their influence; and the other, from the lowest bounds of that to the bottom. It is easy to see, that these *regions* rather regard quality than space, and that their boundaries are far from being regular, or equal in all places, and at all times. The places exposed to the hottest sunshine will have the largest upper *region*; those where the sun has least power will have the smallest; and the same part of the sea will have its upper *region* more or less deep, according to the season of the year. This upper *region* of the sea is always more or less hot; the lower *region*, except in some few particular places, is every where cold; and the water, where the upper *region* is large, is always remarkably still and quiet in the lower. Boyle of Cosmical Qualities.

REGION, *subterranean*. The earth is not only divided on its surface into *regions* and countries, but philosophers, who have had occasion to discourse of its inner parts, have also divided them into three distinct *regions*, according to their different depths from the surface. The temperature of the subterranean parts of the globe is distinguished according to the division of these *regions*, but is not so regular and precise as some have supposed. The first *region* of the earth is very variable, both as to bounds and temperature. The second *region* seems for the most part cold, in comparison of the other two; but in several places, which, by reason of their distance from the surface of the earth, it would be natural to call the middle *region*, the temperature of the air is very different at the same seasons of the year, which shews that it depends on something more than bare depth from the surface. The third *region* of the earth is universally observed to be warm, but by no means regularly or uniformly: the same depth in some places, giving only a moderate warmth, while in others it gives a very considerable heat.

Borrichius tells us of a certain abbé, fond of chemistry, and particularly curious in the matter of long digestions by regular heat, who found a way of making a furnace perpetually warm, by piercing the earth to a certain depth, and using the heat of this third *region* of it. His method, we are told, was to bore a hole with a pike twenty feet deep, and pour into it ten or twelve pounds of quicksilver; this made its way into the strata, and through them in a body into the chambers of heat in this third *region*, where the heat, having a vent upwards, made

made by this opening, never failed to ascend in a perpetual and regular stream, and gave that regular digesting heat that no artificial fire could equal. But this is an alchemical story. Boyle of Cosmical Qualities. Borrich. de Ortu Chem.

REGION, in ancient Rome, a part or division of the city. They were only four in number till Augustus's time, who divided the city into fourteen *regions*, over each of which he settled two surveyors, called *curatores viarum*, who were made annually, and took their divisions by lot. These fourteen *regions* contained 424 streets, 31 of which were called great or royal streets, which begun at the gilt pillar that stood at the entry into the open place in the middle of the city.

The extent of these divisions varied greatly, some being from 12,000 or 13,000 to 33,000 feet and upwards in circumference. Authors, however, are not agreed as to the exact limits of each.

REGION, in *Anatomy*, denotes also a division of the human body. Anatomists divide the body into three *regions*, or venters.

The upper *region* is that of the head, reaching as low as the first vertebra, and comprehending the animal organs, the brain, &c. See HEAD, &c.

The middle *region* is that of the thorax or breast, which Hippocrates calls the upper venter, and which reaches from the clavicles to the diaphragm: in this are contained the vital parts, as the heart, lungs, &c. See HEART, LUNGS, &c.

The third, or lower *region*, is the abdomen or belly, &c. containing the natural parts, destined for digestion, purgation, and generation. See ABDOMEN.

REGION, *epicolic*, *epigastric*, and *umbilical*. See the adjectives.

REGIONARY, *regionarius*, in *Ecclesiastical History*, a title given from the fifth century to persons who had the charge and administration of the church affairs within a certain district or region.

At Rome there were anciently seven *regionary* deacons, who presided over a kind of hospitals, and looked to the distribution of alms.

There were also *regionary* subdeacons, and *regionary* notaries, as also *regionary* bishops, &c.

A *regionary* bishop was properly a missionary invested with an episcopal character, but without being attached to any particular see, that he might be at liberty to go to preach, and perform other functions of his ministry, whithersoever the Spirit of God and the wants of the people should call him.

REGIS *pondus*. See PONDUS.

REGIS *villa*. See VILLA.

REGISTER, *registrum*, a public book serving to enter and record memoirs, acts, and minutes, to be had recourse to occasionally, for the justifying of matters of fact. Menage derives the word, by corruption, from *regestum*, a book containing extracts of several books, &c. collected together: *Dicitur regestum quasi iterum gestum*. Others derive it from the old French *gister*, *to lie down in a bed*, &c.

The law of Scotland is rendered very easy and regular by means of the great number of *registers*, for recording the conveyances of lands, &c. of private persons. Of these there are two kinds: the one general, fixed at Edinburgh, under the direction of the *lord register*, who, before the Union, was the fifth officer of the state, and, besides the registry, was clerk of the parliament, treasury, exchequer, and session.

The other is particularly kept in the several shires, stewarties, and regalities. The clerks hereof are obliged to transmit the *registers* of their respective courts to the general *register*; and the notaries their protocols: and here they are so disposed, that, on demand, the lieges can have a view of any writs, which the law require to be registered, or which parties, for their security, have thought fit to record.

The *registers* were first set on foot by act of parliament under king James VI. to the unspeakable advantage of the subject.

No man can have a right to any estate, but it must be registered within forty days of his becoming seised of it, otherwise it is null; and by this means all secret conveyances are cut off.

By a law, in 1704, it was enacted, that a memorial of all deeds and conveyances, and of all wills and devises in writing, whereby any honours, manors, &c. in the West Riding of Yorkshire, might be any way affected in law or equity, may, at the election of the party or parties concerned, be registered: and that, after such *register*, every subsequent deed or conveyance of the said honours, manors, &c. so registered, or any part thereof, shall be adjudged fraudulent and void, unless a memorial thereof shall also be registered: and the like of wills, &c. But this act did not extend to copyhold estates, nor to leases at rack-rent, nor to any lease not exceeding twenty-one years.

In the year 1708, a similar statute was passed for the registering of deeds, conveyances, wills, devises, mortgages, &c. in the East Riding of Yorkshire: and all the provisions and clauses in this act were hereby extended to the honours, manors, lands, and tenements, in the West Riding of the same county.

In 1709, a law was made for the public registering of deeds, conveyances, wills, &c. in the county of Middlesex; which may be done for the fee of one shilling: and every deed or conveyance, which shall hereafter be executed, shall be adjudged fraudulent and void, against any subsequent purchaser or mortgagee for valuable consideration, unless such memorial thereof be registered according to the direction of this act, before the registering of the memorial of the deed or conveyance, under which such subsequent purchaser or mortgagee shall claim; and the like as to memorials of wills not registered.

In 1735, a similar *register* of mortgages, &c. was legally enacted for the North Riding of the county of York; whence York and Middlesex are *register* counties. 2 & 3 Ann. cap. 4. 6 Ann. cap. 35. 7 Ann. cap. 20. 8 Geo. II. cap. 6.

Many have wished that the same regulation was extended to all the counties of England and Wales: but judge Blackstone observes, that, however plausible these provisions may appear in theory, it hath been doubted, by very competent judges, whether more disputes have not arisen in those counties, by the inattention and omission of parties, than prevented by the use of *registers*.

REGISTER, *registrarius*, is also used for the clerk, or keeper of a *register*, or *registry*.

Of these we have several, denominated from the *registers* they keep; as *register of the high court of delegates*, *registers of the arches court of Canterbury*, *register of the court of admiralty*, *register of the prerogative court*, *registers of the province of Canterbury*, *register of the archdeaconry of Middlesex*, *&c. register of the faculty office*, and *register of the garter*, who is always dean of Windsor, and deputy *registers*.

There are also, in the court of chancery, the *principal register*, the *lord chancellor's registers*, the *registers of the master of the rolls*, *entering registers*, and *register of the affidavits*.

REGISTER, *city*. See TOWN-*clerk*.

REGISTER of a parish-church is a book, wherein the yearly baptisms, marriages, and burials, of each parish, are orderly registered. See MARRIAGE.

This practice was laudably instituted by that great but unfortunate person Thomas Cromwell, earl of Essex, anno 1538, while he was vicar-general to king Henry VIII.

These parish-*registers* are to be subscribed by the minister and church-wardens; and the names of the persons shall be transmitted yearly to the bishop: and it has been enforced by canon 70. and by statute, &c.

By 26 Geo. II. cap. 33. to make a false entry in a marriage-*register*, to alter it when made, to forge or counterfeit such entry or a marriage-licence, or aid and abet such forgery, to utter the same as true knowing it to be counterfeit, or to destroy or procure the destruction of any *register*, in order to vacate any marriage, or subject any person to the penalties of this act; all these offences, knowingly and wilfully committed, subject the party to the guilt of felony, without benefit of clergy.

REGISTER is also the title of a book, containing the forms of most of the writs used in common law. This is called the *register of writs*, or *registrum omnium brevium*. This *register*, Coke on Littleton observes, is one of the most ancient books of the common law. And judge Blackstone observes, concerning it, that it is the most ancient and highly venerable collection of legal forms, upon which Fitzherbert's Natura Brevium is a comment, and in which every man, who is injured, will be sure to find a method of relief, exactly adapted to his own case, described in the compass of a few lines, and yet without the omission of any material circumstances.

REGISTER, in *Antiquity*, a book or table at Athens, belonging to each particular φρατρία, or ward, in which all fathers were obliged to enroll their sons, making oath, at the same time, that every son, so registered, was either born to them in lawful wedlock or lawfully adopted. The adopted sons were registered in the festival THARGELIA; the natural, upon the third day of the festival APATURIA.

At what age children were thus registered is not agreed. Some are of opinion, that at every return of the Apaturia it was customary to *register* all the children that had been born that year. Others affirm, that they were commonly

commonly three or four years old before they were regiſtered.

There were two other ſeaſons when young Athenians were enrolled in a public *regiſter*: one, when they arrived at the age of eighteen years, and were admitted into the number of the εφηβοι, and was performed on the third day of the feſtival Apaturia; and the other, before the feſtival PANATHENÆA, when thoſe who were twenty years old were entered in a *regiſter*, called ληξιαρχικον γραμματειον, wherein the names of all perſons of that borough, who were of age to ſucceed in the ληξις, or inheritance of their fathers, were entered. This was termed *to be regiſtered among the men*: and the perſons, thus enrolled, became their own maſters, and free from the government of their guardians. Potter's Arch. Græc. vol. i. p. 48.

REGISTER *of ſeamen*. See MANNING *the fleet*.

REGISTER *ſhips*, or *ſhips of* REGISTER, in *Commerce*, are veſſels to which the king of Spain, or the council of the Indies, grants permiſſion to go and traffic in the ports of Spaniſh America.

They are thus called becauſe the ſhips are to be regiſtered before they ſet ſail from Cadiz, which is the place where they uſually load for Buenos Ayres.

Theſe veſſels, by the tenor of the cedula or permit, are not to exceed three hundred tons; but there is that good underſtanding between the merchants and the council of the Indies, that ſhips of five or ſix hundred tons frequently paſs unnoted.

Theſe *regiſter* ſhips, which were firſt introduced in order to furniſh America with a regular and timely ſupply, and thus to prevent a contraband trade with the Engliſh, French, and Dutch iſlands, are fitted out, during the intervals between the ſtated ſeaſons when the GALLEONS and FLOTA ſail, by merchants in Seville or Cadiz, upon obtaining a licence from the council of the Indies, for which they pay a very high premium, and are deſtined for thoſe ports where any extraordinary demand is foreſeen or expected. In proportion as experience manifeſted the advantages of carrying on trade in this mode, the number of *regiſter*-ſhips increaſed, and at length, in the year 1748, the galleons, after having been employed upwards of two centuries, were finally laid aſide. From that period there has been no intercourſe with Chili and Peru, but by ſingle ſhips, diſpatched from time to time, as occaſion requires, and when the merchants expect a market will open. Theſe ſail round Cape Horn, and convey, directly to the ports in the South Sea, the productions and manufactures of Europe, for which the people ſettled in thoſe countries were formerly obliged to repair to Porto Bello or Panama.

But as all the the *regiſter* ſhips, deſtined for the South Seas, muſt ſtill take their departure from Cadiz, and are obliged to return thither, this branch of the American commerce, even in its new and improved form, continues ſubject to the reſtraints of a ſpecies of monopoly, and feels its pernicious effects.

REGISTER, among *Letter-Founders*, is one of the inner parts of the mould wherein the printing types are caſt.

Its uſe is to direct the joining of them juſtly together again, after opening them to take out the new-caſt letter.

REGISTER, in *Printing*, the diſpoſing the forms of the preſs ſo as that the lines and pages printed on one ſide of the ſheet meet exactly againſt thoſe on the other; which is done by means of two points in the greater or outward tympan.

REGISTERS, in *Chemiſtry*, are holes, or chinks, with ſtopples to them, contrived in the ſides of furnaces, to regulate the fire; i. e. to make the heat immediately more intenſe, or remiſs, by opening them to let in the air, or keeping them cloſe to exclude it. See FIRE-*places*.

REGISTRY, *regiſtrum*, comprehends the office, books, and rolls, wherein the proceedings of chancery, or any ſpiritual court, are regiſtered or recorded.

REGIUS *profeſſors*. King Henry VIII. founded five lectures in each of our univerſities; viz. of Divinity, Hebrew, Greek, Law, and Phyſic; the readers of which lectures are in the univerſity ſtatutes called *regii profeſſores*.

REGIUS *market*. See JAUNDICE.

REGLET, or RIGLET, in *Architecture*, a little flat narrow moulding, uſed chiefly in compartiments, and pannels, to ſeparate the parts or members from one another, and to form knots, frets, and other ornaments.

The word is a diminutive of the French *regle, rule*.

The *reglet*, according to Daviler, differs from the *fillet* and *liſtel*, in that it projects equally like a ruler.

REGLETS, or RIGLETS, in *Printing*, are thin rulers, or ſlips of wood, of different dimenſions, placed in the chaſe, between the pages, and at the extremes thereof, to keep them aſunder, and to hold them tight.

The *reglets* make the chief part of what they call *the furniture of the chaſe*. See CHASE.

They are particularly denominated from the place they hold in reſpect of the pages, *head-ſticks*, *gutter-ſticks*, &c.

The term *reglets* is alſo uſed abroad for a ruler of metal, three quarters of an inch long, but which may be lengthened out by joining ſeveral together; uſed to ſeparate the columns, in books that have ſeveral in the ſame page; as alſo for lines to place the notes on in printing of muſic. See PRINTING.

Reglet is alſo uſed for a little thin ſlip of wood, occaſionally though ſeldom uſed by compoſitors for the preſs to take off the lines from the compoſing ſtick, and place them on the galley, where the lines are of an extraordinary length: and where the lines are at great diſtances, thoſe diſtances are made by leaving a *reglet* between each line, when printed.

REGNANT *queen*. See QUEEN.

REGNO, *ne exeat*, in *Law*. See NE *exeat*, &c.

REGRADATION, *regradatio*. See DEGRADATION.

REGRATOR, *regratarius*, a law-word, formerly uſed for one that bought wholeſale, or by the great, and ſold again by retail.

The term is now chiefly uſed as it is deſcribed by ſtat. 5 & 6 Edw. VI. cap. 14. to denote one that buys corn, or other dead victual, in any market, and ſells them again, in the ſame market, or within four miles of the place.

Regrating is an offence againſt the public, and is liable, by the ſtatute juſt cited, to the ſame penalty with ENGROSSING and FORESTALLING.

REGRATOR is alſo uſed for a perſon who furniſhes up old moveables, to make them paſs for new. See FRIPPERY.

Among maſons, &c. to *regrate* is to take off the outer ſurface of an old hewn ſtone, with the hammer and ripe, in order to whiten and make it look freſh again.

REGRESSION, or *retrogradation* of curves, &c. See RETROGRADATION.

REGULA. See RULE.

REGULA, in *Architecture*. See REGLET.

REGULAR, *regularis*, denotes the relation of any thing that is agreeable or conformable to the rules of art.

In this ſenſe, the word ſtands oppoſed to *irregular*, or anomalous.

Thus we ſay, a *regular* proceeding, a *regular* building, *regular* poem, *regular* verb, &c.

REGULAR *figure*, in *Geometry*, is a figure which is both equilateral and equiangular; i. e. whoſe ſides, and conſequently its angles, are all equal.

The equilateral triangle and ſquare are *regular figures*.— All other *regular figures*, conſiſting of more than four ſides, are called *regular polygons*.

Every *regular figure* may be inſcribed in a CIRCLE.— For the dimenſions, properties &c. of *regular figures*, ſee POLYGON.

REGULAR *body*, called alſo *Platonic body*, is a ſolid terminated on all ſides by regular and equal planes, and whoſe ſolid angles are all equal.

The *regular bodies* are five in number; viz. the *cube*, which conſiſts of ſix equal ſquares; the *tetrahedron*, of four equal triangles; the *octahedron*, of eight; the *dodecahedron*, of twelve; and the *icoſahedron*, of twenty. See each under its proper article. Beſides theſe five, there can be no other *regular bodies* in nature.

To meaſure the ſurface and ſolidity, &c. of the five REGULAR *bodies*. The ſolidity, &c. of the cube is ſhewn under the article CUBE. The tetrahedron being a pyramid, and the octahedron a double pyramid; and the icoſahedron conſiſting of twenty triangular pyramids; and the dodecahedron of twelve quinquangular ones, whoſe baſes are in the ſurface of the icoſahedron and dodecahedron, and their vertices meeting in a centre; the ſolidities of theſe bodies are all found from what we have ſhewn under PYRAMID.

1. Their ſurface is had by finding the area of one of the planes, from the lines that bound it; and multiplying the area thus found, by the number from which the body is denominated: e. g. for the tetrahedron, by 4; for the hexahedron, or cube, by 6; for the octahedron, by 8; for the dodecahedron, by 12; and for the iſocahedron, by 20. The product is the ſuperficial area.

Or, the ſuperficial contents of any of the five Platonic bodies may be had by the following proportion: as 1 is to the ſide of the given Platonic body,

ſo is	1.73205	to the ſuperficial content of the	Tetrahedron.
	3.46410		Octahedron.
	6.00000		Hexahedron.
	8.66025		Icoſahedron.
	20.64573		Dodecahedron.

2. The diameter of a ſphere being given, to find the ſide of any of the Platonic bodies, that may be either inſcribed in the ſphere, or circumſcribed about the ſphere, or that is equal to the ſphere.

As 1 is to the number in the following table, refpecting the thing fought, fo is the diameter of the given fphere to the fide of the Platonic body fought.

The diameter of a fphere being unity, the fide of a	That may be *infcribed* in the fphere, is	That may be *circumfcribed* about the fphere, is	That is *equal* to the fphere, is
Tetrahedron	0.816497	2.44948	1.64417
Octahedron	0.707107	1.22474	1.03576
Hexahedron	0.577350	1.00000	0.88610
Icofahedron	0.525731	0.66158	0.62153
Dodecahedron	0.356822	0.44903	0.40883

3. The fide of any of the five Platonic bodies being given, to find the diameter of a fphere, that may be infcribed in that body, or circumfcribed about it, or that is equal to it. As the refpective number in the above table, under the title, *infcribed*, *circumfcribed*, or *equal*, is to 1, fo is the fide of the given Platonic body to the diameter of its infcribed, circumfcribed, or equal fphere, in folidity.

4. The fide of any of the five Platonic bodies being given, to find the fide of either of the Platonic bodies, which are equal in folidity to that of the given body.—As the number under the title *equal*, againft the given Platonic body, is to the number under the fame title, againft the body whofe fide is fought, fo is the fide of the given Platonic body to the fide of the Platonic body fought.

5. To find the folid contents of any of the five Platonic bodies. As 1 is to the cube of the fide of any of thefe bodies, fo is 0.117851 to the folid content of a tetrahedron, 0.417404 to that of the octahedron, 1.00000 to that of the hexahedron, 2.181695 to that of the icofahedron, and 7.663199 to the folid content of the dodecahedron. Fergufon's Tables and Tracts, &c. p. 219.

If one thefe bodies be required to be cut out of the fphere of any diameter, let dr (*Tab.* IV. *Geometry*, *fig.* 85.) be the diameter of any fphere, and da $\frac{1}{3}$ of it, $= ab = br$. Erect the perpendiculars ae, cf, and bg; and draw de, df, er, fr, and gr; then will (1.) re be the fide of the tetrahedron; (2.) df, the fide of the hexahedron; (3.) de the fide of the octahedron; (4.) and cutting de in extreme and mean proportion in h, dh will be the fide of the dodecahedron; (5.) fetting the diameter dr up perpendicular at r, from the centre c, to its top, draw the line cg, cutting the circle in g, let fall the perpendicular gb; fo is br the fide of the icofahedron.

REGULAR *curve*. See CURVE.

REGULAR *architecture*, *fortification*, &c. See ARCHITECTURE, and FORTIFICATION.

REGULAR *attacks*, in a fiege, are thofe that are made in form, or by regular APPROACHES. See PARALLELS.

REGULAR *baftion*. See BASTION.

REGULAR *place*. See PLACE.

REGULAR, in the *Monaftic Senfe*, denotes a perfon who has made the vows in fome religious houfe. See RELIGIOUS, and VOW.

Under *regulars* are comprehended the whole body of monks, friars, and mendicants, &c.

The denomination of *regulars*, in this cafe, arifes hence, that they are bound to obferve the regula or rule of the order they are entered into. Hence,

REGULAR *prieft* is ufed for a prieft who is in fome religious order, in oppofition to a *fecular* prieft, who lives in the world, or at large.

A cardinal is reputed both *regular* and fecular, and is intitled to the privileges of both ftates.

Regulars may be promoted to bifhopricks and archbifhopricks, as well as feculars; but their promotion fecularizes them; the epifcopal dignity difpenfing them from the obfervation of the rule whereof they had before made profeffion.

REGULAR *abbots*. See ABBOT.

REGULAR *benefices* are fuch as can only be held by monks or religious; or at leaft, *per cupientem profiteri*, by a perfon defirous to embrace the monaftic life. See BENEFICE.

It is a maxim in the Romifh canon law, *regularia regularibus*; i. e. *regular benefices* are to be conferred on *regular* priefts. The abbeys that are chiefs of their refpective orders are all *regular*, and can only be ferved by monks and cardinals. All benefices are prefumed to be fecular, unlefs they be proved *regular*.

Anciently, the *regular benefices* were almoft all conferred by way of adminiftration or curacy; the religious incumbents being always *ad manum* to their fuperiors, who difplaced them at pleafure. Hence the common maxim among the canonifts, *omne beneficium regulare manuale*.

The benefices appropriated to *regulars* are abbeys, conventual priories, fimple priories, and clauftral offices.—They may be conferred on feculars *in commendam*.

REGULAR *canons*. See CANON.

REGULAR *places* are thofe within the boundary or inclofure of the convent; as the cloifter, dormitory, chapter, and refectory. In oppofition to thofe deftined for guefts, and for the neceffaries of the houfe, which are reputed without the inclofure.

REGULAR *corporation*. See CORPORATION.

REGULATION, a rule or order prefcribed by a fuperior, for the uniform and orderly management of fome branch of policy, juftice, or the like.

REGULATOR *of a watch*, is a fmall SPRING belonging to the balance, ferving to adjuft the going, and to make it go either fafter or flower.

REGULO, a title given to the fons of the emperor of China.

REGULUS, *petty king*, in our *Ancient Cuftoms*, is a term frequently ufed, in the Saxon councils, for comes or count.

Hence *fub-regulus* was alfo ufed for a vice-comes or vifcount: though in many places the two feem ufed indifferently for the fame dignitary. Thus in the archives of the cathedral of Worcefter, Uthredus fometimes ftyles himfelf *regulus*, and fometimes *fub-regulus*, of the city of Worcefter.

But in other places we find a diftinction. *Offa rex Merciorum*; *Uthredus*, *regulus*; *Aldredus*, *fub-regulus*; &c.

REGULUS, in *Chemiftry*, denotes the fineft and pureft part of a metal or mineral, which finks or precipitates to the bottom of the crucible, or furnace, in melting the mineral or ore.

The alchemifts will have this matter called *regulus*, i. e. *little king*, as being the firft-born of the royal metallic blood; which is, as they exprefs it, really a fon, but not a perfect man; i. e. not yet a perfect metal, for want of time, and proper nourifhment.

To procure the *regulus*, that is, the mercurial parts of metals, &c. flux-powders are commonly ufed; as nitre, tartar, &c. which purge the fulphureous part adhering to the metal, by attracting and abforbing it to themfelves.

The feparation of filver out of the *regulus* made from the filver ore by means of lead, is to be performed in this manner: put two coppels, of the fame bignefs, perfectly dry, and capable of containing at leaft one third more than the *regulus*, under a muffle in an affay-furnace; make a ftrong fire, and let them be red-hot for a quarter of an hour, then free the *regulus* from its fcoriæ, by ftriking it gently with a hammer, and put it carefully into one of the hot coppels, and into the other put, at the fame time, the fame quantity of granulated lead alone, as was ufed in making the *regulus*. When the *regulus* boils and fmokes, diminifh the fire a little, and let the coppels be kept moderately, but not violently red-hot. When it has ftood fo long, that the fkin of litharge, continually produced from the lead, and covering the furface of the *regulus*, difappears, and the coppel fhews the fcoriæ only of the lead with the pure filver, either in fufion, or hard and bright in the middle, let the coppel continue only a minute or two longer on the fire; then take it out with a pair of tongs, take away the metal in grains, and if any fcoria, or fragment of the coppel adhere to it, wrap it together in a paper, and fqueeze it between the cheeks of a vice, or a pair of tongs, to break off that brittle matter without hurting the *regulus*. If this *regulus* be pure filver, it will now be very white, but if it contain any gold, it will fhew it by its yellownefs.

To determine exactly how much filver the quantity of ore contained, weigh it nicely in a fine balance, and take out the fmall reguline lumps from the other coppel, and weighing that, deduct its weight from that of the other, becaufe fo much filver that owes to the lead ufed in making it, and the remainder is the proportion of filver contained in the ore. Cramer's Art of Affaying, p. 211.

Regulus is principally ufed for that of antimony, which is a ponderous femi-metallic mafs, that, upon fufing fome of the mineral in its crude ftate, finks to the bottom, being feparated from the fulphur which mineralifes it, and leaving the fcoria or impurities at the top.

This femi-metal, when very pure and well fufed, is of a white fhining colour, and compofed of many laminæ applied to each other. It is remarkable for the regular arrangement of its parts, when it is perfectly fufed and gradually cooled, which, by a kind of cryftallization, form upon its upper furface a fort of a ftar, compofed of many radii iffuing from one centre. This fubftance is moderately hard, but, like other femi-metals, has no ductility. It lofes about one feventh part of its weight in water, and lofes its luftre by the action of air and water. It is fufible with a moderate heat, but when heated

heated to a certain degree is diſſipated in vapours. Its fumes, paſſing through air, form the *argentine* FLOWERS of *regulus* of *antimony*.

By calcination, with a moderate fire, this *regulus* is deprived of more and more of its phlogiſton, and is ſucceſſively changed, firſt into a grey calx, capable of being fuſed by a ſtronger heat either into a vitreous and brittle matter, which is brown or opake, or to a reddiſh tranſparent glaſs, according to its degree of calcination. The former is called LIVER, and the latter GLASS of *antimony*. If the calcination be continued longer, the calx of the *regulus* loſes more of its phlogiſton, colour, volatility, and fuſibility, and reſembles *diaphoretic* ANTIMONY and BEZOARD *mineral*. The beſt menſtruum for this *regulus* is aqua regia.

Regulus of antimony is eaſily obtained pure and diſengaged from ſulphur, by calcining the ore, and thus depriving it of its mineraliſing ſubſtances, ſulphur and arſenic, and afterwards by fuſing the metallic earth with a matter proper to give it phlogiſton. But the uſual method of making ſmall quantities of *regulus*, in laboratories, is more expeditious, and conſiſts in mixing four parts of crude antimony, with three parts of tartar, and one part and a half of nitre; in detonating this mixture, by parts, in a large red-hot crucible, and afterwards raiſing the heat ſo as to produce fuſion. When the crucible is cold it is to be broken, and the *regulus* will be found at the bottom, lying under a ſaline ſcoria.

Regulus of antimony is one of the moſt important metallic matters, as it furniſhes very powerful emetic and purgative remedies, and is uſeful in many arts. See ANTIMONY.

REGULUS, *martial*, *of antimony*. See ANTIMONY.

REGULUS *of arſenic* is white arſenic, combined with a ſufficient quantity of phlogiſton, to give it the properties of a ſemi-metal.

The proceſs of making it, anciently uſed, conſiſted in mixing four parts of arſenic, with two parts of black flux, one part of borax, and one part of filings of iron, or of copper, and quickly fuſing the mixture in a crucible.

Mr. Brandt directs that white arſenic ſhould be mixed with ſoap (or olive oil will anſwer the purpoſe), and the mixture to be put into a retort or glaſs matraſs, and to be diſtilled or ſublimed with a fire, at firſt very moderate, and only ſufficient to raiſe the oil, and when the oily vapours ceaſe to riſe, increaſed; and the metalliſed arſenic will be ſoon ſublimed to the upper part of the veſſel, and form on the inſide a metallic cruſt, which may be eaſily ſeparated by breaking the veſſel. The *regulus*, thus prepared, has all the properties of a ſemi-metal; it has metallic gravity, opacity, and luſtre; its colour is white and livid; it tarniſhes in the air, is very brittle, but much more volatile than any other ſemi-metal, and eaſily loſes its inflammable principle, when ſublimed in veſſels to which the air has acceſs. It may be combined with acids and moſt metals. Dict. Chem. Art. *Regulus*. See ARSENIC.

REGULUS *of cobalt* is a ſemi-metal obtained from cobalt, by thoroughly torrefying it, to deprive it of all the ſulphur and arſenic it contains, and ſeparating the unmetallic earthy and ſtony matters from it by waſhing. The cobalt, thus prepared, is then to be mixed with double or triple its quantity of black flux, and a little decrepitated ſea-ſalt, and fuſed either in a forge or hot furnace. After it has cooled, by breaking the crucible, a metallic *regulus*, covered with a ſcoria of a deep blue colour, is obtained. See COBALT.

REGULUS, in *Aſtronomy*, is a ſtar of the firſt magnitude, in the conſtellation Leo; called alſo, from its ſituation, *Cor Leonis*, or the *Lion's Heart*; by the Arabs, *Alhabor*; and by the Chaldeans, *Kalbeleced*, or *Kalbeleceid*; from an opinion of its influencing the affairs of the heavens; as is obſerved by Theon.

The longitude of *Regulus*, as fixed by Mr. Flamſteed, is 25° 31′ 21″; and its latitude 0° 26′ 38″ north. See LEO.

REGULUS *criſtatus*. See WREN.

REHABILITATION, *rehabilitatio*, in the *Civil* and *Canon Law*, an action whereby a prince or pope, by diſpenſations or letters patent, reſtores a delinquent to the condition he was in before his delinquency. See DEGRADATION.

The king alone can rehabilitate an officer, noted, condemned, and degraded; or a gentleman who has derogated from his rank.

The pope alone pretends to rehabilitate, i. e. to render capable of benefices and orders, ſuch as had fallen into hereſy, or other irregularities.

In Romiſh countries, an eccleſiaſtic who aſſiſts at the execution of a ſentence of death is to be rehabilitated by an abſolution, called *a ſævis*.

REHEARING, in the *Court of Chancery*, is a proceſs to which either party that thinks himſelf aggrieved may have recourſe, before the execution of a final decree.—Every petition for a *rehearing* muſt be ſigned by two counſel of character, certifying that they apprehend the cauſe is proper to be reheard. And upon the *rehearing* all the evidence taken in the cauſe, whether read before or not, is now admitted to be read; becauſe it is the decree of the chancellor himſelf, who only now ſits to hear reaſons why it ſhould not be enrolled and perfected; at which time all omiſſions of either evidence or argument may be ſupplied. But after the decree is once ſigned by the chancellor and enrolled, it cannot be reheard or rectified, except by bill of review, or by appeal to the houſe of lords.

REHEARSAL, in *Muſic* and the *Drama*, an eſſay or experiment of ſome compoſition, which is made in private, previous to the repreſentation or performance thereof in public; to habituate the actors or performers, and make them more ready and perfect in their parts.

REI *domeſticæ domeſticus*. See DOMESTICUS.

REJECTIO, a word uſed by medical authors for the caſting any thing up preternaturally by the mouth, whether it be by vomiting, or by ſpitting.

REIGNING *winds* are thoſe winds which uſually prevail in any particular coaſt or region, the knowledge of which is eſſentially neceſſary to every pilot, who is charged with the navigation in thoſe ſeas.

REIMBURSEMENT, in *Commerce*, the act of repaying or returning what monies a perſon had received, by way of advance, &c. or what another had diſburſed or paid for us. A perſon who gives a bill of exchange in payment, is to reimburſe it, if it come to be proteſted, for want of being accepted or paid.

REIMBURSING is alſo uſed for paying the price a commodity coſts its owner.

REIN *Deer*. See DEER.

REINFORCE, in *Gunnery*, is that part of a gun next to the breech, which is made ſtronger to reſiſt the force of the powder. There are generally two *reinforces* in each piece, called the firſt and ſecond *reinforce*: the ſecond is ſomewhat ſmaller than the firſt, upon the ſuppoſition that when the powder is inflamed and occupies a greater ſpace, its force is diminiſhed, which is very abſurd. See *Great* GUNS, and A E and E F, *Tab. Gunnery*, *fig.* 1.

REINFORCE *rings* of a cannon are flat mouldings like iron hoops, placed at the breech end of the firſt and ſecond *reinforce*, projecting beyond the reſt of the metal about one fourth of an inch. See *Great* GUNS, and *Tab. Gunnery*, *fig.* 1.

REINFORCEMENT, in *War*, a ſupply, or new proviſion of men, arms, ammunition, &c.

REINS, in *Anatomy*, the kidneys; or that part of an animal whereby the urine is ſeparated from the blood. See KIDNEY.

The word, according to Varro, is formed from the Greek, *ρειν*, *quaſi rivi obſceni humoris ab iis oriantur*.—The Greeks call the *rein* *νεφρος*, from the verb *νεφειν*, *to rain*, *ſnow*, &c.

In the manege they ſay, a horſe ſhould have *double reins*; that is, he ſhould have them a little more elevated on each ſide of the back bone, than upon it; ſo that, paſſing your hand along it, you find it large, well furniſhed, and double, by the hollow that goes all along the back bone. The back ſhould be firm, and not hollow, or bending from the withers to the croup, but ſtraight.

REINS, of a bridle, alſo denote two ſtraps of leather meeting in the bridle-hand of the horſeman, in order to make the bit bear, and keep the horſe under ſubjection. See BRIDLE.

It is alſo a name given by the duke of Newcaſtle to two ſtraps, or ropes of a caveſſon, which he ordered to be made faſt to the girths, or the pommel of the ſaddle, with intent that the rider ſhould pull them with his hand, in order to bend and ſupple the neck of the horſe.

REIN, *falſe*, is a lath of leather, paſſed ſometimes through the banquet, to bend the horſe's neck, which is diſapproved of by the duke of Newcaſtle, becauſe it ſlacks the curb, and makes the bit no more than a trench that has no curb.

REINS *of a vault*. See VAULT.

REINSTATING, the reſtoring of a perſon or thing to its former ſtate or condition, from whence it had been diſturbed or diſplaced. See REHABILITATION.

REINTEGRATION. See REDINTEGRATION.

REJOICING *fire*, in *Military Affairs*, is uſed on obtaining a victory, or in celebrating ſome public feſtival: of this there are two ſorts, viz. one by a VOLLEY, and the other by a *running* FIRE, from the right to the left of the battalion or line.

REJOINDER, in *Law*, the defendant's anſwer to the plaintiff's replication.

The

The order of the court of chancery is thus: firſt, the defendant puts in an anſwer or plea to the plaintiff's bill, which is ſometimes alſo called an *exception*; the plaintiff's anſwer to this is called a *replication*; and the defendant's anſwer to that, a *rejoinder*.

The plaintiff may anſwer the *rejoinder* by a *ſur-rejoinder*; upon which the defendant may *rebut*; and the plaintiff may anſwer him by a *ſur*-REBUTTER: which pleas, replications, *rejoinders*, ſur-*rejoinders*, rebutters, and ſur-rebutters, anſwer to the *exceptio*, *duplicatio*, *triplicatio*, and *quadruplicatio* of the Roman laws. See PLEADING.

REJOINTING, or REJOYNTING, in *Architecture*, the filling up of the joints of the ſtones in old buildings, &c. when worn hollow by the courſe of time, or by weather.

Rejointing is to be performed with the beſt mortar, as that of lime and cement: ſometimes alſo with plaiſter; as in the joints of vaults, &c.

REIS, RE, or RES. See REE.

REIS *effendi*, in Turkiſh affairs. See EFFENDI.

REITERATED *grafting*. See ENGRAFTING.

REITERATING, in *Printing*. See PRINTING.

REITERATION, the act of repeating a thing, or doing it a ſecond time.

The church does not allow of the *reiteration* of baptiſm. St. Gregory obſerves, that it is no *reiteration* when there are wanting proofs of the thing's having been regularly done before.

REITTERS, an ancient title given the German cavalry. The word is originally High Dutch, and ſignifies a horſeman, cavalier, or even knight.

RELAIS, in *Fortification*, a French term, the ſame with BERME.

RELAPSE, a return or backſliding into a danger or evil, out of which a perſon had eſcaped.

Fevers, dropſies, &c. are diſeaſes into which *relapſes* are very frequent and dangerous. Such a perſon is *relapſed* into a hereſy he had abjured.

RELATION, *relatio*, in *Philoſophy*, the mutual reſpect of two things; or what each is with regard to the other.

The word is formed *a referendo*; *relation* conſiſting in this, that one thing is *referred* to another; whence it is alſo called *reſpect*, *habitude*, and *compariſon*.

The idea of *relation* we acquire, when the mind ſo conſiders any thing, that it doth, as it were, bring it to, and ſet it by, another, and carry its view from the one to the other. Hence the denominations given to things intimating this reſpect, are called *relatives*; and the things ſo brought together, are ſaid to be *related*.

Thus, when I call Caius *huſband*, or this wall *whiter*, I intimate ſome other perſon or thing in both caſes, with which I compare *him* or *it*. Hence the wall is called by the ſchoolmen the *ſubject*; the thing it exceeds in whiteneſs, the *term*; and the whiteneſs, the *foundation* of the *relation*.

Relation may be conſidered two ways; either on the part of the mind referring one thing to another; in which ſenſe *relation* is only a mode or affection of the mind, whereby we make ſuch compariſon: or on the part of the things referred, which being no other than ideas, *relation*, in this ſenſe, is only a new idea reſulting or ariſing in the mind upon conſidering of two other ideas. So that *relation*, take it as you will, is only in the mind, and has nothing to do with the things themſelves.

Any of our ideas, Mr. Locke obſerves, may be the foundation of *relation*. Though, where languages have failed to give correlative names, the *relation* is not eaſily taken notice of; as in concubine, which is a *relative* name, as well as wife.

There is, in effect, no idea but is capable of an infinite number of *relations*: thus, one ſingle man may at once ſuſtain the *relations* of father, brother, ſon, huſband, friend, ſubject, general, European, Engliſhman, iſlander, maſter, ſervant, bigger, leſs, &c. to an almoſt infinite number; he being capable of as many *relations* as there can be occaſions of comparing him to other things in any manner of agreement or diſagreement, or any reſpect whatſoever.

The ideas of *relations* are much clearer and more diſtinct than thoſe of the things *related*; becauſe the knowledge of one ſimple idea is oftentimes ſufficient to give the notion of a *relation*; but, to the knowing of any ſubſtantial being, an accurate collection of ſeveral ideas is neceſſary.

The perception we have of the *relations* between various ideas wherein the mind acquieſces, makes what we call *judgment*. Thus, when I judge that twice 2 make 4, or do not make 5, I only perceive the equality between twice 2 and 4, and the inequality between twice 2 and 5.

The perception we have of the *relations* between the *relations* of various things, conſtitutes what we call *reaſoning*. Thus, when from this, that 4 is a ſmaller number than 6, and that twice 2 is equal to 4, I gather, that twice 2 is a leſs number than 6; I only perceive together the *relation* of the numbers twice 2 and 4, and the *relation* of 4 and 6.

The ideas of cauſe and effect, we get from our obſervation of the viciſſitude of things, while we perceive ſome qualities or ſubſtances begin to exiſt, and that they receive their exiſtence from the due application and operation of other beings. That which produceth, is the cauſe; that which is produced, is the effect.

Thus, fluidity in wax is the effect of a certain degree of heat, which we obſerve to be conſtantly produced by the application of ſuch heat.

The denominations of things taken from time are, for the moſt part, only *relations*. Thus, when it is ſaid, that queen Elizabeth lived ſixty-nine, and reigned forty five years, no more is meant, than that the duration of her exiſtence was equal to ſixty-nine, and of her government to forty-five, annual revolutions of the ſun; and ſo are all words anſwering to how long.

Young and old, and other words of time, that are thought to ſtand for poſitive ideas, are indeed *relative*, and intimate a *relation* to a certain length of duration, whereof we have the ideas in our minds. Thus, we call a man young or old, that had lived little or much of that time which men uſually attain to: and thus a man is called young at twenty, but a horſe old at the ſame period.

There are other ideas that are truly *relative*, which we ſignify by names that are thought poſitive and abſolute; ſuch as great and little, ſtrong and weak. The things thus denominated are referred to ſome ſtandards, with which we compare them: thus, we call an apple *great*, which is bigger than the ordinary ſort of thoſe we have been uſed to; and a man *weak*, that has not ſo much ſtrength or power to move as men uſually have, or as others of his own ſize have.

Authors give various diviſions of *relations*. The ſchool philoſophers commonly divide them into thoſe of *origination*, under which are comprehended the *relations* of cauſe and effect; thoſe of *negation*, which are between oppoſite things; and thoſe of *affirmation*, which are *relations* of agreement between whole and part, the ſign and thing ſignified, the adjunct and ſubject. This diviſion is founded upon this, that the mind can only compare things three ways; viz. by inferring, denying, and affirming.

Others divide *relations* into thoſe of *origination*; thoſe of *agreement*, e. gr. ſimilitude, parity, &c. thoſe of *diverſity*; and thoſe of *order*, as priority, poſteriority, &c.

Others divide them into *predicamental* and *tranſcendental*. Under the firſt come thoſe *relations* between things that belong to the ſame predicament, e. gr. between father and ſon. To the latter belong thoſe which are more general than the predicaments, or are of different predicaments; as the *relations* of ſubſtance and accident; of cauſe and effect; and of Creator and creature.

Mr. Locke gives us a diſtribution of *relations* on a different principle. All ſimple ideas, he obſerves, wherein are parts or degrees, afford an occaſion of comparing the ſubjects wherein they are, to one another in reſpect of thoſe ſimple ideas; as whiter, ſweeter, more, leſs, &c. Theſe, depending on the equality and exceſs of the ſame ſimple idea, in ſeveral ſubjects, may be called *proportional relations*.

Another occaſion of comparing things being taken from the circumſtances of their origin, as father, ſon, brother, &c. theſe may be called *natural relations*.

Sometimes the foundation of conſidering things is ſome act, whereby any one comes by a moral right, power, or obligation, to do ſomething: ſuch are general, captain, burgher: theſe are *inſtituted* and *voluntary relations*, and may be diſtinguiſhed from the natural, in that they are alterable and ſeparable from the perſons to whom they ſometimes belonged, though neither of the ſubſtances ſo related be deſtroyed. But natural *relations* are not alterable, but are as laſting as their ſubjects.

Another *relation* is the conformity or diſagreement of men's voluntary actions to a rule, to which they are referred, and by which they are judged of: theſe may be called *moral relations*.

It is this conformity or diſagreement of our actions to ſome law (whereby good or evil is drawn on us from the will and power of the law-maker, and is what we call *reward* or *puniſhment*) that renders our actions morally good or evil.

Of theſe moral rules or laws there ſeem to be three ſorts, with their different enforcements. Firſt, the divine law; ſecondly, civil law; thirdly, the law of opinion or reputation. By their *relation* to the firſt, our actions are

heated to a certain degree is dissipated in vapours. Its fumes, passing through air, form the *argentine* FLOWERS of *regulus* of *antimony*.

By calcination, with a moderate fire, this *regulus* is deprived of more and more of its phlogiston, and is successively changed, first into a grey calx, capable of being fused by a stronger heat either into a vitreous and brittle matter, which is brown or opake, or to a reddish transparent glass, according to its degree of calcination. The former is called LIVER, and the latter GLASS of *antimony*. If the calcination be continued longer, the calx of the *regulus* loses more of its phlogiston, colour, volatility, and fusibility, and resembles *diaphoretic* ANTIMONY and BEZOARD *mineral*. The best menstruum for this *regulus* is aqua regia.

Regulus of antimony is easily obtained pure and disengaged from sulphur, by calcining the ore, and thus depriving it of its mineralising substances, sulphur and arsenic, and afterwards by fusing the metallic earth with a matter proper to give it phlogiston. But the usual method of making small quantities of *regulus*, in laboratories, is more expeditious, and consists in mixing four parts of crude antimony, with three parts of tartar, and one part and a half of nitre; in detonating this mixture, by parts, in a large red-hot crucible, and afterwards raising the heat so as to produce fusion. When the crucible is cold it is to be broken, and the *regulus* will be found at the bottom, lying under a saline scoria.

Regulus of antimony is one of the most important metallic matters, as it furnishes very powerful emetic and purgative remedies, and is useful in many arts. See ANTIMONY.

REGULUS, *martial, of antimony*. See ANTIMONY.

REGULUS *of arsenic* is white arsenic, combined with a sufficient quantity of phlogiston, to give it the properties of a semi-metal.

The process of making it, anciently used, consisted in mixing four parts of arsenic, with two parts of black flux, one part of borax, and one part of filings of iron, or of copper, and quickly fusing the mixture in a crucible.

Mr. Brandt directs that white arsenic should be mixed with soap (or olive oil will answer the purpose), and the mixture to be put into a retort or glass matrass, and to be distilled or sublimed with a fire, at first very moderate, and only sufficient to raise the oil, and when the oily vapours cease to rise, increased; and the metallised arsenic will be soon sublimed to the upper part of the vessel, and form on the inside a metallic crust, which may be easily separated by breaking the vessel. The *regulus*, thus prepared, has all the properties of a semi-metal; it has metallic gravity, opacity, and lustre; its colour is white and livid; it tarnishes in the air, is very brittle, but much more volatile than any other semi-metal, and easily loses its inflammable principle, when sublimed in vessels to which the air has access. It may be combined with acids and most metals. Dict. Chem. Art. *Regulus*. See ARSENIC.

REGULUS *of cobalt* is a semi-metal obtained from cobalt, by thoroughly torrefying it, to deprive it of all the sulphur and arsenic it contains, and separating the unmetallic earthy and stony matters from it by washing. The cobalt, thus prepared, is then to be mixed with double or triple its quantity of black flux, and a little decrepitated sea-salt, and fused either in a forge or hot furnace. After it has cooled, by breaking the crucible, a metallic *regulus*, covered with a scoria of a deep blue colour, is obtained. See COBALT.

REGULUS, in *Astronomy*, is a star of the first magnitude, in the constellation Leo; called also, from its situation, *Cor Leonis*, or the *Lion's Heart*; by the Arabs, *Alhabor*; and by the Chaldeans, *Kalbeleced*, or *Kalbeleceid*; from an opinion of its influencing the affairs of the heavens; as is observed by Theon.

The longitude of *Regulus*, as fixed by Mr. Flamsteed, is 25° 31′ 21″; and its latitude 0° 26′ 38″ north. See LEO.

REGULUS *cristatus*. See WREN.

REHABILITATION, *rehabilitatio*, in the *Civil* and *Canon Law*, an action whereby a prince or pope, by dispensations or letters patent, restores a delinquent to the condition he was in before his delinquency. See DEGRADATION.

The king alone can rehabilitate an officer, noted, condemned, and degraded; or a gentleman who has derogated from his rank.

The pope alone pretends to rehabilitate, i. e. to render capable of benefices and orders, such as had fallen into heresy, or other irregularities.

In Romish countries, an ecclesiastic who assists at the execution of a sentence of death is to be rehabilitated by an absolution, called *a sævis*.

REHEARING, in the *Court of Chancery*, is a process to which either party that thinks himself aggrieved may have recourse, before the execution of a final decree.—Every petition for a *rehearing* must be signed by two counsel of character, certifying that they apprehend the cause is proper to be reheard. And upon the *rehearing* all the evidence taken in the cause, whether read before or not, is now admitted to be read; because it is the decree of the chancellor himself, who only now sits to hear reasons why it should not be enrolled and perfected; at which time all omissions of either evidence or argument may be supplied. But after the decree is once signed by the chancellor and enrolled, it cannot be reheard or rectified, except by bill of review, or by appeal to the house of lords.

REHEARSAL, in *Music* and the *Drama*, an essay or experiment of some composition, which is made in private, previous to the representation or performance thereof in public; to habituate the actors or performers, and make them more ready and perfect in their parts.

REI *domesticæ domesticus*. See DOMESTICUS.

REJECTIO, a word used by medical authors for the casting any thing up preternaturally by the mouth, whether it be by vomiting, or by spitting.

REIGNING *winds* are those winds which usually prevail in any particular coast or region, the knowledge of which is essentially necessary to every pilot, who is charged with the navigation in those seas.

REIMBURSEMENT, in *Commerce*, the act of repaying or returning what monies a person had received, by way of advance, &c. or what another had disbursed or paid for us. A person who gives a bill of exchange in payment, is to reimburse it, if it come to be protested, for want of being accepted or paid.

REIMBURSING is also used for paying the price a commodity costs its owner.

REIN *Deer*. See DEER.

REINFORCE, in *Gunnery*, is that part of a gun next to the breech, which is made stronger to resist the force of the powder. There are generally two *reinforces* in each piece, called the first and second *reinforce*: the second is somewhat smaller than the first, upon the supposition that when the powder is inflamed and occupies a greater space, its force is diminished, which is very absurd. See *Great* GUNS, and A E and E F, *Tab. Gunnery, fig.* 1.

REINFORCE *rings* of a cannon are flat mouldings like iron hoops, placed at the breech end of the first and second *reinforce*, projecting beyond the rest of the metal about one fourth of an inch. See *Great* GUNS, and *Tab. Gunnery, fig.* 1.

REINFORCEMENT, in *War*, a supply, or new provision of men, arms, ammunition, &c.

REINS, in *Anatomy*, the kidneys; or that part of an animal whereby the urine is separated from the blood. See KIDNEY.

The word, according to Varro, is formed from the Greek, ῥεῖν, *quasi rivi obsceni humoris ab iis oriantur*.—The Greeks call the *rein* νεφρος, from the verb νεφειν, *to rain, snow*, &c.

In the manege they say, a horse should have *double reins*; that is, he should have them a little more elevated on each side of the back bone, than upon it; so that, passing your hand along it, you find it large, well furnished, and double, by the hollow that goes all along the back bone. The back should be firm, and not hollow, or bending from the withers to the croup, but straight.

REINS, of a bridle, also denote two straps of leather meeting in the bridle-hand of the horseman, in order to make the bit bear, and keep the horse under subjection. See BRIDLE.

It is also a name given by the duke of Newcastle to two straps, or ropes of a cavesson, which he ordered to be made fast to the girths, or the pommel of the saddle, with intent that the rider should pull them with his hand, in order to bend and supple the neck of the horse.

REIN, *false*, is a lath of leather, passed sometimes through the banquet, to bend the horse's neck, which is disapproved of by the duke of Newcastle, because it slacks the curb, and makes the bit no more than a trench that has no curb.

REINS *of a vault*. See VAULT.

REINSTATING, the restoring of a person or thing to its former state or condition, from whence it had been disturbed or displaced. See REHABILITATION.

REINTEGRATION. See REDINTEGRATION.

REJOICING *fire*, in *Military Affairs*, is used on obtaining a victory, or in celebrating some public festival: of this there are two sorts, viz. one by a VOLLEY, and the other by a *running* FIRE, from the right to the left of the battalion or line.

REJOINDER, in *Law*, the defendant's answer to the plaintiff's replication.

The

The order of the court of chancery is thus: firſt, the defendant puts in an anſwer or plea to the plaintiff's bill, which is ſometimes alſo called an *exception*; the plaintiff's anſwer to this is called a *replication*; and the defendant's anſwer to that, a *rejoinder*.

The plaintiff may anſwer the *rejoinder* by a *ſur-rejoinder*; upon which the defendant may *rebut*; and the plaintiff may anſwer him by a *ſur-*REBUTTER: which pleas, replications, *rejoinders*, ſur-*rejoinders*, rebutters, and ſur-rebutters, anſwer to the *exceptio*, *duplicatio*, *triplicatio*, and *quadruplicatio* of the Roman laws. See PLEADING.

REJOINTING, or REJOYNTING, in *Architecture*, the filling up of the joints of the ſtones in old buildings, &c. when worn hollow by the courſe of time, or by weather.

Rejointing is to be performed with the beſt mortar, as that of lime and cement: ſometimes alſo with plaiſter; as in the joints of vaults, &c.

REIS, RE, or RES. See REE.

REIS *effendi*, in Turkiſh affairs. See EFFENDI.

REITERATED *grafting*. See ENGRAFTING.

REITERATING, in *Printing*. See PRINTING.

REITERATION, the act of repeating a thing, or doing it a ſecond time.

The church does not allow of the *reiteration* of baptiſm. St. Gregory obſerves, that it is no *reiteration* when there are wanting proofs of the thing's having been regularly done before.

REITTERS, an ancient title given the German cavalry. The word is originally High Dutch, and ſignifies a horſeman, cavalier, or even knight.

RELAIS, in *Fortification*, a French term, the ſame with BERME.

RELAPSE, a return or backſliding into a danger or evil, out of which a perſon had eſcaped.

Fevers, dropſies, &c. are diſeaſes into which *relapſes* are very frequent and dangerous. Such a perſon is *relapſed* into a hereſy he had abjured.

RELATION, *relatio*, in *Philoſophy*, the mutual reſpect of two things; or what each is with regard to the other.

The word is formed *a referendo*; *relation* conſiſting in this, that one thing is *referred* to another; whence it is alſo called *reſpect*, *habitude*, and *compariſon*.

The idea of *relation* we acquire, when the mind ſo conſiders any thing, that it doth, as it were, bring it to, and ſet it by, another, and carry its view from the one to the other. Hence the denominations given to things intimating this reſpect, are called *relatives*; and the things ſo brought together, are ſaid to be *related*.

Thus, when I call Caius *huſband*, or this wall *whiter*, I intimate ſome other perſon or thing in both caſes, with which I compare *him* or *it*. Hence the wall is called by the ſchoolmen the *ſubject*; the thing it exceeds in whiteneſs, the *term*; and the whiteneſs, the *foundation* of the *relation*.

Relation may be conſidered two ways; either on the part of the mind referring one thing to another; in which ſenſe *relation* is only a mode or affection of the mind, whereby we make ſuch compariſon: or on the part of the things referred, which being no other than ideas, *relation*, in this ſenſe, is only a new idea reſulting or ariſing in the mind upon conſidering of two other ideas. So that *relation*, take it as you will, is only in the mind, and has nothing to do with the things themſelves.

Any of our ideas, Mr. Locke obſerves, may be the foundation of *relation*. Though, where languages have failed to give correlative names, the *relation* is not eaſily taken notice of; as in concubine, which is a *relative* name, as well as wife.

There is, in effect, no idea but is capable of an infinite number of *relations*: thus, one ſingle man may at once ſuſtain the *relations* of father, brother, ſon, huſband, friend, ſubject, general, European, Engliſhman, iſlander, maſter, ſervant, bigger, leſs, &c. to an almoſt infinite number; he being capable of as many *relations* as there can be occaſions of comparing him to other things in any manner of agreement or diſagreement, or any reſpect whatſoever.

The ideas of *relations* are much clearer and more diſtinct than thoſe of the things *related*; becauſe the knowledge of one ſimple idea is oftentimes ſufficient to give the notion of a *relation*; but, to the knowing of any ſubſtantial being, an accurate collection of ſeveral ideas is neceſſary.

The perception we have of the *relations* between various ideas wherein the mind acquieſces, makes what we call *judgment*. Thus, when I judge that twice 2 make 4, or do not make 5, I only perceive the equality between twice 2 and 4, and the inequality between twice 2 and 5.

The perception we have of the *relations* between the *relations* of various things, conſtitutes what we call *reaſoning*. Thus, when from this, that 4 is a ſmaller number than 6, and that twice 2 is equal to 4, I gather, that twice 2 is a leſs number than 6; I only perceive together the *relation* of the numbers twice 2 and 4, and the *relation* of 4 and 6.

The ideas of cauſe and effect, we get from our obſervation of the viciſſitude of things, while we perceive ſome qualities or ſubſtances begin to exiſt, and that they receive their exiſtence from the due application and operation of other beings. That which produceth, is the cauſe; that which is produced, is the effect.

Thus, fluidity in wax is the effect of a certain degree of heat, which we obſerve to be conſtantly produced by the application of ſuch heat.

The denominations of things taken from time are, for the moſt part, only *relations*. Thus, when it is ſaid, that queen Elizabeth lived ſixty-nine, and reigned forty five years, no more is meant, than that the duration of her exiſtence was equal to ſixty-nine, and of her government to forty-five, annual revolutions of the ſun; and ſo are all words anſwering to how long.

Young and old, and other words of time, that are thought to ſtand for poſitive ideas, are indeed *relative*, and intimate a *relation* to a certain length of duration, whereof we have the ideas in our minds. Thus, we call a man young or old, that had lived little or much of that time which men uſually attain to: and thus a man is called young at twenty, but a horſe old at the ſame period.

There are other ideas that are truly *relative*, which we ſignify by names that are thought poſitive and abſolute; ſuch as great and little, ſtrong and weak. The things thus denominated are referred to ſome ſtandards, with which we compare them: thus, we call an apple *great*, which is bigger than the ordinary ſort of thoſe we have been uſed to; and a man *weak*, that has not ſo much ſtrength or power to move as men uſually have, or as others of his own ſize have.

Authors give various diviſions of *relations*. The ſchool philoſophers commonly divide them into thoſe of *origination*, under which are comprehended the *relations* of cauſe and effect; thoſe of *negation*, which are between oppoſite things; and thoſe of *affirmation*, which are *relations* of agreement between whole and part, the ſign and thing ſignified, the adjunct and ſubject. This diviſion is founded upon this, that the mind can only compare things three ways; viz. by inferring, denying, and affirming.

Others divide *relations* into thoſe of *origination*; thoſe of *agreement*, e. gr. ſimilitude, parity, &c. thoſe of *diverſity*; and thoſe of *order*, as priority, poſteriority, &c.

Others divide them into *predicamental* and *tranſcendental*. Under the firſt come thoſe *relations* between things that belong to the ſame predicament, e. gr. between father and ſon. To the latter belong thoſe which are more general than the predicaments, or are of different predicaments; as the *relations* of ſubſtance and accident; of cauſe and effect; and of Creator and creature.

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Sometimes the foundation of conſidering things is ſome act, whereby any one comes by a moral right, power, or obligation, to do ſomething: ſuch are general, captain, burgher: theſe are *inſtituted* and *voluntary relations*, and may be diſtinguiſhed from the natural, in that they are alterable and ſeparable from the perſons to whom they ſometimes belonged, though neither of the ſubſtances ſo related be deſtroyed. But natural *relations* are not alterable, but are as laſting as their ſubjects.

Another *relation* is the conformity or diſagreement of men's voluntary actions to a rule, to which they are referred, and by which they are judged of: theſe may be called *moral relations*.

It is this conformity or diſagreement of our actions to ſome law (whereby good or evil is drawn on us from the will and power of the law-maker, and is what we call *reward* or *puniſhment*) that renders our actions morally good or evil.

Of theſe moral rules or laws there ſeem to be three ſorts, with their different enforcements. Firſt, the divine law; ſecondly, civil law; thirdly, the law of opinion or reputation. By their *relation* to the firſt, our actions are

are either sins or duties; to the second, criminal or innocent; to the third, virtues or vices. Locke's Essay, vol. i. chap. 25, 26, 33.

RELATION, in *Logic*, is an accident of substance, accounted one of the ten categories or predicaments.

Each substance admits of an infinity of *relations*. Thus, the same Peter considered with regard to Henry, is in the *relation* of a master; with regard to John, in that of a tenant; with regard to Mary, in that of a husband, &c. Again, with regard to one person, he is rich; with regard to another, poor; with regard to another, he is far, near, tall, short, a neighbour, stranger, learned, unlearned, good, bad, equal, &c. It is disputed among the school philosophers, whether or no the *relation* be a thing formally and really distinct from the foundation of the substance.

RELATION, *relatio*, in *Rhetoric*, is sometimes used to signify the same with RECRIMINATION.

RELATION is also used, in the *School Theology*, to denote certain of the divine perfections, called *personal* ones; because by these one Divine Person is referred to another, and distinguished from it.

Hence they teach, that in God there is one nature, two processions, three persons, and four *relations*.

These *relations* are paternity, filiation, active spiration, and passive spiration.

RELATION, in *Geometry*, *Arithmetic*, &c. is the habitude or respect of two quantities to one another, with regard to their magnitude. This we more usually call RATIO, or *reason*.

The equality or sameness of two such *relations* we call PROPORTION.

RELATION, in *Grammar*, is the correspondence which words have to one another in CONSTRUCTION.

Faulty and irregular *relations* are the things chiefly to be guarded against, in writing correctly; they make the sense obscure, and frequently equivocal. Thus: the orator was attended to with a coldness, which was the more remarkable, as the audience were under some emotion before he began. Here *coldness* being put indeterminately, the relative *which* can have no just and regular *relation* to it.

RELATION is also frequently used for ANALOGY, or what several things have in common.

In painting, architecture, &c. a certain *relation* of the several parts and members of the building, or picture, constitutes what we call SYMMETRY.

RELATION *inharmonical*, in *Musical Composition*, is that whose extremes form a false or unnatural interval, incapable of being sung.

This is otherwise called a *false relation*, and stands opposed to a *just* or *true relation*.

RELATION, in *Law*, is where two things, as times, &c. are considered as if they were one; the thing subsequent being considered as taking effect, by *relation*, at the time preceding.

As if A deliver a writing to B, to be delivered to C, as the deed of A; the writing shall be deemed to be delivered to C, at the time when it was given to B, by *relation*.

So bills in parliament to which the king assents on the last day of parliament, shall relate and be of force from the first day thereof. Coke calls this *fictio juris*.

RELATIVE *propositions*, are such as include some relation and comparison.

Thus, Where the treasure is, there will the heart be; As much as thou hast, so much thou art worth, &c. are *relative propositions*.

RELATIVE *gravity*, *levity*, *motion*, *necessity*, *place*, *space*, *time*, *velocity*. See the several substantives.

RELATIVE *terms*, in *Logic*, are words which imply a relation, or a thing considered as compared to another.

Relative terms include a kind of opposition between them; yet so, as that the one cannot be without the other.

Such are *father* and *son*, *husband* and *wife*, *king* and *subjects*, &c.

RELATIVE, in *Grammar*, is a word or term which in the construction answers to some word foregoing, called the ANTECEDENT.

All *relatives* are said to reciprocate, or mutually infer each other; and, therefore, they are often expressed by the genitive case.

RELATIVE, *Pronoun*. See PRONOUN.

RELAXATION, *relaxatio*, in *Medicine*, &c. the act of loosening or slackening the tone or tension of the fibres, nerves, muscles, &c.

The *relaxation* of a muscle is supposed to be effected, either by the perspiration of the nervous spirits, or the regress of the spirits, blood, &c. which inflated its fibres; or by the contraction of the air, in the globules of blood before expanded by the sudden influx and admixture of the spirits, &c. See MUSCULAR *motion*.

RELAXATION, in *Surgery*, is a preternatural extension, or straining of a nerve, tendon, muscle, or the like; either through violence, or weakness.

Hernias are descents or *relaxations* of the intestines, &c. From the same cause arise descents or prolapsions of the anus, &c.

RELAXATION, in *Law*, is used for a *releasing*. See RELEASE.

In this sense we say the *relaxation* of an attachment in the court of admiralty.

The tenor of indulgence is a *relaxation*, or diminution, of the pains of purgatory.

RELAY, a fresh equipage, horse, &c. sent before, or appointed to be ready, for a traveller to change, to make the greater expedition; as in riding post.

The term is borrowed from the French, *relais*, which signifies the same thing. In France, the general of the posts entitles himself superintendant of the *relays*.

RELAY *horses*, in the *Artillery*, are horses that march with the artillery or baggage, and are ready to relieve others, or to assist in going up a hill, or through bad roads, &c.

RELAYS, in *Hunting*, are fresh sets of dogs, or horses, or both, disposed here and there for readiness, in case the game come that way, to be cast off, or to mount the hunters in lieu of the former, which are supposed to want respite.

RELAY, in *Tapestry*, is an opening left in a piece of tapestry, where the colours or figures are to be changed; because, on those occasions, the workmen are changed; or else the places are left to be filled up, till the rest of the work is done. See TAPESTRY.

RELEASE, *relaxatio*, in *Law*, denotes an instrument, whereby estates, rights, titles, entries, actions, and other things, are sometimes extinguished and annulled, sometimes transferred, sometimes abridged, and even sometimes enlarged: and it is a species of conveyance which presupposes some other conveyance precedent, and serves to enlarge, confirm, alter, restrain, restore, or transfer the interest granted by such original conveyance.

A *release* is either in fact or in law.—A *release in fact* is that which the very words do expressly declare.

A *release in law* is that which acquits by way of consequence, or intendment of law. These *releases* may enure either, 1. By way of *enlarging an estate*, or *enlarger l'estate*: as, if there be tenant for life or years, remainder to another in fee, and he in remainder *releases* all his right to the particular tenant and his heirs, this gives him the estate in fee. But in this case the releffee must be in possession of some estate, for the *release* to work upon; for if there be lessee for years, and, before he enters and is in possession, the lessor *releases* to him all his right in the reversion, such *release* is void for want of possession in the releffee. 2. By way of *passing an estate*, or *mitter l'estate*: as when one of two coparceners *releaseth* all her right to the other, this passeth the fee-simple of the whole. And in both these cases there must be a privity of estate between the releffor and the releffee; that is, one of their estates must be so related to the other, as to make but one and the same estate in law. 3. By way of *passing a right*, or *mitter le droit*: as if a man be disseised, and *releaseth* to his disseisor all his right; hereby the disseisor acquires a new right, which changes the quality of his estate, and renders that lawful which before was tortious. 4. By way of *extinguishment*: as if my tenant for life makes a lease to A for life, remainder to B and his heirs, and I *release* to A; this extinguishes my right to the reversion, and shall enure to the advantage of B's remainder as well as of A's particular estate. 5. By way of *entry and feoffment*: as if there be two joint disseisors, and the disseisee *releases* to one of them, he shall be sole seised, and shall keep out his former companion; which is the same in effect as if the disseisee had entered, and thereby put an end to the disseisin, and afterwards had enfeoffed one of the disseisors in fee. And hereupon we may observe, that when a man has in himself the possession of lands, he must at the common law convey the freehold by feoffment and livery; which makes a notoriety in the country: but if a man has only a right or a future interest, he may convey that right or interest by a mere *release* to him that is in possession of the land: for the occupancy of the releffee is a matter of sufficient notoriety already. Blackst. Com. book ii. p. 324, &c. See LEASE *and release*.

RELEGATION, *relegatio*, a kind of EXILE or BANISHMENT, wherein the obnoxious person is commanded to retire to a certain place prescribed, and to continue there till he be recalled.

Lord Coke calls *relegation* a banishment for a time only:

Courtin more adequately defines *relegation* a banishment to a certain place or a certain term.

In Rome, *relegation* was a less severe punishment than deportation, in that the *relegated* person did not thereby lose the rights of a Roman citizen, nor those of his family, as the authority of a father over his children, &c.

RELICS, *reliquiæ*, in the *Romish Church*, certain remains of the body or cloaths of some saint or martyr, devoutly preserved in honour to his memory, carried at processions, kissed, revered, &c.

The abuses of that church in point of *relics* are very flagrant. F. Mabillon, a Benedictine, complains of the great number of suspected *relics* exposed on altars: he owns, that, were there to be a strict inquisition into the *relics*, vast numbers of spurious ones would be found offered every where to the piety and devotion of the faithful; and adds, that bones are frequently consecrated, so far from belonging to saints, that, in all probability, they do not belong to Christians.

The catacombs are an inexhaustible fund of *relics*; yet it is still disputed who were the persons interred therein.

In the eleventh century, a method was introduced of trying supposed *relics* by fire. Those which did not consume in the fire, were reputed genuine; the rest not.

It is an ancient custom, which still obtains, to preserve the *relics* in the altars whereon mass is celebrated. To this purpose, a square hole is made in the middle of the altar, big enough to receive the hand; and herein is the *relic* deposited, being first wrapped in red silk, and inclosed in a leaden box.

The Romanists alledge a good deal of antiquity in behalf of their *relics*. The Manichees, it seems, out of hatred to the flesh, which they held an evil principle, are recorded as refusing to honour the *relics* of saints; which is esteemed a kind of proof, that the Catholics did it in the first ages.

Indeed, folly and superstition got into religion but too early. Even the touching of linen cloths on *relics*, from an opinion of some extraordinary virtue derived therefrom, appears to be as ancient as the first ages, there being a hole made in the coffins of the forty martyrs at Constantinople, expresly for this purpose.

This practice of honouring the *relics* of saints, on which the church of Rome, in succeeding ages, founded her superstitious and lucrative use of them, as objects of devotion, as a kind of charms or amulets, and as instruments of pretended miracles, seems to have originated in a very ancient custom, that prevailed among Christians, of assembling at the cœmiteries or burying-places of the martyrs, for the purpose of commemorating them, and of performing divine worship. When the profession of Christianity obtained the protection of the civil government, under Constantine the Great, stately churches were erected over their sepulchres, and their names and memories were treated with every possible token of affection and respect. See SAINTS. In process of time, this reverence of the martyrs exceeded all reasonable bounds; and those prayers and religious services were thought to have a peculiar sanctity and virtue, which were performed over their tombs. Hence probably proceeded the practice, which obtained in the fourth century, of depositing *relics* of the saints and martyrs under the altars in all their churches. This practice, however, was then thought of such importance, that St. Ambrose would not consecrate a church, because it had no *relics*; and the council of Constantinople in Trullo ordained, that those altars should be demolished, under which there were found no *relics*. The rage of procuring *relics* for this and other purposes of a similar nature became so excessive, that, in 386, the emperor Theodosius the Great was obliged to pass a law, forbidding the people to dig up the bodies of the martyrs, and to traffick in their *relics*.

Such was the commencement of that respect for sacred *relics*, which, in after ages, was perverted into a formal worship of them, and became the occasion of innumerable processions, pilgrimages, and miracles, from which the church of Rome hath derived incredible advantage. Towards the close of the ninth century, it was not enough to reverence departed saints, and to confide in their intercessions and succours; it was not enough to clothe them with an imaginary power of healing diseases, working miracles, and delivering from all sorts of calamities and dangers; their bones, their cloaths, the apparel and furniture they had possessed during their lives, the very ground which they had touched, or in which their putrified carcases were laid, were treated with a stupid veneration, and supposed to retain the marvellous virtue of healing all disorders both of body and mind, and of defending such as possessed them against all the assaults and devices of satan. The consequence of this wretched notion was, that every one was eager to provide himself with these salutary remedies, for which purpose great numbers undertook fatiguing and perilous voyages, and subjected themselves to all sorts of hardships; while others made use of this delusion, to accumulate their riches, and to impose upon the miserable multitude by the most impious and shocking inventions. As the demand for *relics* was prodigious and universal, the clergy employed all their dexterity to satisfy these demands, and were far from being nice in the methods they used for that end. The bodies of the saints were sought by fasting and prayer, instituted by the priest in order to obtain a divine answer and an infallible direction, and this pretended direction never failed to accomplish their desires; the holy carcase was always found, and that always in consequence, as they impiously gave out, of the suggestion, and inspiration of God himself. Each discovery of this kind was attended with excessive demonstrations of joy, and animated the zeal of these devout seekers to enrich the church still more and more with this new kind of treasure. Many travelled with this view into the Eastern provinces, and frequented the places which Christ and his disciples had honoured with their presence, that, with the bones and other sacred remains of the first heralds of the Gospel, they might comfort dejected minds, calm trembling consciences, save sinking states, and defend their inhabitants from all sorts of calamities. Nor did these pious travellers return home empty; the craft, dexterity, and knavery of the Greeks found a rich prey in the stupid credulity of the Latin *relic*-hunters, and made a profitable commerce of this new devotion. The latter paid considerable sums for legs and arms, skulls and jaw-bones (several of which were Pagan, and some not human), and other things that were supposed to have belonged to the primitive worthies of the Christian church; and thus the Latin churches came to the possession of those celebrated *relics* of St. Mark, St. James, St. Bartholomew, Cyprian, Pantaleon, and others, which they shew at this day with so much ostentation. But there were many, who, unable to procure for themselves these spiritual treasures by voyages and prayers, had recourse to violence and theft; for all sorts of means and all sorts of attempts in a cause of this nature were considered, when successful, as pious and acceptable to the Supreme Being.

Besides the arguments from antiquity to which the Papists refer, in vindication of their worship of *relics*, of which the reader may form some judgment from this article, Bellarmine appeals to Scripture in support of it, and cites the following passages, viz. Exod. xiii. 19. Deut. xxxiv. 6. 2 Kings xiii. 21. 2 Kings xxiii. 16, 17, 18. Isaiah xi. 10. Matthew xi. 20, 21, 22. Acts v. 12—15. Acts xix. 11, 12. See POPERY.

Relics are forbidden to be used or brought into England by several statutes; and justices of peace are empowered to search houses for popish books and *relics*, which, when found, are to be defaced and burnt, &c. 3 Jac. I. cap. 26.

RELICT, *relicta*, in *Law*. See WIDOW.

RELICTA *verificatione*, in *Law*, is when a defendant relinquishes his proof or plea, and thereupon judgment is entered for the plaintiff.

RELIEF, *relevium*, *levamen*, in *Law*, a fine paid to the chief lord, by a person at his coming to the inheritance of land held by military service.

This was said *relevare hereditatem caducam*; and the money thus paid was called *relevamen*, *relevium*, or *relief*. *Relief* is usually to the value of a year's rent or revenue.

The origin of the custom is thus: a feudatory or beneficiary estate in lands being at first only granted for life, after the death of the vassal, it returned to the chief lord; and was hence called *feudum caducum*, q. d. fallen to the lord by the death of the tenant.

In course of time, these feudatory estates being converted into inheritances by the connivance and consent of the lord; when the possessor of such estate died, it was called *hæreditas caduca*, q. d. an inheritance fallen to the lord, from whom it was to be recovered, by the heir's paying a certain sum of money. But this sum was arbitrary, and at the will of the lord; so that, if he pleased to demand an exorbitant *relief*, it was in effect to disinherit the heir. The English ill brooked this consequence of their new-adopted policy; and therefore William the Conqueror by his laws (cap. 22, 23, 24.) ascertained the *relief*, by directing (in imitation of the Danish heriots) that a certain quantity of arms and habiliments of war should be paid by the earls, barons, and vavasours respectively; and if the latter had no arms, they should pay one hundred shillings. William Rufus broke

broke through this composition, and again demanded arbitrary uncertain *reliefs*, as due by the feodal laws; thereby in effect obliging every heir to new-purchase or redeem his land: but his brother Henry I. by his charter, restored his father's law; and ordained that the *relief* to be paid should be according to the law so established, and not an arbitrary redemption. But afterwards, when, by an ordinance in 27 Hen. III. called the Assise of Arms, it was provided that every man's armour should descend to his heir, for defence of the realm, and it thereby became impracticable to pay these acknowledgments in arms, according to the laws of the Conqueror, the composition was universally accepted of one hundred shillings for every knight's fee; as we find it ever after established. But it must be remembered, that this *relief* was only then payable, if the heir at the death of his ancestor had attained his full age of twenty-one years.

Relief *reasonable*, called also *lawful*, and *ancient relief*, is that enjoined by some law, or fixed by ancient custom; and which does not depend on the will of the lord.

Thus, in a charter of king John, mentioned by Matthew Paris: —*Si quis comitum vel baronum nostrorum, sive aliorum tenentium de nobis in capite per servitium militare, mortuus fuerit, & cum decesserit, hæres suus plenæ ætatis fuerit, &* relevium *debet, habeat hæreditatem suam per* antiquum relevium.

What this was, may be seen in the laws of William the Conqueror, &c. Bracton says, this fine was called a *relief, quia hæreditas, quæ jacens fuit per antecessoris decessum*, relevatur *in manus hæredum*, &c.

A *relief* is also paid in socage tenure, or petit serjeanty; where a rent, or other thing, is paid by rendering as much as the rent or payment reserved.

By the custom of Normandy, *relief* is due for lands held in villainage as well as in fee. By the custom of Paris, *relief* is not due upon inheritances in the direct line.

The quantity of the *relief* is very different; there are *single reliefs, double reliefs*, &c. The quality, too, is diverse: there are *reliefs of property*, paid by the heir; *reliefs of bail*, or *tutorage*, paid by the guardian for his minor, or by the husband for the fiefs of his wife, &c. *relief of horse and arms*, &c.

By the laws of king Canutus, the *relief* of an earl, paid to the king, was eight war-horses with their bridles and saddles, four cuirasses, four helmets, four swords, four hunting-horses, and a palfrey. The *relief* of a baron or thane was four horses, &c.

Relief, in *Chancery*, denotes an order sued out for the dissolving of contracts, and other acts, on account of their being unreasonable, prejudicial, grievous, or from some other nullity, either *de jure*, or *de facto*.

Minors obtain *relief* against acts passed in their minority. Majors have *relief* in cases of enormous damage, deceit, violence, over-reaching, extravagant bargains, &c.

Among the Romanists it is a rule, that the church obtains *relief* any time, and against all acts passed in its prejudice; no prescription prevailing against it.

Relief, *Aid de*. See Aid.

Relief *of a hare*, among *Hunters*, is the place where she goes to feed in the evening.

Relief, in *Sculpture*. See Relievo.

RELIEVE, in the *Military Sense*. To *relieve*, is to take the post of another body. Hence, to *relieve* the guard, to *relieve* the trenches, &c. is to bring fresh men upon the guard, or to the trenches, and to send those to rest who have been upon duty before. They also say, *relieve* a sentinel, which is generally done every two hours, by a corporal who attends the relief; *relieve* the steersman, &c.

To *relieve* a place that is besieged, is to furnish it with a supply of men, provisions, ammunition, &c.

RELIEVER, in *Artillery*, is an iron ring fixed to a handle by means of a socket, so as to be at right angles to it. It serves to disengage the first searcher of a gun, when any of its points are retained in a hole, and cannot be got out otherwise.

RELIEVING *tackles*, in a *Ship*, are two strong tackles, used to prevent a ship from overturning on the careen, and to assist in bringing her upright after that operation is completed. The *relieving* tackles are furnished with two strong *guys* or pendants, by which their efforts are communicated, under the ship's bottom, to the opposite side, where the ends of the guys are attached to the lower gun-ports. The other ends of the tackles are hooked to the wharf, or pontoon, by which the vessel is careened. Thus if a ship is first to be laid down on the larboard side, which is nearest the wharf, the *relieving* tackles are passed under her bottom from the said wharf, and attached to the starboard side, by which they will restrain her from falling lower than is necessary. Falconer.

Relieving *tackle* is also a name given to the train tackles of a gun-carriage.

RELIEVO, or Relief, *imbossment*, is applied to a figure which projects, or stands out prominent, from the ground or plane whereon it is formed, whether that figure be cut with the chissels, moulded, or cast. There are three kinds of *relievo*; viz. *alto, basso*, and *demi-relievo*.

Relievo, *Alto, haut relief*, or *high relievo*, is when the figure is formed after nature, and projects as much as the life.

Relievo, *Basso, bas relief*, or *low relievo*, is when the work is but raised a little from its ground, as we see in medals, and in the frontispieces of buildings, particularly the histories, festoons, foliages, and other ornaments in friezes. See Basso *relievo*.

Relievo, *Demi*, is when one half of the figure rises from the plane, i. e. when the body of a figure seems cut in two, and one half is clapped on a ground. When in a *basso relievo* there are some parts that stand clear out, detached from the rest, the work is called a *demi-bosse*.

Relievo, in *Architecture*, denotes the sally or projecture of any ornament.

This, Daviler observes, is always to be proportioned to the magnitude of the building it adorns, and the distance at which it is to be viewed.

If the work be insulate, and terminated on all sides, it is called a *figure in relievo*, or a *round imbossment*. Such are statues, acroters, &c.

Relievo, in *Painting*, denotes the degree of force or boldness whereby a figure seems, at a due distance, to stand out from the ground of the painting, as if really imbossed.

The *relievo* depends much on the depth of the shadow, and the strength of the light; or on the light of the different colours bordering on one another; and particularly on the difference of the colour of the figure from that of the ground.

When the light is well chosen, to make the nearest parts of figures advance; and well diffused on the masses, still diminishing insensibly, and terminating in a large specious shadow, brought off insensibly; the *relievo* is said to be *bold*, and the *clair obscure, well understood*.

RELIGION, *religio*, that worship or homage due to God, considered as Creator, Preserver, and, with Christians, as Redeemer, of the world.

The foundation of all *religion* is, that there is a God; and that he requires some service at the hands of his creatures. From the different manners wherein we arrive at the knowledge of this service, *religion* is divided into *natural* and *revealed*.

Religion, *Natural*, is whatever we discover to be due and meet, by the mere dictates of natural reason; as to love and honour God, not to abuse his creatures, &c.

Religion, *Revealed*, is what we receive as the express declaration of God himself, by the mouths of prophets, &c. See Revelation.

The first flows immediately from the relation between the creature and the Creator; the latter does not follow from such a relation, but is superadded from the mere will and pleasure of the Creator.

The first we ordinarily call morality, or ethics; because immediately conversant about the manners and duties of men towards one another; and towards themselves, considered as creatures of that Being.

The latter we call, by way of eminence, *religion*, as being the rule of our duty immediately to God himself.

The first supposes a God, a providence, a future state, rewards and punishments; the latter likewise supposes an immediate mission from God himself, attested by miracles, &c. See Christian *religion*.

Religion is more particularly used for that special system of faith and worship, which obtains in a particular age, sect, or country, &c.

In this sense we say the Romish *religion*, the Reformed *religion*, the *religion* of the Greeks, the Mahometan *religion*, the Jewish *religion*, &c. See Judaism, Mahometanism, &c.

The Siamese hold the diversity of *religions*, i. e. the different manners of honouring God, to be pleasing to him; inasmuch as they have all the same object, and all tend to the same end, though by different means. Claude.

This sentiment of these idolaters is doubtless more just than that of our zealots, who hold all but those of their own religion odious to God. The several sects in *religion* see under their proper articles. See also Sect.

Of the *religion* of the ruling part of the world, you may find a lively description in a chorus in Seneca's Troas, at the end of the second act, beginning thus: *Verum est, an timidos fabula decipit? umbras corporibus vivere conditis*, &c. This, according to Patin, is the religion of princes, and great men, of magistrates, monastic superiors,

viors, and even some physicians and philosophers. M. Du Maine, head of the leaguers in France, used to say, that princes have no *religion* till after they are turned of forty. *Cum numine nobis mors instat, majore facit.* Patin. Lett. Chois. 106.

Religion, again, is applied to a military order, consisting of knights who live under some certain rule, &c.

In this sense we say the *religion of Malta*, &c. see Malta.

Religion is sometimes also used for a convent. Thus we say, there are *religions* of men, i. e. monks; *religions* of women, i. e. nuns. There are new *religions* established every day, i. e. there are continually new monasteries built.

The Religion used absolutely, denotes the Reformed in France. Thus, they say, D'Ablancourt and Dacier were of the *religion*. See Huguenots.

RELIGIOUS, in a general sense, something that relates to religion.

We say, a *religious* life, *religious* society, &c. Churches and church-yards are *religious* places. A *religious* war is also called a croisade.

Religious is more particularly used for a person engaged by solemn vows to the monastic life; or a person shut up in a monastery, to lead a life of devotion and austerity, under some rule or institution.

The male *religious* we popularly call *monks* and *friars*; the female, *nuns* and *canonesses*. See Canon, Monk, Nun, &c.

M. Nicole observes, that some domestic chagrins, and a certain pride, which leads people to abscond when they cannot make a figure to their mind, make as many *religious* as real piety. He adds, that a girl must often be made a *religious* for no other reason, but because she cannot be married answerable to her condition.

A *religious* cannot make any will. By the council of Trent, a *religious* may reclaim his vows within five years.

Anciently the *religious* were all laymen, and it was even prohibited them to take up orders. In 1557, the parliament of Paris made a difficulty of receiving a bishop of Laon to the oath of a duke and peer, by reason of his being a *religious*: yet a *religious*, being promoted to a bishoprick, is thenceforth secularized or dispensed from the observation of his rule.

In ancient deeds and conveyances of lands, we often find the seller restrained from giving or alienating it, *viris religiosis, vel Judæis*, to *religious*, or to Jews; to the end the land might not fall into mortmain.

In a memorial directed by king John to his viscounts, they are ordered to proclaim through their respective counties, that nobody, as they love their bodies and cattle, injure the *religious* or clerks, either in word or deed, on penalty of being hanged up on the next oak. *Nulli, sicut diligunt corpora & catalla sua, malum faciant vel dicant* viris religiosis *vel* clericis. *Si quem inde attingere possimus, ad proximam quercum eum suspendi faciemus.*

Religious *impostors*. See Impostors.

Religious *order*. See Order.

Most military orders pretend likewise to be *religious*; as those of Malta, who make vows, &c. See Malta.

RELINQUISHMENT, in *Law*, is a forsaking, abandoning, or giving over. It hath been adjudged, that a person may *relinquish* an ill demand in a declaration, &c. and have judgment for that which is well demanded.

RELIQUA, the remainder or debt, which a person finds himself debtor in, upon the balancing and liquidating an account.

Hence, *reliquitary*, the debtor of a *reliqua*; as also a person who only pays piece-meal.

The term *reliqua* is pure Latin.

RELIQUARY, a shrine or casket, in which the relics of a dead saint are kept.

RELIQUES. See Relics.

RELIQUIÆ, *relics*, in *Antiquity*, the ashes and bones of the dead, which remained after burning their bodies; and which they very religiously gathered, and put into urns, and afterwards deposited in tombs.

RELL *mouse*, in *Zoology*, the English name of the white-bellied mouse, with a blackish back and long body. See Glis.

REM, *Information in*, in *Law*. See Information.

REMAINDER, *remanentia*, in *Law*, an estate limited to take effect and be enjoyed after another estate is determined. As if a man seised in fee-simple granteth lands to A for twenty years, and, after the determination of the said term, then to B and his heirs for ever: here A is tenant for years, *remainder* to B in fee. In the first place, an estate for years is created or carved out of the fee, and given to A; and the residue or *remainder* of it is given to B. But both these interests are in fact only one estate; the present term of years and the *remainder* afterwards, when added together, being equal only to one estate in fee. Thus also if land be granted to A for twenty years, and after the determination of the said term to B for life; and after the determination of B's estate for life, it be limited to C and his heirs for ever: this makes A tenant for years, with *remainder* to B for life, *remainder* over to C in fee. In this case also, the first estate, and both the *remainders*, for life and in fee, are one estate only. Hence it is easy to infer, that no *remainder* can be limited after the grant of an estate in fee-simple; because this is the highest and largest estate that a subject is capable of enjoying; and he that is tenant in fee hath in him the whole of the estate; a *remainder*, therefore, which is only a portion, or residuary part of the estate, cannot be reserved after the whole is disposed of.

The rules that are laid down by law to be observed in the creation of *remainders*, are as follow. 1. There must necessarily be some particular estate, precedent to the estate in *remainder*; which particular estate is said to support the *remainder*. 2. The *remainder* must commence or pass out of the grantor at the time of the creation of the particular estate: as where there is an estate to A for life, with *remainder* to B in fee; here B's *remainder* in fee passes from the grantor at the same time that seisin is delivered to A of his life-estate in possession. And it is this which induces the necessity at common law of livery of seisin being made on the particular estate, whenever a freehold *remainder* is created. 3. The *remainder* must vest in the grantee during the continuance of the particular estate, or *eo instanti* that it determines. As, if A be tenant for life, *remainder* to B in tail; here B's *remainder* is vested in him, at the creation of the particular estate to A for life: or if A and B be tenants for their joint lives, *remainder* to the survivor in fee; here, though during their joint lives the *remainder* is vested in neither, yet on the death of either of them, the *remainder* vests instantly in the survivor; whence both these are good *remainders*. But if an estate be limited to A for life, *remainder* to the eldest son of B in tail, and A dies before B hath any son; here the *remainder* will be void, for it did not vest in any one during the continuance, nor at the determination, of the particular estate: and even supposing that B should afterwards have a son, he shall not take by this *remainder*; for, as it did not vest at or before the end of the particular estate, it never can vest at all, but is gone for ever. Hence *remainders* are either *vested* or *contingent*. *Vested remainders* (or *remainders* executed, whereby a present interest passes to the party, though to be enjoyed *in futuro*) are such where the estate is invariably fixed, to remain to a determinate person after the particular estate is spent. As if A be tenant for twenty years, *remainder* to B in fee; here B's is a *vested remainder*, which nothing can defeat or set aside. *Contingent* or executory *remainders* (whereby no present interest passes) are where the estate in *remainder* is limited to take effect, either to a dubious and uncertain person, or upon a dubious or uncertain event; so that the particular estate may chance to be determined, and the *remainder* never take effect. In the first case, if A be tenant for life, with *remainder* to B's eldest son (then unborn) in tail, this is a contingent *remainder*; and if A dies before B's son is born, the *remainder* is absolutely gone; even though A leaves his wife big with child, and after his death a posthumous son is born. But to remedy this hardship, it is enacted by statute 10 & 11 W. III. cap. 16. that posthumous children shall be capable of taking in *remainder*, in the same manner as if they had been born in their father's life-time; that is, the *remainder* is allowed to vest in them, while yet in their mother's womb. In the second case, where land is given to A for life, and in case B survives him, then with *remainder* to B in fee; here B is a certain person, but the *remainder* to him is a contingent *remainder*, depending upon the uncertainty of his surviving A. During the joint lives of B and A it is contingent; and if B dies first, it can never vest in his heirs, but is for ever gone; but if A dies first, the *remainder* to B becomes vested. *Contingent remainders* may be defeated, by destroying or determining the particular estate upon which they depend, before the contingency happens, whereby they become vested.

In devises by last will and testament, *remainders* may be created in some measure contrary to the rules here laid down: though our lawyers will not allow such dispositions to be strictly *remainders*; but call them by another name, that of executory *devises*, or devises hereafter to be executed. Blackst. Com. book ii. chap. 11. § 3.

Spelman makes the difference between a *remainder* and *reversion* to consist in this; that by a reversion, after the appointed term, the estate returns to the donor, or his heirs,

heirs, as the proper fountain; whereas by *remainder* it goes to some third person, or stranger.

Or, a *remainder* is an EXPECTANCY, created by act of the parties; whereas a REVERSION is created by act of law.

The limitations of personal goods and chattels, in *remainder* after a bequest for life, are permitted in last wills and testaments: so that if a man, either by deed or will, limits his books or furniture to A for life, with *remainder* over to B, this *remainder* is good. But where an estate-tail in things personal is given to the first or any subsequent possessor, it vests in him the total property, and no *remainder* over shall be permitted on such a limitation.

Glanville observes, that bishops and abbots, in regard their baronies are the king's alms, cannot give any part thereof by way of *remainder*.

REMAINDER, *Writ of formedon in the*. See FORMEDON.

REMAINDER, in *Mathematics*, is the difference; or that which is left after the taking a lesser number, or quantity, from a greater.

REMANCIPATION, *remancipatio*, among the Romans, a form of divorce observed in marriages that had been contracted by *coemption*. This was done by delivering the wife into the husband's hands; so the marriage was dissolved by the husband's redelivering the wife into any person's hands, agreed upon between them.

RE-MARRYING, the repeating of a marriage; or the going through the solemnities of a second marriage.

Clandestine and uncanonical marriages are deemed null; and the parties are to be *re-married* in form; at least, it had always better be so to avoid disputes.

It was anciently expresly forbid to *re-marry* in the first year of viduity. M. Bayle observes, that a person who does not *re-marry*, is answerable to the public for all the time lost in his viduity, or widowerhood.

REMEDIAL *part of a law*. See LAW.

REMEDIAL *statutes* are those which are made to supply such defects, and abridge such superfluities, in the common law, as arise either from the general imperfection of all human laws, from change of time and circumstances, from the mistakes and unadvised determinations of unlearned judges, or from any other causes whatsoever. And this being done, either by enlarging the common law where it was too narrow and circumscribed, or by restraining it where it was too lax and luxuriant, hath occasioned another subordinate division of *remedial* acts of parliament into enlarging and restraining statutes. E. g. In the case of treason, clipping the current coin of the kingdom was an offence not sufficiently guarded against by the common law; therefore it was thought expedient by statute 5 Eliz. cap. 11. to make it high treason, which it was not at the common law; so that this was an enlarging statute. At common law also spiritual corporations might lease out their estates for any term of years, till prevented by the statute 13 Eliz. cap. 10. this was, therefore, a restraining statute. Blackst. Com. book i. p. 86.

REMEDY, in *Law*, is the action or means given by law for the recovery of a right. *Lex semper dabit remedium.*

REMEDY, *remedium*, in *Physic*, a medicine, or preparation, applied either internally or externally, for the cure of a disease.

Emplasters, unguents, cataplasms, &c. are *topical remedies*. Mercury and the bark are *specific remedies*. Mineral waters, and ass's milk, and country air, are usually the *last remedies*. Salivation is sometimes called, by way of eminence, *the remedy*.

When *remedies* are stuffed with too many ingredients, they load the stomach with a slimy mucilage, which swells, obstructs, and does more hurt than good.

REMEDIES *appended*. See APPENSA.

REMEDY *for the master of the mint*, in the *English Coinage*, denotes a certain latitude allowed him with respect to the STANDARD of gold coin. Out of every fifteen pounds of gold coined at the mint (according to the account published by the learned Mr. Folkes, in his curious tables of English silver coins) some pieces are taken at random, and deposited in a strong box called the pix: at certain intervals, sometimes of one year and sometimes of several years, the pix is opened at Westminster, in the presence of the lord chancellor, the lords commissioners of the treasury, and others; portions taken from the pieces of each coinage are melted together, and an assay made of the collective mass by a jury of the goldsmiths' company. At this trial the mint-master is held excusable, though the moneys be either too base or too light; provided the imperfection and deficiency together are less than the sixth part of a carat, which amounts to forty grains of fine gold on the pound of standard, or the one hundred and thirty-second part of the value. It is said that this *remedy* is contained within as narrow limits, as any workers can reasonably be supposed to make themselves answerable for.

REMEMBRANCE, is when the idea of something formerly known recurs again to the mind, without the operation of a like object on the external sensory. See MEMORY, REMINISCENCE, and RECOLLECTION.

REMEMBRANCERS *of the exchequer*, are two officers, or clerks therein, formerly called *clerks of the remembrance*.

They are now distinguished by the appellations of the *king's remembrancer*, and the *lord treasurer's remembrancer*. There is also another officer, called the *remembrancer of the first fruits*. Their business is to put the lord treasurer and justices of the court in *remembrance* of such things as are to be called upon, and dealt in for the king's benefit.

The king's REMEMBRANCER enters into his office all recognizances taken before the barons, for any of the king's debts; for appearance; or for observing orders; and makes out process against the collectors of customs, subsidies, excise, and other public payments, for their accounts. All informations upon penal statutes are entered in this office; and there all matters upon English bills in the exchequer-chamber remain. He makes the bills of composition upon penal laws; takes the statement of debts; has delivered into his office all manner of indentures, fines, and other evidences whatsoever that concern the assuring of any lands to the crown: he every year, *in crastino Animarum*, reads, in open court, the statute for election of sheriffs, and gives them their oath, and reads the oath of all the officers of the exchequer, when they are admitted.

The lord treasurer's REMEMBRANCER is charged to make process against all sheriffs, escheators, receivers, and bailiffs, for their account; process of fieri facias, &c. extent for any debts due to the king, either in the pipe, or with the auditors; and process for all such revenues as are due to the king, by reason of his tenures. He also makes record, whereby it appears whether sheriffs, or other accountants, pay their proffers due at Easter and Michaelmas. He makes another record, whether sheriffs, or other accountants, keep their days of prefixion: all estreats or fines, issues, and amerciaments, set in any of the courts of Westminster, or at the assizes or sessions, are certified into his office, and are by him delivered to the clerk of the estreats to write process upon them, &c.

The REMEMBRANCER *of the first fruits* takes all compositions and bonds for first fruits and tenths; and makes process against such as do not pay the same.

REMEMBRANCER is also the title of an officer in the city of London, who is to attend the lord mayor on certain days, and whose business is to remind his lordship of the select days, when he is to go abroad with the aldermen, &c. He is to attend daily at the parliament-house, during the sessions, and to report to the lord mayor their transactions.

REMIGES, in *Ornithology*, denote the primary and secondary wing-feathers.

REMINISCENCE, *reminiscentia*, is that power of the human mind, whereby it recollects itself, or calls again to its remembrance such ideas or notions as it had really forgot: in which it differs from *memory*, which is a treasuring up of things in the mind, and keeping them there, without forgetting them.

Hence memory may be considered as a continual *remembrance*; and *reminiscence*, as an interrupted memory.

How near akin soever the two faculties may seem, yet they are generally found separated; so that they who excel in the one, are generally defective in the other.

The ancient Platonists were of opinion, that all learning and knowledge consisted in the *reminiscence* or recollection of notices which had been in the soul before its union with the body.

REMINISCERE, the second Sunday in Lent; anciently thus called from the first word of the introit of the mass said for that day, *Reminiscere miserationum tuarum.*

REMISIT. — *Recto quando dominus* REMISIT. See RECTO.

REMISSION, in *Law*, *&c.* denotes the pardon of a crime, or the giving up the punishment due thereto.

REMISSION, in *Medicine*, is when a distemper abates, but does not go quite off, before it returns again; as is common in fevers which do not quite intermit.

REMISSION, *remissio*, in *Physics*, the abatement of the power or efficacy of any quality. In opposition to the increase of the same, which is called its *intension*.

In all qualities capable of intension and *remission*, the intension decreases reciprocally as the squares of the distance from the centre of the radiating quality increase.

REMISSION, *remissio*, ἄνεσις, in the *Ancient Music*, was used to signify the passage of the voice from acute to grave, being opposite to intention.

REMIT,

REMIT, in *Commerce*. To *remit* a ſum of money, bill, or the like, is to ſend a ſum of money, &c.

To *remit* is alſo uſed among bankers for what is accuſtomed to be given a banker, or, as it were, diſcounted with him, for his giving a bill of exchange.

To *remit* is alſo to give up part of one's due to a debtor; as, I would *remit* you a fourth of what you owe on condition of paying me the reſt in hand.

REMITTANCE, in *Commerce*, the traffic or return of money from one place to another, by bills of exchange, orders, or the like.

A *remittance* is properly a bill of exchange, or the like, ſent to a correſpondent, and the content thereof to be received by him, or ſome other perſon, on whom it is drawn. By means of theſe *remittances*, large ſums of money are returned from one city to another, without danger, without carriage, &c.

In London it is eaſy to get *remittances* upon any city in the world; in the country it is more difficult.

Remittances, *Book of*. See Book.

Remittance is alſo uſed in ſpeaking of the payment of a bill of exchange. Thus, I have received a hundred piſtoles on your *remittance*. Mr. N. banker in your city, ſhould have paid you two hundred crowns on my *remittance*.

Remittance alſo denotes the due or fee allowed the banker or merchant, both on account of his trouble, and the different value of the ſpecies in the place where you pay the money, and where he *remits* it.

The *remittance* at London is very high. This *remittance* is more uſually called *change* and rechange.

REMITTER, in *Law*. Where a man has two titles to land, and is ſeiſed by the latter; and, that proving defective, he is *remitted* or reſtored to the former more ancient title, this is called a *remitter*, from the Latin, *remittere*, *to ſend back*.

If land deſcend to him that had right to it before, he ſhall be *remitted* to his better title, if he pleaſe.

REMITTING *fever*. See Fever, and Bilious *fever*.

REMOLADE, in the *Manege*. See Charge.

REMONSTRANCE, an expoſtulation, or humble ſupplication, addreſſed to a king, or other ſuperior, to beſeech him to reflect on the inconveniences, or ill conſequences, of ſome order, edict, or the like.

Remonstrance is alſo uſed for an expoſtulatory counſel or advice; or a gentle and handſome reproof, made either in general or particular, to appriſe or correct ſome fault.

REMONSTRANTS, *Remonſtrantes*, a title given to the Arminians, by reaſon of the *remonſtrance* they made in 1610 to the ſtates of Holland, againſt the ſynod of Dort, wherein they were condemned.

Epiſcopius and Grotius were at the head of the *Remonſtrants*. And as the patrons of Calviniſm preſented an addreſs in oppoſition to their remonſtrance, which they called their counter-remonſtrance, they received, in conſequence of this, the name of *Counter-remonſtrants*.

REMORA, in *Natural Hiſtory*, the *ſucking-fiſh*; a little fiſh, reſembling a herring, called by the Greeks *echeneis*, famous for ſticking to the ſides of ſhips. It belongs to the genus of *echeneis* and claſs of *thoracici* in the Linnæan ſyſtem.

Its characters, according to Artedi and Linnæus, are theſe: the branchioſtege membrane on each ſide contains about ten bones; the head is thick, depreſſed, naked, and marked on the upper ſide with tranſverſe rough ſtriæ; the body is oblong, roundiſh, and naked, but ſomewhat compreſſed; the back fin is oblong, and placed very far toward the tail; its under jaw is longer than its upper; it has a great number of teeth in both jaws; the colour of its body is hoary, and it has ſeven fins; two pectoral ones, two ventral ones placed farther from the ſnout than the pectoral ones, one at the anus, one on the back, and one at the tail; the ſtriæ of the head are from eighteen to twenty-four in number, they are rough and tranſverſe, but are divided as it were into two ſeries by a middle longitudinal line. By means of theſe ſtriæ or ridges the fiſh can fix itſelf to any animal or other ſubſtance, and has often been found adhering to the ſides of ſhips and the bodies of ſharks, &c.

Linnæus enumerates two ſpecies of the *echeneis*; the *remora* and *neucrates*: the former has a forked tail, and eighteen ſtriæ on the head; the latter has an entire tail, which is longer than that of the former, twenty-four ſtriæ, a larger body, and ſharper fins. They are both inhabitants of the Indian ocean. See *Tab.* IV. *Fiſh*, N° 42.

The *remora* is much talked of by the ancients, who, as we find from Pliny, lib. ix. cap. 25. lib. xxxi. cap. 31. unanimouſly believed it had the force to ſtop a veſſel in full ſail, or a whale in ſwimming; and hence called it *remora, a remorando*. See Ælian's Hiſt. de Animal. lib. ii. cap. 17. Plutarch. Sympoſ. lib. ii. — But Mr. Cateſby obſerves, that even ſeveral of thoſe fiſhes together can do no more than ſhells or corals, and other foulneſſes of the ſame bulk, which make a ſhip ſail ſomewhat the ſlower. And in the ſame manner only they may be ſome ſmall hindrance to a whale. The author laſt mentioned aſſures us he has taken five of them off the body of a ſhark. Vide Phil. Tranſ. N° 438. p. 113.

Remora, among *Surgeons*, is alſo an inſtrument uſed for ſetting broken bones.

Remora *mutiani*, in *Natural Hiſtory*, a name given by ſome to the genus of ſhells called *concha venerea*, and *porcellana*. See Porcelain *ſhell*.

REMOTION, *remotio*, in *Rhetoric*, the ſame with what is otherwiſe called metastasis.

REMOVAL *of the poor*. See Poor.

REMOULIN, in the *Manege*, is uſed to denote a ſtar upon a horſe's forehead.

REMOUNT, in *War*. To Remount *the cavalry*, or *dragoons*, is to furniſh them with freſh horſes, in lieu of ſuch as have been killed or diſabled in the ſervice.

REMPHAN, in *Antiquity*, the Egyptian name for the planet Saturn. Some think that *remphan* was the moon, others Mercury and Mars, and others the ſun. See Chiun.

REMPLY, in *Heraldry*, ſomething *filled up*. The term is chiefly uſed to denote, that the chief is quite filled up with a ſquare piece of another colour, leaving only a bordure of the proper colour of the chief about the ſaid piece.

REMURIA, among the Romans, a feſtival inſtituted in honour of Remus by his brother Romulus. See Lemuria.

RENAL, *renalis*, ſomething belonging to the reins or kidneys.

Renal *glands*, *glandulæ renales*, in *Anatomy*. See *Renal* Glands.

RENALIS *lapis*, in *Natural Hiſtory*, the name given by many authors to a ſort of ſiderochitum, or cruſtated ferruginous body of that kind, containing a nucleus of a different matter from that of the cruſts. It is found about Prague, and in ſome other places, lying near the ſurface in ſtrata of a yellow clay. Its uſual bigneſs is that of a ripe peach, and its cruſts are of a duſky ferruginous brown colour; and its internal nucleus of a pale yellowiſh green, compoſed of a marley earth, and uſually of a kidney-like ſhape, whence its name.

RENCOUNTER, formed from the French, *rencontre*, *meeting*, in the *Military Art*, the encounter of two little bodies or parties of forces.

In which ſenſe, *rencounter* is uſed in oppoſition to a pitched battle.

Rencounter, in ſingle combats, is uſed by way of contradiſtinction to duel.

When two perſons fall out, and fight on the ſpot, without having premeditated the combat, it is called a *rencounter*.

RENCOUNTRE, or Rencontre, in *Heraldry*, is applied to animals when they ſhew the head in front, with both eyes, &c. or when the face ſtands right forward, as if they came to meet the perſon before them.

Indeed, in deer, this is called *maſacré*; and, in the leopard, it is the natural ſituation. He bears ſable, in *rencountre*, a golden fleece.

RENDER, in *Law*, a term uſed in levying a fine. A fine with *render*, is that whereby ſomething is rendered back again by the cogniſee to the cogniſor.

The lawyers alſo ſay, there are certain things in a manor, which lie in *prender*, i. e. which may be taken by the lord, or his officers, when they pleaſe, without the tenant's leave; and others which lie in *render*, that is, muſt be *rendered* or anſwered by the tenant, as rents, reliefs, heriots, and other ſervices. See Prender. Some ſervice conſiſts in ſeiſance, ſome in *render*.

RENDERING, in *Building*. See Pargeting.

Rendering, in *Sea-language*, is generally underſtood to be the effect of yielding or giving way, without reſiſtance, to the efforts of ſome mechanical power. It is uſually expreſſed of a complicated tackle, laniard or laſhing, when the effect of the power applied is communicated with facility to all the parts, without being interrupted in its paſſage. It is therefore uſed in contradiſtinction to Jamming.

RENDEZVOUS, or Rendevous, a place appointed to meet in, at a certain day and hour.

The word is French, and is found ſo commodious, that moſt nations uſe it in its purity, for want of a word of equal import in their reſpective languages.

Thus, in a military ſenſe, the *rendezvous* is the place appointed by the general, where all the troops that compoſe the army are to meet at the appointed time, in caſe of an alarm; and the regiments have their particular *rendezvous*, called their quarters of aſſembly.

In a naval ſenſe, it denotes the port or place of deſtination, where the ſeveral ſhips of a fleet, or ſquadron, are appointed to rejoin the whole, in caſe of a ſeparation, occaſioned

occasioned by tempestuous weather, or other unforeseen accident.

RENDS, in a *Ship*, are the same as the seams between her planks.

RENEGATE, RENEGADO, a person who has apostatized, or renounced the Christian faith, to embrace some other religion, particularly Mahometanism.

They are the *renegadoes* who prove the most barbarous to the Christians when they fall into their hands. The *renegate* is thus called, *quasi re-negat Christum*—Hoveden mentions this in the year 1192, under the name of *renier*, from the French, *renier*, *to deny again.*

RENES *succenturiati*, in *Anatomy*, are glands thus called, as resembling the figure of kidneys; and hence accounted a kind of *secondary reins*; *succenturiatus* signifying something in the place of another.

They are also called CAPSULÆ *renales*, and *glandulæ renales*. See GLANDS.

Valsalva has endeavoured to prove the *renes succenturiati*, or *glandulæ renales*, to be organs of generation, or assistant to them. Valsalva claimed this discovery. Mr. Ranby suspected that the duct which the Italian journals mentioned as the principal part of this discovery, was no other than an artery sent off from that of the capsula on each side, to the testicles of men, and ovaria of women. Morgagni explained Valsalva's doctrine more fully. Valsalva gives the following reasons for his opinion. He observes the seminary vessels of several fowls to come out from these capsulæ, before they are sent from the testicles. In the viper and water-tortoise, he remarks such membranous connections between the *renes succenturiati* and testicles, as make it probable that such excretories are sent through the capsulæ to the testicles. He affirms his having seen vessels, which were neither nervous, sanguiferous, or lymphatic, going from the human capsulæ to the testicles. His observations are much the same as to females. To these he subjoins the consent and sympathy observed between the loins and genital parts. To confirm all, he cut away one testicle, and extirpated the *kidney* of the opposite side, of a whelp. The wounds healed, but the creature was of a very lax habit, and so far from attempting coition, that he did not seem fond of bitches when they were proud. Acad. Bonon. Comment. p. 367, & seq. See also Phil. Transf. N° 387. sect. 3. where we have an inquiry into this discovery made by Valsalva, of an excretory duct from the glandula renalis to the epididymis by Mr. John Ranby. And in N° 395, sect. 12. there are mentioned, by the same gentleman, two newly discovered arteries in women, going to the ovaria; which he thinks to be probably the same with what Valsalva took for excretory ducts of the glandulæ renales. Valsalva's discovery was first mentioned in the Giornale di Letterati of Venice for 1719, and inserted in the Phil. Transf. N° 385. sect. 9.

RENETTE, in the *Manege*, is an instrument of polished steel, with which they found a prick in a horse's foot.

RENEWING of *leases* and *lives*. See REVERSION, ANNUITY, POLITICAL *arithmetic*, &c.

RENIFORM *leaf*. See LEAF.

RENITENCY, *renitentia*, or *renisus*, among *Philosophers*, that force in solid bodies, whereby they resist the impulse of other bodies; or re-act as much as they are acted on.

RENNET. See RUNNET.

RENT, *reditus*, in *Law*, a sum of money, or other consideration, issuing yearly out of lands or tenements, alienated on that condition.

It is thus called from the corrupt Latin, *rendita*, for *reddita*, of *redditus*; because, as Fleta tell us, *retroit*, *et quotannis redit*.

The original of *rents* is to be sought for in the constitution of the ancient feuds, which were of a military nature, and in the hands of military persons: however, the feudatories, being under frequent incapacities of cultivating and manuring their own lands, soon found it necessary to commit part of them to inferior tenants, obliging them to such returns in service, corn, cattle, or money, as might enable the chief feudatories to attend their military duties without distraction, which returns, or *reditus*, were the original of *rents*.

Rent is regularly due and payable upon the land from whence it issues, if no particular place is mentioned in the reservation; but, in case of the king, the payment must be either to his officers of the exchequer, or to his receiver in the country. And strictly the *rent* is demandable, and payable before the time of sunset of the day whereon it is reserved, though some have thought it not absolutely due till midnight. The usual remedy for non-payment of *rent* is DISTRESS: however, by the common law, distresses were incident to every *rent-service*, and by particular reservation to *rent-charges* also, but not to *rent-seck*, till the statute 4 Geo. II. c. 28. extended the same remedy to all *rents* alike. Moreover, by this statute it is enacted, that every landlord, who hath, by his lease, a right of re-entry in case of non-payment of *rent*, when half a year's *rent* is due, and no sufficient distress is to be had, may serve a declaration in ejectment on his tenant, or fix the same upon some notorious part of the premises, which shall be valid, without any formal re-entry or previous demand of *rent*. And a recovery in such ejectment shall be final and conclusive, both in law and equity, unless the *rent*, and all costs, be paid or tendered within six calendar months afterwards. Other remedies are action of DEBT, an ASSISE of *mort d'ancestor* or *novel disseisin*; the writ *de* CONSUETUDINIBUS *et servitiis*, which compels a specific payment of the *rent*, the writ of CESSAVIT, and the writ of right *sur disclaimer*.

The *rents* of all the lands of England and Wales appear, by the computations of Dr. Davenant and Mr. King, from the land-tax, to be nearly ten millions per annum; those of houses, not lett with lands, two millions more; and those of all other her hereditaments, two millions more; in all, fourteen millions. See POLITICAL *Arithmetic*.

The lawyers ordinarily reckon three sorts of *rents*, viz. *rent-service*, *rent-charge*, and *rent-sec*.

RENT-*service* is where a man holds lands of his lord by fealty, and certain rent; or by fealty-service, and certain rent; or that which a man, making a lease of lands to another for term of years, reserveth to be yearly paid for them.

RENT-*charge* is where a man makes over his estate to another by deed indented, either in fee, or fee-tail, or for term of life; yet reserves to himself, by the same indenture, a sum of money yearly to be paid to him, with a clause of distress for non-payment; so called, because, in this manner, the land is charged with distress for the payment of it.

RENT-*sec*, or *Dry* RENT, is that which a man, making over his estate by a deed indented, reserveth yearly to be paid to him, without any cause of distress mentioned in the indenture. There are also other species of *rents*, which are reducible to these three.

RENTS *of assize* are the certain established *rents* of freeholders, and ancient copyholders; thus called, because assized and certain, in opposition to *reditus mobiles*.

Those of the freeholders are often called CHIEF *rents*, *reditus capitales*, and both sorts are indifferently denominated QUIT *rents*, because thereby the tenant goes quit and free of all other services.

RENT, *fee-farm*, is a *rent*-charge issuing out of an estate in fee; and at least one fourth of the value of the lands, at the time of its reservation: for a grant of lands, reserving so considerable a *rent*, is indeed only letting lands to farm in fee-simple, instead of the usual method for life, or years.

RENTS *resolute* are reckoned among the fee-farm *rents* to be sold by the stat. 22 Car. II. being such *rents* or tenths as were anciently payable to the crown from the lands of abbeys, and other religious houses; which lands, upon the dissolution of abbeys, being demised to others, the said *rents* were still reserved, and made payable to the crown.

RENTS, *assart*, *chauntry*, *chief*, *gild*, *paschal*, *rack*, *quit*, and *white*. See the several adjectives.

RENTAL, a roll wherein the rents of a manor are written and set down, and by which the lord's bailiff collects the same: it distinguishes the lands and tenements, and the names of the tenants, the several *rents* arising, and for what time, usually a year.

RENTER *warden*, an officer in most of the companies of London, whose business is to receive the rents or profits belonging to the company.

RENTERING, and FINE-DRAWING, in the *Manufactories*, the sewing of two pieces of cloth, edge to edge, without doubling them; so as that the seam scarce appears at all: hence it is called *fine-drawing*.

The word is formed from the French *rentraire*, which signifies the same thing; and which Menage, after Salmasius, derives from the Latin *retrahere*, of *re*, *in*, and *trahere*, by reason the seam is drawn out of sight, and covered.

Serges, &c. are to be sewed; cloths *fine-drawn*. The author of one of the Let. Edif. et Cur. speaking of the great dexterity of the *fine-drawers* in the East Indies, assures us, that, if you tear a piece of fine muslin, and give it one of them to mend, it shall be impossible for you to discover the place where it is rejoined, even though you had made a mark to know it by.

The dexterity of our own *fine-drawers*, though inferior to that above mentioned, is nevertheless such, as puts them in a condition to defraud the king, by sewing a head or slip of English cloth on a piece of Dutch, Spanish, or other foreign cloth: or a slip of foreign cloth on a piece of English, so as to pass the whole, as of a piece; and by that means avoid the duties, penalties, &c. The

trick was first discovered in France, by M. Savary, author of the Diction. de Commerce.

To *renter*, in *Tapestry*, is to work new warp into a piece of tapestry damaged, eaten by the rats, &c. and on this warp to restore the ancient pattern, or design—The warp is to be of woollen, not linen. Among the titles of the French tapestry-makers, is included that of *renterers*.

FINE-DRAWING is particularly used for a rent, or hole, happening in the dressing or preparing of a piece of cloth, artfully sewed up or mended with silk.

All *fine-drawings* are reputed defects or blemishes; and ought to be allowed for in the price of the piece: Hence, M. Savary establishes it as a rule, which is certainly founded on natural equity, that every manufacturer mark the *fine-drawings* of his cloth with a piece of packthread tied to the list; to direct the draper to the spot: and that the draper apprize the taylor, or other person, to whom he sells it, of the same, that he may not come to damage in the cutting; there being instances of drapers condemned to take back their cloth, when cut to pieces, for omitting to mention the *fine-drawings*, and other flaws.

On this occasion M. Savary extols the procedure of an English merchant, who, sending a piece of cloth damaged in one spot, to his correspondent at Paris, put a piece of gold in the damaged place, to make up the damage. But as this example is perhaps the only one of its kind, that author recommends it to the merchant, or draper, to unfold all the pieces entirely, as they come to him; to discover the *fine-drawings*, and other flaws, in order to make the clothier accountable for them.

RENVERSE', *inverted*, in *Heraldry*, is when any thing is set with the head downwards, or contrary to its natural way of standing: thus a chevron *renverse* is a chevron with the point downwards.

The same term they also use when a beast is laid on its back.

RENVERSED *volte*. See VOLTE.

RENVERSING. See REVERSING.

RENUENTES, in *Anatomy*, a pair of muscles of the head, thus called as being antagonists to the annuentes; and serving to throw the head backward, with an air of refusal.

From their situation they are also called RECTUS *capitis, major et minor*.

RENUNCIATION, *renunciatio*, the act of renouncing, abdicating, or relinquishing any right, real or pretended. *Renunciations* are sometimes *express*; as by contracts, &c. sometimes *tacit*, as by contrary acts.

To *renounce* an inheritance, a community, &c. is to pass a solemn act before a notary, or public officer, whereby a person declares he will not intermeddle in an inheritance, or profit in a company; but surrenders his part, and quits all pretensions.

REORDINATION, *reordinatio*, the act of conferring orders on one already ordained.

The ceremony of ordination impresses what the divines call an indelible character; and cannot, therefore, be repeated: yet is *reordination* practised in England, with regard to the dissenting ministers, who conform to the church; the bishops pretending, that they alone have right to confer holy orders, and that every priest or minister, who does not receive them at their hands, has no lawful or regular vocation.

This has formerly proved a great obstacle to the reunion of those ministers to the church of England; many of whom, otherwise disposed to conform, have scrupled to be *reordained*; inasmuch as *reordination* implies their former vocation to be null; that they had administered the sacraments without any right thereto; and that all their ministerial acts were invalid.

In the eleventh century, the crime of simony having been very flagrant, many people fell into the error to believe, that the simoniacal bishops could not ordain validly, and those who had received orders at their hands should be *reordained*. The people of this opinion made a party of themselves, and were distinguished by the title of *Reordinantes*.

REPAIRING, in *Building*, &c. See REPARATION and RESTAURATION.

The repairing of large walls, doors, cielings, coverings, &c. belongs to the proprietor or landlord: the tenant is only charged with small *repairs*, as glass windows, locks, &c. by the French called *locative repairs*.

To REPAIR a *statue*, or other piece of sculpture, is to touch up a statue, &c. (cast in a mould) with a chissel, graver, or other instrument, to finish the places which have not come well off.

To REPAIR a *cast*, figure, or the like, they clear off the barb, and what is redundant in the joints and projectures. See STATUE.

To REPAIR a *medal*, is to retouch it; so as, from rusty and defaced as it was, to render it clean, neat, and perfect. In order to this, they take off the rust with a graver, touch up the letters, polish the ground, and raise and restore the figures which before were sometimes scarce seen. When the figures are eroded or broken, they fit a piece of cement on the spot; and on this cut with a graver so dextrously, that the figures appear entire, and well kept; yet nothing spoils medals so much as *repairing* them. See MEDAL.

To REPAIR a *ship*, is to amend any injuries, or supply any deficiences, which a ship may have received by age, battle, tempestuous weather, &c. The repair is necessarily greater or smaller, in proportion to the loss or damage the vessel has sustained. Accordingly a suitable number of the timbers, beams, or planks, or a sufficient part of either are removed, and new pieces fixed in their places. The whole is completed by *breaming*, *calking*, and *paying* the body with a new composition of stuff.

REPAIRERS, artificers who chase figures, and beautify sword-hilts, &c.

REPAIRS, in *Hunting*, are the haunts and places which the hare runs to.

REPAND *leaf*, *repandum folium*, among *Botanists*. See LEAF.

REPARANDIS *pontibus*. See PONTIBUS.

REPARATION, *reparatio*, the act of repairing, re-establishing, retrieving, or mending a building, or other work, damaged, or gone to decay.

The enemy *repaired* the breach as soon as it was made. The establishment of turnpikes is for *repairing* of the roads. An ecclesiastical patron is by ancient custom obliged to repair the choir or chancel of a church, and the parishioners the nave.

REPARATIONE *facienda*, is a writ which lies in divers cases; e. gr. where there are tenants in common, or joint tenants of a house, &c. which is fallen to decay, and the one being willing to *repair* it, the other two will not; in this case, the party willing shall have this writ against the other two.

REPART, in the *Manege*, is to put a horse on, or make him part a second time.

REPARTEE. See REPARTY.

REPARTITION, *repartitio*, a dividing or sharing a thing a second time.

REPARTY, or REPARTEE, a ready, smart reply: especially in matters of wit, humour, or *raillery*.

The word in the original French, *repartie*, has the same signification.

Wicquefort observes that there is a great difference between a free, sprightly *reparty*, and an offensive SARCASM.

REPAST, *repastum*, a meal or refection, taken at a stated hour.

In old law-books REPAST is particularly used for a meal's meat given to servile tenants, while at work for their lord.

The French call their meal *repast*; the Latins, *pastus*; the Italians and Spaniards, *pasto*.

In antiquity the *repasts* were frequently sacrifices; for which reason we find them often prepared by kings themselves.

REPEALING, in *Law*, the revoking or annulling of a statute, deed, or the like. See ABROGATION, REVOCATION, &c.

No act of parliament shall be *repealed* in the same session it was made in. A deed or will may be *repealed* for a part, and stand good for the rest.

Brook uses the word *repellance* in the same sense.

REPEAT, in *Music*, a character shewing that what was last played or sung, must be *repeated*, or gone over again.

The *repeat* serves instead of writing the same thing twice over. There are two kinds of *repeats*; the *great* and the *small*.

The great REPEAT, is only a double bar, dotted on each side; or two parallel lines drawn perpendicular across the staff; with dots on either hand. See its form under CHARACTERS *of music*.

This mark shews, that the preceding strain is to be *repeated*; that is, if it be near the beginning of the piece, all hitherto sung or played is to be *repeated*; or, if towards the end of a piece, all from such another mark.

In gavots, we usually find the *repeat* at about the third part of a piece; in minuets, borees, courants, &c. towards the end.

Some make this a rule, that if there be dots on each side the bar, they direct to a *repetition* both of the preceding and the following strain; if there be only dots on one side, then only the strain on that side is to be *repeated*.

REPEAT, *the small*, is where only some of the last measures of a strain are to be repeated: this is denoted by a character set over the place where the *repetition* begins (see CHARACTERS *in music*) and continues to the end of the strain.

When the ſong ends with a *repetition* of the firſt ſtrain, or part of it, inſtead of a *repeat*, they uſe the word *da capo*, i. e. from the beginning.

REPEATING *watches*. See WATCH.

REPELLENT, *repellens*, in *Medicine*, a remedy which *repels* or drives back a morbid humour into the maſs of blood, from which it was unduly ſecreted.

Repellents are medicines which prevent ſuch an afflux of the fluids to any particular part, as might raiſe it into a tumor, or drive them back when they are collected.

The Greek name given, by ſome writers, to what (from the Latin) are called repellents, is *apocruſtics*, *αποκρουστικα*, compounded of *απο*, *from*, and *κρουω*, *to beat*.

To form an idea of the manner of their operation, it may be obſerved, that all tumors ariſe either from an increaſe in the velocity or quantity of the fluids, or a weakneſs in ſome particular part, though ſometimes both concur. Now an increaſe in the velocity of the fluids makes them more forcibly puſh againſt, and diſtend, all the parts in their circuit: if therefore any part be unequally preſſed or relaxed by external injuries, that will be more elevated than any other; and, for want of equal reſiſtance with the reſt of the body, it will at length receive ſuch a quantity of fluid, as will raiſe it into a tumor, eſpecially if any of its veſſels be obſtructed, becauſe the protruſion of freſh matter, a tergo, will continue to add thereunto, till the part is on the utmoſt ſtretch, and can hold no more.

In this caſe all thoſe means are ſaid to be *repellent*, which check the growth of the tumor, and aſſiſt the refluent blood in taking up the obſtructed matter, and waſhing it again into the common ſtream.

This intention is chiefly favoured by evacuation and revulſion; for whatſoever leſſens the quantity of the fluid, will diminiſh the force upon the tumefied part: but it concerns us moſt to know how external application to the part itſelf helps this affair.

Herein a medicine comes to be *repellent*, by conſiſting of ſuch ſubtile parts, as may tranſmit ſome of them through the pores, and help to render the obſtructed matter more fluid; ſo that it comes the more eaſy to be looſened, and fall again into the circulating current: but in this caſe there is a hazard of ſuch things likewiſe putting the obſtructed humour into a ferment, whereby it turns ſooner into pus; and then they come under the denomination of *ſuppuratives* or *ripeners*.

What, therefore, in the moſt ſtrict ſenſe, is to be reputed a *repeller*, is that which aſtringes and ſtrengthens the part, ſo as to make it reſiſt any ſuch lodgment.

Theſe are ſuch whoſe qualities are moſt manifeſt in their coldneſs, and drying properties; but there are ſo few inſtances wherein bandage is not better than any ſuch application, that very little comes to be uſed for that purpoſe.

In hæmorrhages and ouſings out of ſerum, ſo as to deform the ſkin, ſimples of this nature moſtly take place; which anſwer their ends in aſtringing the fibres, whereby their apertures are ſo cloſed, as not to admit through them afterwards any ſuch fluid.

Some things alſo anſwer this end only by ſtimulating the fibres of the tumefied part, ſo as to give them ſudden and forcible twitches, whereby the obſtruction is ſometimes looſened, and ſhaken away, as it were, into the refluent current. Such a ſort of motion will be occaſioned by the ſudden application of any thing extremely cold, as common water; but the practice is ſeldom ſafe, becauſe, if the firſt efforts which the fibres are put upon by thoſe means, do not ſucceed in breaking away the incloſed matter, they will be ſtrained, and not able afterwards to repeat their natural vibrations; the conſequence of which is weakening the part, which will render the tumor more obſtinate.

REPELLING *power*, *vis repellens*, in *Phyſics*, is a certain power or faculty reſiding in the minute particles of natural bodies, whereby, under certain circumſtances, they mutually fly from each other.

This power is the reverſe of the *attractive* power.

Sir Iſaac Newton, having eſtabliſhed the attractive power of matter from obſervation and experiment, argues, that, as in algebra, where poſitive quantities ceaſe, there negative ones commence; ſo in phyſics, where the attractive force ceaſes, there a *repelling* force muſt begin; and adds, that there is ſuch a force, does likewiſe appear from obſervation.

As the *repelling* power ſeems to ariſe from the ſame principle as the attractive, only exerciſed under different circumſtances, it is governed by the ſame laws: now the attractive, we find, is ſtronger in ſmall bodies than in great ones, in proportion to the maſſes; therefore the *repelling* is ſo too. But the rays of light are of all others the moſt minute bodies we know of; therefore, of all others, their *repelling* force muſt be the greateſt.

Sir Iſaac Newton computes, that the attractive force of the rays of light is above 1000000000000000 times as ſtrong as the force of gravity on the ſurface of the earth: hence ariſes that inconceivable velocity wherewith light muſt move, to reach from the ſun to our earth in ſeven minutes. For the rays emitted from the body of the ſun by the vibrating motion of its parts are no ſooner got without the ſphere of attraction of the ſun, than they come within the action of the *repelling* power.

The elaſticity or ſpringineſs of bodies, or that property whereby, after having their figure altered by an external force, they return to their former figure, follows from the *repelling* power. See REPULSION.

REPENTANCE, in *Theology*, is a change of ſentiments followed by a change of conduct: or *repentance* denotes ſuch a conviction of the evil and danger of a ſinful courſe, as is ſufficient to produce ſhame and ſorrow in the review of it, and effectual reſolutions of amendment.

This definition expreſſes the ſenſe of the two words, *μεταμελεια* and *μετανοια*, which are commonly uſed by the evangelical writers to ſignify *repentance*.

REPERCUSSION, in *Mechanics*. See REFLECTION.

REPERCUSSION, in *Muſic*, a frequent repetition of the ſame ſounds.

This often happens in the modulation, where the eſſential chords of each mode, or of the harmonical triad, are to be ſtruck oftener than the reſt; and of theſe three chords, the two extremes, i. e. the final and the predominant one (which are properly the *repercuſſions* of each mode) oftener than the middle one.

REPERTORY, *repertorium*, a place wherein things are orderly diſpoſed, ſo as to be eaſily found when wanted.

The indices of books are *repertories*, ſhewing where the matters ſought for are treated of. Common places are a kind of *repertories*, very uſeful to the learned.

REPERTORIUM *anatomicum*, denotes a large hall near an amphitheatre of diſſections, where ſkeletons, both human and brutal, are orderly preſerved. Such is the *repertory* in the French king's garden at Paris.

REPETEND, in *Arithmetic*, is uſed for that part of an indeterminate or infinite decimal fraction, which is continually repeated ad infinitum.

Thus in the indeterminate decimal fraction 317. 45 316 316 316, &c. the figures 316 are called the *repetend*.

Theſe *repetends* often ariſe in the reduction of vulgar fractions to decimals, thus $\frac{1}{3} = 0.\ 3333$, &c. $\frac{1}{7} = 0.\ 142857$, 142857, &c. $\frac{1}{11} = 0.\ 09\ 09,\ 09$, &c.

Decimals of this kind are called repeating or circulating DECIMALS, on account of this continual repetition or circulation of the ſame figures. Infinite decimals are of two kinds, which may be diſtinguiſhed by the general denominations of certain and uncertain. A certain infinite decimal is ſuch whoſe numerator runs into infinity by a continual repetition of one or more figures, as .44, &c. .033, &c. Uncertain decimals are ſuch, whoſe numerator goes on for ever without a conſtant circulation of figures. The eſſential difference between theſe two kinds is this; that the certain infinite decimals have a determinate, finite, and certain value, in that there is a certain determinate vulgar fraction, which expreſſes the true and complete value of that infinite decimal, whereas the uncertain have no ſuch finite and aſſignable value: and hence the reaſon of the names.

REPETEND, *ſingle*, is that where only one figure is repeated, as in 0. 3 3 3, &c.

REPETEND, *compound*, is that where two or more figures are repeated, as in 0. 09 09, &c. or in 0. 142857 142857, &c.

Decimals with *repetends* may always be reduced to vulgar fractions. For either the *repetend* begins with the decimal, or not.

If the *repetend* begins with the firſt place of decimals, or if the decimal is a pure circulate, make it the numerator of a vulgar fraction, and make the denominator conſiſt of as many 9's as the *repetend* has figures; or if there be cyphers between the point and *repetend*, with as many cyphers to the right hand of the denominator, then will this vulgar fraction be equal to the decimal.

Thus, if the *repetend* be ſingle, as in 0. 3 3 3 3, the vulgar fraction equal to it will be $= \frac{3}{9} = \frac{1}{3}$. So if the *repetend* be compound, as in 0. 09 09, &c. the equivalent vulgar fraction will $= \frac{09}{99} = \frac{9}{99} = \frac{1}{11}$.

And in like manner 0. 142857 142857, &c. $= \frac{142857}{999999} = \frac{1}{7}$.

The reaſon is obvious from this conſideration, that the decimal 0. 3 3 3, &c. is $= \frac{3}{10} + \frac{3}{100} + \frac{3}{1000}$, &c. the ſum of which will be equal to $\frac{3}{10}$ divided by $1 - \frac{1}{10} = \frac{3}{9} = \frac{1}{3}$; and ſo of the reſt.

If the *repetend* does not begin with the firſt place of decimals, but at ſome place farther on towards the right, or if it be a mixed circulate, as in the decimal 0. 83333 &c. where the *repetend* does not begin till the ſecond place of decimals, obſerve, that 0. 8 3 3 3 + &c. $= \frac{8}{10}$

$+ \frac{3}{100} + \frac{3}{1000} +$, &c. $= \frac{8}{10} + \frac{1}{10} \times \frac{3}{10} + \frac{3}{10^2} +$, &c. But $\frac{3}{10} + \frac{3}{10^2} +$, &c. $= \frac{3}{9} = \frac{1}{3}$, as before: therefore the proposed decimal is $= \frac{8}{10} + \frac{1}{10} \times \frac{1}{3} = \frac{8}{10} + \frac{1}{30} = \frac{24+1}{30} = \frac{25}{30} = \frac{5}{6}$.

Thus also if the decimal 0. 2 27 27, &c. were proposed, we shall find it $= \frac{2}{10} + \frac{1}{10} \times \frac{27}{100} + \frac{27}{100^2} +$, &c. And $\frac{27}{100} + \frac{27}{100^2} +$, &c. being $= \frac{27}{99} = \frac{3}{11}$, the decimal will be $= \frac{2}{10} + \frac{1}{10} \times \frac{3}{11} = \frac{2}{10} + \frac{3}{110} = \frac{22+3}{110} = \frac{5}{22}$. The reason of which is obvious from what has been said.

It may perhaps be worth while to observe, that if the numerator of a vulgar fraction be unity, and the denominator any prime number, except 2 and 5, the decimal equal to the proposed fraction will always be a *repetend*, beginning at the first place of decimals; and this *repetend* must necessarily be a submultiple, or an aliquot part of a number expressed by as many nines as the *repetend* has figures; that is, if the *repetend* have six figures, it will be a submultiple of 999999; if four figures, it will be a submultiple of 9999, &c. From whence it follows, that if any prime number be called p, the series 9999, &c. produced as far as is necessary, will always be divisible by p, and the quotient will be the *repetend* of the decimal fraction $= \frac{1}{p}$. For the management of decimals of this kind, see Malcolm's Arithmetic, book v. chap. 4.

REPETITION, *repetitio*, the reiterating of an action. See REITERATION.

Habits are acquired by the frequent *repetition* of actions. *Repetition* is sometimes used for REHEARSAL.

School-philosophers call the *repetition* of the same numerical effect, in another place, the *replication* of that effect.

REPETITION, in *Music*, denotes a reiterating or playing over again of the same part of a composition, whether it be a whole strain, or part of a strain, or a double strain. The *repetition* is denoted by a character, called a REPEAT; which is varied so as to express the various circumstances of the *repetition*.

REPETITION, *reply*, is also used in music, when, after a little silence, one part *repeats* or runs over the same notes, the same intervals, the same motions; in a word, the same song, which a first part had already gone over during the silence of this.

REPETITION, *reply*, is also a doubling or trebling, &c. of an interval, or a reiteration of some concord or discord. Thus a fifteenth is a *repetition* of the octave, i. e. a double octave, or second octave.

REPETITION, in *Rhetoric*, is a figure whereby the orator rehearses the same word or phrase over again.

Of this there are two kinds. In the first, the word is repeated precisely in the same sense: as, *Oh, Jerusalem, Jerusalem, who killest the prophets*, &c. *My God, my God, why hast thou forsaken me?*

Such *repetitions* have the same effect in discourse, with second strokes of the pencil in painting; they render the colours more strong and lively.

Sometimes the orator begins again and again with the same word, of which we have an instance in the beginning of Cicero's first oration against Catiline: *Nihilne te nocturnum præsidium palatii, nihil urbis vigiliæ, nihil timor populi, nihil consensus bonorum omnium, nihil hic munitissimus habendi senatus locus, nihil horum ora vultusque moverunt?* Where the word *nihil* so often reiterated gives an admirable force and vehemence to the discourse. Again, the same author: *Quem senatus damnârit, quem populus R. damnârit, quem omnium existimatio damnârit, eum vos sententiis vestris absolvetis?* Again, *Non feram, non patiar, non sinam.*

The second kind of *repetition*, called πλοκη, PLOCE, is a *repetition* of the same word, in the same phrase; but in such a manner, as that some new idea or character is added to the word in the second, which it had not in the first.

As, *Corydon is always Corydon: Ex illo Corydon Corydon est tempore nobis*; by which we signify, that Corydon is no ordinary person; and that nothing can distinguish him but the *repetition* of his own name: as if we should say, *he is Corydon, that is enough*. By the same figure our Saviour speaks, when he says: *Let your language be yea, yea; and nay, nay*. See RECAPITULATION.

REPLANTING, in *Gardening*, the act of PLANTING a second time.

The gardeners use to displant their tulips every year, and *replant* them. Lettuces must be displanted and *replanted* yearly, to make them head and knit. If strawberries, &c. be not displanted and *replanted* once in a few years, they degenerate.

REPLEADER, *replacitare*, in *Law*, is to plead over again what was once pleaded before.

If, by the misconduct or inadvertence of the pleaders, the issue be joined on a fact totally immaterial, or insufficient to determine the right, so that the court upon the finding cannot know for whom judgment ought to be given, the court will after verdict award a *repleader, quod partes replacitent*; unless it appears from the whole record that nothing material can possibly be pleaded in any shape whatsoever, and then a *repleader* would be fruitless. And, whenever a *repleader* is granted, the pleadings must begin *de novo* at that stage of them, whether it be the plea, replication, or rejoinder, &c. wherein there appears to have been the first defect, or deviation, from the regular course.

REPLEGIANDO *homine, writ de.* See HOMINE.

REPLEGIARE *de averiis*, a writ brought by one whose cattle are distrained, and put in a pound, by another, upon security given the sheriff to pursue, or answer the action at law against the distrainer.

REPLETION, in *Medicine*, a plenitude, or PLETHORA. *Repletion* is more dangerous than inanition. Bleeding and diet are the great resources when a person is incommoded with a *repletion*.

REPLETION is sometimes also used where the stomach is overloaden with too much eating or drinking. The physicians hold all *repletion* prejudicial; but that of bread is of all others the worst.

REPLETION, in the *Canon Law*, is where the revenue of a benefice or benefices is sufficient to fill or occupy the whole right or title of the graduate who holds them. When there is a *repletion*, the party can demand no more by virtue of his degrees. In England, where benefices are not appropriated to degrees, *repletion*, strictly speaking, has no place.

In France, six hundred livres, or 45*l.* sterling per annum, make a *repletion*, when the benefice is obtained otherwise than by a degree; and 30*l.* per annum, when it is obtained by virtue of a degree.

REPLEVIN, *plevina*, in *Law*, a remedy granted on a distress; being a re-deliverance of the goods distrained to the first possessor, on security or pledges given by him to try the right with the distrainer, and answer him in the course of law.

If a person distrain another's goods or cattle for rent, or damage fesant, &c. the owner, upon giving security to the sheriff, that he will prosecute his action against the party distraining, and return the goods or cattle again, if the seizure shall be adjudged good, may have a writ of *replevin*, or *replegiari facias*. See DISTRESS and REPLEVY, *infra*.

REPLEVISH, in *Law*, is to let one to mainprise, upon surety. See MAINPRISE.

REPLEVY, *replevie*, in *Law* (from the Latin *replegiare*, to re-deliver to the owner upon pledges of surety), is the bringing of a writ of *replevin*, or *replegiari facias*, issuing out of chancery, by him whose cattle or goods are distrained by another upon any cause; having first given security to the sheriff, that, on the delivery of the thing distrained, he will prosecute the action against the person who made the distress.

In the stat. 24 of Henry VIII. we read of *canes replegiati*, or *hounds replevied*, in a case between the abbot of St. Albans and Geoffery Childwic.

Goods may be *replevied* two ways; viz. *by writ*, which is that used by the common law; and *by plaint*, which is that by statute law, for the more speedy having again the cattle and goods; and is brought in the sheriff's court. Accordingly the statute of Marlbridge (52 Hen. III. cap. 21.) directs, that (without suing a writ out of chancery) the sheriff, immediately upon complaint made to him, shall proceed to *replevy* the goods. And for the greater ease of the parties, it is farther provided by statute 1 P. & M. cap. 12. that the sheriff shall make at least four deputies in each county, for the sole purpose of making replevins. Upon application, therefore, either to the sheriff, or one of his said deputies, security is to be given, in pursuance of the statute of Westm. 2. 13 Edw. I. cap. 2. 1. That the party replevying will pursue his action against the distreinor; for which purpose he puts in *plegios de prosequendo*, or pledges to prosecute; and, 2. That if the right be determined against him, he will return the distress again; for which purpose he is also bound to find *plegios de retorno habendo*. Besides these pledges, which are merely discretionary in the sheriff, the statute 11 Geo. II. cap. 19. requires, that the officer, granting a replevin on a distress for rent, shall take a bond, with two sureties, in a sum of double the value of the goods determined; which bond shall be assigned to the avowant or person making cognizance, on request made to the sheriff; and if forfeited, may be sued in the name of the assignee. The sheriff, on receiving such security, is immediately, by his officers, to cause the chattels taken in distress to be restored into the possession of the

the party diſtrained upon; unleſs the diſtreinor claims a property in the goods ſo taken. If this be the caſe, the party replevying muſt ſue out a writ *de* PROPRIETATE *probanda*. But if no claim of property be put in, or if (upon trial) the ſheriff's inqueſt determines it againſt the diſtreinor, then the ſheriff is to *replevy* the goods, if they be found within his county. When the goods are delivered back to the party replevying, he is then bound to bring his action of replevin, which may be proſecuted in the county-court; but either party may remove it to the ſuperior courts. Blackſt. Comm. book iii. p. 147.

REPLICATION, *replicatio*, in *Logic*, the aſſuming or uſing the ſame term twice in the ſame propoſition; otherwiſe called REDUPLICATION.

Some philoſophers uſe the phraſe *replicatio mundi*, *replication* of the world, for its converſion, or turning round.

The human ſoul is ſaid to be in a place *replicatively*, *replicative*, when conceived to be all in the whole, and all in every part thereof.

REPLICATION, in *Law*, is an exception of the ſecond degree, made by the plaintiff to the plea or firſt anſwer of the defendant.

The *replication* is particularly that which the plaintiff replies to the defendant's anſwer in chancery; and which is either *general* or *ſpecial*. The *ſpecial* is grounded upon matter ariſing out of the defendant's anſwer, &c. The general is ſo called from the general words therein uſed. See REJOINDER, and CONFESS *and avoid*.

REPOLON, in the *Manege*, is a DEMIVOLTE, the croupe in, cloſed at five times. The Italians are extremely fond of this ſort of manege. In making a demivolte, they ride their horſes ſhort, ſo as to embrace or take in leſs ground, and do not make way enough every time of the demivolte.

REPORT, the relation made upon oath, by officers or perſons appointed to viſit, examine, ſtate, or eſtimate, any thing.

Damages, repairs, &c. are judged from the *reports* of experienced perſons. Proviſions for perſons wounded are only granted on the *reports* of ſurgeons, &c. In caſes of rapes, a *report* of matrons is to be had.

REPORT, in *Law*, is a public relation, or bringing to memory, of caſes judicially argued, debated, reſolved, or adjudged, in any of the king's courts of juſtice, with the cauſe and reaſon of the ſame delivered by the judges.

Theſe *reports*, which, in matters of conſequence and nicety, the judges direct to be ſearched, are extant in a regular ſeries from the reign of king Edward the Second incluſive; and from his time to that of Henry the Eighth were taken by the prothonotaries, or chief ſcribes of the court, at the expence of the crown, and publiſhed annually; whence they are known under the denomination of the *Year-books*. And it is much to be wiſhed (ſays judge Blackſtone) that this beneficial cuſtom had, under proper regulations, been continued to this day; for though king James the Firſt, at the inſtance of lord Bacon, appointed two reporters, with a handſome ſtipend, for this purpoſe, yet that wiſe inſtitution was ſoon neglected; and from the reign of Henry the Eighth to the preſent time, this taſk has been executed by many private and cotemporary hands; who ſometimes through haſte and inaccuracy, ſometimes through miſtake and want of ſkill, have publiſhed very crude and imperfect (perhaps contradictory) accounts of one and the ſame determination. Some of the moſt valuable ancient *reports* are thoſe publiſhed by lord chief juſtice Coke, which are ſo highly eſteemed, that they are generally cited without the author's name. The *reports* of judge Croke are alſo cited in a particular manner, by the name of thoſe princes in whoſe reigns the caſes reported in his three volumes were determined, viz. queen Elizabeth, king James, and Charles the Firſt, as well as by the number of each volume. Blackſt. Com. book i. p. 71, &c,

When the chancery, or any other court, refers the ſtating of ſome caſe, or comparing an account, &c. to a maſter in chancery, or other referee, his certificate therein is alſo called a *report*.

REPORTS, in *Military Matters*, are daily, weekly, and monthly *reports* of the ſtate of the companies or regiments, relative to their being preſent or abſent, on duty, ſick, confined, &c.

REPORT, *pinion of*. See PINION.

REPOSE, in *Poetry*, &c. See REST, PAUSE, &c.

REPOSE, in *Painting*, is applied to certain maſſes, or large ſyſtems or aſſemblages of light and ſhade; which, being well conducted, prevent the confuſion of objects and figures; by engaging and taking up the eye ſo as it cannot attend to the other parts of the painting for ſome time; and thus leading it to conſider the ſeveral groups gradually, and, as it were, to proceed from ſtage to ſtage.

REPOSITION *of the foreſt* (formed from *re*, and *ponere*, *to lay again)*, an act whereby certain grounds, before made purlieu, are, upon a ſecond view, laid to the foreſt again.

REPOSITION, in *Surgery*, the REDUCTION of a bone.

REPOSITORY, *repoſitorium*, a ſtore-houſe or place where things are laid up, and kept. In which ſenſe we ſay, the *repoſitory* of the Royal Society, &c. See MUSEUM.

REPREHENSION, in *Rhetoric*. See PARRHESIA.

REPRESENTATION, *repræſentatio*, in the *Drama*, the exhibition of a theatrical piece; including the ſcenes, machines, recitation, &c.

Sir Richard Steele's principle is, that the deſign of a play is not to be read, but *repreſented*; ſo that it is on the ſtage, not in the preſs, it is to be judged of; and that the pit, not the public, are the proper judges.

REPRESENTATIVE, one that perſonates, or ſupplies the place of another; and is inveſted with his right and authority.

The word *repreſentative* is equivalent to procurator or proxy.

The commons are the people's *repreſentatives* in parliament.

There is this defect in the conſtitution of our parliament; that whereas all Engliſhmen who have conſiderable eſtates ought not to be taxed without their own conſent in parliament, by themſelves, or their *repreſentatives*; copyholders, whereof ſome have a thouſand pounds a year, have no voice in the election of knights of the ſhire. See PARLIAMENT.

REPRESENTATIVE *power*, in *Metaphyſics*, a term introduced by Leibnitz, to ſignify that power of the human ſoul, by which it repreſents to itſelf the univerſe, according to the ſituation of the body in the univerſe.

Wolfius calls this power *vis repreſentativa*, to denote its being an active power, or rather a force actually exerting itſelf. For he expreſly ſays, *quod vis conſiſtat in continuo agendi conatu*. And he thinks that from this principle of a *vis repreſentativa*, every phenomenon of the human mind may be accounted for. See his Pſycholog. Ration. art. 529.

But it may be preſumed, that many will find this principle too obſcure to be admitted.

When it is ſaid, that our ideas are *repreſentative* of things without us, or of the univerſe; it may be aſked in what ſenſe this is to be underſtood? Do they *repreſent* it, 1. As a picture does its original? Or, 2. As an effect of a cauſe? Or, 3. As a ſign repreſents the thing ſignified? The firſt opinion is exploded in part by Locke and the Carteſians, and totally by Dr. Berkeley, late biſhop of Cloyne. The ſecond is admitted by Hobbes, but denied by Leibnitz himſelf, and the idealiſts. The third ſhould ſeem to be the opinion of Leibnitz, but he is not ſufficiently explicit.

Dr. Berkeley admits ideas to be ſigns; but, according to him they are arbitrary ſigns, depending on the immediate will of the Deity: hence the viſual language; and ideas only ſignify or ſuggeſt each other, and ſpirits; but not bodies, the exiſtence of which is totally unknown.

REPRIEVE, or REPRIVE, from *reprendre*, *to take back*, in *Law*, a ſuſpending or deferring the execution of the law upon a priſoner, for the preſent time.

A *reprieve* is properly a warrant from the king, for ſuſpending the execution of a perſon condemned.

This may be, firſt, *ex arbitrio judicis*, either before or after judgment; as, where the judge is not ſatisfied with the verdict, or the evidence is ſuſpicious, or the indictment inſufficient, or he is doubtful, whether the offence be within clergy; or ſometimes, if it be a ſmall felony, or any favourable circumſtances appear in the criminal's character, in order to give room to apply to the crown for either an abſolute or conditional pardon. Theſe arbitrary *reprieves* may be granted or taken off by the juſtices of gaol-delivery, although their ſeſſion be finiſhed, and their commiſſion expired; but this rather by common uſage than by ſtrict right. *Reprieves* may alſo be *ex neceſſitate legis*, as where a woman is capitally convicted, and pleads her pregnancy; which is referred to a *jury of* MATRONS. Another cauſe of regular *reprieve* is, if the offender become *non compos* between the judgment and the award of execution. See LUNATIC.

REPRIMAND, a ſharp authoritative reproof. Such a perſon was *reprimanded* in court by the bench, &c.

REPRISALS, or REPRIZALS, *repreſalia*, in the *Civil Law*, a right which princes have to retake from their enemies ſuch things as they unjuſtly detain from them; or other things equivalent thereto.

The word is formed from the Italian *repreſaglia*, which ſignifies the ſame thing.

When a place is taken or held from a prince, he ſeizes another by way of *repriſal*. Sometimes he takes men of the oppoſite party, by right of *repriſals*.

The Romans called this CLARIGATIO; and the Greeks had

had something like it under the name of ANDROLEPSIA.

REPRISALS is also used for a letter or permission which a prince sometimes gives a subject, upon a full cognizance of the cause; authorizing him to retake from the first persons he meets of the opposite party, as many effects as make an equivalent to what have been violently forced from him, and for which the opposite prince has refused to do him justice.

These permissions are also called LETTERS *of marque*, or *mart*; and in the stat. 27 Edw. III. *law of marque*; in regard a person denied justice in another man's territory, redresses himself by goods belonging to men in that territory.

REPRISAL is also used in the same sense with RECAPTION.

REPRISE, or REPRIZE, in the commerce by sea, a merchant-ship, which, having been taken by a corsair, privateer, or other enemy, is retaken or recovered by a vessel of the contrary party.

The word is French, and signifies a *resumption* or *retaking*.

When a vessel thus retaken has been twenty-fours in the hands of the enemy, it is deemed a lawful prize. If the *reprize* have been made within twenty-four hours, the vessel is to be restored to the proprietor, with every thing therein, upon his allowing one third to the vessel who made the *reprize*.

If the *reprize* have been abandoned by the enemy, either in a tempest, or from any other cause, before it have been led into any port, it is to be restored to the proprietor.

REPRISE, in the *Manege*, is a lesson repeated, or a manege recommenced. Thus we say to give breath to a horse upon the four corners of the volte with only one *reprise*, that is, all with one breath.

REPRIZES, in *Law*, are deductions, drawbacks, or duties paid yearly out of a manor, or lands. Such are rent-charges, pensions, fees of stewards or bailiffs, &c. The manor of Doll yields 40*l*. per annum, *ultra reprizas*, besides all *reprizes*.

REPRIVE. See REPRIEVE.

REPROBATION, *reprobatio*, in *Theology*, a decree or resolve, which God has taken from all eternity to punish sinners, who shall die in impenitence.

Reprobation stands in direct opposition to *election*.

Divines hold it a symptom of *reprobation* when a sinner is hardened so as not to feel any farther remorse or misgivings of conscience.

The casuists distinguish two kinds of *reprobation*, *positive* and *negative*.

REPROBATION, *positive*, is that whereby God is supposed to create men with a positive and absolute resolution to damn them eternally.

This opinion of *reprobation* is countenanced by St. Augustine, and others of the fathers; and is strongly maintained by Calvin, and most of his followers. Something like it is also found in the thirty-nine articles of the church of England; but it is now generally exploded, as injurious to the justice of God.

REPROBATION, *negative* or *conditional*, is that whereby God, though he creates all men with a sincere desire to save them, and furnishes them with the necessary means thereto, so that all may be saved, if they will; yet sees there are several who will not do it, with the aids he shall afford them, how powerful soever; and sees, at the same time, they would do it with certain other aids, which he sees, but will not give them. *O altitudo!* &c.

REPRODUCTION, *reproductio*, the act whereby a thing is produced anew, or grows a second time.

When the stock of an oak, a fruit-tree, or the like, is cut off short, it *reproduces* an infinity of young shoots.

By *reproduction* is usually understood the restoration of a thing before existing, and since destroyed.

It is very well known, that trees and plants are to be raised from slips and cuttings; and some late observations have shewn, that there are some animals which have the same property.

The polype was the first instance we had of this; but we had scarce time to wonder at the discovery Mr. Trembley had made, when Mr. Bonett discovered the same property in a species of water-worm. See POLYPE and *Water*-WORM.

Amongst the plants which may be raised from cuttings, there are some which seem to possess this quality in so eminent a degree, that the smallest portion of them will become a complete tree again. See PLANT.

It deserves enquiry, whether or not the great author of nature, when he ordained that certain insects, as these polypes and worms, should resemble those plants in that particular, allowed them this power of being *reproduced* in the same degree; or, which is the same thing, whether this *reproduction* will or will not take place in whatever part the worm is cut. In order to try this, Mr. Bonett entered on a course of many experiments on the water-worms which have this property. These are, at their common growth, from two or three inches long, and of a brownish colour, with a cast of reddish. From one of these worms he cut off the head and tail, taking from each extremity only a small piece of a twelfth of an inch in length, but neither of these pieces were able to *reproduce* what was wanting. They both perished in about twenty-four hours; the tail first, and afterwards the head. As to the body of the worm from which these pieces were separated, it lived as well as before, and seemed indeed to suffer nothing by the loss, the head-part being immediately used as if the head was thereon, boring the creature's way into the mud. There are besides this, two other points in which the *reproduction* will not take place; the one of these is about the fifth or sixth ring from the head, and the other at the same distance from the tail; and in all probability the condition of the great artery in these parts is the cause of this.

What is said of the want of the *reproductive* power of these parts, relates only to the head and tail ends; for as to the body, it feels very little inconvenience from the loss of what is taken off, and very speedily *reproduces* those parts. Where then does the principle of life reside in such worms, which, after having their heads cut off, will have not only the same motions, but even the inclinations that they had before? and yet this difficulty is very small, compared to several others, which at the same time offer themselves to our reason. Is this wonderful *reproduction* of parts only a natural consequence of the laws of motion, or is there lodged in the body of the creature a chain of minute buds or shoots, a sort of little embryos, already formed and placed in such parts where the *reproductions* are to begin? Are these worms only mere machines, or are they, like more perfect animals, a sort of compound, the springs of whose motions are actuated or regulated by a sort of soul? And if they have themselves such a principle, how is it that this principle is multiplied, and is found in every separate piece? Is it to be granted, that there are in these worms not a single soul (if it is to be so called) in each, but that each contains as many souls as there are pieces capable of *reproducing* perfect animals? Are we to believe with Malpighi, that these sorts of worms are all heart and brain from one end to the other? This may be, but yet if we knew that it was so, we should know in reality but very little the more for knowing it; and it seems after all, that in cases of this kind we are only to admire the works of the great Creator, and sit down in silence.

The nice sense of feeling in spiders has been much talked of by naturalists; but it appears that these worms have yet somewhat more surprising in them in regard to this particular. If a piece of stick, or any other substance, be brought near them, they do not stay for its touching them, but begin to leap and frisk about as soon as it comes towards them. There want, however, some farther experiments to ascertain whether this be really owing to feeling or to sight; for though we can discover no distinct organs of sight in these creatures, yet they seem affected by the light of the sun or a candle, and always frisk about it in the same manner at the approach of either; nay even the moon-light has some effect upon them.

A twig of willow, poplar, or many other trees being planted in the earth, takes root, and becomes a tree, every piece of which will in the same manner produce other trees. The case is the same with these worms; they are cut to pieces, and these several pieces become perfect animals; and each of these may be again cut into a number of pieces, each of which will in the same manner produce an animal. It had been supposed by some that these worms were oviparous; but Mr. Bonett, on cutting one of them to pieces, having observed a slender substance, resembling a small filament, to move at the end of one of the pieces, separated it, and on examining it with glasses, found it to be a perfect worm of the same form with its parent, which lived and grew larger in a vessel of water into which he put it. These small bodies are easily divided, and very readily complete themselves again, a day usually serving for the production of a head to the part that wants one, and in general the smaller and slenderer the worms are, the sooner they complete themselves after this operation. When the bodies of the large worms are examined by the microscope, it is very easy to see the appearance of the young worms alive and moving about within them; but it requires great precision and exactness to be certain of this; since the ramifications of the great artery have very much the appearance of young worms, and they are kept in a sort of continual motion by the systoles and diastoles of the several portions of the artery which serve as so many hearts. It is

is very certain, that what we force in regard to theſe animals by our operations, is done alſo naturally every day in the brooks and ditches where they live. A curious obſerver will find in theſe places many of them without heads or tails, and ſome without either; as alſo other fragments of various kinds, all which are then in the act of completing themſelves; but whether accidents have reduced them to this ſtate, or they thus purpoſely throw off parts of their own body for the *reproduction* of more animals, is not eaſy to determine. They are plainly liable to many accidents, by which they loſe the ſeveral parts of their body, and muſt periſh very early, if they had not a power of *reproducing* what was loſt; they often are broken into two pieces, by the reſiſtance of ſome hard piece of mud, which they enter; and they are ſubject to a diſeaſe, a kind of gangrene, rotting off the ſeveral parts of their bodies, and muſt inevitably periſh by it, had they not this ſurpriſing property.

This worm was a ſecond inſtance, after the polype, of the ſurpriſing power in an animal of recovering its moſt eſſential parts, when loſt; but nature does not ſeem to have limited her beneficence in this reſpect to theſe two creatures; Mr. Bonett tried the ſame experiments on another ſpecies of water-worm, differing from the former in being much thicker: this kind of worm, when divided in the ſummer ſeaſon, very often ſhews the ſame property; for if it be cut into three or four pieces, the pieces will lie like dead for a long time, but afterwards will move about again, and will be found in this ſtate of reſt to have recovered a head, or a tail, or both. After recovering their parts, they move very little, and according to this gentleman's experiments, ſeldom live more than a month.

It ſhould ſeem that the more difficult ſucceſs of this laſt kind of worm, after cutting, and the long time it takes to recover the loſt parts, if it do recover them at all, is owing to its thickneſs; ſince we always find in that ſpecies of worms which ſucceeds beſt of all, that thoſe which are thinneſt always recover their parts much ſooner than the others.

The water-inſects alſo are not the only creatures which have this power of recovering their loſt parts. The earth affords us ſome already diſcovered to grow in this manner from their cuttings, and theſe not leſs deſerving our admiration than thoſe of the water; the common earth-worms are of this kind. Some of theſe worms have been divided into two, others into three or four pieces, and ſome of theſe pieces, after having paſſed two or three months without any appearance of life or motion, have then began to *reproduce* a head or tail, or both. The *reproduction* of the anus, after ſuch a ſtate of reſt, is no long work; a few days do it; but it is otherwiſe with the head, that does not ſeem to perform its functions in the divided pieces, till about ſeven months after the ſeparation. It is to be obſerved, that in all theſe operations both on earth and water-worms, that the hinder part ſuffers greatly more than the fore part in the cutting, for it always twiſts itſelf about a long time, as if actuated by ſtrong convulſions; whereas the head uſually crawls away without the appearance of any great uneaſineſs.

The *reproduction* of ſeveral parts of LOBSTERS, CRABS, &c. makes alſo one of the great curioſities in natural hiſtory. That, in lieu of an organical part of an animal broken off, another ſhall ariſe perfectly like it, may ſeem inconſiſtent with the modern ſyſtem of generation, where the animal is ſuppoſed to be wholly formed in the egg. Yet has the matter of fact been well atteſted by the fiſhermen, and even by ſeveral virtuoſos, who have taken the point into examination, particularly M. de Reaumur, and M. Perrault, whoſe ſkill and exactneſs in things of this nature will hardly be queſtioned. The legs of lobſters, &c. conſiſt each of five articulations: now, when any of the legs happen to break by any accident, as in walking, &c. which frequently happens, the fracture is always found to be in a part near the fourth articulation; and what they thus loſe, is preciſely *reproduced* in ſome time afterwards; that is, a part of a leg ſhoots out, conſiſting of four articulations, the firſt whereof has two claws as before; ſo that the loſs is entirely repaired.

If a lobſter's leg be broken off by deſign at the fourth or fifth articulation, what is thus broken off always comes again; but it is not ſo, if the fracture be made in the firſt, ſecond, or third articulation. In thoſe caſes, the *reproduction* is very rare, if things continue as they are. But what is exceedingly ſurpriſing is, that they do not; for, upon viſiting the lobſter maimed in theſe barren and unhappy articulations, at the end of two or three days, all the other articulations are found broken off to the fourth; and it is ſuſpected they have performed the operation on themſelves, to make the *reproduction* of a leg certain.

The part *reproduced* is not only perfectly like that retrenched, but alſo, in a certain ſpace of time, grows equal to it. Hence it is, that we frequently ſee lobſters, which have their two big legs unequal, and that in all proportions. This ſhews the ſmaller leg to be a new one.

A part thus *reproduced* being broken, there is a ſecond *reproduction*. The ſummer, which is the only ſeaſon of the year when the lobſters eat, is the moſt favourable time for the *reproduction*. It is then performed in four or five weeks; whereas it takes up eight or nine months in any other ſeaſon.

The ſmall legs are ſometimes *reproduced*, but more rarely, as well as more ſlowly, than the great ones: the horns do the ſame. Vide Mem. Acad. Roy. Scienc. ann. 1712. p. 295. Hiſt. p. 45. ſeq. item. ann. 1718. p. 31.

The experiment is moſt eaſily tried on the common crab.

REPROOF, *objurgatio*, in *Rhetoric*, is diſtinguiſhed from INVECTIVE.

REPRODUCTIVE *ſyſtem of preſervation.* See ANNIHILATION.

REP-SILVER, money anciently paid by ſervile tenants to their lord, to be quit of the duty of reaping his corn.

REPTILES, formed from *repo, I creep*, in *Natural Hiſtory*, a kind of animals ſo denominated from their creeping or advancing on the belly. Or, *reptiles* are diſtinctly a genus of animals and inſects, which, inſtead of feet, reſt on one part of the body, while they advance forward with the reſt.

Such are earth-worms, ſnakes, &c. Indeed, many of the ordinary claſs of *reptiles* have feet, only thoſe very ſmall, and the legs ſhort in proportion to the bulk of the body.

Naturaliſts obſerve great contrivance for the motion of *reptiles*. Thus, particularly in the earth-worm, Dr. Willis tells us, the whole body is only a chain of annular muſcles; or, as Dr. Derham ſays, it is only one continued ſpiral muſcle, the orbicular fibres whereof, by being contracted, render each ring narrower and longer than before; by which means it is enabled, like the worm of an augre, to bore its paſſage into the earth. Its *reptile* motion may alſo be explained by a wire wound on a cylinder, which, when ſtripped off, and one end extended, and held faſt, will bring the other nearer it. So the earth-worm having ſhot out or extended its body (which is formed with a wreathing) it takes hold by thoſe ſmall feet it hath, and ſo contracts the hinder part of its body. Dr. Tyſon adds, that, when the fore part of the body is ſtretched out and applied to a plane at a diſtance, the hind part, relaxing and ſhortening, is eaſily drawn toward it as a centre.

The little feet of this creature are diſpoſed in a quadruple row the whole length of the worm; with which, as with ſo many hooks, it faſtens down ſometimes this, and ſometimes that, part of the body to the plane, and at the ſame time ſtretches out, or drags after it, another.

The creeping of ſerpents is effected after a ſomewhat different manner, there being a difference in their ſtructure; in that theſe laſt have a compages of bones articulated together.

The body here is not drawn together, but, as it were, complicated, part of it being applied on the rough ground, and the reſt ejaculated and ſhot from it; which, being ſet on the ground in its turn, brings the other after it. The ſpine of the back, variouſly wreathed in theſe creatures, has the ſame effect in leaping, as the joints of the feet in other animals; they making their leaps by means of muſcles that extend the plicæ, or folds.

In the Linnæan ſyſtem, *reptiles* conſtitute an order of animals under the claſs of *amphibia*; the characters of which are, that they breathe through the mouth by means of lungs only, and are furniſhed with four feet. To this order belong four genera, viz. the TORTOISE, FROG, dragon, or DRACO, and lizard, or LACERTA, and eighty-two ſpecies. Linnæus has referred moſt of thoſe animals, which others have denominated *reptiles*, to the order of *ſerpents*, and claſs of *vermes*, or worms.

REPTILE is likewiſe uſed, abuſively, for plants which creep on the earth, or on other plants, as wanting ſtrength of ſtalk to ſuſtain themſelves.

Such are cucumbers, melons, &c. ſuch alſo are ivy, the vine, and bryony.

REPUBLIC, *reſpublica*, *commonwealth*, a popular ſtate or government; or a nation where the body, or only a part of the people, have the government in their own hands. When the body of the people is poſſeſſed of the ſupreme power, this is called a DEMOCRACY. When the ſupreme power is lodged in the hands of a part of the people, it is then an ARISTOCRACY.

The celebrated *republics* of antiquity are thoſe of Athens, Sparta, Rome, and Carthage. At preſent, there is ſcarce any ſuch thing as a real *republic*, i. e. a ſtrictly popular ſtate.

ſtate. Indeed, the Venetians and Genoeſe call their ſtates *republics*; but their government is apparently *oligarchic*.

The Dutch come the neareſt to the character of a *republic*; yet they are very defective, at leaſt in the ſenſe and ſeverity wherewith Rome, Carthage, &c. were *republics*. See STATES-*general*.

It is a remark of M. St. Evremont, that, if the Dutch love the *republican* form, it is more for the ſake of their trade than of their liberty.

Holland, which is compoſed of about fifty *republics*, all different from one another, may be conſidered as a confederate *republic*; which is a convention by which ſeveral petty ſtates agree to become members of a larger one, which they intend to eſtabliſh. In this view, Germany, which conſiſts of free cities, and of petty ſtates, ſubject to different princes, and the Swiſs cantons, are conſidered in Europe as perpetual *republics*.

REPUBLIC *of letters* is a phraſe uſed in ſpeaking collectively of the whole body of the people of ſtudy and learning.

There is a journal, begun in Holland by M. Bayle, and continued by M. Bernard, conſiſting of extracts of books printed in the courſe of the year, called Nouvelles de la Republique des Lettres, News from the *Republic* of Letters.

REPUDIATION, *repudium*, in the *Civil Law*, the act of divorcing. See DIVORCE.

REPULSION, *repulſio*, in *Phyſics*, the act of a REPELLING *power*, whereby natural bodies, under certain circumſtances, mutually fly from each other.

Repulſion is the counter-part to *attraction*. Attraction only reaches to a little diſtance; where that terminates, there *repulſion* commences. See AIR and COMPRESSION.

Indeed, we meet with many obvious inſtances of *repulſion* among bodies, as between water and oil, and, in general, between water and all unctuous bodies; between mercury and iron, as alſo between the particles of duſt, &c.

Thus, if a fat body, lighter than water, be laid on the ſurface thereof, or if a piece of iron be laid on mercury, the ſurface of the fluid will be depreſſed about the bodies laid on it. This is a plain indication of *repulſion*; as the riſing up of the fluid about the ſurfaces of other incumbent bodies is of attraction.

In the latter caſe, the fluid is ſuſpended, by an attractive power, above the level, and kept from falling by its gravity: in the former, a depreſſion is made by the repelling power, which the liquor, notwithſtanding its gravity, cannot run down into, and fill up.

Upon this depend all the phenomena of very light glaſs bubbles floating on water, about which, when clean, the water riſes; but when greaſed, the water ſinks into a channel all around them. Hence alſo it is, that, in a glaſs-veſſel of water, the fluid ſtands higher all about the edges near the glaſs than towards the middle; but when the glaſs is filled till the water run down on all ſides, then it ſtands higher at the middle than at the ſides. Hence, alſo, in a glaſs not full of water, a clean glaſs bubble always runs to the ſide, by reaſon the preſſure, which is upon it towards the middle, is partly taken off by the attractive force wherewith the water is raiſed near the edge. If the glaſs be ſo full as to be ready to run over, the bubble returns from the ſide towards the middle, the force wherewith the water is raiſed in the middle taking off part of the preſſure.

Juſt the reverſe happens if the bubble be greaſy; becauſe there the force, whereby the water and the bubble repel each other, is greateſt where the water is higheſt. Two clean bubbles and two greaſy ones always run towards each other, as being attracted; and a greaſy and a clean one always fly each other, as being repelled.

REQUEST, in *Law*, a ſupplication or petition preferred to a prince, or court of juſtice, begging relief in ſome conſcionable caſes, where the common law grants no immediate redreſs.

The term *requeſt* is now, ſince the inſtitution of chancery, much diſuſed; together with the court of *requeſts*, where *requeſts* were cognizable.

In France, *requetes civiles*, *civil requeſts*, ſtill obtain for the annulling of contracts, &c. made by ſurprize.

They have eighty *maſters of requeſts* to take cognizance of cauſes between the officers of the crown, the ſervants of the houſhold, &c.

REQUESTS, *court of*. See COURT *of requeſts*, and COURT *of conſcience*.

REQUEST, in *Hunting*, is when the dogs have loſt the QUEST or track of the beaſt, and muſt *requeſt*, or *queſt* it again. They ſay, *to call to the* requeſt, *come to the* requeſt, &c.

To *requeſt* the game is chiefly uſed, when, after having run it down the night before, they ſeek it again the next morning with the blood-hound, or the like.

REQUIEM, a maſs ſung in the Romiſh church for the reſt of the ſoul of a perſon deceaſed.

It is thus called, becauſe the introit begins with, *Requiem æternam dona eis, Domine*, &c.

RERE *county*. See RIER *county*.

RERE *fiefs*, a name given in the Scotch laws to thoſe fiefs which were held by inferior tenants or feudatories, who cultivated the lands under the chief feudatories, who held by military ſervice.

RERE *ward*, *arreire-garde*. See REAR, and GUARD.

RES, *thing*. See REALITY, ENS, ESSE, SUBSTANCE, &c.

RES *mancipi*. See ABALIENATION.

RES *naturales*. See NATURALS.

RES *non naturales*, &c. See NON *naturals*, &c.

RESCEIT, *receptio*, in *Law*, an admiſſion or receiving of a third perſon to plead his right, in a cauſe formerly commenced between other two.

As, where an action is brought againſt a tenant for life or years, and he makes default; in ſuch caſe he in the reverſion may come in and pray to be *received*, to defend the land, and to plead with the demandant.

RESCEIT is ſometimes alſo applied to an admittance of plea, though the controverſy be only between two. He in reverſion may come into court, and pray to be *received* in a ſuit againſt his particular tenant.

RESCEIT *of homage*, *receptio homagii*, denotes the lord's receiving homage of his tenant, at his admiſſion to the lands.

RESCISSION, *reſciſſio*, formed of *re*, and *ſcindo*, q. d. *I cut or divide again*, in the *Civil Law*, an action intended for the annulling or ſetting aſide of any deed, contract, or the like.

A thing's being found damaged, or ſold at above double the juſt value, is a good cauſe of *reſciſſion*.

The deed or contract thus annulled, or *reſcinded*, is ſometimes called a *reſciſſory*; though that denomination be more properly given to the action brought for *reſcinding* or ſetting it aſide; which is properly called *actio reſciſſoria*.

RESCOUS, or RESCUE, *reſcuſſus*, in *Law*, an illegal taking away, and ſetting at liberty, a diſtreſs taken, or a perſon arreſted, by proceſs, or courſe of law. This is properly a *reſcous in fact*. If one diſtrain beaſts for damage feaſant in his ground, and as he drives them along the highway towards the pound, they enter into the owner's houſe, and he with-holds them there, and will not deliver them upon demand; this detainer is a *reſcous in law*.

Reſcous, in matters relating to treaſon, is deemed treaſon; and in matters concerning felony, is felony; and in miſdemeanors, a miſdemeanor. By the ſtat. 16 Geo. II. cap. 31. to aſſiſt a priſoner in cuſtody for treaſon or felony with any arms, inſtruments of eſcape or diſguiſe, without the knowledge of the gaoler, or any way to aſſiſt ſuch priſoner to attempt an eſcape, though no eſcape be actually made, is felony, and ſubjects the offender to tranſportation for ſeven years. And by the ſtatutes 25 Geo. II. cap. 37. and 27 Geo. II. cap. 15. to *reſcue*, or attempt to *reſcue*, any perſon committed for murder, or for any of the offences enumerated in that act, or the black act, 9 Geo. I. cap. 22. is felony without benefit of clergy. The *reſcue* of a priſoner from any of the king's ſuperior courts of juſtice in Weſtminſter-hall, or at the aſſizes, without ſtriking a blow, is puniſhed with perpetual impriſonment and forfeiture of goods, and of the profits of lands during life.

He that commits a *reſcue* or *reſcous*, is called the *reſcuſſor*.

RESCOUS is alſo uſed for a writ which lies for this fact, called *breve de reſcuſſu*.

RESCRIPT, *reſcriptum*, an anſwer delivered by an emperor, or a pope, when conſulted by particular perſons, on ſome difficult queſtion or point of law, to ſerve as a deciſion thereof.

The civil and canon laws are full of ſuch *reſcripts*.

When the *reſcript* was made in anſwer to the inquiry of a community, it was called a *pragmatic ſanction*.

The papal *reſcripts* are a kind of bulls or monitories, beginning with theſe words, *Significavit nobis dilectus filius*, &c.

They never obtained either in England or France, when contrary to the liberties of the Engliſh and Gallican churches; but were declared abuſive.

Among the Romans the contending parties, and even the magiſtrates themſelves, frequently conſulted the emperor on the meaſures they were to take in certain nice and difficult caſes; and the anſwers returned by the emperors on ſuch conſultations, were called *reſcripts*. Theſe had not, indeed, the full force of laws; but they were deemed a ſtrong prejudice or preſumption.

Justinian has inserted a great number of them in the Code; and by that means given them the authority they before wanted.

The author of the life of the emperor Macrinus observes of that prince, that he would have his officers judge by laws, not by *rescripts*; as esteeming it absurd to admit the wills of ignorant men, such as Commodus and Caracalla, for rules of judging; and because Trajan never gave any *rescripts* at all, as being loth to countenance a custom, where what is frequently granted as a favour, in particular cases, might be afterwards pleaded as a precedent. It is added, that Macrinus had a design to strip the *rescripts* of all their authority.

M. Schulting, in his Dissertations, does not at all approve of this design; and to the emperor's reasons answers, that indeed all *rescripts* are not to be admitted; that those which appear dictated out of favour, are to be thrown aside; but those which appear founded in reason, and natural equity, are, with Justinian, to be allowed. He adds, that it cannot be denied but the worst emperors have frequently made good laws, and useful *rescripts*.

As to what is urged of the emperor Trajan's never giving any *rescripts*, it appears but ill supported. For what is it but a *rescript* that he delivers to Pliny on the subject of the Christians, lib. x. epist. 28.? Or that on the Iselastici, lib. x. epist. 120.? The Digest, and Pliny's Epistles, need only to be opened and compared, to find *rescripts* of Trajan.

RESCUE. See RESCOUS.

RESCUSSOR, in *Law*. See RESCOUS.

RESEARCH, formed of the French *recherche*, and literally denoting a *second search*, a diligent search or enquiry into any thing.

RESEARCH, in *Music*, is a kind of prelude or voluntary played on the organ, harpsichord, violin, &c. wherein the composer seems to *search* or look out for the strains and touches of harmony, which he is to use in the regular piece to be played afterwards.

This is usually done off-hand; and consequently it requires a master's skill. When in a motetto the composer takes the liberty to use any thing that comes into his head, without applying any words to it, or subjecting himself to the sense or passion thereof, the Italians call it *fantasia ricercata*, the French *recherche*, and the English *research* and voluntary.

RESEARCHING, in *Sculpture*, the repairing of a cast figure, &c. with proper tools; or the finishing it with art and exactness, so as that the minutest parts may be well defined.

RESEDA, in *Botany*. See ROCKET.

RESEISER, *reseisire*, in *Law*, a taking of lands into the king's hands, where a general livery, or ouster le main, was formerly misused, contrary to order of law.

RESEMBLANCE. See SIMILITUDE.

RESERVATION, *reservatio*, in *Law*, an action or clause whereby something is *reserved*, i. e. is retained, kept, or secured to one's self.

Thus when a man lets his land, he reserves a rent to be paid to himself for his maintenance, &c.

William the Conqueror, getting all the lands of England, except those belonging to the church and religious houses, into his hands by right of conquest, bestowed a great part thereof among his followers, *reserving* some retribution of rents and services to him and his heirs; which *reservation* is now, as it was before the Conquest, called the tenure of the lands.

Sometimes *reservation* signifies as much as an exception; as, when a man lets a house, and *reserves* to himself one room, that room is excepted out of the demise.

RESERVATION, *mental*, is a proposition which, strictly taken, and according to the natural import of the terms, is false; but if qualified with something *reserved* or concealed in the mind, becomes true.

Mental *reservations* are the great refuge of religious hypocrites, who use them to accommodate their consciences with their interests. The Jesuits are zealous advocates for mental *reservations*; yet are they strictly all real lyes, as including an intention to deceive.

RESERVATORY. See RESERVOIR.

RESERVE, in *Law*, the same with *reservation*.

Benefices are sometimes resigned with *reserve* of a pension. By the canon law, no person may reserve to himself a pension out of a benefice, unless he hath served it ten years.

In the Romish church, the ordinary priests have only a power to absolve, in *reserve* of certain cases, hence called *reserved cases*, as being *reserved* to the bishop.

The court *reserves* the cognizance of such an affair to itself. The lawyers say, that no prince ever grants such a power by his letters or patents, but that he *reserves* to himself a greater.

RESERVE, *body of*, *corps de reserve*, in *War*. See BODY *of reserve*.

RESERVE *guard* denotes the same as a *picquet* GUARD, except that the one mounts at troop-beating, and the other at retreat-beating.

RESERVED *cases*. See CASES.

RESERVOIR, *receptacle*, a place where water is collected and reserved. See BASON.

The *reservoir* in a building is a large bason, usually of wood, lined with lead, where water is kept to supply the occasions of the house. At Cannons, the late noble seat of the duke of Chandois, there was a very large *reservoir* at the top of the house, to which the water was raised by a curious engine contrived for the purpose. This *reservoir* was of such capacity, as that, besides supplying all parts of the house by means of pipes and cocks, it likewise turned a mill.

The *reservoir* is sometimes also a large bason of strong masonry, clayed or paved at the bottom, where the water is reserved to feed jets d'eau, or spouting fountains. Such is that large one on the top of Marly, called *trou d'enfer*, *hell mouth*, whose surface, Daviler tells us, contains fifty acres, and its depth such as to contain a hundred thousand cubic fathom of water.

RESERVOIR, in *Anatomy*. See RECEPTACULUM.

RESET, in *Law*, the receiving or harbouring an outlawed person. Hence a receiver of an outlawed person is called a *resetter*.

RESIANCE, *resiantia*, in *Law*, a man's abode or continuance in a place.

The word has the same signification with regard to laymen, as *residence* with regard to ecclesiastics.

Glanville observes, that in the ancient law, *resiance* properly signified a disease, whereby the person was disabled from stirring out of doors. Whence their *essoin de resiantia*, was the same as our *essoin de malo lecto*.

RESIANT *rolls*, are rolls wherein the *resiants* of a tithing, &c. are set down.

RESIDENCE, *residentia*, in *Canon* and *Common Law*, the abode of a parson or incumbent upon his benefice; and his assiduity in attending on the same.

The default of *residence*, called NON-*residence*, unless where the party has a dispensation for the same, with us is the forfeiture of ten pounds for each month. Thus, by statute 21 Hen. VIII. cap. 13. persons wilfully absenting themselves from their benefices for one month together, or two months in the year, incur a penalty of 5*l.* to the king, and 5*l.* to any person that will sue for the same; except chaplains to the king, or others therein mentioned, during their attendance in the houshold of such as retain them; and also except all heads of houses, magistrates, and professors in the universities, and all students under forty years of age residing there, *bona fide*, for study. Legal *residence* is not only in the parish, but also in the parsonage house; for it hath been resolved, that the statute intended *residence*, not only for serving the cure, and for hospitality, but also for maintaining the house, that the successor also may keep hospitality there. 25 Hen. VIII. cap. 16. 33 Hen. VIII. cap. 28. 28 Hen. VIII. cap. 13. See LEASE.

By the canon law, beneficiaries are obliged to *residence*, under pain of deprivation of their benefices. The original reason is, that in the primitive church none were promoted to holy orders, but such as had a benefice in promptu, which they were obliged to serve; so that this service was necessarily attached to the orders; and whoever was honoured therewith, at the same time was obliged to personal service.

But this strict discipline was not observed long. The beneficiaries by degrees got dispensations from serving their benefices themselves; and thus pluralities very soon got footing.

France, of all other countries, seems to be that where *residence* is the most strictly regarded. All their cures, or ministers who have cure of souls, are obliged to actual *residence*; and the parliaments have declared all the dispensations granted by popes, &c. abusive, as esteeming the obligation of *residence* to be jure divino.

Under Charles I. there was even a design to re-establish the primitive discipline in all its severity; and in 1651, a declaration was registered, appointing all bishops to reside, conformably to the ancient canons, in their bishopricks. The same parliament also forbad the bishops to assume the quality of counsellors of the king; in regard such a quality was deemed inconsistent with the indispensable obligation they were under to reside in their bishopricks.

Du Pin adds, that the procureur general, or attorney-general Buordin, even seized the temporalities of such bishops as continued in Paris fifteen days after this declaration; having first certified them, that if they had any business there, he would undertake the management thereof.

RESIDENCE, in *Chemistry*, &c. the *settling* or what remains of

of a liquor, or other substance, in the vessel, after the chief part of it has been poured or taken out, to change the manner of the operation on what is left.

RESIDENT, a public minister, who manages the affairs of a king in the court of a prince, or petty state; or the affairs of a prince, or petty state, in the court of a king or prince.

Thus the king of England has *residents* in the courts of the electors, and other princes of Germany and Italy; at the republics of Genoa and Lucca; and they, reciprocally, have *residents* in the court of Great Britain.

Residents are a class of public ministers inferior to ambassadors and envoys; but, like them, they are under the protection of the law of nations.

RESIDENT, *residens*, in our *Ancient Customs*, was a tenant who was obliged to reside on his lord's land, and not to depart from the same; called also *homme levant* and *couchant*, and in Normandy *resseant du fief*.

Quantumque de aliis teneat, ei magis obnoxius est; & ejus residens *esse debet, cujus legius est.* Leg. H. I.

RESIDENTIARY, *residentiarius*, a canon installed to the privileges and profits of residence.

RESIDUAL *figure*, in *Geometry*, the figure remaining after subtraction of a lesser from a greater.

RESIDUAL *root*, is a root composed of two parts or members, only connected together with the sign —.

Thus, $a-b$, or $5-3$, is a *residual* root; and is so called, because its true value is no more than its *residue*, or difference between the parts a and b, or 5 and 3.

RESIDUARY *legatee*. See LEGATEE.

RESIDUE, *residuum*, the remainder or reliqua of an account, debt, or obligation.

RESIDUUM *of a charge*, in *Electricity*, first discovered by Mr. Gralath, in Germany, in 1746, is that part of the charge that lay on the uncoated part of a LEYDEN *phial*, which doth not let go all its electricity at once; so that it is afterwards gradually diffused to the coating.

RESIDUUM, in *Law*. See EXECUTOR, and *Residuary* LEGATEE.

RESIGNATION, *resignatio*, in the *Canon Law*, the surrender or giving up of a benefice into the hands of the ordinary or bishop.

Resignation is of equal import with *surrender*; only the former is restrained to spiritual benefices, and the latter to temporal offices or employments.

It is a maxim in the ecclesiastical law, that all *resignations* must be made to some superior; therefore a bishop must resign to his metropolitan; but the archbishop can resign to none but the king himself. No *resignation* can be valid, till it is accepted by the proper ordinary; and in the regular course, it must be made in person, and not by proxy.

Resignations are either *simple*, or *conditional*.

RESIGNATIONS, *simple* or *pure*, are those whereby the incumbent strips himself of all his right, absolutely, and without any conditions, or reserve of pension. These are made to the bishop, or ordinary.

RESIGNATIONS *in favour*, or *conditional* RESIGNATIONS, are such as are only made on condition that such other persons shall be invested therewith; so that the *resignations* are null, unless the conditions be punctually executed. These *resignations in favorem* are not of above two hundred and fifty years standing. Strong opposition was at first made to them, they being esteemed a kind of succession or transmission of benefices, as of patrimonies belonging to a family. Accordingly, these *resignations* are not made into the hands of the ordinary, or collator, as pure *resignations* are, but to the collator paramount, who in the Romish church is the pope, there being a suspicion of simony or other unlawful paction, therein, where admitted of in prejudice to the lay patron.

By the 31 Eliz. cap. 6. § 8. if any incumbent of any benefice, with cure of souls, shall corruptly resign the same, or corruptly take for, or in respect of resigning the same, directly or indirectly, any pension, sum of money, or other benefit whatsoever; as well the giver, as the taker, shall lose double the value of the sum given or received; half to the queen, and half to him that shall sue for the same. Before this statute, the bishop, in cases of *resignation*, might and did frequently assign a pension, during life, out of the benefice resigned, to the person resigning. But by the aforesaid act no pensions whatsoever can be reserved. See SIMONY. But a man may bind himself by bond to resign, and it is not unlawful.

RESIGNEE, in *Law*, the party to whom a thing is resigned.

RESIN, *resina*, a fat, viscid, sulphureous juice, oosing either spontaneously, or by incision, from several kinds of trees, particularly the pine, fir, &c.

Camphor is a kind of *resin*. Mastic is the *resin* of the lentisk. The best of all the class of *resins* is turpentine. The coarsest is what we commonly call ROSIN.

Resin is properly a juice of the bark of a tree only.

According to Theophrastus *resin* was obtained by stripping off the bark from pines, and by incisions made in the silver-fir and the pitch-pine. The inhabitants of Mount Ida, he tells us, stripped the trunks of pines on the sunny side two or three cubits from the ground. He observes, that a good pine might be made to yield *resin* every year, but the indifferent pines only every other year, and the weaker trees once in three years; and that three runnings were as much as a tree could bear. It is remarked by the same author, that a pine doth not at once produce fruit and *resin*; but the former only in its youth, and the latter in its old age.

Boerhaave will have it to be the oil of the bark farther inspissated by the heat of the sun, &c. so as to become friable. He adds, that *resin* may be produced from any vegetable oil, by boiling it much and long.

If turpentine be set over a gentle fire, it first dissolves, and becomes an oil, then a balsam, then pitch, and then *resin*; in which state it is friable in the cold, fusible by fire, and withal inflammable and combustible, and dissoluble in spirit of wine, but not in water, which are all the characters of a *resin*.

There are two kinds of *resins*, the one *liquid*, the other *dry* and hard. The first is the natural *resin*, as it flows from the tree; the second only differs from the first, in that it is condensed by the heat of the sun, or by that of a culinary fire.

Resins will incorporate with oil, or rectified spirits, but not with an aqueous menstruum.

The difference between *resins* and *gums* consists in this, that *resins* are more sulphureous, and gums more aqueous; so that the first dissolve in oil, or spirit of wine, and the last readily in water.

M. Tournefort makes a kind of intermediate class of vegetable juices, which he calls *gum-resins*; which dissolve partly in spirit of wine, partly in water. Such are *galbanum, bdellium, opopanax, sagapenum*, &c. See GUM, and GUM-*resins*.

The *resins* of several vegetables which abound with resinous particles, but not so as to yield any by incision, as jalap, benzoin, scammony, turbith, &c. are thus obtained. The vegetable, being grossly powdered, is put into a matrass, and rectified spirit of wine is poured on it, to the height of four fingers above the matter. Then the neck of another matrass being luted into the former, to make a double vessel, the matter is digested three or four days in a sand-heat, till it have given a good tincture to the spirit of wine. Then the dissolution is filtrated, and two thirds of the clear liquor evaporated off, and the remainder poured into a large vessel of water, where it turns into a kind of milk; whence the *resin*, in time, precipitates to the bottom in form of a white powder. This, when washed and dried in the sun, grows into the ordinary consistence of a *resin*.

Resins are employed for many purposes. The cheapest kinds are used for torches, and to cover the outsides of ships and boats. The fine, transparent *resins*, compose varnishes. Many of them are employed medicinally: such are those which enter into the composition of ointments and plasters; or internally, as the *resins* of scammony, jalap, and turpeth, which are purgative. Other *resins*, the smell of which is agreeable, as benjamin and storax, are employed as perfumes.

RESIN, *elastic*. See CAOUTCHOUC.

RESIN, *mastic*. See MASTIC.

RESISTANCE, or RESISTING *force*, in *Physics*, any power which acts contrarily to another, so as to destroy or diminish its effect.

Of *resistance* there are various kinds, arising from the various natures and properties of the resisting bodies, and governed by various laws: as, the *resistance* of solids, the *resistance* of fluids, the *resistance* of the air, &c. The doctrine of each whereof will be seen under the following articles.

RESISTANCE *of solids*, in *Mechanics*, is the force wherewith the quiescent parts of solid bodies oppose the motion of others contiguous therewith.

Of this there are two kinds. The first, where the resisting, and the resisted parts, i. e. the moving and quiescent bodies, are only contiguous, and do not cohere; i. e. where they constitute separate bodies or masses.

This *resistance* is what M. Leibnitz calls *resistance of the surface*; and we, properly, *friction*; the consideration whereof being of the last importance in the doctrine of machines, see its laws under the article FRICTION.

The second case of *resistance* is where the resisting and resisted parts are not only contiguous, but cohere; i. e. are parts of the same continued body or mass. This *resistance* is what we may properly call *renitency*; and was first considered by Galileo.

RESISTANCE *of the fibres of solid bodies, theory of the*. To conceive

conceive an idea of this *resistance* or renitency of the parts, suppose a cylindrical body suspended vertically by one end. Here all its parts, being heavy, tend downwards, and endeavour to separate the two contiguous planes, where the body is the weakest; but all the parts resist this separation by the force wherewith they cohere, or are bound together: here then are two opposite powers; viz. the weight of the cylinder, which tends to break it; and the force of cohesion of the parts, which resists the fracture.

If the base of the cylinder be increased without increasing its length; it is evident the *resistance* will be increased in the same ratio as the base; but the weight also increases in the same ratio; whence it is evident, that all cylinders of the same matter and length, whatever their bases be, have an equal *resistance*, when vertically suspended.

If the length of the cylinder be increased without increasing the base, its weight is increased without increasing its *resistance*; consequently the lengthening it weakens it. To find the greatest length a cylinder of any matter may have without breaking, there needs nothing but to take any cylinder of the same matter, and fasten to it the greatest weight it will sustain before it break; and then see how much it must be lengthened by the addition of its weight, till it equals its former weight with the addition of a foreign weight. Let A be the given weight, B that of the cylinder, L its length, C the greatest weight it can bear, and x the length sought; then we shall have $A + \frac{Bx}{L} = C$, and $x = \frac{CL - AL}{B}$. By this means Galileo found a copper-wire, and of consequence any other cylinder of copper, might be extended to 4801 braccios or fathoms of six feet each.

If one end of the cylinder were fixed horizontally into a wall, and the rest suspended thence, its weight and *resistance* would then act in a different manner; and if it be broke by the action of its weight, the rupture would be at the end fixed into the wall. A circle or plane contiguous to the wall, and parallel to the base, and consequently vertical, would be detached from the contiguous circle within the plane of the wall, and would descend. All the motion is performed on the lowest extremity of the diameter, which remains immoveable, while the upper extremity describes a quadrant of a circle, and till the circle which before was vertical become horizontal; i. e. till the cylinder be entirely broken.

In this fracture of the cylinder it is visible two forces have acted, and the one has overcome the other: the weight of the cylinder, which arose from its whole mass, has overcome the *resistance* which arose from the largeness of the base; and as the centres of gravity are points wherein all the forces, arising from the weights of the several parts of the same bodies, are conceived to be united, one may conceive the weight of the whole cylinder applied in the centre of gravity of its mass, i. e. in a point in the middle of its axis; and the *resistance* of the cylinder applied in the centre of gravity of its base, i. e. in the centre of the base; it being the base which resists the fracture.

When the cylinder breaks by its own weight, all the motion is on an immoveable extremity of a diameter of the base. This extremity, therefore, is the fixed point of a lever, whose two arms are the radius of the base, and half the axis; and, of consequence, the two opposite forces do not only act of themselves, and by their absolute force, but also by the relative force they derive from their distance with regard to the fixed point of the lever.

Hence it evidently follows, that a cylinder, e. gr. of copper, which, vertically suspended, will not break by its own weight, if less than four hundred and eighty fathom long, will break with a less length in an horizontal situation; because the length in this latter case contributes two ways to the fracture; both as it makes it of such a weight, and as it is as an arm of a lever to which the weight is applied. Hence, also, the smaller the base is, the less length or weight will suffice to break it; both because the *resistance* is really less, and because it acts by a less arm of a lever.

If two cylinders of the same matter, having their bases and lengths in the same proportion, be suspended horizontally; it is evident, that the greater has more weight than the lesser, both on account of its length, and of its base. But it has less *resistance* on account of its length, considered as a longer arm of a lever, and has only more *resistance* on account of its base; therefore it exceeds the lesser in its bulk and weight more than in *resistance*, and consequently it must break more easily.

Hence, we see why, upon making models and machines in small, people are apt to be mistaken as to the *resistance* and strength of certain horizontal pieces, when they come to execute their designs in large, by observing the same proportion as in the small. Galileo's doctrine of *resistance*, therefore, is no idle speculation, but becomes applicable in architecture, and other arts.

The weight required to break a body, placed horizontally, being always less than that required to break it in a vertical situation; and this weight being to be greater or less according to the ratio of the two arms of the lever, the whole theory is always reducible to this; viz. to find what part of the absolute weight the relative weight is to be, supposing the figure of the body known; which indeed is necessary, because it is the figure that determines the two centres of gravity, or the two arms of the lever. For if the body, e. gr. were a cone, its centre of gravity would not be in the middle of its axis, as in the cylinder; and, if it were a semi-parabolical solid, neither would its centre of gravity be in the middle of its length or axis, nor the centre of gravity of its base in the middle of the axis of its base. But still, wheresoever these centres fall in the several figures, the two arms of the lever are regulated by these.

It may be here observed, that, if the base, whereby the body is fastened into the wall, be not circular, but e. g. parabolical, and the vertex of the parabola be at the top, the motion of the fracture will not be on an immoveable point, but on a whole immoveable line; which may be called the *axis of equilibrium*; and it is with regard to this that the distances of the centres of gravity are to be determined.

Now, a body horizontally suspended, being supposed such as that the smallest addition of weight would break it, there is an equilibrium between its positive and relative weight; and of consequence those two opposite powers are to each other reciprocally as the arms of the lever to which they are applied. On the other hand, the *resistance* of a body is always equal to the greatest weight which it will sustain in a vertical situation, without breaking, i. e. is equal to its absolute weight. Therefore, substituting the absolute weight for the *resistance*, it appears that the absolute weight of a body, suspended horizontally, is to its relative weight as the distance of its centre of gravity from the axis of equilibrium is to the distance of the centre of gravity of its base from the same axis.

The discovery of this important truth, at least of an equivalent to it, and to which this is reducible, we owe to Galileo. From this fundamental proposition are easily deduced several consequences: as, for instance, that, if the distance of the centre of gravity of the base from the axis of equilibrium be half the distance of the centre of gravity of the body, the relative weight will only be half the absolute weight; and that a cylinder of copper, horizontally suspended, whose length is double the diameter, will break, provided it weigh half what a cylinder of the same base, 4801 fathoms long, weighs.

On this system of *resistance* of Galileo, M. Mariotte made a very subtle remark, which gave birth to a new system. Galileo supposes, that, where the body breaks, all the fibres break at once; so that the body always resists with its whole absolute force; i. e. with the whole force that all its fibres have in the place where it is to be broke. But M. Mariotte, finding that all bodies, even glass itself, bend before they break, shews that fibres are to be considered as so many little bent springs, which never exert their whole force till stretched to a certain point, and never break till entirely unbent. Hence, those nearest the axis of equilibrium, which is an immoveable line, are stretched less than those farther off; and, of consequence, employ a less part of their force.

This consideration only takes place in the horizontal situation of the body: in the vertical, the fibres of the base all break at once; so that the absolute weight of the body must exceed the united *resistance* of all its fibres; a greater weight is therefore required here than in the horizontal situation, i. e. a greater weight is required to overcome their united *resistance* than to overcome their several *resistances* one after another. The difference between the two situations arises hence, that, in the horizontal, there is an immoveable point or line, as a centre of motion, which is not in the vertical.

M. Varignon has improved on the system of M. Mariotte, and shewn, that, to Galileo's system, it adds the consideration of the centre of percussion. The comparison of the centres of gravity with the centres of percussion, afford a fine view, and set the whole doctrine in a most agreeable light.

In each system, the base, whereby the body breaks, moves on the axis of equilibrium, which is an immoveable line in the same base; but in the second, the fibres of this base are continually stretching more and more, and that in the same ratio, as they recede farther and farther from the axis of equilibrium; and, of consequence, are

are ſtill exerting a greater and greater part of their whole force.

Theſe unequal extenſions, like all other forces, muſt have ſome common centre where they all meet, and with regard to which they make equal efforts on each ſide; and as they are preciſely in the ſame proportion as the velocities which the ſeveral points of a rod moved circularly would have to one another, the centre of extenſion of the baſe, whereby the body breaks, or tends to break, muſt be the ſame with its centre of percuſſion. Galileo's hypotheſis, where fibres ſtretch equally, and break all at once, correſponds to the caſe of a rod moving parallel to itſelf, where the centre of extenſion or percuſſion does not appear, as being confounded with the centre of gravity.

The baſe of fraction being a ſurface, whoſe particular nature determines its centre of percuſſion, that is neceſſary to be firſt known, to find on what point of the vertical axis of that baſe it is placed, and how far it is from the axis of equilibrium. Indeed, we know in the general, that it always acts with ſo much the more advantage as it is farther from it; becauſe it acts by a longer arm of a lever; and of conſequence it is the unequal *reſiſtance* of the fibres in M. Marriotte's hypotheſis, which produces the centre of percuſſion; but this unequal *reſiſtance* is greater or leſs, according as the centre of percuſſion is placed more or leſs high on the vertical axis of the baſe, in the different ſurfaces of the baſe of the fracture.

To expreſs this unequal *reſiſtance*, accompanied with all the variation it is capable of, regard muſt be had to the ratio between the diſtance of the centre of percuſſion from the axis of equilibrium, and the length of the verticle axis of the baſe. In which ratio, the firſt term, or the numerator, is always leſs than the ſecond, or the denominator; ſo that the ratio is always a fraction leſs than unity; and the unequal *reſiſtance* of the fibres in M. Mariotte's hypotheſis is ſo much the greater, or, which amounts to the ſame, approaches ſo much nearer to the equal *reſiſtance* in Galileo's hypotheſis, as the two terms of the ratio are nearer to an equality.

Hence it follows, that the *reſiſtance* of bodies in M. Mariotte's ſyſtem is to that in Galileo's, as the leaſt of the terms in the ratio is to the greateſt. Hence, alſo, the *reſiſtance* being leſs than what Galileo imagined, the relative weight muſt alſo be leſs; ſo that the proportion already mentioned between the abſolute and relative weight cannot ſubſiſt in the new ſyſtem, without an augmentation of the relative weight, or a diminution of the abſolute weight; which diminution is had by multiplying the weight by the ratio, which is always leſs than unity. This done, we find that the abſolute weight, multiplied by the ratio, is to the relative weight, as the diſtance of the centre of gravity of the body from the axis of equilibrium is to the diſtance of the centre of gravity of the baſe of the fracture from the ſame axis: which is preciſely the ſame thing with the general formula given by M. Varignon for the ſyſtem of M. Mariotte. In effect, after conceiving the relative weight of a body, and its *reſiſtance* equal to its abſolute weight, as two contrary powers applied to the two arms of a lever, in the hypotheſis of Galileo, there needs nothing to convert it into that of M. Mariotte, but to imagine that the *reſiſtance*, or the abſolute weight, is become leſs, every thing elſe remaining the ſame.

We have here only conſidered bodies as to be broke by their own weight. It will amount to the ſame, if we ſuppoſe them void of weight themſelves, and to be broken by a weight applied to their extremities: only it is to be obſerved, that a foreign weight acts by an arm of a lever equal to the whole length of a body; whereas their own weight, being all united in their centre of gravity, is only the diſtance of that centre from the axis of equilibrium.

One of the moſt curious, and perhaps the moſt uſeful queſtions in this reſearch is to find what figure a body muſt have, that its *reſiſtance* may be equal in all its parts, whether it be conceived as loaden with a foreign weight, or as only ſuſtaining its own weight. We ſhall here only conſider the latter caſe, from which the former will be eaſily determined.

For a body, then, ſuſpended horizontally, to reſiſt equally in all its parts, it is neceſſary, ſome part of it being conceived as cut off in a plane parallel to the baſe or fracture of the body, the weight of the body retrenched be to its *reſiſtance* in the ſame ratio as the weight of the whole to its *reſiſtance*; theſe four powers acting by arms of levers peculiar to themſelves. Now the weight of any body thus conceived, is its whole weight multiplied by the diſtance of the centre of gravity of the body from the axis of equilibrium; and the *reſiſtance* is the plane of the baſe of fracture multiplied by the diſtance of the centre of gravity of the baſe from the ſame axis; conſequently theſe four quantities are to be proportional in the whole, and in each part, of a ſolid of equal *reſiſtance*. From this proportion, M. Varignon eaſily deduces two ſolids, which ſhall reſiſt equally in all their parts. Galileo had found one before: that diſcovered by M. Varignon is in form of a trumpet, and is to be fixed into a wall at its greater end; ſo that its bigneſs and weight is always diminiſhed in proportion as its length, or the arm of the lever whereby its weight acts, increaſes. It is added (which ſeems very remarkable) that, howſoever different the two ſyſtems may be, the ſolids of equal *reſiſtance* are the ſame in both.

For the *reſiſtance* of a ſolid ſupported at each extreme, as of a beam between two walls, ſee Beam.

Resistance *of fluids*, in *Hydroſtatics*, is the force wherewith bodies, moving in fluid mediums, are impeded and retarded in their motion.

Resistance, *laws of, of the fluid mediums.* A body moving in a fluid is reſiſted from two cauſes: the firſt, the coheſion of the parts of the fluid. For a body, in its motion, ſeparating the parts of a liquid, muſt overcome the force with which thoſe parts cohere.

The ſecond is the inertia, or inactivity of matter, whereby a certain force is required to move the particles from their places, in order to let the body paſs.

The retardation from the firſt cauſe is always the ſame in the ſame ſpace, the ſame body remaining whatever be the velocity. Hence, the *reſiſtance* increaſes as the ſpace run through; in which ratio the velocity alſo increaſes; and therefore the *reſiſtance* is as the velocity itſelf.

The *reſiſtance* from the ſecond cauſe, when the ſame body moves through different fluids with the ſame velocity, follows the proportion of the matter to be removed in the ſame time, which is as the denſity of the fluid.

When the ſame body moves through the ſame fluid with different velocities, this *reſiſtance* increaſes in proportion to the number of particles ſtruck in an equal time; which number is as the ſpace run through in that time, that is, as the velocity. But, farther, it increaſes in proportion to the force with which the body ſtrikes againſt every part; which force is alſo as the velocity of the body; and therefore, if the velocity be triple, the *reſiſtance* is triple, from a triple number of parts to be removed. It is alſo triple from a ſtroke three times ſtronger againſt every particle; therefore the whole *reſiſtance* is ninefold, that is, as the ſquare of the velocity. Hence, a body moved in a fluid is reſiſted partly in a ratio of the velocity, and partly in a duplicate ratio of it.

The *reſiſtance* from the coheſion of parts in fluids, except glutinous ones, is not very ſenſible in reſpect of the other *reſiſtance*, which increaſes in the ratio of the ſquares of the velocities; but the firſt in the ratio of the velocity itſelf. By how much the velocity increaſes, by ſo much more do theſe *reſiſtances* differ, wherefore, in ſwifter motions, the *reſiſtance* alone is to be conſidered, which is as the ſquare of the velocity.

If a fluid be included in a veſſel of a priſmatic figure, and there be moved along in it, with equal velocity, and in a direction parallel to the ſides of the priſm, two bodies, the one ſpherical, the other cylindric, ſo that the diameter of the baſe of the latter be equal to the diameter of the ſphere, and the cylinder be moved in the direction of its axis; theſe bodies will ſuffer the ſame *reſiſtance*.

To demonſtrate this, ſuppoſe the bodies at reſt, and that the fluid moves in the veſſel with the ſame velocity that the bodies had; by this, the relative motion of the bodies and the fluid is not changed: conſequently, the actions of the bodies on the fluid, and of the fluid on the bodies, are not changed. The retardation which the liquor ſuffers in paſſing by the body, ariſes only from this; that, in that place, it is reduced to a narrower ſpace: but the capacity of the veſſel is equally diminiſhed by each body; therefore each body produces an equal retardation: and becauſe action and reaction are equal to one another, the fluid acts equally upon each body; wherefore, alſo, each body will be equally retarded, when the bodies are moved, and the fluid is at reſt.

The greateſt part of authors have eſtabliſhed it as a certain rule, that whilſt the ſame body moves in the ſame medium, it is always reſiſted in the duplicate proportion of its velocity; that is, if the reſiſted body move in one part of its track, with three times the velocity with which it moved in ſome other part, then its *reſiſtance* to the greater velocity will be nine times the *reſiſtance* to the leſſer. If the velocity in one place be four times the velocity in another, the *reſiſtance* to the greater velocity will be ſixteen times the *reſiſtance* to the leſſer, and ſo on.—This rule, though exceſſively erroneous, when taken in a general ſenſe, is yet undoubtedly very near the truth, when confined within certain limits.

In order to conceive the *resistance of fluids* to a body moving in them, it is necessary to distinguish between those fluids, which being compressed by some incumbent weight, perpetually close up the space deserted by the body in motion, without permitting, for an instant, any vacuity to remain behind it; and those fluids, in which (they being not sufficiently compressed) the space left behind the moving body remains for some time empty. These differences, in the resisting fluids, will occasion very remarkable varieties in the laws of their *resistance*, and are absolutely necessary to be considered in the determination of the action of the air on shot and shells; for the air partakes of both these affections, according to the different velocities of the projected body.

If a fluid was so constituted, that all the particles composing it were at some distance from each other, and there was no action between them, then the *resistance* of a body moving therein would be easily computed, from the quantity of motion communicated to these particles: for instance, if a cylinder moved in such a fluid in the direction of its axis, it would communicate to the particles it met with a velocity equal to its own, and in its own direction, supposing that neither the cylinder, nor the parts of the fluid were elastic; whence, if the velocity and diameter of the cylinder be known, and also the density of the fluid, there would thence be determined the quantity of motion communicated to the fluid, which (action and re-action being equal) is the same with the quantity lost by the cylinder, consequently the *resistance* would be hereby ascertained.

In this kind of discontinued fluid, the particles being detached from each other, every one of them can pursue its own motion in any direction, at least for some time, independent of the neighbouring ones; wherefore, if, instead of a cylinder, moving in the direction of its axis, a body, with a surface oblique to its direction, be supposed to move in such a fluid, the motion which the parts of the fluid will hereby acquire, will not be in the direction of the resisted body, but perpendicular to its oblique surface; whence the *resistance* to such a body will not be estimated from the whole motion communicated to the particles of the fluid, but from that part of it only, which is in the direction of the resisted body.——In fluids then, where the parts are thus discontinued from each other, the different obliquities of that surface, which goes foremost, will occasion considerable changes in the *resistance*; although the section of the solid, by a plain perpendicular to its direction, should in all cases be the same. And sir Isaac Newton has particularly determined, that, in a fluid thus constituted, the *resistance* of a globe is but half the *resistance* of a cylinder of the same diameter, moving in the direction of its axis with the same velocity.

But though the hypothesis of a fluid, thus constituted, be of great use in explaining the nature of *resistances*; yet, in reality, no such fluid does exist within our knowledge: all the fluids, with which we are conversant, are so formed, that their particles either lie contiguous to each other, or at least act on each other in the same manner as if they did; consequently, in these fluids, no one particle, contiguous to the resisted body, can be moved, without moving at the same time a great number of others, some of which will be distant from it; and the motion thus communicated to a mass of the fluid, will not be in any one determined direction, but will in each particle be different, according to the different manners in which it lies in contact with those from which it receives its impulse; whence, great numbers of the particles, being diverted into oblique directions, the *resistance* of the moving body, which will depend on the quantity of motion communicated to the fluid in its own direction, will be hereby different in quantity, from what it would be in the preceding supposition, and its estimation becomes much more complicated and operose.

If the fluid be compressed by the incumbent weight of its upper parts (as all fluids are with us, except at their very surface), and if the velocity of the moving body be much less than that with which the parts of the fluid would rush into a void space, in consequence of their compression; it is evident, that in this case the space left by the moving body will be instantaneously filled up by the fluid; and the parts of the fluid, against which the foremost part of the body presses in its motion, will, instead of being impelled forwards in the direction of the body, circulate, in some measure, towards the hinder part of the body, thereby to restore the equilibrium, which the constant influx of the fluid behind the body would otherwise destroy; whence the progressive motion of the fluid, and consequently the *resistance* of the body, which depends thereon, would be, in this instance, much less than in the hypothesis, where each particle is supposed to acquire, from the stroke of the resisting body, a velocity equal to that with which the body moved, and in the same direction. Sir Isaac Newton has determined, that the *resistance* of a cylinder, moving in the direction of its axis, in such a compressed fluid as we have here treated of, is but one fourth part of the *resistance*, which the same cylinder would undergo, if it moved with the same velocity, in a fluid, constituted in the manner described in the first hypothesis, each fluid being supposed to be of the same density.

But again, it is not only in the quantity of their *resistance* that these fluids differ, but likewise in the different manner in which they act on solids, of different forms, moving in them. In the discontinued fluid, first described, the obliquity of the foremost surface of the moving body would diminish the *resistance*; but in compressed fluids this holds not true, at least not in any considerable degree; for the principal *resistance* in compressed fluids arises from the greater or lesser facility with which the fluid, impelled by the forepart of the body, can circulate towards its hindermost part; and this being little, if at all, affected by the form of the moving body, whether it be cylindrical, conical, or spherical, it follows, that while the transverse section of the body, and consequently the quantity of impelled fluid is the same, the change of figure in the body will scarcely affect the quantity of its *resistance*.

And this case, that is, the *resistance* of a compressed fluid to a solid, moving in it with a velocity much less than what the parts of the fluid would acquire from their compression; this case has been very fully considered by sir Isaac Newton, who has ascertained the quantity of such a *resistance*, according to the different magnitudes of the moving body, and the density of the fluid. But he very expressly informs us, that the rules he has laid down are not generally true, but upon a supposition that the compression of the fluid be increased in the greater velocities of the moving body: however, some unskilful writers, who have followed him, overlooking this caution, have applied his determination to bodies moving with all kinds of velocities, without attending to the different compressions of the fluids they are resisted by; and by this means they have accounted the *resistance* of the air to musket and cannon-shot, to be but one third part of what it is found to be by experience.

Indeed it appears plain enough, that the resisting power of the medium must be increased, when the resisting body moves so fast that the fluid cannot instantaneously press in behind it, and fill the deserted space; for when this happens, the body will be deprived of the pressure of the fluid behind it; which in some measure balanced its *resistance*, and must support on its forepart the whole weight of a column of the fluid, independent of the motion it gives to the parts of the fluid; and besides, the motion in the particles driven before the body, is, in this case, less affected by the compression of the fluid, and consequently they are less deflected from the direction in which they are impelled by the resisted surface; whence this species of *resistance* approaches more and more to that described in the first hypothesis, where each particle of the fluid being unconnected with the neighbouring ones, it pursued its own motion, in its own direction, without being interrupted or deflected by their contiguity; and therefore, as the *resistance* of a discontinued fluid to a cylinder, moving in the direction of its axis, is four times greater than the *resistance* of a fluid sufficiently compressed of the same density, it follows, that the *resistance* of a fluid, when a vacuity is left behind the moving body, may be near four times greater than that of the same fluid, when no such vacuity is formed; for when a void space is thus left, the *resistance* approaches in its nature to that of a discontinued fluid.

This then may probably be the case in a cylinder moving in the same compressed fluid, according to the different degrees of its velocity; so that if it set out with a great velocity, and moves in the fluid till that velocity be much diminished, the resisting power of the medium may be near four times greater in the beginning of its motion than in the end.

In a globe the difference will not be so great, because, on account of its oblique surface, its *resistance* in a discontinued medium is but about twice as much as in one properly compressed; for its oblique surface diminishes its *resistance* in one case, and not in the other: however, as the compression of the medium, even when a vacuity is left behind the moving body, may yet confine the oblique motion of the parts of the fluid, which are driven before the body, and as in an elastic fluid (as is our air) there will be some degree of condensation in those parts; it is highly probable, that the *resistance* of a globe, moving in a compressed fluid with a very great velocity, will be between that of a globe and of a cylinder, in a discontinued medium; that is (in proportion to its velocity),

we may suppose it to be more than twice, and less than four times the *resistance* of the same globe, moving slowly through the same medium; whence, perhaps, we shall not much err in supposing the globe, in its swiftest motions to be resisted near three times more, in proportion to its velocity, than when it is slowest.

And as this increase of the resisting power of the medium will take place, when the velocity of the moving body is so great, that a perfect vacuity is left behind it, so some degree of augmentation will be sensible in velocities much short of this; for even when, by the compression of the fluid, the space left behind the body is instantaneously filled up; yet, if the velocity with which the parts of the fluid rush in behind, is not much greater than that with which the body moves, the same reasons we have urged above, in the case of an absolute vacuity, will hold in a less degree in this instance; and therefore we are not to suppose, that, in the increased *resistance*, which we have hitherto treated of, it immediately vanishes, when the compression of the fluid is just sufficient to prevent a vacuum behind the resisted body; but we must consider it as diminishing only, according as the velocity, with which the parts of the fluid follow the body, exceeds that with which the body moves.

Hence then we conclude, that if a globe sets out in a resisting medium, with a velocity much exceeding that with which the particles of the medium would rush into a void space, in consequence of their compression, so that a vacuum is necessarily left behind the globe in its motion; the *resistance* of this medium to the globe will be near three times greater, in proportion to its velocity, than what we are sure, from sir Isaac Newton, would take place in a slower motion. We may farther conclude, that the resisting power of the medium will gradually diminish as the velocity of the globe decreases, till at last, when it moves with velocities which bear but a small proportion to that with which the particles of the medium follow it, the *resistance* becomes the same with what is assigned by sir Isaac Newton in the case of a compressed fluid.

And from this determination we may learn how false that position is, which asserts the resistance of any medium to be in the duplicate proportion of the velocity of the resisted body; for it plainly appears, by what we have said, that this can only be considered as nearly true in small variations of velocity, and can never be applied in the comparing together the *resistances* to all velocities whatever, without the most enormous errors. See New Principles of Gunnery, by Mr. Robins, chap. 2. prop. 1. See Resistance *of the air*. See also Projectile and Gunnery.

Resistance and retardation are used indifferently for each other, as being both in the same proportion, and the same *resistance* always generating the same retardation. But, with regard to different bodies, the same *resistance* frequently generates different retardations; the *resistance* being the quantity of motion, and the retardation the celerity. For the difference and measure of the two, see Retardation.

The retardations from this *resistance* may be compared together, by comparing the *resistance* with the gravity. It is demonstrated, that the *resistance* of a cylinder, which moves in the direction of its axis (to which the *resistance* of a sphere of the same diameter is equal), is equal to the weight of a cylinder of that fluid through which the body moves, having its base equal to the body's base, and its height equal to half the height from which a body falling in vacuo may acquire the velocity with which the cylinder moves through the fluid.

From the given celerity of the body moved, the height of the fluid cylinder is found, as also the weight of it, from the known specific gravity of the liquid, and diameter of the body. Let a ball, for instance, of three inches diameter, be moved in water with a celerity wherewith it would go sixteen feet in a second: from experiments on falling bodies, and others made on pendulums, it has been found, that this is the celerity which a body acquires in falling from a height of four feet; therefore the weight of a cylinder of water of three inches diameter, and two feet high, that is, a weight of about six pounds and three ounces, is equal to the *resistance* of the aforesaid ball. See Descent.

Let the *resistance*, so discovered, be divided by the weight of the body which determines its quantity of matter, and you will have the retardation.

Resistance *of fluid mediums to the motion of pendulums.* The arc described by a pendulum oscillating in vacuo with the celerity it has acquired in descending, is equal to the arc described by the descent; but the same does not happen in a fluid; and there is a greater difference between those arcs, the greater the *resistance* is; that is, the greater the arc is which is described in the descent.

Let the *resistance* of the fluid be in proportion to the velocity; and let two pendulums, entirely alike, oscillating in a cycloid, perform unequal vibrations, and begin to fall the same moment; they here begin to move by forces that are as the arcs to be described. If those impressions alone, which are made the first moment, be considered; after a given time the celerities will be in the same ratio as at the beginning: for the retardations, which are as the velocities themselves, cannot change their proportions, the ratio between quantities not being changed by the addition and subtraction of quantities in the same ratio; therefore, in equal times, however, the celerities of bodies are changed in their motion by the *resistance*, the spaces gone through are as the forces in the beginning, that is, as the arcs to be described by the descent; therefore, after any times, the bodies are in the correspondent points of those arcs. But in these points the forces generated are in the same ratio as in the beginning; and the proportion of the celerities, which is not varied by the *resistance*, suffers no change from the gravity. In the ascent, gravity retards the motion of the body; but in correspondent points its actions are in the same ratio as its descents; and therefore every where, in correspondent points, the celerities are in the same ratio: but as in the same moments the bodies are in their correspondent points, it follows, that the motion of both is destroyed in the same moment; that is, they finish their vibrations in the same time. The spaces run through in the time of one vibration are as the forces by which they are run through; that is, the arcs of whole vibration are as the arcs described by the descent, the doubles whereof are the arcs to be described in vacuo. The deficiencies of the arcs to be described in fluids, from the arcs to be described in vacuo, are the differences of quantities in the same ratio, and are as the arcs described in the descent.

Resistance *of fluid mediums to the motion of falling bodies.* The *resistances* are as the squares of the celerities; and therefore every where, in correspondent points, as the squares of the arcs described by the descent; in which ratio, also, the retardations are: but as each of them retain the same proportion in corresponding points, the sums of them all will be in the same proportion; that is, the whole retardations, which are the defects of the arcs described in the fluid, from the arcs to be described in vacuo; or, which is the same, the difference between the arcs described in the descent, and the next ascent. Therefore these differences, if the vibrations are not very unequal, are nearly as the squares of the arcs described by the descent, which is also confirmed by experiments in greater vibrations; for in these the proportion of *resistance*, here considered, obtains.

A body freely descending in a fluid is accelerated by the respective gravity of the body, which continually acts upon it, yet not equally, as in a vacuum: the *resistance* of the fluid occasions a retardation, that is, a diminution of acceleration, which diminution increases with the velocity of the body. Now there is a certain velocity, which is the greatest a body can acquire by falling; for if its velocity be such, that the *resistance* arising from it becomes equal to the respective weight of the body, its motion can be no longer accelerated: for the motion here continually generated by the respective gravity, will be destroyed by the *resistance*, and the body forced to go on equably. A body continually comes nearer and nearer to this greatest celerity, but can never attain to it.

When the densities of a fluid body are given, the respective weight of the body may be known; and by knowing the diameter of the body, it may be found from what height a body falling in vacuo can acquire such a velocity as that the *resistance* in a fluid shall be equal to that respective weight, which will be that greatest velocity above mentioned. If the body be a sphere, it is known, that a sphere is equal to a cylinder of the same diameter, whose height is two third parts of that diameter; which height is to be increased in the ratio wherein the respective weight of the body exceeds the weight of the fluid, in order to have the height of a cylinder of the fluid, whose weight is equal to the respective weight of the body; but if you double this height, you will have a height from which a body falling in vacuo acquires such a velocity as generates a *resistance* equal to this respective weight, and which therefore is the greatest velocity which a body can acquire, by falling in a fluid, from an infinite height. Lead is eleven times heavier than water; wherefore its respective weight is to the weight of water, as ten to one: therefore a leaden ball, as it appears from what has been said, cannot acquire a greater velocity, in falling in water, than it would acquire in falling in vacuo, from a height of thirteen one-third of its diameters.

A body lighter than a fluid, and ascending in it by the action

action of the fluid, is moved exactly by the same laws as a heavier body falling in the fluid. Wherever you place the body, it is sustained by the fluid, and carried up with a force equal to the difference of the weight of a quantity of the fluid of the same bulk as the body, from the weight of the body; therefore you have a force that continually acts equably upon the body; by which not only the action of gravity of the body is destroyed, so as that it is not to be considered in this case: but the body is also carried upwards by a motion equably accelerated, in the same manner as a body heavier than a fluid descends by its respective gravity: but the equability of the acceleration is destroyed in the same manner by the *resistance*, in the ascent of a body lighter than the fluid, as it is destroyed in the descent of a body heavier.

When a body specifically heavier than a fluid is thrown in it, it is retarded upon a double account; on account of the gravity of the body, and on account of the *resistance* of the fluid: consequently, a body rises to a less height than it would rise to in vacuo with the same celerity. But the defects of the height in a fluid from the height to which a body would rise in vacuo with the same celerity, have a greater proportion to each other than the heights themselves: and in less heights the defects are nearly as the squares of the heights in vacuo.

RESISTANCE *of the air*, in *Pneumatics*, is the force wherewith the motion of bodies, particularly of projectiles, is retarded by the opposition of the air or atmosphere.—See GUNNERY.

The air being a fluid, the general laws of the *resistance* of fluids obtain therein; only the different degrees of density, in the different stages or regions of the atmosphere, occasion some irregularity.

As to the *resistance* of the air, it has been thus determined from experiments. Mr. Robins, in his New Principles of Gunnery, chap. 2. prop. 2, &c. having taken a musket barrel, and charging it successively with a leaden ball of three quarters of an inch diameter, and about half its weight of powder, and taking such precaution in weighing of the powder, and placing it, as to be sure, by many previous trials, that the velocity of the ball could not differ by 20 feet in 1″ from its medium quantity, fired it against a pendulum (described under GUNNERY), placed at 25 feet, at 75 feet, and at 125 feet distance from the mouth of the piece respectively. In the first case, it impinged against the pendulum with a velocity of 1670 feet in 1″; in the second case, with a velocity of 1550 feet in 1″; and in the third case, with a velocity of 1425 feet in 1″; so that in passing through 50 feet of air, the bullet lost a velocity of about 120 or 125 feet in 1″; and the time of its passing through that space being abont $\frac{1}{32}$ or $\frac{1}{30}$ of 1″, the medium quantity of *resistance* must, in these instances, have been about 120 times the weight of the ball; which, as the ball was nearly $\frac{1}{12}$ of a pound, amounts to about 10 lb. avoirdupoise.

Now if a computation be made, according to the method laid down for compressed fluids, in the 38th propos. of lib. ii. of sir Isaac Newton's Principia, supposing the weight of water to be to the weight of air as 850 to 1, it will be found that the *resistance* of a globe of three quarters of an inch diameter, moving with a velocity of about 1600 feet in 1″, will not, on those principles, amount to any more than a force of $4\frac{1}{6}$ lb. avoirdupoise; whence we may conclude (as the rules in that proposition for slow motions are very accurate), that the resisting power of the air in slow motions is less than in swift motions, in the ratio of $4\frac{1}{6}$ to 10, a proportion between that of 1 to 2, and 1 to 3.

Again, charging the same piece with equal quantities of powder, and balls of the same weight, and firing three times at the pendulum, placed at 25 feet distance from the mouth of the piece, the medium of the velocities with which the ball impinged was nearly that of 1690 feet in 1″. Then removing the piece 175 feet from the pendulum, the velocity of the ball, at a medium of five shots, was that of 1300 feet in 1″. Whence the ball, in passing through 150 feet of air, lost a velocity of about 390 feet in 1″; and the *resistance*, computed from these numbers, comes out something more than in the preceding instance, amounting to between 11 and 12 pounds avoirdupoise: whence, according to these experiments, the resisting power of the air to swift motions is greater than in slow ones, in a ratio which approaches nearer to the ratio of 3 to 1, than in the preceding experiments.

Next, to examine this *resistance* in smaller velocities, the pendulum, being placed at 25 feet distance, was fired at five times, with an equal charge each time, and the mean velocity, with which the ball impinged, was that of 1180 feet in 1″. Then removing the pendulum to the distance of 250 feet, the medium velocity of five shot, at this distance, was that of 950 feet in 1″; whence the ball, in passing through 225 feet of air, lost a velocity of 230 feet in 1″, and as it passed through that interval in about $\frac{3}{14}$ of 1″, the *resistance* to the middle velocity will come out to be near $33\frac{1}{2}$ times the gravity of the ball, or 2 lb. 10 oz. avoirdupoise. Now the *resistance* to the same velocity, according to the laws observed in slower motions, amounts to $\frac{7}{11}$ of the same quantity; whence in a velocity of 1065 feet in 1″ (the medium of 1180 and 950) the resisting power of the air is augmented in no greater proportion than that of 7 to 11; whereas in greater degrees of velocity, as before, it amounted very near to the ratio of 1 to 3.

By other experiments, it appears, that the *resistance* of the air is very sensibly increased, even in so small a velocity as that of 400 feet in 1″.

That this resisting power of the air to swift motions is very sensibly increased beyond what sir Isaac's theory for slow motions makes it, seems hence to be evident. It being, as has been said, in musket, or cannon shot, with their full charge of powder, near three times the quantity assigned by that theory.

However, this increased power of *resistance* diminishes as the velocity of the resisted body diminishes, till at length, when the motion is sufficiently abated, the actual *resistance* coincides with that supposed in the theory.

The *resistance* of a bullet of three quarters of an inch diameter, moving in air with the velocity of 1670 feet in 1″, amounting, as we said, to 10 lb. the *resistance* of a cannon ball of 24 lb. fired with 16 lb. or its full charge of powder, and thereby moving with a velocity of 1650 feet in 1″ (which scarce differs from the other), may hence be determined. For the velocity of the cannon ball being nearly the same as the musket bullet, and its surface above 54 times greater, it follows, that the *resistance* on the cannon ball will amount to more than 540 lb. which is near 23 times its own weight. And from hence it appears how rash and erroneous the opinion of those is, who neglect the consideration of the *resistance* of the air as of no importance in the doctrine of projectiles. See PROJECTILE.

Professor Euler has shewn, that the common doctrine of *resistance* answers very well when the motion is not very swift, but in very swift motions it gives the *resistance* less than it ought to be, on two accounts. 1. Because in very quick motions the air does not fill up the space behind the body fast enough to press on the hinder parts, that the *resistance* on the fore part is increased. 2. The density of the air before the ball, being increased by the quick motion, will press more strongly on the forepart, and, being heavier than in its natural state, will retard its motion.

He has shewn, that Mr. Robins has restrained his rule to velocities not exceeding 1670 feet in 1″; whereas had he extended it to greater velocities, the result must have been erroneous; as he apprehends that it is not perfectly exact, when the motion is not extremely swift. He has investigated a formula for determining the degree of this *resistance*, and deduced conclusions differing from those of Mr. Robins. See Principles of Gunnery investigated, &c. 1777. p. 224, &c.

Mr. Robins, having proved that, in very great changes of velocity, the *resistance* does not accurately follow the duplicate proportion of the velocity, lays down two positions, which may be of considerable service in the practice of artillery, till a more complete and accurate theory of *resistance*, and the changes of its augmentation, may be obtained. The first of these is, that till the velocity of the projectile surpasses that of 1100 feet in a second, the *resistance* may be esteemed to be in the duplicate proportion of the velocity: and the second is, that if the velocity be greater than that of 11 or 1200 feet in a second, the absolute quantity of the *resistance* will be near three times as great as it should be by a comparison with the smaller velocities. Upon these principles, he proceeds in approximating the actual ranges of pieces with small angles of elevation, viz. such as do not exceed 8° or 10°, which he sets down in a table, compared with their corresponding potential ranges.—See his Mathematical Tracts, vol. i. p. 179, &c.

Mr. Glenie, in his Hist. of Gunnery, 1776, p. 49, observes, in consequence of some experiments with a rifled-piece, cast at Carron, and properly fitted for experimental purposes, that the *resistance* of the air to a velocity somewhat less than that mentioned in the first of the above propositions is considerably greater than in the duplicate ratio of the velocity; and that, to a celerity somewhat greater than that stated in the second, the *resistance* is considerably less than that which is treble the *resistance* in the said ratio. Some of Mr. Robins's own experiments seem necessarily to make it so; since, to a velocity no quicker than 400 feet in a second, he found the *resistance* to be somewhat greater than in that ratio.

Resistance, *different, of the same medium to bodies of different figures.* Sir Isaac Newton shews, that if a globe and a cylinder, of equal diameters, be moved with equal velocity in a thin medium, consisting of equal particles, disposed at equal distances, according to the direction of the axis of the cylinder; the *resistance* of the globe will be less by half than that of the cylinder.

Rrsistance, *solid of the least.* From the last proposition the same author deduces the figure of a solid which shall have the least *resistance* of any containing the same quantity of matter and surface.

The figure is this. Suppose DNFG (*Tab.* VI. *Mechanics, fig.* 104.) to be such a curve, as that if from any point N be let fall a perpendicular NM, to the axis AB; and from a given point G be drawn a right line GR parallel to a tangent to the figure in N, and cut the axis, when continued, in R; MN be to GR as GR *cub.* to 4 BR × GB *q*; a solid described by the revolution of this figure about its axis AB, moving in a medium from A towards B, is less resisted than any other circular solid of the same area, &c.

This theorem, which sir Isaac Newton has given without a demonstration, has been demonstrated by several mathematicians, as Fatio, Craig, M. D'Hospital, Bernoulli, &c. See Dr. Horsley's edition of Newton, vol. ii. page 390, and Maclaurin's Fluxions, sect. 606 and 607.

Resistance *of a globe* perfectly hard, and in a medium whose particles are so too, is to the force wherewith the whole motion may either be destroyed, or generated, which it has at the time when it has described four thirds of its diameter, as the density of the medium to the density of the globe. Hence, also, sir Isaac Newton infers, that the *resistance* of a globe is, *cæteris paribus*, in a duplicate ratio of its velocity. Or its *resistance* is, *cæteris paribus*, in a duplicate ratio of its diameter; or, *cæteris paribus*, as the density of the medium. Lastly, that the actual *resistance* of a globe is in a ratio compounded of the duplicate ratio of the velocity, and of the duplicate ratio of the diameter, and of the ratio of the density of the medium.

In these articles the medium is supposed to be discontinuous, as air probably is; if the medium be continuous, as water, mercury, &c. where the globe does not strike immediately on all the particles of the fluid generating the *resistance*, but only on those next it, and those again on others, &c. the *resistance* will be less by half: and a globe in such a medium undergoes a *resistance* which is to the force wherewith the whole motion it has after describing eight thirds of its diameter, might be generated, or taken away, as the density of the medium to the density of the globe.

Resistance *of a cylinder*, moving in the direction of its axis, is not altered by any augmentation or diminution of its length; and therefore is the same with that of a circle of the same diameter, moving with the same velocity in a right line perpendicular to its plane.

The *resistance* of a cylinder, moving in an infinite unelastic fluid, arising from the magnitude of a transverse section, is to the force wherewith its whole motion, while it describes four times its length, may be taken away, or generated, as the density of the medium to that of the cylinder, very nearly.

Hence, the *resistances* of cylinders moving length-wise, in infinitely continued mediums, are in a ratio compounded of the duplicate ratio of their diameters, the duplicate ratio of their velocities, and the ratio of the density of the mediums.

The *resistance* of a globe, in an infinite unelastic medium, is to the force whereby its whole motion, while it describes eight thirds of its diameter, might be either generated, or taken away, as the density of the fluid to the density of the globe, *quam proximè*.

Mr. James Bernoulli demonstrates the following theorems, Acta Erud. Lipsf. for June 1693, p. 252, &c.

Resistance *of a triangle.* If an isosceles triangle be moved in a fluid according to the direction of a line perpendicular to its base; first, with the vertex foremost, and then with its base; the *resistances* will be in the duplicate ratio of the base, and of the sum of the legs.

Resistance, *the, of a square*, moved according to the direction of its side, is, to the *resistance* of the same square, moved with the same celerity in the direction of its diagonal, as the diagonal is to the side.

Resistance, *the, of a circular segment*, less than a semicircle, carried in a direction perpendicular to its basis, when it goes with the base foremost, and when with its vextex foremost (the same direction and celerity continuing), is as the square of the same diameter to the same, less $\frac{1}{2}$ of the square of the base of the segment. Hence, the *resistances* of a semicircle, when its base and when its vertex go foremost, are to one another in a sesquialterate ratio.

Resistance *of a parabola.* A parabola moving in the direction of its axis, first with its basis, and then its vertex, foremost, has its *resistances* as the tangent to an arc of a circle, whose diameter is equal to the parameter, and the tangent equal to half the basis of the parabola.

Resistances, *the, of an hyperbola and ellipsis*, when the vertex and base go foremost, may be thus computed.— Say, as the sum (or difference) of the transverse axis and latus rectum is to the transverse axis, so is the square of the latus rectum to the square of the diameter of a certain circle; in which circle apply a tangent, equal to half the basis of the hyperbola or ellipsis. Then say again, As the sum (or difference) of the axis and parameter is to the parameter, so is the aforesaid tangent to another right line. And farther, as the sum (or difference) of the axis and parameter is to the axis, so is the circular arc corresponding to the aforesaid tangent to another arc.— This done, the *resistances* will be as the tangent to the sum (or difference) of the right line thus found, and the arc last mentioned.

In the general, the *resistances* of any figure whatever, going now with its base foremost, and then with its vertex, are as the figures of the base to the sum of all the cubes of the elements of the base, divided by the squares of the elements of the curve line.

All which rules may be of use in the construction of ships, and in perfecting the art of navigation universally; as also for determining the figures of the balls of pendulums for clocks, &c.

Non-Resistance, in *Politics.* See Passive *obedience.*

RESOLUTION, *resolutio*, or *solutio*, in *Physics*, the reduction of a body into its original or natural state, by a dissolution or separation of its aggregated parts.

Thus snow and ice are said to be resolved into water; and a compound is resolved into its ingredients, &c. water resolves into vapour by heat; and vapour is again resolved into water by cold.

Some of the modern philosophers, particularly Mr. Boyle, M. Mariotte, Boerhaave, *&c. maintain*, that the natural state of water is to be congealed, or in ice; inasmuch as a certain degree of heat, which is a foreign and violent agent, is required to make it fluid: so that near the pole, where this foreign force is wanting, it constantly retains its fixed or icy state. On this principle, the *resolution* of ice into water, must be allowed an improper expression.

Resolution, in *Chemistry*, is the reduction of a mass, or mixed body, into its component parts, or first principles, by a proper analysis.

The *resolution* of bodies is performed variously; by distillation, sublimation, dissolution, fermentation &c. See each operation under its proper article. See also Dissolution and Solution.

Resolution, in *Ethics*, is that passion which encounters difficulties and dangers; but when it has to do more peculiarly with dangers, it is called boldness. Desire, joy, and sorrow, enter into its constitution; but joy is much the principal ingredient. When *resolution* degenerates into a concern to maintain our mistakes, humours, or vices, it is more properly denominated obstinacy. See Passions.

Resolution, in *Logic*, is a branch of method, called also analysis.

The business of *resolution* is to investigate or examine the truth or falshood of a proposition, by ascending from some particular known truth, as a principle, by a chain of consequences, to another more general one in question.

Resolution, or the analytic method, stands in direct opposition to *composition*, or the synthetic method; in which last we descend from some general known truths to a particular one in question.

For an instance of the method of *resolution*; suppose the question this: Whether, on the supposition of man's existance, we can prove that God exists?

To resolve this, our method is thus: "Mankind did not always exist. It is evident, from a thousand considerations, the species had a beginning; and that, according to all history, not six thousand years ago; but if it had a beginning, there must be some cause of its beginning; something to induce it to exist then more than it did before; in effect there must be a cause or author of its existence; for from nothing, nothing arises: this cause, whatever it is, must at least have all the faculties we find in ourselves; for none can give more than he has: nay, he must have others, which we have not, since he could do what we cannot do, i. e. create, make man exist, &c. Now, this cause either exists still, or has ceased to do so: if the former, he did not exist from eternity; for what is from eternity is necessary, and can neither by itself nor any other cause be reduced to nothing: if the latter, it must have been produced from some other; and then the same question will return upon the producer. There is

is then some first cause, and this cause has all the properties and faculties we have; nay more, has existed from eternity, &c. Therefore, from the supposition of man's existence, it follows there is a God."

Resolution, or Solution, in *Mathematics*, is an orderly enumeration of several things to be done, to obtain what is required in a problem.

Wolfius makes a problem to consist of three parts. The *proposition* (which is what we properly call the *problem*), the *resolution*, and the *demonstration*.

The general tenor of all problems is, those things being done which are injoined by the *resolution*, the thing is done which was to be done.

As soon as a problem is demonstrated, it is converted into a theorem; whereof the *resolution* is the hypothesis; and the proposition the thesis.

The process of a mathematical *resolution*, see in the following article.

Resolution, in *Algebra*, or *algebraical*, is of two kinds; the one practised in numerical problems, the other in geometrical ones.

To resolve a given numerical problem algebraically, the method is thus. 1. Distinguish the given quantities from the quantities sought; and note the former with the first letters of the alphabet, and the latter with the last.

2. Find as many equations as there are unknown quantities: if that cannot be, the problem is indeterminate; and one or more of the sought quantities may be assumed at pleasure. The equations, unless they be contained in the problem itself, are found by theorems relating to the equality of quantities.

3. Since, in an equation, the unknown quantities are mixed with the known; it must be reduced, in such manner as that only one unknown quantity be found on one side, and none but known quantities on the other. This reduction is performed by adding the subtracted quantities, dividing the multiplied quantities, and multiplying the divided ones, extracting the roots out of powers, raising roots to their powers, &c. so as that the equality may be still preserved. See Reduction *of equations*.

To resolve a geometrical problem algebraically. The process in the former article is to be observed throughout; but as it rarely happens we come at an equation in geometrical problems by the same means as in numerical ones, there are some farther things to be noted: 1st then, suppose the thing done, which was proposed to be done. 2. Examine the relations of all the lines in the diagram, without any regard to known or unknown, in order to find which depends on which; and from which being had, what others are had, whether by similar triangles, or rectangles, &c. 3. To obtain the similar triangles or rectangles, the lines are to be frequently produced, till they become either directly or indirectly equal to given ones, or intersect others, &c. Parallels and perpendiculars to be frequently drawn: points to be frequently connected: and angles to be made equal to others. If thus you do not arrive at a neat equation, examine the relation of the lines in another manner. Sometimes it is not enough to seek the thing directly, but another thing must be sought, whence the first may be found.

The equation being reduced, the geometrical construction is to be deduced therefrom, which is done in various manners in the various kinds of equations.

Resolution, *problematical*. See Problematical.

Resolution, in *Medicine*, that coction, or alteration of the crude, peccant matter of any disease, either by the natural strength of the patient, or of its own accord, or by the application of remedies; whereby its bulk, figure, cohesion, &c. are so far changed, as that it ceases to be morbid, and becomes laudable.

This, the learned Boerhaave observes, is of all others the most perfect cure, where it is effected without any evacuation; as supposing the matter favourable, the constitution excellent, and the medicines good. See Inflammation.

Resolution *of motion*. See Motion.

Resolution, in *Music*, is when a canon or perpetual fugue is not written all on the same line, or in one part; but all the voices that are to follow the guida, or first voice, are written separately, either in score, i. e. in separate lines, or separate parts, with the pauses each is to observe, in the beginning, and in the tone proper to each.

RESONANCE, Resounding, in *Music*, &c. a sound returned by the air inclosed in the bodies of stringed-musical instruments; as lutes, &c. or even in the bodies of wind instruments, as flutes, &c.

Elliptic and parabolic vaults resound strongly, i. e. they strongly reflect or return the sound. See Echo.

The mouth, and the parts thereof, as the palate, tongue, teeth, nose, and lips, Mons. Dodart observes, contribute nothing to the tone of the voice; but their effect is very great as to the *resonance*.

Of this we have a very sensible instance in that vulgar instrument called *Jews-harp*, or *trompe de Bearn*: for if you hold it in your hand, and strike the tongue or spring thereof, which yields all the sound of the instrument, it scarce makes any noise at all; but, holding the body of the instrument between the teeth, and striking the spring as before, it makes a musical buzz, which is heard to a good distance, and especially in the lower notes.

So also in the hautboys, the tone of the reed is always the same; being a sort of drone: the chief variety is in the tone of the *resonance*, produced in the mouth by the greater or less aperture, and the divers motions of the lips.

RESOLVENTS, *resolventia*, in *Medicine*, remedies proper to resolve and dissipate tumors and gatherings, to soften indurations, and, by their tenuity and warmth, evacuate redundant or peccant humours through the pores.

Under this class come various unguents, emplasters, &c.

RESORT. See Ressort.

RESPECTU *computi vicecomitis habendo*, a writ for the respiting a sheriff's accompt, upon just occasion, directed to the treasurer and barons of the exchequer.

RESPECTUANDO *homagio*. See Homagio.

RESPIRATION, *respiratio*, the act of respiring, or breathing the air.

Respiration is an involuntary motion of the breast, whereby the air is alternately taken in and thrown out: it therefore includes two contrary motions, the one called *inspiration*, whereby the fluid is received into the cavity of the lungs; the other, *expiration*, whereby it is again expelled.

The principal organs of *respiration* are the lungs, trachea, larynx, &c. the descriptions whereof see under Larynx, Lungs, and Trachea.

For the manner whereby Respiration *is performed*. It is to be observed, that the lungs, when suspended in the open air, by the contractive power of the muscular fibres, which tie together the squamous parts of the bronchia, are reduced to less space than they possessed while in the cavity of the thorax: and when thus contracted, if a quantity of new air be injected through the glottis, they again become distended, so as to possess an equal, nay a greater space, than that assigned them in the thorax.

Hence it appears, that the lungs, by their proper force, are always endeavouring to contract themselves into less compass than they possess when inclosed in the thorax; and that therefore they are always in a state of violent dilatation while the man lives. For the air that encompasses them in the thorax, shut up between their external membrane and the pleura, is not of equal density with common air.

In effect, the ingress of the air, through the glottis, into the lungs, is always free, but that on the outside, wherewith they are compressed, is impeded by the diaphragm, so as it cannot enter the thorax in quantity sufficient to make an equilibrium.

Since, then, in inspiration, the air enters the lungs in greater quantity than it was before, it will dilate them more, and will overcome their natural force. The lungs therefore are wholly passive in the matter: what it is that acts must be learnt from the phenomena.

1. Then, it is observed that in inspiration, the nine upper ribs articulated to the vertebræ and the sternum, rise archwise towards the clavicles; and the three lower are turned downwards; and the eighth, ninth, and tenth, are drawn inwards.

2. That the abdomen is dilated. And,

3. The thorax inlarged.

4. The diaphragm is brought from its convex and sinuous position to a flat figure.

Now, as these are the only visible actions in inspiration, the cause of the operation must be referred to them, or rather to the muscles of these parts, which are the intercostals, the subclavian, &c.

The capacity of the thorax being inlarged by the action of these muscles on the ribs, &c. a space is left between the pleura and the surface of the lungs; so that the air, entering the glottis, inflates them till such time as they become contiguous to the pleura and diaphragm. In this case, now, the air presses the lungs as much as the thorax resists them. And hence the lungs become at rest; the blood passes less freely, and is forced in less quantity into the left ventricle of the heart; and so less comes into the cerebellum, and its nerves; and the arterial blood acts less on the intercostal muscles and diaphragm. The causes, therefore, which at first dilated the thorax, grow weaker; consequently, the ribs become depressed; the distended fibres of the muscles of the abdomen restore themselves; the viscera thrust the diaphragm up again into the thorax; the space whereof being thus contracted, the air is driven out of the lungs; and thus is

expiration performed. Immediately the blood, being quickened in its motion, begins to flow ſtronger, and more plentifully to the cerebellum and muſcles; and thus the cauſes of the contraction of the intercoſtals and diaphragm being renewed, inſpiration is repeated. Such is the true, immediate, adequate manner of vital *reſpiration.*

The alternate motion of the thorax and lungs in *reſpiration* is evident, but it is not eaſy to determine the mechaniſm by which theſe motions are performed.

Dr. Martine thinks this has not been accounted for in a ſatisfactory manner, either by Swammerdam, Borelli, Bellini, Pitcairn, or Boerhaave, and has given us an eſſay on this ſubject in the Medic. Eſſ. Edin. vol. i. art. 12.

According to Swammerdam, thoſe muſcles, which are not exactly balanced by equally ſtrong antagoniſts, muſt neceſſarily be contracted and relaxed by turns; as in the motions of the ventricles and auricles of the heart, of the reſpiratory muſcles, of the antagoniſts of wounded or paralytic muſcles, &c. But he does not attempt to explain the mechaniſm of the alternate contracting and relaxation of the muſcles in ſuch motions.

Borelli accounts for *reſpiration* by merely obſerving, that, after it is once begun, the animal, from the good it feels by it, is neceſſarily determined to continue the ſame all its life afterwards; but by what natural mechaniſm this operation is performed, he does not inform us.

Bellini's account is equally vague, who ſays, that, when the muſcles of the breaſt are once contracted, the animal muſt neceſſarily continue to reſpire, as theſe muſcles will be alternately contracted and relaxed.

Dr. Pitcairn tells us, that muſcles without antagoniſts, ſuch as he conceives the inſpiratory muſcles to be, muſt neceſſarily be contracted and relaxed alternately; on account of the alternate influx of the animal ſpirits through the nerves into them, proceeding from the alternate compreſſion of the brain, by the pulſation of its arteries. On this ſuppoſition it ſhould ſeem, that the alternate dilatation and contraction of the thorax ſhould always correſpond, and be iſochronous to the pulſes of the heart and arteries, which is contrary to fact.

Dr. Boerhaave's explication of the alternate motions of *reſpiration* occurs in the preceding part of this article.

To this Dr. Martine objects, not only the diſſonance of the motion of the heart and thorax juſt mentioned, but that it will be difficult to perſuade us, that the diaphragm and intercoſtal muſcles ceaſe to contract for want of a ſufficient ſtore of blood furniſhed to the left ventricle of the heart, and for want of ſpirits furniſhed to the cerebellum and the vital nerves. Would not, upon the ſame account, all the other muſcles, whether voluntary or involuntary, and the brain itſelf, and all the nerves of ſenſe and motion, alternately ſuffer ſome failure at the end of every inſpiration, from the diminiſhed quantity of blood ſupplied to the left ventricle, and thence to the reſt of the body? Is not the beating of the heart and arteries, equally full, ſtrong, and frequent at all the different moments of *reſpiration?* Which plainly ſhews, that, in a ſound ſtate, the heart never wants blood, nor the cerebellum ſpirits to furniſh the organs that depend upon them; ſo that the inſpiratory muſcles, which are ſuppoſed to be much ſtronger than their antagoniſts, would always remain rigid and contracted, if there were not ſome other way provided to ſuſpend alternately the cauſe of their contraction.

According to Dr. Martine, the nerves of the diaphragm, which is allowed to be the chief organ of *reſpiration*, are in a great degree ſubſervient to this operation. Theſe nerves have their chief origin from the middle cervical nerves, and are conveyed by a long courſe, through the cavity of the breaſt, to this muſcular membrane. The preſſure of the external air on the pulmonary veſicles, and on the membrane inveſting the lungs, and incloſing theſe veſicles, is thus propagated (he ſays) to the membrane lining the thorax, called the pleura. But at the end of expiration, when the thorax is collapſed, it will be eaſy to conceive, by conſidering the natural contractility of the membranes and fibres of animals, and the reticulated work of muſcular fibres ſurrounding the lungs, how the contractile pulmonary membranes and fibres will, by their reaction, in ſome meaſure, ſupport the action or preſſure of the inflating air, which, therefore, cannot preſs with its whole force upon the pleura, nor on the phrenic nerves, that are ſlightly covered by it; hence the preſſure of the air on theſe nerves muſt be leſs than upon the other parts of the body, to which it has freer acceſs, at the end of expiration; and, therefore, the liquor of the nerves, or whatever influence is communicated by them, has an eaſier paſſage to the midriff, cauſing that muſcle immediately to contract itſelf; and thus by the enlargement of the thorax, inſpiration commences, and will continue till the thorax has acquired its ordinary enlargement, by the natural and ordinary depreſſion of the diaphragm. But the inſpired air, rarefied by heat, and not finding a free exit, by the narrow ſlit of the glottis, will every way preſs the veſicles of the lungs, and this preſſure will be at length propagated to the pleura and phrenic nerves: on this account their influence muſt ceaſe, and the diaphragm be relaxed; and expiration muſt ſucceed by the ſpontaneous reſtitution of the overſtretched peritoneum and abdominal muſcles, compreſſing their contained viſcera; and puſhing the midriff into the thorax, and thus ſqueezing the lungs. Thus does Dr. Martine endeavour to account for ſucceſſive inſpiration and expiration, as they depend on the alternate dilatation and compreſſion of the lungs, and theſe again on the alternate contraction and relaxation of the midriff.

Dr. Hoadley, in his lectures on *reſpiration*, endeavours to prove, that the external intercoſtal muſcles ſerve for inſpiration, while the internal intercoſtals are their antagoniſts, depreſſing their ribs in expiration. He thinks it proved by Dr. Hales's experiments, that there is air in the cavity of the thorax, between the lungs and the pleura, and endeavours to take off the force of Dr. Houſton's aſſerting that he ſaw the lungs and pleura contiguous. He grants, however, that ſometimes there may be little or no air. He accounts for *reſpiration* much in the ſame way with thoſe who aſſume the contiguity of the lungs and pleura. He joins with thoſe who think the impetus, which the internal ſurface of the lungs ſuſtains in common *reſpiration*, to be very little. He ſubjoins the picture and deſcription of an ingenious inſtrument for illuſtrating the manner in which *reſpiration* is performed.

As to the uſes and effects of *reſpiration*, they are greatly diſputed among anatomiſts. Hippocrates reckoned air among the aliments of the body; but the ancients more generally believed, that, as there was a kind of vital fire kept up in the heart, the heat of the blood was tempered in the lungs. To this purpoſe Galen ſuppoſed, that the chief uſe of this organ was to carry off ſuch vapours, as were equivalent to ſmoke thrown off from that fire; and Carteſius alſo maintains, that air was neceſſary for cooling and condenſing the blood.

Other authors, as Sylvius, Etmuller, &c. take a great uſe of *reſpiration* to be, by the neighbourhood of the cold nitrous air, to cool the blood, coming reeking hot out of the right ventricle of the heart, through the lungs, and to act as a refrigeratory.

Mayow, and others, aſſert one grand uſe of expiration to be, to throw off the fuliginous vapours of the blood along with the expelled air; and for inſpiration, he aſſerts, that it conveys a nitro-aerial ferment to the blood; to which the animal ſpirits, and all muſcular motion, are owing.

The learned Boerhaave takes the principal uſes of *reſpiration* to be the farther preparation of the chyle, its more accurate mixture with the blood, and its converſion into a nutritious juice, proper to repair the decays of body.

Borelli takes the great uſe of *reſpiration* to be the admiſſion and mixture of air with the blood in the lungs, in order to form thoſe elaſtic globules it conſiſts of; to give it its red florid colour, and to prepare it for many of the uſes of the œconomy. Some ſuppoſe that the effect of the admiſſion of this air into the blood is a fermentation; others ſuppoſe, that it acts by its ſpring, preventing the too cloſe contact of the globules, and thereby preſerving its fluidity, inteſtine motion, and heat.—Van Helmont aſcribed the volatility of the fixed elements in the food to this air; and Stevenſon thought, that the air, which had circulated in the blood, and which had too much heated the blood, was exhaled by the lungs. Others again ſay, that a vital ſpirit is ſeparated from the air, and paſſes from the lungs to the heart and arteries, and at length becomes the animal ſpirits, which are by this means generated from the air.

Malpighius ſuppoſes this vital principle to be a ſaline vapour; Liſter, a hot, inflammable, ſulphureous ſpirit; Vieuſſens, a volatile ſalt, which keeps up the fermentation of the blood; and Bryan Robinſon, the aerial acid, which preſerves the blood from putrefaction, maintains its denſity, and ſtrengthens the animal fibres. They who ſuppoſe that nitre is taken from the air into the blood, aſcribe to that principle its fermentation, heat and denſity.

Dr. Thurſton maintains the principle uſe of *reſpiration* to be to move or paſs the blood from the right to the left ventricle of the heart, and ſo to effect the circulation. Whence it is, that perſons hanged, drowned, or ſtrangled, ſo ſuddenly die; viz. becauſe the circulation of the blood is ſtopped; and for the ſame reaſon it is, that animals die ſo ſpeedily in the air pump.

He inſtances an experiment, made by Dr. Croon, before the

the Royal Society, who, after strangling a pullet, so as not the least sign of life appeared, yet by blowing into the lungs through the trachea, and so setting the lungs a-playing, brought the bird to life again. Another experiment of the same kind is, that of Dr. Hook, who, after hanging a dog, cut away the ribs, diaphragm, and pericardium, as also the top of the windpipe, that he might tie it on to the nose of a pair of bellows; and thus, by blowing into the lungs, he restored the dog to life; and then ceasing to blow, the dog would soon fall into dying fits, but recover again by blowing, and thus alternately, as long as he pleased.

This use of *respiration* Dr. Drake not only confirms, but carries farther, making it the true cause of the diastole of the heart; which neither Borelli, Dr. Lower, or Mr. Cowper had well accounted for.

The weight of the incumbent atmosphere, he shews to be the true antagonist to all the muscles, serving both for ordinary inspiration, and the contraction of the heart. As in the elevation of the ribs, that author observes, the blood, by the passage opened for it, is, in a manner, solicited into the lungs; so in the depression thereof, by the subsidence of the lungs, and the contraction of the blood-vessels consequent thereon, the blood is forcibly driven through the pulmonary vein into the left ventricle of the heart; and this, together with the general compression of the body by the weight of the atmosphere, is that power which causes the blood to mount in the veins, after the force impressed on it by the heart is spent; and which forces the heart itself from its natural state of contraction, to that of dilatation.

The uses of *respiration*, according to Dr. Hoadley, are to discharge from the venal blood and chyle such parts as are unfit to render them arterial blood, and to admit air into the blood. And from this doctrine he accounts for the phenomena of the diseases of the lungs.

It is a received opinion, that one use of the lungs is to attenuate the blood; and Malpighius adds, that, by this means, the different particles of the blood become thoroughly mixed together; while others think that the blood is condensed in the lungs; and others, that the globules, and all the finer humours, receive their configuration there. Some, without considering the air as of any other use than to put the lungs in motion, think, that heat is produced in the lungs by the attrition of the blood in passing through them; to which also they have erroneously ascribed the red colour of the blood.

Dr. Whytt thought, that there was something of a vital and stimulating nature derived from the air into the blood, by means of which it made the heart to contract.

Dr. Hales seems at different times to have adopted different opinions concerning the use of air in *respiration*. He supposes, that air is rendered alkaline by breathing, and corrected, in some measure, by the fumes of vinegar. In agreement, as he observes, with Boerhaave, he elsewhere says, that the blood acquires its warmth chiefly in the lungs, where it moves with much greater rapidity than in any other capillary vessels of the body; but that one use of the air is to cool the blood, and he makes an estimate of the degree of this refrigeration. He also supposes, that another great use of the lungs is to attenuate and separate the globules of the blood; he adds, that the blood may probably, in the lungs, derive some other important influence from the air, which is in such great quantities inspired into them, exploding, however, in other places, the doctrine of a vivifying spirit in the air.

One great design of nature, he says, in the structure of this important and wonderful viscus was to frame the vessels so very minute, as effectually to hinder the ingress of gross, feculent particles, which might be injurious to the animal œconomy. Lastly, he concludes that the effect of *respiration* is to abate, and in part destroy the elasticity of the air. Hales's Statical Essays, vol. ii. passim.

Haller, after reciting the opinions of all that had gone before him, supposes, with Dr. Hales, that in consequence of the air losing its spring in the lungs, they cannot be kept dilated; and, therefore, they must collapse, and the circulation of the blood be impeded. In stating his opinion, concerning the use of the lungs, more fully, he observes, that the true use of them is partly inhaling, and partly exhaling; that the lungs inhale both water and air; but that in the lungs the air loses its elastic property, so as to be easily soluble in water or vapour; and he thinks it probable, that this air serves as a cement to bind the earthy parts together. He also makes no doubt but that various other matters, miscible with water, are inhaled by the lungs, and he thinks it not improbable, that the air may carry some electric virtue along with it. The principal exhalation of the lungs he, thinks, to be water, abounding with oily, volatile, and saline principles; and these oily and fetid vapours he thinks to be the *fuligines* of Galen and the ancients. Haller's System of Physiology, vol. iii. passim.

M. Cigna, of Turin, takes it for granted, that air, which has been once breathed, is unfit for farther *respiration*, on no other account than its being loaded with noxious vapours, which discover themselves by a fetid smell: and that the elasticity of air is diminished by *respiration*, though he does not consider that diminution of elasticity as the cause of its noxious quality. He, therefore, concludes, that air, which has been breathed, suffocates by means of the irritation which it occasions to the lungs, by which the bronchia and the lungs themselves are contracted, so as to resist the entrance of the air; and, therefore, that respired air is noxious on the same account as mephitic vapours, or those of burning brimstone; that, in frequently breathing the same air, it becomes so loaded with these vapours, as to excite a convulsion in the lungs, and thereby render them unfit for transmitting the blood. He supposes that air enters the pores of the blood, retaining its elastic power; and that it continues at rest there, because its endeavour to escape is counteracted by the equal pressure of the ambient medium. This air, he supposes, to be introduced into the blood by chyle, and never by the way of the lungs, except when, by some means or other, the equilibrium, between the air and the blood, and the external air, is lost. If the external air be rarer than the internal, the air in the blood, expanding itself, will inflate the animal, and have the same effect as air introduced into the veins. To the contact of air with the blood he ascribes its florid colour; an hypothesis which has since been satisfactorily ascertained and established by the experiments of Dr. Priestley. See *Analysis of the* Blood.

Upon the whole, M. Cigna concludes, that the principal use of air to the blood is to preserve the equilibrium with the external air, and to prevent the vessels from being rendered unfit to transmit the blood, on account of the external pressure; whereas, by means of the air they contain, the fluids move in their proper vessels as freely as in *vacuo*, and the membranes and viscera also easily slide over one another. And with respect to the use of the lungs, since he imagined that air is not introduced into the blood by means of them, he thinks, that because such lungs as those of man are given to the warmer animals only, the chief use of *respiration* is exhalation, and consequently the cooling of the blood. Miscel. Taurin. vol. v. p. 30, &c.

Such are the various and discordant opinions, that have prevailed, with respect to the use of *respiration*. It is evident, that without breathing most animals would presently die; and it is also well known, that the same air will not long answer the purpose; for if it has been frequently respired, the breathing of it is as fatal as the total deprivation of air. But by what property it is, that air contributes to the support of animal life, and why air that has been much breathed will no more answer the purpose, seems not to have been discovered by any of the numerous philosophers and physicians who have professedly written upon the subject. For this curious and important discovery we are indebted to the penetrating genius and indefatigable application of Dr. Priestley, who, in pursuing his successful researches into the properties of different kinds of air, had occasion repeatedly to observe, that *respiration* is a phlogistic process, affecting air in the same manner as every other phlogistic process (*viz.* putrefaction, the effervescence of iron filings and brimstone, or the calcination of metals, &c.) affects it; diminishing the quantity of it in a certain proportion, lessening its specific gravity, and rendering it unfit for *respiration* or inflammation, but leaving it in a state capable of being restored to a tolerable degree of purity, by agitation in water, &c. See Air, Air *fixable*, Air *phlogisticated*, &c.

Having discovered this, he concluded, that the use of the lungs is to carry off a putrid effluvium, or to discharge that phlogiston, which had been taken into the system with the aliment, and was become, as it were, effete; the air that is respired serving as a menstruum for that purpose. This general conclusion he afterwards more directly demonstrated in a series of experiments, by which he proved, that this process was effected by means of the blood, in consequence of its coming so nearly into contact with the air in the lungs; the blood appearing to be a fluid wonderfully formed for imbibing and parting with that principle which the chemists call phlogiston, and changing its colour in consequence of being charged with it, or being freed from it; and affecting air in the very same manner, both out of the body and in the lungs; and even notwithstanding the interposition of various substances, which prevent its coming into immediate contact with the air. Philos.

RES

Philoſ. Tranſ. vol. lxvi. pt. i. p. 226, &c. or Obſ. and Exp. on Air, vol. iii. p. 55, &c. See Blood.

The reciprocal dilatation and contraction of the ſuperficial dimenſions of the body conſequent on *reſpiration*, are ſo neceſſary to animal life, that there is no animal ſo imperfect as to want it.

Though moſt kinds of fiſh and inſects want both lungs, and moveable ribs, and conſequently have no dilatable thorax; yet that want is made up to them by an analogous mechaniſm.

Fiſh, for inſtance, have gills, which do the office of lungs; receiving and expelling alternately the water, whereby the blood-veſſels ſuffer the ſame alteration of dimenſions as they do in the lungs of more perfect animals.

Inſects having no thorax, or ſeparate cavity, for the heart and lungs, or air-veſſels, have the latter diſtributed through the whole trunk of their bodies; by which they communicate with the external air through ſeveral ſpiracles, or vent-holes, to which are faſtened ſo many little tracheæ, or wind-pipes, which ſend their branches to all the muſcles and viſcera, and ſeem to accompany the blood-veſſels all over the body, as they do in the lungs only of the more perfect animals. By this diſpoſition, in every inſpiration, the whole body of theſe little animals is inflated, and in every expiration compreſſed; and, conſequently, the blood-veſſels muſt ſuffer a viciſſitude of extenſion and compreſſion.

The only animal exempted from the neceſſity of breathing is a Foetus; but this, while included in the womb, ſeems to have little more than a vegetative life, and ought ſcarce to be reckoned among the number of animals: it is rather a graft on, or a branch of, the mother.

Respiration, *the laws of*, are of the laſt importance to a right underſtanding of the animal œconomy; for which reaſon a computation of the force of the reſpiring organs, and of the ſtreſs and preſſure of the air upon the ſame, may not be unacceptable. It may therefore be obſerved, that, by blowing into a bladder, a conſiderable weight will be raiſed by the mere force of the breath; for, with a bladder that is oblong, nearly of a cylindrical figure, and tied at both ends, if a pipe be fixed at one end, and a weight at the other, and the pipe faſtened at ſuch a diſtance from the ground, as juſt allows the weight to reſt upon the ground, the bladder, by an eaſy inſpiration, will raiſe ſeven pounds weight, and by the greateſt inſpiration of a pretty ſtrong man, twenty-eight pounds weight. Now, the force by which the air enters this pipe is that force by which it is driven out of the lungs; if therefore the force by which the air enters the pipe can be determined, we ſhall have the force by which the air is driven into the trachea. But the preſſure of air upon the bladder is equal to twice the weight it can raiſe; becauſe the upper part of the bladder being fixed, it reſiſts the force of the air juſt as much as the weight at the other end. And again, ſince the air preſſes every way equally, the whole preſſure will be to that part of it which preſſes on the orifice of the pipe, as the whole ſurface of the bladder is to the orifice of the pipe; that is, as the ſurface of a cylinder, whoſe diameter, for inſtance, is four inches, and axis ſeven, is to the orifice of the pipe.

Thus, if the diameter of the pipe be 0.28, and its orifice 0.616, the ſurface of the cylinder will be 88. Therefore, as 88 : 0.616 :: 14, double the leaſt weight raiſed, to 0.098, which is almoſt two ounces; and, in raiſing the greateſt weight, it is near ſeven ounces.

Theſe, therefore, are the forces by which the air is driven through the trachea in an eaſy and ſtrong inſpiration.— Now, if we conſider the lungs as a bladder, and the larynx as a pipe, the preſſure upon the orifice of the trachea, when the air is driven out, will be to the preſſure upon the lungs as the whole ſurface of the lungs is to the orifice of the trachea.

Suppoſe, e. g. the diameter of the larynx to be 5, the orifice of the larynx will be 0.19; and ſuppoſe the two lobes of the lungs to be two bladders, or ſpheres, whoſe diameters are each ſix inches; their ſurfaces are each 113 inches, and the preſſure on the larynx will be to the preſſure upon the whole external ſurface as 0.19 to 226, which is as 1 to 1189; and, therefore, if the preſſure upon the larynx in an ordinary breathing be two ounces, the preſſure upon the whole external ſurface of the lungs will be 148 pounds; and the utmoſt force, when the preſſure upon the larynx is ſeven ounces, will be equal to 520 pounds. But the lungs are not like an empty bladder, where the air preſſes only upon the ſurface; for they are full of veſicles, upon the ſurface of each of which the air preſſes, as it would upon the ſurface of an empty bladder: and, therefore, to know the whole preſſure of the air, we muſt determine the internal ſurfaces of the lungs.

To do this, ſuppoſe that $\frac{1}{3}$ part of the lungs is taken up with the branches of the trachea, that another third part is filled with blood-veſſels, and the remainder to be veſicles, where we ſuppoſe the chief preſſure upon the blood-veſſels to be made: now both lobes of the lungs contain 226 ſolid inches, of which one-third, or 75 inches, is full of veſicles. Let the diameter of each veſicle be $\frac{1}{30}$ part of an inch, the ſurface of a veſicle will be .001256, and the ſolidity .0000043, by which ſum if we divide 75 (the ſpace filled by the veſicles) the quotient gives us 17441860 for the number of veſicles in both lobes of the lungs. This number multiplied by .001256, the ſurface of a veſicle, gives the ſum of the ſurfaces of all the veſicles, to wit, 21906.976 inches. And, therefore, the preſſure upon the larynx will be to the preſſure upon the whole ſurface of the lungs, as 0.19 to 21906.976; and conſequently when in an ordinary expiration the preſſure upon the larynx is two ounces, the preſſure on the whole internal ſurfaces of the lungs will be 14412 pounds weight; and the utmoſt force of the air in breathing, when the preſſure upon the larynx is ſeven ounces, will be 50443 pounds weight.— Though theſe ſeem to be prodigious weights, yet it muſt ſtill be underſtood, that the preſſure upon each part of the ſurface of the lungs equal to the orifice of the larynx, is not greater than it is at the larynx; and that theſe vaſt weights ariſe from the vaſt extent of the ſurfaces of the veſicles, upon which it was neceſſary that the blood ſhould be ſpread in the ſmalleſt capillary veſſels, that each globule of blood might, as it were, immediately receive the whole force and energy of the air, and by that be broken into ſmaller parts, fit for ſecretion and circulation.

And hence we may learn the mechanical reaſon of the ſtructure of the lungs; for, ſince the whole blood of the body was to paſs through them, in order to receive the effect of the air, and that this could not be unleſs the blood were diffuſed in ſmall capillary veſſels, it was neceſſary, that the ſurfaces upon which they were to be ſpread, ſhould be proportioned to their number: which is admirably well provided for by the wonderful fabric of the lungs.

If the gravity of the air was always the ſame, and if the diameter of the trachea, and the time of every expiration, were equal in all, this weight upon the lungs would be always the ſame. But, ſince we find by the barometer, that there is three inches difference between the greateſt and the leaſt gravity of the air, which is a tenth part of its greateſt gravity; there muſt be, likewiſe, the difference of a tenth part of its preſſure upon the lungs at one time and another: for the momenta of all bodies, moved with the ſame velocity, are as their gravities.

This is a difference which ſuch as are aſthmatic muſt be very ſenſible of; eſpecially if we conſider, that they likewiſe breathe thicker, that is, that every expiration is performed in leſs time; if in half the time, and the ſame quantity of air be drawn in, then the weight of the air upon the lungs muſt be 57648 pounds; of which a tenth part is 5764 pounds; and conſequently aſthmatic people, upon the greateſt riſe or fall of the barometer, feel a difference of the air, equal to above one-third of its preſſure in ordinary breathing.

Again, if the trachea be ſmall, and its aperture narrow, the preſſure of the air increaſes in the ſame proportion as if the times of expiration were ſhorter; and therefore a ſhrill voice is always reckoned among the prognoſtic ſigns of a conſumption, inaſmuch as that proceeds from the narrowneſs of the larynx, or trachea; and conſequently increaſes the preſſure of the air upon the lungs, which, upon every expiration, beats the veſſels ſo thin, that at laſt they break, and a ſpitting of blood comes on.

The eſtimate of the capacity and dimenſions of the human lungs above given is calculated by Dr. James Keill (ſee his Tentamina Medico-phyſica, p. 80, &c.); but Dr. Hales apprehends them to be much more capacious than 226 cubic inches; for he calculated the ſurface of the whole lungs of a calf, and found it to be 41635 ſquare inches, or 289 ſquare feet, which is equal to nineteen times the ſurface of a man's body, which, at a medium, is computed to be equal to fifteen ſquare feet. And Dr. Jurin, by an accurate experiment, found, that he breathed out, at one large expiration, 220 cubic inches of air, with which his own experiments agreed: and there muſt be a large allowance made for the bulk of the remaining air, which could not be expired from the lungs, and alſo for the ſubſtance of the lungs. Suppoſing then, that according to Dr. Jurin's eſtimate (in Motte's Abridgement of the Phil. Tranſ. vol i. p. 415.) we draw in, at each common inſpiration, 40 cubic inches of air; that will be 48000 cubic inches in an hour, at the rate of 20 inſpirations in a minute. Dr. Hales made

made ſeveral experiments, with a view of determining the effect of *reſpiration* on air; and, in one of theſe, he found that near two gallons of air, being breathed to and fro for two minutes and a half, became thereby unfit for reſpiration. Dr. Prieſtley (Experiments and Obſ. vol. v. p. 117.) by a more accurate method of inveſtigation found, that the quantity of air, which he could completely phlogiſticate by the reſpiration of two minutes, amounted to about a quart in a minute; whereas it is generally ſuppoſed, that we phlogiſticate, or as it has uſually been termed, that we conſume a gallon of air in a minute: and if by conſuming be meant reducing the air to a ſtate in which a candle will not burn in it, the eſtimate will be pretty near the truth.

With regard to the quantity of moiſture carried off by *reſpiration*, Dr. Hales, by an experiment on wood-aſhes, eſtimates it to be equal to 17 grains in 50 expirations; and this he takes to be nearly the quantity of moiſture with which 522 cubic inches of air are impregnated, when it becomes unfit for *reſpiration*; ſince we breathe 50 times in $2\frac{1}{2}$ minutes. And ſince a quantity of moiſture, equal to 17 grains, was breathed off in 50 expirations, he concludes, that there will be proportionably 408 grains evaporated in the 1200 expirations of an hour, and in 24 hours 9792 grains, or 1.39 pound; which, ſuppoſing the ſurface of the lungs to be 41635 inches, will give the quantity evaporated from that ſurface $\frac{1}{1074}$ part of an inch depth. Hales's Stat. Eſſ. vol. i. p. 262, &c. vol. ii. p. 322, &c.

RESPITE, *reſpectus*, in *Law*, &c. a delay, forbearance, or prolongation of time, granted any one for the payment of a debt, or the like.

Menage derives the word *reſpite* from the Latin *reſpectus*; as *deſpite* from *deſpectus*. Du-Cange will rather have it come from *reſpirare, to breathe*; *reſpite* being, in effect, a breathing-while, granted a debtor, &c.

In the cuſtomary of Normandy, *reſpite* is a judicial delay or demur, given to procedures.

RESPITE, *letters of*, or CREDIT. See LETTERS.

RESPITE *of homage* is a forbearance of the homage due from the vaſſal, or tenant, holding by homage, or by knight-ſervice, to his lord.

Anciently, thoſe who held by theſe tenures paid a ſmall ſum every fifth year into the exchequer, to be reſpited doing their homage or ſervice.

By ſtat. 12 Car. II. this *reſpite* of homage is taken away, as a charge ariſing from knight-ſervice; which is thereby likewiſe annulled.

RESPITE *of execution*. See REPRIEVE.

RESPITE *of jury*. See JURY.

RESPOND, in *Eccleſiaſtical Hiſtory*, was a ſhort anthem ſung after reading three or four verſes of a chapter: after which they proceeded with the chapter.

RESPONDEAS *ouſter*, in *Law*, is to anſwer over in an action to the merits of the cauſe: or put in a more ſubſtantial plea.

RESPONDEAT *ſuperior*, a *Law* phraſe. Where the ſheriffs are removeable, as in London, for inſufficiency; *reſpondeat ſuperior*, that is, the mayor and commonalty are to anſwer for them.

For the inſufficiency of a bailiff of a franchiſe, *reſpondeat ſuperior*, that is, the lord of the franchiſe is to anſwer.

RESPONDENT, *reſpondens*, in the ſchools, a perſon who maintains a theſis in any art or ſcience.

He is thus called, as being to anſwer all objections propoſed by the opponent, or impugner, &c.

The *reſpondent*'s buſineſs is to ſee whether the oppoſition made by the contrary party be juſt and legitimate; or whether ſome of the laws and conditions of oppoſition be not broken; which is called *ignoratio elenchi*. He is alſo to examine the moods and figures of the ſyllogiſms, to ſee whether the premiſes be juſt, &c. and through the whole to anſwer rather by diſtinguo's, than by direct negation.

RESPONDENT, formed from the Latin *reſpondere, to anſwer*, q. d. *pro alio ſpondere, to promiſe for another*, in *Law*, a perſon who undertakes to anſwer for another; or binds himſelf as ſecurity for the good behaviour of another.

The *reſpondent* is to anſwer for the damages done by the perſon for whom he reſponds. There are four ordonnances of the kings of France, whereby the citizens are expreſly forbid to take ſervants without *reſpondents*, bound in writing.

RESPONDENTIA, in *Commerce*, a term applied to money, which is borrowed, not upon the veſſel, as in BOTTOMRY, but upon the goods and merchandize contained in it, which muſt neceſſarily be ſold or exchanged, in the courſe of a voyage; in which caſe the borrower, perſonally, is bound to anſwer the contract; and he is ſaid to take up money at *reſpondentia*.

It is enacted, by ſtat. 19 Geo. II. cap. 37, that all monies, lent on bottomry, or *reſpondentia*, on veſſels bound to or from the Eaſt Indies, ſhall be expreſly lent only upon the ſhip, or upon the merchandize; that the lender ſhall have the benefit of ſalvage; and that, if the borrower has not on board effects to the value of the ſum borrowed, he ſhall be reſponſible to the lender for ſo much of the principal as hath not been laid out, with legal intereſt and all other charges, though the ſhip and merchandize be totally loſt.

RESPONSA *prudentum*. See CIVIL *law*.

RESPONSALIS, in *Law*, he who appears for another in court, at a day aſſigned.

Fleta makes this difference between *reſponſalis atturnatus*, and *eſſoniator*, that the *eſſoniator* came only to allege the cauſe of the party's abſence, be he demandant or tenant; whereas *reſponſalis* came for the tenant not only to excuſe his abſence, but to ſignify what trial he means to undergo, the combat, or the country.

RESPONSARY *ſong*, an anthem in which the choriſters ſing by turns.

RESPONSE, RESPONSAL, *reſponſatio*, an anſwer, reply, or repartee.

The word is chiefly uſed in ſpeaking of the anſwers made to the prieſt, by the people, in the litany, the pſalms, and other parts of the office.

It has its uſe, too, in ſpeaking of the opinions or anſwers of the ancient juriſconſulti, when conſulted on points of law.

The fifty books of the *Digeſt* are compoſed of *reſponſa prudentum*, the *reſponſes* of Papinian, Ulpian, Scævola, &c. collected by Juſtinian; who afterwards gave them the force of laws. See CIVIL *law*.

The *reſponſes* of the emperors were more properly called *reſcripts*.

RESPONSIONS, *reſponſiones*, a term uſed in the *Military Orders*, for certain penſions, or charges, which the knights, or the commandries they held, paid to the order.

Such a knight Templar paid a *reſponſion* of fifty pounds per annum to his order, on account of ſuch a COMMANDRY.

In Rot. parl. 9 Ric. II. the word is written *reſponcies*.

RESSAULT, in *Architecture*, the effect of a body which either projects, or falls back, i. e. ſtands either more out or in than another; ſo as to be out of the line, or range, therewith.

The term *reſſault* is French, and but little uſed in Engliſh; though the want of a word of equal import pleads for its naturalization.

RESSELA, a term uſed by Paracelſus to ſignify, as himſelf explains it, any thing that expels heat, in oppoſition to *aſſa*, which with him ſignifies any thing that promotes it.

RESSORT, or RESORT, a term purely French, yet frequently uſed, by our late writers, to ſignify the juriſdiction or authority of a court.

The word, in its popular meaning, ſignifies *ſpring*, or the force of elaſticity. Hence it is alſo uſed for a juriſdiction, and the extent or diſtrict thereof; as when we ſay, ſuch a thing belongs to his *reſſort*; a judge out of his *reſſort* has no authority. But its chief uſe among us is in ſpeaking of a court or tribunal, where appeals are judged; or of a court or perſon who judges finally and ultimately, and whence there is no appeal.

The houſe of lords judge in the laſt *reſſort*, *en dernier reſſort*. Preſidials judge in the laſt *reſſort* of all criminals proſecuted by the provoſts of the marſhals. See DERNIER *reſſort*.

RESSORT, or RESORT, is alſo uſed in a writ of ayel, or couſenage, in the ſame ſenſe as *deſcent*, in a writ of right.

RESSOURCE, or RESOURCE, a term purely French, yet uſed by Engliſh writers, to denote a means or foundation of a man's recovering himſelf from his fall or ruin; or an after-game for the repairing his damages.

Skinner derives the word from the French *reſoudre, to reſolve*. A *reſource* ſtrictly and literally expreſſes a means which preſents itſelf afreſh.

This merchant has credit and friends ſtill left; he has great *reſources*.

REST, *quies*, in *Phyſics*, the continuance of a body in the ſame place; or its continual application or contiguity to the ſame parts of the ambient and contiguous bodies.— See SPACE.

Reſt is either *abſolute* or *relative*, as PLACE is.

Some define *reſt* the ſtate of a thing without motion; and hence again *reſt* becomes either abſolute or relative, as motion is.

Sir Iſaac Newton defines true or abſolute *reſt*, to be the continuance of a body in the ſame part of abſolute and immoveable ſpace; and relative reſt to be the continuance of a body in the ſame part of relative ſpace.

Thus,

Thus, in a ſhip under ſail, relative *reſt* is the continuance of a body in the ſame region of the ſhip, or the ſame part of its cavity. True or abſolute *reſt* is its continuance in the ſame part of univerſal ſpace, wherein the ſhip, with its cavity and contents, are all contained.

Hence, if the earth be really and abſolutely at *reſt*, the body relatively at reſt in the ſhip will really and abſolutely move, and that with the velocity wherewith the veſſel moves. But if the earth do likewiſe move, there will then ariſe a real and abſolute motion of the body at *reſt*; partly from the real motion of the earth in abſolute ſpace, and partly from the relative motion of the ſhip on the ſea. Laſtly, if the body be likewiſe relatively moved in the ſhip, its real motion will ariſe partly from the real motion of the earth in immoveable ſpace, and partly from the relative motion of the ſhip on the ſea, and of the body in the ſhip.

Thus, if that part of the earth, where the ſhip is, move eaſtward with a velocity of 10010 parts, and the veſſel be carried by the wind weſtward ten parts, and, at the ſame time, a ſeaman aboard walk with the velocity of one part, the ſeaman will be moved really and abſolutely in immoveable ſpace eaſtwards, with 10001 parts of velocity; and relatively on the earth, with nine parts of velocity weſtwards.

It is an axiom in philoſophy, that matter is indifferent as to *reſt* or motion. Hence Sir Iſaac Newton lays it down, as a *law* of NATURE, that every body perſeveres in its ſtate, either of *reſt* or uniform motion, except ſo far as it is diſturbed by external cauſes.

The Carteſians will have firmneſs, hardneſs, or ſolidity of bodies to conſiſt in this, that their parts are at *reſt* with regard to each other; and this *reſt* they eſtabliſh as the great nexus, or principle of coheſion, whereby the parts are connected together.

Fluidity, they add, conſiſts in a perpetual motion of the parts, &c. But the Newtonian philoſophy furniſhes us with much better ſolutions. See SOLIDITY, FLUIDITY, and COHESION.

Monſieur de Maupertuis aſſerts that when bodies are in equilibrio, they muſt be ſo ſituated, that, if any ſmall motion be impreſſed on them, the quantity of action reſulting will be the leaſt poſſible. This he calls the law of *reſt*, and from this law he deduces the fundamental propoſition of ſtatics. See Mem. de l'Acad. de Berlin, tom. ii. p. 294.

Monſieur de Maupertuis deduces the laws of percuſſion from the ſame principle. See *Quantity of* ACTION.

REST, *repoſe*, or *pauſe*, in *Poetry*, is uſed for the CÆSURA, which, in Alexandrine verſes, falls on the ſixth ſyllable; and, in verſes of ten or eleven ſyllables, on the fourth.

The *reſt* ſhould never fall on a monoſyllable, whereon the voice may not dwell: it is called *reſt*, becauſe the ear and the pronunciation have both a repoſe, or reſpite.

REST, in *Muſic*, is a pauſe, or interval of time, during which there is an intermiſſion of the voice, or ſound.

Reſts are ſometimes uſed in melody, that is, in muſic of a ſingle part, to expreſs ſome ſimple paſſion, or even for variety-ſake; but more frequently in harmony, or compoſitions of ſeveral parts, for the ſake of the pleaſure of hearing one part move on while another *reſts*, and this interchangeably.

Reſts are either for a whole bar, or more than a bar, or but for a part of a bar. When the *reſt* is for a part it is expreſſed by certain ſigns, correſponding to the quantity of certain notes of time; as minim, crotchet, &c. and is accordingly called *minim-reſt*, *crotchet-reſt*, &c.

The characters or figures whereof, ſee under CHARACTERS *of muſic*, where the notes and correſponding *reſts* are found together.

When any one of thoſe characters occurs either on a line or ſpace, that part is always ſilent for the time of a minim, or crotchet, &c. Sometimes a *reſt* is for a crotchet and quaver together, or for other quantities of time for which there is no particular note; in which caſe the ſigns of ſilence are not *reſts*, but ſuch ſilence is expreſſed by placing together as many *reſts*, of different time, as make up the deſigned *reſt*. When the *reſt* is for a whole bar, the ſemibreve *reſt* is always uſed. If the *reſt* be for two meaſures, it is marked by a line drawn acroſs a whole ſpace. For three meaſures it is drawn acroſs a ſpace and an half, and, for four meaſures, acroſs two ſpaces. But, to prevent ambiguity, the number of bars is uſually written over the ſign.

Some of the more ancient writers in muſic make theſe *reſts* of different value in different ſpecies of time. *E. gr.* the character of a *minim-reſt*, in common time, ſay they, expreſſes the *reſt* of three crotchets in triple time; in that of the triples $\frac{6}{8}$, $\frac{6}{16}$, $\frac{12}{8}$, $\frac{12}{16}$, it always marks a half-meaſure, how different ſoever theſe may be among themſelves.

They add, that the *reſt* of a crotchet in common time is a *reſt* of three quavers in the triple $\frac{9}{8}$, and that the *quaver-reſt* of common time is equal to three ſemiquavers in the triple $\frac{9}{16}$. But this variety in the uſe of the ſame character is now laid aſide. Malcolm's Treat. of Muſic, p. 409, &c.

REST *Harrow*, *ononis*, in *Botany*, a genus of the *diadelphia decandria* claſs. Its characters are theſe: the empalement of the flower is cut into five narrow ſegments, the upper being a little raiſed and arched, the lower bending under the keel; the flower is of the butterfly kind. The ſtandard is heart-ſhaped, and larger than the wings; the wings are oval and ſhort; the keel is pointed and longer than the wings. It hath ten ſtamina joined together, and an oblong hairy germen, ſupporting a ſingle ſtyle, crowned by an obtuſe ſtigma. The germen afterwards becomes a turgid pod with one cell, incloſing kidney-ſhaped ſeeds. Miller. There are nineteen ſpecies.

The common ſort of *reſt-harrow* is a weed frequent in moſt parts of England, ſo is rarely admitted into gardens. It has a ſtrong creeping root, which ſpreads far in the ground, and is with great difficulty eradicated; the ſtalks riſe a foot and a half high; they are ſlender, reddiſh, and hairy, ſending out ſmall branches on their ſides, which are armed with ſharp prickles. The flowers come out ſingly from the ſide of the branches, they are of the butterfly kind, of a purple colour, which are ſucceeded by ſmall pods, containing one or two kidney-ſhaped ſeeds. It flowers great part of ſummer, and the ſeeds ripen in the autumn. The root of this is one of the five opening roots; the cortical part of it is eſteemed a good medicine for ſtoppage of urine, and to open obſtructions of the liver and ſpleen; for this purpoſe it is ſometimes given in powder, in doſes of a dram, and made an ingredient in apozems or decoctions, as an aperient and diuretic. Its virtue is extracted both by water and ſpirit. There is a variety of this with white flowers. Miller and Lewis.

RESTAUR, RESTOR, in *ancient Cuſtoms*, the remedy, or recourſe, which aſſurers have againſt each other, according to the date of their aſſurances; or againſt the maſters, if the average ariſe through their default; as through ill loading, want of caulking, or want of having the veſſel tight.

The word is alſo uſed for the remedy, or recourſe, a perſon has againſt his guarantee, or other perſon, who is to indemnify him from any damage ſuſtained. Hence *reſtaurant*, and *reſtauration*. In the lower Latin they alſo uſe the words *reſtor*, and *reſtaur*.

RESTAURATION, *reſtauratio*, RESTORATION, the act of re-eſtabliſhing, or ſettling a thing in its former good eſtate.

Thus we ſay, the *reſtauration* of a minor to the poſſeſſion of his effects, alienated in the time of his minority. In the French laws it is an ancient formula, uſed for the *reſtoring* a perſon to his good name, after he has been wrongfully accuſed and condemned.

In England we ſay *the* RESTAURATION, by way of eminence, for the return of king Charles II. in 1660, after the civil wars.

The 29th of May is an anniverſary feſtival, appointed to be held in commemoration of the *reſtauration* of regal and epiſcopal government, by ſtat. 12 C. II. c. 14.

We ſhall here obſerve, that the form of prayer for the 29th of May, as well as for the 30th of January, were of a different complexion in the reign of king Charles II. from the preſent, of which the reaſon is ſaid to be this: the parliament, and other leading men, who were active in his *reſtoration*, and who had been concerned in oppoſing his father's meaſures, would not be called traitors; and required that a diſtinction ſhould be made between the commencement of the war and the concluſion of it; they would not ſuffer the firſt oppoſition made to the meaſures of that unhappy prince to be ſtyled rebellion, though they diſapproved of the abolition of regal government which enſued. And accordingly the offices for theſe two ſolemnities were drawn up, without any reflection on the firſt authors or promoters of the oppoſition, and, in general, breathe more a ſpirit of piety than of party, of humiliation than of revenge; and, throughout, are modeſt, grave, decent, ſenſible, and devout. King James II. altered theſe forms, and king William did not venture to reduce them to their primitive ſtate; and ſo they have continued, with very little variation, to this day.

RESTAURATION, in *Architecture*, the act of repairing all the parts of a building gone to decay, either through the courſe of time, or other injuries; in ſuch manner, as that it is not only re-eſtabliſhed in its firſt form, but conſiderably augmented.

It is evident, from the plinths of the Corinthian columns

of the Pantheon (which are almoſt wholly under ground), that the pavement of this temple is only a *reſtauration* made in the time of Septimius Severus. Daviler.

The temple of Concord, behind the Capitol at Rome, having been burnt long after it was built, and having angular baſes different from the reſt, ſeems to have been *reſtored* from the ruins of ſeveral ancient buildings.

RESTAURATION, in *Sculpture*, is the repairing of a mutilated ſtatue, &c. See REPAIRING.

Moſt of the antique ſtatues have undergone a *reſtauration*; as the Farneſe Hercules, the Faunus in the Villa Borgheſe at Rome, the Wreſtlers in the gallery of the great-duke of Florence, the Venus of Arles, in the gallery at Verſailles. But theſe *reſtaurations* have all been made by the ableſt ſculptors. Daviler.

RESTINCTION, *reſtinctio*, in *Chemiſtry*, the quenching of a metal or mineral in ſome liquor, in order either to correct or to exalt it; by giving it ſome new quality, power, &c.

RESTIO, in *Botany*, a genus of the *dioecia triandria* claſs: its characters are, that it hath male and female flowers; the calyx of the male is an ovated ſpike, imbricated with membranaceous, ovated, ſingle-flowered ſcales; and the corolla has ſix oblong, almoſt equal, membranaceous, permanent petals, ſhorter than the ſcales of the calyx; the ſtamina are three capillary filaments, and the antheræ are oblong and erect; the calyx and corolla of the female flowers are like thoſe of the male; the piſtil is a roundiſh germen, formed into ſix flowers; the ſtyles, which are three, are awl-ſhaped, erect, and permanent; the ſtigmata are filiform and withering; the pericarpium is a roundiſh, ſexplicate capſule, with three cells, containing ſeveral obtuſe ſeeds.

RESTITUTION, *reſtitutio*, in *Phyſics*, the returning of elaſtic bodies forcibly bent to their natural ſtate, by ſome called the *motion of reſtitution*. See ELASTICITY.

Contraction being the proper and natural action of muſcular fibres, ſome authors aſcribe dilatation to a motion of *reſtitution*; but the expreſſion, as well as the idea, is very faulty.

RESTITUTION, in the moral and legal ſenſe, is the act of reſtoring a perſon to his right, or of returning ſomething unjuſtly taken or detained from him.

Reſtitution is reducible to commutative juſtice; and till it be made, the caſuiſts determine the party all the while guilty of theft.

The illegal incumbents of benefices are condemned to a *reſtitution* of the fruits of the benefices. In the Romiſh church, uſurers, &c. are obliged to a *reſtitution* of their ill-gotten goods; otherwiſe the prieſt has no authority to give them abſolution.

RESTITUTION of *ſtolen goods*, in *Law*, is allowed to the proſecutor, on a conviction of larceny, by ſtat. 21 Hen. VIII. c. 11. For, by the common law, there was no *reſtitution* of goods upon an indictment, becauſe it is at the ſuit of the king only; and therefore the party was forced to bring an appeal of robbery, in order to have his goods again. But it being conſidered that the party, proſecuting the offender by indictment, deſerves as much encouragement as he who proſecutes by appeal, this ſtatute was made, which enacts, that if any perſon be convicted of larceny by the evidence of the party robbed, he ſhall have full *reſtitution* of his money, goods, and chattels, or the value of them out of the offender's goods, if he has any, by a writ to be granted to the juſtices. And this writ of *reſtitution* ſhall reach the goods ſo ſtolen, notwithſtanding the property of them is endeavoured to be altered by ſale in market overt; or elſe, without ſuch writ of *reſtitution*, the party may peaceably retake his goods, wherever he happens to find them, unleſs a new property be fairly acquired therein; or, laſtly, if the felon be convicted and pardoned, or be allowed his clergy, the party robbed may bring his action of trover againſt him for his goods, and recover a ſatisfaction in damages: but ſuch action lies not before proſecution, for ſo felonies would be made up and healed. See RECAPTION.

RESTITUTION *in integrum*, is uſed for what is otherwiſe called *reſciſſion*.

Religious obtain *reſtitution* againſt their vows, i. e. they are freed from their obligation, when they proteſt againſt them within five years of their profeſſion.

In the hiſtory of Germany for the XVIIth century, the firſt day of January, 1624, is called the *term of reſtitution*; becauſe by the peace of Munſter, then concluded, the Lutheran and Calviniſt princes were obliged to *reſtitute*, or reſtore what they had taken from the Roman catholic churches in their territories till that day.

By the peace of Weſtphalia in 1648, the *reſtitution*-edict was abrogated, and both the contending parties confirmed in the perpetual and uninterrupted poſſeſſion of whatever they had occupied in the beginning of the year 1624. And all the articles agreed upon by this peace were confirmed and ratified, in the year 1650, at Nuremberg.

RESTITUTIONS *of medals*, or RESTITUTED *medals*, is a phraſe uſed by antiquaries, for ſuch medals as were ſtruck by the emperors, to renew or retrieve the memory of their predeceſſors.

Hence it is that, in ſeveral medals we find the letters REST. Claudius was the firſt who began this practice, by ſtriking afreſh ſeveral medals of Auguſtus. Nero did the ſame; and Titus, after the example of his father, ſtruck *reſtitutions* of moſt of his predeceſſors. Some, however, have maintained that the *reſtituted* medals of Claudius and Nero are modern and ſpurious, and that the practice began under Titus.

Gallienus ſtruck a general *reſtitution* of moſt of the preceding emperors in two medals, the one bearing an altar, the other an eagle, without the REST. F. Joubert chooſes rather to call them *converſations* than *reſtitutions*, as being done quite anew. Theſe were deſigned to preſerve the remembrance of the conſecration of thoſe emperors in honour of whom they were ſtruck, and they have all the ſame legend on the reverſe, viz. CONSECRATIO.

RESTITUTIONE *extracti ab eccleſia*, a writ anciently granted for the reſtoring a man to the church, or ſanctuary, from which he had been forced away.

RESTITUTIONE *temporalium*, a writ which lies where a man is elected and confirmed biſhop of a dioceſe; for the recovery of the temporalities, or barony, of the ſaid biſhoprick.

It is directed from the king to the eſcheator, or rather ſheriff of the county.

RESTIVE, or RESTY, a term applied to a horſe, &c. that ſtops, or runs back, inſtead of advancing forwards.

In the manege, a *reſtive* horſe is a rebellious, refractory, ill-broken horſe, which only goes where it will, and when it will. The word is formed from the Latin *reſtivus*; which ſignifies the ſame thing. See RAMINGUE.

A horſe of this ſort, who has been too much conſtrained and tyrannized over, ſhould be treated with the ſame lenity as a young colt. The ſpurs are improper to be uſed to either: inſtead of which a ſwitch ſhould be uſed, in order to drive him forward, as he will be thus leſs alarmed; becauſe the ſpurs ſurpriſe a horſe, abate his courage, and are more likely to make him *reſtive*, than oblige him to go forward if he refuſes to do ſo. There is likewiſe another method to puniſh a *reſtive* horſe, which is to make him go backward the moment he begins to reſiſt. Theſe corrections generally ſucceed; but the general rule is to puſh and carry your horſe forward, whenever he refuſes to advance, and continues in the ſame place, and defends himſelf either by turning or flinging his croupe on one ſide or the other; and, for this purpoſe, nothing is ſo efficacious as to puſh him forward vigorouſly. Berenger's Horſemanſhip, vol. ii. p. 29, &c.

RESTOR. See RESTAUR.

RESTORATION. See RESTAURATION.

RESTORATIVE, in *Medicine*, a remedy proper for the reſtoring and retrieving ſtrength and vigour.

Reſtoratives belong to the claſs of balſamics; and are otherwiſe called ANALEPTICS.

The medicines that come under this denomination are of an emollient, ſoftening nature, but nutritive withal; and are rather adminiſtered to repair the waſtes of the conſtitution, than to alter and rectify its diſorders.

Such are the leaves of white and black maidenhair, rocket, eruca, ſcabious, colts-foot, bohea-tea, chich-peas, hops, chocolate, piſtachia-nuts, balſam of Tolu, bdelium, benzoin, ſtorax, eryngo, iris, ſatyrion, &c.

RESTRAINING *ſtatute*. See REMEDIAL.

RESTRAINING *ſtatute* of *leaſes*. See LEASES by *ſtatute*.

RESTRAINT is when an action is hindered, or ſtopped, contrary to volition, or the preference of the mind.

RESTRICTION, the act of modifying, limiting, or reſtraining a thing to narrower bounds.

General laws always bear ſome *reſtriction*. In contracts it is uſual to have *reſtrictive clauſes*, which bind the covenants down to certain bounds.

RESTRICTION, *mental*. See RESERVATION.

RESTRICTION, among *Logicians*, is underſtood of the limiting a term, ſo as to make it ſignify leſs than it uſually does.

In which ſenſe the name philoſopher is *reſtrained* to Ariſtotle; Great, to Alexander; City, to Rome, &c.

RESTRICTIVE *propoſition*. See PROPOSITION.

RESTRICTIVE *ſuture*. See SUTURE.

RESTRINGENT, in *Medicine*. See ASTRINGENT.

RESTY. See RESTIVE.

RESULT, what is gathered from a conference, an inquiry, meditation, diſcourſe, or the like; or the concluſion and effect thereof.

The

The usual *result* of disputes, Mr. Bayle observes, is, that each person remains more attached to his own opinion.

RESULTING *use*, in *Law*. See Use.

RESUMMONS, *resummonitio*, a second summons or calling a man to answer an action where the first summons is defeated, or suspended, by an accident; as the death of a party, &c.

RESUMPTION, *resumptio*, in a *Law*-sense, signifies the taking again into the king's hands such lands or tenements as before, upon false suggestions, or other error, he had delivered to the heir, or granted, by letters patent, to any man.

Resumption, in the *Schools*, a summary repetition, or running over, of an argument, or of the substance thereof, in order to refute it.

Resumption is also used by *Logicians* for the reduction of some figurative or quaint proposition, to a more intelligible and significant one.

RESUMPTIVE, in *Pharmacy*, an epithet given to a kind of unguent, used to recruit and restore arid languishing constitutions, and to dispose the dry body to receive nourishment. It is called in Latin *unguentum resumptivum*.

RESURRECTION, *resurrectio*, Resuscitation, the act of returning to a new, or second life, after having been dead.

The great argument for the truth of Christianity, and that urged with the most force and conviction for the same, is drawn from the *resurrection* of our Saviour. The circumstances thereof are such as almost admit of a demonstration; which has accordingly been attempted on the strict principles of geometricians. See Ditton on the *Resurrection*.

Many Christians believe the *resurrection* of the same identical body, the very same flesh and bones, at the day of judgment. The two principal philosophical objections against it are these:

1. That the same piece of matter, or substance, may happen to be a part of two or more bodies: thus a fish feeding on a man, and another man afterwards feeding on the fish, part of the body of the first man becomes first incorporated with the fish, and afterwards, in the fish, with the last man. Again, instances have been known of one man's feeding immediately on another; and, among the cannibals of the West Indies, the practice is frequent.

Now, where the substance of one is thus converted into the substance of another, each cannot arise with his whole body; and to which shall the common part be allotted?

To this objection some answer, that, as all matter is not fit, or disposed, to be assimilated to the body, and incorporated with it, human flesh may very probably be of this kind; and, therefore, what is thus eaten, may be again excreted, and carried off. But Mr. Leibnitz's answer seems the more solid. All that is essential to the body, he urges, is the original stamen which existed in the semen of the father; nay, and on the footing of the modern theory of generation, which existed in the semen of the first man. This we may conceive as the most minute speck, or point, imaginable; and therefore not to be separated, or torn asunder, and any part of it united with the stamen of any other man. All this bulk we see in the body, is only an accretion to this original stamen; an addition of foreign matter, of new juices, to the primary, solid stamen. There is, therefore, no reciprocation of the proper matter of the human body.

The second objection is this: the human body, we know, by the late discoveries in the animal œconomy, is continually changing; a man has not entirely the same body to-day as he had yesterday; and it is even computed, that, in less than seven years time, his whole body undergoes a change, and not a particle of the same body remains. Which of those many bodies, then, which the same person has in the course of his life, is it that shall rise? or does all the matter that has ever belonged to him rise again? or does only some particular system thereof? The body, e. gr. he had at twenty, at thirty, or at sixty years old? If only this or that body arise, how shall it be rewarded or punished for what was done in the other? with what justice does one person suffer, &c. for another?

To this it may be answered, on Mr. Locke's principles, that personal identity, or the sameness of a rational being, consists in self-consciousness; in the power of considering itself the same thing in different times and places. By this every one is to himself what he calls *self*; without considering whether that self be continued in the same or diverse substances. So far reaches the identity of that person. It is the same self now it was then; and it was by the same self which now reflects on an action, that action was performed.

Now, it is this personal identity that is the object of rewards and punishments, which we have observed may exist in different successions of matter; so that to render the rewards and punishments just and pertinent, nothing needs but that we rise again with such a body as that we retain the consciousness of our past actions.

RESUSCITATION. See Resurrection, and Revivification.

Resuscitation *of plants*, in *Chemistry*, the art of reproducing a plant from its ashes. See Palingenesia.

Many have pretended to this art, and have shewn *resuscitated* plants in vials; but all these seem only particular instances of artificial chemical vegetations, of which many others may be given. The external appearances of these resemble plants, and the ignorant may easily take them for such; but, when closely considered, there is a great difference to be found. See *artificial* Vegetation.

RETAIL, in *Commerce*, &c. the buying of goods in the great, or by wholesale, and selling them out again in small parcels.—*Qui rem integram ementes, per minutiores eam partes distrahebant.*

To RETAIN, spoken of mares, signifies *to hold*, i. e. to conceive after covering.

RETAINER, in *Law*, a servant not menial or domestic, that is, not continually dwelling in the house of his lord or master, but only wearing his livery, and attending on special occasions.

This livery was anciently given by a great man, and frequently for the maintenance of quarrels; whence it was justly prohibited by several statutes; as under Richard II. on pain of imprisonment, and grievous forfeiture to the king.

It was farther prohibited by other statutes of the succeeding kings, whereby the delinquents were subjected to make ransom at the king's pleasure; and knights and esquires hereof duly attainted were to lose their said liveries, and forfeit their fees for ever.

Edward IV. added a special penalty of five pounds per month on every man that gave such livery, and as much on every person so *retained*, either by writing, word, or oath. But most of these statutes are repealed by a statute 3 Car. I.

Retainer of *debts*, in *Law*, a remedy which the law gives to an executor or administrator for his debt, by allowing him to retain so much as will pay himself, before any other creditors whose debts are of equal degree. See Debt. The debts of co-executors shall be discharged in proportion. An executor of his own wrong shall not, in any case, be permitted to retain.

RETAINING-*fee* is the first fee given in any cause to a serjeant or counsellor at law, whereby to make him sure, that he shall not be on the contrary side.

RETALIATION, *retaliatio*, the act of returning like for like. See Talionis *lex*.

RETARDATION, *retardatio*, in *Physics*, the act of *retarding*; that is, of delaying the motion or progress of a body, or of diminishing its velocity.

The *retardation* of moving bodies arises from two great causes, the *resistance of the medium*, and the *force of gravity*.

The Retardation *from the resistance* is frequently confounded with the resistance itself; because, with respect to the same moving body, they are in the same proportion.

With respect to different bodies, however, the same resistance often generates different *retardations*. For if bodies of equal bulk, but different densities, be moved through the same fluid with equal velocity, the fluid will act equally on each; so that they will have equal resistances, but different *retardations*: and the *retardations* will be to each other as the velocities which might be generated by the same forces in the bodies proposed; that is, they are inversely as the quantities of matter in the bodies, or inversely as the densities.

Suppose, then, bodies of equal density, but of unequal bulk, to move equally fast through the same fluid, their resistances increase according to their superficies; that is, as the squares of their diameters. But the quantities of matter are increased in proportion to the cubes of the diameters: the resistances are the quantities of motion; the *retardations* are the celerities arising from them; and dividing the quantities of motion by the quantities of matter, you will have the celerities; therefore the *retardations* are directly as the squares of the diameters, and inversely as the cubes of the diameters; that is, inversely as the diameters themselves.

If the bodies be equal, move equally swift, and are of the same density, but moved through different fluids, their *retardations* are as the densities of those fluids.

And when bodies equally dense, and of bulk equal, are carried through the same fluid with different velocities, the *retardations* are as the squares of the velocities.

The RETARDATION *from gravity* is peculiar to bodies projected upwards. A body thrown upwards is *retarded* after the same manner as a falling body is accelerated; only, in the one case, the force of gravity conspires with the motion acquired; and in the other, it acts contrary to it.

As the force of gravity is uniform, the *retardation* from that cause will be equal in equal times.

Hence, as it is the same force which generates motion in the falling, and diminishes it in the rising body, a body rises till it has lost all its motion; which it does in the same time wherein a body falling would have acquired a velocity equal to that wherewith the body was thrown up.

Thus, also, a body thrown up, will rise to the same height from which falling it would acquire the velocity wherewith it is thrown up; therefore the heights which bodies thrown up with different velocities can rise to, are to each other as the squares of the velocities.

Hence, the *retardations* of motions may be compared together: for they are, first, as the squares of the velocities; secondly, as the densities of the fluids through which the bodies are moved; thirdly, inversely, as the diameters of those bodies; lastly, inversely, as the densities of the bodies themselves.

The numbers in the ratio compounded of those ratios, express the proportion of the *retardations*; multiplying the square of the velocity by the density of the fluid, and dividing the product by the product of the diameter of the body multiplied into its density; and working thus for several motions, the quotients of the divisions will have the same compound ratio to one another.

RETARDATION *of motion, Laws of.* 1. If the motion of a body be uniformly *retarded*, that is, if its celerity be diminished equally in equal times, the space it passes over is one half of that it would pass over in the same time by an uniform motion.

2. The spaces described in equal times by an uniformly *retarded* motion, decrease according to the uneven numbers 9, 7, 5, 3, &c. See ACCELERATION and MOTION.

RETCH, or RETCHES, a name given by our farmers to an iron, or a pair of irons, which in the common plow serve to fasten the sheat to the beam. The *retches* are fastened to the sheat with nails, and to the beam with pins.

RETCHING, or REACHING, the effort or endeavour to vomit. See NAUSEA.

RETE *mirabile*, in *Anatomy*, a small plexus or net-work of vessels in the brain, surrounding the pituitary gland.

The *rete mirabile* is very conspicuous in brutes; but it is either not existent in man, or is so very minute, that its existence has been doubted.

Willis will have it to consist of arteries, veins, and nerves; Vieussens, of arteries only; and others, of arteries, and small veins.

Vieussens asserts, with many other anatomists, that there is no *rete mirabile* in man, in the horse, dog, &c. but that it is found in the calf, sheep, goat, &c.

It was observed and described by Galen, who, upon finding it in some brutes, concluded it to be likewise in man; but all we see like it in man is, that on the sides of the pituitary gland, where its place should be, the carotid arteries make a double flexure in form of ∽, before they penetrate the dura mater.

The use of the *rete mirabile* Galen takes to be for concocting and elaborating the animal spirits: as that of the epididymides is for elaborating the seed.

Dr. Willis thinks, with more probability, it may serve to bridle the two rapid incursions of the blood into the brain of those creatures, whose head hangs down much; to separate some of the superfluous serous parts of the blood, and send them to the salival glands, as the blood enters the brain; and to obviate obstructions which may happen in the arteries.

RETE *mucosum*. See SCROTUM.

RETE *peny*, in *Ancient Records*, a customary due of one penny for every person to the parish priest.

RETEINER, or RETAINER. See RETAINER.

RETENEGI, in the *Materia Medica*, a name used by Avicenna, and others, to express the common resin of the pine, or fir-tree, and sometimes common black pitch. The lexicographers have given us *storax* as the explanation of *retenegi*, but this is not warranted by any passage in the authors who use the word. It is certain, indeed, that the generality of authors have confounded the several sorts of resin and pitch-making trees together, and among them the pine, fir, cedar, and turpentine trees, are called by the same name, but the storax-tree is never included among the number. These were only confounded together, because of the similitude of the things they produced; but the storax was too different from all these, and too precious a gum not to be distinguished.

RETENTA, a word used by the medical writers to express things retained in the body, or which are not to be retained in a state of good health.

RETENTIO, *retinentia*, in our law-books, is sometimes used to signify RETINUE.

RETENTION, *retentio*, a faculty of the human mind, whereby, in order to a farther progress in knowledge, it keeps or *retains* those simple ideas, which it before received by sensation or reflection.

This is done two ways. First, by keeping the idea which is brought into the mind for some time actually in view. This is called CONTEMPLATION.

Secondly, by reviving those ideas in our minds, which have disappeared and have been, as it were, laid out of sight. This is MEMORY, which is, as it were, the repository of our ideas.

RETENTION is also used, in *Medicine*, &c. for the state of contraction in the solids, or vascular parts of the body, which makes them hold fast their proper contents.

In this sense, *retention* stands opposed to *evacuation* and *excretion*.

Retention and excretion make two of the non-naturals.

RETENTION is also frequently considered as a disorder, and defined the act of retaining the excrements, humours, &c. so as they cannot be voided out of the body. See INFANT.

It is the *retention* of peccant humours which causes such a disease. A *retention* of urine is very painful and dangerous. See SUPPRESSION of *urine*.

RETIARII, in *Antiquity*, a kind of gladiators, thus denominated from a net which they made use of against their antagonists, who were called *secutores*, and sometimes *myrmillones*. See GLADIATOR.

The word is formed from the Latin, *rete*, net; or perhaps from *retejaculum*; for they call their net *jaculum*, and sometimes in one word *retejaculum*.

This net they carried under their buckler, and, when opportunity served, cast it over the head of their antagonist, and, in this condition, killed him with a trident, which they bore in the other hand.

Lipsius and others observe, that they fought in tunics, and were furnished with sponges to wipe off the sweat, blood, &c. and to stop their wounds.

RETICENCY, *reticentia*, a figure in *Rhetoric*, whereby we make oblique mention of a thing, in pretending to pass it over unmentioned.

Thus: *to say nothing of the nobility of his ancestors: I forbear to speak of his courage, and pass over the severity of his morals.* See APOSIOPESIS and PRETERITION.

RETICULA, *reticule*, in *Astronomy*, a contrivance for the exact measuring the quantity of eclipses, introduced several years ago by the Royal Academy of Paris. See ECLIPSE.

The *reticule* is a little frame, consisting of thirteen fine silken threads, equidistant from each other, and parallel; placed in the focus of object-glasses of telescopes; that is, in the place where the image of the luminary is painted in its full extent. Of consequence, therefore, the diameter of the sun or moon is hereby seen divided into twelve equal parts or digits; so that, to find the quantity of the eclipse, there is nothing to do but to number the luminous and the dark parts.

As a square *reticule* is only proper for the diameter, not for the circumference of the luminary, it is sometimes made circular, by drawing six concentric equidistant circles. This represents the phases of the eclipse perfectly.

But it is evident that the *reticule*, whether square or circular, ought to be perfectly equal to the diameter or circumference of the sun or star, such as it appears in the focus of the glass, otherwise the division cannot be just. Now, this is no easy matter to effect, because the apparent diameter of the sun and moon differ in each eclipse; nay, that of the moon differs from itself in the progress of the same eclipse.

Another imperfection in the *reticule* is, that its bigness is determined by that of the image in the focus; and of consequence it will only fit one certain magnitude.

But M. de la Hire has found a remedy for all these inconveniences, and contrived that the same *reticule* shall serve for all telescopes, and all magnitudes of the luminary in the same eclipse. The principle whereon his invention stands is, that two object-glasses applied against each other, having a common focus, and there forming an image of a certain magnitude, this image will increase in proportion as the distance between the two glasses is increased as far as a certain limit.

If then a *reticule* be taken of such a magnitude, as just to comprehend the greatest diameter the sun or moon can ever have in the common focus of two object-glasses applied

plied to each other, there needs nothing but to remove them from each other, as the ſtar comes to have a leſs diameter, to have the image ſtill exactly comprehended in the ſame *reticule*.

Another improvement is, that whereas the ſilken threads are ſubject to ſwerve from the paralleliſm, &c. by the different temperature of the air; a *reticule* may be made of a thin looking-glaſs, by drawing lines or circles thereon with the fine point of a diamond; which ſhall be ſafe from any alteration of the air. See MICROMETER.

RETICULAR *body, corpus reticulare*, in *Anatomy*, a body of veſſels lying immediately under the cuticle or ſcarfſkin.

Theſe veſſels contain a mucous liquor, from the tincture whereof Malpighi imagines the colour of the ſkin to be derived; founding his conjecture on this, that the cutis, as well as the cuticle of blacks, is white; and that they differ in no other circumſtance from thoſe of Europeans but in this particular.

RETICULAR *plexus, plexus reticularis*, ſometimes denotes the CHOROIDES, which is thus called, becauſe its fibres are interwoven like a net.

RETICULUM, a name ſometimes given to the *caul* or OMENTUM, from its net-like ſtructure.

RETIFORMIS *lacis*, in *Anatomy*, the ſame with RETE *mirabile*.

RETINA, in *Anatomy* and *Optics*, one of the tunics of the eye; called alſo *amphibleſtroides, retiformis*, and *reticularis tunica*, as being woven in manner of a net.

The *retina* is the laſt or innermoſt of the coats of the eye, lying immediately under the choroides.

It is formed of an expanſion of the medullary part of the optic nerve; whence it is very thin, ſoft, white, &c. reſembling the ſubſtance of the brain, with the tranſparency of the horn of a lantern. When ſeparated from the choroides, it runs into a mucous maſs, or lump.

The *retina* is uſually ſuppoſed to be the great organ of viſion, which is effected by means of the rays of light reflected from each point of the objects refracted in their paſſage through the aqueous, vitreous, and cryſtalline humours, and thus thrown on the *retina*, where they paint the image of the object; and where they make an impreſſion, which is continued thence, by the fine capillaries of the optic nerves, to the ſenſory. See VISION.

Indeed, whether the *retina*, or the choroides, be the principal organ of viſion, and that whereon the images of objects are repreſented, has been much controverted between ſeveral members of the Royal Academy; particularly Meſſ. Mariotte, Pecquet, Perrault, Mery, and de la Hire. Mariotte firſt referred viſion to the choroides, and was ſeconded by Mery: the reſt aſſerted the cauſe of the *retina*.

The *retina* was always judged to have all the characters of the principal organ. It is ſituate in the focus of the refraction of the humours of the eye; and of conſequence receives the vertices of the cones of rays, proceeding from the ſeveral points of objects. It is very thin, and conſequently very ſenſible. It has its origin from the optic nerve, and is itſelf wholly nervous; and it is the common opinion, that the nerves are the vehicles of all ſenſations. Laſtly, it communicates with the ſubſtance of the brain, where all ſenſations terminate.

As to the choroides, its uſe was ſuppoſed to be to ſtop the rays, which the extreme tenuity of the *retina* ſhould let paſs; and to do the ſame office with reſpect to the *retina* which the quickſilver does to a looking-glaſs; eſpecially in thoſe animals wherein it is black.

But from an experiment of a cat plunged into water, M. Mery conceived a different opinion. See PUPIL. He obſerved the *retina* to diſappear abſolutely on that occaſion, as well as all the other humours of the eye; while the choroides ſtill appeared diſtinctly, and even with all the lively colours which it has in that animal. Hence he concluded, that the *retina* was as tranſparent as the humours, but the choroides opake; conſequently the *retina* was not a proper inſtrument to terminate and ſtop the cones of rays, or to receive the images of objects; but that the light muſt paſs through it, and could only be ſtopped on the choroides; which therefore would become the principal organ of viſion. The black colour of the choroides in man is extremely favourable to this opinion; the principal organ ſhould ſeem to require, that the action of the light ſhould terminate on it as it arrives; which it is certain it here does in the black, that abſorbs all the rays, and reflects none; and it ſhould alſo ſeem neceſſary, that the action of the light ſhould be ſtronger on the organ of ſight than any-where elſe: now, it is certain that the light, being received and abſorbed in a black body, muſt excite a greater vibration there than any where elſe; and hence it is that black bodies are kindled by a burning-glaſs much ſooner than white ones.

The ſituation of the choroides behind the *retina* is another circumſtance on its ſide; M. Mery having obſerved the ſame poſition of the principal organ behind a mediate organ in the other ſenſes, which makes an happy analogy. Thus the cuticle extended over the ſkin is the mean organ of feeling; but the cutis underneath is the principal organ. The like is obſerved in the ear, noſe, &c.

The *retina*, therefore, ſhould ſeem a kind of mediate or ſecondary organ, ſerving to break the too ſtrong impreſſion of the light on the choroides, or to preſerve it; which is the uſe aſcribed to the cuticle. Add to all this, that the *retina* is inſenſible, as having its origin from the medullary ſubſtance of the brain, which is ſo too; and the choroides, on the contrary, is very ſenſible, as ariſing from the pia mater, which is certainly ſenſible in a great degree.

This laſt argument being doubted of, M. Mery was engaged to prove it; which he did before the Royal Academy, where he ſhewed that the optic nerve is not compoſed, like the other nerves, of fibres; that it is only a train of the medulla incloſed in a canal, out of which it is eaſily ſeparable.

This ſtructure of the optic nerve, hitherto unknown, ſhews that the *retina* can be no membrane; it is only a dilatation of the medulla, incloſed under two membranes; and a pith or medulla ſeems no proper ſubſtance to be the ſeat of ſenſation. It can ſcarce ſerve for any thing but to filtrate the ſpirits neceſſary for the action of viſion. The vibration whereby the ſenſation itſelf is effected, muſt be made on a part more ſolid, more firm, and more ſuſceptible of a briſk impreſſion.

For other arguments in favour of the choroides being the ſeat of viſion, ſee CHOROIDES.

RETINACULUM, the name of a chirurgical inſtrument uſed in caſtration, and in the operation for a hernia, to prevent the inteſtines from falling into the ſcrotum.

RETINUE, *retinentia*, the attendants or followers of a prince, or perſon of quality, chiefly in a journey.

In *Law*, thoſe perſons are properly ſaid to be of a nobleman's *retinue*, who belong to him in quality either of ſervants or retainers.

RETIRADE, in *Fortification*, a kind of retrenchment made in the body of a baſtion, or other work, which is to be diſputed inch by inch, after the firſt defences are diſmantled. It uſually conſiſts of two faces, which make a re-entering angle. When a breach is made in a baſtion, the enemy may alſo make a *retirade*, or a new fortification behind it.

RETIRED *flank*, in *Fortification*. See FLANK.

RETORNO *falſo brevium*. See FALSO.

RETORNO *habendo*, &c. See RETURNO *habendo* and REPLEVIN.

RETORT, *retorta*, in *Chemiſtry*, a kind of crooked mataſs, or a round bellied veſſel, either of earth or glaſs, with a ſlender crooked beak or neck, to which the recipient is to be faſtened.

From this form this veſſel has been probably called a *retort*. The moſt capacious part is called the belly; its upper part the arch or roof of the *retort*; and the bent part, which makes with the belly an angle of about ſixty degrees, is the neck; and the paſſage from the belly to the neck ſhould be free and wide, and gradually diminiſhing to the extremity of the neck or mouth of the *retort*. *Retorts* differ in form and materials; their bellies are generally round: ſome of them are oblong, and ſhaped like a cucurbit, and theſe are called *Engliſh retorts*. They are preferable for the diſtillation of matters which are ſubject to ſwell, and to paſs into the receiver before they be decompoſed.

A *retort*, which has a little hole pierced in its roof, is called a *tubulated retort*. This hole muſt be capable of being exactly cloſed with a ſtopper of proper materials. *Retorts* of this kind are employed in diſtillations, where ſome matter muſt be introduced into the *retort* after the receiver is joined to it, as in the diſtillation of ſmoking marine acid, and in the operations for procuring the ſeveral kinds of clyſſus. See *Tab.* II. *Chemiſtry*, *fig.* 31, 32, &c.

When the *retort* is of glaſs, it is uſually covered with a lute of loam, &c. an inch thick, to enable it to bear the fire the better: and it is uſed for all operations which require a leſs heat than is ſufficient for its fuſion. Earthen *retorts* are neceſſary when great heat is requiſite, as in the preparation of phoſphorus.

The *retort* ſeems to draw ſpirits and oil from woods, gums, minerals, earths, and other matters which require a ſtrong fire.

The *retort* is a kind of compendium or improvement on the

the cucurbit and bolt-head; anſwering all the purpoſes of both, without the aſſiſtance of a capital or head, which the other require.

The quantity of air riſing from ſome ſubſtances is apt to burſt glaſſes in diſtilling; Dr. Browne Langriſh has therefore given us a new contrivance of applying receivers to *retorts*, by which ſuch accidents may be prevented. To his firſt receiver he adapts a ſecond, inſerted into an opening at the top of the firſt, in order to give more room to the rarefied and new generated air. To an opening at the bottom of each of theſe receivers, he fixes a bottle, tied on cloſe by means of a bladder, ſo that they may be removed at any time, and another inſtantly placed in their room; by which means very little of the ſteam will eſcape. He alſo ties on a bladder to an opening, or upper neck of the ſecond recipient; and this bladder being much thinner and weaker than any of the glaſſes, will always give way firſt, and prevent their burſting. And even when there is the greateſt danger of this accident, the ſmalleſt pin-hole made through the top of the bladder, as ſoon as the fumes begin to riſe, will be ſufficient to let out the air as faſt as it is generated. See Philoſ. Tranſ. N° 475. ſect. 3. where we have a figure of the whole apparatus. See alſo Tab. of Chemiſtry, N° 33, and 34.

RETRACTATION, *retractatio*, the act of unſaying what a perſon had ſaid or written.

Galileo made a public *retractation* of his doctrine of the world, De Mundo, after its being cenſured and condemned by the pope. See Copernican *Syſtem*.

Among St. Auguſtine's works is a book of *retractations*; where, however, the word is to be underſtood in a new ſenſe; not as if he recanted or unſaid any thing he taught, but only treated of the ſame matter, or handled the ſame ſubject, a ſecond time. This ſenſe the word will very well bear; being a compound of *re*, *again*, and *tracto*, *I handle*, *treat of*.

RETRACTION, *retractio*, formed from *retrahere*, *to draw back*, in *Anatomy*, the contraction or ſhortening of a part. A *retraction* of the nerves takes away the uſe of the limbs.

RETRACTS, among *Horſemen*, pricks in a horſe's feet, ariſing from the fault of the farrier in driving nails that are weak, or in driving them ill-pointed, or amiſs.

Theſe, unleſs timely prevented, feſter, and prove very dangerous. When the farrier, in ſhoeing, perceives the horſe to ſhrink at every blow on the nail, it is a ſign of a *retract*, and the nail is to be pulled out again; which is done without any harm.

When the horſe halts immediately after he is ſhod, it is concluded ſome of the nails preſs the veins, or touch him in the quick.

To find where the grievance lies, they knock the nails round with a hammer, till the horſe's ſhrinking upon hitting a particular nail diſcovers the place.

Some farriers give this as a rule, that throwing water on the hoof, the place where he is hurt will be dry ſooner than any of the reſt. The places where the horſes are moſt uſually pricked, are the heel in the fore-foot, and the toe in the hind-foot.

RETRACTOR *alæ naſi*, in *Anatomy*, a muſcle called alſo elevator *labii ſuperioris*.

RETRAHENS *auriculam*, in *Anatomy*, a muſcle of the external ear, conſiſting of a parcel of fleſhy fibres, which in ſome bodies are divided into three diſtinct muſcles, ariſing from the os temporale, and fixed to the hind part of the concha.

But theſe muſcles are ſo ſmall in men, that the auricle is ſeldom moveable at all. See Ear.

RETRAXIT, in *Law*, is where the plaintiff comes into court in perſon, alone, or with the defendant; and declares he will proceed no farther in his action.

A *retraxit* is peremptory, and a perpetual bar, and may be pleaded as ſuch to the plaintiff in the ſame action for ever. See Nonsuit.

RETREAT, in *War*, the retiring or moving back again of an army, or part thereof.

We ſay, to ſound a *retreat*, to ſecure a *retreat*, &c. What they call a *retreat* in the armies, is really a flight; only a flight made by deſign, and with conduct.

The ſkill and ability of the general is known by his *retreats*, more than his engagements. The *retreat* of the ten thouſand Greeks under the command of Xenophon, has been admired in all antiquity.

Retreat, or Tattou, in *the Art of War*, is a beat of the drum in the evening, at the firing of a piece called the evening-gun, at which the drum-major, with all the drums of the battalion, except ſuch as are upon duty, beat round the regiment; the drums of the quarter-guards, of the general-guards, and all other ſmall guards, do likewiſe beat; the trumpets at the ſame time ſounding at the head of their reſpective troops. This is to warn the ſoldiers to forbear firing, and the ſentinels to challenge, till break of day, that the reveille is beat.

The *retreat* is likewiſe called *ſetting the watch*.

Retreat, or Relay, in *Maſonry*, denotes a little receſs or diminution of the thickneſs of a wall, rampart, &c. in proportion as it is raiſed.

The *retreat* is properly the diminution of a wall, withoutſide, or the contraction of its upper courſes more than the foundation. Where the foundation is very large, they uſually make two or three *retreats*. Parapets are always built with *retreats*.

RETRENCHMENT, in a general ſenſe, literally ſignifies the cutting off, or taking from a thing: in which ſenſe it coincides with ſubtraction, diminution, &c.

The word is French, *retrenchement*, formed of *re*, and *trencher*, *to cut*.

Retrenchment, in *Architecture*, *Carpentry*, &c. is uſed not only for what is cut off from a piece when too large, in order to a better proportioning it, or ſome other convenience, but alſo for the projectures taken out of ſtreets, public ways, &c. to render them more even, and in a line.

Retrenchment, in *War*, denotes any kind of work caſt up to ſtrengthen or defend a poſt againſt the enemy.

Such are ditches with parapets, gabions, faſcines, &c. for a covering, &c.

The enemy came with deſign to oblige them to raiſe the ſiege; but could not force the *retrenchments*.

Retrenchment is more particularly uſed for a ſimple retirade made on a horn-work or baſtion, when it is intended to diſpute the ground inch by inch. See Retirade.

It is uſually a re-entering angle, whoſe faces flank each other; and is fortified with ditches, parapets, gabions, &c.

RETRIBUTION, *retributio*, an handſome preſent, gratuity, or acknowledgment, given in lieu of a formal ſalary or hire, to perſons employed in affairs that do not ſo immediately fall under eſtimation, nor within the ordinary commerce in money.

Thoſe who miniſtered at the altar anciently lived on *retributions*, which they received for the ſervices they did the church. But theſe *retributions* were afterwards judged proper to be fixed to preciſe ſums.

RETRIEVE, *retrouver*, to recover, get again, or repair a thing loſt or damaged.

To *retrieve*, in *Falcoury*, ſignifies to bring or find partridges again, which have been once ſprung before.

RETROACTIVE, compounded of *retro*, *backwards*, and *ago*, *I act*, in *Law*, that which has an influence or effect on time paſt.

New laws and ſtatutes, we ſay, have no *retroactive* effect; that is, they have no force or effect as to what is already paſſed; nor can be alleged as rules for any thing done before their promulgation. Their authority is wholly as to what is to come.

Indeed we have ſome inſtances of laws that have a retroſpect or *retroaction*, i. e. are made with expreſs deſign to extend to things already paſt. Theſe we uſually call laws *ex poſt facto*.

RETROCESSION, *retroceſſio*, the act of going backwards, more uſually expreſſed by *retrogreſſion* or *retrogradation*.

Retrocession *of the Equinox*. See Precession.

Retrocession *of Curves*, &c. See Retrogradation.

RETROGRADATION, or Retrogression, the act or effect of a thing moving backwards.

Retrogradation, in *Aſtronomy*, is an apparent motion of the planets, wherein they ſeem to go backwards in the ecliptic, and to move contrary to the order or ſucceſſion of the ſigns.

When a planet moves *in conſequentia*, i. e. towards the following ſigns, or according to the order of the ſigns, as from Aries to Taurus, from Taurus to Gemini, &c. that is, from weſt to eaſt, it is ſaid to be direct.

When it appears for ſome days in the ſame point of the heavens, it is ſaid to be *ſtationary*.

And when it goes *in antecedentia*, i. e. towards the antecedent ſigns, or contrary to the order of the ſigns; viz. from eaſt to weſt; it is ſaid to be *retrograde*.

The ſun and moon always appear direct. Saturn, Jupiter, Mars, Venus, and Mercury, ſometimes direct, ſometimes ſtationary, and ſometimes *retrograde*.

The ſuperior planets are *retrograde* about their oppoſition with the ſun; the inferior ones about their conjunction. The intervals of time between two *retrogradations* of the ſeveral planets, are unequal. In Saturn it is a year and 13 days, in Jupiter a year and 43 days, in Mars two years 50 days, in Venus one year and 220 days, and in Mercury 115 days. Again, Saturn continues *retrograde* 140 days, Jupiter 120, Mars 73, Venus 42, Mercury 22; yet are not the ſeveral *retrogradations* of the ſame planet conſtantly equal.

Theſe changes of the courſes and motions of the planets are

are not real, but only apparent: when viewed from the centre of the system, i. e. from the sun, they appear always uniform and regular. The inequalities arise from the motion and position of the earth whence they are viewed, and are thus accounted for:

Suppose PNO (*Tab. Astronomy, fig.* 53.) a portion of the zodiac, ABCD the earth's orbit, and EMGHZ the orbit of a superior planet, e. gr. Saturn; and suppose the earth in A, and Saturn in E, in which case he will appear in the zodiac at the point O. If now Saturn remained without any motion, when the earth arrives at B, he will be seen in the point of the zodiac L, and would appear to have described the arch OL, and to have moved according to the order of the signs from west to east. But because, while the earth is passing from A to B, Saturn likewise moves from E to M, where he is seen in conjunction with the sun, he will appear to have described the arch OQ greater than that OL. In this state the planet is direct, and its motion is from west to east, or according to the order of the signs. And its motion, now that it is in conjunction with the sun, and most remote from us, is quicker than at any other time.

The earth arriving in C, while Saturn describes the arch MG, he will be observed in the zodiac at R. But the earth being advanced to K, and Saturn to H, so that the line KH, joining the earth and Saturn, be for some time parallel to itself, or nearly so, Saturn will be seen all that time in the same point of the zodiac at P, and with the same fixed stars; and is therefore at this time stationary.

But the earth being come to D, and Saturn arrived in opposition to the sun in Z, he will appear in the zodiac in V, and will seem to have been *retrograde*, or to have gone backwards through the arch PV. Thus the superior planets, on optical considerations, are always *retrograde*, when in opposition to the sun.

The arch which the planet describes while thus *retrograde*, is called the *arch of retrogradation.*

The arches of *retrogradation* of the several planets are not equal. That of Saturn is greater than that of Jupiter; that of Jupiter than that of Mars, &c.

RETROGRADATION *of the nodes*, is a motion of the line of the nodes, whereby it continually shifts its situation from east to west, contrary to the order of the signs; completing its *retrograde* circulation in the compass of about nineteen years: after which time, either of the nodes, having receded from any point of the ecliptic, returns to the same again. See NODES.

RETROGRADATION *of the sun.* When the sun is in the torrid zone, and has his declination AM (*Tab. Astronomy, fig.* 54.) greater than the latitude of the place AZ, but either northern or southern as that is, the sun will appear to go backwards, or to be *retrograde* both before and after noon. This can never happen, without the tropics, in a natural way.

For, draw the vertical circle ZGN to be a tangent to the sun's diurnal circle in G, and another ZON through the sun rising, in O, it is evident all the intermediate vertical circles cut the sun's diurnal circle twice; first, in the arch GO, and the second time in the arch GI. Wherefore, as the sun ascends through the arch GO, it continually arrives at farther and farther verticals. But as it continues its ascent through the arch GI, it returns to its former verticals; and therefore is seen *retrograde* for some time before noon. The same it may be shewn, after the same manner, it does for some time after noon. Hence, as the shadow always tends the opposite way to that of the sun, the shadow will be *retrograde* twice every day in all places of the torrid zone, where the sun's declination exceeds the latitude.

RETROGRADATION, or RETROGRESSION, in the *Higher Geometry*, is the same with what we otherwise call *contrary flexion.* See FLEXURE and INFLEXION.

The general rule given by the marquis de l'Hopital, for finding the point of reflection in curves whose ordinates are parallel, is the same as that for finding the point of contrary flexure, and consists in taking the second fluxion of the ordinate of the curve, and supposing it nothing or infinite: but this rule admits of many exceptions. See Maclaurin's Flux. b. i. c. 9. and b. ii. c. 5.

RETROGRADE, *retrogradus*, formed from *retro, backwards*, and *gradior, I go*, something that goes backwards, or in a direction contrary to the natural one.

If the eye and the object move both the same way, but the eye much faster than the object, the object will appear to be *retrograde*, i. e. to go back, or to advance the contrary way from what it really does.

Hence it is that the planets in some parts of their orbits appear to be *retrograde.*

RETROGRADE *order*, in matters of numeration, is when, in lieu of accounting 1, 2, 3, 4, we count 4, 3, 2, 1.

RETROGRADE *verses*, are such as give the same words, whether read backwards or forwards; called also *reciprocal verses*, and *recurrents*. Such is

Signa te signa: temere me tangis et angis.

RETROGRESSION, or RETROCESSION, the same with RETROGRADATION.

RETROMINGENTS, compounded of *retro, backwards*, and *mingo, I make water*, in *Natural History*, a class or division of animals, whose characteristic is, that they stale backwards, both males and females. Such are lions, cats, &c.

RETROPANNAGIUM, *retropannage*, in our *Ancient Law-Books*, *after-pannage*; or what is left when the beasts have done, or eaten the best. See PANNAGE.

Et debent habere retropannagium *a festo Sancti Martini usque ad festum Pur. Beatæ Mariæ.* Petit. in Parl. temp. Edw. III.

RETROSPECT, a look or view backwards. See RETROACTIVE.

RETROVERSIO *uteri*, in *Midwifery*, a disorder to which pregnant women are occasionally subject, and commonly occurring in the early stages of pregnancy, seldom so late as the fourth month; and consisting, as the term imports, in a distorted and unnatural position of the uterus. This disorder was first demonstrated by Dr. Hunter in his public lectures, in the year 1754, and has been since illustrated in his tables of the gravid uterus. In this case the uterus may be *fully retroverted*, by means of the distension of the bladder, which, as it rises upwards in the abdomen, where it has room to expand, naturally tends to drag along with itself the cervix uteri, and adjacent part of the vagina, to which it is fixed. Or, when there is a coincidence of such causes as, in some degree, obstruct the revolution of the uterus, it will be only *partially*, or *half retroverted.* Or, again, when these causes operate powerfully in keeping the uterus steady, it will be so *little retroverted*, that the orifice of the uterus will be pushing out of the body, as in a common PROCIDENTIA. The particular form and state of the pelvis may contribute, in many instances, to various degrees of the *retroversion*; the pelvis, which is most capacious below, and narrowest above, being the most disposed to such disorders. They have been also occasioned by frights and accidents, in the first months of pregnancy; and they have produced first a difficulty, and by degrees a suppression of urine, and soon after a suppression even of the intestinal discharge. The following method of treatment has usually succeeded in this complaint: after the case has been suspected from the suppression of urine, and then certainly known by examination with the fingers, both in the vagina and in the rectum, the urine must be first completely drawn off by the catheter, and then a sufficiently stimulating clyster injected; and when the intestines have been thus well evacuated, the uterus has sometimes recovered its natural situation; but as this is uncertain, it has been thought more adviseable to replace it; because if the impregnated uterus is once thrown into this unnatural position, and continues in it for some time, it will probably always remain so, unless reduced by art before it becomes so bulky as to be locked in the grasp of the pelvis; and in proportion as this process advances, the discharge both of urine and of stool will become more difficult, and at length both will be entirely suppressed. When such suppressions once begin, they aggravate the evil, not merely by causing pain, but by occasioning a load of accumulated urine and fæces in the abdomen above the uterus, which presses it still lower in the cavity of the pelvis; at the same time that the distention of the bladder, in this state, draws up that part of the vagina and cervix uteri with which it is connected, so as to throw the fundus uteri still more directly downwards. In order to reduce the uterus to its natural situation, the woman must be placed upon her knees and elbows, with her head and shoulders as low as possible; one hand must be introduced into the vagina, and two fingers of the other into the anus; and thus the operator must endeavour to replace the uterus by pushing it up with the two fingers, and by trying, at the same time, to draw down the upper part of the vagina. While there is reason to apprehend the *retroversion* of the uterus, it will be favourable to be frequently in a recumbent posture, and to take care that the bladder be never much distended with urine, nor the rectum and colon much loaded with fæces. London Med. Obs. &c. vol. iv. p. 388, &c. vol. v. p. 104—110—378—381—388.

RETURN, RETURNA, or RETORNA, in *Law*, hath divers acceptations. As

RETURN *of writs* by sheriffs and bailiffs, is a certificate made to the court by the sheriff, bailiff, &c. of what is done with regard to the execution of the writ directed to them.

Whence the day, on which the defendant is ordered to appear in court, and on which the sheriff is to bring in the writ, and report how far he has obeyed it, is called the *return* of the writ; it being then returned by him to the king's justices at Westminster. And it is always made returnable at the distance of at least fifteen days from the date or teste, that the defendant may have time to come up to Westminster, even from the most remote parts of the kingdom; and upon some day in one of the four terms, in which the court sits for the dispatch of business. See RETURNS, infra.

Such also is the *return of a commission*, which is a certificate, or answer of what is done by the commissioners, to whom such commissions, precepts, mandates, or the like, are directed.

RETURN is also used in case of a replevin. If a man distrain cattle for rent, &c. and afterwards justify or avow his act, so as it is found lawful, the cattle before delivered unto him that was distrained, upon security given to prosecute the action, shall now be *returned* to him that distrained them. See RETURNO *habendo*, and REPLEVY.

RETURN *of members of parliament*. See PARLIAMENT.

RETURN *to a mandamus*. See MANDAMUS.

RETURNS, RETURN-*days*, or *days in bank*, *dies in banco*, that is, days of appearance in the court of common pleas, usually called *bancum*, or *commune bancum*, to distinguish it from *bancum regis*, or the court of king's bench, are certain days in each term peculiarly set apart for the several kinds of proceedings in any cause to be determined. These days are generally at the distance of about a week from each other, and regulated by some festival of the church. On some one of these days in bank all original writs must be made returnable; and therefore they are commonly called the *returns* of that term; whereof every term has more or less, said by the Mirror (cap. 5. § 108.) to have been originally fixed by king Alfred, but certainly settled as early as the statute of 51 Hen. III. stat. 2. But though many of the *return* days are fixed upon Sundays, yet the court never sits to receive these *returns* till the Monday after; and, therefore, no proceedings can be had, or judgment can be given, or supposed to be given, on the Sunday. See DAY.

Hilary term has four such *returns*; viz. *octabis Hilarii*, eight days after Hilary day; *quindena Hilarii*, fifteen days; *crastina Purificationis*, the day after the Purification; and *octabis Purificationis*, eight days after, inclusive.

Easter term has five *returns*; viz. *quindena Paschæ*, fifteen days after Easter; *tres Paschæ*, three weeks after; *mense Paschæ*, the day month after Easter; *quinque Paschæ*, the day five weeks from Easter; and *crastino Ascensionis Domini*, the day after Ascension-day.

Trinity term has four *returns*; viz. *crastino Trinitatis*, the day after Trinity; *octabis Trinitatis*, eight days after, inclusive; *quindena Trinitatis*, fifteen days after; and *tres Trinitatis*, three weeks after.

Michaelmas term has four *returns*, by stat. 24 Geo. II. cap. 48. viz. *crastino Animarum*, morrow of All souls; *crastino Martini*, the morrow of St. Martin; *octabis Martini*, eight days after, inclusive; and *quindena Martini*, fifteen days after.

The first *return* in every term is, properly speaking, the first day in that term; e. gr. the octave of St. Hilary, which falling on the thirteenth of January, the octave, or first day of Hilary term, is the twentieth of January; and this is called the ESSOIGN *day of term*. But by reason of the QUARTO *die post*, the court does not sit, at the beginning of each term, for dispatch of business, till the fourth day, as in Hilary term on the twenty-third of January; and in Trinity term, by statute 32 Hen. VIII. cap. 21. not till the sixth day; which is, therefore, usually called and set down in the almanacs as the first day of TERM.

RETURN, in the *Military Language*, denotes the list of the sick, given in once a week by the surgeon to the commanding officer of a regiment.

Commissioned officers are not put in the *returns*, which, on that account, are but an imperfect list of the sick.

Twelve sick, in a battalion of 780 private men, is the lowest *return* that can be expected, even in the most healthy season and climate, as well as best quarters. *Returns* are often much higher, but seldom exceed seventy in a battalion.

It is to be observed, that *returns* include all accidents unfitting a soldier for duty; together with a general state of the army, regiment, or company. See Pringle's Observ. on the Diseases of the Army, p. 12 – 36.

RETURN, in *Building*, denotes a side, or part, that falls away from the foreside of any straight work.

RETURNS *of a trench*, in *Fortification*, are the turnings and windings which form the lines of a trench.

RETURNS *of a mine*, in the *Military Art*, are the turnings and windings of the GALLERY.

RETURNING *stroke*, in *Electricity*, is an expression used by lord Mahon to denote the effect produced by the *return* of the electric fire into a body from which, in certain circumstances, it has been expelled.

In order to understand the meaning of these terms, it is necessary to premise that, according to the noble author's experiments, an insulated smooth body, immerged within the electrical atmosphere, but beyond the striking distance, of another body, charged positively, is at the same time in a state of threefold electricity. The end next to the charged body acquires negative electricity; the farther end becomes positively electrified; while a certain part of the body, somewhere between its two extremities, is in a natural, unelectrified, or neutral state; so that the two contrary electricities balance each other. Moreover, it may be added, that if the body be not insulated, or have a communication with the earth, the whole of it will be in a negative state; a certain portion of its natural quantity of electricity being driven into the common mass, by the pressure, repulsion, or other action of the electric matter belonging to the charged prime conductor. Let us then suppose a brass ball, which we may call A, to be constantly placed at the striking distance of a prime conductor; so that the conductor, the instant when it becomes fully charged, explodes into it. Let another large conductor, which we may call the second conductor, be suspended, in a perfectly insulated state, farther from the prime conductor than the striking distance, but within its electrical atmosphere: let a person standing on an insulated stool touch this second conductor very lightly with a finger of his right hand; while, with a finger of his left hand, he communicates with the earth, by touching very lightly a second brass ball fixed at the top of a metallic stand, on the floor, which we may call B; while the prime conductor is receiving its electricity, sparks pass (at least if the distance between the two conductors is not too great) from the second conductor to the insulated person's right hand; while similar and simultaneous sparks pass out from the finger of his left hand into the second metallic ball B, communicating with the earth. These sparks are part of the natural quantity of electric matter belonging to the second conductor, and to the insulated person, driven from them into the earth, through the ball B, and its stand, by the elastic pressure or action of the electrical atmosphere of the prime conductor; the second conductor, and the insulated person, are hereby reduced to a negative state. At length, however, the prime conductor, having acquired its full charge, suddenly strikes into the ball, A, of the first metallic stand, placed for that purpose at the striking distance. The explosion being made, and the prime conductor suddenly robbed of its elastic atmosphere, its pressure or action on the second conductor, and on the insulated person, as suddenly ceases; and the latter instantly feels a smart *returning stroke*, though he has no direct or visible communication (except by the floor) either with the striking or struck body, and is placed at the distance of five or six feet from both of them. This *returning stroke* is evidently occasioned by the sudden re-entrance of the electric fire naturally belonging to his body and to the second conductor, which had before been expelled from them by the action of the charged prime conductor upon them, and which *returns* to its former place in the instant when that action or elastic pressure ceases. When the second conductor and the insulated person are placed in the densest part of the electrical atmosphere of the prime conductor, or just beyond the striking distance, the effects are still more considerable; the *returning stroke* being extremely severe and pungent, and appearing considerably sharper than even the main stroke itself, received directly from the prime conductor. Lord Mahon, in the application of this experiment, and of the doctrine deduced from it, observes, that persons and animals may be destroyed, and particular parts of buildings may be considerably damaged, by an electrical *returning stroke*, occasioned even by some very distant explosion from a thunder cloud; possibly at the distance of a mile or more. It is certainly easy to conceive (says a very ingenious anonymous writer, in his reflections on this subject) that a charged extensive thunder cloud must be productive of effects similar to those produced by the prime conductor. Like the conductor, while it continues charged, it will, by the superinduced elastic electrical pressure of its atmosphere, drive into the earth a part of the electrical fluid naturally belonging to the bodies which are within the reach of its widely extended atmosphere, and which will, therefore, become negatively electrical. This portion too of their electric fire will, on the explosion of the cloud, at a distance, and the cessation of its action upon

upon them, suddenly *return* to them, so as to produce an equilibrium, and restore them to their natural state. But the effects are not so great, nor the danger so terrible, as the noble author seems to apprehend. If the quantity of electric fluid naturally contained, e. gr. in the body of a man, were immense or indefinite, his lordship's estimate between the effects producible by a cloud, and those caused by a prime conductor, might be admitted; but surely an electrified cloud, how great soever may be its extent and the height of its charge, when compared with the extent and charge of a prime conductor, cannot expel from a man's body (or any other body) more than the natural quantity of electricity which it contains. On the sudden removal, therefore, of the pressure by which this natural quantity had been expelled, in consequence of the explosion of the cloud into the earth, no more (at the utmost) than his whole natural shock of electricity can re-enter his body, provided he be so situated, that the *returning* fire of other bodies must necessarily pass through his body. But we have no reason to suppose that this quantity is so great, as that its sudden re-entrance into his body should destroy or even injure him.

In the experiment above described, the insulated person receives into his body, at the instant of the *returning stroke*, not only all that portion of his own natural electric fire which had been expelled from it, but likewise transmits through it, at the same instant, in consequence of his peculiar situation, all the electric fire of which the large second conductor had been robbed, and which must necessarily repass through his body, to arrive at that conductor. To render the case somewhat parallel, in natural electricity, the man's body must be so peculiarly circumstanced, supposing him to be in a house, that the electric matter which has been expelled from the house into the earth, by the pressure of an extensive thunder cloud, could not return back into the building, on the explosion of the cloud at a distance, without passing through his body; a case not likely to happen, unless the house were insulated (like the second conductor in the preceding experiment), and his body became the channel through which alone the house could have its electric matter restored to it. It appears much more probable, that the electric matter returns to the house through the same channels by which it before insensibly passed out, and with equal silence, though more suddenly. In the case of a man who is abroad, and in an open field, during the time of an explosion; as he is unconnected with other masses of matter above him, no more than the precise quantity of electric fire, which had been before expelled from his body, will suddenly return into it at the instant of a distant explosion; and that this quantity is not very large, may be inferred from many considerations. Allowing, therefore, the existence of the *returning stroke*, as sufficiently ascertained and well illustrated, in a variety of circumstances, by the author's experiments, the magnitude and danger of it are not so alarming as he apprehends. Lord Mahon's Principles of Electricity, &c. 4to. 1779. p. 76—113—131. Monthly Review, vol. lxii. p. 436—442.

RETURNO *habendo*, or RETURNUM *averiorum*, a writ which lies for him who has avowed a distress made of cattle, and proved his distress to be lawfully taken; for the *return* of the cattle distrained unto him, which before were replevied by the party distrained, upon surety given to pursue the action.

The same writ is granted when the plaint or action is removed by *recordare*, or *accedas ad curiam*, into the court of common pleas; and he whose cattle were distrained makes default, and does not prosecute his action. See REPLEVY.

RETURNUM *averiorum*, a judicial writ, the same with RETORNO *habendo*.

RETURNUM *irreplegiabile*, a judicial writ, sent out of the common pleas to the sheriff, for the final restitution or return of cattle to the owner, unjustly distrained damage-feasant, and so found by the jury before justices of assize in the county, or otherwise through default of prosecution.

RETUSE *leaf*, *retusum folium*, among *Botanists*. See LEAF.

REVE, REEVE, or GREVE, in *Ancient Customs*, the bailiff of a franchise, or manor, thus called; especially in the western parts.

Hence, *shire-reve*, sheriff, *port-greve*, *church-reve*, &c. See SHERIFF, PORT-GREVE, &c.

REVE, *reva*, is also used, in *Ancient Customs*, for a duty or imposition on merchandizes imported.

M. Du-Cange derives the word from the Latin *roga*, of *rogare*, *to ask*; the word formerly signifying a tribute anciently granted princes at their request, as a free gift.

REVE-*land*. The land which in Domesday is said to have been *thane-land*, and afterwards converted into *reve-land*, seems to be such lands as being reverted to the king after the death of his thane, who had it for life, was not since granted out to any by the king, but rested in charge upon the account of the *reve*, or bailiff of the manor. Spelm. Feuds, cap. 24.

REVEALED *religion*. See RELIGION, and REVELATION.

REVEALED *theology*. See THEOLOGY.

REVEILLE, formed of the verb *reveiller*, *to awake*, a beat of drum in the morning, intended to give notice that it is day-break; and that the soldiers are to arise, and the sentinels forbear challenging.

REVELATION, *revelatio*, formed from *revelo*, of *re*, and *velum*, q. d. *to unveil*, the act of revealing, or making a thing public, which before was a secret, or unknown.

The *revelation* of a confession, made by the confessor, is adjudged, in the Romish church, to deserve the most exemplary punishment.

REVELATION is used, by way of eminence, for the discoveries made by God to his prophets, &c. and by them to the world.

REVELATION is more particularly used for the discovery which God has made to the world, by the mouths of his prophets, of certain points of faith and duty, which they could not learn from natural reason.

Religion is divided into natural religion and *revelation*, or *revealed* religion.

The Christian *revelation* is that made by Christ, and his apostles, in the New Testament. The Jewish *revelation* is that made by Moses and the prophets, in the Old Testament. See CHRISTIAN *religion*, and JUDAISM.

A late author observes, somewhat invidiously, that it is the common method of all new *revelations*, to be built on precedent ones. Thus, the mission of Moses to the Israelites, supposes a former *revelation* to Abraham, &c. The mission of Christ supposes that of Moses, and the pretended mission of Mahomet supposes the mission of Christ. The mission of Zoroaster to the Persians supposes the religion of the Magi, &c.

The general foundation of all *revelation* is this, that God is pleased man should know something relating to himself, his own nature, dispensation, &c. which the natural faculties with which he was pleased to create him could not attain to; and that he requires some duty or service at our hands more than what necessarily follows from the relation we are under to him as our creator, preserver, &c.

This is also urged by deists, to the discredit of all particular *revelations*, as derogating from the perfections of God; such supplementary informations and instructions arguing, according to them, a prior deficiency in the established œconomy of nature, of which he is the author. But many able answers have been given to such cavils.

Particular or occasional *revelations* have their particular geniuses, characteristics, and designs. That made by Moses and the prophets chiefly related to the nation of the Jews, considered as the descendants of Abraham; its design seems to have been to rescue that people from their slavery; to settle them in a new plantation; to give them a set of laws; to new form their manners; to support them under difficulties and dangers of their enemies, from an opinion of their being under the immediate direction and appointment of God; to keep them from intermixing again with their neighbours, from an opinion of their being a chosen people, and of a Messiah to be born among them; and thus to preserve and transmit the knowledge and hope of the Messiah, till the period of his appearance arrived. To some or other of these ends do all the Old Testament prophecies seem to tend.

The Christian *revelation* is founded on a part of the Jewish. The Messiah promised in the one is *revealed* in the other.

All the rest of the Jewish *revelation* which related peculiarly to the Jewish people, is here set aside; and only that part of it in which the world in general was interested, and that relating to the advent, offices, and character of the Messiah, is retained.

Indeed, it must be owned, the Jews ever looked on this to be as peculiar to themselves as any of the rest; the Messiah was promised to them; he was to be their deliverer, their restorer, &c. and under this character he actually appeared. But, upon the taking place of this new *revelation*, a new scene was opened, different from what many of them apprehended, because they misinterpreted the prophecies relating to the Messiah. The ceremonial part of their institution, local and temporary in its establishment and use, was abolished; and the Messiah appeared, not as they erroneously imagined, to be the restorer of their civil sovereignty and liberties, which were now

now fallen into the hands of the Romans; but to restore and re-establish mankind in general, who had lost their original righteousness, and were become slaves of sin; to preach repentance and remission; and at last to suffer death, that all who believed in him might not die, but have everlasting life.

Such is the tenor and design of the Christian *revelation*, which, in the event, was so far from being what it had been apprehended to be by the people to whom it was first promised, that it proved the very reverse; and, instead of re-establishing and confirming the other branches of their *revelation*, it superseded, and set them all aside. The pale was now broken down, and the being of the seed of Abraham ceased to be a privilege, all the world being invited on the same terms with the Jews.

The consequence was, that the Jews, denying this to be the Messiah that had been promised to them, because their pride and prejudice prevented their discerning the accomplishment of their ancient prophecies in him, were generally excluded from the privileges of that mission which they had vainly supposed to be not only primarily but wholly intended for themselves; and had their ruin completed from the very means whence they expected their redemption: because they expected a redemption, different in its nature, from that which their own prophecies, fairly interpreted, proposed.

REVELS, formed from the French *reveiller, to awake*, as alluding to the night season, when they were chiefly held; entertainments of dancing, masking, gaming, acting comedies, farces, &c. anciently very frequent in inns of courts, at certain seasons, and in noblemen's houses, &c. but now much disused.

The officer who has the direction or ordering of the *revels* at court, is called the MASTER *of the revels*.

REVENUE, the yearly rent or profits arising to a man from his lands, possessions, &c.

The word is French, formed from *revenir, to return*. Whence *revenue* is sometimes also used in ancient authors for a return; as the *revenue* of Easter.

The *revenues* of the English clergy were first fixed by king Ethelwulph, anno 853, who granted them for ever the tithe of all goods, and the tenth part of all the lands of England, free from all secular service, taxes, impositions, &c. Though Rapin observes, that tithes were settled on the clergy by the laws of Ina and Offa. But these laws were probably not observed, or perhaps Ethelwulph extended the law of TITHES all over England.

The certain *revenues* of the king of England were anciently greater than those of any king in Europe; and till the time of the civil wars they enjoyed in domains and fee-farm-rents almost enough to discharge all the ordinary expences of the crown, without any tax or imposition on the subject.

The *revenue* which the British constitution hath vested in the royal person, in order to support his dignity, and maintain his power, is either *ordinary* or *extraordinary*. The king's *ordinary revenue* is such, as hath either subsisted time out of mind in the crown, though, by reason of royal grants, the king be not at present in the actual possession of the whole of it; or else has been granted by parliament, by way of purchase or exchange for such of the king's inherent hereditary *revenues*, as were found inconvenient to the subject. Of the king's ordinary *revenues* there are four, which are of an ecclesiastical kind. Such are, 1. The custody of the temporalties of bishops, or all the lay *revenues*, lands, and tenements (in which is included his barony), which belong to an archbishop's or bishop's see, which, upon the vacancy of the bishoprick, revert immediately to the king, as his right, during the vacancy. This branch of the royal *revenue* was formerly very considerable, but is now, by a customary indulgence, reduced almost to nothing; for, at present, as soon as the new bishop is consecrated and confirmed, he usually receives the restitution of his temporalties, entire and untouched, from the king; and then, but not sooner, he has a fee-simple in his bishoprick, and may maintain an action for the profits. 2. A CORODY out of every bishoprick, or a right of sending one of his chaplains to be maintained by the bishop, or to have a pension allowed him till the bishop promotes him to a benefice; which is now fallen into total disuse. 3. The tithes arising in extra-parochial places, which are held, indeed, under an implied trust, that the king will distribute them for the good of the clergy in general. 4. The FIRST-*fruits* and TENTHS of all spiritual preferments in the kingdom.

The following branches of the king's *ordinary revenue* are of a lay or temporal nature. 5. The first of these consists in the rents and profits of the demesne lands of the crown, which are either the share reserved to the crown at the original distribution of landed property, or such as came to it afterwards by forfeitures or other means, and were formerly very extensive, but are now contracted within a very narrow compass, having been almost entirely granted away to private subjects. 6. The advantages which used to arise to the king from the profits of his military tenures, to which most lands in the kingdom were subject, till they were in a great measure abolished by the statute 12 Car. II. cap. 24. to which may be also referred the profitable prerogative of PURVEYANCE and PRE-EMPTION; which branches of the royal *revenue* and power were resigned entirely by king Charles at his Restoration; in recompence for which the parliament settled on him, his heirs and successors for ever, the hereditary EXCISE of fifteen pence per barrel on all beer and ale sold in the kingdom, and a proportionable sum for certain other liquors; so that this hereditary excise forms the sixth branch of his majesty's ordinary revenue. 7. The rents payable to the crown by such persons as are licensed to sell WINE by retail throughout England, except in a few privileged places, first settled on the crown by the statute 12 Car. II. cap. 25. but abolished by the statute 30 Geo. II. cap. 19. when an annual sum of upwards of 7000*l.* per annum, issuing out of the new stamp duties imposed on wine licences, was settled on the crown in its stead. 8. The profits arising from the king's FORESTS, consisting principally in amercements or fines levied for offences against the forest-laws, for levying which few, if any, courts have been held since 1632, 8 Car. I. 9. The profits arising from the king's ordinary courts of justice; consisting not only in fines imposed upon offenders, forfeitures of recognizances, and amercements levied upon defaulters, but also in certain fees due to the crown in a variety of legal matters; as for setting the great seal to charters, original writs, and other forensic proceedings, and for permitting fines to be levied of lands in order to bar entails, or otherwise to ensure their title. These, in process of time, have been almost all granted to private persons, or else appropriated to certain particular uses. All future grants of these, by 1 Ann. stat. 2. cap. 7. are to endure for no longer time than the prince's life who grants them. 10. The right to ROYAL *fish*. 11. The *revenue* arising from shipwrecks, which is frequently granted out to lords of manors, as a royal franchise. See WRECK. 12. The right to mines of silver and gold. See MINE. 13. The *revenue* of TREASURE-*trove*. 14. WAIFS. 15. ESTRAYS, which the law gives to the king as the general owner and lord paramount of the soil; though they now most commonly belong to the lord of the manor, by special grant from the crown. 16. Forfeitures of lands and goods for offences. See CONFISCATE and DEODAND. These are for the most part granted out to the lords of manors, or other liberties. 17. The *revenue* arising from the ESCHEATS of lands, reverting, upon the default of heirs to succeed to the inheritance, to the king, who is esteemed, in the eye of the law, the original proprietor of all the lands in the kingdom. 18. The last branch of the king's *ordinary revenue* consists in the custody of IDIOTS. Such is the king's *ordinary revenue*, or the proper patrimony of the crown, which was formerly very large, and capable of being increased to a magnitude truly formidable; but, fortunately for the liberty of the subject, this hereditary landed *revenue* is now sunk almost to nothing; and the casual profits, arising from the other branches of the *census regalis*, are likewise almost all of them alienated from the crown. In order to supply the deficiencies of which, we are now obliged to have recourse to new methods of raising money, unknown to our early ancestors; which methods constitute the king's *extraordinary revenue*. See TAX, FUND, and NATIONAL *debt*. We shall here observe, that the *aggregate* FUND stands mortgaged by parliament to raise an annual sum for the maintenance of the king's houshold, and the CIVIL *list*. For this purpose, in the late reigns, the produce of certain branches of the excise and customs, the post-office, the duty on wine licences, the revenues of the remaining crown lands, the profits arising from courts of justice (which articles include all the hereditary *revenues* of the crown), and also a clear annuity of 120,000*l.* in money, were settled on the king for life, for the support of his majesty's houshold, and the honour and dignity of the crown. And, as the amount of these several branches was uncertain (though in the last reign they were computed to have sometimes raised almost a million), if they did not arise annually to 800,000*l.* the parliament engaged to make up the deficiency. But his present majesty, soon after his accession, having accepted the limited sum of 800,000*l.* per annum for the support of his civil list (charged also with three life-annuities, to the princess of Wales, the duke of Cumberland, and the princess of Amelia, to the amount of 77,000*l.*) the said hereditary and other *revenues* are now made a part of the aggregate fund, which is charged with the payment of the

the whole annuity to the crown of 800,000*l.* per annum. The expences defrayed by the civil list are those that in any shape relate to civil government; as the expences of the houshold; all salaries to officers of state, to the judges, and each of the king's servants; the appointments to foreign ambassadors; the maintenance of the queen and royal family; the king's private expences, or privy purse; and other very numerous outgoings, as secret service money, pensions, and other bounties; which sometimes have so far exceeded the *revenues* appointed for that purpose, that application has been made to parliament to discharge the debts contracted on the civil list; as particularly in 1724, when one million was granted for that purpose by the statute 11 Geo. I. cap. 17. and in 1769, when half a million was appropriated to the like use, by the statute 9 Geo. III. cap. 34.

The civil list is, indeed, properly the whole of the king's *revenue* in his own distinct capacity; the rest being rather the *revenue* of the public, or its creditors, though collected and distributed again in the name and by the officers of the crown.

The whole *revenue* of queen Elizabeth did not amount to more than 600,000*l.* a year; that of king Charles I. was 800,000*l.* and the *revenue* voted for king Charles II. was 1,200,000*l.* but under these sums were included all kinds of public expence. The same *revenue*, subject to the same charges, was settled on king James II. but by the increase of trade, and better management, it amounted on an average to a million and a half per annum (beside other additional customs, granted by parliament, which produced an annual *revenue* of 400,000*l.*) out of which his fleet and army were maintained at the yearly expence of 1,100,000*l.* At this time the *revenues* of the king of France were computed at seven millions sterling; and those of the states of Holland at three millions. After the Revolution, when the parliament took into its own hands the annual support of the forces, both maritime and military, a civil list *revenue* was settled on the new king and queen, amounting, with the hereditary duties, to 700,000*l.* per annum; and the same was continued to queen Anne and king George I. That of king George II. was nominally augmented to 800,000*l.* and in fact was considerably more. But that of his present majesty is expresly limited to that sum; and by reason of the charges upon it, amounts at present to little more than 700,000*l.* Blackst. Comm. vol. i. chap. viii.

The clear yearly sum of 100,000*l.* to commence from the fifth of January, 1777, over and above the sum of 800,000*l.* before granted, was granted to his majesty out of the aggregate fund by stat. 17 Geo. III. To which if we add the *revenue* from Hanover, Ireland, Wales, Lancaster, Cornwall, the $4\frac{1}{2}$ per cent. in the West Indies, the coal-pits at Louisbourg, and the interest of debts due to the late king, the clear royal income may be estimated at considerably more than one million; and the expenditure for one year, viz. from January 6, 1776, to January 5, 1777, has been stated at 984,100*l.* but by some late regulations (1782) is reduced to 850,000*l.*

For more particulars of this kind, see POLITICAL *arithmetic*, and FUND, and TAX.

REVENUE, *auditors of the.* See AUDITOR.

REVENUE, *court of.* See COURT *of Exchequer*.

REVENUE, *officers of*, are excluded from voting in elections for members of parliament by 22 Geo. III.

REVENUE, *revenu*, in *Hunting*, a fleshy mass or lump, formed chiefly of a cluster of whitish worms on the heads of deer, and supposed to occasion them to cast their horns, by those worms gnawing the roots thereof.

The *revenue* distilled, is said to help women in travail.

REVENUE is also used for a new tail of a partridge, growing out after the loss of a former. The *revenue* is measured by fingers: thus they say, a partridge of two, three, four fingers *revenue*.

REVERBERATION, *reverberatio*, formed from *re*, and *verbero*, q. d. *I beat again*, in *Physics*, the act of a body repelling or reflecting another, after its impinging thereon.

In the glass-men's furnace the flame *reverberates* or bends back again to burn the matter on all sides. Echoes are occasioned by the *reverberation* of sounds from arched obstacles.

Reverberation and *resilition* refer to the same action; only the one to the agent, the other to the patient. A polished body *reverberates* the rays all around; the *resilition* of the rays does not arise from their striking against the solid parts of bodies. See REFLECTION.

REVERBERATION, in *Chemistry*, denotes a kind of circulation of the flame, by means of a *reverberatory*; or the return of the flame from the top of the furnace back to the bottom, chiefly used in calcination.

Reverberation is of two kinds. The first with a *close fire*; that is, in a *reverberatory* furnace, where the flame has no vent a-top; being covered with a dome, or capital, which repels its action back on the matter, or the vessel that contains it, with increased vehemence.

After this manner are refining, the distillation of acid spirits, &c. performed.

Reverberation with an *open fire*, is that performed in a furnace or *reverberatory*, whose registers are all open; used in calcination, &c.

REVERBERATORY, or REVERBERATING *furnace*, is a chemical furnace built close all around, and covered at the top with a capital of brick or tiles, so as not to give any vent to the heat or flame, but to determine it to *reverberate* or turn back from the brick-work with new force, upon the matters placed at bottom.

When the fire has no vent or passage a-top, it is a whole *reverberatory*; when the middle of the capital is open, and only the sides close, so that there is only a half circulation of the flame, it is called a *half reverberatory*.

The *reverberating* furnace is chiefly used in the fusion and calcination of metals and minerals, and on other occasions, where the most intense heat is required, as in assaying, &c. Whence it is also called the *melting furnace*, and *assaying furnace*. See *Reverberating* FURNACE.

REVEREND, *reverendus*, a title of respect given to ecclesiastics.

The religious abroad are called *reverend* fathers; and abbesses, prioresses, &c. are called *reverend mothers*.

With us, bishops are *right reverend*; and archbishops *most reverend*. In France, their bishops, archbishops, and abbots, are all alike *reverendissimes*, *most reverend*.

REVERIE, a term purely French, frequently used of late in English, to signify a delirium, raving, or distraction. It is an ill sign in fevers when the patient falls into a *reverie*.

Hence also *reverie* comes to be used for any ridiculous, extravagant imagination, action, or proposition, a chimera or vision. Thus we say, authors obtrude abundance of their *reveries* upon us for solid truths.

But the most ordinary use of the word *reverie*, among English writers, is for a deep, disorderly musing or meditation, equivalent to what we popularly call a *brown study*. Thus, a little distraction I would allow; but for that continued series of *reveries* some people are guilty of, who are ever absent from the place where you see them, and are never present any where, it is inexcusable.

REVERS, *battery de.* See BATTERY.

REVERSATA *arma.* See ARMA.

REVERSE, in the *Military Art*, signifies on the back, or behind. Thus we say, a *reverse view*, a *reverse commanding ground*, a *reverse battery*, &c.

REVERSE, formed of *re*, *again*, and *versus*, *turned*, in *Law*, &c. To *reverse*, signifies to undo, repeal, or make void.

A judgment may be *reversed* or voided for matters foreign to or *dehors* the record, that is, not apparent upon the face of it, by writ of error, and by act of parliament. The effect of falsifying or reversing an outlawry is, that the party shall be in the same plight as if he had appeared upon the capias; and if it be before plea pleaded, he shall be put to plead to the indictment; if after conviction, he shall receive the sentence of the law; for all the other proceedings, except only the process of outlawry for his non-appearance, remain good and effectual as before. But when judgment, pronounced upon conviction, is falsified or *reversed*, all former proceedings are absolutely set aside, and the party stands as if he had never been at all accused; restored in his credit, his capacity, his blood, and his estates. But he still remains liable to another prosecution for the same offence. See ATTAINDER, JUDGMENT, and OUTLAWRY.

REVERSE of a medal, coin, &c. denotes the second, or back side; in opposition to the head or principal figure.

F. Chamillart, a Jesuit, has an express dissertation on this point, whether or no the *reverses* of medals have always a regard to the emperors or empresses whose heads are represented on the front-side of the medal? He says, that till of late the antiquaries have made no doubt of it; but that there are now several authors of another opinion.

The knowledge of the *reverses* of medals constitutes a distinguishing part of this science. With respect to the consular medals, it is observed, that the same *reverse* is common to many of them; as Castor and Pollux on horseback, first used; then a Victory, or one of the gods; or the person to whose honour the medal was struck, driving a chariot with two or four horses; whence the denomination of the DENARIUS *bigatus*, and *quadrigatus*. The ratis or ship, or prow of a ship, as an emblem of naval power, was no uncommon *reverse* on the consular coins; which were, on this account, called *ratiti*. Some of the consular medals, that bore on the face the impress of their ancient kings, preserved on the *reverse* the

the record of some worthy action which they had performed, as the famous aqueduct on the *reverse* of Ancus, in honour of his having begun it. Medals, struck on occasion of founding colonies, have sometimes on the *reverse* a priest following a yoke of oxen, with a plough; designed to denote the manner in which the boundaries of colonies were marked out, or that they were planted by the common people; and those trophies that are sometimes seen on medals of this kind, signify that they were planted by the veteran soldiers.

The *reverses* of imperial medals are very various; but the chief of them may be reduced to three classes, viz. figures or personages; public monuments or buildings; and inscriptions. The figures are sometimes those of princes in miniature, whose portraits are exhibited more at large on the face; as on the *reverses* of the emperors of the family of Constantine, we often see the emperor standing with a labarum in his right hand, and a globe, surmounted with a victory, in his left. Sometimes the emperor is disguised under the figure of some god; as on the *reverse* of a Dioclesian, who had assumed the name Jovius, he appears in the figure of Jupiter, sitting in a chair, with a globe in his hand, surmounted with a Victory; the legend being IOVI. H. U. C. C. i. e. *Hoc voluerunt consules*. Sometimes the figure on the *reverse* is some relation of that on the face; as Augustus on the *reverse* of Julius, and Claudius on the *reverse* of his mother Antonia. The figure of some deity is sometimes seen on the *reverse*; as Minerva on the *reverse* of a Domitian; and the goddess Salus, with a patera in her hand, sacrificing to Esculapius, on the *reverse* of a Marcus Aurelius. The virtues for which the emperors were or wished to be celebrated, are also frequently expressed by the figures on the *reverses*; as Virtue or Courage, represented by a bold armed woman with a spear in her right hand, and a parazonium in her left, on the *reverse* of a Domitian; Liberty, carrying in her right hand the cap of liberty, and in her left the wand called rudis or vindicta, on the *reverse* of a Commodus; and Equity, with a spear in her right hand, and a balance in her left, on the *reverse* of a Vespasian. The virtues of the ladies are also celebrated on the *reverses* of their medals; as Piety, in the habit of a vestal virgin, strewing frankincense on an altar, on the *reverse* of a Faustina; Fœcunditas on another medal of the same, and Spes Reipublicæ, expressed by a female figure, wearing a helmet to represent the republic, and two children at her breasts, on the *reverse* of a Maximiana Fausta, second wife of Constantine the Great. Provinces are also represented by figures or personages, denoting either the emperor's conquest or care of them; as Judæa, sitting in a melancholy posture at the bottom of a pillar adorned with trophies, to signify her captive state, on the *reverse* of a Vespasian; and Italia, with a cornucopia, in her right hand, to denote her fruitfulness; a crown of towers on her head, to represent her many cities; a scepter in her left hand, and sitting on a globe, to shew that she was sovereign of nations, on the *reverse* of a Commodus. Moreover, the figure is sometimes designed to immortalize some worthy action of the emperor; as the goddess Moneta, with a cornucopia in her left hand, and a balance in her right, on the *reverse* of a Domitian, to denote his care about the public coin. There are sometimes two, three, or more figures, on the same *reverse*; as Honos and Virtus on the *reverse* of Galba; and three kings, with the emperor crowning them, on a medal of Trajan. There are also the figures of animals on the *reverses* of some medals; as the eagle and peacock, to denote the apotheosis of princes and princesses; the crocodile, as the symbol of Egypt; a serpent, of Esculapius; a camel, of Arabia, &c. and elephants in trappings on the *reverse* of an Antoninus Pius and a Severus, importing that these emperors procured those beasts to entertain the people at the public shews. We meet also with fabulous animals; as the grifin on the *reverse* of one medal of Gallienus, a centaur on another, and a phœnix on some medals of Constantine and his sons, denoting the perpetuity of the empire.

The second sort of *reverses* comprehends public monuments and buildings; as the Temple of Janus shut on the *reverse* of a Nero, to signify the universal peace he gave to the empire; the Macellum, or shambles, which he caused to be erected, on another; the sumptuous Bridge built by Trajan over the Tiber, on the *reverse* of one of his medals; and the Amphitheatre and Naval Column, on those of Titus.

The third sort of *reverses* includes inscriptions on the table or field of the medal. On several Latin and Greek imperial medals, we find nothing on the reverse but S. C. or Δ. E. for δημαρχικης εξουσιας, inclosed in a crown. Others represent signal occurrences; as VICTORIA GERMANICA IMP. VI. COS. III. on the *reverse* of M. Aurelius. Others have titles of honour granted to the princes; as S. P. Q. R. OPTIMO PRINCIPI, on the *reverse* of a Trajan, and also of an Antoninus Pius. Other inscriptions again have respect to public vows, which were made for the emperor every ten years, or sometimes, in the lower empire, every five years. Thus we have on the *reverse* of a Constantius VOTIS XXX. MULTIS XXXX. importing probably their engagement to make new vows at the expiration of thirty years, that he might reign forty years.

Besides the *reverses* already enumerated, there are others, called by Addison riddles, which cannot be referred to any of the above classes. Thus, Mercury in the form of a Terminus, standing on a thunder-bolt, on the *reverse* of an Augustus, was probably intended for a rebus, to express the sense of that emperor's motto, *festina lente*. Instruments of religion were symbols of the pontifex maximus, and signified the piety of the prince on whose coin they appear; as the lituus, the simpulum, the aspersorium, and the capula, on the *reverse* of a Nerva. Two hands joined, holding two ears of corn, and a caduceus betwixt them, on the *reverse* of a Titus, import the good harmony and union subsisting betwixt the prince and the public, the peace arising from such an union, and the plenty, which is the fruit of such a peace. Jennings's Introduction to the Knowledge of Medals, p. 44, &c. Addison's Three Series of Medals, in his Works, vol. i. p. 522, &c. See MEDALS.

REVERSE, in *Fencing*, a back-stroke.

REVERSED, in *Heraldry*, a thing turned backwards, or upside down.

REVERSED *talon*, in *Architecture*. See TALON.

REVERSING, or RENVERSING, in *Music*, the inverting the order of the parts; that is, placing the higher part, or treble, in the room of the lower part or bass.

Reversing is frequently practised in figurative counterpoint, where the bass serves as treble, and the treble, at the same time, as bass; and all this in such manner, as that the harmony, though very different, is yet as correct as before the *reversing*, when the parts were in their natural order.

A *reversed* fugue, or counterfugue, called by the Italians *per contrarii movementi*, is when the guida falls, and the other, instead of imitating by falling, imitates by rising; or, it is a figure *per arsin & thesin*.

REVERSION, *reversio*, in *Law*, is defined by Coke, a returning of lands, &c. into the possession of the donor, or his heirs, after the expiration of the term for which they were given or granted to another. Or, an estate in *reversion*, is the residue of an estate left in the granter, to commence in possession after the determination of some particular estate granted out by him.

The word has a double acceptation. The first is, *jus revertendi, cum status possessionis defecerit*; which is no more than an interest in the land, when the occupation or possession of it shall fall.

The second is, when the possession and estate, which was parted with for a time, ceaseth, and is determined in the person of the alienees, assignees, grantees, or their heirs, or effectually returns to the donor, his heirs or assigns, whence it was derived.

This is the most proper signification of the word, which is derived from *revertor*: *Et apte dici non potest* reversio, *antequam revertatur in facto*. Littlet.

The difference between a *reversion* and a REMAINDER consists in this, that a remainder is general, and may remain or belong to any man but him that granteth or conveyeth the land, &c.

Whereas a *reversion* is to himself, from whom the conveyance of the land, &c. proceeded, and is commonly perpetual as to his heirs also. And yet sometimes *reversion* is confounded with remainder.

A *reversion* is never created by deed or writing, but arises from construction of law; a remainder can never be limited, unless by either deed or devise. But both are equally transferable, when actually vested, being both estates *in præsenti*, though taking effect *in futuro*. The usual incidents to *reversions* are said to be fealty and rent. When no rent is reserved on the particular estate, fealty however results of course, as an incident quite inseparable, and may be demanded as a badge of tenure, or acknowledgment of superiority, being frequently the only evidence that the lands are holden at all. Where rent is reserved, it is also incident, though not inseparably so, to the *reversion*. The rent may be granted away, reserving the *reversion*; and the *reversion* may be granted away, reserving the rent, by special words; but by a general grant of the *reversion*, the rent will pass with it, as an incident thereunto; though by the grant of the rent generally, the *reversion* will not pass. The incident passes by the grant of the principal, but not *e converso*; for the maxim of the law is, *accessorium non ducit, sed sequitur, suum principale*.

The law has carefully diſtinguiſhed remainders from *reverſions*. Thus, if one ſeiſed of a paternal eſtate in fee makes a leaſe for life, with remainder to himſelf and his heirs, this is properly a mere *reverſion*, to which rent and fealty ſhall be incident; and which ſhall only deſcend to the heirs of his father's blood, and not to his heirs general, as a remainder limited to him by a third perſon, would have done; for it is the old eſtate, which was originally in him, and never yet was out of him. And ſo, likewiſe, if a man grants a leaſe for life to A, reſerving rent, with *reverſion* to B and his heirs, B hath a remainder deſcendible to his heirs general, and not a *reverſion* to which the rent is incident; but the granter ſhall be entitled to the rent, during the continuance of A's eſtate.

For the aſſiſtance of thoſe who have any eſtate in remainder, *reverſion*, or expectancy, after the death of others, againſt fraudulent concealments of their deaths, it is enacted by 6 Ann. cap. 18. that all perſons on whoſe lives any lands or tenements are holden, ſhall (upon application to the court of chancery, and order made thereupon) once in every year, if required, be produced to the court or its commiſſioners; or, upon neglect or refuſal, they ſhall be taken to be actually dead, and the perſon entitled to ſuch expectant eſtate may enter upon and hold the lands and tenements, till the party ſhall appear to be living. Blackſt. Comm. book ii. p. 175, &c.

For the method of finding the values of *reverſions*, or eſtates in *reverſion*, ſee ANNUITIES and SURVIVORSHIP.

REVERSION *of ſeries*, in *Algebra*, is a method of finding a natural number from its logarithm given; or the ſine from its arch; or the ordinate of an ellipſis from an area given to be cut off from any point in the axis.

Or more generally thus. The value of any indefinite quantity, y, for inſtance, being expreſſed by an infinite ſeries of ſimple terms, including different powers of another variable quantity, x, the value of x is thence to be found, by a kind of reverſed operation, expreſſed in a ſeries of ſimple terms, including different powers of the quantity y.

There are various ways of doing this. One, which is often convenient, is by aſſuming a ſeries with indeterminate coefficients of a certain form.

Example 1. Let $ax+bx^2+cx^3+dx^4+ex^5$, &c. $= y$; to *revert* the ſeries, or to find x in an infinite ſeries expreſſed in the powers of y.

Here, by writing y^n for x, the indices of the powers of y, in the equation, will be n, $2n$, $3n$, &c. and 1; therefore $n = 1$; and the differences are 0, 1, 2, 3, 4, 5, &c. and ſo the ſeries to be aſſumed, in this caſe, is $Ay + By^2 + Cy^3 + Dy^4$, &c. which being involved and ſubſtituted for the reſpective powers of x (neglecting, every where, all ſuch powers of x and y as exceed the higheſt you would have the ſeries carried to) there ariſes

$$\left.\begin{array}{lllll} aAy + aBy^2 & + aCy^3 & + aDy^4 & \&c. \\ * \quad + bA^2y^2 & + 2bABy^3 & + 2bACy^4 & \&c. \\ & & + bB^2y^4 & \&c. \\ * \quad\quad * & + cA^3y^3 & + 3cA^2By^4 & \&c. \\ * \quad\quad * & \quad * & + dA^4y^4 & \&c. \end{array}\right\} = y$$

Whence, by comparing the homologous terms, $A = \frac{1}{a}$; $B = -\frac{b}{a^3}$; $C\left(= -\frac{2bAB + cA^3}{a}\right) = \frac{2bb - ac}{a^5}$; $D\left(= -\frac{2bAC + bB^2 + 3cA^2B + dA^4}{a}\right) = \frac{5abc - 5b^3 - a^2d}{a^7}$, &c. and conſequently $x = \frac{y}{a} - \frac{by^2}{a^3} + \frac{2bb - ac}{a^5} \times y^3 - \frac{5b^3 - 5abc + a^2d}{a^7} \times y^4$, &c.

For an inſtance of the uſe of this concluſion, let $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4}$, &c. $= y$. Then a being, in this caſe, $= 1$, $b = -\frac{1}{2}$, $c = \frac{1}{3}$, $d = -\frac{1}{4}$, &c. we ſhall, by ſubſtituting theſe values, have $x = y + \frac{y^2}{2} + \frac{y^3}{6} + \frac{y^4}{24}$, &c.

From whence, when y is given, x will alſo be given; provided the value of y be ſufficiently ſmall.

Example 2. Let there be given $ax + by + cx^2 + dxy + ey^2 + fx^3 + gx^2y + hxy^2 + iy^3 + kx^4 + lx^3y$, &c. $= 0$; to find y.

By aſſuming $y = Ax + Bx^2 + Cx^3 + Dx^4$, &c. and proceeding as above, A will be found $= -\frac{a}{b}$, $B = -\frac{c + dA + eA^2}{b}$, $C = -\frac{dB + 2eAB + f + gA + hA^2 + iA^3}{b}$, $D = -\frac{dC + 2eAC + eB^2 + gB + 2hAB + 3iA^2B + k + lA + mA^2 + nA^3 + pA^4}{b}$, &c.

Example 3. Laſtly, let $x^m + bx^{m+p} + cx^{m+2p} + dx^{m+3p} +$ &c. $= z$.

Here, in order to determine the form of the ſeries to be aſſumed, let z^n be wrote for x in the given equation, according to the uſual method; and then the exponents, ſuppoſing z tranſpoſed, will be 1, nm, $nm + np$, $nm + 2np$, $nm + 3np$, &c. reſpectively; whereof the two leaſt (1 and nm) being made equal to each other, n is found $= \frac{1}{m}$; and the differences are $\frac{p}{m}$, $\frac{2p}{m}$, $\frac{3p}{m}$, &c. Whence the ſeries to be aſſumed for x is $z^{\frac{1}{m}} + Bz^{\frac{1+p}{m}} + Cz^{\frac{1+2p}{m}} + Dz^{\frac{1+3p}{m}} +$, &c. (for it is evident, by inſpection, that the coefficient (A) of the firſt term muſt here be an unit). This ſeries being therefore raiſed to the ſeveral powers of x, in the given equation, and the coefficients of the homologous terms in the new equation compared together, it will be found that, $B = -\frac{b}{m}$, $C = \frac{\overline{1 + m + 2p} \times bb - 2mc}{2m^2}$, $D = -\frac{\overline{2m^2 + 9mp + 9p^2 + 3m + 6p + 1} \times b^3}{6m^3} + \frac{\overline{1 + m + 3p} \times bc}{m^2} - \frac{d}{m}$, &c.

From the general value of x, found above, iunumerable theorems, for *reverting* particular forms of ſerieſes, may be deduced.

Thus, if $x + bx^2 + cx^3 + dx^4$, &c. $= z$; then (m being $= 1$, and $p = 1$) x is $= z - bz^2 + \overline{2bb - c} \times z^3 - \overline{5b^3 - 5bc + d} \times z^4$, &c.

And, if $x + bx^3 + cx^5 + dx^7 +$, &c. $= z$; (m being $= 1$, and $p = 2$) $x = z - bz^3 + \overline{3bb - c} \times z^5 - \overline{12b^3 - 8cb + d} \times z^7$, &c.

Alſo, if $x^{\frac{1}{2}} + bx^{\frac{3}{2}} + cx^{\frac{5}{2}} + dx^{\frac{7}{2}}$, &c. $= z$; then (m being $= \frac{1}{2}$, and $p = 1$) $x = z^2 - 2bz^4 + \overline{7bb - 2c} \times z^6 - \overline{30b^3 - 18bc + 2d} \times z^8$, &c. &c.

It may be obſerved that, in all theſe forms of ſerieſes, the firſt term is without a coefficient (which renders the concluſion much more ſimple). Therefore, when the ſeries to be *reverted* has a coefficient in its firſt term, the whole equation muſt be firſt of all divided thereby. Thus, if the equation was $3x - 6x^2 + 8x^3 - 13x^4$, &c. $= y$; by dividing the whole by 3 it will become $x - 2x^2 + \frac{8x^3}{3} - \frac{13x^4}{3}$, &c. $= \frac{1}{3}y$; where, putting $z = \frac{1}{3}y$, we have, by Form. 1. $x = z + 2z^2 + \frac{16}{3}z^3$, &c. $= \frac{y}{3} + \frac{2y^2}{9} + \frac{16y^3}{81}$, &c. Simpſon's Fluxions, vol. ii. p. 302, &c. Mac-Laurin's Algebra, p. 263. and Mr. De Moivre, in the Phil. Tranſ. N° 240.

Other methods may be ſeen in Mr. Stuart's explanation of Sir Iſaac Newton's Treatiſe of Analyſis by Equations of an infinite Number of Terms, p. 455. See alſo Horſley's edition of Newton's Works, vol. i. p. 291, &c. and Colſon's Comment. on Newton's Fluxions, &c. p. 219, &c.

REVERT, in *Law*. A thing is ſaid to *revert*, when it returns or falls back to its firſt owner.

All honours and royal fees, alienated, *revert* to the crown, or are *revertible*. Apanages, or portions of younger ſons of kings, are granted on condition of *reverſion*.

REVERTER, *formedon in the*, in *Law*. See FORMEDON.

REVETEMENT, in *Fortification*, is a ſtrong wall built on the outſide of the rampart and parapet, to ſupport the earth, and prevent its rolling into the ditch. See CORDON.

REVIEW, in *Chancery*. A *bill of review* is where the cauſe has been heard, and a decree therein ſigned and enrolled; but ſome error in law appears in the body of the decree, or ſome new matter is diſcovered in time, after the decree made. A bill of *review* is not exhibited but by leave of the court.

A *commiſſion of review* is a commiſſion ſometimes granted, in extraordinary caſes, to reviſe the ſentence of the COURT *of delegates*; when it is apprehended they have been led into a material error. This commiſſion the king may grant, although the ſtatutes 24 and 25 Hen. VIII. declare the ſentence of the DELEGATES definitive; becauſe the pope, as ſupreme head by the canon law, uſed to grant ſuch commiſſions of *review*; and ſuch authority, as the pope heretofore exerted, is now annexed to the crown by ſtatutes 26 Hen. VIII. cap. 1. and 1 Eliz. cap. 1. But this is not matter of right, which the ſubject may demand *ex debito juſtitiæ*, but merely a matter of favour, and which, therefore, is often denied. See APPEAL.

REVIEW, in *Military Language*, is the appearance of an army, or part of an army, arranged in form of battle and exercised, in presence of the king or of a general. The firings in *reviews* are generally thirty-six rounds, viz. by companies; by grand divisions; by subdivisions; obliquely, advancing, retreating; by files; in the square; street-firings, advancing and retreating; and, lastly, a volley.

The intention of a *review* is to know the condition of the troops, and to see that they are complete, and that they perform their exercise and evolutions well.

REVILING *the ordinances of the church*, in *Law*, is an offence punishable by statute. Thus it is provided by 1 Edw. VI. cap. 1. and 1 Eliz. cap. 1. that whoever *reviles* the sacrament of the Lord's Supper shall be punished by fine and imprisonment. See COMMON *Prayer*.

REVISE, among *Printers*, a second proof of a sheet to be printed, taken off after correcting the first.

REVIVER. See REVIVOR.

REVIVIFICATION, RESUSCITATION, or REDUCTION, in *Chemistry*, the art of restoring a mixed body to its first state, after it had been altered and disguised by dissolution, calcination, or the like.

This term, in its more confined sense, is usually applied to those operations by which metals are restored to their metallic state, after they have been deprived of this state, either by the loss of their phlogiston, or by the union of some heterogeneous matters which disguise them, as fulminating gold, luna cornea, cinnabar, and other such compounds. The *revivification* of metallic calces regards only imperfect metals, which alone lose their metallic properties by the loss of phlogiston, and which are deprived of this principle by the action of air or water, whereby they are changed into rust, or by the action of acids, or by ordinary calcination. These are capable of recovering their metallic properties, by being recombined with the inflammable principle, provided that their calcination or dephlogistication has not been too complete, and that the phlogiston be applied in a state favourable for combination. The calces of those metals which cannot be radically calcined, as lead, bismuth, iron, and copper, may recover their phlogiston, and be revivified, without fire or fusion, merely by the contact of phlogistic vapours, e. gr. by the vapour of liver of sulphur; or by being precipitated by some substance capable of applying phlogiston to them. However, metals, whose masses are large, are only superficially revivified in this way. A much more expeditious method of revivifying metals is by fusion; in which operation care should be taken to well mix the metallic calx with a proper quantity of the matter, that is to furnish it with phlogiston; to add to the mixture some saline or vitreous matter, capable of facilitating the fusion, and separation of the reduced metal from the scoria; to prevent any communication with external air, that the phlogiston may not be consumed; and to keep the fire low at first, and to raise it towards the end, so that both the metal and the superabundant scoria may be perfectly fused. The reduction of very volatile semi-metals, as zinc and arsenic, should be made in vessels perfectly close; as in an earthen retort.

The reduction of metals, which do not lose their inflammable principle, as gold, silver, and mercury, is to be performed, not by restoring phlogiston, but by some intermediate substance, capable of separating from them the matter which is united with them; which will, therefore, be different, according to the matter united with the metal. Thus, fulminating gold may be reduced by fusing it with sulphur, or with fixed alkali; because either of these substances will decompose the nitrous ammoniacal salt which gives the fulminating property to gold. Luna cornea is reduced by fusing it with a large quantity, e. gr. with twice its weight of fixed alkali, which separates the marine acid united with the silver. It may also be well reduced by precipitation, and by treating it with other metals which have more affinity than silver with marine acid; such as tin, iron, and regulus of antimony. The mercury of cinnabar is to be reduced or separated from the sulphur, by mixing with the cinnabar any substance which has greater affinity with sulphur than mercury has, such as fixed alkalis, absorbent earths, iron, copper, lead, silver, or regulus of antimony. Filings of iron are generally employed in this operation; an equal weight of which is to be mixed with the cinnabar, and the whole distilled together, by which the mercury will be raised and collected at the bottom of the receiver under some water placed there to facilitate its condensation. The sulphur of the cinnabar remains in the *retort* united with the intermediate substance employed for the separation. This is called *mercury revived from cinnabar*. Chem. Dict. art. *Reduction*. See CINNABAR *of antimony*.

REVIVIFIED *antimony*. See ANTIMONY.

REVIVING, in *Law*, a renewing of rents and actions after they had been extinguished.

REVIVOR, or REVIVER, in *Law*. A bill of *revivor* is where a bill has been exhibited in chancery against one who answers; but, before the cause is heard, or at least before the decree is enrolled, one of the parties dies.

In this case, a bill of *revivor* must be brought, praying the former proceedings may stand *revived*, and be put in the same condition as at the time of the abatement.

REVOCATION, *revocatio*, in *Law*, the act of *revoking*, calling back, or annulling, a power, grant, &c. made before.

The *revocation* of an offer, after it is accepted of, is invalid. All preceding wills or testaments are *revoked* by the last; but the republication of a former will revokes one of a later date, and establishes the first again.

The *revocation* of a devise of lands and tenements must be in writing, signed by the testator, or some other person in his presence, and by his express direction; and be subscribed, in his presence, by three or four credible witnesses.

A prior claustral is *revocable* at pleasure. The *revocation* of the *edict of* NANTES was fatal to the French protestants.

REVOCATION *of uses*. See USE.

REVOLUTION, formed from *revolvo*, *to roll backwards*, in *Politics*, denotes a grand turn or change of government.

There are no states in the world but have undergone frequent *revolutions*. The abbot de Vertot has furnished us with two or three good histories of the *Revolutions* of Sweden, the *Revolutions* of Rome, &c.

The REVOLUTION, used with us by way of eminence, denotes the great turn of affairs in England in 1688, when king James II. abdicating, the prince and princess of Orange were declared king and queen of England, &c. See *Right of* CROWN.

The true ground and principle upon which that memorable event proceeded, was an entirely new case in politics, which had never before happened in our history; the abdication of the reigning monarch, and the vacancy of the throne thereupon. Accordingly, in a full assembly of the lords and commons, met in convention on occasion of this vacancy, both houses came to this resolution: "That king James the Second, having endeavoured to subvert the constitution of the kingdom, by breaking the original contract between king and people; and, by the advice of Jesuits, and other wicked persons, having violated the fundamental laws; and having withdrawn himself out of this kingdom, has abdicated the government, and that the throne is thereby vacant." The lords and commons having determined this fundamental article, that there was a vacancy of the throne, proceeded to fill up that vacancy in such manner as they judged the most proper. And this was done by their declaration of 12 February, 1688, in the following manner: "That William and Mary, prince and princess of Orange, be, and be declared king and queen, to hold the crown and royal dignity during their lives, and the life of the survivor of them; and that the sole and full exercise of the regal power be only in, and executed by, the said prince of Orange, in the names of the said prince and princess, during their joint lives; and after their deceases the said crown and royal dignity to be to the heirs of the body of the said princess; and for default of such issue to the princess Anne of Denmark, and the heirs of her body; and for default of such issue to the heirs of the body of the said prince of Orange." This transaction, founded in equity, and strictly agreeable to the spirit of our constitution, and the rights of human nature, formed a new æra in the history of our country, in which the bounds of prerogative and liberty have been better defined, the principles of government more thoroughly examined and understood, and the rights of the subject more explicitly guarded by legal provisions, than in any other period of the English history. Blackst. Comm. book i. p. 211, &c. book iv. p. 433.

REVOLUTION, in *Geometry*. The motion of any figure quite round a fixed line, as an axis, is called the *revolution* of that figure; and the figure so moving is said to *revolve*.

Thus, a right-angled triangle, revolving round one of its legs, as an axis, generates, by that *revolution*, a CONE.

REVOLUTION, in *Astronomy*, denotes the period of a star, planet, comet, or other phenomenon; or its course from any point of its orbit, till it return to the same.

The planets have a twofold *revolution*. The one about their own axis, usually called their *diurnal rotation*, which constitutes what we call their *day*.

The other about the sun, called their *annual revolution* or

or *period*, conſtituting their year. See *Motion of the* PLANETS.

REVOLUTUM *folium*, among *Botaniſts*. See LEAF.

REUTELE, in *Ichthyology*, a name uſed by ſome for the *umbla minor*, or red CHARR, a fiſh common in the lakes of Germany, and of the northern parts of England and Wales. The name is originally German.

REVULSION, *revulſio*, in *Medicine*, the turning a flux of humours from one part of the body to another, either neighbouring or oppoſite part.

In very dangerous wounds, where the loſs of blood is great, and the ſtopping it ſpeedily enough is impracticable, it is uſual to open a vein in ſome remote part, to cauſe a *revulſion*; that is, to turn the courſe of the blood from the former part to that where the aperture is made. *Revulſions* are alſo cauſed by cupping, friction, &c.

REVULSION is alſo uſed for a ſpontaneous turn or reflux of humours in the body. Sudden diſeaſes are occaſioned by great *revulſions* of humours, which fall all at once on certain parts.

REWARDS. Military *rewards*, among the Athenians, conſiſted ſometimes in crowns preſented to thoſe that had merited them; on which their names and noble actions were inſcribed. Some had leave granted them to erect pillars or ſtatues in honour of ſome god, with inſcriptions ſetting forth their victories. This was a favour that was ſeldom granted; Cimon indeed was honoured with it, but Themiſtocles could never obtain the like. Another honour conferred at Athens on the valiant, was to have their arms placed in the citadel, and to be called *Cecropidæ*, or citizens of the true old blood. Others were preſented with a πανοπλια, or complete ſuit of armour. Songs of triumph were honorary compliments paid to ſome. The children of thoſe who were killed in battle were maintained at the public expence, till they came to maturity; at which time they were preſented before the aſſembly of the Athenian people with a complete ſuit of armour, one of the public miniſters proclaiming before them, "that hitherto, in remembrance "of their fathers merits, the commonwealth had edu- "cated theſe young men, but now diſmiſſed them ſo "armed, to go forth and thank their country by imitat- "ing their fathers examples."

Solon made a farther proviſion for the parents of thoſe that died in the wars, it being extremely reaſonable that they ſhould be maintained at the public expence, who had loſt their children, the comfort and ſupport of their declining age, in the ſervice of the public.

As for thoſe who were any wiſe diſabled, they had an allowance from the public towards their maintenance. Potter, tom. ii. p. 118, ſeq.

REWARDS, in a *Legal Senſe*. There are *rewards* given in many caſes, by ſtatute, for the apprehending of criminals, and bringing them to juſtice; as a *reward* of 40*l.* to thoſe who apprehend robbers on the highway, and proſecute them to conviction, by 4 & 5 W. & M. c. 8. to be paid to them (or, if killed in the endeavour to take them, their executors) by the ſheriff of the county; to which the ſtatute 8 Geo. II. c. 16. ſuperadds 10*l.* to be paid by the hundred indemnified by ſuch taking. Alſo the like *reward* of 40*l.* for apprehending and proſecuting of burglars. Stat. 5 Ann. cap. 31. See LARCENY. The ſame *reward* for apprehending of money-coiners or clippers, &c. 6 & 7. W. III. And the like *reward* for the apprehenſion of thief-takers, not proſecuting felons; and of perſons reſiſting the officers of the cuſtoms, by force of arms, &c. 6 Geo. I. cap. 20. 22. See DISCOVERY *of accomplices*.

REWEY, a term among *Clothiers*, ſignifying cloth unevenly wrought, or full of *rewes*. 43 Eliz. cap. 10.

REX *mullorum*, in *Ichthyology*, a name given by ſome authors to a ſpecies of MULLET, diſtinguiſhed from all the others by its having a prominent belly, and having no beards under the mouth.

REY, or RYE *graſs*, in *Botany*. See GRASS.

RHABARBARUM, in *Botany*. See RHUBARB.

RHABDOIDES, Ῥαβδοειδης, formed from ῥαβδος, *rod*, or *ſtaff*, and ειδος, *form*, in *Anatomy*, a name given the ſecond true future of the ſkull, called alſo the *ſagittal* SUTURE.

RHABDOLOGY, or RABDOLOGY, in *Arithmetic*, a name ſometimes given to the method of performing the two moſt difficult and operoſe rules, viz. multiplication and diviſion, by the two eaſieſt, viz. addition and ſubtraction, by means of two little rods or laminæ, whereon are inſcribed the ſimple numbers, and which are to be ſhifted according to certain rules.

Theſe rods are what we popularly call *Neper's bones*, from their inventor, a Scottiſh baron, who likewiſe invented logarithms. For their deſcription and uſe, ſee NEPER's *bones*.

RHABDOMANCY, an ancient method of divination, performed by means of rods or ſtaves.

Whence its name, from the Greek ῥαβδος, *rod*, and μαντεια, *divination*.

St. Jerom makes mention of this kind of divination, in his commentary on Hoſea, chap. iv. 12. The ſame he finds again in Ezekiel xxi. 21, 22.

If it be the ſame kind of divination that is mentioned in the two paſſages, *rhabdomancy* muſt have been alſo the ſame ſuperſtition with BELOMANCY.

In effect, the two are ordinarily confounded. The ſeventy themſelves tranſlate the חצים of Ezekiel, by ῥαβδος, a *rod*; though in ſtrictneſs it ſignifies an *arrow*.

This, however, is certain; the inſtruments of divination mentioned by Hoſea are different from thoſe of Ezekiel. In the former it is עצו *etſo*, מקלו *maklo*, his *wood*, his *ſtaff*; in the latter, חצים *hhitſim*, *arrows*. Though it is poſſible they might uſe rods or arrows indifferently; or the military men might uſe arrows, and the reſt rods.

It appears by the laws of the Friſones, that the ancient inhabitants of Germany practiſed *rhabdomancy*. The Scythians were likewiſe acquainted with the uſe hereof; and Herodotus obſerves, lib. iv. that the women among the Alani ſought and gathered together fine ſtraight rods or wands, and uſed them in the like ſuperſtition.

RHABDONALEPSIS, Ῥαβδον Αναληψις, among the Greeks, the Reception or Elevation of the Rod, a feſtival kept every year in the iſland of Cos, at which the prieſts carried a cypreſs-tree.

RHABDOPHORI, Ῥαβδοφοροι, among the Greeks, officers appointed to preſerve peace and good order, and to correct the unruly at their public games.

RHABDUS, Ῥαβδος, among the *Ancients*, the iron rod with which the boys rolled the TROCHUS.

RHACHITIS, Ῥαχιτις, in *Medicine*. See RICKETS.

RHACOMA, in *Botany*, a genus of the *tetrandria monogynia* claſs. Its characters are, that the calyx and the corolla are each of them divided into four ſegments; and that the capſule is unilocular and monoſpermous. There is only one ſpecies.

RHACOSIS, Ῥακωσις, in *Medicine*, is a relaxation of the ſkin of the ſcrotum without that of the contained bodies; being an affection very indecent to the ſight.

The method of cure uſed by Leonides, was to lay the patient upon his back, and to cut off the ſuperfluous ſkin againſt a board, or a piece of hard leather; after which he ſewed up the wound. But Antyllus uſed to take up the ſuperfluous ſkin with three or four ſtitches of a needle, and then with a knife, or ſharp pair of ſciſſars, cut off what was without the ſtitches; ſecuring the place with a ſuture, he cured it as he did other bleeding wounds.

RHADAMANTHUS, in *Mythology*, one of the three judges or ſovereigns of Hades, or the inviſible world, to whom was aſſigned Tartarus, as Erebus was to Minos, and Elyſium to Æacus. He was the brother of Minos, and the ſon of Jupiter and Europa; and is ſaid to have been preferred to the honour of preſiding over Tartarus, on account of the diſtinguiſhed wiſdom and juſtice of his adminiſtration. His office is deſcribed by Virgil, Æneid, lib. iv.

Gnoſſius hæc Rhadamanthus *habet duriſſima regna*
Caſtigatque auditque dolos, ſubigitque fateri,
Quæ quis apud ſuperos, furto lætatus inani
Diſtulit in ſerum commiſſa piacula mortem.

RHAGADES, Ῥαγαδες, in *Medicine*, a Greek term uſed for the chaps or clefts in the lips, hands, anus, and other ſoft parts of the body.

Rhagades are a ſort of fiſſures, and little chapped ulcers of the œdematous kind; formed of a ſharp ſaline humour, and occaſioning a great contraction and ſtraightening of the part, which is by this means ſhrivelled up like a wet parchment, when held to the fire.

They are chiefly found on the fundament, the neck of the womb, the præputium, lips, &c. ſometimes even in the mouth; in which caſe the patient is not able to ſpeak, chew, or the like.

They are ſometimes moiſt, and of a cancerous nature, eating deep, and difficult of cure; but they are more commonly of a leſs malignant tendency, being often in the anus the conſequence of a diarrhœa, dyſentery, or the like.

RHAGADIOLUS, in *Botany*, a ſpecies of the *lapſana*. See NIPPLE-*wort*.

RHAGE, a word uſed by medical writers for a fiſſure or chap in any part. The ſtones of grapes are alſo by ſome called *rhages*; and by others the ſame word is made to expreſs the extremities of the fingers or toes.

RHAGOIDES, Ῥαγοειδης, in *Anatomy*, the ſecond coat or tunic of the eye; more uſually called UVEA.

It has its name *rhagoides*, as reſembling a grape-ſtone. In the tunica *rhagoides* is the hole called the PUPIL.

RHAMNOIDES, a name given by Tournefort, and others, to a genus of plants, called by Linnæus *hippophae*. See SEA *buckthorn*.

RHAMNUS, *buckthorn*, in *Botany*. See BUCKTHORN.

RHAMNUSIA, in *Mythology*, an appellation given to Nemesis, on account of her celebrated statue at Rhamnus, in Attica.

RHAPONTICUM and RHAPONTICOIDES, in *Botany*, a species of CENTAURY.

RHAPONTICUM, a medicinal root, in form resembling rhubarb; and nearly of the same virtues.

It was called *rhaponticum*, q. d. *root of Pontus*; because chiefly produced in the country of Pontus in Asia.

It is the root of a plant, which is a species of the *rheum*, with smooth roundish leaves, and somewhat channelled pedicles. It grows wild on the mountain Rhodope in Thrace, from whence it was brought into Europe by Alpinus about the year 1610; it bears the hardest winters of this climate. The root of this plant, says Dr. Lewis, which appears to have been the true rhubarb of the ancients, is confounded by some with the modern rhubarb, though considerably different from that root in appearance as well as in quality. The *rhapontic* is of a dusky colour on the surface, and of a loose spongy texture; more astringent than rhubarb, and less purgative; in this last intention two or three drams are required for a dose. Lewis's Mat. Med.

It has, however, been much controverted, whether the *rhaponticum* of the ancients, and the rhubarb of the moderns, be one and the same plant; the reasonings on both sides may be seen in the appendix to the second volume of John Bauhin's History of Plants. See RHUBARB.

RHAPSODI, Ῥαψῳδοὶ, RHAPSODISTS, in *Antiquity*, persons who made a business of singing or reciting pieces of Homer's poems.

Cuper informs us, that the *rhapsodi* were clothed in red when they sung the Iliad; and in blue when they sung the Odyssey.

They performed on the theatres; and sometimes strove for prizes, in contests of poetry, singing, &c.

After the two antagonists had finished their parts, the two pieces, or papers they were written in, were joined together again; whence the name, viz. from ῥαπτω, *suo*, *I join together*, and ῳδη, *ode*, *song*.

But there seem to have been other *rhapsodi* of higher antiquity than these; people who composed heroic poems, or songs in praise of heroes and great men, and sung their own compositions from town to town, for a livelihood; of which profession, it is said, was Homer himself.

Hence, some critics, instead of the former origin, derive the word *rhapsodist* from ῥαβδῳ αδειν, *to sing with a laurel-rod in the hand*, which it seems was the badge of the primitive *rhapsodi*.

Philochorus, again, derives the word from ῥαπτειν τας ῳδας, q. d. συντιθεναι, to compose songs or poems; as if they were the authors of the poems they sung. This opinion, to which Scaliger inclines, reduces these *rhapsodi* to the second kind.

In effect, it is probable, that they were all of the same class, whatever distinction some authors may imagine among them; and that their business was to sing or rehearse poems, either of their own, or other people's composition, as might best serve their purpose, which was gaining a pecuniary advantage by them. So that we do not apprehend it any injury to them, to set them on the foot of our ballad-singers; some of whom may probably pen their own ditties. After Homer's time, it is no wonder they confined themselves altogether to his pieces, for which the people had the utmost veneration; nor is it surprising, that they should erect stages, &c. and dispute the point of recitation in fairs and markets.

RHAPSODOMANCY, ῥαψῳδομαντεια, an ancient kind of divination performed by fixing on a passage of a poet at hazard, and reckoning on it as a prediction of what was to come to pass.

There were various methods of practising this *rhapsodomancy*. Sometimes they wrote several verses or sentences of a poet on so many pieces of wood, paper, or the like; shook them together in an urn; and drew them out one, which was accounted the lot.

Sometimes they cast dice on a table, whereon verses were written; and that whereon the die lodged, contained the prediction.

A third manner was by opening a book, and pitching on some verse, at first sight. This method they particularly called the *sortes Prænestinæ*, and afterwards, according to the poet thus made use of, *sortes Homericæ*, *sortes Virgilianæ*, &c.

RHAPSODY, ῥαψῳδια, in *Antiquity*, a discourse in verse, sung or rehearsed by a rhapsodist.

Others will have *rhapsody* properly to signify a collection of verses, especially those of Homer; which, having been a long time dispersed in pieces and fragments, were at length, by Pisistratus's order, digested into books, called *rhapsodies*; from the Greek ῥαπτω, *suo*, *I sew*, and ῳδη, *song*.

Hence, among the moderns, *rhapsody* is also used for an assemblage of passages, thoughts, and authorities, raked together from divers authors, to compose some new piece. Lipsius's Politics make such a *rhapsody*, wherein there is nothing of the author's own but conjunctions and particles.

RHEA, in *Mythology*, one of the titles of CYBELE, derived from ῥεω, *I flow*, on account of that abundance of benefits which she dispenses.

RHEA, in the *Linnæan System of Ornithology*, a species of the *struthio* or OSTRICH, the same bird with the NHANDUGUACU of the Brasils.

RHEEDIA, in *Botany*, the name of a genus of plants, of the *polyandria monogynia* class, so called from Mr. Van Rheed. The characters of the genus are these: the flower has no cup; it consists of four petals, which are of an oval figure, and are hollowed, and expanded wide open; the stamina are five filaments; the germen of the pistil is globose; the fruit is small, and of an oval figure; it is succulent, and consists only of one cell, and contains three very large seeds, which are of an oval oblong figure, and marked with strangely irregular lines, resembling several characters. There is only one species.

RHEGMA, formed of ῥηγνυμι, *I break*, a word used by the ancients to express any breaking, or bursting of a soft part without a wound, but most frequently for abscesses breaking inwardly.

RHENONES, among the ancient Germans, a kind of garment covering the shoulders and breast down to the middle. It was either entirely made of skins, or covered over with them; the long hair of which being outward, proved a good defence against rain.

RHEO-STATICS, is used by some for the statics, or the science of the equilibrium of fluids.

RHETORIANS, *Rhetorii*, a sect, in the 4th century, in Egypt, so nominated from their leader Rhetorius.

His distinguishing doctrine, as represented by Philastrius, was, that he approved of all the heresies before him, and taught that they were all in the right. But what Philastrius mentions of him appears so absurd and ridiculous, that St. Augustine, Hæres. 7. could not persuade himself it was true.

RHETORIC, *rhetorica*, formed from ῥητορικη, of ῥεω, *I speak*; whence ῥητωρ, *speaker*, *orator*, &c. the art of speaking copiously on any subject, with all the advantages of beauty and force. See ORATORY.

RHETORIC, *characters in*. See CHARACTER.

RHETORICAL *numbers*. See NUMBERS.

RHETORICAL *accent*, among *Hebrew Grammarians*. See ACCENT.

RHETORICIAN. See ORATORY.

RHEUM, in *Botany*. See RHUBARB.

RHEUM, *rheuma*, Ῥευμα, in *Medicine*, formed from ῥεω, *I flow*; a thin serous humour, occasionallyousing out of the glands about the mouth and throat.

A fluxion of *rheum*, usually happening after taking cold, occasions excoriations and inflammations of the fauces, &c.

RHEUM is also used for a *catarrh*, or a defluxion of such humours on the trachea, and the neighbouring parts, occasioning a coughing, spitting, hoarseness, running at the nose, &c.

The *rheum* is not caused from a pituita falling from the brain on those parts, as the ancients imagined, there being no passage from the brain thither; but from a thin, sharp, serous humour ousing out of the extremities of the glands about the fauces and throat.

The most ordinary occasion of *rheums* is external cold, especially the being exposed to it when the body is much heated; and hence the disorder itself is popularly called a *cold*.

Rheums falling on the breast, lungs, &c. are dangerous; others, not very violent, serve to clear the head, &c. See CATARRH.

RHEUMATISM, in *Medicine*, a painful disorder, affecting the intermediate spaces between the joints and muscles in different parts of the body, and occasionally the viscera, and sometimes attended with inflammation and swelling. As to the origin of the denomination given to this disorder, we may observe, that the ancients called all kinds of pains affecting the external parts or joints by the name of *arthritis*; but about the end of the sixteenth or the beginning of the seventeenth century, some celebrated French physicians called those that were situated any where but in the joints, that is, in their tendinous and nervous ligaments, by the name of *rheumatism*. The proper seat of this disorder, whatever part of the body it attacks, is supposed to be the cellular membrane; and it is most common in the spring and towards the end of autumn. The *rheumatism* bears a great analogy to the gout, being, as Boerhaave calls it, the *agnatus morbus* to the gout, whence some call it the universal gout. The difference,

difference between them consists chiefly in this, that the *rheumatism* attacks not only the joints with an exquisite pain, as the gout does, but also the muscles and membranes between the joints. See Gout.

Some have distinguished the *rheumatism* into *universal* and *particular*; the former being that which attacks all the parts of the body, even the internal ones; and the latter, that which is confined to particular parts; in which case the pains are usually erratic, passing from one side to another, but sometimes fixed. This is also called sometimes a windy, and sometimes a scorbutic *rheumatism*. But the *rheumatism* is more usually and more properly distinguished into the *acute* and *chronic*, or the *rheumatism with* and *without* a fever.

Rheumatism, *causes of the*. The *rheumatism* is supposed to arise from a sharp, serous humour thrown on the sensible parts, and occasioning a pain by its vellication. Quincy says, it proceeds from the same cause as that whereby the mucilaginous glands become stiff and gritty in the gout.

Musgrave takes it to be occasioned by a sharp alcaline salt, rather than an acid one; from this consideration, that the urine of *rheumatic* people does not afford above the thirtieth part of the alkaline salt found in that of healthful persons.

Hence, he conjectures that the salt, which should go off this way, is retained in the blood, implicated and embarrassed in the pituita; by which means it forms a viscidity, which occasions all the pains and tumors of the *rheumatism*.

The remoter causes are frequently the same as those of an inflammatory fever, viz. an obstructed perspiration, the immoderate use of strong liquors, and the like. Sudden changes of the weather, and all quick transitions from heat to cold, wet cloaths, damp beds, sitting and lying on the damp ground, travelling in the night, &c. have often been productive of this disorder: it has likewise been occasioned by excessive evacuations, or the stoppage of customary discharges; and it has often proceeded from chronic diseases, which vitiate the humours; as the scurvy, the lues venerea, obstinate autumnal agues, &c. The *rheumatism* prevails most in cold, damp, marshy countries; and it is most common among the poorer sort of peasants, who are ill-clothed, live in low damp houses, and eat coarse unwholesome food, not easily digested, and affording little nourishment.

Rheumatism, *symptoms of the*. The acute *rheumatism* commonly begins with weariness, shivering, a quick pulse, restlessness, thirst, and other symptoms of a fever. Afterwards the patient complains of flying pains, which are increased by the least motion, and at length fix in the joints, which are often affected with swelling and inflammation. If blood be let in this disease, it has generally the same sizy appearance as in the pleurisy. The violence of the *acute rheumatism* seldom continues above fourteen days, though a weakness and puffiness will remain, perhaps many months, if the disease attacks the patient in autumn. The *chronic rheumatism* is seldom attended with any considerable degree of fever, and is generally confined to some particular part of the body, as the shoulders, the back, or the loins. In this case there is seldom any inflammation or swelling. Persons in the decline of life are most subject to this kind of *rheumatism*, and with them it often proves extremely obstinate, and sometimes incurable. If their constitutions are weak and viscera decayed, it sometimes seizes the head. When the pain is in the hip, and extends down the thigh, it is called sciatica. When rheumatic pains are attended with the symptoms of a scorbutic habit, which is not uncommonly the case, the disorder is called a scorbutic *rheumatism*. When a violent pain is fixed in the loins, sometimes making to the os sacrum, and attended with nephritic complaints, it is called a rheumatic lumbago. Dr. Rutherford, of Edinburgh, observes that, wherever a *rheumatism* is seated, that part never sweats, and that as soon as a sweat can be raised in the pained part, the disorder will be conquered: it may also be observed, that when in either the acute or chronical *rheumatism* the symptoms vanish, and at the same time a free perspiration comes on, and the same is arrived on the parts affected, and the urine is turbid and copious, a cure may be expected.

Method of cure.—The *acute rheumatism* requires a treatment similar to that of an acute or inflammatory fever. If the patient be young and strong, the symptoms violent and threatening, and the wandering pains shift suddenly from the extremities to the internal parts, and affect the sides or the breath, bleeding is necessary, and may be repeated, with considerable advantage, according to the exigencies of the case. However, profuse bleedings should be very cautiously, if at all, admitted, as they have retarded the crisis of the disease, and laid a foundation for the *chronic rheumatism*, and other disorders. Dr. Sydenham much laments the necessity of repeated bleeding, and expresses his anxiety for discovering another effectual method of curing this disease; for this purpose he had recourse to a diet of whey, which had the desired effect: and he observes, that the *rheumatism* may be as successfully cured in young persons, who live temperately and drink wine with moderation, by a very cooling and moderately nourishing diet, as by repeated bleeding, which they cannot so well bear. The body should be kept open with gentle purges, emollient clysters with nitre, and cool laxative liquors. Nitre is particularly recommended in the inflammatory *rheumatism*, and should be taken in considerable quantities, as freely as the stomach will bear. In the decline of *acute*, and in every stage of *chronical rheumatisms*, it may be given to advantage in conjunction with the sal. vol. c. c. Opiates should be occasionally administered, as they will be sometimes necessary to moderate those rheumatic pains which are most severe in the night; but the use of them requires peculiar caution. Dr. Sydenham observes, that they fix the disease; Dr. Tissot condemns them, as really augmenting the cause of the disease, destroying the efficacy of the proper medicines, and, instead of assuaging, increasing the pains: Dr. Cullen says that opiates, unless where they are directed to procure sweat, always prove hurtful in every stage of the *rheumatism*: however Dr. Cheyne observes, that opium is the sovereign relief in all acute and vehement pain, as of the *rheumatism*, &c. From these, and many other discordant opinions that might be alleged, we may infer that it requires skill and attention to know how and when to administer opiates without injury; but, in general, it will be proper to bleed and purge before recourse is had to opium. The medicine which has been lately much extolled in *rheumatic* and gouty complaints is the volatile tincture of gum guaiacum. This may be given from two drachms to half an ounce twice a-day, in any liquor which the patient drinks; and to prevent its passing off by stool, and to determine it as much as possible to the surface, a few drops of the tinctura thebaica may be added to each dose. The first person who prescribed the tincture of guaiacum in such a large dose as half an ounce, and to be so often repeated, was the late Dr. Dawson; and he found, in a variety of cases, its beneficial effects, as a gentle laxative, in promoting a free perspiration and a large discharge of urine, and in producing a cessation both of rheumatic pains and fever. And he directed it to be administered in the *acute* as well as in the *chronic rheumatism*, to which latter kind the use of it had been chiefly confined by other medical practitioners. He proposes the following general form for administering it:

> ℞ Tinct. guaiac. vol. ʒſs. solve in vitel. ov. mucilag. gum arab. vel mel com. q. ſ. dein adde gradatim
> Aq. hordeat. ℥iſs.
> Syr. balsam. ℥ſs. m. fiat haust.

However, he says, he generally gave it in common water, with which it mixes very well, and thus sits easiest on the stomach, and bids fairest for answering every beneficial intention. Dawson's Cases in the Acute Rheumatism, &c. 1781. But we believe it is now generally agreed by the faculty, that the exhibition of large doses of the volatile tincture of guaiacum, in the *acute rheumatism*, is a practice requiring much caution, and neither so universally safe, nor successful, as Dr. Dawson seemed to imagine. See Dr. Sanden's Short Strictures on the Method of Treatment recommended by Dr. Dawson in the Acute Rheumatism, 1781.

Farther, the preparations of antimony may be also given, at proper intervals, betwixt the doses of other medicines. When the *acute rheumatism* assumes the appearance of an intermittent, the bark is necessary; and whether it intermits or no, when plentiful sweat breaks out, and the urine deposits a copious sediment, the bark will contract the duration of the disease. Blisters have been sometimes applied to the affected part with advantage: Dr. Cullen says, that they may be very effectual in removing the pain from any particular part, but will be of little use, except where the pains are much confined to one part, and therefore their efficacy and use are most considerable in *chronic rheumatisms*. Warm bathing, after proper evacuations, has often produced an exceeding good effect; with this view the patient may be either put into a bath of warm water, or have cloths wrung out of it applied to the affected parts; but great care must be taken that he does not catch cold after bathing: and it would be adviseable, after rubbing him dry, to put him between the blankets, in order to promote a perspiration. Some have recommended the patient's keeping his bed, after the feverish symptoms have abated, during the continuance of the pain, and whilst he is taking such

ſuch things as promote perſpiration, e. gr. white wine whey, ſpiritus Mindereri, guaiacum, &c. But Dr. Sydenham adviſes the patient in the *acute rheumatiſm* to ſit up ſome hours every day, becauſe the heat which proceeds from always lying in bed promotes and increaſes the diſeaſe; and he alſo recommends the uſe of ſmall beer, among other diluting liquors, in inflammatory diſorders. The diet ſhould be light and in ſmall quantity, conſiſting chiefly of roaſted apples, groat gruel, or weak chicken broth. After the cure the cold bath is uſeful, in order to prevent returns of the *rheumatiſm*, and the ſtrength ſhould be confirmed by the uſe of bitters, aromatics, and chalybeats.

In the *chronic rheumatiſm* the regimen ſhould be nearly the ſame as in the *acute*: the diet ſhould be cool and diluting, conſiſting chiefly of vegetable ſubſtances, as ſtewed prunes, coddled apples, and currants or gooſeberries boiled in milk. According to Arbuthnot, whey and cream of tartar in water gruel are of great uſe in eaſing rheumatic pains. Mild mercurials, a decoction of the rad. ſeneca, and the volatile tincture of guaiacum, in large doſes, have been alſo much recommended; eſpecially the latter. Leeches, cupping, or bliſters, have been alſo beneficially applied to the affected parts; and obſtinate fixed rheumatic pains have been removed by the *warm* PLASTER, or a plaſter of Burgundy pitch, or by rubbing the diſeaſed part with tincture of cantharides. Dr. Brockleſby relates ſome caſes, in which gentle and continued frictions on the pained rheumatic parts with common ſallad oil afforded conſiderable relief. And he recommends it to be tried how far, after bleeding, where it is indicated, animal oils applied by friction long continued, to the aggrieved parts, in the gout, *rheumatiſm*, and other painful diſeaſes, will eaſe the pain, without repelling or obſtructing the matter which nature is labouring to throw off. Phil. Tranſ. vol. xlix. p. 245.

We may obſerve with regard to the *rheumatiſm*, and the *chronic* kind in particular, that the uſe of medicines, which do not ſeem to produce any immediate effect, ſhould be perſiſted in for ſome time; and that the diſorder is, like the gout, moſt likely to be extirpated by the uſe of medicines, when the patient is moſt free from the diſorder. The warm baths of Matlock and Buxton are very ſerviceable in obſtinate *rheumatiſms*: and when the diſorder is complicated with ſcorbutic complaints, the waters of Harrowgate and Moffat are proper, and ſhould both be drank and uſed as a warm bath.

Dr. Buchan obſerves, that there are many of our own domeſtic plants which may be beneficially uſed in the *rheumatiſm*. A table ſpoonful of the ſeed of white muſtard may be taken twice or thrice a day, in a glaſs of water or ſmall wine. Water-trefoil, infuſed in wine or ale, and drank as tea, may be alſo of great uſe; as are likewiſe ground-ivy, chamomile, and other bitters, uſed in the ſame manner, and continued for ſome time.

Cold bathing, eſpecially in ſalt-water, often cures the *rheumatiſm*. Riding on horſeback and wearing flannel next the ſkin are alſo particularly recommended. Iſſues are proper, eſpecially in chronic caſes: if the pain affects the ſhoulders, an iſſue may be made in the arm; but if it affects the loins, it ſhould be opened in the leg or thigh. In obſtinate *rheumatiſms* ſmall doſes of emetic wine are much recommended by Dr. Huxham. The beſt medicines for ſcorbutic perſons afflicted with the *rheumatiſm*, are bitters and mild purgatives. An ounce of Peruvian bark, and half an ounce of powdered rhubarb, may be infuſed in a bottle of wine, and one, two, or three wine glaſſes of it taken every day, as may be found neceſſary for keeping the body open. If the bark is of itſelf ſufficiently purgative, the rhubarb may be omitted.

Thoſe who are ſubject to the *rheumatiſm* ſhould chooſe a dry, warm ſituation, and avoid the night air, wet cloaths, and wet feet, as much as poſſible. Their clothing ſhould be warm, they ſhould wear flannel next their ſkin, and make frequent uſe of the fleſh bruſh. Buchan's Dom. Med. ed. 5. p. 422, &c. Tiſſot's Advice, &c. p. 177, &c. Pringle's Obſ. on Diſeaſes of the Army, p. 152, &c. Many perſons have received conſiderable benefit in this diſorder from being electrified. See *Medical* ELECTRICITY.

The following receipt for the *rheumatiſm* is famous in America: take of garlick two cloves, and of gum ammoniac one drachm, and bruiſe them together; make them into two or three boluſes with fair water, and ſwallow them, one at night and one in the morning: drink, in the uſe of this medicine, very ſtrong ſaſſafras tea. Thus, it is ſaid, after taking a few doſes, the *rheumatiſm*, and even contractions of the joints have been removed.

RHEUMATISM, *electary for the*, may be compoſed of conſerve of roſes, two ounces; cinnabar of antimony, levigated, an ounce and a half; gum guaiacum, in powder, an ounce; and a ſufficient quantity of ſyrup of ginger. In obſtinate *rheumatiſms*, not accompanied with a fever, ſays Dr. Buchan, a tea-ſpoonful of this electary may be taken twice a day with conſiderable advantage. Dom. Med. p. 716.

RHEUMATISM, *liniment for the*. See LINIMENT.

RHEXIA, in *Botany*, a genus of the *octandria monogynia* claſs. Its characters are theſe: the empalement of the flower is permanent, oblong, tubulous, and of one leaf divided into four parts at the brim; the flower has four roundiſh petals inſerted in the empalement; it has eight ſlender ſtamina, which are inſerted in its empalement, terminated by declining furrowed ſummits; it has a roundiſh germen, ſupporting a declining ſtyle the length of the ſtamina, crowned by a thick oblong ſtigma; the germen afterwards becomes a roundiſh capſule, with four cells on the ſwollen empalement, opening with four valves filled with roundiſh ſeeds. There are two ſpecies, natives of North America. Miller.

RHEXIS, or RHEGMA, formed from ῥῆξις, *rupture*, of ῥήγνυμι, *I break*, among *Oculiſts*, denotes a rupture of the cornea of the eye.

RHIME, or RIME, in *Poetry*. See RHYME.

RHINANTHUS, in *Botany*. See *Yellow* LOUSEWORT.

RHINE, in *Ichthyology*, a name given by Ariſtotle, Appian, and moſt of the Greek writers to that ſpecies of the *ſqualus*, which we uſually call the *ſquatina*; the *ſquatus* of Iſidore and Pliny. Artedi has diſtinguiſhed this from all the other ſpecies of the *ſqualus*, by the having no pinna ani, and the mouth in the extremity of the ſnout.

RHINE-GRAVE, in *Germany*, a count palatine of the Rhine. See GRAVE, and PALATINE.

RHINE-LAND-*Rod*, in *Fortification*, &c. a meaſure of two fathom, or twelve feet, uſed by the Dutch and German engineers, &c.

RHINECHITIS, a name of a chirurgical inſtrument, uſed for ſyringing the noſtrils.

RHINGAU, in *Ichthyology*, a name given by ſome authors to the LAVARETUS, a ſmall fiſh caught in the German lakes, and ſent in pickle into many parts of the world.

RHINOBATOS, in *Ichthyology*, the name of a flat cartilaginous fiſh, of the *ſquatina* or *monk-fiſh* kind, but differing from it in this, that the body is proportionably longer, and the head is more pointed; and the mouth is a great way below the end of the ſnout, and placed under the head. It is from three to four feet long, and is common in the Mediterranean, and brought to market in ſome parts of Naples. This is a ſpecies of RAY in the Linnæan Syſtem.

RHINOCEROS, in *Zoology*, the name of a genus of quadrupeds, of the order of *belluæ*, in the claſs of *mammalia* in the Linnæan ſyſtem, ſo called from a horn growing on their noſe.

Of this genus there are only two known ſpecies. 1. The *rhinoceros* with only one horn on its noſe; and 2. The *rhinoceros* with two horns.

In the year 1739 we had a young *rhinoceros* with one horn ſhewn in England, of which Dr. Parſons has given a very accurate account in the Philoſophical Tranſactions, Nº 470. p. 523, &c. or Abridg. vol. ix. p. 94, &c.

The creature fed on rice, ſugar, and hay; his keeper uſed to mix the rice and ſugar in the following manner: ſeven pounds of rice and three pounds of ſugar made the proviſion for one day; he eat this at three meals; and beſides this he eat about a truſs of hay every week, and a large quantity of greens that were brought to him at different times, and of which he ſeemed more fond than of dried food. He drank often, and always ſwallowed a large quantity of water at a time.

He appeared very peaceable in his temper, and bore to be handled on any part of his body with great patience, except when he was hungry; but he was then always outrageous, as alſo when he was ſtruck. His moſt violent paſſions, even on the laſt occaſion, were however always immediately appeaſed by giving him victuals.

Notwithſtanding the lumpiſh aſpect and heavy make of this creature, he would jump about very nimbly in his fits of paſſion, and often leap to a great height; and one common mark of his fury was the ſtriking his head againſt the walls, or any thing elſe that was in the way, and this he would do with terrible violence. He was very apt to fall into theſe paſſions in a morning before his rice and ſugar were given him, and from the whole he appeared quite untractable, and ſeemed able, in his paſſions, to have run ſo faſt, as that a man on foot could not have eſcaped him.

This creature was two years old, and did not exceed a young heifer in height, but was remarkably broad and thick. His head was very large; and the hinder part of it, near the ears, remarkably elevated above the reſt of the

the face, which was flat, and sunk down in a remarkable manner in the middle, rising again toward the origin of the horn, but in a much smaller degree.

The horn in this young animal did not rise above an inch high from its tough basis (though in full grown animals it is sometimes three feet and an half long), and was black and smooth at the top, but ragged downwards; and the determination of its growth is backward, not straight up; this is very evidently seen in the horns of old *rhinoceroses*, which are always curved in a considerable degree that way. If we consider the proportion of this animal's size to the length of its horn, and thence carry the proportion to that between the large horns we see in the museums of the curious, we must suppose the animal of a very stupendous size, when at its full growth.

The sides of the under-jaw in this creature stand very wide asunder, slanting outward to the lower edge, and backward to the neck; the edges turn outwards from this structure of the bones, and the head necessarily looks very large. The *rhinoceros* has four cutting teeth, one on each corner of each jaw, and six grinders in each; the first remote from the cutting teeth. That part of the head which reaches from the forepart of the horn to the upper lip may be called the nose; this is very thick and bulky, and has a kind of circular sweep down towards the nostrils; on all this part there is a great number of rugæ or wrinkles.

The nostrils are situated very low, in the same direction with the opening of the mouth, and not more than an inch from it; and, when viewed in a foreview, the whole nose, from the top of the horn to the verge of the lower-lip, is shaped like a bell. The under-lip is like that of an ox, but the upper more like that of a horse, and he uses it as that creature does, to gather up hay from the rack, or grass from the ground; but with this superior advantage, that this creature has a power of extending this lip to six or seven inches in length from the nose, and there drawing it to a point; with this lip, thus extended, the creature is able to grasp a stick, or any small substance, and hold it extremely fast; and this power of prolonging the lips serves, in many purposes, to the same end as the trunk of that other unwieldy animal the elephant.

The tongue of the *rhinoceros* is said to be so rough as to be able to rub a man's flesh off from the bones; but in this young subject it was so soft, that it resembled that of a calf. It may possibly grow harder with age; but the story of its effects seems of a piece with the many other false marvels reported of this animal. The eyes are dull and sleepy, much like those of a hog in shape; he seldom opens them entirely; and it is to be observed, that they are situated nearer the nose than those of any other known quadruped. The ears are broad and thin towards the top; the neck is very short; the shoulders are thick and heavy; the body is thick and juts out at the sides, and has a hollow in the back; the belly hangs low; the legs are short, thick, and strong; the hoofs are divided into three parts, each pointing forward; the tail is slender, flatted at the end, and covered on the sides with very stiff thick black hairs; the skin is naked, rough or tuberculated, lying about the neck in vast folds; there is another fold from the shoulders to the fore-legs; and another from the hind part of the back to the thighs. The skin is thick, and seems almost impenetrable, insomuch that it will turn the edge of a scymitar, and resist a musket ball; it feels like a piece of board of half an inch thick. It is covered in all parts, more or less, with a sort of incrustations, resembling scales. These are small on the neck, and largest of all in the shoulders and hips; between the folds of this thick skin, the cuticle, which is left bare, is soft and easily penetrable. The scabby incrustations of the skin have been called scales by some writers, but this is a very wrong term, for they have nothing of the nature of scales, nor any thing of regularity in them.

The creature is of the retromingent, and therefore probably of the retrogenerative kind. Those animals that have been brought to Europe have been young and small; but, according to Bontius, they equal the elephant in the bulk of their bodies, though they are lower on account of the shortness of their legs. They inhabit Bengal, Siam, Cochin-China, Quangsi in China, and the isles of Java and Sumatra: they are fond of shady forests, the neighbourhood of rivers, and marshy places; and are fond of wallowing in the mud like the hog. The *rhinoceros* is a solitary animal, brings one young at a time; is quiet and inoffensive, but furious when provoked; very swift and dangerous; and, though dull of sight, has a most exquisite smell. It grunts like a hog. The flesh of this animal is eaten. The skin, flesh, hoofs, teeth, and dung itself, are used in India medicinally. The horns are in great repute as an antidote against poison, especially those of the virgin female called abbada; cups of which are said to communicate virtue to the liquor poured in them. Redi, who has been very sagacious in discovering the falsity of many of the pretended medicines taken from animals, yet gives us, on the testimony of his own experience, an account of some very remarkable virtues in the parts of the *rhinoceros*. The blood, he assures us, is excellent in colics and in dysenteries. The decoction of the skin, he assures us, is a grand stomachic antidote, and the horns are very valuable and alexipharmic.

This animal is the UNICORN of scripture, and the Indian ass of Aristotle, who says it has but one horn. See *Tab.* IV. *Quadrupeds*, N° 53.

The *rhinoceros* with two horns has no fore-teeth; the skin is without folds, granulated, and of a deep ashen grey: between the legs it is smooth, and flesh coloured; in other parts there are a few bristles, but they are most numerous about the ears and end of the tail. See *Tab.* IV. *Quadrupeds*, N° 54. This animal inhabits Africa only; and seems, in its manners, to agree with the former. The mischief it does is more the effect of a senseless impulse than of rage; for, though its sight is bad, its senses of hearing and smelling are exquisite, so that the least noise or scent puts it in motion, and in running to the spot whence the alarm proceeds, it overturns and tramples on animals, or any thing else which it meets with in its way, but never stays or returns to renew the charge. This was the species described by Martial, under the name of *rhinoceros cornu gemino*, who relates its combat with the bear.

> *Namque gravem gemino cornu sic extulit ursum*
> *Jactat ut impositas taurus in astra pilas.*
>
> Spect. Epig. 22.

The Romans, who procured their *rhinoceroses* from Africa, represent them with double horns. That figured in the Prenestine pavement, and that in a coin of Domitian, have two horns; that which Pausanias describes (ix. 9.) under the name of Æthiopian bull, had one horn in the nose, and another lesser higher up; and Cosmar Ægyptius, (tom. ii. 334.) who travelled into Æthiopia, in the reign of Justinian, also attributes to it the same number. Augustus introduced a *rhinoceros* (probably of this kind) into the shews, on occasion of his triumph over Cleopatra. Dion. Cassius, lib. ii. Phil. Transf. abr. vol. ix. ubi supra. Id. vol. lvi. p. 32, &c. Pennant's Hist. of Quadrupeds, vol. i. p. 138.

RHINOCEROS *avis*, the *rhinoceros-bird*, a name given by authors to a species of Indian raven, called by others *corvus Indicus cornutus*: the beak of which is frequently brought over into Europe. This, in the Linnæan system, is a species of BUCEROS.

It is a very ugly bird, and of a very rank smell. It much exceeds the European raven in bigness, and its head and neck are very thick. Its eyes are very large, and its beak of a very remarkable figure, having a large and thick horn-like protuberance on its upper part. The whole beak is bent like a bow, not hooked at the end like the beaks of the hawk, &c. It is of a yellowish white below, and on the upper part toward the head is of a fine gay red, and the rest of a yellowish white; the upper chap is serrated. The horn grows out from the head with this and runs along it, and bends up at its extremity; its upper and under part are red, its middle yellow. The bird feeds on carrion.

RHINOCEROS, in the *History of Insects*, a species of beetle, so called, because it has a kind of horn upon its head.

RHINOPTES, a word used by the ancients to express a person, who, from an ulcer in the great canthus of the eye, laying open the passages to the nose, can see through his nostril.

RHINSBERGERS, in *Ecclesiastical History*. See COLLEGIANS.

RHIPTASMOS, a word used by the ancients to express a restlessness and frequent tossing about, a very common symptom in fevers.

RHIZAGRA, the name of a chirurgical instrument, used to extract the stumps of teeth.

RHIZOPHORA, in *Botany*, the name given by Linnæus to a genus of plants, described under the name of *mangles* by Plumier. See MANGROVE.

RHODES, *colossus of*. See COLOSSUS.

RHODIOLA, in *Botany*. See ROSE-*root*.

RHODITES *lapis*, the *rose-stone*, in *Natural History*, the name given by authors to a kind of *astroites*, or STAR-*stone*, in which the figures more represent roses than stars; they are in both owing to coralloide bodies immersed in the stone; which, according to their various species, afford a different figure, when cut transversely, in cutting the stone into plates for use.

RHODIUM *lignum*. See ASPALATH.

RHODIUM *marmor*, a name given by the ancients to a marble brought from Rhodes; it was of a good white, but inferior to the Parian, and was uſed by the Romans in their public buildings, and ſometimes in ſtatuary.

RHODODENDRON, *dwarf roſe-bay*, in *Botany*, a genus of the *decandria monogynia* claſs: its characters are, that the flower has a permanent empalement cut into five parts; the flower hath one wheel funnel-ſhaped petal; it has ten ſlender declining ſtamina, of the length of the petal, terminated by oval ſummits, and a five-cornered germen ſupporting a ſlender ſtyle of the length of the petal, crowned by an obtuſe ſtigma; the germen afterwards becomes an oval capſule with five cells, filled with ſmall ſeeds. Miller enumerates two and Linnæus ſix ſpecies.

RHODOMELON, a name given by the ancients to a confection made of roſes, quinces, and honey, uſed as a grateful aſtringent and detergent in many caſes.

RHODON, in *Pharmacy*, from ῥοδον, *roſa*, a name applied to ſome compoſitions, wherein roſes are the chief ingredient, as *diarrhodon*, &c. Hence alſo RHODOSACCHARUM, i. e. *ſugar of roſes*. See ROSE.

RHODOPUS *gallinula*, in *Ornithology*, a name given by ſome authors to the bird more uſually known by the name TRINGA.

RHOITES, the name of a medicine among the ancients, which is a ſort of rob of the juice of pomegranates. Dioſcorides deſcribes it as the ſimple juice of the fruit, evaporated over the fire to the conſiſtence of an extract; but Paulus Ægineta gives the receipt to be three parts juice of pomegranate, and one part honey, boiled to the evaporation of a third part. So that the *rhoites* of Dioſcorides was a true rob of pomegranates; the other, rather honey of pomegranates, like our honey of roſes.

RHOMB. See RHOMBUS.

RHOMBO, the name of a peculiar fiſh of the *rhombus*, or turbot-kind, called *rhombus aculeatus* by Aldrovand, Geſner, and other writers. It is a large fiſh, of an aſh-coloured green on the back, and white on the belly. It has no ſcales; but the ſkin of its back is divided by lines, ſomething in the manner of the ſkins of ſnakes. The mouth is very large, and is well furniſhed with teeth; and the palate has a number of tubercles, armed alſo with a ſort of teeth. It feeds on fiſh, and its fleſh is very delicate. It is very common in the markets at Venice, and is caught in the neighbouring ſeas, and in many other places. See *Tab.* IV. *Fiſh.* N° 43. See TURBOT.

RHOMBOIDÆUS *major* and *minor*, names given by Albinus to what he makes two muſcles, though Winſlow and others account it only one. What Winſlow calls the inferior portion of the rhomboidalis Albinus calls *rhomboidæus major*, and what he calls the upper portion of that muſcle, Albinus calls *rhomboidæus minor*. See RHOMBOIDES.

RHOMBOIDALIS. See RHOMBOIDÆUS.

RHOMBOIDES, in *Geometry*, a quadrilateral figure, whoſe oppoſite ſides and angles are equal, but which is neither equilateral nor equiangular.

Such is the figure NOPQ, *Tab. Geometry*, *fig.* 21.

For the method of finding the area of a *rhomboides*, ſee RHOMBUS.

RHOMBOIDES, in *Anatomy*, a muſcle thus called from its figure. See *Tab. Anat.* (Myol.) *fig.* 6, *n.* 29.

It is a thin, broad, and obliquely ſquare fleſhy plane, ſituated between the baſis of the ſcapula and the ſpina dorſi.

It may be divided into two portions, one ſuperior, the other inferior, which ſometimes appear ſeparate. The ſuperior portion, which ſeems in ſome ſubjects to be made up of two, is fixed by an inſertion wholly fleſhy in the two or three loweſt ſpinal apophyſes of the neck, and partly in the poſterior cervical ligament. The inferior portion is fixed by a tendinous plane in the three or four uppermoſt ſpinal apophyſes of the back.

Theſe two portions, of which the inferior is much the broadeſt, being united, are inſerted in the edge of the baſis ſcapulæ, from the ſmall triangular ſpace to the inferior angle, the ſuperior portion covering a ſmall portion of the angularis at its inſertion. This whole muſcle is covered by the trapezius, and covers the ſerratus poſticus ſuperior, being joined to each of theſe muſcles by a filamentary or cellular ſubſtance. According to its inſertions and direction, its general uſe muſt be to draw backward and upward the ſub-ſpinal portion of the baſis ſcapulæ. It is likewiſe a moderator to the trapezius and ſerratus major, when they raiſe the ſhoulder; and it brings the ſcapula back to its natural ſituation, when the action of theſe muſcles ceaſes. Winſlow.

RHOMBOIDIA, in *Natural Hiſtory*, the name of a genus of ſpars, given them from their being of a rhomboidal form. They owe this figure to an admixture of particles of iron, and conſiſt of ſix planes.

Of this genus there are only two known ſpecies, *viz.* a white thin one with very thin cruſts, and a whitiſh brown thick one with thicker cruſts. They are both found in the foreſt of Dean in Glouceſterſhire, and in other places, where there are iron-ores. Hill.

RHOMBUS, Ῥομβος, is formed of ῥομβος, of ῥεμβειν, *to incompaſs* or *turn round*, in *Geometry*, an oblique-angular parallelogram; or a quadrilateral figure, whoſe ſides are equal and parallel; but the angles unequal: two of the oppoſite ones being obtuſe, and the other two acute. Such is the figure ABCD, *Tab. Geometry*, *fig.* 22.

To find the area of a rhombus, *or* rhomboides. Upon CD, which is here aſſumed as a baſe, let fall a perpendicular AE, which will be the altitude of the parallelogram: multiply the baſe by the altitude, the product is the area. Thus, if CD be $= 456$, and AE $= 234$, the area will be found 106704.

For it is demonſtrated, that an oblique-angular parallelogram is equal to a rectangle upon the ſame baſe CD, and of the ſame altitude AE (ſee PARALLELOGRAM). But the area of a rectangle is equal to the factum of the baſe into the altitude; therefore the area of an oblique-angular parallelogram is equal to the ſame. See RECTANGLE.

RHOMBUS, *ſolid*, in *Geometry*, two equal and right cones joined together at their baſes.

RHOMBUS, in *Icthyology*, a ſpecies of the PLEURONECTES. See PEARL.

RHOMBUS, in *Conchyliology*, the name given by the generality of authors to a genus of the ſhell-fiſh, much more properly called by ſome CYLINDRUS.

RHOMBUS, among *Surgeons*, denotes a ſort of BANDAGE of a *rhomboidal* figure.

RHOMBUS *aculeatus*. See TURBOT.

RHOPALIC *verſes*, among the *Ancients*, a kind of verſes which began with monoſyllables, and were continued in words growing gradually longer and longer to the laſt, which was the longeſt of all.

They had their name from the Greek ῥοπαλον, *a club*, which, like them, begins with a ſlender tip, and grows bigger and bigger to the head. Such is that verſe of Homer,

Ω μακαρ Ατρειδη μοιρηγενες, ολβιοδαιμων.

And this Latin one of Auſonius:

Spes deus æternæ ſtationis conciliator.

RHOPALOSIS, a diſtemper of the hair deſcribed by the ancients, and ſeeming to be the ſame with what we call the PLICA *Polonica*, being a ſort of matting together of the hair into long and thick treſſes.

RHOPE, formed of ῥεπω, to *preponderate*, a word uſed by the Greek writers to expreſs a violent tendency of the humours to any particular part of the body.

RHOPOGRAPHI, Ῥοπογραφοι, formed of ῥοπος, *toys*, or *odd ware*, and γραφω, *I paint*, in *Antiquity*, an appellation given to certain painters, who confined themſelves to low ſubjects, ſuch as animals, plants, landſcapes, &c. The ſame appellation has been alſo given to ſuch as cut figures of men, &c. in box, philyrea, yew, &c. in gardens.

RHOX, a word uſed by ſome authors to expreſs the tunica uvea of the eye.

RHUBARB, *rhabarbarum*, *rheum*, in *Botany*, a genus of the *enneandria trigynia* claſs. Its characters are theſe: the flower has no empalement; it hath one petal, which is narrow at the baſe, and impervious; the brim is cut into ſix parts, which are obtuſe and alternately ſmaller; it hath nine hair-like ſtamina inſerted in the petal, and of the ſame length, terminated by oblong ſummits, which are obtuſe, and a ſhort three-cornered germen, with ſcarce any ſtyle, crowned by three-feathered ſtigmas, which are reflexed; the germen afterwards becomes a large three-cornered ſeed, with acute membranaceous borders. Miller reckons four and Linnæus five ſpecies. The true rhubarb is now ſown in many gardens, and may probably ſucceed ſo well here in time, as that a ſufficient quantity of that valuable drug may be raiſed, to ſupply our conſumption. Miller.

The *rhubarb* with hairy leaves and equal foot ſtalks has been generally reckoned the true *rhubarb* plant, having been produced from the ſeeds ſent from Ruſſia, as thoſe of the true *rhubarb*, to Juſſieu of Paris, Rand at Chelſea, and Linnæus at Upſal. It is a native of China and Siberia, and has been raiſed in ſome of our own gardens, where it is found to grow with vigour in the open ground. Some have derived its name from *Rha*, the river called by us Wolga, and *barbarum*, q. d. the root found by the Barbarians on the river *Rha*. However it is neceſſary to obſerve, that Dr. Hope received, in 1763, *rhubarb* ſeeds from Ruſſia, which Dr. Mounſey aſſured him were the ſeeds of the true *rhubarb*; and having ſown them in the open ground at Edinburgh, they produced

duced a different species, viz. the *rheum palmatum Linnæi*, with the leaves deeply cut into pointed segments. He observes that the root of this plant, though taken up too young, and at an improper season, viz. in July, agreed perfectly with the best foreign *rhubarb* in colour, smell, taste, and purgative quality. See his botanical description and drawing of the plant in Phil. Trans. vol. lv. art. 32. Perhaps, says Dr. Lewis, the roots of both species may be of the same quality, and taken promiscuously. The *rhaponticum* is a different species from either of these. Mr. Bell informs us, in his travels, that the best *rhubarb* grows in that part of the Eastern Tartary called Mongallia, which serves as a boundary between Russia and China. This plant, he says, does not run and spread itself like docks, but grows in tufts at uncertain distances, as if the seeds had been dropped with design. As the Mongalls do not think it worth cultivating, the MARMOTS, which burrow under the shade of its spreading leaves, and probably feed on its leaves and roots, contribute to its increase, partly by the manure which their dung affords it, and principally by casting up and loosening the earth, into which the ripe seeds blown by the wind-fall, and where they immediately take root. After digging and gathering the *rhubarb*, the Mongalls cut the large roots into small pieces, in order to make them dry the more readily. In the middle of every piece they scoop a hole, through which a cord is drawn, in order to suspend them in a convenient place; and by this practice they destroy some of the best part of the root.

All *rhubarb* plants, says Miller, are propagated by seeds, which should be sown in autumn soon after they are ripe, and then the plants will come up the following spring; whereas, if they are sown in the spring, they will not come up till the next spring. The plants should remain where the seeds are sown, and when they appear in the spring, the ground should be hoed to cut up the weeds, and they should be thinned, like carrots and parsnips, leaving them at the first hoeing six or eight inches asunder; and, at the second hoeing, at the distance of at least a foot and a half. After this the plants will require no other culture but to keep them clean from weeds: in autumn the leaves decay, when the ground should be made clean; and it should also be hoed and cleaned in the spring, when the plants put out their new leaves. In the second year after they come up the strongest will produce flowers and seeds; and, in the third year, most of them will flower. The roots will remain many years without decaying, and, it is said, that the old roots of the true *rhubarb* are much preferable to the young ones. They delight in a rich soil, not too dry nor too moist, and where there is a good depth for their roots to run down; in such land their leaves will be very large, and their roots will grow to a great size.

Two sorts of *rhubarb* roots are met with in the shops. The first is imported from Turkey and Russia, in roundish pieces, freed from the bark, with a hole through the middle of each, externally of a yellow colour, internally variegated with lively reddish streaks. The other, which is less esteemed, comes immediately from the East Indies, in longish pieces, harder, heavier, and more compact than the foregoing. The first sort, unless kept very dry, is apt to grow mouldy and worm-eaten; the second is less subject to these inconveniences. Some of the more industrious artists are said to fill up the worm-holes with certain mixtures, and to colour the outside of the damaged pieces with powder of the finer sorts of *rhubarb*, and sometimes with cheaper materials. The marks of the goodness of *rhubarb* are, the liveliness of its colour when cut, its being firm and solid, but not flinty or hard; its being easily pulverable, and appearing, when powdered, of a fine bright yellow colour; its imparting to the spittle, on being chewed, a deep saffron tinge, and not proving slimy or mucilaginous in the mouth. Its taste is subacrid, bitterish, and somewhat styptic; the smell is lightly aromatic.

Rhubarb is a mild cathartic, and commonly considered as one of the safest and most innocent of the substances of this class. Besides its purgative virtue it has a mild astringent one, discoverable by the taste, and by its striking an inky blackness with chalybeate solutions; hence it is found to strengthen the tone of the stomach and intestines, to leave the belly costive, and to be one of the most useful purgatives in diarrhœas, dysenteries, and all disorders proceeding from a debility and laxity of the fibres: it is frequently given with a view to this stomachic and corroborating virtue rather than to its producing any considerable evacuations. It tinges the urine of a high yellow colour. *Rhubarb* in substance purges more effectually than any preparation of it: the dose is from a scruple to a dram. By roasting it with a gentle heat, till it becomes easily friable, its cathartic power is diminished, and its astringency supposed to be increased. The purgative virtue of *rhubarb* is extracted more perfectly by water than by rectified spirit; the root remaining after the action of water is almost if not wholly inactive; whereas, after repeated digestion in spirit, it proves still very considerably purgative: when the *rhubarb* has given out to spirit all that this menstruum can extract, it still imparts a deep colour, as well as a purgative impregnation, to water. A dram of the extract, formed by inspissating the watery infusion, is not more efficacious than a scruple of the root in substance; but half a dram of the extract formed from the spirituous tincture proves moderately purgative, though scarcely more so than an equal quantity of the powder. The spirituous extract dissolves almost wholly in water, and hence the tincture, like the spirituous infusions of most other vegetables, does not turn milky on being mixed with aqueous liquors; of the watery extract scarce above one fourth is dissolved by rectified spirit, and the part that does not dissolve proves more purgative than that which does. Hence it appears, that *rhubarb* contains much more gummy or mucilaginous than resinous matter; and its purgative quality seems to reside chiefly in a combination of gummy and saline matter.

Tinctures of this root are drawn in the shops with proof spirit and with Mountain wine, in the proportion of an ounce of *rhubarb* to a pint of the menstruum. These preparations, used chiefly as mildly laxative corroborants, in weakness of the stomach, indigestion, diarrhœas, colicky and other such complaints, are commonly aromatised with a little cardamom seeds, and saffron, as two drams of the former and one of the latter to the above quantity of the root, and thus are formed the *tincture of rhubarb, vinosa & spirituosa*. For some purposes a tincture, called *tinctura rhei dulcis*, is drawn from the *rhubarb* and cardamom seeds with proof spirit, and two ounces of white sugar-candy dissolved in the strained liquor. For others, instead of sweets and aromatics, gentian and snake-root are joined, in the proportion of a dram and a half of the former and a dram of the latter, with the addition of a scruple of cochineal as a colouring ingredient; this last tincture, called *tinctura rhei amara*, is, in many cases, an useful assistant to the Peruvian bark in the cure of intermittents.

The Turkey *rhubarb* is generally preferred to the East India sort, though the latter is more astringent, but has some thing less of an aromatic flavour. Tinctures made from both, with equal quantities of rectified spirit, have nearly the same taste; on drawing off the menstrua, the extract left by the tincture of the East India *rhubarb* proves in taste considerably stronger than the other. They seem both, says Dr. Lewis, to be the produce of the same climate, and roots of the same species of plant, taken up probably at different seasons, or cured in a different manner. Lewis's Mat. Med.

The yellow colour of *rhubarb*, it is said, is much less destructible than many other vegetable yellows. Aqua fortis, and other acids which destroy the colour of saffron, turmeric, &c. make no change in that of *rhubarb*, or at most render it only turbid. Volatile spirits heighten the colour, and incline it to red. Fixed alkaline salts have this effect in a greater degree. Mr. Model affirms that a considerable quantity of selenites is contained in *rhubarb*. In one experiment he obtained six ounces of selenites from four pounds of *rhubarb*; and, in the other, no less than an ounce of selenites from two ounces and five drams of old *rhubarb*. Rozier's Journal for July, 1775.

The Indian *rhubarb* sown in our gardens has this peculiar property, that it yields a fine and clear gum. This is perfectly white and pellucid, and in the months of June and July is so plentiful, that an ounce may sometimes be gathered at a time from one plant of it. It exsudates of itself from all parts of the stalks and ribs of the leaves, and sometimes from the under part of the leaves themselves. It stands in some places in large drops, and in others the stalks, &c. seem only to be covered with a thin layer of it; and the under part of the leaves in some have it in form of twisted wires or long icicles. The plant may always be seen wounded by a sort of caustic in the places where the germen makes its way out, and these may be followed with any pointed instrument through the skin; in some parts of the plant this juice is found to be turned gummy within it, and looks like clear ice. As this is the only known herbaceous plant that yields a true gum like that of trees, it would be worthy observation, whether or not some of our own plants have some tendency of nature to form a juice of the same kind. It would be most proper to look for this in the plants of the same genus, and as nearly related to the *rhubarb* as we can. The docks, so common about our fields, are of the same genus; and the

the ſorrel ſhews, by its taſte, that it is particularly allied to the plant; for both are alike of the dock-kind, and both alike ſour. It would be proper to look carefully about the leaves of ſorrel a little before it flowers, to ſee whether any thing like the ſame gum appears on it.

There is yet this farther analogy between this *rhubarb* and our common ſorrel; that the huſks of our ſorrel, boiled in water, with a little alum, turn it to a fine red colour; and the huſks of *rhubarb* do the ſame, and both the one and the other often turn red in decaying.

The juice of the roots of this *rhubarb*, extracted by bruiſing and ſteeping it in common water, when the liquor is ſtrained and evaporated, becomes only a clear uninflammable gum, and melts in the flame of a candle. This gum, as well as that of the ſtalks and leaves, is of an inſipid taſte; and it is obſervable, that though the plant naturally yields it in ſo large a quantity, yet it will not flow from wounds made by art in any part of the plant. Upon the conſideration of the inſipid taſte of this gum, and its ſolubility in water, we may found ſome probable conjecture, in regard to the different virtues of this plant in purging and binding.

The woody fibres have a ſtrong taſte; and, in all probability, are alone endued with the aſtringent quality. An infuſion of *rhubarb* is known to purge, and a powder of it to bind: the reaſon is eaſily ſeen on this conſideration. The water in infuſion takes up all this gummy juice, and its other juices, but leaves the fibroſe part behind, in conſequence of which it ought to purge without binding; but in caſe of giving the powder, the juices are in great part evaporated in the drying, and the woody part left almoſt alone; it therefore purges but little, and proves powerfully aſtringent. Phil. Tranſ. N° 224.

RHUBARB, *monk's*, a ſpecies of DOCK.

The root of this plant is more aſtringent than *rhubarb*, but is much inferior in its purgative virtue, though given, as uſually directed, in double its doſe; nauſeating the ſtomach, without producing any conſiderable evacuation. It communicates a deep yellow tincture, both to water and ſpirit. Lewis.

RHUBARB, *white*. See MECHOACAN.

RHUMB, RUMB, or RUM, in *Navigation*, a vertical circle of any given place; or the interſection of a part of ſuch a circle with the horizon.

Rhumbs, therefore, coincide with *points* of the world, or of the horizon.

And hence the mariners diſtinguiſh the *rhumbs* by the ſame names as the points and winds. But we may obſerve, that the *rhumbs* are denominated from the points of the compaſs in a different manner from the winds: thus, at ſea, the north-eaſt wind is that which blows from the north-eaſt point of the horizon towards the ſhip in which we are; but we are ſaid to ſail upon the north-eaſt *rhumb*, when we go towards the north-eaſt.

They uſually reckon 32 *rhumbs*, which are repreſented by the 32 lines in the roſe, or card, of the compaſs.

Aubin defines a *rhumb* to be a line on the terreſtrial globe, ſea-compaſs, or ſea-chart, repreſenting one of the 32 winds which ſerve to conduct a veſſel. So that the *rhumb* a veſſel purſues is conceived as its route, or courſe.

Rhumbs are divided and ſubdivided like points. Thus, the whole *rhumb* anſwers to the cardinal point. The half *rhumb* to a collateral point, or makes an angle of 45 degrees with the former. The quarter *rhumb* makes an angle of 22 deg. 30 min. therewith. And the half-quarter *rhumb* makes an angle of 11 deg. 15 min.

Sometimes navigators divide the 32 points into four quarters, and call the *rhumb* next the eaſt the firſt *rhumb*, the next to that the ſecond *rhumb*, &c.

For a table of the *rhumbs*, or points, and their diſtances from the meridian, ſee WIND.

RHUMB-LINE, *loxodromia*, in *Navigation*, is a line prolonged from any point of the compaſs in a nautical chart, except the four cardinal points: or it is the line which a ſhip, keeping in the ſame collateral point, or *rhumb*, deſcribes throughout its whole courſe.

The great property of the *rhumb-line*, or loxodromia, and that from which ſome authors define it, is, that it cuts all the meridians under the ſame angle.

This angle is called the *angle of the rhumb*, or the *loxodromic* angle.

The angle which the *rhumb-line* makes with any parallel to the equator, is called the *complement of the rhumb*.

An idea of the origin and properties of the *rhumb-line*, the great foundation of navigation, may be conceived thus: a veſſel beginning its courſe, the wind wherewith it is driven makes a certain angle with the meridian of the place; and, as it is ſuppoſed, the veſſel runs exactly in the direction of the wind, it makes the ſame angle with the meridian which the wind makes.

Suppoſing then the wind to continue the ſame, as each point or inſtant of the progreſs may be eſteemed the beginning, the veſſel always makes the ſame angle with the meridian of the place where it is each moment, or in each point of its courſe which the wind makes.

Now a wind, e. gr. that is north-eaſt, and which, of conſequence, makes an angle of 45 degrees with the meridian, is equally north-eaſt wherever it blows, and makes the ſame angle of 45 degrees with all the meridians it meets. A veſſel, therefore, driven by the ſame wind, always makes the ſame angle with all the meridians it meets with on the ſurface of the earth.

If the veſſel ſail north and ſouth, it makes an angle infinitely acute with the meridian, i. e. it is parallel to it; or rather ſails in it. If it run eaſt and weſt, it cuts all the meridians at right angles.

In the firſt caſe, it deſcribes a great circle; in the ſecond, either a great circle, viz. the equator, or a parallel to it. If its courſe be between the two, it does not then deſcribe a circle; ſince a circle, drawn in ſuch a manner, would cut all the meridians at unequal angles, which the veſſel cannot do.

It deſcribes therefore another curve, the eſſential property whereof is, that it cuts all the meridians under the ſame angle. This curve is what we call the *loxodromic curve*, *rhumb-line*, or *loxodromy*.

It is a kind of ſpiral, which, like the logarithmic ſpiral, makes an infinity of circumvolutions without ever arriving at a certain point, to which it yet ſtill tends, and towards which it approaches at every ſtep.

This aſymptotic point of the *rhumb-line* is the pole: at which were it poſſible for it to arrive, it would find all the meridians conjoined, and be loſt in them.

The courſe of a veſſel then, except in the two firſt caſes, is always a *rumb-line*; which line is the hypothenuſe of a rectangled-triangle, whoſe two other ſides are the ſhip's way, or diſtance run in longitude and latitude. Now the LATITUDE is uſually had by obſervation, and the angle of the *rhumb*, with one or other of the two ſides, by the COMPASS.

All, therefore, that is required by calculation in ſailing is, the value of the length of the *rhumb-line*, or the diſtance run.

But as ſuch curve line would prove very perplexing in the calculation, it was neceſſary to have the ſhip's way in a right line; which right line, however, muſt have the eſſential property of the curve line, viz. to cut all the meridians at right angles. The method of effecting which, ſee under the article CHART.

If PA, PF, PG, &c. (*Tab. Navigation, fig.* 21.) be ſuppoſed meridians, AI the equator, and EB, KL, MN, parallels; AO will repreſent a *rhumb-line*, which makes equal angles with the meridians, and conſequently different from thoſe made by a great circle, which cuts the meridians at unequal angles, whence it follows, that the *rhumb* is not a great circle of the ſphere. If a ſhip, therefore, be at firſt directed towards E, and conſtantly perſiſt in the ſame *rhumb*, it will never arrive at the place E, but at the place O, which is farther from the equator AI.

Hence, as on the ſurface of a ſphere the ſhorteſt way between A and O is an arch of a great circle between A and O; the *rhumb-line* is not the ſhorteſt way, or leaſt diſtance from one place to another.

RHUMB-LINES, *uſe of the*, in *Navigation*. 1. If the meridians PA, PB, PC, PD, &c. (*fig.* 23.) be not very far apart, the *rhumb-line* AIHG is divided by the equidiſtant parallels, LE, MF, NG, &c. into equal parts.

Hence, 1. The parts of the *rhumb* AI and AG are as the latitudes AL and AN of the places A and G. 2. Since the arcs, AB, IK, HF, are equal in magnitude, and therefore unequal in number of degrees; the ſum of the arcs, called the *latus mecodynamicum*, or *miles of longitude*, is not equal to the difference of longitude AD of the places A and G.

2. The length of the *rhumb-line* AG is to the change or difference of latitude GD, in the ſame ratio as the whole ſine to the co-ſine of the angle of the *rhumb*.

Hence, 1. The *rhumb* ſailed on being given, together with the difference or change of latitude, turned into miles, the length of the *rhumb-line*, or the diſtance from the place A to the place G upon the ſame *rhumb*, is had by the rule of three. 2. The *rhumb* being given, together with the quantity of the ſhip's way on the ſame *rhumb*, i. e. the length of the *rhumb* AG; the difference of latitude DG is had, by the rule of three, in miles, to be converted into degrees of a great circle. 3. The difference of latitude DG being given in miles, as alſo the length of the *rhumb-line* AG, the angle of the *rhumb*, and conſequently the *rumb* ſailed on, is had by the rule of three. 4. Since the co-ſine of an angle is to the whole ſine, as the whole ſine to the ſecant of the ſame angle; the

the difference of latitude GD is to the length of the *rhumb-line* AG, as the whole sine to the secant of the angle of the *rhumb*.

3. The length of the *rhumb-line*, or of the ship's way in the same *rhumb* AG, is to the *latus mecodynamicum* or *mecodynamic* side AB + IK + HF, as the whole sine to the sine of the *loxodromic* angle GAP.

Hence, 1. The *rhumb*, or angle of the *rhumb*, being given; as also the ship's way in the same *rhumb-line* AG, the *mecodynamic* side is had, by the rule of three, in miles, i. e. in the same measure wherein the length of the *rhumb* is given. 2. In like manner, the *mecodynamic* side AB + IK + HF being given, as also the *rhumb-line* or ship's way AG, the *rhumb* sailed in is found by the rule of three.

4. The change of latitude GD is to the *mecodynamic* side AB + IK + HF; as the whole sine to the tangent of the *loxodromic* angle PAG or AIB.

Hence the *rhumb* or *loxodromic* angle PAG, and the change of latitude GD being given, the *mecodynamic* side is found by the rule of three.

5. The *mecodynamic* side AB + IK + HF is a mean proportional between the aggregate of the *rhumb* AG, and the change of latitude GD, and their difference.

Hence the change of latitude GD, and the *rhumb-line* AG being given in miles, the *mecodynamic* side is found in the same measure.

6. The *mecodynamic* side AB + IK + HF being given, to find the longitude AD.

Multiply the change or difference of latitude GD by six, which reduces it into parts of ten minutes each; divide the *mecodynamic* side by this product, and the quotient gives the miles of longitude, answering to the difference of latitude in ten minutes: reduce these miles of longitude in each parallel into differences of longitude from a loxodromic table, and the sum of these is the longitude required.

7. If a ship sail on a north or south *rhumb*, it describes a meridian; if on an east or west *rhumb*, it describes either the equinoctial, or a parallel thereto. Wolfii Elem. Math. tom. iv. cap. 11.

8. *To find the* rhumb *between two places by calculation, or geometrically*, we have two canons, or proportions: the first, As the radius is to the co-sine of the middle latitude, so is the difference of longitude to the whole departure from the meridian, in the course between the two places proposed.

The second, As the radius is to the half-sum of the co-sines of both latitudes, or (rather for geometrical schemes) as the diameter is to the sum of the co-sines of both latitudes, so is the difference of longitude to the departure from the meridian.

For an example of the former proportion, let the *rhumb* be required between cape Finisterre, latitude 43°, longitude 7° 20′, and St. Nicholas isle, latitude 38°, longitude 352°. The middle latitude is 40° 30′, the complement 49° 30′; and the difference of longitude 15° 20′. Out of these lesser equal parts prick down 15° from C to L (*fig.* 24.) and describe the arc BD with 60° of the chords, and make it equal to 49° 30′, and draw CD continued farther to A. From L take the nearest distance to AC, which is equal to LM, and make it one leg of a right-angled triangle; make the other leg the difference of latitude 5°, which prick from the equal parts from L to B. Then the extent MB, measured on the said parts, shews the distance to be 13° 24′; which, allowing 20 leagues to a degree, is almost 268 leagues. Then with the radius CB, setting one foot at M, cross the *rhumb* triangle at GH; which extent, measured on the greater chord, is almost 22°, the complement whereof is 68°; and so much is the *rhumb* from the meridian between the two places, amounting to 6 points, and upwards of 80 minutes.

For an instance of the latter proportion, let it be required to find the *rhumb* and distance between the Lizard and Bermudas. The latitude of the Lizard being 56°, and that of Bermudas 32° 20′, or 32° 41 centesms, and their difference of longitude 55 degrees: draw the lines AC and CD (*fig.* 25.) at right angles, and with 60 degrees of the lesser chords describe the quadrant HI, and prick the radius from I to D; so is CD the diameter: then count both latitudes from H to F and G, the nearest distance from F to CI is the co-sine of Bermudas latitude, which prick from C to E. Again, the nearest distance from G to CI is the co-sine of the Lizard's latitude, which place from C to S, so is CS the sum of both co-sines; draw DS, and prick down 55 degrees, the difference of longitude from C to V, out of the greatest equal parts, and draw VB parallel to DS; so is CB the departure from the meridian in the course between both places. Making that, therefore, one leg of a right-angled triangle, prick down 17 degrees 59 centesms, the difference of latitude between those places, out of the same equal parts, from C to L, and draw BL. This represents the course and distance between the Lizard and Bermudas; and the extent LB, measured on the same equal parts, shews the distance to be 44 degrees 31 centesms; which, allowing 20 leagues to a degree, is 886 leagues.

Then to find the course: with 60 degrees of the chords, setting one foot in L, with the other make marks at Y and Z; then the extent ZY, measured on the chord, shews the *rhumb* to be 66° 37′ from the meridian. This proportion, in the present example, holds very just, according to Mercator's chart; whereas the former proportion, by the middle latitude, would have given the *rhumb* 67° 2′ from the meridian, and the distance 902 leagues. Again, making CA equal to CV, a line joining LA would be the course and distance according to the same longitudes and latitudes laid down on the plain chart, whereby the course should be 72° 17′ from the meridian, and the distance 1155 leagues. See SAILING.

RHUS, in *Botany*. See SUMACH, and POISON-*wood*.

RHUSELNIUM, in *Botany*, a name given by some authors to the RANUNCULUS.

RHYAS, Ῥύας, formed from ῥεῖν, *to flow*, in *Medicine*, a diminution or consumption of the caruncula lacrymalis situate in the great canthus or angle of the eye.

The *rhyas* is used in opposition to the *encanthis*, which is an excessive augmentation of the same caruncle.

The cause of the *rhyas* is a sharp humour falling on this part, and gnawing and consuming it away by degrees; though it is sometimes also produced by the too great use of catheretics in the fistula lacrymalis. It is to be cured by incarnatives.

RHYME, RHIME, RYME, or RIME, in *Poetry*, the similar sound or cadence and termination of two words which end two verses, &c.

Or, *rhyme* is a similitude of sound between the last syllable or syllables of one verse, and the last syllable or syllables of a verse succeeding either immediately, or at a distance of two or three lines.

Rhyme is a modern invention, and the product of a Gothic age: Milton calls it the *modern bondage*. Yet some authors will have it, that the English, French, &c. borrow their *rhyme* from the Greeks and Latins. The Greek orators, they say, who endeavoured to tickle the ears of the people, affected a certain cadence of periods which ended alike, and called them ὁμοιοτέλευτα. The Latins, who imitated them, called these chiming terminations, *similiter desinentia*.

This affectation increased as the Latin tongue declined; so that, in the later Latin writers, scarce any thing is more common than rhyming periods.

The French, and from them the English, &c. adopted this cadence of *rhyme*, which seemed to them more pretty and agreeable than the metrical verses of the Greek and Roman poets.

This kind of Latin poetry in *rhyme* was much in vogue in the twelfth century; and the verses thus running were called LEONINE *verses*, for what reason Camden owns he does not know (for a lion's tail, says he, does not answer to the middle parts, as these verses do); but, doubtless, they had their name from a canon called *Leoninus*, who first composed them with success, and of whom we have several pieces in them remaining, addressed to pope Adrian IV. and Alexander III.

Camden has given us a collection of Latin *rhymes* of our ancient English writers; among whom, Walter De Mapes, archdeacon of Oxford, in the time of king Henry II. makes a principal figure, especially for two pieces; the one in praise of wine, beginning,

> *Mihi est propositum in taberna mori,*
> *Vinum sit appositum morientis ori;*
> *Ut dicant, cum venerint, angelorum chori,*
> *Deus sit propitius huic potatori.*

The other against the pope, for forbidding the clergy to have wives, beginning,

> *Prisciani regula penitus cassatur,*
> *Sacerdos per* hic *&* hæc *olim declinatur;*
> *Sed per* hic *solummodo nunc articulatur,*
> *Cum per nostrum præsulem* hæc *amoveatur.*

Since the restoration of learning in the sixteenth century, attempts have been made to banish *rhyme* out of the modern poetry, and to settle the English and French verses on the footing of the ancient Greek and Latin ones, by fixing the quantities of the syllables, and trusting wholly to those, and to the numbers or measure.

This Milton has done, with great success, in his Paradise Lost, and other pieces; and after him Philips, Addison, and some others. Verses of this kind we call *blank verses*.

The French have attempted the same, but not with the same success. Jodelet made the first essay, and after him Pasquier;

Pasquier; but they both failed. Passerat and Rapin followed them, and failed, like them. Their hexameter and Sapphic verses were neither imitated nor approved; and the cadence of *rhyme* was generally preferred to quantity, or the use of long and short syllables. Des Portes, likewise, made some essays of verses, constructed of long and short lines, without *rhyme*; but the attempt only served to convince the world, that this kind of measure is inconsistent with the genius of the French tongue.

To succeed in such kind of verses, there must be a liberty of varying the order of the words, or of changing their situation, as may best suit the occasions of the poet; of making the substantive either go before or follow after the verb, as the verse requires, &c. Now none of the modern tongues will admit of such an arbitrary situation of the words, equally with the ancients; yet none will allow this more than the English, nor any less than the French.

Rhymes are either *single*, or *double*, or *triple*, though the two last are now much disused.

RHYMES, *single*, are divided into perfect or whole *rhymes*, and imperfect or half *rhymes*.

RHYME, *a whole* or *perfect*, is where there is a similitude of sound without any difference; or where a thorough identity of sound appears in the pronunciation of the two syllables, notwithstanding that there may be some difference in the orthography.

RHYME, *a half* or *imperfect*, is where there is a similitude, with a difference either in respect of the pronunciation, or the orthography, but chiefly the former.

RHYME, *the feminine*, is that where the last syllable of the *rhyme* ends with an *e* mute, or quiescent, as in *dove*, *belle*, &c.

RHYMES, *masculine*, are those of all other words.

Menage observes, that the masculine *rhymes* close the periods better; but that feminines, being the softer, and more languishing, end more agreeably, especially in mournful subjects.

RHYMES, *double*, by the French called *rich rhymes*, are those where the two words terminate alike through the whole two last syllables, as *squabble* and *rabble*, &c.

RHYMES, *plain*, are those where the two rhyming verses succeed immediately to each other.

RHYMES, *cross*, are those where the verses are so disposed, as that the first *rhymes* with the third, and the second with the fourth, &c.

RHYMES, *assonant*. See ASSONANT.

RHYNE, in *Botany*, a name used by some authors for the camphor tree.

RHYPTICS, RHIPTICS, Ῥυπτικα, in *Medicine*, detergent remedies, or cleansers. See DETERGENT.

RHYTHM, RHYTHMUS, Ῥυθμος, in *Music*, the variety in the movement, as to the quickness or slowness, and length and shortness, of the notes.

Or the *rhythmus* may be defined, more generally, the proportion which the parts of a motion bear to each other.

Aristides, among the ancient musicians, applies the word *rhythmus* three ways; viz. either to immoveable bodies, when their parts are rightly proportioned to each other; as a well-made statue, &c. or to things that move regularly, as in handsome walking, in dancing, in the dumb shews of the pantomimes, &c. or, thirdly, to the motion of sound, or the voice; in which, the *rhythmus* consists of long and short syllables, or notes, joined together in succession in some kind of order, so that their cadence on the ear may be agreeable.

This, in oratory, constitutes what we call *a numerous style*; and when the tones of the voice are well chosen, *a harmonious style*.

In effect, *rhythmus*, in the general, is perceived either by the eye or ear, and may be either with or without metre: but the strict musical *rhythm* is only perceived by the ear, and cannot exist without it. The first either exists without sound, as in dancing; or with sounds: it may be either without any difference of acute and grave, as in a drum, or with a variety of these, as in a song.

The *rhythmus* of the ancients, Mr. Malcolm observes, was very different from that of the moderns. The former was only that of the long and short syllables of the words and verses; it depended altogether on the poetry, and had no other forms or varieties than what the metrical art afforded. The changes therein are none but those made from one kind of metre to another, as from iambic to choraic, &c.

In the modern music, the constitution of the *rhythmus* differs from that of the verse, so far, that in setting music to words, the thing chiefly regarded is to accommodate the long and short notes to the syllables in such manner, as that the words be well separated, and the accented syllable of each word so conspicuous, that what is sung may be distinctly understood.

Vossius, in his book De Poematum Cantu & Viribus *Rhythmi*, extols the ancient *rhythmus*. Though he owns it was confined to the metrical feet; yet so well did they cultivate their language, especially in what relates to the *rhythmus*, that the whole effect of the music was ascribed to it, as appears by that saying of theirs, το παν παρα μουσικοις ὁ ρυθμος. See, on this subject, Burney's General History of Music, vol. i. sect. 6.

RHYTHM, RHYTHMUS, in the *Ancient Poetry*, denotes the measure of the feet, or the number and combination of long and short syllables; called also *metre* and *quantity*.

Vossius attributes the whole force of the ancient music to their happy *rhythmus*: but this is somewhat inconceivable. Mr. Malcolm rather takes it, that the words and sense of what was sung had the chief effect; and that hence it was that in all ancient music the greatest care was taken, that not a syllable of the words should be lost, lest the music should be spoiled.

Pancirollus seems of this opinion; and the reason he gives why the modern music is less perfect than the ancient, is, that we usually hear sounds without words.

Vossius says, the *rhythm* which does not express the very forms and figures of things can have no effect; and that the ancient poetical numbers alone are justly contrived for this end. He adds, that the modern languages and verse is altogether unfit for music; and that we shall never have any right vocal music till our poets learn to make verses capable of being sung; i. e. till we new-model our language, restore the ancient quantities and metrical feet, and banish our barbarous rhymes. Our verses, says he, run all as it were on one foot; so that we have not any real *rhythmus* at all in our poetry; he adds, that we mind nothing farther than to have such a number of syllables in a verse, of whatever nature, and in whatever order. But this is an unjust exaggeration.

RHYTHMICA, RHYTHMICE, Ῥυθμικη, in the *Ancient Music*, that branch of music which regulated the *rhythmus*. The *rhythmica* considered the motions; and regulated their measure, order, mixture, &c. so as to excite the passions, keep them up, augment, diminish, or allay them.

Aristides, and other ancient musical writers, divided artificial music into *harmonica*, *rhythmica*, and *metrica*.

But the *rhythmica*, with them, likewise comprehended dumb motions, and, in effect, all *rhythmical*, i. e. all regular motion.

Porphyry divides music into *harmonica*, *rhythmica*, *metrica*, *organica*, *poetica*, and *hypocritica*.

The ancients seem to have had no rhythm in their music beside the long and short syllables of their words and verses, which were sung, and always made a part of their music; so that the *rhythmica* with them was only the application of the metrical feet, and the various kinds of verses used by them. The modern goes much farther.

RHYTHMOPŒIA, one of the musical faculties, as they are called, which prescribes rules for the motions, or *rhythm*.

The ancient *rhythmopœia* is very defective. We find nothing of it in the books of the ancients, but some general hints, which can scarce be called rules. In their explications there appears nothing but what belongs to the words and verses of their songs, which is a strong presumption they had no other. See RHYTHMICA.

RHYTIDOSIS, formed of ῥυτιδοω, *to wrinkle*, the name of a distemper of the eye, in which it wastes and wrinkles up.

RIADHIAT, in *Modern History*, a superstitious practice among the Mahometans, and chiefly among those of Hindostan, which consists in shutting themselves up for fifteen days, without any other nourishment than bread and water, in a place where there is no light; during which time, the devout Mussulman incessantly repeats the word *hou*, which denotes one of the attributes of God.

RIAL, or RYAL, a Spanish silver coin; being the eighth part of the piaster or PIECE *of eight*.

The word in the original Spanish, *real*, signifies *royal*.

The *rial* is equal to about six pence $\frac{3}{4}$ sterling.

The silver *rial* is equal to 34 silver maravedis; the copper *rial* to 44 copper maravedis, which only amount to 18 silver maravedis.

There are also *rials* of eight, *rials* of four, *rials* of two, and half *rials*. The *rials* of eight are the piasters, those of four are half piasters, &c.

Great quantities of *rials*, or *rials* of eight, are carried into the East Indies, where they are divided into three classes, and received on different footings; viz. the *old rial*, known by the chaplet around, whereof 100 are current for 215 rupees; the *second*, known by the largeness

neſs of its head, current at 212½ rupees for 100; and the *new*, at 208¼ rupees for 100 *rials*. See Rupee.

Rial, or Royal, is alſo the name of a piece of gold, anciently current among us for ten ſhillings.

In 1 Henry VI. by indenture of the mint, a pound weight of gold of the old ſtandard was coined into 45 *rials*, going for ten ſhillings a-piece, or a proportional number of *half rials*, going at five ſhillings a-piece; or *rial farthings*, which went at two ſhillings and two pence.

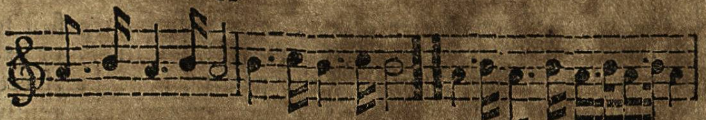
In 1 Henry VIII. the gold *rial* was ordered to go at eleven ſhillings and three pence. In 2 Elizabeth, gold *rials* were coined at fifteen ſhillings a-piece, when a pound weight of old ſtandard gold was to be coined into 48 *rials*. In 3 James I. *roſe-rials* of gold were coined at thirty ſhillings a-piece, and *ſpur-rials* at fifteen ſhillings.

RIB. See Ribs.

RIBATTUTA, in the *Italian Muſic*, a ſtriking or ſounding the ſame note over again. Hence,

Ribattuta *di gola*, one of the graces in ſinging, is performed by repeated beating or ſtriking a note, from that which is immediately above it. See example A. It differs from a ſhake.

A



B

Ribattuta *di gola doppia*. See example B. This is pretty near what the French call *tour de goſier*, or double cadence.

RIBBAND, or Ribbond, a narrow ſort of ſilk, chiefly uſed for head ornaments, badges of chivalry, &c.

The knights of the Garter wear a blue *ribband*; thoſe of the Thiſtle, a green *ribband*, &c. ſcarfwiſe. See Collar, Garter, &c.

Ribbands, *figured*. See Figured.

Ribband, or Ribbon, in *Heraldry*, is the eighth part of a bend. See *Tab.* II. *Herald. fig.* 82. See alſo the article Bend. It is borne a little cut off from the outlines of the eſcutcheon: thus; he beareth or, a *ribband*, gules.

Ribbands, in *Naval Architecture*, long narrow flexible pieces of timber, nailed upon the outſide of the ribs, from the ſtem to the ſtern-poſt, ſo as to envelop the ſhip lengthways, and appear on her ſide and bottom like the meridians on the ſurface of the globe.

The *ribbands*, being judiciouſly arranged, with regard to their height and diſtance from each other, and forming regular ſweeps about the ſhip's body, will compoſe a kind of frame, whoſe interior ſurface will determine the curve of all the intermediate or filling timbers, which are placed between the principal ones. Falconer.

Ribband-*ſcrew-ſhell*, the Engliſh name of the turbo, with broad ſpiral faſciæ, and a ſmall mouth.

RIBBING, in *Huſbandry*. See Ploughing.

Ribbing *nails*. See Nail.

RIBES, in *Botany*. See Currant *tree*.

RIBS, *coſtæ*, in *Anatomy*, certain long arched bones, ſerving to form or ſuſtain the inner ſides of the thorax or breaſt. See *Tab. Anat.* (*Oſteol.*) *fig.* 7. *lit. p. p. p.* &c.

The *ribs* are in number twenty-four; twelve on each ſide; though their number ſometimes varies. Their figure is an imperfect ſegment of a circle: they are harder, rounder, and more incurvated towards their articulation with the vertebræ than at the other extremity towards the ſternum, which is thinner, broader, and more ſpongy.

The *ribs* are divided into *true* or genuine, and *ſpurious* or falſe.

The *true ribs* are the ſeven upper pair, which are thus diſtinguiſhed, as forming the moſt perfect arches, and as having a ſtrong articulation with the ſternum. See *Tab. Anat.* (*Oſteol.*) *fig.* 3. *lit. a. a.* &c.

The five lower are called *nothæ*, or *ſpurious ribs*, as being ſmaller, ſhorter, and more cartilaginous than the reſt, and not forming entire arches, nor reaching ſo far as the ſternum, which makes their articulation very lax; becauſe they terminate in long ſoft cartilages, which bending upwards are joined to the upper ribs. See *Tab. Anat.* (*Oſteol.*) *fig.* 3. *lit. c. c.* &c.

Anatomiſts have divided each *rib* into the middle part, or body, two extremities, the one anterior, the other poſterior; two ſides, one external and convex, the other internal and concave; two edges, one ſuperior, and the other inferior; and two labia in each edge, one external, the other internal. The poſterior extremity, which may be called the head of the *rib*, is articulated with the vertebræ of the back. At the anterior extremity freſh *ribs* are lengthened out by cartilaginous epiphyſes, ſtuck into their bony ends. Each of the true *ribs*, at the poſterior extremity, has two ſmall cartilaginous impreſſions, diſtinguiſhed by a kind of angle, by which they are articulated with the lateral cartilaginous impreſſions in the bodies of two vertebræ of the back; but the firſt *rib* has no more than one ſuch impreſſion, being articulated with one vertebra only. At a ſmall diſtance from the head of this extremity poſteriorly is another cartilaginous impreſſion on each ſide, a little convex, and cloſely joined to a ſmall tuberoſity. By theſe the *ribs* are articulated with the lateral cartilaginous depreſſions in the tranſverſe apophyſes of the dorſal vertebræ; and the tuberoſities ſerve for the inſertion of ligaments: the portion which lies between the head and theſe impreſſions is contracted, and repreſents a neck. When the poſterior extremity of a *rib* is articulated with two vertebræ, the ſecond articulation is always with the tranſverſe proceſs of the loweſt of the two. Between the tuberoſity and middle part of the *ribs*, there is, on their outſide, a kind of oblique rough angle of different breadths. In the firſt *rib*, this angle is not diſtinct from the tuberoſity; in the ſecond, it reaches but to a ſmall diſtance from it; in the third *rib*, this diſtance is ſtill greater, and from thence it continues to increaſe gradually all the way to the third falſe *rib*; ſo that if we look directly at the back of a ſkeleton, theſe angles repreſent the legs of a pair of compaſſes, opened pretty wide. On the inſide of the *ribs*, toward the lower edge, we obſerve a groove reaching all the way from the angle to the extremity, and that chiefly in the five lower true *ribs*, and the three firſt falſe ones. The upper edge of the two firſt *ribs* is ſharp, the lower a little rounded. The upper edge of the third is more obtuſe, and the lower a little more flat. In the reſt, the upper edge is rounded, the lower more or leſs ſharp.

In all the *ribs* the anterior extremity is lower than the poſterior; the *ribs* are much more crooked in the back than in the forepart; the appendices, epiphyſes, or cartilaginous portions of the true *ribs*, increaſe in length, as they deſcend in the ſame manner as the *ribs* themſelves; the cartilages of the firſt three or four *ribs* lie nearly in the ſame direction with the *ribs* themſelves. In the *ribs* below theſe, the cartilages make angles, at which they turn upward towards the ſternum, and this curvature increaſes in proportion as the *ribs* deſcend; and the loweſt cartilages, in changing their direction upwards, lie very cloſe to each other, and thoſe of the laſt two true *ribs* have often, at their inferior edge, a ſort of apophyſis or production, by which they are connected with the cartilages immediately below them. The laſt two true *ribs* extend conſiderably in breadth toward their lower ſharp edges, from the angle for a good diſtance anteriorly. Afterwards they contract in breadth and increaſe in thickneſs, forming a ſort of neck, a little longer than that at their poſterior extremity; then their breadth begins to increaſe again, by degrees, to the anterior extremity. In all the *ribs*, this extremity terminates in a cavity, in which the cartilages are grafted.— The three uppermoſt falſe *ribs* increaſe in breadth from the angle forward, and the grooves are moſt conſiderable in theſe. They have alſo heads, necks, tuberoſities, and angles, almoſt the ſame as in the laſt true *ribs*. All the falſe *ribs* have cartilaginous appendages; the firſt of which is longeſt, and fixed to the cartilage of the laſt true *rib*; the two following are united together at their extremities, and the two laſt are connected only to muſcles and ligaments. They are both very ſhort, eſpecially the laſt, which is not above a quarter of an inch in length, and all theſe cartilages of the falſe *ribs* are pointed at their extremities.

The *ribs* are articulated anteriorly with the ſternum, and behind with the vertebræ of the back; the firſt *rib* is entirely united with the ſternum, by means of its cartilage, and in the ſix following the extremities of the cartilages join that bone. The three upper falſe *ribs* are joined to each other by the extremities of their cartilages; the connection of the *ribs*, with the vertebræ of the back, is for the moſt part by ginglymus. The ten upper *ribs* are confined to two motions only, upward and downward; whereas the two laſt are left more at liberty, and are therefore termed floating *ribs*. Winſlow.

All the *ribs*, together with the ſternum, are raiſed by the reſpiratory muſcles, in the action of inſpiration, by which means, and by the deſcent of the diaphragm in that action, the cavity of the thorax is enlarged for the more commodious expanſion of the lungs.

Ribs, *cartilages of the*. All the *ribs* have cartilaginous portions, which differ from each other in length, breadth, incurvations, adheſions, and in their extremities. It is

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to be observed, that these cartilages are white, more polished, broader, and thicker in their natural state, than in the dried skeleton. The cartilages of the false *ribs* are naturally softer and more pliable than those of the true; the middle or inner substance of these acquires the consistence of bones in old age, and their extremities sometimes ossify, and are immoveably fixed to the sternum.

Ribs, *ligaments of the*. All the *ribs* are connected to the bodies of the vertebræ by strong, short, ligamentary fasciculi, fixed by one end round the fossulæ in the vertebræ, and by the other round the head of each *rib*.—They are also tied together by thin ligaments, which go from the cartilage of each *rib* obliquely to that of the next. The ten uppermost *ribs* on each side are connected to the transverse apophyses of the vertebræ of the back, by strong, short, articular ligaments, fixed to the tuberosities of the *ribs*, and round the fossulæ of the apophyses, much in the same manner with those which go between the heads of the *ribs* and bodies of the vertebræ: both these articulations are provided with capsular ligaments. The eleventh *rib*, on each side, having no articulation with the transverse apophyses, is connected to them by auxiliary, strong, short ligaments, fixed in its neck. The last *rib* is only joined by its head to the body of the twelfth vertebra of the back; but it is connected, in a particular manner, to the transverse apophysis of the first vertebra of the loins, by a broad ligament, fixed in the whole upper edge of the apophysis, and in the lower edge of the *rib*, through about two-thirds of its length. The first true *rib* has no ligamentary connection with the sternum, the cartilaginous symphysis being sufficient; the rest are closely joined to that bone by small ligamentary portions, fixed by one end round the extremity of the cartilage, and by the other round the notches in the sternum. The cartilage of the first false *rib* is joined to that of the last true *rib*, by several short filaments, which go from the lower edge of the one to the upper edge of the other, near its small extremity. The other false *ribs* are connected together much in the same manner; except that the filaments, by which the fourth is connected to the third, are longer than those above them, and those between the fifth and fourth are much longer than any of the rest; and for this reason these *ribs* are less steady than the others.—The ligamentary expansions of the vertebræ are in place of a periosteum, but the *ribs* and sternum have a periosteum like other bones, only that the cartilaginous portions of the *ribs* generally give their covering the name of a perichondrium. Winslow.

Ribs, *dislocated*. The *ribs* are sometimes, though but seldom, dislocated; for they are sometimes displaced by some external violence, and thrust either upwards or downwards, outwards or inwards. They cannot easily indeed be luxated outwards, because prevented by the vertebral processes, and resisted by very thick and strong muscles; but when they are driven into the cavity of the thorax, which oftner happens, they not only lacerate the pleura, or membrane, which lines the cavity of the thorax, but generally do great injury also to the contained parts: in consequence of which arise most sharp pains, inflammation, difficulty of breathing, coughs, ulcers, immobility, and many other dangerous symptoms.

When the *rib* is luxated, either upwards or downwards, in order to replace it conveniently, the patient is to be laid on his belly upon a table, and the surgeon must endeavour to reduce the luxated bone to its right place with his hands; or the arm of the disordered side may be suspended over a gate or ladder; and while the *ribs* are thus stretched up from each other, the heads of such as are luxated may be pushed into their former seat.

Those luxations, where the heads of the *ribs* are found to be thrust inwards into the cavity of the thorax, are much the most difficult to be reduced, because neither the hand, nor any other instrument, can be applied internally, to assist and direct the bone in the operation. In this case it seems proper to lay the patient on his belly, over some gibbous or cylindric body, and move the forepart of the *rib* inwards toward the back, shaking it sometimes; for thus it sometimes happens, that the head of the luxated *rib* slips into its former place. But if this method of cure will not avail, we have no remedy left but incision, and endeavouring to replace the luxated head of the *rib* by the fingers, plyers, or little hooks. In the mean time, where the symptoms are not very urgent, and the heads of the *ribs* but little displaced, it is much more adviseable to have recourse to none of those means, because there are several instances where the luxated *ribs* have safely retained their dislocated stations; but, above all, care must be taken to lay on a compress, dipped in warm spirit of wine upon the part, and retain it on by the napkin and scapulary bandage.—Heister.

Ribs, *fractured*. Sometimes the *ribs* are only fissured in such a manner, that the external or internal part of them are only hurt, without their being removed out of their place. This is usually attended by no bad accident, and the bone frequently grows together again of itself, without the accident being discovered. But if the whole *rib* be fractured, and some part of it be removed out of its place, it is a more dangerous case: for the costal muscles, and the pleura, that lines the internal cavity of the thorax, will be much disturbed by the fragments of the bone.

When a *rib* is fractured, it projects either externally or internally in the form of a broken arch; when it projects externally the symptoms are usually much milder; but when it is drove inward the case is usually much worse, especially if any vein or artery be divided by it, so as to let blood run into the cavity of the thorax; in consequence of which there follow prickings, inflammation, difficult respiration, coughs, fevers, spitting of blood, suppuration, extravasation of blood, and other bad symptoms, particularly if any of the viscera are hurt at the same time.

In order to replace fractured *ribs*, it is necessary first to inquire whether the splinters project internally or externally; when externally, the patient is to be placed upon a high table, and the separated bones must be gently forced by the fingers into their places; the proper compresses, dipped in spirit of wine, must be laid on, and then covered with slips of pasteboard, or splints, and the circular bandage, or napkin and scapulary. But when the splinters are thrust inward, while the patient retains a deep breath, both sides of the bone must be compressed with the hands, and agitated till they are properly fixed. When they are replaced, the pasteboard must not be applied in this case, but only the bandage drawn a little less tight. By these means, fractures of this kind are usually cured in three or four weeks.—Heister.

Ribs *of fish*. There is a very great variety in the shape and other peculiarities of the *ribs of fish*. They are in some smooth and flatted sideways, as in the cyprini; in others they are rounded, as in the cotti and gadi. In the cyprini the several species have from thirteen to nineteen *ribs* on a side, and the vertebræ are from thirty-seven to forty-nine in number, differing greatly in number in the several species of the same genus. The *ribs* in many fish adhere to the vertebræ, by means of cartilages, and seem only continued parts of them; but in others they are free and loose, and do not so much as touch the vertebræ. We find instances of the first sort of structure in the cyprini, salmons, &c. and of the other in the pearch, the gadi, and the pleuronectæ. In the spinose fishes, the last vertebra always is terminated by a pair of broad apophyses placed perpendicularly, and touching one another, and by means of cartilages these are fixed to the bones of the tail. Artedi Ichthyolog.

Ribs *of a ship*, are the timbers of the futtocks, when the planks are off, so called because they are bent like the *ribs* of a carcase or skeleton.

Ribs *of parrel*, in a ship. See Parrels.

Ribs, among *Jewellers*, the lines, or ridges, which distinguish the several parts of the work, both of brilliants and roses.

Rib-*wort*, in *Botany*. See Plantain.

RICA, among the Romans, a veil with which the ladies covered their heads.

RICCIA, *Marsh liver-wort*, in *Botany*, the name of a genus of plants of the *lichen* class, or, according to Linnæus, of the *algæ*. The characters of this genus are these: the male flower stands on the surface of the leaf without a pedicle, and has neither cup nor petals, nor even stamina, but is a simple anthera, or apex, of a cylindric form, but truncated, and opening at the top when ripe. The female flower grows sometimes on the same, sometimes on different plants; it has scarce any cup, and no petals, but is loaded with a globose fruit, having only one cell, which contains a vast number of seeds. Linnæus enumerates five species.

RICE, *oryza*, in *Botany*, a genus of the *hexandria digynia* class. Its characters are these: the chaff is small, acute-pointed, having two valves, nearly equal, inclosing a single flower; the petal has two valves, which are boat-shaped, ending in a beard or awn; it has a two-leaved nectarium, and six hairy stamina, the length of the petal, terminated by summits, bifid at their base, and a turbinated germen, supporting two reflexed hairy styles, crowned by feathered stigmas; the germen afterward becomes one large, oblong, compressed seed, having two channels on each side, sitting on the petal of the flower. There is but one species of this plant.

This

This grain is greatly cultivated in moſt of the Eaſtern countries, where it is the chief ſupport of the inhabitants; and great quantities of it are brought into England, and other European countries, every year, where it is in great eſteem for puddings, &c.

It is too tender to be produced in theſe Northern countries, without the aſſiſtance of artificial heat; but from ſome ſeeds, which were ſent to South Carolina, about the year 1697, there have been great quantities produced, and it is found to ſucceed as well there as in its native country, which is a very great improvement to the American ſettlements.

This plant grows upon moiſt ſoils, where the ground can be flowed over with water, after it is come up; ſo that whoever would cultivate it in England, for curioſity, ſhould ſow the ſeeds upon a hot-bed; and when the plants are come up, they ſhould be tranſplanted into pots, filled with light rich earth, and placed in pans of water, which ſhould be plunged into a hot-bed; and as the water waſtes, ſo it muſt from time to time be renewed again. In July, theſe plants may be ſet abroad in a warm ſituation, ſtill preſerving the water in the pans, otherwiſe they will not thrive. Toward the latter end of April they will produce their grain, which will ripen tolerably well, provided the autumn proves favourable. Miller.

The Chineſe water their *rice*-fields by means of moveable mills, placed as occaſion requires, upon any part of the banks of a river. The water is raiſed in buckets to a proper height, and afterwards conveyed in channels to the deſtined places.

Rice is much uſed as food in the Roman Catholic countries in time of Lent. The ordinary preparation is by firſt ſteeping it in water, then boiling it in milk. Some make it into a ſort of farina, or flour, by pounding it in a mortar, after having firſt put it in hot water, and again waſhed it out in cold.

Among the common kinds of grain, *rice* is accounted the mildeſt and moſt nutritious, and is ſuppoſed to be particularly ſerviceable in dyſenteries and diarrhœas. It is leſs viſcous than wheat, or of leſs tenacity, when boiled with water.

The northen nations eat their fowls and other meats with *rice* and ſaffron. The Chineſe make a wine of *rice*, which is of an amber colour, and taſtes like Spaniſh wine, and ſerves them for their common drink. In ſome parts of Europe they alſo draw a very ſtrong brandy, or ſpirit, from *rice*.

RICERCATA, in the *Italian Muſic*. Sae RESEARCH.

RICHARDIA, in *Botany*, the name of a genus of plants, of the *hexandria monogynia* claſs; the characters of which are theſe: the cup conſiſts of one leaf, divided into ſix parts, and is erect and pointed, and of about half the length of the flower; the flower is monopetalous, and of a cylindric funnel-like ſhape, the edge is divided into ſix ſegments; the ſtamina are ſix filaments, ſo ſhort as to be ſcarce obſervable; the antheræ are roundiſh and ſmall, and ſtand in the notches of the flower; the germen of the piſtil ſtands beneath the cup; the ſtyle is capillary, of the length of the ſtamina, and divided into three parts at the top; the ſtigmata are obtuſe; the ſeeds ſtand naked, and are three in number, they are roundiſh but angular, and are broad at the upper part and gibbous. There is only one ſpecies.

RICINOCARPODENDRON, compounded of *ricinus*, καρπος, *fructus*, and δενδρον, *arbor*, in *Botany*, the name of a genus of plants, eſtabliſhed by Dr. Amman, the characters of which are theſe: the flower is of the roſaceous kind, conſiſting of three petals, diſpoſed in a circular order, in the center of which there ariſes a large and open tube, through which ſhoots up the piſtil, which grows at the bottom of the cup; this piſtil, finally, becomes a trigonal fruit, divided into three cells within, and containing each one ſeed in a rough coat.

The leaves of this tree ſometimes reſemble thoſe of the aſh, being compoſed of three or four pairs of ſmaller leaves joined to a middle rib, theſe are not ſerrated, and terminate in a ſharp point; the flowers grow at the alæ of the leaves, they are white, and are diſpoſed in lax ſpikes; the fruit is green at firſt, afterwards it becomes of a yellowiſh red, and finally ſcarlet; it is of the bigneſs of a walnut, and in ſhape much reſembles the fruit of the ricinus; the covering of the ſeeds is black on the outſide, and red within, and each ſeed is divided into two lobes; when ripe, the fruit burſts, and the ſeeds fall out. It is a native of the Eaſt Indies. Act. Petropol. vol. viii. p. 214.

RICINOIDES, in *Botany*. See CROTON.

RICINUS, in *Botany*. See PALMA *Chriſti*.

RICK, in *Huſbandry*, a pile of corn, hay, ſtraw, &c. regularly heaped up in the open air, and ſheltered from wet. See STACK.

RICKETS, *rhachitis*, in *Phyſic*, a diſorder affecting the bones of children, and cauſing a conſiderable protuberance, incurvation, or diſtortion thereof.

This diſeaſe, which appeared firſt in England about the time when manufactures began to flouriſh, and ſtill prevails moſt in towns, where the inhabitants follow ſedentary employments, generally attacks children betwixt the age of nine months and two years.

RICKETS, *cauſes of the*. Diſeaſed parents often produce rickety children. Any diſorder that weakens the conſtitution, or relaxes the habit of children, as the ſmall-pox, meaſles, teething, the hooping-cough, &c. diſpoſes them to this diſeaſe: but the chief cauſe is bad nurſing. It ſometimes ariſes from a fault in ſwathing the child, rolling it too tight in ſome places, and too looſe in others; placing it in an inconvenient, or too often in the ſame poſture; or ſuffering it to be long wet. It is likewiſe attributed to the want of proper motion, for a healthy child ſhould be always in motion, unleſs when aſleep; and if it be ſuffered to lie or ſit, inſtead of being toſſed or dandled about, it will not thrive. It is likewiſe occaſioned by uſing the child to be borne in one arm only; whence the legs and knees remain too long in the ſame incurvated ſituation.

Or it may be the effect of improper diet, or of ſome fault in the digeſtion, occaſioning the aliment to be unequally applied to the body; by which ſome parts of the body increaſe in bulk more than the reſt.

The want of free air is alſo very pernicious to children.—When a nurſe lives in a cloſe ſmall houſe, where the air is damp and confined, and is too indolent to carry her child abroad in the open air, it will hardly eſcape this diſeaſe.

RICKETS, *ſymptoms of the*. At the beginning of this diſeaſe, the part which it affects grows lax, flaccid, and weak; and, if it be the legs, they become unable to ſupport the body. All the parts ſubſervient to voluntary motion are likewiſe debilitated and enfeebled; and the child becomes unuſually grave, pale, ſickly, ſlothful, and cannot ſit erect.

His head generally becomes too large for the trunk, and cannot be ſupported or managed by the muſcles of the neck, which gradually wear away. Swellings, and knotty excreſcences, appear in the wriſts, ancles, and tips of the ribs; and the bones of the legs and thighs grow bowed or crooked. The like diſorder ſometimes alſo ſeizes the bones of the arms.

If the ſymptoms continue long, the thorax becomes ſtrait; a difficulty of reſpiration enſues, as alſo a cough, and a hectic fever; the abdomen ſwells; the face appears full, and the complexion florid; the pulſe grows weak and languid; the appetite and digeſtion fail; the teeth come ſlowly, and with difficulty, and often rot and fall out; and, the ſymptoms increaſing, at length prove mortal.

When a child is able to talk before he can make uſe of his legs, he is commonly preſumed to have the *rickets*.

Method of cure. The chief aim, for this purpoſe, muſt be to brace the ſolids, and to promote digeſtion and the due preparation of the fluids. Theſe ends will be beſt anſwered by wholeſome nouriſhing diet, open dry air, and ſufficient exerciſe. In a cold ſeaſon, the child ſhould be kept warm, and in hot weather it ought to be kept cool: the limbs ſhould be frequently rubbed with a warm hand, and the child kept as chearful as poſſible.

This diſeaſe is more likely to be cured by the nurſe than by the phyſician.

However, if the children are of groſs habits, gentle vomits, and repeated purges of rhubarb may ſometimes be of uſe. Iſſues have been ſometimes found beneficial in this diſeaſe, eſpecially if the children abound with groſs humours. An infuſion of the Peruvian bark in wine or ale is likewiſe of uſe. Buchan.

Rickety children have larger livers, and leſs hearts and leſs blood, than children in health, from too full and too groſs a diet, and too little exerciſe; and they have larger livers than children in health, from the livers always increaſing in weight, when the weight of the heart and quantity of blood leſſen.

Dr. Hahn, in a letter on the cyrtonoſus, or *rickets*, which is commonly thought to be a modern diſeaſe, quotes Hippocrates, and ſeveral other ancient writers, as treating of it. Med. Eſſ. Edinb.

When the diſorder is taken early, it may be remedied by proper bolſters and bandages, ſuited to the parts affected: but, when the bones are grown rigid and inflexible, other mechanical contrivances, as padding, ſtrait boots, and ſeveral ſorts of machines, or engines, made of paſteboard, whale-bone, tin, &c. are made uſe of, to reſtore the diſtorted bones to their natural ſtraitneſs.

Cold bathing is alſo found of ſervice in the *r ckets*, before the diſtemper comes to be too much confirmed. This is

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best done during May and June, continuing the child in the water two or three seconds at each plunge, and rubbing it well with a dry cloth, after he comes out: but, if cold bathing is found to weaken the child, it should be discontinued.

Others chuse a liniment of rum and palm-oil; and others a plaster of the de minio and oxycroceum, applied along the back, to cover the whole spine. Dry frictions over the whole body, with a warm linen cloth before the fire, especially on the parts affected, are found of service. What is called the oil of snails is very famous for the same intention: this is what drops from them, after bruising and suspending them in a flannel bag. With this the limbs and spinal bone are to be anointed. But more depends on regimen than on any medicines.

RICOCHET *battery*, in *Fortification*. See BATTERY *à ricochet*.

RICOCHET *firing*, in the *Military Art*, is a method of firing with pieces elevated from three to six degrees, and loaded with a small charge, so that the ball may bound and roll along the inside of the parapet. The ball or shot, thus discharged, goes rolling and bounding, killing, maiming, or destroying all it meets with in its course, and creates much greater disorder, by moving thus slowly, than if thrown from the piece, whose elevation is greater, with greater violence.

The word *ricoche* signifies *duck and drake*, terms applied to the bounding of a flat stone thrown almost horizontally into the water.

RICOTIA, in *Botany*, a genus of the *tetradynamia siliquosa* class. Its characters are, that the pod is unilocular, oblong, and compressed, and formed with small flat valves. There is only one species.

RIDDLE. See ÆNIGMA.

RIDDLE, in *Husbandry*, an oblong sort of sieve, used to separate dust, and the seeds of plants, from corn.

RIDE of hazle, or other wood, is a group or cluster of sprigs shooting out of the same root or foot.

RIDE, in the *Manege*. To *ride* signifies to learn to *ride*. Thus, he *rides* under a good master.

The knowledge and utility of the art of riding consist in being able to discern, and dextrous to employ the means by which the horse may be brought to execute what the rider requires of him, with propriety, readiness, and safety: and this knowledge in the man, and obedience in the horse, should be so intimately connected as to form one perfect whole: this union being so indispensibly necessary, that, where it is not, there is no meaning between the man and horse; they talk different languages, and all is confusion.

RIDE, in the *Sea Language*, a term variously applied.—Thus, a ship is said to *ride*, when her anchors hold her fast, so that she drives not away by the force of the wind or tide.

A ship is said to *ride well*, or *easy*, when she does not labour heavily, or feel a great strain, when anchored in an open road or bay. On the contrary, when she pitches violently into the sea, so as to strain her cables, masts, or hull, she is said to *ride hard*, and the vessel is termed a bad roader.

A ship *rides across*, when she *rides* with her main-yards and fore-yards hoisted up to the hounds, and both yards and arms topped alike.

She is said to *ride apeek*, when one end of the yard is peeked up, and the other hangs down: this is also said of a ship, when, in weighing, she is brought directly over her anchor.

She is said to *ride athwart*, when her position lies across the direction of the wind and tide, when the former is so strong as to prevent her from falling into the current of the latter: and to *ride betwixt wind and tide*, when the wind hath equal force over her one way, and the tide another, so that she is in a manner balanced between them, and *rides* without the least strain on her cables.—If the wind have more power over her than the tide, she is said to *ride wind-road*.

She is said to *ride hawsefull*, when, in stress of weather, she falls so deep, that the water runs in at her hawses.

She is said to *ride portoise*, when her yards are struck down upon the deck, or when they are down a-port-last.

To RIDE *land-locked*, at sea. See LAND-*locked*.

To RIDE *by the stoppers*, at sea. See STOPPERS.

RIDEAU, in *Fortification*, a small elevation of earth, extending itself lengthways on a plain; serving to cover a camp, or give an advantage to a post.

The word, in its original French, signifies a *curtain* or *cover*, formed from the Latin, *ridellum*. Borel derives it from *ridere*.

A *rideau* is also convenient for those who would besiege a place at a near distance, and to secure the workmen in their approaches to the foot of a fortress.

RIDEAU is sometimes also used for a trench, the earth whereof is thrown up on its side, to serve as a parapet for covering the men.

RIDER, in *Artillery Carriages*, a piece of wood, somewhat higher than it is broad, and of a length equal to that of the body of the axle-tree, upon which the side pieces rest in a four-wheel carriage; such as the ammunition-waggon, block-carriage, and sling-waggons.

RIDERS, in a *Ship*, are a sort of interior RIBS, fixed occasionally in a ship's hold, opposite to some of the principal timbers, and reaching from the kelson to the beams of the lower deck, and sometimes higher, in order to strengthen her frame. They are bolted to the other timbers to support them, when it is apprehended the ship is not sufficiently strong in the part where they are fixed; which is generally amidships. See *Tab. Ship. fig.* 2. *n.* 47, 49, 50.

RIDER is also used for after-clauses, added to bills, whilst they are depending in PARLIAMENT.

RIDER-*roll*. See ROLL.

RIDERS, *out*. See OUT-*riders*.

RIDGE, in *Building*, the highest part of the roof or covering of a house.

Ridge is particularly used for a piece of wood, wherein the rafters meet.

RIDGE-*tyle*. See TYLE.

RIDGE, in *Sea Language*, is a long assemblage of rocks, lying near the surface of the sea, so as to intercept the passage of a ship under sail.

RIDGES, in *Agriculture*, are long pieces of rising soil, between two furrows.

The method of ploughing land up into *ridges* is a particular sort of tillage. The chief use of it consists in the alteration it makes in the degrees of heat and moisture; these being two of the grand requisites of vegetation, and very different degrees of them being requisite to the different sorts of plants. Those plants commonly sown in our fields require a moderate degree of both, not being able to live upon the sides of perpendicular walls in hot countries, nor under the water in cold ones, neither are they amphibious; but they must have a surface of earth, not covered, nor much soaked with water, which deprives them of a proper degree of heat, and causes them to languish. In this case they look weak, and their leaves yellowish; they cease growing; and, in fine, die in a weak and very bad state.

The only way to cure the land of giving this disease to plants is to lay it up in *ridges*, that the water may fall off, and run into the furrows below, from whence it may be conveyed by drains and ditches into some river, or otherwise carried wholly off from the land.

The more any soil is filled with water the less heat it will have. The two sorts of land most liable to be overglutted with water are hills, the upper stratum of mould in which lies on clay; and generally all deep and strong lands. Hills are made wet and spewy by the wet that falls in rains, dews, and mists; and this wet not being able to sink through the clay, in these soils, runs down between it and the mould; but extending itself through the mould all the way, and making it continually washy. The ploughing this sort of land in *ridges*, made from the higher to the lower part of the field, is of no benefit; for the water will press from below upwards in these *ridges*, being forced by the addition of fresh supplies above.

There are two methods of draining a hill-ground like this. The one is to dig several deep trenches cross-wise, or horizontally, on the sides of the hill: let these be nearly filled up with stones, and the surface covered in the common method; the wet will be received into these in all parts, and discharged at the ends; and the plough will go over the stones, without striking through the depth of earth that covers them. Thus the land will be dried for a time; but as these channels fill up with earth between the stones, they become of no use, and the expence of making new ones is very great.

The other way is to plough the land in *ridges* almost horizontally, and then the furrows between them are so many drains, carrying off the water at their lower ends; if the plough is made to strike a few inches deep into the clay, and the ends of the furrows are no higher than the other parts, every furrow will be a drain to every *ridge*, and the land of the *ridges* will be kept dry. If there were no other manner of ploughing the *ridges* on the sides of hills, than there is in the plain lands, this method of having open furrows, or drains, on declivities would be impracticable; because the plough could not turn up the furrows against the hill and against the *ridge* also, from the lower side of it. But the easy remedy against this inconvenience is to plough such *ridges* in pairs, without throwing any earth into the trenches, and then

then the *ridges* will be plain at top, and the rain-water will run ſpeedily downward to the next trench, and thence to the head-land, and ſo out of the field. Theſe trenches will be made, as well as kept, always open by ploughing in pairs; and this is abundantly more eaſy than the way of ploughing *ridges* ſingly.

Every time of ploughing, the *ridges* muſt be changed as to the pairs; ſo that the furrow, which had two *ridges*, or lands, turned towards it one time, muſt have two turned from it the next time; and this method keeps the ſurfaces of all the *ridges*, or lands, pretty nearly even. This, however, cannot be done on a hill, whoſe declivity is ſo great, that the plough is not able to turn a furrow againſt it; but, in this caſe, perhaps, it may be ſufficient to plough the *ridges* obliquely enough for the furrows to be turned both ways.

This ploughing in a horizontal manner, on hills, is the beſt of all others; but our farmers are not to be eaſily brought into it, though they ſee thin lands of this kind ruined for want of it: their reaſons for not doing it are, that it would prevent the ſuppoſed benefit of croſs ploughing; and that they loſe more ground by having more furrows between the *ridges*, than when they lay their lands flat; where the lands are made much larger than the round *ridges* can conveniently be. But theſe are in reality very erroneous, as well as miſchievous opinions; for more miſchief than good is done by croſs ploughing in general; and inſtead of any real loſs of land by *ridges*, the true ſtate of the caſe is, that much ground is gained by it; that is, the ſurface of the earth is increaſed in quantity; for if a flat piece be ploughed into *ridges*, and if in earth ſixteen feet in breadth, there be an empty furrow of two feet; and yet, by the height and roundneſs of the *ridges*, they have eighteen feet of ſurface, capable of producing corn equally with eighteen feet, while the piece was flat; there is then, inſtead of any loſs, one eighth part of profitable ground, gained by the altering the piece from a level into a *ridge*. Tull's Horſe-hoeing Huſbandry, chap. 16. See PLOUGHING.

RIDGES *of a horſe's mouth* are wrinkles or riſings of the fleſh in the roof of the mouth, running acroſs from one ſide of the jaw to the other, with interjacent furrows.

It is commonly in the third or fourth *ridge* that the farriers ſtrike with the horn, in order to bleed a horſe, whoſe mouth is overheated.

RIDGLING, or RIDGEL, among *Farriers*, &c. the male of any beaſt that has been but half caſtrated.

RIDICULE, in *Ethics*, is commonly uſed in the ſame ſenſe with irriſion; and has for its objects the abſurdities and misfortunes of mankind. The latter, however, are very improperly objects of *ridicule*, whoſe province ſhould extend only to the careleſſneſs, inconſtancy, humour, affection, impertinence, and in ſhort all the leſſer follies and imperfections of mankind. Such are generally the ſubjects of Horace's Satires; and Dr. More obſerves, that irriſion, which is the parent of *ridicule*, was the original of ſatire.

RIDICULE, in a *Comedy*. See COMEDY.

RIDICULI *ædicula*, or the *chaple of laughter*, in *Roman Antiquity*, was a building erected at Rome, about two thouſand paces beyond the gate Capena, in memory of the flight of Hannibal from the ſiege of the city, on account of the ruin and tempeſt that befel him on that occaſion. The Romans, in *ridicule* of his flight, built and conſecrated this chaple.

RIDING, a corruption of TRITHING; a diviſion of Yorkſhire, whereof there are three; viz. the Eaſt-*riding*, Weſt-*riding*, and North-*riding*.

In indictments, in that county, it is neceſſary that the town and *riding* be expreſſed. See REGISTER.

RIDING *academy*. See ACADEMY and MANEGE.

An academy for *riding* was founded, in this country, by king William III. See RIDE.

RIDING *armed*, with dangerous and unlawful weapons, is an offence at common law. 4 Inſt. 160. By the ſtatute 2 Edw. III. cap. 3. none ſhall ride armed by night or day to the terror of the people; or come with force and arms before the king's juſtices, &c. doing their office, upon pain to forfeit their armour, and ſuffer impriſonment at the king's pleaſure: and a fine may be ſet upon them by the juſtices, by 20 Ric. II. cap. 1. And no perſon can excuſe the *riding armed*, in public, by alleging that he wears armour for his defence againſt an aſſault; but men may wear common arms, according to their quality and the faſhion, and have attendants with them armed agreeable to their characters: alſo perſons may ride or go armed to take felons, ſuppreſs riots, execute the king's proceſs, &c. 3 Inſt. 162.

RIDING *caſt*, in *Huſbandry*, a term uſed by the farmers for a particular method of ſowing their grounds, by making two caſts upon the ground at the ſame time.— This is not much uſed, but it is a quicker way than the double caſt, which is the method now moſt uſed. Plot's Oxfordſhire, p. 251.

RIDING-*clerk*, one of the ſix clerks in chancery, who in his turn, for one year, keeps the controlment-books of all grants that paſs the great ſeal that year. Blount.

RIEMLING, in *Ichthyology*, a name given by ſeveral to the ſmall freſh water fiſh, called by the Latins *poxinus*, and vulgarly the *pink*.

RIENS *arrear*, in *Law*, a kind of plea uſed to an action of debt upon arrearages of accounts; whereby the defendant alleges, that there is nothing in arrear.

REINS *paſſe par le fait*, *nothing paſſes by the deed*, is the form of an exception taken in ſome caſes to an action.

REINS *par deſcent*, *nothing by deſcent*, is the plea of an heir when ſued for his anceſtor's debt, though he had no lands from it by deſcent, nor has aſſets in hand.

RIER, or REER-COUNTY, *retro-comitatus*, is uſed in the ſtatute of Weſtm. 2. c. 39. 2 Ed. III. cap. 5. and in our law books, in oppoſition to *open county*.

This appears to be ſome public place, which the ſheriff appoints for the receipt of the king's money after the end of the county-court. Fleta ſays it is *dies craſtinus poſt comitatum*.

RIFLE *Guns*, in the *Military Art*, are thoſe whoſe barrels, inſtead of being ſmooth on the inſide, like our common pieces, are formed with a number of ſpiral channels, reſembling female ſcrews, except that the threads or *rifles* are leſs deflected, and approach more to a right line: the threads, with which the *rifled* barrel is indented, taking uſually a little more than one turn in its whole length. The numbers of theſe threads in each barrel are different, according to the fancy of the workman and the ſize of the barrel; and, in like manner, the depth, to which theſe channels or *rifles* are cut down, is not regulated by any invariable rule; but differs according to the country where the work is performed, or the caprice of the artificer. There are different methods of charging pieces of this kind, but the uſual method is as follows: after the powder is put in, they take a leaden bullet ſomewhat larger than the bore of the gun, and having greaſed it well, they lay it on the mouth of the piece, and ram it down with an iron rammer, hollow at the end; the ſoftneſs of the lead giving way to the violence with which the bullet is impelled, that zone of the bullet, which is contiguous to the piece, varies its circular form, and acquires the ſhape of the inſide of the barrel, ſo that it becomes the part of a male ſcrew, exactly fitting the indents of the *rifle*. And hence it happens that, when the piece is fired, that indented zone of the bullet follows the ſweep of the *rifles*, and thereby, beſides its progreſſive motion, acquires a circular motion round the axis of the piece, which motion will be continued to the bullet after its ſeparation from the piece; by which means a bullet diſcharged from a *rifled* barrel is conſtantly made to whirl round an axis, which is coincident with the line of its flight. And hence it follows, that the reſiſtance on the foremoſt ſurface of the bullet is equally diſtributed round the pole of its circular motion, and acts with an equal effort on every ſide of the line of direction, ſo that this reſiſtance can produce no deviation from that line: and if, by the caſual irregularity of the foremoſt ſurface of the bullet, or by any other accident, the reſiſtance ſhould be ſtronger on one ſide of the pole of the circular motion than on the other; yet, as the place where this greater reſiſtance acts muſt perpetually ſhift its poſition round the line, in which the bullet flies, the deflection, which this inequality would occaſion, if it acted conſtantly with the ſame given tendency, is now continually rectified by the various and contrary tendencies of that diſturbing force, during the courſe of one revolution; ſo that the ball will always go right forewards, and thus that deflection or deviation, already taken notice of under the article PROJECTILE, will be prevented. This may be explained by the motion of an arrow; for if an arrow that is not feathered be ſhot from a bow, its motion will be very irregular; but when the feathers of the arrow are properly arranged in a ſpiral form, ſo as to make the arrow ſpin round its axis, it will always fly ſtraight forward. Upon the ſame principle every ſchoolboy finds himſelf under the neceſſity of making his ſhuttlecock ſpin, before he can depend upon the truth of its flight. Mr. Robins obſerves, that the actual motions of bullets diſcharged from *rifled* pieces correſpond very well with theſe ſpeculations. Although the uſe of pieces of this kind hath long prevailed in Europe, particularly in Germany and Switzerland, the advantages reſulting from them have been very imperfectly underſtood, and, as Mr. Robins obſerves, unaccountably miſrepreſented. The three following reaſons have been conſtantly alleged in favour of this conſtruction: either that the inflammation of the powder was greater by the reſiſtance which the bullet thus forced into the barrel gave it, and that hereby the bullet received a much greater impulſion than

it would have done from the ſame quantity of powder in a common piece; or that the bullet, by the compounding of its circular and revolving motion, did, as it were, bore the air, and thereby flew to a much greater diſtance, than it would otherwiſe have done; or that, by the ſame boring motion, it made its way much eaſier through all ſolid ſubſtances, and penetrated much deeper into them, than if diſcharged in the common manner. The ingenious writer, juſt mentioned, ſatisfied himſelf by numbers of experiments made with *rifled* barrels of various ſizes, that none of theſe reaſons hold true in the uſe of ſuch pieces; but that the advantage of their conſtruction reſults from its preventing the deflection of the ball, as we have above repreſented it. And that it produced this effect he found by obſerving, that the ſame hemiſphere of the bullet which lies foremoſt in the piece, continued foremoſt during the whole courſe of its flight, which was almoſt ſteady for about a mile and a half, whereas the deviation with a common piece would often amount to half a mile, and perhaps conſiderably more, in a ſimilar trial.

In Germany and Switzerland, an improvement is made to the method, already recited, of charging theſe pieces; eſpecially thoſe of the larger ſort, which are uſed for ſhooting at great diſtances. This is done by cutting a piece of very thin leather, or of thin fuſtian, in a circular ſhape, ſomewhat larger than the bore of the barrel. This circular piece being greaſed on one ſide is laid upon the muzzle with its greaſy parts downwards, and the bullet being placed upon it, is then forced down the barrel with it; by which means the leather or fuſtian incloſes the lower half of the bullet, and by its interpoſition between the bullet and the *rifles*, prevents the lead from being cut by them. But in thoſe barrels, where this method is practiſed, the *rifles* are generally ſhallow, and the bullet ought not to be too large. The *rifle*-barrels, which have been made in England, where they are not very common, are contrived to be charged at the breech, the piece being, for this purpoſe, made larger there than in any other part. The powder and bullet are put in through the ſide of the barrel by an opening, which, when the piece is loaded, is filled up with a ſcrew. By this means, when the piece is fired, the bullet is forced through the *rifles*, and acquires the ſame ſpiral motion as in the former kind of pieces. Some barrels ſcrew off at the breech, for the convenience of charging them. With regard to the defects of theſe *rifled* pieces, Mr. Robins obſerves, that if either the angle of elevation, or the curvature of the bullet's track through the air be great, the inclination of the axis round which it whirls will cauſe irregularities, which will often produce conſiderable deflections. Accordingly, he propoſes to make uſe of bullets of an egg-like form, inſtead of ſpherical ones, and to fire them with their broad ends foremoſt, that thus their longer axes may be always carried, by their centres of gravity, into the lines of their flight. Upon the whole he concludes, that whatever tends to diminiſh the friction of theſe pieces, tends, at the ſame time, to render them more complete; and conſequently the leſs the *rifles* are indented, the better they are, provided that they are juſt ſufficient to keep the bullet from turning round in the piece. Beſides, the bullet ought to be no larger than to be juſt preſſed by the *rifles*, for the eaſier the bullet moves in the piece, ſuppoſing it not to ſhift its poſition, the more violent and accurate its flight will be. And to render them in this reſpect ſtill more complete, the ſweep of the *rifles* ſhould be in each part exactly parallel to each other: for then, after the bullet is once put in motion, it will ſlide out of the barrel without any ſhake, and with a much ſmaller degree of friction than if the threads of the *rifles* have not all of them the ſame degree of incurvation. The foreigners are ſo exact in this article, that they try their pieces, with a view to this particular, in the following manner: they firſt pour melted lead into them, and letting it cool, they procure a leaden cylinder of perhaps two or three diameters in length, exactly fitted to one part of the inſide of the piece; then if this leaden cylinder, being gently puſhed by the rammer, will paſs from one end of the barrel to the other, without any ſenſible ſtrain or effort, they pronounce the piece perfect, but if it any where ſticks or moves hard, they eſteem it defective. In ſome late experiments made in Scotland with *rifle* field-pieces, caſt at Carron, leaden balls with protuberances or knobs caſt upon them, ſo as exactly to fit the *rifles*, were made uſe of; and thus the *rifles* are exactly filled, whilſt the bullets themſelves are not prevented from being eaſily ſent home in the pieces.

From the nature of *rifled* pieces it is evident, that they can be uſed only with leaden bullets, and conſequently cannot be adapted, without ſome new contrivance, to the adjuſting of the motions of either ſhells or cannon-bullets. Mr. Robins cloſes his account of theſe pieces with predicting, that whatever ſtate ſhall thoroughly comprehend the nature and advantages of *rifled* barrel pieces, and having facilitated and completed their conſtruction, ſhall introduce into their armies the general uſe of them, with a dexterity in the management of them, they will by this means acquire a ſuperiority, which will almoſt equal any thing that has been done, at any time, by the particular excellence of any one kind of arms, and will perhaps fall but little ſhort of the wonderful effects, which hiſtories relate to have been formerly produced by the firſt inventors of fire-arms. See his Diſcourſe on the Nature and Advantage of *Rifled*-barrel Pieces in his Tracts, vol. i. p. 328, &c.

RIFTS, in *Farriery*, a diſeaſe in horſes, ariſing from corruption lodged in the palate of the mouth.

RIG. See RIDGLING.

RIGADOON, a kind of briſk and gay dance, borrowed originally from Provence, and performed in figure by a man and a woman.

The word is formed from the French, *rigadon*, which ſignifies the ſame.

RIGAL, in *Muſic*. See RIGOLL.

RIGEL, in *Aſtronomy*. See REGEL.

RIGGING *of a ſhip* includes her whole cordage; or all the ropes employed to ſupport the maſts, and to extend or reduce the ſails, or arrange them to the diſpoſition of the wind. The former, which are uſed to ſuſtain the maſts, remain uſually in a fixed poſition, and are called *ſtanding rigging*; ſuch are the ſhrouds, ſtays, and back-ſtays. The latter, whoſe office is to manage the ſails, by communicating with various blocks or pullies, ſituated in different places of the maſts, yards, ſhrouds, &c. are comprehended under the general term *running rigging*; ſuch are the braces, ſheets, halliards, clue-lines, brails, &c. See *Tab. Ship. fig.* 1.

A ſhip is ſaid to be *well rigged*, when all her ropes are of their fit ſize in proportion to her burden. She is ſaid to be *over-rigged*, when her ropes are too big for her; which wrongs her much in her ſailing, and is apt to make her heel.

RIGGING *out a boom* is the operation of running out a pole, upon the end of a yard or bowſprit, to extend the foot of a ſail. Theſe booms are confined in thoſe places by double rings, formed like a figure of 8, one part of which is faſtened to the reſpective yard-arm, or bowſprit-end, and the other receives the boom, which is occaſionally rigged out, or drawn in through it. The rings uſed in this ſervice are termed boom-irons. Falconer.

RIGGING, *ſerving the*. See MALLET.

RIGHT, in *Geometry*, ſomething that lies evenly, without inclining or bending one way or another.

Thus a *right line* is that whoſe ſeveral points all tend the ſame way.

In this ſenſe, *right* ſignifies as much as *ſtraight*, and ſtands oppoſed to *curved* or *crooked*.

RIGHT *angle*. See ANGLE.

In this ſenſe, the word *right* ſtands oppoſed to *oblique*.

RIGHT-*angled* is underſtood of a figure, when its ſides are at *right* angles, or ſtand perpendicularly one upon another.

This ſometimes holds in all the angles of the figure, as in ſquares and rectangles; ſometimes only in part, as in *right-angled* triangles.

RIGHT *cone*. See CONE.

RIGHT-*lined angle*. See ANGLE.

RIGHT *ſine*. See SINE.

The word here ſtands contradiſtinguiſhed to VERSED.

RIGHT *ſphere* is that where the equator cuts the horizon at *right* angles: or, that wherein the poles are in the horizon, and the equator is in the zenith.

Such is the poſition of the ſphere with regard to thoſe who live directly under the equator. The conſequences hereof are, that they have no latitude, nor elevation of the pole. They can ſee nearly both poles of the world; all the ſtars riſe, culminate, and ſet, with them; and the ſun always riſes and deſcends at right angles to their horizon, and makes their days and nights equal.

In a *right ſphere* the horizon is a meridian; and, if the ſphere be ſuppoſed to revolve, all the meridians ſucceſſively become horizons, one after another.

RIGHT *aſcenſion*. See ASCENSION.

RIGHT *aſcenſion, angle of*. See ANGLE.

RIGHT *aſcenſion, parallax of*. See PARALLAX.

RIGHT *deſcenſion*. See DESCENSION.

RIGHT *deſcenſion, parallax of*. See PARALLAX.

RIGHT *ſailing* is when a voyage is performed on ſome one of the four cardinal points.

If a ſhip ſail under the meridian, that is, on the north or ſouth points, ſhe varies not in longitude at all, but only changes the latitude, and that juſt ſo much as the number of degrees ſhe has run.

If

If a ſhip ſail under the equinoctial upon the very eaſt or weſt points, ſhe alters not her latitude at all, but only changes the longitude, and that juſt ſo much as the number of degrees ſhe has run.

If ſhe ſail directly eaſt or weſt, under any parallel, ſhe there alſo altereth not her latitude, but only the longitude; yet that not according to the number of degrees of the great circle ſhe hath ſailed in, as under the equinoctial, but more according as the parallel is remoter from the equinoctial towards the pole. For the leſs any parallel is, the greater is the difference of longitude.

RIGHT *circle*, in the *Stereographical Projection of the Sphere*, is a circle at *right* angles to the plane of projection, or that which paſſes through the eye. See PROJECTION.

RIGHT, *rectum*, in *Logic* and *Ethics*.

In this ſenſe, the word ſtands oppoſed to *wrong*, *erroneous*, *falſe*, &c.

RIGHT, *jus*, in *Law*, ſignifies not only a property, for which a writ of *right* lies, but alſo any title or claim, either by virtue of a condition, mortgage, or the like, for which no action is given by law, but only an entry.

Such are *jus proprietatis*, *a right of* PROPERTY; *jus poſſeſſionis*, *a right of* POSSESSION; and *jus proprietatis et poſſeſſionis*, *a right both of property and poſſeſſion*.

This laſt was formerly called *jus duplicatum*. As, if a man be diſſeiſed of an acre of land, the diſſeiſee has *jus proprietatis*; the diſſeiſor hath *jus poſſeſſionis*; and, if the diſſeiſee releaſe to the diſſeiſor, he hath *jus proprietatis et poſſeſſionis*. See JUS.

RIGHT, *hereditary*. See HEREDITARY.

RIGHT, *petition of*. See PETITION.

RIGHT, *pretenſed*. See PRETENSED.

RIGHT *of reformation*. See REFORMATION.

RIGHT, *writ of*. See WRIT and RECTO.

RIGHT *in court*. See RECTUS *in curia*.

RIGHT *diſtillation*. See DISTILLATION.

RIGHT *the helm*, a ſea-phraſe, ordering to replace the helm even with the middle of the ſhip, after it has wheeled her to the right or left, as much as appeared neceſſary.

RIGHTING, in *Sea Language*, denotes alſo the act of reſtoring a ſhip to her upright poſition, after ſhe has been laid on a careen. This is generally the natural effect of caſting looſe the careening pullies, by which ſhe had been drawn down. But it is ſometimes neceſſary to apply mechanical powers to *right* the ſhip in ſuch a ſituation; and the principal of theſe are the RELIEVING-*tackles*.

A ſhip is alſo ſaid to *right* at ſea, when ſhe riſes with her maſts erected, after having been preſt down on one ſide by the effort of her ſails, or a heavy ſquall of wind. Falconer.

RIGHTS, *bill of*, in *Law*, is a declaration, delivered by the lords and commons to the prince and princeſs of Orange, 13 February, 1688; and afterwards enacted in parliament, when they became king and queen. This declaration ſets forth, that king James II. did, by the aſſiſtance of divers evil counſellors, endeavour to ſubvert the laws and liberties of this kingdom, by exerciſing a power of diſpenſing with and ſuſpending of laws; by levying money for the uſe of the crown, by pretence of prerogative, without conſent of parliament; by proſecuting thoſe who petitioned the king, and diſcouraging petitions; by raiſing and keeping a ſtanding army, in time of peace; by violating the freedom of election of members to ſerve in parliament; by violent proſecutions in the court of king's bench; and cauſing partial and corrupt jurors to be returned on trials, exceſſive bail to be taken, exceſſive fines to be impoſed, and cruel puniſhments inflicted; all which were declared to be illegal. And the declaration concludes in theſe remarkable words, "And they do claim, demand, and inſiſt upon, all and ſingular the premiſes, as their undoubted *rights* and liberties." And the act of parliament itſelf (1 W. & M. ſtat. 2. cap. 2.) recognizes "all and ſingular the *rights* and liberties aſſerted and claimed in the ſaid declaration to be the true, ancient, and indubitable *rights* of the people of this kingdom."

RIGID *marble*. See MARBLE.

RIGIDITY, among *Philoſophers*, a brittle HARDNESS; or that kind of hardneſs ſuppoſed to ariſe from the mutual indentation of the component particles within one another.

Rigidity is oppoſed to ductility, malleability, &c.

RIGLET. See REGLET.

RIGOLL, or REGALS, a kind of muſical inſtrument, conſiſting of ſeveral ſticks bound together, only ſeparated by beads. It makes a tolerable harmony, being well ſtruck with a ball at the end of a ſtick.

Such is the account which Graſſineau gives of this inſtrument.

Skinner, upon the authority of an old Engliſh dictionary, repreſents it as a clavichord, or CLARICORD; poſſibly founding his opinion on the nature of the office of the tuner of the *regals*, who ſtill ſubſiſts in the eſtabliſhment of the king's chapel at St. James's, and whoſe buſineſs is to keep the organ of the chapel royal in tune; and not knowing that ſuch wind inſtruments as the organ need frequent tuning, as well as the clavichord and other ſtringed inſtruments.

Sir Henry Spelman derives the word *rigol* from the Italian *rigabello*, a muſical inſtrument, anciently uſed in churches inſtead of the organ.

Walther, in his deſcription of the *regal*, makes it to be a reed-work in an organ, with metal and alſo wooden pipes, and bellows, adapted to it. And he adds, that the name of it is ſuppoſed to be owing to its having been preſented by the inventor to ſome king.

From an account of the *regal*, uſed in Germany, and other parts of Europe, it appears to conſiſt of pipes and keys on one ſide, and the bellows and wind-cheſt on the other.

We may add, that lord Bacon (Nat. Hiſt. cent. ii. § 102.) diſtinguiſhes between the *regal* and organ, in a manner which ſhews them to be inſtruments of the ſame claſs. Upon the whole there is reaſon to conclude, that the *regal*, or *rigol*, was a pneumatic, and not a ſtringed inſtrument.

Merſennus relates that the Flemings invented an inſtrument, *les regales de bois*, conſiſting of ſeventeen cylindrical pieces of wood, decreaſing gradually in length, ſo as to produce a ſucceſſion of tones and ſemitones in the diatonic ſeries, which had keys, and was played on as a ſpinnet; the hint of which, he ſays, was taken from an inſtrument in uſe among the Turks, conſiſting of twelve wooden cylinders, of different lengths, ſtrung together; which, being ſuſpended, and ſtruck with a ſtick, having a ball at the end, produced muſic. Hawkins's Hiſt. Muſ. vol. ii. p. 449.

RIGOR, in *Medicine*, a convulſive ſhuddering from ſevere cold, an ague-fit, or other diſorder.

RIGOURISTS, in *Eccleſiaſtical Hiſtory*. See JANSENISM.

RILL, or RIVULET. See RIVER.

RIM, in a watch or clock, the circumference or circular part of a wheel.

RIMA literally denotes a fiſſure or chink. See FISSURE, and RHAGADES.

Hence, it is applied to ſeveral parts of the body, that bear a reſemblance thereto: as *rima pudendi*, fiſſura magna, the ſame with vulva; and *rima laryngis*, the aperture of the larynx, called the *glottis*.

RIMA is alſo uſed for a narrow aperture of a ſmall cavity under the fornix, opening into the infundibulum; called alſo the third ventricle of the brain.

RIME, in *Poetry*. See RHYME.

RINÆUS *muſculus*, the name of a muſcle mentioned by Douglas, which he alſo calls *naſalis*. It ariſes fleſhy from the extremity of the os naſi, and adjacent parts of the os maxillare, and is inſerted into all the cartilages of the alæ.

Its uſe is to open and dilate the noſtril, by pulling that part outwards.

RINAR, a word uſed by the chemiſts to expreſs filings of any thing.

RIND, the ſkin of any fruit that may be cut off, or pared. The outer coat of the cheſnut, ſet with prickles, is particularly called the *urchin-like rind*.

RIND is alſo uſed for the inner bark of trees; or that ſoft, whitiſh, juicy ſubſtance, adhering immediately to the wood.

Through this it is that the ſap has been ſuppoſed to return from the extremities of the branches to the root: the veſſels hereof are by ſome alſo ſuppoſed to do the office of arteries; whence Mr. Bradley calls them *arterial* veſſels. See PLANTS.

RIND, *grafting in the*. See ENGRAFTING.

RINEUS *marinus*, a name given by ſome botanical writers to the *crithmum*, or *ſamphire*, a ſea plant, uſed as a pickle.

RING, *annulus*, a little moveable, put on the finger, either by way of ceremony, or of ornament.

The biſhop's *ring* makes a part of the pontifical apparatus; and is eſteemed a pledge of the ſpiritual marriage between the biſhop and his church.

The epiſcopal *ring* is of a very ancient ſtanding. The fourth council of Toledo, held in 633, appoints, that a biſhop condemned by one council, and found afterwards innocent by a ſecond, ſhall be reſtored, by giving him the *ring*, ſtaff, &c.

From biſhops, the cuſtom of the *ring* has paſſed to cardinals, who are to pay a very great ſum, *pro jure annuli cardinalitii*.

RINGS, *origin of*. Pliny, lib. xxxvii. cap. 1. obſerves, that we are in the dark as to the perſon who firſt invented, or wore the *ring*; becauſe what is ſaid of Prometheus, as alſo

also of Midas's *ring*, are fables. The first people among whom we find the *ring* in use, are the Hebrews, Gen. xxxviii. where Judah, Jacob's son, gives Tamar his *ring* or signet, as a pledge of his promise; but the *ring* appears to have been in use at the same time among the Egyptians, from Gen. xli. where Pharaoh puts his *ring* upon Joseph's hand as a mark of the power he gave him. And in the first book of Kings, chap. xxi. Jezebel seals the warrant she sent for the killing of Naboth, with the king's *ring*.

The ancient Chaldeans, Babylonians, Persians, and Greeks, had likewise the use of the *ring*; as appears from several passages in Scripture, and from Quintus Curtius, who tells us, that Alexander sealed the letters he wrote into Europe, with his own seal; and those in Asia with Darius's *ring*.

The Persians will have Guiamschild, the fourth king of the first race, to have first introduced the *ring*, for sealing his letters and other acts. The Greeks, Pliny thinks, knew nothing of the *ring* in the time of the Trojan war; the reason he gives is, that we find no mention thereof in Homer, but that when letters, &c. were to be sent away, they were tied up, and the strings knotted.

The Sabines had *rings* in Romulus's time; and it is to them, probably, the practice first came from the Greeks; and from them that it passed to the Romans, though it was some time before it got footing there. Pliny cannot learn which of the kings of Rome first adopted it; but there are no signs of it in any of their statues, before those of Numa, and Servius Tullius. He adds, that it was also in use among the ancient Gauls and Britons.

RINGS, *matter of ancient.* There were some of one single metal, and others of a mixture, or two. For the iron and silver were frequently gilt; or at least the gold part was fixed within the iron, as appears from Artemidorus, lib. ii. cap. 5. The Romans were contented with iron *rings* a long time; and Pliny assures us, that Marius first wore a gold one in his third consulate, which was in the year of Rome 650. Sometimes the *ring* was iron, and the seal gold; sometimes it was hollow, and sometimes solid; sometimes the stone was engraven, and sometimes plain; and the graving sometimes was in relievo, and sometimes in creux: the last were called *gemmæ ectypæ*; the former *gemmæ sculptura prominente.*

RING, *the manner of wearing the,* has been various. From Jeremiah, chap. xxii. it appears, that the Hebrews wore it on their right hand. Among the Romans, before they came to be adorned with stones, and while the graving was yet on the metal itself, every one wore them at pleasure, on what hand and finger he pleased. When stones came to be added, they wore them altogether on the left hand; and it would have been held an excessive foppery to have put them on the right.

Pliny says, they were at first worn on the fourth finger, then on the second or index; then on the little finger; and at last on all the fingers, excepting the middle one. The Greeks wore them altogether on the fourth finger of the left hand, as we are informed by Aul. Gellius, lib. x. and the reason he gives for it is, that having found from anatomy, that this finger had a little nerve that went straight to the heart, they esteemed it the most honourable, by reason of this communication with that noble part. Pliny says, the Gauls and ancient Britons wore the *ring* on the middle finger.

At first they only wore a single *ring*, then one on each finger, and at length several on each finger. Martial, lib. xi. epig. 60. At last one on each joint of each finger. Aristoph. in Nub. &c. Their foppery at length arose to that pitch, that they had their weekly *rings*. Juvenal, Sat. vii. speaks of *annuli semestres*; as also of winter and summer *rings*. But, of all others, Lampridius, cap. 32. observes, that Heliogabalus carried the point farthest, who never wore the same *ring*, or the same shoe, twice.

Rings have been also worn in the nose, as pendants in the ears. Bartholin has an express treatise, De *Annulis Narium*, *Of* Rings *of the Nostrils.* St. Augustine assures us, it was in his time the fashion of the Moors; and Pietro della Valle observes the same of the modern Orientals.

In effect, there is no part of the body where *rings* have not been worn. Several East India travellers affirm, that the natives now commonly wear them on their nose, lips, cheeks, and chin. Ramusio tells us, that the ladies of Narsingua in the Levant, and Diodorus Siculus, lib. iii. that those of Ethiopia used to adorn their lips with iron *rings*.

As to the ears, the custom still obtains of wearing *rings* therein, both by men and women, almost all over the world. See PENDANT.

The Indians, particularly the Guzzarats, have worn *rings* on their feet. And when Peter Alvarez had his first audience of the king of Calicut, he found him all covered with stones set in *rings*, having bracelets and *rings* both on the hands and fingers, and even on the feet and toes. Louis Bartome represents a king of Pegu as still more extravagant, having *rings* set with precious stones on every toe.

RINGS, *use of.* The ancients had three different kinds; the first served to distinguish conditions or quality. Pliny assures us, that the senators at first were not allowed to wear the gold *ring*, unless they had been ambassadors at some foreign court. Nor was it even allowed them to wear the gold *ring* which was given them in public, except on public occasions; at other times they wore an iron one. And those who had a triumph observed the same rules.

At length the senators and knights were allowed the common use of the gold *ring*; but Acron on Horace, lib. ii. sat. vii. observes, they could not do it unless it were given them by the prætor.

In after days the gold *ring* became the badge of the knights, the people wearing silver *rings*, and the slaves iron ones; though the gold *ring* was sometimes also allowed the people, and Severus granted it to his common soldiers. Augustus allowed it the liberti or freedmen; and though Nero made a regulation to the contrary, yet it was soon set aside.

A second kind of *rings* were the *annuli sponsalitii, wedding-rings.* Some carry the origin of this custom as far back as the Hebrews, on the authority of a text in Exodus xxxv. 22. Leo of Modena, however, maintains, that the ancient Hebrews did not use any nuptial *ring*. Selden, in his Uxor Ebraica, lib. ii. chap. xiv. owns, that they gave a *ring* in the marriage, but that it was only in lieu of a piece of money of the same value which had used to have been given before. The Greeks and Romans did the same, and from them the Christians took it up very early, as appears from Tertullian, and in some ancient liturgies, where we find the form of blessing the nuptial *ring*.

The third kind of *rings* were those used as seals, called *cerographi* or *cirographi*; an account whereof see under the article SEAL.

Richard bishop of Salisbury, in his Constitutions, anno 1217, forbids the putting of *rush-rings*, or any the like matter, on women's fingers, in order to the debauching them more readily; and he insinuates the reason of his prohibition, that there were some people weak enough to believe, that what was thus done in jest was a real marriage.

De Breveil, in his Antiquities of Paris, says, it was an ancient custom to use a *rush-ring* in the nuptials of such as had had an affair together before their marriage.

RING, in *Angling*, an instrument intended to free the hook, when accidentally entangled among weeds. See ANGLING.

RING, in *Astronomy.* The *ring of Saturn* is a thin, broad, opake, circular arch, encompassing the body of that planet, like the horizon of an artificial globe, without touching it, and appearing double, when seen through a good telescope.

The discovery hereof is owing to M. Huygens, who, after frequent observation of Saturn, perceived two lucid points, or ANSÆ, arising out from the body in a right line.

Hence, as in subsequent observations he always found the same appearance, he concluded that Saturn was encompassed with a permanent *ring*; and accordingly produced his new system of Saturn in 1659.

However, Galilæo first discovered that the figure of Saturn was not round. Huygens makes the space between the globe of Saturn and the *ring* equal to, or rather bigger than, the breadth of the *ring*; and the greatest diameter of the *ring*, in proportion to that of the globe, as 9 to 4. But Mr. Pound, by an excellent micrometer applied to the Huygenian glass of 123 feet, determined this proportion, more exactly, to be as 7 to 3.

The plane of the *ring* is inclined to the plane of the ecliptic in an angle of thirty degrees, and it is about twenty-one thousand miles in breadth, which is also its distance from Saturn on all sides. The *ring*, probably, turns about its axis; because, when it is almost edgewise to us, it appears somewhat thicker on one side of the planet than on the other; and the thickest edge has been seen on different sides at different times. The sun shines almost fifteen of our years together on one side of Saturn's *ring* without setting, and as long on the other in its turn; so that the *ring* is visible to the inhabitants of that planet for almost fifteen of our years, and as long invisible, by turns, if its axis has no inclination to its *ring*; but if the axis of the planet be inclined to the *ring*, e. gr. about thirty degrees, the *ring* will appear and disappear once every natural day to all the inhabitants within thirty de-

grees

grees of the equator, on both fides, frequently eclipfing the fun in a Saturnian day. Moreover, if Saturn's axis be fo inclined to his *ring*, it is perpendicular to his orbit; and thereby the inconvenience of different feafons to that planet is avoided.

This *ring*, feen from Saturn, appears like a large luminous arch in the heavens, as if it did not belong to the planet. When we fee the *ring* moft open, its fhadow upon the planet is broadeft; and from that time the fhadow grows narrower, as the *ring* appears to do to us; until, by Saturn's annual motion, the fun comes to the plane of the *ring*, or even with its edge; which, being then directed towards us, becomes invifible, on account of its thinnefs.

The phenomena of Saturn's *ring* are illuftrated by a view of *fig.* 22. *Tab. Aftronomy.* Let S be the fun, ABCDEFGH Saturn's orbit, and IKLMNO the earth's orbit. Both Saturn and the earth move according to the order of the letters; and when Saturn is at A, his *ring* is turned edgewife to the fun S, and he is then feen from the earth as if he had loft his *ring*, let the earth be in any part of its orbit whatever, except between N and O; for whilft it defcribes that fpace, Saturn is apparently fo near the fun as to be hid in his beams. As Saturn goes from A to C, his *ring* appears more and more open to the earth; at C the *ring* appears moft open of all; and feems to grow narrower and narrower as Saturn goes from C to E; and when he comes to E, the *ring* is again turned edgewife both to the fun and earth; and as neither of its fides is illuminated, it is invifible to us, becaufe its edge is too thin to be perceptible; and Saturn appears again as if he had loft his *ring*. But as he goes from E to G, his *ring* opens more and more to our view on the under fide; and feems juft as open at G as it was at C; and may be feen in the night-time from the earth in any part of its orbit, except about M, when the fun hides the planet from our view. As Saturn goes from G to A, his *ring* turns more and more edgewife to us, and, therefore, it feems to grow narrower and narrower; and at A it difappears as before. Hence, while Saturn goes from A to E, the fun fhines on the upper fide of his *ring*, and the under fide is dark; and whilft he goes from E to A, the fun fhines on the under fide of his *ring*, and the upper fide is dark. The *ring* difappears twice in every annual revolution of Saturn, viz. when he is in the 19th degree of Pifces and of Virgo, and when Saturn is in the middle between thefe points, or in the 19th degree either of Gemini or of Sagittarius, his *ring* appears moft open to us; and then its longeft diameter is to its fhorteft, as 9 to 4. Ferguson's Aftr. fect. 204.

Kepler, in his Epitom. Aftron. Copern. and after him Dr. Halley, in his Enquiry into the Caufes of the Variation of the Needle, Phil. Tranf. N° 195. fuppofe our earth may be compofed of feveral crufts or fhells, one within another, and concentric to each other. If this be the cafe, it is poffible the *ring* of Saturn may be the fragment or remaining ruin of his formerly exterior fhell, the reft of which is broken or fallen down upon the body of the planet.

RING is alfo the name of an inftrument ufed in navigation for taking the altitudes of the fun, &c.

It is ufually of brafs, about nine inches diameter, fufpended by a little fwivel, 45° from the point whereof is a perforation, which is the centre of a quadrant of 90° divided in the inner concave furface.

To ufe it, they hold it up by the fwivel, and turn it to the fun, till the fun-beams, falling through the hole, make a fpot among the degrees, which marks the altitude required.

This inftrument is preferred to the aftrolabe, becaufe the divifions are here larger than on the aftrolabe.

RING is alfo ufed for the found or tone of a BELL.

The *ringing* of bells, though now a recreation chiefly of the lower clafs of people, is a very curious exercife. As for the tolling of a bell, this is nothing more than the producing of a found by a ftroke of the clapper againft the fide of the bell, the bell itfelf being in a pendant pofition, and at reft. In *ringing*, the bell, by means of a wheel and rope, is elevated to a perpendicular; in its motion to this fituation, the clapper ftrikes forcibly on one fide, and in its return downwards, on the other fide of the bell, producing at each ftroke a found. The mufic of bells is altogether melody; but the pleafure arifing from it confifts in the variety of interchanges, and the various fucceffion and general predominance of the confonances in the founds produced.

The practice of *ringing* bells in change is faid to be peculiar to this country, which for this reafon is called the *ringing* ifland; but the antiquity of it is not eafily afcertained. There are in London feveral focieties of ringers, particularly one known by the name of the College Youths. Merfennus has faid nothing of the *ringing* of bells in changes; and Kircher has only calculated the poffible combinations arifing from a given number. See ALTERNATIONS.

In England the practice of *ringing* is reduced to a fcience; and peals have been compofed which bear the names of the inventors. Some of the moft celebrated peals now known were compofed about fifty years ago, by Mr. Patrick, fo well known as the maker of barometers.

For the method of *ringing* in the Low Countries, fee CARILLONS.

RINGS *of colours*, in *Optics*, a phenomenon firft obferved in thin plates of various fubftances, by Mr. Boyle, and Dr. Hooke, but afterwards more fully explained by Sir Ifaac Newton. Mr. Boyle having exhibited a variety of colours in colourlefs liquors, by fhaking them till they rofe in bubbles, as well as in bubbles of foap and water, and alfo in turpentine, procured glafs blown fo thin as to exhibit fimilar colours; and he obferves, that a feather of a proper fhape and fize, and alfo a black ribband, held at a proper diftance between his eye and the fun, fhewed a variety of little rainbows, as he calls them, with very vivid colours. Boyle's Works by Shaw, vol. ii. p. 70.

Dr. Hooke, about nine years after the publication of Mr. Boyle's Treatife on Colours, exhibited the coloured bubble of foap and water, and obferved, that though at firft it appeared white and clear, yet as the film of water became thinner, there appeared upon it all the colours of the rainbow. He alfo defcribed the beautiful colours that appear in thin plates of Mufcovy glafs; which appeared, through the microfcope, to be ranged in *rings* furrounding the white fpecks or flaws in them, and with the fame order of colours as thofe of the rainbow, and which were often repeated ten times. He alfo took two thin pieces of glafs, ground plane and polifhed, and putting them one upon another, preffed them till there began to appear a red coloured fpot in the middle; and preffing them clofer, he obferved feveral *rings* of colours encompaffing the firft place, till, at laft, all the colours difappeared out of the middle of the circles, and the central fpot appeared white. The firft colour that appeared was red, then yellow, then green, then blue, then purple, then red again; yellow, green, blue, and purple; and again in the fame order, fo that he fometimes counted nine or ten of thefe circles, the red immediately next to the purple; and the laft colour that appeared before the white was blue; fo that it began with red, and ended with purple. Thefe *rings*, he fays, would change their places, by changing the pofition of the eye, fo that, the glaffes remaining the fame, that part which was red in one pofition of the eye, was blue in a fecond, green in the third, &c. Birch's Hift. of the Royal Society, vol. iii. p. 54.

Sir Ifaac Newton, having demonftrated that every different colour confifts of rays which have a different and fpecific degree of refrangibility, and that natural bodies appear of this or that colour, according to their difpofition to reflect this or that fpecies of rays (fee COLOUR), purfued the hint fuggefted by the experiments of Dr. Hooke, already recited, and cafually noticed by himfelf, with regard to thin tranfparent fubftances. Upon compreffing two prifms hard together, in order to make their fides touch one another, he obferved, that in the place of contact they were perfectly tranfparent, which appeared like a dark fpot, and when it was looked through, it feemed like a hole in that air, which was formed into a thin plate, by being impreffed between the glaffes. When this plate of air, by turning the prifms about their common axis, became fo little inclined to the incident rays, that fome of them began to be tranfmitted, there arofe in it many flender arcs of colours, which increafed, as the motion of the prifms was continued, and bended more and more about the tranfparent fpot, till they were completed into circles, or *rings*, furrounding it; and afterwards they became continually more and more contracted.

By another experiment with two object glaffes, he was enabled to obferve diftinctly the order and quality of the colours from the central fpot, to a very confiderable diftance. Next to the pellucid central fpot, made by the contact of the glaffes, fucceeded blue, white, yellow, and red. The next circuit immediately furrounding thefe confifted of violet, blue, green, yellow, and red. The third circle of colours was purple, blue, green, yellow, and red. The fourth circle confifted of green and red. All the fucceeding colours became more and more imperfect and dilute, till, after three or four revolutions, they ended in perfect whitenefs.

In order to determine the thicknefs of the plate of air, by which he fuppofed the colours were produced, he meafured the diameters of the firft fix circles, at their moft

oft lucid parts, and found their fquares to be in the rithmetical progreffion of the odd numbers 1, 3, 5, 7, , 11; and hence he concluded, that the intervals of he glaffes at thefe circles muft be in the fame progref-fion. He alfo meafured the diameters of the dark or faint *rings* between the more lucid colours, and found their fquares to be in the arithmetical progreffion of the even numbers 2, 4, 6, 8, 10, 12; and he concluded, after an accurate menfuration, that the thicknefs of the air at the darkeft part of the firft dark *ring*, made by perpendicular rays, to be in the neareft round numbers $\frac{1}{89000}$ part of an inch, half of which, multiplied by the progreffion 1, 3, 5, 7, 9, 11, &c. gives the thicknefs of the air at the moft luminous parts of all the brighteft *rings*, their arithmetical means being its thicknefs at the darkeft parts of all the dark ones. In examining the under fide of the thin plate, in order to obferve what light was tranfmitted, he found that the central fpot was white, and the order of the colours was yellowifh red; black, violet, blue, white, yellow, red; violet, blue, green, yellow, red, &c. but thefe colours were very faint and dilute, except when the light was tranfmitted very obliquely through the glaffes. When he put water between the glaffes, and meafured the *rings* again, he found the proportion of their diameters to the diameters of the like circles made by air, to be about 7 to 8; fo that the intervals of the glaffes, at fimilar circles, caufed by water and air, were about 3 to 4.

When thefe *rings* were examined in a darkened room, by the coloured light of a prifm caft on a fheet of white paper, they became more diftinct, and vifible to a far greater number than in the open air. He fometimes faw more than twenty of them, whereas in the open air he could not difcern above eight or nine.

From other curious obfervations on thefe *rings*, made by different kinds of light thrown upon them, he inferred, that the thickneffes of the air between the glaffes, where the *rings* are fucceffively made, by the limits of the feven colours, red, orange, yellow, green, blue, indigo, and violet, in order, are one to another as the cube roots of the fquares of the eight lengths of a chord, which found the notes in an octave, *fol*, *la*, *fa*, *fol*, *la*, *mi*, *fa*, *fol*; that is, as the cube roots of the fquares of the numbers 1, $\frac{8}{9}$, $\frac{5}{6}$, $\frac{3}{4}$, $\frac{2}{3}$, $\frac{3}{5}$, $\frac{9}{16}$, $\frac{1}{2}$. Thefe *rings* appeared of that prifmatic colour, with which they were illuminated; and by projecting the prifmatic colours immediately upon the glaffes, he found that the light, which fell on the dark fpaces between the coloured *rings*, was tranfmitted through the glaffes without any change of colour. From this circumftance he thought that the origin of thefe *rings* is manifeft; becaufe the air between the glaffes is difpofed, according to its various thicknefs, in fome places to reflect, and in others to tranfmit the light of any particular colour, and in the fame place to reflect that of one colour, where it tranfmits that of another.

In examining the phenomena of colours made by a denfer medium furrounded by a rarer, fuch as thofe which appear in plates of Mufcovy glafs, bubbles of foap and water, &c. the colours were found to be much more vivid than the others, which were made with a rarer medium furrounded by a denfer. From the preceding phenomena it is an obvious deduction, that the tranfparent parts of bodies, according to their feveral feries, reflect rays of one colour, and tranfmit thofe of another; on the fame account that thin plates, or bubbles, reflect or tranfmit thofe rays; and this Newton fuppofed to be the reafon of all their colours. Hence alfo he has inferred, that the fize of thofe component parts of natural bodies that affect the light, may be conjectured by their colours. See Colour and Reflection.

Sir Ifaac Newton, purfuing his difcoveries concerning the colours of thin fubftances, found that the fame were alfo produced by plates of a confiderable thicknefs, divifible into leffer thickneffes. The *rings* formed in both cafes have the fame origin, with this difference, that thofe of the thin plates are made by the alternate reflexions and tranfmiffions of the rays at the fecond furface of the plate, after one paffage through it; but that, in the cafe of a glafs fpeculum, concave on one fide, and convex on the other, and quickfilvered over on the convex fide, the rays go through the plate, and return before they are alternately reflected and tranfmitted. Newton's Optics, p. 160, &c. or Newton's Opera, Horfley's edit. vol. iv. p. 121, &c. p. 184, &c.

The abbé Mazeas, in his experiments on the *rings* of colours that appear in thin plates, has difcovered feveral important circumftances attending them, which were overlooked by the fagacious Newton, and which tend to invalidate his theory for explaining them. In rubbing the flat fide of an object-glafs againft another piece of flat and fmooth glafs, he found that they adhered very firmly together after this friction, and that the fame colours were exhibited between thefe plane glaffes, whic Newton had obferved between the convex object glafs o a telefcope, and another that was plane; and that th colours were in proportion to their adhefion. When th furfaces of pieces of glafs, that are tranfparent and we polifhed, are equally preffed, a refiftance will be perceived; and wherever this is felt, two or three very fine curve lines will be difcovered, fome of a pale red, and others of a faint green. If the friction be continued, the red and green lines increafe in number at the place of contact; the colours being fometimes mixed without any order, and fometimes difpofed in a regular manner; in which cafe the coloured lines are generally concentric circles, or ovals, more or lefs elongated, as the furfaces are more or lefs united. When the colours are formed, the glaffes adhere with confiderable force; but if the glaffes be feparated fuddenly, the colours will appear immediately upon their being put together, without the leaft friction. Beginning with the flighteft touch, and increafing the preffure by infenfible degrees, there firft appears an oval plate of a faint red, and in the centre of it a fpot of light green, which enlarges by the preffure, and becomes a green oval, with a red fpot in the centre; and this enlarging in its turn, difcovers a green fpot in its centre. Thus the red and green fucceed one another in turns, affuming different fhades, and having other colours mixed with them. The greateft difference between thefe colours exhibited between plane furfaces, and thofe by curve ones, is; that, in the former cafe, preffure alone will not produce them, except in the cafe above mentioned. In rubbing together two prifms, with very fmall refracting angles, which were joined fo as to form a parallelopiped, the colours appeared with a furprifing luftre at the places of contact, and differently coloured ovals appeared. In the centre there was a black fpot, bordered by a deep purple; next to this appeared violet, blue, orange, red tinged with purple, light green, and faint purple. The other *rings* appeared to the naked eye to confift of nothing but faint reds and greens. When thefe coloured glaffes were fufpended over the flame of a candle, the colours difappeared fuddenly, though they ftill adhered; but being fuffered to cool, the colours returned to their former places, in the fame order as before.

At firft the abbé Mazeas had no doubt but that thefe colours were owing to a thin plate of air between the glaffes, to which Newton has afcribed them; but the remarkable difference in the circumftances attending thofe produced by the flat plates, and thofe produced by the object glaffes of Newton, convinced him that the air was not the caufe of this appearance. The colours of the flat plates vanifhed at the approach of flame, but thofe of the object glaffes did not. Nor was this difference owing to the plane glaffes being lefs compreffed than the convex ones; for though the former were compreffed ever fo much by a pair of forceps, it did not in the leaft hinder the effect of the flame. Afterwards he put both the plane glaffes and the convex ones into the receiver of an air-pump, fufpending the former by a thread, and keeping the latter compreffed by two ftrings; but he obferved no change in the colours of either of them, in the moft perfect vacuum that he could make. Sufpecting ftill that the air adhered to the furface of the glaffes, fo as not to be feparated from them by the force of the pump, he had recourfe to other experiments, which rendered it ftill more improbable that the air fhould be the caufe of thefe colours. Having laid the coloured plates, after warming them gradually, on burning coals; and thus, when they were nearly red, rubbing them together, he obferved the fame coloured circles and ovals as before. When he ceafed to prefs upon them, the colours feemed to vanifh; but they returned, as he renewed the friction. In order to determine whether the colours were owing to the thicknefs of fome matter interpofed between the glaffes, he rubbed them together with fuet and other foft fubftances between them; yet his endeavours to produce the colours had no effect. However, by continuing the friction with fome degree of violence, he obferved, that a candle appeared through them encompaffed with two or three concentric greens, and with a lively red inclining to yellow, and a green like that of an emerald; and at length the *rings* affumed the colours of blue, yellow, and violet. The abbé was confirmed in his opinion that there muft be fome error in Newton's hypothefis, by confidering that, according to his meafures, the colours of the plates varied with the difference of a millionth part of an inch; whereas he was fatisfied that there muft have been much greater differences in the diftance between his glaffes, when the colours remained unchanged. From other experiments he concluded, that the plate of water introduced between the glaffes was not the caufe of their colours, as Newton apprehended; and that the coloured *rings* could not be owing

ing to the compreffion of the glaffes. After all he adds, that the theory of light, thus reflected from thin plates, is too delicate a fubject to be completely afcertained by a fmall number of obfervations. Berlin Mem. for 1752, or Memoires Prefentes, vol. ii. p. 28—43.

M. du Tour repeated the experiments of abbé Mazeas, and added fome obfervations of his own. Mem. Pref. vol. iv. p. 288.

M. Mufchenbroeck is alfo of opinion, that the colours of thin plates do not depend upon the air; but as to the caufe of them, he acknowledges that he could not fatisfy himfelf about it. Introd. ad Phil. Nat. vol. ii. p. 738. See on this fubject Prieftley's Hift. of Light, &c. per. 6. fect. 5. p. 498, &c.

For an account of the *rings* of colours produced by electrical explofions, fee COLOURS *of natural bodies*, CIRCULAR *fpots*, and FAIRY *circles*.

RINGS *of flies*, in *Natural Hiftory*, the feveral rounds, or circular portions, of which the bodies of thefe and other infects are compofed.

In the fly kind thefe are cruftaceous or cartilaginous, and confequently of a matter little capable of extenfion; many actions of thefe infects require, however, that their bodies, or a part at leaft of their bodies, fhould be able to inflate or diftend, and contract their fize occafionally. Were every *ring* of the body one entire fcale, or fhelly fubftance, thefe changes could not be eafily effected; nature has therefore fo provided, that the tender bodies of thefe little creatures are fufficiently defended, and yet all the neceffary motions may be performed.

RING, *bafe*. See BASE.

RING-*bolt*, in a *Ship*, is an iron bolt with an eye at one end, in which is fitted a circular *ring*, and ufed for various purpofes; particularly for hooking the tackles, by which the cannon of a fhip is managed and fecured.

RING-*bone*, among *Farriers*, &c. a hard callous fubftance, growing in the hollow circle of the little paftern of a horfe, above the coronet.

It fometimes goes quite round, like a *ring*; whence its name; fometimes it is hereditary, derived from the ftallion or mare; but it oftener comes by accident, as from a ftrain, a blow of a horfe, &c.

RING, *corniche*. See CORNICHE.

RING *dial*. See DIAL.

RING *dove*. See DOVE.

RING, *fairy*. See FAIRY.

RING-*head*, an engine ufed in ftretching of cloth.

RING, *natal*. See NATAL.

RING *ouzel*. See OUZEL.

RING, *reinforce*. See REINFORCE.

RING-*ropes*, in a *Ship*, fhort pieces of rope, tied occafionally to the *ring-bolts* of the deck, to faften the cable more fecurely, when the fhip rides in a tempeft, or turbulent fea, or rapid current. They are ufed more particularly in veering away the cable gradually in thofe circumftances, in order to frefhen the haufe.

RING-*fcalpel*. We have a defcription and figure of a *ring-fcalpel*, for affifting the delivery of women in child-birth, by Dr. Thomas Simfon, in the Medical Effays of Edinburgh, vol. v. art. 39.

RING-*tail*, in *Ornithology*, the Englifh name for the *fubbuteo*, or *pygargus accipiter*; which has been generally fuppofed to be the female of the HEN-HARRIER; but males have lately been found of this fpecies.

The *ring-tail* is a moderately large bird. It has a fort of *ring*, or chain of feathers, round the back part of its head, reaching to its chin on each fide, which ftand erect, and are brown in the middle, and of a reddifh white at the edges, and make a fort of crown, which furrounds the head; on the top of the head and cheeks the feathers are dufky, bordered with ruft colour; under each eye is a white fpot; the back is dufky, the rump white, with oblong yellowifh fpots on each fhaft; the tail is long, and its tip white; the breaft and belly are of a yellowifh brown, marked with oblong dufky fpots; its legs are yellow, and the infide of its mouth is black; it feeds on fmall birds, and its eggs are of a reddifh hue, with very little clear white appearing in them. Thefe birds fly higher than the hen-harrier, and fometimes perch on trees.

RING-*tail eagle*. See *White-tailed* EAGLE.

RING-*tail*, in a *Ship*, a fmall triangular fail, extended on a little maft, which is occafionally erected for that purpofe on the top of a fhip's ftern. The lower part of this fail is ftretched out by a boom, which projects from the ftern horizontally. This fail is only ufed in light and favourable winds, particularly in the Atlantic ocean. Falconer.

RING-*tail* is alfo a name given to a fort of ftudding fail, hoifted beyond the after-edge or fkirt of thofe main-fails which are extended by a boom and gaff; as in all floops, brigs, and fchooners; and it is of the fame depth with that part of the main-fail upon which it borders.

RING, *trunnion*. See TRUNNION.

RING-*walk*, among *Hunters*, a round walk. See HUNTING.

RING-*worm*, *ferpigo*, in *Medicine*, a kind of herpes, called alfo a tetter.

It confifts of a number of very fmall puftules, rifing clofe to each other, fometimes in a circular form, with great pain and itching. It never comes to digeftion, and is not cured without difficulty; for after it appears to have been quite extinguifhed, it frequently breaks forth again at certain feafons of the year. The common people ufe to cure it, by rubbing it with ink; but where the difeafe is fixed, fome univerfals fhould be firft applied.

RIONDO, in *Ichthyology*, a name ufed by fome for the fifh more commonly called APER, a fmall fifh, of the fhape of the faber or doree, caught in the Mediterranean.

RIOT, in *Law*, the forcible doing of an unlawful thing, of a private nature, by three or more perfons affembled together for that purpofe; either with or without a common caufe or quarrel: as if they beat a man; or hunt and kill game in another's park, chafe, warren, or liberty; or do any other unlawful act with force and violence; or even do a lawful act, as removing a nufance, in a violent and tumultuous manner.

The word is formed from the Latin *riota*, of *arietare*, to run at each other as rams do. Though, from an ancient Gaulifh verfion of the Bible, quoted by Skinner, *riot* fhould rather feem originally to fignify luxury and excefs; whence our law *riot* might proceed; becaufe thefe are frequently attended with quarrels.

For the difference between a *riot*, rout, and unlawful affembly, fee ROUT, and UNLAWFUL *affembly*.

The punifhment of *riots* and routs, where a number of perfons from three to eleven are concerned, is, by the common law, fine and imprifonment only; to which, in very enormous cafes, the pillory has been fometimes fuperadded. And by the ftat. 13 Hen. IV. cap. 7. any two juftices, together with the fheriff or under-fheriff of the county, may come with the POSSE *comitatus*, if need be, and fupprefs any fuch *riot*, affembly, or rout, and arreft the rioters, and record upon the fpot the nature and circumftances of the whole tranfaction, which record alone fhall be a fufficient conviction of the offenders; and it is held that any battery, wounding, or killing the rioters, that may happen in fuppreffing the *riot*, is juftifiable. The riotous affembling of twelve perfons or more, and not difperfing upon proclamation, was firft made high treafon by ftat. 3 & 4 Edw. VI. cap. 5. but repealed by ftat. 1 Mar. cap. 1. Neverthelefs the offence was made a fingle felony by 1 Mar. ftat. 2. cap. 12. and by 1 Eliz. cap. 16. with whom the law expired. However, it was revived, in order to fupport the execution of the act of fettlement, and made perpetual by 1 Geo. I. cap. 5. which enacts, that if any twelve perfons are unlawfully affembled to the difturbance of the peace, and any one juftice of the peace, fheriff, under-fheriff, or mayor of a town, fhall think proper to command them by proclamation to difperfe, if they contemn his orders, and continue together for one hour afterwards, fuch contempt fhall be felony without benefit of clergy. And farther, if the reading of the proclamation be by force oppofed, or the reader be in any manner wilfully hindered from the reading of it, fuch oppofers and hinderers are felons, without benefit of clergy; and all perfons to whom fuch proclamation ought to have been made, and knowing of fuch hindrance, and not difperfing, are felons, without benefit of clergy. And the act indemnifies the peace officers, and their affiftants, if they kill any of the mob in endeavouring to difperfe them. Moreover, if any perfons, fo riotoufly affembled, begin, even before proclamation, to pull down any church, chapel, meeting-houfe, dwelling-houfe, or out-houfes, they fhall be felons, without benefit of clergy. Blackft. Comm. book iv. chap. xi.

RIPENERS, in *Medicine*, a fort of topical remedies, called alfo *drawers*, *digeftives*, *maturantia*, *fuppuratives*, &c. See MATURATION.

RIPENING *of fruit*, in *Gardening*, may be forwarded feveral ways. The method practifed in the Levant, for maturating the domeftic fig-tree, has been already mentioned, alfo the great ufe of hot-beds, for bringing to maturity many exotic plants, which could not be otherwife effected in cold climates. See CAPRIFICATION, HOT-*beds*, and FORCING.

RIPIENO, in the *Italian Mufic*, is ufed in pieces of mufic in parts, to diftinguifh thofe that play to fill up, from thofe that play throughout the piece.

There are, fays Mr. Broffard, two kinds of the *ripieno*; one plays the part of the little chorus exactly, and does not, therefore, increafe the harmony or number of parts. What is to be played by all the muficians is marked with the words *tutti* or *omnes*. This fort of *ripieno* is found in almoft all compofitions. The other fort is much better, a dif-

a different part being played, whereby the number of parts is increaſed, and the harmony made fuller. Thus in pieces where in ſtrictneſs two trebles, and baſs, and thorough baſs, are ſufficient, becauſe theſe parts are diſpoſed in ſuch a manner, as that their harmony is complete when played all together; yet, in order to render the piece more perfect, and to give it more grandeur, a counter-tenor, tenor, and often two violins, are added, whoſe parts are entirely different from the other; and the harmony then has ſeven parts inſtead of three, and is conſequently more complete and full. The parts thus added are properly called *ripieni*.

RIPIERS, *ripiarii*, in our *Old Writers*, thoſe that bring fiſh from the ſea coaſt to the inner parts of the land.

They were thus called *à fiſcella, qua in devehendis piſcibus utuntur, Anglice*, a rip.

RIPOSTE, in the *Manege*, is the vindictive motion of a horſe that anſwers the ſpur with a kick of his foot.

RIPPERS, in the *Wire-works*, are the people who attend in the mills, take the prepared ſmall rods of iron, and work at the barrels where they are drawn into wire.

RIPPLING, in *Sea Language*, a broken and interrupted noiſe, produced by a current on or near the ſea-coaſt.

Rippling *of flax* is the operation of taking off the ſeed from the flax, by drawing it through a *ripple*, or large comb.

RISCUS, among the Romans, ſometimes ſignifies a cheſt or trunk covered with ſkins; ſometimes it is uſed for a hamper, made of twigs or ruſhes to hold lint; and ſometimes for a hollow place in the wall of a houſe, uſed likewiſe for holding lint, or the like.

RISENTITO, in the Italian *Muſic*, a briſk, lively, or expreſſive manner of playing.

RISIBILITY, the faculty of laughter.

Riſibility is commonly ſuppoſed an attribute peculiar to man; as being the only creature capable of judging what is ridiculous.

Some philoſophers go ſo far as to aſſert, that the degree of judgment is always ſeen in that of laughter; fools always either have too little or too much of it.

Authors do not agree as to the peculiar mechaniſm in man, whereby laughter is raiſed. It is uſually attributed to the communication between the plexus nervoſus, and the diaphragmatic nerves.

RISIGALLUM, in the *Materia Medica*. See Realgar.

RISING, in *Aſtronomy*, the appearance of the ſun, a ſtar, or other luminary, above the horizon, which before was hid beneath it.

By reaſon of the refraction of the atmoſphere, the heavenly bodies always *riſe* before their time; i. e. they are ſeen above the horizon, while they really are below it.

There are three poetical kinds of *riſing* of the ſtars. See Acronychal, Cosmical, and Heliacal.

To find the riſing, &c. *of the ſun and ſtars by the globe*, ſee Globe.

Rising-*line*, in a *Ship*, a name given by ſhipwrights to an incurvated line, which is drawn on the plane of elevation, to determine the height of the ends of all the floor-timbers throughout the ſhip's length, and which accordingly aſcertains the figure of the bottom, with regard to ſharpneſs and flatneſs. Falconer.

RISK, or Risque, the hazard or chance of a loſs, damage, &c.

There is a great *riſk* run in letting goods go upon credit to great lords, wives not authorized by their huſbands, and young people not yet arrived at the age of majority.

Skinner derives the word from the Spaniſh *riſco*, *ſteep*; Covarruvias, from *rigeo*. In the barbarous Greek, they ſay, ῥιζικαρω, for *periclitor*, *I hazard*; and ῥιζικον, for *lot* or *chance*; which words, as well as *riſque*, Skinner thinks, may be deduced from ῥιπτω, for *αναῤῥιπτω τον κυϐον*, *I caſt the dye*.

To prevent any *riſk* in invoices of merchandizes by ſea, it is uſual to inſure them.

The *riſk* of merchandizes commences from the time they are carried aboard. In matters of inſurance, it is a maxim, that all is never to be *riſked* on one bottom, or in the ſame veſſel; to denote, that aſſurers muſt act with diſcretion in the ſigning of policies, and not hazard too much on each veſſel; there being more to be expected from ſeveral than from one.

RISORIUS *novus*, in *Anatomy*, a name given by Santorini to a muſcle, formed of that part of the *quadratus genæ*, which ariſes from the cheek.

RISVIGLIATO, in the Italian *Muſic*, is uſed to ſignify, that after having played or ſung a doleful and lamenting ſtrain, a gay and lively air is to follow.

RISUS. See Laughter.

Risus *caninus* is a kind of laughter wherein the lips are contracted, ſo as to ſhew all the teeth.

Risus *Sardonius*, Sardonian laughter, is a forced, ſpiteful laughter; or a laughter that does not go beyond the teeth.

The phraſe is by ſome ſaid to be founded on this, that in Sardinia there is a venomous plant, which occaſions ſuch a contraction of the muſcles of the face in perſons it kills, that they ſeem to die laughing in this manner.

RITE, *ritus*, in *School Divinity*, denotes the particular manner or form of celebrating or performing the religious ceremonies, which obtains in this or that place.

The eaſtern people, Armenians, &c. celebrate divine ſervice according to the Greek *rite*. The weſtern world follow the Latin *rite*; or that of the Roman church.

The Engliſh obſerve the *rite* of the church of England, preſcribed in the book of Common Prayer, &c.

RITHER, or Rider, in *Mining*, is a ſtone or thin cliff that lies in the vein; the ore ſometimes runs on both ſides it. Sometimes the *rither* is ſo thick, that it parts the vein, and makes one vein two.

RITORNELLO, or Refret, in *Muſic*, the burden of a ſong, or a repetition of the firſt or other verſes of the ſong, at the end of each ſtanza or couplet.

The word is Italian, and ſignifies properly a *little return*, or a ſhort repetition, ſuch as that of an echo, or of the laſt words of a ſong; eſpecially when the repetition is made after a voice, by one or more inſtruments.

But cuſtom has extended the uſe of the word to all ſymphonies, played before the voices begin, and which ſerve by way of prelude or introduction to what follows.

In the partitions or ſcore of the Italian muſic, we frequently find the *ritornellos* ſignified by the words *ſi ſuona*, to ſhew that the organ, ſpinnet, or the like, are to repeat what the voice has been ſinging.

RITUAL, *rituale*, a church book, directing the order and manner of the ceremonies to be obſerved in celebrating divine ſervice in a particular church, dioceſe, religious order, or the like.

The ancient heathens had, likewiſe, their *rituals*, or *rituales libri*; thoſe of the Hetrurians were much famed. See Aruspici *Libri*.

Theſe books contained the rites and ceremonies to be obſerved in the building a city, in the conſecrating a temple or an altar, in ſacrificing, and deifying, in dividing the curiæ, tribes, centuries, and, in general, in all their religious ceremonies.

There are ſeveral paſſages in Cato's books, De Re Ruſtica, which may give us ſome idea of the *rituals* of the ancients.

RIVAGE, *rivagium*, a toll anciently paid to the king on ſome rivers, for the paſſage of boats or veſſels therein.

RIVAL, *rivalis*, a term of relation applied to two perſons who have the ſame pretenſion.

It is properly uſed for a competitor, in love; and figuratively for an antagoniſt in any other purſuit. The intrigues of comedies and romances uſually turn on the jealouſies of *rivals*, who diſpute for the ſame miſtreſs.

The lawyers derive the word from the Latin *rivus*, *ſtream*, *quod ab eodem rivo aquam hauriant*.

Donatus ſuppoſes it to have been formed hence, that beaſts coming to drink at the ſame brook, or fountain, frequently quarrel.

Cælius ſays, that *rivales* were originally ſuch whoſe fields were parted by a brook or rivulet, the courſe whereof being liable to be varied ſeveral ways, occaſioned frequent diſputes and law-ſuits.

RIVER, *fluvius*, or *flumen*, in *Geography*, a ſtream or current of freſh water, flowing in a bed or channel, from a ſource or ſpring, into the ſea.

If the ſtream be not large enough to bear boats, or ſmall veſſels, loaden, it is properly called in Engliſh, by the diminutive, *rivulet* or *brook*; by the Latins *rivus*; and by the French *riviere*. If it will only bear ſuch veſſels, the Latins call it *amnis*. If it be conſiderable enough to carry larger veſſels, it is called by the general name *river*; by the Latins *fluvius*, and *flumen*; and by the French *fleuve*; between all which the difference is only as to greater and leſs.

Some will have none to be properly *rivers*, except thoſe which bear the ſame name from their ſource to their mouth.

Others, none but thoſe which empty themſelves immediately into the ſea; and not into any other river.

Rivulets have their riſe, ſometimes, from great rains, or great quantities of thawed ſnow; eſpecially in mountainous places; as in the long ridges in Africa, India, Sumatra, &c. But the generality of *rivulets* ariſe from ſprings.

Rivers themſelves all ariſe either from the confluence of ſeveral *rivulets*, or from lakes; nor is there any great *river*, ſuch as the Rhine, Elbe, &c. known to flow from a ſingle ſpring.

The Volga, e. gr. conſiſts of above two hundred *rivulets*, all

all flowing into it, before it reach the Caspian; and the Danube receives as many.

The Rhine and the Po receive each above a hundred others, great and small; and the *river* of the Amazons receives into its large bed a prodigious number, some of which are five or six hundred leagues in length, and are of such a depth and breadth as render them principal *rivers*.

Pliny, indeed, and Cardan, say, that the Nile receives none; but the later travellers into Abyssinia assure us of the contrary.

The Rhine, Rhone, Danube, Borysthenes, &c. arise originally from springs in the mountains; and the Nile, the Volga, the great *river* of St. Laurence, &c. from lakes.

It has been held by many, that all springs and *rivers* owe their origin to rains and dews; but there are some springs which cannot be accounted for on this principle, though others very well may. The intermitting springs, which flow violently in rainy seasons, and are dry in summer, are probably owing to rains; but there are some springs which discharge more water annually than all that falls in rain and dews in the neighbouring country. The great perennial spring at Willowbrig in Staffordshire is of this kind, and that of the Sorgue in France is much more eminently so; the *river* of that name being, according to Gassendus, navigable up to the very springs which are its source.

But if such springs as these discharge too great a quantity of water for the supply of rains and dews; how is it possible, that such small supplies of water as these can afford the constant currents of the larger *rivers*? The Volga alone, according to Ricciolus, pours forth as much water in a year's time into the Caspian sea, as would suffice to drown the surface of the whole earth. The *river* of St. Laurence, in America, pours forth nearly as much as this. If either of these *rivers* alone do, as has been affirmed, from calculations, discharge annually as much water as falls in the same time in rains and mists upon the surface of the whole earth; from whence are all the rest to be supplied, according to the system of their all being made by rains; and particularly where is left the supply for the Rio de la Plata; which Ricciolus affirms to be larger than the Nile, the Ganges, and the Euphrates, put together? its mouth being ninety miles wide, and running with that violence into the sea, that it makes it fresh for two hundred miles together. These, and the other *rivers* of the several parts of the globe, upon a very moderate calculation, discharge at least five hundred times as much water into the sea, as falls upon the whole surface of the earth, in rains, mists, dews, snows, &c. in a like space of time.

As it is evident, therefore, that these cannot be supplied by rains, so neither is it possible that the several hot springs and the salt springs can be supplied that way: the origin of springs also in places where there falls little or no rain, and where the conservatories must needs be too small to contain a supply, are great proofs that rain and mists are not the origin of springs, at least not in all places. The isles of Mago, Rotunda, and the Strophades, and the rock whereon the Maiden Tower stands in the Thracian Bosphorus, cannot be supplied with, or retain a sufficiency of rain water to supply constant springs, yet such are always found running there.

It cannot be otherwise but that there are subterranean communications between the sea and the sources of fountains, *rivers*, and the larger springs, by which these are supplied; and there are certainly charybdes which swallow the sea for these purposes; and when these happen to be stopped, the largest *rivers* have been dried up, and wholly ceased to run for a considerable time: this we have accounts in history has happened to the Thames, the Trent, and Medway, in England; the Elve, the Motala, and Gulfspang, in Sweden, and other *rivers* in other countries. If, on the other hand, these charybdes happen to be too open, fresh water springs depending upon them will become salt. This we have instances of in history also; and even so old a writer as Pliny has said, that this once happened in Caria near Neptune's Temple. Plot. de Origine Fontium. See EVAPORATION and SPRING.

RIVERS, *phenomena and variations of*. *Rivers* are found subject to great alterations, at different seasons of the year, day, &c. from frequent rains, and melted snow. Thus in Peru and Chili many of the *rivers* are almost insensible in the night-time, and only flow by day, as being then augmented by the dissolution of the snow on the mountains Andes. Thus the Volga abounds in water in May and June, so as to cover the sand-banks, &c. which all the rest of the year lie bare, so as scarce to allow a passage to the loaden ships. Thus also the Nile, Ganges, Indus, &c. are frequently so increased as to overflow; and that either in the winter, from rain, or in the summer, from the melting of the snow. Some *rivers* bury themselves under-ground in the middle of their course, and break out again in other places, like new *rivers*. Thus the Niger, which some cosmographers derive by a subterraneous channel from the Nile, because it swells at the same time with the Nile, without any other apparent cause of its swelling; the Niger itself, meeting the mountains of Nubia, is hidden under them, and rises again on the western side of those mountains. Thus also the Tigris is lost in the mountain Taurus, &c.

Aristotle, and the poets, mention several such *rivers* about Arcadia: Alpheus, a *river* of Arcadia, is particularly famed. This, being swallowed up in the ground, is supposed, by the Greek authors, to continue its progress under the earth, and under the bottom of the sea, into Sicily; where, breaking up near Syracuse, it forms the *river* Arethusa. The great reason of this opinion was, that, every fifth summer, the *river* Arethusa, in Sicily, cast up the dung of cattle about the time of the celebration of the Olympic games in Achaia, when the dung of victims was used to be cast into the Alpheus.

Some *rivers* empty themselves into the sea by one mouth, some by several. Thus, the Danube opens into the Euxine sea by seven mouths; the Nile by seven; and the Volga by at least seventy. The cause of this variety of mouths Varenius attributes principally to banks of sand, &c. formed therein; which, gradually increasing, form islands, whereby the channel is divided into several branches. Indeed, the ancients tell us, that the Nile formerly only emptied itself at one mouth, called the *ostium Canopicum*; and add, that the other six are adventitious, or artificial.

The channels of *rivers*, except such as were formed at the creation, Varenius endeavours to prove to be all artificial, and dug by men. His reasons are, that, when a new spring breaks forth, the water does not make itself a channel, but spreads over the adjacent land; so that the people have been necessitated to cut it a channel, to secure their grounds; and that a great number of channels of *rivers* are certainly known, from history, to have been dug by men, &c.

As to the question, whether those *rivers* which run into others, have made themselves that way by their own motion, or have been turned thither in canals cut by men? he takes the latter to be the more probable; and concludes the same of the arms, or branches, of *rivers*, and of the turns whereby islands are formed in the Tanais, Volga, &c.

To the question, why we have no salt *rivers*, when there are so many salt springs? he answers, that it is because men, having no occasion for salt water, have not dug channels to conduct the water of salt springs; salt being procurable at less expence.

The water of most *rivers* carries with it particles of metals, minerals, sands, or oily and fat bodies, &c. Thus, some *rivers* bring sands intermixed with grains of gold; of which kind is, 1. A *river* in Japan. 2. Another in the island Lequeo, near Javon. 3. A rivulet in Africa, called Arroe, breaking out of the foundation of the mountains of the Moon, wherein there are gold mines. 4. A *river* in Guinea, where the negroes separate the gold-dust from the sand, and sell it to the Europeans, who traffick thither for that very purpose. 5. In some rivulets near the city of Mexico, there are grains of gold taken up, especially after rain; which is also to be understood of all the other *rivers*, none of which yield any thing considerable, except in rainy seasons. 6. In Peru, Sumatra, Cuba, Hispaniola, and Guinea. Lastly, there are several brooks in the countries about the Alps, especially Tirol, out of the sediment of whose waters gold is drawn, though there be no grains conspicuous therein. Add to this, that the Rhine also, in many places, affords a golden mud.

As to *rivers* that bring grains or particles of silver, iron, copper, lead, &c. we find no mention of them in authors, though, doubtless, there are great numbers of each; and many of the medicinal effects of mineral waters are, doubtless, owing to particles of these kinds.

We must not here omit a water in Germany, which is ordinarily supposed to change iron into copper. The truth is, there is no real conversion of the metal; all that is done is, that the [illegible] and vitriolic particles in the water corrode the iron; and detaching parts thereof by means of the motion of the water, coppery particles succeed in their room.

From this variety in the mixture of *river*-water result various qualities, different specific gravities, different colours, &c.

Some *rivers*, at certain seasons of the year, swell so as to overflow their banks, and drown the neighbouring lands. Of these the most eminent is the Nile, which rises so as to

to cover all Egypt, except the hills. The inundation begins about the ſeventeenth day of June, and increaſes for the ſpace of forty days, and decreaſes for as many; during which period, the cities of Egypt, which are all built on hills, appear as ſo many iſlands.

To theſe inundations Egypt owes all its fertility; the heavens there affording no rain, or at leaſt none in any reſpect conſiderable. Hence, as the inundation is great or ſmall, Egypt, for that year, is fruitful or barren.

The ancient Greeks, &c. were miſtaken as to the cauſe of this inundation, nobody, in thoſe days, having travelled up to the ſource of the *river*; but the modern Engliſh and Portugueſe traders into Congo, Angola, Monomotapa, &c. have let us into the ſecret. From them we learn, that the ſpring, or ſource, of the Nile, is in a large lake called Zaire, round which are a great number of huge mountains, called the Mountains of the Moon. Now, as theſe lie in the ſouthern hemiſphere, their winter will be at the time of our ſummer; but on account of their nearneſs to the equator (being only 10° diſtant from it), they never feel any notable cold: hence it is, that inſtead of ſnow in the winter, they have rain every day, at leaſt two hours before, and two hours after noon. In effect, the tops of theſe mountains are always covered with clouds; and the rains are, at the proper ſeaſon, almoſt continual. Hence torrents are conſtantly guſhing down from the mountains, all ending in the lake of Zaire; whence they flow into the channel of the Nile, and other *rivers* ariſing from the ſame lake; as the Cuamar, the Zaire, &c. and hence the inundation of the Nile. See NILOMETER.

The other *rivers*, which have any notable ſtated inundations, are the Niger, or Gambia, which overflows at the ſame time with the Nile. Leo Africanus ſays, it begins on the fifteenth day of June, increaſes for forty days, and decreaſes as long. The Zaire, a *river* of Congo, proceeding from the ſame lake with the Nile, and therefore affected in the ſame manner; the Rio de la Plata, in Braſil, which, Maffeus obſerves, overflows at the ſame time with the Nile; the Ganges; and the Indus; both which laſt overflow in June, July, and Auguſt; at which times the natives ſave great quantities of the water in ponds, to ſerve them the reſt of the year; ſeveral *rivers* flowing out of the lake Chiamay into the bay of Bengal, which overflow in September, October, and November: theſe all bring a very great fertility with them to the ground; the *river* Macoa, in Camboia; the *river* Parana, or Paranguaſa, which ſome will have to be the ſame with the Silver *river*; ſeveral *rivers* in Coromandelia, a part of India, which overflow in the rainy months, from the great quantity of water iſſuing from the mountain Gatis; the Euphrates, which overflows Meſopotamia certain days in the year; and, laſtly, the *river* Sus, in Numidia.

The *rivers* moſt celebrated for their length, breadth, ſwiftneſs of current, &c. are, the Nile, which runs almoſt in a ſtraight courſe two thouſand five hundred and twenty geographical miles; the Niger, which runs two thouſand four hundred miles; the Ganges, twelve hundred miles; the Ob, ſixteen hundred miles; the Jeniſcea, in Aſia, about the ſame length with the Ob; the *river* Orellana, in America, ſixty miles broad at its mouth, and five thouſand miles long; the Rio de la Plata, eighty miles broad at the mouth; the Omarannan, another *river* of Braſil; and the great *river* of St. Laurence, near two thouſand five hundred miles long.

RIVER, in *Phyſics*, denotes a ſtream of water running by its own gravity, from the more elevated parts of the earth towards thoſe which are more depreſſed, in a natural bed or channel open above. Such as AE, *Tab.* VI. *Hydroſtatics*, *fig.* 60.

If this channel is artificial, it is called a canal; of which there are two kinds, viz. that whoſe channel is every where open, without ſluices, called an artificial *river*, and that whoſe water is kept up or let off by means of ſluices, which is properly a CANAL.

RIVERS, *laws of the motion of.* The modern philoſophers endeavour to reduce the motion and flux of *rivers* to preciſe laws; and, with this view, they have applied geometry and mechanics to this ſubject; ſo that the doctrine of *rivers* is become a part of the new philoſophy. The Italian authors have diſtinguiſhed themſelves herein, and it is chiefly to them we are indebted for the improvement; parti[illegible]mini, who, in his treatiſe Della Natura de [illegible] has abundance of new obſervations and diſcoveries relating to it.

Rivers, he obſerves, uſually have their ſources in mountains, or elevations of ground; and it is in their deſcent from theſe that they acquire the velocity, or acceleration, which maintains their future current. In proportion as they advance farther, this velocity diminiſhes, on account of the continual friction of the water againſt the bottom and ſides of the channel, of the various obſtacles they meet with in their progreſs, and of their arriving, at length, in plains, where the deſcent is leſs; and their inclination to the horizon, of conſequence, greater. Thus the Reno, a *river* of Italy, which gave occaſion, in ſome meaſure, to theſe ſpeculations, is found, near its mouth, to have ſcarce a deſcent of fifty-two ſeconds.

If the acquired velocity be quite ſpent, through the many obſtacles, ſo that the current becomes horizontal, there will then nothing remain to propagate the motion, and continue the ſtream, but the depth, or the perpendicular preſſure of the water, which is always proportional to the depth. And, happily for us, this reſource increaſes, as the occaſion for it increaſes; for, in proportion as the water loſes of the velocity acquired by the deſcent, it riſes and augments in depth.

It appears from the laws of motion pertaining to bodies moved on inclined planes, that when water flows freely upon an inclined bed, it acquires a velocity, which is always as the ſquare root of the quantity of declivity of the bed. But in an horizontal bed, opened by ſluices or otherwiſe, at one or both ends, the water flows out by its gravity alone; and the flowing is quicker or ſlower in a direct ratio of the reſpective heights of the water, by reaſon of the weight of the ſuperior waters upon the inferior. Hence it follows, firſt, that as much as the declivity of the bed or channel of a *river* is greater, ſo much alſo will the velocity of the flowing waters be proportionably increaſed.

Secondly, As much as the water in an horizontal bed is deeper, ſo much will the velocity of the current be increaſed; and this velocity will diminiſh in proportion to the decreaſing depths of the water in the bed.

Thirdly, Abſtracting from the reſiſtance cauſed by the bottom and ſides of the bed, as much nearer as the water is to the bottom, ſo much will its motion be accelerated; not only becauſe the inferior waters are more compreſſed by the ſuperior in proportion to their greater depth; but alſo becauſe the inferior ones have a greater declivity than the ſuperior, by reaſon of their greater depth in the bed, where they are more depreſſed with reſpect to the elevation of their common ſource or ſpring.

The upper parts of the water of a *river*, and thoſe at a diſtance from the banks, may continue to flow, from the ſingle cauſe, or principle, of declivity, how ſmall ſoever it be; for, not being detained by one obſtacle, the minuteſt difference of level will have its effect; but the lower parts, which roll along the bottom, will ſcarce be ſenſible of ſo ſmall a declivity; and will only have what motion they receive from the preſſion of the ſuperincumbent waters.

The natural viſcidity and coheſion of the particles of water, and that implication, as it were, which they ſeem to have with one another, make the lower, which are moved by means of the depth, carry along with them the upper, which, in an horizontal channel, would have no motion at all: or, in a channel very little inclined, next to none; ſo that the lower, in this caſe, communicate to the upper a part of the motion they have received from the preſſure of it. Hence, from the preſſure, it frequently happens that the greateſt velocity of a *river* is about the middle of its depth, or that point which is the fartheſt poſſible from the ſurface of the water, and from the bottom and ſides of the bed; ſuch middle parts having the advantage of being preſſed with half the depth of the *river*, and of being free, at the ſame time, from the friction of the bottom; whereas, on the contrary, the leaſt velocity of the water is at the bottom and ſides of the bed, becauſe there the reſiſtance reſulting from friction is the greateſt, which is communicated to the other parts of the ſection of the *river*, in an inverſe duplicate proportion of the diſtances from the bottom and ſides combined together.

To find whether the water of a *river*, almoſt horizontal, flows by means of the velocity acquired in its deſcent, or by the preſſure of its depth, ſet up an obſtacle perpendicular to it; if the water riſe and ſwell immediately againſt ſuch obſtacle, it runs in virtue of its fall; or, if it ſtop a little while firſt, in virtue of its preſſion.

Rivers, according to this author, almoſt always make their own beds. If the bottom have originally been a large declivity, the water, in conſequence hereof, falling with a great deal of force, will have ſwept away the moſt elevated parts of the ſoil, and carrying them lower down, will gradually render the bottom horizontal; where the ſtream is ſwifteſt, there will the earth be moſt dug up; and, conſequently, there the greateſt cavity will be made.

The water having made its bed horizontal becomes ſo itſelf, and conſequently rakes with the leſs force againſt the bottom, till at length that force becomes only equal

to the reſiſtance of the bottom. The bottom is now arrived at a ſtate of permanency, at leaſt for a conſiderable time; and the longer, according to the quality of the ſoil, clay and chalk reſiſting longer than ſand or mud.

On the other hand, the water is continually gnawing and eating off the brims of its channel, and this with the more force, as, by the direction of its ſtream, it impinges more perpendicularly againſt them. By this means it has a continual tendency to render them parallel to its own courſe; and when it has arrived as near that as poſſible, it ceaſes to have any effect that way. At the ſame time that it has thus rectified its edges, it has enlarged its own bed; that is, it has loſt of its depth, and conſequently of its force and preſſure; this it continues to do till there is an equilibrium between the force of the water and the reſiſtance of its banks, upon which they will remain without farther mutation. And it is evident, from experience, that theſe equilibriums are all real, inaſmuch as we find that *rivers* only dig and widen to a certain pitch.

The very reverſe of all theſe things does alſo on ſome occaſions happen. *Rivers*, whoſe waters are thick and muddy, raiſe their bed, by letting part of the heterogeneous matters contained in them fall to the bottom: they alſo contract their banks, by a continual appoſition of the ſame matter, in bruſhing over them. This matter, being thrown aſide far from the ſtream of water, might even ſerve, by reaſon of the obſcureneſs of the motion, to form new banks.

Now theſe oppoſite effects ſeem almoſt always to concur, and are differently combined, according to the circumſtances, whence it is very difficult to judge of the reſult; yet muſt this combination be known very accurately, before any meaſures can be taken about *rivers*, eſpecially as to the diverting of their courſes. The Lamona, which emptied itſelf into the Po, being turned another way, to make it diſcharge itſelf into the Adriatic, was ſo altered, and its force ſo far diminiſhed, now that its waters were left to themſelves, that it raiſed its bed a great height, by continual depoſitions of mud, till it became much higher than the Po in its utmoſt accretions, and needed very high banks, or dykes, to keep it from overflowing.

If various cauſes of reſiſtance to the motion of flowing waters did not exiſt, ſuch as the attraction and continual friction of the bottom and ſides, the inequalities in both, the windings and angles that occur in their courſe, and the diminution of their declivity the farther they recede from their ſprings, the velocity of their currents would be accelerated to twelve, fifteen, and, in ſome caſes, even to twenty times more than it is at preſent in the ſame *rivers*, whereby they would become abſolutely unnavigable.

A little *river* may be received into a large one, without either augmenting its width or depth. This ſeeming paradox ariſes hence, that the addition of the little *river* may only go towards moving the waters, before at reſt near the banks of the large one, and thus augmenting the velocity of the ſtream, in the ſame proportion as it does that of the quantity of water. Thus the Venetian branch of the Po ſwallowed up the Ferrareſe branch, and that of Panaro, without any inlargement of its own dimenſions. And the ſame may be concluded proportionally of all other acceſſions to *rivers*, and, in the general, of all new augmentations of water.

A *river* offering to enter into another, either perpendicularly or in an oppoſite direction, will be diverted by degrees from that direction, and obliged to make itſelf a new and more favourable bed towards the mouth.

The union of two *rivers* into one makes the whole flow the ſwifter, becauſe, in lieu of the friction of four ſhores, they have only two to ſurmount; and that the ſtream, being farther diſtant from the banks, goes on with the leſs interruption; beſides, that a greater quantity of water, moving with a greater velocity, digs deeper in the bed, and of courſe retrenches of its former width. Hence alſo it is that *rivers*, by being united, take up leſs ſpace on the ſurface of the earth, and are more advantageous to low grounds, which diſcharge their ſuperfluous moiſture into them, and have likewiſe leſs occaſion for dykes to prevent their overflowing.

Theſe advantages are ſo conſiderable, that S. Guglielmini thinks them worthy of nature's having had a view to them in her contriving to make the confluences of *rivers* ſo frequent as we find them.

To determine more preciſely the general laws of the motion of *rivers*, it may be obſerved, 1. That a *river* is ſaid to remain in the *ſame ſtate*, or to be in a *permanent ſtate*, when it flows uniformly, ſo as to be always at the ſame height in the ſame place. 2. That a plane, which, cutting a *river*, is perpendicular to the bottom, and to the direction of the ſtream of water, and whoſe limits are thoſe of the water itſelf, which runs off in that place, as $p\,o\,n\,q$, is called the *ſection of a river*. See *Tab. Hydroſtat. fig.* 60.

Hence, when a *river* is terminated by flat ſides, parallel to each other, and perpendicular to the horizon, and the bottom alſo is a plane, either horizontal or inclined, the ſection of the *river* with theſe three planes makes right angles, and is a parallelogram.

Now, in every *river* that is in a permanent ſtate, the ſame quantity of water flows in the ſame time through every ſection; for, unleſs there be in every place as great a ſupply of water, as what runs from it, the *river* will not remain in the ſame ſtate. This will hold good, whatever be the irregularity of the bed, or channel; from which, in other reſpects, ſeveral changes in the motion of the *river* may ariſe; for example, a greater friction, in proportion to the inequality of the channel. Hence it appears, that where the ſection of the *river* is greater, the velocity of the flowing water is leſs; and where the ſection is leſs, the velocity is greater; and, conſequently, the ſections of the bed, the mean velocities, the times of flowing, and the quantity which flows, are univerſally in a combined ratio together; and this combination is called the *momentum* of a *river*, which momentum of the ſame flowing water is univerſally equal. Hence may be deduced the principles for calculating the quantity of diminution of the water in a lake, pond, or veſſel, by any determinate flowings whatſoever; for as the ſurface of the lake, &c. is to the ſection of the current which carries off the waters, ſo is the mean velocity of the current in this ſection to the decreaſe of waters in the lake, &c. and *vice verſa*.

The irregularities in the motion of a *river* may be infinitely varied, nor can any rules be given to ſettle them. To aſcertain their general courſe, all irregularities muſt be ſet aſide, only the general tenor, or flux, be conſidered.

Suppoſe then the water to run in a regular channel, without any ſenſible friction, and that the channel is terminated with plane ſides, parallel to one another, and vertical; and alſo, that the bottom is a plane, and inclined to the horizon. Let AE be the channel into which the water runs from a greater receptacle or head, and let the water always remain of the ſame depth at the head, ſo that the *river* may be in a permanent ſtate; the water here deſcends along an inclined plane, and is accelerated; whereby, becauſe the ſame quantity of water flows through every ſection, the depth of the water, as you recede from the head of the *river*, is continually diminiſhed, and its ſurface will acquire the figure $i\,q\,s$.

To determine the velocity of the water in different places, ſuppoſe the aperture of the channel ADCB to be ſhut up with a plane; if there be a hole made in the plane, water will ſpout the faſter through the hole, as the hole is more diſtant from the ſurface of the water $h\,i$; and the water will have the ſame celerity that a body falling from the ſurface of the water to the depth of the hole below it would acquire; all which regularly ariſes from the preſſure of the ſuperincumbent water. There is the ſame preſſure, that is, the ſame moving force, when the obſtacle at AC is taken away, upon which every particle of water enters into the channel with the celerity a body would acquire in falling from the ſurface of the water to the depth of the particle. This particle is moved along in an inclined plane in the channel, with an accelerated motion; and that in the ſame manner as if falling, vertically, it had continued its motion to the ſame depth below the ſurface of the water in the head of the *river*.

So if you draw the horizontal line $i\,t$, the particle at r will have the ſame celerity as a body falling the length iC, and running down Cr, can acquire; which is the celerity acquired by the body in falling down $t\,r$. Therefore the celerity of a particle may be every where meaſured, by drawing from it a perpendicular to the horizontal plane, which is conceived to run along the ſurface of the water in the head of the *river*: and the velocity which a body acquires in falling down that perpendicular, will be the celerity of the particle; which is greater the longer the perpendicular is. From any point, as r, draw $r\,s$ perpendicular to the bottom of the *river*: this will meaſure the height or depth of the *river*. Since $r\,s$ is inclined to the horizon, if from the ſeveral points of that line you draw perpendiculars to $i\,t$, they will be ſhorter, the more diſtant they are from r, and the ſhorteſt of them will alſo be $s\,v$; therefore the celerities of the particles in the line $r\,s$ are ſo much the leſs, the nearer they are to the ſurface of the *river*, and the lower water is moved faſter than the upper water.

Yet the celerities of thoſe waters, as the *river* runs on, continually approach nearer and nearer to an equality; for the ſquares of thoſe celerities are as $r\,t$ to $s\,v$, the difference

difference of which lines, as you recede from the head of the *river*, is continually leſſened, becauſe of the depth *r s*, which is alſo continually diminiſhed, as the lines themſelves are lengthened. Now, as this obtains in the ſquares, it will much more obtain in the celerities themſelves; whoſe difference, therefore, is diminiſhed as they increaſe.

If the inclination of the bottom be changed up to the head of the *river*, ſo as to become *y Z*, and a greater quantity of water flow into the channel, it will be deeper every where in the *river*, but the celerity of the water will not be changed. For this celerity does not depend on the depth of the water in the *river*, but on the diſtance of the moved particle from the horizontal plane of the ſurface at the head continued over the ſaid particle, which diſtance is meaſured by the perpendicular *r t*, or *s v*; but theſe lines are not changed by the afflux of water, provided the water remain at the ſame height in the baſon or head.

Suppoſe the upper part of the channel ſtopped by an obſtacle, as X, which deſcends a little way below the ſurface of the water; here the whole water which comes cannot run through, therefore it muſt riſe; but the celerity of the water below this cataract is not increaſed; and the water that comes on is continually heaped up, ſo that at laſt it muſt riſe ſo as to flow over the obſtacle, or the banks of the *river*. If the banks be raiſed, and the obſtacle be continued, the height of the water would riſe above the line *i t*: but, before that, the celerity of the water cannot be increaſed; in which caſe the height of all the water in the head will be increaſed; for, as we ſuppoſe the *river* in a permanent ſtate, there muſt continually be as great a ſupply of water to the head as there runs from it down the channel; but if leſs water runs down, the height muſt neceſſarily be increaſed in the head till the celerity of the water, flowing under the obſtacle, be increaſed to ſuch degree, that the ſame quantity of water ſhall run under the obſtacle, as uſed to run in the open channel before.

The beſt and moſt ſimple method of meaſuring the velocity of the current of a *river* or canal, is the following. Take a cylindrical piece of dry, light wood, and of a length ſomething leſs than the depth of the water in the *river*; round one end of it let there be ſuſpended as many ſmall weights as may be neceſſary to keep up the cylinder in a perpendicular ſituation in the water, and in ſuch a manner that the other end of it may juſt appear above the ſurface of the water. Fix to the centre of that end which appears above water, a ſmall and ſtraight rod, preciſely in the direction of the cylinder's axis; to the end, that when the inſtrument is ſuſpended in the water, the deviations of the rod from a perpendicularity to the ſurface of it, may indicate which end of the cylinder advances the faſteſt, whereby may be diſcovered the different velocities of the water at different depths; for if the rod inclines forwards, according to the direction of the current, it is a proof that the ſurface of the water has the greateſt velocity; but if it inclines back, it ſhews that the ſwifteſt current is at the bottom; if it remains perpendicular, it is a ſign that the velocities at the ſurface and bottom are equal.

This inſtrument being placed in the current of a *river* or canal, receives all the percuſſions of the water throughout the whole depth, and will have an equal velocity with that of the whole current *from the ſurface to the bottom* at the place where it is put in, and by that means may be found, both with eaſe and exactneſs, the mean velocity of that part of the *river* for any determinate diſtance and time.

But to obtain the mean velocity of the whole ſection of the *river*, the inſtrument muſt be put ſucceſſively both in the middle and towards the ſides, becauſe the velocities at thoſe places are often very different from each other. Having by this means found the *difference of time required for the currents to run over an equal ſpace*; or, *the different diſtances run over in equal times, the mean proportional* of all theſe trials, which is found by dividing the common ſum of them all by the number of trials, *will be the mean velocity of the* river *or canal.*

If it be required to find the velocity of the current only at the ſurface, or at the middle, or at the bottom, a ſphere of wood, of ſuch a weight as will remain ſuſpended in equilibrium by the water at the ſurface or depth which we want to meaſure, will be better for the purpoſe than a cylinder, becauſe it is only affected by the water of that ſole part of the current where it remains ſuſpended.

It is very eaſy to guide both the cylinder and the globe in that part which we want to meaſure, by means of two threads or ſmall chords, which two perſons muſt hold and direct, one on each ſide the *river*; taking care at the ſame time neither to retard nor accelerate the motion of the inſtrument.

It follows from what has been ſaid in the preceding part of this article, that the deeper the waters are in their bed in proportion to its breadth, the more their motion is accelerated; ſo that their velocity increaſes in an inverſe ratio of the breadth of the bed, and alſo of the magnitude of the ſection; whence, in order to augment the velocity of water in a *river* or canal, without augmenting the declivity of the bed, we muſt increaſe the depth and diminiſh the breadth of its bed; but to diminiſh the velocity of water in a *river* or canal, we muſt, on the contrary, increaſe the breadth and diminiſh the depth of its bed. Theſe principles are conſonant to obſervation; and it is well known, that the velocity of flowing waters depends much more on the quantity and depth of the water, and on the compreſſion of the upper parts on the lower, than on the declivity of the bed; and, therefore, the declivity of a *river* muſt be made much greater in the beginning than toward the end of its courſe; where it ſhould be almoſt inſenſible. If the depth or volume of water in a *river* or canal is conſiderable, it will ſuffice, in the part next the mouth, to allow one foot perpendicular of declivity through ſix, eight, or even, according to Dechales (De Fontibus & Fluviis, prop. 49.) ten thouſand feet in horizontal extent; at moſt it muſt not be above one in ſix or ſeven thouſand. From hence the quantity of declivity in equal ſpaces muſt ſlowly and gradually increaſe as far as the current is to be made fit for navigation; but in ſuch a manner, as that at this upper end there may not be above one foot of perpendicular declivity in four thouſand feet of horizontal extent.

We ſhall cloſe this article with a remark of M. de Buffon, who ſays, that people accuſtomed to *rivers* can eaſily foretell when there is going to be a ſudden increaſe of water in the bed from floods produced by ſudden falls of rain in the higher countries through which the *rivers* paſs. This they perceive by a particular motion in the water, which they expreſs by ſaying, that the *river's* bottom moves; that is, the water at the bottom of a channel runs off faſter than uſual; and this increaſe of motion at the bottom of a *river* always announces a ſudden increaſe of water coming down the ſtream. Nor, ſays he, is their opinion ill-grounded; becauſe the motion and weight of the waters coming down, though not yet arrived, muſt act upon the waters in the lower parts of the *river*, and communicate by impulſion part of their motion to them, within a certain diſtance.

See on the ſubject of this article an elaborate treatiſe on *rivers* and canals by Mr. Mann, who has availed himſelf of the obſervations of Guglielmini, and moſt other writers, in Phil. Tranſ. vol. lxix. part ii. art. 37, p. 555, &c.

River, *New*. See Canal, and Company.

By the ſtatute of Weſtm. 2. cap. 47. the king may grant commiſſions for perſons to take care of *rivers*, and the fiſhery therein; and the lord mayor of London is to have the conſervation in breaches and ground overflown as far as the water ebbs and flows in the *river* Thames. 4 Hen. VII. cap. 15. Perſons annoying the *river* Thames, making ſhelves there, caſting dung therein, or taking away ſtakes, boards, timber work, &c. of the banks, incur a forfeiture of 5*l.* ſtat. 27 Hen. VIII. cap. 18. Commiſſioners were appointed to prevent exactions of the occupiers of locks, wears, &c. upon the *river* Thames, weſtward from the city of London, to Cricklade in the county of Wilts, and for aſcertaining the rates of water-carriages on the ſaid *river*, by ſtat. 6 & 7 W. III. and this ſtatute is revived with authority for the commiſſioners to make orders and conſtitutions to be obſerved, under penalties, &c. 3 Geo. II. cap. 11.

By ſtatutes 6 Geo. II. cap. 37. 8 Geo. II. cap. 20. and 10 Geo. II. cap. 32. it is made felony, without benefit of clergy, maliciouſly to cut down any *river* or ſea-bank, whereby lands may be deſtroyed, and to deſtroy ſluices or locks upon navigable *rivers*. See Nusance.

River *horſe*, in *Zoology*. See Hippopotamus.

RIVET, in the *Manege*, is the extremity of the nail that reſts or leans upon the horn when you ſhoe a horſe.

RIVINA, in *Botany*. Its characters are theſe: the empalement of the flower is permanent, compoſed of four oval, concave, coloured leaves; the flower has no petals; it has eight ſtamina, which are longer than the empalement, terminated by ſmall oval ſummits, and a large roundiſh germen, ſupporting a ſhort ſtyle, crowned by an obtuſe ſtigma; the germen afterward turns to a roundiſh berry, ſitting in the empalement, including one hard ſeed. There are two ſpecies, natives of the Weſt Indies. Miller.

In the Linnæan ſyſtem this is a genus of the *tetrandria monogynia* claſs, with a permanent corolla, and compoſed of four petals, no calyx, the fruit a ſingle-ſeeded berry; and he enumerates four ſpecies. But Miller ſays, that this genus is totally different from the plants to which

Plumier applied the title *Rivina*, in honour of the celebrated botanist Rivinus.

RIVOLGIMENTO, in the Italian *Music*, is the placing a treble or upper part in the place of the bass, or any low part, or *vice versa*. This often happens in double counterpoint, where the treble serves for the bass, or the bass for the treble; and that in such a manner, that the harmony, though different, remains as correct after this change, as it was in the natural order of the parts.

RIVULET, a diminutive of RIVER.

RIXDOLLAR, or RIXDALLER, a silver coin, struck in several states and free cities in Germany, as also in Flanders, Poland, Denmark, Sweden, &c.

There is but little difference between the *rixdollar* and the *dollar*, another silver coin struck in Germany, each being nearly equal to the French crown of three livres, or the Spanish piece of eight, or 4*s*. 6*d*. sterling.

The *rixdollar* is one of the most current and universal coins in the world. It is used equally in the commerce of the Levant, the North, Muscovy, and the East Indies. See COIN.

RIZIUM, in *Botany*, a name given by the ancients to a peculiar kind of red root brought from Syria, and used by the Grecian women to paint their cheeks red.

The Latin writers, who have mentioned this, have called it *radicula*; and Pliny, who has more than once mentioned it, calls it *herba lanaria*, or *radix lanaria*. This, however, is a very great error, confounding it with the *struthium* of the Greeks. It is probable, that the *rizium* was no other than the ANCHUSA, or *alkanet root*, which grows very plentifully in the countries from whence the Greeks had their *rizium*, and which will answer all the purposes for which they used it.

ROACH, in *Ichthyology*, the English name of a well known fish, called by the generality of authors the *rutilus* and *rubiculus*, by some the *rubellio*. It is a species of the *cyprinus*, according to the new system of Artedi, and the *cyprinus rutilus* of Linnæus. It has been deemed, though without much reason, remarkable for its liveliness and vivacity; whence the proverb, *found as a roach*.

In some parts of the world this fish will only live in standing waters; with us it equally thrives in ponds and in deep still rivers, and is remarkable for its numerous progeny; a pond being much sooner stocked with this than with any other fish.

ROACH *fishing*. See FISHING.

ROACHING *of alum*, one of the last processes used in the *alum* making, and is what renders it fit for the market.

After the *alum* liquor has been left four days in the cooler, and is sufficiently shot, they drain it out; and taking out the *alum*, they wash it in a cistern of *alum* water so strong, that it can scarce take up any more of that salt, but only cleanses it of its accidental foulnesses. After this washing the *alum* is put into large pans, and a quantity of water added to it. It is set over the fire to melt in this water and boil a little; then it is scooped into a great cask, where it is suffered to stand about ten days; and it is then fit for the market under the name of *roach alum*, or *roached alum*; the liquor let out of the cooler is boiled up again, and shoots more *alum*. See ALUM.

ROAD, *via*, an open way or passage, forming a commodious communication between one place and another.

The Romans, of all people, took the most pains in their *roads*; the labour and expence they were at to render them spacious, straight, smooth, and agreeable, to the very extremities of their empire, are incredible.

Usually, they strengthened the ground by ramming it, laying it with flints, pebbles, or sand; sometimes by a lining of masonry, rubbish, bricks, potsherds, &c. bound together with mortar.

F. Menestrier observes, that in some places in the Lyonnois he has found huge clusters of flints cemented with lime, reaching ten or twelve feet deep, and making a mass as hard and compact as marble itself; and which, after resisting the injuries of time for sixteen hundred years, is still scarce penetrable by all the force of hammers, mattocks, &c. and yet the flints it consists of, are not bigger than eggs.

Sometimes they even paved their *roads*, regularly, with large square free-stones: such are the Appian and Flaminian ways, &c.

The *roads* paved of very hard stones, they usually called *viæ ferreæ*, either because they resembled iron, or because they resisted the iron of the horses feet, chariots, &c.

Roads are either *natural* or *artificial*, *terrestrial* or *aquatic*, *public* or *private*.

ROAD, *natural*, is that which has been frequented for a long succession of time, and subsists with little expence by reason of its disposition, &c.

ROAD, *artificial*, is that made by labour of the hand, either of earth or masonry; and, in the making whereof, several difficulties were to be surmounted: such are most of those along the banks of rivers, and through marshes, lakes, &c.

ROADS, *terrestrial*, or *land*, are not only those made upon the ground, but also those formed of earth heaped up in manner of a bank, and sustained by spurs, buttresses, and counterforts.

ROAD, *aquatic*, is a *road* made in the waters, whether current, as those of rivers, &c. or stagnant, as banks and causeways, or over morasses, &c.

Under this denomination are also comprehended navigable rivers, and artificial canals. See CANAL.

ROAD, *public*, or *grand road*, is any common *road*, whether straight or across, military or royal, &c. *Private road* is that made for the convenience of some particular house, &c. See HIGHWAY.

ROADS, *military*, so called among the Romans, were grand *roads* appointed for the marching of their armies into the provinces of the empire, for the assistance of their allies, &c.

The principal of these *roads*, in England, are Watling-street, Ikenild-street, Foss-way, and Erminage-street. See WAY.

ROADS, *double*, among the Romans, were *roads* for carriages, having two pavements or causeways, the one for those going one way; the other, for those returning the other, to prevent clashing, stopping, and confusion.

These two ways were separated from each other by a bank raised in the middle, paved with bricks, for the convenience of foot people, with borders and mounting stones from space to space, and military columns to mark the distance. Such was the *road* from Rome to Ostia, called *Via Portuensis*.

ROAD, *subterraneous*, is that dug in a rock with the chissel, and left vaulted. Such is that of Puzzuoli, near Naples, which is near half a league long; and is fifteen feet broad, and as many high.

Strabo says, it was made by one Cocceius, a relation probably of Nerva; but it has since been widened by Alphonsus, king of Arragon and Naples, and made straight by the viceroys. There is another of the same kind in the same kingdom, between Baiæ and Cumæ, called the Grotto of Virgil, because mentioned by that poet in the sixth book of his Æneid.

ROAD, in *Navigation*, denotes a place of anchorage at some distance from shore, and sheltered from the winds, where vessels usually moor to wait for a wind or tide proper to carry them into harbour, or to set sail.

When the bottom is clear of rocks, and the hold firm, and the place well covered from the wind, the *road* is said to be good. An open *road* is one which has but little land on any side.

The *roads*, within his majesty's dominions, are free to all merchant vessels, either of his subjects or allies. Captains and masters of ships who are forced by storms, &c. to cut their cables, and leave their anchors in the *roads*, are obliged to fix up marks or buoys, on pain of forfeiture of their anchors, &c.

The masters of ships, coming to moor in a *road*, must cast anchor at such distance as that the cables, &c. may not mix, on pain of answering the damages. When there are several vessels in the same *road*, the outermost to the seaward is obliged to keep a light in his lantern in the night-time, to apprise vessels coming in from sea. See PORT.

ROAD, *cock*. See COCK-*road*.

ROAD-*goose*, in *Zoology*, the name of a small species of wild goose. See GOOSE.

ROADER, among *Sailors*, a ship that rides at anchor in a road.

ROAN, in the *Manege*. A *roan* horse is one of a bay, sorrel, or black colour, with grey or white spots interspersed very thick: when this party-coloured coat is accompanied with a black head and black extremities, he is called a *roan* with a black-a-moor's head. And if the same mixture is predominant upon a deep sorrel, it is called claret-*roan*.

ROANE-*tree*, in *Botany*. See SERVICE-*tree*.

ROASTING *of meat*. See DRESSING *of meats*.

ROASTING, in *Metallurgy*, is the separation of volatile bodies, from those which are more fixed by the combined action of air and fire; and is generally the first process in the separation of metals from their ores: it differs from sublimation only in this, that in this operation the volatile parts are dissipated, when resolved into vapours; whereas in that they are preserved.

Sulphur and arsenic are in this manner collected and preserved in the *roasting* of many ores; and sublimation made, as it were, occasionally in the process.

The separation of the volatile parts of bodies from the more fixed, is, however, in many cases very difficult, and much nicety is required in the conducting of this operation;

ration: this is the caſe, for inſtance, when the whole compound body melts in almoſt the ſame degree of fire that is neceſſary to raiſe, and diſſipate the volatile parts in the air; in ſuch caſes, care muſt be taken, firſt previouſly to pound a little the body to be *roaſted*, that its ſurface contiguous to the air may be increaſed in extent. A gentle fire is alſo neceſſary on ſuch occaſions, and a very free acceſs of the air, which is the vehicle of theſe vapours. When the body in the *roaſting* grows on theſe occaſions into large lumps or clods, the ſurface of it muſt be reſtored to the neceſſary extent, by repeated poundings; for it is neceſſary above all things, that the matter be kept extended and recent, and never collected into a heap.

Bodies the moſt refractory in the fire, are always the moſt eaſily *roaſted*; for a great fire may be conſequently kept up to ſuch, nor need the operation be repeated ſo often. Care muſt always be taken, however, that while the volatile bodies are diſſipating in the fire, they do not carry up with them ſomething from the fixed ones alſo; for this is a diſadvantageous accident, and too often happens, eſpecially when a fire too violent is uſed in the beginning of the operation; to prevent this, it is ſometimes neceſſary to add ſome fixing body to the maſs. Cramer's Art of Aſſaying, p. 189.

The buſineſs of *roaſting* ores, as now uſually practiſed, is ſubject to many inconveniencies, which may be moſt of them eaſily remedied, and the whole buſineſs reduced to a few eaſy rules. 1. The *roaſting* of ores ſhould be always performed without addition, when the ores are rich, or of themſelves merely of a metallic nature. But the additions of quick-lime, pot-aſhes, iron-filings, and the like, are neceſſary, when arſenical, antimonial, and ſulphureous matters, are found to be mixed with the ores. 2. The fire is to be ſo regulated from the firſt, that only the lighter or more volatile ſulphureous or arſenic fumes may fly off, otherwiſe the more metallic part would likewiſe go, and without ſome contrivance to catch it, would be loſt. The ore muſt, however, always feel the force of an open flame, otherwiſe the ſulphur, arſenic, &c. will never be thoroughly diſlodged. 3. The more theſe immature ſubſtances abound in ore, the gentler the fire ſhould be at firſt; and when the greater part of the ſulphureous matter is thus exhaled, the fire is then to be quickened. 4. Where ſuch additions are uſed as are not metalline, as lime, mud, pot-aſh, &c. they ought always to be ſeparated afterwards from the matter before the fuſion, by waſhing. Shaw's Lectures, p. 251. See IRON and SMELTING.

ROB, in *Pharmacy*, the inſpiſſated juice of any ſubſtance, uſually boiled up to the conſiſtence of honey.

There are *robs* made of quinces, ſloes, cherries, mulberries, elderberries, barberries, gooſberries, and other fruits, for various diſeaſes. The juice of grapes, thus prepared, is more particularly called *rob*, or *ſapa ſimplex*; this is almoſt of the conſiſtence of honey.

When only one third of the humidity is boiled away, it is called *defrutum*; and when only boiled to the conſiſtence of a ſoft electary, a *reſin*.

The word *rob* is pure Arabic; and ſignifies originally a juice dried in the ſun, or over the fire, that it may keep the longer without damage.

Sometimes it alſo denotes a compoſition of ſome juice made up with honey or ſugar, in which ſenſe it is confounded with loche or lohoc.

The *rob* is a form now much out of uſe, though there are ſeveral directed in the college diſpenſatory; as *robs* of black cherries, of ſloes, of quinces, &c. The *rob* of elder is now moſt uſed.

It is poſſible that great improvements might be made, by introducing the uſe of this form among the malt-diſtillers. The great inconvenience attending that art being, that the malt being of a large bulk, in proportion to its ſaccharine part, and requiring a larger proportion of water to extract that ſaccharine part, many large veſſels, ſuch as maſh-tubs, coolers, fermenting-backs, &c. are neceſſary; and the neceſſary labour on the ſubject is increaſed, and the commodity rendered dearer. The remedy of this ſhould ſeem the introducing a new art ſubſervient to that of the malt-diſtiller, and confining itſelf to the boiling down of malt-wort to a *rob*, ſo as to ſupply the malt-ſtiller with his ſubject, in the ſame manner as the fine ſtillers are ſupplied with treacle by the ſugar-baker. By this means the buſineſs of the malt-ſtiller would be reduced to a great degree of ſimplicity, and the ſpirit produced would be alſo much finer than at preſent, becauſe the ſubject would come tolerably refined to his hands, and purged of its groſs, mealy, and huſky matter, which yields a diſagreeable oil in diſtillation, and is alſo apt to burn to the ſtill, and ſpoil the ſpirit. It is poſſible that a ſpirit purer and finer than that from treacle might this way be procured from malt prudently managed. Shaw's Lect. p. 219.

ROBALO, in *Ichthyology*, a name by which ſome have called the CAMURI.

ROBBERY, ROBBERIA, or ROBERIA, in *Law*, a felonious and forcible taking away another man's goods or money, from his perſon, preſence, or eſtate, by putting him in fear, &c.

A mere attempt to rob was held to be felony, ſo late as Henry the Fourth's time; and afterwards it was only a miſdemeanor, and puniſhable with fine and impriſonment, till the ſtat. 7 Geo. II. cap. 21. which makes it a felony tranſportable for ſeven years. If the thief, having once taken a purſe, returns it, ſtill it is a *robbery*. The previous putting in fear is the criterion that diſtinguiſhes *robbery* from other *larcenies*; and yet this putting in fear does not imply any great degree of terror or affright in the party robbed; it is ſufficient, that ſo much force, or threatening by word or geſture, be uſed, as might create an apprehenſion of danger, or oblige a man to part with his property without or againſt his conſent.

This is ſometimes alſo called *violent theft*, and its puniſhment, be the value of the thing taken ever ſo ſmall, is death.

This ſpecies of LARCENY is debarred of the benefit of clergy by 23 Hen. VIII. cap. 1. and other ſubſequent ſtatutes; not indeed in general, but only when committed in or near the king's highway. A *robbery*, therefore, in a diſtant field or foot-path was not puniſhed with death, but was open to the benefit of clergy, till the ſtat. 3 & 4 W. & M. cap. 9. which takes away clergy from *robbery* whereſoever committed.

The word is ſaid to have taken its riſe hence, that, anciently, *robbers* only took away the *robes* or cloaths from travellers. Though lord Coke, in the third of his inſtitutes, takes the name to have had its riſe from Robin Hood, who lived under Richard I. in the borders of England and Scotland, by *robbery*, burning houſes, rape, and ſpoil. Hence, alſo,

Robers-men, or *roberds-men*, mentioned in ſeveral ſtatutes for great thieves.

ROBBING. See HOUSE-*robbing*.

ROBBINS, or ROBANDS, i. e. *rope-bands*, in a *Ship*, ſmall lines, or braided cordage, which make the upper edges of the great ſails faſt to their reſpective yards, being reeved into eyelet-holes in the head of the ſail under the head-rope for that purpoſe. They are generally of a ſufficient length to paſs two or three times about the ſaid yard. The word is, *make faſt the robbins*; for at ſea they do not ſay *tie*, but *make faſt*.

ROBE, *roba*. See GOWN.

ROBES, *maſter of the*, is an officer of the houſhold, with an appointment of 500*l*. a year, who has the ordering of all his majeſty's *robes*. See MASTER *of the wardrobe*.

He has ſeveral officers under him, as a clerk of the *robes*, a yeoman, three grooms, a page, a bruſher, furrier, ſempſtreſs, laundreſs, ſtarcher, and ſtanding wardrobe keepers at St. James's, Windſor-caſtle, Hampton-court, &c. There is alſo in the eſtabliſhment of his majeſty's houſhold a miſtreſs of the *robes*, with an appointment of 500*l*. a-year, and two keepers of the *robes*. See WARDROBE.

ROBERDSMEN. See ROBBERY.

ROBERT, *herb*, in *Botany*. See GERANIUM.

ROBERVALLIAN *lines*, a name given to certain lines, uſed for the transformation of figures: thus called from their inventor M. de Roberval.

Theſe lines bound ſpaces infinitely extended in length, which are nevertheleſs equal to other ſpaces terminated on all ſides.

The abbot Gallois, in the Memoirs of the Royal Academy, anno 1693, obſerves, that the method of transforming figures, explained at the latter end of M. de Roberval's Treatiſe of Indiviſibles, is the ſame with that ſince publiſhed by Mr. James Gregory, in his Univerſal Geometry, and afterwards by Barrow in his Lectiones Geometricæ; and that, by a letter of Torricelli, it appears, that Roberval was the inventor of this manner of transforming figures, by means of certain lines, which Torricelli therefore called *Robervallian lines*.

He adds, that it is highly probable, that J. Gregory firſt learned the method in the journey he made to Padua in 1668, the method itſelf having been known in Italy from the year 1646, though the book was not publiſhed till the year 1692.

This account Dr. David Gregory has endeavoured to refute, in vindication of his brother. His anſwer is inſerted in the Phil. Tranſact. an. 1694, and the abbot has rejoined in the French Memoirs of the Academy, an. 1703.

ROBIA *herba*, in *Botany*, a name given by Paulus Ægineta, and many others, to a plant uſed in dying.

The near reſemblance of the name to the word *rubia*, has made many conclude that it was the *rubia*, or madder, which they have meant by it; but they have taken care

care in their writings to diftinguifh it from that plant, and it is plainly the *geniftella tinctoria*, or dyer's weed, that they meant by the *robia herba*. They fay it was ufed to dye yellow, and that it was alfo a cuftom to ftain the hair with it.

Thefe are the properties recorded of the *cymene* and *æcs-menium* of the Greeks, and the *lutum*, or *lutea herba* of the Latins, which were names of the *geniftella tinctoria*. Pliny fays, that the *lutum* had leaves like flax, and flowers like broom, which is exactly the cafe with the *geniftella tinctoria*, but by no means agrees with the glaftum or woad.

ROBIGALIA, or Rubigalia, in *Antiquity*. See Rubigalia.

ROBIN, or, as it is more ufually called, Robin *red-breaft*, *rubecula*, in *Ornithology*. See Red-*breaft*.

Robin, *ragged*, in *Botany*. See Campion.

Robin, *wake*. See Wake *robin*.

ROBINIA, in *Botany*. See *Falfe* Acacia.

ROBORANTIA, in *Medicine*, *ftrengtheners*; or fuch medicines as ftrengthen the parts, and give new vigour to the conftitution.

ROBUR *Carolinum*, in *Aftronomy*. See Royal *oak*.

ROCAMBOLES, a mild fort of garlic, by fome called Spanifh garlic; being much of the nature of fhalot; and well known in cookery, in quality of a fauce.

ROCELLA, a kind of fucus or fea-wrack, found in the Mediterranean, and other feas, and in fome places ufed by the dyers for a purple colour, and called by the botanical writers, in general, *alga tinctoria*. See Archil.

ROCHELLE *falt*. See Rupellensis *fal*.

ROCHET, or Rocket, a lawn garment, worn by bifhops and abbots, refembling a furplice, except in this, that the fleeves are gathered at the wrifts; whereas the furplice is quite open.

Menage derives the word from the Latin *rochettus*, a diminutive of *rocchus*; ufed in writers of the lower Latin for *tunica*, and formed originally from the German *rok*. The regular canons of St. Auguftine alfo wear *rochets* under their copes.

Rochets alfo denote the mantles worn on days of ceremony, by the peers fitting in the Englifh parliament. Thofe of vifcounts have two bands, or borders, and a half; thofe of earls, three; thofe of marquifes, three and a half; and thofe of dukes, four.

Rochet, the name given to a fifh, otherwife called *cuculus*, and *red-gurnard*. See Gurnard.

ROCHETTA, in the *Glafs Trade*, another name for polverine. See Pot-*afhes*.

ROCK, *rupes*, a large mafs or block of hard ftone, firmly fixed in the ground.

The word is formed of the Greek ῥωξ, *rima*, *cleft*, *chink*, and ῥωξ, from ῥηγνυμι, *I break*, whence ῥαχια, *a ftony fhore*.

Rocks are generally fuppofed great enemies to vegetation, and the people of Scotland have been deterred from cultivating many of their beft lands, from an obfervation that they had a rocky bottom. This is, however, but a vulgar error among them, for *rocks* of a proper kind and properly difpofed, as very many of theirs are, fertilize and are beneficial to the land, not hurtful.

In many parts of England, we fee gardens, the moft beautiful that can be imagined, both in regard to flowers and excellent plants, on a foil where the bottom is a hard *rock*, and the earthy covering not more than a foot or thereabout in depth. In fome of thefe, all the difadvantages the Scots complain of take place, and yet the gardens are fruitful, many of them having lofty hills on the fouth fide, the declivity due north, and the *rock* perfectly bare next the walls on the north fide.

The north fides of thefe hills in this very afpect, only with the *rock* covered with two or three feet of earth, make very good hop-gardens, producing a vaft quantity of a very valuable commodity, at a fmall expence; and it is remarkable, that thofe gardens, which ftand in this expofure, inftead of being fubject to particular evils, often efcape thofe blafts, and other mifchiefs, which affect the plantations, of the fame kind, on the fouth fide of the hills. It might be a very valuable article of trade, if the bleak hills of Scotland, or thofe of fome of our northern plantations in America, could be made thus fruitful, in fo ufeful a commodity, and there feems only the want of a proper trial.

Another extremely valuable plant, that might be raifed on thefe barren rocky places, as they are generally fuppofed to be, is flax, in places where the defcent is too fteep for ploughing in the common way. It has been proved, that a hand-plough with a ftem of afh of about feven feet long, and a plate on each fide near the end to turn the turf, a coulter to be let out fhorter or longer to four or five inches depth, to cut the earth up, as deep as it lies upon the *rock*, and an iron wheel, may be managed with eafe and conveniency by two people, and will prepare ground for producing large crops of the fineft flax. The beft fort of flax-feed, of Flanders, fown on this fort of ground, fucceeds fo well, that if brought into general ufe, it might give the only advantage that is at prefent wanting to the Scotch holland manufactory, and make it excel that of all the world befide. The northern American colonies might alfo furnifh us with the fame fort of flax, raifed at a fmaller expence than almoft any other vegetable commodity, and coming to a fure market, and at a very confiderable price.

Agriculture, in Scotland, is too much neglected, to the great impoverifhing of the country, and the diftrefs of a numerous poor, for whom it would find conftant employment. It is not yet known whether many of the moft valuable plants, for medicinal and mechanic ufes, will not profper as well there, as where there are immenfe fums made by the raifing of them; and the owners of lands would do well in this fcheme to try the effect of liquorice, madder, woad, and the like plants on their grounds. Wherever the ground is deep enough, it is pretty certain that madder and liquorice would flourifh, and the laft of thefe needs fo little culture, that if once planted it may almoft be left to itfelf. The rocky bottoms of lands, not too bleak, may alfo fucceed very well with faffron, which is one of the moft profitable plants that can be cultivated. Philof. Tranf. N° 109.

There are various ways of breaking *rocks* with wood, gun-powder, &c.

We have roads, grottos, labyrinths, &c. dug through *rocks*.

Rock-*alum*. See Alum.

Rock-*cryftal*, or *cryftal of the rock*, is that fuppofed to be formed by a congelation of the lapidific juice, which trickles down in *rocks* and caverns. See Crystal.

Rock-*fifh*, a common Englifh name for the *gobius marinus*, or fea-gudgeon. See Gogee.

Rock *germander*, in *Botany*, a fpecies of *veronica*. See Speedwell.

Rock-*oil*. See Petroleum.

Rock-*ouzel*, in *Ornithology*. See *Ring* Ouzel, and Amzel.

Rock-*rofe*, in *Botany*. See Rose.

Rock-*falt*. See Salt.

ROCKET, in *Pyrotechny*, an artificial firework, confifting of a cylindrical cafe of paper, filled with a compofition of certain combuftible ingredients; which being tied to a ftick, mounts into the air to a confiderable height, and there burfts.

The *rocket* has a great part in all fire-works of entertainment, being not only ufed fingly, but fometimes alfo as an ingredient in others.

Befides the *rocket* here defined, which is properly called the *fky-rocket*, there is another, which from the fphere it moves in, in the water, is denominated *water-rocket*. The mechanifm, preparation, &c. of each whereof, we fhall here defcribe.

Rockets, *fky*, *method of making*. 1. A concave cylindrical mould, or frame, A B (*Tab*. III. *Mifcellany*, *fig*. 39.) is turned, of hard wood, with a bafe B D, and a capital H C, ufually adorned with architectonical moulding.—The cylinder is to be open at both ends, and its dimenfions, for *rockets* of various fizes, as in the following article. When large, it is fometimes alfo made of brafs or tin; and when fmall, of bone.

2. Of the fame matter with the cylinder, is prepared a quadra, or foot, E; in the middle whereof is turned an hemifphere G, confiderably lefs than that of the cavity of the frame; making the cap or head of another cylinder I K, and reaching up within the cafe; where it is kept fteady by a pin L M.

Authors do not agree about the proportions. Simienowitz prefcribes thofe that follow. If the diameter of the aperture H N be equal to that of a leaden ball of a pound, or at moft two pounds weight; the height of the cylinder, with the bafe and capital H E, will be feven diameters, and the height of the quadra F E, $1\frac{1}{3}$; the altitude of the cylinder K I, 1; the diameter I N, $\frac{19}{20}$; the diameter of the hemifphere G, $\frac{2}{3}$ I N; the height of the capital H C, 1. The fame author adds, that he finds, by abundant experience, that if the diameter of the aperture be divided into 100 parts, according to the different weight of the leaden balls, to whofe diameter it is equal, the following numbers, being multiplied by 7, give the height H E.

Weight of Leaden Ball.	Subfeptuple of Altitude H E.	Weight of Leaden Ball.	Subfeptuple of Altitude H E.
1	100	20	86
2	98	30	82
4	96	40	78
6	94	50	75
10	91	70	67
15	88	100	57

The mould being ready, a wooden cylinder, or mould, A B (*fig.* 40.) is provided, whose diameter is $\frac{2}{3}$ of the aperture of the frame, and its length equal to the height of the same; to which is fixed a haft or hilt A D. About this mould is a thick strong paper rolled, till such time as it fill the cavity of the frame. This done, where the haft is joined to the cylinder, as at A, it is choked, i. e. firmly bound round with fine pack-thread, so as to constringe or straiten the cavity thereof. The part thus choked or bound up F G (*fig.* 41.) is to be equal to the hemisphere G (*fig.* 39.).

The case is now taken off the mould, and put into the cavity of the frame, (*fig.* 39.) the choke G F upon the hemisphere; and, in this disposition, is filled with a composition described in the following article, rammed strongly in by means of a wooden cylinder, or rammer, fitting the cavity, and a mallet.

When filled, a paper cap of a conical form is glued over the end of the case filled last; and the space left a-top is filled with whole gunpowder, to the height of about one diameter; then the *rocket* is bound, or choked, in E, as before in G.

Lastly, the *rocket* is bored, as is represented in A L (*fig.* 41.); care being taken to do this in the middle. Some, indeed, bore the *rocket* as they fill it, by thrusting a long, sharp spike through the lower basis, and drawing it out again when the *rocket* is full: but it is best not to bore till the *rocket* be used. The boring is to go two-thirds of the height of the *rocket*, abating one diameter of the cavity. The diameter of the bore in G is to be $\frac{1}{4}$ of the diameter of the cylinder; and in L $\frac{1}{3}$ of the lower diameter.

To make the *rocket* mount strait up, it is tied fast to the end of a long slender stick M N, eight times as long as the *rocket*; in such manner as that, when poised on the finger near the touch-hole F, the stick (which is usually made biggest at this end, and sloping gently to the other) may preponderate, though very little. The *rocket*, thus prepared, is hung at freedom, and lighted with port-fire.

Note. Some, instead of a stick to make the *rocket* mount, furnish it with two wings, as M N (*fig.* 42.), which have the same effect: and instead of paper, some make the cases of wood covered with leather; others, of a thin iron plate; and some, instead of a wooden stick, use an iron wire, with a plumbet at the end of it.

The composition, wherewith *rockets* are filled, consists of the three following ingredients; viz. salt-petre, charcoal, and sulphur, all well ground: but the proportions of these are various, for *rockets* of various sizes; as in the following table: noting, that in small *rockets* gunpowder-dust is added.

Compositions for Rockets *of various sizes.*

Weight of *Rocket.*	Salt-pet.	Sul-phur.	Char-coal.	Gunpowder-Dust.
℔	℔	℔	℔	
100 or 60	30	10	20	
50 30	30	7	18	
20 18	42	12	26	
15 12	23	8	16	
10 9	62	9	20	
9 6	35	5	10	
5 4	64	8	16	
3 2	60	2	15	
1		2	6	32
ounces.	oun.	oun.	oun.	ounces.
9	4	1	2	9
6	12	$1\frac{1}{2}$	4	15
3	2	$\frac{1}{2}$	1	12
1			2	15

Note, Several *rockets* being disposed round the circumference of a wheel, whether circular or polygonous, the head of the one applied to the tail of another, and the wheel put in motion, as one *rocket* is spent another will take fire, and the wheel be continued in its rotation.

As an additional ornament to *rockets*, it is usual to furnish them either with stars, or with serpents, or sparks, which take fire when the *rocket* bursts; and sometimes little *rockets* are inclosed in great ones: these are to take fire when the great one is at its greatest height.

Rockets, *stars for, to make.* Mix three pounds of saltpetre with eleven ounces of sulphur, three ounces of beaten gunpowder, and one of antimony. Moisten the mass with gum-water, and form them into little balls of the size of filberds, drying them well, either in the sun, or an oven. When dry, inclose a number of them in the conical cap of the *rockets.*

Rocket, *a water, method of making.* Make a *rocket* A B after the usual manner, excepting in the number of chokes, expressed in *fig.* 43. Let its diameter be equal to that of a leaden ball of two or three inches diameter, and let it be bored to a third part of its height. Inclose the *rocket* in a hollow paper cylinder, which smear over with melted pitch, or wax, that it may resist the moisture.

Note, the weight of the *rocket* is to be so proportioned to that of the water, that the whole cylinder may be immerged. Some, instead of a cylinder, use a truncated cone, or even a spheroid; and some hang a weight to the end at which it is lighted. Wolfii Elem. Math. tom. iv. p. 212, &c.

Dr. Pemberton, in his Chemistry, p. 209, &c. has given the following concise account of *rockets.* A *rocket* (he says) is a hollow cylinder, usually made of paper, of a thickness equal to about one-sixth of its diameter within, and filled with gun-powder, or some like composition. If a *rocket* be made of great bigness, intended for a signal in war or such like use, its case may be made of a more solid material.

Near one end the case of the *rocket* is drawn in, till its diameter be reduced to one half of the whole internal diameter. This place is usually called the choke. The most approved length of the case, from the choke, is about six times its internal diameter, to be filled with gun-powder; if the *rocket* be small, beat into fine dust, and rammed in with as even strokes as can be, that the powder be uniformly compressed. In great *rockets* the charge is usually a little weakened by adding to the gun-powder a small portion of charcoal and of sulphur.

To the end of the *rocket* is added a cylindrical cavity, not above half the length of the *rocket* from its choke in height, and of such a diameter, that, together with the materials put into it, it may not exceed the weight of the rest of the *rocket.* These materials, besides some corn powder to burst the case, consist of some composition, that may give the appearance of stars, a shower of fire, or the like.

These fiery showers may be made of saw-dust, boiled in water, strongly impregnated with nitre, and while wet rolled among gun-powder in dust; or by gun-powder mixed with melted brimstone, and, when cold, grossly beaten.

These stars are a mixture of gun-powder, nitre, sulphur, antimony, camphor, and the like combustible materials, moistened with a solution of some gum, thereby to form pellets of a convenient size. These pellets are to be covered over with thread, well soaked in a strong solution of nitre, and while wet rolled in gun-powder. To charge the *rocket* with larger balls, any of the foresaid ingredients (whereof nitre, in a sufficient quantity, must always be one) may be mixed with turpentine, melted pitch, or rosin, and tow steeped in it. This way larger balls may be formed, which should be covered over with thread, prepared as just now described.

It is necessary for giving the *rocket* a sufficient degree of motion, that the powder within the *rocket* be bored with a tapering cavity from the choke. At the choke this cavity must be as wide as the choke itself, at the farther end it need not be more than one half that width. The length of this bore must be but one inner diameter of the *rocket* short of the whole height, to which the *rocket* is rammed. The use of this bore is to increase the surface, that takes fire at once; that a greater body of fire may issue out of the mouth of the *rocket.* For from the vehemence, with which the fire issues out, the *rocket* receives its motion. *Rockets* are used in all fire-works, that have motion, except such as are thrown into the air after the manner of bombs. When the *rocket* is designed to mount upwards, a stick, eight or nine times the length of the *rocket*, is tied to it, sufficient to poize the *rocket* at an inch or two from its mouth.

Rockets, *sky, theory of the flight of.* Mariotte takes the rise of *rockets* to be owing to the impulse or resistance of the air against the flame. Dr. Desaguliers accounts for it otherwise.

Conceive the *rocket* to have no vent at the choke, and to be set on fire in the conical bore; the consequence would be, either that the *rocket* would burst in the weakest place, or that, if all its parts were equally strong, and able to sustain the impulse of the flame, the *rocket* would burn out immoveable. Now, as the force of the flame is equable, suppose its action downwards, or that upwards, sufficient to lift forty pounds; as these forces are equal, but their directions contrary, they will destroy each other's action.

Imagine then the *rocket* opened at the choke; by this means the action of the flame downwards is taken away, and there remains a force equal to forty pounds acting upwards, to carry up the *rocket*, and the stick it is tied to.

to. Accordingly, we find, that, if the composition of the *rocket* be very weak, so as not to give an impulse greater than the weight of the *rocket* and stick, it does not rise at all; or, if the composition be slow, so that a small part of it only kindles at first, the *rocket* will not rise.

The stick serves to keep it perpendicular; for if the *rocket* should begin to tumble, moving round a point in the choke, as being the common centre of gravity of *rocket* and stick, there would be so much friction against the air, by the stick between the centre and the point, and the point would beat against the air, with so much velocity, that the re-action of the medium would restore it to its perpendicularity. When the composition is burnt out, and the impulse upwards is ceased, the common centre of gravity is brought lower towards the middle of the stick; by which means the velocity of the point of the stick is decreased, and that of the point of the *rocket* is increased; so that the whole will tumble down, with the *rocket* end foremost.

All the while the *rocket* burns, the common centre of gravity is shifting and getting downwards, and still the faster and the lower as the stick is lighter; so that it sometimes begins to tumble before it be burnt out: but when, the stick being a little too heavy, the weight of the *rocket* bears a less proportion to that of the stick, the common centre of gravity will not get so low, but that the *rocket* will rise strait, though not so fast.

Mr. Robins, considering the great use that may be made of *rockets*, in determining the position of distant places, and in giving signals for naval and military purposes, procured some, with a view of ascertaining the height to which they rise, and the distance at which they may be seen. The greatest part of them did not rise to above 400 yards, one to about 500, and one to 600 yards nearly. The greatest distance at which these were observed, was from 35 to 38 miles. Others were fired at a different time; one of which rose to 690 yards; and it was observed, that the largest, which were about 2½ inches in diameter, rose the highest. In some subsequent experiments, conducted by Mr. Da Costa, Mr. Banks, &c. it was found that of two *rockets*, of about 3½ inches diameter, one rose to about 833, and the other to 915 yards. In another trial, a *rocket* of 4 inches diameter rose to 1190 yards. In other experiments, a *rocket* of 1½ inch rose to 743 yards; one of 2 inches to 659; one of 2½ inches to 880; another of the same size to 1071; one of 3 inches to 1254; one of 3½ inches to 1169; and one of four inches rose to near 700 yards, and, turning, fell to the ground before it went out. Besides these, there was one of the *rockets* of 24 inches in diameter, which rose to 784 yards, and another of the same size to 833 yards. From these experiments it is inferred, that *rockets* from 2½ to 3½ inches in diameter are sufficient to answer all the purposes for which they are intended; and they may be made to rise to a height, and to afford a light capable of being seen to considerably greater distances than those just mentioned. The manufacture of large *rockets* is expensive; and they are more uncertain than those of a smaller size. Phil. Trans. vol. xlvi. p. 578, &c. or Robins's Math. Tracts, vol. i. p. 317, &c.

To prevent mischief from the fall of the *rocket*-sticks, which are sometimes very heavy, they now bore the sticks of large *rockets*, and fill them with powder, that they may shiver in the air before they fall. See Fire-works.

Rocket, *eruca*, in *Botany*; its characters are these: the flower has a four-leaved empalement; it hath four oblong petals, placed in form of a cross; it hath six stamina, four of which are a little longer than the empalement, the other two are shorter; it hath an oblong taper germen, which afterwards becomes a taper-cornered pod, with two cells, filled with roundish seeds.—There are two species. Miller.

Linnæus makes the *eruca* a species of brassica.

The leaves of both the garden and the wild *rocket* are accounted good aperients and antiscorbutics, but rarely used. The seeds of *rocket* agree with those of mustard, but are inferior to them in medicinal virtue.

Rocket, *bastard*, *reseda*, in *Botany*, a genus of the *dodecandria trigynia* class. Its characters are these: the empalement of the flower is of one leaf, cut into several parts, almost to the bottom, and is permanent; the petals of the flower are unequal, and generally trifid, and have a honey gland on their base, of the length of the empalement; the honey glands are plain, erect, and produced from the upper side of the receptacle, between the stamina and the place of the upper petal, joining with the base of the petals, dilating from the sides; it hath fifteen or sixteen short stamina, terminated by erect obtuse summits, and a gibbous germen, sitting upon very short styles, crowned by a single stigma; the germen afterwards becomes a gibbous angular capsule of one cell, with an aperture between the styles, filled with kidney-shaped seeds, fastened to the angles of the capsule. Miller enumerates eight, and Linnæus eleven species.

The dyer's *weed*, or weld, is a species of the *reseda*.

Rocket, *corn*, *sea*, or *square-podded* Rocket, a distinct genus of plants, called by Tournefort *erucago*, and by Linnæus bunias.

Rocket, *garden*, a name by which the *hesperis* of botanists is sometimes called. See *Dame's* Violet.

Rocket, *water*, *marsh*, or *winter*, the name of a species of *sisymbrium*. See *Water* Cresses.

Rocket is also used for a habit. See Rochet.

ROCOU. See Roucou.

ROD, *virga*, *verge*, a wand, or long slender stick, or staff. See Verge.

Rod is also used for a land-measure of 16½ feet: the same with perch and pole.

Rod, in *Gauging*. See Gauging-*rod*.

Rod, in the *Manege*, called in French *gaule*, is a switch, held by the horseman, in his right hand, partly to represent a sword, and partly to conduct the horse, and second the effects of the hand and heels.

Rod, *golden*, or *Aaron's*, in *Botany*. See Golden-*rod*.

Rod, *shepherd's*. See Teazel.

Rod, *golden*, *tree*. See Bosea.

Rod-*knights*, in *Ancient Customs*. See Red-Mans.

Rod, *black*. See Black-*rod*, and Usher.

Rod, *Ezekiel's*. See Ezekiel.

Rod, *fishing*. See Fishing.

Rod, *Rhineland*. See Rhineland.

ROE of a fish is that part which contains the spawn or seed thereof.

That of the male fish is usually distinguished by the name of *soft roe*, or milt; that of the female by *hard roe*, or spawn.

The soft *roe*, when squeezed, yields a liquor resembling milk; whence its name *milt*: the French call it expressly *milk*, *lait*.

M. Petit found 342144 ovula, or little eggs, in the hard *roe* of a carp, eighteen inches long.

Leewenhoeck, tom. i. p. 216, only found 211629 eggs in a carp; but four times the number in a cod: and, p. 188. he says, that a common cod contains 9344000 eggs; and that the eggs of a fish of one year old are as big as those of a fish of twenty-five years old. Mem. Acad. R. Scien. an. 1733. p. 290. See Milt and *Fecundity of* Fish.

Roe is also one of the beasts of chase.

Roe-*buck*, the English name of the *cervus* with ramose, cylindric, and erect horns. It is the smallest of the deer-kind, and has been called *capreolus* and *caprea*, though without the least resemblance of the goat-kind. See *Roe* Deer.

The *roe-buck* is called a *hind* the first year; *gyrle* the second; *hemuse* the third; *roe-buck of the first head* the fourth; and a *fair roe-buck* the fifth.

The *roe-buck* is a deer well known in Germany; and seems to have also been formerly found in England, though now the race be extinct.

Roe-*buck hunting*. See Hunting.

ROELIA, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are, that the corolla is funnel-shaped, the stigma bifid, and the fruit a double-celled cylindric capsule. There are two species.

ROFFENSIS *textus*. See Textus.

ROGA, ῥογα, in *Antiquity*, a donative, or present, which the Augusti, or emperors, made to the senators, magistrates, and even the people; and the popes, or patriarchs, to their clergy.

The word is derived by some from the Latin *erogare*, *to give*, or *distribute*; according to others from *rogo*, *I ask*; hence, say they, it is that St. Gregory the Great calls such distributions *precaria*, as being to be demanded, in order to be had. Others, again, derive it from the Greek ῥογος, sometimes used for *corn*; because it anciently consisted in corn, distributed among the populace, the soldiery, &c.

The emperors used to distribute these *rogæ* on the first day of the year, or on their birth-day, or on the *natalis dies* of the cities. The popes and patriarchs in Passion Week.

This custom of *rogæ*, or largesses, was introduced by the tribunes of the people, to gain the populace more effectually over to their interest. The emperors at length took it up, and made such distributions to the people, and even to the soldiery, who are hence called by the Greek writers of the middle age ῥογάτορες.

Roga is also used for the ordinary pay of the soldiery.

ROGATIO, *rogation*, in the *Roman Jurisprudence*, a demand made by the consuls, or the tribunes, of the Roman people, when a law was proposed to be passed.

The demand was made in these terms: *Do you will and appoint that* (for instance) *war be declared against Philip?* This was the *rogatio*: and what the people returned in answer, as, *The Roman people do appoint war to be made against Philip*, was the *decretum*, *decree*, or *resolve*.

The word *rogatio* is frequently also used for the decree itself, to distinguish it from a senatus-consultum, or decree of the senate.

Frequently, also, *rogatio* is used in the same sense with *law*; because there never were any laws established among the Romans, but what was done by this kind of *rogation*. Otherwise they were null.

ROGATION *Week*, the week immediately preceding Whitsunday; thus called from three fasts therein; viz. on the Monday, Tuesday, and Wednesday, called also *Rogations*, or *Rogation-days*, because of the extraordinary prayers, and processions then made, for the fruits of the earth.

Dr. Godolphin says, the *Rogation* days derived their name from certain ordinances for abstinence, or days of fasting, which the bishop of Rome recommended to be observed by the Western churches, before he assumed the power of compulsion; and which he, therefore, called by the gentle name of *Rogation*, the time of abstinence being appointed by that ordinance, which was called *Rogatio*, and not *lex*, or *decretum*.

The first who appointed these *rogations* was St. Mamertus, bishop of Vienne, who, in 474, assembled several bishops, to implore the mercy of God by a fast of three days, on occasion of an incursion then made into the country, by a great number of wild beasts. Others say, it was first set on foot by the same Mamertus, in 463, on occasion of some great public calamities.

His example was soon followed, first by the church of Clermont, in Auvergne, then by all their neighbours, and afterwards throughout all Gaul.

In 801, Leo III. confirmed this fast, and made it universal.

ROGATORES, among the Romans, those who in the *comitia centuriata* brought the chest into which the people threw the ballots, containing their votes.

ROGUE, in *Law*, an idle and sturdy beggar, who, by ancient statutes, for the first offence, is called a *rogue of the first degree*, and punished by whipping, and boring through the gristle of the right ear with a hot iron, an inch in compass; and, for the second offence, is called a *rogue of the second degree*, and ordered to be put to death as a felon, if he be above eighteen years of age.—For the description and punishment of *rogues*, as they are established by 17 Geo II. cap. 5. see Vagabond.

Rogues-*yarn* is a name given to a rope-yarn, which is placed in the middle of every strand, in all cables and cordage in the king's service. It differs from all the rest, as being untarred and twisted in a contrary manner, by which it is easily discovered. The use of this contrivance is to examine whether any cordage, supposed to be stolen or embezzled, has been formed for the king's service. Falconer.

ROLL, in the *Manufactories*, something wound and folded up in a cylindrical form.

Few stuffs are made in *rolls*, except sattins, gauzes, and crapes, which are apt to break, and take plaits not easy to be got out, if folded otherwise. Ribbands, however, and laces, galloons, and paduas of all kinds, are thus *rolled*.

The ancients made all their books up in form of *rolls*, or little columns; and, in Cicero's time, the libraries consisted wholly of those *rolls*. The dearness of parchment, and the cheapness of papyrus, whereof the *rolls* were made, was the reason that scarce any but paper *rolls* were used.

Vossius says, they pasted several sheets end to end, when filled on one side, and *rolled* them up together, beginning with the last, which they called *umbilicus*, and to which they fastened an ivory or boxen stick, to sustain the *roll*. To the other extremity they pasted a piece of parchment, to cover and preserve it.

These *rolls* were placed in the libraries perpendicularly to the horizon. The Jews still preserve the ancient usage of *rolls* for the books they read in their synagogues.

Roll *of tobacco* is tobacco in the leaf, twisted on the mill, and wound twist over twist, about a stick, or roller.

The generality of tobacco in America is there fold in *rolls* of various weights; and it is not till after its arrival in England, Spain, France, and Holland, that it is cut.—*Roll* tobacco is what is chiefly used, both for chewing and rasping. See Tobacco.

Roll, *rotulus*, in *Law*, denotes a schedule of paper or parchment, which may be wound up by the hand into the fashion of a pipe.

Of these there are, in the exchequer, several kinds; viz. the great *wardrobe-roll*, the *cofferer's roll*, the *subsidy-roll*, &c.

The word is formed from the French *rolle*, of the Latin *rotulus*; because most instruments and expeditions in law were anciently written on papers, or parchments, sewed or glued together, and thus rolled up: whence the word *enroll*, and the like.

Rolls *of parliament* are the manuscript registers of the proceedings of our ancient parliaments.

Before the use of printing, and till the reign of Henry VII. our statutes were all ingrossed in parchment, and (by virtue of the king's writ for that purpose) proclaimed openly in every county.

In these *rolls* we have also a great many decisions of difficult points in law, which were frequently, in former times, referred to the decision of that high court.

Roll, *rider*, a schedule, or small piece of parchment, frequently sewed or added to some part of a *roll*, or record.

Noy observes, that the court ex officio may award a certiorari ad informandam conscientiam; and that which is certified shall be annexed to the record, and called a *rider-roll*.

Roll is also used for a list of the names of several persons of the same condition, or entered in the same engagement.

Roll, *court*. See Court-*roll*.

Roll, *muster*. See Muster-*roll*.

Roll-*calling* is the calling over of the soldiers of a troop, or company, by their names, to see that they are all present.

Roll, *calves-head*, is a *roll* in the two Temples, wherein every bencher is taxed yearly at 2*s.* every barrister at 1*s.* 6*d.* and every gentleman under the bar at 1*s.* to the cook, and other officers of the house, in consideration of a dinner of calves heads, provided in Easter term.

Roll, *Ragman's*, or *Ragimund's* Roll, is a *roll* denominated from *Ragimund*, a papal legate in Scotland; who, calling before him all the people who held benefices in that kingdom, caused them, upon oath, to give in the value of their estates, according to which they were taxed in the court of Rome.

Rolls, or *office of* Rolls, in Chancery-lane, London, is an office appointed for the custody of the *rolls* and records in Chancery.

The master of this office is the second person in that court; and, in the absence of the lord chancellor, he sits as judge. See Master *of the rolls*.

This house, or office, was anciently called *Domus Conversorum*, as being appointed, by king Henry III. for the use of converted Jews; but their irregularities occasioned king Edward III. to expel them thence: upon which, the place was deputed for the custody of the *rolls*.

Rolls, *clerk of the*. See Clerk *of the rolls*.

Roll, or Roul, among *Military Men*. See Roul.

Roll, *bead*. See Bead-*roll*.

Roll, *check*. See Check-*roll*.

Roll, *counter*. See Counter-*roll*.

Roll *of parchment* properly denotes the quantity of sixty skins.

Roll, in *Antiquity*. From the time of Anastasius, we find in the hands of the emperors, on medals, a kind of narrow long *roll*, or sachel; the meaning whereof has greatly puzzled the antiquaries.

Some imagine it to be a *roll* or bundle of papers, memoirs, petitions, &c. presented occasionally to princes, consuls, and the like. Others take it to be a plaited handkerchief, which the persons who presided at the games cast forth as a signal for their beginning. Others will have it a bag of dust and ashes, presented the emperor at the ceremony of his coronation, and called AKAKIA; q. d. a means of preserving innocence, by the remembrance of dust, &c.

Roll, or Roller, is also a piece of wood, of a cylindrical form, used in the construction of several machines, and in several works and manufactures; though sometimes under other names.

It is on such *rolls*, properly called *beams*, that the woollen, silken, and other threads are wound, whereof the weavers works consist. For which end, each loom has usually two, and that of the gauze-weavers three.

In the glass manufacture, they have a *running roll*, being a thick cylinder of cast brass, serving to conduct the melted glass to the end of the table whereon large looking-glasses are to be cast.

The founders also use a *roller* to work the sand which they use in making their moulds.

The presses called calenders, as serving to calender stuffs withal, consist, among other essential parts, of two *rollers*.

It is also between two *rollers* that the waves are given to silks, mohairs, and other stuffs, proper to be tabbied.

Prints, or impressions, from copper-plates, are also taken by passing the plate and the paper between two *rollers*. See *Rolling-press* PRINTING.

ROLLS, in *Coining*, are two iron instruments, of a cylindrical figure, which serve to draw or stretch out the plates of gold, silver, and other metals, whereof the planks or pieces are to be formed for the species.

ROLLS, in *Printing*, are two large cylinders or barrels of wood fastened in the middle of what they call the cradle or gallows of the press; and which, by means of a cord or girt passing over each, and a handle which gives motion to one of them, draw the carriage of the press backwards and forwards. See PRINTING.

ROLLS, in the *Sugar Works*, are two large iron barrels, which serve to bruise the canes, and express the juice. They are cast hollow, and their cavities are filled up with wood, the cylinders of which are properly the *rollers*.

ROLLS, or ROLLERS, among *Carpenters*, *Masons*, &c. are plain cylinders of wood, seven or eight inches in diameter, and three or four feet long; used for the removing of beams, huge stones, and other like burdens, which are cumbersome, but not exceedingly heavy.

These *rollers* are placed, successively, under the forepart of the masses to be removed; which, at the same time, are pushed forward by levers, &c. applied behind.

ROLLS, *endless*. When blocks of marble, or other excessive heavy loads, are to be removed, they use what they call *endless rolls*.

These, to give them the greater force, and prevent their bursting, are made of wood joined together by cross-quarters: they are about double the length and thickness of the common *roller*, and, besides, are girt with several large iron hoops at each end. At a foot's distance from the ends are four mortises, or rather only two, but pierced through and through, into which are put the ends of long levers, which the workmen draw by ropes fastened to the ends, still changing the mortise, as the *roll* has made a quarter of a turn.

ROLL-*rich stones*, in *Antiquity*, a series of huge stones, ranged in a circle, near Morton in the Marsh, in Oxfordshire. There are many fabulous traditions about them. Among the antiquaries, some take them to be a monument of a victory; others, a burying place; and others, a place for the coronation of the Danish kings. Near Penros, in Cornwall, is a like monument.

ROLLER. See ROLL.

ROLLER, in *Gunnery*, a round piece of wood of about nine inches diameter, and four feet long, which serves in moving mortars from one place to another, when near. This is done by raising the fore part of the bed so high that a *roller* may be laid under it; then pushing the bed forwards, and laying another in its way, and another before that, and so on, the mortar is easily moved.

ROLLER, in *Husbandry*, a large piece of wood, turning on its axis, and drawn over the surface of the ground, in order to break the small clods, and render it smooth and even.

This instrument was formerly made with an even or uniform surface; but Mr. Randall was led by a hint, suggested in Mr. Ellis's Husbandry, to construct what he calls a *spiky roller*: the length of which was 7 feet, the diameters of the ends 18 inches, and the whole cylinder made of heart of oak. In the surface of the cylinder were fixed several rows of iron spikes, at the distance of four inches from one another in each row, the distance from row to row being about four inches. These iron spikes are of the shape of ox harrow teeth, and six inches in length; three inches of which, towards the smaller end, are burnt into the wood, and the remaining three inches of the blunter end projecting beyond it. The weight of this whole machine, including that of the box annexed to it, and of the man employed in guiding it, was about a ton.

Mr. Randall observes, that wheels are needless appendages to this instrument.

The utility of this kind of *roller*, especially in land that is stiff and liable to clod, has been generally acknowledged. It is better adapted for the purposes of preparing the soil for seed, of burying it when sown, and leaving the ground in a fine state, of rolling the corn in the spring, and likewise of laying down lawns, or large pieces of grass, that are required to be level, than those which were formerly used for the various purposes of rolling. It will also serve to reduce the half-burnt turf of burn-baked land more expeditiously and effectually than any other method.

Mr. Young, in the third volume of his Tour to the Eastern Parts of England, mentions a *cutting roller*, which had been found better adapted to stiff clays, even than this *spiky roller*. This was usually about six feet eight inches long; the central cylinder on which the cutting wheels roll is about six inches, and the diameter of the wheels twenty inches; their cutting edges being of cast iron. To this machine is annexed a trough, about ten inches deep, and twenty over; and the whole is to be loaded with additional weights, whenever the nature of the service to which it is applied requires it.

ROLLER, in *Ornithology*, the common name of a bird of the mag-pie kind, called *garrulus argentoratensis* by authors, and suspected to be the same with the bird described by Gesner, under the name of the *blue crow*, *cornix cærulea*, and by Aldrovand under the name of *pica marina*. It is the *coracias garrula* of Linnæus. Its beak is black and long, somewhat crooked at the end, otherwise like that of the common mag-pie; its eyes are of a greyish hazel colour, and near them are two tubercles bare of feathers; its rump and part of its wing-feathers are of a fine blue, like the ultramarine colours, used in painting; the middle of its back is of a reddish brown, and the head is of a bluish green, and its breast and belly are of a whitish blue, or dove-colour. It is brought to market in Italy, and some other places. It is remarkable for making a chattering noise, whence it has been called *garrulus*. See *Tab.* IV. *Birds*, N° 52.

ROLLER is also the name by which some call the *ampelis*, or *garrulus Bohemicus*.

This, in the Linnæan system, is a species of the AMPELIS.

It is of the size of the black-bird. Its head is crested with a little pointed plume of feathers, and is of a fine glossy brown; from the base of the bill, which is short, thick, and black, there passes to the hind part of the head, over each eye, a bar of black; its neck is very short, and variegated with black, brown, and white; the throat is black, with a small bristly tuft in the middle; its breast is of a reddish brown, and its belly grey; its back is of a chesnut brown, and its wing-feathers variegated with black and grey. What distinguishes this from all other birds are the horny appendages from the tips of seven of the secondary feathers, of the colour and gloss of the best red wax: some have one more or one less.

It is thought to be peculiar to Bohemia, having been seldom found in any other country. The species appears annually about Edinburgh, in February, and feeds on the berries of the mountain ash; and appears as far south as Northumberland.

These birds were once considered as the presages of pestilence.

The *roller* feeds on fruits, particularly grapes, whence its name; and is very voracious, and generally flies in large flocks together.

This bird is easily tamed, and is esteemed delicious food. Ray and Pennant. See *Tab.* IV. *Birds*, N° 53.

ROLLER, in a *Ship*, a cylindrical piece of timber, fixed either perpendicularly, or horizontally, above a ship's deck, so as to revolve about an axis. It is used to prevent the cables, hauses, &c. from being chafed by the friction which their surfaces would otherwise encounter, from bearing against that part of the ship, where the *roller* is placed, whilst they are drawn into the ship by mechanical powers.

ROLLER, in *Surgery*, a long and broad ligature, usually of linen cloth, used for binding, surrounding, and containing, the parts of the human body, and keeping them in, or disposing them to a state of health.

A *roller* consists of two parts; the *body*, and the two extremities, which some call *heads* or *chiefs*, and others *tails*. There are single headed *rollers*, that is, such as are rolled at one head only, double-headed *rollers*, &c.

Again; some are equally rolled and gathered together; as those applied to fractures and dislocated joints. Others are cut into several chiefs or heads; as those for the head, chin, &c. Others are composed of several swaths, gathered and stitched together; as those for the testicles, &c. Some again are *broad*; as those for the breast, belly, &c. Others narrow; as those for lips, fingers, &c.

Guidon directs the *roller* for the shoulder to be six fingers broad; that for the thigh, five; for the leg, four; for the arm, three; and the finger, one. See BANDAGE.

ROLLING, *rotation*, in *Mechanics*, a kind of circular motion, wherein the moveable turns round its own axis, or centre, and continually applies new parts of its surface to the body it moves upon.

Such is that of a wheel, a sphere, or the like. Such, particularly, are the motions of the earth, the planets, &c.

The motion of *rolling* is opposed to that of *sliding*; wherein the same surface is continually applied to the plane it moves along.

It must be noted, that in a wheel it is only the circumference that properly rolls; the rest proceeds in a compound angular kind of motion, and partly rolls, partly slides. The not distinguishing between which two, occasioned the difficulty of that celebrated problem, the ROTA *Aristotelica*, *Aristotle's wheel*.

The friction of a body in *rolling*, or the resistance made to it, by the roughness of the plane it moves on, is found to be much less than the friction in sliding.

Hence the great use of wheels, rolls, &c. in machines; as much of the action as possible being laid thereon, to make the resistance the lesser.

For the laws of bodies *rolling* on inclined planes, see *Inclined* PLANE, and DESCENT.

ROLLING *carts*. See CARTS.

ROLLING-*press printing*. See PRINTING.

ROLLING, in *Sea Language*, the motion by which a ship rocks from side to side, like a cradle, occasioned by the agitation of the waves. As this is a sort of revolution about an imaginary axis, passing through the centre of gravity of a ship, it is plain that the nearer the centre of gravity is to the keel, the more violent will be the *rolling* motion; because the centre, about which the vibrations are made, is placed so low in the bottom, that the resistance, made by the keel, to the volume of water, which it displaces in *rolling*, bears very little proportion to the force of the vibration above the centre of gravity, the radius of which extends as high as the masthead. But if the centre of gravity is placed higher above the keel, the radius of vibration will not only be diminished, but an additional force to oppose the motion of *rolling* will be communicated to that part of the ship's bottom, which is below the centre of gravity. This motion may in some measure be prevented, by changing the quantity or disposition of the ballast, and also by the construction of the ship's bottom. Falconer.

ROLLING *tackle*, in a *Ship*, a pulley, or purchase, fastened to that part of a sail-yard, which is to the windward of the mast, in order to confine the yard close down to the leeward, when the sail is furled. It is used to prevent the yard from having a great friction against the mast in a high sea, which would be equally pernicious to both. Falconer.

ROMAIN, in *Husbandry*, the name of a plant, cultivated in the fields, in many parts of the world, particularly in France, and called, by our farmers, *French vetches*, or *French tares*. It is an annual plant, but a very quick grower, and is extremely good food for cattle, particularly for horses: they let these creatures feed on it all the former part of the summer, and then cut it for hay in August or September. Its short continuance in the ground makes it less valuable than saint-foin and clover, but it has this advantage over them, that it will grow on poor ground.

ROMAN, something belonging to the city of Rome.

ROMAN *monarchy*. See MONARCHY.

The *Roman* commonwealth lasted from the expulsion of the Tarquins to the battle of Pharsalia, 460 years; the *Roman* empire, from the battle of Pharsalia to the building of Constantinople, by Constantine, in the year 330, lasted 378 years; from the building of Constantinople to the taking it, by the Turks, in 1453, was a farther period of 1123 years.

A *Roman* citizen, at first, was only a citizen of Rome; at length, the right of citizenship was given to other cities and people, both in Italy, and the provinces. It was thus St. Paul was a *Roman* citizen, Acts xvi: 21, 37, 38. xxii. 25, 26, 27. xxiii. 26. the city of Tarsus, in Cilicia, a native of which he was, having the right of *Roman* citizens. See MUNICIPAL *cities*.

For the *Roman* senate, their magistracy, consuls, soldiery, tribes, courts, names, weights, measures, coins, and other matters relating to the antiquities of that people, their policy, religion, law, customs, &c. see the respective articles in this work.

ROMAN *alum*. See *Roman* ALUM.

ROMAN *purple* now denotes the dignity of a cardinal.

ROMAN or ROMISH *church* is that whereof the pope is head; so called in opposition to the reformed churches. See PAPISTS, and POPERY. See also CHURCH and REFORMATION.

The *Roman* law is the CIVIL *law*, or the written law, as compiled by the emperor Justinian.

A ROMAN *charity*, among *Painters*, is a picture of a woman suckling an old man. *Roman* knight, &c. See KNIGHT, &c.

ROMANS, *king of the*, in *Our Age*, is a prince elected and designed successor to the German empire.

ROMAN *games*, *ludi Romani*, were solemn games, held in ancient Rome, thus called by way of eminence, and on account of their antiquity, as having been instituted by Romulus.

They were sometimes also called *magni ludi*, from the great pomp and expence thereof; and sometimes CONSUALIA, because performed in honour of the god Neptune, who was also called *Consus*, in his quality of god of secret counsels.

They also bore the denomination of *ludi* CIRCENSES, because held in the Circus.

This solemnity, Halicarnasseus observes, was originally instituted by Evander, in honour of Neptune, under the name of Ἱππιος, whence the festival itself was called Ἱπποκρατια; and was afterwards renewed by Romulus, in honour of the same deity, only under another name.

For Romulus, needing the advice of a god, to counsel him in the design he had to furnish his new citizens with wives, applied to the god of secret counsel himself, Consus; proclaimed the Consualia; and invited his neighbours all around to the first celebration thereof.— The consequence was the rape of the Sabine women, who came to be spectators thereof.

The great ceremony, in these games, consisted in a cavalcade of horses and asses, adorned with garlands; Neptune being reputed the first author of riding on horseback.

Their horses here were of two kinds; viz. πομπικοι, or such as were merely led up and down for state, and δρομικοι, which were for race and exercise.

The other diversions were fencing, and that till one of the combatants was killed on the spot; fighting with beasts, and with the cæstus, or whirlbats; wrestling, running, leaping, sea-fights, horse-races, chariot-races, &c. These games, Livy tells us, were improved, and rendered much more magnificent, by Tarquinius Priscus. Manutius says, they were held on the eve of the nones of September; i. e. on the 14th day of the month.

ROMAN *order*, in *Architecture*, is that more usually called the COMPOSITE.

ROMAN *balance*, *statera Romana*, the STEEL-YARD.

ROMAN *indiction*. See INDICTION.

ROMAN *year*, &c. See YEAR, &c.

ROMAN *language*, &c. See LATIN, &c.

ROMANCE, anciently ROMAUNT, and ROMANT, a fabulous relation of certain intrigues and adventures, in the way of love and gallantry, invented to entertain and instruct the readers.

M. Fontenelle calls *romances* poems in prose; and Bossu is not averse to their being admitted as poetical pieces, though not written in verse.

Setting aside the versification, it is certain, an epic poem and a *romance* are almost the same thing. The just notion, therefore, of a *romance*, is, that it is a discourse invented with art, to please and improve the mind, and to form or mend the manners, by instructions, disguised under the allegory of an action, or series of actions, related in prose, in a delightful and probable, yet surprising manner.

A just *romance* consists of two parts: viz. a moral, as its foundation, and end; and a fable, or action, as the superstructure and means.

It must also have the manners; that is, the characters must be distinguished, and the manners must be necessary; and it must have all the other qualities of poetical manners.

The incidents must be delightful, and, to that end, rightly disposed and surprising. The sentiments fall under the same rules as in the drama.

But the diction is allowed to be more lofty, and figurative; as being a narration, and not having terror or pity, but admiration, for its end.

A *romance* of chivalry, according to the definition of a late writer, is any fabulous narration, in verse or prose, in which the principal characters are knights, conducting themselves, in their several situations and adventures, agreeably to the institutions and customs of chivalry.

As compositions of this kind have a long time been little else but histories of amorous adventures, and feats of knight-errantry, the origin of *romances* is referred to that of love-histories: and accordingly Dearchus, a disciple of Aristotle, who first wrote of those matters, is usually termed the original author of *romances*. Though Photius is of opinion, that Antonius Diogenes's book on the errors and amours of Dinias and Dercyllis gave birth to most of the works of this kind. Be this as it will, it is certain the ancients have had their *romances* as well as we. Such are the Amours of Rhodanis and Sinonides, described in iambics; such is the *romance* of Leucippe and Clitophon, composed by Achilles Tatius, a Greek writer, afterwards a bishop; such are the Four Books of Incredible Things, written by Damascius; such are the Ethiopics of Heliodorus, wherein he relates the amours of Theagenes

Theagenes and Chariclea. Laſtly, under the ſame claſs may be ranked the Fables of Parthenius Nicenus, of Athenagoras, Theodorus Prodromus, Euſtathius, and Longus.

Indeed antiquity could ſcarce be reconciled to ſuch pieces, and always looked on them as abuſes. Photius, in his Bibliotheca, cod. lxxxvii. gives a frightful account of that of Tatius; and the Ethiopics of Heliodorus, though one of the modeſteſt and moſt reſerved pieces of the kind, met with very ſevere treatment. The author was biſhop of Tricca, in Theſſalia, in the fourth century. Nicephorus tells us, that a ſynod, conſidering the danger which might accrue to youth from reading his *romance*, authoriſed as it was by the dignity of its author, propoſed it to him, either to ſuppreſs his book, or renounce his biſhoprick; and that he choſe the latter. But this hiſtory is a little doubtful.

Be this as it will, Heliodorus has ſerved as a model to all the *romances* wrote ſince; and the marriage of Theagenes and Chariclea has produced a very numerous iſſue, even all the *romances* now extant in the world.

In imitation of the archbiſhop Turpinus, who paſſed for author of the *romance* of the Feats of Charlemagne and Orlando, a great number of hiſtories, of the like kind, were written in France, during the time of Philip the Fair; the authors whereof ſeemed to improve on each other, contending who ſhould go fartheſt in the merveilleux. Theſe books, being intended for polite people, were written in the court language of that age, which was called the *romans*, *romant*, or *romantic*; whence the books themſelves were called by thoſe names: and thus, by degrees, *romans*, &c. became the general name of all books of this kind; whence, at length, our *romance*.

To this purpoſe, Creſcimbeni, reciting the ſeveral opinions, reſpecting the name *romanzo*, derives it from the word *Roma*, and tells us, that it means that vulgar idiom, which, with colonies of Romans, paſſed into Provence, and elſewhere, and was eſteemed, even by the barbarians, who inhabited thoſe kingdoms, and called *Romano* and *Romanzo*; and in this they wrote the acts and atchievements of knights; which writings were, therefore, ſtyled *romanzi*, or *romances*.

Others derive the word from the Spaniſh *romanſero*, *I invent*; as intimating *romances* to be mere fictions. And hence it is that the ancient poets of Provence, who were the firſt great dealers in *romances*, are called TROUBADOURS, q. d. finders, or inventors.

Creſcimbeni remarks, that the Italians derived from Provence, not only the origin and art of writing *romances*, but alſo the very ſubjects on which they were founded; and though it is not preciſely known who were the *romance* writers of Provence, yet many of their *romances* are found in the Italian libraries; and, indeed, from ſuch a ſource of poetical fiction as the country of Provence appears to have been, nothing leſs could be expected than a vaſt profuſion of *romances*, and other works of invention. See PROVENÇAL *poets*.

It has been a received opinion, amongſt modern critics, that the fictions of *romance* were communicated to the Weſtern world by means of the Cruſades. Mr. Warton (in his Diſſertation on the Origin of romantic Fiction in Europe, prefixed to the Hiſtory of Engliſh Poetry,) is of opinion, that they were introduced at a much earlier period by the Saracens, who came from Africa, and ſettled in Spain, about the beginning of the eighth century. From Spain, he imagines, they found an eaſy paſſage into France and Italy; and the cloſe connection which ſubſiſted for many centuries between the Welſh and their coloniſts the Armoricans, might have been the means of bringing them from France into this iſland.

In examining the hypotheſis of Dr. Percy and Mr. Mallet, who derive theſe fictions, in a lineal deſcent, from the ancient hiſtorical ſongs of the Gothic bards and ſcalds, he allows this opinion to be in ſome meaſure well founded, and that ſo far it is alſo reconcileable with his own ſyſtem.

The ſcaldic inventions, he ſays, had undoubtedly taken deep root in Europe, and prepared the way for the more eaſy admiſſion of the Arabian fabling, about the ninth century, by which they were, however, in a great meaſure ſuperſeded. As a proof of which he obſerves, that the inchantments of the Runic poetry are very different from thoſe in our *romances* of chivalry. The former chiefly deals in ſpells and charms, ſuch as would preſerve from poiſon, blunt the weapons of an enemy, procure victory, allay a tempeſt, cure bodily diſeaſes, or call the dead from their tombs, in uttering a form of myſterious words, or inſcribing Runic characters. The magicians of *romance* are chiefly employed in forming and conducting a train of deceptions. There is an air of barbaric horror in the incantations of the ſcaldic fablers: the magicians of *romance* often preſent viſions of pleaſure and delight; and, although not without their alarming terrors, ſometimes lead us through flowery foreſts, and raiſe up palaces glittering with gold and precious ſtones. The Runic magic is more like that of Canidia in Horace; the romantic reſembles that of Armida in Taſſo. The operations of the one are frequently but mere tricks, in compariſon of that ſublime ſolemnity of necromantic machinery which the other ſo awfully diſplays.

He adds, it is alſo remarkable, that in the earlier ſcaldic odes we find but few dragons, giants, and fairies. Theſe were introduced afterwards, and are the progeny of Arabian fancy. Nor, indeed, do theſe imaginary beings often occur in any of the compoſitions which preceded the introduction of that ſpecies of fabling.

That the ideas of chivalry, the appendage and the ſubſtance of *romance*, ſubſiſted among the Goths, our author readily allows, but not without certain limitations. It was under the feudal eſtabliſhments, which were ſoon afterwards erected in Europe, that it received new vigour, and was inveſted with the formalities of a regular inſtitution.

From the whole of his obſervations, the author deduces the following general concluſion.

Amid the gloom of ſuperſtition, in an age of the groſſeſt ignorance and credulity, a taſte for the wonders of oriental fiction was introduced by the Arabians into Europe, many countries of which were already ſeaſoned to a reception of its extravagancies, by means of the poetry of the Gothic ſcalds, who, perhaps, originally derived their ideas from the ſame fruitful region of invention. Theſe fictions, coinciding with the reigning manners, and perpetually kept up and improved in the tales of troubadours and minſtrels, ſeem to have centered about the eleventh century in the ideal hiſtories of Turpin and Geoffrey of Monmouth, which record the ſuppoſititious atchievements of Charlemagne and king Arthur, where they formed the ground-work of that ſpecies of fabulous narrative, called *romance*. And from theſe beginnings, or cauſes, afterwards enlarged and enriched by kindred fancies, fetched from the Cruſades, that ſingular and capricious mode of imagination aroſe, which at length compoſed the marvellous machineries of the more ſublime Italian poets, and of their diſciple Spenſer.

The French, above all other nations, have applied themſelves to this kind of writing; whether it be owing to the natural taſte and genius of the people, or to the freedom, &c. wherewith they converſe with the women. They began chiefly with *romances* of chivalry: hence their Amadis, in twenty-four volumes; Palmerin D'Oliva, and of England; king Arthur, &c. whereof we have an agreeable critique in Don Quixote.

The later *romances* are much more polite; the beſt of which are the Aſtrea of D'Urfe; the Cyrus and Clelie of Mademoiſelle de Scuderi; the Caſſandre and Cleopatre of La Calprenede; Ariane, Francion; and the Adventures of Telemachus, by the late archbiſhop of Cambray, worth all the reſt.

The Germans, too, have their *romances*; eſpecially Hercules and Herculiſcus, the Aramena, Octavia, Arminius Otbert, &c.

The Italians have their Eromena, by Biondi; the works of Loredano, Marino, &c. The Spaniards, their Diana, and Don Quixote. The Engliſh their Arcadia, &c. And in modern times, the number has been ſo great, that our circulating libraries are full of them.

The Argenis of Barclay is rather a ſatire, than a *romance*.

ROMANS, ROMANT, ROMANIC, or ROMANCE, the polite language formerly ſpoke at the court of France; in contradiſtinction to the WALOON, or ancient Gauliſh, ſpoke by the common people.

The *Romans* having ſubdued the Gauls, introduced part of their language among them; and a mixture of half Latin, half Gauliſh, or Celtic, conſtituted the *Romans*; whereof the modern French is only an improvement.

Hence, to *enromance* was to write in *romance*, &c. See ROMANCE.

Covarruvias, a learned Spaniſh writer, obſerves, that the name *romance* is generical, and belongs alike to the Tuſcan, French, and Spaniſh; inaſmuch as all theſe were derived from the purity of the Latin tongue, which the Romans, being conquerors, introduced into theſe provinces, and which, at firſt, the nobles ſpoke and wrote. He farther ſays, that the Latin tongue, being admitted into Spain, was ſpoken as in Rome, and that there were men well ſkilled in it, who ſpoke and wrote it with greater refinement than the vulgar; but upon the irruption of the Goths it was remarkably corrupted: that which was before Roman was converted into *Romance*, which is equivalent to its being derived from the Roman. And it farther appears, that the

name *Romance* was given to the Spanish language, to distinguish it from the Gothic.

Mr. Planta, in his elaborate account of the *Romansh* language (Phil. Trans. vol. lxvi. part i. p. 129, &c.), which is now spoken in the most mountainous parts of the country of the Grisons, near the sources of the Rhine and the En, informs us, that this language consists of two principal dialects; which, though partaking of the same general name, differ so widely, as to constitute in a manner two distinct languages. One dialect, he says, which is spoken in the Engadine, a valley extending from the source of the En to the frontiers of the Tyrolese, is by the inhabitants called *Ladin*. And he observes, that the *Romansh* has never been used in any regular composition in writing, till the sixteenth century, nor affected by any foreign invasion, or intimate connection: but that it is at present the identical language that was spoken two hundred years ago.

This learned writer observes, that notwithstanding the variety of conjectures and controversies, which have occurred with regard to the Gallic *Romance*, it is agreed on all hands, that the vocabulary of the Roman, and the idiom of the Celtic, have chiefly contributed to its formation; and, therefore, that it partakes of a common origin with that of the Grisons. He adds, that there are incontestible proofs that this language was once universal through France, and that this, and not immediately the Latin, hath been the parent of the Provençal, and afterwards of the modern French, the Italian, and the Spanish.

From a comparison of the two *Romances*, as well as from the similarity of their origin, Mr. Planta infers, that they are one and the same language.

However, whilst the Grisons neglected to improve their language, or had no opportunity for this purpose, the taste and fertile genius of the Troubadours, fostered by the countenance and elegance of the brilliant courts and splendid nobility of Provence, did not leave theirs long in the rude state in which we find it in the ninth century. But the change being gradual, and almost imperceptible, the French historians have fixed no epocha for the transition of the *Romance* into the Provençal. Nevertheless it appears, that the former language had received no considerable alteration in the twelfth century, and it still bore the same name. But after this æra, though the name occurs, the language distinguished by it is very different from the *Romance* of the ninth century. Allowing, however, the universal use of the *Romance* all over France, till the twelfth century, and that what the writers of those times say of the Gallic is to be understood of the *Romance*, of which there is sufficient evidence, it follows, says Mr. Planta, that the language introduced into England under Alfred, and afterwards more universally established by Edward the Confessor, and William the Conqueror, must have been an emanation of the *Romance*, very near a-kin to that which is now spoken in the Alps.

According to Du-Cange, the *Romance* had also penetrated into Scotland, before the twelfth century. The same corruption, or coalescence, which gave rise to the Gallic *Romance*, and that of the Grisons, must also have produced, in Italy, a language, much resembling, if not perfectly similar, to those two idioms. It appears also, from what has been already said, that the language of the Romans penetrated very early into Spain, and that the *Romance* was very common in that kingdom. The universality of the *Romance* in the French dominions, during the eleventh century, accounts for its introduction into Palestine, and many other parts of the Levant, by Godfrey de Bouillon, and other adventurers, who engaged under him in the Crusades.

This writer farther adds, that the heroic atchievements and gallantry of the knights of the Cross gave rise to a swarm of fabulous narrations, which, though not an invention of those days, were yet, from the name of the language in which they were written, ever after distinguished by the appellation of *Romances*. And he presumes, that the *Romance* hath been preserved so near its primitive state, not only in the country of the Grisons, but in several other remote and unfrequented parts.

ROME *scot.* }
ROME *peny.* } See PETER-*pence*.

ROMNEY *marsh*. See RUMNEY *marsh*.

ROMPEE, or ROMPU, in *Heraldry*, is applied to ordinaries, that are represented as broken; and to chevrons whose upper points are cut off: as in *Tab.* II. *Herald. fig.* 83. He beareth a chevron *rompee*, between three mullets, argent, by the name of Sault.

ROMPION. This kind of bell-flower was formerly much esteemed, in England, for the sweet taste of the roots, and universally cultivated in kitchen gardens; but we at present disregard it, though the French continue to be very fond of it. The seeds are to be sown in a bed of light dry earth in March, and in May the young plants will be of a size to remove, or they may be left where sowed, only houghing them up to four inches distance; and being kept clean from weeds, for the remaining part of the summer, they will be fit for eating in the succeeding winter.

RONDEL, in *Fortification*, a round TOWER, sometimes erected at the foot of a bastion.

RONDELETIA, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the flower has a permanent empalement, sitting upon the germen, cut into five acute points; it has one funnel-shaped petal, with a cylindrical tube, longer than the empalement, cut into five roundish segments at the brim, which are reflexed; it has five awl-shaped stamina, terminated by single summits; the roundish germen is situated under the flower, supporting a slender style, the length of the tube, crowned by an obtuse stigma; the germen afterwards becomes a roundish crowned capsule, with two cells, inclosing two or three angular seeds in each.—Miller enumerates two, and Linnæus four species, natives of the East and West Indies.

RONDINE, in *Ichthyology*, a name by which some authors have called the *milvus*, or FLYING-*fish*.

RONDINE *pesce*, in *Ichthyology*, a name by which some have called the *hirundo piscis*, or SWALLOW-*fish*, called by others *mugil alatus*.

ROOD, a quantity of land, equal to the fourth part of an acre; and containing forty square perches, or poles.

In Scotland, the *rood* contains forty square falls. See FALL.

ROOF, in *Architecture*, the uppermost part of a building; being that which forms the covering of the whole.

The *roof* contains the timber-work and its furniture of slate or tile, wherewith the house is covered, or that which serves it as a cover. Though carpenters usually restrain *roof* to the timber-work only.

The form of a *roof* is various: sometimes it is pointed, in which case the most beautiful proportion is to have its profile an equilateral triangle.

Sometimes it is square, that is, the pitch or angle of the ridge is a right angle; which, therefore, is a mean proportion between the pointed and the flat form.

A flat *roof* is that in the form and proportions of a triangular pediment. This is chiefly practised in Italy, and the hot countries, where little snow falls.

Sometimes the *roof* is in the pinnacle form.

Sometimes it has a double ridge. Sometimes it is cut, or mutilated, that is, consists of a true and a false *roof*, which is laid over the former: this last is particularly called a *mansard*, from its inventor M. Mansard, a famous French architect.

Sometimes, again, it is in form of a platform; as in most of the Eastern buildings.

Sometimes it is truncated; that is, instead of terminating in a ridge or angle, it is cut square off at a certain height, and covered with a terrace, and sometimes this also incompassed with a ballustrade.

Sometimes it is in manner of a dome; that is, its plan is square, and the contour circular.

Sometimes it is round, that is, the plan is round or oval, and the profile spherical.

Sometimes the base being very large, it is cut off to diminish its height, and covered with a terrace of lead, raised a little in the middle, with sky-lights from space to space, to give light to some corridore, or other intermediate piece, which without such an expedient would be too dark.

ROOF-*trees*, or RUFF-*trees*, are the timbers, in a ship, which go from the half-deck to the fore-castle. See ROUGH-*tree*.

The term is also used for the upper timbers of any building; whence, in the northern counties, it is common to signify a whole family, by saying, *all under such-a-one's roof-tree*.

ROOF, *false*. See FALSE.

ROOF, *hip*. See HIP *roof*.

ROOF, *Attic of a*. See ATTIC.

ROOF-*tyles*. See TYLE.

ROOK, in *Ornithology*, a well-known bird of the CROW-kind.

This is the CORVUS *frugilegus* in the Linnæan system; the characters of which are, that it is black, with an ashen-colour face, and a roundish tail.

The *rook* does not much differ in form from the carrion crow, but is larger in size. What distinguishes the *rook* from the crow is the bill; the nostrils, chin, and sides of that, and the mouth, being in old birds white, and bared of feathers, by often thrusting the bill into the ground, in search of the *erucæ* of the dor-beetle. *Rooks* live together in large flocks; whereas crows go in pairs; they

they begin to build their nests in March; but after the breeding season desert their nest-trees, and go elsewhere to roost, returning to them in August, and repairing their nests in October.

Rooks are very destructive of corn, especially of wheat; though they clear the ground of caterpillars, that do incredible damage by eating the roots of the corn, and on this account may be considered as the farmers friends. They search out the lands when it is sown, and watching them more carefully than the owners, they perceive when the seed first begins to shoot up its little blade; as this is the time of their feeding on it, they will not be at the pains of searching for it at random in the sown land, for that is more trouble than so small a grain will requite them for; but as soon as these blades appear, they are directed, without loss of time or pains by them, to the places where the grains lie, and in three or four days time they will root up such vast quantities of them, that a good crop is often thus destroyed in embryo. After a few days the wheat continuing to grow, its blades appear green above ground, and then the time of danger from these birds is over; for then the seeds are so far robbed of their mealy matter that they are of no value to that bird, and it will no longer give itself the trouble to destroy them.

The best remedy the farmer has, is to watch well the time of the corn's being in the condition in which they feed upon it; and as this lasts only a few days, he should keep a boy constant in pay to watch the field from day-break till the dusk of the evening. Every time they settle upon the ground, or fly over it, the boy is to hollow, and throw up a dead *rook* into the air; this will always make them rise, and by degrees they will be so tired of this constant disturbance, that they will seek out other places of preying, and will leave the ground even before the time of the corn's being unfit for them. The reason of their rising at the tossing up of their dead fellow-creature is, that they are a bird extremely apprehensive of danger, and they are always alarmed when one of their comrades rises. They take this for the rising of an outbird, and all fly off at the signal. Tull's Horsehoeing Husbandry.

ROOM, in *Building*. See BUILDING.

ROOM, *cook*. See COOK-*room*.

ROOMS, *flight of*. See FUGUE.

Rooms in houses might be warmed by the steam of boiling-water conveyed in pipes along their walls. See Phil. Transf. N° 476, p. 370, seq.

This contrivance is a copper with a still-head, and a lead or copper-pipe fixed to this head, which conveys the hot steam of the boiling-water through the different *rooms* intended to be warmed.

ROOM, in a *Ship*, a place distinguished by partitions, or bulk-heads, as the gun-*room*, bread-*room*, cook-*room*, powder-*room*, &c.

ROOMER, in the *Sea Language*. A ship is said to be a *roomer*, when she is larger than ordinary.

ROOT, *radix*, in *Botany*, that part of a plant which immediately imbibes the juices of the earth, and transmits them to the other parts, for their nutrition.

The *root* consists of woody fibres, covered with bark, more or less thick. It arises from a little point in the seed, called the *radicle*.

It is no small difficulty to conceive, how the *root* should always get downwards, and turn up the stem perpendicularly; considering that in the sowing of plants the *radicle* must frequently happen to be upwards, and the plumule downwards. See PERPENDICULARITY.

The *root* is always found in the ground, in terrestrial plants, except in a very few cases: the ivy and cuscuta being perhaps the only plants where part of the *root* lies bare.

The *root* in plants has been observed to do the office of the stomach in animals; that is, to make the first and principal digestion of the alimentary matter. M. Reneaume shews that the *root* does the office of all the parts in the belly of animals destined for nutrition; it being the *root* that receives the nourishment, that prepares it, digests it, and alters and changes it into sap, to be afterwards distributed to all the parts of the plant. See PLANTS.

The smell, colour, and even taste, shew how considerable an alteration the juices undergo in the *root*; so that the *root* may be laid down as the great principle of vegetation.

Plants growing at the bottom of the sea have this peculiar to them, that they have no *roots*; at least the parts which do the office of *roots* have nothing of the usual figure of other *roots*. These plants are usually fastened to some solid body; adhering to it by a very smooth polished lamina, which does not send forth any fibre. Add to this, that the body to which they adhere, being frequently a rock or flint, appears very unfit to feed them, in case they had *roots*. M. Tournefort, therefore, conjectures that they are fed by a juice afforded them by the thick oily mud at the bottom of the sea, which they receive by the pores or the exterior surface of this lamina; but it is more probable that they are all over *root*, and take in nourishment from the water at all parts.

Boerhaave observes, that the *root* may have any situation at pleasure, with respect to the body of the plant; nor needs to be either lowest or highest. Accordingly, in the aloe, coral, mosses, &c. the *root* is frequently uppermost, and its growth downwards.

Roots are generally divided by botanists into

1. *Fibrous*, which send out only small strings from the bottom of the plant, distinct from each other. Such are those of most species of grass. See FIBROSE *roots*.
2. More *thick and gross*, which have a body thick and large, either branched out into subdivisions, or else sending out fibres from it all along.

These last are either *carnous*, which again are either,

- 1. *Broad* and swelling, or
- 2. *Long* and slender, which are commonly harder and more woody.

Broad and swelling *roots* are either

- 1. *Bulbous*, which consist but of one globe, or head, and send out fibres from the bottom (see BULB), and are either
  - *Squamous* and scaly, as those of lilies, martagon, &c.
  - *Coated*, or *tunicated*, which are involved in skins or coats, as in the cepa, hyacinthus, allium, &c.
- 2. *Tuberous*, which are of a carnous, solid, and continued consistence, and these either
  - 1. *Simple*, with but one globe or head, as rapa, crocus, &c.
  - 2. *Manifold*, as asphodelus, pæonia, &c.

  Under this division we may reckon the TESTICULATED, PALMATED, GRUMOSE, GRANULOSE, and TAP-*roots*.

Long roots are either,

- (1) *Sarmentous*, i. e. twiggy, or branching, which shoot or creep out transversly, or in breadth: of these some are geniculated, knotty, or jointy; as those of couch-grass, mints, &c.
- (2) *Cauliformes*, i. e. stemmy or stalky, which shoot down deep directly, though often sending out fibres and strings from the great stem; which also itself is sometimes divided or branched.

The *roots* of plants of all kinds have great numbers of fibres issuing horizontally from them on all sides, and running a great way; but these seldom go deeper than about ten or twelve inches, the depth to which the earth is commonly stirred in agriculture by the plough-spade. Some plants have all their *roots*, even the large ones, directed horizontally, and spreading in this manner; but of the others, even those which have tap-roots, or such as run perpendicularly down into the earth, the greater part have visible fibres running horizontally from them in great numbers, and even those which seem to have none, are not truly without them, they being only more fine, and therefore less distinguishable by the eye.

The horizontal *roots* issuing from the main body of the *root* seem to the eye to be short, and reach only a little way, but they in reality extend many times farther than they seem to do, often spreading to the distance of many yards, after their extreme fineness and earthy colour make them imperceptible to the eye.

Mr. Tull has made experiments of this kind, and found that a turnep, which is a plant whose root seems to have as few, and those as short, fibres growing from its main stem as any, yet has such as when the ground about it is properly moved by digging, extend to the distance of six feet every way. The distance to which these fibres of the *roots* of plants extend, may be discovered by trials with salt; the common garden-plants will not live, if their *roots* reach to a place where there is salt; therefore if several plants of the same kind be planted in different parts of the same bed of earth, and a trench dug round each at different distances, and salt buried in this trench, it will be seen by the decaying of some of these plants, and the thriving of others, according to the distance at which the salt lies, which of them has reached it with their *roots*, and which have not; that is, which salt is placed at a distance to which the plants cannot extend their *roots*, and which is the farthest place to which they do. If a furrow be cut in the ground of the depth of nine inches, and at the distance of a yard from a turnep-*root*, that *root* will extend its horizontal fibres to this distance, at the depth of six inches or thereabout from the surface; but when they are come thus far they will descend perpendicularly below the level of the bottom of the furrow; and when they have passed it, they will rise to

to the level of the others on the oppoſite ſide, and extend to the diſtance of a yard beyond it. This could ſcarce be conceived of a plant which ſeems to have ſo few horizontal fibres as the turnep, but experiment has ſhewn it to be a certain fact.

This is not peculiar to the turnep; for all other plants do it on occaſion. The open mould being the natural ſoil for them to draw nouriſhment from, if they deſcend perpendicularly out of this to avoid expoſing themſelves to the open air where there is a cut or ditch, as ſoon as they have paſſed this, they always mount upwards again to enjoy the vegetable mould again at their proper depth: this is the reaſon of what ſeems ſo ſtrange a thing in the turnep-fibres as their riſing after they had paſſed the furrow.

The *roots* of a common thorn-hedge may be obſerved to run horizontally in their natural direction; and if they come to a ditch they will deſcend perpendicularly, till lower than its bottom, and then running acroſs it, they will immediately mount again toward the ſurface, and extend themſelves horizontally, at the depth of eight or ten inches, to a great diſtance; on opening the earth at five feet diſtance from the ditch, the *roots* will be found tolerably large, and none of them reaching deeper than the common mould, which ſeldom is above a ſpade deep.

Mr. Tull mentions a very extraordinary inſtance of the ſpreading of the *roots* of trees in that of a witch-elm: a chalk-pit contiguous to a barn, the area of which was about forty perch of ground, was made clean and ſwept, ſo that it could plainly be ſeen that there was no vegetable matter about it, any more than in the floor of the barn; ſtraw was thrown from thence into the pit for cattle to lie on, and about three years after the pit was cleanſed, the dung made in it being taken up; the bottom of the pit, and the top of the chalk, were at this time covered with *roots*, and theſe were found to come from a witch-elm, of not more than five or ſix yards in height, which was about five yards above the area of the pit, and eleven yards from it; ſo that in three years the *roots* of this tree had extended themſelves to eight times the length of the body of the tree, beyond the extremity of the old *roots*, at eleven yards diſtance from the bottom of the trench, whence the original *roots* proceed. The annual increaſe of the length of the *roots*, in this caſe, was about three times as much as the whole length of the tree.

The vegetable mould which lies uſually from the ſurface, to about a foot deep, being a proper place for the *roots* of trees, they will riſe into it, though the unſkilful hand of man plant them deeper. Thus in an orchard where the trees are ſet too deep, their *roots* all aſcend till they come to a proper ſcene of nouriſhment; but if the ground be moiſt, there is a diſadvantage in this; for the *roots* paſſing through a watery place are chilled, and the circulation retarded.

The uſe of digging the earth to a great diſtance every way from the *roots* of ſuch plants as are deſired to thrive well, is evident from this; for theſe tender *roots* which in an open mould will run to ſo many feet diſtance, are pinched up, and deſtroyed when they come into a hard and undug earth. The advantage of having clear ſpaces between plants cultivated for uſe, is alſo plain from this, ſince they all have *roots*, though imperceptible to us, which occupy thoſe ſpaces, and draw nouriſhment from them.

The ſtirring of the earth about the *roots* of plants has been a practice long uſed by our gardeners, who were well acquainted with the effects of it, though ignorant of its cauſe. The *roots* of plants ſend out horizontal fibres every way, and theſe ſend out fibrillæ on every ſide from them, which run through the whole upper ſtratum of vegetable mould. Every time this mould is ſtirred, a great number of theſe fibres and fibrillæ are broken off, and the conſequence of this is, that they increaſe in number, ſeveral new *roots* always ſhooting out in the place of one that was broken off; and as the number of *roots* is the great means of the ſupply of a plant, every time the earth is ſtirred, that number, and conſequently that ſupply, is increaſed.

There ſeems no danger of the plant's being ſurfeited by an over ſupply of nouriſhment this way; for we ſee nature has provided for a diſcharge of the abundant moiſture by the other *roots*, as we find by the water diſcharged into the earth in the trough. Tull's Horſehoeing Huſbandry.

The *roots* of plants may be reverſed and turned into branches; and *vice verſa*, the branches into *roots*. This is called *planting reverſe*. See PLANT, and PLANTING-*reverſe*.

ROOTS, in *Medicine*. The principal *roots* uſed in the practice of phyſic, are rhubarb, rhaponticum, ſarſaparilla, ipecacuanha, jalap, zedoary, galangal, caſſumenar, gentian, turmeric, liquorice, madder, &c. See RHUBARB, RHAPONTIC, SARSAPARILLA, IPECACUANHA, &c.

There are ſeveral ways of preparing *roots* for medicinal uſe in the eaſtern nations, which ſtrongly alter them from their original form and appearance. An inſtance we have of this in the drug called SALEP, which is no other than the *root* of an orchis thus prepared.

Other *roots* they alſo prepare in the ſame manner, or ſomething like it; an inſtance of which we have in ſome of the oriental ginſeng, which is clear and pellucid as a reſin, and friable like one, retaining very little of the ſtructure or appearance of the *root*. Kempfer gives the method by which the people in the Eaſt do this, and it may be well worth trying on ſome of our own *roots*.

The Chineſe, this author informs us, give their ginſeng its colour and tranſparence in this manner. They macerate the freſh *root* for three days in cold rice-water, then expoſe it in cloſe veſſels to the vapour of the ſame water; after which they carefully and leiſurely dry it, and it becomes hard and brittle, of a browniſh red colour, and as tranſparent as a reſin.

All the ginſeng of China is not of this ſort; and it has been ſuppoſed by ſome, that ſuch as was ſo had aſſumed that appearance by age, as many of the more ſucculent *roots*, which have very ſmall fibres, will become much leſs opake when perfectly dry, than they were at firſt; but experience ſhews that this is not the caſe; for many perſons have kept the oriental ginſeng a great many years, but it has never been known to aſſume that appearance.

There is no doubt, however, but that if the Weſt Indian ginſeng were treated in this manner, it would equal the prepared ginſeng of the Eaſt; for the roots of ſome of our umbelliferous plants, particularly the ſkirret, may be made clear and tranſparent in this manner, by only boiling it in common water, and afterwards drying it in the open air. Mem. Acad. Scien. Par. 1740.

ROOTS, *flower*. See FLOWER.

ROOT *of oſteocolla*, a word uſed to expreſs a ſort of ſoft and rotten matter, on which the OSTEOCOLLA of Germany is found in ſandy grounds.

The workmen ſeek after the oſteocolla by the direction of certain lumps of a white marley matter, which they find lying on the ſands; under this they always find a parcel of rotten vegetable matter, branching out from a main ſtem or trunk, at ten or twelve feet deep up to the ſurface; this rotten ſubſtance they call the *root of the oſteocolla*; and they obſerve, that where the matter they ſeek after is not found round it at the time of their digging, they need only mark the place, and dig again a year afterwards, and they will find it formed in a perfect manner. The oſteocolla found near Frankfort is all of this kind; and we find the holes in the centre of all the pieces, through which this *root* had paſſed. It is ſo tender, that it uſually moulders away on the oſteocolla being expoſed to the air; but ſometimes they waſh it out. Phil. Tranſ. N° 39.

It is not eaſy to conceive what this is, unleſs the remains of foſſile branches of trees; but even then it is as difficult to account for the formation of the oſteocolla about them, as there is none of it found concreted where they are not. We have a ſort of oſteocolla found with us in what we call *petrifying ſprings*; but as this is done in the water, it is eaſier to conceive how it becomes ſo pure, than how a ſoft and pappy ſubſtance, found in the midſt of a bed of ſand, comes not to have ſome ſand embodied in it.

ROOT, *Indian arrow*. See ARROW-*root*.

ROOT, *China*. See SMILAX.

ROOT, *falſe China*, a ſpecies of *ſenecio*. See GROUNDSEL.

ROOT, *fever*, a ſpecies of *trioſteum*. See *Falſe* IPECACUANHA.

ROOT, *hollow*, a ſpecies of ADOXA.

ROOT, *roſe*. See ROSE-*root*.

ROOT, *ſeminal*. See SEMINAL.

ROOT, *ſnake*. See SNAKE-*root*.

ROOT, *black*, or *wild ſnake*, of America, a ſpecies of *actæa*. See HERB *Chriſtopher*.

ROOT, *Dr. Witt's rattle-ſnake*, a ſpecies of *prenanthes*. See *Wild* LETTUCE.

ROOT, *ſenegaw rattle-ſnake*, a ſpecies of *polygala*. See MILK-*wort*.

ROOT, *ſweet*, a ſpecies of *glycirrhiza*. See LIQUORICE.

ROOT-*grafting*. See ENGRAFTING.

ROOT, in *Mathematics*, denotes a quantity which is multiplied by itſelf; or a quantity conſidered as the baſis or foundation of a higher power.

Thus if any number, as 2, be multiplied by itſelf, the product 4 is called the *ſquare*, or ſecond power of 2; and 2 itſelf, with regard to that power, is called the *root*; or particularly the SQUARE *root* of 4.

Since, as unity is to the ſquare *root*, ſo is the *root* to the

ſquare; the *root* is a mean proportional between unity and the ſquare. Thus 1 : 2 : : 2 : 4.

If a ſquare number, as 4, be multiplied by its *root* 2, the product 8 is called the *cube*, or third power of 2; and with reſpect to this cubic number 8, the number 2 is called *root*; or particularly the *cube root*.

Since as unity is to the *root*, ſo is the *root* to the ſquare; and as unity is to the *root*, ſo is the ſquare to the cube: the *root* will be to the ſquare, as the ſquare to the cube; i. e. unity, the *root*, the ſquare, and the cube, are in continual proportion: thus 1 : 2 : : 4 : 8. And the *cube root* is the firſt of the two mean proportionals between unity and the cube.

ROOT, *to extract the*, out of a given number, or power, as 8, is the ſame thing as to find a number, as 2, which, being multiplied by itſelf a certain number of times, v. gr. twice, produces the given number, 8.

A *root*, whether ſquare or cubic, or of any higher power, if it conſiſt of two parts, is called a *binomial root*, or ſimply a *binomial*; as 24, or 20+4.

If it conſiſts of three, a *trinomial*; as 245, or 240+5; or 100+140+5. If of more than three, it is called *multinomial*; as 2456, or 2450+6, or 2400+56, or 2000+456, or 2000+400+50+6. See EXTRACTION *of roots*.

ROOT *of an equation*, in *Algebra*, denotes the value of the unknown quantity in an equation.

Thus, if the equation be $a^2+b^2=x^2$, the *root* of the equation is expreſſed thus, $x=\sqrt{a^2+b^2}$.

The extraction of the *roots* of algebraic quantities, may be performed in a manner analogous to that uſed in arithmetic, for extracting the *roots* of numbers; and if the *root* cannot be accurately found, the proceſs may be continued indefinitely, which will give a ſeries. Thus the quantity $aa+xx$ being propoſed, its ſquare *root* thus extracted will be found to be $a+\frac{x^2}{2a}-\frac{x^4}{8a^3}+\frac{x^6}{16a^5}-\frac{5x^8}{128a^7}+\frac{7x^{10}}{256a^9}-$, &c. See Newton's Method of Fluxions and Inf. Series, p. 4. of Mr. Colſon's edition. See alſo EXTRACTION *of roots*.

But the extraction of *roots* may be abbreviated by that great author's BINOMIAL *theorem*, which he thus expreſſes in his letter to Oldenburgh.

$$\overline{P+PQ}|^{\frac{m}{n}}=P^{\frac{m}{n}}+\frac{m}{n}AQ+\frac{m-n}{2n}BQ+\frac{m-2n}{3n}CQ+\frac{m-3n}{4n}DQ+, \&c.$$

Where $P+PQ$ ſignifies the quantity whoſe *root*, or dimenſion, or *root* of any dimenſion, is to be inveſtigated; P is the firſt term of the quantity, Q the reſt of the terms divided by the firſt. And $\frac{m}{n}$ is the index of the dimenſion or power of $P+PQ$, whether that denomination be a whole number, a fraction, affirmative, or negative. Laſtly, A, B, C, D, &c. repreſent the terms of the *root* as they are found; that is, A ſtands for the firſt term $P^{\frac{m}{n}}$, B for the ſecond $\frac{m}{n}AQ$, &c. The uſe of the rule will appear by a few examples.

1. To find the ſquare *root* of $cc+xx$; that is, $\sqrt{cc+xx}$, or $\overline{cc+xx}|^{\frac{1}{2}}$. Subſtituting cc for P, $\frac{xx}{cc}$ for Q, 1 for m, 2 for n, $\overline{cc}|^{\frac{1}{2}}=c=P^{\frac{m}{n}}=A$, &c. we ſhall have $\overline{cc+xx}|^{\frac{1}{2}}=c+\frac{x^2}{2c}-\frac{x^4}{8c^3}+\frac{x^6}{16c^5}-$, &c.

2. In like manner $\frac{N}{\sqrt[3]{y^3-a^2y}}$, or $N\times\overline{y^3-a^2y}|^{-\frac{1}{3}}$ will be found equal to $N\times\frac{1}{y}+\frac{a^2}{3y^3}+\frac{2a^4}{9y^5}+\frac{14a^6}{81y^7}+$, &c. For $P=y^3$, $Q=\frac{-aa}{yy}$, $m=-1$, $n=3$, $A=P^{\frac{m}{n}}=y^{3\times-\frac{1}{3}}=y^{-1}=\frac{1}{y}$. $B=\frac{m}{n}AQ=-\frac{1}{3}\times\frac{1}{y}\times=\frac{aa}{yy}=\frac{aa}{3y^3}$, &c.

3. Simple powers may be found in the ſame way. Thus, if $\overline{d+e}|^5$, or $\overline{d+e}|^{\frac{5}{1}}$ were required. Then by the rule, $P=d$, $Q=\frac{e}{d}$, $m=5$, and $n=1$. Hence, $A=P^{\frac{m}{n}}=d^5$, $B=\frac{m}{n}AQ=5d^4e$, &c. $C=10d^3e^2$, $D=10d^2e^3$, $E=5de^4$, $F=e^5$; and laſtly, $G=\frac{m-5n}{6n}FQ=0$.

Here the ſeries terminates, and therefore $\overline{d+e}|^5=d^5+5d^4e+10d^3e^2+10d^2e^3+5de^4+e^5$.

4. Diviſion may be performed by the ſame rule. Thus, if it were required to divide 1 by $d+e$. Then $\frac{1}{d+e}=\overline{d+e}|^{-1}=\overline{d+e}|^{-\frac{1}{1}}$. Hence by the rule, $P=d$, $Q=\frac{e}{d}$, $m=-1$, $n=1$, $A=P^{\frac{m}{n}}=d^{-\frac{1}{1}}=d^{-1}=\frac{1}{d}$, $B=\frac{m}{n}AQ=-1\times\frac{1}{d}\times\frac{e}{d}=-\frac{e}{d^2}$, and $C=\frac{ee}{d^3}$, $D=-\frac{e^3}{d^4}$, &c. That is, $\frac{1}{d+e}=\frac{1}{d}-\frac{e}{d^2}+\frac{e^2}{d^3}-\frac{e^3}{d^4}+$, &c. See Newt. Epiſt. ad Oldenburgh, tom. iii. Oper. Wallis. Analyſ. per Quant. Series, &c. Lond. 1711. p. 23, ſeq. and Newtoni Opera, Horſley, vol. i. p. 285, &c.

The method of extracting the *roots* of numbers, mentioned under the head EXTRACTION, is the ſame as that given long ago by Vieta, and is to be met with in almoſt all books of arithmetic and algebra. Monſ. de Lagney and Dr. Halley have given us much more expeditious methods. Dr. Halley's rules for the ſquare and cube are inſerted under APPROXIMATION. We ſhall here inſert the doctor's rules, which extend to the ſeventh power, and may eaſily be continued at pleaſure, the law of the continuation being obvious.

$$\sqrt{aa\pm b}=\sqrt{aa\pm b}, \text{ or } a\pm\frac{ab}{2aa\pm\frac{1}{2}b}.$$

$$\sqrt[3]{a^3\pm b}=\frac{1}{2}a+\sqrt{\frac{1}{4}aa\pm\frac{b}{3a}}, \text{ or, } a\pm\frac{ab}{3a^3\pm b}.$$

$$\sqrt[4]{a^4\pm b}=\frac{2}{3}a+\sqrt{\frac{1}{9}aa\pm\frac{b}{6aa}}, \text{ or, } a\pm\frac{ab}{4a^4\pm\frac{3}{2}b}.$$

$$\sqrt[5]{a^5\pm b}=\frac{3}{4}a+\sqrt{\frac{1}{16}aa\pm\frac{b}{10a^3}}, \text{ or, } a\pm\frac{ab}{5a^5\pm 2b}.$$

$$\sqrt[6]{a^6\pm b}=\frac{4}{5}a+\sqrt{\frac{1}{25}aa\pm\frac{b}{15a^4}}, \text{ or, } a\pm\frac{ab}{6a^6\pm\frac{5}{2}b}.$$

$$\sqrt[7]{a^7\pm b}=\frac{5}{6}a+\sqrt{\frac{1}{36}aa\pm\frac{b}{21a^5}}, \text{ or, } a\pm\frac{ab}{7a^7\pm 3b}.$$

For the application of theſe formulæ or rules, obſerve, that a denotes the neareſt *root* to that of the propoſed number, whether greater or leſs than the true; and that b is the difference between this *root*, involved to the proper power, and the propoſed number. Thus, if it were propoſed to extract the cube-*root* of 231, the neareſt cube to it is 216, the *root* of which is $6=a$, and the difference between 231 and 216 is $15=b$. The *root* required will therefore be $=\frac{1}{2}a+\sqrt{\frac{1}{4}aa+\frac{b}{3a}}=3+\sqrt{9+\frac{5}{6}}=3+\sqrt{9.8333}=6.1358$. But this is only a firſt approximation. For a ſecond, ſuppoſe $6.1358=a$; then its cube will be $=231.000853894712$, which is greater than the truth, and the difference $0.000853894712=b$. Therefore the *root* $=\frac{1}{2}a+\sqrt{\frac{1}{4}aa-\frac{b}{3a}}=3.0679+\sqrt{9.41201041-\frac{0.000853894712}{18.4074}}=6.135792439661958 97$, true to the eighteenth figure, which Dr. Halley aſſures us he computed within an hour.

By this example the method of working may be ſufficiently clear, and the uſe of the double ſign ± is obvious. When a is leſs than the truth, then a^3+b repreſents the given number; but when a is greater than the truth, the propoſed number will be repreſented by a^3-b. In the firſt caſe, the *root* is $\frac{1}{2}a+\sqrt{\frac{1}{4}aa+\frac{b}{3a}}$, or $a+\frac{ab}{3a^3+b}$, and in the ſecond caſe it is $\frac{1}{2}a+\sqrt{\frac{1}{4}a^2-\frac{b}{3a}}$, or $a-\frac{ab}{3a^3-b}$.

Dr. Halley juſtly obſerves, that the irrational formula, $\frac{1}{2}a+\sqrt{\frac{1}{4}aa\pm\frac{b}{3a}}$ is preferable to the rational, $a+\frac{ab}{3a^3\pm b}$; becauſe the extraction of the ſquare-*root* is much eaſier than a diviſion by ſo great a diviſor, as $3a^3\pm b$.

Theſe rules give at leaſt triple the figures of the *root* at every new operation. Thus, in the foregoing example, by the firſt operation, we had five figures, viz. 6.1358 for the *root*; and at the ſecond, we had the *root* true to eighteen places.

Monſ.

Monf. de Lagney publifhed a rule for the furfolid *root*, or fifth power, which quintuplicates the figures of the *roots*, at leaft. The rule is this:

$$\sqrt[5]{a^5 \pm b} = \frac{1}{2}a + \sqrt{\sqrt{\frac{1}{4}a^4 \pm \frac{b}{5a}} - \frac{1}{4}aa}.$$ See Phil. Tranf. N° 210, or Lowthorp's Abridgment, vol. i. cap. 1. fect. 20. p. 81. Maclaurin's Algebra, p. 242. Simfon's Algebra, p. 155. Where various general theorems for approximation to the *roots* of pure powers are given. See alfo Equation, and Reduction *of equations*.

For common ufe, thefe extractions may be moft commodioufly performed by logarithms; dividing the logarithm of the power by the index of the required *root*, that is, two for the fquare, three for the cube, &c. the quotient is the logarithm of the *root*; which may therefore be found by the tables.

In fome books we have tables of fquare and cube numbers, by which the neareft fquare or cube to any propofed number, within the limits of the table, may be found by infpection. Preftet has given a table of this kind in his Elemens des Mathematiques.

For the *roots* of adfected equations, fee Equation, and Reduction *of equations*.

Root, *cube*, in *Algebra*. Obferve, that the *cube-root* of any quantity A^3 may be A, or $\frac{-1+\sqrt{-3}}{2} \times$ A, or $\frac{-1-\sqrt{-3}}{2} \times$ A. This follows from what is fhewn under Unity, that the *cube-roots* of unity or 1 are 1, $\frac{-1+\sqrt{-3}}{2}$, $\frac{-1-\sqrt{-3}}{2}$. Hence the *cube roots* of A^3, or of $1 \times A^3$, will be as above mentioned. Maclaurin's Algebra, p. 226, where he fhews the ufe of fuch expreffions.

Root, *falfe*. See False.

Root, *impoffible*, is not only the fquare *root* of a negative quantity, but any other *root* denominated by any even number. Thus $\sqrt[4]{-1}$, $\sqrt[6]{-1}$, $\sqrt[8]{-1}$, or in general $\sqrt[2m]{-1}$, $\sqrt[2m]{-x}$, are all *impoffible roots*, or quantities. Some call them imaginary *roots* or quantities. See False *root*.

Root, *real*. See False *root*.

Root, *refidual*. See Residual.

Roots *of equations, extraction of the*. See Extraction; and Reduction *of equations*, and Root *of an equation*, fupra.

Roots, *radices*, in *Grammar*, are the primitive words of a language, whence others are compounded or derived.

Thus the Latin *fluo* is the *root* of *fluctus*, *fluxio*, *flumen*, *fluvialis*, *influxus*, *refluens*, *fluctifer*, *fluctifonus*, *fluctivagus*, &c. Thus alfo the Greek θεος, is the *root* of αθεος, ενθεος, ενθεσιασμος, &c.

And thus alfo, though in a lefs proper fenfe, the Danifh *rood* is the *root* of the Englifh word *root*; the Latin *radix* the *root* of the French *racine*, as *rodo* is the *root* of *radix*; and perhaps ῥαδιος, the *root* of *rado*.

The Greek and Hebrew tongues are learnt by *roots*. Of dictionaries, fome are in alphabetical order, others are difpofed by *roots*, as Scapula, Faber's Thefaurus, and the firft edition of the Dictionary of the French Academy. In the edition of 1718, this laft is thrown into the ufual alphabetical order.

ROPALON, in *Botany*, a name given by fome authors to the *nymphæa*, or *water*-Lily, and alfo to the *faba Ægyptia* of the river Nile.

ROPE, an affemblage of feveral twifts or ftrings of hemp, twifted together by means of a wheel; of various ufes, as in binding, ftaying, drawing, fufpending, &c.

When the *rope* is made very thick, it is called a *cable*; and, when very fmall, a *cord*.

Though it be difficult to give a certain account of the forces required to bend *ropes* of different diameters, in making them go round bodies of different bigneffes, yet to make no allowance for the lofs of motion fuftained thereby, would be as prejudicial to the practice of mechanics, as it would be to overlook the Friction of the parts of engines. The difficulty of afcertaining this force arifes from the different materials of which they are made, their different ftiffnefs, according as they are more or lefs twifted; and fometimes from the temperature of the air, as to moifture and drinefs.

Dr. Defaguliers has computed the forces required to bend *ropes* of different diameters, ftretched by different weights, round rollers of different bigneffes. The refult of his experiments is expreffed in the following table.

Diameters of the *ropes* of three ftrands, expreffed in tenth parts of an inch	Weights ftretching the *ropes*, expreffed in lb. avoirdupois	Refiftance about a roller of half an inch diameter, in oz. avoirdupois	Refiftance about a roller of one inch diameter, in oz. avoirdupois	Refiftance about a roller 1½ inch diameter, in oz. avoirdupois
0.5	60lb.	225 oz.	112½ oz.	75 oz.
0.2	60	90	45	30
0.1	60	45	22½	15
0.5	40	150	75	50
0.2	40	60	30	20
0.1	40	30	15	10
0.5	20	75	37½	25
0.2	20	30	15	10
0.1	20	15	7½	*

On the whole, it has been found by experiments, that the difficulty of bending a *rope* round a roller decreafes directly as the diameter of the roller increafes, or is, inverfely, as the diameter of the roller. See Defaguliers, Experim. Phil. vol. i. p. 233, &c. See Cordage.

A Table, fhewing how many fathoms, feet, and inches of a *rope* of any fize, under fourteen inches, makes a hundred weight, with the ufe of the table.

Inches	Fathoms	Feet	Inches	Inches	Fathoms	Feet	Inches	Inches	Fathoms	Feet	Inches	Inches	Fathoms	Feet	Inches
1	486	—	—	4¼	26	5	3	7½	8	4	—	10¾	4	1	8
1¼	313	13	—	4½	24	—	—	7¾	8	3	6	11	4	0	3
1½	216	—	—	4¾	21	3	—	8	7	3	6	11¼	3	5	7
1¾	159	3	—	5	19	3	—	8¼	7	0	8	11½	3	4	1
2	124	3	—	5¼	17	4	—	8½	6	4	3	11¾	3	3	3
2¼	96	2	—	5½	16	1	—	8¾	6	2	1	12	3	2	3
2½	77	3	—	5¾	14	4	6	9	6	0	0	12¼	3	2	1
2¾	65	4	—	6	13	3	—	9¼	5	4	0	12½	3	2	0
3	54	—	—	6¼	12	2	—	9½	5	2	0	12¾	2	7	8
3¼	45	5	2	6½	11	3	—	9¾	5	0	6	13	2	5	3
3½	39	3	—	6¾	10	4	—	10	4	5	0	13¼	2	4	9
3¾	34	3	9	7	9	5	6	10¼	4	4	1	13½	2	4	0
4	30	1	6	7¼	9	1	6	10½	4	2	2	13¾	2	3	6
												14	2	2	1

Suppofe I want to know how much of 8 inch and ¼ *rope* will make a hundred weight? Find 8¼ under inches, and againft it in the 6th column you will find 7 0 8, which fhews in a *rope* of 8¼, there will be 7 fathoms 8 inches required to make one hundred weight.

A Table, fhewing the weight of any cable or *rope* of 120 fathoms in length, and for every ½ inch from 3 inches to 24 in circumference.

Inches	Cwts.	Qrs.	Inches	Cwts.	Qrs.	Inches	Cwts.	Qrs.	Inches	Cwts.	Qrs.	Inches	Cwts.	Qrs.
3	2	1	7½	14	0	12	36	0	16	64	0	20	100	0
3½	4	0	8	16	0	12½	39	0	16½	68	0	20½	105	0
4	4	1	8½	18	0	13	42	1	17	72	1	21	110	1
4½	5	0	9	20	1	13½	45	2	17½	76	2	21½	115	2
5	5	1	9½	22	2	14	49	0	18	81	0	22	121	0
5½	7	0	10	25	0	14½	52	2	18½	85	2	22½	126	2
6	9	0	10½	27	2	15	56	1	19	90	1	23	132	1
6½	10	2	11	30	1	15½	60	0	19½	95	0	23½	138	0
7	12	1	11½	33	0							24	144	0

The greateft confumption of *ropes* is in navigation, for the tackling of fhips; where, though *ropes* include all forts of cordage, above one inch in circumference, yet there are feveral *ropes* particularly fo denominated: as, the *entering rope*, hung at the ladder to help people up; the *top-rope*; a *bolt-rope*, wherein the fail is fewed; *buoy-rope*, to which the buoy of the anchor hangs; *gueft-rope*, to tow the long boat; the *keel-rope*; the *bucket-rope*; *rudder-rope*, to fave the rudder, if it fhould chance to be beaten off; *preventor-rope*, to fave the yard, in cafe any part of the tyes fhould be broken; *breaft-rope*, to lafh the panels to the mafts; *guy-rope*, to keep the foremaft forwards directly over the hatch-way; and *boat-rope*, by which the boat hangs, or is faftened aftern of the fhip; *port-ropes*. See Port-*ropes*.

Ropes are diftinguifhed by being either cable-laid, or haufer-laid: the former are compofed of nine ftrands, viz. three great ftrands, each of which is compofed of three fmaller ftrands; and the latter is made with three ftrands, each of which contains a certain number of *rope-yarns*, in proportion to the fize of the *rope* required.

Ropes, *standing*, in a *Ship*, the shrowds and stays are so called, because they are not removed, unless to be eased or set taught.

Rope-*bands*. See Robbins.

Ropes, *drag*, in the *Artillery*, are those by which the soldiers pull the guns backwards and forwards both in their exercise and in an engagement. They are of various lengths and dimensions, as they are used for guns or howitzers of different weights.

Ropes, *foot*. See Foot-*ropes*.

Rope, *cord*, or *strap*, in the *Manege*, is any of these tied round a pillar, to which the horse is fastened, when they begin to quicken, and supple, to teach him to fly from the shambrier, and not gallop fastly or incompactly.

In those maneges where there is no pillar, a man stands in the centre of the ground, and holds the end of the *rope*.

Ropes *of two pillars*, are the *ropes* or reins of a cavezon, used to a horse that works between two pillars. See Pillar.

Rope-*dancer*. See Dancer, and Nusance.

Rope-*deck*. See Deck.

Rope-*yarn*, is the yarn of any *rope* untwisted. It commonly consists of cable-ends, which are worn out; and are called *junks of the cables*. It serves for many purposes among the sailors.

Rope-yarn properly denotes the smallest and simplest part of any *rope*, being one of the threads of which a strand is composed; so that the size of the latter, and of the rope into which it is twisted, are determined by the number of *rope-yarns*.

ROQUET, in *Zoology*, the name of a species of American lizard, of small size, and of a reddish brown colour, variegated with black and yellow spots. Its fore-legs are remarkably long for a creature of this kind; its eyes are particularly vivid and sparkling, and its head is carried continually erect; and the creature is almost always in motion, hopping about like a bird, and it usually carries its tail bent into a semicircle over the back. It is far from being shy or timorous, and is delighted at the sight of men; when tired with play or with running, it will open its mouth and pant, and loll out its tongue as the dogs do.

RORIDULA, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are, that the corolla has five petals, the calyx is composed of five leaves, and the fruit is a three-valved capsule. There is only one species.

RORIFEROUS *duct*, q. d. *dew dropping pipe*; a name given by some to the thoracic duct; from its slow manner of conveying, and, as it were, distilling, the chyle into the common stream of blood.

ROS, *dew*. See Dew.

Ros *solis*, in *Botany*. See Sun-*dew*.

Ros *vitrioli*, among *Chemists*, is sometimes used for the first phlegm distilled from vitriol in balneo Mariæ.

ROSA, in *Botany*. See Rose.

Rosa *crucis*, in *Church History*. See Rosycrucians.

Rosa *fatuina*, in *Botany*, a name given by some authors to the piony.

Rosa *junonis*, in *Botany*, a name given by some authors to the lily.

ROSACEOUS *flower*, *rosaceus flos*, in *Botany*, a term used to express such flowers as are composed of several petals or leaves, disposed in a sort of circular form, like those of the rose: such are the flowers of the piony, crowfoot, cinquefoil, &c. In this sort of flowers the disposition only of the leaves is regarded, their number being of no consequence. It is very seldom that the number is two or four, except in the circæa and onagra. The most frequent number of leaves in these flowers is five, and such as have four differ from the cruciform flowers, not only in their disposition, but in this, that the number is in the same species indeterminately four, five, or six, as is the case in the clematitis, the capers, and the species of rue, whereas in the cruciform ones it is ever constant. See *Tab. X. of Botany, Class* 21.

ROSACLORUM, or, according to some authors *rosi-chiero*, a fine red used to enamel on gold with. It is prepared in this manner: take ten pounds of crystal-glass, put it into a pot, and when it is well melted, add to it, at twice, a pound of the best red-lead; stir the mass well together, and afterwards cast it into water. Repeat this process three times, then when the matter is again in fusion, mix with it five ounces of calcined brass, and the same quantity of the deepest cinnabar; stir the whole well together, and let it settle three hours; then add of glass of tin three ounces, mix the whole, and it will be of a fine rose-colour. Merret's Notes on Neri, p. 350.

ROSADE, a kind of liquor, prepared of pounded almonds and milk, mixed with clarified sugar.

ROSALIA, a name used by authors for the measles, or a disease very like the measles, consisting in a number of asperities and protuberances of the skin, which soon die away.

ROSARBA, in *Botany*, the name of an imaginary plant, which has given great trouble to the commentators on the works of the ancients.

The Arabian writers, Avicenna, Serapion, and others, have mentioned two kinds of carob or ceration; the one esculent, and endued with the virtue of a gentle purgative, the other an astringent.

This last they have distinguished from the other by the name of the nabathæan pod or aljembut. They say, in their descriptions, that the aljembut is like the *rosarba*; so run the old translations; but the true meaning of the original is *rosa vineæ*. This was a name given to the common wild acacia-tree, and the tree, which produced the nabathæan pod, might be very well likened to this; it being, in reality, only a species of the acacia, and the succus acaciæ, or inspissated acacia juice of the shops; being, according to Isidore, made oftentimes from the unripe fruit of this very species.

ROSARIA, among the Romans, a kind of perfumes, so called either from their being chiefly made of roses, or because they had a most exquisite odour.

ROSARUM *acetum*. See Acetum.

ROSARY, in the Romish *Church*, a chaplet consisting of five or fifteen decads of beads, to direct the recitation of so many Ave Maria's, in honour of the Virgin.

Rosary also denotes a particular mass or form of devotion addressed to the Virgin, to which the chaplet of that name is accommodated. It consists of fifteen repetitions of the Lord's prayer, and an hundred and fifty salutations of the blessed Virgin; whilst the *crown*, as it is called, according to the different opinions of the learned concerning the age of the Virgin, consists of six or seven repetitions of the Lord's prayer, and six or seven times ten salutations or Ave Maria's.

Some attribute the institution of the *rosary* to St. Dominic; but F. d'Achery shews it was in use in the year 1100; so that St. Dominic could only make it more celebrated. Others attribute it to Paulus Libycus, and others to St. Benedict; others to the Chartreux; others to Venerable Bede; and, finally, others to Peter the Hermit. Those who ascribe it to St. Dominic, differ as to the particular time of its institution; some referring it to the year 1208, when he preached against the Albigenses; others will have him to have set it on foot in the course of his missions in Spain, before he passed into France.

Rosary, *order of the*, or of *our Lady of the* Rosary, is an order of knights, supposed by Schoonebeck, and the Jesuit Bonanni, to have been instituted by St. Dominic; but by mistake; for that saint never instituted any order under this name, and these authors apparently make a military order of an army of croisees, who, under the command of the count de Montfort, fought against the Albigenses.

The abbot Justiniani, and M. Hermant, will have this order to have been established by an archbishop of Toledo, named Frederic, after St. Dominic's death; and to have borne for a badge a black and white cross, in the middle whereof was represented our Lady, holding her little son in one hand, and in the other a *rosary*. F. Mendo adds, that they were obliged to rehearse the *rosary* on certain days. After all, F. Helyot doubts whether or no such an order is in reality ever existed.

Rosary is a word frequently met with in the ancient histories of Ireland, and used to express a peculiar sort of base money coined abroad, in the form of the penny, current in that kingdom; but of so much baser an alloy, that it was not worth quite half the real value of the penny. This and many other such coins were decried, and it was made death to import any of them, by Edward the First, in 1300.

ROSATA *aloe*. See Aloe.

ROSATUM *acetum*. See Acetum.

Rosatum *aromaticum*. See Aromaticum.

Rosatum *vinum*. See Vinum.

ROSBOTH, a word used by some authors to express a soft excrescence from any part.

ROSCOLÆ, a name given by some medical writers to the measles.

ROSE, *rosa*, in *Botany*, a genus of the *icosandria polygynia* class. Its characters are these: the empalement of the flower is divided into five parts at the top, but the base is globular, and bell-shaped; the flower hath five oval heart-shaped petals inserted in the empalement, and a great number of short hair-like stamina, inserted in the neck of the empalement, terminated by three-cornered summits; it hath many germina situated in the bottom of the empalement, each having a short hair style, inserted in the sides of the germina, crowned by obtuse stigmas; the fleshy base of the empalement afterward becomes a top-shaped coloured fruit with one cell, includ-ing

ing many hairy oblong ſeeds, faſtened on each ſide to the empalement. Miller enumerates twenty-two ſpecies, including many varieties. Linnæus reckons fourteen ſpecies.

We have a vaſt variety of theſe beautiful flowers preſerved in our gardens; ſome few of which are natives of our own country, but the far greater number are of foreign origin. They are all propagated either by ſuckers, by layers, or by budding them on the other ſorts of *roſes*; the laſt method is but ſeldom practiſed, but is neceſſary for the finer ſorts, which do not naturally ſhoot vigorouſly, and which produce few or no ſuckers. The beſt ſort of *roſe* for ſtocks is the Frankfort kind; the ſeaſon for doing it is in June, and there muſt be great care afterwards, that the ſtock produce no ſuckers at the bottom, for theſe would ſoon ſtarve the bud.

When *roſes* are to be propagated from ſuckers, they are to be taken off annually in October, and tranſplanted into nurſery-beds, or into the places where they are to remain. They always take root well the firſt year, but if ſuffered to remain on the ſtock longer, they grow woody, and often fail.

But the beſt method of obtaining vigorous plants, is, by laying down the ſhoots; this is to be done in autumn; and by the autumn following they will have taken root ſo well, that they may be taken off from the old plant, and removed to the places where they are to remain. Theſe may be tranſplanted any time from October to April, but the earlier the better.

Roſes, in general, delight in a rich moiſt ſoil, and an open ſituation, in which they will produce great quantity of flowers, and thoſe much more beautiful than when they are on a dry ſoil and ſhady ſituation.

All the pruning they require is to have their dead wood cut, and their ſuckers taken away every autumn; and if there are any very luxuriant branches they may be ſhortened, and the doing this will ſupply the other parts of the tree with freſh wood. Miller.

For the method of deſtroying inſects in *roſe*-trees, ſee Peach.

The kinds of *roſes* chiefly uſed in medicine are the *red* and *damaſk roſes*. The *damaſk* are a good and ſafe gentle purgative for children, adminiſtered in infuſion, or by way of ſyrup. The doſe of the decoction, or ſtrong infuſion of the flowers, made into a ſyrup, with a proper quantity of ſugar, is a ſpoonful; but of the extract, obtained by inſpiſſating the decoction, from a ſcruple to a dram, is ſaid to be ſufficient for adults. The college of London directs the ſyrup to be made, by preſſing out the liquor remaining after the diſtillation of ſix pounds of damaſk roſes, and boiling it down to three pints; then, after it has ſettled for a night, adding five pounds of fine ſugar, and boiling the mixture to the weight of ſeven pounds and a half. A ſpoonful of this ſyrup appears to be equivalent to about three drams of the freſh flowers. The ſolutive matter of the flowers is combined alſo in the ſame manner, for the purpoſes of clyſters, with brown ſugar and honey; towards the end of the boiling down of the ſtrained decoction, an ounce of cummin ſeeds, bruiſed a little, and tied in a linen cloth, is added, and the liquor afterwards boiled with four pounds of brown ſugar, and two of honey. The *red* are aſtringent; but their aſtringency is greateſt before the flowers have opened, in which ſtate they are choſen for medicinal uſe, as a mild corroborant; the full blown flowers being probably as laxative as the former kind. The aſtringency of the buds is improved by haſty exſiccation in a gentle heat; by ſlow drying, both the aſtringency and colour are impaired. The freſh buds, clipt from the white heels, and beaten with thrice their weight of fine ſugar, form an agreeable conſerve; which is given in doſes of a dram or two, diſſolved in warm milk, in weakneſſes of the ſtomach, coughs, and phthiſical complaints. Mixtures of the *roſes*, with a larger proportion of ſugar, are made in the ſhops into lozenges; one part of the buds, clipt from the heels, and haſtily dried, and twelve parts of fine ſugar, are ſeparately reduced into powder, then mixed, and moiſtened with ſo much water as will render them of a due conſiſtence for being formed; or the conſerve is mixed with as much freſh ſugar as is ſufficient to bring it to a like conſiſtence; that is, about thrice its own weight.

A ſyrup is formed by infuſing ſix ounces of the dried *roſe*-buds in four pints, or four pints and a half of boiling water; and the infuſion is made into a ſyrup with ſix pounds of fine ſugar, or boiled to a ſyrupy conſiſtence with ſix or ſeven pounds of clarified honey: this ſyrup is chiefly valued for its gratefulneſs, and fine red colour; the mixture with honey is uſed as a mild, cooling detergent, particularly in gargariſms for inflammations, and ulcerations of the mouth and tonſils. The infuſions, acidulated with a little vitriolic acid, and ſweetened with ſugar, make a grateful, cooling, reſtringent julep, which is ſometimes preſcribed in hectic caſes and hæmorrhages, and ſometimes uſed as a gargariſm. The college of London orders two pints and a half of boiling water, mixed with a ſcruple of oil of vitriol, to be poured on half an ounce of the freſh buds, and an ounce and a half of fine ſugar to be diſſolved in the ſtrained infuſion. That of Edinburgh orders two pints of water, and half a dram of the acid, to half an ounce of the dry buds, and an ounce of ſugar. See Infusion. Lewis's Mat. Med.

For the conſerve of the dog-*roſe*, ſee Hip.

It is a tradition among the ancients, that the god of love made a preſent to Harpocrates, the god of ſilence, of a beautiful *roſe*, the firſt that had been known, to engage him not to diſcover any of the private practices of his mother Venus. And hence it became a cuſtom to have a *roſe* placed in their rooms of mirth and entertainment, that under the aſſurance thereof they might be induced to lay aſide all conſtraint, and ſpeak what they pleaſed. Thus did the *roſe* become a ſymbol of ſilence; ſo that to be *ſub roſa*, *under the roſe*, denotes as much as to be out of danger of having any converſation divulged.

Rose-water, a water drawn by diſtillation from damaſk *roſes*.

Six pounds of the freſh *roſes* ſtrongly impregnate, by diſtillation, a gallon or more of water ſtrongly with their fine flavour. On diſtilling large quantities, there ſeparates from the watery fluid a ſmall portion of a fragrant butyraceous oil, which liquifies by heat, and appears yellow, but concretes in the cold into a white maſs; an hundred pounds of the flowers afford ſcarcely half an ounce of the oil. The oil and water, uſed chiefly as perfumes and flavouring materials, are recommended by Hoffman as excellent cordials for raiſing the ſtrength and ſpirits, and allaying pain. They appear to be of a mild nature, and not liable to heat or irritate the conſtitution.

Roſe-water is, however, in great eſteem throughout the Eaſt, particularly in China and Perſia, where the trade thereof is very conſiderable. The *roſe*-leaves, remaining at the bottom of the ſtill, are kept under the name of *roſe* cakes for a perfume.

Rose *bay*, in *Botany*. See Oleander.

Rose, *campion*. See Campion.

Rose, *China*, the name by which ſome call the *ketmia* of botaniſts. See *Syrian* Mallow.

Rose, *Chriſtmas*. See Hellebore.

Rose, *corn*. See Poppy.

Rose, *mountain-bay*, or *dwarf bay*, a name by which the chamærhodendros of botaniſts is ſometimes called. See Kalmia, and Rhododendron.

Rose, *gelder*, a name ſometimes given to the *opulus*, or water-elder. See Gelder *roſe*.

Rose, *Virginian gelder*. See Spiræa.

Rose, *Martinico*. See *Syrian* Mallow.

Rose *of Jericho*, a name by which ſome call the *heſperis*. See *Dame's* Violet, and Anastatica.

Rose *mallow*. See Mallow.

Rose, *South Sea*, a name ſometimes given to the *nerion* of botaniſts. See Oleander.

Rose, *rock*, *ciſtus*, in *Botany*, a genus of the *polyandria monogynia* claſs. Its characters are theſe: the flower, which hath a five-leaved empalement, two of the middle alternate leaves being ſmaller than the other, has five large roundiſh petals, which ſpread open, and a large number of hairy ſtamina, which are ſhorter than the petals, and terminated by ſmall roundiſh ſummits; in the centre is ſituated a roundiſh germen, which becomes an oval, cloſe capſule, having in ſome five, and others ten cells, filled with ſmall roundiſh ſeeds. Miller enumerates eighteen ſpecies, which grow naturally in the ſouth of France, Spain, and Portugal; and Linnæus thirty-ſeven ſpecies.

The ladanum is obtained from a ſpecies of *ciſtus*.

The ſeveral ſpecies of this beautiful ſhrub are to be propagated by ſowing their ſeeds on a gentle hot-bed, or on a warm border of common rich earth in March. When the plants are grown to be about an inch high, they ſhould be tranſplanted either into ſmall pots, or into a border of rich earth, placed at ſix inches diſtance. They will require ſome ſcreening from hard weather for the firſt winter, and muſt be watered at times. In the ſpring following, they muſt be very carefully removed, with as much as poſſible of their own earth about them, and be placed where they are to remain. They are very bad plants to remove when old.

They may alſo be propagated by cuttings, planting them in a rich bed in May or June, and ſhading them with mats, and watering them carefully for two months: they will by that time have taken root, and may be treated as the ſeedling plants of the ſame age. Miller.

ROSE-*root*, *rhodiola*, in *Botany*, a genus of the *dioecia octandria* class. Its characters are these: it hath male and female flowers in different plants; the male flowers have an empalement of one leaf, cut into four or five segments almost to the bottom; they have four obtuse petals, and four nectariums, which are erect and shorter than the empalement, with eight awl-shaped stamina, which are longer than the petals, terminated by obtuse summits; they have four oblong acute germina, without style or stigma, so are abortive; the female flowers have the same empalement as the male; they have four obtuse petals, equal with the empalement, and have four nectariums like the male, with four oblong acute-pointed germina, sitting upon an erect style, crowned by obtuse stigmas; the germina afterward become four horned capsules, compressed on their inner side, with roundish seeds. Miller reckons two, and Linnæus only one species.

ROSES, *essence of*. There is scarce a more valuable perfume in the world, than the essence of damask *roses*, and scarce any thing is obtained from its subject with more difficulty, and in less quantity. All essences or essential oils are, while in the plant, contained in certain vesicles lodged in different parts, and of different structure: these vesicles are in the *rose* particularly small and tender, and are placed very superficially; the consequence of this is, that there is originally but a very little of this essence in the flower, and this is the very subject that will be dissipated and lost when the flowers are gathered and thrown in a heap together, as they are succulent, and very quickly heat in lying together. To avoid all dissipation and waste of this choice essence, the *roses* should be thrown into the still as soon as gathered, and distilled with very little water, and that in a balneum Mariæ; then the fire is to be continued so long as the flowers float separate about in the water; but as soon as ever they form themselves into a cake, and stick to the bottom, the distillation should be finished, as they then yield no more essence. With all these precautions, however, it is with great difficulty we can procure any essence of *roses*. What we obtain by this distillation being chiefly a very odoriferous and fragrant water. In the warmer countries the same caution affords a larger quantity of oil, which may be separated and preserved under the name of the essence. In Italy, they make some quantity of it, but there it is very dear; a vast quantity of the flowers yielding only a very little essence, and that being thick and troublesome in the procuring, as it every where sticks to the vessels.

It is to be observed, that the season of the year, as to wet or dry, makes a very great difference in the essential oils of all plants; they are always much finer in dry and hot seasons, than in cold and moist: we find our *rose*-water in England much finer, and more fragrant, though distilled in the same proportion, in hot and dry summers, than in colder and rainy ones; and Mr. Geoffroy gives an account that he succeeded, one very hot and dry year, in the making essence of *roses* in France in the following manner.

As the *roses* were brought to him fresh gathered, he turned them immediately into the still; and drawing over the water into a glass matrass, when it had stood by some time, and was perfectly cold, he discovered some of the essence fixed to the sides of the matrass, and the surface of the water covered with a thin reticular pellicle. All the contents of the matrass were put to filter through a paper, supported by a fine linen cloth; and the filtrated water was added to new *roses* for many succeeding distillations, the produce of which was all filtered through the same paper. After a long course of distillations, with fresh flowers every time, but still with the same vessels and the same water, there was found in the paper of the filtre a quantity of thick essence; this being carefully washed out of the paper, with a small quantity of the most fragrant of the water, and afterwards separated pure from its surface, was very white and extremely fragrant, and as thick as fine butter. This is not the only essential oil which naturally concretes into this firm state; oil of annifeed, though fluid when distilled, always concretes in the same manner on the first approach of cold; and another oil of this kind is that of the laurel, which is used in some places, though very improperly, to give the scent and taste of bitter almonds, or apricot kernels, to foods of different kinds.

Monsieur Homberg has taught us how to gain a larger quantity of the essential oil of *roses* than in the usual distillation, by the previous addition of mineral acids, as the spirit of salt, vitriol, &c. thereto; which increase the fermentation, and joining with the oil, render it more liquid, and easier to be raised by heat. He advised a perfumer (who before scarce obtained an ounce of oil from a hundred weight of *roses*) to steep his flowers, for fifteen days, in water made sharp with the spirit of vitriol; by which means the perfumer, upon distillation, found his quantity of oil increased almost a third.

The perfumers keep the structure of the vessel they employ in this distillation a great secret. Mr. Homberg tells us, it is a large convenient still, that opens in a tube at the top to receive the water, which must often be poured upon the *roses*, to bring over the oil with it; this it does but very slowly, and so requires that its quantity be large; the still also opens below, that the flowers, when they will yield no more oil, may be easily taken out; but the principal contrivance is the figure of the vessel which receives the oil; this is made like an ordinary matrass, from the lower part of the belly whereof comes a tube, as from an old-fashioned cruet, and rising to the bottom of the neck of the receiver, it bends outwards; so that though the vessel usually contains but two or three French pints, it conveniently receives and lets pass many hundred pints of the *rose*-water, without any necessity of being changed; for a change would lose the small quantity of the oil obtained. The water distilled runs through a pipe into a second receiver: the oil being lighter than the water, floats upon its surface, and adheres to the neck of the vessel, as high as the aperture of the little pipe, while the water runs from the bottom of the first receiver into the second. See Mem. de l'Acad. des Sciences, 1700.

Mr. Homberg observes, that this still may be useful to draw off any kind of precious essential oils.

ROSE-*fly*, in *Natural History*, the name given by authors to a peculiar species of fly, found very frequently on *rose*-bushes, and produced out of a bastard caterpillar, which feeds on the leaves of that tree.

The male of this fly has a long body, the female a short and thick one; she deposits her eggs in small holes, which she makes in the bark of the young branches, and for this purpose is furnished with a very remarkable instrument, placed at the hinder part of the body, which is a kind of saw.

This is a four-winged fly, and is so common on *rose*-bushes, that it is scarce possible to miss it in any of the summer months; and the parts of the branches where it has deposited its eggs are so vitiated by it, that they also are easily known. They are usually swelled to a greater bigness, than either the part above or below them, and are usually somewhat bent; they are often black on the underside, and among this blackness the holes made for the eggs, and often the eggs in them, may be seen. The head and breast of this fly are black; it wings also are edged with black, its body is yellow, and its legs yellow, with a few black spots.

If these flies be observed in a summer morning, as they are crawling upon the branches of the *rose*-tree, they will soon be found at work for the depositing of their eggs. These creatures give us a very good opportunity of observing the manner in which they perform this, as they are of a very sluggish disposition, and will stand still even to be taken between the fingers; so that when one of them is in a proper situation, it may be examined by bringing the eye near it, and by using the common magnifying glasses, without quitting its place or its work; and if there be leaves of the tree, or small branches of it in the way, they may be removed without disturbing the creature. Reaumur's Hist. Inf. vol. ix. p. 145.

There is, besides this species, another fly of the same genus, produced from a bastard caterpillar of the *rose*-tree, and of the same shape and structure of parts with this, but differing in colour. The head and breast of this fly are of a deep violet colour, the body is yellow, and the legs and wings are of a somewhat paler violet tinge. This creature also deposites its eggs in holes, made in the branches of the *rose*-tree, by means of a double saw, placed at the hinder part of the body; but, as the former species lays them in a single straight line, this disposes them in a very beautiful and very regular manner in two rows.

ROSE-*galls*, in *Natural History*, a name given by authors to certain unnatural productions of the *rosa sylvestris*, or dog-*rose*, occasioned by the bites of insects. There are two kinds of these, the one very common, the other more rare.

The scarcer kind is usually found on the young shoots, and on the heps, or fruit, and is of a woody substance; the other is hairy and spongy, and is found on the old branches. The woody kind usually appears in the months of June and July, and is always found in clusters. These are composed of ten, twelve, or more galls of different sizes and figures, some round, others oblong, some of the size of an olive, and others not larger than a pea. They are of the common substance of the white wood, or blea, of trees, and, when situated on the fruit, they

they prevent its ripening, and make a very singular figure. They are of a reddish colour, and are usually smooth and glossy, but sometimes they are beset with short and fine prickles.

The hairy *rose-gall* is too common, and too singular a figure to have escaped the observation of persons in all ages; it has been introduced into medicine in many parts of the world, and is at this time prescribed in Germany, when reduced to powder, in diarrhœas, dysenteries, and other disorders of the bowels, and to promote urine and break the stone.

These *rose-galls*, though they appear at first sight composed of tufts of hair, are, however, in reality, made up of several small galls, growing from a bud on the branch, and forming a cluster on the part. They are of an oblong figure, and resemble the shape of a plum-stone. Each of them is the habitation of a single worm, each having one cell in the centre.

All these galls of the *rose*-tree afford the same species of worms and flies. The proper inhabitants, however, are hardly to be distinguished by the most curious observer from the great variety of species which are found in them, all produced of the eggs of other flies, whose worms are of the carnivorous kind, and are lodged in the gall, not to feed on the juices of the tree, but on the flesh of the proper inhabitant. When the parent-fly, who gives origin to the galls, has deposited her eggs, and the tumor, in consequence, begins to be formed, an enemy of this kind pierces the covering, and sends in her offspring to feed on the inhabitant. These are flies of the ichneumon kind, and several species of them are of great beauty. All the flies described by authors as issuing out of this gall seem to have been of this kind: the proper inhabitant, being a small black fly of no great beauty, is disregarded, while the others have been particularly described.

Mentzelius has given an elegant account of a species whose back is of a fine blue, and its belly purple; and others have figured and described greenish and gold-coloured ones; but these are all ichneumons, all bred of devouring enemies, which have fed on the proper inhabitants of the galls, and lived and transformed themselves in their cells.

ROSES, *oil of*. See *Essence of* ROSES.

ROSE-*pink*. See PINK.

ROSE, *golden*, is a *rose* which the pope blesses at mass, on the first Sunday in Lent, while they sing Lætare Jerusalem; and which, after mass, he carries in procession; and then sends as a present to some sovereign prince.

ROSE, *the factions of the red and white*, are famous in our English histories. They had their rise in 1454, under Henry VI. between the houses of York and Lancaster, and ended in Henry VII. who united the two branches. The house of Lancaster had for its badge a *red rose*; that of York a *white* one.

ROSE-*wood*, *lignum rhodium*, or *aspalathum*. See ASPALATH.

ROSE, in *Architecture* and *Sculpture*, an ornament cut in resemblance of a *rose*. See *Tab. Archit. fig.* 11.

It is chiefly used in frizes, corniches, and vaults of churches, and particularly in the middle of each face of the Corinthian ABACUS. And in the spaces between the modillions, under the plafonds of corniches.

ROSE, in *Heraldry*, is a DIFFERENCE denoting the seventh son of a family.

ROSE *nails*. See NAIL.

ROSE *diamond*. See DIAMOND.

ROSE *noble*, an ancient English gold coin, first struck in the reign of Edward III. and then called the *penny of gold*; since called *rose-noble*, because stamped with a *rose*. It was current at 6*s*. 8*d*. See MONEY.

ROSEA, a name given by some authors to the erysipelas, or St. Anthony's fire.

ROSEMARY, *rosmarinus*, in *Botany*, a genus of the *diandria monogynia* class. Its characters are these: the flower has a tubulous empalement, compressed at the top, the mouth erect and divided into two lips, the upper lip entire, and the under bifid; it hath one petal, whose tube is longer than the empalement; the brim is ringent; the upper lip short, erect, and divided into two parts, whose borders are reflexed; the lower lip is reflexed and cut into three parts; it hath two awl-shaped stamina, inclining toward the upper lip, terminated by single summits, and a four-pointed germen, with a style, whose shape, length, and situation are the same with those of the stamina, crowned by an acute stigma; the germen afterwards becomes four oval seeds, sitting in the bottom of the empalement. Linnæus mentions only one, and Miller two species.

We have three or four varieties of this shrub in our gardens; they grow wild in the south of France, and in Spain and Italy, on rocks near the sea, where they multiply prodigiously. With us they grow the most vigorously on a moist rich soil, but they are much sweeter scented when on a poor soil, and on such they bear the severity of our seasons much better, than where they grow more freely.

They are all propagated by planting slips or cuttings of them, in the spring of the year, on a bed of light fresh earth, and when they are rooted, they are to be removed into the places where they are to remain. The best season for doing this is in the beginning of September; if they are planted later than this, they seldom live through the winter; therefore such as are not transplanted at this time should be left till the following spring, when March is a very good time for removing them; and, if this be done in showery weather, they take root almost immediately. The plants are sometimes killed in cold winters in our gardens, but when by accident they have rooted themselves in an old wall, as is often the case, they stand all weathers unhurt, which is owing to their being stinted, and their roots dry.—Miller.

The flowers of *rosemary* are used on many occasions, in medicine; they are cephalic, good in all nervous and hysteric cases, and are ingredients in many compositions of the shops; they are esteemed of great service in apoplexies, palsies, vertigoes, and epilepsies; they strengthen the sight, are good against a stinking breath; they are also prescribed in obstructions of the liver and spleen. The conserve of the flowers, made by beating them with thrice their weight of sugar, is an excellent thing to bring other medicines in these intentions into form, when they are intended to be given in boluses and electaries: but the fragrance of the flowers being in a great measure destroyed by beating and bruising them, this conserve has very little of the flavour of the *rosemary*. The active matter of the flower resides chiefly, if not wholly, in the cup, which, however, is weaker than the leaves or tops, though more pleasant, and, therefore, generally preferred.

The HUNGARY *water*, so long famous in England, and elsewhere, is made of the flowers of *rosemary* distilled with rectified spirit of wine.

The leaves and tops of *rosemary*, distilled with water, yield a thin, light, pale-coloured essential oil, inclining a little to yellowish, or greenish, of great fragrancy, though not quite so agreeable as the *rosemary* itself. From one hundred pounds of the herb, in flower, were obtained eight ounces of oil: and the decoction, on being inspissated, yields an unpleasant, weak, bitterish extract. Tournefort observes, that those sorts of *rosemary*, which produce neither flowers nor seeds, and which have very hard shrubby stalks, and long narrow leaves, smell strongly like camphor, and yield on distilling a large quantity, for the purpose of obtaining their oil, a portion also of real camphor.

ROSEMARY, *poet's*. See POET'S *cassia*.

ROSEMARY, *Spanish*. See SPARROW-*wort*.

ROSEMARY, *wild*, *marsh cistus*, or *ledum*, in *Botany*, a genus of the *decandria monogynia* class. Its characters are these: the empalement of the flower is indented in five parts; it hath five oval concave petals, ten slender stamina, and a roundish germen, which afterwards becomes a capsule with five cells, opening at the base in five parts, filled with small, narrow, acute-pointed seeds.—We have but one species of this genus, which grows naturally upon mosses and bogs, in many parts of Yorkshire, Cheshire, and Lancashire. Miller.

ROSEMARY, *lesser wild*. See ANDROMEDA.

ROSICRUCIANS. See ROSYCRUSIANS.

ROSIN, *resina*, in *Pharmacy*. See RESIN.

ROSIN is particularly used for a resinous matter prepared from the juice of the pine-tree; in ordinary use for the making of ointment, plasters, and for other purposes.

For the method of procuring it, see PINE, and TURPENTINE.

ROSLAND, in our old writers, heathy land, or ground full of ling: also watery and moorish land.

ROSMADIAN, a name used by the alchemists for what they call mercury of the philosophers.

ROSMARUS, in *Zoology*, the name of an animal called also by some the sea-horse, and more usually known by the name of MORSE.

ROSOLIS, or ROS-SOLIS, popularly, ROSA-SOLIS, *sundew*, an agreeable spirituous liquor, formerly much in repute, chiefly taken after meals, by way of dram, to aid digestion; being composed of burnt brandy, sugar, cinnamon, and milk-water, and sometimes perfumed with a little musk.

It had its name, because anciently prepared wholly of the distilled water of the plant *ros solis* (see SUN-*dew*); but that plant was at length neglected in the composition.

The

The best was that of Turin. The French have now a particular kind not called *ros solis*, but *du roy*; because used with good effect by Lewis XIV. It is composed of Spanish wine, wherein are infused anise, fennel, aneth, coriander, &c. for three weeks.

ROSOMACHA, or ROSOMAK, in *Zoology*, a name given, by the Russians, to the GLUTTON. They are, says Olaus, taken by the hunters chiefly on account of their skins, which are much esteemed by people of fortune for robes, as being variegated with very bright colours, resembling flowers.

ROSPUS, a name used by some authors for the strange fish called the *rana piscatrix*, or frog-fish. See SEA *devil*.

ROSSE, in *Ichthyology*, the name given by Bellonius to that kind of cyprinus of Artedi, which we call the ROACH.

ROST, in *Metallurgy*, a term used by the miners at Chremnitz to express the ore of gold after it has been washed and powdered, and melted first with lime-stone, and afterwards burnt with charcoal alone. See LECH.

ROSTEN, in the *Materia Medica* of earlier ages, a name given to crab's eyes.

ROSTER, in *Military Language*, a plan, or table, by which the duty of officers, entire battalions, and squadrons, is regulated.

ROSTRA, in *Antiquity*, a part of the Roman forum, wherein orations, pleadings, funeral harangues, &c. were delivered.

The rostrum was a kind of chapel, taken out of the forum, and furnished with a suggestum, or eminence, called more particularly the *rostra*, where the orators stood to speak.

It was adorned, or, as Livy says, built with the beaks of ships taken from the people of Antium, in a naval engagement; whence the name.

There were two kinds of *rostra*; *rostra vetera* and *rostra nova*. The latter was erected by Augustus, and decorated with the prows of vessels, which he took at the battle of Actium. The first were those already described.

ROSTRALIS *corona*, *rostral crown*, in *Antiquity*. See CROWN.

ROSTRALIS *columna*, *rostral column*. See COLUMN.

ROSTRATA, in *Zoology*. See TOUCAN.

ROSTRIFORMIS *processus*, in *Anatomy*, the same as CORACOIDES.

ROSTRUM literally denotes the beak or BILL of a bird. This is a hard horny substance, consisting of an upper and under part, extending from the head, and answering to the mandibles in quadrupeds. Its edges are generally plain and sharp, like the edge of a knife, or cultrated; sometimes serrated, or jagged, or pectinated, or denticulated; but always destitute of real teeth immersed in sockets.

Hence the word is also figuratively applied to the beak, or fore-part of the head of a ship.

The *rostrum*, or snout, in fishes, varies very much in figure, and serves as a considerable article of distinction. It is, 1. in some plagioplateous, or depressed, as in the pike, &c. 2. In some it is conic in shape, as in the oxyrynchus, &c. 3. In some it is extended into a long and sharp point, as in the common ones. And, 4. in others it is triangular, or nearly so, as in the rays.

ROSTRUM is also used to signify an instrument wherewith paper is ruled for musical compositions.

ROSTRUM, in *Chemistry*, signifies the nose, or beak, of the common alembic, which conveys the liquor distilled into its receiver.

ROSTRUM is also a sort of crooked scissars, which the surgeons, in some cases, make use of for the dilatation of wounds.

ROSYCRUCIANS, ROSICRUCIANS, or *brothers of the* ROSY-CROSS, a name assumed by a sect or cabal of hermetical philosophers; who arose, as it has been said, or at least became first taken notice of, in Germany, in the beginning of the fourteenth century.

They bound themselves together by a solemn secret, which they all swore inviolably to preserve; and obliged themselves, at their admission into the order, to a strict observance of certain established rules.

They pretended to know all sciences, and chiefly medicine: whereof they published themselves the restorers. They pretended to be masters of abundance of important secrets; and, among others, that of the philosophers stone; all which they affirmed to have received by tradition from the ancient Egyptians, Chaldeans, the Magi, and Gymnosophists.

Their chief was a German gentleman, called Christian Rosencruz, educated in a monastery, where he learnt the languages. About the close of the fourteenth century, he went to the Holy Land, where falling sick, at Damascus, he consulted the Arabs, and other eastern philosophers, by whom he was supposed to be initiated into this wonderful art. At his return into Germany, he formed a society, to whom he communicated the secrets he had brought with him out of the East, and finally died in 1484. The whole of this account is generally rejected as fabulous.

They have been distinguished by several names, accommodated to the several branches of their doctrine. Because they pretend to protract the period of human life, by means of certain nostrums, and even to restore youth, they were called *immortales*.

As they pretended to know all things, they have been called *illuminati*: and because they have made no appearance for several years, but have kept altogether incognito, they have been called the *invisible brothers*.

Their society is frequently signed by the letters F. R. C. which some among them interpret *fratres roris cocti*; it being pretended, that the matter of the philosophers stone is dew concocted, exalted, &c.

Some, who are no friends to free-masonry, make the present flourishing society of free-masons a branch of *Rosicrucians*; or rather the *Rosicrucians* themselves, under a new name or relation; viz. as retainers to building. And it is certain, there are some free-masons who have all the characters of *Rosicrucians*; but how the æra and original of masonry, as traced by Mr. Anderson, and that of *Rosicrucianism*, here fixed from Naudæus, who has written expresly on the subject, consist, we leave others to judge.

Notwithstanding the pretended antiquity of the *Rosicrucians*, it is probable that the alchemists, Paracelsists, or *fire-philosophers*, who spread themselves through almost all Europe, about the close of the sixteenth century, assumed, about this period, the obscure and ambiguous title of *Rosicrucian* brethren, which commanded, at first, some degree of respect, as it seemed to be borrowed from the arms of Luther, which were a *cross* placed upon a *rose*.

But the denomination evidently appears to be derived from the science of chemistry. It is not compounded, says Mosheim, as many imagine, of the two words *rosa* and *crux*, which signify *rose* and *cross*, but of the latter of these words, and the Latin word *ros*, which signifies *dew*. Of all natural bodies, dew was deemed the most powerful dissolvent of gold: and the *cross*, in the chemical language, is equivalent to *light*, because the figure of a cross + exhibits, at the same time, the three letters of which the word *lux*, or *light*, is compounded. Now *lux* is called, by this sect, the seed or menstruum of the red dragon, or, in other words, that gross and corporeal light, which, when properly digested and modified, produces gold. Hence it follows, if this etymology be admitted, that a *Rosicrucian* philosopher is one, who, by the intervention and assistance of the dew, seeks for light, or, in other words, the substance called the philosophers stone.

The true meaning and energy of this denomination did not escape the penetration and sagacity of Gassendi, as appears by his Examen Philosophiæ Fluddanæ, sect. 15. tom. iii. p. 261. And it was more fully explained by Renaudot, in his Conferences Publiques, tom. iv. p. 87.

At the head of these fanatics were Robert Fludd, an English physician, Jacob Behmen, and Michael Mayer. The common principles, which serve as a kind of centre of union to the *Rosicrucian* society, are the following. They all maintain, that the dissolution of bodies, by the power of fire, is the only way by which men can arrive at true wisdom, and come to discern the first principles of things. They all acknowledge a certain analogy and harmony between the powers of nature and the doctrines of religion, and believe that the Deity governs the kingdom of grace by the same laws with which he rules the kingdom of nature; and hence they are led to use chemical denominations to express the truths of religion. They all hold, that there is a sort of divine energy, or soul, diffused through the frame of the universe, which some call the ARCHEUS, others the *universal spirit*, and which others mention under different appellations. They all talk in the most superstitious manner of what they call the signatures of things, of the power of the stars over all corporeal beings, and their particular influence upon the human race, of the efficacy of magic, and the various ranks and orders of demons. In fine, they all agree in throwing out the most crude incomprehensible notions and ideas, in the most obscure, quaint, and unusual expressions. Mosh. Eccl. Hist. vol. iv. p. 266, &c. Eng. ed. 8vo. See BEHMISTS and THEOSOPHISTS.

ROT, a disease, which, in moist years, is incident to sheep, in the same ground, where, in drier years, they are free from it; which yet arises, not only from the moisture,

moiſture, but from a certain principle of putrefaction, both in the air, and the graſs.

The true cauſe of this diſorder is very imperfectly underſtood, if not altogether unknown. Many have ſatisfied themſelves with attributing it to moiſture in general; others have aſcribed it to the quick growth of graſs and herbs in wet places; a late writer conſiders it as an indubitable fact, that the inſects which are ſometimes found in the livers, &c. of ſheep, and which he deſcribes as reſembling the flat-fiſh called the plaiſe, are the cauſe of the *rot*; another writer conjectures that it is a diſorder of the liver, occaſioned by obſtructed and inſpiſſated bile; but amidſt this variety of opinion, nothing more can be inferred than that this is probably a putrid diſeaſe.

It is well known, that it is the greateſt of all the inconveniences that attend the keeping of theſe uſeful animals. It is a very hard thing to prevent the *rot* if the year prove very wet, eſpecially in May or June. Salt-marſhes and lands where broom grows are the beſt places of preſervation for them. Sheep are ſometimes all cleared of the *rot* when not too far gone with it, only by removing them into broom-fields. Scurvy-graſs, muſtard, parſley, marſh-trefoil, and thyme, are alſo good for the prevention of it.

Some propoſe the giving ſheep half a handful of bay-ſalt, every month or oftener. A farmer is ſaid to have cured his whole flock of the *rot*, by giving each ſheep a handful of Spaniſh ſalt five or ſix mornings ſucceſſively; and there is great probability that this may be of ſervice: but the rational way of attacking all diſorders in cattle, is by conſidering what are the cauſes of them. It will appear, upon enquiry, that wet ſeaſons are the general occaſions of the *rot* in ſheep, and therefore it would be adviſeable for the owners, when ſuch ſeaſons come on, to remove the animals into the drieſt paſtures they can, and then to feed them principally with dry ſweet hay, oats, bran, and the like, this would prevent the occaſion; and if they were already a little infected, ſome ſalt, given with their dry food, would be a happy means of curing them.

The two following receipts have been much recommended by thoſe who have tried them with ſucceſs. Steep ſome regulus of antimony in ale, adding to it ſome grains of paradiſe, and a little ſugar to ſweeten it.—Of this infuſion, two or three doſes, each doſe being ſomewhat leſs than a gill, are to be given to the infected ſheep, at the interval of two days.

Or, ſteep a handful of rue in a pail of water all night, and in the morning put in as much ſalt as will make it bear an egg. Let half a pint of this liquor be given to each ſheep, and repeated thrice, every other morning. A farmer, who kept four hundred ſheep, tried this remedy, in a general *rot*, and loſt none; though his neighbours loſt almoſt all theirs. Of twenty, to which this liquor was not adminiſtered, for the ſake of experiment, many were rotten.

The following receipt was preſented to the Royal Society, by Mr. Boyle, and is preſerved in their regiſter, vol. ii. p. 303. Some time before Allhollantide, the ſheep is to be blooded under the eye, and, if neceſſary, again in the ſpring; and, in October, his gums may be rubbed at three or four different times with Spaniſh ſalt. But the principal remedy conſiſts in this: that about Allhollantide, or ſomewhat ſooner, you take a ſmall handful of the forementioned ſalt, and making the ſheep hold up his head, compel him to ſwallow it, and keep him from drinking any thing for about an hour after.

ROTA, in *Mechanics*. See Wheel.

Rota *Ariſtotelica*, *Ariſtotle's wheel*, is the name of a celebrated problem in mechanics, founded on the motion of a wheel about its axis; thus called, becauſe firſt, that we know of, taken notice of by Ariſtotle.

The difficulty is this. While a circle makes a revolution on its centre, advancing at the ſame time in a right line along a plane, it deſcribes, on that plane, a right line, equal to its circumference. Now if this circle, which we may call the *deferent*, carry with it another ſmaller circle, concentric with it, and which has no motion but what it receives from the deferent; which is the caſe of the nave of a coach-wheel carried along by the wheel; this little circle, or nave, will deſcribe a line in the time of the revolution, equal, not to its own circumference, but to that of the wheel: becauſe its centre advances in a right line as faſt as that of the wheel does; as being in reality the ſame therewith.

The matter of fact is certain: but how it ſhould be, ſeems a myſtery. It is obvious, that the wheel, advancing during the revolution, muſt deſcribe a right line equal to its circumference; but how would the nave, which revolves like the wheel, deſcribe a right line ſo much greater than its circumference? The ſolution Ariſtotle gives is no more than a good explication of the difficulty. Galileo, who next attempted it, has recourſe to an infinity of infinitely little vacuities in the right line deſcribed by the two circles; and imagines that the little circle never applies its circumference to thoſe vacuities; but in reality only applies it to a line equal to its own circumference; though it appears to have applied it to a much larger.

But it is evident, that this is all gratis dictum. The vacuities are imaginary; and why does not the great circle apply its circumference to them? Laſtly, the magnitude of theſe vacuities muſt be augmented or diminiſhed according to the different proportion of the two circles.

F. Tacquet will have it, that the little circle, making its rotation more ſlowly than the great one, does on that account deſcribe a line longer than its circumference; yet without applying any point of its circumference to more than one point of its baſe. But this is no more allowable than the former.

The attempts of ſo many great men proving vain, M. Dortous de Meyran, a French gentleman, had the good fortune to hit on a ſolution, which he ſent to the Royal Academy of Sciences; where being examined by Meſſ. de Louville and Saulmon, appointed for that purpoſe, they made their report, that it was ſatisfactory. The ſolution is to this effect:

The wheel of a coach is only acted on, or drawn in a right line; its circular motion or rotation ariſes purely from the reſiſtance of the ground whereon it is applied. Now this reſiſtance is equal to the force wherewith the wheel is drawn in the right line, inaſmuch as it defeats that direction; of conſequence, the cauſes of the two motions, the one right, the other circular, are equal; and therefore their effects, i. e. the motions, are equal. And hence the wheel deſcribes a right line on the ground equal to its circumference.

As for the nave of the wheel, the caſe is otherwiſe. It is drawn in a right line by the ſame force as the wheel; but it only turns round becauſe the wheel turns, and can only turn with it, and at the ſame time therewith. Hence it follows, that its circular velocity is leſs than that of the wheel in the ratio of the two circumferences; and therefore its circular motion is leſs than its rectilinear one.

Since then it neceſſarily deſcribes a right line equal to that of the wheel, it can only do it by ſliding, or what they call the motion of *rotation*; that is, a part of the circular nave cannot be applied to a part of a right line greater than itſelf but by ſliding along that part, and that more or leſs, as the part of the nave is leſs than that of the circle.

Rota is alſo uſed for a particular court of juriſdiction in Rome, eſtabliſhed for taking cognizance of beneficiary matters, &c.

The *rota* conſiſts of twelve doctors, choſen out of the four nations of Italy, France, Spain, and Germany; three of them being Romans, one a Florentine, one a Milaneſe, one of Bologna, one of Ferrara, one a Venetian, one a Frenchman, two Spaniards, and one German, each having four clerks or notaries under him.

Their office is to judge of all beneficiary cauſes, both within Rome, and throughout the ſtate of the church, in caſe of appeal, and of all civil proceſſes which are for above five hundred crowns.

They are alſo called *chaplains* of the pope, as ſucceeding the ancient judges of the ſacred palace, who held their court in his chapel.

The denomination *rota*, *wheel*, ſome will have derived hence, that they officiate by rotation; others, becauſe the moſt important affairs of the Chriſtian world turn upon them. Du-Cange derives it from *rota porphyretica*, becauſe the pavement of the chamber where they formerly ſat was of porphyry, and faſhioned like a wheel.

ROTATED, *rotatus*, in *Botany*, the name of a ſort of flowers, ſo called from their ſhape, ſomewhat reſembling a wheel. Theſe are of the monopetalous kind; and are only a ſub-diſtinction of the infundibuliform flowers. *Tab.* VIII. *of Botany*, *Claſs* 2.

ROTATION, *rolling*, in *Mechanics*. See Rolling.

Rotation, in *Geometry*, the circumvolution of a ſurface round an immoveable line, called the *axis of rotation*.

By ſuch *rotation* of planes, the figures of certain regular ſolids are formed or generated.

The method of cubing ſolids, generated by ſuch *rotation*, is laid down by M. de Moivre, in his ſpecimen of the uſe of the doctrine of fluxions. For the fluxions of ſuch ſolids take the product of the fluxion of the abſciſſa, multiplied by the circular baſe; and ſuppoſe the ratio of a ſquare to the circle inſcribed, to be as $\frac{n}{1}$; the equation expreſſing the nature or property of any circle, whoſe

diameter

diameter is *d*, is $yy = dx - xx$. Therefore $4\frac{dx\dot{x} - x^2\dot{x}}{n}$ is the fluxion of a portion of the ſphere, and conſequently the portion itſelf $4\frac{\frac{1}{2}xdx - \frac{1}{3}x^3}{n}$, and the circumſcribed cylinder is $4\frac{dxx - x^3}{n}$; therefore the portion of the ſphere is to the circumſcribed cylinder as $\frac{1}{2}d - \frac{1}{2}x$ to $d - x$. Phil. Tranſ. N° 216.

For other inſtances of this kind, and a view of the application of the doctrine of fluxions, to finding the contents of ſolid bodies, ſee SOLIDITY. See alſo CENTROBARYC *method.*

ROTATION, *revolution*, in *Aſtronomy*. See REVOLUTION.

ROTATION, *diurnal*. See DIURNAL, and EARTH.

ROTATION, in *Anatomy*, the action of the *muſculi rotatores*; or the motion which they give to the parts they are fixed to.

There are two muſcles, the great and the little obliquus, uſed to perform the *rotation* of the eye. The obturator internus and externus effect the *rotation* of the thighs.

Mr. Winſlow has given an account of this, as well as of pronation, and other circulatory animal motions. See Mem. de l'Acad. des Sciences, 1729.

ROTATOR, in *Anatomy*, a name given to the oblique muſcles of the eye, called alſo from the direction of the fibres *circulares*, and from the effect of their action *amatorii*.

ROTCHET, an Engliſh name for the fiſh, called by authors *cuculus*, and more frequently by us the *red gurnard*.

ROTELE, in *Ichthyology*, a name by which ſome call the *rutilus latior*, or *rubellio fluviatilis*, more frequently known by the name of the *rud* or *finſcale*, a river-fiſh, with red belly-fins and tail. See RUBELLIO.

ROTHALS, in *Ornithology*, a name given by Geſner, and ſome others, to the *pochard*, or *red-headed wigeon*; a bird diſtinguiſhed from all others of the duck-kind, by having no variegation in its wings. See POCHARD.

ROTHBEINLEN. See RED-*ſhank*.

ROTHER-*beaſts*, a word uſed in old ſtatutes, and ſtill in the northern parts of England, for any horned beaſts; as oxen, cows, ſteers, heifers, &c.

Whence *rother-ſoil*, in Herefordſhire, is taken for the dung or ſoil of ſuch cattle.

ROTHER-*nails*, are ſuch as have a very large head, and are uſed to faſten the rudder-irons in ſhips. See RUDDER.

ROTKNUSSEL, in *Ornithology*, a name by which the Germans call the *gallinula melampus* of Geſner. It is a bird ſomewhat approaching to the ſnipe-kind; its back is brown, with a ſlight admixture of reddiſh, and ſome ſpots of a duſky colour; its wings are variegated with black and white, and its beak and legs are black. It is common in many parts of Germany.

ROTOLO, an Egyptian weight of twelve ounces, each ounce conſiſting of twelve drachms, and each drachm of ſixteen carats.

ROTONDO, *rotundo*, in *Architecture*, a popular term for any building that is round both within and withoutſide, whether it be a church, hall, a ſaloon, a veſtible, or the like.

The moſt celebrated *rotundo* of antiquity is the PANTHEON at Rome, dedicated to Cybele, and all the gods, by Agrippa, ſon-in-law of Auguſtus; but ſince conſecrated by pope Boniface IV. to the Virgin, and all the ſaints, under the title of Sta. Maria della *Rotondo*.

The chapel of the Eſcurial, which is the burying-place of the kings of Spain, is alſo a *rotondo*; and in imitation of that of Rome, is alſo called Pantheon.

ROTSCHWENTZEL, in *Ornithology*, the name of a bird deſcribed by Geſner, and ſome other authors, and ſeeming to be the ſame with our *ruticilla*, or RED-*ſtart*.

ROTSIMPA, in *Ichthyology*, a name given by the Swedes to a ſpecies of cottus, called by Jonſton and Schonveldt *ſcorpius marinus*. It is different from the *ſcorpæna* of the generality of writers, and is of the cottus kind. It is diſtinguiſhed by Artedi under the name of the *ſmooth cottus*, with many thorns upon the head, and with the upper jaw ſomewhat longer than the under one.

ROTTEN *ſtone*. See TRIPOLI.

ROTTENNESS, *putredo*. See PUTREFACTION.

ROTULA, in *Anatomy*. See PATELLA.

ROTULA, in *Natural Hiſtory*, the name of a genus of the *echini marini*, of the general claſs of the placentæ. The characters of the *rotulæ* are, that they are flat ſhells in form of a cake, compoſed of various flat pieces, and formed into a round, ſomething like that of a wheel, but wanting one or more parts of its outer ring, and radiated or dentated; their mouth is ſituated in the middle of the baſe, and the aperture of the anus in the third region of the axis, and marked with a cinquefoil flower at the ſummit. The great and obvious character is, however, the dentated edge. Of this genus there are two known ſpecies. See *Table of Teſtaceous Animals*, N° 10.

ROTULA, in *Ichthyology*, is alſo a name given by ſome to the faber, or DOREE.

ROTULI *magni ingroſſator*. See INGROSSATOR.

ROTULORUM *cuſtos*. See CUSTOS.

ROTULUS, a *roll*. See ROLL.

ROTULUS *contrarientium*. The earl of Lancaſter taking part with the barons againſt king Edward II. it was not thought fit, in reſpect of their power, to call them rebels or traitors, but only *contrarients*; accordingly, we have a record of thoſe times called *rotulus contrarientium*.

ROTULUS *Wintoniæ*, an exact ſurvey of all England, by counties, hundreds, and tithings, made under king Alfred, not unlike that of *Domeſday*.

It was thus called, becauſe anciently kept at Wincheſter, among other records of the kingdom.

ROTUNDO. See ROTONDO.

ROTUNDUS, in *Anatomy*, a name given to ſeveral muſcles, from the roundneſs of their body.

Such are the *rotundus major*, called alſo *teres major*, and the *rotundus minor*, called alſo *teres minor*, and *tranſverſalis*. See *Tab. Anat. (Myol.) fig.* 2. *n.* 13. *fig.* 6. *n.* 12, 13. *fig.* 7. *n.* 14. 34. and 35.

ROTUNDUS, *pronator radii*. See PRONATOR.

ROUAGE, *battery en*. See BATTERY.

ROUCOU, otherwiſe called *annotto* and *orlean*, is a red dye, formed in maſſes, from the pellicles of the ſeeds of an American tree. For this purpoſe the red ſeeds, cleared from the pods, are ſteeped in water for ſeven or eight days, or longer, till the liquor begins to ferment; then ſtirred and ſtamped with wooden paddles and beaters, to promote the ſeparation of the red ſkins; this proceſs is repeated ſeveral times, till the ſeeds are left white. The liquor, paſſed through cloſe cane ſieves, is pretty thick, of a deep red colour, and very ill ſmell. In boiling, it throws up its colouring matter to the ſurface, in form of ſerum, which is afterwards boiled down by itſelf to a due conſiſtence, and made up while ſoft into balls. That which is commonly met with among us is moderately hard and dry, of a brown colour on the outſide, and a dull red within. Labat informs us, that the Indians prepare a dye of this ſort much ſuperior to that which is brought to us; of a bright ſhining red colour, almoſt equal to carmine. For this purpoſe, inſtead of ſteeping and fermenting the ſeeds in water, they rub them with the hands, previouſly dipt in oil, till the pellicles come off, and are reduced into a clear paſte, which is ſcraped off from the hands with a knife, and laid on a clean leaf, in the ſhade, to dry. De Laet, in his notes on Marcgrave's Natural Hiſtory of Braſil, mentions two kinds of *roucou* or annotto; one of a permanent crimſon colour, uſed as a *fucus*, and another which gives a colour inclining more to that of ſaffron. This laſt, which is our annotto, he ſuppoſes, to be a mixture of the firſt ſort with certain reſinous matters, and with the juice of the root of the tree. See ANNOTTO.

ROVER. See PIRATE.

ROVES, in *Ship-Building*, ſmall ſquare pieces of iron, with a hole punched in the middle, through which the nail goes, where it is clenched, and binds together the boards of pinnaces, yawls, &c.

ROUGE-*croix*, q. d. *red croſs*. See POURSUIVANTS.

ROUGE-*dragon*, q. d. *red dragon*. See POURSUIVANTS.

ROUGET, in *Ichthyology*, a name given by the French to the fiſh called the *lyra* and *capo* by authors. It is a ſpecies of the trigla, and is diſtinguiſhed by Artedi by the name of the *trigla* with the long bifid ſnout and tubulous noſtrils.

ROUGH-*tree*, a name given in merchant ſhips to any maſt, yard, or boom, placed as a rail or fence above the ſhip's ſide, from the quarter-deck to the fore-caſtle. See ROOF-*tree*.

It is, however, with more propriety, applied to any maſt, &c. which remains *rough* and unfiniſhed.

ROUGH, *roughneſs*, in *Mechanics*. See FRICTION, and RESISTANCE.

ROUGH *caſting*. See PLASTERING.

ROUGH *diamond*. See DIAMOND.

ROUGH *emerald*. See EMERALD.

ROUGH-*leaved plants*. See PLANT.

ROUGH *taſte*. See TASTE.

ROUGHING *cloth*. See CLOTH.

ROUGHINGS, a word uſed in many parts of the kingdom for the graſs which comes after mowing.

ROUL, ROLL, or ROWL, in the *Military Art*. Officers of the ſame rank, who mount the ſame guard, and take their turns in relieving one another, are ſaid to *roul* or *roll*.

ROULADE, in *Muſic*, a trilling or quavering.

ROUND, *rotundus*, in *Geometry*. See CIRCLE, GLOBE, and SPHERE.

ROUND, in *Anatomy*. See ROTUNDUS.

ROUND, in *Music*. The Italians call b *round*, what we call a *flat*; and the French b *mol*, and b *square*, what we call a *sharp*. See FLAT, and SHARP.

ROUND is also used in music, to denote a species of FUGUE. See ROUNDELAY.

ROUND is also a military term, signifying a walk or turn which an officer, attended with some soldiers, takes in a garrison, or fortified place, *around* the ramparts, in the night-time, to listen if any thing be stirring without the works, and to see that the sentinels are watchful, and do their duty, and all things are in good order.

In strict garrison the *rounds* go every half hour, that the rampart may be always furnished. The sentinels are to challenge at a distance, and to rest their arms as the *rounds* pass, and let no one come near them.

When the *round* is near the corps de garde, the sentry calls aloud, *Who comes there?* and when the answer is, *The rounds*, he says, *Stand*; then calls for the serjeant of the guard, who draws his sword, and calls also, *Who comes there?* and when it is answered, *The rounds*, he that has the word, or the serjeant of the *round*, advances, and delivers it to the serjeant of the guard, who receives it with the spear of his halbert, pointed at the giver's breast. See WORD.

ROUNDS, *way of the*. See WAY.

ROUNDS, *counter*. See COUNTER-*round*.

ROUND, *quarter*. See QUARTER-*round*.

ROUNDS, among *Masons*, denote the broken pieces of statues.

ROUND-*heads*. See WHIG and TORY.

ROUND-*head nails*. See NAIL.

ROUND-*house*, in a *Ship*, is a name given, in East India-men, and other large merchant-ships, to a cabin or apartment built in the after part of the quarter-deck, and having the poop for its roof. This apartment is usually called the coach in our ships of war.

ROUND-*house* also denotes a kind of prison, for the nightly watch to secure persons in, till they can be carried before a magistrate. See WATCH.

ROUND-*in*, or ROUND-*aft*, at *Sea*, a term belonging to the main and fore-sail. When the wind largeth, they say, *Let rise the main-tacks*, or *the fore-tacks! Hale aft the fore-sheet to the cat-head*; *and the main-sheet to the cub-bridge-head!* And when these sheets are thus haled down, they keep them from flying up with the passarado rope. This work is called *rounding-in*, or *rounding-aft the sail*.

ROUND *niche*, *roof*, *seam*, *shot*, *splice*, *table*, *top*. See the substantives.

ROUND, in the *Academies*, denotes a circular PISTE or tread.

To ROUND *a horse*, is a general term for all sorts of maneges, upon a volt, or circular tread.

Hence, to *round* a horse upon a trot, gallop, &c. is to make him carry his shoulders and haunches roundly or compactly, upon a large or smaller circle, without traversing or bearing to a side.

ROUNDELAY, or ROUNDO, a kind of ancient poem, thus called, according to Menage, from its form; and because it still turns back again to the first verse, and thus goes round.

The word is formed from *round* and *lay*. The French call it *rondeau*. The Spaniards *gloses*.

The common *roundelay* consists of thirteen verses, eight whereof are in one rhyme, and five in another. It is divided into couplets; at the end of the second and third whereof, the beginning of the *roundelay* is repeated; and that, if possible, in an equivocal or punning sense.

The *roundelay* is a popular poem among the French, but little known among us. Marot and Voiture have succeeded the best in it.

Rapin observes, that if the *roundelay* be not very exquisite, it is intolerably bad. In all the ancient *roundelays*, Menage observes, that the verse preceding has a complete sense, and yet joins agreeably with that of the close; without depending necessarily thereon. This rule, well observed, makes the *roundelay* more ingenious, and is one of the finesses of the poem.

Some of the ancient writers speak of the *roundelay*, or *roundel*, as a kind of air appropriated to dancing; and in this sense the term seems to indicate little more than dancing in a circle, with the hands joined.

ROUNDELEF. See RUNDLET.

ROUNDING, in *Sea-Language*, denotes certain old ropes wound firmly and closely about that part of a cable which lies in the hause, or under the ship's bow, or athwart the stem. It is used to prevent the surface of the cable from being chafed or fretted in those places.

ROUNDING-*in* generally implies the act of pulling upon any rope which passes through one or more blocks, in a direction merely horizontal; as *round-in* the weather-braces, &c. It seems to be derived from the circular motion of the rope about the sheave or pulley, through which it passes.

ROUNDING-*up* is expressed of a tackle which hangs in a perpendicular position, without sustaining or hoisting any weighty body; in which case it is the operation of pulling the blocks closer to each other, by means of the rope which passes through them, to compose the tackle; and is opposed to over-hauling, by which the blocks are drawn farther asunder.

ROUNDNESS, *rotundity*, in *Physics*. See SPHERICITY.

ROUNDO, or ROUNDELAY, in *Music*, a kind of burden or ritornello; where the beginning of each couplet is repeated at the end thereof.

ROUP, in *Poultry*, is a filthy boil or swelling upon their rumps, known by the staring, or turning back of the feathers.

The *roup*, if not soon remedied, will corrupt the whole body; to prevent which, the feathers are to be pulled away, the swelling laid open, and the matter pressed out; after which the part is to be washed with salt and water, or brine.

ROUPIA, or RUPEE. See RUPEE.

ROUSE *up a hare*, among *Hunters*. See HUNTING.

To ROUSE, among *Falconers*, is when a hawk lifts up and shakes himself.

ROUSSIN, in the *Manege*, is a strong well-knit, well-stowed horse, such as are commonly brought into France from Germany and Holland.

ROUSSING, in *Sea-Language*, is the act of pulling together upon a cable, hauser, &c. without the assistance of tackles, capsterns, &c. It is particularly used in the exercise of removing a ship from one place to another, by means of ropes and anchors.

ROUT, *route*, a public road, highway, or course; especially that which military forces take.

The word is French, *route*, formed from the Latin *rupta*, or *ruta*; or the French *roux*, an old word for *horse*; or rather from the old Celtic *rout*, *road*.

Sanson and Ogilby have made maps of the *routs* and post-roads of France and England. Soldiers are prohibited going out of their *routs*. *Routs* are frequently cut in parks, forests, &c. both for ornament, and for the conveniencies of hunting.

Some use *rout* for a path cut across a wood; in opposition to *way*, which is a great road.

ROUT, in *Navigation*. See COURSE.

ROUT is also used for the defeat and flight of an army.

ROUT, in *Law*, is an assembly or combination of three or more persons, upon a common quarrel, going forcibly to commit an unlawful act; such as breaking down fences upon a right claimed of common, or of way, though they do not actually perform it.

If they go, ride, or move forwards, after their meeting, thus making some advances towards the execution of their purpose, it is a *rout*, though they do not put their purpose in execution; if they do, it is a *riot*.

A *rout*, therefore, seems to be an unlawful assembly; and a riot the disorderly fact committed thereby.

Two things, however, there are in common to *rout*, *riot*, and *unlawful assembly*: the one, that there be at least three persons together; the other, that, being together, they disturb the peace, either by words, shew of arms, turbulent gesture, or actual violence.

For the punishment incurred by *routs*, &c. see RIOT.

ROUT *of wolves*, among *Hunters*, denotes a herd of those wild beasts.

ROUTIER, in *Navigation*. See WAGGONER.

ROWEL, among *Farriers*, a kind of issue, made by drawing a skain of silk, thread, hair, or the like, through the nape of the neck, or other part of a horse; answering to what in surgery is called a *seton*.

The ROWELLING *of horses* is a method of cure frequently had recourse to, in cases of inward strains, especially about the shoulders or hips; as also for hard swellings not easy to be resolved.

The operation is thus: a little slit being made through the skin, about a hand-breadth below the part aggrieved, big enough to put a swan's quill in; the skin is raised from the flesh, the end of the quill put in, and the skin blowed from the flesh upwards, and all over the shoulder.

Then the hole being stopped with the finger, the place blown is beaten with a hazel stick, and the wind spread with the hand all over, and then let go.

This done, a skain of horse-hair, or red sarsenet, half the thickness of the little finger, is put in a *rowelling* needle seven or eight inches long; the needle is put into the hole, and drawn through again six or seven inches higher; then the needle is drawn out, and the two ends of the *rowel* tied together; anointing it every day, as well as before the putting it in, with sweet butter and hog's grease, and

drawing it backwards and forwards in the ſkin, to make the putrid matter diſcharge itſelf more plentifully.

Others, diſliking theſe *rowels*, as making too great a ſore and ſcar, uſe the French *rowel*, which is a round piece of ſtiff leather, with a hole in the midſt, laying it flat between the fleſh and ſkin, the hole of the *rowel* juſt againſt that in the ſkin; ſewing it with a needle and thread drawn through the hole in the ſkin; cleaning it once in two or three days, and then anointing it afreſh.

ROWELS *of a ſpur.* See SPUR.

ROWING, is the action of impelling a boat or veſſel along the ſurface of the water by oars, which are managed in a direction nearly horizontal. See OAR, BOAT, &c.

ROWING-*guard.* See GUARD-*boat.*

ROWLE, in a *Ship*, is a round piece of wood or iron, wherein the whip goes, being made to turn about, that it may carry over the whip the eaſier from ſide to ſide.

ROW-LOCKS, among *Ship-Carpenters*, ſmall ſpaces left in the gunwale, where two thoals are let in, at ſuch a diſtance from each other, as to admit the oar, at the end of the loom, to lie on to row the boat.

In the ſides of the ſmalleſt veſſels of war, a number of little ſquare holes, called *row-ports*, are cut for this purpoſe, parallel to the ſurface of the water.

ROWS *of trees.* See PARALLELISM.

ROYAL, *regal*, ſomething relating to a king.

The word is French, formed from the Latin *regalis*, of *rex, king.*

In this ſenſe we ſay, the *royal family*, the *royal blood, royal line*, &c.

In England the prince and princeſs of Wales, the king's brothers, &c. are addreſſed under the title of *royal highneſs.* The ducheſs of Savoy is called *madame royale.*

ROYALS, in *Artillery*, are a kind of ſmall mortars, which carry a ſhell, whoſe diameter is five inches and a half. See MORTAR.

ROYAL, in *Sea-Language*, is a name given to the higheſt ſail which is extended in any ſhip. It is ſpread immediately above the top-gallant-ſail, to whoſe yard-arms the lower corners of it are attached. This ſail is never uſed but in light and favourable breezes.

ROYAL *abbey*, denotes an abbey founded by a king, or by a prince who is ſucceeded by a king.

ROYAL *Academy of Sciences*, &c. See ACADEMY, &c.

ROYAL *antler*, among *Hunters*, expreſſes the third branch of the horn of a hart or buck, that ſhoots out from the rear or main horn above the back-antler.

ROYAL *army.* See ARMY.

ROYAL *aſſent*, is that aſſent or approbation which the king gives to a thing done by others; as the election of a biſhop by dean and chapter, or by a bill paſſed in both houſes of parliament.

The *royal* aſſent in parliament being given, the bill is indorſed with theſe words, *Le roy le veut*; that is, *it pleaſes the king.* If he refuſes it, thus, *Le roy s'aviſera*, q. d. *the king will adviſe upon it.* See PARLIAMENT.

ROYAL *boroughs.* See BOROUGH.

ROYAL *crown*, is that worn by kings. See CROWN.

ROYAL *charter.* See CHARTER.

ROYAL *African company.* See COMPANY.

ROYAL *Exchange*, the burſe or meeting-place of the merchants in London.

It was firſt built in 1566, at the charge of Sir Thomas Greſham; and in a ſolemn manner, by herald with ſound of trumpet, in preſence of queen Elizabeth, proclaimed the *Royal Exchange.* Till that time the merchants met in Lombard-ſtreet.

It was built of brick; yet then eſteemed the moſt ſplendid burſe in Europe. A hundred years after its building, at the great fire, it was burnt down; but it was ſoon raiſed again in a ſtill more magnificent manner; the expence thereof amounting to 50,000*l.*

One half of this ſum was diſburſed by the chamber of London, the other by the company of mercers; who, to reimburſe themſelves, lett to hire a hundred and ninety ſhops above ſtairs, at twenty pounds each; which, with other ſhops, &c. on the ground, yielded a yearly rent of above four thouſand pounds; yet the ground it ſtands on does not exceed three-fourths of an acre; whence it is obſerved to be much the richeſt ſpot of ground in the world.

It is built quadrangular, with walks around, wherein the merchants of the reſpective countries aſſociate themſelves. In the middle of the area, or court, is a fine marble ſtatue of king Charles II. in the habit of a Roman Cæſar, erected by the ſociety of merchant-adventurers; the workmanſhip of Grinlin Gibbons. Around are ranged the ſtatues of the ſeveral kings ſince the Norman Conqueſt.

ROYAL *fiſhes* are whales and ſturgeon, and ſome add porpoiſes too; which the king, by his prerogative, is to have, whenever caſt on ſhore, or wrecked, in all places of the realm; unleſs granted to ſubjects by expreſs words.

ROYAL *foot, fort, franchiſe, hoſpital.* See the ſubſtantives.

The ROYAL *oak*, was a fair-ſpreading tree at Boſcobel, in the pariſh of Donnington, in Staffordſhire, the boughs whereof were all covered with ivy; in the thick of which king Charles II. ſat in the day-time with colonel Careleſs, and in the night lodged in Boſcobel-houſe; ſo that they are miſtaken who ſpeak of it as an old hollow oak; it being then a gay flouriſhing tree, ſurrounded with many more. The poor remains hereof are now fenced in with a handſome wall, with this inſcription over the gate, in golden letters: FELICISSIMAM ARBOREM, QUAM IN ASYLUM POTENTISSIMI REGIS CAROLI II. DEUS OP. MAX. PER QUEM REGES REGNANT, HIC CRESCERE VOLUIT, &c. Phil. Tranſ. N° 310.

ROYAL *Oak, Robur Carolinum*, in *Aſtronomy*, one of the new ſouthern conſtellations, the ſtars of which, according to Sharp's Catalogue, annexed to the Britannic, are 12. Their longitudes, latitudes, &c. are as follow:

Names and ſituations of the ſtars.	Signs.	Longitud.			Latitude			Magnitude
		°	′	″	°	′	″	
At the root	♎	28	7	26	72	13	8	2
In the top of the trunk		25	18	30	62	7	34	3
Northern of the 4 in the firſt branches		14	0	16	59	53	4	5
Subſequent		18	17	26	58	54	43	4
Preceding		16	13	48	62	35	13	4
5.								
Middle		19	11	44	61	25	38	4
Northern of the two in the next branches	♏	0	39	44	56	46	47	4
Southern		7	6	58	58	29	37	5
Preceding of the 2 in the top of the head	♎	3	34	41	51	2	46	4
Subſequent		6	39	58	51	4	21	3
10.								
1ſt Informis at the trunk		19	3	21	67	28	33	4
2d	♏	3	32	15	67	21	18	4

ROYAL *officers.* See OFFICER.

ROYAL *parapet*, or *parapet of the rampart*, in *Fortification*, is a bank about three fathoms broad, and ſix feet high, placed upon the brink of the rampart, towards the country; to cover thoſe who defend the rampart.

ROYAL *poop.* See POOP.

ROYAL, *Port.* See PORT *Royal.*

ROYAL *Society of England*, is an academy, or body, of perſons of eminent learning; inſtituted by king Charles II. for the promoting of natural knowledge.

This illuſtrious body had its original in an aſſembly of ingenious men, reſiding in London, who, being inquiſitive into natural, and the new and experimental philoſophy, agreed, about the year 1645, to meet weekly on a certain day, to diſcourſe upon ſuch ſubjects. Theſe meetings, it is ſaid, were ſuggeſted by Mr. Theodore Haak, a native of the Palatinate in Germany, and they were held ſometimes at Dr. Goddard's lodgings in Wood-ſtreet, ſometimes at a convenient place in Cheapſide, and ſometimes in or near Greſham College. This aſſembly ſeems to be that mentioned under the title of the *Inviſible*, or *Philoſophical College*, by Mr. Boyle, in ſome letters written in 1646 and 1647. About the years 1648 and 1649, the company, which formed theſe meetings, began to be divided: thoſe in London continued to meet there as before; and thoſe who were removed to Oxford occaſionally joined them. The latter, viz. Dr. Wilkins, Dr. Wallis, and Dr. Goddard, in connection with others, continuing their aſſemblies in Oxford, brought the ſtudy of natural and experimental philoſophy into faſhion there; meeting firſt in Dr. Petty's lodgings, afterwards at Dr. Wilkins's apartments in Wadham College, and, upon his removal, in the lodgings of the honourable Mr. Robert Boyle. The greateſt part of the Oxford ſociety coming to London about the year 1659, they met once or twice a week in term-time at Greſham College, till they were diſperſed by the public diſtractions of that year, and the place of their meeting was made a quarter for ſoldiers. Upon the Reſtoration, in 1660, their meetings were revived, and attended with a larger concourſe of perſons, eminent for their character and learning.

They were at length taken notice of by the king, who was pleaſed to grant them an ample charter, dated the twenty-ſecond of April, 1663, whereby they were erected into a corporation, *conſiſting of a preſident, council, and fellows, for promoting natural knowledge.*

Their manner of electing fellows is by balloting. Their council are in number twenty-one, including the preſident, vice-preſident, treaſurer, and two ſecretaries; eleven of which are continued for the next year, and ten more added to them; all choſen on St. Andrew's day.

Each member, at his admiſſion, ſubſcribes an engagement, that he will endeavour to promote the good of the ſociety; from which he may be freed at any time, by ſignifying to the preſident, that he deſires to withdraw.

The charges are five guineas paid to the treaſurer at admiſſion; and 13*s.* per quarter ſo long as the perſon continues a member: or, in lieu of the annual ſubſcription, a compoſition of twenty-five guineas in one payment.

Their deſign is to "make faithful records of all the works "of nature or art, which come within their reach; ſo "that the preſent, as well as after ages, may be enabled "to put a mark on errors which have been ſtrengthened "by long preſcription; to reſtore truths that have been "neglected; to puſh thoſe already known to more various "uſes; to make the way more paſſable to what re"mains unrevealed," &c.

To this purpoſe they have made a great number of experiments and obſervations on moſt of the works of nature; eclipſes, comets, meteors, mines, plants, earthquakes, inundations, ſprings, damps, ſubterraneous fires, tides, currents, the magnet, &c. Alſo, numbers of ſhort hiſtories of nature; arts, manufactures, uſeful engines, contrivances, &c. The ſervices they have been of to the public are very great. They have improved naval, civil, and military architecture; advanced the ſecurity and perfection of navigation; improved agriculture; and put not only this kingdom, but alſo Ireland, the plantations, &c. upon planting.

They have regiſtered experiments, hiſtories, relations, obſervations, &c. and reduced them into one common ſtock; and have, from time to time, publiſhed ſome of the moſt immediate uſe, under the title of Philoſophical Tranſactions, &c. and laid the reſt up in public regiſters, to be nakedly tranſmitted to poſterity, as a ſolid groundwork for future ſyſtems. See TRANSACTIONS.

They have a library adapted to their inſtitution; towards which Mr. Henry Howard, afterwards duke of Norfolk, contributed the Norfolcian library, and which is, at this time, greatly increaſed by a continual ſeries of benefactions. The muſeum, or repoſitory, of natural and artificial rarities, given them by Daniel Colwal, eſq. and ſince enriched by many others, is now removed to the Britiſh Muſeum, and makes a part of that great repoſitory. Their motto is, *Nullius in verba*; and their place of aſſembling is Somerſet-houſe, in the Strand. Sir Godfrey Copley, bart. left five guineas to be given annually to the perſon who ſhould write the beſt paper in the year, under the head of experimental philoſophy. This reward, which is now changed to a gold medal, is the higheſt honour the ſociety can beſtow. It is conferred on St. Andrew's day.

ROYAL *Spaniſh Academy*. See ACADEMY.

ROYAL *ſugar*. See SUGAR.

ROYALTIES, *regalities*, the rights of the king; otherwiſe called the *king's prerogative*, and the *regalia*. See PREROGATIVE, and REGALIA.

Of theſe, ſome the king may grant to common perſons; others are inſeparable from the crown.

ROYENA, *African bladder-nut*, in *Botany*, a genus of the *decandria digynia* claſs. Its characters are theſe: the flower has a bellied, permanent empalement, whoſe mouth is obtuſe, and five-pointed; it has one petal, having a tube the length of the empalement, but the brim is divided into five parts, which turn back; it has ten ſhort ſtamina growing to the petal, terminated by oblong, erect, twin ſummits, and an oval hairy germen ſitting upon two ſtyles, a little longer than the ſtamina, crowned by ſingle ſummits; the empalement afterward turns to an oval capſule, with four furrows, having one cell, with four valves, containing four oblong triangular ſeeds. Miller reckons three, and Linnæus four ſpecies.

RUBBER *of pencil-ſtrokes*. See CAOUTCHOUC.

RUBEDO, in *Medicine*. See GUTTA *roſacea*.

RUBELLIO, in *Ichthyology*, a name given by ſome authors to a ſmall ſea-fiſh of a red colour, caught in the Mediterranean, and more uſually called by writers on theſe ſubjects the ERYTHRINUS.

RUBELLUS, in *Ichthyology*, a name given by ſome authors to the common ROACH, and by others to the RUDD or finſcale.

RUBEOLA, in *Botany*. See CRUCIANELLA.

RUBETA, in *Zoology*. See TOAD.

RUBETRA, in *Ornithology*, a name by which Geſner and ſome others have called that ſpecies of the œnanthe, commonly known by the name of the STONE-*chatter*, *ſtone-ſmick*, or *moor-titling*.

RUBIA, a root, or drug, popularly called MADDER.

RUBICAN, in the *Manege*. A horſe is ſaid to be of a *rubican* colour, that is, a bay, ſorrel, or black, with a light grey or white upon the flanks, but ſo that this grey or white is not predominant there.

RUBICILLA *Americana*, in *Ornithology*, a name given by Mr. Ray to the GUIRATIRICA, a Braſilian bird, of the bull-finch kind, very beautifully variegated with red, black, and grey.

RUBICULUS, in *Ichthyology*, a name given by Figulus and ſome others to that ſpecies of fiſh which we call the ROACH. It is of the cyprinus kind, and is diſtinguiſhed by Artedi under the name of the red-eyed cyprinus, with the tail and belly-fins red.

RUBIFYING, formed of *rubens*, *ruddy*, and *fio*, *I become*, in *Chemiſtry*, &c. the act of turning a thing red by force of fire, &c.

Red arſenic is common white arſenic *rubified* by a mixture of ſulphur and copper.

RUBIGALIA, or ROBIGALIA, in *Antiquity*, a feaſt celebrated by the Romans, in honour of the god Rubigus, or the goddeſs Rubigo; to engage thoſe deities to preſerve the corn from blaſting and mildews.

The *Rubigalia* were inſtituted by Numa, in the eleventh year of his reign; and were held on the ſeventh of the calends of May, which is our twenty-fifth of April; being about the time when the blight or mildew, called by the Latins *rubigo*, uſes to attack the corn.

Varro fixes it to the time when the ſun enters the 16th degree of Taurus. Indeed the true time ſeems rather to have been on the 18th day before the equinox, and the true reaſon, becauſe then Canicula, or the Little Dog, ſets; which is eſteemed a malific conſtellation.

Hence they ſacrificed a dog to Rubigo: Ovid ſays, the entrails of a dog, and thoſe of a ſheep; Columella, only a ſucking puppy. Feſtus inſinuates, that the victim muſt alſo be red.

RUBIGO, or ROBIGO, a diſeaſe incident to corn, popularly called MILDEW.

The *rubigo* is a ſpecies of blight. See BLIGHT, and RUST *of corn*.

RUBIN *of antimony*, in *Chemiſtry*, a kind of LIVER *of antimony*, made with equal parts of nitre and crude antimony detonated together, to which is afterwards added an equal quantity of common ſalt. It is alſo called MAGNESIA *opalina*.

RUBRIC, *rubrica*, in the *Canon-Law*, denotes a title, or article, in certain ancient law-books; thus called, becauſe written, as the titles of the chapters in our ancient Bibles are, in red letters.

RUBRICS alſo denote the rules and directions given in the Liturgy; for the order and manner wherein the ſeveral parts of the office are to be performed.

They are called *rubrics* from the Latin *ruber*, *red*; becauſe formerly printed in red ink, to diſtinguiſh them from the reſt of the office, which was in black; as they ſtill are in the Roman miſſals, &c.

The great *rubric* for the celebration of Eaſter, preſcribed by the Nicene council, is to this purpoſe; Eaſter-day to be the Sunday which falls upon, or next after, the firſt full moon which immediately ſucceeds the vernal equinox.

Dr. Wallis has a particular diſcourſe on the ancient *rubrics* for the feaſt of Eaſter, in the Philoſ. Tranſactions.

RUBRICA. See REDDLE.

RUBUS, in *Botany*. See RASPBERRY-*buſh*.

RUBUS, in *Ichthyology*, a name given by Joannes Cuba, Albertus, and ſome other writers, to the ſpecies of *ray*, uſually called the SKAITE or *flaire*.

RUBY, *rubinus*, in *Natural Hiſtory*, a gem, the diſtinguiſhing character of which is, that it is of a red colour with an admixture of purple.

The *ruby*, in its moſt perfect ſtate, is a gem of very great beauty and value. It is often found perfectly pure, and free from all ſpots or blemiſhes; but it is much more frequently debaſed by them, and greatly brought down in its value, eſpecially in the larger ſpecimens. It is of very great hardneſs, equal to that of the ſapphire, and ſecond only to the diamond. It is various in ſize, but is leſs ſubject to variations in its ſhape than moſt of the other gems. It is moſt frequently found very ſmall; its common ſize being that of the heads of the larger ſort of pins; and when of this ſize it is very cheap; but it is alſo found of four, ſix, and ten carats; and ſometimes, though but very rarely, up to twenty, thirty, or forty; nay, we have accounts of ſome of more than a hundred. It is never found of an angular or cryſtalliform ſhape, but always of a pebble-like figure, often roundiſh, ſometimes oblong, and much larger at one end than the other, and in ſome ſort reſembling a pear, and is uſually more or leſs flatted on one ſide.

It is commonly ſo naturally bright and pure on the ſurface as to need no poliſhing; and it is worn in rings, and in the crowns of princes, in its rough or native ſtate. Its colour is red in very different degrees, from the deepeſt garnet colour to that of the paleſt red diamond, but it ever has with the red more or leſs of a purpliſh tinge: this is very plainly diſtinguiſhed in the deeper coloured ſpecimens, but in the pale ones is gradually leſs and leſs to be diſtinguiſhed in proportion to their degree of colour. Theſe are the diſtinguiſhing characters of the *ruby*, and

and by these it is easily known from the garnet, carbuncle, and other red gems.

As *rubies* are frequently found in gold mines, it is very probable that they receive their colour from that metal. See *Colours of* METALS.

Our jewellers are very nice, though not perfectly determinate in their distinctions; knowing this gem, in its different degrees of colour, under three names; the first is simply the *ruby*: this is the name they give to it in its most perfect and strongest coloured state.

The second is the *spinel ruby*. Under this name they know those *rubies*, which are of a somewhat less deep and much less vivid colour, than what they call the true *ruby*, or simply the *ruby*.

The third is the *balass ruby*, a name derived from Balakeia, the name of a country where the paler *rubies* are principally found. Under this name they express a pale, yet very bright *ruby*, with a smaller admixture of the purple tinge than in the deeper coloured one, and something resembling the colour of the damask-rose. This is of a considerable value, but less than the deeper, or, as they call it, the true *ruby*.

Beside these, they know also two other stones, under the general name *rubies*, calling them the *rock ruby*, and the *rubacelle*. But these are not truly of the *ruby* kind; the first being a very beautiful species of garnet, and having a tinge of blue with its red; and the other a hyacinth, having a manifest cast of yellow.

We have the true *rubies* only from the East Indies. In Europe there are not unfrequently found crystals tinged to the true colour of the *ruby*, but these ever want its lustre and hardness. In the East Indies, the true *rubies* are often found almost colourless, and not unfrequently variegated with spots or stains of a pure blue, evidently the same with that of the sapphire. Doubtless also the *ruby* is sometimes found like the other gems, wholly destitute of colour; but in this case, as the hardness of the stone is the only thing that proves it to be of the gem class, both this, and all the other colourless specimens of the gems, are confounded under the name of the colourless sapphire; or, as our jewellers choose to speak it, the white sapphire. Hill's Hist. of Foss. p. 590, seq.

There are but two places in the East where the *ruby* is found; the kingdom of Pegu, and the isle of Ceylon. The mine in Pegu, where it is found in greatest plenty, is in the mountain Capelan, twelve days journey from Siren, the residence of the king of that country. The finest *rubies* brought hence do not exceed three or four carats; the king reserving all the larger to himself.

In Ceylon the *rubies* are found in a river which descends from the mountains towards the middle of the island: some few are also found in the ground. The *rubies* of Ceylon are usually brighter and more beautiful than those of Pegu; but they are rare; the king of Ceylon prohibiting his people to gather them, or traffick with them.

There are, as some say, *rubies* also found in Europe, particularly in Bohemia and Hungary, especially the former, wherein is a mine of flints of divers sizes; which, upon breaking, are sometimes found to contain *rubies*, pretended to be as fine and hard as any of the Eastern ones.

The Greeks call the *ruby* ἀπυρωτος, q. d. resisting the fire.

The ancients, out of their credulity and superstition, attributed many virtues to the *ruby*; as, that it expels poisons, cures the plague, abates luxury and incontinence, banishes sorrow, &c.

It is said the inhabitants of Pegu have the art of heightening the redness and brilliancy of *rubies*, by laying them in the fire, and giving them a proper degree of heat; but this seems a very erroneous account.

The *ruby* is formed in a stony substance, or bed, of a rose-colour, called *mother of ruby*; it has not all its colour and lustre at once, but comes to it by degrees. At first it is whitish; and, as it approaches to maturity, becomes red. Hence we have white *rubies*, others half-white, half-red, and others blue and red, called *sapphire rubies*.

When a *ruby* exceeds twenty carats, it may be called a CARBUNCLE; the name of an imaginary stone, whereof the ancients and moderns have given us so many descriptions.

They have several manners of counterfeiting *rubies*; and some have carried the imitation to that length, that the most able lapidaries, till they come to try the hardness, are sometimes overseen.

Fruetiere assures us very positively, that there have been *rubies* in France of two hundred and forty carats. Tavernier tells us, he saw one in the Indies of fifty carats, which he had a mind to have bought. He adds, that the king of France has finer and larger *rubies* than any in the possession of the Great Mogul.

RUBY, *sapphire*. See SAPPHIRE.

RUBY, *counterfeit*. See *Ruby* GLASS, and *Ruby* PASTE.

RUBY, in *Chemistry*, is a name given to several preparations of natural bodies, because of their red colour: as

RUBY *of arsenic*, &c. See REALGAR.

RUBY, in *Heraldry*, denotes the red colour wherewith the arms of noblemen are blazoned; being the same which in the arms of others, not noble, is called *gules*.

RUCTATION, *belching*, a ventosity arising from indigestion, and discharging itself at the mouth, with a disagreeable noise.

There are belches owing to repletion, and others to inanition, or emptiness.

Quincy says, hypochondriac and hysteric people are particularly liable to this disorder. They are rather to be cured with proper stomachics than carminatives and hot liquors. Burnet recommends the iliac pills of Rhasis against *ructation*.

RUDBECKIA, in *Botany*. See *Dwarf* SUNFLOWER.

RUDD, in *Ichthyology*. See RED-*eye*.

RUDDER, in *Navigation*, a piece of timber turning on hinges in the stern of a ship; and which opposing sometimes one side to the water, and sometimes another, turns or directs the vessel this way or that. See *Tab. Ship. fig.* 2. *n.* 106.

The *rudder* becomes gradually broader, in proportion to its distance from the top, or to its depth under water. The back, or inner part of it, which joins to the stern-post, is diminished into the form of a wedge through its whole length, so as that the *rudder* may be the more easily turned from one side to the other, where it makes an obtuse angle with the keel. The hinges, which are bolted round the stern-post to the after extremity of the ship, are called *googings*, and are furnished with a large hole on the after-part of the stern-post. The other parts of the hinges, which are bolted to the back of the *rudder*, are called *pintles*, being strong cylindrical pins, which enter into the googings, and rest upon them. The length and thickness of the *rudder* are nearly equal to those of the stern-post. The *rudder* is turned upon its hinges, by means of a long bar of timber, called the TILLER, the operation of which is directed by the tiller-rope, which in large vessels is wound about a wheel. The power of the *rudder* is reducible to that of the lever, and the oblique action of the water upon it is to be determined by the resolution of forces. As to the most advantageous angle made by the helm, with the line prolonged from the keel, geometricians have fixed it at 54° 44′. See MECHANICS. But it has been said, that, in determining this angle, they have presumed that the ship is as narrow at her floating line, or at the line described by the surface of the water round her bottom, as at the keel; whereas all vessels increase in breadth from the keel upward to the extreme breadth, where the floating line, or the highest water-line, is terminated; and, therefore, the angle above stated is too large. For the *rudder* is impressed by the water, at the height of the floating line, more directly than at the keel, because the fluid exactly follows the horizontal outlines of the bottom; so that a particular position of the helm might be supposed necessary for each different incidence which it encounters from the keel upwards. But as a middle position may be taken between all these points, it will be sufficient to consider the angle formed by the sides of the ship, and her axis, or the middle line of her length, at the surface of the water, in order to determine afterwards the mean point, and the mean angle of incidence. The angle 54° 44′, it is said, is too open, and very unfavourable to the ship's head-way, because the water acts upon the *rudder* there with too great a sine of incidence, as being equal to that of the angle which it makes with the line prolonged from the keel below; but above, the shock of the water is almost perpendicular to the *rudder*, because of the breadth of the bottom. If then the *rudder* is only opposed to the fluid, by making an angle of 45° with the line prolonged from the keel, the impression, by becoming weaker, will be less opposed to the ship's head-way, and the direction of the absolute effort of the water upon the helm drawing nearer to the lateral perpendicular, will be placed more advantageously. To which it is added, that experience daily testifies, that a ship steers well, when the *rudder* makes the angle of 35°. L. Euler recommends an obliquity somewhat less than 54° 44′, for the greatest action of the *rudder*, and establishes this rule, that an obliquity of about 48° will, in general, produce the best effort. Bouguer Traité de la Manœuvre des Vaisseaux. Falconer's Marine Dict. art. *Helm*; and Euler's Complete Theory of the Construction and Properties of Vessels, translated by Mr. Watson, 1776, book ii. chap. vii. viii. ix.

A narrow *rudder* is best for a ship's sailing, provided she can feel it, that is, be guided and turned by it; for a broad *rudder* will hold much water when the helm is put over to any side; but if a ship have a fat quarter, so that the water cannot come quick and strong to her *rudder*, she will require a broad *rudder*.

The aftmost part of the *rudder* is called the *rake* of the *rudder*.

Rudder-*irons*, in a *Ship*, are the checks of that iron, whereof the pintle is part, which is fastened and nailed down about the rake of the *rudder*.

Rudder-*rope*, in a *Ship*. See Rope.

RUDDLE, *rubrica*. See Reddle.

RUDDOCK, in *Ornithology*, an English name for the *rubecula*, more commonly known by the name of the red *breast*, or *robin red breast*.

RUDENTURE, in *Architecture*, the figure of a rope, or staff, sometimes plain, sometimes carved; wherewith a third part of the flutings of columns are frequently filled up.

It is thus called from the Latin *rudens*, *cable*; whence some call it a *cabling*; and the columns whose flutings are thus filled, they call *rudented*, or *cabled columns*.

There are also *rudentures* in relievo, laid on the naked of pilasters, not fluted; an instance of which we have in the church of St. Sapienza at Rome.

RUDERATION, *ruderatio*, in *Building*, a term used by Vitruvius for the laying a pavement with pebbles, or little stones.

To perform the *ruderation*, it is necessary the ground be first well beaten, to make it firm, and to prevent its cracking. Then a stratum of little stones is laid, to be afterwards bound together with mortar, made of lime and sand, called by Vitruvius *statumen*.

If the sand be new, its proportion to the lime may be as 3 to 1; but if dug out of old pavements, or walls, as 5 to 2.

Ruderation, Daviler observes, is also used by Vitruvius, lib. vii. cap. 1. for the coarsest and most artless kind of masonry; where a wall is, as it were, cobbled up.

RUDIARIUS, in *Antiquity*, a veteran gladiator, who had got a discharge from the service.

He was thus called, because, as a mark of dismission, a rod was put into his hand, called rudis.

The *rudiarii* were also called *spectatores*.

RUDIMENTS, *rudimenta*, the first principles, or grounds, of any art or science; called also the elements thereof.

RUDIS, a knotty, rugged stick, which the pretor, among the Romans, gave the gladiators, as a mark of their freedom and dismission.

The *rudis* seems to have been bestowed both on slaves and freedmen; with this difference, that it procured for the former no more than a discharge from any farther performance in public, upon which they commonly turned *lanistæ*, spending their time in training up young fencers; but the latter, who had hired themselves out for these shews, were restored to a full enjoyment of their liberty. Kennet, Rom. Ant. p. 280.

Hence the Latin phrase, *rude donare*, to make a gladiator free, to discharge him from fighting any more. They were hence called *rudiarii*, and had a custom of hanging up their arms in the temple of Hercules, the patron of their profession, and were never called out again without their consent.

RUDMAS *day*, in our *Old Writers*, the feast of the *Holy Cross*. There are two of those feasts, one on the third of May, being the Invention of the *Cross*; and the other the fourteenth of September, called *Holy Rood-day*, and is the Exaltation of the Cross.

The word is compounded of the Saxon *rode*, i. e. *crux*, and *mass-day*, i. e. *feast-day*.

RUDOLPHINE *tables*. See Catalogue *of the stars*.

RUE, *ruta*, in *Botany*, a genus of the *decandria monogynia* class. Its characters are these: the flower has a permanent empalement, cut into five parts; it has four or five oval petals, which are narrow at their base, and eight or ten awl-shaped spreading stamina, the length of the petals, crowned by erect summits; with a gibbous germen, having a cross furrow, supporting an erect awl-shaped style, crowned by a single stigma; the germen afterward becomes a gibbous capsule, with five lobes, and five cells opening in five parts at the top, filled with rough angular seeds. Miller reckons seven, and Linnæus four species.

We have several sorts of *rue* in the gardens of the curious, but the common kind only is propagated for medicinal use. All the kinds may be propagated, either by cuttings in the manner of rosemary, or else by seeds. These should be sown in the spring on a bed of light earth; and when the young plants come up, they should be removed at about two inches high to the places where they are to remain.

All the sorts of *rue* will live much longer, and are less liable to be injured by frost in winter, when they grow in a poor, dry, rubbishy soil, than in good ground; for in rich, moist land, the plants grow very vigorously in summer, and are so replete with moisture, that a small frost will kill their tender shoots; whereas in poor, dry ground, their growth will not be great, but their shoots will be hard and compact, and, therefore, more able to resist the cold. Miller.

Rue is recommended as a powerful stimulant, aperient, antiseptic, and possessing some degree of an antispasmodic power; in crudities and indigestion, for preserving against contagious diseases, and the ill effects of corrupted air; in uterine obstructions, and hysteric complaints; and externally in discutient and antiseptic fomentations. Among the common people, the leaves are sometimes taken with treacle, on an empty stomach, as an anthelmintic. A conserve, made by beating the fresh leaves with thrice their weight of fine sugar, is the most commodious form for using the herb in substance. The virtues of *rue* are extracted both by water and spirit, but more perfectly by the latter. On inspissating the spirituous tincture, very little of its flavour rises with the menstruum; most of the active parts of the *rue* being concentrated in the extract. In distillation with water, an essential oil separates; which is of a yellowish or brownish colour, a moderately acrid taste, and penetrating smell: the decoction, inspissated, yields a moderately warm, pungent, and bitterish extract. The seeds and capsules contain more oil than the leaves. Lewis.

Rue, *dog's*. See Fig-*wort*.

Rue, *goats*, *galega*, in *Botany*. See Goat's *rue*.

Rue, *meadow*, *thalictrum*, in *Botany*, a genus of the *polyandria polygynia* class. Its characters are these: the flower has no empalement, but has four or five roundish, concave petals, which fall off soon, and a great number of broad stamina, which are compressed toward their tops, terminated by twin summits, with several very short styles sitting singly upon roundish germina, crowned by thick stigmas; the germina afterward turn to so many keelshaped capsules, collected in a head, each containing one oblong seed. Miller enumerates eleven, and Linnæus fourteen species.

The leaves of *meadow rue*, mixed with other greens, are somewhat laxative, according to Dodonæus; but a decoction of the root is more so, and may be well substituted for rhubarb.

Rue, *wall*, or *white maidenhair*, *ruta muraria*, in *Botany*, a species of *asplenium*. See Milt-*waste*.

This plant is found growing out of the joints of old walls in various parts of England, where it is gathered for medicinal use; but as it cannot be cultivated in gardens so as to grow to advantage, it is needless to say more of it.

This is one of the five capillary herbs mentioned in the Dispensatory, and has the same virtues with the rest of the maidenhairs: it is sometimes used in pectoral decoctions, and diuretic apozems.

Rue, *wild Assyrian*, *peganium*, in *Botany*, a genus of the *dodecandria monogynia* class. Its characters are these: the flower has a permanent empalement, composed of five narrow, erect leaves; it has five oblong, oval petals, which spread open, and fifteen awl-shaped stamina, about half the length of the petals, whose bases spread into a nectarium under the germen, and are terminated by erect, oblong summits; it has a three-cornered roundish germen, elevated at the base of the flower, which afterward becomes a roundish, three-cornered capsule, having three cells filled with oval acute-pointed seeds. We have but one species. Linnæus reckons two.

Its virtues agree with the garden *rue*, but it is more acrimonious.

RUELLE, a French term, formerly introduced into our language; is a diminutive of *rue*, *street*, and signifies, literally, a *little street*.

Its use, among us, was for an alcove, or other genteel apartment, where the ladies receive visits either in bed or up. The poets go reading their works from *ruelle* to *ruelle*, to bespeak the approbation and interest of the ladies. The term, however, is now disused.

RUELLIA, in *Botany*, a genus of the *didynamia angiospermia* class. Its characters are these: the flower has a permanent empalement, cut into five narrow, acute segments at the top, which are erect; it has one petal, with a tube the length of the cup, which inclines at the neck; the brim spreads open, and is cut into five segments, the two upper being large and reflexed; it hath four stamina situated in the tube, connected in pairs, terminated by short summits, and a roundish germen, supporting a slender style, crowned by a bifid stigma; the germen afterward becomes a taper capsule, pointed at each end, having two cells, inclosing roundish, compressed seeds. Miller reckons four, and Linnæus thirteen species.

RUFF, or Ruffle, in *Military Language*, a beat on the drum. Lieutenant-generals have three *ruffles*, major-generals two, brigadiers and governors, one, as they pass by the regiment, guard, &c.

Ruff-*trees*. See Roof-*trees*.

RUFFE, in *Ichthyology*, the English name of the *cernua*, or small gilded pearch, a fish common in our rivers, and much resembling the pearch in figure, though of a more slender form.

The *ruffe* is called by the generality of authors *cernua fluviatilis*; and by some *chærus acerina* and *aspredo*. It is called by Johnson and Charleton also *scrollus*. Willughby, as well as these authors, has mentioned the *scrollus* as another species of fish; but it is proved, by observation, that they are evidently the same species. Artedi makes this fish a pearch, or *perca*; and accurately distinguishes it from the other fish of that genus by the name of the pearch, with only one fin on the back, and with a cavernous head. In the Linnæan system it is the *perca* CERNUA. The teeth are small, and disposed in rows; it has one dorsal fin extending along the greatest part of the back; the first rays are strong, sharp, and spiny; the others soft; the pectoral fins consist of fifteen rays, the central of six, the anal of eight; the two first strong and spiny; the tail is a little bifurcated; the body is covered with rough scales; the back and sides are of a dirty green, the last inclining to yellow, and both spotted with black; the dorsal fin is spotted with black, and the tail marked with transverse bars. It is found in several of the English streams; being a gregarious fish, assembling in large shoals, and keeping in the deepest part of the water. Pennant.

This fish may be preserved alive in glass jars with fresh water, and be made very tame. It must be fed; for it cannot subsist on the animalcula of river water as small dace can.

No fish shews the circulation of the blood in a finer manner than *ruffes*, whose fins are exceeding transparent. Besides, it is a creature vastly tenacious of life, and will live twenty or thirty minutes out of water, without receiving much damage. Phil. Transf. N° 478. p. 26.

RUFFE, in *Ornithology*, the name of a male species of bird, the female of which is called *reeve*, and the Latin name for which is *avis pugnax*, or the fighting bird.

This species is the TRINGA *pugnax* of Linnæus.

The feathers of the males assume in several parts a variety of colours; but they are distinguished by a very remarkable circle of long feathers, surrounding their necks; whence their name: on the back of their necks they have a tuft of feathers, which spreads wide on both sides; these feathers around the neck are black in some birds; and in others white, yellow, or ferruginous; and they frequently differ in colour, even in the same bird; the coverts of the wings are brown or ash-coloured; the feathers on the breast black or dusky; the four exterior feathers of the tail of a cinereous brown, and the four middle barred with black and brown; the bill is black towards the end, and red at the base; the legs are yellow. In moulting they lose the neck-feathers, nor do they recover them till after their return in the following spring, when a set of small pear-shaped yellow pimples break out on the face above the bill. The male birds of the first year want these marks; and the older they are, the more numerous are the pimples, and the fuller and longer the ruffs. The length of the male to the tip of the tail is one foot, the breadth two; of the *reeve* ten inches, the breadth nineteen; the weight of the former, when just taken, is seven ounces and a half, and of the latter only four. The *reeves* never change their colour, which is pale brown; the back spotted with black, slightly edged with white; the tail brown; the middle feathers spotted with black; the breast and belly white; and the legs of a pale dull yellow. They come over to us in vast numbers early in spring, and disappear about Michaelmas, building in some parts of Lincolnshire, particularly in the fenny country about Croyland. They are found also in the isle of Ely, and in the East Riding of Yorkshire, and for about three weeks at Martin-mere, in Lancashire. The *reeves* lay four eggs, which are white, marked with large rusty spots, in a tuft of grass, the first week in May, and sit about a month. Soon after their arrival, the males begin to *hill*, i. e. to collect on some dry bank, near a pool of water, in expectation of the females, who resort to them. Each male keeps possession of a small piece of ground, which it runs round till the grass is worn quite away, and nothing but a naked circle left; and when a female lights, the *ruffs* immediately fall to fighting. When a fowler discovers one of those hills, he places his net at night, and at day-break resorts to his stand; and at the first pull takes those birds that are within reach; he then places his stales, or stuft birds, to entice those that are traversing the fen. In this way a fowler will take forty or fifty dozen in a season. When they first come over, there are many more males than females among them; but these are so continually fighting, that their number soon decreases below an equality. They are fed after they are taken with bread and milk, hemp-seed, and sometimes boiled wheat; to which, if expedition is required, they add sugar, and thus they become very fat. They are killed by cutting off the head with a pair of sciffars; and they discharge a great quantity of blood, considering their size. They are dressed like woodcocks, with their intestines; and when killed at the proper time, they are reckoned by the epicures very delicious. Ray and Pennant.

RUFFE is also the name of a particular species of pigeon, called by Moore the *columba cucullata rudis*.

It is in shape very like that species of pigeon called the *jacobine*, but is larger, and has a longer beak. The iris of the eye is sometimes red, sometimes pearl-coloured; the feathers of the hood and chain are much longer than the *jacobine*, though they do not come down so low to the shoulders of the wings, nor are they so compact and close, but are apt to blow about with every little blast of wind, and fall more backward off the head, and lie in a rough confused manner.

It is a common thing to match the *jacobine* pigeon with this species, with intent to improve its chain by the length of the *ruffe's* feathers; but the event is, that the pigeon is always worse instead of better, being longer beaked, and looser in its head and chain without any real advantage.

RUFTER-HOOD, among *Falconers*, a plain leathern hood, large and open behind, to be worn by a hawk, when she is first drawn.

RUGGIOLA, a sort of Spanish slate, serving in many places in the room of tiles and bricks. It is a flaky stone, of the nature of some of our grey slates, and is cut out of a mountain near Cordova; a plate of this being well heated on both sides, will retain its warmth for twenty-four hours.

The people of Cornwal and some parts of Yorkshire use a stone, which is of a talcky nature, to warm themselves when in bed, applying it at the feet of the bed. This they call the warming stone, from its use, and it will retain a sensible heat six or eight hours, after once moderately warming. Plot's Oxfordshire, p. 258.

RUGOSE *leaf*, among *Botanists*. See LEAF.

RUININE *oil*, a name given by some authors to the oil of the PALMA *Christi*, which is very common in the West Indies, and is used by the common people in lamps. It is a delicate, sweet, and transparent oil, and has no peculiar operation in physic. They often give it in glysters from one spoonful to three at a time, and it has only the effect of common oil; but the leaves of the plant are one of the grand medicines of the Negroes: bruised, and applied to the head, they are thought to be an almost infallible remedy for the head-ach, of whatever kind, or from whatever cause. See CASTOR-*oil*.

RUINS, a term particularly used for magnificent buildings fallen to decay by length of time, and whereof there only remains a confused heap of materials.

Such are the *ruins* of the tower of Babel, of the tower of Belus, two days journey from Bagdat, in Syria, on the banks of the Euphrates; which are now no more than a heap of bricks, cemented with bitumen; and whereof we only perceive the plan to have been square.

Such, also, are the *ruins* of a famous temple, or palace, near Schiras, in Persia; which the antiquaries will have to have been built by Ahasuerus; and which the Persians now call Tchelminar, or Chelminar; q. d. the forty columns; because there are so many columns remaining pretty entire, with the traces of others; a great quantity of basso relievos, and unknown characters, sufficient to shew the magnificence of the antique architecture. The *ruins of* PALMYRA may also be reckoned in the class of famous *ruins*.

RUKKIA, in *Zoology*, a name given by some to a peculiar kind of squirrel, found in the island of Ceylon.

RULE, or RULER, *regula*, a very simple instrument, ordinarily of hard wood, thin, narrow, and straight, serving to direct the drawing of right lines.

The *rule* is of principal use in all the mechanical arts. To prove whether or no it be just, draw a line by it on paper; then turn the *rule* about, the right end to the left, and apply the same edge this way to the line: if the edge now agree exactly with the line, the *ruler* is true.

Desmarets has a fine poem on the amours of the *rule* and compass. The stone-cutters *rule* is usually four feet long, and divided into feet and inches.

The masons *rule* is twelve or fifteen feet long, and is applied under the level to regulate the courses, to make the piedroits equal, &c.

RULE, *parallel*, or RULER. See PARALLEL.

RULE is also applied to certain instruments which have other considerable uses besides that of drawing lines. Such are the carpenters *joint-rule*, Everard's and Coggeshal's *sliding-rules*, &c.

RULE, *carpenters joint*, is an instrument usually of box, twenty-

twenty-four inches long, and one and a half broad, each inch being ſubdivided into eight parts. On the ſame ſide with theſe diviſions is uſually added Gunter's line of numbers.

On the other ſide are the lines of timber and board-meaſure, the firſt beginning at $8\frac{1}{2}$, and continued to 36, near the other end; the latter is numbered from 7 to 36, four inches from the other end. *Tab.* III. *Surveying, fig.* 47.

The diviſion of the timber-line is formed from a conſideration, that 1728 inches make a ſolid foot, in the following manner: thus, 9 is ſo placed againſt one of the diviſions of inches, or parts, on the other ſide of the *rule*, beginning from the right hand, that its ſquare, which is 81 inches, multiplied by that number of inches and parts, muſt make 1728 inches; which, dividing 1728 by 81, muſt be placed againſt $21\frac{1}{3}$ from the right hand; and 10 muſt be placed againſt $17\frac{28}{100}$ inches; becauſe 1728 divided by the ſquare of 10 or 100, gives $17\frac{28}{100}$, &c. But becauſe a ſquare, whoſe ſide is 1, 2, &c. to 8 inches, requires more than 24 inches in length, as a multiplier, in order to produce 1728 inches; and ſince the length of the *rule* is only 24 inches, there is a table upon the left end of it, which ſupplies its defect of length. In this table the upper row of figures, viz. 1, 2, 3, 4, 5, 6, 7, 8, denotes inches, or the lengths of the ſides of ſquares; and the ſecond and third rows are the correſpondent feet and inches to make up a ſolid foot. It is made by dividing 144 inches by the ſquares of 1, 2, 3, 4, 5, 6, 7, 8.

The line of board-meaſure is thus divided: ſuppoſe the diviſion 7 to be marked; divide 144, the number of inches in a ſquare foot, by 7, and the quotient will be $20\frac{4}{7}$ inches; whence the diviſion 7 muſt be againſt $20\frac{4}{7}$ inches on the other ſide of the *rule*. To mark the diviſion 8, divide 144 by 8, and the quotient, which is 18 inches, muſt be placed on the line of board-meaſure againſt 18 inches on the other ſide, &c. But becauſe the ſide of a long ſquare, that is 1, 2, 3, 4, 5 inches, requires the other ſide to be more than 24 inches, the whole length of the *rule*; there is a table annexed, formed by dividing 144 inches by each of the numbers in the upper row, and then each of the quotients by 12, to reduce them into feet.

RULE, *uſe of the carpenters joint.* The application of the inches in meaſuring lengths, breadths, &c. is obvious. That of the Gunter's line, ſee under GUNTER's *line.* The uſe of the other ſide is all we need here meddle with.

1. *The breadth of any ſurface, as board, glaſs, &c. being given, to find how much in length makes a ſquare foot.*—Find the number of inches the ſurface is broad, in the line of board-meaſure, and right againſt it, on the inches ſide, is the number of inches required. Thus, if the ſurface were 8 inches broad, 18 inches will be found to make a ſuperficial foot.

Or, more readily, thus. Apply the *rule* to the breadth of the board or glaſs, that end marked 36 being even with the edge; the other edge of the ſurface will ſhew the inches and quarters of inches which go to a ſquare foot.

To find the content of a given ſurface. Find the breadth, and how much makes one foot; then turn that over as many times as you can upon the length of the ſurface, and ſo many feet does the ſurface contain.

2. *Uſe of the table at the end of the board-meaſure.* If a ſurface be one inch broad, how many inches long will make a ſuperficial foot? Look in the upper row of figures for one inch, and under it, in the ſecond row, is 12 inches, the anſwer to the queſtion.

3. *Uſe of the line of timber-meaſure.* This reſembles the former; for, having learnt how much the piece is ſquare, look for that number on the line of timber-meaſure: the ſpace thence to the end of the *rule* is the length, which, at that breadth, makes a foot of timber. Thus, if the piece be 9 inches ſquare, the length neceſſary to make a ſolid foot of timber is $21\frac{1}{3}$ inches. If the timber be ſmall, and under 9 inches ſquare, ſeek the ſquare in the upper rank of the table, and immediately under it are the feet and inches that make a ſolid foot. Thus, if it be 7 inches ſquare, 2 feet 11 inches will be found to make a ſolid foot.

If the piece be not exactly ſquare, but broader at one end than another, the method is, to add the two together, and take half the ſum for the ſide of the ſquare. For round timber, the method is, to girt it round with a ſtring, and to allow the fourth part for the ſide of the ſquare. But this method is erroneous; for hereby you loſe above $\frac{1}{4}$ of the true ſolidity. See TIMBER.

RULE, *caliber.* See CALIBER.

RULE, *Everard's ſliding.*
RULE, *Coggeſhall's ſliding.* } See SLIDING *rule.*

RULE, *regula*, alſo denotes a certain maxim, canon, or precept, to be obſerved in any art or ſcience. Thus we ſay, the *rules* of grammar, of logic, of philoſophizing, &c.

School philoſophers diſtinguiſh two kinds of *rules*; viz. *theoretical*, or *rules of knowing*, which relate to the underſtanding, being of uſe in the diſcovery of truth; and *practical*, or *rules of acting*, which relate to the will, and ſerve to direct it to what is good and right.

For the management and application of theſe two ſorts of *rules*, there are two diſtinct arts; viz. *logic*, and *ethics.*

RULES *of knowing, regulæ ſciendi*, are ſuch as direct and aſſiſt the mind, in perceiving, judging, and reaſoning.

RULES *of acting, regulæ agendi*, are thoſe whereby the mind is guided in her deſires, purſuits, &c.

Authors are extremely divided about the regard to be had to the RULES *of poetry* fixed by the ancients, Ariſtotle, Horace, Longinus, &c. and admitted by the modern critics, as Boſſu, &c. ſome contending, that they muſt be inviolably obſerved; others pleading for liberty to ſet them aſide on occaſion. *Rules*, it is complained, are fetters; rank enemies to genius; and never religiouſly obſerved by any, but thoſe who have nothing in themſelves to depend on. Voiture frequently neglected all the *rules* of poetry, as a maſter who ſcorned to be confined by them.

The theatre has its particular *rules*, as the *rule* of twenty-four hours, the unities of action, time, and place, &c. If it be true, ſays Moliere, that plays conducted according to the *rules* do not pleaſe, but thoſe which are not, do, the *rules* muſt be naught. For myſelf, when a thing hits and diverts me, I do not enquire whether I have done amiſs, nor whether Ariſtotle's *rules* forbid me to laugh.

RULE *of philoſophizing.* See PHILOSOPHIZING.

RULE, in *Arithmetic*, denotes a certain operation with figures, to find ſums or numbers unknown, and to facilitate computations, mercantile, aſtronomical, &c.

Each *rule* in arithmetic has its particular name, according to the uſe for which it is intended. The four firſt, which ſerve as the foundation of the whole art, are called *addition, ſubtraction, multiplication*, and *diviſion.* See ADDITION, &c.

From theſe ariſe ſeveral other *rules*; as the *rule of three*, or *of proportion*; called alſo *the golden rule*, and diſtinguiſhed into *direct* and *inverſe, ſimple* and *compound.* Alſo, the *rule of five numbers.*—*Rule of fellowſhip, ſimple* and *with time.*—*Rule of alligation, medial* and *alternate.*—*Rule of exchange.*—*Rule of falſe poſition, ſingle* and *double.* To which add, *approximation, barter, combination, equation, exchange, extraction, involution, progreſſion, rebate, reduction*, &c. See FELLOWSHIP, &c.

RULE *of three*, or *of proportion*, commonly called the *golden rule*, is a *rule* which teaches how to find a fourth proportional number to three others given. See *Geometrical* PROPORTION.

As, if three degrees of the equator contain 70 leagues, how many do 360 degrees, the circumference of the earth, contain?

The *rule* is this: *Multiply the ſecond term* 70 *by the third* 360; *divide the product* 25,200 *by the firſt term* 3, *and the quotient* 8400 *is the fourth term required.*

The uſe of this *rule* is of vaſt extent, both in common life, and the ſciences; but has no place except where the proportion of the given numbers is known. Suppoſe, e. gr. a large veſſel full of water to empty itſelf by a little aperture; and ſuppoſe three gallons to flow out in two minutes, and it were required to know in what time a hundred gallons would be diſcharged? Here, indeed, are three terms given, and a fourth required; but as it is evident, from experience, that this water flows faſter at firſt than afterwards, the quantity of flowing water is not proportional to the time; and, therefore, the queſtion does not come under the *rule of three.*

The things which come under commerce are proportionable to their prices, twice as much of any commodity always coſting twice as much money, &c. The price, therefore, of any quantity of a commodity being given, the price of any other quantity of the ſame, or the quantity of the commodity anſwering to any other given ſum, is found by the *rule of three.* E. gr. If 3 pounds coſt 17*s.* what will 30 pounds coſt? Since as 3 pounds are to 30 pounds, ſo is the value of the former 17*s.* to the value of the latter; the queſtion ſtands thus:

3 ℔ ——— 30 ℔ ——— 17*s.*
17
——
3)510(170*s.* —— 8*l.* 10*s.*

Again, if 3 pounds be bought for 17*s.* how many will 170*s.* buy? Since as 17*s.* is to 170*s.* ſo are 3 pounds to the pounds required; the number will be found thus:

17*s.*——170*s.*——3℔.
3
17)510(30℔.
51
00

If the given terms be heterogeneous, i. e. have broken numbers among them, they do not bear the fame proportion to each other which the things they exprefs bear. They muft therefore be reduced to homogeneous ones, or to the fame denomination, as pounds into fhillings, fhillings into pence, &c. hours into minutes, &c.

E. gr. If 3 pounds and four ounces coft 2*s.* 4*d.* what will 2 pounds coft? The operation will be thus:

3lb. 4oz.——2lb.——2*s.* 4*d.*
16 16 12
52 32 28
28
256
64
52)896(17*d.* $\frac{12}{52}$ of a penny.
52
376
364
12

In many cafes of commerce and accompts, we have more compendious ways of working queftions that come under the *rule of three*, than by the *rule* itfelf; which, by reafon of their expediting practice, are called PRACTICE, and conftitute a particular *rule* of themfelves.

RULE *of three inverfe*, is where the natural order of the terms is inverted. As, if 100 workmen build a houfe in two years, in how long time will 200 workmen build the fame?

This is ufually confidered by the writers of arithmetic, and taught in the fchools, as a particular *rule*; being wrought by multiplying the firft term 100, by the fecond 2, and dividing the product 200 by the third term 200, the quotient 1 is the number required.

But there is no neceffity for making a particular *rule* for the matter; this coming naturally enough under the former, by only ranging the terms as the nature of the queftion requires.

Thus it is evident, that, as the number of men 200 is to 100, fo is the fpace 2 years, wherein 100 build the houfe, to the fpace wherein 200 will build the fame. For the lefs time the more hands are required. The queftion then will ftand thus:

200 M.——100 M.——2 Y.
2
200)200(1 year.

Nothing more is neceffary than to place the terms in due order; for which purpofe, firft fet down the quantity that is of the fame kind with the quantity fought; then confider, from the nature of the queftion, whether that which is given is greater or lefs than that which is fought: if it be greater, place the greateft of the other two quantities on the left hand; but if it be lefs, place the leaft of the other two quantities on the left hand, and the other on the right; and proceed by multiplying the fecond by the third, and dividing their product by the firft. Accordingly the above queftion will be thus ftated:

200——2——100; and hence $\frac{2 \times 100}{200} = 1$.

RULE *of five numbers*, or *compound rule of three*, is where two *rules* of three are required to be wrought, before the number fought be found. As if 300*l.* in two years yield 30*l.* intereft, how much will 1000*l.* yield in 12 years? Here the firft thing to be done is, to find by the *rule of three* what intereft 1000*l.* will give in 2 years; and then, by the fame rule, what it will give in 12 years.

This, alfo, is confidered by the writers, &c. of arithmetic, as a particular *rule*, but without any neceffity; a double operation folving it better; as in this example:

300*l.*——1000*l.*——30*l.* int.
30
3|00)300|00(100 int.
2 Y——12——100*l.*
12
2)1200(600 int.

But in queftions of this kind, a fingle *rule of three* may do the bufinefs: for 300*l.* give the fame intereft in two years which twice 300 give in one year; and twelve times 1000*l.* give the fame intereft in one year that 1000 give in 12: omitting, therefore, the circumftances of time, fay, If twice 300 (that is 600) give 30*l.* intereft (in one year) what will 12 times 1000 (that is, 12000) give (in one year)?

600——12000——30
30
600)3600|00(600

What is faid of this *rule* being more eafily performed by two fimple *rules of three*, is fometimes true, but not always. In fome cafes, not only five, but feven, or nine, terms may be given, from whence it is neceffary to determine an eighth, or a tenth, which indeed might be performed by repeated applications of the fimple *rule of three*, but not fo expeditioufly. Mr. Jones has therefore given a general *rule* by which all cafes of the *rule of three*, or of proportion, may be folved.

The *rule* is, 1. Set down the terms expreffing the condition of the queftion, in one line. 2. Under each conditional term fet its correfponding one in another line. 3. Multiply the *producing terms* of one line, and the produced term of the other line continually, and take the refult for a dividend. 4. Multiply the remaining terms continually, and let the product of them be a divifor. 5. The quotient of this divifion will be the term required.

By *producing terms* here, are meant, whatever neceffarily and jointly produce any effect; as the caufe and the time; length, breadth, and depth; buyer and his money; feller and his goods; all neceffarily infeparable in producing their feveral effects.

In a queftion where a term is underftood, and not expreffed, that term may be expreffed by unity.

Example. If 250*l.* ferve fix perfons for nine months; how long will 1000*l.* ferve four perfons at the fame rate? Here the terms which exprefs the condition are,

	£.	*P.*	*M.*
	250 :	6 :	9
correfponding terms	1000 :	4 :	Q

Where Q is put to reprefent the term required.

Among the conditional terms, fix perfons and nine months are producing, and 250*l.* is produced: among their correfponding terms four perfons and Q are producing, and 1000*l.* is produced.

But it being impoffible to multiply the producing terms in the fecond line, and the produced in the firft, becaufe Q is unknown; therefore multiply the producing terms of the firft line, by the produced in the fecond, and divide by the product of the reft.

Then will $Q = \frac{6 \times 9 \times 1000}{4 \times 250} = 6 \times 9 = 54$. See Mr. Dodfon's Anti-Logarithmic Canon, p. 38, feq.

But if the notion of producing and produced terms fhould feem obfcure, thofe who have a knowledge of the doctrine of compound ratios, will eafily perceive that in the foregoing queftion, Q is to 9 months in the compound ratio of 4 perfons to 6 perfons inverfely, and of 1000*l.* to 250*l.* directly, that is, $\frac{Q}{9} = \frac{6}{4} \times \frac{1000}{250}$, therefore $Q = \frac{6 \times 9 \times 1000}{4 \times 250} = 54$, as before. And in like manner may other queftions, relating to the compound rule of proportion, be ftated and folved, however complex.

RULE, *central.* See CENTRAL.

RULE, in a monaftic fenfe, is a fyftem of laws, or conftitutions, whereby religious houfes are eftablifhed and regulated; and which the religious make a vow to obferve at their entrance.

The monaftic *rules* are all to be approved of by the pope, in order to make them valid. The *rule* of St. Benedict is, by fome authors, called the *holy rule.*

Thofe of St. Bruno, and St. Francis, are, of all others, the moft auftere. See CARTHUSIANS.

When a religious cannot fupport the aufterities of his *rule*, he fues for a difpenfation.

RULE, in the *Canon Law.* The RULE, *de verifimili notitia, of probable notice*, in the Romifh church, renders all provifions to a benefice, vacant by death, null; if it appear, that, from the day of the deceafe, to the day of the date of the provifions, or to the day when the courier arrives from Rome, there has not been time fufficient for regular notice of the perfon's deceafe to be conveyed to the pope.

Provifions are even null, if it be proved the courier fet out before the perfon was deceafed. This *rule* is ftrictly obferved in France; in other countries the pope finds frequent occafions to difpenfe with it. See PROVISIONS.

Rule *of twenty days, regulâ viginti dierum.* By this *rule*, if an eccleſiaſtic reſign his benefice, to make the reſignation valid, the reſigner muſt ſurvive its admiſſion in the court of Rome twenty days. If he die before the expiration of the twenty days, the reſignation is void, and the benefice becomes vacant by death.

This *rule* does not hold of the proviſions of ordinary collators; nor of ſimple and pure reſignations into the hands of the ordinary; but only in caſe of proviſions of the pope, diſpatched on reſignations *in favorem*.

This *rule* anciently extended to ſuch as reſigned in time of health, as well as of ſickneſs. Pope Boniface reſtrained it to the latter; whence it is commonly called *regula de infirmis reſignantibus*.

Rule *de publicandis.* By this *rule* the reſignee of a benefice, if he have a proviſion from the court of Rome, is obliged to publiſh the reſignation, and take poſſeſſion within ſix months; or, if he have it from the ordinary collator, within one month. Otherwiſe, if the reſigner die, the reſignation becomes null.

Rules *of court*, in *Law*, are certain orders made, from time to time, in the courts of law, which attornies are bound to obſerve, in order to avoid confuſion; and both the plaintiff and defendant are at their peril alſo bound to pay obedience to *rules* made in court relating to the cauſe depending between them. It is to be obſerved, that no court will make a *rule* for any thing that may be done in the ordinary courſe; and that if a *rule* be made, grounded upon an affidavit, the other ſide may move the court againſt it, in order to vacate the ſame, and thereupon ſhall bring into court a copy of the affidavit and *rule*. On the breach and contempt of a *rule* of court an attachment lies; but it is not granted for diſobedience to a *rule* when the party has not been perſonally ſerved; nor for diſobeying a *rule* made by a judge in his chamber, which is not of force to ground a motion upon, unleſs the ſame be entered. A *rule* of court is granted every day the courts of Weſtminſter ſit, to priſoners of the king's bench, or Fleet priſons, to go at large about their private affairs.

Rules, *clerk of the.* See Clerk.

RULER, *parallel.* See Parallel *ruler*.

RUM, a ſpecies of brandy, or vinous ſpirit, drawn by diſtillation from ſugar-canes.

The word *rum* is the name it bears among the native Americans.

Rum is very hot and inflammable, and is in the ſame uſe among the natives of the ſugar-countries, as brandy among the French.

Rum differs from what we ſimply call ſugar-ſpirit, in that it contains more of the natural flavour or eſſential oil of the ſugar-cane; a great deal of raw juice and parts of the cane itſelf being often fermented in the liquor, or ſolution of which the *rum* is prepared.

The unctuous or oily flavour of *rum* is often ſuppoſed to proceed from the large quantity of fat uſed in boiling the ſugar; which fat, indeed, if coarſe, will uſually give a ſtinking flavour to the ſpirit, in our diſtillations of the ſugar liquor, or waſh, from our refining ſugar-houſes; but this is nothing like the flavour of the *rum*, which is really the effect of the natural flavour of the cane. The method of making *rum* is this:

When a ſufficient ſtock of the materials is got together, they add water to them, and ferment them in the common method, though the fermentation is always carried on very ſlowly at firſt; becauſe, at the beginning of the ſeaſon for making *rum* in the iſlands, they want yeaſt, or ſome other ferment, to make it work; but by degrees, after this, they procure a ſufficient quantity of the ferment, which riſes up as a head to the liquor in the operation, and thus they are able afterwards to ferment and make their *rum* with a great deal of expedition, and in large quantities.

When the waſh is fully fermented, or to a due degree of acidity, the diſtillation is carried on in the common way, and the ſpirit is made up proof; though ſometimes it is reduced to a much greater ſtrength, nearly approaching to that of alcohol or ſpirit of wine, and is then called double-diſtilled *rum*. It might be eaſy to rectify the ſpirit, and bring it to much greater purity than we uſually find it to be of; for it brings over in the diſtillation a very large quantity of the oil; and this is often ſo diſagreeable, that the *rum* muſt be ſuffered to lie by a long time to mellow before it can be uſed; whereas, if well rectified, it would grow mellow much ſooner, and would have a much leſs potent flavour.

The beſt ſtate to keep *rum* in both for exportation, and other uſes, is doubtleſs that of alcohol, or rectified ſpirit. In this manner it would be tranſported in one half the bulk it uſually is, and might be let down to the common proof ſtrength with water when neceſſary. For the common uſe of making punch, it would likewiſe ſerve much better in the ſtate of alcohol; as the taſte would be cleaner, and the ſtrength might always be regulated to a much greater exactneſs than in the ordinary way.

The only uſe to which it would not ſo well ſerve in this ſtate, would be the common practice of adulteration among our diſtillers; for when they want to mix a large portion of cheaper ſpirit with the *rum*, their buſineſs is to have it of the proof-ſtrength, and as full of the flavouring oil as they can, that it may drown the flavour of the ſpirits they mix with it, and extend its own. If the buſineſs of rectifying *rum* was more nicely managed, it ſeems a very practicable ſcheme to throw out ſo much of the oil, as to have it in the fine light ſtate of a clear ſpirit, but lightly impregnated with it; in this caſe it would very nearly reſemble arrac, as is proved by the mixing a very ſmall quantity of it with a taſteleſs ſpirit, in which caſe the whole bears a very near reſemblance to arrac in flavour.

Rum is uſually very much adulterated in England: ſome are ſo barefaced as to do it with malt-ſpirit; but when it is done with molaſſes-ſpirit, the taſtes of both are ſo nearly allied, that it is not eaſily diſcovered. The beſt method of judging of it is by ſetting fire to a little of it; and, when it has burnt away all the inflammable part, examining the phlegm both by the taſte and ſmell.—Shaw's Eſſay on Diſtillery.

For the duty, &c. on *Rum*, ſee *Foreign* Spirits.

RUMB, Rum, or Rhumb, in *Navigation.* See Rhumb.

Rumb-*line*, or *loxodromia.* See Rhumb-*line*.

RUMEN, the firſt ſtomach of animals which chew the cud, and which are hence called *ruminants*.

The food is tranſmitted into the *rumen* without any other alteration in the mouth, than being a little rolled and wrapped up together.

The *rumen*, or paunch, is much the largeſt of all the ſtomachs, as being to contain both the drink, and the whole crude maſs of aliment, which there lie and macerate together, to be thence remitted to the mouth, to be re-chewed and comminuted, in order to their farther digeſtion in the other ventricles. See Abomasus.

In the *rumen*, or firſt ventricle, of camels, are found divers ſacculi, which contain a conſiderable quantity of water; an admirable contrivance for the neceſſities of that animal, which, living in dry countries, and feeding on dry hard food, would be in danger of periſhing, but for thoſe reſervoirs of liquor.

RUMEX, in *Botany.* See Dock.

RUMI, in the *Materia Medica*, a name given by Avicenna and Serapio to maſtic of the finer kind. They diſtinguiſhed this drug into two ſorts; the one called by this name *rumi*, which was white and pure; the other called *cupti*, which was foul and blackiſh; the former came from the iſland of Chios, the latter from ſome parts of Ægypt.

RUMINANT, *ruminans*, in *Natural Hiſtory*, an animal which chews over-again what it has eat before: this is popularly called *chewing the cud*.

Joah. Con. Peyer has an expreſs treatiſe De *Ruminantibus* & *Ruminatione*; where he ſhews, that there are ſome animals which do really ruminate; ſuch are oxen, ſheep, deer, goats, camels, hares, and ſquirrels; whereas others only appear to ruminate, which he calls *ruminantia ſpuria*; of which number are moles, crickets, bees, beetles, crabs, mullets, and ſeveral other fiſhes.

This latter claſs, he adds, have their ſtomachs compoſed of muſcular fibres; by means whereof the food is ground up and down, much as in real *ruminants*.

Ruminants, Mr. Ray obſerves, are all quadrupedal, hairy, and viviparous; ſome with hollow and perpetual horns, others with deciduous ones. See Quadrupeds.

The horned *ruminants* have all four ſtomachs, appropriated to the office; viz. 1. The κοιλια μεγαλη of Ariſtotle, the *rumen*, *venter magnus*, or what we call the *paunch*, or *inward*, which receives the meat ſlightly chewed, retains it awhile, and then delivers it back again into the mouth, which is what we call the *cud*, to be re-chewed. 2. The κεκρυφαλος, or *reticulum*, which we call the *honeycomb*, from its internal coat being divided into cells like honeycombs. 3. The εχινος, which Mr. Ray thinks hath been wrongly tranſlated *omaſus*, and which he chooſes to call the *echinus*: this being difficult to clear, our people throw it away, and call it the *manifold*. 4. The ενυστρον of Ariſtotle, by Gaza called the *abomaſus*; and, among us, the *maw*.

Again, all the horned *ruminant* animals want the *dentes primores*, or broad teeth in the upper jaw; and they afford that hard kind of fat called *ſuet*, *ſebum*, στεαρ, which is firmer, and leſs liquifiable in them, than the adeps of other animals.

RUMINATION, *ruminatio*, an action peculiar to a claſs of animals called *ruminants*, whereby they return the food

food they have formerly swallowed, to be chewed over-again, and rendered more fit for chyle, by this second grinding in the mouth.

Peyer defines *rumination*, a natural motion of the stomach, mouth, and other parts; by means of which, the food eaten at first, hastily, is returned back again to the mouth; where it is re-chewed, and swallowed a second time; and that much to the benefit of the animal.

Burnet, in his Thesaur. Med. gives several instances of men that ruminated, from Salmuth, Rhodius, &c. Dr. Slare, in the Philos. Trans. N° 193, gives us a fresher instance in one of our own countrymen, living at Bristol. His account, as it is curious, and may let us see a little how it fares with ruminating animals, we shall here add.

"He begins to chew his meat over again within a quarter of an hour after meals, if he drink with it; if not, somewhat later. His chewing after a full meal lasts about a hour and a half: and if he go to bed presently after meals, he cannot sleep till the usual time of chewing be over. The victuals, upon the return, taste somewhat more pleasant than at the first. Bread, meat, cheese, and drink, return much of such colours as they would be of, were they mixed together in a mortar. Liquids, as spoon-meat, return to his mouth in the same manner as dry and solid food. The victuals seem to him to lie heavy till they have passed the second chewing; after that they pass clean away. If he eat variety of things, that which passes down first, comes up again first. If the ruminating faculty chance to leave him, it signifies sickness; and it is never well with him till it returns. He is about twenty years of age, and was always thus since he can remember. His father does the like, sometimes; but only in small quantities."

RUMMAGE, probably derived from the Saxon *raum*, *room*, or *space*, in the *Sea Language*, signifies to clear a ship's hold, or to remove goods or luggage from one place to another.

RUMNEY or ROMNEY *marsh*, a tract of land, in the county of Kent, containing 24000 acres, governed by certain ancient and equitable laws of sewers, composed by Henry de Bathe, a venerable judge in the reign of king Henry III. who granted a charter to this district, impowering twenty-four men, thereunto chosen, to make distresses equally upon all those which have lands and tenements in the said marsh, to repair the walls and water-gates of the same, against the dangers of the sea.

The commissioners of SEWERS, in other parts of England, may act according to the laws and customs of *Rumney marsh*, or otherwise, at their own discretion; subject to the discretionary revision of the court of king's bench.

RUMOUR, in *Law*. Spreading false *rumours* is criminal, and punishable at common law.

RUMP *of a bird*. See UROPIGIUM.

RUMPHIA, in *Botany*, the name of a plant which makes a distinct genus of the *triandria monogynia* class: the characters of which are, that the cup is a one-leaved perianthium, divided by three notches at the extremity, and is placed erect, and is plain; the flower is composed of three petals, which are all oblong, obtuse, and equal in size; the stamina are three pointed filaments of the length of the flower; the antheræ are very small; the pistil has a roundish germen; the style is pointed, and of the same length with the stamina; and the stigma is three-cornered. The fruit is a skinny drupe of a turbinated form, and furrowed in three places. The seed is a whole nut of an oval figure, containing three cells; the nuts in each of these are three-cornered in shape.

RUN *of a ship*, so much of her hull as is always under water; growing thinner and lanker by degrees, from the floor-timber to the stern-posts.

This is also called the *ship's way aftward*.

A ship is said to have a *good run*, when it is long, and the water passes easily to her rudder, her tuck not lying too low, which is of great importance to her sailing. If the water do not come strongly to her rudder, by reason of her being built too broad below, she cannot steer well; and a ship that cannot steer well, cannot keep a good wind, nor will have any fresh way through the sea, but will always be falling to leeward.

And yet a ship with a large and good *run* loses much stowage, because it is made narrow below.

RUN, in the *Manege*. To *run* a horse is to put him to his utmost speed. Some use the word *running* for any kind of gallop.

RUNCARIA, in our old writers, signifies land full of brambles and briars. 1 Inst. 5. The word comes from the Latin *runca*, *a weed*.

RUNCATION, a term used in the *Ancient Husbandry* to express the clearing away the weeds from among the corn, and other sown plants.

They used, when the corn or other plants were an inch or two high, to draw a sort of rake or harrow over the ground indiscriminately over the corn and weeds, and when this was done a person followed over all the field, and picked up all the weeds with the hand; the treading down the young corn, however, by this person's feet, and the injury done to it by the rake, were so great, that the crop always suffered greatly by it; and many of the Romans chose to omit the use of the rake or harrow, as a thing that did as much injury to the corn as to the weeds, and contented themselves with the sending a person to pick up the weeds without it.

This was a sort of first hint to the horsehoeing husbandry of the moderns, though so injudiciously managed, that it was of very little, if any use, in this its infancy.—But had these farmers been instructed to sow their corn in rows, and then to use the rake or harrow, as we do the hoe, only between those rows, they would then have had all the advantage of destroying weeds by it, and of stirring the earth, and no injury would have been done to the crop. See HUSBANDRY.

RUNDLES, or ROUNDLES, in *Heraldry*, the same as balls or PELLETS.

RUNDLET, RONLET, or ROUNDLET, a small vessel, containing an uncertain quantity of any liquor, from three to twenty gallons.

RUNGS, in a ship, the same with the floor or ground-timbers, being the timbers which constitute her floor, and are bolted to the keel, whose ends are called *rung-heads*; and more properly floor-heads.

RUNG-*heads*, in a ship, are made a little bending to direct the sweep or mold of the *futtocks*, and naval timbers: for here the lines, which make the compass and bearing of a ship, do begin.

RUNIC, a term applied to the language and letters of the ancient Goths, Danes, and other northern nations.

The word *rune*, according to Mallet, is derived from a word in the ancient Gothic language, signifying *to cut*: but Wormius, with greater probability, derives *rune* from either *ryn*, *a furrow*, or *ren*, *a gutter* or *channel*. As these characters were first cut in wood or stone, the resemblance to a furrow, or channel, would easily suggest the appellation.

Some have been of opinion, that Gulphilas, or Ulphilas, a Gothic bishop, about the year 370, was the first inventor of the *Runic character*: but Olaus Wormius shews at large, that Ulphilas could only be the first who taught it to foreigners; for that the *Runæ*, or characters themselves, were older than he.

In reality, Ulphilas, according to other authors, was so far even from teaching the character, that he invented an alphabet of his own, on purpose to put the *Runic* characters, which had been made subservient to the superstitions of heathenism, out of use. See GOTHIC *character*.

Many learned writers have adopted the opinion, first suggested by Dr. Hickes, that the *Runic* character was borrowed from the Roman: and they farther maintain, that it was not known in the North before the introduction of Christianity. If it were allowed, that the *Runic* characters are borrowed from the Roman alphabet, it by no means follows that the Scandinavians had waited for the secret till the introduction of Christianity among them: but it is justly observed, by Wormius, that they are as easily reducible to the Greek and Hebrew alphabets as to the Roman. An evident proof that the *Runic* were not derived from the Roman letters results, not only from their form, which has scarce any resemblance to these, but from their number (being but 16), and their order and names, which have nothing in common with the Roman, Greek, or Gothic characters of Ulphilas. A comparative view of the *Runic* and Gothic in these respects may be seen in the English translation of Mallet's Northern Antiquities, vol. i. p. 370. M. Mallet has sufficiently shewn, that all the old chronicles and poems of the North universally agree in assigning to the *Runic* characters a very remote antiquity, and in attributing the invention of them to ODIN himself, whom their poets expresly call the inventor of the *Runes*. Besides, instances occur of princes and Pagan heroes, who made use of this character, in an age long before Christianity had penetrated into the North.

In Blekingia, a province of Sweden, there is a road cut through a rock, on which are various *Runic* characters, said to have been engraved there by king Harold Hyldetand, in honour of his father; and king Harold is said to have ascended the throne about the beginning of the seventh century. It is, therefore, extremely probable that Odin introduced the *Runic* characters into the North, intending by the introduction of letters and writing to acquire respect from the rude uncivilized inhabitants of Scandinavia; who would be ready enough

to conceive that there was something divine or magical in them. Accordingly we find that they were actually employed for the pretended purpose of working prodigies.

The *Runic* characters were distinguished into various kinds. The *noxious*, or *bitter Runes* were employed to bring various evils on their enemies; the *favourable* averted misfortunes; the *victorious* produced conquest to those who used them; the *medicinal* were inscribed on the leaves of trees for healing; others served to dispel melancholy thoughts, to prevent shipwreck, as antidotes against poison, as preservatives against the resentment of their enemies, and in order to render a mistress favourable. These various kinds differed only in the ceremonies observed in writing them, in the materials on which they were written, in the place where they were exposed, in the manner in which the lines were drawn, whether in the form of a circle, a serpent, or a triangle, &c.

The *Runic* characters were also employed for more rational purposes: for writing epistles and epitaphs, and for various kinds of inscriptions, which, the older they are, so much the better are they engraven. They are rarely written from the right hand to the left; but it is not uncommon to meet with the line running from the top to the bottom, after the manner of the Chinese and other Indian nations; or from the top to the bottom, and then turning round to the left, and so up again to the place it begins at; or else from the left to the right, and so back to the left again, which was the manner of the early Greeks. The greater part of the ancient monuments, written in the *Runic* character, which are still preserved, are inscriptions dispersed here and there in the fields, and cut out on large stones or pieces of rock. They are also found in churches, and sometimes in other buildings.

In the tenth and eleventh centuries the *Runic* gave way to the Roman character; till at length the missionaries succeeded in totally abolishing them, as tending to retain the people in their ancient superstitions. They are, however, still retained among the mountaineers of one province in Sweden. Mallet's Northern Ant. vol. i. p. 359, &c.

It is supposed they were called *Runic* as being mysterious and scientifical, like the Egyptian hieroglyphics. See Wormius de Literatura *Runica*; and Hickes's Thesaurus of the ancient Northern Languages.

There are some *Runic* medals in the closets of the curious; and some modern Danish and English medals, the inscriptions whereof are Latin, and the character *Runic*.

There is extant a coin of king Offa with a *Runic* inscription, which seems to shew that this character had been used by the Saxons as well as their Scandinavian brethren.

There are also *Runic* inscriptions in this island; one in Cumberland, and another in Scotland. See Hickes's Thes. Ling. Sept.

In several parts of Sweden, stones may be met with, which were formerly set up as obelisks in memory of the dead; and these monuments are marked with the ancient northern letters called *Runor*, or the *Runic* characters. In some places the characters vary from the *Runic*, particularly in free-stones found in Helsingland, of which Mr. Celsius has given us a description, with an explanation. See Philos. Trans. N° 445. sect. 3.

From these Helsingland inscriptions an alphabet of sixteen letters may be derived, which is very singular. In other alphabets different sounds are generally denoted by different figures; but here the same character, according to the diversity of its place and altitude between two parallels, denotes different sounds.

But these characters, however different they may appear at the first sight from the *Runic*, may easily be derived from them; or, *vice versa*, the *Runic* may be derived from the *Helsingic*, if these be supposed the most ancient. The subtraction of a perpendicular line in the first case, or its addition in the latter, brings the two characters to a near resemblance.

The inscription, which Mr. Celsius considers, was published in Monf. de la Motraye's Travels, but erroneously.

RUNIC *staffs* were a kind of calendars or compendious almanacs, used in the North, marked out by lines upon short pieces of board, or smooth sticks; some of which bear the appearance of great antiquity. They were called, in the North, *rim-stocks* and *prim-staffs*; and exhibited, by different lines or marks, the fasts and festivals, the golden number, Dominical letter, epact, &c. Dr. Plot, in his History of Staffordshire, p. 418, &c. describes one of these instruments, under the name of a *clog*, and illustrates the construction of it by a figure.— He observes, that this kind of almanac is a remain of the Danish government, and that it was still in use amongst the meaner sort of people. Those which he met with in Staffordshire had only the prime and the immoveable feasts upon them; whereas others of a more perfect kind, preserved in the cabinets of the curious, have likewise the Dominical letters. And of those imperfect ones there were two kinds: some public, of a larger size, which were commonly hung at one end of the mantle-tree of the chimney, for the use of the whole family, as Wormius informs us they dispsed of them in Denmark; and others private, of a smaller size, which they carried in their pockets. This chronological instrument is sometimes, by an evident corruption, called *runstock*.

RUNNER, in the *Sea Language*, a rope belonging to the garnet, and to the two bolt-tackles. It is reeved in a single block seized to the end of a pennant, and has at one end a noose to hitch into any thing, and at the other end a double block, into which is reeved the fall of the tackle, or the garnet; by which means it purchases more than the tackle or garnet could allow. See *Tab. Ship. fig.* 1. *n.* 39. 73. 82. 110.

To *overhale the runner* is to pull down the hooked end, and hitch it into the sling.

RUNNET, or RENNET, an acid juice, found in the stomachs of calves that have fed on nothing but milk, and are killed before the digestion be perfected.

It also signifies the liquor made by steeping the stomach of a calf in hot water.

It is this *runnet* that is chiefly used to curdle or turn milk for cheese.

Its proper place is the abomasus. The like matter is also said to be found in goats and hares.

The longer the *runnet* is kept, the better it is. Though it readily coagulates milk; yet, if put into it when already coagulated, it dissolves it.

If salt be put in the milk before the *runnet* be applied, it prevents its coagulation; but if the salt be put in afterwards, it hardens the coagulum.

Aristotle will have the *runnet* to be the proper substance of the milk; but he is mistaken when he says it is found in all animals which give milk, especially in all ruminants.

RUNNING, in *Antiquity*, made one of the exercises performed in the PENTATHLON, or quinquertium. See RACE.

This exercise was in so great esteem among the ancient Greeks, that such as prepared themselves for it, thought it worth their while to burn, or parch their spleen, because it was believed to be a hindrance to them.

Indeed, all those exercises, that conduced to fit men for war, were more especially valued; and that swiftness was esteemed such in an eminent degree, appears from Homer's giving his hero the epithet of ποδας ωκυς Αχιλλευς.

RUNNING *of the eyes*, in infants. See INFANT.

RUNNING-*fights*, at sea. See FIGHTS.

RUNNING-*fire*. See FIRE.

RUNNING *out a warp*, in *Sea Language*, the act of carrying the end of a rope out from the ship in a boat, and fastening it to some distant place, to remove the ship towards the said place, or keep her steady while her anchors are lifted, &c.

RUNNING-*rigging* denotes all that part of a ship's rigging which passes through the blocks, to dilate, contract, or traverse the sails.

RUNNING *the gauntlet*, in *Military Language*. See GANTLOPE.

RUNNING *of goods*, a clandestine landing of goods, without paying the legal customs or duties for the same.— See SMUGGLING.

RUNNING-*saddle*. See SADDLE.

RUNNING-*thrush*, or *frush*, in *Farriery*, denotes an imposthume, that sometimes gathers in a horse's frog; or a scabby and ulcerous disposition which sometimes causes it to fall off. When this discharge is natural, the feet should be kept merely clean. When an imposthume appears, the safest course is to pare out the hard part of the frog, or that which appears rotten, and to wash the bottom of the foot three times a day with old chamber-ley.— But if a horse has been neglected, and there be a strong flux to the part, it will be necessary, in order to prevent its degenerating into a canker, to bathe the thrush with the following lotion, laying over the ulcer a little tow dipped in the same, and using the purges and diuretics recommended in the GREASE. Take spirit of wine and vinegar, of each two ounces; tincture of myrrh and aloes, one ounce; Ægyptiacum, half an ounce; and mix them together. Bartlet.

RUNOR. See RUNIC.

RUNT, the name used, with the distinction of places, for several species of pigeons. These are the Leghorn, the

Spanish, the Friesland *runt*, &c. The *columba domestica Pisorum, Hispaniæ, & Frisiæ*, of Moore.

The Leghorn *runt* is a stately large pigeon, seven inches or better in the legs, close feathered and fast fleshed, extremely broad breasted, and very short in the back. He carries his tail, when he walks, somewhat turned up like a duck's; his neck is longer than any other pigeon's, and he carries it bending like a goose or swan; he is goose-headed, and his eye lies hollow in his head, with a thin skin round it, like that of the Dutch tumbler; his beak is very short for so large a bird, and has a small wattle on it, and the upper chap falls a little over. It is a very valuable pigeon, but is tender and requires care.

The Spanish *runt* is the longest bodied of all the pigeons; it is short legged, and loose feathered, and does not walk so upright as the Leghorn *runt*. These are of a great variety of colours, but are apt to have accidents in sitting, from their sitting too heavy, and often breaking their eggs.

The Friesland *runt* is a large pigeon, and has all its feathers reverted, or looking as if placed the wrong way.

The Roman *runt* is a pigeon of the same general make with the common kind, but so large and heavy that it can hardly fly.

The Smyrna *runt* is middle sized, and is feather-footed, and that to such a degree sometimes, as to look as if there were wings upon the feet; the feathers of these are sometimes four or five inches long, and often pull the eggs and young out of the nests.

The common *runt* is the common blue pigeon, kept for the table, and known to every body. Moore's Columb. p. 42.

RUNT is also a name given to Canary-birds, when three years old. See CANARY-*bird*.

RUNT is likewise a name given to the small black cattle brought out of Wales and Scotland.

RUPEE, ROUPIA, or ROUPIAS, a coin very current in the territories of the Great Mogul, and in several other parts of the East Indies. See COIN.

Rupees are struck both of gold and silver, and both the one and the other have their diminutions, as *half-rupees*, *quarter-rupees*, &c.

The gold *rupee* is worth 1*s.* 6*d.* sterling. The silver *rupee* is struck in the Mogul's mints, with an inscription of his name and titles, the year of his reign, and the place it was struck at. It weighs from 7 dwt. 10½ gr. to 7 dwt. 11 gr. and has from 1 to 2 parts in 100 allay. 100,000 is one LACK, 100 lacks are one crore, and 100 crores are one anib.

The value of the silver *rupee* is various, according to its quality, and the place where it is coined. A general observation is, that the *rupees* are always current for more at the place where they are struck, than elsewhere; and the new *rupees* for more than the old ones. The reason of this last difference is, that the Indians, being very fond of silver, to save it, use, as soon as they have got a few *rupees* together, to hide them under-ground. To prevent which inconvenience, tending to drain the state of current monies, the princes and rajas strike new *rupees* every year, still augmenting the value thereof, without any augmentation of the weight.

Besides this difference of new and old *rupees*, the Indians make three other classes, the first called *rupees siceas*, which at Bengal are worth 2*s.* 11*d.* sterling; the second, *rupees of Surat*, worth 2*s.* 6*d.* sterling; the third *rupees of Madras*, worth 2*s.* 5*d.* sterling. All which is to be understood of the new *rupees*.

As to the old ones, those of Madras are only current at 1*s.* 11*d.* sterling; those of Surat at 2*s.* and the siceas at 2*s.* 4*d.* Yet in other places the order and prices vary. At Surat, those struck there have the first place, the siceas the second, and those of Madras the third. Along the coast of Coromandel, the Madras has the first place, the siceas the second, &c.

RUPELLENSIS *sal*, *Rochelle salt*, in *Chemistry*, a name given to a peculiar salt, invented by M. Seignette, apothecary, at Rochelle, and extolled as a very valuable medicine.

The preparation of it was kept a great secret, till Mess. Boulduc and Geoffroy discovered and published its composition.

To prepare this salt, crystals of marine alkali are to be dissolved in hot water, and into this liquor powdered cream of tartar is to be thrown. When the effervescence ceases, more cream of tartar is to be added, till the liquor is saturated; it is then to be filtered and evaporated; and very fine and large crystals may be obtained by cold, each of which is the half of a polygonous prism cut in the direction of its axis.

The crystallization of this salt, according to M. Baumé, as well as of the vegetable salt, is much more easy and more beautiful, when the liquor, in which it is made, contains an excess of alkali, which does not prevent the salt from being exactly neutral, after it has been well drained.

The salt of Seignette has a saline taste, moderately strong, and disagreeable. It retains much water in its crystallization, is soluble in a less quantity of hot water than of cold water, and becomes farinaceous in a dry air.

This salt is used only in medicine; being a good purgative, when taken from an ounce to an ounce and a half. It is dissolved in pure water, or in ptisans and mineral waters, to render them purgative. It is also given in small doses of one or two drachms, as an alterative, aperitive, and corrector of other purgatives. But, upon the whole, it does not differ much from ordinary soluble tartar. Chem. Dict.

RUPERT'S *drops*, *lacrymæ Batavicæ*, a sort of glass drops with long and slender tails, which burst to pieces, on the breaking off those tails in any parts, said to have been invented by prince Rupert, and therefore called after his name.

The history of these drops is this: they were first brought into England by prince Rupert, out of Germany, and shewn to king Charles II. who communicated them to the Royal Society, at Gresham College; and a committee, appointed on this occasion by the society, gave the following account of them. They must be made of green-glass well refined, for till the metal, as the glass-men call it, is perfectly refined, they never succeed if made of it; but always crack and break soon after they are dropped into the water.

The best way of making them is to take up some of the metal out of the pot upon the end of an iron rod, and immediately let it drop into cold water, and there lie till it is cold. If the metal be too hot when it is dropped into the water, the business does not succeed, but the drop frosts and cracks all over, and falls to pieces in the water, and every one that does not crack in the water, but lies in it whole till it is quite cool, is sure to be good. There is great nicety in the hitting a due degree of heat in the metal, and the workmen who best know their business cannot promise before hand which shall succeed, but often two fail for one that hits right. Some of them frost over the surface without falling to pieces, and others break into pieces before the red heat is quite over, and that with a small noise; others break soon after the red heat is over and make a great noise, and some neither break nor crack till they seem to be quite cold; and others hold together while they are in the water, but fly to pieces with a smart noise when they are taken out of it; some do this on the instant, others an hour or two after, and others will keep several days, nay weeks, and at last fall to pieces without being touched.

These drops, thus formed, are so hard, that they will bear smart blows of a hammer without breaking; and yet if you grind the surface, or break off the tip of the tail, they will shatter, with a loud report, into powder; and in an exhausted receiver, with greater impetuosity than in the open air, and into a finer powder, exhibiting light, when the experiment is made in the dark. But if the drops are ground with powder of emery and oil, or annealed by the fire, they will escape breaking.

This surprising phenomenon is supposed to arise from hence; that while the glass is in fusion, or in a melted state, the particles of it are in a state of repulsion; but being dropped into cold water, it so condenses the particles in the external parts of their superficies, that they are thereby reduced within the power of each other's attraction, and by that means they form a sort of hard case, which keeps confined the before mentioned particles in their repulsive state; but when this outer case is broke by the breaking off the tail of the drop, the said confined particles have then liberty to exert their force, which they do by bursting the body of the drop, and reducing it to a very peculiar form of powder. See a paper on the phenomena and explication of these glass-drops, by Dr. Le Cat, in the Philos. Trans. vol. xlvi. p. 175, &c.

RUPICAPRA, in *Zoology*, a species of GOAT. See CHAMOIS.

RUPITANI, a name given to the Donatists. See CAMPITÆ.

RUPPIA, in *Botany*, the name given by Linnæus to a genus of plants of the *tetrandria tetragynia* class, called by Micheli *bucca ferrea*. The characters are these: the cup is composed of a subulated spadix, straight, and of a very simple structure, which becomes a little bent when the fruit is ripe, and is doubly beset with fructifications; there are no petals, nor any stamina, but a number of kidney-shaped antheræ placed on each side; the

the pistils are several slender capillary styles, each bearing an oval germen, with a simple stigma; the fruit is an oval, pointed, thin capsule, or cortex, placed on the style, which becomes elongated; there are as many of these as there were pistils on the plant, and each contains one roundish seed. There is only one species.

RUPTURE, in *Medicine*, called also *hernia*, and popularly *burstenness*, is when the rim, thin film, or caul, which holds up the intestines, is broken, or over-strained, or stretched, so as that the guts fall down either into the groin, scrotum, or elsewhere. See HERNIA.

According as the *rupture* happens in the abdomen, or inguen, or scrotum, it is called *exomphalus*, *hernia inguinalis*, or *hernia scroti*.

RUPTURE *wort*, *herniaria*, in *Botany*, a genus of the *pentandria digynia* class. Its characters are these: the flower hath a coloured empalement of one leaf, cut into five parts, which spread open; it hath five small stamina, situated in the divisions of the empalement, and five others which are barren, placed alternately between them; in the centre is an oval germen, which afterward turns to a small capsule, inclosed in the empalement, having one oval-pointed seed. There are four species.

This plant has been long celebrated for the virtues its name expresses in the curing of ruptures; but though the modern practice does not seem to allow all those virtues to it, yet there is another case in which a German physician strongly recommends it. It is in the disorder of the eyes, which is brought on by reading or writing by candle-light, or by examining nice objects, or very fine work. This distemperature seems to be properly a diminution of sight, without any apparent cause, or visible alteration in the eye, and is probably owing to a viscid matter obstructing the optic nerves, and preventing a supply of their proper fluid. The *herniaria*, being a gentle and mild attenuant, comes in admirably for the relief of this disorder. Gruhlman De novo Caliginis Remedio.

The author gives many instances of the success of this remedy, and mentions two methods of giving it; the one in powder, and the other in tincture: the former way is preferred, and the method is to gather the herb in its prime, and powder it after it has been dried in the shade; then to sprinkle the quantity of a scruple of this powder on the bread and butter used for breakfast. If this is not liked, the tincture is to be made with spirit of wine, as strong as the plant will make it, and forty drops are to be taken every morning and evening in any liquor.

The distemperature this is proposed to cure is very common, yet this is almost the only thing that has been prescribed by way of remedy, and deserves to be fairly tried.

RURAL, or RUSTIC, formed of *rus*, *ruris*, *country*, something that relates to the country.

RURAL *dean*, in the *Ancient Church*. See DEAN.

RUSCUS, in *Botany*. See BUTCHER'S *broom*.

RUSH, *juncus*, in *Botany*, a genus of the *hexandria monogynia* class. Its characters are these: it has a chaff opening, with two valves, an empalement, with six oblong pointed leaves; the flower hath no petals, but the coloured empalement is by some taken for petals; it hath six short hair stamina, and a three-cornered germen, which afterward becomes a three cornered capsule with one cell, opening with three valves, inclosing roundish seeds. Linnæus enumerates nineteen species, and Miller four: observing that there are many other species, which grow naturally in England, and are very troublesome weeds in many pastures, so are not worthy of being enumerated.

The best method of destroying *rushes* is to fork them up clean by the roots in July, and after having let them lie a fortnight or three weeks to dry, lay them in heaps and burn them gently, and the ashes which these afford will be tolerable manure for the land; but in order to prevent their growing again, and to make the pasture good, the land should be drained, otherwise there will be no destroying them entirely; but after it is well drained, if the roots are annually drawn up, and the ground kept duly rolled, they may be subdued. Miller.

RUSH, *flowering*, or *Water* GLADIOLE, *butomus*, in *Botany*, a genus of the *enneandria hexagynia* class. Its characters are these: the flowers grow in a single umbel, and have six roundish concave petals, which are alternately smaller, and nine awl-shaped stamina, six of which surround the other; it hath six oblong pointed germina, which become six oblong pointed capsules, having one cell filled with oblong seeds. We have but one species. This plant is said to be of an aperient and deobstruent quality.

RUSH, *lesser flowering*. See SCHEUCHZERIA.

RUSH, *round*, *black-headed*, *marsh*, or *bog*. See SCHOENUS.

RUSH, *sweet*, *acorus*, in *Botany*. This plant grows naturally in deep standing waters, so is rarely admitted into gardens, for it will not thrive on dry land; but the roots are used in medicine.

Whoever has an inclination to propagate it, should procure some roots from the places where it grows naturally, and plant them in ditches, or close on the side of ponds, where they will thrive and increase greatly, if they are not disturbed.

The roots, which only are used, are hot and dry, opening and attenuating, and good for the obstructions of the liver and spleen, provoke urine and the menses, help the colic, resisting putrefaction, are useful against pestilential contagions and corrupt noxious air, are an ingredient in the theriaca and mithridate, and are outwardly used in sweet bags and perfumes. See ACORUS.

RUSH-*grass*, *scirpus*, in *Botany*, a genus of the *triandria monogynia* class. It characters are, that it has a chaffy imbricated glume, as a calyx, no corolla, and a single unbearded seed. There are twenty-eight species.

RUSHES, *petrified*. What is usually called by this name is a kind of fossile coral. But we have in England, also, another not uncommon substance, frequently called by the same name: this is an incrustation of sparry matter, in the form of a stony crust on the outsides of real *rushes*; though in this case, it is no real petrifaction, but only a covering of this stone-like matter.

Incrustations and petrifactions are usually confounded together, and the generality of people do not attend to the distinction, which is, that in a real petrifaction, the stony matter penetrates the very substance of the body, as is the case in the petrified wood of Ireland, and other places; whereas, in these incrustations the substance itself remains unaltered within, and its outer part alone is covered with the stony substance; this is the case with what is called the petrified moss at Scarborough, and in other parts of England, and this is the case in regard to what we call sometimes petrified *rushes*.

RUSMA, in *Natural History*, the name given by the eastern nations to the substance, called by the ancient Greeks SORY. It is properly an ore of vitriol, and is used as a depilatory, being mixed with lime.

Mr. Boyle tells us, he made a fine powder of equal parts of *rusma* and quick-lime, and letting them soak a little time in water, they became a soft paste, which he spread on the part he would free from hair; and after letting this paste lie on about three minutes he wiped it off with a wet cloth, and found the hair taken away by the roots, without any inconvenience to the part.—Orpiment and quick-lime is used in Europe for a depilatory. See HAIR.

RUSSET, a country word for a dark brown colour.

RUSSGANGENUM, in *Natural History*, a name given by the people of the East Indies to a yellow and brass-like fossile substance, found in many places there; it resembles the marcasites, only that on trial it is found to contain very little sulphur: it is probably an ore of zink.

RUSSIA *company*. See COMPANY.

RUST *of corn*, or BLIGHT, in *Husbandry*, the name given by our farmers to a disease in corn and other vegetables, in which their stalks and leaves seem burnt up, and appear of a sort of *rust*-colour.

The ancients generally thought that it came from heaven, being ignorant of its true cause, which is want of nourishment in the earth. Virgil gives this up as an incurable distemper, and tells the farmer, that if his corn is blighted he must live upon acorns, not supposing that any remedy could be devised for such a distemper. These people in general having no true knowledge of the theory of husbandry, had recourse to magic, and used what they thought spells and enchantments on all occasions. Cato, Varro, and even Columella, are full of these ridiculous devices. A better knowledge in the real nature of husbandry has taught us to understand this matter in a very different manner, and to apply more efficacious remedies to it.

Wheat is blighted at seasons, first in the blossom, and then its generation is prevented, many of the husks being empty in the ear, and the rudiments of the grains not impregnated: secondly, wheat is blighted when the grains are brought to maturity; and in this case they become light, and are of little value for making of bread, having scarce any flour in them.

The first of these cannot happen in England from frosts, because our wheat is not in flower till the month of June; but long and continued rains chill the blossoms, and in this manner prevent their fertility: this, however, does not

not often happen to us; these rains are not common at this season of the year; and if they were, this country lying much of it open, the winds dislodge these drops of water from the ears, and prevent the mischief they would do there.

Lammas wheat does not retain these drops so long as the bearded or cone wheat; and, in consequence of this, in the terrible blight in England in the year 1725, the bearded wheat received infinitely greater mischief than the lammas wheat.

The second kind of *blight* from light ears is, that which is more frequent, and more general with us; this brings the greatest scarcity of wheat, and the cause of this is plainly want of nourishment of the grain, by whatever means that want is occasioned. Several accidents kill the plants, or injure their health, and in that case the grains are not filled: lightning does great mischief to the farmer in this kind, as is plain by the several black spots and patches in fields of corn, in years, when there has been more lightning than usual. This is a disaster that must be quietly suffered, since it can be neither prevented nor remedied; but the other causes of *blights*, which are most general, and do the most damage, may be prevented in some measure at least.

One great and common cause of the *blight* is, the lodging or falling of corn; in this case the stalks are broken near the ear, and the vessels are hurt which should carry up the nourishment to the ear. In this case, there can just juices enough pass for the keeping the plant alive, and bringing it to its full height, but it is languid all the time, and the grains can never be filled with flour. The earlier in the season this lodging of the stalks happens, the thinner and poorer the ears will be: hence it happens, that when dung and tillage have brought a wheat land into so good a state, that in April or May it seems to promise the farmer five or six quarters of wheat, it shall be all destroyed by falling in June, and scarce yield him five bushels, and this so thin and lank, that the expences of reaping and threshing are more than its value. The wind is generally accused of the throwing down these stalks, but this does not seem to be truly the case; the wind may press upon the plants; but the cause of their giving way to it is a weakness in their stalks, and this seems owing either to the want of nourishment, or the want of air, or of the sun's rays, and perhaps to the want of all three together. A rich acre will maintain a crop of five quarters standing, while a poor acre will not be able to support such a crop, as would have yielded only about three quarters had it stood. This is a proof of want of due nourishment being one great cause of the falling. Air is necessary to the nourishment of all plants, wheat in particular requires a very free air. It succeeds best in open hilly places where the wind comes freely to it, and shakes off the drops of water from the leaves, as well as their own recrements; and it is plain, that a great quantity of the suns rays is necessary to keep wheat strong; because in the hotter countries it is not subject to fall as it is with us, and in other northern countries. There is another cause of the *blight*, which is the wheat's coming too late into blossom. It should blossom in the beginning of June, because there is not otherwise time during the hot weather for it to pass through the different stages to the perfection of the grain.

The causes of the *blight* being thus known, the cure or prevention may be attempted by the farmer, on much more rational grounds than it was among the ancients. It is advantageous to hasten as much as possible the time of blossoming of the corn, and to protract as long as we can the ripening of the grain, that it may have sufficient time to fill and swell. The earliest sown wheat is generally observed to escape the *blight* best, and this is owing to its coming soonest into blossom. The ancients used to let their sheep feed upon the corn while young in the blade, by way of preventing it from lodging or falling afterwards: some of our own farmers use this method also; and, it is true, that the corn is prevented from falling by this; but the remedy is as bad as the disease, for the stalks are not made very strong by this practice, but the ears lighter. They therefore do not weigh down and lodge the stalks indeed, but they are in some sort blighted by this means, and the disease is caused by the means used to prevent it. This feeding the wheat with sheep retards the time of its blossoming, and the only advantage of early sowing is thus taken away by it: what grows after the eating of the sheep is a sort of latter crop, and is always weaker and later than the first. The longer the corn remains on the ground the more nourishment it requires from it; and in this unnatural remaining on the land, there is no proper supply provided.

The general remedy for all the cases of the *blight* is the modern method of horsehoeing husbandry. In this the hoe stirs up the ground as often as the farmer pleases, and every such stirring gives new life and nourishment to the plant: this way a supply of food for the ear may be given, whenever it is necessary, and the wide intervals left for the hoe in the drilling of the wheat; for this sort husbandry gives a free passage for the sun and air to all of the plants.

The most general *blight* of all that happen in these cold countries is caused by insects, which some think are brought in the air by an east wind, accompanied by moisture, a little before the grain is filling with that milky juice which hardens into flour. These insects deposite their eggs within the outer skin or rind of the stalks; and when the young ones are hatched they feed on the parenchyma, and eat off many of the vessels which should convey this juice: then the ear is deprived of it, and must in consequence be thin and poor, in proportion to the number of the vessels eaten, and as the insects happen to come earlier or later; for sometimes they come so late, that the grains are sufficiently filled with this milky juice before they have any power to hurt the vessels.

In this case, though the straw, when examined by the microscope, appears to have its vessels eaten and torn, and to be full of black specks, which are caused by the same insects, yet the grain is plump and full. This is one of the many cases in which the early sown wheat escapes the *blight*. It has been seen, that of the crop of wheat, in the same field, some of which has been sown earlier and some later, though there has been no other difference in the whole, yet the early sown wheat has been full eared, and the late sown has been light eared; and both have had their stalks equally eaten and spotted by the insects.

A proof that these mischievous insects are brought by the east wind, is, that the corn on the east side of hedges is often found *blighted*, and destroyed by them, while that on the west side of the same hedge is unhurt. Some suppose they are bred in the earth, and crawl up the stalks, because some whole fields are subject to them, and others escape them wholly; but this is more probably owing to the difference of the situation of these fields, as they are more or less exposed to the east. Some wheat is more liable to be hurt by this insect-*blight* than another, and the best remedy in this evil is to plant fields which are most exposed to these *blights*, with such wheat as is least subject to be injured by them. The white cone, or bearded white, which has its stalk or straw like a rush, not hollow, but full of pith, except near the lower part, where it is very thick and strong, is very proper on this occasion; it is probable, that this plant has sap vessels, that lie deeper, and so are not to be destroyed like those of common wheat; the stalks of this are often found spotted with black, which shews that the insects have been there, and yet the ears are found full, and the grains plump in them.

There is another kind of *blight*, called the farmers *moor loor*: this is occasioned by the earth's falling away from the roots of the wheat, and is cured by throwing up small furrows against the rows in the drilling method. The horsehoeing husbandry is best of all others calculated to prevent *blights*, and to cure them when they happen; but as there are some years when all wheat is *blighted*, even at these times, the horsehoeing husbandry has an advantage; for when the stalks fall they never lie absolutely on the ground in this case, but the air has room to play between them; but the common sown wheat has not this advantage. The ears in the *blighted* wheat of the drill kind are not so light nor poor as in others, but make the farmer some amends in the corn, though greatly less than in the common produce. Tull's Horsehoeing Husbandry.

Corn is always more subject to *blights* after a wet summer than at any other season; the reason seems, that the roots being continually drenched with water, the plant runs up to stalk, and has very little ear, and the corn in the ear is never large or full.

It is observed, that when the mildews rise, or *blights* fall, they generally infest only one kind of grain, sometimes wheat, sometimes oats, and sometimes barley only; and the same sort of observation holds good in regard to fruit, sometimes only apples are *blighted*, sometimes only pears, sometimes cherries, and so on. Mortimer's Husbandry, tom. i. p. 305. See BLIGHT.

RUST *of a metal*, the flowers or calx thereof, procured by corroding and dissolving its superficial parts by some menstruous fluid: or the earth of the metal decomposed by the action of a proper menstruum.

Water is the great instrument or agent in producing *rust*; the air apparently rusts bodies, but it is only in virtue of the water it contains.

Hence in a dry air, metals remain a long time without contracting *rust*; and hence oils, and other fatty bodies, secure

secure metals from *rust*; water being no menstruum to oil, &c. and therefore not able to make its way through it. See IRON.

All metals are liable to *rust*; even gold itself, though generally held incapable thereof, grows rusty, if exposed to the fumes of sea-salt.

The reason why gold is so rarely found to rust, is, that sea-salt, which is the only salt that will prey upon it, is of a very fixed nature; and therefore little of its effluvia, or exhalations, are found floating in the air.

Rust is usually supposed a corruption of the metal, but without much foundation: it is the very metal itself, only under another form; and accordingly we find, that *rust* of copper may again be turned into copper.

The *rust* of copper, called *ærugo*, makes what we call *verdegris*. Cerufs is made of lead converted into *rust* by vinegar. Iron, in time, turns wholly into *rust*, unless preserved from the air by paint or varnish.

RUSTIC *gods, dii rustici*, in *Antiquity*, were the gods of the country, or those who presided over agriculture, &c. Varro invokes the twelve *dii consentes*, as the principal among the *rustic* gods; viz. Jupiter, Tellus, the Sun, Moon, Ceres, Bacchus, Rubigus, Flora, Minerva, Venus, Lympha, and Good Luck. Besides these twelve arch-*rustic* gods, there were an infinity of lesser ones; as Pales, Vertumnus, Tutelina, Fulgor, Sterculius, Mellona, Jugatinus, Collinus, Vallonia, Terminus, Sylvanus, and Priapus. Struvius adds the Satyrs, Fauns, Sileni, Nymphs, and even Tritons; and gives the empire over all the *rustic* gods to the god Pan.

RUSTIC, in *Architecture*, expresses a manner of building in imitation of simple or coarse nature, rather than according to the rules of art.

RUSTIC *fasti*. See FASTI.

RUSTIC *fountain*. See FOUNTAIN.

RUSTIC *freeze*. See FREEZE.

RUSTIC *quoins*, by Vitruvius called *lapides minantes*. See *Rustic* QUOIN.

RUSTIC *services*. See SERVICE.

RUSTIC *work* is where the stones in the face, &c. of a building, instead of being smooth, are hatched or picked with the point of an instrument.

RUSTICS, *regular*, are those in which the stones are chamfered off at the edges, and form angular or square recesses of about an inch deep at their jointings, or beds, and ends. See *Tab. Archit. fig.* 40. *let.* V.

RUSTIC *order* is an order decorated with *rustic* quoins, *rustic* work, &c.

Felibien says, it is properly where the several parts of the five orders are not exactly observed; but this confounds *rustic* with *Gothic*.

RUSTICULA, in *Ornithology*, a name by which Aldrovand, and some other authors, have called the GODWIT, more commonly known by the name *ægocephalus*.

RUSTICULA *Brasiliensis*, in *Ornithology*, the name given by Mr. Ray, and some others, to the GUARAUNA, a water-bird of the Brasils, of the size of our snipe.

RUSTRE, in *Heraldry*, a bearing of a diamond shape, pierced through in the middle with a round hole.

RUT, in *Hunting*, &c. a term used for the venery or copulation of deer.

For the terms which obtain in respect of this and other beasts of game, with the noise they make during the acts, see HUNTING.

The *rutting*-time with the hart begins about the middle of September, and holds two months: the older they are, the better, and the more beloved they are by the hinds, and the earlier they do go to *rut*. At this time they will turn head, and furiously make at any living creature. It is easy killing them at this time; their whole business being to scent and pursue the track of the females; scarce feeding at all. The young herd are forced to fly with great precipitancy when the hart comes in sight of his mate. If there be any other of bulk, they will dispute it very hotly with their horns. As the season expires, they withdraw, and dig themselves holes wherein to lie to asswage the strong fervour of their lust: when become a little sweet, they return to their pasture, and live in herds.

The *rutting* or tourning time of the roe-buck begins in October, and lasts only twelve or fifteen days. This over, he casts his horns.

After the hind is filled, she keeps no more company with the male till she be delivered. But the doe always accompanies her paramour till her time approaches, when she retires, for the safety of her young, which he would otherwise kill.

RUT is also used for the mark or track of a wheel in the road.

RUT *of the sea* is where it dashes against any thing.

RUTA, *rue*, in *Botany*. See RUE.

RUTICILLA, in *Ornithology*. See RED-*start*.

RUTICILLA, in the Linnæan system of *Ornithology*, is a species of the *muscicapa*, or FLY-*catcher*. This is a black bird, with the breast, and base of the primary and secondary wing-feathers, and those of the tail, yellow; and a yellow spot on the wings. This bird inhabits America.

RUTILUS, in *Ichthyology*. See ROACH.

RUTILUS *latior*, in *Ichthyology*, a name given by many authors to the fish called in English RUDD, or *finscale*, and more usually in Latin *rubellio fluviatilis*. See RED-*eye*.

RUTTEE, a weight used in the East Indies, one hundred of which make eighty-eight caracts. See CARACT.

RUTULUS, in *Roman Antiquity*, the barrier of the cavea, or place where the wild beasts used in amphitheatrical sports were shut up. It was made of iron bars, which turned upon hinges, and all at once flew open with great swiftness.

RUTY-PUNDOC, in *Natural History*, a name given by the people of the East Indies to a peculiar species of yellow orpiment, which they find on the tops of the mountains there; and, after several calcinations, give internally in coughs and colds. The ancient Greeks used this orpiment in the same manner. We have of late run into an opinion of its being a fatal poison; but Dr. Boerhaave, in his Chemistry, affirms, on his own trials, that it is innocent and harmless. These people, who have not the use of chemistry, give us a hint of the virtues of great numbers of our own fossils, which are common also to their country. The selenitæ, fibrose talcs, spars, and many other fossils, which we wholly neglect, are in common use with them, and great cures are often performed by them.

RUYSCHIANA. See TUNICA.

RYAL. See RIAL.

RYDER, or RIDER, *to a bill*. See PARLIAMENT.

RYE, *secale*, in *Botany*, a genus of the *triandria digynia* class. Its characters are these: there are two flowers in each involucrum, they have two leaves which are opposite, narrow, erect, and sharp-pointed; the petals have two leaves, the outer valve is rigid, bellied, acute-pointed, and compressed, the lower border is hairy, ending in a long awn, the inner is plain and spear-shaped; they have two oval erect nectariums, and three hair-like stamina, hanging without the flower, terminated by oblong forked summits, with a top-shaped germen supporting two reflexed hairy styles, crowned by a single stigma; the germen afterward becomes an oblong almost cylindrical seed which ripens in the empalement.

We have but one distinct species of this genus which is cultivated in England, though it is often supposed the two varieties, distinguished by the farmers under the names of winter and spring *rye*, are essentially different; but from several years cultivating them on the same land, Mr. Miller could find no real difference between them.

Dr. Linnæus, who enumerates four species, entitles this *secale glumarum ciliis scabris*, *rye* with rough hairs to the awns.

The winter *rye* is that which is generally propagated by the farmers, and this sort of grain succeeds very well on any sort of dry land, even on the most barren gravel or sand. The farmers sow it about the beginning of September, after a summer's fallow, in the driest time they can. Two bushels of seed are the quantity generally allowed to an acre of land; but if it be ground newly broken up, or if it be subject to worms, they then allow a peck more to the acre. A little sprinkling of dung, or mud, upon *rye*-land, will greatly advance the crop, though it is laid but half the thickness that it is for other corn. Its produce is commonly about twenty bushels upon an acre.

The farmer knows it is ripe when the straw is yellow, the ear bends, and the grain feels hard. It is not apt to shed the seeds; and, therefore, if there are many weeds among the crop, it may be left lying upon the ground, or gravel, as they call it, eight or nine days after it is cut, before it is bound up, if the weeds are not dry sooner: for otherwise, they will grow moist in the barn, and cause the whole to give, and not to thrash well, and sometimes they will make it musty.

As it is a grain that will grow in the ear sooner than any other if it be wet, care must be taken if rain falls after it is cut, to turn it as it lies on the ground every other day; and at the same time to keep the ears as far from the earth, and as much above the stubble as may be; this will prevent the mischief. If it be pretty clear of weeds it may be housed as soon as it is cut. If either this grain or wheat lodge upon the ground, it is best to cut them, even though they are not ripe; for the stalk being broken will yield no more nourishment to the ear.

The small *rye* may be sown in the spring, about the same time with oats; but in a wet season it is apt to run much into straw, and the grain is generally lighter than the other; and therefore this is only sown upon such lands, where the autumnal crops have miscarried.

The general use of *rye* is for bread, either alone or mixed with wheat. And there is another very essential use to the farmer made of *rye*. April is the season of the year when food is of all others the scarcest for cattle, especially for sheep and lambs: on this account some split the ridges of the wheat-stubble and sow them with *rye*; they harrow this in, allowing about a bushel to an acre: they feed the sheep with this in April, and in May they plow it up for fallow. When this is intended, the *rye* should be sown early in autumn, that it may have strength to furnish early seed.

Rye also yields a strong spirit when distilled.

In many parts of France there have been certain years, in which this grain, from no apparent cause, has proved noxious, and sometimes even poisonous. Mr. Perrault travelling through Sologne, was informed that the *rye* of that province was sometimes so corrupted, that those who eat of the bread, that had much of the corrupted grain in it, were seized with gangrenes in different parts of the body, which were not preceded by any fever, inflammation, or any considerable pain; and that the gangrened parts usually fell off after a time of themselves, without the assistance of chirurgical instruments.

The grains of *rye* thus degenerated are black on the outside, and tolerably white within; and when they are dry, they are harder and closer than the natural good grain: they have no ill taste, but sometimes they have a viscous metallic like honey hanging to one end of them. They grow longer than the other grains in the same ear, and are found from one or two, to seven or eight in the same ear. Some have supposed that these were not the proper seeds of the plant, but some other extraneous bodies that got in among them; but it is evident from a close inspection, that they are really the genuine seeds, only altered by some accident; the coats, and the furrow, and even the germen for the young plant, being entirely the same as in the natural seeds.

The places where the *rye* is found to degenerate in this manner, are all a dry and sandy soil. In these places there is scarce any soil in which more or less of these large seeds are not found among the others, but where there are but few of them, the ill effects are not perceived. The seasons when the degeneracy is greatest, and the effects the worst of all, are, when there have been excessive rains in the spring, and there come on excessive heats in the succeeding summer.

The bread which is made of the *rye* that holds ever so much of this bad corn, is not distinguishable from other *rye*-bread by the taste, and seldom produces its ill effect, till some considerable time after it is taken. Beside the gangrenes already mentioned, it not unfrequently brings on other bad consequences, such as drying up the milk of women who give suck, and occasioning sometimes malignant fevers, accompanied with drowsiness, ravings, and other dangerous symptoms. The part usually seized by the gangrene is the legs, and this often in a very frightful manner. The arms are the part most subject next; but all the other parts of the body are subject to it.

The first symptom of this approaching gangrene is a stupefaction and deadness in the part; after this there comes on some pain, though not violent, and the skin becomes livid; sometimes the skin shews no mark of it, but the pain and swelling increase; and it is necessary to make an incision into the flesh, to find the gangrened part. In the more desperate cases, the only remedy is the taking off the part; and if this is neglected, the flesh is all wasted, and the skin becomes black, and clings round the bones, and the gangrene appears again in the shoulders.

The poorer people are only subject to this disease; and, as they principally eat the *rye*-bread, and as those years when there is most of this bad grain among the ears of *rye* produce most of these disorders, it has been judged certain that the *rye* is the occasion of it. It may deserve enquiry, however, whether that grain may not be innocent of the mischief, and its degeneracy and the distemperature attributed to it may not both be the effect of the same bad constitution of the air. If it proves, on enquiry, that only those who eat of the *rye* are subject to the disease, it will seem a proof of its being really owing to it; and in this case the mischief may be prevented by the sifting the grain before it is ground, the generated grains being so long that they will all remain in the sieve that lets the others through. The experiment has been made on the spot, by giving the flour of the corrupted grains alone to animals, and it is said they have been killed by it. Philos. Trans. N° 130.

RYE or REY *grass*. See GRASS.

RYME. See RHYME.

RYNCHOPS, *skimmer*, or *cutwater*, in *Ornithology*, a genus of *anseres*. Its characters are, that the bill is straight, the upper mandible much shorter than the lower, which is truncated at the end; the nostrils are linear and pervious, the tail is a little forked, and the birds of this genus have a small back toe. Linnæus enumerates two species; one of which is blackish above, and below white, with its bill red at the base; and the other yellow, with a black bill, which Brisson reckons a variety of the former. They are both inhabitants of America. The name *rynchops* is derived from ῥυγχος, *a bill*, and κοπτειν, *to cut*, because the upper mandible is as if it were cut. Pennant calls it *skimmer*, from the manner of its collecting its food, with its lower mandible, as it flies along the surface of the water.

RYPTICS, in *Medicine*. See RHYPTICS.

RYSAGON, in the *Materia Medica*, a name by which some authors have called the *cassumunar root*.

S.

S, A conſonant, and the eighteenth letter of the alphabet, the ſound of which is formed by driving the breath through a narrow paſſage between the palate and the tongue elevated near it, together with a motion of the lower jaw and teeth towards the upper; the lips being a little way open, with ſuch a configuration of every part of the mouth and larynx, as renders the voice ſomewhat hiſſing.

S is, therefore, accounted one of the three hiſſing conſonants; the other two being *z* and *j*. It is alſo held a ſemi-vowel, as forming a kind of imperfect ſound, without the aſſiſtance of any of the vowels.

It is the peculiar quality of *s*, that it may be ſounded before all conſonants, except *x* and *z*, in which *s* is compriſed, *x* being only *ks*, and *z* a hard or groſs *s*. This *s* is, therefore, termed by grammarians *ſuæ poteſtatis litera*. In the beginning of words it has invariably its natural and genuine ſound; in the middle it is ſometimes uttered with a ſtronger appulſe of the tongue to the palate, like *z*, as *roſe*, *buſy*, &c. and ſometimes it keeps its natural ſound, as *looſe*, *deſignation*, &c. In the end of monoſyllables, it is ſometimes *s*, as *this*; and ſometimes *z*, as *as*, and generally in verbs where *es* ſtands for *eth*, as *gives*. A ſingle *s* ſeldom ends any word, except the third perſon of verbs, as *loves*, the plural of nouns, as *trees*, the pronouns *this*, *his*, *ours*, *yours*, *us*, the adverb *thus*, and words derived from the Latin, as *rebus*: the cloſe being always either in *ſe*, as *houſe*, or *ſs*, as *graſs*: It ſounds like *z* before *ion*, if a vowel goes before, as *intruſion*; and like *s*, if it follows a conſonant, as *converſion*. It ſounds like *z* before *e* mute, as *refuſe*, and before *y* final, as *roſy*. Johnſon.

Some of the ancients avoided all uſe of the *s* very ſtudiouſly; particularly Pindar, who has whole poems without once mentioning it. And hence alſo in Plautus, and ſome others of the Latin poets, we find it cut abruptly off, as in *dignu'*, *omnibu'*, &c. Others, on the contrary, affected the uſe of it every where, inſerting it where it was not wanted; as *Caſmenæ* for *Camenæ*, *duſmoſæ* for *dumoſæ*, *cœſna* for *cœna*, &c.

Of all other letters, the *s* is neareſt akin to the *r*; whence it was frequently changed, on account of its diſagreeable ſound, into *r*. Thus the *Valerii*, *Furii*, &c. were at firſt called *Valeſii*, *Fuſii*, &c. and what we now call *ara*, *arena*, *carmen*, *feriæ*, *lares*, &c. were anciently wrote *aſa*, *aſena*, *caſmen*, *feſiæ*, *laſes*, &c. Add to this, that the Latin nouns now terminated in *or*, as *arbor*, *labor*, &c. all anciently ended in *s*; as *arbos*, *labos*, &c.

In the inflections of nouns, *s* is variouſly changed; ſometimes into *r*, as *flos*, *floris*; ſometimes into *n*, as *ſanguis ſanguinis*; ſometimes into *d*, as *pes pedis*; ſometimes into *t*, as *nepos nepotis*. On the contrary, in verbs, it is frequently put for other letters; for *b*, as in *jubeo juſſi*; for *c*, as in *parco parsi*; for *d*, as in *ludo luſi*; for *g*, as in *ſpargo*, *ſparſi*, &c.

The Latins alſo frequently changed the Greek *s* into *l*, as Αννιϐας, *Annibal*; into *d*, as μεσον, *medium*, &c. The double *s* was frequently changed into *x*, as πισσα, *pix*; and ſometimes even the ſingle one, as Αιας, *Ajax*.

The old and the new orthography of the French, differ chiefly in the uſe of the *s*; the latter omitting it in writing, where it is not heard in the pronunciation, and the former retaining it: thus the followers of the one, particularly the Academy in their Dictionary, write *tempeſte*, *huiſtre*, *fluſte*; thoſe of the other, *tempête*, *huître*, *flûte*, &c.

S was a numerical letter among the ancients, ſignifying ſeven: according to the verſe,

S *vera ſeptenos numeratos ſignificabit.*

Among the Greeks, σʹ ſignified 200, and ͵σ denoted 200,000; the *ſigma* joined to *tau*, i. e. ϛ, denoted 6. The *ſamech* of the Hebrew ס denoted 50; and with two points above ס̈, it ſignified 50,000.

In abbreviations, S. ſtands for *ſocietas*, or *ſocius*; as, R. S. S. for *Regiæ Societatis Socius*, i. e. *fellow of the Royal Society*. In medicinal preſcriptions, S. A. ſignifies *ſecundum artem*, i. e. *according to the rules of art*; and in the notes of the ancients, S. ſtands for *ſextus*, *ſervius*, or *ſanctus*; S. S. *ſanctiſſimus*; S. P. for *ſpurius*; S. C. for *ſenatus conſultum*; S. D. for *ſalutem dicit*; S. P. D. for *ſalutem plurimam dicit*; S. P. Q. R. for *ſenatus populuſque Romanus*; S. S. S. for *ſtratum ſuper ſtratum*, i. e. *one layer above another alternately*; S. V. B. E. E. Q. V. for *ſi vales bene eſt ego quoque valeo*, a form uſed in Cicero's time, in the beginning of letters. Upon the French coins, S diſtinguiſhed thoſe that were ſtruck at Rheims.

S, in *Books of Navigation*, &c. ſignifies ſouth; S. E. ſouth-eaſt; S. W. ſouth-weſt; S. S. E. ſouth-ſouth-eaſt, &c. See Compass.

S, in the *Italian Muſic*, ſtands for solo.

SABÆANS, Sabæi, or Sabians, the adherents to Sabaism; a ſect of idolaters, much ancienter than Moſes, and the Jewiſh law.

Hottinger ſets aſide the common derivation of *Sabæan* from צבא, *militia*, *hoſt*; and will not have it the name of a ſect of religion, but of a people in Arabia Felix, the deſcendants of *Saba*, grandſon of Cham. But the critics, to a man, conſpire againſt this opinion.

The word is ſometimes alſo written *Sabians*, *Sabaites*, *Zabæans*, *Zabians*, *Zabaites*, *Tſabæans*, *Tſabians*, and *Tſabaiſts*.

The *Sabæans* were very numerous throughout the Eaſt: in later times they have mixed ſomething of Chriſtianity with their ſuperſtition. They ſet a great value on the baptiſm of St. John; whence they have been alſo denominated Christians *of St. John*. See Hemerobaptists.

Some, indeed, doubt whether the *Sabæans* be the ſame with the Chriſtians of St. John; but father Angelo de St. Joſeph, a Carmelite miſſionary, and Maracci, in his notes on the Alcoran, aſſert it expreſly. Be this as it will, Mahomet, in his Alcoran, and the Arabian authors ſince him, make frequent mention of them. Beidavius, in his comment on the Alcoran, repreſents them as a kind of mean between the Chriſtians and the Maguſians, who are the followers of the Magi, among the Perſians: he adds, that they pretend to be of the religion of Noah. Keſſæus notes, that they pretend to be in poſſeſſion of the books of Seth and Enoch; though they own none of the books of Scripture, except the book of Pſalms. See Mem. de l'Acad. des Inſcrip. & Belles Lett. tom. xii. p. 16, &c.

Some charge them with worſhipping the ſtars; and others, the angels or demons. Maimonides attributes both to them; as is obſerved under Sabaism.

Abu Joſeph Aſchæus and Keſſæus, place the *Sabæans* about Charran, or Charres, and Ghezira in Meſopotamia; which opinion is confirmed by this, that all their books are in the Chaldee tongue, though in a character very different from the Chaldee.

Sale, in his preliminary diſcourſe to the Koran, p. 14, &c. has given the following brief account of the tenets and worſhip of this ſect. They believe in the exiſtence of one God, though they alſo pay an adoration to the ſtars, or the angels and intelligences which they ſuppoſe reſide in them, and govern the world under the ſupreme Deity. They endeavour to perfect themſelves in the four intellectual virtues, and believe the ſouls of wicked men will be puniſhed for nine thouſand ages, but will afterwards be received to mercy. They are obliged to pray three

three times a-day, before ſun-riſe, before noon, and before ſun-ſet; and in praying they turn their faces, as ſome ſay, to the north; according to others, to the ſouth, to Mecca, or to the ſtar to which they pay their devotion. They have three faſts in the year; the firſt laſts thirty days, the ſecond nine days, and the laſt ſeven. They offer many ſacrifices, of which they eat no part, but wholly burn them. They abſtain from beans, garlic, and ſome other pulſe and vegetables. They go on pilgrimage to a place near the city of Harran or Charran, in Meſopotamia, where great numbers of them dwell; and they have alſo a great reſpect for the temple of Mecca, and the pyramids of Egypt; fancying theſe laſt to be the ſepulchres of Seth, and of Enoch and Sabi, his two ſons, whom they conſider as the firſt propagators of their religion; and at theſe ſtructures they ſacrifice a cock and black calf, and offer up incenſe. This is one of the religions, the practice of which Mahomet tolerated (on paying tribute), and the profeſſors of it are often included in that expreſſion of the Koran, *thoſe to whom the Scriptures have been given*, or, literally, *people of the Book*.

SABAISM, an ancient kind of idolatry; the firſt that ever entered into the world.

Sabaiſm conſiſted in the worſhip and adoration of the ſtars; or as the Scriptures call them צבא שמים *tſeba ſchamaim*, or *ſeba ſchamaim*, i. e. *hoſt*, or *militia of heaven*; whence ſome moderns have formed the word *Sabaiſm*, to denote the worſhip of the heavenly bodies, and that of *Sabæans* for the worſhippers. But as the Hebrew word, whence theſe are formed, is wrote with a צ *tſade*, which ſome expreſs in the modern tongues by an *s*, ſome by a *z*, others by *ts*, and others by *tz*; hence ariſe a great many different manners of writing the word among different authors; ſome, e. gr. writing *Sabæans*, others *Zabians*, or *Zabæans*, or *Zabæiſts*, as Buxtorf; others *Tſabians*, others *Tſabæans*, &c.

Maimonides makes frequent mention of this idolatry in his More Nevochim: it was very general, he obſerves, in the time of Moſes. Some of the retainers hereto taught, that God was the ſpirit of the ſphere, that is, the ſoul of the world. Abraham, he adds, was brought up in the doctrine of the *Sabæans*, who admitted no other gods but the ſtars, and who in their books, many of which have been tranſlated into Arabic, maintain expreſly, that the fixed ſtars and planets are inferior gods, and the ſun and moon the ſuperior ones. Abraham at length, he tells us, oppoſing theſe errors, firſt aſſerted the exiſtence of a Creator diſtinct from the ſun. The king of the Cuthæans clapt him up in priſon; but he ſtill perſiſting, that prince, from an apprehenſion of his diſturbing the ſtate by teaching a new religion, confiſcated his goods, and baniſhed him to the extremities of the Eaſt. This relation, he tells us, is found in a book, entitled, העבורה הנכטיב, The Religion of the Nabathæans.

He adds, that the *Sabæans*, to the adoration of the ſtars, joined a great reſpect for agriculture; they ſet a high value on cattle and ſheep; and taught, that it was unlawful to kill them. He even adds, that they worſhipped demons, under the form of goats, and that they eat the blood of animals (though they judged it unclean) merely becauſe they imagined it was the food of demons.

Hyde, in his Rel. Vet. Perſarum, maintains, that the ancient *Sabaiſm* was very different from Paganiſm. According to him, Shem and Elam were the firſt founders of this religion, which was afterwards corrupted, reformed by Abraham, perſecuted by Nimrod, and re-eſtabliſhed by Zoroaſter; and the worſhip which the Sabians paid to the ſun was ſubordinate and ſubſervient to that of the true God. The account given of it by Dr. Prideaux (Conn. vol. i. p. 249, &c.) is much to the ſame purpoſe. In tracing the riſe of the idolatry of the Sabians, which conſiſted in the worſhip of images, he obſerves, that the true religion, which Noah taught his poſterity, was that which Abraham practiſed, and comprehended the worſhip of one God, the ſupreme creator and governor of all things, with hopes in his mercy, through a mediator. The notion of a mediator, he ſays, was very ancient and general; and under a conviction of the neceſſity of ſuch an appointment, mankind had recourſe to the ſun, moon, and ſtars, which they conceived to be the habitations of intelligences, of a middle nature between God and them, for this purpoſe. As the planets were of all the heavenly bodies the neareſt to them, and had the greateſt influence, as they generally apprehended, on this world, they made choice of them in the firſt place for their gods-mediators, to whom, as ſuch, they directed their worſhip. Here, he ſays, commenced all the idolatry that hath been practiſed in the world. They firſt worſhipped them *per ſacella*, that is, by their tabernacles, directing their worſhip towards the planets, in which they ſuppoſed the ſeveral intelligences reſided, and, in their abſence, by images; in which, after their conſecration, they thought theſe intelligences, or inferior deities, were as much preſent by their influence, as in the planets themſelves. To theſe images they gave the names of the planets which they repreſented; and hence, he ſays, Saturn, Jupiter, Mars, Apollo, Mercury, Venus, and Diana, were firſt ranked in the polytheiſm of the ancients, becauſe theſe were their firſt gods. They then proceeded to the worſhip of deified men. See Idolatry.

This religion began among the Chaldæans; to which they were partly led by their knowledge in aſtronomy; and from this Abraham is ſaid to have ſeparated himſelf, when he left Chaldæa. From the Chaldæans it ſpread over all the Eaſt, where the profeſſors of it had the name of *Sabians*. From them it paſſed into Egypt, and thence to the Grecians, who propagated it to all the weſtern nations of the world. The remainder of this ſect ſtill ſubſiſts in the Eaſt under the ſame name, and their religion is a mixture of Chriſtianity, Judaiſm, Mahometaniſm, and Paganiſm. See Sabæans, Mendæans, and Hemerobaptists.

SABAZIA, Σαϐαζια, among the Greeks, nocturnal myſteries in honour of Jupiter *Sabazius*, into which all that were initiated had a golden ſerpent put in at their breaſts, and taken out at the lower part of their garments, in memory of Jupiter's raviſhing Proſerpina in the form of a ſerpent.

There were alſo other feaſts and ſacrifices diſtinguiſhed by this appellation, in honour of Mithras, the deity of the Perſians, and of Bacchus, who was thus denominated by the Sabians, a people of Thrace.

SABBATARIANS, or *ſeventh day Baptiſts*, a ſect of anabaptiſts; thus called, becauſe they obſerved the Jewiſh or Saturday-Sabbath, from a perſuaſion that it was never abrogated in the New Teſtament by the inſtitution of any other.

SABBATH, *Sabbatum*, the ſeventh day of the week, held as a feaſt among the Jews, in memory of God's reſting on the ſeventh day of the creation.

The word is pure Hebrew, שבת, and ſignifies *ceſſation*, or *reſt*. Philo calls it, τȣ κοσμȣ γενεσια, *the world's birth-day*.

The *Sabbath* was appointed from the beginning, by God himſelf, Gen. ii. 2, 3. and by him it was ſet apart for the commemoration of the great work of the creation; and when it had fallen into neglect after the flood, it was re-eſtabliſhed by him, upon his ſettling the Jewiſh polity after the return out of Egypt.

It has been a ſubject of diſpute both among Jews and Chriſtians, whether the *Sabbath* was firſt inſtituted immediately after the creation, or whether the account in Gen. ii. 3. is to be underſtood proleptically of God's appointing the ſeventh day to be obſerved as a *Sabbath*, not at that time, but by the Iſraelites many ages afterwards. The advocates for the latter opinion, among whom are Limborch, Le Clerc, &c. alledge, that there is no mention of the *Sabbath* in the ſacred hiſtory till the time of Moſes, i. e. during the ſpace of about two thouſand five hundred years; and that when it is mentioned Exod. xvi. 23. it ſeems to be intimated that it was before unknown to the children of Iſrael. Ver. 25—27. To the firſt argument it is replied, that the ſilence of Moſes cannot warrant our inferring that the *Sabbath* was not obſerved by the patriarchs; becauſe it is by no means probable that they had no ſtated time for reſt or devotion, or that they were left deſtitute of ſo ſalutary an inſtitution; beſides, it might be argued on the ſame principle, that the Jews did not obſerve the *Sabbath* from Moſes to David, ſince in the hiſtory of that period there is no mention of the day; and, moreover, no notice is taken of ſacrifices in the fifteen hundred years that elapſed between the birth of Seleg and the deluge, nor of the obſervance of circumciſion from the ſettlement of the Iſraelites in Canaan to the circumciſion of Chriſt, though there is no reaſon to queſtion that ſacrifices were offered in the former period, and circumciſion performed in the latter. The early diviſion of time by weeks of ſeven days, affords alſo a very ſtrong preſumption of the primitive inſtitution and obſervance of the *Sabbath*; and this method of dividing time prevailed even in thoſe heathen nations, who can be ſuppoſed to have had no knowledge of the law or hiſtory of Moſes. And we actually find that they accounted one day of the ſeven more ſacred than the reſt: thus Heſiod ſtyles the ſeventh day the illuſtrious light of the ſun,

Εϐδοματη δ' αυθις λαμπρον φαος ηελιοιο.

And Homer ſays,

Εϐδοματη δ' ηπειτα κατηλυθεν ιερον ημαρ.

Then came the ſeventh day, which is ſacred or holy.

As to the second argument above mentioned, Dr. Kennicott hath observed, that when the *Sabbath* is first mentioned in the time of Moses, it is not spoken of as a novel institution, but as one with which the people were well acquainted: "To-morrow is the holy *Sabbath* to the "Lord;" though, with respect to the manner of keeping the *Sabbath*, by a total cessation from labour, and the particular day on which it was to be kept by the Jews, it seems to have been a new institution; otherwise, as to the day, there would have been no occasion for its being so particularly marked out by Moses, as the reason why there would be a double quantity of manna on the sixth day; for it must have immediately occurred to the people, that it was intended for their provision on the *Sabbath*, if the next day had been the *Sabbath* in course. Besides, if this day, which was the twenty-second of the month, had been the *Sabbath*, according to the paradisaical computation, the fifteenth must have been so too, and, therefore, would not have been spent in marching from Elim to Sin. Again, that the Jewish *Sabbath* was on a different day from the paradisaical, is probable, because it was appointed as a sign between God and the children of Israel, by observing which they were to know or acknowledge Jehovah as their God. Accordingly, the Jewish *Sabbath* is declaredly instituted as a memorial of their deliverance out of the land of Egypt. Compare Exod. xx. 11. and Deut. v. 15. The learned Mr. Joseph Mede farther conjectures, that the Jewish *Sabbath* was ordained to be observed on that day, when the deliverance of the Israelites was completed by the overthrow of the Egyptians in the Red Sea.

It is a very probable conjecture, that the day which the heathens in general consecrated to the honour and worship of their chief god the Sun, was the ancient paradisaical *Sabbath*; and, therefore, the reason for changing the day might be to take off the Israelites more effectually from concurring with the Gentiles in this idolatrous worship. It is a farther presumption in favour of this change, that upon their migration out of Egypt, the beginning of the year was changed from the month Tizri to the opposite month Abib (Exod. xii. 2.), and the beginning of the day from the morning to the evening; and they were to compute their days, at least their *Sabbaths*, from evening to evening. By this means the fifteenth day was changed into the fourteenth, and the seventh into the sixth; and the change of the *Sabbath* made a change in the beginning of the week, which always commenced the next day after the *Sabbath*, which was still the seventh day of the week, or the seventh in respect of the preceding six of labour, though not the seventh from the beginning of time. We may also observe, that the law of the *Sabbath* is limited, not only to the people of Israel, but to the duration of their state and polity. Exod. xxxi. 16. Hence it has been concluded, that, by the second change which took place under the Christian dispensation, our *Sabbath*, which is the first day of the week, is the same with the primitive patriarchal *Sabbath*. Mede's Works, vol. i. p. 56, &c. Jennings's Jewish Ant. vol. i. book iii. chap. 3.

Leo of Modena informs us, that it is a received opinion among the modern Jews, that the souls of the damned suffer no torments on the *Sabbath*, and, therefore, they make it last as long as possible.

The Christians also apply the word *Sabbath*, by extension, to the first day of the week, popularly called *Sunday*, or the *Lord's day*; as instituted by the apostles to take place of the Jewish *Sabbath*, and by us observed in remembrance, not of the creation, but of the work of redemption's being completed by our Saviour's resurrection on that day.

Those who dispute the divine appointment of a Christian *Sabbath*, yet allow the moral necessity thereof, as a wise designation of time for the recruiting of our bodies, and at the same time keeping up a sense of the great benefits we have received from God, and a spiritual temper of mind. By allowing six days to labour, the poor has time to earn his bread, and the man of business has time to dispatch his affairs. Had more time been allotted to labour and business, and none to rest, our bodies would have been too much fatigued and wasted, and our minds too long engaged about worldly matters, so as to have forgotten divine things. Greedy people, without such an injunction, would scarce have spared their own bodies, much less their servants, slaves, cattle, &c.

SABBATH-*breaking*. See SUNDAY.

The Jews had also their SABBATIC YEAR, which was every seventh year; wherein they were obliged to set their slaves at liberty, and to let their lands lie idle. See JUBILEE.

SABBATH is also used, by writers on divination, for a nocturnal assembly which witches are supposed to hold on Saturdays, where the devil appears in form of a goat, around whom they make several dances, and magic ceremonies, amply described in the books of Dæmonomania.

To prepare themselves for this meeting, it is pretended, they take certain soporific drugs; after which they are said to fly up the chimney, and to be spirited through the air to the *Sabbath* on a switch. See Delrio Disquis. Mag. lib. iv. qu. 16.

SABBATH *day's journey*, is a Jewish itinerary measure, fixed by critics to the space of 750 paces, or 2000 Jewish cubits, or about two-thirds of an English mile.

SABBATIANS, *Sabbatiani*, in *Ecclesiastical History*, a sect thus called from *Sabbatius*, their leader, who lived under Dioclesian; he was first a Jew, then converted, and made a priest by Marcion; but he afterwards left the sect of Marcionites, on account of the celebration of Easter, which he would have to be on the fourteenth day of the moon; whence he, and his adherents, were called also QUARTODECIMANS.

The *Sabbatians* are recorded by ecclesiastical historians, as having a great abhorrence of the left-hand; so as to make it a point of religion not to receive any thing with it. This custom, which is now become a piece of manners among us, was then esteemed so singular, that the *Sabbatians* were thence denominated *αριστεροι*, q. d. *sinistri*, or *left-hand men*.

SABELLA, in *Natural History*, a genus of the *testaceous worms*. Its animal is a NEREIS; and its covering is tubular, formed with sand and broken shells, coherent by a glutinous cement. Linnæus enumerates seven species.

SABELLIANS, in *Ecclesiastical History*, a sect in the East, who reduced the three persons in the Trinity to three states or relations; or rather reduced the whole Trinity to the one person of the Father; making the Word and the Holy Spirit to be only virtues, emanations, or functions thereof.

Sabellius, their chief, first broached this doctrine, in the third century, about the year 255, in a city of Lybia, called Ptolemais. He taught, according to Epiphanius, that the same being is Father, Son, and Holy Ghost; so that there are only three denominations in one hypostasis or subsistence; or, as in man, body, soul, and spirit. He says, that the *Sabellians* agreed with the NOETIANS, except in one thing, viz. that they said, the Father did not suffer. Theodoret's account of Sabellius is, that he taught, the Father and the Son and the Holy Spirit to be one hypostasis or subsistence, and one person with three names; that he speaks of the same sometimes as Father, sometimes as Son, and sometimes as Holy Ghost; and says, that in the Old Testament he delivered the law as Father, and in the New dwelt among men (or was incarnate) as the Son, and descended on the apostles, as the Holy Spirit. Augustin repeatedly says, that there was no difference in opinion between Noetus and Sabellius; and that the *Sabellians*, as well as the Noetians, taught the Father to have suffered; and that they were oftener called PATRIPASSIANS than *Sabellians*. Lardner's Credibility, vol. vi. p. 446, &c. p. 600, &c.

Epiphanius tells us, that the God of the *Sabellians*, whom they called the Father, resembled the sun, and was a mere substratum; whereof the Son was the illuminative virtue or quality, and the Holy Spirit the warming virtue.

The Word, they taught, was shot or darted forth like a divine ray, to accomplish the work of redemption; and that being reascended to heaven, as the ray returns to its source, the warmth of the Father was communicated, after a like manner, to the apostles.

The council of Antioch, held by the Eusebians in 345, tells us, that, at Rome, those were called *Patripassians*, who in the East were called *Sabellians*.

SABIANS. See SABÆANS.

SABINA, *savin*, in *Medicine*. See SAVIN.

SABINITES *lapis*, in *Natural History*, a name given to a stone in which are preserved the leaves of the common savin. See *Fossile* PLANTS.

SABLE, in *Heraldry*, the black colour in the arms of gentlemen.

The name is borrowed from the little animal called *sable*, which is of a black colour.

In those of nobility, it is called *diamond*; and in the coats of sovereign princes, *saturn*.

It is expressed in engraving by perpendicular and horizontal hatches drawn across each other; as represented in *Tab. Herald. fig.* 27.

SABLE, in *Zoology*, the name of the animal whose fur is so much valued, and sold under the same name. It is a creature of the weasel kind, and called by authors *mustela zibellina*, in size equal to that of the MARTIN, whose form it much resembles; except that the tail of the martin is much longer than the hind legs, when extended, whereas that of the *sable* is shorter. It has long whiskers, rounded

rounded ears, large feet, white claws, long and buſhy tail, the colour of the hair being black at the tips and cinereous at the bottom, chin cinereous, ſometimes white, yellow or ſpotted, the edges of the ears yellowiſh; the hair has ſometimes a tawny caſt; and ſometimes a ſnowy whiteneſs; for the colour varies. This animal inhabits Siberia, Kamtſchatka, and ſome of the Kurile iſles, that lie between Kamtſchatka and Japan. It is alſo found in North-America. The *ſable* lives in holes in the earth, or beneath the roots of trees, and ſometimes forms neſts in the trees, and will ſkip with great agility from one tree to another. They caſt from three to five young at a time, the end of March or beginning of April, and ſuckle them for four or five weeks. They prey in ſummer, chiefly on hares; in winter, on birds; and in autumn, on hurtle-berries, cranberries, and the berries of the ſervice-tree. The hunters of *ſables* form themſelves into troops, from five to forty each; and put themſelves under the conduct of a leader: and being provided with boats and proviſions, together with a dog and net for every two men, they proceed to the hunting country, where they wait till the waters are frozen and the ſeaſon commences; they then penetrate into the woods, building huts and laying traps as they advance: and having provided as many ſkins as the ſeaſon will admit, they ſhare the booty and return home. The price of *ſables* varies from 1 to 10£. ſterling and above: fine and middling *ſable* ſkins are without bellies, and the coarſe ones are with them: the fineſt are ſold in pairs, perfectly ſimilar, and are dearer than ſingle ones of the ſame goodneſs. The blackeſt are reputed the beſt. They are in ſeaſon from November to February; for thoſe caught at any other time of the year are ſhort-haired. The more long hair a ſkin has, the blacker they are, and the more valuable is the fur. The beſt of all have none but long and black hairs. The gloſs vaniſhes in old furs, and the dyed *ſables* always loſe their gloſs: though the Chineſe have a method of dying them (unknown to the Ruſſians) ſo that the colour not only laſts, but the fur keeps its gloſs: the beſt *ſables* are, therefore, carried to Ruſſia and the reſt go to China. White *ſables* are rare and bought only as curioſities; ſome are yellowiſh, and are bleached in the ſpring on the ſnow. The common *ſables* are ſcarcely better in hair and colour than the martin. The American fur is more gloſſy than that of the Siberian colour, and of a bright cheſnut colour, but of a coarſe quality. Pennant.

SABLE *mouſe*. See MOUSE.

SABRE, formed from the German *ſabel*, which ſignifies the ſame, of the Sclavonic *ſabla*, a *ſword*, or *hanger*, a kind of cutting ſword, or ſcimitar, having a very broad, heavy blade; thick at the back, and a little crooked towards the point.

The Turks are very expert in the uſe of the *ſabre*, which is the weapon they ordinarily wear by their ſide, &c. With this, it is ſaid, they can cleave a man quite down, at a ſingle ſtroke.

SABURRÆ, *grits*, in *Natural Hiſtory*, the name of a genus of foſſils found in form of powder, and uſually confounded among the ſands, and called by the ſame name. Theſe are not compoſed like the genuine ſands of pure natural concretions, but are irregular particles, ſeeming to have been the fragments of other large bodies. They are not to be diſſolved or diſunited by water, but retain their figure in it, and do not cohere by means of it into a maſs. They are often very opake, and in many of the ſpecies will ferment with acids, and are often fouled with heterogene particles, taking in the coarſer, ſtony, mineral, and metalline particles, and are according to their colour divided into ſeveral kinds.

Of the white *ſaburræ* there are nine ſpecies; of the red *ſaburræ* we have nine ſpecies; of green *ſaburræ* there are two ſpecies; of yellow, one; and of black, ſix ſpecies. Hill's Foſſils, 569.

SAC, or SAK, SACA, or SACHA, in *Law*, an ancient privilege which a lord of a manor claims in his court, of holding plea in cauſes of debate ariſing from his tenants and vaſſals, and of impoſing and levying fines and amercements touching the ſame.

The word is Saxon, *ſac*, and literally ſignifies *cauſe*, *conteſt*, &c.

Raſtal defines *ſac* by the forfeiture or amercement itſelf.

SACA, in *Zoology*, a ſpecies of beautiful wild cat, found in Madagaſcar.

SACABURGH, SACABERE, or SAKEBERE, in our *Old Writers*, one that is robbed, or by theft deprived of his money or goods, and puts in ſurety to proſecute the thief with freſh ſuit; according to Selden, in his Titles of Honour, and Briton, cap. 15 & 29. with whom agrees Bracton (lib. iii. tract. 2. cap. 32. n. 2.) *Furtum vero manifeſtum eſt, ubi latro deprehenſus ſit ſeiſitus de aliquo latrocinio*, ſcil. Honhabend & Backberend & *inſecutus fuerit per aliquem cujus res illa fuerit, qui dicitur* ſacaburth, &c.

The word may come from the Saxon *ſac* or *ſacca*, i. e. *lis, cauſa, proſecutio*, and *burh, pignus, hoc eſt furti ſymbolum*.

But Sir Edward Coke ſays, *ſacabere*, or *ſakebere*, is derived from *ſac* and *bere*, that is, *he that did bear the bag*. 3 Inſt. fol. 69.

SACÆA, Σακαια, in *Antiquity*, a feaſt which the ancient Babylonians, and other Orientals, held annually in honour of the deity Anaitis.

The *Sacæa* were in the Eaſt what the *Saturnalia* were at Rome, viz. a feaſt for the ſlaves. One of the ceremonies hereof, was to chooſe a priſoner condemned to death, and allow him all the pleaſures and gratifications he would wiſh, before he were carried to execution.

SACCADE, in the *Manege*, a jerk or violent check which the rider gives his horſe, by drawing both the reins very ſuddenly; it is uſed when the horſe bears too heavy on the hand, or obſtinately arms himſelf.

The *ſaccade* is a kind of correction rarely to be uſed; for fear of ſpoiling the horſe's mouth.

SACCARII, among the Romans, were a company or fraternity of porters, who had the ſole privilege to carry all goods from the harbour to the warehouſes, none being allowed to employ their own ſlaves, and much leſs thoſe of others, for that purpoſe.

SACCER. See SAKER.

SACCHARUM. See SUGAR.

SACCHARUM *Saturni*, in *Medicine*, is prepared by gently boiling CERUSSE with diſtilled vinegar, or in the ſtrong acid which remains after diſtilling the vinegar in a lead or glazed earthen veſſel, till the vinegar is ſweet; then pouring off the clear vinegar, and evaporating it to the conſiſtence of honey, and ſetting it to cryſtallize in a cool place; then exhaling the remaining liquor, and ſetting it to ſhoot again, &c. until no more ſalt will ſhoot. The ceruſſe ſhould be well powdered before the vinegar is put to it; and during the boiling it ſhould every now and then be ſtirred with a wooden ſpatula. If the heat is conſiderable in the boiling of the vinegar and lead together, the acid will be diſſipated before it can be fixed by its combination with the lead: the vinegar may be made hot, which will be ſufficient. When the ſolution is exhaled for cryſtallization, let a ſmall quantity of rectified ſpirit of wine be added to it, and the mixture ſuffered to cool gradually. The ſugar will then concrete into very large tranſparent cryſtals. See *Extract of* LEAD.

This preparation of lead is recommended by ſome internally, in the quantity of a few grains, for dyſenteries, and obſtinate hæmorrhages; but the generality of the world condemn it, as containing all the poiſonous qualities of the metal it is made from in their higheſt degree.

Externally it has been long famous for its virtues in the eryſipelas, in inflammations of all kinds, and in embrocations. It is uſed alſo in ſmall quantities in collyriums for the eyes; it deterges, dries, and cicatriſes ulcers; and in gonorrhœas is mixed in injections with great ſucceſs.

It is well known that this ſalt made with the common vegetable or mineral acids, when diſtilled, will not give back the acid again, but only yields a water without any ſharp taſte, and an inflammable oil; but if it be made into the animal acid of piſmires, whether procured by diſtilling thoſe inſects freſh, or by throwing large quantities of them into water till it is ſufficiently impregnated, it will on diſtillation yield back the ſame proportion of acid of the ſame ſtrength. Phil. Tranſ. N° 68. See TINCTURA *antiphthiſica*.

SACCHARUM *lactis*. See MILK.

SACCINI, in our *Old Writers*, monks ſo called, becauſe they wore a garment of goat's hair next to their ſkins. *Saccus* is applied to coarſe cloth made of ſuch hair.

SACCO *beneditto*. See SANBENITO.

SACCOPHORI, Σακκόφοροι, formed of σακκος, a *ſack*, and φερω, *I bear*, in *Eccleſiaſtical Hiſtory*, a ſect of ancient heretics, thus called, becauſe they always went clothed in ſackcloth, and affected a great deal of auſterity and penance.

We know but little of their tenets: in all probability they were the ſame with the MASSALIANS.

The emperor Theodoſius made a law againſt the *Saccophori*, and Manichees.

SACCULUS, a diminutive of *ſaccus*; uſed in anatomy, to expreſs ſeveral parts of the body, bearing ſome reſemblance to bags; as

SACCULUS *chyliferus*, or *roriferus*, a paſſage which makes the beginning of the thoracic duct; called alſo RECEPTACULUM *chyli*.

SACCULUS *cordis*, the PERICARDIUM.

Sacculus *lacrymalis*, a little membranous bag, into which the *puncta* lacrymalia of the eye open; and which is, itself, the entrance of a canal, by which the liquor separated in the glandula lacrymalis, is discharged into the cavity of the nose. It is the ulceration of this *saccus* that makes the fistula *lacrymalis*.

Sacculi *adiposi*, little cells or vesicles, in the membrana adiposa, wherein the fat of the body is contained.

Sacculus *medicinalis*, denotes a topical medicine, applied to the side, stomach, or other pained part; consisting of herbs, or drugs inclosed in a linen bag.

Sacculus *medicinalis*, is also a name given to a bag of ingredients suspended in a liquor, in making diet-drinks; called also *nodule*.

SACCUS *cum brochia*, in our *Old Writers*, a service or tenure of finding a *sack* and a *broach* to the king, for the use of his army.

Saccus *lacteus*, a name given by some anatomists to the receptaculum *chyli*.

SACELLUM, in Roman *Antiquity*, denoted a place sacred to the gods, without a roof.

SACER, or Sacer Dorsi, in *Anatomy*, a muscle arising from the hind-part of the os sacrum, and running along under the longissimus dorsi. With its several tendons, it lays hold on the spine, and every transverse process of the loins, and the lowest of the back. It assists in erecting the trunk.

Sacer *ignis*. See Erysipelas.

Sacer *morbus*. See Epilepsy.

Sacer, in *Ichthyology*, a name given by Gaza and some others to that species of the *labrus*, distinguished by Artedi by the name of other red forked-tail *labrus*, and called by the generality of other authors the anthias *piscis*.

SACERDOTAL, *sacerdotalis*, formed from *sacerdos*, *priest*, of *sacer*, *holy*, something belonging to the priesthood.

Sacerdotal *benefices*, are such as cannot be legally held by any but persons in holy orders: such are all cures of souls, bishopricks, &c.

Sacerdotal *ornaments*, *the*, are those wherewith the priests are clothed when they officiate, &c.

SACHETTUS, in *Ichthyology*, the name of a sea-fish, much resembling the common river perch in shape and colour, and having the same black obliquely transverse lines on its sides, and seeming the same with the channadella of Bellonius, Rondeletius, and other authors. It is common in the Mediterranean, and is brought to market at Rome, Venice, and elsewhere, and accounted a very delicate and well tasted fish. See Chane.

SACK *of wool*, is a determinate quantity, containing just twenty-six stone, and every stone fourteen pounds. 14 E. III. stat. 1. cap. 2.

In Scotland, a *sack* is twenty-four stone; each stone containing sixteen pounds.

A Sack *of cotton wool* is a quantity from a hundred and half to four hundred weight.

Sacks *of earth*, *sacs à terre*, in *Fortification*, are canvas bags full of earth, the largest about a cubic foot wide, and the lesser somewhat more than half a foot.

They are also called *earth bags*, and *canvas bags*, and are used on several occasions; particularly for making retrenchments in haste to place on parapets, or the heads of the breaches, &c. or to repair them when beaten down.

They are of good use also, where the ground is rocky, and affords not earth to carry on the approaches, because they can easily be brought on, and carried off. See Sand-*bags*.

The same bags, on occasion, are used to carry powder in, of which they hold about fifty pounds apiece.

SACKBUT, a musical instrument of the wind kind; being a kind of a trumpet, though different from the common trumpet both in form and size.

The *sackbut* is very fit for playing bass; and is contrived so as to be drawn out or shortened, according to the gravity or acuteness of the tones. The Italians call it *trombone*, the Latins *tuba ductilis*.

It takes asunder into four pieces, or branches; and hath frequently a wreath in the middle; which is the same tube only twisted twice, or making two circles in the middle of the instrument; by which means, it is brought down one-fourth lower than its natural tone. It has also two pieces or branches on the inside, which do not appear, except when drawn out by means of an iron bar, and which lengthen it to the degree requisite to hit the tone required.

The *sackbut* is usually eight feet long, without being drawn out, or without reckoning the circles. When extended to its full length, it is usually fifteen feet. The wreath is two feet nine inches in circumference. It serves as bass in all concerts of wind music.

There are *sackbuts* of different sizes, serving to execute different parts; particularly a small one, called by the Italians *trombone picciolo*; and by the Germans, *cleine alt posaune*, proper for a counter-tenor. The part assigned it is usually called *trombone primo*, or I°. There is another large kind, called *trombone maggiore*, which may serve as a tenor; its part is usually called *trombone secondo*, or II°. or 2°. There is a third still bigger, called *trombone grosso*; its part is called *trombone terzo*, or III°. or 3°. Lastly, there is another, which exceeds all the rest, and which is much heard in the music, especially in the bass; its part is called *trombone quarto*, or IV°. or 4to. or simply *trombone*. It has usually the key of *F*, *ut*, *fa*, on the fourth line; though frequently also on the fifth line from the top, on account of the gravity or depth of the sounds.

SACRA *arteria*, a branch of the aorta descendens, which descends through the middle of the os sacrum to the pelvis. See Aorta, and Artery.

Sacra *fistula*, a name given by some to the cavity in which the spinal marrow is lodged, and by others to the spinal marrow itself.

Sacra *gentilitia*, among the Romans. Beside the public festivals observed by the whole Roman people, and beside the holy-days kept on birth-days, marriages, or any other personal account, there were likewise family feasts celebrated annually by the descendants only of particular families.

They thought themselves obliged to keep these with the utmost exactness and regularity, on pain of divine vengeance. Livy tells us, that a young man of the Fabian family, when the Capitol was besieged by the Gauls, made his way through the enemy's army, in order to celebrate the yearly festival of his family, to the no small astonishment both of the besiegers and besieged. Mem. Acad. Inscript. vol. viii. p. 310.

Sacra *vena*, a vein arising from the os sacrum, and terminating usually in the iliac vein; sometimes in the place where the two iliacs meet the ascending aorta.

SACRAMENT, *sacramentum*, in the general, denotes a sign of a holy or sacred thing.

The word is formed from the Latin *sacramentum*, which signified an oath, particularly that which the soldiers took, to be true to their commanders; the words whereof, according to Polybius, were *obtemperaturus sum & facturus quicquid mandabitur ab imperatoribus juxta vires*.

In this sense, the word includes both the *sacraments* of the law of nature, as sound morality, the manner of offering the bread and wine practised by Melchisedek, &c. and those of the law of Moses, as the circumcision, the paschal lamb, purifications, order of priesthood, &c.

Sacrament, with regard to the Christian church, is defined, an outward and visible sign of an inward and spiritual grace annexed to the use thereof.

But some have objected against this definition, as obscure; unless it supposes some divine influence of an extraordinary nature inseparably annexed to the outward sign; and if this be the meaning of it, they apprehend there is reason to question, whether there be any *sacrament* at all. Accordingly, they have chosen to define *sacraments* to be ordinances instituted by Christ, to be used by all Christians as seals of the covenant of grace; or as tokens of, their accepting the Gospel covenant as well as of the divine acceptance. Or, the term *sacrament*, originally signifying the oath which the Roman soldiers took to be faithful to their general (though it be no scripture term), is properly enough transferred to denote the affectionate zeal, and inviolable fidelity, which the followers of Jesus, in baptism and the Lord's Supper, profess and promise to the captain of their salvation.

There are two objects in a *sacrament*; the one a material sign, the object of the senses; the other the thing signified, which is the object of faith. Thus it has pleased God to give as it were a body or substance to spiritual mysteries, that our faith might have the assistance of sensible signs.

The *sacrament* is the most solemn act of worship amongst us, and by the rubric there must be three at the least to communicate, and a minister is not without lawful cause to deny it to any who shall devoutly and humbly desire it; but notorious sinners are not to be admitted to it till they have repented; nor those who maliciously contend, until they are reconciled, &c. Also the *sacrament* is not to be administered to such who refuse to kneel, or to be present at the prayers of the church, or to strangers; for a minister is not obliged to give it to any but those of his own parish; and the partakers of the holy *sacrament* ought to signify their names to the curate at least a day before it is administered. Can. 27. If a minister refuses to give the *sacrament* to any one being required by the bishop, he is to certify the cause of such refusal; and a parson refusing to administer the *sacrament* to any, without just cause, is liable to be sued in action of the case; because a man may sustain a temporal loss by such refusal

refusal. By statute no persons shall be chosen into any office of magistracy, or place of trust, &c. unless they receive the *sacrament* according to the rites of the church of England, and deliver a certificate thereof to the court of king's bench or quarter sessions, under the hand of the minister, and prove it by witnesses. 13, 14, & 25 Car. II. In every parish church the *sacrament* is to be administered three times in the year (whereof the feast of Easter to be one), and every layman is bound to receive it thrice every year, &c. In colleges, and the halls of the universities, the *sacraments* are to be administered the first and second Sunday of every month; and in cathedral churches upon all principal feast days. Canon 21, 22, 23. The churchwardens, as well as the minister, are to take notice whether the parishioners come so often to the *sacrament* as they ought; and on a churchwarden's presenting a man for not receiving the *sacrament*, he may be libelled in the ecclesiastical court and excommunicated, &c. Reviling the *sacrament* of the Lord's supper is punishable by fine and imprisonment. 1 Edw. vi. c. 1. 1 Eliz. c. 1.

Roman catholics own seven *sacraments*; viz. baptism, confirmation, the eucharist, penance, extreme unction, ordination, and marriage. See each under its proper article. See POPERY.

The protestants admit of only two; viz. baptism and the eucharist, or Lord's Supper.

The Romanists, however, call the eucharist, by way of eminence, the *Holy Sacrament*. Thus, to expose the *Holy Sacrament*, is to lay a consecrated HOST on the altar to be adored. The PROCESSION of the *Holy Sacrament*, is that wherein this host is carried about the church, or about the town.

In a like sense they say, the feast of the *Holy Sacrament*, the congregation of the *Holy Sacrament*.

SACRAMENT, *Congregation of the Holy*, a religious establishment formed in France, whose founder was Autherius, bishop of Bethlehem, and which, in 1644, received an order from Urban VIII. to have always a number of ecclesiastics ready to exercise their ministry among pagan nations, wherever the pope, or congregation *de propaganda*, should appoint.

SACRAMENT, *Festival of the Holy*, or of the body of Christ, a festival observed in the Romish church, and established in the following manner. A certain devout woman of Liege, whose name was Juliana, declared that she had received a revelation from heaven, intimating to her, that it was the will of God that a peculiar festival should be annually observed in honour of the *Holy Sacrament*, or rather of the real presence of Christ's body in that sacred institution. This pretended vision was supported by the bishop of Liege, who, in 1246, published an order for the celebration of this festival through the whole province. Eve, one of Juliana's companions, after her death, prevailed with Urban IV. to publish, in 1264, a solemn edict, imposing the observance of this feast on all Christian churches; which was confirmed, in the pontificate of Clement V. by a council held at Vienne, in France, in 1311; and this contributed more to render the doctrine of transubstantiation agreeable to the people than the decree of the council of the Lateran under Innocent III. or than all the exhortations of his successors.

SACRAMENT was also used, in the Roman law, for a pledge or gage of money, which both the plaintiff and defendant, in a real action, laid down in court to be forfeited by him who should lose the cause.—This was particularly called, *sacramento provocare, rogare, stipulari*, &c.

SACRAMENTARIANS, a general name given to all such as have published, or held erroneous doctrines of the sacrament of the Lord's supper.

The term is chiefly applied among Roman catholics, by way of reproach, to the Lutherans, Calvinists, and other Protestants.

SACRAMENTARY, *sacramentarium*, an ancient church-book, comprehending all the prayers and ceremonies practised at the celebration of the sacraments.

Pope Gelasius was the first author of the *sacramentarium*: it was afterwards revised, corrected, and abridged, by St. Gregory.—It was the same with what the Greeks now call EUCHOLOGIUM.

SACRAMENTUM *Altaris*, denotes the sacrifice of the mass in Popish countries; and with us the Lord's supper.

SACRAMENTUM *Decisionis*, denotes the voluntary and decisive oath of the civil law; where one of the parties to the suit, not being able to prove his charge, offers to refer the decision of the cause to the oath of his adversary; which the adversary was bound to accept, or tender the same proposal back again; otherwise the whole was taken as confessed by him.

SACRANUS *color*, a name given by some authors to purple, or very deep red.

SACRARIUM, among the Romans, a chapel in a private family. It differed from *lararium*, as being dedicated to some particular deity, and the *lararium* to the houshold gods in general.

SACRE, or SAKER, in *Ornithology*, the name of a species of falcon, called by authors *falco sacer*, and differently described by different authors, but by all agreed to be an extremely bold and active bird. The description Mr. Ray has selected of it is this: it is a larger bird than the common falcon; its head is flat and of a greyish colour; its eyes large, and its beak bluish; its back and wings are brown; its breast white, and variegated with brown spots; its thighs are white within, and its tail is variegated with spots of the shape of a kidney; its wings are very long, and its legs and feet of a bluish colour. The yearling birds of this species are called *sori*, and differ considerably in their plumage from those of a more advanced age, having their legs paler, and their breasts less spotted. It will seize upon the largest birds, and on young goats, &c. for food. Ray. See HAWK and HAWKING.

SACRED, *sacer*, something holy, or that is solemnly offered, and consecrated to God with ceremonies, benedictions, unctions, &c.

Kings, prelates, and priests, are held *sacred* persons; abbots are only blessed.—The deaconhood, subdeaconhood, and priesthood, are all *sacred* orders, and are said to impress a *sacred* indelible character.

The custom of consecrating kings with holy oil is derived, according to Gutlingius, from the Hebrews; among whom, he agrees with Grotius, it was never used but to kings who had not an evident right by succession. He adds, that the Christian emperors never used it before Justin the younger; from whom he takes it to have passed to the Goths, &c.

SACRED, is also applied to things belonging to God, and the church.

Church-lands, ornaments, &c. are held *sacred*.—The *sacred* college is that of the cardinals.

SACRED *majesty*, is applied to the emperor, and to the king of England; yet Loyseau says it is blasphemy. See MAJESTY.

The ancients held a place struck with thunder as *sacred*.

In the civil law, *sacred* place chiefly denotes that, where a person deceased has been interred.

SACRED *elixir*. See ELIXIR.

SACRIFICE, *sacrificium*, an offering made to God on an altar, by means of a regular minister, as an acknowledgment of his power, and a payment of homage.

Sacrifices (though the term is sometimes used to comprehend all the offerings made to God, or in any way devoted to his service and honour) differ from mere oblations, in this, that in a *sacrifice* there is a real destruction or change of the thing offered; whereas an oblation is only a simple offering or gift, without any such change at all: thus, all sorts of tythes, and first fruits, and whatever of men's worldly substance is consecrated to God, for the support of his worship and the maintenance of his ministers, are offerings or oblations: and these, under the Jewish law, were either of living creatures or other things: but *sacrifices* in the more peculiar sense of the term, were of living creatures, of which five sorts were prescribed or allowed by the law, viz. bullocks, sheep, goats, doves, and turtles: beasts only were allowed in public *sacrifices* and birds in private ones.

Divines divide *sacrifices* into *bloody*, such as those of the old law; and *bloodless*, such as those of the new law.

They also divide them again into *impetratory*, which are those offered to obtain some favour of God, or to thank him for some already received: and *propitiatory*, which are those offered to obtain forgiveness of sins.

The Phœnicians are usually held to have been the first authors of *sacrifices*: Porphyry, indeed, attributes the invention to the Egyptians; who, he says, first offered the first-fruits of their grounds to the gods; burning them upon an altar of turf. At length they came to burn perfumes; and at last, he says, they sacrificed animals; observing that they first eat some herbs or fruits regularly offered on the altars.—He adds, that libations were very frequent before the *sacrifices* of beasts got footing.

Ovid observes, that the very names *victim* and *hostia* import, that they were not slain, till such time as victories were obtained over enemies: indeed, while men lived on herbs and pulse, it is no wonder they abstained from *sacrifices* of beasts; since the law of *sacrifices* required, that they should eat some part thereof. In effect, it is supposed to be this that first introduced flesh as a food, and made man a carnivorous animal.

The truth is, in all antiquity, both sacred and profane, *sacrifices* were ordinarily nothing else but holy banquets.

The scriptures furnish us with a somewhat different account: Noah certainly *sacrificed* animals at his coming out of the ark; and it is even suggested that Abel himself *sacrificed* the best and fattest of his flocks; though Grotius thinks it more probable, he contented himself with making a mere oblation of his lambs, &c. to God, without *sacrificing* them.

The origin of *sacrifices* hath been a subject of considerable controversy both among Jews and Christians. Maimonides, R. Levi Ben Gerson, and Abarbanel, among the former, Chrysostom, Spencer, Grotius, &c. among the latter, maintain, that *sacrifices* were at first an human institution; and it is said, that, in order to prevent their being offered to idols, God introduced them into his service, not that he approved them as good in themselves, or as proper rites of worship. Those, who apprehend that *sacrifices* were originally of divine institution, alledge, that Abel offered his *sacrifice* by faith (Heb. xi. 4.) which must imply a divine promise connected with that rite, and a divine direction for the performance of it; (see also Gen. iv. 4.) that the paschal lamb which was a real *sacrifice*, was expresly instituted by God himself; and that the deity, who resented and punished will-worship in other cases (Lev. x. 1, 2.) would not have approved of the patriarch's *sacrificing* as he actually did, if he had not commanded it. The advocates for this opinion, therefore, suppose, that *sacrifices* were first instituted by God himself, and injoined our first parents soon after the fall; from whom, and afterwards from Noah, they say, all nations received them by tradition. Those, who apprehend that animal food was not used till after the flood, derive from hence an additional argument in favour of the very ancient use and probably divine institution of *sacrifices*: for the skins used for cloathing, (Gen. iii. 21.) they suppose, must have been obtained from beasts slain for this purpose. Those who wish to see this subject farther discussed may consult Outram de Sacrificiis, lib. i. cap. 1. §. 3. 4.

In process of time, instead of brute animals, which God had appointed, human *sacrifices* were introduced, and the objects, as well as the subjects of *sacrifice*, were altered; for the heathen nations *sacrificed* to dæmons, and not to God. To Israel, therefore, the appointed guardians of the true religion in the world, God delivered a-new his law concerning *sacrifices*, with the addition of such particular rites as were best adapted to the situation of this people and the most likely to answer the purpose of their institution. With regard to their signification and use, *sacrifices* were distinguished into four kinds, burnt-offerings, sin-offerings, trespass-offerings and peace-offerings. *Sacrifices*, besides their religious use, were intended, under the Jewish dispensation, for the support of the state and civil government. See Priest. But what was their precise design and use, in a moral and religious view, has been the subject of controversy. Nevertheless it has been the more generally received opinion, that *sacrifices*, both before and under the law of Moses (when they are taken in the strict sense, and distinguished from all other offerings that accompanied either prayers or thanks for particular blessings), were instituted by way of positive mulct and forfeiture, to render every breach of duty burthensome and expensive to the transgressor: in other words, that they were piacular and expiatory; thus reminding sinners of their defect by the suffering and death of the victim, which they were required to offer, and typifying, as some say, and thus assisting their faith in that promised *sacrifice* of atonement, which the son of God was to offer in due time. Dr. Sykes, however, and many others, consider all *sacrifices* as federal rites, which implied men's entering into friendship with God; or if they had violated their friendship with him, then they denoted reconciliation, and a renewal of that friendship: of the former kind were those *sacrifices*, part of which was consumed on the altar and part eat by the offerers; or of the latter, the whole burnt-offering or Holocaust. But Dr. Sykes, &c. utterly rejects the notion of *sacrifices* being vicarious and expiatory. Ess. on the Nature, Design, and Origin of *Sacrifices*, passim.

Macrobius tells us, that the Egyptians, long accustomed to bloodless *sacrifices*, being at length obliged to admit the worship of Serapis and Saturn, to whom *victims* were to be *sacrificed*, would not allow their temples to be built in the cities. These *victims*, however, or bloody *sacrifices*, at length obtained, in exclusion of almost all the rest: the most usual of these among the ancients, were bulls, oxen, cows, sheep, and lambs, in regard these were the most ordinary food of man.

The manner of *sacrificing* among the ancient Hebrews, is amply described in the books of Moses. That in use among the Romans, is as follows.— n the choice of the victim, care was taken it were without blemish or imperfection, its tail not too small at the end; the tongue not black, nor the ears cleft; and the bull, such as had never been yoked. The victim being pitched upon, they gilt his forehead and horns, especially if a bull, heifer, or cow. The head they also adorned with a woollen infula, whence hung two rows of chaplets with twisted ribbands; and on the middle of the body a kind of stole, pretty large, hung down on both sides: the lesser victims were only adorned with bundles of flowers and garlands, together with white tufts or wreaths.

The victims, thus made ready, were brought before the altar: the lesser were not led in a string, but driven to the place: the greater were conducted in a halter; if they made any struggle, or refused to go, the resistance was taken for an ill augury, and the *sacrifice* was often set aside.—The victim, thus brought before the altar, was examined very circumspectly, to see if there were no defect in it; then the priest, being clad in his sacerdotal habit, and accompanied with the sacrificers and other attendants, and being washed and purified according to the ceremonies prescribed, began the *sacrifice*, with making a loud confession of his unworthiness, acknowledging himself guilty of divers sins; for which he begged pardon of the gods, hoping they would be pleased to grant his requests.—The confessions were like those of the Hebrews; with this difference, that the Pagans confessed the frailty of mankind, and owned their faults; the Jews confessed chiefly the greatness of God, accompanying it with hymns and musical instruments.

The confession over, the priest cried aloud, *Hoc age!* i. e. compose yourselves, and mind your business; and presently an usher, holding a rod in his hand, called *commentaculum*, went through the temple, and made all those withdraw, who were not initiated in the mysteries of religion, or such as were excommunicated.

Sacrifices among the Greeks, were of four kinds, viz. 1. Free-will offerings, or such as were paid in consequence of a vow, χαριστηρια and ευκταια; for a victory obtained, the first fruits offered by husbandmen for a plentiful harvest, and the like. 2. Propitiatory offerings, ιλαστικα, to avert the anger of some offended deity, and such were all *sacrifices* used in expiation. 3. Petitionary *sacrifices*, αιτητικα, for success in any enterprize. 4. *Sacrifices* expresly commanded by some oracle or prophet, τα απο μαντειας.

The custom of the Greeks, from whom the Romans borrowed theirs, was, that the priest coming to the altar, should ask aloud, Τις τηδε? Who is here? The people answered, Πολλοι και αγαθοι, Many good persons: then the usher went through the temple, crying, Εκας εκας εστε, βεβηλοι, that is, Out with the wicked. The Romans commonly used the words, *Nocentes, profani, abscedite*.—All those who were driven out of the temples among the Greeks, were comprehended under these general words, βεβηλοι, αμυητοι, ακαθαροι. The profane being withdrawn, they cried, *Favete linguis*, or *animis*, and *Pascite linguam*, to require silence, and attention during the *sacrifice*.

These ceremonies ended, the chief *sacrificer* being sat down, and the rest of them standing, the magistrates or private person, who offered *sacrifice*, came before him, and presented him with the first-fruits and victim, and sometimes made a short discourse, by way of compliment; as we find Homer makes Ulysses do, when he presented the high priest with Iphigenia to be *sacrificed*.—As any person came to present his offering, he washed his hands in a place appointed in the temple for that purpose.

Lastly, when the offering was made, the priest that officiated, perfumed the victim with incense, and sprinkled it with the lustral water; and having washed his hands, and got up again to the altar, he prayed to the god to whom he presented the *sacrifice*, with a loud voice, that he would accept of those offerings, and be pleased with the victim he *sacrificed* to him for the public good, and for such and such things in particular.—In the close of the offertory and prayer, made by the priest to the gods, he came down the steps of the altar, and from the hand of one of his assistants, received the sacred paste, called *mola salsa*, made of barley or wheat flour, mixed with salt and water, which he threw upon the head of the victim, sprinkling a little wine upon it, which was called *immolatio*.—Servius says, the priest scattered little bits of this paste upon the head of the victim, and also on the altar where the sacred fire burned, and on the knives, by way of consecration.

He then took wine in a vessel called *simpulum*, and having tasted it himself first, and made his assistants do the same, to shew that they partook of the *sacrifice*, he poured it between the horns of the victim, pronouncing these words of the consecration, *Mactus hoc vino inferis esto*. This done, he pulled off the hairs from between the horns, and threw them into the fire; and commanded the

the victimarius (who asked him, *Agon?* Shall I strike?) to knock down the victim with a blow on the head with a hammer or ax; upon which, another assistant, named *popa*, presently thrust a knife into its throat; whilst a third received the blood, wherewith the priest sprinkled the altar.

When the victim was slain, they flayed him, if it was not a burnt-offering (for they then burned skin and all); they then took the flesh of the head, and adorning it with garlands and flowers, fastened it to the pillars of the temples, as well as the skins, as ensigns of religion; carrying them about in procession in public calamities.—Not but that the priests oft wore the skins, and others went to sleep upon them in the temples of Æsculapius and Faunus, that they might receive favourable responses in their dreams, or be cured of their maladies. They then opened the victim's entrails, and after circumspectly viewing them, to draw presages therefrom, according to the art of the aruspices, they floured them with meal, and sprinkled them with wine, and made a present of them to the gods, *reddebant exta diis*, by throwing them into the fire in small bits, boiled or parboiled; and hence the entrails were called *porricæ*.

The entrails being burned, and the other ceremonies finished, they believed the gods to be satisfied; and that they could not fail to find the vows accomplished, which they expressed by the word *litare*, q. d. all is finished, and well done; whereas *non litare*, on the contrary, intimated there was something wanting to the perfection of the *sacrifice*, and that the gods were not appeased.—The priest afterwards dismissed the people with this form, *Ilicet*.

Hence it may be observed, that the *sacrifices* consisted of four principal parts; the first called *libatio*, or the pouring a little wine upon the victim; the second *immolatio*, when, after they had scattered the crums of salted paste thereon, they killed it; the third *redditio*, when they offered the entrails to the gods; and the fourth *litatio*, when the *sacrifice* was perfected, and accomplished without any fault. For a more particular account of the materials and rites of *sacrifice*; see Potter's Archæol. Græc. tom. i. p. 209, &c.

SACRILEGE, *sacrilegium*, the crime of profaning sacred things, or things devoted to God; or of alienating to laymen, or common purposes, what was given to religious persons, and pious uses.

Our forefathers were so tender in this case, that, when the order of knights Templars was dissolved, their lands, &c. were all given to the knights Hospitallers of Jerusalem, for this reason, *Ne in pios usus erogata, contra donatorum voluntatem, in alios usus distraherentur.*

Church robbery, or a taking of things out of a holy place, is *sacrilege*; as where a person steals any vessels, ornaments, or goods of the church: And it is said to be a robbery of God, at least of what was dedicated to his service. If any thing belonging to private persons, left in a church be stolen, it is only common theft, not *sacrilege*: But the canon law determines that also to be *sacrilege*; as likewise the stealing of a thing known to be consecrated, in a place not consecrated. By the civil law, *sacrilege* is punished with greater severity than any other thefts; and the common law distinguished this crime from other robberies, for it denied the benefit of the clergy to the offenders, which it did not do to other felons: but by statute it is put upon a footing with other felonies by making it felony excluded of clergy, as most other felonies are.

All persons not in holy orders, who shall be indicted whether in the same county where the fact was committed, or in a different county, of robbing any church, chapel, or other holy place, are excluded from their clergy, by 23 H. 8. c. 1. 25 H. 8. c. 3. 5. & 6 Ed. 6. c. 10. And all persons in general are ousted of their clergy for the felonious taking of any goods out of any parish church, or other church, or chapel, by the 1 Ed. 6. c. 12. But the word *robbing* being always taken to carry with it some force, it seems no *sacrilege* is within these statutes, which is not accompanied with the actual breaking of a church, &c. And the statute 23 H. 8. is the only statute which extends to accessaries to these robberies, except the offence amount to burglary; in which case accessaries before are ousted of clergy, by 3 & 4 W. & M. c. 9.

SACRIMA, among the *Romans*, the new wine which was offered to Bacchus as an acknowledgment of his protecting and preserving every thing that belonged to wine.

SACRISTA, or *sacristan*, a church-officer, otherwise called SEXTON.

SACRISTY, *sacristia*, a place or apartment in the church, where the vessels, and other utensils and ornaments of the church, are preserved; and where the ministers dress and undress themselves before and after the service.

The *sacristy* is also called in ancient authors, *secretarium*:—among us the VESTRY.

SACRO-COCCYGÆUS, in *Anatomy*, a name given by Winslow to a muscle now generally called simply the *coccygæus*; he calls it also *coccygæus posterior*.

SACRO-LUMBARIS, or *sacro-lumbus*, in *anatomy*, a muscle, that arises fleshy from the superior part of the os sacrum, the posterior part of the ileum, and from all the spines and transverse processes of the vertebræ of the loins. —It gives a small tendon to the posterior part of each rib near its root, where a small bundle of fleshy fibres arises and unites with each ascending tendon, to the third, fourth, fifth, and sixth vertebræ of the neck.—See *Tab. Anat.* (*Myol.*) *fig.* 6. *n.* 30. 30. *fig.* 7. *n.* 16. 16.

It lies between the spine and posterior part of all the ribs, and along the back of the regio lumbaris, all the way to the os sacrum. Through all this space it is closely accompanied by the longissimus dorsi, which lies between it and the spinal apophyses of the vertebræ, a narrow fatty or cellular line running between them; it is fixed below by a broad thin tendinous aponeurosis to the os sacrum, and part of the crista of the os ilium. From thence it runs upwards, and a little laterally over all the regio lumbaris; afterwards it runs up obliquely over all the ribs, sometimes as high as the two or three lowest vertebræ of the neck. The side next the longissimus dorsi is all this way very even; but that next the ribs is divided into several digitations, resembling the branch of a palm tree. These are fixed in the transverse apophyses of the neck, in the tuberosity of the first rib, in the lower part of the angular impressions, in the following ribs, and near the extremity of the last.

This with the serratus posticus inferior, and triangularis, help to contract the ribs in exspiration. But they are but of small force; and seem only to accelerate the motion of the ribs, which fall down chiefly by their own gravity, and the elasticity of the ligaments, by which they are tied to the vertebræ.

SACRO-LUMBARIS *pars superior*, in *Anatomy*, a name given by Cowper and some others, to a muscle called by Winslow TRANSVERSALIS *collateralis colli*, and by Albinus the *cervicalis descendens*.

SACRO-SCIATIC *ligaments*. These are two in number, the one broad and external, the other small, narrow, and internal. The broad, or external, *sciatic* ligament is slightly fastened to the inside of the tuberosity or crista of the os ilium. It covers exteriorly the two posterior spines of that bone, and continues to be inserted along the anterior or exterior edges of the false transverse apophyses of the sacrum. From thence this ligament diminishing in breadth, descends obliquely towards the tuberosity of the os ischium, and is inserted immediately below the sinus, which lies between that tuberosity and the *sciatic* spine. This insertion is afterwards continued over the whole internal labium of the inferior portion of the os ischium, and of the ramus of that bone, and the inferior portion of the ramus of the neighbouring os pubis. Through all this latter course of its insertion, that is, after its arrival at the tuberosity of the *ischium*, it produces a kind of ligamentary falx, one edge of which is fixed to the bones, the other lies loose; and by this situation of the falx, it seems, together with the bones, a kind of deep channel or groove. The small *sacro-sciatic*, or internal *sciatic* ligament, adheres closely to the inside of the posterior portion of the former. It is fixed interiorly also to the edge of the inferior part of the fourth false transverse apophysis of the os sacrum, and from thence all the way to the upper part of the os coccygis. From this insertion it runs up a little obliquely to the spine of the ischium, in a sharp point and upper part of which it is fixed. During this course it crosses the broad ligament, being closely united to the inside thereof, and loses but very little of its breadth. By these two ligaments two distinct openings are formed; a large one which is the superior *sciatic* sinus, and a small one with the inferior *sciatic* notch. Winslow.

SACRUM OS, in *Anatomy*. See Os *sacrum*.

SACTIM, a word used by some of the chemical writers to express vitriol.

SADAF, in the *Materia Medica*, a name given by the Arabian writers, sometimes to the purpura or purple fish, and sometimes to the purple fucus, with which the ancient Greek women used to stain their cheeks. This was the original of all painting, and the plant was the common purple sea wracks. After this every thing was called fucus that was used by the women to paint their faces; and they had a fucus metallica made of white lead or cerus; and the purple root of alcanet, &c. were called fuci.

SADAR, or *Alsadar*, the Arabian name of the medicinal *lotus*, described by Dioscorides, and many others of the ancients. The fruit of this tree, called by Virgil the berries of the *acanthus*, is the *nabac* of the Arabian writers, though some would have it to be a kind of fig. Serapion evidently declares the *sadar* and *acanthus* of Virgil, that is the *lotus cyreniaca* of Herodotus, and the *lotus* of Dioscorides,

corides, to be one and the same plant. Bellonius has also described it under the name of *napeca*, a name probably derived from *nabac*, the appellation usually given its fruit: he says it is an ever-green shrub, and was called by some of the Greek writers *œnoplia*. Prosper Alpinus, in his account of the Ægyptian plants, also describes the *nabeca* as a thorny shrub; though authors have observed that there are two species of it, the one thorny and the other not. Leo Africanus, in his third book, mentions also the same tree; but he mistakes the name, writing it *rabech* instead of *nabech*: he says it is a prickly tree, producing a fruit resembling a cherry, but smaller, and of the taste of the zizyphus. These are the berries of the *acanthus* mentioned by Virgil.

SADDER, in *Modern History*, a compendium of the ZEND in modern Persian, containing an abstract of the religious system of the Persees.

SADDLE, in the *Manege*, a kind of stuffed seat, laid on the back of a horse, for the convenience of the rider.

The origin of the *saddle* is not well known: Gorop. Becanus attributes its invention to the Salii, a people among the ancient Franks; and hence, says he, came the Latin *sella*, saddle.

It is certain the ancient Romans were unacquainted with the use either of *saddle* or stirrups; whence Galen observes in several places, that the Roman cavalry, in his time, were subject to several diseases of the hips and legs, for want of having their feet sustained on horseback. And long before him, Hippocrates had noted, that the Scythians, who were much on horseback, were frequently troubled with defluxions in their legs, because of their hanging down.

The first time we hear of *saddles* among the Romans, was anno 340. when Constantius, endeavouring to deprive his brother Constantine of the empire, made head against his army, and entering the squadron where he himself was, threw him off his *saddle*, as we are informed by the historian Zonaras.—Before this time, they made use of square pannels; such as we see in the statue of Antoninus in the Capitol.

The succeeding emperors made many regulations concerning horses, and occasionally take notice of *saddles*. In the Theodosian code there is a rescript, given by the emperors Valentinian, Theodosius, and Arcadius, which prescribes the exact weight of a *saddle*, confining it to 60 pounds, including the bridle.

The use of *saddles*, says Mr. Chambers, was first established in England, by a law of Henry VII. whereby the nobility were obliged to ride on *saddles*.—But this assertion, as Mr. Berenger observes, is not countenanced by any act of parliament, or proclamation. It is much later that the Irish have taken to it.

There are various kinds of *saddles*; as the

SADDLE, *hunting*, which is composed of two bows, two bands, fore-bolsters, pannels, and *saddle*-straps: and the great *saddle* has beside these parts, corks, hind-bolsters, and a troussequin. The pommel is common to both. A horseman that would sit a horse well, ought always to sit on his twist, and never on his buttocks, which ought never to touch the *saddle*; and whatever disorder the horse commits, he ought never to move above the *saddle*.

SADDLE, *running*, a very small one, with round skirts.

SADDLE, *Burford*, which has the seat and skirts plain.

SADDLE, *pad*, of which there are two kinds; the one made with burs before the seat, the other with bolsters under the thighs.

SADDLE, *French pad*, the burs whereof come round the seat.

SADDLE, *portmanteau*, furnished with a cantle behind the seat, to keep a carriage off the rider's back.

SADDLE, *war*, furnished with a cantle, and a bolster, both behind and before.

SADDLE-*backed*, among *Horsemen*, a name given to a horse, that is hard to fit with a *saddle*, his reins being low, and his head and neck raised, so as to require a *saddle* to be made on purpose for him.

SADDLE-*case*. See HOUSING.

SADDLE-*roll*. See TROUSSEQUIN.

SADDLE-*straps* are small leathern straps, nailed to the bows of the *saddle*, which are used to hold the girths fast to the *saddle*. See BOWS.

SADDLE-*galled* is when a horse's back is hurt or fretted with the *saddle*.

It is to be cured by bathing the part with urine, or warm wine: when the sore is large, they bathe it with aqua secunda, strewing over it the powder of old ropes or flax, and consuming the proud flesh with vitriol, or colcothar.

Good horses are often subject to *gall* upon their backs, and the utmost care ought to be taken to prevent or cure it. The best method of prevention is to take a hind's skin, well furnished with hair, and fit it neatly beneath the pannel of the *saddle*, so that the hairy side may be next the horse; this does not harden by sweat, but keeps the horse from *galling*. This is also a method that should never be omitted with horses that are newly cured of such a hurt, as it will prevent their falling into it again.

In long journeys, and in horses that are subject to *gall*, it is always proper to take off the *saddle* as soon as the horse is brought in, and examine whether the back be at all pressed, or pinched in any part: it will be well to re-examine it after an hour or two, to see what effect the standing has had, for often the part hurt will not shew it at first, but will swell very violently afterwards. In this case, where the skin is not fretted, but a swelling comes on, a bag of coarse cloth should be filled with warm dung, and tied upon the swelling, which will not only prevent it from growing worse, but will take it often quite down; or the swelling may be well rubbed with good brandy, laying on a paper soaked in it. If the skin be broken, a mixture of red wine, and sallad oil is a good remedy.

SADDLE, in the *Sea-Language*, a small cleat or wooden block, hollowed on the upper and lower side, and nailed on the lower yard-arms, to retain the studding-sail booms in a firm and steady position. For this purpose the cavity on the lower part of the *saddle* conforms to the cylindrical surface of the yard to which it is attached; and in like manner, the hollow, on the upper side, answers to the figure of the boom, and serves as a channel, whereby it may be run out or in, along the yard, as occasion requires. Falconer.

SADIR, a word used by some chemists to express the scoria of any metal in fusion.

SADLER. Under this title is carried on a very considerable trade, but in very different degrees. Their business is not only *saddle*-making, which is a curious as well as very ancient employ, but to complete some, and sell all other, necessaries for the *saddle*, nag, and horseman. They were a company before the year 1190, but not incorporated till 1272. In the reign of king Edward I. the livery-fine 10*l*. Their hall is near Foster-lane, Cheapside; and their court day, on the first Tuesday in the month. See COMPANY.

SADLER'*s Wells*, a well known place of entertainment in the neighbourhood of London. It derives its name from Mr. Sadler, who erected a music-house near the spot, which was much frequented, before the Reformation, on account of the famous well, to the waters of which many extraordinary cures were ascribed, and which was, therefore, deemed sacred, and called holy well. The priests belonging to the priory of Clerkenwell used to attend there, and hence the people were led to believe, that the virtues of the water proceeded from the efficacy of their prayers.

Upon the Reformation the well was stopped up, on account of the superstitious use that was made of it; till, in 1683, Mr. Sadler found it covered with a carved arch of stone. After his decease, one Francis Forcer, a musician, became occupier of the wells and music house. His son succeeded him, and first exhibited in this place the diversions of rope-dancing, tumbling, &c.

SADDUCES, or SADDUCEES, *Sadducæi*, a sect among the ancient Jews, consisting of persons of the greatest quality and opulence, esteemed as deists, or free-thinkers, rather than real Jews; though they assisted at all the ceremonies of the worship in the temple.

St. Epiphanius will have the *Sadduces* to have taken their rise from Dositheus, a Samaritan sectary; and Tertullian is of the same opinion. St. Jerom, and other writers add, that the *Sadduces* came near the Samaritans in many things; particularly in this, that they allowed no books of Scripture, but the five books of Moses. The Jesuit Serrarius has also embraced this opinion, as seeming to be supported by the authority of Josephus. But Josephus says only this, that they admitted all that was written, i. e. all the books of Scripture; intimating hereby, that they disowned the unwritten traditions of the Pharisees. In effect, St. Epiphanius is forced to own, that the *Sadduces* were Jews, and not Samaritans; inasmuch as they assisted at the worship and sacrifices of the temple at Jerusalem; whereas the Samaritans sacrificed on Mount Gerizzim.

Some authors ascribe the origin of this sect to one Sadoc, a disciple of Antigonus Sochæus, president of the sanhedrim, about 260 years before Christ, who frequently inculcated upon his scholars, that God is to be served for his own sake, and not out of view to any reward from him in the next world, as slaves serve their masters merely for recompence. Sadoc, add they, putting a false interpretation on these words of his master, published, that there was no reward allotted to good actions done

done in this world. And hence aroſe the ſect of *Sadducees*; thus denominated from their leader Sadoc.—Though St. Epiphanius, and ſome modern writers after him, take the *Sadducees* to have been thus called from the Hebrew, צדק, *ſadec, juſt*, or *ſedec, juſtice*, in regard of the great juſtice and equity which they ſhewed in all their actions.

But this derivation neither ſuits the word *Sadducee*, nor the true character of the ſect; for ſo far were they from being eminently righteous, that they are commonly ſaid to be the moſt wicked and profligate of all the Jews; neither were they given to boaſt of their own righteouſneſs, as the Phariſees were.

It is certain they denied the reſurrection and the exiſtence of angels and ſpirits, (Matt. xxii. 23. Acts xxiii. 8.) and allowed of no happineſs but what is enjoyed in this life; believing, that every thing told of the other world had been artfully invented by the Phariſees.—Hence, alſo, they denied a divine providence, and attributed all things to free-will; in which they oppoſed the opinion of the Phariſees, who admitted a kind of deſtiny, or fatality, in all our actions; ſo that they were, upon the whole, Epicurean deiſts in all other reſpects, except that they acknowledged the world to have been created, and perhaps to be upheld and preſerved by God.

SADRE, a title given by the Perſians to the chief of the Mahometan religion. See Caliph.

SÆPÆ, a name given by ſome medical writers to ſharp corroding puſtules.

SAFE-CONDUCT, *ſalvus conductus*, a ſecurity given by the prince under his great ſeal, and inrolled in chancery, to a ſtranger, for his quiet coming in and paſſing out of the realm.

The *ſafe-conduct* is granted to enemies, the paſſport to friends. Paſſports under the king's ſign-manual, or licences from his ambaſſadors abroad, are now more uſual, and are allowed to be of equal validity with letters of *ſafe-conduct*. For the violation of *ſafe-conduct*, &c. See Passport. Judges ſometimes give *ſafe-conducts* to delinquents, or priſoners, to enable them to act in their affairs.

SAFE-GUARD, *ſalva guardia*, in a *Law ſenſe*, a protection given by the king to a perſon fearing the violence of ſome other, for ſeeking his right by courſe of law.

Safe-guard, at *ſea*, denotes a rope which ſaves and ſecures any thing: for inſtance, that whereby perſons walk ſecurely over the bolt-ſprit.

Safe-guard *of the helm*, is a rope which goes through the helm, and is faſtened to the futtocks of the ſhip.

SAFE-PLEDGE, *ſalvus plegius*, in *Law*, a ſecurity given for a man's appearance on a day aſſigned. See Pledge.

SAFFLOWER. See *Baſtard* Saffron.

Safflower is a name alſo erroneouſly given to a ſpecies of lake.

SAFFRON, *crocus*, in *Botany*; a genus of the *triandria monogynia* claſs. Its characters are theſe: it hath a ſpatha or ſheath of one leaf; the flower hath one petal, which is deeply cut into ſix oblong equal ſegments; and three ſtamina, which are ſhorter than the petal, terminated by arrow-pointed ſummits; the roundiſh germen is ſituated at the bottom of the tube, ſupporting a ſlender ſtyle, crowned by three twiſted ſtigmas which are ſawed; the germen afterwards becomes a roundiſh fruit with three cells, filled with roundiſh ſeeds. Miller enumerates four ſpecies, including many varieties. Linnæus mentions one ſpecies, with two varieties. See Crocus.

The word is formed from the Arabic, *zapheran*, which ſignifies the ſame. Botaniſts call the plant crocus autumnalis ſativus.

The plant which produces the *ſaffron*, has a roundiſh bulbous root, as large as a ſmall nutmeg; it is a little compreſſed at the bottom, and is covered with a coarſe brown netted ſkin. From the upper part of the root come out the flowers, which, together with the young leaves, whoſe tops juſt appear, are cloſely wrapped about by a thin ſpatha, or ſheath, which parts within the ground, and opens on one ſide. The tube of the flower is very long, ariſing immediately from the bulb, without any footſtalk, and at the top is divided into ſix oval obtuſe, ſegments, which are equal, and of a purple blue colour. In the bottom of the tube is ſituated a roundiſh germen, ſupporting a ſlender ſtyle, which is not more than half the length of the petal, crowned with three oblong golden ſtigmas (which is the *ſaffron*); theſe ſpread aſunder each way; the ſtyle is attended by three ſtamina, whoſe baſes are inſerted in the tube of the petal, and riſe to the height of the ſtyle, where they are terminated by arrow-pointed ſummits. This plant flowers in October, and the leaves keep growing all the winter, but it never produces any ſeeds here. Miller.

See a figure and deſcription of the plant by Dr. Douglas, in Phil. Tranſ. N° 380. p. 441. or Abridg. vol. vii. p. 311, &c.

From the account which Dr. Douglas has given of the culture and management of *ſaffron* in that tract of ground, that lies between Saffron Walden, in Eſſex, and Cambridge, in a circle about ten miles diameter, where *ſaffron* has been longeſt cultivated, we ſhall extract the following particulars. This tract is an open level country with few incloſures; and it is the cuſtom to crop two years, and let the land lie fallow the third: *Saffron* is always planted upon fallow ground, and that is preferred, *cæteris paribus*, which has borne barley the year before. In chuſing the *ſaffron* grounds, which are generally between one and three acres, they prefer thoſe that are well expoſed, whoſe ſoil is neither poor nor a ſtiff clay, but a temperate dry mould, ſuch as commonly lies upon chalk and is of a hazel colour. In the beginning of April they carefully plough it, drawing the furrows much cloſer and deeper than for any kind of corn; in May they well dung it, allowing to each acre between twenty and thirty loads, and plough it as before; about Midſummer they plough a third time, and between every pole in breadth leave a vacant furrow or trench: the fences are dead hedges or hurdles for keeping out cattle, and eſpecially hares, which would feed on the *ſaffron* leaves during winter. The time of planting the roots is commonly in July, and the only inſtrument uſed for this purpoſe is a narrow ſpade, called a ſpit-ſhovel. One man with his ſpit-ſhovel raiſes between three and four inches of earth, and throws it before him about ſix inches; and two perſons following him with *ſaffron*-heads, place them in the fartheſt end of the trench which he has made at the diſtance of about three inches from one another. As ſoon as the digger has gone over the breadth of the ridge once, he begins again at the other ſide, and digging as before, covers the roots laſt ſet, and makes room for the ſetters to place a new row, at the ſame diſtance from the firſt, as they are from one another. Thus they proceed, till a whole ridge, commonly one rod, is planted; and the only nicety in digging is to leave ſome part of the firſt ſtratum of earth untouched to lie under the roots, and in ſetting, to place the roots directly upon their bottoms. The quantity of roots planted in an acre is generally about one hundred and twenty-eight buſhels. When the roots begin to ſpire and are ready to ſhew themſelves above ground, the ground muſt be carefully pared with a ſharp hoe and the weeds raked into the furrows. When the *ſaffron* flowers appear, they are gathered as well before as after they are full blown; in doing which the whole flowers are pulled off and thrown into a baſket; and the beſt time for this work is the morning. Having carried them home and ſpread them on a table, they pick out the filaments, ſtyles or chives, together with a long portion of the ſtyles or ſtring to which they are joined; and throw away the reſt of the flower as uſeleſs. They employ every morning in gathering, and the reſt of the day in picking, till the whole crop is gathered. The next labour is drying the chives; for this purpoſe they are furniſhed with a kiln of a particular conſtruction, over which they lay a net-work of iron wire, or a hair-cloth, and over this five or ſix ſheets of white paper; upon which they ſpread the wet *ſaffron*, between two and three inches thick; they cover this with other ſheets of paper, over which they lay a coarſe blanket five or ſix times doubled, or a canvas pillow filled with ſtraw; and when the fire, which may be made of any fewel, though charcoal, which is the leaſt ſmoaky, is the beſt, has been lighted for ſome time, they cover the whole with a board, having upon it a large weight. When the chives have been firſt ſweated by a pretty ſtrong heat, and dried for about an hour, they turn both the papers and *ſaffron* cakes, and cover them as before. Having continued the heat for another hour, they turn and cover the cakes as before; and then keeping a gentle fire, and turning the cakes every half hour, they will be thoroughly dry in about twenty-four hours. When dry the *ſaffron* is in perfection and fit for uſe. It is obſerved that about five pounds of wet *ſaffron* yield one pound of dry; and when the heads are planted very thick, two pounds of dried *ſaffron* may, at a medium, be allowed to an acre for a firſt crop, and twenty-four pounds for the two remaining crops. About the Midſummer after the third crop is gathered, the roots muſt be taken up and tranſplanted; in order to which they ſometimes plough the ground, and ſometimes uſe a forked kind of hoe, called a pattock, and then harrow it once or twice over, during which time a number of people are employed in gathering up the heads: theſe are thoroughly cleared, and then become fit to be planted in new ground, or to be kept for ſome time without injury.

There is no accident attending the culture of this valuable and uſeful plant, which the farmers ſo much dread as what they call the *rot* with us, and in French *la mort*. This is more common in the *ſaffron* fields of the Gatinois than in ours. Mr. du Hamel, who undertook to give the Paris Academy ſome account of this malady of the plant, obſerves,

observes, that no author has given any account of it; and that the people employed in the culture of the *saffron* know the terrible effects of it, without at all guessing at what may be its cause. It seems a sort of contagion among the plants, spreading far and wide, and extending from one root as from a centre all over a whole field, if not stopped; the season of its most fatal spreading is the spring, and the mischief is found to be stopped from farther progress, by digging deep trenches at that time of the year between the sound and the tainted parts of the field.

Mr. du Hamel, in enquiring into the state of the roots or bulbs of the *saffron* in many fields where this disorder reigned, found that the roots in the centre where the distemperature most raged, and those at a middle distance from this part and the border of the field, and those at the border, were all in three different states, according to the degree of spreading of the infection. Those in the middle where the infection began, were utterly destroyed, their several coats all shrivelled up and withered, their inner part resembling only a dirty and rotten earth, and their superficies being covered with several brownish red glandulous bodies of the bigness of beans. Those of the middle distance were found in a condition nearly allied to these; their integuments were flaccid, but not wholly withered; and there were some remains of the fleshy bulb within; but this matter was a sort of pulp, looking as if it had been boiled. It was easy to see from this, that these roots were speedily approaching to the perfect state of decay of the others; they were covered in the same manner on their outsides with glandulous substances, like those of the middle roots, only that they seemed on these more plump, and well fed. At some distance from these he also observed a number of violet coloured threads, forming a sort of network in the ground. The roots at the edges of the field were found in a yet much sounder state than any of the others; their bulbs seemed unhurt, and the membranes sound and fresh, but they were in many places covered with reticular violet coloured filaments, and from some parts of these issued small glandules, which seemed ready to grow into the same shape and size with those on the decayed roots; though they, at this time, appeared only as so many purple spots lodged on the surface of the root or between its membranes. The earth all about these roots was also found to be full of these reticular violet coloured threads. These violet threads and their glandules being always found in the places where the rot was among the *saffron* roots, and never in any other place, it became very natural to suppose they had some considerable share in the contagion; to examine, therefore, what they truly were, Mr. du Hamel picked several of them out of the earth, and having washed them clean, he found that they were very like the truffle in appearance and in all their qualities; they were seldom larger than a hazel nut, and were covered with a sort of soft down or velvety coat, and they had a mushroom like taste, but with an earthy flavour. There were found some of them adhering to the bulbs of the *saffron*, and others two or three inches distant from them; the violet threads are of the thickness of a coarse thread, and are covered with a velvety coat, in the same manner with the glandulous bodies; some of these extend themselves from one to another between these glandules, while others spread themselves over the surface of the bulb of the *saffron*, and pierced it in many directions quite to the centre: they make numerous anastomoses and inosculations in the body of the root, and have fastened to them in several places little knots or ganglions, which seem only small tufts of the cottony or velvety matter which covers them.

From the whole it seems very clear, that this is a parasitical plant, which grows very quick in its glandules; and by means of these threads, or filaments, sucks its nutritious juices from the roots of the *saffron*, which it by that means destroys. It seems to grow in the same manner with the truffle, that is, it nevers appears above the surface of the earth, but is produced under ground, and there grows and propagates its species. It spreads very fast, and soon occupies a large compass of ground, continually furnishing new glandules at the end of the filamentous roots, in the manner of the potatoe and some other roots. Thus the disease of the *saffron*, wherever it begins, spreads itself every way in a circular direction, and there is nothing to be seen on the surface of the earth, which can give any opportunity of guessing at its cause.

It remained now to enquire whether this plant was peculiar to fields of *saffron*; and whether it was brought thither with the *saffron*, or was there before: and another material question was, whether it could draw its nourishment from any other plants, or must have it from *saffron* only. To try this, Mr. du Hamel put some of the bulbs of the new plant into a pot of fresh earth, where he also planted some roots of *saffron*, of narcissus, and of the common lily. Six months afterwards, examining the whole, he found the glandules had greatly increased in number, and had fed upon the lily roots as well as on the *saffron*; hence it appeared, that this was a real plant capable of increasing itself, and not destined singly to that food; after this, digging up the earth in several places where *saffron* had never been planted, he found in some places the same parasitical plant, fastening itself to the roots of the anonis, and some other plants, and letting alone several others, such as the senecio, &c. The roots of muscari were also sometimes found affected by it; and a certain distemperature, which the florists complain of in their tulip roots, seems to be owing to the same cause.

This mischievous plant, however fatal it prove to the *saffron* fields, may, on the contrary, prove a real benefit in corn fields, by destroying many of the pernicious herbs which hurt the corn, as it preys only on those which send their roots deep into the earth, never hurting those which are superficially fixed, as corn, and the like are. The florist, however, is probably often as much injured by it, as the *saffron* cultivator; and doubtless, whole beds of plants are often destroyed without the proprietor's knowing what to attribute the mischief to. One misfortune attending this destroying plant, is, that the common culture of land which destroys other weeds, serves rather to promote its increase, since it delights in light dry earth, not in wet, or undug lands: it is possible, however, to stop its progress, by digging pretty deep between the sound and the infected roots; of the last, those which are eaten to the heart can never recover again, but of those which are only wounded superficially there is some hope; since it is common for them to be cured by taking them up, peeling off their outer husks, and drying them in the sun. This separates the worst part of the destructive plant, and the rest becomes soon dried and withered, and incapable of farther vegetation, while the root itself is uninjured, and when put into ground will shoot again. Mem. Acad. Par. 1728.

The best *saffron* in Europe is that of England, and may be distinguished from the sorts brought from abroad by its blades being broader: that brought from Spain is good for nothing; because of the oil the Spaniards mix with it to make it keep.

It should be chosen fresh, not above a year old, in close cakes, neither dry nor yet very moist, tough and firm in tearing, of a high fiery colour, staining the hands on rubbing it, and of the same colour within as on the outside.

Saffron is used, both in food and medicine, to chear, fortify, and resolve. It is the greatest cordial in medicine, so as when taken too freely, to occasion immoderate mirth; and a sure promoter of a diaphoresis: and is supposed to be particularly serviceable in disorders of the breast, in female obstructions, and hysteric depressions. It tinges the urine of a high colour: the dose is commonly from two or three grains to ten or twelve; Geoffroy says, it may be safely extended to a scruple and more. *Saffron* gives out the whole of its virtue and colour to rectified spirit, proof spirit, wine, vinegar and water. The officinal preparations are, the *syrup* and *tincture* of SAFFRON. In distillation with water, a small portion of a fragrant and very pungent essential oil may be collected, amounting, it is said, to about a dram and a half from sixteen ounces: the extract, obtained from rectified spirit, inspissated only to the consistence of oil, is recommended by Boerhaave as one of the highest cordials and exhilarants; the dose is a few drops, which may be taken in a glass of rich wine. It dissolves in wine and in water, as well as in spirit, and mingles with oils both expressed and distilled, appearing to be a substance of a peculiar nature. The spirit, distilled from *saffron*, is said to have an advantage above most other cordial spirits, of disposing the patient to sweat. Lewis.

Saffron is also used by illuminers, to make a golden yellow colour.

The yellow tinge, which this medicine is able to give to the fluids, is carried so far, that no juice escapes it. Amatus Lusitanus gives an account of a fœtus in a mother's womb, tinged yellow, by her taking very frequently medicines with *saffron* in them. This had been disputed and disbelieved by many; but an experiment made at Leipsick on a bitch big with puppies, restored the credit of Amatus: for on giving this creature *saffron* frequently among her food, the puppies had their flesh and the whites of their eyes, when opened, dyed yellow with it; though the chyle, in the lacteals, was not yellow but whitish. However, it does not seem improper to verify the experiment farther.

SAFFRON, *bastard*, or SAFFLOWER, *carthamus*, in *Botany*, a genus of the *syngenesia polygamia æqualis* class. Its characters

racters are these: it hath a flower composed of several hermaphrodite florets, included in one common scaly empalement; the florets are funnel-shaped, cut into five equal segments at the top, these have five short hairy stamina; in the centre is situated a short germen which afterward becomes a single, oblong, angular seed, inclosed in the empalement. There are eight species.

The quantity of *safflower* which is annually consumed in England, is so great, as to make a very considerable article in trade, therefore might be very well worthy of the public attention: if this plant was introduced to Carolina, it might be there cultivated to as great advantage as in any part of the world, for there the seeds will constantly ripen; and as this country is furnished with it from the Mediterranean, where there is great danger of our navigation being interrupted, so it should incite the inhabitants of the American states, to make trial of as many of the vegetables, as there is a probability of succeeding there, as can be procured; which are of real use in any of the manufactories of this country. The seeds of this plant were sent to Carolina in the year 1758, which have succeeded there; and more seeds may be easily procured from the American islands, and in one season may be multiplied, in so great quantity, as to furnish a whole province. Miller.

Carthamus seeds are said to be emetic and cathartic, but at present they are very little used. Its flowers are sometimes used in medicine, but their chief use is in dying.

SAFFRON, *Indian*. See TURMERIC.

SAFFRON, *meadow*, *colchicum*, in *Botany*; a genus of the *hexandria trigynia* class. Its characters are these: the flower has neither empalement nor spatha; it has one petal, rising with an angular tube from the root, and is divided at the top into six oval concave segments, and six stamina with four valves; the germen is situated near the root, which becomes a capsule with three lobes, having a seam on the inside, dividing it into three cells which contain several roundish rough seeds. Linnæus reckons three species, and Miller four, including several varieties.

The several species of this plant are very valuable in a flower-garden, as they are in their beauty in autumn, when most other plants are dead. The flowers come up, and are blown some time before the green leaves appear, which make some people call them naked ladies; the green leaves come up in winter, and in spring are extended to a great length; in May, these leaves begin to decay, and soon after this is a proper time to take up, and transplant the roots. The roots should be kept above ground till the middle of August, at which time, if they are not planted, they will produce their flowers as they lie out upon the ground. For the manner of planting the roots of this sort of plants, see the article TULIP; and for that of raising them from seeds, for the sake of producing varieties of the flower, see IRIS.

The root of *colchicum* is supposed by some to be the hermodactyls of the shops: it is of a poisonous quality, but is recommended for the gout, being externally applied. See COLCHICUM.

SAFFRON-*tree*, in *Natural History*, the name of an East Indian shrub, which grows to about two feet high, having square branches, which are beset with leaves in pairs. The pedicles of the flowers come from the alæ of the leaves, and are branched, each pedicle supporting about five flowers; these are of the shape of the jasmine flowers, and are white above, and of the fine reddish yellow colour of *saffron* below. The flowers never open but in the night, and then do not perfectly expand themselves, but all the petals remain in such a position, that they can close instantaneously on occasion of the least heat; they are placed each in a green cup, to which they are so slightly fastened, that the least motion makes them fall. They seldom stand more than four days, often not so long; the flowers have no smell, but are of a cordial virtue, approaching to that of *saffron*. Mem. Acad. Paris. 1699.

SAFFRON, *Syrup of*. This medicine is thus made: take fine *saffron* an ounce, cut it small, and put it to infuse in a pint of mountain-wine; let it stand three days without heat, then strain off the wine; to which, after filtration, add twenty-five ounces of double-refined sugar: melt the sugar over a gentle heat, and then set it by for use.

SAFFRON, *Tincture of*: a preparation made as follows: take *saffron* an ounce, cut it small, and pour on it in a matrass a pint of proof-spirit; let them stand together three days without heat, often shaking the vessel, then filter off the tincture for use. Its dose is from thirty drops to a drachm or more. It is good in all cases where the *saffron* in substance is.

If the same quantity of wine be used instead of spirit, it is called *vinum crocatum*, *saffron*-wine.

SAFFRON, *Tincture of*, made by pouring hot water on the best English *saffron* in a vessel, placed for some time in a heat almost equal to that of boiling water, and filtered through a linen cloth is used as a yellow wash with water colour: this tincture is a fine warm yellow, and when very strong, makes a very proper shade for the gamboge or other light yellows that are bright; and it will stand as well as any of the vegetable tinctures.

SAFFRON is also a name given to several chemical preparations, from the resemblance of their colour to that of the vegetable *saffron*, but more usually called *croci*. See CROCUS. Such are

SAFFRON *of Venus*. See COPPER, and VENUS.

SAFFRON *of Mars*. See CROCUS *Martis*.

SAFFRON *of Gold*. See AURUM *fulminans*.

SAGADENON, a name given by the ancients to what they say was the very finest kind of opobalsamum, produced in Palestine and the country thereabout.

SAGAN, in *Scripture History*, the suffragan or deputy of the Jewish high-priest: who, according to some, was only to officiate for him, when he was rendered incapable of attending the service through sickness, or legal uncleanness, on the day of expiation; or, according to others, who was to assist the high-priest in the care of the affairs of the temple and the service of the priests.

SAGAPENUM, Σαγαπηνον, a medicinal gum resin, whose smell comes very near that of a pine; whence its name.

It flows by incision, from the trunk of a ferulaceous plant growing in Persia: the best is in bright transparent tears of a strong, pungent, porraceous smell: and the whiter and freer from dirt, the better. Sometimes it is found as white, both within and without side, as milk; though this is very rare. See FENNEL-*Giant*.

The *sagapenum* is brought directly from Alexandria; either in distinct tears, or run together into large masses; outwardly of a yellow colour, but internally somewhat paler and clear like horn; growing soft on being handled, so as to stick to the fingers. It is sometimes supplied in the shops by the larger and darker coloured masses of bdellium. It has a strong disagreeable smell, resembling that of the leek-kind, or a mixture of galbanum with a little assa fœtida; and a moderately hot biting taste. It is one of the strongest deobstruent gums, and frequently prescribed, either by itself, or in conjunction with ammoniacum or galbanum, in hysteric cases, uterine obstructions, asthmas, and other disorders. It may be commodiously taken in the form of pills, from two or three grains to a scruple or half a dram: in doses of a dram, it loosens the belly. Lewis.

It is also used externally to assuage pains, and resolve tumors.

SAGATHEE, in *Commerce*, a slight woollen stuff; being a kind of serge, or ratteen; sometimes mixed with a little silk.—It is manufactured chiefly at Amiens; though we have our share of it in England.

The word is formed from the French, *sayette*, a diminutive of *saye*, *say*. See SAY. The French name *sayette* again is derived from that of the thread used herein, which is chiefly prepared and spun in Flanders, about Turcoing, &c. and called *fil de sayette*.

SAGDA, or PSAGDA, in *Natural History*, the name of a stone described by Aldrovand, which he says is of a green colour, and has the property of attracting wood.

Pliny and the ancients give this name to a gem of a greenish colour, very much esteemed at that time; and about the origin of which the ancients had many fabulous reports. Solinus tells us, that it is produced at the bottom of the sea, and thence rises up of itself as ships pass over the place where it is, and fixes itself to their bottoms, and that it cannot be got off again without cutting away a part of the wood. This author has generally taken his accounts of things from Pliny; though he has been at the pains to disguise them, in such a manner, that they are often unintelligible. All that Pliny says on this occasion, is, that the *sagda* was of a green colour, and was found by the Chaldæans at the bottoms of their ships; even this, however, is not very intelligible, unless they meant that the ships which traded to the Red Sea, and lay long in the harbours, and were sometimes a-ground, picked up at their bottoms the stones which make up the shores, and some of these are of the jasper-kind, and usually green; at this rate it could not be a stone of any great value, nor do we indeed find any where that it was, except in Solinus.

It is to be observed, that the ancients called a certain ointment by the name *sagda* as well as this stone; this ointment was green, and probably the stone had its name from the resembling it in colour. This was a custom common among the writers of early times; and they have the names of *libanotis*, *myrrhites*, *stactachates*, and *aromatites*, from the resemblance which certain agates and jaspers had to the drugs, &c. in common use among them.

SAGE, *salvia*, in *Botany*, a genus of the *diandria monogynia* class. Its characters are these: the empalement of the flower is tubulous, of one leaf, large at the mouth, where

where it is cut into four parts; the flower is of the lip kind, of one petal, the lower part is tubulous, the upper is large and compressed, the lower lip is broad and trifid; it has two short stamina, which stand transverse to the lip, and are fixed in the middle to the tube, to whose tops are fixed glands, upon the upper side of which sit the summits; it has a four-pointed germen, supporting a long slender style, situated between the stamina, crowned by a bifid stigma; the germen afterward becomes four roundish seeds, which ripen in the empalement. Miller enumerates twelve species, including several varieties: and Linnæus reckons thirty-nine species.

The several sorts of *sage* propagated either for the kitchen, or for medicine in our gardens, are to be produced by slips planted in the beginning of April, watering and shading them till they have taken root, and after that they should be removed to a dry soil, where they may have the benefit of the sun. Miller.

The common broad-leaved *sage*; or, as we usually call it, from the colour of some of the leaves, red-*sage*, is a sudorific and diuretic; it promotes the menses, and is good in palsies, vertigoes, tremors and catarrhs; and mixed with honey, it is said to be one of the best known cures for the aphthæ and erosions of the mouths of children.

This alone is used in the shops.—It makes an excellent gargarism for sore throats when mixed with honey, and sharpened with vinegar or any acid. Its decoction is very grateful and cooling, with the addition of a little lemon-juice. It is both detergent and absorbent, and, as such, finds place in diet-drinks, and medicated ales, intended for sweeteners and cleansers of the blood.

The smaller-leaved *sage* generally sold among us under the name of *sage* of virtue, has the same qualities in a greater degree.

The Dutch are said to dry and prepare this *sage* like other teas, and carry it to the Indies as a very precious thing. They there find a good market for it; the Chinese preferring it to the best of their Indian teas; and for every pound of *sage* giving in exchange four pounds of their tea, which they sell again very dear in Europe. Of both kinds the flowers are weaker and more grateful than the leaves; and the cup of the flower stronger, and obviously more resinous than any other part. The leaves of *sage* give out their virtue both to water and rectified spirit, most perfectly to the latter. To the former they impart a brownish, to the latter a dark green tincture. The broad-leaved sawed *sage* called by the gardeners balsamic *sage*, is preferred to all the others for making tea.

The school of Salernum recommends *sage* as a remedy in all diseases: hence the verse,

Cur moriatur homo, cui salvia crescit in horto?

"Why should a man die, while he has *sage* in his garden?"

Sage when viewed with a microscope, often appears covered all over with little spiders, which are seen moving about.—It yields by distillation, a very agreeable, aromatic essential oil, of some use in the shops.

There used to be a syrup, conserve, and simple water of *sage* kept in the shops; which are all disused, and the dried herb only retained.

SAGE-*tree*, or *Jerusalem* SAGE, *phlomis*, a genus of the *didynamia gymnospermia* class. Its characters are these: the flower hath a permanent empalement with an oblong tube, having five angles; it is of the lip kind; the tube is oblong, the upper lip is oval, forked, and inflexed; the under is cut into three segments, the middle one being large and obtuse; it hath four stamina hid under the upper lip, two being longer than the other, and a germen divided into four parts, supporting a style the length of the stamina; the germen afterwards becomes four oblong cornered seeds sitting in the empalement: Linnæus enumerates thirteen, and Miller fourteen species. All the species of this genus are ornamental plants, when properly disposed in gardens; as they afford a succession of flowers for two or three months, and their hoary downy leaves, intermixed with plants whose leaves are green, form an agreeable contrast. The leaves of two of the species, viz. the shrubby Jerusalem *sage* with a broader and rounder *sage*-leaf, and the same with a narrower and longer *sage*-leaf, have been much recommended by some persons to be used as tea for sore throats. Miller.

SAGE-*apples*, a name given by naturalists to a sort of soft gall, or protuberance, found frequently on the leaves and stalks of *sage* in the eastern parts of the world, and much resembling the soft gall of the oak-leaf, called the *oak-apple*. These are both owing to the same cause, the puncture of an insect of the fly-kind, which deposits its eggs in the wound, and the worms or maggots hatched from those eggs feed on the inside of the gall, and occasion a preternatural derivation of juices to the part, whence it swells and assumes this form. The leaves of many other plants are also liable to the same accident, particularly those of ground-ivy, on which there grow eatable galls of this kind. The *sage-apples* are so frequent in the East, that they are brought to market at Constantinople, and eaten as delicacies. See GALLS.

SAGE of *Jerusalem*, *pulmonaria*, in *Botany*. See LUNG *Wort*.

SAGE, *Wild*, or *Wood* SAGE. See GERMANDER.

SAGE, *Indian wild*, a species of LANTANA.

SAGENE, a Russian measure equivalent to seven English feet. Five hundred *sagenes* make a WERST.

SAGGING *to Leeward*, in *sea language*, denotes the movement by which a ship makes a considerable lee-way, or is driven far to leeward of the course in which she apparently sails. It is generally expressed of heavy-sailing vessels, as opposed to keeping well to windward, or, in the sea-phrase, holding a good wind.

SAGIMEN *vitri*, a name given by some of the chemists to any alkaline salt.

SAGINA, in the Linnæn System of *Botany*, the name of a genus of plants of the *tetrandria tetragynia class*; the characters of which are these: the cup is a four-leaved perianthium remaining after the flower is fallen; the leaves being of an oval figure, hollow, and spread very open; the flower is composed of four oval obtuse petals, shorter than the leaves of the cup, and spread wide open; the stamina are four capillary filaments, the antheræ are roundish; the germen of the pistil is of a globose figure; the styles are four in number, tapering in shape, and bent back; these are downy, and the stigmata are simple; the fruit is a capsule, of an oval figure, containing one cell, with four valves; the seeds are numerous and very small, and are fixed to the receptacle. There are three species.

SAGITTA, in *Architecture*, the name sometimes used for the key piece of an arch.

SAGITTA, in *Astronomy*, the *Arrow* or *Dart*, a constellation of the northern hemisphere near the Eagle. The stars in the constellation *Sagitta*, in Tycho's catalogue, are five, and as many in Ptolemy's and Hevelius's; in Mr. Flamsteed's catalogue they are eighteen; the longitudes, latitudes, &c. whereof, are as follow:

Names and situations of the stars.	Bayer's ch.	Signs.	Longitude °	′	″	Lat. Nort. °	′	″	Magn.
		♑	20	00	08	43	07	45	6
			21	45	45	38	31	25	6
5			21	53	27	38	31	18	6
Preced. glyphis or nib tow. S.	ε		25	29	42	37	27	09	5
Preced. of three in the shaft	α		26	45	16	38	49	52	4
10									
In the extremity of the nib	β		26	53	23	38	15	17	4
In the middle of the shaft	δ		29	04	40	38	56	52	4.5
Last of three in the shaft	ζ		29	43	47	39	27	05	6
		♒	0	35	41	38	48	23	6
			1	02	13	36	36	54	6
15									
			1	34	53	36	39	43	6
In the point of the arrow	γ		2	42	58	39	13	39	4
In the triangle under the point — north	χ		2	28	06	37	14	03	6
In the triangle under the point — south	y		3	00	24	35	35	06	6
Middle and posterior	z		3	33	10	36	35	02	6
20									
Preced. of 3 following the point	η		4	46	28	39	18	22	6
Middle	θ		6	29	53	39	52	58	6
Last		♒	8	37	48	40	07	17	6

SAGITTA, in *Botany*, signifies the top of any small twig, cyon, or graft of a tree.

SAGITTA, in *Geometry*, is a term which some writers use for the abscifs of a curve.

SAGITTA, in *Trigonometry*, &c. is the same as the versed sine of any arch; and is so called by some writers, because it is like a dart, or arrow, standing on the chord of the arch.

SAGITTAL, SAGITTALIS SUTURA, in *Anatomy*, the second of the genuine *sutures* of the cranium—See *Tab. Anat.* (*Myol.*) *fig.* 1. *lit. f. fig.* 2. *lit. i.*

It reaches the whole length of the head; and has its name from the Latin, *sagitta*, as being straight, like an arrow. Whence it it also called *recta*, and sometimes also *rhabdoides*.

SAGITTARIA, in *Botany*. See ARROW-*Head*.

SAGITTARIUM *alexipharmacum*, in the *Materia Medica*, the name of a root cultivated with great care in Jamaica, and supposed a remedy for the wounds of poisonous arrows. The plant of which it is the root is the *canna Indica radice alba*. Sloane's Hist. i. p. 253. but its virtues have not yet brought it into use on this side the water.

SAGITTARIUS, in *Astronomy*, the *Archer*, one of the signs of the zodiac; the ninth in order.

The stars in the constellation *Sagittarius*, in Ptolemy's catalogue

catalogue, are thirty-one; in Tycho's, fourteen; in Hevelius's, twenty-two; in the Britannic catalogue, sixty-nine. The longitudes, latitudes, magnitudes, &c. whereof are as follow:

Names and situations of the stars.	Bayer's ch.	Signs.	Longitude	Latitude.	Magn.
			° ′ ″	° ′ ″	
		♐	19 23 10	2 39 52 N	6
			20 46 23	1 30 24 S	6
Inform. preced. the bow	*p*		22 55 1	4 22 42	6
Nebulous	*b*		25 38 16	0 19 45	6.7
	i		25 43 17	0 47 51	7
5					
			26 0 18	6 20 22 N	7
Nebulous	*a*		26 19 47	0 47 50 S	6
			26 25 42	4 8 20 N	7
			26 33 35	0 52 24 S	7
That in the point of the arrow	γ		26 55 47	6 55 51	3
10					
			26 51 44	0 18 36 N	7
			28 43 1	0 31 33 S	7
North in the top of the bow 1st	μ		28 54 10	2 22 54 N	4
			28 59 32	1 43 43	7
2d	μ		29 15 5	2 42 28	6
15					
			29 15 26	3 2 42	7
			29 34 56	2 53 2	7
		♑	0 13 13	7 24 41 S	7
In the handle, of the left hand	δ		0 14 12	6 25 21	3
In the southern part of the bow	ε		0 45 33	10 59 54	3
20					
			1 38 55	2 48 39 N	6
In the north. part of the south. bow	λ		1 59 55	2 4 1 S	4
			2 40 15	0 36 39	7
			3 15 52	0 45 42	7
			2 35 23	0 57 48	7
25					
			5 16 0	0 41 20	6
Preceding the left shoulder	φ		5 50 42	3 54 35	5
			6 24 0	0 39 45 N	7
			7 19 56	2 39 12	6
			7 26 24	0 48 34	6
30					
			7 45 55	1 1 30	6
1st of contig. stars in the eye	ν		8 9 4	0 9 12	5
			8 15 9	1 32 3	6
Bright one in the left shoulder	σ		8 3 12	3 23 32 S	4.3
Subseq. of contig. in the eye	ν		8 22 14	0 12 33 N	5
35					
1st of three in the head	ξ		9 6 9	2 9 25	5
	ξ		9 8 52	1 42 12	6
That under the arm-pit	ζ		9 17 22	7 7 55 S	3
Middle of three in the head	ο		10 40 46	0 54 38 N	4
Midd. of 3 over the ribs in the shoulder	τ		10 30 10	5 1 12 S	4
40					
Last of three in the head	π		11 56 44	1 28 59 N	4
Between the shoulders	ψ		12 43 6	2 52 55 S	5
South of 3 in the north part of the robe	*d*		14 2 22	3 17 59 N	6
Middle of the three			15 8 20	4 15 43	5
			15 6 17	3 48 43	6
45					
North. of the three	*v*		15 21 49	6 8 42	6
	χ		15 0 19	2 26 17 S	5
In the right shoulder	χ		15 2 43	2 21 5	5
	χ		15 7 46	1 54 36	6
			15 39 4	0 12 20 N	6
50					
In the bend of right arm	*h*		17 24 12	3 1 53 S	6
	h		17 31 15	3 13 1	6
			18 28 4	1 54 4	6
	e		19 53 56	5 5 54 N	6
	e		20 20 29	5 11 26	6
55					
South. of two in south part of robe	*f*		20 36 41	1 27 2	6
			22 6 2	1 54 3	6
First in the root of the tail at the north side of the quadrilat.	*w*		21 29 46	5 22 55 S	5
First of southern side	*b*		21 35 15	6 16 34	5
Second of north side	*a*		22 13 16	5 24 44	5
60					
North of the second in the south part of robe	*g*		24 7 49	5 8 23	6
2d of south side of quadrilat.	*c*		22 43 30	7 3 48	6
			25 27 19	6 44 32 N	6
			26 38 1	8 34 40	6
			26 29 27	7 31 45	6
65					
In the joint of the fore leg	η	♐	29 51 38	13 17 45	3
South in the left	α	♑	11 57 16	22 26 50	4
North	α		11 54 44	22 5 48	4
In the fore left knee	β		12 44 39	18 19 51	4

Sagittated *Leaf*, in *Botany*; see Leaf.

SAGO, a medicinal substance brought from the East Indies, of considerable use in diet, as a nourisher, and restorative.

Sago is a sort of bread procured from a tree called *landan*, growing in the Moluccas.

This tree is a species of the palm, which grows naturally in Japan, and upon rocky dry mountains in Malabar.

When the tree is felled, they cleave it into two in the middle, and take out the pith, which is even eatable when it comes fresh out of the tree. They pound this very small in a mortar, till it is reduced into a kind of powder somewhat like meal. This done, they put it in a searce made of the bark of the same tree, and place the searce over a cistern, pouring water upon it, and by this means separating the pure part of the powder from the veins of wood, wherewith the pith abounds.

The flour, thus filtrated, they call *sagu*: they make it into cakes, and bake it in earthen furnaces; and this they do with so much expedition, that in three or four hours a man makes as much bread as will feed a hundred persons a day.

The cakes are reduced into small grains, which are the *sago* of the shops. This substance, commonly recommended as a restorative in phthises and emaciations, and for restraining fluxes, appears to be a light, moderately nutritious demulcent food; in which view it is by some directed as a proper aliment for young children, in preference to the more tenacious and less digestible preparations of wheat flour.

SAGOCHLAMYS, among the Romans, a sort of garment that partly resembled the sagum, and partly the chlamys.

SAGOUIN, in *Zoology*, the name of a very beautiful small species of monkey, described by Clusius, and seeming the same with the cagui *minor* of Margrave, and the simia *jacchus* of Linnæus.

Clusius says it is of the size of a squirrel, and has the look of a lion about the head, and that it is a very tender and delicate little animal, and impatient of the slightest injury.

SAGREE, in *Ichthyology*. See Galeus *spinax*.

SAGULUM, among the Romans, a little or short sagum.

SAGUM, in *Antiquity*, a military garment worn by the Greeks, Romans, and Gauls, in manner of a cloak or cassock; covering the shoulders and back as low as the hips; where it was fastened to the cuirass.

It was usually made of coarse wool and square. They had one for the winter, and another lighter for summer.

SAHIRA, in the *Materia Medica*, a name given by Avicenna to the *misy* of Dioscorides and the Greeks. See Melanteria and Misy.

SAI, in *Zoology*, a name given to the capuchin monkey.

SAIC, one of the many names given by the ancients to quicksilver. See Mercury.

SAICK, or Saique, a Turkish vessel, very proper for the carriage of merchandizes.

It has square sails on the middle mast; without either mizen, top-gallant, or shrouds: only a main-mast, with a main-top-mast, both very high; with a boltsprit, and a little mizen-mast.

The height of the main-mast makes the *saicks* visible at a great distance: their make renders it impossible for them to go with a side wind; but when they have the wind before them, nothing can outgo them. The generality of them carry no guns.

SAIGA, in *Zoology*. See Goat.

SAIGNER, in *Fortification*, a French term, signifying to empty or drain.

Hence *saigner la fosse* is to empty or drain the water out of the moat, by conveyances under-ground; that it may be passed over the more easily; by laying hurdles or rushes on the mud remaining.

SAIL, in *Navigation*, an assemblage of several breadths of canvas, or strong hempen cloth, sewed together, with a double seam, and edged round with a cord, extended on or between the masts to receive the wind, and carry the vessel along the water.

There are two kinds of *sails*; the one quadrilateral, the other triangular; i. e. the surfaces of all *sails* are contained either between four or three sides. The former are either extended by yards, as the principal *sails* of a ship; or by yards and booms, as the studding *sails*, drivers, ring-tails, and all those *sails* which are set occasionally; or by gaffs and booms, as the main-*sails* of sloops and brigantines. The latter are sometimes spread by a yard, as lateen *sails*, and otherwise by a stay, as stay-*sails*; or by the mast, as shoulder-of-mutton-*sails*; in all which cases the foremost leech or edge is attached to the said yard, mast, or stay, throughout its whole length.

The principal *sails* of a ship are the courses, or lower *sails*,

ſails, *a*, (*Tab.* II. *Ship*, *fig.* 3.) the top-*ſails*, *b*, which are next in order above the courſes, and the top-gallant-*ſails*, *c*, which are expanded above the top-*ſails*. The courſes are the main-*ſail*, fore-*ſail*, and mizen, main-ſtay-*ſail*, fore-ſtay-*ſail*, and mizen-ſtay-*ſail*; but more particularly the three firſt. The main-ſtay-*ſail* is rarely uſed except in ſmall veſſels.

In all quadrangular *ſails* the upper edge is called the head; the ſides or ſkirts are called leeches; and the bottom or lower edge is called the foot. If the head is parallel to the foot, the two lower corners are denominated clues, and the upper corners earings.

In all triangular *ſails*, and in thoſe four-ſided *ſails*, wherein the head is not parallel to the foot, the foremoſt corner at the foot is called the tack, and the after-lower-corner the clue; the foremoſt perpendicular or ſloping edge is called the fore-leech, and the hindmoſt the after-leech. The heads of all four-ſided *ſails*, and the fore-leeches of lateen *ſails*, are attached to their reſpective yard or gaff by a number of ſmall cords called robands; and the extremities are tied to the yard-arms, or to the peek of the gaff, by earings.—The ſtay-*ſails* are extended upon ſtays between the maſts, on which they are drawn up or down occaſionally, as a curtain ſlides upon its rod, and their lower parts are ſtretched out by a tack and ſheet. The clues of a top-*ſail* are drawn out to the extremities of the lower yard by two large ropes called the top-ſail-ſheets; and the clues of the top-gallant-*ſails* are in like manner extended upon the top-*ſail*-yard-arms, as exhibited in the figure. The ſtudding *ſails* are ſet beyond the leeches or ſkirts of the main-*ſail* and fore-*ſail*, or of the top-*ſails* or top-gallant-*ſails* of a ſhip. Their upper and lower edges are accordingly extended by poles run out beyond the extremities of the yards for this purpoſe. Thoſe *ſails*, however, are only ſet in favourable winds and moderate weather.

All *ſails* derive their name from the maſt, yard, or ſtay, upon which they are extended. Thus the principal *ſail* extended upon the main-maſt is called the main-*ſail*, *d*, *fig.* 4; the next above, which ſtands upon the main-top-maſt, is termed the main-top-*ſail*, *e*; and the higheſt, which is ſpread acroſs the main-top-gallant-maſt, is named the main-top-gallant-*ſail*, *f*. In the ſame manner, there is the fore-*ſail*, *g*; the fore-top-*ſail*, *h*; and the fore-top-gallant-*ſail*, *i*; the mizen, *k*; the mizen-top-*ſail*, *l*; and mizen-top-gallant-*ſail*, *m*. Thus alſo there is the main-ſtay-*ſail*, *o*; main-top-maſt-ſtay-*ſail*, *p*; and main-top-gallant-ſtay-*ſail*, *q*; with a middle-ſtay-*ſail*, which ſtands between the two laſt. All theſe ſtay-*ſails* are between the main and fore maſts. The ſtay-*ſails* between the main-maſt and mizen-maſt are the mizen-ſtay-*ſail*, *r*, and the mizen-top-maſt-ſtay-*ſail*, *s*; and ſometimes a mizen-top-gallant-ſtay-*ſail* above the latter. The ſtay-*ſails* between the fore-maſt and bowſprit are the fore-ſtay-*ſail*, *t*; the fore-top-maſt-ſtay-*ſail*, *u*; and the jib, *x*. There are, beſides, two ſquare *ſails* extended by yards under the bowſprit, one of which is called the ſprit-*ſail*, *y*, and the other the ſprit-*ſail*-top-*ſail*, *z*.

The ſtudding-*ſails*, being extended upon the different yards of the main-maſt and fore-maſt, are likewiſe named according to their ſtations, the lower, top-maſt, or top-gallant-ſtudding-*ſails*. The ropes by which the lower yards of a ſhip are hoiſted up to their proper height are called the JEARS. In all other *ſails* the ropes employed for this purpoſe are called HALIARDS. The principal *ſails* are expanded by haliards, ſheets, and bow-lines, except the courſes, which are always ſtretched out below by a tack and ſheet. They are drawn up together or truſſed up, by bunt-lines, clue-lines, *d d*, *fig.* 3; leech-lines, *e e*; reef-tackles, *f f*; ſlab-line, *g*; and ſpilling-lines. The bunt-lines and leech-lines, which paſs on the other ſide of the *ſail*, are expreſſed by dotted lines in the figure. The courſes, top-*ſails*, and top-gallant-*ſails*, are wheeled about the maſt, ſo as to ſuit the various directions of the wind, by braces. The higher ſtudding-*ſails*, and in general all the ſtay-*ſails*, are drawn down, ſo as to be furled or taken in by down-hauls.—Falconer. See *Tab. Ship. fig.* 1. *n.* 2. 17. 20. 44. 65. 67. 86. 107. 109. 126. 138.

SAILS, *after*, in a *Ship*, are thoſe that belong to the main-maſt and mizen. They keep the ſhip to windward. On which account ſhips ſailing on a quarter-wind require a head-*ſail* and an *after-ſail*; one to countermand the other.

SAIL, *netting*, in a *Ship*, is only a *ſail* laid over the nettings.

SAIL is alſo a name applied to any veſſel beheld at a diſtance under *ſail*.

SAIL, *to make*. See MAKE.

SAIL, *to ſet*, is to unfurl and expand the *ſails*, upon their reſpective yards and ſtays, in order to begin the action of ſailing.

SAIL, *to ſhorten*, is to reduce or take in part of the *ſails*, with an intention to diminiſh the ſhip's velocity.

SAIL, *to ſtrike*, is to lower it ſuddenly. This is particularly uſed in ſaluting or doing homage to a ſuperior force, or one whom the law of nations acknowledges as ſuperior in certain regions. Thus all foreign veſſels ſtrike to an Engliſh man of war in the Britiſh ſeas. See SALUTATION.

SAIL-*cloth*. For encouraging the manufacture of *ſail-cloth*, any perſon may import into this kingdom undreſſed flax, without paying any duty for the ſame, ſo as a due entry be made thereof at the cuſtom-houſe, &c. And no drawback is to be allowed on the exportation of foreign *ſail-cloth*: but an allowance ſhall be made of 1*d*. per ell for Britiſh *ſail-cloth* exported, &c. 4 Geo. II. cap. 27. All foreign *ſail-cloth* imported, for which duties are granted, ſhall be ſtamped, expreſſing from whence imported, &c. and manufacturers of *ſail-cloth*, in this kingdom, are to affix to every piece, by them made, a ſtamp containing their names and places of abode, or expoſing it to ſale ſhall forfeit 10*l*. And if any perſons cut off or obliterate ſuch ſtamps, they incur a forfeiture of 5*l*. upon conviction before one or more juſtices, to be levied by diſtreſs, &c. Ships built on firſt ſetting out to ſea, to have one complete ſet of *ſails* manufactured here, on pain of 50*l*. And no *ſail*-maker may work up into *ſails* foreign *ſail*-cloth not ſtamped, under 20*l*. penalty.

SAILS alſo denote the vanes of wind-mills; or the arms or flights, whereby the wind has its effect on them.

Theſe are either horizontal or perpendicular. See WIND-MILL.

SAILS, in *Falconry*, denote the wings of a hawk.

SAILING, in a *general ſenſe*, denotes the movement by which a veſſel is wafted along the ſurface of the water, by the action of the wind upon her ſails.

For the method of regulating this movement by the proper adjuſtment of the ſails and rudder, ſee SAILING in a *more confined ſenſe*, *infra*.

SAILING is alſo uſed for the art, or act, of navigating; or of determining all the caſes of a ſhip's motion, by means of ſea-charts. And as theſe charts are conſtructed either on the ſuppoſition that the earth is a large extended flat ſurface, whence we obtain thoſe that are called plane charts, or on the ſuppoſition that the earth is a ſphere, whence we derive globular charts: *ſailing* may be diſtinguiſhed into two general kinds, viz. *plane* or *plain*, and *globular ſailing*.

SAILING, *plain*, is that which is performed by means of a *plain* CHART; in which caſe, as is evident from the conſtruction of the chart, the meridians are conſidered as parallel lines, the parallels of latitude are at right angles to the meridians, the lengths of the degrees on the meridians, equator, and parallels of latitude, are every where equal; and the degrees of longitude are reckoned on the parallels of latitude, as well as on the equator. We ſhall here ſuppoſe, that the terms COURSE, DEPARTURE, DISTANCE, RHUMB-*line*, &c. are underſtood. And obſerve, that if a ſhip ſails either due north or ſouth, ſhe ſails on a meridian, makes no departure, and her diſtance and difference of latitude are the ſame; and if a ſhip ſails either due eaſt or weſt, ſhe runs on a parallel of latitude, makes no difference of latitude, and her departure and diſtance are the ſame. See RIGHT *ſailing*.

It is to be obſerved farther, that the difference of latitude and departure always make the legs of a right-angled triangle, whoſe hypothenuſe is the diſtance the ſhip has ſailed. See PLAIN *ſailing*.

It is obvious from the conſideration of ſuch a triangle, that when the courſe is 45 degrees, or 4 points, the difference of latitude and departure are equal; when the courſe is leſs than 45 degrees, the difference of latitude is greater than the departure; but when the courſe is greater than 45 degrees, the departure is greater than the difference of latitude.

In *Tab.* II. *Navigation*, *fig.* 26, let the circle FHFH repreſent the horizon of the place A, whence the ſhip ſails; AC the rhumb on which ſhe ſails, whether it be in the N. E. or N. W. S. E. or S. W. quarters of the horizon; and C the place at which ſhe arrives: then HH repreſents the parallel of latitude from which ſhe ſailed, and CC the parallel of latitude at which ſhe arrives: ſo that AD is the difference of latitude, DC the departure, AC the diſtance ſailed, DAC the angle of the courſe, and DCA the complement of the courſe. From this conſtruction it appears, that the difference of latitude, departure, and diſtance, form the ſides of a right-angled triangle, whoſe angles are the courſe, its complement, and the right angle: and, therefore, if of theſe four things, viz. the courſe, diſtance, difference of latitude, and departure, any two of them be given, the reſt may be found by plane trigonometry.

For the ready working of any ſingle courſe, there is a table, called a TRAVERSE *table*, uſually annexed to treatiſes of navigation; which is ſo contrived, that by finding in it the given courſe, and a diſtance not exceeding 100 miles, the difference of latitude and departure are had by inſpection. And this table will ſerve for greater diſtances, by taking their halves, thirds, fourths, &c. and doubling, trelling, quadrupling, &c. the difference of latitude and departure found to thoſe parts of the diſtance.

From the figure above referred to, in which A E, A F, or A H repreſents the radius of the tables, E B the ſine of the courſe, G F its tangent, and A G its ſecant, A B the ſine of the complement of the courſe, H I its tangent, and A I its ſecant, we may deduce all the proportions, or canons as they are uſually called by mariners, that can ariſe in *plain ſailing*; becauſe the triangles A D C and A B E, A D C and A F G are evidently ſimilar. Theſe proportions are exhibited in the following table.

Caſe.	Given.	Required.	Solutions.
1	∠ A, A C, i. e. courſe and diſtance.	A D, D C, i. e. diff. of lat. and departure.	A E : A B : : A C : A D, i. e. rad. : diſt. : : coſine of courſe : diff. of lat. A E : E B : : A C : D C, i. e. rad. : diſt. : : ſine of courſe : departure.
2	∠ A, A D, i. e. courſe and diff. of lat.	A C, D C, i. e. diſtance and departure.	A B : A E : : A D : A C, i. e. coſ. courſe : diff. lat. : : rad. : diſtance. A B : B E : : A D : D C, i. e. coſ. courſe : diff. lat. : : ſine courſe : departure.
3	∠ A, D C, i. e. courſe and departure.	A C, A D, i. e. diſtance and diff. of lat.	B E : A E : : D C : A C, i. e. ſine courſe : departure : : rad. : diſtance. B E : A B : : D C : A D, i. e. ſine courſe : departure : : coſ. courſe : diff. lat.
4	A D, A C, i. e. diſtance and diff. of lat.	∠ A, D C, i. e. courſe and departure.	A C : A D : : A E : A B, i. e. diſtance : rad. : : diff. lat. : coſ. courſe. A E : E B : : A C : D C, i. e. rad. : diſtance : : ſine courſe : departure.
5	A C, D C, i. e. diſtance and departure.	∠ A, A D, i. e. courſe and diff. of lat.	A C : D C : : A E : E B, i. e. diſtance : rad. : : departure : ſine courſe. A E : A B : : A C : A D, i. e. rad. : diſtance : : coſ. courſe : diff. lat.
6	A D, D C, i. e. diff. of lat. and departure.	∠ A, A C, i. e. courſe and diſtance.	A D : D C : : A F : F G, i. e. diff. lat. : departure : : rad. : tangent courſe. B E : A E : : D C : A C, i. e. ſine courſe : departure : : rad. : diſtance.

We ſhall now give ſome examples of the application of theſe canons to the ſolution of ſingle courſes.

Caſe 1. A ſhip from the latitude 47° 30′ N. has ſailed S. W. by S. 98 miles. What latitude is ſhe in, and what departure has ſhe made?

By the traverſe table. In the column of the courſe, viz. 3 points, againſt the diſtance 98, ſtand 81,5 miles for the diff. of lat. and 54,45 miles for the departure.

By conſtruction. Draw the meridian A D (*fig.* 27.) and make the quadrant A *m c p*. Make the arc *m c* equal to 3 points, and through *c* draw A B = 98 miles. Draw B D parallel to *p* A; and A D the diff. of lat. meaſures about 81½ miles, and B D the departure about 54,4 miles.

By computation. For the diff. of lat. rad. : diſt. : : coſ. courſe : diff. lat. i. e. 10,00000 : 1,99123 (log. of 98) : : 9,91985 (coſ. 33° 45′) : 1,01108 the log. of 81,48 miles. For the departure : rad. : diſt. : : ſin. courſe : departure, i. e. 10,00000 : 1,99123 : : 9,74474 (ſine of 33° 45′) : 1,73597 the log. of 54,45 miles.

By Gunter's ſcale. The extent from radius, or 8 points, to 3 points, on the line of ſine rhumbs, applied to the line of numbers, will reach from 98, in either interval, to 54,4. And the extent from 8 points to 5 points, among the rhumbs, reaches from 98 to 81,5 on the line of numbers.

Caſe 2. A ſhip has ſailed S. E. by S. from the lat. 47° 30′ N. to the lat. 46° 8′ N. What diſtance has ſhe run, and what departure has ſhe made?

By the traverſe table. The diff. of lat. is equal to 47° 30′ − 46° 8′ = 82′. Under the courſe or 3 points in the column of lat. find the neareſt number to 82, which is 82,3, and the correſponding departure is 55, and the diſtance 99 miles.

By conſtruction. Deſcribe the quadrant A *m c p* (*fig.* 28); make *m c* = 3 points, and produce A *m*, till A D becomes = 82 miles; draw D B parallel to A *p*, meeting the line A B drawn through *c* in B: and the diſtance A B meaſures about 99 miles, and the departure D B meaſures about 55 miles.

By computation. For the diſtance: coſ. courſe : diff. lat. : : rad. : diſt. i. e. 9,91985 (coſ. 33° 45′) : 1,91381 (log. of 82) : : 10,00000 : 1,99396 the log. of 98,62 miles. For the departure : coſ. courſe : diff. lat. : : ſine courſe : departure; i. e. 9,91985 : 1,91381 : : 9,74474 : 1,73871 the log. of 54,79 miles.

By Gunter's ſcale. The extent from 5 points to 8 points, in the line of ſine rhumbs, will reach, on the line of numbers, from 82 to 99. And the extent from 5 points to 3, on the ſine rhumbs, will reach from 82 to 55 on the line of numbers.

Caſe 3. A ſhip from lat. 47° 30′ N. ſailing N. W. by W. finds ſhe has made 82 miles of departure. What is her diſtance run, and what latitude is ſhe now in?

By the traverſe table. The courſe being 5 points, over that, in the column of departure, the neareſt number to 82 is 82,3; and the correſponding diff. of lat. is 55 miles, and the diſtance is 99 miles.

By conſtruction. Deſcribe the quadrantal arc A *m c p* (*fig.* 29.); make *m c* = 5 points, and produce A *p*, till A *b* becomes = 82 miles; through *b* draw *b* B, parallel to A *m*, meeting the line A B, drawn through *c*, in B; and through B draw B D, parallel to *b* A, meeting A *m* produced in D: then the diſtance A B meaſures about 99 miles, and the diff. of lat. A D meaſures about 55 miles.

By computation. For the diſtance : ſine of courſe : dep. : : rad. : diſt. i. e. 9,91985 (ſine of 56° 15′) : 1,91381 (log. of 82) : : 10,00000 : 1,99396 the log. of 98,62, the diſtance. For the diff. of lat. ſine courſe : dep. : : coſ. courſe : diff. lat. i. e. 9,91985 : 1,91381 : : 9,74474 (coſ. 56° 15′) : 1,73870 the log. of 54,79 the diff. of lat.

By Gunter's ſcale. The extent from 5 points to 8 points, on the line of ſine rhumbs, will reach, on the line of numbers, from 82 to 99. And the extent from 5 points to 3 points, on the line of ſine rhumbs, will reach from 82 to 55 on the line of numbers.

Caſe 4. A ſhip from lat. 47° 20′ N. ſails between the north and eaſt 98 miles, and is arrived in lat. 48° 42′ N. What courſe did ſhe ſteer, and what departure has ſhe made?

By the traverſe table. The diff. of lat. is 48° 42′ − 47° 20′ = 82′. Againſt the diſtance 98 ſtands the lat. 81,95 the neareſt to 82, and the correſponding departure is 53,73 miles, and the courſe is 33° 15′.

By conſtruction. Deſcribe the quadrant A *m c p* (*fig.* 30.); produce A *m*, till A D becomes = 82; through D draw D B parallel to A *p*, and with the diſtance 98 interſect D B in B: the departure will be found to meaſure 53 miles, and the courſe D A B is meaſured by the arc *m c* of about 33°.

By computation. For the courſe : diſt. : rad. : : diff. lat. : coſ. courſe, i. e. 1,99123 (log. of 98) : 10,00000 : : 1,91381 (log. of 82) : 9,92258 the coſine of 33° 13′. For the departure : rad. : diſt. : : ſine courſe : departure, i. e. 10,00000 : 1,99123 : : 9,73863 (ſine of 33° 13′) : 1,72986 log. of 53,69.

By Gunter's ſcale. The extent from 98 to 82, on the line of numbers, will reach, on the line of ſines, from 90 to about 57°. And the extent from 90° to 33°, on the line of ſines, will reach, on the line of numbers, from 98 to about 53 miles. Thus it appears that the courſe is N. 33° 15′ E. or N. E. by N. nearly, and the departure is 53,69 miles to the eaſtward.

Caſe 5. From lat. 50° 13′ N. a ſhip, in failing between the ſouth and eaſt 98 miles, makes her departure 82 miles. What courſe did ſhe keep, and what latitude is ſhe arrived at?

By the traverſe table. Againſt the diſtance 98 ſtands 81,95, in the column departure, the neareſt to 82, and here the diff. of lat. is 53,73 miles, and the courſe is 56° 45′.

By conſtruction. Deſcribe the quadrant A *m c p* (*fig.* 31); produce A *p* till A *b* = 82; and through *b* draw *b* B parallel to A *m*; from A, with the diſtance 98, cut *b* B in B; through B draw B D parallel to A *b*, meeting A *m* produced

produced in D: and the diff. lat. A D meaſures about 53 miles, and the courſe D A B is meaſured by the arc *m c* of about 57°.

By computation. For the courſe : diſt. : rad. : : dep. : ſine courſe, i. e. 1,99123 : 10,00000 : : 1,91381 : 9,92258 ſine of 56° 47′. For the diff. lat. rad. : diſt. : : coſ. courſe : diff. lat. i. e. 10,00000 : 1,99123 : : 9,73863 : 1,72986 the log. of 53,69; ſo that the lat. arrived at is 50° 13′ N. — 54′ = 49° 19′ N.

By Gunter's ſcale. The extent from 98 to 82, on the line of numbers, will reach, on the line of ſines, from 90° to about 57°: and the extent from 90° to 33°, on the line of ſines, will reach from 98 to about 53 miles on the line of numbers. So that the courſe is S. 56° 47′ E. or S. E. by E. nearly, and the latitude arrived in is 49° 19′ N.

Caſe 6. A ſhip from lat. 48° 32′ N. is arrived in lat. 49° 54′ N. and her departure is 54 miles W. What courſe did ſhe ſteer, and what the direct diſtance run?

By the traverſe table. The diff. lat. = 49° 54′ — 48° 32′ = 82 m. The numbers in the table neareſt to 82 and 54 are 81,95 and 53,73; and the diſtance anſwering to theſe is 98 miles, and the courſe is 33° 15′.

By conſtruction. Deſcribe the quadrant A *m c p* (*fig.* 32), and produce A *m*, till A D = 82; through D draw D B, parallel to A *p*, and = 54, and draw A B. Then the diſtance A B meaſures about 98 miles, and the courſe D A B is meaſured by the arc *m c* of about 33°.

By computation. For the courſe : diff. lat. : dep. : : rad. : tang. courſe, i. e. 1,91381 (log. of 82) : 1,73239 (log. of 54.) : : 10,00000 : 9,81858 tang. of 33° 22′. For the diſtance : ſine courſe : dep. : : rad. : diſt. i. e. 9,74036 (ſine of 33° 22′) : 1,73239 : : 10,00000 : 1,99203 the log. of 98,18 miles.

By Gunter's ſcale. The extent from 82 to 54, on the line of numbers, will reach, on the line of tangents, from 45° to about 33°. And the extent from about 33° to 90°, on the line of ſines, will reach, on the line of numbers, from 54 m. to about 98 m. The courſe is, therefore, N. 33° 22′ W. or N. W. by N. nearly, and the diſtance 98,18 miles.

For the method of conſtructing and reſolving compound courſes. See Traverse.

Sailing, *oblique.* In the preceding examples, the bearing and diſtances of places were determined by the ſolution of right-angled triangles: but at ſea there are many caſes in which only oblique poſitions can be obſerved; and, therefore, it may not be improper to give a few examples of the ſolution of ſuch caſes.

Ex. 1. Two ſhips, A and B (*Tab.* II. *Navigation, fig.* 33.) ſail from two iſlands, bearing the one from the other N. E. and S. W. their diſtance being 76 miles; A ſails S. by E. and B runs E. by S. at laſt they meet. How far has each ſailed?

Conſtruction. With the chord of 60° deſcribe a circle repreſenting the horizon of one of the places ſailed from; e. g. of A, the northern; draw the meridian N S, and, at right angles to it, draw the parallel of latitude E W. In this circle lay off the S. W. rhumb S *o*, the S. by E. rhumb S *p*, and the E. by S. S *m*; through *o* draw A B equal to 76 miles; through B draw B C, parallel to A *m*, meeting A C drawn through *p*. Then A and B repreſent the places ſailed from; A C and B C the diſtances and courſes, when properly compared with the meridian, the ſhips had ſailed when they met at C: and theſe diſtances may be meaſured from the ſcale A B was taken from.

Computation. In the triangle A B C there is given one ſide A B, and all the angles, to find the other ſides.— Thus, ∠ A = 5 points = 56° 15′; for S *o* + S *p* = 5 points: ∠ B = 5 points = 56° 15′; for B C is parallel to A *m*; and ∠ B = B A *n* = 5 points; and ∠ C = C A *m* = 6 points = 67° 30′. Then by a well known theorem in trigonometry, ſine of C : A B : : ſine of A : B C: i. e. ſine of 67° 30′ : 76 m. : : ſine of 56° 15′ : 68,4 m. And ſince the angle B = the angle A, A C = B C; conſequently A ſails S. by E. 68,4 miles, and B ſails E. by S. 68,4 miles.

Ex. 2. At noon a headland bore N. W. by W. then *ſailing* N. N. E. 5 miles an hour, we anchored at nine in the evening, in a creek, 18 leagues diſtant from the headland. Required its diſtance at noon, and bearing from the creek?

Conſtruction. Having deſcribed the horizon, and drawn the meridian and parallel, in the meridian take any point A (*fig.* 34.) for the ſhip's place at firſt; draw the N. W. by W. and N. N. E. rhumbs, and parallel to them draw A B, A C. Make A C = 45 miles = 9 h. × 5 m. and from C with 54 m. (= 18 leag. × 3) cut A B in B: then B is the headland, and C the creek.

Computation. In the triangle A B C we have the ſide A C = 45 m. the ſide C B = 54 m. and ∠ A = 78° 45′ = 5 points for N. W. by W. + 2 points for N. N. E. whence, B C : S. A : : A C : S. B, i. e. 54 : S. 78° 45′ : 45 : S. B = 54° 49′; and the angle C = 46° 26′; and in the ſame manner we ſhall have A B = 39,9 miles; conſequently ∠ *o a n* — ∠ *n a w* = ∠ *o a w* = 21° 4′, which taken from 90° leaves 68° 56′. Hence the headland's diſtance at noon is 39,9 miles, and its bearing from the creek is S. 68° 56′ W. or W. S. W. ½ W. nearly.

Ex. 3. A merchant ſhip meeting with a ſhip of war, which had ſailed S. E. by E. 39 leagues from the latitude of 45° 30′ N. informed them, that ſhe had been plundered the day before, in the ſame latitude; and had ſince run 67 leagues on a direct courſe, between the ſouth and weſt; and that the pirates were cruiſing about the place where they robbed her. What courſe muſt the man of war ſteer to come up with them?

Suppoſe A (*fig.* 35.) the place the man of war ſailed from, B the place where the merchant-man was robbed, C the place where they met; then the man of war muſt ſail along C B to meet the pirates, which courſe will be ſhewn by *c n* drawn parallel to C B. Here are two given ſides, and an angle oppoſed to one of them, to find the angle B oppoſite to the other ſide A C. C B : S. ∠ A : : A C : S. ∠ B : i. e. 67 leagues : S. 33° 45′ : : 39 leagues : S. 18° 52′; conſequently the courſe the man of war muſt ſteer is N. 71° 8′ E. for *n c* B = C B *c*, and 90° — *n c* B = N *c n*.

Ex. 4. Coming within ſight of two headlands, bearing north and ſouth of each other; the ſouthern one bore from the ſhip due eaſt, and the other N. E. by E. and after ſailing due eaſt 5 miles, the northern headland bore N. E. by N. ½ E. Required the diſtance of thoſe headlands from one another, and their diſtance from the ſhip at each time of ſetting them?

In the eaſt and weſt line take B A (*fig.* 36) = 5 miles; draw the N. E. by E. and N. E. by N. ½ E. rhumbs B *n*, B D; through A draw A D, parallel to B *n*, meeting B D in D; draw D C perpendicular to A B produced. Then D and C are the headlands; A, B are the ſhip's places at the times of ſetting them; and A B the diſtance ſailed. The angle A = C B *n* = 3 points; the angle D B C = 4½ points; then A B D = 11½ points, A D B = 1½ point, and B D C = 3½ points. In the triangle A B D, having the ſide A B and all the angles given, find the ſides A D, B D: and in the right-angled triangle B C D, having the ſide B D and all the angles, it is eaſy to find the ſides B C, C D. A D will be = 13,31 m. B D = 9,565 m. B C = 6,07 m. and C D = 7,395 m.

Ex. 5. Having caſt anchor, I obſerved the bearings of a tower, a mill, and a light houſe, known to lie due eaſt and weſt of one another; the tower bore W. S. W. the mill S. W. by S. ½ W. and the light-houſe S. by W. ½ W. the diſtance of the tower from the mill is 5½ miles. How far are each of thoſe objects diſtant from the place where I anchored?

Draw the given rhumbs B *r*, B *o*, B *n*, (*fig.* 37.) make B A = 5½ miles; produce *o* B till it meets A D, drawn parallel to B *r*, in D C; draw D C parallel to B *n*; then D repreſents the ſhip's place, A the tower, B the mill, and C the light-houſe. The angles are found and the triangles ſolved, as in the laſt example; and we ſhall have D A = 9,021 m. D B = 4,466 m. and D C = 3,608 miles.

Sailing *to windward.* The doctrine of plane triangles is farther applicable to this method of *ſailing*; for the right underſtanding of which, it will be neceſſary to explain the terms that occur in this part of navigation, though moſt of them may be met with in their proper places in this work. See Aft, Beam, Larboard, Starboard, &c.

It may be obſerved, in general, that when the wind is directly, or partly, againſt the ſhip's direct courſe to the place whither ſhe is bound, ſhe reaches her port by a kind of zigzag, or z like courſe; which is made by ſailing with the wind, firſt on one ſide of the ſhip, and then on the other ſide.

The windward or weather-ſide of a ſhip is that ſide on which the wind blows, the other being called the lee-ward, or lee-ſide.

When a ſhip ſails the ſame way the wind blows, ſhe is ſaid to ſail before the wind, and the wind is ſaid to be *right aft*, or *right aſtern*; and her courſe is then 16 points from the wind. When a ſhip ſails with the wind blowing directly acroſs her, ſhe is ſaid to have the wind *on the* beam; and her courſe is 8 points from the wind. When the wind blows obliquely acroſs the ſhip, the wind is ſaid to be *abaft the beam*, or *afore the beam*, according as her courſe is more or leſs than 8 points from the wind. When a ſhip endeavours to ſail towards that point of the compaſs from whence the wind blows, ſhe is ſaid to *ſail on a wind*, or to ply *to windward*. A veſſel

veſſel *ſailing* as near as ſhe can to the point from whence the wind blows is ſaid to be CLOSE-HAULED: moſt ſhips will lie within about 6 points of the wind; but ſloops, and ſome other veſſels will lie much nearer. When a ſhip ſails on a wind, the windward TACKS are always hauled forwards, and the leeward SHEETS aft. The ſtarboard tacks are aboard when the ſtarboard ſide is to windward, and the larboard to leeward; and the larboard tacks are aboard when the larboard ſide is to windward, and the ſtarboard to leeward. In order to know how near the wind a ſhip will lie, obſerve the courſe ſhe goes on each tack, when ſhe is cloſe-hauled; then half the number of points between the two courſes will ſhew how near the wind that ſhip will lie.

The moſt common caſes in turning to windward may be conſtructed by the following precepts. Having drawn the meridian and parallel of latitude (or eaſt and weſt line) in a circle repreſenting the horizon of the place, mark in the circumference the place of the wind; draw the rhumb paſſing through the place bound to, and lay thereon the diſtance of that place from the centre. On each ſide of the wind, lay off in the circumference the points or degrees, ſhewing how near the wind the ſhip can lie; and draw theſe rhumbs: the firſt courſe will be on one of theſe rhumbs according to the tack the ſhip leads with; draw a line through the place bound to, parallel to the other rhumb and meeting the firſt, and this will ſhew the courſe and diſtance on the other tack.

Ex. 1. The wind at north, and I am bound to a port 25 miles directly to windward, being on my ſtarboard tacks, and can lie within 6 points of the wind. What muſt be my courſe and diſtance on each of two tacks to reach my port?

The conſtruction being made as directed, N (*fig.* 38.) is the place of the wind, A the port bound to, and B the place where the ſhip is ſuppoſed to be, when the port is 25 miles to windward of her. As the ſhip leads with her ſtarboard tacks, i. e. has the wind blowing on her ſtarboard ſide, ſhe muſt firſt ſail along the line B C drawn parallel to the rhumb A *n*, which is 6 points from the wind; and where the other rhumb A *o*, 6 points alſo from the wind, being produced from A towards C, meets with B C in the point C, is the place where ſhe muſt tack about to reach her port within 6 points of the wind on her larboard tacks. Since B C is parallel to A *n*, the ∠ B = ∠ N A *n* = 6 points: and B A C = N A *o* = 6 points; hence ∠ C = 4 points; and as ∠ B = B A C, the ſide B C = C A; conſequently, as one ſide A B, and all the angles are given, we ſhall have ſine of C : A B :: ſine of B A C : B C, i. e. ſine of 45° : 25 m. :: ſine of 67° 30′ : 32,66. Hence it appears, that the ſhip muſt ſail on her ſtarboard tacks W. N. W. 32,66 miles, and her larboard tacks E. N. E. 32,66 miles.

Ex. 2. A privateer lying by with the wind at N. N. E. ſees a ſloop on her ſtarboard tacks, that had juſt doubled a point 18 miles to the W. by N. the ſloop run for her port within 6 points of the wind; the privateer gave chaſe at the rate of eight knots an hour, and in four hours came up with her. Required the ſloop's rate of ſailing, and alſo the courſes of both veſſels?

Draw B A (*fig.* 39.) to the E. by S. and equal to 18 miles; on A with 32 m. = 8 × 4, cut the rhumb B C, drawn 6 points from the wind, at *w*; then the privateer is firſt at A, ſees the ſloop at B, gives chaſe along the line A C, and takes the ſloop at C; and B *o*, drawn parallel to A C, ſhews the privateer's courſe from the north. Here are known 2 ſides, A B, A C, and the angle A B C = 13 points. Hence we may eaſily obtain the other parts of the triangle; and find that the ſloop ſails N. W. at the rate of 3,86 m. per hour $= \frac{BC}{4}$, and that the privateer's courſe is N. 63° 12′ W.

Ex. 3. A ſhip that can lie within 6 points of the wind, ſees a headland 21 miles to the N. E. which ſhe is to weather, in order to reach an iſland 9 miles to windward thereof, the wind being at eaſt. What courſe and how far muſt ſhe go on each tack, leading with the ſtarboard?

Draw B A (*fig.* 40.) = 21 m. to the S. W. B C = 9 m. to the eaſt, join A C; draw A D and C D each 6 points from the wind: then A is the ſhip's place, B the headland, C the iſland, A D the run on the ſtarboard tacks, and D C that on the larboard. In the triangle A B C, we have B A, B C, and the angle A B C = 12 points; and can hence find the other angles, and A C. Then in the triangle A C D, with the ſide A C, and all the angles are known (becauſe ∠ D = 4 points, D C A = D C B + B C A, and C A D = B A D + B A C), and we may find A D, D C. On the ſtarboard the ſhip runs 30,19 miles on the N. N. E. rhumb, and on the larboard 23,12 miles on the S. S. E. rhumb.

SAILING, *current*, for an account of, ſee CURRENT.

SAILING, *globular*, is the method of eſtimating either the difference of latitude, difference of longitude, departure, courſe, or diſtance, from any two of them being known, upon principles deduced from the figure of the earth: and in this conſiſts the application and uſe of *Mercator's* CHART. See the principles of this method explained and demonſtrated under MERIDIONAL *parts*.

Globular ſailing, in the extenſive ſenſe here applied to the term, comprehends PARALLEL *ſailing*, MIDDLE *latitude ſailing*, and MERCATOR'S *ſailing*; to which we may alſo add CIRCULAR *ſailing*. Of each of theſe we ſhall here give a brief account, with examples of their uſe.

SAILING, *parallel*, is the art of finding what diſtance a ſhip ſhould run due eaſt or weſt, in *ſailing* from the meridian of one place to that of another place, in any parallel of latitude: the method of performing which is by *ſailing* to the parallel of latitude the place is in, keeping a good account, ſo as to be certain whether the place is then to the eaſtward or weſtward; and alſo, if poſſible, to know the longitude arrived at: and then to run due weſt or eaſt, till the ſhip comes near the longitude of the given place; where ſhe is then ſure to make the port required.

The computations in *parallel ſailing* depend on the following rule: as radius, R, to the coſine of the latitude of any parallel, S, ſo are the miles of longitude between any two meridians, L, to the diſtance of thoſe meridians in that parallel, D. For the demonſtration of this rule, ſee MERIDIONAL *parts*.

From the preceding proportion is eaſily deduced the following rule: as the coſine of one latitude, S, is to the coſine of another latitude, *s*, ſo is a given meridional diſtance in the firſt parallel, D, to the correſponding meridional diſtance in the ſecond parallel, *d*. Hence ariſe the following proportions:

$$R : S :: L : D$$
$$S : R :: D : L$$
$$L : D :: R : S$$
$$S : s :: D : d$$
$$D : d :: S : s$$

whereby all the caſes that can happen in this kind of *ſailing* are readily reſolved by the logarithms, and alſo by the following table, calculated for a difference of longitude of 1 degree, or 60 nautical miles of the equator, by the firſt rule.

Lat.	Miles.	Lat.	Miles.	Lat.	Miles.	Lat.	Miles.	Lat.	Miles.	Lat.	Miles.
1	59,99	16	57,67	31	51,43	46	41,68	61	29,09	76	14,51
2	59,96	17	57,38	32	50,88	47	40,92	62	28,17	77	13,50
3	59,92	18	57,06	33	50,32	48	40,15	63	27,24	78	12,48
4	59,85	19	56,73	34	49,74	49	39,36	64	26,30	79	11,45
5	59,77	20	56,38	35	49,15	50	38,57	65	25,36	80	10.42
6	59,67	21	56,01	36	48,54	51	37,76	66	24,41	81	9.38
7	59,56	22	55,63	37	47,92	52	36,94	67	23,44	82	8,35
8	59,42	23	55,23	38	47,28	53	36,11	68	22,48	83	7,32
9	59,26	24	54,81	39	46,63	54	35,27	69	21,50	84	6,28
10	59,09	25	54,38	40	45,96	55	34,41	70	20,52	85	5,23
11	58,89	26	53,93	41	45,28	56	33,55	71	19,53	86	4,18
12	58,69	27	53,46	42	44,59	57	32,68	72	18,54	87	3,14
13	58,46	28	52,97	43	43,88	58	31,79	73	17,54	88	2,09
14	58,22	29	52,47	44	43,16	59	30,90	74	16,54	89	1,05
15	57,95	30	51,96	45	42,43	60	30,00	75	15,53	90	0,00

See another table of this kind, allowing 69 miles 864 feet to one degree, under DEGREE.

As a ſpecimen of the manner of uſing this table; let the meridional diſtance correſponding to any number of degrees and minutes be required: take the difference of the meridional diſtances to the given degrees, and thoſe which are next greater; multiply this difference by the given minutes, and divide by 60; then the quotient, ſubtracted from the miles againſt the given degrees in the table, will leave the meridional diſtance required.— E. g. How many miles anſwer to a degree of longitude in the latitude of 48° 26′?

Lat. 48° 40,15 miles. } The difference is 0,79, which
Lat. 49° 39,36 miles. } multiplied by 26 gives 20,55;
and this divided by 60 gives 0,38; which taken from 40,15 leaves 39,77, the miles required.

Again, if it were required to find the correſponding degrees and minutes to a given meridional diſtance, intermediate to thoſe in the table; ſubtract the given meridional diſtance from the next greater, found in the table; multiply the remainder by 60; divide the product by the difference of the meridional diſtances next greater and leſs than the given one; then the quotient, annexed as minutes to the degrees of the next greater meridional diſtance, will give the degrees and minutes ſought.— E. g. In what latitude do 46,08 miles anſwer to one degree of longitude?

From 46,63, the miles correſponding to 39°,
take 46,08, the given miles,

The difference 0,55, multiplied by 60, gives 33; and this divided by 0,67, the difference between 39° and 40°, gives 49′: and, therefore, 39° 49′ is the latitude ſought.

We ſhall here ſubjoin an example to each of the above proportions or canons.

Caſe 1. A ſhip in the lat. of 32° N. ſails thence due eaſt till her difference of longitude is 384 miles. Required the diſtance ſhe has run?

By conſtruction. From any point P (*fig.* 41.) with a radius of 90°, taken from the ſcale of natural ſines, deſcribe the arc E Q; draw the chord E Q equal to 384 miles taken from a ſcale of equal parts; and draw the radii P E, P Q. From the ſame point P, with a radius equal to the ſine of 58° (the complement of the lat.) taken from the natural ſines, deſcribe the arc A B; and draw the chord A B, whoſe meaſure is the diſtance ſought. In this figure P repreſents the north pole; the arc E Q the equator; the arc A B a parallel of latitude; the chord E Q is the difference of longitude; the chord A B is the meridional diſtance ſought; A is the place ſailed from; B the place arrived at; and the radii P E, P Q expreſs the meridians of the places ſo ſailed from and come to.

By computation. R : S : : L : D, i. e. 10,00000 : 9,92842 (coſ. of 32°) : : 2,58433 : 2,51275 the log. of 325,6 the miles of diſtance run.

By the table. Find the miles anſwering to the given latitude: multiply them by the given difference of longitude; the quotient, divided by 60, will give the meridional diſtance ſought. To 32° degrees anſwers 50,88 miles, then 50,88 × 384 = 19537,92, which, divided by 60, gives 325,632, the meridional diſtance ſought.

Caſe 2. A ſhip from the lat. 53° 36′ N. long. 10° 18′ E. ſails due weſt 236 miles. Required her preſent longitude?

By conſtruction. From the point P (*fig.* 41.) with the ſine of 90°, and the coſine of 53° 36′, deſcribe the arcs E Q, C D; draw the chord C D = 236; through C and D draw the radii P E, P Q; then the chord E Q, being drawn, will be the difference of longitude.

By computation. S : R : : D : L : or P C : P E : : C D : E Q : i. e. 9,90574 (coſ. of 53° 36′) : 10,00000 : : 2,37291 (log. of 236 m. the meridional diſtance) : 2,59955 (the log. of 397,7) the difference of longitude: which, divided by 60, gives 6° 38′ W. and this ſubtracted from 10° 18′ E. gives the longitude required = 3° 40′ E.

By the table. Find the meridional diſtance to a degree of longitude in lat. 53° 36′, and make it a diviſor to the product of the given meridional diſtance by 60; and the quotient will be the difference of longitude ſought. Thus, the difference of the meridional diſtances to 53° and 54° is 0,85; which multiplied by 36′, and divided by 60′ gives 0,51; this taken from 36,11 the meridional diſtance to 53° leaves 35,6 for the meridional diſtance to 53° 36′: then $\frac{236\times60}{35,6}=397,7$ the difference of longitude ſought.

Caſe 3. In what latitude do 384 miles of meridional diſtance anſwer to 500 miles of difference of longitude?

By conſtruction. From the point P (*fig.* 42.) with the ſine of 90°, deſcribe the arc E Q; draw the chord E Q = 500, and draw the radii P E, P Q; make E C = 384, draw C B parallel to E P; then the arc A B being deſcribed with the radius P B is the parallel of latitude ſought.

By computation. L : D : : R : S or E Q : A B : : P E : P A, i. e. 2,69897 : 2,58433 (log. of 384) : : 10,00000 : 9,88536 the coſine of 39° 49′, in which lat. 384 miles of meridional diſtance anſwers to 500 miles of longitude.

By the table. The given meridional diſtance 384, being multiplied by 60, and the product divided by the given diff. of long. 500 gives 46,08 the merid. diſt. to one degree of longitude in the latitude ſought: and the latitude will be found to be 39° 49′.

Caſe 4. From two ports in the lat. 32° 20′ N. diſtant 256 miles, two ſhips ſail directly north. How far are they diſtant from one another, when they come to the latitude 44° 30′ N.?

By conſtruction. From the point P (*fig.* 43.) with radii equal to the coſines of 32° 20′ and 44° 30′ deſcribe the arcs A B, D E; draw the chord A B = 256, and draw P A, P B; then will the chord D E be the diſtance ſought.

By computation. S : *s* : : D : *d* or P A : P D : : A B : D E, i. e. 9,92683 (coſ. 32° 20′) : 9,85324 (coſ. 44° 30′) : : 2,40824 (log. of 256) : 2,33465 the log. of 216,1 the diſtance ſought.

By the table. The meridional diſtances, correſponding to 32° 20′ and 44° 30′ are 50,7 and 42,8; then the given meridional diſtance 256 × 42,8 = 1095,68, which divided by 50,7 gives 216,1 the meridional diſtance ſought.

Caſe 5. If two ſhips in the lat. 44° 30′ N. diſtant from one another 216 miles, ſhould both ſail hence directly ſouth, until their diſtance is 256 miles: what latitude are they come to?

By conſtruction. From P (*fig.* 44.) with a radius of the coſine of 44° 30′, deſcribe the arc D E, draw the chord D E = 216; and through D and E draw P A, P B; produce D E till D F = 256; through F draw F B parallel to P A meeting P B in B; then an arc deſcribed from P through B and A will be the parallel of latitude come to.

By computation. D : *d* : : S : *s* or D E : A B : : P D : P A, i. e. 2,33445 (log. of 216) : 2,40824 (log. of 256) : : 9,85324 (coſ. 44° 30′) : 9,92702, the coſine of 32° 17′, the latitude ſought.

By the table. To lat. 44° 30′ find the merid. diſt. 42,8; then $\frac{42,8\times256}{216}=50,72$, which will be the merid. diſt. correſponding to 32° 17′ the latitude ſought.

Sailing, *middle latitude*, is a method of ſolving the ſeveral caſes of globular *ſailing*, by the principles of plane and parallel *ſailing* jointly: and it is founded on the ſuppoſition, that the departure is reckoned as a meridional diſtance in that latitude, which is a middle parallel between the latitude ſailed from, and the latitude come to. This method is not quite accurate; becauſe the arithmetical mean of the coſines of two diſtant latitudes is not the coſine of the arithmetical mean of thoſe latitudes; nor is the departure between two places on an oblique rhumb, equal to the diſtance between their meridians in a mean latitude: yet when the parallels of thoſe places are near the equator, or not far diſtant from one another, in any latitude, the error is inconſiderable.—The computations, in this method, depend on the following rules:

1. Add the latitude ſailed from to the latitude arrived at, and take half the ſum for the middle latitude.

2. As the coſine of the middle latitude, C, is to the radius, R, ſo is the departure, D, to the difference of longitude, L. See *Parallel* Sailing, and Meridional *parts*.

3. As the coſine of the middle latitude, C, is to the tangent of the courſe, T, ſo is the difference of latitude, P, to the difference of longitude, L: for, from rule 2, we obtain rad. × dep. = coſ. mid. lat. × diff. long. and, from caſe 6 of *plane* sailing, rad. × dep. = diff. lat. × tang. courſe: therefore, by equality and proportion, we ſhall have the rule. Hence ariſe the following proportions or canons.

C : R : : D : L L : D : : R : C R : C : : L : D	C : T : : P : L P : L : : C : T.

Sailing, *Mercator's*, is the art of reſolving the ſeveral caſes of globular *ſailing*, by plane trigonometry, with the aſſiſtance of a table of meridional parts, or of logarithmic tangents. The computations are performed by the following rules:

1. As the merid. diff. of lat. M, is to the diff. of long. L, ſo is the radius, R, to the tangent of the courſe, T: whence we have alſo, R : T : : M : L and T : R : : L : M.

2. As the proper diff. of lat. P, is to the departure, D, ſo is the merid. diff. of lat. M, to the diff. of long. L: whence we have alſo, M : L : : P : D.

3. As the difference of the logarithmic tangents of $\frac{1}{2}$ colatitudes, G, is to the tangent of 51° 38′ 9″ N. ſo is a given diff. of long. L, to the tangent of the courſe, T: whence we have alſo, N : G : : T : L and T : L : : N : G.

The manner of working with the meridional parts and logarithmic tangents will appear from the two following caſes:

1. Let the latitudes of two places be given, and the meridional difference of latitude between them be required. By the meridional *parts*, when they are on the ſame ſide of the equator, ſay the difference; when on different ſides, the ſum of the meridional parts anſwering to each latitude, will give the meridional difference of latitude required.

By logarithmic tangents, when they are on the ſame ſide of the equator, ſay the difference of the logarithmic tangents, when on different ſides, the ſum of the logarithmic co-tangents, abating the index, of the half colatitudes, divided by 12,63, will give the meridional difference of latitude required.

2. Let the latitude of one place, and the meridional difference of latitude between that and another place be given; and the latitude of the other place be required.

The ſum of the meridional parts of the given latitude, and the given meridional difference of latitude, when they

they have like names, or their difference, when they have unlike names, found in the table of meridional parts, will give the latitude ſought. Or, multiply the given meridional difference of latitude by 12,63; and in the former caſe ſubtract, but in the latter caſe add, the product to the logarithmic tangent of the given half co-latitude, the degrees correſponding to the tangent of the remainder, or of the ſum being doubled, will give the co-latitude required.

The following example will ſerve to illuſtrate the application and uſe, both of middle latitude and Mercator's *ſailing*.

Ex. What is the courſe and diſtance from Cape Clear, in Ireland, lat. 51° 18′ N. long. 9° 50′ W. to the iſland of St. Mary, one of the Azores, lat. 37° 0′ N. and long. 22° 56′ W.?

By middle latitude ſailing. In this example the diff. of lat. = 14° 18′ = 858 m. and diff. of long. 13° 6′ = 786 m. ſum of the latitudes 88° 18′; middle lat. = 44° 9′; and co-mid. lat. 45° 51′.

By conſtruction. Draw the meridian A D (*fig.* 45.); deſcribe the quadrant A *m p* with the ſine of 90°, and the arc E F with the coſine of the middle latitude; make the chord *m* B equal to 786, the difference of longitude; draw A B cutting the arc E F in F, and draw the chord E F; make A D = 858, the difference of latitude; draw D C parallel to A *p* and equal to E F; and draw A C, which is the diſtance, and the angle D A C is the courſe.

By computation. For the courſe; P : L :: C : T, i. e. 2,93349 (log. of diff. lat. 858) : 2,89542 (log. of diff. long. 786) :: 9,85583 (coſ. of mid. lat. 44° 9′) : 9,81776 the tangent of 33° 19′, the courſe. For the diſtance: ſin. ∠ C : A D :: R : A C, i. e. 9,92202 (coſ. of 33° 19′) : 2,93349 :: 10,00000 : 3,01147 the log. of 1027 the diſtance.

By the traverſe table. With the co-mid. lat. found among the degrees, and the diff. of long. or ſome part thereof (if too large) taken among the diſtances, find the departure, or ſome part thereof, in its column: obſerving to multiply this departure by the ſame number the diff. of long. was divided by. Then, with the diff. of lat. and dep. together, or their like parts, find the courſe among the degrees, and the diſtance in its column.

Let the diff. long. 786 be broken into parts, viz. into 100 taken 7 times, and into 86: and as the co-mid. lat. is 45° 51′ = 45° $\frac{5}{6}$, proceed thus. The departures to 100 in the columns of 45° and 46° are 70,7 and 71,9; the diff. is 1,2; $\frac{5}{6}$ part thereof is 1,0; which added to 70,7 makes 71,7 for the dep. to 100; and for 700 it will be 501,9. Alſo the departures to 86 in the columns of 45° and 46° are 60,8 and 61,9; $\frac{5}{6}$ of their diff. is 0,9; and this with 60,8 makes 61,7 the departure to 86; and the whole departure = 563,6.

Now take $\frac{1}{20}$ of the diff. of lat. 858, and of the dep. 564, viz. 42,9 and 28,2; theſe will be found together under 33° 15′ for the courſe; and between 51 and 52 diſt. Suppoſe 51½; which taken 20 times gives 1030 for the diſtance.

By Mercator's ſailing.

Lat. Cape Clear, 51° 18′ } Merid. Parts, 3597, Diff. Lat. 858 m.
Lat. St. Mary's, 37° } —— 2393, Diff. Long. 786 m.
Merid. Diff. Lat. 1204.

By conſtruction. Draw the meridian A B (*fig.* 46.) and deſcribe the quadrant A *m p*; make A D = 858 the proper diff. lat. and A B = 1204, the meridional diff. lat. draw D C, B E parallel to A *p*; make B E = 786 the diff. long. and draw A E. Then A is the place of Cape Clear, C that of St. Mary's, A C is the diſtance, C D the departure, and the angle D A C is the courſe.

Computation by meridional parts. For the courſe: M : L :: R : T, i. e. 3,08063 (log. of 1204) : 2,89542 (log. of 786) :: 10,00000 : 9,81479 the tangent of 33° 8′ the courſe. For the diſtance: ſine of C : A D :: R : A C, i. e. 9,92293 (coſ. courſe) : 2,93349 (log. of 858) :: 10,00000 : 3,01056 the log. of 1024 the diſtance.

Computation by logarithmic tangents.

Cape Clear's Lat. 51° 18′ Co-lat. 38° 42′ ½ Co-lat. 19° 21′.
St. Mary's lat. 37° 0′ Co-lat. 53° 0′ ½ Co-lat. 26° 30′.
Log. Tang. of ½ Co-lat. 26° 30′ = 9,69774
— — — — — 19° 21′ = 9,54552
Diff. = 1522,2 = G.

For the courſe: G : N :: L : T, i. e. 3,18240 (log. of 1522) : 10,10151 (log. tang. of 51° 38′ 9″) :: 2,89542 (log. of 786) : 9,81452 tang. of 33° 7′ the courſe. The diſtance will be the ſame as in the former computation; for the difference of near a minute in the courſe would not happen in working by tables containing more places.

By the traverſe table. Seek the merid. diff. lat. and diff. long. together, like diff. lat. and departure, and the courſe is given among the degrees. Then with the courſe and proper diff. lat. find the diſtance. Thus, taking $\frac{1}{20}$ of 1204 and 786, viz. 60,2 and 39,3; they will be found together under 33° 15′ for the courſe. And taking $\frac{1}{20}$ of the diff. lat. 858, viz. 42,9, and the courſe 33° 15′, we ſhall have about 51½ for the diſtance, which taken 20 times gives 1030 the diſtance.

Sailing *circular*, or *great circle*, is the art of finding what places a ſhip muſt go through and what courſes to ſteer, ſo that her tract ſhall be in the arc of a great circle, or nearly ſo, paſſing through the place ſailed from and that bound to. This method of ſailing has been propoſed, becauſe the ſhorteſt diſtance between two places on the ſphere is an arc of a great circle intercepted between them, and not the ſpiral or rhumb paſſing through them, unleſs that rhumb coincides with a great circle, which can only be on a meridian or on the equator. As the ſolutions of the caſes in Mercator's *ſailing* are performed by plane triangles, in this method of *ſailing* they are reſolved by the means of ſpheric triangles. A great variety of caſes might be here propoſed, but thoſe that are the moſt uſeful and moſt commonly recur pertain to the following problem.

Problem I. Given the latitudes and longitudes of two places on the earth, required their neareſt diſtance on the ſurface, together with the angles of poſition from either place to the other. This problem comprehends ſix caſes.

Caſe 1. When the 2 places lie under the ſame meridian; their difference of latitude will give their diſtance, and the poſition of one from the other will be directly north and ſouth.

Caſe 2. When the 2 places lie under the equator; their diſtance is equal to their difference of longitude, and the angle of poſition is a right angle, or the courſe from one to the other is due eaſt or weſt.

Caſe 3. When both places are in the ſame parallel of latitude. E. g. What is the leaſt diſtance between St. Mary's, in lat. 37° 0′ N. long. 22° 56′ W. and Cape Henry, lat. 37° and long. 76° 23′ W.?

Let P E S Q (*fig.* 47.) repreſent the meridian of St. Mary's, E Q the equator, P S the axis, P the north pole, and S the ſouth pole, and from P to A lay off the complement of the latitude of St. Mary's. From Q to C on the equator lay off the difference of longitude between the two places; and through P, C, S, deſcribe the circle P C S, which will be the meridian of Cape Henry, on which, from P to B, lay its co-latitude, by deſcribing the arc A *a*, about the pole P, at the diſtance of the co-latitude. Through the points A, B, D, deſcribe a great circle A B D. Then A repreſents St. Mary's, B Cape Henry, P A and P B their co-latitudes, the angle A P B, meaſured by the arc Q C, their difference of longitude; the arc A B their neareſt diſtance; the angle P A B the angle of poſition from A to B, and the angle P B A that of poſition from B to A. As the places have the ſame latitude, P A = P B, and P A B = P B A; and if the arc P I be deſcribed, making the angle A P I = 26° 43½′ = half the difference of longitude = I P B, P I will be perpendicular to A B, and biſect it. And in the triangle A I P, right-angled at I, we ſhall have the hypothenuſe A P = 53° and A P I = 26° 43½′, whence we can find the leg A I = half the diſtance ſought, and the angle P A I = the angle of poſition.

For the diſtance: rad. : ſin. hyp. P A :: ſine of A P I : ſine of A I, i. e. 10,00000 : 9,90235 (coſ. of 37°) :: 9,65292 (ſine of 26° 43½′) : 9,55527 ſine of 21° 3′ half the diſtance, which doubled gives 42° 6′ the whole diſtance A B: and this reduced to nautical miles is 2526, which is 35 miles leſs than 2561, the diſtance given by *parallel* SAILING.

For the angle of poſition: rad. : coſ. P A :: tang. A P I : cotang. A, i. e. 10,00000 : 9,77946 (coſ. of co-lat. or ſin. lat. 37°) :: 9,76199 (tang. 26° 43½′) : 9,48145 cotang. of 73° 9′, the angle of poſition. Conſequently to ſail from A to B, or from B to A, the ſhip muſt firſt ſteer N. 73° 9′ W. or E. and then gradually increaſe her courſe till ſhe comes to I, where it will be due W. or E.; and from thence the courſe is to be gradually diminiſhed again till ſhe comes to the other port, where it will be 73° 9′, the ſame as ſhe ſet out with. How theſe courſes are to be altered will be ſhewn in Prob. II.

Caſe 4. When one place has latitude, and the other is under the equator: e. gr. what is the neareſt diſtance between the iſland of St. Thomas in lat. 0° 0′, and long. 1° 0′ E. and port St. Julian, in lat. 48° 51′ S. and long. 65° 10′ W.?

Let A (*fig.* 48.) repreſent St. Thomas, A C the meaſure of the angle A S C = 66° 10′ = diff. of long. about the ſouth pole S, at the diſtance of St. Julian's co-lat. deſcribe the arc *a a*, interſecting S C P, the meridian of St. Julian in B, and through A, B, E deſcribe a great circle;

circle; and AB is the diſtance ſought; and the angles of poſition are at A and B.

For the diſtance: in the triangle ACB, rad. : coſ. of either leg AC : : coſ. of the other CB : coſ. hyp. AB, i. e. 10,00000 : 9,60646 (coſ. of 66° 10′) : : 9,81825 (coſ. of 48° 51′ = diff. of lat.) : 9,42471, the coſ. of 74° 35′, the diſtance required; which is 4475 miles, leſs by 57 miles than the diſtance found by *Mercator's* SAILING.

For the angle of poſition at A : rad. : ſin. AC : : cotang. CB : cotang. A, i. e. 10,00000 : 9,96129 (ſin. 66° 10′) : : 9,94146 (cotang. 48° 51′) : 9,90275, cotang. of 51° 22′, the angle at A.

For the angle at B : rad. : ſin. CB : : cotang. AC : cotang. B, i. e. 10.00000 : 9.87679 (ſin. 48° 51′) : : 9,64517 (cotang. 66° 10′) : 9,52196, cotang. of 71° 36′, the angle at B. Hence it appears, that a ſhip ſailing from the iſland of St. Thomas muſt firſt ſhape her courſe S. 51° 22′ W. and then by conſtantly altering her courſe towards the weſt, ſo as to arrive at port St. Julian, on a courſe S. 71° 36′ W. ſhe will have ſailed the ſhorteſt diſtance between thoſe places.

Caſe 5. When the latitudes of the given places are both north, or both ſouth: e. gr. what is the neareſt diſtance between the Lizard and the iſland of Bermudas, and alſo the angles of poſition at each place?

Lat. Lizard 49° 57′ N. and long. 5° 14′ W.
Lat. Bermudas 32° 25′ N. and long. 66° 38′ W.

Diff. long. 61° 24′.

Make PA (*fig.* 49.) = 57° 35′, the co-lat. of Bermudas; P*a* = 40° 3′, the co-lat. of the Lizard; and with the tangent of P*a* deſcribe the arc *a a*. With the ſecant of 61° 24′ arcs, deſcribed from P and S, give the centre of the circle PCS, the meridian of the Lizard, and its interſection with *a a* gives B, the place of the Lizard: the intercepted arc AB of the great circle deſcribed through A, B, and D, is the diſtance ſought, and the angles PAB, PBA, are the poſitions ſought.

For the diſtance: in the triangle APB, rad. : coſ. APB : : tang. PA : to tang. of a fourth arc M : i. e. 10,00000 : 9,68006 (coſ. 61° 24′) : : 10,19721 (tang. 57° 35′) : 9,87727, tang. of 37° 1′ = M, which, taken from the co-lat. of the Lizard, = 40° 3′, leaves a fifth arc 3° 2′ = N : then coſ. M : coſ. N : : coſ. of ſide firſt uſed, PA : coſ. ſide required AB : i. e. 9,90225 (coſ. 37° 1′) : 9,99939 (coſ. 3° 2′) : : 9,72922 (coſ. co-lat. or ſin. lat. 32° 25′) : 9,82636, coſ. 47° 54′, the required diſtance.

For the angle PBA : as this angle is oppoſite to the ſide uſed in the firſt proportion, therefore the fourth and fifth arcs here uſed, are the ſame as above : ſin. N : ſin. M : : tang. APB : tang. PBA, i. e. 8,72359 (ſin. 3° 2′) : 9,77963 (ſine of 37° 1′) : : 10,26343 (tang. of 61° 24′) : 11,31947, tang. of 87° 15′ = PBA.

For the angle PAB : ſin. PA : ſin. PBA : : ſin. BP : ſin. PAB, i. e. 9,92643 (ſin. 57° 35′) : 9,99950 (ſin. 87° 15′) : : 9,80852 (ſin. 43° 3′) : 9,88159, ſin. of 49° 35′ = PAB.

Hence, the ſhorteſt diſtance between the Lizard and Bermudas is 47° 54′ = 2874 ſea miles, leſs by 178 miles than the diſtance found by Mercator's ſailing. And a ſhip muſt ſail from the Lizard S. 87° 15′ W. and gradually leſſen the courſe, ſo as to arrive at Bermudas on the rhumb bearing S. 49° 35′ W.; whereas the direct courſe from one to the other as found by Mercator's ſailing, is S. 69° 2′ W.

Caſe 6. When one of the given places has north latitude, and the other ſouth latitude; e. gr. what is the neareſt diſtance from the iſland of St. Helena to the iſland of Bermudas; and alſo the angles of poſition at each place?

Bermudas lat. 32° 25′ N. and long. 66° 38′ W.
St. Helena lat. 16° 0′ S. and long. 6° 15′ W.

Diff. long. 60° 23′

Make QA (*fig.* 50.) = 16°, the lat. of St. Helena; with the tang. of P*a* = 57° 35′, the co-lat. of Bermudas, deſcribe the arc *a a* about P; arcs deſcribed from P, S, with the ſecant of 60° 23′, will give the centre of the circle PCS, the meridian of Bermudas, and its interſection B with *a a*, is the place of Bermudas. Deſcribe a great circle through A, B, D, and the intercepted arc AB is the diſtance ſought, and the angles PAB, ABP, are the poſitions required.

For the diſtance AB : in the triangle ABP, rad. : coſ. P : : tang. PB : tang. of 4th arc M : i. e. 10,00000 : 9,69390 (coſ. 60° 23′) : : 10,19721 (tang. 57° 35′) : 9,89111, tang. of 37° 54′, which taken from 106° = St. Helena's N. polar diſtance, leaves a fifth arc = 68° 6′ = N. Then coſ. M : coſ. N : : coſ. PB : coſ. AB, i. e. 9,89712 (coſ. 37° 54′) : 9,57169 (coſ. 68° 6′) : : 9,72922 (ſin. 57° 35′) : 9,40379, coſ. of 75° 19′, the diſtance ſought.

For the angle of poſition PAB : ſin. N : ſine M : : tang. P : tang. A, i. e. 9,96747 (ſin. 68° 6′) : 9,78837 (ſin. 37° 54′) : : 10,24530 (tang. 60° 23′) : 10,06620, tang. of 49° 20′ = the angle PAB.

For the angle ABP : rad. : coſ. P : : tang. PA : tang. M, i. e. 10,00000 : 9,69390 (coſ. 60° 23′) : : 10,54250 (tang. 106°) : 10,23640, tang. of 59° 53′; but this fourth arc muſt be like PA, or obtuſe, and, therefore, the ſupplement of 59° 53′, or 120° 7′, is the fourth arc M; and the difference between this and PB is 62° 32′ for N, or the 5th arc. And ſin. N : ſin. M : : tang. P : tang. ABP, i. e. 9,94806 (ſin. 62° 32′) : 9,93702 (ſin. 120° 7′) : : 10,24530 (tang. 60° 23′) : 10,23426 tang. of 59° 45′ : therefore, as the angle ABP ought to be obtuſe, it is the ſupplement of 59° 45′ = 120° 15′. A ſhip, in order to ſail from St. Helena to Bermudas, on the arc of a great circle, muſt firſt ſhape her courſe N. 49° 20′ W. and gradually deflect from the north, ſo as to arrive at Bermudas on a courſe N. 59° 45′ W. after having run 75° 19′ or 4519 ſea miles. The courſe by Mercator's *ſailing* is N. 50° 5′ W. and the diſtance 4527 miles.— Whence it appears, that when the places are one in N. lat. and the other in S. lat. there is but a ſmall difference between the reſults found by Mercator's and great circle *ſailing*; for near the equator the rhumb lines do not much differ from great circles.

From the ſolutions of the preceding caſes it appears, that to ſail on the arc of a great circle, the ſhip muſt continually alter her courſe; but as this is a difficulty too great to be admitted into the practice of navigation, it has been thought ſufficiently exact to effect this buſineſs by a kind of approximation, that is, by a method which nearly approaches to the *ſailing* on a great circle: upon this principle, that in ſmall arcs, the difference between the arc and its chord or tangent is ſo ſmall, that they may be taken for one another in any nautical operations: and, accordingly, it is ſuppoſed, that the great circles on the earth are made up of ſhort right lines, each of which is a ſegment of a rhumb line.

On this ſuppoſition the ſolution of the following problem is deduced.

Problem II. Having the latitudes and longitudes of the places ſailed from and bound to, given; to find the ſucceſſive latitudes on the arc of a great circle in thoſe places where the alteration in longitude ſhall be a given quantity; together with the courſes and diſtances between thoſe places.

1. Find the angle of poſition at each place, and their diſtance by one of the preceding caſes. 2. Find the greateſt latitude the great circle runs through, i. e. find the perpendicular from the pole to that circle; and alſo find the ſeveral angles at the pole, made by the given alterations of longitude between this perpendicular and the ſucceſſive meridians come to. 3. With this perpendicular and the polar angles ſeverally find as many correſponding latitudes, by ſaying, as rad. : tang. greateſt lat. : : coſ. 1ſt polar angle : tang. 1ſt lat. and : : coſ. 2d polar angle : tang. of 2d lat. &c. 4. Having the ſeveral latitudes paſſed through, and the difference of longitude between each, find, by Mercator's *ſailing*, the courſes and diſtances between thoſe latitudes. And theſe are the ſeveral courſes and diſtances the ſhip muſt run, to keep nearly on the arc of a great circle. The ſmaller the alterations in longitude are taken, the nearer will this method approach the truth; but it is ſufficient to compute to every five degrees of difference of longitude; the length of an arc of five degrees, differing from its chord, or tangent, only by 0,0002.

As an example of this method of ſolution; a ſhip, being bound from the iſland of St. Mary to Cape Henry, propoſes to ſail as near the arc of a great circle as ſhe can by altering her courſe at every 5 degrees difference of longitude. Required the latitude at each time of altering the courſe, and alſo the courſes and diſtances between thoſe ſeveral latitudes?

Let the figure be deſcribed, and the computation made, as in Caſe 3, of Prob. 1; the diſtance BA (*fig.* 51.) is found to be 42° 6′, and the ∠ A or ∠ B = 73° 9′, the angle of poſition. The triangle APB being iſoſceles, the perpendicular PI falls in the middle of AB; and the latitudes, courſes and diſtances being known in running the half BI, thoſe in the half IA will alſo be known. Let the points *a*, *b*, *c*, *d*, &c. be the places come to on each alteration of 5 degrees longitude; then will the arcs P*a*, P*b*, P*c*, P*d*, &c. be the reſpective co-latitudes of thoſe places, and they are the hypothenuſes of the right-angled ſpheric triangles PI*a*, PI*b*, PI*c*, PI*d*, &c. In the triangle PIB, given PB = 53°, PBI = 73° 9′, to find PI, rad. : ſin. PB : : ſin. B : ſin. PI, i. e. 10,00000 : 9,90235 (ſin. of 53°) : : 9,98094 (ſin. 73° 9′) : 9,88329 ſine of 49° 51′ = PI. Now IPB = $\frac{53° 27′}{2}$ = 26° 43½′;

IP*a* = 21° 43½′; IP*b* = 16° 43½′; IP*c* = 11° 43½′; IP*d* = 6° 43½′: and theſe are the ſeveral polar angles.

Then

	21° 43½′	16° 43½′	11° 43½′	6° 43½′
Then rad. —— ——	10,00000	10,00000	10,00000	10,00000
Toco-tang PI=49° 51′	9,92612	9,92612	9,92612	9,92612
So coſine polar angle	9,96800	9,98123	9,99084	9,99700
To tang. lat. ——	9,89412	9,90735	9,91696	9,92312
Which are	38° 5′	38° 56′	39° 33′	39° 57′

The degrees and minutes ſet over each column are the polar angles uſed in that proportion, and the correſponding latitudes ſtand at bottom.

Hence it appears the ſhip muſt firſt ſail from the lat. 37° 0′ N. to lat. 38° 5′ N. thence to lat. 38° 56 N. thence to lat. 39° 33′; thence to lat. 39° 57′ N. thence to lat. 40° 9′ N. which is the greateſt latitude ſhe muſt go to; and from thence ſhe muſt proceed through the latitudes 39° 57′, 39° 33′, 38° 56′, 38° 5′, and ſo to 37° 0′, the parallel ſhe ſet out from, and in which ſhe is to find Cape Henry. Now between theſe ſeveral latitudes, with the reſpective differences of longitude, find, by Mercator's *ſailing*, the courſes and diſtances. If the reſult of the ſeveral operations, in the queſtions of great circle *ſailing*, be entered in ſuch a table as the following, it will be found convenient to the operator.

Polar Angles.			Succeſſ. Longs.		Succeſſ. Lats.		Diff. Long.	Diff. Lat.	Merid. Parts.	Merid. D. Lat.	Cour.	Diſt.
∠ I P B	26°	43½′	22°	56′	37°	00′	300	65	2392,6	82,0	74,43	246,6
∠ I P *a*	21	43½	27	56	38	05	300	51	2474,6	65,2	77,44	240,0
∠ I P *b*	16	43½	32	56	38	56	300	37	2539,8	47,8	80,57	235,2
∠ I P *c*	11	43½	37	56	39	33	300	24	2587,6	31,2	84,04	232,2
∠ I P *d*	6	43½	42	56	39	57	403,5	12	2618,8	15,7	87,46	207,9
			49	39½	40	09			2634,5			
												1261,9

The column of diſtances being ſummed up amounts to 1261,9, which being doubled gives 2523,8 miles for the diſtance between St. Mary and Cape Henry; differing from the diſtance found in a great circle (*Caſe* 3. *Prob.* 1.) by 2,2 ſea miles. And the courſes the ſhip muſt ſteer are, firſt, N. 74° 43′ W. then N. 77° 44′ W. &c. on the courſes in the table, and to run the diſtances 246,6, &c. miles correſponding to them.

The track of a ſhip, when directed nearly in the arc of a great circle, may be delineated on the Mercator's chart, by marking on it, by the help of the latitudes and longitudes, the ſucceſſive places where the ſhip is to alter her courſe; then thoſe places or points being joined by right lines will ſhew the path along which the ſhip is to ſail, under the propoſed circumſtances. See, on the ſubject of theſe articles, Robertſon's Elements of Navigation, vol. ii. paſſim.

SAILING, in a *more confined ſenſe*, is the art of conducting a veſſel from place to place, by the working or handling of her ſails and rudder: though what is done by means of this latter, is more properly called *ſteering*.

To bring *ſailing* to certain rules, M. Renau computes the force of the water, againſt the ſhip's rudder, ſtem, and ſide; and that of the wind againſt her ſails. In order to this, he 1. conſiders all fluid bodies, as the air, water, &c. as compoſed of little particles, which when they act upon, or move againſt, any ſurface, do all move parallel to one another, or ſtrike againſt the ſurface after the ſame manner. 2. That the motion of any body, with regard to the ſurface on which it is to ſtrike, muſt be either perpendicular, parallel, or oblique. In the firſt caſe, the body ſtrikes with all its force, which will be greater or leſs, according as the body moves ſwifter or ſlower. In the ſecond caſe, the line of motion *a b* (*Tab.* II. *Navigation, fig.* 52.) will not affect the ſurface at all, becauſe it is no way oppoſed to it; nor can the moving body ſtrike upon it, or touch it. In the third, if the line of motion, A D, be oblique to the ſurface, D C, ſo that the angle of the incidence be A D C, then the motion of the body in the line A D may be reſolved into two directions, viz. into A E, or B D, and into A B. But the direction or line of motion, A E, being parallel to the ſurface, D C, cannot affect it at all; ſo that the whole motion of the body, A, in that oblique manner of ſtriking on the ſurface, will be expounded by the perpendicular line, A B. And if D A be made the radius of a circle, whoſe centre is at D, B A will be the ſine of the angle of incidence, A D C.

Hence it is deduced, that the force of a particle of air, or water, as A, ſtriking againſt the ſurface, D C, which may repreſent, either a ſail, or the rudder of a ſhip, in the oblique direction, A D, will be to the perpendicular force thereof, as B A is to D A; that is, as the ſine of the angle of incidence is to the radius.

And ſince what is thus true of one particle, ſingly conſidered, will be true of all the particles of any fluid body collectively; it will follow, that the force of the air or water, ſtriking perpendicularly upon a ſail or rudder, to the force of the ſame, in any oblique impingency, will be as the ſquare of the radius to the ſquare of the ſine of the angle of incidence: and conſequently, that all oblique forces of the wind againſt the ſails, or of the water againſt the rudder, will be to one another as the ſquares of the ſines of the angles of incidence.

If the different degrees of velocities be conſidered, it will be found, that the forces will then be as the ſquares of the velocities of the moving air or water; that is, a wind that blows thrice as ſtrong, or moves thrice as ſwift, as another, will have nine times the force upon the ſail. And it being alſo indifferent, whether you conſider the motion of a ſolid in a fluid, whoſe particles are at reſt; or of thoſe particles moving all parallel againſt a ſolid that is at reſt; the reciprocal impreſſions being always the ſame; if a ſolid be moved with different velocities in the ſame fluid matter (as ſuppoſe water), the different reſiſtances which it will receive from that water, will be in the ſame proportion as the ſquares of the velocities of that body.

Let H M (*fig.* 53.) repreſent a ſhip, C D the poſition of the ſail, and A B the courſe of the wind blowing towards B. Draw B G perpendicular to the ſail, and G K perpendicular to the line of the keel produced H M K. By what is ſaid above, the ſail, C D, will be driven by the wind, A B, according to the direction of the line B G. So that if ſhe could divide the water every way with the ſame facility, as ſhe doth with her head, the ſhip would go directly to the point, G, along the line, B G. And if H K repreſent her direct courſe, ſhe ſhould have got forward the length, B K, and ſideways ſhe would have gone the quantity, G K. But as her length is much greater than her breadth, ſo ſhe will divide the water, or make her way in it with more difficulty with her ſide, than with her head or ſtern; on which account, ſhe ſhall not run ſideways ſo far as K G, but will fall ſhort of it in proportion to the ſaid difficulty of dividing the water with her ſide, that is, if the reſiſtance ſhe finds in her paſſing through the water ſideways, be to that of paſſing lengthways, ſuppoſe, as ten to one, then will not the ſhip get ſideways above a tenth part of the line G K. Wherefore, if K G be found to G L in the ratio of the reſiſtance of the ſide to that of the ſtern, and the line B L be drawn; the ſhip will go to the point, L, along the line B L, in the ſame time as it would have gone to G, if it could have divided the water every way equally. This part, K L, is called the *drift*, or *lee-way* of a ſhip, and the angle, K B L, is her degrees of lee-way; as the angle, A B K, expreſſes how near the wind ſhe lies.

After this, the author proceeds to demonſtrate, that the beſt poſition or ſituation of a ſhip, ſo as ſhe may make the leaſt lee-way, but go windward as much as poſſible, is this: that, let the ſail have what ſituation it will, the ſhip be always in a line biſecting the complement of the wind's angle of incidence upon the ſail; that is, ſuppoſing the ſail in the poſition, B C (*fig.* 54.), the wind blowing from A to B, and, conſequently, the angle of the wind's incidence on the ſail A B C, and its complement C B E: then muſt the ſhip be put in the poſition B K, or move in the line B K, biſecting the angle C B E.

He ſhews farther, that the angle which the ſail ought to make with the wind, i. e. the angle, A B C, ought to be but 24 degrees; that being the moſt advantageous ſituation to go to windward, the moſt that is poſſible. And in order to bring this to bear in practice, he directs to put marks to the ſheets, braces, and bow-lines of the lower ſails, to know when they are in their beſt ſituation; and then, even in the night, when the marks of a brace, or of a ſheet, ſhall come to the cleat, one may be pretty well aſſured, that the ſail trims well.

To this might be added, many curious things from Borelli de Vi Percuſſionis, concerning the different directions given to a veſſel from the rudder, when *ſailing* with a wind, or floating without ſails in a current: in the former caſe, the head of the ſhip always coming to the rudder, and in the latter always flying off from it.

In order to illuſtrate, by examples, the various modes of *ſailing*,

ſailing, as they depend on the different degrees and ſituations of the wind, with regard to the courſe of the veſſel, the plan of a number of ſhips proceeding on various courſes is repreſented *Tab.* II. *Navigation, fig.* 55, which exhibits the 32 points of the compaſs, of which C is the centre; the direction of the wind, which is northerly, being expreſſed by the arrow.

It has been obſerved, in the article CLOSE-HAULED, that a ſhip in that ſituation will ſail nearly within ſix points of the wind. Thus the ſhips B and *y* are cloſe-hauled, the former being on the larboard tack, ſteering E. N. E. and the latter on the ſtarboard tack, *ſailing* W. N. W. with their yards, *a b*, braced obliquely, as ſuitable to that manner of *ſailing*. The line of battle, on the larboard tack, would accordingly be expreſſed by C B, and on the ſtarboard by C *y*.

When a ſhip is neither cloſe-hauled, nor ſteering afore the wind, ſhe is in general ſaid to be *ſailing* large. The relation of the wind to her courſe is preciſely determined by the number of points between the latter and the courſe cloſe-hauled. Thus the ſhips *c* and *x* have the wind one point large, the former ſteering E. by N. and the latter W. by N. The yards remain almoſt in the ſame poſition as in B and *y*: the bowlines and ſheets of the ſails being only a little ſlackened.

The ſhips *d* and *u* have the wind two points large, the one ſteering E. and the other W. In this manner of *ſailing*, however, the wind is more particularly ſaid to be upon the beam, *perpendiculaire du vent*, as being at right angles with the keel, and coinciding with the poſition of the ſhip's beams. The yards are now more acroſs the ſhip, and the bowlines are caſt off, and the ſheets more relaxed; ſo that the effort of the wind being applied nearer to the line of the ſhip's courſe, her velocity is greatly augmented.

In *e* and *t* the ſhips have the wind three points large, or one point abaft the beam, the courſe of the former being E. by S. and that of the latter W. by S. The ſheets are ſtill more flowing; the angle which the yards make with the keel farther diminiſhed; and the courſe accelerated in proportion.

The ſhips *f* and *ſ*, the firſt of which ſteers E. S. E. and the ſecond W. S. W. have the wind four points large, or two points abaft the beam. In *g* and *r* the wind is five points large, or three points abaft the beam, the former *ſailing* S. E. by E. and the latter S. W. by W. In both theſe ſituations the ſheets are ſtill farther ſlackened, and the yards laid yet more athwart the ſhip's length, in proportion as the wind approaches the quarter.

The ſhips *h* and *q*, ſteering S. E. and S. W. have the wind ſix points large, or more properly on the quarter; which is conſidered as the moſt favourable manner of *ſailing*, becauſe all the ſails co-operate to increaſe the ſhip's velocity: whereas, when the wind is right aft, as in the ſhip *m*, it is evident, that the wind, in its paſſage to the foremoſt ſails, will be intercepted by thoſe which are farther aft. When the wind is on the quarter, the fore-tack is brought to the cat-head; and the main-tack being caſt off, the weather-clue of the main-ſail is hoiſted up to the yard, in order to let the wind paſs freely to the fore-ſail; and the yards are diſpoſed ſo as to make an angle of about two points, or nearly 22°, with the keel.

The ſhips *i* and *p*, of which the former ſails S. E. by S. and the latter S. W. by S. are ſaid to have the wind three points on the larboard or ſtarboard quarter: and thoſe expreſſed by *k* and *o*, two points; as ſteering S. S. E. and S. S. W. in both which poſitions the yards make nearly an angle of 16°, or about a point and a half, with the ſhip's length.

When the wind is one point on the quarter, as in the ſhips *l* and *n*, whoſe courſes are S. by E. and S. by W. the ſituation of the yards and ſails is very little different from the laſt mentioned; the angle which they make with the keel being ſomewhat leſs than a point, and the ſtay-ſails being rendered of very little ſervice. The ſhip *m* ſails right afore the wind, or with the wind right aft. In this poſition the yards are laid at right angles with the ſhip's length: the ſtay-ſails, being entirely uſeleſs, are hauled down: and the main-ſail is drawn up in the brails, that the fore-ſail may operate; a meaſure which conſiderably facilitates the ſteerage, or effort of the helm. As the wind is then intercepted, by the main-top-ſail and main-top-gallant-ſail, in its paſſage to the fore-top-ſail and fore-top-gallant-ſail, theſe latter are by conſequence entirely becalmed, and might therefore be furled, to prevent their being fretted by flapping againſt the maſt, but that their effort contributes greatly to prevent the ſhip from broaching-to, when ſhe deviates from her courſe to the right or left thereof.

Thus all the different methods of *ſailing* may be divided into four, viz. cloſe-hauled, large, quartering, and afore the wind; all which relate to the direction of the wind to the ſhip's courſe, and the arrangement of the ſails.—See DRIFT and LEEWAY.

SAILING, *order of*, denotes the general diſpoſition of a fleet of ſhips, when proceeding on a voyage or expedition.—See FLEET.

SAILOR, a perſon trained in the exerciſe of fixing the machinery of a ſhip, and managing her, either at ſea, or in a road or harbour. See MARINER.

SAIL-YARD. See YARD.

SAINT CUTHBERT's BEADS, an Engliſh name for the TROCHITÆ and ENTROCHI, found in great abundance in the clay of Yorkſhire, and ſome other counties with us. They are truly the remains of parts of the arms of the *ſtella arboreſcens*, or branching *ſtar-fiſh*; but have been ſo far miſtaken, by authors, as to be ſuppoſed a ſort of rock-plants, or the parts of ſome unknown vegetable petrified.

SAINTFOIN, *onobrychis*, in *Botany*. Its characters are theſe: the empalement of the flower is permanent, cut into five parts at the top; the flower is of the butterfly kind; the ſtandard is oblong, reflexed, and indented at the top; the wings are oblong and erect; the keel is compreſſed, broad at the end, and bifid at the baſe; it has ten angular ſtamina, nine joined, and one ſeparate, and a narrow compreſſed germen, ſupporting an awl-ſhaped ſtyle, crowned by a ſingle ſtigma; the germen afterward becomes a compreſſed roundiſh pod, which opens with two valves, incloſing one kidney-ſhaped ſeed. There are four ſpecies. Miller.

Linnæus has joined this to the genus of HEDYSARUM.

The common *ſaintfoin* is a plant frequently uſed for the food of cattle, either freſh or dried; it is called *ſaint-foin*, i. e. *holy hay*, or *wholeſome hay*, from its excellent nutritive quality. The ſtalks of the plant are commonly about two feet long, but they grow ſometimes to five or ſix feet, and it has tufts of red flowers of three, four, or five inches in length, which are ſucceeded by roundiſh, compreſſed, prickly pods, each having one kidney-ſhaped ſeed. It flowers in June, and the ſeeds are ripe in September; but the roots continue many years. There are two or three varieties of this, which differ only in the colour of their flowers.

This plant will make a forty times greater increaſe in poor ground than the common turf; and this is owing to its having a long perpendicular root of that kind, called *tap-roots*, which ſinks to a great depth to attract its nouriſhment. This root is frequently drawn out of the ground to the length of twelve or fourteen feet, but it is ſaid to be often thirty feet or more in length.

The farmers have a general opinion, that this plant never ſucceeds well in any land, where there is not an under ſtratum of ſtone, chalk, or ſome other hard matter, to ſtop its running; but that otherwiſe it ſpends itſelf in root, and comes to nothing above ground. This, according to Mr. Tull, is a groſs error; becauſe it is certain, that the roots being to plants what the ſtomach and guts are to animals, the more and larger roots any plant has, the more nouriſhment it receives, and the better it thrives.

Saintfoin always ſucceeds where its roots run deep, and the beſt crops of all are produced upon lands where there is no hard inferior ſoil to obſtruct their paſſage. An inferior ſoil of clay may kill the plants, by retaining the water, and chilling and rotting their roots.

The long root of *ſaint-foin* has, near the ſurface, many horizontal roots iſſuing from it, which extend themſelves every way; there are of the ſame kind all the way down, as the roots go, but they become ſhorter and ſhorter all the way. Any dry land may be made to produce this valuable and uſeful plant, though it be ever ſo poor; but the richeſt and beſt land will produce the fineſt crops of it. In the iſle of Thanet, *ſaintfoin* thrives beſt on a thin coat of earth, with a chalky bottom; and it is obſerved, in general, that it will grow in any ſoil, except ſuch as is clayey, very damp and low; and that though the crop is in proportion to the goodneſs of the land, yet that which grows on poor land is reckoned moſt nouriſhing for cattle. The beſt way of ſowing it is by drilling; but the earth muſt be very well prepared, and the ſeed well ordered, or elſe very little of it will grow. The heads of theſe ſeeds are ſo large, and their necks ſo weak, that if they be much more than half an inch deep, they are not able to riſe through the incumbent mould; and if they are not covered they will be malted, as the farmers expreſs it; that is, they will ſend out their roots while they lie above ground, and be killed by the air; and whether the farmer plants bad ſeed that will not grow, or good ſeed that is buried or malted, the event will be the ſame; the ground will be underſtocked with plants. A buſhel

bushel of seed to an acre of land is full twenty seeds to each square foot of land; but as there is some difference in the largeness of the seeds, there is no absolute certainty as to this calculation. The worst seasons for planting it are the beginning of winter, and the drought of summer; the best is the beginning of the spring; and it is always strongest when planted alone, and is not sown together with corn, as is the practice of some farmers. If barley, oats, or any other corn, sown with the *saint-foin*, happen to be lodged afterwards, it kills the young *saint-foin*. If it be planted with any other corn, it is best done by drilling in the horsehoeing way; in this case it is not much liable to be killed by the lodging of the corn, as the drilled corn seldom falls at all, and when it does, never falls so low as the sown corn.

The quantity of seed to be drilled upon an acre of land will depend wholly upon the goodness of it; for there is some seed of which not one in ten will strike, whereas in good seed not one in twenty will fail. The method of knowing the goodness is, by sowing a certain number of the seeds, and seeing how many plants are produced by them. The external signs of the seed being good, are, that the husk is of a bright colour, and the kernel plump, of a light grey or blue colour, and sometimes of a shining black. The seed may be good, though the husk be black, as that is sometimes owing to the letting it receive the wet in the field, not to its being half rotted in the heap.

If the kernel be cut across, and appear greenish and fresh, it is a certain sign that it is good. If it be of a yellowish colour, and friable, and look thin and pitted, they are bad signs. The quantity of seeds allowed to the acre in the drill way, is much less than that by sowing, and is to be computed according to the number of plants that are to be allowed in that space, allowing for the common casualties. It is not necessary to be exact in this calculation, or to say whether two, three, or four hundred plants, are to be allowed to a square perch; neither is it possible to know before-hand the precise number of plants that may live out of those that come up; for sometimes the grub takes them when they have only the two first leaves, and the crop is greatly diminished by this means. Four gallons of good seed to an acre of land will cover the land with plants when judiciously managed.

Single plants of *saintfoin* make the greatest crops; but the farmers, in general, plant them so close, that they starve one another. The single plants always run the deepest, and those which do so will always draw most nourishment.

The farmer who expects to make a profit of this plant, must not expect a good crop the first year. Nothing is so injurious to *saintfoin* as its standing too thick; if it be sown so thick as to cover the ground the first summer, the plants will starve one another for ever after; but if the owner will be content to place them so thinly as to have but a small crop the first year, they will increase prodigiously, and every succeeding crop will be better and better. When *saintfoin* is well hoed, it will grow as much in a fortnight as it would otherwise do in six weeks; and this quick growing is of advantage to it every way, not only making the plants larger, but of better nourishment to the cattle, whether they are eaten green, or made into hay.

The proper distance to drill this plant for the horsehoeing husbandry is at double rows, with eight inches partitions between them, and thirty inch intervals between every two and two. These intervals need only be hoed alternately, leaving every other interval for making the hay on. This method of hoeing is of vast advantage, and poor land by means of it will always produce two crops in a year. For hand-hoeing, the rows should be drilled sixteen inches asunder, and the single plants set at eight inches apart in the rows. When *saintfoin* is drilled without any intention of hoeing, the best way is to plant single rows at eight inches distance, with no greater quantity of seed than when the rows are at sixteen inches distance. The land is always to be perfectly cleared of grass before the sowing of the *saintfoin*, and the lumps of earth carefully broken. But no harrowing is to be allowed after it is drilled, for that would bury it; and it is not proper to roll it at all, unless for the sake of barley, when they are sown together; and when that is done, it should be with a light roller, and in dry weather. This should be done lengthwise of the rows, and as soon as it is drilled; if it be not done at this time, it is best to stay three weeks before it is done, that the necks of the young *saintfoin* may not be broken. One acre of drilled *saint-foin*, considering the difference of the quantity and goodness of the crop, is worth two acres of sown *saintfoin* on the same land, though the expence of drilling be twenty times less than that of sowing.

No cattle are to be suffered to come in the first winter upon the *saintfoin*, after the corn is cut, among which it was sown. Their feet would injure it by treading the ground hard, as much as their mouths by cropping it, and it would never come to good. Sheep should not be suffered to come at it even the following summer and winter. The first winter is the time to lay on manure after the corn is reaped off. Peat-ashes, or the like, are very proper, and a small quantity of them will do, as there are at this time no other plants to partake of the benefit, but the young crop has it all; and the young plants being thus made strong at first, will continue so, and be long the better for it.

It is observed, however, that in the drilling and horsehoeing way there is no necessity for any manure at all. Some farmers sow eight or ten bushels of the seed of *saintfoin* to an acre along with their corn, with intent that it should kill all the other weeds; but the consequence is, that the plants stand close and starve one another, and are no bigger than where the plant grows wild on the hills in Calabria, where it is so small and seemingly despicable a plant, that it seems a wonder that any body could be tempted to think of cultivating it; yet, when rightly managed, it seems capable of being as useful a plant as any in the world. Where these plants stand so thick they draw out all the nourishment from the ground in a few first years, and soon die, though manured ever so carefully. Six or seven years seem to be their greatest duration; whereas, when the seed is drilled in, and the plants are horsehoed, they will be as strong and vigorous as ever, at thirty years standing.

Saintfoin succeeds best also in high grounds, which is a great advantage in the article of making it into hay, as it has greatly more advantage of the sun, and is less liable to mischief from wet, than grass which grows in low grounds. On the high grounds the wind will dry more in an hour than it will in meadows that lie low in a whole day; and often the crops of *saintfoin* make very good hay in the same seasons in which all the grass hay is utterly spoiled. The sun, on the high grounds, has also a more benign influence, and sends off the dew there two hours earlier in the morning, and holds it up as much longer in the evening; by these advantages the *saintfoin* has more time to dry, and is made with half the expence of common hay.

All kinds of hay differ greatly in their goodness, according to the manner in which they are made; but the hay of *saintfoin* differs more than all.

There are properly four kinds of the *saintfoin* hay, differing according to the times of cutting them. These are, first, the virgin hay; secondly, the blossomed hay; thirdly, the full grown hay; and, fourthly, the thrashed hay. The first of these, or virgin hay of *saintfoin*, is the best of all, and, excepting lucerne, has not its equal in the world. The *saintfoin* for this hay must be cut before it begins to blossom; for when it stands till full blown, the most volatile, spirituous and nutritive parts of its juice are spent on the generation; and this being done at once, the sap is greatly depauperated, and the plant can never afterwards recover the strength, vigour, and nutritive qualities, it had at that time. The exact time of cutting this is, when a few of the blossoms, which are forwarder than the rest, are beginning to look red. *Saint-foin* cut in this state, even though the weather prove bad, may be made up in small ricks, and a chaff basket drawn in the middle of each; this easy care will prevent it from firing; and though the colour be a little altered, it will be as good and nourishing as if made at the most favourable season. Working stone-horses have been kept fat the whole winter on this hay alone without corn; and they are so fond of it, that they will refuse beans and oats mixed with chaff in the common way for it.

Sheep will also be fattened in pens in winter with only this hay and water, better than with pease, oats, and the like; and if the hay be weighed to them, and the whole expence and profit computed, the clear profit will be found to amount to four pounds a ton. These creatures make no waste in this way of feeding, but eat up every morsel of the stalks, though ever so thick, for they are always brittle, and are as well tasted as the rest. It is also esteemed one of the best sorts of food for other cattle; it yields much milk; and since its introduction into this country has occasioned an increase in the number of our dairy-farms.

The blossom hay is very beautiful to the eye, and of a very sweet smell, but it does not fatten the sheep as the virgin hay does, nor can working horses be kept fat upon this without an admixture of some corn.

The land ought to be well tilled for the virgin hay; for if it stand on a poor land, without much culture, it will not be above four or five inches long before it flowers, and

and will therefore yield but a poor quantity, and will ſpring up again but very ſlowly for another crop; but when on good land and well tilled, it will yield at this time two or three tons to an acre, and will ſpring up immediately very ſtrong for a ſecond crop. However, though ſome cut two crops of this hay in a year, the latter crop is ſeldom of much value; and as this practice weakens the roots, it is not recommended. After the firſt crop is removed, the roots will ſoon ſhoot again, and be fit for feeding.

This virgin hay is ſeldom ſold; it being worth a much greater price than the common, and being uſually kept by the farmer for his own uſe.

Beſide the advantage the farmer makes of this plant, as well for hay as for the feeding his cattle, there is a conſiderable profit to be made by ſelling the ſeed of it when properly managed.

The owner of a land of *ſaintfoin* has three chances for the making his hay; ſince this may be done either when it is in the leaf, or in the bloom, or when full grown. If the weather ſhould prove unfavourable all this time, he may ſtill reſerve the crop for ſeed, and for thraſhed hay, to his no ſmall advantage. The ordinary crop of ſeed from one acre is ſufficient to plant a hundred acres in the way of horſehoeing huſbandry; but as this is not yet univerſally practiſed, there is a ſufficient demand for what ſeed a few who practiſe it can ſpare.

But beſide the uſe of *ſaintfoin* ſeed in ſowing for new crops, it is alſo an excellent provender for horſes; and thoſe, in general, who have tried it, affirm, that one buſhel of it will go as far as a buſhel and a quarter of oats. When this ſeed is well cured it is extremely ſweet, and all ſorts of cattle are fond of it: hogs will eat it, and be fattened very well by it. But the goodneſs of the ſeed, and of the remaining hay, out of which it is thraſhed, depends very much upon the manner of the managing them. When the thraſhed hay has been kept dry, it is found to be better food for horſes than common graſs hay; and when cut ſmall with an engine it is found as good as chaff for any cattle. It requires ſome ſkill to know the time at which the *ſaintfoin* ſhould be cut for ſeed. The ſeeds never ripen all at once. The flowers grow in ſpikes, and begin opening at the bottom, from thence gradually opening to the top. It will require ſeveral days before the whole ſucceſſion of flowers are blown, and the ſeed ripens in the ſame manner, ſo that the lower part of the ear has ripe ſeeds many days before the top; and, in conſequence, if the farmer ſtays till the top ſeeds are quite ripe, the lower ones will be all ſhed and loſt.

The moſt proper time to cut it is when the greateſt part of the ſeed is ripe, the top part beginning to be full, and the bottom full ripe. The kernel or ſeed is bluiſh, and the huſk browniſh when ripe. The ſeeds and huſks are green for ſome time after the flowers are fallen, and it is better to cut the plant while it is in this ſtate, than to let it ſtand too long; for the ſeeds will ripen and become bluiſh after cutting, which will be much better than the letting them be loſt by waiting till they ripen upon the ſtalks in bad weather.

The *ſaintfoin* for ſeed muſt never be cut in the heat of the day, for then it will dry too faſt as it falls, and much of the ſeed will be loſt. It is beſt for the mowers to begin at day-break, and to leave off as ſoon as the ſun has any power, going to work again in the cool of the evening. If the plant be dry at the time of cutting, it may be immediately made up into little cocks; but if not, it muſt be made hay of, only obſerving never to turn it while the ſun is hot upon it: unleſs there happen rain, it is ſcarce neceſſary to turn the ſwarths at all; and when this is done, it muſt be done very carefully, that the ears be not ſhaken.

There are two ways of thraſhing this plant; the one on the field, the other in the barn. The firſt can only be done in very fine weather, and while the ſun ſhines warmly upon the field. The middle of the day is the only time for this, and the method is to ſpread a large ſheet, and peg it down at the corners, and in this thraſh the plants from the cocks by ſmall parcels at a time. The ſtraw is to be ſeparated from the ſeed, and made up into ricks; and this is good food for horſes and other cattle, and the ſeed, &c. is to be collected, and afterwards winnowed, to ſeparate the chaff.

If the ſeed have been wetted in the time of thraſhing, or lying in the ear, it may be put up immediately; but if it have been thraſhed and winnowed dry, it will ferment and ſpoil if laid together too ſoon. The common way of managing is by ſpreading it in a malt-houſe, or on a barn floor; but in ſpite of this it will often heat and ſpoil; the beſt way of all is to ſpread a layer of ſtraw, and on this ſprinkle a layer of the ſeeds; then cover theſe with another layer of ſtraw, and this with more ſeeds, and ſo on, till the heap is raiſed ſix or ſeven feet high. The ſeed will thus be kept cool, and in ſpring it may be eaſily ſeparated from the ſtraw, and will be as freſh as if juſt thraſhed; if this be ſown, not one ſeed in twenty will fail of coming up. When the weather is not fine enough to give opportunity to the thraſhing the *ſaintfoin* in the field, it muſt be very carefully carried into the barn with ſheets at the bottom of the carts, otherwiſe a great quantity of the ſeed will be loſt in the way. Tull's Huſbandry, chap. xii. p. 90.

SAINTS, *ſancti*, in the Romiſh church, holy perſons deceaſed, and, ſince their deceaſe, canonized by the pope, after ſeveral informations and ceremonies.

One of the points wherein the Roman catholics and proteſtants differ, is, that the former addreſs, invoke, and ſupplicate *ſaints*, &c. to intercede for them; whereas the latter hold it ſufficient to propoſe their good examples for our imitation.

Cardinal Bellarmine, and other popiſh writers, have pleaded, that by praying to the *ſaints*, they only intend to expreſs a deſire of their interceſſion, and that their invocation of the *ſaints* terminates ultimately in God. Accordingly they have diſtinguiſhed two ſorts of worſhip, one called *latria*, appropriate to God, and another *dulia*, which, being of an inferior nature, is paid to angels and *ſaints*. However, many of their own writers have exploded this diſtinction, and others have owned that it is unſcriptural. There is another ſort of worſhip, which is of a higher degree than that paid to *ſaints* in common, and which is peculiar to the Virgin Mary: this they call *hyperdulia*.

After all, thoſe who read their books of devotion, their *Hours*, their *Offices*, their *Roſaries*, their *Breviaries*, and their *Miſſals*, will find many direct addreſſes to the *ſaints*, which are very different from thoſe prayers whoſe object is merely to ſupplicate their interceſſion. Beſides, the council of Trent, ſeſſ. 25. directs to apply to the *ſaints* for their help and aſſiſtance, as well as their prayers; and condemns all who think, that it is not good and profitable to offer prayers to *ſaints*, as chargeable with impious ſentiments. And the creed of pope Pius IV. expreſly inſiſts upon it as an article of faith, that the *ſaints* reigning together with Chriſt are to be invocated. As to the antiquity of this practice, the council of Trent, ſeſſ. 25. ſpeaks of it as the uſage of the apoſtolic and catholic church from the beginning of Chriſtianity. As to the doctrine of the interceſſion of *ſaints* and angels, there is not the leaſt intimation of it in the writings of the two firſt centuries; though it muſt be allowed to have been introduced in the next century, and that Origen and Cyprian expreſly favour this ſuperſtition. The worſhip of *ſaints* and angels is of a much later date; eſpecially as a ſtanding generally received doctrine of the church. For though Athanaſius was for worſhipping the *ſaints*, yet Cyril, who lived in the next century, ſays, we neither call the holy martyrs gods, nor are we uſed to worſhip them. St. Auſtin affirms, that neither *ſaints* nor angels will be worſhipped. Archbiſhop Uſher ſays, that as to the firſt four hundred years after Chriſt, for nine parts of that time, not one true teſtimony can be produced out of any father in favour of this doctrine; and cardinal Perron, Richlieu, and other learned writers among the Romaniſts, own, that the invocation of *ſaints* was not practiſed for the three firſt centuries. The firſt ſymptoms of this worſhip did not appear till towards the end of the fourth century, and it ſeems to have ſprung out of the regard which the Chriſtians at that time manifeſted to the memory of the martyrs. See Relics. They frequented their tombs, and erected altars there, praying to God, and engaging themſelves to a ſtrict imitation of the virtues and piety of the departed martyrs; by degrees this veneration degenerated into praiſes and eulogiums of the *ſaints* themſelves, in which they uſed ſome apoſtrophes and rhetorical addreſſes; whence proceeded a ſuperſtitious regard to them, and, at length, a direct invocation and worſhip of them. Nor does it appear, that any public prayers to *ſaints* were eſtabliſhed till A. D. 788, by the ſecond council of Nice; and this council was condemned by another held at Francfort, A. D. 794; and the invocation of *ſaints* was likewiſe condemned by a former council held at Conſtantinople, A. D. 755, conſiſting of three hundred and eighty-eight biſhops. In the ſeventh century, Gregory expreſly ſays, that angels refuſed to be worſhipped ſince the appearance of Chriſt. See Popery.

In order to convey ſome idea of the extravagance to which veneration for reputed *ſaints* hath arrived in the Romiſh church, we ſhall only mention one inſtance out of many that might be alledged. It is well known that there were three altars in the cathedral church of Canterbury, one erected to the honour of Chriſt, another to the

the Virgin Mary, and a third to St. Thomas à Becket; and the offerings at his shrine amounted to about 1000*l*. when those to the Virgin did not amount to 5*l*. and those to Christ were nothing; and Rapin informs us, that in one year, viz. A. D. 1420, there were no less than fifty thousand foreigners who came in pilgrimages to pay their homage at this tomb.

The number of *saints*, allowed as such, in the Romish church, is prodigious. Father Papebroche reckons seventeen or eighteen hundred to have died on the first of June, only. Indeed the croud of *saints*, wherewith their martyrologies are stocked, is scandalous, even to the more sober of their own communion. Father Mabillon, in an express dissertation on the worship of unknown *saints*, observes, that honours are given to *saints*, who, perhaps, were not Christians, and whose very names were never known. Hence, being under a necessity of giving them names, they are therefore called *baptised saints*. He adds, that they every day beseech *saints* to intercede for them with God, when it is much doubted whether they themselves be in heaven.

Father Papebroche and his associates have been a long time employed in writing the lives and acts of the *saints*; they range them each on the day of the year wherein they died: for the first six months they have published twenty-four volumes in folio; and since Papebroche's death, in 1714, his successors have published more.

SAKER, the name formerly used for a small sort of cannon, whereof there were three species; *extraordinary*, *ordinary*, and *least sized*.

SAKER *extraordinary*, was about four inches diameter at the bore, 1800 pounds weight, 10 feet long; its load 5 pounds, shot 3 inches and half diameter, and something more than 7 pound and a quarter weight; its level range was estimated at 163 paces.

SAKER *ordinary* was a size less, 3 inches 3 quarters bore, 9 feet long, 1500 weight; its charge, 4 pounds of powder; bullet's diameter 3 inches and a half; weight, 6 pounds; its level range was 160 paces.

SAKER *of the least size* was 3 inches and a half diameter at the bore, 1400 pounds weight, 8 feet long, its load near 3 pounds and a half; shot 4 pounds 3 quarters weight, and 3 inches and a quarter diameter. See CANNON and GUN.

SAKER, in the *Manege*, the same with DOCK.

SAKER, in *Ornithology*. See SACRE.

SAKRADAWENDRA is the name of one of the Ceylonese deities, who commands and governs all the rest, and formerly answered the prayers of his worshippers; but according to the fabulous account which is given of him, the golden chair, on which he sat, and the foot of which was made of wax, that was softened by their prayers and tears, and sunk downward, so that he could take notice of their requests and relieve them, being disposed of among the poor, they no longer derive any benefit from him, or pay him any reverence. Phil. Trans. abr. vol. v. part ii. p. 182. See BUDUN.

SAL, *salt*. See SALT.

SAL *alkalinus*. See ALKALY.

SAL *armoniac*, or rather AMMONIAC *salt*, in *Natural History* and *Chemistry*. See *Sal* AMMONIAC, under which article the reader will find a brief account of the nature and properties of this salt, and the method of preparing it.

Our chemists have divers ways of preparing a *sal ammoniac*, in imitation of this. The common way is by putting one part of common salt to five of urine; to which some add half that quantity of soot; the whole being put in a vessel, they raise from it, by sublimation, a white, friable, farinaceous substance, which they call *sal ammoniac*.

The *sal ammoniac* of the moderns may be easily prepared in the following manner: take four ounces of common volatile *salt* of ox-bone, saturate it with strong spirit of sea salt, and evaporate the superfluous moisture, upon which there will be found a cake of true *sal ammoniac* left behind.

Our own volcanos, or subterraneous fires, which we have in the coal countries, afford us *sal ammoniac*. It is found sticking to the sides of the openings of these volcanos, in considerable thick crusts, under other crusts of sublimed sulphur. There is no fossile *salt* in these places, nor any thing else, that can form *sal ammoniac* in the common way we suppose it to be found in; but it appears truly that it proceeds only from the coal that feeds these fires. It is certain, that *sal ammoniac* is sometimes found on brick kilns, where nothing but coals and common brick clay are burnt; and as no one would suspect it of being contained in the brick clay, there is here only the coal to afford it. The common coal slate of those countries also contains alum, sulphur, and *sal ammoniac*; for alum may be drawn from it by the common operations; and when it is burnt, as it frequently is there for hardening the coal ways, both brimstone and *sal ammoniac* are found in the heaps in several places.

The *sal ammoniac* found in the openings of the burning mountains, particularly mount Ætna, is evidently the same in all respects with ours; and even this also may, for aught we know, be formed of coals, of which the inaccessible bowels of that mountain may contain great stores; though none have been found rising near enough to the surface to be dug for use. Other bitumens also may possibly afford this *salt* on burning as well as coal, and it is not to be doubted but many such are to be found in the earth thereabouts. The *salt* on the sides of the mouths of mount Ætna is found in large and thick cakes, and in dry weather may be collected in vast quantities, and possibly a great part of what the Venetians sell in other parts of Europe may be from these places. Either this *salt*, or that of our own volcanos, may be used in all the processes of chemistry, with the same success as other *sal ammoniac*. It is of itself grey and coarse; but on mixing it with lime, and wetting them, a volatile spirit is raised; and on subliming a mixture of it with pot-ash, a dry and white volatile *salt* is obtained. If some spirit of wine be added to the mixture of *sal ammoniac* and pot-ash, more of the volatile *salt* will be produced than any other way. Phil. Trans. N° 130. See ÆTNA *salt*.

We are well assured that this *salt* is a concrete, the acid of which is that of sea *salt*, and its alkali, a volatile urinous one; both of which are found in dung, burnt and raised into soot.

If there is occasion to separate the acid of sea *salt* from *sal ammoniac*, there need only be used the common vitriolic acid, which being well known to be stronger than that of sea *salt*, it divests that acid of its alkali by its superior power, and it becomes the basis of a new concrete *salt* with this acid, while the acid of sea *salt*, now freed and separated, may be drawn off pure by distillation.

If, on the other hand, it were required to draw from *sal ammoniac* its volatile alkali, the substances to be employed to this purpose are such alkalies as act upon the acid of the sea *salt*, absorbing and retaining it; the volatile alkali becomes freed, and rises with a very small heat. This alkali, thus raised, appears in two different forms, the one a liquid, which is called spirit of *sal ammoniac*, the other a dry one, which is called the sublimed *salt* of *sal ammoniac*; and though these are sometimes obtained separate, yet in some operations they are in part of the one and in part of the other kind. This is well explained by Mr. du Hamel in his course of experiments on this substance. Mem. Acad. Scien. Par. 1735. See *Properties of sal* AMMONIAC.

The spirit and *salt* of *sal ammoniac* being the same matter in a dry and a liquid form; it is evident, that the liquid must of the two be most striking to the nose, because the particles of the *salt* are more easily disunited from this latter union; and the *salt*, in a dry form, is so very volatile, that it entirely evaporates when laid on a hot iron, however fixed the matter may have been, which it originally carried up with it. It appears very plain from this, that the union between this volatile body, and the particles of more fixed ones, which it carries up with it in sublimation, and which are proper to give it the form of a dry concrete, is so intimate, that it will bear very severe trials and remain unaltered, and, indeed, that it is scarce possible at all to decompose it.

It is no indifferent matter what the additions are with which *sal ammoniac* is distilled; they must, by no means, be either such as contain a nitrous, or a vitriolic acid; the former of these meeting with the fatty and sulphureous part of the *sal ammoniac*, may cause a detonation, and burst the vessels; and the other, which is yet much more dangerous, might disengage a portion of the sea *salt*, which would again mix with the volatile part with which it has now no business to be allied, and with the fatty matter it might form a very disagreeably scented sulphur. Bole contains a vitriolic acid, and is therefore to be rejected. Gypsum mixed with it gives a smoaking liquor, whose odour is insupportable, and chalk and common pot-ashes are the best of all additions.

The *sal ammoniac*, which is prepared chiefly in Egypt, is brought to us, sometimes in conical loaves, but most commonly in large round cakes, convex on one side, and concave on the other; appearing, when broken, of a needled texture, or composed of striæ, running transversly and parallel to one another; the internal part is generally pure, and of an almost transparent whiteness; the outside for the most part foul, and of a yellowish grey, or blackish hue. It is purified, either by sublimation, with a gradual fire, in an earthen cucurbit, having a blind head adapted to it; or perhaps more perfectly, by solution in water, filtration and crystallization. It dissolves

diſſolves, in temperately warm weather, in about thrice its weight of water, and by the aſſiſtance of heat in a much ſmaller quantity, and cryſtallizes into long ſhining ſpicula, or thin fibrous plates, like feathers. This ſalt has a very ſharp, penetrating taſte. It is a powerful attenuant and deobſtruent; the liberal and continued uſe of it, according to Boerhaave, renders the blood ſo thin as to burſt through the veſſels, particularly thoſe of the lungs and the urinary organs. In doſes of half a drachm, or a drachm, diſſolved in water, if the patient is kept warm, it generally proves ſudorific; by moderate exerciſe, or walking in the open air, its action is determined to the kidneys; in larger doſes it looſens the belly.

The firſt who gave *ſal ammoniac* internally was Platerus; but its uſe in fevers was not then known; he only uſing it in aſthmas. In ſucceeding times it became known as a febrifuge. It is frequently uſed in this intention in Germany and Holland, and with great ſucceſs. The common doſe to a grown perſon is one drachm; the largeſt doſe, in caſes of the moſt robuſt conſtitutions, is two drachms. A perſon of eleven or twelve years old may take two ſcruples, and an infant of a year old may take fourteen grains. Its chief virtue is in intermittent fevers, in which it may be thus given. Let the doſe of *ſal ammoniac*, proportioned to the age and ſtrength of the patient, be diſſolved in an ounce of common water, or of any diſtilled water; and let the patient take it half an hour before the time that the fit is to come on. This is to be repeated in the ſame manner, before every fit, till the diſtemper is removed.

Though the great uſe of this medicine be in intermitting fevers, it is not, however, adapted only to thoſe, but may be of uſe in fevers of other kinds. The ſame doſe may be taken every five or ſix hours, drinking a baſon of ſage-tea after it. It very frequently ſucceeds ſo well, that one doſe of it carries off the diſeaſe, ſo that it never returns again; but if the firſt doſe does not ſucceed in this manner, a few others will. Two, three, or four doſes, almoſt always prove ſufficient. This medicine has no viſible effect upon the body, more than the ſudden removal of the ſickneſs; for it neither operates by vomit, nor by ſtool, nor by ſweat: its effect ſeems to be owing to the correcting and altering of the matter of the diſeaſe, not the evacuating it out of the body.

The bark is ſuperior to this *ſalt* in the cures of quartan agues, and indeed in other caſes it is more certain in the ſtopping a ſecond fit; but there is another advantage in this, which the bark greatly wants; this is the preventing relapſes. Theſe are very frequent after cures in the common way, but are ſcarce ever found to follow in caſes when this *ſalt* has been uſed.

Another advantage of this medicine is the ſmall quantity of the doſe, and the few doſes that are neceſſary to be taken for a cure; whereas every one knows how many large doſes of the bark are neceſſary, and that often at ſuch ſmall diſtances of time, in caſes, that it is often difficult to perſuade the patient to be cured at the expence of ſo nauſeous a load of medicines. Act. Erudit. 1717.

Dr. Lewis obſerves, that in many caſes, as an aperient, it is an excellent aſſiſtant to the bark, where that aſtringent drug would by itſelf produce dangerous obſtructions, or aggravate thoſe already formed. This ſalt is employed likewiſe externally as an antiſeptic, and in lotions and fomentations for œdomatous tumors; as alſo in gargariſms, for inflammations of the tonſils, and for attenuating and diſſolving thick mucus in the mouth and fauces. Saturated ſolutions of it are ſaid to conſume warts. See *Sal* AMMONIAC.

There are various preparations of this ſalt in the modern pharmacy; as,

SAL *ammoniac, ſublimate of*, is of like virtue as the purified.

SAL *ammoniac, volatile.* See *Volatile Sal* AMMONIAC.

SAL *ammoniac, flowers of*, made of *ſal ammoniac*, with ſea-ſalt decrepitated. See FLOWERS *of ſal ammoniac.*

The virtues are much the ſame as of the ſublimed *ſal ammoniac.*

Sometimes, inſtead of the ſea-ſalt, iron or ſteel is uſed; which makes what they call *martial flowers of ſal ammoniac*, of a very penetrating and deobſtruent nature, and recommended in all kinds of obſtructions, cachexies, jaundice, dropſies, &c.

SAL *ammoniac, ſpirit of.* Of this we have various kinds, which derive different denominations and properties from the different additional ingredients the ſalt is diſtilled with: as, *ſpirit of ſal ammoniac with tartar*; with *quick-lime*; with *amber*; with *ſteel* or *iron*; *ſweet* ſpirit of *ſal ammoniac*; *acid* ſpirit of *ſal ammoniac*; *diuretic* ſpirit of *ſal ammoniac*, &c. See AMMONIAC.

SAL *Ægypti*, in *Natural Hiſtory*, a name given by Hippocrates, and many other of the old writers, to the NATRUM of the ancients, called alſo *nitrum* by ſome, though very different from our nitre. It had the name *natrum* from *Natrium*, or *Nitrium*, the name of a city of Egypt; and therefore this, as well as the name uſed by Hippocrates, ſtood for Egyptian ſalt. See NATRON.

SAL *aquarum*, in *Natural Hiſtory*, a name given by many of the ancient writers to the nitre of the ancients, or NATRON.

They had this ſalt principally from Egypt, and called it in their works the produce of the evaporated waters of the Nile; for this reaſon Hippocrates ſometimes calls it *ſal Ægypti*, and ſometimes *ſal in aquis creſcens, a ſalt growing in the water.*

SAL *catharticus amarus*, the bitter purging ſalt, commonly called EPSOM *ſalt*, which was firſt made by Dr. Grew by evaporating Epſom waters.

This ſalt is compoſed of the vitriolic acid and magneſia; diſtinguiſhable from that whoſe baſis is an alkali, by ſolutions of it being turned milky, and depoſiting their earth, on the addition of any alkaline ſalt. For a full doſe, eight or ten drachms of this ſalt may be diſſolved in a proper quantity of common water, or four or five drachms in a pint or quart of the purging waters; to which may be added a little tincture of cardamom ſeeds, or ſome other grateful aromatic. Theſe liquors, in ſmaller doſes, paſs farther into the habit, promote the ſecretions in general, and prove excellent aperients in ſundry chronical diſorders.

SAL *catharticus Glauberi.* See SAL *mirabile.*

SAL *circulatum*, in *Chemiſtry*, a term uſed by Paracelſus for a preparation of ſea ſalt, of which he diſtinguiſhes two kinds, under the name of the *circulatum minus* and *circulatum majus.* Theſe ſeem to have a great affinity with the famous alkaheſt, or univerſal ſolvent, ſo much talked of in the works of this author, and his ſucceſſor Van Helmont. Many ridiculous properties were attributed to it. See ALKAHEST.

SAL *communis.* See SALT.

SAL *de duobus.* See ARCANUM *duplicatum*, and *Vitriolated* TARTAR.

SAL *decrepitatum.* See *Common* SALT.

SAL *diureticus*, a form of medicine, of the nature of the *terra foliata tartari*, introduced into practice by the late college diſpenſatory. The method of preparing it is this: take of any alkaline fixed ſalt a pound, boil it in four or five pints of diſtilled vinegar, in a gentle heat. When the fermentation is over, pour on more diſtilled vinegar; and when the fermentation ariſing from this addition is over, pour on ſtill more, and proceed thus till the moiſture being nearly all evaporated, freſh vinegar being added will excite no more fermentation: this generally happens when about ten quarts have been uſed; then evaporate to a drineſs; the ſalt will be impure, and muſt be melted for a ſmall time, with a gentle heat, afterwards diſſolved in water, and filtered; if the melting has been rightly performed, the ſtrained liquor will be pellucid as water; then evaporate this in a gentle heat to a drineſs, and you will have a very white ſalt, ſoluble either in water or ſpirit of wine. This, as well as the regenerated TARTAR, are given in doſes of ten or twenty grains, as mild aperients; and to a dram or two as purgatives and diuretics.

SAL *enixus.* See ENIXUM *ſal.*

SAL *gemmæ.* See *Foſſile* SALT.

SAL *Jamblici.* See JAMBLICI *ſal.*

SAL *lucidum*, in *Natural Hiſtory*, a name given by ſome to NITRE. Others uſe the phraſe to expreſs the nitre of the ancients, that is, the NATRON.

SAL *marinus.* See SALT.

SAL *marinus*, in *Ichthyography*, the name of a truttaceous fiſh of the umbla kind, and very much approaching to that ſpecies called the REUTELE; and by ſome ſuſpected not to be eſſentially different from that ſpecies. It is a very ſcarce fiſh, and is extremely valued for the table, but is never caught in any plenty, never keeping in ſhoals as many other fiſh, but living ſingly. It loves clear ſtony rivers of a ſharp current, and feeds on ſmall fiſh. Its moſt frequent ſize is of about a pound weight, and it very rarely exceeds twice that. Its tail and fins are very red; its ſides and belly reddiſh, and its back of a ſort of orange-colour or reddiſh yellow, having ſome yellow ſpots; its ſcales are moderately large, and do not eaſily fall off on rubbing.

The *ſal marinus* is diſtinguiſhed by Artedi by the name of the forked-tail ſalmon, with a yellowiſh back, and with yellow ſpots.

SAL *marinus regeneratus*, in *Chemiſtry*, the name given to a ſea ſalt, produced by adding a fixed vegetable alkali to marine acid, or the acid ſpirit of ſalt drawn by diſtillation. The proceſs is thus: dilute four ounces of oil of tartar, with three times its weight of fair water; put this mixture into a tall glaſs body, and heat it, and drop into it any of the kinds of ſpirit of ſea ſalt, whether Glau-

Glauber's, or that prepared with bole; shake the vessel now and then, and continue to drop in the acid till the alkaline liquor is sated, and there rises no more effervescence; filter the liquor, and evaporate to a pellicle, and set it by to crystallize, and there will be procured crystals of perfect sea salt, in all things agreeing with common salt.

This salt has been denominated the febrifugal salt of Sylvius; though it does not seem to deserve the name. However, in proper doses, it may as a purgative and antiseptic, contribute to the cure of some fevers; qualities which it possesses in common with other neutral salts. But it is not now employed.

SAL *martis*, *salt of iron*, a chemical preparation, which is made as follows: mix together a quart of water and eight ounces of oil of vitriol; pour the oil of vitriol in by a little at a time; and having put this mixture into a glass vessel, add to it filings of iron, four ounces. When the ebullition is over, evaporate the liquor to a pellicle, and set it to shoot; there will be found a green vitriol or salt in fair crystals, which dry for use.

This salt is one of the most powerful preparations of iron; it opens obstructions of all kinds, and strengthens the viscera; it is an excellent medicine in cachexies, obstructions of the spleen and liver, and in suppressions of the menses; it is also found good against worms.

The best manner of giving it is in solution, half an ounce in a quart of water, four ounces of which are a dose; and if drank in the manner of the natural chalybeat waters, it will be found to exceed most of them in its good effects. See IRON, in *Medicine*.

SAL *microcosmicus*. See PHOSPHORUS and URINE, and *Fusible* SALT, &c.

SAL *mirabile*, or *Glauber's salt*, is composed of the vitriolic acid of the mineral alkali NATRON. It is usually prepared by adding to sea salt equal or half its weight of oil of vitriol, diluted with water, distilling off the marine acid, and dissolving and crystallizing the residuum. Though this be a well known preparation, and the result of a mixture of a vitriolic acid with marine salt, and the world has supposed it could be no other way found than by such an union made by art; yet Mr. Hellot has communicated to the Academy of Sciences of Paris, an account of its being found in vitriol alone, without the addition of any foreign matter.

The common green vitriol or copperas is well known to be made in England, by an union of the sulphureous acid of the common pyrites, and iron. Old iron is thrown into large quantities of a solution of the pyrites, that it may be dissolved, and the union produces a concrete in the form of a regular salt. This salt, we well know, contains a sulphureous matter; whether that be obtained from the pyrites, or from the iron that enters its composition; since, in the distillation of its oil, there ever escapes a very strong and penetrating scent of sulphur through the junctures of the vessels.

Mr. Lemery has shewn, that after a moderate distillation of green vitriol, a salt of the nature of alum may be drawn by a lixivium from the colcothar; and beside this, Mr. Hellot has found in that colcothar a vitrifiable earth, and a genuine *Glauber's salt*. Mem. de l'Acad. Scien. Par. 1738.

Glauber's salt may be obtained from borax, by mixing oil of vitriol with it. Mix four ounces of borax with one ounce and one drachm of oil of vitriol; upon sublimation, this gives the *sal sedativum* of Homberg, and the residuum, exposed to a strong fire, affords *Glauber's salt*. This operation may be shortened very much; for instead of sublimation, the *salt* may be obtained by crystallization, in light foliated laminæ. This *salt*, whether prepared by sublimation, or by crystallization, has the property of dissolving in spirit of wine; and if this spirit of wine be set on fire, the flame is green. Spirit of wine has no effect on borax, and the oil of vitriol digested with it does not make its flame green; therefore it is necessary, in order to give this greenness to the flame, that borax should be united to an acid. Phil. Trans. N° 436. p. 89.

And, in general, *Glauber's salt* may be obtained from all vitriolic salts with earthy or metallic bases, by decomposing them with soda; and also by burning sulphur with common salt or soda.

Sal mirabile may likewise be obtained by the following process: powder calcined kelp in an iron mortar, put it into a glazed earthen pan, and pour upon it boiling water, in the proportion of a quart to a pound; stir it about, and either filtrate or decant the clear liquor from the sediment; put this liquor into a glazed earthen dish, and having heated it over a gentle fire, pour in gradually oil of vitriol, diluted (viz. to every pound of oil allowing a pint and a half of water) till no effervescence arises; and having thus gained the exact point of saturation, filtrate through paper, or let it stand to depurate, and decant the clear liquor; evaporate it to a pellicle, and set it by to crystallize. By the above process, eight ounces and a half of the salt have been procured from a pound and a half of kelp; and somewhat less than two ounces of the oil of vitriol was found sufficient for the saturation. Mr. Fergus, who describes this process, observes, that it may be also had from barilla instead of kelp, but not so cheap.

Glauber's *sal mirabile* was long thought to be the produce of art only; but of late years, a natural *salt*, perfectly similar to Glauber's, has been found in many places. We have a full account, by Mr. Boulduc, of a substance of this kind, which had been found near Grenoble in Dauphiné. The same gentleman also found a *sal mirabile* in the waters of Passy. The true Epsom *salt*, described by Dr. Grew in 1696, is also either the same as Glauber's, or at least Glauber's is the principal part of it. Stahl afterwards found a true *Glauber's salt* in the acidulæ, or ferruginous waters, and did not scruple placing this among the natural mineral salts. Hoffman also found a spring of very bitter and purgative mineral water, a pound of which contained two drachms of this salt. The cathartic salt, found near Madrid, is also of the same nature; and it may be observed in general, that though it differs from Epsom salt, it is contained in sea-water, and many mineral waters. See Hist. de l'Acad. Par. 1727. p. 29, 30. and the Memoires of the same year, 4to. p. 375.

It is to be observed, that though Glauber made his *salt* known about the middle of the preceding century, yet Kunckel, in his Laborat. Chymic. assures us, it was known in the electoral house of Saxony a hundred years before. However this be, we owe the knowledge of it to Glauber, who called it *admirable*; and it soon acquired, and has ever since maintained, the reputation of an excellent internal medicine in many cases. Its medicinal qualities are nearly the same with those of the SAL *catharticus amarus*, which frequently supplies its place in the shops.

SAL *muriaticus calcareus*, is a combination of the marine acid with calcareous earths, which forms a very pungent saline compound, that assumes with difficulty a crystalline form, deliquiates in the air, dissolves not only in water but in rectified spirit of wine, and changes the colours of blue flowers of vegetables to a green. This salt is contained, in considerable quantity, in sea water, and remains fluid after the crystallization of its other saline matters; and it is found also in many common waters, to which, like the calcareous nitre, it communicates a greater or less degree of hardness and indisposition to putrefy, according to its quantity. It is much more antiseptic than the perfect marine salt, and is said to be diuretic and lithontriptic. The medicine commonly sold as a lithontriptic, under the name of *liquid-shell*, appears to be no other than a combination of this kind, consisting of calcined shells dissolved in marine acid. These combinations have been chiefly prepared, by mixing the calcareous earth with sal ammoniac, and urging the mixture with a gradual fire, till the volatile alkali of the sal ammoniac is either dissipated in the air, or collected by distillation, and only its acid left incorporated with the earth; and so much of the earth as is satiated with the acid, may be separated from the rest by elixation with water. Lewis.

SAL *nitrium*. See NATRON.

SAL *petræ*, or *nitri*. See SALT-*petre*, and NITRE.

SAL *polychrest of Seignette*, a soluble tartar made with *sal kali*, instead of salt of tartar. Mr. Boulduc describes this salt in the Mem. Acad. Scienc. 1731. See RUPELLENSIS *sal*.

SAL *prunellæ*. See PRUNELLÆ, and CRYSTAL *mineral*.

SAL *Rupellensis*. See RUPELLENSIS *sal*.

SAL *sedativus of Homberg*. This used to be made by dissolving borax in water, into which oil of vitriol was poured, and then distilling this mixture, quieting salt was obtained. Mr. Geoffroy has lately taught us an easier way of preparing it; he evaporates the liquor to the proper consistence, and then allows it to crystallize. See *Sedative* SALT.

SAL *tartari*. See TARTAR.

SAL *vegetabilis*, is obtained by dissolving vegetable alkali in boiling water, in the proportion of a pound to a gallon, and then adding refined tartar, till a fresh addition occasions no farther effervescence; the liquor is then filtered while hot, and either crystallized or evaporated to dryness.

SAL *volatile oleosum* is the name of an aromatic volatile liquor, first prepared by Sylvius de la Boe, and found a very notable medicine, chiefly, as a cephalic, and cordial.

It is made thus: to an ounce of volatile salt of sal ammoniac, distilled with salt of tartar, and dulcified with spirit of wine, put a drachm and a half of some aroma-

tic oil, or eſſence, drawn from ſome generous aromatic vegetable; as cinnabar, cloves, roſemary, baum, &c. and when the ſpirit and oil are well ſtirred and incorporated together, draw off the volatile ſalt and ſpirit in a cucurbit. Some, inſtead of this, mix all the ingredients together at firſt; viz. the ſal ammoniac, ſal tartari, ſpirit of wine, and powder of cinnamon or cloves, with other aromatics, and diſtil off the volatile ſpirit and ſalt at once; but the former way is preferred.

The college of London orders a quart of the dulcified ſpirit of ſal ammoniac, two drachms of eſſential oil of nutmegs, the ſame quantity of eſſence of lemons, and half a drachm of oil of cloves, to be diſtilled together with a very gentle heat. That of Edinburgh directs an ounce and a half of oil of roſemary, an ounce of oil of amber, and half an ounce of eſſence of lemons, to be put to eight ounces of the volatile ſalt of ſal ammoniac, and a gallon and a half of French brandy, and near a gallon to be drawn off in the heat of a water bath.

SAL, in the *Hiſtory of Gems*, a term uſed by Pliny and the ancients, to ſignify a defect or flaw, which took off very much from the value of the gem. Martial having occaſion to mention this ſort of blemiſh in cryſtal, calls it *nitrum* inſtead of *ſal*.

Et turbata levi queſtus cryſtallina nitro.

The critics have ſometimes changed this word *nitro*, to *vitro*, and others have made the confuſion yet greater, by ſuppoſing that the poet did not mean rock cryſtal, but cryſtalline glaſs; but theſe are all errors. It is plain, by what Pliny and others have ſaid on the ſame ſubject, that the author means here the ſame that others do by the word *ſal*. This was a duſky and duſty foulneſs, ſeemingly compoſed of a quantity of ſaline particles, ſhooting into their forms within the body of the cryſtal. The gems in general were ſubject to this blemiſh; and we find, in particular, that the emerald was frequently debaſed by it.

It is found at this time, indeed, that cryſtal is much more ſubject to it than any of the gems; but as the Romans called all the green cryſtals found in the copper-mines of Cyprus by the name of emeralds, it is eaſy to conceive, that the emerald, as they underſtood the word, muſt be frequently ſubject to it. The poets uſing the word *nitrum* inſtead of *ſal*, is not wonderful; for the Greeks called common ſalt *halonitrum*, ſo that the words ſeem almoſt ſynonymous.

SALACIA, in *Zoology*, the name of a genus of inſects of the GYMNARTHRIA kind; the body of which is ovato-oblong, and the tentacula are numerous, and diſpoſed in little cluſters.

It is called by different authors *priapus marinus*, and *mentula marina*. See PRIAPE *de mer*.

SALACSAE, in *Natural Hiſtory*, a name given by the inhabitants of the Philippine iſlands to a kind of bird, by whoſe flight they pretend to divine the event of things. All the account we have of the bird is, that it is of a ſmall ſize, and is variouſly coloured, and has a long and large beak.

SALADINE, a tax impoſed in England and France, in the year 1188, to raiſe a fund for the croiſade undertook by Richard I. of England, and Philip Auguſtus of France, againſt Saladin, ſultan of Egypt, then going to beſiege Jeruſalem.

The *Saladine* tax was thus laid: that every perſon who did not enter himſelf a croiſee, was obliged to pay a tenth of his yearly revenue, and of the value of all his moveables, except his wearing-apparel, books, and arms.

The Carthuſians, Bernardines, and ſome other religious, were exempted from the *Saladine*.

SALAMANDER, in *Zoology*, a name given by authors to ſeveral ſpecies of the lizard kind, but the principal are two, the *ſalamandra aquatica*, and *ſalamandra terreſtris*.

The *ſalamandra aquatica*, or *water ſalamander*, the *lacerta paluſtris* of Linnæus, is our common water-newt, or EFT, which is very common in fiſh-ponds, and other ſtanding waters, and is diſtinguiſhed from the reſt by the flatneſs of its tail.

The manner of propagation in theſe animals is very ſingular, and ſerves to illuſtrate the analogy between animal and vegetable nature.

The *ſalamandra terreſtris*, or land *ſalamander*, the *ſalamandra lacerta* of Linnæus, is a ſpecies of lizard very like the green kind, except that its head and its belly are thicker; its tail is ſhort, and its colour a fine black, marked with red ſpots, and of a bright, ſhining, and gloſſy appearance. It is very common in many mountainous places, in the ſouthern parts of Europe. It has a naked body, from the pores of which iſſue an oil, which is ſaid to be an excellent depilatory.

The difference between this and the water-kind is not only in colour, but in the ſhape alſo of the tail; which in this is round, not flat as in that; yet there are ſome who affirm, there is no ſpecific difference between the two, but that the water-kind, when it deſerts that element, and comes to live on ſhore, alters in colour, and becomes round at the tail.

The opinion of this creature's being able to remain unhurt in the fire for a long ſpace of time, is wholly falſe and fabulous.

The *ſalamander* is evidently a viviparous animal, yet it is ſuppoſed that the young are hatched from perfect eggs while in the body of the parent animal. See EFT.

SALAMANDER'*s blood*, a term which chemiſts give to the red vapours, which, in diſtilling ſpirit of nitre, riſe towards the latter end, and fill the receiver with red clouds.

They are the moſt fixed, and the ſtrongeſt part of the ſpirit; nothing but nitre yields a red vapour in diſtillation.

SALAMANDRINO, in *Ichthyology*, a name given by the Italians to that ſpecies of ſalmon, which Salvian calls SAL-*marinus*.

SALAMGA, in *Natural Hiſtory*, the name given by the people of the Philippine iſlands to a ſpecies of ſea-ſwallow. This is the bird, whoſe neſts are ſo famous as an ingredient in ſoops.

SALANDRA, or SALANDRIA. See CHELANDIUM.

SALAR, in *Ichthyology*, a name given by ſome authors to the TROUT.

Others apply the name to a young SALMON, while very ſmall.

SALARY, *ſalarium*, a ſtipend, or wages allowed any perſon in conſideration of his pains, induſtry, or ſervice, in another man's buſineſs.

SALAYASIR, in *Natural Hiſtory*, the name by which the people of the Philippine iſlands call that ſmall ſpecies of duck, which is ſo common thereabouts. This is an inhabitant of their lakes and marſhes, and is a perfect duck, and very beautifully coloured, but does not exceed the bigneſs of a man's fiſt.

SALE, *venditio*, in *Commerce*, is the transferring of the property of goods from one to another, upon valuable conſideration; and if a bargain is, that another ſhall give me 5*l*. for ſuch a thing, and he gives me EARNEST, which I accept, this is a perfect *ſale*. On *ſale* of goods, if earneſt be given to the ſeller, and part of them be taken away by the buyer, he muſt pay the reſidue of the money upon fetching away the reſt, becauſe no other time is appointed; and the earneſt given binds the bargain, and gives the buyer a right to demand the goods; but a demand without paying the money is void; and it has been held, that after the earneſt is taken, the ſeller cannot diſpoſe of the goods to another, unleſs there is ſome default in the buyer; therefore if he doth not take away the goods, and pay the money, the ſeller ought to require him ſo to do; and then if he doth not do it in convenient time, the bargain and *ſale* are diſſolved, and the ſeller may diſpoſe of them to any other perſon. A ſeller of a thing is to keep it a reaſonable time for delivery; but where no time is appointed for delivery of things ſold, or for payment of the money, it is generally implied that the delivery be made immediately, and payment on the delivery. Where one agrees for wares ſold, the buyer muſt not carry them away before they are paid for, except a day of payment is allowed him by the ſeller. It is ſaid a perfect bargain and *ſale* between parties will be good, though the ſeller knows of an execution that is againſt him, and doth ſell the goods, to prevent the falling of it upon them. A *ſale* may be of any living or dead goods in a FAIR or MARKET, be they whoſe they will, or however the ſeller come by them, if made with the cautions required by law; but if one ſell my goods unduly, I may have them again. If a man affirms a thing ſold is of ſuch a value, when it is not, this is not actionable; but if he actually warrants it, at the time of the *ſale*, and not afterwards, it will bear an action, being part of the CONTRACT.

SALE *of diſtreſs*. See DISTRESS and REPLEVY.

SALEFUR, a name given by ſome of the chemiſts to garden SAFFRON.

SALEP, in the *Materia Medica*, the root of a ſpecies of ORCHIS.

The *orchis maſcula* of Linnæus is moſt valued, although the roots of ſome of the palmated ſorts, particularly of the *orchis latifolia*, are found to anſwer almoſt equally well. The *orchis* flouriſhes in various parts of Europe and Aſia, and grows in our country ſpontaneouſly, and in great abundance. It is much cultivated in the Eaſt, and the root of it forms a conſiderable part of the diet of the inhabitants of Turkey, Perſia, and Syria. The *ſalep*, which is brought from the eaſtern countries, is in oval pieces, of a yellowiſh white colour, ſomewhat clear and pellucid, very hard, and almoſt horny, of little or no ſmell, in taſte like gum tragacanth.

Salep ſhould be choſen clean, firm, and hard; it is very little liable either to decay, or ſophiſtication.

The people of the Eaſt are extremely fond of *ſalep*; they look upon it as one of the greateſt reſtoratives and provocatives to venery in the whole vegetable world.

That *ſalep* is the root of an *orchis*, no way differing from our common *orchis* in virtue, but owing its appearance to the manner of preparing it, and, conſequently, that *ſalep* may be prepared from the roots of *orchis* of our own growth, Mr. Geoffroy has proved in the following manner. He conſidered, that the method of curing one root in the eaſtern part of the world was probably the ſame with that uſed in all; and obſerving that Kæmpfer had deſcribed the manner in which the Chineſe prepare their ginſeng, to make it pellucid, which was by firſt ſteeping, or macerating it in water, and afterwards carefully drying it, he determined to attempt the curing of the roots of the common *orchis*, in a method not unlike that uſed with the ginſeng, in order to make *ſalep* of it. The *ſalep*, which we receive from Turkey, is a root of a white or reddiſh colour, according to its different age; and as we receive it, is always tranſparent. As to our own *orchis*, if we attempt to dry the roots in the common way, they never will appear at all like the *ſalep*, but will become ſhrivelled up and brown, and will always retain, or be ready to imbibe from a humid air, a great quantity of moiſture. To prepare theſe, in imitation of the *ſalep*, Mr. Geoffroy choſe the largeſt, plumpeſt, and faireſt roots he could find; theſe he nicely ſkinned, taking off the whole outer rind, then throwing them into cold water, he ſuffered them to macerate there ſome time; after this he ſlightly boiled them; and taking them out of the water, and draining them, he had them ſtrung upon threads, to be dried in a warm and dry air. When the roots were thoroughly dried, they were very tranſparent, and reſembled pieces of gum tragacanth, and continued dry and hard. The roots, thus prepared, may be kept long in a dry place, and will never attract humidity, or become mouldy and rotten; as they will always do in wet weather, if dried in the common way with their ſkins on.

The *orchis* roots thus prepared may be reduced to powder; this powder will diſſolve away in boiling water, and a ſcruple of it will make a baſon full of jelly, in the manner of the Turkiſh *ſalep*. This jelly is an admirable medicine in all the caſes, in which *ſalep* is preſcribed, and may be rendered agreeable by the addition of wine, ſugar, ſpice, &c. and the powder may be given with great ſucceſs in aſſes milk, for diſeaſes of the breaſt.

If the water, in which the roots have been boiled, be evaporated over a gentle fire in an earthen veſſel, there will remain an extract of a viſcous texture, and a very agreeable ſmell, reſembling that of a meadow of flowers when the wind blows over it.

Retzius, in the Swediſh Tranſactions for 1764, has improved upon Geoffroy's method; but Mr. Moult, of Rochdale, having publiſhed a new proceſs, which is recommended by the ingenious Dr. Percival, from his own knowledge of its ſucceſs, we ſhall here add an account of it; firſt premiſing, that the beſt time for gathering the roots is when the ſeed is formed, and the ſtalk ready to fall; becauſe the new bulb, of which the *ſalep* is made, is then arrived to its full maturity, and may be diſtinguiſhed from the old one, by a white bud ariſing from the top of it, which is the germ of the orchis of the ſucceeding year. The new root is to be waſhed in water, and the fine brown ſkin which covers it is to be ſeparated by means of a ſmall bruſh, or by dipping the root in hot water, and rubbing it with a coarſe linen cloth. When a ſufficient number of roots have been thus cleaned, they are to be ſpread on a tin plate, and placed in an oven heated to the uſual degree, where they are to remain ſix or ten minutes, in which time they will have loſt their milky whiteneſs, and acquired a tranſparency like horn, without any diminution of bulk. In this ſtate they are to be removed, to dry and harden in the air, which will require ſeveral days; or by uſing a very gentle heat, this operation may be finiſhed in a few hours. Mr. Moult obſerves, that his *ſalep* has a quality of thickening water, which is to that of fine flour nearly as two and a half to one, with this difference, that the jelly of *ſalep* powder is clear and tranſparent, whereas that of flour is turbid and white. Phil. Tranſ. vol. lix. p. 1, &c.

Dr. Percival informs us, that *ſalep* thus prepared may be afforded, in that part of England where labour bears a high value, at about eight pence or ten pence per pound, and that it might be ſold ſtill cheaper, if the orchis were cured without ſeparating from it the brown ſkin which covers it; whereas the foreign *ſalep* is ſold at five or ſix ſhillings per pound.

Salep is ſaid to contain the greateſt quantity of vegetable nouriſhment in the ſmalleſt bulk. The powder of it has been, therefore, propoſed to conſtitute part of the proviſions of a ſhip's company at ſea. This powder and portable ſoup, diſſolved in boiling water, form a rich, thick jelly; and an ounce of each, with two quarts of boiling water, will be ſufficient ſubſiſtence for a man a day; and as portable ſoup is ſold at half a crown a pound, and *ſalep*, cultivated in our own country, might be aſforded at ten pence per pound, the day's ſubſiſtence would amount only to two pence half-penny. And this food, it is ſaid, would prove more nouriſhing than double the quantity of rice cakes, made by boiling rice in water. Beſides rice, as an aliment, is ſlow of fermentation, and a very weak corrector of putrefaction, and much inferior, as a wholeſome nouriſhment, to *ſalep*. *Salep* has alſo the ſingular property of concealing the taſte of ſalt water; and it has the property of retarding the acetous fermentation of milk. Dr. Percival propoſes *ſalep* as a very uſeful and profitable addition to bread.

The reſtorative, mucilaginous, and demulcent qualities of the orchis root, render it of conſiderable uſe in various diſeaſes. In the ſea-ſcurvy, it powerfully obtunds the acrimony of the fluids, and is eaſily aſſimilated into a mild and nutritious chyle. In diarrhœas and the dyſentery, it is highly ſerviceable, by ſheathing the internal coat of the inteſtines, by abating irritation, and gently correcting putrefaction. In the ſymptomatic fever, which ariſes from the abſorption of pus, from ulcers in the lungs, from wounds, or from amputation, *ſalep* uſed plentifully is an admirable demulcent, and well adapted to reſiſt the diſſolution of the craſis of the blood, incident to theſe caſes. By the ſame mucilaginous quality, it is equally efficacious in the ſtrangury and dyſury. It has alſo been found an uſeful aliment for patients afflicted with the ſtone or gravel. Percival's Eſſ. Med. and Exp. vol. ii.

SALET, Sallet, or Salade, in *War*, a light covering, or armour, for the head, anciently worn by the light horſe; only differing from the caſk in that it had no creſt, and was little more than a bare cap.

Nicod derives the word from *ſila*, which had the ſame ſignification among the Latins; others, from *ſaladinus*, alledging, that it was borrowed from the orientals; others, from the Italian *celeta*, as if the head where hid hereby; others, from the Spaniſh *celada*, *a little caſk*, &c.

SALIÆ, in *Antiquity*, Roman virgins, dreſſed after the manner of the Salii, who aſſiſted the pontif in ſacrificing. Pitiſc. in voc.

SALIAN *dance*, in *Antiquity*. See Dance and Salii.

SALIANT, in *Fortification*, denotes *projecting*.

The word is formed from the French *ſaillant*, which ſignifies the ſame thing; of *ſailler*, *to project*, *advance outwards*; and that of the Latin *ſalire*, *to leap*.

There are two kinds of angles; the one *ſaliant*, which are thoſe that preſent their points outwards: the other *re-entring*, which have their points inwards. Inſtances of both kinds we have in tenailles and ſtar-works.

SALIC, or Salique *law*, *Lex* Salica, an ancient and fundamental law of the kingdom of France, uſually ſuppoſed to have been made by Pharamond, or at leaſt by Clovis; in virtue whereof males only are to inherit.

Some, as Poſtellus, will have it to have been called *Salic*, q. d. *Gallic*, becauſe peculiar to the Gauls. Cenal takes the reaſon to be, that the law was only ordained for the royal *ſalles*, or palaces. Claud. Seiſſel ſays, it was thus called, becauſe of the *ſalt* and the prudence with which it abounds; Fer. Montanus inſiſts, it was becauſe Pharamond was at firſt called *Salicus*; others, with the abbot Uſperg, derive its name from *Salogaſt*, Pharamond's principal miniſter; and others, from the frequent repetition of the words *Si aliqua*, at the beginning of the articles. Genebrard ſays, it was called *Salic* for *Salomonic*, becauſe Solomon ſet the firſt example of it. Daviſon derives it from the German words *ſalts* and *lick*, q. d. *like to ſalt*. The moſt probable opinion is that which derives the word from the ancient Franks, who were called *Sali*, *Salici*, and *Salingi*, on account of the Sala, a river of ancient Germany. This is the ſentiment of Rhenanus and Æmilius, who are followed by ſeveral others; among the reſt, Menage, Paſquier, Borel, and Juncker. Bouterouе gives another plauſible origin of the word: he ſays, it comes from the word *ſalich*, which, in the old Teutonic language, ſignified *ſalutary*; and that the French in this law imitated the policy of the ancient Romans, who made ſalutary laws, which the magiſtrates were to have before them when they adminiſtered juſtice. This he confirms from a curious figure taken out of the Notitia Imperii, where the book is repreſented covered with gold, with this inſcription, *Leges ſalutares*.

Du Haillan, after a critical examination of the *Salic law*, declares it to have been an expedient of Philip the Long, in 1316, for the excluſion of the daughter of Louis Hutin from inheriting the crown. Father Daniel, on the other

other hand, maintains, that it is quoted by authors much more ancient than Philip the Long; and that Clovis is the real author of it. The opinion of Du Haillan has been confuted by Messrs. Vertot and de Foncemagne, in the Mem. de l'Acad. des Inscript. tom. ii. p. 603, &c. and tom. viii. p. 490, &c. who trace the existence of the *Salic* laws to the kings of the first and second race. The style, which is scarce intelligible, and which is in a Latinized dialect, is a mark of its antiquity.

This law has not any particular regard to the crown of France: it only imports, in the general, that in *Salic* land no part of the inheritance shall fall to any female, but the whole to the male sex. *De terra* Salica *nulla portio hæreditatis mulieri veniat; sed ad virilem sexum tota terræ hæreditas perveniat.* So that it is a popular error to suppose, that the *Salic law* was established purely on account of the succession to the crown; since it extends to private persons as much as to those of the royal family.

Part of it seems to have been borrowed by our Henry I. in compiling his laws, cap. 89. *Qui hoc fecerit, secundum legem Salicam moriatur.*

By *Salic* lands, or inheritances, were anciently denoted all lands, by whatever tenure held, whether noble or base, from the succession to which women were excluded by the *Salic law*; for they were by it admitted to inherit nothing but moveables and purchases, whenever there were any males. Indeed, M. Fenelon observes, that there were originally *Salic* lands, distinguished from all others, and destined for the military people of the nation; and to these, it is supposed, the law was originally intended to be confined.

M. Eccard, a Hanoverian, is said to have recovered an ancient MS. of this famous law, containing a third part thereof, much more amply than any yet discovered, with a very curious chronology of the same law, hitherto unknown.

SALICARIA, in *Botany*, a species of the *purple* LOOSE-*strife*.

SALICARIA, in *Ornithology*, a name by which Gesner, and some others, have called a small bird, very much resembling the MUSCICAPA, or FLY-*catcher*, if not the same species.

It lives among the willows in wet places, and feeds on spiders, flies, and other insects.

SALICASTRUM, a name by which Pliny, and some other botanical authors, have called the *solanum lignosum*, the woody nightshade, or bitter-sweet. Ger. Emac. Ind. 2.

SALICHA, in the *Materia Medica*, a name given by some of the old writers to cinnamon. Avicenna and Serapion use it for the bark we call *cassia lignea*, and the Greeks *hylecasia*, when stripped clean from the wood.

SALICINEA, in the *Materia Medica*, a name used by Gesner, and some other authors, for the *nardus Celtica*, or Celtic spikenard.

SALICORNIA, in *Botany*. See SALT-*wort*.

SALIENS *punctum*. See PUNCTUM.

SALIENT, SALIANT, or SAILANT, in *Heraldry*, is applied to a lion, or other beast, when its fore-legs are raised in a leaping posture.

A lion *salient* is that which is erected bend-ways; standing so as that his right fore-foot is in the dexter chief point, and his hinder left-foot in the sinister base point of the escutcheon; by which it is distinguished from RAMPANT.

SALII, in *Antiquity*, priests of Mars, whereof there were twelve, instituted by Numa, for preserving the brazen target, which is said to have fell down from heaven, in the eighth year of the reign of Numa, for the relief and safety of Rome, against a raging pestilence; and also those other eleven shields made so much to resemble this that they could not be distinguished from one another: they wore painted, parti-coloured garments, and high bonnets, with a steel cuirass on the breast.

They had their name *Salii* from *saltare, to dance*; because, after assisting at sacrifices, they went dancing about the streets with ancilia, or bucklers, in the left hand, and a rod in the right, striking musically on one another's bucklers with their rods, and singing hymns in honour of the gods. Their great feast was kept in the month of March, when they carried their sacred charge about the city. They also carried about the ancilia whenever a just war had been proclaimed by order of the senate against any state or people, supposing that by this means they secured the patronage and succour of Mars.

There were two companies or colleges of the *Salii*; the ancient established by Numa, called *Palatini*; the latter by Tullus Hostilius, called *Collini*, and *Agonales*. Though Servius tells us, there were two kinds instituted by Numa, the *Collini* and *Quirinales*; and two others by Tullus, the *Pavorii* and *Palorii*.

In singing, they used a peculiar ancient song, called *Saliare Carmen*; and after the ceremony they were entertained with a feast: whence *Saliares Epulæ*, and *Saliares Dapes*, passed into a proverb for good eating.

Their chief, called *præsul*, and *magister Saliorum*, was one of their number. It was he that led the band, and began the dance; the rest imitating all his steps and motions. The whole company was called *Collegium Saliorum*.

Sext. Pompeius makes mention of *Salian maids*, *virgines Saliares*, hired for the purpose, and joined with the *Salii*, wearing a kind of military garb, called *paludamentum*, with high round bonnets like the *Salii*, and, like them, performing sacrifice with the pontifices in the palaces of kings.

SALINE, a name given to a preparation of sea-*salt*, procured from the froth of the sea, hardened by the sun in hot countries. It is called by some authors *pilatro de Levante*, and is used in glass making; and in the making the fine purple colour from cochineal, by boiling it in a small quantity, with the bran and fœnugreek, of which the magistery is made for that purpose.

SALINE is also the name given by authors to springs of salt-water, called by us *salt-wells*, *salt-springs*, and *brine-pits*. Most parts of the world are found to have these; but those of Franche Compté, in France, seem to be the most remarkable. The springs are situated in deep caves, and those in the greater work are about four hundred feet in length, and fifty feet in breadth; into this work they descend by a stone staircase of forty steps, and thence by a wooden one of twenty; at the bottom of these stairs is a cave with an arched roof. The first cave, or vault, is forty feet long, and thirty-two feet and a half broad, and in it are six springs of *salt* water, and two springs of fresh water; all which issue out of the same rock, in the space of fourteen feet in length. From this cave they go into others, which are supported in the middle, each by a row of thick pillars, from which are carried double rows of arches. They then pass through two gates into a spacious vault, thirty-five feet high, and supported, nigh the entrance, by four strong pillars, placed in form of a square. In the middle space, between these pillars, is a bason of a very considerable size, into which the *salt* water from several springs is collected; and in the same vault, beyond these pillars, are four others placed in a row, supporting different arches, of sixty feet in length, and forty-eight feet in breadth; beyond which there is an irregular space, sixty-three feet long, in which are six or seven springs of *salt* water, and ten or twelve of fresh. The *salt* waters of these springs, and of the six springs before mentioned, are kept separate from the fresh water, and are all conveyed through gutters to the bason before mentioned. From this bason they are drawn out by a wheel and buckets into four large stone basons or reservoirs, one of which holds fifteen thousand hogsheads, and the other three together twenty-five thousand hogsheads. From these reservoirs they are to be drawn off, as occasion requires, into small cisterns placed near the boiling-houses; and the waters contained in the several basons, as they are drawn from the springs, at different times, and are of different strength, are mixed together before the boiling, in such proportion, that each pound of the water yields about three ounces of *salt*.

The water of the fresh springs is also collected in the caves into a fresh water bason prepared to receive it, and is raised by means of a crane to the level of a little brook, through which it runs away by a subterranean conduit. Brownrig of Salt, p. 94.

SALINE *principle*, a term used by the chemical writers, to express a constituent part of several mixt bodies, on which their existence in that form depends; and which, though always existent in them, and always separable by art, is yet not perceivable in many of them in the complex. See SALT.

The *saline principle* of vitriol is of the number of those made by some a necessary principle of the existence of that body, and by others supposed not to exist at all, otherwise than in the general form of that compound *salt*. But the existence of it, in a separate state, is proved by this experiment: take four or five gallons of the strong vitriolate water at the water-works, as it runs from the beds of pyrites to the great cistern; this is to be chosen, because having yet undergone no operation but that of the air and water, it must needs be in the most simple and natural state; distil from this about two-thirds of the insipid water, let the glasses cool, and the water will then let fall a vitriol of a pale green colour, together with a large quantity of ochre or yellow earth. Evaporate away a third part of the remaining liquor, and more vitriol still will be produced, of a paler colour than the former, and some yellow earth will also be thrown down, though less in quantity than before. After this has been repeated five times, instead of vitriol, a yellow *salt* will be obtained; and after that, on more evapora-

tions, a white *salt* will be every time obtained, which will be extremely different from vitriol both in colour and taste, being fiery and pungent, and partaking scarce at all of that acrid and nauseous astringent taste, which is so peculiar to vitriol. It is unctuous like *salt* of tartar, and cleansing like soap, rendering the hands washed with it soft and supple; whereas the common vitriol makes them very harsh and rough; finally, this last *salt* dissolved in water appears fatty and mucilaginous.

From five pounds and a half of the last lixivium, four pounds of this salt will be obtained, and half a pound of the liquamen will never congeal. It is remarkable, that this *saline* matter is the most soluble of all the sorts, as the greatest quantity of it may be kept fluid in the smallest quantity of water we know of in any experiment of this nature.

The liquamen remains thin, and is of an acrid and fiery taste, scarce supportable on the tongue. See Liquamen *pyriticum*.

The white salt, which is called the *saline principle* of vitriol, being put into a retort, and distilled in a sand furnace, the far greater part of it comes over in form of a highly acid spirit, especially that coming last in small drops. This liquor being rectified in a tall glass body, a volatile sulphureous liquor arises immediately on the application of the heat. The smell of this is so subtile and penetrating, that it is almost insupportable, and yet it is clear as water, and insipid to the taste. This may be preserved in its full perfection many years, only by keeping it close stopped, not letting fall any sediment. The remaining liquor is the common acid liquor of vitriol, and by distillation may be separated into spirit of vitriol, and that heavy and corrosive liquor, commonly called oil of vitriol.

In alum, vitriol, and mineral sulphur, the *saline principle*, which in each of them is by far the chief part, both in quantity and energy, has much the same nature and properties. In the last indeed it is clogged with sulphur; for the true nature of common sulphur is, that it is a vitriolic salt, the very same with that of common vitriol; and the sulphureous parts, which give it that form and existence which we express by the word *sulphur*, are less copious than could be imagined, compared with the *saline*, which are genuine vitriol, differing in nothing from the common vitriol, but that it contains a smaller admixture of terrestrial and metalline parts. Phil. Transf. N° 123.

Saline *earths*. The chemists under this, as a general head, reckon all those *saline* and *earthy* substances, which are calcined or burnt in the fire; as all the kinds of lime, pot-ashes, soot, and the like; these being so many mixtures of salt and *earth*; and all salts appearing to them, indeed, on a rigorous examination, to be only *earths* of different natures, which when reduced to a certain degree of subtilty or fineness of parts, so as permanently to dissolve in water, are then emphatically denominated salts. Shaw's Lectures, p. 67.

Saline *julep*. See Julep.

Saline *mixture*. See Mixture.

SALIVA, *spittle*, a thin, pellucid humour, separated from the arterial blood by the glands about the mouth and fauces; and conveyed by proper salival ducts into the mouth, for several uses.

It consists of a great deal of water or phlegm, and a volatile salt, and, some add, a sulphureous spirit.

The *saliva*, Boerhaave observes, is void both of taste and smell; it does not harden by heat; it is more copious, fluid, sharp, penetrating, and detergent, as a person has fasted longer; and it is separated from the pure arterial blood.

The glands wherein the *saliva* is separated from the blood, are usually reduced to three pairs; viz. the two parotides; the two maxillary glands; and the two sublinguales, or those under the tongue; these are the largest, and furnish the greatest quantity of *saliva*; but there are others, which are less, and may be reckoned assistants to the former: such as the molares, the buccales, labiales, linguales, uvulares, arytenoideæ, the thyroidæa, the amygdalæ, or almonds of the ears, and the palatinæ, or glands of the palate. See each under its proper article.

The great use of the *saliva* is, in masticating and diluting the food, and making the first digestion thereof; the other uses are, to moisten the tongue, to render its motion more quick and easy; to lubricate the throat and œsophagus, in order to facilitate deglutition; to prevent thirst; and to assist in the sensation of tastes by dissolving the salts.

Some imagine it to do the office of a menstruum, by mixing the oily and aqueous parts of the food more intimately, dissolving the saline parts, and procuring a fermentation in the stomach; but Dr. Drake will not allow it fit for that purpose. Were the *saliva*, says he, acrimonious enough for this, it would be impossible but it must offend the stomach; especially, considering the quantities of it that many swallow even upon an empty stomach.

The fermentative power, ascribed to the *saliva* by Boerhaave and Hoffman, has been sufficiently ascertained by the later experiments of Sir John Pringle and Dr. Macbride. The former, in the Appendix to his Observations on the Diseases of the Army, has given the result of several experiments made to ascertain the effects of the *saliva* in digestion.

By adding a small portion of it to some raw beef, he remarked, that this mixture putrefied slower than another which had no *saliva* in it; from whence he infers its antiseptic nature.

Another experiment, made to ascertain the fermentative power of *saliva*, was this: he took two drachms of fresh meat, the same quantity of bread, and to these added as much *saliva* as he supposed necessary to digestion. This mixture being beat in a mortar, was put into a close phial, and set in the furnace, where it remained about two days, with scarce any visible fermentation; but on the third day this action became manifest. The bread and flesh were then found risen in the water, a sediment forming, and bubbles of air continually mounting. In short, the fermentation was complete, being distinguished by a vinous smell, as in ordinary working liquors. The action continued about twice as long as when no *saliva* was used; it was likewise much more moderate, and generated air with little tumult. When the fermentation entirely ceased, the mixture had a pure acid taste; and what was equally remarkable, had no putrid smell during the whole process.

From these experiments the doctor concludes, that if the *saliva* is well prepared, is in a sufficient quantity, and well mixed with the aliment, it is qualified for resisting putrefaction, preventing immoderate fermentation, flatulence, and acidity in the primæ viæ. But if the *saliva* is deficient, unsound, or not well mixed with what is swallowed, that the aliment may first putrefy, then grow acid, and in that action ferment strongly, and generate much air in the stomach and bowels.

Accordingly, in surfeits, or upon swallowing without due mastication; when meats are eat tough and fat, or with farinaceous substances unfermented; or, when by any accident the *saliva* is vitiated, too scanty, or not intimately mixed with the food, the fermentation becomes tumultuous, the stomach swells with air; and this extraordinary commotion being attended with an unusual heat, brings on that uneasiness called the heart-*burn*, and occasions that excessive sourness of the stomach, whereby the teeth are not only set on edge, but the throat excoriated. This last, however, only happens when the stomach is relaxed, or any wise disabled from conveying the whole aliment into the intestines; for what is left having time to undergo a complete fermentation, is thereby changed into a harsh sort of vinegar.

Since one great use of *saliva* is to moderate fermentation, it is probable, that such substances as resemble it most in this quality, will prove the best stomachics, whenever that humour fails. Of this class are acids, wine, spirits, and bitters; but as all these retard as well as moderate fermentation, they may be frequently less proper than some of the antiscorbutics, as horse-radish, mustard, and garden scurvy-grass, which, at the same time that they moderate, retard fermentation but little. As to aromatics, however assisting they may be in digestion by their heat and stimulus, they promise less of a carminative quality than either the bitters or antiscorbutics; in as much as they are more disposed to increase than to moderate fermentation, and consequently to produce air instead of suppressing it.

Dr. Macbride, in his Experimental Essays, essay first and second, gives an account of several experiments in which fermentation was produced in different alimentary mixtures, by the addition of *saliva*, which discovered no signs of fermentation without it. See Digestion.

M. Gastaldy, in a thesis on the *saliva*, observes, that it takes its name from the salt it contains; which salt he will have to be partly a volatile acid, and partly alcalious. He adds, that it contains some oleaginous parts, and a little earth. By being compounded of so many different kinds of parts, it becomes a dissolvent proper for all the different kinds of foods whereof we live. Its natural and laudable state is, to be a little more viscid than common water, and much less so than milk; and it is preserved in this state by the application of the spirits, and of the particles of air which insinuate into it.

According to all appearance, the *saliva* is derived from the blood of the arteries: part of the arterial blood, brought to the salival glands, serves to feed them; another part is returned into the veins, and continues the circulation; and a third part, which is the serum, receiving a sub-acid quality from them, is there converted into *saliva*.

Some authors have imagined, that the nervous juice contributed to the composition of the *saliva*; and the rather, because larger and more numerous twigs of nerves are communicated to these glands than to most other parts, which yet have a more exquisite feeling than these; but Dr. Nuck has refuted this opinion, by several experiments.

Too great an excretion of *saliva*, Boerhaave observes, disorders the first digestion; and hence causes thirst, driness, a black bile, and, finally, consumption, and atrophy. On the contrary, if no *saliva* be discharged into the mouth, or if only less than ordinary, it spoils both the manducation of the food, and its taste, swallowing, and digestion; and, withal, occasions thirst.

SALIVAL, or SALIVARY *ducts*, in *Anatomy*, certain little lymphatic canals lately discovered; whereby the saliva falls into the mouth.

The *lower salival duct* comes from the maxillary glands, situated under the lower jaw, and terminated behind the dentes incisores. It was first described by our Dr. Wharton, in his Treatise of the Glands, in 1656, and is called *ductus salivalis Whartoni*.

The *upper salival duct* was discovered by Nicolas Steno, in 1660, and is distinguished by the name of *ductus salivalis Stenonis*. It comes from the parotid glands; whence, perforating the buccinator, it terminates near the third upper grinder.

Casp. Bartholine, in 1682, discovered another *salival duct* coming from the glands, situate on the side of the tongue; and Rivinus, a physician of Leipsic, had mentioned it before, in a dissertation printed in 1679.

Ant. Nuck, professor at Leyden, discovered a fourth *salival duct*, arising from a gland situate in the orbit of the eye, between the musculus abductor, and the upper part of the os jugale.

These ducts are all double; there being one of each kind on either side. But it is pretended, the two last are only found in some brutes, and not in man.

Dr. Trew endeavours to shew, that the vessels called *salival ducts*, by Coschwitzius, are not truly *salival ducts*, but veins. Phil. Trans. N° 457. sect. 7. p. 441.

As the demand of saliva is greatest in mastication, deglutition, talking, &c. the disposition of the *salival ducts*, to favour the discharge on those occasions, is very remarkable: thus the ducts of the parotides pass close over the musculi masseteres, and through the buccinatores; the *salival ducts* of the maxillary glands pass close under the mylohyoideus, where the sublingual glands are placed; by means whereof, the intumescence of the masseters, in chewing, accelerates the spittle in the parotid *salival ducts*, as the mylohyoideus does in the action of deglutition, by drawing the hyoides upwards. The agitation of the cheeks and lips is fully sufficient to promote the discharge from the glands of the lips, &c.

SALIVARIS, in *Botany*, a name given by some authors to the pellitory of Spain, or pyrethrum of the shops, from its quality of draining a large quantity of the saliva into the mouth by its great heat and acrimony.

SALIVATION, *salivatio*, in *Medicine*, a promoting of the flux of saliva, by means of medicines; chiefly by mercury.

The chief use of *salivation* is in diseases belonging to the glands, and the membrana adiposa, and principally in the cure of the venereal disease; though it is sometimes also used in epidemic cases.

The body is prepared for *salivation* by a copious and continued use of attenuating, diluting, softening decoctions; as of scabious, pellitory, china, sarsaparilla, sassafras, and sanders.

Salivation is either *partial*, or *universal*. By the first, only the humours of some part of the body are to be discharged; as in catarrhs, tooth-ach, &c. By the second, the whole mass of blood is to be purged.

The first is raised either by a slow continued chewing of some tenacious matter, as mastich, wax, or myrrh; especially if other sharp things be mixed with them, as pyrethrum, ginger, or pepper; or by drawing in sharp irritating vapours, as those of tobacco, rosemary, thyme, marjoram, &c.

The latter is effected by the action of such medicines as create some slight but constant nausea; as stibium not quite fixed, nor yet quite emetic; a little common vitriol, &c. but chiefly by such as dissolve all the parts of the mass of blood, turn them into lympha, and thus cause a ptyalism: such are crude quicksilver, cinnabar, a solution of quicksilver in aqua fortis, white and red precipitate, turbith mineral, sweet sublimate of mercury, &c.

SALIVATION, *mercurial*, has been a very usual method of cure; especially in venereal, scrophulous, and hypochondriac cases: in effect, it proves the surest remedy, yet discovered, for the Gallic lues; though the discovery hereof, as that of most other remedies, was owing to chance. Jac. Carpi, a physician of Bologna, having read in Avicenna, and Mesve, two Arab authors, that mercury, applied externally, was proper for the lepra, and some kinds of pustules, particularly the scabies or itch, had a mind to try it in a pocky itch: a *salivation* was, hereupon, unexpectedly raised, and the patient was unexpectedly cured, not only of his itch, but of his pox. The same method he afterwards used for the pox itself; and, meeting with great success therein, others were induced to follow him; and thus it acquired a very general and distinguished reputation. But this method has been of late less commonly used, because the advantages of mercury have been obtained by using it as an alterative, without the trouble and danger which attend this mode of promoting an evacuation by it. However, venereal maladies of long standing, and such as have arisen to a great height, or have affected the bones, require a full ptyalism. In these cases, the disease has been subdued for a time by the alterative method, but afterwards broken out afresh, and been completely cured by *salivation*; and, on the other hand, some cutaneous foulnesses, after resisting *salivation*, have yielded to an alterative course.

There are two manners of applying mercury to raise a *salivation*; the one external, or in the way of unction, by mixing it up by some unguent, and then rubbing it on the joints, &c. This is, in general, best done by rubbing a proper quantity of the unguentum cœruleum every night, or every other night, on the thighs. The *salivation* should be raised gradually, and subside as slowly; the patient should be prepared by a spare diet for a few days, by bleeding, and by using the warm bath two or three times, before the operation; and during the progress of it, his strength should be supported with plenty of light but nourishing diet; a pint of gruel, or a decoction of mallows and liquorice in milk and water, almond emulsion, and barley-water, with gum arabic dissolved in it, may be repeatedly given every two or three hours; and if he is faint, he may take, occasionally, a little wine whey, maced ale, or mulled wine. A woman that expects the menses should defer the operation, till they settle. The other method is internal, where the mercury is taken at the mouth.

In each case, the mercury insinuates itself into the mass of blood; and mixing with the venereal poison, the two bodies, thus locked together, are drawn, with the serosity, into the salival glands, where they are separated and discharged; as finding the pores of those glands proportioned to their figures, and proper to receive them.

Dr. Quincy will have the internal to be much the safer and better method. The mineral globules, he thinks, being intimately combined with salts, in the preparations given inwardly, will, by the irritation thereof, be easily and fully thrown off by the secretory organs, till the blood is quite discharged of its load: whereas, in mercurial frictions, it is possible some of the heavy particles may be left lodged in the interstices of the fibres, or cells of the bones. Add to this, that, by computing the proportion of mercury in all the doses necessary to promote a spitting, internally, and the weight of the same mineral used when it is done by unction; the quantity used in the latter case far exceeds that in the former: consequently, the ill effects apprehended from that dangerous medicine, must needs be more sensible in the one case than the other.

The external application, therefore, is only to be allowed of, where either the case requires the violence of such a management; or outward ulcers and tumors require a particular cure by liniments. Thus Quincy.

For the best method of administering mercury, and its use, see MERCURY and VENEREAL *disease*.

But a learned French physician, M. Chicoyneau, chancellor of the university of Montpelier, has done some discredit to the practice of *salivating* in any manner, and that in a little treatise; where he endeavours to prove, that the *salivation* itself contributes nothing to the cure, but is rather prejudicial thereto; that the salutary effects of the mercury are independent of any evacuation at all; and that it acts purely as a specific. It is without reason, therefore, he urges, that venereal patients are put to the torture of a *salivation*; since the full effect of the medicine may be had, without carrying matters to that extremity. The *salivation* is only an accident to the cure; which is effectually obtained by a mercurial unguent rubbed on the joints in such quantities, and at such intervals, as not to raise any *salivation*. He supports the whole by the experience of forty or fifty cures, wrought in one year, by this new method. The same method, it seems, has been also tried in England, and with success; as appears from a translation of Chicoyneau's piece, since published, with notes, by an English physician.

It has been observed, that ill consequences have resulted from

from the sudden stopping of *salivations*; for the removal of which Dr. Silvester recommends a renewed *salivation*; either by pills with guaiacum, to be taken morning and evening, with one grain of calomel in each dose, and to be washed down with a draught of a warm decoction of the woods, or, in more obstinate cases, by rubbing a drachm of the ung. cær. fortius upon the legs and thighs twice a day, for three days, which is sufficient to produce a gentle *salivation*. See a recital of the cases to which this method was applied, in London Med. Obs. and Inq. vol. iii. art. 24.

SALIX, in *Botany*. See WILLOW.

SALLET, or SALLAD, a dish of eatable herbs, ordinarily accompanying roast meat; composed chiefly of crude, fresh herbage, seasoned with salt, oil, and vinegar.

Menage derives the word from the Latin *salata*; of *sal*, *salt*; others from *salcedo*; Du-Cange from *salgama*, which is used in Ausonius and Columella, in the same sense.

Some add mustard, hard eggs, and sugar; others, pepper, and other spices, with orange-peel, saffron, &c.

The principal *sallet-herbs*, and those which ordinarily make the basis of our English *sallets*, are lettuce, celery, endive, cresses, radish, and rape; along with which, by way of furniture, or additionals, are used purslane, spinach, sorrel, tarragon, burnet, corn-sallet, and chervil.

The gardeners call some plants *small herbs*, in *sallets*; these should always be cut while in the seed-leaf: as cresses, mustard, radish, turnep, spinach, and lettuce; all which are raised from seeds sown in drills, or lines, from the middle of February to the end of March, under glasses or frames; and thence to the middle of May, upon natural beds, warmly exposed; and, during the summer heats, in more shady places; and afterwards, in September, as in March, &c. and lastly, in the rigour of the winter, in hot-beds. If they chance to be frozen in very frosty weather, putting them in spring-water two hours before they be used, recovers them.

SALLIUS *lapis*, a name by which Ludovicus Dulcis, and some other writers of his time, have miscalled the *lapis samius* of the ancients. That author describes it as being heavy, white, and brittle, and gives it the same virtues with the *lapis samius* of Pliny.

SALLOW, in *Botany*. See WILLOW.

SALLY, in *Architecture*, from the French *saillie*, is what we more usually call *projecture*.

SALLY, in the *Military Art*, the secret issuing out of the besieged from their town, or fort, and sudden falling upon the besiegers to cut them off, nail their cannon, hinder the progress of their approaches, destroy their works, &c.

We say, *to make a* sally, *to repulse a* sally, &c.

To cut off a sally, is to get between those who made it and the town.

SALLY-*port*, in a *Fire Ship*, is a great opening in her side, made on purpose for the men to escape by, when they have grappled an enemy, and fired their train.

SALLY-*ports*, or *postern-gates*, in *Fortification*, are those under-ground passages, which lead from the inner works to the outward ones: such as from the higher flank to the lower, or to the tenailles, or the communication from the middle of the curtin to the ravelin. In each place of arms there are two *sally-ports*, z, z (*Tab.* VII. *Fortif. fig.* 41.) which are ten or twelve feet wide, for the troops to *sally* out. In time of a siege they are shut up with barriers or gates. See POSTERN.

SALMO, *salmon*, in *Ichthyography*, is a genus of the *abdominales* in the Linnæan system. In the Artedian system of ichthyology, the characters of this genus of fishes are these: the branchiostege membrane on each side contains eleven, twelve, or nineteen bones; the body of the fish is generally variegated with spots; the back fins are placed nearer the head than those of the belly, and the teeth are large, and are placed in the jaws and palate, and on the tongue; to which we may add, from Linnæus, that the posterior dorsal fin is adipose, and that the ventral fins have many rays.

The *salmo salar*, or *salmon*, is distinguished from other fish of the truttaceous kind by these characters. It is of an oblong body, covered with very small scales, a small head, a sharp nose, and a forked tail; its back and sides are grey, sometimes spotted with black, sometimes plain; the covers of the gills are subject to the same variety; the belly is silvery; its under jaw is bent upwards, and that sometimes so much as to make itself a sinus in the upper, by constant motion, and sometimes to perforate it. It is said that this curvature is lost when the fish returns to sea. The *salmon* is first produced from its parent's spawn in fresh rivers, thence it goes into the sea to acquire its growth and feed; and at the time of its full growth, and in the season for spawning, it removes into the fresh waters again. See *Salmon* FISHERY.

The *salmon* in the different stages of its life and growth has different names. The Latins called it when young *salar*, when of a middle growth *fario* or *fario*, and only when full grown *salmo*. In England the fishermen have names for it in every year of its growth. In the first it is called a *smelt*, in the second a *sprod*, in the third a *mort*, in the fourth a *fork-tail*, and in the fifth a *half-fish*; finally, in the sixth it is called a *salmon*. This is the common agreement of our fishermen, though there are some who say the *salmon* comes much sooner to its full growth.

The species of this genus enumerated by Artedi are ten. Gen. Pisc. p. 9. Linnæus enumerates twenty-nine species, distributing them into four classes, viz. the trouts with a variegated body, to which belong the *salmon, grey, salmon-trout, trout, charr*, &c. the smelts, with the dorsal and anal fins opposite; those with teeth scarcely perceptible, as the *gwiniad, umber*, &c. and those with only four branchiostegous rays.

The *salmon* is a very peculiar kind of fish. It is bred in rivers, but goes every year from thence into the sea; and at a certain season of the same year it always returns up into the fresh water again; and what is remarkable, is, that so far as observation has been able to trace them at any time, the same shoals of *salmon* always return into the same river out of which they swam, not into any other; so that the people who live on the *salmon* fishery are not afraid for their rivers being cleared, by all the fish in them going down into the sea, for they know that they will all return up to them again at a proper time.

When the *salmon* has once entered a fresh river, he always swims up against the stream, and is, therefore, observed to swim as deep or as near the bottom as possible; and, on the contrary, when they are going down the same river into the sea, they are always seen swimming near the surface. The reason of this is, that in going up they are to swim against the current, which always runs much swifter at the surface than deeper; and when they are going down, they get to the surface, where the force of the current alone is sufficient to carry them, and they have little or no trouble in pushing themselves on.

Salmon will often go a hundred leagues up in the large rivers, springing with surprising agility over cataracts many feet high; but Mr. Pennant contradicts the vulgar opinion of their taking their tail in their mouth when they attempt to leap; and thus the people at this vast distance from the mouth have the pleasure of taking a fish, that is in part of the sea kind. It is also remarkable, that the rivers which most abound with *salmon* do not make the seas about their mouths any more abound with them than others; particularly the harbour of Brest affords no *salmon*; though the river Chateaulin, which discharges itself into it, is the richest *salmon* river in France.

Another singularity, in regard to the *salmon*, is their swimming up the rivers together in such vast numbers. It is to be allowed, indeed, that herrings, mackrel, and many other fish, do in the same manner appear on the coasts at certain seasons in prodigious numbers. See FISH. The *salmons* do this, in order to propagate their species.

Salmon do not equally frequent all rivers, though they may seem to us equally proper for their reception. There are two rivers which open themselves into the harbour of Brest, very near one another; the one of these is famous for the quantity of *salmon* in it, and the great advantage of the fishery; the other never has any of these fish in it. It most probably is owing to their finding plenty of food, and proper places for the depositing their spawn in the one of these rivers, and not in the other, that makes this regular choice.

Salmon are cured in this manner: they are first split, and rubbed with fine salt; and after lying in pickle in great tubs or reservoirs for six weeks, are packed up with layers of coarse brown Spanish salt in casks, six of which make a ton. These are exported to Leghorn and Venice at the price of twelve or thirteen pounds per ton, but formerly from sixteen to twenty-four pounds each. For a farther account of *salmon*, see *Salmon* FISHERY.

SALMO *Alpinus*. See CHARR.

SALMO *eperlanus*. See SMELT.

SALMO *eriox*. See GREY.

SALMO *fario*. See TROUT.

SALMO *lavaretus*. See GUINIAD.

SALMO *thymallus*. See GRAYLING.

SALMO *trutta*. See SALMON-*trout*.

SALMON-*peel*, the name of a fish found in great plenty in the rivers of Wales, agreeing in the colour of its flesh, and perhaps in kind, with the common *salmon*.

SALMON-*sewse*, a name sometimes used for the young fry of *salmon*.

SALMON-*pipe*, in our *Old Writers*, an engine to catch *salmon*, or such like fish.

SALMON-*trout*, *salmo trutta* of Linnæus, in *Ichthyology*, the English name of the fish called *trutta lacustris*, by Gesner and other authors. It is also called *bull-trout* and *scurff*, it

It is caught in lakes, in mountainous countries, and grows to a very considerable size, sometimes to thirty, forty, or fifty pounds weight. It resembles the *trout* in figure, but its belly is very flat, and has, as it were, a long furrow or cavity running the length of the belly. Its back and head are of a very beautiful bluish green colour; and the whole fish, especially its back and the upper parts of its sides, are marked with numerous black spots. Its back fin is also spotted with black, and its scales are small and silver coloured. This species migrates, like the salmon, up several of our rivers, spawns, and returns to the sea. The flesh when boiled, is of a pale red, but well flavoured.

SALMULUS, in *Ichthyology*, the name of a small fish of the truttaceous kind, called in English a *samlet*.

It seldom grows to more than seven inches in length. It is very like the common trout, but differs in these particulars. 1. Its head is narrower, the mouth less, and the body deeper. 2. It has fewer spots, and those of a deader colour. 3. The pectoral fins have generally only one large black spot, attended sometimes with a small one; whereas the pectoral fins of the trout are more numerously marked. 4. The tail is more forked. 5. The spurious or fat fin on the back is never tipped with red; nor is the edge of the anal fin white. 6. The sides under the lines are yellowish. And, 7thly, It has several bluish streaks near the side lines; but these are sometimes found in young trouts.

The *samlet* is the least of the trout kind, and is frequent in the Wye, where it is called *skirling* or *lasspring*, in the upper part of the Severn, and the rivers that run into it, in the north of England, Wales, and the rivers of Scotland, where it is called *par*. It is also called BRANLIN and *fingery*. This fish is thought by many to be the fry of the salmon; but Mr. Pennant dissents from this opinion, for the following reasons: because the salmon fry never continue in fresh water the whole year, but vanish with the first vernal flood that happens, which sweeps them into the sea; the growth of the salmon fry is so quick and considerable, as soon to exceed the bulk of the largest *samlet*; the salmon attains also a considerable bulk before it begins to breed; whereas the *samlets* are found, males and females, distinguished by the milt and roe, of their common size; and they are found in the fresh waters at all times of the year, and even at seasons when the salmon fry have gained a considerable size. They spawn in November and December, when those of the Severn push up towards the head of that river, quitting the lesser brooks, and return to them again when they have done. British Zool. vol. iii. p. 304.

SALON, or SALOON, in *Architecture*, a grand, lofty, spacious sort of hall, vaulted at top, and usually comprehending two stories, with two ranges of windows.

The *salon* is a grand room in the middle of a building, or at the head of a gallery, &c. Its faces, or sides, are all to have a symmetry with each other; and as it usually takes up the height of two stories, its cieling, Daviler observes, should be made with a moderate sweep.

The *salon* is a state-room: it is much used in the palaces in Italy, and from thence the mode came to us. Ambassadors, and other great visitors, are usually received in the *salon*.

It is sometimes built square, sometimes round or oval, sometimes octagonal, as at Marly, and sometimes in other forms.

SALPA, *sparus salpa* of Linnæus, in *Ichthyology*, the name of a fish caught in great plenty in the Mediterranean, and common in the markets of Italy and elsewhere. Its usual size is about a foot in length, and it has a somewhat flatted, yet considerably thick body, and a straight back; its sides are variegated with a number of fine gold-coloured lines running longitudinally; the intermediate spaces between these toward the back are of a bluish green, toward the belly they are white; there are usually eleven of these lines on each side; the mouth is extremely small, and each jaw has only one row of teeth, which are thick and broad below, and terminate in a double point; it has only one back-fin, the anterior rays of which are prickly, the hinder ones soft; it generally keeps about the shores, and swims in large shoals. Though it be a very beautiful fish it is no very delicate tasted one, nor much regarded, the poorer sort of people usually buying it up. See *Tab.* IV. *of Fishes*, N° 44.

SALPUGA, in *Natural History*, a name given by some of the Latin writers to the SOLIPUGA.

SALSAFY. See GOAT'*s beard*.

SALSIRORA, in *Botany*, a name used by some authors for the *ros solis*, or sundew.

SALSOLA, in *Botany*. See KALI.

SALT, *sal*, in *Chemistry*, a simple substance, which enters the composition of all bodies, and is held one of the five principles or elements thereof; and may always be extracted by fire.

Salt, M. Homberg observes, is an ingredient in all animal, vegetable, and mineral bodies, excepting, perhaps, some metals and stones. In vegetables, and animal bodies, that have undergone a fermentation, the *salt* rises first in the alembic, then the phlegm; if the mixt have not undergone a fermentation, the *salt* rises after the phlegm.

Salts are distinguished, with regard to the manner of extracting them, &c. into *volatile*, *fixed*, and *essential*.

To these may be added an intermediate kind of *salt*, under the title of

SALTS, *mixed*, which are those resulting from a mixture of a *volatile* with a *fixed salt*.

SALTS, again, are of different kinds, according to the different matters wherewith they are found mixed: some are mixed bodies themselves and their mixture separable by fire, and lixiviation. Such are, all essential *salts* of plants, and all fossile *salts*, &c. but these are no proper chemical principles. There are others which we are sensible are mixed, and whose mixture we know pretty nearly, though we are not yet able to decompound them: these make the chemical principle *salt*; for our analysis will not render them more simple; which is the character of a principle. And in this sense *salt* is defined a matter dissoluble by water, and unchangeable by fire; to which some add, of a pungent taste. There are three kinds or classes of *salts*, which come under this definition; two whereof are *volatile*, and the third *fixed*. The *volatile* ones are acid *salts* and urinous *salts*; the *fixed* are those drawn by a lixivium, after calcination, and called *lixivious salts*. Nature produces none of these *salts* simple and unmixed; but we easily extract them, by art, from the mixts wherein she has placed them.

Salts are defined, by Dr. Hill, to be solid fossile bodies, friable, pellucid, not inflammable, but fusible by fire, and congealing again in the cold; soluble in water, so as to disappear in it, naturally concreting into regularly figured crystals, and impressing a sensation of acrimony on the tongue.

These are the characters and qualities common to all *salts*, and to no other bodies: and these they always manifest when pure and freed from heterogeneous substances; but in the state in which they are naturally found in the earth, though they have that in their taste alone which may sufficiently distinguish them, yet they do not exhibit all their genuine characters: some of them being found solid and pure, either within the earth or on its surface, but commonly without their proper form; others embodied in earths and stones, as the particles of metals in their ores; and others in a fluid state suspended in waters.

Of the fossils of this class, nature therefore affords us three distinct orders, and under those they are distinguishable into five genera. The *salts* of the first order are those found native and pure, either in the earth or without its surface, and exhibiting all other natural characters, though often without their proper form. Of the second are those found not native, but in form of ores, never pure, but distinguishable by their taste, and immersed in, and blended with the constituent matter of earths and stones in extremely small particles. And of the third are those naturally found suspended in waters, and in a fluid form, but ready to assume their proper figures on the evaporation of a part of that water. Of the first of these orders are the common *alimentary salt* or *muria*, and the NATRUM or *nitre* of the ancients. Of the second are ALUM and NITRUM: and of the third are BORAX and HALCRYPTIUM, an alkaline *salt* hid in the chalybeate waters. Hill's Hist. of Foss. p. 380.

In examining the essential properties of those substances that are called saline, and to which the denomination of *salts*, in a general sense, is applied, it is found that they affect the taste, are soluble in water, and possess all the principal qualities, as gravity and fixity, in an intermediate degree betwixt those of water and of pure earth. Some substances of a saline nature possess these properties in so inconsiderable and weak a degree, that they are scarce discoverable; but in other substances they are so strong, as to allow of being more or less communicated to such as have of themselves no saline qualities, by combining the former with the latter.—These two kinds of substances should be carefully distinguished; and, for this purpose, we may consider all those substances as essentially saline, which have not only the characteristic properties of *salts*, as taste and perfect miscibility with water, in an eminent degree, but which also, when disengaged, can communicate these properties, at least in part, to the other substances, which have them not, by combining with these latter; from which when afterwards separated, they resume their former state, and peculiar saline characters. The slightest view even of those substances that are essentially saline is sufficient to shew, that they possess the saline properties

perties in very different degrees: and hence the greatest chemists, and particularly Stahl, have been led to conclude, that the number of substances truly and essentially saline is very small; and even that only one saline principle exists, which, by the intimate union it is capable of contracting with several other substances, constitutes a certain number of matters which possess the saline properties in a degree sufficiently strong to preserve these properties, more or less, in their several combinations with other matters that are not saline, and to recover them entirely when separated from these combinations: so that as they do not themselves undergo any decomposition, and as they always appear again with the same properties after having been combined and separated, they seem to be simple matters, essentially saline, although they really are compounds of several bodies, not saline, united intimately with only one saline principle, which is universal and always the same. In order to discover which is the most simple of all saline substances, and, consequently, the principle of all others, the most certain method is to compare together the several saline substances, and to consider that as the most simple of all, which possesses the saline properties in the most eminent degree, and which also appears, upon all occasions, to be least susceptible of decomposition or alteration. According to this method of investigation, all *neutral salts* must be excluded; for these may be decomposed, and many of them appear to be compounded of two simple saline substances, viz. the acid and the alkali; which are not in general so easily altered as neutral *salts*.—Pursuing the enquiry upon the same principles, and comparing together the saline properties of the purest and strongest acids and alkalis, it will be found, that the saline properties are stronger and more distinct in acids than alkalis, because the former are more active, more dissolving, more adhering to the bodies dissolved, more deliquescent, &c. and also, that alkalis, fixed and volatile, appear to be more susceptible of alteration and decomposition than acids. The strongest and simplest saline matter must, therefore, be sought for among acids. In a similar examination of acids, we shall perceive, that those which are truly vegetable and animal, that is, in the combination of which oil enters, are infinitely more weak and susceptible of alteration than acids deprived of all oil, which are called mineral acids; of which the vitriolic will be easily discovered to be the strongest and most unalterable, and, consequently, of all bodies, which have saline properties, the purest, simplest, and the most sensibly and essentially a *salt*.

From this reasoning the most celebrated chemists have agreed in considering this acid as the purest and simplest of all saline matters; and the illustrious Stahl carries this notion farther. From his writings, and the whole of his doctrine, we may infer, first, that he considers the vitriolic acid as the only substance essentially saline; as the only saline principle, which, by uniting more or less intimately with other substances that are not saline, is capable of forming an innumerable multitude of the other saline matters, which nature and art furnish: and, secondly, that this saline principle is a secondary principle, composed only of the intimate union of two primary principles, water and earth. In examining the proofs upon which this admirable theory is founded, although it has a great appearance of truth by its consistency with the principles of chemistry, and with many phenomena; yet, says the ingenious author of the Dictionary of Chemistry, art. SALT, it is not supported by a sufficient number of facts and experiments to ascertain its truth. However both the preceding principles acquire from the various facts alledged in support of them, a great degree of probability, though not amounting to a complete demonstration. For a summary of these we must refer to the Chemical Dictionary, *ubi supra*.

Substances essentially saline may be distributed into three classes, viz. I. ACIDS, II. ALKALIS, III. NEUTRAL *salts with basis of alkali*.

To the first class belong, 1. the simplest and strongest acids, called mineral acids, which are vitriolic acid, called also universal acid, or saline principle; nitrous acid, commonly called spirit of nitre, or aqua fortis; and marine acid, called also spirit of *salt*; and acid of common *salt*. See the several articles.

2. The acids less simple and less strong than the mineral acids, which are those that have entered into the combinations of vegetables and animals, and that are united to a certain quantity of oil more or less attenuated: these are crystallized essential acid *salts*, such as crystals of TARTAR; the acid of VINEGAR; the unfermented acids of sharp fruits and plants, as of gooseberries, citrons, sorrel, &c. the acids and acid spirit obtained in the distillation of vegetables, of their extracts, essential *salts*, oils, balsams, and resins, called EMPYREUMATIC acids; the acids obtained from animal substances, such as the acid obtained in the distillation of ants, flies and other insects, and that obtained in the distillation of butter or of fat; and the PHOSPHORIC acid.

The second class comprehends alkalis, or saline alkaline substances, which are the fixed alkali or common *salt*, called also mineral or fossile alkali, marine alkali, crystals and *salt* of soda, vegetable or common fixed alkalis, called also *salt* of TARTAR, and volatile alkali. See ALKALI.

To the third class belong the NEUTRAL *salts*; including, 1. the vitriolic *salts*, formed by a combination of the vitriolic acid with different substances. See SAL *mirabile*, ARCANUM *duplicatum*, *Sal* AMMONIAC, SELENITES, ALUM, and VITRIOL.

2. The nitrous *salts*, resulting from combining the nitrous acid with various substances. See NITRE.

3. Marine *salts*, formed by the marine acid. See *Common* SALT, *Sal* AMMONIAC, PLUMBUM *corneum*, MERCURY, *Butter of* ANTIMONY.

4. Tartareous *salts*, formed by the combination of the acid of tartar, or of other concrete vegetable acids analogous to it, with the several substances capable of uniting with these acids. See *Soluble* TARTAR, and RUPELLENSIS *sal*.

5. Acetous *salts*, including all *salts* formed by the acid of vinegar. See *Regenerated* TARTAR, *Spiritus* MINDERERI, CRYSTALS *of* VENUS or VERDEGRISE, and *Salt of* LEAD.

6. Vegetable *salts*, composed of the acid juices, concrete *salts*, and natural or unfermented acids of vegetables, with the several substances capable of uniting with them; none of which *salts* are yet known.

7. Empyreumatic *salts*, which are vegetable, formed with the acids obtained by the distillation of vegetable matters, furnishing acid spirits, or concrete acids; or animal, composed with acids obtained from the distillation of animal matters, as acids of insects, butter, and fat.

8. Phosphoric *salts*, produced by combining the acid of phosphorus of urine with alkaline, earthy, and metallic substances. See *Fusible* SALT and PHOSPHORUS.

9. *Salts* of borax, formed by combining the sedative *salt* with several substances. See BORAX.

And, 10. arsenical *salts*, produced by combining arsenic with various substances. See ARSENIC and *Neutral arsenical* SALT.

We shall now recite the principal *salts* in alphabetical order.

SALTS, *acid*. See ACID and SALT *supra*.

SALT, *Ætna*. See ÆTNA *salt*.

SALT *alembroth*, a saline matter composed of corrosive sublimate and of sal ammoniac, mixed in equal parts or different proportions, and formerly used as a powerful solvent of metals, and even of gold. See ALEMBROTH.

SALT, *alimentary*. See *Common* SALT.

SALTS, *alkaline*. See ALKALI and SALT *supra*.

SALT *of amber*. See AMBER.

SALTS, *ammoniacal*. See *Sal* AMMONIAC and SAL *Ammoniac*.

SALTS, *arsenical*. See *Neutral arsenical* SALT, and SALT *supra*.

SALT, *bay*. See *Common* SALT.

SALT, *brine*. See *Common* SALT.

SALT, *cathartic*. See SAL *catharticus*.

SALT, *common*, is a perfectly neutral *salt*, composed of a peculiar acid, denominated from it the *marine* ACID, and the marine, or mineral, or fossile fixed alkali. This kind of *salt*, in its popular sense, denotes a sort of saline crystallization, or a sharp, pungent, detergent, and astringent substance, used to season flesh, fish, butter, hides, and other things that are to be kept; as also to give a relish to meats, &c. It is usually called *common*, or *culinary*, or *alimentary salt*, in contradistinction to the chemical *salt*. In order to arrange the matter that has occurred to us on this subject in some order, we shall recite the different kinds of *salt*, the method of preparing it, its principal properties and uses, and the laws relating to it.

SALT, *common, different kinds of*. Mineralogical writers have distinguished common *salt*, with reference to the general sources from which it is most copiously derived, into three different sorts, viz. *fossile* or *rock salt*, *sea* or *marine salt*, and *spring salt*, or that drawn from briny springs and wells.

Mines of fossil or rock *salt* are found in Poland, Hungary, Germany, Italy, Spain, England, and other countries in Europe.

The greatest and best part of sea-*salt* is made in France, though not a little in England. As for *salt*-springs, there are considerable ones in Cheshire, Worcestershire, Staffordshire, Hampshire, Northumberland, Franche Comté,

Comté, Lorrain, Tyrol, and ſeveral other places. Chemiſts can alſo extract *common ſalt* from every vegetable or animal.

Foſſile or *rock ſalt* is called alſo *ſal gemmæ*, from its tranſparence and reſemblance of gems. By *rock ſalt*, or *ſal rupium*, the ancient chemiſts meant *ſalt* adhering to the rocks above high-water mark, being there lodged by the ſpray of the ſea, evaporated by the heat of the ſun; which is the pureſt *ſalt* of all for chemical uſes, and is to be had off the rocks of Sicily, and ſeveral iſlands in the Weſt Indies. But by rock *ſalt*, in this place, we mean that which is found in large beds within the bowels of the earth, ſometimes cryſtallized, but more frequently in irregular maſſes of a red, yellow, or blue colour, and which hath undergone no artiſicial preparation. This *ſalt* was entirely unknown to the ancients: Pliny, however, gives ſome curious things about *ſalts* in Nat. Hiſt. lib. xxx. cap. 7, which we ſhould have tranſcribed, could we perſuade ourſelves of their truth. We ſhall here content ourſelves with what well-warranted relations we could get of the *ſalt* mines of Wilizka in Poland, thoſe in Upper Hungary, and thoſe in the mountains of Catalonia, which make a very conſiderable article of commerce in thoſe three ſtates; *ſalt* being tranſported thence to the ſeveral neighbouring nations, which cannot be conveniently ſupplied with ſea *ſalt*.

The Poliſh mines, in the village of Wilizka, five leagues from Cracow, were firſt diſcovered in 1251. Their depth and capacity are ſurpriſing. Within them is found a kind of ſubterraneous republic, which has its polity, laws, families, &c. and even public roads, and carriages, horſes, &c. being kept here to draw the *ſalt* to the mouth of the quarry, where it is taken up by engines. Theſe horſes, when they are once down, never ſee the light again; but the men take frequent occaſions of breathing the village air. When a traveller is arrived at the bottom of this ſtrange abyſs, where ſo many people are interred alive, and where ſo many are even born, and have never ſtirred out, he is ſurpriſed with a long ſeries of lofty vaults, ſuſtained by huge pilaſters cut with the chiſſel, and which, being themſelves all of rock *ſalt*, appear, by the light of flambeaux, which are inceſſantly burning, as ſo many cryſtals, or precious ſtones of various colours, caſting a luſtre which the eye can ſcarce bear.

The rocks of *ſalt* are hewn in form of huge cylinders; the workmen uſing hammers, pick-axes, and chiſſels, much as in our ſtone quarries, to ſeparate the ſeveral banks. At ſoon as the maſſive pieces are got out of the quarry, they break them into fragments fit to be thrown into the mill, where they are ground, and reduced into a coarſe farina, or flour, which ſerves all the uſes of ſea *ſalt*.

In the *ſalt* mines of Wilizka, there are two kinds of *ſal gemmæ*; the one harder and more tranſparent, and the cryſtallization whereof appears more perfect than that of the other: this is the real *ſal gemmæ* of the druggiſts and dyers. It cuts like cryſtal, and is frequently uſed for toys, chaplets, little vaſes, &c. the other is leſs compact, and fit only for kitchen uſes.

One of the chief wonders of the place is, that through theſe mountains of *ſalt*, and along the middle of the mine, there runs a rivulet of freſh water, ſufficient to ſupply the inhabitants.

The *ſalt* mines in the Upper Hungary are in every reſpect as extraordinary. They are found on the mountains, two miles from Eperies, a city in the county of Sarax, on the river Tarhz. The depth is a hundred and eighty fathoms.

The mineral runs in huge veins, ſo that pieces are ſometimes dug not leſs than a hundred thouſand weight; which, however, are afterwards reduced into ſquare pieces, two feet long and a foot thick, for the conveniency of drawing them out of the mine. When out, they are broken farther, and put to the mill to be ground. The colour of the *ſalt*, while in the maſs, is a little browniſh; and yet when ground, it becomes as white as if it had been refined. Some of the maſſes are found as hard and tranſparent as cryſtal; ſome white, yellow, blue, &c. fit for various works, whereon they engrave as on precious ſtones. The mine is cold and moiſt; whence there ariſes ſome difficulty in reducing the *ſalt* into powder. Of the water drawn out of it, and boiled, is made a blackiſh *ſalt*, which fattens cattle.

The *ſalt* mines of Catalonia are found in the mountains of the duchy of Cardona, and belong to the grandees of that name.

They form a ſolid mountain of rock *ſalt*, between four and five hundred feet in height, and a league in circuit; and deſcending to a depth below the ſurface not known. This prodigious mountain of *ſalt*, which has no mixture of other matter with it, is eſteemed ſo ſingular an appearance, that it is thought to militate very much againſt the opinion of thoſe who would derive the origin of all the beds of rock *ſalt*, which are found under the ſurface of the earth, from the evaporation of *ſalt* water, left in ſubterraneous caverns, either at the deluge, or upon ſome local commotions of the globe. It is the opinion of the country people there, that the *ſalt* grows again, and is re-produced, after ſeveral years, in the ſame places whence it had been dug. But the naturaliſts will ſcarce allow of ſuch a re-production. Many think, however, that it vegetates, or grows, ſometimes: M. Tournefort, by the ſpecimens he had of it in his cabinet, thought this plain.

The *ſalt* is of four kinds, white, bay, red, and brilliant. The firſt is almoſt like *common ſalt*, only that it is not granulated. The ſecond, of an iron and ſlate colour, has moſt of the qualities of the firſt. The third, of a conſerve roſe colour, only differing from the reſt by the mixture of ſome bole, or earth, which gives it this colour. The fourth is a brilliant *ſalt*, tranſparent as cryſtal, which is the proper *ſal gemmæ* of the druggiſts. Of this kind there is ſome blue, and ſome green, orange, red, &c. but they all become white by grinding.

Theſe four kinds of *ſalts* are found over each other in diſtinct ſtrata or beds. The commerce hereof is very conſiderable. The Engliſh, &c. when trade is prohibited with France, furniſh themſelves hence.

Sal gemmæ is to be choſen in large, bright, tranſparent pieces, eaſy to break, and dividing into little ſquare grains. It grows red hot in the fire, like iron; but diſſolves eaſily in air: the druggiſts waſh it, to give it the greater luſtre; but they take care to wipe it dry again ſpeedily.

The mines of rock *ſalt*, near Northwich, in Cheſhire, were firſt diſcovered in the year 1670, as they were boring for coal. It lay there thirty-three or thirty-four yards from the ſurface, and there iſſued from it a vigorous ſharp brine, ſtronger than any of the Cheſhire *ſalt* ſprings before known afforded. The Northwich *rock-ſalt* mines are ſaid to be ſuperior to thoſe near Cracow, with reſpect to the quantity of *ſalt* which is annually raiſed. One pit has yielded at a medium four thouſand tons of *ſalt* in a year, which is about two-thirds of the quantity raiſed every year in the Poliſh mines. Since the time of the firſt diſcovery, many other mines of it have been found in the ſame county, and a great many are now worked by a company of proprietors, and yield vaſt quantities of *ſalt*; but this is eſteemed unfit for domeſtic uſes in its natural ſtate, and for that reaſon the proprietors uſe the method practiſed in Poland, Hungary, and many other places on the coarſer rock *ſalt*, that is, the refining it, by diſſolving it in weak brine, and then boiling it into *ſalt* again; this is done with great quantities on the ſpot; and beſides this, great quantities are carried in the rough ſtate to Liverpool, and there refined with the water of the river Merſey at full ſea, or elſe ſhipped at Liverpool, and thence tranſported to other parts of England, and Ireland, where it is wrought into *ſalt* with ſea water.

The rock *ſalt* refined upon the ſpot is alſo exported to Ireland; and, in times of war, to our American colonies, when they cannot have bay *ſalt*.

The works where they refine the rock *ſalt* are called refineries, and the rock *ſalt* is broken ſmall and put into leaden ciſterns, where it is diſſolved cold in ſea water. When the ſolution has ſtood a day and night to ſettle, it is drawn off from the ſediment into the *ſalt* pan, and refined into *ſalt* in the ſame manner that common brine is boiled up. The ſame additions are uſed in clarifying it, and the ſcratch or calcarious matter falling from it, forms a cruſt as in the other works. The brine left in the pans after the *ſalt* is taken out is not thrown away, but is added to the next quantity put into the pan, and ſo on to the end of the works.

We may here obſerve, that though the Northwich rock *ſalt* is never uſed at our tables in its crude ſtate, and its application to the pickling or curing of fleſh, or fiſh, or preſerving any proviſions, without being previouſly refined into white *ſalt*, is prohibited under a penalty of 40*s.* for every pound of rock *ſalt* ſo applied; yet the pure tranſparent maſſes of it might, probably, be uſed by us with our food, without any ſort of danger or inconvenience; for we know, that rock *ſalt* is ſo uſed, without being refined, both in Poland and in Spain.

The iſland of Tſongming, in the Eaſt Indies, affords the moſt remarkable kind of foſſile or native dry *ſalt* in the world. The country is there, in general, very fruitful, but in certain parts of the iſland there are ſpots of ground, of ſeveral acres, which appear wholly barren, yielding not the leaſt appearance of any thing vegetable upon them.

Theſe ſpots of ground taſte very *ſalt*, and abound in *ſalt* in ſuch a manner, that they ſupply not only the whole iſland, but a great part of the neighbouring continent. When the people ſee the earth become dry, and covered with

with white spangles, which are pieces of *salt*, they dig it up about a foot deep, and carry it away to the work places, where they put it into large wooden vessels of four or five inches deep, and many feet broad, set a little slanting. They pour water upon it in these. When it has stood a proper time they let it out, and add more, till all the *salt* is dissolved; then they boil this water in the common way, and extract the *salt* from it. It is very remarkable, that the same pieces of land, which produce vegetables one year, will produce this *salt* another; and, on the contrary, the *salt* parts will some seasons produce vegetables. The *salt* work there is a thing of great advantage to the inhabitants, and all the poor are, in the season, employed in it; the men in collecting and wetting the earth, and the women in boiling up the water, which they attend as carefully as the men.

Marine or *sea salt* is that *salt* which is made from sea water, thickened by repeated evaporation, and at length crystallized. Of sea *salt* there are two kinds, viz. bay *salt* and white *salt*. See *infra*.

Brine or *spring salt* is a name given to that sort of common *salt* which is not made from sea water, but from the water of *salt* wells and springs. Great quantities of this *salt* are made in most of the inland countries, as in Germany, Switzerland, Hungary, and in some parts of France and England.

In Somersetshire, Cumberland, Westmoreland, Durham, and Yorkshire, there are many *salt* springs, but they are either too weakly impregnated, or situated where fuel is scarce, and for these and other reasons are not worked; but in other parts of England there are many rich and valuable *salt* springs, which are worked to a great advantage: of these some are situated in Staffordshire, a great many in Lancashire, but the chief are those at Droitwich in Worcestershire, and Northwich in Cheshire; about which last place there are many rich mines of fossile *salt*, above and beneath the beds of which the *salt* springs are usually found.

At Nantwich, in the last county, there are also some *salt* wells, which have been of very long standing, being supposed by many to have been worked in the time of the Romans. The brine of these springs is found to differ very greatly in its strength and qualities; some yielding much more *salt* than others, and the *salt* extracted from some of them being found improper for many uses, for which that of others serves very well.

The brine of Barton and Northwich is almost fully saturated with *salt*, a pound of it yielding, as some have said, 6 ounces of *salt*; but this cannot be strictly true; for, allowing that 16 ounces of water can dissolve 6 ounces of *salt*, and no more, it must follow, that no brine spring can yield 6 ounces of *salt* from a pint of the brine; because 16 ounces of water, impregnated with 6 ounces of *salt*, constitute a saturated brine, weighing 22 ounces: and, therefore, by the rule of proportion, if 22 ounces of brine contain 6 ounces of *salt*, 16 ounces of brine will contain $4\frac{4}{11}$ ounces of *salt*. Hence we may infer, that the strongest brine springs will not yield much above one quarter of their weight of *salt*. Accordingly, Dr. Leigh (Hist. of Lancashire, p. 43.) informs us, that some of the strongest springs at Northwich yielded 7 or 8 ounces of *salt* from a quart of brine; but a quart of brine weighs considerably more than 32 ounces, the weight of a quart of water: so that the Northwich springs, from this account, do not yield a quarter of their weight.

The brine of Droitwich, Upwich, and Middlewich, contains about one fourth *salt*; some of the springs at Nantwich yield a sixth part *salt*; and those of Weston, in Staffordshire, afford only one ninth part. In England, we seldom boil weaker brine than the last; but in Germany, and some other places, where *salt* is scarce, they work springs, whose water is not higher impregnated than the common sea water, containing about $\frac{1}{30}$ *salt*.

Here we may observe, that sea water, brine springs, and rock *salt*, generally contain, besides *common salt*, various other earthy and saline ingredients, such as calcareous earth, magnesia, Epsom *salts*, selenites, Glauber's *salt*, fixed alkali uncombined with any acid, &c. These substances are foreign to the nature of the *salt*, and injure its quality; and hence it must appear, that *common salt* may have very different properties, according to the quality of the water from which it is made, or the skill of the *salt*-maker in separating these heterogeneous substances from it.

Alimentary or *common salt* may also be distinguished into various kinds, according to the various ways of preparing it.

Hence we have, 1. *Bay salt*, prepared by evaporation, by the heat of the sun. This *salt* is of two kinds: the first drawn from sea water, as is practised in France, Spain, and Portugal, and many other hot countries; the other from the water of *salt* springs, or lakes, as in the Cape Verd islands, in the island of Tortuga, Turks island, and many parts of America. The first kind, in time of peace, is imported into Great Britain in large quantities. America, and its fisheries, are commonly supplied with the latter.

The several kinds of bay *salt* made in the different parts of the world are found to differ greatly from one another in several particulars; as, 1. in the size of the crystals, which is owing to the heat of the sun, and the time it lies in the pits. The French cream of *salt*, and the blown *salt* of the isle of May, are fine and small grained. The Portugal *salt* is larger grained than that of France; and that of Tortuga is larger than either. 2. In purity: as all bay *salt* has some mud, slime, or the like, in the making, and some kinds are mixed with the bittern *salt*, or what is called Epsom *salt*. 3. They are all more white while dry, and more pellucid when moist; and they differ in colour, according to the earth which makes the bottoms of the pits. Thus some of the French bay *salt* is grey, some reddish, and some white, according as a blue clay has lined the pits, or a red, or white one. 4. Some kinds of bay *salt* are more apt to contract a moisture from the air than others; an imperfection to which the common sorts of marine *salt* are much more subject: this is sometimes owing to the smallness of the grain, and sometimes to a mixture of a calcareous or alkaline *salt* with it, or to a combination of earth with marine acid. And, 5. some kinds have an agreeable smell in large heaps; such are the Portugal, and the Hampshire bay *salts*; and this seems owing to the sea water they were made from, having a bituminous matter in it. 6. It differs greatly in taste, according to the various foreign mixtures it contains; and it will often alter in taste, and other qualities, by long keeping. Thus the *salt* of Peccais is so bitter, when new made, as not to be eatable, but after keeping a while it becomes very pleasant. This is owing to its containing at first a large portion of the bittern *salt*, or Epsom *salt*, which liquifies in keeping, and, running off in form of a fluid, leaves the rest of a good taste. In general bay *salt* is much fitter for use after it has been kept some time in a dry place, than when it is first made.

2. *Marine salt* boiled, which is extracted from sea water by coction.

3. *Brine salt*, or fountain *salt*, prepared by boiling from natural brine, whether of ponds and fountains, or of lakes and rivers.

4. *White salt*, prepared from sea water, or any other kind of *salt* water, first heightened into a strong brine by the heat of the sun, and operation of the air.

5. *White salt*, prepared from a strong brine, or lixivium, drawn from earth, stones, or sands, strongly impregnated with common *salt*.

6. Refined *rock salt*, which is boiled from a solution of fossile *salt* in *salt* water, or in fresh.

And, 7. *Salt upon salt*, which is made from bay *salt* dissolved in sea water, or other water, and boiled to a white *salt*.

All these kinds, except the first, are comprehended by Dr. Brownrigg under the general denomination of *white salt*.

SALT, *common*, *method of preparing*. The art of refining rock *salt* was first communicated to the Cheshire *salt*-boilers by Dr. Leigh. See *Rock salt* supra.

Bay *salt* is prepared in the most simple and easy manner, when the water of the ponds and lakes impregnated with *salt* is totally exhaled by the force of the sun and air, and the *salt* is left concreted into a hard crust at the bottom.

We have many natural *salt marshes*, or *salinæ*, as they are called, of this kind, in several parts of the world, where *salt* is produced without any art or labour of man. Pliny, Alonso Barba, Shaw, and other writers, give accounts of large briny lakes, which are evaporated to a perfect dryness in summer time; when the inhabitants cut and carry away as much *salt* as they have occasion for. Lakes of this kind are found in the Podolian desert, near the river Borysthenes, on the Russian frontiers towards Crim Tartary, in the kingdom of Algiers, and in other countries.

Mr. Masson, in his botanical travels from the Cape of Good Hope (Philos. Trans. vol. lxvi. part i. p. 297.) met with such a lake, called Zwart Kop's *Salt*-pan, several miles distant from the sea, and situated upon an eminence. In the rainy season it is filled with fresh water, which, by the saltness of the ground, soon becomes strongly impregnated with saline particles; and when the summer's heat exhales the fresh water, the bottom of the lake is covered with a crust of pure *salt*, two or three feet

feet thick. The lake is about three miles round, and furrounded by a rifing ground.

In thofe countries, however, where this manufacture of *falt* is not naturally performed, it may be effected by art; and *falinæ* or *falt marfhes* may be conftructed for this purpofe. This is annually done to great advantage in France, where the chief coafts for bay *falt* are thofe of Bretagne, Saintonge, and the Pays d'Aunis.

In order to make a faline or *falt* marfh, a low plat of ground muft be chofen adjoining to the fea, and diftant from the mouths of large rivers, and this muft be near fome convenient harbour for veffels. The ground muft be free from frefh water fprings, and out of the reach of land floods, and, if poffible, fhould have a clayey bottom; and, finally, it muft be well defended from the fea, either by natural or artificial banks of earth of a proper ftrength and thicknefs.

The ground thus chofen muft be hollowed out to three ponds or receptacles. The firft, into which the fea water is ufually admitted, may be called the refervoir; the fecond receptacle, which is to be divided into three diftinct ponds, communicating with each other by narrow paffages, and containing brine of different degrees of ftrength, may be called the brine-ponds; and the third receptacle is to be furnifhed with an entrance, between which and the brine-ponds there is to run a long narrow and winding channel; the reft of it is to be divided into fmall and fhallow pits, containing a very ftrongly faturated brine, which in them is to be converted into *falt*, and they may, therefore, very properly be called the *falt* pits.

The firft receptacle or refervoir muft have a communication with the fea by a ditch, defended on each fide by walls of brick or ftone, and made of fuch a depth, that by it all the water of the refervoir and other parts of the *falt* marfhes may be able to run out at low water, and by it alfo the fea may be admitted into it at high tide. So that at neap tides the marfh may be filled with fea water to the depth of ten inches in the refervoir; and, confequently, at higher tides, to the depth of two feet, when there is occafion to overflow the marfh, as is always to be done in the winter feafon, when there is no *falt* to be made; for by this means, the wood work is kept from decay, and the clay bottom from injuries by froft. The ditch between the refervoir and fea muft have a flood-gate, by which the fea water may be admitted, retained, or let out, as occafion may require.

The feveral ponds or receptacles muft not have all their bottoms upon the fame level, but muft be made of unequal depths, fo that the firft receptacle or refervoir may be eight inches and a half deeper than the *falt* pits in the third receptacle. The three brine ponds alfo fituated between the refervoir and the *falt* pits muft be of unequal depths. The next adjoining to the refervoir muft be the deepeft, and that which is nigheft the *falt* pits the fhalloweft, but all of them muft be fhallower than the refervoir; and the three receptacles being thus conftructed, the water ftanding at the fame height in them all, and forming with its furface one continued plain, will be ten inches deep in the refervoir, when only an inch and a half in the *falt* pits.

The length and breadth of the brine ponds and refervoirs are to be at difcretion; but it is beft to err in making them too large, and in general they ought to be fo large as to furnifh the *falt* pits with a conftant fupply of brine, fully faturated with *falt*; and for this purpofe, it is neceffary to have them of different dimenfions, in different countries according to the degree of heat.

The bottoms of the refervoir or brine ponds are to be lined with any kind of lean and tough clay, or earth, that will hold water; and the French ufe a red, or blue clay, to be had in the neighbouring grounds. With them the blue always fucceeds better than the red, which colours the *falt* much more; but in order to have a perfectly pure *falt* from this kind of manufacture, the bottom fhould be lined with fome clean cement, which will hold water perfectly, and will not be eafily broken up.

The faline or marfh being thus conftructed, the faltmen, at the proper feafon of the year, which is from the middle of May to the end of Auguft, open the flood-gate when the tide is out, and drain off all the ftagnating water: when this is done, they repair the bottom of the marfh in feveral places, where it is found neceffary, and cleanfe the feveral receptacles from mud and dirt: after this they admit the fea water at the next high tide, till it floats the whole marfh, and ftands at about ten inches high in the refervoir. In a day or two moft of the water in the *falt* pits is exhaled, and what remains is a very ftrong brine, they then let in more fea water at the two or three following tides; and fo take care to admit as much frefh water into the marfh, as has been wafted in vapour by the heat, conftantly raifing it to the height of ten inches in the refervoir, and conftantly to an inch and half in the *falt* pits; and when the weather is extremely hot, or there are fharp drying winds, they fill them fomething higher than this.

All the parts of the marfh are thus fupplied with water out of the refervoir, but the fea water, which is let into the refervoir, is not confufedly let into the other water or brine of the ponds and *falt* pits; for as the feveral parts of the work communicate only by narrow channels, it is provided, that the *falt* water flowing out of the refervoir never returns to it again, but gently flows along till it arrives at the fecond brine pond, and from that to the third, being forced forward by the fea water received from time to time in the refervoir. During this flow courfe, the watery fluid alway flies off in great quantity by exhalation, and the brine is continually preparing for cryftallization as it flows along gently, growing all the way ftronger and ftronger, as it approaches the *falt* pits; fo that when it at length enters thefe pits, it is fully faturated with *falt*; and particular care is taken to guard the entrance of the *falt* pits by a long and narrow channel, by which means the ftrong brine contained in thefe pits is prevented from returning back, and mixing with the weaker brine in the brine ponds; care is alfo taken, that the ftrong brine in the *falt* pits is fpread out very thin, and expofed to the fun and air with a large furface, by which means the water more quickly exhales from it, and the *falt* is left concreted in the cryftals. Thefe cryftals, or *falt*, the workmen in France draw out every day, and difpofe them at length together in a pyramidal heap, which they cover over at the top with thatch or ftraw, and fo preferve them from the injuries of weather. Thus at a fmall expence and trouble a *falt* is prepared, which is found very fit for all domeftic ufes; and France is furnifhed with a very profitable article for exportation into other countries.

The *falt* thus made is of different colours, according to the colour of the clay employed in making the pits.— That of the French is brown, whence the denomination of *bay falt*, and it is ufually fold without farther preparation; though in fome places they make it into *white falt* by refining it in large flat cauldrons. In a favourable feafon, the French are faid to be able to make enough of bay *falt* in a fortnight, to fupply their home confumption for a year, and the wants of other nations, who purchafe from them much more than is confumed in France.

The greateft difficulty which attends the making of bay *falt* in Great Britain arifes from the heat of our fummer not being fufficiently ftrong to evaporate a great quantity of fea water in a fmall portion of time. But Dr. Brownrigg has fufficiently evinced the practicability of our imitating the French in their manner of procuring bay *falt*. It is well known, that in Hampfhire, and fome other counties, they have a method of heightening the fea water into a ftrong brine, by expofing it to the fun in large pits, much after the manner in which bay *falt* is made; and fo much of the fea water is, by this means, naturally evaporated, that though they boil the remainder with Newcaftle coal, yet they can afford their *falt* at a lefs price than the Newcaftle *falt*-boilers can afford theirs; though the fea water is, probably, equally impregnated with *falt* at both places.

The works in which the fea water is heightened into brine are called funworks or outworks. Thefe are conftructed on a flat down or oozy beach: within a mole which is raifed, if neceffary, to keep out the fea, there is a large refervoir, or feeding pond, communicating with the fea by a fluice, and adjoining to this refervoir a long trench, parallel to which there are feveral fquare ponds, called brine pots, nine or fometimes twelve placed in a row, and parallel to this two other rows of the fame kind; beyond the third row, there is a row of larger ponds, three in number, called fun pans, with each of which three or four of the brine pits in the third row communicate by narrow openings; and thefe often communicate with a larger pond, called the common fun pan, from which the brine flows into large covered ciftems (made very tight of brick and clay), adjoining to the boiling-houfe. The bottoms of the ponds are in feveral places formed of an oozy mud, well trodden and laid fmooth; and in the brine pits and fun pans covered with fea fand. The bottoms of all the pits form an inclined plane, higheft at the refervoirs, and loweft at the common fun pan. The partitions between the ponds are of mud and earth, about two feet broad, with little openings, by which the pits communicate with one another. The fea water, received at full fea, into the refervoir, is thence let out, as occafion requires, into the trench, and from the trench into the firft row of brine pits; and when they are duly filled, the openings between them and

and the trench are closed with mud. The water, after standing for some time in these pits, is let out into the second row; and after a certain time, according to the degree of evaporation, into the third row of pits; those of the first row being again filled; and thus they are filled and emptied alternately. When the brine is sufficiently evaporated, in the third row of brine pits, it is suffered to flow into the common sun pan, where its weight is examined by glass hydrometers; and being found of due strength, it is drawn from thence into the cisterns, where it remains till they are ready for boiling it. The sea water, thus carried through the whole work, is called a course of brine; and, in hot weather, it acquires its proper strength in twenty-four hours; but, if showers approach, it is drawn into the cistern before it is brought to its full strength. In this course the *salt* water stands deepest in the pits of the first row, and is gradually shallower in the others, till it arrives at the sun pan, where it is shallowest, and in the common sun pan it is somewhat deeper, being about six or seven inches deep. After this manner, if the season proves favourable, they make as much brine as keeps them boiling till near Christmas; after which they repair their pans and furnaces, and prepare their Epsom *salt* from the bittern, and begin again to make brine about April.

The pans in which they boil the *salt*, at Lymington, are of lead, of a square form, and smaller than those used for boiling sea water into *salt*. They have usually four of these in a saltern, placed in a row, with a furnace to each of them. The chimnies are carried up by the side of the wall, which divides the boiling house from the fire house; and the smoke is conveyed from each furnace into these chimnies by two flues, one on each side of the mouth of the furnace. To each of these flues is fitted a register or plate of iron, placed horizontally, which may be drawn out or thrust in over the flue, so as to close it, and prevent the smoke from ascending through it, and by means of these registers and vent holes, and doors to the mouths of the furnaces and ash pits, they are able to regulate the fires in the exactest manner, and damp them while the *salt* is graining, or smother them quite out, if they find occasion. In the boiling house they have a chimney to convey off the vapours from each pan; which is a square funnel of boards. There is only one long walk in the boiling house, on the side of the pans opposite to the mouths of the furnaces, and between this walk and the wall are placed large wooden troughs, with several little holes at their bottoms; into which troughs the *salt*, when drawn out of the pans, is put to be drained from the bittern. Below these troughs others are placed to receive the bittern; and in them several sticks are fixed erect, to which the CAT-*salt* adheres in large crystals. Such is the general construction of the Lymington salterns.

The process of boiling *salt* is much the same here as at the brine works; except that at these works they use no clarifying mixtures; they boil the brine violently, till a thin skin of *salt* appears on its surface, when the brine is said to begin to *yew*, and then damp the fire, and carefully skim off this skin, and also take out the calcareous earth, and cast it away. This earth they suffer to settle to the bottom of the pan, without collecting it into scratch pans, as at most other works, and rake it to the side, and thence draw it out. To the brine, cleared from the scratch, they add butter and other seasonings; and afterwards proceed to grain the *salt* with moderate fires, commonly reducing three pans full of brine into *salt* in twenty-four hours. When the *salt* hath remained in the troughs six or seven hours, it is taken out; and without any other preparation laid up in the storehouses for sale. A *salt* boiler, with an assistant, attends four pans, and also prepares the brine in the outworks.

The artificial method of promoting the evaporation of sea water, and the preserving the brine, in the English *salt* pits from being diluted with rain, proposed by Dr. Brownrigg, is as follows. A number of *salt* pits should be made in a row in the marsh, from east to west, and their bottoms lined with plaister, or some strong cement, that will not easily break up; and by this caution, the *salt* may be drawn white and pure like the Portugal kind, not grey like the French. Over each pit covers should be made of thin boards, or rather of canvas painted white, and stretched on frames of wood, and these should be fixed to strong posts, erected on the north side of the pits, and contrived to be easily drawn back to them, in the manner of draw-bridges. These covers, thus fixed, may be let down over the pits, in the manner of a shed or penthouse, in rainy weather, to keep the brine from being diluted with fresh water; and in dry weather they may be raised almost to a perpendicular, but inclining a little towards the south, so as to form a wall with a south aspect; and thus they would serve for a double use, being a covering to the pits in rainy weather, and reflectors of the sun's heat in dry weather. The reflection of so large a body of the sun's rays, in the course of a bright day, would greatly promote the evaporation of the brine; and the hinges, on which the reflectors turn, being placed at ten inches from the ground, when the reflectors stand upright, there will be a space under them, through which the air will continually flow in a brisk current, and this will greatly promote the evaporation of the water.

The passages of communication between the pits must be narrow and winding, and must be wholly stopped up in wet weather, that no fresh water run into the brine. This channel should be covered also with boards, and, at the entrance of the pits, there must not be a pond, as is the custom in France, but only a narrow covered trench, running parallel with the side of the pits, which is opposite to the reflectors; and the pond, which forms the entrance of the pits in the French *salt* marshes, must in these be detached from them, and instead of it, there must be formed a fourth brine pond, communicating with the third by a long and narrow channel.

If these contrivances should be reduced to practice in England, the *salt* will probably crystallize much faster there than in the French marshes, and the brine may be kept as deep, and even deeper than in the French pits; and a shower of rain will only retard the work for the small time in which it is falling: whereas, in the French works, it throws them back three or four days, as no *salt* can be formed till all the water it brought be evaporated.

Four cisterns may be dug adjoining to the brine pits, to admit the brine in the *salt* ponds, when the weather is very rainy; and as to the *salt* water in the reservoir, if it should be found necessary to preserve it from rain in cisterns, when so much rain falls as to make it fresher than sea water, it may be let out, and sea water admitted in its place. And in order to promote the evaporation, and to make the *salt* water in the reservoir fitter to supply the first brine pond with brine of a due strength it may be proper, by means of a small fire-engine, continually to force up the *salt*-water in the reservoir, as often as occasion requires, and by means of a diverger, fitted to the engine, to make it descend again into the reservoir like a shower of rain; by which means, the evaporation of the watery vapours will be greatly promoted after much the same manner as is practised at several of the *salt* works in Germany, where the brine is very weak.

Thus by augmenting the force of the sun's heat, and of the air, by promoting the evaporation of the watery vapours, and preventing the brine from being diluted with rain, it is very probable that, during the summer season, double the quantity of *salt* might be prepared at an English work with these contrivances, that is now usually prepared at a French *salt* marsh of equal magnitude.

Besides these methods of managing sea water, it is certain, that very large quantities of bay *salt* might be prepared in England with great ease, from the natural brine of *salt* springs, and from the common fossile or rock *salt* of Cheshire, dissolved in weak brine, or in sea water. Upon the whole, the bay *salt* might thus be made here at a moderate price, and in sufficient quantities to supply both the nation itself, and all our colonies.

Dr. Watson, in his Chemical Essays, vol. ii. p. 58, having found, by experiment, that, in a summer day of sixteen hours, three gallons of water may be dispersed into the air, by a warm sun and a brisk wind, from the surface of a linen cloth, equal to one square yard, suggests a method of manufacturing bay *salt*, by wetting and drying alternately any number of square yards of course cloth: and he observes, that one labourer, assisted by proper mechanical contrivances, might be equal to the daily management of a thousand yards, or more. By this plan in favourable weather there would be daily evaporated twenty-four thousand pounds of water, which, supposing sea water to contain one thirty-second part of its weight of *salt*, would give seven hundred and fifty pounds of *salt*.

He adds, that those who have seen the artifice of strengthening brine, which is practised in Franche Comté, and other places, by making it drip through faggots, in order to increase the evaporation, by increasing the surface of the water, which is exposed to the air, will not be surprised at this method of evaporating water.

Marine salt is prepared by boiling sea water. This *salt* is only made in countries where great quantity of fuel can be had at a very low price, or where the sun has not force enough; and is therefore made in few counties of England, except on those parts of the British coast which most abound in pit coal. This has thence got the name of *Newcastle salt*, and is exported to Denmark

mark and Norway, and ſome other countries, as well as ſent to London and other parts of England.

The moſt convenient works for the making this *ſalt* are conſtructed in the following manner. The ſaltern is erected at ſome convenient place near the ſhore; it is a long and low building, conſiſting of two parts, one called the fore-houſe, and the other the pan-houſe or boiling-houſe. The fore houſe ſerves to receive the fuel, and cover the workmen; and in the boiling-houſe are placed the furnace, and the pan in which the *ſalt* is made. And in ſome places they have two pans, one at each end of the building, and the fuel and place for the workmen are in the middle. The furnace opens into the fore-houſe by two mouths, and from theſe is carried up a wall to prevent the aſhes from flying to the *ſalt* pans, and in this is a door of communication between the two houſes. The body of the furnace conſiſts of two chambers, divided from one another by a brickwork, called the *mid-feather*, which from a broad baſe terminates in a high edge nigh the top of the furnace, and by means of ſhort pillars of caſt iron fixed upon it, ſupports the *ſalt* pan.—The pans are oblong and ſhallow, the common meaſure being fifteen feet in length, twelve feet in breadth, and ſixteen inches in depth; they are commonly made of plates of iron joined together with nails, and the joints filled with a ſtrong cement; and the bottom of the pan is prevented from bending down, or changing its figure, by hooks faſtened to ſtrong iron bars which are placed acroſs it.

Between the ſides of the pan and the walls of the boiling houſe there runs a walk, five or ſix feet broad, where the workmen ſtand to draw out the *ſalt*. The roofs are wood, and are faſtened with pegs of wood, nails mouldering away into ruſt in a few months.

Not far diſtant from the ſaltern on the ſea ſhore, between full ſea and low water mark, they make a little pond in the rocks, or with ſtones in the ſand; this they call a *lump*, and from this pond they lay a pipe; through which, when the ſea is in, the water runs into a well adjoining to the ſaltern, and by this well they pump it into troughs, by which it is conveyed into their ſhip or ciſtern, in which it is ſtored up till they have occaſion to uſe it.

The ciſtern is built cloſe to the ſaltern, and may be placed moſt conveniently between the boiling-houſes on the back ſide of the fore-houſe. It is made either of wood, brick, or clay, and ſhould be covered with a ſhed, that the *ſalt* water in it may not be weakened by rains, and ſhould be placed ſo high that the water may conveniently run out of it into the pans. When the ſea water has ſtood in the ciſtern till the mud and ſand are ſettled from it, it is drawn off into the *ſalt* pan; and at the four corners of the *ſalt* pan, where it is ſupported by the brick work and conſequently the flame does not touch its bottom, there are placed four ſmaller leaden pans and ſcratch pans, which, for a *ſalt* pan of fifteen feet, are uſually about a foot and half long and a foot broad, and three inches deep. Theſe have a bow or circular handle of iron, by which they may be drawn out with a hook when the liquor in the pan is boiling.

The *ſalt* pan being filled with ſea water, a ſtrong fire of pit coal is lighted in the furnace, and then, for a pan which contains about fourteen hundred gallons, the *ſalt* boiler takes the whites of three eggs, and incorporates them all with two or three gallons of ſea water, which he pours into the *ſalt* pan, while the water contained therein is only lukewarm, and mixes this with the reſt by ſtirring it about with a rake. In many places they uſe inſtead of eggs the blood of ſheep or oxen to clarify the ſea water, and in Scotland they do not give themſelves the trouble of clarifying it at all. As the water heats, there ariſes a black frothy ſcum upon it, which is to be taken off with wooden ſkimmers. After this the water appears perfectly clear, and by boiling it briſkly about four hours, a pan loaded in the common way, that is about fifteen inches deep, will begin to form cryſtals upon its ſurface. The pan is then filled up a ſecond time with freſh ſea water, and about the time when it is half filled, the ſcratch pans are taken out and emptied of a white powder, ſeeming a kind of calcareous earth, which ſeparates itſelf from the ſea water during its boiling, before the *ſalt* begins to ſhoot. When theſe have been emptied they are again put into their places, where they are afterwards filled again. This powder, being violently agitated by the boiling liquor, does not ſubſide till it comes to the corners of the pan where the motion of the maſs is ſmaller, and it there falls into theſe pans placed on purpoſe to receive it. The ſecond filling of the pan is boiled down after clarifying in the ſame manner as the firſt, and ſo a third, and a fourth; but in the evaporation of the fourth, when the cryſtals begin to form themſelves, they ſlacken the fire, and only keep the liquor ſimmering: in this heat they keep it all the while that the *ſalt* is granulating, which is nine or ten hours. The granules or cryſtals all fall to the bottom of the pan; and when the water is almoſt all evaporated, and the *ſalt* lies nearly dry at the bottom, they rake it all altogether into a long heap on one ſide of the pan, where it lies a while to drain from the brine, and then is put into barrows and carried to the ſtore-houſe, and delivered into the cuſtody of his majeſty's officers. In this matter the whole proceſs is uſually performed in twenty-four hours, the *ſalt* being commonly drawn out every morning. This is the method in moſt of our *ſalt* works, but in ſome they fill the pan ſeven times before they boil up the *ſalt*, and ſo take it out but once in two days, or five times in a fortnight. In the common way of four boilings, a pan of the uſual ſize, containing one thouſand three hundred gallons, they draw from fifteen to twenty buſhels of *ſalt* every day, each buſhel weighing fifty-ſix pounds.

When the *ſalt* is carried into the ſtore-houſe, it is put into *drabs*, which are partitions, like ſtalls for horſes, lined at three ſides, and the bottom with boards, and having a ſliding board on the foreſide to draw up on occaſion. The bottoms are made ſhelving, being higheſt at the back, and gradually inclining forward; by this means the brine remaining among the *ſalt*, eaſily ſeparates and runs from it, and the *ſalt* in three or four days becomes ſufficiently dry. In ſome places they uſe cribs and barrows, which are long and conic wicker baſkets for this purpoſe, and in ſome places wooden troughs with holes in the bottom. The ſaline liquor which remains from the making of *ſalt*, is what is called BITTERN.

The ſides of the pans in which the *ſalt* is made are ſoon cruſted over with the ſame ſort of matter, formed into cakes or cruſts, that falls in powder into the ſcratch pans; this the workmen call ſtone ſcratch; they are obliged to cleanſe the pans of it once in a week or ten days, otherwiſe they will be burnt. In England they do this with iron picks, but at Hall in Saxony they have a much better method; for they then take out the pans, and turning them bottom upwards, burn ſtraw under them, by which means the matter of the cruſt looſens itſelf, and after this it falls off on being ſtruck with a mallet or hammer.

In Lancaſhire, and ſome other parts of England, ſea *ſalt* is made in this manner: they pare off, in dry weather, in ſummer, the ſurface of the flats, which are covered at full ſea, and bare when the tide is out. When they have procured heaps of this they put it into troughs, and pour freſh water on it; this waſhes off the *ſalt* that hung about the ſand, and is received ſo impregnated into veſſels ſet underneath the troughs. So long as this liquor is ſtrong enough to bear an egg, they put on more water; when an egg ſinks in it they throw the ſand out of the troughs, and put in freſh from the heaps. The water thus impregnated with *ſalt* they boil in leaden pans, and evaporate to a dryneſs, the *ſalt* remaining behind.

Brine or *fountain ſalt* is prepared from the water of *ſalt* wells and ſprings.

The ancient methods of boiling brine into *ſalt*, in Cheſhire and Worceſterſhire, are accurately deſcribed in the Tranſactions of the Royal Society; and the method, formerly uſed in Staffordſhire, is delivered in Dr. Plott's hiſtory of that county; but the method, now generally uſed in England, is this.

The brine being received from the well into a large ciſtern, is thence received, as occaſion requires, into the *ſalt* pan. Theſe pans are of the ſame form with thoſe uſed in the boiling of ſea *ſalt*, and uſually hold about eight hundred gallons: in ſome places theſe are made of iron, and in others of lead. When the brine is put into the pan, a little blood is mixed with it, in order to clarify it, and leaden pans are placed at the corners to receive the ſcratch, or calcareous earth, that ſeparates from them in the boiling. An ounce of blood is ſufficient for eight hundred gallons of brine. In ſome places they clarify their brine with whites of eggs. As ſoon as it is boiled, it is carefully ſkimmed, and afterwards it is ſuffered to boil very briſkly for ſome time, till the *ſalt* is granulated; after this the ſcratch is ſeparated, and the fire ſlackened, till the whole *ſalt* is formed.

When they have ſeparated the ſcratch, and the *ſalt* is ready to cryſtallize, they put into the pan ſeveral ſorts of ſeaſoning, as they call them, ſuch as ale, butter, and the like, which they ſuppoſe correct the bad qualities of the brine, and make the *ſalt* of a ſmaller grain. After this they boil it very gently, and when as much *ſalt* is formed, as will fill two or three of their wicker baſkets, they rake it up to the ſides of the pan, and fill it into the baſkets, placing them over the leach trough, that the brine may drain into it from the *ſalt*. The ſalt taken out

out, they call a draught of *salt*, and the operation, a clearing of the pan.

In this manner they draw the *salt*, and clear the pan five or six times during each process, leaving at last only a few quarts of brine at the bottom of the pan. The baskets, into which they put the *salt* out of the pan, are called also *barrows*: they usually contain about a bushel of *salt*, and are of a conic figure, open at the base. The whole process of working a pan of brine usually lasts about twenty-four hours. After the *salt* has drained an hour or two in the baskets, it is removed into the hot-house over the furnace, where it remains four or five hours to be thoroughly dried, and is then taken out of the baskets, and laid up for sale. In all the English *salt* works, the leach brine, which is what remains in the pan after the *salt* is crystallized, and what drains from the *salt* in the baskets, is not thrown away, as it is in Germany, but is added to the pan next to be boiled. And beside the *salt* made in this manner, they have, at most of the English *salt* works, a different kind, which they call *shivery salt*. This is of a larger and firmer grain than that prepared in the common way, and is stronger, being formed by a milder heat, and therefore more fit for preserving meat. When they would make this *salt*, they fill the pans on Saturday night, and then, as they draw out no *salt* on Sundays, there is a very moderate fire kept up all that day, and on Monday morning all the *salt* is taken out at one draught, having had time to form itself into larger crystals than ordinary, as it is eight and forty hours instead of four and twenty in forming.

They have also another kind of *salt*, made up in form of sugar loaves in small wicker baskets, which is thence called *loaf salt*, or *basket salt*. This is the whitest, driest, and finest grained of any *salt*, and is therefore greatly esteemed at table. In preparing this *salt* they use some resin and other additions, to break the grain and render it very small; others also, to this purpose, boil it the more briskly, and stir it briskly all the while. But in Cheshire, where the best basket *salt* is made, they use no particular process about it, but only take the second and third draughts of every pan, which always are the purest *salt*; and they do not suffer these to lie so long in the pan, as when they make *salt* of a larger grain, but take it out before it can form large crystals: by this means they have it of a fine small grain, and they then press it hard down into the wicker baskets, and, when dried in the stove, they let it remain in the baskets for sale.

Not long since, Mr. Lowndes published a method of greatly improving the English brine *salt*, so as to make it at least equal to the French bay *salt*.

The method is this. Let a brine pan, containing about eight hundred gallons of liquor, be filled with brine to within an inch of the top; then make and light the fire, and, when the brine is just lukewarm, put in either an ounce of blood from the butchers, or the whites of two eggs. Let the pan boil with all possible violence, and as the scum rises take it off. When the fresh or watery part is pretty well decreased, throw into the pan the third part of a pint of new ale, or the same quantity of the grounds of any malt liquor. When the brine begins to grain, add to it the quantity of a small nut of fresh butter, and when the liquor has stood half an hour longer, draw out the *salt*. By this time the fire will be greatly abated, and so will the heat of the liquor; let no more fuel be thrown on the fire, but let the brine gently cool, till a person can just bear to put his hand into it; keep it in that degree of heat as nearly as possible, and when it has worked for some time, and is beginning to grain, throw in the quantity of a small nutmeg of fresh butter, and about two minutes after that scatter throughout the pan, as equal as may be, an ounce and three quarters of common alum, pulverized very fine; then instantly, with the common iron scrape-pan, stir the brine very briskly in every part of the pan for about a minute; then let the pan settle, and constantly feed the fire, so that the brine may never be quite scalding hot, yet always a great deal more than lukewarm; let the pan stand working thus for about three days and nights, and then draw it, or take out the *salt*. The brine remaining will, by this time, be so cold, that it will not work at all, therefore fresh coals must be thrown upon the fire, and the brine must boil for about half an hour, but not near so violently as before the first drawing; then with the usual instrument take out such *salt* as is beginning to fall, and put it apart; then let the pan settle and cool. When the brine becomes no hotter than one can just put one's hand into it, proceed as before, and let the quantity of alum not exceed an ounce and a quarter, and about eight and forty hours after draw the pan, and take out all the *salt*.—Lowndes's Brine Salt improved.

This is Mr. Lowndes's process; except that he afterwards directs cinders to be chiefly used in preparing the fires, the better to preserve an equal heat, and by that means also he proposes saving a considerable expence, asserting, that at present cinders are so little valued in Cheshire, as to be thrown out into the highways. Mr. Lowndes adds, that, in a pan of the size before mentioned, there may be prepared, at each process, sixteen hundred pounds weight of *salt* from the best brine in Cheshire, and one thousand and sixty-six pounds from the ordinary brine of that county. This, as the process continues five days, is a little more than five bushels and a half of *salt* a day from the best brine, and a little more than four bushels a day from the ordinary kind.

The *salt* boilers, and particularly those who prepare brine *salt*, have long been accustomed to make use of various substances, which they call additions or seasonings, and mix them with the brine while it is boiling; either when they first observe the *salt* begin to form, or else afterwards during the time of granulation. The intention of these additions is to make the *salt* grain better, or more quickly form into crystals, to make it of a small fine grain, to make it of a large firm and hard grain, and less apt to imbibe the moisture of the air, to render it more pure, and to make it stronger and fitter for preserving provisions.

The additions commonly used for these purposes are wheat-flour and resin, in order to give the *salt* a small grain; butter and tallow, to make the brine crystallize more readily; new ale, stale beer, bottoms or lees of ale and beer, wine lees, and alum. Wine lees, new ale, stale ale, and the lees of ale and beer are now generally rejected by the marine *salt* boilers; except in the West of England, where the briners, who use them, affirm that they raise a large grain, and make their *salt* more hard and firm, and some say that they make it crystallize more readily.

Hoffman prefers the strongest ale; and Plot assures us, that it makes the *salt* of a larger or smaller grain, according to the degree of its staleness. Dr. Brownrigg apprehends, that the only good effects which fermented liquors can have, as an addition, are owing to their acid spirit, which may correct the alkaline *salts* of the brine, and thus render the common *salt* more dry and hard, and less apt to dissolve in moist air. For correcting the alkaline quality of the brine, if any additions are thought necessary, he recommends stale ale or Rhenish wine; or perhaps malt vinegar would answer the same purpose. Alum and butter were long used in Cheshire, but the use of the former has been discontinued. Mr. Lowndes introduced it, with a view of correcting the flakyness and softness of brine *salt*: but Dr. Brownrigg is of opinion, that alum cannot answer these purposes, and that it is not necessary; for, he says, that the grains of common *salt* will always be sufficiently hard, and of their natural figure, large size, and undeliquiable, if formed by a gentle heat, and perfectly free from heterogeneous mixtures: and he imagines, that the goodness of Mr. Lowndes's *salt* is not owing to the alum, but to the gentle heat used in the preparation of it. The addition recommended by the Dutch will appear in the sequel of this article.

We may observe, that bay *salt* and boiled *salt* have respective different qualities, according as they are prepared at different places: and there are two general causes of this diversity; one respects the manner of preparing the *salt*, the other respects the quality of the water from which the *salt* is prepared. When sea water or brine is boiled into *salt*, a portion of the acid, which is one of its constituent parts, is dispersed; and a greater or less portion is dispersed, according as the *salt* has been formed with a greater or less degree of heat. We have an instance of this, both in bay *salt* compared with boiled *salt*, and in the different sorts of the latter, when compared with each other.

Bay *salt*, which is prepared from sea water, by the mild heat of the sun, is generally esteemed much stronger than the white *salt*, which is prepared likewise from sea water, by boiling the water. Hence this *salt* is not only weaker, but more disposed to deliquiate in the air; both which imperfections are said to be corrected by a small addition of fresh acid, when the *salt* begins to concrete. Hence also distilled *sea* WATER is manifestly impregnated with acid, so as to be unfit for drinking, or for the common purposes of life; unless a little chalk, vegetable ashes, or other like substances, be added in the distillation, to absorb and keep down the acid extricated by the heat; by which means the distilled fluid proves perfectly sweet.

White salt is prepared by boiling either the natural brine of sea water, or *salt* ponds and springs, whence are obtained the marine *salt* and brine *salt*, or the stronger brine

brine produced by artificial means, viz. by previous evaporation, or solution of fossile *salt*, or the impregnation of common *salt* drawn from earths, sands, or stones. Of this *salt* two very different kinds are required; the one for the use of the table, and the other as a condiment for provisions. Its whiteness, dryness, and the smallness of its grains, are the properties which chiefly recommend the first kind, and its strength and purity the latter.

Dr. Brownrigg has proposed a method of improving the preparation of both kinds, founded on the following principles; viz. 1. That in the common processes for making white *salt*, the *salt* is deprived of a considerable part of its acid spirit, by the violent boiling used in its preparation; whence it is rendered less fit for preserving fish, flesh, and other provisions, than it would be if prepared with a more gentle heat. 2. That most kinds of white *salt* are rendered impure by the mixture of various heterogeneous substances, which render it less proper for preserving provisions, than it would be if separated from them.

In order to obtain a *salt* of this kind, free from all impurities, and in no respect weakened by a dissipation of its acid spirit, let the sea water (if that be used) be heightened into a strong brine by the sun, after the method practised in Hampshire, and other parts of England, or in a *salt* marsh constructed after the French manner.

For this purpose a saltern must be erected, adjoining to the *salt* marsh, and a large boiler, or *salt* pan, made of iron, placed in it. The bottom of the pan may be of a square figure, forty feet on each side, and its depth may be eighteen inches; or it may be made of a cylindrical form, forty feet in diameter, and eighteen inches deep, like those used in Holland. The furnace over which the pan is erected may have four mouths, made on the opposite sides at equal distances, for the convenience of receiving fuel. The fire may be made on a hearth; and within the furnace must be erected proper pillars of brick or mid-feathers; and, if necessary, strong posts and cross bars of iron, to support the bottom of the *salt* pan. There must be also four funnels, for conveying away the smoke, at equal distances, between the mouths of the furnace. If the pan be square, the funnels may be carried up at its four corners, and the mouths may be under the middle of its four sides. To the mouths must be fitted close doors, and the funnels must be furnished with registers, for regulating the fire. When this apparatus is provided, let the *salt* pan be filled with strong brine, drawn from the cistern, and well cleared from its muddy sediment. Then kindle a fire, and mix a sufficient quantity of whites of eggs with the brine, in order to clarify it; let the brine boil gently at first, and let it be well skimmed. When this is done, diminish the fire, and apply a moderate heat, sufficient to keep the brine of a scalding heat.

When the *salt* begins to grain, rake out the scratch, which will be found at the bottom of the pan. When the brine is thus fully depurated, in order to correct its alcaline quality, a proper quantity of sour whey may be added to it; the brine being kept of a scalding heat, while the *salt* is graining or forming into crystals; and when most of it is crystallized, and lies in the pan almost dry on its surface, the fire must be damped by shutting the doors of the furnace and registers; and the *salt* must be drawn from the liquor to the sides of the pan, and put into drabs, or proper vessels, till the bitter liquor is drained from it, and then it will be fit to be used in the second process of refining.

In this way may be prepared a sea *salt* stronger, and of a much firmer and larger grain than any kind of common white *salt* made by the ordinary methods; and also a *salt* for the table, better in quality and cheaper than that prepared by the common methods. However, it is necessary to observe, that the *salt* which is required of a fair grain, should be granulated with quicker fires, and drawn out of the pan before it hath lain long enough to form itself into large crystals, so that it may be taken out at five or six draughts during the process. The second or third draughts will be the best *salt*, being most free from scratch, and the *salts* of the bittern. After the same manner, a good kind of white *salt* may be extracted from natural brine, and likewise from a solution of rock *salt* in weak brine or sea water.

In the second process of refining, a sufficient quantity of the white *salt*, prepared as above directed, should be put into a large cistern, made of wood, or bricks and clay; and to this should be added as much pure river water, as will be sufficient to reduce it to a strong brine, almost fully saturated with *salt*; when the *salt* is dissolved, and the brine has remained unmoved, a scum will arise which must be taken off, and a sediment will fall to the bottom. Let the clear brine be drawn out of the cistern into a *salt* pan, such as has already been described in the first process, well cleansed from bittern; let a fire be kindled in the furnace, and the heat be so gentle, that the watery part of the brine may be slowly evaporated without any of the saline spirit; for this purpose the heat should be regular, and less than the heat of boiling water; but the degree which *salt* can endure without any dissipation of its acid spirit, is best known by experience, and may be adjusted by the registers, &c. When the evaporation is so far advanced, that little saline crystals begin to appear on the surface of the brine, then may be added to it a sufficient quantity of the acid muriatic spirit (in the proportion of about one, two, or three drops of the spirit to a gallon of the brine) so that neither the acid, nor the alcaline principle of the *salt* may be predominant. When this is done, the evaporation must be continued until the surface of the *salt* in the pan is almost dry. The doors of the furnace and registers must then be closed, and the fire smothered out, and the *salt*, which will be found in large clear crystals, must be raked to the sides of the pan, and having drained there a little while, be taken out, and put in proper vessels to drain farther from the superfluous brine, and it will be then fit for sale.

The strong brine which remains in the pan after the refined *salt* is drawn out, and the brine that drains from it, ought not to be mixed with the solution intended to be made into refined *salt*, but will serve to mix with the brine, to be boiled up in the first process, into common white *salt*. See on the subject of this article Brownrigg's Art of making Common Salt, 8vo. 1748. passim.

Salt, *white sea, method of making*. The *white salt* of Normandy is not made by refining the *bay salt*, but has this colour naturally when taken out of the pits. To make it they gather a muddy sand on the flats of the shore, which the rising tide has covered and impregnated with its waters for seven or eight days. This sand being removed into pits for the purpose, discharges itself by degrees of all its water, which filtrates through some straw, wherewith the opening of the pit is filled, and trickles into vessels set on purpose to receive it. Of this water it is that they make their *salt*.

Their furnaces are of earth, and their boilers of lead: each furnace boils four leads. When the water wherewith they have filled the leads begins to boil, they take off the scum, which arises in abundance; and in proportion as it diminishes, throw in fresh water, which they continue to skim, as before. When it thickens, they keep it continually stirring, with a crooked stick or ladle; and when the grain is formed, they take it off the fire to purify it.

The purifying is performed by letting it stand in large osier baskets; where it drains itself of certain humidities that remained. When dry, it is laid in heaps, and thence is carried into the magazines.

The commerce of *salt* brings an immense profit to France, though more to the king than to the makers and sellers: the duty is one fourth part of the price the *salt* is sold at. The English and Dutch, and (when they are at war with France) the Swedes and Danes, take off most of the *salts* of the Comte Nantois; paying for it, *communibus annis*, from 20 to 35 livres the load. That of Guerande is preferred, by the English and Irish, to all the rest, as the best. Yet that of Borneuf, though browner, and heavier, is most used in France, as also throughout the Baltic; particularly in Poland, where, besides the ordinary uses, it serves in tilling the ground; being found to warm it, and prevent little vermin from gnawing the grain.

The English and Dutch have often striven hard, in times of war, to do without the French *salts*; and to that end have endeavoured to take *salts* from the Spaniards and Portuguese; but there is a disagreeable sharpness and serosity natural to them, which renders them very unfit for the salting of flesh, fish, &c. To remove this, they boil them with sea-water, and a little French *salt*, which they procure by means of neutral nations, which not only softens them, but increases their quantity by one third. But it should seem their refining does not succeed to their wish, by the eagerness wherewith they return to the *salts* of Bretagne, &c. as soon as any treaty has opened the commerce.

Salt *upon salt*, a kind of common *salt*, prepared by the Dutch, of great use in preserving herrings and other fish, and to which they principally owe their advantages in the herring trade. The Dutch prepare two kinds of refined *salt*, one of a small grain, intended for the use of the table, and called butter *salt*. They export large quantities of this to the countries upon the Rhine, and into other parts of Germany. The other kind is a very strong and pure *salt*, and is of the largest grain of any boiled

boiled *salt* now made: this last they call the St. Ubes or Lisbon *salt*, from its resemblance to the pure bay *salt* made in those places.

The *salt*, which they refine, is altogether marine bay *salt*, and they chiefly have it from France and Spain; but they find, by experience, that any one kind of bay *salt* does not answer their purposes, so well as two or more kinds; they therefore frequently mix three parts of Cadiz *salt* with one part of that of Souston, which is of great strength, but very dirty, and of a green colour, and does not cost above half the price of the Spanish *salt*; for dissolving the bay *salt*, they use sea-water, which they bring in lighters to Dort and Rotterdam from below the Brill or Helvoet; out of these lighters it is craned into cellars, and is thus impregnated with bay *salt* to a certain degree of strength, which they determine by hydrometers made for that purpose. After the heavy dross of the *salt* is subsided to the bottom of the cellar, the clear brine is pumped up into the *salt* pan through a mat, which retains the light scum, straws or other impurities, which floated on the surface of it. These *salt* pans are of iron, of a round figure, and commonly forty feet in diameter, and eighteen inches deep. These pans are placed over a hearth furnace, and the only fuel they use in the boiling the *salt* is dry turf. The fire is kept up so high, that the liquor boils briskly all the time, and if any scum arises, they carefully take it off, but they use no clarifying mixtures. A little before the *salt* begins to granulate, they add to the pan, a lump of butter of the bigness of a walnut, and half a pint of sour whey, which has stood at least half a year. This acid whey, called *azy*, unites itself with the uncombined fixed alkali contained in the *salt*, and thus prevents it from adhering to the common *salt*, as it crystallizes. Any other mild acid might probably answer the same purpose.—When these things are perfectly mixed in by a good stirring, they shut the doors and windows of the house, that no air can blow in cold, and the house is kept thus hot all the time that the *salt* is forming. This method is not new, or peculiar to the Dutch works, for Agricola describes an apparatus of boards, to keep the cold air out of the *salt* pan all the time that the *salt* is forming; and the Germans use it, in many places, at this time.

It is out of this same brine, and by the same process, that they make the table *salt* and the strong *salt*; only towards the end of the process they make this difference; if the pan is to be wrought into table *salt*, the brine is kept gently simmering during the whole operation, and all is finished in twenty-four hours; but if it be to be made into a strong *salt*, they slacken the fire to such a degree, that the operation takes up three days. In both cases they let the *salt* remain in the pan till the whole is finished; they then rake it out with wooden rakes, and after it has drained a while in wooden drabs, it is fit for use. The mother brine, of which there always remains a large quantity in the pan after the strong *salt* is made, as also the drainings of the drabs where the *salt* is put, is reserved to be boiled up into table *salt*; but the mother brine of the table *salt* becomes more sharp and bitter after every process, and is finally thrown away.

SALT, *common, principal properties and uses of.* That *salt* is esteemed the best for curing provisions and for preserving them the longest time, which is the strongest and purest. This may be known by the following properties. It is usually concreted into large grains or crystals, which are firm and hard, and with respect to those of other kinds of common *salt*, the most solid and ponderous. It is not disposed to grow moist in a moderately dry air, to which it has been exposed for a considerable time; its colour is white and somewhat diaphanous; it hath no smell; its taste is truly muriatic, and more sharp and pungent than that of other kinds of common *salt*. The *salts* which approach nearest to this degree of perfection are the best kinds of bay *salt* and the strong Dutch refined *salt*.

With regard to *alimentary salt* in general, we may observe, that though it appears to us under various forms, it is immediately distinguished by applying it to the tongue, and its always assuming the same figures after a regular crystallization. Its crystals are cubes, several of which unite together into the form of hollow truncated pyramids.

Common *salt* dissolves in water, and cold water dissolves nearly the same quantity as hot boiling water, nor does it concrete again in the cold, like the other neutral *salts*, as long as the evaporation of the fluid is prevented; but writers are not agreed about the proportion of *salt* dissolved in water. Some say that it dissolves in less than thrice its weight of boiling water; others say that it requires three times and one seventh its own quantity of water; and others again say that four parts of water to one of *salt* are required, for a perfect solution. These differences may be easily accounted for by the different *salts* that may have been used. Boerhaave is of opinion that 16 ounces of water will not dissolve quite 5 ounces of *rock salt*; Spielmann, with whom Neumann agrees, thinks that they will dissolve 6½ ounces; Eller says that 7 ounces of *fossile salt* may be dissolved in 16 ounces of water; and Hoffmann assures us that 16 ounces of water will not dissolve above 6 ounces of *common salt*. Dr. Watson's experiments confirm that of Hoffmann; for he observes, that he never could dissolve quite 6 ounces of *rock salt* in 16 ounces of water. The *sea* WATER, in different parts of the world, is very differently sated with *salt*; that of some parts containing twice as much as others. The sea-water which surrounds the coasts of Great Britain, is said to hold seldom more than one thirtieth, or less than one fiftieth part of *common salt*. When water is impregnated with any *salt*, as much as it can bear, it will still dissolve a quantity of another *salt*, whose particles are of different figures, proper to insinuate into the remaining vacuities of the water: thus, after *common salt* will no longer dissolve in it, alum will; and after alum, *salt*-petre, then *sal* ammoniac, &c.

Although *common salt* is very crystallizable, and exactly neutral, it very readily becomes moist, when exposed to humid air, and must, therefore, be kept in dry places.—This *salt* contracts an union with *common salt* with a calcarious basis, and, consequently, all the *salt* obtained either from sea water, or *salt* fountains, contains a certain quantity of this *salt* with earthy basis, the white earth of which will precipitate by adding fixed alkali to a solution of *common salt* in pure water. In order to obtain a very pure *common salt*, it is necessary to dissolve it in water, filtrate it, and add a solution of crystals of soda, or marine alkali, till no more white cloud is formed by the addition; then filtrate the liquor again, and evaporate it.

The crystals of *common salt*, exposed to the fire, crackle and burst, and thus form the *sal decrepitatum*, soon after melt, and, when cooled, fix in form of a white and almost opake mass. This *salt* is absolutely unalterable by fire, even when it has been heated strongly, together with inflammable matters; a property which results from the slight disposition which its acid has to combine with phlogiston, as the experiments of Messrs. Duhamel and Margraaf have demonstrated. However, though it be fixed in the fire to a certain degree, yet when it is exposed to a violent fire with free access of air, it exhales in vapours, and attaches itself, in white flowers, to bodies, less hot than itself. Chemists know no other acid but vitriolic and nitrous acids, and sedative *salt*, which can decompose *common salt* by disengaging its acid.

Common salt is of all saline substances the most necessary and useful. Its acid and alkali are employed in many chemical operations in the arts; it is an important ingredient in the fusion of GLASS, which it whitens and purifies; it facilitates the fusion and precipitation of the metallic parts of minerals in essays, and perfectly covers them; and its peculiar use in preserving meats, &c. seasoned with it, or steeped in solutions of it, and in improving the taste of aliments, is universally known. In the application of *salt* to this important purpose, it retards and prevents the putrefaction of almost all our aliments, without producing any such change upon them, even when preserved a long time, as to render them altogether unfit for nourishment. And though salted animal foods are generally accounted one of the principal causes of the scurvy at sea, this is owing not to the *salt* itself being prejudicial, but to its being incapable of preserving the animal subjects, for a length of time, in a perfectly uncorrupted state. Pure sea *salt*, and sea water, are rather salubrious than hurtful, both in the true SCURVY, and in impurities of the blood and humours in general.

Hoffmann observes, that an ounce of the *salt*, dissolved in a proper quantity of water, occasions commonly six stools or more, without uneasiness; that this *salt* checks the operation of emetics, and carries them off by stool; that in glysters it is more effectual, though used only in the quantity of a dram, than any of the purgatives; and that where other glysters fail of opening the belly, a solution of *common salt* produces effect.

With regard to the antiseptic property of *common salt*, it is proved by the experiments of sir John Pringle, Dr. Macbride, and M. Gardane, in his Essay towards a History of Putrefaction, that, though when mixed with animal substances in a large proportion, it preserves them from putrefaction, yet when a small quantity of it is employed, it considerably accelerates putrefaction. Whence it appears, that small quantities of *common salt*, such as are taken with food, facilitate digestion, which is a kind of incipient putrefaction, and serve at the same time as a mild stimulus to the stomach itself: and, therefore, *common*

common *salt* is not only agreeable and useful, but also salutary, at least to all constitutions, in which the digestion is too remote from putrefaction, as in those which are properly called crudities; though different temperaments may differ much in this respect. *Common salt* is observed to differ from other saline substances, in occasioning drought, and tending, not to cool, but rather to heat the body. Lewis's Mat. Med. and Dict. Chem. Eng. ed. art. *Common* SALT. See SPIRIT *of salt*, and *Marine* ACID.

Common salt is also useful as a manure, by contributing to fertilize the soil; though in the more early ages of the world it was regarded as a symbol of extreme sterility. And we read of princes, who, in token of their indignation, sowed grounds with *salt* to render them barren. See Judges, ix. 45. Deut. xxix. 23. Zephan. ii. 9. Virgil, Georg. lib. ii. reprobates a *salt* soil as occasioning the degeneration of fruit trees, and admitting no melioration from ploughing.

Pliny, speaking of fossile *salt*, affirms, that every place in which it is found, is barren and unfit for vegetation. And Plutarch observes, that the Egyptians believed *salt* to be the spittle or foam of the giant Typhon, the great enemy of their gods; and hence, he adds, they held it in the greatest abhorrence.

In later times, however, *salt* is frequently used as a manure with great success. It has been the custom, ever since the time of Henry III. at least, for the farmers on the Cornish coast to manure their lands with sea sand, in which sea *salt* is so copiously mixed, that in many places it is used to be extracted from a ley made of sand. When the sand has been long exposed to the air, it proves less useful and enriching, which some have attributed to its having been deprived of a good part of its *salt* by the dews and rains. This practice of manuring lands with sea sand has, within these few years, been introduced with advantage, in other parts of Great Britain. The Cheshire farmers purchase no inconsiderable quantity of refuse *salt* from the *salt* boilers: they mix it with dung, and it makes an excellent manure. At Northwich alone, there were sold, a few years ago, near 3000 tons of it in one year, for the use of the farmers in that and other counties.

In Cheshire, and other counties, they make a great use of the water of their *salt* springs, as a manure for their lands. They let out the water of these springs for a certain time upon the lands, after there has been rain, and by this means the quantity of *salt* they contain is so blended with the rain-water, that it is too weak to hurt the corn or grass, and yet strong enough to kill worms and other vermin, and to improve vegetation.

On the other hand, when the soil abounds with rushes and weeds, it is customary in Cheshire to lay a quantity of rock *salt* upon it, as it is found utterly to destroy every vegetable. And Mr. Tull, observing that common sea *salt* is destructive to almost all plants, except those which naturally grow in the sea water, or on the shores, invented a method of determining how far the horizontal ROOTS of plants run, by burying *salt* at a distance from them.

From the above observation it should seem, that *salt*, when used in small quantities, is a good manure, and, when in large ones, a real poison to vegetables.

Some of the African and Arabian deserts are thought to be barren by their having too much *salt* in them; whilst many parts of Barbary are reckoned to be peculiarly fruitful, from their containing a less quantity of it. As *salt*, in small quantities, is known to accelerate the putrefaction of animal substances, and when in larger to retard it, and thus is useful in assisting the organs of digestion in man and other carnivorous animals, as we have already observed, *salt* applied in like manner, as a manure, may be found very beneficial; not from its entering as an aliment into the substance of vegetables, since there are many experiments tending to prove that no kind of *salt* can of itself become the *food of* PLANTS; but from its efficacy in reducing weeds, dried herbage, dead roots, &c. into a putrid oily mass; the fructifying virtue of oily composts being now generally acknowledged: but when it is used in a larger proportion, by preserving these matters from corruption, and drying up or hardening the fibrous capillaries of the roots, so that they become unfit for sucking in nutriment, the fertility of the ground is diminished, or wholly destroyed.

As to the fertility of lands overflowed by sea water, it may be partly owing to the slime and mud left by it, and partly to the *salt* contained in it, which, being in a small quantity, may contribute to the putrefaction of the effete vegetable roots, and the consequent production of an oily compost.

There are no lands that fatten cattle sooner than those pasture grounds which are thus, at times, overflowed by *salt*-water; such, e. g. are the pastures at Erith, near the Thames, which are sometimes overflowed at spring tides. Some farmers have tried the scattering of *salt* over their corn fields, as soon as sown, in the quantity of two bushels to an acre, with good success: and this quantity may be productive of all the advantages which arise from the occasional overflowing of high tides and natural *salt* springs.

SALT, *common, duties on, and laws relating to.* The duties upon *salt* are under the management of a distinct office, called the *salt-office*, established in 1694, subject to the direction of five commissioners, at an annual salary of 500*l.* each, who have, by statute 1 Anne, cap. 21. the same powers, and must observe the same regulations as those of other excises. To this office belong also a comptroller, with an annual salary of 350*l.* deputy and clerks, a treasurer, who has for himself and clerks 430*l.* *per annum*, his deputy and clerk, a secretary at 200*l.* *per annum*, assistant secretary and clerk, an accomptant general at 200*l.* *per annum*, and clerk, solicitor at 150*l.* *per annum*, correspondent at 100*l.* *annum*, and clerk, chief accomptant and clerk of securities at 180*l.* *per annum*, two accomptants and assistant clerks, housekeeper at 100*l.* a year, storekeeper and clerk of the charity and diaries, collector of London port, assistant searcher, two surveyors, &c.

By 5 W. cap. 7, a duty is laid on home *salt* of $1\frac{1}{4}d.$ a gallon; which, by 7 & 8 W. cap 31. is extended to all *salt* made from rock *salt*, *salt* refined, and *salt* made from *salt*. And by 9 & 10 W. cap. 44. a farther duty is imposed on all such *salt* of $3\frac{3}{4}d.$ a gallon: the same amounting in the whole to 3*s.* 4*d.* a bushel: *salt* being estimated at 56lb. to the bushel. These duties were repealed by 3 Geo. II. cap. 20. but were revived by 5 Geo. II. cap. 6. for three years, continued from time to time, and made perpetual by 26 Geo. II. cap. 3.

By 5 W. cap. 7. there shall be paid for every gallon of foreign *salt* imported 3*d.* over and above other duties; and by 9 & 10 W. cap. 44. an additional duty is laid of 7*d.* a gallon: the same amounting in the whole to 6*s.* 8*d.* a bushel: the gallon to be rated after 8 gallons to the bushel Winchester measure; and 84 lb. of foreign *salt* shall be deemed a bushel. 1 Anne, stat. i. cap. 21.

By 9 Anne, cap. 23. a farther duty, over and above the duty on home *salt*, of 9*s.* a ton, is laid on all rock *salt* exported to Ireland; and rock *salt* shall be ascertained as to payment of the duties, at 65 lb. weight to the bushel.

By 20 Geo. III. cap. 34, an additional duty upon *salt* is charged, as follows: viz. for every gallon of *salt* imported, not being the product or manufacture of Great Britain, the sum of $2\frac{1}{4}d.$ for every gallon of *salt* and rock *salt*, made at any *salt* works or taken out of any pit in England, $1\frac{1}{4}d.$ for every bushel of *salt*, made at any *salt* works or taken out of any pit, in Scotland, 3*d.* and for every bushel of *salt* imported from Scotland into England, 7*d.* By 8 Geo. III. cap. 25, foul *salt*, produced in the manufacturing of white *salt*, not fit to be applied to the curing of provisions, but which may be beneficial to agriculture, shall be charged only with a duty of 4*d.* in a bushel. The duties on foreign *salt* shall be paid by the importer, on entry, and before landing; who, on giving security to the collector, shall be allowed six months for payment, or at the rate of 10*l.* *per cent. per annum*, upon paying ready money. 9 & 10 W. cap. 44. Farther time is allowed, if the *salt* imported amounts to more than 40 bushels, under certain restrictions, by 5 Anne, cap. 29. No foreign *salt* shall be imported in any ship of less burthen than 40 tons, on pain of forfeiting the *salt*, and double its value, 3 Geo. II. cap. 20. and *salt* that is landed before payment of the duty is forfeited, and also 10*s.* a bushel; and every person assisting therein shall forfeit 100*l.* Obstructing an officer searching a ship incurs a forfeiture of 40*l.* 5 Geo. cap. 18. Importing or landing British *salt* in England incurs a forfeiture of the same, and also of the ship and tackle; and every person assisting forfeits 20*l.* or is liable to six months imprisonment: which regulation is also extended to *salt* shipped for exportation, and put on shore again or taken out of the vessel. 1, 2, & 3 Ann. cap. 14. 5 Geo. cap. 18.

The duties on rock *salt* refined into white *salt* shall be allowed, 10 & 11 W. cap. 22. but no rock *salt* shall be refined, or made into white *salt*, in any place, except within ten miles of the pit, &c. on pain of 40*s.* a bushel. 1 Ann. stat. 1. cap. 21. By the same act every maker of *salt*, refiner of rock *salt*, and proprietor of any *salt* works or pits, who shall set up or use any *salt* work, pit, pan, storehouse, warehouse, &c. for making, laying, refining, or keeping of *salt*, without giving notice at the next *salt* office, shall forfeit 40*l.* and the officer shall be allowed to enter and survey, under a forfeiture of 40*l.* and obstructing the officer in his duty incurs a forfeiture of 20*l.* Nor shall any *salt* be delivered from any works or pits without notice to the officer, on pain of forfeiting the same, 10*s.* a bushel, and 20*l.* 5 W. cap. 7. 9 & 10 W. cap.

cap. 44. Any officer neglecting or violating his duty incurs a forfeiture of double the value of the *salt*, clandestinely conveyed away and landed, and also 10*s.* a bushel. 5 Geo. III. cap. 43. *Salt* shall be weighed before removal, in the presence of the *salt* officer, or the proprietor shall forfeit 20*l.* and double value. 10 & 11 W. cap. 22. Upon entry of *salt*, made or imported, the officer shall give a warrant, impowering the removal of it, on paying or securing the duty in nine months; but any person, paying ready money, shall be allowed at the rate of 10 *per cent. per annum*. 5 W. cap. 7. 5 Ann. cap. 29. The duties on rock *salt* shall be paid, or security given to pay in twelve months, on pain of double value of the duties; or if they are paid within two days after the charge is made, 10*l. per cent. per annum*, shall be allowed. Officers may seize *salt* carried before entry, without a permit, which, if not claimed within ten days, shall be forfeited and sold; but if it be claimed without evidence of entry and warrant for removing it, it shall be forfeited: and every person, who shall carry it before entry and warrant, shall forfeit double the value, and 10*s.* a bushel. 5 W. cap. 7. 9 & 10 W. cap. 44. and by 5 Ann. cap. 21, the officer may seize and secure the offender. By 2 & 3 Ann. cap. 14, he that shall carry *salt* without a permit shall forfeit 20*l.* Permits shall be delivered gratis by the *salt* officers. 7 & 8 W. cap. 31. And sight of these may be demanded. 5 Geo. III. cap. 43. The lord mayor and aldermen, in London, and the justices of the peace, in the county, at their general sessions, may set and publish in writing the prices of *salt*, and alter the same as occasion requires; and persons refusing to sell at such price, or selling at a higher price, shall forfeit 5*l.* half to the king, and half to the informer. 7 & 8 W. cap. 31. No person, dealing in *salt*, shall sell it otherwise than by weight, after the rate of 56 lb. to the bushel, on pain of 5*l.* to the informer. 9 & 10 W. cap. 6. Nor shall any person buy *salt* otherwise than by weight, on pain of 10*s.* a bushel. 1 Ann. stat. i. cap. 21. No *salt* shall be carried coast-wise before the duty is paid or secured, 5 W. cap. 7. It shall be weighed when put on board, and a permit given, on pain of forfeiture of 10*s.* a bushel. 10 & 11 W. cap. 22. And the cocquet, signed by the *salt* officer, shall express the quantity. 1 Ann. stat. i. cap. 11. Allowance shall be made for waste, at the rate of three bushels for forty of white *salt*, and one bushel and a half for forty of rock *salt*. 5 Ann. cap. 29. 6 Ann. cap. 12. The officer at the unlading port may demand a sight of the permit, and weigh the *salt* upon unlading; and if it weighs more than the permit expresses, the surplusage shall be forfeited. There shall be a drawback of the duties on *salt* exported; besides an allowance of four bushels for forty of white *salt*, and two bushels for forty of rock *salt* exported to Ireland, on account of the waste of carriage; but if any such be relanded, without entry and payment of duties, the offender shall forfeit double value, and 10*s.* a bushel, and the other penalties for foreign *salt* landed unentered. 5 W. cap. 7. 9 & 10 W. cap. 44. 10 & 11 W. cap. 22. 5 Ann. cap. 29. The curers of fish for exportation may import foreign *salt* or take from the pit or work British *salt*, or rock *salt* refined, without duty, except the customs on importation, entering the quantity, and an account of the same being kept by the officer. 5 Geo. cap. 18. For the various regulations relating to this business, we must refer also to 8 Geo. cap. 16. 11 Geo. cap. 30. 8 Geo. II. cap. 12. 19 Geo. III. cap. 52. By 5 Ann. cap. 29, there shall be allowed five shillings for every barrel of salted beef or pork exported for sale; but if such beef or pork be relanded, it shall be forfeited, and 40*s.* a bushel. By 1 Ann. stat. i. cap. 21. No person shall use any brine before it is boiled into *salt*, or any rock *salt* before it is refined, for pickling or curing flesh or fish, on pain of 40*s.* for every gallon of brine, or pound of rock *salt*. See Burn's Justice, art. EXCISE.

There is a custom duty in the city of London, called *granage*, payable to the lord mayor, &c. for *salt* brought to the port of London, being the twentieth part.

SALTS, *cryſtallizable*, in *Chemiſtry*, distinguish and comprehend all saline matters susceptible of crystallization; in contradistinction to *fluor* SALTS.

SALT *of colcothar* is a white saline matter, obtained by lixiviating COLCOTHAR.

SALTS, *deliqueſcent*, a denomination comprehending all saline matters, which may be obtained by crystallization, or drying in a concrete form, but which, when exposed to the air, imbibe its moisture, and lose their concrete crystallized form, deliquiating into a liquor by means of this moisture. See DELIQUESCENCE.

SALT, *diuretic*. See SAL *diureticus*.

SALT *of England*, is a name given to a very rectified, concrete, volatile alkali, obtained from silk; and also to the concrete volatile alkali obtained from sal ammoniac.

SALT, *Epſom*. See EPSOM, and SAL *mirabile*.

SALTS, *eſſential*, include all concrete saline matters which preserve the smell, taste, and all other principal qualities of bodies from which they were obtained, which bodies are only vegetable or animal. The usual method of preparing them is by evaporating, to almost the consistence of a syrup, the liquors containing the *eſſential ſalt*, viz. the expressed and depurated juices and strong decoctions, and by keeping them in a cold place. From many of these liquors, saline matters or crystals are deposited upon the sides of the containing vessels after a considerable time, and after they have undergone a kind of fermentation. These crystals, which are always very red, may be purified by dissolving them in water, filtrating, evaporating, and crystallizing. These mineral *ſalts* are extraneous to the vegetables and animals from which they are obtained; and are procured in the same state in which they were introduced. The best known of these *eſſential ſalts* is TARTAR.

SALTS, *fixed*, a name given by many chemists to the *ſalts* obtained from the ashes of plants, which, not having been dissipated by fire, ought to be considered as fixed, in comparison of the other saline matters of these plants, which evaporate during their deflagration. As the saline substances remaining in the ashes of vegetables are entirely or chiefly alkaline, the name of *fixed ſalt* has become synonimous with that of *fixed* ALKALI. But other saline substances, as most neutral *ſalts*, which have not bases of volatile alkali, are nearly as fixed as fixed alkali.

Mr. Homberg has given, in the Memoirs of the Paris Academy, for 1714, a very curious paper on the subject of volatilizing the *fixed ſalts* of plants. He observes, that the *fixed ſalt* of any plant is a *ſaline* matter, which has already lost in the fire all, or the greater part at least, of the volatile matter contained in the plant it is obtained from, as its phlegm, acid spirit, urinous spirit, its essential oil, and urinous *ſalt*; and that its figure is in some degree that of a spunge, the pores of which being always open, are ever ready to receive again such sorts of volatile substances as the fire has before driven off from them; and that art may in such a manner add these its deprived parts to it again, that the concrete shall lose its fixity, and become volatile, as the whole was in a great measure before. The whole of this operation consists in adding to the lixivial *ſalt* one or more of those volatile substances, the loss of which gave it its present form. These are to be introduced into the *ſalt* by repeated cohobations, which are to be continued till so much volatile matter is added to the fixt, that the whole becomes volatile together; the naturally volatile particles being mixed in such proportion, as to be able to carry up the fixed in vapour with them. The several volatile substances of plants are of different kinds, and consequently require different operations, to make them mix with the *ſalt*. Tartar may very well serve as a general instance in this case, and the manner of introducing into its *fixed ſalt* those principles, of which the fire before divested it, and by this means rendering it volatile, may serve as a specimen of the manner of doing it in all the rest; but as *ſalt* of tartar, and all other fixed vegetable alkaline *ſalts*, however well purified, always contain a great deal of earth, the several volatiles employed act differently on this, according to their several natures; some carrying it all up in vapour, others carrying only a part of it, and leaving at the bottom of the vessel more or less of an earthy matter, insipid to the taste, and wholly divested of its alkaline *ſalt*; every particle of which, even in this case, has been volatilized, and raised by the fire. The alkaline *ſalt*, thus volatilized, appears also, according to the different substances employed, in very different forms; sometimes in that of a *ſaline* liquor, sometimes in an acid, and sometimes in an urinous spirit; sometimes also it becomes changed into a volatile *ſal ſalſus*, sometimes into an acrid and fetid *ſalt*, and, finally, sometimes into a volatile aromatic one. The first matter which fire drives out of tartar, or any other vegetable substance, is its phlegm: this being mere water, one would think at first should be little able to change so fixed a substance as *ſalt* of tartar into a volatile one; but when we farther consider the great power of water, when put in action by the fire, and that this agent is the cause of some of the greatest changes that happen in animal and vegetable bodies, and perhaps of every thing of this kind that passes in our earth, we shall not wonder that it may be made, by the help of fire, one of the agents capable of raising, or volatilizing a part at least of *ſalt* of tartar; but as phlegm is the least active of all the principles which chemistry separates from bodies, or at least acts upon the others the most slowly, and with the least violence, the method of volatilizing part of *ſalt* of tartar by means of this, must naturally be more tedious than by

by any of the other principles; yet it is to be done with time by this, as well as by the other.

The thing that put Mr. Homberg upon this courſe of experiments was, as he candidly acknowledges, an accident. He was diſpleaſed with the Venice ſoap, with which he ſhaved himſelf; and endeavouring to mend it, he cut it into thin ſlices, and after drying it three months in the ſhade, he powdered it in a mortar, and wetted it into a paſte again with oil of lavender and ſpirit of wine; and in continuing his trials to this purpoſe, he at length found part of the *ſalt* of the ſoap become volatile.

It is very well known that ſoap is made of the *ſalt* of kali, or pot-aſhes, and oil. On the event of this experiment Mr. Homberg proceeded to judge, according to the known rules of chemiſtry, that oil, of which the volatile *ſalts* are generally ſuppoſed to borrow their volatility, being intimately mixed with the fixed alkaline *ſalts*, as here with that of the kali, might render them all volatile, as in this inſtance; for that in this ſtate they were no longer alkalis, their pores being now not open, but filled to the utmoſt with the particles of oil. All oils contain alſo an acid, and that acid being mixed with the alkali *ſalt*, the whole on this muſt ceaſe to be an alkali, and become a middle, or neutral *ſalt*, ſuch as common ſea-*ſalt*; but then as the acid is not, in this caſe, joined to the alkali, but by the means of oil, and accompanied with oil, this new found neutral *ſalt* muſt neceſſarily be of an oily, or a ſulphureous nature.

In carrying on this idea, and trying by chemical experiments all the objects it offered, Mr. Homberg, in fine, found, that in order to volatilize the *fixed ſalts* of vegetables, it was neceſſary to begin, by converting them into ſoap; then to wait for the ſhooting of certain cryſtals, or bright points, which would appear upon the ſurface, and that theſe cryſtals were a neutral *ſalt*, volatilized of itſelf by the mere operation of nature: after this the matter is to be moiſtened with a new liquor, and then ſet upon the fire, and that thus there would be a new appearance of volatilized *fixed ſalt*; and the repeating this proceſs ſeveral times, affords always, at length, a very large proportion of the *fixed ſalt*, no longer ſuch, but truly volatilized. The choice of a proper liquor for the wetting the matter, is a thing of no ſmall conſequence. Water is, of all others, the leaſt proper, and oil appears the moſt ſo; and of the different oils, thoſe drawn by diſtillation are much more effectual than the common expreſſed ones. The great reaſon of this is, that the liquor ought not only to be the moſt volatile that may be, but it muſt be alſo ſuch, as will moſt intimately unite with *ſalt*. Spirit of wine is very excellent for the purpoſe, but would be much more ſo, did it not want this laſt quality. Mr. Homberg, by various trials, carried at length this attempt to ſo great a height, that he was able to volatilize nearly one half of *ſalt* of tartar, or of any other volatile *ſalt*. The new *ſalt* often appears in a dry form, the oil, which is employed in the making it, preſerving it from the effect of humid vapours, which would otherwiſe have reſolved it into a liquor.

Salt, *foſſile*. See *Common* Salt.

Salts, *fluor*, diſtinguiſh and include all ſaline ſubſtances, which cannot by any method be rendered ſolid; ſuch are nitrous and marine acids, volatile alkali altered by quicklime and ſome others.

Salt, *fuſible*, *of urine*, called alſo *native* or *eſſential ſalt of urine*, *phoſphoric ſalt*, and *microcoſmic ſalt*, is a neutral *ſalt*, compoſed of phoſphoric acid, ſaturated with an alkali fixed or volatile.

It is beſt prepared from putrified human urine; but it may be prepared from freſh. A quantity of the urine of ſound beer-drinking men being putrified in a moderate heat, and then ſlowly boiled in glazed earthen veſſels to the conſiſtence of a ſyrup; if this liquor be placed in a cellar or cool place, in about four weeks time, or ſooner in winter, cryſtals of a peculiar figure will be formed. But theſe, being impure, muſt again be diſſolved in a ſufficient quantity of water, and filtered as hot as poſſible through grey paper, and the ſolution again put in a cool place, where, in a few days, cryſtals will again be formed much cleaner than the former. Theſe being ſeparated from the liquor and dried, the operations of ſolution, filtration, and cryſtallization, muſt be reiterated twice or thrice, till the *ſalt* becomes perfectly white and without ſmell.

Mr. Margraff ſays, that a hundred, or a hundred and twenty meaſures of urine, give about three or four ounces of this *ſalt*, which always cryſtallizes firſt, and is eaſily diſtinguiſhed from that which appears afterwards in cryſtals of a long and cubical form.

This *ſalt* is ammoniacal, but of a peculiar nature. It is a ſaline acid body. By diſtillation an urinous volatile ſpirit firſt riſes. The reſiduum may be reduced by a violent fire into a pellucid white tranſparent maſs like glaſs, of a very fixed nature, and from which neither acid nor any thing elſe can be ſeparated, without the addition of ſome other matter.

This vitreous ſubſtance may be entirely diſſolved in two or three parts of diſtilled water, and is thereby changed into a tranſparent liquor, ſomewhat thick, not unlike the concentrated oil of vitriol, and having the properties of all acids, ſuch as fermenting with volatile and fixed alkalies, forming neutral *ſalts* with them, precipitating bodies diſſolved in alkaline menſtruums, and diſſolving alkaline earths. It does not diſſolve gold nor ſilver; and copper, tin, and lead little, but iron very ſtrongly. It extracts a red colour from *cobaltum pro cæruleo*, in German, *blau farben-kobalde*, the mineral by which glaſs is tinged blue.

But this *ſalt* in its dry ſtate attracts metals with much more vigour, and with them produces ſeveral remarkable and ſingular phenomena; for all which, as alſo for the relation their *ſalt* bears to acid, alkaline, and neutral *ſalts*, we refer to the learned author, who has alſo examined its effects on ſeveral ſolutions of terreſtrial bodies. One moſt eminent property is, that mixed with the inflammable part of ſoot, and diſſolved in a cloſe veſſel, it produces a phoſphorus. An ounce of this *ſalt of urine*, thus ſeparated from its urinous part, and exactly mixed with half an ounce of ſoot, affords in this way a dram of the beſt Phosphorus. The reſiduum did not produce any when tried.

The learned author does not pretend to determine exactly the true origin of this *ſalt*; he thinks its acid may come into the human body from vegetable aliments. He has obſerved elſewhere, that creſſes, muſtard, rocket, and even corn, expoſed to a very violent fire, produce a phoſphorus. Hence he thinks this acid muſt be mixed with thoſe ſubſtances; and the like may happen in other vegetables. He thinks this conjecture ſtrengthened, becauſe urine in ſummer, when people eat moſt vegetables, always produces this *ſalt* in the greateſt quantity.— Margraff in Mem. de l'Acad. de Berlin, 1746. See alſo Miſcel Berol. tom. vii. p. 341.

Mr. Pott obſerves, that the figure of *fuſible ſalts* varies much according to the heat, evaporation, and different mode of cryſtallization; and that it aſſumes the ſhape of moſt others, as of ſaltpetre, vitriol, ſal ammoniac, Glauber's *ſalt*, &c. but that it is generally in ſhining, octogonal, priſmatic cryſtals. The taſte of this *ſalt* is cool, reſembling that of borax, to which it is in other reſpects ſimilar. When put on the fire in a crucible, it froths, ſwells, and melts. When melted upon a bit of charcoal, by means of a blow-pipe, it forms a round drop. The cryſtals of the ſecond cryſtallization do alſo melt upon charcoal, when they are pure, but when cold they have a milky colour. They do not, like the cryſtals of the firſt cryſtallization, form phoſphorus with phlogiſton. They effloreſce in the air, and are hot to the taſte, in both which inſtances they alſo differ from the firſt cryſtals.

Salt, *foſſile*. See *Common* Salt.

Salt *of glaſs*, called alſo *glaſs-gall*, is a kind of ſaline ſcum or maſs, found in glaſs-houſe pots upon the ſurface of the melted glaſs. It conſiſts of neutral *ſalts*, as common *ſalt*, vitriolated tartar, and others, which are contained in the ſoda and pot-aſh employed in the compoſition of glaſs, and which not being themſelves ſuſceptible of vitrification, are ſeparated from the glaſs during the fuſion, and collected together upon its ſurface, becauſe they are ſpecifically lighter.

Salt, *Glauber's*. See Sal *mirabile*.

Salts *of count Lagarais*, a name by which the French and ſome other nations call a preparation of vegetable bodies, invented by the gentleman whoſe name it bears, but very improperly called by him a *ſalt*.

The hiſtory of theſe preparations is this: in the year 1731, the count de Lagarais ſhewed the French king ſome powders, which proved to be very uſeful in medicine, and which he called the *eſſential ſalts of certain plants*. The method of making theſe was long kept a ſecret, but at length, the diſcoverer publiſhing it to the world, it appeared that they were made by means of water only, agitated in a violent and continued manner in a cloſe veſſel with an inſtrument reſembling a chocolate mill. Mr. Langelot had before attempted a reſolution of this kind of vegetable, and other ſubſtances, by means of water and motion, but his was done by grinding them with a ſmall quantity of water at a time; whereas this of the count's is by powdering the ingredients, mixing them with a large quantity of water, and breaking them to pieces by a continued motion of this ſort of mill made with four vanes, or flaps of thin wood, which was kept for ſix or eight hours in a continual motion, by means of a larger wheel, ſuch as the lapidaries poliſh ſtones with.

There is no doubt but that the inſtrument, uſed by the

count, is of very great use, and that the result of the operation is a very valuable form of medicine; but it is not a *salt*, but an extremely fine extract, containing the gummy, resinous, and saline parts of the body, and in a form capable of being reduced to powder, and easily administered, as it contains the virtues of the plant it is made from, in an extremely small compass, and is capable of ready solution in aqueous fluids. It is certainly a form of medicine worthy to be brought into practice, and must be a very proper way of administering the more bulky medicines to children, and persons of tender constitutions.

To give a proper view of the nature of these preparations, and their difference from the extracts made in the common manner, it may be proper to enter, in some degree, into the manner of preparing the two forms. The common extracts of the shops are made either from the juices of succulent plants, as houseleek, purslain, or the like; or from a strong decoction of the other drier plants in common water, which when separated from the coarser parts by subsidence, filtration, or the like means, are evaporated over a balneum Mariæ to the consistence of a thick honey.

There will, in process of time, an essential *salt* separate itself from these extracts, and many plants have, in the decoctions, a large quantity of a fine substance, which will never be made to pass the filter: and the extracts, made by this means, contain the oil, the gummy and resinous parts of the plants, and the essential *salts*, though this is but in a very inconsiderable quantity. These are the common extracts of plants.

The method of making those extracts, called *count Lagarais's salts*, is this. They choose a glass vessel, capable of holding six or seven pints, and having a wide mouth; into this they put an ounce of bark, sena, guaiacum, or whatever other vegetable they are to make the extract of, first reduced to a coarse powder. They pour on this two pints and a half of rain water, or distilled water, and then taking the vessel to the place where the mill is fixed, they raise it so high, that the body of the mill is in the middle of the liquor; then they cover the top of the vessel with a wet bladder, that the froth may not be thrown over, and then turning the large wheel, they make the mill move round very swiftly in the liquor for six or seven hours together; after this they let the liquor settle for an hour or two, till only the finer parts of the body remain suspended in it, and then pour it off into a number of flat China or stone-ware dishes, putting only a small quantity into each dish, and these they set in the sun, or over a balneum Mariæ prepared on purpose; for should they attempt the evaporation in a sand heat, the small quantity of extract in each dish would be burned. When the whole is evaporated to a dryness, there remains on the whole inner surface of the dishes a thin crust of an extract, which is to be separated by scraping it off with a piece of stiff paper, and reserved for use. This always breaks up in small scales, which have a very shining surface on that part where they adhered to the dishes, and it seems that this has given occasion to some to believe, that they were particles of real *salt*.

There is no doubt but this method of procuring a powerful extract might be of great use, in regard to all those substances which water can have power to penetrate; but it is not easy to give credit to its being able to make the like valuable medicines from the metals, though that has been pretended. Gold and silver are pretended to be operated on in a powerful manner by it, but there seems a fallacy in this, since even iron itself, which is much more penetrable by water than those metals, yields but little virtue to it, two ounces of the filings of this metal yielding, with the utmost care and accuracy, only about four grains of a white earthy matter, which is also much more likely to be a part of the water than of the metal.

The *salts of the metals*, as the count called them, which were prepared by this means, were always suspected to hold some *saline* quality, which they owed to the *menstruum*, which, whatever was pretended, was not simple water, and a strict examination of them always discovered a marine *salt* among them. It is true, indeed, that according to Langelot's method of grinding, some leaves of gold were reduced, by the addition of a very small quantity of water, into a liquor, from which, on distillation, a few red drops were separated; but it is to be observed, that as Langelot's method is the grinding the substance with great vehemence, and for a long time, in an iron mortar, with a pestle of the same metal, there is reason to suspect, that what was found to come forth in red drops was a solution of iron, not of gold, as was pretended by those who first prepared them.

It is not to be doubted, but the method of evaporation of count Lagarais's medicines is of great use, since no other can so well retain the finer parts of the medicines. Mr. Geoffroy tried it on roses, violets, and some other flowers, and found great reason to wish that all the medicinal extracts could be prepared in the same manner; but the method is impracticable, when medicines are to be prepared for general use; for though the mills might be made to be moved in great numbers at once, by a current of water, and so this part of the work performed with tolerable ease, yet the evaporations, in such quantities, could by no means be made in any tolerable room, or time; and they must be evaporated as soon as made, since they very quickly turn sour, and lose all the virtues. Mem. de l'Acad. Scienc. Par. 1739. See EXTRACT.

SALT *of lead*. See *Salt of* LEAD, and SACCHARUM *Saturni*.

SALTS, *lixivial*, a general name given to all saline substances obtained by lixiviation of ashes, but particularly applied to *fixed* ALKALI.

It may appear very natural, from considering the common method of making *lixivial salts*, that they should be all of them one and the same substance; and as the greater part of them agree perfectly, not only in taste, smell, and colour, but even in their effects, in the nicest chemical operations, in which it appears wholly the same thing, whether one or another of them be employed; many, even of the most celebrated chemists, have positively declared that they are all the same, and Kunckel has positively asserted this on many repeated experiments, allowing them no other difference, than that some contain more, some less earth; and this he affirms not to be owing to the different species of the plant, but from certain accidents in the burning.

This account, however specious, is not true; for though there are many of the *lixivial salts* procured from different plants, which, on many trials appear alike, yet there are some that greatly differ from the common kinds; as that of tamarisk, which wants the greatest of all their characters, in that it is no alkali, but a true *sal salsus*; and beside this, there are probably many other as remarkable differences in others, which happen not yet to have been observed. Mr. Bourdelin, of the Paris Academy, having observed, that among the lixivial *salts* some were much more, some much less alkaline, and this last mentioned kind not at all, determined to search minutely into their differences in this respect. In this attempt he tried the produce of a great number of different fruits and flowers of plants, many of which gave *lixivial salts*, considerably different from one another; but nothing more strengthened his opinion of the essential differences of some of them, than the *salt* of guaiacum, which proved to be little more an alkali than the *salt* of tamarisk, and which he is of opinion may be prepared in such a manner, as not to prove at all alkaline. Mem. de l'Acad. Par. 1728. See LIXIVIOUS.

The opinion of the fixed *salts*, drawn by elixiviation from all plants, being the same, having greatly prevailed, Mr. Gmelin, of the Petersburgh academy, went through a multitude of experiments with the *salts*, made carefully from a great number of different plants, on a number of different liquors; some mineral acids, others solutions and impregnations of different substances; and by these he found that they had very different qualities, beside their differing greatly in the degree of their alkaline power, which had been looked upon as their essential character.

He observes, that these *salts* are not to be obtained pure by any means, except a violent and repeated calcination; and that this is not the method used with the several *salts* made for medicinal use, and consequently that they are all impure. The additional matter, which makes these *salts* impure, is either an earthy, an oily, an acid, or a volatile alkaline substance, according as the plant, while recent, abounded with one or the other of those principles, or as their mutual connections with one another were more or less strong in each. As therefore the several species of plants are well known to abound with different principles, it must necessarily follow that the *lixivial salts*, obtained from them in the common way, must differ in their nature and properties, as the acid abounds in one, the volatile alkali in another, and the earth or oil in a third.

This difference unquestionably owes its origin to the nature of the different plants; but, besides this, it must be allowed, that there are several accidents by which the *salt* may also be rendered of a different nature, or at least its natural diversity from others may be increased, and set in a stronger light. The different manner of burning the plant will occasion a great change in the *salt* it yields, and two different *salts* will be obtained, if one half of the same quantity of ashes be lixiviated with hot water, and the other half with cold. This has been fully proved by Stahl, in his Fundamenta Chemica.

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Theſe are only accidental differences in the ſame *ſalt*; what Mr. Gmelin takes upon him to prove by experiment, is, that there are more real differences between the *ſalts* of various plants, and thoſe wholly dependent on the nature of thoſe plants, than had been before ſuſpected.

That the *ſalts* of plants may be fairly compared together, it is neceſſary that they ſhould all be made in the ſame manner; the fire ſhould, in all the proceſſes, be raiſed to the ſame degree, and the time of the plants remaining in it ſhould be alſo aſcertained, and the lixivium from each be prepared in the ſame uniform manner: thus the volatile parts of one plant will be no farther evaporated than of another, and the lixivia will contain an equal ſhare of the principles of the ſeveral plants, proportioned to their ſeveral natures; for, it is a certain fact, that if the lixivium of the ſame aſhes be made in part with hot water, and in part with cold, the *ſalt* obtained from that made with the hot water, will contain more of the earthy and oily parts of the plant than that made with the cold.

The method of making a fixt *lixivial ſalt* of a plant, ſo as to retain as much as may be of the virtues of the plant, is this. Let the plant continue on fire without breaking out into flame, and let the fire be continued till it fall into aſhes, but no longer, leſt ſome of the volatile parts be driven off, which might have been preſerved. Cold water, and not hot, ſhould be uſed to make the lixivium, that the *ſalt* may appear in its proper form; and as the water of wells, rivers, and other places, differ greatly from one another, the water uſed for this purpoſe ſhould be ſuch, as has been previouſly diſtilled two or three times over, and ſo rendered perfectly pure, and kept in glaſs-veſſels, not in earthen, leaden, or wooden ones, leſt it contract ſome adventitious particles. Now if the lixiviums of plants, made with all theſe cautions, are found to differ from one another, there is no room to doubt but that the *ſalts* of thoſe plants are really different one from another.

This evidently appeared from the labours of a Swediſh chemiſt, whoſe papers fell into Mr. Gmelin's hands, and who had with all this care and caution prepared the *ſalts* of a number of plants; a copious table of the different effects of which, in different mixtures, is added to Mr. Gmelin's account: but not only the *ſalts*, but the very aſhes of different plants, prepared in the ſame exact manner, are found to differ obviouſly to the ſenſes. The aſhes of mugwort, ſmall centaury, chervil, and dill, are of a browniſh grey; goats-beard and lungwort afford white aſhes; thoſe of ſanicle are whitiſh; thoſe of Roman wormwood, of a greeniſh grey; thoſe of rue, agrimony, and ſaxifrage, brown; thoſe of tanſy, of a duſky green; thoſe of dodder, of a fine green; eyebright, ſouthernwood, common wormwood, and ſcabious, afford them grey; ſcurvygraſs, of a whitiſh grey; hyſſop, yarrow, and ſowbane, of a duſky grey; melilot and oak-leaves, as alſo plantain, colts-foot, pine-tops, and fumitory, of a duſky brown; pennyroyal, of a pale brown, with ſome ſpots of white; elder-flowers, ſage, and mother of thyme, afford yellow aſhes; thoſe of ſtrawberry leaves are of a pale brimſtone colour; thoſe of catmint, of a duſky red; of prunella, brick-coloured; of honeyſuckle, blue; of fern, blackiſh; and thoſe of St. John's wort, feverfew, origanum, and pimpernel, are all of a deep black.

The quantity of aſhes, produced from an equal weight of different plants, is very different, ſome yielding a ſeventh part of their weight, others but a twelfth or thirteenth, and ſome particular plants much leſs than this; St. John's wort in particular yields but a twenty-eighth part, and fern but a twenty-fourth.

The lixiviums made from theſe different aſhes were ſome colourleſs from the beginning, others at firſt were bluiſh, greeniſh, or of other colours, but theſe tinges all went off after a few days, and the liquor became limpid.

The lixiviums of the ſeveral plants are very differently acrid to the taſte, though made exactly in the ſame manner and proportion, and thoſe of ſome plants are not acrid at all; that of ſtrawberry leaves has ſcarce any taſte; that of the barba capræ, inſtead of an acrid taſte, has a ſweet one; and the lixivium of mother of thyme has no taſte, by which it can be diſtinguiſhed from fair water: the lixiviums of pimpernel, dill, and ſtrawberry leaves, have a ſulphureous ſmell; thoſe of moſt other plants are wholly ſcentleſs. Act. Pretopol. vol. iv. p. 28.

SALTS *of metals*. See METAL.

SALT *of milk*. See MILK.

SALT, *microcoſmic*. See *Fuſible* SALT *of urine.*

SALT, *mineral*. It has been for many ages a conſtant opinion among the chemiſts, that minerals contain no volatile *ſalt*. Mr. Homberg, however, found the means of preparing an acid mineral *ſalt*, in a dry form and volatile. This would diſſolve in ſpirit of wine, and that ſolution being thrown on marble, fermented, and diſſolved it in the manner of aqua fortis.

It is univerſally known that many mineral ſubſtances contain an acid, and that this is eaſily raiſed in diſtillation, and therefore is very volatile; but as this could never before be ſeparated, otherwiſe than in a liquid form, they eſteemed it ſomething of a peculiar nature, and called it an acid mineral ſpirit, baniſhing the word *ſalt* from its name. But Mr. Homberg found, that if the acid ſpirit of any mineral was ſo embarraſſed in the particles of ſome metal, as that it ceaſed to be fluid, that metal was always conſiderably increaſed in weight by it; and that if afterwards all the acid which had been added to it were again ſeparated from it, there would remain a volatile *ſalt* in a dry form, and that this *ſalt*, if diſſolved in ſpirit of wine, or in common water, made an acid liquor, which would diſſolve all alkalies with an ebullition. From this, he ſays, it is plain, that the minerals have a volatile *ſalt*, as well as the animals or plants; which laſt were alſo long ſuppoſed to want it, and the volatile *ſalt* ſuppoſed peculiar to the animal kingdom: from this alſo it very plainly appears, that the acid ſpirits of minerals, as they are called, are in reality no other than theſe volatile *ſalts* diſſolved in their own phlegm.

The method of procuring this *ſalt* may be ſeen in the following inſtance. Take two ounces of fine ſilver, diſſolve it in five ounces of ſpirit of nitre; pour this ſolution, while hot, into a pint of river water, in which there has been before diſſolved as much ſea *ſalt* as it can contain, the ſilver will precipitate itſelf in form of white ſcales. Waſh this precipitate till it is inſipid to the taſte, and then dry it; it will, when perfectly dried, weigh two ounces and a half.

After this calcine in an iron veſſel, over a ſtrong fire, two or three pounds of fine tin, in which there is no mixture of any other metal. Take of this calx of tin well dried an ounce and half; mix this carefully with the two ounces and half of the calx of ſilver, perfectly dry alſo; put the mixture into a matraſs, of which two-thirds ſhall remain empty; expoſe this matraſs to the naked fire, with its neck turned downwards, there will run into the neck of the matraſs a black matter, which will immediately fix itſelf into a hard ſtone of a brown colour; this will weigh about an ounce and half; this ſtone is the calx of tin diſſolved by the acids, which remain in the calx of ſilver; and the caput mortuum, at the bottom of the matraſs, will be found to be the ſilver now diveſted of thoſe *ſalts*, which it had carried off with it from its diſſolvent in the precipitation. This may be run into a maſs by the copel, and no part of it will be loſt.

Beat this brown ſtone to powder; let the powder be perfectly dry; then put it into a double veſſel; ſublime it according to art; and the reſult of the operation will be half an ounce of a volatile *ſalt*; this is to be rectified by re-ſubliming it two or three times over a very gentle fire, and it will then be a volatile and mineral *ſalt*, perfectly dry, of a fine white colour, and tranſparent. The caput mortuum of this ſublimation is the calx of tin. Mem. Acad. Par. 1692.

SALT *of mineral waters*. See HALCRYPTIUM.

SALT, *muriatic calcareous*. See SAL *muriaticus calcareus*.

SALTS, *neutral*. See NEUTRAL, and the diſtribution of ſaline ſubſtances at the beginning of the article SALT.

SALT, *neutral arſenical*, is a combination of arſenic with fixed alkali to the point of ſaturation. M. Macquer firſt diſcovered this combination, and began an account of its properties in the Memoirs of the Royal Academy for 1746 and 1748. His method of making this *ſalt* is, by mixing together equal parts of very white cryſtalline arſenic and purified nitre, and by diſtilling this mixture in a retort with a graduated heat, in the uſual manner, till the retort is red hot, and no more vapours of nitrous acid ariſe. In the retort there remains a ſaline maſs, white, compact, and fixed; from which, after ſolution in hot water, filtration, evaporation, and cryſtallization, may be obtained beautiful, quadrangular, priſmatic cryſtals, terminated at each end by a quadrangular pyramid, the ſides of which correſpond with thoſe of the priſm. This new *ſalt* is preciſely neutral, and exhibits no marks of an alkaline quality. It is infinitely more ſoluble in water than pure arſenic, and diſſolves in a leſs quantity of hot than of cold water. It is eaſily fuſible by fire, and remains fuſed and tranſparent like glaſs, without being alkaliſed, if it has not touched any inflammable matter; for it may be eaſily decompoſed by phlogiſton, which unites with the arſenic, ſeparates it from the alkali, and is ſublimed. This *ſalt* cannot be decompoſed by any pure mineral acid, becauſe arſenic ſeems to have a greater affinity with fixed alkali than acids have; but when theſe acids are united with metallic matters, they can eaſily decompoſe the neutral arſenical *ſalt*, even by the humid way; ſo that a ſolution of this *ſalt*, added to a ſolution

of metals, occaſions a precipitate, compoſed of the arſenic and metal, while the acid of the metallic ſolution combines with the fixed alkali of the neutral, arſenical *ſalt*, and forms another neutral *ſalt*. Dict. Chemiſtry, art. *Salt*.

SALT, *pine*. See PINE.

SALTS *of plants*. See PLANT.

SALT *of Rochelle*, or of *Saignette*. See RUPELLENSIS *ſal*.

SALT, *ſea*. See *Common* SALT.

SALT, *ſedative*, a name given by the modern chemiſts to a *ſalt* obtained from borax, by means of acids, of the virtues of which they boaſt much. Thoſe who firſt deſcribed it gave the proceſs for making it in a very enigmatical manner; and their ſucceſſors invented many different ways of preparing it. The truth is, that all mixtures of borax with the vitriolic acids furniſh us with a *ſedative ſalt*, as do all the mixtures of borax with ſpirit of nitre, or of ſea *ſalt*.

Becher firſt gave the enigmatic account of it, which Homberg traced to its origin, and found the way of making it with the vitriolic, as Lemery did with the other acids. This *ſalt* is formed by ſublimation, and is a congeries of ſaline flowers, not a little approaching to flowers of benjamin. Theſe flowers are ſo light and fine, that they ſwim upon water, and require a great quantity of water to diſſolve them, and much more of cold than of boiling water; and, therefore, it may be cryſtallized by cold, and even by evaporation alone.

The *ſedative ſalt* is a perfect *ſal ſalſus*. It makes no alteration in the colour of the juice of violets, and has no ſenſible effect on the ſolution of corroſive ſublimate, or on a ſolution of mercury in ſpirit of nitre for a long time; but it finally precipitates a yellow powder from it, as the borax does. There is this difference, however, between this precipitate, and that formed by crude borax, that the powder precipitated by the *ſedative ſalt*, does not, as the other, become white on waſhing with large quantities of water. Theſe experiments ſhew this *ſalt* to be wholly analogous to tartarum vitriolatum, or to the Glauber's *ſalts* in its effects.

When the compoſition of which this *ſalt* is to be made is placed on the fire, there ariſe different liquors before the *ſalt* appears; the firſt is a phlegm of a fattiſh complexion, and with the ſmell of ſoap; this is ſucceeded by a turbid white liquor, along with which there ariſe ſome of the firſt flowers. This makes a ſolution of mercury in ſpirit of nitre muddy after ſome time, and finally precipitates from it a ſmall quantity of a white powder. After this all the *ſalt* or flowers aſcend; theſe flowers, diſſolved in warm water, recryſtallize themſelves in it when cold, aſſuming the ſame form with that they had in the flowers, except that the combinations of particles are more denſe and heavy.

The uſual method of making this *ſalt* by ſublimation, has been this. Take a glaſs retort, with a large neck; put into it four ounces of borax in fine powder, and pour on this half an ounce of common water, to wet it into a ſort of ſoft paſte; then add to this an ounce and two drachms of concentrated oil of vitriol; place the retort in a reverberatory furnace, and give at firſt a ſmall fire, which raiſe by degrees till the retort is red-hot: there will paſs over into the receiver about an ounce of aqueous matter; and after this the flowers, or *ſedative ſalt*, will riſe with a little more humidity; hence ſome part of the flowers will be diſſolved in the liquor, and run over into the recipient, but the greater quantity will remain in form of a dry ſublimation in the neck of the retort; they will finally ſtop up the whole orifice of the neck, and what ariſes after this uſually forms a circle of a ſort of gloſſy *ſalt*, about their baſes, out of which the flowers ſeem to ſhoot.

They are compoſed of multitudes of fine thin blades, or flakes, and are eaſily bruſhed out of the neck of the retort with a feather; the gloſſy circle at the bottom of them may be diſſolved in water, and recryſtallized, and by this means all the *ſalt* will be procured.

Mr. Geoffroy the younger has given, in the Memoirs of the Paris Academy, in 1732, an account of a way of making this *ſalt* by ſolution and cryſtallization alone, without the trouble of diſtilling; he has alſo ſummed up the ſeveral other ways of making it with blue and white vitriol, but the method here mentioned is that by which the chemiſts now make it.

Geoffroy's method by cryſtallization is as follows: take four ounces of borax, and one ounce one drachm of the moſt concentrated oil of vitriol; put the borax into a glaſs retort, pour in it half an ounce of common water after the oil of vitriol, and expoſe the mixture to a fire gradually increaſed: after the phlegm has paſſed off, and even while it is paſſing, there ariſe flowers, or a volatile *ſalt*, in beautiful foliated laminæ, ſome of which always melt by the heat of the fire: after the operation is over, the fineſt of the flowers are to be carefully gathered and theſe are what ſtick to the neck of the retort. Thoſe that are grey, are to be thrown upon the remaining maſs, this maſs is to be diſſolved in water, filtrated and evaporated gradually; ſometimes, even without evaporation, the ſhining talcous laminæ are to be ſeen in the liquor; after twenty-four hours ſtanding, the water is to be poured off from theſe laminæ, which are to be waſhed with freſh water, and then dried carefully in a warm place. If theſe cryſtals do not calcine in the place where they are put to dry, nor in the ſun's heat, it is a ſign there is nothing cryſtallized but the *ſal neutrum*; if they do calcine, it is a proof that there is ſome Glauber's *ſalt* formed of the borax and the vitriolic, and cryſtallized in the maſs. This ſedative *ſalt*, obtained by cryſtallization, does not differ eſſentially from that which is ſublimed, only that the cryſtals or laminæ of the latter are more ſeparated and detached than thoſe of the former. This *ſalt* when once it has loſt its water by drying, cannot be raiſed into vapours by the moſt violent fire, in which it remains fixed, and melts into a vitreous matter, as borax does. Hence it appears, that it is a ſaline compound, the principles of which are ſtrictly united, and ſeparable with great difficulty. This truth has been illuſtrated by numerous and accurate experiments on the ſubject, by M. Bourdelin, related in the Memoirs of the Academy for the years 1753 and 1755.

M. Cadet has alſo publiſhed in the Memoirs for 1766, an account of experiments on this *ſalt*.

Homberg, the inventor of *ſedative ſalt*, believed that he diſcovered in it a ſedative, antiſpaſmodic, and even narcotic quality, and thence called it the narcotic *ſalt* of vitriol; it was, therefore, generally employed in convulſive diſeaſes; but its ſedative powers have not been well aſcertained.

SALT *of ſoda*, a name given to the marine or mineral alkali obtained from the aſhes of *ſoda*, and of other maritime plants. See KALI.

SALT, *ſpirit of*. See *Marine* ACID.

SALT *of Stahl*, *ſulphureous*, a neutral *ſalt*, compoſed of volatile *ſulphureous* acid, combined to the point of ſaturation with fixed vegetable alkali. This *ſalt* may be made either by ſaturating fixed alkali with volatile *ſulphureous* acid, made in a cracked retort, in *Stahl*'s manner, or by expoſing linen, ſoaked in liquid fixed alkali, to the vapours of ſulphur ſlowly burning. In the latter method, the linen dries, becomes ſtiff, and ſhines with many ſmall needle-like cryſtals, which are the *ſulphureous ſalt*. This has a more pungent taſte than vitriolated tartar, is more ſoluble in water, and is cryſtallizable by cold. It may be decompoſed by any acid, and its ſulphureous acid expelled from it: and it is perpetually changing, from the conſtant diſſipation of its phlogiſton.

SALT *of Sylvius*, *febrifugal*. See SAL *Marinus regeneratus*.

SALTS *of Tachenius*, are impure fixed alkalis, obtained from the aſhes of vegetables, burnt by ſuffocating their flame, and leaving no more communication with the air, than is ſufficient for the burning of their moſt diſengaged inflammable parts. The dried plant, in this proceſs, is put in an iron pot, ſo heated, that its bottom may be red, and continually ſtirred, when a thick fume, and at length a flame, will riſe from it. A lid muſt then be put on the pot, ſo looſely, that the ſmoke may eſcape but the flame be extinguiſhed, and this lid muſt be occaſionally removed for the convenience of ſtirring the plant. When it is thus reduced to aſhes, the aſhes muſt be lixiviated with boiling water; and when the lixivium has been evaporated to dryneſs, a ſaline matter, more or leſs reddiſh, will remain, which is Tachenius's fixed *ſalt*, and ſhould be kept in a bottle. See the proceſs deſcribed at large by Boerhaave, Chem. part ii. p. 28, &c. In this way of burning plants, the fixed alkali is phlogiſticated, rendered ſemi-ſaponaceous, and mixed with all the neutral *ſalts* contained in the plants.

SALT *of tartar*, the fixed alkali of TARTAR; or this name is given to fixed vegetable alkali in general.

SALT, *vegetable*. See *Soluble* TARTAR.

SALT *of vinegar*, is a name given to *vitriolated* TARTAR, impregnated with very ſtrong *radical* VINEGAR.

SALT, *vitreous*, a term uſed by ſome modern chemiſts for a kind of *ſalt*, which till of late has wanted a name, and which is found in, and ſeparable from the fixed alkaline *ſalts* of vegetables.

It is bitter, hard, fixed, and not alkaline, and of a cryſtalline, or gloſſy appearance.

The method preſcribed by Boerhaave for the procuring it with the moſt eaſe, is this: put ſix pounds of the beſt pot-aſhes into a clean glaſs, add thereto twenty pints of cold rain water; ſtir them together with a ſtick, and ſuffer the whole to reſt. When the aſhes are thoroughly diſſolved, gently decant the clear lixivium, and there

will be found at the bottom, mixed with the fæces, a number of small greyish granules, of a bitter taste, and of an almost glassy brittleness and hardness; these are the *salt* required, and contain no alkaline quality. But to obtain it in greater purity, dissolve six pounds of pot-ashes in four times their weight of water; filter the lixivium while hot, and make it perfectly clear, then put it into a glass vessel, ready heated and moistened, and suffer it to stand; a dusky crust will soon begin to shoot to the bottom and sides of the glass, and will gradually become thicker and thicker; at length, when no more appears to shoot, pour off the liquor, and there will remain behind a *salt* like the former, but purer, and in larger quantity; if the remaining lixivium be boiled a little, and set to crystallize again, it will afford a small quantity more of this *salt*, but after this it will yield no more, whence there seems to be only a certain and determinate quantity of this *salt* contained in the alkali. If this *salt* be put into a vessel of rain water and shook about, it does not dissolve, only the alkali washes off, and the *salt* remains purer than before; after this it is to be gently dried and kept. Boerh. Chem. p. ii. p. 42.

It is well known among the chemists, that genuine fixed alkaline *salts* can hardly be crystallized; and though some have produced this *salt* as a crystallized alkali, the fallacy of the pretext is evident, since this appears on trial to be no alkali at all; and it remains not less difficult than before to crystallize pure alkali, though a *salt* different in its nature from it, may be crystallized in a certain quantity from among it.

This *vitreous salt* never runs spontaneously in the air, nor does it easily dissolve in cold water; when boiled it requires a large proportion of water to dissolve it, and as soon as cold it easily separates itself from it again; it is lastingly bitter to the taste, and crackles very much when thrown into the fire; it is neither acid nor alkaline, nor approaches in its nature to any other *salt* hitherto known, but seems nearest of all others to resemble sandiver. This may suggest a query, whether the fire in producing the fixed alkali, does not at the same time produce this *salt* from vegetables; and whether by combining the sand and alkali together in glass making, the fire does not again separate and throw up this *salt* in sandiver. Something of this kind seems to be the case, and a close inquiry on these principles may shew us why tartar, in the state of an alkali, does not afford this *salt*; for tartar proceeds from a subtile liquor, intimately fermented in all its parts. There yet remains the trying this *salt* on various bodies, by means of fire, to give a true knowledge of its nature, which is at present too little known. This is to be observed, however, that it differs so much from the alkali, in which it is contained, that the careful chemist, before he makes use of that alkali in any nice process, or experiment, ought carefully to separate this neutral *salt* from it. Boerhaave's Chem. p. ii. p. 100.

SALTS, *volatile*, a name commonly given to *volatile*, concrete alkaline salts, as *volatile sal* AMMONIAC, and *volatile salt* of *harts*-HORN. See also *Volatile Salt of* AMBER.

SALTS, *urinous*, a term synonimous with alkaline *salts*.

SALT *of steel*, a name given to several combinations of iron with acids; hence *Riverius's salt of steel* is a martial vitriol, made with iron, vitriolic acid, and spirit of wine.

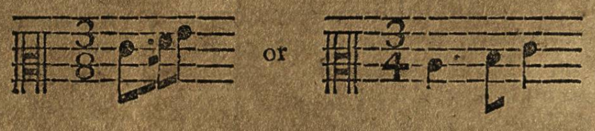
SALTS *microscopically examined*. Mr. Leewenhoeck has opened a very extensive field for microscopic observations, in the evaporation of certain fluids, in which *salts* of various plants, and other substances of a like kind, had been dissolved.

The fixed *salts*, in general, are said by chemists to admit of no crystallizations at all; but this curious observer found, that, on being evaporated in small quantities before the microscope, they each would shoot into extremely minute, but regular crystals, and those often of various forms in the same *salt*; but that these varieties were only of a certain number, and that no other *salt*, but that to which they belonged, had them all in the same regular manner.

The sophistications of *salts*, too common among our chemists, may be discovered by this means, and many other advantages may be obtained from it, as well as great amusement, in the observation of the variety and beauty of the figures.

The most agreeable way of examining these *salts* is by the solar microscope; but the most accurate and fittest for making deductions from, is that by the common double microscope. The way is to dissolve a small quantity of *salt*, of any kind, in water, and add to this about one fourth part of spirit of wine; this renders the whole a much less fit menstruum for keeping the *salt* in solution, and consequently it much more readily concretes from among it. A large drop of this liquor is to be laid on the surface of a thin and clear piece of glass, such as may conveniently be laid upon the stand for receiving objects in this microscope; then this glass is to be held till gently heated over a clear fire, and when it begins to evaporate, the glass is to be placed under the microscope, and about a third magnifier used to examine it. The *salts* will soon be seen beginning to shoot, and will form themselves under the eye into very beautiful figures; some resembling branches of trees, others ruins and fortifications, and the like; but what are most to be depended upon, as essential to the *salt*, are certain little single shoots, resembling crystals; these are determinate in their figure, the others more vague and uncertain. These will always be produced the same from the same *salt*, the others scarce twice from even the different drops of the same solution, alike in all respects. Phil. Trans. N° 172. p. 1075. See *Table of* MICROSCOPIC *objects*.

SALTARELLA, or SALTARELLO, in the *Italian Music*, is applied to triple time, the first note of which is pointed thus:



Airs in this kind of movement are said to be in *saltarello*. Such are the Venetian forlanos, sicilianas, some jigs, and other gay dances.

SALTATIO *mimicorum*, in *Antiquity*. See DANCE.

SALTIER, SALTEER, or SALTIRE, in *Heraldry*, an honourable ordinary, in form of St. Andrew's cross; anciently called the *cross of Burgundy*.

The *saltier* may be said to be composed of a bend dexter and sinister, crossing each other in the centre of the escutcheon. See *Tab. Herald. fig.* 35.

Its ordinary breadth, when alone, is one fifth of the field; but if charged one third.

It is sometimes borne alaise, and sometimes in number, placed in different parts of the field: sometimes charged, countercharged with the field, accompanied, raguled, engrailed, indented, quarterly-quartered, &c.

The *saltier* was entirely a piece of the knight's harness; being fastened to the saddle, and serving him for a stirrup to mount upon; and hence it had its name *saltier*, by the French *sautoir*, from *sauter*, *to leap*. It was made of silk cord, or some other kind of cord, covered with some rich stuff.

Others will have it, that the original *saltier* was a kind of palisade, serving to fence parks, woods, &c. where wild beasts were inclosed. Though Spelman says, it was an instrument for the taking them, thus called, *quod sit in usu in saltu*.

Lastly, others assure us, that *saltier* was anciently the figure of an engine, which being full of pins, was used in the scaling of the walls of a besieged place: whence its origin from *sauter*, as it helped the soldiers to leap over the wall.

SALTING-*boxes*, in *Artillery*, are boxes for holding mealed powder, to sprinkle the fuzes of shells, that they may take fire from the blast of the powder in the chamber; but as the fuze takes fire without this operation with mealed powder, *salting-boxes* are become almost useless.

SALTNESS, *salsedo*, the quality of something that is impregnated with salt; or that yields a saline taste.

The *saltness* of the sea, lakes, &c. is a thing that has long perplexed the philosophers to account for.

Kircher, after having consulted thirty-three authors upon the subject, remarks, that the fluctuations of the ocean itself are scarcely more various than the opinions of men concerning the origin of its saline impregnation.

Some, with Aristotle (lib. ii. cap. 7. Meteor.) have even taken it to be the effect of the dry, adust, and even saline exhalations, which the sun raises from the earth, and the winds, and which rains discharge into the sea: and hence, say they, it is that the sea is found more brackish near the surface, than towards the bottom.

Others contend, that the sun being continually extracting the purest and subtilest parts from the water; the coarser parts remaining, being exalted and concocted by this heat, acquire, by little and little, their degree of *saltness*.

Others, as father Bouhours and Nollet, will have it, that the Creator gave the waters of the ocean their *saltness* at the beginning, not only to prevent their corruption, but also to enable them to bear greater burdens. This opinion was advanced by Bernardine Gomesius, about two hundred years ago, in an ingenious treatise upon *salt*. Gomes. de Sale, lib. i. cap. 24.

Bernier seems to be nearer the matter, when he ascribes the *saltness* of the ocean to the fossile or mineral salts brought

brought into it by subterranean currents, and dissolved in the water.

The count de Marsigli observes, that, in Provence, the bottom of the sea is wholly stony, and is nothing but a continuation of the mountains of the Cevennes; being even found to consist of several strata; among which are salt and pitcoal: and hence he derives the *saltness* and bitterness of the sea-water.

Those who have adopted this opinion, and who ascribe the *saltness* of the sea to those beds of rock salt, which they suppose to be situated at its bottom, observe, that, without such a permanent saline principle, the sea would long since have become insipid from the fresh water poured into it by an infinity of rivers. But upon this hypothesis it may reasonably be inquired, why the waters of the ocean are not perfectly saturated with salt, if they have ever since the creation been exerting their dissolving powers upon such permanent masses of rock salt as are thought to be situated at the bottom. Besides, the patrons of this opinion found their reasoning upon a mistake, when they alledge that, if there were no mines of rock salt in the bed of the ocean, its waters would have been long ago converted into fresh water, by the rivers discharged into it: for supposing that the rivers themselves contained no salt, and that they returned into the sea, in any given time, the same quantity of water, which in the same time is raised from it by evaporation, the *saltness* would remain precisely the same for ever. But neither of these suppositions is true; for the rivers do convey into the ocean some portion of salt every day, and they do not, in any given time, return into the ocean so much water as in the same time is separated from it; and upon both these accounts, the *saltness* of the sea, so far from being diminished, ought constantly to be increased, from the rivers poured into it.

Dr. Halley, in an express discourse of the *saltness* of the ocean, in the Philosophical Transactions, N° 344, or Abr. vol. v. part ii. p. 216, observes, that all the lakes in the world are saline, some more, some less so, than the ocean, which, in this case, may be esteemed a great lake itself: and that all the vapours exhaled by the sun from lakes are perfectly fresh: so that all the saline particles brought in by the waters which have passed over salt mines remain behind, while the fresh evaporate. Hence it is evident their *saltness* must be continually augmented.

Now if this be the true reason of the *saltness* of lakes, it is probable the *saltness* of the ocean itself arises from the same cause: and hence we are furnished with a method of estimating the age of the world, by observing the increase of *saltness* in the waters of lakes; and computing in how long time the ocean might, at that rate, arrive at its present *saltness*.

The principle upon which this opinion is founded, cannot become the subject of accurate calculation; rivers may have formerly carried more or less salt into the sea than they do at present; and the quantities contained at present in different rivers are so various, that any general position, with respect to the proportion of salt observable in river water, will be liable to many exceptions from particular cases; but that the cause here assigned of the *saltness* of the sea, is not adequate to the effect, may appear probable from the following observation, suggested by the ingenious Dr. Watson. Sea water, at a medium, taken from observations made in different climates, may be supposed to contain about one thirtieth of its weight of common salt; but all the rivers in the world could not have conveyed into the sea one five hundredth part of the weight of the sea, though we suppose, that they have daily, ever since the creation, carried into the sea and left there, the same quantity of salt, which they do at present daily deposit in it: nor, admitting, what some eminent philosophers have endeavoured to prove, that all the rivers in the world flowing into the bed of the sea, with a continuance of their present stores, would take up at least eight hundred years to fill it to its present height (Buffon's Hist. Nat. vol. i. p. 356), and supposing the ocean to have been originally fresh, and to have daily lost by evaporation as much water as it daily received from the influx of the rivers, then must eight hundred years have elapsed before the fresh water of the ocean could have been changed into river water, or acquired that proportion of salt with which river water is impregnated. River water may, in general, be supposed to contain one four thousandth part of its weight of sea salt; upon this hypothesis, the ocean, at the expiration of eight hundred years from the creation, would have contained one four thousandth part of its weight of sea salt, and at the expiration of eight times eight hundred years, it would have contained eight four-thousandth parts, or one five hundredth part of its weight of salt; but eight times eight hundred years carry us back to an æra antecedent to the creation of the world.

The honourable Mr. Boyle (Works, vol. iii. p. 381.) unites, as it were, the two preceding hypotheses, and takes the *saltness* of the sea to be supplied, not only from rocks and other masses of salt, which at the beginning were, or in some countries may yet be found, either at the bottom of the sea, or at the sides where the water can reach them; but also from the salt which the rivers, rains, and other waters dissolve in their passage through divers parts of the earth, and at length carry with them into the sea. Buffon, and most modern philosophers, acquiesce in this opinion. There is another opinion concerning the saline impregnation of the sea, which deserves to be mentioned, viz. that sea salt is constantly and abundantly generated, both on the surface of the earth, and in the bosom of the ocean.

The degree, as well as the cause, of the *saltness* of the sea, has been the subject of investigation and experiment; whence we have reason to believe, that this varies in different latitudes, and even in the same latitude at different times.

From some experiments mentioned in a voyage towards the north pole, in 1773, by Capt. Phipps (now Lord Mulgrave) p. 143, it appears, that the sea water at the Nore contained not quite $\frac{1}{36}$ of salt; at the back of Yarmouth Sands not quite $\frac{1}{32}$; off Flamborough-head, rather more than $\frac{1}{29}$; off Shetland, rather less than $\frac{1}{29}$; lat. 74° at at sea $\frac{1}{29}$; lat. 78°, less than $\frac{1}{28}$; lat. 80°, near the ice, not quite $\frac{1}{30}$; lat. 80.30°, under the ice, not quite $\frac{1}{28}$; lat. 68.46°, rather more than $\frac{1}{28}$; lat. 65° at sea, rather less than $\frac{1}{28}$.

Dr. Hales obtained only $\frac{1}{27}$ from water taken up in the Mediterranean, and $\frac{1}{29}$ from water taken up at the Nore. Dr. Rutty obtained $\frac{1}{25}$ from water taken up in lat. 65°; $\frac{1}{28}$ from water taken up near Dublin; and $\frac{1}{30}$ from water taken up at Dungarvan; and Dr. Lucas got $\frac{1}{25}$ from sea water taken up at Harwich.

We learn from some experiments formerly made in a voyage from England to Bombay in the East Indies, that the weight of the sea water was the greatest, not precisely at the equator, but where the sun was vertical, and consequently, in similar circumstances, where the heat was greatest. The greatest weight of a definitive quantity of sea water, observed in sailing from 28° N. lat. to the Cape of Good-Hope, which is about 34½° S. lat. in the months of May, June, and July, was at St. Jago island N. lat. 15°, and the least at Teneriffe island, 28° N. lat. The proportional weights of equal bulk of Thames water, Teneriffe sea water, and St. Jago sea waters were 1000.1022 and 1184; whence, by comparing these numbers with a table in the Phil. Transf. for 1770, p. 349, exhibiting the comparative weight of equal bulks of simple water, and of water impregnated with different portions of sea salt, it may be conjectured, that the Teneriffe sea water contained about $\frac{1}{32}$ of salt, and the St. Jago water above $\frac{1}{4}$ of its weight of salt, so that it was nearly, if not fully, saturated.

The difference in the *saltness* of the sea in different places, may be owing to the variable quantity of vapours exhaling from it, to the quantity of fresh water received into certain parts of it in rains, or from the mouths of rivers, to beds of fossil salt situated at the bottom of the ocean, or to the salt water of springs and rivers, which are discharged into it in certain places.

Dr. Watson mentions the following easy method of estimating the quantity of salt contained in sea water: take a clean towel, or any other piece of cloth, dry it well in the sun or before the fire, then weigh it accurately, and note down its weight; dip it in the sea water, and, when taken out, wring it a little till it will not drip when hung up to dry; weigh it in this wet state, then dry it, and when it is perfectly dry weigh it again. The excess of the weight of the wetted cloth above its original weight, is the weight of the sea water imbibed by the cloth; and the excess of the weight of the cloth, after being dried, above its original weight, is the weight of the salt retained by the cloth; and by comparing this weight with the weight of the sea water imbibed by the cloth, we obtain the proportion of salt contained in that species of sea water. But in making this or any other experiment with the same view, it is necessary to observe the state of the weather before the experiment is made, because the quantity of salt contained in the water near the surface may be influenced, either by the antecedent moisture, or the antecedent heat of the atmosphere.

It has been already observed, at the beginning of this article, that Aristotle, and others after him, have supposed, that the upper parts of the sea are salter, and also warmer, than the lower; but modern philosophers have differed in their accounts of the *saltness* of the sea at different

different depths. There have been various contrivances for raiſing the ſea water, in order to determine its *ſaltneſs* and temperature. See *Bucket Sea* GAGE and *Sea* WATER.

The *ſaltneſs* of ſea water raiſed from different depths has been determined, either by weighing equal bulks of it, or by evaporating equal meaſures of it, and weighing the ſalt remaining after the water has been wholly diſſipated. Mr. Boyle (ſee his Obſervations on the *Saltneſs* of the Sea) purſuing the former method, found, that equal bulks of water taken up in the Engliſh Channel at the ſurface, and at the depth of fifteen fathoms, were equally heavy; and thence concludes that the ſuperficial water was as ſalt as that at a great depth. On the other hand, Count Marſigli (Hiſt. Phyſ. de la Mer) obtained, by evaporating the water, only a thirty-ſecond part of its weight of ſalt from water, taken up in the ſurface of the ſea in the gulf of Lyons; whilſt that taken up at the ſame time and place, from a great depth, gave him a twenty-ninth part of its weight of ſalt; and he thence infers, the greater *ſaltneſs* of the ſea at the bottom than at its ſurface, a concluſion which has been ſupported by experiments made in the gulf of Bothnia, and by captain Ellis at Cape Monte on the coaſt of Africa, menmentioned in Philoſophical Tranſactions, vol. xlvii. p. 213.

It has been obſerved, however, that in other places, the water is more ſalt near the ſurface than at greater depths. From the experiments relating to this ſubject made on occaſion of the voyage to the north pole, we learn that equal quantities of water, taken up in the open ſea off Shetland, 60°, N. lat. at the ſurface, and at the depth of ſixty-five fathoms, yielded by evaporation equal quantities of ſalt, viz. $\frac{1}{26}$ of their weight nearly. In N. lat. 65°, water taken from the ſurface gave nearly $\frac{1}{27}$ of its weight of ſalt, whilſt an equal weight taken up from the depth of 683 fathoms, in the ſame place, gave only $\frac{1}{32}$. The different reſults obtained from theſe ſeveral experiments may be accounted for by ſome circumſtances which attended them, without conteſting the accuracy of any of them.

It is well known, that the Rhone diſcharges much freſh water into the gulf of Lyons, which being lighter than ſea water will not readily mix with it, and, therefore, the ſuperficial water, being moſt diluted, will contain, bulk for bulk, leſs ſalt than that which is at a greater depth. The gulf of Bothnia receives many rivers, and, therefore, its ſurface may be more diluted, with freſh water, than its middle or bottom. But the water of the Engliſh Channel has a communication with the German ocean, on one ſide, and with the Atlantic, on the other; and, conſequently, is ſubject to a conſtant agitation, which will cauſe the freſh water, poured into it by the Thames, Medway, &c. to be uniformly diffuſed through all its parts, ſo as to render it equally ſalt at all depths. In other places, where the ſuperficial water appears to be more ſalt than that at different depths, the ſupply of freſh water may be inconſiderable, and the evaporation by the ſun's heat may be great. And the difference of evaporation, at differerent ſeaſons of the year, will account for the various reſults of experiments made at ſuch ſeaſons. After all, the fact of the ſea's being ſalter at the ſurface than at the bottom requires the confirmation of repeated experiments; ſince it is known, that the heavier water of the ſurface muſt gradually ſink and mix itſelf with the lighter and aſcending water below it. See Brownrigg's Art of making common Salt, 1748, 8vo. p. 83, &c. Watſon's Chem. Eſſ. vol. ii. eſſ. iv. p. 93, &c.

SALTO, in the *Italian Muſic*. See LEAP.

SALTPETRE, *ſal petræ*. See NITRE. See alſo NATRON.

SALTS, or SAULTS, in the *Manege*, denote the leaps, or high airs and vaults of a horſe; from the French *ſaut*, of the Latin *ſaltus, a leap, dance*, &c.

A *ſtep and a ſalt* is a high air, wherein the horſe riſing makes a curvet between two *ſalts*, or caprioles; ſo as to mount before, and fling back with his hind feet.

Two ſteps and a ſalt are a motion compoſed of two curvets, ending with a capriole.

SALT-SILVER is a denomination given to one penny paid at the feaſt of St. Martin, by the tenants of ſome manors, as a commutation for the ſervice of carrying their lord's *ſalt*, from market to his larder.

SALTUARIUS, in *Antiquity*, an officer, or ſervant, among the Romans, who had the care and cuſtody of a country-houſe, with lands and woods, and who was to look to the fruit, the fences, &c.

In Nehemiah, chap. ii. 8. mention is made of an officer of this kind; *cuſtos ſaltus regis*, which the Engliſh tranſlators interpret, *keeper of the king's foreſt*; but he was more, having not only the keeping of a foreſt, but of a houſe with a foreſt; *ſaltus* being here uſed as *horti*, for a houſe of pleaſure, becauſe gardens are the principal part. In the laws of the Lombards, *ſaltuarius* is an officer who has the guard of the frontiers.

SALTUM. *Ordination per* SALTUM. See ORDINATION.

SALTUS, in *Law books*, a high thick wood.

SALT-WORT, or *jointed glaſs-wort*, *ſalicornia*, in *Botany*, a genus of the *monandria monogynia* claſs. Its characters are theſe: the flower hath a rugged, ſwelling, fourcorned empalement, which is permanent; it has no petal, and only one ſtamen, of the length of the empalement, crowned by an oblong twin ſummit, and an oblong oval germen, ſupporting a ſingle ſtyle, crowned by a bifid ſtigma; the germen afterwards becomes a ſingle ſeed, incloſed in the ſwelling empalement. Linnæus enumerates five, and Miller two ſpecies. See KALI and KELP.

SALT-WORT, *black*. See GLAUX.

SALVADORA, in *Botany*, a genus of the *tetrandria monogynia* claſs: its characters are; that the empalement is divided into four ſegments; it has no corolla; the fruit is a ſingle-ſeeded berry, and the ſeed is furniſhed with a coat. There is one ſpecies.

SALVAGE *money*, is a recompence allowed both by the ſtatute and civil law, to ſuch perſons as have aſſiſted in ſaving merchandizes, ſhips, &c. from periſhing in wrecks, or by pirates or enemies. This uſually was a tenth part of the value of the things ſaved.

By the ſtat. 2 Edw. III. c. 13. if any ſhip be loſt on the ſhore, and the goods come to land (ſo as it be not legal wreck), they ſhall preſently be delivered to the merchants, they paying only a reaſonable reward, called *ſalvage*, to thoſe that preſerved them. Alſo, by the common law, if any perſons (other than the ſheriff) take any goods ſo caſt on the ſhore, which are not legal wreck, the owners might have a commiſſion to enquire or find them out, and compel them to make reſtitution. And, by ſtat. 12 Anne ſt. 2. c. 18. confirmed by 4 Geo. I. c. 12. in order to aſſiſt the diſtreſſed, and prevent the ſcandalous illegal practices on ſome of our ſea coaſts, it is enacted, that all head officers and others, of towns near the ſea, ſhall, upon application made to them, ſummon as many hands as are neceſſary, and ſend them to the relief of any ſhip in diſtreſs, on forfeiture of 100*l*.; and, in caſe of aſſiſtance given, *ſalvage* ſhall be paid by the owners, to be aſſeſſed by the neighbouring juſtices. See WRECK.

SALVATELLA, in *Anatomy*, a famous branch of the axillary vein, paſſing over the back of the hand, between the ring-finger and the little-finger.

Several phyſicians, in imitation of the Arabs, recommend bleeding in the *ſalvatella*, as proper in tertian and quartan agues, and in moſt hypochondriac diſeaſes.

SALVE *regina*, among the Romaniſts, the name of a Latin prayer, addreſſed to the Virgin, and ſung after complines; as alſo upon the point of executing a criminal. Durandus ſays, it was compoſed by Peter biſhop of Compoſtella.—The cuſtom of ſinging the *ſalve regina*, at the cloſe of the office, was begun by order of St. Dominic, and firſt, in the congregation of Dominicans at Bologna, about 1237. Gregory IX. firſt appointed it to be general. St. Bernard added the concluſion, *O dulcis! O pia, &c.*

SALVE, *lip*. See POMATUM.

SALVER, a flat diſh, commonly of ſilver, or other precious metal, uſed to ſet glaſſes on to ſerve wines, and other liquors.

The French call it *ſous coupe, under-cup*. The Italians uſe to preſent a *ſalver*, with ſeveral kinds of wines, with this compliment, *ſi non e buono, fatte lo: if it be not good, make it ſo.*

SALVIA, in *Botany*. See SAGE and CLARY.

SALUSANDRIA, in *Botany*, a name given by ſome authors to the nigella, called in Engliſh *gith*, or FENNEL-*flower*.

SALUTATION, the act or ceremony of ſaluting, greeting, or paying reſpect or reverence to any one.

Salutatio, among the *Romans*, was a daily homage paid by clients and inferiors to their ſuperiors.

Among the great the ATRIUM was the place appointed for this purpoſe, but among people of middling condition the VESTIBULUM only.

This practice of *ſalutation* was not confined to the city, but took place in the army likewiſe; it being uſual for the private ſoldiers to go very early in the morning to *ſalute* their centurion, who at their head proceeded to *ſalute* the tribune, and then the tribune with the reſt went and *ſaluted* the imperator, or commander in chief.

The women too had their crowds of *ſaluters* attending them every morning.

The manner of receiving thoſe who came to pay their reſpects, was to receive thoſe of the better ſort with a kiſs, and the poorer ſort had a ſmall entertainment given them,

them, and were even feasted by such as wanted to be thought more liberal than ordinary.

There is a great variety in the forms of *salutation:* we *salute* God by adorations, prayers, *&c.* kings by genuflexion, &c. In England, we salute one another by uncovering the head, inclining the body, *&c.* The orientals *salute* by uncovering their feet, laying their hands on their breast, &c. The pope makes no reverence to any mortal but the emperor of Germany, to whom he stoops a very little, when he admits him to kiss his mouth.

It was believed by the ancients, that the statue of Memnon, in a temple of Egypt, *saluted* the sun every morning at his rising; the cheat consisted in this, that the statue being hollow, when the warmth of the morning began to rarify the including air, it was driven out through a narrow duct in the mouth, this made a gentle murmur, which the priests interpreted a *salutation.*

In the *Army*, the *salute* is performed by a discharge of artillery, or small arms, or both. The colours likewise *salute* royal personages, and generals commanding in chief, which is done by lowering the point to the ground. In the field, when a regiment is to be reviewed by the king, or his general, the drums beat a march as he passes along the line, and the officers *salute* one after another, bowing their half pikes or swords to the ground, then recover, and take off their hats. The ensigns *salute* all together by lowering their colours.

At sea, this ceremony is variously performed, according to the circumstances, rank, or situation of the parties. It consists in firing a certain number of cannon, or vollies of small arms, in striking the colours or top-sails, and in one or more general shouts of the whole ship's crew, mounted in the masts or rigging for that purpose.

Ships always *salute* with an odd number of guns; galleys with an even one. A vessel under the wind of another is always obliged to *salute* first.

To *salute with musquets*, is to fire one, two, or three volleys, which is a method of *salutation* that sometimes precedes that of the cannon, and is chiefly used on occasion of feasts.

After the cannon, they sometimes also *salute* or hail with the voice, that is, a joint shout of all the ship's company three times, which *salutation* also occasionally obtains where they carry no guns, or do not care to discharge any.

Saluting with the flag is performed two ways, either by holding it close to the staff, so as it cannot flutter; or by striking it so as it cannot be seen at all, which is the most respectful *salutation.*

Saluting with the sails, is performed by hovering the topsails half-way of the masts. Only those vessels which carry no guns *salute* with the sails.

When there are several ships of war together, the commander alone *salutes.*

Father Fournier has an express treatise of sea *salutes* and signals. See SIGNAL.

The principal regulations with regard to *salutes* in the royal navy are as follow.

When a flag-officer *salutes* the admiral and commander in chief of the fleet, he is to give him fifteen guns; but when captains *salute* him, they are to give him seventeen guns. The admiral or commander in chief of the fleet is to return two guns less to flag-officers, and four less to captains. Flag-officers *saluting* their superior or senior officer, are to give him thirteen guns. Flag-officers are to return an equal number of guns to flag-officers bearing their flags on the same mast, and two guns less to the rest, as also to captains.

When a captain *salutes* an admiral of the white or blue, he is to give him fifteen guns; but to vice and rear admirals, thirteen guns. When a flag-officer is saluted by two or more of his majesty's ships, he is not to return the *salute* till all have finished, and then to do it with such a reasonable number of guns as he shall judge proper.

In case of the meeting of two squadrons, the two chiefs only are to exchange *salutes.* And if single ships meet a squadron consisting of more than one flag, the principal flag only is to be *saluted.* No *salutes* shall be repeated by the same ships, unless there has been a separation of six months at least.

None of his majesty's ships of war, commanded only by captains, shall give or receive *salutes* from one another, in whatsoever part of the world they meet.

A flag officer commanding in chief shall be *saluted*, upon his first hoisting his flag, by all the ships present, with such a number of guns as is allowed by the first, third, or fifth articles.

When any of his majesty's ships shall meet with any ship or ships belonging to any foreign prince or state within his majesty's seas, (which extend to Cape Finistere) it is expected, that the said foreign ships do strike their topsail, and take in their flag, in acknowledgment of his majesty's sovereignty in those seas: and if any shall refuse or offer to resist, it is enjoined to all flag-officers and commanders to use their utmost endeavours to compel them thereto, and not suffer any dishonour to be done to his majesty. And if any of his majesty's subjects shall so much forget their duty, as to omit striking their topsail in passing by his majesty's ships, the name of the ship and master, and from whence, and whither bound, together with affidavits of the fact, are to be sent up to the secretary of the admiralty, in order to their being proceeded against in the admiralty-court. And it is to be observed, that in his majesty's seas, his majesty's ships are in no wise to strike to any; and that in other parts, no ship of his majesty's is to strike her flag or top-sail to any foreigner, unless such foreign ship shall have first struck, or at the same time strike her flag or top-sail to his majesty's ship.

The flag-officers and commanders of his majesty's ships are to be careful to maintain his majesty's honour upon all occasions, giving protection to his subjects, and endeavouring what in them lies to secure and encourage them in their lawful commerce; and they are not to injure, in any manner, the subjects of his majesty's friends and allies.

If a foreign admiral meets with any of his majesty's ships, and *salutes* them, he shall receive gun for gun. If he be a vice-admiral, the admiral shall answer with two guns less. If a rear-admiral, the admiral and vice-admiral shall return two less. But if the ship be commanded by a captain only, the flag-officers shall give two guns less, and captains an equal number.

When any of his majesty's ships come to an anchor in a foreign port or road, within cannon-shot of its forts, the captain may *salute* the place with such a number of guns as have been customary, upon good assurance of having the like number returned, but not otherwise. But if the ship bears a flag, the flag-officer shall first carefully inform himself how flags of like rank, belonging to other crowned heads, have given or returned *salutes*, and to insist upon the same terms of respect.

It is allowed to the commanders of his majesty's ships in foreign parts, to *salute* the persons of any admirals, commanders in chief, or captains of ships of war of foreign nations, and foreign noblemen or strangers of quality, as also the factories of the king's subjects, coming on board to visit the ship; and the number of guns is left to the commander, as shall be suitable to the occasion, and the quality of the persons visiting; but he is nevertheless to remain accountable for any excesses in the abuse of this liberty. If the ship visited be in company with other ships of war, the captain is not to make use of the civilities allowed in the preceding article, but with leave and consent of the commander in chief, or the senior captain.

Merchant ships, whether foreigners, or belonging to his majesty's subjects, *saluting* the admiral of the fleet, shall be answered by six guns less; when they *salute* any other flag ships, they shall be answered by four guns less; and if they *salute* men of war commanded by captains, they shall be answered by two guns less. If several merchant ships salute in company, no return is to be made till all have finished, and then by such a number of guns as shall be thought proper; but though the merchant ships should answer, there shall be no second return.

None of his majesty's ships of war shall *salute* any of his majesty's forts or castles in Great Britain or Ireland, on any pretence whatsoever. Regulations and Instructions for the Sea Service.

Angelical SALUTATION, is an address which the Romanists make to the Virgin, containing the formula wherein the angel saluted her, when he acquainted her with the mystery of the incarnation.

SALUTATORIUM, in *Nunneries*, a place where the nuns receive the salutation of those that come to see them.

Salutatorium is also used for the vestry, or place where the bishop was dressed, and received the salutation of visitants before divine service.

SALUTE, an ancient name of a coin made by king Henry V. after his conquest in France, on which the arms of France and England were stamped and quartered.

SALUTIGERULI, among the Romans, were servants chiefly employed by the women in carrying salutations to one another.

SALUTIS *elixir.* See ELIXIR *Salutis.*

SALZ, SULZ, SALTZ, or SULTZ, a sort of brine or pickle made of salt, dissolved by the coldness or moisture of a cellar.

SAMALUM, in *Botany*, a name by which Pliny and some other authors have called the *pulsatilla*, or pasque-flower.

SAMANEANS, in *Antiquity*, a kind of MAGI, or philosophers, erroneously confounded by some with the Brahmins, who, proceeding from Ariana, a province of Persia, and the neighbouring countries, spread themselves in India, and taught new doctrines. According to some writers, the Brahmins, before their arrival, were in the highest period of their glory, they were the only oracles of India, and their principal residence was on the banks of the Ganges, and in the adjacent mountains; while the *Samaneans* were settled towards the Indus. Others say, that the Brahmins derived all their knowledge from the *Samaneans*, before whose arrival it would be difficult to prove that the Brahmins were the religious teachers of the Indians. The most celebrated and ancient of the *Samanean* doctors was Boutta, or Budda, who was born 683 years before Christ. His disciples honoured him as a god; and his doctrine, which consisted chiefly in the transmigration of souls, and in the worship of cows, was adopted not only in India, but also in Japan, China, Siam, and Tartary. It was propagated, according to M. de Sainte Croix, in Thibet, in the VIIIth century, and succeeded there the ancient religion of Zamolxis. The *Samaneans*, or Buddists, were entirely destroyed in India by the jealous rage of the Brahmins, whose absurd practices and fables they affected to treat with contempt; but several of their books are still respectably preserved on the coasts of Malabar; and, moreover, we are told, that several of the Brahmin orders have adopted their manner of living, and openly profess the greatest part of their doctrines. L' Ezour Vedam, ou Ancien Comment. du Vedam, published by M. de S. Croix, Paris, 1779. See BRACHMANS.

SAMARITANS, an ancient sect among the Jews; still subsisting in some parts of the Levant, under the same name.

Its origin was in the time of Rehoboam; under whose reign, a division was made of the people of Israel into two distinct kingdoms. One of these kingdoms, called Judah, consisted of such as adhered to Rehoboam, and the house of David; the other retained the ancient name of Israelites, under the command of Jeroboam.—The capital of the state of these latter was Samaria; and hence it was that they were denominated *Samaritans*.

Some affirm that Salmanazar, king of Assyria, having conquered Samaria, led the whole people captive into the remotest parts of his empire; and filled their place with colonies of Babylonians, Cutheans, and other idolaters. These finding themselves daily destroyed by wild beasts, it is said, desired an Israelitish priest to instruct them in the antient laws and customs of the land they inhabited. This was granted them; and they thenceforth ceased to be incommoded with any beasts.—However, with the law of Moses, they still retained somewhat of their ancient idolatry. The rabbins say, they adored the figure of a dove on mount Gerizim.

Upon the return of the Jews from the Babylonish captivity, and the rebuilding of Jerusalem and the temple, the religion of the *Samaritans* received another alteration on the following occasion. One of the sons of Jehoiada the high priest, whom Josephus calls Manasseh, married the daughter of Sanballat the Horonite; but the law of God having forbidden the intermarriages of the Israelites with any other nation, Nehemiah set himself to reform this corruption, which had spread into many Jewish families, and obliged all that had taken strange wives immediately to part with them. Nehem. xiii. 23—30. Manasseh, unwilling to surrender his wife, fled to Samaria; and many others in the same circumstances, and with similar disposition, went and settled under the protection of Sanballat, governor of Samaria. From that time the worship of the *Samaritans* came much nearer to that of the Jews, and they afterwards obtained leave of Alexander the Great to build a temple in Mount Gerizim, near the city of Samaria, in imitation of the temple at Jerusalem, where they practised the same forms of worship.

Notwithstanding the charge above mentioned, it is certain, the modern *Samaritans* are far from idolatry: some of the most learned among the Jewish doctors own, that they observe the law of Moses more rigidly than the Jews themselves.—They have a Hebrew copy of the Pentateuch, differing in some respects from that of the Jews; and written in different characters, commonly called *Samaritan* characters; which Origen, Jerom, and other fathers and critics, ancient and modern, take to be the primitive character of the ancient Hebrews; though others maintain the contrary. The point of preference, as to purity, antiquity, &c. of the two Pentateuchs, is also much disputed by the modern critics.

Origen, Jerom, and Epiphanius inform us, that the *Samaritans* rejected all the sacred writings except the five books of Moses.

The *Samaritans* are now few in number; though it is not very long, since they pretended to have priests descended directly from Abraham. They were chiefly found at Gaza, Neapolis (the ancient Sichem), Damascus, Cairo, &c. They had a temple, or chapel, on mount Gerizim, where they performed their sacrifices.

Joseph Scaliger, being curious to know their usages, wrote to the *Samaritans* of Egypt, and to the high-priest of the whole sect, who resided at Neapolis. They returned two answers, dated in the year 998, of the Hegira of Mahomet. These answers never came to the hands of Scaliger. They are now in the French king's library, and have been translated into Latin by father Morin, priest of the Oratory; and printed in the collection of letters of that father in England, 1682, under the title of *Antiquitates Ecclesiæ Orientalis*. M. Simon has inserted a French translation, in the first edition of *Ceremonies & Coûtumes des Juifs*, by way of supplement to Leo de Modena.

In the first of these answers, written in the name of the assembly of Israel, in Egypt, they declare, that they celebrate the passover every year, on the fourteenth day of the first month, on mount Gerizim; and that he who then did the office of high-priest, was called Eleazar, a descendant of Phinehas, son of Aaron.—At present they have no high-priest. In the second answer, which is in the name of the high-priest Eleazar, and the synagogue of Sichem, they declare, that they keep the sabbath in all the rigour wherewith it is enjoined in the book of Exodus; none among them stirring out of doors but to the synagogue. They add that on that night they do not lie with their wives; that they begin the feast of the passover with the sacrifice appointed for that purpose in Exodus; that they sacrifice nowhere else but on mount Gerizim; that they observe the feasts of harvest, the expiation, the tabernacles, &c. They add farther, that they never defer circumcision beyond the eighth day; never marry their nieces, as the Jews do; have but one wife; and, in fine, do nothing but what is commanded in the law: whereas the Jews frequently abandon the law to follow the inventions of their rabbins.

At the time when they wrote to Scaliger, they reckoned one hundred and twenty-two high-priests; affirmed that the Jews had no high-priests of the race of Phinehas; and, that the Jews belyed them, in calling them Cutheans; for that they are descended from the tribe of Joseph by Ephraim. The truth is, the Jews impose abundance of things on the *Samaritans*: they frequently confound them with the Sadducees, as if they were infected with their errors.—Rabbi Benjamin, who lived in the XIIth century, confirms the best part of what we have said of the *Samaritans*: he observes, they had priests of the tribe of Aaron, and who never married with any but those of the same tribe: that they sacrificed on mount Gerizim, where they had an altar of stone, raised by the Israelites after passing over Jordan. He adds, that they are of the tribe of Ephraim; that they change their habit to go to the synagogue, and wash before they put it on.

SAMARITAN *characters*, or *letters*. See LETTER, and HEBREW.

SAMARITAN *medals*.—In the cabinets of antiquaries we find some medals, usually called *Samaritan medals*; the inscriptions or legends whereof are Hebrew; but the character different from the Hebrew of our Bibles, which is the square Hebrew, or Chaldee: and it is hence, viz. from the character, not from their being struck by the *Samaritans*, that they are denominated *Samaritan*.

These medals have been infinitely canvassed by the critics, both Jewish and Christian, particularly rabbi Alascher, rabbi Bartenora, rabbi Azarias, rabbi Moses, father Kircher, Villalpandus, Waserus, Coringius, Hottinger, Father Morin, Walton, Hardouin, Spanheim, &c.

The learned Jesuit Souciet, in an express dissertation on the *Samaritan medals*, rejects all Hebrew medals, whose inscriptions are in Chaldee characters, as spurious; and allows of none to be genuine but the *Samaritan*.—Of these there are four kinds.

The first bear expressly the name of *Simon*, and the subject for which they were struck, viz. the deliverance of Jerusalem. The second kind have not the name *Simon*, but only the deliverance of Sion, or Jerusalem. The third kind have neither Simon, nor the deliverance of Sion; but only the epochas, first year, second year, &c. The fourth class have neither any inscriptions, nor any thing whence one may judge of the time when they were struck.

The three first kinds were certainly struck after the return from the Babylonish captivity, and in the time of Simon

Simon Maccabeus, after Jerusalem had been freed from the yoke of the Greeks. But though struck after the captivity, father Souciet observes, their character shews itself to be that of the ancient Hebrew, which was used before the captivity, and the use whereof was lost by the people, during their sojourn in Babylon and Chaldæa; but was again restored after their return, on the same footing as before. He adds, that the inscriptions are pure Hebrew, such as it was spoken before the captivity; that the character, therefore, is the true ancient Hebrew character: that it was the custom to write each language in its proper character: that if they had departed from this rule, they had doubtless used the new character they brought with them from Babylon: that there could be no other reason, but that of settling all things on the same foundation they were on before the destruction of Jerusalem, that could have induced them to use this character on their coins. And, lastly, that these medals were not struck by the *Samaritans*, but by the Jews, and in Jerusalem.

F. Souciet is very full on all these points, and, to the proofs drawn from medals, he adds two others foreign thereto: the first drawn from the resemblance of the Greek letters, introduced by Cadmus the Phœnician, with this Hebrew character, which was the same with that of the Phœnicians, as the language of those people was the same with that of the Hebrews. The second drawn from several various readings in the Scriptures, which cannot be well accounted for otherwise than by supposing, that the books written before the captivity, were in the same character with these medals, and which shew, that it is the conformity which certain letters have in that character, that has deceived the copyists.

From the whole, he concludes, that this character of the medals is the true ancient Hebrew character; and, that to judge of the various readings of the Hebrew text, and the differences of the ancient Greek and Latin translations, either from themselves, or from the Hebrew text, recourse must be had to this character.

SAMARITAN *Chronology*. See *Sacred* CHRONOLOGY.

SAMARITAN *Pentateuch*. See PENTATEUCH.

SAMARRA, a garment worn by those condemned by the Romish inquisition to be burnt; such are impenitents, and those who confess themselves guilty of heresy, but repent, and renounce their errors before the execution.

It is a kind of frock, made of sackcloth, of a saffron colour, and painted with flames pointing downwards; sometimes the unhappy sufferer's picture is drawn to the life on it, and sometimes devils are painted on it, dragging, as it were, the person along with them to hell; on their frock there is likewise put the cross St. Andrew, of a red colour on the back and heart; it is otherwise called *sambenito*, or *blessed sackcloth*, and *samaretta*.

SAMBAK, or ZAMBAK, in *Botany*, a name used by some authors for the jasmine, or common white jessamy. Chabræus, p. 112.

SAMBENITO. See SAMARRA.

SAMBUCUS, an ancient musical instrument of the wind-kind, resembling a kind of flute; probably thus called because made of the stalks of the elder, which the Latins call *sambucus*.

SAMBUCUS was also the name of an ancient engine of war, used by Marcellus in besieging the city of Syracuse.

It was so big, that Plutarch, in the life of that general, observes, two ships were required to carry it.

SAMBUCUS, in *Botany*. See ELDER-*Tree*.

SAMEL *Bricks*. See BRICK.

SAMIA *terra*, in the *Materia Medica*, an earth of the MARLE kind, found in the island of Samos, and much used both in medicine and in the pottery of the ancients.

It is of two kinds, a white dull-looking one, called the *collyrium Samium*, and a brownish and glittering one, called the *aster Samius*.

The *collyrium Samium* is still to be found in the place from whence they had it, and from whence it has its name; and is a very fine and pure earth, of a close, equal, and regular texture, and yet remarkably light. It is of a fine bright white colour, and of a smooth, even, and glossy surface. It is soft to the touch, adheres firmly to the tongue, is easily broken between the fingers, and does not at all stain the hands; but drawn along a rough surface, leaves a fine clean white line. It melts slowly in the mouth, and does not ferment with acids. These are the characters by which it is to be distinguished from the white earths: to which may be added its manner of lying in the earth; which is not, as that of most of the other earths, in a continued stratum, or bed, but in the perpendicular fissures, and horizontal cavities in the strata of stone, in the manner of the European earths, called the *medullæ saxorum*, but in substance very different from them all.

The other kind of *Samian* earth, called *aster Samius*, is still found in the place from whence they had it, and lies in the same manner in which they have described it, in a horizontal cavity between two rocks.

It is a loose, lax, and crumbly earth, of a mixed colour, between a dusky white and a pale brown, and all over spangled with small glittering particles. It is of a loose and incoherent structure, but usually breaks away into flat pieces, and seems somewhat of an obscurely laminated make. It is of a dry dusty surface, falls to pieces very readily between the fingers, and though it dusts the hands, does not at all stain them. It melts very readily in the mouth, and when thrown into water parts immediately, with a hissing noise, into a number of flaky pieces, and from thence moulders into a loose powder. It makes no effervescence with acid menstrua, and when its glittering particles are separated, and strictly examined, they are found to be so many thin flakes of that species of fossils, called *selenites*.

This, as well as the other species, or *collyrium*, was prepared by calcination and washing, and used by the ancient physicians internally in fluxes and hæmorrhages, and externally in inflammations. These were also some of the most valued earths in the Roman pottery. Hill's Hist. of Foss. p. 38, &c.

There is also a SAMIAN *stone*, λιθ⊕ Σαμιος, taken out of the mines in the same island.—It is white, and sticks to the tongue when applied to it: it his held astringent, and cooling; and is also used by the goldsmiths to burnish their gold, and give it a greater lustre.

SAMIARII, among the *Romans*, were a kind of furbishers, who, with Samian earth, polished the arms of the prætorian soldiers and emperor's life-guards.

SAMLET, in *Ichthyology*. See SALMULUS.

SAMNITES, in *Antiquity*, an order of GLADIATORS armed by the Campanians after the fashion of the country of the *Samnites*. They wore a shield broad at the top, to defend the breasts and shoulders, and growing more narrow toward the bottom, that it might be moved with the greater convenience; they had also a sort of belt coming over their breasts, a greave on their left foot, and a crested helmet on their heads. Livy, lib. ix.

SAMOLUS, *round-leaved water pimpernel*, in *Botany*, a genus of the *pentandria monogynia* class, its characters are, that the impalement of the flower is permanent, erect, and cut into five segments; it has one petal, with a short spreading tube, the brim is plain, obtuse, and cut into five parts; it has five short stamina placed between each segment of the petal, terminated by summits which join together; the germen is situated under the flower, supporting a slender style, crowned by a headed stigma; it afterwards becomes an oval capsule, with one cell, cut half through into five valves filled with small oval seeds. There is only one species.

SAMOSATENIANS, *Samosateni*, a sect of ancient Antitrinitarians, thus called from their leader, Paulus Samosatenus, bishop of Antioch, under the emperors Aurelian and Probus.

They are also called by St. Augustine *Pauliani*, and by the fathers of the council of Nice, Παυλιανιζοντες. See PAULIANISTS.

St. Epiphanius will have the *Samosatenians* to be real Jews, without any thing more than the name of Christians; adding, that they use the same arguments against the mystery of the Trinity that the Jews do; pleading against it, with them, on pretence of maintaining the unity of the Godhead: though they do not observe the ceremonies of the law.

SAMP, in America, a name given to a sort of bread made of the MAIZE, or Indian-corn.

They first water the corn for about half an hour, and then beat it in a mortar, or grind it in a hand-mill; they then sift out the flour, and winnow the husks from it; they then mix this into a thin paste with water, and bake it in flat loaves, which they call *samp*-loaves, or *samp*-bread.

Beside this they have another dish prepared of this corn, which they esteem a great delicacy, and call by the name of *samp*, without the addition of loaf or bread. To make this, they only bruise or grind the corn to the size of rice, and then winnowing away the husks, they boil it gently till it is thoroughly tender, and then add to it milk and butter and sugar: this is not only a very wholsome, but a very pleasant dish. It was the first diet of our planters when newly settled there, and is still in use, as an innocent food in sickness as well as health.

The Indians, who feed on this sort of food, are found never to be subject to the stone, and to escape several other painful diseases.

The English have found a way of making a very good sort of beer of the grain of this Indian corn: they do this either by using the bread made of it, or else by malting

it

it as we do our own corn. When they make the beer of the maize-bread, they break or cut it into lumps as big as a man's fist; they mash these in the same manner that we do malt, and boil up the wort in the same manner, either with or without hops. Phil. Transf. N° 142.

SAMPHORÆ, among *the ancients*, were horses marked with the letter Σ on their legs.

SAMPHIRE, *Crithmum*, in *Botany*, a genus of the *pentandria dygynia* class. Its characters are these: it is a plant with an umbelliferous flower; the great umbel is hemispherical, and composed of many smaller of the same figure; the involucrum of the general umbel is composed of several spear-shaped leaves; those of the particular umbels have very narrow leaves of the length of the umbel; the general umbel is uniform; the flowers have five oval inflexed petals, which are almost equal, and five stamina of the length of the petals, terminated by roundish summits; the germen is situated under the flower, supporting two reflexed styles, crowned by obtuse stigmas; the germen afterward becomes an oval compressed fruit, dividing into two parts, each having one compressed, elliptical, furrowed seed. There are two species.

The *samphire* which grows upon rocks by the sea in many parts of England, is with difficulty propagated in gardens, nor will it grow so vigorous with any culture, as it does upon rocks; but if the plants are planted on a moist gravelly soil, they will thrive tolerably well, and may be preserved some years; it may be propagated either by seeds or parting of the roots. Miller.

Samphire is more made use of as a pickle, being a very agreeable one, than for any medicinal purposes. However, it is strengthening to the stomach, procures an appetite, provokes urine, opens obstructions of the bowels, and is good for the jaundice. Miller's Bot. Off.

It is farther recommended as a dissolvent of the stone, and a promoter of the menses. James.

SAMPHIRE, *golden*, a species of the *inula*. See ELECAMPANE.

SAMPHIRE, *prickly*, a species of the *echinophora*. See *Prickly* PARSNEP.

SAMPSEANS, *Sampsæi*, ancient sectaries; the same, according to St. Epiphanius, with the ELCESAITES.

The *Sampseans* were not properly either Jews, Christians, or Gentiles; though they took their name from the Hebrew, *semes*, *sun*; as if they adored the sun.

They acknowledged one only God; washed themselves often, and were attached, in almost every thing, to the religion of the Jews.—Many among them abstained wholly from eating of flesh.

Scaliger, after Epiphanius, will have the *Sampseans* to be the same with the *Essèni*. In effect, the *Elcesaites*, *Sampseans*, *Massalians*, and *Esseni*, appear to be no more than so many different names for the same sect; unless, perhaps, the first added something to the opinions of the last.

SAMPSUCHUS, a word generally used as a name of the common sweet-marjoram. This is as old a custom as Dioscorides; for that author expressly says, that the plant *sampsuchus* was called *amaracus* by the Cyzenians, and some others whom he names, and seems to make them proper synonyms of the same plant; yet afterwards mentioning the oils, called *oleum sampsuchinum*, and *oleum amaracinum*, he declares them to be different medicines.

This might seem to imply a false text, either by the error of the transcribers or printers, in one of the places, but those who are versed in the writings of Dioscorides, will not infer so much; for there are too many instances of this sort of contradiction in his works. It appears, however, from the most ancient writers of all, that the *amaracus* and *sampsuchus* were originally the names of different plants.

SAMPUNIA, a pneumatic instrument of music among the ancient Hebrews, like our common BAG-*pipe*.

SAMPSON'S *post*, in *Naval Language*, a sort of pillar erected in a ship's hold, between the lower deck and the keelson, under the edge of a hatchway, and furnished with several notches, that serve as steps to mount or descend as occasion requires. This post being firmly driven into its place, not only serves to support the beam, and fortify the vessel in that place, but also to prevent the cargo, or the materials contained in the hold, from shifting to the opposite side, by the rolling of the ship in a heavy turbulent sea.

SAMYDA, in *Botany*, a genus of the *decandria monogynia* class. Its characters are these: the flower has a rough bell-shaped empalement of one leaf, which is cut at the brim into five points; it has no petal, but has fifteen short awl-shaped stamina, inserted in the empalement, terminated by oval summits; and a hairy globular germen, supporting a cylindrical style, crowned by a headed stigma; the germen afterward becomes an oval berry with four furrows, having four cells, including many kidney-shaped seeds, immersed in the oval receptacle. Linnæus enumerates five, and Miller two species, which grow naturally in the West Indies.

SANALIA, a name given by some authors to those tumors, commonly called MELICERES.

SANAMUNDA, in *Botany*, a name used by some authors for the sea heath-spurge, or empetrum of the shops, a plant of the thymelæa kind.

In the *Materia Medica*, however, according to most catalogues, the *sanamunda* is appropriated to be the name of the heath-spurge, another plant of the thymelæa kind, different from the sea sort.

SANATES, among the Romans, an appellation given to those people in the neighbourhood of Rome, who having revolted, soon submitted themselves again; on which account they had equal privileges with the other citizens, there being a law in the Twelve Tables ordaining *ut idem juris* sanatibus *quod foretibus sit*.

SANATODOS, in *Natural History*, a name given by the people of Sicily to the spungy excrescence found on the stalk of the dog-rose, and more usually called the *bedeguar*.

This they greatly esteem in all venomous bites, and use it in fine powder, both internally and externally, in many parts of that country. They use no other remedy for the bite of a viper: the wound is scarified, and some of the powder is sprinkled on, and large doses of it are also given internally in strong wine.

In the bite of a mad dog they apply it to the wound, softened into a sort of poultice with oil, or with strong wine; and they give it in repeated doses internally in broths, and other weak fluids. They give it also in continual fevers, and in many other cases, particularly in the colic. It is said, that a single dose of a dram of it, in red wine, takes off all the pain of the colic in an hour.

There seems a very old opinion on the side of this medicine, in the cure of a bite from a mad dog; for Pliny tells us, that the root of the wild-rose, from the stalks of which this substance grows, was revealed in a dream for the curing this terrible disease. People, who have found out some one virtue in a plant, are generally ready to attribute a great many more to it; but though too much may be said in praise of the virtues of this substance, by the people of that part of the world, it is well worth trying whether it does not contain some of them, as it is a thing very common among us, and easily had in any quantities.

SAN BENITO, or SACO BENITO. See SAMARRA.

SANCTIFICATION, the act of *sanctifying*, or making a thing holy, and separate to God.

The reformed divines define *sanctification* an act of God's grace, whereby a man is renewed inwardly, his desires and affections are alienated from the world, and the man put in a course of dying to sin, and living to righteousness.

The *sanctifying of the sabbath*, among the Jews, is of divine right or institution.—By *sanctifying* the sabbath, is meant, the spending it in prayer, praise, &c. not in worldly concerns.

The first petition in the Lord's Prayer is, *Hallowed*, i.e. *sanctified be thy name*: by which is meant, let thy name be ever accompanied with blessing and praise.

SANCTION, *sanctio*, the authority given to a judicial act; or that, whereby it becomes legal and authentic.

The word is formed from the Latin *sancire*, *to establish*.

The royal assent gives the *sanction* of statutes, to all bills in parliament that have passed each house.

SANCTION of *a law*. See LAW.

SANCTION, *pragmatical*. See PRAGMATIC.

SANCTI VITI *Chorea*. See VITUS'S *Dance*.

SANCTORIAN *tables*, are used to signify such registers as exhibit the quantities of perspiration, its proportion to stool or urine, &c. We have such tables from the observations of Dr. Lining, at Charles-Town, South-Carolina. See Philos. Transf. N° 470, and 475.

SANCTUARIUM, in *Ecclesiastical Writers*, the same with BRANDEUM.

SANCTUARY, among the *Jews*, was the holiest and most retired part of the temple of Jerusalem; wherein was preserved the ark of the covenant; and into which nobody was allowed to enter but the high-priest, and that only once a-year, to intercede for the people.

The *sanctuary*, called also *sanctum sanctorum*, or *holy of holies*, is supposed to be a type or figure of heaven, and of Jesus Christ the true high-priest, who is ascended thither to make intercession for us.

Some will have it, that the whole temple was called the *sanctuary*: and that the *sanctum sanctorum*, where the ark was kept, was only a little chapel or oratory therein.

To try or examine a thing by the *weight of the* SANCTUARY, is to examine it by a just and equal scale; because, among

among the Jews, it was the custom for the priests to keep stone weights, to serve as standards for regulating all weights by; though these did not differ from the royal or profane weights.

SANCTUARY, in *our ancient customs*, denotes an asylum, or place privileged by the prince, for the safeguard of men's lives, who were guilty of capital crimes.

In Scotland they call the *sanctuary*, *girtholl*, or *gyrthol*. The Saxons also called it *frodmortel* and *fridstoll*.

Till Henry the VIIIth, all our churches and church-yards were *sanctuaries*; and protected persons accused of any crime (except treason, wherein the crown, and facrilege, wherein the church, was too nearly concerned) who fled to them; and who within forty days after went in sackcloth, and confessed themselves guilty before the coroner, and declared all the particular circumstances of the offence; and who thereupon took the oath in that case provided, viz. that they abjured the realm, and would depart from thence forthwith, at the first port that should be assigned them, and would never return without leave from the king: by this means they saved their lives, if they observed the conditions of the oath, by going with a cross in their hands, and with all convenient speed, to the port assigned, and embarking; for, if, during these forty days privilege of *sanctuary*, or in the road to the sea side, they were apprehended and arraigned in any court for this felony, they might plead the privilege of *sanctuary*, and had a right to be remanded, if taken out against their will. But by this abjuration their blood was attainted, and they forfeited all their goods and chattels. During this time, if any layman expelled them, he was excommunicated; if a clerk, he was made irregular; but after forty days no man might relieve them.

The immunity of these privileged places was very much abridged by the statutes 27 Hen. VIII. cap. 19. and 32 Hen. VIII. cap. 12. And now, by the statute 21 Jac. I. cap. 20. all privilege of *sanctuary*, and abjuration consequent thereupon, is utterly taken away and abolished.

St. John's of Beverley had an eminent *sanctuary*, called by the Saxons, *a seat of peace*: so had St. Martin's le Grand, in London. Rippon had the like granted by Whitlafe, king of the Mercians: so had St. Burien's in Cornwall, granted by king Athelstan, anno 936; and Westminster had the like, granted by Edward the Confessor.

SANCTUARY is also used in the Romish church, for the chancel, or that part of the church wherein the altar is placed, incompassed with a rail or balustrade.

SANCTUM SANCTORUM. See SANCTUARY.

SANDS, *arenæ*, in *Natural History*, a genus of fossils, the characters of which are, that they are found in minute concretions, forming together a kind of powder, the genuine particles of which are all of a tendency to one determinate shape, and appear regular, though more or less complete concretions; not to be dissolved or disunited by water, or formed into a coherent mass by means of it, but retaining their figure in it; transparent, vitrifiable by extreme heat, and not dissoluble in, nor effervescing with acids.

Sand is composed of small stony matter; and, therefore, the kinds of *sand* are as numerous as the kinds of stones. But in *Natural History* and *Chemistry*, by *sand* is understood a matter of the nature of vitrifiable earths.

The most general distinction of *sands* is taken from the places whence they are drawn; viz. *pit-sand*; *river-sand*, and *sea-sand*.

The use of *sand* in building is as an ingredient in MORTAR.—For this purpose, *pit-sand* is of all others the best; and of *pit-sand*, the whitest is always the worst. Of *river-sand*, that found in the falls of waters is best, because most purged: and *sea-sand* is the worst.

Pit-sand, as being fat and tough, is most used in walls and vaults.—*River sand* serves best for rough casting.

All *sand* is good in its kind, if, when squeezed and handled, it crackles; and if, being put on a white cloth, it neither stains, nor makes it foul.—That *sand* is naught, which, mixed with water, makes it dirty and muddy, and which has been long in the air; for such will retain much earth, and rotten humour.—Hence, some masons wash their *sand* before they use it.

The *sand* of Puzzuolo, de Lorme observes, is the best in the world; especially for maritime buildings. See POZZOLANA.

Sands are subject to be variously blended and intermixed either with homogene or heterogene particles, particularly with flakes of talc; and according to these, and their different colours, are to be subdivided into several kinds.

1. *White sands*; such as are pure and free from heterogene particles, and such as are mixed with sandy and heterogeneous particles of other colours.
2. *Red*, or *reddish sands*, both pure and impure.
3. *Yellow sands*, pure and impure, which are very numerous.
4. *Brown sands*; distinguished in the same manner.
5. *Black sands*; of which there are two species, viz. a fine shining greyish black *sand* found in Italy, and a fine shining reddish black *sand* peculiar to America.
6. *Green sands*; of which there is only one known species, viz. a coarse variegated dusky green *sand*, common in Virginia. Hill's Hist. of Fossils, p. 568.

Some distinguish *a male sand*, which is of a deeper colour than another sort in the same banks or beds, called *female sand*.

The *sand* whereof GLASS is made, is white and gritty, and full of little sparkling grains.

The *sand* used by founders is fossile: it is properly a yellow fat earth, whereof they make their moulds, for the casting of small work; whence it is they say, CASTING *in sand*.

The plumbers also use *sand* to mould several of their works, particularly large sheets. To prepare the *sand* for these sheets, they wet it lightly; then stir and work it with a stick; and then beat and plane it. See PLUMBERY.

Sands may be divided into *sharp* and *soft*.

Sharp, or *rag sand*, is that composed of small transparent pebbles, naturally found in the mountains.

Of this, again, there is some *fine* and white, or grey, reddish, or brown; and others *coarse*, either of a grizzly, or brown colour.

Soft or *smooth sand*, is that mixed with flat particles from lime-stone, or with micæ of glittering particles, either silver-like, as the *sea-sand* about the Scilly islands; or gold-like, as in Cleveland.

It is remarkable that *sand*, though it appear a very hard, dense, and indissoluble body, yet is contained invisibly in the brine, or salt water of our salt springs; and even on the shooting of the salt after evaporation, there still remain the particles of it in the clear pellucid salt; and this, though wholly soluble in water, yet when a brine, made by such a solution, is boiled, deposits as much of the *sand* as the common brine of the pits, or sea water.

Some have supposed that the *sand* was generated during the time of the boiling of the liquor, but the more careful examiners think otherwise; it appearing to them, that the particles of this *sand* may be seen in the brine, by the help of a microscope, before the boiling, in form of rectangular oblong plates, some nearly square; these are so small, as readily to pass the strainer with the water; and appearing as numerous in it after as before the straining, shew that they are no more to be withheld by such means, than the salt.

The pores of the finest strainers, examined by the microscope, appear twenty times bigger than these plates, or particles of the *sand*, and therefore it is not to be wondered at that they let them through. There requires, therefore, no more to the formation of the *sand*, than the coalescing of several of these particles into one larger granule, and so on; and this is very likely to be done by means of the evaporation of the fluid which kept them separate, and of the motion given to them in boiling, which naturally and necessarily brought them into the spheres of their own mutual attractions, at a time when their attraction with the fluid they swam in, was also much diminished with its quantity. See farther Philos. Trans. Nº 140.

Sand seems to have been the first substance added to proper salts for making of glass. Josephus, Tacitus, Strabo, Pliny, Agricola, &c. all mention this, and tell us of the stores from which the *sand* for this use was brought, being inexhaustible. See GLASS.

Common *sand* is a very good addition by way of manure to all sorts of clay-lands, it warms them, and makes them more open and loose. The best *sand* for the farmer's use is that which is washed by rains from roads or hills, or that which is taken from the beds of rivers; the common *sand* that is dug in pits never answers nearly so well. *Sand* mixed with dung is much better than laid on alone: and a very fine manure is made by covering the bottom of sheep-folds with several loads of *sand* every week, which are to be taken away, and laid on cold stiff land, impregnated as they are with the dung and the urine of the sheep.

Beside clay land, there is another sort of ground very improveable by *sand*; this is that sort of black foggy land on which bushes and sedge grow naturally, and which they cut into turf in some places. Six hundred load of *sand* being laid upon an acre of this land, according to the Cheshire measure, which is near double the statute acre, meliorate it so much, that without ploughing, it will yield good crops of oats or tares, though before it would have produced scarce any thing. If, after this crop is taken off, the land be well dunged, and laid down for grass, it will yield a large crop of sweet hay.

Once *sanding* this land will improve it for a vast number of years, and it will yield two crops of hay in the year, if there be weather to make it in. Some land in Cheshire has been, by this means, rendered of twelve times its

its former value to the ówer. The bogs of Ireland, when drained, have been rendered very fruitful land, by mixing *ſand* in this manner among the earth of which they conſiſt. Add to this, that in all theſe boggy lands, the burning them, or firing their own turf upon them, is alſo a great advantage. The common peat, or turf aſhes, mixed with the *ſand* for theſe purpoſes, add greatly to its virtue.

Sea *ſand*, which is thrown up in creeks and other places, is by much the richeſt of all *ſand* for manuring the earth; partly its ſaltneſs, and partly the fat and unctuous filth that is mixed among it, give it this great virtue. In the weſtern parts of England, that lie upon the ſea coaſts, they make very great advantages of it. The fragments of ſea ſhells alſo, which are always in great abundance in this *ſand*, add to its virtues; and it is always the more eſteemed by the farmers, the more of theſe fragments there are among it.

The ſea *ſand* uſed as manure in different parts of the kingdom is of three kinds: that about Plymouth, and on other of the ſouthern coaſts, is of a blue grey colour like aſhes, which is probably owing to the ſhells of muſcles, and other fiſh of that or the like colour, being broken and mixed among it in great quantity. Weſtward, near the Land's-end, the ſea *ſand* is very white, and about the iſles of Scilly it is very gliſtering, with ſmall particles of talc; on the coaſts of the North Sea the *ſand* is yellowiſh, brown, or reddiſh, and contains ſo great a quantity of fragments of cockle-ſhells, that it ſeems to be chiefly compoſed of them. That ſea *ſand* is accounted beſt which is of a reddiſh colour; the next in value to this is the bluiſh, and the white is the worſt of all.

Sea *ſand* is beſt when taken up from under the water, or from *ſand* banks which are covered by every tide.

The ſmall grained *ſand* is moſt ſudden in its operation, and is therefore beſt for the tenant, who is only to take three or four crops; but the coarſe or large grained *ſand* is much better for the landlord, as its effects continue many years.

Where the *ſand* is dredged out of the ſea, it is uſually twice as dear as where it is taken from the *ſand* banks.

When the land has been well manured with the large *ſand*, they take four crops of corn from it, and then lay it down for paſture for ſix or ſeven years before they plough it again. The graſs is ſo good, that they commonly mow it for hay the firſt year; it always abounds very much with the white flowered clover. If the graſs grows but ſhort, it is the farmer's intereſt to feed his cattle upon it, and it will turn to as good account this way, being very ſweet and rich, and making the cattle fat, and the cows yield a very large quantity of milk. Mortimer's Huſbandry. See MANURING *of Ground* and *Common* SALT.

Indian SAND. The ſubſtance commonly called *Indian ſand*, is famous for anſwering to the magnet. It is brought into ſeveral parts of Europe, and is ſaid to be gathered on the ſea ſhore in Perſia. After it is gathered, it is boiled in water to waſh away the impurities it may contain; and when dried is ſent abroad in form of a black powder, conſiſting of grains of different ſizes. Some of theſe grains are very rough in every part of their ſurface, and others have one ſide only rough, the others perfectly ſmooth and gloſſy. Their figure is very irregular, and reſembles that of the grains of common *ſand*; only the grains of this *Indian ſand* are uſually ſmaller than thoſe of our common *ſands*.

Theſe little lumps have neither taſte nor ſmell, and are ſo friable, that they are eaſily reduced to an impalpable powder by rubbing. Some of the particles are ſtrongly attracted by the loadſtone, and others are ſo inactive as to be ſcarce at all affected by it. Thoſe particles, which are of the deepeſt duſky black, are moſt of all affected by the loadſtone; thoſe which are not affected by it, ſeem rather of the colour of lead, of a bluiſh black and ſhining; theſe are in the greateſt quantity, and the others are ſelected from among theſe by the loadſtone.

There are ſeveral parts of the world which afford this *ſand*, but with ſome difference in the figure of its grains, and their magnetic virtue. Beſide Perſia, it is found on the ſhores of Virginia; another ſort of it is found about Italy, and very common at Leghorn; this is very magnetic. There are two ſorts of it found in the river Eber in Hania, of which one is like the Italian, but the other conſiſts of large grains, almoſt as big as hempſeed, but having very little virtue. A very ſtrong ſort is found in Dalmatia, near old Raguſa; and probably future enquiries will ſhew, that there are yet many more kinds of it, differing in ſtrength and ſize. Phil. Tranſ. Nº 432. p. 301. See MAGNET.

SAND is alſo applied to thoſe dry, crumbling earths, which, wanting fatneſs to bind them together, the wind eaſily breaks into duſt and carries them away.

In this ſenſe it is that travellers tell us, the caravans in Africa are frequently loſt, and buried under clouds of *ſand*, torn up by whirlwinds; and ſometimes heaped into mountains. The deſerts of Libya are mere *ſands*, and hence their ſterility.

SAND-*bags*, in the *Military Art*, are bags of earth or *ſand*, uſed in *fortification*. See SACKS *of Earth*.

The ſmaller *ſand-bags* hold about half a cubical foot of earth, and ſerve to be placed upon the ſuperior talus of the parapet, to cover thoſe that are behind, who fire through the embraſures, or intervals, which are left betwixt them.

SAND *box-tree*, in *Botany*. See *Sand* BOX-TREE.

SAND-*eel*. See AMMODYTES.

SAND-*flood*, a term uſed by the people of Suffolk, and ſome other parts of England, to expreſs a miſchief to which they are ſubject, by having their lands covered with vaſt quantities of *ſand*, rolling in upon them like a deluge of water.

Mr. Wright, a ſufferer by one of theſe deluges, gives a very good account of them in the Philoſophical Tranſactions. In the neighbourhood of the plains ſubject to this miſchief, there are always hills which are made up of *ſand*, and only covered with a thin turf. The plains themſelves, which are inevitably ruined by the deluge of this dry ſort, are alſo ſandy; having only the ſame ſort of thin turf on them, though capable of producing very good crops, and ſtanding all common accidents.

When violent winds break through the turf that covers theſe hills, the *ſand* lying looſe and naked, is ſoon carried down upon the plains, where it covers and buries the graſs, and in a very little time eats through the light turf, and mixing itſelf with the *ſand* underneath, becomes one bed of this dry matter never to be covered with a turf again. A large body of *ſand* being thus got together, nothing ſtops its progreſs, but it at every ſtorm rolls over more and more ground, ſo that in a few years it extends itſelf a vaſt way; eſpecially where the ground over which it paſſes is of the ſame ſandy nature, and only covered with a thin turf.

In ſome parts of Suffolk, the ground encourages this change ſo greatly, that a bed of *ſand* broke looſe from a neighbouring hill, and covering only a few acres, perhaps eight or ten, will, before it has travelled four miles forward, which it does in a ſmall courſe of years, deluge a thouſand acres. It travels down hill faſter than any way elſe, but will not be ſtopped by aſcent, but will move up the ſteepeſt hill, only that it requires more time. The making of fences in the common way to keep it out is vain; it runs through the hedges, and flies over the tops of the banks, and when it reaches a village in its courſe, will bury the cottages, unleſs preſerved at more charge than they are worth. It will in a very little time beat up to the eaves of a houſe of the low kind, that are uſually built in country villages, and has often weight enough to break down walls in its paſſage.

The beſt way of ſtopping its progreſs is, by hedges of furze, planted one over another as they become levelled; theſe, if well kept up, will by degrees ſtop or divert the progreſs; and ſome who have tried this with reſolution, after they have had the *ſand* raiſed twenty feet high, have found it ſtop its increaſe; and then having manured this adventitious ſoil with dung, found it as good ground as that which made the ſurface before.

About Thetford, the villages were wholly deſtroyed by this about ninety years ago, and the branch of the river Ouſe, called then Thetford river, ſo blocked up by it, that very ſmall veſſels could only go up it, where very large ones uſed before. The river has been of great ſervice in ſtopping its progreſs into Norfolk, where otherwiſe its courſe would have carried it, and its vaſt ſpreading ſideways in proportion of its going forward, would have made it bury vaſt quantities of land in a very few years.

The moſt probable conjecture, as to the cauſe of this ſtrange ſort of deluge in theſe parts of England, is, that this portion of the county of Suffolk lies eaſt north-eaſt of a part of the great level of the fens, and is by this expoſed to very impetuous winds, which acquire more than ordinary force, by their paſſing through ſo large a tract of country uninterrupted, the ſtorms ſeem to be one great cauſe of the miſchief, and the ſandy nature of the ſoil the other. There are old ſtories in the country, of ſuits at law commenced among the farmers, for grounds blown out of the owner's poſſeſſion; but the people who gain this ſort of wandering land are the greateſt ſufferers. A little *ſand* ſprinkled by the winds over a tract of land, where there is a bed of *ſand* under the turf, ſoon eats through that obſtacle; and what was at firſt only a thin coat of *ſand*, becomes then a deep plain of it, capable of being blown away to the depth of eight, ten, twenty, or more feet, and is carried over

every thing in its progress before the winds, when once taken up by them. Phil. Trans. N° 37.

Sand-*gavel*, a payment due to the lord of the manor of Rodley, in the county of Gloucester, for liberty granted to the tenants to dig *sand* for their common use.

Sand *land*. See Soil.

Sand *piper*, in *Ornithology*, a name given by Mr. Pennant to the tringa of Linnæus; because most of the species belonging to this genus are conversant about shores, and their note is whistling or piping.

Sand *snake*. See Ammodytes.

Sand *swallow*, in *Ornithology*. See Swallow.

SANDAL, *sandalium*, σανδαλιον, in *Antiquity*, a rich kind of slipper, worn on the feet, made of gold, silk, or other precious stuff, used by the Roman and Greek ladies; consisting of a sole, with a hollow at one extreme to embrace the ancle, but leaving the upper part of the foot bare.

Terence speaks of this *sandal*, *Utinam tibi commitigari videam* sandalio *caput: I wish she would break your head with her* sandal.

Apollo was sometimes called *Sandaliarius*, *sandal-maker*; the reason of which appellation has given great perplexity to the critics. Some derive it from a street called *Sandaliarius*, chiefly inhabited by *sandal-makers*, wherein that god had a temple; but others, with more probability, derive the name of the street from that of the god, and take Apollo to have been thus called from his effeminate dress, as if he wore women's *sandals*.

Sandal is also used for the shoe or slipper worn by the pope, and other Romish prelates, &c. when they officiate; being such as is supposed to have been worn by St. Bartholomew.

Alcuin observes, that there was some difference between the *sandals* of bishops, priests, and deacons. Monks were not allowed to wear *sandals*, except in travelling; as is observed by Du-Cange, Salmasius, &c.

Sandal is also the name of a sort of slipper still worn by several congregations of reformed monks.

It consists of no more than a mere leathern sole, fastened with latches or buckles, all the rest of the foot being left bare.

The Capuchins wear *sandals*, the Recollects, clogs; the former are of leather, the latter of wood.

Sandal-*bricks*. See Brick.

SANDALIGERULI, among the *Ancients*, servants whose business it was to carry their masters or mistresses *sandals*.

SANDAPELONES, among the Romans, a kind of porters who were employed in carrying the bier called *sandapila*. Pitisc. in voc.

SANDAPILA, among the Romans, a sort of bier used for carrying out the bodies of people of low circumstances.

It was not a bed, but a kind of wooden chest, made of a few boards nailed together, and was usually burnt along with the body.

SANDARACH, in the works of some of the ancients, a name by which the yellow matter collected on the legs of bees is called; others of them called it *erithace*, and some *ambrosia*. We usually esteem this to be wax; but the experiments of Reaumur, and others, evidently prove, that it is not real wax; though it contains the matter of which wax is to be made: it is only the farina of flowers, collected into lumps, and probably serves the bees as food; and after it has afforded them nourishment, suffers some change in their bowels, by which it is converted into the substance we call wax. See Pain *d'abeille*.

Sandarach, *sandaracha*, in *Natural History*, &c. a native mineral; or a preparation of orpiment, made by fusing it by a close fire into a red friable mass. See Orpiment.

Sandaracha is the same with what is by some otherwise called realgar.

It is sometimes also called *sandaracha Græcorum*, in opposition to the gum *sandarach*. Some distinguish two sorts of Grecian *sandarach*; the *natural*, which is the first above described; and the *factitious*, which is only ceruse exalted by the fire, and burnt into a kind of minium. Both the one and the other are poisons.

Sandarach, *gum*, or Sandaracha *Arabum*, a resinous juice ousing out of the trunk and thick branches of the great juniper-tree, in the warmer climates, and particularly on the coasts of Africa, by incisions made in the heats of the summer.

This juice concretes into semipellucid, pale yellowish tears or globes, resembling mastich, but larger: the resin, thus formed, has a light, agreeable smell, but no considerable taste; it dissolves in rectified spirit, and in oils both expressed and distilled; but being nearly a pure resin, yields little or nothing to watery liquors.

The small or common juniper yields very little *sandarach*; but its fruit yields oils, waters, salts, spirits, and extracts of some repute in medicine.

The *gum sandarach* is an ingredient in varnish, and hence has been called *vernix*. With this, melted in oil of turpentine, is made the factitious varnish now used by painters and cabinet-makers. It is also reduced into an impalpable powder, called pounce, used to prevent paper from imbibing ink.

Gum sandarach has been sometimes given internally in diarrhœas and hæmorrhages, its dose being from ten grains to half a drachm. It is also sometimes prescribed in gonorrhœas and the fluor albus; but it has been chiefly employed externally in corroborant, nervine, traumatic applications. With us it is hardly ever used for any medicinal purposes.

The best is in fine white tears, free of dust: the English, Swedes, &c. drive a considerable trade therewith.

Some will have it, that the gum of the juniper is not the right *sandarach*, but that of the oxycedrus, or lesser cedar.

SANDARESUS, in *Natural History*, a gem, the chief property of which, according to Pliny, is its being pellucid, and containing in its substance a kind of gold-coloured globules; which are likewise transparent, when seen betwixt one and the fire.

SANDARUS, in the *Materia Medica*, the original name of the gum, which later ages have, by corruption of the name, called *sandarax*, or *sandaracha*. The latter name is peculiarly improper, as it confounds this innocent gum with a poisonous mineral of the arsenic or orpiment kind.

The Arabians are not easily to be understood in what they say of this gum. Some describe it as a distinct gum from all others, and say that it resembled amber in its colour and properties. This seems to express properly what we at this time call *sandaracha*, which has much of the appearance of yellow resin, and therefore cannot be wholly unlike amber; but as this gum was used in varnish, and several other gums were also used for the same purpose, these writers, according to their usual custom of attributing the same name to different things, which had the same properties, have sometimes called the *carcamum* by this name, and sometimes amber. Gum lacca has often been called also by this name by these authors; and the context only can clear up what is meant, when either the word *sandarus* or *carcamum*, or *vernix*, is used.

SANDASTER, in *Natural History*, a kind of gem mentioned by Pliny, with gold-coloured globules in it that shone like stars, and were in number and disposition not unlike the seven stars.

SANDEMANIANS, in *Ecclesiastical History*, a modern sect that originated in Scotland about the year 1728; where it is at this time distinguished by the name of *Glassites*, after its founder Mr. John Glass, who was a minister of the established church in that kingdom; but being charged with a design of subverting the national covenant, and sapping the foundation of all national establishments by the kirk judicatory, was expelled by the synod from the church of Scotland. His sentiments are fully explained in a tract published at that time, intitled, "The Testimony of the King of Martyrs," and preserved in the first volume of his works. In consequence of Mr. Glass's expulsion, his adherents formed themselves into churches, conformable in their institution and discipline to what they apprehended to be the plan of the first churches recorded in the New Testament. Soon after the year 1755, Mr. Robert Sandeman, an elder in one of these churches in Scotland, published a series of letters addressed to Mr. Hervey, occasioned by his Theron and Aspasio, in which he endeavours to shew, that his notion of faith is contradictory to the Scripture account of it, and could only serve to lead men, professedly holding the doctrines commonly called Calvinistic, to establish their own righteousness upon their frames, inward feelings, and various acts of faith. In these letters Mr. Sandeman attempts to prove, that faith is neither more nor less than a simple assent to the divine testimony concerning Jesus Christ, recorded in the New Testament; and he maintains, that the word faith, or belief, is constantly used by the apostles to signify what is denoted by it in common discourse, viz. a persuasion of the truth of any proposition, and that there is no difference between believing any common testimony, and believing the apostolic testimony, except that which results from the nature of the testimony itself. This led the way to a controversy, among those who were called Calvinists, concerning the nature of justifying faith; and those who adopted Mr. Sandeman's notion of it, and who took the denomination of *Sandemanians*, formed themselves into church order, in strict fellowship with the churches in Scotland, but holding no kind of communion with other churches. The chief opinions and practices in which this sect differs from

from other Christians, are, their weekly administration of the Lord's Supper; their love-feasts, of which every member is not only allowed but required to partake, and which consist of their dining together at each other's houses in the interval between the morning and afternoon service; their kiss of charity used on this occasion, at the admission of a new member, and at other times, when they deem it to be necessary or proper; their weekly collection before the Lord's Supper for the support of the poor, and defraying other expences; mutual exhortation; abstinence from blood and things strangled; washing each other's feet, the precept concerning which, as well as other precepts, they understand literally; community of goods so far as that every one is to consider all that he has in his possession and power as liable to the calls of the poor and church, and the unlawfulness of laying up treasures on earth, by setting them apart for any distant, future, and uncertain use. They allow of public and private diversions so far as they are not connected with circumstances really sinful; but apprehending a lot to be sacred, disapprove of playing at cards, dice, &c. They maintain a plurality of elders, pastors, or bishops, in each church, and the necessity of the presence of two elders in every act of discipline, and at the administration of the Lord's Supper. In the choice of these elders, want of learning, and engagements in trade, &c. are no sufficient objection; but second marriages disqualify for the office; and they are ordained by prayer and fasting, imposition of hands, and giving the right hand of fellowship. In their discipline they are strict and severe, and think themselves obliged to separate from the communion and worship of all such religious societies as appear to them not to profess the simple truth for their only ground of hope, and who do not walk in obedience to it. We shall only add, that in every church transaction, they esteem unanimity to be absolutely necessary. From this abstract of the account which they have published of their tenets and practices, it does not seem to be probable that their number should be very considerable.

SANDERLING, or CURWILLET, in *Ornithology*, is the CHARADRIUS *calidris* of Linnæus; its body is of a more slender form than that of others of the same genus, its bill is an inch long, weak and black; the head and hind part of the neck are ash-coloured, and marked with oblong black streaks, the back and scapulars are of a brownish grey, edged with dusky white; the whole under side of the body is white, slightly clouded in some places with brown; the tail consists of twelve sharp-pointed feathers of a deep ash colour, and the legs are black. This species is found, in large flocks, on the Cornish shores.

SANDEVER, or SANDIVER, called also the *gall* and the AXUNGIA *of glass*, is the recrement of glass; or the scum that arises from the ashes of the herb kali, used in the making of glass.

This is said to contain the vitriolic acid, which Tachenius supposes to proceed from the flints used in the composition of *glass*. It is used as a flux in essays of ores, and in the fusion of filings of gold or silver, in the same manner as borax is. It is also said to increase the malleability of metals.

Some also use *sandever* for the kali, or glass-wort itself.

It is reported by many authors of great credit, that this salt, in its genuine form, and no way differing from such as is separated from glass, is thrown out in great abundance in the eruptions of the burning mountains, and lies about in lumps of a spungy texture and great size, or in smaller solid ones among the sciarri and ashes thrown out at those times. The more firm and solid pieces are the most pure, and are generally of a fine white; the others not unfrequently are tinged bluish or yellow, and have sometimes some of the melted matter of the sciarri blended among the mass, and filling up some of the cavities. In the catalogue of the specimens of substances thrown out of Mount Ætna in one of its eruptions, and sent as a present to the Royal Society, we find mention of several pieces of *sandiver*, but without any particular description. Phil. Trans. N° 53.

SAND-HEAT, or SAND-BATH, denotes one of the chemists fires; consisting of hot sand, wherein herbs, flowers, &c. are infused in a cucurbit.

The *sand-heat* is esteemed gentle, digestive, and alterative of many bodies.

SANDIVER. See SANDEVER.

SANDYX, a kind of minium, made of ceruss, or rather lead, calcined and rubefied; called also *factitious sandarach*.

It is of little use in painting; the real minium, or red lead, to which it is substituted, making a much better, brighter, and more durable colour.

Though the generality of authors have taken this to be only a name for the fine red colour, some have plainly used it for a bluish-green. Strabo tells us, that the colour used by painters in his time, and called *armenium pictorium*, was of a bluish-green colour, and that it was called *sandycis metallum* by some. Thus the word *zarnich* was made to express the same two things with the addition of the yellow orpiment; and Avicenna describes them all together, telling us, that *zarnich* is yellow, red, or green. The two first of these colours are natural to zarnich, as the name of orpiment; and there is, indeed, a greenish zarnich now also known in the world, but that was unknown in his times; and we find that he meant the *lapis armenus* by the *green zarnich*.

SANE *memory*, i. e. perfect and sound memory to do any lawful act.

SANGUIFICATION, in the *Animal Oeconomy*, the action whereby the chyle is converted into BLOOD.

Sanguification succeeds CHYLIFICATION, and is followed by NUTRITION.

Sanguification is thus effected: the chyle, having passed the lacteals of the several kinds, is delivered into the blood at the subclavian; whence the two humours pass together to the right ventricle of the heart, where being yet more intimately mixed, they circulate together through the whole body; till, after several circulations and depurations at the several colatures and strainers of the body, they become assimilated, or, as the chemists call it, *cohobated*, so as only to make one uniform compound mass, which appears to be nothing else but chyle altered by the artifice of nature, and exalted into blood. In effect, it does not appear, that any thing extraneous is mixed with the circulating liquor but chyle, excepting what was before separated from it for particular occasions; unless perhaps it should receive some portion of air in the lungs, which is a point long disputed, and yet scarce ascertained.

Indeed, that there is a quantity of air mixed with the blood, and circulating with it, is granted; but whether this be any more than what was at first contained in the bodies whereof the chyle was formed, is much doubted: the principal arguments for it are, the necessity of respiration, and the florid colour the blood receives in the lungs, and first shews in the pulmonary vein. But the first is satisfactorily accounted for another way. See RESPIRATION.

The latter is chiefly supported by this experiment, that blood drawn by venesection, and suffered to coagulate, upon turning up, the bottom, which before was blackish, being now exposed to the air, acquires a florid colour, like that we observe in the blood of the pulmonary vein.

The ancients were in great perplexity about the seat of *sanguification*, or the place where, and the instrument whereby it is effected; whether in the heart, or the liver, or the lungs; but, according to the doctrine of the moderns, the heart, liver, vessels, &c. contribute no otherwise to the changing of the chyle into blood than the sun does to the changing of the must into wine.

The ancients accounted for *sanguification* from a plastic power. In the last century, when chemistry was introduced, *sanguification*, and almost every thing else, were to be effected by a ferment; and the physicians of those times were very solicitous as to the particular officina where this ferment was prepared and kept. Some would have it the liver, others the spleen, &c. but the very notion of it is now exploded.

Of *sanguification* we may admit two degrees; the first amounting to no more than a confusion, or such an intimate mixture of parts, as suffices so to confound the different coloured liquors, as that the whiteness of the chyle shall be lost or drowned in the redness of the blood, so as never more to appear in its own shape and colour. This we suppose may be effected by repeated circulations alone; though how many circulations are necessary thereto, it is difficult to determine.

The second degree of *sanguification* is, when the parts of the chyle are so exalted, or comminuted and subtilized, as to lose all tendency to a coagulatory separation, such as they have in chyle and milk.

To these two degrees may be added a third, wherein the fibres and filaments of the crude blood are so broken and blended with the serum, as not to be again separable from them. This is a morbid *sanguification*, such as happens in fevers, &c. attended with a bloody sweat, purple spots, &c. All these degrees of *sanguification*, Dr. Drake makes no doubt, are procured by reiterated circulations, wherein as well the intestine, as the progressive motion, conspires to the mixing and comminuting of the adventitious parts. Doubtless they have their stated period, wherein they are in perfection; though where precisely to fix it, we do not know.

SANGUINARIA, *bloodwort*, a name given by many botanical authors to the *lapathum sanguineum*, or bloody-dock, from the red veins in its leaves; and by some to the

the *cornu cervinum*, or buckshorn-plantain, from its supposed virtues.

SANGUINARIA, in *Botany*. See PUCCOON.

SANGUINE, *bloody*; or a thing abounding in BLOOD.

SANGUINE *temperament*, or *constitution*, is that where blood and heat predominate.

Sanguine constitutions require a frequent use of phlebotomy.

Sanguine people are usually observed to be brisk, bold, daring, and even presumptuous. Hence *sanguine* hopes, i. e. strong, assured, &c. hopes.

SANGUINE, in *Heraldry*, the colour usually called *murrey*; being made of red lake, tinged with a little Spanish brown. It is represented in engraving, by transverse hatches like purpure; and is mostly used in the coats of knights of the Bath.

When borne by nobles, it is rather called *sardonyx*; and in the coats of sovereign princes *dragon's tail*.

SANGUINE *stone*, *lapis* SANGUINALIS, a kind of JASPER, brought from New Spain, of a dark-brown colour, marked with spots of a blood-red.

It seems to be only an accidental HELIOTROPE, differing from the common heliotropes, that are brought from the East Indies, merely in being coarser, and less transparent.

The Indians cut it in form of a heart, and use it in hæmorrhages, immoderate menses, and other fluxes of blood. The patient applies it by grasping it in his right hand, having first dipt it in water. It is sometimes also hung on the part whence the blood flows.

SANGUINEA, a name given by some of the chemists to NITRE.

SANGUINEOUS *fever*, a term used by the medical writers to express a kind of fever, in which there is always a plethora, or fullness of blood, which nature is attempting to lessen by means of this accelerated motion of it, either by forming some hæmorrhage, or by throwing a part of it off in form of sweat. It is very obvious to reason, therefore, that bleeding is the first thing necessary in these fevers. The continent fevers, such as the ephemera and synocha, are of this kind. Junker's Consp. Med. p. 252. See FEVER.

SANGUINEROLA, in *Ichthyology*, a name given by the Italians to the *phoxinus*, or MINOW. Artedi makes this a species of cyprinus.

It has the Italian name from the blood-red colour which displays itself under its belly.

SANGUINEUS, in *Botany*, a name given by some of the ancients to the birch-tree, from the deep reddish black colour of its twigs. Pliny calls it *sanguineus frutex*, and not understanding that it was the same with the birch, mentions the name of that tree immediately after it, as if different from it. The Italians still call the birch *sanguino*; and some authors, from the redness of the twigs of some species of the alaternus, have called that shrub the *sanguineus albus*. Some have supposed that this name was used to express the birch-tree also, but erroneously; for though the bark of the body of that tree is sometimes white, there was no reason for adding that epithet to the word *sanguineus*, which not being used for any other tree, could need no distinction. The Romans, and many other nations, used this tree as we do, for the punishment of children's faults; and it is possible that the name *sanguineus* might be given it on this occasion. Pliny, lib. xvi. cap. 36.

SANGUIPURGIUM, a name given by some authors to a slight species of fever, which was judged salutary, and only serving to purge and cleanse the blood.

SANGUIS, in *Medicine*, &c. See BLOOD.

SANGUIS, in our *Ancient Customs*, denotes a right or power, which the chief lord of the fee anciently had to judge and determine cases where blood was shed. *De murderia & raptu, de igne, de* sanguine, *&c.* Monast.

SANGUIS *draconis herba*, in *Botany*, a name by which some authors call the *lapathum sanguineum*, or bloody-dock.

SANGUINEM *emere*, was an obligation which the inhabitants of some manors, as that of Grendon, were under, to buy and redeem their villain blood, or tenure, and make themselves free men.

SANGUIS *caprinus*, or *hircinus*, the blood of the he-goat either wild or tame. This used to be prepared, with great precaution, to be used in medicine, and was supposed by many to have very extraordinary qualities.

The principal precautions are these: the goat is not to exceed four or five years of age; it is to be fed a considerable time with aromatic herbs, and especially those of the saxifrage kind; the blood to be drawn out of the throat, or the testicles, by cutting them; but neither what comes first, nor last, is to be used, the former being too full of humidity, and the latter too thick; the operation to be only performed in July, and the blood put into earthen vessels, and dried either in the sun, or the shade; and, lastly, bottled up, to be used occasionally.

Among other specific virtues attributed to goat's blood, the two most considerable are, that, as they say, it cures the pleurisy without bleeding, and that it dissolves the stone in the bladder, by taking it in vehicles proper for those diseases. To be good, it is to be very hard, and difficult to pulverize.

SANGUIS *draconis*, in *Pharmacy*. See DRAGON'S BLOOD.

SANGUISORBA, *burnet*, in *Botany*, a genus of the *tetrandria monogynia* class. Its characters are these: the empalement of the flower is composed of two short leaves, placed opposite; the flower hath one petal, cut into four obtuse segments, which join at their base; it has four stamina of the length of the petal, terminated by small roundish summits, and a four-cornered germen situated between the empalement and petal, supporting a short slender style, crowned by an obtuse stigma; the germen afterward turns to a small capsule with two cells, filled with small seeds. Linnæus reckons three, and Miller four species. The first species, or greater burnet, with oval spikes, grows naturally in moist meadows in various parts of England; the second species, with cylindric spikes, in Piedmont; the third, with round compact spikes, in Spain; and the fourth, with the longest spikes, or the greatest Canada burnet, in North America. All these sorts are hardy perennial plants, and will thrive in almost any soil or situation. They may be propagated either by sowing their seeds, or parting of their roots, in autumn. For other species of burnet, see POTERIUM.

SANGUISUGA, in *Zoology*, a name by which some authors express the *hirudo*, or LEECH.

SANGUISUGUM, a name given by some barbarous authors to a disorder of the heart, supposed to arise from its retaining an abundant quantity of blood.

SANHEDRIN, or SANHEDRIM, *Synedrium*, among the ancient Jews, the supreme council, or court of judicature, of that republic; wherein were dispatched all the great affairs both of religion and policy.

The word is derived from the Greek συνεδριον, *a council, assembly*, or company of people sitting together; from συν, *con, together*, and εδρα, *seat*.

Many of the learned agree, that it was instituted by Moses, Numbers, chap. xi. and consisted at first of seventy persons, all inspired of the Holy Ghost, who judged finally of all causes and affairs; and that they subsisted, without intermission, from Moses to Esdras. Others will have it, that the council of seventy elders, established by Moses, Numb. chap. xi. was temporary, and did not hold after his death; adding, that we find no sign of any such perpetual and infallible tribunal throughout the whole Old Testament; and that the *sanhedrim* was first set up in the time of the Maccabees.

The Jews, however, contend strenuously for the antiquity of their great *sanhedrim*; M. Simon strengthens and defends their proofs, and M. le Clerc attacks them. Be the origin and establishment of the *sanhedrim* how it will, it is certain it was subsisting in the time of our Saviour; that it was held at Jerusalem; and that the decision of all the most important affairs among the Jews belonged to it. The president of this assembly was called *Nasi*.

There were several inferior *sanhedrim* in Palestine, all depending on the great *sanhedrim* at Jerusalem. The inferior *sanhedrim* consisted each of twenty-three persons; and there was one in each city and town. Some say, that to have a right to hold a *sanhedrim*, it was requisite there were one hundred and twenty inhabitants in the place. Where the inhabitants came short of the number of one hundred and twenty, they only established three judges.

Into the great as well as the inferior *sanhedrim* were admitted priests, levites, and laymen of all the tribes, provided they were of noble extraction, rich, wise, without any blemish of body, and, as was pretended, expert in magic; which last was esteemed a necessary qualification: very old people, and eunuchs, were excluded.

In each *sanhedrim* there were two scribes; the one to write down the suffrages of those who were for condemnation; the other to take down the suffrages of those who were for absolution.

Selden has a learned work on the subject of the Jewish *sanhedrim*, De *Synedriis*, printed at London in 1635, in three volumes, quarto.

SANICLE, *sanicula*, in *Botany*, a genus of the *pentandria digynia* class. Its characters are these: it is a plant with an umbellated flower; the universal umbel hath but few rays; the involucrum is situated but half-round on the outside; the partial umbels have many clustered rays, and their involucrums surround them on every side; the flowers have five compressed petals, which are bifid, and turn

turn inward; they have five erect stamina, which are twice the length of the petals, terminated by roundish summits, and a bristly germen situated under the flower, supporting two awl-shaped styles, which are reflexed; the germen afterward becomes a rough, oval, pointed fruit, dividing into two parts, each containing one seed. There is but one species of this plant in the English gardens, which is perennial and evergreen, grows wild in woods, on hilly grounds, and flowers in May. Linnæus enumerates three species.

The medical writers all agree in celebrating this plant as one of the greatest vulneraries we have of our own growth. They recommend it as a mild restringent, internally and externally, for healing fresh wounds and erosions; and many go so far as to talk of fistulas having been cured by injecting a decoction of it; but the modern practice of surgery has fallen upon very different methods of practice in these cases, from their predecessors, and in consequence of that, the whole tribe of vulnerary herbs is disregarded.

Sanicle, *bastard American, mitella*, in *Botany*, a genus of the *decandria digynia* class. Its characters are these: the flower has a bell-shaped empalement of one leaf, cut into five parts; it has five petals, which are inserted in the empalement, as are also ten awl-shaped stamina, which are shorter than the petals; it has a roundish bifid germen, with scarcely any style; the empalement becomes an oval capsule with one cell, opening with two valves, filled with small seeds. There are two species, the one a native of North America, the other of the northern parts of Asia.

Sanicle, *bear's ear, cortusa*, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the flower has one wheel-shaped petal, cut into five parts at the brim, having five prominent tubercles at the base; it has five short, obtuse stamina; and in the centre is fixed an oval germen, which afterward becomes an oval, oblong, pointed capsule, having two longitudinal furrows, and one cell, opening with two valves, and filled with small, oblong seeds. There are two species. Miller.

It grows in mountainous places, and the leaves promote expectoration.

Sanicle, *water*. See Herb *bennet*.

Sanicle, *Yorkshire*. See Butter-*wort*, and Pinguicula.

SANIDIUM, in *Natural History*, the name of a genus of fossils, of the class of the selenitæ, but neither of the rhomboidal nor columnar kinds, nor any other way distinguishable by its external figure, being made up of several plain flat plates.

The word is derived from the Greek σανιδιον, *tabella*, a flat thin plate or table, and expresses a body made up only of such plates. And the selenitæ of this genus are of no determinate form, nor consist of any regular number of planes or angles, but are merely flat, broad, and thin plates or tables, composed of other yet thinner plates, like the talcs, but distinguished from those bodies by this, that these plates are made up of arrangements of slender fibres, disposed obliquely, but in uninterrupted lines across the body.

The selenitæ having been always esteemed (when meant of this class of bodies, for some have applied the word to certain spars and other substances) regularly figured fossils, this genus has been overlooked by authors, and the specimens of it which occurred, looked on as bodies of a different class, as spars or talcs. Their not fermenting with acids, however, determines them not to be spars; and their obliquely striated structure, their want of elasticity, and their readily calcining in the fire, distinguish them from the talcs, and shew them to be true and genuine selenitæ.

Of this genus there are only two known species, the one colourless and pellucid, the other whitish and opake. The first is found pretty frequently about Oxford, as also in Northamptonshire, Yorkshire, and other counties; the other is very common in all parts of Germany, and is found also in Leicestershire, and some other parts of England, but with us it is not common. Hill's Hist. of Foss. p. 144, 145.

SANIES, in *Medicine*, a thin, limpid, serous matter, issuing out of wounds and ulcers; by the Greeks called ιχωρ.

Galen compares it to whey: it differs from *pus*, which is thicker and whiter.

SANIS, Σανις, among the Greeks, a kind of punishment, inflicted by binding the malefactor fast to a piece of wood.

SANKIRA, in *Botany*, a name given by some authors to the plant, of which the China-root, used in medicine, is the root.

SANS *pareille*, in *Conchyliology*, the name of a particular species of buccinum, which has its mouth opening a contrary way to that of all other buccina. This is a single species among the recent buccina, but we find more than one kind with this peculiarity among the fossile shells, and that in great abundance in many places in England.

SANTALUM, in the *Materia Medica*. See Saunders.

Santalum, in *Botany*, the name of a genus of plants of the *octandria monogynia* class; the characters of which are these: the perianthium is a narrow rim, standing on the germen of the pistil, and rightly indented into four segments; the flower is monopetalous, and of the campanulated kind; its edge is divided into five acute segments; the stamina are eight filaments; they stand on the upper part of the tube of the flower, and are alternately one shorter than another; the antheræ are simple; the germen of the pistil is turbinated; the style is of the length of the stamina, and the stigma is simple; the fruit is a berry. There is only one species.

SANTEO, in *Botany*, a name given by the people of Guinea to a herb, which they esteem remarkably good in all diseases of the eyes, the herb being boiled in water, and the eyes washed with it. The leaves of this grow in pairs, opposite one to another, and have no footstalks. The joints, or settings on of the leaves, are blackish, and they are of the size and shape of those of the laurel.

SANTOLINA, in *Botany*. See Lavender-*cotton*.

SANTONICUM *semen*, in the *Materia Medica*. See Chouan.

SANTSI, in *Botany*, a name given by the Chinese to a plant, famous among them for its medicinal virtues.

It is described by the writers, who have been on the spot, in so remarkable a manner, that it cannot easily be mistaken, provided their descriptions are just. They tell us that it grows wild on the mountains in some of the provinces of China, and that each root of it usually sends up eight stalks, the middle one greatly higher than the rest.

They have no branches, and have each only three leaves at the top, and the middle stalk bears clusters of flowers.

The root they say is four inches thick, and pushes out several side-branches of the thickness of a finger. The bark of these roots is rough and brown, and their internal part soft and yellow.

The small roots only are used in medicine, the great ones being seldom found. The plant flowers in the month of July, and the spring season is accounted the best for taking up the roots.

The way of multiplying the plant is to cut the great root into slices transversly, and plant these an inch deep in a good soil; they will soon shoot up the natural number of branches, and in three years the plant will grow to its utmost perfection.

The great use of the plant is in hæmorrhages, in which case it is said to be almost infallible.

SAP, in speaking of plants, denotes *juice*.

The word is formed from the Saxon *sæpe*, which signifies the same; and that, according to Mylius, from the Greek οπος, *succus, juice*. Whence also the Latin *sapa*, used for an inspissated juice. See Rob.

Sap, *circulation of the*. See Circulation *of the sap*.

Sap, *course of the*, a term used by gardeners and nurserymen to express the current of the *sap* in trees.

This has been generally supposed to run in an equable and even manner; but Mr. Fairchild has shewn, that it has an irregular, and even contrary motion to its first course.

This is a discovery of more real use in gardening, than might at first thought be imagined; since this accurate experimenter observes, that by means of it he could render barren trees fruitful, and decaying trees healthful, and render the system of gardening much better in itself, and more useful to the public.

The laureola grafted on the mezereon, and the evergreen oak of Virginia upon the common English oak; both these hold their leaves all the winter, and are in good state and flourishing, though grafted on trees which drop their leaves in winter. This plainly shews, that the juices rise upwards in winter, even in those trees which drop their leaves, otherwise these grafted evergreens must have starved at that season.

If all the variety of foreign oaks were to be grafted on the English oak, it would make the timber more firm and lasting than it is, when raised from foreign acorns; for as the crab-stock makes the wood of the apple more firm and lasting than that of the apple-stock, and the peaches and almonds, budded on plums, are more lasting than those on peach-stalks; so, by the contrary rule, all firm timber, grafted on spungy stocks, would be made worse than it would be on its own bottom; as if the English elm were grafted upon the Dutch elm, it would partake so much of the nature of the stock, as to be a spungy wood, and not fit for the uses it is usually put to.

In grafting the New England cedar, or juniper, upon the Virginia cedar, this experimenter found that the branch which was grafted, being left several inches below the grafting, that part continued growing, as well as the upper part above the grafting. The viburnum was another subject of his experiments: on bending down the top of this tree, and burying its upper branches in the earth, these became roots, and the proper roots were by degrees removed out of the ground as these took place. All the roots became branches, and finally the tree became inverted, and grew as well as in its natural state.

A pear tree being inarched upon two pear stocks, continued in a flourishing state, even when the root was raised out of the ground, and it received no nourishment, but from the two inarched branches. This tree, after it had stood some years in this condition, pushed out new suckers from the root; which proves, that the branches are as useful to supply the root with nourishment, as that is to supply the branches; and hence it is no wonder that so many trees miscarry in planting, when there are no branches left on the head. Phil. Trans. N° 384, p. 127.

SAP, *procurement of the, for œconomical uses.* See TAPPING.

SAP, or SAPP, in *Building.* To *sap* a wall, &c. is to dig or open a trench in the ground at the foot of a wall, &c. so as to bring it down all at once for want of support.

To *sap*, according to Daviler, is to undermine a work with hammers, pickaxes, mattocks, &c. viz. a bank, or hillock, by propping it up, digging underneath it, and then burning the props or stays; or a rock, by digging a mine underneath it.

To demolish the thick, firm walls of old castles, &c. *sapping* is much the readiest way.

SAP, in the *Military Art,* denotes a work carried on under cover of gabions and fascines on the flank, and mantlets or stuffed gabions on the front, to gain the descent of a ditch, counterscarp, or the like.

It is performed by digging a deep trench, descending by steps from top to bottom, under a corridor, carrying it as far as the bottom of the ditch, when that is dry; or as far as the surface of the water, when wet.

When the covert-way is well defended by musqueteers, the besiegers make their way down into it by *sapping.* See *Tab. Fortif. fig.* 21. *n.* 5. When they are got near the foot of the glacis, the trench is carried on directly forwards; the workmen covering themselves with blinds, woolpacks, sand-bags, and mantelets upon wheels. They also make epaulements, or traverses, on each side, to lodge a good body of men.

The *sap* is usually made five or six fathoms from the saliant angle of the glacis, where the men are only covered sideways; for which reason they lay planks over-head with hurdles, and earth above them.

When they have forced the enemy to quit the covert-way, the pioneers immediately with sand-bags, woolpacks, or other fences, make a lodgment, and cover themselves, as well as they can, from the fire of the opposite bastion.

There are several sorts of *saps*; as the single, which has only a single parapet; the double, having one on each side; the flying, made with gabions, &c.

SAP-*faggots* are a kind of fascines, about three feet in length.

SAP-*green* is a yellow green prepared from the juice of buckthorn-berries, and used in water-painting. See BUCKTHORN, and *Colours from* FRUITS.

SAPA, among the Romans, new wine boiled to the third part of its first quantity.

SAPHENA, in *Anatomy,* a vein, which, arising over the malleolus internus, and running up along the leg, and the inner part of the thigh, discharges itself, near the groin, into the crural vein. See *Tab. Anat. (Angeiol.) fig.* 6. *n.* 44.

It is this vein they usually open when they bleed in the foot, for suppressions of the menses.

It has its name, probably, from σαφης, *manifestus,* as lying plain in sight.

SAPHETA, in *Architecture,* is the board over the top of a window, placed parallel and opposite to the window-stool at the bottom.

SAPIENTIÆ *dentes,* the two last or inmost of the dentes molares of the upper jaw, one on each side; thus called, because they appear not till persons are grown.

SAPIENTIAL, *sapientialis,* an epithet applied to certain books of Scripture, calculated for our instruction and improvement in prudence, or moral wisdom; they are thus called in contradistinction to the historical and prophetical books.

The *sapiential* books are Proverbs, Canticles, Ecclesiastes, the Psalms, and Job; though some reckon this last among the historical books.

SAPINDUS, in *Botany.* See SOAP-*berry tree.*

SAPINUS, in *Botany,* a name given by some of the modern botanical writers to the fir-tree. This does not seem, however, to have been the tree so called by the ancients. Some of those writers have plainly described the pine-tree under this name, and Pliny makes it the denomination of the pitch-tree, such as was manured in his time.

The word *sapinus* seems to be only a contraction of *sapapinus,* a name given by the Latins to the domestic or cultivated pine, from the vast quantity of juice or sap it contained. They had a way of expressing this juice, called by the word *sapa*; and Theophrastus has, for the same reason, called the domestic pine by the name *orrus,* ὀῤῥος, a word signifying *juice* or *sap.* This was the pine-tree which bore the pine-nuts used in medicine and in foods; and Pliny, who calls it the *manured pitch-tree,* plainly errs, because that tree cannot bear esculent nuts, or answer to the rest of the description.

SAPLING, among *Gardeners,* a name by which they call any young tree that is full of *sap.*

SAPO *amygdalinus, almond soap,* a new form of medicine got much into use of late in nephritic cases, and made to supply the place of the common hard *soap* for internal uses, in a more determinate manner for the physician, and a more cleanly one for the patient.

It is thus made. Take any quantity of fresh oil of almonds, and thrice its quantity of soap lees; digest them together in such a heat as will make them but just boil; within a few hours the oil and lees will be united, and the liquor will soon after become ropy, and something transparent, and will cool into the consistence of a jelly; then throw in sea salt till the boiling liquor has lost its ropiness; continue the boiling till drops of the liquor being received upon a tile, the water is seen to separate freely from the coagulated soap; then take away the fire, and the soap will rise to the top of the water; whence it is taken off before it grows cold, and put into a wooden mould or frame, with a cloth bottom. Being afterwards separated from the mould, it is set by till it has acquired a due consistence.

SAPONACEA *terra,* in *Natural History,* a term used by some to express a kind of native alkali *salt,* of the nature of the nitre, or natron, of the ancients, which is found on the surface of the earth, mixed with dirt, &c. in the neighbourhood of Smyrna, and thence called by some *Smyrna earth.* See FLOS *Asiæ.*

It is found principally in two places near Duraclea, a large open village, about six leagues to the eastward of Smyrna; and in a very flat plain, about a league westward from the river Hermus. It is at first gathering a fine whitish salt, which of itself boils up, as it were, out of the ground. It is always gathered before sun-rise, and only in mornings in which there falls no dew; so that a stock sufficient for the whole year must be laid in during the summer months. It comes up in some places an inch or two above the surface of the ground; but when the sun rises upon it, it dries and falls down again. The earth producing it lies low in both places, and in winter is washy. It is thinly covered with grass.

It may be suspected, at first sight, that the neighbouring sea impregnates this earth about Hermus; but the ground which produces it, and lies about Duraclea, is so far from the sea, that it overthrows this speculation; though every morning in summer the earth be swept clean of this *salt,* the next morning always produces a new crop.

Dr. Smyth, who made experiments upon this *salt,* informs us, that three hundred drachms of it being put into a retort, and this set in a sand-heat with a very strong fire for twelve hours, yielded between five and six ounces of an insipid phlegm, of no other smell but such as, in all such operations, arises from the fire. It appeared from this, that the matter contained no volatile *salt.* After this the quantity of two hundred drachms, calcined in a German crucible, were dissolved in water. This composition of earth and water, boiled into a lixivium, made five hundred drachms, after it had boiled three hours, and the foul scum had been continually taken off during that time, and been filtrated; the close liquor being then evaporated to a dryness, there remained a pure white fixed alkaline *salt,* of the nature of pot-ash.

The people of the place make soap with this earth in the following manner: they mix three fourths of this earth with one fourth of lime, and then pour boiling water upon this mixture; they stir this with a stick, and there arises to the top a thick brownish substance, which they scum off; they save this in vessels by itself. They use both this and the clear liquor in making soap, but this is much stronger than the liquor. They put fifty quintals of oil into a larger copper boiling vessel, and kindling a large fire under it, they let the oil boil a little, and then throw in by little and little first the scum of the ley, and after-

wards the liquor itſelf; though ſometimes they uſe only the one, or only the other. They continue adding more and more of theſe, till the oil acquires the conſiſtence of ſoap, which is often ſeveral days. The fire muſt be all this time kept up very ſtrong. The ſcum of the ley, and the ſtronger part of the ley itſelf, mix with the oil in the boiling, and the weaker part unmixing itſelf, ſinks to the bottom, and is let out by a cock prepared for that purpoſe. This is not thrown away, but is let run upon freſh lime and earth, to make a ley for future uſe; and when the ſoap is perfectly made, it is laded out, and put upon a brick or lime floor to harden.

The common proportion in the making the ſoap is two loads of earth, five quintals each, to fifty quintals of oil, and the produce is between ſeventy and eighty quintals of ſoap. The earth is bought at a dollar a load, and the ſoap at ſix and a half a quintal. There are employed annually, in making ſoap at Smyrna, at leaſt ten thouſand quintals of oil. The bringing the ſoap earth to Smyrna employs a thouſand camels, or fifteen hundred, for eight months of the year, the four ſummer months being too hot for camels to travel in. A common ſoap-houſe produces, at a medium, a thouſand dollars a year clear profit. Phil. Tranſ. Nº 220, p. 230.

SAPONARIA, in the *Materia Medica*, a name given at different times to ſeveral plants, which had in ſome ſort the properties of ſoap. See Soap-*wort*.

The *ſtruthium* of the Greeks, and *herba lanaria* of the Romans, having ſomewhat of this property, and being uſed in the cleaning of wool, ſeveral authors have explained it by the word *ſaponaria*; but this is leaving us as much in the dark, as to the plant, as we were before, not at all aſcertaining which, if any of the plants at one time or other ſo called, was to be underſtood as being the ſame with the *ſtruthium*.

The Greeks had many times called hyſſop by the name *ſaponaria*; others have given the ſame name to the anagallis, or pimpernel; and others to ſeveral different plants, which they ſuppoſed to have the effects of ſoap, or of nitre, in cleanſing of things.

None of the plants, however, that we have under the name *ſaponaria*, will at all agree with the *ſtruthium*, or *herba lanaria*, which was a thiſtle; and the very Arabians ſeem not to have known it, but have erroneouſly ſuppoſed their candiſi to be it.

Saponaria *terra*, in *Mineralogy*, a name given by ſome authors to the common fullers *earth*.

Saponaria *terra alba*, in *Natural Hiſtory*, a name given by ſome authors to the common tobacco-pipe-clay.

They call the common fullers earth alſo *ſaponaria terra*, and diſtinguiſh it from this by the epithet *purpuraſcens*; though it has no ſuch colour as purple about it. See Cimolia.

SAPONARIUM *lixivium*. See Lixivium *ſaponarium*.

SAPONEA, a name given by authors to a pectoral medicine, made of oil of ſweet almonds and ſugar, mixed with the diſtilled water of violets.

SAPOTA, *achras*, in *Botany*, a genus of the *hexandria monogynia* claſs. Its characters are theſe: the flower has a permanent empalement, compoſed of ſix oval, acute-pointed leaves; it is ovated, divided into ſix ſegments, and has ſix ſhort ſtamina the length of the tube, terminated by arrow-pointed ſummits, with an oval germen ſupporting a ſhort ſtyle, crowned by an obtuſe ſtigma; the germen becomes an oval, ſucculent fruit, divided into ten cells, and incloſing one or two oval hard nuts, or ſtones. Miller enumerates two, and Linnæus three ſpecies.

The name of *ſapota* is what theſe fruits are called by the natives of America, to which ſome add the appellation of mammee; but there is no other name given to theſe fruits by the Engliſh, ſince they have ſettled in the Weſt Indies.

The firſt of theſe trees is common about Panama, and ſome other places in the Spaniſh Weſt Indies, but is not to be found in any of the Engliſh ſettlements in America.

The ſecond ſort is very common in Jamaica, Barbadoes, and moſt of the iſlands in the Weſt Indies, where the trees are planted in gardens for their fruit, which is by many perſons greatly eſteemed. Miller.

SAPP. See Sap.

SAPPADILLA, in *Botany*. See *Star* Apple.

SAPPAN, in the *Materia Medica*, a name uſed by ſome authors for the wood of the *arbor Campechiana*, or logwood, uſed in dying.

SAPPERS, are ſoldiers belonging to the royal artillery, who are employed in forming the *ſaps*.

A brigade of *ſappers* generally conſiſts of eight men, which forms two equal parties; whilſt one party is advancing the *ſap*, the other furniſhes the neceſſary materials; and thus they alternately relieve each other.

SAPPHIC, in *Poetry*, a kind of verſe much uſed by the Greeks and Latins; and ſo denominated from the inventreſs *Sappho*.

The *Sapphic* verſe conſiſts of eleven ſyllables, or five feet; whereof the firſt, fourth, and fifth, are trochees, the ſecond a ſpondee, and the third a dactyl, as in

Integer vitæ, ſceleriſque purus,
Non eget Mauri jaculis nec arcu. Hor.

Three verſes of this kind, cloſed with an Adonic verſe, conſiſting of a dactyl and ſpondee, uſually make a ſtrophe. Though we have ſome choruſes in the ancient tragic poets, containing a much greater number of *Sapphics* ſucceſſively. They generally run rough, unleſs they have the cæſure after the ſecond foot.

SAPPHIRE, in *Natural Hiſtory*, the name given by the moderns to a beautiful pellucid gem of a blue colour. This is, however, extremely different from the ſtone the ancients knew under the name of the *ſapphire*; for that was no pellucid gem, but an opake ſtone of a very deep blue, veined with white, and ſpotted with ſmall gold-coloured ſpangles, in form of ſtars, and was only a more beautiful kind of their *cyanus*, which was the ſtone we call *lapis lazuli*.

The deſcriptions all the authors of antiquity give of the ſtone they called the *ſapphire*, plainly evince this; and hence authors of a later date have too haſtily concluded, that our *ſapphire* was wholly unknown to them; but this ſeems a very improbable conjecture; and a ſtrict enquiry into their writings will ſhew that they have very well deſcribed our *ſapphire* under the name of *the ſky blue beryl*, or *beryllus aëroides*; and as it had among them no peculiar generical name, it could not have been better named than thus; as the beryl is plainly that of all the gems to which the *ſapphire* moſt approaches, and its colour is in the fineſt ſpecimens a pure ſky blue.

It is in its moſt perfect ſtate a very elegant and valuable gem, and is ſecond only to the diamond in luſtre, hardneſs, and price. It is met with of various ſizes, but ſeldom ſo very ſmall as many of the other gems, and has been ſometimes found up to three quarters of an inch in diameter. Its more uſual ſtandard is between a ſeventh and a ſixth of an inch. It is various in figure, being ſometimes found in the pebble, and ſometimes in the cryſtal form. Its moſt uſual appearance is in ſmall, irregularly rounded, or oblong flattiſh ſtones, covered with no cruſt, and looking of a bright blue, but without the luſtre and fine poliſh of the native ruby. It is ſometimes alſo found in beautiful hexangular cryſtals, terminated by hexangular pyramids of a fine blue throughout, and naturally of a high poliſh. Sometimes alſo theſe ſprigs are only coloured at their points, and ſometimes they are wholly colourleſs.

The proper and only colour of the gem is blue; in ſome ſpecimens this is a fine deep colour, like that of the cleareſt ſky; and in others it varies into paleneſs in ſhades of all degrees, between that and the pure brightneſs and water of cryſtal, without the leaſt tinge of colour, but with a ſuperior brightneſs, that eaſily diſtinguiſhes it at ſight from cryſtal, it more than any ſtone approaching to the nature of the diamond; and in ſome it has a duſky whiteneſs, like that of milk: this laſt colour might be ſuppoſed owing to a mixture of a fine white earthy matter, but that it has been found that different mixtures of pellucid liquors, ſolutions of copper, and of different ſalts, are capable of producing the ſame colour.

It ſeems very clear, from a multitude of experiments, that this gem, in its pureſt and fineſt ſtate, owes its beautiful blue to copper; and the ſame metal being found capable of giving this milky look with a caſt of blue, the general opinion of the laſt mentioned milky-looking ſtone being a true *ſapphire*, ſeems perfectly right.

The pebble *ſapphires* are always finer than the cryſtalliform ones; and moſt of the fine colourleſs *ſapphires*, which our jewellers commonly, but very improperly, call white *ſapphires*, as they have not the leaſt tinge of whiteneſs in them, but are abſolutely colourleſs, as the pureſt waters are of the pebble, not of the ſprig kind.

The *ſapphire* is of very different degrees of hardneſs and brightneſs in different parts of the world, and conſequently of very different value.

The ancients uſed to diſtinguiſh the *ſapphire*, as they did all the other precious ſtones, into the male and female kind, according to the deeper or paler colour; and our jewellers, according to their cuſtom of dividing the gems into ſeveral kinds, according to their different accidents of purity, beauty, &c. make four kinds of *ſapphire*.

The fineſt *ſapphires* in the world are thoſe brought from the kingdom of Pegu in the Eaſt Indies, where ſome are found perfectly colourleſs as cryſtal, and others of all ſhades of blue, up to the violet colour, but never with the leaſt tinge of purple, or any other colour but true blue:

blue: these are all found in the pebble form. We have other very fine *sapphires*, both of the pebble and crystalliform kind, from Bisnagar, Conanor, Calicut, and the island of Ceylon: these are of all the shades of colour; and in Ceylon there are sometimes found a sort of bastard gems, part red and part blue, seeming of a mixt nature between the *sapphire* and the ruby.

The occidental *sapphires* are from Silesia, Bohemia, and many other parts of Europe, and are often very beautiful stones; but are greatly inferior, both in lustre and hardness, to the oriental.

Many people value the *sapphire* beyond the ruby, and give it the second place among precious stones, viz. that next the diamond: others give that place to the ruby.

A *sapphire* is unfusible by fire; but being heated to a certain degree between two crucibles luted together, loses all its blue, and becomes perfectly colourless; so as to deceive even the jewellers themselves, and pass for a diamond.

Our druggists sell two kinds of *sapphires* used in the confection of hyacinth; the one red, the other blackish. The last, by reason of the deep tincture they give that medicine, are very improperly used there: the former are little reddish stones, of the size of pin heads, very hard, and difficult to pulverize.

Some rank the cat's eye, *oculus cati*, in the number of *sapphires*. This is a gem remarkable for a fine diversity of colours, as well as for its hardness, which bears a polish equal with that of the true *sapphire*.

The chemists make several preparations of *sapphire*; as a salt, a tincture, an essence, a water, an oil, &c. and there are few diseases but they pretend themselves able to cure by remedies composed thereof.

The method of making the counterfeit *sapphires* in paste is this. Take of crystal prepared, two ounces; minium, or common red lead, six ounces; zaffer prepared, five grains; manganese prepared, seven grains; mix all the powders perfectly together, and put them into a crucible; cover it with a strong lute, and put the whole into a potter's kiln, to stand in the hottest place for twenty-four hours; it will be of a most beautiful deep *sapphire* colour. Blue pastes of two other degrees of blue are also made in the following manner. For a sky blue, take crystal prepared, two ounces; red lead, six ounces; prepared zaffer, twenty-one grains; mix all well together, and bake them as before. For a deep violet blue, take crystal, two ounces; red lead, four ounces, and four grains of painters blue smalt; mix all, and bake together in the kiln.

These both make good blues, but much inferior to the first process. Neri's Art of Glass, p. 132. See PASTE.

SAPPHIRE-*colour*. To give this elegant and beautiful blue to glass, the workers in the glass-house use the following method. Take a hundred weight of rochetta-fritt, and add to it a pound of prepared zaffer, and to this an ounce of manganese; mix all well together, and put them into the furnace to melt and purify, and when it is become perfectly pure and fine, work it into vessels, &c. This small quantity of manganese, with the zaffer, gives a most beautiful violet blue. Neri's Art of Glass, p. 93. See *Blue* GLASS.

SAPPHIRE-*rubies* are certain precious stones, between blue and red; which, in effect, are nothing but rubies, whose colour is mixed with blue.

SAPPHIRINA *aqua*, the *blue eye-water*, is thus made. Pour a pint of strong and fresh lime-water into a copper vessel; add to it a drachm of crude sal ammoniac, and throw in some filings, or small pieces of copper, it soon acquires a beautiful blue colour, and is not only used as an eye-water, but also to deterge old ulcers; and sometimes is mixed with other things in injections for gonorrhœas.

SAPPHIRO-ACHATES. See AGAT.

SAPPHIRO-RUBINUS, in *Natural History*, a name given by some modern writers on gems to a stone, partly a sapphire, and partly a ruby; or, more properly speaking, a sapphire tinged in some part with the ruby colour, while the rest remains blue. The Indians call this NILACUNDI.

SARABAITES, *Sarabaitæ*, a name anciently given by the Egyptians to vagabond and strolling monks, who travelled through various cities and provinces, and gained a maintenance by fictitious miracles, by selling relics to the multitude, and other similar frauds.

The word is derived from the Hebrew סרב *sarab, to rebel.*

St. Benedict gives a frightful idea of these *Sarabaites* in the first chapter of his rule. Cassian does not speak a whit more favourably of them in his fourteenth conference; nor St. Jerom in his letter to Eustochium.

Cassian calls them, *Renuitæ; quia jugum regularis disciplinæ renuunt.*

SARABAND, a musical composition in triple time; being, in reality, no more than a minuet, whose motions are slow and serious.

Saraband is also a dance to the same measure, usually terminating when the hand rises; whereby it is distinguished from the courant, which ends, when the hand that beats time, falls.

The *saraband* is said to be derived originally from the Saracens, as well as the CHACONE. It had its name, according to some authors, from a comedian called Sarabande, who first danced it in France. Others derive the name from the Spanish *sarao, a ball.* It is usually danced to the sound of the guitar, or castanettes.

SARABARA, among the *Ancients*, a Medish or Babylonish garment, which reached only to the knees.

SARACA, in *Botany*, a genus of the *diadelphia pentandria* class. Its characters are, that it has no calyx; that the corolla is funnel-shaped and quadrifid, and that the fruit is a pedicillated pod. There is only one species.

SARACEN's *consound*, in *Botany*. See GOLDEN *rod*.

SARACEN's *consound, true.* See GROUNDSEL.

SARACHINUS, in *Ichthyology*, a name given by Charleton, and others, to the fish, called by the generality of authors the *thrissa*, by us the SHAD, or mother of the herrings.

Authors have given names to the herring kinds, according to their different growth and size, and multiplied the species much beyond what they ought to be. Artedi observes, that the *agonus* and *sarachinus* are only herrings of different growth, and that the *alausa minor* of authors is the same with the *agonus*. See CLUPEA.

SARACUS, in *Ichthyology*, a name given by some authors to a species of sea-fish of the herring kind, more usually called *agonus*, and by many suspected to have no essential difference from the *alausa* or shad, but to be the same fish in another state.

SARAX, in *Botany*, a name given by some authors to the whole class of the ferns.

SARCASM, *sarcasmus*, in *Rhetoric*, a keen, bitter irony, whereby the orator scoffs and insults his adversary.

Such was that of the Jews to our Saviour: *Thou, who destroyest the temple, and raisest it in three days, save thyself*, &c. And again, *He saved others, himself he cannot save.* Or that of Turnus to a Trojan slain by him, in Virgil:

> *En agros, &, quam bello, Trojane, petisti,*
> *Hesperiam metire jacens! Hæc præmia, qui me*
> *Ferro ausi tentare, ferunt: sic mœnia condunt!*

SARCITES, the *flesh stone*, in *Natural History*, a name given by some authors to the cornelian, from its being of the colour of flesh, as it is very exactly in some pieces.

SARCITES, or SUARITES, is also a stone supposed to be found in the belly of a lizard; it seems to have been a species of pale cornelian. Pliny mentions it, but gives no description of it.

SARCITES, the *flesh stone*, is also a name given by some authors to a species of stone, whose fibres were supposed to represent those of beef. It was of a black colour and firm texture.

SARCLIN-*time*, is the time or season when husbandmen weed their corn.

SARCOCELE, Σαρκοκηλη, formed from σαρξ, *caro, flesh*, and κηλη, *tumor*, in *Surgery*, a fleshy, scirrhous excrescence, very hard, yet not very painful; rising up by little and little about the testicles, or on the inner membrane of the scrotum.

Sometimes, indeed, it is painful; in which case there is danger of its degenerating into a cancer.

The *sarcocele* consists primarily in an enlargement, induration, and obstruction, of the vascular part of the testicle; but this alteration is attended, in different people, with such a variety of circumstances and appearances, as to occasion many distinctions of this disease. If the body of the testicle, though enlarged and indurated to some degree, be perfectly equal in its surface, and void of pain, has no appearance of fluid in its tunica vaginalis, and produces very little uneasiness, except what is occasioned by its mere weight, it is usually called a *simple sarcocele*, or an indolent schirrhus. If the testis be enlarged and hardened, and there be, at the same time, a palpable accumulation of fluid in the vaginal coat, the disease has by many been named a *hydro-sarcocele*. If the lower part of the spermatic vessels and the epidydimis were enlarged, hard, and knotty, they supposed it to be a fungous or morbid accretion, and called it the *caro adnata ad vasa*. If the testicle itself was unequal in its surface, but not painful, they distinguished it by the title of *caro adnata ad testem*. If it was tolerably equal, not very painful, nor frequently so, but at the same time hard and large, they gave it the appellation of an *occult*, or *benign cancer*. If it was ulcerated, subject to frequent acute

acute pain, to hæmorrhage, &c. it was known by the name of a *malignant*, or *confirmed cancer*. These several distinctions refer only to different stages of the same disease, and depend on various accidental circumstances; such as age, habit, manner of living, &c. There is hardly any disease subject to greater variety than this in its first appearance, and the changes it undergoes. Sometimes its first appearance is a mere simple enlargement and induration of the body of the testicle, without pain, inequality of surface, or any sensible inconvenience, except that which is owing to its weight; and in this state it has remained for a considerable time, without any material alteration. Sometimes, on the other hand, it suddenly becomes unequal and knotty, and is attended with very acute pains, darting up to the loins and back, but without bursting through the integuments. At other times it makes its way through all the membranes which envelope the testicle, and either produces a large, foul, stinking, phagedenic ulcer, with hard edges, or thrusts forth a painful, gleeting fungus, subject to frequent hæmorrhage. Sometimes it appears under the form of the *hydro-sarcocele*; sometimes there is no fluid in the cavity of the tunica vaginales; but the body of the testicle itself is formed into cells, containing either a turbid kind of water, a bloody sanies, or a purulent, fetid matter. Sometimes the disorder seems to be merely local, that is, confined to the testicle, not proceeding from a tainted habit, nor accompanied with diseased viscera, but occasioned by an external injury. At other times, a pallid, leaden countenance, indigestion, frequent nausea, colic pains, sudden purgings, &c. indicate a vitiated habit, and diseased viscera. Its progress from the testis upward toward the process, which is its most common course, is also very uncertain; the disease occupying the testicle only, without affecting the spermatic process, in some subjects, for a considerable time; while, in others, it totally spoils the testicle very soon, and almost as soon seizes on the spermatic chord.

There are various causes to which this disease has been ascribed; but the most common, though equally groundless with many others, are the HERNIA *humoralis*, and the HYDROCELE of the vaginal tunic.

It usually owes its origin to some external cause, as a blow, a bruise, or contusion. Such accidents occasion the nutritious juices to stop, and to be collected in great quantities in the relaxed or compressed pores of those parts; by which means is formed that kind of tumor called *sarcocele*, and by some *hernia carnosa*. It has been frequently owing to venereal complaints, and a cancerous habit.

It is a very troublesome and obstinate disease, and is frequently incurable by any other means than castration, or cutting out of the testicle. But great skill is necessary to determine the precise nature and seat of the disease, and the proper time and manner of performing this operation. In the true *venereal sarcocele*, or indurated testis, the disease ought always to be eradicated from the habit before any attempt be made locally. It should be carefully observed, that the method of treating the venereal induration, which is most frequently successful, will prove extremely prejudicial in the schirrhous hardness. By mercury, judiciously administered, the venereal patient's disease may be removed, and his health restored; but a schirrhus, or cancer, is usually exasperated by it, and a mercurial course occasions a loss of time, which is not always retrievable. In cases where the testicle is enlarged and indurated, but the disease is not degenerated into a proper schirrhus, a course of medicine may not only give relief, but effect a cure. Mr. Warner, in the treatment of such cases, began with giving his patient some mercurial purges; after he had taken two or three doses of this physic, he put him into a course of the extractum cicutæ, beginning with small quantities of this medicine, and gradually increasing it. With the cicuta he joined the decoctum corticis; ordering, at the same time, the tumor to be twice a day fomented with a strong decoction of the leaves of the cicuta boiled in water, and afterwards to be covered with a cataplasm of the same leaves mixed with the decoction, and softened with oil. Having pursued this method, in a particular case which he recites, the tumor of the testicle was removed; and there remained only a small degree of induration and enlargement of the epididymis, which were perfectly dispersed by wearing a plaster composed of mercury, soap, and gum ammoniacum. But when there is no probability of lessening the tumor, either by local applications, or internal remedies, but, on the contrary, it is found to increase; and more especially when by neglect it becomes cancerous, the only relief which the case admits of is the extirpation of the part. However, it behoves every practitioner to be well acquainted, not only with such circumstances as render castration practicable and adviseable, but with those which prohibit such attempt. These, Mr. Pott observes, are of two kinds; and relate either to the general habit of the patient, and the disorder and indispositions of some of the viscera, or to the state of the testicle and spermatic chord. Whenever there are manifest symptoms of a truly diseased state of any of the principal viscera, the success of the operation becomes very doubtful; more especially if there be reason to conclude, that a cancerous virus is the real cause of them. The state of the mere testis can hardly ever be any objection to the operation; the sole object of consideration is the spermatic chord: if this be in a natural state, and free from disease, the operation not only may, but ought to be performed, whatever be the condition of the testicle; but if the spermatic chord be really diseased the operation ought not to be attempted. When the spermatic vessels are not only turgid and full, but firm and hard; when the membrane, which invests and connects them, has lost its natural softness and cellular texture, and has contracted such a state, and such adhesions, as not only greatly to exceed its natural size, but to become unequal, knotty, and painful, upon being handled, and this state has possessed all that part of the chord, which is between the opening in the oblique muscle and the testicle, no prudent, judicious, or humane person, will attempt the operation: nevertheless, every enlargement of the spermatic chord is not of this kind, nor by any means sufficient to prohibit or prevent the operation. These alterations or enlargements arise from two causes, viz. a varicose dilatation of the spermatic vein, and a collection, or collections, of fluid in the membrane investing and enveloping the said vessels; and they are particularly described by Mr. Pott.

The operation of castration, described by this excellent writer, is performed as follows: the patient being laid on a table of convenient height, the integuments covering the spermatic vessels in the groin are to be divided. This incision should be begun, as nearly as can be, opposite to the opening in the abdominal muscle, and should be continued a good way down the scrotum. The spermatic chord, thus laid bare, is to be freed from its surrounding membranous connections; and then the operator, with his finger and thumb, separating the blood-vessels from the vas deferens, must pass a needle, armed with a ligature, between them; and having tied the former only, must cut through or divide the whole chord, at a quarter or half an inch distance from the said ligature, according as the state of the process and testicle will admit. He is then, with the same knife, to dissect the testicle out from its connection with the scrotum; the loose texture of the dartos, the previous separation of the testicle from the spermatic vessels, and the help of an assistant to hold up the lips of the wound, will enable him to do this with very little pain to the patient, and great facility to himself. If any considerable artery bleeds, either in the scrotum or in the dartos, it must be restrained by ligature; and when that is done, the void space, in which the testicle was, is to be very lightly filled with soft dry lint, which lint should be suffered to remain, until it be perfectly loosened by the suppuration from every part of the sore; and thus the sore will be found clean, and well digested, and require no other dressing afterward than mere dry lint; which, from this time, should be applied in such quantity and manner, as to give nature an opportunity of contracting and healing the wound as fast as she can; in both which she may be considerably assisted by the judicious exhibition of the bark. See remarks on this method of operation, compared with M. Le Dran's, and a recital of cases, &c. in Pott's Chirurgical Works, vol. ii. sect. xii. p. 429, &c. 1779. See also Warner's Account of the Testicles, p. 76, &c.

SARCOCOLLA, Σαρκοκολλα, a gum-resin ousing out of an oriental vegetable, either with or without incisions.

It has been the opinion of many writers of the middle ages, that this was the gum of the peach-tree. The origin of this opinion may be traced to Dioscorides, who, treating of *sarcocolla*, says, that it is the gum of a Persian tree. The words *Persian tree* and *peach-tree* are the same both in Greek and Latin; and hence what he said of a tree growing in Persia, has been attributed to the peach-tree; and this gum, so very different from the gum of that tree, has been supposed to flow from it.

Neither authors, nor merchants, are agreed as to the place where it grows: some say it is in Persia; others, in Arabia Deserta. It comes either in grains, or in tears of different colours; sometimes white, sometimes yellow, and sometimes red; but the whitest are preferred, as being the freshest.

The taste is bitter, accompanied with somewhat of a disagreeable sweetness. It softens in the mouth, bubbles, and catches flame from a candle, dissolves almost wholly in

in water, and the greateſt part of it in rectified ſpirit. It is eſteemed warm and drying; it is ſaid, internally, to act as a ſlow and dangerous purgative; but externally to be very good for conſolidating and healing wounds; whence its name; from the Greek σαρξ, *fleſh*, and κολλα, *glue*.

It is ſometimes alſo uſed, diſſolved in breaſt-milk, in collyria, to ſtop defluxions, and take off ſpecks in the eye.

SARCO-EPIPLOCELE, a term uſed by the old medical writers, to expreſs a compound rupture, conſiſting of a deſcent of the *epiploon* and a *ſarcocele*; or a rupture of the indurated *epiploon*, whether umbilical or ſcrotal.

SARCOLOGY, in *Anatomy*, a diſcourſe on the FLESH, or the ſoft parts of the human body.

Anatomy is divided into two principal parts; *oſteology* and *ſarcology*. The firſt whereof treats of the bones and cartilages; the ſecond of the fleſh, and ſoft parts.

SARCOMA, Σαρκωμα, in *Surgery*, a fleſhy, fungous excreſcence, ariſing in the noſtrils, or other parts; nearly reſembling a polypus.

The *ſarcoma* chiefly differs from the polypus, as the latter grows from the part by ſeveral roots; the former by one continued root, or without any roots at all.

Every polypus is a *ſarcoma*; but not *vice verſa*. The *ſarcoma* frequently degenerates into a polypus.

The *ſarcoma narium*, by ſome called alſo *hyperſarcoma narium*, is the ſame with what is commonly called the *polypus narium*, a caruncle of various ſize and conſiſtence in the noſtril. Theſe caruncles are uſually ſoft, extenſive, and capable of elongation, but ſometimes they are hard and rigid. They are ſometimes pale, ſometimes red, and are generally ſmall in their beginnings, and advance but gradually; though ſome of them grow ſo faſt, as to hang down out of the noſe in three or four days time. They are uſually not attended with pain; but ſome of them are hard, livid, very painful, and have a tendency to become cancerous. Some are wholly concealed in the noſe, others hang down to the lips, and others, though contained in the noſe, yet diſtend it greatly. Some are of an even ſurface, and others like a cluſter; ſome deſcend backward through the apertures by which we draw breath through the noſe into the fauces; and grow ſo big there as to be viſible behind the uvula, and occaſion difficulty of ſpeaking and ſwallowing, and ſometimes almoſt ſtrangle the patient.

They have uſually but one root, though ſometimes ſeveral, and are uſually formed in and from the pituitary membrane; and the diſorder ſeems to be really no other than a morbid diſpoſition of the ſpungy production and glands of this membrane. The *ſarcoma* and *polypus*, though diſorders of the ſame kind, may however be properly enough made two ſpecies; the *polypus* being ſoft, and hanging by a ſlender root, like the ſtalk of a fig; and the *ſarcoma* of a more fleſhy conſiſtence, and adhering by a large, firm, and immoveable baſis.

Theſe diſorders come ſometimes from internal cauſes, ſometimes from external injuries, and too often prove cancerous, or are attended with a ſpina ventoſa, or caries of the bones of the noſe. They may be ſometimes removed by cauſtics; but the extirpating them with the knife is the ſhorteſt, ſafeſt, and moſt eligible method. Heiſter.

SARCOMA *of the eyes*, a fleſhy excreſcence or tubercle formed on the inner ſurface of the eye-lids. Theſe tubercles, in their beginnings, are uſually ſmall; but they, by degrees, advance often to a very conſiderable bulk. Some of theſe are of ſmooth ſurfaces, others rough and unequal, like a raſberry or mulberry.

They are always to be cured by extirpation, getting them out by a hook, a pair of plyers, or a needle and thread, and then cutting them out to the roots with ſciſſars; the wound ſhould be ſuffered to bleed a while, and afterwards waſhed with a collyrium made of aloes, tutty, and ſugar of lead, mixed in roſe-water, till it is perfectly healed. Some uſe the cauſtic to theſe tumors, but the ſciſſars are more ſafe, and leſs painful. Heiſter.

SARCOMPHALUM, Σαρκομφαλον, formed from σαρξ, *fleſh*, and ομφαλος, *navel*, in *Surgery*, &c. a fleſhy excreſcence of the navel; the cure of which is ſometimes attempted by emollient and reſolving remedies; but if theſe prove ineffectual, extirpation will be neceſſary.

SARCOPHAGUS, Σαρκοφαγος, in *Antiquity*, a ſort of ſtone coffin, or grave, wherein the ancients laid thoſe they had not a mind to burn.

The word, as derived from the Greek, literally ſignifies *fleſh-eater*; becauſe, at firſt, they uſed a ſort of ſtones for the making of theſe tombs, which quickly conſumed the bodies. The quarries from whence they dug them were near a city of Troas, named Aſſum. They had the faculty to waſte away a body to nothing, ſave the teeth, in forty days.

This ſtone reſembled a reddiſh pumice-ſtone, and had a ſaltiſh taſte; they alſo made veſſels of it to cure the gout, into which they put their feet, not ſuffering them to continue there too long. See *Aſſius* LAPIS.

SARCOTHLASMA, formed of σαρξ, *fleſh*, and θλαω, *I bruiſe*, a term uſed by the old phyſicians to expreſs a bruiſe on the fleſh.

SARCOTICS, Σαρκωτικα, formed from σαρξ, *fleſh*, in *Surgery*, remedies proper to fill up wounds and ulcers with new fleſh; the ſame as incarnatives. Such are ſarcocolla, dragon's blood, frankincenſe, &c. See INCARNATIVE, and EPULOTIC.

SARCULATION, a term uſed in the *Ancient Huſbandry*, to expreſs a ſort of hoeing, which they uſed among their peaſe and beans, and ſometimes among their corn.

The *ſarculum* was a ſort of narrow and long hoe, with which they rooted up the weeds among plants growing irregularly. We have the ſame kind of inſtrument in uſe at this time in ſome places for hoeing between the plants of flax; but one way of ſowing, in rows, at preſent, has prevented the neceſſity of having recourſe to ſo inconvenient and troubleſome an inſtrument in other caſes.

SARCULATURA, in our *Old Writers*, weeding of corn; whence *una ſarculatura* was the tenant's ſervice of one day's weeding for the lord. *Tenet in bondagio & debet unam* ſarculaturam, &c.

SARDA, in *Natural Hiſtory*. See CORNELIAN.

SARDA, in *Ichthyology*, a name by which ſome call the fiſh, more uſually known by the name of PELAMYS, or *pelamys ſarda*; a fiſh reſembling a young tunny, but having larger and longer teeth, and no ſcales.

SARDACHATES, in the *Natural Hiſtory of the Ancients*, the name of a ſpecies of agate, found frequently at this time on the ſhores of rivers in the Eaſt Indies, and ſeeming to contain an admixture of the matter of the common red cornelian, is very excellently characterized by the name the ancients gave it.

It is a very elegant and beautiful ſpecies, and is often found of a conſiderable ſize. It is of a pale, whitiſh ground, and has no veins or other variegations, except a multitude of minute ſpots, of a pale red, and of the matter of the red cornelian; theſe are ſcattered very ſparingly in ſome parts of the maſs, but in others they are ſo cluſtered together, as to make ſmall clouds of an elegant red. It is very hard, and is capable of an elegant poliſh. Our lapidaries do not much eſteem it, but in ſome other places it is wrought into toys, which are much eſteemed.

SARDANUS, in *Ichthyology*, the name of a fiſh of the harengiform kind, caught in the Mediterranean, and common in the markets of Rome and Venice. Its body is broader than that of the pilchard, and its back green; and the line which runs along the belly is much leſs rough than in that fiſh. It is indeed eaſy to diſtinguiſh it from the pilchard, but not ſo eaſy to ſhew in what it differs from the common herring more than in ſize. It ſeems very probable, that it is no diſtinct ſpecies of fiſh; but that the herring, like the pilchard, is always ſmaller in the Mediterranean than the ocean. Willughby.

SARDAR, in the Turkiſh *Military Orders*, the title of an officer choſen from among the caias of the janizaries on ſome particular occaſion; ſuch as to head a detachment ſent to war, or on any other occaſion.

The word is of Perſian origin, and is derived from *ſar*, which in that language ſignifies a *head* or *chief*.

This officer is a colonel of a detached body; he is attended in his expedition by his deputy, and two ſecretaries, and his office expires at his return from the buſineſs he was diſpatched on.

SARDELLA, in *Ichthyology*, a name by which ſome have called the pilchard of the Mediterranean ſea, ſuppoſing it different in ſpecies from that of the ocean, but it ſeems in reality to be no other than the common PILCHARD, only not growing ſo large there as in the ocean.

SARDIAN, *Sardoin*, or *Lapis* SARDIUS, a precious ſtone, of a blood colour, ſemi-tranſparent; the ſame with what we otherwiſe call a *cornelian*.

The moſt beautiful *Sardians* are thoſe brought from about Babylon: thoſe of Sardinia, whence they take their name, are in the ſecond claſs. There are others, and thoſe no contemptible ones, found near St. Mauro, in Albania; and other, very ſmall ones, about the Rhine, in Bohemia, Sileſia, &c. To give them the greater luſtre, it is uſual, in ſetting them, to lay ſilver leaf underneath. The *Sardian* is moſt uſed for ſeals, as graving eaſily, yet taking a fine poliſh.

The author of the book falſly aſcribed to Albertus Magnus, attributes ſeveral wonderful virtues to this ſtone. See CORNELIAN.

SARDINA, in *Ichthyology*, a name by which many have diſtinguiſhed a fiſh of the harengiform kind, which is in reality, however, no other than a ſmall pilchard, the pilchard growing to a larger ſize in the ocean than in the Mediterranean.

SARDOA, Sardoum, or Sardonia *herba*, ſo called from its growing plentifully in Sardinia, in *Botany*, a name given by the ancients to the water-crowfoot, with jagged leaves, called alſo *apiaſtrum* and *ranunculus apii folio*, from its leaves reſembling in ſome degree thoſe of the ſmallage. This has been in all ages characterized as a poiſon; nor will the cattle touch it, though a ſucculent and well-looking herb; but Pliny has found means to confound this with baum, under the name of apiaſtrum, which he ſays is fed on by the bees in Italy, but is very well known to be a dangerous poiſon in Sardinia.

SARDONIAN *laughter*. See Risus *Sardonius*.

SARDONYX, in *Natural Hiſtory*, the name of a genus of the ſemi-pellucid gems, which are conſiderably tranſparent, of the true onyx ſtructure, either zoned or tabulated, and are compoſed of the true matter of the onyx, variegated with zones of that of the red or yellow carnelian.

Of this genus there are four known ſpecies. 1. The thin-zoned red *ſardonyx*, or whitiſh onyx, with thin, ſnow white, and red zones; this is one of the moſt beautiful of the ſemi-pellucid gems. It is only found in the Eaſt Indies, and is greatly valued among our lapidaries.

The ſecond ſpecies is the broad-veined red *ſardonyx*, or horny onyx, with red punctuated zones. This is a beautiful ſtone, though greatly inferior to the former kind. This is found in New Spain, and in ſome parts of Europe, and is ſometimes wrought into ſnuff-boxes, counters for cards, or other toys; but is very little eſteemed.

The third ſpecies is the yellow-leaved *ſardonyx*, which, as its veins are as truly of the matter of the yellow carnelian, as thoſe of the former ſpecies are of the red, is certainly entitled as much as they to the name of *ſardonyx*.

It is found in many parts of the world, but is no where common, it being rare to meet with two ſpecimens of it together. Arabia, Armenia, Perſia, China, and New Spain, have all been known, at times, to produce it. In Italy it is very much valued, but with us it is hardly known.

The fourth ſpecies is the orange-coloured *ſardonyx*, or the bluiſh white onyx with orange-coloured and whitiſh zones. This is a very ſingular ſpecies, and is not without its beauty, though greatly inferior to the former. It is found in Egypt, Arabia, and the Eaſt Indies, and not unfrequently in Germany; but the European is greatly inferior to the oriental.

Theſe are all the genuine *ſardonyxes*; but the ſtone called *ſardonyx*, in Pliny's time, being properly a camæa, not a *ſardonyx*, belongs to that claſs. Hill's Hiſt. of Foſſ. p. 497.

SARFAR, a name given by ſome of the chemiſts to iron.

SARFE, in *Ichthyology*. See Red-*eye*.

SARGAZO, or Sargaso, in *Botany*, a name for the plant commonly called *ſea lentils*; a ſmall ſea-plant found among the rocks, and ſometimes at open ſea, and ſuppoſed to be a good diuretic.

SARGO, the name uſed by Aguſtino Scilla, in his book of Petrifactions, for the name of one of thoſe kinds of ſea-fiſh, in the hinder part of whoſe jaws are found thoſe round *dentes molares*, or grinder-teeth, which, when found in a petrified ſtate, are called *bufonitæ*, or toad-ſtones.

It is very certain, that by *ſargo* Scilla means no other fiſh than the *ſargus*; yet Mr. Willughby ſays, that the *ſargus* has none of theſe round grinders, or *tubercula oſſea*, as he calls them, and makes this one of the characters by which the *ſargus* is to be diſtinguiſhed from the ſparus and ſcarus, and other fiſhes of that tribe.

It is probable that Scilla, who wrote more expreſly on theſe ſubjects, diſſected his *ſargus* with too much accuracy, to be miſtaken in this material part of it; and it is poſſible that Mr. Willughby, though a very accurate writer, might overlook theſe teeth in the hinder part of the jaw of a fiſh which he was only deſcribing in the common way, and had no peculiar reaſon for examining in ſo nice a manner juſt in this part. Phil. Tranſ. N° 219, p. 195.

SARGUS, in *Ichthyology*, the name of a fiſh well known, and much eſteemed among the ancients, and not uncommon at this time in the markets of Rome, Venice, &c. being caught in the Mediterranean and Adriatic in conſiderable quantities. See *Tab.* IV. *of Fiſh*, N° 45.

It ſomething reſembles the ſparus in figure, but its noſe is longer and more pointed, and turns up a little, and its fore-teeth are ſhaped like two human teeth, which ſtand in the ſame part of the mouth. It has no tubercles in the hinder part of the jaws, as the ſparus has; and its whole body is variegated with brown tranſverſe rings, reſembling the variegations of the pearch, and has only one fin on the back, the anterior rays of which are prickly, the hinder ones not at all ſo. Willughby and Geſner.

Sargus, in *Ichthyology*, is alſo the name of a river fiſh, called by others *gardon*, *ſardus*, and *cephalus*, and by many ſuppoſed to be no way eſſentially different from our common roach.

It is a river fiſh, very much reſembling the chub in its general figure, and the ſize of its ſcales, but it has a ſmaller head, and a ſomewhat broader body than that fiſh; its back is bluiſh, its neck greeniſh, and its belly white; it has no teeth; its eyes are yellow, and it is uſually leſs fat than the chub.

It is a very briſk and lively fiſh, and is a ſort of emblem of health among the French, and uſed proverbially as ſuch in the ſame manner as the roach among us. We ſay of a healthy man, *he is as ſound as a roach*; they, *he is as ſound as a gardon*. It is common in the rivers of France, Italy, and Germany, and is eſteemed but a moderately fine fiſh for the table. Willughby.

SARIGOY, in *Zoology*, a name by which ſome call the creature we know by the name of the opossum.

SARIO, in *Ichthyology*, a term uſed by ſome authors for the ſalmon when in the middle ſtage of its growth, when it is paſt its younger ſtate, in which it is properly called a *ſalar*, and is not yet arrived at what is properly called a salmon.

SARISSA, in *Antiquity*, a very long ſpear uſed by the Macedonians. Ælian ſays, that by the ancient uſage they ought to be ſixteen cubits in length; but that in fact they were but fourteen, two cubits being allowed for the handle, and the other twelve to cover their bodies.

SARKA *princeps*, one of the Hebrew accents, ſometimes denoting a comma, and marked over a letter thus (∞).

SARMATICA *lues*, a name given by ſome authors to the plica *Polonica*.

SARMENIUS *lapis*, a name given by the writers of the middle ages to a ſtone ſaid to be uſed in the poliſhing of gold, and to have virtues in medicine alſo; ſuch as preventing abortion, and the like.

It ſeems to have been only a corrupt way of ſpelling *ſamius lapis*, a ſtone to which Pliny has attributed the ſame virtue.

SARMENTOUS *ſtalk*. See Stalk.

SARONIA, Σαρωνια, among the Greeks, a feſtival kept in honour of Diana, ſurnamed *Saronia*, from Saro, the third king of Trœzene, by whom a temple was erected, and this feſtival inſtituted to her.

SAROS, Σαρος, in *Chronology*, a period of two hundred and twenty-three lunar months. Suidas in voc. Σαρος. Mem. Acad. Inſcr. tom. viii. p. 283.

The etymology of the word is ſaid to be Chaldean, ſignifying reſtitution, or return of eclipſes; that is, conjunctions of the ſun and moon in nearly the ſame place of the ecliptic.

The *ſaros* was a cycle like to that of *meto*. See Cycle *of the moon*.

SAROSEL, in the *Glaſs Trade*, the name of the room into which the mouth of the leer opens, and in which the glaſs veſſels are placed, when taken out of the leer. The men who attend to do this are called the *ſarole* men.

SAROTHRA, *baſtard gentian*, in *Botany*, a genus of the *pentandria trigynia* claſs. Its characters are, that the calyx is divided into five ſegments; the corolla has five petals, and the fruit is a ſingle-celled, three-valved, coloured capſule. There is only one ſpecies.

SARPA, in *Ichthyology*, the name by which the salpa, a very beautiful fiſh of the Mediterranean, is known in the Italian markets.

SARPICULA, among the Romans, a term uſed by the old Roman writers to ſignify a pruning-hook.

SARPLAR *of wool*, a quantity of wool, otherwiſe called a pocket, or half ſack; a sack containing eighty tod, a tod two ſtone, and a ſtone fourteen pounds.

In Scotland it is termed *ſarpliath*, and contains eighty ſtone.

SARPOE, a name given to the fiſh called by authors salpa.

SARRACENA, in *Botany*. See *Hollow-leaved ſea* Lavender.

SARRASIN, or Sarrazin, in *Fortification*, a kind of port-cullice, otherwiſe called a herse, which is hung with ropes over the gate of a town or fortreſs, and let fall in caſe of a ſurprize.

SARRITION, *ſarritio*, in Roman authors, the term uſed to expreſs what we call hoeing in huſbandry, or ſomething analogous to it; that is, a way of ſtirring up the earth about young plants, and deſtroying the weeds that would grow among them. When the plants had been ſome time come up, they ſtirred the land with wooden rakes or harrows, and then went over the fields, and pulled up the weeds by hand.

They uſed two kinds of *ſarrition*; the one was intended only to move the ground, and was done lengthways of the

the furrows; the other was to cover up the young plants, that they might grow the more ſtrong and vigorous; and was performed by ſtirring up the earth croſs-ways of the furrows.

It is an error in the tranſlators of the ancients, to render the word *ſarritio* by *hoeing*, without giving any farther explication of it; for the ancients truly hoed their vineyards in an exact ſenſe of the word, but not their corn; neither did they plant their corn in rows, without which they could not give it their vineyard hoeing. This ſarculation was uſed only among ſmall quantities of ſown corn, and is yet in uſe for flax; for the ſarculum, which is a ſort of very narrow hoe, is ſtill uſed among the plants of flax growing irregularly, but this is too tedious and expenſive ever to have place in whole fields of corn.

If the ancients hoed their crops of corn ſtanding irregularly, as ſown at random, they muſt have made very mad work of it, ſince they were at no pains to ſow in rows, and hoe between them with their bidens, which was an inſtrument with which they tilled many of their vineyards, and which entered the ground as deep as the plough, and was a much better inſtrument than the Engliſh hoe, which is very ill calculated for the office its principal buſineſs lies in, which is ſtirring the ground. Tull's Horſehoeing Huſbandry.

SARSAPARILLA, Salsaparilla, or Sarsa, a medicinal plant, being the root of a ſpecies of *rough bindweed*, or smilax, growing in New Spain, Peru, &c. chiefly uſed in decoctions and potions, for the venereal diſeaſe; being eſteemed a great abſorbent and ſweetener; and, on that ſcore, ſometimes taken as a tea.

Its root, which is the part in uſe, divides itſelf into a great number of filaments, ſix or ſeven feet long; of the thickneſs of a quill; it is browniſh withoutſide, and white within, only marked with two red ſtreaks. Its branches creep on the earth, or along the trunks of trees, &c. as the ivy does.

To be good, it muſt be very dry, its filaments long, eaſy to cleave; and, in cleaving, they muſt not yield any duſt; when boiled in water, it muſt give it a reddiſh tincture. Some phyſicians much doubt the medicinal virtue of this root; as it does not diſcover much, either in taſte, ſmell, or tincture.

Sarſaparilla was firſt brought into Europe by the Spaniards, about the year 1563, with the character of a ſpecific for the cure of the lues venerea, which made its appearance a little before that time. The method of preparing it by the Spaniards and Indians of South America is as follows: they macerate an ounce of the root in almoſt four pints of water for twenty-four hours, and boil it away to one-half. They give of the expreſſed decoction half a pint twice a day, four hours before their meals, in bed, covered with cloaths, where they ſweat two hours, mixing a ſufficient quantity of the fine powder of the root with each doſe of the decoction. They purge them every tenth day. The reputation of this medicine declined, after its introduction into Europe; though it appears from experience, that, in many caſes, ſtrong decoctions of it, drank plentifully, and duly continued, are of very conſiderable ſervice for promoting perſpiration, and ſweetening or purifying the blood and humours. In the London Medical Obſervations, vol. i. art. 16. there are ſeveral inſtances of its efficacy in venereal maladies, as an aſſiſtant to mercury, or when mercury had preceded its uſe. It frequently and ſpeedily anſwered after mercurial unctions, and long continued courſes of ſtrong decoctions of guaiacum, had failed. Three ounces of the root are boiled in three quarts of river water, till the liquor, when ſtrained, amounts to about one quart, which is taken at three or four doſes, either warm or cold, every twenty-four hours. Dr. Harris ſays, that infants who have received the infection from the nurſe, though full of puſtules and ulcers, and ſometimes troubled with nocturnal pains, are cured by *ſarſaparilla* without mercurials. He directs the powder of the root to be mixed with their food.

There is another kind of *ſarſa*, the filaments of whoſe root are thicker, growing in the iſland Marignan, on the coaſt of Braſil: this is not eſteemed ſo good as the former.

There is a third kind brought from Muſcovy, whoſe roots are ſtill bigger, but good for nothing.

SARTORIUS, in *Anatomy*, the *taylor's muſcle*; a muſcle thus called, becauſe ſerving to throw one leg acroſs the other. It is alſo called longus *tibiæ*, and *faſcialis*; and is an antagoniſt to the poplitæus. See *Tab. Anat.* (*Myol.*) *fig.* 1. *n.* 49. *fig.* 2. *n.* 38.

This is the longeſt muſcle of the human body; it is flat, and about two fingers in breadth, ſituated obliquely along the inſide of the thigh. It is fixed above by a very ſhort tendon, in the lower part of the anterior ſuperior ſpine of the os ilium, before the muſculus faſciæ latæ. The beginning of its body lies in the notch, between the two anterior ſpines of that bone. From thence it runs down obliquely over the vaſtus internus, and other muſcles that lie near it, all the way to the inſide of the knee, where it terminates in a ſmall tendon, which grows broader near its extremity, and is inſerted obliquely, and a little tranſverſly, in the forepart of the inſide of the head of the tibia, near the ſpine or tuberoſity of that bone, immediately above the inſertion of the gracilis interior.

The fleſhy body of this muſcle is encloſed in a vagina made by the faſcia lata; its fibres in general are longitudinal, and when its lower tendon turns obliquely over toward the head of the tibia, it ſeems to be braced down, and ſecured in its place by a tendinous frænum or vagina. Winſlow.

SASHES, in *Military Language*, are badges of diſtinction, worn by officers, either round the waiſt, or over the ſhoulders. They are made of crimſon ſilk.

SASSAFRAS, in *Botany*, a ſpecies of the *laurus* or bay-*tree*.

The wood of this tree, which is very common in moſt parts of North America, is yellowiſh and odoriferous, of a briſk, aromatic ſcent, ſomewhat reſembling fennel. The natives call it *pavama*; the Spaniards and French call it *cinnamon-wood*; becauſe, at the conqueſt of that country, under Ferdinand Soto, in 1558, they imagined this to have been the true cinnamon-tree.

The lignum *ſaſſafras*, and chiefly its bark, wherein its principal virtue is ſuppoſed to reſide, as it does alſo in the ſmaller twigs more than in the larger pieces, was formerly ſold at an incredible price, to be uſed with ſarſaparilla and China-root, in the cure of the venereal diſeaſe. It is very drying and hot, though not quite ſo much as the guaiacum.

It is ſomewhat come into faſhion in families, as a common tea, which the ſhavings of it make agreeable enough; but the ſcandal of being good in venereal caſes is a detriment to it, and prevents much good being done by it. Chooſe that covered with a thick bark, reddiſh, and rough, of a ſharp taſte, and a ſtrong aromatic ſmell. It gives out its virtues, together with a reddiſh colour, totally to ſpirit, and leſs perfectly to water. Diſtilled with water, it yields a fragrant eſſential oil (ſee Oil *of ſaſſafras*), of a penetrating pungent taſte, the heavieſt of all eſſential oils, and ſo ponderous as to ſink in water; limpid and colourleſs when newly diſtilled; by age growing yellowiſh, and at length of a reddiſh brown colour; the remaining decoction, inſpiſſated, yields a bitteriſh, ſubaſtringent extract. The inſpiſſated extract, obtained from rectified ſpirit, diſtilled from the tincture made in that menſtruum, retains, along with the bitterneſs and ſubaſtringency, nearly all the aromatic matter of the root.

Saſſafras is uſed as a mild corroborant, diaphoretic, and ſweetener, in ſcorbutic, venereal, cachectic, and catarrhal diſorders. For theſe purpoſes, both the volatile and the fixt parts, the diſtilled oil, and the watery extract, have been given with ſucceſs: the ſpirituous tincture, or extract, which contain both, appear to be the moſt elegant preparations. Infuſions of the cortical or woody part, raſped or ſhaved, in water, are apt, by their fragrance, on firſt taking them, to affect the head; but this inconvenience, to which neither the watery nor ſpirituous extract are ſubject, is commonly remedied by continued uſe. Lewis's Mat. Med.

SASSE, in ſome of our ſtatutes, denotes a kind of weir, with flood-gates, commonly uſed in navigable rivers, for the damming and looſing the ſtream of water, as occaſion requires, for the better paſſing of boats and barges to and from places.

This, in the weſt of England, is called a *lock*, in the river Lee a *turnpike*, and in other places a *ſluice*.

SASSOROLLA, in *Ornithology*, the name of a peculiar ſpecies of pigeon, called by ſome *columba rupicola*, or the rock pigeon.

It is of the ſhape of the common pigeon, but ſmaller, and has red legs, and a grey variegated back. It ſeems the ſame with the livia of other authors.

SATAN, in *Sacred Criticiſm*, a Hebrew word, which ſignifies an adverſary, perſecutor, or accuſer. See Devil.

SATELLITE, *ſatelles*, *guard*, a perſon attending on another, either for his ſafety, or to be ready to execute his pleaſure.

Among the eaſtern emperors, *ſatellite* originally expreſſed the dignity, or office, of captain of the life-guard.

The term was afterwards applied to the vaſſals of lords; and afterwards to ſuch as held fees, called *ſergeanties*. See Sergeanty.

Satellites, in *Aſtronomy*, certain ſecondary planets, moving round the other planets, as the moon does round the earth; they are thus called, becauſe always found attending

tending them, from rising to setting, and making the tour of the sun together with them.

The *satellites* move round their primary planets, as their centres, by the same laws as those primary ones do round their centre the sun. For the physical cause of their motions, see GRAVITY. See also *Secondary* PLANETS.

The words moon and *satellite* are sometimes used indifferently; and thus we say, either Jupiter's moons, or Jupiter's *satellites*; but, ordinarily, we distinguish; restraining the term *moon* to the earth's *satellite*; and *satellite* to the little moons more lately discovered about Jupiter and Saturn, by the assistance of the telescope, which is necessary to render them visible.

We do not know of any *satellites* besides those just mentioned; what farther discoveries may be made by improving the magnifying powers of telescopes, it is impossible to say.

SATELLITES *of Jupiter* are four little secondary planets, performing their revolutions about Jupiter, as that planet does round about the sun.

Simon Marius, mathematician of the elector of Brandenburg, about the end of November 1609, observed three little stars moving round Jupiter's body, and proceeding along with him; and in January 1610, he found a fourth. In January 1610, Galileo also observed the same in Italy, and the same year published his observations; from which time commenced the observation of the circumjovial *satellites*.

Galileo, in honour of his patron, first called them *astra Medicæa*, Medicæan stars; Marius, the first discoverer, called that next Jupiter *Mercurius Jovialis*, Jupiter's Mercury; the second, *Venus Jovialis*, Jupiter's Venus; the third, *Jupiter Jovialis*; and the fourth, *Saturnus Jovialis*, Jupiter's Saturn.

Indeed, Antony Maria Schyrlæus de Rheita, a Capuchin of Cologne, imagined, that, besides the four known *satellites* of Jupiter, he had discovered five more, on the 29th of December, anno 1642, and, in honour of Urban VIII. the pope then reigning, he denominated them *Sidera Urbanoctaviana*. But, upon Nauda's communicating the observation to Gassendus, who had observed Jupiter on the same day, he soon perceived, that the monk had mistaken five fixed stars, in the effusion of the water of Aquarius, marked in Tycho's catalogue 24, 25, 26, 27, and 28, for *satellites* of Jupiter; whence it is no wonder they should appear to the discoverer to move a contrary way to that of the rest; viz. from west to east. See Epist. Gassend. ad Gab. Naud. de Novem Stellis circa Jovem visis.

SATELLITES, *phenomena and nature of Jupiter's*. See *Nature of the* PLANETS, art. 6, 7, 8.

SATELLITES, *periodical times and distances of Jupiter's*. The periods, or revolutions, of Jupiter's *satellites*, are found from their conjunctions with Jupiter; after the same manner as those of the primary planets are found from their oppositions to the sun.

As in the primary planets, with regard to the sun, so in the *satellites*, with regard to their primaries, the squares of the periodical times are in a triplicate ratio of their distances from their centres respectively.

To determine the distance by observation, they measure them with a micrometer, in semidiameters of Jupiter.

By the latest and most exact observations, the periodical times and distances of these *satellites* are as follow:

Satellites	Periodical times				Distances in semidiameters of Jupiter
1	1^d	18^h	27$'$	34$''$	5,667
2	3	13	13	42	9,017
3	7	3	42	36	14,384
4	16	16	32	09	25,299

Hence, supposing the semidiameter of Jupiter to be 47000 miles (see PLANET), the distance of the first *satellite* from the centre of Jupiter will be 266,000 miles; that of the second, 423,000 miles; that of the third, 676,000 miles; and that of the fourth, 1,189,000 miles.

The angles under which the orbits of Jupiter's *satellites* are seen from the earth, at its mean distance from Jupiter, are as follow: the first, 3$'$ 55$''$; the second, 6$'$ 14$''$; the third, 9$'$ 58$''$; and the fourth, 17$'$ 30$''$.

SATELLITES, *eclipses of Jupiter's*. See ECLIPSE, JUPITER, LIGHT, LONGITUDE, &c.

SATELLITES *of Saturn* are five little stars revolving about Saturn.

One of these *satellites*, viz. the fourth, reckoning from Saturn, was discovered by M. Huygens, anno 1655, March the 25th, by means of a telescope twelve feet long; and the other four, at different times, by M. Cassini; viz. those two next Saturn, in March 1684, by help of Campani's glasses, of one hundred, and one hundred and thirty-six feet; the third in December 1672, by a telescope of Campani's, of thirty-five feet; and the fifth in October 1671, by a telescope of seventeen feet.

Most, perhaps all, of the phenomena observed of Jupiter's *satellites*, are also found exhibited by those of Saturn. Thus they are found sometimes bigger, and sometimes less: the fifth is sometimes, also, found eclipsed, &c. And hence there is no doubt but they are of the same nature, &c. See *Nature of the* PLANETS.

The periodical times and distances of the SATELLITES *of Saturn*, are exhibited in the following table.

Satellites	Periodical times				Distances in semidiameters of Saturn's ring.	Distances in semidiameters of Saturn, according to Cassini.
1	1^d	21^h	18$'$	27$''$	2,10	$4\frac{3}{8}$
2	2	17	41	22	2,69	$5\frac{1}{2}$
3	4	12	25	12	3,75	8
4	15	22	41	14	8,70	18
5	79	07	48	00	25,35	54

Hence, the distance of *Saturn's* RING from Saturn, and its breadth being equal to 42,000 miles, and the semidiameter of Saturn (see PLANET) being 39,000, and, therefore, the semidiameter of the ring being 81,000 miles, the distance of the first *satellite* from the centre of Saturn will be 170,000 miles; that of the second, 217,000 miles; that of the third, 303,000 miles; that of the fourth, 704,000 miles; and that of the fifth, 2,050,000 miles.

The great distance between the fourth and fifth *satellite*, gave occasion to Huygens to suspect that there might be some intermediate one; or else, that the fifth might have some other *satellite* moving round it, as its centre.

Dr. Halley, in the Philosophical Transactions (N° 145, or Abr. vol. i. p. 371), gives us a correction of the theory of the motions of the fourth or Huygenian *satellite*. Its true period he makes 15 days, 22 hours, 41 minutes, 6 seconds; its diurnal motion 22° 34$'$ 38$''$ 18$'''$; its distance from the centre of Saturn, 4 diameters of the ring; which Mr. Pound, with his micrometer applied to the Huygenian telescope, found to be 8,7 semidiameters; and its orbit to be little or nothing distant from that of the ring, intersecting the orbit of Saturn under an angle of $23\frac{1}{2}$ degrees. See SATURN.

SATIRE, in *Literature*, a term which signifies all manner of discourse wherein any person is reprehended; but more particularly a poem, wherein men's follies and vices are wittily exposed, in order to their reformation.

SATIRE, *proper*, is distinguished by the generality of the reflections from a lampoon, which is aimed at a particular person; but they are frequently confounded.

The origin of the word has been the occasion of considerable dispute among the critics. The common opinion supported by Scaliger, Heinsius, and Vossius, deduces it from the Greek Σατυροι, *Satyrs*, a sort of Sylvan deities, by the Romans called *Fauni*, to whose petulancy and wantonness this sort of composition is supposed to bear some resemblance. On which footing *satire* is considered as a poem of a wanton and licentious nature, which like the *Satyrs*, turns things upside down to find occasion for censure and ridicule.

Casaubon, on the contrary, followed by Spanheim and Dacier, derives the Roman *satyr* from the Latin *satur*, used for *plenum, full*, a thing to which nothing is wanting; whence came *satura*, written also *satira*, which, being an adjective, refers to a substantive understood, viz. *lanx*; *satura lanx* being the name of a bason filled with all manner of fruits, which the Romans offered yearly to Ceres and Bacchus as their first fruits.

The word *satura* was afterwards applied to other mixtures, and at length transferred to works of genius; thus *leges saturæ* denoted laws consisting of many heads or titles. Upon the whole, it is inferred, that the *satirical* pieces of the poets were so called, as being various and miscellaneous compositions; on this principle it is urged, that the word should be written in Latin with an *u* or *i*, and in English only with an *i*, whereas those who write it with a *y*, do it on the supposition that the sylvan *Satyri* gave name to this composition, which Casaubon endeavours to disprove by shewing, that from *satyrus* must be formed *satyrica*, and not *satyra*, and by explaining the great difference between the Greek *satyric* poems and the Roman *satire*.

However, satirical poetry, according to Scaliger, may be

be naturally enough deduced from the wantonness of the *satyrs*; and this opinion is confirmed by considering that Σατυριστης is rendered in ancient glosses by *ludio*, and *satirical* by *ludicrous*, *sportive*, *&c.* Thus Seneca's *satire* is called *ludus*, and Horace and Persius use *ludere* for *scribere satyras.*

Satire bears a near affinity to raillery, ridicule, lampoon, libel, &c. and stands opposed to panegyric. The reason why *satires* generally please, and panegyrics tire the readers, seems to be, because the former are commonly true, and the latter false.

Horace calls his two books of *Satires*, indifferently either *sermones* or *satyræ*, two words which at first sight present very different ideas.

The chief satirists among the ancients are, Horace, Juvenal, and Persius; among the moderns, Regnier, and Boileau in French; and Dryden, Oldham, Rochester, Buckingham, Wycherley, Pope, Young, &c. among the English.

A *satire* ought to be lively, pleasant, moral, and full of variety; in these respects Juvenal and Horace excelled, though their *satires* ought not to be read without caution.

Among the qualifications requisite in a *satirist*, one of the most essential is good-nature, all the sentiments which are beautiful in this way of writing must proceed from that quality in the author. Good-nature produces that disdain of all baseness, vice and folly, which prompts the poet to express himself with smartness against the errors of men, but without any bitterness towards their persons. It is this quality which keeps the mind in equanimity, and never lets an offence unseasonably throw a man out of his character.

In all the writings of Horace and Juvenal, there is not one ill-natured expression; not one sentence of severity, which does not apparently proceed from the contrary disposition. Tatler, N° 242.

Satire may be divided with regard to the measure, and kind of verse, as well as the manner of the poem, and the character, into narrative, dramatic, mixed, &c.

Narrative, is a simple narration or recital of abuses in the poet's own person. Such is the first of Juvenal.

Dramatic, is that wherein several persons discourse together, whether they be nameless, as in the first of Persius, or have names, as of Catius and Damasippus.

Mixt, is a compound of both the former; as that fine one of Horace, *Ibam forte via sacra.*

Grave, and animated, which inveigh with warmth and earnestness against corruption, and vice in every shape: as those of Juvenal and Persius.

Sportive, and lighter, which seem to play with men's follies, but in playing omit no opportunity of making them feel the lash. Such are those of Horace, which are hence said to be *sermoni propiora.*

The *grave* sort brandishes a naked sword; the *sportive* presents a thyrsus, like that of the ancient *Satyrs* surrounded with vine leaves, with which it stabs unawares. The heat of the former sometimes degenerates into fury and indignation; and the calmness of the latter sometimes sinks into mere raillery; but between the two extremes are many intermediate species and degrees. The former, especially when dictated by passion, is much the easiest; nothing is more difficult than to make people of taste laugh, even at the expence of others. The attainment of this must be the fruit of genius and talents rather than of rules; perhaps it may be unnecessary to explain either, since vanity, self-love, and even malice are masters, more than sufficient for a poet who wants not wit and judgment. Thus Juvenal, *si natura negat, facit indignatio versum*; and Boileau, *La colere suffit & vaut un Apollon.*

In perusing the writings of the two leaders of the two sorts of *satire* last mentioned, it may not be unnecessary to consider, that they lived in very different times: Horace was intimate with a prince of the greatest goodness and humanity, and his court was formed after his example; and, therefore, the faults which the poet notices, were little inconsistencies in behaviour, false pretences to politeness, or impertinent affectations of what men were not fit for; vices of a coarser sort could not come under his consideration, or enter the palace of Augustus.

Juvenal, on the other hand, lived under Domitian, in whose reign every thing great and noble was banished from the habitations of men in power; therefore, he attacks vice as it passes by in triumph, not as it breaks into conversation. The fall of empire, contempt of glory, and a general degeneracy of manners, are before his eyes in all his writings. In the days of Augustus, to have talked like Juvenal had been madness, or in those of Domitian like Horace. Morality and virtue are every where recommended in Horace, as became a man in a polite court, from the beauty, propriety, and convenience of pursuing them; vice and corruption are attacked by Juvenal in a style, which denotes, that he fears he shall not be heard, unless he calls to them in their own language, with a barefaced mention of the villanies and obscenities of his contemporaries. Tatler, N° 242.

The Italians divide *satire* into *serious*, as that in common use; and *jocose*, *giocosa*, which they also call *bernesca*, and we *burlesque*.

Their chief *satirists* in the serious way are Dante (whom they particularly call *principe satirico*), Ariosto, Aretine, Ercole Bentivoglio, Luigi Alamanni, Jacobo Soldani, Lorenzo Azzolino, Salvator Rosa, Lun. Adimari, and Benedetto Menzini. Those who have excelled in the jocose kind are, Francesco Berni (the inventor of it), Mauro, Firenzuola, Casa, Coppetta Varchi Lasca, Caporali, &c.

Satire is divided into *general*, which is levelled at common abuses wherein numbers are equally interested: and *personal*, which points out and exposes particular characters, more properly called *lampoon*. This last, as it affects men's reputation, on which their interest greatly depends, is scarce distinguishable from defamation and scandal.

To this last class belong most of those which bear the title of *anti*; as the Anti-Baillet of Menage, with which M. Baillet was so stung, that he composed a treatise express on personal *satires*, which bear the title *anti*; to shew the immorality and unlawfulness of them, and their contrariety to the precepts of the Gospel.

It is farther objected to this kind of *satire*, that a public detection, far from producing the effect it is designed for, reformation, is apt to drive men to desperation, and harden them in their course. The excellent author of the Treatise of the Government of the Tongue, speaking of uncharitable truths, says, a discovery of this kind serves not to reclaim, but only to enrage the offender, and precipitate him into farther degrees of ill. Modesty, and fear of shame, is one of those natural restraints which the wisdom of heaven has put on mankind; and he, who once stumbles, may yet, by a check of that bridle, recover himself again. But when, by a public detection, he is fallen under that infamy he feared, he will be then apt to discard all caution, and to think he owes himself the utmost pleasures of vice at the price of his reputation. Nay, perhaps, he advances farther, and sets up for a reversed sort of fame, by being eminently wicked; thus he, who before was but a clandestine disciple, becomes a doctor of impiety. Doubtless it was this sort of reasoning that induced our wise legislators lately to repeal the law which put the brand of infamy in the face of felons. In effect, where crimes are enormous, the delinquent deserves little pity, yet the reporter may deserve less. Vide Tatl. N° 74—76.

Satire, *Greek.* Casaubon makes a distinction between the satirical poetry of the Greeks, and the *satire* of the Romans, which he maintains was peculiar to themselves; in which also he seems to be justified by Quintilian. Inst. Or. lib. x. cap. 1.

For a like reason Horace, *Sat.* I. lib. 2. v. 62. calls *satire*, *Græcis intactum carmen*, a sort of poetry unknown to the Greeks. Spanheim, in his fine preface to the Cæsars of the emperor Julian, has shewn five or six essential differences between those two poems. The Greeks chiefly reprehended vice, &c. in their dramas, though they had also a sort of narrative poems called *silli*, like the Roman and our *satires*. These *silli* were cutting or sarcastic poems, as may be easily seen by the fragments of Timon's silli, with this difference, that the Greek silli were parodies from one end to the other, which cannot be said of the Roman *satire*; or, if we find sometimes a parody in them, it is what the poet did not design, and consequently the parody does not make the essence of *satire*, as it does that of the *silli*.

Scaliger, notwithstanding all this, followed by some of the latest and best critics, scruples not to derive the satirical poetry of the Latins from that of the Greeks. According to these authors, *satire*, in its origin, was a sort of interlude in tragedy, wherein goat-footed *satyrs* were introduced to alleviate the distress, and with their jeers and humour diversify the solemnity of the tragic scene; much like the mimes in comedy, and the fescennines in the Atellan sports.

At first, it was only in the tragedies exhibited in the feasts of Bacchus, that *satyrs*, the supposed companions and priests of that god, were introduced, but afterwards they made a part in the solemnities of the other deities. So that *satire*, in its first institution, was wholly dramatic. Vide Scalig. Poet. lib. i. cap. 11 & 12.

Satire, *Roman.* Dacier, after Casaubon, traces the institution

ſtitution of the Roman *ſatire* very minutely, and diſtinguiſhes three ſpecies or ſtates of it; the firſt *dramatic*, the ſecond *narrative*, the third that called the *Varronean*, or *Menippean ſatire*.

The ancient Romans had been without any ſcenical entertainments for almoſt four hundred years, till chance and merriment, in one of their feſtivals, gave riſe to the Saturnine and Feſcennine verſes, which, for ſome years, ſupplied the place of theatrical performances. Theſe verſes were rude, and without any meaſure, being extemporary, and the productions of a ſavage people, who had no other inſtructors than the fumes of wine. Accordingly they were ſtuffed with groſs railleries, and accompanied with various geſticulations and dances. An idea of them may be formed by conceiving a knot of country fellows dancing in an hobling manner, toſſing about their home-ſpun jokes, and expoſing each other's failings. Thus Horace, Epiſt. i. lib. 2.

Feſcennina per hunc inventa licentia morem
Verſibus alternis opprobria ruſtica fudit.

The ancient Roman *ſatires*, therefore, were a ſort of innocent farces, where the ſpectators and actors were indifferently rallied. And thus they continued till the time of Livius Andronicus, who firſt attempted to write plays in imitation of the Greeks. This new entertainment, appearing more noble and perfect, drew crowds of ſpectators, which occaſioned the *ſatires* to be neglected for ſome time, but they were afterwards reſumed, and tacked to the ends of comedies, much like the modern farces. They were annexed more peculiarly to the Atellan pieces, and, on this occaſion, they changed their name *ſatires* for that of *exodia*, which they ever after retained.

After Livius Andronicus, Ennius, having obſerved the eagerneſs of the Romans for *ſatire*, imagined that poems not accommodated to the theatre, but retaining the gall, raillery, and pleaſantry, of the theatrical *ſatire*, would not fail of ſucceſs. Accordingly, he wrote diſcourſes under the title of *ſatires*, in which he took the liberty of mixing ſeveral ſorts of verſe together, as hexameters with iambic trimeters, and trochaic tetrameters. In theſe pieces were found the ſame variety, raillery, alluſions, fables, and even dialogue, in a word, every thing that conſtituted the character and beauty of the firſt *ſatires*, except the dancing and muſic. Pacuvius ſucceeded, who alſo wrote *ſatires* in imitation of his uncle, or, grandfather Ennius. When Pacuvius was in his prime, Lucilius was born, who alſo compoſed *ſatires*, ſomewhat of a new turn, endeavouring to imitate the character of the ancient Greek comedy, of which the Romans had but an imperfect image in their own *ſatires*. This ſeems to be what Horace meant, when he ſaid, *Satyr*. i. lib. 2.

————*Quid? cum eſt Lucilius auſus*
Primus in hunc operis componere carmina morem.

He could not mean, that the Romans had no *ſatires* before Lucilius, ſince that poet was preceded by Ennius and Pacuvius, whom he imitated. Horace's deſign was only to hint, that Lucilius's manner and turn were new; that he had embelliſhed this poem, inſomuch that he might be looked upon as its firſt author. But, in fact, Lucilius only added to it a little more politeneſs and ſalt, without any other alteration. And though, like Ennius, he did not mix together ſeveral ſorts of verſe in the ſame piece, yet he compoſed different poems, ſome of which were entirely hexameter, others iambic, and others trochaic, as appears from his fragments.

The third kind of *ſatire* was the *Varronian* or *Menippean*, ſo called from its author Varro, the moſt learned of the Romans, and becauſe in this he imitated the manner of Menippus the Gadarenian, a cynic philoſopher.

This *ſatire* was not only a miſcellany of different ſorts of verſe, but was alſo interlarded with proſe, and mixed up Greek and Latin. Seneca's poem on the death of Claudius, Petronius's Satyricon, Lucian's dialogues, the Golden Aſs of Apuleius, and the Cæſars of the emperor Julian, are ſo many *ſatires* in the Varronian taſte. To the ſame head may alſo be referred the Catholicon of Spain, the Moriæ Encomium of Eraſmus, the Don Quixote of Cervantes, the Advertiſements from Parnaſſus of Boccalini, the Tale of a Tub by Dr. S. &c. V. Dacier Diſcours ſur la Satire, in Mem. de Liter. de l'Acad. R. des Inſcr. tom. iii. p. 246. ſeq. And in the preface to his verſion of Horace's *Satires*. V. Rapin Reflex. ſur la Poet. en Partic. § 28. Oeuv. Diverſ. tom. ii. p. 205, ſeqq.

SATIRICAL, ſomething relating to, or that partakes of, the nature of *ſatire*.

We have *ſatirical* poets; *ſatirical* preachers, as South; *ſatirical* hiſtorians, as Burnet and Mezeray; *ſatirical* philoſophers, as Apuleius and Montaigne. In the heathen theology, we find a *ſatirical* god, viz. Momus: Homer, in his Therſites, gives the character of a *ſatirical* courtier. The Dutch have been often charged with *ſatirical* prints and medals, which have ſometimes coſt them dear. *Satirical* poetry had its origin at Athens, though its perfection be owing to the Romans. According to father Mourgues, and Bianchini, it was at firſt a ſort of tragedy acted at the feaſt of Bacchus, wherein Satyrs were introduced converſing with heroes. Burette rather takes it for a ſort of paſtoral farce tacked to the ends of tragedies. One of the chief ornaments of it was a wild, groteſque ſort of dance performed by Satyrs, and called *ſicinnis*. See DANCING.

The *ſatirical* ſhews of the Greeks were abſolute maſquerades; the actors herein were diſguiſed variouſly, ſome in the habits of Satyrs, Sileni, Centaurs, Mænades, and other of Bacchus's crew; while others perſonated giants, cyclopes, monſters, and even beaſts; the whole making a medley more romantic and extravagant than any thing on the modern ſtage, unleſs perhaps ſome of our late groteſque pantomime entertainments. The only piece of the kind now extant is the ΚΥΚΛΩΨ of Euripides.

SATIRIC *fountain*. See FOUNTAIN.

SATIRIST, a writer of SATIRE.

SATISDATIO, or STIPULATIO, in the *Roman Law*, anſwers to our BAIL *above*, and was mutually given by each litigant party to the other; by the plaintiff, that he would proſecute his ſuit, and pay the coſts if he loſt his cauſe; in like manner as our law ſtill requires nominal pledges of proſecution from the plaintiff; and by the defendant, that he would continue in court and abide the ſentence of the judge, much like our ſpecial bail, with this difference, that the ſide juſſores were there abſolutely bound judicatum ſolvere, to ſee coſts and condemnation paid at all events; as our ſpecial bail may be diſcharged by ſurrendering the defendant into cuſtody, within the time ordered by law; for which purpoſe they are at all times intitled to a warrant to apprehend him.

SATISFACIENDUM, *Capias ad*. See CAPIAS.

SATISFACTION, in *Law*, is uſed for the giving of recompence for an injury done; or the payment of money due on bond, judgment, &c. In which laſt it muſt be entered on record.

SATISFACTION, or *atonement*, in *Theology*, is defined to be, that which being done or ſuffered either by an offending creature himſelf, or by another perſon for him, ſhall ſecure the honour of the divine government, in beſtowing upon the offender pardon and happineſs. This ſenſe of the word *ſatisfaction* is agreeable to the uſe of the word in the Roman law, where it ſignifies to content a perſon aggrieved, and is put for ſome valuable conſideration, ſubſtituted inſtead of what is a proper payment, and conſiſtent with a remiſſion of that debt or offence, for which ſuppoſed *ſatisfaction* is made. In this ſenſe Chriſt is ſaid by many divines to have made *ſatisfaction* for the ſins of the penitent and ſincerely obedient. See EXPIATION, PROPITIATION, and SACRIFICE.

SATISFACTION, in a *Popiſh ſenſe*. See PENANCE and POPERY.

SATRAPA, or SATRAPES, in *Antiquity*, a governor of a province among the ancient Perſians.

King Darius uſually walked attended by his principal lords and *ſatrapæ*, Q. Curtius. The kingdom of Perſia was divided into *ſatrapes*, or juriſdictions of *ſatrapæ*.

The word is originally Perſian, ſignifying, ſtrictly, admiral, or commander of a naval army; but it was afterwards applied indifferently to all governors of provinces. In which ſenſe it was alſo borrowed by the Greeks, who uſed the word σατραπης in the ſame ſignification.

We alſo meet with the word in ſome ancient Engliſh charters of king Ethelred, where the lords, who ſign next after the dukes, take the title of *ſatrapes* of the king. Du-Cange takes the word here to ſignify miniſters of the king.

SATTIN, or SATIN, a kind of ſilken ſtuff, very ſmooth and ſhining, the warp whereof is very fine, and ſtands out; the woof coarſer, and hidden underneath; on which depend that gloſs and beauty which give it its price.

The word comes from the French *ſatin*; which Menage derives farther from the Latin *ſeta*, *a briſtle* or *hair*; others from the Hebrew *ſadin*, or from the old French *ſade* and *ſadinet*, *handſome*, *genteel*.

There are ſome *ſattins* quite plain, others wrought, ſome flowered with gold or ſilk, others ſtriped, &c. All the varieties in the fabric of *ſattins* are made by uſing new warps, or woofs. The fineſt *ſattins* are generally ſaid to

to be those of Florence and Genoa, yet the French will not allow those of Lyons any thing inferior thereto. The *sattins* of Bruges have their warp of silk, and their woof of thread.

Indian *sattins*, or *sattins* of China, are silken stuffs, much like those manufactured in Europe. Of these, some are plain, either white, or of other colours; others worked either with gold or silk, flowered, damasked, striped, &c. They are mostly valued because of their cleaning and bleaching easily, without losing any thing of their lustre. In other respects they are inferior to those of Europe.

F. le Comte observes, that the Chinese prepare their *sattins* in oil, to give them the greater lustre; but this makes the dust liable to hang to them.

SATTIN *flower*, and *white sattin*, in *Botany*. See HONESTY.

SATTINET, or SATTINADE, a very slight, thin sort of sattin, chiefly used by the ladies for summer night-gowns, &c. and ordinarily striped. The word is a diminutive of sattin.

SATURANTIA is sometimes used in the same sense as ABSORBENTS.

SATURATION, in *Chemistry*, is the impregnation of an acid with an alkali, or *vice versa*, till either will receive no more, and the mixture becomes neutral. The term is more generally applied to any menstruum that is capable of dissolving any substance, or of absorbing and uniting with any fluid; thus the air is said to be *saturated* with water, when it can dissolve and retain no more, &c. and the limit of its capacity of solution is called the *point of saturation*. This is different in different substances that tend to unite with each other. See AFFINITY.

SATURDAY, the seventh or last day of the WEEK, so called, as some have supposed, from the idol Seater, worshipped on this day by the ancient Saxons, and thought to be the same as the Saturn of the Latins. *Saturday* answers to the Jewish SABBATH.

SATURDAY-*stop*, a space of time, in which, of old, it was not lawful to take salmons in the North, viz. from even-song on *Saturday*, till sun-rising on Monday.

SATUREIA, in *Botany*. See SAVORY.

SATURN, in *Astronomy*, one of the primary planets; being that which is farthest from the earth, and the sun; and whose motion is the slowest, if we except the *Georgium* SIDUS, as it is now called, lately discovered by Mr. Herschel. It is thus characterized, ♄.

Saturn shines but with a feeble light, by reason of its distance; on which account also, though the biggest of all the planets, it appears the smallest.

For the apparent diameter, relative distance, and excentricity of the orbit of *Saturn*, see DIAMETER, DISTANCE, and EXCENTRICITY.

For the real diameter of *Saturn*, its content, period, distance from the sun, inclination of its orbit, quantity of matter, density, &c. see PLANETS.

Dr. Halley observes, in the preface to his catalogue of the southern stars, that he has found *Saturn* to have a slower motion than is assigned him in the tables: this irregularity is abundantly rectified in his own tables.

It has been doubted whether or no *Saturn*, like the other planets, revolves on his axis: it does not appear from any astronomical observation, that he does; and there is one circumstance that should seem to argue the contrary; viz. that whereas the earth, and other planets, which we know do revolve on their axes, have their equatorial diameter greater than their polar, nothing like this is observed in *Saturn*.

However, if we argue from analogy, it is most probable that this planet also, as well as the others, revolves upon its axis; although, because it has no visible spots upon his body, whereby to determine this revolution, the length of his days and nights, and the position of his axis, are unknown to us.

The distance of *Saturn* from the sun being $9\frac{1}{2}$ times greater than that of the earth from the same, it is found, that the apparent diameter of the sun, seen from him, will not exceed three minutes; which is near thrice the diameter of Venus. The sun's disk, therefore, to an inhabitant of *Saturn*, will appear 90 times less than it does to us, and both its light and heat will be diminished in the same proportion.

Hence some have concluded that *Saturn*, as well as Jupiter, whose light and heat are only $\frac{1}{28}$ part of ours, are entirely unfit for rational inhabitants. But that their light is not so weak as we imagine is evident from their brightness in the night-time. Besides, allowing the sun's LIGHT to be 45000 times as strong, with respect to us, as the light of the moon when full, the sun will afford 500 times as much light to *Saturn* as the full moon does to us, and 1600 times as much to Jupiter. So that these two planets, even without any moons, would be much more enlightened than we at first imagine; and by having so many they may be very comfortable places of residence. Their heat, so far as it depends on the force of the sun's rays, is certainly much less than ours; to which no doubt the bodies of their inhabitants are as well adapted as ours are to the seasons we enjoy. And if we consider that Jupiter never has any winter, even at his poles, which probably is also the case with *Saturn*, the cold cannot be so intense on these two planets as is generally imagined. To this we may add, that there may be something in the nature of their mould warmer than in that of our earth; and we find that all our heat does not depend on the rays of the sun; for if it did, we should always have the same months equally hot or cold at their annual return, which is very far from being the case.

To such eyes as ours, unassisted by instruments, Jupiter is the only planet that can be seen from *Saturn*; and *Saturn* the only planet that can be seen from Jupiter.

The phases of *Saturn* are very various and extraordinary, and long perplexed the astronomers, who could not divine the meaning of such irregularity: thus Hevelius observed him to be sometimes *monospherical*, sometimes *trispherical*, *spherico-ansated*, *elliptico-ansated*, and *spherico-cuspidated*. But Huygens plainly shews, that all these monstrous appearances are owing to the imperfection of the telescopes that author had used. Huygens, upon observing him very attentively with much better glasses, reduced all their phases to three principal ones; viz. *round*, *brachiated*, and *ansated*.

One thing *Saturn* has peculiar to himself; viz. his ring: for the phenomena, &c. of which, see RING.

Saturn performs his course round the sun attended with five satellites, or secondary planets: the periods, distances, &c. whereof, see under SATELLITES.

SATURN, in *Chemistry*, signifies LEAD; in regard that metal is supposed to lie immediately under the influence of this planet.

SATURN, in *Heraldry*, denotes the black colour in the coats of arms of sovereign princes; answering to diamond in the coats of noblemen, and sable in those of gentlemen.

SATURN, in *Mythology*, one of the terrestrial gods; the son of Uranus and Vesta, or Cœlum and Terra. He is represented under the figure of a decrepid old man in fetters, with a long beard, and hoary head; bearing in his right hand a pruning hook or scythe, and in his left a child, which he is about to devour. According to the Roman fable, *Saturn* being dethroned by Jupiter, took refuge in Italy, called from him *Saturnia*, where he introduced several parts of agriculture, particularly the art of pruning and managing their vines, and civilized the people, uniting them to one another in chains of brass, i. e. by brass money, which he invented.

The age in which *Saturn* lived was called the *golden* AGE, because it was pretended by the poets, that the earth brought forth its fruits without the labour of tillage, that all things were common, and that universal harmony prevailed. Virgil has given a beautiful description of this age in his eighth Æneid, and in the first book of his Georgics.

The name *Saturn* is derived by some *a satu*, from sowing; because he is said to have first taught the art of sowing, and tilling the ground, in Italy, and was therefore esteemed the god of husbandry, and called by the Romans *Stercutius*, because he first manured the earth with dung; and on this account he is painted with a sickle. By others his name is derived *a saturando*, from that fulness which is the effect of his bounty; as his wife was called Ops, because she helps the hungry. Others ascribe the name to his being satisfied with the years that he devours; Saturn and Time being the same. Thus Cicero, de Nat. Deorum, *quod ipse saturetur annis quos ipse devorat*. Others again derive the name from *sator vov*, because he is the former of the mind.

A distinguishing character of *Saturn* among the ancients was that of presiding over time; with which the name Χρονος, given him by the Greeks, more particularly agrees. On this account *Saturn* is represented as devouring his children, and casting them up again; as bound in fetters, and furnished with wings, to denote both the slowness and swiftness of time; and as furnished with a scythe.

Rome, and several other cities of Italy, dedicated temples to *Saturn*, and paid him religious worship.

According to Bochart, in his Phaleg. lib. i. cap. 1. *Saturn* and Noah were the same.

SATURNALIA, in *Antiquity*, feasts celebrated among the Romans, in honour of the god Saturn.

The *Saturnalia*, called in the Greek language Κρονια, were instituted either by Tullus, king of the Romans, or, according

cording to Livy, by Sempronius and Minutius, the consuls. Till the time of Julius Cæsar they were finished in one day, viz. the 19th of December; but then they began to be celebrated in three days, and afterwards in four or five, by order of Caligula; and some say, that they have lasted seven days, and when these days were added to the feast, the first day of celebrating it was the 17th of December.

During this solemnity the slaves were reputed masters; they were allowed to say any thing; and, in fine, they were served at table by the masters themselves. Every thing ran into debauchery and dissoluteness, and nothing was heard or seen in the city of Rome, but the din, riot, and disorder of a people wholly abandoned to joy and pleasure.

M. Dacier observes, that the *Saturnalia* were not only celebrated in honour of Saturn, but also to keep up the remembrance of the golden age, when all the world was on a level.

On occasion of this feast, presents were sent from friends to one another; no war was to be proclaimed, and no offender executed; the schools observed holy-day; and the senate did not sit.

The *Saturnalia* were not only observed at Rome, but also in Greece; and were in reality, much older than Rome itself. Some ascribe their institution to the Pelasgi, who were cast upon the island of Delos; others to Hercules; and others to Janus. Goropius Becanus makes Noah the author of them. Orig. lib. iv. Vossius goes still higher, and will have it, that the Saturn, in honour of whom this feast was instituted, was Adam.

SATURNI *extractum*. See *Extract of* LEAD.

SATURNI, *saccharum*. See SACCHARUM.

SATURNIAN, *saturnius*, in *Ancient Poetry*, a kind of IAMBIC verse used in satirical writings: it consisted of six feet and a syllable over, and thence called *trimeter hypercatalectus*.

SATURNILLIANS. See SATURNINIANS.

SATURNINE, or SATURNIAN, a term applied to persons of dark, sullen, melancholic complexions; as being supposed under the predominancy of Saturn, or at whose births Saturn was the ascendant.

SATURNINE *tincture*, *tinctura saturnina*. See TINCTURE.

SATURNINE *water*. See *Water of* LEAD.

SATURNINIANS, or SATURNILLIANS, a sect of ancient Gnostics; thus called from their chief Saturnillus, or Saturninus, a disciple of Menander, the famous Gnostic. See MENANDRIANS.

Saturnillus taught the same errors with his master, in Syria, about the close of the second century; and drew after him many disciples, by the pompous appearance of an extraordinary virtue. He held the doctrine of two principles, from whence proceeded all things; the one a wise and benevolent deity; and the other, matter, a principle effentially evil, and which he supposed under the superintendence of a certain intelligence of a malignant nature. The world and its first inhabitants were (according to the system of this raving philosopher) created by seven angels, which presided over the seven planets. This work was carried on without the knowledge of the benevolent deity, and in opposition to the will of the material principle. The former, however, beheld it with approbation, and honoured it with several marks of his beneficence. He endowed with rational souls the beings, who inhabited this new system, to whom their creators had imparted nothing more than the mere animal life; and having divided the world into seven parts, he distributed them among the seven angelic architects, one of whom was the god of the Jews; and reserved to himself the supreme empire over all. To these creatures, whom the benevolent principle had endowed with reasonable souls, and with dispositions that led to goodness and virtue, the evil being, to maintain his empire, added another kind, whom he formed of a wicked and malignant character; and hence the difference we see among men. When the creators of the world fell from their allegiance to the supreme deity, God sent from heaven, into our globe, a restorer of order, whose name was Christ. This divine conqueror came cloathed with a corporeal appearance, but not with a real body; he came to destroy the empire of the material principle, and to point out to virtuous souls the way by which they must return to God. This way is beset with difficulties and sufferings; since those souls, who propose returning to the supreme being, after the dissolution of this mortal body, must abstain from wine, flesh, wedlock, and, in short, from every thing that tends to sensual gratification, or even bodily refreshment. Mosheim's Eccl. Hist. vol. i. p. 176, Eng. ed. 8vo. 1758.

SATYR, *Satyrus*, Σάτυρος, in the *Heathen Theology*, a fabulous kind of semigod; who, with the Fauns and Sylvans, presided over groves and forests, under the direction of PAN.

The word is usually derived from *sathe*, σαθη, which, in the ancient Greek, signifies the *virile member*; these deities being supposed much addicted to lasciviousness, and hence called *lascivi Satyri*.

The *Satyrs* were painted half men and half goats; the upper part was human, excepting horns on the head; and the lower brutal, with the tail and legs of a goat; the whole covered with hair. See ORANG-OUTANG.

The poets usually confound the *Satyrs*, SYLVANS, SILENI, FAUNS, and PANES.

Nonnus, in his Dionysiaca, makes the *Satyrs* the offspring of Mercury and a Doric nymph, called Ypthima, and gives us the names of several; viz. Pæminius, Thyasus, Hypsichorus, Oristas, Apæus, Phlegræus, Lycon, &c.

Memnon, in his book against the tyrants of Heraclea, derives the *Satyrs* from Bacchus, and a Naiad, called Nicæa.

Satyrs made part of the dramatis personæ in the ancient Greek tragedies, which gave rise to a new species of poetry, called *satirical*. See SATIRE.

SATYRIASIS, σατυρίασις, in *Medicine*, is a violent desire of venery, attended with a tension and rigidity of the pudendum, occasioned by a morbous disposition of the body.

It takes its name, as some will have it, from the relation it bears to Satyrs, who, according to ancient fable, are a kind of demons, extremely addicted to wine and venery: or, as others say, from the herb satyrion, which has an extraordinaey power of exciting venereal desires.

Antecedent causes of this disorder are medicines taken as provocatives to venery; which are acrimonious, incentive, and prejudicial to the nerves. Or the disease may be occasioned by an intemperate and unseasonable indulgence in venery. It is an affection common to both sexes. See PRIAPISM.

SATYRION, *satyrium*, *lizard flower*, in *Botany*, a genus of the *gynandria diandria* class. Its characters are these: it has a single stalk, and the flowers have no empalement, but sit upon the germen; they have five oblong oval petals, three outer and two inner, joined in a helmet, and a one-leaved nectarium, situated on the side between the division of the petals; the upper lip is short and erect, the under plain and hanging downward, their base represents the hinder part of a scrotum; they have two short slender stamina, sitting upon the pointal, having oval summits, with double cells shut up in the upper lip of the nectarium; it has an oblong twisted germen, sitting under the flower, having a short style growing on the upper lip of the nectarium, crowned by an obtuse compressed stigma; the germen becomes an oblong capsule with one cell, having three keels and three cells, opening under the keels three ways, and filled with small seeds. Miller enumerates four, and Linnæus eight species.

The root is called by this name, because of its fancied promotion of lust.

Dioscorides distinguisheth this from the ORCHIS; but Mr. Dale makes it the same. It passes for a great cordial and restorer; but its shape, resembling the human testicles, seems to be the chief foundation of the opinion of its virtues.

SAVADILLOS. See *Yellow* LOUSE-*wort*.

SAVAGES, or SALVAGES, wild, barbarous people, without any fixed habitation, religion, law, or policy.

The word is formed from the Italian *salvagio*, of *salvaticus*, *selvaticus*, or *silvaticus*; which we find used in the barbarous Latin for *silvestris*, belonging to the woods.

A great part of America is peopled with *savages*. Many, some say, most of the *savages* are ANTHROPOPHAGI.

SAVANT. See SCAVANT.

SAUCE, *white*. See WHITE.

SAUCE *alone*, in *Botany*. See *Hedge* MUSTARD.

SAUCIDGE. See SAUSAGE.

SAUCISSE, *sausage*, in the *Military Art*, a long train of powder sewed up in a roll of pitched cloth, and sometimes of leather, about two inches in diameter; serving to set fire to mines or caissons. It is usually placed in a wooden pipe, called an *auget*, to prevent its growing damp.

The length of the *saucisse* is to extend from the chamber of the mine to the place where the engineer stands to spring it. There are usually two *saucisses* to every mine; that if the one should fail, the other may take effect.

SAUCISSON, French, signifying literally a *big sausage*, in *Fortification*, a kind of faggot, made of thick branches of trees, or of the trunks of shrubs, bound together; whose use is to cover the men, and to serve as epaulements;

ments; and alſo to repair breaches, ſtop paſſages, make traverſes over a wet ditch, &c.

The *sauciſſon* differs from a *faſcine*, which is only made of ſmall branches; and by its being bound at both ends, and in the middle.

Anciently, they made the *sauciſſon* forty-ſix feet long, and fifteen feet thick; ſince, it is uſually twenty-three feet long, and twelve thick; bound ſtrongly together with three bands ſtrengthened with iron.

SAUEL, in *Ichthyology*, a name given by the Portugueſe to a kind of fiſh, very frequent on the coaſts of China, which by the natives is called *xiyu*. In the months of April and May vaſt numbers of them are taken in the river Kiang, near Nanking: during which time one of the moſt honourable of the emperor's eunuchs takes care to have ſeveral ſhips filled with theſe fiſh; which being put into the ſhips alive, are buried, as it were, in ice provided for that purpoſe, and in this manner preſerved for the ſummer's proviſion of the emperor. The ſhips made uſe of to carry theſe fiſh to the emperor's court at Pekin, are of the neateſt kind, and richly adorned; and all other veſſels are obliged to make way for them.

SAVELIN, in *Ichthyology*, the name of a truttaceous fiſh of the umbla or umbra kind, caught in the Danube, and in ſome other large rivers. Its back is black; its ſides ſpotted with yellow ſpots; and its belly and the belly-fins are yellow; the ſcales are very ſmall, and on the head there is a very remarkable ſeries of ſpotted lines running into a ſingular figure, and ſurrounding the eyes, and running afterwards to the angle of the gills; the upper jaw is much longer than the lower. Its moſt frequent ſize is about a foot in length, but it ſometimes comes up to ſix or eight pounds in weight. It is a very fine taſted fiſh. Willughby.

SAVER DE FAULT, in *Law*, ſignifies to excuſe a fault: as when a man, having made default in court, comes afterwards and alleges good cauſe why he did it; as impriſonment at the time, or the like. See DEFAULT.

SAVIN, *ſabina*, in *Medicine*, is a famous hyſteric and attenuant; it promotes the diſcharges by urine; but its great effect is the promoting the menſes, which it will do more forcibly than ſafely, if not under very careful management.

It is kept in the ſhops as an ingredient in many compoſitions, but it is very rarely uſed in extemporaneous preſcription.

The eſſential oil, obtained by diſtilling the leaves and tops with water, is accounted one of the moſt potent emmenagogues, and it is likewiſe a ſtrong diuretic.

Savin is a ſpecies of JUNIPER, which is a native of ſome of the ſouthern parts of Europe, and raiſed with us in gardens.

SAVIN, *Indian*. See BAUHINIA.

SAVIOUR. *Order of St.* SAVIOUR. See BRIGITTINS.

By the conſtitutions of this order, it is principally appointed for women, who are to pay a particular honour and ſervice to the Virgin. The monks are only to afford them the ſpiritual aſſiſtances they may need, to adminiſter them the ſacraments, &c.

The number of nuns is fixed to ſixty in each monaſtery, and that of monks to thirteen, according to the number of apoſtles, whereof St. Paul makes the thirteenth.—Four of them are to be deacons, to repreſent the four doctors of the church, and eight converts; the whole number making ſeventy-two, the number of the diſciples of our Saviour.

Setting aſide theſe circumſtances, and the habit, this order is under the rule of St. Auguſtin.

It was approved of by Urban V. and ſeveral ſucceeding popes. In 1603, Clement VIII. made ſome alterations in it, on account of the double monaſteries which then began to be built in Flanders, &c.

SAULTS. See SALT.

SAUNDERS. See SANTALUM.

There are three different woods brought under this name from the Eaſt Indies, in large billets, and ſaid to be the produce chiefly of the iſland Timor, in the Indian ocean.

The *yellow ſaunders* is of a pale yellowiſh or browniſh colour, cloſe even grain, pleaſant ſmell, and bitteriſh, aromatic, pungent taſte. Diſtilled with water it yields a fragrant eſſential oil, thickening in the cold to the conſiſtence of a balſam, and approaching in ſmell to ambergris, or a mixture of ambergris and roſes. Rectified ſpirit extracts, by digeſtion, conſiderably more than water, and yields a rich yellow tincture. This wood, though generally diſregarded, except occaſionally as a perfume, ſeems to have a good claim to the corroborant virtues aſcribed to it by Hoffman and others.

The *white ſaunders* is of a paler whitiſh colour; and, being far weaker than the other, promiſes little medicinal virtue, and has been long neglected.

The *red ſaunders* is of a dull red, almoſt blackiſh, colour on the outſide, and deep brighter red within; its fibres are occaſionally curled, as in knots. This, though recommended as an aſtringent and corroborant, appears to have very little virtue. Its principal uſe is as a colouring drug. To watery liquors it communicates only a yellowiſh tinge, but to rectified ſpirit a fine deep red.—Lewis's Mat. Med.

SAVOR, or SAVOUR, *ſapor*. See TASTE.

SAVORY, *ſatureja*, in *Botany*, a genus of the *didynamia gymnoſpermia* claſs. Its characters are theſe: the flower has an erect, tubulated, ſtriated empalement of one leaf, indented at the brim in five points; and has one ringent petal, whoſe tube is cylindrical and ſhorter than the empalement; the chaps are ſingle, the upper lip erect and obtuſe, having an acute indenture at the point, the under lip is ſpreading, and divided into three equal parts; it has four briſtly ſtamina, two of which are almoſt the length of the upper lip, the other two ſhorter, terminated by ſummits which touch each other; it has a four-pointed germen, ſupporting a briſtly ſtyle, and crowned by two briſtly ſtigmas; the germen becomes four ſeeds, which ripen in the empalement. There are nine ſpecies, two of which are well known under the names of *ſummer ſavory*, and *winter ſavory*.

The leaves of *ſavory* are a warm aromatic, of a grateful ſmell, and a penetrating pungent taſte. They give out the whole of their active matter to rectified ſpirit, with a dark green tincture; to water they give a reddiſh colour and conſiderable ſmell, but little taſte. In diſtillation, with water, they yield a ſmall quantity of a fragrant eſſential oil, very pungent, ſubtle, and volatile. The extract obtained from diſtillation with rectified ſpirit ſmells agreeably, and has a warm, pungent, aromatic taſte.

Winter *ſavory* is much uſed in the kitchens. Miller's Bot. Off.

SAVOY, in *Botany*, a variety of the common white CABBAGE.

SAURITES, a ſtone mentioned by Pliny, and ſuppoſed, by the ancients, to be found in the belly of a lizard. It ſeems to have been a kind of cornelian of a pale fleſh-colour.

SAURURUS, in *Botany*. See LIZARD's *tail*.

SAURUS, in *Ichthyography*, a name given by ſome authors to the *lacertus* or longer gar-fiſh, called *aguglia imperiale* by the Italians, and the *girrock* by the Engliſh fiſhermen.

SAURUS, the *lizard-fiſh*, is alſo a name given by Salvian, and ſome other writers, to a fiſh of the cuculus kind, reſembling the mackrel in figure and taſte, and more uſually called TRACHURUS.

SAUSAGE, or SAUCIDGE, a term of ſome ſignificancy in commerce, denoting a popular food, prepared of ſome crude meat, uſually either pork or veal ſhred ſmall, ſeaſoned, and put up in a ſkin, in manner of a pudding. The word comes immediately from the French *sauciſſe*, which ſignifies the ſame, formed of the Italian *ſalciccia*, and that, according to Salmaſius, from the Latin *ſalciſium*, written for *ſalſum*, *ſalted*.

The moſt eſteemed confection of this kind is the Bologna *ſauſage*, which is much thicker than the common one, and is made with much ſucceſs in ſome cities in Italy, particularly Bologna, Venice, &c. whence great quantities are exported to other places.

It is made of raw pork, well beaten in a mortar, with a quantity of garlick, pepper in the grain, and other ſpices: the Italians are furniſhed with a great part of the ſkins or guts for their *ſauſages* from England: the quantities of that commodity yearly exported are greater than one would imagine.

SAUSAGE, in *War*. See SAUCISSE.

SAUSTRA *beady*, in *Natural Hiſtory*, a name given by the people of the Eaſt Indies to a kind of foſſil, to which they attribute great virtues in medicine.

Before it is given internally, it undergoes a hundred calcinations, and ſeveral preparations with the juices of herbs. When the operation is over, they ſay it will cure a thouſand diſeaſes. It has its name from thence, the word *ſauſtra* ſignifying with them *a thouſand*.

It is a talcy ſtone, and in its native ſtate is of a reddiſh colour.

SAUT, in the *Manege*. See SALTS.

SAUVAGESIA, in *Botany*, the name of a genus of plants of the *pentandria monogynia* claſs, the characters of which are theſe: the perianthium is compoſed of five acute and lanceolated leaves, and remains after the flower is fallen; the flower conſiſts of five plane, erect, obtuſe, emarginated petals, which are longer than the leaves of the cup; the ſtamina are numerous capillary filaments, but half the length of the flower; the antheræ are ſimple; the germen of the piſtil is buried in the

cup;

cup; the ſtyle is ſimple and ſhort; the ſtigmata are ſix, they are of an oblong figure, and of the length of the ſtyle; the fruit is a covered oval capſule, conſiſting of one cell; the ſpatha and capſule open horizontally along the middle; the ſeeds are ſmall and numerous. There is only one ſpecies.

SAW, *ſerra*, an inſtrument ſerving to divide into pieces divers ſolid matters, as wood, ſtone, marble, ivory, &c. The *ſaw* is one of the moſt uſeful machines, in the mechanic arts, ever invented. The fable, which is perhaps founded on ſome ſurer tradition, attributes the invention thereof to Icarus, who, vying with his father Dædalus, enriched the riſing arts with ſeveral diſcoveries. It is added, he took the firſt hint from the ſpine or backbone of a flat fiſh, ſuch as the ſoal. The *ſaw* is made of ſteel, with teeth; but thoſe differently filed, and turned, according to the uſe it is deſigned for. There is alſo a kind of *ſaws* without teeth, uſed in the ſawing of marbles, and other ſtones.

The beſt *ſaws* are of tempered ſteel, ground bright and ſmooth: thoſe of iron are only hammer-hardened: hence, the firſt, beſides their being ſtiffer, are likewiſe found ſmoother, than the laſt. They are known to be well hammered by the ſtiff bending of the blade; and well or evenly ground, by the bending into a bow.

The edge, wherein the teeth are, is always thicker than the back, in regard the back is to follow the edge. The teeth are cut and ſharpened by a triangular file; firſt fixing the blade of the *ſaw* in a whetting block.

When filed, the teeth are to be *ſet*, that is, to be turned alternately aſkew, or out of the right line, to make the wider kerf or fiſſure, that the back may follow the better. This is done by putting an inſtrument, called a *ſaw-wriſt*, between every other two teeth, and giving it a little wrench, which turns one of the teeth a little toward you, and the other a little from you. The teeth are always ſet ranker for coarſe cheap ſtuff, than for hard and fine; becauſe the ranker the tooth is ſet, the more ſtuff is loſt in the kerf; and if the ſtuff be hard, the greater is the labour of ſawing it.

The workmen, who make the greateſt uſe of the *ſaw*, are the ſawyers, carpenters, joiners, eboniſts, ſtone-cutters, carvers, ſculptors, &c. The lapidaries too have their *ſaw*, as well as the workers in moſaic; but theſe bear little reſemblance to the common *ſaws*.

But of all mechanics there are none have ſo many *ſaws* as the joiners; nor of ſo many different kinds. The chief are as follow:

Pit-ſaw, a large two-handed *ſaw*, uſed to ſaw timber in pits. It is ſet rank for coarſe ſtuff, ſo as to make a kerf or fiſſure of almoſt a quarter of an inch; but for finer ſtuff it is ſet finer.

Whip-ſaw, which is likewiſe two-handed, uſed to ſaw ſuch large pieces of ſtuff as the *hand-ſaw* will not eaſily reach.

Hand-ſaw is made for a ſingle man's uſe; of which there are various kinds; as the

Bow or *frame-ſaw*, furniſhed with cheeks: by the twiſted cord and tongue in the middle of the *ſaw*, the upper ends are occaſionally drawn cloſe together, and the lower ſet farther apart.

Tenon-ſaw: this, being very thin, has a back to keep it from bending.

Compaſs-ſaw: this is very ſmall, and its teeth uſually not ſet. Its uſe is to cut a round, or any other compaſs kerf: hence, the edge is made broad, and the back thin, that it may have a compaſs to turn in.

The ſurgeons likewiſe uſe a *ſaw*, to cut off bones. It is to be very ſmall, and light, in order to be managed with the more eaſe and freedom: the blade exceedingly fine, and the teeth exquiſitely ſharpened, to make its way more gently, and yet with more expedition, in amputations of limbs.

The *ſaw* is alſo a gardener's inſtrument, uſed in the pruning of trees, &c. It is chiefly applied in the cutting of old, dry, and conſequently hard woods, whether roots or branches, which might ſpoil the pruning-knife; and branches, which the knife could not well take off at one ſtroke.

Except on theſe occaſions, Quintiney always prefers the knife to the *ſaw*.

Saws on being imported pay the following duties; viz. whip *ſaws* each $11\frac{55}{100}$*d.* drawback on exportation $10\frac{12\frac{1}{2}}{100}$*d.* hand *ſaws* the dozen 1*s.* $3\frac{40}{100}$*d.* drawback on exportation 1*s.* $1\frac{1}{2}$*d.* tenon *ſaws* the dozen 2*s.* $6\frac{80}{100}$*d.* drawback on exportation 2*s.* 3*d.* beſide the uſual duties on iron.

SAW-*fiſh*, in *Ichthyology*, the Engliſh name for the fiſh called by authors the *priſtis ſerra piſcis*, and *ſqualus priſtis* of Linnæus. It has theſe names from the form of its ſnout, which reſembles a large-toothed *ſaw*.

According to the new ſyſtem of Artedi, this is a ſpecies of ſqualus, and is diſtinguiſhed from the other ſpecies of the ſame genus, by the name of the ſqualus with a long, pointed, and flatted ſnout, dentated on each ſide. See *Tab.* IV. *of Fiſh*, N° 46.

This fiſh, from its large ſize, is generally reckoned a kind of whale, but erroneouſly; for it is truly of the ſame genus with the galei, or hound fiſh. It is aſh-coloured on the back, and white on the belly; its head is of a heart-like ſhape, and flatted; its mouth is placed far below the end of the ſnout, and in the upper part of the head, as in the zygæna; its lips are rough and ſharp like a file, but it has no other teeth; its head is terminated by a long and flat bony ſubſtance, furniſhed on each ſide with jaggs or points, like deep teeth of a ſaw; there are from twenty to thirty of theſe teeth on each ſide; the body is round, and grows ſmall towards the tail. The ſword of this fiſh is ſometimes five feet long. It is found in the weſtern ocean.

SAW-*wort*, in *Botany*, a genus of the *ſyngeneſia polygamia æqualis* claſs. Its characters are theſe: the flowers are compoſed of many hermaphrodite florets, contained in one common cylindrical empalement, the ſcales of which are ſpear-ſhaped, ending in acute points; the hermaphrodite florets are equal, funnel-ſhaped, and of one petal; the tube is inflexed, the brim is bellied, and cut into five points; they have each five ſhort hair-like ſtamina, terminated by cylindrical ſummits, and an oval germen ſupporting a ſlender ſtyle, crowned by two oblong reflexed ſtigmas; the germen afterwards turns to a vertical oval ſingle ſeed, crowned with down, which ripens in the empalement. Miller enumerates twelve, and Linnæus fifteen ſpecies.

The common *ſaw-wort* grows in woods and meadows, and flowers in July. It is eſteemed vulnerary, and is ſaid to mundify ulcers, and to promote the generation of fleſh in them, to mitigate the pains of the hæmorrhoids, and to cure an inteſtinal rupture. The herb and root are recommended in caſe of bruiſes in falls from eminences. James.

It ſeems very expreſly proved by Dioſcorides, Pliny, Antonius Muſa, and ſeveral other of the ancients, that the *betonica*, or, as they ſometimes wrote it, *vettonica*, was our *ſerratula*. They mention its growing in woods, and having leaves deeply ſinuated, or cut in, and indented all about the edges, and ſay it grew in wet ſhady places. All this agrees very well with our cut-leaved *ſerratula*, and with the *betonica*, or *vettonica*, of the ancients. Apuleius confounds the *brittanica antiquorum* with the *betonica*, and ſays that it has large leaves like the dock.

SAWING, the application of the ſaw, in dividing of timber, &c. into boards, &c.

There are wind-mills and water-mills, which do the office of *ſawing* wood, with infinitely more expedition and eaſe, than is performed by the hand. They conſiſt of ſeveral parallel ſaws, which are made to riſe and fall perpendicularly, by means of one of the grand principles of motion. A very few hands are here needed, viz. only to puſh forward the pieces of timber, which are laid on rollers, or ſuſpended by ropes, in proportion as the *ſawing* advances. Theſe mills are frequently uſed abroad; and have been alſo introduced in England; but the parliament, in conſideration of this, that they would ſpoil the ſawyers trade, and ruin great numbers of families, thought fit to ſuppreſs them.

The mechaniſm of a *ſawing* mill may be reduced to three principal things; the firſt, that the ſaw be drawn up and down as long as is neceſſary, by a motion communicated by water to the wheel; the ſecond, that the piece of timber to be cut into boards be advanced by an uniform motion to receive the ſtrokes of the ſaw, for here the wood is to meet the ſaw, and not the ſaw to follow the wood, therefore, the motion of the wood and that of the ſaw ought immediately to depend the one on the other; the third, that when the ſaw has cut through the whole length of the piece, the whole machine ſtops of itſelf, and remains immoveable, for fear, left having no obſtacle to ſurmount, the force of the water ſhould turn the wheel with too great rapidity, and break ſome part of the machine.

M. Felibien mentions a kind of long ſaws, invented by one Miſſon, inſpector of the marble quarries in the Pyreneans; by means whereof ſtones are ſawed even in the rock itſelf, whence they are taken. He adds, that ſome of them were made twenty-three feet long; but does not deſcribe either their form or application: he only ſays, they are of iron, and without teeth.

SAXIFRAGE, *ſaxifraga*, compounded of *ſaxum*, *ſtone*, and *frango*, *I break*, in *Botany*, a genus of the *decandria digynia* claſs. Its characters are theſe: the flower hath a ſhort permanent acute empalement, of one leaf, cut into five parts;

parts; it has five plain petals, longer than the empalement, and ten awl-ſhaped ſtamina, terminated by roundiſh ſummits, with a roundiſh acute-pointed germen, ſitting upon two ſtyles, crowned by obtuſe ſtigmas; the germen afterwards becomes an oval capſule, with two horns opening between their tops, filled with ſmall ſeeds. Miller enumerates twelve, and Linnæus thirty-ſix ſpecies.

The leaves of the common white *ſaxifrage* are round, indented, ſucculent, and ſhining, like thoſe of ivy; in the middle of the leaves there riſe ſtalks, about a foot high, which, at their extremities, bear little white flowers, conſiſting of five leaves, diſpoſed in form of a roſe. Its ſeed, which is very ſmall, is incloſed in the capſule, which is a roundiſh pod. Its root divides itſelf into ſeveral fibres, at the bottom whereof are found little reddiſh tubercles, like coriander ſeed.

Theſe are the grains that are commonly called the ſeed of the *ſaxifrage*, and are the part uſed in medicine.—The beſt manner of adminiſtration is, to take them infuſed in white wine, or in a decoction in common water.

In the materia medica we have two very different plants deſcribed under the name of *ſaxifrage*; ſo that the writers on theſe ſubjects ſeem often ſtrangely to contradict one another in their deſcriptions, when they are really deſcribing two perfectly different plants.

The one is the *ſaxifraga antiquorum*. This is a low plant, ſomewhat reſembling thyme, and its ſeed is of an agreeable ſmell, and warm and acrid taſte. The other is the common white meadow *ſaxifrage*, a plant of ſix or eight inches high, with roundiſh leaves and large white flowers. The root of this ſpecies is granuloſe, or made up of a number of ſmall knobs, and theſe are in moſt places uſed in the ſhops under the name of *ſaxifrage* ſeeds. The ſeeds as well as the leaves and roots of *ſaxifrage* were once in great eſteem, as aperients and diuretics, in obſtructions of the menſes, ſtranguries, and nephritic caſes, whence the name; but they have of late loſt their credit.

It may be obſerved, however, that we are not proper judges of what might have been the virtues of an acrid ſeed, while we uſe in its ſtead an inſipid root.

SAXIFRAGE, *burnet*, *pimpinella*, in *Botany*, a genus of the *pentandria digynia* claſs. Its characters are theſe: it has an umbellated flower, the principal umbel compoſed of many rays or ſmaller umbels, neither of which have any involucrums, the greater umbel is uniform; the flowers have five heart-ſhaped inflexed petals, nearly equal, and five ſtamina longer than the petals, terminated by roundiſh ſummits, the germen is ſituated under the flower, ſupporting two ſhort ſtyles, crowned by obtuſe ſtigmas; the germen becomes an oblong oval fruit, divided in two parts, containing two oblong ſeeds, plain on the inſide, convex on the other, and furrowed. Miller enumerates ſeven, and Linnæus five ſpecies, of which the common ANISE is one.

The roots of the greater *burnet ſaxifrage* with a white umbel have a hot and pungent, but not very durable, taſte; their virtue is extracted partially by water, and completely by rectified ſpirit. When large quantities are diſtilled with water, there ſeparates from the water a ſmall portion of a yellowiſh eſſential oil, extremely acrid and fiery. The leaves and ſeeds of the plants have likewiſe a conſiderable acrimony; the leaves leſs than the ſeeds, and both leſs than the roots. This pungent root is in great eſteem among the Germans, as a warm ſtimulating reſolvent, aperient, diaphoretic, &c. in weakneſs of the ſtomach from viſcid phlegm, infarctions of the breaſt, tumors and obſtructions of the glands, impurities of the blood, and, in general, wherever tenacious humours are to be attenuated, or the fluid ſecretions promoted. It is an uſeful ingredient in our officinal compound arum powder; and it is alſo employed as a maſticatory for ſtimulating the ſalival glands, and in gargariſm for diſſolving viſcid mucus in the fauces. Lewis Mat. Med.

SAXIFRAGE, *golden*, *chryſoſplenium*, in *Botany*, a genus of the *decandria digynia* claſs. Its characters are theſe: the empalement is divided into four or five parts, which ſpread open, are coloured, and permanent; the flower has no petals, but eight or ten ſtamina, which are ſhort, erect, and ſtand oppoſite to the angles of the empalement; the germen is immerſed in the empalement, which afterward becomes a capſule with two beaks, opening with two valves, and filled with ſmall ſeeds.—There are two ſpecies, which grow wild in many parts of England.

SAXIFRAGE, *meadow*, a ſpecies of *peucedanum*. See *Hog's* FENNEL.

SAXIFRAGE, *red*, *ſaxifraga rubra*, a name given by ſome botanic authors to the *filipendula*, or DROPWORT.

SAXIFRAGE, *yellow*, *ſaxifraga lutea*, a name given by Fuchſius, and ſome other authors, to the common MELILOT.

SAXON, or the SAXON *language*. See ENGLISH.

SAXON *blue*. See BLUE.

SAXON *green*, in *Dying*. See GREEN.

SAXON *verſion*. See BIBLE.

SAY, or SAYE, in *Commerce*, a kind of ſerge; or a very light croſſed ſtuff, all wool; much uſed abroad for linings, and by the religious for ſhirts; and with us, by the quakers, for aprons, for which purpoſe it is uſually dyed green.

There are very conſiderable manufactures hereof at Sudbury, near Colcheſter; alſo at Ypres, Houdſcot, &c. in Flanders, &c. Thoſe made in England are chiefly exported to Portugal and Leghorn.

SAYACU, in *Ornithology*, the name of a Braſilian bird, of the ſize of our chaffinch, and all over of a greyiſh green colour, and very beautifully bright and ſhining in the back and wings. Its beak is black, as are alſo its eyes.

SAYAN, in *Natural Hiſtory*, a name given by ſome to a ſpecies of ſea-ſwallow. This is the bird whoſe neſts are ſo famous an ingredient in ſoups.

SCAB. *Crown* SCAB, in the *Manege*. See CROWN *ſcab*.

SCABBARD, in the *Manege*, is the ſkin that ſerves for a ſheath or caſe to a horſe's yard.

SCABBED *head*, in *Medicine*. See TINEA.

SCABBED *heels*, or *fruſh*, in the *Manege*, is an eating putrefaction upon a horſe's fruſh, which is very hard to cure, and has a noiſome ſmell.

SCABELLUM, in the *Ancient Architecture*, a kind of pedeſtal, uſually ſquare, ſometimes polygonous, very high and ſlender, commonly terminating in a kind of ſheath or ſcabbard, or profiled in manner of a baluſter. Its uſe is to ſupport buſtos, or other relievos, &c.

SCABIES, in *Medicine*. See ITCH.

SCABIOUS, *ſcabioſa*, in *Botany*, a genus of the *tetrandria monogynia* claſs. Its characters are theſe: the common empalement is compoſed of many leaves containing many flowers; it has ſeveral ſeries of leaves ſurrounding the receptacle, upon which they ſit, the inner are gradually ſmaller; the flowers have a double empalement, and ſit upon the germen, the outer is ſhort, membranaceous, folded and permanent, the inner is divided into five awl-ſhaped capillary ſegments; the florets have one erect tubulous petal, cut into four or five parts at the brim; they have four weak, awl-ſhaped, hairy-like ſtamina, terminated by oblong proſtrate ſummits; the germen is ſituated under the receptacle of the florets, ſupporting a ſlender ſtyle, crowned by an obtuſe ſtigma, which is obliquely indented; it afterward becomes an oblong oval ſeed ſitting in the common empalement, and crowned by the cup of the flower. Miller enumerates nineteen, and Linnæus twenty-ſix ſpecies.

The muſk *ſcabious*, and other garden kinds are propagated by ſowing their ſeeds in May or the beginning of June, and the next year they will be very ſtrong, flowering from June to September, and producing ripe ſeeds, which they will not do if ſown early in the ſpring, and ſo made to flower the ſame year. The ſeeds are to be ſown on ſhady borders, and at Michaelmas the young plants are to be removed to the places where they are to remain. They are very hardy, and ſeldom periſh, till after they have ripened their ſeeds.

The common *ſcabious* of our corn-fields has been accounted a great alexipharmic and pectoral; and made an ingredient in ptiſans, and infuſions given in coughs and all diſorders of the lungs, and recommended greatly by authors in pleuriſies, quinzies, coughs, aſthmas, and conſumptions. Some have recommended it in malignant fevers, and even in the plague.

It has been alſo uſed externally, either in a ſtrong decoction, or elſe boiled into an ointment with lard, in the itch, and many other diſorders of the ſkin; whence it has its names, viz. from *ſcabies*, *itch*; and upon which account it is often met with in decoctions, and ſometimes in a ſyrup, among ſuch things as are called ſweeteners: but it ſeems now, in a great meaſure, to have loſt its credit and uſe.

SCABIOUS, *ſheep's*. See JASIONE.

SCABRITA, in *Botany*, a genus of the *tetrandria monogynia* claſs. Its characters are, that the corolla has a ſingle petal, and is ſalver-ſhaped; the ſeeds are two, and emarginated; and the calyx is truncated. There is only one ſpecies.

SCABROUS *leaf*, among *Botaniſts*. See LEAF.

SCABROUS *ſtalk*. See STALK.

SCAD, the Engliſh name of a fiſh, reſembling the mackrel in ſhape, called by writers the *trachurus*. See *Horſe* MACKREL.

SCÆNANTH, or SCHÆNANTH, in the *Materia Medica*, the dried ſtalk of a plant brought to us from Arabia.

This plant is called, by the generality of botaniſts, *juncus odoratus*, and *aromaticus*; but Linnæus gives it the name of ISCHÆMUM, under which head its botanical characters are deſcribed.

The ſtalk is uſually eight or ten inches in length, ſometimes conſiderably more; it is ſmooth and gloſſy on the ſurface, and about the thickneſs of a wheat ſtraw, but much more rigid and firm. It is round, jointed, and not ſolid, but has a cavity in it filled with a central pith, like that of our common ruſhes. Its colour is yellowiſh at the baſe, or toward the root, but toward the top it is purpliſh or greeniſh; it is very light, yet conſiderably hard, and is of a fragrant or aromatic ſmell, in which we may diſcover ſomething of a mixed ſcent, between that of the roſe and penny-royal. Its taſte is acrid and bitteriſh, but not unpleaſant.

It ſhould be choſen freſh, ſound, and clean, not duſty, or decayed, of a good ſmell and ſtrong acrid taſte.

The word *ſchænanth*, ſignifying the flower of the ruſh, might naturally lead us to ſuppoſe, that what we now receive under that name, is not the drug that was ſo called by the ancient Greeks and Romans, and ſome have very vigorouſly ſupported this opinion. But on enquiry into the Grecian materia medica, we find that none of their *ſchænanth* had flowers on it any more than ours.

The ancients uſed the whole plant in medicine, ſtalk, leaves, and flowers; its virtue reſiding pretty equally in every part of it, as is manifeſt from every part's poſſeſſing the ſame ſmell and taſte, and having the ſame pungency in the mouth.

They preſcribe it as a deobſtruent and promoter of the menſes; but at preſent it is never heard of in extemporaneous preſcription, only kept as an ingredient in ſome compoſitions. Hill's Hiſt. Mat. Med.

SCAFFOLD, a timber work, raiſed in manner of an amphitheatre, to place ſpectators upon for the commodious viewing of ſome ſhew or ceremony.

Some derive the word from the German *ſchawhaus*, which ſignifies the ſame, compounded of *ſchawen, to look, view*, and *haus, houſe*. Guyet derives it from the Italian *catafalco*, which ſignifies the ſame thing. Du-Cange, from *eſchafaudus*, a word in the corrupt Latin, ſignifying a *tribunal*, or *pulpit*: he adds, that it might come originally from *cata*, a wooden machine uſed to carry earth to fill up ditches, and carry over the ſoldiers to the attack; whence the Italians formed their *catafalco*, the old French their *chafaut*, the monks their *ſcaffaldus*, and finally the Engliſh their *ſcaffold*.

SCAFFOLD is alſo uſed for a little ſtage, or theatre, raiſed in ſome public place, to execute criminals upon, either by beheading or breaking upon the wheel.

SCAFFOLD, or SCAFFOLDING, is alſo uſed for an aſſemblage of planks and boards, ſuſtained by treſſes, or by pieces of wood fixed in the wall, whereon maſons, ſculptors, painters, &c. ſtand to work in high places, cielings, &c.

SCAGLIOLA is an imitation of marble of any ſort, with reſpect to which the artiſt ſucceeds in an aſtoniſhing degree with the moſt beautiful marbles, ſuch as Sienna, jaſper, brocatello, and porphyry: it is hard, and when finiſhed bears a very fine poliſh. It is laid on brick in the manner of ſtucco, and worked off with iron tools. The Pantheon, in Oxford-ſtreet, has all its columns formed of this material, and, when firſt done, they appear as well as the original marble, and, without accident, laſt for a great number of years, without any material diminution of their beauty.

SCALA, in *Anatomy*. The cochlea, or inner cavity of the ear, is divided by a ſeptum into two canals, called *ſcalæ*: whereof the one, looking towards the tympanum, is called the *ſcala tympani*; the other, having a communication with the veſtibulum, is called the *ſcala veſtibuli*. See COCHLEA, EAR, TYMPANUM, and VESTIBULUM.

SCALA, in the *Ancient Architecture*, denotes what in the modern we call a STAIR-CASE.

SCALÆ *gemoniæ*. See GEMONIÆ.

SCALADO, or SCALADE. See ESCALADE, and *Scaling* LADDERS.

SCALARE, in *Natural Hiſtory*, a name given by Rumphius to a peculiar ſpecies of TURBO, or *ſcrew-ſhell*; the ſeveral wreaths of which having an opening between them form an open ſpiral.

SCALD. See BURN.

SCALD *and burns, liniment for*. See LINIMENT.

SCALD *head*, in *Medicine*. See TINEA.

SCALDS, in the *Hiſtory of Literature*, a name given by the ancient inhabitants of the northern countries to their poets; in whoſe writings their hiſtory is recorded.

SCALE, a mathematical inſtrument, conſiſting of one or more lines drawn on wood, metal or other matter, divided into equal or unequal parts, of great uſe in laying down diſtances in proportion, or in meaſuring diſtances already laid down.

There are *ſcales* of ſeveral kinds, accommodated to the ſeveral uſes; the principal are, the *plain ſcale*, the *diagonal ſcale*, *Gunter's ſcale*, and the *plotting ſcale*.

SCALE, *plain* or *plane*, a mathematical inſtrument of very extenſive application and uſe. The lines generally drawn upon it are the following: viz.

		marked
1.	Lines of Equal Parts	E. P.
2.	—— Chords	Cho.
3.	—— Rhumbs	Ru.
4.	—— Sines	Sin.
5.	—— Tangents	Tan.
6.	—— Secants	Sec.
7.	—— Half-Tangents	S. T.
8.	—— Longitude	Long.
9.	—— Latitude	Lat.
10.	—— Hours	Ho.
11.	—— Inclinations	In. Mer.

1. The lines of equal parts are of two ſorts, viz. ſimply divided, and diagonally divided. The firſt of theſe are formed by drawing three lines parallel to one another, at unequal diſtances, (ſee *Tab.* IV. *Geometry, fig.* 98.) and of any convenient length. Divide this length into any number of equal parts that may be thought neceſſary, allowing a certain number of theſe parts to an inch, ſuch as 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, &c. which diviſions are diſtinguiſhed by lines, croſſing the three parallels. Divide the left hand diviſion into ten equal parts, diſtinguiſhed by lines croſſing only the lower parallels, but let the fifth diviſion be ſomewhat longer than the others. And it may be convenient to divide the ſame left hand diviſion into twelve equal parts, laid down upon the upper parallel line, having the third, ſixth, and ninth diviſions diſtinguiſhed by longer ſtrokes than the reſt, of which that at the ſixth is longeſt. There are, uſually, ſeveral of theſe ſimply divided *ſcales* put on rulers one above the other, with numbers on the left hand, ſhewing, in each *ſcale*, into how many equal parts an inch is divided, ſuch as 20, 25, 30, 35, 40, 45, &c. which are ſeverally uſed, as the ſize of the plan to be expreſſed may require.

The uſe of theſe lines of equal parts is to lay down any line expreſſed by a number of two places or denominations, whether decimally or duodecimally divided; as leagues, miles, chains, poles, yards, feet, inches, &c. and their tenth or twelfth parts: thus, if each diviſion be reckoned 1, as 1 league, mile, &c. then each of the ſubdiviſions will expreſs $\frac{1}{10}$ part thereof; and if each of the large diviſions be called 10, then each ſmall one will be 1; and if the large diviſions be 100, then each ſmall one will be 10, &c. Conſequently, to lay off a line $8\frac{7}{10}$, 87, or 870 parts, as leagues, miles, &c. ſet one point of the compaſſes on the eighth of the large diviſions, counting from the left hand towards the right, and extend the other point to the ſeventh of the ſmall diviſions, counting from the right hand, towards the left, then are the compaſſes opened to expreſs a line of $8\frac{7}{1}$, 87, or 870 leagues, miles, &c. bearing ſuch a proportion in the plan, as the line meaſured does to the thing repreſented.

If a length of feet and inches was to be expreſſed, the ſame large diviſions may repreſent the feet but the inches muſt be taken from the upper part of the firſt diviſion, which is divided into twelve equal parts; e. g. for a line of 7 feet 5 inches, ſet one point of the compaſſes on the fifth diviſion among the 12, counting from the right hand to the left, and extend the other to ſeven among the large diviſions; and that diſtance laid down in the plan ſhall expreſs a line of 7 feet 5 inches.

The ſecond or diagonal diviſions are formed by drawing eleven lines parallel and at equal diſtances (*fig.* 99): divide the upper of theſe lines into ſuch a number of equal parts, as the *ſcale* to be expreſſed is deſigned to contain, and from each of theſe diviſions draw perpendiculars through the eleven parallels; ſubdivide the firſt of theſe diviſions into ten equal parts, both in the upper and lower lines; then each of theſe ſubdiviſions may be alſo ſubdivided into ten equal parts, by drawing diagonal lines, viz. from the tenth below to the ninth above, from the ninth below to the eighth above, from the eighth below to the ſeventh above, &c. till from the firſt below to the 0th above: ſo that by theſe means one of the primary diviſions on the *ſcale* will be divided into a hundred equal parts.

There are generally two diagonal *ſcales* laid on the ſame plane or face of the ruler, one being commonly half the other

other. The uſe of the diagonal *ſcale* is much the ſame with the ſimple *ſcale*, except that in this a line may be taken of three denominations. From the conſtruction it is plain, that, if each of the primary diviſions repreſents 1, each of the firſt ſubdiviſions will expreſs $\frac{1}{10}$ of 1; and each of the ſecond ſubdiviſions (taken on the diagonal lines, counting from the top downwards) will expreſs $\frac{1}{10}$ of the former ſubdiviſions, or a hundredth of the primary diviſions; and if each of the primary diviſions expreſs 10, then each of the firſt ſubdiviſions will expreſs 1, and each of the ſecond $\frac{1}{10}$: and if each of the primary diviſions repreſent 100, then each of the firſt ſubdiviſions will be 10, and each of the ſecond will be 1, &c. Conſequently, to lay down a line, whoſe length is expreſſed by 347, $34\frac{7}{10}$, or $3\frac{47}{100}$ leagues, miles, chains, &c. on the diagonal line, joined to the fourth of the firſt ſubdiviſions, count ſeven downwards, reckoning the diſtance of each parallel 1, and there ſet one point of the compaſſes, and extend the other till it falls on the interſection of the third primary diviſion with the ſame parallel in which the other foot reſts, and the compaſſes will then be opened to expreſs a line of 347, $34\frac{7}{10}$, or or $3\frac{47}{100}$, &c.

In order to deſcribe the remaining lines of the plane *ſcale*, deſcribe a circumference with any convenient radius (*fig.* 100), and draw the diameters A B, D E, at right angles to each other; continue B A at pleaſure towards F; through D draw D G parallel to B F; and draw the chords B D, B E, A D, A E. Circumſcribe the circle with the ſquare H M N, whoſe ſides H M, M N, ſhall be parallel to A B, E D.

2. For the line of chords, divide the arc A D into ninety equal parts; mark the tenth diviſions with the figures 10, 20, 30, 40, 50, 60, 70, 80, 90; on D, as a centre, with the compaſſes, transfer the ſeveral diviſions of the quadrantal arc to the chord A D, which, marked with the correſponding figures, will become a line of chords. One of the obvious uſes of the line of chords is to lay down a propoſed angle, or to meaſure an angle already laid down.

3. For the line of rhumbs, divide the arc B E into eight equal parts, marking them with the figures 1, 2, 3, 4, 5, 6, 7, 8; and divide each of thoſe parts into quarters: on B, as a centre, transfer the diviſions of the arc to the chord B E, which, marked with the correſponding figures, will be a line of rhumbs: the uſe of which is to delineate or meaſure a ſhip's courſe.

4. For the line of ſines, through each of the diviſions of the arc A D, draw right lines parallel to the radius A C; and C D will be divided into a line of ſines, which are to be numbered from C to D for the right ſines, and from D to C for the verſed ſines, which may be continued to 180° by laying the diviſions of the radius C D from C to E.

5. For the line of tangents, lay a ruler on C, and the ſeveral diviſions of the arc A D, and it will interſect the line D G, which will become a line of tangents, and is to be numbered from D to G with 10, 20, 30, 40, &c.

6. For the line of ſecants, transfer the diſtances from the centre C to the diviſions on the line of tangents to the line A F, from the centre C, and theſe will give the diviſions of the line of ſecants, which muſt be numbered from A towards F, with 10, 20, 30, &c.

7. For the line of half-tangents, lay a ruler on E, and the ſeveral diviſions of the arc A D, which will interſect the radius C A in the diviſions of the half-tangents: mark theſe with the correſponding figures of the arc A D. The ſemi-tangents on the plane *ſcale* are generally continued as far as the length of the ruler on which they are laid will admit. The diviſions beyond 90° are found by dividing the arc A E like the arc A D, and laying a ruler by E, and thoſe diviſions of the arc A E; and the diviſions of the ſemi-tangents above 90° will be obtained on the line C A continued.

The uſes of the *ſcales* of ſines, tangents, ſecants, and half-tangents, are to find the poles and centres of the ſeveral circles repreſented in the *orthographical* and *ſtereographical* PROJECTION of the ſphere.

8. For the line of longitude, divide A H into ſixty equal parts; through each of theſe diviſions parallels to the radius A C will interſect the arc A E in as many points. From E, as a centre, the diviſions of the arc E A, being transferred to the chord E A, will give the diviſions of the line of longitude. If this line be put on the *ſcale*, cloſe to the line of chords, both inverted, ſo that 60° in the *ſcale* of longitude be againſt 0° in the chords, &c. and any degree of latitude be counted on the chords, we ſhall have, oppoſite to it, in the line of longitude, the miles contained in one degree of longitude, in that latitude: the meaſure of one degree under the equator being ſixty geographical miles. However tables anſwer

this purpoſe much better. See DEGREE, and *Parallel* SAILING.

9. For the line of latitude, lay a ruler on A, and the ſeveral diviſions of the ſines on C D, and it will interſect the arc B D in as many points; on B, as a centre, transfer the interſections of the arc B D to the right line B D; number the diviſions from B to D with 10, 20, 30, &c. to 90, and B D will be a line of latitude.

10. For the line of hours, biſect the quadrantal arcs B D, B E, in *a*, *b*; divide the quadrantal arc *a b* into ſix equal parts (giving 15° for each hour), and each of theſe into four others, which give the quarters. A ruler on C, and the ſeveral diviſions of the arc *a b*, will interſect the line M N in the hour, &c. points, which are to be marked as in the figure.

11. For the line of inclinations of meridians, biſect the arc E A in *c*; divide the quadrantal arc *b c* into ninety equal parts; lay a ruler on C, and the ſeveral diviſions of the arc *b c*, and the interſections of the line H M will be the diviſions of a line of inclinations of meridians.

The lines of latitude, hours, and inclinations of meridians are applicable to the practice of DIALLING. Robertſon's Deſcrip. and Uſe of Math. Inſt. ſect. 8. ed. 2. See PLOTTING *ſcale*.

SCALE, *decimal*, *Gunter's*, *plotting*, *proportional*, and *reducing*. See the ſeveral articles.

SCALE, in *Geography* and *Architecture*, a line divided into equal parts, placed at the bottom of a map or draught, to ſerve as a common meaſure to all the parts of the building, or all the diſtances and places of the map.

In maps of large tracts, as kingdoms and provinces, &c. the *ſcale* uſually conſiſts of miles; whence it becomes denominated *a ſcale of miles*.

In more particular maps, as thoſe of manors, &c. the *ſcale* is uſually of chains, ſubdivided into poles or links.

The *ſcales* uſed in draughts of buildings uſually conſiſt of modules, feet, inches, palms, fathoms, or the like.

To find the diſtance between two towns, &c. in a map, the interval is taken in the compaſſes, and ſet off in the *ſcale*; and the number of diviſions it includes gives the diſtance. The ſame method ſerves to find the height of a ſtory, or other part in a deſign.

SCALE, *front*, in *Perſpective*, is a right line in the draught, parallel to the horizontal line; divided into equal parts, repreſenting feet, inches, &c.

SCALE, *flying*, is a right line in the draught, tending to the point of view, and divided into unequal parts, repreſenting feet, inches, &c.

SCALE, *ſcala*, in *Muſic*, is a denomination given to the arrangement of the ſix ſyllables, invented by Guido Aretino, *ut re mi fa ſol la*; called alſo GAMMUT.

It bears the name *ſcale*, q. d. ladder, becauſe it repreſents a kind of ladder, by means whereof the voice riſes to acute, or deſcends to grave; each of the ſix ſyllables being, as it were, one ſtep of the ladder.

SCALE is alſo uſed for a ſeries of ſounds riſing or falling towards acuteneſs or gravity, from any given pitch of tune to the greateſt diſtance that is fit or practicable, through ſuch intermediate degrees as to make the ſucceſſion moſt agreeable and perfect, and in which we have all the harmonical intervals moſt commodiouſly divided.

The *ſcale* is otherwiſe called an *univerſal ſyſtem*, as including all the particular ſyſtems belonging to muſic.—See SYSTEM.

SCALE *of muſic*, *origin and conſtruction of the*. Every concord, or harmonical interval, is reſolvable into a certain number of degrees or parts; the octave, for inſtance, into three greater tones, two leſs tones, and two ſemi-tones; the greater ſixth, into two greater tones, two leſs tones, and one ſemi-tone; the leſs ſixth, into two greater tones, one leſs tone, and two ſemi-tones; the fifth, into two greater tones, one leſs tone, and one ſemi-tone; the fourth, into one greater tone, one leſs tone, and one ſemi-tone; the greater third, into one greater tone, and one leſs tone; and the leſs third into one greater tone, and one leſs tone. It is true, there are varieties of other intervals, or degrees, beſides greater tone, leſs tones, and ſemitones, into which the concords may be divided; but theſe three are preferred to all the reſt, and theſe alone are in uſe. For the reaſon whereof, ſee TONE.

Farther, it is not any order, or progreſſion, of theſe degrees, that will produce melody: a number, for inſtance, of greater tones will make no muſic, becauſe no number of them is equal to any concord; and the ſame is true of the other degrees: there is a neceſſity, therefore, of mixing the degrees to make muſic; and the mixture muſt be ſuch, as that no two of the ſame kind are ever placed next each other.

A natural and agreeable order of theſe degrees Mr. Malcolm

holm gives us in the following diviſion of the interval of an octave, wherein (as all the leſſer concords are contained in the greater) the diviſions of all the other ſimple concords are contained. Under the ſeries are the degrees between each term, and the next. In the firſt ſeries, the progreſſion is by the greater third, in the latter by the leſs third.

	great 2d	gr. 3d	4th	5th	6th	7th	8th
1 :	$\frac{8}{9}$:	$\frac{4}{5}$:	$\frac{3}{4}$:	$\frac{2}{3}$:	$\frac{3}{5}$:	$\frac{8}{15}$:	$\frac{1}{2}$
Key or fund.	great tone.		leſs tone.	ſemi-tone.	great tone.	leſs tone.	great tone. ſemi-tone.

great ſecond.

1 :	$\frac{8}{9}$:	$\frac{5}{6}$:	$\frac{3}{4}$:	$\frac{2}{3}$:	$\frac{5}{8}$:	$\frac{5}{9}$:	$\frac{1}{2}$
key or fund.	great tone.	ſemi-tone.	leſs tone.	great tone.	ſemi-tone.	great tone.	leſs tone.

Now, the ſyſtem of octave containing all the original concords; and the compound concords being only the ſums of octave, and ſome leſs concord; it is evident, that if we would have the ſeries of degrees continued beyond octave, they are to be continued in the ſame order through a ſecond as through the firſt octave, and ſo on through a third or fourth octave, &c. and ſuch a ſeries is what we call the *ſcale of muſic.*

Of this there are two different ſpecies, according as the leſs or greater 3d, or the leſs or greater 6th, are taken in; for both can never ſtand together in relation to the ſame key or fundamental, ſo as to make an harmonical *ſcale.* But if, by either of theſe ways, we aſcend from a fundamental or given ſound, to an octave, the ſucceſſion will be melodious, though the two make two different ſpecies of melody. Indeed, every note is diſcord with regard to the next, but each of them is concord to the fundamental, except the 2d and 7th.

In continuing the ſeries, there are two ways of compounding the names of the ſimple interval with the octave: thus, a greater or leſs tone or ſemi-tone above an octave, or two octaves, &c. or to call them by the number of degrees from the fundamental, as 9th, 10th, &c.

In the two *ſcales* above, the ſeveral terms of the *ſcale* are expreſſed by the proportionable ſections of a line, repreſented by 1, the key or fundamental of the ſeries. If we would have the ſeries expreſſed in the whole numbers, they will ſtand as follows, in each whereof the greateſt number expreſſes the longeſt chord, and the other numbers the reſt in order; ſo that if any number of chords be in theſe proportions of length, they will expreſs the true degrees and intervals of the *ſcale* of muſic, as contained in an octave concinnouſly divided in the two different ſpecies above mentioned.

540 :	480 :	432 :	405 :	360 :	324 :	288 :	270
great tone.	leſs tone.	ſemi-tone.	great tone.	leſs tone.	great tone.	ſemi-tone.	

216 :	192 :	180 :	162 :	144 :	135 :	120 :	108
great tone.	ſemi-tone.	leſs tone.	great tone.	ſemi-tone.	great tone.	leſs tone.	

This *ſcale* the ancients called the *diatonic ſcale,* becauſe proceeding by tones and ſemi-tones.

The moderns call it, ſimply, *the ſcale,* as being the only one now in uſe; and ſometimes, *the natural ſcale,* becauſe its degrees, and their order, are the moſt agreeable and concinnous, and are preferable, by the conſent both of ſenſe and reaſon, to all other diviſions ever inſtituted. Thoſe others, are the *chromatic* and *enharmonic ſcales,* which, with *diatonic,* made the three *ſcales* or *genera* of melody of the ancients.

Many have been the diſputes among ancient and modern muſicians, about the conſtitution of muſical *ſcales.* Some of the ancients, with Euclid, will have it compoſed of tones major and limmas, ſo that the ſeven intervals of an octave would be thus expreſſed $\frac{9}{8}$, $\frac{256}{243}$ $\frac{9}{8}$. $\frac{9}{8}$, $\frac{256}{243}$, $\frac{9}{8}$, $\frac{9}{8}$. Some modern authors have from hence inferred the imperfection of the Greek muſic. They alledge, we here find the ditonus, or an interval equal to two tones major expreſſed by $\frac{81}{64}$, inſtead of the true third major expreſſed by $\frac{5}{4}$. As there can be no queſtion of the beauty and elegance of the latter, the former therefore muſt be out of tune by a whole comma, which is very ſhocking to the ear. In like manner, the trihemitone of the ancients falls ſhort of the third minor by a comma; which is alſo the deficiency of their hemi-tone, or limma, from the true ſemi-tone major, ſo eſſential to good melody. All which errors would make their *ſcale* appear much out of tune to us. A late learned author (Dr. Pepuſch, Philoſophical Tranſactions, N° 48, p. 268) ſays he readily grants the objection, but adds, that ſuch a *ſcale* alſo appeared out of tune to the ancients themſelves, ſince they expreſsly tell us, that the intervals leſs than the diateſſaron, or fourth, as alſo the intervals between the fifth and octave, were diſſonant, and diſagreeable to the ear. Their *ſcale* here mentioned, and called by ſome *ſcala maxima,* was not intended to form the voice to ſing accurately, but was deſigned to repreſent the ſyſtem of their modes and tones, and give the true fourths and fifths of every key a compoſer might chooſe. Now if, inſtead of tones major and limmas, we take the tones major and minor, with the ſemi-tone major, as the moderns contend we ſhould, we ſhall have a good *ſcale* indeed, but a *ſcale* adapted only to the concinnous conſtitution of one key; and whenever we proceed from that into another, we find ſome fourth or fifth erroneous by a comma. This the ancients did not admit of. If to diminiſh ſuch errors, we introduce a temperature, we ſhall have nothing in tune but the octave; ſo that this *ſcale* of the ancients was not deſtitute of reaſon, and no good argument againſt the accuracy of their practice can from thence be formed.

The names of the notes of the Greek *ſcale,* ſee under Diagram.

The deſign of the *ſcale of muſic* is, to ſhew how a voice may riſe and fall leſs than any harmonical interval, and thereby move from the one extreme of any interval to the other, in the moſt agreeable ſucceſſion of ſounds. The *ſcale,* therefore, is a ſyſtem exhibiting the whole principles of muſic, which are either harmonical intervals (commonly called *concords*), or concinnous intervals; the firſt are the eſſential principles, the others are ſubſervient to them, to make the greater variety.

Accordingly, in the *ſcale,* we have all the concords, with their concinnous degrees, ſo placed, as to make the moſt perfect ſucceſſion of ſounds from any given fundamental or key, which is ſuppoſed to be repreſented by 1.

It is not to be ſuppoſed, that the voice is never to move up and down by any other more immediate diſtances than thoſe of the concinnous degrees; for though that be the moſt uſual movement, yet to move by harmonical diſtances, as concords, at once, is not excluded, but is even abſolutely neceſſary. In reality, the degrees were only invented for variety ſake, and that we might not always move up and down by harmonic intervals, though thoſe are the moſt perfect, the others deriving all their agreeableneſs from their ſubſerviency to them.

Add that, beſides the harmonical and concinnous intervals, which are the immediate principles of muſic, and are directly applied in practice; there are other diſcord relations, which happen unavoidably in muſic, in a kind of accidental and indirect manner; for, in the ſucceſſion of the ſeveral notes of the *ſcale,* there are to be conſidered not only the relations of thoſe that ſucceed others immediately, but alſo of thoſe betwixt which other notes intervene. Now the immediate ſucceſſion may be conducted ſo as to produce good melody, and yet among the diſtant notes there may be very groſs diſcords, that would not be allowed in immediate ſucceſſion much leſs in conſonance. Thus in the firſt ſeries, or *ſcale* above delivered, though the progreſſion be melodious, as the terms refer to one common fundamental; yet are there ſeveral diſcords among the mutual relations of the terms; *e. gr.* from 4th to 7th is 32 : 45; and from the greater 2d to the greater 6th is 27 : 40; and from the greater 2d to 4th is 27 : 32, which are all diſcords; and the ſame will happen in the ſecond ſeries.

From what we have obſerved here, and under the article Key, it appears, that the *ſcale* ſuppoſes no determinate pitch of tune; but that being aſſigned to any key, it marks out the tune of all the reſt with relation to it; it alſo ſhews what notes can be naturally joined to any key, and thereby teaches the juſt and natural limitations of melody; and when the ſong is carried through ſeveral keys, yet it is ſtill the ſame natural *ſcale,* only applied to different fundamentals. If a ſeries of ſounds be fixed to the relations of the *ſcale,* it will be found exceedingly defective, but this imperfection is not any defect in the *ſcale,* but follows accidentally from its being confined to this condition, which is foreign to the nature and office of the *ſcale* of muſic.

This is the caſe in muſical inſtruments, and in this conſiſts their great deficiency; for, ſuppoſe a ſeries of ſound, as thoſe of an organ or harpſichord, fixed in the order of this *ſcale,* and the loweſt taken at any pitch of tune, it is evident, 1. That we can proceed from any note, only by one particular order of degrees; ſince from every note of the *ſcale* to its octave, is contained a different order of the tones and ſemi-tones. Hence, 2. we cannot find any interval required from any note upwards or downwards, ſince the intervals from every note to every other are alſo limited. And hence, 3. a ſong may be contrived, that beginning at a particular note of the inſtrument, all the intervals, or other notes, ſhall be found exactly on the inſtrument, or in the fixed ſeries; yet, were the ſong, though perfectly diatonic, begun in any other note, it could not proceed.

In effect, it is demonstrable, that there can be no such thing as a perfect *scale* fixed on instruments, *i. e.* no such *scale*, as, from any note upwards or downwards, shall contain any harmonical or concinnous interval required.

The only remedy for this defect of instruments whose notes are fixed, must be by inserting other notes and degrees betwixt those of the diatonic series. Hence some authors speak of dividing the octave into 16, 18, 20, 24, 26, 31, and other number of degrees; but it is easy to conceive, how hard it must be to perform on such an instrument.

The best of it is, we have a remedy on easier terms; for a *scale* proceeding by twelve degrees, that is, thirteen notes, including the extremes, to an octave, renders our instruments so perfect, that we have little reason to complain. This, then, is the present *scale* for instruments, viz. between the extremes of every tone of the natural *scale* is put a note, which divides it into two unequal parts, called *semi-tones*, whence the whole may be called the *semitonic scale*, as containing twelve semitones betwixt thirteen notes within the compass of an octave.

And to preserve the diatonic series distinct, these inserted notes take either the name of the natural note next below, with the mark ✱ called a *sharp*, or the name of the natural note next above, with this mark ♭ called a *flat*. Malcolm's Treat. of Music ch. 8, 9, 10.

For the *scale* of semi-tones, see SEMITONIC *scale*.

For Guido's *scale*, commonly called the *gammut*, see GAMMUT.

For the *scale* of the ancients, commonly called the *diagram*, see DIAGRAM.

SCALE, *differential*, is used for the *scale* of relation subtracted from unity. See SERIES.

SCALE *of relation*, in *Algebra*, an expression denoting the relation of the terms of recurring series to each other. See SERIES.

SCALE, *hour*. See HOUR.

SCALES, in *Natural History*. What the naturalists understand by *scales*, are certain flat and semi-pellucid bodies, common to the fish, the serpent, and the lizard kind; consisting of a substance somewhat analogous to that of the horns and hoofs of other animals, as is found by cutting and burning them, and by their smell.

The *scales* in fishes are of so many different kinds and shapes, that they afford, in many cases, very good characters for the distinction of the species. The differences of these parts of fish arise from their number, situation, figure, and proportion, and some other qualities peculiar to a few of them.

Their differences, in regard to number, are these: there are none on several kinds of fish, as on the petromyza, the dolphin, and the whales. Upon some other fishes they are but very few in number, as on the conger, the eel, the clariæ, &c. and they are on others found in vastly great numbers, and placed in clusters one over another, as in the pearch, salmon, &c.

In regard to their situation they differ in these particulars. 1. On some fish they are placed extremely thick and close upon one another. 2. In others they stand in imbricated rows. The esoces give us an example of the first, and the cyprini, in general, of the second kind. And, 3. In some they are scattered, and at such distances, that they do not touch one another, as in the congers, the eels, the clariæ, &c. Their differences in figure are not less evident than those in position. 1. Some are roundish, as those of the clupeæ and salmons. 2. Some are oval, or of an oblong round figure, as those of the gadi. 3. In some fish they are straight on one side, and rounded on the others, as in the pearch and mullet. The proper description of these is, that they have a rectilinear base, and rounded sides.

Their differences in proportion are these; they are either in regard to one another, or to the *scales* of other fishes, or according to our senses, in regard to the size of the fish, either very large, great, small, middling, or extremely minute. These are words, which give a sort of useful idea in the description, though they are far from being determinate or regular in their significations.

As to the other peculiar qualities of the *scales* of fishes, they are in some soft and smooth, as in the salmon and cyprini; and in others hard and rough, and, as it were, a little prickly; of this sort are the *scales* of the pearch, the capriscus, and some of the pleuronecti. Artedi, Ichthyol.

Scales of fishes make a set of very curious objects for the microscope; they are formed with a surprising beauty and regularity, and in the different kinds exhibit almost an endless variety in their figure and contexture.

These *scales* are not supposed to be shed every year, nor during the whole life of the fish, but to have an annual addition of a new *scale* growing over, and extending every way beyond the edges of the former, in proportion to the fish's growth, somewhat in the manner as the wood of trees increases annually, by the addition of a new circle next the bark. And as the age of a tree may be known by the number of ringlets its trunk is made up of, so in fishes, the number of plates composing their *scales* denotes to us their age.

Mr. Leewenhoeck took some *scales* from an extremely large carp, forty-two inches and a half long, Rhineland measure, which were as broad as a dollar, these he macerated in water, to make them cut the easier, and then cutting obliquely through one of them, beginning with the first formed, or very little shell in the center, he by his microscope plainly distinguished forty lamellæ, or *scales*, glewed, as it were, to one another, whence he concluded the fish to be forty years old.

It is generally imagined that an eel has no *scales*, but if the slime be wiped clean away, and the skin then examined by a microscope, it is found covered with extremely small *scales*, ranged in a very orderly and pretty manner; and probably very few fishes, except such as have shells, are truly free from *scales*.

The way of preparing *scales* for the microscope is to take them off carefully with a pair of nippers, wash them very clean, and then place them between the leaves of a book to make them dry flat, and when thoroughly dry, they are to be put between two slips of talc. The snake, viper, and eft afford also a very beautiful and very different series of *scales* from those of fishes. Baker's Microscop. p. 237. Leewenhoeck's Arc. Nat. tom. iii. p. 214.

SCALENE, SCALEUM, or SCALENOUS *triangle*, in *Geometry*, a triangle, whose sides and angles are all unequal.

The word is formed from the Greek σκαληνος, which signifies oblique, unequal, &c.

A cylinder or cone, whose axis is inclined to its base, is also said to be *scalenous*.

SCALENUS, or SCALENUM, in *Anatomy*, a name given to three pair of muscles, from their form; all of them serving to draw the ribs upwards, in conjunction with the serratus superior posticus, &c. See Tab. Anat. (Myol.) fig. 2. n. 5. fig. 1. n. 16.

The ancients call them only two in number, afterwards they were divided into six, three lying on each side, but usually there are only two on each side, one lying upon the other.

SCALENUS *primus* springs fleshy from the transverse processes of the second, third, and fourth vertebræ of the neck, where descending laterally, it is inserted into the first rib, which it helps to draw upwards.

SCALENUS *secundus* arises from the same processes, as likewise from those of the fifth vertebra of the neck, and is inserted into the second rib, and sometimes into the third.

SCALENUS *tertius* arises from the same processes with the former, and from those of the sixth vertebra of the neck, and is inserted into the first rib.

The vertebral insertions of the *scaleni* vary, being sometimes confounded with each other, and sometimes with those of the neighbouring muscles. Winslow's Anatomy, p. 220.

SCALENUS *lateralis*, in *Anatomy*, a name given by Albinus to a muscle, called by Cowper and others *scalenus secundus*, and by Winslow, and the French anatomists, *portion anterieur du seconde scalene*. Morgagni calls it *scaleni pars a costa secunda enata*; and Fallopius describes it under the name of *octavi thoracis musculi pars quæ inseritur in secundum*.

SCALENUS *medius*, in *Anatomy*, a name given by Albinus to a muscle called the second *scalenus* by Douglas, and the third *scalenus* by Cowper. The French call it by the name given by Winslow, *la portion ou branche posterieur du premier scalene*; and Vesalius has described it under the name of *pars tertii et quarti dorsum moventium*.

SCALENUS *minimus*, in *Anatomy*, a name given by Albinus to a very small muscle, which other writers on this subject have omitted to describe, and which the author acknowledges to be sometimes wanting.

It is very small, and arises from the upper edge of the first rib, and has two caudæ; the one of which is inserted into the lower part of the spine, and the other a little higher. It often wants one, and sometimes the other, or latter of these two caudæ, and is of the same use with the other *scalenus*.

SCALENUS *posticus*, in *Anatomy*, a determinate name given by Albinus to one of the *scaleni*, too much confounded by other authors with the rest of the muscles of that name, as they are in general with one another.

This is the muscle described by Fallopius under the name

name of the *nonus thoracis muſculus*, and by Morgagni under the name of the *ſcaleni pars a ſecunda coſta enata*. The French call it *la portion poſterieur du ſecond ſcalene*.

SCALING *the guns*, denotes the act of cleaning the inſide of a ſhip's cannon, by the exploſion of a ſmall quantity of powder, which effectually blows out any dirt or ſcales of iron which may adhere to the interior ſurface.

Scaling *ladders*. See Ladders.

SCALLION, or Escallion, a ſort of onion which never forms any bulb at the root, but is uſed green in ſpring, before the other ſorts ſown in July are large enough.

This is however very ſcarce in London, the gardeners uſually ſelling in its place the ſhoots of ſuch decayed common onions, as have ſprouted in the houſe. Theſe they plant in a bed early in the ſpring, and they ſoon grow large enough for uſe when they pull them out; and taking off all the old outer coat of the roots, they lay them in bunches, and ſell them in the market for *ſcallions*.

The true *ſcallion* is eaſily propagated by parting the roots in autumn, and planting them three or four together in a hole at ſix inches diſtance. Theſe will grow in any ſoil or ſituation, and will multiply very quickly, and in a very great abundance, and their being hardy enough to endure the ſevereſt winter, and fit for uſe ſo early in ſpring, makes them worthy a place in all kitchen gardens.

SCALLOP. See Pecten. This ſhell-fiſh, whoſe animal is a *tethys*, grows to a large ſize, is found in ſeparate beds, dredged up, pickled and barrelled for ſale. The anatomy of this fiſh lets us greatly into the knowledge of the ſtructure of the parts of other bivalve ſhell-fiſh.

The *ſcallop* is compoſed of two ſhells, which, as in many others, are one concave, and the other plane or flat. The cardo, or hinge, is lightly bent from the concave-ſhell, and thence carried over a part of the plane-ſhell, in the middle, and all the way between, it is firmly connected to a cartilage. In the middle of the length of the cardo there is placed another ſhort, black, and very ſtrong cardo.

It is eaſy to ſee, from hence, to what is owing that remarkable ſtrong power, which this creature has of ſhutting and opening its ſhell; and it is very poſſible, that by means of ſo ſtrong an apparatus of tendons or ligaments as it has in this part, it may be able to move the plane-ſhell in ſo ſwift and regular, as well as forcible and eaſy a manner, that it may uſe it in moving from place to place; and poſſibly it may make a ſort of wing of it, to beat againſt the water, as the pinion of a bird does againſt the air; and what the ancients have ſo frequently ſaid of its moving about in a very ſwift manner, from place to place, may be true, though we have been wanting in later obſervations to ſee it.

For a more particular examination into the ſtructure of this fiſh. See Philoſ. Tranſ. N° 299. p. 567.

Scallop *tyles*. See Tyles.

SCALMUS, among the *Romans*, a block or round piece of wood in a boat, to which the oars were tied with a thong of leather called *ſtrappus*.

Scalmus was alſo uſed to denote the boat, a part being taken for the whole.

SCALPEL, Scalpellum, in *Surgery*, a kind of knife chiefly uſed in diſſections, but which may be occaſionally uſed in many other operations, as in amputations, and to cut off the fleſh and membranes that are between the two bones of an arm or leg, before the bones be ſawed off.

There are two kinds of *ſcalpels*; the firſt cuts on both ſides, and is fixed in an ebony or ivory handle, which, being very flat and thin at the extremity, ſerves to part the membranous and fibrous parts in anatomical preparations.

The other has a back, that is, it only cuts on one ſide; this is crooked, and is very commodious for ſtripping the fleſh off the bones in embalming, making ſkeletons, &c. Scultetus, in his Arſenal, deſcribes ſeveral other kinds of *ſcalpels*, as a deceitful *ſcalpel*, thus called, becauſe it deceives the patient by hiding its blade. It was much uſed by the ancients, in opening and dilating of ſinuſes, but as it is apt to deceive the ſurgeon himſelf, and is, beſides, very ſlow, it is better uſing a common one. A *ſcalpel*, ſharp on both ſides, for ſetons. A little crooked *ſcalpel* for ſeparating the coherence of the eyelids. A ſharp double-cutting *ſcalpel*, with a bone handle, for the cutting off an ægilops. *Scalpels* like ſcolopomachærions, &c. And even the ſcolopomachærion itſelf is a kind of *ſcalpel*.

SCALPER, Scalprum, or Scalping-*iron*, a ſurgeon's inſtrument wherewith to raſp and ſcrape foul, carious bones.

SCALPING, in *Military Hiſtory*, a barbarous cuſtom in practice among the Indian warriors, of taking off the tops of the ſcalps of the enemies ſculls with their hair on; theſe are preſerved as trophies of victory, and thoſe who bring them are rewarded by their chiefs, in proportion to their number.

SCALPRA *dentalia*, inſtruments uſed by the ſurgeons to take off thoſe black, livid, or yellow cruſts, which infeſt the teeth, and not only looſen and deſtroy them, but taint the breath.

According to the varieties of the occaſion, the ſurgeon has theſe inſtruments of various ſhapes and ſizes; ſome are pointed and narrow at the end, others are broader pointed, and have edges; others are hooked, or falciform, but theſe are uſually, for convenience of carriage, all adapted to one handle.

The manner of uſing them is to begin near the gums, ſupporting the blade with the left hand, and ſcraping all along the tooth, till the cruſt is taken off, taking care not to wound the gums, or diſplace the teeth. *Heiſter*.

SCALPTOR *ani*, in *Anatomy*. See Latissimus *Dorſi*.

SCAMILLI *impares*, in the *Ancient Architecture*, a term much contended about among the critics, though, in effect, it ſignifies no more than certain zoccoes or blocks, ſerving to raiſe the reſt of the members of an order, column, ſtatue, or the like, and to prevent their being loſt to the eye, which may chance to be placed below the level, or below the projecture of ſome of the ornaments thereof.

Theſe *ſcammilli* are well enough repreſented by the pedeſtals of ſtatues. See Pedestal.

SCAMMA, *Σκαμμα*, among the *Greeks*, the mark in leaping, or throwing quoits; ſo called, from its being made by digging up the earth.

SCAMMATHA, or Shematta, שמתא, in the *Jewiſh cuſtoms*, a kind of excommunication, and the moſt terrible of all in uſe among that people. Some pretend that this was proclaimed by the ſound of four hundred trumpets, and that a perſon, ſo excommunicated, was never to be received again into the congregation, and that it was even lawful to put him to death; and they derive the term from שם *there*, and מתה *death*, to which they ſuppoſe the expreſſion of St. John to allude, *there is a ſin unto death*; others derive it from שם *name*, אתא *comes* or *approaches*, and ſuppoſe that it anſwers to the *maranatha* of St. Paul, 1 Cor. xvi. 22. and refer it to a tradition among the Jews, derived from Enoch, and recorded Jude ver. 14. See Niddui.

SCAMMONY, *Scammonium*, in *Pharmacy*, an inſpiſſated, gummy reſinous juice, of the root of a plant of the ſame name, growing in Syria, particularly about Aleppo and St. John de Acre, and which, being hardy, will thrive in the open air in England on any ſoil. It is a ſpecies of bindweed. See Convolvulus.

This milky juice flows from an inciſion made in the root, and on ſtanding concretes into ſolid maſſes.

The beſt *ſcammony* is brought from Aleppo, in light ſpongy maſſes, eaſily friable, gloſſy, of different ſhades of colour, from grey, or yellowiſh, to white almoſt to black; when reduced to powder, of a browniſh white colour. That ſhould be choſen which crumbles moſt eaſily betwixt the fingers, becomes inſtantly white on the contact of watery moiſture, and leaves little or no fæces on being diſſolved. Its colour in the maſs affords no criterion of its purity or goodneſs.

The *ſcammony* of Smyrna, and that of the Eaſt Indies, are leſs valued; the firſt as being more heavy, hard, and black, full of ſand and other impurities; the latter, though light, friable, &c. is in reality only a compoſition of common roſin with ſome other violent purgatives. Pomet aſſerts, that both theſe kinds are rather poiſons than remedies.

Scammony has a ſlight unpleaſant ſmell, and a weak bitteriſh ſubacid taſte. It conſiſts of about equal parts of reſinous and gummy matter, and hence diſſolves almoſt totally in a mixture of equal parts of rectified ſpirit and water, i. e. in proof ſpirit. Rectified ſpirit takes up the reſin with ſome part of the gum; if the tincture be inſpiſſated a little, and then mixed with water, the gum continues diſſolved, and the pure reſin precipitates. This gummy reſin is one of the ſtrong ſtimulating cathartics, more kindly in operation, and, therefore, more generally uſed than moſt of the other ſubſtances of this claſs; the doſe is from two or three grains to twelve.

Many ill qualities have been aſcribed to it which it does not poſſeſs, and many correctives have been deviſed which it does not need. See Diagrydium.

In cold, indolent, ſerous habits, *ſcammony* itſelf procures generally a plentiful evacuation, with great eaſe and ſafety;

safety; in inflammatory cases, and with the more irritable dispositions, it is dangerous, but no otherwise so than the rest of the strong purgatives. By the smallness of the dose of this medicine, its easy solubility, and its having little taste, it is fitted for being commodiously taken in almost any form. In the shops we have *scammony* POWDER, and an ELECTARY *e scammonio.*

Agreeable purging troches are prepared by grinding together three drams of *scammony*, four drams of crystals of tartar, four drops of oil of cinnamon, and eight ounces of fine sugar, and moistening the mixture with as much rose water as will render it of a due consistence for being formed; each tablet is made to weigh about a dram, and consequently contains 2½ grains of *scammony*. One of the most elegant liquid preparations, is a solution of the *scammony* in a strong infusion or decoction of liquorice, poured off from the fæces, and aromatised with some grateful distilled water, or aromatic tincture, as those of cardamom seeds. The dried root of the plant, as well as the juice, may deserve notice; as Dr. Russell relates, that a decoction of half an ounce of the root procured five stools, without gripes, sickness, or any uneasiness; and that the decoctions are entirely without smell, and in taste rather sweetish than disagreeable. Neither the stalks, leaves, flowers, nor seeds seemed to have any purgative virtue. Lewis's Mat. Med. Med. Observ. vol. i. p. 13, &c.

The *scammony* now in use, must be very different from that of the ancients, at least in the preparation; because the ancients gave it in much greater doses: hence Fallopius conjectures the modern *scammony* to be adulterated with juice of tithymal.

Some give the name of American *scammony* to mechoacan.

SCAMMONIA MONSPELIACA, *Montpelier scammony*, a name given by some botanical writers to a species of periploca, distinguished by Mr. Tournefort by the name of *periploca Monspeliaca foliis rotundioribus*. This, in the Linnæan system, is a species of *cynanchum*. See *Bastard* DOG's-*bane*.

SCAMPIUSA, in *Botany*, a name used by Myrepsus and others for a plant, which they greatly recommend in the itch, and other cutaneous disorders. This was probably a corruption of *scabiosa*.

SCANDAL, in the *popular language*, is some action, or opinion, contrary to good manners, or to the general sense of a people.

Scandal also denotes a disadvantageous rumour, or report, or an action whereby any one is affronted in public.

For the legal punishment of *scandal*. See SCANDALUM *Magnatum*.

SCANDAL, *stone of*, *lapis scandali*, or *vituperii*, a stone raised in the great portal of the Capitol in Rome, whereon was engraven the figure of a lion, upon which bankrupts or cessionaries being seated bare-breeched, cried with a loud voice, *cedo bonis*, *I surrender my effects*; when, squatting their breech violently three times on the stone, they were acquitted.

It was called the *stone of scandal*, because thenceforward the cessionary became intestable, and incapable of giving any evidence.

Julius Cæsar introduced this form of surrender, after abrogating that article of the laws of the Twelve Tables, which allowed their creditors to cut their insolvent debtors in pieces, and take each his member, or at least to make a slave of him.

SCANDALUM *magnatum*, in *Law*, denotes a scandal or wrong done to any high personage of the land, as peers, prelates, judges, or other great officers, by false or slanderous news or tales, whereby any debate or discord between them and the commons, or any scandal to their persons might arise.

This offence has also given name to a writ granted to recover damages thereupon.

Slanders of this kind, though they be such as would not be actionable in the case of common persons, amount to an atrocious injury, which is redressed by an action on the case, founded on many ancient statutes, viz. Westm. 1. 3 Edw. I. c. 34. 2 Rich. II. c. 5. 12 Rich. II. c. 11. as well on behalf of the crown, to inflict the punishment of imprisonment on the slanderer, as on behalf of the party, to recover damages for the injury sustained. Words also tending to scandalize a magistrate, or person in a public trust, are reputed more highly injurious than when spoken of a private man. It is said, that formerly no actions were brought for words, unless the *slander* was such, as, if true, would endanger the life of the object of it. But it is now held, that for scandalous words, that may endanger a man in law, by impeaching him of some heinous crime, exclude him from society, by charging him with having an infectious disease, impair his trade, by calling a tradesman a bankrupt, a physician a quack, or a lawyer a knave, or affect a peer of the realm, a magistrate, or one in public trust, an action on the case may be had, without proving any particular damage to have happened, but merely upon the probability that it might happen. However, actions for words must be brought within two years after the injury committed. With regard to words not apparently, and upon the face of them injurious, the plaintiff must aver some particular damage to have happened, which is called laying his action with a *per quod*. But mere scurrility, or opprobrious words, which neither in themselves import, nor are in fact attended with any injurious effects, will not support an action. Words of heat and passion, as to call a man a rogue and rascal, if productive of no ill consequence, and not of any of the dangerous species before mentioned, are not actionable; neither are words spoken in a friendly manner, as by way of advice, admonition, or concern, without any tincture or circumstance of ill-will; for in both these cases they are not maliciously spoken, which is part of the definition of *slander*; neither are any reflecting words made use of in legal proceedings, and pertinent to the cause in hand, a sufficient ground of action for *slander*. Also, if the defendant be able to justify and prove the words to be true, no action will lie, even though special damage hath ensued; for then it is no *slander* or false tale. In this case, though there may be damage sufficient accruing from it, yet, if the fact be true, it is *damnum absque injuria*; and where there is no injury the law gives no remedy. Blackstone's Comment. vol. iii. p. 124.

SCANDIACA, in *Botany*, a name given by some authors to the white flowered *lamium*, called ARCHANGEL by others.

SCANDIX, in *Botany*. See SHEPHERD's *Needle*.

SCANDULÆ, in *ancient House-building*, shingles, or flat pieces of wood, used by the Romans instead of tiles to cover houses. This, according to Cornelius Nepos, was the only covering used in Rome till the war with Pyrrhus, or 470th year of the city.

SCANDULARII, among the *Romans*, mechanics who prepared the scandulæ used in covering houses, who were exempted from all public services.

SCANELLO, in the *Italian Music*, is used for the BRIDGE in violins and other instruments. It is the same with *ponticello* and MAGAS.

SCANNING, *scansio*, formed of *scandere*, *to climb*, in *Poetry*, the measuring of a verse, to see what number of feet and syllables it contains, and whether or no the quantities, that is, the long and short syllables, be duly observed.

The term is chiefly used with regard to Greek and Latin verses; the quantities not being well settled and observed in the verses of the modern languages.

Hexameters are *scanned* one way, iambics another, sapphics another.

SCANSOR, in *Ichthyology*, a name given by Gesner to the fish called by the generality of writers LUPUS *piscis*.

SCANTLING, a measure, size, or standard, whereby the dimensions, &c. of things are to be determined.

The word is formed from the French, *eschantillon*, a pattern or specimen.

The term *scantling* is particularly applied to the dimensions of any piece of timber, with regard to its breadth and thickness.

SCANTON, a word used by some to express the fetid smell of wine.

SCAPE-*goat*, in the *Jewish Antiquities*, the goat which was set at liberty on the day of solemn expiation. For the ceremonies on this occasion, see Levit. xvi. 5, 6, &c.

Some say that a piece of scarlet cloth, in form of a tongue, was tied on the forehead of the *scape-goat*. Hofm. Lex. univ. in voc. Lingua.

Many have been the disputes among the interpreters concerning the meaning of the word *scape-goat*, or rather of עזאזל *azazel*, for which *scape-goat* is put in our version of the Bible.

Spencer, who is followed by Witsius, Cocceius, Altingius, Meyer and others, is of opinion that *Azazel* is a proper name, signifying the devil, or evil dæmon, who was worshipped by the heathens, particularly by the Egyptians, under the form of a goat. See his reasons in his book De Leg. Hebr. Ritual. Dissert. viii. Among other things he observes, that the ancient Jews used to substitute the name *Samael* for *Azazel*, and many of them have ventured to affirm, that at the feast of expiation they were obliged to offer a gift to *Samael* to obtain his favour. Thus also the *goat*, sent into the wilderness to Azazel, was understood to be a gift or oblation. Some Christians have been of the same opinion. But Spencer thinks that the genuine reasons of the ceremony were, 1. That the *goat* loaded with the sins of the people, and sent to Azazel, might be a symbolical representation of the

the miserable condition of sinners. 2. God sent the *goat* thus loaded to the evil dæmons, to shew that they were impure, thereby to deter the people from any conversation or familiarity with them. 3. That the *goat* sent to Azazel sufficiently expiating all evils, the Israelites might the more willingly abstain from the expiatory sacrifices of the Gentiles.

However, though it be allowed with Spencer, that the *goat*, which, he says, was sent to *Azazel*, or *the devil*, was not to be considered as a proper sacrifice to him, but merely as being delivered into his power, and given up to his disposal; yet this seems to have been a rite, which might so easily have been interpreted into an encouragement of dæmon worship, that we can scarce admit it to have been a divine institution.

Le Clerc is of opinion, that *Azazel* was the name of a place, either a mountain or cliff, to which the *goat* was led, and from thence, as the rabbies say, it was cast down and killed; but no such place has been specified, except a mountain near Mount Sinai, mentioned by an anonymous writer of very little credit, which must have been too far distant for the *scape-goat* to have been conducted thither from Jerusalem.

The most common opinion is, that *Azazel* is a name given to the *goat* itself, on account of his being let go, as being derived from עז *gnez* or *az*, *goat*, and אזל *azel*, *he hath gone away*. Thus it was understood by our translators, who render it *scape-goat*; the Septuagint likewise render it αποπομπαιος, and the Vulgate *emissarius*. Those who adopt this opinion observe, that as the sacrifice-goat was typical of the expiation of sin by the sacrifice of Christ, the *scape-goat*, which was to have the sins of the people confessed over him, and as it were put upon him, and then to be sent away alive into some desart place, where they would see him no more, was intended to signify the effect of the expiation, namely the removing of guilt, insomuch that it should never more be charged on the once pardoned sinner. Jenn. Jew. Antiq. vol. ii. p. 268, &c.

SCAPEMENT, in *Clockwork*, a general term for the manner of communicating the impulse of the wheels to the pendulum: the ordinary *scapements* consist of the swing-wheel and pallets only, but modern improvements have added other levers or detents, chiefly for the purposes of diminishing friction, or for detaching the pendulum from the pressure of the wheels during part of the time of its vibration. Notwithstanding the very great importance of the *scapement* to the performance of clocks, no material improvement was made in it from the first application of the pendulum to clocks to the days of Mr. George Graham; nothing more was attempted before his time, than to apply the impulse of the swing-wheel, in such manner as was attended with the least friction, and would give the greatest motion to the pendulum. Dr. Halley discovered, by some experiments made at the Royal Observatory in Greenwich, that by adding more weight to his clock, the pendulum was made to vibrate larger arcs, and the clock went faster; by diminishing the weight of the clock, the vibrations of the pendulum became shorter, and the clock went slower; the result of these experiments being diametrically opposite to what ought to be expected from the theory of the pendulum, probably first roused the attention of Mr. Graham, and led him to such farther trials as convinced him, that this seeming paradox was occasioned by the retrograde motion, which was given to the swing-wheel by every construction of *scapement* that was at that time in use; and his great sagacity soon produced a remedy for this defect, by constructing a *scapement* which prevented all recoil of the wheels, and restored to clock pendulum, wholly in theory, and nearly in practice, all its natural properties in its detached simple state; this *scapement* was named by its celebrated inventor *the dead beat*, and its great superiority was so universally acknowledged, that it was soon generally introduced into use, and yet continues in universal esteem; the importance of the *scapement* to the accurate going of clocks, was by this improvement rendered so unquestionable, that artists of the first rate all over Europe, were forward in producing each his particular construction, as may be seen in the works of Thiout l'Ainée M. J. A. Lepaute M. le Roy, M. Ferdinand Bertoud, and Mr. Cumming's Elements of Clock and Watch-work, in which we have a minute description of several new and ingenious constructions of *scapements*, with an investigation of the principles on which their claim to merit is founded; and a comparative view of the advantages or defects of the several constructions. Besides the *scapements* described in the above works, many curious constructions have been produced by eminent artists who have not published any account of them, nor of the motives which have induced each to prefer his favourite construction: Mr. Harrison, Mr. Hindley of York, Mr. Ellicot, Mr. Mudge, Mr. Arnold, Mr. Whitehurst, and many other ingenious artists of this country, have made *scapements* of new and peculiar constructions, of which we are unable, for the above reason, to give any farther account than that those of Mr. Harrison and Mr. Headley had scarce any friction, with a certain mode and quantity of recoil; those of all the other gentlemen, we believe, have been on the principle of the dead beat, with such other improvements as they severally judged most conducive to a good performance.

SCAPHA, in *Anatomy*, is used to express the external circumference of the ear.

It is in surgery used to express a BANDAGE for the head.

SCAPHEPHORI, Σκαφηφοροι, among the *Athenians*, an appellation given to the strangers residing among them, because they were obliged, at the festival Panathenæ, to carry little ships, called *scaphæ*, σκαφαι, which were a sign of their foreign extraction.

SCAPHISM, *scaphismus*, formed of σκαφος, *digging*, of σκαπτω, *I dig*, *hollow*, in *Antiquity*, a kind of torture or punishment formerly in use among the Persians. It consisted in locking the criminal close up within the trunk of a tree bored to the dimensions of his body, only with five holes for his head, arms, and legs, to come through. In this state he was exposed to the sun, and the parts thus appearing were anointed with honey and milk, to invite the wasps and flies.

To increase the torment, they forced the criminal also to eat abundantly, till his excrements, close pent up in the wood, rotted his body. Some authors observe, that persons ordinarily lived forty days in this condition.

The invention is ascribed to Parisatis, queen of Persia, and mother of Artaxerxes Mnemon, and the young Cyrus. It is added, she first ordered it to be practised on the person who brought the tidings of the death of Cyrus.

SCAPHIUM, among the *Romans*, a cup of an oblong form, somewhat resembling that of a boat, whence also it had its name.

Scaphium likewise signifies a kind of dial, which, beside the hours, shewed also the solstices and equinoxes.

SCAPHOIDES, Σκαφοειδης, in *Anatomy*, a bone of the wrist and also of the foot, called also NAVICULARE.

The word is formed of σκαφη, *a boat*, or *bark*; of σκαπτω, *I hollow*, because boats were originally made of trunks of trees hollowed, as are still the canoes of several savages, and ειδος, *form*.

The *scaphoides carpi*, has a convex side next the radius, by which it is articulated with the basis of that bone, and with a tubercle, which is one of the four eminences on the concave side of the carpus. Toward the thumb it has two half sides, one large one for the os trapezium, and the other a small one for the os trapezoides. It has likewise a hollow side for the os magnum, and a small semilunar side for the os lunare. Its inner and outer surfaces are rough. Winslow.

SCAPHOIDES *tarsi* lies before the astragalus. It has two cartilaginous sides, an oval circumference, and a tuberosity. Its thickness is inconsiderable when compared with its other dimensions, and it lies, as it were, on its side, before the astragalus. The concave side is posterior, and is articulated with the anterior convex side of the astragalus. The anterior convex side is divided by two small lines into three planes, for the articulation of the three ossa cuneiformia. The circumference forms an oval, which contracts by small degrees, and terminates in an obtuse point; one side of this circumference is more convex and rough than the other, and the inequalities in it serve for the insertion of ligaments. The point of the oval ends in a tuberosity, marked with a muscular impression. In the natural situation of this bone, the most convex side is uppermost, the other lowest, and the tuberosity turned inward and downward. By this situation, and the difference of the sides, it is easy to distinguish the os naviculare of the right foot from that of the left. The small, or inferior convexity of the circumference has, near the tuberosity, a superficial notch, and on the opposite side a small cartilaginous surface, and a small tubercle for its articulation with the os cuboides, and the insertion of ligaments. Winslow.

For the cartilages of this bone. See FOOT.

SCAPULA, in *Anatomy*, *omoplata*, or *shoulder-blade*; a large, broad bone, representing a scalenous triangle, situated on each side of the upper and back-part of the thorax, from about the first rib down to the seventh. See *Tab. Anat. (Osteol.) fig.* 7. *n.* 6, 6.

The substance of the *scapula* is thin, but solid and firm; its outside is somewhat convex, and its inside concave; its upper edge is called *costa superior*, and its lower *costa inferior*:

inferior; its broad end is called its *basis*, which, with the two edges, make the upper and lower angles.

The *scapulæ* have each three processes, of which the first runs all along the middle of their outside, and is called their *spine*. *Fig.* 3. *n.* 4, 4. & *fig.* 7. *n.* 7, 7. That end of the spine, which receives the extremity of the clavicula, is called *acromium*. The second process is a little lower than the acromium; it is short and sharp, like a crow's bill, therefore called *coracoides*; these two processes are tied to one another by a strong ligament, which serves to keep the head of the humerus in the cavity of the third process, which is called *cervix*. This process is the extremity of the *scapula*, which is opposite to its basis. It has a round sinus, surrounded about its brim with a cartilage, which receives the head of the humerus.

The neck of the *scapula* is the largest of its three angles, and ought more justly to be called a head with a very short neck, and a superficial, or glenoide cavity in the top of it, which is lined with a cartilage, and of an oval figure, but pointed at the upper part, and rounded at the lower; and is much deeper in the natural state, than when viewed in the skeleton. In the natural situation of the *scapula* this cavity is turned obliquely forward, and not directly outward. Between the edge of this cavity and the contracted part, which is the true neck, some inequalities are observable, which are the remains of the symphysis of ossification. Above and below the glenoide cavity are two small rough marks, or impressions, the lowest of which extends itself a little over the neighbouring costa. These may be termed the muscular impressions of the neck of the *scapula*. In the neck, spine, basis, inferior costa, and coracoide process of the *scapula*, there is a diploe; the rest of the bone is transparent, thin, and almost without any middle cellular substance. The *scapula* is articulated with the clavicle by the acromion, and with the os humeri by the glenoide cavity: it is likewise joined to the trunk by a fleshy symphysis, or syssarcosis. It serves to facilitate the motions of the arm, to give insertion to a great many muscles, and as a shield to defend the back part of the thorax.

The motions and different situations of the shoulder in men depend chiefly on the *scapula*. The clavicle is pushed or pulled in different directions by the other bone, and entirely follows its motion, serving in some circumstances to regulate or limit them. When we raise the shoulder, it is the acromium which rises, and while the superior angle descends, the inferior angle is removed to a greater distance from the spina dorsi. When the shoulder is depressed, the acromium falls down more or less, the superior angle rises in proportion, and the inferior angle is brought nearer the vertebræ. The shoulder can scarcely be brought forward, or toward the foreside of the thorax, without being proportionably raised, nor drawn back, without more or less depressing it. All these different attitudes are regulated by the clavicula, the angle which it naturally makes with the *scapula* being lessened, in raising the shoulder, or in bringing it more forward; and increased, when the shoulder is depressed, or drawn backward. In most of the motions performed by the *scapula*, this bone turns more or less upon its own plane, in two contrary directions. In the first case, the acromium, together with the humeral extremity of the clavicula, is removed to a greater distance from the ribs, and in the second it is brought nearer to the ribs. Winslow.

SCAPULA, *fracture of the*. The *scapula* is usually fractured either near its acromion, or head, where it joins the clavicle, or in some more distant part. If the fracture happens in the process of the acromion, the reduction will be easily made, by lifting up the arm to relax the deltoide muscle, and pushing the arm evenly upwards, making the fractured parts meet together with the fingers; but notwithstanding their reduction is so easy, they easily slip away again from any slight cause, and so are difficultly agglutinated. They are in particular very easily separated by the weight and motion of the arm, and by the contraction of the deltoide muscle; insomuch that there is scarce ever an instance of a fractured acromion being so perfectly cured, as to admit afterwards of a free motion of the arm upwards: all means must, however, be used to endeavour to keep the replaced bones in their proper situation. A compress, wet with spirit of wine, is to be applied to the fracture; a ball is to be put under the arm-pit to support it; the whole is to be bound up with the bandage commonly called *spica*, and the arm is to be suspended in a sash or sling hung about the neck. But if the neck of the *scapula*, which lies under the acromion, or its acetabulum, should be fractured, which is a case that indeed very seldom happens, and when it does is very difficult to discover, it is a hundred to one but from the vicinity of the articulation, the tendons, muscles, ligaments, nerves, and large veins and arteries, there will follow a stiffness and loss of motion in the joint: great inflammation is also to be expected, and abscesses with the worst symptoms, and sometimes death itself.

SCAPULA, *cartilages and ligaments of the*. See SHOULDER.

SCAPULAM *antrorsum agens*, in *Anatomy*, a name given by Vesalius, and some of his followers, to the muscle generally known under the name of the SERRATUS *anticus*. He has also, in another part of his work, called it *primus scapulam moventium*. Riolanus has called it the *serratus minor*, and several other authors the *secundus scapulæ*.

SCAPULAM *attollens*, in *Anatomy*, a name given by Spigelius to a muscle, which he also calls *musculus patientiæ*. It is the LEVATOR *scapulæ* of Albinus and Cowper.

SCAPULAM *moventium secundus*, in *Anatomy*, the name given by Vesalius to a muscle, called by Winslow and some others the *trapezia*, and by Albinus the *cucullaris*. Cowper calls it the TRAPEZIUS, or *cucullaris*.

SCAPULAR, *scapularis*, in *Anatomy*, an epithet given to two arteries, and as many veins, of the body.

The SCAPULARIS *interna* & *externa*, or inner and outer *scapular* arteries, arise out of the subclavian, and are spread over the *scapulæ*.

SCAPULARY *veins*, *the inner and outer*, discharge themselves into the axillary, or vein of the arm-pits.

SCAPULAR, or SCAPULARY, also denotes part of the habit of several orders of religious, worn over the gown, as a badge of peculiar veneration for the Virgin.

The word is formed from the French *scapulaire*, which signifies the same; and that from the Latin *scapula*, the shoulder-blade.

The *scapular* consists of two narrow breadths, or slips, of cloth, covering the back and the breasts, and hanging down to the feet of the professed religious, and to the knees of the lay brothers, &c.

There is also a *Friery*, or *Fraternity of the* SCAPULAR, consisting of lay-brothers, who profess a particular devotion to the Virgin; and who, in honour of her, wear a little *scapular*, in manner of a bracelet, or otherwise, for representing the great one. They are obliged to certain prayers, and to observe certain rules, in their manner of life.

SCAPUS, in *Architecture*, the FUST, or shaft, of a column.

SCAPUS, among *Botanists*, a peculiar kind of STALK, which supports the parts of fructification of a plant. It does not grow from any part of the main stalk, but rises immediately from the root.

SCAR. See ESCHAR.

SCARABÆUS, the *beetle*. This is an extremely numerous genus of insects, belonging, in the Linnæan system, to the order of *coleoptera*, distinguished by clavated and fissile antennæ, and by the fore-legs being generally dentated. Linnæus distributes them into such as have a horned thorax; such as have an unarmed thorax, and horned head; and such whose feet have no claws, with an unarmed head and thorax. He enumerates and describes eighty-seven different species.

In order to have a distinct idea of the differences of the species, they are arranged by Lister into a sort of method. The first general distinction is into those which live on land, and those which live in the water; of each of which there is a very great number. Those *beetles* which live on land have some of them antennæ laminated at the end, others have them sharp pointed. The outer wings, or cases of the wings, in some are perfect, in others they seem mutilated. Some have the antennæ inserted into a sort of promuscis. These were called by the ancients *gurguliones*, and in some there is only one juncture in this, in the middle; in others, several near the end. See GURGULIO. Some have a sharp-pointed instrument at their head; these are called *cimices*. See CIMEX.

Of the water *beetles* there are two principal kinds, one sort living in salt water, the other in fresh.

Of those *beetles*, the extremity of whose antennæ are formed like a comb, there are ten species mentioned by Mr. Ray.

1. The great reddish *beetle* with the tail bending downwards, known among us under the name of the *chaffer*. This is too well known to need a description; it is common among trees and bushes at the end of May, and seems particularly fond of the maple. 2. The greyish yellow woolly *beetle*. This seems nearly allied to the former species, but is but about half as big. These are very common in the southern parts of England in the month of June; they fly about elms in vast swarms; they are very rare in the northern counties. 3. The greenish black *beetle* with reddish brown cases of the wings.

wings. This is of the ſize of a horſe-bean, and is found among roſe-trees in May. 4. The great purpliſh black *beetle* with ſerrated legs. This is one of our largeſt *beetles*, and is very common on heaths, and in other places, in the month of March; it flies about in the evening, and makes a great noiſe; it is uſually infeſted with a great number of yellow lice, and is thence called the *louſy beetle*. 5. The large black *beetle* with two yellow undulated faſciæ on the caſes of the wings. This is ſometimes found without the faſciæ; it ſometimes flies, but rarely. It is found about human dung, and probably feeds on it, for it has always a very ſtrong ſcent of it. 6. The green *beetle* with red caſes for the wings. This is about the ſize of a horſe-bean, and is found in woods in the month of June. 7. The ſmall *beetle*, called the *lady-bird*. 8. The *lady-bird* with only two large black ſpots, one on each of the caſes of the wings. This is common among buſhes in the beginning of June. 9. The yellow *beetle* with black ſpots. This is much ſmaller than the *lady-bird*; its colour is a pale yellow, or lemon colour, and it has four black ſpots, of an oblong ſquare figure, on the caſes of the wings. 10. The reddiſh *beetle* with two ſpots on the ſhoulders, and ſeven white marks on each of the caſes of the wings. This is about the ſize of the common lady-bird, and is found in June near rivers, among the ruſhes, and in cyperus graſſes. Ray's Hiſt. Inſect. p. 384.

Of thoſe *beetles* which have antennæ terminating in ſlender points, there is a great number of ſpecies, which may be ſubdivided into ſome other general claſſes: ſome of them have whole and perfect caſes to their wings, and have long horns; theſe are by ſome called *capricorn-beetles*; of theſe there are ſeveral ſpecies. See *Capricorn* BEETLE.

The ſix ſpecies enumerated by Liſter, are theſe. 1. The great ſweet-ſmelling *capricorn*, called by ſome authors *cerambyx*, and by others the *muſk beetle*. This is one of the moſt beautiful of the Engliſh beetles; the male is much ſmaller than the female, and is of a mixed colour of purple and gold; the female is more of a green colour; the horns of the males alſo conſiſt of longer joints, and in both ſexes the horns hang over the back, and are longer than the whole body. It is found among old willows, and often in the very wood; it is moſt frequent in the month of July. It makes a mournful ſound when taken, and Mouffet obſerves that it loſes its perfumed ſmell when dead; but Liſter obſerves farther, that this ſmell is only found in it at the time of copulation. 2. The ſmall gilded *capricorn*; this is of a true gold colour, but in ſome lights has a caſt of purple and of green. It is found very frequently among reeds by the banks of rivers. 3. The yellow *capricorn*, with a large black ſpot on each of the caſes of the wings; this is found among dry hay in April. 4. The yellow legged *beetle*, with a black body, variegated with yellow ſtreaks. This is found in gardens among the kitchern herbs, principally in the month of May. 5. The black *capricorn*, with the caſes of the wings yellow at the top, and white at the bottom, with ſome other white marks about them; this is found in the meadows in the month of May. 6. The green *capricorn*; this is of the ſize, ſhape, and colour of the cantharides; it is found in May, in woods. Ray's Hiſt. Inſect. p. 386.

Some *beetles* are covered with a very hard cruſt, and have ſcarce any wings underneath it. Theſe are generally very ſlow creepers, and of theſe we have in England three ſpecies.

1. The ſhort purpliſh black *beetle* with gibbous ſhoulders. This ſeems to be the ſame with the *cat-beetle*, or *ſcarabæus feliformis* of Mouffet, and others. This is not unfrequently found on heaths in March, and at that time is often found in coitu. The male is conſiderably ſmaller than the female. This creature feeds on the yellow gallium, and when fatigued will caſt out at its mouth a yellowiſh liquor, which is of a pungent taſte like pepper. 2. The ſlow ſtinking black *beetle*, called the *blatta fœtida* by Pliny and others. This is of a deep duſky black colour, not at all gloſſy or ſhining. This is common in cellars, and other damp places, in the month of April. 3. The great purpliſh *beetle* with a caſt of green. This is common in gardens, and in April is always infeſted with a great number of lice.

Some *beetles* which have wings very rarely uſe them, but run very ſwiftly along the ground; of theſe we have two ſpecies common among us.

1. The black *beetle* with ſulcated wings. This is a very common inſect, and is frequent in path-ways in April. 2. The black *beetle* with ſtriated wings, and with yellow legs and horns. This is alſo common in path-ways in ſummer.

All theſe *beetles* have the antennæ laminated at the ends. Of the other kind, which have them go off to a ſlender and taper point, there are alſo many kinds: of theſe ſome have only ſhort caſes for their wings, as if they had been cut off near the root. The general characters of this claſs of *beetles* are, that they have oblong and ſlender bodies, and have two appendages, forming a kind of fork at the tail. Of this kind are the common ear-wig, or forficula, and the ſtaphylinus, which is a large and long black *beetle*, with a ſharp fork at its tail, and with a naked body. It is of a deep and duſky black, not at all gloſſy; it has very large yellow wings, folded under the ſmall thecæ on the back; it turns up its tail in a threatening poſture when attempted to be caught, and throws out a ſort of white bladders at it; it runs very nimbly, and is a very voracious creature, feeding on the other *beetles*, or on any inſects it can catch.

Some *beetles* are all over ſoft, and have no membranaceous wings. The bodies of theſe *beetles* ſeem covered with a cruſtaceous ſubſtance, but it is ſoft, and yields to the preſſure of the finger like a bladder; theſe all eat herbaceous or vegetable food; we have two ſpecies of them.

1. The oil *beetle*, a bluiſh black ſhining *beetle*, called *proſcarabæus* by Mouffet. This is found in meadows in great abundance, and feeds on the leaves of ſome of the ſpecies of ranunculus. 2. The ſhort-legged, black, ſmooth *beetle*. This has ſcarce any antennæ, and when tired, rolls itſelf up into a round ball. This is found in May feeding on the aparine, or common cleavers; but Liſter ſuſpects whether this be not a worm ſtate of ſome *beetle*, rather than a perfect *beetle*.

Some *beetles* have long heads, ſhaped like the trunks of other inſects, and in theſe the horns are lodged: theſe were called by the ancients *gurguliones*. Ray's Hiſt. Inſect. p. 391. See GURGULIO.

Some *beetles* have a forceps at the head, indented on each ſide in the manner of a ſaw. Of this kind we have only one known ſpecies in England; this is the green *beetle* with ten white ſpots on the caſes of the wings. This is found in June in the northern parts of England. It is a very voracious animal, deſtroying great numbers of other inſects, particularly caterpillars.

Some *beetles* have a very remarkable property of leaping, and this of a very peculiar kind; for they do not leap, like other inſects, by means of their hinder legs, but by means of their breaſt. There are ſome general marks by which this genus of *beetles* may be diſtinguiſhed from others: theſe are, 1. They are always of an oblong and flatted figure. 2. Their head is always joined in a very nice manner to the ſhoulders. 3. Their legs are extremely ſhort and ſlender.

Of this kind of *beetles* we have in England only two known ſpecies.

1. The cheſnut-coloured leaping *beetle*. This is found frequently in corn-fields, and elſewhere. 2. The greeniſh black *beetle* with horns pectinated on one ſide. This is a ſcarce ſpecies, but is found in dry places in March. Ray's Hiſt. Inſect. p. 387.

SCARABÆUS *tardipes*, the *ſlow beetle*. We have a very ſingular account of the longevity of this animal, given by Mr. Baker from his own obſervation; which lived two years and a half without any viſible food or drink. It ſeems probable that it received ſufficient nouriſhment from the particles floating in the air; and it is poſſible that lizards, ſnakes, &c. when they live ſo long without any viſible food, are ſupplied in the ſame manner.

We know that the Egyptians had a very high veneration for the *beetle*. This appears not only by the account hiſtorians give of its being one of their deities, but by the many images of it we find among their antiquities. As theſe were a wiſe and learned people, we cannot ſuppoſe they would, without ſome reaſon, pay ſo much regard to ſo contemptible an animal as this appears to be; and it is very poſſible they might have diſcovered this property of its living in this manner without food, and thence eſteem it a ſymbol of the deity. It is not known how long Mr. Baker's *beetle* would have lived in this manner with him; for it at length got away, while a careleſs ſervant took up the glaſs to wipe it. Phil. Tranſ. Nº 457, p. 447.

SCARABÆUS *vorax*, the *cankerworm*. This laſt term is uſed in the tranſlation of our Bibles to ſignify a very deſtructive inſect, of the nature of the locuſt, and uſually mentioned as its companion. The Septuagint gives it the name βρυχος, *bruchus*, a name ſignifying an animal which makes a great noiſe, as this inſect does both in eating and in flying. We generally underſtand by this word a reptile, but it certainly means no other than that ſort of *beetle* which we call the *cockchaffer*, or *dor*; a flying inſect, very remarkable for the humming noiſe it makes with its wings when in motion, and which, when it is found in ſwarms ſitting upon the hedges, makes a continual noiſe in eating, like the ſawing of wood. This

creature deserves very well to be placed with the locust, as a destroyer of the fruits of the earth.

In another part of the Old Testament, the same word *bruchus* is translated *locust*, or *beetle*; and this explains the rationale of that odd clause in the Jewish law, where Moses tells the Israelites, "these ye may eat of: every flying creeping thing that goeth upon all four, which have legs above their feet to leap withal upon the earth; even these of them ye may eat: the locust after his kind, and the bald locust after his kind, and the *beetle* after his kind, and the grasshopper after his kind."

It has appeared very strange to many, that among the pure and clean foods, the *beetle*, and such other dry and nasty reptiles, should be recommended in Scripture as wholesome food for man; but there appears reason on the side of this when thoroughly considered. It is very evident that neither the Jews, nor any other people, would eat such insects as these, while any thing better was to be had; but as they lived in a country often visited by locusts and these *cockchaffers*, which might at some time eat up all the fruits of the earth, then in the want of these the prophet tells them they might eat up the devourers themselves, and yet be clean. So also it appears that we are to understand what we are told of St. John the Baptist, that he fed on locusts and wild honey; for it was in the desert that he eat these, where no other food was to be had.

The poor people of Ireland have taught us, that the prophet advised his people to a wholesome food in this text; for some years ago, when the county of Galway, and other neighbouring parts, were so infested with this vermin, that the whole face of the country was destroyed by them, and the trees stripped of their leaves and fruits, as much as in the depth of winter; the poor people wanting other food, eat the vermin themselves that had done the mischief; and the *cockchaffers*, which are doubtless what is meant by Moses under the name of the *beetle*, as they are truly of the *beetle* kind, were found to be a very good and wholesome food.

It is very probable also that this kind of *beetle*, so famous for devouring the fruits of the earth, is that kind to which the Egyptians paid divine honours, and for which they had such high veneration, that they frequently engraved its figure on their obelisks; though the antiquaries give a very different account of it, supposing that the *beetle* was held sacred by them, as being an hieroglyphical representation of the sun. This seems a very forced conjecture; whereas nothing can be supposed more natural, than that a nation, addicted to polytheism, as the Egyptians were, and in a country frequently suffering great mischief and scarcity from swarms of devouring insects, should, from a strong sense and fear of evil to come, give sacred worship to the visible authors of their sufferings, in hopes to render them more propitious for the future. The same Egyptians, we very well know, worshipped the other great destroyer of their country, the crocodile; and the Romans, a much more civilized people, built a temple to the disease which raged most among them, the fever.

The ignorant people among the Irish, when the vast swarms of these *beetles* first appeared among them, were of the same turn, and rather reverenced than destroyed them; saying, that they were the ghosts of their dead friends killed at the battle of Aghrim, who were come in this form to pester and annoy their heretical enemies, the English protestants. They even thought that the English families suffered more by them than the Irish; but this was only because the grounds of the former were better improved, and the creatures found plenty of better food there. Phil. Transf. N° 234.

Scarabæus, in *Ichthyology*, a name given by Gaza to that species of *sparus*, which is called by others the cantharus.

SCARBOROUGH *water*. The water of this medicinal spring has been the subject of great contests and disputes among the physical people; all allowing it considerable virtues, but some attributing them to one ingredient, others to another. Dr. Witty alleges that its material principles are alum, nitre, and vitriol of iron; but though this author declares, that these principles are all to be separated out of it, Dr. Tonstall, on the other hand, affirms, that it has no vitriol of iron in it, but a stone powder and a clay, leaving sand at the bottom of the vessel; and therefore that it is apt to breed the stone, and is bad in the gout, jaundice, and all other diseases, where indurations of the parts, or stony concretions in the body, are the cause; and this author seems to speak very experimentally, when he alleges that he never had any symptoms of the stone till he drank the *Scarborough water*, but acquired that disease during the course of it.

Alum-stone dissolved in water is always found to yield a purple tincture with galls, and therefore the colouring an infusion of this or other vegetable substances by the *Scarborough-water*, which is by all allowed to contain this stone, is no proof of any vitriol of iron being contained in it, other than such a small portion of it as is always found in this alum-stone. All waters, which have dissolved iron, will yield vitriol as a salt from that metal, on evaporation. The cliffs about Scarborough yield abundance of salt in shoots and effervescences, plainly owing to the waters of the spring; yet all these are nitro-aluminous, none of them at all vitriolic. If the *Scarborough water* is set by for some days, after it is taken fresh from the spring, it precipitates a sediment; which being examined, is found not to be of a ferruginous nature, but a mere glebe of alum.

Upon the whole, the virtues of alum and vitriol are so far different, that it must be easy to see which of the two salts the water partakes most of, by its virtues; but as to the stony matter, which the one of these disputants calls an insipid clay, and the other a sandy stone, it is no other than spar, which is contained in all water; and which has been in general so far from being accused of breeding the stone in the bladder, that the general consent of mankind has seemed to esteem it a cure for that disorder. The spar, in the form of the lapis Judaicus and ostracites, and the very waters which are so impregnated with it as to encrust every thing with it that is put into them, are given for the cure of this disease. Phil. Transf. N° 85.

The waters of *Scarborough* are chalybeate and purging. Of these there are two wells, both impregnated with the same principles, in different proportions; though the purging well is the most celebrated, and the water of this is usually called the *Scarborough water*. When these waters are poured out of one glass into another, they throw up a number of air-bubbles; and if they are shook for some time in a phial close stopped, and the phial be suddenly opened before the commotion ceases, they displode an elastic vapour, with an audible noise, which shews that they abound in fixed air. At the fountain they have a brisk, pungent, chalybeate taste; but the purging water tastes bitterish, which is not usually the case with the chalybeate one. They lose their chalybeate virtues by exposure, and by keeping; but the purging water the soonest. They both putrefy by keeping; but in time recover their sweetness. Four or five half pints of the purging water drank within an hour, give two or three easy motions, and raise the spirits. The like quantity of the chalybeate purges less, but exhilarates more, and passes off chiefly by urine. These waters have been found beneficial in hectic fevers, weaknesses of the stomach, and indigestion; in relaxations of the system; in nervous, hysteric, and hypochondriacal disorders; in the green sickness, scurvy, rheumatism, and asthmatic complaints; in gleets, the fluor albus, and other preternatural evacuations, and in habitual costiveness. Elliot on Mineral Waters, p. 187.

SCARE-*crow*, in *Ornithology*, the name of a bird of the *larus*, or sea-gull kind, called by authors *larus niger*, or the black gull, and by the Germans *brandvogel* and *meyvogel*. This is the sterna *fissipes* of Linnæus. It is a very long-winged bird, and of the size of the common blackbird; the head, neck, breast, and belly, as far as the vent, are black; beyond it, white; the male has a white spot under its chin; the back and wings are of a deep ash-colour; the tail is short and forked; its legs are short and red. It is common about the sea coasts, and feeds on insects and small fish. It is a well tasted bird. These birds frequent fresh waters; breed on their banks, and lay three small eggs of a deep olive colour, much spotted with black. They are found, during spring and summer, in vast numbers in the fens of Lincolnshire, where they make an incessant noise. Birds of this species are also seen very remote from land. Pennant.

SCARFED, in the *Sea Carpenter's Language*, is the same as pieced, or fastened or joined in, and denotes a particular method of uniting two pieces of timber together by the extremities.

When two pieces of timber are joined together, so that the end of one goes over the end of the other, being tapered so that the one may be let into the other, and become even, they are said to be *scarfed*: such are the heel-pieces. But when the ends of the two pieces are cut square, and put together, they are said to butt to one another; and when another piece is laid upon and fastened to both, as is the case in all the frame-timbers, this is called *scarfing* the timber; and half the piece which fastens the two timbers together, is reckoned the length of the *scarf*. Murray on Ship-Building, p. 192.

SCARIFICATION, *scarificatio*, in *Surgery*, an operation whereby several incisions are made in the skin, with a lancet, or other instrument proper for that purpose.

Salmasius will have us write *scarifacio*, not *scarificatio*; because

because the word is derived from the Greek σκαριφος. See his notes on Solinus, p. 519. where he thus corrects the reading of Pliny, lib. xvii. F. Hardouin lets the old reading *scarificatio* stand, though he owns the MSS. have it *scariphatio*; but adds, that Theod. Priscian writes *scarificatio*.

Scarification is chiefly practised after cupping.

It acts by stimulating and evacuating.

SCARIFICATOR, a chirurgical instrument, used in *scarification*.

The *scarificator* is made in form of a box, wherein are fitted ten, twelve, or sixteen lancets, all perfectly in the same plane; which being, as it were, cocked, by means of a spring, are all discharged at the same time, by pulling a kind of trigger, and driven equally within the skin. Till of late, they used little sharp cutting wheels, instead of lancets.

The use of the *scarificator* is to evacuate the blood, and other humours, spread under the skin, by making a great number of apertures, or outlets, therein; which, being thus all struck at once, gives much less pain than when struck successively. See CUPPING.

SCARLET, in *Dying*, one of the six kinds of good reds. See RED, COLOUR, and DYING.

Menage derives the word from the barbarous Latin *scarleta*, or *scarletum*; which he deduces farther from the German *scharlach*, or the Flemish *scarlaken*; whence the English have formed *scarlet*, the Italians *scarlato*, and the French their *escarlate*. Others derive it from the Celtic *scuarlera*. Dalechampius will have it called *scarlatum*, by corruption, for *casculiatum*, a barbarous word introduced into Spain; others fetch it from the Arabic *yxquerlate*.

There are two kinds of *scarlets*; the one given with KERMES, or *scarlet-grain*; the other with COCHINEAL. See BOW-*dye*.

SCARLET *cardinal's flower*, in *Botany*. See CARDINAL'S *flower*.

SCARLET *lychnis*, in *Botany*. See CAMPION.

SCARLET *oak*. See OAK.

SCARLETINA *febris*. See *Scarlet* FEVER.

SCARP, in *Fortification*, the interior slope of the ditch of a place; that is, the slope of that side of a ditch which is next to the place, and faces the champaign.

The *scarp* commences from the liziere, or foot of the rampart. The *scarp* is opposite to the *counterscarp*, which is the other side of the ditch.

SCARP is also a term in *Heraldry*, probably derived from the French *escharpe*, signifying the scarf which military commanders wear for ornament.

It is borne something like a battoon sinister; but is broader, and is continued out to the edges of the field; whereas the battoon is cut off at each end. He beareth argent, a *scarp* azure. See *Tab. Herald. fig.* 44.

SCARUS, in *Ichthyology*, the name of a sea-fish, being, in the Linnæan system, a species of the LABRUS, of which there have been several remarkable things asserted by the ancients, some with and some without any foundation; as that it ruminates, or chews the cud like our oxen, &c. This Aristotle, Pliny, Oppian, and others, affirm, but none of them of their own personal knowledge; they seem to have had it by hearsay, or else, as authors often do, to have taken it from one another; for the thing is not true in fact.

It has been said also to be the only fish which feeds on herbs; and it is so far true that it does feed on them, and that few other fish, but not that no other feed in the same manner. It has been reported also that this is the only fish that sleeps. Gesner would persuade us, that not only this, but many other fish, also sleep. But this does not seem to be the fact; for this race of animals have no eye-brows, nor any membrane to close and cover their eyes with, as other creatures have, which nature has allowed sleep to.

The later naturalists have described three species of this fish: Rondeletius two, the *scarus onias*, and *scarus varius*; and Bellonius one, which is different from both these, and seems to have been the very fish the ancients knew by this name.

The *scarus onias* is a sea-fish, found among rocks and near the shores. Its scales are large and very thin, and its back of a blackish blue; its belly of a fine white, and is of an oblong and rounded shape; its teeth are broad, not pointed, and resemble those in the human jaws; its eyes also are large, and its head over the eyes of a fine strong and clear blue.

The *scarus varius* is of the shape and figure of the former, but its eyes and its belly are of a purple colour; its tail is of a fine clear and strong blue, and the rest of its body is of a greenish or bluish black; its scales are spotted and speckled with dusky dots; its mouth is moderately large, and its teeth broad in the upper jaw, and somewhat pointed in the under; from the head to the tail, all along the ridge of the back, there runs a row of short spines, which are connected at their bottoms by a membrane; and in the middle of the belly there are several purple spots. It is a very beautiful fish. Rondelet. de Pisc. lib. v. cap. 3.

The *scarus Bellonii*, which differs from both these, and seems to be the same fish which the ancients called by this name, is of a mixed bluish and red colour; its scales are broad and thin, and it has two transverse protuberances near the sides of the tail; its body is rounded, but not very long; its teeth are strong and obtuse, and well fitted for their office, which is the tearing off the tough sea-herbs from the rocks, and chewing them for food; its mouth is but small, and it has only one fin on the back, which is prickly; its usual size is about five or six inches in length; it is accounted a very delicate fish, but is insipid, unless eaten with the guts, and all that they contain. The liver and stomach of this fish, with its contents, are cooked up by the Greeks into a very delicate dish; the epicures among them not regarding the rest of the fish. Bellonius, de Pisc. p. 126.

SCARY, in *Husbandry*, a term used by the farmers for a barren land, which has a poor or thin sward, or coat of grass, upon it.

SCATARELLO, in *Ornithology*, the name of a small bird of the ficedula kind, of a greyish brown on the back, and a pale yellow on the breast and belly; its legs are black. It seems nearly allied to the BECCIFAGO.

SCATCH-*mouth*, in the *Manege*, a bit-mouth, differing from a canon-mouth in this, that the canon is round, whereas a *scatch* is more upon the oval. That part of the *scatch-mouth* that joins the bit-mouth to the branch, is likewise different; a canon being stayed upon the branch by a fonceau, and a *scatch* by a chaperon, which surrounds the banquet. The effect of the *scatch-mouth* is somewhat greater than that of the canon-mouth, and keeps the mouth more in subjection. Commonly snaffles are *scatch-mouths*.

SCATEA, a word used by Paracelsus for a somewhat hard fabulous concretion in the urine.

SCAVAGE, SCHEVAGE, SCHEWAGE, or SHEWAGE, in our *Ancient Customs*, a kind of toll, or custom, exacted by mayors, sheriffs, &c. of merchant-strangers, for wares shewed, or offered to sale, within their liberties. This custom is prohibited by stat. 19 Hen. VII. cap. 7. though the city of London still retains the benefit of it.

SCAVANT, *savant*, a term purely French, signifying *learned*. It is little used, except in the phrase *Journal des Sçavans*, denoting a journal of the works of the learned, published monthly at Paris; being the first work of that kind, and that from which all the rest have had their rise.

Menage derives the word from the Latin *sapere, to be wise*; and, on that footing, he will have it written *savant*; others from *scire, to know*; and, for that reason, write it *sçavant*. The latter etymology and orthography are followed by the academy; though all the ancient MSS. have it *savant, savoir*, &c.

SCAVEL *spitter*, denotes a small spade, shod only half way, and used in digging clay.

SCAVENGERS, two officers chosen yearly in each parish in London, and the suburbs, by the constables, church-wardens, and other inhabitants, whose business it is to hire persons called *rakers*, with carts, to cleanse the streets, and carry away the dirt and filth thereof, under a penalty of 40*s*.

The word is derived from the Saxon *scaefda*; or Dutch *schaven, to scrape*, or *shave away*.

All persons within the weekly bills are to sweep the streets before their doors every Wednesday and Saturday, on pain of forfeiting 3*s*. 4*d*. and persons laying dirt or ashes before their houses, incur a forfeiture of 5*s*. For defraying the expences of *scavengers*; constables, church-wardens, &c. may make a tax, being allowed by two justices of the peace, not exceeding 4*d*. in the pound. Persons who refuse to take upon them the office of *scavenger*, forfeit 10*l*. 14 Car. II. cap. 2. 2 W. & M. c. 2. Persons authorized by 22 & 23 Car. II. may order such parts of London streets, &c. as lie before vacant houses, to be paved and amended, and impose assessments on the owners; and such authorized persons may direct posts to be set up in all passages within the city, to preserve foot-paths, and make assessments for that purpose. 10 Geo. II. c. 22. By 1 Geo. I. c. 48. justices of peace in their quarter-sessions may appoint *scavengers*, and order the repairing and cleansing of streets in any city or market-town, and appoint persons to make assessments, so as not to exceed 6*d*. per pound per annum.

The *scavengers* are much the same with what were anciently

anciently called *street-wards*. The Germans call them *dreckſimons*, from one Simon, a famed *ſcavenger* of Marpurg.

SCAULEZ, in *Ichthyography*, the name of a fiſh common on the Mediterranean ſhores, and called by authors HEPSETUS and *anguella*.

SCAUP *duck*. See DUCK.

SCAZONE, in *Ichthyology*, a name given by Salvian and others to the fiſh which we call the *pricked-dog*, or *hound*, and the generality of authors the GALEUS *ſpinax*. It is a ſpecies of ſqualus, diſtinguiſhed by the roundneſs of the body, and having no pinna ani.

SCEAT, among the Saxons, a ſmall coin equal to four farthings.

SCELAZIUS, in *Zoology*, the name by which Dr. Hill has called a genus of animalcules with viſible legs.

It is common in ditch-water, and is leſs quick in its motions than moſt other animalcules.

SCELETON, in *Anatomy*. See SKELETON.

SCELOTYRBE, Σκελοτυρϐη, compounded of σκελος, *leg*, and τυρϐη, *tumult*, or *uproar*, weakneſs and pains in the legs, generally attending ſcorbutic habits.

Scelotyrbe is alſo uſed for the SCURVY itſelf; and ſometimes applied to medicines contrived againſt ſuch diſorders.

SCEMI, in *Botany*, a name given by ſome authors to the *carob*, or ſweet pipe-tree.

SCENE, *ſcena*, in its primary ſenſe, denoted a theatre, or place, where dramatic pieces, and other public ſhews, were repreſented.

The word is originally Greek, σκηνη ſignifying a *tent*, *hut*, *booth*, or the like, where dramatic pieces were anciently performed.

The original *ſcene* for acting of plays was as ſimple as the repreſentations themſelves; it conſiſted only of a plain plat of ground, proper for the occaſion, which was in ſome degree ſhaded by the neighbouring trees, whoſe branches were made to meet together, and their vacancies ſupplied with boards, ſticks, and the like, to complete the ſhelter; and theſe were ſometimes covered with ſkins, ſometimes only with the branches of other trees newly cut down, and full of leaves.

Thus Virgil, in his Æneid:

Tum ſylvis ſcena *coruſcis*
Deſuper horrentique atrum nemus imminet umbrâ.

Upon which Servius remarks, Scena *apud antiquos parietem non habuit.*

So Ovid:

Primus ſollicitos feciſti, Romule, ludos
Cum juvit viduos rapta Sabina viros.
Tunc neque marmoreo pendebant vela theatro
Nec fuerant liquido pulpita rubra croco.
Illic quas tulerant nemoroſa palatia frondes
Simpliciter poſitæ ſcena *ſine arte fuit.*

Thus alſo Caſſiodorus derives the word *ſcene*, from the cloſe ſhade of the grove, where, in the ſpring-time, the ancient ſhepherds uſed to ſing and play.

It does not appear that the ancient poets were at all acquainted with the modern way of changing the *ſcenes*, in reſpect of the different parts of the play, but all was performed in the ſame place.

The firſt things repreſented in theſe new theatres were what they called *mimi*. Theſe were a very coarſe ſort of poems, repreſenting, in obſcene and indecent language, the vices and indecent actions of the principal people of the time. Sophrones and Xenarchus ſeem to have been the firſt writers of this ſort of comedy, and they uſed ſometimes proſe, ſometimes verſe, in theſe compoſitions. After the licentious things, thus repreſented, had given great offence to the magiſtracy, the poets hands were tied up from writing at all, and the actors in theſe *ſcenes* were forbid to ſpeak. Hence aroſe a new way of entertaining the ſpectators, which we ſtill continue, under the name *pantomime*, the ſame by which they expreſſed it. In this all was repreſented in dumb ſhew, and the geſtures and motions of the limbs were all they had to repreſent the actions of others by.

This ſort of public diverſion ſeems to have been in faſhion in the days of Ariſtotle, and to have been continued long afterwards. Salmaſius is of opinion, that Pylades was the firſt who ſeparated the pantomime and dancing from the plays, where the actors ſpoke. But this ſeems an error in that great critic; for they ſeem, by what hiſtories we have left of them, to have been repreſented ſingly long before that time, Pylades living in the time of Auguſtus Cæſar.

Poetry and dancing were early ſuppoſed to have ſome relation to one another; the firſt was called a *ſpeaking dance*, and the latter a *dumb poem*; a name afterwards, and not till long afterwards, given to a picture. Thus they were introduced on the ſame *ſcenes*, as things naturally connected together.

SCENE was afterwards more particularly uſed for the decorations of a ſtage, or theatre.

The ancients, we are informed by Vitruvius, had three ſorts of *ſcenes*, or ſcenical decorations, in their theatres. That in common uſe was a ſpacious front, or range, of building, adorned with columns and ſtatues; in which were three large openings, through which other buildings appeared in perſpective; viz. a palace, for tragedies; houſes and ſtreets, for comedies; and foreſts, for paſtorals.

Theſe decorations were either *verſatile*, i. e. they turned on pivots, as deſcribed by Vitruvius; or *ductile*, i. e. ſlided along grooves, as thoſe in our theatres. And as this or that ſide, or repreſentation, was turned towards the ſpectators, the *ſcene* was called a *tragic*, *comic*, or a *paſtoral ſcene*. See ſeveral curious remarks on the ancient *ſcene* in M. Perrault's notes on Vitruvius, lib. v. cap. 6. See PLAYHOUSE.

SCENE is alſo uſed for the place repreſented, or that where the action is conceived to have paſſed.

One of the grand laws of the drama is, to obſerve the unity of the *ſcene*; which we more uſually call the *unity of place*.

In effect, to keep cloſe to nature and probability, the *ſcene* ſhould never be ſhifted from place to place, in the courſe of the play. The ancients were pretty ſevere in this reſpect, particularly Terence; in ſome of his plays, the *ſcene* never ſhifts at all, but the whole is tranſacted before the door of an old man's houſe, whither, with inimitable art, he brings all his actors, occaſionally.

The French, too, are very ſtrict in this reſpect; but the Engliſh plead for a diſpenſation from the rule; which they think confines them to too narrow bounds, and precludes them from that variety of adventures and intrigues, without which an Engliſh audience will never be ſatisfied.

However, the more judicious and accurate of our own writers are very moderate in the uſe of this licence, and take care not to deviate too far from probability, by ſhifting the *ſcene*, between the acts, much farther than the perſons concerned may be ſuppoſed to have gone in the interval. Hence they ſeldom carry the *ſcene* out of the ſame town; though others, who own no ſubjection to the ancient rules, take larger liberties: with ſome of theſe, it is nothing, when a fancied *ſcene* is in view, to ſkip from Covent-Garden to Peru. The great Shakſpeare is exceedingly faulty in this reſpect, in almoſt all his plays.

SCENE is alſo a part, or diviſion, of a dramatic poem, determined by a new actor's entering.

Plays are divided into *acts*, and acts are ſubdivided into *ſcenes*.

In moſt of our printed plays a new *ſcene* is never expreſſed to begin, but when the place is ſuppoſed to be changed, by ſhifting, or drawing, the moveable *ſcene*; but this muſt be eſteemed an overſight, ſince, on our ſtage, the *ſcene* is, properly, the perſons preſent at, or concerned in, the action on the ſtage at ſuch time. Whenever, therefore, a new actor appears, or an old one diſappears, the action is changed into other hands; and, therefore, a new *ſcene* then commences.

It is one of the laws of the ſtage, that the *ſcenes* be well connected; that is, that one ſucceed another, in ſuch manner, as that the ſtage is never quite empty, till the end of the act.

The ancients did not allow of above three perſons on the ſtage at the ſame time, excepting in the choruſes, where the number was not limited; but the moderns have but little regard to this reſtriction.

SCENIC *Games*, *Ludi* SCENICI, among the *Ancients*, were entertainments exhibited on the *ſcena*, or theatre; including what we now call *plays*, of all kinds, with dancing, and other theatrical performances.

The Romans were almoſt four hundred years without any *ſcenic games* at all. Livy obſerves, that they were firſt inſtituted in the year of Rome 392, under the conſulate of C. Sulpitius Peticus, and C. Licinius Stolo. But the critics have obſerved a miſtake here in Livy; the conſulate of thoſe perſons falling in the year 389, which, therefore, is held the æra of the introduction of the *ſcenic games*.

At firſt, ſome actors for theſe diverſions were ſent for out of Hetruria; who, without reciting any thing, danced about to the ſound of inſtruments; ſo that thus far was no more than a ball, or rather what the French call a *ballet*. At length they began to rehearſe verſe, and SATIRE was introduced, adorned with compoſitions of muſic, and accompanied with dances. At length, Livius Andronicus,

Andronicus, about the year of Rome 514, introduced the entertainments of tragedy and comedy.

Thus, by degrees, growing more and more perfect, their *scenical* shews were at last represented with a justness and magnificence beyond any thing the world elsewhere ever saw. The fathers, in their writings, cry out loudly against the *scenical games*.

SCENOGRAPHY, formed from σκηνη, *scene*, and γραφη, *description*, in *Perspective*, a representation of a body on a perspective plane; or a description thereof in all its dimensions, such as it appears to the eye.

The ichnography of a building, &c. represents the plan, or ground-work, of the building; the orthography the front, or one of the sides; and the *scenography* the whole building, front, sides, height, and all, raised on the geometrical plan.

To exhibit the SCENOGRAPHY *of any body*. 1. Lay down the basis, ground-plot, or plan, of the body, in the perspective ichnography, according to the method laid down under the article PERSPECTIVE. 2. Upon the several points of the plan raise the perspective heights: thus will the *scenography* of the body be completed, excepting that a proper shade is to be added. The method of raising the heights is as follows:

On any point given, as C (*Tab.* IV. *Perspective, fig.* 59.) to raise a perspective altitude, answerable to an objective altitude PQ. On the terrestrial line raise a perpendicular PQ, equal to the given objective altitude. From P and Q, to any point, as T, draw right lines, PT and QT. From the given point C draw a right line CK, parallel to the terrestrial line DE, meeting the right line QT, in K. In the point K, upon the line KC, erect a perpendicular IK. This IK is the *scenographic* altitude required. See PERSPECTIVE, art. XXI.

The application of this general method of drawing the *scenography* of a body, is not so obvious, in every case, but that it may be necessary to illustrate it a little by a few examples.

To exhibit the SCENOGRAPHY *of a cube, viewed by an angle*. 1. As the basis of a cube viewed by an angle, standing on a geometrical plane, is a square viewed by an angle; draw a square, viewed angular-wise. 2. Raise the side HI (*fig.* 60.) of the square perpendicularly on any point of the terrestrial line DE; and to any point, as V, of the horizontal line HR, draw the right lines VI and VH. 3. From the angles *d*, *b*, and *c*, draw *c* 1, *d* 2, &c. parallel to the terrestrial line DE. 4. From the points 1 and 2, raise L 1, and M 2, perpendicular to the same. Lastly, since HI is the height to be raised in *a*, L 1 in *c* and *b*, and M 2 in *d*; in *a* raise the line *fa* perpendicular to *a*E; in *b* and *c*, raise *bg* and *ce* perpendicular to *bc* 1; and, lastly, raise *dh* perpendicular to *d* 2, and make $af = HI$, $bg = ec = L\,1$, and $hd = M\,2$: if, then, the points *g*, *b*, *e*, *f*, be connected by right lines, the *scenography* will be complete.

Otherwise: let AB (*fig.* 61.) be the breadth of either of the six equal square sides of the cube AG, O the place of the observer, almost even with the edge CD of the cube, S the point of sight, SP the horizon parallel to AD, and P (SP being made equal to SO) the point of distance. Make ABCD a true square, draw BS and CS to the point of sight, and BP to the point of distance, intersecting CS in G; then draw FG parallel to BC, and the uppermost perspective square side BFGC of the cube, will be finished. Draw DS to the point of sight, and AP to the point of distance, intersecting DS in I; then draw GI parallel to CD; and, if the cube be opaque, as if wood or metal, all the outlines of it will be finished, and then it may be shaded as in the figure. But if you want a perspective view of a transparent glass cube, all the sides of which will be seen; draw AH toward the point of sight, FH parallel to BA, and HI parallel to AD; then AHID will be the square base of the cube, perspectively parallel to the top BFGC; ABFH will be the square side of the cube, parallel to CGID, and FGIH will be the square side parallel to ABCD.

Having the representation of one cube, that will be sufficient for any number of the same size, provided that they all stand in the same line, or at the same distance from the bottom of the picture. If the cube were above the horizontal line, the representation of it is found in the same manner.

Again: to exhibit the representation of a cube with the fewest possible lines, within the picture. Divide the bottom and one side of the picture (*fig.* 62.) into any number of equal parts, which may be considered as feet; let the proposed representation be six feet from the bottom of the picture, and four feet in diameter; and let CH or CL be half the distance of the eye, and C the centre of the picture.

From *r* draw a line to C; from *q* produce one to H, cutting *r*C in *v*, from *v* draw a parallel line; then a line from *p* to H, which gives *tv* for the bottom of the cube. Upon the line *tv* make the square, and bisect the upper side in *s*; from *x* produce a line to C; and another from *s* to H, which gives the corner *i*; whence the representation may be completed.

Mr. Kirby has proposed the following universal rules for exhibiting the true perspective representations of any objects, and applied them to a variety of elegant drawings in architecture, &c.

Rule I. To determine the perspective length of any given line *ab* (*fig.* 63.) parallel to the horizontal line, and to divide it so as that it may represent any number of equal or unequal parts. Divide the bottom AB of the picture into any given number (e. gr. ten) of equal parts, and let this be a scale for adjusting the proportions of such objects as are to be drawn upon the picture. Let *a* be one end of the line proposed, and from *a* draw at pleasure the parallel *ab*. From any point, as 1 on the scale, draw a line through *a*, to cut the horizontal line in P. Let the space between 1 and 3 be the real length of the proposed line on the scale, and from 3 draw a line to P, cutting *ab* in *b*, and *ab* will represent a length equal to the space 13. In order to divide *ab* into any number of equal or unequal parts, mark on the scale the given proportion, and from thence draw lines to P, which will intersect *ab* in the points proposed.

If *ab* be a perspective line given, and its length be required. Draw a line from any point in the horizontal line through the ends of *ab* to the scale, and these will shew its length. Then *ab* represents six parts, as feet, &c. according to the nature of the design.

Rule II. To cut off a part *ab* (*fig.* 64.) of the line *a*C, that vanishes into the centre of the picture, so as to represent any given length, and to obtain any number of perspective divisions upon it. From C set off the width IK of the picture to L, for the distance of the eye. From L to any point, as 2, on the scale, draw L 2 cutting *a*C in *b*, and *ab* will represent the length *a* 2. In the same manner, lines drawn from any divisions on the scale to L, will cut *a*C so as to give the perspective of such divisions.

Rule III. To cut off a part *ab* (*fig.* 65.) of the line *a*H, that vanishes into one of the points of distance H; and to divide it. Divide the distance CH or CL into five equal parts, and make the dot at P*b* two parts one fourteenth from C. From any division on the scale, as 1, draw a line to P*b*, cutting *a*H in *b*; then will *ab* represent the length *a* 1. To divide *ab*, set off the real lengths of those parts on the scale, and draw lines to P*b*, which will cut *ab* in the proposed points.

For the line *ac*, which vanishes into the point of distance L: make the dot at P*l* the same distance from C as P*b* is from C. From P*l* draw a line to any point, 2, and *ac* will be the perspective of *a* 2, &c. The first of these rules is adapted to the sides of such objects or buildings as are directly front, or are even with the eye; the second to those which run directly from the eye; and the third to such as are viewed angle-ways, and in such a manner that both sides have an equal degree of obliquity. Mr. Kirby has added a fourth rule; for which, being only wanted occasionally, we shall refer to his Perspective of Architecture, &c. p. 5.

For the application of the first and second of the preceding rules, in drawing the representations of squares and circles, see PERSPECTIVE, art. VI. and XI.

For the farther use of these rules: *Let it be required to put a parallel cube of two feet square, and placed at the bottom of the picture in perspective*. Draw the front side *ab* 13 (*fig.* 66.) and lines from *b*, *a*, 3 to C; then from 5 draw a line to H, and from *c* the perpendicular *cd*, and from *d* another parallel, as in the figure. Let the same figure be placed at the distance of one foot within the picture. A line drawn from 6 to L will give the corner *f*, by Rule II. Draw a line from 5 to C, and the parallel *fe*; make $fg = fe$, and draw the front side *fikg*; a line drawn from *e* to L gives the point *h*; from *h* draw the perpendicular *h* 1, and from 1 another parallel.

To exhibit the perspective of several cubes placed behind one another. Draw the front side A*ab* 2 (*fig.* 67.) from *a*, *b*, 2; draw lines to C, and complete the first cube as above. Again, draw a line from 4 to C, and the parallel *cd*; then from *d* draw a line to H, which gives a space to represent the breadth of one cube; from *g* draw the parallel *gh*, and a line from *h* to H will give the breadth of another cube; from *g* and *n* draw perpendiculars cutting *b*C, and from these intersections draw the parallels for the top.

For obtaining the same number of cubes on the opposite side: upon 8 B draw the front side; from 8, and the two upper corners, draw lines to C; and from the seve-

ral corners of the cubes already drawn, produce parallels, as *c m*, intersecting 8 C; from these intersections draw perpendiculars for the sides, and then the parallels for the tops, &c.

To find the perspective appearance of an oblique cube two feet square; the nearest corner being one foot from the bottom of the picture. Find by Rule II. the corner *a* (*fig.* 68.) by the first, the length *a b*; by the third, the depth at *a c*; and draw the parallel *c d*, which gives the other side *a d*. From *c*, *a*, *d*, draw the perpendiculars *c f*, *a e*, *d g*; and *a e* = *a b*; then from *e* draw lines to H and L; and from *f* and *g* lines to H and L.

To exhibit several oblique cubes behind one another, both to the right and left. Draw the first cube from the point 5 (*fig.* 69.); draw lines from 5 to H and L; and a line drawn from 7 to P *l* gives the side 5 *b*; draw the parallel *b c* and the perpendiculars for the upright edges; and make 5 *a* equal to 57, and draw lines from *a* to H and L, and from *d* to L, and from *e* to H, which completes one cube. Let the spaces between the cubes be three feet; draw a line from 8 to L, and another from *b*, and then the parallel *b f* of three feet; and a line from *f* to P *l* gives *b g* to represent *b f*, by Rule III. From 7 draw a line to L, and from *g* the parallel *g h*, which represents two feet, or the breadth of one cube; then from *h* draw a line to P *l*, which gives the side *g i*; and draw a line from *g* to H, and from *c* to L, which will give the other side *g m*. Again, from *g*, *m*, *i*, draw perpendiculars; and then intersections with the lines drawn from the top of the first cube to L, will determine the height of two sides; and by drawing other lines to H, as *n* H, we shall complete another cube; and so on. The figures on the right hand side are found from those which are already drawn by means of parallel lines.

N. B. The representation of the cube prepares the way for the projection of all the regular solids; and we have, therefore, been more diffuse in illustrating the method of doing it.

To exhibit the SCENOGRAPHY *of a hollow, quinquangular prism.* 1. Since the base of a hollow quinquangular prism, standing on a geometrical plane, is a pentagon, with a limb, or breadth, of a certain dimension, find the appearance of this pentagon on a table, or plane. See PERSPECTIVE.

2. On any point, as H, of the terrestrial line DE (*fig.* 70.) raise a perpendicular HI, equal to the objective altitude; and to any point, as V, of the horizontal line HR, draw the lines HV and IV. 3. From the several angles *a*, *b*, *d*, *c*, *c*, of the perspective ichnography, both the internal and external ones, draw lines, as *b* 2, *d* 3, &c. parallel to the terrestrial line; and from the points 1, 2, 3, raise perpendiculars to the same, as L 1, M 2, *m* 2, N 3, *n* 3. If these, then, be raised in the correspondent points of the ichnography, as in the second article, the *scenography* will be complete.

Another method of representing a prism. Let *a b* (*fig.* 62.) be the width of the bottom; from C draw lines through *a*, *b*, in order to obtain the real width of the line *a b*, viz. five feet; at the point *n* erect the perpendicular *n m*, and make it equal to the real height of the prism, viz. four feet; draw the front side *a b d f*. Make an equilateral triangle ABE, whose sides are each equal to *a b*; bisect this triangle by the line DE, and divide DE into two equal parts in F; bisect also *f d* in *c*; and draw *c* C; then take DF, and set it from *c* to *l*, and draw *l* L, intersecting *c* C in *e*; lastly, draw *f e* and *d e*, which complete the figure.

To exhibit the SCENOGRAPHY *of a cylinder.* 1. Since the base of a cylinder, standing on a geometrical plane, is a circle, seek the appearance of a circle. In the points *a*, *b*, *d*, *f*, *h*, *g*, *e*, *c* (*Tab.* II. *fig.* 34.) raise the apparent altitudes, as in the preceding articles. If, now, their upper lines be connected by curve lines, as in the base *a*, *b*, *d*, *f*, *g*, *h*, *e*, *c*, the *scenography* of the cylinder will be complete.

It is evident, that those lines are to be omitted, both in the plan, and in the elevation, which are not exposed to the eye; though they are not to be disregarded from the beginning, as being necessary for the finding of other lines. E. gr. in the *scenography* of the cube, viewed angle-wise, the lines *b d* and *d c* (*Tab.* IV. *fig.* 60.) in the base, and *d h* in the elevation, are hidden from the eye, and are therefore omitted in the description. But since the upper point *h* is not to be found, unless the point *d* be had in the ichnography; nor can the lines *g h* and *h e* be drawn without the height *d h*; the appearance of the point *d* is as necessary to be determined in the operation, as the height *b d*.

Another method. Let the proposed cylinder (*fig.* 71.) be four feet in diameter, six feet high, and three feet from the bottom of the picture; and let the centre be in the line 3 C. Find the point *c*, by Rule II. above, and the diameter *a b* by Rule I. With this diameter find the perspective of a circle. See PERSPECTIVE, art. XI. Divide *a b* into four feet, by Rule I. From *c* draw the perpendicular *c m*; then take one foot from *a b*, and from *c* set it six times to *m*; through *m* draw the parallel *k l*, and make it equal to the lower diameter *a b*; with *k l* find the perspective of another circle, and from the outer part of each oval draw lines, as *a l*, *b k*, which will complete the proposed representation.

For two cylinders behind one another. Let the centres *c* and *m* (*fig.* 72.) of the cylinders be in the line 9 C, and let each be two feet in diameter, and five feet high; let the centre of the first cylinder be only one foot from the bottom of the picture, but that of the other six feet. By Rule I. and II. we may obtain the centre *c*, and the diameter *a b* of the first cylinder, and the whole operation is the same as in the last case. By the same rules we find also the centre *m*, and diameter *l n* of the farthest cylinder; and by drawing a line from *f* to C, we shall have the height of it.

To exhibit the SCENOGRAPHY *of a pyramid standing on its base.* Suppose, e. gr. it were required to delineate a quadrangular pyramid, viewed by an angle. 1. Since the base of such a pyramid is a square seen by an angle, draw such a square. 2. To find the vertex of the pyramid, i. e. a perpendicular let fall from the vertex to the base, draw diagonals mutually intersecting each other in *e* (*fig.* 73.) 3. On any point, as H, of the terrestrial line DE, raise the altitude of the pyramid HI; and, drawing the right lines HV, and IV, to a point of the horizontal line HR, produce the diagonal *d b*, till it meet the line VH in *h*. Lastly, from *h* draw *h i* parallel to HI. This, being raised on the point *e*, will give the vertex of the pyramid K; consequently, the lines *d* K, K *a*, and K *b*, will be determined at the same time.

After the like manner is the *scenography* of a cone delineated.

Another method. Let AD (*fig.* 74.) be the breadth of either of the four sides of the pyramid ATCD at its base ABCD, and MT its perpendicular height. Let O be the place of the observer, S his point of sight, SE his horizon, parallel to AD, and perpendicular to OS; and let the proper point of distance be taken in SE, produced toward the left hand, as far from S as O is from S. Draw AS and DS to the point of sight, and DL to the point of distance, intersecting AS in the point B. Then from B draw BC parallel to AD, and ABCD shall be the perspective square base of the pyramid. Draw the diagonal AC intersecting the other diagonal BD at M, and this point of intersection shall be the centre of the square base. Draw MT perpendicular to AD, and equal to the intended height of the pyramid; then draw the straight lines AT, CT, and DT; and the outlines of the pyramid, as viewed from O, will be finished; and the whole may be so shaded as to give it the appearance of a solid body. If the observer had stood at *o*, he could have only seen the side ATD of the pyramid; and two is the greatest number of sides that he could see from any other place of the ground.

To exhibit the SCENOGRAPHY *of a truncated pyramid.* Suppose the truncated pyramid quinquangular. 1. Then, if from the several angles of the upper base be conceived perpendiculars let fall to the lower base, we shall have a pentagon, with another inscribed therein, whose sides are parallel to those of the former: this coincides with a pentagon, furnished with a rim, or breadth, &c. and may, therefore, be delineated in the same manner. 2. Raising the altitude of the truncated pyramid IH (*fig.* 75.) determine the *scenographic* altitudes to be raised in the points *a*, *b*, *c*, *d*, *e*. If, now, the higher points, *f*, *g*, *h*, *i*, *k*, be connected by right lines, and the lines *ik*, *fm*, *gn*, be drawn, the *scenography* will be complete. By drawing two concentric circles in a geometrical plane, and doing every thing else as in this problem, the *scenography* of a truncated cone will be drawn.

To put two equal figures in perspective, one of which shall be directly over the other, at any given distance from it, and both of them parallel to the plane of the horizon. Let ABCD (*fig.* 76.) be a perspective square on a horizontal plane, S being the point of sight, SP the horizon, parallel to AD, and P the point of distance. Suppose AD, the breadth of the square, to be three feet, and that such another square, EFGH, is to be placed directly above it, parallel to it, and two feet from it. Make AE and DH perpendicular to AD, and two-thirds of its length; draw EH, which will be equal and parallel to AD; then draw ES and HS to the point of sight S, and EP to the point of distance P, intersecting HS in the point G; then draw FG parallel to EH, and you will have two perspective squares, ABCD, and EFGH, equal

equal and parallel to one another, the latter directly above the former, and two feet diſtant from it. By this method ſhelves may be drawn parallel to one another, at any diſtance from each other, in proportion to their length.

To repreſent a double croſs in perſpective. Let ABCD, and EFGH (*fig.* 77.) be two perſpective ſquares, equal and parallel to one another, drawn by the laſt operation, whoſe diſtance is equal to the given height of the upright part of the croſs; S being the point of ſight, and P the point of diſtance, in the horizon PS, taken parallel to AD. Draw AE, DH, and CG; then AEHD, and DHGC, ſhall be the two viſible ſides of the upright part of the croſs; of which the length AE is here made equal to three times the breadth EH. Divide DH into three equal parts, HI, IK, and KD. Through theſe points of diviſion, at I and K, draw MO and PR parallel to AD; and make the parts MN, IO, PQ, KR, each equal to HI; then draw MP and OR parallel to DH. From M and O, draw MS and OS to the point of ſight S; and from the point of diſtance P draw PN cutting MS in T; from T draw TU parallel to MO, and meeting OS in U; and you will have the uppermoſt ſurface MTUO of one of the croſs pieces of the figure. From R, draw RS to the point of ſight S; and from U, draw UV parallel to OR; and OUVR ſhall be the perſpective ſquare end next the eye of that croſs-part. Draw PM*x* (as long as you pleaſe) from the point of diſtance P, through the corner M; lay a ruler to N and S, and draw XN from the line P*x*; then lay the ruler to I and S, and draw YZS. Draw XY parallel to MO, and make XW and YB equal and perpendicular to XY; then draw WB parallel to XY, and WXYB ſhall be the ſquare viſible end of the other croſs-part of the figure. Draw BK toward the point of ſight S; and from U draw UP to the point of diſtance P, interſecting YS in Z; then, from the interſection Z, draw Z*a* parallel to MO, and Z*b* parallel to HD, and the whole delineation will be finiſhed. This done, ſhade the whole, as in *fig.* 78. and you will have a true perſpective repreſentation of a double croſs.

To exhibit the Scenography *of walls, columns,* &c. *or to raiſe them on the pavement.* 1. Suppoſe a pavement AFHI (*fig.* 79.) repreſented in a plan, together with the baſes of the columns, &c. if there be any. 2. Upon the terreſtrial line ſet off the thickneſs of the wall BA, and 1, 3. 3. Upon A and B, as alſo upon 3 and 1, raiſe perpendiculars AD and BC, as alſo 3, 6, and 1, 7. 4. Connect the points D and 6 with the principal point V, by the right lines DV, and 6V. 5. Upon F and H raiſe perpendiculars FE, and HG. Thus will all the walls be delineated.

Now to raiſe the pillars, &c. there needs nothing but, from their ſeveral baſes (whether ſquare or circular) projected on the perſpective plan, to raiſe indefinite perpendiculars; and on the fundamental line, where interſected by the radius FA paſſing through the baſe, raiſe the true altitude AD; for DV being drawn as before, the *ſcenographical* altitudes will be determined.

Scenography *of a door in building, to exhibit the.* Suppoſe a door required to be delineated in a wall DEFA: 1. Upon the fundamental line ſet off its diſtance AN from the angle A, together with the breadths of the poſts NI and LM, and the breadth of the door itſelf LI. 2. To the point of diſtance K, from the ſeveral points N, I, L, M, draw right lines KN, KI, KL, KM, which will determine the breadth of the door *l i*, and the breadths of the poſts *i n* and *m l*. 3. From A to O ſet off the height of the door AO, and from A to P the height of the poſts AP. 4. Join O and P with the principal point by the right lines PV and OV. 5. Then, from *n*, *i*, *l*, *m*, raiſe perpendiculars, the middle ones whereof are cut by the right line OV in *o*, and the extremes by the right line VP in *p*. Thus will the door be delineated, with its poſts.

If the door were to have been exhibited in the wall EFGH, the method would be nearly the ſame. For, 1. upon the terreſtrial line, ſet off the diſtance of the door from the angle, and thence alſo the breadth of the door RT. 2. From R and T draw right lines to the principal point V, which give the breadth *r t* in the perſpective plan. 3. From *r* and *t* raiſe indefinite perpendiculars to FH. 4. From A to O ſet off the true height AO. Laſtly, from O to the principal point V, draw the right line OV, interſecting EF in *z*, and make *r r* and *t t* equal to F*z*. Thus is the door *r r*, *t t*, drawn; and the poſts are eaſily added, as before.

Scenography *of windows in a wall, to exhibit the.* When you know how to repreſent doors, you will find no difficulty in adding windows; all that is here farther required being to ſet off the height of the window from the bottom of the ground. The whole operation is as follows: 1. From 1 to 2 ſet off the thickneſs of the wall at the window; from 3 to 4 its diſtance from the angle 3; and from 4 to 5 its breadth. 2. From 4 and 5, to the point of diſtance L, draw the right lines L 5 and L 4, which will give the perſpective breadth 10, 9 of the window. 3. From 10 and 9 raiſe lines perpendicular to the pavement, i. e. draw indefinite parallels to 6, 3, 4. From 3 to 11 ſet off the diſtance of the window from the pavement 3, 11; and from 11 to 12 its height 11, 12. Laſtly, from 11 and 12, to the principal point V, draw lines V 11, and V 12; which, interſecting the perpendiculars 10, 13, and 9, 14, in 13 and 14, as alſo in 15 and 16, will exhibit the appearance of the window.

From theſe examples, which are all no more than applications of the firſt grand or general rule, it will be eaſily perceived what method to take to delineate any other thing, and at any height from the pavement.

Thoſe who wiſh to ſee the practice of perſpective largely illuſtrated, and applied to a great variety of caſes, may conſult the ſecond book of Kirby's Perſpectire, fol. 1768. and Kirby's Architecture, fol. 1761.

For a mechanical method of exhibiting the *ſcenography* of any object, ſee Designing.

Scenography is alſo uſed for Scene-painting, and denotes the art of painting upon ſeveral planes or ſcenes, at different diſtances, and in various poſitions with reſpect to the eye, in ſuch a manner, that all thoſe different ſcenes, when ſeen from one certain determinate point, may correſpond with each other, and repreſent one entire view of the deſign without breaks or confuſion, as if it were one continued picture.

The deſign of ſcene-painting is not only to decorate the theatre, but to make that part of it, which lies beyond the ſtage, appear much longer than it really is. This is effected by raiſing the floor to a certain angle, by ſloping the cieling, and by raiſing the ſcenes in ſuch a manner, that the floor, cieling, and ſcenes, ſhall be part of a hollow pyramid, which, if continued, would meet in a point; and after having diminiſhed each ſcene in its due proportion, then by drawing thereupon the intended deſign, by the common rules of perſpective; ſo that every ſcene, when put into its proper place, ſhall appear as a part of the general deſign. On this ſubject, ſee Pozzo's Perſpective, 1709. fol. Hamilton's Stereography, in 2 vol. fol. 1738. And, for an abſtract, Kirby's Perſpective, book ii. cap. 7.

SCENOPEGIA, σκηνοπηγια, formed of σκηνη, *ſcene, tabernacle, tent*, and πηγνυμι, *figo, I fix*, the third grand feſtival among the Jews, at which all their males were to attend at the national altar, more uſually called *feaſt of tabernacles*, inſtituted after the people of Iſrael were in poſſeſſion of the land of Canaan, in memory of their having dwelt under tents in the wilderneſs.

The *ſcenopegia* was held for ſeven days ſucceſſively, commencing on the fifteenth of September, i. e. on the fifteenth day of the month Tiſri, the firſt of the civil and ſeventh of the eccleſiaſtical year. To theſe ſeven days there was alſo added an eighth day which was much the moſt ſolemn; both on account of the conflux of perſons, and of the extraordinary tokens they all gave of their joy. This eighth day was properly the feaſt of ingathering, on which they were to give thanks for their whole harveſt. However, the feaſt of tabernacles, and that of ingathering, though properly diſtinct, are ſometimes ſpoken of as one feaſt, and the name of either indifferently applied to the other.

It is of this eighth day St. John muſt be underſtood to ſpeak, when he tells us, our Saviour was at the feaſt of tabernacles, on the laſt and great day.

The rabbies inform us, that there pertained to this feaſt a peculiar ceremony of drawing water out of the pool of Siloam, and pouring of it, mixed with wine, on the ſacrifice, as it lay on the altar. This they are ſaid to have done with ſuch expreſſions of joy, that it became a common proverb, "He that never ſaw the rejoicing of drawing water, never ſaw rejoicing in all his life." To this ceremony our Saviour is ſuppoſed to refer, John vii. 37, 38.

It is the practice of the modern Jews to tie together one branch of palm, three branches of myrtle, and one of willow; and with this in their right hands, and a branch of citron with its fruit in the left, to make a proceſſion, during the ſeven days of the feaſt, in their ſynagogues, round their reading deſks, as their anceſtors did round the walls of Jericho, in token of the expected downfal of their enemies. They alſo turn about with theſe branches to the four cardinal points, and ſhake or puſh them every way, to drive the devil from them. While they are making this proceſſion, they ſing Hoſannah; whence this feaſt is called Hoſannah.

When the Holy Scripture ſays abſolutely *the feaſt*, it is uſually to be underſtood of the *ſcenopegia*.

SCENT. Some animal carcases, buried with lime, though ten feet under ground, have been observed to give so strong a *scent*, as to attract dogs to the place.

SCENT-*bags*, in *Natural History*, a name given by Tyson to those peculiar pouches, or bags, which certain animals, as the civet-cat and musk-animal, have for the receiving the matter of their perfume. These bags are common to more animals than is generally supposed, and in all have much the same qualities, the matter they contain being in most of them fetid and disagreeable, while contained in the bag, and only becoming sweet and pleasant when dried, or taken at least from the animal, and smelt in small quantities. The weasel and polecat, with us, have bags of this kind, and the famous bag or pouch of the opossum is of the nature of these, though it serves also to the other great purpose of receiving and sheltering the young in time of danger. It contains, like the rest, a tough and viscous matter, which ouzes out of the glands, and is of a very offensive smell, while the creature lives; but as soon as it is taken out and dried, the smell changes into a fine perfume. The gland of the aper moschiferus, as Tyson calls it, is of this kind, containing a glutinous humour of a very offensive smell when fresh, but when dried becoming sweet and perfumed as musk. Philos. Trans. N° 239. p. 125.

SCEPASTRA, the name of a kind of bandage for the head, described by Galen.

SCEPTER, *sceptrum*, a royal staff, or batoon, borne, on solemn occasions, by kings, as a badge of their command and authority.

Nicod derives the word from the Greek σκηπτρον, which he says originally signified *a javelin*, which the ancient kings usually bore as a badge of their authority; in regard that instrument was in very great veneration among the heathens. But σκηπτρον does not properly signify a javelin, but *a staff to rest upon*, from σκηπτω, *innitor*, *I lean upon*. Accordingly, in the simplicity of the earlier ages of the world, the *scepters* of kings were no other than long walking-staves: and Ovid, in speaking of Jupiter, describes him as resting on his *scepter*. Met. i. v. 178.

The *scepter* is an ensign of royalty of greater antiquity than the crown. The Greek tragic and other poets put *scepters* in the hands of the most ancient kings they ever introduce.

Justin observes, that the *scepter*, in its original, was an *hasta*, or spear. He adds, that, in the most remote antiquity, men adored the *hastæ*, or *scepters*, as immortal gods; and that it was upon this account, that, even in his time, they still furnished the gods with *scepters*.—Neptune's *scepter* is his trident.

Tarquin the Elder was the first who assumed the *scepter* among the Romans.

Le Gendre tells us, that in the first race of the French kings, the *scepter* was a golden rod, almost always of the same height with the king who bore it, and crooked at one end like a crozier. Frequently, instead of a *scepter*, kings are seen on medals with a palm in their hand.

SCEPTICISM, the doctrine and opinions of the sceptics; called also *Pyrrhonism*, from the name of its author.

The term sceptic, in its original Greek, σκεπτικος, properly signifies *considerative*, and *inquisitive*; or a man who is ever weighing the reasons one side and the other, without ever deciding between them. It is formed from the verb σκεπτομαι, *I consider, look about, deliberate*.

The ancient *scepticism* consisted in doubting of every thing, in affirming nothing at all, and in keeping the judgment in suspense on every subject. Sextus Empiricus makes *scepticism* to consist in a faculty of opposing all appearances, of making all, even contrary things, equally probable, and of proceeding, first to an εποχη, or suspense of mind, and then to entire undisturbedness or tranquillity.

Hence, these great maxims of theirs: Ου μαλλον τουτο η εκεινο, *this no more than that*: Παντι λογω λογος, &c. *every reason has another against it*: and Ουδεν οριζω, *I determine nothing*.

The proper character then of *scepticism*, is an ακαταληψια, *neutrality*, or such a disposition of mind as does not, upon any occasion, incline to any thing more than the contrary thing.

This hesitancy of the sceptics is well described by Aristocles, in Euseb. de Prepar. Evan. All things are equally indifferent, uncertain, and undeterminate: neither our senses, nor our opinions, give us either truth or falshood; therefore neither the one, nor the other, are to be credited, but all things to be left on a level, without admitting any opinion, inclination, or motion of the mind at all. It is added, that the sceptics carried this suspense of theirs so far, as even to deny that any thing is either good or evil, just or unjust, true or false; or that any thing is this, more than that.

It is from this acatalepsia of the sceptics that Descartes seems to have borrowed his great principle of doubting of all things; as is owned by many of his followers. It must be confessed, indeed, that there is some difference between the doubting of the sceptics, and that of the Cartesians. In physical matters, it is true, there does not seem a great deal of difference; and Descartes, in that respect, may, without much injustice, be deemed a sceptic; but this may be said in his favour, that the great Socrates was so far a sceptic himself; physical and sensible things, he held, were all dubious, and at best but probable.

The origin of *scepticism* is somewhat obscure. Pyrrho, who lived under Alexander the Great, and made the tour of India in his retinue, is usually reputed its author; whence the words PYRRHONIANS and *sceptics* are ordinarily used indifferently.

It must be owned, however, that the great dogma of the sceptics had been countenanced, and even cultivated, before Pyrrho, by Democritus, Heraclitus, &c. Sextus Empiricus says expresly, that all that Pyrrho did, was to improve, illustrate, and enforce the dogma, and form the retainers thereof into a sect.

Democritus's philosophy was near akin to *scepticism*; for upon his observing, that honey seemed sweet to some and bitter to others, he concluded, that it was neither sweet nor bitter, and thereupon pronounced, ου μαλλον, *non magis*, which is pure *scepticism*. Yet the same Sextus adds, that Democritus was no sceptic.

Though Plato argues very strenuously against the acatalepsy of the sceptics; yet it is certain that dogma received a great part of its encouragement from Socrates's school, and from Plato's academy. Nay, it was a great controversy among the ancients, whether Plato himself were a sceptic or a dogmatist. Indeed Plato's decisive way of speaking, in many cases, seems to leave no great room for such a doubt; but it is certain, his followers, of the new academy, founded by Arcesilas, gave much into this way; and *nihil scitu* was held by them a principle.

Plato refutes the great principle of the sceptics thus: when you say, that all things are incomprehensible, do you comprehend or conceive that they are thus incomprehensible, or do you not? if you do, then something is comprehensible; if you do not, there is no reason we should believe you, since you do not comprehend your own assertion.

Sextus Empiricus observes, that Socrates himself had a tincture of *scepticism*: some even make him the author of it, from that customary saying of his, *I know nothing but this, that I know nothing*. If this were the origin of *scepticism*, it must be owned, it was mightily improved afterwards, before Metrodorus said, *I know nothing, not even this, that I know nothing*. The same Sextus, however, adds, that Plato, introducing his master in his gymnastic dialogues, disputing with the sophists, makes him act the part of a sceptic.

SCEPTICS, *sceptici*, a sect of ancient philosophers, founded or improved by Pyrrho. Their distinguishing tenet was, that all things are uncertain and incomprehensible; contraries equally true; and that the mind is never to assent to any thing, but to keep up an absolute hesitancy or indifference.

Laertius notes, that the followers of Pyrrho had various denominations: from their master, they were called *Pyrrhonians*; from their dogma, *Aporetici*, that is doubters, of απορειν, *to doubt*; from their suspension and hesitation, *Ephectici*, of επεχειν, *to stay, to keep back*; and from their never getting beyond the search of truth, *Zetetici*, *seekers*.

SCHADIDA *calli*, in *Botany*, a name given by some authors to the plant which affords the euphorbium of the shops.

SCHÆNANTH, *schænanthus*, in *Botany*, the same with ISCHÆMUM. See SCÆNANTH.

SCHÆNICLOS, in *Ornithology*, the name of a bird, which, by the description of Bellonius, seems to be same with that called by the French *alouette de mer*, the *sea-lark*, and by us the STINT.

SCHAFFILT, in *Ornithology*, the name of a very small owl, not larger than the thrush, called NOCTUA *minor* by authors.

Its eyes are very bright, and of a yellow colour; its ears very large; its feet are feathered to the toes, and the soles of its feet are yellow. It is caught in the woods in Germany.

SCHAKARILLA, or SCHACARILLA, in the *Materia Medica*, a name given by some authors to the medicinal bark called *cortex thuris*, and *cortex eleutherii* by others. Montani, Exot. p. 8.

SCHAPHAN, in *Jewish Antiquity*, the name of an animal declared unclean by the law of Moses.

Interpreters do not agree in their explanation of this word.

SCHAR-PENY, SCHARN-PENY, or SCHORN-PENY. It appears, from our old books, that some customary tenants were obliged to pen up their cattle at night in the pound, or yard, of their lord, for the benefit of their dung, or *scearn*, as the Saxons called it. In defect of this they were to pay a small compensation; which was hence called *schar-peny*.

SCHASIS, a word used by some of the writers in surgery to express SCARIFICATION.

SCHEAT, or SEAT, in *Astronomy*, a fixed star of the second magnitude, in the juncture of the leg with the left shoulder of PEGASUS.

Some call it *Scheat Alpheras*, and some *Scheat Pegasi*.

SCHEAT, or, as it is sometimes written, SCHEAD, or *sheart*, a name given by many to the jentling, a fish of the chub-kind, caught in the Danube, and most of the larger rivers of Germany, and called by Gesner and Aldrovand *capito cæruleus*.

This is the *glanus* of Pliny, and the other old Roman authors, and is distinguished by Artedi by the name of the *silurus* with four beards near the mouth. This is its character in which it differs from the *lake*, another fish of this kind; which, though a genuine species of *silurus*, has only one beard.

SCHEDULE, *schedula*, a scroll of paper, or parchment, annexed to a will, lease, or other deed; containing an inventory of goods, or some other matter, omitted in the body of the deed.

The word is a diminutive of the Latin *scheda*, or Greek σχηδη, *a leaf*, or *piece of paper*.

SCHEIK, a name given by the Turks to the prelates of the Mahometan religion, who pretend to be the legitimate successors of Mahomet. Their chief resides at Mecca.

SCHEITER's *fortification*. See FORTIFICATION.

SCHELDAL, the name of a silver coin, current in Denmark, and some parts of Germany.

SCHELLENT, in *Ornithology*, the name of a species of duck, found about the sea coasts, of the size of the common duck, and differing from the *capo rosso* in this, that it is twice as large, and the eyes have yellow irises; though agreeing with it in the colour of the head, which is of a reddish brown. Its neck is grey, and its back is of a blackish grey; its throat, breast, and belly white, but near the anus there is a transverse brown line. The long feathers of the wings are black and white, and the tail of a blackish grey.

SCHELLEY, in *Ichthyology*, a name given in some counties of England to the fish known among authors by the name of *ferra*. See GUINIAD.

SCHEMATISM, σχηματισμος. See FIGURE and TROPE.

SCHEME, formed from σχεμα, *habitus*, a draught, or representation, of any geometrical or astronomical figure, or problem, by lines sensible to the eye; or of the celestial bodies in their proper places for any moment.

SCHEME, *schema*, σχημα, in the *Ancient Music*, is used for the varieties arising from the different positions of the tones and semitones in a consonance.

SCHEME *arches*. See ARCH.

SCHERIF, a title which the Arabians give to a Mahometan prince, who is the sovereign of Mecca, in subordination to the sultan. See SHERIF.

SCHETES was formerly a term for usury; and the commons prayed that order might be taken against this horrible vice, practised by the clergy as well as the laity. Rot. Parl. 14 Ric. II.

SCHETIC *diseases*, a term used by old writers in medicine to express such diseases as were not deeply rooted in the constitution, but might be easily removed.

SCHEVAGE. See SCAVAGE.

SCHEUCHZERIA, *lesser flowering rush*, in *Botany*, the name of a genus of plants of the *hexandria trigynia* class; the characters of which are these: the perianthium is divided into six oblong, acute, reflex, and expanded leaves, remaining with the fruit; there is no flower of petals; the stamina are six very short and flaccid capillary filaments; the antheræ are erect and obtuse, very long and of a compressed figure; the germina of the pistils are three in number, they are of the size of the cup, and of an oval compressed figure, though there be no style; the stigmata are oblong, and obtuse on the upper part, they grow on the outside to the germina; the fruit consists of as many capsules as the pistil had germina; they are of a roundish figure, inflated, and compressed, and each composed of two valves; the seeds are single and oblong.

The number of the germina and capsules vary, from three up to six; the three seem, however, the most natural state of the flower, and are the most frequent.—There is only one species.

SCHILUS, in *Ichthyology*, a name given by many to the fish called by the generality of authors LUCIOPERCA, or the pike-fish.

SCHINELÆON, a word used by the ancients to express an oil of mastich, or oil in which mastich was dissolved.

SCHINUS, in *Botany*. See *Indian* MASTICH.

SCHIPPER. See SHIPPER.

SCHIREMOTE, or SCYREMOT. See SCYREMOT.

SCHIRROSIS, a name given to a disorder of the eye, arising from the violence of a long continued inflammation, when the flesh increases in bulk, and assumes a livid colour.

SCHIRRUS. See SCIRRHUS.

SCHIRRUS *of the testicle*, &c. See SARCOCELE.

SCHISM, *schisma*, formed from σχισμα, *cleft*, *fissure*, in the general, signifies *division*, or *separation*; but it is chiefly used in speaking of separations happening through diversity of opinions among people of the same religion and faith.

Thus, we say, the *schism* of the ten tribes of Israel, from the two tribes of Judah and Benjamin; the *schism* of the Persians, from the Turks, and other Mahometans, &c. Among ecclesiastical authors, the *great schism of the West* is that which happened in the times of Urban VI. and Clement VII. who were both advanced to the papacy at the same time, the latter residing at Avignon in France, and the former at Rome, which divided the church for forty or fifty years; the cause of Clement being espoused by France and Spain, Scotland, Sicily, and Cyprus, while the rest of Europe acknowledged Urban to be the true vicar of Christ; and was at length ended by the election of Martin V. at the council of Constance, summoned to meet in the year 1414.

The Romanists number thirty-four *schisms* in their church. They bestow the name *English schism* on the reformation of religion in this kingdom. Those of the church of England, again, apply the term *schism* to the separation of the nonconformists; viz. the Presbyterians, Independents, and Anabaptists, who contend for a farther reformation.

Some call the separation of the Protestants from the church of Rome a *passive schism*; because that church cut them off from her communion.

The word *schism* is used, in Scripture, in an indifferent sense; and, therefore, the lawfulness or unlawfulness of it is entirely to be determined by circumstances. In our own language, indeed, common use has affixed to the term an idea of guilt and reproach: but in this sense there can be no such thing as *schism*, except in cases where there is an obligation to unity and communion: so that in order to define the nature of it justly, we must find out some centre of union, which is common to all Christians. This must be either uniformity of sentiment in matters of speculative belief, or in external modes of worship and discipline, which, in the nature of things, is impossible; or, if it be unreasonable to expect either of these, the only centre of unity that remains is charity and mutual forbearance, notwithstanding lesser differences, where there is an assent to all the necessary principles of Christian faith, and the profession of Christianity is proved to be sincere by a regular and virtuous life. However numerous the differences that subsist among Christians, as long as mutual charity is preserved, there cannot be the guilt of *schism*. Alienation of affection, and a turbulent excommunicating spirit, are the essence of *schism*, and not mere difference of opinion; not the use of different ceremonies, or of no ceremonies at all; or joining ourselves to any particular religious communion: for, according to St. Paul, who in several passages, blames the Corinthians for divisions, or *schisms*, among themselves in the same community, this crime may be committed where there is no separation from a particular church; and, consequently, they that differ uncharitably whether they belong all to one, or form distinct worshipping assemblies (and they alone), are *schismatics*.

SCHISM, *Greek*. See *Greek* CHURCH.

SCHISM *bill*, the name of an act passed in the reign of queen Anne, which restrained Protestant dissenters from educating their own children, and forbad all tutors or schoolmasters being present at any conventicle, or dissenting place of worship. The queen died on the day when this act was to have taken place (Aug. 1st, 1714), and the *schism bill* was repealed in the fifth year of Geo. I.

SCHISMA, in *Music*. Some, as Grassineau, make this interval equal to half a comma, and say that eighteen of them are required to make a complete tone, reckoning nine commas to a tone. But all this is inaccurate. See INTERVAL.

It is also used by some for the difference between the tones major and minor, called by others a comma. See COMMA.

SCHISTON. See ALLUMEN *scagliolæ*.
SCHISTUS. See SLATE.
SCHIT-ELU, in *Botany*, a name given by some authors to the plant which produces the seed called *sesamum* in the shops.
SCHLEMMEN, a term used by the smalt-makers to express the substance of the smalt after fusion, when it is separated from the *eschel*; that is, a sort of grey ashes which adhere to it, and is ready for powdering for use.
SCHMIDELIA, in *Botany*, a genus of the *octandria digynia* class. Its characters are, that the calyx consists of two leaves, the corolla of four petals, that the germina have little foot-stalks, and are longer than the flower. There is only one species.
SCHNOT-*fish*, a name by which some call the hasela or hasler, a fresh water fish, approaching to the mullet or chub kinds, and at some seasons esteemed a very delicate dish. See HASELA.
SCHŒNANTH, or SCHÆNANTH. See SCÆNANTH.
SCHOENAS, among the ancients, a land measure containing two parasangs, or sixty stadia, according to Herodotus, which makes seven and a half of our miles. But Pliny computes it at five miles, or fifty stadia. See PARASANG and STADIUM.
SCHOENOBATES, σχοινοϐατης, formed from σχοινος, *a rope*, and βαινω, *I walk*, a name which the ancient Greeks gave to their rope dancers, by the Romans called *funambuli*.
The *schoenobates* were slaves, whose masters made money of them by entertaining the people with their feats of activity. Mercurialis, de Arte Gymnastica, lib. iii. gives us five figures of *schoenobates*, engraven after ancient stones. See *Rope* DANCER.
SCHOENUS, *bastard cypress*, in *Botany*, a genus of the *triandria monogynia* class. Its characters are, that the calyx consists of chaffy glumes, which are single-valved, and folded over one another, it has no corolla, and a single roundish seed between the glumes. There are twelve species, among the grasses, distributed by Linnæus into those that have a round and a three-sided stalk.
SCHOLARES, an ecclesiastic order, instituted by Innocent III. in the council of Lateran.
SCHOLARUM *domesticus*. See DOMESTICUS.
SCHOLASTIC, σχολαστικ☉, something belonging to the schools, or that is taught in schools. See SCHOOL.
Scholastic, *scholasticus*, was a long time a title of honour, at first only given to such as distinguished themselves by their eloquence in declaiming, &c.
After Nero, the appellation *scholasticus* was also given to the advocates; and, among others, to Socrates and Eusebius, the ecclesiastical historians, who were both advocates at Constantinople. Constant. Harmenopulus also bore it, in the twelfth century; with several others.
Afterwards *scholasticus* became restrained to such as had the government of the ecclesiastical schools, established under the first race of French kings, who instructed the clerks of each church, first in the humanities, then in the theology, and the liturgy. These were also called *primiciers escolastres*, and *theologaux*: and, if the church were situated in a city, the *scholasticus* was called the *chancellor*.
Among the Greeks, *scholasticus*, σχολαστικ☉, was also the name of an office, or dignity, answering to our *divine*, or *theologue*. Indeed, Genebrard observes, it was only properly applied to people of general learning and fine parts; and who were well known to the world in that character.
Thus St. Jerom mentions, that Serapion was surnamed *Scholasticus*, by reason of the delicacy of his wit. Walafrid. Strabo calls the poet Prudentius *Scholasticus*: and Fortunatus was called *Scholasticissimus*.
SCHOLASTIC *divinity* is that part or species of divinity which clears and discusses questions, by reason and arguments.
In which sense, it stands, in some measure, opposed to *positive* divinity; which is founded on the authority of fathers, councils, &c.
The *school divinity*, like Plato's school, has had its three several ages, or periods: the *ancient*, the *middle*, and the *new*.
The ancient began under Lanfranc, archbishop of Canterbury, or more properly under Abelard and Peter Lombard, his disciple, the master of sentences, a work which appeared in 1172, and held almost 100 years; ending under Albertus Magnus, who was born in 1193.
The followers of Lombard were called *sententiarii* as well as *scholastici*.
This was succeeded by the middle *school divinity*, which commenced in the year 1220, under Albertus, who was succeeded by his disciple Thomas Aquinas: during which time the Peripatetic philosophy was raised to its utmost reputation. See REALISTS.
The third age began under Durandus, who set himself up against Thomas, the chief of the middle age. After his time people's wits became more and more subtile; and the school began to be wholly taken up in frivolous questions. They disputed, with great heat, about mere formalities; and even raised phantoms on purpose to combat withal.
The *school divinity* is now fallen into the lowest contempt; and is scarce regarded any where, but in some of the universities, where they are still obliged by their charters to teach it.
SCHOLIAST, σχολιαςης, *commentator*, a grammarian who writes *scholia*, that is, notes, glosses, &c. upon ancient authors, who have written in the learned languages.
SCHOLIUM, σχολιον, a note, annotation, or remark, occasionally made on some passage, proposition, or the like.
The term is much used in geometry, and other parts of mathematics; where, after demonstrating a proposition, it is frequent to point out how it might be done some other way; or to give some advice or precaution, in order to prevent mistakes; or add some particular use or application thereof.
Wolfius has given us abundance of curious and useful arts and methods, and a good part of the modern philosophy, the description of mathematical instruments, &c. all by way of *scholia* to the respective propositions in his Elementa Matheseos.
SCHOOL, *schola*, a public place, wherein the languages, humanities, or other arts and sciences, are taught.
The word is formed from the Latin *schola*, which, according to Du-Cange, signifies discipline and correction. He adds, that it was anciently used, in the general, for all places where several persons met together, either to study, to converse, or do any other matter. Accordingly, there were *scholæ palatinæ*, being the several posts wherein the emperor's guards were placed; *schola scutariorum*, *schola gentilium*, &c. At length the term passed also to civil magistrates; and, accordingly, in the code we meet with *schola chartulariorum*, *schola agentium*, &c. and even to ecclesiastics, as *schola cantorum*, *schola sacerdotum*, &c.
Thus we say, a grammar-*school*, a writing-*school*, a *school* of natural philosophy, &c.
SCHOOL is also used for a whole faculty, university, or sect; as Plato's *school*, the *school* of Epicurus, the *school* of Paris, &c. The *school* of Tiberias was famous among the ancient Jews; and it is to this we owe the Massora, and Massoretes.
SCHOOL, in *Painting*, is used as a term to distinguish the different manners of places and persons.
Thus, we say, the Roman *school*, the Venetian *school*, the Flemish *school*, &c. Raphael's *school*, Titian's *school*, Da Vinci's *school*, &c. meaning their disciples, pupils, &c.
SCHOOL *of Athens* is the name of a celebrated piece of Raphael, now in the Vatican. It contains a great number of figures, representing philosophers, mathematicians, and other persons engaged in the arts and sciences.
Several authors have written of this painting, and given different explications thereof. Vasari will have it to be the agreement of philosophy and astronomy with theology.
The engravers, by the inscription they add at the bottom of the print thereof, shew, that they take it for a painting of St. Paul preaching at Athens. An Augustine of Venice takes the philosopher, who is writing, for St. Mark; and him at his knees, for the angel Gabriel.
M. de Piles rejects all these explications of the *school of Athens*, and especially the last; his opinion is, that it is nothing more than an image of philosophy, which Raphael here represents under all the philosophers he has painted.
In behalf of the Venetian engravers it may be said, that they do not pretend to explain the painting, but have only copied such of the figures as they thought proper to represent St. Mark, Gabriel, &c.
SCHOOL, or *schooling*, in the *Manege*, is used to signify the lesson and labour both of the horse and horseman.
A *school pace*, or *gate*, denotes the same with ECOUTE.
SCHOOLMASTER. No person shall keep a *schoolmaster*, who does not constantly go to church, or is not allowed by the ordinary, on pain of 10*l*. a month, and the *schoolmaster* shall be disabled, and suffer a year's imprisonment, stat. 23 Eliz. cap. 1.
RECUSANTS are not to be *schoolmasters* in any public grammar school, nor any other, unless the persons be licensed by the bishop, under the penalty of forfeiting 40*s*. a day. 1 Jac. I. c. 4.

By

By 17 Car. II. cap. 2. no person shall be *schoolmaster*, or take any boarders to be instructed by himself, or by any other, without taking an oath of allegiance therein mentioned, on pain of 40*l*.

Every *schoolmaster* keeping any public or private school, and every tutor in any private family, shall subscribe the declaration, that he will conform to the liturgy of the church of England as by law established, and be licensed by the ordinary, or he shall for the first offence suffer three months imprisonment; for the second and every other offence, be imprisoned three months and forfeit 5*l*. &c. 13 & 14 Car. II. c. 4.

For the exemption relating to Popish *schoolmasters*, provided by 18 Geo. III. c. 66. See PAPISTS.

By 19 Geo. III. c. 44. no dissenting minister, nor any other protestant dissenting from the church of England, who shall take the oaths, and subscribe the declaration against popery, and the other declaration enjoined by that act (see TOLERATION) shall be prosecuted in any court whatsoever, for teaching and instructing youth as a tutor or *schoolmaster*: provided, that this shall not extend to the enabling any person, dissenting from the church of England, to hold the *mastership* of any college, or *school* of royal foundation, or of any other endowed college or *school* for the education of youth, unless the same shall have been founded since the first year of king William and queen Mary, for the immediate use and benefit of protestant dissenters.

SCHOOL *philosophy*, *theology*, &c. the same with SCHOLASTIC.

SCHOOLS, *charity*. See CHARITY.

SCHOONER, in *Sea Language*, a small vessel with two masts, whose main-sail and fore-sail are suspended from gaffs, reaching from the mast towards the stern, and stretched out below by booms, whose foremost ends are hooked to an iron, which clasps the mast, so as to turn therein as upon an axis, when the after-ends are swung from one side of the vessel to the other.

SCHOOUBIAH, a sect among the Mussulmen, whose distinguishing tenet it is, that the Sonnites are not at all preferable to the Shiites, or Rafadhites, *i. e.* the orthodox to the heterodox, but that both the one and the other are equally true believers.

The *Schooubiah*, therefore, should be, properly, the latitudinarians in Mahometanism, yet are not they regarded by either party, as much better than gentiles or heathens, as their name in that language imports.

There are abundance among the Mussulmen, who give into this sect, only secretly; Mahometanism, like all other false religions, being an avowed enemy to toleration.

SCHORN-PENY. See SCHAR-PENY.

SCHRAITSER, in *Ichthyology*, the name of a fish very common in the Danube, and in many things resembling our ruff, or small gilded pearch.

Its common size is about three inches in length; its tail is forked, and its back-fin is supported by thirty rays or nerves, eighteen of which are rigid and prickly, and those which stand behind them soft and flexile. The upper jaw has a membrane somewhat like a lip, which hangs from it, and the coverings of the gills terminate in a spine or prickle. The membrane of the back-fin is variegated with black spots, and its general colour is somewhat paler than that of the pearch. It is a very well tasted fish.

SCHREBERA, in *Botany*, a genus of the *pentandria digynia* class: its characters are, that the calyx is divided into five segments, and that the corolla is funnel-shaped. There is only one species.

SCHWALBEA, in *Botany*, the name of a genus of plants, of the *didynamia angiospermia* class; the characters of which are these: the perianthium consists of one leaf, and is of a very singular figure, being tubular, inflated, and striated on the surface, and terminated by an oblique mouth, lightly divided into four segments; the upper segment is smallest of all, the two side ones are longer, and the bottom one is longer and broader than these, and is emarginated; the flower consists of one leaf, and is of the labiated kind; the tube is of the length of the cup, and the limb erect; the upper lip is erect, hollow, and undivided; the lower lip is of the same size, but is divided into three obtuse and equal segments; the stamina are four capillary filaments, of the length of the flower, but two of them are a little shorter than the others; the antheræ are incumbent; the germen of the pistil is round. The style is of the length and figure of the stamina, and is placed in the same situation; the stigma is thick and crooked; the seed is single, roundish, and small. There is only one species.

SCHWENKIA, in *Botany*, a genus of the *diandria monogynia* class: its characters are, that the corolla is subequal, with a plicated glandulous opening, that the stamina are three and sterile, and the fruit is a double-celled polyspermous capsule. There is only one species.

SCIADEPHORI, σκιαδηφοροι, formed of σκιαδειа, an *umbrella*, and φερω, *I carry*, among the *Athenians*, an appellation given to the stranger women residing in Athens, because they were obliged, at the festival Panathenæa, to carry umbrellas to defend the free women from the weather.

SCIÆNA, in the *Linnæan system of Ichthyology*, the name of a distinct genus of fishes, of the order of *thoracici*, the characters of which are, that the opercula of the gills are scaly, that it has six branchiostegous rays, and a groove in the back to receive the dorsal fin. Of this genus are the *umbra*, &c.

The characters of this genus, according to the Artedian system, are these: the whole head, and the coverings of the gills are scaly, and one of the laminæ of these coverings is serrated at the edge; the body is compressed and broad; the back is acute; and the teeth are only in the jaws and fauces, the palate and tongue being bare; there is only one fin on the back, but it is bifid, being so deeply divided at the middle, that it seems to make two; the tail is not forked, but even at the end; the appendices of the pylorus are seven or eight in number. There are five species found in the Mediterranean.

The name *sciæna* is of Grecian origin, derived from the word σκια, *a shadow*. The fish had this name from its being of a dusky or shadowy colour.

SCIAGRAPHY, or SCIOGRAPHY, the profile, or section, of a building, to shew the inside thereof.

SCIAGRAPHY, formed of σκια, *shadow*, and γραφω, *I describe*, in *Astronomy*, &c. is a term some authors use for the art of finding the hour of the day or night, by the shadow of the sun, moon, stars, &c. See DIAL.

SCIAMACHIA, formed of σκια and μαχω, *I fight*, the fighting with a person's own shadow, a sort of exercise prescribed by the ancient physicians, in which the motion of the arms, and other parts of the body, were of very great service in many chronic cases.

SCIAMANTIA, SCIAMANCY, or SCIOMANCY, formed from σκια, *shadow*, used metaphorically for the soul, and μαντεια *divination*, a kind of divination, otherwise called *psychomancy*. *Sciamancy*, among the ancients, was the art of raising and calling up the manes or souls of deceased persons, to give intelligence of things to come. The witch who conjured up the soul of Samuel, to foretel Saul the event of the battle he was about to give, did it by *sciamancy*.

SCIAPODES. See SCIOPODÆ.

SCIARRI, in *Natural History*, the matter which runs down in burning torrents from the craters of mount Ætna.

This matter, when cold and hard, is hewed and employed at Catania, and other places. It is chiefly used for the basements and quoinage of buildings. It probably contains mineral and metallic particles, being a ponderous, hard, grey stone. Philos. Trans. N° 481. p. 327, 328. See STONE.

Some of the *sciarri* are coarse, and others fine and polished on the surface; some of them are black, others reddish, and others of the colour of iron; and many of them have coverings of pure sulphur over the whole surface, or a part of it. Some very fine and smooth ones, resembling iron, but very light, are found in, or near the mouths of the eruption, and some very hard and heavy, and of a mixed nature, seeming to be the result of many sorts of minerals melted together. These latter, when the mountains have poured out streams of fire, always remain in the places, and are the substance that was on fire cooled again.

At the time of the most terrible eruptions of this kind, these heaps of *sciarri*, which sometimes appear to be solid rocks of metalline matter, are only a sort of covered arches, under which the melted matter yet continues liquid and running, and bursts out, at times, in the several parts of their sides or surfaces. The general appearance of a train of these *sciarri*, left after the eruption of such a rivulet of fire, is much like that of the Thames, or some other such large river, in the time of a severe frost, the rocks of *sciarri* rising above the general surface, like the clods of ice in that scene; the colour only differing, the great quantities of the *sciarri* in these places being of a deep bluish hue.

It is remarkable, that the substance of these *sciarri*, even while melted and running in streams down the hill, is so firm and solid, that no weight will sink into it, nor any instrument make its way through the surface, any more than a solid mass of cold metal. It has been supposed by some, that the flowing matter concreted into the common pumice stone, but that is a vulgar error, the pumice being a wholly different substance. Philos. Trans. N° 49.

SCIATHERICA, a name given to DIALLING.

SCIATHERICUM *teleſcopium*, a horizontal dial with a teleſcope, adapted for obſerving the true time, both by day and night, to regulate and adjuſt pendulum-clocks, watches, and other time-keepers. It is the invention of the ingenious Mr. Molyneux, who has publiſhed a book with this title, containing an accurate deſcription of this inſtrument, its uſes, and application.

SCIATIC *artery*, in *Anatomy*, is a branch of the *hypogaſtric* artery, which gives ſome branches to the muſculus pyriformis, the quadrigemini, the os ſacrum, &c. and to the inner ſide of the os iſchium. It likewiſe detaches a branch, which runs under the muſculus quadratus, to the articulation of the os femoris. It paſſes obliquely over the *ſciatic* nerve, and as they both go through the great poſterior ſinus of the os ilium, it detaches ſmall arteries, which are diſtributed to the inner ſubſtance of that nerve. Afterwards it runs up in a radiated manner, on the outſide of the os ilium, and is diſtributed to the inner ſubſtance of that bone, and to the muſculi glutæi, eſpecially to the medius and minimus.

SCIATIC *vein*, in *Anatomy*, a branch of the CRURAL vein, which runs down on the ſide of the trunk, covering the crural artery, almoſt as low as the ham, where it is again united to the trunk by an anaſtomoſis, and ſometimes it is continued ſeparate a little way down on the leg. It has its name from the *ſciatic* nerve which it accompanies.

SCIATIC *nerve*. See NERVE.

SCIATICA, in *Medicine*, the GOUT, or rather RHEUMATISM, in the hip and thigh. This is a very tedious and obſtinate pain. Dr. Tiſſot has ſucceeded in removing it by the application of ſeven or eight cupping-glaſſes on the tormented part: he adds, that bliſters, and other ſtimulating plaſters, have often contributed to the cure, though leſs effectual than cupping; that a plaſter of quick lime and honey blended together, has cured inveterate *ſciaticas*; and that a ſeton has alſo been ſucceſsfully made in the lower part of the thigh. Tiſſot's Advice, &c. 2d ed. p. 189.

Dr. Fothergill, conſidering that the LUMBAGO and *ſciatica* are pains deeply ſeated in the moſt fleſhy parts of the human body, to which it is extremely difficult to convey the efficacy of any medicine entire, whether given internally or applied without, and that mercurials, of all the medicines we are acquainted with, moſt certainly pervade the inmoſt receſſes of the muſcular and tendinous parts, and remove diſeaſes which are known to reſide in them, recommends the uſe of calomel in caſes of this kind. His method of adminiſtering it in the *ſciatica* is as follows:

℞ Calom. levig. gr. x. Conſerv. roſ. q. ſ. f. pil. x. non deaur. Capiat j. omni nocti ſuperbibendo hauſt. ſeq.

℞ Aq. alexit. ſimp. ℥i. ſs. Aq. alexit. ſpir. ʒi. ſs. Vin. antimon. gut. xxx. Tinct. Theb. gut. xxv. Syr. ſimp. ʒi. m.

This proceſs he hath found of ſingular ſervice, after various other medicines and operations, recommended for the cure of this complaint, had been uſed to very little purpoſe. If the pain does not abate by the time this quantity is taken, he increaſes the doſe of calomel to two grains one night, one the next, and thus proceeds alternately; when the pain abates, the anodyne and antimonial are gradually leſſened, perhaps omitted every other night, or wholly dropped. He ſays, that he has ſeldom met with a genuine *ſciatica*, which has not yielded to this proceſs in the ſpace of a few weeks, and has as ſeldom returned. Lond. Med. Obſerv. vol. iv. p. 74, &c.

Dr. Dawſon prefers giving to perſons, of robuſt habits, mercurials once or twice a week, as Dr. Radcliffe, Mead, &c. uſed to do, in pretty large doſes, joined with the more draſtic purgatives, and on the intermediate days ſuch medicines as are in common uſe, among which, he ſays, the guaiacum is certainly not the leaſt efficacious. Caſes in the Acute Rheumatiſm, &c. 5th ed. p. 99.

SCIATICA *creſſes*, in *Botany*. See CRESSES and DITTANDER.

SCIE.—*Feuille de* SCIE. See FEUILLE *de ſcie*.

SCIENCE, formed from *ſcientia*, of *ſcire*, *to know*; in *Philoſophy*, a clear and certain knowledge of any thing, founded on ſelf-evident principles, or demonſtration.

In this ſenſe, *doubting* is oppoſed to *ſcience*; and opinion is the middle between the two.

The ſceptics profeſs to deny, that we have any ſuch thing as *ſcience*; that is, any clear or certain notices of any thing capable of producing abſolute conviction.

SCIENCE *of conditionals*. See CONDITIONALS.

SCIENCE is more particularly uſed for a formed ſyſtem of any branch of knowledge, comprehending the doctrine, reaſon, and theory, of the thing, without any immediate application thereof to any uſes or offices of life.

In this ſenſe, the word is uſed in oppoſition to *art*.

Indeed the preciſe notion of an art, and *ſcience*, and their juſt adequate diſtinction, do not ſeem to be yet well fixed. See the PREFACE to this Work. See alſo ART.

As to the number and diviſion of the *ſciences*, Mr. Locke limits them thus; all that can fall within the compaſs of human underſtanding, is, firſt, either the nature of things, their relations, and their manner of operation: or, ſecondly, that which man ought himſelf to do as a voluntary and rational agent, for the attainment of any end, eſpecially of happineſs: or, thirdly, the ways and means whereby the knowledge of both of theſe is attained and communicated: whereupon, *ſcience* may be properly divided into theſe three ſorts.

Firſt, the knowledge of things, their conſtitutions, properties, and operations, whether material or immaterial. This, in a little more enlarged ſenſe of the word, may be called *φυσικη*, or *natural philoſophy*. The end of this is bare ſpeculative truth, and whatſoever can afford the mind of man any ſuch, falls under this branch, whether it be God himſelf, angels, ſpirits, bodies, or any of their affections, as number, figure, &c.

Secondly, *πρακτικη*, the ſkill of right applying our own powers and actions for the attainment of things good and uſeful. The moſt conſiderable under this head, is ETHICS, which is the ſeeking out thoſe rules and meaſures of human actions, which lead to happineſs, and the means to practiſe them. The end of this is not bare ſpeculation, but right, and a conduct ſuitable thereto.

Thirdly, *σημειωτικη*, or the doctrine of ſigns. The moſt uſual being words, this is aptly enough termed *logic*; the buſineſs whereof is to conſider the nature of thoſe ſigns which the mind makes uſe of for the underſtanding of things, or conveying its knowledge to others. Things are repreſented to the mind by ideas, and men's ideas are communicated to one another by articulate ſounds or words. The conſideration then of ideas and words, as the great inſtruments of knowledge, makes no deſpicable part of their contemplation, who would take a view of human knowledge in the whole extent of it.

This ſeems the firſt, and moſt general, as well as the moſt natural diviſion of the objects of our underſtanding: for a man can employ his thoughts about nothing, but either the contemplation of things themſelves for the diſcovery of truth; or about the things in his own power, which are his actions, for the attainment of his own ends, or the ſigns the mind makes uſe of, both in the one and the other, and the right ordering of them, for its clearer information. All which three, viz. things as they are in themſelves knowable, actions, as they depend on us in order to happineſs, and the right uſe of ſigns in order to knowledge, being *toto cælo* different, they ſeem to be the three great provinces of the intellectual world, wholly ſeparate and diſtinct one from another.

SCIENCES, *academy of*. See ACADEMY.

SCIENTIA *media*, in *Theology*. See MOLINISTS.

SCIENTIFIC, or SCIENTIFICAL, ſomething relating to the pure, ſublimer ſciences; or that abounds in ſcience, or knowledge.

A work, a method, &c. is ſaid to be *ſcientifical*, when it is founded on the pure reaſon of things, or conducted wholly on the principles thereof.

In which ſenſe the word ſtands oppoſed to narrative, arbitrary, opinionative, poſitive, tentative, &c.

SCIERIA, Σκιερια, in *Antiquity*, a feſtival in honour of Bacchus, kept in Arcadia.

It was ſo called, becauſe that God's image was expoſed *ὑπο τῇ σκιάδι*, *i. e.* under an umbrella. At this time the women were beaten with ſcourges, in the ſame manner with the Spartan boys at the altar of Diana Orthia, which they underwent in obedience to a command of the Delphian oracle.

SCILLA, in *Botany*. See SQUILL.

SCILLITICUM *vinum*. See SQUILL.

SCILLONEORTE, Σκιλλων Ἑορτη, in *Antiquity*, the feſtival of ſea-onions. It was obſerved in Sicily. The chief part of it was a combat, wherein youths beat one another with ſea-onions. He that obtained the victory was rewarded by the gymnaſiarch with a bull.

SCIMPODIUM, Σκιμποδιον, among the *Ancients*, a ſmall couch or bed, on which one perſon only could reſt at a time. It was on the *ſcimpodium* that the Romans uſed to lay themſelves when weary or indiſpoſed.

The *ſcimpodium* was ſometimes uſed inſtead of the LECTICA, to carry both men and women, not only through the city, but likewiſe in journies into the country.

SCINCUS, the *ſkink*, in *Zoology*, the name of a ſpecies of

of lizard, called alſo by ſome the land crocodile, *crocodilus terreſtris*, and well known in the druggiſts ſhops as an ingredient in ſeveral compoſitions.

It reſembles the ſmaller ſort of lizards, being uſually about ſix inches long, and its uſual thickneſs is that of a man's thumb. It is of a ſilvery greyiſh colour, ſcaly, and has a rounded tail; its head is of an oblong figure; its noſe ſharp; and its feet, as it were, alated, having five toes each, armed with very ſharp claws. It is very common in Egypt and Arabia.

The dried fleſh of the *ſcincus* is greatly commended, as poſſeſſing all the virtues of that of vipers, but in a more exalted degree. It is ſaid to be a diuretic, alexipharmic, and uſeful in leprous diſorders, and to do wonders as a reſtorative, and provocative to venery. For this laſt purpoſe the belly is preferred to any other part of it, but there appears no reaſon for this in the dried animal. The people of Egypt cut the fleſh to pieces, and boil it down to a ſtrong broth or jelly, in which form it may do ſome ſervice, though it fails with us. The only uſe made of it at preſent in the ſhops, is as an ingredient in ſome of the old compoſitions.

SCINDALMOS, a word uſed by the ancients to expreſs a fiſſure of the cranium, or of any other part.

SCINTILLA *veneris*, a term uſed by Paracelſus to expreſs a reſolution of the limbs, or deprivation of motion from a venereal cauſe.

SCIOGRAPHY. See SCIAGRAPHY.

SCIOMANTIA. See SCIAMANTIA.

SCIOPODÆ, in *Hiſtory*, the name given by Pliny, and other of the old writers, to a nation of people which they place in Æthiopia, on the burning ſands; and who they ſay, when too hot, lie down upon their bellies, and ſhadow themſelves from the ſun by lifting up their feet, which are very large and broad, againſt it. Theſe are ſome of the *gentes mirabilis figuræ* of Pliny, and are worthy to ſtand among the MONOCOLI, and other ſuch monſters.

SCIPIO, in *Ancient Hiſtory*, a name given by the Romans to a baton, or ſceptre of ivory, borne by the conſuls as a token of their dignity. Under the republic, it was no more than a rod without any additional ornaments. Under the emperors, and principally thoſe of Conſtantinople, it was ſurmounted with an eagle, and terminated by a buſt, which repreſented the reigning emperor.

SCIOPTIC, a ſphere or globe of wood, with a circular hole or perforation, wherein a lens is placed. It is ſo fitted, that, like the eye of an animal, it may be turned round every way, to be uſed in making experiments of the darkened room.

SCIRA, Σκειρα, a feſtival among the Athenians, otherwiſe called SCIRROPHORIA.

SCIRE FACIAS, a judicial writ, moſt commonly uſed to call a man to ſhew cauſe to the court whence it iſſues, why execution of a judgment paſſed ſhould not be made out.

This writ is not granted, till a year and a day be elapſed after a judgment given.

Scire facias, upon a fine, lies only after a year and a day after the fine levied. Otherwiſe, it is the ſame with the writ of HABERE *facias ſeiſinam*.

There are alſo writs of *ſcire facias* againſt bail to an action, compelling his appearance; *ad audiendum errores*, or *writs of error*; in detinue, after judgment, for delivery of goods; to remove an uſurper's clerk incumbent; upon a recognizance in chancery for extending lands, &c. to repeal letters patent and grants; to repeal the grants of offices, for conditions broken, non-attendance, &c. and in appeal of murder. See Blackſt. Com. vol. iii. p. 416. 413. 248. 261. 421.

SCIRONA, a word uſed by ſome of the ancients to expreſs the autumnal dews.

SCIRPUS, the *ruſh*, in the *Linnæan Syſtem of Botany*. See RUSH-*graſs*.

SCIRRHUS, or SCHIRRHUS, Σκιῤῥος, formed of σκιρος, *a piece of marble*, whence σκιῤῥοω, *to harden*, in *Medicine* and *Surgery*, a hard, indolent tumor, formed gradually in the ſoft, glandulous parts of the body; ſometimes internal, and ſometimes external.

When a gland of the conglobate, or conglomerate kind has for ſome time been enlarged and indurated; and ſuch enlargement and induration are not attended with pain or inflammation, or a duſky livid-coloured complexion of the integuments; or a diſtenſion and contorted form of the veins; or with any, or at moſt with a ſmall degree of inequality of ſurface; ſuch a diſeaſed ſtate of the parts, from their freedom from diſcolouration, their exemption from pain, their equality of ſurface, their peculiar hardneſs, and ſtony reſiſtance to the touch, is uſually denominated a *ſcirrhus*; but when a *ſcirrhous* tumor is accompanied with all, or moſt of theſe appearances, the diſeaſe is then called a CANCER.

There are two kinds of *ſcirrhuſes*, the one only beginning, and frequently painful when preſſed by the fingers, the other confirmed and ſenſeleſs.

The *ſcirrhus* ariſes from a thick, viſcid, and probably gritty matter, detained and indurated in the pores, and other minute paſſages of the parts affected.

The ſeat of a *ſcirrhus* is very various and uncertain; for this diſorder is not confined to the internal parts alone, to wit, to the liver, ſpleen, lungs, meſentery, pancreas, and in females to the uterus; but it frequently happens alſo to the external parts, as to the lips, tongue, tonſils, fauces, palate, gums, neck, mammæ, axillæ, inguina, penis, and teſticles, and that generally after inflammations of thoſe parts, though it ſometimes alſo appears without any INFLAMMATION, eſpecially in perſons of a heavy phlegmatic habit.

This diſeaſe, the matter of which is an inſpiſſated lymph, is often owing to ſuppreſſed evacuations; hence it proves ſo frequently fatal to women of a groſs habit, about the time when the menſtrual flux ceaſes. It may likewiſe be occaſioned by exceſſive grief, fear, anger, religious melancholy, or any of the depreſſing paſſions. It may be alſo occaſioned by the long-continued uſe of food that is too hard of digeſtion, or of an acid nature; by barrenneſs, celibacy, indolence, cold, blows, friction, preſſure, &c. Sometimes the diſeaſe is owing to an hereditary diſpoſition.

As ſoon as the *ſcirrhus* is formed, the immediate conſequence is, that the indurated part becomes unfit to perform the functions allotted by nature to it, and the neighbouring parts ſuffer preſſure, and become impeded in the performance of their ſeveral functions. It is therefore no wonder that they are found ſubject, in theſe caſes, to inflammations, ulcerations, cancers, gangrenes, tabes, ſtiffneſs, immobility, and the like, according to the nature of the injured part.

The more inveterate a *ſcirrhus* is, the greater will be the difficulty in the cure. When this diſorder happens to young people, and ſuch as are of a good habit of body, it is much more ſafe and tractable, than when it happens to older infirm perſons. When there is any thing venereal in the caſe, the difficulty is yet the greater. The *ſcirrhus* is of the more or leſs conſequence, according to the nature of the part it is ſeated in; and internal ones are always more dangerous, for this reaſon, than the external.

While a *ſcirrhus* continues free from pain, there is little danger from it, but when it becomes painful or ulcerated, it generally threatens a cancer. The cure of theſe diſorders is always difficult and uncertain, but in young robuſt habits ſometimes the knife and corroſives will effect it.

When the *ſcirrhus* is of long ſtanding, and in old people, great care muſt be taken how it is meddled with, leſt, while under treatment, it ſhould become cancerous. On the other hand, when the *ſcirrhus* is but newly formed, and in a benign ſtate, and you have no ſigns of vehement pain or hardneſs, or of itching and heat, where the patient is otherwiſe of a good habit of body, external and internal remedies are to be employed at once, to endeavour to ſet the confined fluids at liberty. The internal remedies, found of moſt ſervice on theſe occaſions, are the decoctions of the woods, digeſtive tinctures, or mild mercurials, giving between whiles relaxing medicines, to reſolve the inſpiſſated humours.

In regard to the external remedies, plaſters made of the warm gums, as ammoniacum, galbanum, ſagapenum, and the reſt, either alone or mixed together, and aſſiſted ſometimes by the powder of bryony-root, or of the birthwort, are uſed.

Mercurials ſerve greatly to this purpoſe, and the following compoſition is alſo excellent as a plaſter on theſe occaſions. Take galbanum and opopanax of each an ounce, ammoniacum and bdellium of each two ounces, oil of olives two pounds, yellow wax half a pound, powder of long and round birthwort, lapis calaminaris, myrrh and frankincenſe, of each one ounce, Venice turpentine four ounces, melt them all into a plaſter.

Next to plaſters, cataplaſms are found highly ſerviceable in theſe caſes, one of the beſt of which is made in the following manner. Take white bryony-root, four ounces; round birthwort and angelica, of each an ounce; leaves of ſavin, rue, ſcordium, wormwood, and camomile-flowers, of each one handful; melilot, elder, marſhmallows, and centaury, of each half a handful; let theſe be boiled together in a ſufficient quantity of water to the proper conſiſtence for a cataplaſm, adding, toward the end of the boiling, three ounces of galbanum, diſ-

diſſolved in the yolk of an egg, two ounces of linſeed-meal, and as much as is neceſſary of linſeed-oil.

It is to be applied warm, and often renewed, and a fomentation made from the ſame ingredients, boiled in vinegar, is often found alſo of great uſe.

Inſtead of theſe remedies ſome highly extol the uſe of acid vapours on this occaſion; ſometimes the ſteam of boiling vinegar is ordered to be received on the part, and that either of plain vinegar, or of ſuch as has been medicated by infuſions of rue, lavender flowers, or other ſuch ingredients, or of the Venice treacle. Some ſprinkle vinegars of theſe kinds over a hot ſtove, and receive the vapour through a funnel; others adviſe the burning of common brimſtone, and holding the part over the fume; and others are fond of fumigations of cinnabar. Great care muſt be taken in theſe caſes not to raiſe too large a fume, nor to keep the patient over it too long, and he muſt be adviſed not to admit it into his noſe or mouth, for all theſe ſteams are injurious to the lungs; and in the laſt caſe, the quantity of mercury raiſed in vapour from the cinnabar may often be enough to raiſe a ſalivation.

Mercurial medicines are alſo found to perform wonders in theſe caſes, either adminiſtered in the beginning, or after all other remedies have failed. When a *ſcirrhous* tumor is firſt diſcovered, the diet of the patient ſhould be light and nouriſhing, and he ſhould avoid all ſtrong liquors, and high ſeaſoned or ſalted proviſions; and take twice or thrice a week a doſe of the common purging mercurial pill, and a pint of the decoction of woods or ſarſaparilla may be drank daily.

Beſide giving mercurials internally, an excellent mercurial ointment may be made, by mixing quickſilver firſt with a ſmall quantity of Venice turpentine, and afterwards with a much larger of hog's lard, by rubbing them together in a glaſs or marble mortar. The *ſcirrhus* ſhould be anointed two or three times a day with this, covering it with a common mercurial plaſter; and to prevent this method from raiſing a ſalivation, ſome purging medicine, as the extract of Rudius, or jalap, is to be given in ſmall doſes every fourth or fifth day.

But if all theſe methods prove unſucceſsful, and the *ſcirrhus* is free and moveable, and its ſituation threatens no danger from the neighbourhood of any conſiderable veſſels, and if the patient's ſtrength ſhall be judged ſufficient to undergo the operation, the aſſiſtance of the knife muſt be called in, and the *ſcirrhus* cut out, to prevent its growing cancerous. When the *ſcirrhus* is thus taken out, the wound is to be dreſſed and healed with the common vulnerary balſams; but when the *ſcirrhus* is fixed, knotty, uneven, and deeply rooted; where the patient is of a bad habit of body, is ſubject to form *ſcirrhuſes* from an hereditary taint, or has formed ſeveral already; and laſtly, where the ſituation of the diſorder is ſuch, that, from the vicinity of conſiderable veins and arteries, there is danger of bringing on an hæmorrhage, which may prove fatal, then all attempts to cure, whether by the knife, by digeſtives, or by corroſive medicines, are to be neglected; for this kind of *ſcirrhus* is almoſt always attended with very violent pains, and all that can be done is to attempt to alleviate thoſe pains, and prevent a cancer. Heiſter. See CANCERS, *to prevent.*

SCIRRHUS *hepatis*, in *Medicine*, a diſeaſe conſiſting in an indurated tumor of the liver, occaſioned by a ſtagnation of the humours which grow thick there, from an exhalation of their more fluid and ſubtle parts.

This differs from the *infarctus* HEPATIS, not only in degree, but in its ſymptoms, for it almoſt always is attended with a hectic, or with œdemato-hydropic ſwellings.

Signs of it. Theſe are a tumor and hardneſs in the right hypochondrium, or region of the liver, always evident to the patient, and often ſenſibly perceived by any body elſe, on touching the part. To this are to be added dull tenſive pains, and a ſenſe of a weight hanging there, and uſually aſthmatic ſymptoms, and a dry cough. It becomes painful to lie on the left, or oppoſite ſide; and with theſe a hectic comes on, with a waſting of the upper parts, and a ſwelling of the inferior ones; firſt of the feet, but afterwards upwards to the belly, which finally becomes very obſtinate, and truly aſcitic. The urine in this caſe is ſmall in quantity, and of a deep orange colour, and thick conſiſtence. It has uſually a mucid ſediment, and ſometimes a thick one of a roſe-colour.

Cauſes of it. Theſe are uſually either an omiſſion of artificial diſcharges of the blood, by habitual bleedings at ſpring and autumn, or a ſuppreſſion of the natural ones, by the menſes or hæmorrhoidal veſſels; an improper treatment of intermittent fevers with aſtringents, of quartans with large quantities of bark, and of acute fevers with too cooling a regimen, or a violent quantity of the volatile ſalts, or a condenſation of the humours in a ſimple infarction, by means of cold external applications. The ſtopping hæmorrhages, which nature had brought on for her relief in plethoras, have alſo been ſometimes known to occaſion a *ſcirrhus* of the liver, as have alſo external injuries by blows, falls, and the like.

Prognoſtics. A recent *ſcirrhus* of the liver admits of a cure, but this not without great difficulty, and in a more confirmed one there is very little hope. This tumor has a continual tendency to corruption, either by ſphacelation, or by an inflammatory ſuppuration; neither of which can happen ſucceſsfully, for the firſt muſt occaſion inſtantaneous death, and the latter exulceration, and a ſucceeding fatal hectic. A *ſcirrhus* of the liver often follows, and ſometimes precedes a jaundice of the moſt violent kind.

Method of treating it. The bowels are firſt to be cleanſed and relaxed by a clyſter, made of a decoction of mallows, camomile flowers, mullein, and fennel ſeed; after this, bleeding in the foot is to be ordered, and then the nitrous and other reſolvent medicines are to be given, ſuch as tartar of vitriol, and the like. After this medicated wines ſhould be drank as the common drink, prepared with bryony and arum roots, centaury, hyſſop, and maidenhair leaves, ſaſſafras, ſenna, black hellebore, and rhubarb; and externally, plaſters of the reſolvent and ſtrengthening kinds are to be applied. But after all directions for the treatment, it is to be acknowledged, that an obdurate and inveterate *ſcirrhus* admits of no remedy. Junker's Conſp. Med. p. 210.

SCIRRHUS *of the teſticle.* See SARCOCELE.

SCIRRONES, a name given to a ſort of ſmall lice breeding under the ſkin.

SCIRROPHORIA, Σκιῤῥοφορια, in *Antiquity*, an anniverſary ſolemnity at Athens, upon the twelfth day of the month *Scirrophorion.* For its origin and ceremonies, ſee Potter, Archæol. Græc. lib. ii. cap. 20. tom. i. 430.

SCIRROPHORION, Σκιῤῥοφοριων, in *Ancient Chronology*, the twelfth and laſt month of the Athenian year. It contained twenty-nine days, and anſwered to the latter part of our May and beginning of June.

It had its name from the feaſt *Scirrophoria*, kept in it.

SCISSIMA, in *Botany*, a name given by ſome authors to the beech-tree.

SCISSORS. Mr. Monro has given us the figure and deſcription of a pair of *ſciſſors*, the blades of which are crooked on their flat ſides. Theſe *ſciſſors* are very uſeful for taking off excreſcences from hollow parts, or for cutting in curve lines, which the common *ſciſſors* cannot eaſily be applied to. Med. Eſſ. Edinb. vol. v. art. 41.

SCITE. See SITE.

SCIURUS. See SQUIRREL.

SCLAREA, in *Botany.* See CLARY.

SCLAVONIC, the language of the Sclavi, an ancient people of Scythia Europæa, who, about the year 518, quitting their native country, ravaged Greece, and eſtabliſhed the kingdoms of Poland and Moravia, and at laſt ſettled in Illyria, which thence took the name of *Sclavonia.*

The *Sclavonic* is held, after the Arabic, the moſt extenſive language in the world; it is ſpoken from the Adriatic to the North Sea, and from the Caſpian to the Baltic, by a great variety of people, who are all the deſcendants of the ancient Sclavi, viz. the Poles, Muſcovites, Bulgarians, Carinthians, Bohemians, Hungarians, Pruſſians, Suabians, &c. each of whom, however, have their particular dialect, only the *Sclavonic* is the common mother of their ſeveral languages, viz. the Poliſh, Ruſſian, Hungarian, &c.

By a Latin chronicle of the Sclavi, compoſed by Helmold, a prieſt of Boſow, and Arnold, abbot of Lubec, and corrected by M. Leibnitz, it appears, that the Sclavi anciently inhabited the coaſts of the Baltic Sea, and were divided into the eaſtern and weſtern; in the latter whereof were the Ruſſians, Poles, Bohemians, &c. and in the former the Vandals.

Dom. Maur. Orbini Rauſer, abbot of the order of Malta, in an Italian hiſtory of the Sclavi, intitled, Il Regno de gli Sclavi, printed in 1601, will have them to be originally of Finland, in Scandinivia. Laur. Pribero, a Dalmatian, in an expreſs diſcourſe on the origin of the Sclavi, maintains them to be originally of Thrace, and the ſame with the Thracians, the poſterity of Thiras, who was the ſeventh ſon of Japhet. Theod. Polycarpowitz, in a Greek, Latin, and *Sclavonic* dictionary, printed at Moſcow in 1704, obſerves, that the word *Sclava*, whence *Sclavonic* is formed, ſignifies in their language, *glory.*

SCLERANTHUS, *German knot-graſs*, or *knawel*, in *Botany*, a genus of the *decandria digynia* claſs: its characters are, that

that the calyx is single-leaved, that it has no corolla, and two seeds inclosed in the calyx. There are three species.

SCLERIA, formed of σκληρος, *hard*, a word used by medical writers to express a hardness of the inner part of the eye-lids.

SCLEROPHTHALMIA, σκληροφθαλμια, a kind of OPHTHALMIA, wherein the eye is dry, hard, red, and painful, and the eye-brows likewise, so as not to be opened after sleep without great pain.

SCLEROTICA, formed from σκληρος, *hard*, whence also *sclerotic*, in *Anatomy*, one of the common membranes of the eye, situate between the adnata and the uvea: it is very firm and opaque, behind, but transparent before. Though, in strictness, it is only the hind part that is called *sclerotica*, the fore-part being properly called the CORNEA.

The *sclerotica* is a segment of a larger spheroid than the cornea. See EYE.

The *sclerotica*, called also *cornea opaca*, and the *cornea lucida* are, in reality, one and the same coat, though differently circumstanced as to size, situation, texture, and use. The *sclerotica* is a large, firm, thick, hard opaque membrane, composed of several strata closely united; and it is extended from the external circumference of the cornea to the optic nerve, and forms much the greater part of the globe of the eye externally. The *sclerotica* and the cornea compose the case in which all the internal coats of the eye, and its humours, are contained. The *sclerotica*, on its posterior part, is perforated obliquely in five or six different places by those branches of the internal carotid artery, that are bestowed upon the internal coats of the eye and its humours, which vessels are called by Nuck *aqueducts*. See AQUEOUS *Humour*.

SCLEROTICS, medicines proper to harden and consolidate the flesh, &c. of the parts they are applied to. Such are purslain, house-leek, flea-wort, garden nightshade, &c.

SCNIPS, in *Natural History*, a name given by authors to the small species of gnat, always found about the oak-tree, feeding on the juices of its leaves, which it sucks by means of its sharp trunk.

It is supposed by some to be hatched of the small oblong white worm, that inhabits the oak-apples.

SCOBS, a word used by some authors to express the raspings of ivory, hartshorn, or other hard substances. Some also have used it to express the scoriæ of metals; and some as a name for the *cineres clavellati*, or *pot-ashes*, used in soap and glass-making.

SCODEGHINO, a name given by chirurgical authors to a peculiar species of inciſion-knife, described by Scultetus, and used by Rousset in performing the Cæsarean operation.

SCODINEMA, a word used by some medical writers to express a heaviness of the head.

SCOLDS. The punishment allotted by our laws for *scolds*, or *scolding* women, is, to be set in a trebucket, commonly called a *ducking-stool*, though properly a CUCKING-*stool*, which in the Saxon language signifies a *scolding-stool*, placed over some deep water, into which they are to be let down, and plunged thrice under water, to cool their heat and choler.

SCOLECIA, in the *Materia Medica* of the ancients, a name given to a kind of verdigrise.

Of this there were two species, the one found native in the earth, the other fictitious.

The latter kind was prepared by rubbing a quantity of vinegar in a brass mortar, with a brass pestle, till it became thick and ropy; when it was in this condition, a small quantity of alum and sea-salt, or nitre, were added to it, and it was set in the sun in the heat of the dog-days. It was to stand thus till it became ropy, thick, and of a green colour; and then being drawn out into long threads, and dried, it had the resemblance of worms in shape, and thence had its name.

SCOLION, among the *Ancients*, a kind of Bacchanal song used at entertainments.

SCOLIOSIS, a word used by Hippocrates to express a distortion of the spine sideways.

SCOLOPAX, in *Ornithology*, a genus of the *grallæ* in the Linnæan system: the characters of which are, that the beak is roundish, obtuse at the end, and longer than the head; the nostrils are linear; the face covered with feathers; and the feet furnished with four toes, the hinder one consisting of several joints. Linnæus enumerates eighteen species, among which are the GUARAUNA, the CURLEW, WIMBREL, LIMOSA, SNIPE, GODWIT, WOODCOCK, &c.

SCOLOPAX, in *Ichthyology*. See TRUMPET-*fish*.

SCOLOPENDRA, in *Zoology*, an insect of a very slender and long body, very smooth, and of a yellowish or reddish colour, furnished with a vast number of legs, and having two long antennæ, and a bifid tail.

It is used by some as a depilatory, being boiled in wine. The *scolopendra* is, in the Linnæan system, a genus of the order of *aptera*. Its characters are, that it has as many feet on each side as its body hath segments, that the antennæ are setaceous, that it has two articulated palpi, and that its body is depressed. Linnæus enumerates eleven species.

There is a species of this animal, which naturally shines in the dark in the manner of a glow-worm, but with a fainter and more general light. Every part of the body of this animal will emit sparks, if pressed in the dark. It is covered with a soft down, or short and fine hair, much resembling in texture the downy matter which grows on the back of coltsfoot leaves.

Among this hair on the sides there are set a vast number of long and sharp prickles; they are about the same length with the hair, but they are as stiff as a hog's bristle, and are very sharp at the points, and of a black colour; there are several hundreds of these on the two sides. The tail or smaller end terminates, on the back, in two bright scales; and this in the anus; at which the creature voids its excrements. It has no horns, no eyes, nor any other of the common organs of insects heads. The mouth is wide, and placed under the belly-part, which is smooth, flat, and irregularly variegated with brown spots. The legs are placed in two rows, each of the whole length of the body; they begin from the angle of the mouth on each side, and are continued to the tip of the tail: those standing near the mouth are longer than the others, which gradually decrease till they are very short at the tail; the longest are about a quarter of an inch in length, and the shortest not a sixth of that length. The whole number of legs is seventy-two, thirty-six standing on each side. From within the body, through the middle of each leg, there passes a cluster of three or four prickles; those are larger or smaller, according to the size of the leg, and vary also in number, the longest legs having most of them; they give strength and firmness to the legs, serving them in the place of bones, and issuing out beyond the end of the leg, in the way of claws: they serve the creature for the laying fast hold of any thing it pleases. On each side of the upper, or back part of the animal, there are also placed a number of soft, flat, and smooth fins; these stand near the legs, and are placed face to face in such a manner, that each foot has its corresponding fin. The fins are exactly of the same number with the legs, and like them are largest towards the head, and go off gradually tapering towards the tail. These serve the creature to swim in the water, as the others serve it as a reptile to crawl upon the ground at the bottom. The fins on each side are fringed with the same changeable coloured hair that the stripes on the back are.

On opening of the body there appears a muscular organization, elegantly contrived for the working so great a number of legs and fins. This appears in form of one large and broad red muscular congeries, and from this there are propagated on each side thirty-six pair of rays, or oblong and slender muscles, every pair serving for the motion of one leg and one fin. These are very distinctly visible, and represent the spine and ribs in some fish. Philos. Trans. N° 225.

Mr. Maloet relates the history of a man, who for three years had a violent pain at the lower part of the forehead, near the root of the nose; at length he felt an itching, and afterwards something moving within his nostril, which he brought away with his finger: it was a worm of the centiped kind, an inch and a half long, which run swiftly. It lived five or six days among tobacco. The patient was free of his pain ever after.

Mr. Littre mentioned a like case, in 1708, of a larger centiped voided at the nose, after it had thrown the woman, in whose frontal sinus it was, into convulsions, and had almost taken away her reason. Hist. Acad. Scienc. 1733.

SCOLOPENDRA *marina*, a name given by Dr. Molyneux to a new species of sea animal, of the centiped *scolopendra* kind. See *Tab. of Microscopical Objects, Class* 1.

This remarkable insect, taken in the Irish seas, is evidently the same animal described by Oligerus Jacobæus, in the Acta Medica Hafniensia, under the name of *vermis aureus*, or *erucæ marinæ species rarior*. Philos. Trans. N° 224.

Dr. Peyssonel describes a marine *scolopendra* of very small bulk, and square figure, whose body and head were formed of eighty rings, and which had a power of occasionally throwing out its intestines. The four sides of this animal were armed with prickles, and every ring had four bundles of them, which are sometimes spread out

out like fans: those under the body served the insect as feet. These *scolopendræ*, being placed upon the fingers, thrust a great number of their prickles into the skin, and caused a sharp pain, resembling the effect of fire, of some continuance. Phil. Trans. vol. li. art. 6.

SCOLOPENDRA *scutata*, in *Natural History*, the name of an animal of the insect kind, found in the year 1736, by Klein, in Prussia, and at the same time by Mr. Brown, in some parts of Kent.

It was met with in Prussia in vast abundance, in the places where they take cray-fish, and having not been met with there before, surprised the people employed in that fishery so much, that they brought home many of them.

In Kent, its appearance was attended with greater singularity. Mr. Brown found it in a pond on Bexby Common, where the country people had observed vast numbers of them for five or six weeks before. This pond was quite dry on the 24th of June that year, but being filled by the thunder shower on the 25th of the same month, the pond was observed to swarm with them in two days, by a farmer watering his cows there; and what is very observable is, that there appears no channel into this pond, that could convey them from any other place.

The creature is about an inch and a half in length, and somewhat less than an inch in breadth, and though so small, yet bears a great resemblance, in many of its parts, to the great Molucca crab, called by some the *buckler-crab*. When the back is viewed, it is seen to be covered with a case or shield, so that it in some measure resembles a tortoise, only it is remarkably gibbous, or prominent all along the middle of the back, and has a triangular opening in the shell near the tail. On the head it has two short horns, standing in the common place of the antennæ. When the case or shell is taken off, the rings on the body are found to be about thirty in number. The legs are very extraordinary; they are forty-two on each side; the twenty that stand next the head are nearly of the same size, but then they grow gradually smaller towards the tail. The feet consist each of five membranaceous claws; these are flat, and have a stiff rib in the middle, and are beset at the edges with hairs, in the manner of the legs of a crab. The whole structure of the legs seem calculated for swimming, rather than walking. Philos. Trans. N° 447, p. 151.

SCOLOPENDRITES *lapis*, in *Natural History*, a name given by some authors to a species of the *lapis syringoides*, or pipe-stone, the tubules of which they supposed to resemble the figure of the body of the scolopendra.

SCOLOPOMACHÆRION, σκολοπομαχαιριων, in *Surgery*, a kind of scalpel, thus called, by the Greeks, from its resembling a woodcock's bill.

Its use is to open and dilate narrow wounds of the breast, abscesses, &c. Aquapendente recommends it for tapping in dropsies.

It is usually furnished with a little button at the point, that it may be used to open wounds of the breast without danger of wounding the lungs.

SCOLYMUS, in *Botany*. See *Golden* THISTLE.

SCOMBER, in the Linnæan system of *Ichthyology*, is a distinct genus of the *thoracic* order. The characters of which are, that the head is compressed, that it has seven branchiostegous rays, and that it has several small fins between the dorsal fin and the tail. The species of this genus are the *scomber* or MACKREL, the *pelamis*, *thynnus*, *cordyla*, *glaucus*, *trachurus*, *hippos*, *chrysurus*, *amia*, and *pelagicus*. In the Artedian system, the characters of this genus are these: the branchiostege membrane on each side contains seven slender bones, the upper one of which is nearly covered by the covering of the gills; the tail is very forked, in the form of a crescent; there are one or more eminences on each side towards the tail; the fins are either only two on the back, or else beside these, there are several other small and short ones, running all the way to the tail, as well on the upper as the under part of the body; the appendices to the pylorus are very numerous. The species of this genus are four, viz. the *scomber* or common mackrel, the tunny-fish, the horse-mackrel, the amia of Salvian, and the glaucus primus of Willughby and Rondeletius.

SCONCES, small forts, built for the defence of some pass, river, or other place.

Some *sconces* are made regular, of four, five, or six bastions; others are of smaller dimensions, fit for passes, or rivers; and others for the field. See FORT.

SCOOP, in *Sea Language*, a small hollowed piece of wood, used to throw water out of a boat into the sea, usually called bailing the boat.

SCOPARIA, in *Botany*, a genus of the *tetrandria monogynia* class. Its characters are, that the calyx is wheel-shaped, and divided into four segments; and the fruit a single-celled, double-valved, polyspermous capsule. There are two species.

SCOPELISMUS, σκοπελισμος, an audacious crime practised by some villains among the Arabians.

It consisted in placing a certain number of stones upon the farm or field of persons these miscreants had a pique at; which stones served as a denunciation of utter destruction to those, who for the future should attempt to till the ground on which they were laid. And such terror attended this malevolent and clandestine threatening, that none ever ventured to till such fields.

SCOPER-HOLES, or SCUPER-HOLES, in a *Ship*. See SCUPPERS.

SCORBUTUS, or SCORBUTUM. See SCURVY.

SCORCHING *fennel*. See THAPSIA.

SCORDIUM. See GERMANDER.

SCORE, in *Music*, denotes *partition*, or the original draught of the whole composition, wherein the several parts, viz. treble, second treble, bass, &c. are distinctly *scored*, and marked.

SCORIA, in *Metallurgy*, the recrements of metals in fusion, or, more determinately speaking, the mass, or part of the mass, of a melted metal, converted by the action of the fire into a body, which when cold is brittle, fixed, not dissoluble in water, but melts again when exposed to the fire, and is properly a kind of glass.

Some authors call by this name that saline mass, which is produced by melting ores and metals together with saline, and reducing fluxes. But the word *scoria* is not properly to be understood of all this mass, but only of the vitrified particles which are lodged between, and adhere to the small masses of the salts, and which may be separated from them by water.

SCORIFICATION, in *Metallurgy*, is the art of reducing a body either entirely, or in part, into scoria.

It is used by metallurgists, in order that any metal, imprisoned in a solid body, may, on account of its weight, descend and separate itself therefrom, and finally if that be required, by itself either wholly or in part converted into scoriæ.

All fixed bodies are subject to this alteration, not totally excepting even gold and silver. There are also, among the volatile bodies, some that may be fixed, and which assume the form of scoriæ, by adding fixed bodies to them.

It is often proper to make this *scorification* in a vessel that may absorb the scoriæ, and retain only the metallic part of the mass under trial. In this case the operation is called COPPELLING, and vessels made of ashes, called *tests* and *coppels*, serve for this purpose. It is evident in these processes, that a great attenuation of the scoriæ is necessary, that they may be able to pass through the vessel; nor is there any fitter body to promote this operation than lead, which, by its undergoing itself a like attenuation in the fire, disposes other bodies to be reduced into a subtle scoria for the same attenuation.

SCORITH, a word used by the chemical writers to express sulphur.

SCORPÆNA, in *Ichthyology*, the name of a genus of fish, of the acanthopterygious kind, in the Artedian system, and the thoracic order in the Linnæan; the characters of which are these: the branchiostege membrane on each side contains seven bones; the head is large, and very prickly; there is only one back fin, and that is lower in the middle than elsewhere; the body grows small toward the tail; the eyes are placed near one another, and are covered with the common skin; there are teeth in the jaws, palate, and fauces; and the appendices to the pylorus are eight or nine.

The species of this genus are three; viz. the *porcus*, *scrofa*, and *horrida*.

According to Mr. Willughby, the *scorpæna* is a fish of the anguilliform kind, called by the people of Cornwall FATHER *lasher*.

Scorpæna is also the name of a fish caught in many parts of the Mediterranean. It seldom grows to more than a pound weight. Its body is of a long, not flatted form, and is moderately thick. Its head is extremely large, and is armed with prickles, and it grows gradually less from thence to the tail.

The prickles about the head are accounted venomous, and the fishermen usually cut them off as soon as the fish is caught. Its tail is not forked, but rounded at the end. The belly and belly-fins are reddish.

SCORPIACA, the name of an antidote recommended by Galen against the stinging of scorpions.

SCORPIO, the *scorpion*, in *Zoology*. See SCORPION.

SCORPIO, *scorpion*, in *Astronomy*, the eighth sign of the zodiac, denoted by the character ♏.

The stars in *Scorpio*, in Ptolemy's catalogue, are 24; in that

that of Tycho, 10; in that of Hevelius, 20; in that of Mr. Flamsteed and Mr. Sharp, 44. The longitudes, latitudes, magnitudes, &c. whereof, are as follow:

Names and situations of the stars.	Bayer's ch.	Signs.	Longitude ° ′ ″	Latitude. ° ′ ″	Magn.
In the first south foot	b	♏	26 48 50	5 26 33 A	6
Subseq. in the first foot	A		27 18 08	4 54 13 A	5
Contiguous to this	A		27 30 49	4 46 19 A	7
That proced. south of forehead			27 55 46	5 43 48 A	6
In third south foot	ϛ		28 48 52	8 33 25 A	4
5					
South of 3 in the forehead	π		28 37 25	5 25 46 A	3
Middle of the forehead	δ		28 15 50	1 56 31 A	3
North of the forehead	β		28 52 56	1 03 09 B	2
North } of the contiguous ones	ω		29 21 35	0 16 05 B	5
South } under nort. star of fore.	ω		29 32 09	0 05 56 B	5
10					
			28 01 11	8 04 40 B	6
Preced. in the last south foot	c	♐	2 00 35	7 07 03 A	6
Contiguous thereto northward	c		1 55 59	6 38 22 A	6
Most north and following forehead	ν		0 20 11	1 40 50 B	4
	χ	♏	28 35 7	10 54 30 B	5
15					
			28 19 54	12 29 24 B	6
			29 23 11	9 15 16 B	6
Subsequent in last south foot			29 09 23	12 46 39 B	4
That over the other prec. heart		♐	3 07 35	2 37 10 A	6
The preced. heart northward	σ		3 29 24	3 59 04 A	5
20					
Scorpion's heart, called *antares*	α		5 26 04	4 31 26 A	1
That over the heart			5 25 12	3 11 30 A	5.6
That following the heart to south	τ		7 07 56	6 24 23 A	4
Inform. between Opiuchus's legs			6 59 26	4 28 18 B	6
			9 12 54	3 05 10 A	6
25					
In the first ring of the tail	ε		11 03 32	11 39 49 A	3
More north and post. to this			12 22 01	10 29 56 A	6
			13 12 55	1 21 50 B	6
			15 28 15	3 53 47 A	6
			15 55 15	3 20 08 A	6
30					
			16 12 46	3 29 39 A	6.7
			17 00 27	1 42 28 A	6.7
			17 43 57	0 59 54 A	7
Preced. of two in the sting	υ		19 41 16	13 57 14 A	4
Subsequent			20 15 10	13 44 20 A	3
35					
In the first joint of the back	μ		12 15 14	15 24 59	3
Nebulous of the third joint	ζ		13 8 40	19 5 5	N
Contiguous to the preced.			13 20 12	19 37 17	4
In the fourth joint	η		16 53 4	20 8 53	4
In the fifth	θ		21 44 57	19 37 36	2
40					
In the sixth	ι		23 40 19	16 41 41	3.4
In the seventh	κ		22 37 29	15 36 38	4
Informis near the tail			24 7 30	13 37 15	4
Between the tail and the bow			24 55 24	11 24 34	4

Scorpio, in *Botany*, a name by which some of the old authors have called the *genista spinosa*, or common furze bush. Ger. Emac. Ind. 2.

SCORPIOIDES, in *Ichthyology*, the name of a fish of the gottorugine kind, but differing in colour, being of a faint green, variegated with black spots; and in either wanting the eye fins, or else having them extremely minute. See Gottorugine.

Scorpioides, in *Botany*. See Caterpillars.

SCORPION, *scorpio*, in *Zoology*, a genus of insects of the order of *aptera*: the characters of which are, that it has eight legs, and a pair of claws at the head; eight eyes, three on each side of the thorax, and two in the back; two claw-like feelers; a long jointed tail, terminated by a bent pointed weapon; and two pectines, or kinds of combs, between the breast and the abdomen. Linnæus enumerates six species.

The opinions of authors are very different as to the sting of the *scorpion*; some asserting that there is an opening in it, through which a poisonous liquor is thrown into the wound made by it, as is the case in the tooth of the viper, &c. and others affirming that there is no such opening.

Galen affirms that there is none, but most of the writers of the middle ages assert that there is. But the whole is set in the clearest light by signior Redi, who took the pains of examining microscopically the stings of *scorpions*, brought alive from Tunis, Egypt, and Italy, and found in all the trials, which he made with several of them, a small drop of white liquor upon the sting. And Mr. Leewenhoek discovered an opening on each side of the sting of this creature, for the emission of the poison, which he supposes is not discharged till the sting is buried in the wound. Baker's Microscope, p. 213.

Mr. de Maupertuis having caused *scorpions* to bite several animals, of which very few died, or suffered any more than the pain of the sting, is of opinion, that oil of *scorpions*, and other vulgar antidotes to the poison of these animals, have rather got their reputation from the innocence of the sting of these creatures, than from any considerable virtue in the medicines. Mem. de l'Acad. Scienc. 1731.

Scorpion, *water*, *scorpio palustris*, a name given to a very remarkable species of water-insect. It is a very thin and light little creature, yet it is but a very slow mover. Its head is very small, and is hard to the touch, and of a paler brown than the rest of the body; and this is terminated by a very fine and sharp hollow proboscis, of the same colour and texture.

The eyes are small, but prominent, and very hard and black; the shoulders are broad and flat, of the same colour with the head, and wrinkled on the surface; the triangular spot between the wings is black and shining; the body is of a bright red-lead colour on the back, and of a faint dusky brown on the belly, and composed of six joints, covered with a sort of scales; the outer wings are hard and firm, and of a dark muddy brown; the inner wings are of a dusky white, varied with a red-lead colour; the two fore-legs are broader and thicker than the rest, and end in short blunt claws; the hinder pair are the longest, and both these and the middle ones terminate in a sharp claw: they are all of a pale brown, and somewhat transparent; the tail is long and straight, composed of two slender bristles of a pale brown.

It lives among the weeds in clear standing waters, and is continually watching for its prey. It feeds on other insects, and is particularly fond of the *cicada aquatica*, or worm of the great libella. It seizes its prey with the fore legs, and holds it fast in them while the proboscis pierces into the body, and sucks the juices. See *Tab. of Insects*, N° 8.

Scorpion *fly*, in *Natural History*, a name given by Mouffet, and other writers, to a kind of fly, remarkable for carrying the end of its tail turned up in the form of the *scorpion*'s sting.

Its distinguishing characters are these: its rostrum, or trunk is of a cylindric figure, and of a horny structure; and its tail furnished with a weapon of the cheliform kind.

There are two very beautiful species of these. The one has silvery wings, variegated with three transverse streaks of black towards the ends; the head is black; and the breast, shoulders, and feet, whitish; the rest of the body is black; the tail, which represents a sting, has five joints, three of which are red, and the others black; the end of the tail also is forked, and the forks black, and turned up like the sting of a *scorpion*.

The other resembles this in many respects; but the end of the tail is thicker, and the forks blunter; the head is dunnish, the mouth long, and each wing variegated with six black spots, of a large size.

Scorpion, *scorpio*, is also the name of an ancient military engine, used chiefly in the defence of walls, &c.

Marcellinus describes the *scorpio*, as consisting of two beams bound together by ropes. From the middle of the two, rose a third beam, so disposed, as to be pulled up and let down at pleasure; and on the top of this were fastened iron hooks, where was hung a sling, either of iron or hemp; and under the third beam lay a piece of hair-cloth full of chaff, tied with cords.

To use the engine, a round stone was put into the sling, and four persons on each side, loosening the beams bound by the ropes, drew back the erect beam to the hook: when, the engineer standing on an eminence, giving a stroke with a hammer on the cord to which the beam was fastened with its hook, set it at liberty; so that hitting against the soft hair-cloth, it struck out the stone with a vast force.

It had its name *scorpio*, because when the long beam or tiller was erected, it had a sharp top, in manner of a sting. More modern times have given it the name *onager*, *wild ass*, because that animal, when hunted, flings back stones.

Scorpion, *grass*. See Caterpillars.

Scorpion *grass*, *mouse-ear*. See Mouse-*ear*.

Scorpion *sena*. See Sena.

Scorpion's *thorn*. See Furze.

SCORPIURUS. See Caterpillars.

SCORPIUS *marinus*, in *Ichthyology*. See Father-*lasher*.

SCORTIUM, among the Romans, a measure of capacity of a round form, which used always to be heaped.

SCORTUM. See Scrotum.

SCORZONERA, in *Botany*. See Viper's *grass*.

SCOT, Scotta, or Scottus, a customary contribution laid upon all subjects, according to their ability.

 Who-

Whoever are affeffed to any contribution, though not by equal portions, are faid to pay *fcot* and *lot*.

Affeffments by commiffioners of fewers are called *fcots*.

SCOT, *church* and *foul*. See CHURCH and SOUL-*fcot*.

SCOTAL, or SCOTALE, is ufed where any officer of a foreft keeps an ale-houfe within the foreft, by colour of his office caufing people to come to his houfe, and there fpend their money, for fear of his difpleafure. We find it mentioned in the Charter of the Foreft, cap. 8. *Nullus foreftarius faciat* fcotallas, *vel garbas colligat, vel aliquam collectam faciat*, &c. Manwood, 216.

The word is compounded of *fcot* and *ale*, and by tranfpofition of the words, is otherwife called *alefhot*.

SCOTER, in *Ornithology*, the name of a fpecies of duck, *anas nigra*, called alfo in fome places the *black-diver*.

It is nearly of the fize of the common duck, but of a rounder body, and is all over of a deep fhining and beautiful black. It is very common on the fhores of Lancafhire, and fome other counties. It lives only about falt waters, and is a very great diver. This bird is the *macreufe* of the French, and allowed in the Romifh church to be eaten in Lent.

SCOTIA, in *Architecture*, a femicircular cavity or channel between the tores, in the bafis of columns. See *Tab. Arch. fig.* 4.

The *fcotia* is a concave, dark moulding; whence its name, viz. from σκοτος, *obfcurity*, *darknefs*.

The *fcotia* has an effect juft oppofite to that of the quarter-round. Our workmen frequently call it the *cafement*.

It is alfo called TROCHILUS, partly from its form.

In the Ionic and Corinthian bafe there are two *fcotias*, the upper whereof is the fmaller.

According to Felibien, the CAVETTO is a fourth part of the *fcotia*.

SCOTINUS, in *Botany*, the name of a fhrub called by the Latins *cotinus*, and *cotinus coriaria*, to diftinguifh it from the *cotinus*, κοτινος, of the Greeks, which was the *oleafter*, or wild olive.

The Italians call the *cotinus coriaria*, fometimes *fcotinus*, and fometimes *fcotanus*; the latter word feems an erroneous way of writing the former, which is only the Roman name of the fame tree, with an *f* put before the firft letter; and this is very common with the Italians, in their adopting Latin words.

SCOTISTS, a fect of fchool divines and philofophers; thus called from their founder, J. Duns Scotus, a Scottifh, or, as others fay, an Irifh Cordelier; who, in the fourteenth century, maintained the *immaculate* CONCEPTION of the Virgin, or that fhe was born without original fin; in oppofition to Thomas Aquinas, and the Thomifts. As to philofophy, the *Scotifts* were, like the Thomifts, Peripatetics; only diftinguifhed by this, that in each being, as many different qualities as it had, fo many different formalities did they diftinguifh; all diftinct from the body itfelf, and making, as it were, fo many different entities; only thefe were metaphyfical, and, as it were, fuperadded to the being.

The *Scotifts* and Thomifts likewife difagreed about the nature of the divine co-operation with the human will, the meafure of divine grace that is neceffary to falvation, and other abftrufe and minute queftions, which it is needlefs to enumerate.

SCOTODINOS, a term ufed by medical writers to exprefs a vertigo, or dizzinefs of the head, attended with a dimnefs of fight.

SCOTOMIA, or SCOTOMA, in *Medicine*, a dizzinefs or fwimming in the head, wherein the animal fpirits are fo whirled about, that external objects feem to go round. See VERTIGO.

SCOTTA, or SCOTTUS. See SCOT.

To SCOUR *a line*, in the *Military Language*, is to flank it fo as to fee directly along it; that a mufket-ball, entering at one end, may fly to the other, leaving no place of fecurity.

SCOURINGS, among *Farriers*, fuch gentle purges as preferve horfes from noxious humours.

SCOUTS, in *Military Language*, are generally horfemen fent out before, and on the wings of an army, at the diftance of a mile or two, to difcover the enemy, and give the general an account of what they obferve.

SCRAPER, an inftrument ufed in mezzotinto engraving, formed much in the manner of a knife, except that the edge is ftraight till near the point, and there flopes off at an angle from both fides; the lines of which flopes meeting, form another angle of the point; but the flope on one fide is much longer than that of the other.

SCRAPING *in mezzotinto*. See MEZZOTINTO.

SCRAPING, in *Naval Language*, is the act of fhaving off the dirty furface of the plank, in a fhip's fide or decks, particularly after a voyage, or when the feams have been covered with a new compofition of melted pitch or rofin. The inftrument with which this is performed is called a *fcraper*.

SCRATCH, in the language of the falt-workers of our country, the name of a calcareous, earthy, or ftony fubftance, which feparates from fea-water in boiling it for falt.

This forms a thick cruft in a few days on the fides and bottoms of the pans, which they are forced to be at the pains of taking off once in a week or ten days, otherwife the pans burn away, and are deftroyed. See SALT.

This is no other than the fame fubftance which crufts over the infides of our tea-kettles, and is truly a fpar, fuftained more or lefs in all water, and feparable from it by boiling. The fhells of fea-fifh have great affinity in their fubftance and nature with this, both being powerful alkalis, and both eafily calcining into lime.

The *magnefia alba*, fo celebrated in Germany for its mild purgative and alkaline virtues, feems very nearly allied to this earth; and it is probable, according to Hoffman, that the purging virtues of many fprings are owing to the quantities they contain of this fubftance.

SCRATCH-*pans*, in the Englifh *Salt-Works*, a name given to certain leaden pans, which are ufually made about a foot and a half long, a foot broad, and three inches deep, and have a bow, or circular handle of iron, by which they may be drawn out with a hook, when the liquor in the pan is boiling. See SALT.

The ufe of thefe pans is to receive the *fcratch*; and thefe pans being placed at the corners of the falt-pan, where the heat is leaft violent, catch it as it fubfides there.

SCRATCHES, among *Farriers*, a diftemper incident to horfes, confifting of dry fcabs, chops, or rifts, that breed between the heel and the paftern joint.

There are various kinds of *fcratches*, diftinguifhed by various names, as crepances, rats-tails, mules, kibes, pains, &c. which are all fo many fpecies of the fame malady, engendered from fome hot humours falling on the legs, or from the fumes of the beaft's own dung lying under his heels, or near them, or for want of rubbing his heels, efpecially after a journey, from over hard-riding, &c.

The diforder begins firft with dry fcabs in the paftern joint, in feveral forms. It is known by the ftaring, dividing, and curling of the hair on the part. For the cure of this diforder, fee GREASE.

In order to prevent it, the heels fhould be kept fupple with currier's dubbing, which is made of oil and tallow; by ufing this precaution before exercife, and wafhing the heels with warm water when the horfe comes in, the *fcratches* will be prevented.

SCRATCH-WORK, *fgraffiata*, a way of painting in frefco, by preparing a black ground, on which is laid a white plafter; which white being taken off with an iron bodkin, the black appears through the holes, and ferves for fhadows.

This kind of work is lafting; but being very rough, it is unpleafant to the fight. It is chiefly ufed to embellifh the fronts of palaces, and other magnificent buildings.

SCREAMER, *palamedea* of Linnæus, in *Ornithology*, a genus of *grallæ*; the characters of which are, that the bill is conic, the upper mandible being hooked; the feet are cloven, and have four toes. Pennant calls this the *fcreamer*, on account of the violent noife it makes. There are two fpecies, which inhabit South America. See ANHIMA and CARIAMA.

SCREEN, an inftrument for keeping off the wind, or the heat of the fire.

SCREEN is alfo ufed for a frame of laths to fift earth, fand, gravel, &c.

SCREEN likewife denotes a wire-frame for feparating of corn from duft, fand, cockle, &c.

SCREW, or SCRUE, *cochlea*, in *Mechanics*, one of the fix mechanical powers; chiefly ufed in preffing or fqueezing bodies clofe, though fometimes alfo in raifing weights. See MECHANICAL *powers*.

The *fcrew* is a right cylinder, as AB (*Tab.* VI. *Mechanics*, *fig.* 105.) furrowed fpiral-wife: it is generated by the equable motion of a right line FG, (*fig.* 106.) around the furface of a cylinder; while, at the fame time, the point I defcends equably from F towards G. Or, it may be conceived to be made by cutting a piece of paper into the form of an inclined plane, or half wedge, and then coiling it round a cylinder. If the furrowed furface be convex, the *fcrew* is faid to be *male*; if concave, it is *female*.

Where motion is to be generated, the male and female *fcrew* are always joined; that is, whenever the *fcrew* is to be ufed as a fimple engine, or mechanical power.

When joined with an axis in peritrochio, there is no occafion for a female; but in that cafe it becomes part of a compound engine.

The *fcrew* cannot properly be called a fimple machine,

because it is never used without the application of a lever, or winch, to assist in turning it.

Screw, *doctrine of the*. 1. If, as the compass, described by the power in one turn of the *screw*, is to the interval or distance between any two immediate threads, or spiral windings, as BI (measured according to the length of the *screw*), so is the weight or resistance to the power; then the power and the resistance will be equivalent one to the other; and, consequently, the power being increased, so as to counteract the friction of the *screw*, which is very considerable, will overcome the resistance. For it is evident, that in one turn of the *screw*, the weight is so much lifted up, or the resistance so much removed, or the thing to be pressed is squeezed so much closer together, as is the distance between two immediate spirals; and in the same time, the power is so much moved, as is the compass described by the said power in one turn of the *screw*. Wherefore the velocity of the weight (or whatsoever answers thereto) will be to the velocity of the power, as is the said distance between the spirals to the compass described by the power, in one revolution or turning round of the *screw*; so that the gaining in power is here recompensed by the loss in time.

2. As the distance between two threads, BI, is less; the power required to overcome the said resistance is less; therefore the finer the thread, the easier the motion.

3. If the male *screw* be turned in the female, at rest, a less power will be required to overcome the resistance, as the lever or scytala, CD (*fig.* 107.) is the longer.

4. The distance of the power from the centre of the *screw*, CD, the distance of the two threads IK, and the power to be applied in D, being given, to determine the resistance it will overcome: or, the resistance being given, to find the power necessary to overcome it.

Find the periphery of a circle described by the radius CD; then to the distance between the two threads, the periphery just found, and the given power; or, to the periphery found, the distance of the two threads IK, and the given resistance, find a fourth proportional. This, in the former case, will be the resistance that will be overcome by the given power; and in the latter, the power necessary to overcome the resistance.

E. gr. Suppose the distance between the two threads, 3, the distance of the power from the centre of the *screw* CD, 25, and the power 30 pounds; the periphery of the circle to be described by the power, will be found 157. Therefore, as 3 : 157 :: 30 : 1570, the weight to which the resistance is equal.

5. The resistance to be overcome by a given power being given; to determine the diameter of the *screw*, the distance of two threads IK, and the length of the scytala or handle; the distance of the threads, and the diameter of the *screw*, may be assumed at pleasure, if the male be to be turned in the female by a handle. Then, as the given power is to the resistance it is to overcome, so is the distance of the threads to a fourth number, which will be the periphery to be described by the handle CD, in a turn of the *screw*. The semidiameter of this periphery, therefore, being sought, we have the length of the handle CD. But if the female *screw* be to be turned about the male, without any handle; then the periphery and semidiameter found will be very nearly those of the *screw* required.

E. gr. Suppose the weight 6000, the power 100, and the distance of the threads 2 lines; for the periphery to be passed over by the power, say 100 : 6000 :: 2 : 120; the semidiameter of which periphery being $\frac{1}{3}$ of 120=40 lines, will be the length of the handle, if any be used; otherwise the side of the female *screw* must be 40 lines.

Mr. Hunter has described a new method of applying the *screw* with advantage in particular cases, in Phil. Trans. vol. lxxi. part i. p. 58, &c.

Screw, *endless*. If a *screw* be so fitted as to turn a dented wheel DF (*fig.* 108.) it is called an *endless*, or *perpetual screw*; because it may be turned for ever, without coming at an end. From the scheme, it is evident enough, that while the *screw* turns once round, the wheel only advances the distance of one tooth.

Screw, *doctrine of the endless*. 1. If the power applied to the lever, or handle of an *endless screw* AB, be to the weight, in a ratio compounded of the periphery of the axis of the wheel EH, to the periphery described by the power, in turning the handle, and of the revolutions of the wheel DF, to the revolutions of the *screw* CB, the power will be equivalent to the weight.

Hence, 1. As the motion of the wheel is exceedingly slow, a small power may raise a vast weight, by means of an *endless screw*; for this reason, the great use of the *endless screw* is, either where a great weight is to be raised through a little space; or, where a very slow, gentle motion is required. On which account it is very useful in clocks and watches.

2. The number of teeth, the distance of the power from the centre of the *screw* AB, the radius of the axis HE, and the power, being given; to find the weight it will raise.

Multiply the distance of the power from the centre of the *screw* AB, into the number of teeth: the product is the space of the power passed through, in the time the weight passes through a space equal to the periphery of the axis. Find a fourth proportional to the radius of the axis, the space of the power now found, and the power. This will be the weight which the power is able to sustain. Thus, if AB = 3, the radius of the axis HE = 1; the power 100 pounds, number of teeth of the wheel DF 48; the weight will be found 14,400; whence it appears, that the *endless screw* exceeds all others in increasing the force of a power.

A machine for shewing the power of the *screw*, may be contrived in the following manner. Let the wheel C (*fig.* 109.) have a *screw* *a b* on its axis, working in the teeth of the wheel D, which we may suppose to be forty-eight in number. It is plain, that for every revolution of the wheel C, and *screw* *a b*, by the winch A, the wheel D will be moved one tooth by the *screw*; and, therefore, in forty-eight revolutions of the winch, the wheel D will be turned once round. Then, if the circumference of a circle, described by the handle of the winch, be equal to the circumference of a groove *e* round the wheel D, the velocity of the handle will be forty-eight times as great as the velocity of any given point in the groove. Consequently, if a line G goes round the groove *e*, and has a weight of forty-eight pounds hung to it below the pedestal EF, a power equal to one pound at the handle will balance and support the weight. To prove this by experiment, let the circumferences of the grooves of the wheels C and D be equal to one another; and then if a weight H of one pound be suspended by a line going round the groove of the wheel C, it will balance a weight of forty-eight pounds hanging by the line G; and a small addition to the weight H will cause it to descend, and so raise up the other weight. If the line G, instead of going round the groove *e* of the wheel D, goes round its axle I, the power of the machine will be as much increased, as the circumference of the groove *e* exceeds the circumference of the axle; and if we suppose it to be six times, then one pound at H will balance six times 48, or 288 pounds hung to the line on the axle; and hence the power or advantage of this machine will be as 288 to 1; i. e. a man, who by his natural strength could lift a hundred weight, will be able to raise 288 hundred, or $14\frac{8}{20}$ ton weight by this engine. Ferguson's Mech. edit. 4to. p. 44.

Screw, *Archimedes's*, or the *spiral pump*, is a machine for the raising of water, first invented by Archimedes.

Its structure and use will be understood by the following description of it. ABCD (*Tab.* VI. *Hydraulics*, *fig.* 61.) is a wheel, which is turned round, according to the order of the letters, by the fall of water EF, which need not be more than three feet. The axle G of the wheel is elevated so as to make an angle of about 44° with the horizon; and on the top of that axle is a wheel H, which turns such another wheel I of the same number of teeth; the axle K of this last wheel being parallel to the axle G of the two former wheels. The axle G is cut into a double-threaded *screw* (as in *fig.* 62.) exactly resembling the *screw* on the axis of the fly of a common jack, which must be (what is called) a right-handed *screw*, like the wood *screws*, if the first wheel turns in the direction ABCD; but must be a left-handed *screw*, if the stream turns the wheel the contrary way; and the *screw* on the axle G must be cut in a contrary way to that on the axle K, because these axles turn in contrary directions. These *screws* must be covered close over with boards, like those of a cylindrical cask; and then they will be spiral tubes. Or, they may be made of tubes of stiff leather, and wrapt round the axles in shallow grooves cut therein, as in *fig.* 63. The lower end of the axle G turns constantly in the stream that turns the wheel, and the lower ends of the spiral tubes are open into the water. So that, as the wheel and axle are turned round, the water rises in the spiral tubes, and runs out at L through the holes M, N, as they come about below the axle. These holes, of which there may be any number, as four or six, are in a broad close ring on the top of the axle, into which ring the water is delivered from the upper open ends of the *screw* tubes, and falls into the open box N. The lower end of the axle K turns on a gudgeon, in the water in N; and the spiral tubes in that axle take up the water from N, and deliver it into another such box under the top of K; on which there may be such another wheel as I, to turn a third axle by such a wheel upon it. And in this manner water

ter may be raiſed to any given height, when there is a ſtream ſufficient for that purpoſe to act on the broad float-boards of the firſt wheel. Ferguſon's Mechanics, Supplement, p. 22.

SCREW, in the *Manege*. See SPLENT.

SCREW-*ſhell*, the Engliſh name of the TURBO.

SCREW-*tree*, in *Botany*. See HELICTERES.

SCRIBE, *Scriba*, ספר *ſopher*, derived from ספר *ſaphar*, *numeravit*, whence ספר *ſepher*, *liber*, a principal officer in the Jewiſh law, whoſe buſineſs was to write, and interpret Scripture.

The *Scribes*, according to the etymological meaning of the term, were perſons employed about books, writings, numbers, or accounts; in tranſcribing, reading, explaining, &c.

We find no mention of *Scribes*, in the Old Teſtament, before Ezra, chap. vii. 6. whence ſome learned men have concluded, that the office was brought from Chaldæa and Aſſyria, and firſt eſtabliſhed by the Jews after their return from the Babyloniſh captivity. However, Ezra's being called a *Scribe*, which was a general title given to men of literature, will not prove the office of eccleſiaſtical *Scribes*, as it occurs in our Saviour's time, to have been ſo ancient. It probably grew up by degrees, after the ſpirit of prophecy ceaſed among the Jews; for when they had no prophet to reſolve their doubts about doctrine or worſhip, they fell into diſputes, and ſplit into ſects and parties; which made an order of men neceſſary, whoſe proper buſineſs it ſhould be to ſtudy the law, that they might explain and teach it to the people.

The *Scribes* were in great credit and eſteem among the Jews, and had even the precedency of the prieſts and ſacrificers.

The *Scribes* are referred by moſt authors to two general claſſes; viz. *civil* and *eccleſiaſtical Scribes*: the former were employed about any kind of civil writings or records, and the latter were ſuch as addicted themſelves to ſtudying, tranſcribing, and explaining the holy Scriptures. Of the *civil Scribes* there were various ranks and degrees, from the common ſcrivener, or public notary or ſchoolmaſter, to the principal ſecretary of ſtate. As for the *eccleſiaſtical Scribes*, they were the learned of the nation, who expounded the law, and taught it to the people; and they are, therefore, ſometimes called *νομοδιδασκαλοι*, *doctors of the law*, or *νομικοι*, *lawyers*. Compare Matt. xxii. 35. with Mark xii. 28. Theſe *Scribes*, who were generally Phariſees, were the preaching clergy among the Jews; and whilſt the prieſts attended the ſacrifices, they inſtructed the people. Joſ. Scaliger endeavours to eſtabliſh a diſtinction between the *Scribes* of the people, referred to by Herod, Matt. ii. 4. and the *Scribes of the law*. The former he conſiders as a ſort of public notaries, who were employed in ſecular buſineſs; the latter as preachers and expounders of the law. But the phraſe, *Scribes of the law*, no where occurs in Scripture; and the *Scribes of the people*, whom Herod conſulted, were applied to, on account of their ſkill in explaining Scripture prophecies. Matt. xvii. 10. And they were probably called *Scribes* of the people, becauſe they were the ſtated and ordinary teachers of the people. Mark i. 22. Camero obſerves, that a key was delivered to each *Scribe*, as a badge of his office, when he firſt entered upon it, to which our Saviour may be ſuppoſed to allude, Luke xi. 52.

SCRIBE, *ſcriba*, was alſo the title of an officer, among the Romans, who wrote decrees, or acts, and made out authentic copies thereof.

Every magiſtrate had his *ſcriba*, or ſecretary; ſo that there were *ſcribæ ædilitii*, *prætorii*, *quæſtorii*, &c.

The *ſcribæ* were not admitted to the management of the principal offices of the republic, unleſs they relinquiſhed their profeſſion.

In the time of the emperors, they were alſo called *notarii*; becauſe they made uſe of abbreviations, and ſhort notes, in writing.

SCRIBING, in *Joinery*, &c. a term uſed, when one ſide of a piece of ſtuff being to be fitted to the ſide of ſome other piece, which laſt is not regular; to make the two join cloſe together all the way, they *ſcribe* it.

That is, they lay the piece of ſtuff to be *ſcribed* cloſe to the other piece they intend to *ſcribe* to, and open their compaſſes to the greateſt diſtance the two pieces any where ſtand from each other; then, bearing one of the legs againſt the ſide to be *ſcribed* to, with the other point they draw a line on the ſtuff to be *ſcribed*. Thus have they a line on the irregular piece parallel to the edge of the regular one; and if the ſtuff be wrought away exactly to the line, when the two pieces are put together, they will ſeem a joint.

SCRIPTORIUS *calamus*. See CALAMUS.

SCRIPTULUM, among the Romans, the twenty-fourth part of an ounce, and equal to two *oboli*. See OBOLUS.

SCRIPTULUS, a word uſed by ſome inſtead of *ſcrupulus*, a ſcruple, or weight of twenty grains.

SCRIPTURARY, among the *Jews*. See CARAITES.

SCRIPTURE, or SCRIPTURES. See BIBLE.

SCRIPTURE, *canon of*. See CANON.

SCRIPTURE, *ſcoffing*, &c. *at*, is puniſhable by fine and impriſonment. See BLASPHEMY.

SCRIVENER, one who lends money out at intereſt; it is alſo uſed for one who draws contracts.

Scriveners are mentioned in the ſtatute againſt uſury and exceſſive intereſt of money. 12 Ann. cap. 6. If a *ſcrivener* is entruſted with a bond, he may receive the intereſt; and if he fails, the obligee ſhall bear the loſs; and ſo it is if he receive the principal, and deliver up the bond; for being entruſted with the ſecurity itſelf, it ſhall be preſumed he is entruſted with power to receive the principal and intereſt; and the giving up the bond on payment of the money is a diſcharge thereof; but if a *ſcrivener* be entruſted with a mortgage-deed, he hath only authority to receive the intereſt, not the principal; the giving up the deed in this caſe not being ſufficient to reſtore the eſtate, but there muſt be a reconveyance, &c. Decreed in Chanc. Hill. 7 Ann. 1 Salk. 157.

SCROBICULUS *cordis*, the ſame as ANTICARDIUM.

SCROFANELLO, in *Ichthyology*, a name by which ſome have called a ſmall fiſh of the Mediterranean, more uſually known by the name of the SCORPÆNA.

SCROLL, in *Heraldry*, is the ornament placed under the eſcutcheon, containing a motto or ſhort ſentence, alluding ſometimes to the bearings, or the bearer's name; ſometimes expreſſing ſomewhat divine or heroic; ſometimes enigmatical, &c. It is often placed by the French and Scotch above the atchievement; which, according to Sir J. Mackenzie, is right, when the motto relates to the creſt; otherwiſe it ſhould be annexed to the eſcutcheon. Thoſe of the order of knighthood are generally placed round ſhields. See ESCROLL.

SCROPHULÆ, formed, by diminution, from *ſcropha*, *ſow*, in *Medicine*, ſcirrhous tumors, ariſing uſually about the neck, and ſometimes on other glandulous parts; called alſo *ſtrumæ*, and popularly the *king's evil*, or, ſimply, the EVIL.

SCROPHULARIA, in *Botany*. See FIGWORT.

SCROTUM, or SCORTUM, in *Anatomy*, the common capſula or membrane wherein the teſticles are contained; thus called from its reſembling a pouch or purſe of leather, called by the ancients *ſcortea*.

The *ſcrotum* is compoſed of the cuticle, ſituated on its external ſurface; the cutis, which lies under the cuticle, and between both which is ſpread the rete mucoſum; the membrana cellularis, which is a thin covering of a looſe and hollow texture, void of fat, adjoining the internal ſurface of the cutis; and under this membrane, a thin, muſcular, or fleſhy body, called DARTOS. Immediately under the expanſion of the dartos, there is diſcovered a ſecond cellular membrane, more conſiderable than the other, and communicating with it. Upon the external ſurface of the *ſcrotum* is a prominent line or ridge, called *raphe*, or the *ſeam* of the *ſcrotum*, which is continued in a perpendicular or longitudinal direction from the anus to the extremity of the penis, on its inferior part, and divides the external ſurface of the *ſcrotum* into two nearly equal portions.

The *ſcrotum* conſiſts of two diſtinct bags, one for each teſticle, and its immediate coats, formed by a duplicature of the dartos muſcle, and ſituated on each ſide of the raphe. Theſe bags are laterally connected by the intervention of a cellular membrane; and the union of the ſides of the dartos conſtitutes the partition, denominated *ſeptum ſcroti*, which is connected, on its inferior part, with the internal ſurface of the cutis under the raphe; and on its ſuperior part with the interior and external ſurface of the urethra, after having been expanded upwards betwixt the tunica vaginalis of each teſticle.

The uſe of the *ſcrotum* is to ſuſtain the teſticles, to prevent their colliſion, as alſo their falling too low, and to promote the corrugation of the *ſcrotum*.

Many authors have given accounts of the diſtemperatures of this part, of various kinds, impeding the intent of the propagation of the ſpecies; but one of the moſt remarkable of theſe, is the exceſſive growth of that part, as well in length as in breadth and thickneſs. See *Tumors of the* TESTICLES.

SCROTUM, *hernia of the*. See OSCHEOCELE, and HERNIA *inguinalis*.

SCROTUM *cordis*, the ſame as PERICARDIUM.

SCROWLS, or SCROLLS, in *Architecture*. See VOLUTE.

SCRUE. See SCREW.

SCRUPI, in *Natural Hiſtory*, the name of a claſs of foſſils, formed in detached maſſes, without any cruſts; of no determinate figure, or regular ſtructure; and compoſed of a cryſtalline or ſparry matter, debaſed by an admixture of earth, in various proportions.

Under this claſs are comprehended, 1. The TELAUGIA. 2. The PETRIDIA. 3. The LITHOZUGIA. 4. The *jaſpides*, or JASPERS.

All theſe genera ſtrike fire with ſteel, only ſome more readily than others.

SCRUPLE, SCRUPULUS, SCRUPULUM, or SCRIPULUM, the leaſt of the weights uſed by the ancients, which, amongſt the Romans, was the twenty-fourth part of an ounce, or the third part of a drachm.

SCRUPLE is ſtill a weight among us, containing the third part of a drachm, or twenty grains.

Among goldſmiths the *ſcruple* is twenty-four grains.

SCRUPLE, in *Chronology*. The Chaldee *ſcruple* is $\frac{1}{1080}$ part of an hour, called, by the Hebrews, *helakin*. Theſe *ſcruples* are much uſed by the Jews, Arabs, and other eaſtern people, in computations of time.

SCRUPLES, in *Aſtronomy*. *Scruples eclipſed*, that part of the moon's diameter which enters the ſhadow, expreſſed in the ſame meaſure wherein the apparent diameter of the moon is expreſſed. See DIGIT.

SCRUPLES *of half duration*, an arch of the moon's orbit, which the moon's centre deſcribes from the beginning of an eclipſe to its middle.

SCRUPLES *of immerſion*, or *incidence*, an arch of the moon's orbit, which her centre deſcribes from the beginning of the eclipſe, to the time when its centre falls into the ſhadow. See IMMERSION.

SCRUPLES *of emerſion*, an arch of the moon's orbit, which her centre deſcribes in the time from the firſt emerſion of the moon's limb, to the end of the eclipſe.

SCRUTATORES, among the Romans, certain officers, or ſervants, whoſe buſineſs it was to ſearch every body that came to ſalute the emperor, in order to diſcover if they had any kind of arms concealed about them. They were firſt inſtituted under the emperor Claudius.

SCRUTINY, *ſcrutinium*, in *Antiquity*, an examination, or probation, practiſed in the laſt week of Lent, on the catechumens, who were to receive baptiſm on the Eaſter-day.

The *ſcrutiny* was performed with a great many ceremonies: exorciſms and prayers were made over the heads of the catechumens. On Palm Sunday, the Lord's Prayer and Creed were given them; which they were afterwards made to rehearſe.

The proceſs was called *ſcrutinium*, *ſcrutiny*; becauſe hereby the hearts of the catechumens were ſcrutinized, or ſearched, that the prieſts might underſtand who were fit to be admitted to baptiſm.

This cuſtom was more in uſe in the church of Rome than any where elſe; though it appears, by ſome miſſals, to have been likewiſe uſed, though much later, in the Gallican church. It is ſuppoſed to have ceaſed about the year 860. Some traces of this practice ſtill remain at Vienne, in Dauphine, and at Liege.

SCRUTINY is alſo uſed in the *Canon Law*, for a ticket, or little paper billet, wherein, at elections, the electors write their votes privately, ſo as it may not be known for whom they vote.

SCRUTINY, among us, is chiefly uſed for a ſtrict peruſal and examination of the ſeveral votes haſtily taken at an election; in order to find out any irregularities committed therein, by unqualified voters, &c.

SCRUTORE, or SCRUTOIR (from the French *eſcritoire*) a kind of cabinet, with a door or lid opening downwards, for conveniency of writing on, &c.

SCRY, in *Falconry*, denotes a large flock of fowl.

SCUDDING, in *Sea-Language*, denotes the movement by which a ſhip is carried precipitately before a tempeſt. This expedient is never attempted in a contrary wind, unleſs when the condition of the ſhip renders her incapable of ſuſtaining the mutual efforts of the waves and wind any longer on her ſide, without being expoſed to the moſt imminent danger. A ſhip *ſcuds* either with a ſail extended on her fore-maſt, or, if the ſtorm is exceſſive, without any ſail, which in the ſea-phraſe is called *ſcudding under bare poles*. In ſloops and ſchooners, and other ſmall veſſels, the ſail employed for this purpoſe is called the ſquare-ſail. In large ſhips, it is either the fore-ſail, at large, reefed, or with its gooſe-wings extended, according to the degree of the tempeſt: or it is the fore-top-ſail cloſe reefed, and lowered on the cap; which laſt is particularly uſed when the ſea runs ſo high as to becalm the fore-ſail occaſionally; a circumſtance which expoſes the ſhip to the danger of *broaching-to*. The principal hazards incident to *ſcudding* are generally a pooping ſea, the difficulty of ſteering, which expoſes the veſſel perpetually to the riſk of broaching-to, and the want of ſufficient ſea-room. Falconer.

SCULION, in *Ichthyology*, the name given by Ariſtotle, and many others of the ancient writers, to the fiſh called by later authors *catulus*, and CATULUS *major*, and in England the BOUNCE.

SCULK, amongſt *Hunters*, denotes a company; as, a *ſculk* of foxes.

SCULL. See SKULL.

SCULL *cap*, in *Botany*. See SKULL *cap*.

SCULPONEÆ, among the Romans, a kind of ſhoes worn by ſlaves of both ſexes. Theſe ſhoes were only blocks of wood made hollow, like the French *ſabots*.

SCULPTURE, *ſculptura*, the art of cutting or carving wood, ſtone, or other matter, and forming various figures or repreſentations therein; as alſo of faſhioning wax, earth, plaſter, &c. to ſerve as models, or moulds, for the caſting of metalline figures.

Sculpture, in its latitude, includes both the art of working en creux, properly called ENGRAVING; and of working in relievo, which is what we more ſtrictly call *ſculpture*.

The antiquity of this art is paſt doubt; as the ſacred writings, the moſt ancient and authentic monuments we have of the earlieſt ages, mention it in ſeveral places: witneſs Laban's idols ſtolen away by Rachael, and the golden calf which the Iſraelites ſet up in the deſert, &c. But it is very difficult to fix the original of the art, and the firſt artiſts, from profane authors; what we read thereof being greatly intermixed with fables, after the manner and taſte of thoſe ages.

Some make a potter of Sicyon, named Dibutades, the firſt ſculptor: others ſay, the art had its origin in the iſle of Samos, where one Ideocus, and after him Theodorus, performed works of this kind, long before Dibutades's time. It is added, that Demaratus, father of Tarquin the Elder, firſt brought it into Italy upon his retiring thither; and that by means of Eucirapus and Eutygrammus, two excellent workmen herein, who communicated it chiefly to the Tuſcans; among whom it was afterwards cultivated with great ſucceſs. They add, that Tarquin ſent for Taurianus, one of the moſt eminent among them, to Rome, to make a ſtatue of Jupiter, &c. of baked earth, for the frontiſpiece of the temple of that deity.

Soon after this time, there were many ſculptors, both in Greece and Italy, who wrought altogether in earth: ſome of the moſt noted were, Chalcoſthenes, an Athenian, who made himſelf and his houſe famous by the great number of earthen figures he adorned it with; and Demophilus and Gorſanus, two painters, who enriched the temple of Ceres with great variety of painting, and earthen images. In effect, all the firſt ſtatues of the heathen deities were either of earth or wood; and it was not ſo much any frailty of that matter, or unfitneſs for the purpoſe, as the riches and luxury of the people, that firſt induced them to make images of marble, and other more precious ſtones.

Indeed, how rich ſoever the matter were, whereon they wrought, yet they ſtill firſt uſed earth, to form models thereof; and to this day, whether they be for cutting marble ſtatues with the chiſſel, or for caſting them in metal, they never undertake the one, or the other, without firſt making a perfect model thereof in earth, wax, plaſter, &c. Whence, doubtleſs, aroſe the obſervation of Praxiteles, that the art of moulding earthen figures was the natural mother of that of making marble and metalline ones; which laſt never appeared in perfection, till about three hundred years after the building of Rome; though the firſt was at its height long before.

Phidias of Athens, who came next, ſurpaſſed all his predeceſſors, both in marble, in ivory, and in metals; and about the ſame time appeared ſeveral others, who carried *ſculpture* to the higheſt perfection it ever arrived at; particularly Polycletus at Sicyon; and after him Myron; Lyſippus, who alone was allowed the honour of caſting Alexander's image in braſs; Praxiteles and Scopas, who made thoſe excellent figures, now before the pope's palace at Montecavallo; Briaxis, Timotheus, and Leochares, who, with Scopas, wrought at the famous tomb of Mauſolus, king of Caria; Cephiſſodotus, Canachus, Dædalus, Buthieus, Niceratus, Euphranor, Theodorus, Xenocrates, Pyromachus, Stratonicus, Antigonus, who wrote on the ſubject of his art; the famous authors of the Laocoon, viz. Agaſander, Polydore, and Athenodorus, and many others, the names of ſome whereof have paſſed to poſterity; while thoſe of others have periſhed with their works; for though the number of ſtatues in Aſia, Greece, and Italy, was ſo immenſe, that in Rome alone, as we are informed, there were more than there were living perſons, yet we have but few now left, at leaſt very few of the fineſt.

When Marcus Scaurus was ædile, his office obliging him to provide what was requiſite towards the public rejoicings, he adorned the ſtately theatre which he erected with three thouſand brazen ſtatues; and though L. Mummius,

Mummius, and Lucullus, brought away a great number out of Asia and Greece, yet there were ſtill above three thouſand remaining in Rhodes, as many at Athens, and more at Delphi.

But what is moſt extraordinary, was the bigneſs of the figures, which thoſe ancient artiſts had the courage to undertake. Amongſt thoſe Lucullus brought to Rome, there was one of Apollo, thirty cubits high; the Coloſſus of Rhodes, made by Cares of Lyndos, the diſciple of Lyſippus, far exceeded this; Nero's ſtatue, made by Xenodorus, after that of Mercury, was alſo of an extraordinary ſize, being a hundred and ten feet high.

Sculpture, however, which, as we learn from Pauſanias, was brought to the higheſt perfection between the fifty-ſecond or fifty-third Olympiad, and the eighty-third, i. e. in about a hundred and twenty years from Dædalus to Phidias, continued in this ſtate no longer than to the time of Alexander the Great, during the period of about a hundred and ten years; and then it began inſenſibly to decline; not but that there were ſtill ſome fine pieces of workmanſhip made both in Greece and Italy, though not performed with ſo good a fancy, and ſuch exquiſite beauty, as ſome of the former works. Beſides that the Greek ſtatues are moſt eſteemed for the workmanſhip, there is a ſpecial difference between them, and thoſe of the Romans, as the greateſt part of the firſt are naked, like thoſe who wreſtle, or perform ſome other bodily exerciſe, wherein the youth of thoſe times placed all their glory; whereas the others are clad and armed, and particularly have the toga on, which was the greateſt mark of honour amongſt the Romans.

Although the arts had lain dead for many centuries, they no ſooner felt the genial warmth of protection in the generoſity of Lorenzo de Medicis, Leo X., Coſmo, grand duke of Tuſcany, &c. than they ſtarted into being, like a man awoke from ſleep, and appeared in their maturity, as it were, inſtantaneouſly. The truth of this remark will appear in an enumeration of ſome of the chief productions of ſeveral eminent modern artiſts. Lorenzo Ghiberti produced the fine gates of St. John the Baptiſt at Florence; Donatelli executed the group of Judith and Holofernes in the great ſquare of that city, and a bas-relief in the church of St. Croce; Michael Angelo formed the ſtatue of Moſes in St. Peter's de Vinculis, at Rome, a Bacchus in the gallery of Florence, and ſome figures on the monuments of the ſepulchral chapel in that place; John of Bologna produced the rape of the Sabines in the great ſquare at Florence, the large fountain in the great ſquare at Bologna, and the fine horſe at the Pont Neuf at Paris; Roſconi and Algardi formed many ſtatues and monuments of popes, &c. in St. Peter's, and the latter executed a large bas-relief in the ſame church, repreſenting Leo I. going out to meet king Attila, whereby he ſaved the city of Rome from deſtruction, about the year 450; to Bernini we are indebted for the chair of St. Peter, ſupported by the four fathers of the church; the monuments of the popes Urban VIII. and Alexander VII. and the large fountain in the Piazza Navona; and to Francis Queſnoy, ſurnamed the Flemiſh, for a beautiful ſtatue of Chriſt, another of Suſanna, and a fine one of St. Andrew, in St. Peter's; the reputation of this artiſt for boys is unparalleled both among the ancients and moderns.

In France, the principal artiſts in *ſculpture* have been Jean Goujoin, contemporary with Michael Angelo, who formed the fountain in the Rue St. Denis, at Paris, ſome fine caryatides in the Louvre, and the *ſculptures* at the gate of St. Anthony; Puget, celebrated on account of the *ſculptures* at the gate of the town-houſe at Marſeilles, the ſtatue of St. Sebaſtian, at Genoa, and that of Milo, at Verſailles; and Girardon, for the monument of cardinal Richelieu, at the Sorbonne; the equeſtrian ſtatue of Louis XIV. at Paris, and the rape of Proſerpine, at Verſailles. For theſe laſt ſculptors we are indebted to the munificence of Louis XIV.

We are not without ſome excellent ſpecimens of *ſculpture* in England. The ſtatues of Phrenzy and Melancholy on the piers before Bethlehem hoſpital, deſerve to be ranked among the firſt performances in this art; they were executed, in the reign of Charles II. by Cibber, the father of the poet-laureat of that name. There is alſo a moſt elegant ſtatue of king Edward VI. in bronze, which ſtands in one of the courts of St. Thomas's hoſpital, in Southwark, by Sckeemaker; and one of Sir Iſaac Newton, at Cambridge, by Roubiliac. Weſtminſter abbey is the moſt famous repoſitory of *ſculpture* in England; but the figures that are here preſerved loſe much of their effect, by being crouded together, without any orderly arrangement: the monument of the duke of Argyle, and one of Mrs. Nightingale, both by Roubiliac, and Dr. Chamberlain's, by Sckeemaker, ſeem to ſtand higheſt in the public opinion.

It is probable that *ſculpture* is more ancient than painting; and if we examine the ſtyle of ancient painting there is reaſon to conclude, that *ſculpture* ſtood firſt in the public eſteem: as the ancient painters have evidently imitated the ſtatuaries, even to their diſadvantage; ſince their works have not that freedom of ſtyle, more eſpecially with reſpect to their compoſition and drapery, which the pencil might eaſily acquire to a greater degree than that of the chiſſel; but as this is univerſally the caſe, it cannot be attributed to any thing elſe beſides the higher eſtimation of the works on which they formed themſelves. Which is the moſt difficult art has been a queſtion often agitated. Painting has the greateſt number of requiſites, but at the ſame time her expedients are the moſt numerous; and, therefore, we may venture to affirm, that, whenever *ſculpture* pleaſes equally with a painting, the ſculptor is certainly the greateſt artiſt. *Sculpture* has indeed had the honour of giving law to all the ſchools of deſign, both ancient and modern, with reſpect to purity of form. The reaſon, perhaps, is, that being diveſted of thoſe meretricious ornaments by which painting is enabled to ſeduce its admirers, it is happily forced to ſeek for its effect in the higher excellencies of the art: hence elevation in the idea, as well as purity and grandeur in the forms, are found in greater perfection in *ſculpture* than in painting. Beſides, whatever may be the original principles which direct our feelings in the approbation of intrinſic beauty, they are, without doubt, very much under the influence of aſſociation. Cuſtom and habit will neceſſarily give a falſe bias to our judgment: it is, therefore, natural, and in ſome meaſure reaſonable, that thoſe arts which are temporaneous, ſhould adapt themſelves to the changes of faſhion, &c. But *ſculpture*, by its durability, and conſequent application to works of perpetuity, is obliged to acquire and maintain the eſſential principles of beauty and grandeur, that its effect on the mind may be preſerved through the various changes of mental taſte. It is conceived, that it will ſcarcely admit of a queſtion, whether the ancients or moderns have moſt excelled in this art; the palm having been ſo univerſally adjudged to the former. To determine in what proportion they are ſuperior is too difficult an attempt. Wherever there is a real ſuperiority in any art or ſcience, it will in time be diſcovered; but the world, ever fond of exceſs, never ſtops at the point of true judgment, but dreſſes out its favourite object with the ornaments of fancy, ſo that even every blemiſh becomes a beauty. This it has done by ancient *ſculpture* to ſuch a degree as not to form its judgment of *that* by any rules, but to form an opinion of *rules* by the example. As long as this is the caſe, modern art can never have a fair compariſon with the ancient. This partiality to the ancients is ſo ſtrong as to prevent almoſt all diſcrimination; and is the ſole reaſon, why many antiques, that now ſtand as patterns of beauty in the judgment of moſt connoiſſeurs, are not diſcovered to be copies. This is not more important than it is eaſy to be perceived by a judicious eye; for wherever there is a grandeur or elegance to an eminent degree in the idea and general compoſition of a ſtatue, and when the execution of the parts (called by artiſts the treating of the parts) betrays a want of taſte and feeling, there is the greateſt reaſon to conclude, that the ſtatue is a copy, though we were ever ſo certain of its antiquity. And ſurely if evidence of a picture's being a copy proportionably diminiſhes its value, the ſame rule of judgment may be no leſs properly applied to a ſtatue. Modern and ancient art can never, therefore, be fairly compared, till both are made to ſubmit to the determination of reaſon and nature. It may be obſerved, that the ancients have chiefly confined themſelves to the ſublime and beautiful; and whenever a pathetic ſubject has come before them, they have ſacrificed expreſſion to beauty. The famous group of Niobe is one inſtance of this kind; and, therefore, however great our partiality to the ancients may be, none can heſitate to affirm, that, whenever the moderns ſhall unite great expreſſion with great beauty, they will wreſt the palm out of their hands.

The Editor is indebted for the preceding ingenious remarks to Mr. Bacon, an artiſt of very diſtinguiſhed eminence in his profeſſion.

Sculpture, *to perform any thing in the way of*, they begin with making a model of earth, or wax. For earthen models, they uſe but few inſtruments; their hands and fingers do almoſt the whole. For waxen models, to a pound of wax they put half a pound of colophony; ſome add turpentine, melting the whole with oil of olive; and ſome add a little vermilion, or other matter, to give it a colour. This is wrought and moulded with the fingers, like the earth.

For Sculpture *in wood*, which we properly call carving, the firſt thing required is, to chooſe a wood proper for

for the particular kind of work. If it be any thing large, and require a great deal of ſtrength and ſolidity, the hardeſt and moſt durable wood is to be choſen, as oak or cheſnut; for ſmaller works they uſe pear-tree, and ſervice-tree. But as theſe woods are very hard, for little delicate works they uſe ſofter woods, only cloſe, and of a fine grain; ſuch is the linden-tree, which the chiſſel is found to cut more eaſily, and cleanlily, than any other wood.

As to ſtatues, we find the ancients have made them of almoſt all kinds of wood: at Sicyon was an image of Apollo in box; at Epheſus, that of Diana was in cedar. As theſe two kinds of wood are very hard, and even held incorruptible, eſpecially cedar, Pliny obſerves, they were judged particularly ſuitable for the repreſentations of the deities. In a temple on mount Cyllenius, dedicated to Mercury, was an image of that god formed of the wood of the lemon-tree: others there were of the palm-tree, olive-tree, ebony, and even of the vine.

For large works, if it be only ſingle figures, it is better they conſiſt of ſeveral pieces, than of a ſingle one, on account of the liableneſs of the latter to warp; for every large piece may probably not be dried to the heart, however it may appear withoutſide. Obſerve, alſo, that the wood will not be ſo fit for working, till after it hath been cut at leaſt ten years.

Sculpture *in marble and ſtone*. In this work, the firſt thing they do is, out of a great block of marble to ſaw another of the ſize required; which is performed with a ſmooth ſteel ſaw, without teeth, caſting water and ſand thereon, from time to time; then they faſhion it, by taking off what is ſuperfluous with a ſteel point, and a heavy hammer of ſoft iron; after this, bringing it near the meaſure required, they reduce it ſtill nearer with another finer point; they then uſe a flat cutting inſtrument, having notches in its edge, or teeth; and then a chiſſel to take off the ſcratches the former has left; till, at length, taking raſps of different degrees of fineneſs, by degrees they bring their work into a condition for poliſhing. To poliſh, or make the parts ſmooth and ſleek, they uſe pumice-ſtone and ſmalt; then tripoli; and when a ſtill greater luſtre is required, they uſe burnt ſtraw.

When any conſiderable work is undertaken, as a ſtatue, baſſo relievo, or the like, they make a model, beforehand, of clay; but as this ſhrinks in drying, and eaſily cracks and breaks, they only uſe it to make a mould of plaſter, or ſtucco, wherein they caſt a figure of the ſame matter, which ſerves them thenceforth for a model, and by which they adjuſt all their meaſures and proportions.

To proceed the more regularly; on the head of the model they place an immoveable circle, divided into degrees, with a moveable ruler, or index, faſtened in the centre of the circle, and divided likewiſe into equal parts. From the end of the ruler hangs a thread with a plummet, which ſerves to take all the points to be transferred thence to the block of marble, from whoſe top hangs another plummet like that of the model. See *Tab.* III. *Miſcell. fig.* 44.

Indeed there are ſome excellent ſculptors who diſapprove of this method; urging, that the ſmalleſt motion of the model changes their meaſures; for which reaſon they rather chuſe to take all their meaſures with the compaſſes.

For the caſting of ſtatues, or figures of metal, and the moulding of ſtatues, &c. *of ſtucco, plaſter,* &c. ſee Statue, Stuc, and Plaster. See alſo Bronze and Foundery.

SCUM, or Spume, *ſpuma*, a light excrement, ariſing from liquors when briſkly ſtirred; called alſo *foam* or froth.

Scum is alſo uſed for the impurities which a liquor by boiling caſts up to the ſurface; and alſo for thoſe taken from off metals when in fuſion; theſe are alſo called scoria.

Scum *of lead*, is a kind of recrement, of various colours, procured from melted lead.

Scum *of ſilver*, is what we commonly call litharge of ſilver.

Scum *of nitre*. See Nitre.

Scum *of ſalt*. See Salt.

Scum, *ſugar of the*. See Sugar.

SCUMA, a word uſed by ſome of the chemiſts for *ſquama*, the ſcales of any metal, and particularly applied to the flakes flying off from hot iron under the hammer.

SCUPPERS, in a *Ship*, are certain channels cut through the water-ways and ſides of a ſhip, at proper diſtances, and lined with plated lead, in order to carry the water off from the deck into the ſea. The *ſcuppers* of the lower deck of a ſhip of war are uſually furniſhed with a leathern pipe, called the *ſcupper-hoſe*, which hangs downward from the mouth or opening of the *ſcupper*. The intent of this is to prevent the water from entering when the ſhip inclines under a weight of ſail. Falconer.

Scupper *nails*. See Nails.

SCURFF, in *Ichthyology*, an Engliſh name for a ſpecies of ſalmon, called alſo in ſome places the *bull-trout*. It never grows to any great ſize, and differs plainly from the ſalmon of the common kind in this, that its tail is even, and not forked; its head is ſhort and thick, and its fleſh is leſs red than that of moſt of the ſalmon kind. See Salmon-*trout*.

SCURRA, in *Ornithology*, a name by which the ancients have called the *monedula*, or common jackdaw.

SCURVOGEL, in *Ornithology*, the name of an American bird, called by ſome the *uhender-apoa*, and by the Braſilians *jabiruguacu*.

It is of the crane kind, or nearly approaching to that genus. Linnæus has made a diſtinct genus of it under the title of mycteria. The beak is large, long, and acute; both the mandibles bend upwards; the upper mandible is triangular, and the lower has three corners; the noſtrils are linear, and it has no tongue; the feet are furniſhed with four toes; in the ſummit of the head this bird has a ſort of bony crown, of a mixed greyiſh and whitiſh colour; the neck is of a conſiderable length, and both that and the head are deſtitute of feathers, and are only covered by a naked ſquamoſe ſkin; it is about the ſize of the ſtork, and has a ſhort black tail; all the reſt of the feathers are white, except that the long wing-feathers are blackiſh, with ſomewhat of a purpliſh gloſs. When the ſkin is taken off, it is dreſſed ſeveral ways, and is a very delicately taſted bird. See *Tab.* III. *of Birds*, N° 35.

SCURVY, *ſcorbutus*, in *Medicine*, a diſorder of the putrid kind; the cauſe and cure of which have been lately the ſubject of very ſucceſsful inveſtigation. This is the ſame diſtemper which Pliny, (Nat. Hiſt. lib. xxv. ſect. 6.) from the ulcers in the mouth and legs, calls *ſtomocace*, and *ſceletyrbe*; aſcribing it to the drinking of bad waters; and recommending, as a remedy for it, our hydrolapathum, or water-dock. Hippocrates (De Int. Affect. § 34. and De Aerib. Aquis, & Locis, § 10.) long before his time, deſcribed it as a diſeaſe of the ſpleen, owing chiefly to cold, raw, and turbid waters.

This diſorder prevails chiefly in cold northern countries, eſpecially in low damp ſituations, abounding with fens, marſhes, and ſtagnating water. Some writers, obſerving that it rages moſt among the inhabitants of northern climates, and particularly about the Baltic ſea, have erroneouſly aſcribed it to the coldneſs of the air, which checks perſpiration; but the true cauſes are their living on ſalted meat, their want of greens and fruit in the winter, and of fermented liquor, and their dwelling in damp, foul, and ill-aired houſes. And that this is the cauſe we may infer from the ſtate of the Laplanders, and others, who know nothing of the *ſcurvy*, though they live in as high a latitude; becauſe they eat no putrid and ſalted meats, but uſe through the winter the freſh fleſh of their rein-deer. We may obſerve in general, that ſedentary people of a dull melancholy diſpoſition, are moſt ſubject to this diſeaſe; and that it has been moſt powerful and fatal to ſailors in long voyages.

The *ſea-ſcurvy* has been ſo much more violent and deſtructive than the diſorder that has been diſtinguiſhed by the denomination of *ſcurvy* on the land, as to have led ſome writers to conſider them as two diſorders, of different kinds; but others have attributed their different ſymptoms merely to the various degrees of their malignity. Sir John Pringle obſerves, that the diſtemper commonly, but erroneouſly, in this country called the *ſcurvy*, belongs to a claſs of diſeaſes totally different from the *ſea-ſcurvy*, and ſo far, he ſays, is the commonly received opinion, that there are few conſtitutions altogether free from a ſcorbutic taint, from being true, that, unleſs among ſailors, and others in like circumſtances with them, more particularly with reſpect to thoſe who uſe a ſalt and putrid diet, and eſpecially if they live in foul air and uncleanlineſs, he apprehends, there are few diſorders leſs frequent.

Scurvy, *cauſes of the*. As the *ſcurvy* was found to be moſt violent at ſea, the cauſe of it was generally ſought for in ſome apprehended noxious quality of the ſea air; but Sir John Pringle long ago obſerved, that even in the longeſt voyages, cleanlineſs, ventilation, and freſh proviſion, were effectual preſervatives; and that upon the ſea-coaſt, free from marſhes, the inhabitants, who frequently breathed the air from the ſea, were not liable to this diſeaſe. Accordingly, he agreed with others in aſcribing the *ſcurvy* to a ſeptic reſolution; that is, a beginning corruption of the whole habit, ſimilar to that of every animal ſubſtance when deprived of life; and this hypotheſis was verified by an examination of the ſymptoms in the ſcorbutic ſick, and by the appearances in their

their bodies after death. Having diſcovered the putrefying quality of *ſea*-SALT, he was naturally led to attribute the *ſcurvy* partly to the long uſe of ſalted meats. He was confirmed in this opinion, by conſidering, that though the Laplanders are generally exempt from this diſorder, yet in thoſe provinces which border on Lapland, where the inhabitants eat ſalted meats, they are as much troubled with the *ſcurvy* as in any other country. It has, indeed, been aſſerted, that men living on ſhore will be affected with the *ſcurvy*, though they have never been confined to ſalted meat; but of this he has known no inſtance, except in thoſe who breathed a marſhy air, or which was otherwiſe putrid, and who wanted exerciſe, fruits, and the common herbs. Under ſuch circumſtances it muſt be owned, that the humours will corrupt in the ſame manner, though not in the ſame degree, with thoſe of ſeamen. Whatever, therefore, contributes to produce or promote the putrefactive diatheſis, in which the peculiar and diſtinguiſhing nature of this diſeaſe conſiſts, may be juſtly conſidered as the remoter cauſe of it. Thus, it has been found to proceed from a ſuppreſſion of the cuſtomary evacuations, from grief, fear, and other depreſſing paſſions; from an hereditary taint, in which caſe a ſmall additional cauſe will excite it; from a neglect of cleanlineſs, bad clothing, want of proper exerciſe, confined air, unwholeſome food, long uſe of mercury, or any diſeaſe which greatly weakens the body, or vitiates the humours.

According to Dr. Lind, the principal and main prediſpoſing cauſe of the *ſcurvy* is too great a degree of moiſture in the atmoſphere; and the uſe of ſalt diet, bad water, or foul air, can only be reckoned as ſecondary cauſes, which will not of themſelves produce the diſeaſe. Dr. Macbride, in conformity to the modern theory of PUTREFACTION, maintains, that as dead bodies become putrid from the loſs of their *fixed* AIR, the immediate cauſe of putrefaction in living bodies may be the detachment of too large a proportion of their fixed air; and from the ſymptoms that occur in the *ſcurvy*, and other highly putrid diſeaſes, he infers, that the air is actually detached from the blood in theſe terrible caſes. The known cauſes, likewiſe, of that degree of putrefaction, which often takes place in the living body, confirm this opinion. To this purpoſe he obſerves, that a long continuance in an over moiſt atmoſphere is known to bring on the putrefactive diatheſis; becauſe ſuch an atmoſphere may admit the eſcape of the aerial part of the perſpirable matter, which is the lighteſt and moſt fugitive, whilſt it will not allow the aqueous, ſaline, earthy, and phlogiſtic, or oily principles, to be exhaled; and theſe, deprived of their air, are in a putrefactive ſtate, and may become ferments to the remaining maſs of fluids. This account of the effect of ſurrounding moiſture is farther confirmed by attending to the methods of preſerving health, which experience preſcribes; ſuch as keeping the body well clothed with ſuch kind of apparel as will moſt readily abſorb the watery part of the perſpirable matter which the atmoſphere cannot abſorb; uſing ſuch a courſe of diet as will afford the animal fluids more than uſual ſupplies of air, to make up for the extraordinary waſte; ſuch as recent vegetables, ſugar, and aromatics; eating ſparingly of animal food, which yields a ſmall proportion of air; and abſtaining from the immoderate uſe of ardent ſpirits and fermented liquors, which check the alimentary fermentation, and hinder the free extrication of air from the ſubſtances that are conſumed. On the ſame principle of the ſeparation of the air from the conſtituent particles of the blood, Dr. Macbride accounts for the putrefactive effects of that circulatory motion of the fluids, which is occaſioned by too violent exerciſe, or by a fever, and for the ſolution of the texture of the fluids by mercury, and many of the poiſons. The modern methods, recited in the ſequel of this article, of preventing or curing the *ſcurvy*, and ſimilar diſeaſes, are alledged as farther evidence of the truth of his general hypotheſis.

SCURVY, *ſymptoms of the.* This diſeaſe is accompanied with ſuch a variety of ſymptoms, diſcovering themſelves at once in the ſeveral parts of the body, that it is not improperly called by Willis a legion of diſeaſes. And Boerhaave ſays, that it produces pleuritic, colic, nephritic, hepatic pains; various fevers, as hot, malignant, and intermitting; dyſenteries, faintings, anxieties, dropſies, conſumptions, convulſions, palſies, and fluxes of blood; and, in a word, that it may be ſaid to contain the ſeeds and origin of almoſt all diſtempers. The moſt common ſymptoms are unuſual wearineſs, heavineſs, and difficulty of breathing, eſpecially after motion; ſwelling and rottenneſs of the gums, which are apt to bleed on the ſlighteſt touch; and this change of the gums, Dr. Lind conſiders as the pathognomonic ſymptom of the diſeaſe; ſtinking breath; frequent bleeding at the noſe; difficulty of walking; itching and aching of the limbs; a diſcolouring of the ſkin with dark, and occaſionally darkiſh blue ſpots; ſometimes a ſwelling, and ſometimes a falling away of the legs, in which there are livid, yellow, or violet-coloured ſpots; ſwelling of the body and of the face, which is generally of a pale or leaden colour; and in the progreſs of the diſeaſe, looſeneſs of the teeth; hæmorrhages from different parts of the body; foul, obſtinate ulcers; pains in various parts of the body, eſpecially about the heart; dry, ſcaly eruptions, all over the body; great obſtructions of the liver or ſpleen, or both; extreme coſtiveneſs, and ſtoppage of urine. At laſt, a waſting or hectic fever comes on; and the diſeaſe terminates in a dyſentery, diarrhœa, dropſy, palſy, fainting fits, or mortification of ſome of the bowels. In lord Anſon's Voyage, it is related, that the malignity of this diſeaſe, with which his men were afflicted, was ſo great, that the ſcars of wounds which had been healed for many years were forced open, and the callus of broken bones, which had been completely formed for a long time, was diſſolved, and the fracture ſeemed as if it had never been conſolidated. John Woodall, an old Engliſh ſurgeon, who hath given a very accurate deſcription of the *ſcurvy*, obſerves, that many of thoſe which have been opened after death, had their livers entirely rotted; others have had them ſwoln to an exceſſive bulk; in ſome the ſpleen had been exceedingly ſwelled; others have been full of water; and others have had the lungs putrefied, and have been offenſive even whilſt they have lived. See LEPROSY.

Method of cure. This diſeaſe can be removed by no other way than by a proper attention to diet, air, and exerciſe. A perſon that has been uſed to breathe a cold, damp, confined air, ſhould be removed to an air that is moderately warm, dry, and open. Sedentary perſons ſhould uſe daily exerciſe in the open air; and thoſe who labour under depreſſing paſſions ſhould be diverted by chearful company, and other amuſements. When the *ſcurvy* has been brought on by a long uſe of ſalted proviſions, the proper medicine is a diet conſiſting chiefly of freſh vegetables, as oranges, apples, lemons, limes, tamarinds, water-creſſes, *ſcurvy*-graſs, &c. The continued uſe of theſe with milk, pot-herbs, new bread, and freſh beer or cyder, will generally remove a *ſcurvy* that is not far advanced. Pickled or preſerved vegetables may be ſubſtituted in the room of freſh ones, when the latter cannot be obtained; and in the want of theſe, ſome writers recommend the chemical acids, and direct the patient's food and drink to be ſharpened with cream of tartar, elixir of vitriol, vinegar, and the ſpirit of ſea-ſalt. A courſe of this kind, however, will rather prevent than cure the *ſcurvy*; and it is of great importance that ſailors in long voyages ſhould be provided with plenty of the articles above enumerated. If they were furniſhed with a good ſtore of fruits, greens, cyder, &c. the ſhips were well ventilated, and proper regard were paid to cleanlineſs and warmth, they would ſeldom ſuffer from the *ſcurvy* or putrid fevers, which have in many caſes been ſo fatal. Dr. Buchan obſerves, that he has ſeen extraordinary effects in the land *ſcurvy* from a milk diet; and that the moſt proper drink is whey or butter-milk; but when theſe cannot be had, ſound cyder or perry may be uſed. Wort, as we ſhall more particularly ſhew, has been much recommended; as well as the decoction of the tops of the ſpruce-fir, in the quantity of a pint twice a day. See CHOWDER-*beer*.

The biſhop of Cloyne extols TAR-*water*, as of itſelf, when regularly and copiouſly uſed, an effectual remedy for the *ſcurvy*. Decoctions of any of the mild mucilaginous vegetables, as ſarſaparilla, marſhmallow roots, &c. infuſions of the bitter plants, ſuch as ground-ivy, the leſſer centaury, marſh trefoil, &c. and all kinds of ſallad, as ſpinage, lettuce, parſley, celery, endive, radiſh, dandelion, &c. have been found beneficial.

Scorbutic complaints of long ſtanding have been conſiderably relieved by the uſe of a decoction of the roots of herba Britannica, or water-dock, which is uſually made by boiling a pound of the freſh root in ſix pints of water, till about one third of the water be conſumed: the doſe is from half a pint to a whole pint every day. Patients who have been very deplorably reduced by the *land-ſcurvy*, have been greatly relieved both by drinking the *Harrowgate* ſulphur WATER, and by bathing in it. The chalybeate water may be alſo uſed with advantage. A ſlight degree of *ſcurvy*, eſpecially when it affects only the gums, may be removed by often ſucking the juice of a bitter orange or lemon; our own ſorrel may anſwer the ſame purpoſe. Dr. Hulme informs us, that the cortex, joined to the acid juices, has been uſed at ſea with great ſucceſs. The method of Mr. Hodgkin, a ſurgeon in the royal navy, who firſt introduced this practice, is to give a drachm of the cortex in powder, with an ounce of lemon

mon or orange juice, three times a day; and night and morning the swelled limbs are to be bathed in vinegar. This course is to be persisted in till the scorbutic symptoms disappear; the belly being always kept open by gentle laxatives. In cases where the cortex in powder was found to disagree with the patients, Dr. Hulme used, instead of the powder, a tincture, which was made by digesting two ounces and a half of the cortex, and half an ounce of myrrh, in a pint of brandy. The usual dose was half an ounce of the tincture mixed with an ounce of the acid juice.

With regard to the *modus operandi*, or efficacy of the means that have been made use of either for preventing or curing the *scurvy*, Sir John Pringle remarks, that though they may vary in form, and in their manner of operating, yet they all some way or other contribute towards preventing or correcting putrefaction, whether of the air in the closer parts of a ship, of the meats, of the water, of the cloaths and bedding, or of the body itself. And Dr. Macbride, laying down as an incontrovertible position, that the genuine putrid *scurvy* has never been known to yield to any other medicines than to such as are composed of fresh vegetables, and observing that the acid and alcalescent, the mild and the acrid, the sweet and the bitter, cure the *scurvy*, infers, that this virtue must be owing to some property which they all possess in common; which property is this; viz. that when mixed with any animal substance, and placed in the proper degree of heat, they presently run into fermentation; and in the course of that fermentation throw off a subtile vapour or spirit of surprising activity, called fixed air, endowed with a power of restoring sweetness to putrid animal fluids. The theory, which makes the cure of the *scurvy* to depend on a change produced in the diseased fluids, in consequence of the fermentation of the fresh vegetables in the stomach and bowels, it is said, was first taught by Dr. Cullen. In confirmation of this theory, Dr. Macbride observes, that the recovery of people in the very last stage of the *scurvy* is brought about in a surprisingly short space of time; provided the patients are but fully supplied with fresh vegetables; and this sudden change must be effected by that subtile and active spirit, discharged by fermentation in the bowels, which seems to be the only thing capable of pervading in so short a time the most intimate recesses of the whole vascular system, and of totally changing the corrupted nature of the entire mass of fluids. He adds, that the liquors which have completed their first stage of fermentation, and thereby lost much of their fixed air, though they are found useful as preservatives, will none of them cure the disease. Cyder, he says, which appears to have a greater degree of antiscorbutic virtue than any of the common fermented liquors, is generally stopped sooner in its career of fermentation, and on that account contains the more fixed air; and he farther urges, that acids, both mineral and vegetable, and ardent spirits, which contain little fixed air in themselves, and check the alimentary fermentation, are found to be, the first, useless and insignificant, and, the second, extremely hurtful, in this disease. Dr. Lind has also observed, that experience abundantly evinces the inefficacy of spir. salis, elixir vitrioli, and vinegar, for preventing, and much less for curing the *scurvy*. Before the power of fixed air in subduing putrefaction was known, the efficacy of fruits, greens, and fermented liquors, was commonly ascribed to the acid in their composition; and Sir John Pringle supposes, that the acid does concur in producing that effect. And though mineral acids, which contain little or no fixed air, have been used in the *scurvy* with little success, he apprehends that in the unsuccessful trials they have never been sufficiently diluted; for it is easy to conceive, that in the small quantity of water the elixir of vitriol, e. gr. is commonly given, that austere acid can scarcely get beyond the first passages; considering the delicate sensibility of the mouths of the lacteals, which must force them to contract and exclude so pungent a liquor. He, therefore, proposes to use, in a deficiency of other remedies at sea, distilled water, acidulated with the spirit of sea-salt, in the proportion of only ten drops to a quart, or with the weaker spirit of vitriol thirteen drops to the same measure; and to give those that are threatened with the *scurvy* at least three quarts of this liquor daily.

Dr. Macbride, having sufficiently proved that the air produced by alimentary fermentation was endowed with a power of correcting putrefaction, and having found this fluid to be fixed air, concluded, that whatever substance, proper for food, abounded with it, and which could be conveniently carried to sea, would afford one of the surest remedies against the *scurvy*. Beer, e. gr. had always been esteemed one of the best antiscorbutics; and it has been a constant observation, that in long cruises and distant voyages, the *scurvy* is never seen whilst the small beer holds out at a full allowance; but that when it is all expended, the distemper soon prevails. Dr. Macbride judging that beer derived all its fixed air from the malt of which it was made, inferred, that malt itself was preferable in long voyages, as it took up less room than the brewed liquor, and would keep longer found. Fresh wort, he says, or infusion of malt, is a liquor similar to the recent juices of the sweet vegetables; fermenting readily like them, and being precisely of the same mild, saponaceous, and aperient nature. This theory has been since amply verified by experience. The method in which he proposes to give the wort is to boil it up into a panada, with the sea-biscuit, and some of the dried fruits that are usually carried to sea; then let the scorbutic patients make at least two meals a day on this palatable mess, and let them drink a quart or more, if it shall be found to agree, of the fresh infusion, in the course of the twenty-four hours. When it gripes and immoderately purges, the dose must be lessened, and some drops of the acid elixir of vitriol may be given with it, in order to check the too great tendency to fermentation, and to make it sit easy on the stomach. And it is not only in the *scurvy*, but likewise in acute putrid diseases, that he expects the wort will be found of singular service.

The wort is to be prepared in the following manner: take one measure (e. gr. a quart) of the ground malt, and pour on it three measures of boiling water; stir them well, and let the mixture stand, close covered up, for three or four hours; after which, strain off the liquor. In hot weather, it must be brewed fresh every day. When malt cannot be procured, Dr. Macbride recommends that melasses, honey, or sugar, may be tried, dissolved in a due proportion of water (about four to one), and given in such manner as may be found most agreeable and convenient to the patients. The artificial PYRMONT-*water* has been much recommended, as an excellent antiscorbutic. Wine likewise abounds with fixed air, in a degree perhaps greater than any vegetable substance. The Russians make use of a liquor called QUAS with great success in this intention; and the kind of food called SOOINS has been also found beneficial.

The modern theory, with regard to the cause, prevention, and cure of the *scurvy*, has been lately illustrated and verified in circumstances of peculiar advantage by captain Cook, who, with a company of a hundred and eighteen men, performed a voyage of three years and eighteen days throughout all the climates from 52° N. to 71° S. with the loss of only one man by sickness. The method he pursued, as communicated to the Royal Society (Phil. Transf. vol. lxvi. part ii. art. 22.) was in general as follows. Of the malt, with which he was largely provided, he made sweet wort, and gave it not only to those men who had manifest symptoms of the *scurvy*, but to such as were judged to be most liable to it, in a quantity which sometimes amounted to three quarts in the twenty-four hours. This, he says, is one of the best antiscorbutic medicines yet found out; and though it will not cure the *scurvy* in an advanced state at sea, it will, with proper attention to other things, prevent its making any considerable progress for a long time. The malt, according to captain Cook's account, held out sufficiently good for two years; and though after that time it was considerably decayed, yet the surgeon found it still useful, when he employed a larger proportion of it to make the infusion.

The next article of very extensive use was *sour* KROUT, which he found to be highly antiscorbutic, and not to spoil by keeping. Of this a pound was served to each man, when at sea, twice a week, or oftener, if necessary. Another essential article was *portable* SOUP, of which an ounce to each man was boiled with their pease three days in the week, or with fresh vegetables, when they could be obtained, and wheat or oatmeal, every morning for breakfast, and with dried pease and fresh vegetables for dinner. He was also provided with rob of lemons and oranges, with sugar instead of oil, and wheat instead of much oatmeal. He also adopted certain regulations of the most beneficial kind. He put his people at three watches, instead of two, which is the usual practice at sea: by this means they were not so much exposed to the weather as if they had been at watch and watch; and they had generally dry clothes to shift themselves when they happened to get wet. Care was also taken to preserve the men from wet, and the other injuries of the weather: in the torrid zone, he shaded them from the scorching sun by an awning over his deck; and in his course under the antarctic circle, he had a coat provided for each man, of a substantial woollen stuff, with the addition of a hood for covering their heads. He was also particularly careful in guarding against putrefaction,

trefaction, by keeping clean the persons, the clothes, the bedding, and births of the sailors. He was not satisfied with ordering upon deck the hammocks and bedding every day that was fair, which is the common practice, but took care that every bundle should be unlashed, and so spread out that every part of it might be exposed to the air. Equal pains were taken to keep the ship clean and dry between decks. Once or twice a week she was aired with fires; and when this could not be done, she was smoaked with gunpowder, moistened with vinegar or water. He had also frequently a fire made in an iron pot at the bottom of the well, which greatly purified the air in the lower parts of the ship. Thus the foul air was expelled, and the fresh air admitted; and the acid steams of the wood, in burning, acted as an antiseptic, and corrected the corrupted air that remained. These portable fires served also to dry up the moisture, especially in those places where there was the least circulation of air; in aid of which men were employed in rubbing hard, with canvass or oakum, every part of the inside of the ship that was damp and accessible. He trusted chiefly to fire for purifying his decks, and made no great account of vinegar: however, future navigators should not neglect this acid, which will serve at least for a wholesome variety in the seasoning of salted meats, and may be sometimes successfully used as a medicine, especially in sprinkling the births of the sick. Captain Cook was also provided with the WIND-*sails*, which at times he found very serviceable; and perhaps Dr. Hales's VENTILATORS would have answered the purpose better. He also used every proper and possible precaution for procuring a liberal supply of fresh water, which is of incredible importance. With this view he was furnished with an apparatus for distilling sea water; he never failed to take in fresh water wherever it could be procured; and those large masses of ice, among which he steered his course, melted into water that was not only fresh, but soft, and very wholesome.

Mr. Patten, the ingenious surgeon who accompanied captain Cook in this voyage, observes in his Journal, that wort is the best remedy hitherto found out for the cure of the *sea-scurvy*; and expresses his conviction, from what he has seen the wort perform, and from its mode of operation, that, if aided by portable soup, sour krout, sugar, sago, and currants, the *scurvy*, that maritime pestilence, will seldom or never make its alarming appearance among the ship's crew, on the longest voyages; proper care with regard to cleanliness and provisions being observed. Mead on the *Scurvy*. Appendix to Pringle's Diseases of the Army. Macbride's Exper. Essays, passim. Lind on the *Scurvy*. Pringle's Discourse on occasion of presenting captain Cook with Sir Godfrey Copley's medal, in his Life, &c. by Kippis, p. 143, &c.

Mr. Henry, in his Account of a Method of preserving Water at Sea, p. 24. proposes to improve the efficacy of the malt decoction, by impregnating it, in the manner described under PYRMONT *water*, with fixed air. And he is of opinion, that the decoction so impregnated, and inclosed in vessels for a few days, would ferment, and furnish an useful and not unpleasant kind of beer.

M. Poupart, in the Memoirs of the French Academy, gives us a very accurate history of a particular kind of *scurvy*, very frequent in Paris in the year 1699. The symptoms and consequence of this new *scurvy* were very extraordinary; and soon determined M. Poupart to conclude it to be somewhat like that cruel plague wherewith the Athenians were so long and so dreadfully harrassed; yet was it a true *scurvy*, and the persons attacked with it had all the usual scorbutic symptoms.

SCURVY-*grass*, *cochlearia*, in *Botany*, a genus of the *tetradynamia siliculosa* class. Its characters are these: the empalement of the flower is composed of four oval, concave leaves; the flower has four petals, placed in form of a cross, and six stamina, four of which are longer than the other two, terminated by obtuse, compressed summits; the germen is heart-shaped, supporting a short, single style, crowned by an obtuse stigma, and becomes a gibbous, heart-shaped, compressed pod, fastened to the style, having two cells, in each of which are lodged four roundish seeds. Miller enumerates six, and Linnæus eight species.

Scurvy-grass is an annual plant, grows wild in several parts of England, particularly about the sea-coasts and salt-marshes, is commonly cultivated in gardens for medicinal use, and flowers in April. The fresh leaves have an ungrateful smell, and a penetrating acrid taste; the flowers and seeds are also pungent, but less so than the leaves. The active matter of this plant is extracted by maceration both in watery and spirituous menstrua, and the most considerable part of it is of a very volatile kind. The fresh leaves beaten into a conserve, with thrice their weight of fine sugar, may be kept in a close vessel, without much diminution of their virtue, for years. The principal virtue of this plant resides in an essential oil, separable by distillation with water; this oil is so ponderous as to sink in water, but very volatile, subtile, and penetrating. One drop of it, dissolved in spirit, or received on sugar, communicates to a quart of wine, or other liquor, the smell and taste of *scurvy-grass*. It rises in distillation with rectified spirit as well as water. *Scurvy-grass* is a powerful antiseptic, attenuant, and aperient; it manifestly promotes the sensible excretions, particularly urine, without much heat or irritation. It is one of the capital antiscorbutic herbs, and has been used in conjunction, generally, with mild vegetable acids, as orange juice, sorrel, &c.

The *scurvy*, however, is a disease so various, that the same medicine cannot be good for all the kinds. Accordingly *scurvy-grass* proves hurtful, where the *scurvy* is attended with a redness in the face, palpitations of the heart, frequent feverish heats, head-achs, purgings, and the like; in all which, acrid medicines of any kind do harm. It is of service also in paralytic and cachectic indispositions, and in long-continued wandering rheumatic pains, unaccompanied with a fever, called by Sydenham the scorbutic RHEUMATISM. With this view he prescribes sixteen parts of fresh-made conserve of garden *scurvy-grass*, eight of conserve of wood-sorrel, and six of the compound powder of arum root (instead of which powder may be substituted an equal quantity or more of fresh arum root, mixed with as much powdered gum arabic) made up with syrup of orange-peel into an electary; of which two drams are to be taken thrice a day for a month, along with some ounces of a distilled water, impregnated with *scurvy-grass*, mint, nutmegs, &c. Lewis.

SCURVY-*grass*, *Scotch*. See SOLDANEL.

SCUT, among *Sportsmen*, the tail of a hare or rabbit.

SCUTAGE, *scutagium*, in *Ancient Customs*. See ESCUAGE.

SCUTARIUS, among the Romans, besides its ordinary signification of a shield-maker, was used to denote one of the emperor's life-guards, because their whole body was covered with armour.

SCUTCHEON. See ESCUTCHEON.

SCUTCHEON-*grafting*. See ENGRAFTING.

SCUTE, a French gold coin of 3*s.* 4*d.* in the reign of king Henry V. And Catherine, queen of England, had an assurance made her of sundry castles, manors, lands, &c. valued at the sum of forty thousand *scutes*, every two whereof were worth a noble.

SCUTELLARIA, in *Botany*, a name given to a species of *cassida*. See SKULL *cap*.

SCUTELLUM, or ESCUTCHEON, in the *History of Insects*, is the posterior part of the thorax; it is frequently triangular, and appears to be separated from the thorax by its intervening suture, as in most of the COLEOPTERA.

SCUTHINON, in *Botany*, a name given by the ancient Greeks to a yellow wood, called also *thapsum*, *chrysoxylon*, and *Scythicum lignum*. It was of a beautiful yellow colour, and was used in dying and in colouring the hair yellow, which was the favourite colour of that time.

The same authors have sometimes also called it *cythinon*, or *cuthinon*: this is only the former word with the initial *s* taken away, as it was common with them to do in regard to many words; thus they called the smilax *milax*, the smaragdus *maragdus*, and so of many more.

SCUTIFORME *os*, in *Anatomy*, the chief bone of the knee, called also PATELLA, *mola*, &c.

SCUTIFORMIS *cartilago*, in *Anatomy*, one of the cartilages of the LARYNX, the broadest and biggest of them all: it was thus called by the Latins, because in form of a shield, or square buckler; and by the Greeks *thyroides*. It is also by some called the *anterior cartilage*, because situate in the fore-part.

It is gibbous withoutside, and hollow within: sometimes double, chiefly in women, in whom it does not advance so far forward as in men.

SCUTTLES, in a *Ship*, are square holes cut in the deck, big enough to let in the body of a man; serving to let people down into any room below, upon occasion, or from deck to deck.

They are generally before the main-mast, before the knight in the fore-castle; in the gun-room, to go down to the stern-sheets; in the round-house, to go down into the captain's cabin, when forced by the enemy in a fight aloft.

There are also some smaller *scuttles*, which have gratings over them; and all of them have covers to them, that men may not tumble in, in the night.

SCUTTLE is also a denomination given to those little windows, and long holes, which are cut out in cabins to let in light.

Scuttle-*hatch*, in a *Ship*, the little hatch that covers the *ſcuttle*.

SCUTTLING, in *Sea-Language*, the act of cutting large holes through the bottom or ſides of a ſhip, either when ſhe is ſtranded or overſet, and continues to float on the ſurface. It is commonly deſigned for taking out the whole or part of the cargo, proviſions, ſtores, &c. with all poſſible expedition.

SCUTUM *Sobieſki*, *Sobieſki's Shield*, in *Aſtronomy*, a conſtellation formed by Hevelius; the ſtars of which in his Catalogue are ſeven: four of theſe are enumerated in the Aquila in the Britannic Catalogue.

Scutum, in *Natural Hiſtory*, the name of a genus of the *echini marini*; the characters of which are, that it is a ſhell of an irregular figure, which on the lower part repreſents, in ſome meaſure, a ſhield; on the ſuperficies it has the ſhape of a five-leaved flower; its mouth is in the middle of the baſe, and the aperture for the anus at the edge. See *Tab. of Teſtaceous Animals*, N° 6 and 7.

Of this genus of the echini there are two kinds, the angular and the oval.

Of the firſt of theſe kinds, the angular *ſcuta*, there are only two known ſpecies: the firſt a lower flattiſh kind, and the ſecond a more elevated one.

Of the ſecond, or the oval *ſcuta*, there are three known ſpecies. Klein's Echinod. p. 28.

Scutum, in *Pharmacy*, a name given to a ſolid ſtomachic topic, whether made in form of a bag, with medicinal ingredients ſewed in it, or of a plaſter. It is always faſhioned into the ſhape of a ſhield. The plaſters, for this purpoſe, were uſed to be made of the warm ſtomachic gums, and the bags were filled with the warm aromatic powders; and they were worn to warm and ſtrengthen the ſtomach, correct a cold intemperature, and promote digeſtion, and prevent vomiting. The patella, or kneepan, is alſo ſometimes called by anatomiſts *ſcutum*.

SCYBALA, a term uſed by the ancient phyſicians to expreſs the excrements of the inteſtines, hardened into lumps while in the body.

SCYBELITES, a term uſed by the ancients to expreſs a ſort of muſt, or juice of the grapes, which diſtilled from them ſpontaneouſly without preſſing.

SCYLACION, a word by which the ancients expreſſed the fleſh of puppies, which they recommended as of great ſervice in many chronic caſes.

SCYLDWIT, in our *Old Writers*, a mulct or fine for any fault.

It comes from the Saxon *ſcilde*, i. e. *delictum*, and *wite*, i. e. *pœna*.

SCYLLÆA, in the Linnæan ſyſtem, is a genus of the *molluſca* claſs of worms; the characters of which are, that the body is oblong and compreſſed, and the back longitudinally canaliculated; the mouth is a round opening, and it has three pair of tentacula, like arms, under the body. There is one ſpecies, called by ſome writers the sea-*hare*, which is found in the floating fucus of the ſea.

SCYMNUS, in *Ichthyology*, a name uſed by Ælian, Appian, and many other of the old Greek writers, for the fiſh called *ſculion* by Ariſtotle. This is a ſpecies of the squalus, called by Artedi and others the *ſqualus* with the pinna ani placed in the midſt, between the anus and tail; the *catulus vulgaris*, and *catulus major* of authors.

SCYPHUS, among the Romans, a very large kind of drinking cup. The *ſcyphus* was called the cup of Hercules, as that of Bacchus, *liberi patris*, was named cantharus.

SCYRA, in our *Old Writers*, a fine impoſed on ſuch as neglected to attend the *ſcyregemot court*, which all tenants were bound to do.

SCYREGEMOT, or Scyremot, in *Ancient Cuſtoms*, a county-court held twice every year by the biſhop of the dioceſe, and the ealdorman, or ſheriff; wherein both the eccleſiaſtical and temporal laws were given in charge to the county.

In the time of Canutus the *ſcyregemot* was held thrice every year. Edward the Confeſſor appointed it to be held twelve times in the year.

SCYRIUM *marmor*, a name given by the ancients ſometimes to a white, and ſometimes to a yellowiſh marble, both uſed in the public buildings of the Romans, but ſeldom in ſtatuary, not being capable of a high poliſh.

SCYTALA, in *Mechanics*, a term which ſome writers uſe for a kind of radius, or ſpoke, ſtanding out from the axis of a machine, as a handle or lever, to turn it round, and work it by.

Scytala *Laconica*, in *Antiquity*, a ſtratagem, or device, of the Lacedæmonians, for the ſecret writing of letters to their correſpondents; ſo that if they ſhould chance to be intercepted, nobody might be able to read them.

To this end they had two wooden rollers, or cylinders, perfectly alike, and equal; one whereof was kept in the city, the other by the perſon to whom the letter was directed. For the letter, a ſkin of very thin parchment was wrapped round the roller, and thereon was the matter written; which done, it was taken off, and ſent away to the party, who, upon putting it in the ſame manner upon his roller, found the lines and words in the very ſame diſpoſition, as when they were firſt written.

This expedient they ſet a very high value on; though, in truth, artleſs and groſs enough: the moderns have improved vaſtly on this method of writing. See Cipher.

SCYTALE, in *Zoology*, the name given by the ancients to a ſpecies of ſerpent, which was very long and thin, and equally big all along the body, ſo that the tail was not eaſily diſtinguiſhed from the head.

Linnæus mentions two animals under this title; one, a ſpecies of anguis or snake, and the other a ſpecies of the boa.

SCYTHÆ, Σκυθαι, among the Athenians, a deſignation ſometimes given to the officers, more uſually called lexiarchi.

They had the name *Scythæ*, becauſe they were often natives of Scythia who were choſen *lexiarchi*, as being brawny and ſturdy fellows.

SCYTHARION, in *Botany*, a name given by the ancient Greek writers to a tree, whoſe wood was of a fine yellow colour, and was uſed in thoſe early times to dye things yellow; it was called alſo *Scythicum lignum*, from its country, and chrysoxylon, or golden wood, from its fine yellow colour. It has been ſuppoſed that this was the ſame with the *cotinus coriaria* of the Romans; but this is an erroneous conjecture, ſince the wood of this tree dyed a yellow colour, and that a browniſh red, or a clear and pure red, according as the infuſion was made more or leſs ſtrong. This *ſcytharion*, therefore, could not be the ſame with the *cotinus*, but it certainly is the ſame with the *thapſum* of the Greeks.

SCYTHIAN, a word uſed very often in the old Greek writers on the materia medica, to diſtinguiſh the peculiar ſort of gum, or other drug, brought from that place. The *Scythian* and Indian drugs have been by many ſuppoſed different kinds of the ſame medicine; but this is an error; for it appears very obvious, on comparing the writings of Galen, Aetius, Ægineta, and other of the later writers among the Greeks, with thoſe of Dioſcorides, Theophraſtus, and the other old ones, that the words *Scythian* and Indian mean the ſame thing, and that what the old writers have called Indian, theſe have called *Scythian*.

The meaning of this is, that thoſe things were called *Scythian*, which were brought from the country of Indoſcythia, or that part of *Scythia* which lay at the oſtia of the river Indus; but it is to be obſerved, that though the later Greek writers mean this by their term *Scythian*, yet the word is uſed in a very different ſenſe by the Arabians, Avicenna, Serapio, and others; and that whereever they mention a drug under the name of *Scythian*, they mean that it comes from the northern parts of *Scythia*, on the confines of Europe. Theſe authors having underſtood of this *Scythia*, what the Greek writers have ſaid of the other, have made no ſmall errors in regard to the hiſtory of drugs, having given bdellium, and many other gums, the produce of only the *Scythia* of the Greek medical writers, to the frozen *Scythia* before mentioned.

SCYTHICUM *lignum*, in *Botany*, a name given by the ancients to a tree called alſo scytharion by the later writers of the Greeks.

SE, *ſelo de*. See Felo.

Se, *per*. See Per *ſe*.

SEA, *mare*, in *Geography*, is frequently uſed for that vaſt tract of water encompaſſing the whole earth, more properly called ocean.

For the cauſe of the ſaltneſs of the ſea, ſee Saltness.

Sea is more properly uſed for a particular part, or diviſion of the ocean, denominated from the countries it waſhes, or from other circumſtances.

Thus we ſay, the *Iriſh ſea*, the *Mediterranean ſea*, the *Baltic ſea*, the *Red ſea*, &c.

Till the time of the emperor Juſtinian, the *ſea* was common and open to all men; whence it is, that the Roman laws grant an action againſt a perſon who ſhall prevent or moleſt another in the free navigation or fiſhing therein.

The emperor Leo, in his fifty-ſixth novel, firſt allowed ſuch as were in poſſeſſion of the lands, the ſole privilege of fiſhing before their reſpective territories, excluſive of all others; he even gave a particular commiſſion to certain perſons, to divide the Thracian Boſphorus among them.

From that time, the ſovereign princes have been endeavouring to appropriate the *ſea*, and to withdraw it from the public uſe. The republic of Venice pretends to be ſo

so far mistress in her gulf, that there is a formal marriage every year between that signory and the Adriatic. In these last ages, the English have particularly claimed the empire of the *sea* in the Channel, and even that of all the *seas* encompassing the three kingdoms of England, Scotland, and Ireland, and that as far as the shores of the neighbouring states. In consequence of which pretension it is, that children born on these *seas* are declared natural Englishmen, as much as if born on English ground. The justice of this pretension is strenuously argued between Grotius and Selden, in the *Mare liberum*, and *Mare clausum*.

The term *sea* is variously applied by sailors, to a single wave, to the agitation produced by a multitude of waves in a tempest, or to their particular progress or direction. Thus they say, a heavy *sea* broke over our quarter; or, we shipped a heavy *sea*; there is a great *sea* in the offing; the *sea* sets to the southward. Hence a ship is said to head the *sea*, when her course is opposed to the setting or direction of the surges. A *long sea* implies an uniform and steady motion of long and extensive waves; on the contrary, a *short sea*, is when they run irregularly, broken, and interrupted, so as frequently to burst over a vessel's side or quarter.

SEA, *general motion of the*. Mr. Dassie of Paris, in a work published about eighty years ago, has been at great pains to prove that the *sea* has a general motion, independent of winds and tides, and of more consequence in navigation than is usually supposed. He affirms that this motion is from east to west, inclining toward the north, when the sun has passed the equinoctial northward, and that during the time the sun is in the northern signs; but the contrary way, after the sun has passed the said equinoctial southward; adding, that when this general motion is changed, the diurnal flux is changed also; whence it happens, that in several places the tides come in during one part of the year, and go out during the other, as on the coasts of Norway, in the Indies, at Goa, Cochinchina, &c. where, while the sun is in the summer signs, the *sea* runs to the shore; when in the winter signs, from it. On the most southern coasts of Tonquin and China, for the six summer months, the diurnal course runs from the north with the ocean; but the sun having repassed the line toward the south, the course declines also southward. Philosoph. Transact. N° 135.

SEA, *bason of the, fundus maris*, a term used by geographers, and other writers, to express the bottom of the *sea* in general.

Mr. Boyle has published a treatise on this subject, in which he has given an account of its irregularities and various depths, founded on the observations communicated to him by mariners.

The ingenious count Marsigli has, since his time, given us a much fuller account of this part of the globe, mostly from his own experiments in many places, particularly along the coasts of Provence and Languedoc. The entire bason of the *sea* is of such immense extent, and covered in many places with such an unfathomable depth of water, that it is not to be expected that it can be traced in every part; but as the whole may be guessed at, from some part of it, and as its general figure is of no consequence in a search of this kind, the observations of this curious author are of great value, in forming a judgment of the whole.

The materials, which compose the bottom of the *sea*, may very rationally be supposed, in some degree, to influence the taste of its waters; and Marsigli has made many experiments to prove, that fossile coal, and other bituminous substances, which are found in plenty at the bottom of the *sea*, may communicate in great part its bitterness to it. See SALTNESS.

We are not, however, to judge hastily, that there are not so many beds of these at the bottom of the *sea*, as would be necessary for such a purpose, or to judge too hastily against the existence of any other substances there, because we do not find proofs of them by the plummet, which in sounding brings up other substances, and not these; for the true bottom of the *sea* is very often covered and obscured from us by another accidental bottom, formed of various substances mingled together, and often covering it to a considerable depth.

The entire gulf of Lyons, situated between Cape Quiez in Rousillon, and Cape Croisit in Provence, forms a bank above the surface of the water at the shore, of the exact and perfect figure of an arch; and within this there is formed another such arch, making the bottom of the *sea* in that place for a very great way from shore, which is of different depths in various places, but usually between sixty and seventy fathom. See *Sea*-SHORE.

It is a general rule among sailors, and is found to hold true in a great many instances, that the more the shores of any place are steep and high, forming perpendicular cliffs, the more deep the *sea* is below; and that on the contrary, level shores denote shallow *seas*. Thus the deepest part of the Mediterranean is generally allowed to be under the height of Malta. The observation of the strata of earth, and other fossils, on and near the shores, may serve to form a very good judgment as to the materials which are found in its bottom.

The veins of salt and of bitumen doubtless run on the same, and in the same order in which we see them at land; and the strata of rocks, that serve to support the earth of hills and elevated places on shore, serve also, in the same continued chain, to support the immense quantity of water in the bason of the *sea*. It is probable also, that the veins of metals, and of other mineral substances, which are found in the neighbouring earth, are in the same manner continued into the depths of the *sea*. The particles of metals in this case, are probably carried off into deep water, and sunk among the softer matter of the bottom, but some of the lighter minerals seem to have given colour to those beautiful crusts, which are found upon many *sea* plants, and which lose their lustre in the drying. The subterranean rivers, and currents of water, make great changes in what would be the natural surface of the bottom of the *sea*, where they arise, each having a peculiar bason of its own. We are informed by numerous instances of subterranean currents, and as we see them break out in rivers on the surface on the earth in some parts, so in others we may be well assured that they break up the bottom of the *sea*, and empty their fresh waters into the salt mass.

In this case, the rushing up continually of such a body of water makes a roundish cavity, and its running some one way, lengthens and carries on that cavity, till by degrees it is lost, as the fresh water by degrees becomes blended with the salt. Thus every river that arises in the bottom of the *sea*, alters the form of its surface, and makes a bason for itself, in which it runs a considerable way. Many *seas* near the shore, and when the water is tolerably clear, shew the traces of these currents to the naked eye from the surface, and the water taken up from them is found more or less fresh.

The coral fisheries have given us occasion to observe, that there are many, and those very large caverns, or hollows in the bottom of the *sea*, especially when it is rocky; and that the like caverns are sometimes found in the perpendicular rocks, which form the steep sides of those fisheries. These caverns are often of great depths, as well as extent, and have sometimes wide mouths, equal to their largest diameter in any part, but sometimes they have only narrow entrances into large and spacious hollows. It is the common opinion of the people about the place, that these caverns are prepared by nature for the circulating of the *sea* water; but that operation, however necessary, may be performed as well without, as with these caverns, and they seem in reality to be only accidental.

We daily meet with immense hollows and caverns, naturally made in rocky mountains; and as this part of the bottom of the *sea* is almost all rock, and its sides of the same nature, it is no wonder that the same accidents should happen, and like hollows be found, though with no particular intent of Providence in their use. Nay there is this farther reason to expect them in the rocks buried under the *sea* than in those in hills, that the latter are in a state of rest and quiet, whereas the former are in continual reach of water, which will insinuate itself into every crack or crevice nature has left in them, and may be easily supposed to have burrowed its way in a small hole made by nature, till it has formed of it a very large one.

From such observations he infers, that the bason of the *sea* was at the creation, or at its second formation after the universal deluge, covered with, or composed of the same substances, as the surface of the rest of the earth is, that is of rocks, clay, and sand, and other such substances. Over these there is an artificial bottom formed of muddy tartarous incrustations, dead weeds, broken shells, and other bodies of the same kind, cemented together into a firm mass or crust; and in those places where this crust has never been formed, or where it has been broken, the bottom of the *sea* is of the same nature with the strata of the earth.

The bottom of the *sea* is covered with a variety of matters, such as could not be imagined by any but those who have examined into it, especially in deep water, where the surface only is disturbed by tides and storms, the lower part, and consequently its bed at the bottom, remaining for ages perhaps undisturbed. The soundings, when the plummet first touches ground on approaching the shores, gives some ideas of this. The bottom of the plummet is hollowed, and in that hollow

there is placed a lump of tallow; this being the bottom of the lead, is what firft touches ground, and the foft nature of this fat receives into it fome part of thofe fubftances, which it meets with at the bottom: this matter, thus brought up, is fometimes pure fand, fometimes a fort of fand made of the fragment of fhells, beat to a fort of powder, fometimes it is made of a like powder of the feveral forts of corals, and fometimes it is compofed of fragments of rocks; but befide thefe appearances, which are natural enough, and are what might very well be expected, it brings up fubftances which are of the moft beautiful colours.

Things of as fine a fcarlet, vermilion, purple, &c. as the fineft paint could make them, and as yellow as a folution of gamboge, are common; and fometimes, though not fo frequently, the matter brought up is blue, green, or of a pure fnowy whitenefs. Thefe coloured matters fometimes feem to have made up the whole bottom or mafs of the furface, but more ufually they have been formed upon other things, as upon the mud, or upon larger pieces of fhells, corals, and the like, in the manner of tartarous crufts, and thofe in fome degree refembling the cruftaceous coats of fome of the *fea* plants. The colours of thefe fubftances are not merely fuperficial and tranfient, but many of them are fo real and permanent, that they may be received into white wax melted, and poured upon them, or kept in fufion about them; and when thus examined, they feem as if a proper care might make them of great value, as paints of the finer kinds, where little is to be ufed.

The fame coloured matters that thus coat the fubftances, found at the bottom of the *fea* in thefe places, are alfo fometimes found extended over the furface of marine fubftances of the harder kind, which are found in deep water. They are always, in this cafe, in a fort of liquid form, being lodged within, or embodied among a fort of jelly or glue of a tranfparent fubftance, which in thefe cafes perfectly coats over the whole. In this ftate it gives the naturalift, who is prefent at the fifhing up his treafures, a tranfient profpect of a very elegant kind, but this vanifhes while he admires it. A piece of coral, or other hard fubftance, thus coated over, appears, as it rifes to the furface of the water, of a delicate green, blue, or purple, but when taken above water, it is found that this fine colour is only in the coat of glue or jelly which covers the fubftance; as foon as this is wiped off, the colour is carried away with it, and the coral fhews its own native tinge; and it is to no purpofe to attempt the preferving it, by fuffering this glue to dry upon the coral, for the colour flies away by degrees, as the moifture evaporates, and the coral, &c. whatever it be, is only fo much the lefs beautiful, than it naturally would have been, as it is covered with a dry yellowifh dirty looking horny matter. Thefe are beauties in the fubmarine productions, therefore, which can be only feen by thofe who venture out, in order to take them up.

The fmall quantities of thefe elegant colours, which we thus find fpread over the furfaces of marine bodies, as we approach deep water, may give a rational idea of what we fhould find, were we able to examine the bottoms of the *fea* in its deep and unfathomable receffes. It is eafy to conceive, that in thefe places we fhould find great quantities of the moft beautiful fubftances. Marfigli, Hift. Phyf. de la Mer.

Dr. Donati, in an Italian work, containing an effay towards a natural hiftory of the Adriatic *fea*, printed at Venice in 1750, has recited many curious obfervations on this fubject, and which confirm the above account of Marfigli: having carefully examined the foil and productions of the various countries that furround the Adriatic *fea*, and compared them with thofe which he took up from the bottom of the *fea*, he found that there is very little difference between the former and the latter. At the bottom of the water there are mountains, plains, vallies, and caverns, fimilar to thofe upon land. The foil confifts of different ftrata placed one upon another, and for the moft part, parallel and correfpondent to thofe of the rocks, iflands, and neighbouring continents. They contain ftones of different forts, minerals, metals, various putrified bodies, pumice-ftone and lavas formed by volcanos.

The adjacent countries, as well as the bottom of the Adriatic *fea*, confift of a mafs of a whitifh marble, of an uniform grain, and of almoft an equal hardnefs; and this marble, in many places under both the earth and *fea*, is intercepted by feveral other kinds of marble, and covered by a great variety of bodies, fuch as gravel, fand, and earths more or lefs fat. To this variety of foils, he afcribes the varieties obferved with refpect to the nature and quantity of plants and animals found at the bottom of the *fea*.

One of the objects, which moft excited his attention, was a cruft, which he difcovered under the water, compofed of cruftaceous and teftaceous bodies, and beds of polypes of different kinds, confufedly blended with earth, fand, and gravel; the different marine bodies, which form this cruft, are found at the depth of a foot or more, entirely petrified and reduced into marble; thefe, he fuppofes, are naturally placed under the *fea* when it covers them, and not by means of volcanos and earthquakes, as fome have conjectured. On this account, he imagines, that the bottom of the *fea* is conftantly rifing higher and higher, with which other obvious caufes of increafe concur; and from this rifing of the bottom of the fea, that of the level of the water naturally refults; in proof of which this writer recites a great number of facts. Philofoph. Tranf. vol. xlix. p. 585, &c.

SEA, *Dead.* Dr. Perry made feveral experiments on the water of the *Dead Sea*, in order to find what particles it contained. Upon infufing fome fcrapings of galls in it, it becomes of a bright purple colour, but that not till it has ftood a confiderable time. On adding oil of tartar *per deliquium* to it, it becomes turbid, and looks as if globules of fat were fluctuating in it; this unctuous matter, upon its long ftanding in repofe, comes together in form of a fediment at the bottom. On pouring fpirit of vitriol into it, it depofits a milk-white greafy fediment, which, after ftanding twelve hours, occupies about one-fifth part of the liquor. On putting a fmall quantity of faccharum faturni to it, it depofits a fmall quantity of a greyifh powder: being feverally and feparately mixed with a folution of fublimate, with fpirit of fal ammoniac, and with fugar of violets, it neither ferments nor depofits any fediment, nor changes colour, except with the fugar of violets, with which it becomes green.

It is highly faturated with falt, fo that it is to common water in fpecific gravity, as five to four; and it has fo acrid and ftyptic a tafte, that on being held in the mouth, it conftringes it in the manner of alum.

It appears, that this water is impregnated with a fort of an acrid and alkaline nature, and a matter partly of a fulphureous, partly of a bituminous nature. Philof. Tranf. N° 462. p. 50.

SEA, *luminoufnefs of the*, is a phenomenon that has been taken notice of by many nautical and philofophical writers. Mr. Boyle, after reciting feveral circumftances attending this appearance, afcribes it to fome cofmical law, or cuftom of the terreftrial globe, or at leaft of the planetary vortex.

Father Bourzes, in his voyage to the Indies, in 1704, took particular notice of this phenomenon, and very minutely defcribes it, without affigning the true caufe. See an abftract of his account under the article FIRE.

The Abbè Nollet was long of opinion, that the light of the *fea* proceeded from electricity, and others have had recourfe to the fame hypothefis. M. Bayon, in his Memoires pour fervir à l'Hiftoire de Cayenne, &c. Paris, 1778, informs us, that, having made a great number of experiments, in different feafons, in order to find out the true caufe of this phenomenon, he always found, that the luminous points in the furface of the *fea* were produced merely by friction.

However, there have been two hypothefes, which have moft generally been received, for the folution of this phenomenon; one of which afcribes it to the fhining of luminous infects or animalcules, and the other to the light proceeding from the putrefaction of animal fubftances. The Abbé Nollet, who at firft confidered the *luminoufnefs* of the *fea* as an electrical phenomenon, having had an opportunity of afcertaining the circumftances of it, when he was at Venice in 1749, relinquifhed his former opinion, and concluded that it was occafioned either by the luminous afpect, or by fome liquor or effluvia of an infect which he particularly defcribes; but he does not altogether exclude other caufes, and efpecially the fpawn or fry of fifh.

The fame hypothefis had alfo occurred to M. Vianelli, profeffor of medicine in Chioggia near Venice; and both he and M. Grizellini, a phyfician in Venice, have given drawings of the infects from which they imagined this light to proceed.

A fimilar conjecture is propofed by a correfpondent of Dr. Franklin, in a letter read at the Royal Society in 1756; the writer of which apprehends, that this appearance may be caufed by a great number of little animals, floating on the furface of the fea, which, on being difturbed, might, by expanding their fins, or otherwife moving themfelves, expofe fuch a part of their bodies as exhibits a luminous appearance, fomewhat in the manner of a glow-worm, or fire-fly; that thefe animals may be more numerous in fome places than others, and, therefore, that the appearance above mentioned, being

fainter and stronger in different places, might be owing to this cause; and that certain circumstances of weather, &c. might invite them to the surface, on which, in a calm, they might sport themselves and glow, or in storms, being forced up, make the same appearance.

Mr. Forster, in his account of a voyage round the world with captain Cook, in the years 1772, 1773, 1774, and 1775, describing this phenomenon as a kind of blaze of the *sea*, and having attentively examined some of the illumined water, expresses his conviction, that the appearance was occasioned by innumerable minute animals of a round shape, moving through the water in all directions. One of these luminous sparks, which stuck to his finger while he was stirring his water with his hand, was examined by the common magnifier of Mr. Ramsden's improved microscope, and was found to be globular, transparent like a gelatinous substance, and somewhat brownish; by means of the greatest magnifier, the orifice of a little tube was discovered, which entered the body of the animal; within which were four or five intestinal bags connected with the tube. He imagines that these animalcules may be the young fry of some species of medusa, or blubber, and considers them as possessed of the power of shining, or of withholding their light at pleasure.

M. Dagelet, a French astronomer, sailing into the bay of Antongil, in the island of Madagascar, observed a prodigious quantity of fry, which covered the *sea* above a mile in length, and which he at first took for banks of sand on account of their colour; they exhaled a disagreeable odour, and the sea had appeared with uncommon splendor some days before. On another occasion, having perceived the *sea* to be remarkably luminous in the road of the Cape of Good-Hope, during a perfect calm, he remarked that the oars of the canoes produced a whitish and pearly kind of lustre: when he took in his hand the shining water, he discerned in it, for some minutes, globules of light as large as the heads of pins; upon pressing these, they seemed to be a soft and thin pulp, and some days after the sea was covered, near the coasts, with whole banks of these little fish in innumerable multitudes.

M. Dagelet, in his return from the Terra Australis in 1774, brought with him several kinds of worms, which shine in water when it is set in motion; and Mr. Rigaud affirms, that the luminous surface of the sea, from the port of Brest to the Antilles, contains an immense quantity of small, round, shining polypuses.

M. le Roi, after giving much attention to this phenomenon, concludes that it is not occasioned by any shining insects, especially as, after carefully examining with a microscope some of the luminous points, he found them to have no appearance of any animal; and he also found, that the mixture of a little spirit of wine with water just drawn from the *sea*, would give the appearance of a great number of little sparks, which would continue visible longer than those in the ocean: the same effect was produced by all the acids, and various other liquors. M. le Roi is far from asserting that there are no luminous insects in the sea; for he allows that the Abbé Nollet and M. Vianelli had found them; but he is satisfied that the *sea* is luminous chiefly on some other account, though he does not so much as offer a conjecture with respect to the true cause.

Other writers, equally dissatisfied with the hypothesis of luminous insects, for explaining the phenomenon, which is the subject of this article, have ascribed it to some substance of the phosphorus kind, arising from putrefaction.

The observations of F. Bourzes, above referred to, render it very probable, that the *luminousness* of the *sea* arises from slimy and other putrescent matter with which it abounds, though he does not mention the tendency to putrefaction, as a circumstance of any consequence to the appearance.

The correspondent of Dr. Franklin, part of whose letter has been already cited, observes, that several gentlemen have been of opinion, that the separated particles of putrid, animal, and other bodies, floating on the surface of the *sea*, might cause this appearance, for putrid fish, &c. will cause it; and the *sea* animals which have died, and other bodies putrified therein since the creation, might afford a sufficient quantity of these particles to cover a considerable portion of the surface of the *sea*; which particles being differently dispersed, might account for the different degrees of light in this appearance; but he adds, this account seems liable to an obvious objection, viz. that as putrid fish, &c. make a luminous appearance without being moved or disturbed, it might be expected that the supposed putrid particles on the surface of the *sea* should always appear luminous, when there is not a greater light, and, consequently, that the whole surface of the *sea* covered with those particles, should always, in dark nights, appear luminous, without being disturbed, which, he says, is contrary to fact. Franklin's Experiments and Observations, p. 274, &c.

This difficulty is, in a great measure, removed by the experiments of Mr. Canton, recited in the Philosophical Transactions, vol. lix. p. 446, &c. which have the advantage of being easily made, and leave no room for doubt, that the *luminousness* of the *sea* is principally owing to putrefaction. Having put a fresh whiting into a gallon of *sea* water, neither the whiting, nor the water when agitated, gave any light; Fahrenheit's thermometer, placed in the cellar where the pan was placed, standing at 54°; the following evening, that part of the fish which was even with the surface of the water was luminous, but the water itself was dark; however, on drawing through it the end of a stick, the water appeared luminous behind the stick all the way, but gave light only where it was disturbed: when all the water was stirred, the whole became luminous, and appeared like milk, yielding a considerable degree of light to the sides of the pan, which it continued to do for some time after it was at rest. The water was most luminous when the fish had been in it about twenty-eight hours, but would give no light by being stirred after it had been in it three days. He then put a gallon of fresh water into one pan, and an equal quantity of *sea* water into another, and into each pan he put a fresh herring, of about three ounces; the next night the whole surface of the *sea* water was luminous without being stirred, but much more so when put in motion, and the upper part of the herring, which was considerably below the surface of the water, was also very bright; while at the same time, the fresh water, and the fish that was in it, were quite dark. There were several very bright luminous spots on different parts of the surface of the *sea* water, and the whole, when viewed by the light of a candle, seemed covered with a greasy scum. The third night the light of the *sea* water, while at rest, was very little, if at all, less than before; but when stirred its light was so great as to discover the time by a watch, and the fish in it appeared as a dark substance. After this its light was evidently decreasing, but was not quite gone before the seventh night; the fresh water and the fish in it were perfectly dark during the whole time. The thermometer was generally above 60°. Having made artificial *sea* water, determined by an hydrometer to be of the same specific gravity with the *sea* water, by adding four ounces avoirdupois of salt to seven pints of water, wine measure, he put into a gallon of this water a small herring; and another into a gallon of water, in which two pounds of salt had been dissolved. The next evening, the whole surface of the artificial *sea* water was luminous without being stirred, but gave much more light when it was disturbed, and exhibited the same appearances with the real *sea* water in the preceding experiment; while the other water, which was almost as salt as it could be made, never gave any light. The herring which was taken out of it the seventh night, and washed from its salt, was found firm and sweet; but the other herring was very soft and putrid, much more so than that which had been kept as long in fresh water. If a herring, in warm weather, be put into ten gallons of artificial *sea* water, instead of one, the water, Mr. Canton says, will still become luminous, but its light will not be so strong.

These experiments confirm an observation of sir John Pringle, that the quantity of salt contained in *sea* water hastens putrefaction; but since that precise quantity of salt which promotes putrefaction the most, is less than that which is found in *sea* water, it is probable, Mr. Canton observes, that if the *sea* were less salt, it would be more luminous. See Putrefaction.

Mr. Canton observed, as Mr. Ant. Martin Swed. Abhand. vol. xxiii. p. 225. had done, that several kinds of river fish could not be made to give light, in the same circumstances in which any *sea* fish became luminous. He says, however, that a piece of carp made the water very luminous, though the outside or scaly part of it did not shine at all.

Sea-*adder*, an English name for a *sea* fish of the acus-kind, called by Willughby the *acus lumbriciformis*.

It is a small fish of a cylindric shape, without scales, and of a greenish brown colour, with some admixture of a reddish yellow.

Their snout is long and hollow, and the mouth opens upwards at its end; the eyes are small, and their iris red; the gills are four on each side, but are covered by a membrane, and the whole body divided into rings like the common earth-worm: it is usually about three

or four inches long, and of the thickness of a goose-quill; it has but one fin, which is situated on the back. The anus is much nearer the head than the tail, and under the snout there is always a fleshy tubercle.

The fish is common on the coast of Cornwall. See *Sea-*ADDER. Willughby.

SEA *army*. See *Naval* ARMY.

SEA *astrolabe*. See ASTROLABE.

SEA *banks*. See BANK. Malicious destroying *sea banks*, whereby lands may be overflowed, is made felony without benefit of clergy by 6 Geo. II. c. 35. and 10 Geo. II. c. 32.

SEA *bear*, in *Zoology*, the PHOCA *ursina* of Linnæus, called also by some writers the *sea cat*, and by Pennant the *ursine seal*, inhabits together with the *sea* lion and manati, from June to September, the isles that are scattered in the *seas* between Kamtschatka and America, in order to copulate, and bring forth their young in full security. In September, they quit their station in a very emaciated state; some returning to the Asiatic, and others to the American shores, but, like the *sea* otters, they are confined in those *seas* between lat. 50° and 56°. These animals are also common about New Zealand, Staten-island, New Georgia, and the Falkland Islands.

The *ursine seals* lead, during the three months of summer, a very indolent life; they are confined for several weeks to the same spot, sleep the greater part of their time, eat nothing, and are totally inactive, the employment of the females in suckling their young excepted. They live in families, each male having from eight to fifty females, which he guards with jealousy; and though they lie by thousands on the shores, each family, consisting sometimes of one hundred and twenty, keeps itself separate from the rest.

The old animals, which are deserted by the females, live apart, and are exceedingly splenetic and quarrelsome, very fierce, and so attached to their old haunts, that they would die sooner than quit them; in defending these, discord is sometimes spread through the whole shore. The other males are also very irascible, and the causes of their disputes are generally such as these; an attempt to seduce any of their females; the intrusion of one upon the station of another, and interference in their mutual quarrels. Their battles are severe and bloody, and when they terminate, the combatants throw themselves into the *sea*, to wash away the blood.

The males are very fond of their young, of which the female generally brings but one at a time, and never more than two; but they are very tyrannical towards the females, which, on the other hand, are very fawning and submissive.

The *sea bears* swim very swiftly, at the rate of seven miles an hour; when wounded, will seize on the boat, bear it away with impetuosity, and sometimes sink it. They can continue a long time under water. When they want to climb the rocks, they fasten with the fore-paws, and draw themselves up. They are very tenacious of life, and will live for a fortnight after receiving such wounds as would immediately destroy any other animal.

The males of this species are much larger than the females; their bodies are of a conical form, thick before and tapering to the tail; the length of a large one is eight feet, the greatest circumference five feet, and near the tail twenty inches; the weight 800 ℔; the nose projects like that of a pug dog, but the head rises suddenly; the nostrils are oval, divided by a septum; the lips thick, and in the inside red and serrated; the whiskers long and white; the teeth, which are thirty-six in number, lock into each other when the mouth is closed; the tongue bifid; the eyes are large and prominent, and capable of being covered at pleasure with a fleshy membrane; the ears are small and sharp-pointed; the length of the fore-legs is twenty-four inches; the feet are formed with toes, but covered with a naked skin, so as entirely to appear a shapeless mass: the hind-legs are twenty-two inches long, and fixed to the body behind, but capable of being brought forward, and the feet are divided into five toes; the tail is only two inches long; the hair is long and rough, under which is a soft down of a bay colour; the general colour of these animals is black, but the hairs of the old ones are tipt with grey. The females are cinereous. The skins of the young, cut out of the bellies of their dams, are useful for cloathing.

The fat and flesh of the old males is very nauseous, but the flesh of the females resembles lamb, and the young ones roasted are as good as sucking-pigs. Pennant's Hist. Quad. vol. ii. p. 526, &c.

SEA *bisket*. See BISKET.

SEA *boat*, in *Naval Language*, a vessel that bears the *sea* firmly, without labouring heavily, or straining her masts and rigging.

SEA *breaches*, a term used by the farmers to express the overflowing of their low lands near the *sea* by the *sea* water.

Sea salt, moderately used, is a great improvement to all lands, but too much of it kills all sorts of vegetables, except such as nature has intended to live among it. See SALT.

The *sea* breaking in upon lands thus, injures them greatly. The owner is to stop the breach by which it entered with all possible diligence, and then trenches and drains must be cut through all parts of the land, to carry the salt water into some one low place, from which it may be emptied by means of an engine; or if it be small in quantity, it may be laded out by hand over the bank; or if yet less, the sun and winds may dry it away; but in either case, the place where it was suffered to rest must be covered with a large quantity of fresh earth, to take off from the too great saltness of the other; and the whole land should be ploughed for three or four years, to let in the rains and air to freshen it.

SEA *bream*, in *Ichthyology*, the English name for the fish called by the generality of authors the PAGRUS and *phagrus*. According to the new system of Artedi, it is a species of the *spari*, and is distinguished by the name of the *red sparus*, with the skin carried into a sinus at the roots of the back-fins, and the pinna ani.

SEA *buckthorn*, *hippophae*, in *Botany*, a genus of the *diœcia tetrandria* class; its character sare these: it is male and female in different plants; the male flowers have an empalement of one leaf, cut into two parts; they have no petals, but have four short stamina; the female flowers have no petals, but a one-leaved empalement, which is oval and bifid at the brim; these have no stamina, but in the centre is situated a small roundish germen, which turns to a globular berry with one cell, inclosing one roundish seed. There are two species, the one a native of our *sea* banks, and the other of North America.

SEA *calf*, PHOCA *vitulina*, in the Linnæan system of *Zoology*, is the common *seal*, with large black eyes, large whiskers, oblong nostrils, flat head and nose, tongue forked at the end, two canine teeth in each jaw, six cutting teeth in the upper jaw, four in the lower, no external ears, body covered with thick short hair, short tail, and toes furnished with strong sharp claws; its usual length is from five to six feet; the colour various; dusky, brinded, or spotted with white or yellow. This species inhabits most quarters of the globe, but is found in greatest number towards the north and south; they swarm near the arctic circle, and the lower parts of South America, in both oceans near the southern end of Terra del Fuego, and among the floating ice as low as lat. 60° 21′ S.

They are also found in the Caspian *sea*, in the lake Aral, and lakes Baikal and Oron, which are fresh waters, but these are less, and more fat than those of the salt water. Seals bring forth two young at a time in autumn, which are for a short time white and woolly, and suckle them till they are six or seven weeks old in rocks or caverns, when they take to sea; as they cannot remain long under water, they frequently rise to take breath, and often float on the waves.

In summer they sleep on rocks or sand banks; if surprised, they plunge into the *sea*, and when at a distance fling up the sand with their hind feet, and make a piteous moaning, as they scramble along, and if they are overtaken, vigorously defend themselves with their feet and teeth; they are soon killed by a slight blow on the nose, otherwise they will survive many wounds.

These animals swim with great strength and speed, and in their own element sport without fear about ships and boats, which, says Mr. Pennant, may have given rise to the fable of *sea*-nymphs and syrens. They are gentle and docile; they feed on all sorts of fish; are themselves good food, and eat by voyagers: they are killed for the sake of the oil made from their fat, of which a young *seal* will yield eight gallons; their skins are useful in making waistcoats, covers for trunks and other conveniences; and they are the wealth of the Greenlanders, supplying them with every necessary of life.

We have a draught of this animal in the Philosophical Transactions, No. 469, by Dr. Parsons, who observes, that Aldrovandus, Johnston, Rondeletius, and Gesner, have made several mistakes in the figure of this creature, so as to convey no just idea of it.

Upon dissecting one of these animals, the stomach, intestines, bladder, kidneys, ureter, diaphragm, lungs, great blood vessels, and pudenda, were like those of a cow; the hairs of the whiskers were very horny and

clear;

clear; the ſpleen was two feet long, four inches broad, and very thin; the liver conſiſted of ſix lobes, each hanging as long and as lank as the ſpleen, with a very ſmall gall-bladder. The beaſt was long and flabby in its contexture in general, having a large foramen ovale, and very great columnæ carnoſæ. In the lower ſtomach were about four pounds weight of flinty pebbles, all ſharp and angular, as if the animal choſe them of that form for cutting the food. The uterus was of the horned kind, each of the cornua being thicker than the body or duct leading to them: the ovaria were very large, being granulated on the ſurface with the ova, under a very thin membrane; and the opening into the tubes leading to the cornua is a great hole.

The authors who have treated on this animal, are Ariſtotle, Pliny, Aldrovandus, Rondeletius, Geſner, Wolfgangius, and Johnſton.

This animal is viviparous, and ſuckles its young by the mamillæ like quadrupeds; and its fleſh is carnous and muſcular. That diſſected by Dr. Parſons was ſeven feet and an half long, though very young, having ſcarce any teeth, and having four holes regularly placed about the navel, which in time became papillæ. See a deſcription of other ſpecies of *ſeal*, with figures, by Dr. Parſons in Philoſ. Tranſ. vol. xlvii. p. 109, &c. and Pennant's Hiſt. Quad. vol. ii. p. 518, &c.

SEA *chart*. See CHART.

SEA *coaſt*. See COAST.

SEA *compaſs*. See COMPASS.

SEA-*cow*, in *Zoology*, the Engliſh name of the *manati*, a ſpecies of fiſh ſo different from all the other cetaceous tribe, to which it properly belongs, that Artedi, in his new ſyſtem of ichthyology, allots it a peculiar generical name, which is *trichechus*: in the Linnæan ſyſtem it is the TRICHECHUS *manatus*. This ſpecies has thick lips, very ſmall eyes, two ſmall orifices in the place of ears; neck ſhort, and thicker than the head; the greateſt thickneſs of the body is about the ſhoulders, from which it grows gradually ſmaller to the tail, which lies horizontally, being broad, and thickeſt in the middle, and growing thinner to the edges, and quite round. The feet are placed at the ſhoulders; beneath the ſkins are bones for five complete toes, and externally are three or four nails flat and rounded; near the baſe of each foot in the female is a teat; the ſkin is very thick and hard, having a few hairs ſcattered over it, whence the name *trichechus*, formed of θριξ, *hair*, and ιχθυς, *a fiſh*.

Thoſe animals of this ſpecies, that were meaſured by Dampier in the Weſt Indies were ten or twelve feet long; their tail twenty inches in length, fourteen in breadth, and four or five thick in the middle, and two at the edges; and the largeſt of them weighed twelve hundred pounds; but ſome have been mentioned, the length of which has been ſixteen feet and a half, and even twenty feet.

According to Dampier, thoſe which inhabit freſh waters are much leſs than the others: they inhabit the rivers of Africa, from that of Senegal to the Cape of Goodhope, and abound in certain parts of the eaſtern coaſts and rivers of South America, about the Bay of Honduras, ſome of the greater Antilles, the rivers of Oronoque and of the Amazons.

They ſometimes live in the *ſea*, and often near the mouth of ſome river, into which they come once or twice in twenty-four hours, for the ſake of feeding on the marine plants, and they are fonder of brackiſh or ſweet water than of the ſalt; and delight in ſhallow water near low land, and in places ſecure from ſurges, and where the tides run gently. They are ſaid to frolic and leap at ſome times out of the water to a great height. Their fleſh and fat are white, ſweet, and ſalubrious; and the tail of a young female is much eſteemed, and a ſuckling roaſted highly delicious. The thicker part of the ſkin, cut firſt into lengths of two or three feet, ſerves for whips, &c. and becomes tough, when dried, as wood.

Theſe animals are taken by a harpoon ſtuck in the end of a ſtaff, which the Indians uſe with great dexterity. If a female with a young one is ſtruck, ſhe takes it under its fins or feet, and ſhews, in extremity, the greateſt affection for its offspring; and the young one never forſakes its captured parent, but becomes a ſure prey to the harpooner.

This animal is called by Herrera *taurus marinus*, or the *ſea-bull*, and by others the *tachas* and *la donna*. The French call it *lamantin*, or *namentin*, and the Portugueſe *pezze mouller*.

It may ſeem ſtrange, that ſo ill ſhaped a creature as this ſhould have given riſe to the ſtories of the ſyrens and mermaids, the *ſea*-men and *ſea*-women, yet there is great reaſon to believe, that all the fabulous accounts of theſe monſters, are owing to the ſeeing this animal, and the common ſeal, raiſe their head and ſhoulders above the water. See SEA-*man*.

Mr. Pennant has deſcribed an animal of this ſpecies, which he calls the whale-tailed manati, and which the Ruſſians diſtinguiſh by the name of the *morſkaia korowa*, or *ſea-cow*. This animal, whoſe feet are merely pectoral fins, and ſerve only for ſwimming, brings forth in the water, and, like the whale, ſuckles its young in that element; like the whale, it has no voice, and like that animal, has an horizontal broad tail, without even the rudiments of hind feet. It inhabits the *ſeas* about Bering's and the other Aleutian iſlands, between Kamtſchatka and America.

In calm weather theſe animals ſwim in great droves near the mouths of rivers; when hurt, they ſwim out to the *ſea*, but ſoon return again. They live in families near one another, each conſiſting of a male, female, a half grown young one, and a very ſmall one; the females oblige the young to ſwim before them, while the other old ones ſurround, and, as it were, guard them on all ſides. The affection between the male and female is very great, for if ſhe is attacked, he will defend her to the utmoſt, and if ſhe is killed, will follow her carcaſe to the very ſhore, and ſwim for ſome days near the place where it was landed.

They copulate in the ſpring, in the ſame manner as the human kind, eſpecially in calm weather, towards the evening; the female ſwims gently about, the male purſues, till tired with wantoning, ſhe flings herſelf on her back, and admits his embraces: the leonine and urſine ſeals copulate after the ſame manner on ſhore. Steller ſays, they go with young above a year, and bring forth one at a time, which they ſuckle by two teats, placed between the breaſt. They are very voracious and gluttonous, and feed not only on the fuci that grow in the *ſea*, but ſuch as are flung on the edges of the ſhore; and when they are filled, they fall aſleep on their backs. Their back and ſides are generally above water, and as their ſkin is infeſted with a ſpecies of louſe peculiar to themſelves, numbers of gulls are continually perching on their backs to pick out the inſects.

They continue in the Kamtſchatkan and American *ſeas* the whole ſummer, but in winter are very lean. They are taken by harpoons faſtened to a ſtrong cord, but after they are ſtruck, it requires the united force of thirty men to draw them on ſhore. When one is ſtruck, its companions repair to its help, ſome will endeavour to overturn the boat, by getting under it; others will preſs down the rope, in order to break it, and others ſtrike at the harpoons with their tails, with a view of getting it out, in which artifice they ſometimes ſucceed. Their noiſe is like the ſnorting of a horſe, which is occaſioned by hard breathing. They are of an enormous ſize, ſome being twenty-eight feet long, and eight thouſand pound in weight: the head is ſmall, oblong, and almoſt ſquare; the noſtrils filled with ſhort briſtles, the lips double, and the mouth, near the junction of the jaws, full of white tubular briſtles, which ſerve to prevent the food from running out with the water; the lips are alſo furniſhed with briſtles, which ſerve inſtead of teeth to cut the roots of the *ſea* plants; in the mouth there are no teeth, only two flat white bones, one above and another below in each jaw, with undulated ſurfaces, which anſwer the purpoſe of grinders. The eyes are ſmall; inſtead of ears there are two ſmall orifices; the tongue is pointed and ſmall, the neck is thick, and the head always hangs down. Near the ſhoulders the circumference of the body is twelve feet, about the belly twenty, near the tail four feet eight inches; the head is thirty-one inches, and the neck near ſeven feet; which dimenſions render the animal extremely deformed. Near the ſhoulders are two feet or fins, two feet two inches long, without fingers or nails; the tail is thick, ſtrong and horizontal, ending in a ſtiff black fin, ſlightly forked. The ſkin is thick and black, and full of inequalities, and ſo hard as ſcarcely to be cut with an ax, without hair; beneath the ſkin is a thick blubber, which taſtes like oil of almonds. The fleſh is coarſer than beef, and will not ſoon putrefy. The young ones taſte like veal: the ſkin is uſed for ſhoes, and for covering the ſides of boats. Pennant's Hiſt. Quad. vol. ii. p. 536, &c.

The *ſea-cow* of the gulf of St. Lawrence weighs from fifteen hundred to two thouſand pounds, and produces from one to two barrels of oil, which is boiled out of a fat ſubſtance that lies between the ſkin and the fleſh; it carries its young about nine months, and ſeldom brings forth more than one at a time. The ſkin is cut into ſlices of two or three inches wide, and exported to America for carriage traces, and to England for glue. The teeth afford an inferior ſort of ivory, which very ſoon turns yellow. Philoſoph. Tranſ. vol. lxv. part 2. p. 249, &c.

SEA-*crow*, in *Ornithology*, a name given by the common people of many counties of England to the PEWIT.

SEA-*devil*, in *Ichthyology*, an English name for the *rana piscatrix*, or LOPHIUS *piscatorius* of Linnæus; a very remarkable species of fish, of a middle nature between the cartilaginous and bony fishes. In shape and figure it resembles a tadpole: its head is extremely large, being equal, or more than so, to the rest of the body, and of a circular figure: the opening of its mouth is surprisingly great, and its lower jaw is above a finger longer than the upper; both jaws, but particularly the under one, are armed with a great number of long and sharp teeth, which are set in clusters, and not in regular rows, and they are all moveable inwards: with the lower jaw and the external clusters of the teeth of the upper jaw, this fish holds fast its prey, whilst with another cartilaginous jaw, whose teeth correspond with an inner cluster of teeth in the upper, he chews and tears his prey; neither the under jaw, nor external row of the upper, having any share in the mastication at all.

The back is flat, and of a bluish green colour, mottled with a few white spots: the eyes are pearly in the iris, and a transverse streak of white is drawn across the pupil. In the upper part of the head, at half a finger's breadth distance from the angle of the upper jaw, are placed two bristles, the fore one is six fingers long, the hinder one four; and in the middle of his back, lower down, are three more, which serve in the place of fins. Over the upper jaw there are, on each side, two sharp thorns, and there are thorny tubercles all about the eyes; and on the middle of the back, not far from the tail, there is a fin with ten rays: the tail is not forked, but the rays are branched, and all stand out a little beyond the fin, and are hooked. In the under part of the body, just under the throat, there are two fins like a mole's feet, each composed of five rays or fingers: there are two others on the edge of the body, and the extremity of all these, as also of the tail, is black.

The bronchial holes are three on each side, which are situated deep in the mouth, and open into marsupia or sacculi on the side of the head, the sides of which are the brancheostegæ, having several long slender cartilaginous bones, running longitudinally for their support, analogous to the branchiostegal bones of other fishes; and these sacks, Dr. Parsons conjectures, may answer two ends, first, to form the membranæ branchiostegæ; and, secondly, to make a covenient receptacle for the young till they are able to shift for themselves. If this end, he says, was not to be answered, the branchiæ might have been terminated near their origin in the mouth, as in other fishes. If this fish does not bring forth its young perfect, Dr. Parsons thinks there can be no use assigned for these sacks; but if they are viviparous, then the young may probably be harboured in them, being capable of crawling into them, as we may see by the pectoral webs on the under side; besides, as these fishes crawl on the bottoms of shoal places, watching and alluring their prey, the young must be protected by the parent, till they are able to provide for themselves, which may probably be when they grow too large to enter into these marsupiæ.

This fish has either no nostrils, or else they are hid within the head, and has a sort of membranous rim running all round the commissures of its sides and belly. Its flesh, when boiled, tastes like that of the frog. See *Tab.* IV. *of Fish*, N° 47. and Willughby's Hist. Pisc. p. 85. Phil. Trans. vol. xlvi. p. 126, &c.

SEA-*dragon*, in *Ichthyology*. See DRACO *marinus*.

SEA-*drags*, among *Mariners*, are such things as hang over the ship in the *sea*, as shirts, coats, and even the boat, &c. when towed.

SEA-*eagle*, *aquila marina*, in *Ichthyology*, a species of the RAIA, with a smooth body, and a long serrated spine on a finny tail. See *Sea*-EAGLE and *Tab. Fish*, fig. 1.

SEA-*eel*. See EEL, and *Tab. Fish*, *fig.* 11.

SEA *egg*, or *sea apple*, the name of the roundish *centronia*, with crooked or fesciculated spines. See CENTRONIA.

SEA *fans* and *sea feathers*. See GORGONIA.

SEA-*faring*, denotes the condition of a mariner.

SEA-*fight*. See ENGAGEMENT and SIGNAL.

SEA-*fox*, an English name for a fish of the squalus kind, called also the *sea-ape*; both names being given on occasion of the length of its tail in proportion to the body.

The old Greek writers have called it *alopæcia*, and the later *vulpes marina*, and *simia marina*, whence the names *sea-fox*, and *sea-ape*. See *Sea*-FOX.

SEA-*gage*. See ALTITUDE and GAGE.

SEA-*gate*, at *Sea*, when two ships are aboard one another, by means of a wave or billow, the seamen say, they lie aboard one another in a *sea-gate*.

SEA-*gudgeon*, an English name given to the fish called by the generality of writers *gobius niger*, and the *gobius marinus*. Artedi, who has made a genus of the *gobii*, excludes the common *gudgeon*, or *gobio fluviatilis*, from it, but he admits this fish as a genuine species of it.

Athenæus tells us of three kinds of *gudgeons*, the black, the yellow, and the white. This seems to have been very plainly the black *gudgeon* of that author. Salvian, in his figure of this fish, has given three fins on the back, but it really has only two. See GOGET.

SEA-*hare*, in the *History of Insects*, the name of the *lernea*; a species of the SCYLLÆA.

SEA-*hen*, in *Ornithology*, a name given by some to the LOMMIA, a web-footed bird, common on our coasts, and called the *guillemot*, or *kiddow*.

SEA-*holly*. See ERYNGO.

SEA-*horse*, in *Ichthyology*, the English name of the *hippocampus*, a species of the *acus*, according to the older writers, and one of the *syngnathi* of Artedi. For the characters see HIPPOCAMPUS. *Tab.* II. *Fish*, fig. 13.

The many idle tales reported of this vast amphibious creature, such as his method of bleeding himself when distempered, his vomiting fire when enraged, and the like, have made people, in almost all ages, desirous of seeing the animal. The Romans were fond of exhibiting it in their shews of wild beasts, and the description Pliny gave of it from thence, was all the world knew of the creature for many ages. That author's account, however, of its feeding on grass on the banks of the Nile, no way agrees with the teeth we find its mouth furnished with.

The skeletons of these animals, as rare as they are with us at present in their recent state, yet are found not unfrequently, in part at least, buried under ground, and that at great depths. The bones of the head are different from those of any other known animal, and when found in some parts of France, had always puzzled the wits of the naturalists there, who had in vain compared them with those of oxen, horses, &c. but at length one of the heads of these animals being sent over to France, cleared up the whole difficulty. The two jaws of this weighed forty-five pounds, and were two feet long, a foot deep, and a foot and half wide.

It is easy to conceive from this, that the accounts we have of the size of the animal are not fabulous, these bones corresponding very well with them. Mem. Acad. Par. 1724.

Sea-horse is also a name sometimes, but improperly, given to the river-*horse*, or HIPPOPOTAMUS.

Sea-horse is also a name given to that species of seal called WALRUS.

SEA-*lark*. See *Sea*-LARK.

SEA-*laws*. See *Laws* of OLERON, and USES and CUSTOMS of the *Sea*.

SEA-*leech*. See HIRUDELLA MARINA.

SEA-*lion*, *phoca leonina* of Linnæus, in *Zoology*, is a species of seal, which inhabits the *seas* about New Zealand, the island of Juan Fernandez, the Falkland Islands, and that of New Georgia. The animals of this species are seen in great numbers in June and July, the breeding season, on the island of Juan Fernandez, whither they resort in order to suckle their young on shore, and where they continue till September: they bring forth two at a time; and during this season, the female is very fierce. They arrive on the breeding islands very fat and full of blood, and their blubber has been found a foot thick; one of them has been known to yield a butt of oil, and the blood has filled two hogsheads.

Lord Anson's people eat the flesh, calling it beef by way of distinction from that of the common seal, which they called lamb. The old animals, except at the breeding season, are very timid; and to prevent surprise, each herd places a centinel, who gives certain signals at the appearance of danger; they associate in families, like the *sea*-bears, and are equally jealous of their mistresses. They are of a lethargic nature, and fond of wallowing upon one another in miry places; they grunt like hogs, and snort like horses.

During the breeding season they abstain from food, and become very lean; at other times they feed on fish and the smaller seals. The male has a projecting snout, hanging five or six inches below the lower jaw; the upper part consists of a loose wrinkled skin, which the animal when angry has the power of blowing up, so as to give the nose an arched appearance; the feet are short and dusky, having five toes on each, furnished with nails; the hind-feet appear like laciniated fins; the eyes and the whiskers are large; the hair on the body is short and of a dun colour; that on the neck a little longer, and the skin very thick. The length of an old male is twenty feet, and the greatest circumference fifteen. The nose of the female is blunt and tuberous at the top; the nostrils wide; the mouth breaking very little into the jaws; two small cutting teeth below; two small

ſmall and two large above; two canine teeth, remote from the preceding, five grinders in each jaw, and all the teeth conic; the eyes oblique and ſmall; no auricles; the fore-legs twenty inches long; the toes furniſhed with oblong flat nails; the hind parts, inſtead of legs, divided into two great bifurcated fins; no tail; and the whole covered with ſhort ruſt-coloured hair. The length from the noſe to the end of the fins is four yards, and the greateſt circumference two and a half. Pennant's Hiſt. of Quad. vol. ii. p. 531. See *Tab.* V. *Quadrupeds,* Nº 55.

SEA-*louſe, pediculus marinus,* a name given to the Molucca crab.

SEA-*lungs,* in the *Hiſtory of Inſects,* the Engliſh name of a ſpecies of MEDUSA.

SEA-*man.* We have many accounts, even from authors of credit, of ſomething reſembling the human figure ſeen at *ſea,* and fancy has carried them to ſuch a height, that the truth of the deſcription is loſt in moſt of them. The ſyrens, which we have accounts of even in Bartholin, and the *ſea-man,* or *homo marinus,* as it was called, ſeen and deſcribed by Barchewitz, give the greateſt credit to the ſtory; but writers are ſo fond of telling marvellous things, that great allowances are to be made in the reading.

The general deſcription of the *ſea-man* is, that from the navel downwards the whole is only a ſhapeleſs lump of fleſh, without any the leaſt mark, either of limbs, fins, or tail. On the breaſt there ſtand two pectoral fins, which are each compoſed of five bones or rays, reſembling the human hand, and connected together by a membrane like the toes of a duck, or ſome other water fowl's foot.

Theſe fins are what have the appearance of ſomething human, and when ſeen about the boſom of a white bellied fiſh, may be taken for hands with ſhort arms, and the reſemblance of a head is eaſily fancied. Theſe fins are not peculiar to any one kind of fiſh, but the manati or *ſea-*cow, the rana piſcatrix or lophius, and many others have them. It is probable from moſt of the accounts we have, that the manati, or *ſea-*cow, is the creature, which being ſeen raiſing its head above water at a diſtance, and extending theſe pectoral fins, which are what it ſwims with, has given riſe to the idea of the upper part of a human figure.

As to the deſcription of a ſhapeleſs lump of fleſh making up the lower part of the animal, it ſeems too contrary to the courſe of nature in all other *ſea-*animals, to have any foundation in reality, and probably was only the invention of the deſcriber, to make out what he did not ſee above water.

It is true, that Barchewitz takes great pains to prove that the *ſea-man,* or *homo marinus,* he deſcribes, was a wholly different creature from the *ſea-*cow; but his deſcription of it carries too little the air of any thing in nature, to meet with an eaſy credit.

It is wonderful, that ſo judicious a writer as Artedi ſhould give any faith to the exiſtence of ſo ſtrange a fiſh as this, but he mentions it with a great air of diſtruſt, and wiſhes a more perfect hiſtory of it, if it any where exiſts.

The public are often impoſed upon by cheats, who ſhew different things under the name of *ſea-men,* mermaids, and ſyrens; but if we may judge of the generality of theſe creatures, thus ſhewn by the lateſt inſtance among us, they are very wretched counterfeits indeed. This creature was ſaid to be a young mermaid taken on the Acapulca ſhore, and maintained its credit ſo well in London, as to afford the proprietor a comfortable ſubſiſtence for ten months among us, though no other than a human fœtus of about eight months, with a hydrocephalus head, and with the two legs growing together, and covered by one common membrane: the toes of this fœtus were beat out into a reſemblance of fins.

SEA-*mark,* a point, and conſpicuous place diſtinguiſhed at *ſea.* See LAND-*mark,* BEACON, and BUOY.

SEA-*moſs.* See CORALLINE and CONFERVA.

SEA-*mouſe,* in the *Hiſtory of Inſects,* the Engliſh name of the APHRODITA.

SEA-*nettle.* See NETTLE.

SEA-*oak.* See WRECK and FUCUS.

SEA-*officer.* See OFFICER.

SEA-*onion.* See SQUILL.

SEA-*otter.* See OTTER, and *Tab.* V. *Quadrupeds,* No. 56.

SEA-*owl,* in *Ichthyology,* a name given by many to that fiſh which we more uſually call the *lump-fiſh,* the *lumpus* of Willughby, &c. and the *cyclopterus* of Artedi.

SEA-*pearch.* See PEARCH.

SEA-*pen.* See *Sea-*PEN.

SEA-*pheaſant,* in *Ornithology,* the name of a bird of the duck kind, but differing from all the other ſpecies in the ſhape of its tail, which has two long feathers ſtanding out beyond the reſt, and terminating in a point. It is called more generally the *cracker.* See *Pin-tail* DUCK.

SEA-*pie,* in *Ornithology.* See PICA *marina.*

SEA-*plants,* a denomination comprehending thoſe marine productions which are formed by inſects, and which properly belong to the animal kingdom; however, they ſo much reſemble vegetables in their form, that they have been long taken for plants, called by this name, and claſſed under the vegetable kingdom.

Count Marſigli, who was at indefatigable pains to collect the various *ſea-plants* of ſeveral places, divides all theſe productions, which he referred to the rank of vegetables, into three claſſes. The firſt claſs contains the ſoft or herbaceous ones; ſuch are the algæ, called *ſea-*WRECKS, the FUCUSES, or *ſea-oaks,* the *ſea-moſſes,* or CONFERVÆ, and the different ſpecies of SPUNGES: the ſecond claſs comprehends thoſe that are ligneous, or of a woody hardneſs, which were called LITHOPHYTA by the ancients, as if their hardneſs approached to that of ſtones; theſe, Marſigli ſays, conſiſt of two ſubſtances, a cortical and an internal; the cortical part, while in the *ſea,* is ſoft, but in drying becomes as hard as chalk, and eaſily crumbles between the fingers; the internal ſubſtance ſeems more of the nature of horn than of wood; when burnt, it throws out a ſpume, or froth, like that which horns or feathers of animals yield in the fire, and their ſmell in burning is of the ſame kind; the branches of theſe are very pliable, bending in the manner of whalebone, and giving the ſame reſiſtance to a knife in cutting. The third claſs comprehends thoſe plants which are of the hardneſs of ſtone, and which ſhould properly be called the *lithophyta:* theſe are the ſeveral ſpecies of CORAL, MADREPORA, and the like.

Marſigli endeavours to explain the differences of theſe ſeveral ſubſtances, and to account for the manner of their receiving nouriſhment, agreeably to the ſyſtem which prevailed in his time, and which appropriated them to the claſs of vegetables. Marſigli, Hiſt. Phyſ. de la Mer. Mem. de l'Acad. Par. 1710.

By later experiments and obſervations, it has been ſufficiently demonſtrated by M. Peyſſonnel, Bernard de Juſſieu, Donati, &c. that thoſe marine ſubſtances, which Marſigli thought to be plants, are the work and habitation of animals. See on this ſubject the articles CORAL and CORALLINES.

Dr. Liſter apprehends, that thoſe ſubſtances, which in his time were thought to be *ſea-plants,* ſerve to render a great deal of the *ſea* water freſh, and give it in miſts to the clouds, whence it again falls on the earth. This is eaſily proved by experiment thus; if a quantity of *ſea* water be put into a long glaſs body, and into it there be put a large and vigorous *ſea-plant,* ſuch as the common *ſea-*wreck, and the head placed on the glaſs, and a receiver fitted for it without cutting the joints, there will daily diſtil into the receiver, without giving any fire below, a clear and ſweet water, freſh and potable, and without any diſagreeable or unwholeſome quality. The quantity is but ſmall that is obtained this way, but it is evident, that in the ſame manner a very immenſe quantity of the *ſea* water is every hour made freſh, and raiſed up into the air from the infinite number of plants that grow in it. Dr. Liſter even thinks that the tropic winds, which blow conſtantly one way, may be owing to this ſort of cauſe. Philoſ. Tranſ. Nº 156. See TROPIC *winds.*

SEA-*quadrant.* See BACK-*ſtaff* and QUADRANT.

SEA-*ſalt.* See SALT.

SEA-*room,* denotes a ſufficient diſtance from the coaſt, as well as from any rock and ſhallows, whereby a ſhip may drive or ſcud without danger of ſhipwreck.

SEA-*ſand.* See SAND and *Common* SALT.

SEA-*ſcorpion.* See FATHER LASHER.

SEA-*ſerpent.* See *Sea-*SNAKE.

SEA-*ſickneſs* is ſaid to be prevented by drinking *ſea* water mixed with wine.

SEA-*ſun-crown, American.* See AMERICAN, &c.

SEA-*ſwallow,* the name of a bird of the *larus,* or gull kind, called by authors *ſterna,* and common on our coaſts. See *Sea-*SWALLOW.

SEA-*turtle dove.* See *Sea-turtle* DOVE.

SEA-*water,* that briny bitteriſh fluid, which conſtitutes the *ſea.* See WATER.

SEA-*weed.* See FUCUS.

SEA-*worms.* See WORMS.

SEA-*wreck.* See WRECK.

SEA-*yoke.* See YOKE.

SEA, *head.* See HEAD *ſea.*

SEA, *high.* See HIGH.

SEA, *lie under the.* See LYING.

SEA, *pacific.* See PACIFIC.

SEA, *reflux of the.* See REFLUX.

SEA, *trough of the*. See TROUGH.

SEA, *under the*. See UNDER.

SEAH, in *Jewish Antiquity*, a meaſure of capacity containing ſix CABS.

SEAL, *ſigillum*, a puncheon, or piece of metal, or other matter, uſually either round or oval, whereon are engraven the arms, device, &c. of ſome prince, ſtate, community, magiſtrate, or private perſon, often with a legend or inſcription; the impreſſion whereof in wax ſerves to make acts, inſtruments, &c. authentic.

The king's great *ſeal*, is that whereby all patents, commiſſions, warrants, &c. coming from the king are ſealed: this conſiſts of two impreſſions, one being the *ſeal* itſelf, with the effigies of the king ſtamped upon it; the other has an impreſſion of the king's arms in the figure of a target, for matters of ſmaller moment, as certificates, &c. that are uſually pleaded *ſub pede ſigilli*.

The keeping hereof is in the hands of the lord high chancellor, who is hence alſo denominated *lord keeper*.

This office of lord CHANCELLOR, or lord KEEPER, whoſe authority by 5 Eliz. c. 18. is declared to be exactly the ſame, is with us at this day created by the mere delivery of the king's great *ſeal* into his cuſtody, without writ or patent.

The king's PRIVY-*ſeal* is a *ſeal* uſually firſt ſet to grants that are to paſs the great *ſeal*. See PATENTS.

The uſe of *ſeals* is very ancient, an inſtance of which occurs in Daniel, chap. vi. 17. but *ſeals* are ſtill older than this; for Jezebel, in 1 Kings, chap. xxi. *ſeals* the orders ſhe ſent for Naboth's death with the king's ring. See alſo Jerem. xxxii. 10. &c.

In effect, as the ancient *ſeals* were all engraven on the collets, ſtones, &c. of rings, and as the original uſe of rings, it is aſſerted, was only to be in readineſs for the ſealing of acts, inſtruments, &c. *ſeals* ſhould ſeem as ancient as rings themſelves.

Theſe ſealing rings, called *annuli ſignatorii, ſigillares, cirographi* or *cerographi*, it is ſaid in ancient authors, were firſt invented by the Lacedæmonians, who, not content to ſhut their cheſts, armories, &c. with keys, added *ſeals* to them; and to this end, at firſt they made uſe of worm-eaten wood, the impreſſions whereof they took on wax, or ſoft earth; but they at length found the art of engraving figures, or rings, the impreſſions of which they took in the ſame manner. This, however, muſt be granted, that even in Moſes's time, the art of engraving, not only on metals, but alſo on precious ſtones, was known.

Indeed, it does not appear, that the ring had any other uſe among the primitive Jews beſides ornament: but at length it was uſed to *ſeal* inſtruments, contracts, diplomas, letters, &c. inſtances whereof we have in the firſt book of Kings xxi. 8. Eſther viii. 10. Xenophon. Hellen. lib. I. Quint. Curt. lib. vi. Juſt. lib. xliii. cap. iii. where we learn, the keeping of the emperor's *ſeal* was become a particular office; Lucian adds, that Alexander gave his *ſeal* to Perdiccas, thereby appointing him his ſucceſſor.

Pliny obſerves, that in his time there were no *ſeals* uſed any where but in the Roman empire; at Rome he tells us, they were become of abſolute neceſſity, inſomuch that a teſtament was null without the teſtator's *ſeal*, and the *ſeals* of ſeven witneſſes; but it does not appear that the Romans had any ſuch things as public *ſeals*; nor that their edicts and contracts were *ſealed*, not even in the times of the emperors.

In France the cuſtom anciently was, inſtead of ſigning their inſtruments, &c. only to *ſeal* them; as appears from an infinity of ancient charters, which are not ſigned at all: the reaſon whereof was, that in thoſe days very few people were able to write; ſcarce any body, indeed, could read and write but clerks; and the cuſtom continued when learning made its way among them, though the reaſon for doing it had ceaſed.

In England, the firſt ſealed charter we find extant, is that of Edward the Confeſſor, upon his founding of Weſtminſter abbey; yet, we read of *ſeals* in the MS. hiſtory of king Offa.

And ſir Edward Coke relies on an inſtance of king Edwyn's making uſe of a *ſeal* about an hundred years before the Conqueſt; though ſome have doubted the authenticity of this charter; becauſe it is certain that *ſealing* was not then in common uſe.

Before the time of William the Conqueror, the Engliſh did not *ſeal* with wax, but only made a golden croſs on the parchment, and ſometimes an impreſſion on a piece of lead, which hung to the grant with a ſilken ſtring, and was deemed an abundant authorizing of the grant itſelf, without either ſigning or witneſſes.

This practice of affixing the ſign of the croſs proceeded from their inability to write; which is honeſtly avowed by Cædwalla, a Saxon king, at the end of one of his charters: *propria manu pro ignorantia literarum ſignum ſanctæ crucis expreſſi et ſubſcripſi*.

The ſame circumſtance is related concerning the emperor Juſtin in the Eaſt, and Theodoric king of the Goths in Italy.

The colour of the wax wherewith William's grants were *ſealed*, was uſually green, to ſignify that the act continued for ever freſh, and of force. The uſual impreſſion on all laymen's *ſeals*, till the year 1218, was a man on horſeback, with a ſword in his hand; afterwards, they began to engrave their COATS *of arms* on their *ſeals*: only the archbiſhops and biſhops, by a decree of cardinal Otto, who was legate here in 1237, were to bear in their *ſeals* their title, office, dignity, and even their proper names.

Du Cheſne obſerves, that none below the dignity of a knight had any right to a pendant *ſeal*, called *authenticum*.

The emperors long *ſealed* all their acts of importance with a golden *ſeal*; and the golden bull of Charles IV. for the election of an emperor, takes its name from the gold *ſeal* hanging to it, which is called *bull*.

The pope has two kinds of *ſeals*: the firſt uſed in apoſtolical briefs, and private letters, &c. called the *fiſherman's ring*. This is a very large ring, wherein is repreſented St. Peter, drawing his net full of fiſhes.

The other is uſed in bulls, repreſenting St. Peter's head on the right, that of St. Paul on the left, with a croſs between the two; on the reverſe are ſometimes the pope's name and arms.

The impreſſions of the firſt *ſeal* are taken in red wax; but thoſe of the ſecond, always in lead.

Theod. Hopink, a German lawyer, has furniſhed the world with a learned and curious work on the ſubject of *ſeals*, printed in 1642, at Nurembergh, in quarto, under the title, De Sigillorum priſco & novo Jure, Tractatus Practicus, &c. We have another work of the like kind, by Heineccius, in folio, printed at Francfort, and Leipſic, in 1709, under the title, De Veteribus Germanorum aliarumque Nationum Sigillis, eorumque Uſu & Præſtantia, Syntagma Hiſtoricum.

SEAL, *hermetical*. See HERMETICAL.

SEAL, in *Zoology*. See SEA-*bear* and SEA-*calf*.

SEAL is alſo uſed for the wax or lead, and the impreſſion thereon, affixed to the thing *ſealed*.

The manufacturers *ſeal* frequently applied to their ſtuffs, &c. is to be lead. That of knights, by the French law, is to be of hard wax; that of agents, of ſoft wax.

Some *ſeals* are ſtamped on the paper or parchment itſelf, others hung by ſilken ſtrings.

The French *ſeal* their edicts with green wax; arrets with yellow wax; expedients for Dauphiné with red wax. And the letters of the French academy are *ſealed* with blue wax. See WAX.

SEAL, *lady's* SEAL, in *Botany*, a ſpecies of BRYONY.

SEAL, *Solomon's*, in *Botany*. See LILY *of the Valley*.

SEALER, an officer in chancery, appointed by the lord chancellor, or keeper of the great ſeal, to ſeal the writs and inſtruments there made in his preſence.

SEALING, in *Architecture*, the fixing a piece of wood or iron in a wall, with plaiſter, mortar, cement, lead, or other ſolid binding.

For ſtaples, hinges, and joints, plaſter is very proper.

SEALING *wax*. See WAX.

SEAM or SEME *of corn*, is a meaſure of eight buſhels.

SEAMS, or SEYMS, in *horſes*, certain clefts in their quarters, occaſioned by the drineſs of the foot, or by riding upon hard ground.

SEAM *of glaſs*, is the quantity of one hundred and twenty pounds, or twenty-four ſtone, each five pounds weight.

The *ſeam* of wood, is a horſe-load.

SEAM, *monk's*. See MONK.

SEAMS *of a ſhip*, are places where her planks meet and join together; they are always filled with a quantity of oakum, and covered with hot pitch to prevent the entrance of the water. There is alſo a kind of peculiar *ſeam* in the ſowing of ſails, which they call a *monk's ſeam*.

SEAMS *of a ſail*, are, of two ſorts, *monk's ſeam*, and *round ſeam*. See MONKS, &c.

SEAM, *round*, of a ſail, is ſo called, becauſe round like the common *ſeam*.

SEAMEN. See MARINERS and NAVY.

SEARCE. See SIEVE.

SEARCH-*warrant*, in *Law*, a kind of *general warrant* iſſued by juſtices of peace, for ſearching all ſuſpected places for ſtolen goods; and there is a precedent in Dalton, requiring the conſtable to *ſearch* all ſuch ſuſpected places, as he and the party complaining ſhall think convenient; but ſuch practice is condemned by lord Hale, Mr. Hawkins, and the beſt authorities. However, in caſe of a complaint, and oath made of goods ſtolen, and

that the party suspects that goods are in such house, and shews the cause of such suspicion, the justice may grant a *warrant* to *search* in those suspected places mentioned in his *warrant*, and to attach the goods, and the party in whose custody they are found, and bring them before him or some other justice, to give an account how he came by them, and to abide such order as to law shall appertain; which *warrant* should be directed to the constable, or other public officer, who may enter a suspected house and make *search*.

SEARCHER, an officer in the customs, whose business it is to *search* and examine ships outward bound, if they have any prohibited or uncustomed goods on board, &c. 12 Car. II. There are also *searchers* of leather, &c. See ALNAGER.

SEARCHER, in *Artillery*, is an iron socket with branches, from four to eight in number, a little bent outwards, with small points at their ends; to this socket is fixed a wooden handle, from eight to twelve feet long, of about an inch and a quarter diameter. This *searcher* is introduced into the gun after it has been fired and turned round, in order to discover the cavities within; and after their distances are marked on the outside with chalk, they make use of another *searcher* that has only one point, about which a mixture of wax and tallow is put, to take the impression of the holes; and if there are any a quarter of an inch deep, or of any considerable length, the gun is rejected as unserviceable to the government. The gun is thus proved and *searched* twice.

SEAR-CLOTH, or CERE-CLOTH. The word *sear-cloth* is supposed to be a corruption of *cere-cloth*, and to be derived originally from the Greek *κηρὸς*, *wax*.

In *Surgery*, it denotes a form of external remedy, somewhat harder than an unguent, yet softer than an emplaster, though it is frequently used both for the one and the other.

The *sear-cloth* is always supposed to have wax in its composition, which distinguishes, and even denominates it. In effect, when a liniment or unguent has enough wax in it, it does not differ from a *sear-cloth*.

Sear-cloths are a kind of substitutes to friction, and are sometimes used for other purposes: the best are compounded of resolvent drugs, as saffron, myrrh, and aloes, incorporated with wax and gums, as galbanum, gum ammoniac, and sagapenum; the whole tempered with wine.

SEASE, SEASIN, or SEASING, in a *Ship*. See SEIZE.

SEASONING *of timber*. See TIMBER.

SEASONINGS, in the West Indies, a kind of aguish distemper, which foreigners are much subject to at their first coming.

SEASONS, in *Cosmography*, certain portions or quarters of the year, distinguished by the signs which the sun then enters, or by the meridian altitudes of the sun; consequent on which, are different temperatures of the air, different works in tillage, &c.

The word is formed from the French *saison*, which Menage derives from the Latin *statio*, whence the Italians have formed *stagione*. Nicod derives it from *satio*, *tempus sationis*, *sowing time*.

The year is divided into four *seasons*, spring, summer, autumn, and winter. The beginnings and endings of each whereof, see under its proper article.

It is to be observed, the *seasons* anciently began differently from what they now do: witness the old verses,

Dat Clemens hyemem; dat Petrus ver cathedratus;
Æstuat Urbanus; autumnat Bartholomæus.

SEAT, in *Astronomy*. See SCHEAT.

SEAT, in the *Manege*, is the posture or situation of a horseman upon the saddle.

To *seat* a horse upon his haunches or hip. See PUT.

SEAZE. See SEIZE.

SEBACEÆ *glandulæ*. See GLANDS.

SEBAR, or CEBAR, in the *Materia Medica*, a name by which the Arabians call the *lignum aloes*, or *aloe-wood*, a perfumed aromatic drug.

SEBAT, in *Chronology*, the fifth month of the civil year of the Hebrews, and the eleventh of the ecclesiastical year, answering to part of our January and part of February.

SEBEL, an Arabian name for the disorder of the eye, usually called a PANNUS.

SEBESTEN, SEBESTENA, *myxa*, in *Pharmacy*, *&c.* the fruit of a species of CORDIA, resembling a little plum or prune; which, when ripe, is of a deep red colour, bordering on black; very sweet, and the flesh, or pulp, glutinous or sticky.

The Syrians make a kind of glue, or birdlime, of the *sebestens*, called *birdlime of Alexandria*. The fruit has been esteemed pectoral, cooling, and emollient; though it is now discarded by the colleges both of London and Edinburgh.

The stone within it is triangular: it brought its name from Arabia, whence Pliny observes it came in his time into Italy.

SEBESTENA, in *Botany*, the name given by Dillenius to a genus of plants called CORDIA by Plumier, and under that name characterised by Linnæus.

SEBUÆI, a sect among the ancient Samaritans, whom St. Epiphanius accuses of changing the time expressed in the law, for the celebration of the great annual feasts of the Jews.

Serrarius conjectures, that they were thus called from their celebrating the feast of the passover on the seventh month, called by the Hebrews *seba*, *seventh*. Drusius rather takes them to have been denominated from *Sebaia*, the leader of a sect among the Samaritans. Scaliger derives the name from the Hebrew, *sebua*, *week*, because of their celebrating every second day of the seven weeks, between Easter and Whitsuntide.

SEBURAI, *Sebûræi*, a name which the Jews give to such of their rabbins, or doctors, as lived and taught some time after the finishing of the Talmud.

The word is derived from סבר, *saber*, *I think*: whence סברא, *sabura*, *opinion*, *sentiment*: and thence סבראי, *seburi*, or *seburai*, *opiniative*.

The reason of this appellation, say the rabbins, is, that the Talmud being finished, published, and received in all the schools and synagogues, these doctors had nothing to do but to dispute for, and against, the Talmud, and its decisions. Others say, it was because their sentiments were not received as laws or decisions, as those of the Mischnic and Gemaric doctors were; but were held as mere opinions. Others, as the author of Schalschelesh Hakkabala, or *chain of tradition*, tell us, that the persecution the Jews underwent in those times, not allowing them to teach quietly in their academies, they only proposed their opinion in the composition of the Mischna. The first and chief of the *Seburai* was R. Josi, who began to teach in the year 787, of the æra of contracts; which, according to R. David Gautz, falls on the year of the world 4236, and who, according to R. Abraham, was thirty-eight years president of the Jewish academy.

The æra of contracts is the same with that of the *Seleucidæ*, the 787th year whereof falls on the year of Christ 476, which, of consequence, is the æra of the origin of the *Seburai*, whose reign did not hold long: Buxtorf says, not above sixty years; R. Abraham, and others, say not fifty. The last of them was R. Simona. They were succeeded by the Gaons or Geonim.

SECACUL, in the *Materia Medica of the Ancients*, a name given by Avicenna, Serapion, and others, to a root which was like ginger, and was brought from the East Indies, and used as a provocative to venery.

The interpreters of their works have rendered this word *iringo*, and hence some have supposed that our eryngium, or eryngo, was the root meant by it: but this does not appear to be the case on a strict enquiry, and there is some reason to believe that the famous root, at this time called *ginseng*, was what they meant.

SECALE, in *Botany*. See RYE.

SECAMONE, in *Botany*, a name by which the Ægyptians call a species of periploca common there, and distinguished by Mr. Tournefort by the name of *periploca foliis oblongis angustioribus*, the long narrow-leaved periploca. See *Virginian* SILK.

SECANT, in *Geometry*, a line that cuts another, or divides it into two parts. See LINE, &c.

Thus the line A M (*Tab.* IV. *Geometry*, *fig.* 101.) is a *secant* of the circle A E D, &c. as it cuts the circle in B.

It is demonstrated by geometers: 1. That if several *secants* M A, M N, M E, &c. be drawn from the same point M, that passing through the centre, M A, is the greatest; and the rest are all so much the less, as they are more remote from the center. On the contrary, the portions thereof without the circle M D, M O, M B, are so much the greater, as they are farther from the centre. The least is that of M A, which passes through the centre.

2. That if two *secants*, M A and M E, be drawn from the same point M, the *secant* M A will be to M E as M D to M B: or $ME \times MD = MA \times MB =$ the square of a tangent to the circle drawn from the point of concurrence M.

SECANT, in *Trigonometry*, denotes a right line, drawn from the centre of a circle, which, cutting the circumference, proceeds, till it meets with a tangent, to the same circle. Thus the line F C (*Tab. Trigonometry*, *fig.* 3.), drawn from the centre C, till it meets the tangent E F, is called a *secant*; and particularly, the *secant of the arch* A E, to which E F is tangent.

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The *ſecant* of the arch A H, which is the complement of the former arch to a quadrant, is called the *co-ſecant*, or *ſecant of the complement*.

The ſine of an arch, A D, being given, to find the *ſecant* thereof F C, the rule is, as the co-ſine D C is to the whole ſine, ſo is the whole ſine, or radius, A C, to the *ſecant* C F: or, the *ſecant* is a third proportional to the co-ſine and radius. See SINE.

To find the logarithm of the *ſecant* of any arch, the ſine of the complement of the arch being given, multiply the logarithm of the whole ſine by two, and from the product ſubtract the logarithm of the ſine complement; the remainder is the logarithm of the *ſecant*. The reaſon of which operation is obvious; becauſe $\frac{EC^2}{DC} = \text{to } CF$; and, therefore, from the nature of LOGARITHMS, twice the log. of E C — the log. of D C = the log. of C F.

SECANTS, *line of*. See SECTOR.

SECESPITA, among the Romans, a knife with a round ivory handle, adorned with gold and ſilver, which the flamens and prieſts uſed at ſacrifices.

SECIUM, among the Romans, a term uſed to ſignify every thing the prieſts cut with the knife *ſeceſpita*, as the *libum*, *placenta*, &c.

SECK, *rent*. See RENT *ſec*.

SECLIA, a name by which ſome authors have called wormwood.

SECOMIÆ, in *Natural Hiſtory*, the name of a genus of foſſils, of the claſs of the *ſeptariæ*; the characters of which are, that they are bodies of a duſky hue, divided by ſepta, or partitions of a ſparry matter, into ſeveral more or leſs regular portions, of a moderately firm texture, not giving fire with ſteel, but fermenting with acid menſtrua, and eaſily calcining.

The *ſeptariæ* of this genus are, of all others, the moſt common, and are what have been known by the little expreſſive, or miſtaken names of the *waxen vein*, or *ludus Helmontii*. We have many ſpecies of theſe bodies common among us. Of the whitiſh or browniſh kinds we have thirteen; of the yellowiſh, five; and of the ferruginous ones, four.

SECOND, in *Anatomy*. See SECUNDI *generis*.

SECOND, in *Geometry*, *Aſtronomy*, &c. the ſixtieth part of a prime, or minute; either in the diviſion of circles, or in the meaſure of time.

A degree, or an hour, are each divided into ſixty minutes, marked thus ′; a minute is ſubdivided into ſixty *ſeconds*, marked thus ″; a *ſecond* into ſixty thirds, marked thus ‴, &c.

We ſometimes ſay a *ſecond minute*, a *third minute*, &c. but more uſually, ſimply, *ſecond*, *third*, &c.

A PENDULUM, three feet, three inches, and two tenths of an inch long, vibrates *ſeconds*, according to ſir Jonas Moor's reduction of Huygens's three feet eight lines and a half of Paris meaſure to Engliſh meaſure.

SECOND, in *Muſic*, denotes one of the muſical intervals; being only the diſtance between any ſound, and the next ſound, whether higher or lower.

As in the compaſs of a tone there are reckoned nine ſenſibly different ſounds, which form thoſe little intervals, called *commas*; one might in ſtrictneſs ſay there are eight kinds of *ſeconds*.

There are three kinds of *ſeconds* occurring in practice, the leſſer, the greater, and the ſuperfluous *ſecond*; to which, if the enharmonic genus were reſtored, we might add the diminiſhed *ſecond*. The leſſer *ſecond* is the ſemi-tone major, and is nearly equal to $5\frac{1}{3}$ commas. The greater *ſecond* is the tone, which being either major or minor, there muſt alſo be two greater *ſeconds*; one nearly equal to $8\frac{1}{2}$ commas, and the other to $9\frac{1}{2}$ commas: but practitioners uſually confound theſe two. The ſuperfluous *ſecond* is a tone major, and ſemi-tone minor; the other ſuperfluous *ſecond*, ariſing from the tone minor and ſemi-tone minor, is not in uſe. Laſtly, the diminiſhed *ſecond* is a ſemi-tone minor leſs than the leſſer *ſecond*; that is, equal to the dieſis enharmonica. Thus between E and F, or between A and B, would be a diminiſhed *ſecond*, as alſo between G ſharp and A. This laſt has been practiſed by Mr. Handel, in the oratorio of Samſon, in the ſecond part of the ſong, Return, return, O God of Hoſts. See INTERVAL.

Some authors, as Ozanam, call the ſemi-tone minor by the name of *diminiſhed ſecond*; but this is contrary to the analogy in like caſes, where diminiſhed is uſually applied to intervals a ſemi-tone minor leſs than a true diatonic interval. Thus the diminiſhed ſeventh is a ſemi-tone minor leſs than the flat ſeventh, or ſeventh minor.

SECOND, *diminiſhed*, in *Muſic*. See DIMINISHED *ſecond*.

SECOND *de l'oreille*, in *Anatomy*, a name given by Vieuſſens and others to a muſcle of the EAR, called by Cowper and others *ſtapidaceous*, and *ſtapedis muſculus*; and by Albinus *ſtapedium*. Winſlow calls it *le muſcle de l'étrier*.

SECOND *captain*. See CAPTAIN.

SECOND *cauſe*. See CAUSE and EFFICIENT.

SECOND *deliverance*, *ſecunda deliberatione*, a judicial writ that lies after nonſuit of the plaintiff in replevin, and a *returno habendo* of the cattle replevied, adjudged to him that diſtrained them; commanding the ſheriff to replevy the ſame cattle again, upon ſecurity given by the plaintiff in the replevin for the redelivery of them, if the diſtreſs be juſtified. It is a *ſecond* writ of replevin, &c. F. N. B. 68.

SECOND *flank*, *notion*, *order of curves*, *rate*. See the ſubſtantives.

SECOND *ſight*, an odd qualification, which many of the inhabitants of the Weſtern Iſlands of Scotland are ſaid to be poſſeſſed of. The thing is atteſted by many credible authors (among whom is Mr. Martin, author of the natural hiſtory of theſe iſlands, and a member of the Royal Society); and, notwithſtanding the ſtrangeneſs of it, many have ſtedfaſtly believed it.

The *ſecond ſight* is ſaid to be a faculty of ſeeing things to come, or things done at a great diſtance, repreſented to the imagination as if actually viſible and preſent. Thus, if a man be dying, or about to die, his image, it is pretended, ſhall appear diſtinctly in its natural ſhape, in a ſhroud, with other funeral apparatus, to a *ſecond-ſighted* perſon, who, perhaps, never ſaw his face before: immediately after which, the perſon ſo ſeen certainly dies.

The quality of *ſecond ſightedneſs*, they ſay, is not hereditary; the perſon who has it cannot exert it at pleaſure; nor can he prevent it, or communicate it to another; but it comes on him involuntarily, and exerciſes itſelf on him arbitrarily; and often, eſpecially in the younger *ſecond* ſeers, to their great trouble and terror.

There are a great number of circumſtances ſaid to attend theſe viſions; by obſervation whereof, the particular circumſtances, as to time, place, &c. of the death of the perſon, &c. are learnt. The method of judging of them, or interpreting them, grows into a kind of art; which is very different in different perſons. *Second ſightedneſs* is held a diſcredit in the country; ſo that none, they ſay, will counterfeit it; but that many conceal and diſſemble it. See Johnſon's Journey to the Weſtern Iſlands of Scotland, p. 248, &c.

SECOND *ſurcharge*, *writ of*, in *Law*. See SURCHARGE.

SECOND *terms*, in *Algebra*, thoſe where the unknown quantity has a degree of power leſs than it has in the term where it is raiſed to the higheſt.

The art of throwing theſe *ſecond terms* out of an equation; that is, of forming a new equation, where they have no place, is one of the moſt ingenious and uſeful inventions in all algebra.

SECOND *tithe*. See TITHE.

SECONDARY, or SECUNDARY, an officer who acts as ſecond, or next to the chief officer.

Such are the *ſecondaries* of the courts of king's bench and common pleas; the *ſecondaries* of the compters, who are next the ſheriffs of London in each of the two compters; two *ſecondaries* of the pipe; *ſecondaries* to the remembrancers, &c.

Secondary is more frequently uſed in an adjective ſenſe, by way of oppoſition to PRIMARY, or principal.

SECONDARY *actors*. See ACTOR.

SECONDARY *affections*. See AFFECTION.

SECONDARY *circles of the ecliptic* are circles of longitude of the ſtars; or circles which, paſſing through the poles of the ecliptic, are at right angles to the ecliptic. See CIRCLES *of latitude*.

By the help of theſe, all points in the heavens are referred to the ecliptic; that is, any ſtar, planet, or other phenomenon, is underſtood to be in that point of the ecliptic, which is cut by the *ſecondary* ſemicircle, which paſſes through ſuch ſtar, or phenomenon.

If two ſtars be thus referred to the ſame point of the ecliptic, they are ſaid to be in conjunction; if in oppoſite points, they are ſaid to be in oppoſition; if they be referred to two points at a quadrant's diſtance, they are ſaid to be in a quartile aſpect; if the points differ a ſixth part of the ecliptic, they are ſaid to be in ſextile aſpect.

In the general, all circles which interſect one of the ſix greater circles of the ſphere at right angles, may be called *ſecondary circles*. As the azimuth or vertical circles in reſpect of the horizon, &c. the meridian in reſpect of the equator, &c.

SECONDARY *collateral points*. See COLLATERAL.

SECONDARY *conveyances*, in *Law*. See DERIVATIVE.

SECONDARY *dials*. See DIAL.

SECONDARY *fever* is that which ariſes after a criſis, or the diſcharge of ſome morbid matter: as after the declenſion of the ſmall-pox, or meaſles. See FEVER, *Small*-POX, &c.

SECONDARY *motion.* See MOTION.
SECONDARY *place.* See PLACE.
SECONDARY *planets*, those moving round other planets as the centres of their motion, and along with them round the sun. See PLANET.
SECONDARY *qualities, rainbow.* See the substantives.
SECONDARY *use*, in *Law.* See USE.
SECONDINE. See SECUNDINE.
SECRETARIUM, among the Romans, a reclufe room, where the judges confidered the caufes that had been litigated before them, and came to a refolution what fentence they were to pronounce from the tribunal. It was moft ufually feparated from the tribunal by a veil.

SECRETARY, an officer, who, by order of his mafter, writes letters, difpatches, and other inftruments, which he renders authentic by his fignature.

Of thefe there are feveral kinds, as *fecretary of ftate, fecretary of war, fecretary of the treafury, fecretary of the admiralty, fecretary of the lord chancellor,* &c.

SECRETARIES *of ftate* are officers attending the king, for the receipt and difpatch of letters, grants, petitions, and many of the moft important affairs of the kingdom, both foreign and domeftic.

The king's *fecretaries* were anciently called the *king's clerks* and *notaries, regi a commentariis.* As for the name *fecretary*, it was at firft applied to fuch as, being always near the king's perfon, received his commands, and were called *clerks of the fecret*; whence was afterwards formed the word *fecretary, regi a fecretis:* and as the great lords began to give their clerks alfo the quality of *fecretaries*, thofe who attended the king were called, by way of diftinction, *fecretaries of the commands, regi a mandatis.* This continued till the reign of our Henry VIII. 1559; when, at a treaty of peace between the French and Spaniards, the former obferved, that the Spanifh minifters, who treated for Philip II. called themfelves *fecretaries of ftate:* upon which, the French *fecretaires de commandements*, out of emulation, affumed the fame title; which thence paffed alfo into England.

Till the reign of king Henry VIII. there was only one *fecretary of ftate*; but then, bufinefs increafing, that prince appointed a fecond *fecretary*: both were of equal power and authority, and both ftyled *principal fecretaries of ftate.* Before queen Elizabeth's time, the *fecretaries* did not fit at the council board; but that princefs admitted them to the place of privy counfellors, which honour they have held ever fince; and a council is never, or at leaft very feldom, held without one of them. On the union of England and Scotland, queen Anne added a third *fecretary*, on account of the great increafe of bufinefs, which, as to Britain, was equally and diftinctly managed by all the three, although the laft was frequently ftyled *fecretary of ftate for North Britain.* We had alfo lately a *fecretary of ftate* for the American department. But both thefe offices are now abolifhed, and there remain two *fecretaries* who have, under their management and direction, the moft confiderable affairs of the nation, and are obliged to a conftant attendance on the king: they receive and difpatch whatever comes to their hands, be it for the crown, the church, the army, private grants, pardons, difpenfations, &c. as likewife petitions to the fovereign; which, when read, are returned to the *fecretaries* for anfwer: all which they difpatch, according to the king's command and direction.

The correfpondence with all parts of Great Britain is managed by either of the two *fecretaries* without diftinction; but in refpect to foreign affairs, all the nations which have any intercourfe or bufinefs with Great Britain are divided into two provinces or departments, the fouthern and the northern; each *fecretary* receiving all letters and addreffes from, and making all difpatches to, the feveral princes and ftates comprehended in his province.

Ireland and the plantations are under the direction of the elder *fecretary*, who has the fouthern province.

Each of thefe two *principal fecretaries* has two *under fecretaries* and one chief clerk, befides a number of other clerks and officers, wholly depending upon them.

Our *fecretaries of ftate* are allowed power to commit perfons for treafon, and other offences againft the ftate, in order to bring them to their trial. Some have faid that this power is incident to their office; and others, that they derive it in virtue of their being named in the commiffions of the peace for every county in England and Wales.

The *fecretaries of ftate* have the cuftody of that feal, properly called the *fignet*, and the direction of the fignet office; wherein there are four clerks employed, who prepare fuch things as are to pafs the fignet, in order to the privy or great-feal. All grants, figned by the king, are returned hither, which, tranfcribed, are carried to one of the principal *fecretaries of ftate*, and fealed, and then called fignets; which, being directed to the lord privy-feal, are his warrant.

On the *fecretaries of ftate* is likewife dependant another office, called the PAPER-*office*; wherein all public writings, papers, matters of ftate, &c. are preferved.

All the *under fecretaries* and clerks are in the choice of the *fecretary of ftate*, without referve to any perfon: the *under fecretaries* receive orders and directions from them, for writing difpatches, foreign or domeftic, which they give to the chief clerk, who diftributes them to the under clerks.

SECRETARY *of an embaffy* is a perfon attending an ambaffador, for the writing of difpatches relating to the negotiation.

There is a great difference between the *fecretary of the embaffy*, and the ambaffador's *fecretary:* the laft is a domeftic, or menial of the ambaffador's; the firft a fervant, or minifter, of the prince.

SECRETION, *fecretio*, in *Medicine*, the act whereby the feveral juices, or humours, in the animal body, are feparated from the blood, by means of the glands.

In the bodies of animals, we obferve a great number of juices of different natures; viz. the blood, lympha, faliva, ftomach-liquor, inteftinal juices, pancreatic juice, bile, urine, &c. Now the blood is the general fource of all; and from it they are fecerned by particular organs, called *glands.*

The manner wherein this *fecretion* is effected, has been much inquired into in thefe laft ages; though not with the greateft fuccefs. The ancient phyficians, indeed, contented themfelves to affert certain particular virtues, or faculties, inherent in the feveral vifcera, whereby they were determined to feparate one liquor, rather than another, without troubling themfelves much about the manner wherein this was done: but the moderns, according to the genius of their philofophy, muft have this point cleared, and the modus of *fecretion* rendered intelligible. Hence, as the exceeding fmallnefs of thefe organs prevented any regular fearch, they have imagined various manners of explaining it.

Some, full of the effects they have obferved from the fermentation, maintain, that there are ferments in the feveral parts; by aid whereof, certain kinds of particles, mixed in the blood, are feparated therefrom; after the fame manner as we fee in muft, or new wine, from which, while fermenting, certain parts are detached, in form of froth. But this opinion has fo many inconveniencies with which to grapple, that it is almoft univerfally abandoned.

Others confider the glands as a kind of fieves; whofe holes, having different figures, will only let pafs certain particles, or molecules, whofe figures refemble thofe of the holes. But the falfity of this hypothefis was foon found out; and it was thought fufficient to fix fome proportion between the diameters of the pores, and that of the molecules that were to pafs through them, to account why very fubtil parts fhould pafs through the glands, through which the coarfer could not pafs. Yet this opinion was not found perfectly fatisfactory: for, on this fuppofition, the moft fubtil parts of the blood muft pafs in fuch quantity through the largeft pores, that there would not be enough left to furnifh the little ones with what they needed: and, for the fame reafon, thofe parts, whofe pores are biggeft, ought to furnifh liquors much fuller of fubtil parts than thofe whofe pores are fmaller; which yet is contrary to experience. For the ferofity feparated in the kidneys, under the name of *urine*, confifts of parts much fubtiler, and fmaller, than the bile feparated in the liver: why, then, does not this ferofity efcape in the liver, the pores whereof muft be much greater than thofe of the kidneys?

This inconvenience many naturalifts being aware of, it has made them have recourfe to *imbibition* (if the word may be allowed us, for want of a better). They maintain then, that, befides the different diameters of the pores, it is required, that the feveral parts be already imbued, or moiftened, with a liquor like to that they are to filtre. This opinion is rather the refult of reafon than of experiment; and the maintainers hereof, well pleafed they had fomething to fatisfy their reafon, never troubled themfelves whether it were true, or not, till Mr. Winflow adopted it.

Dr. Keill, whofe theory prevails moft in England, accounts for *fecretion* from the joint confideration of the different diameters of the veffels, the different velocity of the blood, the different angles the ducts make with the arteries, and the different attraction of the different parts under all thefe different circumftances.

His theory may be reduced to the following heads:

1. Different juices may be feparated from the common mafs of blood, by means of the different diameters of the orifices of the fecretory ducts. For all particles, whofe

whose diameters are less than those of the ducts, will pass through them; so that any matter may be evacuated by any of the glands, provided the diameters of its particles be made lesser than those of the secretory duct, either by a comminution of the matter to be separated, or by an enlargement of the separating passage.

2. By the different angle which the secretory duct makes with the trunk of the artery. For all fluids press the sides of the containing vessels in a direction perpendicular to its sides; which is evident in the pulsation of the arteries, it being to that pressure that the pulsation is wholly owing. It is likewise evident, that the blood is urged forward by the force of the heart; so that the motion of *secretion* is compounded of both these motions. Now the lateral pressure is greater when the direct velocity is so, but yet not in proportion to such velocity: for the lateral pressure is considerable, even when the fluid is at rest; being then in proportion to the specific gravity of the fluid: and in a fluid like the blood in the arteries, which is thrown in a right direction, or a direction parallel to the axis of the vessel, the lateral pressure will be in a proportion compounded of both: from whence it will follow, that if two particles of equal diameters, but of unequal specific gravities, arrive, with the same velocity, at an orifice capable of admitting them, yet they will not both enter it and pass, because their motion of direction will be different: so that the diversity of the angles which the ducts make with the trunk of the artery, is altogether necessary to account for all the possible diversity of secerned fluids, even supposing their diameters and figures to be the same.

3. By the different velocities with which the blood arrives at the orifices of the secretory ducts. For since the secretions are made in a fluid form; no possible reasons can be assigned, why some *animals* have a soft loose texture of the solid parts, and why one part of the body is of an easily separated texture, and others of a firmer, but this different velocity of the blood at the orifices of the secretory ducts, whereby the particles secerned for nourishment, and accretion, are drove or impacted into the vacuola that receive them, with a greater or less force; it being difficult to imagine that such a diversity in texture can altogether proceed from the different solidities and contacts of the constituent parts.

But, even in this, there is something arbitrary, and conjectural: besides, the reasoning is carried to such a length, that in a thing, the principles whereof are so obscure, the parts or organs so imperfectly known, and the whole process carried on out of sight, the mind can scarce safely acquiesce in it.

Mr. Winslow of the Royal Academy of Sciences at Paris, seems to have taken a better course for the discovery of this important action of *secretion*: he does not take up with conjectural principles, nor draw a plausible scheme of reasoning therefrom through the dark; but applies himself to experiment, and investigates, in nature herself, and the structure of the parts, the manner *secretion* is performed in. From a strict examination of the several kinds of glands, both in men and other animals, he finds, with some other anatomists, that the glands are only bundles or plexuses of vessels: but the vessels peculiar to the glands, and which constitute the principal part thereof, Mr. Winslow first discovered to be tubes, furnished, on the inside, with a kind of down or lanugo, or rather with a very fine, spongeous tissue, which fills the whole cavity of those vessels like a pith, or marrow. This he finds in all the glands of all animals. In different glands it appears of different colours; and this different colour is even found in the different glands of foetuses themselves.

The gland then is, or at least its main part is, a compound of these downy or spongeous vessels, which, from their office, we will call *secretory vessels*, or *ducts*; and which frequently do, almost of themselves, form what we call a *gland*, or *glandulous body*: though, besides these vessels, we usually remark four other kinds; viz. arteries, veins, excretory ducts, and nerves. The *secretory* ducts we distinguish from the excretory ones, in that the former, by the peculiar texture of their down, serve to separate a particular liquor; and that the latter only serve to receive the liquor thus secreted, and to carry it to the place it is destined for. For a more particular account of the structure and organization of the glands, see Gland.

For the manner wherein the glands act, in separating the several liquors from the body, Mr. Winslow lays it down thus: it is a thing well known by physicians, and chemists, that a piece of brown paper, which is only an assemblage of small fibres impacted close to each other, having once imbibed oil, or water, will never let any other liquor pass through it, but of the same kind with what it is impregnated with; all others it stops. And the like is observed of a wick of cotton, or other matter; which, having first imbibed its fill of oil, or water, and being then dipped, at one end, in a vessel full of oil and water together; the wick, that had imbibed the oil, will only raise and distil oil; and that with water, only water. Now, in the *secretory* ducts of the glands, we find a parallel structure; an assemblage or plexus of fine threads or filaments bound close together, much as in brown paper or cotton wick; only differently disposed: this plexus, then, having once imbibed a certain juice, will not let pass any of the liquors which arrive at the orifices of these ducts, but that which it had first imbibed. The cause of this phenomenon is doubtless to be referred to the great principle of attraction, which is found stronger between the homogeneous than the heterogeneous parts of the same fluid.

As the blood, then, is not an homogeneous liquor, but a compound of an infinity of different parts or molecules, some oily, others mucilaginous, aqueous, saline, subtil, gross, &c. in its motion along the arteries of the gland, it becomes divided into all the little ramifications thereof; by which means, its velocity is exceedingly abated, and its molecules are obliged to go off, one by one, through the narrow passage of the artery into the vein; and, of consequence, to pass over the orifices of the *secretory* ducts of the glands, whose down is already tinged with a juice of a certain nature: such of the molecules, therefore, as are found of the same nature with the juice they meet with at the entrance of the *secretory* duct, join themselves to them, and enter the ducts driven on by others that follow them. Thus they pass, successively, through the whole vessel, and, at length, go out of it into the excretory duct; while the rest, which are of a different kind, run over the orifice of the *secretory* vessel, without ever mixing with the juice thereof; and thus, arriving in the vein, they are carried back to the heart.

All that remains is, to explain how these parts should have first imbibed the particular juices necessary for their respective *secretions*: how, for instance, the bile should come to be separated in the liver, for the first time, preferably to any other liquor? To this Mr. Winslow answers, that, having observed the glands of the smallest foetus to be coloured much as in adults, it appears highly probable, they had been imbued with the juices they were to filtrate, at the first formation of the animal, or at the same time when the solid parts of the fabric themselves were framed.

SECT, *secta*, a collective term, comprehending all such as follow the doctrines, or opinions, of some famous divine, or philosopher, &c.

The *sects* of philosophers among the ancients, particularly in Greece, were numerous; as the Pyrrhonians, Platonists, Epicureans, Stoics, Peripatetics, Academics, &c. See each under its proper article.

At present, the *sects* of philosophy are chiefly reducible to three; viz. the Cartesians, Peripatetics, and Newtonians. See Cartesian, &c.

In theology, the *sects* are much more numerous; yet the ancients had many legions, now extinct; as Manichees, Gnostics, Montanists, &c.

The principal now on foot are the Lutherans, Calvinists, Anabaptists, Arians, Socinians, and Arminians. The rise, progress, and fate, with the distinguishing characters and opinions of each, see under Lutheran, Calvinist, &c.

Sect, *Ionic*. See Ionic.

Sect, *Italic*. See Italic.

SECTA, in *Law*. See Suit.

Secta, *hundred*. See Hundred *suit*.

Secta *ad curiam*, a writ which lieth against him who refuseth to perform his suit to the county court, or court baron.

Secta *curia*. See Suit *of court*.

Secta *facienda per illam quæ habet æniciam partem*, a writ to compel the heir that hath the elder's part among coheirs, to perform service for all the coparceners.

Secta *faldæ*. See Faldage.

Secta *ad justitiam faciendam* is a service which a man is bound to perform by his fee.

Secta *molendini*, a writ lying where a man by usage, time out of mind, &c. has ground his corn at the mill of a certain person, and afterward goes to another mill with his corn, thereby withdrawing his suit to the former. And this writ lies especially for the lord against his tenants, who hold of him to do suit at his mill. This is now generally turned into an action of the case.

Secta *regalis*, a suit by which all persons were bound twice in a year to attend the sheriff's tourn, and was called *regalis*, because the sheriff's tourn was the king's leet; wherein the people were to be obliged by oath to bear true allegiance to the king, &c.

Secta *unica tantum facienda pro pluribus hæreditatibus*, a writ

writ that lies for an heir who is distrained by the lord to do more suits than one, in respect of the land of divers heirs descended to him.

SECTILIA, among the Romans, pavements laid with stones cut into various forms. Suetonius distinguishes them from those that were tesselated.

SECTINEUS, a small, flat, and pretty long muscle, broad at the upper part, and narrow at the lower; situated obliquely between the os pubis, and the upper part of the os femoris.

It is commonly a single muscle, but is sometimes found double. It is fixed above by fleshy fibres to all the sharp ridge, or crista, of the os pubis, and to a small part of the oblong notch, or depression, on the foreside of the crista, in which the upper extremity of this muscle is lodged; and thence it runs down obliquely towards the little trochanter, under, and a little behind which it is inserted obliquely by a flat tendon, between the superior insertion of the vastus internus, and inferior insertion of the triceps secundus, with which it is united. Winslow.

SECTIO *Cæsarea.* See CÆSARIAN *section.*

SECTION, *sectio*, formed from *seco, I cut*, a part of a thing divided; or the division itself.

Such, particularly, are the subdivisions of chapters, by others called *paragraphs*, and sometimes *articles.* The mark of a *section* is §.

The ancients neglected to divide their books into chapters, and *sections*: that was a task left for future editors and critics.

SECTION, in *Geometry*, denotes a side or surface appearing of a body, or figure, cut by another; or the place wherein lines, planes, &c. cut each other.

The common *section* of two planes is always a right line; being the line supposed to be drawn by the one plane in its cutting or entering the other.

If a sphere be cut in any manner, the plane of the *section* will be a circle, whose centre is in the diameter of the sphere.

The *sections* of the cone are four; viz. a circle, parabola, hyperbola, and ellipsis. See each under its proper article. See also CONE.

SECTIONS, *conic.* See CONIC *section.*

SECTION, *axis of a conic.* See AXIS.

SECTION, *centre of a conic.* See CENTER.

SECTION, *diameter of a conic.* See DIAMETER.

SECTION, *tangent of a conic.* See TANGENT.

SECTIONS, *following, sectiones sequentes*, in *Conics*, may be thus conceived: suppose two right lines, as A B, C D (*Tab. Conics, fig.* 5.) mutually intersecting one another in E, which point E is supposed to be the common centre of the opposite hyperbolic *sections* F, G, H, I, and whose common asymptotes, the proposed lines A B, C D, also are. In this case, the *sections* G, F, and H, I, are called *sectiones sequentes*; because they are placed following one another in the contiguous angles of two intersecting right lines.

If the determinate diameter H, G, of one of the *sectiones sequentes* (which is coincident with the supposed indeterminate diameter of its opposite) be equal to the vertical tangent K L, applied between the asymptotes in the point G, of the diameter G F; then Apollonius calls such *sections, conjugate sections.* See *Genesis of the hyperbola*, under CONIC *sections.*

SECTIONS, *opposite.* See OPPOSITE.

SECTIONS, *similar.* See SIMILAR.

SECTION *of a building* denotes its PROFILE, or a delineation of its heights and depths raised on the plan; as if the fabric was cut asunder to discover the inside.

SECTION, *horizontal.* See ICHNOGRAPHY.

SECTIS *non faciendis*, a writ brought by a woman, who for her dower, &c. ought not to perform suit of court.

SECTOR, in *Geometry*, a part of a circle comprehended between the radii and the arch.

Thus the mixt triangle A C D (*Tab.* IV. *Geometry, fig.* 102.) comprehended between the radii A C and C D, and the arch A D, is a *sector of the circle.*

It is demonstrated by geometricians, that the *sector* of a circle, as A C D, is equal to a triangle, whose base is the arch A D, and its altitude the radius A C.

If from the common centre of two concentric circles be drawn two radii to the periphery of the outer, the two arches included between the radii will have the same ratio to their peripheries; and the two *sectors*, the same ratio to the areas of their circles.

To find the area of a *sector* D C E; the radius of the circle C D, and the arch D E, being given. To 100,314, and the radius D C, find a fourth proportional number; this will be the semiperiphery: then to 180 degrees, the given arch D E, and the semiperiphery just found, find another fourth proportional; this will give the arch D E in the same measure in which the radius D C is given: lastly, multiply the arch D E into the semiradius, and the product is the area of the *sector.*

SECTOR also denotes a mathematical instrument, of great use in finding the proportion between quantities of the same kind: as between lines and lines, surfaces and surfaces, &c. whence the French call it the *compass of proportion.*

The great advantage of the *sector* above the common scales, &c. is, that it is made so as to fit all radiuses, and all scales. By the lines of chords, sines, &c. on the *sector*, we have lines of chords, sines, &c. to any radius betwixt the length and breadth of the *sector* when open.

The *sector* is founded on the fourth proposition of the sixth book of Euclid; where it is demonstrated, that similar triangles have their homologous sides proportional. An idea of the theory of its construction may be conceived thus. Let the lines A B, A C (*Tab.* IV. *Geometry, fig.* 103.) represent the legs of the *sector*; and A D, A E, two equal sections from the centre: if, now, the points C B and D E be connected, the lines C B and D E will be parallel; therefore the triangles A D E, A C B, will be similar; and, consequently, the sides A D, D E, A B, and B C, proportional; that is, as A D : D E :: A B : B C: whence, if A D be the half, third, or fourth part of A B; D E will be a half, third or fourth part of C B: and the same holds of all the rest.

If, therefore, A D be the chord, sine, or tangent, of any number of degrees to the radius A B; D E will be the same to the radius B C.

SECTOR, *description of the.* The instrument consists of two rulers, or legs, of brass or ivory, or any other matter, representing the radii, moveable round an axis or joint, the middle of which expresses the centre; whence several scales are drawn on the faces of the rulers. See *Tab.* IV. *Geometry, fig.* 104.

The scales generally put on *sectors* may be distinguished into single and double. The single scales are such as are commonly put upon plain scales: the double scales are those which proceed from the centre; each scale is laid twice on the same face of the instrument, viz. once on each leg: from these scales, dimensions or distances are to be taken, when the legs of the instrument are in an angular position.

The scale commonly put upon the best *sectors* are

Single	1	a line of	Inches, each inch divided into 8 and 10 parts.		
	2		Decimals, containing 100 parts.		
	3		Chords,	marked	Cho.
	4		Sines,		Sin.
	5		Tangents,		Tang.
	6		Rhumbs,		Rum.
	7		Latitude,		Lat.
	8		Hours,		Hou.
	9		Longitude,		Lon.
	10		Inclin. Merid.		In. Mer.
	11		the Logarithms of Numbers,		Num.
	12		the Logarithms of Sines,		Sin.
	13		the Logarithms of Versed sines,		V. Sin.
	14		the Logarithms of Tangents,		Tan.

Double	1	a line of	Lines, or of equal parts,	marked	Lin.
	2		Chords,		Cho.
	3		Sines,		Sin.
	4		Tangents to 45°		Tan.
	5		Secants,		Sec.
	6		Tangents to above 45°		Tan.
	7		Polygons,		Pol.

The manner in which these scales are disposed of on the *sector*, is best seen in the figure.

The scales of lines, chords, sines, tangents, rhumbs, latitudes, hours, longitude, incl. merid. may be used, whether the instrument is shut or open, each of these scales being contained on one of the legs only. The scales of inches, decimals, log. numbers, log. sines, log. versed sines, and log. tangents, are to be used with the *sector* quite opened, part of each scale lying on both legs.

The double scales of lines, chords, sines, and lower tangents, or tangents under 45 degrees, are all of the same radius or length; they begin at the centre of the instrument, and are terminated near the other extremity of each leg; viz. the lines at the division 10, the chords at 60, the sines at 90, and the tangents at 45; the remainder of the tangents, or those above 45°, are on other scales beginning at ¼ of the length of the former, counted from the centre, where they are marked with 45, and run to about 76 degrees.

The secants also begin at the same distance from the centre, where they are marked with 10, and are from thence continued to as many degrees as the length of the *sector* will allow, which is about 75°.

The angles made by the double ſcales of lines, of chords, of ſines, and of tangents to 45 degrees, are always equal. And the angles made by the ſcales of upper tangents, and of ſecants, are alſo equal; and ſometimes theſe angles are made equal to thoſe made by the other double ſcales.

The ſcales of polygons are put near the inner edge of the legs, their beginning is not ſo far removed from the centre, as the 60 on the chords is. Where theſe ſcales begin, they are marked with 4, and from thence are figured backwards, or towards the centre, to 12.

From this diſpoſition of the double ſcales, it is plain, that thoſe angles which were equal to each other, while the legs of the *ſector* were cloſe, will ſtill continue to be equal, although the *ſector* be opened to any diſtance it will admit of.

The ſcale of inches is laid cloſe to the edge of the *ſector*, and ſometimes on the edge; and contains as many inches as the inſtrument will receive when opened; each inch being uſually divided into eight, and alſo into ten equal parts. The decimal ſcale lies next to this: it is of the length of the *ſector*, when opened, and is divided into ten equal parts, or primary diviſions, and each of theſe into ten other equal parts; ſo that the whole is divided into a hundred equal parts: and if the *ſector* admits of it, each of the ſubdiviſions is divided into two, four, or five parts; and by this decimal ſcale, all the other ſcales, that are taken from tables, may be laid down. The length of a *ſector* is uſually underſtood when it is ſhut; and, therefore, a *ſector* of ſix inches makes a ruler of twelve inches when opened; and a foot *ſector* is two feet long when quite opened. The ſcales of chords, rhumbs, ſines, tangents, hours, latitudes, longitudes, and inclinations of meridians, are ſuch as are deſcribed under *Plane* Scale.

The ſcale of logarithmic or artificial numbers, called *Gunter's ſcale*, or Gunter's *line*, is a ſcale expreſſing the logarithms of common numbers, taken in their natural order.

For the conſtruction of this ſcale, and alſo of thoſe of logarithmic ſines, logarithmic tangents, and logarithmic verſed ſines, ſee Gunter's *line*, and Gunter's *ſcale*.

We ſhall here obſerve, that all theſe ſcales ſhould have one common termination to one end of each ſcale, i. e. the 10 on the numbers, the 90 on the ſines, the 0 on the verſed ſines, and the 45 on the tangents, ſhould be oppoſite to each other: the other end of each of the ſcales of ſines, verſed ſines, and tangents, will run out beyond the beginning (marked 1) of the numbers; nearly oppoſite to which will be the diviſions repreſenting 35 minutes on the ſines and tangents, and $168\frac{1}{2}$ degrees, on the verſed ſines.

The double ſcales are conſtructed in the following manner. The line of lines is only a ſcale of equal parts, whoſe length is adapted to that of the legs of the *ſector*: thus, in the ſix-inch *ſector*, the length is about $5\frac{3}{4}$ inches. The length of this ſcale is divided into primary diviſions; each of theſe into ten equal ſecondary parts; and each ſecondary diviſion into four equal parts. The accuracy of the diviſion may be determined by taking between the compaſſes any number of equal parts from this line, and applying that diſtance to all the parts of the line; and if the ſame number of diviſions be contained between the points of the compaſſes in every application, the ſcale may be received as perfect. The line of ſines is conſtructed by making the whole length of this ſcale equal to that of the line of lines; and from this line taking off ſeverally the parts expreſſed by the numbers in the tables of the natural ſines, correſponding to the degrees, or to the degrees and minutes, intended to be laid upon the ſcale: and then by laying down theſe ſeveral diſtances on the ſcale, beginning from the centre. In ſcales of this length, it is cuſtomary to lay down diviſions, expreſſing every 15 minutes, from 0 degree to 60 degrees; between 60 and 80 degrees, every half degree is expreſſed; then every degree to 85; and the next is 90 degrees. The length of the ſcale of tangents is equal to that of the line of lines, and the ſeveral diviſions upon it (to 45 degrees) are laid down from the tables and line of lines, in the ſame manner as the former; obſerving to uſe the natural tangents in the tables.

The ſcale of upper tangents is laid down, by taking $\frac{1}{4}$ of ſuch of the natural tabular tangents above 45 degrees, as are intended to be put upon the ſcale. The beginning of this ſcale, at 45 degrees, though the poſition of it on the *ſector* reſpects the centre of the inſtrument, is diſtant from the centre $\frac{1}{4}$ of the length or radius of the lower tangents.

The diſtance of the beginning of the ſcale of ſecants from the centre, and the manner of laying it down are the ſame as thoſe of the upper tangents: except that in this the tabular ſecants are to be uſed.

For the ſcale of chords; its length is to be made equal to that of the ſines; and the diviſions, which are twice the length of the ſines of half the degrees and minutes, counted from the centre, expreſs every 15 minutes from 0 degrees to 60 degrees, to be laid down as in the ſcale of ſines.

The ſcale of polygons uſually comprehends the ſides of the polygons from ſix to twelve ſides incluſive. The diviſions are laid down by taking the lengths of the chords of the angles at the centre of each polygon, and laying them down from the centre of the inſtrument. When the polygons of four and five ſides are alſo introduced, this line is conſtructed from a ſcale of chords, where the length of 90 degrees is equal to that of 60 degrees of the double ſcale of chords on the *ſector*. Inſtead of ſome of the double ſcales above deſcribed, there are found other ſcales on the old *ſectors*, and alſo on ſome of the French ones, ſuch as ſcales of ſuperficies, of ſolids, of inſcribed bodies, of metals, &c. but theſe are left out to make room for others of more general uſe. See Caliber.

In deſcribing the uſe of the *ſector*, the terms, *lateral diſtance* and *tranſverſe diſtance*, often occur. By the former is meant the diſtance taken with the compaſſes on one of the ſcales only, beginning at the centre of the *ſector*; and by the latter, the diſtance taken between any two correſponding diviſions of the ſcales of the ſame name, the legs of the *ſector* being in an angular poſition: but in taking theſe tranſverſe diſtances, it is to be obſerved, that each of the ſeveral ſcales hath three parallel lines, acroſs which the diviſions of the ſcale are marked, and that the points of the compaſſes muſt be always ſet on the inſide line, or that line next the inner edge of the leg, which is the only line, in each ſcale, which runs to the centre.

For the uſe of the logarithmic ſcale of numbers, ſee Gunter's *line*.

Sector, *uſe of the line of lines on the*. 1. To divide a given line into any number of equal parts; e. g. 9. Make the length of the given line or ſome known part thereof, a tranſverſe diſtance to 9 and 9: then will the tranſverſe diſtance of 1 and 1 be the $\frac{1}{9}$ part thereof; or ſuch a ſubmultiple of the $\frac{1}{9}$ part, as was taken of the given line: or, the $\frac{1}{9}$ part will be the difference between the given line, and the tranverſe diſtance of 8 and 8. Hence, 2. To make a ſcale of a given length, to contain a given number of equal parts; e. g. let the ſcale to the map of a ſurvey be 6 inches long, and contain 140 poles, and let it be required to open the *ſector*, ſo that a correſponding ſcale may be taken from the line of lines. Make the tranſverſe diſtance 7 and 7 (or 70 and 70, viz. $\frac{140}{2}$) equal to 3 inches ($=\frac{6}{2}$); and this poſition of the line of lines will produce the given ſcale.

3. To divide a given line (e. g. of 5 inches) into any aſſigned proportion, as of 4 to 5. Make 5 inches, the length of the given line, a tranſverſe diſtance to 9 and 9, the ſum of the propoſed parts; and the tranſverſe diſtances of the aſſigned numbers, 4 and 5, will be the parts required.

4. To 2 given lines, viz. 2 and 6, to find a third proportional. Take between the compaſſes the lateral diſtance of the ſecond term, viz. 6; ſet one point on the diviſion expreſſing the firſt term, viz. 2, on one leg, and open the legs of the *ſector* till the other point will fall on the correſponding diviſion on the other leg: keeping the legs of the *ſector* in this poſition, take the tranſverſe diſtance of the ſecond term, viz. 6, and this diſtance is the third term required, which diſtance, meaſured laterally from the centre, will give 18, the number required: for 2 : 6 :: 6 : 18. Otherwiſe, take the diſtance 2 laterally, and apply it tranſverſely to 6 and 6, the *ſector* being properly opened; then the tranſverſe diſtance at 2 and 2, being taken with the compaſſes, and applied laterally from the centre of the *ſector* on the ſcale of lines, will give the third term, when the proportion is decreaſing: for 6 : 2 :: 2 : $\frac{2}{3}$. If the legs of the *ſector* will not open ſo far as to let the lateral diſtance of the ſecond term fall between the diviſions expreſſing the firſt term; then take $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, or any aliquot part of the ſecond term, that will conveniently fall within the opening of the *ſector*, and make ſuch part the tranſverſe diſtance of the firſt term: then, if the tranſverſe diſtance of the ſecond term be multiplied by the denominator of the part taken of the ſecond term, the product will give the third term.

5. To 3 given lines, viz. 3, 7, and 10, to find a fourth proportional. Open the legs of the *ſector*, till the tranſverſe diſtance of the firſt term, 3, be equal to the lateral diſtance of the ſecond term, 7, or to ſome part thereof; then will the tranſverſe diſtance of the third term, 10, give the fourth term, $23\frac{1}{3}$, required; or ſuch a ſubmultiple thereof as was taken of the ſecond term; for 3 : 7 :: 10 : $23\frac{1}{3}$. Otherwiſe, ſet the lateral diſtance 7 tranſ-

tranſverſely from 10 to 10, opening the *ſector* accordingly; and the tranſverſe diſtance at 3 and 3 applied laterally will give $2\frac{1}{10}$; for 10 : 7 :: 3 : $2\frac{1}{10}$.

6. To diminiſh a line of 4 inches, in the proportion of 8 to 7. Open the *ſector* till the tranſverſe diſtance of 8 and 8 be equal to the lateral diſtance of 7: mark the point, where 4 inches, as a lateral diſtance, taken from the centre, reaches; and the tranſverſe diſtance, taken at that point, will be the line required. If the line ſhould be too long for the legs of the *ſector*, take $\frac{1}{2}$, $\frac{1}{3}$, or $\frac{1}{4}$, &c. part of the given line for the lateral diſtance, and the correſponding tranſverſe diſtance, taken twice, thrice, or four times, &c. will be the line required.

7. To open the *ſector* ſo, that the 2 ſcales of lines ſhall make a right angle. Take the lateral diſtance from the centre to the diviſion, marked 5, between the points of the compaſſes, and ſet one foot in the diviſion marked 4 on one of the ſcales of lines, and open the legs of the *ſector* till the other foot falls on the diviſion marked 3, on the other ſcale of lines; and then will thoſe ſcales ſtand at right angles to one another; for the lines 3, 4, 5, or any of their multiples, conſtitute a right angled triangle.

8. To 2 right lines given, e. g. 40 and 90, to find a mean proportional. Set the 2 ſcales of lines at right angles; find the half ſum of the given lines, viz. 65, and the half difference, viz. 25; and take with the compaſſes, the lateral diſtance of the half ſum, 65, and apply one foot to the half difference, 25, the other foot tranſverſely will reach to 60, the mean proportional required; for 40 : 60 :: 60 : 90.

SECTOR, *uſe of the ſcale of chords on the.* 1. To open the *ſector* ſo that the two ſcales of chords may make an angle of any number of degrees, e. g. 40. Take the diſtance from the joint to 40, the number of degrees propoſed on the ſcale of chords; open the *ſector* till the tranſverſe diſtance from 60 to 60, on each leg, be equal to the aforeſaid lateral diſtance of 40: then do the ſcales of chords make the angle required.

2. The *ſector* being opened, to find the degrees of its aperture. Take the extent from 60 to 60, and lay it off on the ſcale of chords from the centre: the number, where it terminates, ſhews the degrees of its opening. By applying ſights on the ſcale of chords, the *ſector* may be uſed to take angles, as a ſurveying inſtrument.

3. To protract or lay down an angle, of any given number of degrees. 1. Let the number of degrees be leſs than 60, viz. 46. At any opening of the *ſector*, take the tranſverſe diſtance of 60 and 60 on the chords; and with this opening deſcribe an arc: take the tranſverſe diſtance of the given number of degrees 46, and lay this diſtance on the arc deſcribed, marking its extremities: from the centre of the arc, through theſe extremities, draw two lines, and they will contain the angle required.

2. When the degrees given are more than 60, viz. 148. Deſcribe the arc as before; take the tranſverſe diſtance of $\frac{1}{2}$ or $\frac{1}{3}$ of the given degrees, 148, e. g. $\frac{1}{3}=49\frac{1}{3}$ degrees: lay this diſtance on the arc thrice; and from the centre draw two lines to the extremities of the arc thus determined, and they will contain the required angle. N. B. If the radius of the arc or circle is to be of a given length; then make the tranſverſe diſtance of 60 and 60 equal to that aſſigned length.

4. To find the degrees which a given angle contains. About the vertex deſcribe an arc, and open the *ſector* till the diſtance from 60 to 60, on each leg, be equal to the radius of the circle; then taking the chord of the arc between the compaſſes, and carrying it on the legs of the *ſector*, ſee what equal number, on each leg, the points of the compaſſes fall on: this is the quantity of degrees the given angle contains.

5. To take an arc, of any quantity, from off the circumference of a circle. Open the *ſector* till the diſtance from 60 to 60 be equal to the radius of the given circle; then take the extent of the chord of the number of degrees, on each leg of the *ſector*, and lay it off on the circumference of the given circle. By this uſe, may any regular polygon be inſcribed in a given circle, as well as by the line of polygons: e. g. in a circle whoſe diameter is given to deſcribe a regular polygon of 24 ſides. Make the given diameter a tranſverſe diſtance from 60 to 60 on the ſcales of chords; divide 360 by 24, and take the tranſverſe diſtance of 15 and 15, the quotient, and this will be the chord of the twenty-fourth part of the circumference. In order to prevent errors, where the diſtance is to be repeated ſeveral times, it will be beſt to proceed thus: with the chord of 60 degrees divide the circumference into 6 equal parts; in every diviſion of 60 degrees lay down, firſt, the chord of 15 degrees, and next the chord of 30 degrees, and then the chord of 45 degrees, beginning always at the ſame point. Thus the error in taking diſtances will not be multiplied into any of the diviſions following the firſt.

SECTOR, *uſe of the line of polygons on the.* 1. In a given circle to inſcribe a regular polygon, e. g. an octagon. Open the legs of the *ſector*, till the tranſverſe diſtance of 6 and 6 be equal to the given diameter, then will the tranſverſe diſtance of 8 and 8 be the ſide of an octagon, which may be inſcribed in the given circle. In like manner may any other polygon, the number of whoſe ſides does not exceed 12, be inſcribed in a given circle.

2. On a given line to deſcribe a regular polygon, e. g. a pentagon. Make the given line a tranſverſe diſtance to 5 and 5: at that opening of the *ſector*, take the tranſverſe diſtance of 6 and 6; and with this radius, on the extremities of the line, as centres, deſcribe arcs interſecting each other; and on the point of interſection, as a centre, with the ſame radius, deſcribe a circumference paſſing through the extremities of the given line; and in this circle may the pentagon, whoſe ſide is given, be inſcribed. By a like proceſs may any other polygon, of not more than 12 ſides, be deſcribed on a given line.

3. On a right line, to deſcribe an iſoſceles triangle, having the angles at the baſe double that at the vertex. Open the *ſector* till the ends of the given line fall on 10 and 10 on each leg; then take the diſtance from 6 to 6; this will be the length of the two equal ſides of the triangle.

SECTOR, *uſe of the ſcales of ſines, tangents, and ſecants, on the.* By the ſeveral lines diſpoſed on the *ſector*, we have ſcales to ſeveral radiuſes: ſo that, 1. having a length, or radius, given, not exceeding the length of the *ſector* when opened, we find the chord, ſine, &c. thereto: e. g. ſuppoſe the chord, ſine, or tangent, of 10 degrees to a radius of 3 inches required. Make 3 inches the aperture, or tranſverſe diſtance, between 60 and 60 on the ſcales of chords of the two legs; then will the ſame extent reach from 45 to 45 on the ſcale of tangents, and from 90 to 90 on the ſcale of ſines on the other ſide; ſo that to whatever radius the line of chords is ſet, to the ſame are all the others ſet. In this diſpoſition, therefore, if the aperture, or tranſverſe diſtance, between 10 and 10, on the ſcales of chords, be taken with the compaſſes, it will give the chord of 10 degrees; if the tranſverſe diſtance of 10 and 10 be in like manner taken, on the ſcales of ſines, it will be the ſine of 10 degrees: laſtly, if the tranſverſe diſtance of 10 and 10 be in like manner taken on the ſcales of tangents, it gives the tangent of 10 degrees, to the ſame radius.

2. If the chord, or tangent, of 70 degrees were required: for the chord, the tranſverſe diſtance of half the arc, viz. 35, muſt be taken, as before; which diſtance, being repeated twice, gives the chord of 70 degrees. To find the tangent of 70 degrees, to the ſame radius, the ſcale of upper tangents muſt be uſed, the other only reaching to 45: making, therefore, 3 inches the tranſverſe diſtance between 45 and 45 at the beginning of that ſcale; the extent between 70 and 70 degrees, on the ſame, will be the tangent of 70 degrees to 3 inches radius.

3. To find the ſecant of an arc, make the given radius the tranſverſe diſtance between 0 and 0 on the line of ſecants; then will the tranſverſe diſtance of 10 and 10, or 70 and 70, on the ſaid lines, give the ſecant of 10 degrees, or 70 degrees.

The ſcales of upper tangents and ſecants do not run quite to 76 degrees; but thoſe of a greater number of degrees may be found by the *ſector* in the following manner. Thus, the tangent of any number of degrees may be taken from the *ſector* at once; if the radius of the circle can be made a tranſverſe diſtance to the complement of thoſe degrees on the lower tangent. E. g. To find the tangent of 78 degrees to a radius of 2 inches. Make 2 inches a tranſverſe diſtance to 12 degrees on the lower tangents: then the tranſverſe diſtance of 45 degrees will be the tangent of 78 degrees. In like manner the ſecant of any number of degrees may be taken from the ſines, if the radius of the circle can be made a tranſverſe diſtance to the coſine of thoſe degrees. Thus making 2 inches a tranſverſe diſtance to the ſine of 12 degrees, then the tranſverſe diſtance of 90 and 90 will be the ſecant of 78 degrees. Hence it will be eaſy to find the degrees anſwering to a given line, expreſſing the length of a tangent or ſecant, which is too long to be meaſured on thoſe ſcales, when the *ſector* is ſet to the given radius. Thus, for a tangent, make the given line a tranſverſe diſtance to 45 and 45 on the lower tangents; then take the given radius, and apply it to the lower tangents: and the degrees, where it becomes a tranſverſe diſtance, give the cotangent of the degrees anſwering to the given line. And for a ſecant, make the given line a tranſverſe diſtance to 90 and 90 on the ſines: then the degrees anſwering to the given radius applied as a tranſverſe diſtance on the ſines, will be the coſine of the degrees anſwering to the given ſecant line.

4. If the converſe of any of theſe things were required,

that is, if the radius be required, to which a given line is the ſine, tangent, or ſecant: it is but making the given line, if a chord, the tranſverſe diſtance on the line of chords, between 10 and 10, and then the *ſector* will ſtand at the radius required: that is, the aperture between 60 and 60, on the ſaid line, is the radius.

If the given line were a ſine, tangent, or ſecant, it is but making it the tranſverſe diſtance of the given number of degrees: then will the diſtance of 90 and 90 on the ſines, of 45 and 45 on the lower tangents near the end of the *ſector*, and of 45 and 45 on the upper tangents towards the centre of the *ſector*, and of 0 and 0 on the ſecants, be the radius.

5. If the radius, and any line repreſenting a ſine, tangent, or ſecant, be given, the degrees correſponding to that line may be found by ſetting the *ſector* to the given radius, according as a ſine, tangent, or ſecant, is concerned; taking the given line between the compaſſes, applying the two feet tranſverſely to the ſcale concerned, and ſliding the feet along till they both reſt on like diviſions on both legs: and the diviſions will ſhew the degrees and parts correſponding to the given line.

For the method of determining the degrees anſwering to any tangent, or ſecant, that cannot be thus meaſured, ſee above.

6. To find the length of a verſed ſine to a given number of degrees, and a given radius. Make the tranſverſe diſtance of 90 and 90 in the ſines equal to the given radius; take the tranſverſe diſtance of the ſine complement of the given degrees; if the given degrees are leſs than 90, the difference, but if greater, the ſum of the ſine complement and radius gives the verſed ſine.

7. To open the legs of the *ſector* ſo that the correſponding double ſcales of lines, chords, ſines, tangents, may make, each of them, a right angle. On the lines, make the lateral diſtance 10, a diſtance between 8 on one leg, and 6 on the other leg; on the ſines, make the lateral diſtance 90 a tranſverſe diſtance from 45 to 45, or from 40 to 50, or from 30 to 60, or from the ſine of any degrees to their complement: or, on the ſines, make the lateral diſtance of 45 a tranſverſe diſtance between 30 and 30.

SECTOR *in trigonometry, uſe of the.* 1. The baſe and perpendicular of a right-angled triangle being given, to find the hypothenuſe. Suppoſe the baſe A C (*Tab. Trigonometry, fig.* 4.) 40 miles, and the perpendicular A B 30; open the *ſector* till the two ſcales of lines make a right angle: then, for the baſe, take 40 parts on the ſcale of lines on one leg; and, for the perpendicular, take 30 on the ſame ſcale on the other leg: then the extent from 40 on the one to 30 on the other, taken in the compaſſes, will be the length of the hypothenuſe; which line, applied to the ſcale of lines, will be found 50 miles.

2. The perpendicular A B of a right-angled triangle A B C being given, 30, and the angle B C A 37 degrees; to find the hypothenuſe B C. Take the given ſide A B, and ſet it over, on each ſide, on the ſine of the given angle A C B: then the parallel diſtance of 90 and 90 or radius, will be the hypothenuſe B C; which will meaſure 50 on the ſcale of lines.

3. The hypothenuſe and baſe being given, to find the perpendicular. Open the *ſector* till the two ſcales of lines be at right angles; then lay off the given baſe on one of thoſe ſcales from the centre; take the hypothenuſe in your compaſſes, and ſetting one foot in the term of the given baſe, let the other fall on the ſcale of lines on the other leg: the diſtance from the centre to the point where the compaſſes fall will be the length of the perpendicular.

4. The hypothenuſe being given, and the angle A C B; to find the perpendicular. Make the given hypothenuſe a parallel radius, i. e. make it the extent from 90 to 90 on the ſcales of ſines; then will the parallel ſine of the angle A C B be the length of the ſide A B.

5. The baſe and perpendicular A B given, to find the angle B C A. Lay off the baſe A C, on both ſides the *ſector*, from the centre, and note its extent; then take the given perpendicular, and to it open the *ſector* in the terms of the baſe: the parallel radius will be the tangent of B C A.

6. In any right-lined triangle, two ſides being given, with the included angle; to find the third ſide. Suppoſe the ſide A C (*fig.* 5.) 20, the ſide B C 30, and the included angle A C B 110 degrees; open the *ſector* till the two ſcales of lines make an angle equal to the given angle, viz. 110 degrees; lay off the given ſides of the triangle, from the centre of the *ſector*, on each of the ſcales of lines: the extent between their extremes is the length of the ſide A B ſought.

7. The angles C A B and A C B given, and the ſide C B; to find the baſe A B. Take the given ſide C B, and turn it into the parallel ſine of its oppoſite angle C A B; and then the parallel ſine of the angle A C B will be the length of the baſe A B.

8. The three angles of a triangle being given; to find the proportion of the ſides. Take the lateral ſines of the ſeveral angles, and meaſure them in the ſcale of lines; the numbers anſwering thereto give the proportion of the ſides.

9. The three ſides being given, to find the angle A C B. Lay the ſides A C, C B, along the ſcales of lines, from the centre, and ſet over the ſide A B in their terms: ſo is the *ſector* opened, in theſe lines, to the quantity of the angle A C B.

10. The hypothenuſe A C (*fig.* 6.) of a right-angled ſpherical triangle A B C, given, e. g. 43 degrees, and the angle C A B 20 degrees; to find the ſide C B. The rule is, as radius is to the ſign of the given hypothenuſe 43 degrees, ſo is the ſine of the given angle 20 degrees to the ſine of the perpendicular C B. Take then 20 degrees from the centre, along the ſcale of ſines, in your compaſſes, and ſet the extent from 90 to 90, on the two legs; and the parallel ſine of 43 degrees, the given hypothenuſe, will, when meaſured from the centre on the ſcale of ſines, give 13° 30′, the ſide required.

11. The perpendicular B C, and the hypothenuſe A C given, to find the baſe A B. As the ſine complement of the perpendicular B C is to radius, ſo is the ſine complement of the hypothenuſe to the ſine complement of the baſe. Therefore make the radius a parallel ſine of the complement of the given perpendicular, e. gr. 76° 30′; then the parallel ſine of the complement of the hypothenuſe, e. gr. 47°, meaſured along the ſcale of ſines, will be found 49° 25′, the complement of the baſe required; conſequently the baſe itſelf will be 40° 35′.

SECTOR *in geometry, &c. particular uſes of the.* 1. To make a regular polygon, whoſe area ſhall be of any given magnitude. Let the figure required be a pentagon, whoſe ſuperficial area is 125 feet; extract the ſquare root of $\frac{1}{5}$ of 125, it will be found 5. Make a ſquare, whoſe ſide is 5 feet; and, by the line of polygons, as already directed, make the iſoſceles triangle C G D (*Tab.* IV. *Geom. fig.* 105.) ſo as that C G being the ſemidiameter of a circle, C D may be the ſide of a regular pentagon inſcribed therein; then let fall the perpendicular G E. Then continuing the lines E G and E C, make E F equal to the ſide of the ſquare before made; and from the point F, draw the right line F H parallel to G C; then a mean proportional between G E and E F will be equal to half the ſide of the polygon ſought, which, doubled, will give the whole ſide. The ſide of the pentagon thus had, the pentagon itſelf may be deſcribed, as above directed.

2. A circle being given, to find a ſquare equal to it. Divide the diameter into fourteen equal parts, by the ſcale of lines, as above directed; then will 12.4 of thoſe parts, found by the ſame line, be the ſide of the ſquare ſought.

3. A ſquare being given, to find the diameter of a circle equal to it. Divide the ſide of the ſquare into eleven equal parts, by means of the ſcale of lines; and continue that ſide to 12.4 parts; this will be the diameter of the circle required.

4. To find the ſide of a ſquare equal to an ellipſis, whoſe tranſverſe and conjugate diameters are given. Find a mean proportional between the tranſverſe and conjugate diameters; which being divided into fourteen equal parts, $12\frac{4}{10}$ thereof will be the ſide of the ſquare required.

5. To deſcribe an ellipſis in any given ratio of its diameter, the area whereof ſhall be equal to a given ſquare. Suppoſe the proportion of the tranſverſe and conjugate diameters be required, as 2 to 1; divide the ſide of the given ſquare into eleven equal parts: then, as 2 is to 1, ſo is $11 \times 14 = 154$ to a fourth number; the ſquare root whereof is the conjugate diameter ſought. Then, as 1 to 2, ſo is the conjugate diameter to the tranſverſe. Now,

6. To deſcribe an ellipſis, by having the tranſverſe and conjugate diameters given. Let the two diameters A B, C D, biſect each other at right angles in E (*Tab.* IV. *Geometry, fig.* 106.) Make A E a tranſverſe diameter to 90 and 90 on the ſines; and take the tranſverſe diſtances of 10°, 20°, 30°, 40°, 50°, 60°, 70°, 80°, ſucceſſively, and apply thoſe diſtances to A E from E towards A, as at the points 1, 2, 3, 4, 5, 6, 7, 8; and through thoſe points draw lines parallel to E C; make E C a tranſverſe diſtance to 90 and 90 on the ſines; take the tranſverſe diſtances of 80°, 70°, 60°, 50°, 40°, 30°, 20°, 10°, ſucceſſively, and apply theſe diſtances to the parallel lines from 1 to 1, 2 to 2, 3 to 3, 4 to 4, 5 to 5, 6 to 6, 7 to 7, 8 to 8, and ſo many points will be obtained, through which the curve of the ellipſis is to paſs.

The

The same work being done in all the four quadrants, the elliptical curve may be completed. In the construction of solar eclipses, instead of using the sines to every ten degrees, the sines, belonging to the degrees and minutes corresponding to the hours and quarter hours, are to be used.

7. To describe a parabola whose parameter shall be equal to a given line. Draw a line to represent the axis, in which make AB (*fig.* 107.) equal to half the given parameter; divide AB like a line of sines into every ten degrees, as at the points 10, 20, 30, 40, 50, &c. and through these points draw lines at right angles to the axis AB. Make the lines A *a*, 10 *b*, 20 *c*, 30 *d*, 40 *e*, &c. respectively equal to the chords of 90°, 80°, 70°, 60°, 50°, &c. to the radius AB, and the points *a*, *b*, *c*, *d*, *e*, &c. will be in the curve of a parabola; and a smooth curve line drawn through those points, and the vertex B, will represent the parabolic curve required.

N. B. As the chords on the *sector* run no farther than 60, those of 70, 80, and 90, may be found by taking the transverse distance of the sines of 35°, 40°, 45°, to the radius AB, and applying those distances twice along the lines 20 *c*, 10 *b*, &c.

8. To describe an hyperbola, the vertex A, and asymptotes BH, BI, being given. (*fig.* 108.) The asymptotes BH, BI, being drawn, the line BA bisecting the angle IBH, and the vertex A taken, draw AI, AC, parallel to BH, BI. Make AC a transverse distance to 45 and 45, on the upper tangents, and apply to the asymptotes from B so many of the upper tangents taken transversly as may be thought convenient, as BD 50°, BE 55°, BF 60°, BG 65°, BH 70°, &c. and draw D *d*, E *e*, &c. parallel to AC. Make AC a transverse distance to 45 and 45 on the lower tangents; take the transverse distances of the co-angents before used, and lay them on those parallel lines: thus, make D *d* = 40°, E *e* = 35°, F *f* = 30°, G *g* = 25°, H *h* = 20°, &c. and through the points A, *d*, *e*, *f*, *g*, *h*, &c. draw a curve line, which will be the hyperbola required.

Sector *in surveying, use of the.* The bearings of three places, as A, B, C (*Tab.* III. *Surveying*, *fig.* 48.) to each other, i. e. the angles ABC, BCA, and CAB, being given; and the distance of each, from a fourth standing among them, as D, i. e. BD, DC, and AD, being given; to find the distances of the several places A, B, C, from each other, i. e. to find the lengths of the sides AB, BC, AC. Having drawn the triangle EFG (*fig.* 49.) similar to ABC, divide the side EG in H, so that EH may be to HG, as AD to DC, after the manner already directed; and after the like manner must EF be divided in I, so that EI may be to IF, as AD to DB. Then continuing the sides EG, EF, say, as EH − HG is to HG, so is EH + HG to GK; and as EI − IF is to IF, so let EI + IF be to FM; which proportions are easily wrought by the scales of lines on the *sector*. This done, bisect HK and IM, in the points L, N; and about the said points as centres, with the distances LH and IN, describe two circles intersecting each other, in the point O; to which, from the angles E, F, G, draw the right lines EO, FO, and OG, which will have the same proportion to each other, as the lines AD, BD, DC. Now, if the lines EO, FO, and GO, be equal to the given lines AD, BD, DC, the distances EF, FG, and EG, will be the distances of the places required. But if EO, OF, OG, be less than AD, DB, DC, continue them, till PO, OR, and OQ, be equal to them; then the points P, Q, R, being joined, the distances PR, RQ, and PQ, will be the distances of the places sought. Lastly, if the lines EO, OF, OG, be greater than AD, DB, DC, cut off from them lines equal to AD, BD, DC, and join the points of section by three right lines; the lengths of the said three right lines will be the distances of the three places sought.

Note, if EH be equal to HG, or EI to IF, the centres L and N will be infinitely distant from H and I; that is, in the points H and I, there must be perpendiculars raised to the sides EF, EG, instead of circles, till they intersect each other; but if EH be less than HG, the centre L will fall on the other side of the base continued; and the same is to be understood of EI, IF.

The *sector* is of especial use for facilitating the projection of the sphere, both orthographic and stereographic.

See on the construction and use of the *sector*, Bion's Construction, &c. of Mathematical Instruments, by Stone, p. 54, &c. edit. 1. and Robertson's Treatise of Mathematical Instruments, &c. p. 30, &c. edit. 2.

Sector *of a sphere.* The *sector of a sphere*, generated by the revolution of the *sector* of a circle CAE (*Tab.* IV. *Geometry*, *fig.* 109.) about the radius AC, is equal to a cone, whose base is equal to the portion of the spherical surface generated by the arch AE, or to the circle described with the radius AE, and whose height is equal to CA, the radius of the sphere. Arch. de Sphær. et Cyl. Maclaurin's Fluxions, Introd. p. 15.

Sector, *astronomical*, an instrument invented by Mr. George Graham for finding the difference in right ascension and declination between two objects, whose distance is too great to be observed through a fixed telescope, by means of a micrometer. This instrument (*Tab.* III. *Astronomy*, *fig.* 88.) consists of a brass plate, called the *sector*, formed like a T, having the shank CD, as a radius, about two feet and a half long, and two inches broad at the end D, and an inch and a half at C; and the cross-piece AB, as an arch, about six inches long, and one and a half broad; upon which, with a radius of thirty inches, is described an arch of ten degrees, each degree being divided into as small parts as are convenient. Round a small cylinder C, containing the centre of this arch, and fixed in the shank, moves a plate of brass, to which is fixed a telescope CE, having its line of collimation parallel to the plane of the *sector*, and passing over the centre C of the arch AB, and the index of a Vernier's dividing plate, whose length, being equal to sixteen quarters of a degree, is divided into fifteen equal parts, fixed to the eye end of the telescope, and made to slide along the arch; which motion is performed by a long screw, G, at the back of the arch, communicating with the Vernier through a slit cut in the brass, parallel to the divided arch. Round the centre F of a circular brass plate *a b c*, of five inches diameter, moves a brass cross KLMN, having the opposite ends O and P of one bar turned up perpendicularly about three inches, to serve as supporters to the *sector*, and screwed to the back of its radius; so that the plane of the *sector* is parallel to the plane of the circular plate, and can revolve round the centre of that plate in this parallel position. A square iron axis HIF, eighteen inches long, is screwed flat to the back of the circular plate along one of its diameters, so that the axis is parallel to the plane of the *sector*. The whole instrument is supported on a proper pedestal, so that the said axis shall be parallel to the earth's axis, and proper contrivances are annexed to fix it in any position. The instrument, thus supported, can revolve round its axis HI, parallel to the earth's axis, with a motion like that of the stars, the plane of the *sector* being always parallel to the plane of some hour-circle, and consequently every point of the telescope describing a parallel of declination; and if the *sector* be turned round the joint F of the circular plate, its graduated arch may be brought parallel to an hour-circle; and consequently any two stars, whose difference of declination does not exceed the degrees in that arch, will pass over it.

To observe their passage, direct the telescope to the preceding star, and fix the plane of the *sector* a little to the westward of it; move the telescope by the screw G, and observe, at the transit of each over the cross wires, the time shewn by the clock, and also the division upon the arch AB, shewn by the index; then is the difference of the arches the difference of the declination; and that of the times shews the difference of the right ascension of those stars. For a more particular description of this instrument, see Smith's Optics, book iii. chap. 9.

SECULAR, something that is *temporal*: in which sense, the word stands opposed to *ecclesiastical*.

Thus we say, *secular power*, *secular* arm, *secular* jurisdiction, &c.

Secular is more peculiarly used for a person who lives at liberty in the world; not shut up in a monastery, nor bound by vows, nor subjected to the particular rules of any religious community.

In which sense the word stands opposed to regular.

The Romish clergy is divided into *regular* and *secular*.

The *regulars* pretend, that their state is much more perfect than that of the *seculars*. *Secular* priests may hold abbeys and priories both simple and conventual, though not regularly, but only *in commendam*.

It is a maxim, in their canon-law, *secularia secularibus*, i. e. *secular* benefices are only to be given to *secular* persons; regular only to regular.

Secular *corporation.* See Corporation.

Secular *games*, *ludi* Seculares, in *Antiquity*, were solemn games held among the Romans, once in an age; or, in a period deemed the extent of the longest life of man, called by the Greeks *αιων*, and by the Latins *seculum*.

The *secular games* were also called *Terentine games*, *ludi Terentini*, either because Manius Valerius Terentinus gave occasion to their institution; for having been warned, in a dream, to dig in the ground in a place near the Campus Martius, called *Terentum*, he there found an altar inscribed to Dis, or Pluto, and Proserpine: upon which, as had been foretold him in his dream, three of his children born blind, obtained their sight; and he, in gratitude,

gratitude, performed ſacrifices on the ſame altar, for three days and three nights ſucceſſively. Or, finally, by reaſon here was an altar of Pluto buried deep underground, becauſe the water of the Tyber *terram tereret*, eat into the ground in this place.

The *ſecular games* laſted three days, and as many nights; during which time, ſacrifices were performed, theatrical ſhews exhibited, with combats, ſports, &c. in the circus.

Their origin and inſtitution are delivered at length by Val. Maximus; the occaſion thereof, according to this writer, was to ſtop the progreſs of a plague. The firſt who had them celebrated at Rome, was Valerius Publicola, the firſt conſul created after the expulſion of the kings, in the year of Rome 245. The ceremonies to be obſerved therein were found preſcribed in one of the books of the Sibyls; in which was contained a prophecy to this effect; viz. that if the Romans at the beginning of every age ſhould hold ſolemn games in the Campus Martius to the honour of Pluto, Proſerpine, Juno, Apollo, Diana, Ceres, and the Parcæ, their city ſhould ever flouriſh, and all nations be ſubjected to their dominion. Accordingly, they were very ready to obey the oracle, and in all the ceremonies uſed on this occaſion conformed to its directions.

At the time of the celebration of the *ſecular games*, heralds were ſent to invite all the world to a ſolemnity which nobody had ever yet ſeen, nor was ever to ſee again.

They were introduced with extraordinary preparation, under the direction of the quindecemviri; who diſtributed to the people flambeaux and ſulphur, and wheat and other grain, for an offering. On the firſt day after they had offered ſacrifices to the above named deities at the Capitol, they returned to the Campus Martius, where they had aſſembled, and held ſports to the honour of Apollo and Diana. On the ſecond day, at the hour appointed by the oracle, the noble matrons went to the Capitol to ſing hymns to Jupiter; and on the third day of the feaſt, twenty-ſeven boys, and as many girls, ſung in the temple of Palatine Apollo hymns and verſes in Greek and Latin, to recommend the city to the protection of thoſe deities, whom they particularly honoured by their ſacrifices.

Authors are not agreed as to the number of years wherein theſe games returned; partly becauſe the quality of an age or *ſeculum*, among the ancients, is not known; and partly on other accounts: ſome will have it, that they were held once every hundred years; and that the *ſeculum*, or age, was our century. This Varro and Livy ſeem to expreſs in very plain terms; yet others will have it, that *ſeculum* comprehended a hundred and ten years; and that the *ſecular games* only returned in that period, that is, at the beginning of every 111th year; which opinion is countenanced by Horace, in his *Secular Poem*, ver. 21.

Be this as it will, it is certain they ſometimes did not ſtay for the 111th, nor even for the 100th year, for the celebration of theſe games. The firſt were held A. U. C. 245, or 298; the ſecond, A. 305, or 408; the third, A. 518; the fourth, either A. 605, or 608, or 628. Auguſtus held them in the year of Rome 736, and Claudius again in the year of Rome 800, and of Chriſt 38, viz. ſixty-four years after the former; and Domitian, again, in ſtill leſs time; viz. in the year of Rome 841, or of Chriſt 79, at which Tacitus aſſiſted in quality of quindecimvir, as he himſelf tells us, Annal. lib. xi. cap. 11. and this was the ſeventh time that Rome had ſeen them from their firſt inſtitution. The emperor Severus exhibited them the eighth time, that is, a hundred and ten years after thoſe of Domitian. Zoſimus ſays, theſe were the laſt; but he is miſtaken; for in the year of Rome 1000, that is, fifty years after thoſe of Severus, the emperor Philip had them celebrated with greater magnificence than had ever been known. Thoſe that were celebrated by permiſſion of the emperor Honorius, after having received the news of the victory of Stilicon over Alaric, were the laſt recorded in hiſtory. Zoſimus aſcribes the decline of the empire to the neglect of theſe games among the Romans. We find them repreſented on many medals.

Secular *poem*. See Seculare *carmen*.

Secular *year*, the ſame with Jubilee.

SECULARE *carmen*, Secular *poem*, a poem ſung, or rehearſed, at the secular *games*.

Of this kind we have a very fine piece among the works of Horace; it is a Sapphic ode, which uſually comes at the end of his epodes. In ſome editions, the twenty-firſt ode of the firſt book is alſo called *Carmen Seculare*.

SECULARIZATION, the action of *ſecularizing*, or of converting a regular perſon, place, or benefice, into a ſecular one.

Almoſt all the cathedral churches were anciently regular, i. e. the canons were to be religious; but they have been ſince ſecularized.

For the *ſecularization* of a regular church there is required the authority of the pope, that of the prince, the biſhop of the place, the patron, and even the conſent of the people. And in France all this muſt be confirmed by parliament.

Religious, that want to be releaſed from their vows, obtain briefs of *ſecularization* from the pope.

SECULUM, in *Antiquity*. See Age, and Secular *games*.

SECUNDA *aqua*, among *Chemiſts*, &c. See Aqua *ſecunda*.

Secunda *ſuper oneratione paſturæ*. See Surcharge.

SECUNDANS, in *Mathematics*, an infinite ſeries of numbers, beginning from nothing, and proceeding as the ſquares of numbers in arithmetical progreſſion, as 0, 1, 4, 9, 16, 25, 36, 49, 64, &c.

SECUNDARY, or Secondary. See Secondary.

SECUNDI *generis*, in *Anatomy*, a diſtinction among the lacteal veſſels. There are two kinds of lacteals; viz. *primary*, or thoſe of the firſt kind, *primi generis*; and *ſecundi generis*, *ſecondary*, or of the ſecond kind.

The firſt carry the chyle from the inteſtines into glands diſperſed in great numbers throughout the meſentery. The ſecond carry it from theſe glands, after its being diluted there with lympha, into the common receptacle. See Lacteals.

Secundi *internodii pollicis extenſor*. See Extensor.

SECUNDIANS, in *Eccleſiaſtical Hiſtory*, a ſect of Valentinians in the ſecond century, whoſe chief, Secundus, one of the principal followers of Valentine, maintained the doctrine of two eternal principles, viz. light and darkneſs, from whence aroſe the good and the evil that are obſervable in the univerſe.

SECUNDINE, or Secundines, *ſecundinæ*, in *Medicine*, the ſeveral coats or membranes wherein the fœtus is wrapped up, in the mother's womb; as the chorion and amnios, with the placenta, &c. See *Tab. Anat.* (*Splanch.*) *fig.* 16. *litt. bb.* They are thus called, becauſe they come out in the ſecond place, i. e. after the child, in delivery. The good women and midwives call them the after-*birth*, as being eſteemed a ſecond burden, whereof the mother is freed. Others call them the *delivery*, becauſe when theſe are out, the woman is reckoned to be perfectly delivered.

The *ſecundine* muſt never be left in the matrix; it is a foreign body, which would deſtroy the mother; it is dangerous even to have the leaſt piece of it left behind. The aſſiſtance of a ſkilful hand is, in many caſes, neceſſary to the getting them out; and this is to be done with great care and ſpeed, before the uterus cloſes itſelf upon them, otherwiſe they occaſion terrible hæmorrhages, faintings, and often inflammatory and putrid fevers.

The patient herſelf may greatly promote the expulſion of theſe, by any forcible emotion of the body, as by a forced cough, or by ſneezing; the midwife at the ſame time is gently to pull them by the navel-ſtring, but this muſt be done very cautiouſly, for fear of its breaking. If this fails, the cautious introducing the hand often ſets all right, or the uſe of gently pellent medicines may be called in; and to theſe may be added broths, with ſaffron in them, and by the uſe of common clyſters great good is often done; but if after all this care, there yet remain ſome fragments of them behind, there uſually ariſes a fever within twelve hours; and in this caſe the utmoſt care muſt be taken to prevent putrefaction, and expel the remains of them. To theſe purpoſes medicines prepared with myrrh, amber, ſaffron, and the cortex eleutherii, are of the greateſt ſervice; and to theſe may be added occaſionally the colliquating and attemperating ſalts, ſuch as tartarum vitriolatum and nitre. Junker's Conſp. Med. p. 723. See Delivery.

Notwithſtanding the great danger that uſually attends the leaving any part of this behind at the time of delivery, there are inſtances of ſome perſons lucky enough to eſcape; the ſubſtance left behind remaining uncorrupted, till the time of its being afterwards diſcharged.

Kerkring gives us an inſtance of this, which fell under his own knowledge. A woman had a large portion of it left behind, where it remained four months, and at the end of that time was diſcharged uncorrupted, and without any hurt to the perſon. Kerkring's Spicileg. Anat.

Hippocrates obſerves, that twins have always the ſame *ſecundine*.

Dr. Grew, in his Anatomy of Plants, applies the term *ſecundine* to the fourth and laſt coat or cover of ſeeds; becauſe this performs nearly the ſame office in plants, that the membranes, inveſting the fœtus, do in animals. And indeed Pliny, Columella, Apuleius, &c. have uſed *ſecundine* in the ſame ſenſe.

SECUNDO. *Propositio de* SECUNDO *adjacente.* See PROPOSITION.

SECUNDUS *mallei*, in *Anatomy*, a name given by Duverney, and some others, to one of the muscles of the ear. It is the *internus auris* of Cowper and others, and is most properly named by Albinus *tensor tympani*.

SECUNDUS *oculum movens*, in *Anatomy*, a name given by Vesalius to that muscle of the eye, called by Riolanus and others *superbus*, and *elevator oculi*, and by Albinus the *subductor*, one of his four musculi recti of the eye.

SECUNDUS *peronæus*. See PERONÆUS.

SECUNDUS *scalenus*. See SCALENUS.

SECURIDACA, in *Botany*. See *Hatchet* VETCH.

SECURITATE *pacis*, a writ which lies for one who is threatened with death or danger, against the person who so threatens him. It is taken out of chancery, directed to the sheriff. See PEACE and SURETY.

SECURITATEM *inveniendi quod se non divertat ad partes exteras sine licentia regis*, an ancient writ lying for the king against any of his subjects, to stay them from going out of this kingdom into foreign parts; the ground whereof is, that every man is bound to serve and defend the commonwealth, as the king shall think fit.

SECURUM, *si te fuerit*, in *Law*. See SI *te fuerit*.

SECUTOR, among the Romans, most commonly signified an attendant upon great men.

SECUTORES, in *Antiquity*, a kind of GLADIATORS among the Romans, who fought against the retiarii.

The word is formed from the verb *sequi*, *to follow*; because the *secutores* used to pursue the RETIARII, when they failed to cast their net, and fled to put in order.

The *secutores* were armed with a sword and a buckler, to keep off the net, or noose, of their antagonists; and they wore a cask on their head. Some confound the *secutores* with the myrmillones, because both had nearly the same weapons.

SECUTORES was also a name given to such gladiators as took the place of those killed in the combat; or, who fought the conqueror. This post was usually taken by lot.

In ancient inscriptions we also meet with *secutor tribuni*, *secutor ducis*, *secutor Cæsaris*, &c. who were officers attending the tribunes and generals; perhaps like our aids de camp.

SEDAB, in *Botany*, a name given by the Arabian physicians to the wild, or mountain-rue, a plant common in Syria, Greece, and other places. Avicenna supposes the gum, which he calls *gentum*, or *jentum*, to be produced from this plant, but very erroneously, that gum being obtained from the roots of the thapsia, or deadly carrot.

SEDAN *chair* is a covered vehicle for carrying a single person, suspended by two poles, and borne by two men, hence denominated chairmen. They were first introduced in London in 1634, when sir Sanders Duncomb obtained the sole privilege to use, let, and hire a number of the said covered chairs, for fourteen years.

SEDATIVUM *sal*. See *Sedative* SALT.

SE DEFENDENDO, a plea for him who is charged with the death of another; alleging, that he was forced to do what he did, in his own defence, the other so assaulting him, that had he not done as he did, he must have been in danger of his own life. See SELF-*defence*, HOMICIDE, and MANSLAUGHTER.

SEDEM *attollens*, in *Anatomy*, a name given by Vesalius and others to the muscle, now more generally known by the name of LEVATOR *ani*.

SEDENTARIUM *os*, a name given by some anatomical writers to the protuberance of the os coxendicis, on which the whole weight of the body rests in sitting.

SEDER OLAM, in *Philology*, a Hebrew term, literally signifying, *order of the world*; being the title of two chronicles in that language.

They are both very short, though the one more so than the other; for which reason the one is called *seder olam rabba*, that is, the *great sedar olam*; and the other, *seder olam zuta*, i. e. *little seder olam*.

SEDER OLAM, *the great*, commences at the creation of the world, and comes down as low as the war of the pseudo-messiah Barchochabas, under Adrian, fifty-two years after the destruction of the temple of Jerusalem; and, of consequence, to the hundred and twenty-second year of Christ. It is almost all taken from the Scripture, excepting the end. It is the work of R. Josa, son of Hhelpeta of Tsippora, who lived in the second century, about the year 130, and was master of the famous R. Juda Hakkadosch, the compiler of the Mischna.

SEDER OLAM, *the lesser*, is an abridgment of the former, brought down as far as Mar Sutra, who lived four hundred and fifty years after the destruction of the temple, or five hundred and twenty-two years after Christ. F. Morin, continually bent upon diminishing the antiquity of the principal books of the Jews, endeavours to prove this to have been written about the year of Christ 1124, as indeed it is expressed at the beginning; but R. Dav. Gantz has overthrown this opinion in his Tsemahh David, and shewn, that the date, in the beginning, is an interpolation.

These two chronologies were first printed at Mantua, in 1514, quarto; again, at Basil, by Frobenius, in 1580, octavo; at Venice, in 1545, quarto; and at Paris, with a Latin version of Genebrard, in duodecimo. They have been since reprinted at Amsterdam, in 1711.

SEDGE, in *Botany*. See IRIS *lutea palustris*.

SEDIMENT, formed from the Latin *sedimentum*, which Matthias Sylvaticus derives *à diuturna sede*, the settlement or dregs of any thing; or that gross, heavy part of a fluid body, which, upon resting, sinks to the bottom of the vessel.

Some physicians have found means to discover much of the nature of the disease, from the *sediment* of the urine.

Dr. Woodward maintains, that, at the deluge, the whole terrestrial globe was dissolved into one uniform mass; and that the new world, arising thence, was perfectly spherical, and without any inequalities, consisting of several strata, which the earthy *sediment* gradually produced, as it drained.

SEDINA, in the *Materia Medica*, a word used by some writers to express dragon's blood.

SEDITION, among *Civilians*, is used for an irregular commotion of the people, or an assembly of a number of citizens without lawful authority, tending to disturb the peace and order of the society.

This offence is of different kinds: some *seditions* more immediately threatening the supreme power, and the subversion of the present constitution of the state; others tending only towards the redress of private grievances. Among the Romans, therefore, it was variously punished, according as its end and tendency threatened greater mischief. See lib. i. Cod. de *Seditiosis*, and Math. de Crimin. lib. ii. n. 5. de Læsa Majestate. In the punishment, the authors and ringleaders were justly distinguished from those who, with less wicked intention, joined, and made part of the multitude.

The same distinction holds in the law of England, and in that of Scotland. Some kinds of *sedition* in England amount to high treason, and come within the stat. 25 Edw. III. as levying war against the king. And several *seditions* are mentioned in the Scotch acts of parliament as treasonable. Bayne's Crim. Law of Scotland, p. 33, 34.

The law of Scotland makes riotous and tumultuous assemblies a species of *sedition*. But the law there, as well as in England, is now chiefly regulated by the riot act, made 1 Geo. I. only it is to be observed, that the proper officers in Scotland, to make the proclamation thereby enacted, are sheriffs, stewards, and bailies of regalities, or their deputies; magistrates of royal boroughs, and all other inferior judges and magistrates; high and petty constables, or other officers of the peace, in any county, stewartry, city, or town. And in that part of the island, the punishment of the offence is death, and confiscation of moveables: in England it is felony. See RIOT.

SEDMA, a word used by some as a name for the *lapis hæmatites*.

SEDUM *majus*. See HOUSE-*leek*.

SEDUM, *lesser house-leek*, in *Botany*, a genus of the *decandria pentagynia* class. Its characters are these: the empalement of the flower is cut into five parts; the flower has five plain, spear-shaped petals, which spread open, and five nectaria, with small single scales, indented at the top, and inserted at their base to the outside of the germen, which becomes five erect spreading capsules, filled with small seeds. Miller enumerates eighteen, and Linnæus nineteen species.

SEDR, or SEDRE, the high priest of the sect of Ali, among the Persians.

The *sedr* is appointed by the emperor of Persia, who usually confers the dignity on his nearest relation.

The jurisdiction of the *sedr* extends over all effects destined for pious purposes, over all mosques, hospitals, colleges, sepulchres, and monasteries. He disposes of all ecclesiastical employments, and nominates all the superiors of religious houses. His decisions, in matters of religion, are received as so many infallible oracles; he judges of all criminal matters, in his own house, without appeal; and is, without contradiction, the second person in the empire.

The *sedr*, however, has not any indelible character, but frequently quits his post for another purely secular one. His authority is balanced by that of the mudsitchid, or first theologue of the empire.

SEED, *semen*, a matter prepared by nature, for the reproduction of the species, both in men, animals, and plants.

Some

Some naturalists add, that even stones, minerals, and metals, themselves, have each their proper *seed* in their mines, and are produced and perpetuated thereby.

SEED, *semen*, in the *Animal Oeconomy*, is a white, liquid matter, or humour, the thickest of any in the body, separated from the blood in the testicles, and reserved in proper vessels, to be the means of generation. By chemical analysis it is found to consist almost entirely of oil, and volatile salts, blended together by the mediation of a little phlegm. Its activity, Dr. Drake takes to be derived from the salts wherewith it abounds, far more than any other animal liquor.

The parts concerned in the preparation of the *seed* are the spermatic arteries, which bring the blood to be secreted into the testicles; the testicles, and parastatæ, where the secretion itself is chiefly effected; the vasa deferentia, which convey the secreted matter out of the testicles; and the vesiculæ seminales, which receive and preserve it to be emitted in coition. See TESTICLE, &c.

The blood received, in small quantities, into the spermatic arteries, and there, by the particular structure of the parts, much diminished of its velocity, is yet farther retarded about the corpus pyramidale, or varicosum; and its redder and thicker parts carried off by canals opening into the veins. Thus rendered paler and slower, it is received into the winding recesses of the testicles, where, almost stagnating, it assumes an ash-colour, and is farther prepared, thickened, &c. in the ductus Highmorianus, whence it is slowly driven into the epididymidæ, or parastatæ: it is then farther prepared and elaborated in the folds and complications thereof; and, at length, creeps slowly into the vasa deferentia, or ejaculatoria. These consist, at their beginnings, of a thick, fungous matter, and are very narrow; but growing sensibly wider, and then again narrower, in the winding meanders hereof the humour is collected, its motion abated, it is farther elaborated and concocted; and at last driven into the vesiculæ seminales; in the various cells and meatuses whereof it is received, laid up, fixed, thickened, whitened, and raised to its last perfection; in which state it is called *seed*.

It is observable, that no humour in the body is generated so slowly, or meets with so many means to retard it, or to elaborate and concoct it, when at rest, as the *seed*. Some imagine that, in its whole retarded progress, besides what is apparent, there is something still added to it from the minute nervous vesicles; and something taken away, by the various lymphatics, and discharged thereby into the venous vesicles of the corpus pyramidale, and the little veins of the vesiculæ seminales, and thence into the humours of the whole body. Boerhaave takes both the one and the other to be very probable.

The *seed*, or humour, thus formed in the testicles, parastatæ, vasa deferentia, and vesiculæ seminales, being, while fresh, diluted with a little warm water, and viewed with a good microscope, seems to consist of innumerable little, oblong, living, nimble, animalcula, floating in the other part of this humour. This is said to be always observed in the *seed* of all men, quadrupeds, birds, fishes, amphibious animals, and insects.

Upon comparing this with the bulk, figure, place, change, &c. of the carina of the chick described by Malpighi, and with the known law of nature observed in the generation of frogs, it appears highly probable, that the animalcula of the male *seed* contain the rudiments, or stamina, of the future human body; and the more so, since, whenever the testicles, or this humour, is wanting, there is always sterility on the side of the male.

M. Leewenhoeck, the first discoverer of these animalcula, and many after him, make no scruple to call them true *fœtuses*, or little men; and some have even pretended to discover somewhat of the human figure therein. But Verheyen, and others after him, deny the existence of any such animalcula; maintaining, that it is only the intestine motion of the parts of the *seed*, maintained by the warmth thereof, that exhibits this appearance, which fanciful persons have improved into frisking animalcula; and urging, in confirmation hereof, that no sooner is the warmth gone, than all appearance of animals ceases. But notwithstanding this, the doctrine of the animalcula in semine has been very generally received. See GENERATION.

Against this system it has been lately objected, that those corpuscles, which Leewenhoeck discovered in the male sperm, are by no means animalcules, having proper and voluntary motion, but mere inert particles diffused through the male sperm, like so many oily particles swimming in a fluid, as clearly observed with good microscopes; that if they were really animalcules, to be metamorphosed in the ovula, they must necessarily have their own two tunics; and by casting those tunics successively after one another, they must be changed, first, from the state of a larva or grub, into the state of a pupa, nympha, chrysalis, or aurelia, and next into a complete animal; but the amnion and chorion of the fœtus derive their origin from the egg, and not from those animalcules, as they are called; that the author of nature always acts in the most compendious way, and that it is hardly credible, that he should form so many myriads of animalcules for the sake of one only; and supposing that those corpuscles were really animalcules, they must have their animalcules by which they were produced, and these last others, and so on, without end, which is alledged to be exceedingly absurd; that the secundines are from the yolk, and that the yolk is found in an egg not fecundated, and, therefore, if we should ascribe the rudiments of the fœtus to the male sperm, then the umbilical cord, with its membranes, would be totally distinct from the yolk, and by that means not have the same common tunic with the yolk, which we know to be false. Hence it is argued, that we are still in total ignorance as to the manner in which generation, or the fecundation of the ovula, is effected. Hunter's Evelyn's Sylva, p. 435.

Some admit of four several kinds of *seed*: the *seed* of the testicles, that of the vesiculæ seminales, that of the prostates, and that of the glands of the penis. The two first, which we have described as one and the same humour, only in different stages, those authors take to be different, as not being able to find any strict communication between the deferentia and the vesiculæ; but that communication is fully shewn by Dr. Drake, so that nothing more is necessary to shew these *seeds* to be the same. The liquor of the prostates, and that of the glands of the penis, are generally allowed not to be any true *seed*, no more than that emitted by women; nor is there any good reason why either of them should be called so, as their appearance is very different, and as other sufficient uses are assigned for them; viz. to line and lubricate the parts, that the seed, urine, &c. may pass more freely, and without adhering.

The seminal liquor, however, such as is emitted for use, is a mixture of several fluids, poured at the same time into the common canal of the urethra, either from the glands that have secreted them, or the reservoirs that have kept them. M. du Verney observes, that, in different species, the number and structure of these organs are different. In man, the principal are, the vesiculæ seminales, and the prostates, besides what was discovered by Mr. Cowper; viz. a number of new glandulous bodies on each side the urethra, whose excretory ducts open into the urethra, towards the root of the penis. M. du Verney has found, that the same are likewise in most other animals, and placed in the same manner.

It is controverted, whether or no the liquor filtrated hereby be necessary to generation? M. du Verney thinks it is; and his chief reason is, that, in animals that have been castrated, these glands, as well as all the other sources of generation, are found dried up, and decayed. M. Littre objects to this, that the vesiculæ seminales, and prostates, having little cells, where their filtrated liquor is deposited, it is easily conceived, that their humours may wait some time for an occasion of being emitted; but that these new prostates, or glands, of Mr. Cowper, having no such reservoirs, their liquor must ouse out into the cavity of the urethra, in proportion as it is separated, and be destined for some continual, not for any momentary or occasional use. He adds, that, as the exeretory ducts of these glands traverse the spongious body of the urethra, for two inches, before they penetrate into its cavity, and that in the sole moments when the liquor should be discharged, to assist in generation; that spongious body is extremely dilated, and its sides in a state of compression; and the liquor must be then less disposed to a discharge than ever.

For the fate of the *seed*, when lodged in the uterus, see CONCEPTION, and GENERATION *of man*.

SEED, in *Botany*, is the last product of a plant, whereby the species is propagated.

According to the definition of Linnæus, the *seed* is a deciduous part of the vegetable, the rudiment of a new one, quickened for vegetation by the sprinkling of the pollen. It is furnished with sap, and covered with a coat or tunic, in form of a bladder. The parts of which it consists are the *corculum*, which is the first principle of a new plant within the *seed*; the *plumula*, or scaly part of the corculum, which ascends; the *rostellum*, or plain part of the corculum, which descends; the *cotyledon*, or side lobe of the *seed*, of a porous substance, and perishable; the *hilum*, which is an external mark or scar on the *seed*, where it was fastened within the fruit; the *arillus*, or proper exterior coat or tunic of the *seed*, which falls off of itself; the *coronula*, which is either

the calyx of a floret, adhering to the *ſeed*, and aſſiſting it to fly, or *pappus*, a down, which is a feathery or hairy crown, anſwering the ſame end, and connected with the *ſeed* by a *ſtipes*, or trunk, denoting the thread on which the down is raiſed and ſupported; and the *ala*, or wing, which is a membrane affixed to the *ſeed*, and ſerving to diſperſe it.

The *ſeed* is frequently the fruit of the plant, as is the caſe in many herbs.

Sometimes it is only a part incloſed in the fruit; and that in form either of grain, kernel, or berry.

The *ſeed* is the natural offspring of the flower, and that for whoſe production all the parts of the flower ſeem intended; ſo that when this is once well formed, the ſeveral parts of the flower dwindle and diſappear. See Lee on Bot. p. 15.

It is produced from the farina of the apices, let fall on the head of the piſtil, and thence forwarded to an uterus at the bottom thereof, which uſually is divided into ſeveral cells; where, coming to receive the nutritious juice of the plant, it is firſt ſoftened, then ſwelled, and increaſed both in matter and bulk, and at length comes to its ſtate of maturity. For the farther explication of the conſtituent parts of a *ſeed*, the body or placenta of a bean, with its germ, radicle, umbilical cord, and ramifications, is repreſented *Tab. Nat. Hiſt. fig.* 12. *a* is the germ; *b* the body or placenta, with the umbilical cord and ramifications; *e*, the radicle. The placenta, or ſeed-leaves of a turnip, with its radicle and germ, are exhibited in *fig.* 13. *a* is the germ; *b* the placenta; *c* the radicle. *Fig.* 14. repreſents the germ of a grain of wheat, with its root and capſule, containing the milky juice for the nouriſhment of the tender plant; *a* is the origin of the crown; *b* the pipe of communication between the firſt roots and the crown; and *c* the grain, with its firſt roots. For a farther account of the principles and progreſs of vegetation, ſee *Theory of* VEGETATION, and *Generation of* PLANTS.

That the whole plant is contained in the *ſeed*, is an opinion as old as Empedocles; and it is ſtill the prevailing doctrine among the generality of naturaliſts. Experience, the microſcope, and the modern philoſophy, give it great countenance. In effect, by the uſe of good microſcopes, we diſcover, in the *ſeed*, ſeveral of the parts of the future tree, only in miniature; particularly a little root called the *radicle*, and the ſtem called the *plumule*.

In Malpighi's life, we have a debate between him and ſignor Triumphetti, provoſt of the phyſic garden at Rome, whether the whole plant be actually contained in the *ſeed?* The affirmative is maintained by Malpighi, with cogent arguments; among which this is one, that in a kidney-bean, before ſown, the eye, aſſiſted with a microſcope, eaſily diſcovers leaves, a bud, and even the knots or implantations of the leaves on the ſtem. The ſtem itſelf alſo is very conſpicuous, and plainly conſiſts of woody fibres, and ſerieſes of little utricles. And whereas ſignor Triumphetti had objected, that by poverty, tranſplantation, &c. ſeveral plants degenerated into others, particularly wheat into tares, and tares again into wheat: in anſwer to this, which is one of the ſtrongeſt objections againſt that opinion, Malpighi replies, that he is not fully ſatisfied as to the truth of the objection; for that both himſelf, and his friends, making the experiment, no metamorphoſis of the wheat ſucceeded; but, granting the metamorphoſis, it is the ſoil, or the air, or the culture, that is in the fault. Now, from a morbid and monſtrous condition of nature, there is no inferring her genuine and permanent ſtate.

To the ſame effect Mr. Leewenhoeck, after a nice obſervation of an orange kernel, which he had made to germinate in his pocket, &c. concludes, "Thus we ſee "how ſmall a particle, no bigger than a coarſe ſand, is "increaſed," &c. A plain demonſtration, that the plant, and all that belongs to it, was actually in the *ſeed*; viz. the body, root, &c. Dr. Derham adds, that of all the *ſeeds* he has viewed, except the maple, this plant appears the plaineſt to the naked eye in the nux vomica.

The fecundity of plants, in the production of *ſeeds*, is very ſurpriſing; inſtances of which are recited under FECUNDITY, and *Propagation of* PLANTS.

Several ſpecies of plants have been long ſuppoſed to be deſtitute of *ſeeds*, in regard no obſervation, no microſcope, no anatomy, had diſcovered any thing like them; ſuch are the capillaries, the ſeveral kinds of fuci, ſea-plants, moſſes, &c. But the happy induſtry of the preſent age has diſcovered the *ſeeds* of ſome of them, and has left us out of all doubt, that the reſt, which are properly plants, are not without the ſame. See *Generation of* PLANTS.

The exterior form, and even the internal ſtructure, of the generality of vegetable *ſeeds*, have been ſuppoſed by ſome ſo much alike in the ſeveral kinds, and of ſo little curioſity and beauty in the whole, that they have been little regarded by the curious; but when nearly examined with the help of microſcopes, they are found to be worthy of a greater attention: thoſe which appear moſt like to one another, when viewed by the naked eye, often proving as different, when thus examined, in their ſeveral forms and characters, as the different genera of any other bodies of the creation. If their external forms carry all this variety and beauty about them, their internal ſtructure, when laid open by different ſections, appears yet more admirable.

The *ſeed* of the muſk ſcabious is amazing in its ſhape and ſtructure: it reſembles in figure an octagonal vaſe, with a ſcalloped brim; the whole is bell-faſhioned, having ribs or diviſions, which run down from the mouth of the vaſe, and thence becoming narrower, form the bottom. Between theſe ribs, down to the beginning of the narrow part, it is clear, though not wholly tranſparent, and from thence to the bottom the ribs are hairy. This vaſe contains a *ſeed*, which is like a peſtle ſtanding in a mortar. The peſtle ſtands looſe in an octagonal caſe, but the narrowneſs of the mouth of this vaſe hinders the peſtle's being drawn out, becauſe its extremity within is rounded, and thicker than any other part of it. From its upper end there ariſe five ſpiculated ariſtæ, or awns, whoſe little thorns are directed upwards, and are thereby prepared to cauſe the *ſeed* to recede from any thing that might injure it on being touched. The baſon, from which theſe ariſtæ ariſe, is of a fine green colour, and they are of an elegant ſhining brown.

The *ſeed* of the angelica is one of the moſt fragrant in its ſmell in the world. When the outer huſk of this *ſeed* is pulled off, the nucleus appears of a browniſh colour, and of an elliptical ſhape. By the help of the microſcope we ſoon diſcover what it is that produces this charming ſmell; this is a fine amber-coloured gum, which appears laid in ridges, diſpoſed alternately with others of a browniſh colour, longitudinally, all over the *ſeed*, and on the flat ſide there is a white part, which is a ſort of theca, which receives a very minute ſtylus from the pedicle that ſupports it.

The medicinal *ſeed*, commonly known in the ſhops under the name of *grain of paradiſe*, is one that promiſes very little from its external appearance, being only a brown *ſeed* of an irregular ſurface, with many flats and angles, and having an apex like the mouth of a purſe when drawn together with a ſtring; from this unpromiſing aſpect, however, there ariſes a very wonderful appearance on diſſection. In a longitudinal ſection we ſee firſt the edge of the brown cortex; next within that appears a black pitchy ſubſtance, and within that a very white matter, lodged in a radiated form: this reſembles a fine white ſalt, and is probably a mixture of a volatile ſalt, and a farinaceous matter. Its radiated diſpoſition, and extremely pungent taſte, favour alſo this opinion. But there is in this *ſeed* a yet far more curious particular than theſe; the centre of every *ſeed* is occupied by a ſmall piece of perfect camphor: this is, in all reſpects, the ſame with the common camphor ſold in the ſhops, and is always of the figure of a vinegar cruet, having a round large bottom, and a long and narrow neck. This is invariably the appearance in every *ſeed*, and that not only in this, but in other *ſeeds* of the ſame kind.

The *ſeed* of the great maple, which we commonly, but improperly, call the *ſycamore-tree*, conſiſts of a pod and its wing; two of theſe grow upon a pedicle with the pods together, which makes them reſemble the body of an inſect with its expanded wings. The wings are finely vaſculated, and the pods are winged with a fine white down, reſembling ſilk: this contains a round compact pellet, covered with a brown membrane, that ſticks very cloſely to it. When this is pulled off, inſtead of diſcerning a kernel, as in other *ſeeds*, there appears an entire green plant, folded up in a moſt ſurpriſing manner. The pedicle of this is about two eighths of an inch long, and its ſeminal leaves of about ſix eighths each; between theſe the germina of the next pair of leaves are plainly viſible to the naked eye, but with a microſcope they are ſeen with the greateſt beauty and perfection. See *Tab. of Microſcopical Objects, Claſs* 2.

Theſe, and a number of ſuch other beauties in this part of the creation, are deſcribed at large by Dr. Parſons in his work, entitled, A Microſcopic Theatre of *Seeds*, to which we refer for the reſt. Phil. Tranſ. N° 474. p. 187.

Moſt kinds of *ſeeds* ſhould be prepared for a microſcopical examination, by ſteeping them in warm water till their coats are ſeparated, and their ſeminal leaves may be opened without laceration. But *ſeeds*, while dry, and without any preparation, are of an almoſt infinite variety of ſhape, and afford a number of pleaſing objects for the microſcope.

Seeds, *echinate.* See Echinate.
Seeds, *naked.* See Naked.
Seeds, *winged.* See Winged.
Seeds, in *Gardening* and *Agriculture.* Mr. Bradley observes, that the *seeds* of plants, though exceedingly good, will degenerate from the mother plant, if they be sown on the same ground whence they were gathered; so that there is a great necessity for a yearly change of *seeds* of forest-trees, as acorns, masts, &c. If the place be too cold to sow them when gathered in August, they may be kept barrelled, or potted up, in moist sand or earth, *stratum super stratum*, during the winter; at the end of which time they are found sprouted, and, if gently sown, will be as forward as if they had been sown in autumn, besides their missing the vermin, to which the winter *seed* is much exposed.

It is surprising, says Mr. Miller, how many sorts of *seeds* will continue good for several years, and retain their growing faculty; whereas many others will not grow when they are more than one year old; which he apprehends is owing, in a great measure, to their abounding more or less with oil, as also to the nature of the oil, whether it is of a cold or hot quality, and the texture of their outward covering; e. gr. the seeds of cucumbers, melons, and gourds, will continue good eight or ten years; those of radish, turnep, rape, &c. for three or four years; but those of parsley, carrot, parsneps, and most other umbelliferous plants, lose their growing faculty often in one year, and seldom remain good longer than two years. He farther observes, that all sorts of *seeds* are preserved best in their pods or husks, especially if they are not separated from the placenta, to which they are fastened by an umbilical cord, through which they received their nourishment in their embryo state. See *Theory of* Vegetation.

He also advises those who would preserve their *seeds* good to gather them in dry weather, to hang them up in bags in a dry room, and in a moderate temperature of warmth; and those who would send *seeds* to a distant country should gather them when fully ripe, preserve them in their pods, and in packing them up, take care that they are not shut up too closely from the air. The anointing of *seeds*, or covering them over with fat or oil, is altogether improper. He adds, that the earth, which is the natural nurse of all *seeds*, will preserve them much longer than any other body; provided they are buried so deep as to be beyond the influence of sun and showers, whereby they are prevented from vegetating. With proper precautions, and with a zeal in any degree resembling that of the late Dr. Solander, of Mr. Blake, who had formed a plan of procuring the *seeds* of all the vegetables produced in China, which are used in medicine, manufactures, or food, or are in any way serviceable to mankind, and to forward to Europe not only such *seeds*, but the plants producing them (see Kippis's edit. of Biog. Brit. art. Blake), and of sir Joseph Banks; we might obtain a great variety of curious and useful plants, now uncultivated in this country.

The *seed* of fruit trees, it is said, should not be chosen from those that are the most fruitful, so much as from the most solid and fair; nor are we to covet the largest acorns, but the most weighty, clean, and bright. Porous, insipid, mild sorts of *seeds*, are to be sown as soon as ripe; hot, bitter *seeds*, ought to be kept a year before they are sown. See Seminary.

The shape and weight of *seeds* direct how they are to be set; most of them, when they fall, lie on one side, with the small end towards the earth; which shews that posture to be best to set any stone or nut in: if they be heavy, sow them the deeper. Acorns, peaches, &c. are to be sown two or three inches deep. See Semination.

There is a common method of trying the goodness of many sorts of *seeds*, which is by putting them in water; and those which sink to the bottom are esteemed good, but those that swim on the surface are rejected. This rule, Mr. Miller observes, is not universal; for having saved the *seeds* of melons which floated on the surface of water, they were washed from the pulp, and keeping them two years, they grew very well; but the melons they produced were not so thick fleshed as those which he obtained from heavy *seeds* of the same melon. The lightness of many sorts of *seeds* he ascribes to their not having been sufficiently impregnated by the farina fœcundans; and, therefore, care should be taken that this operation be properly performed, by not excluding plants that are in flower from the external air, or even by assisting nature in conveying the farina of the male flowers to those of the female. Miller's Gard. Dictionary, art. *Seed.*

Seed, *change of*, a term used by the farmers to express the common, and, as they suppose, necessary custom, of changing among one another the *seed* of their lands, as wheat, and the like; it being a received opinion, that the *seed* produced on one land will grow better on another than on that which produced it, though the same species of plant be sown.

Seeds, in their natural climate, do not degenerate, unless culture has improved them; they then indeed are liable, upon omission of that culture, to return to their natural state again. Whatever benefit arises to the farmer from the changing the *seed* of the same species, is from causes which are themselves the effects of different climates, such as heat and moisture, which may vary very much in the same neighbourhood.

Laurembergius has carried this notion of degeneracy and change from the soil, so far as to affirm that wheat will, in some places, degenerate into rye; and in other places, rye will be exalted into wheat by the soil; but those who are acquainted with botany know, that a horse might as soon be changed into a bull by feeding in an improper pasture, as one plant degenerate into another by fault of the soil. Tull's Husbandry, p. 116.

Seeds, *steeping of*, in prolific liquors, is a practice that has occasionally prevailed, and it is not of modern invention. The Romans, who were good husbandmen, have left us several receipts for steeping of grain, in order to increase the powers of vegetation. In England, France, Italy, and in all countries where agriculture has been attended to, a variety of liquors have been recommended for this purpose. The practice is founded on a presumption, that, by filling the vessels of the grain with nourishing liquors, the germ, with its roots, would be invigorated. On this subject Dr. Hunter observes, that all his experiments demonstrate, that steeps have no inherent virtue; having sown more than once the same *seed*, steeped and unsteeped, all other circumstances being alike, he never found the least difference in the growth of the crop. When, indeed, the light *seeds* are skimmed off, as in the operation of brining, the crop will be improved, and diseases prevented; but these advantages proceed from the goodness of the grain sown, and not from any prolific virtue of the steep. In this opinion many rational farmers, determined by their own experience, concur. Duhamel speaks in the strongest terms against the practice of steeping, so far as it supposes an impregnation of vegetative particles. Dr. Hunter, having sprouted all kinds of grain in a variety of steeps, assures the farmer, that the radicle and germ never appeared so vigorous and healthy, as when sprouted by elementary water; whence it appears, that the *seed* requires no assistance.

Upon the whole he concludes, that, as no invigorating or fructifying liquor, however pompously introduced, has ever stood the test of fair and correct experiment, it may be laid down as an established truth, that plump *seeds*, clear of weeds, and land well prepared to receive it, will seldom disappoint the expectations of the farmer, and upon these he should rely for the goodness of his crop. Hunter's Evelyn's Silva, p. 15, &c.

Seeds, in *Pharmacy*, &c. The medicinal *seeds*, especially those imported from the Indies, Levant, &c. are severally described under their respective articles; which see. Among those used with us, the principal are, the four *greater hot*, and the four *greater cold seeds*, as they are called. The first are those of anise, fennel, cumin, and carraway; the latter, those of gourd, citrul, melon, and cucumber.

The chief use of the four cold *seeds* is, for the making of emulsions, cool refreshing drinks, pastes for the hands, and oils used by the ladies for the complexion.

Seed, *amber*, *anise*, *lac*, *line*, *mustard*, *worm*. See the respective articles.

Seed *of pearl*. See Pearl.

SEEDLINGS, among *Gardeners*, denote such roots of gilliflowers, &c. as come from *seed* sown. Also the young tender shoots of any plants that are newly sown.

SEEDY, in the *Brandy Trade*, a term used by the dealers to express a fault that is found in several parcels of French brandy, and which renders them unsaleable. The French suppose that these brandies obtain the flavour, which they express by this name, from the weeds which grew among the vines, from whence the wine, of which this brandy was made, was pressed.

However it be, the thing is evident, and the taste not of any one kind; but some pieces of brandy shall taste strongly of anniseed, some of carraway seed, and some of other of the strong flavoured seeds of plants, principally of the umbelliferous kind; so that it shall be rather taken for anniseed, carraway, or some other water, than for brandy.

The proprietor of such brandies is always at great trouble to get them off, and usually is reduced to the necessity of mixing them in small quantities with pieces of other brandies, so as to drown and conceal the taste; and where he

he has not opportunities of doing this, is obliged to sell them on very disadvantageous terms.

The business of rectification of spirits is very little understood abroad, though much practised with us; and a man in France or Holland, who could take off this taste from these brandies, might get great advantages by it. There is no doubt but that the same means, which we use to rectify malt spirits, that is to clear it of its nauseous and stinking oil, which always rises with it in the first distillation, would also serve to purify these brandies, and by leaving these extraneous oils behind, render them as well tasted as any others; since there is no question, but that the oil of malt, which is a principle of the same ingredient with the spirit, is more firmly united to it than these flavouring oils in the brandy, which are not the produce of the grape, but of some foreign matter only accidentally mixed with it. See BRANDY and SPIRITS.

It is a mistake to imagine, that all the brandies made in France are so fine as those which we meet with on the quays of London; on the contrary, there are many hundred pieces made every year, which are as badly flavoured as our coarsest malt spirit. But the case is this, they send the best brandies, and the best wines to England, where they can get the best prices for them. In Holland, on the contrary, the mart of goods of all sorts, it is sometimes difficult to select one piece of good brandy out of fifty, the general run of them being either *seedy*, or musty, oily, or otherwise infected with some unnatural and disagreeable flavour; and these are the sorts which in France they despair of curing by re-distillation, or bringing to the state of three fifths, or *trois cinques*, as they express their stronger brandies. Shaw's Essay on Distillery.

SEEING, the act of perceiving objects by the organ of SIGHT; or, it is the sense we have of external objects, by means of the eye.

For the apparatus, or disposition of the parts necessary to *seeing*, see EYE. For the manner wherein *seeing* is performed, and the laws thereof, see VISION.

Our best anatomists differ greatly as to the cause why we do not *see* double with the two eyes? Galen, and others after him, ascribe it to a coalition, or decussation, of the optic nerve, behind the os sphenoides. But whether they decussate or coalesce, or only barely touch one another, is not so well agreed.

The Bartholines and Vesalius say expressly, they are united by a perfect confusion of their substance; Dr. Gibson allows them to be united by the closest conjunction, but not by a confusion of their fibres.

Alhazen, an Arabian philosopher of the 12th century, accounts for single vision by two eyes, by supposing that when two corresponding parts of the retina are affected, the mind perceives but one image.

Descartes, and others, account for the effect another way; viz. by supposing that the fibrillæ constituting the medullary part of those nerves, being spread in the retina of each eye, have each of them corresponding parts in the brain; so that when any of those fibrillæ are struck by any part of an image, the corresponding parts of the brain are affected thereby.

Somewhat like which is the opinion of Dr. Briggs, who takes the optic nerves of each eye to consist of homologous fibres, having their rise in the thalamus nervorum opticorum, and being thence continued to both the retinæ, which are composed of them; and farther, that those fibrillæ have the same parallelism, tension, &c. in both eyes; consequently, when an image is painted on the same corresponding, sympathizing parts of each retina, the same effects are produced, the same notice carried to the thalamus, and so imparted to the soul. Hence is that double vision ensuing upon an interruption of the parallelism of the eyes; as when one eye is depressed by the finger, or their symphony is interrupted by disease: but Dr. Briggs maintains, that it is but in few subjects there is any decussation; and in none any conjunction more than mere contact.

Dr. Briggs's notion is by no means consonant to facts, and is attended with many improbable circumstances.

It was the opinion of sir Isaac Newton, and of many others, that objects appear single, because the two optic nerves unite before they reach the brain. But Dr. Porterfield shews, from the observation of several anatomists, that the optic nerves do not mix, or confound their substance, being only united by a close cohesion; and objects have appeared single, where the optic nerves were found to be disjoined. To account for this phenomenon, this ingenious writer supposes, that, by an original law in our natures, we imagine an object to be situated somewhere in a right line drawn from the picture of it upon the retina, through the centre of the pupil; consequently, the same object appearing to both eyes to be *in* the same place, the mind cannot distinguish it into two.

In answer to an objection to this hypothesis, from objects appearing double when one eye is distorted, he says, the mind mistakes the position of the eye, imagining, that it had moved in a manner corresponding to the other, in which case the conclusion would have been just: in this he seems to have recourse to the power of habit, though he disclaims that hypothesis. This principle, however, has been thought sufficient to account for this appearance.

Originally, every object making two pictures, one in each eye, is imagined to be double; but, by degrees, we find that when two corresponding parts of the retina are impressed, the object is but one; but if those corresponding parts be changed by the distortion of one of the eyes, the object must again appear double as at the first. This seems to be verified by Mr. Cheselden, who informs us that a gentleman, who, from a blow on his head, had one eye distorted, found every object to appear double, but by degrees the most familiar ones came to appear single again, and in time all objects did so without amendment of the distortion. A similar case is mentioned by Dr. Smith.

On the other hand, Dr. Reid is of opinion, that the correspondence of the centres of two eyes, on which single vision depends, does not arise from custom, but from some natural constitution of the eye and of the mind.

M. du Tour adopts an opinion, long before suggested by Gassendi, that the mind attends to no more than the image made in one eye at a time; in support of which he produces several curious experiments; but as M. Buffon observes, it is a sufficient answer to this hypothesis, that we see more distinctly with two eyes than with one; and that when a round object is near us, we plainly see more of the surface in one case than in the other.

With respect to single vision with two eyes, Dr. Hartley observes, that it deserves particular attention, that the optic nerves of men, and such other animals as look the same way with both eyes, unite in the sella turcica in a ganglion, or little brain, as it may be called, peculiar to themselves, and that the associations between synchronous impressions on the two retinas must be made sooner, and cemented stronger on this account; and that they ought to have a much greater power over one another's images, than in any other part of the body. And thus an impression made on the right eye alone by a single object, may propagate itself into the left, and there raise up an image almost equal in vividness to itself; and, consequently, when we *see* with one eye only, we may, however, have pictures in both eyes.

It is a common observation, says Dr. Smith, that objects seen with both eyes appear more vivid, and stronger than they do to a single eye, especially when both of them are equally good. Porterfield on the Eye, vol. ii. p. 285. 315. Smith's Optics, Remarks p. 31. Reid's Inquiry, p. 267. Mem. Presentes, p. 514. Acad. Par. 1747. M. p. 334. Hartley on Man, vol. i. p. 207. Priestley's Hist. of Light and Colours, p. 663, &c.

Whence it is that we *see* objects erect, when it is certain, that the images thereof are painted invertedly on the retina, is another difficulty in the theory of *seeing*. Descartes accounts for it hence, that the notice, which the soul takes of the object, does not depend on any image, nor on any action coming from the object, but merely on the situation of the minute parts of the brain, whence the nerves arise. E. gr. the situation of a capillament of the optic nerve corresponds to a certain part of the brain, which occasions the soul to see all those places lying in a right line therewith.

But Mr. Molyneux gives us another account; the eye, he observes, is only the organ, or instrument; it is the soul that *sees*. To inquire, then, how the soul perceives the object erect by an inverted image, is to inquire into the soul's faculties. Again, imagine that the eye receives an impulse on its lower part, by a ray from the upper part of an object, must not the visive faculty be hereby directed to consider this stroke as coming from the top, rather than the bottom of the object; and, consequently, be determined to conclude it the representation of the top?

Upon these principles, we are to consider, that inverted is only a relative term, and that there is a very great difference between the real object, and the means or image whereby we perceive it. When all the parts of a distant prospect are painted upon the retina (supposing that to be the seat of vision), they are all right with respect to one another, as well as the parts of the prospect itself; and we can only judge of an object being inverted, when it is turned reverse to its natural position with respect to other objects which we *see* and compare it with.

The eye or visive faculty (says Molyneux) takes no notice of

of the internal ſurface of its own parts, but uſes them as an inſtrument only, contrived by nature for the exerciſe of ſuch a faculty. If we lay hold of an upright ſtick in the dark, we can tell which is the upper or lower part of it, by moving our hand upward or downward; and very well know, that we cannot feel the upper end by moving our hand downward. Juſt ſo, we find by experience and habit, that upon directing our eyes towards a tall object, we cannot *ſee* its top by turning our eyes downward, nor its foot by turning our eyes upward; but muſt trace the object the ſame way by the eye to ſee it from head to foot, as we do by the hand to feel it; and as the judgment is informed by the motion of the hand in one caſe, ſo it is alſo by the motion of the eye in the other. Molyneux's Dioptr. p. 105, &c. Muſchenbrock's Int. ad Phil. Nat. vol. ii. p. 762. Ferguſon's Lectures, p. 132. See SIGHT, VISIBLE, &c.

SEEING *faith*. See FAITH.

SEELING. A horſe is ſaid to *ſeel*, when he begins to have white eyebrows; that is, when there grows on that part about the breadth of a farthing of white hairs, mixed with thoſe of his natural colour, which is a mark of old age.

It is ſaid a horſe never *ſeels* till he is fourteen years old, and always does before he is fixteen. The light-ſorrel and black ſooner *ſeel* than any other.

Horſe-jockeys uſually pull out thoſe hairs with pincers; but if there be ſo many, that it cannot be done without making the horſe look bald and ugly, then they colour their eye-brows, that they may not appear old.

SEELING, in *Falconry*, is the running a thread through the eye-lids of a hawk, when firſt taken, to make her endure the hood the better.

SEELING, at *Sea*, is uſed in the ſame ſenſe nearly with heeling: when a ſhip lies down conſtantly, or ſteadily, on one ſide, the ſeamen ſay ſhe *heels*; and they call it *ſeeling*, when ſhe tumbles on one ſide violently, and ſuddenly, by reaſon of the ſea forſaking her, as they call it, *i. e.* the waves leaving her for a time in a bowling ſea. When a ſhip thus tumbles to leeward, they call it *lee-ſeel*; and in this there is not much danger, even in a ſtorm, becauſe the ſea will preſently right her up again; but if ſhe rowls or *ſeels* to windward, there is fear of her coming over too ſhort or ſuddenly, and ſo by having the ſea break right into her, be either foundered, or elſe have ſome of her upper works carried away.

SEEM, or SEME. See SEAM.

SEGGARS, in the *Manufacture* of porcelain and pottery, are caſes formed of coarſer clays, but which are capable of ſuſtaining the required heat without fuſion; in which different kinds of earthen ware are baked. See PORCELAIN and POTTERY.

SEGMENT *of a circle*, in *Geometry*, a part of a circle, comprehended between an arch and the chord thereof: or, it is a part of a circle comprehended between a right line leſs than a ſemi-diameter, and part of the circumference.

Thus the portion A F B A (*Tab.* IV. *Geometry, fig.* 110.) comprehended between the arch A F B, and the chord A B, is a *ſegment* of the circle A B F D, &c. ſo is alſo A D B A a *ſegment* comprehended between the arch A D B and the chord A B.

As it is evident every *ſegment* of a circle muſt either be greater or leſs than a ſemicircle, the greater part of the circle cut off by a chord, *i. e.* the part greater than a ſemicircle, is called the *greater ſegment*, as A F B; and the leſſer part, or the part leſs than a ſemicircle, the *leſſer ſegment*, as A D B, &c.

The angle which the chord A B makes with a tangent L B, is called the ANGLE *of a ſegment*.

Some alſo call the two mixed angles comprehended between the two extremes of the chord and the arch, *angles of the ſegment*; but thoſe are in reality the ſame with thoſe of the chord and tangent.

SEGMENT, *angle in the*. See ANGLE.

SEGMENTS, *ſimilar*. See SIMILAR.

The height of a *ſegment* D E, and half its baſe, or chord, A E, being given, to find the area of the *ſegment*. Find the diameter of the circle. On this deſcribe a circle, and draw the baſe of the *ſegment* A B; draw the radii A C, B C; and find the number of degrees of the arch A D B. From the diameter had, and its ratio to the periphery, find the periphery itſelf; and from the ratio of the periphery to the arch A D B, and the periphery itſelf, find the length of the arch A D B. This done, find the area of the SECTOR A D B C A: and that of the triangle A C B. Laſtly, ſubtract the triangle from the ſector, and the remainder is the area of the *ſegment*.

If the area of the greater *ſegment* B F A were required, the triangle A C B muſt be added to the ſectors A C F and B C F.

SEGMENT *of a ſphere*, is a part of a ſphere terminated by a portion of its ſurface, and a plane which cuts it off, paſſing ſomewhere out of the centre. This is more properly called a *ſection of a ſphere*.

The baſe of ſuch a *ſegment*, it is evident, is always a circle whoſe centre is in the axis of the ſphere.

The ſolid content of a *ſegment* of a ſphere is found, by multiplying the ſurface of the whole ſphere by the altitude of the *ſegment*, and then dividing the product by the diameter of the ſphere, and to the quotient adding the area of the baſe of the *ſegment*: or, if it be leſs than a hemiſphere, thus; take the altitude of the *ſegment* from the radius of the ſphere, and by the difference multiply the area of the baſe of the *ſegment*, and ſubtract this product, from that which will ariſe by multiplying the ſemi-axis of the ſphere into the convex ſurface of the *ſegment*; then divide the remainder by 3, and the quotient is the ſolidity ſought.

The latter method ſuppoſes the axis of the ſphere to be given; if not, it may be found thus; let the altitude of the *ſegment* be called a, and its ſemidiameter, s, then will $a : s :: s : \frac{ss}{a}$; add $\frac{ss}{a}$ to a, and that ſhall give the axis ſought. See FRUSTUM.

SEGMENT *reſiſtance of a*. See RESISTANCE.

SEGMENT is ſometimes alſo extended to the parts of ellipſes, and other curvilinear figures.

SEGMENTS, *line of*. On Gunter's SECTOR there are uſually two lines, called *lines of ſegments*; they are numbered with 5, 6, 7, 8, 9, 10, and lie between the lines of ſines, and thoſe of ſuperficies. They repreſent the diameter of a circle, ſo divided into one hundred parts, as that a right line drawn through thoſe parts, and normal to the diameter, ſhall cut the circle into two *ſegments*, of which the greater ſhall have that proportion to the whole circle, which the parts cut have to one hundred.

SEGMENT-*leaves*, a denomination given by botaniſts to thoſe leaves that are cut and divided into many ſhreds, or ſlices, as fennel, &c.

SEGMENTUM, among the *Romans*, an ornament of lace uſed by the women on their ſhoulders, which, according to ſome, reſembled our ſhoulder-knots.

Segmenta were likewiſe a kind of teſſelated or Moſaic pavements, made up of pieces of various ſhapes and colours, but which had an uniform and regular arrangement.

SEGMOIDAL *valves*, in *Anatomy*, are little valves of the pulmonary artery; thus called from their reſembling ſegments of circles but more uſually called SEMILUNAR *valves*.

SEGREANT is the *heralds* word for a gryphon, when drawn in a leaping poſture, and diſplaying his wings, as if ready to fly.

SEGOLTA *rex*, one of the Hebrew ACCENTS, uſually anſwering to our ſemicolon, and marked with three points over a letter thus (∴), or (.·.).

SEGUE, in the *Italian Muſic*, is often found before *aria*, *alleluja*, *amen*, &c. to ſhew that thoſe portions or parts are to be ſung immediately after the laſt note of that part over which it is writ. But if theſe words *ſe piace*, or *ad libitum*, are joined therewith, it ſignifies that thoſe portions may be ſung or not at pleaſure.

SEGUENZA, in the *Italian Muſic*, a kind of hymn ſung in the Roman church, generally in proſe. The *ſeguenze* are often ſung after the gradual, immediately before the Goſpel, and ſometimes in the veſpers before the Magnificat. They were formerly more uſed than at preſent.

The Romiſh church has retained three *ſeguenze*, called *le tre ſequenze dell' anno*. They are *Lauda Sion ſalvatorem*, &c. *Victimæ paſchali laudes*, &c. *Veni ſancte Spiritus*, &c. Theſe are ſung to muſic in many places. There is alſo one called *Dies iræ, Dies illa*, in the funeral ſervice, which is admirably well ſet, and on which Legrenzi, Lully, and others, have made excellent compoſitions.

SEGUIERIA, in *Botany*, a genus of the *polyandria monogynia* claſs. Its characters are theſe; the calyx is pentaphyllous, it has no corolla, and the fruit is a monoſpermous capſule, terminated by a large wing, and ſmall lateral wings. There is only one ſpecies.

SEJANT is a term uſed in *Heraldry*, when a lion, or other beaſt, is drawn in an eſcutcheon, ſitting like a cat, with his fore-feet ſtraight.

SEIKS, *q. d. diſciples*, in *Modern Hiſtory*, a ſect of Hindoſtan, thus called, becauſe they are followers of a certain philoſopher of Thibet, who taught the idea of a common-wealth, and the pure doctrine of deiſm, without any mixture of either the Mahomedan or Hindoo ſuperſtitions. They made their firſt appearance about the commencement of this century, but were rather reckoned then a particular ſect than a nation. Since the empire began to decline, they have prodigiouſly increaſed their numbers by admitting proſelytes of all religions, without any other

other ceremony than an oath, which they tender to them, to oppose monarchy.

SEIGNEUR, or SEIGNOR, *lord*. See SIRE, SIEUR, MONSEIGNEUR, LORD, &c.

SEIGNIORY, *dominium*, in our *Law*, is used for a manor or lordship.

SEIGNORAGE, or SEIGNOURAGE, a right or due belonging to a seigneur, or lord.

SEIGNORAGE is particularly used for a duty belonging to the prince for the coining of money, called also COINAGE, and in the baser Latin *monetagium*.

This duty is not always the same, but changes according to the pleasure of the prince, and the occasions of state. It is in some measure for the discharge of this duty that alloy was invented; that is, the mixture of other metals with gold and silver.

Under our ancient kings, for every pound of gold brought in the mass to be coined, the king's duty was five shillings; one shilling, and sometimes eighteen pence, whereof went to the master of the mint. Under Edward III. the *seignorage* of every pound weight of silver was eighteenpennyweight, which was then equivalent to a shilling. Under Henry V. the king's *seignorage* for every pound of silver was fifteenpence. At present, the king claims no *seignorage* at all, but the subject has his money coined at the public expence; nor has the king any advantage therefrom, but what he has by the alloy.

In France, under Philip Augustus, the *seignorage* was one third of the profit made by the coining: St. Louis fixed it at one sixteenth part of the value of the money coined: king John, at three livres the mark of gold: Charles VII. by reason of the distressed state of his finances, raised it to three-fourths of the value; Louis XIII. fixed it at six livres the mark, or eight ounces of gold, and ten sols the mark of silver. Louis XIV. took away the right of *seignorage* in 1679, though it was re-established in 1689, on the foot of seven livres ten sols the mark of gold, and twelve sols six deniers the mark of silver.

It must be observed, that for the levying of this duty of *seignorage*, the just value of the money is augmented by the value of the duty.

SEIM, in *Agriculture*, a term used by the farmers of Cornwall to express a certain determinate quantity of sea-sand, which they use as manure to their lands.

They dredge this up on the sea coasts, and carry it as far towards the lands, where it is to be used, as they can by water. At the landing place the farmers bring a train of horses to receive it, each horse carrying a *seim*, that is a sack of it, containing thirteen gallons. The land carriage of this sand, in Cornwall alone, is supposed to cost thirty-two thousand pounds annually; and yet the farmers find abundant encouragement to continue the use of it, it is so rich a manure.

SEISACHTHEIA, Σεισαχθεια, in *Antiquity*, a public sacrifice at Athens, in memory of Solon's ordinance, whereby the debts of poor people were either entirely remitted, or at least the interest due upon them lessened, and the creditors hindered from seizing upon the persons of their debtors, as had been customary before that time.

The word signifies the shaking off a burden.

SEISIN, SEISINA, in *Law*, signifies *possession*. In this this sense we say, PRIMER *seisin*, for the first possession, &c.

Seisin is twofold, *seisin in fact*, and *seisin in law*.

SEISIN *in fact*, is when an actual and corporal possession is taken.

SEISIN *in law* is, when something is done, which the law accounted a *seisin*, as an inrollment.

This in law gives a right to lands and tenements, though the owner be by wrong disseised of them. "He who hath an hour's possession quietly taken, hath *seisin de droit, & de claime*, whereof no man may disseise him by his own force or subtlety, without process of law. See DISSEISIN.

The civilians call the latter *civilem possessionem*, and the former *naturalem*.

SEISIN, *livery of*. See LIVERY.

SEISINA *habenda, quia rex habuit annum, diem et vastum*, in *Law*, a writ that lies for delivery of *seisin* to the lord of lands or tenements, after the king, in right of his prerogative, hath had the year, day, and waste, on a felony committed.

SEISINAM *habere facias*. See HABERE.

SEISOR. See DISSEISOR.

SEITAN, a name given by Avicenna, and other of the Arabian writers, to a species of prickly tree, often recommended in their prescriptions.

The word is sometimes also written *setan*, *siten*, *setah*, or *setim*.

Pliny mentions this as a wood remarkably durable. He says it grew most plentifully in Egypt, and that it remained uncorrupted in waters. It is called by him, and others of the old Latin writers, *spina nigra*, the *black thorn*; and the durable nature of our common sloe-tree, or black thorn, growing in our hedges, has tempted some to believe it to be the same with the *setan*, or *spina nigra* of the ancients; but this is overthrown by the common account of Pliny, and others, of ships being built of this wood, the small size of our black thorn rendering it wholly impossible to put it to such uses.

Theodotion is to be understood of this wood, when he speaks of the *setah*, or *acanthina*.

It is plain from Avicenna, that this *setan*, or *seitan*, is no other than that species of *acacia*, which, from its producing our gum arabic, is called *the gum arabic tree*.

SEIZE, SEAZE, or SEISE, in the *Sea Language*, is to make fast, or bind, particularly to fasten two ropes together with a small line or cord, which is called *seizing*.

The *seizing*, *seasing*, or *seasen of a boat*, is a rope tied to a ring, or little chain, in the foreship of the boat, by which means it is fastened to the side of the ship.

SEIZING, in *Falconry*, is when an hawk gripes her prey, or any thing else, fast between her claws.

SEIZURE, in *Commerce*, an arrest of some merchandize, moveable, or other matter, either in consequence of some law, or of some express order of the sovereign.

Contraband, goods, those fraudulently entered, or landed without entering at all, or landed at wrong places, are subject to *seizure*.

In *seizures* among us, one half goes to the *seizor*, or informer, and the other half to the king. In France, half the painted linens, &c. seized, used to be burnt, and the other half sent abroad, but in 1715, by an arret of council, the whole was ordered to be burnt.

SEL, in the *Materia Medica* of the ancients, a name given to the fruit of an Indian plant, resembling the cucumber in its manner of growth, but bearing a fruit like a pistachia-nut.

There are three of these fruits mentioned by the Arabian writers, the BEL, FEL, and *sel*.

They tell us expressly that the bel and fel, as also the fruit *sel*, were not the fruit of a tree, but of a plant, and that of the creeping kind. It is very probable, that the other fel of Avicenna is the root of the *nymphæa Indica*, which he mentions in the chapter of *nenuphar*, as possessing the same virtues which he attributes to this sort of fel, that is the same with those of mandrake.

SELAGINOIDES, in *Botany*, the name of a genus of mosses in the arrangement of Dillenius, a species of LYCOPODIUM; the characters of which are these: the capsules are produced in the alæ of the leaves, in the manner of those of the selago, but they are of a different form, being tricoccous, and sometimes quadricoccous, and opening, when mature, into so many valves. See *Tab.* XIV. *Botany*, N° 16.

Of this genus of moss we have only one known species, which is the prickly *selaginoides*, commonly called *feeding mountain moss*. This is found in the mountainous parts of Yorkshire, and in Wales, and loves rocky and moist places.

SELAGO, in *Botany*, a genus of the *didynamia angiospermia* class. Its characters are these: the flower has a permanent empalement of one leaf, cut into five parts at the top; the flower is of one petal, and has a very small tube; the brim is spreading, and cut into five parts, the two upper segments being the least. It has four hair-like stamina the length of the petal, to which they are inserted, two of them longer than the other, terminated by single summits; and a roundish germen supporting a single style, crowned by an acute stigma. The germen afterward becomes a single seed, wrapped up in the petal of the flower. Miller mentions only one species, which is a native of the Cape of Good Hope; Linnæus enumerates ten species.

SELAGO is also the name of a species of LYCOPODIUM in the Linnæan system; but of a genus of mosses in the distribution of Dillenius; the characters of which are these: the capsules are produced in the alæ of the leaves, and are either reniform, or globular, and have neither pedicle, operculum, nor calyptra, like the capsules of the other mosses; they have only one cavity, and part into two valves when ripe; to this it may be added, that the plants are all rigid and shrubby, and the stalks as well as roots are dichotomous. See *Tab.* XIV. *of Botany*, N° 13.

Dillenius ennumerates five species. Hist. M. p. 436.

SELAH, in *Scripture Criticism*, a word which occurs no less than seventy times in the Hebrew text of the Psalms, and which has occasioned great difficulty to the critics.

The Septuagint renders it διαψαλμα, *q. d.* a pause in singing: and this, it must be owned, was greatly wanted before the Psalms were divided into verses.

 SEL

SELANICN, in *Botany*, a name by which fome authors have called the common *crocus vernus*, or the garden fpring-flower we call the *crocus*.

SELATUS, one of the many names by which the chemical writers have called *quickfilver*.

SELECTI *judices*, in the *Roman Republic*, were perfons appointed by the prætor with the mutual confent of contending parties, and bearing in many refpects a remarkable refemblance to our juries; for they were firft returned by the prætor, then their names were drawn by lot, till a certain number was completed; then the parties were allowed their challenges; next they ftruck what we call a tales; and, laftly, the judges, like our JURY, were fworn.

SELENÆ, Σεληναι, in *Antiquity*, a kind of cakes ufed in facrifices, and fo called from their being broad and horned, in imitation to the new moon.

SELENDERS, in the *Manege*, are chops or mangy fores in the bending of a horfe's hough, as the MALANDERS are in the knees.

SELENEUSIACA *terra*, *earth of Seleneufia*, in the *Materia Medica of the Ancients*, a light fungous earth called by later naturalifts AGARICUS *mineralis*, and when found in form of powder, or in a difcontinuous ftate, *lac lunæ*.

It is an earth common enough, wherever there are ftone quarries, all over the world; but the fineft ever met with is that from Sicily, the place where the ancient Seleneufia, or Selinus ftood, and from whence the ancient phyficians had it. Some of them have called it the *creta Seleneufiaca*; but all their defcriptions agree in proving it to be this very earth now found there. Diofcorides and Galen mention its remarkable diffufibility in water, and Pliny mentions its melting into a kind of juice, or fmooth homogene fubftance with it; properties fo very applicable to this earth, and fo little fo to any other, as to leave no doubt of their having been originally applied to the very fame fubftance.

The ancients gave it internally as an aftringent; but its principal ufe was external, as a cofmetic among the ladies. And Dr. Plot recommends our lac lunæ, on perfonal experience, for the fame purpofes.

SELENIACON, a name for a kind of amulet worn for the epilepfy.

SELENITES, in *Natural Hiftory*, the name of a large clafs of foffils, the characters of which are thefe; they are bodies compofed of flender and fcarce vifible filaments, arranged into fine, even, and thin flakes; and thofe difpofed into regular figures, in the feveral different genera, approaching to a rhomboide, or hexangular column, or a rectangled parallelogram; fiffile, like the talcs, but that not only in a horizontal, but alfo in a perpendicular direction: they are flexile in a fmall degree, but not at all elaftic; they do not ferment with acid menftrua, but readily calcine in the fire. See *Tab. of Foffils, Clafs* 2.

Of this clafs there are feven orders of bodies, and under thofe, ten genera: the *felenitæ* of the firft order are thofe compofed of horizontal plates, and approaching to a rhomboidal form: of the fecond are thofe compofed of horizontal plates, arranged into a columnar and angular form: of the third are thofe whofe filaments are fcarce vifibly arranged into plates, but which, in the whole maffes, appear rather of a ftriated than of a tabulated ftructure: of the fourth are thofe which are flat, but of no determinately angular figure: of the fifth are thofe formed of plates, perpendicularly arranged: of the fixth, are thofe formed of congeries of plates, arranged into the figure of a ftar; and of the feventh are thofe of a complex and indeterminate figure.

Of the firft of thefe orders are three genera. 1. The LEPTODECARHOMBES. 2. The PACHODECARHOMBES. 3. The TETRADECARHOMBES.

Of the fecond order there are alfo three genera. 1. The ISCHNAMBLUCES. 2. The ISAMBLUCES. 3. The OXUCIÆ.

Of the third order there is only one known genus, the INAMBLUCIA.

Of the fourth order there is alfo only one known genus, the SANIDIA.

Of the fifth order there is alfo only one known genus, the CATHETOLIPES.

Of the fixth order there are two genera. 1. The LEPASTRA. 2. The TRICHESTRA.

Of the feventh order there is only one genus, the SYMPLEXIA.

The ftructure of the *felenitæ* of all the genera of the firft order is exactly alike; they are all compofed of a great number of broad flakes or plates, in a great meafure externally refembling the flakes of the foliaceous talcs: thefe are of the length and breadth of the whole mafs; the top and bottom being each only one fuch plate, and thofe between them, in like manner, each complete and fingle, and the body may always be eafily and evenly fplit, according to the direction of thefe flakes. Thefe differ, however, extremely from the talcs, for they are each compofed of a number of parallel threads or filaments, which are ufually difpofed parallelly to the fides of the body, though fometimes parallelly to its ends. In many of the fpecies they are alfo divided by parallel lines, placed at a confiderable diftance from each other, and the plates in fplitting often break at thefe lines; add to this, that they are not elaftic, and that they readily calcine. The ftructure of thofe of the fecond order is the fame with that of the firft; but that in many of the fpecimens of them, the filaments, of which the plates are compofed, run in two directions, and meet in an obtufe angle; and in the middle there is generally feen in this cafe a ftraight line, running the whole length of the column, and fmall parcels of clay infinuating themfelves into this crack, reprefent in it the figure of an ear of grafs fo naturally, as to have deceived many into a belief, that there was really an ear of grafs there. The other orders confifting only of fingle genera, the ftructure of each is explained under the generical name. Hill's Hift. of Foff. p. 121.

SELENITES is alfo a name given by the modern chemifts to a fort of neutral falt, formed by the union of vitriolic acid with any calcareous earth. Nature furnifhes us with a very large quantity of *felenitic* matters: chemifts agree that all gypfums, or plaifter ftones, alabafters, and gypfeous fpars are nothing elfe but *felenites*; and thefe fubftances abound within and upon the earth.

Selenites may be alfo artificially compofed, by combining vitriolic acid to the point of faturation with calcareous earth; for which purpofe the earth muft be finely pulverized, the acid much diluted with water, and more earth added than is neceffary for the faturation; or it may be made by faturating lime-water gradually with weak vitriolic acid, or by pouring this acid into a folution of nitrous or marine falts, with calcareous bafes. This falt is, of all the known neutral falts, the leaft foluble by water; feven or eight hundred parts of water being neceffary to diffolve one part of *felenites*: by a flow evaporation it cryftallizes and forms thin laminæ; when expofed to a moderate fire, it is reduced to a white powder. With a great fire it is not fufible alone, but more eafily fufible than pure calcareous earth, by the addition of fluxes, as fand, and clay, and vitrifying falts.

It refifts the greateft heat without lofing its acid; it cannot be decompofed by phlogifton, by alkalis fixed or volatile, and by metallic folutions in nitrous acid, by means of a double affinity.

Moft waters of wells or rivers contain *felenites* diffolved in them, which may be difcovered by adding to them the folution of mercury, as its forms a precipitate of turbith mineral. Chem. Dict. Art. *Selenites*.

SELENOGRAPHY, formed from σεληνη, *moon*, and γραφη, *defcription*, a branch of cofmography, which defcribes the moon, and all the parts and appearances thereof, as geography does thofe of the earth.

Since the invention of the telefcope, *felenography* is very much improved.

We have now diftinct names for moft of the regions, feas, lakes, mountains, &c. vifible in the moon's body. Hevelius, a celebrated aftronomer, who was a burgher-mafter of Dantzick, and who publifhed the firft *felenography*, named the feveral places of the moon from thofe of the earth; and Ricciolus named them afterwards, from the names of the celebrated aftronomers and philofophers. Thus, what the one calls *mons Porphyrites*, the others calls *Ariftarchus*. What the one calls *Ætna*, *Sinai*, *Athos*, *Apenninus*, &c. the other calls, *Copernicus*, *Pofidonius*, *Tycho*, *Gaffendus*, &c. See MOON.

At the royal obfervatory at Paris, they continue to make *felenographic* maps. And M. Caffini has publifhed a work called *Inftructions Seleniques*.

SELEUCIANS, SELEUCIANI, a fect of ancient heretics, called alfo HERMIANI.

Seleucus and Hermias, taught, that God was corporeal; that the elementary matter was co-eternal with him; and that the human foul was formed by the angels of fire and air. They alfo denied, that Jefus Chrift fat at the right hand of God; afferting that he had quitted that right, and had removed his throne into the fun.

SELEUCIDÆ, in *Chronology*; æra of the *Seleucidæ*, or the Syro-Macedonian æra, is a computation of time, commencing from the eftablifhment of the *Seleucidæ*, a race of Greek kings, who reigned as fucceffors of Alexander the Great, in Syria, as the Ptolemies did in Egypt.

This æra we find expreffed in the book of Maccabees, and on a great number of Greek medals ftruck by the cities of Syria, &c.

The rabbins and Jews call it, the *æra of contracts*, be-

cauſe, being then ſubject to the kings of Syria, they were obliged to follow their method of computing in all contracts.

The Arabs call it *therick dilcarnain*, æra of two horns, which ſome ſay ſignifies the æra of Alexander the Great; by reaſon that prince bore two rams horns on medals, in imitation of Jupiter Ammon, whoſe ſon he would needs be; but others underſtand it much better of the two kingdoms of Syria and Egypt, which were now cloven or divided, and of one ſingle empire parted into two monarchies.

The grand point is to know the year wherein the ſeparation was made; or, which is the ſame thing, when Seleucus Nicanor, one of Alexander's captains, and the firſt of the *Seleucidæ*, eſtabliſhed his throne in Syria.

Without detailing the various ſentiments of various authors, it may ſuffice to obſerve, that, according to the beſt accounts, the firſt year of this æra falls in the year 311, before Chriſt, which was twelve years after Alexander's death. See Epocha.

SELF-*abuſe*. See *Self*-Pollution.

Self-*defence*, in *Law*. With regard to the defence of one's ſelf, or the mutual and reciprocal defence of ſuch as ſtand in the relations of huſband and wife, parent and child, maſter and ſervant, it is obſerved, that, in theſe caſes, if the party himſelf, or any of theſe his relations, be forcibly attacked in his perſon or property, it is lawful for him to repel force by force; and the breach of the peace, which happens, is chargeable upon him only who began the affray.

Self-defence, therefore, as it is juſtly called the primary law of nature, ſo it is not, nor can it be in fact, taken away by the law of ſociety.

In the Engliſh law, particularly, it is held an excuſe for breaches of the peace, nay, even for homicide itſelf; but care muſt be taken, that the reſiſtance does not exceed the bounds of mere defence and prevention, for then the defender would himſelf become an aggreſſor. Blackſt. Com vol. iii. p. 4.

Self-*examination*. See Examination.

Self-*heal*, *prunella*, in *Botany*, a genus of the *didynamia angioſpermia* claſs. Its characters are theſe: the flower has a permanent empalement of one leaf divided into two lips; the upper lip broad, plain, and ſlightly indented in three parts; the flower is of the lip kind, having one petal with a ſhort tube and oblong chaps; the upper-lip is entire and concave, the under-lip reflexed, obtuſe, and trifid; the middle ſegment is broad and indented at the point; it has four awl-ſhaped ſtamina, two long and two ſhorter; and four germina ſupporting a ſlender ſtyle, crowned by an indented ſtigma: the germina become four ſeeds incloſed in the empalement.

Miller ennumerates ten, and Linnæus four ſpecies.

The greater *ſelf-heal*, with an undivided leaf, grows wild in paſture grounds, and flowers in June and July. It is reckoned among the vulnerary plants, and is accounted ſerviceable in all ſorts of wounds and putrid ulcers. It is reſtringent, and good for inward bleedings, and making bloody water; and is much uſed in gargles for ulcers in the mouth, throat, or gums, either in juice, or in a ſtrong decoction.

Its virtues do not appear to be very great; its auſtere or bitteriſh taſte is more ſenſible in the flowery tops than in the leaves; though the latter are generally directed for medicinal uſe.

Self-heal is alſo a name given to Sanicle.

Self-*love*, in *Ethics*, is that principle, or paſſion, which leads a man to deſire and purſue his own happineſs. It is contradiſtinguiſhed from benevolence.

Self-*opens*, a term uſed by the miners in the North of England to expreſs certain natural cavities, or chambers, which are frequently met with, ſome near the ſurface, ſome at very great depths, ſome ſmall, and others very large.

Theſe are of various figures, and often run into ſtrange ſinuſes. Dr. Liſter, in accounting for the origin of earthquakes, ſuppoſes the whole cruſt of the earth to be more or leſs hollowed in this manner; which he alſo argues for, from the ſtreams of waters which ariſe in large quantities from the ſides of mountains, and muſt have communication with theſe *ſelf-opens*, and ſupplies from them.

Theſe natural hollows the doctor thinks to be the means of continuing, and propagating earthquakes; the firſt cauſe of which he aſcribes to the breath of the pyrites, which he alſo ſays is the pyrites itſelf *tota ſubſtantia*. This he obſerves takes fire of itſelf, on being expoſed to the air in our ſight, and may do ſo, from various other cauſes underground. The ſulphureous ſmell of the air and waters before and after earthquakes, in the places where they happen, ſeems a proof that they owe their origin to ſome ſuch ſulphureous matter as this ſtone; and the rolling and deſultory noiſe of an earthquake ſeems alſo to ſhew that it is not expanded every way at once, but is propagated through a chain of theſe ſubterranean hollows.

It is not neceſſary that we ſhould ſuppoſe a continued chain of them, from the place where the earthquake begins to be felt to the ſpot where it ends; but if there are many of them irregularly ſcattered about the earth, the force of the exploſion will be ſufficient to burſt through the ſolid parts between, and open a paſſage from one to the other, which may continue open no longer than the force continues, and after the ſhock is over cloſe together again, ſo as to leave no trace where it was.

Our miners not only find the natural caverns, but they alſo find them often full of what they call *fire* damps, which are inflammable vapours, of the very nature of thoſe which he ſuppoſes to occaſion earthquakes; and when fired make the ſame exploſions, and cauſe the ſame effects in a certain degree. Theſe ſometimes require a candle, or other actual fire, to come in contact, in order to kindle them; but ſometimes they are found kindled of themſelves, and flaming on the ſurface of the waters, in the bottoms of the pits, or at the fiſſures of the coal. Phil. Tranſ. Nº 157.

SELI, in *Botany*, a word formed by an abbreviation of the word seseli, and ſignifying the ſame plant.

SELICHA, a name given by the Arabians to a kind of cinnamon.

SELIGONION, in *Botany*, a name by which ſome authors have called piony.

SELINUM, in *Botany*. See *Milky*-Parsley.

SELION *of land*, *ſelio terræ*, is derived from the French, *ſeillon*, which ſignifies *a ridge of land*, or ground ariſing between two furrows, and contains no certain quantity, but ſometimes more and ſometimes leſs. Therefore Crompton ſays, that a *ſelion of land* cannot be in demand, becauſe it is a thing uncertain.

SELKIE, the name in Zetland for a ſeal. Many of theſe are found in that iſland.

SELL, in *Building*, is of two kinds, viz. ground-*ſell*, which denotes the loweſt piece of timber in a timber building, and that whereon the whole ſuperſtructure is raiſed. See Ground *Plates*.

Sell, *window*, called alſo *window-ſoil*, is the bottom piece in a window frame.

Sell-*bed*, in *Mining*, a term uſed in ſome parts of England to expreſs ſome particularly rich parts of the vein of ore.

In Cornwall they ſometimes find the tin-ore ſo pure, that it requires only bruiſing to dreſs it, without the waſhing and ſeparation by grates, launders, and the like means: they call theſe collections of ore the *ſell-beds* of tin; and it is obſerved, that theſe never have any ſtrings iſſuing from them, as the other lands have. Philoſ. Tranſ. Nº 69.

SELLA, among the *Romans*, a chair in which the old and infirm were carried by ſervants through the city, and in journeys. Sometimes the phyſicians preſcribed it as an exerciſe. See Lectica.

Sella *curulis*, among the Romans. See Curule *chair*.

Sella *equina*, *Turcica*, or *ſphenoides*, is a name given to the four apophyſes of the os ſphenoides, or cuneiforme, in the brain; in regard of their forming a reſemblance of a ſaddle, which the Latins call *ſella*.

They are ſometimes alſo called by the Greek name *ellenoides*. Herein is contained the pituitory gland, and in ſome beaſts, the *rete mirabile*.

SELLIGA, in the *Materia Medica*, a name by which ſome authors have called the *narda Celta*, or Celtic ſpikenard of the ſhops.

SELLI, Σελλοι, in *Antiquity*, an appellation given to thoſe who firſt delivered oracles. Theſe, according to Strabo and Euſtathius, were men, and the name *ſelli* is ſaid to come from *Sellæ*, a town in Epirus, or from the river called by Homer *Selleis*.

SELTZER-*water*, the name of a mineral water of Germany, which ariſes near Neider Seltzer, or Lower Seltzer, about ten miles from Francfort on the Mayne, and which is now uſed in England and many other countries.

This water iſſues forth at the ſpring with great rapidity, is remarkably clear and bright, and on pouring it from one bottle into another, diſcharges abundance of air-bubbles.

That which is imported at London is brought over in ſtone-bottles, cloſely corked and cemented, containing about three Engliſh pints each, by which means this water, as long as the common air is excluded, will retain many of its excellent qualities for ſeveral months; but this caution is ſo neceſſary, that if too large an empty ſpace is left even in the neck of a bottle, it ſoon loſes in a great degree that briſk, ſmart, pungent taſte, which principally characteriſes its excellence, and is more liable to be injured by keeping than any other mineral water.

Hoffman,

Hoffman, in conſequence of an analyſis of this water, obſerves, that an immediate effervescence enſues on mixing any acid with it, and eſpecially with Rheniſh wine and ſugar, in which caſe the emotion is attended with a noiſe, and the liquor becomes milky; but mixed with Rheniſh wine alone, it becomes turbid, and acquires a brown colour with a reddiſh caſt; that the taſte of this water is not ſo penetrating and ſubacid as that of moſt other mineral waters, but has a flavour reſembling that of a diluted ſolution of a lixivial ſalt; that, with an addition of powder of galls, it does not become purple, nor blacken the ſtools of thoſe who drink it; that, on adding oil of tartar, it becomes milky without any precipitation: that a quart of this water gently evaporated yields a drachm and twelve grains of a ſaline matter, which, diſſolved and filtrated, yields, on a ſecond evaporation, two ſcruples of a pure alkaline ſalt; and that this ſalt diſſolved in water, and added to a ſolution of corroſive ſublimate, precipitates a yellow powder or turbith mineral, and mixed with an infuſion of rhubarb, gives it a reddiſh colour, and mixed with ſal ammoniac, emits a pungent ſmell: that a quart of this water, ſaturated with ſpirit of vitriol, and gently evaporated, affords a drachm and a half of ſalt, not diſtinguiſhable from vitriolated tartar: that no medicinal water is ſo apt to ſpoil and be corrupted by keeping, and that if it be ſet for a day or two in an open veſſel, it wholly loſes its natural flavour, and taſtes only like water in which oil of tartar had been mixed.

From all theſe obſervations he infers, that this water abounds with an alkaline ſalt in a much greater quantity than any of the other known mineral waters, without ſeeming to contain any particles of the ferruginous earth and bitter purging ſalt, which are the common ingredients of the other mineral waters: on this account, he adds, that it does not purge, but generally goes off by urine. Hoffman recommends it as one of the mildeſt and moſt innocent of all the mineral waters, and obſerves that it may be taken by perſons of the weakeſt conſtitution.

From the experiments of Dr. Brockleſby on *Seltzer-water*, we learn, that upon dropping twelve drops of very highly coloured ſyrup of violets into a wine-glaſs of it, the ſyrup ſeemed firſt to manifeſt a purple hue, but upon their intimate union, the whole changed into a beautiful green: that the ſame quantity of oil of tartar per deliquium dropped into a glaſs of ſparkling, freſh, clear water, quickly turned the whole milky, and after ſtanding, a fine pearl-coloured powder fell to the ſides and bottom of the glaſs; on adding an equal number of drops of pure dephlegmated ſpirit of vitriol to a glaſs of this water, a light cloud was ſeen ſuſpended towards the middle of the glaſs, and numerous air-bubles roſe from all parts of the water, and the ſparkling might be renewed by adding one or more drops of the acid, and ſhaking the glaſs; and the like ebullition was more readily produced by a ſolution of ſugar and Rheniſh wine, or vinegar with the ſame: and the ſame appearances were exhibited by dropping any vegetable or mineral acids into this water, as are obſerved when alkalis and acids are mixed together: a volatile cauſtic alkali, in half an hour after it had been dropped into this water, produced at firſt a cloud and afterward a precipitation. Lixivium ſaponarium ſo far decompoſed a glaſs of *Seltzer-water*, that a cloud inſtantly appeared in the middle of it, and the air-bubbles emerging from the lower part of it were greedily abſorbed by the cauſtic alkali, which is known to imbibe fixed air, whenever it comes into contact with it. This water, ſays Dr. Brockleſby, poured into a glaſs, ſeparates more air-bubbles than any other water which he had tried, and continues longer to do ſo in the open air, but its ſparkling may be renewed by adding any ſubacid vegetable, and a little ſugar, as ſharp cyder and Rheniſh wine and ſugar; but, he adds, that the beſt *Seltzer-water* here will not perfectly curdle milk, nor lather with ſoap, and that with powder of gall-nuts no farther change of colour appeared than in pure water. By evaporating twenty-four ounces of the beſt *Seltzer-water*, he obtained thirty-ſix grains of a ſaline reſiduum; and the greateſt quantity he could ever get from a pint, wine meaſure, was leſs than thirty grains.

Ten drops of ſtrong ſpirits of vitriol, poured on as many grains of ſalt of *Seltzer-water*, cauſed great and inſtant ebullition, and ſuffocating ſteam, which tinged blackiſh a ſilver ſpoon held in them, and gave to its poliſhed ſurface a bitter taſte.

Having diſſolved ſixty-ſix grains of pure white ſalt, obtained from this water, in diſtilled water, and filtrated it, he thereby obtained ſeven grains of a calcareous earth, perfectly ſoluble in all weak acids; but by ſeveral different modes of trial he was led to conclude, that this water contains no ferruginous principle.

Finding that the ſalts and earths, contained in *Seltzer-water*, are too inconſiderable both in quantity and quality to promiſe any very material medicinal effects, he proceeded to inveſtigate what might be aſcribed to the great quantity of fixed air, which this water conſtantly diſcharges, in a heat not exceeding that of the human body; and the reſult was, that the factitious air yielded by a bottle full of water, containing exactly fourteen ounces ſeven drachms, in a heat never exceeding 116° by Fahrenheit's ſcale, amounted to a quantity which occupied a ſpace, that required two ounces two and a half drachms of water to fill it; or, allowing two hundred and ſixty-five grains of common water for a cubic inch, the whole water amounted to twenty-ſeven cubic inches, and that which would fill the ſpace occupied by the air four ounces and one-fifth; and ſo large a quantity of interſticial air, he ſays, was generated in a heat not incompatible with life in any part of the world, as the fever heats in all climates teſtify, and leſs than the heat which is often experienced without inſtantaneous prejudice in ſome tropical climates.

However, this generated air ſoon began to be re-abſorbed into the body of the water, and in about eight hours, the ſpace occupied by the remaining air did not exceed one-fifth of what it had formerly done.

From another experiment with the ſalt of *Seltzer-water*, he found, that this ſeems to have let go much the greateſt part of its fixed air, and probably thereby loſt moſt of the virtues inherent in the pure freſh water itſelf.

From ſuch experiments Dr. Brockleſby infers, that *Seltzer* mineral water contains, beſides the mere elementary water, a very ſmall quantity of calcareous earth, and a much greater portion of a native mineral alkali, together with ſome acid retained a while within the water, but which either evaporates into the open air, or elſe is ſoon combined with the mineral alkali: and he thinks it probable, that the active virtues of this water depend more on this elaſtic matter, or fixed air, which it contains in ſuch uncommon abundance beyond other mineral waters, than in any combination of its ſaline and earthy contents, which are found in ſuch ſmall quantities, as to be incapable of any material ſervice, though this water is known to be exceedingly beneficial.

This account of the analyſis of *Seltzer-water* is cloſed with the hiſtory of ſome medical caſes, in which the uſe of this water completed a cure, after a great variety of other remedies had proved inſufficient.

The operations of this water, as Hoffman obſerves, is chiefly by urine, for it has no purgative virtues. It corrects acidities, renders the blood and juices more fluid, and promotes a briſk and free circulation; and, therefore, it is good in obſtructions of the glands, and againſt groſs and viſcid humours. It is of great uſe in the gravel and ſtone, and other diſorders of the kidnies and bladder.

It is alſo excellent in gouty and rheumatic complaints, eſpecially when mixed with milk, or improved by the addition of Rheniſh wine and a little ſugar. It is drank with great ſucceſs in ſcorbutic, cutaneous, and putrid diſorders. It relieves the heart-burn, and is an excellent ſtomachic. On account of its diuretic quality, it is ſerviceable in dropſical complaints; and mixed with aſſes milk, it is much recommended in conſumptive caſes, and in diſorders of the lungs: with or without milk, it is in great eſteem in nervous diſorders; and alſo in hypochondriacal and hyſteric complaints, and in obſtructions of the menſes, accompanying the uſe of it with proper exerciſe.

It is alſo adminiſtered with ſucceſs in purging and fluxes ariſing from acidity in the bowels; and it is ſaid, if drank by nurſes, to render their milk more wholeſome and nouriſhing, and to prevent it from turning ſour on the ſtomachs of children. See on the ſubject of this article Hoffman. Oper. vol. v. p. 144. London Med. Obſerv. vol. iv. p. 7. &c. Elliot's Account of the Principal Mineral Waters, p. 194. &c.

SELTZER-*water, artificial*, may be prepared by adding one ſcruple of magneſia alba, ſix ſcruples of foſſil alkali, and four ſcruples of common ſalt to each gallon of water, and ſaturating the water with fixed air, in the manner directed under PYRMONT-*water*.

SELVAGE, in *Sea Language*, a ſort of hank or ſkein of rope-yarn tied together at ſeveral diſtances. It is uſed to faſten round any rope, as a ſhroud or ſtay, ſo that a tackle may be hooked in it, to extend the ſaid ſhroud or ſtay, which is called *ſetting it up*.

SEMAMPLEXICAULE *leaf*. See LEAF.

SEMBELLA, among the Romans, a ſmall ſilver coin, equal in value and weight to half the LIBELLA.

SEMBIANI, SEMBIANS, a ſect of ancient heretics, denominated from their leader, *Sembius* or *Sembianus*, who condemned all uſe of wine, as evil of itſelf; perſuaded his

his followers, that the wine was a production of Satan, and the earth; denied the resurrection of the dead, and rejected most of the books of the Old Testament. Jovet.

SEMBRADOR, an engine, invented by Don Jos. de Lucatello, for the evenly sowing of seeds, described in the Philosophical Transactions, under the title of the *Spanish Sembrador*.

The perfection of agriculture is allowed to consist much in setting plants at proportional distances, and giving sufficient depth to the roots, that they may spread, and receive their necessary nourishment; yet there is very little care taken in the practice of this important part of husbandry, but all sorts of grains are sown by handfuls cast at random, by which means four parts in five of the seed are lost. To remedy this inconvenience, the *sembrador*, or sower, is invented, which being fastened to the plough, the whole business of plowing, sowing, and harrowing, is done at once; the seedman's trouble is saved, and the grain spread at equal distances, and equally deep at the bottom of the furrow.

An experiment hereof was made before the emperor Leopold in the fields of Luxemburgh in Austria, where the land usually yields four or five fold; but the crop from the ground sowed by this instrument was sixty-fold, as appears by a certificate of the emperor's officer appointed to see the experiment; signed, Vienna, August 1. 1663.

A figure of the *sembrador* we have in the Transactions, N° 60, by the earl of Castlemain. See *Drill*-Plough.

SEME, or Seeme. See Seam.

SEMEIOSIS, Σημειωσις, in *Medicine*. See Semeiotica.

SEMEIOTICA, Σημειωτικη, formed from σημειον, *sign*, *symptom*, that part of medicine, which considers the signs or indications of health and diseases; and enables the physicians to judge what is, was, or will be, the state, degree, order, and effect, of health or sickness. See Nosology.

SEMELE, in *Mythology*, the mother of Bacchus.

SEMEN *sanctum*, or *santonicum*. See Worm-*seed*.

SEMENTINÆ *feriæ*, in *Antiquity*, feasts held annually among the Romans, to obtain of the gods a plentiful harvest.

They were celebrated in the temple of Tellus, or the *earth*, where solemn sacrifices were offered to Tellus and Ceres.

The time of the celebration was about seed-time, usually in the month of January; for Macrobius observes, they were moveable feasts. They had their name from *semen*, *seed*.

SEMETS, Summets, or Summits, in *Botany*, are used by Dr. Grew, and others, for the apices of the attire of plants.

SEMI, a word borrowed from the Latin, signifying *half*; but only used in composition with other words, as in the following articles.

The French, instead of *semi*, frequently use *demi*, the Greeks *hemi*.

In music, *semi* has three several usages: first, when prefixed to the name of a note, it expresses a diminution of half its value, as in *semi-breve*, &c.

Secondly, when added to the name of an interval, it expresses a diminution, not of half, but of a lesser semitone, or four commas, in the whole compass, as in *semi-diapente*, &c.

Thirdly, it sometimes also signifies an imperfection: thus, *semi-circulo* or *circolo mezzo*, signifies an imperfect circle, which is the mark of imperfect time, that is of double time: whereas the circle, being a character of perfection, marks triple time.

SEMI-ARIANS, in *Ecclesiastical History*, a branch of the ancient Arians, consisting, according to Epiphanius, of such as, in appearance, condemned the errors of that heresiarch, but yet acquiesced in some of the principles thereof, only palliating and hiding them under softer and more moderate terms.

It is true, they separated from the Arian faction; but yet could never be brought to acknowledge, that the Son was homoousios, that is, consubstantial, or of the same substance with the Father; they would only allow him to be homoiousios, that is, of a like substance with the Father, or similar to the Father in his essence, not by nature, but by a peculiar privilege. See Homoousios, &c.

Though, as to expression, they only differed from the orthodox by a single letter, yet were they, in effect, in the opinion of the Arians, as they placed the Son in the rank of creatures. It did not avail the teaching, that there was no other creature of the same class with him, since by denying him consubstantial with God, they effectually precluded him from being truly God.

Yet some, even among the orthodox, use the word homoiousios, in speaking of the Son; applying such an idea to it, as it seems is consistent with orthodoxy.

But the name *Semi-Arians* is also given by the second general council, to another branch of Arians, who believed orthodoxly of the Father and Son, but denied the deity of the Holy Ghost; thus rejecting that part of the Arian system relating to the Son, but stiffly retaining that which related to the Holy Ghost.

As the zeal of the Arians was chiefly levelled against the second person in the Trinity, that of the *Semi-Arians* was bent against the third; whence as the former were sometimes called Χριστομαχοι, the latter were denominated Πνευματομαχοι.

Macedonius bishop of Constantinople made an innovation in this sect in 360, and gave rise to a new branch of Macedonian *Semi-Arians*, or Pneumatomachi; who allowed the Son not to be ομοουσιος, of the *same substance*, but ομοιος, of *like substance* with the Father; and at the same time openly asserted the Holy Ghost to be a creature. This heresy was condemned by the eleventh general council held at Constantinople in the year 381. See Macedonians.

SEMI-BREVE, in *Music*, a note, or measure of time, comprehending the space of two minims, or four crotchets, or half a breve.

The *semi-breve* is accounted one measure of time, or the integer in fractions and multiples whereof the time of the other notes is expressed. Thus the minim is expressed by $\frac{1}{2}$; a crotchet by $\frac{1}{4}$, &c. i. e. by $\frac{1}{4}$ of a measure or *semi-breve*. A breve by 2; and a long by 4, that is, by 4 measures or *semi-breves*.

The character of the *semi-breve* is O.

SEMICIRCLE, in *Geometry*, a figure comprehended between the diameter of a circle, and half the circumference.

Two *semicircles* can only cut each other in one point.

Semicircle is also an instrument in *Surveying*, sometimes called the *graphometer*.

It consists of a *semicircular* limb, as FIG, (*Tab.* III. *Surveying*, *fig.* 50.) divided into one hundred and eighty degrees, and sometimes subdivided diagonally or otherwise into minutes. This limb is subtended by a diameter FG, at the extremities whereof are erected two sights. In the centre of the *semicircle*, or the middle of the diameter, is fixed a box and needle. On the same centre is fitted an alidade, or moveable index, carrying two other sights, as H, I. And the whole is mounted on a staff, with a ball and socket.

The *semicircle*, then, is nothing else but half a theodolite; with this only difference, that whereas the limb of the theodolite, being an entire circle, takes in all the 360° successively; in the *semicircle* the degrees only going from 1 to 180, it is usual to have the remaining 180°, or those from 180° to 360°, graduated in another line on the limb within the former.

To take an angle with a semicircle. Place the instrument in such manner, as that the radius CG may hang over one leg of the angle to be measured, and the centre C over the vertex of the same. The first is done by looking through the sights F and G at the extremities of the diameter, to a mark fixed up in one extremity of the leg; the latter is had by letting fall a plummet from the centre of the instrument. This done turn the moveable index HI on its centre towards the other leg of the angle, till through the sights fixed in it, you see a mark in the extremity of the leg. Then the degree, which the index cuts on the limb, is the quantity of the angle.

For farther uses of the *semicircle*, they are the same with those of the Theodolite.

Semicircular *arches*. See Arch.

Semicirculares *canales*. See Canales.

SEMICIRCULARIS *palpebrarum musculus*, in *Anatomy*, a name given by Spigelius, and some others, to one of the muscles of the face, called by Albinus and Winslow the *musculus* orbicularis *palpebrarum*.

SEMICOLON, in *Grammar*, one of the points or stops, used to distinguish the several members of a sentence from each other.

The mark or character of the *semicolon* is (;). It has its name, as having a somewhat less effect than a colon, or as demanding a shorter pause.

The use of the *semicolon*, the grammarians generally say, is to mark a sense less complete than the colon, and more complete than the comma, but this only conveys a very obscure idea. In effect, the precise office of the *semicolon*, or that office which distinguishes it from the colon, is a thing very little known in the world. Our best authors seem to use them promiscuously. See Colon.

Dr. Ward, formerly professor at Gresham, is perhaps the first who settled a just use of the *semicolon*. His position is, that the *semicolon* is properly used to distinguish the conjunct members of sentences. Now, by a conjunct member of a sentence, he means, such an one as contains at least two simple members.

Whenever, then, a sentence can be divided into several members

members of the same degree, which are again divisible into other simple members, the former are to be separated by a *semicolon*.

E. gr. If fortune bear a great sway over him, who has nicely stated and concerted every circumstance of an affair; we must not commit every thing, without reserve, to fortune, lest she have too great a hold of us.

But though the proper use of the *semicolon* be to distinguish conjunct members, it is not necessary, that all the members divided hereby be conjunct. For upon dividing a sentence into great and equal parts, if one of them be conjunct, all those other parts of the same degree are to be distinguished by a *semicolon*. Thus, whoever is overtaken with poverty; the same will find, that coldness, contempt, injuries, &c. are not far behind. Hither likewise may be referred such sentences, where the whole going before, the parts follow: as, the parts of rhetoric are four; invention, disposition, elocution, and pronunciation.

According to bishop Lowth, a member of a sentence, whether simple or compounded, that requires a greater pause than a comma, yet does not of itself make a complete sentence, but is followed by something closely depending on it, may be distinguished by a *semicolon*. E. gr. But as this passion for admiration, when it works according to reason, improves the beautiful part of our species in every thing that is laudable; so nothing is more destructive to them, when it is governed by vanity and folly. Here the whole sentence is divided into two parts by the *semicolon*; each of which parts is a compounded member, divided into its simple members by the COMMA.

SEMICON, a musical instrument among the Greeks, which had thirty-five strings.

SEMICROMA, *sextuple of*. See SEXTUPLE.

SEMI-CUBICAL *parabola*, a curve of the second order, wherein the cubes of the ordinates are as the squares of the abscisses. Its equation is $ax^2 = y^3$.

SEMICUPIUM, a half bath, wherein the patient is only placed up to the navel. See INSESSUS.

SEMIDIAMETER, a right line drawn from the centre of a circle or sphere, to its circumference; the same with what we otherwise call a *radius*.

The distances, diameters, &c. of the heavenly bodies, are usually estimated by astronomers in *semidiameters* of the earth.

To find the *semidiameters* of the primary planets in *semidiameters* of the earth. The sun's true *semidiameter* is 111,25 *semidiameters* of the earth; and the ratio of the diameters of the primary planets to that of the sun, is as follows; viz. that of the sun being 10,000, that of Mercury will be $34\frac{1}{10}$, that of Venus $103\frac{1}{2}$, that of the Earth $104\frac{1}{2}$, that of the Moon $28\frac{1}{2}$, that of Mars $58\frac{1}{6}$, that of Jupiter $1061\frac{2}{3}$, and that of Saturn $878\frac{1}{9}$; and, therefore, their *semidiameters* are easily found by the rule of three. Thus, for the *semidiameter* of Saturn, say, 10000 : 111,25 :: 878,11, &c. : 9,7689, &c.; for that of Jupiter, 10000 : 111,25 :: 1061,66, &c. : 11,81; for that of Mars, 10000 : 111,25 :: 58,16, &c. : ,647; for that of Venus, 10000 : 111,25 :: 103,5 : 1,15, &c. and for that of Mercury, 10000 : 111,25 :: 36,1 : ,379, &c. For the more exact proportions and values of the *semidiameters* of the planets, see PLANETS. For their apparent *semidiameters*, see DIAMETER.

SEMI-DIAPENTE, in *Music*, a defective fifth, called usually by the Italians, *falsa quinta*, and by us a *false fifth*.

SEMI-DIAPASON, in *Music*, a defective octave; or an octave diminished by a lesser semitone, or four commas. See DIAPASON.

SEMI-DIATESSARON, in *Music*, a defective fourth, called, properly, a *false* FOURTH.

SEMI-DITONE, *diapason*. See DIAPASON.

SEMI-DITONE, *dis-diapason*. See DIS-DIAPASON.

SEMI-DITONUS, in *Music*, is used by some writers, as Salinas, for the third minor.

SEMI-DOUBLE, in the Romish *Breviary*, a term applied to such offices and festivals as are celebrated with less solemnity than the double ones; but yet with more than the single ones.

The *semi-double* office has double vespers, and nine lessons at matins; but the anthems are not redoubled. It is performed on Sundays, on the octaves, and on the feasts marked for *semi-double* in the calendar.

SEMIFISTULAR *flowers*. See FLOWERS.

SEMIFLOSCULOUS, in *Botany*, a term used to express the flowers of a certain class of plants, of which the dandelion, hawkweed, and the like, are kinds.

This sort of flower consists of a number of *semiflosculi*, which are disposed into one or more circles, and all comprehended in the same cup, which often becomes inverted as the flower ripens. These *semifloscules* are petals, hollow in their lower part, but in their upper half are flat, and continued in the shape of a tongue. These are often separated from each other by intermediate leaves, and are placed upon the embryo fruit, from which there stands out a slender capillament, divided at the end into two parts; often carried beyond the vagina, supported by five props. The embryos are placed in the thalamus, or bottom of the cup, and finally become seeds, sometimes winged with down, sometimes naked, sometimes coronated, and sometimes foliated. See *Tab.* IX. *of Botany, Class* 13. Tourn. Inst. p. 467.

SEMI-INTEROSSEUS *indicis*, in *Anatomy*, a small, short, flat, fleshy muscle, very like the antithenar, or internal *semi-interosseus* of the thumb. It is situated obliquely on one side of that of the thumb, between the first phalanx thereof, and the first metacarpal bone. It is fixed by one end to the outside of the basis of the first phalanx of the thumb, and a little to that bone of the carpus, by which this phalanx is supported; and by the other end it is fixed near the head of the first phalanx of the index, on that side next the thumb. It lies almost parallel to the antithenar, crossing it a little; this muscle lying on the convex side of the hand, and the antithenar on the concave. Winslow.

SEMI-JUDAIZERS, in *Ecclesiastical History*, a sect of Socinians, consisting of the disciples and friends of Francis Davides, superintendent of the Socinian churches in Transylvania; who, in consequence of his adherence to the opinions he had adopted, was thrown into prison by Christopher Bathory, prince of Transylvania, where he died, in the year 1579, in an advanced age. The most eminent of his followers were Jacob Palæologus, of the isle of Chio, who was burnt at Rome in the year 1585; Christian Francken, who had disputed in person with Socinus; and John Sommer, who was master of the academy of Clausenburg. The followers of Davides were called *Semi-Judaizers* by the Socinian writers, according to Mosheim, by way of reproach; but others maintain, that it was grounded on their sentiments, and that it was designed to express the partial preference they gave to the Law of Moses above the Gospel of Christ. The words of Christ, as Davides asserts, and those of his apostles, are to be tried by the doctrine of Moses and the prophets, which ought to be to us the sole rule of life and religious worship. He also maintains, that there is no difference between the old covenant established by Moses, and the new confirmed by Christ, in doctrine or in promises; and that they differ merely in this circumstance, that under the former there was the ministry of the letter, and under the latter that of the spirit; and, therefore, the one has not abrogated or changed the other: so far from it, that the new covenant existed only till the destruction of Jerusalem, and will have no farther influence till the time of Christ's worldly government over Israel in the city of Jerusalem, which is to be rebuilt. In the mean time, Christ is not really the Christ or king of God's people, but only by designation; the Christ predicted by the prophet, and promised by God, having no other than an earthly kingdom, which Jesus was appointed to take possession of; but being slain by the Jews, contrary to the divine purpose, he was translated into a secure and quiescent state. In this state he is not any more to be called God, as he was by virtue of his office during his abode on earth, because his office hath ceased; nor is he entitled to any adoration and worship, as Socinus thought, nor to any other kind of reverence, except obedience to his precepts, and faith in his doctrine; nor is he employed under the distinguishing appellations of priest and intercessor, both which offices terminated at his death. See the propositions drawn up by Faustus Socinus, and presented to C. Bathory, in Socin. Op. tom. ii. p. 801—803, or Toulmin's Life of Socinus, p. 453, &c.

SEMILUNAR *valves*, in *Anatomy*, are three little valves or membranes, of a *semilunar* figure, placed in the orifice of the pulmonary artery; to prevent the relapse of the blood into the heart at the time of its dilatation. See *Tab. Anat. (Angeiol.) fig.* 1. *lit. a.*

SEMILUNARES *cochleæ*, in *Natural History*, the name of a genus of sea-snails, so called, from their having semicircular mouths. See *Tab. of Fossils, Class* 9. and *Tab. of Shells*, N° 6.

The characters of the genus are these. They are univalve shells of a compact body, with a flat semicircular, and often dentated mouth; the columella, or inner lip, running diametrically across it in a straight line. Some of the species have exerted apices, and some depressed; these are nearly globose shells, and the turban is never much produced, but lies flat or level with the bottom.

There are many distinctive and specific characters in the several species of this genus, which arrange together considerable numbers of the species under each. Thus the

the *neritæ*, which are of this genus, are ſome of them umbilicated, and others have teeth, and a kind of gums. The *ſnail* kinds, diſtinctly ſo called, that fall under this genus, are very different from the *neritæ*, in that they have no teeth, no gums, and no palate. The term *ſemilunares cochleæ* was invented by Rumphius to expreſs their mouths, being of the ſhape of half a circle.

The *neritæ* generally inhabit caverns in the ſides of rocks, and uſually ſtick faſt to the ſtone. Bonani, Recreat. Ment. et Ocul. p. 56. Aldrovand. de Teſtac. lib. iii. cap. 8. Plin. lib. ix. cap. 33.

All the ſpecies of the *ſemilunar* ſhells have few convolutions, and have the extremity of the voluta ſmall, and uſually ſtanding a little out.

The ſpecies of the *ſemilunar cochleæ* are theſe, as arranged under the two general diviſions of dentated *neritæ*, and umbilicated *cochleæ*; viz. the dentated *nerita*, commonly called the gum-ſhell; the bloody-tooth *nerita*; the ox-palate *nerita*; the ſtriated and punctulated *nerita*; the canaliculated; the furrowed; the thruſh; and the partridge *nerita*.

Of the *neritæ* which have no teeth, we have ten ſpecies; viz. the jaſper with a long beak; the jaſper with an operculum; the lemon-coloured pea; the yellow pea; the prickly; the reticulated; that variegated with black ſpots; the red and white faſciated; the lightly ſtriated green; and the undulated *nerita*.

Of the umbilicated ſnails we have nine ſpecies; viz. the long umbilicated; that with an exerted apex; that with a depreſſed apex; the teſticulated; the hermit; the umbonated; the ſmall nipple; the heavy white; and the orange-coloured *cochlea*. Hiſt. Naturel. Eclairc. part ii. p. 256.

SEMIMEMBRANOSUS, in *Anatomy*, a long thin muſcle, partly tendinous, and ſituated on the backſide of the thigh, a little toward the inſide.

It is fixed above by a ſtrong broad tendon, or long aponeuroſis, in the irregular obtuſe, prominent line, which goes from the acetabulum to the tuberoſity of the iſchium, a little above the inſertion of the ſeminervoſus, and between thoſe of the gemellus inferior, and quadratus; mixing ſome fibres with the triceps tertius. From thence it runs down fleſhy, in an oblique direction, behind the inner condyle of the os femoris; below which it terminates in a thick tendon, which is inſerted in the poſterior and interior ſide of the inner condyle of the tibia, by three ſhort branches; the firſt, or uppermoſt of which, goes a little toward the inſide, the ſecond more backward, and the third lower down. Before it is inſerted, it ſends off ſometimes an aponeuroſis, like that of the biceps. Winſlow.

SEMI-METALS. See METALS.

SEMINAL, *ſeminalis*, in *Medicine*, ſpermatic, or ſomething belonging to the ſemen or ſeed.

SEMINAL-*leaves*, thoſe ſoft, plain, and undivided leaves, that firſt ſhoot forth from the greateſt part of all ſown ſeeds, and are different from thoſe of the ſucceeding plant in figure, texture, and all other reſpects. See SEED, and VEGETATION.

SEMINAL-*root*, in *Natural Hiſtory*, a name given by Grew to that part of the ſeeds of plants, which may otherwiſe be called the inner body of the ſeed: this is diſtributed through the parenchyma of the ſeed, but is wholly different from it, and diſtinguiſhed by Dr. Grew from the radicle, which becomes the plant-root in its future growth. The parenchyma of the ſeed is, in ſome degree, that to the *ſeminal-root*, which the mould or earth is to the plant-root, or radicle; and the *ſeminal-root* is to the plant-root, what the plant-root is to the trunk.

SEMINALIS, in *Botany*, a name by which ſome authors have called horſetail.

SEMINARY, a place appointed for the inſtruction of young perſons deſtined for the miniſtry, in the duties, ceremonies, and offices thereof; firſt inſtituted, as Thomaſſin tells us, by St. Auguſtine.

Of theſe *ſeminaries* there are many abroad, furniſhed with halls for the aſſemblies of the exercitants, and little chambers, or cells, where each perſon retires, ſtudies, and prays, apart. Such is the *ſeminary* of St. Sulpitius at Paris.

The council of Trent decrees, that children exceeding twelve years of age be taken, brought up, and inſtructed in common, to qualify them for the eccleſiaſtical ſtate; and that there be a *ſeminary* of ſuch belonging to each cathedral, under the direction of the biſhop.

In France, the eſtabliſhment of *ſeminaries* is ſomewhat different from the decree of the council: none are taken in but young people ready to ſtudy theology, and to be ordained; ſo that the *ſeminaries* are a kind of houſes of probation where the vocation of clerks is examined, and they are prepared to receive orders. And by an edict of 1749, no *ſeminary* can be eſtabliſhed without letters patent from the king.

For the ſubſiſtence of theſe *ſeminaries*, there are ſeveral unions of benefices, or elſe the clergy of the dioceſe are obliged to contribute to maintain them.

Pope Pius IV. having eſtabliſhed a *ſeminary* at Rome, in conſequence of the decree of the council of Trent; by advice of the cardinals, it was given to the Jeſuits, who have made very good uſe thereof.

SEMINARY, among the canons of St. Auguſtine, is uſed for a kind of college, or ſchool, where penſioners are kept, and inſtructed in the claſſical, and other learning; and this among us is the popular ſenſe of the word.

The houſes of the ſociety *de propaganda fide*, eſtabliſhed for the preparing of eccleſiaſtics for miſſions among infidels and heretics, are alſo called *ſeminaries*. The principal whereof is that at Rome, called the *apoſtolical college*, *apoſtolical ſeminary*, *paſtoral ſeminary*, *ſeminary of the propaganda*, &c.

SEMINARY, in *Gardening*, the term uſed for the ſeed plot, or place allotted for raiſing plants from ſeed, and keeping them till they are fit to be removed into the garden, or nurſery.

When the *ſeminary* is intended for trees, it muſt be proportioned to the quantity of ſeeds ſown, and of a ſoil adapted to the generality of the trees intended to be raiſed in it. The land ſhould be good, and the ſituation warm, and well defended, and as near the NURSERY as poſſible. A fertile mead, or rich paſture, lowly ſituated, will be very proper for the purpoſe. In preparing the *ſeminary*, let the ground be double dug, working the ſward to the bottom, which operation may be performed in winter. In the ſpring, the weeds muſt be conſtantly kept down; and about Midſummer, if the ſoil is not naturally very rich, ſome rotten dung ſhould be ſpread over the ſurface of the ground, which ſhould be then trenched, or double dug afreſh. From Midſummer till September the ground muſt be kept clean from weeds; and juſt before the ſeeds are committed to it, it ſhould be double dug afreſh; at which time the parts muſt be wholly incorporated. When this is done, the ground muſt be levelled, and the beds laid out for the different purpoſes wanted; reſerving ſuch a portion of it as will be wanted for the reception of thoſe ſeeds which are to be ſown in the ſpring.

The *ſeminary* muſt be divided into different apartments, for the different ſorts of ſeeds, according to their nature; thoſe ſeeds that are ſown in autumn being ſown in a part by themſelves; thoſe in the ſpring in another. Thoſe ſeeds, which remain till the ſecond ſpring before they come up, ſhould be all ſown in beds contiguous to each other; and thoſe, which often continue three years, muſt be ſown by themſelves. When the plants produced in any of theſe apartments are taken off for the nurſery, the ground ſhould be double dug, and lie fallow the following ſummer, manuring it with rotten dung, and double digging it about Midſummer, as before. In autumn it will be ready to be ſown afreſh, which ſhould be done with ſeeds of a different nature from thoſe by which it was before occupied. The *ſeminary* ſhould be well fenced and guarded. The *ſeminary*, which is moſt in uſe, is for the ſupply of the flower-garden, and this is the place where flowers are to be raiſed from their ſeeds, to procure varieties, or, as the floriſts expreſs it, new flowers; as alſo for the ſowing of all the biennial plants, to ſucceed thoſe which decay in the flower garden.

This *ſeminary* ſhould always be ſituated at ſome diſtance from the houſe, and be walled or paled round, and kept under lock and key, to keep out dogs, &c. and to prevent a great deal of damage, that is frequently done by thoſe who are not acquainted with gardening, before they are aware of it. The ſeveral directions, for the management of the *ſeminary*, are to be ſeen under the names of the ſeveral plants intended to be raiſed in it.

SEMINATION, *ſeminatio*, in *Natural Hiſtory*, &c. the act of ſowing or ſhedding ſeed; particularly that of vegetables.

As ſoon as the ſeed is ripe, Dr. Grew obſerves, nature takes ſeveral methods for its being duly ſown; not only by the opening of the uterus, but in the make of the ſeed itſelf. Thus, the ſeeds of many plants, which affect a peculiar ſoil or ſeat, as arum, poppy, &c. are heavy and ſmall enough, without farther care, to fall directly down to the ground. Others, that are large, and light enough to be expoſed to the wind, are often furniſhed with one or more hooks to ſtay them from ſtraying too far from their proper place: thus, the ſeeds of avens have each a ſingle hook; thoſe of agrimony and gooſe-graſs, many; both the former loving a warm bank, and the laſt a hedge, for its ſupport.

On the contrary, many ſeeds are furniſhed with wings, or

or feathers, partly with the help of the wind to carry them, when ripe, off the plant, as thoſe of aſh, &c. and partly to enable them to make their flight more or leſs abroad, that they may not, by falling together, come up too thick; and that if one ſhould miſs a proper ſoil or bed, another may hit. So the kernels of pines have wings, though ſhort ones, whereby they do not fly in the air, but only flutter on the ground. But thoſe of typha, dandelion, and moſt of the pappous kind, have numerous long feathers, by which they are wafted about every way.

Others are ſown by being laid in ſpringy elaſtic caſes, which, when they crack and burſt, dart their ſeed out to convenient diſtances: thus, wood-ſorrel having a running root, nature ſees fit to ſow the ſeed at ſome diſtance, the doing of which is effected by a white, ſturdy, tendinous cover, which, beginning to dry, burſts open on one ſide in an inſtant, and is violently turned inſide outwards. The ſeed of harts-tongue, and codded arſe-ſmart, is alſo flung or ſhot away, by means of a ſpring, wound or girt round the ſeed-caſe. When the ſpring is become tenſe enough, it ſuddenly breaks the caſe into two halves, like little cups, and ſo flings out the ſeed.

Divers notable means of *ſemination* are obſerved by authors: a quantity of fern-ſeed, Mr. Ray tells us, laid in a lump, on a paper, the ſeminal veſiculæ are heard to crackle, burſt, and, by a microſcope, the ſeeds are ſeen to be projected to a conſiderable diſtance from each other.

Dr. Sloane obſerves, that the gentinella flore cœruleo, requiring wet weather to be ſown in, as ſoon as the leaſt drop of rain touches the end of the ſeed-veſſels, with a ſmart noiſe, and a ſudden leap, opens itſelf, and, with a ſpring, ſcatters its ſeed.

The plants of the cardamine family throw their pods open, and dart out their ſeed, upon a ſlight touch of the hand. Nay, Mr. Ray adds, that the pods of the cardamine impatiens not only burſt upon the ſlighteſt touch, but even by an approach of the hand to touch them, without any real contact.

Other plants ſow their ſeeds by inviting birds, by their agreeable taſte and ſmell, to feed on them, ſwallow them, and carry them about; thereby alſo fertilizing them, by paſſing through their bodies. In ſuch manner is miſſeltoe uſually ſown and propagated.

SEMINERVOSUS, in *Anatomy*, a name given by Riolan, and ſome others, to a muſcle of the thigh, more generally known by the name of the *ſemitendinoſus*. The French in general, however, call it *le demi nerveux*. Cowper calls it *ſeminervoſus ſeu ſemitendinoſus*; and Albinus ſeems to claim the merit of aſcertaining its true name of *ſemitendinoſus*.

It is a long muſcle, half fleſhy and half tendinous, or like a nerve. It is ſituated a little obliquely, on the poſterior and inner part of the thigh. It is fixed above to the poſterior part of the tuberoſity of the iſchium, immediately before, and a little more inward than the biceps. It is afterwards fixed by fleſhy fibres to the tendons of the biceps, for about the breadth of three fingers, much in the ſame manner as the coraco-brachialis is fixed to the biceps of the arm. From thence it runs down fleſhy toward the lower part of the inſide of the thigh, having a ſort of tendinous interſection in the inner part of its fleſhy portion. Having reached below the middle of the thigh, it terminates in a ſmall, long, round tendon, which runs down to the inſide of the knee, beſide that of the gracilis, where it expands in breadth. It is inſerted in the inſide of the upper part of the tibia, about two or three fingers breadth below the tuberoſity of the ſpine, immediately under the tendon of the gracilis internus, with which it communicates. It has the ſame oblique form with the gracilis and ſartorius, and ſends off a like kind of aponeuroſis. Winſlow.

SEMINIUM, a term uſed by the writers on foſſils to expreſs a ſort of firſt principle, from which the ſeveral figured ſtones, or, as they are more uſually called, the extraneous foſſils, are ſuppoſed to have their origin.

The generality of the learned world, at this time, ſuppoſe theſe to be the remains of real ſhells, &c. brought from the ſea to the places where they are now found, at the time of the univerſal deluge. See *Formed* STONES, and *Adventitious* FOSSILS.

But thoſe who diſſent from this ſyſtem pretend, that theſe foſſile bodies, though they exactly repreſent ſhells, &c. yet never were in the ſea at all, but that their minute firſt principles, or, to uſe their own term, their *ſeminia*, have been carried from the ſea, through ſubterranean paſſages, to the places where we now find the complete ſhells, &c. into which they have grown. Langius, who has written expreſly on this ſubject, though he has candidly collected all that has been ſaid in favour of the diluvian ſyſtem, by the abettors of it, yet is not convinced by thoſe arguments, but rather inclines to the other ſide of the queſtion, or the riſe of ſuch foſſils from *ſeminia*.

Theſe foſſile ſhells are uſually found throughout of one and the ſame ſubſtance, and that the moſt different imaginable from the ſubſtance of the living creatures which they repreſent; and often, though found in pairs, and perfectly cloſed on all ſides, yet when broken they are found full of the ſubſtance of the ſtone in which they lie, and the armature of ſeveral kinds of them, particularly of many of the cornua ammonis, is ſuppoſed to plead greatly in favour of this hypotheſis; as it is not of the nature of, or at all owing to the ſubſtance of the matrix, in which they lie, or of the matter of which they are formed, and is therefore to ariſe ſolely from the nature of the *ſeminium*, from which they are formed.

The immenſe number of the ſea-ſhells, as they are called, thus found foſſile, is alſo thought to argue much on this ſide of the queſtion; as the favourers of this hypotheſis ſuppoſe that the ſea could not, at any one time, have given up ſuch numbers as the earth is ſtocked with, though there are no limits to the numbers ſuppoſed to be raiſed from *ſeminia*; and the immenſe columns of black marble, found in Ireland, and found of ſuch regular joints, are brought as a proof of the poſſibility of ſuch a formation of foſſils as this from *ſeminia*, which they ſuppoſe muſt have given origin to thoſe pillars.

SEMIORBICULARIS *labiorum*, a name given by Winſlow, and others, to the muſcle called by Albinus *orbicularis oris*, and by others *conſtrictor*, and *ſphincter labiorum*.

SEMI-ORDINATES, in *Geometry*, the halves of the ordinates or applicates. See ORDINATE.

SEMI-PARABOLA, in *Geometry*, a curve defined by the equation, $ax^{m-1} = y^m$; as $ax^2 = y^3$, $ax^3 = y^4$.

In *ſemi-parabolas* $y^m : v^m \; (:: ax^{m-1} : az^{m-1}) :: x^{m-1} : z^{m-1}$, or the powers of the *ſemi-ordinates* are as the powers of the abſciſſes one degree lower; e. gr. in cubical *ſemi-parabolas*, the cubes of the ordinates y^3 and v^3 are as the ſquares of the abſciſſes x^2 and z^2.

SEMIPELAGIANS, in *Eccleſiaſtical Hiſtory*, a name anciently, and even at this day, given to ſuch as retain ſome tincture of Pelagianiſm.

St. Proſper, in a letter to St. Auguſtine, calls them *reliquias Pelagii*.

Many learned men, principally among the Gauls, who could not come into St. Auguſtine's doctrine of grace, &c. were accuſed of *Semipelagianiſm*; they were alſo called *Maſſilians*, or *prieſts of Marſeilles*, in regard their errors had their firſt riſe in that city.

Caſſian, who had been a deacon of Conſtantinople, and was afterwards a prieſt at Marſeilles, was the chief of theſe *Semipelagians*. And about the year 430 ſeveral other perſons embarked in the undertaking of fixing upon a kind of mean between the opinions of Pelagius and thoſe of Auguſtine, and formed this new ſect.

The leading principles of the *Semipelagians* were the five following. 1. That God did not diſpenſe his grace to one more than another in conſequence of predeſtination, i. e. an eternal and abſolute decree, but was willing to ſave all men, if they complied with the terms of his Goſpel. 2. That Chriſt died for all men. 3. That the grace purchaſed by Chriſt, and neceſſary to ſalvation, was offered to all men. 4. That man, before he received grace, was capable of faith and holy deſires. 5. That man was born free, and was conſequently capable of reſiſting the influences of grace, or of complying with its ſuggeſtion. The *Semipelagians* were very numerous; and the doctrine of Caſſian, though variouſly explained, was received in the greateſt part of the monaſtic ſchools in Gaul, from whence it ſpread itſelf far and wide through the European provinces. As to the Greeks, and other eaſtern Chriſtians, they had embraced the *Semipelagian* doctrine before Caſſian, and ſtill adhere firmly to it. In the ſixth century, the controverſy between the *Semipelagians*, and the diſciples of Auguſtin, prevailed much, and continued to divide the weſtern churches. Moſheim's Eccl. Hiſt. vol. i. p. 425, &c.

SEMI-PERIOD, in *Grammar*, a mark of diſtinction recommended by Dr. Ward, but not admitted by other grammarians. It is greater than the colon, and ſuppoſed to anſwer the ſame purpoſe between the colon and period as the ſemicolon does between the comma and colon. It is uſed to terminate a perfect ſentence, when a new ſentence ariſing out of the preceding is annexed to it; and he diſtinguiſhes it by beginning the new ſentence with a ſmall letter. But the colon and ſemicolon, differently applied, ſuperſede the neceſſity of this new diſtinction.

SEMI-PORCELLANÆ, in the *Hiſtory of Shells*. See SHELLS.

SEMI-PREBEND. See PREBEND.

SEMIPROOF, an imperfect PROOF.

In the French law, the depoſition of a ſingle evidence only makes a *ſemiproof*.

The teſtament of a perſon deceaſed is deemed a *ſemiproof*.

In enormous caſes, the *ſemiproof* frequently determines them to try the torture.

SEMIQUARTILE, or SEMIQUADRATE, is an ASPECT of the planets, when diſtant from each other 45 degrees, or one ſign and a half.

SEMIQUAVER, in *Muſic*. See QUAVER.

SEMIQUINTILE is an ASPECT of the planets, when at the diſtance of 36 degrees from one another.

SEMIREVERBERATORY *fire*, in *Chemiſtry*, a term uſed to expreſs ſuch a reverberatory fire, in which the flame is only beaten back upon the bottom of the veſſel.

SEMIS, among the Romans, the half of the AS.

SEMISEXTILE, or SEMISEXTUS, or S. S. an aſpect of two planets, wherein they are diſtant from each other one twelfth part of a circle, or 30 degrees.

The *ſemiſextile* was added to the ancient aſpects by Kepler; and, as he ſays, from meteorological obſervations.

SEMISICILICUS, a word uſed by ſome pharmaceutic writers to expreſs a drachm.

SEMISIDERATUS, a word uſed by ſome for a perſon ſtruck with a hemiplegia.

SEMI-SOSPIRO, in the *Italian Muſic*, a little pauſe, of the eighth part of a bar in common time.

SEMI-SPINALIS, in *Anatomy*, a muſcle, called alſo *tranſverſo-ſpinalis dorſi*. It is a fleſhy maſs, which, from all the ſpinal and tranſverſe apophyſes of the back and loins, is extended in diſtinct faſciculi over the vertebræ themſelves.

It is made up, like that of the neck, of ſeveral oblique converging muſcles, the uppermoſt of which is fixed below to the third tranſverſe apophyſis of the back, and above to the firſt ſpinal apophyſis. The loweſt is fixed below to the third tranſverſe apophyſis of the loins, and above the laſt ſpinal apophyſis of the back. They are divided by anatomiſts into the external, which are firſt diſcovered, and the internal, which lie immediately on the vertebræ. The external, from the firſt vertebra to the ſeventh incluſively, appear to be longer than the internal, which are covered by them. Winſlow.

SEMI-SPINALIS *colli*, in *Anatomy*, a muſcle, called alſo *tranſverſo-ſpinalis colli*, and taking into its compoſition all that fleſhy maſs, which lies between the tranſverſe and ſpinal apophyſes, from the ſecond vertebra of the neck to the middle of the back, under the ſplenius and complexus major.

It is compoſed of ſeveral oblique converging muſcles, which may be divided into external and internal, of which the external are the longeſt. Theſe are fixed below to the tranſverſe apophyſes of the ſixth, ſeventh, eighth, or ninth vertebræ of the back, by tendinous extremities, which as they aſcend become fleſhy, and mix with each other. Their ſuperior inſertions in the neck are ſix in number, whereof the firſt, which is tendinous, is in the ſeventh ſpinal apophyſis, and the others, which are fleſhy, are in the five next ſpinal apophyſes. The internal are ſhorter, and more oblique than the external, and are partly covered by them. They are fixed, by their lower extremities, to the tranſverſe apophyſes of the three or four upper vertebræ of the back, and to the oblique apophyſes of the four or five lower vertebræ of the neck, and by their other extremities they are inſerted in the ſix ſpinal apophyſes of the neck. Some of theſe internal muſcles are very ſhort, lying wholly between the ſpinal apophyſes, and the oblique or tranſverſe apophyſes next them. Winſlow.

SEMISPINATUS, in *Anatomy*, a name given by Riolanus, and ſome others, to the muſcle, more generally known by the name of *longiſſimus* DORSI.

SEMITA *luminoſa*, a name given to a kind of lucid tract in the heavens, which, a little before the vernal equinox, or after the autumnal, may be ſeen about ſix o'clock at night, extending from the weſtern edge of the horizon, up towards the Pleiades.

The phenomenon has been taken notice of by Caſſini and Facio, who both evince, that this light comes diffuſed from both ſides of the ſun. Its brightneſs is much the ſame with that of the via lactea, or the tail of a comet: it is ſeen plaineſt with us about the beginning of October, or the latter end of February.

Facio conjectures, that the bodies, or rather the congeries or aggregate of bodies, which occaſions this light, conforms to the ſun like a lens; and takes it to have ever been the ſame; but Caſſini thinks it ariſes from a vaſt number of ſmall planets, which encompaſs the ſun, and give this light by reflexion; eſteeming it alſo not to have exiſted long before he obſerved it. See ZODIACAL *light*.

SEMITALES, among the Romans, a name given to the gods, who were the protectors of roads.

SEMITEINTS. See TEINTS.

SEMITONE, in *Muſic*, one of the degrees, or concinnous intervals, of concords.

There are three degrees, or leſs intervals, by which a ſound can move upwards and downwards ſucceſſively from one extreme of any concord to the other, and yet produce true melody; and by means whereof, ſeveral voices and inſtruments are capable of the neceſſary variety in paſſing from concord to concord. Theſe degrees are the greater and leſs tone, and the *ſemitone*. The ratio of the firſt is 8 : 9; that of the ſecond 9 : 10.

The ratio of the *ſemitone* is 15 : 16; its compaſs is five commas; which interval is called a *ſemitone*, not that it is geometrically the half of either of the tones, for it is more; but becauſe it comes ſomewhat near it. It is alſo called the *natural ſemitone*, and the *greater ſemitone*, becauſe greater than the part it leaves behind, or its complement to a tone, which is four commas. The Italians alſo call it *ſeconda minore*, or a leſſer SECOND.

There are ſeveral ſpecies of *ſemitones*; but thoſe that uſually occur in practice are of two kinds, diſtinguiſhed by the addition of greater and leſs. The firſt is expreſſed by the ratio of 16 to 15, or $\frac{16}{15}$; and the ſecond by 25 to 24, or $\frac{25}{24}$. The octave contains ten *ſemitones major*, and two dieſes, nearly; for the meaſure of the octave being expreſſed by the logarithm 1,000000, the *ſemitone major* will be meaſured by 0,093109; and the octave contains ſeventeen *ſemitones minor*, nearly. If the meaſure of the octave be the logarithm 1,000000, the meaſure of the *ſemitone minor* will be 0,058894. Theſe two differ by a whole enharmonic DIESIS; which is an interval practicable by the voice, and was much in uſe among the ancients, and not unknown even among the modern practitioners. Euler, Tent. Nov. Theor. Muſ. p. 107. See INTERVAL.

Theſe *ſemitones* are called *fictitious notes*; and, with reſpect to the natural ones, are expreſſed by characters called *flats* and *ſharps*.

Their uſe is to remedy the defects of inſtruments, which, having their ſounds fixed, cannot always be made to anſwer to the diatonic ſcale.

By means of theſe we have a new kind of ſcale, called the

SEMITONIC *ſcale*, or the *ſcale of ſemitones*; a ſcale or ſyſtem of muſic, conſiſting of 12 degrees, or 13 notes, in the octave, being an improvement on the natural or diatonic ſcale, by inſerting between each two notes thereof, another note, which divides the interval or tone into two unequal parts, called *ſemitone*.

The uſe of this ſcale is for inſtruments that have fixed ſounds, as the organ, harpſichord, &c. which are exceedingly defective on the foot of the natural or diatonic ſcale. For the degrees of the ſcale being unequal, from every note to its octave there is a different order of degrees; ſo that from any note we cannot find any interval in a ſeries of fixed ſounds; which yet is neceſſary, that all the notes of a piece of muſic, carried through ſeveral keys, may be found in their juſt tune, or that the ſame ſong may be begun indifferently at any note, as may be neceſſary for accommodating ſome inſtrument to others, or to the human voice, when they are to accompany each other in uniſon.

The diatonic ſcale, beginning at the loweſt note, being firſt ſettled on an inſtrument, and the notes thereof diſtinguiſhed by their names *a*, *b*, *c*, *d*, *e*, *f*, *g*; the inſerted notes, or *ſemitones*, are called *fictitious notes*, and take the name or letter below with a ⁂, as *c* ⁂, called *c ſharp*; ſignifying that it is a *ſemitone* higher than the ſound of *c* in the natural ſeries; or this mark ♭, called a *flat*, with the name of the note above, ſignifying it to be a *ſemitone* lower.

Now $\frac{15}{16}$ and $\frac{128}{135}$ being the two *ſemitones* the greater tone is divided into; and $\frac{15}{16}$ and $\frac{24}{25}$, the *ſemitones* the leſs tone is divided into; the whole octave will ſtand as in the following ſcheme, where the ratios of each term to the next are written fraction-wiſe between them below.

Scale of SEMITONES.

c.	*c*⁂.	*d.*	*d*⁂.	*e.*	*f.*	*f*⁂.	*g.*	*g*⁂.	*a*♭.	*b.*	*c c*
$\frac{15}{16}$	$\frac{128}{135}$	$\frac{15}{16}$	$\frac{24}{25}$	$\frac{15}{16}$	$\frac{128}{135}$	$\frac{15}{16}$	$\frac{15}{16}$	$\frac{24}{25}$	$\frac{15}{16}$	$\frac{128}{135}$	$\frac{15}{16}$

For the names of the intervals in this ſcale, it may be conſidered, that as the notes added to the natural ſcale are not deſigned to alter the ſpecies of melody, but leave it ſtill diatonic, and only correct ſome defects ariſing from ſomething foreign to the office of the ſcale of muſic, viz. the fixing and limiting the ſounds; we ſee the reaſon why the names of the natural ſcale are continued, only making a diſtinction of each into a greater and leſs. Thus an interval of one *ſemitone* is called a *leſs ſecond*; of

of two *semitones*, a *greater second*; of three *semitones*, a *less third*; of four, a *greater third*, &c.

A second kind of *semitonic scale* we have from another division of the octave into *semitones*; which is performed by taking an harmonical mean between the extremes of the greater and less tone of the natural scale, which divides it into two *semitones* nearly equal. Thus, the greater tone 8 : 9 is divided into two *semitones*, which are 16 : 17, and 17 : 18; where 16 : 17 : 18, is an arithmetical division, the numbers representing the lengths of the chords; but if they represent the vibrations, the lengths of the chords are reciprocal; viz. as $1 : \frac{16}{17} : \frac{8}{9}$; which puts the greater *semitone* $\frac{16}{17}$ next the lower part of the tone, and the lesser $\frac{17}{18}$ next the upper, which is the property of the harmonical division. And after the same manner the less tone 9 : 10 is divided into the two *semitones* 18 : 19, and 19 : 20; and the whole octave stands thus:

c.	*c※.*	*d.*	*d※.*	*e.*	*f.*	*f※.*	*g.*	*g※.*	*a.*	♭.	*b.c*
$\frac{16}{17}$	$\frac{17}{18}$	$\frac{18}{19}$	$\frac{19}{20}$	$\frac{15}{16}$	$\frac{16}{17}$	$\frac{17}{18}$	$\frac{18}{19}$	$\frac{19}{20}$	$\frac{16}{17}$	$\frac{17}{18}$	$\frac{15}{16}$

This scale, Mr. Salmon tells us, in the Philosophical Transactions, he made an experiment of, before the Royal Society, on chords, exactly in these proportions, which yielded a perfect concert with other instruments, touched by the best hands. Mr. Malcolm adds, that, having calculated the ratios thereof, for his own satisfaction, he found more of them false than in the preceding scale; but then their errors were considerably less, which made amends. Malcolm's Music, chap. x. § 2.

SEMIVULPA, in *Zoology*, a name by which Gesner, and some others, have called the OPOSSUM.

SEMODIUS, among the Romans, a measure equal to half the MODIUS, or the sixth part of the AMPHORA.

SEMONES, among the *Ancients*, a class of gods that were of a middle nature between the celestial and terrestrial gods. Justin Martyr has mistaken one of these for Simon Magus. Mem. de l'Acad. des Inscrip. vol. i. p. 270.

SEMPERVIVUM, in *Botany*. See HOUSELEEK.

SEMYDA, in *Botany*, the name of a tree, mentioned by Theophrastus, and by some supposed to be the same with the *betula*, or birch-tree, but very erroneously.

SENA, or SENNA, in *Medicine*, a purgative leaf much used in draughts and compositions of that intention.

The shrub which bears it is a species of CASSIA, cultivated in several parts of the Levant, and grows five or six feet high; it puts forth woody branches, furnished with oblong leaves; its flowers are yellow; its fruit is a greenish flat pod, containing several lodges or cells of seeds, resembling grape-stones. These pods some physicians prefer to the leaves themselves.

There is also a kind of *sena* growing about Florence; but it is inferior to that of the Levant, as is owned by the Italians themselves. Father Plumier mentions also a third kind growing in the Antilles islands.

M. Lemery distinguishes three sorts of *sena* of the Levant: the first brought from Seyda, called *sena of apalto*, that is, *custom sena*, by reason of the custom paid the grand signior, for the privilege of exporting it; the second comes from Tripoli; the third is called *sena of Mocha*.

The best of these kinds is the first, which Pomet directs us to chuse in narrow leaves, of a moderate size, shaped like the end of a spear point, of a pale green colour, a pungent smell, soft to the touch, &c.

The *sena* of Tripoli holds the second rank in goodness: its difference from that of Seyda consists in its colour, which is green; its smell, which is very weak; and in a certain harshness, or roughness, which it discovers upon the touch. Besides these three kinds of *sena*, and their pods, the druggists sell the dust found at the bottom of the bales, which is a very poor commodity, and yet much better than what they call the *small sena*, which comes with it in the bales, by way of package, and which many hold to be a plant of no virtue, put in by chance, or, at best, to increase the weight.

The best *sena*, ordinarily found in our shops, is that which is brought from Alexandria in Egypt; it is of a lively yellowish green colour, oblong, somewhat oval-figured, sharp-pointed at the ends, about a quarter of an inch broad, and not a full inch in length; the brightness of its colour, and quickness of its taste, are also indications of its goodness; for when it has lost its scent, and grows dusky, it is good for little. The inferior sorts, brought from Tripoli, and other places, may be distinguished by their being narrower, longer, and sharper pointed; or larger, broader, and round pointed, with small prominent veins; or large, obtuse, and of a fresh green colour, without any yellow cast.

Sena is a moderately strong, and, in general, a safe cathartic. Geoffroy specifies hæmorrhages, inflammations of all kinds, and disorders of the breast, as being almost the only exceptions to its use. The dose, in substance, is from a scruple to a dram; in infusion, from one dram to three or four. It gives out its virtue both to watery and spirituous menstrua; communicating to water and proof spirit a brownish colour, and to rectified spirit, a fine green. The two inconveniencies attending the use of this medicine are its being liable, in most constitutions, to occasion gripes, and its being accompanied with an ill flavour, which is apt to nauseate the stomach and palate. The first may be greatly obviated by dilution; the latter by aromatic and other additions; e. gr. cinnamon, or a dram or two of its distilled water.

Several compositions of this kind are prepared in the shops, sufficiently palatable, and which operate for the most part with ease and mildness. Thus, six drams of tamarinds, and two of crystals of tartar, are boiled in a pint and a half of water, till half a pint is wasted, and the strained liquor poured boiling hot upon one, two, or three drams of *sena*. After maceration for four hours, the strained infusion is sweetened with an ounce of syrup of violets, and flavoured with half an ounce of simple cinnamon water. Or, three drams of *sena* are infused in a quarter of a pint of boiling water, for four hours, or till the liquor has grown cold; with the addition of a scruple of ginger; or with half a dram of lesser cardamom seeds, husked, and three-fourths of a dram of crystals of tartar; which last are previously boiled in the water till dissolved; or with two drams of fresh lemon-peel, and two drams, by measure, of lemon juice. This last form is the most agreeable, which the committee of the London College has been able to contrive, for the exhibition of *sena*, to those who are much offended with its flavour. Some macerate the *sena* for a night in cold water, which becomes sufficiently impregnated with its purgative virtue, without extracting so much as boiling water does of the nauseous matter: if the liquor, poured off from the *sena*, be boiled a little by itself, great part of its ill flavour will be dissipated; and the remains of its offensiveness may be covered by infusing in it some bohea tea. By continuing the coction for a considerable time, the purgative virtue of the *sena* will be diminished; for, as Dr. Lewis observes, the inspissated watery extracts are scarcely found to purge so much as one fourth of the infusion or decoction they were made from, or so much as an equal weight of the leaves in substance. Lewis's Mat. Med.

However, some have highly extolled Mr. Geoffroy's dry EXTRACT, which is made of a very strong infusion, evaporated to a dry and pulverisable substance: this, they say, is easily taken, of no ill taste, and operates in a very small quantity, one third part containing the virtue of the whole, or nearly so; the nicest calculations shewing, that twenty-four grains of the extract, some part of which may be supposed to be earth, or other accidental or useless matter, possess the virtues of a dram in substance. Mem. de l'Acad. des Scienc. Paris. 1738.

The officinal spirituous tinctures of *sena* are prepared by digestion with or without heat, in proof spirit. See TINCTURA *senæ*.

Sena is a principal ingredient in LENITIVE *electary*.

Rulandus imagined there was a sudorific quality in *sena*; and accordingly ordered it in some compositions of that intention.

SENA, *bastard*. See CASSIA.

SENA, *bladder*, *colutea*, in *Botany*, a genus of the *diadelphia decandria* class. Its characters are these: the flower, which has a permanent, bell-shaped empalement, of one leaf, indented in five parts, is of the butterfly kind, and the standard, wings, and keel, vary in their figure in different species; it hath ten stamina, nine of which are joined, and the other stands separate, which are terminated by single summits; in the centre is situated an oblong, compressed germen, which becomes a broad, swelling pod, with one cell, including several kidney-shaped seeds. Linnæus enumerates three, and Miller seven species.

SENA, *podded*. See CORONILLA.

SENA, *scorpion*, *emerus*, in *Botany*. Its characters are these: the flower has an empalement of one leaf, divided in five parts; the flower is of the butterfly kind, the standard narrow, and shorter than the wings, over which it is arched; the wings are large and concave, and the keel heart-shaped and reflexed; it hath ten stamina, and in the empalement is situated an oblong, slender germen, which becomes a taper, cylindrical pod, swelling in those parts where the seed is lodged. There are three species. Miller.

This, in the Linnæan system, is a species of CORONILLA. The leaves of this plant are used, but Boerhaave is unacquainted with any medicinal virtue in them. Ruppius writes, that the common people substitute the leaves instead of those of *sena*; and Buxhaum tells us, that old women

women who pretend to medicine, call it *senes blatter*, and use it instead of *sena* leaves.

SENATE, *senatus*, an assembly or council of senators; that is, of the principal inhabitants of a state, who have a share in the government.

Such were the *senates* of Rome, of Carthage, &c. among the ancients; and such are the *senates* of Venice, of Genoa, &c. among the moderns.

The *senate* of ancient Rome was, of all others, the most celebrated, during the splendor of the republic. Cicero, in his oration for Milo, defines it, *templum sanctitatis, amplitudinis, mentis, consiliique publici Romani, caput orbis, ara sociorum, portusque omnium gentium.* The Roman *senate* exercised no contentious jurisdiction: it appointed judges either out of the *senate*, or among the knights; but it never stooped to judge any processes in a body. The *senate* concerted matters of war; appointed who should command the armies; sent governors into the provinces; took order, and disposed of the revenues of the commonwealth. Yet did not the whole sovereign power reside in the *senate*; it could not alone elect magistrates, make laws, nor decide of war and peace; but in all these cases, the senators were to consult the people. Under the emperors, when the *senate* became despoiled of most of its other offices, they began to hear causes. For those of less consequence they appointed particular judges; the rest, principally criminal causes, they reserved for their own cognizance, to be judged by them in a body, and that frequently in the emperor's presence. This was put in their way to keep their heads from state affairs. Nero farther committed to the *senate* the judgment of all appeals; but this did not hold long; nor do we find any footsteps thereof any where but in the sixty-second Novel.

With regard to the jurisdiction of the *senate*, Dr. Middleton observes, that the supreme power at home was in the collective body of the people; yet where haste, perhaps, or secrecy was required, and where the determinations of the *senate* were so just and equitable, that the consent of the people might be presumed, and taken for granted, the *senate* would naturally omit the trouble of calling them from their private affairs to an unnecessary attendance on the public; till by repeated omissions of this kind, begun at first in trivial matters, and proceeding insensibly to more serious, they acquired a special jurisdiction and cognizance in many points of great importance, to the exclusion even of the people; who yet, by the laws and constitution of the government, had the absolute dominion over all. For example:

1. They assumed to themselves the guardianship and superintendance of the public religion; so that no new god could be introduced, nor altar erected, nor the Sibylline books consulted, without their express order.

2. They held it as their prerogative, to settle the number and condition of the foreign provinces, that were annually assigned to the magistrates, and to declare which of them should be consular, and which prætorian provinces.

3. They had the distribution of the public treasure, and all the expences of the government; the appointment of stipends to their generals, with the number of their lieutenants and their troops, and the provisions and clothing of their armies.

4. They nominated all ambassadors sent from Rome, out of their own body, and received and dismissed all who came from foreign states, with such answers as they thought proper.

5. They had the right of decreeing all supplications, or public thanksgivings, for victories obtained, and of conferring the honour of an ovation, or triumph, with the title of emperor, on their victorious generals.

6. It was their province to enquire into public crimes or treasons, either in Rome, or the other parts of Italy; and to hear and determine all disputes among the allied and dependent cities.

7. They exercised a power, not only of interpreting the laws, but absolving men from the obligation of them, and even of abrogating them.

8. In the case of civil dissensions, or dangerous tumults within the city, they could arm the consuls by a vote with absolute power, to destroy and put to death, without the formality of a trial, all such citizens as were concerned in exciting them.

9. They had a power to prorogue, or postpone the assemblies of the people, to decree the title of king to any prince whom they pleased; thanks and praise to those who had deserved them; pardon and reward to enemies, or the discoverers of any treason; to declare any one an enemy by a vote; and to prescribe a general change of habit to the city, in cases of any imminent danger or calamity.

The tribunes soon snatched from them that original right, which they had enjoyed from the very foundation of the city, of being the authors, or first movers of every thing, which was to be enacted by the people, and excluded them from any share or influence in the assemblies of their tribes; and though in the other assemblies of the curiæ and the centuries, they seemed to have reserved to them their ancient right, yet it was reduced to a mere form, without any real force; for instead of being what they had always been, the authors of each particular act that was to be proposed to the people's deliberation, they were obliged, by a special law, to authorize every assembly of the people, and whatever should be determined in it, even before they had proceeded to any vote. And C. Gracchus afterwards, in his famous tribunate, used to boast that he had demolished the *senate* at once, by transferring to the equestrian order the right of judicature in all criminal causes, which the *senate* had possessed from the time of the kings.

It has been a question among the learned, how senators were created, and how the vacancies of the *senate* in old Rome were supplied.

Dr. Middleton is of opinion, that the constant and regular supply of the *senate* was from the annual magistrates; who, by virtue of their several offices, acquired an immediate right to sit and vote in that assembly. The usual gradation of these offices was that of quæstor, tribune of the people, ædile, prætor, and consul; which every candidate, in the ordinary forms of the constitution, was obliged to take in their order, with this exception only, that he might forego either the tribunate, or the ædileship, at his own choice, without a necessity of passing through them both. See QUÆSTOR, TRIBUNE, &c. But though these offices gave both an immediate right, and actual entrance into the *senate*, yet the senatorian character was not esteemed complete, till the new senators had been enrolled by the censors at the next lustrum, or general review of all the orders of the city, which was generally held every five years. Yet this enrolment was but a matter of form, which could not be denied to any of them, except for some legal incapacity, or the notoriety of some crime, or infamy upon their characters; for which the same censors could expel, or deprive, any other senator, of what rank or standing soever. See CENSOR.

It has been the opinion of some, that under the kings of Rome the choice and nomination of all the senators depended wholly on the will of the prince, without any right in the people, either direct or indirect; and that the consuls, who succeeded to the kingly power, enjoyed the same prerogative, till the creation of the censors, who ever after possessed the sole and absolute right of making and unmaking senators. But Dr. Middleton is of opinion, that the kings, the consuls, and the censors, acted in this affair but ministerially, and subordinately to the supreme will of the people, in whom the proper and absolute power of creating senators always resided. And the doctor assures us, upon the strictest search into the state of the present question, as it stood under the kingly government, he cannot but conclude, from the express testimony of the best historians, the concurrence of similar facts, and the probability of the thing itself, that the right of chusing senators was originally and constitutionally vested in the people. Middleton of Rom. Sen. p. 36.

But lord Hervey, who seems to have studied the Roman history with care and attention, is of a different opinion. The *senate*, at its first establishment (notwithstanding the judicial and legislative power it afterwards acquired) was nothing more than the king's council. In this light not only Festus, Eutropius, and Livy, represent the *senate*, but even Dionysius himself. It is therefore highly probable, his lordship says, that each member of this council was merely, as Livy and Plutarch relate, the choice of the king, and not, as Dionysius reports, elected by the people. Nor is there the least ground to imagine, he tells us, from any author whatever, except Dionysius, that during the whole regal government, the people had, directly or indirectly, actually or virtually, any share or concern at all in the choice of the senators. The first institution, in a word, every augmentation, and every supply on vacancies, he supposes to have depended entirely on the will and authority of the kings. Nor does he, like Monsieur Vertot, imagine the reason why Dionysius had reported otherwise, proceeded from his republican spirit, but from what every body who reads him must find in his manner of describing every institution, law, or custom, among the Romans, viz. an affectation of tracing its origin from some similar practice in the Grecian states, in order, from his partiality to that country, to give Greece the honour of having furnished the sketch of every plan, on which the Roman government was framed, and the Roman greatness raised.

Soon

Soon after the expulsion of Tarquin, and the establishment of the consular government, the *senate*, which, by many condemnations to death, or exile, the last king had reduced to less than half its complement, was filled up to its former number of three hundred; this supply, according to every historian, was made out of the plebeians; and in all probability, his lordship says, by the sole power of the consuls, since no author relates otherwise, and all authors agree that the consulate power at first differed from the regal powers in no particulars but that of being annual, instead of perpetual, and divided between two persons, instead of being vested in a single one.

Till the time of the censors then, lord Hervey tells us, there is not the least reason to imagine, that the people had any hand in promoting any man to the senatorial rank. From the time that the people were allowed to chuse the annual magistrates out of their own body, till the time the commonwealth fell into confusion, which ended, as confusion generally does, with a total loss of liberty, the only difficulty in accounting for the filling up of the *senate*, his lordship says, is to reconcile the right of the annual magistrates to enter the *senate*, with the power of the censors. And this, he thinks, may be done by distinguishing between *a right to vote in the senate*, and *being a senator*, which were two different privileges, and quite distinct honours. The first was obtained by virtue of exercising any public office, from the quæstorship to the consulship; and was consequently conveyed by the people; whereas the last was a dignity conferable only by the censors. Festus says, that those who held any public office in the state, and by virtue of that office voted in the *senate*, were nevertheless no senators till made so by the censors. And Aulus Gellius, in his chapter upon the *Pedarii Senatores*, says the same thing.

These two classes were always distinguished even in the edict that convoked the *senate*; the form of the edict, as may be seen in many writers, being *to convene the senators, and all those who had a right to vote in the senate*.

Nor was the difference, according to Aulus Gellius, between the voters in the *senate*, and the confirmed senators, so unessential, as it may at first appear; for those, who had only a right to vote in the *senate*, and were not enrolled senators, had no right to speak there, and could only pass in silence to one side or the other, when a division was made on the point in debate. Whereas an enrolled senator had a right, when he gave his vote, to speak as long as he pleased, and on what he thought fit; a privilege, which amounted to a power of stopping all proceedings for that day, and was often so used.

From the story of Fabius Maximus and Crassus, related by Valerius Maximus, book ii. chap. 2. there appears to have been another very essential difference between a senator, and a voter in the *senate*; for by that story one must imagine that those who were enrolled senators, had not only the sole right of debating any question that came into the *senate*, but were like a secret committee, or cabinet council, who previously weighed every proposal that was to be made in a general *senate*, and determined whether it should be brought in or not.

The power of taking cognizance of the manners of every Roman citizen, was first annexed to the censorship, when the office itself was disjoined from that of the consulship, in the three hundred and eleventh year of Rome, as may be seen in Livy, book iv. chap. 8. But the power of chusing the new senators was not transferred from the consuls to the censors till near a hundred years afterwards, in the tribuneship of Ovinius; and it was then given to the censors by the people, to revenge the breach of the Licinian law (which law ordained that one of the consuls should always be chosen out of the plebeians) for both the consuls being that year patricians, and one of the censors that year, for the first time, being a plebeian, the tribune Ovinius put the people upon this expedient to do themselves justice, and mortify the nobility.

When the annual magistrates were not sufficient to supply the vacancies in the senate, the censors chose whom they pleased. And that the annual magistrates were seldom enough to supply the vacancies, may easily be concluded, when one considers how few they were, and how many vacancies must be made in so large a body as three hundred men, by natural deaths, the chance of perpetual war, and the purgations made by the reforming authority of the censors.

The filling up of the *senate* then from the Ovinian tribuneship till the time of the Gracchi, lord Hervey thinks, depended entirely on the censors; for though he allows that the annual magistrates, at the expiration of their office, had a sort of claim and pretension to be put on the roll of senators, by the censors; yet as the censors, under the pretence of reformation, had an uncontroulable power to remove senators already enrolled, so on the same pretence they could, if they pleased, *refuse to enroll*, and even without giving any reason; since their manner both of expelling or admitting senators was merely by omitting or inserting a name in the ceremony of calling over the roll.

Though the censorship, therefore, at its original institution by Servius Tullius, was nothing more than the office of numbering the people, and taking the valuation of their estates, and an office annexed first to the royal authority, and afterward to the consular power; yet when it was detached from the consular power, and erected into a separate office, with the power of filling up the *senate* annexed; from that time, as the cognizance of the manners of every citizen of Rome was also in their department, his lordship looks upon the censors to have been full as absolute in the city and the civil government, with regard to all promotions and degradations, from the *senate* down to the lowest tribe, curia, or century, as the consuls were in the camp and the military government.

Ever after the time of the Gracchi, the state was either in such confusion, or such absolute slavery, that his lordship thinks there was no regular method at all observed in filling up the *senate*, or any justice in purging it. Whoever had the sovereign power in his hand, under what title soever he seized or possessed it, modelled the *senate* by the introduction of new members, or the expulsion of old ones, just as he thought fit.

Dr. Middleton politely acknowledges, that the hypothesis of lord Hervey has the advantage of his own, and will be thought the more solid or plausible by the generality of readers. See Letters between Lord Hervey and Dr. Middleton, concerning the Roman *Senate*; published by Dr. Knowles, quarto, 1778.

The magistrates who had the power of assembling the *senate* were the dictator, the consuls, the prætors, the tribunes of the commons, and the interrex. Yet upon extraordinary occasions the same privilege was allowed to the tribuni militum, invested with consular power, and to the decemviri, created for regulating the laws; and to other magistrates chosen upon some unusual occasion.

In the early ages of the republic, when the precincts of the city were small, the senators were personally summoned by an apparitor; and sometimes by a public crier, when their affairs required immediate dispatch; but the usual way of calling them, in later days, was by an edict, appointing the time and place, and published several days before, that the notice might be more public. These edicts were commonly understood to reach no farther than to those who were resident in Rome, or near it; yet when any extraordinary affair was in agitation, they seem to have been published also in the other cities of Italy. If any senator refused, or neglected to obey this summons, the consul could oblige him to give surety for the payment of a certain fine, if the reasons of his absence should not be allowed. But from sixty years of age they were not liable to that penalty, nor obliged to any attendance but what was voluntary.

The *senate* could not regularly be assembled in any private or profane place, but always in one set apart, and solemnly consecrated to that use by the rites of augury.

The *senate* frequently met in certain curiæ. See CURIA.

But their meetings were more commonly held in certain temples, dedicated to particular deities; as in that of Jupiter, Apollo, Mars, Vulcan, Castor, Bellona; of Concord, Faith, Virtue, the Earth, &c.

These temples, on account of the use which the *senate* made of them, were called likewise *curiæ*; as well as the proper curiæ, or *senate* houses, on account of their solemn dedication, are frequently called temples.

On two special occasions the *senate* was always held without the gates of Rome, either in the temple of Bellona, or of Apollo. 1st. For the reception of foreign ambassadors, and especially of those who came from enemies, who were not permitted to enter the city. 2dly, To give audience, and transact business with their own generals, who were never allowed to come within the walls, as long as their commission subsisted, and they had the actual command of an army.

The *senate* met always of course on the first of January, for the inauguration of the new consuls, who entered into their office on that day.

The month of February, generally speaking, was reserved entire by old custom to the *senate*, for the particular purposes of giving audience to foreign ambassadors.

In all months, universally, there were three days, which seem to have been more especially destined to the *senate*, the kalends, nones, and ides, from the frequent examples found in history, of its being convened on those days. But Augustus enacted afterwards, that the *senate* should not meet regularly, or of course, except on two days only of each month, the kalends and ides.

On their days of meeting, they could not enter upon any

business

buſineſs before the ſun was riſen, nor finiſh any after it was ſet; every thing tranſacted by them, before or after that time, was null and void, and the author of it liable to cenſure. Whence it became a ſtanding rule, that nothing new ſhould be moved after four o'clock in the afternoon.

The *ſenate*, as has been ſhewn above, was compoſed of all the principal magiſtrates of the city, and of all who had borne the ſame offices before them: and conſiſted therefore of ſeveral degrees and orders of men, who had each a different rank in it, according to the dignity of the character which he ſuſtained in the republic. At the head of the *ſenate* ſat the dictator and conſuls, in chairs of ſtate. Manutius thinks that the other magiſtrates ſat next to the conſular chair, each according to his rank; the prætors, cenſors, ædiles, tribunes, quæſtors. But Dr. Middleton rather thinks that the conſular ſenators, who, in all ages of the republic, were the leaders and firſt ſpeakers in the *ſenate*, uſed to ſit next in order to the conſuls; and after them the prætors, and all who were of prætorian dignity, or had been prætors; then the ædiles, the tribunes, and the quæſtors, on diſtinct benches; and on the ſame bench with each, all who had borne the ſame offices; but the curule magiſtrates, as the prætors and ædiles, were perhaps diſtinguiſhed, at the head of their ſeveral benches, by ſeats ſomewhat raiſed, or ſeparated at leaſt from the reſt, in the form of our ſettees, or of that *longa cathedra*, which Juvenal mentions, to denote the curule dignity.

All the private ſenators ſat on different benches, and in a different order of precedency, according to the dignity of the magiſtracies which they had ſeverally borne. Firſt the conſulars, then the prætorians, ædilitians, tribunitians, and quæſtorians; in which order, and by which titles, they are all enumerated by Cicero. And as this was their order in ſitting, ſo it was the ſame alſo in delivering their opinions when it came to their turn. Cic. Phil. 13. 14.

The *ſenate* being aſſembled, the conſuls, or the magiſtrate, by whoſe authority they were ſummoned, having firſt taken the auſpices, and performed the uſual office of religion, by ſacrifice and prayer, uſed to open to them the reaſons of their being called together, and propoſe the ſubject of that day's deliberation; in which all things divine, or relating to the worſhip of the gods, were diſpatched preferably to any other buſineſs. When the conſul had moved any point, with intent to have it debated and carried into a decree, and had ſpoken upon it himſelf as long as he thought proper, he proceeded to aſk the opinions of the other ſenators, ſeverally in their name, and in their proper order, beginning always with the conſulars, and going on to the prætorians, &c. It was the practice originally to aſk the PRINCE *of the ſenate* the firſt; but that was ſoon laid aſide, and the compliment transferred to any other ancient conſular, diſtinguiſhed by his integrity and ſuperior abilities; till in the later ages of the republic, it became an eſtabliſhed cuſtom to pay that reſpect to relations, or particular friends, or to thoſe who were likely to give an opinion the moſt favourable to their own views and ſentiments on the queſtion propoſed. But whatever order the conſuls obſerved, in aſking opinions on the firſt of January, when they entered into their office, they generally purſued the ſame through the reſt of the year. Julius Cæſar indeed broke through this rule; for though he had aſked Craſſus the firſt, from the beginning of his conſulſhip; yet, upon the marriage of his daughter with Pompey, he gave that priority to his ſon-in-law, for which, however, he made an apology to the *ſenate*.

This honour of being aſked in an extraordinary manner, and preferably to all others of the ſame rank, though of ſuperior age or nobility, ſeems to have been ſeldom carried farther than to four or five diſtinguiſhed perſons of conſular dignity; and the reſt were afterwards aſked according to their ſeniority. And this method, as has been ſaid, was obſerved generally throughout the year, till the election of the future conſuls, which was commonly held about the month of Auguſt; from which time, it was the conſtant cuſtom to aſk the opinions of the conſuls elect, preferably to all others, till they entered into their office, on the firſt day of January following.

As the conſuls elect had this preference given in ſpeaking before all the conſulars, ſo the prætors, and tribunes elect, ſeem to have had the ſame, before the reſt of their particular orders.

None were allowed to ſpeak till it came to their turn, excepting the magiſtrates, who ſeem to have had a right of ſpeaking on all occaſions, whenever they thought fit; and for that reaſon, perhaps, were not particularly aſked, or called upon by the conſuls.

If in the debate ſeveral different opinions had been offered, and each ſupported by a number of ſenators, the conſul, in the cloſe of it, uſed to recite them all, that the *ſenate* might paſs a vote ſeparately upon each; but in this he gave what preference he thought fit to that opinion which he moſt favoured, and ſometimes even ſuppreſſed ſuch of them, as he wholly diſapproved.

In caſes, however, where there appeared to be no difficulty or oppoſition, decrees were ſometimes made, without any opinion being aſked or delivered upon them.

When any queſtion was put to the vote, it was determined always by a diviſion, or ſeparation of the oppoſite parties, to the different parts of the *ſenate* houſe; the conſul, or preſiding magiſtrate, having firſt given order for it in this form: *Let thoſe, who are of ſuch an opinion, paſs over to that ſide; thoſe, who think differently, to this.*

What the majority of them approved was drawn up into a decree, or *ſenatus-conſultum*, which was generally conceived in words prepared and dictated by the firſt mover of the queſtion, or the principal ſpeaker in favour of it; who, after he had ſpoken what he thought ſufficient to recommend it to the *ſenate*, uſed to conclude his ſpeech, by ſumming up his opinion in the form of ſuch a decree as he deſired to obtain. Which decree, when confirmed by the *ſenate*, was always ſigned and atteſted by a number of ſenators, who choſe to attend through the whole proceſs of it, for the ſake of adding their names to it, as a teſtimony of their particular approbation of the thing, as well as of reſpect to the perſon, by whoſe authority, or in whoſe favour it was drawn.

When the *ſenate* appeared to be diſpoſed, and ready to paſs a decree, it was in the power of any one of the ten tribunes of the people to intercede, that is, to over-rule it. See INTERCESSION.

In all caſes, where the determinations of the *ſenate* were over-ruled by the negative of a tribune, of which there are numberleſs inſtances, if the *ſenate* was unanimous, or generally inclined to the decree ſo inhibited, they uſually paſſed a vote to the ſame purpoſe, and in the ſame words, which was called *ſenatus auctoritas, an authority* or *judgment of the ſenate*, and was entered into their journals. But this had no other force than to teſtify the judgment of the *ſenate* on that particular queſtion, and to throw the odium of obſtructing an uſeful act on the tribune who hindered it.

In order to deter any magiſtrate from acting factiouſly and arbitrarily, in affairs of importance, they often made it part of the decree, which they were going to enact, that if any one attempted to obſtruct it, he ſhould be deemed to act againſt the intereſt of the republic. Yet this clauſe had ſeldom any effect on the hardy tribunes, who uſed to apply their negative in defiance of it as freely, as on any other more indifferent occaſion.

The factious, and leaders of parties, had ſeveral arts of obſtructing, or poſtponing a decree, by many pretexts and impediments which they could throw in its way. Sometimes they alledged ſcruples of religion, that the auſpices were not favourable, or not rightly taken; which, if confirmed by the augurs, put a ſtop to the buſineſs for that day. At other times, they urged ſome pretended admonition from the Sibylline books, which were then to be conſulted and interpreted to a ſenſe, that ſerved their purpoſe. But the moſt common method was to waſte the day, by ſpeaking for two or three hours ſucceſſively, ſo as to leave no time to finiſh the affair in that meeting: yet when ſome of the more turbulent magiſtrates were groſly abuſing this right, againſt the general inclination of the aſſembly, the ſenators were ſometimes ſo impatient as to ſilence them, as it were, by force, and to diſturb them in ſuch a manner, by their clamour and hiſſing, as to oblige them to deſiſt.

The decrees of the *ſenate* were uſually publiſhed, and openly read to the people ſoon after they were paſſed; and an authentic copy of them was always depoſited in the public treaſury of the city, or otherwiſe they were not conſidered as legal or valid.

As to the force of theſe decrees, it is difficult to define preciſely what it was. It is certain that they were not conſidered as laws, but ſeem to have been deſigned originally as the ground-work, or preparatory ſtep to a law, with a ſort of proviſional force, till a law of the ſame tenor ſhould be enacted in form by the people; for in all ages of the republic, no law was ever made, but by the general ſuffrage of the people.

Even under the kings, the collective body of the people was the real ſovereign of Rome, and the dernier reſort in all caſes. But their power, though ſupreme and final, was yet qualified by this check, that they could not regularly enact any thing, which had not been previouſly conſidered and approved of by the *ſenate*. This indeed continued to be the general way of proceeding in all quiet and regular times, from the beginning of the republic to the end of it; and the conſtant ſtyle of the old writers, in their accounts of the public tranſactions, is, that the *ſenate* voted or decreed, and the people commanded ſuch and ſuch an act. Middleton, ubi ſupra, and the authorities cited by him.

SENATE *of four hundred*, an ancient *senate* of Athens, when the city was divided into four tribes, each of which chose a hundred men. This lasted till Solon instituted the *senate* of five hundred, after the city was divided into five tribes.

SENATE *of Venice*. See PREGADI.

SENATOR, a member of a senate.

There were two orders, or degrees, among the Roman nobility; that of the *senators*, and that of the *knights*: after these two, came the people. The first hundred *senators* were appointed by Romulus, and called *patres, fathers*. Upon the union with the Sabines, Romulus, or, as others say, Tullus, added a second hundred, called *patres majorum gentium*; this distinguished them from a third hundred added by the elder Tarquin, and called *patres minorum gentium, fathers of the lower rank*.

In ancient Rome, the number of *senators* is commonly supposed to have been limited to three hundred, from the time of the kings to that of the Gracchi. But this must not be taken too strictly. The senate generally had that number, or thereabout, and upon any remarkable deficiency, was filled up again to that complement by an extraordinary creation. But as the number of the public magistrates increased with the increase of their conquests and dominions, so the number of the senate, which was supplied of course by those magistrates, must be liable also to some variation. To what number Sylla increased them is not absolutely certain; but in Cicero's time they were not less than four hundred and fifteen, as appears by his letter to Atticus, lib. i. ep. 14.

In the time of Gracchus they were six hundred; during the civil wars they were reduced to three hundred. Julius Cæsar augmented that number to nine hundred; the triumvirs to above a thousand; and Augustus reduced them to six hundred, according to Dion Cassius; and to three hundred, according to Suetonius. For the choice of *senators* belonged at first to the kings, then to the consuls, then to the censors, who in their census or survey every fifth year, appointed new *senators* in lieu of those dead or degraded; but at length it fell to the emperors. See SENATE.

Though, for a long time, none were raised to the dignity of *senators*, but those most conspicuous for their prudence, &c. yet some regard was afterwards had to their estate, lest their dignity should become debased by poverty. To hold the *senatorial* dignity, a yearly revenue of eight hundred thousand sesterces was required, which amounts to between six and seven thousand pounds of our money. Half as much was required for the qualification of the knights. The *senators*, who sunk below this revenue, were discarded, and expunged out of the list by the censor; and this was increased by Augustus to twelve hundred thousand.

This qualification must not be taken, as it is by some, for an annual income, but the whole estate of a *senator*, real and personal, as estimated by the survey and valuation of the censors.

This proportion of wealth may seem perhaps too low, and unequal to the high rank and dignity of a Roman *senator*, but it must be considered only as the lowest to which they could be reduced; for whenever they sunk below it, they forfeited their seats in the senate.

In ancient Rome, a certain age was required for a *senator*, as is often intimated by the old writers, though none of them have expressly signified what it was. The legal age for entering into the military service was settled, by Servius Tullius, at seventeen years; and they were obliged, as Polybius tells us, to serve ten years in the wars, before they could pretend to any civil magistracy. This fixes the proper age of suing for the quæstorship, or the first step of honour, to the twenty-eighth year; and as this office gave an admission into the senate, so the generality of the learned seem to have given the same date to the *senatorian* age. Some writers, indeed, on the authority of Dion Cassius, have imagined it to be twenty-five years; not reflecting that Dion mentions it there as a regulation only proposed to Augustus by his favourite Mæcenas. Dr. Middleton takes the quæstorian age, which was the same with the *senatorian*, to have been thirty years complete.

The laws concerning the age of magistrates were not very ancient; and were made to check the forward ambition of the nobles, and to put all the citizens upon a level in the pursuit of honours. And Livy tells us, that L. Villius, a tribune of the people, was the first who introduced them, A. U. 573, and acquired by it the surname of Annalis. Middlet. of Rom. Sen. p. 99.

The *senators* were ordinarily chosen from among the knights, or from among such as had borne the principal offices. At first the magistrates were taken wholly from among the *senators*; whence Tacitus calls the senate, the *seminary of all dignities*; but after the people had been admitted to magistratures, *senators* were taken from among such as had discharged those offices, though before plebeians.

There was some law subsisting from the earliest times, concerning the extraction and descent of *senators*, enjoining that it should always be ingenuous; and as their morals were to be clear from all vice, so their birth likewise from any stain of base blood. In consequence of which, when Appius Claudius, in his censorship, attempted to introduce the grandsons of freed slaves into the senate, they were all immediately turned out again.

These are some of the laws by which the censors were obliged to act, in the enrollment of the new, or the omission of old *senators*; and when we read of any left out, without any intimation of their crime, it might probably be for the want of one or other of these legal, or customary qualifications.

It was from the *senatorian* order alone, that all ambassadors were chosen and sent to foreign states; and when they had occasion to travel abroad, even on their private affairs, they usually obtained from the senate the privilege of a free legation, as it was called; which gave them a right to be treated every where with the honours of an ambassador, and to be furnished on the road with a certain proportion of provisions and necessaries, for themselves and their attendants; and as long as they resided in the Roman provinces, the governors used to assign them a number of lictors, or mace-bearers, to march before them in state, as before the magistrates in Rome. And if they had any law-suit, or cause of property depending in those provinces, they seem to have had a right to require it to be remitted to Rome.

At home, likewise, they were distinguished by peculiar honours and privileges; for at the public shews and plays they had particular seats set apart, and appropriated to them, in the most commodious part of the theatre; and on all solemn festivals, when sacrifices were offered to Jupiter by the magistrates, they had the sole right of feasting publicly in the Capitol, in habits of ceremony, or such as were proper to the offices which they had borne in the city.

The peculiar ornament of the *senatorian* tunic was the *latus clavus* (see LATICLAVIUM), as it was called, being a broad strip of purple sewed upon the forepart of it, and running down the middle of the breast, which was the proper distinction between them and the knights, who wore a much narrower stripe of the same colour, and in the same manner. The fashion also of their shoes was peculiar, and different from that of the rest of the city: this difference appeared in the colour, shape, and ornament of the shoes. The colour of them was black, while others wore them of any colour perhaps, agreeable to their several fancies; the form of them was somewhat like to a short boot, reaching up to the middle of the leg, as they are sometimes seen in ancient statues and bas-reliefs; and the proper ornament of them was a half moon sewed, or fastened upon the forepart of them, near the ancle.

Consuls, prætors, ædiles, tribunes, &c. during the year of their magistracy, always wore the prætexta, or a gown bordered round with a stripe of purple. In which habit also, as has been signified above, all the rest of the senate, who had already borne those offices, used to assist at the public festivals and solemnities.

The *senators* carried their children with them to the senate, to inform them betimes of affairs of state; though these children had not admittance till seventeen years of age.

Some make a distinction among the *senators*; and say, that besides the *senators* who were allowed to speak, and were asked their opinions, there were others, who, without speaking, or being ever asked their judgment, were only to follow the opinion of those they thought the most reasonable, and were hence called *pedarii*. A. Gellius gives us another notion of the pedarii, and says, those were thus called, who, having never borne the office of curule magistrate, were obliged to go to the senate on foot.

They had the name *senators*, q. d. *old men*, given them in imitation of the Greeks, who called their senate γερουσια. So when the Athenians assembled the people to consult about the affairs of the public, the officers summoned none but such as were at least fifty years old. The Egyptians and Persians followed the same example, after the Hebrews; and the Lacedæmonians and Carthaginians received none but such as were sixty years of age. See CONSCRIPT.

As to other matters, relating to Roman *senators*, see the article SENATE, supra.

SENATUS *auctoritas*. See SENATE.

SENATUS-CONSULTUM, a vote, or resolution, of the Roman senate, pronounced on some question, or point of law, proposed to it. See SENATE.

The *senatus-consulta* made a part of the Roman law: when passed, they were deposited in the temple of Ceres, under the custody of the ædiles; and at last they were carried,

carried, by the cenſor, to the temple of Liberty, and put up in an armory called *tabularia*.

Julius Capitolinus ſpeaks of a ſort of *ſenatus-conſulta tacita*, which, he ſays, were made in reference to affairs of great moment and ſecrecy by the ſenators themſelves, without the privity of the public officers, under an oath of ſecrecy, till their deſigns ſhould be effected.

SEND, is uſed by ſeamen, when a ſhip, either at an anchor, or under ſail, falls with her head, or ſtern, deep into the trough of the ſea, i. e. into a hollow made between two waves, or billows. They ſay ſhe *ſends* much that way, whether it be a-head or a-ſtern.

SENDAL, in our *Old Writers*, a kind of thin fine ſilk, mentioned in the ſtat. 2 Rich. II. cap. I.

SENECIO, *groundſel*, in *Botany*. See GROUNDSEL.

SENECTA *anguium*, the exuviæ, or ſloughs of ſerpents. The ſnakes caſt their whole ſkin, and with it were ſuppoſed to caſt off their age, and be born anew; whence the name of theſe caſt ſkins. A decoction, or infuſion of theſe, is recommended by medical writers againſt pains of the ears and eyes; and ſome ſuperſtitious people recommend it to women, to tye about their waiſtes, to prevent miſcarriages, and about their thighs, in time of labour, to haſten delivery.

SENEGA. See GUM *ſenega*.

SENEKA *rattleſnake-root*. This is a root lately brought into uſe among us, and which ſeems to deſerve very great regard. It is the root of a ſpecies of *polygala*, or MILKWORT, diſtinguiſhed by Gronovius, in his Flora Virginica, under the name of the erect *polygala*, with a ſimple ſtalk, with oval leaves, pointed at the end, and with an erect cluſter of flowers. We generally call it the *rattleſnake-root*, and the French, from the place whence it comes, *Seneka*. The plant is a native of Virginia, Penſylvania, and Maryland, and is cultivated in ſome of our gardens.

The root is perennial; the thickneſs of it is generally about that of a man's little finger. It is four or five inches, or more, in length, and is variouſly contorted and twiſted, and divides into many branches, furniſhed with ſmall fibres, and with a membranaceous rim running all along it. It is yellowiſh on the outſide, and white within; very acrid, and ſomewhat bitter to the taſte, and has ſomewhat of an aromatic flavour. From this root ariſe numerous ſtalks, all ſimple, and without branches; ſome lie on the ground, others ſtand erect. Theſe are ten or twelve inches high, when full grown. The leaves ſtand alternately on the ſtalks, and the flowers are white, and perfectly like thoſe of our own kinds of polygala. This root is of no remarkable ſmell, but has a peculiar kind of ſubtile, pungent, penetrating taſte. Its virtue is extracted both by water and ſpirit.

Dr. Tennent, who brought over a vaſt quantity of this root from America ſome years ago, and took great pains to introduce it into practice, praiſes it very largely as a diuretic, a diaphoretic, and an alexipharmic, and a very powerful attenuant and reſolvent. He ſays it will ſometimes vomit and purge.

The Senegaw Indians firſt taught the uſe of it to the Europeans; they eſteem it a ſovereign remedy againſt the bite of the *rattleſnake*; and Dr. Tennent aſſures us that he ſaw two perſons, who had been bitten by this creature in the month of July, when its poiſon is moſt fatal, perfectly reſtored to health by it. The powder, or a decoction of the root, is taken internally; and either the powder or cataplaſms made with it applied to the wound.

He afterwards gave it in pleuriſies and peripneumonies with great ſucceſs, and in all other caſes where the blood is inſpiſſated. The effect of this medicine was found to be, that it made the ſizy blood fluid, procured a plentiful ſpitting, increaſed perſpiration and urine, and ſometimes purged or vomited. If the firſt doſes of it provoke a vomiting, it is not at all the worſe, except in caſes in which the patient is very weak; and in ſuch this effect is eaſily prevented, by giving ſome of the teſtaceous powders with it.

In pleuriſies it is beſt to take away ten ounces of blood, before the entering on the uſe of the medicine; in other caſes no precaution is required, but it is to be given in powder, or tincture, in white wine, particularly Madeira wine; and the ordinary drink, during the uſe of it, ſhould be marſhmallow tea.

This medicine may be given either in powder or decoction; but Dr. Tennent prefers the decoction, having obſerved it to give relief ſooner than the powder does. The doſe of the powder is thirty-five grains, and he gives at once three ſpoonfuls of the decoction, prepared by boiling three ounces of the root bruiſed in a quart of water to near the half. The doſe is repeated every ſix hours. He is alſo fond of this root in the rheumatiſm, dropſy, and gout, in which laſt diſeaſe, he ſays, he has given it with ſucceſs. See his Letter concerning the *Seneka*, or *rattleſnake-root*.

Meſſrs. Lemery, Du Hamel, and Juſſieu, vouch for the good effects of the *Seneka-root* in pleuriſies, and other inflammatory diſeaſes. Mem. de l'Acad. des Scienc. 1739.

SENEMBI, in *Zoology*, the name of a ſpecies of Braſilian lizard, more commonly known by the name IGUANA.

SENESCHAL, *ſeneſcallus*, a name anciently uſed for a ſteward or MAJORDOMO; formed from the German *ſind*, *houſe* or *family*, and *ſcalc*, *ſervant*.

Thus the *ſeneſchal* of a lord, or a baron, is his ſteward or bailiff, who holds his courts, and manages his demeſne lands; and the *ſub-ſeneſchal*, his under-ſteward.

High ſeneſchal of England is the high ſteward of England; *high ſeneſchal del hotel du roi*, is the ſteward of the king's houſhold.

The ancients uſed the term *ſeneſcallus* indifferently with that of *dapifer*; whence we are ſure it ſignifies *ſteward*.

SENESCHALLO *et marcſhallo quod non teneant placita de libero tenemento*, a writ, directed to the ſteward and marſhal of England, inhibiting them to take cognizance of an action in their court that concerns freehold.

SENGREEN, in *Botany*. See HOUSELEEK.

SENNA. See SENA.

SENNIT (of *ſeven* and *knit*), a ſort of flat, braided cordage, formed by platting five or ſeven rope-yarns together. This is beaten ſmooth and flat with a hammer, and ſerves to keep the ropes to which it is applied from galling.

SENOPLE. See SINOPLE.

SENORIÆ, in *Botany*, a name by which ſome authors have called the bonana-tree, or *muſa fructu breviore*.

SENSATION, the act of perceiving external objects, by means of the organs of ſenſe.

To conceive the manner wherein *ſenſation* is effected; obſerve, that all the organs conſiſt of little filaments, or nerves, which have their origin in the middle of the brain, are diffuſed thence throughout all the members which have any ſenſe, and terminate in the exterior parts of the body; that when we are in health, and awake, one end of theſe nerves cannot be agitated or ſhaken, without ſhaking the other; becauſe they are always a little ſtretched; as is the caſe of an extended chord, one part of which cannot be ſtirred without a like motion of all the reſt. Obſerve, farther, that theſe nerves may be agitated two ways; either at the end out of the brain, or at that in the brain. If they be agitated from without, by the action of objects, and their agitation be not communicated as far as the brain, as frequently happens in ſleep, when the nerves are in a ſtate of relaxation; the ſoul does not then receive any new *ſenſation*. But if the nerves happen to be agitated on the brain, by the flux of the animal ſpirits, or any other cauſe; the ſoul perceives ſomething, though the parts of thoſe nerves, that are out of the brain, diffuſed through the ſeveral parts of the body, remain at perfect reſt: as likewiſe is frequently the caſe in ſleep. Laſtly, obſerve, that experience tells us, we may ſometimes feel pain, as if in parts of the body that have been entirely cut off; by reaſon the fibres in the brain, correſponding to them, being agitated in the ſame manner as if they were really hurt, the ſoul feels a real pain in thoſe imaginary parts.

All theſe things ſeem to ſhew, that the ſoul reſides immediately in that part of the brain wherein the nerves of all the organs of ſenſe terminate: we mean, that it is there it perceives all the changes that happen with regard to the objects that cauſe them, or that have been uſed to cauſe them; and that it only perceives what paſſes out of this part, by the mediation of the fibres terminating in it.

Theſe things premiſed, it will not be difficult to explain how *ſenſation* is performed, the manner whereof may be conceived from what follows: when the point of a needle, for inſtance, is thruſt againſt the hand, that point ſtirs and ſeparates the fibres of the fleſh; which fibres are extended from that place to the brain, and, when we are awake, are in ſuch a degree of tenſion, as that they cannot be ſtirred without ſhaking alſo the fibres of the brain. If then the motion of the fibres of the hand be gentle, that of the fibres of the brain will be ſo too; and if the firſt be violent enough to break any thing in the hand, the laſt will be ſtronger and more violent in proportion. In like manner, if the hand be held to the fire, the little particles of the fuel it throws off in great numbers, and with a great deal of violence, ſtriking againſt theſe fibres, and communicating a part of their agitation thereto; if the action be moderate, that of the extremities of the fibres of the brain, correſponding to thoſe of the hand, will be moderate likewiſe: if it be violent enough to ſeparate any of the parts of the hand, as it happens in burning, the motion of the fibres in the brain will be proportionably more violent. This is what befalls the body, when objects ſtrike upon it. We are now to conſider how the mind is affected.

The mind, we have obſerved, reſides principally, if we may be allowed to ſay ſo, in that part of the brain, where all the fibres of the nerves terminate. It attends here, as

as its ſenſory, or office, to look to the preſervation of all the parts of the body; and, of conſequence, it muſt be here advertiſed of all the changes that happen, and muſt be able to diſtinguiſh between thoſe agreeable to the conſtitution of the body, and thoſe hurtful thereto. Any other abſolute knowledge, without a relation to the body, were uſeleſs. Thus, though all the changes in our fibres do, in reality, conſiſt in motions, which ordinarily only differ as to more and leſs; it is neceſſary the ſoul ſhould conſider them as changes eſſentially different; for though in themſelves they differ but very little, yet, with regard to preſervation of the body, they are to be looked on as eſſentially different.

The motion, for inſtance, which cauſes pain, frequently differs exceedingly little from that which occaſions a pleaſing titillation: it is not neceſſary, that there ſhould be an eſſential difference between theſe two motions; but it is neceſſary there be an eſſential difference between the pain and the tickling, which thoſe two motions occaſion in the ſoul; for the agitation of the fibres, which accompanies the titillation, informs the ſoul of the good ſtate of the body, that it is able to reſiſt the impreſſion of the objects, and that it need not apprehend its being hurt; but the motion which occaſions pain, being ſomewhat more violent, is capable of breaking ſome of the fibres of the body; wherefore it is neceſſary the ſoul be advertiſed hereof by ſome diſagreeable *ſenſation*, that it may provide againſt it.

Thus, though all the motions which paſs in the body only differ in themſelves, as to more or leſs; yet, when conſidered with regard to the preſervation of life, they may be ſaid to be eſſentially different: for this reaſon it is, that the ſoul does not perceive the ſhakes or motions themſelves, which objects excite in the fibres of the fleſh: it would be uſeleſs to perceive them; and ſhe would never be able, thence, to learn whether the objects were capable of doing hurt or good. But ſhe perceives herſelf affected with *ſenſations*, which differ eſſentially, and which, ſhewing preciſely the qualities of the objects, as they regard the body, make her perceive diſtinctly, whether or no thoſe objects are capable of hurting it.

In effect, from a ſtrict examination of the ſeveral ſenſes, it appears, that ſenſible objects act no otherwiſe upon the body, for the producing of *ſenſation*, than by exciting a change in the extreme ſurface of the fibres of the nerves; the quality of which change depends on the figure, bulk, hardneſs, and motion, of the object; ſo that, according to all appearance, the moſt different objects, which ſhould agree in theſe four circumſtances, would produce the ſame *ſenſation*.

From the various texture of the object, the diverſity of the nerve affected, the different fabric of the organ of ſenſe, the different place in the medulla of the brain where the nerve ariſes, and the different degree of motion wherewith the action of the object is applied, there ariſe various *ſenſations* and ideas in the mind; none of which repreſent any thing in the action of the object, or in the paſſion of the organ. And yet the ſame action of the ſame object, on the ſame organ, always produces the ſame *ſenſation* or idea; and the ſame ideas neceſſarily follow the ſame diſpoſition of the ſame ſenſible organ, in the ſame manner as if the idea perceived were the natural and neceſſary effect of the action on the organ. See Idea.

SENSE, a faculty of the ſoul, whereby it perceives external objects, by means of ſome action or impreſſion made on certain parts of the body, called *organs of ſenſe*, and propagated by them to the ſenſory.

Some uſe the word *ſenſe* in a greater latitude; and define it a faculty whereby the ſoul perceives ideas or images of objects, either conveyed to it from without, by the impreſſion of objects themſelves, or excited within by ſome effort of the ſoul on the ſenſory itſelf.

Under this notion, *ſenſe* becomes diſtinguiſhable into two kinds, *external* and *internal*; correſponding to the two ſeveral manners wherein the images of the objects perceived are occaſioned, and preſented to the mind, viz. either immediately from without, or from within; that is, either by what we commonly call the *five external ſenſes*, hearing, ſeeing, &c. or by the *internal* ones, imagination, memory, and attention; to which ſome alſo add hunger and thirſt.

But as theſe *internal ſenſes* are not ordinarily conſidered in the notion of *ſenſes*, nor implied under the word *ſenſe*, but are thus only denominated by analogy; we ſhall wave them, to be farther conſidered under their reſpective articles, Imagination, Memory, &c.

Senses, *external*, or, ſimply, *the* Senses, in their general ſignification, are the means whereby the ſoul apprehends, or takes cognizance of, external objects; the means, we mean, both on the part of the mind, and on that of the body.

The means, on the part of the mind, are in all caſes the ſame; it being one and the ſame faculty, whereby we ſee, hear, &c. The means, on the part of the body, are different; as different as are the objects we are concerned to perceive; for the being and well-being of the animal being the end nature had in view in giving him any perception of external bodies; by this, the meaſure and manner of that perception are regulated; and we have ſo many ways of perceiving ſo many things, as the relation we bear to external bodies renders neceſſary for the preſervation, &c. of our being.

Hence thoſe ſeveral organs of *ſenſe*, called *eye*, *ear*, *noſe*, *palate*, and the univerſal one *cutis*; each of which is ſo diſpoſed as to give ſome repreſentation and report to the mind, of the ſtate of external things, the nearneſs, convenience, hurtfulneſs, and other habitudes; and each of them a different one, according to the degree and immediateneſs, &c. of the danger, or conveniency. And hence the ſeveral exerciſes of thoſe organs, hearing, ſeeing, ſmelling, taſting, and feeling.

A late excellent author, Dr. Hutcheſon, gives us a more ingenious, extenſive, and philoſophical notion of *ſenſe*. On his principle, *ſenſe* is defined, a power of perception, or, a power of receiving ideas; at leaſt, if what is abſolutely paſſive may be properly called a power.

On ſome occaſions, inſtead of power, he chuſes to call it, a determination of the mind to receive ideas. And the ideas thus perceived, or raiſed in the mind, he calls *ſenſations*.

Senſe, he conſiders, either as natural or moral; and the natural, either as external or internal: though the diſtribution is chiefly founded on the common ways of conceiving; for, in reality, they appear to be all natural and neceſſary: ſome reaſons, however, for the diſtinction, will be ſhewn under the ſeveral articles thereof.

Senses, *external*, then, are powers of perceiving ideas, upon the preſence of external objects. On ſuch occaſions, we find the mind is merely paſſive, and has not power directly to prevent the perception, or idea, or to vary it at its reception; as long as the body is continued in a ſtate fit to be acted upon by the external object.

When two perceptions are entirely different from each other, or agree in nothing but the general idea of ſenſation; the powers of receiving thoſe different perceptions are called *different ſenſes*. Thus, ſeeing and hearing denote the different powers of receiving the ideas of colours and ſounds. And though colours, as well as ſounds, have vaſt differences amongſt themſelves; yet is there a greater agreement among the moſt oppoſite colours, than between any colour and a ſound; and hence all colours are deemed perceptions of the ſame *ſenſe*.

All the ſeveral *ſenſes* ſeem to have their diſtinct organs, except feeling, which is, in ſome degree, diffuſed over the whole body. Inquiry into the Original of our Ideas of Beauty and Virtue, p. 2. 8vo. 1726.

In another place the ſame writer defines the *external ſenſes* to be thoſe determinations of nature by which certain perceptions conſtantly ariſe in the mind, when certain impreſſions are made upon the organs of the body, or motions raiſed in them. Some of theſe perceptions are received ſolely by one *ſenſe*; others may be received by two or more. Of the former claſs are theſe five ſorts; viz. colours, ſounds, taſtes, ſmells, cold, or heat. Some ingenious authors reckon more: theſe we may call the proper ideas of ſenſation. Syſtem of Moral Philoſophy, vol. i. p. 4.

Senses, *internal*, are powers or determinations of the mind to be pleaſed with certain forms and ideas, which occur to our obſervation, in objects perceived by the external *ſenſes*. Of theſe there are two different ſpecies, diſtinguiſhed by the different objects of pleaſure, viz. pleaſurable or beautiful forms of natural things, and pleaſurable or beautiful actions, or characters of rational agents: whence the internal *ſenſes* become diviſible into natural and moral; though what others call the *internal natural ſenſe*, our author calls ſimply, and by way of eminence, the *internal ſenſe*.

In reflecting on our external *ſenſes*, we plainly ſee, that our perceptions of pleaſure and pain do not depend directly on our will. Objects do not pleaſe us according as we incline they ſhould: the preſence of ſome objects neceſſarily pleaſes us, and the preſence of others as neceſſarily diſpleaſes us; nor can we, by our will, any otherwiſe procure pleaſure, or avoid pain, than by procuring the former kind of objects, and avoiding the latter. By the very frame of our nature, the one is made the occaſion of delight, and the other of diſſatisfaction. In effect, our ſenſitive perceptions are pleaſant, and painful, immediately, and without any knowledge of the cauſe of this pleaſure and pain, or of the manner how they excite it, or are occaſions of it, or without our ſeeing to what farther advantage, or detriment, the uſe of ſuch objects might tend. Nor would the moſt accurate knowledge of theſe things vary either the pleaſure, or the pain, of

of the perception; however it might give a rational pleasure, distinct from the sensible; or might raise a distinct joy, from prospect of farther advantage in the object, or another aversion, from apprehension of evil. There is scarce any object which our minds are employed about, but is constituted the necessary occasion of some pleasure or pain. Thus, we shall find ourselves pleased with a regular form, a piece of architecture, or painting, a composition of notes, a theorem, an action, an affection, a character; and we are conscious, that this pleasure naturally arises from the contemplation of the idea then present to the mind, with all its circumstances, though some of those ideas have nothing of what we call sensible perception in them; and in those which have, the pleasure arises from some uniformity, order, arrangement, and imitation; and not from the simple ideas of colour, or sound, or mode of extension, separately considered.

It seems hence to follow, that when instruction, education, or prejudice of any kind, raise any desire or aversion towards an object; this desire, or aversion, is founded on an opinion of some perfection, or deficiency, in those qualities, for perception whereof we have the proper *senses*. Thus, if beauty be desired by one who has not the *sense* of sight; the desire must be raised by some apprehended regularity of figure, sweetness of voice, smoothness, softness, or some other quality perceivable by the other *senses*, without relation to the ideas of colour.

The only pleasure of *sense*, which our philosophers seem to consider, is that which accompanies the simple ideas of sensation; but there are vastly greater pleasures in those complex ideas of objects, which obtain the names of beautiful and harmonious. The power, then, whereby we receive ideas of beauty and harmony, has all the characters of a *sense*. It is no matter, whether we call these ideas of beauty and harmony, perceptions of the external *senses* of seeing and hearing, or not: we should rather choose to call these ideas an *internal sense*, were it only for the convenience of distinguishing them from other sensations of seeing and hearing, which men may have without perception of beauty and harmony. Hutcheson's Inquiry, &c. Preface, and p. 3, &c.

For the general manner wherein our *senses* act, or more properly, the manner wherein we become *sensible*, that is, perceive external objects, see Sensation.

For the particular *senses*, or, more properly, the particular manners wherein we become sensible, by the particular organs of *sense*, see Hearing, Seeing, Smelling, &c.

For the several organs of *sense*, ministering to the several manners of sensation, see Eye, Ear, Nose, &c.

Pliny observes, that of all the *senses*, feeling and tasting are those which man enjoys in the greatest perfection. As to seeing, he says, he is excelled by the eagle, &c. as to smelling, by the vulture, &c. and as to hearing, by the mole, even when hid under-ground.

The *senses* have been sometimes found greatly sharpened and improved by diseases; Mr. Boyle mentions a gentleman, who, during a distemper he had in his eyes, had his organs of sight brought to be so sensible, that when he waked in the night, he could, for a while, plainly see and distinguish colours, and other objects; and the same author gives an instance of another person, who, after getting half-fuddled with claret, if he waked in the night, could see for some time to read a moderate print.

Grimaldi tells us, that some women of Megara were able by their eyes alone, to distinguish between eggs laid by black hens, and those by white ones. Grimald. de Lum. & Col.

In the Philosophical Transactions, N° 312, we have an account of Dan. Fraser, who continued deaf and dumb from his birth to the seventeenth year of his age; when, upon recovering from a fever, he perceived an uneasy motion in his brain, after which he began to hear, and by degrees to speak.

Sense, *moral*, is a determination of the mind to be pleased with the contemplation of those affections, actions, or characters, of rational agents, which we call *good* or *virtuous*.

This moral *sense* of beauty in actions and affections, may appear strange at first view: some of our moralists themselves are offended at it in lord Shaftesbury, as being accustomed to deduce every approbation, or aversion, from rational views of interest. Our gentlemen of good taste can tell us of a great many *senses*, tastes, and relishes, for beauty, harmony, imitation in painting and poetry; and may we not find, too, in mankind a relish for a beauty in characters, in manners? The truth is, human nature does not seem to have been left quite indifferent in the affair of virtue, to form to itself observations concerning the advantage or disadvantage of actions, and accordingly to regulate its conduct. The weakness of our reason, and the avocations arising from the infirmities and necessities of our nature, are so great, that very few of mankind could have framed those long deductions of reason, which may shew some actions to be, in the whole, advantageous, and their contraries pernicious. The author of nature has much better furnished us for a virtuous conduct, than our moralists seem to imagine; by almost as quick and powerful instructions, as we have for the preservation of our bodies: he has made virtue a lovely form, to excite our pursuit of it; and has given us strong affections, to be the springs of each virtuous action. Hutcheson's Inquiry, &c. ubi supra. Essay on the Nature and Conduct of the Passions, p. 5, &c. See Virtue.

Sense, *public*, is defined by the same author to be our determination to be pleased with the happiness of others, and to be uneasy at their misery. This, he says, is found in some degree in all men, and was sometimes called *κοινονοημοσυνη*, or *sensus communis*, by some of the ancients.

Sense, *common*, is a term that has been variously used both by ancient and modern writers. With some it has been synonymous with *public sense*; with others it has denoted prudence; in certain instances it has been confounded with some of the powers of taste; and, accordingly, those who commit egregious blunders with regard to decorum, saying and doing what is offensive to their company, and inconsistent with their own character, have been charged with a defect in *common sense*. Some men are distinguished by an uncommon acuteness in discovering the characters of others; and this talent has been sometimes called *common sense*: similar to which is that use of the term, which makes it to signify that experience and knowledge of life which is acquired by living in society. Hor. lib. i. sat. 3. lin. 66. To this meaning Quintilian refers, speaking of the advantages of a public education: *Sensum ipsum qui communis dicitur, ubi discet, cum se a congressu, qui non hominibus solum, sed mutis quoque animalibus naturalis est, segregarit?* Lib. i. cap. 2.

But the term *common sense* hath in modern times been used to signify that power of the mind which perceives truth, or commands belief, not by progressive argumentation, but by an instantaneous, instinctive, and irresistible impulse; derived neither from education nor from habit, but from nature; acting independently of our will, whenever its object is presented, according to an established law, and, therefore, called *sense*; and acting in a similar manner upon all, or at least upon a great majority of mankind, and, therefore, called *common sense*.

The first among the moderns, who took notice of this principle as one of the springs of our knowledge, was Buffier, a French philosopher of the present century, in a book entitled Traité des Premières Veritez; and this doctrine hath lately, in our own country, been illustrated and maintained by Dr. Reid, Beattie, Oswald, and Campbell.

In order to evince, that there is a real and essential difference between this faculty and that of reason, it is observed, that we are conscious, from internal feeling, that the energy of understanding, which perceives intuitive truth, is different from that other energy which unites a conclusion with a first principle, by a gradual chain of intermediate relations; that we cannot discern any necessary connection between reason and *common sense*; that the one is more in our power than the other; the faculty of reasoning being improveable by culture, whereas *common sense*, like other instincts, arrives at maturity with almost no care of ours, and it is impossible to teach *common sense* to one who wants it; though this, like other instincts, may languish for want of exercise; and that a distinction, similar to that which is here maintained, is acknowledged by the vulgar, who speak of mother-wit, as something different from the deductions of reason, and the refinements of science. All sound reasoning, it is said, must ultimately rest on the principles of *common sense*; that is, on principles intuitively certain, or intuitively probable; and, consequently, *common sense* is the ultimate judge of truth, to which reason must continually act in subordination. Thus the advocates for this faculty, as an original and distinct power of the human mind, assign to it a very extensive empire, and an authority that is supreme and absolute. And they have proceeded so far, as to substitute in the room of Mr. Locke's abstraction, this faculty, as the characteristic of rationality. To this they refer the evidence of mathematical truth, of external and internal *sense*, of memory, of reasoning from the effect to the cause, of probable or experimental reasoning, of analogical reasoning, of faith in testimony, and, indeed, of all primary truths. To *common sense*, therefore, all truth must be conformable: this, they say, is its fixed and invariable standard. And what-

whatever contradicts *common sense*, or is inconsistent with that standard, though supported by arguments that are deemed unanswerable, and by names that are celebrated by all the critics, academies, and potentates on earth, is not truth, but falshood. In a word, the dictates of *common sense* are, in respect to human knowledge, in general, what the axioms of geometry are in respect to mathematics: on the supposition that these axioms are false or dubious, all mathematical reasoning falls to the ground; and on the supposition that the dictates of *common sense* are erroneous or deceitful, all truth, virtue, and science, are vain. And hence it appears, that, according to this system, *common sense* is not only the test of truth, but the standard of moral obligation.

Dr. Priestley, in his attack upon this system, has charged the abettors of it with an unnecessary innovation in the received use of a term; as no person ever denied that there are self-evident truths, and that these must be assumed as the foundation of all reasoning. But they also recommend particular positions as axioms, not as being founded on the perception of the agreement or disagreement of any ideas, which is the great doctrine of Mr. Locke, and which makes truth to depend upon the necessary nature of things, to be absolute, unchangeable, and everlasting; but merely some unaccountable instinctive persuasions, depending upon the arbitrary constitution of our nature, which makes all truth to be a thing that is relative to ourselves only, and consequently to be infinitely vague and precarious. This system, he says, admits of no appeal to reason, properly considered, which any person might be at liberty to examine and discuss; but, on the contrary, every man is taught to think himself authorized to pronounce decisively upon every question, according to his present feeling and persuasion; under the notion of its being something original, instinctive, ultimate, and uncontrovertible; though, if strictly analysed, it might appear to be a mere prejudice, the offspring of mistake. Some of the maxims which they have adopted as self-evident truths, and which they have multiplied without necessity, are so far from being self-evident, that, in the judgment of many sober and candid enquirers after truth, they are not true, but capable of a satisfactory refutation.

At the same time, since no man can pretend to any natural right to fix the principles of faith for another, they teach unbelievers, and by their example authorize them, to reject the principles of religion by the same summary and superficial process, as what appear to them to be, at first sight, too absurd and ridiculous to be admitted as true and divine.

Dr. Priestley apprehends, that the inconveniences above mentioned, may attend even the calling of that faculty by which we discern truth by the name of *sense*. By this term, philosophers in general have denominated those faculties, in consequence of which we are liable to feelings relative to ourselves only, and from which they have not pretended to draw any conclusions concerning the nature of things; whereas truth is a thing not relative, but absolute and real, independent of any relation to this or that particular being, or this or that order of beings. Besides, if the determinations of this new principle of *common sense* be so instantaneous, irresistible, and infallible, as Dr. Reid, Dr. Beattie, and Dr. Oswald represent, how can we account for all the error there is in the world? Not to add, that this system, in its practical influence, tends to prevent the exercise of free and unrestricted enquiry, with regard either to truth or duty; and to promote, in many cases, the extravagancies of credulity, enthusiasm, and mysticism. Dr. Priestley also observes, that Dr. Price (in his Review of the Principal Questions and Difficulties in Morals. 8vo.) though unnoticed by the writers above cited, by maintaining that the understanding is the source of many of our most important simple ideas (see Idea), has secured all the flattering advantages of the new doctrine of *common sense*, without the capital inconveniences attending it. Like this system, his scheme cuts off, if it be admitted, all objections to primary moral truths, resting them on a simple appeal to the faculty of intuition; and refusing to reason upon a subject, which is maintained to be as evident as the truth of the geometrical axiom, that if equal things be taken from equal things, the remainders will be equal.

If the ideas of moral right and wrong, &c. be perceived by a *sense*, it depends upon our arbitrary constitution, that we conceive of them as we do, or whether we perceive them at all; and we have no method whatever of investigating, whether they have any foundation in the absolute nature of things: whereas by making moral ideas the object of the understanding as such, the principles of morality become part of the system of necessary, eternal, and unalterable truth, perceived by the divine Being, as by ourselves, but altogether independent of his will, as well as of all other beings and things whatsoever; as much so as the truth of the axiom above mentioned, or of the proposition, that two and two make four.

It is added, that these writers seem even to have borrowed their language, as well as their ideas from Dr. Price, who also uses the term *common sense*, though applied in a different manner. Reid's Enquiry into the Human Mind, on the Principles of *Common Sense*. 8vo. ed. 2. 1765. Beattie's Essay on the Nature and Immutability of Truth. 8vo. ed. 2. 1771. Oswald's Appeal to Common *Sense* in behalf of Religion. 8vo. ed. 2. 1768. Campbell's Philosophy of Rhetoric. 8vo. 1776, vol. i. p. 109, &c. Priestley's Examination of Reid, Beattie, and Oswald, &c. 8vo. 1774. For a farther account of this system, see Abstraction and Idea.

SENSIBILITY *of the animal fibres*. See Irritability.

SENSIBLE *horizon, point*, and *qualities*. See the Substantives.

Sensitive-*fluid*. Some have imagined a *sensitive-fluid* as the principle that preserves animals from corruption, and to which we owe our sensation and motion. This animal fluid passes in the proper nervous tubes to the organs of motion, but is contained in the fibrous coats of the nerves to become an organ of sensation. This *sensitive fluid* is, according to Mr. Le Cat, capable of thinking, and is so modified by the ganglions, that what is lodged in each part, is capable of being impressed by the object proper to each organ. And from the doctrine concerning this animal fluid, he endeavours to account for most operations, which are generally said to depend on the soul. Med. Ess. Edinb. Abrid. vol. ii. p. 481.

But all these attempts to account for sensation and thought, from the properties of matter, seem to be very desperate undertakings, not to say absurd.

Sensitive or *sensible soul*, the soul of brutes, or that which man is supposed to have in common with brutes. See Brute.

It is thus called, either as intimating its utmost faculty to be that of sensation; or, perhaps, because it is supposed to be material, and to come under our senses.

Lord Bacon asserts, that the *sensible* or brute *soul* is plainly no more than a corporeal substance, attenuated by heat, and thus rendered invisible; or a kind of aura or vapour, partly of an aereal, and partly of a fiery nature, endued with the softness of air, to be fit to receive impressions, and with the vigour of fire to communicate its action; fed partly with oily matters, and partly with aqueous ones, inclosed in the body, and, in the more perfect animals, principally in the head, moving along the nerves, and restored and repaired by the spirituous blood of the arteries. Bac. de Augment. Scient. lib. iv. See Life.

Sensitive *plant*, *mimosa*, in *Botany*, a genus of the *polygamia monoecia class*. Its characters are these: the empalement of the flower is small, indented in five parts at the top; the flowers are male and hermaphrodite, included in each head; the male flowers have ten, but the other have seldom more than five hairy stamina, a short slender style, crowned by a truncated stigma; the germen afterward turns to a jointed pod, with several transverse partitions, inclosing compressed roundish seeds. Miller enumerates ten, and Linnæus forty-six species.

The ten species enumerated by Miller are natives of America, and so were unknown to the other parts of the world till that was discovered; and a few years ago Mr. Miller sent some of the seeds of these plants to China, which succeeded, and occasioned great admiration in all who saw the plants.

There is no particular management which these plants require, different from others of the same warm countries; the great care must be to keep them in a proper temperature of heat, and not to give them too much water, especially in cool weather; nor should they be kept too dry, for many of the sorts require frequent waterings, as they naturally grow in moist places: there should also be care taken that they do not root into the tan-bed. Miller.

The *sensitive plant* is sufficiently known to the world for its remarkable property of receding from the touch, and giving signs, as it were, of animal life. Philosophers in general have, however, contented themselves with admiring the fact, without giving themselves any trouble about the cause.

Mr. Hook, indeed, has made some conjectures about it; but the greatest light that has been given into the thing, is from the inquiries which Messrs. du Fay and du Hamel, gentlemen of the Academy of Sciences at Paris, concerted together, and afterwards made separately on different shrubs, or at different times, that each might be able to correct the errors of the other.

Botanic writers mention many kinds of *sensitive plants*, some

ſome of which contract at a touch, others with heat, others with cold. The truth is, many, if not moſt, vegetables expand their flowers, down, &c. in warm ſunſhiny weather, and again cloſe them towards even, or in rain, &c. eſpecially at the beginning of flowering, or after the flowers are fallen, whilſt the ſeed is yet young and tender; as is very evident in the down of dandelion, &c. and in the flower of the pimpernel, the opening and ſhutting whereof are the countryman's weather-wiſer; whereby, Gerard ſays, he foretels what weather ſhall follow next day; for if the flowers be cloſe ſhut up, it betokens rain and foul weather; if they be ſpread abroad, fair weather.

The ſtructure of the *ſenſitive plant* is this: from the large ſtems, or main branches of the whole, there part off ſeveral other leſſer ones, and from theſe there go off others ſtill leſs, which by way of diſtinction may be called the ribs of the leaves, as they ſerve to ſupport a number of leaves arranged on each ſide, and ſtanding on ſhort pedicles in pairs, over againſt one another. Several other plants have this ſort of compound leaves, as the caſſia, colutea, and the like; and all theſe ſhut their leaves together at night, and open them again in the morning, in the ſame manner as the *ſenſitive plant* does. This periodical opening and ſhutting of the leaves is therefore common to many plants, not peculiar to the *ſenſitive plant*; but the marvel in this is, that beſide having this motion periodical and regular, it is to be brought on at other times, and by accidents, there requiring no more than the touching the *plant* to make it cloſe its leaves at any time of the day, which it ſoon afterwards naturally opens again. This is peculiar to this *plant*, and reſembles the action of an animal which had been injured or frighted. A cloſe obſervation alſo of the manner in which this is performed, will give many hints toward the finding its cauſe.

It is a very difficult thing to touch the leaf of a vigorous *ſenſitive plant* ſo lightly, as not to make it cloſe: its ſenſation is extremely delicate, and its large rib or nerve, which runs along its middle, is as it were a hinge, on which the two halves of the leaf move when they turn up on being touched, till they ſtand erect, and by that means meet one another.

The ſlighteſt touch imaginable gives this motion to the ſide of the leaf which is touched, which is communicated immediately to the other ſide, or half, and they move together; and if the touch have been a very little rougher, the oppoſite leaf on the ſame rib receives the impreſſion, and cloſes up in the ſame manner with that which was actually touched.

Nor is this all, for when the two ſides of each of theſe leaves move upwards, the pedicle of each half moves upwards at the ſame time, and by this means they in ſome meaſure approach toward each other, and make the angles of their pedicles with the main rib, or ſtalk of the compoſite leaf, leſs than before; and the total motion of each leaf is compoſed of theſe two motions.

If the touch be ſtill rougher, the whole arrangement of leaves on the ſame rib feels its influence on each ſide, and all cloſe in the ſame manner with the ſingle pair in the precedent inſtance; and if the touch be yet ſtronger than this, the rib itſelf feels it, and attempts to cloſe in its way; moving itſelf upwards toward the branch from which it is produced, juſt as the ſingle pedicles of the leaves did toward it: and if the touch be yet more hard and rough, the very branches have the ſenſation propagated to them, and apply themſelves to the main ſtem, or trunk of the ſhrub, as the ſimple leaves did before to their rib, and that rib to the branch; ſo that the whole *plant* in this ſtate forms itſelf from a very complexly branched figure, into a ſort of ſtraight cylindric one. That motion which has, of all others, the greateſt effect upon this *plant*, is a ſhaking one.

Theſe three motions of the *plant* are performed by means of three diſtinct and ſenſible articulations; the firſt that of the ſingle leaf to its pedicle, the ſecond that of the pedicle to its branch, the third that of the branch to the trunk. The primary motion of all which, is the cloſing of the two halves of the leaf upon their rib, which ought alſo to be performed in a ſimilar manner, and by a ſimilar articulation; this, however, is much leſs viſible than the others.

Theſe motions are wholly independent on one another, as may be proved by experiment. It ſhould appear, that if the ſtalks are moved, and collapſe toward the branches, or theſe toward the trunk, that the leaves, whoſe motion is uſually primary to theſe, ſhould be affected alſo; yet experiment proves, that it is poſſible to touch the branches in ſuch a manner, as to affect them only, and make them apply themſelves to the trunk, while the leaves feel nothing of the touch; but this cannot be, unleſs the branches are ſo diſpoſed, as that they can fall to the trunk without ſuffering their leaves to touch any other part of the *plant* in their paſſage, becauſe, if they do, they immediately become affected.

Winds and heavy rains cauſe the *ſenſitive plants* to ſhut up their leaves, while eaſy ſhowers do not at all affect them: it is plain hence, that the agitation of the *plant* by the wind, and the ſtrokes given by the large and haſty drops of rain, are what cauſe the contraction.

By whatever accident the *plant* has been made to cloſe its leaves, it always regularly opens them again afterwards. This, however, requires different times, according to ſeveral circumſtances, as the time of the day, the ſeaſon of the year, and the more leſs and vigorous and healthy ſtate of the *plant*; ſometimes this is done in ten minutes, ſometimes it requires half an hour: and the manner is not leſs different than the time, for ſometimes the leaves unfold themſelves firſt, and ſometimes the branches, whereas ſometimes all is done at once, and the whole *plant* ſeems in motion at a time.

In endeavouring to account for the motions of this *plant*, the gentlemen above-named have conjectured that they are performed by means of a ſort of very nice and fine hinges, which communicate one with another by means of very minute and ſlender cords, which occaſion them to act as we ſee when the *plant* is ſufficiently diſturbed, and theſe cords ſhaken; and what gives a ſtrong probability to this conjecture is, that the decayed and dying leaves of the *plant* perform this motion as regularly and vigorouſly, as thoſe which are freſh and full of juice.

It ſeems plain, that while the juices are evaporating, and the parenchymatous ſubſtance of the leaves drying up, theſe more ſolid parts, the lines and cordages, retain their figure; and, conſequently, if it is by means of theſe that the motion is always performed, it will be as well performed in theſe as in the freſher leaves, which could not be the caſe were it owing to the juices.

The natural opening and ſhutting of the leaves of this *plant* at night and morning, are not ſo fixed but that they are variable alſo, according to circumſtances of place, temperature, &c.

In the month of Auguſt, a *ſenſitive plant* was carried in a pot out of its uſual place into a dark cave, the motion that it received in the carriage ſhut up its leaves, and they did not open till twenty-four hours afterwards; at this time they became moderately open, but were afterwards ſubject to no changes at night or morning, but remained three days and nights with their leaves in the ſame moderately open ſtate. At the end of this time they were brought out again into the air, and there recovered their natural periodical motions, ſhutting every night and opening every morning, as naturally and as ſtrongly, as if it had not been in this forced ſtate; and while in the cave, it was obſerved to be very little leſs affected with the touch than when abroad in the open air.

Repeated experiments have proved, that it is not the light of the day that opens the leaves of this *plant*, nor the darkneſs of the night that cloſes them; neither is it the alternate warmth of the day, and cold of the night, that have this effect, ſince it ſhuts in nights which are much warmer than the days often are in which it opens; and the increaſing the heat of the place in which it is kept, and marking the increaſe or decreaſe on the thermometer, have been found to have not the leaſt effect, as to its ſooner or later opening or ſhutting its leaves.

The moſt probable conjecture ſeems, that it is not great heat, or great cold, ſuch as it can bear, that bring on this effect, but the ſudden change from one to the other, and this is confirmed by this experiment, that if one of theſe *plants* be raiſed under a glaſs bell, or caſe, and the bell or covering be taken off, it immediately cloſes, even though it be in the middle of the day; and this is alſo obſerved, that the more open or expoſed the *plant* ſtands, the more ſtrong and lively are its ſhutting and opening; and that they are moſt obſervable in ſummer, and much leſs ſo when it is kept in a cloſe ſtove in winter.

The great heats of ſummer, when there is open ſunſhine at noon, affect the *plant* in ſome degree like cold, cauſing it to ſhut up its leaves a little, but never in any very great degree. The *plant*, however, is leaſt of all affected about nine o'clock in the morning, and that is conſequently the propereſt time to make experiments on it.

A branch of the *ſenſitive plant* cut off, and laid by, retains yet its property of ſhutting up and opening in the morning for ſome days; and it holds it longer if kept with one end in water, than if left to dry more ſuddenly.

The leaves only of the *ſenſitive plant* ſhut up in the night, not the branches, and if it be touched at this time, the branches are affected in the ſame manner as in the day, ſhutting up, or approaching to the ſtalk or trunk, in the ſame manner, and often with more force. It is of no conſequence what the ſubſtance is with which the *plant* is

is touched, it anſwers alike to all; but there may be obſerved a little ſpot, diſtinguiſhable by its paler colour in the articulations of its leaves, where the greateſt and niceſt ſenſibility is evidently placed.

The *ſenſitive plant* plunged into water immediately cloſes its leaves, which is partly owing to the touch, partly to the coldneſs of the water; afterwards the leaves expand again, and if they are then touched, cloſe again as before, as if in the open air, only that they do it with leſs force.

If the end of one of the leaves be burned with the flame of a candle, or by a burning glaſs, or by touching it with hot iron, it cloſes up in a moment, and the oppoſite leaf does the ſame, and after that the whole ſeries of leaves on each ſide the rib, then the rib itſelf, then the branch, all do the ſame, if the burning has been in a ſufficient degree. This proves that there is a very nice communication between all the parts of the *plant*, by means of which the burning, which only is applied to the extremity of one leaf, diffuſes its influence through every part of the ſhrub.

If a drop of aqua fortis be carefully laid upon a leaf of the *ſenſitive plant*, ſo as not to ſhake it in the leaſt, the leaf does not begin to move till the acrid liquor corrodes the ſubſtance of it; but at that time, not only that particular leaf, but all the leaves placed on the ſame rib, cloſe themſelves up. The vapour of burning ſulphur has alſo this effect on many leaves at once, according as they are more or leſs expoſed to it; but a bottle of very acrid and ſulphureous ſpirit of vitriol, placed under the branches unſtopped, produces no ſuch effect.

The wetting the leaves with ſpirit of wine, has been obſerved alſo to have no effect, nor the rubbing oil of almonds over them; though this laſt application deſtroys many *plants*.

A branch of the *plant* was cut away longitudinally, till only a third part of the ſubſtance remained, yet it communicated the effects of the touch, in the ſame manner as before, to thoſe branches which aroſe lower on the ſhrub. The tranſpiration of the *plant* being retarded, is of no effect as to its periodical opening and cloſing; for one kept under a cloſe glaſs bell ſhuts and opens as regularly night and morning, as when it ſtands in an open green-houſe. A branch of it put into the exhauſted receiver of an air-pump, is found to have its force of opening and cloſing up much impaired, but not wholly taken off. Mem. de l'Acad. des Scienc. Par. 1736.

Dr. Hill, notwithſtanding the experiments and obſervations above recited, conſiders the phenomenon of the *ſenſitive plant* as the effect of light, and in an expreſs diſſertation on this ſubject, endeavours to account for it from this principle; aſcribing that other phenomenon, which is called the *ſleep of* PLANTS, to the abſence of light. Hill's Sleep of Plants, and the Cauſe of Motion in the *Senſitive Plant* explained, 12mo.

A ſatisfactory explication of this phenomenon ſeems to be ſtill among the deſiderata of ſcience.

Mr. Ellis has lately deſcribed a *ſenſitive plant*, which is a native of the ſwamps in North Carolina, called *dionæa muſcipula*, or *Venus's fly trap*, and which, from his account of it, appears to be the moſt animated of the whole *ſenſitive* tribe of vegetables. Its ſenſibility exiſts in its leaves, each of which exhibits, in miniature, the figure of a rat-trap with teeth, cloſing on every fly or other inſect that is tempted to taſte the ſweet liquor, which is ſuppoſed to be ſecreted in certain minute red glands that cover its inner ſurface; but before it has had time to taſte it, the lobes of the leaves riſe up, and incloſe and graſp the invader, and he is ſoon deprived of his life by the action of three ſmall erect ſpines, fixed near the middle of each lobe; nor do the leaves open again while the dead animal continues there. The ſame effect is produced by a ſtraw or pin.

Mr. Ellis conjectures, that in the conſtruction and motive powers of this plant, nature may have had ſome view to its nouriſhment, by forming the upper joint of each leaf like a machine to catch food, and by having laid a bait upon the middle of it, to entice the unhappy inſect that becomes its prey. But, perhaps, it may be equally probable, that nature has armed and animated this plant for the preſervation of its juices againſt the depredation of inſects. Ellis's Directions for bringing over Seeds and Plants, &c. 1770.

SENSITIVE *plant, baſtard*. See ÆSCHYNOMENE.

SENSORY, SENSORIUM *commune*, the ſeat of the common ſenſe, or that part or place where the ſenſible ſoul is ſuppoſed more immediately to reſide.

The *ſenſory* is ſuppoſed to be that part of the brain wherein the nerves, from all the organs of ſenſe, terminate; which is generally allowed to be about the beginning of the medulla oblongata: Deſcartes will have it in the conarion or pineal gland.

Sir Iſaac Newton deſcribes the *ſenſory* of animals as the place to which the ſenſible ſpecies of things are carried through the nerves and brain, that they may be there perceived by their immediate preſence to the ſoul. The organs of ſenſe are not intended for enabling the ſoul to perceive the ſpecies of things in its *ſenſory*; but only for conveying them thither.

The ſame great author conſiders the univerſe as the *ſenſory* of the godhead.

SENTENCE, in *Law*, *doom*; a judgment paſſed in court by the judge, upon ſome proceſs either civil or criminal.

Sentences are either *definitive*, which put an end to the ſuit in controverſy, and regard the principal matter in queſtion; or *interlocutory*, which determine only ſome incidental matter; *contradictory*, &c.

There are *ſentences* of abſolution, excommunication, &c. Superior judges may either confirm or annul the *ſentences* of inferior ones.

Every *ſentence* muſt be in writing, on a double ſixpenny ſtamp, and it muſt be pronounced in the preſence of both parties; otherwiſe *ſentence* given in abſence of one of the parties is void.

SENTENCES, *three conformable, tres ſententiæ conformes*: in the Romiſh *Eccleſiaſtical Law*, it is allowed to appeal three times; ſo that there muſt be *three conformable ſentences* before the deciſions of the judges can take effect. The firſt degree of juriſdiction is in the biſhop's official; from him an appeal lies to the metropolitan, and from the metropolitan to the primate, or immediately to the pope. If the appeal come from the metropolitan to the pope, the pope is obliged to delegate judges *in partibus*; and then if the three *ſentences* paſſed in theſe three ſtages be *conformable*, there is no farther appeal; but if one of them annul another, new judges are to be required of the pope for a fourth *ſentence*; and thus they ſometimes proceed to a ſixth or ſeventh *ſentence*.

This number of juriſdictions is found infinitely prejudicial to the public, and vexatious to private perſons.

SENTENCE, in *Grammar*, denotes a period, or a ſet of words comprehending ſome perfect ſenſe or ſentiment of the mind.

Every *ſentence* comprehends at leaſt two words.

Mr. Harris, in his Hermes, p. 17, &c. conſidering that the leading powers of the ſoul are thoſe of perception and volition, obſerves, that every *ſentence*, in its reference to theſe powers, will be either a *ſentence* of aſſertion, or a *ſentence* of volition: and he deſcribes it as a compound quantity of ſound ſignificant, of which certain parts are themſelves alſo ſignificant. Thus he diſtinguiſhes a *ſentence* from a WORD, which is a ſound ſignificant of which no part is of itſelf ſignificant.

The buſineſs of pointing is, to diſtinguiſh the ſeveral parts and members of *ſentences*, ſo as to render the ſenſe thereof the cleareſt, apteſt, and fulleſt poſſible. See PUNCTUATION.

In every *ſentence* there are two parts neceſſarily required; a noun for the ſubject, and a definite verb; whatever is found more than theſe two, affects one of them, either immediately, or by the intervention of ſome other, whereby the firſt is affected.

Again, every *ſentence* is either ſimple or conjunct: a *ſimple ſentence* is that conſiſting of one ſingle ſubject, and one finite verb. A *conjunct* or compounded *ſentence* contains ſeveral ſubjects, and finite verbs, either expreſly or implicitly; or it conſiſts of two or more ſimple *ſentences* connected together.

A ſimple *ſentence* needs no point or diſtinction, only a period to cloſe it; as, *A good man loves virtue for itſelf*. In ſuch a *ſentence*, the ſeveral adjuncts affect either the ſubject, or the verb, in a different manner. Thus the word *good* expreſſes the quality of the ſubject, *virtue* the object of the action, and, *for itſelf*, the end thereof. Now none of theſe adjuncts can be ſeparated from the reſt of the *ſentence*; for if one be, why ſhould not all the reſt? And if all be, the *ſentence* will be minced into almoſt as many parts as there are words.

But if ſeveral adjuncts be attributed in the ſame manner either to the ſubject, or the verb; the *ſentence* becomes conjunct, and is to be divided into parts.

In every conjunct *ſentence*, as many ſubjects, or as many finite verbs, as there are, either expreſſed or implied, ſo many diſtinctions may there be. Thus, *My hopes, fears, joys, pains, all centre in you*; and thus Cicero, *Catilina abiit, exceſſit, evaſit, erupit*. The reaſon of which pointing is obvious; for as many ſubjects or finite verbs as there are in a *ſentence*, ſo many members does it really contain; whenever, therefore, there occur more nouns than verbs, or contrariwiſe, they are to be conceived as equal; ſince, as every ſubject requires its verb, ſo every verb requires its ſubject, wherewith it may agree, excepting, perhaps, in ſome figurative expreſſions.

Indeed,

Indeed, there are some other kinds of *sentences* which may be ranked amongst the conjunct kind, particularly the absolute *ablative*, as it is called. Thus, *Physicians, the disease once discovered, think the cure half wrought*; where the words, *disease once discovered*, are equivalent to, *when the cause of the disease is discovered*.—So also in nouns added by apposition, as, *The Scots, an hardy people, endured it all*; so also in vocative cases and interjections, as, *This, my friend, you must allow me*: and, *What, for heaven's sake! would he be at?*

The case is much the same, when several adjuncts affect either the subject of the *sentence* or the verb in the same manner, or at least something whereby one of them is affected, as, *A good, wise, learned man, is an ornament to the commonwealth*: where the several adjectives, denoting so many qualities of the subject, are to be separated from one another. Again, when I say, *Your voice, countenance, gesture, terrified him*, the several nominative cases denote so many modes of the verb, which are likewise to be distinguished from each other. The case is the same in adverbs, as, *He behaved himself modestly, prudently, virtuously*. In the first example, the adjuncts immediately affect the subject; in the third, the verb; in the following one, another adjunct, as, *I saw a man loaden with age, sickness, wounds*.

Now, as many such adjuncts as there are, so many several members does the *sentence* contain; which are to be distinguished from each other, as much as several subjects, or finite verbs; and that this is the case in all conjunct *sentences*, appears hence, that all these adjuncts, whether they be verbs or nouns, &c. will admit of a conjunction copulative, whereby they may be joined together. And, wherever there is a copulative, or room for it, there a new member of a *sentence* begins. For the other partitions, &c. of *sentences*, see Colon, Semicolon, and Period.

Sentence is also used, in *Rhetoric and Poetry*, for a short, pithy remark, or reflection, containing some sentiment of use in the conduct of life.

Such are, *Discite justitiam moniti, & non temnere divos*; or, *A teneris assuescere multum est, &c.*

Sentences, father Bossu observes, render poems useful; and besides, add I know not what lustre and spirit, which pleases. But there is no virtue which is not accompanied with some dangerous vice. Too many *sentences* give a poem too philosophical an air, and sink it into a kind of gravity; this is less fit for the majesty of a poem, than the study of a learned man, and the quaintness of a dogmatist. Such thoughts not only contain, but inspire a certain calm wisdom, which is directly opposite to the passions, and cools them both in the hearers and in the speaker. Lastly, the affectation of speaking *sentences* leads a person to trifling and impertinent ones, instances whereof we have in abundance in Seneca's tragedies. Petronius recommends it to authors to disguise their *sentences*, that they may not stand glaring above the thread or ground of the discourse.

SENTIMENTS, in *Poetry*, and particularly dramatic, are the thoughts which the several persons express, whether they relate to matters of opinion, passion, business, or the like.

The manners form the tragic action, and the *sentiments* explain it, discovering its causes, motives, &c. The *sentiments* are to the manners, what those are to the fable. In the *sentiments*, regard is to be had to nature and probability; a madman, for instance, must speak as a madman; a lover as a lover; a hero as a hero. The *sentiments*, in great measure, are to sustain the character.

The word *sentiment*, in its true and old English sense signifies, *a formed opinion, notion, or principle*; but of late years, it has been much used by some writers to denote an internal impulse of passion, affection, fancy, or intellect, which is to be considered rather as the cause or occasion of our forming an opinion, than as the real opinion itself.

SENTINEL, Centry, or *sentry*, in *War*, a private soldier placed in some post to watch any approach of the enemy, to prevent surprizes, and to stop such as would pass without orders, or without discovering who they are. They are placed before the arms of all guards, at the tents and doors of general officers, colonels of regiments, &c.

The word is modern; it is not long since they said, *To be on the scout*, in the same sense as we now say, *To stand sentry, &c.* Menage derives the word *a sentiendo*, from *perceiving*.

Sentinel perdu, is a *sentinel* placed at some very advanced and dangerous post, whence it is odds that he never returns. See Perdue.

The *sentinel's* word, when he challenges is, *Who is there? Qui vive*, or *Qui va la! Stand! Demure la!*

SEPARABLE *modes*. See Mode.

SEPARATE *affection*. See Affection.

Separate, *penultimate of the*. See Penultimate.

SEPARATION, in *Navigation*, the same with what we more usually call departure.

Separation *of man and wife*. See Divorce.

Separation, *waters of*. See Water.

SEPARATISTS, a religious sect in England, so denominated from their setting up a *separate* church, in opposition to that established by law. See Dissenters, &c.

At present, *separatists* is rather the name of a collection of sects, than of any particular one; but nearer their original, there was that agreement among them, that one name served them all.

Their division into presbyterians, anabaptists, independents, &c. is a more modern thing.

The *separatists*, Hornius tells us, Hist. Eccl. are such as under Edward VI. Elizabeth, and James I. refused to conform to the church of England, and who were first called puritans, then *separatists*, and lastly nonconformists.

The first leader of the *separatists* was Bolton, who, upon quitting the party he had formed, was succeeded by Robert Brown, from whom the *separatists* were called Brownists.

SEPARATRIX, in *Arithmetic*, denotes the point, or comma, which separates and distinguishes decimals from integers; thus, 465,32 or 465.32.

SEPHALITES. See Moatazalites.

SEPHIROS, a word used by Paracelsus and his followers, to express a sort of dry and hard imposthume, or kind of spurious scirrhus.

SEPHIROTH, a Hebrew word signifying *brightnesses*; and the cabalists give the name of *sephiroth* to the most secret parts of their science.

SE PIACE, in the *Italian Music*, signifies that the part it is joined to, may be repeated or not, at pleasure.

SEPIA, in the *Linnæan System*, a genus of the mollusca *worms*, comprehending five species. The characters of this genus are, that it has eight arms placed round the mouth, with small concave discs on their insides, and often two long tentacula; the mouth is formed like a horny beak; the eyes are placed beneath the tentacula; the body is fleshy, with a sheath for the breast, and a tube at the base of the breast. See Cuttle-*fish* and Cuttle-*bone*.

SEPS, in *Zoology*, the name of a very peculiar animal of the lizard or lacerta kind, but seeming as if of a middle nature between that genus and the snakes, and appearing rather a serpent with feet than a lizard. See *Tab. of Serpents*, N° 31.

It is a small species; its body is rounded, and its back variegated with longitudinal lines of black; its eyes are black; it has ears, and a small and very slender tail. What appears most singular in it is, that it has four legs, with feet divided into toes; the first pair are placed very near the head, the other by the anus; the scales are laid in a reticulated manner, they are of an oblong figure, approaching to a rhomboides, and laid longitudinally; its belly is white, with a slight cast of blue, and it has nostrils near the end of the snout. Columna took five living young ones out of the body of one of this species, some of which were included in membranes, and others loose, as is the case in the fœtus found in the viper.

The bite of the *seps* is said to occasion an instant putrefaction of the flesh of the whole body.

SEPTA, in *Antiquity*, were inclosures, or rails made of boards, through which persons went in to give their votes in the assemblies of the Romans.

The word also signifies divisions, and, in that sense, is used to express the plates of spar, which separate or divide the tali of the ludus *Helmontii*, thence called by Dr. Hill, septariæ.

SEPTANA, a word used by the ancient physicians for a septenary fever, or one that performs its regular period in seven days.

SEPTARIÆ, in *Natural History*, the name of a large class of fossils, called by some ludus *Helmontii*, and by others the *waxen veins*. They are defined to be fossile bodies not inflammable, nor soluble in water, naturally found in loose detached masses of a moderately firm texture and dusky hue, divided by several *septa*, or thin partitions, and composed of a sparry matter greatly debased by earth, not giving fire with steel, fermenting with acids, and in great part dissolved by them, and calcining in a moderate fire.

Of this class there are two distinct orders of bodies, and under those six genera. The *septariæ* of the first order are those which are usually found in large masses of a simple uniform construction, but divided by large *septa* either into larger and more irregular portions, or into smaller and more equal ones, called *tali*.

Those of the second order are such as are usually found in smaller masses of a crustated structure, formed by various incrustations round a central nucleus, and divided by very thin *septa*.

SEPTAS, in *Botany*, a genus of the *heptandria heptagynia* class. Its characters are; that the empalement is divided into seven segments; that the flower has seven petals; that it has seven germina, which become so many polyspermous capsules. There is only one species.

SEPTEMBER, the ninth month of the year, reckoned from January, and the seventh from March, whence its name, viz. from *septimus*, *seventh*.

The Roman senate would have given this month the name of *Tiberius*, but that emperor opposed it; the emperor Domitian gave it his own name *Germanicus*; the senate under Antoninus Pius gave it that of *Antoninus*; Commodus gave it his surname *Herculeus*, and the emperor Tacitus his own name *Tacitus*. But these appellations are all gone into disuse.

SEPTEMVIR, *in Antiquity*. See QUINQUEVIR.

The Germans sometimes use the word *septemvirate* for the seven electors of the empire. See ELECTOR.

SEPTENTRIO, or SEPTENTRIONES, in *Astronomy*, a northern constellation of stars, more usually called URSA *Minor*, or the *Little Bear*; and by the people *Charles's Wain*: though the seven stars in the *Great Bear* have been of late so denominated.

The word is formed from the Latin *septem*, *seven*; and *triones*, *bullocks*, which, in the ancient constellation, were yoked to the plough.

SEPTENTRIO, in *Cosmography*, the same with *north*; thus called from the ancient constellation *Septentrio*, one of whose stars is the pole-star. Hence also

SEPTENTRIONAL, SEPTENTRIONALIS, something belonging to the *north*; as *septentrional signs*, *septentrional parallels*, &c. are those on the northern side of the equator.

SEPTERION, Σεπτήριον, in *Antiquity*, a Delphic festival, celebrated every ninth year, in memory of Apollo's victory over Python. The chief part of the solemnity was a representation of Python pursued by Apollo.

SEPTFOIL, in *Botany*. See TORMENTIL.

SEPTICS, among *Physicians*, an appellation given to all such substances as promote PUTREFACTION.

From the many curious experiments made by Dr. Pringle to ascertain the *septic* and *antiseptic* virtues of natural bodies, it appears that there are very few substances of a truly *septic* nature. Those commonly reputed such by authors, as the alcaline and volatile salts, he found to be no wise *septic*. However, he discovered some, where it seemed least likely to find any such quality; these were chalk, common salt, and testaceous powders. He mixed twenty grains of crabs eyes, prepared with six drams of ox's gall, and an equal quantity of water. Into another phial he put an equal quantity of gall and water but no crabs-eyes. Both these mixtures being placed in the furnace, the putrefaction began much sooner, where the powder was, than in the other phial. On making a like experiment with chalk, its *septic* virtue was found to be much greater than that of the crabs-eyes: nay, what the doctor had never met with before, in a mixture of two drams of flesh, with two ounces of water and thirty grains of prepared chalk, the flesh was resolved into a perfect mucus in a few days.

To try whether the testaceous powders would also dissolve vegetable substances, the doctor mixed them with barley and water, and compared this mixture with another of barley and water alone. After a long maceration by a fire, the plain water was found to swell the barley, and turn mucilaginous and sour; but that with the powder kept the grain to its natural size, and though it softened it, yet made no mucilage, and remained sweet.

Nothing could be more unexpected, than to find sea-salt a hastener of putrefaction; but the fact is thus: one dram of salt preserves two drams of fresh beef in two ounces of water, above thirty hours uncorrupted, in a heat equal to that of the human body; or, which is the same thing, this quantity of salt keeps flesh sweet twenty hours longer than pure water; but then half a dram of salt does not preserve it above two hours longer. Twenty-five grains have little or no antiseptic virtue, and ten, fifteen, or even twenty grains, manifestly both hasten and heighten the corruption. The quantity which had the most putrefying quality, was found to be about ten grains to the above proportion of flesh and water.

Many inferences might be drawn from this experiment: one is, that since salt is never taken in aliment beyond the proportion of the corrupting quantities, it would appear that it is subservient to digestion, chiefly by it's *septic* virtue, that is, by softening and resolving meats; an action very different from what is commonly believed.

It is to be observed, that the above experiments were made with the salt kept for domestic uses. See Pringle's Observ. on the Diseases of the Army, p. 348, seq. See SALT and SCURVY.

From some experiments of Mr. Canton, it appears likewise, that the quantity of salt contained in sea-water hastens putrefaction; but since that precise quantity of salt, which promotes putrefaction the most, is less than that which is found in sea water, he concludes it probable, that if the sea were less salt, it would be more luminous. See *Luminousness of the* SEA.

SEPTIER, or SETIER, a French measure, differing according to the species of the things measured. For liquors, the *septier* is the same thing with the chopine or half pint.

For dry measure, the *septier* is very different in different places, and different commodities; as not being any vessel of measure, but only an estimation of several other measures.

At Paris, the *septier* of wheat consists of two mines, the mine of two minots, and the minot of three bushels.

The *septier* of oats is double that of wheat. See MEASURE.

SEPTIMONTIUM, among the Romans, a festival celebrated in December on all the seven hills of Rome; whence also it had this name, being otherwise called AGONALIA.

SEPTIZON, SEPTIZONIUM, in the *ancient Architecture*, a term almost appropriated to a famous mausoleum of the family of the Antonines, which, Aur. Victor tells us, was built in the tenth region of the city of Rome, being a large insulated building, with seven stages or stories of columns.

The plan was square, and the upper stories of columns, falling back much, rendered the pile of a pyramidal form, terminated atop with the statue of the emperor Septimius Severus, who built it.

It had its name *septizon*, *septizonium*, from *septem and zona*, *q. d.* seven zones or girdles, by reason of its being girt with seven rows of columns.

Historians make mention of another *septizon*, more ancient than that of Severus, built near the Thermæ of Antoninus.

SEPTUAGESIMA, in the *Calendar*, denotes the third Sunday before Lent, or before quadragesima; as quinquagesima is the next before quadragesima, then sexagesima, and *septuagesima*: these were all days appropriated by the church to acts of penance and mortification, by way of preparation for the devotion of the lent ensuing.

It is supposed by some to take its name from its being about seventy days before Easter: pope Telesphorus first made it a feast-day, and appointed Lent to commence from it.

The laws of king Canutus ordained a vacation from judicature, from *septuagesima* to *quindena paschæ*. See QUINQUAGESIMA. From *septuagesima* to the octaves after Easter, marriage is forbidden by the canon law.

SEPTUAGINT, LXX, or the SEVENTY, a term famous among divines and critics, for a version of the Old Testament out of Hebrew into Greek, said to have been performed by seventy-two Jewish interpreters, in obedience to an order of Ptolemy Philadelphus.

The ancients, till Jerom's time, universally believed, that the *Seventy* were inspired persons, not mere translators, grounding their belief on a fabulous history of this version given by Aristeas; who tells us, that the high-priest Eleazar chose six doctors out of each tribe for this office, which made the number of seventy-two; and that these being shut up each in his several cell, each translated the whole; and without seeing what any of the rest had done, they were all found to agree to a letter.

The learned Dr. Hody, De Bibliorum Textibus Originalibus, &c. who seems to have studied the origin of the Greek version more accurately than any critic before him, has laboured very successfully in detecting the false story of Aristeas; and he has likewise proved, that this version was made by the Jews living at Alexandria, for the use of themselves and many thousands of their brethren, who were then settled in Egypt, and who, living among the Greeks, generally used the Greek language. And he has also proved, that the whole Hebrew Bible was not translated into Greek at once, but that different parts were translated at different times: that the Pentateuch was translated first, about 285 years before Christ; that only the Pentateuch was read in the synagogues till about 170 years before Christ, when Antiochus Epiphanes, their cruel persecutor, forbad them to recite any part of the law; that soon after this prohibition, the Jews translated into Greek Isaiah, and the following prophets, for the use of the temple at Heliopolis, and

and the Alexandrian synagogues; and that the other books were translated afterwards, with different degrees of skill and care, at various times, and by various persons. See also on this subject Prideaux's Connect. vol. iii p. 38. &c. See ALEXANDRIAN *Copy* and *Greek* BIBLE.

SEPTUAGINT, *chronology of the*, or SEVENTY, is an account of the years of the world, very different from what is found in the Hebrew text, and the Vulgate; making the world 1466 years older than it is found in these latter.

The critics are much divided as to the point of preference. Baronius prefers the account of the *Seventy*; and If. Vossius makes an apology for it. The two latest and most strenuous advocates in this dispute, are father Pezron, a Bernardine, and father le Quien, a Dominican; the first of whom defends the chronology of the *Septuagint*, and the latter that of the Hebrew text. See *Sacred* CHRONOLOGY.

SEPTUM, in *Anatomy*, a term literally signifying an inclosure or partition, applied to several parts of the body, which serve to separate one part from another.

SEPTUM *lucidum*, or *pellucidum*, is a partition separating the two upper ventricles of the BRAIN, thus called as being transparent.

SEPTUM *medium*, or *cordis*, is a separation between the two ventricles of the HEART. It is about a finger thick, fleshy, and of the same substance with the heart itself; consisting of muscular fibres, which assist it in its motions. Some have imagined it to be perforated with a great number of holes, but mistakenly.

SEPTUM *transversum* is the separation of the two bellies or venters, called also DIAPHRAGM.

SEPTUM *narium*, the partition of the NOSTRILS. See NOSE.

SEPTUM *bulbi* divides the bulb of the URETHRA lengthwise.

SEPTUM *gallinaginis*. See CAPUT *Gallinaginis*.

SEPTUM *clitoridis*, a membranous partition running all along between the two corpora cavernosa of the CLITORIS, from the glans to its divarication at the os pubis.

SEPTUM *scroti*. See SCROTUM.

SEPULCHRAL, SEPULCHRALIS, something belonging to sepulchres or tombs.

SEPULCHRAL *column*. See COLUMN.

SEPULCHRAL *inscriptions*, are the surest monuments we have of antiquity.

SEPULCHRAL *lamps*. See LAMP.

SEPULCHRAL, or SEPULCHRALIS, is also the appellation of a sect; thus called from their supposed principal error, which was that by the word *hell*, whither the Scripture tells us Jesus Christ descended after his death, they understood no more than his grave or sepulchre. See HELL.

SEPULCHRALIS *pecunia*. See PECUNIA.

SEPULCHRE, SEPULCHRUM, a tomb, or place destined for the interment of the dead.

The term is chiefly used in speaking of the burying-places of the ancients; those of the moderns we usually call TOMBS.

Besides the usual *sepulchres* for the interment, either of the whole body, or of the ashes of the body burnt, the ancients had a peculiar kind, called *cenotaphia*, being empty *sepulchres* made in honour of some persons, who, perhaps, had no burial at all; from a superstitious opinion, that the souls of those who wanted burial, wandered a hundred years before they were admitted to pass into the Elysian fields. See BURIAL and CENOTAPH.

The PYRAMIDS are supposed to have been built as *sepulchres* for the kings of Egypt. And the OBELISKS had generally the same intention.

Sepulchres were held sacred and inviolable, and the care taken thereof was deemed a religious duty, grounded on the fear of God, and the belief of the soul's immortality. Those who searched or violated them, have been odious to all nations, and always severely punished.

The Egyptians called their *sepulchres*, *eternal houses*, in contradistinction to their houses and palaces, which they called *inns*; by reason of the short sojourn we have in the one, in comparison of our long stay in the other.

The eastern pilgrimages are all made with design to visit the holy *sepulchre*, that is, the tomb of Jesus Christ. Nobody enters here but bare-footed, and with abundance of ceremonies. The Turks exact twenty-four crowns of each pilgrim, whom devotion carries to the holy *sepulchre*.

SEPULCHRE, ST. or the *Holy Sepulchre*, gives the denomination to an order of regular canons, anciently instituted in Jerusalem, in honour of the holy *sepulchre*.

They ascribe their institution to Godfrey of Boulogne, who, they say, upon his taking Jerusalem in the year 1099, placed canons in the patriarchal church of the Holy *Sepulchre*, which indeed is true, but then they were not regulars. In effect it was Arnoul, who, of archdeacon of the church of Jerusalem, got himself elected patriarch thereof, that, in 1114, first obliged his canons to live in community, and to follow the rule of St. Augustine.

From the Holy Land numbers of these canons were brought into Europe, particularly into France by Louis the Younger; into England by king Henry; into Poland by Jaxa, a Polish gentleman; and into Flanders by the counts thereof.

But the order was afterwards suppressed by Innocent VIII. and its effects given to that of our Lady of Bethlehem, which itself ceasing, they were bestowed in 1484, on that of the knights of St. John of Jerusalem; but the suppression did not take place in Poland, nor in several provinces of Germany, where they still subsist: their general is in Poland; their habit, father Helyot observes, has been different in different places.

SEPULCHRE, St. or the *Holy Sepulchre*, is also the name of a military order, established in Palestine, as some say, by Godfrey of Boulogne, but according to others by his successor, Baldwin.

However, it is certain, there were none but canons in the church of St. *Sepulchre*, till the year 1114; and it is no more than probable, the knights were only instituted upon the ruins of the canons, four hundred years after, and that by pope Alexander VI. in order to excite rich and noble persons to visit the holy places, by giving them the title of *Knights of the Holy Sepulchre*, and to this end, instituting an order under that name, whereof he reserved the quality of master to himself and his successors.

Leo X. and Clement VII. granted to the guardian of the religious of St. Francis, in the Holy Land, the power of making these knights; which power, first granted *viva voce*, was afterwards confirmed by a bull of Pius IV. In 1558, the knights of this order in Flanders chose Philip II. king of Spain, their master, and afterwards his son; but the grand-master of the order of Malta prevailed on him to resign; and when afterwards the duke Nevers assumed the same quality in France, the same grand-master, by his interest and credit, procured a like renunciation of him, and a confirmation of the union of this order to that of Malta.

SEPULCHRI *pretium*. See PRETIUM.

SEQUATUR *sub suo periculo*, a writ that lies when a *summons ad warrantizandum* is awarded, and the sheriff returns that the party hath nothing whereby he may be summoned; then goes forth an *alias* and a *pluries*; and if he comes not in on the *pluries*, this writ shall issue.

SEQUEL, SEQUELA, in *Logic*, a consequence drawn from some preceding proposition.

As, if I say, *The human soul is immaterial, and therefore immortal*, the last member of the sentence is a *sequel* of the first.

SEQUENCE, French, from *sequor*, *I follow*, in *Gaming*, a series or set of cards immediately following each other in the same suit or colour.

We say, a *sequence* of four cards, of five, &c. At piquet, these are called tierces, quarts, quints, &c.

SEQUESTRATION, SEQUESTRATIO, in *Common Law*, the act of separating a thing in controversy, from the possession of both parties, till the right be determined by course of law.

This is of two sorts, *voluntary* and *necessary*.

SEQUESTRATION, *voluntary*, is that which is done by consent of both parties.

SEQUESTRATION, *necessary*, is that which the judge doth by his authority, whether the parties will or not.

SEQUESTRATION, in the *Civil Law*, is the act of the ordinary, disposing of the goods and chattels of one deceased, whose estate no man will meddle with.

A widow is also said to *sequester*, when she disclaims having any thing to do with the estate of her deceased husband.

Among the Romanists, in questions of marriage, where the wife complains of impotency in the husband, she is to be *sequestered* into a convent, or into the hands of matrons, till the process be determined.

SEQUESTRATION is also used for the act of gathering the fruits of a benefice void, to the use of the next incumbent.

Sometimes a benefice is kept under *sequestration* for many years, when it is of so small value, that no clergyman fit to serve the cure, will be at the charge of taking it by institution; in which case the *sequestration* is committed either to the curate alone, or to the curate and church-wardens jointly. Sometimes the profits of a living in controversy, either by the consent of the parties, or the judge's authority, are *sequestered* and placed for safety in a third hand, till the suit is determined, a minister

minifter being appointed by the judge to ferve the cure, and allowed a certain falary out of the profits. Sometimes the profits of a living are *fequeftered* for neglect of duty, for dilapidations, or for fatisfying the debts of the incumbent.

In the time of the civil wars, *fequeftration* was ufed for a feizing of the eftates of delinquents, for the ufe of the commonwealth.

SEQUESTRATION, in *Chancery*, is a commiffion ufually directed to feven perfons therein named, empowering them to feize the defendant's perfonal eftate, and the profits of his real, and to detain them, fubject to the order of the court. It iffues on the return of the ferjeant at arms, wherein it is certified, that the defendant had fecreted himfelf.

Sequeftrations were firft introduced by Sir Nicholas Bacon, lord keeper in the reign of queen Elizabeth; before which the court found fome difficulty in enforcing its procefs and decrees: and they do not feem to be in the nature of procefs to bring in the defendant, but only intended to enforce the performance of the court's decree.

SEQUESTRATION, in *London*, is made upon an action of debt: in which cafe, the action being entered, the officer goes to the fhop or warehoufe of the defendant, when there is nobody within, and puts a padlock upon the door, &c. ufing thefe words; "I do *fequefter* this "warehoufe, and the goods and merchandifes therein of "the defendant in the action, to the ufe of the plantiff," &c. and having put on his feal, makes return thereof to the compter; and after four court days the plaintiff may have judgment to open the doors, and appraife the goods by a ferjeant, who takes a bill of appraifement, having two freemen to appraife them, for which they are to be fworn at the next court holden for that compter; and then the officer puts his hand to the bill of appraifement, and the court giveth judgment. However, the defendant in the action may put in bail before fatisfaction, and fo diffolve the *fequeftration*; and after fatisfaction may put in bail *ad difprobandum debitum, &c.*

SEQUESRATION, *fequeftratio*, in *Chemiftry*, a term ufed by fome writers to exprefs feparation.

SEQUESTRO *habendo*, in *Law*, a writ judicial for the difcharging a *fequeftration* of the profits of a church-benefice granted by the bifhop at the king's commandment, thereby to compel the parfon to appear at the fuit of another. The parfon, upon his appearance, may have this writ for the releafe of the *fequeftration*.

SEQUIN, ZECAIN, ZECCHINO, a gold coin ftruck at Venice, and in feveral parts of the grand fignor's ftates, particularly Cairo; which laft are called *Turkifh fequins*, or *cherifs*. See COIN.

Ablancourt derives the word from *Cizicum*, or *Ciziccnicum*; as fuppofing the *fequin* firft ftruck at Cizicum: Menage, from the Italian *zecchino* of *zecca*, the name of the mint at Venice.

At Conftantinople, the ducats ftruck in feveral parts of Germany are called *Hungarian fequins*.

The value of thefe *fequins* is different; thofe of Venice exceeding thofe of Turky and Germany, by one-fifteenth. In the Eaft-Indies the difference is ftill more fenfible, the Venetian *fequin* being current for four rupees, and fix peffas, or 9*s*. 4*d*. fterling; and the Turkifh *fequin*, only for four rupees, or 9*s*. See STANDARD.

SERACH, in the *Turkifh military Orders*, an officer who holds the ftirrup of the caia of the janizaries in charge, attends him when he goes out on horfeback, and ferves him as a meffenger on all occafions. After this office he has the title of *chous*, and after he has paffed through this, he has the fame office under the aga of the janizaries. Pococke's Egypt, p. 168.

SERAGLIO, formed of the Turkifh word *farai*, which is borrowed from the Perfian *feraw*, fignifying *a houfe*, among the Levantines denotes the palace of a prince or lord.

At Conftantinople they fay, the *feraglio* of the ambaffador of England, of France, &c.

The *feraglio* is ufed, by way of eminence, for the palace of the grand feignor at Conftantinople, where he keeps his court, and where his concubines are lodged, and where the youth are trained up for the chief pofts of the empire.

It is a triangle about three Italian miles round, wholly within the city, at the end of the promontory Chryfoceras, now called the *Seraglio* Point. The buildings run back to the top of the hill, and from thence are gardens that reach to the edge of the fea. It is inclofed with a very high and ftrong wall, upon which there are feveral watch towers: and it has many gates, fome of which open towards the fea-fide, and the reft into the city; but the chief gate is one of the latter, which is conftantly guarded by a company of capoochees, or porters; and in the night it is well guarded towards the fea.

The outward appearance, du Loir tells us, is not beautiful, in regard the architecture is irregular, being cantoned out into feparate edifices and apartments, in manner of pavilions and domes. No ftranger, it is faid, has ever yet been admitted to the inmoft parts of the *feraglio*. See SULTANA.

The old *feraglio* is the place where the emperor's old miftreffes, and the fultanas that have belonged to the deceafed grand feignors, are kept.

Balzac obferves, that the *feraglio* at Conftantinople is only a copy of that which Solomon anciently built at Jerufalem, for his wives and concubines. For a particular defcription of the *feraglio*, fee Greaves's Works, vol. ii. p. 591, &c.

SERANGODES, a word ufed originally as an epithet for the pumice-ftone, and expreffing cavernous, fpungy, or full of holes. It has been hence applied to finuous ulcers, and to all forts of things that are cavernous, or of a fpungy texture.

SERAGE, in *Ornithology*, an Englifh name for a bird of the larus, or gull-kind, more ufually called the *fea*-SWALLOW, and by authors STERNA.

SERAPH, or SERAPHIM, in the *Hierarchy of Angels*, a fpirit fuppofed to be of the firft or higheft rank.

The *feraphs*, or rather *feraphim*, make that clafs of angels, fuppofed to be the moft inflamed with divine love, by their nearer and more immediate attendance on the throne, and to communicate their heat to the inferior, and remoter orders: hence their name, which is formed from the Hebrew root שרף, *to burn, inflame*.

SERAPH is alfo faid to be the name of a Turkifh gold coin, worth about 5*s*. fterling.

SERAPHIC, fomething belonging to the feraphim.

Mr. Boyle has a treatife of *feraphic* love, i. e. of *divine* love, or the love of God.

In the fchools, St. Bonaventure is called the *Seraphic Doctor*, from his abundant zeal and fervor.

St. Francis, founder of the Cordeliers and Francifcans, is called the *Seraphic Father*, in memory of a vifion he faw on mount Alverna.

SERAPHIM. See SERAPH.

SERAPIAS, in *Botany*. See *Baftard* HELLEBORE.

SERAPIAS, in the *Materia Medica*, the officinal name of the dried root, called SALEP.

SERAPIS, in *Mythology*, an Egyptian deity, who was worfhipped under various names and attributes, as the tutelary god of Egypt in general, and as the patron of feveral of their principal cities.

Tacitus informs us, that he was worfhipped as a kind of univerfal deity that reprefented Efculapius, Ofiris, Jupiter, and Pluto; and he was fometimes taken for Jupiter Ammon, the Sun, and Neptune: and the honours that were rendered to him at Alexandria, were more folemn and extraordinary than thofe of any other place.

Learned writers have differed in opinion as to the time of the introduction of this deity into Egypt: fome have fuppofed that he was known and worfhipped in this country long before the time of the firft Ptolemy, and that he was the fame with their APIS; *Serapis* being no other than *Apis εν Σορω* i. e. *Apis in his coffin*. Accordingly, they fay, that while the facred bull, which the Egyptians worfhipped for their great god, was alive, he was called *Apis*, and that when he was dead and buried in his coffin, he was called *Serapis*, that is, *Apis in foro*, and thus they derive his name by corruption from *foro-apis*: and fome have even imagined, that the patriarch Jofeph was worfhipped under this title; but to this etymology it has been objected, that as the Ptolemies firft brought the Greek language into Egypt, if *Serapis* had been an ancient god, worfhipped in that country before the Ptolemies reigned there, his name could not have had a Greek etymology.

According to the learned Mr. Bryant, *far* fignified any thing noble; and OSIRIS, the great hufbandman, who had been expofed in an ark, was ftyled *far-apis*, which fignifies *illuftris genitor*, the great father of mankind. But, he obferves, that there was likewife the term *for*, from whence came the σορος of the Greeks, which fignified *a bier* or *coffin*, and alfo a *place of interment*. Hence the temple where the dead *Apis* was depofited, had the name of *Sor-apis*, rendered inaccurately *farapis*.

Plutarch, who did not know this diftinction, fancied that fome people in Egypt, would not allow *forapis* to have been a god: the difpute was about the found of a word: no Egyptian could deny the divinity of the god *Serapis*, but *Sor-apis* had another meaning; and this was the term in debate. Upon the whole, he concludes, that the dæmon, or deified man was *Sar-apis*, and that *for-apis* was the tomb of Apis. Analyfis of Ancient Mythology, vol. ii. p. 428.

Others have maintained, that *Serapis* was not originally an Egyptian deity anciently worfhipped in that country, but

but an adventitious god brought thither from abroad. The ancient place of his station, according to Polybius, was on the coast of the Propontis, on the Thracian side, over against Hieras; and there Jason, when he went on the Argonautic expedition, sacrificed to him. Thence his image was brought to Sinope in Pontus; and from Sinope, Ptolemy, the first of that name, in obedience, as it is said, to a supernatural direction, brought it to Alexandria, and set it up in one of the suburbs of that city, called *Rhacotis*, where it was worshipped by the name of *Serapis*: and this new god had in that place, soon after, a very famous temple erected to him, called the *Serapeum*. This temple, says Ammianus Marcellinus, did, in the magnificence and ornaments of its buildings, exceed all other edifices in the world, next that of the Capitol at Rome.

And this, say the advocates of this opinion, was the first time that this deity was either worshipped or known in Egypt.

Ptolemy found great difficulty in obtaining this image, but the inhabitants of Sinope being oppressed with a grievous famine, were relieved by Ptolemy with a fleet of corn, and in return they consented to part with the image of their God.

The statue of *Serapis*, according to Macrobius, was of a human form, with a basket or bushel on his head resembling plenty, and referring, as some say, to the history of Joseph's supplying the Egyptians with corn; or, according to others, to the relief of Sinope by Ptolemy; his right hand leaned on the head of a serpent, whose body was wound round a figure with three heads, of a dog, a lion, and a wolf; in his left hand he held a measure of a cubit length, as it were to take the height of the waters of the Nile.

We shall here add, that Osiris was variously represented, sometimes by a sceptre and eye, to express his power and providence; at other times by the image of a hawk, because of its sharp sight, swiftness, and other qualities; and in later times in a human form, in a posture not very decent, signifying his generative and nutritive faculty: but the greatest adoration was paid to his living image, the bull.

The image of Isis was usually in the form of a woman, with cow's horns on her head, representing the appearance of the moon in her increase and decrease, and holding the sistrum (a kind of cymbal) in her right hand, and a pitcher in her left; the former signifying the perpetual motion there is in nature, and the other the fecundity of the Nile. But sometimes she was represented as Cybele, having her body full of breasts, to express her nourishing of all things.

It is observed, that when *Serapis* was introduced into Egypt, at the period above mentioned, as writers have inferred from the silence of Herodotus, and of other authors who wrote before the times of the Ptolemies, he brought in with him among the Egyptians a new way of worship: for till the time of the Ptolemies, the Egyptians never offered any bloody sacrifices to their gods, but worshipped them merely with their prayers and frankincense; but the tyranny of these princes having forced upon them the worship of two foreign gods, viz. Saturn and *Serapis*, they in this worship first introduced the use of bloody sacrifices among that people. And so averse were the Egyptians to this mode of worship, that they would never suffer any temple to be built to either of these gods, within any of the walls of their cities, but they were always erected in their suburbs: and they seem to be only Egyptians of the Greek original who conformed to this practice, and not those of the old race. See Exod. viii. 26, 27. Prid. Conn. vol. iii. p. 15, &c.

The famous temple of *Serapis* at Alexandria was destroyed by order of Theodosius; and the celebrated statue of this deity was broken in pieces, and its limbs carried first in triumph by the Christians through the city, and then thrown into a fierce fire, kindled for that purpose in the amphitheatre. As the Egyptians ascribed the overflowing of the Nile, to which was owing the fertility of their country, to the benign influence of their god *Serapis*, they concluded, that, now he was destroyed, the river would no longer overflow, and that a general famine would ensue; but when they observed, on the contrary, that the Nile swelled to a greater height than had been known in the memory of man, and thereby produced an immense plenty of all kinds of provisions, many of the pagans renouncing the worship of idols, adored the God of the Christians. Ancient Univ. Hist. vol. vi. p. 417.

The figure of *Serapis* is found on many ancient medals.

SERASS, in *Ornithology*, a bird of the same genus with the *colum*, which comes yearly to Surat in the East Indies, from mount Caucasus, and distinguished by a plication of the asperia arteria; which is designed to answer similar purposes with that of the COLUM.

SERBAJEE, in the *Eastern military Orders*, is a captain in the horse in the service of the grand seignor.

SEREIL *feathers of a hawk*, the same which answer to pinions in other fowls.

SERE, in *Falconry*, the yellow between the beak and eyes of a hawk.

SERENADE, SERENATA, a kind of concert given in the night-time by a lover, at his mistress's door, or under her window.

Sometimes it consists wholly of instrumental music; sometimes voices are added, and the pieces composed or played on these occasions, are also called *serenades*.

We do not know whence the word should be derived, unless from the French *serein*, the *dew* falling in the night-time.

SERENA *gutta*, in *Medicine*, the same as AMAUROSIS. See GUTTA *serena*.

SERENE, SERENUS, a quality or title of honour given to certain princes, and chief magistrates of republics.

The king of England is styled, *the most serene*; the same term is also applied to the doge of Venice. The pope and the sacred college, writing to the emperor, to kings, or the doge, give them no other title but that of *most serene*. Indeed the Venetians set the title of *serenity* above that of highness.

In 1646, Wicquefort observes, there was a clashing between the courts of France and Vienna, because the emperor refused the king of France any other title than that of *serene*. Bishops also anciently were addressed under the title of *serene*.

The kings of France of the first and second race, speaking of themselves, use no other quality but *notre serenité*.

The emperor gives no other title to the king of England, nor even to any other king, excepting the king of France. The king of Poland, and other kings, give it to the electors. The emperor, writing to the electors, or other princes of the empire, only uses the term *dilection*; but in treating with them he uses *electoral serenity* to the electors, and *ducal serenity* to the other princes.

SERGE, in *Commerce*, a woollen quilted stuff, manufactured on a loom with four treddles, after the manner of rateens, and other stuffs that have the whale.

The goodness of *serges* is known by the quilting, as that of cloths by the spinning.

Of *serges* there are various kinds, denominated either from the different qualities thereof, or from the places where they are wrought. The most considerable is the London *serge*, now highly valued abroad, particularly in France, where a manufacture is carried on with good success, under the title of *serge façon de Londres*.

SERGES, *manufacture of London*. For wool, the longest is chosen for the warp, and the shortest for the woof. Before either kind is used, it is first scoured, by putting it in a copper of liquor, somewhat more than lukewarm, composed of three parts of fair water, and one of urine. After having stayed long enough therein for the liquor to dissolve, and take off the grease, &c. it is stirred briskly about with a wooden peel; taken out of the liquor, drained, and washed in a running water, dried in the shade, beaten with sticks on a wooden rack, to drive out the coarser dust and filth, and then picked clean with the hands. Thus far prepared, it is greased with oil of olives, and the longest part, destined for the warp, is combed with large combs, heated in a little furnace for the purpose. To clear off the oil again, the wool is put in a liquor composed of hot water, with soap melted therein: whence being taken out, wrung, and dried, it is spun on the wheel.

As to the shorter wool, intended for the woof, it is only carded on the knee with small cards, and then spun on the wheel, without being scoured of its oil. Note, the thread for the warp is always to be spun much finer, and better twisted than that of the woof.

The wool both for the warp and the woof being spun, and the thread divided into skains, that of the woof is put on spools (unless it have been spun upon them) fit for the cavity or eye of the shuttle; and that for the warp is wound on a kind of wooden bobins to fit it for warping. When warped, it is stiffened with a kind of size, whereof that made of the shreds of parchment is held the best; and when dry is put on the loom.

When mounted on the loom, the workman raising and falling the threads (which are passed through a reed), by means of four treddles placed underneath the loom, which he makes to act transversely, equally, and alternately, one after another, with his feet, in proportion as the threads are raised and lowered, throws the shuttle across from one side to the other; and each time that the shuttle is thrown, and the thread of the woof is crossed between those of the warp, strikes it with the frame to which

which the reed is faſtened, through thoſe teeth the threads of the warp paſs; and this ſtroke he repeats twice or thrice, or even more, till he judges the croſſing of the *ſerge* ſufficiently cloſe: thus he proceeds till the warp is all filled with woof.

The *ſerge* now taken off the loom is carried to the fuller, who fulls, or ſcours it in the trough of his mill, with a kind of fat earth, called fullers earth, firſt purged of all ſtones and filth. After three or four hours ſcouring, the fullers earth is waſhed out in fair water, brought by little and little into the trough, out of which it is taken when all the earth is cleared; then, with a kind of iron pincers, or plyers, they pull off all the knots, ends, ſtraws, &c. ſticking out on the ſurface on either ſide; and then returning it into the fulling trough, where it is worked with water ſomewhat more than lukewarm, with ſoap diſſolved therein for near two hours: it is then waſhed out till ſuch time as the water becomes quite clear, and there be no ſigns of ſoap left; then it is taken out of the trough, the knots, &c. again pulled off, and then put on the tenter to dry, taking care as faſt as it dries to ſtretch it out both in length and breadth till it be brought to its juſt dimenſions. When well dried, it is taken off the tenter, and dyed, ſhorn, and preſſed.

SERGEANT, or Serjeant, a term *in our Law*, applied to ſundry offices. *Serjeant at law*, or *of the coif*, is the higheſt degree taken in the common law, as that of doctor is in the civil law.

The firſt mention which judge Blackſtone has met with of *ſerjeants*, or COUNTORS, is in the ſtat. of Weſtm. I. 3 Edw. I. c. 29. But M. Paris, in his life of John II. abbot of St. Alban's, which he wrote in 1255, 39 Hen. III. ſpeaks of advocates at the common law, or countors (*quos banci narratores vulgariter appellamus*) as of an order of men well known; and the antiquity of the COIF appears from the ſame author's Hiſt. of England, A.D. 1259.

Serjeants were anciently called *ſervientes ad legem*, and *ſervientes narratores*: Mr. Selden adds, that they were alſo called *doctores legis*; though others are of opinion that the judges are more properly the *doctores legis*, and *ſerjeants*, the bachelors of law.

Spelman obſerves, that however a *ſerjeant* may be richer than all the doctors of the Commons, yet a doctor is ſuperior in degree to a *ſerjeant*, for the very name of a doctor is magiſterial, but that of a *ſerjeant* miniſterial. Hence, the doctors are ſeated and covered when they plead, but the *ſerjeants* ſtand uncovered at the bar, excepting for their coif.

As theſe are ſuppoſed the moſt learned and experienced, there is one court appropriated for them to plead in by themſelves, which is the Common Pleas, where the common law of England is moſt ſtrictly obſerved: but they are not prohibited pleading in other courts, and all judges, who, by cuſtom, muſt firſt be *ſerjeants*, call them *brothers*.

Serjeants at law are bound by a ſolemn oath to do their duty to their clients.

They are called by the king's mandate, or writ, directed to them, commanding them to take upon them that degree, by a day aſſigned. See Barrister.

Out of theſe, ſome are made the king's *ſerjeants* to plead for him in all cauſes, eſpecially in caſes of treaſon; and one is uſually appointed, called *premier ſerjeant*. See Precedence.

Serjeants *at arms*, are officers appointed to attend the perſon of the king, to arreſt traitors, and perſons of quality offending, and to attend the lord high ſteward when he ſits in judgment on any traitor, &c.

Of theſe by ſtatute (13 Rich. II. cap. 6.) there are not to be above thirty in the realm. There are now nine at court, at 100*l. per annum* ſalary each; they are called the *king's ſerjeants at arms*, to diſtinguiſh them from others: they are created with great ceremony, the perſon kneeling before the king, his majeſty lays the mace on his right ſhoulder, and ſays, *Riſe up, ſerjeant at arms, and eſquire for ever*. They have, beſides, a patent for the office, which they hold for life.

They have their attendance in the preſence-chamber, where the band of gentlemen-penſioners wait; and, receiving the king at the door, they carry the maces before him to the chapel door, whilſt the band of penſioners ſtand foremoſt, and make a lane for the king, as they alſo do when the king goes to the houſe of lords.

There are four other *ſerjeants at arms*, created in the ſame manner; one, who attends the lord chancellor; a ſecond, the lord treaſurer; a third, the ſpeaker of the houſe of commons; and a fourth, the lord mayor of London on ſolemn occaſions.

They have a conſiderable ſhare of the fees of honour, and travelling charges allowed them when in waiting, viz. five ſhillings per day when the court is within ten miles of London, and ten ſhillings when twenty miles from London. The places are in the lord chamberlain's gift.

There are alſo *ſerjeants* of the mace of an inferior kind, who attend the mayor, or other head officer of a corporation.

Serjeant, *common*, an officer in the city of London, who attends the lord mayor and court of aldermen on court days, and is in council with them on all occaſions, within and without the precincts, or liberties of the city. He was to take care of orphans eſtates, either by taking account of them, or to ſign their indentures, before their paſſing the lord mayor and court of aldermen: and he was likewiſe to let and manage the orphans eſtates, according to his judgment to their beſt advantage. See Recorder.

Serjeants *of the houſhold*, are officers who execute ſeveral functions within the king's houſhold, mentioned in the ſtat. 33 Hen. VIII. c. 12.

Serjeant, or *ſergeant*, in *War*, is a non-commiſſioned or inferior officer in a company of foot, or troop of dragoons; armed with an halberd, and appointed to ſee diſcipline obſerved, to teach the ſoldiers their exerciſe and other duty. He receives the orders from the adjutant, which he communicates to his officers.

Each company has generally two *ſerjeants*.

Serjeant-*major*. See Major.

SERJEANTY, or Sergeanty, in *Law*, a ſervice anciently due to the king for lands held of him, and which could not be due to any other lord.

It is divided into *grand* and *petit ſerjeanty*.

Serjeanty, *grand*, is where one holds land of the king by ſervice which he ought to do in his own perſon, as to bear the king's banner or ſpear, aſſiſt at his coronation, or do ſome office in his court.

It was in moſt other reſpects like KNIGHTS-*ſervice*, only he was not bound to pay aid or eſcuage; and when tenant by knight-ſervice paid five pounds for a relief on every knight's fee, tenant by *grand ſerjeanty* paid one year's value of his land, whether it were much or little.

Serjeanty, *petit*, is where a man holds land of the king to yield him yearly ſome ſmall thing towards his wars, as a ſword, dagger, bow, ſpurs, &c. in the manner of rent.

Coke, on Littleton, tells us, that Sir Richard Rockeſly held lands at Seaton, by *grand ſerjeanty*, to be *vantrarius regis, i. e.* the king's fore-footman, when he went into Gaſcogne, till he had worn out a pair of ſhoes of the price of four pence.

By the ſtatute 12 Car. II. all tenures of any honours, manors, lands, &c. are turned into free and common ſocage: but the honorary ſervices of *grand ſerjeanty* are thereby continued.

SERIANA, in *Botany*, a name given by Plumier to a genus of plants, the ſame in its generical characters with his *cururu*; both which are compriſed by Linnæus under one genus, with the new name Paullinia.

SERICH, the name of a ſeed uſed in the food of the Egyptian Coptis. It is produced by an herb called *ſimſim*, and is pounded and put into oil. In this they dip their bread, which is always new, being baked as often as they eat, in ſmall flat cakes: theſe they eat dipped in this oil with raw onions, or elſe they break the cakes to pieces, and put them into a ſyrup of ſugar, made when the canes are green. Pococke's Egypt, p. 183.

SERICUM, *ſilk*. See Silk.

Sericum is alſo a name given by ſeveral chemical writers to the flowers of zinc raiſed by ſublimation in an inclined open crucible. Theſe flowers are not reducible into zinc again, and are of a fibroſe texture, and a beautiful bright white colour. This has made them be called alſo the *philoſophic cotton*, and others have named them the AQUA *ſicca philoſophorum*.

SERIES, a continued ſucceſſion of things in the ſame order, and which have ſome relation or connexion with each other.

Medals are formed into *ſuites* or *ſerieſes*, both with regard to the metal and to the ſubject. The different metals of medals conſtitute three different *ſerieſes* in the cabinets of the curious, we mean, as to the order and arrangement of the ſeveral medals.

The gold *ſeries*, for inſtance, of imperials, amounts to about one thouſand or twelve hundred; that of ſilver may amount to three thouſand; and that of copper, in all the three ſizes, great, middle, and ſmall, to ſix or ſeven thouſand. Of theſe, the *ſeries* of middle copper is the moſt complete, and moſt eaſily formed, as it may be brought down to the fall of the empire in the Weſt, and the time of the Palæologi in the Eaſt.

With regard to the ſubject, the *ſerieſes* of medals are uſually formed from the ſide called the *head*: in the firſt claſs, is diſpoſed the *ſerieſes* of kings; in the ſecond, that of Greek and Latin cities: in the third, the Roman conſular families; in the fourth, the imperial: in the fifth, the deities; and to theſe may be added a ſixth *ſeries*, conſiſting of medals of illuſtrious perſons.

There are alſo *ſerieſes* of modern medals: that of the popes only commences from Martin V. in 1430. From that time we have a *ſeries* of papal medals tolerably complete, to the number of five or ſix hundred.

We might likewiſe have a *ſeries* of emperors from Charlemagne, provided the current coins were admitted; but, in practice, they commonly commence with Frederic II. in 1463.

The *ſeries* of kings of France is moſt numerous and moſt conſiderable of all the modern kings. See Medals.

Series, in *Algebra*, denotes a rank or progreſſion of quantities, increaſing or decreaſing in ſome conſtant ratio, which, in its progreſs, approaching ſtill nearer and nearer to ſome ſought value, and the terms continually decreaſing, is called a *converging ſeries*; and, if infinitely continued, becomes equal to that quantity; whence its uſual appellation of *infinite ſeries*.

Thus, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$, &c. make a *ſeries*, which always converges, or approaches to the value of 1, and, infinitely continued, becomes equal to it.

The doctrine and uſe of *infinite ſerieſes*, one of the greateſt improvements of the preſent age, we owe to Nic. Mercator, of Holſtein, who, however, ſeems to have taken the firſt hint of it from Dr. Wallis's arithmetic of *infinites*.

It takes place principally in the quadratures of curves; where, as we frequently fall upon quantities, which cannot be expreſſed by any preciſe definite numbers, ſuch as is the ratio of the diameter of a circle to the circumference, we are glad to expreſs them by a *ſeries*, which, infinitely continued, is the value of the quantity required.

Series, *nature, origin, and uſe of infinite.* Though arithmetic furniſhes us with very adequate and intelligible expreſſions for all rational numbers, yet it is very defective as to irrational ones; which are infinitely more numerous than the other, there being, for inſtance, an infinity of them between 1 and 2. Were it now required to find a mean proportional between 1 and 2 in rational numbers, which alone are clearly intelligible (the root of 2 being certainly a very obſcure idea), we could ſtill approach nearer and nearer to the juſt value of the quantity required, but without ever arriving at it: thus, if for the mean proportional between 1 and 2, or the root of 2, we firſt put 1, it is evident we have not put enough; if we add $\frac{1}{2}$ we put too much, for the ſquare of $1+\frac{1}{2}$ is greater than 2. If then we take away $\frac{1}{8}$, we ſhall find we have taken away too much, and if we return $\frac{1}{16}$, the whole will be too great; thus we may proceed, without ever coming to the juſt quantity ſought. Theſe numbers thus found, and thoſe found after the ſame manner to infinity, being diſpoſed in their natural order, make what we call an *infinite ſeries*.

Sometimes the *ſerieſes* do not proceed by alternate additions and ſubtractions, but by ſimple additions, or by an infinity of ſubtractions, according to the poſition of the firſt term. In all theſe *infinite ſerieſes* it is viſible, that as all the terms are only equal to a finite magnitude, they muſt be ſtill decreaſing; and it is even convenient that they be ſo as much as poſſible, that one may take only a certain number of the firſt terms for the magnitude ſought, and neglect all the reſt.

But irrational numbers are not the only numbers, that are expreſſed in rational ones by *infinite ſerieſes*. Rational numbers themſelves may be expreſſed in the ſame manner: 1, for inſtance, being equal to the *ſeries* $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, &c. but there is this difference between them, that whereas irrational numbers can only be expreſſed in rational numbers by ſuch *ſeries*, rational ones need no ſuch expreſſion.

Among *infinite ſerieſes*, there are ſome whoſe terms only make a finite ſum; ſuch is the geometrical progreſſion $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, &c. and, in general, all geometrical decreaſing progreſſions: in others, the terms make an infinite ſum; ſuch is the harmonical progreſſion $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, &c. It is not that there are more terms in the harmonical, than in the geometrical progreſſion, though the latter has no term which is not in the former, and wants ſeveral which the former has; ſuch a difference would only render the two infinite ſums unequal, and that of the harmonical progreſſion the greateſt; the cauſe lies deeper.

From the received notion of infinite diviſibility, it follows, that any finite thing, e. gr. a foot, is a compound both of finite and infinite; finite, as it is a foot; infinite, as it contains an infinity of parts, into which it is diviſible. If theſe infinite parts be conceived, as ſeparated from one another, they will make an *infinite ſeries*; and yet their ſum will only be a foot, only no terms are to be here put, but ſuch as may, diſtinct from each other, be parts of the ſame finite whole: now this is the caſe in the geometrical, decreaſing *ſeries* $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, &c. for it is evident, that if you firſt take $\frac{1}{2}$ of a foot, then $\frac{1}{2}$ of what remains, or $\frac{1}{4}$ of a foot, then $\frac{1}{2}$ of what remains, or $\frac{1}{8}$ of a foot; you may proceed to infinity, ſtill taking new decreaſing halves, all diſtinct from each other, and which all together only make a foot.

In this example, we not only take no parts but what were in the whole diſtinct from each other; but we take all that were there; whence it comes to paſs, that their ſum makes the preciſe whole again: but, were we to follow the geometrical progreſſion $\frac{1}{3}$, $\frac{1}{9}$, $\frac{1}{27}$, &c. that is, at firſt, take $\frac{1}{3}$ of a foot, and from what remains $\frac{1}{9}$ of a foot, and from what ſtill remains $\frac{1}{27}$ of a foot, &c. it is true, we ſhould take no parts but what were diſtinct from each other in the foot; but we ſhould not take all the parts that were there, ſince we only take the ſeveral thirds, which are leſs than the halves; of conſequence, all theſe decreaſing thirds, though infinite in number, could not make the whole; and it is even demonſtrated, that they would only make half. In like manner, all the fourths decreaſing to infinity, would only make one-third, and all the hundredths only the ninty-ninth part: ſo that the ſum of the terms of an *infinite ſeries* decreaſing geometrically, is not only always finite, but may even be leſs than any finite quantity that can be aſſigned.

If an infinite decreaſing *ſeries* expreſs parts which cannot ſubſiſt in the whole, diſtinctly from each other; but ſuch, as to take their values, we muſt ſuppoſe the ſame quantity taken ſeveral times in the ſame whole, then will the ſum of theſe parts make more than a whole, nay, infinitely more; that is, the *ſeries* will be infinite, if the ſame quantity be taken an infinity of times. Thus, in the harmonical progreſſion $\frac{1}{2}$, $\frac{1}{3}$, , &c. if we take $\frac{1}{2}$ of a foot, or 6 inches, then $\frac{1}{3}$, or 4 inches, it is evident we cannot take farther $\frac{1}{4}$ of a foot, or 3 inches, without taking 1 inch more than was left in the foot. Since then the whole is already exhauſted by the three firſt terms, we can take no more of the following terms, without taking ſomething already taken: and, ſince thoſe terms are infinite in number, it is very poſſible, that the ſame finite quantity may be repeated an infinite number of times, which will make the ſum of the *ſeries* infinite.

We ſay, poſſible; for though of two infinite *ſerieſes*, the one may make a finite ſum, and the other an infinite one; it is true, that there may be ſuch a *ſeries*, where the finites having exhauſted the whole, the following ones, though infinite in number, ſhall only make a finite ſum; and, in effect, ſince it is demonſtrated, by the laws of geometrical progreſſion, that there are *ſerieſes*, whoſe ſums are leſs than the whole, nay infinitely leſs; it follows, that there muſt likewiſe be *ſerieſes*, which make infinitely more.

There are two farther remarks neceſſary to be made on *ſerieſes* in general. 1. That there are ſome, wherein, after a certain number of terms, all the other terms, though infinite in number, become each a cypher.— Now, it is evident, that the ſum of theſe *ſerieſes* is finite, and eaſily found; they having only an appearance of infinity.

2. That the ſame magnitude may be expreſſed by different *ſerieſes*; and may be expreſſed both by a *ſeries* whoſe ſum may be found, and by another whoſe ſum cannot be found.

Geometry does not labour under the ſame difficulty as arithmetic: it expreſſes irrational numbers exactly in lines, and needs not have recourſe to infinite *ſerieſes*. Thus, the diagonal of a ſquare, whoſe ſide is 1, is known to be the ſquare root of 2: but, in ſome other caſes, geometry itſelf is under the like embarraſſment; there being ſome right lines, which cannot be expreſſed otherwiſe than by an infinite *ſeries* of ſmaller lines, whoſe ſum cannot be found: of which kind are the right lines equal to curves; ſo that in ſeeking, for inſtance, a right line equal to the circumference of a circle, we find, that the diameter being 1, the line ſought will be $\frac{4}{1} - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9}$, &c.

As to the finding of an infinite *ſeries* to expreſs quantities ſought, Mercator, the firſt inventor of the method, did it by diviſion; but ſir Iſaac Newton and M. Leibnitz have improved the doctrine very conſiderably; the firſt finding his *ſeries* by the extraction of roots, and the ſecond by another *ſeries* preſuppoſed.

The notion of a *ſeries* given above is however rather too limited, when confined to ranks or progreſſions of quantities increaſing or decreaſing in ſome conſtant ratio: for the term *ſeries* is indifferently uſed whether the terms of any number of quantities following each other have a conſtant ratio, or even relation or not. And, ſtrictly ſpeaking a *ſeries* of quantities increaſing or decreaſing in a conſtant ratio is no more than what is commonly called a geometric progreſſion.

The doctrine of *ſeries* is of extenſive uſe in mathematics, and has been carried far; though not ſo far as could be wiſhed. It would far exceed the limits of our deſign to enter into a detail of the diſcoveries relating

to this ſubject. Something, however, ſhould be added to what has been ſaid above, to give a notion of the principal kinds of *ſeries*, and the method of notation uſed in treating of them.

A *ſeries* being propoſed, one of the principal queſtions concerning it, is to find the law of its continuation. For this no univerſal rule can be given; but it often happens, that the terms of the *ſeries* taken two and two, three and three, or in greater numbers, have an obvious and ſimple relation, by which the *ſeries* may be determined and produced indefinitely. Thus, if unity be divided by $1-x$, the quotient will be a geometrical progreſſion, any term of which will be to the next antecedent term as x to 1. And by this property the *ſeries* $1+x+x^2+x^3+$ &c. may be diſtinguiſhed from any other, and produced *ad infinitum*. In like manner, in other caſes of diviſion, other *ſerieſes* will ariſe, the terms of which will have a conſtant relation to each other, and this relation recurring always throughout the *ſeries*, they have been called recurring *ſerieſes* by M. de Moivre, who firſt conſidered them, and applied them to the ſolution of ſeveral intricate problems. See *Recurring* SERIES, *infra*.

In many caſes, the relation of the terms of a *ſeries* is not conſtant, as it is in thoſe ariſing from diviſion. Yet this relation often varies according to a certain law obvious upon inſpection. Thus in the *ſeries* $1+\frac{2}{3}x+\frac{8}{15}x^2+\frac{16}{35}x^3+\frac{128}{315}x^4+$ &c. The terms may be continued indefinitely by the continued multiplication of theſe fractions $\frac{2}{3}$, $\frac{4}{5}$, $\frac{6}{7}$, $\frac{8}{9}$, &c. And the following *ſeries*, $1+\frac{1}{6}x+\frac{3}{40}x^2+\frac{5}{128}x^3+\frac{35}{1152}x^4+$ &c. may be continued by the multiplication of the fractions $\frac{1\times1}{2\times3}$, $\frac{3\times3}{4\times5}$, $\frac{5\times5}{6\times7}$, $\frac{7\times7}{8\times9}$, &c.

Serieſes of this kind may be defined by *differential equations*. The equation defining a *ſeries* is that which aſſigns the relation of the terms generally by their diſtances from the beginning. To do this Mr. Stirling conceives the terms of the *ſeries* to be placed as ſo many ordinates on a right line given by poſition, and he, for the ſake of ſimplicity, takes unity as the common interval of theſe ordinates. The initial terms of the *ſeries* he denotes by the initial letters of the alphabet, A, B, C, D, &c. A being the firſt, B the ſecond, C the third, &c. And he denotes any term in general, by the letter T, and the reſt following it in order, T′, T″, T‴, T⁗, &c. He denotes the diſtance of the term T from any given term, or from any given intermediate point between two terms, by the indeterminate quantity z: ſo that the diſtances of the terms T′, T″, T‴, &c. from the ſaid term or point, will be $z+1$, $z+2$, $z+3$, &c. for the increment of the abſciſs is the common interval of the ordinates, or terms of the *ſeries* applied to the abſciſs.

Theſe things being premiſed, let this *ſeries* be propoſed, 1, $\frac{1}{2}x$, $\frac{3}{8}x^2$, $\frac{5}{16}x^3$, $\frac{35}{128}x^4$, $\frac{63}{256}x^5$, &c. in which the relations of the terms are $B=\frac{1}{2}Ax$, $C=\frac{3}{4}Bx$, $D=\frac{5}{6}Cx$, $E=\frac{7}{8}Dx$, &c. The relation in general will be defined by the equation, $T'=\frac{z+\frac{1}{2}}{z+1}Tx$, where z denotes the diſtance of T from the firſt term of the *ſeries*. For by ſubſtituting 0, 1, 2, 3, 4, &c. ſucceſſively in the place of z, the relations of the terms of the propoſed *ſeries* will ariſe. In like manner, if z be the diſtance of T from the ſecond term of the *ſeries*, the equation will be $T'=\frac{z+\frac{3}{2}}{z+2}Tx$, as will appear by ſubſtituting the numbers -1, 0, 1, 2, 3, 4, &c. ſucceſſively for z. Or, if the indeterminate z denotes the place of the term T in the *ſeries*, its ſucceſſive values will be 1, 2, 3, 4, &c. and the equation will be $T'=\frac{z-\frac{1}{2}}{z}Tx$.

It appears, therefore, that innumerable differential equations may define one and the ſame *ſeries*, according to the different points from whence the origin of the abſciſs z is taken. And, on the contrary, the ſame equation defines innumerable different *ſerieſes* by taking different ſucceſſive values of z. For in the equation $T'=\frac{z-\frac{1}{2}}{z}Tx$, which defines the *ſeries* above mentioned, when 1, 2, 3, 4, &c. are the ſucceſſive values of the abſciſſæ; if $1\frac{1}{2}$, $2\frac{1}{2}$, $3\frac{1}{2}$, $4\frac{1}{2}$, &c. be ſucceſſively ſubſtituted for z, the relations of the terms ariſing will be $B=\frac{2}{3}Ax$, $C=\frac{4}{5}Bx$, $D=\frac{6}{7}Cx$, &c. from whence the *ſeries* A, $\frac{2}{3}Ax$, $\frac{8}{15}Ax^2$, $\frac{16}{35}Ax3$, $\frac{128}{315}Bx^4$, &c. will ariſe, which is different from the former. But the equation will always determine the *ſeries* from the given values of the abſciſs and of the firſt term, when the equation includes but two terms of the *ſeries*, as in the laſt example, where the firſt term being given, all will be given. But when the equation includes three terms, two muſt be given; and three muſt be given when it includes four, and ſo forth.

If the *ſeries* x, $\frac{1}{6}x^3$, $\frac{3}{40}x^5$, $\frac{5}{112}x^7$, $\frac{35}{1152}x^9$, &c. be propoſed, where the relations of the terms are, $B=\frac{1\times1}{2\times3}Ax^2$, $C=\frac{3\times3}{4\times5}Bx^2$, $D=\frac{5\times5}{6\times7}Cx^2$, &c. the equation defining this *ſeries* will be $T'=\frac{\overline{2z-1}\times\overline{2z-1}}{2z\times\overline{2z+1}}Tx^2$, or $T'=\frac{4zz-4z+1}{4zz+2z}Tx^2$, where the ſucceſſive values of z are 1, 2, 3, 4, &c. See Mr. Stirling's Methodus Differentialis, in the introduction.

This may ſuffice to convey a notion of theſe differential equations, defining the nature of *ſerieſes*. But as to the application of theſe equations in finding the ſums of *ſerieſes* it would require a treatiſe to explain it. We muſt therefore refer the curious to that excellent one juſt quoted, as alſo to M. de Moivre's Miſcellanea Analytica; and ſeveral curious papers by Mr. Euler in the Acta Petropolitana.

A *ſeries* often converges ſo ſlowly as to be of no uſe in practice. Thus, if it were required to find the ſum of the *ſeries* $\frac{1}{1.2}+\frac{1}{3.4}+\frac{1}{5.6}+\frac{1}{7.8}+\frac{1}{9.10}+$ &c. which lord Brounker found for the quadrature of the hyperbola true to 9 figures, by the mere addition of the terms of the *ſeries*; Mr. Stirling computes that it would be neceſſary to add a thouſand millions of terms for that purpoſe; for which the life of man would be too ſhort. But by that gentleman's method the ſum of the *ſeries* may be found by a very moderate computation. See Meth. Diff. p. 26, ſeq.

SERIES, *to find a, expreſſing a quantity ſought, by diviſion.* Suppoſe a *ſeries* required to expreſs the quotient of b divided by $a+c$. Divide the dividend by the diviſor, as in common arithmetic; continuing the diviſion till the quotient ſhew the order of the progreſſion, or the law, according to which the terms proceed to infinity; ſtill obſerving the rules of ſubtraction, multiplication, and diviſion, about the changing of the ſigns. The proceſs carried on the quotient will be found $\frac{b}{a}-\frac{bc}{a^2}+\frac{bc^2}{a^3}-\frac{bc^3}{a^4}$ &c. in infinitum.

Theſe four or five terms thus found, both the quotient and manner of the diviſion ſhew, that the quotient conſiſts of an infinite *ſeries* of terms, whoſe numerators are the powers of c, whoſe exponents differ from the number of the order by unity, whoſe denominators are the powers of a, and their exponents equal to the number of the order of the terms. E. g. In the third term, the power of c is the ſecond in the numerator; and the power of a is the third in the denominator.

Hence, firſt, if $b=1$, and $a=1$, ſubſtituting this value for that, we have, in that quotient $1-c+c^2-c^3$ &c. to infinity. Wherefore, $\frac{1}{1+2}=1-c+c^2-c^3$, &c. in infinitum.

If then, ſecondly, the terms in the quotient continually decreaſe, the *ſeries* will give a quotient as near the truth as poſſible. E. g. If $b=1$, $c=1$, and $a=2$; theſe values ſubſtituted in the general *ſeries*, or the diviſion performed as in the general example; we ſhall find $\frac{1}{3}=\frac{1}{2+1}=\frac{1}{2}-\frac{1}{4}+\frac{1}{8}-\frac{1}{16}+\frac{1}{32}-\frac{1}{64}+\frac{1}{128}$, &c. Suppoſe, then, the *ſeries* to be broken off in the fourth term; there will be a deficiency; but it will be leſs than $\frac{1}{32}$. If it be broken off in the ſixth, there will be a deficiency, but that leſs than $\frac{1}{128}$. The farther, therefore, the *ſeries* is continued, the nearer it approaches to truth, but it never arrives at it.

After the like manner we find $\frac{1}{4}=\frac{1}{3+1}=\frac{1}{3}-\frac{1}{9}+\frac{1}{27}-\frac{1}{81}+\frac{1}{143}$, &c. in infinitum: $\frac{1}{5}=\frac{1}{4+1}=\frac{1}{4}-\frac{1}{16}+\frac{1}{64}-\frac{1}{156}$, &c. in infinitum: $\frac{1}{6}=\frac{1}{5+1}=\frac{1}{}-\frac{1}{25}+\frac{1}{125}-\frac{1}{625}$, &c. in infinitum. This is a conſtant law, whereby all fractions, whoſe numerator is unity, may be expreſſed by infinite *ſerieſes*; thoſe *ſerieſes* being all geometrical progreſſions, decreaſing in ſuch manner, as that the numerator is always unity; and denominator of the firſt term, which is alſo the exponent of the ratio, differs by unity from the denominator of the fraction to be reſolved.

If the terms of the quotient be continually encreaſing, the *ſeries* recedes ſo much the farther from the quotient

as it is continued longer; nor does it ever become equal to the quotient, unleſs it be terminated, and have the laſt remainder added under its ſign. E. g. Suppoſe $\frac{1}{3} = \frac{1}{1+2}$; the quotient will be found $1 - 2 + 4 - 8 + 16 - 64 + 128$, &c. One term, 1, exceeds $\frac{1}{3}$ by an exceſs of $\frac{2}{3}$; two terms come ſhort by $\frac{4}{3}$; three terms exceed by $\frac{9}{3}$; four fall ſhort by $\frac{15}{3}$, &c. If the *ſeries* be ſuppoſed to terminate in -8; then will $\frac{1}{1+2} = 1-2+4-8+\frac{16}{3}$. But $1 - 2 + 4 - 8 = -5 = -\frac{15}{3}$. Therefore, $\frac{1}{1+2} = \frac{16}{3} - \frac{15}{3} = \frac{1}{3}$. Suppoſe the general *ſeries* to terminate in $-c^3$, then will $\frac{1}{1+c} = 1 - c + c^2 - c^3 + \frac{c^4}{1+c} = \frac{1 + c - c^2 + c^2 + c^3 - c^3 - c^4 + c^4}{1+c} = \frac{1}{1+c}$.

Series, *circular*, is uſed for a *ſeries* whoſe ſum depends on the quadrature of the circle. Such is the *ſeries* $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9}$ — &c. De Moivre, Miſc. Analyt. p. 111. or the ſum of the *ſeries* $1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \frac{1}{25}$ + &c. continued ad infinitum, according to Mr. Euler's diſcovery.

Series, *determinate*, a *ſeries*, the terms of which proceed by the powers of a determinate quantity. If that determinate quantity be unity, the *ſeries* is ſaid to be determined by unity. De Moivre, Miſc. Analyt. p. 111.

Series, *diverging*, a *ſeries*, the terms of which continually increaſe, or whoſe denominators increaſe in a greater proportion than their numerators. The contrary to this is a *converging ſeries*. See Series *ſupra*.

Series, *form of a*, in *Algebra*, is uſed for that affection of an indeterminate *ſeries*, ſuch as,

$A x^n + B x^{n+r} + C x^{n+2r} + D x^{n+3r}$, &c. which ariſes from the different values of the indices of x.

Thus if $n = 1$, and $r = 1$, the *ſeries* will aſſume the *form*,

$A x + B x^2 + C x^3 + D x^4 +$, &c.

If $n = 1$, and $r = 2$, the *form* will be,

$A x + B x^3 + C x^5 + D x^7 +$, &c.

If $n = \frac{1}{2}$, and $r = 1$, the *form* is,

$A x^{\frac{1}{2}} + B x^{\frac{3}{2}} + C x^{\frac{5}{2}} + D x^{\frac{7}{2}} +$, &c.

Again, if $n = 0$, and $x = -1$, the *form* of the *ſeries* will be,

$A + B x^{-1} + C x^{-2} + D x^{-3} +$, &c.

When the value of a quantity cannot be found exactly, it is of uſe in algebra, as well as in common arithmetic, to ſeek an approximated value of that quantity ſufficient for practice Thus in arithmetic, as the true value of the ſquare root of 2 cannot be aſſigned, a decimal fraction is found to a ſufficient degree of exactneſs in any particular caſe. And this decimal fraction is in reality no more than an infinite *ſeries* of fractions converging or approximating to the true value of the root required. For the expreſſion $\sqrt{2} = 1.41421356$, &c. is equivalent to this $\sqrt{2} = 1 + \frac{4}{10} + \frac{1}{100} + \frac{4}{1000} + \frac{2}{10000} + \frac{1}{100000}$ +, &c. Or ſuppoſing $x = \frac{1}{10}$,

$\sqrt{2} = 1 + \frac{4}{x} + \frac{1}{xx} + \frac{4}{x^3} + \frac{2}{x^4} + \frac{1}{x^5} +$, &c.

$= 1 + 4x^{-1} + x^{-2} + 4x^{-3} + 2x^{-4} + x^{-5} +$, &c. which laſt ſeries is a particular caſe of the general indeterminate *ſeries* $A x_n + B x^{n+r} + C x^{n+2r} +$, &c. when $n = 0$, $r = -1$, and the coefficient $A = 1$, $B = 4$, $C = 1$, $D = 4$, $E = 2$, &c.

But the application of the notion of approximations in numbers, to ſpecies, or to algebra, is not ſo obvious. Sir Iſaac Newton, with his uſual ſagacity, took the hint, proſecuted it, and thereby diſcovered general methods in the doctrines of infinite *ſeries*, which before him had only been treated in a particular manner, though with great acuteneſs, by Dr. Wallis and a few others. See Newton's Method of Fluxions and Infinite *Series*, with Mr. Colſon's Comment; as alſo the Analyſis per Æquationes Numero Terminorum Infinitas, publiſhed by Mr. Jones, in 1711, and ſince tranſlated and explained by Mr. Stewart, together with Sir Iſaac's Quadrature of Curves, Lond. 1745, quarto. To theſe may be added Mr. Maclaurin's Algebra, part II. chap. x. p. 244. and Cramer's Analyſe des Lignes Courbes Algebraiques, chap. vii. p. 148.

Among the various methods for determining the value of a quantity by a converging *ſeries*, that ſeems, on many occaſions, preferable to the reſt, which conſiſts in aſſuming an indeterminate *ſeries* equal to the quantity, the value of which is ſought, and afterwards determining the values of the terms of this aſſumed *ſeries*.

For inſtance, ſuppoſe a logarithm being given, it were required to find its number.

Let the number be $= 1 + x$, and the given logarithm $= z$. Then, by the nature of Logarithms and Fluxions, $\dot{z} = \frac{\dot{x}}{1+x}$, and $\dot{z} + x\dot{z} = \dot{x}$. Suppoſe

$x = Az + Bz^2 + Cz^3 + Dz^4 +$, &c. conſequently, $\dot{x} = A\dot{z} + 2Bz\dot{z} + 3Cz^2\dot{z} + 4Dz^3\dot{z} +$, &c. $= \dot{z} + x\dot{z} = \dot{z} + Az\dot{z} + Bz^2\dot{z} + Cz^3\dot{z} + Dz^4\dot{z} +$, &c.

Now if the correſponding terms of theſe two equal *ſerieſes* (each being $= x$) be compared, we ſhall have $A = 1$, $B = \frac{1}{2}$, $C = \frac{1}{6}$, $D = \frac{1}{24}$, &c. which values being ſubſtituted in the *ſeries* $Az + Bz^2 + Cz^3 +$, &c. give $x = z + \frac{1}{2}z^2 + \frac{1}{6}z^3 + \frac{1}{24}z^4 + \frac{1}{120}z^5 + \frac{1}{720}z^6 +$, &c. $= z + \frac{1}{1.2}z^2 + \frac{1}{1.2.3}z^3 + \frac{1}{1.2.3.4}z^4 + \frac{1}{1.2.3.4.5}z^5 +$ &c. And conſequently $1 + x$, the number ſought, will be $= 1 + z + \frac{1}{1.2}z^2 +$, &c.

But the indeterminate *ſeries* $Az + Bzz + Cz^3 +$, &c. was here arbitrarily aſſumed, and will not ſucceed in all caſes.

For inſtance, if from an arc given it were required to find the tangent. Let $x =$ tangent, $v =$ arc, the radius $= 1$. Then, from the nature of the circle, we ſhall have $\frac{\dot{x}}{1+xx} = \dot{v}$, or $\dot{x} = \dot{v} + xx\dot{v}$. Now if to find the value of x we ſuppoſe $x = Av + Bv^2 + Cv^3 +$, &c. and operate as before, we ſhall find all the coefficients B, D, F, of the even powers of v, each $= 0$. Therefore the *ſeries* aſſumed is not of a proper form. But ſuppoſing $x = Av + Bv^3 + Cv_5 + Dv^7 +$, &c. we ſhall find $A = 1$, $B = \frac{1}{3}$, $C = \frac{2}{15}$, $D = \frac{17}{315} +$, &c. and conſequently $x = v + \frac{1}{3}v^3 + \frac{2}{15}v^5 + \frac{17}{315}v^7 +$, &c.

Now to find a proper indeterminate *ſeries* in all caſes, tentatively, would often be very laborious, and often an impracticable work. Mathematicians have therefore endeavoured to find out a general rule for this purpoſe. But, till lately, the method has been but imperfectly underſtood and delivered. Moſt authors, indeed, have explained the manner of finding the coefficients A, B, C, D, &c. of the indeterminate *ſeries* $A x^n + B x^{n+r} + C x^{n+2r}$ + &c. which is eaſy; but the values of n and r, wherein the main difficulty lies, have been aſſigned by many, as if they were ſelf-evident, or at leaſt diſcoverable by an eaſy trial or two, as in the laſt example. Sir Iſaac Newton himſelf has ſhewn the method of determining the number n, by his rule for finding the firſt term of a converging *ſeries*, by the application of his parallelogram and ruler. For the particulars of this method, ſee the authors above cited. See Parallelogram.

Dr. Taylor, in his Methodus Incrementorum, inveſtigates the number r; but, according to Mr. Stirling, the rule given by the doctor fails ſometimes. Lineæ Tert. Ordin. Newtonian. p. 28.

Mr. Stirling found a correction of Dr. Taylor's rule, but ſays he cannot affirm it to be univerſal, having only found it by chance.

S'Graveſande obſerves, that though he thinks Mr. Stirling's rule never leads into error, yet that it is not perfect. See s'Graveſande, De Determin. Form. Seriei Infinit. printed at the end of his Matheſeos Univerſalis Elementa, Lugd. Bat. 1727.

This learned profeſſor has endeavoured to rectify the rule. But Mr. Cramer has ſhewn it to be ſtill defective in ſeveral reſpects; and he himſelf, to avoid the inconveniences to which the methods of thoſe who wrote before him are ſubject, has aſcended to the firſt principles of the method of infinite *ſeries*, and has entered into a more exact and inſtructive detail of the whole method, than is to be met with elſewhere; for which, and for many other reaſons, his treatiſe deſerves to be particularly recommended to beginners.

But it muſt be obſerved, that in determining the value of a quantity by a converging *ſeries*, it is not always neceſſary to have recourſe to an indeterminate *ſeries*: for it is ſometimes more expeditious to find it by common diviſion, or by extraction of roots. See Newton, Meth. of Flux. and Inf. Series, above cited.

Thus, if it were required to find the arc of a circle from its given tangent, that is, to find the value of v in the fluxional equation, $\dot{v} = \frac{\dot{x}}{1+xx}$, by an infinite *ſeries*: divide $\dot{x}$ by $1 + xx$, the quotient will be the *ſeries* $\dot{x} - x^2\dot{x} + x^4\dot{x} - x^6\dot{x} +$, &c. And taking the fluents of each term, we ſhall have $v = x - \frac{1}{3}x^3 + \frac{1}{5}x^5 - \frac{1}{7}x^7 +$, &c. which is the *ſeries* often uſed for the quadrature of the circle. If $x = 1$, that is, if x be the tangent of 45°, then will $v = x - \frac{1}{3}x^3 + \frac{1}{5}x^5 - \frac{1}{7}x^7$, &c. which is the *ſeries* often uſed for the quadrature of the circle. If $x = 1$, that is, if x be the tangent of 45°, then will $v = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} +$, &c. = the length of an arc of 45°, that is, $\frac{1}{8}$ of the circumference of a circle, whoſe radius = 1; or $\frac{1}{4}$ of the circumference, if the diameter

diameter = 1. Consequently, if 1 be the square of the diameter, $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} +$, &c. = the area of the circle; because $\frac{1}{4}$ of the circumference multiplied by the diameter, gives the area of the circle. And this is Leibnitz's *series*, and also James Gregory's.

SERIES, *harmonical*. See HARMONICAL.

SERIES, *hyperbolic*, is used for a *series* whose sum depends upon the quadrature of the hyperbola. Such is the *series* $\frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} +$, &c. De Moivre, Misc. Analyt. p. 111.

SERIES, *interpolation of a*. See INTERPOLATION.

SERIES, *interscendent*. See INTERSCENDENT.

SERIES, *mixt*, that *series* whose sum depends partly on the quadrature of the circle, and partly on that of the hyperbola. De Moivre, Misc. Analyt. p. 111.

SERIES, *recurring*, is used for a *series* which is so constituted, that having taken at pleasure any number of its terms, each following term shall be related to the same number of preceding terms according to a constant law of relation.

Thus in the following *series*,

A B C D E F
$1 + 2x + 3xx + 10x^3 + 34x^4 + 97x^5 +$, &c.

in which the terms being respectively represented by the capitals A, B, C, D, &c. we shall have

$$D = 3Cx - 2Bxx + 5Ax^3$$
$$E = 3Dx - 2Cxx + 5Bx^3$$
$$F = 3Ex - 2Dxx + 5Cx^3, \text{ \&c.}$$

Where it is evident, that the law of relation between D and E is the same as between E and F, each being formed in the same manner from the three terms which precede it in the *series*.

The quantities $3x - 2xx + 5x^3$ taken together and connected with their proper signs give what M. de Moivre calls the *index*, or the *scale of relation*. Sometimes the bare coefficients $3 - 2 + 5$ are called the scale of relation. And this scale of relation subtracted from unity is called the *differential scale*. Thus in the foregoing *series* the scale of relation being $3x - 2xx + 5x^3$, the differential scale will be $1 - 3x + 2xx - 5x^3$.

On the subject of recurring *series*, see M. de Moivre's Miscellan. Analytic. p. 27, seq. and p. 72, seq. as also his Doctrine of Chances, 3d edit. p. 220, seq. and Mr. Euler's Analys. Infinit. tom. i. p. 175, seq.

A recurring *series*, with its scale of relation being given, the sum of that *series* continued in infinitum will also be given. For instance, suppose a *series* $a + bx + cxx + dx^3 + ex^4 +$, &c. where the relation of the coefficient of any term to the coefficients of any two preceding terms may be expressed by $f - g$; that is, $e = fd - ge$; and $d = fc - gb$, &c. Then will the sum of the *series*, continued in infinitum, be,

$$\frac{a + bx - fax}{1 - fx + gxx}$$

To facilitate the intelligence of this rule by a particular example, assume any *series* whereof the two first coefficients are given, such as 2 and 5, and suppose f and g to be respectively 2 and 1; then we shall have the following *series*, $2 + 5x + 8xx + 11x^3 + 14x^4 + 18x^5 +$ &c.

And the sum $= \frac{2 + 5x - 4x}{1 - 2x + xx} = \frac{2 + x}{\overline{1 - x}^2}$

For the proof, divide 1 by $\overline{1 - x}^2$

$1 - 2x + xx)\ 1\ (1 + 2x + 3xx + 4x^3 +$ &c. which multiplied by $2 + x$

$$2 + 4x + 6xx + 8x^3 + \text{\&c.}$$
gives $$+ x + 2xx + 3x^3 + \text{\&c.}$$

the product $= 2 + 5x + 8xx + 11x^3 +$ &c. = the given *series*.

Analogous rules might be derived for more complex cases; and M. de Moivre's general rule is,

1. Take as many terms of the *series* as there are parts in the scale of relation. 2. Subtract the scale of relation from unity, the remainder is the differential scale. 3. Multiply the terms taken in the *series* by the differential scale, beginning at unity, and so proceeding orderly, remembering to leave out what would naturally be extended beyond the last of the terms taken. Then will the product be the numerator, and the differential scale will be the denominator of the fraction expressing the sum required.

But we must here observe, that when the sum of a recurring *series* extended ad infinitum is found by M. de Moivre's rule, it ought to be supposed, that the *series* converges indefinitely, that is, that the terms may become less than any assigned quantity. For, if the *series* diverges, that is, if its terms continually increase, it is not true, that the rule gives the sum. For the sum in such cases is infinite, or greater than any given quantity, whereas the sum exhibited by the rule will often be finite. The rule therefore in this case only gives a fraction, the reduction of which into a *series* gives the proposed *series*. Thus $\frac{1}{\overline{1 - x}^2}$ reduced to an infinite *series* gives the recurring *series* $1 + 2x + 3xx +$ &c. whose scale of relation is $2 - 1$, and its sum by the rule will be $\frac{a + bx - fax}{1 - fx + gxx} = \frac{1 + 2x - 2x}{1 - 2x + xx} = \frac{1}{\overline{1 - x}^2}$ = the quantity from which the *series* arose. But this quantity cannot in all cases be deemed equal to the infinite *series* $1 + 2x + 2xx$, &c. For stop where you will, there will always be a supplement required to make the product of the quotient by the divisor equal to the dividend. When the *series*, indeed, converges infinitely, the supplement diminishing continually, it becomes less than any assigned quantity, and is therefore, without error, reputed nothing; but in a diverging *series*, this supplement becomes indefinitely great, and the *series* deviates indefinitely from the truth. See Mr. Colson's Comment on Sir Isaac Newton's Method of Fluxions and Infinite *Series*, p. 152. Mr. Stirling's Method. Differentialis, p. 36. Bernoulli, de Serieb. Infinit. p. 249. Cramer. Analyse des Lignes Courbes, p. 174.

A recurring *series* being given, the sum or any number of the terms of that *series* may be found. This is prob. iii. p. 73. Miscel. Analyt. and prop. v. p. 223. of the Doctrine of Chances. One solution of the simplest case will be sufficient to give an idea of the method there used.

Let there be a geometric progression $a + ax + ax^2 + ax^3 +$ &c. it is required to find the sum of a number n of its terms. Then will the last term be ax^{n-1}. Suppose the progression continued ad infinitum, and we shall have two infinite progressions, the first beginning with a, and the second with ax^n. Now the difference of the sum of these two must be the sum of the number n of terms. By the rule, the sum of the first infinite progression will be $\frac{a}{1-x}$; and the sum of the second will be $\frac{ax^n}{1-x}$. But $\frac{a}{1-x} - \frac{ax^n}{1-x} = \frac{a - ax^n}{1-x}$, which will therefore be the sum of a number n, of terms.

This quantity $\frac{a - ax^n}{1-x}$ is equal to $\frac{ax^n - a}{x - 1}$, which last expression, calling $ax^{n-1} = l$, will be equivalent to this, $\frac{lx - a}{x - 1}$, which is the common rule for finding the sum of any geometric progression of which a, the first term; x, the ratio; and l, the last term, are given.

The *series* resulting from the division of unity by $\overline{1 - x}^p$ or $\frac{1}{\overline{1 - x}^p} = \overline{1 - x}^{-p}$, is $1 + px + p \times \frac{p+1}{2} xx + p \times \frac{p+1}{2} \times \frac{p+2}{3} x^3 +$ &c. And the sum of any number of terms expressed by n of this *series* will be $\frac{1 - x^n}{\overline{1-x}^p} - \frac{nx^n}{\overline{1-x}^{p-1}} - \frac{\frac{n}{1} \times \frac{n+1}{2}}{\overline{1-x}^{p-2}} x^n - \frac{\frac{n}{1} \times \frac{n+1}{2} \times \frac{n+2}{3}}{\overline{1-x}^{p-3}} x^n -$ &c. which is to be continued till the number of terms $= p$. See Miscel. Analyt. p. 167. Doctrine of Chances, p. 224.

This theorem ia of use in finding the sums of progressions of figurate numbers, and others.

Suppose, for instance, it were required to find the sum of any number n of terms of the geometric progression $1 + x + xx + x^3 +$ &c. generated by $\frac{1}{1-x}$. Here $p = 1$. And the sum will consequently be $= \frac{\overline{1 - x}^n}{\overline{1 - x}^p} = \frac{1 - x^n}{1 - z}$.

Again, if the sum of a number n of terms of the *series* $1 + 2x + 3xx + 4x^3 +$ &c. were required. The *series* is generated from $\frac{1}{\overline{1 - x}^2}$ Then $p = 2$. And the sum $= \frac{1 - x^n}{\overline{1 - x}^2} - \frac{nx^n}{1 - x}$. Suppose $x = 1$, then will the sum be $\frac{nn + n}{2} = n \times \frac{n+1}{2}$ which is the sum of the arithmetical progression $1 + 2 + 3 + 4 +$ &c. continued

tinued to the number n of terms. But it is to be obſerved, that it requires a particular artifice to derive this ſum from the general rule: for at firſt ſight the ſum appears under this form $\frac{1-1}{1-1}^2 \frac{n}{1-1}$ which determines nothing. See Miſc. Analyt. loc. cit.

In like manner, the ſum of a number n of terms of the *ſeries* of triangular numbers will be found to be $n \times \frac{n+1}{2} \times \frac{n+2}{3}$, as in Miſcel. Analyt. p. 168.

By the like methods the ſum of any number of ſquares, cubes, &c. of the natural *ſeries* of numbers may be found. Which may alſo be done by ſir Iſaac Newton's DIFFERENTIAL *method.*

3. In a recurring *ſeries* any term may be obtained whoſe place is aſſigned. For after having taken ſo many terms of the *ſeries* as there are terms in the ſcale of relation, the *ſeries* may be protracted till it reach the place aſſigned. But if that place be very diſtant from the beginning of the *ſeries*, the continuation of the terms will prove laborious: other methods have therefore been contrived. See Miſcel. Analyt. p. 33, ſeq. and Doct. of Chances, p. 224, ſeq.

Theſe queſtions have been reſolved in many caſes, beſides thoſe of recurring *ſeries*. But as there is no univerſal method for the quadrature of curves, neither is there one for the ſummation of *ſeries*; there being a great analogy between theſe things, and ſimilar difficulties ariſing in both. See the authors before cited.

The inveſtigation of Mr. Daniel Bernoulli's method for finding the roots of algebraic equations, which is inſerted in the article EQUATION, depends upon the doctrine of recurring *ſeries*. See Euler, Analyſis Infinitorum, tom. i. p. 276, ſeq.

In general, algebraic quantities may be expreſſed by a *ſeries* either by diviſion or by the extraction of roots, in a method analogous to that uſed in arithmetic for expreſſing vulgar fractions and roots by decimals. And the conſideration of this analogy ſeems to have given riſe to ſir Iſaac Newton's doctrine of infinite *ſeries*. See his Method of Fluxions and Infinite *Series* in the beginning.

But the ſame great author had alſo another method of throwing the quantities into an infinite *ſeries*, by means of a general form aſſumed for that purpoſe. See *Form of a* SERIES, *ſupra.*

SERIES, *reverſion of.* See REVERSION *of ſeries.*

SERIES, *ſummable*, is uſed when the ſum of the terms of a *ſeries* may be found. Such is the *ſeries* $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+$, &c. the ſum of which is ſaid to be equal to unity, or, to ſpeak more accurately, the limit of whoſe ſum is unity.

An indefinite number of ſummable infinite *ſerieſes* may be found: ſuch are, for inſtance, all infinite recurring *ſerieſes*, when converging, and many others, for which Meſſieurs De Moivre, Bernoulli, Stirling, Euler, and Maclaurin may be conſulted. Miſcel. Analyt. p. 110, ſeq. De Serieb. Infinit. paſſim. Method. Different. p. 34. ſeq. Acta Petropolit. paſſim. Fluxions, art. 350, ſeq. See PROGRESSION.

The ſums, or rather the limit of the ſums of infinite *ſerieſes* of fractions, has been one of the principal objects of the modern method of computation; and theſe ſums may often be found. Thus the ſum of $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+$, &c. ad infinitum; or rather, the limit to which this ſum may approach nearer than by a given difference is 1. So likewiſe the limit of the ſum $\frac{1}{3}+\frac{1}{9}+\frac{1}{27}+\frac{1}{81}+$, &c. is $\frac{1}{2}$. And theſe, and the like ſums of geometric progreſſions may be readily found, by applying the common rule for determining the ſum of geometric progreſſions from the firſt and laſt terms and the ratio given. For in theſe converging infinite geometric progreſſions, the laſt term muſt be conſidered as 0; ſo that the ſums of the antecedents of theſe progreſſions are conſidered as the ſum itſelf, becauſe they differ from the ſum of the progreſſion by leſs than any aſſigned quantity; but in every geometric progreſſion the ſum of the antecedents is to the ſum of the conſequents, as one antecedent to one conſequent. Hence calling the ſum S, the firſt term a, and the ratio r, we ſhall have $S : S - a :: a : ar :: 1 : r$. Therefore $Sr = S - a$, or $S = \frac{a}{1-r}$. Thus if $a = \frac{1}{2}$, and $r = \frac{1}{2}$, S will be $= \frac{1}{2}$ divided by $\frac{1}{2}$, or 1. And if $a = \frac{1}{3}$, and $r = \frac{1}{3}$, S will be $= \frac{1}{3}$ divided by $\frac{2}{3}$, or $\frac{1}{2}$; and ſo of the reſt.

But the *ſerieſes* of fractions that occur in the ſolution of problems are rarely reducible to geometric progreſſions; nor can any general rule, in caſes ſo infinitely various, be given. The art here, as in moſt other caſes, is only to be acquired by examples, and by a careful obſervation of the arts uſed by great authors in the inveſtigation of the *ſerieſes* of fractions they have conſidered. And the general methods of infinite *ſeries* which have been carried ſo far by M. de Moivre, Mr. Stirling, and Mr. Euler, are often found neceſſary to determine the ſum of a very ſimple *ſeries* of fractions.—Miſc. Analyt. paſſim. Method. Differentialis. Analyſ. Infinitorum, & Act. Petropol. paſſim.

The ſum of a *ſeries* of fractions decreaſing continually is not always finite, but ſometimes infinite, that is, no limit can be aſſigned but what may be exceeded by the ſum of a certain number of the terms of the *ſeries*. This is the caſe of the *ſeries* $\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\frac{1}{6}$, &c. called the harmonic *ſeries*, the ſum of which (as has been ſaid under the article PROGRESSION) exceeds any given number, and the analogy of this progreſſion with the ſpace comprehended between the Apollonian hyperbola and its aſymptote, ſhews this. But the ſame may be ſhewn independently of the hyperbola from the nature of progreſſions. See Jac. Bernoulli, de Seriebus Infinit.

The foundation of Mr. Bernoulli's demonſtration is, that a number of terms, beginning from any part of the *ſeries*, may be found, the ſum of which ſhall always exceed unity, and conſequently the number of terms of the *ſeries* being ſuppoſed infinite, as many partial ſums as we pleaſe, each exceeding unity, may thus be taken out of the *ſeries*, which therefore may be continued till it exceed any given number.

But if the denominators of this harmonic *ſeries*, $\frac{1}{1}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, &c. be ſquared, that is, if we form the *ſeries* $\frac{1}{1}$, $\frac{1}{4}$, $\frac{1}{9}$, &c. the common numerator of which is 1, and the denominators of which are the ſquares of the natural numbers 1, 2, 3, 4, &c. the ſum of this *ſeries* of fractions will not only be limited, as was ſaid under the head PROGRESSION; but this ſum will be preciſely equal to the ſixth part of the number, which expreſſes the ratio of the ſquare of the circumference of a circle to the ſquare of its diameter. That is, if the circumference be 3.14159, &c. and the diameter 1, then will $\frac{1}{1}+\frac{1}{4}+\frac{1}{9}+\frac{1}{16}+\frac{1}{25}+$, &c. $= \frac{\overline{3.14159,\ \&c.}^2}{6}$. This propoſition was firſt diſcovered by Mr. Euler, and his inveſtigation may be ſeen in the Acta Petropolit. vol. vii. Mr. Maclaurin has ſince obſerved, that this may eaſily be deduced from his Fluxions, art. 822. Philoſ. Tranſ. N° 469.

It would require a treatiſe to enumerate the various kinds of *ſerieſes* of fractions which may be ſummed. Sometimes the ſum or limit of the infinite *ſeries* cannot be aſſigned, either becauſe it is infinite, as in the harmonic *ſeries* $\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}$, &c. or although this ſum be finite, as in the *ſeries* $\frac{1}{1}+\frac{1}{4}+\frac{1}{9}+\frac{1}{16}+$, &c. yet its ſum cannot be aſſigned in finite terms, or by the quadrature of the circle, or hyperbola, which was the caſe of this *ſeries* before Mr. Euler's diſcovery; but yet the ſum of any given number of the terms of the *ſeries* may be expeditiouſly found, and the whole ſum may be aſſigned by approximation, independently of the circle. See Stirling, Method. Different. and De Moivre, Miſcel. Anal.

Beſides the *ſerieſes* of fractions, the ſums of which converge to a certain quantity, there ſometimes occur *ſerieſes* of fractions, which converge by a continual multiplication. Of this kind is the *ſeries* found by Dr. Wallis, for the quadrature of the circle, which he expreſſes thus, $\square = \frac{3\times3\times5\times5\times7\times7\times9\times9\times\ \&c.}{2\times4\times4\times6\times6\times8\times8\times10\times\ \&c.}$ where $\square$ ſignifies the ratio of the ſquare of the diameter to the area of the circle. Hence the denominator of this fraction, continued ad infinitum, is to its numerator as the circle is to the ſquare of its diameter. It may be obſerved, that this *ſeries* is equivalent to $\frac{3\times3}{8} \times \frac{5\times5}{24} \times \frac{7\times7}{48} \times$, &c. or to $\frac{3^2}{3^2-1} \times \frac{5^2}{5^2-1} \times \frac{7^2}{7^2-1} \times$, &c. that is, the product of the ſquares of all the odd numbers 3, 5, 7, 9, &c. is to the product of the ſame ſquares ſeverally diminiſhed by unity, as the ſquare of the diameter is to the area of the circle. Arithmet. Infinit. prop. cxci. Oper. vol. i. p. 469. Id. Oper. vol. ii. p. 819.

Theſe products of fractions, and the like quantities ariſing from the continued multiplication of certain factors, have been particularly conſidered by Mr. Euler, in his Analyſis Infinit. vol. i. chap. xv. p. 221, ſeq.

Mr. Maſeres has given a method of finding, by the help of ſir Iſaac Newton's binomial theorem, a near value of the very ſlowly converging infinite *ſeries*, $x + \frac{x^2}{2} + \frac{x^3}{3} + \frac{x^4}{4} + \frac{x^5}{5}$ &c. when x is very nearly equal to 1;

for

for which see Philosophical Transactions, vol. lxviii. part ii. art. 41. See a new method of investigating the sums of infinite *series*, by Mr. Vince, in Philos. Trans. vol. lxxii. part ii. art. 25.

To find an infinite *series* by extracting of roots; and to find an infinite *series* by a presupposed *series*. See QUADRATURE *of the Circle*.

To extract the roots of an infinite *series*. See EXTRACTION *of Roots*.

SERIES, *transcendental*. See TRANSCENDENTAL.

SERINUS, in *Ornithology*, the name of a small bird; a species of the FRINGILLA in the Linnæan system, common in Germany and Italy, and called by the Austrians *haerngril*, or *hirngryl*. See *Tab*. III. *of Birds*, N° 37.

Its back is of a reddish brown, and its head yellow; the colour being deeper in the male, and paler in the female; the rump is of a beautiful yellowish green, as is also the breast; the belly is white, and the sides have some oblong blackish spots; the tail, and long feathers of the wings are black, and a little greenish at their extremities; the beak is very thick, strong, and short, and is very sharp at the point. It is kept in cages, and sings very sweetly.

SERIOLA, in *Botany*, a genus of the *syngenesia polygamia æqualis* class: its characters are, that the receptacle is paleaceous, the calyx simple, with a soft down. There are four species.

SERIPHIUM, in *Botany*, a genus of the *syngenesia monogamia* class. Its characters are, that the calyx is imbricated; the corolla regular, and has one petal; the seed is single and oblong. There are four species.

SERMOCINATION, *sermocinatio*, in *Rhetoric*, denotes discourse in general, whether held by a person alone, or in company, and is the same with what is otherwise called DIALOGISM.

SERMOLOGUS, SERMOLOGUE, an ecclesiastical book composed of sermons, or homilies of popes, and other persons of eminence and sanctity, formerly read at the feasts of the Confessors, the Purification, All Saints, and on every day from Christmas to the octave of the Epiphany. See HOMILY.

SERMON, a discourse delivered in public, for the purpose of religious instruction and improvement.

SERMON, *funeral*. See FUNERAL.

SERMONES, the title which Horace gives his Satires. See SATIRE.

Critics are divided about the reason of the name; the opinion of father Bossu seems best grounded. A mere observance of feet and measure, such as we find in Terence, Plautus, and in Horace's Satires, he thinks is not sufficient to constitute verse, to determine the work to be poetical, or to distinguish it from prose; unless it have some farther air, or character of poetry; somewhat of the fable or the sublime.

Hence he judges it is, that Horace calls his Satires *prose*, or *sermones*: his Odes have quite another air, and are therefore called *poems*, *carmina*.

SERMONIUM, in *old Records*, a kind of interlude or historical play, which the inferior orders of clergy, assisted by boys, &c. used at times to act in the body of the church, suitable to the solemnity of some festival or high procession day.

This is supposed to have been the origin of the modern drama.

SERMOUNTAIN, in *Botany*, a species of the LASERWORT in the Linnæan system, and, according to others, of the *seseli*, or *wild* SPIGNEL, which grows wild in some of the southern parts of Europe, is raised with us in gardens, and flowers in June.

The seeds of this plant, are the part directed for use in our pharmacopœias, and the roots appear to be useful aromatics, though not regarded in practice; of an agreeable smell, and a warm glowing sweetish taste; the roots have the greatest warmth and pungency; the seeds the greatest sweetness, and the most pleasant flavour. A spirituous extract of the seeds is a very elegant aromatic sweet. Lewis. See SESELI *Seed*.

SERON *of almonds*, is the quantity of two hundred weight; of anise-seed, it is from three to four hundred; of Castile soap, from two hundred and an half to three hundred and three quarters.

SEROSITY, in *Medicine*, an aqueous liquor, or lympha, found in the blood, and other humours.

Degori defines it, a sharp, bilious juice, approaching nearly the nature of blood, but which being extravasated, does not coagulate like the blood.

Disorders of the spleen are attended with *serosities*; the kidneys help to purge off *serosities*.

SERPEGER, in the *Manege*, was used to denote the riding a horse in the serpentine way, or in a tread with waved turnings like the posture of a serpent's body; but is now become obsolete.

SERPENS, in *Astronomy*, a constellation in the northern hemisphere, called more particularly *Serpens Ophiuchi*. The stars in the constellation *Serpens*, in Ptolemy's catalogue, are 18; in Tycho's, 13: in Hevelius's, 22; and in the Britannic catalogue, 64. The longitudes, latitudes, magnitudes, &c. whereof are as follow:

Names and situations of the stars.	Bayer's ch.	Signs.	Longitude ° ′ ″	Latitude. N. ° ′ ″	Magn.
		♏	7 38 45	16 00 52	7
			8 42 07	16 21 3	7
			10 33 31	22 11 0	6.7
Inform. preceding the neck and head of the *Serpent*.			12 04 08	17 50 23	6 6
			12 30 00	19 27 6	6
5					
			13 17 04	18 32 06	6
			10 01 04	9 59 11	7
			14 26 37	17 01 48	7
			9 57 20	32 58 55	6
			14 45 18	20 07 02	6
10					
			16 49 57	17 27 54	6
First of three under the jaw	τ		11 29 35	34 01 52	7
That in first bend of the neck	δ		14 00 35	28 54 23	3
Preced. in 2d bend of the neck	A		17 35 18	18 17 38	6
			11 53 17	35 48 40	6
15					
			14 36 44	27 30 55	7
			13 1 5	33 24 19	6.7
Middle under the jaw	τ		12 40 0	34 23 28	6
Third and subsequent	τ		13 57 54	34 36 12	6
1st from the root of the neck	χ		15 12 31	31 34 09	6
20					
Preced. in the □ of the head, or in extrem. of the cheek	ι		12 51 05	38 08 21	5
			13 23 17	36 59 54	6
Preced. of 2 before the 2d bend	ψ		18 42 50	21 45 03	6
The lucid one of the neck	α		17 43 22	25 31 56	2
Posterior in the 2d bend	A		20 19 46	17 39 25	6
25					
That following the lucida to north by Tycho reckon, the 16 oph.			14 36 34	36 02 33	5
	λ		18 04 56	26 34 53	4
South of □ in root of neck	β		15 37 03	34 21 30	3
			15 45 20	34 27 50	5.6
			21 31 46	15 51 00	6
30					
A small one under that	υ		16 21 06	33 09 36	6
Behind 2d bend before oph. hand	μ		21 37 08	16 16 11	4
			15 40 53	35 34 04	6
Subsequent before the 2d bend	ω		20 27 05	21 47 38	6
In mouth, in middle of □ of head	κ		15 26 47	37 08 50	4
35					
Subsequent behind the 2d bend	b		21 57 13	16 41 49	6
That fol. the lucida to the south	ε		19 59 22	24 02 05	3
Nor, against the nostrils in the □ of the head	δ		15 11 21	40 01 39	4.3
			18 16 18	32 41 18	6
			19 58 18	28 15 34	7
40					
In temples, 1 subsequent of □	γ		18 23 04	35 19 32	3
			26 10 04	11 29 32	6
			23 20 10	25 15 42	6
That without the head to north	π		17 48 23	42 28 52	4
			23 11 47	30 15 25	6
45					
			23 16 17	30 28 14	6
			23 45 56	28 58 4	7
			22 29 59	37 03 33	6
			23 34 07	34 04 40	6
That following preced. oph. hand	σ		29 05 54	22 16 02	5
50					
			27 14 49	35 12 25	6
		♐	11 07 23	9 44 45	6
1st of 3, behind oph. hind thigh	ν		15 57 29	10 18 11	4
These 3 Tycho ranks am. those of oph.			16 12 46	10 08 59	6
South of 2 following this	ξ		20 13 23	7 59 05	4
50					
North of these	ο		21 07 9	10 33 51	5
In last bend, behind oph. hand	ζ		25 47 32	19 47 52	3
Last but one of the tail	η	♑	1 31 03	20 31 56	3
Of three small ones following that — north	d		3 6 51	23 29 53	6
Of three small ones following that — south	c		3 38 38	21 17 24	6
55					
Middle subsequent			4 19 14	22 14 31	6
			11 31 28	29 19 27	5
In extremity of the tail			11 26 15	26 54 41	3
Small one adjacent to this		♑	11 31 48	25 13 45	6

SERPENTS, in the Linnæan system of *Zoology*, an order of animals, belonging to the class of *amphibia*, and comprehending

hending ſix genera, viz. the *crotalus*, or *rattle*-SNAKE; the BOA, or *ſerpent*, including ten ſpecies; the COLUBER, or VIPER; the ANGUIS, or SNAKE; the AMPHISBÆNA, or *annulated ſnake*, the body and tail of which are compoſed of annular ſegments; and the *cæcilia*, or *tentaculated ſnake*, the body and tail of which are wrinkled, without ſcales, and the upper lip furniſhed with two feelers; and including two ſpecies.

The characters of *ſerpents*, according to Linnæus, are theſe; that they are amphibious animals, breathing through the mouth by means of lungs only, and deſtitute of feet, fins, and ears.

Mr. Ray alſo defines *ſerpents* to be creatures breathing by means of lungs, having only one ventricle in the heart, having no feet, and having a long body, covered with ſcales. To which he adds, that in cold ſeaſons they can bear hunger a long time. The greater part of the *ſerpent* claſs are poiſonous, and dangerous in their bite, leaving a miſchievous liquor in the wound made by their tooth, which mixing by this means immediately with the blood, is of fatal conſequence; though the whole creature may be eaten with ſafety, or even the poiſonous liquor, which does this miſchief in the wound, taſted without hurt.

Notwithſtanding that *ſerpents* reſpire by means of lungs, they do not take in and diſcharge their breath by ſuch ſhort intervals as other animals, but what they have once inſpired will ſerve them a long time; for as they are of a cold nature, and their naturally neceſſary vital warmth very ſmall, they do not require ſuch a conſtantly renewed ſupply of that pabulum of vital heat, as thoſe which have more of it; and as with us they lie half the year torpid, and half dead, their vital warmth at that time, like fire ſmothered under aſhes, barely exiſts, and needs perhaps no more air than what the creature took in at one inſpiration, before its laying itſelf down for the ſeaſon, which ſerves it till the life-renewing ſpring returns.

Serpents, according to Mr. Ray, may be divided into the poiſonous and the harmleſs, the firſt having long dentes exerti, with poiſonous liquors contained at their bottom, which on biting they diſcharge into the wound; the others wanting theſe teeth, and this poiſon.

They may alſo be divided in regard to their generation, into the oviparous and viviparous; but this is a leſs firmly founded diſtinction than may be ſuppoſed, ſince all *ſerpents* are truly and properly produced of eggs; and the only difference is, that ſome depoſit their eggs in dung-hills, and the like places, to be hatched by accidental heat; while others retain thoſe eggs to be hatched in their own bodies, and ſo bring forth living young ones. Of the firſt kind is the common ſnake, of the latter the viper. Ray's Syn. Quad. et *Serp.* p. 284. See *Tab. of Serpents*.

SERPENS *bubalinus*. Mr. Cleyer has given a very remarkable account, in the German Ephemerides, of the prodigious ſize, and voracious appetite of this *ſerpent*, and its manner of feeding.

This gentleman aſſures us, that they grow to the length of twenty-five feet, and are ſurpriſingly daring in attacking large creatures for prey; their neck, he obſerves, is ſo ſmall in proportion to the creatures they ſeize, that it is a wonder that they can ſwallow them whole, which yet experience ſhews they certainly do, having no power of tearing them to pieces. This gentleman ſaw a complete ſtag taken out of the belly of one of theſe *ſnakes*, with all its limbs remaining on; and at another time a wild goat, which had been ſwallowed in the ſame manner; and from another a complete porcupine, a very troubleſome morſel; and there was once an inſtance in the Molucca iſlands, of a woman, big with child, being thus ſucked down whole by one of theſe creatures. Ray's Syn. An. p. 333.

The method of their managing their prey is this: when thoroughly lank, lean, and hungry, the *ſnake* lies in wait for any thing it can ſeize; he darts out upon the prey, and ſeizing it with his mouth, winds his body round that of the creature; and this he is able to do with ſuch force, that he will often in twiſting himſelf firmly round the creature, break the bones within its ſkin. This he continues, and at the ſame time is biting with his terrible mouth all the tender parts of the creature, till he has deſtroyed it; or if it be an animal too ſtrong to be killed by theſe ſimple folds, it will drag it to ſome neighbouring tree, and tying it faſt againſt that, draw its body ſo forcibly round it, as to cruſh all its bones to pieces: the part it uſually ſeizes with its teeth, at the ſame time, is the creature's noſe, which he bites ſo forcibly, as not only to ſtop the breath, but to occaſion a diſcharge of blood, which helps to forward its deſtruction.

But the moſt ſingular attack ever known to have been made by this creature, is that recorded by the ſame author, of its ſeizing a buffalo; which it deſtroyed in the manner above deſcribed, though it was a long time about it, and was obliged to have recourſe to the method of tying it up to a tree, againſt which it broke its bones ſeverally, with a noiſe that was heard to a great diſtance. When the creature had thus deſtroyed its prey, it continued breaking of the bones, till there was not one left whole in the body, and the whole reſembled a ſhapeleſs maſs of matter.

The jaws and throat of this, and of the other *ſerpent*-kind, though ſmall and narrow, are prodigiouſly extenſible, and made ſo by nature for the ſwallowing theſe morſels. The *ſerpent*, when the prey lay in this ſtate before it, licked it all over, and covered it thick with its ſaliva, and that ſo regularly, that the whole carcaſe looked as if daubed over with glue: this done, it opened its jaws to a monſtrous extent, and ſucked in the head of the prey, and continuing inceſſantly ſucking, at length drew down the whole body.

This is a work of time, and very often two or three days are employed in it; and when the animal is thus got down, the *ſerpent* is ſwelled up with it, and is no longer in a ſtate of offending, or even of defending itſelf, or ſo much as running away; and the people of the places where this ſpecies is common, well know this, and find it an eaſy thing to deſtroy them in this ſtate, and are very happy when they catch one, as their fleſh is a very delicate food. Ephem. Germ. Ann. 12. Obſ.

SERPENT *cucumber*, in *Botany*. See TRICHOSANTHES.

SERPENS *hypnoticus*. See HYPNOTICUS.

SERPENS *marinus*. See *Sea* SNAKE.

SERPENS *rubeſcens*, the *red ſerpent-fiſh*, in *Ichthyography*, the name of a fiſh, properly of the tænia-kind.

It reſembles the common ſnake in figure, and is of a fine ſtrong red in colour, and marked with oblique lines all down the ſides, and long ones from the gills to the tail, one on each ſide; its mouth is but ſmall, and its teeth ſharp and ſerrated; and it has all over its back a number of fine capillaments, ſet at diſtances from one another, even to the tail, and the ſame on the belly; its tail ends in a ſingle fin.

SERPENS *terrenus*, the *earth-ſerpent*, a name given by ſome of the chemical writers to NITRE. It was originally given to the nitre of the ancients, a ſalt very different from that which we call nitre, but it has ſince been applied alſo to that ſalt.

SERPENT-*ſtones*. See SNAKE-*ſtones*.

SERPENT'S-*tongue*, in *Botany*, a genus of the *cryptogamia filices* claſs; comprehending five ſpecies. See ADDER'S-*tongue*.

SERPENTS-*tongues*. The iſland of Malta abounds with *gloſſopetræ*, or the petrified teeth of ſharks, which, from their reſemblance to a tongue, are by the vulgar ſuppoſed to be the tongues of *ſerpents* turned into ſtone by ſome miracle of St. Paul when he was there. This iſland abounds not only with theſe, but with bufonitæ, and vaſt numbers of other remains of ſea productions.

Auguſtino Scilla, who has written at large on the foſſils of this iſland, gives a very rational account of their being the real remains of animals, which, according to his ſyſtem, it is no way wonderful to find there.

In regard to the iſland of Malta, which ſo abounds with them at this time, he ſuppoſes that long ſince the time of the creation, and even without the aſſiſtance of the general deluge, it may have been formed out of the ſea, and that it appears plainly to have been at firſt no other than a maſs of ſoft mud, with an immenſe number of ſea-ſhells, teeth of fiſhes, and other remains of ſea animals mingled among it; and that theſe ſubſiding as low as they could among that thickening matter, have made the iſland what we now find it, that is, a heap of earth with theſe things in vaſt quantities buried in it, and at different depths. Philoſ. Tranſ. N° 219. p. 182.

And though there are found among theſe teeth, &c. in the iſland of Malta, great quantities of ſhells, of ſuch ſpecies, as are not natives of thoſe ſeas, this is no objection to the opinion; ſince it is well known that the winds when violent, as they probably were about the time of the formation of that iſland, will bring ſuch light bodies as ſhells a vaſt way in water.

The mountains of Sicily afford ſome few *gloſſopetræ*, or *ſnakes-tongues*, but they are few in number, and worſe prepared than thoſe of the iſland of Malta; which is probably owing to the high ground of thoſe mountains being leſs likely to receive the refuſe of the ſea, and its ſoil, which is ſandy, being leſs fitted to preſerve them when there than the marl, of which the iſland of Malta conſiſts.

The *echini marini*, or *ſea-eggs*, and their ſpecies, which are very frequent among the *ſerpents-tongues* of Malta, all lie upon the ſurface of the ground, or near it; whereas the *gloſſopetræ* lie deeper, though at no great depth. This is a plain effect of all theſe things having been really animal

mal bodies, and having floated in the mud, of which that island was formed; for in this it could not be otherwise, but that the *glossopetræ*, or *serpents-tongues*, being heavy, would subside in the water, while the light shells of these other animals would float on, or near the surface.

Whenever the *glossopetræ* are taken carefully up out of the earth in Malta, the marl or earth, which served for their bed, is found to contain all their minutest traces and lineaments, like wax from a seal. This is a proof that the marl was as soft as melted wax when they were put into it, and that they were of the full size and growth when placed there, not having grown, or had any increase in that place.

The apophyses, or processes in the *glossopetræ*, are also a strong proof of their being no other than real sharks-teeth, since they exactly answer to those in the teeth of recent sharks, by which every tooth is received or inserted into its neighbour in the jaw. Nay, whereas sharks-teeth are mortised into one another in such a manner, that a man may easily tell which belongs to each side, which lie near the throat, and which near the front of the mouth; and whereas, in a shark's mouth, the teeth on the left side will not fit on the right, nor those above serve below, but that on seeing a recent tooth, a person of judgment will be able to say what part of the mouth it belonged to; so in the fossile shark's teeth, or *glossopetræ*, there is not any one which may not be referred to the particular part of the mouth of the living animal, and could have belonged to no other. Agustino Scilla, de Petrifac. See GLOSSOPETRA.

SERPENT, a musical instrument, serving as a bass to the CORNET, or *small shawm*, to sustain a chorus of singers in a large edifice. It has its name *serpent* from its figure, as consisting of several folds or wreaths, which serve to reduce its length, which would otherwise be six or seven feet.

It is usually covered with leather, and consists of three parts, a mouth-piece, a neck, and a tail. It has six holes, by means whereof it takes in the compass of two octaves.

Mersennus, who has particularly described this instrument, mentions some peculiar properties of it, e. g. that the sound of it is strong enough to drown twenty robust voices, being animated merely by the breath of a boy, and yet the sound of it may be attempered to the softness of the sweetest voice. Another peculiarity of this instrument is, that great as the distance between the third and fourth hole appears, yet whether the third hole be open or shut, the difference is but a tone.

For a figure of this instrument, see *Tab. Music, fig.* 12.

SERPENT, in *Mythology*, was a very common symbol of the sun, and he is represented biting his tail, and with his body formed into a circle, in order to indicate the ordinary course of this luminary; and under this form it was an emblem of time and eternity.

The *serpent* was also the symbol of medicine, and of the gods which presided over it, as of Apollo and Æsculapius: and this animal was the object of very ancient and general worship, under various appellations and characters. In most of the ancient rites we find some allusion to the *serpent*, under the several titles of Ob, Ops, Python, &c.

This idolatry is alluded to by Moses, Lev. xx. 27. The woman at Endor who had a familiar spirit, is called *Oub*, or *Ob*, and it is interpreted Pythonissa: the place where she resided, says the learned Mr. Bryant, seems to have been named from the worship then instituted; for Endor is compounded of *En-ador*; and signifies *fons pythonis*, the *fountain of light*, the oracle of the god Ador; which oracle was probably founded by the Canaanites, and had never been totally suppressed. His pillar was also called *Abbadir*, or *Abadir*, compounded of *ab* and *adir*, and meaning the *serpent* deity *Addir*, the same as *Adorus*.

In the orgies of Bacchus, the persons who partook of the ceremony, used to carry *serpents* in their hands, and with horrid screams call upon Eva! Eva!

Eva being, according to the writer just mentioned, the same as epha, or opha, which the Greeks rendered *ophis*, and by it denoted a *serpent*.

These ceremonies, and this symbolic worship began among the Magi, who were the sons of Chus; and by them they were propagated in various parts. Wherever the Amonians founded any places of worship, and introduced their rites, there was generally some story of a *serpent*. There was a legend about a *serpent* at Colchis, at Thebes, and at Delphi; and likewise in other places. The Greeks called Apollo himself *Python*, which is the same as *Opis*, *Oupis*, and *Oub*.

In Egypt there was a *serpent* named *Thermuthis*, which was looked upon as very sacred; and the natives are said to have made use of it as a royal tiara, with which they ornamented the statues of Isis. The kings of Egypt wore high bonnets, terminating in a round ball, and surrounded with figures of asps; and the priests likewise had the representation of *serpents* upon their bonnets.

Abadon, or Abaddon, mentioned in the Revelations xx. 2. is supposed, by Mr. Bryant, to have been the name of the Ophite god, with whose worship the world had been so long infected. This worship began among the people of Chaldea, who built the city of Ophis upon the Tigris, and were greatly addicted to divination, and to the worship of the *serpent*. From Chaldea the worship passed into Egypt, where the *Serpent* deity was called *Canoph*, *Can-eph*, and *C'neph*; it had also the name of *Ob* or *Oub*, and was the same as the *Basiliscus*, or *royal Serpent*, the same as the *Thermuthis*, and made use of by way of ornament to the statues of their gods. The chief deity of Egypt is said to have been Vulcan, who was styled *Opas*; he was the same as OSIRIS, the *Sun*, and hence was often called *Ob-el*, or *Pytho sol*; and there were pillars sacred to him, with curious hieroglyphical inscriptions, bearing the same name, whence among the Greeks, who copied from the Egyptians, every thing gradually tapering to a point was styled *obelos*, or *obeliscus*.

As the worship of the *serpent* began among the sons of Chus, Mr. Bryant conjectures, that from thence they were denominated *Ethiopians* and *Aithiopians*, from *Athope*, or *Ath-opes*, the god whom they worshipped, and not from their complexion: the Ethiopes brought these rites into Greece, and called the island where they first established them, *Ellopia*, *Solis Serpentis insula*, the same with *Eubœa*, or *Oubaia*, *i. e.* the *Serpent-island*.

The same learned writer discovers traces of the *serpent* worship among the Hyperboreans, at Rhodes, named Ophiusa, in Phrygia, and upon the Hellespont, in the island Cyprus, in Crete, among the Athenians, in the name of *Cecrops*, among the natives of Thebes in Bœotia, among the Lacedæmonians, in Italy, in Syria, &c. and in the names of many places, as well as of the people where the Ophites settled. One of the most early heresies introduced into the Christian church was that of the OPHITÆ. Bryant's Analysis of Ancient Myth. vol. i. p. 47, &c. p. 473, &c.

SERPENTARIA, a medicinal plant, called by the ancients *pistolochia*, and *dracunculus*; by us popularly *snake-root*, and sometimes *serpentary*. See SNAKE-*root*.

SERPENTARIUS, in *Astronomy*, a constellation of the northern hemisphere, called also *Ophiuchus*, and anciently *Æsculapius*.

The stars in the constellation *Serpentarius*, in Ptolemy's catalogue, are 29; in Tycho's, 15; in Hevelius's 40; in the Britannic catalogue, they are 74. The longitudes, latitudes, magnitudes, &c. whereof, are as follow:

Names and situations of the stars.	Bayer's char.	Signs.	Longitud. ° ′ ″	Latitude ° ′ ″	Magnitude.
North in the preced. hand	δ	♏	27 58 15	17 17 15 N	3
South and subsequent	ε		29 10 45	16 28 20 N	3.4
North in the preceding knee	υ	♐	0 58 20	13 00 18 N	5
South in the preceding leg	ψ		3 14 18	1 36 09 N	5
Under the sole of preced. foot	g		4 07 58	1 42 35 S	5
5					
		♏	28 53 05	26 22 14 N	6
Middle in the preceding leg	χ	♐	3 40 25	3 16 32 N	6
North of these	φ		4 21 26	5 14 41 N	4
In preceding heel	ω		5 19 53	0 28 40 N	5
In the cubitus of preced. arm	λ		1 15 38	23 35 38 N	4
10					
			1 03 21	27 08 34 N	6
			3 23 19	19 34 17 N	6
South in preceding knee		ζ	4 53 55	11 25 27 N	3
			4 17 45	23 12 34 N	6
			8 45 56	0 45 20 S	6
15					
			5 20 03	23 11 30 N	6
			4 12 41	30 41 18 N	6
			9 45 21	2 07 05 S	7
			5 38 12	24 17 04 N	6
			8 03 05	11 38 00 N	5.6
20					
			6 54 17	23 35 16 N	6
			10 47 13	0 51 43 S	7
			8 42 16	16 22 01 N	6
			11 13 03	0 37 15 S	7
Preceding of 2 in fore shoulder	ι		6 17 51	32 32 16 N	4
25					
			11 08 21	2 11 00 S	6
Subsequent	κ		7 30 12	31 52 20 N	4
	♑		12 49 55	2 51 17 S	7
			11 56 42	3 55 50 N	6
			10 09 17	18 28 21 N	6

Names and situations of the stars.	Bayer's ch.	Signs.	Longitud. °	′	″	Latitude °	′	″		Magn.
30										
			13	00	15	2	46	40	S	6
			8	12	21	36	42	00	N	6
			8	38	08	36	15	20	N	6
			8	42	45	36	13	35	N	6
Against the hind knee	η		13	38	46	7	13	53	N	3
35										
	A		15	42	14	3	24	09	N	6
In the toes of the hind foot			11	36	21	33	29	37		6
			16	12	47	3	29	39	S	6.7
In the back of the hind foot	ς		16	06	17	1	08	53	S	6
			16	33	55	2	04	43	N	4
40										
			14	25	04	22	38	32	N	6
	θ		17	03	11	1	47	47	S	4·3
			17	33	05	4	54	47	S	4·5
	B		17	59	54	0	54	03	S	5·4
			18	31	16	6	34	12	S	6
45										
			14	23	27	37	21	14	N	6
			17	28	40	10	44	52	N	6
			15	11	14	36	02	45	N	6
In the middle of the back	σ		16	15	52	27	20	39	N	6
	e		19	00	57	0	31	20	N	7
50										
Posterior in the heel	e		19	09	15	0	38	23	S	6
			19	57	38	1	19	59	N	6
			8	11	12	32	54	27	N	6
			17	53	59	36	28	22	N	6
	α		18	05	32	35	53	16	N	2
55										
			18	06	51	36	27	27	N	5
In the cubitus of hind arm	μ		20	14	37	5	15	51	N	4
Last of those that follow the foot			21	48	44	1	44	45	N	5
			22	35	09	1	36	01	N	6
North of 2 in poster. shoulder	β		21	00	44	27	58	00	N	3
60										
			21	22	46	26	01	24	N	6
South in the hind shoulder	γ		22	18	32	26	09	20	N	3
			24	31	30	1	24	08	S	5
South in the hind hand	ν		25	25	16	13	42	45	N	4
			25	46	01	5	28	51	N	7
65										
Of three informes behind the posterior shoulder — north	η		25	44	33	27	51	03	N	4·5
middle	ο		25	51	19	26	24	31	N	4
south	Κ		26	09	17	24	47	07	N	4
North in the posterior hand	τ		26	27	22	15	17	31	N	5
That foll. middle informis	ρ		27	09	16	26	03	54	N	4
70										
North of those foll. the head	ς		27	47	41	32	11	53	N	6
South and bright. of those	ς		27	49	43	33	01	25	N	6
After 4 informes following the should. — preced.	q		28	21	39	27	26	14	N	6
subseq.	r		1	29	49	26	44	36	N	6

SERPENTINE *verses*, are such as begin and end with the same word. As,

Ambo florentes ætatibus, Arcades ambo.

SERPENTINE, in *Chemistry*, a WORM, or pipe of copper, or pewter, twisted into a spiral, and ascending from the bottom of the alembic to the capital, and serving in the distillation of rectified spirit of wine.

SERPENTINE *marble* or *stone*, a kind of marble called by the ancients *ophites*, from the Greek οφις, *serpent*, as being speckled like a serpent's skin.

The ground of the *serpentine* is usually blackish, but it is beset with green and yellowish stains, streaks, &c. being withal exceeding hard.

The scarceness of the *serpentine* is such as only allows it to be used by way of incrustation. The largest pieces we know of, are some tables in the compartiments of the Attic of the Pantheon; and two columns in the church of St. Laurence in Lucina at Rome.

There is also a kind of *serpentine* brought from Germany, used to make vessels of, but not in building. See OPHITES.

SERPENTINE, in the *Menage*. A horse is said to have a *serpentine* tongue, if it is always frisking and moving, and sometimes passing over the bit, instead of keeping in the void space, called the liberty of the tongue.

SERPENTINE *column*. See COLUMN.

SERPI, *grotta del*. See GROTTA.

SERPICULA, in *Botany*, a genus of the *monoecia tetrandria* class. Its characters are: that it has male and female flowers; the calyx of the former is quadridentate, and the corolla has four petals; the calyx of the latter is quadripartite; and the pericarpium is a nut covered with a whitish down. There is one species.

SERPIGO, in *Surgery*, a kind of herpes, popularly called a *tetter* or RINGWORM.

SERPYLLIUM, in *Botany*. See THYME.

SERRA *piscis*, in *Ichthyology*, a name given by many authors to the *pristis*, or SAW-*fish*.

SERRA is also a name given by Pliny to a species of the balistes, called by the generality of writers *scolopax*. It is distinguished by Artedi by the name of the *balistes*, with two spines in the place of the belly-fins, and one behind the anus. See TRUMPET-*fish*.

SERRATA, a name given by some of the Roman authors to the plant which the Gauls, according to Pliny, had named *betonica*, and which the Greeks called *cestrum psuchrotrophon*, and *priorites*. This was evidently the same plant with our *serratula*, or saw-wort; but beside this there was another plant called by this name, and which, according to Pliny, was the *chamædrys* or *germander* of the Greeks.

Dioscorides says nothing of the chamædrys, but that its leaves were small. And it is much more probable, that the world should take the idea of a saw from the leaves of the serratula, than from those of this plant, they being much less nicely denticulated than those. So that those who have been influenced by Pliny, to suppose the *germander* and *serrata* of the ancients to be the same plant, are in the wrong, though they have the countenance of this so generally reputed authentic author for it.

SERRATE *flies*, in *Natural History*, a name given by authors to certain flies, distinguished from all the other kinds by their having a weapon resembling a double saw, placed at the hinder part of the body; this serves several species of them to make holes in the branches of trees, in which they deposit their eggs; but there are some of them which do not seem to make any use of this curious instrument, though they have it. See ROSE-*fly*.

The *fly* of this kind that lays its eggs on the gooseberry-bush, deposits them only on the surface of the middle rib of the leaf; and the osier-fly, which is one of this genus, produced from a bastard caterpillar of the osier, lays its eggs on the intermediate surface of the leaves between the ribs.

There appears to be no use made of this curious instrument in the depositing of these eggs, since they are only laid in rows upon the leaves, and fixed to them by means of a viscous fluid which covers them. It is a very remarkable property in the eggs of this genus of *flies*, that they grow much larger after they are laid. This is observable in the eggs of the common rose-fly, which are at first buried in the wood, and by their growth force out the surface into tumors of an oval figure; but in these of the osier-fly it is most beautifully seen, and the whole growth of the fœtus in them is clearly seen, on examining them at different times of their growth, which may be easily done without disturbing them, as they lie naked on the surface of the leaf.

There seems a plain proof that the egg receives some sort of benefit, and that a very essential one to its preservation, from the juices of the plant on which it is deposited, since, if those leaves be pulled off from the plant, and left to dry, the eggs always dry up with them, and perish; whereas, if the ends of these leaves be put into water, and the leaf be by that means preserved fresh and juicy, the creature hatches from it as well as if it was left upon the tree. Reaumur's Hist. Inf. vol. ix. p. 164.

SERRATED *leaf*, in *Botany*. See LEAF.

SERRATULA, *saw-wort*, in *Botany*, a name given to several species of *jacea*. See SAW-*wort*.

SERRATUS, in *Anatomy*, a name given to several muscles, from their resemblance, in shape, to a saw. Such are the

SERRATUS *anticus minor*, called also PECTORALIS *minor*; which arises thin and fleshy from the second, third, fourth, and fifth superior ribs, and ascending obliquely, is inserted into the processus coracoides of the scapula. This muscle assists the rhomboides and angularis, as moderators of the action of the trapezius and *serratus major*, in turning the point of the acromium upward, the superior angle downward, and the inferior angle forward. It is likewise an assistant to the rhomboides and angularis, in returning the scapula to its natural situation, when the trapezius and *serratus major* cease to act, by drawing downward the apophysis coracoides in which it is inserted. Some have improperly reckoned it among the muscles employed in respiration; but as the *serratus major*, which principally keeps the shoulder in a fixed position, is partly inserted in the same ribs, and in this action must keep them depressed, it will be impossible for this muscle to raise them. Winslow. See *Tab. Anat.* (*Myol*) *fig.* 2. *n.* 10.

SERRATUS *anticus major*, comes from the whole basis of the scapula, and is inserted into the seven true ribs, and often in one or two of the false ribs, by so many distinct portions or digitations, representing the teeth of a saw. See *Tab. Anat.* (*Myol.*) *fig.* 7. *n.* 15. 15. *fig.* 1. *n.* 42. *fig.* 2. *n.* 26.

This muscle is broad, thick, and pretty fleshy, and lies on the lateral part of the thorax, between the ribs and scapula, by which it is covered. The figure is that of an irregular square.

Though the digitations of this muscle give it a radiated appearance from the scapula to the ribs, yet these radii

do not all lie in that disposition, which at first sight one would be apt to imagine. The muscle is made up of two planes, one great, the other small; the small plane looks like a distinct narrow muscle, closely adhering to the superior edge of the great plane. It is fixed by one extremity under the superior angle of the scapula, and by the other to the first rib by a small insertion, and to the second rib by a broad one.

This plane is easily seen by turning the scapula forward, having first separated the rhomboides; but when it is turned back, the pectoralis minor being first cut off, this plane does not appear, being covered and hid by the broad one. The broad plane may be divided into two portions, one superior, the other inferior, adhering to each other at their edges.

The superior portion is thin, and takes up about three-quarters of the basis of the scapula, reckoning from the superior angle; from thence it contracts by small degrees, and forms two digitations very like these of the small plane, which they cover by their insertions in the two first true ribs, or in the second and third, and sometimes in all the three. The inferior portion is fixed in the lower quarter of the basis scapulæ, from whence it expands itself by six or seven very long fleshy digitations, which decrease in breadth as they descend, and are inserted in the manner before mentioned, in the six or seven ribs which follow the two first. The *serratus major* serves to raise the shoulder, or top of the scapula, bring it forward, and hinder it from sinking. Winslow.

SERRATUS *posticus superior*, is a flat thin muscle, situated on the upper part of the back. It is fixed on one side by a broad aponeurosis, to the lower part of the posterior cervical ligament, and to the spinal apophyses of the two last vertebræ of the neck, and two first of the back; from thence it runs down a little obliquely forward, and is inserted by broad fleshy digitations, in the posterior part of the second, third, fourth, and sometimes of the fifth true ribs, near their angles; but sometimes it has no insertion in the second rib. It is covered by the rhomboides, and closely united with it. See *Tab. Anat.* (*Myol.*) *fig.* 7. *n.* 31.

SERRATUS *posticus inferior*, is a flat thin muscle, lying on the lower part of the back; it is fixed in the last spinal apophysis of the back and in the three first of the loins by a broad aponeurosis; from thence it runs up a little obliquely, and is fixed by fleshy broad digitations in the last four false ribs. Its insertion in the lowest rib is near the cartilage, and in the other three near their angles. It is covered by the latissimus dorsi, to which it adheres very closely, and it covers the sacro lumbaris, and longissimus dorsi.

The use of these muscles is to enlarge the cavity of the thorax in one direction, and to contract it in the other; for the *serratus posticus superior* is disposed to move upwards, the three or four upper ribs next the first; and the *serratus postius inferior* is still better disposed for depressing the last three or four false ribs. Winslow.]

SERTA, *garlands*, among the *Ancients*. See GARLAND.

SERTULA *campana*, in *Botany*, a name given by some authors to melilot.

SERTULARIA, in *Natural History*, the name of a genus of *zoophytes*, in the class of worms. The characters of this genus of bodies, according to Linnæus are, that they have the flowers of the *hydra*, and that their stem is radicated, fibrose, and articulated; and that the joints are uniflorous. This genus comprehends forty-two different species of CORALLINES.

SERVAGE. See SERVICE.

SERVAL, in *Zoology*. See CATUS *pardus*.

SERVANT, SERVUS, a term of relation, signifying a person who owes and pays a limited obedience for a certain time to another, in quality of master.

The first sort of *servants*, acknowledged by the laws of England, are *menial servants*; so called from being *intra moenia*, or *domestics*. The contract between them and their master arises upon the hiring: if the hiring be general, without any particular time limited, the law construes it to be hiring for a year; but the contract may be made for any larger or smaller term. All single men between twelve years of age and sixty, and married ones under thirty years of age; and all single women between twelve and forty, not having any visible livelihood, are compellable by two justices to go out to service in husbandry, or certain specific trades, for the promotion of honest industry: and no master can put away his *servant*, or *servant* leave his master after being so retained, either before or at the end of his term, without a quarter's warning, unless upon reasonable cause, to be allowed by a justice of the peace; but they may part by consent, or make a special bargain.

Another species of *servants* are called APPRENTICES: a third sort are labourers. See LABOUR.

And there is a fourth species, if they may be called *servants*, being rather in a superior capacity of service; such as stewards, factors, and bailiffs, whom, however, the law considers as *servants pro tempore*, with regard to such of their acts as affect their master's or employer's property.

A master may by law correct his apprentice, or *servant*, for negligence, or other misbehaviour, provided it be done with moderation; though, if the master's wife beats him, it is good cause of departure: but if any *servant*, workman, or labourer assaults his master or dame, he shall suffer one year's imprisonment, and other open corporal punishment, not extending to life or limb. 5 Eliz. c. 4.

By service all *servants* and labourers, except apprentices, become intitled to wages, according to their agreement, if menial *servants*; or according to the appointment of the sheriff or session, if labourers or *servants* in husbandry.

A master may maintain, i. e. abet or assist his *servant* in any action at law against a stranger; he may also bring an action against any man for beating or maiming his *servant*, assigning his damage by the loss of service, and proving the loss upon the trial: he may likewise justify an assault in defence of his *servant*, and a *servant* in defence of his master: and if any person hire or retain my *servant*, being in my service, I may have an action for damages against both the new master and the *servant*, or either of them; but if the master did not know that he is my *servant*, no action lies, unless he afterwards refuse to restore him upon information and demand.

As for those things which a *servant* may do in behalf of his master, they seem to be grounded on this principle, that the master is answerable for the act of his *servant*, if done by his command, either expressly given or implied; therefore, if the *servant* commit a trespass by the command or encouragement of his master, the master shall be guilty of it: if an inn-keeper's *servants* rob his guests, the master is bound to restitution; and if the drawer at a tavern sells a man bad wine, whereby his health is injured, he may bring an action against the master. In the same manner, whatever a *servant* is permitted to do in the usual course of his business, is equivalent to a general command; if I pay money to a banker's *servant*, the banker is answerable for it; if a steward lets lease of a farm without the owner's knowledge, the owner must stand to the bargain: a wife, friend, or relation, that use to transact business for a man, are *quoad hoc* his *servants*, and the principal must answer for their conduct. Farther, if a *servant*, by his negligence, does any damage to a stranger, the master shall answer for his neglect: if a smith's *servant* lames a horse while he is shoeing him, an action lies against the master, and not against the *servant*. A master is chargeable if any of his family layeth or carrieth any thing out of his house into the street, or common highway, to the damage of any individual, or the common nusance of his majesty's liege people. In cases of fire the *servant* is accountable. Blackst. Com. book i. p. 425, &c. See LARCENY.

The Romans, besides their slaves, whom they also called *servi*, had another kind of *servants*, whom they called *nexi* and *addicti*, who were such as, being in debt, were delivered up to their creditors by the prætor, to work out their debt, after which they were again at liberty.

The pope, out of his wonderful humility, calls himself in his bulls, *the servant of the servants of God*, *servus servorum Dei*. The first who used the appellation, as Diaconus tells us, were pope Damasus and Gregory the Great, which last is said to have used it to check by his modesty, the arrogance of John, patriarch of Constantinople, who took the title of *œcumenical*—Du Cange adds, that the title *servant* has been assumed by some bishops, some kings, and some monks.

SERVE, in the *Sea Language*; to *serve* a rope, is to lay spun yarn, rope yarn, sennit, a leather, a piece of canvas, or the like upon it, which is rolled fast round about the rope, to keep it from fretting or galling in any place.

SERVETISTS, in *Ecclesiastical History*, a sect said to be the disciples or followers of Michael Servetus, the ringleader of the Anti-trinitarians of these last ages.

Servetus, who was distinguished by his genius, learning, eloquence, resolution, and piety, was born at Villa Nueva, in the kingdom of Arragon, and after a variety of adventures settled at Vienne in Dauphiné, where he applied himself with success to the practice of physic. See CIRCULATION *of the Blood*.

Having escaped from prison at Vienne, he passed through Switzerland, in order to seek refuge in Italy, when Calvin caused him to be apprehended at Geneva, in the year 1553, and had an accusation of blasphemy brought against him before the council. The issue of this accusation was fatal to *Servetus*, who, adhering resolutely to the opinions he had embraced, was, by a public sentence of the court, declared an obstinate heretic, and in consequence thereof condemned to the flames.

It is impossible (says the translator of Mosheim's Eccl. Hist.)

Hist.) to justify the conduct of Calvin in the case of *Servetus*, whose death will be an indelible reproach upon the character of that great and eminent reformer. The only thing that can be alledged, not to efface, but to diminish his crime is, that it was no easy matter for him to divest himself at once of that persecuting spirit, which had been so long nourished or strengthened by the popish religion in which he was educated.

Servetus, in reality, had not any disciples, as being burnt, together with his books, before his dogmas had time to take root. But the name *Servetists* has been given to some of the modern Anti-trinitarians, because they follow the footsteps he had marked out.

However, those who were denominated *Servetists* or *Servetians*, by the theological writers of the sixteenth century, not only differed from *Servetus* in many points of doctrine, but also varied widely from him in his doctrine of the Trinity, which was the peculiar and distinguishing point of his theological system.

Sixtus Senensis calls the Anabaptists *Servetists*, and seems to use the two terms indifferently. The truth is, in many things, the ancient Anabaptists of Switzerland, &c. coincided in opinion with Servetus.

As the books that he wrote against the Trinity are very rare, his real sentiments are but little known: M. Simon, who had a copy of the first edition, delivers them at large in his critical history.

Though Servetus uses many of the same arguments against the Trinity as the Arians, yet he professes himself very far from their sentiments. He also opposes the Socinians in some things; and declares his dissent from the opinions of Paulus Samosatenus; though Sandius mistakenly charges him with having the same sentiments.

In effect, he does not seem to have had any fixed regular system of religion, at least not in the first edition of his book against the Trinity, published in 1531, under the title, De Trinitatis Erroribus Libri septem, per Michaelem Servetum, alias Reves, ab Arragonia Hispanum.

The year following he published his dialogues on the mystery of the Trinity. In the preface to which last work, he declares himself dissatisfied therewith. It was on this account he undertook another on the same subject, of much greater extent, which did not appear till the year 1553, a little before his death, under the title of Christianismi Restitutio.

Those of Geneva, having seized the copies of this edition, had it burnt; nor were there above two or three that escaped; one of which was kept at Basil, where the book was printed, but is now in the college library at Dublin.

It was put to the press secretly in England, but being discovered, the impression was seized and destroyed.

Servetus, according to Mosheim's account, conceived that the genuine doctrine of Christ had been entirely lost, even before the council of Nice; and he was, moreover, of opinion, that it had never been delivered with a sufficient degree of precision in any period of the church. To these extravagant assertions, he added another still more so, even that he himself had received a commission from above to reveal anew this divine doctrine, and to explain it to mankind. His notions with respect to the Supreme Being, and a trinity of persons in the Godhead, were very obscure and chimerical, and amounted in general to the following propositions: that the Deity, before the creation of the world, had produced within himself two personal representations or manners of existence, which were to be the medium of intercourse between him and mortals, and by whom, consequently, he was to reveal his will, and to display his mercy and beneficence to the children of men: that these two representatives were the Word and the Holy Ghost: that the former was united to the man Christ, who was born of the virgin Mary, by an omnipotent act of the Divine Will; and that, on this account, Christ might be properly called *God*: that the Holy Spirit directed the course, and animated the whole system of nature, and more especially produced in the minds of men wise counsels, virtuous propensities, and divine feelings; and, finally, that these two representations were to cease after the destruction of this terrestrial globe, and to be absorbed into the substance of the Deity, from whence they had been formed.

Servetus, however, did not always explain his system in the same manner, nor avoid inconsistencies, contradictions, and ambiguities; so that it is extremely difficult to learn his true sentiments. His system of morality agreed in many circumstances with that of the Anabaptists, whom he also imitated in censuring with the utmost severity the custom of infant-baptism. Eccl. Hist. vol. iv. p. 170, &c. ed. 8vo. 1768.

SERVICE, or SERVAGE, *servitium*, in *Law*, a duty which the tenant, by reason of his fee, owes to the lord.

This, in pure, proper, and original feuds, was only twofold: to follow, or to do suit to, the lord in his courts in time of peace; and in his armies, or warlike retinue, when necessity called him to the field.

Ancient law-books make several divisions of *service*; viz. into *personal*, *real*, and *mixt*; *military* and *base*; *intrinsic* and *extrinsic*, &c. But since the statute 12 Car. II. whereby all tenures are turned into free and common socage; much of that learning is set aside. Yet it may not be amiss to mention how the several kinds of *service* are described in our ancient law-books.

SERVICE, *personal*, is that to be performed by the person. Such is that due from a slave to his master.

SERVICE, *real*, is either *urbane* or *rustic*; which two kinds differ, not in the place, but the thing. The first is that due from a building or house, in whatever place situate, whether city or country; as the keeping a drain, a vista, or the like.

SERVICES, *rustic*, are those due for grounds where there is no building; such is the right of passage through ways, &c.

SERVICE, *mixt*, is that due from the person, by reason of the thing, as an usufruit, &c.

Our ancient law-books tell us of lands held of the king, by the tenant's letting a fart before the king on New Year's Day; others, by furnishing the king with whores whenever he travelled that way; others, by bringing the king a mess of pottage at his coronation-feast, &c.

There are also *natural* SERVICES. For instance, if a man cannot gather the produce of his lands without passing through his neighbour's grounds, the neighbour is obliged to allow a passage, as a *natural service*.

SERVICE, *forensic*, or *extrinsic*, *servitium forensecum*, &c. was a *service* which did not belong to the chief lord, but to the king.

It was called *forensic* and *extrinsic*, because done *foris*, out of doors; and *extra servitium*. We meet with several grants, in the Monasticon, of all liberties, with the appurtenances, *salvo forensi servitio*.

SERVICE, *intrinsic*, *servitium intrinsecum*, that due to the chief lord alone, from his vassals within his manor.

SERVICE, *frank*, *servitium liberum*, a *service* done by the feudatory tenants, who were called *liberi homines*, and distinct from vassals: as was likewise their *service*; for they were not bound to any base *services*, as to plow the lord's lands, &c. but only to find a man and horse to attend the lord into the army or court.

SERVICE, *base*. See VILLENAGE.

SERVICE, *bord*. See BORDAGE.

SERVICE, *foreign*, *honourary*, *knights*, *rent*. See the adjectives.

SERVICE, *heriot*. See HARIOT.

SERVICE, *owelty of*. See OWELTY.

SERVICE, *suit of*. See SUIT.

SERVICE, *choral*, in *Church History*, denotes that part of religious worship which consists in chanting and SINGING. The advocates for the high antiquity of singing, as a part of church music, urge the authority of St. Paul in its favour: Ephes. chap. v. ver. 19. and Coloss. chap. iii. ver. 16. On the authority of which passages it is asserted, that songs and hymns were, from the establishment of the church, sung in the assemblies of the faithful; and it appears, from undoubted testimony, that singing, which was practised as a sacred rite among the Egyptians and Hebrews, at a very early period, and which likewise constituted a considerable part of the religious ceremonies of the Greeks and Romans, made a part of the religious worship of Christians, not only before churches were built, and their religion established by law, but from the first profession of Christianity. However, the æra from whence others have dated the introduction of music into the service of the church, is that period, during which Leontius governed the church of Antioch, i. e. between the year of Christ 347, and 356. See ANTIPHONY.

From Antioch the practice soon spread through the other churches of the East; and in a few ages after its first introduction into the divine *service*, it not only received the sanction of public authority, but those were forbid to join in it who were ignorant of music. A canon to this purpose was made by the council of Laodicea, which was held about the year 372; and Zonanas informs us, that these canonical singers were reckoned a part of the clergy. Singing was introduced into the western churches by St. Ambrose, about the year 374, who was the institutor of the AMBROSIAN *chant*, established at Milan about the year 386; and Eusebius, lib. ii. cap. 17. tells us, that a regular choir, and method of singing the *service*, were first established, and hymns used in the church at Antioch, during the reign of Constantine, and that St. Ambrose, who had long resided there, had his melodies thence. This was, about two hundred and thirty years afterwards, amended by pope Gregory the Great, who established the *Gregorian* CHANT; a plain, unisonous

sonous kind of melody, which he thought consistent with the gravity and dignity of the *service* to which it was to be applied. This prevails in the Roman church even at this day: it is known in Italy by the name of canto fermo; in France, by that of plain chant; and in Germany, and most other countries, by that of the cantus Gregorianus. Although no satisfactory account has been given of the specific difference between the Ambrosian and Gregorian chants, yet all writers on this subject agree in saying, that St. Ambrose only used the four authentic modes, and that the four plagal were afterwards added by St. Gregory. Each of these had the same final, or key-note, as its relative authentic; from which there is no other difference than that the melodies in the four authentic, or principal modes, are generally confined within the compass of the eight notes *above* the key-note, and those in the four plagal, or relative modes, within the compass of the eight notes *below* the fifth of the key. See MODE.

Ecclesiastical writers seem unanimous in allowing, that pope Gregory, who began his pontificate in 590, collected the musical fragments of such ancient psalms and hymns as the first fathers of the church had approved and recommended to the first Christians; and that he selected, methodized, and arranged them in the order which was long continued at Rome, and soon adopted by the chief part of the western church. Gregory is also said to have banished from the church the CANTO *figurato*, as too light and dissolute; and it is added, that his own CHANT was called *canto fermo*, from its gravity and simplicity.

It has been long a received opinion, that the ecclesiastical tones were taken from the reformed modes of Ptolemy; but Dr. Burney observes, that it is difficult to discover any connection between them, except in their names; for their number, upon examination, is not the same; those of Ptolemy being seven, the ecclesiastical eight; and, indeed, the Greek names given to the ecclesiastical modes do not agree with those of Ptolemy in the single instance of key, but with those of higher antiquity. From the time of Gregory to that of Guido, there was no other distinction of keys than that of authentic and plagal; nor were any semitones used but those from E to F, B to C, and occasionally A to B *b*.

With respect to the music of the primitive church, it may be observed, that, though it consisted in the singing of psalms and hymns, yet it was performed in many different ways; sometimes the psalms were sung by one person alone, whilst the rest attended in silence; sometimes they were sung by the whole assembly; sometimes alternately, the congregation being divided into separate choirs; and sometimes by one person, who repeated the first part of the verse, the rest joining in the close of it. Of the four different methods of singing now recited, the second and third were properly distinguished by the names of SYMPHONY and ANTIPHONY; and the latter was sometimes called *responsaria*, in which women were allowed to join. St. Ignatius, who, according to Socrates, lib. vi. cap. 8. conversed with the apostles, is generally supposed to have been the first who suggested to the primitive Christians in the East the method of singing hymns and psalms alternately, or in dialogue; and the custom soon prevailed in every place where Christianity was established; though Theodoret in his history, lib. ii. cap. 24. tells us, that this manner of singing was first practised at Antioch. It likewise appears, that almost from the time when music was first introduced into the *service* of the church, it was of two kinds, and consisted in a gentle inflection of the voice, which they termed plain song, and a more elaborate and artificial kind of music, adapted to the hymns and solemn offices contained in its ritual; and this distinction has been maintained even to the present day.

Although we find a very early distinction made between the manner of singing the hymns and chanting the psalms, it is, however, the opinion of the learned Martini, that the music of the first five or six ages of the church consisted chiefly in a plain and simple chant of unisons and octaves, of which many fragments are still remaining in the canto fermo of the Romish missals. For with respect to music in parts, as it does not appear, in these early ages, that either the Greeks or Romans were in possession of HARMONY or COUNTERPOINT, which has been generally ascribed to Guido, a monk of Arezzo, in Tuscany, about the year 1022, though others have traced the origin of it to the eighth century, it is in vain to seek it in the church. The choral music, which had its rise in the church of Antioch, and from thence spread through Greece, Italy, France, Spain, and Germany, was brought into Britain by the singers who accompanied Austin the monk, when he came over, in the year 596, charged with a commission to convert the inhabitants of this country to Christianity. Bede tells us, that when Austin, and the companions of his mission, had their first audience of king Ethelbert, in the isle of Thanet, they approached him in procession, singing litanies, and that afterwards, when they entered the city of Canterbury, they sung a litany, and at the end of it, Allelujah. But though this was the first time the Anglo-Saxons had heard the Gregorian chant, yet Bede likewise tells us, that our British ancestors had been instructed in the rites and ceremonies of the Gallican church by St. Germanus, and heard him sing Allelujah many years before the arrival of St. Austin. In 680, John, præcentor of St. Peter's, in Rome, was sent over by pope Agatho to instruct the monks of Weremouth in the art of singing; and he was prevailed upon to open schools for teaching music in other places in Northumberland. Benedict Biscop, the preceptor of Bede, Adrian the monk, and many others, contributed to disseminate the knowledge of the Roman chant. At length the successors of St. Gregory, and of Austin, his missionary, having established a school for ecclesiastical music at Canterbury, the rest of the island was furnished with masters from that seminary. The choral *service* was first introduced in the cathedral church of Canterbury, and till the arrival of Theodore, and his settlement in that see, the practice of it seems to have been confined to the churches of Kent; but after that, it spread over the whole kingdom; and we meet with records of very ample endowments for the support of this part of public worship. This mode of religious worship prevailed in all the European churches till the time of the Reformation: the first deviation from it is that which followed the reformation by Luther, who, being himself a lover of music, formed a liturgy, which was a musical service, contained in a work, entitled, Psalmodia, h. e. Cantica sacra Veteris Ecclesiæ selecta, printed at Norimberg, in 1553, and at Wittemberg, in 1561. But Calvin, in his establishment of a church at Geneva, reduced the whole of divine service to prayer, preaching, and singing; the latter of which he restrained. He excluded the offices of the antiphon, hymn, and motet, of the Romish *service*, with that artificial and elaborate music to which they were sung; and adopted only that plain metrical psalmody, which is now in general use among the reformed churches, and in the parochial churches of our own country. For this purpose he made use of Marot's version of the Psalms, and employed a musician to set them to easy tunes only of one part. In 1553, he divided the Psalms into pauses or small portions, and appointed them to be sung in churches. Soon after they were bound up with the Geneva catechism, from which time the catholics, who had been accustomed to sing them, were forbid the use of them, under a severe penalty. Soon after the reformation commenced in England, complaints were made by many of the dignified clergy, and others, of the intricacy and difficulty of the church music of those times: in consequence of which it was once proposed, that organs and curious singing should be removed from our churches. Latimer, in his diocese of Worcester, went still farther, and issued injunctions to the prior and convent of St. Mary, forbidding in their *service* all manner of singing. In the reign of Edward VI. a commission was granted to eight bishops, eight divines, eight civilians, and eight common lawyers, to compile a body of such ecclesiastical laws as should in future be observed throughout the realm. The result of this compilation was a work, first published by Fox the Martyrologist, in 1571, and afterwards in 1640, under the title of Reformatio Legum Ecclesiasticarum. These thirty-two commissioners, instead of reprobating church music, merely condemned figurate and operose music, or that kind of singing which abounded with fugues, responsive passages, and a commixture of various and intricate proportions; which, whether extemporary or written, is by musicians termed descant. However, notwithstanding the objections against choral music, and the practice of some of the reformed churches, the compilers of the English liturgy in 1548, and the king himself, determined to retain musical *service*. Accordingly the statute 2 & 3 Edw. VI. cap. 1. though it contains no formal obligation on the clergy, or others, to use or join in either vocal or instrumental music in the common prayer, does clearly recognize the practice of singing; and in less than two years after the compiling of king Edward's liturgy, a formula was composed, which continues, with scarce any variation, to be the rule for choral *service* even at this day. The author of this work was John Marbecke, or Marbeike; and it was printed by Richard Grafton, in 1550, under the title of The Book of Common Prayer, noted. Queen Mary laboured to re-establish the Romish choral *service*; but the accession of Elizabeth was followed by the act of uniformity; in consequence of which, and of the queen's injunctions, the Book of Common Prayer, noted by Marbecke, was consi-

considered as the general formula of choral *service*. In 1560, another musical *service*, with some additions and improvements, was printed by John Day; and in 1565, another collection of offices, with musical notes. Many objections were urged by Cartwright, and other Puritans, against the form and manner of cathedral *service*, to which Hooker replied, in his Ecclesiastical Polity. In 1664, the statutes of Edward VI. and Elizabeth, for uniformity in the common prayer, were repealed; and the DIRECTORY for public worship, which allows only of the singing of psalms, established. But upon the restoration of Charles II. choral *service* was again revived, and has since uniformly continued. See on this subject Hawkins's Hist. of Music, vol. i. p. 404. vol. ii. p. 264. vol. iii. p. 58—468, &c. vol. iv. p. 44—347. Burney's Hist. Music, vol. ii. chap. i. passim.

SERVICE-*tree*, *sorbus*, in *Botany*, a genus of the *icosandria trigynia* class. Its characters are these: the flower has a spreading, concave, permanent empalement, indented in five parts; it has five roundish, concave petals, which are inserted in the empalement, and about twenty awl-shaped stamina, which are also inserted in the empalement, terminated by roundish summits; the germen is situated under the flower, supporting three slender styles, crowned by erect-headed stigmas; it afterward becomes a soft, umbilicated fruit, or berry, inclosing three or four oblong, cartilaginous seeds. Miller reckons two, and Linnæus three species.

The first sort, or that with winged leaves, which are smooth on both sides, grows naturally in many parts of England, but in the southern countries they are seldom seen of any great magnitude; for the trees are commonly cut down, and reduced to underwood; but in the North of England and Wales, where they are permitted to grow, there are trees of a very large size.

The flowers are produced in large bunches, almost in form of umbels, at the end of the branches; they are composed of five spreading, concave petals, shaped like those of the pear-tree, but smaller; these appear in May, and are succeeded by roundish berries, growing in large bunches, which have a depressed navel on the top, and turn red in autumn, when they ripen.

This tree is cultivated in the nursery gardens, and sold as a flowering shrub; if they were permitted to grow, they would rise to a great height, and have large stems. The leaves of this tree make a pretty variety when they are mixed with others, during the time of their flowering, and also in autumn. The fruit also makes an agreeable appearance, but the blackbirds and thrushes are so fond of it, that in those places where there is plenty of these birds, the fruit will not be allowed to thoroughly ripen. However, as it is a good food for these songsters, where persons are desirous of drawing them about their habitations, the planting a quantity of these trees will attract them.

The second sort, with winged leaves, woolly on their under side, grows naturally in the warm parts of Europe, where it rises to a great height, and becomes a large tree, but in England there are few of any large size. In the south of France, and in Italy, the fruit is served up to the table in their deserts, but in England they have not been much esteemed, which has occasioned their being so little cultivated here.

The several varieties of this tree differ in the number of their seeds, in the same manner as pears, apples, quinces, and medlars; some of them having but three seeds in each fruit, and others four or five; so that, although one of the characters of this genus is, that the fruit has but three seeds, yet that must be understood to be of the wild sort, in which there are seldom more; but those of the cultivated kind are as uncertain as the fruit of apples and pears. Both these sorts may be propagated by sowing their seeds, soon after their fruit is ripe, in pots, sheltering them in a frame in winter, and plunging the pots in a moderate hot-bed in the spring, and in dry weather watering them: here they should remain till the middle of October, and then removed to a warm light spot of ground, where they should be planted in rows two feet asunder, and a foot distant in the rows. After continuing in this nursery three or four years, they should be transplanted in October, or in the spring, just before they begin to shoot, into a warm soil, defended from cold winds, where they are to remain.

The wood of the wild *service-tree* is much commended by the wheelwright for being all heart; and it is of good use for husbandmen's tools, goads, &c. It is very white and smooth, and so will polish pretty well. There is another sort, with variegated leaves, which may be propagated by layers, or by being budded on the plain sort, in a moist strong soil; but they will grow in the most exposed places, being extremely hardy, which renders them worthy of care, since they will thrive where few other trees will succeed. Miller.

The fruit of the *service-tree* is used, and is reckoned to be very restringent and useful for all kinds of fluxes; but when ripe, not altogether so binding. But as it is seldom to be met with in our markets, therefore, for a succedaneum, we use the *sorbus terminalis*.

SERVICE, *wild*, *cratægus*, in *Botany*, a genus of the *icosandria digynia* class. Its characters are these: the flower hath a permanent empalement of one leaf, cut into five concave segments, which spread open; it hath five roundish, concave petals, and many stamina, with roundish summits, inserted into the empalement; the germen is situated under the flower, supporting two slender styles, crowned by roundish stigmas, and becomes an oval berry, including two oblong hard seeds. Miller reckons four, and Linnæus nine species.

The first sort, with oval leaves, unequally sawed, and woody on their outside, grows naturally on the chalky hills in Kent, Surry, and Sussex, and other parts of England, to the height of thirty or forty feet, and divides upward into many branches. It may be propagated by seeds, sown soon after they are ripe; or if they are kept till the spring, they remain one year in the ground before the plants appear; or by layers, laid in the young wood, in which case they are two years before they have sufficient roots to transplant. The wood is white and hard, and is often used for the coggs of mills, and other purposes, which require a rough hard timber.

The second sort, with heart-shaped septangular leaves, whose lower lobes spread asunder, grows naturally in many parts of England, and is chiefly found upon strong soils, rising to the height of forty or fifty feet, with a large trunk and spreading branches. The wood of this tree, which may be propagated like the former, except that the soil should be stronger, is hard and very white, and used by millwrights, &c. The fruit is annually sold in the London markets in autumn, and has an agreeable acid flavour.

The third sort, with oval, oblong, sawed leaves, green on both sides, grows naturally on the mountainous parts of Italy, flowers in May, and the fruit ripens in autumn, and may be propagated like the first sort. It is hardy with respect to cold, but rare in England.

The fourth sort, called the Virginian wild *service*, with an arbutus leaf, grows naturally in most parts of North America. This is generally propagated, by seeds, among flowering shrubs of the same growth. Miller.

SERVIENTES *virgatores*. See VIRGATORES.

SERVING *the rigging*, in *Sea-Language*. See MALLET.

SERVITES, an order of religious, so denominated from their vowing a peculiar attachment to the service of the Virgin.

The order was founded by seven Florentine merchants, who, about the year 1233, began to live in community on mount Senar, two leagues from Florence. In 1239, they received from the bishop the rule of St. Augustine, with a black habit, in lieu of a grey one, which they had worn before. In 1251, Bonfilio Monaldi, one of the seven, from being simple prior of mount Senar, was named general.

This order was approved of by the council of Lateran, and again by cardinal Raynerius, legate of pope Innocent IV. who put it under the protection of the holy see. The succeeding popes have granted it a great many favours. It is become famous in Italy, by the history of the council of Trent, of F. Paolo, a Venetian, who was a religious *Servite*. M. Hermant gives this order the name of the *Annunciate*, doubtless from this mistake, that in some cities of Italy they are called *religious of the Annunciate*, because in those cities their church is dedicated under that name. F. Archang. Giani derives the name *Servites*, servants of the holy Virgin, from hence; that when they appeared for the first time in the black habit given them by the bishop, the sucking children, as they say, cried out, *Behold the servants of the Virgin*. There are also nuns of this order.

SERVITIA, *per quæ*. See PER QUÆ.

SERVITIIS *acquietandis*, a writ judicial that lies for a man distrained for services to one, when he owes and performs them to another, for the acquittal of such services.

SERVITIIS *consuetudinibus*. See CONSUETUDINIBUS.

SERVITOR, in the university of Oxford, a scholar or student, who attends or waits on another for his maintenance there.

SERVITORS *of bills*, denote such servants or messengers of the marshal of the king's bench, as were sent abroad with bills or writs, to summon men to that court. They are now commonly called TIP-*staves*.

SERVITUDE, the condition of a servant, or rather slave.

Under the declension of the Roman empire, a new kind of *servitude* was introduced, different from that of the ancient Romans: it consisted in leaving the lands of subjugated

jugated nations to the firft owners,, upon condition of certain rents, and fervile offices, to be paid in acknowledgment. Hence the names of *fervi* CENSITI, ASCRIPTITII, and ADDICTI *glebæ*; fome wl e eof were taxable at the reafonable difcretion of the lord; others at a certain rate agreed on; and others were mainmortable, who, having no legitimate children, could not make a will to above the value of five pence, the lord being heir of all the reft; and others were prohibited marrying, or going to live out of the lordfhip. Moft of which fervices ftill fubfift in one province or other of France; though they are all abolifhed in England. Such, however, was the original of our tenures, &c. See SLAVE.

SERULA, in *Ornithology*, the name of a web-footed fea-bird, a kind of MERGUS, very common about Venice, and called by Mr. Ray *mergus cirratus fufcus*, the brown crefted, or leffer-toothed diver, and fuppofed to be the *anas longiroftra*, or long beaked duck of Gefner. This is the red-breafted *merganfer* of Pennant.

It is very nearly of the fize of the duck; its head and throat are of a fine changeable black and green; on the firft there is a long pendent creft of the fame colour; the upper part of the neck and of the breaft, and the whole belly, white; the lower part of the breaft ferruginous, fpotted with black; the upper part of the back black; near the fetting on of the wings fome white feathers, edged and tipt with black; the exterior fcapular black; the interior white; lower part of the back, the coverts of the tail, and feathers on the fides, under the wings, and over the thighs, grey, marked with waving lines of black; coverts on the ridge of the wings dufky, fucceeded by a broad bar of white; the quill-feathers dufky; the tail is fhort and brown, and the legs orange-coloured; the head and upper part of the neck of the female are of a deep ruft colour; the creft fhort, the throat white, and diftinguifhed by fome other varieties of colour from the male. Thefe birds breed in the northern parts of Great Britain. Pennant.

SERUM, a thin, tranfparent, watery liquor, fomewhat faltifh, which makes a confiderable part in the mafs of blood.

The blood confifts of two kinds of parts; the *cruor*, or red part; and the *ferum*, or wheyifh, limpid part.

Mr. Boyle, and fome others, have taken the *ferum* to be more ponderous than the *cruor*; but Dr. Jurin, in the Philofophical Tranfactions, from repeated experiments, affures us of the contrary.

The *ferum* has till of late been confounded with the lympha; which is carried by the arteries throughout the feveral parts of the body; whence it returns partly in the veins, and partly in the lymphatic veffels; but Dr. Hewfon has evinced the difference between them.

There have been inftances, in which the blood has been found to contain with its coagulum, a fubftance, very different from what we ufually underftand by the word *ferum*. Dr. Stuart has given an account of a man in an inflammatory fever, from whofe arm eight ounces of blood were taken, which, when it had ftood fome time, afforded, inftead of *ferum*, half its quantity of a white liquor, like milk, fwimming on the coagulum. This had no fmell at firft; but being kept for obfervation, after fix days it contracted a fmell like that of rotten eggs; and after ftanding three weeks more, it neither altered its confiftence nor fmell.

If this liquor was chyle, then is chyle a fubftance very different from milk, milk being apt to turn four, and become thick by keeping, and never contracting the fmell of rotten eggs, as this liquor did. Whether it be not chyle turned putrid, and brought near to purulency by a long circulation in the blood-veffels, without being converted into blood, through fome defect in the fanguification, is a queftion not eafily decided. Five days after this, being blooded again, the blood was found of the common kind, the *ferum* being a thin pellucid water as ufual. Phil. Tranf. N° 442, p. 290.

For an account of Dr. Hewfon's experiments and obfervations, fee *Analyfis of the* BLOOD, CRASSAMENTUM, and particularly *Coagulable* LYMPH.

The ufe of the *ferum* is to nourifh the parts of the body, and to render the chyle and blood more fluid.

Urine and fweat are nothing but *ferum* drained of their nutritious parts, by repeated circulations, and fecreted from the blood in the glands of the kidneys and fkin.

The redundancy and other vices in the *ferum*, are the caufe of various difeafes.

SERUM *aluminofum*, *alum-whey*, a form of medicine prefcribed in the late London Pharmacopœia, made of a pint of milk boiled to whey, with a quarter of an ounce of alum.

SERWOY, in *Natural Hiftory*, a name given by Theodore de Bry, and others, to the animal called by us the OPOSSUM, and by the natives of Brafil the CARIGUEYA.

SESAMION, a word ufed by the ancients to exprefs a preparation of the *fefamum*, or oily grain. It was a cake made of fefamum, honey, and oil.

SESAMOIDEA *offa*, in *Anatomy*, feveral very fmall BONES, placed between the joints of the fingers and toes, to fortify them, and prevent diflocations.

They have their name from their refemblance, in figure and fize, to a grain of fefamum; from *fefamum*, and εἶδος, *form*. They are for the moft part very fmall, and affixed chiefly to ligaments, and only two of them are large enough to be commonly preferved in fkeletons; thefe refemble a large flat oval pearl, and are hollowed on one fide.

They are of about the third of an inch in length, and are half as broad as long. They are connected very near each other, by a fmall fhort ligament, to the bafis of the firft phalanx of the great-toe, fo as to flide on each fide of the middle eminence of the double pulley, in the firft metatarfal bone, like two fmall patellæ. Though thefe are generally faftened in fkeletons to the firft bone of the metatarfus, they neverthelefs belong only to the firft phalanx of the great-toe, as the patella belongs not to the os femoris, but to the tibia. Winflow.

SESAMOIDES, in *Botany*, a fpecies of *refeda*. See *Baftard* ROCKET.

SESAMUM, *oily grain*, in *Botany*. See OILY *grain*.

SESAMUM, in *Botany*, is alfo a name given by fome authors to the *myagrum*, or GOLD *of pleafure*.

SESELI, in *Botany*. See *Wild* SPIGNEL.

Tournefort has referred the fpecies of *fefeli* to the genus of FENNEL, *fœniculum*, from which, however, they greatly differ, in regard to their involucra.

SESELI-*feed*, in the *Materia Medica*, the name of the feed of a plant, called alfo by fome *libanotis*, and growing three or four feet high, with leaves like fennel, but of a paler green. It is a native of warm climates. The *feed* ought to be chofen moderately large, of a longifh fhape, heavy, clean, and of a greenifh colour, frefh, and of a grateful fmell. It affords, by diftillation, a very large quantity of an effential oil, and is hot and dry. It incides, opens, and difcuffes, and is cephalic, neurotic, pectoral, and nephritic. It is good againft epilepfies, apoplexies, vertigos, and all diforders of the head and nerves. Lemery's Dict. of Drugs.

The feeds of the *fefeli Creticum*, or HART-WORT *of Crete*, are diuretic, uterine, and good in all diforders of the breaft and lungs. They are given in fuppreffions of urine, and of the menfes, and in all kinds of flatulencies; and are, among the German phyficians, a common ingredient in medicines, intended to promote expectoration.

The feed of the French hart-wort, or *fefeli Maffilienfe*, has been efteemed of great virtue in difeafes of the head and nerves, in convulfions and epilepfies, and in weaknefs of the fight. It is alfo given in electaries, intended againft all diforders of the breaft and lungs, in coughs, catarrhs, and afthmas, and in obftructions of the liver. Some have recommended it fingly, as a medicine of great efficacy againft obftructions of the menfes; and Schroder tells us, that it has the credit of being an antidote to the poifon of hemlock.

The common hart-wort is poffeffed of the fame fort of virtues with the other two, but its feed is more warm and acrid than that of either of them. It is efteemed a very efficacious remedy in obftructions of the menfes, and in all diforders arifing from indigeftion, crudities, and flatulencies. See SERMOUNTAIN.

SESELI *pratenfe*. See SAXIFRAGE.

SESERINUS, in *Ichthyology*, a name given by Rondeletius, and fome other authors, to a broad and fhort fea-fifh, feeming the fame with the *lampuga* of Italian fifhermen; and defcribed by authors in general, and by this very author in another place, under the name of STROMATEUS.

SESQUI, a Latin particle, fignifying a whole and a half; which, joined with *altera*, *terza*, *quarta*, &c. is much ufed in the Italian mufic, to exprefs a kind of ratios; particularly feveral fpecies of triples.

The ratio expreffed by *fefqui*, is the fecond ratio of the inequality, called alfo *fuper-particular ratio*; and is, when the greater term contains the lefs, once, and fome certain part, over; as 3 : 2; where the firft term contains the fecond one, and unity over; which is a quota part of two.

Now, if this part remaining be juft half the lefs term, the ratio is called *fefqui-altera*: if the remaining part be a third part of the leffer term, as 4 : 3, the ratio is called *fefqui-tertia*, or *fefqui-terza*: if a fourth part, as 5 : 4, the ratio is called *fefqui-quarta*; and thus to infinity, ftill adding to *fefqui* the ordinal number of the fmaller term. In Englifh we fometimes fay, *fefqui-alteral*, or *fefqui-alterate*, *fefqui-third*, *fefqui-fourth*, &c.

As to the kinds of triples expreſſed by the particle *ſeſqui*, they are theſe.

SESQUI-ALTERATE, *the greater perfect*, which is a triple, where the breve is three meaſures, or ſemi-breves, and that without having any point or dot annexed to it.

SESQUI-ALTERATE, *greater imperfect*, which is where the breve, when pointed, contains three meaſures, and, without any point, two.

SESQUI-ALTERATE, *leſſer perfect*, which is where the ſemibreve contains three meaſures, and that without any point.

SESQUI-ALTERATE, *leſſer imperfect*, a triple, where the ſemi-breve, with a point, contains three meaſures, and two without.

According to Buontempi, one may likewiſe call the triples $\frac{6}{4}$ and $\frac{12}{8}$, *ſeſqui-alterates*.

SESQUI-OCTAVE, is a kind of triple, marked C $\frac{9}{8}$, called by the Italians, *nonupla di crome*, where there are 9 quavers in every meaſure or bar, in lieu of 8.

SESQUI-QUARTA, *dupla*, is a kind of triple, marked C $\frac{9}{4}$, called by the Italians, *nonupla di ſememinime*, where there are 9 crochets in each meaſure, inſtead of 4; that is, three crochets to each time.

SESQUI-ALTERATE, in *Geometry* and *Arithmetic*, is a ratio between two lines, two numbers, or the like, where one of them contains the other once, with the addition of a half.

Thus 6 and 9 are in a *ſeſqui-alterate* ratio; ſince 9 contains 6 once, and 3, which is half of 6, over; and 20 and 30 are in the ſame; as 30 contains 20, and half 20 or 10.

SESQUIDITONE, in *Muſic*, a concord reſulting from the ſounds of two ſtrings, whoſe vibrations, in equal times, are to each other in the ratio of 5 to 6. See DITONE and INTERVAL.

SESQUIDUPLICATE *ratio*, is when of two terms, the greater contains the leſs twice, and half the leſs remains: as 15 and 6; 50 and 20.

SESQUIQUADRATE, an aſpect, or poſition, of the planets, when at the diſtance of four ſigns and a half, or 135 degrees, from each other.

SESQUIQUINTILE, an aſpect of the planets, when 108 degrees diſtant from each other.

SESQUITERTIONAL *proportion*. When any number or quantity contains another once and one third, they are *ſeſquitertional proportions*.

SESSILE *roots*, among *Botaniſts*, ſuch tuberous roots as adhere to the baſe of the ſtalk. See ROOT.

SESSILE *leaf*, among *Botaniſts*. See LEAF.

SESSION, *ſeſſio*, denotes each ſitting, or aſſembly, of a council.

In quoting councils, we ſay, in ſuch a *ſeſſion*, ſuch a canon, &c.

SESSION *of parliament*, is a ſeaſon, or ſpace, from its meeting to its prorogation, or diſſolution. See PARLIAMENT.

SESSION, in *Law*, denotes a ſitting of juſtices in court, upon their commiſſion. As, the *ſeſſion of* OYER *and terminer*, of GAOL-*delivery*, &c. See ASSISES, JUSTICES *of aſſiſe*, JUSTICES *of gaol-delivery*, JUSTICES *of oyer*, &c.

SESSIONS *of Wales, great*. See COURTS *of Wales*.

Quarter-ſeſſions, called *general-ſeſſions*, or *open ſeſſions*, ſtand oppoſite to *eſpecial*, otherwiſe called *petty ſeſſions*, which are procured upon ſome ſpecial occaſion, for the more ſpeedy diſpatch of juſtice. See QUARTER-*ſeſſions*.

Statute-ſeſſions, are thoſe kept by the high-conſtable of a hundred, for the placing of ſervants, &c. See STATUTE.

SESSIONS *for weights and meaſures*. In London, four juſtices from among the mayor, recorder, and aldermen (of whom the mayor or recorder is to be one), may hold a *ſeſſions* to enquire into offences of ſelling by falſe weights and meaſures, contrary to the ſtatutes; and to receive indictments, puniſh offenders, &c. Char. K. Cha. I.

SESSION, *the court of*, otherwiſe called the *college of juſtice*, is the ſupreme court in Scotland for all civil cauſes. It conſiſts of one conſtant preſident, who has an annual ſalary of 1300*l.* and fourteen other judges, at 700*l.* per annum, each, who are lords by their office, which they hold by patent *quamdiu ſe bene geſſerint*. The lord high chancellor preſides here when preſent. The king names ſeveral other extraordinary lords, who ſit, but are not obliged to attendance, becauſe they have no ſalaries; but they may vote among the reſt.

The court ſits from the firſt of November, old ſtyle, to the laſt of February, and from the firſt of June to the laſt of July, all incluſive; which holds of all the inferior courts or judicatories in Scotland. In time of *ſeſſion*, or term, they ſit from nine o'clock to twelve in the forenoon, every day in the week but Sunday and Monday; ſometimes they ſit in the afternoon, to end concluded cauſes, or to hear ſuch long debates as the forenoon was too ſhort to hear, which gives a great diſpatch to cauſes that come before them. The lords, both ordinary and extraordinary, when in the inner houſe, ſit on a ſemi-circular bench in their robes; where the advocates debate their clients cauſes before them. There are ſix principal clerks belonging to this court. Nine of the lords make a quorum in the inner houſe, otherwiſe they cannot vote in any caſe, except ſuch as are referred to one or more of the whole lords; and one of the ordinary lords (the preſident being always excepted) is weekly appointed judge in the outer houſe, for diſcuſſing of ordinary actions, and has ſix under clerks to attend him. He meddles with no extraordinary caſes, except where it is remitted to him by all the lords to be diſcuſſed in the outer houſe for diſpatch.

That the lords may have time to read informations, petitions, &c. and the ſuitors be eaſed of the trouble of going with them to their houſes, every lord has a box ſtanding upon a table in the waiting room in the inner houſe from two to four o'clock in the afternoon, every day; wherein all who have papers to offer, may put them by a ſlit in the cover. Each of the principal clerks have alſo a box, and parties muſt put their bills, anſwers, or informations of cauſes to be reported, into the clerk of the proceſs's box.

The rolls of the court bring in all cauſes in their due order. Cauſes of the greateſt conſequence are at firſt adviſed by the whole lords in the inner houſe. Other cauſes are called of courſe before an ordinary in the outer houſe, who decides the controverſy, if clear, without farther trouble or expence; and, in caſe of difficulty, takes ſome little time to adviſe it himſelf, or to adviſe with the whole lords upon it. And if any of the parties think themſelves wronged by the ſentence of the ordinary, they may complain to the lords, and get their anſwer upon a bill.

An appeal lies from this court to the houſe of lords.

The *lords of ſeſſion* were firſt appointed by James I. of Scotland, who ſelected, among the eſtates of parliament, a certain number of perſons, and diſtinguiſhed them by this appellation. They were empowered to hold courts for determining civil cauſes three times a-year, and forty days at a time, in whatever place he pleaſed to name. James IV. on pretence of remedying the inconveniencies ariſing from the ſhort terms of the *court of ſeſſions*, appointed other judges, called *lords of daily council*. The *ſeſſion* was an ambulatory court, and met ſeldom: the *daily council* was fixed, and ſat conſtantly at Edinburgh; and though not compoſed of members of parliament, the ſame powers, which the lords of *ſeſſion* enjoyed, were veſted in it. At laſt, James V. erected the new court that ſtill ſubſiſts, and which he called the *college of juſtice*, the judges or ſenators of which were called *lords of council* and *ſeſſion*. Robertſon's Hiſt. of Scotland, 1776, 8vo. vol. i. p. 40.

SESSIONS, *kirk*. See KIRK.

SESTERCE, *ſeſtertius*, a ſilver coin, in uſe among the ancient Romans, called alſo ſimply *nummus*, and ſometimes *nummus ſeſtertius*.

The *ſeſterce* was the fourth part of the denarius, and originally contained two aſſes and a half.

The *ſeſterce* was at firſt denoted by LLS; the two L's ſignifying two libræ, and the S half. But the librarii, afterwards converting the two L's into an H, expreſſed the *ſeſterce* by HS.

The word *ſeſtertius* was firſt introduced by way of abbreviation for *ſemiſtertius*, which ſignifies two, and a half of a third, or, literally, only half a third; for in expreſſing half a third, it was underſtood that there were two before.

Some authors make two kinds of *ſeſterces*; the *leſs*, called *ſeſtertius*, in the maſculine gender; and the *great* one, called *ſeſtertium*, in the neuter: the firſt, that we have already deſcribed; the latter containing *a* thouſand of the other. Others will have any ſuch diſtinction of great and little *ſeſterces* unknown to the Romans: *ſeſtertius*, ſay they, was an adjective, and ſignified *as ſeſtertius*, or two aſſes and a half; and when uſed plurally, as in *quinquaginta ſeſtertium*, or *ſeſtertia*, it was only by way of abbreviation, and there was always underſtood *centena, millia*, &c.

This matter has been accurately ſtated by Mr. Raper, in the following manner. The ſubſtantive to which *ſeſtertius* referred is either as, or pondus; and *ſeſtertius as* is two *aſſes* and a half; *ſeſtertium pondus*, two pondera and a half, or two hundred and fifty denarii. When the denarius paſſed for ten aſſes, the *ſeſterce* of two aſſes and a half was a quarter of it; and the Romans continued to keep their accounts in theſe *ſeſterces* long after the denarius paſſed for ſixteen aſſes; till, growing rich, they found

found it more convenient to reckon by quarters of the denarius, which they called *nummi*, and ufed the words *nummus* and *feftertius* indifferently, as fynonymous terms, and fometimes both together, as *feftertius nummus*; in which cafe, the word *feftertius*, having loft its original fignification, was ufed as a fubftantive; for *feftertius nummus* was not two nummi and a half, but a fingle nummus of four affes. They called any fum under two thoufand *fefterces* fo many *feftertii* in the mafculine gender; two thoufand *fefterces* they called *duo* or *bina feftertia*, in the neuter; fo many quarters making five hundred denarii, which was twice the *feftertium*; and they faid *dena*, *vicena*, &c. *feftertia*, till the fum amounted to a thoufand *feftertia*, which was a million of *fefterces*. But, to avoid ambiguity, they did not ufe the neuter *feftertium* in the fingular number, when the whole fum amounted to no more than a thoufand *fefterces*, or one *feftertium*. They called a million of *fefterces* decies nummûm, or decies *feftertiûm*, for decies centena millia nummorum, or *feftertiorum* (in the mafculine gender), omitting centena millia, for the fake of brevity. They likewife called the fame fum decies *feftertium* (in the neuter gender) for decies centies *feftertium*, omitting *centies* for the fame reafon; or fimply decies, omitting *centena millia feftertiûm*, or *centies feftertium*; and with the numeral adverbs, *decies*, *vicies*, *centies*, *millies*, and the like, either *centena millia*, or *centies*, was always underftood. Thefe were their moft ufual forms of expreffion; though for *bina*, *dena*, *vicena feftertia*, they frequently faid *bina*, *dena*, *vicena millia nummûm*. If the confular denarius contained fixty troy grains of fine filver, it was worth fomewhat more than eight pence farthing and a half fterling; and the as, of fixteen to the denarius, a little more than a halfpenny. To reduce the ancient *fefterces* of two affes and a half, when the denarius paffed for fixteen, to pounds fterling, multiply the given number by 5454, and cut off fix figures on the right hand for decimals. To reduce *nummi feftertii*, or quarters of the denarius, to pounds fterling; if the given fum be confular money, multiply it by 8727, and cut off fix figures on the right hand for decimals; but for imperial money, diminifh the faid product by one eighth of itfelf. Phil. Tranf. vol. lxi. part ii. art. 48. See DENARIUS and DRACHM.

To be qualified for a Roman knight, an eftate of four hundred thoufand *fefterces* was required; and for a fenator, of eight hundred thoufand.

Authors alfo mention a copper *fefterce*, worth about one-third of a penny Englifh.

SESTERCE, *feftertius*, was alfo ufed, in *Antiquity*, for a thing containing two wholes and a half of another: as *as* was taken for any whole, or integer.

SESTUPLO, in *Mufic*. See SEXTUPLE.

SESUVIUM, in *Botany*, a genus of the *icofandria trigynia* clafs. Its characters are thefe: the calyx is coloured, and divided into five fegments; it has no petal; the fruit is an ovated capfule, which has three cells, and is polyfpermous. There is only one fpecies.

SET-*off*, in *Law*, is an act, whereby the defendant acknowledges the juftice of the plaintiff's demand on the one hand; but, on the other, fets up a demand of his own, to counterbalance that of the plaintiff, either in the whole, or in part: as, if the plaintiff fues for ten pounds due on a note of hand, the defendant may *fet-off* nine pounds due to himfelf for merchandize fold to the plaintiff, and, in cafe he pleads fuch *fet-off*, muft pay the remaining balance into court. This anfwers very nearly to the COMPENSATIO, or ftoppage, of the civil law, and depends upon the ftatutes 2 Geo. II. cap. 22. and 8 Geo. II. cap. 24.

SET-*bolts*, in a *Ship*. See BOLTS.

To SET *fail*. See SAIL, and SETTING.

SETACEUS *vermis*, in *Natural Hiftory*, a name given by Dr. Lifter to that long and flender water-worm, which fo much refembles a horfe-hair, that it has been fuppofed by the vulgar to be an animated hair of that creature. Thefe creatures, fuppofed to be living hairs, are a peculiar fort of infects, which are bred and nourifhed within the bodies of other infects, as the worms of the ichneumon-flies are in the bodies of the caterpillars. See AMPHISBÆNA *aquatica*.

SETAH, in *Botany*, a name ufed by the oldeft writers for the acacia. It is an original Hebrew word, and is explained by the lexicographers, by a thorn growing in the defert. It is rendered by Theodotion *acantha*, one of the names of the acacia.

SETHIANS, or SETHEDIANS, SETHIANI, or SETHINIANI, a branch of the ancient GNOSTICS: thus called, becaufe of their pretending to deduce their origin from Seth, fon of Adam, whom they called Jefus and Chrift; from an opinion, that Seth and Jefus were the fame perfon, who came down from heaven at two feveral times.

As the *Sethians* had the fame philofophy with the other Gnoftics, they had numerous other fables in their fyftem. They pretended to have feveral books of the ancient patriarchs; particularly, feven of their great mafter Seth; befides one of Abraham, which was full of manifeft falfities, which yet they called *Apocalypfe*, or *Revelation*. The book called the *Little Genefis*, anciently very common in the churches of the Eaft, was borrowed from them. From this book they learned the name of Seth's wife, who, they fay, was called *Horæa*. Some imagine, they borrowed a great many of their fictions from the Hellenift Jews.

SETICAUDÆ, in *Natural Hiftory*, a term ufed to exprefs fuch flies as have one or more hairs growing out at their tails. There are many fpecies of thefe, diftinguifhed by their having one, two, or three hairs.

SETIER. See SEPTIER.

SETON, *fetaceum*, in *Surgery*, &c. a kind of topical remedy, ufed like a cautery, or an iffue, to divert defluxions from the eyes, &c. by making a wound in the fkin of the hind part of the neck, which is kept fuppurating, by means of a little fkain of filk, or cotton, paffed through it.

Setons are alfo fometimes applied to fuch as are apt to fall into epileptic fits. They are of more efficacy than a common iffue, but are prefcribed with much the fame intention.

The like operation is frequently practifed on horfes, &c. and called, by the farriers, *rowelling*.

Setons evacuate with a gentle pain; fhake the nerves, difcharge ferum, and give vent to repletions and coacervations of humours.

SETON *needle*. See *Tab. Surgery*, *fig.* 12.

SETS, a term ufed by the farmers to exprefs the young plants of the white thorn, and other fhrubs, which they ufe to raife their quick, or quick-*fet* hedges.

The white thorn is the beft of all trees for this purpofe, and under proper regulations, its *fets* feldom fail of anfwering the farmers utmoft expectations.

SETSE, in *Botany*, the name of a Chinefe tree, called alfo *chitfe*, and much efteemed by the people of that country for its beauty, and for the goodnefs of its fruit. In the provinces of Cantong and Honan there are whole plains covered with thefe trees, many of which grow to the fize of our walnut-tree. The fruit ripens every where in the Eaft, where the tree grows, but it is of a much more delicious flavour in fome places than in others. The leaves are of the colour and fhape of thofe of the walnut-tree, only that they are more round at the ends. The fruit is fometimes round, fometimes pointed at one end, fometimes oval, fometimes flat, and not unfrequently compofed of two pieces, as it were, and refembling two apples cut and joined together. The rind is always green, never changing yellow or red, and the fruit keeps its frefhnefs all the winter. They are about the fize of the orange, and the fkin is very tender and thin, and the fruit has a mixed tafte of the fharp and the lufcious. It is very wholefome and good.

SETTEE, in *Sea Language*, a veffel, very common in the Mediterranean, with one deck, and a very long and fharp prow. They carry, fome two mafts, fome three, without top-mafts. They have generally two mafts, equipped with triangular fails, commonly called lateen fails. The leaft of them are of fixty tons burden. They ferve to tranfport cannon, and provifions for fhips of war and the like. Thefe veffels are peculiar to the Mediterranean fea, and are ufually navigated by Italians, Greeks, or Mahometans.

SETTER, among *Farmers*. To *fetter*, is to cut the dewlap of an ox or cow, and into the wound to put the root of the helleborafter; whereby an iffue is made, for ill humours to vent themfelves.

SETTER *wort*, in *Botany*. See HELLEBORE.

SETTING, in *Aftronomy*, the withdrawing of a ftar or planet; or its finking below the horizon.

Aftronomers and poets make three different kinds of *fetting* of the ftars: COSMICAL, ACRONICHAL, and HELIACAL.

To find the times of the *fetting* of the fun and ftars, fee GLOBE.

SETTING, in *Sea Language*, denotes the act of obferving the fituation of any diftant object by the compafs, in order to difcover the angle which it makes with the neareft meridian. See BEARING.

Thus, to *fet the land*, or *the fun*, by *the compafs*, is to obferve how the land bears on any point of the compafs, or on what point of the compafs the fun is. Alfo, when two fhips fall in fight of one another, to mark on what point the chafed bears, is termed, *fetting the chace by the compafs*.

SETTING alfo fignifies the direction of the wind, current, or fea, particularly of the two latter: as, the tide, which

sets to the south, is opposed to a swelling sea *setting* to the north-west.

SETTING, when applied to the sails, is the loosening and expanding of them, so as to move a ship along the water, after she had been some time at rest; or to accelerate her velocity when she is already moving, and perhaps give a new direction to her motion. The term is used in contradistinction to taking-in of the sails, as loosing or heaving out is opposed to furling or stowing them. Falconer.

SETTING, in the *Language of Sportsmen*, a term used to express a manner of attacking partridges, in order to the taking of them, by means of a dog peculiarly trained to that purpose. The *setting*-dog generally used is a long land-spaniel, taught by nature to hunt partridges more than any other game, and in his untaught state running over the fields, in search of them, with an alacrity that is truly wonderful; yet by art this creature is brought under such excellent command, that he will, in the midst of his highest career, attend to the least hem from his master, and stand still to look in his face, and take his orders by the slightest signals; and when he is so near his game, that it is almost in his mouth, he will stand still, or lie down on his belly, till his master arrive, and he receives his directions.

The *setting*-dog being taken to the haunt of the partridges, is to be cast off, and sent to range; but he must be made to keep near the sportsman, and not to run wildly on, but to beat all the ground regularly. On being reproved for ranging too wildly and too far, he will keep close the whole day, and at times look up in his master's face to know if he does right or wrong. If in the dog's ranging he stop of a sudden, the sportsman is to make up to him, and as there is certainly game before him, he must be ordered to advance; if he refuse this, and look back and shake his tail, it is a signal that they are close before him, and the sportsman is then to take a circumference, and look with a careless eye before the dog's nose to see where they are, and how they lie; then going up, and staking down one end of the net, he is to command the dog to lie still, and to draw the net gently over the birds; then making in with a noise, he is to spring them, and they will be entangled and taken as they rise. It is a rule with fair sportsmen, when they take a covey in this manner, always to let the cock and hen go.

SETTING, among *Cock-Masters*, is the placing of a cock that has fought so that he cannot stand, beak to beak against the other cock, and if he does not strike, the battle is won.

SETTING-*down*, in *Falconry*, is when a hawk is put into mew.

SETTING-*dog*, one trained up to find out and discover to the sportsman whereabout fowls are. See SPANIEL and DOG.

SETTING-*up*, in *Sea Language*, the act of extending the shrouds, stays, and back-stays, to secure the masts, by the application of mechanical powers, as tackles, &c. See DEAD-EYE, LANIARD, &c.

SETTING *of bricks*. See BRICKS.

SETTING *of wheat*, in *Agriculture*, is a method of cultivating wheat, which was, probably, first suggested by planting grains in a garden from mere curiosity, and first attempted on a larger scale by a farmer near Norwich, about the year 1768. His example was followed by some of his neighbours, and particularly by one of the largest occupiers of land in the county of Norfolk, who *set* fifty-seven acres in one year. His success, from the visible superiority of his crop both in quantity and quality, was so great, that the following autumn he *set* three hundred acres, and has continued the practice ever since. The method of *setting* was generally introduced, in consequence of this experiment, among the intelligent farmers, in a very large district of land. And it has been observed, in recommendation of it, that, although the *set* crops appear very thin during the autumn and winter, the plants tiller and spread prodigiously in the spring. The ears are indisputably larger, without any dwarfish or small corn; the grain is of a larger fathom, and specifically heavier per bushel, than when sown. It furnishes employment for aged persons and children, at a season when they have little else to do; it saves to the farmer six pecks of seed wheat in every acre; the expence is already reduced to about six shillings an acre; and a drill-plough has been invented, by which one man may *set* an acre a day.

The lands on which this method particularly succeeds, are either after a clover stubble, or those on which trefoil and grass seed were sown the spring before the last, and on which cattle have occasionally pastured during the summer. These grounds, after the usual manuring, are once turned over by the plough in an extended flag or turf, at ten inches wide; along which a man, who is called a dibler, with two *setting* irons, somewhat bigger than ram-rods, but considerably bigger at the lower end, and pointed at the extremity, steps backwards along the turf, and makes the holes about four inches asunder every way, and an inch deep. Into these holes, the droppers (women and children) drop two grains, which are quite sufficient. After this, a gate, bushed with thorns, is drawn by one horse over the land, and closes up the holes. By this mode, three pecks of grain are sufficient for an acre; and being immediately buried, it is equally removed from vermin, or the power of frost. The regularity of its rising affords the best opportunity of keeping it clear from weeds, by weeding or hand-hoeing.

SETTLEMENT, *act of*, in *British History*, a name given to the statute 12 & 13 W. III. cap. 2. whereby the crown was limited to his present majesty's illustrious house; and some new provisions were added, at the same fortunate æra, for better securing our religion, laws, and liberties; which the statute declares to be the birthright of the people of England, according to the ancient doctrine of the common law. See *Right of* CROWN.

SETTLEMENT, *marriage*. See MARRIAGE.

SETTLEMENT *of the poor*. See POOR.

SETTLING *a deck*, at *Sea*, a term for taking a deck lower than it was at first.

SETTLING *the land*, denotes sinking it lower, by sailing farther out to seaward, and is used in the same sense with *laying the* LAND.

SETTS *for saws*, instruments for setting their teeth when out of order.

SETWELL, in *Botany*, a name sometimes used for a species of VALERIAN.

SEVENTH, *septima*, in *Music*, an interval, called by the Greeks *heptachordon*; whereof there are four kinds.

The first, the *defective* or DIMINISHED *seventh*, consisting of three tones, and three greater semitones, as from *ut* sharp to *si* flat: its ratio is 128 to 75.

The second, called by Zarlini, and the Italians, *semiditono con diapente*, or *settimo minore*, is composed diatonically of seven degrees, and six intervals, four whereof are tones, and the rest greater semitones, as from *re* to *ut*; and chromatically of ten semitones, six whereof are greater, and four less: it takes its form from the *ratio quadripartiens quintas*, 9 to 5.

The third, called by the Italians, *il ditono con diapente*, or *settimo maggiore*, is composed diatonically, like the former, of seven degrees, and six intervals, six whereof are full tones, and a single one a greater semitone; so that only one greater semitone is wanting of the octave: as from *ut* to *si*; and chromatically of eleven semitones, six whereof are greater, and five lesser. It takes its origin from the ratio of 15 to 8.

The fourth, is *redundant seventh*, composed of five tones, a greater semitone, and a lesser, as from *si* flat to *la* sharp: so that it only wants a comma of an octave; that is, so much as it wants to render its second semitone a greater. Hence many confound it with the octave itself; maintaining, with good reason, that only the three first *sevenths* can be of any use.

In thorough basses the *seventh*, whether double, simple, major, or minor, is marked by a figure of 7; but if it be accidentally flat, or minor, thus, ♭7, or 7♭. If sharp, or major, thus, ※7, or 7※. Again, if when it is naturally minor, it be marked with a flat, it must be diminished. See FUNDAMENTAL.

SEVENTH *pair of nerves*. See NERVE.

SEVERAL *tail*, or INHERITANCE, in *Law*. See INHERITANCE.

SEVERAL *tenancy*, *tenura separalis*, a plea, or exception taken to a writ that is laid against two persons as joint tenants, who are *several*.

SEVERALTY, *estates in*. He that holds lands or tenements in *severalty*, or is sole tenant of them, is he who holds them in his own right only, without any other person being connected with him in point of interest, during his estate therein.

SEVERANCE, in *Law*, the *singling* or *severing* two or more that join, or are joined, in the same writ, or action.

As if two join in a writ, *de libertate probanda*, and the one be afterwards nonsuited; here *severance* is permitted, so as, notwithstanding the nonsuit of the one, the other may severally proceed.

There is also *severance of the tenants* in assise; when one, two, or more disseisees appear upon the writ, and not the other. And *severance in debt*, where two executors are named plaintiffs, and the one refuses to prosecute. We also meet with *severance of summons*, *severance in attaints*, &c.

An estate in joint-tenancy may be *severed* and destroyed, by destroying any of its unities. 1. That of time, which respects only the original commencement of the joint estate,

estate, cannot indeed (being now part) be affected by any subsequent transaction. But, 2. The joint-tenants estate may be destroyed, without any alienation, by merely disuniting their possession. 3. The jointure may be destroyed, by destroying the unity of title. And, 4. By destroying the unity of interest. Blackst. Comm. book ii. p. 185, &c.

SEVERANCE *of corn.* The cutting and carrying it from off the ground; and sometimes the setting out the tithes from the rest of the corn, is called *severance.*

SEVERIANS, *Severiani.* There were two sects of heretics thus called: the first, who are as old as the beginning of the third century, were an impure branch of Gnostics; thus called from their chief *Severus.*

The second, by some called *Severites,* were a sect of Monophysites, or Eutychians; their leader, Severus, was preferred to the see of Antioch in 513, where he did his utmost to set aside the council of Chalcedon.

SEVIL, in the *Manege.* The *sevil* of the branches of a bridle is a nail turned round like a ring, with a large head, made fast in the lower part of the branch, called *gargouille.* See BANQUET.

SEVIR, among the Romans, an officer who, according to Pitiscus, commanded a whole wing of horse; though others make him only the commander of a troop, *turmis,* a division answering to our regiments.

SEVIRI, were also magistrates in the colonies, so called, from their being six in number.

SEW, in the *Sea Language.* When a ship at low water comes to lie on the ground, and to lie dry, they say she is *sewed;* and if she be not quite left dry, they say she *sews* to such a part.

SEWEL, among *Sportsmen,* denotes any thing that is set or hung up, to keep a deer out of any place.

SEWEL-*coronde,* a name given by the natives of Ceylon to a species of cinnamon, which, when chewed, is of a mucilaginous nature, like the cassia: this dries well, and is very firm and hard, and has the appearance of a very fine cinnamon; but it has very little taste, and a disagreeable smell. The natives take advantage of the handsome appearance of this kind of cinnamon, and are very apt to mix it with the good kind, to the great detriment of the buyer. Phil. Transf. N° 409.

SEWER, formed from the French *escuyer, esquire, gentleman,* or *usher,* in the *Houshold,* an officer who comes in before the meat of a king, or nobleman, to place and range it on the table. Of these officers there are four in the king's houshold, and eight, called *sewers* of the great chamber.

SEWERS, in *Building,* are shores, conduits, or conveyances, for the suillage and filth of a house.

For the disposition of these, according to the directions of sir Henry Wotton, see *Parts of a* BUILDING.

SEWERS, *clerk of the.* See CLERK.

SEWERS, *commission of.* See COMMISSION.

SEWIN, in *Ichthyology.* See GREY.

SEX, *sexus,* something in the body, which distinguishes male from female.

The number of persons, of the two *sexes,* are exceedingly well balanced; so that every man may have his wife, and every woman her husband.

Hermaphrodites have the apparent marks of both *sexes.*

It is expressly forbidden by the law of Moses, to disguise the *sex.*

SEXAGENARY, *sexagenarius,* something relating to the number sixty: more particularly, a person arrived at the age of sixty years.

Some casuists dispense with *sexagenarians* for not fasting: the Papian law prohibits *sexagenarii* from marriage; because at that age the blood and humours are frozen.

SEXAGENARY *arithmetic.* See SEXAGESIMAL.

SEXAGENARY *tables,* are tables of proportional parts, shewing the product of two *sexagenaries* that are to be multiplied; or the quotient of two to be divided.

SEXAGESIMA, the second Sunday before Lent, or the next to Shrove Sunday; so called, as being about the sixtieth day before Easter.

Sexagesima is that which follows Septuagesima, and precedes Quinquagesima.

SEXAGESIMAL, or SEXAGENARY *arithmetic,* a method of computation, proceeding by sixties.

Such is that used in the division of a degree into sixty minutes; of the minute, into sixty seconds; of the second, into sixty thirds, &c. See ARITHMETIC.

SEXAGESIMALS, or SEXAGESIMAL *fractions,* are fractions, whose denominators proceed in a sexagecuple ratio; that is, a prime, or the first minute $= \frac{1}{60}$; a second $= \frac{1}{3600}$; a third $= \frac{1}{216000}$.

Anciently, there were no other than *sexagesimals* used in astronomical operations, and they are still retained in many cases; though decimal arithmetic is now much used in astronomical calculations.

In these fractions, which some also call *astronomical fractions,* the denominator being always 60, or a multiple thereof, is usually omitted, and the numerator only written down: thus, $4^{o}, 59', 32'', 50''', 16''''$, is to be read, 4 degrees, 59 minutes, 32 seconds of a degree, or 60th parts of a minute, 50 thirds, 16 fourths, &c.

SEXANGLE, in *Geometry,* a figure having six sides, and consequently six angles.

SEXTANS, *sextant,* a *sixth* part of certain things.

The Romans divided their *as,* which was a pound of brass, into twelve ounces: the ounce was called *uncia,* from *unum;* and two ounces *sextans,* as being the *sixth* part of the pound. See As.

SEXTANS was also a measure, which contained two ounces of liquor, or two cyathi. Hence,

Sextantes, Caliste, duos infundi Falerni.

SEXTANS, the *Sextant,* in *Astronomy,* a constellation of the southern hemisphere, made by Hevelius out of unformed stars. In Hevelius's Catalogue it contains 11, but in the Britannic Catalogue 41 stars; the longitudes, latitudes, &c. of which are as follow:

Situation of the stars.	Signs.	Longitud.			Latitude			Magnitude
		°	′	″	°	′	″	
At the cylinder of the *Sextant*	♌	19	59	3	6	59	30	5
In the side, south, superior		21	0	44	8	56	56	5
		27	30	12	19	19	57	6
		23	58	17	8	14	5	6
		28	9	7	19	14	20	6
5								
		27	10	14	16	14	25	6
		25	1	4	9	52	53	6
In the side, south, inferior		28	57	20	19	43	16	6
		24	36	8	7	22	14	6
		23	47	51	3	25	19	6
10								
		24	23	47	3	51	31	5.6
		26	8	41	7	24	41	6
		27	35	45	8	7	37	6
		27	21	37	5	38	35	6
In the middle of *Sextant*		29	46	47	11	8	24	4
15								
		28	45	7	4	53	50	6
In the limb, preceding	♍	3	19	24	18	25	36	6
		3	33	37	18	20	37	6
At the upper side of *Sextant*	♌	28	46	50	5	6	3	6
	♍	3	48	38	17	8	28	6
20								
		4	9	26	17	39	29	6
In the limb following		5	3	1	17	24	10	6
		1	53	18	7	29	0	5
		3	37	56	10	13	42	6
		4	50	38	13	10	16	6
25								
		4	23	39	9	56	26	6
		5	43	53	13	9	32	6
		5	15	35	11	33	30	5
		5	23	29	10	26	35	5
		5	11	2	9	19	47	5
30								
		4	12	21	6	42	41	6
Between the *Sextant* and ♌ *m,* inferior		3	38	53	4	14	36	6
Superior		8	11	16	9	18	26	6
		6	28	48	4	15	27	6
		6	11	46	3	6	33	6
35								
		7	27	0	5	2	42	6
		6	10	48	1	21	41	6
		6	29	33	1	15	59	6
		12	48	42	15	18	38	7
		10	54	52	10	40	35	6
40								
Following the *Sextant,* before *Crater*		13	5	35	15	3	55	6

SEXTANT, in *Mathematics,* denotes the *sixth* part of a circle, or an arch comprehending sixty degrees.

SEXTANT is more particularly used for an astronomical instrument, made like a quadrant; excepting that its limb only comprehends sixty degrees.

The use and application of the *sextant* is the same with that of the QUADRANT.

In the observatories of Greenwich and Pekin, there are very large and fine *sextants.*

SEXTARIUS, an ancient Roman measure, containing two cotylæ, or two heminæ. See COTYLA.

SEXTERY-*lands,* are lands given to a church, &c. for maintenance of the sexton.

SEXTILE, *sextilis,* the position or aspect of two planets, when at sixty degrees distance; or at the distance of two signs from one another. It is marked thus (✱). See ASPECT.

SEXTILIS, in *Chronology*. See AUGUST.

SEXTON, a church-officer, thus called by corruption of the Latin *ſacriſta*, or Saxon *ſegerſtone*, which denotes the ſame. His office is to take care of the veſſels, veſtments, &c. belonging to the church; and to attend the miniſter, churchwarden, &c. at church. He is uſually choſen by the parſon only.

Sextons, as well as PARISH *clerks*, are regarded by the common law as perſons who have freehold in their offices; and, therefore, though they may be puniſhed, yet they cannot be deprived, by eccleſiaſtical cenſures.

The office of *ſexton in the pope's chapel*, is appropriated to the order of the hermits of St. Auguſtine. He is generally a biſhop, though ſometimes the pope only gives a biſhoprick, *in partibus*, to him on whom he confers the poſt. He takes the title of *prefect of the pope's ſacriſty*, and has the keeping the veſſels of gold and ſilver, the relics, &c.

When the pope ſays maſs, the *ſexton* always taſtes the bread and wine firſt. If it be in private he ſays maſs, his holineſs, of two wafers, gives him one to eat; and, if in public, the cardinal, who aſſiſts the pope in quality of deacon, of three wafers, gives him two to eat. When the pope is deſperately ſick, he adminiſters to him the ſacrament of extreme unction, &c. and enters the conclave, in quality of firſt conclaviſt.

SEXTULA, a word uſed by ſome pharmaceutic writers to expreſs the ſixth part of an ounce, that is, four ſcruples, or one drachm and one ſcruple.

SEXTUPLE, *ſeſtuplo*, in *Muſic*, denotes a mixed ſort of TRIPLE time, which is beaten in double time.

This the Italians call *ſeſtuplo*; the French ſometimes call it *ſixth time*, *meſure a ſix temps*; though improperly: according to M. Broſſard, it ought rather to be denominated *triple binary* time.

Authors uſually make mention of three ſpecies hereof; to which M. Broſſard adds two more; viz.

SEXTUPLE *of the ſemibreve*, by the French called *triple* of 6 for 1, as being denoted by thoſe two numbers $\frac{6}{1}$; or becauſe here are required ſix ſemibreves to a meaſure, in lieu of one, viz. three riſing, and three falling.

SEXTUPLE *of the minim*, called by the French triple of 6 for 2; as being denoted by $\frac{6}{2}$, which ſhew, that ſix minims are here required to a meaſure, inſtead of 2.

SEXTUPLE *of the crotchet*, called by the French triple of 6 for 4, becauſe denoted by C $\frac{6}{4}$, or $\frac{4}{6}$, which ſhew, that there muſt be 6 crotchets to a meaſure, in lieu of 4.

SEXTUPLE *of the chroma*, by the French called triple of 6 for 8, as being denoted by $\frac{6}{8}$; which ſhew, that 6 quavers here make the meaſure or ſemibreve, inſtead of 8.

SEXTUPLE *of the ſemichroma*, or triple of 6 for 16; ſo called, becauſe denoted by $\frac{6}{16}$, which ſhews, that 6 quavers are here required to a meaſure, inſtead of 16.

SEXTUS, *ſixth*, in the *Canon Law*, denotes a collection of decretals, made by pope Boniface VIII. uſually thus called from the title, which is *Liber Sextus*; as if it were a *ſixth* book added to the five books of decretals, collected by Gregory IX.

The *ſextus* is a collection of papal conſtitutions, publiſhed after the collections of Gregory IX. containing thoſe of the ſame Gregory, Innocent IV. Alexander IV. Urban IV. Clement IV. Gregory X. Nicolas III. and Boniface VIII. by whoſe order the compilation was made. The perſons employed in making of it were Will. de Mandegot, archbiſhop of Ambrun; and Berenger, biſhop of Beziers; and Richard, of Sienna. See CANON-*law*.

SEXTUS *oculi*, in *Anatomy*, a name given by Fallopius to one of the muſcles of the eye, called by Albinus, and others, the OBLIQUUS *oculi inferior*, and by ſome the *obliquus oculi brevis*.

SEXTUS *thoracis*, in *Anatomy*, a name given by Fallopius, and others, to a muſcle, now generally known by the name of the *triangularis ſterni*.

SEXUAL *ſyſtem*, in *Botany*, denotes that ſyſtem, which is founded on a diſcovery, that there is in vegetables, as well as in animals, a diſtinction of the ſexes; or that plants propagate themſelves by means of male and female organs, either growing upon the ſame tree, or upon different trees of the ſame ſpecies. This ſyſtem is ſuggeſted and confirmed by the analogy obſervable between the eggs of animals and the ſeed of plants, both ſerving equally to the ſame end; viz. that of propagating a ſimilar race; and by the remarks which have been made, that when the ſeed of the female plant is not impregnated with the prolific powder of the male, it bears no fruit; inſomuch that as often as the communication between the *ſexual* parts of plants has been intercepted, which is the cauſe of their fecundity, they have always proved barren. The authors of this ſyſtem, after exactly anatomizing all the parts of the plant, aſſign to each a name, founded on its uſe and analogy to the parts of an animal. Thus, as to the male organs, the filaments are the ſpermatic veſſels, the antheræ the teſticles, and the duſt of the antheræ correſpond to the ſperm and ſeminal animalcules; and as to the female, the ſtigma is the external part of the female organ, which receives the duſt; the ſtyle anſwers to the vagina; the germ to the ovary; and the pericarpium, or fecundated ovary, to the womb. See *Generation of* PLANTS, and VEGETATION.

The *ſexual* ſyſtem was not wholly unknown to the ancients, though their knowledge of it was very imperfect. Accordingly, we find in the account given by Herodotus (lib. i.) of the country about Babylon, where PALM-*trees* abounded, that it was a cuſtom with the natives, in their culture of theſe plants, to aſſiſt the operations of nature, by gathering the flowers of the male trees, and carrying them to the female. By this means they ſecured the ripening of the fruit; which might elſe, on account of unfavourable ſeaſons, or the want of a proper intermixture of the trees of each ſex, have been precarious, or at leaſt not to have been expected in equal quantities. The ancients had alſo ſimilar notions concerning the fig. Theophraſtus (Hiſt. Plant. lib. iii cap. 9.) obſerves, that the characteriſtic and univerſal difference among trees is that of their gender, whether male or female. And Ariſtotle (De Plantis, lib. i. cap. 2.) ſays, that we ought not to fancy, that the intermingling of ſexes in plants is the ſame as among animals. However, there ſeems to have been a difference of opinion among the ancients as to the manner in which plants ſhould be allowed to have a difference of ſex. Some apprehended that the two ſexes exiſted ſeparately; and others thought that they were united in the ſame individual. Empedocles thought, that plants were androgynous or hermaphroditical, or that they were a compoſition of both ſexes. Ariſtotle expreſſes his doubt upon this head. Empedocles (vide Ariſt. de Generat. Anim. lib. i. cap. 23.) called plants oviparous; for the ſeed or egg, according to his account, is the fruit of the generative faculty, one part of which ſerves to form the plant, and the other to nouriſh the germ and root; and in animals of different ſexes, we ſee that nature, when they would procreate, impels them to unite, and like plants to become one; that from this combination of two, there may ſpring up another animal.

As to the manner in which fruits were impregnated, the ancients were not ignorant that it was by means of the prolific duſt contained in the flower of the male; and they remarked, that the fruits of trees never come to maturity, till they had been cheriſhed with that duſt. Upon this ſubject Ariſtotle ſays (De Plant. lib. i. cap. 6.) that if one ſhakes the duſt of a branch of the male palm-tree over the female, her fruits will quickly ripen; and that when the wind ſheds this duſt of the male upon the female, her fruits ripen apace, juſt as if a branch of the male had been ſuſpended over her. And Theophraſtus (Hiſt. Plant. lib. ii. cap. 9.) obſerves, that they bring the male to the female palm, in order to make her produce fruit. The manner in which they proceed, ſays he, is this. When the male is in flower, they ſelect a branch abounding with that downy duſt which reſides in the flower, and ſhake this over the fruit of the female. This operation prevents the fruit from becoming abortive, and brings it ſoon to perfect maturity. Pliny alſo informs us (Nat. Hiſt. tom. i. lib. xiii. c. 7.) that naturaliſts admit the diſtinction of ſex, not only in trees, but in herbs, and in all plants. Yet this is no where more obſervable, he adds, than in palms, the females of which never propagate but when they are fecundated by the duſt of the male. He calls the female palms, deprived of male aſſiſtance, barren widows. He compares the conjunction of theſe plants to that of animals; and ſays, that to generate fruit, the female needs only the aſperſion of the duſt or down of the flowers of the male.

Zaluzianſki ſeems to have been the firſt among the moderns who clearly diſtinguiſhed from one another the male, the female, and the hermaphroditical plants. About a hundred years after him, ſir Thomas Millington, and Dr. Grew, communicated to the Royal Society their obſervations on the impregnating duſt of the ſtamina. Grew's Anatomy of Plants, publiſhed in 1682.

Camerarius, towards the end of the laſt century, obſerved, that upon plucking off the ſtamina of ſome male plants, the buds that ought to have produced fruit came not to maturity. Malpighi, Geoffroy, and Vaillant, have alſo carefully conſidered the fecundating duſt; the latter of whom ſeems to have been the firſt eye-witneſs of this ſecret of nature, the admirable operation that paſſes in the flowers of plants, between the organs of different ſexes. Many authors afterwards applied themſelves to improve this ſyſtem; the principal of whom were Morland, Logan, Van Royen, Bradley, Gotliel, Ludwigius, Blair, Wolfius, Verdrees, and Monro. But Linnæus had

had the honour of completing this system, by reducing all trees and plants to particular classes, distinguished by the number of their stamina, or male organs. See Dutens's Inquiry into the Origin of the Discoveries attributed to the Moderns, 1769, chap. vii. Phil. Trans. vol. xlvii. art. 25.

The *sexual* hypothesis, on its first appearance, was received with all that caution which becomes an enlightened age; and nature was traced experimentally through all her variations, before it was universally assented to. Tournefort refused to give it a place in his system; and Pontedera, though he had carefully examined it, treated it as chimerical. The learned Dr. Alston, professor of botany in the university of Edinburgh, violently opposed it; but the proofs which Dr. Linnæus has given amongst the aphorisms of his Fundamenta Botanica, and farther illustrated in his Philosophia Botanica, are so clear, that the mind does not hesitate a moment in pronouncing animal and vegetable conception to be the same; but with this difference, that in animals fruition is voluntary, but in vegetables necessary and mechanical. The impregnation of the female palm by the farina of the male, related by M. Mylius, in his letter to Dr. Watson (Phil. Trans. vol. xlvii. art. 25.) establishes the fact attested by the ancients concerning the palm-tree; and as the fructification in other vegetables, though it may differ in particular circumstances, has nevertheless a general conformity to that of the palm-tree, with respect to the parts supposed to be the organs of generation, which are discoverable either on the same or in a separate flower, we may, from this single experiment, deduce an argument by analogy for the confirmation of the whole *sexual* hypothesis. Besides, a very striking proof of the analogy between plants and animals may be drawn from observations made in their infant states, at which early period they seem nourished and protected in a similar manner. Those who desire farther satisfaction, may see the several demonstrations collected, and methodically connected, in the Sponsalia Plantarum of J. Gustavus Walkbloom, published in the Amœnitates Academicæ, at Leyden, in 1749. See *Generation of* PLANTS, *Food of* PLANTS, and VEGETATION.

For a distinct view of the arrangement formed upon the Linnæan system, see FRUCTIFICATION.

SEXUALISTÆ, among *Botanical Authors*. See BOTANY, FRUCTIFICATION, and SEXUAL.

SEXUNX, in *Pharmacy*, the weight of six ounces, or half a pound troy.

SEYGAR, in the *Materia Medica*, a name used by some authors for the nutmeg.

SEYMS, among *Farriers*. See SEAMS.

SGRAFFIT, *sgraffiata*, in *Painting*. See SCRATCH-WORK.

SHACK, in *Ancient Customs*, a liberty of winter-pasturage. In the counties of Norfolk and Suffolk, the lord of the manor has *shack*, i. e. a liberty of feeding his sheep at pleasure in his tenants lands, during the six winter months.

In Norfolk, *shack* also extends to the common for hogs, in all men's grounds, from the end of harvest, till seed-time. Whence, to go *a-shack*, is to feed at large.

SHACKLES, aboard a *Ship*, are those oblong iron rings, bigger at one end than at the other, with which the ports are shut fast, by thrusting the wooden bar of the port through them. There is also a sort of *shackles* to lift the hatches up with, of a like figure, but smaller. They are fastened at the corners of the hatches.

SHAD, *alausa*, in *Ichthyology*, the name of a sea-fish of the herring-kind, called also the *mother of herrings*, and by some authors *clupea* and *trissa*, by the ancients *trichis*, or *trichias*, and the *clupea alosa* of Linnæus. See *Tab.* IV. *of Fish*, N° 39.

It very much resembles the herring in its general form, but it is flatter and broader, and grows to a cubit long, and four inches broad. The head slopes down considerably from the back, which at the beginning is very convex, and rather sharp; the body from thence grows gradually less towards the tail; the under jaw is rather longer than the upper; the teeth very minute; the dorsal fin is placed very near the centre, is small, and the middle rays are the longest; the pectoral and ventral fins are small; the tail very forked; the belly extremely sharp, and strongly serrated; the back is of a dusky blue; above the gills begins a line of dark spots, which mark the upper part of the back on each side; the number of these spots is different in different fish, from four to ten.

It is very common in many seas, and in some of our large rivers, which lie near the sea. They run up these in great numbers, and are then very fat; they afterwards become lean, and then go down to the sea again. They usually swim in large shoals together.

In Great Britain the Severn affords the *shad* in higher perfection than any other river; where it first appears in May, but in very warm seasons in April, and continues about two months. The *shad*, at its first appearance, especially near Gloucester, is esteemed a very delicate fish, and sells dearer than salmon. The London fishmongers distinguish it from that of the Thames, by the French name of *alose*. Whether they spawn in the Severn and Wye is not determined, as their fry has not yet been ascertained. The old fish come from the sea in full roe. The fishermen erroneously imagine that the bleak, which appears in multitudes near Gloucester, in July and August, are the fry of the *shad*. Many of these are taken in those months only, but none of the emaciated *shad* are ever caught in their return. The Thames *shad* does not frequent that river till the month of July, and is esteemed a very insipid coarse fish. About the same time, the *twaite*, a variety of the *shad*, makes its appearance near Gloucester, and is taken in great numbers in the Severn, but held in as great disrepute as the *shad* of the Thames. The true *shad* weighs sometimes eight pounds, but their general size is from four to five. The twaite, on the contrary, weighs from half a pound to two pounds, which it never exceeds. The twaite differs from a small *shad* only in having one or more round black spots on the sides; if only one, it is always near the gill, but commonly there are three or four, placed one under the other. Pennant.

No *shad* is to be taken in the Thames or Medway, except from May 10 to June 30. 30 Geo. II. cap. 21.

SHADDOCK, in *Botany*, the name given to a species of ORANGE.

SHADOW, *shade*, in *Optics*, a certain space deprived of light, or where the light is weakened by the interposition of some opake body before the luminary.

The doctrine of *shadows* makes a considerable article in optics, astronomy, and geography; and is the general foundation of dialling.

As nothing is seen but by light, a mere *shadow* is invisible; when, therefore, we say, we see a *shadow*, we mean partly, that we see bodies placed in the *shadow*, and illuminated by light, reflected from collateral bodies; and partly, that we see the confines of the light.

If the opake body, that projects the *shadow*, be perpendicular to the horizon, and the plane it is projected on be horizontal, the *shadow* is called a right *shadow*. Such are the *shadows* of men, trees, buildings, mountains, &c. If the opake body be placed parallel to the horizon, the *shadow* is called a *versed shadow*; as the arms of a man stretched out, &c.

SHADOWS *from opake bodies, laws of the projection of*. 1. Every opake body projects a *shadow* in the same direction with the rays of light; that is, towards the part opposite to the light. Hence, as either the luminary or the body changes place, the *shadow* likewise changes its place.

2. Every opake body projects as many *shadows*, as there are luminaries to enlighten it.

3. As the light of the luminary is more intense, the *shadow* is the deeper. Hence, the intensity of the *shadow* is measured by the degrees of light that space is deprived of. In reality, the *shadow* itself is not deeper, but it appears so, because the surrounding bodies are more intensely illuminated.

4. If a luminous sphere be equal to an opake one, which it illumines, the *shadow* this latter projects, will be a cylinder; and, of consequence, will be propagated still equal to itself, at whatever distance it extends; so that, if it be cut in any place, the plane of the section will be a circle equal to a great circle of the opake sphere.

5. If the luminous sphere be greater than the opake one, the *shadow* will be conical. If, therefore, the *shadow* be cut by a plane parallel to the base, the plane of the section will be a circle; and that so much the less, as it is at a greater distance from the base.

6. If the luminous sphere be less than the opake one, the *shadow* will be a truncated cone: consequently it grows still wider and wider; and therefore, if cut by a plane parallel to its base, that plane will be a circle so much the greater as it is farther from the base.

7. To find the length of the *shadow*, or the axis of the shady cone, projected by a less opake sphere, illumined by a larger; the semidiameters of the two, as CG, and IM (*Tab. Optics, fig.* 12.) and the distances between their centres GM, being given.

Draw FM parallel to CH; then will IM = CF; and therefore FG will be the difference of the semidiameters GC and IM. Consequently, as FG, the difference of the semidiameters, is to GM, the distance of the centres; so is CF, or IM, the diameter of the opake sphere, to MH, the distance of the vertex of the shady cone, from the centre of the opake sphere. If, then, the ratio of PM to MH be very small; so that MH and PH do not differ very considerably, HM may be taken for the axis of the *shadow*

dowy cone: otherwise the part PM must be subtracted from it; to find which, seek the arch LK, which is the measure of the angle LMK, or MHI, and this angle is one of the angles of the right angle triangle MHI, the sides of which, MI and MH, are known; for this, subtracted from a quadrant, leaves the arch IQ, which is the measure of the angle IMP. Since then, in the triangle MIP, which is rectangular at P, besides the angle IMQ, we have the side IM; the side MP is easily found by plain trigonometry.

E. gr. If the semidiameter of the earth be MI = 1; the semidiameter of the sun will be = 117; and therefore GF = 111; and of consequence MH = 217; since then MP is found by calculation to bear a very small ratio to MH; for the angle MIF = KML, may be taken equal to the apparent semidiameter of the sun, because of the sun's great distance, and its considerable magnitude, in proportion to the globe M; and, therefore, MP : MI : : sine of 16′ : radius, i. e. : : 217 : 1, nearly; and as MH is about 217 times MI, PM may be neglected, and PH may be taken to be 217 semidiameters of the earth. See ECLIPSE *of the moon*.

Hence, as the ratio of the distance of the opake body, from the luminous body GM, to the length of the *shadow* MH, is constant; if the distance be diminished, the length of the *shadow* must be diminished likewise. Consequently, the *shadow* continually decreases as the opake body approaches the luminary.

8. To find the length of the *shadow* projected by an opake body TS (*fig.* 13.); the altitude of the luminary, e. gr. of the sun above the horizon, viz. the angle SVT, and that of the body, being given. Since, in the rectangled triangle STV, which is rectangular at T, we have given the angle V, and the side TS; the length of the *shadow* TV is had by trigonometry.

Thus, suppose the altitude of the sun 37° 45′, and the altitude of a tower 178 feet; TV will be found 230 feet nearly.

9. The length of the *shadow* TV, and the height of the opake body TS, being given; to find the altitude of the sun above the horizon.

Since, in the rectangled triangle STV, rectangular at T, the sides TV and TS are given; the angle V is found thus: as the length of the *shadow* TV, is to the altitude of the opake body TS, so is the whole sine to the tangent of the sun's altitude above the horizon. Thus, if TS be 30 feet, and TV 45, TVS will be found 41° 49′.

10. If the altitude of the luminary, e. gr. the sun above the horizon TVS, be 45°, the length of the *shadow* TV is equal to the height of the opake body: the triangle in this case being isosceles.

11. The length of the *shadows* TZ and TV of the same opake body TS, in different altitudes of the luminary, are as the cotangents of those altitudes.

Hence, as the cotangent of a greater angle is less than that of a less angle; as the luminary rises higher, the *shadow* decreases; whence it is, that the meridian *shadows* are longer in winter than in summer.

12. To measure the altitude of any object, e. gr. a tower AB (*fig.* 14.) by means of its *shadow* projected on an horizontal plane.

At the extremity of the *shadow* of the tower C, fix a stick, and measure the length of the *shadow* AC; fix another stick in the ground of a known altitude DE, and measure the length of the *shadow* thereof EF. Then as EF is to AC, so is DE to AB. If, therefore, AC be 45 yards, ED 5 yards, and EF 7 yards; AB will be 32$\frac{1}{7}$ yards.

13. The right *shadow* is to the height of the opake body, as the cosine of the height of the luminary, to the sine.

14. The altitude of the luminary being the same in both cases, the opake body AC (*fig.* 15.) will be to the versed *shadow* AD, as the right *shadow* EB, to its opake body DB. Hence, 1. The opake body is to its versed *shadow*, as the cosine of the altitude of the luminary to its sine; consequently, the versed *shadow* AD is to its opake body AC, as the sine of the altitude of the luminary to its cosine. 2. If DB = AC; then will DB be a mean proportional between EB and AD; that is, the length of the opake body is a mean proportional between its right *shadow* and versed *shadow*, under the same altitude of the luminary. 3. When the angle C is 45°, the sine and cosine are equal; and, therefore, the versed *shadow* is equal to the length of the opake body.

15. A right sine is to a versed sine of the same opake body, under the same altitude of the luminary, in a duplicate ratio of the cosine to the sine of the altitude of the luminary.

Right and versed *shadows* are of considerable use in measuring; as by their means we can commodiously enough measure altitudes, both accessible and inaccessible, and that too when the body does not project any *shadow*.

The right *shadows* we use, when the *shadow* does not exceed the altitude; and the versed *shadows*, when the *shadow* is greater than the altitude. On this footing is made an instrument called the *quadrat*, or *line of shadows*; by means whereof the ratios of the right and versed *shadow* of any object, at any altitude, are determined. This instrument is usually added on the face of the quadrant. Its description and use, see under QUADRAT, and ALTITUDE.

SHADOW, in *Geography*. The inhabitants of the globe are divided, with respect to their *shadows*, into ASCII, AMPHISCII, HETEROSCII, and PERISCII.

SHADOW, in *Painting*, denotes an imitation of a real *shadow*, effected by gradually heightening and darkening the colours of such figures as by their disposition cannot receive any direct rays from the luminary supposed to enlighten the piece. The management of the *shadows* and lights makes what painters call the *clair-obscure*: the laws whereof see under the article CLAIR-OBSCURE.

SHADOW, in *Perspective*. The appearance of an opake body, and a luminous one, whose rays diverge (e. gr. a candle, lamp, &c.) being given; to find the just appearance of the *shadow*, according to the laws of perspective.

The method is this: from the luminous body, which is here considered as a point, let fall a perpendicular to the perspective plane or table; i. e. find the appearance of a point upon which a perpendicular, drawn from the middle of the luminary, falls on the perspective plane; and from the several angles, or raised points of the body, let fall perpendiculars to the plane. These points, whereon the perpendiculars fall, connect by right lines, with the point upon which the perpendicular let fall from the luminary, falls; and continue the lines to the side opposite to the luminary. Lastly, through the raised points, draw lines through the centre of the luminary, intersecting the former; the points of intersection are the terms or bounds of the *shadow*.

E. gr. Suppose it required to project the appearance of the *shadow* of a prism, ABCFED (*Tab.* IV. *Perspective*, *fig.* 80.) scenographically delineated: since AD, BE, and CF, are perpendicular to the plane, and LM is likewise perpendicular to the same (for the luminary is given, if its altitude LM be given), draw the right lines GM and HM, through the points D and E. Through the raised points A and B, draw the right lines GL and HL, intersecting the former in G and H. Since the *shadow* of the right line AD terminates in G; and the *shadow* of the right line BE in H; and the *shadows* of all the other lines, conceived in the given prism, are comprehended within these terms; GDEH will be the appearance of the *shadow* projected by the prism.

If the *shadows* of objects be made by the light of the sun, the situation of that luminary, with respect to the picture, must be determined; and this is done by the help of the following considerations. By reason of the immense distance of the sun, it must always be supposed to be in, or over some point in the horizontal line, in which the ground plane, when extended to an infinite distance, is conceived to vanish; and the particular point in the horizontal line must be determined from the number of degrees by which the sun is situated to the right or left hand of the perpendicular that goes through the point of sight; in the same manner as the vanishing point of a right line upon the ground plane, that is oblique to the ground line, is found. E. gr. If the sun be thirty degrees to the left hand of it, let the angle DEH (*fig.* 81.) be equal to 30°, and H will be that point in the horizontal line, over which the sun may be supposed to be perpendicular; and nothing is wanting to fix its precise place above the horizon, but to know its altitude, which is laid down in the same manner as the vanishing point of a line that is elevated above the ground plane. Thus, if the sun be 35° high, make HI = HE, and, raising the perpendicular HK, make the angle HIK = 35°, and K will be the sun's place.

Let it be required to draw the *shadow* of any object made by the sun in this situation; and suppose K to be the place of the candle L, in *fig.* 80. and H to be, M, the point upon the ground plane that is perpendicularly under it; the process will be exactly the same as in that example. Thus, to draw the *shadow* of the solid X (*fig.* 82.) the place of the sun being at K; draw H *a*, and intersecting it by K *b* in *c*, we have the place of the *shadow* of *b*; and joining *a c*, we have the *shadow* of the perpendicular line *a b*. In like manner find *d*, the *shadow* of *f*, at the top of the line *e f*; and also *g*, the *shadow* of the vertex of the line *hi*. Then joining these points, we have the *shadow* of the whole object X; for it is evident, from the position of it, that the *shadow* of any other line in the figure must fall within that of these. When, as in this example, the place of the sun is fixed

above

above the horizontal line, it is evident, that the *ſhadows* will be projected as falling towards the ſpectator, and that they will always be larger than the objects.

To draw the *ſhadows* which are made by the ſun, having the ſame degree of elevation *behind* the ſpectator, which will make the *ſhadows* fall nearer the horizontal line, and leſs than the objects; the perpendicular from H (*fig.* 81.) muſt be let fall to L, and the angle HIL muſt be the ſame as HIK, in the former caſe; and then, if the point L be made uſe of inſtead of K; as theſe points are ſituated on the contrary ſides of the horizontal line, the *ſhadows* of objects will be repreſented as they would be made by the ſun placed on the back of the ſpectator; and this poſition of *ſhadows* is generally thought more agreeable in a picture than the other. To find, in this manner, the *ſhadow* of the line *a b*, in the ſolid X (*fig.* 83.) draw H *a* to the foot of it, and L *b* to the top, interſecting each other in *c*, the place of the *ſhadow*. Find, in the ſame manner, where the *ſhadow* of the line *e f*, behind the body, would fall, and join that point and *c*, by a line which cuts the ſide of the figure in *d*, where only the *ſhadow* begins to be viſible. Thus, joining *a*, *c*, and *d*, the *ſhadow* of the ſolid, X, is completed.

In both theſe caſes the ſun is ſuppoſed to be ſituated either *before* or *behind* the picture. If it be *in the plane* of the picture, it is evident that its place muſt be in the horizontal line, at an infinite diſtance from the point of ſight; conſequently all lines proceeding from it may be ſuppoſed parallel to one another. To draw the *ſhadows* of objects made by the ſun in this ſituation, draw lines parallel to the horizontal line from the foot of the object, and interſect them by lines making angles with the horizontal line equal to the ſun's altitude. This practice is very eaſy by means of the drawing board and ſquare. Then, in order to draw the *ſhadow* of a ſolid X (*fig.* 84.) with the ruler of the ſquare parallel to the ground line, draw *a c*; and fixing the moveable tranſverſe of the ruler in the angle of the ſun's elevation, draw the line *b c*, which gives *c* for the place of the *ſhadow* of *b*. In the ſame manner alſo find *d*, the place of the *ſhadow* of *e*; and joining the points *d*, *c*, we obtain the *ſhadow* of the whole figure; though it is ſo ſituated, that part of it is hid by the object. If there be ever ſo many lines, the *ſhadows* of which are to be found, once fixing of the ruler ſerves for them all. It is merely neceſſary to ſlide the ruler along the drawing-board, till it comes to the points from which the lines are to be drawn, both for the lines that are parallel to the horizon, and thoſe that interſect them. To draw the *ſhadow* of the ſolid Y (*fig.* 84.), which lies oblique both to the horizon and to the ground plane, draw *a c* from the foot of the line *a b*, parallel to the horizon; and fixing the moveable tranſverſe of the ruler, ſo as to make an angle equal to the ſun's altitude, draw *b c*. In the ſame manner find *g*, the *ſhadow* of *f*; and drawing *g c*, and joining *c d*, the place where the neareſt extremity of the ſolid touches the ground, we may complete the outline of the whole *ſhadow*; for the *ſhadows* of all the other lines muſt fall within theſe. We may obſerve, that it makes no difference in the *ſhadow*, whatever be the height or ſhape of objects, provided their tops, and every part of them, be in the ſame right lines proceeding from the luminous body.

As for thoſe *ſhadows* that are intercepted by other objects, it may be obſerved, that when the *ſhadow* of a line falls upon any object, it muſt neceſſarily take the form of that object. If it fall upon another plane, it will be a right line; and if upon a globe, or cylinder, it will be circular. If the body intercepting it be a plane, whatever be the ſituation of it, the *ſhadow* falling upon it might be found by producing that plane, till it intercepted the perpendicular let fall upon it from the luminous body; for then a line drawn from that point would determine the *ſhadow*, juſt as if no other plane had been concerned. But the appearance of all theſe *ſhadows* may be drawn with leſs trouble, by firſt drawing it through theſe interpoſed objects, as if they had not been in the way, and then making the *ſhadow* to aſcend perpendicularly up every perpendicular plane, and obliquely on thoſe that are ſituated obliquely, in the manner deſcribed by Dr. Prieſtley, *ubi infra*.

Here we may obſerve in general, that ſince the *ſhadows* of all objects which are caſt upon the ground, will vaniſh into the horizontal line; ſo, for the ſame reaſon, the vaniſhing points of all *ſhadows*, which are caſt upon any inclined, or other plane, will be ſomewhere in the vaniſhing line of that plane.

When objects are not ſuppoſed to be viewed by the light of the ſun, or of a candle, but only in the light of a cloudy day, or in a room into which the ſun does not ſhine, there is no ſenſible *ſhadow* of the upper part of the object, and the lower part only makes the neighbouring parts of the ground, on which it ſtands, a little darker than the reſt. This imperfect obſcure kind of *ſhadow* is eaſily made, being nothing more than a ſhade on the ground, oppoſite to the ſide on which the light is ſuppoſed to come; and it may be continued to a greater or leſs diſtance, according to the ſuppoſed brightneſs of the light by which it is made. It is in this manner (in order to ſave trouble, and ſometimes to prevent confuſion) that the *ſhadows* in moſt drawings are made. See on the ſubject of this article Prieſtley's Treatiſe on Perſpective, part ii. p. 73, &c. and Taylor's Method of Perſpective, by Kirby, book ii. chap. 4.

SHADOWS, *geneſis of curves by*. See CURVE.

SHADOWS, *blue*. See BLUENESS.

SHAFT, in *Building*. The *ſhaft of a column* is the body thereof; thus called from its ſtraightneſs: but by architects more frequently the *fuſt*. See *Tab. Archit. fig.* 22, 25, 26, 28, 32. See the dimenſions under COLUMN.

SHAFT is alſo uſed for the ſpire of a church-ſteeple. And for the ſhank or tunnel of a chimney.

SHAFT *of a mine*, is the hollow entrance or paſſage into a mine, ſunk or dug to come at the ore.

In the tin-mines, after this is ſunk about a fathom, they leave a little, long, ſquare place, which is called a SHAMBLE.

Shafts are ſunk ſome ten, ſome twenty fathoms deep into the earth, more or leſs. Of theſe *ſhafts*, there is the landing or working *ſhaft*, where they bring up the work or ore to the ſurface; but if it be worked by a horſe engine or whim, it is called a whim-*ſhaft*; and where the water is drawn out of the mine, it is indifferently named an engine-*ſhaft*, or the rod-*ſhaft*. See MINE.

SHAGGE, or SHAG, in *Ornithology*, a name by which we call a water-fowl common on the northern coaſts, and called by Mr. Ray *corvus aquaticus minor*, or the leſſer cormorant, being properly a bird of the cormorant kind, or the *pelicanus graculus* of Linnæus.

It is ſomewhat larger than the common duck, and weighs about four pounds; its beak is ſtraight and ſlender, and is not flatted, but roundiſh; it is four inches long, and is hooked at the end; its mouth opens very wide, and its eyes are ſmall; the head is adorned with a creſt, two inches long, pointing backward; the whole plumage of the upper part of this bird is of a fine and very ſhining green, the edges of the feathers a purpliſh black; but the lower part of the back, head, and neck, wholly green; the belly duſky, and the legs black. It builds in trees as the common cormorant, ſwims with the head erect, and is very difficult to be ſhot; becauſe, when it ſees the flaſh of a gun, it pops under water, and does not riſe but at a conſiderable diſtance.

SHAGREEN, or CHAGREEN, derived from the Tartar *ſoghrè*, a kind of grained leather, chiefly uſed in the covers of caſes, books, &c. It is very cloſe and ſolid, and covered over with little roundiſh grains, or papillæ. It is brought from Conſtantinople, Tunis, Tripoli, Algiers, and ſome parts of Poland.

There is a diſpute among authors, what the animal is whence the *ſhagreen* is prepared? Rauwolf aſſures us, it is the ONAGER, which, according to him and Bellonius, is a kind of wild aſs. Vide Ray, Synopſ. An. Quad. p. 63.

It is added, that it is only the hard part of the ſkin which is uſed for this purpoſe. Or, it is that part of the ſkin that grows about the rump; that of horſes is ſaid to be equally good. There are large manufactures of it at Aſtracan, and in all Perſia. Borel ſays, it is the ſkin of a ſea-calf; others, of a kind of fiſh, called by the Turks *ſhagrain*, whoſe ſkin is covered with grains; and thoſe ſo hard, that they will raſp and poliſh wood.

There is alſo a ſort of *ſhagreen*, which was formerly made of the ſkin of the ſquatina; in Engliſh, the monk or angel-fiſh, but now of that of the greater dog-fiſh. Vide Willughby Ichth. p. 80.

SHAGREEN, *manner of preparing*. The ſkin, being juſt flayed off, is ſtretched out, covered over with muſtard-ſeed, and the ſeed bruiſed on it; and thus it is expoſed to the weather for ſome days, and then tanned.

The beſt is that brought from Conſtantinople, of a browniſh colour; the white is the worſt. It is extremely hard; yet, when ſteeped in water, it becomes very ſoft and pliable; whence it is of great uſe among caſe-makers. It takes any colour that is given it, red, green, yellow, or black. It is frequently counterfeited by morocco, formed like *ſhagreen*; but this laſt is diſtinguiſhed by its peeling off, which the firſt does not.

SHAKE, in *Muſic*. See GRUPPO and TRILL.

SHAKER-*pigeon*, a kind of pigeons, of which there are two ſorts, the broad-tailed, and the narrow-tailed.

The firſt is the fineſt, and moſt valued. It has a beautiful long thin neck, which bends like the neck of a ſwan, leaning towards the back. It has a full breaſt, a very

ſhort back, and a tail conſiſting of a great number of feathers, ſeldom leſs than four and twenty, which it ſpreads in an elegant manner, like the tail of a turkey-cock, and bends it up ſo, that it meets the head. It is commonly all white, but ſometimes is red, yellow, or blue-pied. The longer the neck of this bird is, the more it is valued.

The ſecond, or narrow-tailed *ſhaker*, has a ſhorter and thicker neck, and a longer back. It is eſteemed by many a different ſpecies, but ſeems only a mixed breed with ſome other pigeon. They are called *ſhakers*, from a tremulous motion which they have with their necks, when courting.

SHAKLES, on board *Ship*. See SHACKLES.

SHAKY, or SHAKEN, among *Builders*, an appellation given to timber which is cracked either with the heat of the ſun, or the drought of the wind.

SHALE, in *Natural Hiſtory*, a black ſlaty ſubſtance, or a clay hardened into a ſtony conſiſtence, and ſo much impregnated with bitumen, that it becomes ſomewhat like a coal. The acid emitted from *ſhal*, during its calcination, uniting itſelf to the argillaceous earth of the *ſhale*, forms alum. About a hundred and twenty tons of calcined *ſhale* will make one ton of alum. The *ſhale*, after being calcined, is ſteeped in water, by which means the alum, which is formed during the calcination of the *ſhale*, is diſſolved: this diſſolved alum undergoes various operations, before it is formed into the alum of the ſhops. Watſon's Chem. Eſſ. vol. ii. p. 315. See ALUM.

This kind of ſlate forms large ſtrata in Derbyſhire; and that which lies near the ſurface of the earth is of a ſofter and more ſhivery texture than that which lies deeper. It is alſo found in large ſtrata, generally above the coal, in moſt coal counties of this kingdom. Dr. Short informs us, that the *ſhale* waſtes the lead ore near it, by its ſtrong acid; and that it corrodes and deſtroys all minerals near it, except iron or coal, of whoſe vitriol it partakes.

SHALLOP, SHALLOOP, or SLOOP, is a ſmall light veſſel, with only a ſmall main-maſt, and fore-maſt, and lug-ſails, to hale up, and let down, on occaſion.

Shalloops are commonly good ſailers; and are therefore often uſed as tenders upon men of war.

SHALLOT. See ESCHALLOT.

SHALLOW. See SHOAL.

SHAMADE, in *War*. See CHAMADE.

SHAMBLE, or SHAMMEL, in *Mining*, a term uſed to expreſs a ſort of nich, or landing place, left at certain diſtances in the adits of mines, and formed by a ſtage of boards. The method of digging the tin mines in Devonſhire, and ſome parts of Cornwall, is this: they ſink their way in ſuch a breadth as is ſufficient for them to ſtand and work, and at every fathom they leave a ſquare place vacant, to which the ore is to be thrown up with ſhovels as it is dug. This they do from caſt to caſt; that is, as far as a man can conveniently throw up the ore with his ſhovel. Thus the ore, as it is dug by the beelmen, is thrown up by the ſhovellers, who follow them from *ſhamble* to *ſhamble*, till it comes to the top of the mine. This, however, is but an inconvenient way, and the uſe of theſe *ſhambles* is generally ſupplied by a winder at the opening of the mine, which manages two buckets, the one of which is ſent down empty, while the other is ſent up full; and one man employed below to load, and another to empty. Phil. Tranſ. N° 69. See DIGGING.

SHAMBRIER, in the *Manege*, is a long thong of leather, made faſt to the end of a cane, in order to animate a horſe, and puniſh him, if he refuſes to obey the rider.

SHAME, in *Ethics*. See PASSION.

SHAMMY, or CHAMMY, CHAMOIS, a kind of leather, either dreſſed in oil, or tanned; much eſteemed for its ſoftneſs, pliancy, &c.

It is prepared from the ſkin of the CHAMOIS, or *ſhamois*, a kind of rupicapra, or wild goat, called alſo *iſard*, inhabiting the mountains of Dauphiny, Savoy, Piedmont, and the Pyrenees.

Beſides the ſoftneſs and warmth of the leather, it has the faculty of bearing ſoap without damage; which renders it very uſeful on many accounts.

In France, &c. ſome wear the ſkin raw, without any preparation. *Shammy* leather is uſed for the purifying of mercury; which is done by paſſing it through the pores of this ſkin, which are very cloſe.

The true *chamois leather* is counterfeited with common goat, kid, and even with ſheep-ſkins; the practice of which makes a particular profeſſion, called by the French *chamoiſure*. The laſt, though the leaſt eſteemed, is yet ſo popular, and ſuch vaſt quantities of it are prepared, eſpecially about Orleans, Marſeilles, and Tholouſe, that it may not be amiſs to give the method of preparation.

Manner of SHAMOISING, *or of preparing ſheep, goat, or kid-ſkins in oil, in imitation of* SHAMMY. The ſkins, being waſhed, drained, and ſmeared over with quick-lime on the fleſhy ſide, are folded in two lengthwiſe, the wool outwards, and laid on heaps, and ſo left to ferment eight days; or, if they had been left to dry after flaying, then fifteen days.

Then they are waſhed out, drained, and half dried; laid on a wooden leg, or horſe, the wool ſtripped off with a round ſtaff for that purpoſe, and laid in a weak pit, the lime whereof had been uſed before, and has loſt the greateſt part of its force.

After twenty-four hours they are taken out, and left to drain twenty-four more; they are then put in another ſtronger pit. This done, they are taken out, drained, and put in again, by turns; which begins to diſpoſe them to take oil; and this practice they continue for ſix weeks in ſummer, or three months in winter: at the end whereof they are waſhed out, laid on the wooden leg, and the ſurface of the ſkin on the wool-ſide peeled off, to render them the ſofter; then made into parcels, ſteeped a night in the river, in winter more, ſtretched ſix or ſeven over one another, on the wooden leg, and the knife paſſed ſtrongly on the fleſh-ſide, to take off any thing ſuperfluous, and render the ſkin ſmooth.

Then they are ſteeped, as before, in the river, and the ſame operation is repeated on the wool ſide; they are then thrown into a tub of water, with bran in it, which is brewed among the ſkins till the greateſt part ſticks to them, and then ſeparated into diſtinct tubs, till they ſwell, and riſe of themſelves above the water.

By this means the remains of the lime are cleared out: they are then wrung out, hung up to dry on ropes, and ſent to the mill, with the quantity of oil neceſſary to ſcour them: the beſt oil is that of ſtock-fiſh.

Here they are firſt thrown in bundles into the river, for twelve hours, then laid in the mill-trough, and fulled without oil till they be well ſoftened; then oiled with the hand, one by one, and thus formed into parcels of four ſkins each; which are milled and dried on cords a ſecond time; then a third; and then oiled again, and dried.

This proceſs is repeated as often as neceſſity requires; when done, if there be any moiſture remaining, they are dried in a ſtove, and made up into parcels wrapped up in wool: after ſome time they are opened to the air, but wrapped up again as before, till ſuch time as the oil ſeems to have loſt all its force, which it ordinarily does in twenty-four hours.

The ſkins are then returned from the mill to the *chamoiſer*, to be ſcoured; which is done by putting them in a lixivium of wood-aſhes, working and beating them in it with poles, and leaving them to ſteep, till the ley hath had its effect; then they are wrung out, ſteeped in another lixivium, wrung again; and this is repeated till all the greaſe and oil be purged out. When this is done, they are half-dried, and paſſed over a ſharp-edged iron inſtrument, placed perpendicular in a block, which opens, ſoftens, and makes them gentle: laſtly, they are thoroughly dried, and paſſed over the ſame inſtrument again; which finiſhes the preparation, and leaves them in form of *ſhammy*.

Kid and goat-ſkins are *ſhamoiſed* in the ſame manner as thoſe of ſheep, excepting that the hair is taken off without the uſe of any lime; and that when brought from the mill, they undergo a particular preparation, called *ramalling*; the moſt delicate and difficult of all the others. It conſiſts in this, that, as ſoon as brought from the mill, they are ſteeped in a fit lixivium, taken out, ſtretched on a round wooden leg, and the hair is ſcraped off with the knife; this makes them ſmooth, and, in working, to caſt a kind of fine knap. The difficulty is in ſcraping them evenly.

SHANK *of an anchor*, on board a ſhip. See ANCHOR.

SHANK, in the *Manege*, is that part of a horſe's fore-leg, which lies between the knee and the fetlock, or paſtern-joint.

SHANK, or *Shank-painter*, in a *Ship*, is a ſhort chain faſtened under the foremaſt-ſhrouds, by a bolt, to the ſhip's ſides, having at the other end a rope faſtened to it. On this *ſhank-painter* the whole weight of the aft part of the anchor reſts, when it lies by the ſhip's ſide. The rope, by which it is haled up, is made faſt about a timber-head. See PAINTER.

SHANKER, in *Medicine*. See CHANCRE.

SHANSCRIT, SAMSCRIT, SAMSCRETAM, or HANSCRIT *language*, is the original language of the *Hindoos* or GENTOOS, in which their SHASTAH, or *Shaſter*, is written, &c.

This language is very copious and nervous; but the ſtyle of the beſt authors wonderfully conciſe. It far exceeds the Greek and Arabic in the variety of its etymology, and, like them, has a prodigious number of derivatives from each primary root. The grammatical rules are alſo numerous and difficult, though there are not many anomalies. It has ſeven declenſions of nouns, which are all uſed

used in the singular, dual, and plural number, and differently formed, as they terminate with a consonant, and with a long or short vowel; and also as they are of different genders. The *Shanscrit* alphabet contains fifty letters; and it is one boast of the Bramins, that it exceeds all other alphabets in this respect. But when we consider that of their thirty-four consonants, nearly half are combined sounds, and that six of their vowels are merely the correspondent long ones to as many which are short, the advantage seems to be little more than imaginary. The *Shanscrit* character, used in Upper Hindostan, is said to be the same original letter that was first delivered to the people by Brihma, and is called Diewnagur, or the language of angels; whereas the character used by the Bramins of Bengal is by no means so ancient, and is evidently a corruption of the former. In the four beids, which constitute the original and sacred text of the great Hindoo creator and legislator Brihma, the length of the vowels is expressed by a musical note or sign placed over every word; and in reading the beids, these distinctions of tone and time must be nicely observed; so that they produce all the effect of a laboured recitative. It is remarkable, that the Jews in their synagogues chant the Pentateuch in the same kind of melody, and it is supposed that this usage has descended to them from the remotest ages. Some writers have erroneously asserted, that the four beids are in verse; whereas they are written in a kind of measured prose; and they are now scarce intelligible to the most learned pundits or lawyers; they are also scarce, and difficult to be found. However, comments have been written upon them from the earliest periods; of which one of the most ancient and approved was composed by Bisesht Mahamomè, or the Most Wise, a great writer and prophet, who is said to have lived in the suttee jogue, or first age of the world. See Halhed's Preface to his translation of the Code of Gentoo Laws, printed in 1776.

To SHAPE *the course*, in *Sea Language*, is to direct or appoint the track of a ship, in order to prosecute a voyage.

SHARE, the name of that part of the plough, which cuts the ground, and the wood to which it is fixed. The extremity of the iron forwards is called the point of the *share*, and the end of the wood behind is called its tail.

The length of the whole *share*, from point to tail, should be three feet nine inches; at the top of the iron it has an upright piece, called the *fin*, and near the iron, at the other end, there is an oblong squared hollow, called the *socket*; the use of which is to receive the bottom of the sheat. Near the tail is a thin plate of iron, well rivetted to the wood; by means of this plate the tail of the *share* is held firmly to the hinder sheat of the plough by a small iron pin, with a screw at the end, and a nut screwed on it, on the inner or right side of the sheat.

The point of the *share* is that part in which it does not run up into the fin: this point is generally made of three inches and a half in length, and should be flat underneath, and round at the top, and the lower part of it must be of hard steel. The edge of the fin should also be well steeled, and should make an acute angle with the *share*.

The socket is a sort of mortise; it should be a foot long, and about two inches deep: the fore end of it must not be perpendicular, but oblique, conformable to the end of the sheat which enters into it. The upper edge of the fore part must be always made to bear against the sheat; but if this end of the socket should not be quite so oblique as the sheat, it may be helped, by paring off a small part of the wood at the point. Tull's Husbandry, p. 140. See PLOUGH.

SHARK, in the Linnæan system of *Ichthyology*, is a species of the SQUALUS. Pennant makes it a distinct genus, the characters of which are these: the body is slender, and grows less towards the tail; it has two fins on the back; a rough skin; five apertures on the sides of the neck; the mouth generally placed far beneath the end of the nose; and the upper part of the tail longer than the lower. We know two different fish under the same name of *shark*, with the addition of their colour, blue and white.

The blue *shark* is that species of squalus, called *glaucus*, and *galeus glaucus*, by authors, and distinguished by Artedi by the name of the *squalus* with a triangular dent, or furrow, in the extremity of the back, and with no foramina about the eyes. It is of a fine deep blue colour on the back, and of a bright silver white on the belly; the skin is smoother than that of the white *shark*, and the nose long pointed, and somewhat flatted, and extending far beyond the mouth; the nostrils are long, and placed transversely; the tail is bifid, and one portion of it is much larger than the other; it is very voracious of human flesh, and will follow close under the shore if there be depth enough, and a man is walking there. It is sometimes found on the English shores, and has been caught on the Cornwall coast, during the pilchard season, with large iron hooks, made on purpose. Ælian informs us, that this fish will permit the small brood, when in danger, to swim down its throat, and take shelter in its belly; and the fact has been confirmed by Rondeletius. Mr. Pennant apprehends, that this care of their young is not peculiar to this species, but common to the whole genus of *shark*. See *Tab.* IV. *of Fish*, N° 48.

The other is the *lamia*, or *canis carcharias* of authors, the *squalus carcharias* of Linnæus, commonly called by us simply *the shark*. This is distinguished by Artedi by the name of the *squalus* with a flat back, and with numerous teeth, serrated at the edges.

The white *shark*, or *lamia*, is a very dreadful and voracious fish, the largest of all the *sharks*. They have been seen of four thousand weight, with throats capable of swallowing a lusty man whole; nay, men have been found whole in them when opened. Some have, for this reason, imagined this, and not the whale, to have been the fish in whose belly the prophet Jonah lay. Swimmers very often perish by them; sometimes losing an arm or leg, and sometimes being bit quite asunder, and serving only for two morsels for this ravenous animal. Its teeth are very sharp and terrible; they are disposed in six rows, and are all triangular, and notched like a saw on their edges; these are, in the whole, a hundred and forty-four in number, and are placed in various directions; their number is not exactly determinate; these teeth, when the fish is in a state of repose, lie quite flat in the mouth, but when he seizes his prey, he has power of erecting them, by the help of a set of muscles that join them to the jaw; the mouth is placed far beneath; on which account these fishes, as well as the rest of the kind, are said to be obliged to turn on their backs to seize their prey; which is an observation as ancient as the days of Pliny; its back is short and broad, in comparison of the other fish of this kind, and its tail, which is of a semilunar form, composed of two fins of a cubit in length each. This fish has surprising strength in its tail, and can strike with great force; so that the sailors instantly cut it off with an ax, as soon as they draw one on board. The pectoral fins are very large, which enable it to swim with great swiftness; the colour of the whole body and fins is a light ash; its skin is rough, and its eyes large and round. It is found both in the Ocean and in the Mediterranean, and is of all fish the most voracious of human flesh. See *Tab. Fish*, N° 3.

It has its name from the Greek λαιμος, a *voracious feeder*, or *glutton*. The fossile bodies, called GLOSSOPETRÆ, or SERPENTS *tongues*, and supposed to be real stones, are the teeth of this fish.

SHARK, *basking*, *squalus maximus* of Linnæus, the name given by Mr. Pennant to a fish which inhabits the northern seas, as high as the arctic circle, and which was taken for a species of whale, till he pointed out the branchial orifices in the sides, and the perpendicular site of the tail. This species has been long known to the inhabitants of the south and west of Ireland and Scotland, and those of Caernarvonshire and Anglesea; they quit the bays of these Welch counties about Michaelmas, and the frith of Clyde, and the Hebrides, about the latter end of July. They have nothing of the fierce and voracious nature of the *shark* kind, but are so tame as to suffer themselves to be stroked; lying motionless on the surface of the water, commonly on their bellies, but sometimes on their backs, as if to sun themselves; whence they are called *basking sharks*. Their food seems to consist entirely of sea-plants. Linnæus says they feed on medusæ. At certain times they are seen sporting on the waves, and leaping with great agility several feet out of the water; they swim deliberately, with the dorsal fins above water; their length is from three to twelve yards, and they are sometimes longer; their form is slender; the upper jaw much longer than the lower, and blunt at the end; the mouth placed beneath, and each jaw furnished with numbers of small teeth; those before being much bent, and those more remote in the jaws being conic, and sharp-pointed; on the sides of the neck there are five large transverse apertures to the gills; on the back two fins; the first very large, nearer the head than the middle; the other small, and situated near the tail; on the lower part there are five others, viz. two pectoral fins, two ventral fins, and a small anal fin; near these, the male has two genitals, as in other *sharks*; and between these fins was situated the pudendum of the female; the tail very large, having the upper part much longer than the lower; the colour of the upper part of the body a deep leaden, and the belly white; the skin rough, like shagreen, but less so on the belly than on the back; withinside the mouth, towards the throat, was a very short sort of whalebone; the liver is of a great size, that of the female being the largest,

and

and is melted into a pure and sweet oil, fit for lamps, and much used by the people, who take it to cure bruises, burns, and rheumatic complaints. A large fish will yield eight barrels of oil. These fishes are viviparous, a young one, a foot in length, having been found in the belly of one of them. When they are struck with a harpoon, and wounded, they fling up their tails, and plunge headlong to the bottom, coiling the rope round them, and attempting to disengage themselves from the harpoon, by rolling on the ground. They swim away with such rapidity and violence, that there has been an instance of a vessel of seventy tons having been towed away against a fresh gale; and they will employ the fishers for twelve, and sometimes twenty-four hours, before they are subdued. Pennant's British Zoology, vol. iii. p. 101, &c.

SHARK, *hammer-headed*, *squalus zygæna*, a fish of the *shark* kind, called also the BALANCE-*fish*. See *Tab.* IV. *of Fish*, N° 49.

It is an extremely singular and remarkable fish, and differs not only from all the other *sharks*, but from all the fish in the world, in the figure of its head: this is not placed, as in all other fishes, longitudinally, or in a line with the body, but is set on transversely, as the head of a hammer or mallet upon the handle. This is semicircular at the front, and runs to so thin and sharp an edge, that as the fish swims forward with violence, it may cut other fishes, and is terminated at each end by an eye; these are very large, and so placed, that they more conveniently look down than either upward or sideway. In the farther part of the forehead also, near the eyes, on each side there is a large oblong foramen, serving either for hearing or smelling, or perhaps for both; the mouth is very large, and placed under the head, and armed with four rows of extremely sharp and strong teeth, flat, and serrated at their edges; the tail is composed of two fins, one vastly larger than the other; the body is rounded and very long, and is not covered with scales, but a thick skin; the back is ash-coloured, and the belly white. Rondelet. de Aquat. p. 549.

It is caught in the Mediterranean, and sometimes in different parts of the Ocean. Some authors have called it *zygæna*, and others *libella*; which last answers to the English name of the BALANCE-*fish*.

SHARK, *picked*. See GALEUS *acanthias*.

SHARK, *long-tailed*. See *Sea* FOX.

SHARK, *spotted*, *squalus canicula* of Linnæus. See CATULUS.

SHARK, *lesser spotted*, called the *morgay*, or *rough hound-fish*, *squalus catulus* of Linnæus. See CATULUS, HOUND-*fish*, and MORGAY.

SHARK, *smooth*, *squalus mustelus* of Linnæus. See GALEUS *lævis*.

SHARK, called the TOPE, *squalus galeus* of Linnæus. See CANIS *galeus*.

SHARK, called the *angel* or *monk-fish*, *squalus squatina* of Linnæus. See ANGEL, and MONK-*fish*.

SHARP, in *Music*, a kind of artificial note, or character (thus formed, ♯): this, being prefixed to a note, shews that it is to be sung or played a semitone, or half a note higher than the natural note would have been. When a *sharp* is placed at the beginning of a stave or movement, it shews, that all notes that are placed on the same line, or space, throughout, are to be raised half a tone above their natural pitch, unless a natural intervene. When a *sharp* occurs accidentally, it only affects as many notes as follow it on the same line or space, without a natural, in the compass of a bar.

When the semitone takes the name of the natural note next above it, it is marked with a character called a *flat*. It is indifferent, in the main, which of the two be used, though there are sometimes particular reasons for the one rather than the other.

The use of flats and *sharps* is by way of remedy to the deficiencies of the fixed scales of instruments.

SHARP *third*, in *Music*, the third major. See INTERVAL.

SHARP *the bow-line*, in *Sea Language*. See BOWLINE.

SHARP *nails*. See NAIL.

SHARPING *corn*, a customary present of corn, which, at every Christmas, the farmers in some parts of England make to their smith, for sharpening their ploughing-irons, harrow-tines, &c.

SHARPLING, in *Ichthyology*, the English name of the GASTEROSTEUS. See STICKLE-*back*.

SHASTAH, or SHASTER, the name of a sacred book, in high estimation among the idolaters of Hindostan, containing all the dogmas of the religion of the Brahmins, and all the ceremonies of their worship, and serving as a commentary on the VIEDAM.

The term *Shaster* denotes *science* or *system*; and is applied to other works of astronomy and philosophy, which have no relation to the religion of the Indians. None but the Brahmins and rajahs of India are allowed to read the Viedam; the priests of the BANIANS, called *shuderers*, may read the *Shaster*; and the people, in general, are allowed to read only the Paran or Pouran, which is a commentary on the *Shaster*.

The *Shaster* is divided into three parts: the first containing the moral law of the Indians; the second, the rites and ceremonies of their religion; and the third, the distribution of the people into tribes or classes, with the duties pertaining to each class.

The principal precepts of morality contained in the first part of the *Shaster*, are the following: that no animal be killed, because the Indians attribute souls to brute animals as well as to mankind; that they neither hear nor speak evil, nor drink wine, nor eat flesh, nor touch any thing that is unclean; that they observe the feasts, prayers, and washings, which their law prescribes; that they tell no lies, nor are guilty of deceit in trade; that they neither oppress nor offer violence to one another; that they celebrate the solemn feasts and fasts, and appropriate certain hours of ordinary sleep to cultivate a disposition for prayer; and that they do not steal, or defraud one another.

The ceremonies contained in the second part of the *Shaster*, are such as these: that they wash often in the rivers, hereby obtaining the pardon of their sins; that they mark their forehead with red, in token of their relation to the Deity; that they present offerings and prayers under certain trees, set apart for this purpose; that they pray in the temples, make oblations to their pagodas, or idols, sing hymns, and make processions, &c. that they practise pilgrimages to distant rivers, and especially to the Ganges, there to wash themselves, and make offerings; that they make vows to particular saints, according to their respective departments; that they render homage to the Deity, at the first sight of the sun; that they pay their respect to the sun and moon, which are the two eyes of the Deity; and that they treat with particular veneration those animals, that are deemed more pure than others, as the cow, buffalo, &c. because the souls of men have transmigrated into these animals.

The third part of the *Shaster* records the distribution of the people into four classes; the first being that of the Bramins, or priests, appointed to instruct the people; the second, that of the Kutteris, or nobles, who are the magistrates: the third, that of the Shudderis, or merchants: and the fourth, that of the mechanics. Each person is required to remain in the class in which he was born, and to pursue the occupation assigned to him by the *Shaster*. According to the Bramins, the *Shaster* was imparted by God himself to Brahma, and by him to the Bramins, who communicated the contents of it to the people. Encyclopedie.

Modern writers have given us very different accounts of the antiquity and importance of the *Shaster*. Mr. Holwell, who had made a considerable progress in the translation of this book, apprehends, that the mythology, as well as the cosmogony of the Egyptians, Greeks, and Romans, were borrowed from the doctrines of the Bramins, contained in it, even to the copying of their exteriors of worship, and the distribution of their idols, though grossly mutilated and adulterated. With respect to the VIEDAM and *Shastah*, or scriptures of the Gentoos, this writer informs us, that *Viedam*, in the Malabar language, signifies the same as *Shastah* in the Sanscrit; and that the first book is followed by the Gentoos of the Malabar and Coromandel coasts, and also of the island of Ceylon. The *Shastah* is followed by the Gentoos of the provinces of Bengal, and by all the Gentoos of the rest of India, commonly called India Proper, along the course of the rivers Ganges and Jumna to the Indus. Both these books, he says, contain the institutes of their respective religion and worship, as well as the history of their ancient rajahs and princes; often couched under allegory and fable: their antiquity is contended for by the partisans of each; but he thinks, that the similitude of their names, idols, and great part of their worship, leaves little room to doubt, nay plainly evinces, that both these scriptures were originally one. He adds, if we compare the great purity and chaste manners of the *Shastah*, with the great absurdities and impurities of the Viedam, we need not hesitate to pronounce the latter a corruption of the former.

With regard to the high original of these scriptures, the account of the Bramins is chiefly as follows. Brahma, q. d. Mighty Spirit, about four thousand eight hundred and sixty-six years ago, assumed the form of man, and the government of Indostan. He translated the divine law (designed for the restoration of mankind, who had offended in a pre-existent state, and who are now in their last scene of probation, to the dignity from which they were degraded) out of the language of angels into the well

well known *Samſcrit* language, and called his tranſlation the *Chartah Bhade Shoſtah* of Birmah, or the Six Scriptures of Divine Words of the Mighty Spirit. He appointed the Bramins, deriving their name from him, to preach the word of God; and the doctrines of the *Shaſtah* were accordingly preached in their original purity a thouſand years. About this time there was publiſhed a paraphraſe on the *Chartah Bhade*; and about five hundred years afterwards, a ſecond expoſition, called the *Aughtorrah Bhade Shaſta*, or eighteen Books of Divine Words, written in a character compounded of the common Indoſtan, and the Samſcrit. This innovation produced a ſchiſm among the Gentoos; on which occaſion, it is ſaid, thoſe of Coromandel and Malabar formed a ſcripture of their own, which they pretended to be founded on the *Chartah Bhade* of Bramah, and called it the Viedam of Birmah, or Divine Words of the Mighty Spirit. The original *Chartah Bhade* was thrown aſide, and at length wholly unknown, except to a few families, who can ſtill read and expound it in the Samſcrit character. With the eſtabliſhment of the *Aughtorrah Bhade*, and *Viedam*, which, according to the Gentoo account, is three thouſand three hundred and ſixty-ſix years ago, their polytheiſm commenced; and the principles of religion became ſo obſcure, and their ceremonies ſo numerous, that every head of a family was obliged to keep a Bramin, as a guide both in faith and practice. Mr. Holwell is of opinion, that the *Chartah Bhade*, or original ſcriptures, are not copied from any other ſyſtem of theology, promulgated to, or obtruded upon mankind. The Gentoos do not attribute them to Zoroaſter; and Mr. Holwell ſuppoſes, that both Zoroaſter and Pythagoras viſited Indoſtan, not to inſtruct, but to be inſtructed.

From the account of Mr. Dow, we learn, that the books which contain the religion and philoſophy of the Hindoos, are diſtinguiſhed by the name of Bedas; that they are four in number, and, like the ſacred writings of other nations, ſaid to be penned by the Divinity. Beda, he ſays, in the Shanſcrit language, literally ſignifies *ſcience*; and theſe books treat not only of religion and moral duties, but of every branch of philoſophic knowledge. The Bramins maintain, that the Bedas are the divine laws, which Brimha, at the creation of the world, delivered for the inſtruction of mankind; but they affirm, that their meaning was perverted in the firſt age by the ignorance and wickedneſs of ſome princes, whom they repreſent as evil ſpirits, who then haunted the earth. The firſt credible account we have of the Bedahs is, that about the commencement of the Callug, of which æra the year 1768 was the 4886th year, they were written, or rather collected, by a great philoſopher, and reputed prophet, called Beäſs Muni, or Beäſs the Inſpired.

The Hindoos, ſays Mr. Dow, are divided into two great religious ſects: the followers of the doctrine of Bedang, which is the original *Shaſter*, or commentary upon the Bedas; and thoſe who adhere to the principles of the *Neadirſen*. The original *Shaſter* is called Bedang, and is a commentary upon the Bedas. This, he ſays, is erroneouſly called, in Europe, the Viedam. It is aſcribed to Beäſs Muni, and ſaid to have been reviſed ſome years after by one Serrider Swami, ſince which it has been reckoned ſacred, and not ſubject to any farther alterations. Almoſt all the Hindoos of the Decan, and thoſe of the Malabar and Coromandel coaſts, are of this ſect. The followers of the *Bedang Shaſter* do not allow that any phyſical evil exiſts; they maintain that God created all things perfectly good, but that man, being a free agent, may be guilty of moral evil, which may be injurious to himſelf, but can be of no detriment to the general ſyſtem of nature. God, they ſay, being perfectly benevolent, never puniſhed the wicked otherwiſe than by the pain and affliction which are the natural conſequences of evil actions; and hell, therefore, is no other than a conſciouſneſs of evil.

The *Neadirſen Shaſter* is ſaid to have been written by a philoſopher, called Goutam, near four thouſand years ago. The Bramins, from Mr. Dow's account of their ſacred books, appear to believe invariably in the unity, eternity, omniſcience, and omnipotence of God; and the polytheiſm of which they have been accuſed is no more than a ſymbolical worſhip of the divine attributes, which they divide into three claſſes. Under the name of Brimha, they worſhip the wiſdom and creative power of God; under the appellation of Biſhen, his providential and preſerving quality; and under that of Shibah, that attribute which tends to deſtroy.

According to M. de Sainte Croix, the *Shaſta*, however extolled in Europe, with reſpect to its antiquity, is poſterior to the Viedam, being no more than the explication of it. Holwell's Intereſting Hiſtorical Events, &c. 8vo. Dow's Hiſtory of Hindoſtan, 4to. 1768. L'Ezour Vedam, &c. by M. de Sainte Croix, 12mo. Paris, 1779. See Gentoos, Shanscrit, and Viedam.

SHAVE *graſs*, in *Botany*. See Horse-*tail*.

SHAVING-*irons*, among *Gardeners*, tools to keep a garden free from weeds, otherwiſe called *edging-irons*.

SHAUL, an article of female dreſs, much prized in the Eaſt, and now well known in England. As the *ſhauls* all come from Caſſemire, or Cachemir, it was generally concluded, that the materials from which they were fabricated was of the growth of that country. It was ſaid to be the hair of a particular goat, and the fine underhair from a camel's breaſt; but we now certainly know that it is the produce of a Thibet sheep. Bernier relates, that in his time, *ſhauls* made for the great omrahs of the Thibetian wool, coſt a hundred and fifty roupees; whereas thoſe made of the wool of the country never coſt more than fifty.

SHAW, in our *Old Writers*, a grove of trees, or a wood.

Shaw *fowl*, an artificial fowl made for fowlers to ſhoot at.

SHEADING, a riding, tything, or diviſion, in the iſle of Man; the whole iſland being divided into ſix *ſheadings*, in every one of which is a coroner, or chief conſtable, appointed by the delivery of a rod at the annual convention.

SHEAR *off*, in the *Sea Language*. See Sheering.

Shear-*water*, in *Ornithology*, the *procellaria puffinus* of Linnæus, and called by ſome writers *avis* diomedis, is a bird about fifteen inches long, and thirty-one inches broad; the bill is an inch and three quarters long; the noſtrils tubular; the head, and whole upper ſide of the body, wings, tail, and thighs, are of a ſooty blackneſs; the under ſide, from chin to tail, and inner coverts of the wings, white; the legs weak, and compreſſed ſideways; duſky behind, and whitiſh before.

Theſe birds are found in the Calf of Man, whither they reſort in February; taking poſſeſſion of the rabbit-burrows, and then diſappearing till April; the young, which are fit to be taken in the beginning of Auguſt, are killed in great numbers, ſalted, and barrelled; and when boiled, eaten with potatoes. They quit the iſle the latter end of Auguſt, or beginning of September; and there is reaſon to imagine, that, like the ſtorm-finch, they are diſperſed over the whole Atlantic ocean. In the Orkney iſles this ſpecies, called the *lyre*, is much valued for food, and for its feathers. They are taken and ſalted in Auguſt for winter proviſion. Pennant.

SHEARING. The beſt time for *ſhearing* of ſheep is about the middle, or the latter end of June, becauſe it is good for them to ſweat in the wool before it is cut. They muſt be very well waſhed before the *ſhearing*, for this is a great addition to the price of the wool: after the waſhing, let them go three or four days in a clean dry ground. When they are cut, the ſhearer muſt be very careful not to wound their ſkins, becauſe this gives occaſion to the flies to teaze the poor creature in a terrible manner. Some *ſhear* their lambs, the firſt year eſpecially, behind; but before the doing of this they ought to be carefully tagged, as it is called; that is, their tails and thighs behind ſhould be well cleared of wool, that the dung may not hang there, which would elſe make them ſore, and ſubject them to the flies, which would blow them, and make them full of maggots.

In Glouceſterſhire they houſe their ſheep every night, and litter them with clean ſtraw. Their dung makes this a very good manure for the land, and the wool of the ſheep is rendered ſo much finer by it, that the farmers have a double advantage from the practice.

In Middleſex, and about London, they have Way-hill ſheep: theſe come from Hampſhire, Wiltſhire, &c. and lamb very early, before Chriſtmas.

SHEARING, in the *Woollen-Manufacture*. See Sheering.

SHEAT, or Sheet, a name by which ſome call a young hog.

Sheat-*fiſh*, in *Ichthyology*. See Silurus.

Sheat *of a plough*, a word uſed by our farmers to expreſs a part of a plough, paſſing through the beam, and faſtened to the ſhare. The *ſheat*, or, as it is ſometimes called, the *fore-ſheat* (there being another timber behind it, called the *hinder-ſheat*), ſhould be ſeven inches wide, and is faſtened to the beam by the retch, a piece of iron with two legs, and by a wedge driven with it, into the hole in the beam. The angle made by the *ſheat*, with the beam of the plough, ſhould be forty-two, or forty-three degrees. See Plough.

Sheats, or Sheets, in a *Ship*. See Sheet.

If the main-ſail-*ſheats* are haled aft, it is in order to make a ſhip keep by a wind, but when the fore-*ſheats* are haled aft, it is that the ſhip may fall off from the wind; and if ſhe will not do it readily, they then hale the fore-ſail, by the *ſheat*, flat in, as near the ſhip's ſides, as they can; and this they call *flatting in the fore-ſail*. When they ſay,

say, *ease the sheat*, they mean veer it; or let it go out gently; but when the word is, *let fly the sheat*, they mean let it go all at once, and run out as fast as it can; and then the sail will hang loose, and hold no wind. The seamen say, when they would have the *sheats* of the main or fore-sail haled aft, *tally the sheats*. In a very great gale, or gust of wind, there is another rope bent to the clews of the main-sail and fore-sail, above the *sheat*-block, to succour and ease the *sheat*, and this they call a *false sheat*.

SHEATS, in a ship, also, are those planks under water which come along her run, and are closed into the stern-post: so also that part within board, in the run of the ship, is called the *stern-sheats*.

SHEAT, *false*. See SHEATS.

SHEAT, *overhale the*, in the *Sea-Language*, a word of command to hale upon the standing part of the *sheat*.

SHEAT-*anchor*, in a ship. See ANCHOR.

SHEATHING *of a ship* is the casing that part of her hull which is to be under water, with something to keep the worms from eating into her planks.

It is usually done by laying tar and hair, mixed together, all over the old plank, and then nailing on thin new boards. But this hinders a ship's sailing; and therefore of late, some have been sheathed with milled lead, which is much smoother, and consequently better for sailing; and also more cheap and durable than the other way. It was first invented by sir Philip Howard, and major Watson.

The *sheathing* with copper is a still later invention, and answers better than any other.

It is very well worth the trying what the new stone pitch will do in this case: if it will defend from the worm, as perhaps it may, a ship might be paid with it cheaper than with the crown pitch; and it will not crack nor scale off, as that will do, but keeps always soft and smooth. It has been found to continue on thirteen months, and to remain very black and soft all the time.

SHEAVE, in *Mechanics*, a solid cylindrical wheel, fixed in a channel, and moveable about an axis, as being used to raise or increase the mechanical powers applied to remove any body.

SHEBAT, in *Chronology*, the eleventh month of the Jewish ecclesiastical year, answering to part of our January and February.

SHECHINAH, in the *Jewish History*, the name of that miraculous light, or visible glory, which was a symbol of the special presence of the Deity. This *shechinah*, after it had conducted the Israelites through the wilderness, had its more stated residence in the tabernacle and the temple. See ARK *of the covenant*.

For a farther account of this miraculous phenomenon, the reader may consult part ii. chap. 2, of Mr. Lowman's Rationale of the Hebrew Ritual.

Toland, in his Tetradymus, has attempted to prove, that this appearance had nothing miraculous in it, but was only a kind of beacon, used by the Israelites for their direction in their journey.

SHEEP, *ovis*, in the Linnæan system of *Zoology*, makes a distinct genus of animals, of the order of the *pecora*.

The characters by which the creatures of this genus are distinguished from the rest of that order, are these: their horns are hollow, bent backward, wreathed and crooked, and scabrous, not smooth on their outside. They have eight cutting teeth in the lower jaw, but none in the upper, and no canine teeth.

The wool of these animals is only a congeries of very long and slender hairs, oddly twisted and contorted, and variously interwoven with one another. This is a clothing peculiar to the *sheep* kind, so far as is yet known, no other animal having been seen to possess it. It is not, however, the cloathing of all the species of *sheep*, some of the distant nations having short hair, like that of the goat.

Linnæus enumerates three species, viz. the *ovis aries*, or *ram sheep*; the *ovis Guineensis*, or *Guinea sheep*; and the *ovis strepsiceros*, or *Cretan sheep*. According to Mr. Pennant, the last two are varieties.

The *first* species comprehends several varieties; such are the *ovis rustica*, or common *sheep*, with large horns, twisting spirally and outwardly; the *ovis Anglica*, or hornless *sheep*, with the tail and scrotum hanging down to the knees, this is common in many parts of England; the *ovis Hispanica*, or Spanish *sheep*; the *ovis polycerata*, or many-horned *sheep*, having usually three horns, sometimes four, and even five (this sort of *sheep* is very common in Ireland, in Siberia, and other parts of the North); the *ovis Africana*, or African *sheep*, of Ray, which has short hair like that of the goat (these are often brought into England, and seem in no respect different from ours, except in their covering); and the *ovis laticauda* or *Arabica*, or the broad-tailed *sheep*, which is common in Syria, Barbary, and Æthiopia. The tails of these are so long as to trail upon the ground, and the shepherds are obliged to put boards with small wheels under them, to keep them from galling. They are esteemed a great delicacy, being of a substance between fat and marrow, and are eaten with the lean of the mutton. Some of these tails weigh fifty pounds each. The short thick-tailed *sheep* are common among the Tartars. The broad-tailed *sheep* are found in the kingdom of Thibet; and their fleeces, in fineness, beauty, and length, are equal even to those of Caramania. The Cachemirians engross this article, and have factors in all parts of Thibet, for buying up the wool, which they work up into SHAULS, superior in elegance to those that are woven from the fleeces of their own country: and this manufacture is a considerable source of wealth.

Both the broad-tailed and long-tailed varieties were known to the ancients.

There is another variety, called the fat-rumped *sheep*, without tails, with arched noses, wattles, pendulous ears, and curled horns like the common *sheep*. The wool is coarse, long, and in flocks; the legs slender; and the head black; the ears of the same colour, with a bed of white in the middle; the wool is generally white, sometimes black, reddish, and even spotted; the buttocks appear like two hemispheres, quite naked and smooth, and composed only of suet, whence Dr. Pallas calls this variety *ovis steatopyges*. These *sheep* grow large, even to two hundred pounds weight, of which the posteriors weigh forty. Their bleating is short and deep, resembling that of a calf. They abound in all the deserts of Tartary, from the Volga to the Irtis, and the Altaic chain, insomuch that 150,000 have been sold annually at the Orenburg fairs. They are very prolific, and usually bring two at a time, often three.

The *second* species of Linnæus is the *ovis Guineensis*, or African *sheep*, commonly called the *Angola sheep*. This species is long-legged and tall; the hinder part of the head is more prominent than that of our *sheep*; and its ears hang down; the horns are small and bending down to the eyes; and the neck adorned with a large mane; the hair of the rest of the body is short; and it has wattles on the neck. The Portuguese call these *sheep* cabritto: their flesh is very bad food.

The *third* species is the *ovis strepsiceros*, or Cretan *sheep*, with horns quite erect, twisted like a screw, and beautifully furrowed on their outside. This *sheep* is common in Hungary, and large flocks are found on Mount Ida, in Crete. Ray and Pennant.

SHEEP, *wild*. See MUSIMON.

SHEEP, *bearded*. See TRAGELAPHUS.

The *sheep* is in its nature a harmless and timid animal; it resists by butting with its horns, and threatens by stamping with its foot; it generally brings one at a time, sometimes two, rarely three, and goes about five months with young. It is subject to many diseases, proceeding from insects which deposit their eggs in various parts of the animal, or from being kept in wet pastures; for as the *sheep* requires but little drink, it is naturally fond of a dry pasture. The dropsy, vertigo, phthisic, jaundice, and worms in the liver, annually make great havock among our flocks. For the first disease, the shepherd finds a remedy by turning the infected into fields of broom. When the eggs deposited by insects in the frontal sinuses of the *sheep* (see SHEEP-*nose-worms*) turn into maggots, they become very painful, and cause those violent agitations to which this animal is subject. The French shepherds make a common practice of easing the *sheep* by trepanning and taking out the maggot: a practice sometimes used by the English shepherds, but not always with the same success. The *sheep* is also troubled with a kind of tick and louse, which magpies and starlings help to ease it of, by lighting on its back, and picking off the insects. The use of SALT is said to preserve *sheep* from the ROT.

In Spain, the first thing the shepherd does when the flock returns from the south to the summer downs, is to give them as much salt as they can eat: every owner allowing his flock of one thousand *sheep* one hundred arroves, or twenty-five quintals of salt, which the flock eats in about five months.

The *sheep* is an animal kept at the least expence of any to the farmer, and will thrive upon almost any ground, and for this reason many prefer them before the larger cattle.

Besides the fleece, there is scarce any part of this animal that is not useful. The flesh is a delicate and wholesome food. The skin dressed forms different parts of our apparel, and is used for covers of books. The entrails, properly prepared and twisted, serve for strings for various musical instruments. The bones calcined form materials for tests for the refiner. The milk is thicker

thicker than that of cows, and conſequently yields a greater quantity of butter and cheeſe. And the dung is a rich manure.

In Spain, there are two kinds of *ſheep*: the coarſe-woolled *ſheep*, which always remain in their native country, and are houſed every night in winter; and the fine-wooled *ſheep*, which are always in the open air, and travel every ſummer from the cool mountains of the northern parts of Spain, to feed in winter on the ſouthern warm plains of Andaluſia, Mancha, and Eſtramadura. Of theſe latter, it appears from accurate computations, that there are about five millions, and that the wool and fleſh of a flock of 10,000 *ſheep* produce yearly about twenty-four reals a-head, or about the value of twelve Engliſh ſix-pences, one of which belongs to the owner, three to the king, and the other eight are allowed for the expences of paſture, tythes, ſhepherds, dogs, ſalt, ſhearing, &c.

Ten thouſand *ſheep* form a flock, which is divided into ten tribes, under the management of one perſon, who has abſolute dominion over fifty ſhepherds and fifty dogs.

The beſt ſort of *ſheep* for fine wool are thoſe bred in Herefordſhire, Devonſhire, and Worceſterſhire, but they are ſmall, and black faced, and bear but a ſmall quantity.

Warwick, Leiceſterſhire, Buckingham, and Northamptonſhire, breed a large-boned *ſheep*, of the beſt ſhape and deepeſt wool we have good.

The marſhes of Lincolnſhire breed a very large kind of *ſheep*, but their wool is not good, unleſs the breed be mended by bringing in *ſheep* of other counties among them, which is a ſcheme of late very profitably followed there. In this county, it is no uncommon thing to give fifty guineas for a ram, and a guinea for the admiſſion of an ewe to one of theſe valuable males, or twenty guineas for the uſe of it for a certain number of ewes during one ſeaſon. Suffolk, alſo, breeds a very valuable kind of *ſheep*.

The northern counties in general breed *ſheep* with long, but hairy wool: however the wool which is taken from the neck and ſhoulders of the Yorkſhire *ſheep* is uſed for mixing with Spaniſh wool, in ſome of their fineſt cloths.

Wales bears a ſmall hardy kind of *ſheep*, which has the beſt taſted fleſh, but the worſt wool of all. Nevertheleſs it is of more extenſive uſe than the fineſt Segovian fleeces: for the benefit of the flannel manufacture is univerſally known.

The *ſheep* of Ireland vary like thoſe of Great Britain: thoſe of the ſouth and eaſt being large and their fleſh rank: thoſe of the north and the mountainous parts ſmall and their fleſh ſweet. The fleeces in the ſame manner differ in degrees of value.

Scotland breeds a ſmall kind, and their fleeces are coarſe.

The farmer ſhould always buy his *ſheep* from a worſe land than his own, and they ſhould be big boned, and have a long greaſy wool, curling cloſe and well. Theſe *ſheep* always breed the fineſt wool, and are alſo the moſt approved of, by the butcher, for ſale in the market.

For the choice of *ſheep* to breed, the ram muſt be young, and his ſkin of the ſame colour with his wool, for the lambs will be of the ſame colour with his ſkin. He ſhould have a large long body; a broad forehead, round, and well riſing; large eyes; and ſtraight and ſhort noſtrils. The polled *ſheep*, that is, thoſe which have no horns, are found to be the beſt breeders. The ewe ſhould have a broad back; a large bending neck; ſmall, but ſhort, clean, and nimble legs; and a thick deep wool, covering her all over.

To know whether they be ſound or not, the farmer ſhould examine the wool, that none of it be wanting, and ſee that the gums be red, the teeth white and even, and the briſket-ſkin red, the wool firm, the breath ſweet, and the feet not hot. Two years old is the beſt time for beginning to breed, and their firſt lambs ſhould not be kept too long, to weaken them by ſuckling, but be ſold as ſoon as conveniently may be. They will breed advantageouſly till they are ſeven years old.

The farmers have a method of knowing the age of a *ſheep*, as a horſe's is known, by the mouth. When a *ſheep* is one ſhear, as they expreſs it, it has two broad teeth before; when it is two ſhear, it will have four; when three, ſix; and when four, eight: after this their mouths begin to break.

The difference of land makes a very great difference in the *ſheep*. The fat paſtures breed ſtraight tall *ſheep*, and the barren hills and downs breed ſquare ſhort ones; woods and mountains breed tall and ſlender *ſheep*, but the beſt of all are thoſe bred upon new-ploughed land, and dry grounds. On the contrary, all wet and moiſt lands are bad for *ſheep*, eſpecially ſuch as are ſubject to be overflowed, and to have ſand and dirt left on them. The ſalt marſhes are, however, an exception to this general rule, for their ſaltneſs makes amends for their moiſture; any thing of ſalt, by reaſon of its drying quality, being of great advantage to *ſheep*.

As to the time of putting the rams to the ewes, the farmer muſt conſider at what time of the ſpring his graſs will be fit to maintain them and their lambs, and whether he has turneps to do it till the graſs comes; for very often both the ewes and lambs are deſtroyed by the want of food; or if this does not happen, if the lambs are only ſtunted in their growth by it, it is an accident that they never recover. The ewe goes twenty weeks with lamb, and according to this it is eaſy to calculate the proper time. The beſt time for them to yean is in April, unleſs the owner has very forward graſs, or turneps, or the *ſheep* are field-*ſheep*: where you have not incloſures to keep them in, then it may be proper they ſhould yean in January, that the lambs may be ſtrong by May-day, and be able to follow the dam over the fallows and water-furrows; but then the lambs that come ſo early muſt have a great deal of care taken of them, and ſo indeed ſhould all other lambs at their firſt falling, elſe, while they are weak, the crows and magpies will peck their eyes out.

When the *ſheep* are turned into fields of wheat or rye to feed, it muſt not be too rank firſt, for if it be, it generally throws them into ſcourings. Ewes that are big ſhould be kept but bare, for it is very dangerous to them to be fat at the time of their bringing forth their young. They may be well fed indeed, like cows, a fortnight beforehand, to put them in heart. Mortimer's Huſbandry, p. 243.

The feeding *ſheep* with turneps is one great advantage to the farmers, from the crops they raiſe of them: they ſoon fatten upon them, but there is ſome difficulty in getting them to feed on them: the old ones always refuſe them at firſt, and will ſometimes faſt three or four days, till almoſt famiſhed, but the young lambs fall to at once.

The common way, in ſome places, of turning a flock of *ſheep* at large into a field of turneps, is very diſadvantageous, for they will thus deſtroy as many in a fortnight as would keep them a whole winter. There are three other ways of feeding them on this food, all of which have their ſeveral advantages.

The firſt way is to divide the land by hurdles, and allow the *ſheep* to come upon ſuch a portion only at a time as they can eat in one day, and ſo advance the hurdles farther into the ground, daily, till all be eaten. This is infinitely better than the former random method, but they never eat them clean even this way, but leave the bottoms and outſides ſcooped in the ground: the people pull up theſe, indeed, with iron crooks, and lay them before the *ſheep* again, but they are commonly ſo fouled with the creatures dung and urine, and with the dirt from their feet, that they do not care for them; they eat but little of them, and what they do does not nouriſh them like the freſh roots.

The ſecond way is by incloſing the *ſheep* in hurdles, as in the former; but in this they pull up all the turneps they ſuppoſe the *ſheep* can eat in one day, and daily remove the hurdles over the ground, whence they have pulled up the turneps: by this means there is no waſte, and leſs expence, for a perſon may in two hours pull up all thoſe turneps; the remaining ſhells of which would have employed three or four labourers a day to get up with their crooks out of the ground trodden hard by the feet of the *ſheep*; and the worſt is, that as in the method of pulling up firſt, the turneps are eat up clean, in this way, by the hook, they are waſted, the *ſheep* do not eat any great part of them, and when the ground comes to be tilled afterwards for a crop of corn, the fragments of the turneps are ſeen in ſuch quantities on the ſurface, that half the crop at leaſt ſeems to have been waſted.

The third manner is to pull up the turneps, and remove them in a cart or waggon to ſome other place, ſpreading them on a freſh place every day; by this method the *ſheep* will eat them up clean, both root and leaves. The great advantage of this method is when there is a land not far off which wants dung more than that where the turneps grew, which perhaps is alſo too wet for the *ſheep* in winter, and then the turneps will, by the too great moiſture and dirt of the ſoil, ſometimes ſpoil the *ſheep*, and give them the rot. Yet ſuch ground will often bring forth more, and larger turneps than dry land, and when they are carried off, and eaten by the *ſheep* on ploughed land, in dry weather, and on green ſward in wet weather, the *ſheep* will ſucceed much the better; and the moiſt ſoil, where the turneps grew, not being trodden by the *ſheep*, will be much fitter for a crop

crop of corn, than if they had been fed with turneps on it. The expence of hurdles, and the trouble of moving them, are saved in this case, which will counterbalance at least the expence of pulling the turneps, and carrying them to the places where they are to be eaten. They must always be carried off for oxen.—Tull's Horsehoeing Husbandry.

Sheep, *folding of*, a term used by our farmers to express the keeping these creatures on their arable lands, within folds made of hurdles, which they remove about, so that when the *sheep* have dunged one place they are set upon another.

This is a very great advantage to the land; the dung of these creatures being a very rich manure. It ought only to be done in summer time and in good weather, for the folding them in bad weather is apt to give them the rot. Care must be taken that they are only driven into these folds over night, and let out again in the morning, half an hour after sun-rise, into places where there is good food; for being hungry at this time they will eat whatever comes next them. Many *sheep* are ruined by this practice in moist ground, and some farmers, who think all folding very bad for *sheep*, only stick up sloping stakes in such parts of the lands as they would have dunged, and never fold the *sheep* at all, but trust to their coming to these stakes to rub themselves for the dunging the ground, as they constantly void their dung and urine at that time. Mortimer.

Sheep, *composition for marking*. Dr. Lewis recommends for this purpose melted tallow, with so much charcoal, in fine powder, stirred into it as is sufficient to make it of a full black colour, and of a thick consistence. This mixture, being applied warm, with a marking iron, on pieces of flannel, quickly fixed or hardened, bore moderate rubbing, resisted the sun and rain, and yet could be washed out freely, with soap, or ley, or stale urine. In order to render it still more durable, and prevent its being rubbed off, with the tallow may be melted an eighth, sixth, or fourth of its weight of tar, which will readily wash out along with it from the wool. Lewis's Com. Phil. Techn. p. 361.

Sheep's *dung*. This is one of the best manures we know. It succeeds better upon cold clayey lands than any other dung whatever: but as it is not so conveniently to be collected as the dung of larger animals, it is commonly conveyed to the land it is intended for, by folding the *sheep* upon it. The urine, as well as the dung, is thus given to the land, and is of very great advantage: but the farmer always should plough in this sort of manure as soon as he can, for the sun soon robs it of a great part of its virtue.

In Northamptonshire they begin to fold the *sheep* upon the lands that they would dung by them after the month of July, and the drier the lands are the later they fold them.

In Flanders they make many thousand loads of manure annually from their *sheep*: they cover the bottom of the folds considerably deep with some light and spungy earth, and when this has received the dung and urine of the animals for seven or eight days, they remove it, and lay fresh in its place: the earth, thus impregnated, becomes an excellent improvement to land, and they raise large crops by means of it, in places where very little could be expected without it.

In England, we have a contrivance like this, which is the covering the bottoms of the folds deep with sand, and changing it once a week, or thereabouts. This is a kind of manure finely calculated for clayey lands, both the sand, and this peculiar kind of dung, being appropriated things for it. Mortimer. See Dung.

Sheep-*nose-worms*, in *Natural History*, a species of fly-worm, found in the noses of *sheep*, goats, and stags, and produced there from the egg of a large two-winged fly. The frontal sinuses above the nose in *sheep*, and other animals, are the places where these worms live, and attain their full growth. These sinuses are always full of a soft white matter, which furnishes these worms with a proper nourishment, and are sufficiently large for their habitation; and when they have here acquired their destined growth, in which they are fit to undergo their changes for the fly-state, they leave their old habitation, and, falling to the earth, bury themselves there; and when these are hatched into flies, the female, when she has been impregnated by the male, knows that the nose of a *sheep*, or other animal, is the only place for her to deposit her eggs, in order to their coming to maturity. Mr. Vallisnieri, to whom the world owes so many discoveries in the insect class, is the first who has given any true account of the origin of these worms. But though their true history had been, till that time, unknown, the creatures themselves were very early discovered, and many ages since were esteemed great medicines in epilepsies.

The fly, produced from this worm, has all the time of its life a very lazy disposition, and does not like to make any use either of its legs or wings. Its head and corcelet together are about as long as its body, which is composed of five rings, streaked on the back; a pale yellow and brown are there disposed in irregular spots; the belly is of the same colours, but they are there more regularly disposed, for the brown here makes three lines, one in the middle, and one on each side, and all the intermediate spaces are yellow; the wings are nearly of the same length with the body, and are a little inclined in their position, so as to lie upon the body, they do not, however, cover it, but a naked space is left between them; the ailerons, or petty wings, which are found under each of the wings, are of a whitish colour, and perfectly cover the balancers, so that they are not to be seen without lifting up these.

The fly will live two months after it is first produced, but will take no nourishment of any kind; and possibly it may be of the same nature with the butterflies, which never take any food during the whole time of their living in that state. Reaumur. Hist. Inf. vol. iv. p. 552, &c.

Sheep-*scabious*, in *Botany*. See Jasione.

Sheep-*shank*, in *Sea-Language*, is a sort of knot, or hitch, cast on a rope, to shorten it as occasion requires; particularly to increase the sweep or length of a tackle, by contracting its runner. By this contrivance the body, to which the tackle is applied, may be hoisted much higher, or removed much farther, in a shorter time. Falconer.

Sheep-*stealing* is now made felony without benefit of clergy. See Cattle.

By an ancient statute, no person shall keep, at one time, above two thousand *sheep*; but lambs are not to be accounted *sheep* till they are a year old. 25 Hen. VIII. cap. 13. Persons exporting *sheep* shall forfeit them, and 20*s*. for every *sheep*, &c. 12 Car. II. cap. 32. And persons in the counties of Kent and Sussex, within ten miles of the sea, are to give an account, in writing, after *sheep*-shearing, of the number of fleeces, to the next officer of the customs, &c. 9 & 10 W. III. cap. 40. See Wool.

SHEER, in reference to a ship, denotes the longitudinal curve of her deck or sides.

SHEERS, aboard a ship, a name given to an engine, used to hoist or displace the lower masts of a ship.

The *sheers* employed for this purpose, in the royal navy, are composed of several long masts, whose heels rest upon the side of the hulk, and having their heads declining outward from the perpendicular, so as to hang over the vessel whose masts are to be fixed or displaced. The tackles, which extend from the head of the mast to the *sheer*-heads, are intended to pull in the latter toward the mast-head, particularly when they are charged with the weight of a mast after it is raised out of any ship, which is performed by strong tackles, depending from the *sheer*-heads. The effort of these tackles is produced by two capsterns, fixed on the deck for this purpose.

In merchant ships this machine is composed of two masts, or props, erected in the same vessel wherein the mast is to be planted, or from whence it is to be removed. The lower ends of these props rest on the opposite sides of the deck, and their upper parts are fastened across, so as that a tackle, which hangs from the intersection, may be almost perpendicularly above the station of the mast, to which the mechanical powers are applied. These *sheers* are secured by stays, which extend forward and aft to the opposite extremities of the vessel. Falconer.

Sheer-*hooks*, or Shear-*hooks*, are large iron hooks, used when a ship designs to board another.

Sheer-*rail*. See Rail.

Sheer-*water*, in *Ornithology*. See Shear-*water*.

SHEERING, or Shearing, in the *Woollen Manufactures*, the clothworker or sheerman's craft, or office; or the cutting off, with large sheers, the too long and superfluous knap, or shag, found on the surface of woollen stuff, fustians, cottons, &c. in order to make them more smooth and even.

Stuffs are shorn more or fewer times, according to their quality and fineness.

Some use the phrase *sheering of hats*, for the passing of hats made of wool over the flame of a clear fire made of straw, or spray, to take off the long hairs: others call this *flaming*, and others *singing*. Other hats, as castors, semicastors, &c. are shorn, by rubbing them over with pumice stone. See Hat.

Sheering, or Shearing, is also a *Sea Term*, for the motion of a ship, when she deviates from the line of the course, either to the right or left, so as to form a crooked and irregular path through the water, either by reason that she is not steered steadily, or on account of the swift

swift running of the tide, &c. in which case she is said to sheer, or go a *sheering*. Hence to *sheer off* is to remove to a greater distance.

When she lies at anchor, near port, &c. by reason of the swift running of the tide-gate, &c. she is often said to be in danger of *sheering home her anchor*, or *sheering ashore*. See Chest *rope*.

SHEET, in the *Manege*. See Caparason.

Sheet, in *Sea-Language*, a rope fastened to one or both the lower corners of a sail, to extend and retain it in a particular station. When a ship sails with a lateral wind, the lower corner of the main and fore-sail are fastened by a tack and a *sheet*; the former being to windward, and the latter to leeward; the tack, however, is entirely disused with a stern wind, whereas the *sail* is never spread without the assistance of one or both of the *sheets*. The stay-sails and studding-sails have only one tack, and one *sheet* each: the stay-sail tacks are always fastened forward, and the *sheet* drawn aft; but the studding-sail tack draws the under clue of the sail to the extremity of the boom, whereas the *sheet* is employed to extend the inmost. Falconer. See Sheats.

Sheet, *to hale home the*. See Home.

Sheet-*anchor*. See Anchor.

Sheet-*nails*. See Nail.

SHEIK, in the *Oriental Customs*, the person who has the care of the mosques in Egypt: his duty is the same as that of the imams at Constantinople. There are more or fewer of these to every mosque, according to its size or revenues. One of these is head over the rest, and answers to a parish-priest with us, and has under him, in large mosques, the readers and people who cry out to go to prayers; but in small mosques the *sheik* is obliged to do all this himself. In such it is their business to open the mosque, to cry to prayers, and to begin their short devotions at the head of the congregation, who stand rank and file in great order, and make all their motions together. Every Friday the *sheik* makes an harangue to his congregation. Pococke's Egypt, p. 171.

Sheik-*bellet*, the name of an officer in the Oriental nations.

In Egypt the *sheik-bellet* is the head of a city, and is appointed by the pasha. The business of this officer is to take care that no innovation be made, which may be prejudicial to the Porte, and that they send no orders which may hurt the liberties of the people. But all his authority depends on his credit and interest, not his office: for the government of Egypt is of such a kind, that often the people of the least power by their posts have the greatest influence; and a caia of the janizaries, or Arabs, and sometimes one of their meanest officers, an oda-basha, finds means, by his parts and abilities, to govern all things. Pococke's Egypt, p. 161.

SHEKEL, Shekle, Sheckle, Siclus, an ancient Hebrew coin, equal to four Attic drachmas, to four Roman denarii, or 2*s.* 9¼*d.* sterling. See Denarius.

In the Bible, the *shekel* is sometimes also rendered *solidus*, and sometimes *stater*.

The Jewish doctors are in great doubt about the weight of the *shekel*; and it is only by conjecture, and by the weight of the modern *shekel*, that the ancient one is judged equal to four Attic drachmas.

Father Souciet has described several of these *shekels* in his dissertation on the Hebrew medals. By the way he observes, that the third and fourth parts of a *shekel*, described by Waserus, de Ant. Num. Heb. are counterfeits of that author.

The Hebrew *shekel*, according to F. Mersenne, weighs 268 grains, and is composed of 20 oboli, each obolus weighing 16 grains of wheat. This, he says, is the just weight, as he found by weighing one in the French king's cabinet. He adds, that such as come short of this weight have been filed or clipped. Bishop Cumberland tells us, he has weighed several, and always found them near the weight of a Roman semuncia, or half ounce.

Some are of opinion, that the Hebrews had two kinds of *shekels*: the *common*, or *profane shekel*, called *didrachma*; and the *shekel of the sanctuary*; which last they will have to be double the former. By this expedient they think we may get clear of some difficulties occurring in Scripture, where things are mentioned as of incredible weight; particularly that passage were it is said, that every time Absalom cut off his hair, the weight whereof used to incommode him, he cut off the weight of two hundred *shekels*.

But Villalpandus will not hear of such a distinction; nor do bishop Cumberland, M. Morin, Greaves, &c. take the opinion to have any foundation. The *profane shekel*, or *shekel* of four drachmas, they agree, was the same with the *sacred shekel*; and it was only called by this last name, because the standard thereof was kept in the sanctuary by the priests.

Greaves apprehends, that the τριακοντα αργυρια, or 30 pieces of silver, which were given to Judas, as the reward of his treason, were 30 *shekels*. Some modern writers, he says, imagine they were 30 denarii, and others, that they were *triginta libræ*, or *triginta talenta*. Greaves's Works, vol. i. p. 257, note *n*.

It is maintained by several, that the Jews had also a gold *shekel*, *siclus aureus*, of the same weight with the silver one; and valued at 1*l.* 16*s.* 6*d.* sterling.

The *shekel* is supposed to have been first struck in the desert, on the footing of 100 to the Attic mina, weighing 160 grains of wheat, and current for 10 geratis, or oboli; but that afterwards they were struck of double that weight.

Some will have the *shekel* to be the oldest piece of money in the world, as being in use in Abraham's time; but this was not coined, or stamped, nor had any other value besides its intrinsic worth.

Xenophon mentions *shekels* as current in Arabia; and Du-Cange speaks of others struck and current in England.

SHELDAFLE, a name used in several parts of the kingdom for the chaffinch.

SHELF, a term used by the miners, in many parts of England, to express a distinction of the inner structure of the earth, so little known to philosophers, that they have no word to express it by. These workmen sometimes also express it by the term *fast ground*, or *fast country*. What they mean by this, is, that part of the earth, which they find lying even, and in an orderly manner, and evidently having retained its primitive form and situation, unmoved by the waters of the general deluge, while the circumjacent, and upper strata, have plainly been removed, and tossed about.

It is evident to reason, that there must have been a very violent concussion of the superficial part of the earth, in the time of its being covered by the waters of the deluge; and experience as much evinces this as reason. Before this concussion it appears probable, that the uppermost surface of mineral veins, or loads, did in most places lie even with the then surface of the earth. The remains of this surface, found at different depths in digging, the miners express by the word *shelf*.

In this concussion of the waters covering the whole earth, its natural surface, together with the uppermost surface of those mineral veins, were then in many places loosened, and torn off; and the earth, and with it the mineral nodules, called *shoad-stones*, were carried down with the descending waters from hills into the adjacent valleys, and sometimes into the streams of rivers, by which they were washed to yet greater distances from their original place. On this depends the method of training mines. Phil. Transf. N° 69. See Training.

SHELL, *testa*, in *Natural History*, a hard calcareous crust, serving to cover and inclose a kind of animals, hence called testaceous.

Shells, *formation of*. Naturalists have been generally mistaken as to the manner of the formation of *shells*. The animal and its *shell* have been always supposed to arise wholly from the egg; but M. Reaumur has shewn the supposition to be false. He has found, by certain experiments, that the *shells* of garden-snails are formed of a matter which perspires from their bodies, and hardens and condenses in the air.

It is certain that all animals perspire, and are encompassed with a kind of cloud, or atmosphere, which exhales from them, and, in all probability, assumes, pretty nearly, their external figure. Snails have nothing peculiar in this respect, unless that the atmosphere of their perspiration condenses and hardens about them, and forms a visible cover, whereof the body is the mould, or model, whereas that of other animals is evaporated and lost in the air. This difference arises from the different substance perspired; that coming from snails being viscous and stony. This is no supposition, but a matter of fact, which M. Reaumur has well proved by experiments.

On this principle, though the *shell* serve the animal as an universal bone, yet it does not grow like a bone, nor like any of the other parts, by nutrition; that is, by a juice circulating within itself; but by an external addition of parts laid one over another; as is commonly supposed the manner of the growth of stones.

But to consider the thing more particularly, it is to be remembered, that the snail's head is always at the aperture of the *shell*, and its tail in the tip or point of the *shell*; and that its body is naturally turned into a spiral form; the different spires or circumvolutions whereof are in different planes. This supposed, take the snail just hatched; as the matter it perspires petrifies around it, there must be first formed a little cover, proportioned to the bigness of its body; and, as its body is yet too little to make a circumvolution of a spiral, at least

least a whole one, this cover will only be the centre, or, at most, the first beginning of a little circle of a spiral. But the animal grows: if, then, it ceased to perspire, it is evident, all that is added to its body would remain naked; but as it continues to perspire, it makes itself a cover in proportion as it needs it. Thus is an entire circumvolution of a spiral formed; and thus is a second and a third; and still every new spire is bigger than the last; in regard the animal grows in thickness at the same time as it grows in length. When the animal ceases to grow, yet it does not cease to perspire; and, accordingly, the *shell* continues to grow thicker, though not longer. See this subject farther traced in Mem. Acad. Par. 1709.

The durable hardness and excellent polish of many of the *shells* of sea fishes, and that even in the thinnest and tenderest kinds, is a thing very amazing. In the ruins of the abbey of St. Edmondsbury, which is built of a kind of stone composed of grit, or sand, interspersed with an infinite variety of very minute *shells*, principally of the small smooth cockle kind, Mr. Collinson observed, that the stone having suffered greatly by the injuries of the air, the grit or sand of which it was composed had disunited and mouldered away, while the smallest of these *shells* stood the same injurious accidents unaltered, and were found standing forth in the utmost perfection, and with all their beautiful natural polish; yet these are as thin and tender a *shell* as almost any of the same size that we know of.

It is possible, indeed, that these *shells* might have been altered in their nature, by the insinuation of stony matter into their pores, as is a common case in *shells* lodged in stone; but those, here mentioned, did not seem to have undergone any such alteration; and it is very certain, that many of the like thin and tender *shells* are found preserved through a long series of ages, in places where they have been in the way of no such alterations from the insinuation of stony matter into their pores, and out of which they are taken fair and beautiful, and with all their natural polish, though not at all hardened in the time. Of this kind are the *shells* of the tender buccinums, and other thin kinds, found buried in earth, in the strata of marle, clay, or loam, and even in chalk.

As hard as these *shells* naturally are, they do not, however, preserve the fish, which inhabit them, from becoming the food of others, which seem to have no organs with which to break them. It is common to see the soal-fish with its belly prominent and hard, as if well filled with spawn, and yet when opened to find no spawn at all; but the prominence and hardness are occasioned by the stomach and guts being filled with *shell*-fish, which the creature had swallowed whole, as food, without having any power of breaking or destroying them. A small species of pectunculus, or cockle, is the fish that the soal usually feeds upon; and when the guts are taken out of this fish, they often resemble so many strings of necklaces, from the continued series of these *shells* which appear prominent in them. When these *shells* are taken out, many of them are usually found in part dissolved, and many entire and unaltered.

Shell-fish are well known to be the food of some other fishes of the larger kinds, particularly the sea-porcupine, and a kind of the wray-fish, are known principally to feed upon them; but these fish are provided by nature with suitable apparatus fitted for the grinding or reducing them into a state more proper for digestion; their jaws being furnished with bony substances, extending to the palate and under part of the mouth, which are capable of reducing much stronger *shells* than these into an absolute pulp. The soal-fish has no apparatus of this kind, and neither its jaws nor stomach are furnished with any thing capable of wearing them to pieces by attrition; but what appears to be the case, is, that nature has furnished this creature with a menstruum in the body capable of digesting them. Philos. Trans. N° 473, p. 39.

The crab, like the lobster, &c. casts its *shell* once every year. Against this extraordinary event, the creature always chooses a close and well secured retreat, in the cavities of rocks, or under great stones; there they creep in, and wait till all the parts are by degrees disengaged, which is effected by withdrawing their legs from their old *shells*, and leaving them and the upper part of their body-*shell* behind. In this naked state they make a very strange appearance, being a mere ill-shapen lump of fleshy matter, covered with a sort of jelly; this by degrees hardens into a *shell*, a degree larger than the old one cast off.

SHELLS, *systems of*. *Shells*, *conchæ*, and *cochleæ*, make a considerable article in the cabinets of the curious; and the study of them, as well as of the animals they contain, is a branch of natural history, which writers on this subject have denominated *conchology* and *conchyliology*.— In Aldrovand, Gesner, and Fabius Columna, we have all that the ancients have said on the subject of *shells*.— The first writer among the moderns, who wrote professedly on this subject, is Buonanni, who printed an Italian work, intitled Ricreazione dell' Occhio, &c. at Rome, in 1681. A Latin translation of this work, with additions, was published, by the author, in 1684. However J. Daniel Major, a physician, of Kiel, in Holstein, was the first who formed a method of *shells*, published in his edition of Columna's Opusculum de Purpura, with Annotations, in 1675.

In the year 1678, Dr. Lister published his Hist. Anim. Angliæ, in which he describes the English *shells*, and illustrates them with figures: but his more valuable work on this subject is his Historia Conchyliorum, published in folio, at different times, from 1685 to 1692. In enumerating and representing the various kinds of *shells*, he distributes them into four classes. Under the first class he ranges the terrestrial or land *shells*; in the second, the fresh-water *shells*, both those called *turbinata* and the *bivalvia*; in the third, he disposes all the sea *shells*, the *bivalvia* and *multivalvia*; and in the fourth, he distributes into several classes those sea *shells*, called *turbinata*.

Rumphius, in his Rarity Chamber of Amboyna, fol. printed, first, in Dutch, at Amsterdam, in 1705, again in 1711, and again in 1745; and printed, in German, at Vienna, in 1766, adopts the three divisions of the simple and turbinated univalves, and the bivalves; blending the multivalves with the other divisions.

Langius, a physician, of Lucerne, in Switzerland, published, in 1722, a new and easy method of *shells*, disposed in their proper classes, genera, and species. He follows the general distribution of Rumphius.

The next writer of any note, not to mention Breynius, de Polythalamis, printed at Dantzick, in 1732, nor Plancus, de Conchis Ariminensibus minus notis, printed at Venice, in 1739, is M. d'Argenville, who published la Conchyliologie, at Paris, in 1742, and again in 1757. This author, of whose work and system we shall here subjoin a particular account, has prefixed a preliminary discourse on the formation of *shells*, the different methods of arrangement, the manner of cleaning them, and their uses; and also on fossil *shells*, and their origin; and an account of the principal musea of Natural History now in being. The other part of his work contains a history of *shells*, ranged in their respective classes, with proper tables, characters, indexes, and remarks: the whole illustrated by a number of plates.

M. d'Argenville throws aside the vulgar distinction of *shells*, into the sea, fresh-water, and land kinds, and very judiciously arranges all under the same class, which have the same general characters.

Shells, he observes, are all naturally to be arranged under three principal classes; these will contain all the species, and are afterwards to be divided into a number of families, or genera, and under these the several species regularly recounted; and at the end of each description, the varieties may be added.

The first general class of *shells* contains those which are found all of one piece, or have only one *shell*, not a pair. These have been called by the Greeks *monothyræ*, and by the Latin authors *univalvia*, *univalves*.

The second general class contains those *shells* which are of two pieces, called *bivalves*, such as oysters, cockles, and the like. See *Tab. of Shells*, passim.

The third class contains those which are composed of more than two pieces. These are called *multivalves*; and of this kind are the pholas and balanus.

This method takes in the fresh-water *shells*, as well as those of the sea; and as those hitherto known are all of one or other of the first classes, their several species will be comprised among, or after the sea *shells* of each of those classes.

The land *shells* are of two kinds, the recent and the fossile; the first kind, as far as hitherto known, are all univalves, and the latter are of all the three classes.

As each of these general classes contains a very great number of species, it may seem difficult to enter on this study, from the multiplicity of the bodies; but method renders all this easy, and it is no way difficult, in the following manner, to find of what class, what family, and what genus any given *shell* is, from a bare inspection. The *shell* is first to be examined, to see whether it is composed of one, two, or more pieces. If it is found to consist only of one piece, it is known thence to belong to the class of univalves; if of two, to the bivalves; and if of more, to the multivalves. When it is thus referred to its proper class, its family and genus will be found by farther examination of its general form, and the shape of its mouth, or aperture.

Shells, *univalve*, are those which consist only of one piece, not of two or more joined together. Of these univalve *shells* nature affords a very great variety; so that they are aptly distributed by this writer into fifteen distinct genera, or families. These are, 1. the *patellæ*, or limpets. 2. The *patella plana*, called also *auris marina*, the ear-*shell*. 3. The *canales*, or *tubuli marini*, the sea tubes. 4. The *lunares cochleæ*, or round-mouthed snails. 5. The *cochleæ semilunares*, or snails with semicircular mouths. 6. The *cochleæ ore depresso*, or flat-mouthed snails. 7. The *naviculæ*, or boat-*shells*, commonly called *nautili*, or *nautilus*. 8. The *buccina*, or trumpet-*shells*. 9. The *turbines*. 10. The *volutæ*. 11. The *rhombi*. 12. The *murices*. 13 The *purpuræ*. 14. The *conchæ globosæ*. And, 15. the *porcellanæ*. Each of which see under its proper head.

As soon as a given *shell* is found to be univalve, the genera of that class are to be used in comparison with it, in order to see to which of them it belongs. If it has no turn or twist, but forms one simple figure, approaching to a cone, and pointed at the top, in the manner of the common limpet, or patella, it is known to be of the family of the *patellæ*; the character of which is to have only one valve, and that fixed in its natural state to a stone, or other hard body, and of a flatted shape, though elevated into a sort of point in the middle. If the *shell* be not conic, but extremely flat, and somewhat of the shape of a man's ear, it is of the second family of the *aures marinæ*, distinguished by the epithet *planæ*, flat or plane. If it forms a tube or pipe, it is of the nature of the common *tubuli marini*, and is of that family. If, on the other hand, it resembles a sort of vessel or boat, it is of the *nautilus* class, and belongs to the *naviculæ*.

These are the distinctions, if it be plain, and without turnings; but if it hath several twists, or wreaths, its aperture, commonly called the mouth, is to be examined, for this forms, in this case, the generical character. If the mouth be exactly round, the *shell* is of that family of the *cochleæ*, or snails, called by the ancients *lunares*. If it be of a semicircular figure, it is of that family of snails called *semilunares*; under which family are comprised the *neritæ*, as one genus.

If the *shell* approaches to a conic figure, and grows larger at the base, and has a flatted or oval mouth, it is of a seventh order of *cochleæ*, or snails, distinguished by the title *cochleæ ore depresso*.

If the *shell* hath the exterior figure of a trumpet, and has a large tail, it belongs to the family of the *buccina*; of which, however, it is to be remarked, that there are some species which have not long tails: in this distinction we also have recourse to the mouth, which is larger than that of the murex, less long, and its lower part is formed into a crooked beak. These are the essential characters which distinguish this family of *shells*; a family, concerning which there is great confusion among authors.

If the base of the *shell* be small, and the whole diminish gradually in size from this to the end, which is pointed, then the *shell* is of the family of the *turbines*. If a *shell* forms a cone, or cornet, there is no occasion to look at the mouth, this figure alone determines it to be a *voluta*; and if one of its extremities is nearly as large as the other, it is then a rhombus. This genus of *shells* has been called *cylindri*, by the Latins, and *rouleaux*, by the French. When this rhombus, or cylinder, has a pointed base, frequently ornamented also with several small eminences; and when its middle is large, and is in the same manner surrounded with tubercles, and its head is elongated by several turns, and its mouth of an oblong figure, and furnished with teeth; and when, as is often the case, there is an excrescence of the plate that covers the mouth, called by authors an *ala*, or wing, this *shell* must be placed among the family of the *murex*, or, as the French call it, the *rocher*.

The *purpura* is distinctly not a synonymous term with the precedent, but expresses such a *shell*, which instead of being furnished with points, is cut and curled from top to bottom, in the manner of leaves of our curled cabbages, or of the endive raised for sallads. The body in this genus is also more compact, and more detached from the other parts, than in the other genera of this kind, and the mouth is usually small and round, and the tail long and crooked, furnished with long points, and hollowed within in form of a pipe.

If the *shell* is round, it belongs to that family of *shell* fish, called, from their figure, *globosæ*, and in French *tonneaux*. It is to be observed, however, that all *shells*, which appear at first sight of a rounded figure, are not to be placed at once in this family; for the helmet *shell*, for instance, which appears roundish, though somewhat triangular, is not to be supposed of this family, but is a murex. The summit of the head, and the little tuberosities, on this occasion, give the essential character, and point out its proper genus: for the *shells* of the globose kind are truly of a spherical figure; they are inflatted in the middle, have no tubercles on the head, and have a large and hollowed mouth, but no teeth.

The last family of the univalves is the porcelain, or *concha veneris*, a genus so well known, that it needs no particular description. Sometimes at the summit of this *shell* there is a small spiral, and sometimes its opening is not exactly in the middle. Some are light and thin, others very thick and hard: but these are only varieties of the same genus, the proper family of the *shell* being always thus determined by the mouth.

Shells, *bivalve*. The former are all the genera of the *shells* composed of one piece, and thence called univalves: and as any given *shell* may, by the characters given of each, be easily referred to that to which it belongs, so, in regard to the bivalves, the task is not more arduous, when entered on upon the same principles; and it is the easier in this respect, that the families of this class are much less numerous than those of the other, these being only six. The first genus, or family, of the bivalves, is that of the *oyster*, *ostrea*. The variety in this one genus is almost infinite, and is extremely agreeable. Some are echinated so as to represent the echini; others have excrescences of parts in undulatory, or jagged forms, representing the ears of animals, or the comb of a cock; and others form themselves into very remarkable figures, by adhering and growing to trees, stones, corals and other substances, either naturally growing in the sea, or such as have accidentally fallen into it.—Sometimes also, the upper *shell* in an oyster is smaller and flatter than the under one. These, however, are all trifling varieties, and the *shells* are still of the oyster kind.

When the bivalve *shell*, under examination, differs from the oyster kind, in being more elevated in the middle, and equally convex, or nearly so, in both *shells*, then it belongs to the family under the name of *chamæ*. These differ also from oysters, in that they are more smooth on the surface, and they often do not close so evenly and regularly at the mouth, whence some have called them *conchylia ore patulo, et hianti*.

The third family is that of the *muscles*. These are all of the general shape of the common muscle, and are thence easily known. It is to be observed, however, that some of them are equal at both ends; these are called *tellinæ*: and some others are extremely long at one end, and broad and short at the other: these are called *pinnæ marinæ*.

The fourth genus, or family, is the cordiform kind, called in French *cœurs*. The essential character of this family is, that the *shells* are of a roundish elevated figure, and that they have no ears, as the pectens have, and they always represent the figure of a heart, in whatever view they are taken; though this is sometimes of a triangular figure. Most of the species of this family, as well as of the following one of the pectens, are striated.

The fifth family of the bivalves is that of the *pectens*, or scallop *shells*. Among these, some have two ears at the head of the *shell*; others have only one ear; and others have none at all. Some species are deeply furrowed, and others are full of protuberances. The general character of the pectens is to have the upper *shell* plain, and the under one somewhat hollow; and the ears are also a very obvious character in those that have them.

The sixth and last family of the bivalves is the *solen*, or razor-fish, called by the French *manche de couteau*. These are very easily known by their figure, which resembles that of a knife-haft, and therefore need no other mark of distinction.

Shells, *multivalve*. These are not less easily distinguished than the other two general classes, into their separate families. Of these also there are six families. The first is that of the *echini marini*, called in English *sea eggs*, by the French *oursins*, *boutons*, and *herissons de mer*. These carry a very obvious distinction, in their being covered with spines or prickles; and if we meet with them in a state, when they are fallen off, they are still easily known by the marks of their insertion. This, and their general figure, which is alike in all, and in all unlike to all other species, is such a distinction as cannot suffer them to be mistaken.

The second family of these, is that of the *vermiculi marini*, particularly characterised in the species called the *sea organ*. These are usually of a beautiful red colour, and are of a very elegant structure. They generally are found in very large clusters, and are easily distinguished from all other genera.

The third family of the multivalves consists of the *balani*

marini,

marini, called by the French *glands de mer*. These are all so like one another, that they are easily known from all the other genera, by their all resembling the common balanus, a *shell* too well known to need description.

The fourth family is that of the *pollicipedes*, or, as the French call them, the *pousspieds*. These are so easily known by their perfect resemblance to one another, that there needs no other character than referring to their figure in the plate of *shells*.

The fifth family of the multivalves is that of the *conchæ anatiferæ*. These were once supposed to produce a bird of the goose kind; and these are all so like to one another, that the referring to the figure of the common species, in the general plate, will shew the characters of all the species.

Finally, the sixth genus of the multivalves is that of the *pholas*. These *shells* are easily distinguished by their figure, which is usually oblong, and their colour, which is simply white in all the species. These *shells* are often found enclosed in stone in the sea, and some of them are composed of five valves.

By these characters it will be easy for an utter stranger to these studies, to refer any *shell*, he occasionally meets with, to its proper class and family. When this is done, it will be easy to observe the lesser differences, which, though not sufficient to constitute different families, or genera, yet very well distinguish different species of the same genus or family; and by comparing these with the names of the several species, to be found enumerated under the head treated of, in the name of that genus or family to which the *shell* is found to belong, it will be soon discerned whether, and which of these species it is of, or whether agreeing with none of those names it is a new species. In order to enquire into these specific differences, it is necessary attentively to consider the exterior parts of the *shell*, its figure, its mouth, its volutions, its alæ, and its smoothness or roughness, and its two extremities, the end of the clavicle, and the mouth. After the exterior parts have been thus examined, the interior ones must be taken into consideration, as the length and hollow of the mouth, and whether it be furnished with teeth, or with ridges; and whether it have a chamber or a tongue within.

In regard to bivalves, when the species are to be distinguished, we must observe whether the two valves are equal or unequal in shape and size; whether one is, or is not more elevated than the other; and whether those valves are smooth, or are covered with wrinkles and tuberosities, or points; whether they have or have not ears; and whether their striæ are charged with points, or tubercles, or are plain and smooth on the surface; and, finally, whether they are longitudinal, or transverse, and whether the ends of the *shells* are even, or are terminated by a point, or beak.

The insides are next to be observed, to find whether the *shells* naturally close evenly and exactly, or whether they remain naturally open; and whether the fish is affixed to them by a single ligament, as is the common case, or by six regular muscles, as the sea muscle does.

The mouth of a *shell* generally distinguishes it from others, but there are some species in which recourse must be had to the other external parts of the *shell*: and we are not to be puzzled, on finding in the same family some small differences in the figure of the mouth, as its being longer in one species, and wider in another; the one species having a tail, and the other not; the one having a summit elevated very high, the other flatted at the top; or, lastly, the one being smooth, and the other covered with tubercles, do not prevent both from being of the same family, when the general characters are the same. These then only distinguish the species and genera of the same family, which are to be placed one after another in the descriptions of it.

The species are distinguished, when, the generical characters being the same, one *shell* is umbilicated, another is not; one smooth, another rough, and so on. The varieties of the several *shells* which are very numerous, and have by many been taken for real species, are distinguished by less essential differences; such as the size, the length, and the thickness of the *shell*, the difference of the colours, and the depth or slightness of the furrows.

It may not be amiss to explain all this in some one family of *shells*, in which there are many different genera, species, and varieties. When the buccinum, for example, has a long or short mouth; when its clavicle, or pyramid, is long, or is flatted; or when its beak is straight, or crooked; these are the marks of genera, being very great and essential characters, and each of them belonging in common to a great number of *shells*, which are to be called species, and are to be distinguished from one another only by some epithet, expressive of their slighter differences. Thus, if the surface is smooth, it is called *buccinum læve*; if rough, *buccinum tuberosum*; if it imitate a spindle, it is called *fusus*; if it be of the figure of a tower, it is called *turris*; and if of a tiara, it is called *mitra papalis*. The varieties are after this distinguished by their proper epithets; the white, red, or yellow, are so called, and the large and small distinguished by these words added to their name: and in this manner are all the classes to be subdivided.

In the examination of the fresh-water *shells*, the same method is to be observed, and the same characters enquired into; but these are a much less numerous series of *shells*; we know of only seven families of the fresh-water univalves, and there are only three families of bivalves, and not one of the multivalve class, so far as is yet known. See FLUVIATILES *cochleæ*.

The land *shells* are also to be distinguished by the very same terms. The living land *shells* constitute but a very few genera, and the fossile one being remains of marine bodies, are the same with the species found at sea; only there are many species, and some whole genera of these, which we never find recent, or living at present: these are probably the inhabitants of the deep seas, and therefore never can come within our sight at present. The universal deluge, which so overturned the whole face of the earth, might easily bring things from the deepest seas into our way, and bury them in the hearts of yet soft and unformed rocks, and leave them there as lasting memorials of that dreadful catastrophe. All these, however, are so nearly allied to the several genera of the same families found recent, that it is easy to reduce them to their proper places. Hist. Natur. Eclair. part ii. p. 126, seq.

There are also many kinds of shelly animals which live on land, not in the sea water, or in the fresh rivers or ponds. Of these we have several very elegant species.

Gualtieri, in his Index Testarum Conchyliorum, &c. fol. published at Florence, in 1742, arranges *shells* into five classes: the first comprehending land and river *shells*, the second sea *shells* that are simple and not turbinated, the third the cochleæ, marinæ or all the turbinated univalves, the fourth bivalves, and the fifth the multivalves, among which he places the echini. Tournefort's arrangement of *shells* into the univalves, bivalves, and multivalves, is contained in this work.

Klein's system of *shells*, intitled Tentamen Methodi Ostracologicæ, &c. was printed at Leyden, in 1753.

Geve, of Hamburgh, published a work on *shells*, in German and French, intitled the Monthly Pleasure of *Shells* and Sea Productions, with illuminated Plates, at Hamburgh, in 1755, 4to.

F. Valentyn published a treatise on *shells*, and other marine bodies, of Amboyna, &c. in Dutch, at Amsterdam, in 1754, fol.

Adanson, in his Hist. Natur. du Senegal, Paris, 1757, 4to. ranges all the *shells* he exhibits by the animals themselves, and subjoins ten tables of affinities of univalves, or of the *shells* themselves, founded on the six following parts; the spires, the top, the opening or mouth, the operculum or cover, the pearliness of the substance of the *shell*, and its periosteum or epidermis. He likewise gives seven tables of affinities, taken from the parts of the animals; as the horns, eyes, mouth, &c. and from these tables forms his arrangement.

Seba's Thesauri Rerum Naturalium Descriptio, printed at Amsterdam, in 1758, fol. contains many valuable plates of *shells*.

Regensus published a Recueil de Coquillages, &c. at Copenhagen, in 1758, fol.

Martini's Cabinet of *Shells* was printed at Nuremberg, in 1768, 4to. the second part was published in 1769, and the third in 1771; but the work is not yet completed.

Linnæus, in the several editions of his Systema Naturæ, has methodized the testaceous animals, particularly in his last and twelfth edition, published at Stockholm, in 1767, 8vo. He begins with the multivalves, then proceeds to the bivalves, and ends with the univalves. He has fourteen families of the turbinated univalves, and five of the simple or non-turbinated.

M. Davila, in his Catalogue Systematique & Raisonné des Curiosités de son Cabinet, printed at Paris, in 1767, 8vo. arranges his *shells* on M. d'Argenville's system, with some useful alterations.

M. Meuschen, envoy from several German courts to the Hague, has lately published a systematic catalogue of *shells*. Those who wish to be farther informed concerning the merits of different publications on this subject may consult Da Costa's Elements of Conchology, 8vo. 1776. This author has formed a system of arrangement, of which it will be proper to give some account. He begins with fixing some essential characters by which

ſhells may be divided into families, or claſſes, genera, and ſpecies. Theſe characters muſt be formed from the chief parts of the *ſhells*, the differences of which in ſize, ſhape, ſituation, &c. will enable us to form the ſeveral ſubdiviſions: e. g. univalves have the five following eſſential characters for the claſſes, or families, viz. ſimple or not turbinated, with a ſingle continued cavity, turbinated and chambered, or with many cavities, the total ſhape, and the aperture or mouth of the *ſhell*. The ſubordinate characters for the genera and ſpecies of univalves are five, viz. the number of ſpires or wreaths, operculated or not operculated, the nature of the ſhelly ſubſtance, whether opake, horny, pearly, &c. the epidermis and the head, and end or tip.

Mr. Da Coſta, rejecting the diviſion of *ſhells* into land, river, and ſea *ſhells*, diſtributes all teſtaceous animals into the three uſual general diviſions of univalves, bivalves, and multivalves: and all thoſe bodies which agree in one fixed character he refers to the ſame claſs; whilſt the affinities or differences of theſe bodies to each other in ſuch parts as are not to be reckoned principal conſtitute the ſubordinate genera and ſpecies. Accordingly he fixes on the aperture or mouth of the *ſhell* as the diſtinguiſhing character of the turbinated univalves; on the hinges for the bivalves; and the number of valves for the multivalves. The ſimple figure, the chambered ſtructure, or the latent whirls of the revolved *ſhells*, which are thoſe univalves that are not characterized by the mouth, ſuch as the limpets, ammonia, and cowries, are made the diſtinguiſhing characters of theſe families. The figure or ſhape, the turban or clavicle, the work on the *ſhell*, and other leſs eſſential particulars, ſuch as the thickneſs or thinneſs of the *ſhell*, the epidermis, and the nature of the ſubſtance, are conſidered as the ſecondary characters of genera or ſpecies.

The Iſt *claſs of univalves* comprehends four general ſubdiviſions, or orders. 1. The ſimple univalves, or thoſe not turbinated, or little if at all ſpiral. This part contains four families, viz. the limpets, or *patellæ*; the *aures marinæ*, which are ſlightly ſpiral; the *vermiculi*, or worm *ſhells*; and the *dentalia*.

The *firſt* family of the limpets is again ſubdivided into three genera, viz. the whole, or entire, that are not perforated at the top; the chambered; and the pierced, or perforated, or maſks, which have their tops perforated with a hole quite through the *ſhell*. The firſt genus, he obſerves, is very numerous; the ſecond has alſo many ſpecies; but the third genus has few ſpecies. Europe, he ſays, affords few ſpecies. The fineſt and largeſt are brought from the Eaſt Indies. Africa, eſpecially about the Cape of Good Hope, produces many fine ones. America has many of the chambered and ſmaller kinds; and ſome large and fine limpets have been lately brought from the Streights of Magellan, and the South Sea. The foſſil limpets are very ſcarce. See LIMPET.

The *ſecond* family is the *haliotis*, *aures marinæ*, or ſea ears. See EAR-*ſhell*.

Of this family there are few ſpecies, and this author obſerves that he has never known a ſingle inſtance of a haliotis being found foſſil.

The *third* family is the *vermiculi*, or worm-*ſhells*. See VERMICULUS *marinus*.

The *fourth* family is the *dentalia*, which are ſimple tubular *ſhells*, of a regular, determinate, curved, conical ſhape, and open at both ends. This family has very few ſpecies. See DENTALIS.

2. The concamerated or chambered univalves have many regular and nearly equidiſtant cells, or chambers, and a pipe, or ſiphunculus, that opens into, and communicates from chamber to chamber. This ſecond part, which is the *fifth* family, contains ſix genera: one of which, viz. the *orthoceratites*, is of a ſimple figure: four genera, as the *lituitæ* or croziers, *turbines polythalami*, *ammonia*, and *ammonoidæ*, are all turbinated; and the other genus, or *nautilus*, is revolved. Of theſe ſix genera there are only two, viz. the *lituitæ* and *nautilus*, that are known recent, and therefore the others muſt be arranged by the help of the foſſil kingdom. Thoſe of the firſt genus, or *orthoceros*, are ſimple, ſtraight, conical *ſhells*, gradually tapering from a broad end to a ſharp-pointed top, like a ſtraight horn, whence their name. They are chambered from bottom to top, and have a ſiphunculus, or pipe of communication, from chamber to chamber.—Mr. Da Coſta divides this genus into two ſections, viz. thoſe that have the ſiphunculus placed on or near the edge, and thoſe that have it near the centre.

The ſecond genus, or *lituus*, exactly reſembles a biſhop's crozier in ſhape, for it has a long cylindric ſtem, one end of which turns in a ſpiral manner, but the ſpires are few, ſeparated, and receding from each other. This genus was firſt formed by Breynius, and it is a very rare foſſil. See LITUUS.

The third genus, or *turbo polythalamus* ſive *concameratus*, firſt propoſed by Da Coſta, is a turbinated or ſpiral *ſhell* of a lengthened ſhape, exactly like a buccinum in appearance, but chambered, and the diaphragms or partitions are cut and jagged, like the foliaceous ſutures of the ammonia. See POLYTHALAMIUM and TUBULI *concamerati*.

The fourth genus is the *cornua ammonis* or *ammonia*. The *ſhells* of this genus are perfect helices, the ſpires lying between two flats or levels. The ſpires are cylindric, and connected with each other; they gradually diminiſh or taper from the circumference to the centre, ſo that by the gradual tapering of the ſpires to the centre, the centres of both flats are concaves: the inner ſtructure is chambered, but the diaphragms or partitions of the chambers are not roundiſh, and with an even edge, but jagged into proceſſes, or appendages, which, laid together, cloſe into one another, and form a beautiful leaf-work, called by foſſilogiſts the foliaceous ſutures of the ammonites.

The foſſil ammonia or ammonitæ are found in great abundance, in moſt parts of the world, from the ſize of a pea through all the gradations of bulk to above a yard in diameter, and proportionably thick. The ſpecific character for the arrangement of the ammonitæ is taken by Da Coſta from the work on the back of their ſpires, according to which he divides them into eight ſections, viz. thoſe whoſe backs are quite ſmooth and plain; thoſe whoſe backs are ſtriated, ſulcated, or ribbed; thoſe that have a plain prominent ridge along the back; thoſe with a plain prominent ridge between two furrows; thoſe with a prominent ridge, not plain, but wreathed or twiſted like a rope; thoſe with a plain furrow, or channel, along the back; thoſe whoſe backs are ſtudded, or ſpiked; and thoſe whoſe backs are deeply notched, or toothed, like a ſaw. See CORNU *ammonis*.

The fifth genus, or *ammonoides*, reſembles the ammonitæ in all reſpects, except ſhape: for theſe bodies are quite globoſe, like nautili, and not flat like ammonitæ: the outer ſpire alone makes above one half of the body, and all the other ſpires are very ſmall and taper into a concavity, ſo that the centre is deeply hollowed or umbilicated.

The ſixth genus, or *nautili*, are revolved *ſhells*, or thoſe whoſe ſpires never appear externally, but are very latent within the body of the *ſhell*. They are of a chambered ſtructure, the partitions of the cells or chambers being concavo-convex roundiſh plates. The paper nautilus, ſays Da Coſta, though claſſed by moſt authors as a nautilus, is a diſtinct genus, as it is not of a chambered ſtructure. The ſpecies of nautili are few. Authors make two ſorts of the Eaſt Indian or pearly kind, viz. the umbilicated and non-umbilicated. The animal of this *ſhell* is ſaid to inhabit only the uppermoſt or open chamber, which is much larger than the others: the reſt remain empty, except that the pipe, or ſiphunculus, which communicates from chamber to chamber, is filled with an appendage or tail of the animal, like a gut or ſtring. This ſiphunculus is a dilatable tube, under the command of the animal: when it is flatted, like the ſwimming bladder of a fiſh, it renders the nautilus buoyant; when it is contracted, the fiſh and *ſhell* ſink, and juſt to ſuch a degree as the preſent occaſions of the animal require. See NAUTILUS.

3. The third ſubdiviſion or order of univalves comprehends revolved *ſhells*, or thoſe *ſhells* whoſe ſpires are latent within the body, and do not in any manner appear externally; ſo that they have no clavicle or turban. This third part, which is the *ſixth* family, contains three genera, viz. the *nuces* or *bullæ*, the *ſemi-porcellanæ*, and *cypreæ* or *porcellanæ*.

Accordingly the firſt genus is the *nuces* or *bullæ*, commonly called the pewit's eggs or dipping ſnails, and the dippers or ſea nuts. Theſe are generally of an oval ſhape, and umbilicated at the bottom; the mouth very wide, eſpecially at the top, and narrowing to a great degree downwards; the lip thin, ſharp, and naked, or without any border or other work, and with a ſmall facing or lip on the upper part of the mouth.

The ſecond genus is the *ſemi-porcellanæ*, or *ſhells* reſembling the cypreæ, or cowries, in their appearance; but their aperture is more open, neither are the lips dentated. Linnæus makes a genus of theſe which he calls *bulla*, including under the ſame title the preceding genus of nuces. Davila makes them a genus of cowries, and others rank them as cowries. The ſpecies of this genus are not numerous: but among them the weaver's ſhuttle, the poached egg, and ſome others, are eſteemed rare and curious *ſhells*.

The third genus is the CYPRÆA or *porçellana*, the cowry. The *ſhells* of this genus are generally ſemi-oval, whoſe flat part is the mouth. The ſpires of the cowries make their revolutions within the body of the *ſhell*; their aperture is on the flat ſide, being a narrow opening of the *ſhell*; the lips are near to one another, broad, turning inwards, and toothed; the two ends or extremes on the upper part are very prominent: at one extreme it has a wry gutter, or opening, like the mouth of a ſoal or other flat fiſh; the other extreme has alſo a gutter, but it is ſtraight or perpendicular; and on its ſide, in ſome kinds, there is another protuberance, like a ſmall rude clavicle, or turban. The particular character of this genus is the deep toothing on the inner edges of the lips, which diſtinguiſhes it from the ſemi-porcellanæ. Linnæus has adhered to this character; but Grew, Liſter, Argenville, Gualtieri, and others, not regarding it, have confounded them all together. The cowries are extremely numerous, and moſt of the ſpecies very beautiful in colour and poliſh. They have this elegant poliſh, even from the ſea, naturally, or without the aid of art: and if they were not common *ſhells* would be probably as highly valued as the volutes, or any other. They ſeem to be littoral *ſhells*, and are found at the Moluccas, the Maldives, Madagaſcar, the Weſt India iſlands, &c. and rarely found foſſil. See PORCELAIN *ſhell*.

4. The fourth ſubdiviſion or order includes the turbinated or ſpiral univalves, which are *ſhells* whoſe ſpires are external, and ſhew themſelves on the outer part of the *ſhell*, in that part which is called the clavicle, or turban, which is either produced ſhort or flat, according to the ſeveral genera or ſpecies.

The *ſeventh* family under this claſs is the CYMBIUM, or paper NAUTILUS: the *ſhells* of this family, in their external ſhape, reſemble a ſhip or boat, whoſe upper part or head is narrow, turns ſpirally, and is like the ſtern; the reſt of it widens to the other end, is quite hollow, forms an horizontal aperture, and lies lower than the ſtern or ſpiral end. The ſpecies are not above three or four; and thoſe known are browniſh or whitiſh, and almoſt as thin as paper, whence they have obtained the name of paper nautili. Linnæus makes this a diſtinct genus, under the denomination of ARGONAUTA. This family is the true ſailer; the nautilus or pompilus of the Greeks and Latins, and which our celebrated Engliſh poet refers to,

"Learn of the little Nautilus to ſail;"

for it has not yet been ſatisfactorily proved, that the other kind or pearly nautilus ever ſails or navigates his *ſhell*. Theſe *ſhells* are found in many parts of the Mediterranean, and alſo in the Eaſt Indies. The fiſh inhabiting the *ſhell* is of the polypus kind, and, according to the account of it by M. Argenville, in his Zoomorphoſe, p. 29, its head is of a moderate ſize, with two large eyes; it has eight arms or legs of a ſoft fleſhy ſubſtance, thicker towards the body, and connected by a ſlight membrane; they are of a ſilvery colour, ſet with ſuckers or knobs on the ſides, flatted like oars, and ſerving for ſwimming; and with theſe he ſeems to row or ſteer his veſſel: the ſix foremoſt are ſhort, and he balances himſelf and extends them as he ſwims; the two hinder ones, longer than the others, he plunges in the ſea to ſerve as a rudder, and theſe hold up the ſkin or membrane, which he uſes as a ſail to ply the wind. Thus equipped, he navigates in calm weather: when fearful of danger, he retires within the *ſhell*, by which action it gains water and ſinks to the bottom: he often pumps the water out, and often quits the ſhell, which floating empty is carried by the waves, and daſhed to pieces on the rocks.

The *eighth* family is the ear-ſnails, or *auris-cochlea*, called alſo the Venus-ear. Theſe *ſhells*, in their ſhape, ſo much reſemble the ſea-ears, that moſt authors have ranked them in that family, and called them non-perforated ſea-ears. Liſter and Gualtieri rank them as cochleæ; and Linnæus places them in a genus which he calls *helix*. Da Coſta defines them to be *ſhells* ſo open as to reſemble ſea-ears, but not perforated with a row of holes. They have a broad ledge along one ſide, which projects over the cavity, and turbinates into one ſingle flat ſpire, quite even or level with the bottom of the *ſhell*. This ſpire is alſo very wide, and extends to near the middle of the bottom or under part. There are few *ſhells* of this family.

The *ninth* family is the *cylindri*, cylinders or olives. See CYLINDRUS.

Linnæus ranks theſe *ſhells* in his genus of voluta, by the name of cylindroideæ. Da Coſta divides the family into two genera, viz. *cylindri emarginati*, or ſuch whoſe edge is quite even and ſharp, and *cylindri marginati*, or ſuch whoſe edge is not ſharp and ſmooth, but has a very thick border, which turns over into a very prominent ledge on the back, like to the helmets. The ſpecies of this family are many and very beautiful *ſhells*.

The *tenth* family of the univalves is the VOLUTA, or *volute*.

The *eleventh* family is called *globoſæ*, or tuns; and the *ſhells* of this family are defined to be generally of a globoſe ſhape, the body being much ſwelled or rounded, whence they derive their name; they have ſhort turbans; the mouth is extremely wide, and very large; the upper part of it ends in a wry channel, like a ſoal's mouth, which is very ſhort and turns backward. None have a pillar or columella-lip; though in ſome, as the Perſian crowns and melons, the columella or pillar itſelf is wrinkled or plaited. The *ſhells* comprehended under this family are the tuns, partridges, figs, harps, Perſian crowns, and melons. This family, though not very numerous, contains ſome very beautiful and curious *ſhells*.

The *twelfth* family is the *caſſides*, or helmets; which are defined to be ſemi-globoſe *ſhells*, with the back very convex and round, and the under or mouth part flat: they have alſo almoſt flat, or at leaſt very ſhort, clavicles, or turbans; the mouth is long, rather narrow, and ends at top in a gutter, which turns very large, ſtrong, and wry on the back; the lip is always ſtrongly and thickly toothed, and riſes into a high thick border or ledge on the upper part or back, and the pillar is generally ſtrongly toothed and ridged, or ſet with ſmall aſperities. Liſter and Linnæus rank theſe *ſhells* among the buccina. They are not numerous; but ſome of them are extremely large and heavy.

The *thirteenth* family is the *trochi*, or tops. See TROCHUS.

The *fourteenth* family is the *cochleæ*, or ſnails; the character of which is a round or nearly round mouth, perfectly bordered, circumſcribed, or defined. Da Coſta divides this family into five genera, viz. nerits, or ſnails, with ſemicircular mouths (ſee *Cochleæ* SEMILUNARES); helices, or round-mouthed ſnails, whoſe ſpires lie horizontal, or between two levels, of which genus there are many curious ſpecies; ſnails with a ſhort or flat turban, to which belong the common land ſnails, and many others; ſnails with a lengthened clavicle, or turban, which may be called TURBO (ſee *Cochlea* LUNARIS); and the cochleæ ſtrombiformes, or ſnails, whoſe turbans are extremely long and ſlender, of which genus there are not many ſpecies.

The *fifteenth* family is the *buccina*, or whelks, which are *ſhells* whoſe mouth is an oblong and very lengthened oval, the upper part whereof is produced into a gutter, or ſlight beak: accordingly Da Coſta divides this family into ſix genera, viz. 1. The *buccina canaliculata*, or guttered whelks, whoſe upper part of the mouth ends in an almoſt ſtraight and ſomewhat prolonged gutter, and which have the inner or columella-lip always extremely ſmooth. The ſpecies of this genus are very numerous. 2. *Buccina recurviroſtra*, or wry-mouthed whelks, whoſe mouth is, as it were, cut ſhort at top; for the gutter or beak does not extend ſtraight forward from the upper part of the mouth, but bends or falls on the back in a wry manner, exactly like the mouth of a ſoal, or other flat fiſh. The ſpecies of this genus are very numerous. 3. *Buccina roſtrata* or *longiroſtra*, or beaked whelks, which have a very lengthened beak, ſuch as the purpuræ, tower of Babel, crane and many other rare and curious ſpecies. 4. *Buccina umbilicata*, or umbilicated whelks, which have a perpendicular hollow, or navel, by the ſide of the columella, or pillar-lip, on the firſt or body whirl. Of this genus there are but few ſpecies. 5. *Buccina columella dentata*, or *plicata*, or whelks with a wrinkled or plaited pillar. 6. *Strombi*, or needles, which are buccina with a very long and taper clavicle or turban, and a wry mouth turning on the back, and in ſome ſpecies of ſuch a length as to be like a ſpur. The genus of ſtrombi is pretty numerous. See TRUMPET-*ſhell*.

The *ſixteenth* family is the *murices*, whoſe fixed or eſſential character is an oblong and equally narrow mouth lengthways, which runs into a ſhort gutter or top; and they are always thorny, or ſpiked, or rough, all over the ſurface, like the ſpikes or aſperities of rugged rocks, whence the Latin name murex, the Engliſh rocks, and the French rochers. See MUREX.

Da Coſta ſubdivides this family into four genera, viz. murex, rocks, or thoſe *ſhells* that have along and equally narrow mouth, and are externally very rugged, whoſe clavicle or turban is generally ſhort and almoſt flat, and the pillar wrinkled or plaited; of which there are many ſpecies, ſome being very large and heavy: the rhombi, or *ſhells* whoſe ſubordinate character is that they have always a rhombic ſhape or contour; of which there are not many ſpecies, but ſome are large and heavy: the alatæ,

or winged *ſhells*, whoſe lip is expanded outwards, like a flap, or wing, which are ranked by Linnæus under the genus of STROMBUS; of this genus there are many fine and beautiful ſpecies: and the aporrhaidæ, or winged *ſhells*, whoſe edges are ſet with ſtrong ſpikes or proceſſes like fingers, as the ſpiders, devil's claws, &c. The ſpecies are few, but fine *ſhells*.

It is obſerved, with regard to univalves, that on account of the beauty of their colours and ſtructure they are the choiceſt objects of collectors, and bear a higher value than bivalves or multivalves; for few of the latter ever fetch above five or ſix guineas, while numbers of the volutes, and other univalves, are worth ten, twenty, or thirty guineas, and ſometimes more.

II. The ſecond diviſion or claſs of *ſhells* comprehends the *bivalves*, which are double *ſhells* compoſed of two pieces, or parts, which by means of proper connection by hinges, play on each other, ſo as to open, ſhut, and perform all other functions neceſſary to the œconomy of the animals whoſe habitations they are.

Da Coſta diſtributes bivalves, of which there are no land *ſhells*, and few in freſh water, into three orders, which are as follow. 1. The firſt order includes thoſe *ſhells* that have unequal valves, and ſhut cloſe; of which there are four families.

The *firſt* family is the *pectens* or eſcallops, the eſſential character of which is a trigonal ſinus, and an elaſtic cartilage for its hinge in the centre of the top of the *ſhell*: the ſubordinate characters are their being eared, and that the top runs into a perfectly ſtraight line, gradually widening thence to a round bottom. Linnæus makes the pectens a genus of oyſters. Gualtieri makes different genera of thoſe with equal, and thoſe with unequal valves; calling the former pecten, and the latter concha pectinata; and the eſcallops, with unequal, or ſingle ears, he calls pectunculi. The ſpecies are numerous, ſome of which are curious and very beautiful, as the ducal mantle, the compaſs or ſole, the duck's foot or coral, eſcallop, &c. The eſcallops leap or raiſe themſelves up by forcing their under valve againſt the body whereon they lie. See PECTEN.

The *ſecond* family is the *ſpondyli*. See SPONDYLUS.

The *third* family is the *oſtreum*, or OYSTER; the hinge of which has not any teeth, but proceſſes of a large inarticulate gutter, running along the length of the top of the *ſhell*, in both *ſhells* alike, and covered and filled with a ſtrong cartilage. The ſpecies of this family are very numerous, ſome of which are curious and beautiful, and bear a large price; as the hammer oyſter, the cocksſcombs, &c. Linnæus ranks the eſcallops with the oyſter. Argenville and others reduce the ſpondylas to this family; while Liſter, &c. ranks the hammer oyſter and ſome others as eſcallops. The chief of the foſſil oyſters are the gryphitæ; of which there are ſeveral ſpecies.—See GRYPHITES.

The *fourth* family is the *anomiæ*, which conſiſts of ſeveral foſſil ſpecies; not more than three or four recent from the ſea. They are called by Columna CONCHÆ *rariores anomiæ*. Woodward was the firſt who ranged the anomiæ from the foſſil *ſhells*. Gualtieri has made a particular genus of them, under the denomination of TEREBRATULA. Linnæus has made them a diſtinct genus under the name of ANOMIÆ; mixing the recent with the foſſil kinds, and defining them to be *ſhells* with unequal valves, one valve being flattiſh, the other convex, the beak perforated, and the hinge inarticulate or toothleſs. Davila conſiders them as a genus of oyſters, and defines them as *ſhells*, whoſe beak or top of the under valve is perforated, and riſes curved up on the upper valve. Da Coſta deſcribes the anomiæ as bivalves, with unequal valves, and never eared; the beak of the largeſt or inferior valve is greatly produced, and riſes or moves over the beak of the ſmaller or upper valve, and is pierced or perforated through like a tube; the valves are connected together in ſome ſpecies by an inarticulate or toothleſs, and in others by a multarticulate or manytoothed hinge, which conſtitute two genera; the former are thoſe in which the hinge of the under valve is a large ſinus or cavity, the corners whereof form two prominences or joints: and the upper valve is indented into it by a correſponding prominence to its cavity, and by two ſmall hollows, anſwering to the two joints; the latter are thoſe whoſe hinge lies on a long ſtraight line and is ſet with many teeth, exactly like the Noah's arks. He apprehends that the animals inhabiting theſe *ſhells* ſeldom open them, as moſt others do, to take their food; but nouriſh themſelves through the tube, or perforated beak only.

2. The ſecond order of bivalves comprehends thoſe *ſhells* that have equal valves, and ſhut cloſe; ſuch as the cockles, tellens, muſcles, &c. Da Coſta diſtributes this order into three ſections, viz. the multarticulate, articulate, and inarticulate. The *firſt* ſection includes the lepto-polyginglymi, or multarticulate *ſhells*, with a great number of teeth on the hinges, of which there are three families.

The *fifth* family of bivalves is the *pectinoideæ*, or *ſhells* with equal valves, generally very flat: the hinge lies on a ſtraight line like the eſcallop, but is ſet with ſeveral parallel and ſtraight ridges or intermediate furrows, and the ſides are diſſimilar. There are few ſpecies of this family.

The *ſixth* family is the *pectunculi lepto-polyginglymi*, or multarticulate cockles: the *ſhells* of this family reſemble the cockles in all reſpects except the hinge, which in theſe is furniſhed with a great number of teeth, and in thoſe with few. There are not many ſpecies. Linnæus places them in his genus of ARCA.

The *ſeventh* family is the *arcæ*, arks or boats, which have their hinges on a ſtraight line, and are of a ſomewhat ſquariſh figure or oblong, as the Noah's arks and ſquare cockles. Argenville places theſe in his fourth family of heart cockles. Davila makes them a diſtinct genus of his fourth family, and calls them *arks*. Gualtieri forms a genus of them by the name of *concha rhomboidalis*. Linnæus and Meuſchen rank them as a diſtinct genus, and call them ARCA. This family has not many ſpecies.

The *ſecond* ſection comprehends all bivalves with equal valves, that are not eared, and have few teeth upon their hinge. There are three families.

The *eighth* family of pectunculi, or cockles, is characteriſed by a curved or ſemilunar hinge, ſet with from two to four ſtrong teeth, and may be divided into three genera, viz. 1. The *pectunculi* or cockles, or chamæ of ſome late authors, which are convex or flattiſh *ſhells* of a roundiſh ſhape, and with ſimilar or diſſimilar ſides, whoſe beaks are not very prominent, and turn much upwards towards the hinge.

This genus is numerous. Argenville, Davila, and Meuſchen call them *cames*: Gualtieri calls them CHAMÆ, and Linnæus diſperſes them into ſeveral of his genera.

2. The *cordiformes*, or heart cockles, whoſe beaks are very prominent, and curve up greatly towards the hinge, thereby forming a figure perfectly like a heart. This genus is pretty numerous. Gualtieri places them among his conchæ cordiformes, and they are ranked by Linnæus in his cardium genus. See CARDIA and HEART-*ſhells*.

3. The *truncati*, or flat-ſided cockles; the ſpecies of which are not numerous.

The *ninth* family is the TELLINÆ.

The *tenth* family is the *placentæ*, which are *ſhells* with equal valves, whoſe hinge lies quite within the *ſhell*, and one valve conſiſts of two ſtraight linear ridges, pretty prominent, and laid obliquely to each other, ſo as to meet at one end in a very acute angle: and the other valve has two correſpondent furrows. Of this family, formed by Da Coſta, there are two ſpecies, viz. the Chineſe glaſs, or pellucid oyſter, and the Poliſh ſaddle.

The *third* ſection includes the inarticulate bivalves, or thoſe that have no teeth on their hinge, of which there are two families.

The *eleventh* family is the *margaritiferæ*, or pearl oyſters, which are eared *ſhells* with equal valves, whoſe hinge is merely a gutter or ſlight furrow, without a ſingle tooth. The ſpecies are few, ſuch as the mother of pearl, or pearl oyſter, the ſwallow, &c.

Rumphius, Davila, and Meuſchen rank theſe as oyſters: Woodward forms a genus which he calls *margaritiferæ*, and Gualtieri places the pearl *ſhells* in one genus, under the name of *inæquilateræ*, the ſwallow in another genus, called *conchæ aliformes*. See PEARL.

The *twelfth* family is the *muſcles*, which are generally very convex, of a long and narrow ſhape, and the hinge is a mere ſlight furrow without any tooth, and ſituated, not at the top of the *ſhell*, but a little way down one of the ſides. The ſpecies are not many. See MUSCLE.

3. The third order of bivalves comprehends the *conchæ hiantes*, whoſe *ſhells* never ſhut cloſe, but are always open or gaping in ſome part. This part conſtitutes the *thirteenth* family, and conſiſts of four genera, viz.

1. The *tridacnæ*, or baſon conques, which are *ſhells* of equal valves and diſſimilar ſides, in hinge and appearance reſembling the heart cockles, but on the longeſt ſide from the back to nearly the extreme margin the two *ſhells* do not cloſe, but leave a large heart like opening, the lips whereof are broad, and turn up on the edges; of this there are few ſpecies, which are the largeſt and heavieſt of all the bivalves, ſome weighing from three hundred and a half to ſix or ſeven hundred weight.

2. The *chamæ*, purrs, or gapers, which have a broad, thick, and large tooth for their hinge, and are, as it were, abruptly cut off on one ſide, which ſide is always open or gaping, as the valves cannot ſhut cloſe at that part. There are few ſpecies of this genus. See CHAMA.

3. The *ſolenes*, ſheaths or razor *ſhells*, which are very broad, though extremely ſhort, open at both ends, and the hinge has teeth placed quite at one end. There are few ſpecies. See Solen.

4. The *pinnæ*, ſea wings or hams, which are *ſhells* of a ſomewhat triangular ſhape, widening from a pointed or narrow top to a very broad end, which is always open; the hinge is inarticulate, and placed on one ſide. The ſpecies are few. See Pinna.

III. The third general diviſion or claſs of *ſhells* comprehends the *multivalves*, or thoſe that are made up of many valves or pieces. In this diviſion there are three families. The *fourteenth* family is the *pholas*, or piddocks, the *ſhells* of which are trivalves, and have two large valves, with a ſmall valve placed between them, near the hinge. The hinge turns up on the outer part of the *ſhell*, and under it, within the *ſhell*, is a long curved tooth or ſpur. The ſpecies of this family are very few. See Pholas.

The *fifteenth* family is the *anatiferæ*, or barnacles, which are quinquevalve *ſhells*, and made up of two large valves, with two ſmall ones beneath them, and a long narrow ſpur-like valve, which connects them, and runs lengthwiſe. Of this family there are but few ſpecies. See Barnacle, and *Concha* Anatifera.

The *ſixteenth* family of *ſhells* is the *balani* or acorns, which are made up of many valves lying parallel to each other, and in a perpendicular poſition, contrary to the poſition of all other valves, which lie horizontally. The top is open, and the fiſh performs its neceſſary functions by that aperture, for the valves never open or ſeparate, as they have no hinges.

The balani are always found fixed by their under part to *ſhells*, ſtones, and other ſolid bodies. There are few ſpecies. See Balani. See Da Coſta's Elements of Chonchology, with ſeven plates, 8vo, 1776, and his Britiſh Chonchology in French and Engliſh, illuſtrated with figures, 4to. 1778, in which he has deſcribed eighty-ſix ſpecies of Britiſh univalves.

Mr. Pennant, in the fourth volume of his Britiſh Zoology, has treated of the Britiſh conchology.

Shells, *collecting and cleaning of*. It is moſt adviſeable in collecting *ſhells*, whenever it can be done, to get thoſe which have in them the living animals, becauſe we ſhall thus obtain the natural hiſtory of the animals, and the *ſhells* themſelves in their natural beauty, and the full glow of their colours. *Shells* ſhould be alſo procured from the deeper parts of their reſorts, and immediately after ſtorms on the ſea beaches and ſhores, becauſe, by being much expoſed to the ſun, their colours fade, and they are liable to other accidents that injure them. In order to kill the fiſh that inhabits them, Mr. Da Coſta adviſes to give them a quick dip in boiling water, and when they are cooled to lay them in cold water till they are cleaned; and in this operation they ſhould not be touched with aqua fortis, or any other acid, nor expoſed to the heat of the fire and ſun. See *Poliſhing of* Shells.

Shells, *figures and colours, &c. of*. It is obſerved, that river *ſhells* have not ſo agreeable or diverſified a colour as the land and ſea *ſhells*; but the variety in the figure, colours, and other characters of ſea *ſhells*, is almoſt infinite. The number of diſtinct ſpecies we find in the cabinets of the curious is very great, and doubtleſs the deep bottoms of the ſea, and the yet unſearched ſhores, contain multitudes more, yet unknown to us. Even the ſame ſpecies differ in ſome degree in almoſt every individual, ſo that it is rare to find any two *ſhells* which are alike in all reſpects. Bonan. Recreat. Ment. et Ocul. p. 49.

This wonderful variety, however, is not all the produce of one ſea, or one country; the different parts of the world afford us their different beauties. Bonani obſerves, that the moſt beautiful *ſhells* we are acquainted with come from the Eaſt-Indies, and from the Red Sea. This is in ſome degree countenanced by what is found to this day; and from the general obſervations of the curious, it ſeems that the ſun, by the great heat that it gives to the countries near the line, exalts the colours of the *ſhells* produced there, and gives them a luſtre and brilliancy, that thoſe of colder climates always want: and it may be, that the waters of thoſe vaſt ſeas, which are not ſubject to be weakened by freſh rivers, give a nouriſhment to the fiſh, that may add to the brilliancy of their *ſhells*.

The ſhores of Aſia furniſh us with the pearl oyſters and ſcallops in great perfection. About Amboyna are found the moſt beautiful ſpecimens of the cabbage-*ſhell*, the arroſoir, the ducal mantle, and the coral oyſters, or echinated oyſters. Here alſo are found a great variety of extremely beautiful muſcles, tellinæ, and volutæ; ſome fine buccinums, and the *ſhell* called the *Ethiopian crown*, in its greateſt perfection.

The dolia, the murices, and the caſſandræ, are alſo found on theſe coaſts in great beauty. Many elegant ſnails and ſcrew-*ſhells* are alſo brought from thence; and finally the ſerapion and ſpider-*ſhells*. Hiſt. Nat. Eclairc. p. 168.

The Maldive and Philippine iſlands, Bengal, and the coaſt of Malabar, abound with the moſt elegant of all the ſpecies of ſnails, and furniſh many other kinds of *ſhells* in great abundance and perfection.

China abounds in the fineſt ſpecies of porcelain *ſhells*, and has alſo a great variety of beautiful ſnails.

Japan furniſhes us with all the thicker and larger bivalves; and the iſle of Cyprus is famous above all other parts of the world, for the beauty and variety of the patella, or limpet, found there.

America affords many very elegant *ſhells*, but neither in ſo great abundance nor beauty as the ſhores of Aſia.

Panama is famous for the cylinders or rhombi, and we have beſide, from the ſame place, ſome good porcelains, and a very fine ſpecies of dolium, or *concha globoſa*, called from this place the *Panama purple ſhell*. One of the moſt beautiful of the cylinders is alſo known among our naturaliſts, under the name of the *Panama ſhell*.

About Braſil, and in the Gulf of Mexico, there are found murices and dolia of extreme beauty, and alſo a great variety of porcelains, purpuræ, pectens, heritæ, bucardiæ, or heart-*ſhells*, and elegant limpets.

The iſle of Cayenne affords one of the moſt beautiful of the buccinum kind, and the Midas ear is found principally about this place.

Jamaica, and the iſland of Barbadoes, have their ſhores covered with porcelains, chamæ, and buccina; and at St. Domingo there are found almoſt all the ſame ſpecies of *ſhells* that we have from the Eaſt Indies, only they are leſs beautiful, and the colours more pale and dead. The pearl oyſter is found alſo on this coaſt, but ſmaller than in the Perſian Gulf. At Martinico there are found in general the ſame *ſhells* as at St. Domingo, but yet leſs beautiful.

About Canada are found the violet chamæ, and the lakes of that country abound with muſcles of a very elegant pale blue and pale red colours; ſome ſpecies of theſe are remarkably light and thin; others are very thick and heavy.

The Great Bank of Newfoundland is very barren in *ſhells*: the principal kind found there are muſcles of ſeveral ſpecies, ſome of which are of conſiderable beauty.

About Carthagena there are many mother of pearl *ſhells*, but they are not of ſo brilliant colours as thoſe of the Perſian Gulf.

The iſland of Magellan, at the ſouthern point of America, furniſhes us with a very remarkable ſpecies of muſcle, called by its name; and ſeveral very elegant ſpecies of limpets are found there, particularly the pyramidal.

In Africa, on the coaſt of Guinea, there is a prodigious quantity of that ſmall ſpecies of porcelain, which is uſed there as money; and there is another ſpecies of porcelain on the ſame coaſt, which is all over white; the women make bracelets of theſe, and the people of the Levant adorn their hair with them.

The coaſt of Zanguebar is very rich in *ſhells*: we find there a vaſt variety of the large porcelains, many of them of great beauty; and the *nux maris*, or ſea nut, is very frequent there. Beſide theſe, and many other *ſhells*, there are found on this coaſt all the ſpecies of nautili, many of which are very beautiful.

The Canary Iſles are found to abound with a vaſt variety of the murices, and ſome other good *ſhells*; and we have from Madeira great variety of the echini, or ſea eggs, different from thoſe of the European ſeas. Several ſpecies of muſcles are alſo common there, and the auris marina is no where more abundant.

The Red Sea is beyond all other parts of the world abundant of *ſhells*, ſcarce any kind is wanting there; but what we principally have from thence are the purpuræ, porcelains, and echini marini.

The Mediterranean and northern ocean contain a great variety of *ſhells*, and many of very remarkable elegance and beauty; they are upon the whole, however, greatly inferior to thoſe of the Eaſt Indies. The Mediterranean abounds much more in *ſhells* than the Ocean.

The Gulf of Tarentum affords great variety of purpuræ, of porcelains, nautili, and elegant oyſters; the coaſts of Naples and Sardinia afford alſo the ſame, and with them a vaſt number of the ſolens of all the known ſpecies.

The iſland of Sicily is famous for a very elegant kind of oyſter, which is white all over; pinnæ marinæ and porcelains are alſo found in great plenty there, with tellinæ and chamæ of many ſpecies, and a great variety of other beautiful *ſhells*.

Corſica is famous beyond all other places, for vaſt quantities of the pinnæ marinæ, and many other very beautiful *ſhells* are found there. Liſter, Hiſt. Conchyl.

About Syracuſe are found the gondola *ſhell*, the alated murex,

murex; and a great variety of elegant fnails, with fome of the dolia and neritæ.

The Adriatic fea, or Gulf of Venice, is lefs furnifhed with *fhells* than almoft any of the feas thereabout. Mufcles and oyfters of feveral fpecies are however found there, and fome of the cordiformes or heart *fhells*; there are alfo fome tellinæ. About Ancona there are found vaft numbers of the pholades buried in ftone, and the aures marinæ are particularly frequent about Puzzoli. Bonani, Recreat. Ment. et Ocul.

The ports of Marfeilles, Toulon, and Antibes, are full of pinnæ marinæ, mufcles, tellinæ, and chamæ. The coafts of Bretagne afford great numbers of the conchæ anatiferæ and pouffepieds; they are found on old rotten boards, on fea fubftances, and among clufters of fpunges. The other ports of France, as Rochelle, Dunkirk, Breft, St. Maloes, and others, furnifh oyfters, excellent for the table, but of the common kind, and of no beauty in their *fhells*; great numbers of mufcles are alfo found there; and the common tellinæ, the onion-peel oyfters, the folens, and conchæ anatiferæ, are alfo frequent there. At Granville, in Lower Normandy, there are found very beautiful pectens, and fome of the cordiforms, or heart *fhells*. Our own Englifh coafts are not the leaft fruitful in *fhells*, though they do not produce fuch elegantly painted ones as the Indies.

About Plymouth are found oyfters, mufcles, and folens, in great abundance; and there, and on moft of our other fhores, are numbers of the aures marinæ and dentalia, with pectens, which are very excellent food; and many elegant fpecies of the chamæ and tellinæ are fifhed up in the fea about Scarborough, and other places.

Ireland affords us great numbers of mufcles, and fome very elegant fcallop *fhells* in great abundance, and the pholades are frequent on moft of our fhores. We have alfo great variety of the buccina and cochleæ, fome volutæ; and on the Guernfey coaft a peculiarly beautiful fnail, called thence the *Guernfey-fnail*.

The coafts of Spain and Portugal afford much the fame fpecies of *fhells* with the Eaft Indies, but they are of much fainter colours, and greatly inferior in beauty. Hift. Nat. Eclairc. p. 172.

There are, according to Tavernier and others, fome rivers in Bavaria, in which there are found pearls of a fine water. About Cadiz there are found very large pinnæ marinæ, and fome fine buccina. The ifles of Majorca and Minorca afford a great variety of extremely elegant *fhells*. The pinnæ marinæ are alfo very numerous there, and their filk is wrought into gloves, ftockings, and other things. The Baltic affords a great many beautiful fpecies, but particularly an orange-coloured pecten, or fcallop *fhell*, which is not found in any other part of the world.

The frefh water *fhells* are found much more frequently, and in much greater plenty than the fea kinds; there is fcarce a pond, a ditch, or a river of frefh water, in any part of the world, in which there are not found vaft numbers of thefe *fhells* with the fifh living in them. All thefe *fhells* are fmall, and they are of very little beauty, being ufually of a plain greyifh or brownifh colour. Our ditches afford us chamæ, buccina, neritæ, and fome patellæ; but the Nile, and fome other rivers, furnifhed the ancients with a fpecies of tellina, which was large and eatable, and fo much fuperior to the common fea tellina in flavour, that it is commonly known by the name of *tellina regia*, the *royal tellina*.

We have a fmall fpecies of buccinum common in our frefh waters, which is very elegant, and always has its operculum in the manner of the larger buccina; a fmall kind of mufcle is alfo very common, which is fo extremely thin and tender, that it can hardly be handled without breaking to pieces.

The large frefh water mufcle, commonly called in England the *horfe-mufcle*, is too well known to need a defcription, and the fize of this gives it a difference from all other frefh water *fhells*.

SHELLS, *polifhing of*. This is an art of no long ftanding in the world, in its prefent perfection; and as the love of fea-*fhells* is become fo common among us, it may not be difagreeable to the reader to find fome inftructions in executing fo pleafing a method of adding to their natural beauty, the rules for which are at prefent fo little known, though the effect of them be fo much efteemed.

Among the immenfe variety of *fhells*, which we are acquainted with, fome are taken up out of the fea, or found on its fhores in all their perfection and beauty; their colours being all fpread by nature upon the furface, and their natural polifh fuperior to any thing that art could give. Where nature is in herfelf thus perfect, it were madnefs to attempt to add any thing to her charms; but in others, where the beauties are latent and covered with a coarfer outer fkin, art is to be called in, and the outer veil being taken off, all the internal beauties appear.

Among the *fhells* which are found naturally polifhed are the porcelains, or cowries, the caffanders, the dolia, or conchæ globofæ, or tuns; fome buccina, the volutes, and the cylinders, or olives, or as they are generally though improperly called the rhombi; excepting only two or three, as the tiara, the plume, and the butter-tub-rhombus; where there is an unpromifing film on the furface, hiding a very great fhare of beauty within. Though the generality of the *fhells* of thefe genera are taken out of the fea in all their beauty, and in their utmoft natural polifh, there are feveral other genera, in which all, or moft of the fpecies, are taken up naturally rough and foul, and covered with an epidermis, or coarfe outer fkin, which is in many rough and downy, or hairy. The tellinæ, the mufcles, the cochleæ, and many others, are of this kind. The more nice collectors, as naturalifts, infift upon having all their *fhells* in their native and genuine appearance, as they are found when living at fea: but the ladies, who make collections, hate the difagreeable outfides, and will have all fuch polifhed. It would be very advifeable, however, for both kinds of collectors to have the fame *fhells* in different fpecimens, both rough and polifhed: the naturalift would by this means, befides knowing the outfide of the *fhell*, be better acquainted with its internal characters than he otherwife could be, and the lady would have a pleafure in comparing the beauties of the *fhell*, in its wrought ftate, to its coarfe appearance as nature gives it. How many elegancies in this part of the creation muft be wholly loft to us, if it were not for the affiftance of an art of this kind! Many *fhells* in their native ftate are like rough diamonds, and we can form no juft idea of their beauties till they have been polifhed and wrought into form.

Though the art of polifhing *fhells* is a very valuable one, yet it is very dangerous to the *fhells*; for without the utmoft care, the means ufed to polifh and beautify a *fhell* often wholly deftroy it. When a *fhell* is to be polifhed, the firft thing to be examined is whether it have naturally a fmooth furface, or be covered with tubercles or prominences.

A *fhell* which has a fmooth furface, and a natural dull polifh, need only be rubbed with the hand, or with a piece of chamoy leather, with fome tripoli, or fine rotten ftone, and will become of a perfectly bright and fine polifh. Emery is not to be ufed on this occafion, becaufe it wears away too much of the *fhell*. This operation requires the hand of an experienced perfon, that knows how fuperficial the work muft be, and where he is to ftop; for in many of thefe *fhells* the lines are only on the furface, and the wearing away ever fo little of the *fhell* defaces them. A *fhell* that is rough, foul, and crufty, or covered with a tartarous coat, muft be left a whole day fteeping in hot water: when it has imbibed a large quantity of this, it is to be rubbed with rough emery on a ftick, or with the blade of a knife, in order to get off the coat. After this, it may be dipped in diluted aqua fortis, fpirit of falt, or any other acid; and after remaining a few moments in it, be again plunged into common water. This will greatly add to the fpeed of the work. After this it is to be well rubbed with linen cloths, impregnated with common foap; and when by thefe feveral means it is made perfectly clean, the polifhing is to be finifhed with fine emery and a hair-brufh. If after this the *fhell* when dry appears not to have fo good a polifh as was defired, it muft be rubbed over with a folution of gum arabic; and this will add greatly to its glofs, without doing it any fort of injury. The gum-water muft not be too thick, and then it gives no fenfible coat, only heightening the colours. The white of an egg anfwers this purpofe alfo very well; but it is fubject to turn yellow. If the *fhell* has an epidermis, which will by no means admit the polifhing of it, it is to be dipped feveral times in diluted aqua fortis, that this may be eaten off; and then the *fhell* is to be polifhed in the ufual way with putty, fine emery, or tripoli, on the hair of a fine brufh. When it is only a pellicle that hides the colours, the *fhells* muft be fteeped in hot water, and after that the fkin worked off by degrees with an old file. This is the cafe with feveral of the cylinders, which have not the natural polifh of the reft.

When a *fhell* is covered with a thick and fatty epidermis, as is the cafe with feveral of the mufcles and tellinæ: in this cafe aqua fortis will do no fervice, as it will not touch the fkin; then a rough brufh and coarfe emery are to be ufed; and if this does not fucceed, feal-fkin, or, as the workmen call it, *fifh-fkin* and *pummice-ftone*, are to be employed.

When a *fhell* has a thick cruft, which will not give way to any of thefe means, the only way left is to plunge it feveral

ſeveral times into ſtrong aqua fortis, till the ſtubborn cruſt is wholly eroded. The limpets, auris marina, the helmet-ſhells, and ſeveral other ſpecies of this kind, muſt have this ſort of management; but as the deſign is to ſhew the hidden beauties under the cruſt, and not to deſtroy the natural beauty and poliſh of the inſide of the *ſhell*, the method of uſing the aqua fortis muſt be this: a long piece of wax muſt be provided, and one end of it made perfectly to cover the whole mouth of the *ſhell*; the other end will then ſerve as a handle, and the mouth being ſtopped by the wax, the liquor cannot get in to the inſide to ſpoil it; then there muſt be placed on a table a veſſel full of aqua fortis, and another full of common water.

The *ſhell* is to be plunged into the aqua fortis; and after remaining a few minutes in it, is to be taken out, and plunged into the common water. The progreſs the aqua fortis makes in eroding the ſurface is thus to be carefully obſerved every time it is taken out: the point of the *ſhell*, and any other tender parts, are to be covered with wax, to prevent the aqua fortis from eating them away; and if there be any worm-holes, they alſo muſt be ſtopped up with wax, otherwiſe the aqua fortis would ſoon eat through in thoſe places. When the repeated dippings into the aqua fortis ſhew that the coat is ſufficiently eaten away, then the *ſhell* is to be wrought carefully with fine emery and a bruſh; and when it is poliſhed as high as can be by this means, it muſt be wiped clean, and rubbed over with gum-water, or the white of an egg. In this ſort of work the operator muſt always have the caution to wear gloves, otherwiſe the leaſt touch of the aqua fortis will burn the fingers, and turn them yellow; and often, if it be not regarded, will eat off the ſkin and the nails.

Theſe are the methods to be uſed with *ſhells*, which require but a moderate quantity of the ſurface to be taken off; but there are others which require to have a larger quantity taken off, and to be uncovered deeper: this is called entirely ſcaling a *ſhell*. This is done by means of an horizontal wheel of lead or tin, impregnated with rough emery; and the *ſhell* is wrought down in the ſame manner in which ſtones are wrought by the lapidary. Nothing is more difficult, however, than the performing this work with nicety: very often *ſhells* are cut down too far by it, and wholly ſpoiled; and to avoid this, a coarſe vein muſt be often left ſtanding in ſome place, and taken down afterwards with the file, when the cutting it down at the wheel would have ſpoiled the adjacent parts.

After the *ſhell* is thus cut down to a proper degree, it is to be poliſhed with fine emery, tripoli, or rotten ſtone, with a wooden wheel turned by the ſame machine as the leaden one, or by the common method of working with the hand with the ſame ingredients, when a *ſhell* is full of tubercles, or protuberances, which muſt be preſerved. It is then impoſſible to uſe the wheel; and if the common way of dipping into aqua fortis be attempted, the tubercles being harder than the reſt of the *ſhell*, will be eat through before the reſt is ſufficiently ſcaled, and the *ſhell* will be ſpoiled: in this caſe induſtry and patience are the only means of effecting a poliſh. A camel's hair pencil muſt be dipped in aqua fortis, and with this the intermediate parts of the *ſhell* muſt be wetted, leaving the protuberances dry: this is to be often repeated, and after a few moments the *ſhell* is always to be plunged into water to ſtop the eroſion of the acid, which would otherwiſe eat too deep, and deſtroy the beauty of the *ſhell*. When this has ſufficiently taken off the foulneſs of the *ſhell*, it is to be poliſhed with emery of the fineſt kind, or with tripoli, by means of a ſmall ſtick, or the common poliſhing ſtone uſed by the goldſmiths may be uſed. This is a very tedious and troubleſome thing, eſpecially when the echinated oyſters and murices, and ſome other ſuch *ſhells* are to be wrought; and what is worſt of all is, that when all this labour has been employed, the buſineſs is not well done; for there ſtill remain ſeveral places which could not be reached by any inſtrument; ſo that the *ſhell* muſt neceſſarily be rubbed over with gum-water, or the white of an egg afterwards, in order to bring out the colours and give a gloſs; in ſome caſes it is even neceſſary to give a coat of varniſh.

Theſe are the means uſed by artiſts to brighten the colours, and add to the beauty of *ſhells*; and the changes produced by poliſhing in this manner are ſo great, that the *ſhell* is often not to be known afterwards for the ſame it was; and hence we hear of new *ſhells* in the cabinets of collectors, which have no real exiſtence as ſeparate ſpecies, but are the poliſhed appearance of others well known. To caution the reader againſt errors of this kind, it may be proper to add the moſt remarkable ſpecies thus uſually altered.

The *onyx-ſhell*, or volute, called by us the purple or violet-tip, which in its natural ſtate is of a ſimple pale brown, when it is wrought ſlightly, or poliſhed with juſt the ſuperficies taken off, is of a fine bright yellow; and when it is eat away deeper, it appears of a fine milk-white, with the lower part bluiſh: it is in this ſtate that it is called the *onyx-ſhell*; and it is preſerved in many cabinets in its rough ſtate, and in its yellow appearance as different ſpecies of *ſhells*.

The *violet-ſhell*, ſo common among the curious, is a ſpecies of porcelane, or common cowry, which does not appear in that elegance till it has been poliſhed; and the common auris marina ſhews itſelf in two or three different forms, as it is more or leſs deeply wrought. In its rough ſtate it is duſky and coarſe, of a pale brown on the outſide, and pearly within; when it is eaten down a little way below the ſurface, it ſhews variegations of black and green, and when ſtill farther eroded, it appears of a fine pearly blue within and without.

The nautilus, when it is poliſhed down, appears all over of a fine pearly colour, but when it is eaten away but to a ſmall depth, it appears of a fine yellowiſh colour with duſky hairs. The burgau, when entirely cleared of its coat, is of the moſt beautiful pearl-colour; but when only ſlightly eroded, it appears of a variegated mixture of green and red; whence it has been called the *parroquet-ſhell*. The common *helmet-ſhell*, when wrought, is of the colour of the fineſt agate; and the muſcles, in general, though very plain *ſhells*, in their common appearance, become very beautiful when poliſhed, and ſhew large veins of the moſt elegant colours. The Perſian *ſhell*, in its natural ſtate, is all over white, and covered with tubercles; but when it has been ground down on a wheel, and poliſhed, it appears of a grey colour, with ſpots and veins of a very bright and highly poliſhed white. The limpets in general become very different when poliſhed, moſt of them ſhewing very elegant colours; among theſe the *tortoiſe-ſhell* limpet is the principal; it does not appear at all of that colour or tranſparence till it has been wrought.

That elegant ſpecies of *ſhell* called the junquil-chama, which has deceived ſo many judges of theſe things into an opinion of its being a new ſpecies, is only a white *chama* with a reticulated ſurface; but when this is poliſhed, it loſes at once its reticular work and its colour, and becomes perfectly ſmooth, and of a fine bright yellow; and the violet-coloured *chama* of New England, when worked down and poliſhed, is of a fine milk-white, with a great number of blue veins, diſpoſed like the variegations in agates.

The aſſes *ear-ſhell*, when poliſhed, after working it down with the file, becomes extremely gloſſy, and obtains a fine roſe-colour all about the mouth. Theſe are ſome of the moſt frequent among an endleſs variety of changes wrought on *ſhells* by poliſhing; and we find there are many of the very greateſt beauties of this part of the creation which muſt have been loſt but for this method of ſearching deep in the ſubſtance of the *ſhell* for them.

The Dutch are very fond of *ſhells*, and are very nice in their manner of working them: they are under no reſtraint, however, in their works, but uſe the moſt violent methods, ſo as often to deſtroy all the beauty of the *ſhell*. They file them down on all ſides, and often take them to the wheel, when it muſt deſtroy the very characters of the ſpecies. Nor do they ſtop at this, but, determined to have beauty at any rate, they are for improving upon nature, and frequently add ſome lines and colours with a pencil, afterwards covering them with a fine coat of varniſh; ſo that they ſeem the natural lineations of the ſhell: the Dutch cabinets are by this means made very beautiful, but they are by no means to be regarded as inſtructors in natural hiſtory. There are ſome artificers of this nation who have a way of covering *ſhells* all over with a different tinge from that which nature gives them; and the curious are often deceived by theſe tricks into the purchaſing them as new ſpecies.

There is another kind of work beſtowed on certain ſpecies of *ſhells*, particularly the nautilus; this is the engraving on it lines and circles, and figures of ſtars, and other things: this is too obvious a work of art to ſuffer any one to ſuppoſe it natural. Buonani has figured ſeveral of theſe wrought *ſhells* at the end of his work; but it is miſerably throwing away labour to do them; the *ſhells* are ſpoiled as objects of natural hiſtory by it, and the engraving is ſeldom worth any thing. They are principally done in the Eaſt Indies.

Shells are ſubject to ſeveral imperfections; ſome of theſe are natural, and others accidental: the natural ones are the effect of age, or ſickneſs in the fiſh. The greateſt miſchief happens to *ſhells* by the fiſh dying in them. The curious in theſe things pretend to be always able to diſtinguiſh a *ſhell* taken up with the fiſh alive, from one found on the ſhores: they call the firſt a living, the ſecond a dead *ſhell*, and ſay that the colours are always much

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much the fainteſt in the dead *ſhells*. When the *ſhells* have lain long dead on the ſhores, they are ſubject to many injuries, of which the being eaten by ſea-worms is not the leaſt: age renders the fineſt *ſhells* livid or dead in their colours.

The fineſt *ſhells* are thoſe which are fiſhed up at ſea, not found on the ſhores. The other natural defects of *ſhells* are their having morbid cavities, or protuberances, in parts where there ſhould be none. When the *ſhell* is valuable, theſe faults may be hid, and much added to the beauty of the ſpecimen, without at all injuring it as an object of natural hiſtory, which ſhould always be the great end of collecting theſe things. The cavities may be filled up with maſtic, diſſolved in ſpirit of wine, or with iſinglaſs; theſe ſubſtances muſt be either coloured to the tinge of the *ſhell*, or elſe a pencil dipped in water-colours muſt finiſh them up to the reſemblance of the reſt, and then the whole *ſhell* being rubbed over with gum-water, or with the white of an egg, ſcarce any eye can perceive the artifice: the ſame ſubſtances may alſo be uſed to repair the battered edge of a *ſhell*, provided the pieces chipped off be not too large. And when the excreſcences of a *ſhell* are faulty, they are to be taken down with a fine file. If the lip of a *ſhell* be ſo battered that it will not admit of repairing by any cement, the whole muſt be filed down to an evenneſs, or ground on the wheel.

Shells, *foſſil*. *Shells* are frequently found under-ground, in places far remote from the ſea, in mines, and even on the tops of mountains; but how they ſhould come thither is a thing the naturaliſts are greatly divided about. The moſt uſual and eaſy opinion is, that thoſe parts have been formerly ſea, or, at leaſt, have been overflown thereby; and many even go back as far as the grand deluge for this. Others take theſe to be the natural places of their birth or formation, ſome of them being found little other than crude clay, others of the ſame texture with the rock whereto they grow, though others ſeem of as abſolute a *ſhelly* ſubſtance as any in the ſea. In effect, they ſay, theſe may be only ſo many different gradations of nature, which can as well produce *ſhells* in mines as in the ſea, there being no want of ſaline or earthy particles for the purpoſe; nor is there any great difference between ſome ſorts of ſpars and ſea *ſhells*.

Dr. Liſter judges, that the *ſhells* found in ſtone quarries were never any part of an animal, and gives this reaſon for it, that quarries of different ſtone yield quite different ſpecies of *ſhells*; different not only from one another, but from any thing in nature beſides, which either ſea or land does yield. This opinion has been ſince proved erroneous, and all theſe bodies to have been really once parts of living animals. See Fossils, *adventitious*, Marine *remains* and *formed* Stones.

Of theſe ſhells, ſome are found remaining almoſt entirely in their native ſtate, but others are variouſly altered by being impregnated with particles of ſtone, and of other foſſils; in the place of others there is found mere ſtone or ſpar, or other native mineral body, expreſſing all their lineaments in the greateſt nicety, as having been formed wholly from them, the *ſhell* having been firſt depoſited in ſome ſolid matrix, and thence diſſolved by very ſlow degrees, and this matter left in its place, on the cavities of ſtone and other ſolid ſubſtances, out of which *ſhells* had been diſſolved and waſhed away, being afterwards filled up leſs ſlowly with theſe different ſubſtances, whether ſpar or whatever elſe: theſe ſubſtances, ſo filling the cavities, can neceſſarily be of no other form than that of the *ſhell*, to the abſence of which the cavity was owing, though all the nicer lineaments may not be ſo exactly expreſſed. Beſide theſe, we have alſo in many places maſſes of ſtone formed within various *ſhells*; and theſe having been received into the cavities of the *ſhells* while they were perfectly fluid, and having therefore nicely filled all their cavities, muſt retain the perfect figures of the internal part of the *ſhell*, when the *ſhell* itſelf ſhould be worn away, or periſhed from their outſide. The various ſpecies we find of theſe are in many genera as numerous as the known recent ones; and as we have in our own iſland not only the *ſhells* of our own ſhores, but thoſe of many other very diſtant ones, ſo we have alſo many ſpecies, and thoſe in great numbers, which are in their recent ſtate, the inhabitants of other yet unknown or unſearched ſeas and ſhores.

The cockles, muſcles, oyſters, and the other common bivalves of our own ſeas are very abundant; but we have alſo an amazing number of the nautilus kind, particularly of the nautilus græcorum, which though a *ſhell* not found living in our own, or any neighbouring ſeas, yet is found buried in all our clay-pits about London and elſewhere; and the moſt frequent of all foſſil *ſhells* in ſome of our counties, are the conchæ anomiæ, which yet we know not of in any part of the world in their recent ſtate. Of this ſort alſo are the cornua ammonis and the gryphitæ, with ſeveral of the echinitæ and others.

The exact ſimilitude of the known *ſhells* recent and foſſil in their ſeveral kinds, will by no means ſuffer us to believe, that theſe, though not yet known to us in their living ſtate, are, as ſome have idly thought, a ſort of luſus naturæ.

It is certain, that of the many known ſhores, very few, not even thoſe of our own iſland, have been yet carefully ſearched for the *ſhell*-fiſh that inhabit them; and as we ſee in the nautilus græcorum an inſtance of *ſhells* being brought from very diſtant parts of the world to be buried here, we cannot wonder, that yet unknown ſhores, or the unknown bottoms of deep ſeas, ſhould have furniſhed us with many unknown *ſhell*-fiſh which may have been brought with the reſt; whether that were at the time of the general deluge, or the effect of any other cataſtrophe of a like kind, or by whatever other means to be left in the yet unhardened matter of our ſtony and clayey ſtrata. Hill's Hiſt. of Foſſ. p. 616.

Foſſil *ſhells* are found to be of great uſe in manuring land. See Manuring.

They are much uſed in France for this purpoſe; and Mr. Reaumur treats of their effects in fertilizing the earth very fully, concluding his uſeful account of theſe ſubſtances by obſerving, that it is much more eaſy to account for the manner of their acting upon land, than for the manner of their coming where they are found. It has been the favourite ſyſtem of our Dr. Woodward, that all theſe *ſhells* were the remains of the univerſal deluge, which having overflowed the whole earth, might eaſily leave them in all places; but Mr. Reaumur has much more rationally accounted for their coming to thoſe parts of France, where they are found at this time in ſuch vaſt abundance, by carefully tracing the courſe of the beds of them ſo far as known there, and eaſily proving that all that extent of country, under which they are found, may have been once overflowed by the ſea without a deluge; it being the very track that a large body of waters, let in at one part of the kingdom, muſt have taken, in order to getting out at another. Mem. de l'Acad. Par. 1720.

Shell, *Arabian*, a name given by ſome to a ſpecies of porcelain *ſhell*, not becauſe it is found on the coaſt of Arabia, but becauſe its lines and variegations are ſuppoſed to repreſent the figures of Arabic characters.

Shell, *aurora*, in *Natural Hiſtory*, a very remarkable ſpecies of *ſhell* fiſh, found in cabinets of the curious. It is of the figure of a bird, having a head, wings, and tail, and is of a flame-colour; it owes much of its beauty, however, to art and accident; the *ſhell* is an oyſter of a peculiar variation of figure from the common one; the head of the bird is the cardo or hinge; the wings are the body of the *ſhells*; and the tail is a peculiar proceſs like that of the marteau, only ſingle.

It is naturally of a duſky brown on the outſide, and pearly within, but when its rough coat is taken off, it appears of this beautiful flame-colour.

Shell, *caterpillar*. See Turbo.

Shell, *centre*, in *Natural Hiſtory*, a name given to the balanus marinus, a kind of ſea *ſhell* of the multivalve kind, with an open mouth, frequently found fixed to the bottoms of ſhips, and other things covered with ſea water. See Balani and Shells.

Shell, *chalice*, or *cup*-shell, a ſpecies of the balanus. See Balani.

Shell, *China-letter*, in *Natural Hiſtory*, a name given by many to that ſpecies of chama, uſually called by authors the *chama Arabica*. It is of a pale browniſh ground, and is variegated with a great number of black lines, which are as ſlender as the ſtrokes of a pen, and are of ſuch odd figures, that they repreſent ſome of the Arabic, or, as others fancy, Chineſe characters. See Chama.

Shell, *crown imperial*, a ſpecies of the voluta.

Shell, *dog-tooth*, a ſpecies of dentalis.

Shell, *ear*. See Ear.

Shell, *guinea*, the Engliſh name for a very beautiful variegated ſpecies of voluta, called by the French *la ſpeculation*.

Shell, *heart*. See Heart.

Shell, *helmet*, in *Natural Hiſtory*, the name of a kind of murex, of which there are ſeveral ſpecies. They all approach ſomewhat toward a triangular figure, and are free from any long ſpines. See *Syſtems of* Shells.

Shell, *leopard*, in *Natural Hiſtory*, the Engliſh name of the pardus, a kind of voluta, ſo called from its ſpots reſembling thoſe of a leopard. There are three kinds of this, one ſpotted with black, another with yellow, and another with red.

Shell, *leveret*, in *Natural Hiſtory*, a name given by many to a ſpecies of porcelain-*ſhell*, reſembling a young hare in colour.

Shell,

SHELL, *lightning*, in *Natural History*, a name given by some authors to a species of MUREX with variegations on its body, resembling the pictures we commonly see of flashes of lightning.

SHELL, *map*, in *Natural History*, the name given by some to a peculiar species of PORCELAIN-*shell*, the figures on which represent the lines on a map.

SHELL, *needle*. See CENTRANIA and NEEDLE.

SHELL, *Noah's ark*. See NOAH.

SHELL, *oyster*. See OYSTER.

SHELL, *old wife*, the name given by some to that species of chama, which the French also have called VIELLE *ridée*.

SHELL, *onion*, a species of OYSTER.

SHELL, *pipe*. See ENTALIUM.

SHELL, *saddle*, in *Natural History*, the name of a species of OYSTER, which in some degree represents a saddle in its shape.

SHELL, *St. James's*, in *Natural History*, a name given by writers on *shells* to a very beautiful species of variegated PECTEN.

SHELL, *St. Michael's*, in *Natural History*, a name given by authors to a species of PECTEN, or scallop-*shell*. It is of a bright yellow colour.

SHELL, *scorpion*, in *Natural History*, the name of a species of MUREX, very much approaching to the nature of the spider *shell*. This is a common *shell* in cabinets; it is of a yellow colour, and very deeply ridged, and full of tubercles; there arise from the lip of the *shell* five large spines, or, as they are usually called, fingers, and two others, which are very much bent, the one from the head, the other from the tail: these are very elegantly radiated with white, and a fine violet colour on the lips.

SHELL, *screw*. See TURBO.

SHELL, *small-pox*, in *Natural History*, a name given to a remarkable kind of concha venerea, or PORCELAIN-*shell*, the protuberances on the surface of which are supposed to represent the pustules of the small-pox. There are two species of this *shell*, the one white, with flattish protuberances, the other greenish, with more elevated ones.

SHELL-*snake*, in *Natural History*, the name given by many to that beautiful species of PORCELAIN-*shell*, the spots of which represent those of a snake's skin.

SHELL, *spider*, the name of a kind of MUREX. See ARANEA.

SHELL, *strawberry*, in *Natural History*, a name given by collectors of *shells* to a very beautiful species of cordiformis, spotted with small round red spots.

SHELL, *swallow*, in *Natural History*, the name given by authors to a species of OYSTER, which in some degree represents the figure of a small bird flying.

SHELL, *swan*. See CIGNE.

SHELL, *tiger*, in *Natural History*, the name of a species of PORCELAIN, or concha venerea, supposed to represent the spots on a tiger's skin.

SHELL, *toe*. See POLLICIPES.

SHELL, *tortoise*. See TORTOISE.

SHELL, *trumpet*. See TRUMPET.

SHELL, *turban*. See TURBAN.

SHELL, *turnep*. This is a species of sea *shell*, by others called the *radish shell*; it is exactly of the shape of a turnep, and is of the DOLIUM, or concha globosa kind. Those who have called it the *radish shell*, allude to the great black round rooted radish, not to our common radish.

SHELL, *turtle*, the names of two species of *shells*. See MUREX and VOLUTA.

SHELL-*apple*, in *Ornithology*, an English name for the loxia, or CROSSBILL, given from his manner of splitting an apple, and feeding on the kernels, leaving the *shell* of the pulp untouched.

SHELL-*drake*, in *Ornithology*, a common English name for the TADORNA.

SHELL *fish*. These animals are in general oviparous, very few instances having been found of such as are viviparous. Among the oviparous kinds, anatomists have found that some species are of different sexes in the different individuals of the same species, but others are hermaphrodites, every one being in itself both male and female: in both cases their increase is very numerous, and scarce inferior to that of plants, or of the most fruitful of the insect class. The eggs are very small, and are hung together in a sort of clusters by means of a glutinous humour, which is always placed about them, and is of the nature of the jelly of frogs spawn; by means of this they are not only kept together in the parcel, but the whole cluster is fastened to the rocks, *shells*, or other solid substances, and thus they are preserved from being driven on shore by the waves, and left where they cannot succeed.

SHELL-*gall-insect*, an insect of the GALL-*insect* class, somewhat resembling those which are called the boat-fashioned ones, but differing in this, that as the two ends of that species are not very different in form, in this kind one of the ends is sharp and pointed in comparison with the other.

It has its name of *shell-insect*, from the resemblance it bears to a muscle *shell*; as it is, in its whole form, not unlike one of the two *shells*, in which the common sea muscle is inclosed, but the pointed end of this *insect* is much more extended in length than the smaller end of this *shell*.

This species is extremely small, and may be easily mistaken for the minute case, out of which some small insect has escaped; or in another state, for the nest in which some small insect had deposited its eggs; but if the assistance of the microscope be called in, they will easily be discovered to be true *gall-insects*, even as soon as they are hatched from the eggs. This species at its full growth, is so small, that it requires good eyes to discover it: it is brown, very smooth, and polished on the surface, and much of the colour of the bark of some trees; it has usually an edge of a cottony matter, visible where its sides touch the tree, and its eggs are always deposited on a fine cottony bed; the young ones are white, flat, and have two small horns, and six legs; in this state they are known to be of the *gall-insect* class, not by their likeness to their parent, but to the young *gall-insects* of other species. They march about very briskly for some time after they are hatched, and after that fix themselves, and then begin to grow, and by degrees alter their form, till they at length are of the same shape with their parent. Reaumur, Hist. Inf. tom. iv. p. 69, 70.

SHELL-*sand*, a name given by the farmers, in some parts of England, to the fragments of *shells* found on the sea shores, and ground to a sort of powder, so that they resemble sand. See MANURING.

There is also another kind, used as this is, in some parts of Cornwall, and composed of fragments of a sort of tender white coral. This is found principally about Falmouth, and is called by the same name of *shell-sand*, though very improperly. All the kinds are of great use in agriculture, but they are differently esteemed by the farmers, as they are more or less rich, which they know by their colours: the reddish kind is esteemed most of all; next to this the blue is judged the best, and after this the white. Such as is dredged up from under the water, is always found better, than such as is found dry on the shores; and such as is entirely composed of *shells* is to be chosen, rather than such as has fragments of stone among it, which is a very common case. See SAND.

SHELL-*toothed*, in the *Manege*, an appellation given to a horse that from five years old to old age, naturally, and without any artifice, bears mark in all his foreteeth, and there still keeps that hollow place with the black mark, which is called in French *germe de feve*, i. e. *the eye of a bean*, insomuch, that at twelve or fifteen he appears with the mark of a horse that is not yet six; for in the nippers of other horses, the hollow place is filled, and the mark disappears towards the sixth year, by reason of the wearing of the tooth. About the same age it is half worn out in the middling teeth, and towards the eighth year it disappears in the corner teeth: but after a *shell-toothed* horse has marked, he marks still equally in the nippers, the middling, and the corner teeth; which proceeds from this, that having harder teeth than other horses, his teeth do not wear, and so he does not lose the black spot.

Among the Polish, Hungarian, and Croatian horses, we find a great many of them hollow-toothed, and generally the mares are more apt to be so than the horses.

SHELLS, *littoral*. See LITTORAL.

SHELL-*gold*. See GOLD.

SHELL-*silver*. See SILVER.

SHELL-*fish*, a collective name for all fishes naturally inclosed in *shells*.

SHELL, in *Artillery*. See BOMB and MORTAR.

SHELLS, *message*, are howitz-*shells*, within which are inclosed a letter, or other papers: the fuze-hole is stopped up with wood or cork, and the *shells* are fired into a garrison or camp.

SHELL *of a block*, in *Mechanics*, is the outer frame or case, wherein the sheave or wheel is contained, and traverses about its axis.

SHELTERS, *horizontal*. See HORIZONTAL.

SHELTIE, the name of a small, but strong kind of horse, found in the island of Zetland, commonly called *Shetland*. In the country, the price of one of these horses is about a guinea.

SHELVES, in *Sea Language*, a general name given to any dangerous shallows, sand banks, or rocks; lying immediately under the surface of the water, so as to intercept any ship in her passage, and endanger her destruction.

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SHEPHERD, in *Rural Affairs*, one who looks after ſheep.

SHEPHERD's *dog*, a variety of the common DOG, uſed in guarding flocks, or driving herds of cattle.

SHEPHERD *kings*, in *Ancient Hiſtory*. See DISPERSION *of Mankind*.

SHEPHERD's *needle*, or *Venus's comb*, *ſcandix*, in *Botany*, a genus of the *pentandria digynia* claſs. Its characters are theſe: it hath an umbelliferous flower; the general umbel is long, and has few rays; the particular umbels have many; the general umbel has no involucrum; the particular have a five-leaved one, the length of the umbels; the general umbel is deformed, and has hermaphrodite florets in the diſk, and female in the rays: the flowers have five inflexed heart-ſhaped petals; the inner are ſmall, and the outer large; and five ſlender ſtamina, terminated by roundiſh ſummits, with an oblong germen ſupporting two permanent ſtyles, crowned by obtuſe ſtigmas: the germen afterward turns to a long fruit, divided in two parts, each having one furrowed ſeed, convex on one ſide, and plain on the other. Miller enumerates ſix, and Linnæus nine ſpecies.

There have been ſome inſtances of the ill effects of this plant, when taken inwardly; ſome who have taken this herb in ſoups, by miſtaking it for garden chervil, have narrowly eſcaped with their lives.

SHEPHERD's *pouch*, *burſa paſtoris*, in *Botany*, a common weed in moſt parts of England, which propagates itſelf ſo faſt by ſeeds, as not to be eaſily cleared where they are permitted to ſhed; for ſo faſt do the ſeed ripen, and the plants come up, that there are commonly four or five generations of them in a year; they cannot, therefore, be too carefully rooted out of a garden. In the Linnæan ſyſtem, this is a ſpecies of the THLASPI.

This is an officinal plant; its juice has been reputed aſtringent and vulnerary, and as ſuch is uſed againſt hæmorrhages, dyſenteries, diarrhœas, &c.

The country people apply it to cuts and freſh wounds, and ſome hold it of great virtue when made up into a cataplaſm, and applied to the wriſts againſt tertians and quartans; but Dr. Lewis obſerves, that he could perceive no pungency or aſtringency, either in the leaves of this plant, or in the extracts made by water and rectified ſpirit, and that a decoction of them ſtrike no degree of blackneſs with ſolution of chalybeate vitriol. Hence, he infers, that there ſeems to be no foundation for the ſtrong ſtyptic virtues, for which this herb has been generally recommended by writers in the materia medica, or for the acrid inflammatory power, which ſome (probably miſled by its botanic affinity with muſtard, and ſome other acrid vegetables) have aſcribed to it. Lewis's Mat. Med.

SHEPHERD's *ſtaff*, or *ſhepherd's rod*. See TEAZEL.

SHERARDIA, in *Botany*. See *Little Field* MADDER.

SHERARDIA is alſo a name given by Pontedera to the genus of plants, called by Linnæus. See GALENIA.

SHERBET, or SHERBIT, a compound drink, firſt brought into England from Turkey and Perſia, conſiſting of fair water, lemon-juice, ſugar, amber, and other ingredients.

Another kind of it is made of violets, honey, juice of raiſins, &c.

The word *ſherbet*, in the Perſian language, ſignifies *pleaſant liquor*.

SHERIF, in the *Egyptian Orders*, the relations of Mahomet, the ſame tribe of perſons called EMIR by the Turks.

The word is Perſian, and ſignifies *great* or *noble*; and theſe perſons have the privilege of being exempt from appearing before any judge but their own head; and if any of the military orders are obliged to puniſh them for any miſdemeanor, they firſt take off their green turban, in reſpect to their character; and the ſame is done, even when they are puniſhed by their own magiſtrate. See SCHERIF.

SHERIFF, or SHIRE-REVE, an officer in each county of England, of very great antiquity; his name being derived from the two Saxon words *ſcire*, *province* or *ſhire*; or rather from *ſciran*, *to divide*, and *gereſa*, *grave*, *reve*, or *prefect*; the *ſheriff* being denominated from the firſt diviſion of the kingdom into counties.

He is called in Latin *vice-comes*, as being the deputy of the earl or comes, to whom the cuſtody of the ſhire is ſaid to have been committed at the firſt diviſion of this kingdom into counties; but the earls being afterwards unable, by reaſon of their high employments, and attendance on the king's perſon, to tranſact the buſineſs of the county, the labour was committed to the *ſheriff*; who now performs all the king's buſineſs in the county; and though he be ſtill called *vice-comes*, yet he is entirely independent of, and not ſubject to the earl: the king, by his letters patent, committing *cuſtodiam comitatus* to the *ſheriff*.

Sheriffs were formerly choſen by the inhabitants of the ſeveral counties; in confirmation of which, it was ordained by 28 Edw. I. c. 8. that the people ſhould have election of *ſheriffs* in every ſhire, where the ſhrievalty is not of inheritance; for anciently in ſome counties the *ſheriffs* were hereditary, as judge Blackſtone apprehends, they were in Scotland, till the ſtatute 20 Geo. II. c. 43. and ſtill continue in the county of Weſtmoreland to this day: the city of London having alſo the inheritance of the ſhrievalty of Middleſex veſted in their body by charter. This election, ſays the ſame author, was, in all probability, not abſolutely veſted in the commons, but required the royal approbation. For in the Gothic conſtitution, the judges of their county courts (which office is executed by our *ſheriff*) were elected by the people, but confirmed by the king: and the form of their election was thus managed; the people, or *incolæ territorii*, choſe twelve electors, and they nominated three perſons, *ex quibus rex unum confirmabat*. But, with us in England, theſe popular elections growing tumultuous, were put an end to by the ſtatute 9 Edw. II. ſt. 2. which enacted, that the *ſheriffs* ſhould from thenceforth be aſſigned by the chancellor, treaſurer, and the judges, as being perſons in whom the ſame truſt might with confidence be repoſed. By ſtatutes 14 Edw. III. cap. 7. 23 Hen. VI. c. 8. and 21 Hen. VIII. c. 20. the chancellor, treaſurer, preſident of the king's council, chief juſtices, and chief baron, are to make this election on the morrow of All Souls in the exchequer: and the king's letters patent, appointing the new *ſheriffs*, uſed commonly to bear date the ſixth day of November. 12 Edw. IV. c. 1.

And the cuſtom now is, which has obtained ſince the time of Henry the Sixth, that all the judges, together with the other great officers, meet in the exchequer chamber on the morrow of All Souls yearly (which day is now altered to the morrow of St. Martin, by the laſt act for abbreviating Michaelmas term), and then and there propoſe three perſons to the king, who afterwards appoints one of them to be *ſheriff*.

This cuſtom of the twelve judges propoſing three perſons, ſeems borrowed from the Gothic conſtitution before-mentioned; with this difference, that among the Goths the twelve nominees were firſt elected by the people themſelves: which uſage of ours was probably founded upon ſome ſtatute, though not now to be found among our printed laws. But notwithſtanding an unanimous reſolution of all the judges of England to this purpoſe, entered in the council book of 3 March, 34 Hen. VI. and the ſtatute 34 and 35 Hen. VIII. cap. 26. ſect. 61. which expreſly recognizes this to be the law of the land; ſome of our writers have affirmed, that the king, by his prerogative, may name whom he pleaſes to be *ſheriff*, whether choſen by the judges or no. This is grounded on a very particular caſe in the fifth year of queen Elizabeth, when, by reaſon of the plague, there was no Michaelmas term kept at Weſtminſter, ſo that the judges could not meet there in *craſtino animarum*, to nominate the *ſheriffs*; whereupon the queen named them herſelf, without ſuch previous aſſembly, appointing for the moſt part one of the two remaining in the laſt year's liſt. And this caſe, ſo circumſtanced, is the only authority in our books for making theſe extraordinary *ſheriffs*.

However, it muſt be acknowledged, that the practice of occaſionally naming what are called POCKET-*ſheriffs*, by the ſole authority of the crown, hath uniformly continued to the reign of his preſent majeſty, Geo. III. in which, ſays Blackſtone, few, if any, inſtances have occurred.

By four ſeveral ſtatutes it is enacted, that no one ſhall be *ſheriff*, except he have ſufficient land within the ſhire to anſwer the king and his people in any matter of complaint. 9 Edw. II. ſt. 2. 4 Edw. III. c. 9. 5 Edw. III. c. 4. 14 & 14 Car. II. c. 21.

It has been adjudged, that an attorney is exempted from the office of *ſheriff*, by reaſon of his attendance on the courts of Weſtminſter.

By 2 Geo. III. c. 20. no perſon, during the time he is acting as a militia officer, ſhall be obliged to ſerve the office of *ſheriff*.

Proteſtant diſſenters, who are exempted by the TOLERATION act, from the obligation of complying with the requiſition of the CORPORATION act, and who can plead their non-compliance as a reaſonable and ſufficient excuſe, are not compellable to ſerve this office, nor of courſe to pay any fine for refuſal. See Furneaux's Letters to Blackſtone, ed. 2. and particularly the Appendix, containing Lord Mansfield's ſpeech in the houſe of lords 1767, on the cauſe between the city of London and the diſſenters, when the houſe affirmed the unanimous judgment of the commiſſioners delegates, who delivered their opinions *ſeriatim* on the 5th of July, 1762, after hearing counſel ſeveral days.

By a by-law of the city of London, no freeman choſen *ſheriff*, &c. ſhall be excuſed, unleſs he voluntarily ſwears he is not worth 10,000*l.* &c. and if he refuſes to take the office, he incurs a forfeiture of 400*l.*

The *ſheriff*, before he exerciſes any part of his office, and before his patent is made out, is to give ſecurity in the king's remembrancer's office in the exchequer, under penalty of 100*l.* for the payment of his proffers, and all other profits of the ſheriffwick; he muſt alſo take the oaths of allegiance and abjuration, and all, except the *ſheriffs* of Wales and Cheſter, an oath appointed by 3 Geo. I. cap. 15. ſect. 18. for the due execution of their office. This oath may be adminiſtered in purſuance of a writ of *dedimus poteſtatem.*

Sheriffs, by virtue of ſeveral old ſtatutes, are to continue in their office no longer than one year; and yet it hath been ſaid, that a *ſheriff* may be appointed *durante bene placito*, or during the king's pleaſure, and ſo is the form of the royal writ; therefore, till a new *ſheriff* be named, his office cannot be determined, unleſs by his own death, or the demiſe of the king.

And by 1 Ann. ſt. 1. c. 8. all officers appointed by the preceding king may hold their offices for ſix months after the king's demiſe, unleſs ſooner diſplaced by the ſucceſſor.

We may farther obſerve, that by 1 Rich. II. c. 11. no man, that has ſerved the office of *ſheriff* for one year, can be compelled to ſerve the ſame again within three years after.

The power and duty of a ſheriff are thoſe that belong to him as a judge, as the keeper of the king's peace, as a miniſterial officer of the ſuperior courts of juſtice, or as the king's bailiff.

In his judicial capacity he is to hear and determine all cauſes of forty ſhillings value and under, in his *county-*COURT; and he has alſo a judicial power in divers other civil caſes. He is likewiſe to decide the elections of knights of the ſhire (ſubject to the controul of the houſe of commons), of coroners, and of verderors; to judge of the qualification of voters, and to return ſuch as he ſhall determine to be duly elected, but incapable of being elected himſelf for the county, &c. of which he is returning officer.

As the keeper of the king's peace, both by common law and ſpecial commiſſion, he is the firſt man in the county, and ſuperior in rank to any nobleman therein, during his office. He may apprehend and commit to priſon all perſons who break the peace, or attempt to break it; and may bind any one in a recognizance to keep the peace. He may, and is bound, *ex officio*, to purſue and take all traitors, murderers, felons, and other miſdoers, and commit them to gaol for ſafe cuſtody. He is alſo to defend his county againſt any of the king's enemies when they come into the land; and for this purpoſe, as well as for keeping the peace and purſuing felons, he may raiſe the *poſſe comitatus.*

However, by the expreſs directions of the great charter, the *ſheriff*, together with the conſtable, coroner, and certain other officers of the king, are forbidden to hold any pleas of the crown, or, in other words, to try any criminal offence; for it would be highly unbecoming, that the executioners of juſtice ſhould be alſo the judges; ſhould impoſe as well as levy fines and amercements; ſhould one day condemn a man to death, and perſonally execute him the next.

Neither may he act as an ordinary juſtice of the peace during the time of his office, for this would be equally inconſiſtent, he being in many reſpects the ſervant of the juſtices.

In his miniſterial capacity, the *ſheriff* is bound to execute all proceſs iſſuing from the king's courts of juſtice. In the commencement of civil cauſes, he is to ſerve the writ, to arreſt, and to take bail; when the cauſe comes to trial, he muſt ſummon and return the jury; when it is determined, he muſt ſee the judgment of the court carried into execution. In criminal matters, he alſo arreſts and impriſons; he returns the jury; he has the cuſtody of the delinquent; and he executes the ſentence of the court, though it extend to death itſelf.

As the king's bailiff, it is the *ſheriff's* buſineſs to preſerve the rights of the king within his bailiwick; for ſo his county is frequently called in the writs. He muſt ſeize to the king's uſe all lands devolved to the crown by attainder, or eſcheat; muſt levy all fines and forfeitures; muſt ſeize and keep all waifs, wrecks, eſtrays, and the like, unleſs they be granted to ſome ſubject; and muſt alſo collect the king's rents within his bailiwick, if commanded by proceſs from the exchequer.

To execute theſe various offices, the *ſheriff* has under him many inferior officers, an under-*ſheriff*, bailiffs, and gaolers, who muſt neither buy, ſell, nor farm their offices, on forfeiture of 500*l.* 3 Geo. I. c. 15.

The under-*ſheriff* uſually performs all the duties of office, few excepted, with regard to which the perſonal preſence of the high *ſheriff* is neceſſary. But no under-*ſheriff* ſhall abide in his office above one year by 42 Edw. III. c. 9. and if he does, by 23 Hen. VI. c. 8. he forfeits 200*l.* and no under-*ſheriff*, or *ſheriff's* officer, ſhall practiſe as an attorney, during the time he continues in ſuch office, by 1 Hen. V. c. 4. But theſe regulations are evaded, by practiſing in the names of other attornies, and putting in them deputies by way of nominal under-*ſheriffs.*

The under-*ſheriff*, before he enter upon his office, is to be ſworn, by 27 Eliz. c. 12. And by 3 Geo. I. c. 15. ſect. 19. it is enacted, that all under-*ſheriffs* of any counties in South Britain, except the counties in Wales, and the county palatine of Cheſter, ſhall take an oath for the due execution of their office. Blackſt. Com. b. i. p. 341, &c.

SHERIFF's *court.* See *County* COURT and *Mayor's* COURTS.

SHERIFF's *tourn*, or *turn.* See TURN.

SHERIFF, *appoſal of.* See APPOSAL.

SHERIFFS, *iſſues on.* See ISSUES.

SHEW-*box for prints.* See CAMERA.

SHEWIN, or SEWIN, in *Ichthyology.* See GREY.

SHEWAGE. See SCAVAGE.

SHIDES. See SHINGLES.

SHIELD, an ancient weapon of defence, in form of a light buckler, borne on the arm to fend off lances, darts, &c.

The form of the *ſhield* is repreſented by the eſcutcheon in coats of arms.

The *ſhield* was that part of the ancient armour on which the perſons of diſtinction in the field of battle always had their arms painted; and moſt of the words uſed at this time to expreſs the ſpace that holds the arms of families, are derived from the Latin name for a *ſhield*, *ſcutum.* The French *eſcu*, and *eſcuſſion*, and the Engliſh word, *eſcutcheon*, or, as we commonly ſpeak it, *ſcutcheon*, is evidently from this origin; and the Italian *ſcudo* ſignifies both the *ſhield* of arms, and that uſed in war.

The Latin name *clypeus*, for the ſame thing, ſeems alſo to be derived from the Greek word γλυφειν, *to engrave*; and it had this name from the ſeveral figures engraved on it, as marks of diſtinction of the perſon who wore it.

The *ſhield* in war, among the Greeks and Romans, was not only uſeful in the defence of the body, but it was alſo a token, or badge of honour to the wearer, and he who returned from battle without it, was always treated with infamy afterwards.

People have at all times thought this honourable piece of the armour the propereſt place to engrave, or figure on the ſigns of dignity of the poſſeſſor of it; and hence, when arms came to be painted for families in after-times, the heralds always choſe to repreſent them upon the figure of a *ſhield*, but with ſeveral exterior additions and ornaments; as the helmet, ſupporters, and the reſt.

The form of the *ſhield* has not only been found different in various nations, but even the people of the ſame nation, at different times, have varied its form extremely; and among ſeveral people there have been *ſhields* of ſeveral forms and ſizes in uſe, at the ſame period of time, and ſuited to different occaſions.

The moſt ancient and univerſal form of *ſhields*, in the earlier ages, ſeems to have been the triangular. This we ſee inſtances of in all the monuments and gems of antiquity: our own moſt early monuments ſhew it to have been the moſt antique ſhape alſo with us, and the heralds have found it the moſt convenient for their purpoſes, when they had any odd number of figures to repreſent; as if three, then two in the broad bottom part, and one in the narrow upper end, it held them very well; or if five, they ſtood as conveniently, as three below, and two above. The other form of a *ſhield*, now univerſally uſed, is ſquare, rounded and pointed at the bottom: this is taken from the figure of the Samnitic-*ſhield* uſed by the Romans, and ſince copied very generally by the Engliſh, French, and Germans.

The Spaniards and Portugueſe have the like general form of *ſhields*, but they are round at the bottom without the point; and the Germans, beſide the Samnite-*ſhield*, have two others pretty much in uſe: theſe are, 1. The bulging *ſhield*, diſtinguiſhed by its ſwelling or bulging out at the flanks; and, 2. The indented *ſhield*, or *ſhield* chancree, which has a number of notches and indentings all round its ſides. The uſe of the ancient *ſhield* of this form was, that the notches ſerved to reſt the lance upon, that it might be firm while it gave the thruſt; but this form being leſs proper for the receiving armorial figures, the two former have been much more uſed in the heraldry of that nation.

Beſide this different form of the *ſhields* in heraldry, we find them alſo often diſtinguiſhed by their different poſitions,

tions, ſome of them ſtanding erect, and others ſlanting various ways, and in different degrees; this the heralds expreſs by the word *pendant*, *hanging*, they ſeeming to be hung up not by the centre, but by the right or left corner. The French call theſe *ecu pendant*, and the common antique triangular ones *ecu ancien*. The Italians call this *ſcuto pendente*; and the reaſon given for exhibiting the *ſhield* in theſe figures in heraldry is, that in the ancient tilts and tournaments, they who were to juſt at theſe military exerciſes, were obliged to hang up their *ſhields* with their armories, or coats of arms on them, out at the windows and balconies of the houſes near the place; or upon trees, pavilions, or the barriers of the ground, if the exerciſe was to be performed in the field. Thoſe who were to fight on foot, according to Columbier, had their *ſhields* hung up by the right corner, and thoſe who were to fight on horſeback, had theirs hung up by the left. This poſition of the *ſhields* in heraldry, is called *couche* by ſome writers, though by the generality *pendant*.

It was very frequent in all parts of Europe, in arms given between the eleventh and fourteenth centuries; but it is to be obſerved, that the hanging by the left corner, as it was the token of the owner's being to fight on horſeback, ſo it was eſteemed the moſt honourable and noble ſituation; and all the pendant *ſhields* of the ſons of the royal family of Scotland and England, and of our nobility at that time, are thus hanging from the left corner.

The hanging from this corner was a token of the owner's being of noble birth, and having fought in the tournaments before; but no ſovereign ever had a *ſhield* pendant any way, but always erect, as they never formally entered the liſts of the tournament.

The Italians generally have their *ſhields* of arms of an oval form; this ſeems to be done in imitation of thoſe of the popes, and other dignified clergy; but their herald, Petro Sancto, ſeems to regret the uſe of this figure of the *ſhield*, as an innovation brought in by the painters and engravers, as moſt convenient for holding the figures, but derogatory to the honour of the poſſeſſor, as not repreſenting either antiquity, or honours won in war, but rather the honours of ſome citizen, or perſon of learning. Some have carried it ſo far, as to ſay that thoſe, who either have no ancient title to nobility, or have ſullied it by any unworthy action, cannot any longer wear their arms in *ſhields* properly figured, but were obliged to have them painted in an oval or round *ſhield*.

In Flanders, where this author lived, the round and oval *ſhields* are in the diſrepute he ſpeaks of; but in Italy, beſide the popes and dignified prelates, many of the firſt families of the laity have them.

The ſecular princes, in many other countries, alſo retain this form of the *ſhield*, as the moſt ancient, and truly expreſſive of the Roman clypeus. Niſbet's Heraldry, p. 12. Componille, Herald.

Shield, in *Heraldry*, denotes the escutcheon, or field, whereon the bearings of the armory are placed.

SHIELDRAKE. See Tadorna.

SHIFTED, in *Sea Language*, denotes the ſtate of a ſhip's ballaſt or cargo, when it is ſhaken from one ſide to the other, either by the violence of her rolling in a turbulent ſea, or by an extraordinary inclination to one ſide when under a great preſſure of ſail.

Shifted, as expreſſed of the wind, implies *altered*.

SHIFTERS, on *board a man of war*, certain men who are employed by the cooks to ſhift and change the water in which the fleſh or fiſh is put, and laid for ſome time, in order to fit it for the kettle.

SHIFTING *a tackle*, in *Sea Language*, the act of removing the blocks of a tackle to a greater diſtance from each other, on the object to which they are applied, in order to give a greater ſcope or extent to their purchaſe. This operation is otherwiſe called fleeting.

Shifting *the helm*, denotes the alteration of its poſition, by puſhing it towards the oppoſite ſide of the ſhip.

Shifting *the voyal*, ſignifies changing its poſition on the capſtern, from the right to the left, and *vice verſa*.

SHIITES. See Sonna.

SHILLING, an Engliſh ſilver coin, equal to twelve pence, or the twentieth part of a pound.

Freherus derives the Saxon *ſcilling*, whence our *ſhilling*, from a corruption of *ſiliqua*; proving the derivation by ſeveral texts of law, and, among others, by the twenty-ſixth law, *De annuis legatis*. Skinner deduces it from the Saxon *ſcild*, *ſhield*, by reaſon of the eſcutcheon of arms thereon.

Biſhop Hooper derives it from the Arabic *ſcheele*, ſignifying *a weight*; but others, with greater probability, deduce it from the Latin *ſicilicus*, which ſignified in that language, *a quarter of an ounce*, or the forty-eighth part of a Roman pound. In confirmation of this etymology it is alledged, that the *ſhilling* kept its original ſignification, and bore the ſame proportion to the Saxon pound as ſicilicus did to the Roman and the Greek, being exactly the forty-eighth part of the Saxon pound; a diſcovery which we owe to Mr. Lambarde. Explicatio Rerum & Verborum in Legg. Sax. voc. Libra.

However, the Saxon laws reckon the pound in the round number at fifty *ſhillings*, but they really coined out of it only forty-eight; the value of the *ſhilling* was five pence; but it was reduced to four pence above a century before the Conqueſt; for ſeveral of the Saxon laws, made in Athelſtan's reign, oblige us to take this eſtimate. Thus it continued to the Norman times, as one of the Conqueror's laws (Legg. Saxon, p. 221.) ſufficiently aſcertains; and it ſeems to have been the common coin by which the Engliſh payments were adjuſted. After the Conqueſt, the French *ſolidus* of twelve pence, which was in uſe among the Normans, was called by the Engliſh name of *ſhilling*; and the Saxon *ſhilling* of four pence took a Norman name, and was called the *groat*, or great coin, becauſe it was the largeſt Engliſh coin then known in England.

It has been the opinion of the biſhops Fleetwood and Gibſon, and of the antiquaries in general, that though the method of reckoning by pounds, marks, and *ſhillings*, as well as by pence and farthings, had been in conſtant uſe even from the Saxon times, long before the Norman Conqueſt, that there never was ſuch a coin in England as either a pound or a mark, nor any *ſhilling*, till the year 1504 or 1505; but in the twentieth year of king Henry VII. (A. D. 1505) a few ſilver *ſhillings*, or twelve-pences, were coined, being about one-half the ſize of the modern *ſhillings*, or forty out of a pound weight of ſilver, which were fair and broad pieces. Theſe, however, it is ſaid, have long ſince been ſolely confined to the cabinets of collectors.

Mr. Clarke combats this opinion, alledging, that ſome coins mentioned by Mr. Folkes, under Edw. I. were probably Saxon *ſhillings* new minted, and that archbiſhop Aelfric (Gram. Saxon. p. 52, at the end of Somner's Saxon Diction.) expreſly ſays, that the Saxons had three names for their money, viz. mancuſes, *ſhillings*, and pennies. He alſo urges the different value of the Saxon *ſhilling* at different times, and its uniform proportion to the pound, as an argument, that their *ſhilling* was a coin; and the teſtimony of the Saxon goſpels, in which the word we have tranſlated *pieces of ſilver*, is rendered *ſhillings*, which, he ſays, they would hardly have done, if there had been no ſuch coin as a *ſhilling* then in uſe. Accordingly, the Saxons expreſſed their *ſhilling* in Latin by *ſiclus* and *argenteus*.

He farther adds, that the Saxon *ſhilling* was never expreſſed by *ſolidus*, till after the Norman ſettlements in England: and howſoever it altered during the long period that elapſed from the Conqueſt to the time of Henry VII. it was the moſt conſtant denomination of money in all payments, though it was then only a ſpecies of account, or the twentieth part of the pound ſterling: and when it was again revived as a coin, it leſſened gradually as the pound ſterling leſſened, from the twenty-eighth of Edw. III. to the forty-third of Elizabeth. Clarke on Coins, &c. p. 120. 152. 155. 200. 376.

In the year 1560, there was a peculiar ſort of *ſhilling* ſtruck in Ireland, of the value of nine pence Engliſh, which paſſed in Ireland for twelve pence. The motto on the reverſe of theſe is, *poſui Deum adjutorem meum*.

Eighty-two of theſe *ſhillings*, according to Malynes, went to the pound; they, therefore, weighed twenty grains one-fourth each, which is ſomewhat heavier in proportion than the Engliſh *ſhilling* of that time, ſixty-two whereof went to the pound, each weighing ninety-two grains ſeven eighths; and the Iriſh *ſhilling* being valued at the Tower at nine pence Engliſh, that is, one-fourth part leſs than the Engliſh *ſhilling*, it ſhould, therefore, proportionably weigh one-fourth part leſs, and its full weight be ſomewhat more than ſixty-two grains; but ſome of them found at this time, though much worn, weighed ſixty-nine grains. In the year 1598, five different pieces of money of this kind were ſtruck in England for the ſervice of the kingdom of Ireland.

Theſe were *ſhillings* to be current in Ireland as twelve pence each; half *ſhillings* to be current at ſix pence, and quarter *ſhillings* at three pence.

Pennies and halfpennies were alſo ſtruck of the ſame kind, and ſent over for the payment of the army in Ireland. The money thus coined was of a very baſe mixture of copper and ſilver; and two years after there were more pieces of the ſame kinds ſtruck for the ſame ſervice, which were ſtill worſe; the former being three ounces of ſilver to nine ounces of copper; and theſe latter only two ounces eighteen pennyweights, to nine ounces two pennyweights of the alloy. Simon's Iriſh Coins.

The Dutch, Flemiſh, and Germans, have likewiſe their *ſhilling*, called *ſchelin*, *ſchilling*, *ſcalin*, &c. but theſe, not being of the ſame weight or fineneſs with the Engliſh *ſhilling*, are not current at the ſame value.

The English *ſhilling* is worth about twenty-three French ſols; thoſe of Holland and Germany about eleven ſols and an half; thoſe of Flanders about nine. The Dutch *ſhillings* are alſo called *ſols de gros*, becauſe equal to twelve gros. The Danes have copper *ſhillings*, worth about one fourth of a farthing ſterling. See COIN.

SHINGLES, or SHIDES, in *Building*, ſmall pieces of wood, or quartered oaken boards, ſawed to a certain ſcantling, or more uſually cleft to about an inch thick at one end, and made like wedges, four or five inches broad, and eight or nine inches long. They are uſed in covering, eſpecially for churches and ſteeples, inſtead of tiles or ſlates.

This covering is dear; yet where tiles, &c. are very ſcarce, and a light cover is required, it is preferable to thatch. If made of good oak, and cleft, not ſawed, and well ſeaſoned, *ſhingles* make a ſure, light, and durable covering.

The building is firſt to be covered all over with boards, and the *ſhingles* then nailed thereon.

SHINGLES, in *Medicine*, a kind of herpes, called alſo the *miliary herpes*.

It conſiſts of innumerable little puſtules breaking out in various parts of the body, viz. the neck, breaſt, loins, thighs, &c. The place affected is ſomewhat inflamed, and the patient is a little feveriſh.

White puſtules finally ariſe and ſuppurate, and are ſucceeded by little round ſcabs reſembling millet ſeeds.

It is to be attacked with diſcutients, and the higher puſtules are to be cut off with ſciſſars, and a cerate of oil and wax is then to be applied.

Wiſeman obſerves, that the *ſhingles* come near the nature of a pſora; and are, therefore, to be cured with mercurial cathartics.

SHINGLING, in the *Iron Works*, in many parts of England, is the operation of hammering the ſow, or caſt iron, into BLOOMS. The tongs, uſed for holding the iron in this operation, are called *ſhingling-tongs*, and the iron to be thus wrought is called a LOOP.

SHIP, a general name for all great veſſels with ſails, fit for navigation on the ſea; but in ſea language, the term is more particularly applied to a veſſel furniſhed with three maſts, each of which is compoſed of a lower maſt, top-maſt, and top-gallant-maſt, with the uſual machinery thereto belonging.

To give the reader an idea of the ſeveral parts and members of a *ſhip*, both internal and external, with their reſpective denominations in the ſea language (the principal whereof are explained in the reſpective places of this Dictionary), we here give him two draughts; the one, a ſection of the body of a firſt rate, to ſhew its conſtruction, the diſpoſition of its inſide, &c. The other, the ſame *ſhip* intire, with the ſails, rigging, &c. See *Tab. Ship. fig.* 1 and 2.

The ſieur Aubin defines a *ſhip*, a timber building, conſiſting of various parts and pieces, nailed and pinned together with iron and wood, in ſuch form, as to be fit to float, and to be conducted by wind and ſails from ſea to ſea.

In order to give our readers ſome idea of the conſtruction and conſtituent parts of a *ſhip*, it may be proper to obſerve, that naval architecture comprehends three principal objects, viz. 1. To give the *ſhip* ſuch an exterior form or figure, as may be beſt adapted to the ſervice for which ſhe is deſigned. 2. To find the proper figures of all the pieces of timber that compoſe a *ſhip*, and to unite them together into a compact frame; and, 3. To provide ſuitable accommodations for the officers and crew, as well as for the cargo, furniture, proviſions, artillery, and ammunition.

The exterior figure of a *ſhip* includes the bottom or *quick work*, or the hold, which is the part that is under water when the ſhip is laden, and the upper works, called the *dead work*, which is uſually above the water when the ſhip is laden.

In order to give a proper figure to the bottom, all the qualities which are neceſſary to render a *ſhip* fit for the ſervice for which ſhe is deſigned ſhould be conſidered; accordingly, a *ſhip* of war ſhould be able to ſail ſwiftly, and carry her lower tier of guns ſufficiently, *e. g.* four or five feet out of the water: a merchant *ſhip* ought to contain a large cargo of goods, and be navigated with few hands; and both ſhould be able to carry ſail firmly, ſteer well, drive little to leeward, and ſuſtain the ſhocks of the ſea without being violently ſtrained.

It is uſual among *ſhip*-wrights to delineate three ſeveral draughts; for the more eaſy explication of which, it will be proper to introduce an account of the ſeveral pieces or parts of which they are compoſed, and to repreſent them in the order of their diſpoſition. See *Tab.* II. *Ship, fig.* 5.

In this figure are exhibited A, A, &c. the pieces which compoſe the keel, to be ſeverally bolted together and clinched: B the ſtern-poſt, which is tenanted into the keel, and connected to it by a knee G; it ſupports the rudder, and unites the ſides of the *ſhip* abaft: C, the ſtern, which is compoſed of two pieces ſcarfed together; this is an arching piece of timber into which the ſhip's ſides are united forwards: D, the beams, which are uſed to ſupport the decks, and confine the ſides to their proper diſtance: E, the falſe poſt, which ſerves to augment the breadth of the ſtern-poſt, being alſo tenanted into the keel: F, the knees, which connect the beams to the ſides: G, the knee of the ſtern-poſt, which unites it to the keel: H, the apron, in two pieces; it is fayed on the inſide of the ſtem, to ſupport the ſcarf thereof; for which reaſon the ſcarf of the former muſt be at ſome diſtance from that of the latter: I, the ſtemſon, in two pieces, to re-inforce the ſcarf of the apron: K, the wing tranſom, which is fayed acroſs the ſtern-poſt, and bolted to the head of it, having its two ends let into the faſhion pieces: L, the deck tranſom, parallel to the wing tranſom, and ſecured in the ſame manner: M, N, the lower tranſoms: O, the faſhion-piece on one ſide; the heel of which is connected with the ſtern-poſt, and the head ſecured to the wing tranſom: P, the top timbers, or upper parts of the faſhion-pieces: Q, the ſleepers, which faſten the tranſoms to the *ſhip*'s ſide: R, the breaſt hooks, in the hold, which are fayed acroſs the ſtem to ſtrengthen the fore part of the *ſhip*: S, the breaſt hooks of the deck, which are placed immediately above the former, and uſed for the ſame purpoſes: T, the rudder, which is joined to the ſtern-poſt by hinges, and ſerves to direct the *ſhip*'s courſe: U, the floor timbers, laid acroſs the keel, to which they are firmly bolted: V, the lower futtocks; W, the top timbers, which are all united to the floor timbers, forming a frame that reaches from the keel to the top of the ſide: X, the pieces which compoſe the kelſon; they are ſcarfed together like the keel-pieces, and placed over the middle of the floor timbers, upon each of which they are ſcored about an inch and a half, as exhibited by the notches: Y, the ſeveral pieces of the knee of the head, the lower part of which is fayed to the ſtem; the keel being ſcarfed to the fore foot: Z, the cheeks of the head or knees, which connect the head to the bows on each ſide: &, the ſtandard of the head, which faſtens it to the ſtem: *a*, the cat-heads, one of which lies on each bow, projecting outwards like the arm of a crane; they are uſed to draw the anchors up to the top of the ſide, without injuring the bow: *b*, the bits, to which the cable is faſtened when the ſhip rides at anchor: *c*, the falſe poſt in two pieces, fayed to the fore part of the ſtern-poſt: *d*, the ſide counter-timbers, which terminate the *ſhip* abaft within the quarter-gallery: *e e*, two pieces of dead wood, one afore, and another abaft, fayed on the keel.

The *firſt* draught is the *plane of elevation* or ſheer draught, *e. g.* of a ſixty gun *ſhip*,* *fig.* 6. which repreſents the whole length of the *ſhip*, according to a ſide view, perpendicular to the keel. The ſame letters are annexed to the ſame objects, as in the preceding explanation of the pieces, when they occur in both figures; accordingly, A A is the keel, whoſe upper edge is prolonged by the dotted line *p*, *q*, upon the extremities of which are erected perpendiculars, that determine the height of the wing tranſom K, and length of the gun-deck K C: A B the ſtern-poſt, A C the ſtem, D D the quarter-gallery with its windows; E F the quarter pieces, which limit the ſtern on each ſide; F the taffarel, or upper piece of the ſtern; F G the profile of the ſtern with its galleries; H the gun ports; I the channels, with their dead eyes and chain plates; K the wing tranſom; K G the counter; L B the deck tranſom; M, N, O, the firſt, ſecond, and third tranſoms, of which O K is the third or loweſt; *m o* L P, the direction of the faſhion-piece, having its breadth canted aft towards the ſtern; Q R the main ſkeeds for hoiſting in the boats clear of the *ſhip*'s ſide; LQZ the main-wale, with its ſheer afore and abaft; D R X the channel wales, parallel to the main wale; SUS the ſheer rail, parallel to the wales; T *t* the rudder; A *t* F the rake of the ſtern; V W V the waiſt rail; P *i i* the drift rails abaft, and *i a* the drift rails forward; T U C the water line; XX the rails of the head; Y the knee of the head, or cut water; Z Z the cheeks of the head; a, a, the cat-head; M⊕C the riſing line of the floor; *k u* C the cutting down line, which limits the thickneſs of all the floor timbers, and likewiſe the height of the dead wood afore and abaft; ⊕*u* U W the mid-*ſhip* frame; *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, the frames or timbers in the fore body of the *ſhip*, i. e. before the mid-*ſhip* frame; 1, 2, 3, 4, 5, 6, 7, 8, 9, the timbers in the after body, which are erected abaft the mid-*ſhip* frame.

In this projection, the eye is ſuppoſed to view the *ſhip*'s ſide in a line perpendicular to the plane of elevation, and,

and, therefore, the convexity will vaniſh: and the frames will be repreſented by ſtraight lines, except the faſhion piece abaft, and the knuckle timber forward.

The plane of elevation determines the length and depth of the keel; the difference of the draughts of water; the length and projection, or rake, of the ſtern and ſtern-poſt; the poſition of the mid-*ſhip* frame upon the keel, together with that of the principal frames afore and abaft; the load water line, the wales, the dimenſions and ſituations of the gun-ports, the projection of the rails of the head and ſtern gallery, with the ſtations of the maſts and channels.

The *ſecond* draught is the *plane of projection*, or vertical plane of the timbers, in which the *ſhip* is exhibited according to an end view, and ſtripped of her planks, ſo as to preſent the outlines of the principal timbers, and the projection of their frames, in relation to each other, appears. See *fig.* 7.

This plane is ſuppoſed to cut the keel at right angles in the place where the *ſhip* is broadeſt; for as all *ſhips* are broader near the middle of their length than towards the extremities, it is evident that the timbers are more extended in proportion. The moſt capacious of theſe repreſents what is called the mid-*ſhip* frame; and upon the area of this frame is delineated the projection of all the others.

Thus the plane of projection limits the different breadths of a *ſhip* in various points of her length, and exhibits the outline of the timbers reſpectively to each other, as they are erected upon the keel. Accordingly, this draught ought to preſent a variety of ſections of the *ſhip* in different places of her length, and always perpendicular to the ſurface of the water; ſo that the eye of the obſerver, when placed in what may be called the axis of the *ſhip*, may perceive the ſeveral ſections at one glance, i. e. when looking full on the ſtem from before the ſhip, he ſhall diſcover the fore timbers: and when looking from behind, directly on the ſtern, he ſhall perceive the form of the after timbers. To form a juſt idea of this plane, therefore, we ſhould ſuppoſe a *ſhip* reſting upon the ſtocks, in the ſame poſition as when afloat upon the water. Thus a variety of black vertical lines may be drawn at equal diſtances upon the bottom, which is white, to form different outlines of the *ſhip*, correſponding to the timbers within.

It is to be obſerved, that the faſhion of the inferior timbers muſt conform to the figure of the mid-*ſhip* frame, which is placed in the fulleſt part of the *ſhip*; and as the planes of all the other timbers diminiſh in a certain progreſſion as they approach the ſtem and ſtern, they are properly delineated on the plane of the mid-*ſhip* frame, which alſo repreſents the depth of the keel and length of the mid-*ſhip* beam; as the two ſides of a *ſhip* ought to be exactly alike, it is ſufficient to repreſent the ſections of the fore part of a *ſhip* on the left ſide, and thoſe in the after part on the right ſide, ſo as to perceive all the ſections, as well afore as abaft, upon one plane. See *fig.* 7. in which A is the keel; B C the line which expreſſes the upper edge of the keel, from which the height of each timber, and the height of its different breadths are meaſured: B D and C E, perpendiculars raiſed on the line B C, to limit the *ſhip*'s extreme breadth and height amid-*ſhips*: A F, a perpendicular erected from the middle of the keel to biſect the line of the *ſhip*'s breadth: F*9, the half breadth line of the aftmoſt top timber; and the ſeven lines parallel to and immediately under this, on the right ſide of the line A F, are all top timber half-breadths, abaft the mid-*ſhip* frame, the loweſt of which coincides with the horizontal line D E; and the parallel lines oppoſite to theſe, on the left ſide of A F, repreſent the top timber half-breadths in the fore body, or the half-breadths of the top timbers before the mid-*ſhip* frame: G, H, I, Q, R, S, T, the radii of the breadth-ſweeps abaft the mid-*ſhip* frame; thoſe of the breadth-ſweeps in the fore body, or before the mid-*ſhip* frame, are directly oppoſite, on the right ſide: ⊕A⊕, the mid-*ſhip* frame, from the extreme breadth downwards: 1, 2, 3, 4, 5, 6, 7, 8, 9, the outlines of timbers abaft the mid-*ſhip* frame in different parts of their height: *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*, the outlines of the timbers before the mid-*ſhip* frame, in different parts of their height, *h* being the foremoſt, or knuckle timber: K *i*, the wing tranſom, whoſe ends reſt upon the faſhion-piece: L, the deck tranſom, parallel to and under the wing tranſom: M N O, the lower tranſoms, of which O *k* is the third and loweſt: *m k* P, the dotted line, which expreſſes the figure of the faſhion-piece, without being canted aft: P, the upper part, or top timber of the faſhion-piece: *n*, *o*, *p*, *q*, *r*, *ſ*, the radii of the floor ſweeps, abaft the mid-*ſhip* frame, thoſe before it being on the oppoſite ſide of the line A F, to which they are all parallel: 1ſt Rd. 2d Rd. 3d Rd. 4th Rd. the diagonal ribbands abaft the mid-*ſhips*: and *t*, *u*, *x*, *y*, the ſame ribbands expreſſed in the fore-body.

Here it may be obſerved, that the various methods by which the curves of the timbers are deſcribed upon the plane of the mid-*ſhip* frame, are equally mechanical and arbitrary. In the latter ſenſe, they are calculated to make a *ſhip* fuller or narrower, according to the ſervice for which ſhe is deſigned; and in the former, they are drawn according to thoſe rules which the artiſt has been implicitly taught to follow, or which his fancy or judgment has eſteemed the moſt accurate and convenient. They are generally compoſed of ſeveral arches of a circle, united together by moulds framed for that purpoſe: the radii of thoſe arches, therefore, are of different lengths, according to the breadth of the *ſhip* in the place where ſuch arches are ſwept; and they are expreſſed on the plane of projection either by horizontal or perpendicular lines: the radii of the breadth ſweeps being always in the former, and the radii of the floor ſweeps in the latter direction. Theſe two arches are joined by a third, which coincides with both, without interſecting either. The curve of the top timber is either formed by a mould, which correſponds to the arch of the breadth-ſweep, or by another ſweep, whoſe centre and radius are without the plane of projection.

The breadth of the *ſhip* at every top timber is limited by an horizontal line drawn on the floor plane, called the *half-breadth* of the top timbers. The extreme breadth is alſo determined by another horizontal line on the floor plane, and the lines of half-breadth are thus mutually transferable from the projection and floor planes to each other.

The neceſſary data by which the curves of the timbers are delineated, are the perpendicular height from the keel, the main or principal breadth, and the top timber breadth; for as a ſhip is much broader near the middle of her length than towards the ends, ſo ſhe is broader in the middle of her height than above and below; and this latter difference of breadth is continued through every point of her length. The main breadth of each frame of timbers is, therefore, the *ſhip*'s breadth, nearly in the middle of her height in that part; and the top timber breadth is the line of her breadth near the upper ends of each timber.

The *third* draught is called the *horizontal plane*, which ſerves to convey a diſtinct idea of the horizontal curves by means of water lines traced upon it; in this draught, the curves of the tranſoms, called the *round-aft*, are alſo marked, and ſometimes the breadth and thickneſs of the timbers.

The horizontal or floor plane, is that upon which the whole frame is erected, and will be more clearly underſtood by deſcribing the water lines and ribbands of which it is compoſed.

When a *ſhip* floats upon the water, her upper works will be evidently ſeparated from the bottom by the ſurface of the water, which will accordingly deſcribe an imaginary horizontal line upon the bottom from the ſtem to the ſtern-poſt. The higheſt of thoſe lines is termed the *load water line*, which is ſuppoſed to be drawn by the ſurface of the water on the upper part of the bottom, when ſhe is ſufficiently laden for a ſea voyage. If the ſhip is lightened of any part of her lading, and preſerves the ſame difference in her draught of water at the two ends, or, which amounts to the ſame, if ſhe is lightened ſo as to preſerve the ſame equilibrium of the keel with regard to the ſurface of the water; it is evident, that ſhe will riſe higher out of the water, the ſurface of which will mark a ſecond water line parallel to the firſt, but nearer the keel in proportion to the number of feet which the *ſhip* has riſen. Then by lightening a *ſhip* gradually, and at the ſame time preſerving the direction of her keel, or the angle which the keel makes with the ſurface of the water, a variety of WATER-*lines* may be drawn parallel to each other.

The RIBBANDS are narrow and flexible planks placed on the bottom at different heights, ſo as to form a ſort of mould for ſtationing the inferior timbers between the principal ones. They differ from the water lines, inaſmuch as the latter have only one curve, which is horizontal, whereas the ribbands, beſides their horizontal one, have a vertical curve; the horizontal curve is expreſſed upon the floor-plane, and the vertical curve is exhibited in the plane of elevation.

The horizontal plane, beſides the water lines and ribbands, contains alſo the main and top timber breadth lines, or the longitudinal lines, by which the main breadth and top timber breadth are limited in every point of the *ſhip*'s length. The horizontal curves of the tranſoms and harpins are alſo repreſented therein, together with the planes of the principal timbers; the cant of the faſhion-piece, the length of the rake afore

and

and abaft, the projection of the cat-heads, and the curve of the upper rail of the head, to which curves of the lower ones are uſually parallel. See *fig.* 8, in which B A C is the line of the *ſhip*'s length, paſſing through the middle of the ſtem and ſtern-poſt; B the upper end of the ſtern-poſt; C the upper end of the ſtem; B F the length of the rake abaft; D W X, the top timber breadth line, or the line which limits the breadth of each top timber: D F the breadth of the aftmoſt timber at the taffarel: BK, the wing tranſom: B L I, the horizontal curve of the deck tranſom: M M, the horizontal curve, or round aft of the firſt tranſom: M N, the horizontal curve of the ſecond tranſom, prolonged into a water line N 8 7: *k* O, the horizontal curve of the third tranſom, which is alſo prolonged into another water line O, *n*, U, *p*, Q: *m* O P, the plane of the faſhion-piece as canted aft: ⊕ W U, the plane of the mid-*ſhip* frame: *a*, *b*, *c*, *d*, *e*, *f*, *h*, the planes of the timbers before the mid-*ſhip* frame: 1, 2, 3, 4, 5, 6, 7, 8, 9, the planes of the timber abaft the mid-*ſhip* frame: XX, the figure of the upper rail of the head: C Y, the projection of the knee of the head, and a a the projection of the cat-head.

Such are the principal draughts uſed in the conſtruction of a *ſhip*, which reciprocally correſpond with each other in the dimenſions of length, breadth, and depth: thus, the plane of elevation is exactly of the ſame length with the horizontal or floor plane. The ſeveral breadths of the timbers in the floor plane, and that of the projection, are immediately transferable; and the real height of the timbers in the projection, exactly conforms to their height in the elevation: e. g. let it be required to transfer the height of the wing tranſom from the elevation to the projection; extend the compaſſes from the point K in the elevation down to the dotted line, prolonged from the upper edge of the keel, and ſetting the other foot in the point *p*, then will the line K *p* be the perpendicular height of the wing tranſom; transfer this from the middle of the line B A C, in the projection, to the point K in the perpendicular A F, then will A K be the height of the wing tranſom in the plane of projection; and thus the height of all the tranſoms may be laid down from the former upon the latter.

Again, let it be required to transfer the main breadth of the mid-*ſhip* frame from the projection to the horizontal plane; ſet one foot of the compaſſes in the point ⊕ on the perpendicular C E, and extend the other along the main breadth ſweep ⊕ G, till it touches the perpendicular A F parallel to C E; lay this diſtance upon the horizontal plane from the point *u* in the line of the *ſhip's* length B A C, along the plane of the mid-*ſhip* frame to the point ⊕: ſo ſhall the line ⊕ W U be the breadth of the mid-*ſhip* frame on the horizontal plane. Thus alſo the top timber breadth, or the diſtance of each top timber from the middle of the *ſhip's* breadth, may be in the ſame manner transfered, by extending the compaſſes from the line B A C, in the horizontal plane, to the top timber breadth line, upon any particular timber, as 1, 2, 3, &c. which will give its proper dimenſions thereon. In the ſame manner the breadths of all the timbers may be laid from the projection to the horizontal plane, and *vice verſa*, from that to the projection: and the height of each timber may alſo be transfered from the elevation to the projection, &c.

In veſſels of war, the general dimenſions are eſtabliſhed by authority of officers appointed by the government to ſuperintend the building of *ſhips*. In the merchants ſervice, the extreme breadth, length of the keel, depth in the hold, height between decks and in the waſte, are agreed on by contract; and from theſe dimenſions the ſhipwright is to form a draught ſuitable to the trade for which the *ſhip* is deſigned.

In projecting the draught of a veſſel of war, the firſt article to be conſidered is her length; and as all *ſhips* are much longer above than below, it is neceſſary to diſtinguiſh the preciſe part of her height from which her length is taken, which is uſually the lower gun-deck, or the load water line. In this draught it will be particularly neceſſary to leave ſufficient diſtance between the ports.

The next object is to eſtabliſh the breadth by the mid-*ſhip* beam; thoſe who would diminiſh the breadth, alledge, that a narrow veſſel meets with leſs reſiſtance in paſſing through the water; that by increaſing the length ſhe will drive leſs to leeward; that the water lines will be more conveniently formed to divide the water; that a long and narrow *ſhip* will require leſs ſail to advance ſwiftly; that her maſts will be lower and her rigging lighter, &c. Thoſe, on the contrary, who would enlarge the breadth, pretend, that this form is better fitted to preſerve a good battery of guns; that there will be more room to work the guns conveniently; that by carrying more ſail, the *ſhip* will be enabled to run faſter, or that this quality will at leaſt overbalance the advantage which the others have of more eaſily dividing the water; that, broader at the load water line, they will admit of being very narrow in the floor, particularly toward the extremities; and that a broad veſſel will more readily riſe upon the waves than a narrow one.

Notwithſtanding this difference of opinion about proportioning the breadth to the length, it is moſt uſual to conform to the dimenſions of *ſhips* of the ſame rate. After the dimenſions of the breadth and length are determined, the depth of the hold muſt be fixed, which is generally half the breadth; but the form of the body ſhould be conſidered on this occaſion, for a flat floor will require leſs depth in the hold than a ſharp one. The diſtance between the decks muſt be alſo ſettled. We may then proceed to fix the length of the keel, by which we ſhall be enabled to judge of the rake of the ſtem and ſtern-poſt.

The rake is known to be the projection of the *ſhip* at the height of the ſtem and ſtern-poſt, beyond the ends of the keel afore and abaft, or the angle by which the length is increaſed as the fabric riſes. To theſe we may alſo add, the height of the ſtem and wing tranſom.

After theſe dimenſions are ſettled, the timbers may be conſidered which form the ſides of the *ſhip*; a frame of timbers, which appear to be one continued piece, is compoſed of one floor timber U, *fig.* 5. whoſe arms branch outward to both ſides of the *ſhip*; two or three futtocks V V, and a top timber W. The futtocks are connected to the upper arms of the floor timbers on each ſide of the *ſhip*, and ſerve to prolong the timber in a vertical direction: and the top timbers are placed at the upper part of the futtocks for the ſame purpoſe. All theſe being united, and ſecured by croſs bars, form a circular incloſure, which is called a frame of timbers; and as a *ſhip* is much broader at the middle than at the extremities, the arms of the floor timber will form a very obtuſe angle at the extreme breadth; but this angle decreaſes in proportion to the diſtance of the timbers from the mid-*ſhip* frame, ſo that the foremoſt and aftmoſt ones will form a very acute angle; floor timbers of the latter ſort are uſually called *crutches*.

Shipwrights differ much in determining the ſtation of the mid-*ſhip* frame, ſome placing it at the middle of the *ſhip*'s length, and others farther forward. They who place it before the middle, alledge, that if a *ſhip* is full forward, ſhe will meet with no reſiſtance after ſhe has opened a column of water; and that the water ſo diſplaced will eaſily unite abaſt, and by that means force the *ſhip* forward, beſides having more power on the rudder, in proportion to its diſtance from the center of gravity; this alſo comes nearer to the form of fiſhes, which ſhould ſeem moſt advantageous for dividing the fluid.

When the riſing of the mid-*ſhip* floor timber is determined, we may then proceed to deſcribe the riſing line of the floor on the ſtern-poſt abaft, and on the ſtem afore.

The height of the lower deck is the next thing to be conſidered: it is determined in the middle by the depth of the hold; and ſome builders make it no higher than the ſtem, but they raiſe it abaft as much above its height in the middle, as the load water mark, or draught of water abaft, exceeds that afore. With regard to the height between decks, it is altogether arbitrary, and muſt be determined by the rate of the *ſhip*, and the ſervice for which ſhe is deſtined.

It is alſo neceſſary to give the ſheer of the wales a proper hanging, becauſe the beauty and ſtatelineſs of a *ſhip* greatly depend upon their figure and curve, which, if properly drawn, will make her appear airy and graceful on the water.

With reſpect to the upper works of a *ſhip*, called the *dead work*, it may be obſerved, that here the *ſhip* muſt be narrower, ſo that all the weight lying above the load water line will thereby be brought nearer the middle of the breadth, and of courſe the *ſhip* will be leſs ſtrained by the working of her guns, &c. But although ſome advantages are acquired by diminiſhing the breadth above water, ſhe muſt not be narrowed too much, as there muſt be ſufficient room left on the upper deck for the guns to recoil.

The ſecurity of the maſts ſhould likewiſe be remembered, which requires ſufficient breadth to ſpread the ſhrouds; a deficiency of this ſort may, however, be in ſome meaſure ſupplied by enlarging the breadth of the channels.

Having given a general account of the theory of *ſhip-building*, we ſhall now briefly trace the progreſs of the work itſelf.

During the conſtruction of a *ſhip*, ſhe is ſupported in the dock, or upon a wharf, by a number of ſolid blocks of timber placed at equal diſtances from and parallel to each other, in which ſituation ſhe is ſaid to be on the ſtocks. The firſt piece of timber laid upon the blocks is generally the keel, though in ſome of the royal dock yards they have

have lately begun with the floor timbers, the keel having been found often apt to rot during the long period of building a *ſhip* of war. The pieces of the keel, ſee (*Tab.* II. *Ship. fig.* 5.) are ſcarfed together and bolted, forming one entire piece AA, which conſtitutes the length of the veſſel below: at one extremity of the keel is erected the STEM, which being incurvated nearly into a circular arch, or compaſſing ſo as to project outwards at the upper end, forms what is called the RAKE forward. At the other extremity of the keel is elevated the STERN-*poſt*, the heel of which is let into a mortiſe in the keel, and its upper end hangs outwards, making an obtuſe angle with the keel, which projection is called the RAKE abaft. The ſtern-poſt, which ought to ſupport the ſtern, contains the iron work, or hinges of the rudder, which are called GOOGINGS, and unites the lower part of the *ſhip's* ſides abaft. Towards the upper end of the ſtern poſt, and at right angles with its length, is fixed the middle of the *wing*-TRANSOM, where it is firmly bolted; under this, and parallel to it, is placed the deck-tranſom, upon which the after end of the lower deck is ſupported. Parallel to the deck tranſom, and under it, another piece is fixed to the ſtern-poſt, called the *firſt tranſom*, all of which ſerve to connect the ſtern poſt to the faſhion-pieces. Two more tranſoms, called the *ſecond* and *third*, are alſo placed under theſe, being likewiſe attached to the faſhion pieces, into which the extremities of all the tranſoms are let. The faſhion-pieces are formed like the other timbers of the *ſhip*, and have their heels reſting on the upper part of the kelſon, at the after extremity of the floor ribbands.

All theſe pieces, viz. the tranſoms, the faſhion-pieces, and their top-timbers being ſtrongly united into one frame, are elevated upon the ſtern-poſt, and the whole forms the ſtructure of the ſtern, upon which the galleries and windows, with their ornaments, are afterwards built.

The ſtem and ſtern-poſt being thus elevated upon the keel, to which they are ſecurely connected by knees and arched pieces of timber bolted to both; and the keel being raiſed at its two extremities by pieces of dead wood, the mid-*ſhip* floor timber is placed acroſs the keel, to which it is bolted through the middle. The floor timbers before and abaft the mid-*ſhip* frame are then ſtationed in their proper places upon the keel; after which the kelſon, which, like the keel, is compoſed of ſeveral pieces ſcarfed together, is fixed acroſs the middle of the floor timbers, to which it is attached by bolts driven through the keel, and clinched on the upper part of the kelſon: the futtocks are then raiſed upon the floor timbers, and the HAWSE-*pieces* erected upon the CANT timbers in the fore part of the *ſhip*. The top timbers, on each ſide, are next attached to the head of the futtocks, as above explained.

The frames of the principal timbers, being thus completed, are ſupported by RIBBANDS.

The ribs of the *ſhip* being now ſtationed, they proceed to fix on the planks, of which the WALES are the principal, being much thicker and ſtronger than the reſt. The harpins, which may be conſidered as a continuation of the wales at their fore ends, are fixed acroſs the hawſe-pieces, and ſurround the fore part of the *ſhip*; the planks that incloſe the *ſhip's* ſides are then brought about the timbers; and the CLAMPS, which are of equal thickneſs with the wales fixed oppoſite to the wales within the *ſhip*: theſe are uſed to ſupport the ends of the beams, and accordingly ſtretch from one end of the *ſhip* to the other.

The thick ſtuff, or ſtrong planks of the bottom within board, are then placed oppoſite to the ſeveral ſcarfs of the timbers, to reinforce them throughout the *ſhip's* length. The planks employed to line the *ſhip*, called the *ceiling*, or FOOT-*waling*, are next fixed in the intervals between the thick ſtuff of the hold: the beams are afterwards laid acroſs the *ſhip* to ſupport the decks, and are connected to the ſide by lodging and hanging knees. The *cable*-BITS being next erected, the CARLINGS and LEDGES are diſpoſed between the beams to ſtrengthen the deck. The WATER-*ways* are then laid on the ends of the beams throughout the *ſhip's* length, and the SPIRKETTING fixed cloſe above them.

The upper deck is then planked, and the STRING placed under the gunnel or planſheer in the waiſt. They proceed next to plank the quarter-deck and forecaſtle, and to fix the PARTNERS of the maſts and capſterns with the COAMINGS of the hatches; the BREAST-*hooks* are then bolted acroſs the ſtem and bow within-board, the ſtep of the fore-maſt placed on the kelſon, and the riders fayed on the inſide of the timbers to re-inforce the ſides in different places of the *ſhip's* length. The POINTERS, if any, are afterwards fixed acroſs the hold diagonally to ſupport the beams, and the CROTCHES ſtationed in the after-hold to unite the half timbers.

The ſteps of the main-maſt and capſterns are next placed; the planks of the lower decks and orlop laid; the NAVEL-*hoods* fayed on the hawſe-holes; and the knee of the head or cutwater connected to the ſtem: the figure of the head is then erected, and the TRAIL-*board* and cheeks fixed on the ſides of the knee.

The TAFFAREL and quarter pieces, which terminate the *ſhip* abaft, the former above, and the latter on each ſide, are then diſpoſed; and the ſtern and quarter-galleries framed and ſupported by their brackets. The pumps with their well are next fixed in the hold; the LIMBER-*boards* laid on each ſide of the kelſon, and the GARBOARD *ſtrake* fixed on the *ſhip's* bottom next to the keel without. The hull being thus fabricated, they proceed to ſeparate the apartments by bulk-heads or partitions; to frame the port-lids; to fix the cat-heads and cheſs-trees; to form the hatchways and ſcuttles, and fit them with proper covers or gratings. They next fix the ladders in the different hatchways, and build the manger on the lower deck, to carry off the water that runs in at the hawſe-holes when the *ſhip* rides at anchor in a ſea. The bread room and magazines are then lined, and the gunnel, rails, and gangways, fixed on the upper part of the *ſhip*. The cleats, kevels, and ranges, by which the ropes are faſtened, are afterwards bolted or nailed to the ſides in different places. The rudder, being fitted with its irons, is next hung to the ſtern-poſt; and the tiller or bar, by which it is managed, let into its upper end: the SCUPPERS are then placed in holes cut through the *ſhip's* ſides, and the ſtandards bolted to the beams and ſides above the decks to which they belong: the poop-lanthorns are laſt fixed upon their cranes over the ſtern, and the bilge-ways, or cradles, placed under the bottom, to conduct the *ſhip* ſteadily into the water whilſt launching. See on this ſubject Murray's *Ship*-Building, &c. p. 130—186. Monceau's Elements of Naval Architecture, abridged by Murray. Murray's Supplement, &c. and Falconer's Marine Dictionary, Art. *Naval* ARCHITECTURE and *Ship*-BUILDING.

The invention of *ſhips* is very ancient, and, at the ſame time, very uncertain. Mythologiſts attribute it to Dædalus, and pretend that the wings he invented to ſave himſelf withal from the labyrinth of Crete, were nothing but ſails, which he firſt gave to veſſels, and wherewith he eluded the vigilance and purſuit of Minos. Others give the honour to Janus, on the credit of ſome ancient Greek and Latin coins, on one ſide whereof is repreſented his double face, and on the reverſe a *ſhip*. Laſtly, others look on Noah to have been the firſt *ſhip*-builder.

The moſt celebrated *ſhips* of antiquity are, that of Ptolemy Philopater, which is ſaid to have been two hundred and eighty cubits (i. e. four hundred and twenty feet) long, thirty-eight broad, and forty-eight high: it carried four thouſand rowers, four hundred ſailors, and three thouſand ſoldiers. That which the ſame prince made to ſail on the Nile, we are told, was three hundred and twelve feet long, forty-five feet broad, with a maſt one hundred and twenty feet high. Yet theſe were nothing in compariſon with Hiero's *ſhip*, built under the direction of Archimedes, on the ſtructure whereof, Moſchion, as we are told by Snellius, wrote a whole volume. There was wood enough employed in it to make ſixty gallies. It had all the variety of apartments of a palace: banqueting-rooms, galleries, gardens, fiſh-ponds, ſtables, mills, baths, a temple of Venus, &c. It was incompaſſed with an iron rampart, and eight towers, with walls and bulwarks, furniſhed with machines of war, particularly one, which threw a ſtone of three hundred pounds, or a dart twelve cubits long, the ſpace of half a mile; with many other particulars related by Athenæus. Deipnoſophiſt. lib. v. p. 204, &c. ed. Cauſab. Lugd. 1657.

The veſſels which are uſually comprehended under the general name of *ſhip*, beſides thoſe of the line of battle, are galleons, frigates, hag-boats, differing from frigate built *ſhips* in the figure of the ſtern, which has a great reſemblance to that of the cat, as being in a middle degree between both, cats, barks, pinks, and fly-boats, all of which are defined in their proper places.

Ships of war are diſtinguiſhed from each other by their ſeveral ranks or claſſes. See RATE.

SHIP *of the line* is uſually applied to all men of war mounting ſixty guns and upwards; of late, however, our fifty-gun *ſhips* have been formed ſufficiently ſtrong to carry the ſame metal as thoſe of ſixty, and accordingly may fall into the line in caſes of neceſſity. See LINE *of Battle*.

SHIP, *armed*. See ARM.

SHIP, *fire*. See FIRE-*ſhip*.

SHIP, *guard*, is a veſſel of war appointed to ſuperintend the marine affairs in a harbour or river, and to ſee that the *ſhips* which are not commiſſioned have their proper watch kept duly, by ſending her GUARD-*boats* around them every night: ſhe is alſo to receive ſeamen who are impreſſed in time of war.

SHIP, *hospital*, a vessel fitted up to attend on a fleet of men of war, and receive their sick or wounded; for which purpose her decks should be high, and her ports sufficiently large; her cables ought also to run upon the upper deck, to the end that the beds or cradles may be more commodiously placed between decks, and admit a free passage of the air, to disperse that which is offensive or corrupted. Falconer.

SHIP, *leeward*. See LEEWARD.

SHIP, *merchant*, a vessel employed in commerce, to carry commodities of various sorts from one port to another. The largest *merchant ships* are those employed by the different European companies of merchants who trade to the East Indies; they are in general somewhat larger than our forty gun ships, and mounted with twenty cannon on their upper deck, which are nine pounders, and six on their quarter deck, which are six pounders. Falconer.

SHIP *of war, private*. See PRIVATEERS.

SHIP, *store*, a vessel employed to carry artillery or naval stores for the use of a fleet, fortress, or garrison.

SHIP, *transport*. See TRANSPORT *ship*.

SHIPS, for the most convenient form of, or that wherein they shall meet with the least resistance from the water, see VESSEL and RESISTANCE.

It is highly necessary to the health of seamen, that *ships* should be cleared of foul air, for it has been found by frequent experience, that air shut up, and confined in a close place, without a succession and fresh supply of it, becomes unwholesome, and unfit for the use of life. This is more sensibly so, if any stagnating water be pent up with it. But it grows still worse, if such an air as this is made use of in respiration; that is, becomes moister and hotter, and phlogisticated, by passing and repassing through the lungs.

These bad effects in different degrees, according to the different manner in which air is inclosed, are observed in many cases, particularly in deep wells, and caverns of the earth; in prisons or close houses, where people are shut up with heat and nastiness; but most of all in large *ships*, in which, with the stench of water in the hold, many men being crouded up in those quarters, all the mentioned circumstances concur in producing greater mischiefs than would follow from any of them singly.

Mr. Sutton did therefore, a few years ago, propose, in order to clear the holds of *ships* of the bad air they contain, that the fire-place and ash-place of the copper or boiler should be both closed up with substantial and tight iron doors; and that a copper or leaden pipe, of sufficient size, should be laid from the hold into the ash-place, for the draught of air to come in that way to feed the fire. And thus, from the natural elasticity of the air, it seems plain, that there will be from the hold a constant discharge of the air therein contained; and, consequently, that the air so discharged must be as constantly supplied by fresh air below the hatches, or such other communications as are open into the hold; whereby the same must be continually made fresh, and its air rendered more wholesome, and fit for respiration. And if into this principal pipe, so laid into the hold, other pipes are let in, communicating respectively either with the well or lower decks, it must follow, that part of the air consumed (or injured) in feeding the fire must be respectively drawn out of such places, to which the communication shall be so made. Philos. Trans. N° 462. p. 42, 43.

The mixture used for covering the bottom and sides of *ships* is made of one part of tallow, of one part of brimstone, and of three parts nearly of rosin. The tallow and rosin are melted together, and the brimstone is stirred into them; one hundred and forty pounds of brimstone will serve for a vessel of one hundred and forty tons. See PAY.

To prevent *ships*, whose bottoms are worm-eaten, from leaking, this method has been proposed. Calk well the inside planks or lining, then fill the vacant spaces between the timbers, and the out and inside planks with boiling pitch or rosin, so high as the main gun-deck. The pitch being put in very hot, will run into the smallest cranny, and make the *ship* as tight as a bottle. There will be no room left for vermin, as rats, &c. and the pitch will serve for other uses when taken out, therefore the expence will be but small. Phil. Trans. N° 476. p. 372.

For the laws relating to *Ships*, &c. see *Act of English* NAVIGATION. See also FRAIGHT, MARINERS, and NAVY.

SHIP; *bulk, burden, captain, clerk, company, corporal, flag, grounding, master, mine, register, rigging, run, sheathing, squadron, stay, steward, warp, washing, way, weather*, in reference to a *ship*, see the respective articles.

SHIP, *to*, in *Sea Language*, is used either actively, as to embark any person, or put any thing aboard *ship*; or passively to receive any thing into a *ship*, as we shipped a heavy sea, &c.

To ship also implies to fix any thing in its place, as *to ship* the oars; *to ship* the swivel guns, i. e. to fix them in their sockets, &c.

SHIP *of pleasure*, among the *Ancients*. See THALAMEGUS.

SHIP, in the *Salt Works*, is a large cistern, out of which the salt pans are supplied for boiling.

This cistern is built close to the saltern, and is made either of wood, brick, or clay; and it ought always to be covered with a shed, that the sea water, contained in it, may be kept clean from soot, and other impurities, and not mixed with fresh water in rains; and it must be always placed so high, that the water may easily run out of it into the pans, to supply them for boiling.

SHIP *guns*. See *Great* GUNS.

The following table shews the dimensions of *ship guns*, settled in 1753.

Brass *Ship* Guns.						Iron *Ship* Guns.					
Caliber.	Length.		Weight.			Caliber.	Length.		Weight.		
	F.	Inch.	C.	qr.	lb.		F.	Inch.	C.	qr.	lb.
42	9	6	61	2	10	42	10	0	55	1	12
32	9	5	55	2	7	32	9	6	53	3	23
24	9	5	51	1	12	24	9	5	48	0	0
18	9	0	48	1	0	18	9	0	41	1	8
12	9	0	29	0	0	12	9	0	32	3	3
9	8	5	26	0	0	9	8	5	23	2	2
6	8	0	19	0	0	6	7	0	17	1	14
3	6	5	11	0	0	4	6	0	12	2	13
						3	4	6	7	1	7

SHIP-MONEY, an imposition which was anciently charged upon the ports, towns, cities, boroughs, and counties of the realm; by writs commonly called *ship writs*, under the great seal of England, for the providing and furnishing certain ships for the king's service.

This imposition was revived by king Charles I. in the years 1635 and 1636; but by stat. 17 Car. I. it was declared to be contrary to the laws and statutes of the realm, claim of right, liberty of the subject, &c.

SHIPPER, SKIPPER, or *schipper*, a Dutch term, signifying the master of a ship.

We also use the word, popularly, for any common seamen.

SHIPPING denotes a multitude of vessels.

SHIP-SHAPE, in *Sea Language*, denotes the fashion of a ship, or the manner of an expert sailor; thus, they say, the mast is not rigged *ship-shape*, and trim your sails *ship-shape*.

SHIPWRECK. See WRECK.

SHIRE, SCYRA, originally Saxon, *scir*, or *scire*, formed from *scyran, to divide*: a part or portion of the land, called also a COUNTY.

SHIRE-*clerk*, he that keeps the county court; and his office is so incident to that of the sheriff, that the king cannot grant it away.

SHIRE-*man*, was anciently the judge of the *shire*, by whom trials for land, *&c.* were determined.

SHIRE-*mote*, in our *old Writers*, an assembly of the county or *shire* at the assizes, *&c.* See SCYREGEMOT.

SHIRE-*reve*. See SHERIFF.

SHIRE, *knights of the*. See KNIGHT.

SHIVERS, in a *ship*, the seamen's term for those little round wheels, in which the rope of a pulley or block runs. They turn with the rope, and have pieces of brass in their centres, which they call the *cocks*, with holes in them, into which the pin of the block goes, and on which they turn.

These *shivers* are usually of wood, but some are of brass, as those in the heels of the top-masts. See SHEAVE.

SHIVERY *salt*, a name given by the salt-workers to a sort of salt, very little different from the common brine salt. See SALT.

SHOAD, in *Mining*, a term for a train of metalline stones mixed with earth, sometimes lying near the surface, sometimes at considerable depths, but always serving to the miners as a proof that the load or vein of the metal is thereabout. The deeper the *shoad* lies, the nearer the vein is.

SHOAD-*stones*, a term used by the miners of Cornwall, and other parts of this kingdom, to express such loose masses of stone, as are usually found about the entrances into mines, sometimes running in a straight course, from the load or vein of ore to the surface of the earth.

These are stones of the common kinds, appearing to have been pieces broken from the strata, or larger masses, but they usually contain mundic, or marcasitic matter, and more or less of the ore to be found in the mine. They appear to have been at some time rolled about in water,

water, their corners being broken off, and their furface fmoothed and rounded.

The antimony mines in Cornwall are always eafily difcovered by the *fhoad-ftones*, thefe ufually lying up to the furface, or very nearly fo; and the matter of the *ftone* being a white fpar, or debafed cryftal, in which the native colour of the ore, which is a fhining bluifh black, eafily difcovers itfelf in ftreaks and threads.

Shoad-ftones are of fo many kinds, and of fuch various appearances, that it is not eafy to defcribe or know them: but the miners, to whom they are of greateft ufe in the tracing, or fearching after new mines, diftinguifh them from other ftones by their weight; for if very ponderous, though they look ever fo much like common ftones, there is great reafon to fufpect that they contain fome metal. Another mark of them is their being fpungy and porous; this is a fign of efpecial ufe in the tin countries, for the tin *fhoad-ftones* are often fo porous and fpungy, that they refemble large bodies thoroughly calcined. There are many other appearances of tin *fhoads*, the very hardeft and firmeft *ftones* often containing this metal.

When the miners in tracing a *fhoad* up hill, meet with fuch odd ftones and earths, that they know not well what to make of them, they have recourfe to vanning, that is, they calcine and powder the ftone, clay, or whatever elfe is fuppofed to contain the metal; and then wafhing it in an inftrument, prepared for that purpofe, and called a *vanning fhovel*, they find the earthy matter wafhed away, and of the remainder, the ftony, or gravelly matter lies behind, and the metalline matter at the point of the fhovel. If the perfon who performs this operation has any judgment, he eafily difcovers not only what the metal is that is contained in the *fhoad*, but alfo will make a very probable guefs at what quantity the mine is likely to yield of it in proportion to the ore. Phil. Tranf. N° 69. Pryce's Mineralogia, p. 124, &c.

SHOAL, in the *Sea-phrafe*, is the fame as *fhallow*, and is applied to flats in the water.

They fay it is *good fhoaling*, when a fhip failing towards fhore, they find, by her founding, it grows fhallower and fhallower by degrees, and not too fuddenly; for then the fhip goes in fafety.

SHOAR, or SHORE, a prop, or counterfort, fet up to fupport any thing of weight which leans on one fide. See BUTTRESS.

SHOE, a covering for the foot, ufually of leather.

Its ftructure, though the object of a particular art, is too popular to need explaining.

Its hiftory is more obfcure. Bened. Baudoin, a *fhoemaker* by profeffion, has a learned treatife of the ancient *fhoe*, De Solea Veterum, where the origin, matter, form, &c. thereof are particularly inquired into.

Baudoin maintains, that God, in giving Adam fkins of beafts to clothe him, did not leave him to go bare footed, but gave him *fhoes* of the fame matter; that, after raw fkins, men came to make their *fhoes* of rufhes, broom, paper, flax, filk, wood, iron, filver, and gold: fo different has their matter been. Nor was their form more ftable, with regard either to the fhape, colour, or ornaments; they have been fquare, high, low, long, and quite even, cut, carved, &c. Pliny, lib. vii. c. 56. tells us, that one Tychius of Bœotia, was the firft who ufed *fhoes*.

M. Nilant, in his remarks on Baudoin, obferves, that he quotes Xenophon wrongly, to fhew that even in his time they ftill wore *fhoes* of raw fkins.

Xenophon relates, that the ten thoufand Greeks, who had followed the young Cyrus, wanting *fhoes* in their retreat, were forced to cover their feet with raw fkins, which occafioned them great inconveniencies.

Nilant will not even allow, that the *fhoes* of the country people, called *carbatinæ*, and *peroneæ*, were of crude fkin, without any preparation.

The patricians, among the Romans, wore an ivory crefcent on their *fhoes*: Heliogabalus had his *fhoes* covered over with a very white linen, in conformity to the priefts of the fun, for whom he profeffed a very high veneration; this kind of *fhoe* was called οὖδος, *udo*, or *odo*. Caligula wore *fhoes* enriched with precious ftones. The Indians, like the Egyptians, wore *fhoes* made of the bark of the papyrus. The Turks always put off their *fhoes*, and leave them at the doors of the mofques.

Shoemakers are to make their fhoes of fufficient leather, or forfeit 3*s*. 4*d*. 1 Jac. I. c. 22. and journeymen *fhoemakers* embezzling leather fhall make fatisfaction for damage, or be ordered by juftices to be whipped, &c. Perfons buying or receiving fuch leather, are to make reafonable recompence, to be levied by diftrefs, &c. and fearch is to be made after the fame: alfo leaving their work undertaken, or neglecting it, to be fent to the houfe of correction for a month. 9 Geo. I. cap. 27. 13 Geo. II. c. 8. See LEATHER.

SHOE, in the *Manege*. A horfe-*fhoe* is a piece of flat iron, with two branches or wings, which being commonly forged according to the form of the hoof for which it is defigned, is made round at the toe, and open at the heel.

A *fhoe* for all feet, is one that is cut at the toe into two equal parts, which are joined by a riveted nail, upon which they are moveable in fuch a manner, that the *fhoe* is enlarged or contracted lefs or more at pleafure, in order to make it fit all forts and fizes of feet. See HORSE-*fhoe*.

To *fhoe* a horfe after the form of a lunette, a patin, &c. See LUNETTE, PATIN, &c.

Berenger obferves, that the ancients did not *fhoe* their horfes, that is to fay, they did not nail upon their hoofs any pieces of iron, or of other metal, in the form of the modern *horfe-fhoes*; but when they intended to defend them from any thing that might annoy them in travelling, they faftened upon their feet, by means of ftraps and ligatures, a fort of fandal, ftocking, or what we call boots. Thefe were made of fedges twifted together like a mat, or elfe of leather, and were fometimes ftrengthened with plates of iron, and adorned by the rich and oftentatious with filver and gold, as in the inftances of Nero and Poppæa.

It does not appear in what æra, or in what country, the modern art of *fhoeing* took its rife. The earlieft proof which the above mentioned writer has met with is the *fhoe* faid to have belonged to the horfe of Childeric, who lived in the year 481, and is preferved in Montfaucon's Antiquities of France. It perfectly refembles the *fhoe* now in ufe. Bereng. Horfemanfhip, vol. I. p. 234.

SHOE *of gold*. See *Hiftory of* GOLD.

SHOE, *horfe*, in *Fortification*. See HORSE-*fhoe*.

SHOE, *horfe, head*. See HORSE-*fhoe head*.

SHOE *of the anchor*, in *Sea Language*, a fmall block of wood, convex on the back, and having a fmall hole fufficient to contain the point of the anchor fluke on the fore fide. It is ufed to prevent the anchor from tearing or wounding the planks on the fhip's bow, when afcending or defcending; for which purpofe the *fhoe* flides up and down along the bow, between the fluke of the anchor and the planks, as being preffed clofe to the latter by the weight of the former. Falconer.

SHOE, *to, an anchor*. See *Shoeing the* ANCHOR.

SHOE-*houfing*. See HOUSING.

SHOOT, in the *Sea Language*. They fay the ballaft *fhoots*, when it runs over from one fide to another.

SHOOTING. See GUNNERY and PROJECTILE.

SHOOTING *of bombs*. See BOMB.

SHOOTING *with air*. See WIND-GUN.

SHOOTING, *malicious*, in *Law*. See MAHIM.

SHOOTING *of falts*. It is to be obferved, that the figures arifing from the *fhooting* of diffolved falts are not conftantly the fame, but vary according to different circumftances, fuch as when they happen to *fhoot* more or lefs haftily, or in different proportions of liquor. See SALT.

SHOOTS, *hot*. See HOT.

SHOOT, *water*. See WATER.

SHOP-LIFTER, a perfon who, on pretence of buying goods or otherwife, takes an opportunity to fteal them; and if the goods amount to the value of five fhillings, though no perfon be in the fhop, he is guilty of felony without benefit of clergy, by 10 & 11 Will. III. c. 23.

SHORE, or *common fhore*, a corruption of *fewer*. See SEWERS.

SHORE, among *Builders*, &c. See SHOAR.

SHORE, *fea*, is a general name for the fea coaft of any country. A bold *fhore*, is a coaft which is fteep and abrupt, fo as to admit the clofeft approach of fhipping without expofing them to the danger of being ftranded.

The *fhores* of the fea are divided, by count Marfigli, into three portions, according to which all his defcriptions, in his account of the *bafon of the* SEA, are given. The firft part of the *fhore* is that tract of land to which the fea juft reaches in ftorms and high tides, but which it never covers; the fecond part of the *fhore* is that which is covered in high tides and ftorms, but is dry at other times; and the third is the defcent from this, which is always covered with water.

The *firft* part is only a continuation of the continent, and fuffers no alteration from the neighbourhood of the fea, except that it is rendered fit for the growth of fome plants, and wholly unfit for that of others, by the faline fteams and impregnations; and it is fcarce to be conceived by any but thofe who have obferved it, how far in land the effects of the fea reach, fo as to make the earth proper for plants, which will not grow without this influence, there being feveral plants frequently found on high hills and dry places, at three, four, and more miles from the fea, which yet would not grow, unlefs in the neighbourhood of it, nor will ever be found elfewhere.

The

The *second* part or portion of the *shores* is much more affected by the sea than the former, being frequently washed and beaten by it. Its productions are rendered salt by the water, and it is covered with sand, or with the fragments of shells in form of sand, and in some places with a tartarous matter deposited from the water, and the colour of this whole extent of ground is usually dusky and dull, especially where there are rocks and stones, and these are covered with a slimy matter.

The *third* part of the *shores* is more affected by the sea than either of the others, and is covered with an uniform crust of the true nature of the bottom of the sea, except that plants and animals have their residence in it, and the decayed parts of these alter it a little.

SHORLING *and morling*, in our *Old Writers*, words used to distinguish fells of sheep; *shorling*, being the fells after the fleeces are shorn off the sheeps back; and *morling*, the fells flead off after they die or are killed: in some parts of England they understand by a *shorling*, a sheep whose fleece is shorn off; and by a *morling*, a sheep that dies.

SHORN *velvet*. See VELVET.

SHORT *accent*, in *Grammar*. See ACCENT.

SHORT *sails*, in a *man of war*, are the same with *fighting sails*, being the fore-sail, main-sail, and fore-top-sail, which are all that are used in fight, lest the rest should be fired and spoiled; besides the trouble of managing them when a ship gives chase to another.

If a chase shews a disposition to fight, they say, the chase *strips into her short sails*, i. e. puts out her colours in the poop, her flag at the main top, and her streamers, or pendants, at the yard's arms; furls her sprit-sail, peeks her mizen, and slings her main yard.

SHORTEN, *to*, *sail*. See SAIL.

SHORT-*jointed*, in the *Manege*. A horse is said to be *short-jointed*, that has a short pastern; when this joint, or the pastern, is too short, the horse is subject to have his fore-legs from the knee to the cornet all in a straight line. Commonly your *short-jointed* horses do not manege so well as the *long-jointed*; but out of the manege the *short-jointed* are the best for travel or fatigue.

SHORT-SIGHTEDNESS, *myopia*, a defect in the conformation of the eye, wherein the crystalline, &c. being too convex, the rays reflected from different objects are refracted too much, and made to converge too fast, so as to unite before they reach the retina, by which means vision is rendered dim and confused. See MYOPS.

A learned author thinks it probable, that out of so great a number of *short-sighted* persons as are daily to be met with, few are born so. For it generally grows upon young people at the age of twenty or twenty-five, and therefore might possibly be prevented by using their eyes while young to all sorts of conformations, that is, by often looking through glasses of all sorts of figures, and by reading, writing, or working with spectacles of several degrees of convexity; for whatever be the powers by which the eye conforms itself to distinct vision, they may possibly grow weak, or lose their extent one way or other, for want of variety of exercise. It seems an opinion without foundation, to think that such an exercise of the eyes can anywise injure them, provided due care be taken to avoid looking at objects that are too bright.

Short-sightedness may come by accidents; of this we have a remarkable instance, mentioned by Dr. Briggs in his Ophthalmographia, of a person upwards of seventy years old, who had used spectacles for ten years, and yet by catching cold, he suddenly became so *short-sighted*, that he could not distinguish objects three feet off, and after the cold and defluxion were cured, he continued to read the smallest print without spectacles for many years.

Dr. Smith mentions a young gentleman, who became *short-sighted* immediately after coming out of a cold bath, in which he did not totally immerse himself, and has ever since used a concave glass for many years.

It is commonly thought that *short-sightedness* wears off in old age, on account of the eye becoming flatter, but the learned doctor questions whether this be matter of fact, or hypothesis only.

It is remarkable, that *short-sighted* persons commonly write a small hand, and love a small print, because they can see more of it at a view. That it is customary with them not to look at the person they converse with, because they cannot well see the motion of his eyes and features, and are therefore attentive to his words only. That they see more distinctly, and somewhat farther off by a strong light than by a weak one; because a strong light causes a contraction of the pupil, and consequently of the pencils, both here and at the retina, which lessens their mixture, and consequently the apparent confusion; and, therefore, to see more distinctly, they almost close their eye-lids, for which reason they were anciently called *myopes*. Smith's Optics, vol. ii. Rem. p. 10, &c.

Dr. Jurin observes, that persons who are much, and long accustomed to view objects at small distances, as students in general, watchmakers, gravers, painters in miniature, &c. see better at small distances, and not so well at great distances as the rest of mankind. The reason is, that in the eye, as well as in other parts, the muscles, by constant exercise, are enabled to contract themselves with more strength, and by disuse are brought to less strength. Hence, in the persons before mentioned, the greater muscular ring of the uvea contracts more easily and strongly, and the cornea more readily obeys the contraction of the ring, whence they see better at small distances. And the cornea, by being thus often and long bent into a greater convexity, does by degrees lose something of its elasticity so as not to return to its natural elasticity, when the muscular ring ceases to act upon it. This is one cause of their not seeing so well at great distances: also the ligamentum ciliare, being seldom employed to lessen the convexity of the capsula, does by degrees become less capable of performing that office: and the capsula being seldom drawn out, and put into tension, must lose something of its distensile quality, so as less easily to comply with the action of the ligament. And this is another cause of their not seeing so well at great distances. Jurin, Essay on dist. and indist. Vision.

The ordinary remedy for *short-sightedness* is a concave lens, held before the eye, which, making the rays diverge, or at least diminishing much of their convergency, makes amends for the too great convexity of the crystalline.

Dr. Hooke suggests another remedy. Finding that many *short-sighted* persons are but little helped by concaves, he recommends a convex glass, placed between the object and the eye, by means whereof, the object may be made to appear at any distance from the eye; and, consequently, all objects may be thereby made to appear at any distance from the eye, so that the *short-sighted* eye shall contemplate the picture of the object in the same manner as if the object itself were in the place. It is true, the image will appear inverted, but we have expedients to remedy this too; for, in reading, there needs nothing but to hold the book up-side down. To write, the best way, in this case, will be, for the person to learn to do it up-side down. For distant objects, the doctor asserts, from his own experience, that, with a little practice in contemplating inverted objects, one gets as good an idea of them as if seen in their natural posture.

SHORTFORD, q. d. *fore-close*, an ancient custom in the city of Exeter, when the lord of the fee cannot be answered rent due to him out of his tenement, and no distress can be levied for the same. The lord is then to come to the tenement, and there take a stone, or some other dead thing off the tenement, and bring it before the mayor and bailiff, and thus he must do seven quarter days successively, and if on the seventh quarter-day the lord is not satisfied his rent and arrears, then the tenement shall be adjudged to the lord to hold the same a year and a day; and forthwith proclamation is to be made in the court, that if any man claims any title to the said tenement, he must appear within the year and day next following, and satisfy the lord of the said rent and arrears: but if no appearance be made, and the rent not paid, the lord comes again to the court, and prays that, according to the custom, the said tenement be adjudged to him in his demesne as of fee, which is done accordingly, so that the lord hath from thenceforth the said tenement, with the appurtenances, to him and his heirs.

SHOT, in the *Military Art*, includes all sorts of ball or bullets for fire arms, from the cannon to the pistol. See BULLET, CANNON, &c.

Those for cannon are of iron; those for muskets and pistols are of lead.

SHOT, for ordnance, especially in the sea service, are of several sorts: as,

SHOT, *round*, balls or globes of iron fitted to the bore of the piece.

SHOT, *bar*, is formed of two bullets, or rather half bullets, joined together by an iron bar, serving to cut down masts, sails, &c.

SHOT, *case*, *chain*, *grape*, *langrel*, *random*, *star*, *and trundle*, see the respective articles, see also *Fire*-ARMS.

SHOT, for fowling, is otherwise called *hail*, by reason of its figure and size.

The method of casting it is as follows: the lead being melted, stirred, and skimmed, a quantity of powdered yellow orpiment is strewed in it, as much as will lie on a shilling, to twelve or fifteen pounds of lead; the whole being well stirred, the orpiment will flame.

To judge whether there be orpiment enough in, a little of the lead is dropped into a glass of water, and if the drops prove round, and without tails, there is orpiment enough, and the degree of heat is as it should be.

This done, a copper-plate, hollow in the middle, and three inches in diameter, bored through with thirty or forty ſmall holes, according to the ſize of the *ſhot*, is placed on an iron frame, over a tub of water, four inches above the water; the hollow part is to be very thin: on this plate are laid burning coals, to keep the melted lead in fuſion. The lead is now poured gently, with a ladle, on the middle of the plate, and it will make its way through the holes in the bottom of the plate, into the water in round drops.

Great care is taken to keep the lead on the plate in its proper degree of heat; if too cold, it will ſtop the holes; and if too hot, the drops will crack and fly.

The *ſhot*, thus made, are dried over a gentle fire, always ſtirring them that they do not melt; this done, the greater are ſeparated from the ſmaller, by paſſing them through ſieves for that purpoſe.

SHOT, *freſh*. See FRESH *ſhot*.

SHOT, *hip*. See HIP *ſhot*.

SHOT, *water*. See WATER *ſhot*.

SHOT *of a cable*, on *ſhip-board*, is the ſplicing of two cables together, that a ſhip may ride ſafe in deep waters and in great roads, for a ſhip will ride eaſier by one *ſhot of a cable*, than by three ſhort cables out a-head.

SHOT-FLAGON, a ſort of *flagon* ſomewhat bigger than ordinary, which in ſome counties, particularly Derbyſhire, it is the cuſtom for the hoſt to ſerve his gueſts in, after they have drank above a ſhilling.

SHOTTEN *herrings*. See HERRING.

SHOTTEN, *blood*. See BLOOD-*ſhotten*.

SHOVELER, in *Ornithology*. See *Broad-beaked* DUCK.

SHOULDER-BLADE, a bone of the ſhoulder, of a triangular figure, covering the hind-part of the ribs, called by anatomiſts the SCAPULA and *omoplata*.

SHOULDER, *cartilages of the*, in *Anatomy*. The ſcapula, in many ſubjects, has a ſmall cartilaginous border along its whole baſis, which in children is remarkable enough, but in grown perſons it diſappears. The glenoide cavity of this bone is covered with a cartilage, which is thicker toward the circumference than in the middle, and a little raiſed above the edge of the bone. The ſmall cartilaginous ſurface of the acromion is thicker in freſh bones than it appears in a dried ſkeleton, and is a little convex.

The ſmall triangular ſurface, at the extremity of the ſpine of the ſcapula, near the baſis, is covered with a very thin, ſmooth, cartilaginous lamina, but this being tranſparent, does not appear very white.

There are no other cartilages but theſe uſually found in the ſcapula in freſh ſubjects, notwithſtanding that in ſkeletons of prepared bones, ſeveral places beſide ſeem to have been cartilaginous; theſe, however, are owing only to the dried remains of ligaments and tendons. Winſlow's Anatomy, p. 137.

SHOULDER, *ligaments of the*. The articulation of the acromium, with the extremity of the clavicle, is ſtrengthened all round by ſeveral ſmall but ſtrong ligaments, which go directly from one bone to the other. Theſe ligaments lie very near one another, and withal are ſo tightly braced over the joint, as to hide it altogether: they appear indeed more like a cartilaginous covering than a ligamentary texture; and the internal ſurface of theſe ligaments is lined with the capſula of the joint. When the ſmall inter-articular cartilage is found in this joint, its whole circumference is ever found connected to theſe ligaments. The articulation of the clavicle with the ſternum is ſuſtained by ſeveral ligaments, fixed by one end round the pectoral extremity of the clavicle, and inſerted at the other in the ſternum. There is alſo a long narrow ſtrong ligament, which goes from one clavicle to the other, behind the furca of the ſternum: this is fixed to the internal angle of the contiguous extremities of the bones, and may be properly called the *inter-clavicular ligament*. The neck of the ſcapula, at a ſmall diſtance from the edge of the glenoide cavity, gives inſertion to the capſular ligament, or mucilaginous bag, and to the articular ligaments of the joint of the ſcapula and os humeri.

And beſide theſe articular ligaments of the ſcapula, there are three ligamentary cords fixed to the tuberoſity of the coracoide apophyſis; two of which, by their other extremities, are inſerted in the oblique eminence on the lower ſide of the humeral extremity of the clavicle, the third under the acromium. There is alſo a thin flat broad ligament, reaching between the criſta of the ſpine of the ſcapula, and the edge of the inferior coſta. Winſlow's Anatomy, p. 138.

SHOULDER-*bone*, in *Anatomy*. See HUMERUS.

SHOULDER, in the *Manege*, is the joint of a horſe's four quarters, that joins the end of the *ſhoulder*-blade with the extremity of the fore-thigh.

SHOULDER *of a branch*, is that part of it which begins at the lower part of the arch of the banquet, overagainſt the middle of the fonceau, or chaperon, and forms another arch under the banquet. The *ſhoulder of a branch* caſts a greater, or leſſer circumference, according as it is deſigned to fortify or weaken the branch. See BRIDLE, BANQUET, and BRANCHES.

SHOULDER-*pegged horſes*, called in French *chevillees*, are ſuch as have their *ſhoulders* gourdy, ſtiff, and almoſt without motion. A horſe charged with *ſhoulders*, is one that has thick, fleſhy, and heavy *ſhoulders*.

SHOULDER *of a baſtion*, in *Fortification*, is where the face and the flank meet.

SHOULDERING, in *Fortification*. See EPAULEMENT.

SHOULDERING-PIECE, in *Building*. See BRACKET.

SHOULDER-KNOTS. See EPAULETTES.

SHOULDER-PITCHT, in *Farriery*, is a diſeaſe in a horſe, when the pitch or point of the ſhoulder is diſplaced, which makes the horſe halt downright.

SHOULDER-SPLAIT, or SHOULDER-TORN, is a hurt which befals an horſe by ſome dangerous ſlip, whereby the ſhoulder is parted from the breaſt.

SHOULDER-WRENCH is a ſtrain in the ſhoulder.

SHOUT, *clamor*, in *Antiquity*, was frequently uſed on eccleſiaſtical, civil, and military occaſions, as a ſign of approbation, and ſometimes of indignation. Thus as Cicero, in an aſſembly of the people, was expoſing the arrogance of L. Antony, who had had the impudence to cauſe himſelf to be inſcribed the patron of the Romans, the people on hearing this raiſed a *ſhout* to ſhew their indignation.

In the ancient military diſcipline, *ſhouts* were uſed, 1. upon occaſion of the general's making a ſpeech, or harangue to the army from his tribunal: this they did in token of their approving what had been propoſed. 2. Before an engagement, in order to encourage and ſpirit their own men, and fill the enemy with dread.

This is a practice of great antiquity, beſides which, it wants not the authority of reaſon to ſupport it, for as mankind are endowed with two ſenſes, hearing and ſeeing, by which fear is raiſed in the mind, it may be proper to make uſe of the ear as well as the eye for that purpoſe.

Shouts were alſo raiſed in the ancient theatre, when what was acted pleaſed the ſpectators. See ACCLAMATION.

It was uſual for thoſe preſent at the burning of the dead to raiſe a great *ſhout*, and call the dead perſon by his name before they ſet fire to the pile. See BURIAL.

SHOWER, a cloud reſolved into rain, and diſcharged on a certain tract of ground.

In *Natural Hiſtory* we meet with abundance of inſtances of extraordinary and preternatural *ſhowers*; as *ſhowers of blood*, mentioned by Gaſſendus and others; a *brimſtone ſhower*, mentioned by Wormius; *ſhowers of frogs*, mentioned by Pliny, and even by Dr. Plott; a *ſhower of millet ſeed* in Sileſia, mentioned in the Ephem. German. *ſhowers of aſhes*, frequent in the Archipelago; a *ſhower of wheat*, in Wiltſhire; a *ſhower of whitings*, mentioned in the Philoſoph. Tranſact. The natural reaſons of many whereof may be ſeen under RAIN.

SHREW, or SHREW-*mouſe*, in *Zoology*, the common name of the creature called by authors *mus araneus*, and SOREX *araneus* of Linnæus. It is an animal of a mixt brown and reddiſh tawny colour; the belly is white; its tail is about one inch and a half long, and covered with ſhort hairs; its body is about two inches and a half in length; and its eyes black and very ſmall; they are indeed little larger than thoſe of the mole, and do not exceed the ſize of the head of the ſmalleſt pin, it is no wonder therefore that the creature is almoſt blind; the noſe long and ſlender; the ears ſhort and rounded; the teeth are very ſmall, and differ in their ſhape and ſituation from thoſe of all other creatures in the world; and ſeem as if nature had in one creature made a ſort of mixture of the teeth of the *mouſe* and the ſnake kind.

It has two long fore-teeth, as all the *mouſe* kind have; but theſe are not ſingle as in *mice*, but have two or three other ſmall and ſharp teeth growing out of them: theſe, to an accurate obſerver, might either be wholly unſeen, or taken for diſtinct teeth; and the anterior long teeth are not ſeparated from the reſt by any gap or ſpace, as in the *mouſe* kind, but make one continued ſeries with the others. The upper-jaw in this creature is longer than the under, and the teeth are ſharp and ſerrated, ſome with two, ſome with three points, and theſe ſo ſmall, that they might eaſily not be ſeen, but that the tips of them are reddiſh. Their whole number is twenty-eight.

It is very common in many parts of the world, and is met with in almoſt all our dry grounds, in old walls and holes in the earth; near hay ricks, dunghills, and neceſſary houſes; it lives on corn, inſects, and any filth; the cats will kill it, but never attempt to eat it. It brings four or five young at a time.

Its

Its whole body has a fetid and offenſive ſmell. The ancients erroneouſly believed it was injurious to cattle. There ſeems to be an annual mortality of theſe animals in the month of Auguſt, numbers being then found dead in the paths.

It is diſtinguiſhed at firſt ſight from the common *mouſe*, in that it is ſmaller; its noſe longer, and like a hog's; it has five toes on the hinder as well as the fore feet; its eyes are extremely ſmall; its ears very ſhort; its claws are long and whitiſh, and its feet ſhort. Ray and Pennant.

SHREW-*mouſe, water, ſorex fodiens* of Pallas, is much larger than the common *ſhrew*; its length from noſe to tail being three ½ inches; its tail two inches; the upper part of the body and the head are of a black colour; the throat, breaſt, and belly of a light aſh-colour; and beneath the tail there is a triangular duſky ſpot.

This animal inhabits Europe and Siberia; was loſt in England till the year 1768, when it was diſcovered in the Lincolnſhire fens; it burrows in the banks near the water, and is ſaid to ſwim under water: it is called in ſome places the *blind mouſe*, on account of the ſmallneſs of its eyes; and it chirrups like a graſshopper. Pennant.

SHRIKE, in *Ornithology*, an Engliſh name for the *lanius excubitor* of Linnæus, or BUTCHER-*bird*.

SHRIKE, *red-backed*, or *lanius collurio* of Linnæus. See FLUSHER.

SHRIMP, in *Natural Hiſtory*, is the CANCER *grangon* of Linnæus, with long ſlender feelers, and between them two projecting laminæ; claws with a ſingle-hooked moveable fang; three pair of legs; ſeven joints in the tail; the middle caudal fin ſubulated; the four others rounded and fringed, with a ſpine on the exterior ſide of each of the outmoſt.

This ſhell-fiſh inhabits the ſandy ſhores of Britain in vaſt quantities, and is reckoned the moſt delicious of the genus. Some writers have claſſed it under the genus of SQUILLA.

The white *ſhrimp*, or *cancer ſquilla*, has a ſnout like the prawn, but deeper and thinner, and feelers longer in proportion to the bulk; the ſubcaudal under fins rather larger. It inhabits the coaſt of Kent.

By 30 Geo. II. c. 21. white *ſhrimps* in the rivers Thames and Medway are only to be taken from Bartholomew day to Good-Friday; and red *ſhrimps* in the river Medway only from April 25 to July 1.

SHRIMP, *freſh water*. See SQUILLA.

SHRINE, formed from *ſcrinium, a deſk*, or *cabinet*, a caſe to hold the RELICS of ſome ſaint.

SHRITE, in *Ornithology*. See MISSEL-*bird*.

SHROUD, from the Saxon *ſhroud*, a *ſhelter* or *cover*, is uſed to denote the dreſs of the dead. This is required by ſtatute to be made of ſheep's wool only. See BURIAL.

If any one, in taking up a dead body, ſteals the *ſhroud*, the property of which remains in the executor, or the perſon who was at the charge of the funeral, it is felony.

SHROUDS, in *Sea Language*. See SHROWDS.

SHROVE-TIDE, the time immediately before Lent; thus called by our anceſtors, becauſe employed in *ſhriving*, that is, in confeſſing their ſins to the prieſt, in order to a more devout keeping the enſuing Lent faſt.

Shrove-Tueſday is the day next before the firſt of Lent.

SHROWDING *of trees*, the cutting or lopping off the top branches; this is only practiſed to trees that are not fit for timber, but deſigned for fuel, or ſome other preſent uſe.

Such trees the huſbandmen find much preferable to coppice, as they need no fence to ſecure them, becauſe ſtanding in no danger of the browzings and rubbings of cattle, which too have the benefit of grazing under them.

As for the time of *ſhrowding*, it is not to be practiſed till the trees have ſtood three or four years; and then it muſt be done either at the beginning of the ſpring, or the end of autumn.

The harder ſort are not to be lopped above once in ten or twelve years, and that at any time in the winter. The pithy and ſofter woods are beſt *ſhrowded* in the ſpring. The ſtumps left ſhould always be cut aſlope, and ſmooth, in order to caſt the water off, and prevent its ſinking in, and rotting the tree.

SHROWDS, or SHROUDS, are great ropes in a ſhip, which go up on both ſides of all maſts, except the bowſprit.

The *ſhrouds* are always divided into pairs, i. e. one piece of rope is doubled, and the two parts faſtened together at a ſmall diſtance from the middle, ſo as to leave a ſort of nooſe or collar to fix upon the maſt-head.

They are faſtened below by chains to the ſhip's ſides, and aloft, over the head of the maſt; their pennants, fore-tackle, and ſwifters, being firſt put under them: and they are ſerved there, to prevent their galling the maſt. The top-maſt *ſhrowds* are faſtened to the PUTTOCKS, by plates of iron, and by what they call *dead-men's eyes*, and laniers alſo, as the others are. See *Tab. Ship, fig.* 1. *n.* 4. 12. 23. 41. 52. 62. 84. 104. and 135.

The *ſhrouds*, as well as the ſails, are denominated from the maſts to which they belong. Thus they are the main, fore, and mizen *ſhrouds*, the main-top-maſt, fore-top-maſt, or mizen-top-maſt *ſhrouds*, and main-top-gallant, fore-top-gallant, or mizen-top-gallant *ſhrouds*.

The number of *ſhrouds* by which a maſt is ſuſtained, as well as the ſize of the rope of which they are formed, is always in proportion to the ſize of the maſt, and the weight of the ſail it is intended to carry. The two fore-maſt *ſhrouds*, on the ſtarboard and larboard ſide of the ſhip, are always fitted firſt upon the maſt-head; and then the ſecond on the ſtarboard, and the ſecond on the larboard, and ſo on till the whole number is fixed.

The intention of this arrangement is to brace the yards with greater facility, when the ſails are cloſe hauled, which could not be performed without great difficulty, if the fore-maſt *ſhrouds* were laſt fitted on the maſt-head, becauſe the angle which they would make with the maſt would then be greatly increaſed. Falconer.

The terms are, *eaſe the ſhrouds*; that is, ſlacken them.

Set taught the ſhrouds; that is, ſet them faſter.

SHROWDS, *futtock*. See PUTTOCKS.

SHRUB, *frutex*, a little, low, dwarf tree, or a woody vegetable, of a ſize leſs than a tree; and which, inſtead of one ſingle ſtem, frequently from the ſame root, puts forth ſeveral ſets or ſtems. See PLANT and TREE.

Such are privet, phillyrea, holly, box, honeyſuckle, &c.

Shrubs and trees put forth in autumn a kind of buttons, or gems, in the axis of the leaves; theſe buttons are as ſo many little ova, which, coming to expand by the warmth of the following ſpring, open into leaves and flowers. By this, together with the height, ſome diſtinguiſh *ſhrubs* from *ſuffrutices*, or *under-ſhrubs*, which are low buſhes, that do not put forth any of theſe buttons; as ſage, thyme, &c.

The two *hardieſt ſhrubs* we are poſſeſſed of are the ivy and box; theſe ſtand the ſeverity of our ſharpeſt winters unhurt, while other *ſhrubs* periſh, and trees have their ſolid bodies ſplit and torn to pieces. In the hard winter of the year 1683, theſe two *ſhrubs* ſuffered no injury any where; though the yews and hollies, which are generally ſuppoſed very hardy, were this winter in ſome places killed, and in others ſtripped of their leaves, and damaged in their bark. Furze-buſhes were found to be ſomewhat hardier than theſe, but they ſometimes periſhed, at leaſt down to the root. The broom ſeemed to occupy the next ſtep of hardineſs beyond theſe; this lived where the others died; and where even this died, the juniper *ſhrubs* were ſometimes found unhurt. This laſt is the only *ſhrub* that approaches to the hardineſs of the box and ivy, but even this does not quite come up to them; for while they ſuffer nothing in whatever manner they are expoſed, the juniper, though it bears cold well under the ſhelter of other trees, yet cannot bear the viciſſitudes of heat and cold; inſomuch that ſome juniper *ſhrubs* were found half dead, and half vigorous; that ſide which faced the mid-day ſun, having periſhed by the ſucceſſive thawings and freezings of its ſap; while that which was not expoſed to the viciſſitudes of heat, had bore the cold perfectly well. Such *ſhrubs* as are not hardy enough to defy the winter, but appear half-dead in the ſpring, may often be recovered by Mr. Evelyn's method of beating their branches with a ſlender hazel-wand, to ſtrike off the withered leaves and buds, and giving a free paſſage to the air to the internal parts. Where this fails, the method is to cut them down to the quick; and if no part of the trunk appears in a growing condition, they muſt be taken off down to the level of the ground. Phil. Tranſ. Nº 165.

SHRUBS, *ſtealing of*. See LARCENY.

Wilfully ſpoiling or deſtroying them is a ſpecies of that *malicious* MISCHIEF, which ſubjects the offender to pecuniary penalties for the firſt two offences, and for the third, if it be committed in the day-time, and even be the firſt at night, to the guilt of felony, and tranſportation for ſeven years. 6 Geo. III. cap. 36. & 48.

SHUT *in land*. See LAND.

SHUTTLE, in the *Manufactures*, an inſtrument uſed by the weavers, which, with a thread it contains, either of woollen, ſilk, flax, or other matter, ſerves to form the woofs of ſtuffs, cloths, linens, ribbands, &c. by throwing the *ſhuttle* alternately from left to right, and from right to left, acroſs between the threads of the warp, which are ſtretched out lengthways on the loom.

In the middle of the *ſhuttle* is a kind of cavity, called the *eye* or *chamber* of the *ſhuttle*; wherein is incloſed the ſpoul,

which is a part of the thread destined for the woof; and this is wound on a little tube of paper, rush, or other matter.

The ribband weaver's *shuttle* is very different from that of most other weavers, though it serves for the same purpose: it is of box, six or seven inches long, one broad, and as much deep; shod with iron at both ends, which terminate in points, and are a little crooked, the one towards the right, and the other towards the left, representing the figure of an ∽ horizontally placed.

SHWAN-*pan*, the name of a Chinese instrument, composed of a number of wires, with beads upon them, which they move backwards and forwards, and which serves to assist them in their computations. See ABACUS.

SI, in *Music*, a seventh note, added in the last century to the six ancient notes invented by Guido Aretin, *ut, re, mi, fa, sol, la, si*; by means whereof, the embarrass of the ancient gamut is avoided.

The original introduction of this syllable is attributed by Mersennus, and other writers, to one Le Maire, a French musician, who laboured for thirty years to bring it into practice; but he was no sooner dead than all the musicians of his country made use of it. However, it has been the more general opinion, that the syllable *si* was introduced into the scale by Ericius Puteanus of Dort, who lived about the year 1580. M. Bourdelot ascribes the introduction of this syllable into the scale to a Cordelier, about the year 1675; and he adds, on the testimony of the abbé de la Louette, that it was invented, or a second time brought into practice, by one Metru, a famous singing-master at Paris, about the year 1676; and Bonet inclines to think, that the honour of the invention might be due to the Cordelier, but that the merit of reviving it is to be ascribed to Metru. Bourdelot insinuates, that though the use of the syllable *si* is much approved of by the French musicians, yet in Italy they disdain to make use of it, as being the invention of a Frenchman. Hawkins's Hist. of Music, vol. i. p. 435. See SOL-FA-ING.

SI *action*, in *Law*, the conclusion of a plea to the action, when the defendant demands judgment, if the plaintiff ought to have his action, &c.

SIAGONAGRA, a name given by some medical writers to the gout in the jaws.

SIALISMUS, formed from σιαλον, *saliva*, a word used by the ancients to express a discharge of saliva, brought on by the holding hot things in the mouth; and by us for a salivation by mercury.

SIALOCHI, a term used by the ancients to express such persons as had a plentiful discharge of saliva, by whatever means. Hippocrates uses it for a person having a quinsey, who discharges a very large quantity of saliva. Others express by it persons, whose mouths naturally abound with a bitter saliva; and others, such persons as, from having a very large tongue, spit into people's faces while talking with them.

SIALOGOGUES, formed from σιαλον, and αγω, *I draw away*, a term used by medical writers to express such medicines as promote a copious discharge of the saliva, such as pellitory of Spain, and all the other hot and acrid vegetables; and mercury, the most powerful of all.

SIANKE, or SYNKE, in *Natural History*, a name given by the people of some parts of the East Indies to the caryophyllus, or clove-spice. The people of the Moluccas, according to Garcias, call it *chanque*, which is only a small difference of pronunciation. The Turks and Persians call the same spice *calafur*.

SIBBALDIA, in *Botany*, a genus of the *pentandria pentagynia* class. Its characters are, that the calyx is divided into ten segments; it has five petals inserted in the calyx; the styles proceed from the side of the germen, and it has five seeds. There are two species.

SIBTHORPIA, in *Botany*, a genus of the *didynamia angiospermia* class. Its characters are, that the calyx is quindentated; the limb of the corolla even; and the fruit a compressed, orbicular, bilocular capsule. There are three species.

SIBYLS, *Sibyllæ*, supposed to be formed of the two Greek words, σιας, for Θεας, *Dei*, and βελη, *counsel*, in *Antiquity*, virgin-prophetesses, or maids supposed to be divinely inspired; and who, in the height of their enthusiasm, gave oracles, and foretold things to come.

Authors do not agree about the number of the *Sibyls*. Capella reckons but two, viz. Erophyle of Troy, called *Sibylla Phrygia*; and Sinnachia of Erythræ, called *Sibylla Erythræa*. Solinus mentions three; viz. Cumæa, Delphica, and Erythræa. Ælian makes their number four, and Varro increases it to ten, denominating them from the places of their birth; the Persian, Libyan, Delphic, Cumæan, Erythræan, Samian, Cuman, Hellespontic or Troiad, Phrygian, and Tiburtine. Of these, the most celebrated are, the Erythræan, Delphic, and Cumæan *Sibyls*.

Some modern authors, without regarding the authority of Varro, or that of the other ancients, are for uniting all the *Sibyls* in one; so that, according to them, different names were given to one and the same *Sibyl* from the different places where she uttered her oracles. She first published her predictions in the city of Erythræa, the place of her nativity; then rambled about the world, and closed her life at Cumæ, in Italy. Dr. Hyde (De Relig. Persar.), shocked at the contradictions and fabulous adventures with which the pagans filled the history of the *Sibyls*, accounts for them in the following manner. He observes in the constellation Virgo a bright star, which the Persians called Sambula; and remarks, that the Persians, who were fond of judiciary astrology, looked on the sign of the Virgin as having a greater power than all the other celestial bodies, for discovering future events. The Greeks, having learnt the sciences of the eastern nations, soon adopted these trifling opinions, and, agreeably to their genius, embellished them with their fictions. Their poets soon invented a *Sibyl* virgin, in allusion to the term *Sambula*, carried her into several countries, and made her act the part of a prophetess. So that, according to this eminent writer, whatever has been said both by the ancients and moderns of the *Sibyls* and their prophecies, is entirely fabulous.

The *Sibylline* oracles were held in great veneration by the more credulous among the ancients; but they were much suspected by many of the more knowing. The books wherein they were written, were kept by the Romans with infinite care; and nothing of moment was undertaken without consulting them. Tarquin first committed them to the custody of two patrician priests, instituted for that purpose. See DUUMVIRI *sacrorum*.

These books were carefully kept till the civil wars of Sylla and Marius; when the Capitol being accidentally set on fire, and burnt down to the ground, these books were burnt with it. This happened in the year before Christ 83. But the Capitol being again rebuilt about seven years after this period, the senate determined to restore the *Sibylline* oracles; and having procured many that were said to be of this kind, laid them up in the Capitol, in order to supply the place and office of those that were lost. However, the books thus obtained had been dispersed in the hands of many, and were, therefore, by being thus vulgarly known, unfit for the use which the Romans proposed to make of them. On this account a law was passed, which required the surrender of them, and prohibited any from retaining copies of them, under pain of death. Augustus, when he assumed the high-priesthood of Rome, revived this law, and destroyed a great multitude of copies which were brought in. Tiberius caused many more to be burnt, and preserved only those which were found most worthy of approbation for that service of the state for which they were originally intended; and to these, as long as Rome remained heathen, they had constant recourse; till at length Honorius the emperor, A. D. 399, issued an order for destroying them; in pursuance of which Stilico burnt all these prophetic writings, and demolished the temple of Apollo, in which they were reposited. Nevertheless, there is still preserved, in eight books of Greek verse, a collection of oracles, pretended to be the *Sibylline*. Dr. Cave, who is well satisfied that this collection is a forgery, supposes that a large part of it was composed in the time of Adrian, about the year 130; that others were added in the time of the Antonines, and the whole work completed in the reign of Commodus. Dr. Prideaux says, that this collection must have been made between the year of our Lord 138, and the year 167. It could not be earlier, for mention is made of the next successor of Adrian, i. e. Antoninus Pius, who did not succeed him till the year 138; and it could not be later, because Justin Martyr in his writings often quotes it, and appeals to it; and he did not outlive the year 167. Fabricius supposes, that this collection does not contain all the *Sibylline oracles* which were used by the ancient fathers; and that the most ancient Christian writers, who have quoted the *Sibylline oracles*, had only a part of the collection which is transmitted down to us. Some of the fathers, not apprized of the imposition, have often cited the books of the *Sibyls* in favour of the Christian religion; and hence Celsus takes occasion to call the Christians *Sibyllists*. See farther on this subject Prideaux's Conn. vol. iv. p. 885, &c. Lardner's Credib. of the Gospel Hist. vol. iv. book i. cap. 29.

SICCHASIA, a word used by some writers to express that uneasiness at the stomach, and loathing of food, which women are often afflicted with in their pregnancy.

SICCINNIS, in *Antiquity*, a mixed kind of DANCE.

SICERA, in the *Jewish Antiquities*. The Hellenist Jews give this name to any inebriating liquor. St. Chrysostom, Theodoret, and Theophilus of Antioch, who were Syrians, and who therefore ought to know the significa-

tion and nature of *ſicera*, aſſures us, that it properly ſignifies palm-wine.

Pliny acknowledges, that the wine of the palm-tree was very well known through all the Eaſt, and that it was made by taking a buſhel of the dates of the palm-tree, and throwing them into three gallons of water; then ſqueezing out the juice, it would intoxicate like wine.

The wine of the palm-tree is white; when it is drank new, it has the taſte of the cocoa, and is ſweet as honey: when it is kept longer, it grows ſtrong, and intoxicates. After long keeping, it becomes vinegar.

SICILIAN *meaſures*, *ſilk*, and *veſpers*. See the ſubſtantives.

SICILIAN, in *Muſic*, denotes a kind of gay ſprightly air, or dance, probably invented in Sicily, ſomewhat of the nature of an Engliſh jig; uſually marked with the characters $\frac{6}{8}$, or $\frac{12}{8}$. It conſiſts of two ſtrains, the firſt of four, and the ſecond of eight bars, or meaſures.

SICILIANA, in *Botany*, a name given by Dodonæus, and ſome other authors, to the great androſæmum, called *tutſan*, and *park-leaves*.

SICILICUM, the name of a weight in uſe among the ancients, which ſome ſay was equal to three drachms of our weight; others ſay only to two.

SICK *herrings*. See HERRING.

SICK, *iron*. See IRON *ſick*.

SICKLE-*fiſh*. See FALX.

SICKLE-*wort*, in *Botany*. See CORONILLA.

SICKNESS. See DISEASE.

SICKNESS, *green*. See CHLOROSIS.

SICKNESS, *ſweating*. See SWEATING *ſickneſs*.

SICKNESS, *falling*. See EPILEPSY.

SICUB, or SICAP, in *Natural Hiſtory*, a name given by the inhabitants of the Philippine iſlands to a ſpecies of hawk, of the bigneſs of their common hawk, or banoy, which is ſomewhat larger than our ſparrow-hawk. This bird is very elegantly variegated all over its body with yellow, white, and black. See LAVIN.

SICUS, in *Ichthyology*, a name uſed by ſome authors to expreſs that ſpecies of coregonus, called by the generality of authors ALBULA *nobilis*. This, in the Linnæan ſyſtem, is a ſpecies of *ſalmo*.

SICUT *alias*, a writ ſent out in the ſecond place, where the firſt was not executed.

It is thus called from its beginning, which is in this form: *Georgius, D. G.* &c. *Vicecomiti Heref. ſalutem. Præcipimus ſalutem tibi* (ſicut alias) *præcipem'*, &c.

SICYANA. See *Gourd* WORM.

SICYONE, a word uſed by Hippocrates to expreſs colocynth, and by others for a ſpecies of hard-ſhelled gourd, in the ſhape of a pear, and by ſome for a cupping-glaſs.

SICYONEUM *oleum*, a word uſed by the ancients to expreſs a medicinal oil, of which there was among them three kinds in uſe. The firſt was called *ſicyonium ſimplex*. This was compoſed of two ounces of the root of the wild cucumber, boiled ſeveral hours in a pint of oil. The ſecond ſort was called the *compound ſicyonium*, and was made of the root of the ſame plant, with many other ingredients. The third was another compound kind, made not with an infuſion of the root, but with the juice of the fruit of the wild cucumber.

SICYONII, among the Romans, were ſhoes of a more delicate form, and better ornamented than ordinary, and chiefly worn by the ladies and their gallants.

SICYOS, in *Botany*. See *Single-ſeeded* CUCUMBER.

SIDA, in *Botany*. See *Indian* MALLOW.

SIDE, *latus*, in *Geometry*. The *ſide of a figure* is a line making part of the periphery of any ſuperficial FIGURE.

In triangles, the *ſides* are alſo called *legs*. In a right-angled triangle, the two *ſides*, including the right angle, are called *catheti*; and the third the *hypothenuſe*.

SIDE *of a polygonal number* is the number of the terms of the arithmetical progreſſion that are ſummed up. See POLYGONAL *number*.

SIDE *of power* is what we otherwiſe call the ROOT, or *radix*.

SIDES *of horn-works*, *crown-works*, *double tenailles*, and the like *out-works*, are the ramparts and parapets which incloſe them on the right and left, from the gorge to the head.

SIDE, *right*, in *Conics*. See LATUS *rectum*.

SIDE, *tranſverſe*, in *Conics*. See LATUS *tranſverſum*.

SIDES *of a ſhip*, are diſtinguiſhed into the *ſtarboard* and *larboard*; that is, into the right and left-hand-*ſide*, when ſtanding with the face towards the head of the veſſel. See STARBOARD and LARBOARD.

SIDE, *broad*, in the *Sea Language*, is to fire all the guns on one *ſide* of the ſhip.

SIDE-*wind*, at *Sea*. See WIND.

SIDE-*grafting*. See ENGRAFTING.

SIDE-*lays* is a term made uſe of, by huntſmen, when dogs are placed in the way, to be let ſlip at a deer, as he paſſes by.

SIDE *ſaddle flower*. See *Hollow-leaved ſea* LAVENDER.

SIDERATION, *ſideratio*, in *Surgery*, a MORTIFICATION of ſome part of the body; called alſo *ſphacelus*, and *necroſis*.

SIDERATION is alſo uſed for a being ſuddenly benumbed, and deprived of the uſe of one's limbs, ſenſes, &c. which the common people call being *planet-ſtruck*.

SIDERATION alſo denotes the blaſting or blighting of trees, plants, &c. by eaſtern winds, exceſſive heat, drought, or the like cauſes. See BLIGHT.

SIDERIA, in *Natural Hiſtory*, the name of a genus of cryſtal.

The word is derived from the Greek σιδηρος, *iron*, and is uſed to expreſs cryſtals altered in their figure by particles of that metal. Theſe are of a rhomboidal form, compoſed only of ſix planes.

Of this genus there are four known ſpecies: 1. A colourleſs, pellucid, and thin one, found in conſiderable quantities among the iron ores of the foreſt of Dean in Glouceſterſhire, and in other the like places. 2. A dull, thick, and brown one, not uncommon in the ſame places with the former. And, 3. A black and very gloſſy kind, a foſſil of very great beauty, found in the ſame place with the others, as alſo in Leiceſterſhire and Suſſex. See *Tab. of Foſſils*, *Claſs* 3. Hill's Hiſt. of Foſſ. p. 197.

SIDERIAL *year*. See YEAR.

SIDERIAL *day* is the time in which any ſtar revolves from the meridian to the meridian again; viz. 23 hours, 56 minutes, 4 ſeconds, 6 thirds of mean ſolar time. There are 366 *ſiderial* days in a year, or in the time of 365 diurnal revolutions of the ſun. The firſt column of the following table is the number of revolutions of the ſtars; the others next are the times in which theſe revolutions are made, as ſhewn by a well regulated clock; and thoſe on the right hand ſhew the daily accelerations of the ſtars, that is, how much any ſtar gains upon the time ſhewn by ſuch a clock, in each revolution.

Revolutions of the ſtars	Times in which theſe revolutions are made						Accelerations of the ſtars.				
	Days	Hours	Min.	Sec.	Thirds	Fourths	Hours	Min.	Sec.	Thirds	Fourths
1	0	23	56	4	6	0	0	3	55	54	0
2	1	23	52	8	12	1	0	7	51	47	59
3	2	23	48	12	18	1	0	11	47	41	59
4	3	23	44	16	24	2	0	15	43	35	58
5	4	23	40	20	30	2	0	19	39	29	58
6	5	23	36	24	36	3	0	23	35	23	57
7	6	23	32	28	42	3	0	27	31	17	57
8	7	23	28	32	48	4	0	31	27	11	56
9	8	23	24	36	54	4	0	35	23	5	56
10	9	23	20	41	0	5	0	39	18	59	55
11	10	23	16	45	6	5	0	43	14	53	55
12	11	23	12	49	12	6	0	47	10	47	54
13	12	23	8	53	18	6	0	51	6	41	54
14	13	23	4	57	24	7	0	55	2	35	53
15	14	23	1	1	30	7	0	58	58	29	53
16	15	22	57	5	36	8	1	2	54	23	52
17	16	22	53	9	42	8	1	6	50	17	52
18	17	22	49	13	48	9	1	10	46	11	51
19	18	22	45	17	54	9	1	14	42	5	51
20	19	22	41	22	0	10	1	18	37	59	50
21	20	22	37	26	6	10	1	22	33	53	50
22	21	22	33	30	12	11	1	26	29	47	49
23	22	22	29	34	18	11	1	30	25	41	49
24	23	22	25	38	24	12	1	34	21	35	48
25	24	22	21	42	30	12	1	38	17	29	48
26	25	22	17	46	36	13	1	42	13	23	47
27	26	22	13	50	42	13	1	46	9	17	47
28	27	22	9	54	48	14	1	50	5	11	46
29	28	22	5	58	54	14	1	54	1	5	46
30	29	22	2	3	0	15	1	57	56	59	45
40	39	21	22	44	0	19	2	37	15	59	41
50	49	20	43	25	0	24	3	16	34	59	36
100	99	17	26	50	0	48	6	33	9	59	12
200	199	10	53	40	1	37	13	6	19	58	23
300	299	4	20	30	2	25	19	39	29	57	35
360	359	0	24	36	2	54	23	35	23	57	6
365	364	0	4	56	32	56	23	55	3	27	4
366	365	0	1	0	38	57	23	58	59	21	3

This table will not differ the 279936000000th part of a ſecond of time from the truth in a whole year.

If the equinoctial points were at reſt in the heavens, there would be exactly 366 revolutions of the ſtars from the meridian to the meridian again in 365 days. But the equinoctial points go backward, with reſpect to the ſtars, at the rate of fifty ſeconds of a degree in a Julian year; which cauſeth the ſtars to have an apparent progreſſive motion eaſtward fifty ſeconds in that time. And, as the

ſun's

ſun's mean motion in the ecliptic is only 11 ſigns 29 degrees 48 min. 40 ſec. 15 thirds, in 365 days, it is plain, that at the end of that time he will be 14 min. 19 ſec. 45 thirds ſhort of that point of the ecliptic from which he ſet out at the beginning; and the ſtars will be advanced 50 ſeconds of a degree with reſpect to that point.

Conſequently, if the ſun's centre be on the meridian with any ſtar on any given day of the year, that ſtar will be $14' \, 19'' \, 45''' + 50''$, or $15' \, 9'' \, 45'''$ eaſt of the ſun's centre, on the 365th day afterward, when the ſun's centre is on the meridian; and therefore that ſtar will not come to the meridian on that day till the ſun's centre has paſſed it by 1 min. 0 ſec. 38 thirds, 57 fourths of mean ſolar time; for the ſun takes ſo much time to go through an arc of $15' \, 9'' \, 45'''$; and then, in 365 days 0 h. 1 min. 0 ſec. 38 thirds, 57 fourths, the ſtar will have juſt completed its 366th revolution to the meridian.

This table was calculated by Mr. Ferguſon; and it is the only table of the kind in which the receſſion of the equinoctial points has been taken into the calculation.

SIDERITES, a name which ſome authors give the loadſtone. See MAGNET.

SIDERITIS, in *Botany*. See IRON-*wort*.

SIDEROCHITA, in *Natural Hiſtory*, a claſs of cruſtated ferruginous bodies, of a moderately firm and compact texture, compoſed of ferruginous mixed with earthy matter, and formed of repeated incruſtations, making ſo many coats or cruſts round a ſofter or harder nucleus, or round looſe earths, or an aqueous fluid. See FOSSILS.

Under this claſs are comprehended the *empherepyra*, *heteropyra*, *geodes*, and *enhydri*. See EMPHEREPYRA, &c.

SIDEROXYLUM, in *Botany*. See IRON *wood*.

SIDES-MEN, properly called *ſynods-men*, or *queſt-men*, perſons who, in larger pariſhes, are appointed to aſſiſt the church-wardens in inquiring into the manners of inordinate livers, and in preſenting offenders at viſitations.

SIDEROMANTIA, Σιδηρομαντεια, in *Antiquity*, a kind of divination performed with a red-hot iron, upon which they laid an odd number of ſtraws, and obſerved what figures, bendings, ſparklings, &c. they made in burning.

SIDEWAYS, in the *Manege*. To ride a horſe *ſideways*, is to paſſage him, or make him go upon two treads, one of which is marked by his ſhoulders, and the other by his haunches.

SIDUS, *Georgium*, in *Aſtronomy*, a new primary planet, diſcovered by William Herſchel, eſq. of Bath, in the year 1781; for which he obtained from the Royal Society the honorary recompence of ſir Godfrey Copley's medal, and ſo called in honour of his majeſty king George III. who has taken Mr. Herſchel under his patronage, and granted to him an annual ſalary. The editor has been favoured with the following account of this planet from the ingenious diſcoverer. From many calculations of our beſt aſtronomers and mathematicians, ſays Mr. Herſchel, I have collected the following particulars, as moſt to be depended upon.

Place of the node	- -	$2^s \, 11^d \, 49' \, 30''$
Inclination of the orbit	-	$43' \, 35''$
Place of the perihelion	-	$172^d \, 13' \, 17''$
Time of the perihelion paſſage		Sep. 7, 1799
Eccentricity of the orbit	-	,82034
Half the greater axis		19,07904
Revolution	-	83,3364 ſiderial years.

From my own obſervations on this planet's apparent diameter, which I have found cannot well be leſs than $4''$, nor indeed much greater, we infer that its real diameter is to that of the earth as 4,454 to 1; and hence it appears to be of very conſiderable bulk, and, except Saturn and Jupiter, by far the largeſt of the remaining planets. Its light is of a bluiſh-white colour, and in brilliancy between that of the Moon and of Venus. With a teleſcope which magnifies about three hundred times, it appears to have a very well defined viſible diſk; but with inſtruments of a ſmall power, it can hardly be diſtinguiſhed from a fixed ſtar of between the ſixth and ſeventh magnitude. In a very fine clear night, when the moon is abſent, it may alſo be ſeen by the naked eye.

SIEGE, in *War*, the encampment of an army around a place, with deſign to take it, either in the way of diſtreſs and famine, by making lines all around it, to prevent any relief from without; or by main force, as by digging trenches, and making formal attacks.

The word is French, and ſignifies, literally, *ſeat*; alluding to the army's taking its ſeat before a town, till the reduction of the place.

The moſt celebrated *ſieges* of antiquity are thoſe of Troy, Tyre, Alexandria, and Numantium; and, among the moderns, thoſe of Oſtend, Candia, Grave, Bergen-op-zoom, &c. See LINE, in *Fortification*.

SIEGE, *to raiſe a*, is to give over the attack of a place, quit the works thrown up againſt it, and the poſts formed about it.

SIEGE, *to turn a*, into a blockade. See BLOCKADE.

SIEVE, or SEARCE, an inſtrument ſerving to ſeparate the fine from the coarſe parts of powders, liquors, and the like; or to cleanſe pulſe from duſt, light grains, &c.

It is made of a rim of wood, the circle, or ſpace, whereof, is filled with a plexus of ſilk, tiffany, hair, linen, wire, or even thin ſlices of wood.

The *ſieves* which have large holes, are ſometimes alſo called *riddles*: ſuch is the coal or lime *ſieve*, the garden *ſieve*, &c.

When drugs, apt to evaporate, are to be paſſed through the *ſieve*, it is uſual to have it covered with a lid.

SIEUR, a title of honour, or quality, among the French; chiefly uſed among the lawyers, and in public acts, and other writings of that kind.

The title *ſieur* is alſo given by a ſuperior to an inferior, in his letters, and other private writings.

In this ſenſe, authors ſometimes uſe it, by way of modeſty, in ſpeaking of themſelves: thus, at the heads of books, we ſee, Traduction du *ſieur* d'Ablancourt; Oeuvres du *ſieur* d'Eſpreaux, &c.

SIEUR is alſo a term expreſſing *ſeigneury*, or lordſhip: as *ecuyer* or *ſieur* of ſuch a place.

SIGAH-*guſh*, or SIYAH-*ghuſh*, or *black-ear*, in *Zoology*, the name of a Perſian animal, of the *felis* or cat-kind, and no way differing from the lynx, but in that it has no ſpots; it has a lengthened face, and ſmall head; its ears have the fine velvety black pencil of hairs at the top, which are the diſtinguiſhing character of the lynx; the inſide and bottom of the ears are white; the noſe white, the eyes ſmall, the upper part of the body of a very pale reddiſh brown, the tail darker, and about half the length of the body; the belly and breaſt whitiſh; the limbs ſtrong, and pretty long, the hind-part of each marked with black. This animal inhabits Perſia, India, and Barbary; and is uſed in the chace of leſſer quadrupeds, and the larger ſort of birds, which they artfully ſurprize and ſeize; it is ſaid to attend upon the lion, and to feed on the remains of its prey. It is fierce when provoked. Pennant's Hiſt. Quadr. vol. ii. p. 283. Phil. Tranſ. vol. li. part ii. p. 648, &c. See *Tab.* V. *Quadrupeds*, N° 57.

SIGESBECKIA, in *Botany*, a genus of the *ſyngeneſia polygamia ſuperflua* claſs. Its characters are theſe: the proper involucrum of the flower is compoſed of five linear, taper, obtuſe leaves, which open beyond the petal, and is permanent; the common cover is five-leaved, ſitting cloſe; the leaves are oval, concave, equal, and diſpoſed in ſeveral ſeries, and between each leaf is contained a floret; the flower is compoſed of hermaphrodite florets in the diſk, and the border or ray is made up of female half florets, which are tongue-ſhaped; the hermaphrodite florets are funnel-ſhaped, cut in five parts at the brim; theſe have five ſhort ſtamina, with tubulous ſummits joined together, and an oblong, incurved germen, as large as the empalement, ſupporting a ſlender ſtyle, crowned by a bifid ſtigma; the germen turns to an oblong, four-cornered, blunt ſeed; the female half florets have a ſhort, broad, tongue-ſhaped petal, indented in three parts; theſe have a germen, ſtyle, and ſtigma, like the hermaphrodite florets, but have no ſtamina, and are ſucceeded by ſingle ſeeds, like the other. Miller mentions one ſpecies of this genus, which is a troubleſome weed in the Eaſt Indies. Linnæus mentions two ſpecies.

SIGHING, an effort of nature, by which the lungs are put into greater motion, and more dilated, ſo that the blood paſſes more freely, and in greater quantity, to the left auricle, and thence to the ventricle. Hence we learn, ſays Dr. Hales, how *ſighing* increaſes the force of the blood, and conſequently proportionably chears and relieves nature, when oppreſſed by its too ſlow motion, which is the caſe of thoſe who are dejected and ſad. Hales's Statical Eſſ. vol. ii. p. 6.

SIGHT, the exerciſe, or act, of the ſenſe of ſeeing.

Our *ſight*, the nobleſt and moſt uſeful of all our ſenſes, father Malebranche ſhews, deceives us in abundance of inſtances; nay, almoſt in all: particularly with regard to the magnitude and extent of things; their figures, motions, &c. Our eyes do not ſhew us any thing leſs than a mite: half a mite is nothing, if we believe their report. A mite is only a mathematical point, with regard to it; and we cannot divide it, without annihilating it. In effect, our *ſight* does not repreſent extenſion, ſuch as it is in itſelf; but only the relation and proportion it has to our body. Hence, as half a mite has no relation to our bodies, and that it cannot either preſerve or

or destroy us; our *sight* hides it entirely. Were our eyes made like microscopes, or were we ourselves as small as mites, we should judge very differently of the magnitude of bodies.

It may be added, that our own eyes are really no other than a kind of natural spectacles; that their humours do the same office as the lens in spectacles; and that, according to the figure of the crystalline, and its distance from the retina, objects are seen very differently by us; insomuch that we are not sure, that there are any two persons in the world who see them equally big. It is even very rare, that the same person sees the same object equally big with both eyes; as both eyes are very seldom perfectly alike: on the contrary, we generally see things bigger with the left than the right eye; of which we have some very good observations in the journal of the learned at Rome, for the year 1669. See VISION.

The Acta Leipsiensia give us an account of a man, who received a smart stroke on the pupil of one of his eyes from the end of a fiddle-string, which broke while he was tuning the instrument, and chanced to fly that way. Some cooling things were applied to the eye, and a bandage used to shade it from the light; but at midnight the patient chancing to wake in the dark, found that he could see with that eye, though not with the other: this continued a long time, and on trial he found that he could read a small print at midnight with this eye, but could scarce distinguish any thing with it in a bright and clear day.

We have, in the same collections, an account of a man, who, after the cure of a confirmed pox, saw every object double for a long time. Act. Leips. 1690.

It is a very common, and a very just observation, that children do not see any thing clearly when new-born; and if their eyes be then examined, they are found to want that brilliancy which they afterwards acquire; and finally, when any object is presented to their view, they at first turn their eyes about in such a manner, that it is evident they either do not see at all, or at best but very imperfectly and obscurely.

This imperfection may either be owing to a fault in some one of the humours, or in their capsules; or, finally, in the retina, or complexly in them all together. It is impossible to discover whether there be any imperfection in the retina in this state of life, that membrane being ever, in new-born infants, tender and soft like a jelly: if it be in any of the other parts that the imperfection lies, it must be either in their nature, or extent. Mr. Petit, of the Academy of Sciences at Paris, determined to enquire thoroughly into the cause of this, was at the pains of dissecting the eyes of several infants which had died soon after their birth, and in three fourths of them he found the vitreous, the crystalline, and the capsule, all greatly deficient in their transparence. The uvea appeared also more opake than in adults, and the pupil over large; and that there was either none, or, at the utmost, very little of the aqueous humour; and in those eyes, where the humours had not this opacity, they were all, as were also the membranes, of a reddish colour; and this was observed in fœtuses of seven and nine months old.

The cornea in these eyes was also remarkably thick, which is, in general, found to be the case in the eyes of all fœtuses. The thickness and opacity in these corneæ gradually diminish in time, and that soon; so that the eyes of children appear much brighter at two or three months old, than when new-born. The aqueous humour seems also, in most fœtuses, to be wholly wanting; and where it is found, is ever greatly in an under proportion to the other humours.

It therefore appears, that the dimness and imperfection of *sight*, in new-born infants, is owing to the over-thickness of the cornea, and to the too small portion of the aqueous or watery humour. It appears plainly also, from experience, that the eye is not able, in infants, to bear the light, till the pupil is greatly contracted; as is the case also, though in a less degree, in adults; and it is very probable, that the extreme softness of the retina in this state may make every ray of light affect it much more plainly than when grown more firm.

Mr. Petit having continued his examinations of the eyes of infants, up to the age of five or six weeks, found in all his dissections, that the cornea daily grew more and more convex and glossy; and this may be rationally concluded to be owing to the daily increase of the aqueous humour, which must, by that accretion, throw it out into a greater convexity, and make it daily more and more thin and transparent. The uvea also acquires a greater extension, and its fibres become more moveable; whence the pupil acquires a power of enlarging or contracting itself, at the approach or absence of light, with much more ease and readiness than it could before. The humours thus all become capable of letting in a larger quantity of light; the retina is at the same time every day gaining a new firmness, and the pupil becomes capable of an easy dilatation, or restriction, for the letting in occasionally a greater or less number of rays, and the refractions are perfected by the augmentation of the aqueous humour. It is plain, therefore, that the clearness of vision must every day increase. All this change comes on in infants only by time; and it may be judged of, as to its state, by inspection, by the brilliancy and convexity of the cornea, and by the manner of their turning their eyes towards objects set before them; and this time is not certain, or limited, but differs greatly in different children, some being able to see clearly at the end of a month, others not till after many months.

At the time that this gentleman was dissecting the eyes of human fœtuses and infants, he also curiously observed the eyes of young quadrupeds. The puppy, when newly brought forth, has always its eyes opake; the kitten, on the contrary, has them clear, and every way like those of adults of the same species. In fœtuses of other quadrupeds, the lamb has its cornea a little turbid and opake; the calf and the pig have them more or less opake, but the calf so most of all. Mem. de l'Acad. Par. 1727.

SIGHT, *short*. See MYOPS, and SHORT-SIGHTEDNESS.

SIGHT, *second*. See SECOND *sight*.

SIGHT, *point of*. See POINT *of view*.

SIGHT, *line of*. See COLLIMATION.

SIGHTS, in *Mathematics*, denote two thin pieces of brass, raised perpendicularly on the two extremes of an alidade or index of a theodolite, circumferentor, or other like instrument; each whereof has an aperture or slit up the middle, through which the visual rays pass to the eye, and distant objects are seen. Their use is, for the just direction of the index to the line of the object.

Sometimes the slits or apertures have glasses or lenses fitted into them; in which case, they are called *telescopic sights*, by way of distinction from the former; which, in respect hereof, are denominated *plain sights*.

Mr. Flamsteed and Dr. Hooke absolutely explode the use of *plain sights* in astronomical observations. The errors in Tycho's latitudes of the stars Mr. Flamsteed ascribes wholly to his using *plain sights*; and suspects, that Hevelius, using the same kind of *sights*, must fall into the like errors. Hevelius, on the contrary, in a paper in the Philosophical Transactions, vindicates the use of *plain sights*, and prefers them to *telescopic* ones: the main objection he makes to the latter is, that no observation can be safely taken with them, without first examining and rectifying them; in which examination, many and gross mistakes are liable to be committed. To which he adds, that in sextants, octants, azimuth quadrants, &c. he does not see how such examination can be made, at all times, without much loss of time.

SIGILLARIA, a solemn feast held among the ancient Romans; thus called from a custom which obtained therein, of sending little presents from one to another, consisting of seals, little figures, and sculptures, made of gold, silver, brass, or even earthen ware, and of devoting them to Saturn, as an atonement for themselves and their friends.

The *Sigillaria* followed immediately after the Saturnalia, and held two days; which, with the five days of the SATURNALIA, made a solemnity of seven days.

Some derive the origin of *sigils* and figures, in this solemnity, from the argei, or rushen figures of men, thrown annually into the Tiber, from the Pons Sublicius, by the Vestals, on the ides of March. Vide Macrob. Saturn. lib. i. cap. 7. 10, & 11. See also ARGEA.

SIGILLATA *terra*, a name given to several kinds of medicinal earths marked with seals, to express their being genuine. The principal is the LEMNIAN *earth*: this is a kind of earth, or bole, dug in the isle of Lemnos, and thence also called *Lemnian* earth; of considerable use in medicine.

It was anciently found in a mountain, in the neighbourhood of the city Hephæstia, where Diana's priests went, at certain times, with great ceremony, to dig it up. After a little preparation, they made it up into troches, and sealed them with Diana's seal; whence the appellation of *sigillata, sealed*.

SIGILLUM, a SEAL, or SIGNET.

SIGILLUM *Mariæ*, *lady's seal*, in *Botany*, a name by which some authors have called the *bryonia nigra*, or black BRYONY, a climbing plant, common in hedges.

SIGMA, among the Romans, the same with the STIBADIUM.

SIGMOIDES, a word used by medical writers to express any thing that is in the shape of the letter sigma. The valves of the heart have this epithet applied to them; the coracoide process of the scapula is also expressed by the same word; the semicircular cavity of the cubit, at the articulation of the fore-arm with the humerus, is sometimes

sometimes also called the *sigmoidal cavity*; and the cartilages of the *sigmoide circles* of the *aspera arteria*, or wind-pipe, have their denomination from the same circumstance.

SIGN, *signum*, a sensible mark, or character, denoting something absent, or invisible.

Anciently the monks, in all religious houses, were not allowed to speak, nor to express their minds, otherwise than by *signs*, which they learned in their noviciate. C. Rhodiginus and Porta have written of the ancient *signs* and cyphers used in speaking and writing.

SIGN, in *Algebra*, denotes a symbol, or CHARACTER.

SIGNS, *like*, *negative*, and *radical*. See the adjectives.

SIGN, in *Medicine*, denotes some appearances in the body, distinguishable by the senses; whence, by just reasoning, is inferred the presence, nature, state, event of health, a disease, or death.

Those which denote the present condition of a body, whether sick or well, dying or the like, are called *diagnostic signs*. Those which foretel the future state thereof, are called *prognostic signs*.

That *sign* which is peculiar to the disease, and inseparable from it, as arising from the nature thereof, is called a *pathognomonic sign*.

As all *signs* are effects produced by the cause of the disease, the disease itself, and its symptoms; they usually note the present condition of the matter which first produced the disease, and even of that produced by the disease: on which footing, the *signs* are all reducible to these three classes, viz. *signs* of the crudity and coction of the disease; of its event, whether in health, sickness, or death; and of its secretion and excretion; which last *signs* are called *critical* ones.

SIGN, *antecedent*. See ANTECEDENT.

SIGN, in *Astronomy*, a twelfth part of the ecliptic, or zodiac; or a portion containing thirty degrees thereof.

The zodiac was divided, by the ancients, into twelve segments, called *signs*; commencing from the point of intersection of the ecliptic and equinoctial; which *signs* they denominated from the twelve constellations, which, in Hipparchus's time, possessed those segments. But the constellations have since so changed their places, by the precession of the equinox, that Aries is now got out of the *sign* called *Aries*, into Taurus, Taurus into Gemini, &c.

The names of the twelve *signs*, and their order, are as follow: *Aries*, *Taurus*, *Gemini*, *Cancer*, *Leo*, *Virgo*, *Libra*, *Scorpio*, *Sagittarius*, *Capricornus*, *Aquarius*, *Pisces*; each of which, with the stars thereof, see under its proper article, ARIES, TAURUS, &c.

The *signs* are distinguished, with regard to the season of the year when the sun is in them, into *vernal*, *æstival*, *autumnal*, and *brumal*.

SIGNS, *the vernal*, or *spring*, are, Aries, Taurus, Gemini.

SIGNS, *the æstival*, or *summer*, are, Cancer, Leo, and Virgo.

SIGNS, *the autumnal*, are, Libra, Scorpio, and Sagittarius.

SIGNS, *the brumal*, or *winter*, are, Capricornus, Aquarius, and Pisces.

The *vernal* and *summer signs* are also called *northern signs*. And the *autumnal* and *brumal signs*, *southern signs*.

SIGNS, *ascending*. See ASCENDING.

SIGNS, *fixed*. See FIXED.

SIGNS, *masculine*. See MASCULINE.

SIGN *manual*, the setting one's hand and seal to a writing. See SIGNATURE.

The expression is used when any bill or writing is signed under the hand of the king, &c. Counterfeiting the *sign manual*, privy signet, or privy seal, is treason. 1 Mar. stat. 2. cap. 6. See PATENTS.

Among the Saxons, before the invention of seals, a ✠ was a common *sign*, or *signum*, prefixed to the names of most subscribing witnesses in charters, and other deeds: as ✠ *signum Roberti Episcop. Lond.* &c. See SEAL.

SIGNA, *standards*, among the Romans, were of different sorts; on some of them the image of the emperor was represented, and they that carried them were called *imaginiferi*; others had a hand stretched out, as a symbol of concord; and these ensign-bearers were called *signiferi*; some had a silver eagle, the bearers of which were called *aquiliferi*; others had a dragon with a silver head, and the rest of his body of taffety, which was blown by the wind as if it had been a real dragon, and the bearers of this ensign were called *draconarii*; lastly, the emperor's ensign was called *labarum*, and those that carried it *labariferi*, which they carried out when he went in person to the field; it was of a purple colour, beset with gold fringe, and adorned with precious stones.

All these ensigns were sustained with a half-pike, sharp at the end, that it might be the more easily fixed in the ground.

SIGNAL, a certain sign agreed upon for the conveying of intelligence to places to which the voice cannot reach.

Signals are given for the beginning of a battle, or an attack; usually with drums and trumpets: at sea, they are given by cannon or musquet-shot, by lights, sails, flags, &c.

All *signals* may be reduced into three different kinds; viz. those which are made by the sound of particular instruments, as the trumpet, horn, or fife; to which may be added, striking the bell, or beating the drum; those which are made by displaying pendants, ensigns and flags of different colours; or by lowering or altering the position of the sails; and those which are executed by rockets of different kinds; by firing cannon or small arms; by artificial fire-works; and by lanthorns.

The *signals* by the drum, made use of in military EXERCISE, instead of the word of command, are as follow: a short roll, q. d. to caution; a flam, to perform any distinct operation; to arms, to form the line or battalion; the march, to advance, except when intended for a salute; the quick march, to advance quick; the point of war, to march and charge; the retreat, to retreat; drum ceasing, to halt; two short rolls, to perform the flank-firing; the dragoon march, to open the battalion; the grenadier march, to form the column; the troop, to double divisions; the long roll, to form the square; the grenadier march, to reduce the square to the column; the preparative, to make ready and fire; the general, to cease firing; two long rolls, to bring or lodge the colours.

Signals have been in use in all ages: the ancients, who had no regular couriers, or posts, made use thereof to convey intelligence of what passed at a great distance; for which purpose, they placed sentinels on the eminences, from space to space; some mention whereof we find made by Homer himself, Iliad Θ. v. 553, &c. Odyss. Ξ. v. 261. Those people, thus disposed, lighted fires, or flambeaux, in the night-time. In the Agamemnon of Æschylus, that prince, at his departure for Troy, promises Clytemnestra, that, the very day the city should be taken, he would apprise her of his victory by fires lighted express. He keeps his word, and tidings are brought the princess, that Troy is taken, and that Agamemnon's *signals* are seen.

Frontinus observes, they were in use among the Arabs; and Bonaventura Vulcanius, in his scholia on Aristotle's book De Mundo, adds, that, while the Moors were masters of the greatest part of Spain, they built, on the tops of the mountains, an infinity of turrets, or watch-houses, called, in the Arabic, *atalayas*, a word the Spaniards still retain; whence, by fires, they could immediately alarm the whole kingdom. Indeed the custom was much more ancient than the Moors in Spain. Q. Curtius observes, it was very frequent among the Asiatics, in the time of Alexander: Livy and Cæsar, also, both mention it as used among the Romans. Polydore Virgil shews it of great antiquity in England; and Boethius adds, that, in several places in England, there were the remains of huge poles that have served for this purpose.

SIGNALS *at sea*, are signs made by the admiral, or commander in chief of a squadron of ships, either in the day, or by night, whether for sailing, for fighting, or for the better security of the merchant ships under their convoy. See ENGAGEMENT.

These *signals* are very numerous, and important; being all appointed and determined by order of the lord high admiral, and lords of the admiralty, and communicated in the instructions sent to the commander of every ship of the fleet, or squadron, before their putting out to sea. It is by the combination of *signals*, previously known, that the admiral conveys orders to his fleet; every squadron, every division, and every ship of which has its particular *signal*. The instruction may, therefore, occasionally be given to the whole fleet, or to any of its squadrons, to any division of those squadrons, or to any ship of those divisions. Hence the *signal* of command may at the same time be displayed for three divisions, and for three ships of each division; or for three ships in each squadron, and for only nine ships in the whole fleet. For, the general *signal* of the fleet being shewn, if a particular pendant be also thrown out from some remarkable place on the same mast with the general *signal*, it will communicate intelligence to nine ships that wear the same pendant.

The preparatory *signal* given by the admiral to the whole, or any part of his fleet, is immediately answered by those to whom it is directed; by shewing the same *signal*, to testify that they are ready to execute his orders. Having observed their answer, he will shew the *signal* which is to direct their operations: as, to chase, to form the line, to begin the engagement, to board, to double upon the enemy, to rally or return to action, to discontinue the fight, to retreat and save themselves. The dexterity of working the ships in a fleet depends on the precise moment

ment of executing these orders, and on the general harmony of their movements: a circumstance which evinces the utility of a *signal* of preparation.

As the extent of the line of battle, and the fire and smoke of the action, or other circumstances in navigation, will often prevent the admiral's *signals* from being seen throughout the fleet, they are always repeated by the officers next in command; by ships appointed to repeat *signals*; and, finally, by the ship or ships for which they are intended. The ships that repeat the *signals*, besides the chiefs of squadrons or divisions, are usually frigates lying to windward or leeward of the line. These should be extremely vigilant to observe and repeat the *signals*, whether they are to transmit the orders of the commanders in chief, or his seconds, to any part of the fleet; or to report the fortunate or distressful situation of any part thereof. By this means, all the ships from the van to the rear will, unless disabled, be ready at a moment's warning to put the admiral's designs in execution. To preserve order in the repetition of *signals*, and to favour their communication, without embarrassment, from the commander in chief to the ship for which they are designed, the commanders of the squadrons repeat after the admiral; the chiefs of the divisions, according to their order in the line, after the commanders of the squadrons; and the particular ships, after the chiefs of the divisions; and those, in return, after the particular ships, *vice versa*, when the object is to convey any intelligence from the latter to the admiral.

Besides the *signals* above mentioned, there are others for different ranks of officers; as for captains, lieutenants, masters, &c. or for any of those officers of a peculiar ship. Falconer.

SIGNALS *by day*. When the commander in chief would have them prepare for sailing, he first looses his fore-top-sail, and then the whole fleet are to do the same. When he would have them unmoor, he looses his main-top-sail, and fires a gun, which, in the royal navy, is to be answered by every flag-ship. When he would have them weigh, he looses his fore-top-sail, and fires a gun, and sometimes hauls home his sheats; the gun is to be answered by every flag-ship, and every ship is to get to sail as soon as it can. If with the leeward-side, the stern-most ship is to weigh first. When he would have the weather-most and head-most ships to tack first, he hoists the union-flag at the fore-top-mast-head, and fires a gun, which each flag-ship answers; but if he would have the stern-most and leeward-most ships to tack first, he hoists the union-flag at the mizen-top-mast-head, and fires a gun; and when he would have all the whole fleet tack, he hoists an union, both on the fore and mizen-top-mast-heads, and fires a gun. When, in bad weather, he would have them wear, and bring to the other tack, he hoists a pendant on the ensign-staff, and fires a gun; and then the leeward-most and stern-most ships are to wear first, and bring on the other tack, and lie by, or go on with an easy sail, till he comes a-head; every flag is to answer with the same *signal*. If they are lying by, or sailing by a wind, and the admiral would have them bear up and sail before the wind, he hoists his ensign, and fires a gun, which the flags are to answer; and then the leeward-most ships are to bear up first, and to give room for the weather-most to wear, and sail before the wind, with an easy sail, till the admiral comes a-head. But if it should happen, when the admiral hath occasion to wear and sail before the wind, that both jack and ensign be abroad, he will haul down the jack, before he fires the gun to wear, and keep it down till the fleet is before the wind. When they are sailing before the wind, and he would have them bring to, with the starboard tacks aboard, he hoists a red flag at the flag-staff, on the mizen-top-mast-head, and fires a gun. But if they are to bring to, with the larboard tack, he hoists a blue flag at the same place, and fires a gun, and every ship is to answer the gun. When any ship discovers land, he is to hoist his jack and ensign, and keep it abroad, till the admiral or commander in chief answer him, by hoisting his; on sight of which, he is to hawl down his ensign. If any discovers danger, he is to tack and bear up from it, and to hang his jack abroad from the main-top-mast cross-trees, and to fire two guns; but if he should strike or stick fast, then, besides the same *signal* with his jack, he is to keep firing, till he sees all the fleet observe him, and endeavour to avoid the danger. When any sees a ship or ships more than the fleet, he is to put abroad his ensign, and there keep it, till the admiral's is out, and then to lower it, as often as he sees ships, and stand in with them, that so the admiral may know which way they are, and how many; but if he be at such a distance, that the ensign cannot well be discovered, he is then to lay his head towards the ship or ships so descried, and to brail up his low sails, and continue hoisting and lowering his top-sails, and making a waft with his top-gallant sails, till he is perceived by the admiral. When the admiral would have the vice-admiral, or him that commands in the second post of the fleet, to send out ships to chase, he hoists a flag, striped white and red on the flag-staff, at the fore-top-mast-head, and fires a gun. But if he would have the rear-admiral do so, he then hoists the same *signal* on the flag-staff at the mizen-top-mast-head, and fires a gun. When the admiral would have any ship to chase to windward, he makes a *signal* for speaking with the captain, and he hoists a red flag in the mizen shrowds, and fires a gun; but if to chase to leeward, a blue flag; and the same *signal* is made by the flag, in whose division that ship is. When he would have them give over chace, he hoists a white flag on his flag-staff at the fore-top-mast-head, and fires a gun; which *signal* is to be made also by that flag-ship which is nearest the ship that gives chace, till the chasing ship sees the *signal*. In case of springing a leak, or any other disaster, that disables their ship from keeping company, they are to haul up their courses, and fire two guns. When any ship would speak with the admiral, he must spread an English ensign, from the head of his main, or fore-top-mast, downwards on the shrowds, lowering his main, or fore-top-sail, and continue firing guns, till the admiral observe him; and if any ship perceive this, and judgeth the admiral doth not, that ship must make the same *signal*, and make the best of his way to acquaint the admiral therewith, who will answer by firing one gun. When the admiral would have the fleet to prepare to anchor, he hoists an ensign, striped red, blue, and white, on the ensign-staff, and fires a gun; and every flag-ship makes the same *signal*. If he would have the fleet moor, he hoists his mizen-top-sail, with the clew-lines hauled up, and fires a gun. If he would have the fleet cut or slip, he looses both his top-sails, and fires two guns; and then the leeward ships are to cut or slip first, to give room to the weather-most to come to sail. So if he would have any particular ship to cut or slip, and to chase to windward, he makes the *signal* for speaking with that ship, hoists a red flag in the mizen-shrowds, and fires a gun; but if a ship is to chase to leeward, he hoists a blue flag as before. If he would have the fleet exercise their small arms, he hoists a red flag on the ensign-staff, and fires a gun; but if the great guns, then he puts up a pendant over the red flag.

SIGNALS *by night*, to be observed at an anchor, weighing anchor, and sailing, are as follow. When the admiral would have the fleet to unmoor, and ride short, he hangs out three lights, one over another in the main-top-mast-shrowds, over the constant light in the main-top, and fires two guns, which are to be answered by the flag-ships; and each private ship hangs out a light in the mizen-shrowds. Note, that all guns, fired for *signals* in the night, must be fired on the same side, that they may make no alteration in the sound. When he would have them weigh, he hangs a light in the main-top-mast-shrowds, and fires a gun, which is to be answered by all the flags; and every private ship must hang out a light in his mizen-shrowd. When he would have them tack, he hoists two flags on the ensign-staff, one over another, above the constant light in his poop, and fires a gun, which is to be answered by all the flags; and every private ship is to hang out a light extraordinary, which is not to be taken in, till the admiral takes in his. After the *signal* is made, the leeward-most and stern-most ships must tack as fast as they can, and the stern-most flag-ship, after he is about on the other tack, is to lead the fleet, and him they are to follow, to avoid running through one another in the dark. When he is upon a wind, and would have the fleet veer, and bring to on the other tack, he hoists up one light at the mizen-peek, and fires three guns; which is to be answered by all the flag-ships, and every private ship must answer, with one light at the mizen-peek. The stern-most and leeward-most ships are to bear up so soon as the *signal* is made. When he would have them, in blowing weather, to lie a-try, short, or a-hull, or with the head-sails braced to the mast, he will form lights of equal height, and fire five guns, which are to be answered by the flag-ships, and then every private ship must shew four lights; and after this, if he would have them to make sail, he then fires ten guns, which are to be answered by all the flags, and then the head-most and weather-most ships are to make sail first. When the fleet is sailing large, or before the wind, and the admiral would have them bring to, and lie by, with their starboard tacks aboard, he puts out four lights in the fore-shrowds, and fires six guns; but if with the larboard tacks aboard, he fires eight guns, which are to be answered by the flag-ships; and every private ship must shew four lights. The wind-most ships must

muſt bring to firſt. Whenever the admiral alters his courſe, he fires one gun, without altering his lights, which is to be anſwered by all the flag-ſhips. If any ſhip hath occaſion to lie ſhort, or by, after the fleet hath made ſail, he is to fire one gun, and ſhew three lights in his mizen-ſhrowds. When any one firſt diſcovers land, or danger, he is to ſhew as many lights as he can, to fire one gun, and to tack, or bear away, from it; and, if any one happen to ſpring a leak, or any be diſabled from keeping company with the fleet, he hangs out two lights of equal height, and fires guns till he is relieved by ſome ſhip of the fleet. If any one diſcovers a fleet, he is to fire guns, make falſe fires, put one light out on the main-top, three on the poop, to ſteer after them, and to continue firing of guns, unleſs the admiral call him off, by ſteering another courſe, and fire two or three guns, for then he muſt follow the admiral. When the admiral anchors, he fires two guns, a ſmall ſpace of time one from the other, which are to be anſwered by the flag-ſhips, and every private ſhip muſt ſhew two lights. When the admiral would have the fleet to moor, he puts a light on each top-maſt-head, and fires a gun, which is to be anſwered by the flag-ſhips, and every private ſhip is to ſhew one light. If he would have them lower their yards and top-maſts, he hoiſts one light upon his enſign-ſtaff, and fires one gun; which is to be anſwered by the flag-ſhips; and every private ſhip muſt ſhew one light. And when he would have them hoiſt their yards and top-maſts, he puts out two lights, one under the other, in the mizen-top-maſt-ſhrowds, and fires one gun; which is to be anſwered by the flag-ſhips; and each private ſhip muſt ſhew one light in the mizen-ſhrowds. If any ſtrange ſhip be diſcovered coming into the fleet, the next ſhip is to endeavour to ſpeak with her, and bring her to an anchor, and not ſuffer her to paſs through the fleet. And if any one diſcovers a fleet, and it blow ſo hard, that he cannot come to give the admiral notice timely, he is to hang out a great number of lights, and to continue firing gun after gun, till the admiral anſwers him with one. When the admiral would have the fleet to cut or ſlip, he hangs out four lights, one at each main-yard-arm, and at each fore-yard-arm, and fires two guns; which are to be anſwered by the flag-ſhips; and every private ſhip is to ſhew one light.

SIGNALS *uſed when a fleet ſails in a fog.* If the admiral would have them weigh, he fires ten guns; which every flag-ſhip is to anſwer. To make them tack, he fires four guns, which are to be anſwered by the flag-ſhips; and then the leeward-moſt and ſtern-moſt ſhips muſt tack firſt, and after they are about, to go with the ſame ſail they tacked with, and not to lie by, expecting the admiral to come a-head; and this is to avoid the danger of running through one another in thick weather.

When the admiral brings to, and lies with his head-ſails to the maſt; if with the ſtarboard tack aboard, he fires ſix guns, but if with the larboard-tack, he fires eight guns, which the flag-ſhips are to anſwer. And after this, if he makes ſail, he fires ten guns, which the flag-ſhips muſt anſwer, and then the head-moſt and weather-moſt ſhips are to make ſail firſt. If it grow thick and foggy weather, the admiral will continue ſailing, with the ſame ſail ſet, that he had before it grew foggy, and will fire a gun every hour, which the flag-ſhips muſt anſwer, and the private ſhips muſt anſwer, by firing of muſquets, beating of drums, and ringing of bells. But if he be forced to make either more or leſs ſail than he had, when the fog began, he will fire a gun every half hour, that the fleet may diſcern, whether they come up up with the admiral, or fall aſtern of him; and the flags and private ſhips are to anſwer, as before. If any one diſcovers danger, which he can avoid, by tacking and ſtanding from it, he is to make the *ſignal* for tacking in a fog; but if he ſhould chance to ſtrike, and ſtick faſt, he is to fire gun after gun, till he thinks the reſt have avoided the danger. When the admiral would have the fleet to anchor, he fires two guns, which the flags are to anſwer; and after he hath been half an hour at an anchor, he will fire two guns more, to be anſwered by the flags, as before; that all the fleet may know it.

SIGNALS *for calling officers on board the admiral.* When the admiral puts aboard an union-flag in the mizen-ſhrowds, and fires a gun, all the captains are to come aboard him; and if, with the ſame *ſignal*, there be alſo a waft made with the enſign, then the lieutenant of each ſhip is to come on board. If an enſign be put aboard in the ſame place, all the maſters of the ſhips of war are to come on board the admiral. If a ſtandard on the flag-ſtaff be hoiſted at the mizen-top-maſt-head, and a gun fired, then all the flag-officers are to come aboard the admiral. If the Engliſh flags only, then a ſtandard in the mizen-ſhrowds, and fire a gun: if the flags, and land general officers, then the admiral puts aboard a ſtandard at mizen-top-maſt-head, and a pendant at mizen-peek, and fires a gun. If a red flag be hoiſted in the mizen-ſhrowds, and a gun fired, then the captains of his own ſquadron are to come aboard the admiral; and if, with the ſame *ſignal*, there be alſo a waft with the enſign, the lieutenant of each ſhip muſt come aboard. If he hoiſts a white flag, as before, then the vice-admiral, or he that commands in the ſecond poſt, and all the captains of his ſquadron, are to go on board the admiral: if a blue flag, &c. then the rear-admiral, and the captains of his ſquadron, muſt come on board, and if a waft, as before, the lieutenants. When a ſtandard is hoiſted on the enſign-ſtaff, and a gun fired, the vice and rear admirals muſt come on board the admiral's ſhip. When the admiral would ſpeak with the captains of his own diviſion, he will hoiſt a pendant on the mizen-peek, and fire a gun; and if with the lieutenants, a waft is made with the enſign, and the ſame *ſignal*; for whenever he would ſpeak with the lieutenants of any particular ſhip, he makes the *ſignal* for the captain, and a waft alſo with the enſign. When the admiral would have all the tenders in the fleet come under his ſtern, and ſpeak with him, he hoiſts a flag, yellow and white, at the mizen-peek, and fires a gun. But if he would ſpeak with any particular ſhip's tender, he makes a *ſignal* for ſpeaking with the captain ſhe tends upon, and a waft with the jack. If all the pinnaces and barges are to come on board, manned and armed, the *ſignal* is a pendant on the flag-ſtaff, hoiſted on the fore-top-maſt-head, and a gun fired; and if he would have them chaſe any ſhip, veſſel, or boat in view, he hoiſts the pendant, and fires two guns. The *ſignal* for the long-boats to come on board him, manned and armed, is the pendant hoiſted on the flag-ſtaff, and the mizen-top-maſt-head, and a gun fired; and if he would have them chaſe any ſhip, veſſel, or boat in open view, without coming on board him, he hoiſts the pendant, as aforeſaid, and fires two guns. When the admiral would have all the boats in the fleet come on board him, manned and armed, he hoiſts a pendant on the flag-ſtaff, both on the fore-top-maſt, and mizen-top-maſt-head, and fires one gun; but if he would have them chaſe, he hoiſts his pendants, as before, and fires two guns. When the admiral would ſpeak with the victualler, or his agent, he puts an Engliſh enſign in the mizen-top-maſt-throwds; and when with him that hath the charge of the gunner's ſtores, he will ſpread an enſign at his main-top-ſail-yard-arm.

SIGNALS *for managing a ſea-fight.* When the admiral would have the fleet form a line of battle, one ſhip a head of another, he hoiſts an union-flag at the mizen-peek, and fires a gun; and every flag-ſhip does the like. But when they are to form a line of battle, one a-breaſt of another, he hoiſts a pendant with the union-flag, &c. When he would have the admiral of the white, or him that commands in the ſecond poſt, to tack, and endeavour to gain the wind of the enemy, he ſpreads a white flag under the flag at the main-top-maſt-head, and fires a gun; and when he would have the vice-admiral of the blue do ſo, he doth the ſame with the blue flag. If he would have the vice-admiral of the red do ſo, he ſpreads a red flag from the cap, on the fore-top-maſt-head, downward on the back-ſtay; if the vice-admiral of the blue, he ſpreads a blue flag, &c. and fires a gun. If he would have the rear-admiral of the red do ſo, he hoiſts a red flag at the flag-ſtaff, at the mizen-top-maſt-head; if the rear-admiral of the white, a white flag; if the rear-admiral of the blue, a blue flag, and under it a pendant of the ſame colour, with a gun. If he be to leeward of the fleet, or any part of it, and he would have them bear down into his wake or grain, he hoiſts a blue flag at the mizen-peek, and fires a gun. If he would be to leeward of the enemy and his fleet, or any part of it be to leeward of him, in order to bring theſe ſhips into the line, he bears down with a blue flag at the mizen-peek, under the union-flag (which is the *ſignal* for battle), and fires a gun; and then thoſe ſhips, that are to leeward of him, muſt endeavour to get into his wake or grain, according to their ſtation in the line of battle. When the fleet is ſailing before the wind, and he would have him, who commands in the ſecond poſt, and the ſhip of the ſtarboard quarter, to clap by the wind, and come to the ſtarboard tack, he hoiſts a red flag at the mizen-top-maſt-head; but a blue one, if he would have ſhips of the larboard quarter come to the larboard tack, with a gun. If the van are to tack firſt, he ſpreads the union-flag at the flag-ſtaff, on the fore-top-maſt-head, and fires a gun, if the red flag be not abroad; but if it be, then he lowers the fore-top-ſails a little; and the union-flag is ſpread from the cap of the fore-top-maſt downwards; and every flag-ſhip doth the ſame. If the

rear

rear be to tack firft, he hoifts the union-flag on the flag-ftaff, at the mizen-top-maft-head, and fires a gun; which all the flag-fhips are to anfwer. If all the flag-fhips are to come into his wake or grain, he hoifts a red flag at his mizen-peak, and fires a gun; and all the flag-fhips muft do the fame. If he would have him that commands in the fecond poft of his fquadron to make more fail (though he himfelf fhorten fail), he hoifts a white flag on the enfign-ftaff. But if he that commands in the third poft be to do fo, he hoifts a blue flag, and fires a gun, and all the flag-fhips muft make the fame *fignal*. Whenever he hoifts a red flag on the flag-ftaff at the fore-top-maft-head, and fires a gun, every fhip in the fleet muft ufe their utmoft endeavour to engage the enemy, in the order prefcribed them. When he hoifts a white flag at his mizen-peak, and fires a gun; then all the fmall frigates of his fquadron, that are not of the line of battle, are to come under the ftern. If the fleet be failing by a wind in the line of battle, and the admiral would have them brace their head-fails to the maft, he hoifts up a yellow flag, on the flag-ftaff, at the mizen-top-maft-head, and fires a gun; which the flag-fhips are to anfwer; and then the fhips in the rear muft brace firft. After this, if he would have them fall their head-fails, and ftand on, he hoifts a yellow flag on the flag-ftaff of the fore-top-maft-head, and fires a gun, which the flag-fhips muft anfwer, and then the fhips in the van muft fall firft, and ftand on. If when this *fignal* is made, the red flag at the fore-top-maft-head be abroad, he fpreads the yellow flag under the red. If the fleets being near one another, the admiral would have all the fhips to tack together, the fooner to lie in a pofture to engage the enemy; he hoifts an union-flag on the flag-ftaves at the fore and mizen-top-maft-heads, and fires a gun; and all the flag-fhips are to do the fame. The fleet being in a line of battle, if he would have the fhip that leads the van, hoift, lower, fet, or haul up any of his fails, he fpreads a yellow flag, under that at his main-top-maft-head, and fires a gun, which *fignal* the flag fhips are to anfwer; and the admiral will hoift, lower, fet, or haul up the fail, which he would have the fhip that leads the van, do; which is to be anfwered by the flag-fhips of the fleet. When the enemies run, and he would have the whole fleet follow them, he makes all the fail he can after them himfelf, takes down the *fignal* for the line of battle, and fires two guns out of his fore-chafe, which the flag-fhips anfwer; and then every fhip is to endeavour to come up with and board the enemy. When he would have the chace given over, he hoifts a white flag at the fore-top-maft-head, and fires a gun. If he would have the red fquadron draw into a line of battle, one abreaft of another, he puts abroad a flag, ftriped red and white, on the flag-ftaff at the main-top-maft-head, with a pendant under it, and fires a gun: if the white or fecond fquadron is to do fo, the flag is ftriped red, white, and blue: if the blue or third fquadron is to do fo, the flag is a Genoefe enfign and pendant: but if they are to draw into a line of battle, one a-head of another, the fame *fignals* are made with a pendant. If they are to draw into the line of battle one a-ftern of another, with a large wind, and he would have the leaders go with the ftarboard tacks, aboard by the wind; he hoifts a red and white flag at the mizen-peek, and fires a gun: but if they fhould go with the larboard tacks aboard, by the wind, he hoifts a Genoefe flag at the fame place; which *fignals*, like others, muft be anfwered by the flag-fhips.

SIGNATORES, among the Romans, witneffes who fealed wills and marriage contracts.

SIGNATURE, *fignatura*, *figning*, a fubfcription, or putting of one's name at the bottom of an act, or deed, in one's own hand-writing.

Anciently, when very few people could write, they difpenfed with the ufe of *fignatures*; and contented themfelves with the party's SEAL. See DEED.

SIGNATURE *of the court of Rome* is a fupplication anfwered by the pope, whereby he grants a favour, difpenfation, or collation to a benefice, by putting the *fiat* at the bottom thereof, in his own hand; or the *conceffum eft* written in his prefence. This *fignature*, at the bottom of the fupplication, gives name to the whole inftrument.

The *fignature* contains the claufes, derogations, and difpenfations, wherewith the pope grants the favour, or the benefice, with a commiffion for the execution thereof, either in forma dignum, or in gracious form.

A *fignature* of the pope's own hand, whereby he anfwers, *Fiat ut petitur*, is preferred to another anfwered by the prefect, in his prefence, in thefe words, *Conceffum uti petitur in præfentia D. N. papæ*. Sometimes in *fignatures*, with the *fiat*, the pope adds, *proprio motu*; which claufe gives them ftill farther force.

There are three kinds of *fignatures*; one in *forma gratiofa*, difpatched on an atteftation of the ordinary; another in *forma dignum antiqua*, difpatched for canonicates; the third in *forma dignum noviffima*, which is a kind of fecond *fignature*, or executorial letter, granted where, upon the ordinary's failing to execute the firft, within thirty days, the neareft other ordinary is enjoined to execute it.

SIGNATURE, in *Printing*, denotes a mark at the bottom of each fheet to regulate the gathering and binding of the book; and to fhew the order and number of the fheets, in collating, to fee if the book is perfect.

The *fignatures* confift of the capital letters of the alphabet. If there be more fheets than letters in the alphabet, to the capital letter they add a fmall one of the fame fort; i. e. a little a after a great A, &c. which they repeat, as often as is neceffary.

SIGNATURE, *fignatura*, is alfo ufed, by fome naturalifts, for the refemblance a vegetable or mineral bears to any part of the human body: this is, by fome fantaftical people, fuppofed to afford an indication of its virtues and ufe.

SIGNET, one of the king's feals, ufed for fealing his private letters, and figning all grants which pafs his majefty's hand by bill. Forging it is treafon. See SIGN *manual*.

The *fignet* is always in the cuftody of the king's fecretaries; on whom attend four clerks of the *fignet-office*. See SECRETARY and CLERK.

SIGNIFER, among the Romans, an enfign-bearer, or the perfon who carries the ftandard, on which was reprefented a hand ftretched out. See SIGNA.

SIGNIFICATION, the fenfe or meaning of a fign, word, phrafe, emblem, device, or the like; that is, the thing denoted, by fuch fign, word, figure, &c.

We are almoft perfectly at a lofs as to the *fignification* of the hieroglyphic characters of the ancients.

SIGNIFICATION, in *Law*, is the notification of an act, &c. made to the oppofite party, by a copy, &c. thereof, given and attefted by a proper officer.

Some *fignifications* are to be made to the perfon himfelf; or at leaft at his houfe: for others, it is enough that they be made to the party's attorney, or agent.

SIGNIFICAVIT. See EXCOMMUNICATO *capiendo*.

SIGNING. See SIGNATURE, and COUNTER-*figning*.

SIGNINUM, among the Romans, a kind of pavement much efteemed: it was made of powdered fhells mixed with lime.

SIGNUM *pugnæ*, the fignal of battle, among the Romans, was a coat of arms, of a purple colour, fet upon the general's pavilion.

SIGUETTE, in the *Manege*, is a caveffon of iron, with teeth or notches, that is, a femicircle of hollow and vaulted iron, with teeth like a faw, confifting of two or three pieces joined with hinges, and mounted with a head-ftall and two ropes, as if they were the caveffons that in former times were wont to be put upon the nofe of a fiery ftiff-headed horfe, in order to keep him in fubjection.

There is a fort of *figuette*, that is, a round iron all of one piece, fewed under the nofe-band of the bridle, that it may not be in view. This *figuette* we employ with a martingale, when a horfe beats upon the hand.

SIL, in *Natural Hiftory*, a name given by the ancients to a red ochre, of which they had three diftinct kinds, the *fil fyricum*, *fil atticum*, and *fil marmorofum*; all of which are to be had at this time, and all very valuable paints.

SIL *fyricum* is a fubftance well known among the painters of the prefent age, though not by name, being the red ochre, commonly ufed for a purple colour in their coarfer works; though it is capable of yielding by proper management, a colour fit for their fineft. It is very heavy, and of a fine ftrong red with fome tendency to purple, of a loofe friable texture, and very rough and dufty furface. It adheres firmly to the tongue, is fomewhat foft to the touch, crumbles eafily to pieces between the fingers, and ftains the hands very much. It melts freely in the mouth, and has a ftrongly aftringent tafte. It burns to a much paler colour, and makes no effervefcence with aqua fortis. Thefe are the characters by which this is diftinguifhed from all the other red earths. It is dug in many parts of England, and is fent to London in great quantities. Hill's Hift. of Foff. p. 57.

SIL *atticum* is the purple ochre, called of later times ALMAGRA.

SIL *marmorofum* is alfo a fubftance in fome degree known in the world at this time. It fometimes falls into the hands of our painters, who call it Indian ftone red, but it has many other valuable qualities extremely worth enquiring

quiring into. It is the hardest and driest of all the ochres, and while in the stratum appears absolutely stony, forming thin, flat, regular strata, and is so hard that it is not to be dug without the pick-ax; it is also of an obscurely and irregular laminated structure, and naturally breaks into flat pieces. It is of a fine purplish red, and very heavy, and contains a multitude of fragments of a fine lead-ore which are bright and bluish, and make a very pretty appearance, and beside these has always among it a small quantity of pure native cinnabar: both these substances are so nicely mixed with it, that it is scarce possible to break off a piece of an inch square from any part of the strata that has not more or less of both in it. It is of a dusty surface, and rough to the touch, and adheres very firmly to the tongue, and stains the hands. It is of a very austere and astringent taste, and makes no effervescence with acids. There are considerable strata of it on the borders of China, and it is much used as a paint in the East Indies. There is some of it at times brought over to us, but not enough to make it a regularly marketable commodity. Beside its use as a paint, it is worth enquiring into on account of the cinnabar it contains; three ounces of it having yielded, on trial, two drachms and a scruple of pure quicksilver. Hill's Hist. of Foss. p. 62.

SILACH, a word used by medical authors for a disorder of the eye-lid, consisting in a preternatural thickness of it, or a swelling without inflammation.

SILATUM, a word used by the ancient Romans to express a morning's draught of wine. This was usually of a wine medicated with the plant sili, or seseli, and thence had its name. It has always been the custom to medicate the morning draughts of any strong liquor; we do it with wormwood, or the common bitter tincture; the Indians with ginger.

SILAUM, in *Botany*, a name used by some authors for the *saxifraga pratensis*, or common meadow saxifrage.

SILENE, in *Botany*. See *Viscous* CAMPION.

SILENTIARY, *silentiarius*, an officer among the ancient Roman slaves; being, according to some authors, a slave placed over the rest, to prevent any noise and uproar, and to keep them silent.

Seneca, in his Epistles, mentioning the great care taken to keep the slaves mute, has given occasion to Lipsius, Popma, and some others, to suppose, that the *silentiary* was established in his time: but others, as Pignorius, think no such conclusion can be drawn from Seneca's words; nor any thing, but that they were, even then, very severe in preventing any noise among the slaves. As to the name and office of the *silentiary*, it was not established till about the time of Salvian; who is the first author that mentions it.

There were also *silentiarii* established in the emperor's court, called *quietis ministri*, and *silentiarii palatii*; and honoured with the farther titles of *clarissimi*, *spectabiles*, *devotissimi*, and in Greek θαυμασιωτατοι, q. d. *most admirable*.

There were a great nuber of these; but only thirty ordinarily officiated, who were divided into three bands, each whereof had its *decurio*. The council of Chalcedon call the body of *silentiaries*, *schola devotissimorum silentiariorum*.

SILENI, in *Antiquity*, a sort of heathen demigods, the same with SATYRS, which were called *Sileni* when they came to be advanced in age.

Yet was there one principal *Silenus*, elder than any of the rest. Diod. Siculus says, he was the master, or tutor, of Bacchus, whom he disciplined nobly, and followed him to the wars. He quotes an ancient poet, named Thymœtas, who relates, that the *Sileni* assisted Bacchus in the war he waged against the Titans; adding, that the first *Silenus* reigned in an island made by the river Triton, in Lybia.

He is represented as having a long tail hanging behind; which is likewise an attribute of all his posterity. The poets always mount him on an ass. He is also represented as distinguished for his skill in music. He is said, not only to have invented musical instruments, but to have had the courage, like Marsyas, to challenge even Apollo himself to a trial of skill.

Nonnus makes *Silenus* a son of Tellus; and gives him three sons, Astræus, Maron, and Lenæus. Servius, on Virgil's Eclogue, makes *Silenus* the son of Mercury; others, the son of Pan, and a nymph; others will have him born of the drops of the blood of Cœlus, the father of Saturn.

Bochart, in his Canaan, will have *Silenus* to take his name from שלח; or שילו, *Silo*, the name of the Messiah; whence שילן, *Silan*. He also adds, that all that is attributed to this imaginary deity is taken from what the prophets have foretold of Jesus Christ. Thus, whereas it is said, the Messiah shall be the instructor of the people; *Silenus* is made the preceptor of Bacchus. Because it was said, that our Saviour should bind his ass to the vine, and his colt to the young vine; *Silenus* is made to ride on an ass. Because our Saviour washed his garments in blood, as those that trod the wine-press; *Silenus* was made to preside over those who pressed the vintage. Because it is added, his eyes were red by reason of wine; *Silenus* was made always fuddled. Bochart, however, advances all this with a great deal of distrust, as he has reason, it having no warrant: he adds, that the devil invented the fable of *Silenus*, to turn the mysteries of our religion into ridicule. But the sense which he has given to the words *rubent oculi ex vino, & dentes ejus ex lacte albescunt*, is very forced and unnatural; as if the words signified any thing more, in the propriety of the Hebrew tongue, than, his eyes are redder than wine, his teeth whiter than milk. We may add, that nobody, before Bochart, neither Christian nor idolater, ever saw any thing of Jesus Christ in the fable of *Silenus*.

SILER, in *Botany*, a name given by the Latin writers of the later ages to the plant called by others *seseli*, an umbelliferous herb, growing in mountainous places. See SERMOUNTAIN.

The ancient Roman authors, however, mean a very different thing by the word *siler*, a shrub growing in watery places, and having twigs very ductile and tough, and fit for basket-work, or any other use of that kind.—The poets have often mentioned it, and always with the epithets of *molle* and *lentum*, *soft* and *tough*.

The error of confounding so different a plant as the *seseli*, with this shrub, arises from the unhappy custom of abbreviation, so common among the old Greeks: instead of *seseli* they wrote the word sometimes only *seli*, and *sile*: thence it was easy for people, less acquainted with botanical distinctions, to add an *r* at the end, to reduce the word, which they did not know, to one that they did; and thus grew *siler* as a name for *seseli*. Hippocrates calls the seseli *sili*; and Pliny both *sili* and *seli*.

SILESIACA *terra*. See TERRA.

SILEX. See FLINT.

SILI, in *Botany*, a name given by the old Greeks to a plant called also SESELI.

SILICERNIUM, among the Romans, a funeral supper, which is otherwise called *exequium*.

SILICULA, in *Botany*, a name given by some authors to fœnugreek.

SILILICON, in *Botany*, a name given by some of the old Latin writers to the carob tree, *siliqua dulcis*. The Latins borrowed this name from the Greek *xyloglycon*, ξυλογλυκον, the sweet, or sweet-fruited tree.

Isidore mispels the word *sililicon*, and making it only *silicon*, supposes it to be a barbarous way of spelling the word *siliqua*; but the evident derivation of the genuine word from the Greek shews his error, both as to the word itself, and the origin of it.

SILIQUA, κεράτιον, among the ancients, the third part of an OBOLUS, or, what comes to the same, the sixth part of a SCRUPLE.

SILIQUA *nabathæa*. See NABATHÆA *siliqua*.

SILIQUA, in *Botany*, the seed-vessel, husk, pod, or shell of a plant of the leguminous kind. Whence *siliquous plants* are those which produce *siliquæ*, or seed pods.

SILIQUA, in *Botany*. See CAROB.

SILIQUASTRUM, in *Botany*. See JUDAS *tree*.

SILIQUASTRUM, in *Natural History*, the name given by Mr. Lhuyd, and others, to the bony palates of fishes, when found fossile. See ICHTHYPERIA.

SILIQUATICUM, among the Romans, a custom or toll paid for merchandize. This the Greeks called *ceratismus*.

SILK, *sericum*, a very soft, fine, bright, delicate thread; the work of an insect, called *bombyx*, or the SILK-*worm*.

The ancients were but little acquainted with the use and manufacture of *silk*; they took it for the work of a sort of spider, or beetle, who spun it out of its entrails, and wound it with its feet about the little branches of trees. This insect they called *ser*, from *Seres*, a people in Scythia, whom we now call the Chinese, who, as they thought, bred it; whence the *silk* itself they called *sericum*. But this *ser* of theirs has very little affinity with our *silk-worm*, *bombyx*: the former living five years; but the latter dying annually, enveloped in a yellowish bag, or ball, which, wound out into little threads, makes what we call *silk*.

It was in the isle of Cos, that the art of manufacturing *silk* was first invented: and Pamphila, daughter of Platis, is honoured as the inventress. The discovery was not long unknown to the Romans. *Silk* was brought them from Serica, where the worm was a native. But so far were they from profiting by the discovery, that they could not be induced to believe so fine a thread should

should be the work of a worm; and thereupon formed a thousand chimerical conjectures of their own.

Silk was a very scarce commodity among them for many ages: it was even sold weight for weight with gold; insomuch that Vopiscus tells us, the emperor Aurelian, who died A. D. 275, refused the empress, his wife, a suit of *silk*, which she solicited of him with much earnestness, merely on account of its dearness.

Others, however, with greater probability, assert that it was known at Rome so early as the reign of Tiberius, about A. D. 17.

Galen, who lived about the year of our Lord, 173, speaks of the rarity of *silk*, being no where but at Rome, and only among the rich.

Heliogabalus, the emperor, who died A. D. 220, is said by some to be the first person who wore a holosericum, i. e. a garment of all *silk*.

The Greeks of Alexander the Great's army are said to have been the first who brought wrought *silk*, from Persia, into Greece, about 323 years before Christ; but the manufacture of it was confined to Berytus and Tyre, in Phœnicia, whence it was dispersed over the West.

At length, two monks, coming from the Indies to Constantinople, in 555, under the encouragement of the emperor Justinian, brought with them great quantities of *silk*-worms, with instructions for the hatching of their eggs, rearing and feeding the worms, and drawing out the *silk*, and spinning and working it. Upon this, manufactures were set up at Athens, Thebes, and Corinth.

The Venetians, soon after this time, commencing a commerce with the Greek empire, supplied all the western parts of Europe with *silks* for many centuries; though sundry kinds of modern *silk* manufactures were unknown in those times, such as damasks, velvets, sattins, &c.

About the year 1130, Roger II. king of Sicily established a *silk* manufactory at Palermo, and another in Calabria; managed by workmen, who were a part of the plunder brought from Athens, Corinth, &c. whereof that prince made a conquest in his expedition to the Holy Land. By degrees, Mezeray adds, the rest of Italy and Spain learned, from the Sicilians and Calabrians, the management of the *silk*-worms, and the working of *silk*: and at length the French got it by right of neighbourhood, a little before the reign of Francis I. and began to imitate them.

Thuanus, indeed, in contradiction to most other writers, makes this manufacture of *silk* to be introduced into Sicily two hundred years later, by Robert the Wise, king of Sicily, and count of Provence.

It appears, by 33 Hen. VI. cap. 5. that there was a company of *silk*-women, in England, so early as the year 1455; but these were probably employed in needle-works of *silk* and thread: and we find that various sorts of small haberdashery of *silk* were manufactured here in 1482: but Italy supplied England, and all other parts, with the broad manufacture, till the year 1489. In Spain, indeed, the culture and manufacture of *silk* seem to have been introduced in an early period by the Moors, particularly in Murcia, Cordova, and Granada. The *silk* manufactures of this last town were very flourishing, when it was taken by Ferdinand, &c. at the close of the fifteenth century.

In 1521, the French, being supplied with workmen from Milan, commenced a *silk* manufacture; but it was long after this time before they could obtain raw *silk* from the worms: and, even in the year 1547, *silk* was scarce and dear in France; and Henry II. is said to have been the first who wore a pair of *silk* knit STOCKINGS; though the first invention originally came from Spain, whence *silk* stockings were brought over to Henry VIII. and Edward VI. After the civil wars in France, the plantations of mulberry trees were greatly encouraged by Henry IV. and his successors: and the produce of *silk* is at this day very considerable.

The great advantage which the new manufacture afforded, made our king James I. very earnest for its being introduced into England: accordingly, it was recommended several times from the throne, and in the most earnest terms, particularly in the year 1608, to plant mulberry trees, &c. for the propagation of *silk*-worms; but unhappily without effect; though, from the various experiments we meet with in the Philosophical Transactions, and other places, it appears that the *silk*-worm thrives and works as well, in all respects, in England, as in any other part of Europe.

However, towards the latter end of this king's reign, i. e. about the year 1620, the broad *silk* manufacture was introduced into this country, and prosecuted with great vigour and advantage. In 1629, the *silk* manufacture was become so considerable in London, that the *silk-throwsters* of the city, and parts adjacent, were incorporated under the name of master, wardens, &c. of the *silk-throwsters*; and in 1661, this company of *silk-throwsters* employed above forty thousand persons. The revocation of the edict of NANTES, in 1685, contributed in a great degree to promote the *silk* manufacture in this kingdom. as did also the invention of the *silk*-throwing machine at Derby, in 1719: for an account of which, see WINDING *of silk*.

So high in reputation was the English *silk* manufacture, that even in Italy, as Keysler (Travels, vol. i. p. 289,) informs us, in 1730, the English *silks* bore a higher price than the Italian.

The *silk*-worm is an insect not more remarkable for the precious matter it furnishes for divers stuffs, than for the many forms it assumes, before and after its being inveloped in the rich cod or ball which it weaves for itself. From a small egg about the size of a pin's head, which is its first state, it becomes a pretty big worm, or caterpillar, of a whitish colour, inclining to yellow. In this state it feeds on mulberry-leaves, till, being come to maturity, it winds itself up in a silken bag, or case, about the size and shape of a pigeon's egg; and becomes metamorphosed into an aurelia: in this state it remains without any signs of life, or motion; till at length it awakes, to become a butterfly; after making itself a passage out of its silken sepulchre: and, at last, dying indeed, it prepares itself, by an egg, which it casts, for a new life; which the warmth of the summer weather assists it in resuming.

As soon as the *silk*-worm, or caterpillar, is arrived at the size and strength necessary for beginning his cod, he makes his web: for it is thus they call that slight tissue, which is the beginning and ground of this admirable work. This is his first day's employment. On the second, he forms his folliculus, or ball, and covers himself almost over with *silk*. The third day, he is quite hid; and the following days he employs himself in thickening and strengthening his ball: always working from one single end, which he never breaks by his own fault; and which is so fine, and so long, that those who have examined it attentively, think they speak within compass, when they affirm, that each ball contains *silk* enough to reach the length of six English miles.

In ten days time, the ball is in its perfection; and it is now to be taken down from the branches of the mulberry-tree, where the worms have hung it. But this business requires a great deal of attention; for there are some worms more lazy than others; and it is very dangerous waiting till they make themselves a passage, which usually happens about the fifteenth day.

The first, finest, and strongest balls are kept for the breed; the rest are carefully wound: if there be no more than can be well wound at once, they lay them for some time in an oven, moderately hot, or else expose them, for several days successively, to the greatest heats of the sun, in order to kill the insect; which without this precaution, would not fail to open itself a way to go and use those new wings abroad, which it has acquired within. Ordinarily, they only wind the more perfect balls.— Those that are double, or too weak, or too coarse, are laid aside; not as altogether useless, but that, being improper for winding, they are reserved to be drawn out into skains. The balls are of different colours; the most common are yellow, orange-colour, Isabella, or flesh-colour. There are some also of a sea-green; others of a sulphur-colour, and others white: but there is no necessity for separating the colours and shades to wind them apart; as all these colours are to be lost in the future scouring and preparing of the *silk*.

SILK, *to wind the, from off the balls.* Two machines are necessary; the one a furnace, with its copper; the other a reel, or frame, to draw the *silk*. The winder, seated near the furnace, throws into the copper of water, over the furnace (first heated to a certain degree, which custom alone can teach), a handful or two of balls, which have been first well purged of all their loose furry substance. He then stirs the whole very briskly about with birchen rods, bound and cut like brushes; and when the heat and agitation have detached the ends of the *silk* of the pods, which are very apt to catch on the rods, he draws them forth; and joining ten or twelve, or even fourteen of them together, he forms them into threads, according to the bigness required to the works they are destined for: eight ends sufficing for ribbands; and velvets, &c. requiring no less than fourteen. The ends, thus joined into two or three threads, are first passed into the holes of three iron rods, in the fore part of the reel, then upon the bobbins or pullies, and at last they are drawn out of the reel itself, and there fastened; each to an end of an arm or branch of the reel. Thus disposed, the workman giving motion to the reel, by turning the handle, guides his threads; substitutes new ones, when any of them break, or any of the balls are wound out; strengthens them when necessary, by adding others; and finally he takes away the balls wound out, or that have been pierced, and are full of water. In this

this manner, two workmen will ſpin and reel three pounds of *ſilk* in a day; which is greater diſpatch than is made by the ſpinning-wheel, or diſtaff. Indeed, all *ſilks* cannot be ſpun and reeled in this manner; either becauſe the balls have been perforated by the *ſilk*-worms themſelves; or becauſe they are double, or too weak to bear the water; or becauſe they are coarſe, &c. Of all theſe together, they make a particular kind of *ſilk*, called *floretta*; which being carded, or even ſpun on the diſtaff, or the wheel, in the condition it comes from the ball, makes a tolerable *ſilk*.

When *ſilk* is reeled from the cocoons, the thread is ſmeared with the natural gum of the *ſilk*, ſoftened by the heat of the water, out of which it is reeled. If the ſeveral rounds of this thread, as it falls on the reel, touch one another in their whole extent, it is then ſo glued together, as not to admit of being wound off, without tearing and breaking. This inconvenience is, in the *ſilk* countries, denominated the vitrage, and many contrivances have been ſuggeſted in order to prevent it. For this purpoſe, or in order to change the poſition of the *ſilk* thread, that it might not always fall on the ſame part of the reel, this machine was furniſhed with a guide-ſtick, which received a progreſſive and regreſſive motion, by means of two wheels, the one fixed to the axle of the reel, and communicating its motion to the other, by means of a band. Notwithſtanding the inconveniences that attend all thoſe reels which uſe a band, yet, being eaſily made, they are commonly uſed in moſt *ſilk* countries. The Piedmonteſe, however, peculiarly attentive to the *ſilk* manufacture, made ſeveral uſeful improvements in the conſtruction of the reel. They firſt ſuppreſſed the old method of reeling the *ſilk* over a bobbin, which was found to give it a flat form, and, in its ſtead, ſubſtituted the method of the croiſſure, which renders it round and compact. They then applied themſelves to correct the imperfections of the guide-ſtick, and to eſtabliſh proper proportions between the wheels which gave it motion. They afterwards laid aſide the uſe of the band, and ſupplied its place with four wheels, having a determined number of teeth, whoſe revolutions, being uniform, gave the guide-ſtick a proper motion for preventing the vitrage; and thus they have been able to give that perfection to their raw *ſilk*, which fits it to be thrown into organzine or warp, and to raiſe the value of each pound of *ſilk* reeled in this manner to one third more than it would have had if reeled otherways.

The French, deſirous of making raw *ſilk* fit for organzine among themſelves, which they uſed to have from Piedmont, applied themſelves wholly, and with conſiderable ſucceſs, to the improvement of the band-reel. But although the Piedmonteſe reel is free from the inconvenience of all thoſe reels which uſe a band, it is liable to objections, which have obſtructed the common uſe of it; the chief of which are, that four-toothed wheels are more difficult to be made than two plain-grooved ones, and that being made only of wood, they are eaſily broken. Mr. Samuel Pullein, with a view of making this reel more ſimple, and more familiar to the common people, conſtructed a reel, which, without any additional mechaniſm, performs the work of the Piedmonteſe reel, and uſes but two wheels with teeth inſtead of four wheels. In his conſtruction, he has introduced a new proportion between the wheels, ſo that the *ſilk* thread will not be laid in the ſame place on the reel, till after the winding of near ſix hundred yards; by which means, the thread having time to dry, all vitrage is avoided; whereas thoſe in common uſe do not reel above one hundred and fifty yards, till the thread is laid in the ſame place. He has alſo added to his reel an improved method of making the double croiſſure as eaſily as the Piedmonteſe make the ſingle one, which gives a conſiderable perfection to the *ſilk*. This reel is repreſented in *Tab.* III. *Miſcellany*, *fig.* 45. At A is exhibited the manner in which a winch D, fixed in the arbre Q A, which paſſes through a nich in an upright ſupporter R, is made to anſwer the ſame purpoſe as the two wheels with teeth, which are uſed in the Piedmonteſe reel, and by a more ſimple mechaniſm to move the guide-ſtick F to the ſame advantage as with the wheels. The double croiſſure, repreſented at large in *fig.* 46, is made by means of the croſs B, called the ſwivel-croſs, which is formed of a common lath. At *b b* are fixed two little ivory or braſs wheels, with ſmooth acute-angled grooves in them, to receive the threads which come from the two ſtop-wires *b b*. One end of the ſwivel-croſs K is ſomewhat broad, and reſts upon the guide-ſtick F, directly in the middle between the two guide-wires *c c*. Here it moves and plays freely on a pin fixed in the guide-ſtick, the pin paſſing through the nich *m*. The other end of the ſwivel M contains the ſtop-wires *b b*, and is fixed to the end of the rod O, which projects from the front bench of the reel, by means of a piece of packthread, paſſing through a hole in the ſwivel and in the piece O, and being fixed to a peg P, which turns in the under part of the piece O, is drawn to a proper degree of tenſion to allow the ſwivel to obey all the motions of the guide-ſtick. The double croiſſure is formed in the following manner: the two *ſilk* threads are paſſed through the two ſtop-wires *b b*, and through the two guide-wires *c c*, and ſo are faſtened to the reel. Then either of the two threads is taken in that part of it which lies between the ſtop-wire and guide-wire, and turned two or three times round the other thread; and then each thread is placed in the groove of the pulley at *b b*; taking care to place each in the groove of that pulley, which lies on the ſide of its own ſtop-wire. The threads will then appear in the ſituation repreſented in the figure twiſted round one another in the two points *o* and *p*. The ſwivel-croſs is ſhewn at B (*fig.* 45.) in its true proportion and ſituation, when the reel is ready to work. Phil. Tranſ. vol. li. art 4, p. 21, &c. The *ſilk* reel has been lately much improved by M. Vaucanſon. See Mem. Acad. Sc. 1770.

As to the balls, after opening them with ſciſſars, and taking out the inſects (which are of ſome uſe for the feeding of poultry) they are ſteeped three or four days in troughs, the water whereof is changed every day to prevent their ſtinking. When they are well ſoftened by this ſcouring, and cleared of that gummy matter the worm had lined the inſide with, and which renders it impenetrable to the water, they boil them half an hour in a ley of aſhes, very clear and well ſtrained: and after waſhing them out in the river, and drying them in the ſun, they card and ſpin them on the wheel, &c. and thus make another kind of floretta, ſomewhat inferior to the former.

Silk being properly an animal fluid hardened by the air, is uſually much mended or depraved in its nature and qualities, according to the nouriſhment the worm receives from a good or bad leaf; a great deal, therefore, depends on the goodneſs or badneſs of the ſpring of the year, in the value of the *ſilk* produced. A warm ſpring is beſt, and it ſhould be moderately moiſt; not overmuch ſo, becauſe too great a fall of rain is always found to rot the leaves. Southerly winds alſo are to be feared, becauſe they burſt the worm; and northerly ones, when ſtrong, uſually ſpoil the leaves. All theſe being deſtructive, either of the animals themſelves, or of their food, very juſt preſages may be formed upon them of the produce of the enſuing year.

When theſe miſchiefs do not happen, but the ſpring is favourable, the people have little to do but to watch the feeding of the worms, and about Midſummer they are to begin to draw the *ſilk* from its cocoon, to ſee what it yields, and judge of its increaſe or ſcarcity, and eſtimate its goodneſs and perfections; the principal of which are, that it proves clean, light, and ſtrong.

Great uſe may be made of theſe obſervations, provided the management be good. It requires great care to hatch the eggs, and when hatched, there muſt be a careful eye over the worms, even to the time of drawing off the *ſilk*. If the ſeaſon foretels a ſcarcity, the buſineſs of the prudent manager is to buy up all the old *ſilk* he can procure, and keep as much of the other as he can, to be employed in the beſt fabrics, that ſo they may not be obliged to hazard all the good at the price of the worſt; but when the ſeaſon proves favourable, they collect the new for the beſt fabrics, and compare it with the old, to ſee whether it be of a better quality, before they venture to determine their prices.

The goodneſs of *ſilk* is beſt diſtinguiſhed by its lightneſs, that being its moſt eſſential quality; this every one knows carries a very great profit with it, being bought by weight, and ſold by meaſure, at the firſt hand, after the collectors. The organzine *ſilk* is the beſt of any made in the country of Piedmont, and two threads are equal in fineneſs, that is, in ſmoothneſs, thickneſs, and length, for the thread of the firſt twiſt. For the ſecond, it matters not whether the ſingle thread be ſtrong before the two are joined, unleſs to ſee whether the firſt twiſt prove well. It is neceſſary that the *ſilk* be clean, and it is to be obſerved, that the ſtraw-coloured is generally the lighteſt, and the white the heavieſt of all. The ſkains ſhould be even, and all of an equality, which ſhews that they were wrought together, otherwiſe we may with juſtice ſuſpect that it is refuſe *ſilk*, and cannot be equally drawn out and ſpun, for one thread will be ſhorter than the other, which is labour and loſs.

It will alſo be requiſite to ſearch the bale more than once, and take from out of the parcels a ſkain to make an eſſay; for unleſs it be known by trial what one buys, there is the greateſt danger of being cheated in this commodity. To make an eſtimate, and know the lightneſs, fix the eſſay upon one eighth of a portee, or hand of *ſilk* of a hundred and ten aunes or ells of Lyons in length, and ſee what it makes of aunes by the eighth part. The ſkain, which is of eighty threads, muſt be multiplied by a hundred

dred and ten aunes of Lyons, and from this number must be deducted one-eighth; as for example, 110 by 80 makes 8800, the eighth part of which is 1100; and this is the eighth part of a portee, or hand of *silk*. Now to calculate what these 1100 aunes weigh, which is the eighth part of a portee, or of 110 aunes of Lyons, it will be proper to take a skain out of the parcels, which you take from out of the bale which you judge may contain, at least, 1100 aunes, to make the one eighth part of a portee, which portee must be divided on two bobbins, half on each; then fix the two bobbins on the centre, or beam, and from thence pass it through the comb hurdissoir, viz. 550 from the two bobbins will make 1100, which will be one eighth part of what you desire to know. This done, you cut off your *silk*, and carry it to put on the hurdissoir, then weigh it, and multiply the weight by eight, it will weigh just as much as a portee of one hundred and ten aunes of Lyons, which is the general rule for calculating. When they draw the *silk* out by this means, one may learn to adjust the weight. There are *silks* of Piedmont which are very light and clean, and are to be preferred before any on the sale: the portee of *silk* of the lightest weighs near twenty-four pennyweights, and from this it arises in gravity to twenty-five, and twenty-six pennyweights the portee, and sometimes to twenty-seven and twenty-eight; but even these weights may be dispensed with, provided that the other qualities be good, that is, that it be well wrought, even and clean. When the *silk* is more than twenty-eight pennyweights the portee, it must always be proportionably cheaper. Philos. Transact. N° 252. p. 186.

The several preparations which *silks* undergo, to fit them to be used in the manufacture of silken stuffs, are the spinning, reeling, milling, bleaching, and dying. The two first we have already spoken of, as they are concerned in drawing the *silk* from off the balls. As to the spinning and reeling of raw *silks* off the balls, such as they are brought hither from Italy, the Levant, &c. the first is chiefly performed on the spinning-wheel; and the latter, either on hand-reels, or on reels mounted on machines, which serve to reel several skains at the same time. As to the milling, they use a mill composed of several pieces, which may mill two or three hundred bobbins at once, and make them into as many skains. See Milling. For the bleaching and dying, see Bleaching and Dying.

Silk is distinguished by different names according to its different states. Thus,

Silk, *raw*, is that taken from the ball, without fire, and wound without any coction: such as is most, if not all, that is brought into England from the Levant: i. e. from Persia by the way of Turkey, from Bengal in India, and from China. The raw *silk* is commonly worked up into two sorts, called *organzine* and *tram*: the former is made by giving a throw or twist to each thread of raw *silk* singly, and then doubling two of these twisted threads together, and twisting them smartly together: this forms the warp or length of a piece when manufactured. The tram, or shoot, which makes the breadth of the piece, is formed by twisting two or more threads of raw *silk* slack. The wasted *silk*, or refuse in reeling, &c. is collected, carded, and spun, and called *floss silk*: this is doubled and thrown, and often made into a cheap sort of *silk* stockings, which are very strong and durable.

In the French *silk*-works, the greatest part of this raw *silk* passes for little better than a kind of fine floretta; yet, when spun, it makes a bright thread, and serves for the manufacture of stuffs of moderate value and lustre. But the raw *silks* of the Levant, whence most of ours come, are exceeding fine and beautiful. The difference arises hence, that, in France, the best balls are spun and wound in boiling water, and only the refuse made into raw *silk*; whereas, in the Levant, there is no such thing as spinning or winding on the fire, but the *silks* are all sent in bales, or packs, as they are drawn from off the balls; so that they are only distinguished by their quality of fine, middling, and coarse.

Silk, *boiled*, is that which has been boiled in water, to facilitate the spinning and winding. This is the finest of all the sorts of *silk* manufactured in France, and is seldom used but in the richest stuffs; as velvets, taffaties, damasks, brocades, &c.

There is also another kind of boiled *silk*, which is prepared by boiling, to be milled; and which cannot receive that preparation, without being first passed through hot water. By the laws of France, it is prohibited to mix raw with boiled *silk*; both as such a practice spoils the dying, and as the raw *silk* corrupts and cuts the boiled.

Silks, *throwed or twisted*, are such as, besides their spinning and winding, have received their milling or throwing. This they receive in a different degree, as they are passed oftener or seldomer over the mill: properly, however, throwed *silks* are those wherein the threads are pretty thick-throwed, and twisted several times.

The thrown *silk* comes to us chiefly from Leghorn, Genoa, Naples, and Messina.

Silks, *slack*, are such as are not twisted, but are prepared, and dyed, for tapestry, and other works with the needle.

Silk, *Eastern or East Indian*. That popularly thus called is not the work of the *silk*-worms, but comes from a plant that produces it, in pods, much like those of the cotton-tree. The matter this pod contains is extremely white, fine, and moderately glossy: it spins easily, and is made into a kind of *silk*, that enters the manufacture of several Indian and Chinese stuffs.

Silks, *French*. It is only in the most southern provinces of France that *silk* is cultivated, mulberry-trees planted, and worms bred. The principal places are Languedoc, Dauphiné, Provence, Avignon, Savoy, and Lyons. This last place, indeed, furnishes very few *silks* of its own growth; but it is the great staple whence the merchants of Paris, and the other cities, are to fetch them. At least, they are obliged to have them pass through Lyons, if they bring them from other places, either by land or sea. There have been computed to enter Lyons, *communibus annis*, six thousand bales; the bale valued at one hundred and sixty pounds weight; of which six thousand bales, there are one thousand four hundred from the Levant, one thousand six hundred from Sicily, one thousand five hundred from Italy, three hundred from Spain, and one thousand two hundred from Languedoc, Provence, and Dauphiné.

At the time when the manufactures of Lyons were in their prosperity, there were reckoned to be eighteen thousand looms employed in the *silk* manufacture; but in 1698, there were not reckoned four thousand. However, this manufacture has revived of late, and a great part of Europe has been supplied from hence with brocade and rich *silks*. The decay has not been less notable at Tours: they had formerly there eight hundred mills for winding and preparing the *silks*; eight thousand looms to weave them; and forty thousand persons employed in the preparation and manufacturing thereof; but these have been reduced to seventy mills, twelve hundred looms, and about four thousand persons.

Silks, *Sicilian*. The commerce of the *silks* of Sicily is very considerable: and the Florentines, Genoese, and Luccese, are the people who chiefly make it. Great quantities are yearly brought thence, especially from Messina: part whereof they use in their own manufactures, and sell the rest to their neighbours, the French, &c. with profit. The Italians have this advantage, especially the Genoese, over other people, that, having large establishments in the island, they are reputed as natives, and pay no duty for the export.

Part of the Sicilian *silks* are raw, the rest are spun and milled; of which last kind, those of St. Lucia and Messina are the most valued. The raw unwrought *silks* are always sold for ready money: the others, sometimes, in exchange for other goods.

Silks, *Italian*. The *silks* brought from Italy are partly wrought, and partly raw and unwrought. Milan, Parma, Lucca, and Modena, furnish none but the latter kind; Genoa most of the former; Bologna affords both kinds. The finest Italian wrought *silk* comes from Piedmont, Novi, Bergamo, and Bologna: and is imported into England from the ports of Nice, Genoa, and Leghorn.

The *silk* we have from Italy is generally thrown, and serves for warp for our manufactures; and the greater part we import from Piedmont, at an annual expence of no less than 200,000*l.* and in general at the price of 20*s.* for every pound. And the king of Sardinia, it is said, hath prohibited the exportation of raw *silk* out of his dominions; though the markets are open in other parts of Italy.

Silks, *Spanish*, are all raw; and are spun, milled, &c. in England, according to the several works they are to be used in.

Silks, *Turkey*, are all raw. One advantage we have in the commerce of the Levant, in *silks*, wanting in those of Sicily, is, that the latter are confined to a particular season of the year; whereas the former are bought at all times. They are brought from Aleppo, Tripoli, Sayda, and from the isle of Cyprus, Candia, &c. But the principal place of commerce, especially for the *silks* of Persia, is Smyrna. The *silks* are brought hither in caravans, from the month of January to September. The caravans in January are loaden with the finest *silks*; those of February and March bring indifferent ones; the rest, the coarsest. They all come from the several provinces of Persia, chiefly those of Ghilan and Shirvan, and the city of Schamachia, situate near the edge of the Caspian sea; from which three places, a Dutch author assures us, there have not come less than thirty thousand bales of *silk* in a year. Ghilan produces the best and greatest quantities of *silk*; next to this comes Shirvan and Erivan, then Mazanderan, and lastly Astrabad; but the latter is much inferior, serving only for a manufacture mixed with cotton; that of Mazanderan and Astrabad is seldom or ever exported.

Ardeuil, or Ardebil, another city of Perſia, not far diſtant from theſe *ſilk* countries, is the place where *ſilks* are laid up, and whence the caravans ſet out for Smyrna, Aleppo, Scanderoon, and Conſtantinople; and it is this city, with Schamachia, that have always been eſteemed the centre of the *ſilk* trade; which has been ſeveral times attempted to be removed from Smyrna, and the Mediterranean, in favour of Archangel, and the White-ſea, by carrying them acroſs Muſcovy, by the Volga and Dwina, two rivers that traverſe the principal provinces of that vaſt empire.

This new courſe of the Perſian *ſilks* into Europe was firſt propoſed by Paolo Centurio, a Genoeſe, to the czar Baſil, under the pontificate of Leo X. The French had the ſame deſign in 1628. The duke of Holſtein, in 1633, ſent ambaſſadors to the court of Perſia, purely with the ſame view: and, in 1668, the czar Alexis Michael attempted the thing himſelf; but he was diſappointed by the rebellion of the Coſſacks, and the ſurprize of Aſtracan.

In 1688, the commerce of Perſian *ſilks* had like to have been removed from Smyrna, by an earthquake, which almoſt overturned the whole city; and, doubtleſs, the removal had been effected, but for the vigorous means uſed by the Turks to prevent it. Smyrna, however, ſtill remains in her ancient poſſeſſion; and the ſeveral nations of Europe continue every year to ſend their fleets, to fetch away the *ſilks*; and matters are like to remain ſo, unleſs the conqueſts made by the late czar, along the Caſpian ſea, enable his ſucceſſors, as it is certain he himſelf had ſuch a thing in view, to put this trade into another channel.

Silks, *China, Japan, and Indian.* Several provinces of China are ſo fertile in mulberry-trees, and their climate is ſo agreeable to the nature of *ſilk*-worms, that the quantity of *ſilk* there produced is incredible: the ſingle province of Tchehiang might ſupply all China, and even a great part of Europe, with this commodity. The *ſilks* of this province are the moſt eſteemed, though thoſe of Nankin and Canton be excellent.

The *ſilk* trade is the principal in China, and that which employs the moſt hands: but the European merchants, who deal in it, eſpecially in wrought *ſilks*, are to be careful of the ſpinning, &c. the waſte being uſually very great, as the French Eaſt India company have found to their coſt.

In the year 1750, an act of parliament was paſſed for repealing the duties payable on China raw *ſilk*, imported into this kingdom, by the Eaſt India company, and entitling ſuch *ſilk*, upon exportation, to the ſame drawbacks and allowances with the raw *ſilk* of the produce of Italy. And another act was paſſed, in 1753, for the farther encouragement of the Britiſh *ſilk* manufacture.

Japan would not afford fewer *ſilks* than China; but that the Japaneſe, a barbarous and diſtruſtful people, have interdicted all commerce with ſtrangers, eſpecially with Europeans, excepting with the Dutch; who are ſaid to be admitted on certain impious terms, related by Tavernier, but which we muſt own we cannot credit. The Dutch have endeavoured to vindicate themſelves from theſe by the pens of ſeveral famous writers.

The *ſilks* of the ſtates of the Great Mogul are brought in great quantities from Caſſem-bazaar, a midland place, whence they are conveyed by a canal of fifteen leagues into the Ganges, by which they are forwarded fifteen leagues farther, to the mouth of the famous river of Indoſtan. The *ſilk* of Caſſem-bazaar is yellowiſh; as are alſo thoſe of Perſia and Sicily; there being none, that we know of, naturally white, but that of Paleſtine. The Indians, however, whiten this with a ley, made of the aſhes of a tree, called *Adam's fig-tree*; but as this tree is pretty ſcarce, and they have not yet found any other that will ſerve in its place, the Europeans are forced to take the greateſt part of their *ſilks* in their native yellow.

Caſſem-bazaar alone is computed to furniſh every year twenty-two thouſand bales of *ſilk*, each bale weighing one hundred pounds; of which the Dutch are ſaid to export ſeven thouſand bales annually.

Great quantities of both raw and wrought *ſilk* are furniſhed by other parts of Bengal, and by ſeveral provinces of Indoſtan, which partly ſupply the natives, and afford a very conſiderable exportation to Europe. Several thouſand bales of raw *ſilk* are annually imported from Bengal and China; ſome of which is, in this ſtate, uſed for making princeſs ſtuffs, but the greater part is prepared for the manufacturers by the *ſilk*-throwſters. The duty on thrown *ſilk* imported is 5*s.* 1*d.*$\frac{1}{20}$; and the duty on raw *ſilk*, whether of the growth of Italy, Turkey, or India, is 1*s.* 4*d.*$\frac{1}{4}$ per pound.

The quantity of Bengal and China raw *ſilk* imported in 1783, was 3636 Bengal bales, each bale weighing about 150 great pounds, and 1390 China bales, at about 145 ſmall pounds *per* bale.

Silk, in *Chemiſtry* and *Medicine.* Raw *ſilk*, which is a ſubſtance of no remarkable ſmell or taſte, yet contains a ſurpriſing quantity of a volatile ſalt. Fifteen ounces of raw *ſilk* cut ſmall, and put into a retort, when diſtilled with a gentle fire will yield two ounces and two drachms of a dry volatile ſalt; whereas fifteen ounces of hartſhorn, a ſubſtance uſually ſuppoſed to contain more volatile ſalt than any other ſubſtance, except ſal ammoniac, yields only half an ounce and half a drachm: from the ſame quantity of *ſilk* there may alſo be drawn three ounces and an half of volatile ſpirit; whereas, from the like quantity of hartſhorn, the quantity of ſpirit exceeds this, being four ounces and a half. But we are to conſider, that there requires but a ſmall proportion of volatile ſalt to be diſſolved in phlegm, to make it what they call a volatile ſpirit; and that upon the whole there is no doubt, but that the *ſilk* contains greatly the larger portion of ſalt. The caput mortuum, from this quantity of hartſhorn, weighed nine ounces and two drams; whereas, that from the *ſilk* was only five ounces and five drams: whence it is plain, that the hartſhorn contains greatly more earth in the ſame quantity, and conſequently leſs active principles.

It has generally been agreed, that the ſpirit of hartſhorn is no other than a phlegm, impregnated with a volatile ſalt, and an extremely penetrating ſulphur: this is proved by the following experiment. If ſpirit of wine be poured upon ſpirit of ſal ammoniac, or ſpirit of *ſilk*, there is immediately produced a large quantity of a ſaline concretion; and when the ſpirit of *ſilk* is uſed, this concretion is manifeſtly compoſed of conſiderably large and ſeparate granules of ſalt; whereas, in caſe the ſpirit of ſal ammoniac has been uſed, the concretion is perfectly fine, and of an even texture, and it is not eaſy to ſay, at firſt ſight, whether it be ſaline, or ſulphureous: this is what has been called by authors *offa Helmontii.* It is proved, however, to be wholly ſaline, on adding water to it, ſince that readily diſſolves it. The ſulphur contained in theſe volatile ſpirits manifeſts itſelf ſufficiently by its ſmell.

The ſpirit of raw *ſilk* rectified with ſome eſſential oil, is the medicine commonly known by the name of Guttæ *Anglicanæ*, or Engliſh drops.

Silk, *ſpider.* Within a few years the ſecret has been found in France, of procuring and preparing *ſilk* from the webs of ſpiders; and the uſing it in ſeveral manufactures has been attempted. This diſcovery is owing to M. Bon, in 1710, who publiſhed a diſſertation on the ſubject; whence what follows is extracted.

Spiders are uſually diſtinguiſhed, either with regard to their colour, as into black, brown, yellow, white, &c. or with regard to the number, or arrangement, of their eyes; ſome having ſix, others eight, others ten. But with regard to the *ſilk*-ſpiders, M. Bon reduces them all to two kinds; thoſe with long legs, and thoſe with ſhort: which laſt are thoſe which furniſh the fineſt raw *ſilk*.

The *ſilk* ſpider makes a *ſilk* every whit as beautiful, gloſſy, and ſtrong, as the *ſilk*-worm: it ſpins it from the anus, around which are five papillæ, or ſmall nipples, and behind theſe, two others; all muſculous; and furniſhed with ſphincters. Theſe nipples ſerve, as ſo many wire-drawing irons, to form and mould a viſcous liquor, which, when dried in the air, after being drawn through them, makes the *ſilk*. Each of theſe nipples, M. Reaumur obſerves, conſiſts of a number of leſs and inſenſible ones; which one may be convinced of, by preſſing a ſpider's belly between the fingers, to oblige the liquor to flow into the nipples; for by this means, applying the finger againſt the anus, ſeveral diſtinct threads will be drawn out through the ſeveral perforations of each nipple. The threads are too fine to be counted with any certainty; but M. Reaumur reckons each larger nipple may ſend forth a great many.

Hence we ſee, how the ſpiders make their threads bigger or ſmaller: for as, before they begin to ſpin, they always apply more or fewer of theſe nipples againſt the body whence the web is begun; or as they apply each more or leſs ſtrongly; ſo, as more or fewer of the minuter nipples come to take, the thread, thus ſpun, will be a compound of more or fewer of the ſingle threads. Indeed, as the threads come from the anus, all joined together, they appear to be ſingle; but M. Bon has diſtinguiſhed one of the ſingle ones to conſiſt of fifteen or twenty diſtinct threads.

The threads are of two kinds: the firſt is weak, and only ſerves for that kind of web wherewith they catch flies. The ſecond is much ſtronger, and ſerves to wrap up their eggs in; which, by this means, are ſheltered from the cold, as well as from inſects, which might otherwiſe gnaw and deſtroy them. Theſe threads they wind very looſely round the eggs, reſembling the balls or bags of *ſilk*-worms, that have been prepared and looſened for the diſtaff.

The ſpider bags are of a grey colour when new; but they turn blackiſh when long expoſed to the air: indeed, one might find other ſpider bags of other colours, and which would afford a better *ſilk*; but their ſcarcity would render the experiment difficult: for which reaſon we confine ourſelves to the bags of the moſt common ſpiders,

which are the short-legged kind. These always find out some place secure from the wind and rain, to make their bags; as hollow trees, the corners of windows, or vaults, or under the eaves of houses.

By collecting a quantity of these bags, a new *silk* is made, inferior in nothing to the common *silk*. It takes all kinds of dyes, and may be made into all kinds of stuffs. M. Bon had stockings and gloves made of it, which he presented to the Academy; and others to our Royal Society.

For the manner of preparing the bags to get the *silk*, it is thus: after having gathered twelve or thirteen ounces of these bags, M. Bon had them well beaten for some time, with the hand, and a stick, to get out all the dust; he then washed them in lukewarm water, till they left the water very clean: after this, he laid them to steep, in a large vessel, with soap, and salt-petre, and gum arabic. The whole was left to boil, over a gentle fire, for three hours. The bags were next washed in warm water, to get out the soap; and, after all, laid to dry some days, to fit them for carding; which was performed by the common *silk*-carders, but with cards much finer than ordinary. By this means, he had a *silk*, of a very particular ash-colour, which was easily spun; and the thread spun from it was both stronger and finer than that of common *silk*; which shews, that all sorts of works may be made of it: nor is there any reason to fear, but it will stand any trials of the loom, after having passed that of the stocking-weavers.

The only difficulty, now, is in procuring a sufficient quantity of spider bags to make any considerable work of it: which, M. Bon observes, would be no difficulty at all, had we but the art of breeding them, as we do *silk*-worms; for they multiply much more; every spider laying six or seven hundred eggs, whereas the *silk*-worms do not lay above one hundred: yet are these last so tender, &c. that one half die without making any bags, or are hindered by some little accident, from making them: whereas the spiders hatch of themselves, without any care, in the months of August and September, in fifteen or sixteen days after they are laid; the old spiders that lay them dying soon after. The young ones thus bred live ten or twelve months without eating, and continue in their bags without growing, till the hot weather, putting their viscid juices in motion, induces them to come forth, spin, and run about to seek food. Were a way, therefore, found of breeding young spiders in rooms, they would, doubtless, furnish a much greater quantity of bags than *silk*-worms do. For of seven or eight hundred young spiders, which M. Bon kept, scarce one died in a year; whereas of one hundred *silk*-worms, not forty lived to make their bags. M. Bon, having ordered all the short-legged spiders that could be found in the months of August and September, to be brought to him, shut them up in paper coffins, and pots; covering the pots with papers, which he pricked full of pin-holes, as well as the coffins, to give them air. He fed them with flies, and found, some time afterwards, that the greatest part of them had made their bags. The same ingenious person found, that spiders bags, with regard to their weight, afford much more *silk* than those of the *silk*-worms: as a proof hereof, he observes, that thirteen ounces yield near four ounces of clear *silk*, two ounces whereof will make a pair of stockings; whereas stockings of common *silk* weigh seven or eight ounces.

Nor is there any venom in the *silk*, or even in the spider, as many have imagined. M. Bon has been bit by them several times, without any manner of harm; and as for the *silk*, it is used with very good success, to stop bleeding, and cure wounds, the natural gluten thereof acting as a kind of balsam. It likewise yields, by distillation, several specific medicines particularly great quantities of spirit, and volatile salt, which being prepared after the same manner as that drawn from the bags of *silk*-worms, in making the guttæ Anglicanæ, or English drops, at one time so famous all over Europe, may serve to make other drops of greater efficacy, which M. Bon calls drops of Montpelier, and advises to be used in all sleepy diseases.

M. Reaumur, being appointed by the Royal Academy, to make a farther enquiry into this new *silk* work, has raised several objections and difficulties against it; which are found in the Memoirs of the Academy for the year 1710. The sum of what he has urged amounts to this. The natural fierceness of the spiders renders them unfit to be bred and be kept together: four or five thousand being distributed into cells, fifty in some, one or two hundred in others, the big ones soon killed and eat the less, so that, in a short time, there were scarce left one or two in each cell; and to this inclination of mutually eating one another, M. Reaumur ascribes the scarcity of spiders, considering the vast number of eggs they lay.

But this is not all: he even affirms, that the spider's bag is inferior to that of the *silk*-worm, both in lustre and strength; and that it produces less matter to be manufactured. The thread of the spider's web, he says, only bears a weight of two grains without breaking; and that of the bag bears thirty-six. The latter, therefore, in all probability, is eighteen times thicker than the former, yet it is weaker than that of the *silk*-worm, which bears a weight of two drachms and a half. So that five threads of the spider's bag must be put together to equal one thread of the *silk*-worm's bag.

Now it is impossible these should be applied so justly over one another, as not to leave little vacant spaces between them, whence the light will not be reflected; and of consequence, a thread, thus compounded, must fall short of the lustre of a solid thread. Add to this, that the spider's thread cannot be wound off, as that of the *silk*-worm may, but must of necessity, be carded; by which means, being torn in pieces, its evenness, which contributes much to its lustre, is destroyed. In effect, this want of lustre was taken notice of by M. de la Hire, when the stockings were presented to the academy.

Again, spiders furnish much less *silk* than the worms: the largest bags of these latter weigh four grains; the smaller three grains; so that 2304 worms produce a pound of *silk*. The spider bags do not weigh above one grain: yet when cleared of their dust and filth, they lose two thirds of their weight. The work of twelve spiders, therefore, only equals that of one *silk*-worm; and a pound of *silk* will require at least 27648 spiders. But as the bags are wholly the work of the females, who spin them to deposit their eggs in, there must be kept 55296 spiders to yield a pound of *silk*. Yet will this only hold of the best spiders; those large ones ordinarily seen in gardens, &c. scarce yielding a twelfth part of the *silk* of the others. 280 of these, he shews, would not yield more than one *silk*-worm; 663552 of them would scarce yield a pound.

SILK-*grass*, a name used for two very different genera of plants, the ALOE, and DOG's *bane*.

SILK-*machine*. See WINDING *of silk*.

SILK-*tail*, or *Bohemian chatterer*, in *Ornithology*. See ROLLER.

SILK, *Virginian*, *periploca*, in *Botany*, a genus of the *pentandria digynia* class; the characters of which are these: the flower hath a small permanent empalement cut into five points; the flower has one plain petal, cut into five narrow segments, indented at their points, with a small nectarium going round the centre of the petal, and five incurved filaments, which are not so long as the petal, and five short stamina, terminated by erect summits, which join in a head. It has a small bifid germen, with scarce any style, crowned by two simple stigmas; the germen afterwards becomes two oblong bellied capsules, with one cell, filled with seeds, crowned with down, lying over each other like the scales of fish. Linnæus enumerates four, and Miller seven species.

SILK-*worm*, *bombyx*. This insect, which is a species of the PHALÆNA, consists of eleven rings, and each of these of a great number of other smaller ones, joined to each other; and the head, which terminates these rings, is furnished with two jaws, which work and cut the food, not by a perpendicular but a lateral action.

The humours found in the body of this creature, all seem approaching to the nature of the *silk* which it spins, for on being rubbed in the hands, they leave a hard or solid crust behind them. Under the skin there is always found a mucous rosy-coloured membrane, enveloping the animal, and supposed to be the new skin in which it is to appear, on throwing off the old one. The heart of this creature reaches from the head to the tail, running the whole length of the body; it is, indeed, rather a series of many hearts connected together than one: the motion of systole and diastole is very evident in this whole chain of hearts; and it is an elegant sight to observe the manner of the vital fluid's passing from one of them to the other. The stomach of this animal is as long as the heart, reaching, like it, from one end of the body to the other: this large receptacle for food, and the sudden passage of it through the animal, are very good reasons for its great voracity.

In the sides of the belly, all about the ventricle, there are deposited a vast number of vessels, which contain the *silky* juice; these run with various windings and meanders to the mouth, and are so disposed, that the creatures can discharge their contents at pleasure at the mouth; and according to the nature of the juices that they are supplied with, furnish different sorts of *silk* from them, all the fluid contents of these vessels hardening in the air into that sort of thread, that we find the web, or balls of this creature consist of.

These creatures never are offended at any stench of whatever

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ever kind, but they always feel a ſouthern wind, and an extremely hot air always makes them ſick. Malpighi de Bombyce.

SILK-*worm, chryſalis of the.* See AURELIA.

SILLON, in *Fortification*, an elevation of earth, made in the middle of the moat, to fortify it, when too broad.

The *ſillon* is more uſually denominated an ENVELOPE.

SILPHA, in the Linnæan ſyſtem of *Natural Hiſtory*, a genus of the *coleoptera* order of inſects; the characters of which are, that the antennæ become thicker toward the extremity, the elytra marginated, the head prominent, the thorax flattiſh and marginated. Linnæus enumerates thirty-five ſpecies.

SILPHIUM, in *Botany*. See *Baſtard* CHRYSANTHEMUM.

SILVER, called alſo *Luna* by chemiſts, a white rich metal; being the fineſt, pureſt, moſt ductile, and moſt precious, of all metals, except gold.

The *ſpecific* GRAVITY *of ſilver* is nearly eleven times greater than that of water; and its proportion to that of gold is as 5 to 9. The tenacity of its parts is about one half leſs than that of gold: a *ſilver* wire, in diameter one-tenth of an inch, ſupporting only a weight of 270 pounds without breaking. It is ſomewhat ſonorous, and harder than gold, as Juncker obſerves, and fuſible with a leſs degree of heat than gold, according to Cramer.

It ſeems to be as fixed and indeſtructible as gold: nevertheleſs Juncker affirms, that it may be changed into a vitreſcent calx by a long reverberation; i. e. by reducing it into very fine parts and expoſing it to the action of the ſtrongeſt heat it can ſuſtain without fuſion, with the contact of free air.

Silver contracts no ruſt, nor does it admit any change of its colour and brilliancy from the combined action of air and water: however its ſurface is apt to tarniſh, and even to become black, by the contact of the phlogiſton of ſeveral inflammable matters, or of their exhalations; becauſe it has the property of impregnating itſelf with the inflammable principle, even in the cold, to a greater degree than any other metal. The effect of the vapour of putrified urine, &c. in rendering *ſilver* ſuperficially yellow, and like gold, has been the occaſion of many abuſes with regard to wire and laces: for preventing which ſeveral edicts have been iſſued in France.

Stahl informs us, that *ſilver*, by being treated in a certain manner, with certain ſubſtances, of which nitre is the principal, may be tinged throughout of a golden colour.

Silver is ſoluble, with greater or leſs facility, in all acids. The vitriolic and marine acids are not without difficulty combined with *ſilver* in its metallic ſtate, and particular management is neceſſary for this purpoſe. The vitriolic acid, in order to diſſolve *ſilver* directly, muſt be much concentrated, and very hot, and therefore diſtillation is neceſſary: and the marine acid cannot attack *ſilver* directly; but when it is very much dephlegmated, and, as it were in a dry ſtate, conſiderably hot, and reduced to vapour, as by the royal cement in concentrated parting. But there are much more ſimple and convenient methods by which *ſilver* may be combined with the above mentioned acids.

Nitrous acid, that is very pure and moderately ſtrong, diſſolves *ſilver* in its metallic ſtate, with the greateſt facility. The ſolution is made ſpontaneouſly, without heat, or with a very gentle heat at firſt; and thus the acid may be ſaturated with *ſilver*. If the *ſilver*, thus diſſolved, be allayed with copper, the ſolution will be green; if it contain no copper, the ſolution will be at firſt greeniſh, and at laſt become quite white. As ſoon as the acid begins to make an impreſſion on the metal, its ſurface becomes black; and this change of colour is owing to the phlogiſton of the acid. The ſolution of *ſilver*, by nitrous acid, is more acrid and corroſive than pure nitrous acid: it corrodes all vegetable and animal ſubſtances, and ſtains the ſkin of an indelible black colour, reſulting from the union of the phlogiſton of the corroded matters with the *ſilver* of the ſolution. Of this ſolution are formed CRYSTALS *of ſilver*, and the cauſtic called LAPIS *infernalis*.

Although *ſilver* is more eaſily ſoluble in nitrous acid than in vitriolic and marine acids, we are not thence to conclude that this metal has a greater affinity with the former than with the two latter. On the contrary, theſe two acids are capable of ſeparating it from the nitrous acid, after this has diſſolved it. If vitriolic acid be poured into a ſolution of *ſilver* in nitrous acid, not too much diluted with water, the liquor will immediately become turbid, and there appears a white precipitate, which is a new combination of the *ſilver* that quitted the nitrous acid to unite with the vitriolic, and to form with it a new ſalt with a metallic baſis, which may properly be called *vitriol of ſilver*, or *lunar vitriol*, and which actually cryſtallizes in the inſtant of precipitation. The ſolution of any ſalt containing this acid, added to a ſolution of *ſilver* in nitrous acid, will produce the ſame effect.

Marine acid, whether engaged in any baſis, or diſengaged, produces in the ſolution of *ſilver* by the nitrous acid the ſame effect as the vitriolic acid; and forms a new compound, which is a marine ſalt with baſis of *ſilver*, called LUNA *cornea*.

Silver, as well as all other metals, may be ſeparated from any acid by abſorbent earths, or by fixed and volatile alkalis; and when afterwards fuſed, it recovers its original properties, and is generally very pure.

Sulphur diſſolves *ſilver* by fuſion, and forms with it a blackiſh maſs, which has almoſt the colour and conſiſtence of lead. This is called *ſulphurated ſilver*; and the combination is made by laying *ſilver* and ſulphur alternately upon each other in ſeveral ſtrata in a crucible, and heating it by degrees till the whole be fuſed. The ſulphur may be ſeparated from the *ſilver* by the mere action of the fire, continued during a certain time, with acceſs of air.

Chemiſts have made frequent attempts to diſſolve *ſilver* in vegetable acids, but with little ſucceſs, according to Mr. Margraaf; who ſays that he himſelf, at laſt, ſucceeded in the attempt.

The chief art required is to find a proper precipitate of *ſilver*. Mr. Margraaf's is formed by precipitating a ſolution of *ſilver*, in the beſt ſpirit of nitre, with that ſalt of urine, which he ſays is the baſis of phoſphorus. See SALT *fuſible of urine*.

This precipitate reduced to a fine powder, and digeſted in a ſand heat with diſtilled vinegar, well concentrated by freezing, will in part be diſſolved thereby.

But if this precipitation of the *ſilver* be made with ſalt of tartar, and then dried and pulverized, a conſiderable quantity of it may be diſſolved in diſtilled vinegar, in juice of lemons, in Rheniſh wine, and in other vegetable acids. The like may be done with MERCURY. Mem. de l'Acad. de Berlin, 1741.

Silver is found within the earth in different ſtates. A very ſmall quantity of it is, in its natural and malleable ſtate, allayed with copper and gold: and is then called *virgin* or *native ſilver*: this is found in form of plates, fibres, or grains, or cryſtallized; and it lies commonly in quartz, flints, ſpar, ſlate, cobalt, and in *ſilver* ores; it is ſometimes alſo enveloped in a thin ſtony cruſt: but *ſilver* is generally found in a mineral ſtate, that is, united and incorporated with heterogeneous matters, ſuch as other metallic ſubſtances, and the mineraliſing ſubſtances, viz. ſulphur and arſenic. *Silver* is capable of being allayed with all metals, and forms with them different compounds. Chem. Dict. art. *Silver*.

For the affinities of *ſilver*, ſee tables under AFFINITY.

There are *ſilver* mines in all the four quarters of the world. Europe has its ſhare: nor is our own iſland quite deſtitute thereof, though it has none yet diſcovered of much value.

Although we have no *ſilver* mines, properly ſpeaking, in Great Britain, we have plenty of lead, from which *ſilver* is, in ſome places, extracted with conſiderable advantage. Cicero, indeed, tells his friend Atticus, that there was not a ſcruple of *ſilver* in the whole iſland (Epiſt. ad Attic. lib. iv. ep. 17. and lib. vii. ep. 7.); but ſo imperfect was the knowledge which the Romans had of this country in his time, that his account cannot be much relied on.

We are certain, that about fifty or ſixty years afterwards, both gold and *ſilver* were reckoned by Strabo (lib. iv. p. 305.) amongſt the products of Britain; and, therefore, if the Britons did not underſtand the art of extracting it from lead at the firſt invaſion of the Romans, they ſoon learned it from their conquerors; and this becomes more probable, if it be admitted, that *ſilver* was coined in Britain in the time of Auguſtus.

Liſter (de Fontibus, cap. ii. ſect. 9, 10.) long ago obſerved, that all the Engliſh lead contained *ſilver*; and he ſpeaks of having proved, by his own experiments, the exiſtence of *ſilver* in the lead of at leaſt thirty different mines, nor has any perſon ſince his time found lead wholly free from *ſilver*.

The Derbyſhire lead has been ſaid to contain two grains of *ſilver* in a pound of lead; and, it is ſaid, that there are ſome lead ores in Great Britain, which, though very poor in lead, contain between three and four hundred ounces of *ſilver* in a ton of the lead. *Silver* has formerly been extracted from lead in many places in this iſland. In the reign of Edward I. near ſixteen hundred pounds weight was obtained in the courſe of three years from a mine in Devonſhire: and the lead mines in Cardiganſhire have at different periods afforded great quantities of *ſilver*: ſir Hugh Middleton is ſaid to have cleared

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from them two thouſand pounds a month, and thus to have been enabled to undertake the great work of bringing the New River from Ware to London. Theſe ſame mines yielded, in the time of the great rebellion, eighty ounces of *ſilver* out of every ton of lead, and part of the king's army was paid with this *ſilver*, which was minted at Shrewſbury.

In the year 1704, near three thouſand ounces of this Welch bullion were minted at one time at the Tower; and there were two places in Craven, in the Weſt Riding of Yorkſhire, mentioned by Webſter in his Hiſtory of Metals, publiſhed in 1671, one of which afforded ore which yielded about the value of ſixty-ſeven pounds of *ſilver* in a ton; and the other belonged to one Pudſey, who is ſuppoſed to have coined the *ſilver* he got out of his mine; whence the name of Pudſey's ſhillings, which obtains in that country.

There is not at preſent any place in Derbyſhire where *ſilver* is extracted from lead. The ore of the lead mine in Patterdale, near Keſwick, which is poor in lead, yields between fifty and ſixty ounces of *ſilver* from a ton of the lead.

There are ſeveral ſmelting-houſes at Holywell in Flintſhire, where *ſilver* is extracted from lead: Mr. Pennant has given the following account of the quantity of *ſilver* extracted at one of the largeſt of theſe houſes in the courſe of ſix years.

Years.		Ounces.	Years.		Ounces.
1754	-	12160	1774	-	5693
1755	-	1276	1775	-	6704
1756	-	7341	1776	-	4347

This *ſilver* is chiefly ſold to the manufacturers at Birmingham and Sheffield. Much *ſilver* is alſo extracted from lead in Northumberland. Watſon's Chem. Eſſ. vol. iii. eſſ. 9.

The mines of Peru, and ſome other parts of America, are much the richeſt, and moſt abundant; they appear almoſt inexhauſtible; particularly thoſe of Potoſi, which, although decayed, continue to be dug with conſiderable advantage, with this only difference, that the veins which were formerly almoſt in the ſurface of that famous mountain, are now ſunk to prodigious depths, the workmen going into them by a painful deſcent of four or five hundred ſteps. Many millions of Indians have periſhed in them; and prodigious numbers continue to be deſtroyed there yearly.

The ores, or mineral ſtones they dig, are not all of the ſame quality, conſiſtence, or colour: ſome are white or aſh-coloured, ſpotted with red or blue, and called *plata blancha*: others are black, and called *plomo ronco*: theſe laſt are the richeſt, and the eaſieſt wrought; no mercury being here needed; nor any thing but to put them in the fire: where the lead burning away, leaves the *ſilver* pure. The Indians, who, till the arrival of the Spaniards, knew nothing of the uſe of mercury, melted none but of this kind of mineral. The *roſſicler* is another black mineral, diſtinguiſhed by whetting and rubbing it againſt iron, which turns it red. It is very rich, and the metal it yields is of the beſt ſort. The *zoroche* is like talc, and looks as if ſilvered; though it does not yield much metal. The *paco* is of a yellow red, very ſoft, and found almoſt broken in pieces: it is not rich. The *cobriſſo* is green, and ſomewhat friable. Though the *ſilver* of this be viſible, yet it is exceeding difficultly drawn from it, by reaſon of the copper wherewith it is intermixed. Laſtly, the *arannea*, ſo called on account of its reſemblance to a ſpider's web, which is only found in Potoſi, and that only in the mine of Cotamiſo, conſiſts of threads of pure *ſilver*, interwoven like a *ſilver* lace that has been burnt to get out the ſilk. The *ſilver* veins, of what quality ſoever, are uſually richer in the middle than towards the extremes: but the richeſt places are thoſe where the veins interſect. It is reckoned a great addition to the richneſs of a mine to be near a river, for the advantage of mills to grind the ore.

At Lipes and Potoſi, for inſtance, the caxon of ore muſt yield ten marks to defray expences; whereas, at Tarama, there need not above five.

The moſt uſual way of ſeparating the *ſilver* from the ore is by what they call *pineas*. See PINEA.

Sometimes, however, they uſe nothing but fire frequently repeated; or aqua fortis.

What render the working of theſe mines exceedingly dangerous, are the exhalations ariſing from them; which are even felt on the outſide; and make an impreſſion on animals grazing in the neighbourhood; but in the inſide, they ſtupify the miners, none of them can bear ſo poiſonous an air above a day together. Sometimes it is ſo fatal, that it kills on the ſpot; and obliges them to ſtop up the veins again, whence it exhales. The mines of Potoſi are much the leaſt ſubject to them; and yet, without the herb paraguay, the infuſion whereof is taken by the miners, as we do that of tea, thoſe mines muſt be ſoon abandoned.

Though the mines of Potoſi and Lipes ſtill keep up their reputation, yet there are ſeveral diſcovered, within theſe few years, that exceed them much in richneſs: ſuch are the mines of Oruro, eight leagues from Arica, and thoſe of Ollachea, near Cuſco, opened in 1712. It is remarkable, that moſt of the mines in America are found in cold and barren places.

Three principal proper ores of *ſilver* are known, which are very rich but very rare. Theſe are,

1. The *vitreous ſilver ore*, which is either in form of plates, or fibres, or cryſtallized, or without any determinate figure: it has nearly the colour, ſoftneſs, and fuſibility of lead, and contains *ſilver* mineraliſed by ſulphur alone. This ore may be imitated by adding about five parts of ſulphur to one of melted *ſilver*, or by expoſing a plate of *ſilver* red hot to the fumes of burning ſulphur.

2. The *corneous ſilver ore*, which has various colours; being white, pearly, brown, yellow, greeniſh, or reddiſh. It is foliated and ſemi-tranſparent; ſomewhat ductile, and fuſible with the flame of a candle; when heated, it emits, according to Wallerius, a ſulphureous and blue flame, and, according to Cramer, alſo a ſmall quantity of an arſenical fume. Wallerius ſays, that it contains two thirds of *ſilver*, mineraliſed by a conſiderable quantity of ſulphur, and a ſmall quantity of arſenic. Lehman thinks, that it is *ſilver* united with a little arſenic. But Cronſtedt ſays, that it is a luna cornea. This ore is rare.

3. The *red ſilver ore*, or roſiclare, which is plated or ſolid, or cryſtallized, and frequently ſemi-tranſparent. Its colour is various, from a dark grey to a deep red, according to the proportions of the arſenic and ſulphur, by which it is mineraliſed. It crackles and breaks in the fire, exhales an arſenical fume, and is readily fuſed: it is generally found in quartz, ſpar, cryſtal, and hornblend. This ore contains a little iron, and affords two thirds its weight of *ſilver*.

Beſides theſe three ores, there are others which contain *ſilver* mixed with other metals; ſuch as the *grey ſilver ore*, which contains copper and *ſilver* mineraliſed by arſenic and ſulphur: the *white ſilver ore*, which is an arſenical pyrites containing *ſilver*: the *black ſilver ore*, which contains ſulphur, arſenic, copper, iron, ſometimes lead, and about a fourth part of *ſilver*, according to Wallerius; the *plumoſe ſilver ore*, which is white or black, ſtriated like plume-alum, or ore of antimony, and is *ſilver* mineraliſed by ſulphur, arſenic, and antimony; the *pech blend*, in which *ſilver*, gold, and zinc are mineraliſed by ſulphur, probably by intervention of iron: and *ſilver* is frequently found in galena; ſometimes in martial pyrites; in the red ore of arſenic; in various ores of copper, lead, tin, iron, and eſpecially cobalt; in blends; in yellow or red earths; in black and blue baſaltes, and alſo in ſtrata of ſtones: the *liquid ſilver ore*, or *guhr* of *ſilver*, which is a grey or whitiſh liquid maſs, which contains, as Wallerius ſays, either native *ſilver*, or ſome fluid ſubſtance capable of producing it: and, moreover, Mr. Von Juſti pretends that he has found *ſilver* mineralized by an alkaline ſubſtance; and Henckel alſo leads us to infer, that by treating calcareous earth, or certain clays with pyrites, *ſilver* may be obtained.

The largeſt piece of *ſilver ore* we have account of any where, is at this time preſerved in the king of Denmark's Muſeum of Curioſities at Copenhagen; this was dug in the mines of Norway, and weighs five hundred and ſixty pounds. It is five feet ſix inches long, and meaſures four feet about; it is valued at five thouſand crowns.

There is in the ſame place another alſo, which was dug in the ſame mine, valued at three thouſand two hundred and ſeventy crowns.

Theſe are both ſo very rich, that they ſeem at leaſt three parts *ſilver*, and the metal appears in very elegant forms in them, and riſes up out of their ſurface in form of ſmall trees and buſhes.

There are alſo ſeveral pieces of pure native, or virgin-*ſilver* there, all of which repreſent trees or plants.

In order to extract *ſilver* from ſeveral kinds of ores, different operations are neceſſary. *Native ſilver* is ſeparated from its adhering earths and ſtones by AMALGAMATION with mercury, as in the manner directed for the ſeparation of GOLD; or by fuſion with lead, from which it may be afterwards ſeparated by cupellation. See COPPELLING.

Pure ores, or thoſe which are not much compounded with other metals, ſeldom require a previous calcination, but being bruiſed and cleanſed from extraneous matters, may be fuſed directly and incorporated with a quantity of lead, unleſs they contain a large portion of ſulphur

fulphur and arfenic, in which cafe calcination may be ufeful. The lead employed muft be in a calcined or vitrified ftate, which, being mixed with the ore, and gradually reduced by the phlogifton of the charcoal added to it, may be more effectually united with the *filver* of the ore, than if lead itfelf had been added, which would have too quickly precipitated to the bottom of the containing veffel. The *filver* is to be afterwards feparated from the lead by cupellation.

Galenical ores, in which the *filver* is mixed with much galena, or ore of lead, mineralifed with fulphur, efpecially thofe in which pyrites is intermixed, require a calcination, which ought to be performed in an oven, or reverberating furnace. They are then to be fufed together with fome inflammable matter, as charcoal, by which the lead is revived, and together with the *filver* is precipitated.

Pyritous ores, in which the *filver* is mixed with the martial pyrites, muft be firft melted, fo as to form a matt. If the fulphur is not fufficient for this kind of fufion, more fulphurated pyrites may be added. This matt contains, befides fulphur and *filver*, alfo various metals, as lead, iron, and fometimes cobalt. The matt muft be expofed to repeated calcinations till the fulphur is diffipated: by thefe calcinations moft of the iron is deftroyed. The calcined matt is to be fufed with litharge, and the *filver* incorporated with the revived lead, from which, and from the other imperfect metals with which it may be mixed, it muft afterwards be feparated by cupellation.

The *filver* contained in cupreous ores may be obtained, either by feparating it from the copper, after this has been extracted along with the *filver* in the ufual manner, from the ore, or by precipitating it immediately from the other matters of the ore. The *filver* may be feparated from the copper, either by adding lead, and fcorifying the imperfect metals; or by *eliquation*, i. e. by mixing the mafs of copper and *filver* with a quantity of lead, and applying fuch a heat as fhall be juft fufficient to make the lead eliquate from the copper, together with the *filver*, which being more ftrongly difpofed to unite with the lead than with the copper, is thus incorporated with the former metal, and feparated from the latter.

The method by precipitation is, to form the ore, previoufly bruifed and cleanfed, into a matt; to fufe the matt with a ftrong heat; and when the fcoria has been removed, and the heat is diminifhed, to add to it fome clean galena, litharge, and granulated lead. When the fire has been raifed, and the additions well incorporated with the matt, let fome caft or filed iron be thrown into the liquid mafs, which being more difpofed than lead is to unite with fulphur, will feparate and precipitate the latter metal, and along with it the *filver* or gold contained in the matt.

This method was introduced by Scheffer, and is practifed at Adelfors in Smoland. In this work, the proportion of the feveral materials is four quintals of matt, two quintals of black copper, containing fome lead with the perfect metal, one quintal of galena, one quintal of litharge, a fifth part of a quintal of granulated lead, and an equal quantity of caft iron.

The *filver* in this, and in all inftances, where it is united with lead, is to be afterwards feparated from the lead by cupellation. Chem. Dict. Art. *Ores* and *Smelting*.

The following proceffes for extracting the *filver* of ores are given by Cramer.

The method of precipitating *filver* out of an eafily fufible *ore*, is this: pound the *ore* very fine in an iron mortar, and for an affay weigh one docimaftical centner of it, and eight centners of granulated lead; pour into a new teft about half the lead, ftir it about with a finger, and fpread it over the cavity of the teft; put upon this lead the pounded *ore*, and then cover it with the remainder of the lead; put the teft, thus loaded, under the muffle of an affay furnace, and in the hinder part of it make the fire, and increafe it to a confiderably high degree. The *ore* will foon be raifed out of the melted lead, and fwim upon it; a little after it will grow clammy, melt and be thrown toward the border of the teft; then the furface of the lead will appear clear in the middle of the teft, and will fmoak and boil; the fire muft now be made a little lefs, till the boiling ceafes for a quarter of an hour, and then made violent again, and the furface of the lead will then diminifh by degrees, and be covered with a mafs of fcoriæ. At this time have at hand an iron hook ready heated, and with this ftir all the matter from the fides into the middle of the teft; if the matter, adhering to the hook from the ftirring, melts quickly again, and the extremity of the hook, when cold, is found covered with a fhining cruft, the fcorification is perfected; but if the fcoriæ feel clammy while ftirred, and adhere in quantity to the hook, and are of a rough furface, the fcorification is not perfect, but the matter adhering to the hook muft be ftruck off with a hammer, and beat to powder, and returned into the teft, and the fire continued till the fcorification is perfected; then take out the teft, and pour the whole contents into a mould, heated and greafed with tallow.

This is the firft procefs, and this ufually takes up three quarters of an hour: the *filver* is now in form of a regulus, and muft be feparated by the coppel in the ufual way. See Regulus.

Some of the *ores* of *filver* are rendered very refractory in the working, by means of a mixture of unmetallic earths, from which no art can wafh them clean. The method to procure the *filver* from thefe by an affay is this: powder the *ore* very fine, and to a docimaftical centner of it add an equal quantity of glafs of lead finely pulverifed; mix thefe thoroughly together; put this powder, when well mixed, into a teft, with twelve centners of granulated lead, and put the teft under a muffle in a furnace, make a ftrong fire, till the lead boils well; when it is in this ftate, diminifh the fire a little, and keep it in this weaker ftate for fome time, then increafe it again to a great ftrength, till the lead is reduced to fcoriæ, and the *filver* is feen pure in the teft; or elfe when the fcorification is perfected, take out the matter together, and putting it into a coppel with more granulated lead, feparate the *filver* in a bead. Sometimes a refractory *ore* of this kind cannot be thus fufficiently diffolved, but a mafs, which has the clamminefs of pitch, fwims upon the furface of the regulus, and upon the fcoriæ that are in part fubdued; in this cafe, diminifh the fire, and touch this clammy mafs with a fmall cold iron hook, to which it will immediately ftick; take it all carefully off, reduce it to fine powder, and mixing it with more glafs of lead in powder, put it back into the teft, then continue the fcorification till it is perfected: but always obferve, that the fcoriæ of thefe refractory *ores* muft be examined, to fee if fome of the regulus does not remain among them, for fometimes the fcoriæ, by their clamminefs, will retain part of the metal; if this appears to be the cafe, powder the fcoriæ very fine, and the metal will be difcovered and feparated, as it cannot be reduced to a fine powder. The *filver* is feparated from this regulus by cupellation.

Mundic is a very common thing in *filver ores*, efpecially in the lefs rich ones, and gives great trouble in working the metal. The method of feparating the *filver* from an ore, rendered refractory by this admixture, is thus: break the ore into a rough powder, and put a centner of it into a teft for an affay; put upon this another teft by way of a cover, and put it under the muffle in a furnace; when the muffle is near red hot, increafe the fire by degrees, there will be a crackling noife, which being ended, take away the upper teft, for when the veffels have been red hot about a minute, the ore ceafes to fplit; leave the ore under the muffle, till the arfenic and fulphur are in a great meafure evaporated, which will be known by the ceffation of the fmoke from the ore, and of the fmell of garlic, or the acid; then take out the teft, and leave it in a place not too cold, that it may cool leifurely of itfelf; take the roafted ore clean out of the teft, powder it very fine, and mix it with an equal quantity of glafs of lead in fine powder; and finally, fcorify the mafs in the fame, or in a new teft, if that was cracked, till the *filver* appear in the form of a bright bead in the middle, after it has ftood a minute or two; after this take it out of the fire, and when cold take out, and weigh the pure *filver*. Cramer's Art of Affaying, p. 205—221.

Silver may alfo be precipitated from its ore by cupellation only (fee COPELLING), and alfo by fcorification in a crucible: the proceffes are defcribed by Cramer ubi fupra.

Alonfo Barba tells us, that the original method of extracting *filver* from the ore, in the mines of Potofi, was only by quickfilver, but this was very difficult in many cafes. Thofe ores which partake of copperas, which are very numerous there, will not bear quickfilver, but confume and fcatter it, breaking its particles, and rendering them unfit for the purpofes they were intended for, of taking up the *filver* contained in the ORE. Burning the ore was another method heretofore ufed with too little caution, and great loffes were fuftained by it.

The grinding the ore is always proper, and the finer it is ground, the better it will always fucceed.

Alonfo Barba alfo greatly recommends boiling the ores, in which the quickfilver is ufed, as of great advantage. The burning of ores is of no fervice but to render the ftony matter more friable; but when there is marcafite

among

among the ore, that is never without loſs, which is often very great. Alonſo Barba de Metall.

When any quantity of this metal is contained in iron, it may according to the rules of aſſaying, be precipitated from it by ſcorification, by the aſſiſtance either of ſtrong acid menſtrua, or of crude antimony; the latter method is the eaſier, and is performed thus: put one centner of the iron, reduced to very fine filings, and two centners of crude antimony, into a ſmall crucible; cloſe it with a tile, and ſet it in a ſtrong fire, that it may melt; when it has been in a perfect ſtate of fuſion for ſix or eight minutes, take it out, and let it cool, break the crucible, and you will find a maſs, compoſed of ſcoria at top, and a regulus underneath; throw away the ſcoria, and powder the regulus, mix it with twelve centners of granulated lead, and ſcorify it in a continual, but not over-ſtrong fire, till the lead is ſeen covered all over its ſurface with ſcoriæ; then take it out, and pour the maſs into a mould: the regulus ſhould now be tough, and of a light lead-colour, both within and without; if it be blackiſh and brittle, it muſt be returned into the teſt, and ſcorified again, and when brought to its proper ſtate, and the antimony all conſumed, let it be put into the coppel; and when the bead of *ſilver* is produced pure, ſubtract from its weight the before-known quantity of the *ſilver* contained in the lead uſed in the proceſs, and the reſt is the weight of the *ſilver* obtained from the iron. Cramer's Art of Aſſaying, p. 223.

Silver, after it hath been ſeparated from its ore, is farther purified from the allay of other deſtructible metals by treating it with lead or with nitre. The former method is generally uſed by refiners, and is called *cupellation*, or *refining*.

The moſt commodious and regular manner, ſays Cramer, of purifying *ſilver* is this; put a large teſt, incloſed in an iron ring, into a furnace; when the teſt has been red-hot about half an hour, put into it the *ſilver* to be purified, wrapt up in pieces of cloth or paper, and divided into ſmall portions; then fill the orifice of the furnace with burning coals, and blow with a pair of hand-bellows till the *ſilver* is in fuſion; then add, at ſeveral times, ſome lead, reduced to globules of a determined weight; continue adding lead, and keep the fire in ſuch a degree, as is juſt ſufficient to keep the metal in fuſion, and continue thus, till the *ſilver* is rendered quite pure. This may be partly gueſſed, by the before made trial of its degree of impurity on the touch-ſtone, and by the quantity of lead, judged neceſſary for the operation, having been conſumed; and farther known, by trial of it on a wire thruſt into it while in fuſion, and the examining what is found adhering to it when it is taken out. When the operation is finiſhed, pour water in a ſmall ſtream on the *ſilver* to make it grow ſolid, and taking it out of the teſt, clean it from all impurities that may adhere to its ſurface with a bruſh made of ſmall braſs wire. Art of Aſſaying, p. 204. 208.

The method of extracting *ſilver* from lead, and of refining *ſilver* by means of lead, depends upon the different eſſential properties of the two metals. Thus, lead, when melted in the open air, is eaſily deprived of its inflammable principle, ſo as to loſe its metallic appearance, and to burn away into a kind of earth; whereas, *ſilver* does not burn away, nor loſe its metallic appearance when expoſed to the action of the ſtrongeſt fires, in the open air. Hence, when a maſs of metal, conſiſting of lead and *ſilver* is melted in the open air, the lead will be burned to aſhes, and the *ſilver* remaining unaltered, it is eaſy to underſtand how the *ſilver* may be extracted from the lead; for being heavier than the aſhes of the lead, and incapable of mixing with them, it will ſink to the bottom of the veſſel in which the maſs is melted.

Iron, tin, and copper reſemble lead, in being convertible into a kind of aſhes, when expoſed to the action of air and fire, and gold reſembles *ſilver*, in not undergoing any change from ſuch action: hence, either gold or *ſilver*, or a maſs conſiſting of both, may be purified from any or all of theſe metals, by the mere operation of fuſion: for theſe metals will riſe to the top of the veſſel, in which the fuſion is made, in the form of earth or droſs, leaving the gold or *ſilver* pure at the bottom.

Lead, when reduced to an earth, by being burned in the open air, may, in a ſtronger degree of heat, be converted into a yellowiſh glaſs, which has the property of greatly contributing to the eaſy vitrification of all earthy ſubſtances: hence, when gold or *ſilver* are mixed with iron, copper, or tin, it is uſual to add to the mixed maſs a quantity of lead, in order to accelerate the purification, for the lead will be converted into glaſs, and this glaſs will vitrify all the extraneous ſubſtances with which the gold or *ſilver* is polluted, without exerting the leaſt action upon the precious metals themſelves. The veſſel in which the maſs of *ſilver* and lead is melted, is of ſhallow form, that a large ſurface of the melted maſs may be expoſed to the air; it is uſually made of four meaſures of the aſhes of calcined bones, and of one meaſure of unwaſhed fern aſhes, and called a TEST. This veſſel is very porous, but not in ſuch a degree as to imbibe the metal, whilſt it continues in the form of a metal; but as the earth, into which the lead is ſoon reduced by the action of the fire, becomes melted, the teſt imbibes a portion of it in that liquid ſtate, the other portion being driven off from the ſurface of the melted maſs, by the blaſt of a bellows. The liquid, half vitrified earth of lead, which is thus driven off, concretes into hard maſſes of a ſcaly texture, called LITHARGE, which is at firſt whitiſh, and with greater heat red: the colour of the litharge being influenced by that of the other metals, which may happen to be mixed with the maſs of lead and *ſilver*. When the ſurface of the melted maſs becomes white, and throws up more litharge, the operation is finiſhed; but as the remaining *ſilver* is not quite pure, ſince it contains a ſmall portion of lead, from which the degree of heat requiſite for melting the mixed maſs cannot readily free it, it is taken to a refining furnace, and rendered quite pure, at leaſt from lead, by cupellation. This proceſs conſiſts in melting the *ſilver* obtained from the firſt operation in a veſſel made of the ſame materials as the teſt, called a *cupel* or COPPEL. This being expoſed to a ſtronger heat than the teſt, the lead which had eſcaped the action of the fire on the teſt, is now driven out from the *ſilver*, and being converted into litharge, is abſorbed by the cupel, and by this means the *ſilver* is purified from every metal except gold. This operation is called *refining*.

M. Macquer in Chem. Dict. Art. *Refining*, aſſerts, that the refining of gold and *ſilver*, merely by the action of fire, was the only method anciently known: upon which Dr. Watſon remarks, that without inſiſting on the paſſage that occurs in Jerem. vi. 29. there is in Diodorus Siculus (lib. iii. p. 183—189.) a very minute deſcription of the manner of working ſome gold mines in the confines of Egypt and Arabia, and that amongſt other particulars, he takes notice of their melting the mineral in conjunction with a little tin, ſome ſmall portion of ſalt, and a lump of lead. Strabo (Geo. lib. ii. p. 221.) quotes Polybius as ſpeaking of a *ſilver* ore, which, after being five times waſhed, was melted with lead, and became pure *ſilver*.

Pliny alſo had probably an alluſion to the uſe of lead in refining *ſilver*, when, he ſays, that a *ſilver* ore in the form of an earth could not be melted, except in conjunction with lead or the ore of lead. Hiſt. Nat. lib. xxxiii. c. 6. See Dict. Chem. Art. *Refining*, and Watſon's Chem. Eſſ. vol. iii. p. 321, &c.

The way of purifying *ſilver* by means of nitre is this: reduce the *ſilver* to grains, or ſmall thin plates, put it into a crucible, and add one quarter part of nitre well dried, an eighth part of pot-aſh, and a little common glaſs, all powdered, and filling two-thirds of the crucible: put upon this crucible another of a ſmaller ſize inverted, having a hole as big as a pea in its bottom; lute the joint of the two crucibles, and place them in a wind-furnace, put charcoal about them as high as the rim of the lower crucible, but no higher, then light the fire at top, and increaſe it till the veſſels are middlingly red-hot, then with a pair of tongs hold a burning coal directly over the hole in the upper crucible, but at the diſtance of one finger: if you ſee a ſudden clear light produced near and about the coal, together with a crackling noiſe, this ſhews that the fire has the right degree of ſtrength; but if this does not appear at all, or but very faintly, the fire muſt be increaſed: but if, on the contrary, you hear a violent blaſt of air from the hole, and a loud crackling noiſe, without holding the coal over, the fire is then too fierce, and muſt be diminiſhed, otherwiſe you will not only loſe a large quantity of *ſilver*, but very often the veſſels will burſt.

When this is perfectly over, increaſe the fire ſo far, as to be able to melt *ſilver* without any addition; then take out the veſſels, and when they are cooled break the under one, and you will find the regulus of *ſilver* at the bottom, and an alkaline ſcoria, commonly green at the top. If the *ſilver* is not yet thoroughly purified, put it into another crucible, and this open into a wind-furnace, throwing upon it a little nitre, and as ſoon as it melts, pour it into a mould for ingots; thus will it be purified from every thing but gold.

This operation is founded on a property which nitre has of effectually calcining all imperfect metals, by burning their phlogiſton, and alſo upon a property of calcined metals, by which they cannot be united with others in their metallic ſtate.

M. Homberg finding the operations of refining *ſilver* with lead, and alſo with nitre, to be tedious and trouble-

blesome, endeavoured to shorten the operation; which he effected with good success. His method is, to calcine the *silver* with half its weight of common sulphur; and after melting the whole together, to cast a quantity of steel filings upon it at several times: upon this, the sulphur quits the *silver*, and joins itself to the iron, and both with the other impurities are converted into scoria, which swims on the *silver*; and the metal itself is found pure at the bottom of the crucible.

The ASSAY of *silver* is also made by the coppel, in the same manner as the refining by lead. If the *silver*, after this assay, preserve its weight, it is STANDARD; if it lose, the grains or pennyweights of its diminution are accounted.

The operations above recited, are founded, in general, upon the destructibility of imperfect metals, and on the indestructibility of *silver*, which is a perfect metal; but as gold is an indestructible metal, all the purifications of *silver*, which are only effected by the destruction of metals allayed within it, are insufficient to separate it from gold; recourse must, therefore, be had to other operations, for the separation of these two metals from each other; and these operations are founded upon the property which *silver* has of being soluble, by many menstrua which do not act upon gold: these menstrua are nitrous acid, marine acid, and sulphur. See PARTING.

SILVER, in *Chemistry*, and *Medicine*, is called *luna*, the moon; and has been much extolled for its virtues by chemical writers. But crude *silver*, however comminuted or attenuated, has not been observed to produce any medical effect. It is not soluble in any of the fluids of the animal or vegetable kingdom.

Several preparations have been made from *silver*; particularly a

SILVER *pill*, or *pilula lunaris*, which is a chemical preparation of *silver*, formerly highly commended as an anthelmintic, and as a purgative remedy for dropsies, and in many other inveterate ulcerous diseases.

The method of making it is this: dissolve an ounce of pure nitre in distilled water, then dissolve an ounce of crystals of *silver* made in the common way, with pure *silver* and aqua fortis, in three times the weight of water, so that the solution may be perfectly limpid; mix the two solutions together, they will become a clear homogene liquor; evaporate this to a pellicle, and crystals resembling nitre will shoot; pour off the remaining nitre as before, and the remaining nitre will shoot with the *silver*, in form of crystals, again, upon a second evaporation: let these crystals be dried upon a paper, and then placed in a glass-vessel in a very gentle heat, enough to make them smoak, but not run; stir it with a piece of glass all the time, and keep it over the fire, till no more fumes arise; thus the acid spirits will be driven off, and the *silver* remain of a very bitter taste, and purging quality. It must be kept in a dry close vessel.

This discovery has been made to serve to many other purposes, beside its uses in medicine, and has furnished the dishonest pretenders to alchemy with one of their most cunning methods of deceit. They have been able, by this means, to conceal *silver* in nitre, and that in a very large proportion, as in one tenth part of the whole quantity; and this nitre being projected in an equal quantity on melted lead, gives an increase of one tenth part in *silver*, which remaining upon the test, will deceive the ignorant, as if a tenth part of the lead were converted into pure *silver*. People who are upon their guard may, however, discover the cheat, by dissolving the pretended nitre in ten times its weight of water, and putting a polished plate of copper into the solution; for every particle of the *silver* will then be precipitated out of the liquor upon the copper, and to the bottom of the vessel.

The medicinal use is this: the dried mass, consisting of the salts of *silver* and nitre, is to be reduced to a fine powder: this powder, applied to ulcers, acts in the manner of the lapis infernalis, or *silver*-caustic, only much milder: but for internal use, the quantity of two grains of it is to be ground to a fine powder, with six grains of loaf sugar, in a glass mortar; this is to be then mixed with ten grains of the crumb of bread, and formed into nine pills: these are to be taken by a grown person upon an empty stomach, drinking after them four or six ounces of hot water, sweetened with honey. It purges gently, and brings away a liquid matter like water, often unperceived by the patient. It is said to kill worms, and perform great things in many obstinate ulcerous disorders. It purges without griping, but it must not be used too freely, nor in too large a dose, for it always proves weakening, and in some degree corrosive on the stomach; but this inconvenience is greatly alleviated by rob of juniper. Boerh. Chem. part ii. p. 297.

However, with this assistance, it is at best a dangerous medicine, and as such is deservedly excluded from practice. Lewis.

SILVER, *tincture of*, is made by dissolving thin *silver* plates, or *silver* shot, in spirit of nitre; and pouring the dissolution into another vessel full of salt water. By this means, the *silver* is immediately precipitated in a very white powder, which they wash several times in spring water. This powder they put into a matrass; and pour rectified spirit of wine, and volatile salt of urine upon it. The whole is left to digest in a moderate heat for fifteen days; during which, the spirit of wine assumes a beautiful sky-blue colour, and becomes an ingredient in several medicines. This is also called *potable silver, argentum potabile*.

Silver is likewise converted into crystals, by means of the same spirit of nitre; and this is called *vitriol of silver*.

The LAPIS *infernalis argenteus* is nothing but the crystals of *silver* melted with a gentle heat in a crucible; and then poured into iron moulds. See CAUSTIC, *lunar*.

SILVER *ale*. See ALE.

SILVER *bush*, in *Botany*, a species of anthyllis. See BARBA *Jovis*, and LADY'S *finger*.

SILVER *coin*. See COIN, and MONEY.

SILVER, *green* and *herring*. See the several articles.

SILVER, *inflammable*, a chemical preparation of the lapis infernalis made by a small heat. The process is this: take an ignited piece of Dutch turf, after it ceases to smoak; place it with its upper flat surface parallel to the horizon; make a little cavity in the middle, and therein put a drachm of dry lapis infernalis; it will immediately melt and glow, and finally it will take flame, and hiss and shine like nitre: after the flame ceases, pure *silver* will be found in the hollow, as much in quantity as was used in making so much lapis infernalis.

This curious experiment shews the physical manner in which acids do but superficially adhere to *silver*; and the manner wherein acids operate, when united to metals, while surrounding their metallic mass, they arm the ponderous principles thereof with spiculæ: it shews also the immutability of *silver* dissolved in an acid, and the various ways in which it may be concealed, yet still have its action: it also shews the difference of potable *silver*, while existing in a saline form, by means of an adhering acid, from that potable *silver* of the adepts, where the principles of *silver* are supposed converted into a fluid, that will mix with the juices of the body, and cannot be reduced to *silver* again; but the great thing to be here observed, is, that the acid spirit of nitre, adhering in a solid mass of *silver*, is, in this state, as inflammable, on coming in contact with an ignited combustible body, as crude nitre itself: this seems to happen with *silver* alone, which is unchangeable with spirit of nitre. Hence also we see one way, by which *silver* may be obtained pure from other adhering matters, by bare burning: the acid here acts neither upon the mercurial part of the *silver*, nor on its fixing sulphur. Boerh. Chem. part ii. p. 297.

SILVER, *king's*. See KING'S *silver*.

SILVER-*leaf* is that which the gold-beaters have reduced into fine thin leaves, to be used by gilders, &c. See GOLD-*leaf*.

SILVER, *quick*. See MERCURY.

SILVER, *rep*. See REP *silver*.

SILVER, *salt*. See SALT *silver*.

SILVER, *shell*, is made of the shreds of *silver* leaves, or of the leaves themselves: and used in painting and silvering certain works. It is prepared after the same manner as shell gold. See GOLD.

SILVER, *slough*. See SLOUGH *silver*.

SILVER, *smoke*. See SMOKE *silver*.

SILVER-*tree*, *protea*, in *Botany*, a genus of the *tetrandria monogynia* class. Its characters are these: the flowers are collected in an oval head; they have one common imbricated scaly perianthium; the flower is of one petal, having a tube the length of the empalement; the brim is cut into four parts, which spread open, and are equal; it has four bristly stamina, the length of the petal, terminated by incumbent summits, and a roundish germen, with an erect bristly style, crowned by an obtuse stigma; the germen afterward turns to a roundish naked seed, sitting in a distinct cell of the cone. There are three species.

These plants are natives of the country near the Cape of Good Hope, in Africa, where there is a great number of species. In the catalogue of the Leyden garden, there are upward of twenty sorts enumerated; not that they have them growing there, but they have good drawings of them, which were made in the country, where they are natives. Miller.

SILVER-*weed*, in *Botany*, a species of POTENTILLA.

Silver, *white-hart.* See White-hart *silver.*

Silver *wire* is *silver* drawn through the holes of a wire-drawing iron, and by this means reduced to the fineneſs of a thread or hair. The manner of drawing it, ſee under the article Gold *wire.* See alſo Wire, and Drawing.

SILVERING, the covering of any work with ſilver leaf or powder.

This may be performed on the ſame ſubſtances, and by ſimilar methods with gilding. But as works of this kind are liable to tarniſh and ſpeckle, they are ſeldom uſed. Wherever, therefore, *ſilvering* is admitted, a ſtrong varniſh, formed of ſome of the compoſitions of maſtic, ſanderac, the gums animi or copal, and white roſin, ought to be put over it.

The varniſh recommended in *ſilvering* leather may be applied to other purpoſes. See Lacquer.

The *ſilver* powder, called Argentum *muſivum,* may be either tempered, in the manner of the ſhell-gold, with gum water, or rubbed over a ground properly ſized; and it will take a very good poliſh from the dog's tooth or burniſhers; and hold its colour much better with a ſlight coat of varniſh over it, than any true *ſilver* powder or leaf.

The ſizes for *ſilvering* ought not to be mixed, as in the caſe of gold, with yellow, or bole armoniac, but with ſome white ſubſtance, whoſe effect may prevent any ſmall failures in covering the ground with the ſilver from being ſeen. This may be done with flake white, or white lead, when the ſizes formed of oil are uſed; but whiting, or tobacco-pipe clay, with a little lamp black added to it, is the proper matter in the burniſh ſize for *ſilvering,* or wherever the glover's or parchment ſize is uſed.

It is uſual to ſilver metals, wood, paper, &c. which is performed either by fire, oil, or ſize. Metal gilders ſilver by the fire, painter-gilders all the other ways. See Gilding.

This is a ſpecies of gilding, and may be done thus: take as much aqua fortis as you think there is occaſion for; put it into a glaſs, which ſet in warm aſhes; then put in your quantity of ſilver, after having beaten it very thin, and cut it into little ſhreds. When the ſilver is diſſolved, take it off the aſhes; and, mixing that liquid with as much white tartar as will make it like paſte; rub with this mixture the metal you want to ſilver.

Copper, braſs, or any other metal may be thus made, to appear like ſilver itſelf.

Braſs may be *ſilvered* by diſſolving fine ſilver in aqua fortis, in a broad bottomed veſſel of glaſs, or glazed earth, and the aqua fortis being afterwards evaporated, water is poured upon the remaining calx. This water muſt alſo be evaporated, and the operation repeated as often as there is occaſion; the fire being increaſed towards the latter end, ſo as to leave a perfectly dry and white calx, which will be thus tolerably freed from the aqua fortis. Of this calx take one part, and an equal meaſure, not weight, of common ſalt, and of the cryſtals of tartar, and mix them together into a fine powder; then having firſt plunged the ſcowered braſs into fair water, rub ſome of the powder upon it with your wet fingers, till the cavities of its ſurface be ſufficiently filled therewith. Laſtly, waſh the metal well in water, and give it a gloſs by rubbing it hard with a dry cloth.

This waſhing, Mr. Boyle obſerves, is expeditious, cheap, requires no quickſilver, and may be made to laſt ſome years, and is eaſily renewable when it begins to wear. See his Works abr. vol. i. p. 151.

Copper, braſs, ſteel, or iron may be *ſilvered,* ſo as not to come off, unleſs made red hot, in the following manner. Take urine which is made in the morning, cover it, and let it ſtand a whole month, and it will ferment; put it afterwards into an earthen pot, and let it boil; ſkim it, and when the third part is evaporated, take to two pints of urine, one ounce of tartar, and one ounce of galiz-ſtone; mix them all together, and let them boil once up. When you would *ſilver* any metal, rub it well with brick-duſt on a wet woollen rag, till it is clean and fine, then put it twenty-four hours in the prepared urine; afterwards dry it, and where you deſign to *ſilver,* rub it over with quickſilver, which muſt be laid on thin with the iron ſpatula that has alſo lain two hours in urine. The quickſilver, thus laid on, muſt be then rubbed on with a ſoft woollen rag, and it will make a fine *ſilvering.*

Braſs may be *ſilvered,* by boiling it with filings of good pewter and white tartar, in equal quantities. There are ſeveral other methods of *ſilvering,* for which ſee Smith's Laboratory, p. 37, ſeq. alſo Handmaid to the Arts, vol. i. p. 471, &c. See Luna *cornea.* See Gilding *of metals.*

Silvering *of leather.* See Lacquer and *Japanner's* Gilding.

The proceeding in *ſilvering* the leather is in all reſpects the ſame as when it is to have the appearance of gilding, except that, inſtead of the yellow varniſh, a clear colourleſs one is to be uſed, where the appearance of ſilver is to be preſerved.

The moſt common varniſh for this purpoſe is only parchment ſize, made warm, and laid on with a ſpunge. However, the more hard and tranſparent the varniſhes are, and the more they are of a reſinous nature, the more brilliant and white, and the more durable will be the *ſilvery* and poliſhed appearance of the *ſilvered* leather. Some inſtead of the parchment ſize uſe that made of iſinglaſs.

Silvering *of looking-glaſſes* and *ſpherical ſpecula.* See Looking-*glaſs,* and Foliating *of looking-glaſſes.*

Silvering *of paper.* See *Chineſe* Paper.

SILVESTRE GRANUM, or Coccus Silvestris, a term uſed by ſome authors to expreſs the coccus *polonicus*; and by others, for a coarſe or bad kind of cochineal, produced in the province of Guatimala in New Spain; it is by ſome ſuppoſed to be the ſeed of a plant, but is, in reality, an inſect, as the true cochineal is, only that the ſcarlet colour it yields is greatly inferior to the other. See Cochineal.

SILURUS, in *Ichthyology,* the name of a very large ſiſh, commonly called in Engliſh the *ſheat-fiſh.*

It is caught in the Viſtula, and other large rivers, and grows to an immenſe ſize, ſome having been caught of more than an hundred weight, and of ſixteen feet long, and ſometimes conſiderably larger than that. It reſembles the eel in colour, but the belly is variegated with black, white, and duſky ſpots; the body is without ſcales, and is covered with a mucous ſubſtance; the head is flat, ſhort, and broad; the opening of the mouth extremely large; the body down to the fundament is thick and cylindric, but the bottom of the belly is flat, and from the anus to the tail it is broader and flat; its eyes are large, and have two antennæ, or ſlender excreſcences before them; and four beards hang from the lower jaw; the gills are four on a ſide; it has only one ſmall fin upon the back, and the tail is not forked; its fleſh is much eſteemed for food, and is dreſſed for the table as the eel. It is a very voracious fiſh, and much dreaded whenever it comes among the ſmaller fry.

Geſner mentions two other ſpecies of it, one flatted toward the tail, and the other of a mixed green and yellow colour, and having two beards on the upper jaw, and three on the under: he only calls theſe *ſiluri ſecunda,* and *tertia ſpecies.* Willughby, Hiſt. Piſc p. 128. See *Black* Fish.

The name is of Grecian origin, and is derived from the words *σειν, to move* or *ſhake,* and *ουρα, a tail.* It is given to this fiſh, from its remarkable quality of being almoſt continually moving its tail in the water.

In the *Linnæan ſyſtem,* the *ſilurus* is a genus of the order of *abdominales.* Its characters are, that the body is naked; that the mouth is furniſhed with ſeveral cirri, ſomewhat filiform; that the branchial membrane conſiſts of a number of rays from four to fourteen; and that the firſt ray of the dorſal and pectoral fins is ſpinoſe and dentated backwards.

Linnæus enumerates twenty-one ſpecies. Piſo ſays of the ſheat-fiſh or callichthys, that in dry ſeaſons this fiſh travels over ſmall tracts of land in ſearch of freſh water.

Silurus is alſo a name given by ſome authors to the ſturgeon, called by others *accipenſer,* but by the generality of writers sturio.

SIMA, or Cyma, in *Architecture,* a term uſed by Wolfius, and ſome other writers, for what we otherwiſe call cymatium, or *ſimatium.*

SIMARONA, a name given by the Spaniards in America to a ſpecies of vanilla, called alſo *baſtard-vanilla.* The pods of this kind are every way ſmaller than thoſe of the true kind, and have very little liquor, or pulp in them when broken, and contain very few ſeeds. Theſe are greatly inferior to the true kind, having ſcarce any ſmell. It is not yet certainly known, whether this ſpecies be the fruit of a different kind of vanilla-plant from the common, or whether it be the fruit gathered at a different ſeaſon, or from a plant growing in a different ſoil. See Vanilla.

SIMAROUBA, in *Botany,* is the bark of a tree, brought from Guiana in long pieces, of a yellowiſh white colour; light, tough, and of a fibrous texture.

The bark of this plant is very ſucceſsful in the cure of dyſenteries, as Mr. Juſſieu aſſures us from his experience. It is a thick yellow bark, of an aſtringent bitteriſh taſte, and reſembling, as it is ſaid, the *macer* of the ancients: it was firſt brought into Europe from America in 1713; but of the tree which produces it we have no certain account.

This medicine is more ſucceſsful in decoctions than in ſubſtance; the decoction is prepared by boiling two drams

of

of the bark in a quart of water, to the consumption of one third: this quantity is divided into four doses, and taken warm at intervals of three hours: thus used, the pain abated in one day, and when continued for a short time, it completed the cure, without producing any nausea or disturbance. Jussieu observes, that it is not accompanied with the ill effects of astringents; that it lessens spasmodic and hysteric symptoms; and that it answers best in fluxes of the serose, bilious, bloody, and mucous kind, supported by a convulsive motion of the intestines, where there is no fever, where the functions of the stomach are unhurt, and in tenesmi. Mem. de l'Acad. Scien. de Paris, 1729.

Dr. Degner likewise made use of this bark in the same form with good success, after proper evacuations, in an epidemic putrid dysentery, which raged at Nimeguen during the summer and autumn of 1736. Act. Nat. Curios. vol. v. append.

SIMARUM *musculus*, in *Anatomy*, a name given by some of the old writers to a muscle, called by the moderns the SERRATUS *magnus*.

SIMATIUM, or SIMAISE, in *Architecture*. See CYMATIUM.

Simatium and *cymatium* are generally confounded together, yet they ought to be distinguished; the latter being the genus, and the former the species.

Simatium of *sima*, camous, according to Felibien, is the last and uppermost member of grand corniches, called particularly the great *doucine*, or *gula recta*; and by the Greeks, *epititheta*.

In the antique buildings, the *simatium*, at the top of the Doric corniche, is generally in form of a cavetto, or semi-scotia; as we see particularly in the theatre of Marcellus. This some modern architects have imitated; but, in the Ionic order, the *simatium* is always a doucine. The *simatium*, or *doucine*, then, is distinguished from the other kinds of *cymatia*, by its being camous or flat-nosed.

SIMBALATH, in the *Materia Medica*, a name given by Avicenna and others to the spikenard, or *nardus Indica*.

The exact interpretation of the word is *spicigera*, and Avicenna, under this general name, distinguishes it into several kinds; the first he calls *alnardin*, or *nardin*. It has been supposed by some that he means the Indian spikenard by this word, but, on the contrary, it appears plainly that he means the Celtic nard; he calls it the *nardus Romani orbis*, and says that it is of European growth. After this he mentions the Asiatic nards of several kinds, which are only the Indian spikenard, growing in different places, and such as used to be brought thence in different degrees of perfection.

SIMELIUM, a Latin term, used by some to signify a table, with ranges of little cavities therein, for the disposing of medals in chronological order.

The word is but ill written; it should rather be *cimelium*, as being formed of the Greek κειμήλιον, *curiosities*, or *a cabinet of precious things*.

We more usually say, a cabinet of medals, than a *simelium*.

SIMIA, the *ape* or *monkey*, in *Zoology*, is made by Linnæus a distinct genus of animals, belonging to the order of *primates*, and class of *mammalia*. The characters of which are, that they have four cutting teeth in each jaw, which are near each other; that the canine teeth are single, longer, and separate; that the grinders are obtuse. Linnæus enumerates thirty-three species.

This genus belongs to the section of anthropomorphous digitated quadrupeds, in Mr. Pennant's system, of which he gives the following characters: they have four cutting teeth in each jaw, and two canine: each of the feet is formed like hands, generally with flat nails, and, except in one instance, have four fingers and a thumb, with eye-brows above and below.

This race of animals, which is very numerous, is almost confined to the torrid zone; they fill the woods of Africa, from Senegal to the Cape, and from thence to Æthiopia; a single species is found beyond that line, in the province of Barbary: they are found in all parts of India, and its islands; in Cochin-China, in the south of China, and in Japan; and one kind is met with in Arabia; they swarm in the forests of South America, from the Isthmus of Darien as far as Paraguay.

These animals are lively and full of frolic, chatter, and grimace: from the structure of their members, they have many actions in common with the human kind: most of them are fierce and untameable; some are of a milder nature, and will shew a degree of attachment, but in general they are mischievous, filthy, lascivious, and thieving; they feed on fruits, leaves, and insects; inhabit woods, and live in trees; are in general gregarious, and go in large companies: the different species never mix with each other, but always keep apart: they leap with great activity from tree to tree, even when loaded with their young, which cling to them: they are the prey of leopards, and other animals of the feline race, and also of serpents, which pursue them to the summits of the trees and swallow them entire: they are not carnivorous, but for the sake of mischief, will rob the nests of birds of the eggs and young; and it is observed, that in those countries where apes most abound, the feathered tribe discover singular sagacity in fixing their nests beyond the reach of these invaders.

Mr. Ray first distributed the animals of this genus into three classes, viz. the *simiæ* or *apes*, such as wanted tails; the *cercopitheci*, or *monkies*, such as had tails; and *papiones*, or *baboons*, those with short tails.

From Ray, Linnæus formed his method, which was followed by M. de Buffon, who made a farther sub-division of the long-tailed apes, or true monkies, into such which had prehensile tails, and such which had not. The true apes, or *simiæ veterum*, having no tail, comprehend in the Linnæan system three species, viz. the *simia satyrus*, or ORANG-*outang*; the *simia sylvanus*, or *pygmy*, with a flattish face; ears like those of a man; body of the size of a cat; colour above of an olive brown, and beneath yellowish; nails flat; buttocks naked, and sitting upright; these animals inhabit Africa, feed on fruits, and are very fond of insects, particularly of ants; assemble in troops, fly when attacked by wild beasts, and when overtaken face their pursuers, and often escape by flinging the sand of the desert in their eyes: and the *simia inuus*, or *Barbary ape*, which has a long face, resembling that of a dog; long and strong canine teeth; ears like the human; flat nails, bare buttocks, the upper part of the body of a dirty greenish brown colour, and the belly of a dull pale yellow. This animal, which grows to above the length of four feet, inhabits many parts of India, Arabia, and all parts of Africa, except Egypt, and a small number is found on the hill of Gibraltar, which breed there. These apes are very ill-natured, mischievous and fierce, agreeing with the character of the ancient *cynocephali*: they are often exhibited to play tricks; assemble in great troops in India, and will attack women going to market, and rob them of their provisions. The females carry their young in their arms, and will leap from tree to tree with them.

The *papiones*, or *baboons*, with short tails, comprehend in the Linnæan system, the three following species, viz. the *simia nemestrina*, or *pig-tailed baboon*, with a pointed face, hazel eyes, a few black hairs above and beneath the mouth, naked face, of a swarthy redness; ears like the human, crown of the head dusky; hair on the limbs and body brown, inclining to ash-colour, and palest on the belly; black fingers, flat and long nails, thumbs on the hind-feet very long, connected to the nearest toe by a broad membrane; tail about four inches long, like a pig's, and almost naked; and length from head to tail twenty-two inches. This animal inhabits the isles of Sumatra and Japan, and, being very docile, is taught several tricks, and exhibited by mountebanks.

The *simia apedia*, or *little baboon*, with a roundish head, projecting mouth, roundish and naked ears, thumb not remote from the fingers, narrow and compressed nails, those of the thumbs rounded, the colour of the hair yellowish, tipt with black; the face brown with a few scattered hairs; tail not an inch long, buttocks covered with hairs, and about the size of a squirrel or cat. This is a lively species and inhabits India. And the *simia sphinx*, or *great baboon*, with hazel irides, small and naked ears, canine and very thick face; the middle of the face and forehead naked, and of a bright vermilion colour, as is also the top of the nose, which is truncated at its termination like that of a hog; the sides of the nose broadly ribbed, and of a fine violet hue; the opening of the mouth very small; the cheeks, throat, and goat-like beard yellow; the hair on the forehead very long, black, turning back, and forming a kind of pointed crest; the head, arms, and legs covered with short hair, yellow and black intermixed; the breast with long whitish yellow hairs, and the shoulders with long brown hair; the nails flat, feet and hands black, the tail four inches long, and very hairy; the buttocks bare, red, and filthy, but the space about them of a very elegant purple colour, which reaches to the inside of the upper part of the thighs. This animal inhabits the hotter parts of Africa.

To this division Mr. Pennant adds the *simia maimon* of Linnæus, and several other species; and to another class of *baboons* with *longer tails*, he refers Linnæus's *simia hamadryas*, or the *dog-faced baboon*, which inhabits the hottest parts of Africa and Asia, and is very fierce in its nature, and lascivious in its manners; the *simia veter* and *simia silenus*, and some other species not enumerated by Linnæus. See PAPIO.

The *cercopitheci*, or *monkies*, with long tails, comprehend in the Linnæan distribution twenty-seven species, viz. the

the *simia maimon, hamadryas, veter, silenus, faunus, belzebul, seniculus, paniscus, cynomolgus, cynocephalus, diana, sabæa, cephus, trepida, aygula, pithecia, nictitans, jacchus, œdipus, rosalia, midas, fatuellus, apella, capucina, sciurea, morta*, and *syrichta*; for the description of which the reader is referred to Linnæus's Systema Naturæ, tom. i. p. 35, &c. and for a more particular account to Pennant's Hist. of Quadrupeds, vol. i. p. 179—211. ed. 4to. 1781. See Cercopithecus and Monkey.

Sima *marina*, the *sea-ape*, in *Ichthyology*, a name used by Bellonius, and some other authors, for the fish called *vulpes marina*, a kind of shark, remarkable for its long tail, from which probably it had both one and the other of these names. See *Sea*-fox.

SIMICON, in *Antiquity*, an ancient musical instrument of the stringed kind, with thirty-five strings. Mem. de l'Acad. Inscript. vol. v. p. 168.

SIMILAR, in *Arithmetic* and *Geometry*, the same with *like*. Those things are said to be *similar*, or *like*, which cannot be distinguished but by their com-presence; that is, either by immediately applying the one to the other, or some other third to them both. So that there is nothing found in one of the *similar* things, but is equally found in the other.

Thus, if you note all the things in A, which may be discerned and conceived, without assuming any other; and, in like manner, note all the things in B, which may be thus conceived, and A be *similar* to B; all things in A will be the same with those in B.

Since a quantity cannot be understood otherwise, than by assuming some other quantity to refer it to; *similar* things, notwithstanding their similitude, may differ in quantity; and since, in *similar* things, there is nothing wherein they differ, beside the quantity; quantity itself is the internal difference of *similar* things.

In mathematics, *similar* parts, as A a, have the same ratio to their wholes B b; and if the wholes have the same ratio to the parts, the parts are *similar*. *Similar* parts A a are to each other as their wholes B b. See Part.

Similar *angles* are also equal angles. See Solid *angle*.

Similar *rectangles* are those which have their sides about the angles proportional.

Hence, 1°, all squares must be *similar rectangles*. 2°, All *similar rectangles* are to each other as the squares of their homologous sides.

Similar *triangles*, are such as have all their three angles respectively equal to each other, and the sides about the equal angles proportional. See Triangle.

Hence, 1°, since, in all triangles mutually equiangular, the corresponding sides containing the equal angles are proportional, equiangular triangles are *similar* to each other. And if two triangles have their sides respectively proportional, those triangles are equiangular.

2°, All *similar triangles* are to each other, as the squares of their homologous sides.

In *similar triangles*, and parallelograms, the altitudes are proportional to the homologous sides, and the bases are cut proportionably by those sides.

Similar *polygons* are those, whose angles are severally equal, and the sides about those angles proportional. And the like of other *similar* rectilinear figures.

Hence, all *similar polygons* are, to each other, as the squares of the homologous sides.

In all *similar* figures, the homologous angles are equal, and the homologous sides proportional. All regular figures, and *similar* irregular ones, are in a duplicate ratio of their homologous sides. Circles, and *similar* figures, inscribed in them, are, to each other, as the squares of the diameters.

Similar *arches*. See Arch.

Similar *curves*, in *Geometry*. The *similarity* of curvilinear figures may be derived from that of rectilinear figures, that are always *similarly* described in them; or, we may comprehend all sorts of *similar* figures, planes, or solids, in this general definition: figures are *similar*, when they may be supposed to be placed in such a manner, that any right line being drawn from a determined point to the terms that bound them, the parts of the right line, intercepted betwixt that point and those terms, are always in one constant ratio to each other. Thus the figure A S D, *a S d* (*Tab.* IV. *Geometry*, *fig.* 111.), are *similar*, when any line SP being drawn always from the same point S, meeting A D in P, and *a d* in *p*, the ratio of S P to S *p* is invariable. It is manifest, that the rectilinear inscribed figures *a p d* S, A P D S, are *similar* in this case, according to the definition of such figures given in Euclid's Elements, book vi. See Maclaurin's Fluxions, Art. 122.

When the *similar* figures are in the situation here described, they are also *similarly* situated, and all their homologous lines are either placed upon one another, or parallel.

Similar *segments of circles* are such as contain equal angles. See Segment.

Similar *conic sections* are those where the ordinates to a diameter in one are proportional to the correspondent ordinates to the *similar* diameter in the other; and where the parts of *similar* diameters between the vertices and ordinates in each section are *similar*.

The same definition also agrees to *similar* segments of conic sections.

Similar *diameters of two conic sections*. When the diameters in two conic sections make the same angles with their ordinates, they are sometimes said to be *similar*.

Similar *solids*. See Like *solid figures*.

Similar *bodies*, in *Natural Philosophy*, such as have their particles of the same kind or nature one with another.

Similar *plain numbers* are those, which may be ranged into *similar* rectangles, *i. e.* into rectangles, whose sides are proportional: as 6 multiplied by 2, and 12 by 4, the product of one whereof is 12, and the other 48, are *similar numbers*.

Similar *solid numbers* are those, whose little cubes may be so ranged, as to make *similar* and rectangular parallelepipeds.

Similar *animals*. We have a treatise by Dr. Martin, wherein he treats of the laws and proportions of the motions and forces of the solids and fluids of animals, of however different magnitudes, which are supposed of *similar* make and constitution. See Tractat. de Similibus Animalibus.

Similar *disease*, in *Medicine*, denotes a disease of some simple, solid part of the body. As of a fibre, with regard to its tension; or flaccidity; of a membrane; a nervous canal, or the like. See Disease.

Similar *parts*, in *Anatomy*, are those parts of the body, which, at first sight, appear to consist of like parts, or parts of the same nature, texture, and formation.

Of these we usually reckon ten, viz. the bones, cartilages, ligaments, membranes, fibres, nerves, arteries, veins, flesh, and skin; each of which see under its proper article.

Dr. Grew, in his anatomy of plants, observes, that these have likewise their *similar* and organical parts.

SIMILE, or Similitude, in *Rhetoric*, a comparison of two things, which, though different in other respects, yet agree in some one. As, *He shall be like a tree planted by the water side*, &c. so that in every *similitude* three things are requisite; two things that are compared together; and a third, in which the likeness or *similitude* between them consists.

The difference between a *simile* and a *comparison*, consists in this, that the *simile* properly belongs to what we call the quality of the thing, and the comparison to the quantity.

And the difference between a metaphor and *similitude* consists in this, that a metaphor has not those signs of comparison which are expressed in a similitude. See Metaphor and Parable.

SIMILITUDE, in *Arithmetic*, *Geometry*, &c. denotes the relation of two things similar to each other, or which are only distinguishable by com-presence.

The notion of *similitude*, which now makes some figure in geometry, &c. is owing to M. Leibnitz; it will be rendered easy by the following instance. Suppose two watches perfectly alike, the one belonging to Caius, the other to Gracchus. If, now, Caius pull out his watch in presence of Gracchus; the latter will be surprised, and fancy it his own; but he will perceive it different from his own, upon pulling out his own; that is, Gracchus distinguishes Caius's watch from his own by their com-presence; or, by applying the one immediately to the other.

Euclid, and after him most other authors, demonstrate every thing in geometry from the sole principle of congruity. Wolfius, in lieu hereof, substitutes that of *similitude*; which, he tells us, was communicated to him by M. Leibnitz, and which he finds of very considerable use in geometry, as serving to demonstrate many things directly, which are only demonstrable from the principle of congruity, by an ambages.

SIMILOR is a name given to an allay of red copper and zinc, made in the best proportions to imitate the colour of gold. See Gold-*coloured metal*.

SIMITAR, or Scimitar, in *War*, a crooked or falcated sword, with a convex edge; not now used.

SIMON, in *Ichthyology*, a name by which some authors have called the *dolphin*. It is affirmed, that this fish loves the name, and will come to a person who calls him by it; but this, though recorded by authors of credit, meets with no faith among the judicious readers.

SIMONIACAL is applied to a person guilty of simony; that is, of purchasing a benefice, or other sacred matter, with money.

SIMONIANS, a sect of ancient heretics, the first that ever disturbed Christianity; if they might be said to do so, who were little more than mere philosophers, and chiefly made profession of magic.

Simon Magus, so often mentioned in the Acts, was their leader, and died under the emperor Nero; St. Peter still surviving; so that Clemens Alexandrinus is mistaken, when he makes Simon posterior to Marcion.

This impious man, says Mosheim, is not to be ranked among the number of those who corrupted with their errors the purity or simplicity of the Christian doctrine, nor is he to be considered as the parent and chief of the heretical tribe; but he is rather to be placed in the number of those who were enemies to the progress and advancement of Christianity. For it is manifest from all the records we have concerning him, that after his defection from the Christians, in consequence of the severe rebuke which he received from the apostle Peter, he retained not the least attachment to Christ, but opposed himself openly to the divine Saviour, and assumed to himself blasphemously the title of the *supreme power of God*. Orig. adv. Celsum. lib. v. p. 272. ed. Spenceri.

Simon was by birth a Samaritan, or a Jew; when he had studied philosophy at Alexandria, he made a public profession of magic, and persuaded the Samaritans, by fictitious miracles, that he had received from God the power of commanding and restraining those evil beings by which mankind were tormented. As for his doctrines, Mosheim adds, that he was, without doubt, in the class of those philosophers, who not only maintained the eternity of matter, but also the existence of an evil being, who presided, and thus shared the empire of the universe with the supreme and beneficent mind; and he, probably, embraced the opinion of those who held, that matter, moved from eternity by an intrinsic and necessary activity, had by its innate force produced, at a certain period of time, from its own substance, the evil principle which now exercises dominion over it, with his numerous train of attendants. From this pernicious doctrine, the other errors attributed to him concerning fate, the indifference of human actions, the impurity of the human body, the power of magic, and similar extravagancies, flow naturally, as from their true and genuine source.

This magician farther pretended, that in his person resided the greatest and most powerful of the divine æons; that another æon of the female sex, the mother of all human souls, dwelt in the person of his mistress Helena; and that he came, by the command of God, upon earth, to abolish the empire of those that had formed this material world, and to deliver Helena from their power and dominion. Mosh. Eccl. Hist. vol. i. p. 115. 8vo. ed. See Gnostics.

SIMONY, Simonia, the crime of trafficking with sacred things; particularly the corrupt presentation of any one to an ecclesiastical benefice for money, gift, or reward.

The word is borrowed from Simon Magus, who is mentioned in the Acts of the Apostles, as offering to buy the power of working miracles with money: though the purchasing of holy orders seems to approach nearer to his offence.

By the English canons, anno 1229, *simony* is not only committed by an agreement for money in hand, or to be paid yearly; but by any other profit or emolument; any reward, gift, or benefit, directly or indirectly; or by reason of any promise, grant, bond, &c. and this, either in the acceptance of a living, or in an exchange or Resignation.

Simony was by the canon law a very grievous crime; and it is so much the more odious, because, as sir Edward Coke observes, it is ever accompanied with perjury; for the presentee is sworn to have committed no *simony*. However, it was not an offence punishable in a criminal way at the common law; it being thought sufficient to leave the clerk to ecclesiastical censures: but many acts of parliament have been made to restrain it by means of civil forfeitures. Thus the statute 31 Eliz. c. 6. enacts, that if any patron, for money, or any other corrupt consideration or promise, directly or indirectly given, shall present, admit, institute, induct, instal, or collate any person to an ecclesiastical benefice or dignity, such presentation shall be void, and the presentee be rendered incapable of ever enjoying the same benefice, and the crown shall present to it for that turn only: moreover, both the giver and taker shall forfeit two years value of the benefice or dignity; one moiety to the king, and the other to any one who will sue for the same. If persons also corruptly resign or exchange their benefices, both the giver and taker shall, in like manner, forfeit double the value of the money, or other corrupt consideration.

Farther, by the statute 12 Ann. stat. 2. c. 12. if any person, for money or profit, shall procure, in his own name, or the name of any other, the next presentation to any living ecclesiastical, and shall be presented thereupon, this is declared to be a simoniacal contract, and the party is subjected to all the ecclesiastical penalties of *simony*, is disabled from holding the benefice, and the presentation devolves to the crown.

In the construction of these statutes, these points, says judge Blackstone, seem to be clearly settled.

1. That to purchase a presentation, the living being actually vacant, is open and notorious *simony*.

2. That for a clerk to bargain for the next presentation, the incumbent being sick and about to die, was *simony*, even before the statute of queen Anne; and now, by that statute, to purchase, either in his own name or another's, the next presentation, and be thereupon presented at any future time to the living, is direct and palpable *simony*.

But, 3. it is held that for a father to purchase such a presentation, in order to provide for his son, is not *simony*; the son not being concerned in the bargain, and the father being by nature bound to make a provision for him.

4. That if a simoniacal contract be made with the patron, the clerk not being privy thereto, the presentation for that turn shall indeed devolve to the crown, as a punishment of the guilty patron; but the clerk, who is innocent, does not incur any disability or forfeiture.

5. That bonds given to pay money to charitable uses, on receiving a presentation to a living, are not simoniacal, provided the patron or his relations be not benefited thereby; for this is no corrupt consideration, moving to the patron.

6. That bonds of resignation, in case of non-residence, or taking any other living, are not simonaical, there being no corrupt consideration herein, but such as is only for the good of the public. So also bonds to resign, when the patron's son comes to canonical age, are legal; upon the reason before given, that the father is bound to provide for his son.

7. Lastly, general bonds to resign at the patron's request, are held to be legal; for they may possibly be given for one of the legal considerations before mentioned, and where there is a possibility that the transaction may be fair, the law will not suppose it iniquitous without proof; but if the party can prove the contract to have been a corrupt one, such proof will be admitted, in order to shew the bond simoniacal, and therefore void. Neither will the patron be suffered to make an ill use of such a general bond of resignation; as by extorting a composition for tithes, procuring an annuity for his relations, or by demanding a resignation wantonly, and without good cause, such as is approved by the law; as for the benefit of his own son, or on account of non-residence, plurality of livings, or gross immorality in the incumbent. Blackst. Com. b. ii. p. 279, &c.

Simony is also committed by buying or selling the sacrament, baptism, ordination, or absolution; as well as by the nomination and collation to a benefice, a place in a monastery, or the like.

By 31 Eliz. cap. 6. persons who shall corruptly ordain or licence any minister, or procure him to be ordained or licensed, shall incur a forfeiture of 40*l*. and the minister himself of 10*l*. besides an incapacity to hold any ecclesiastical preferment for seven years afterwards. See Presentation.

Some have pretended it to be sufficient to avoid the charge of *simony*, if only the ordination were gratuitous, though the revenues were bought and sold as a temporal thing. But the canons of several councils have condemned this subtile distinction; since the revenues are attached to an ecclesiastical office purely spiritual.

Casuists distinguish three kinds of *simony*; viz.

Simony, *mental*, is that which is restricted to the mere will, and inclination, without ever breaking forth into act. As when a present is made to a collator, without taking any notice, that we expect a benefice from him. This kind of *simony* is only punishable in *foro conscientiæ*.

Simony, *conventional*, is where there is an express act, and a formal bargain, though it never come to an execution.

Simony, *real*, is where the convention is executed on both sides; which last is the most criminal of all. The canonical penalty of *simony* is deposition in a clerk, and excommunication in a layman.

It is a maxim among the Romish canonists, that there is no *simony* in the court of Rome; because the pope acts there as an absolute sovereign; they also say, that resignations *in favorem* are not to be admitted but by the pope, as favouring a little of *simony*. On these occasions, however, the parties always swear, that there had been no deceit, collusion, *simony*, or other illegal covenant.

Peter

Peter Damian diſtinguiſhes three kinds of *ſimony*: that *of money*, that *of the tongue*, and that *of ſervices*.

SIMONY *of money*, or *per munus a manu*, is where money is really paid down for a benefice: he adds, that the ſame is likewiſe committed, by expending money to live at court to obtain a benefice.

SIMONY *of the tongue*, or *per munus a lingua*, conſiſts in flattering the collator, or making one's ſelf agreeable by complaiſance and commendation.

SIMONY *of ſervices*, or *per munus ab obſequio*, conſiſts in the doing them good offices to obtain a benefice.

It was agreed by all the juſtices, Trin. oct. Jac. primi, that if the patron preſented any perſon to a benefice with cure, for money; ſuch preſentation, &c. is void, though the preſentee were not privy to it; and the ſtatute gives the preſentation to the king; but this is now repealed.

SIMPLA *nobla*, in *Botany*. See PHYLLIS.

SIMPLARY, *ſimplaris*, in *Antiquity*, a Roman ſoldier, who had only ſingle pay. Thus called, in oppoſition to the *duplares*, or ſuch as had double pay.

SIMPLE, *ſimplex*, ſomething not mixed, or compounded; in which ſenſe it ſtands oppoſed to COMPOUND.

The ELEMENTS are *ſimple* bodies, from the compoſition whereof all mixed bodies reſult.

SIMPLE *equation*, *fraction*, and *ſurd*, in *Algebra*. See the ſubſtantives.

SIMPLE *quantities*, in *Algebra*, are thoſe which conſiſt of one term only; as $+a$, $-ab$, or $+abc$; accordingly they are oppoſed to COMPOUND *quantities*.

SIMPLE *glands*, in *Anatomy*. See GLANDS.

SIMPLE *anomaly* and *excentricity*, in *Aſtronomy*. See the ſubſtantives.

SIMPLE, in *Botany*, is a general name given to all herbs and plants; as having each its particular virtue, whereby it becomes a *ſimple* remedy.

The *ſimples* brought from the Levant, and the Eaſt Indies, were not known among us till about the year 1200.

SIMPLE *flowers*, and *leaf*. See the ſubſtantives.

SIMPLE *fencing*. See FENCING.

SIMPLE *flank* and *tenaille*, in *Fortification*. See the ſubſtantives.

In *Geometry*, we ſay, the moſt *ſimple* demonſtrations are the beſt.

In *Grammar*, we have *ſimple* WORDS, or PRIMITIVES; and compounds, which have ſome particle added to them.

In *Juriſprudence*, they ſay, a *ſimple* donation, in oppoſition to a mutual or reciprocal one: a *ſimple* ſale, in oppoſition to that made with a reſervation of the faculty of redemption; and *ſimple* homage, in oppoſition to liege homage.

SIMPLE *average*, *benefice*, *charter*, *church*, *depoſit*, *eſtate*, *fee*, *force*, *larceny*, *reſignation*, and *vaſſalage*. See the ſubſtantives.

SIMPLE *contract*, *debts by*, are ſuch, where the contract upon which the obligation ariſes is neither aſcertained by matter of record, nor yet by deed or ſpecial inſtrument, but by mere oral evidence, or by notes unſealed, which are capable of a more eaſy proof, and (therefore only) better than a verbal promiſe.

SIMPLE *affection*, *form*, *modes*, *neceſſity*, *oppoſition*, and *propoſition*, in *Logic* and *Metaphyſics*. See the ſubſtantives.

SIMPLE *machine*, *motion*, *pendulum*, and *wheel*, in *Mechanics*. See the ſubſtantives.

The *ſimpleſt* machines are always the moſt eſteemed.

SIMPLE, in *Muſic*, is chiefly uſed in oppoſition to *double*; ſometimes to a compound of ſeveral parts, or figures of different values, &c.

SIMPLE *cadence* is that where the notes are all equal through all the parts.

SIMPLE *concords* are thoſe wherein we hear at leaſt two notes in conſonance; as a third and a fifth; and, of conſequence, at leaſt three parts. This is either done immediately, and is called the *harmonical triad*, or in a more remote manner, that is, when the ſounds, that are not baſs, are one or two octaves higher. This diſtance has no ill effect in the third, but in the fifth it has; and, generally ſpeaking, the nearer, or more immediate, the concords are, the better. See CONCORD.

They alſo ſay C *ſimple*, or plain, in oppoſition to C accented.

SIMPLE *counterpoint*, *dieſis*, *fugue*, *harmony*, *interval*, *ſounds*, and *triple*. See the ſubſtantives.

SIMPLE *foſſils*, in *Natural Hiſtory*. See FOSSILS.

SIMPLE *viſion*, in *Optics*. See VISION.

In *Pharmacy*, there are *ſimple* remedies, and compounds; the former of which are uſually preferable to the latter.

SIMPLE *diachylon*, *diacodium*, *diamorum*, *diaprunum*, *dropax*, *fomentations*, *hydromel*, *mixture*, *oxymel*, and *waters*. See the ſubſtantives.

SIMPLE *taſte*, in *Phyſiology*. See TASTE.

SIMPLE *hiſtory* and *ſtyle*, in *Rhetoric*. See the ſubſtantives.

SIMPLE *fracture* and *ulcer*, in *Surgery*. See the ſubſtantives.

SIMPLER'S *joy*, in *Botany*. See VERVAIN.

SIMPLICITY, in *Ethics*. See SINCERITY.

SIMPLIFYING, in *Eccleſiaſtical Matters*, is the taking away of a cure of ſouls from a benefice, and diſpenſing the beneficiary from reſidence.

Several benefices which have been *ſimplified*, now require reſidence; and many others, which required reſidence, have been *ſimplified*.

Some uſe the word in a more extenſive ſignification; viz. for the ſhortening a relation, &c. or retrenching every thing not preciſely neceſſary. When the matter of fact ſhall be *ſimplified*, and ſtripped of its vain circumſtances, the court will ſee, &c.

SIMPLOCE, in *Rhetoric*, a figure which comprehends both the ANAPHORA and EPISTROPHE. In this figure the ſeveral members begin and end with the ſame word. Thus St. Paul: *Are they Hebrews? So am I? Are they Iſraelites? So am I? Are they the ſeed of Abraham? So am I.* 2 Cor. xi. 22.

SIMPLUDIARIA, in *Antiquity*, a kind of funeral honours paid to the deceaſed at their obſequies.

The word is formed from the Latin *ſimplex*, and *ludus*; whence *ſimpludiaria*, or *ſimpliludaria*, q. d. *ſimple games*.

Some will have *ſimpludiaria* to be the funerals at which games were exhibited: ſuch is the ſentiment of Paulus Diaconus. Feſtus ſays, they were thoſe, in the games whereof nothing was ſeen but dancers and leapers, called *corvitores*; who, according to M. Dacier, were perſons who run along the maſts and yards of veſſels or boats, called *corbes*.

In other reſpects, thoſe two authors agree as to the kind of funerals called *ſimpludiaria*; viz. that they were oppoſite to thoſe called *indictiva*; wherein, beſides the dancers and leapers obſerved in the *ſimpludiaria*, there were deſultores, or people who vaulted on horſes; or, perhaps, horſe-races, wherein the cavaliers leaped from horſe to horſe at full ſpeed.

SIMPULUM, among the Romans, a veſſel with a long handle, and made like a cruet. It was uſed in ſacrifices and libations, for taking a very little wine at a time.

SIMULACRUM, among the Romans. See IDOL, and IDOLATRY.

SIMULATION, in *Ethics*, is making a thing appear which does not exiſt; and thus it is diſtinguiſhed from DISSIMULATION, which is keeping that which exiſts from appearing.

SIMUS, in *Ichthyology*, the name uſed by ſome authors for the NASUS, or naſe, a fiſh common in the large rivers in Germany, and ſomewhat reſembling our chub, and in ſome reſpects our common rudd.

SIN, denotes want of conformity to the law of God in the things which that law requires, or the tranſgreſſion of that law in thoſe things which it forbids; and under this definition are comprehended both the *ſins* of omiſſion and *ſins* of commiſſion.

Plato defines *ſin* to be ſomething void, both of number and meaſure: by way of contradiction to virtue, which he makes to conſiſt in muſical numbers, &c. See VIRTUE, and RHYTHMUS.

Agreeable hereto, Suarez obſerves, that an action becomes ſinful, by its wanting a due commenſuration; for as every thing meaſured refers to ſome rule, from which if it deviate, it becomes incommenſurate; and as the rule of man's will is the law of God; ſo, &c. Suarez adds, that all evil actions are prohibited by ſome divine law; and that this is required to the perfection of the divine providence.

Simplicius, and, after him, the ſchoolmen, aſſert, that evil is not any poſitive thing, contrary to good; but a mere defect and accident.

Sins are diſtinguiſhed into *original*, and *actual*.

SIN, *original*, has been divided by ſome divines into *inherent* and *imputed*: the former term is uſed to denote that corruption or degeneracy of nature, which is propagated by the laws of generation from the firſt man to all his offſpring, and by reaſon of which man is utterly indiſpoſed, diſabled, and made oppoſite unto all that is ſpiritually good, and that continually. Hence, it is ſaid, proceed all actual tranſgreſſions. The general cauſe and ground of this propagation of a ſinful nature, are referred originally to men's common intereſt in the guilt or condemnation of Adam's firſt *ſin*; but the manner in which this hereditary corruption is conveyed, is not particularly explained, though ſome have ſuppoſed that it may reſult from the conſtitution of the body, and the dependence of the mind upon it.

Father

Father Mallebranche accounts for it from natural causes thus: men at this day retain, in the brain, all the traces and impressions of their first parents. For all animals produce their like, and with like traces in the brain; whence it is that animals of the same kind have the same sympathies and antipathies, and do the same things on the same occasions; and our first parents, after their transgression, received such deep traces in the brain, by the impression of sensible objects, that it was very possible they might communicate them to their children.

Now, as it is necessary, according to the order established by nature, that the thoughts of the soul be conformable to the traces in the brain; it may be said, that as soon as we are formed in the womb, we are infected with the corruption of our parents: for having traces in the brain like those of the persons who gave us being; it is necessary we have the same thoughts, and the same inclinations, with regard to sensible objects. Thus, of course, we must be born with concupiscence, and *original sin*. With concupiscence, if that be nothing but the natural effort the traces of the brain make on the mind to attach it to sensible things; and with *original sin*, if that be nothing but the prevalency of concupiscence; nothing, in reality, but these effects considered as victorious, and as masters of the mind and heart of the child.

Imputed original sin denotes that guilt or obligation to punishment, to which all the posterity of Adam are subject, by the imputation of his transgression. This is called the guilt of Adam's first *sin*, in which the sinfulness of that state into which man fell, is said partly to consist; and it is denominated *original sin*, in order to distinguish it from *actual sin*, or personal guilt. This doctrine of imputed guilt has been explained and vindicated by supposing a covenant made with Adam, as a public person, not for himself only, but for his posterity, in consequence of which he became the federal head, surety, or representative of all mankind; and they descending from him by ordinary generation, sinned in him, and fell with him, in his first transgression. It has been debated, how far the imputation of Adam's *sin* reaches: some have maintained, that it extends to final condemnation, and eternal misery: others have suggested, that the *sin* of Adam has subjected his posterity to an utter extinction of being; so that all who die in their infancy fall into a state of annihilation, excepting those who are the seed of God's people, who by virtue of the blessings of the covenant made with Abraham, and the promise to the seed of the righteous, shall, through the grace and power of Christ, obtain a part in a happy resurrection, in which other infants shall have no share.

The Romish casuists distinguish *actual sins* into *mortal*; which are such as make us lose the grace of God; and *venial*, which alone are pardoned, as being only *sins* of infirmity, not of malice. See POPERY.

Divines are not yet agreed what the *sin* against the Holy Ghost is. See BLASPHEMY *against the Holy Ghost*.

SIN, *philosophical*, according to the doctrine of the Jesuits, is an action, or course of action, that is repugnant to the dictates of reason, and yet not offensive to the Deity.

SINAI, *Knights of*. See CATHARINE.

SINAPIS, in *Botany*. See MUSTARD.

SINAPI *Persicum*, *Persian mustard*, a name by which some botanical authors have called the thlapsi, or TREACLE *mustard*.

SINAPISIS, a word used by some writers as a name for Armenian bole.

SINAPISTRUM, in *Botany*. See CLEOME.

SINAPISM, σιναπισμος, formed from *sinapi*, or σιναπι, *mustard-seed*, in *Pharmacy*, an external medicine, in form of a cataplasm; composed chiefly of MUSTARD-*seed* pulverized, and mixed up with the pulp of figs; or with briony, garlick, onion, nasturtium, euphorbium, ranunculus roots, or the like.

Sinapisms excite a redness, heat, itching, tumor, and sometimes a blister, on the place they are applied to. They were anciently in great request, and still continue in use for inveterate diseases of the head, long-continued defluxions, &c.

SINASBARIUM, in *Botany*, a name given by some authors to the *sysimbrium*, or water-mint, common in all our ditches and watery places.

SINCERITY, in *Ethics*, is that excellent habitude and temper of mind, which gives to virtue its reality, and makes it to be what it appears. *Simplicity*, called by the Greeks απλοτης, is included in this virtue, but does not express the whole of it; so that it is necessary to add αληθεια, *truth*: of which two the first stands in opposition to what is mixed and adulterated; the other to what is counterfeit. *Sincerity* has respect to two sorts of objects; persons and things. Of the first kind are God; other men, and every man's self. *Sincerity*, with regard to God, signifies, that the form of religion is accompanied with the power of it, and that piety and obedience are substantial and unaffected; proceeding from principles, right in themselves, and uniform in their influence. *Sincerity*, as it regards men, implies an honesty and openness in our dealings with them, extending to the springs and motions of our actions, as well as the actions themselves; to our words and our thoughts. *Sincerity*, with relation to a man's self, is opposed to self-deception. As to things, truth and goodness are the principal objects of *sincerity*. The extremes of this virtue are over-frankness and hypocrisy. Grove's System of Moral Philosophy, vol. ii. chap. 3.

SINCIPUT, or SYNCIPUT, is the fore-part of the head, reaching from the forehead to the coronal suture. See *Tab. Anat. (Osteol.) fig.* 2. *lit. a. fig.* 7. *n.* 1.

SINDON, in *Surgery*, a little round piece of linen, or silk, or lint, used in dressing the wound after TREPANNING.

The first thing usually done after the operation of trepanning is, to pour a few drops of white balsam on the dura mater; then a spoonful of mel rosatum being warmed with a little balsam, a *sindon* is dipped into it, of fine linen cloth: this is immediately applied upon the dura mater; and being greater than the hole in the skull, its circumference is thrust all round between the cranium and the membrane; then pledgets of lint are applied, and the hole is quite stopped therewith. The next morning, when the dressing is taken off, the brain is never left bare a moment; but as soon as the former *sindon* and lint are removed, new ones are clapped on in their room.

SINE, or *Right* SINE, in *Trigonometry*, a right line drawn from one extremity of an arch, perpendicular to the radius drawn from the other extremity: or, the *sine* is half the chord of twice the arch.

Thus the line AD (*Tab. Trigonom. fig.* 3.) which is half the chord AB of the double arch AEB, is the right *sine*; or, simply, the *sine* of the arch AE.

SINE, *whole*, *sinus totus*, is the *sine* of the quadrant HE, or of 90 degrees; that is, the whole *sine* is the same with the RADIUS HC.

SINE, *versed*, is a part ED of the whole *sine* or radius intercepted between the right *sine* AD and the arch AE.

It is demonstrated, 1. That, the right *sine* AD being perpendicular to the radius EC, all *sines* drawn to the same radius are parallel to each other.

2. Since the arch AE is the measure of the angle ACE, and AI the measure of the contiguous angle ACI, and the quadrant HE the measure of the right angle; AD is also the right *sine*, and ED the versed *sine* of the angles ACE and ACI; and the whole *sine* is the *sine* of the right angle.

3. Two angles contiguous, as ACE and ACI, have the same *sine*.

4. The *sines* of obtuse angles are the same with those of their complements to two right angles: or the *sine* of any angle, and the *sine* of its supplement, are the same; or the *sines* of arches less than 90°, serve equally for arches as much greater than 90°; i. e. the *sines* of 80° and 100°, of 60° and 120°, &c. are respectively equal.

5. All *sines* of similar arches have the same ratio to their radii.

6. In every triangle the sides are as the *sines* of the opposite angles.

SINE-*complement*, or *Co*-SINE, is the *sine* of an arch AE, which is the complement of another arch AH, to a quadrant.

Thus also the *sine* of the arch AH is called the *sine-complement* of the arch AE. And it is plain, that the *versed sine* and *co-sine*, taken together, are equal to the radius.

The SINE BC (*fig.* 11.) *and the versed* sine AB, *being given in common measure, not in parts of the radius, to find the arch* FC *in degrees.* Find the semidiameter AD: then in the triangle DBC, besides the right angle B, by the sides BC and DC we find the angle ADC, which shews the number of degrees in the arch AC; the double whereof is the arch FC. This problem is of use in finding the segment of a circle. See SEGMENT.

SINES, *line of*, a line on the sector, Gunter's scale, &c. the description and use whereof see under the articles SECTOR, and GUNTER'S *scale*.

In estimating the quantity of *sines*, &c. we assume radius for unity; and determine the quantity of the *sines*, tangents, and secants, in fractions thereof. From Ptolemy's Almagest we learn, that the ancients divided the radius into sixty parts; which they called degrees, and thence determined the chords in minutes, seconds, and thirds; that is, in sexagesimal fractions of the radius, which they likewise used in the resolution of triangles.

The

The *ſines*, or half chords, for aught that appears, were firſt uſed by the Saracens.

Regiomontanus, at firſt, with the ancients, divided the radius into ſixty degrees; and determined the *ſines* of the ſeveral degrees in decimal fractions thereof. But he afterwards found it would be more commodious to aſſume radius for 1; and thus introduced the preſent method into trigonometry.

In the common tables of *ſines* and tangents, the radius is conceived divided into 10000000 parts; beyond which we never go in determining the quantity of the *ſines* and tangents. Hence, as the ſide of an hexagon ſubtends the ſixth part of a circle, and is equal to radius, the *ſine* of 30° is half the radius, or 5000000.

1. *The* SINE AD *being given, to find the* ſine complement. From the ſquare of the radius AC ſubtract the ſquare of the *ſine* AD; the remainder will be the ſquare of the *ſine-complement* DC or AG: whence, the ſquare root being extracted, we have the *ſine-complement.* E. gr. Suppoſing AC 10000000, and AD 5000000, AG will be found 8660254, the *ſine* of 60°.

2. *The* SINE AD *of the arch* AE *being given; to find the* ſine *of the half arch, or half of* AE. Find the CHORD of the arch AE; for half of this is its *ſine.* Thus ſuppoſing AG and AD, as in the preceding problem: we ſhall find the *ſine* of half the arch AE, or the *ſine* of 15° = 2588190.

3. *The* SINE DG *of the arch* DF *being given, to find the* ſine DE, *of the double arch* DB (*fig.* 7.) Since the angles at E and G are right angles, and the angle B is common to each triangle BCG, and DEB, we ſhall have BC : CG :: BD : DE: wherefore CG being found by the firſt problem, and BD being double of DG, DE is found by the rule of proportion.

4. *The* SINES FG *and* DE (*fig.* 8.) *of the arches* FA *and* DA, *whoſe difference* DF *is not greater than* 45 *minutes, being given; to find any intermediate* ſine, *as* IL. To the difference FD of the arches, whoſe *ſines* are given, the difference of the arch AI, whoſe *ſine* is required, and AF, viz. IF, and the difference of the given *ſines* DH, find a fourth proportional: this, added to the leſs given *ſine* FG, the aggregate will be the *ſine* required.

5. *To find the* SINE *of* 45 *degrees.* Let HI (*fig.* 3.) be a quadrant of a circle; then will HCI be a right angle; conſequently the triangle rectangular; therefore $HI^2 = HC^2 + CI^2 = 2HC^2$: wherefore, ſince HC the whole *ſine* is 10000000; if from $2HC^2$, 200000000000000, be extracted the ſquare root 14142136; we ſhall have the chord HI, whoſe half 7071068, is the *ſine* of 45° required.

6. *The ſide of a pentagon being given* (ſee POLYGON), *the* ſine *of* 36° *may be eaſily found.* For the *ſine* of 36° is equal to half 11755706, i. e. = 5877853.

7. *The* SINE *of a minute, or* 60″, FG (*fig.* 8.) *being given, to find the* ſine *of one or more ſeconds* MN. Since the arches AM and AF are very ſmall, AMF may be taken for a right line, without any ſenſible error in the decimal fractions of the radius wherein the *ſine* is expreſſed; that is, the arches AM and AF may be taken proportional to their chords. Wherefore, ſince MN is parallel to FG, we ſhall have AF : FG :: AM : MN: therefore AF, FG, and AM, being given, MN is eaſily had.

SINES, *to conſtruct a canon of.* The *ſines* of 30° 15° 45° and 36° (which we have already ſhewn how to find) being had; we can thence conſtruct a canon of all the *ſines* to every minute, or every ſecond. For from the *ſine* of 36° we find thoſe of 18° 9° 4° 30′, and 2° 15′, by the ſecond problem: the *ſines* of 54° 72° 81° 85° 30′, and 87° 45′, &c. by the firſt problem.

Again, from the *ſine* of 45°, find the *ſine* of 22° 30′ 11° 15′, &c. From the *ſine* of 30°, and the *ſine* of 54°, find the *ſine* of 12°. From the *ſine* of 12°, find the *ſines* of 6° 3° 1° 30′ 45′ 78° 84°, &c. From the *ſine* of 15°, find the *ſine* of 7° 30′ 3° 45′, &c. till you have 120 *ſines* ſucceeding each other orderly, at an interval of 45 minutes. Between theſe, find the intermediate *ſines* by the fourth problem: thus will the canon be complete.

From the SINE of an arch given, to find the tangent and ſecant. See TANGENT, SECANT, and ſequel of this article.

To find the logarithm of a given SINE, called the *artificial ſine*, ſee LOGARITHM. Wolfii Element. Math. vol. i. p. 214, &c.

There are various other methods of conſtructing the triangular or trigonometrical canon. We ſhall here ſubjoin the following, as the moſt ſimple and eaſy. But it will be neceſſary to premiſe the three ſubſequent propoſitions.

1. *The* SINE EF *of an arch* AE (*fig.* 9.) *being given, to find its coſine* CF, *verſed* ſine AF, *tangent* AT, *cotangent* DH, *ſecant* CT, *and coſecant* CH. The *coſine* CF is evidently $= \sqrt{CE^2 - EF^2}$, and the verſed *ſine* = CE or CA−CF. And the triangles CFE, CAT, and CDH being ſimilar, we ſhall have CF : FE :: CA : AT; or the tangent will be a fourth proportional to the *coſine*, the *ſine*, and radius; and CF : CE (CA) :: CA : CT, whence the ſecant is a third proportional to the *coſine* and radius; and EF : CF :: CD : DH, or the cotangent is a fourth proportional to the *ſine*, *coſine*, and radius; and EF : EC (CD) :: CD : DH, or the coſecant is a third proportional to the *ſine* and radius. Moreover, becauſe AT : AC :: CD (AC) : DH, the rectangle of the tangent and cotangent is equal to the ſquare of the radius, and, therefore, the tangent of half a right angle, being equal to its cotangent, is equal to the radius; and the cotangents of any two different arches (repreſented by P and Q), are to one another inverſely as their tangents; for tang. P × cotang. P = rad.^{2} = tang. Q × cotang. Q: therefore cotang. P : cotang. Q :: tang. Q : tang. P, or cotang. P : tang. Q :: cotang. Q : tang. P.

2. *If there be three equidifferent arches* AB, AC, AD (*fig.* 10.) *we ſhall have radius to the coſine of their common difference* BC, *or* CD, *as the* ſine CF *of the mean to half the ſum of the* ſines BE + DG *of the two extremes; and as radius to the* ſine *of the common difference, ſo is the coſine of the mean to half the difference of the* ſines *of the two extremes.* For let BD be drawn, interſecting OC in *m*; alſo draw *mn* parallel to CF, and BH and *mv* parallel to AO. The arches BC and CD being equal, OC is perpendicular to BD, and biſects it; and, therefore, B*m* or D*m* will be the *ſine* of BC or DC, and O*m* its *coſine.* Moreover, *mn*, being an arithmetical mean between the *ſines* BE, DG of the two extremes (becauſe B*m* = D*m*) is, therefore, equal to half their ſum, and D*v* equal to half their difference. But the triangles OCF, O*mn*, and D*vm*, being ſimilar, we ſhall have OC : O*m* :: CF : *mn*, and OC : D*m* :: FO : D*v*. Whence $mn\left(\frac{DG+BE}{2}\right) = \frac{Om \times CF}{OC}$, and $Dv\left(\frac{DG-BE}{2}\right) = \frac{Dm \times FO}{OC}$, and conſequently $DG+BE = \frac{2Om \times CF}{OC}$ and $DG-BE = \frac{2Dm \times FO}{OC}$. And, moreover, if the mean arch AC be 60°, OF its *coſine* will be = *ſine* 30° = ½ chord 60° = ½ OC; conſequently DG−BE will, in this caſe, be barely = D*m*, and DG = D*m* + BE. Hence it follows, 1. That if the *ſine* of the mean of three equidifferent arches (radius being unity) be multiplied by twice the *coſine* of the common difference, and the *ſine* of either extreme be ſubtracted from the product, the remainder will be the *ſine* of the other extreme. And, 2. The *ſine* of any arch above 60° is equal to the *ſine* of another arch, as much below 60°, together with the *ſine* of its exceſs above 60°.

3. *To find the* SINE *of a very ſmall arch,* e. gr. of 15′. The chords of very ſmall arches being to each other nearly as the arches themſelves, we ſhall have $\frac{1}{384}$th of the ſemiperiphery : $\frac{1}{360}$th (:: 360 : 384) :: ,00818121, the chord of $\frac{1}{384}$th : ,008726624, the chord of $\frac{1}{360}$th of the ſemiperiphery, or half a degree, whoſe half or ,004363312, is the *ſine* of 15′, very nearly; and, therefore, 15′ : 1′ :: ,004363312 : ,000290888, the *ſine* of the arch of 1′ nearly.

Upon the foregoing principles the canon may be eaſily conſtructed. For, the *ſine* of 1′ being ,0002908882, its ſquare is ,00000008461594, which, ſubtracted from the ſquare of the radius 1, leaves ,99999991538406, whoſe ſquare root ,9999999577, is the *coſine* of 1′, or the *ſine* of 89° 59′. Now having the *ſine* and *coſine* of 1′, the other *ſines* may be found in the following manner. Let the *coſine* of 1′ be called C, and we ſhall have by prop. 2. ſupra,

2C × *ſine* 1′ − *ſine* 0′ = *ſine* 2′ = ,0005817764
2C × *ſine* 2′ − *ſine* 1′ = *ſine* 3′ = ,0008726645
2C × *ſine* 3′ − *ſine* 2′ = *ſine* 4′ = ,0011635526
2C × *ſine* 4′ − *ſine* 3′ = *ſine* 5′ = ,0014544406
2C × *ſine* 5′ − *ſine* 4′ = *ſine* 6′ = ,0017453283, &c.

Thus are the *ſines* of 7′, 8′, 9′, &c. ſucceſſively derived from each other. The *ſines* of every degree and minute, up to 60°, being thus found; thoſe of above 60° will be had by addition only, by prop. 2. ſupra; and the *ſines* being all known, the tangents and ſecants will likewiſe become known by prop. 1. ſupra. If all theſe numbers be multiplied by the radius of any table (radius being here ſuppoſed unity), we ſhall have the natural *ſines*, tangents, &c. of ſuch a table. It will be ſufficient to compute the *ſine* of every fifth minute only by the preceding method; becauſe the *ſines* of all the intermediate arches may be had from them, by taking the proportional parts of the differences ſo near as to give the firſt ſix places true in each number. E. gr. 2C 5′ × *ſine* 5′ −

ſine 0′ = *ſine* 10′; ſubtract the *ſine* 5′ from that of 10′; add $\frac{1}{5}$th of the remainder to the *ſine* 5′, for the *ſine* of 6′, to which add the ſame $\frac{1}{5}$th for the *ſine* of 7′, &c. to 10′. Again, 2 C 5′ × *ſine* 10′ − *ſine* 5′ = *ſine* 15′, &c. Simpſon's Trigonometry, p. 10, &c. Robertſon's Elem. Navig. book iii. § 2.

The tables now chiefly uſed in trigonometrical computations, exhibit the logarithms of thoſe numbers, which expreſs the lengths of the *ſines*, tangents, &c. which, in order to diſtinguiſh them from the natural ones, are called logarithmic or artificial *ſines*, tangents, &c. A table of this kind, the uſe of which often occurs in the courſe of this work, is here annexed. The *ſines*, tangents, &c. of any arch are eaſily found, by ſeeking the degree at the top, if the arch be leſs than 45°, and the minutes at the ſide, beginning from the top, and by ſeeking the degree, &c. at the bottom, if the arch is greater than 45°. If a given logarithmic *ſine*, or tangent, falls between thoſe in the tables, then the correſponding degrees and minutes may be reckoned $\frac{1}{4}$, $\frac{1}{3}$, or $\frac{1}{2}$, &c. minutes more than thoſe belonging to the neareſt leſs logarithm in the tables, according as its difference from the given one is $\frac{1}{4}$, or $\frac{1}{3}$, or $\frac{1}{2}$, &c. of the difference between the logarithm next greater and next leſs than the given log. See Sherwin's Mathematical Tables, which contain both the natural and artificial *ſines*, &c. and Gardiner's Tables of Logarithms, &c. in which the logarithms of the *ſines* are computed to every ſecond in the firſt ſeventy-two minutes of the quadrant.

A Logarithmic Canon, or TABLE of Artificial *Sines* and Tangents; the Radius 10.000000.

Minut.	0 Degree Sine	Sine Complem.	Tang.	Tangent Complem.	
0	0,0000000	10,0000000	0,0000000	Infinite	60
1	6,4637261	9,9999999	6,4637261	13,5362739	59
2	6,7647561	9,9999999	6,7647562	13,2352438	58
3	6,9408473	9,9999998	6,9408475	13,0591525	57
4	7,0657860	9,9999997	7,0657863	12,9342137	56
5	7,1626960	9,9999995	7,1626964	12,8373036	55
6	7,2418771	9,9999993	7,2418778	12,7581222	54
7	7,3088239	9,9999991	7,3088248	12,6911752	53
8	7,3668157	9,9999988	7,3668169	12,6331831	52
9	7,4179681	9,9999985	7,4179696	12,5820304	51
10	7,4637255	9,9999982	7,4637173	12,5362727	50
11	7,5051181	9,9999978	7,5051203	12,4948797	49
12	7,5429065	9,9999974	7,5429091	12,4570909	48
13	7,5776684	9,9999969	7,5776715	12,4223284	47
14	7,6098530	9,9999964	7,6098566	12,3901434	46
15	7,6398160	9,9999959	7,6398201	12,3601799	45
16	7,6678445	9,9999953	7,6678492	12,3321508	44
17	7,6941733	9,9999947	7,6941786	12,3058214	43
18	7,7189966	9,9999940	7,7190026	12,2709974	42
19	7,7424775	9,9999934	7,7424841	12,2575159	41
20	7,7647537	9,9999927	7,7647610	12,2352390	40
21	7,7859427	9,9999919	7,7859508	12,2140492	39
22	7,8061458	9,9999911	7,8061547	12,1938453	38
23	7,8254507	9,9999903	7,8254604	12,1745396	37
24	7,8439338	9,9999894	7,8439444	12,1560556	36
25	7,8616623	9,9999885	7,8616738	12,1383262	35
26	7,8786953	9,9999876	7,8787077	12,1212923	34
27	7,8960854	9,9999866	7,8950988	12,1049012	33
28	7,9108793	9,9999856	7,9108938	12,0891062	32
29	7,9261190	9,9999845	7,9261344	12,0738656	31
30	7,9408419	9,9999835	7,9408584	12,0591416	30
31	7,9550819	9,9999823	7,9550996	12,0449004	29
32	7,9688698	9,9999812	7,9688886	12,0311114	28
33	7,9822334	9,9999800	7,9822534	12,0177466	27
34	7,9951980	9,9999788	7,9952192	12,0047808	26
35	8,0077867	9,9999775	8,0078092	11,9911908	25
36	8,0200207	9,9999762	8,0200445	11,9799555	24
37	8,0319195	9,9999748	8,0319446	11,9680554	23
38	8,0435009	9,9999735	8,0435274	11,9564726	22
39	8,0547814	9,9999721	8,0548094	11,9451906	21
40	8,0657763	9,9999706	8,0658057	11,9341943	20
41	8,0764997	9,9999691	8,0765306	11,9234694	19
42	8,0869646	9,9999676	8,0869970	11,9130030	18
43	8,0971832	9,9999660	8,0972172	11,9027828	17
44	8,1071669	9,9999644	8,1072025	11,8927975	16
45	8,1169262	9,9999628	8,1169634	11,8830366	15
46	8,1264710	9,9999611	8,1265099	11,8734901	14
47	8,1358104	9,9999594	8,1358510	11,8641490	13
48	8,1449532	9,9999577	8,1449956	11,8550044	12
49	8,1539075	9,9999559	8,1539516	11,8460484	11
50	8,1626808	9,9999541	8,1627267	11,8372733	10
51	8,1712804	9,9999522	8,1713282	11,8286718	9
52	8,1797129	9,9999503	8,1797626	11,8202374	7
53	8,1879848	9,9999484	8,1880364	11,8119636	8
54	8,1961020	9,9999464	8,1961556	11,8038444	6
55	8,2040703	9,9999444	8,2041259	11,7958741	5
56	8,2118949	9,9999424	8,2119526	11,7880474	4
57	8,2195811	9,9999403	8,2196408	11,7803592	3
58	8,2271335	9,9999382	8,2271953	11,7728047	2
59	8,2345568	9,9999360	8,2346208	11,7653792	1
60	8,2418553	9,9999338	8,2419215	11,7580785	0
	Sine Complem.	Sine	Tangent Complem.	Tang.	Minut.
	89 Degrees				

Minut.	1 Degree Sine	Sine Complem.	Tang.	Tangent Complem.	
0	8,2418553	9,9999338	8,2419215	11,7580785	60
1	8,2490332	9,9999316	8,2491015	11,7508985	59
2	8,2560943	9,9999294	8,2561649	11,7438351	58
3	8,2630424	9,9999271	8,2631153	11,7368847	57
4	8,2698810	9,9999247	8,2699563	11,7300437	56
5	8,2766136	9,9999254	8,2766912	11,7233088	55
6	8,2832434	9,9999200	8,2833234	11,7166766	54
7	8,2897734	9,9999175	8,2898559	11,7101441	53
8	8,2962067	9,9999150	8,2962917	11,7037083	52
9	8,3025460	9,9999125	8,3026335	11,6973665	51
10	8,3087941	9,9999100	8,3088842	11,6911158	50
11	8,3149536	9,9999074	8,3150462	11,6849538	49
12	8,3210269	9,9999047	8,3211221	11,6788779	48
13	8,3270163	9,9999021	8,3271143	11,6728857	47
14	8,3329243	9,9998994	8,3330249	11,6669751	46
15	8,3387529	9,9998966	8,3388563	11,6611437	45
16	8,3445043	9,9998939	8,3446105	11,6553895	44
17	8,3501805	9,9998911	8,3502895	11,6497105	43
18	8,3557835	9,9998882	8,3558953	11,6441047	42
19	8,3613150	9,9998853	8,3614297	11,6385703	41
20	8,3667769	9,9998824	8,3668945	11,6331055	40
21	8,3721710	9,9998794	8,3722915	11,6277085	39
22	8,3774988	9,9998764	8,3776223	11,6223777	38
23	8,3827620	9,9998734	8,3828886	11,6171114	37
24	8,3879622	9,9998703	8,3880918	11,6119082	36
25	8,3931008	9,9998672	8,3932336	11,6067664	35
26	8,3981793	9,9998641	8,3383152	11,6016848	34
27	8,4031990	9999,8609	8,4033381	11,5966619	33
28	8,4081614	9,9998577	8,4083037	11,5916963	32
29	8,4130676	9,9998544	8,4132132	11 5867868	31
30	8,4179190	9,9998512	8,4180679	11,5819321	30
31	8,4227168	9,9998478	8,4228690	11,5771310	29
32	8,4274621	9,9998445	8,4276176	11,5723824	28
33	8,4321561	9,9998411	8,4323150	11,5676850	27
34	8,4367999	9,9998376	8,4369622	11,5630378	26
35	8,4413944	9,9998342	8,4415603	11,5584397	25
36	8,4459409	9,9998306	8,4461103	11,5538897	24
37	8,4504402	9,9998271	8,4506131	11,5493869	23
38	8,4548934	9,9998235	8,4550699	11,5449301	22
39	8,4593013	9,9998199	8,4594814	11,5405186	21
40	8,4636649	9,9998162	8,4638486	11,5361514	20
41	8,4679850	9,9998125	8,4681725	11,5318275	19
42	8,4722626	9,9998088	8,4724538	11,5275462	18
43	8,4764984	9,9998050	8,4766933	11,5233067	17
44	8,4806932	9,9998012	8,4808920	11,5191080	16
45	8,4848479	9,9997974	8,4850505	11,5149495	15
46	8,4889632	9,9997935	8,4891696	11,5108304	14
47	8,4930398	9,9997896	8,4932502	11,5067498	13
48	8,4970784	9,9997856	8,4972928	11,5027072	12
49	8,5010798	9,9997817	8,5012982	11,4987018	11
50	8,5050447	9,9997776	8,5052671	11,4947329	10
51	8,5089736	9,9997736	8,5092001	11,4907999	9
52	8,5128673	9,9997695	8,5130978	11,4869022	8
53	8,5167264	9,9997653	8,5169610	11,4830387	7
54	8,5205514	9,9997612	8,5207902	11,4792098	6
55	8,5243430	9,9997570	8,5245860	11,4754149	5
56	8,5281017	9,9997527	8,5283490	11,4716510	4
57	8,5318281	9,9997484	8,5320797	11,4679203	3
58	8,5355228	9,9997441	8,5357787	11,4642213	2
59	8,5391863	9,9997398	8,5394466	11,4605534	1
60	8,5428192	9,9997354	8,5430838	11,4569162	0
	Sine Complem.	Sine	Tangent Complem.	Tang.	Minut.
	88 Degrees				

Min.	2 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	8,5428192	9,9997354	8,5430838	11,4569162	60
1	8,5464218	9,9997309	8,5466909	11,4533091	59
2	8,5499948	9,9997265	8,5502683	11,4497317	58
3	8,5535386	9,9997220	8,5538166	11,4461834	57
4	8,5570536	9,9997174	8,5573362	11,4426638	56
5	8,5605404	9,9997128	8,5608276	11,4391724	55
6	8,5639994	9,9997082	8,5642912	11,4357088	54
7	8,5674310	9,9997036	8,5677275	11,4322725	53
8	8,5708357	9,9996989	8,5711368	11,4288632	52
9	8,5742139	9,9996942	8,5745197	11,4254803	51
10	8,5775660	9,9996894	8,5778766	11,4221234	50
11	8,5808923	9,9996846	8,5812077	11,4187923	49
12	8,5841933	9,9996798	8,5845136	11,4154864	48
13	8,5874694	9,9996749	8,5877945	11,4122055	47
14	8,5907209	9,9996700	8,5910509	11,4089491	46
15	8,5939483	9,9996650	8,5942832	11,4057168	45
16	8,5971517	9,9996601	8,5974917	11,4025083	44
17	8,6003317	9,9996550	8,6006767	11,3993233	43
18	8,6034886	9,9996500	8,6038386	12,3961614	42
19	8,6066226	9,9996449	8,6069777	11,3930223	41
20	8,6097341	9,9996398	8,6100943	11,3899057	40
21	8,6128235	9,9996346	,6131889	11,3868111	39
22	8,6158910	9,9996294	,6162616	11,3837384	38
23	8,6189369	9,9996242	,6193127	11,3806873	37
24	8,6219616	9,9996189	,6223427	11,3776573	36
25	8,6249653	9,9996136	,6253518	11,3746482	35
26	8,6279484	9,9996082	,6283402	11,3716598	34
27	8,6309111	9,9996028	,6313083	11,3686917	33
28	8,6338537	9,9995974	,6342563	11,3657437	32
29	8,6367764	9,9995919	,6371845	11,3628155	31
30	8,6396796	9,9995865	,6400931	11,3599059	30
31	8,6425634	9,9995809	8,6429825	11,3570175	29
32	8,6454282	9,9995753	8,6458528	11,3541472	28
33	8,6482742	9,9995697	8,6487044	11,3512956	27
34	8,6511016	9,9995641	8,6515375	11,3484625	26
35	8,6539107	9,9995584	8,6543522	11,3456478	25
36	8,6567017	9,9995527	8,6571490	11,3428510	24
37	8,6594748	9,9995469	8,6599279	11,3400721	23
38	8,6622303	9,9995411	8,6626891	11,3373109	22
39	8,6649684	9,9995353	8,6654331	11,3345669	21
40	8,6676893	9,9995297	8,6681598	11,3318402	20
41	8,6703932	9,9995236	8,6708697	11,3291303	19
42	8,6730804	9,9995176	8,6735628	11,3264372	18
43	8,6757510	9,9995116	8,6762393	11,3237607	17
44	8,6784052	9,9995056	8,6788996	11,3211004	16
45	8,6810433	9,9994996	8,6815437	11,3184563	15
46	8,6836654	9,9994935	8,6841719	11,3158281	14
47	8,6862718	9,9994874	8,6867844	11,3132156	13
48	8,6888625	9,9994812	8,6893813	11,3106187	12
49	8,6914379	9,9994750	8,6919629	11,3080371	11
50	8,6939985	9,9994688	8,6945292	11,3054708	10
51	8,6965431	9,9994625	8,6970806	11,3029194	9
52	8,6990734	9,999456	8,6996172	11,3003828	8
53	8,7015889	9,999449	8,7021390	11,2978610	7
54	8,7040899	9,999443	8,7046465	11,2953535	6
55	8,7065766	9,999437	8,7071395	11,2928605	5
56	8,7090490	9,999430	8,7096185	11,2903815	4
57	8,7115075	9,999424	8,7120384	11,2879166	3
58	8,7139520	9,999417	8,7145345	11,2854655	2
59	8,7163829	9,999411	8,7169719	11,2830281	1
60	8,7188002	9,99940	8,7193958	11,2806042	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.
	8 Degrees				

Min.	3 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	8,7188002	9,9994044	8,7193958	11,2806042	60
1	8,7212040	9,9993978	8,7218063	11,2781937	59
2	8,7235946	9,9993911	8,7242035	11,2757965	58
3	8,7259721	9,9993844	8,7265877	11,2734123	57
4	8,7283366	9,9993776	8,7289589	11,2710411	56
5	8,7306882	9,9993708	8,7313174	11,2686826	55
6	8,7330272	9,9993640	8,7336631	11,2663369	54
7	8,7353535	9,9993572	8,7359964	11,2640036	53
8	8,7376675	9,9993503	8,7383172	11,2616828	52
9	8,7399698	9,9993433	8,7406258	11,2593742	51
10	8,7422586	9,9993364	8,7429222	11,2570778	50
11	8,7445360	9,9993293	8,7452067	11,2547933	49
12	8,7468015	9,9993223	8,7474792	11,2525208	48
13	8,7490553	9,9993152	8,7497400	11,2502600	47
14	8,7512973	9,9993081	8,7519892	11,2480108	46
15	8,7535278	9,9993009	8,7542269	11,2457731	45
16	8,7557469	9,9992938	8,7564531	11,2435469	44
17	8,7579546	9,9992865	8,7586681	11,2413319	43
18	8,7601512	9,9992793	8,7608719	11,2391281	42
19	8,7623366	9,9992720	8,7630647	11,2369353	41
20	8,7645111	9,9992646	8,7652465	11,2347535	40
21	8,7666747	9,9992572	8,7674175	11,2325825	39
22	8,7688275	9,9992498	8,7695777	11,2304223	38
23	8,7709697	9,9992424	8,7717274	11,2282726	37
24	8,7731014	9,9992349	8,7738665	11,2261335	36
25	8,7752226	9,9992274	8,7759952	11,2240048	35
26	8,7773334	9,9992198	8,7781136	11,2218864	34
27	8,7794340	9,9992122	8,7802218	11,2197782	33
28	8,7815244	9,9992046	8,7823199	11,2176801	32
29	8,7836048	9,9991969	8,7844079	11,2155921	31
30	8,7856753	9,9991892	8,7864861	11,2135139	30
31	8,7877359	9,9991815	8,7885544	11,2114456	29
32	8,7897867	9,9991737	8,7906130	11,2093870	28
33	8,7918278	9,9991659	8,7926620	11,2073380	27
34	8,7938594	9,9991580	8,7947014	11,2052986	26
35	8,7958814	9,9991501	8,7967313	11,2032687	25
36	8,7978941	9,9991422	8,7987519	11.2012481	24
37	8,7998974	9,9991342	8,8007632	11,1992368	23
38	8,8018915	9,9991262	8,8027653	11,1972347	22
39	8,8038764	9,9991182	8.8047583	11,1952417	21
40	8,8058523	9,9991101	8,8067422	11,1932578	20
41	8,8078192	9,9991020	8,8087172	11,1912828	19
42	8,8097772	9,9990938	8,8106834	11,1893166	18
43	8,8117264	9,9990856	8,8126407	11,1873593	17
44	8,8136668	9,9990774	8,8145894	11,1854106	16
45	8,8155985	9,9990691	8,8165294	11,1834706	15
46	8,8175217	9,9990608	8,8184608	11,1815392	14
47	8,8194363	9,9990525	8,8203838	11,1796162	13
48	8,8213425	9,9990441	8,8222984	11,1777016	12
49	8,8232404	9,9990357	8,8242046	11,1757954	11
50	8,8251299	9,9990273	8,8261026	11,1738974	10
51	8,8270112	9,9990188	8,8279924	11,1720076	9
52	8,8288844	9,9990103	8,8298741	11,1701259	8
53	8,8307495	9,9990017	8,8317478	11,1682522	7
54	8,8326066	9,9989931	8,8336134	11,1663866	6
55	8,8344557	9,9989845	8,8354712	11,1645288	5
56	8,8362969	9,9989758	8,8373211	11,1626789	4
57	8,8381304	9,9989671	8,8391633	11,1608367	3
58	8,8399561	9,9989584	8,8409977	11,1590023	2
59	8,8417741	9,9989496	8,8428245	11,1571755	1
60	8,8435845	9,9989408	8,8446437	11,1553563	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.
	86 Degrees				

Min.	Degrees				
	Sine	Sine Com	Tang.	Tang. Comp.	
0	8,8435845	9,99898	8,8446437	11,1553563	60
1	8,8453874	9,99899	8,8464554	11,1535446	59
2	8,8471827	9,99890	8,8482597	11,1517403	58
3	8,8489707	9,99891	8,8500566	11,1499435	57
4	8,8507512	9,99892	8,8518461	11,1481539	56
5	8,8525245	9,99882	8,8536283	11,1463717	55
6	8,8542905	9,99871	8,8554039	11,1445966	54
7	8,8560493	9,99880	8,8571713	11,1428287	53
8	8,8578010	9,99889	8,8589321	11,1410679	52
9	8,8595457	9,99898	8,8606859	11,1393141	51
10	8,8612833	9,99806	8,8624327	11,1375673	50
11	8,8630139	9,99414	8,8641725	11,1358275	49
12	8,8647376	9,99321	8,8659055	11,1340945	48
13	8,8664545	9,99228	8,8676317	11,1323683	47
14	8.8681646	9,99135	8,8693511	11,1306489	46
15	8,8698680	9,99041	8,8710638	11,1289362	45
16	8,8715646	9,99947	8,8727699	11,1272301	44
17	8,8732546	9,99853	8,8744694	11,1255306	43
18	8,8749381	9,99758	8,8761623	11,1238377	42
19	8,8766150	9,99663	8,8778487	11,1221513	41
20	8,8782854	9,99567	8,8795286	11,1204714	40
21	9,8799493	9,99471	8,8812022	11,1187978	39
22	8,8816069	9,99375	8,8828694	11,1171306	38
23	8,8832581	9,99278	8,8845303	11,1154697	37
24	8,8849031	9,99181	8,8861850	11,1138150	36
25	8,8865418	9,99084	8,8878334	11,1121666	35
26	8,8881743	9,99986	8,8894757	11,1105243	34
27	8,8898007	9,99888	8,8911119	11,1088881	33
28	8,8914209	9,99790	8,8927420	11,1072580	32
29	8,8930351	9,96691	8,8943660	11,1056340	31
30	8,8946433	9,96591	8,8959842	11,1040158	30
	Sine Comp.	ıe	Tang.Comp	Tang.	Min.
	85 Degrees				

Min.	4 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
30	8,8946433	9,9986591	8,8959842	11,1040158	30
31	8,8962455	9,9986492	8,8975963	11,1024037	29
32	8,8978418	9,9986392	8,8992026	11,1007974	28
33	8,8994322	9,9986292	8,9008030	11,0991970	27
34	8,9010168	9,9986191	8,9023977	11,0976023	26
35	8,9025955	9,9986090	8,9039866	11,0960134	25
36	8,9041685	9,9985988	8,9055697	11,0944303	24
37	8,9057358	9,9985886	8,9071472	11,0928528	23
38	8,9072975	9,9985784	8,9087190	11,0912810	22
39	8,9088535	9,9985682	8,9102853	11,0897147	21
40	8,9104039	9,9985579	8,9118460	11,0881540	20
41	8,9119487	9,9985475	8,9134012	11,0865988	19
42	8,9134881	9,9985372	8,9149509	11,0850491	18
43	8,9150219	9,9985268	8,9164952	11,0835048	17
44	8,9165504	9,9985163	8,9180340	11,0819660	16
45	8,9180734	9,9985058	8,9195675	11,0804325	15
46	8,9195911	9,9984953	8,9210957	11,0789043	14
47	8,9211034	9,9984848	8,9226186	11,0773814	13
48	8,9226105	9,9984742	8,9241363	11,0758637	12
49	8,9241123	9,9984636	8,9256487	11,0743513	11
50	8,9256089	9,9984529	8,9271560	11,0728440	10
51	8,9271003	9,9984422	8,9286581	11,0713419	9
52	8,9285866	9,9984315	8,9301552	11,0698448	8
53	8,9300678	9,9984207	8,9316471	11,0683529	7
54	8,9315439	9,9984099	8,9331340	11,0668660	6
55	8,9330150	9,9983990	8,9346160	11,0653840	5
56	8,9344811	9,9983881	8,9360929	11,0639071	4
57	8,9359422	9,9983772	8,9375650	11,0624350	3
58	8,9373983	9,9983663	8,9390321	11,0609679	2
59	8,9388496	9,9983553	8,9404944	11,0595056	1
60	8,9402960	9,9983442	8,9419518	11,0580482	0
	Sine Comp	Sine	Tang.Comp.	Tang.	Min.
	85 Degrees				

5 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	8.9402960	9.9983442	8.9419518	11.0580482	60
1	8.9417376	9.9983332	8.9434044	11.0565956	59
2	8.9431743	9.9983220	8.9448523	11.0551477	58
3	8.9446063	9.9983109	8.9462954	11.0537046	57
4	8.9460335	9.9982997	8.9477338	11.0522662	56
5	8.9474561	9.9982885	8.9491676	11.0508324	55
6	8.9488739	9.9982772	8.9505967	11.0494033	54
7	8.9502871	9.9982660	8.9520211	11.0479789	53
8	8.9516957	9.9982546	8.9534410	11.0465590	52
9	8.9530996	9.9982433	8.9548564	11.0451436	51
10	8.9544991	9.9982318	8.9562672	11.0437328	50
11	8.9558940	9.9982204	8.9576735	11.0423265	49
12	8.9572843	9.9982089	8.9590754	11.0409246	48
13	8.9586703	9.9981974	8,9604728	11.0396272	47
14	8,9600517	9.9981859	8.9618659	11.0381341	46
15	8.9614288	9.9981743	8.9632545	11.0367455	45
16	8.9628014	9.9981629	8.9646386	11.0353614	44
17	8.9641697	9.9981510	8.9660188	11.0339812	43
18	8.9655337	9.9981393	8.9673944	11.0326056	42
19	8.9668934	9.9981275	8.9687658	11.0312342	41
20	8.9682487	9.9981158	8.9701330	11.0298670	40
21	8.9695999	9.9981040	8.9714959	11.0285041	39
22	8.9709468	9.9980921	8.9728547	11.0271453	38
23	8.9722895	9.9980802	8.9742092	11.0257908	37
24	8.9736280	9.9980683	8.9755597	11.0244403	36
25	8.9749624	9.9980563	8.9769060	11.0230940	35
26	8.9762926	9.9980443	8.9782483	11.0217517	34
27	8.9776188	9.9980323	8.9795865	11.0204135	33
28	8.9789408	9.9980202	8.9809206	11.0190794	32
29	8.9802589	9.9980081	8.9822507	11.0177493	31
30	8.9815729	9.9979960	8.9835769	11.0164231	30
31	9.9828829	9.9979838	8.9848991	11.0151009	29
32	8.9841889	9.9979716	8.9862173	11.0137827	28
33	8.9854910	9.9979593	8.9875317	11.0124683	27
34	8.9867891	9.9979470	8.9888421	11.0111579	26
35	8.9880834	9.9979347	8.9901487	11,0098513	25
36	8.9893737	9.9979223	8.9914514	11.0085486	24
37	8.9906602	9.9979099	8.9927503	11.0072497	23
38	8.9919429	9.9978975	8.9940454	11.0059546	22
39	8.9932217	9.9978850	8.9953367	11.0046633	21
40	8.9944968	9.9978725	8.9966243	11.0033757	20
41	8.9957681	9.9978599	8.9979081	11.0020919	19
42	8.9970356	9.9978473	8.9991883	11.0008117	18
43	8.9982994	9.9978347	9.0004647	10.9995353	17
44	8.9995595	9.9978220	9.0017375	10.9982625	16
45	9.0008160	9.9978093	9.0030066	10.9969934	15
46	9.0020687	9.9977966	9.0042721	10.9957279	14
47	9.0033179	9.9977838	9.0055340	10.9944660	13
48	9.0045634	9.9977710	9.0067924	10.9932076	12
49	9.0058053	9.9977582	9.0080471	10.9919529	11
50	9.0070436	9.9977453	9.0092984	10.9907016	10
51	9.0082784	9.9977323	9.0105461	10.9894539	9
52	9.0095096	9.9977194	9.7117903	10.9882097	8
53	9.0107374	9.9977064	9.0130310	10.9869690	7
54	9.0119616	9.9976933	9.0142682	10.9857318	6
55	9.0131823	9.9976803	9.0155021	10.9844979	5
56	9.0143996	9.9976672	9.0167325	10.9832675	4
57	9.0156135	9.9976540	9.0179594	10.9820406	3
58	9.0168239	9.9976408	9.0191831	10.9808169	2
59	9.0180309	9.9976276	9.0204033	10.9795967	1
60	9.0192346	9.9976143	9.0216202	10.9783798	0
	Sine Comp.	Sine	Tang Comp.	Tang.	Min.

84 Degrees

6 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9.0192346	9.9976143	9.0216202	10.9783798	60
1	9.0204348	9.9976011	9.0228338	10.9771662	59
2	9.0216318	9.9975877	9.0240441	10.9759559	58
3	9.0228254	9.9975743	9.0252510	10.9747490	57
4	9.0240157	9.9975609	9.0264548	10.9735452	56
5	9.0252027	9.9975475	9.0276552	10.9723448	55
6	9.0263865	9.9975340	9.0288524	10.9711476	54
7	9.0275669	9.9975205	9.0300464	10.9699536	53
8	9.0287442	9.9975069	9.0312373	10.9687627	52
9	9.0299182	9.9974933	9.0324249	10.9675751	51
10	9.0310890	9.9974797	9.0336093	10.9663907	50
11	9.0322567	9.9974660	9.0347906	10.9652094	49
12	9.0334212	9.9974523	9.0359688	10.9640312	48
13	9.0345825	9.9974386	9.0371439	10.9628561	47
14	9.0357407	9.9974248	9.03[illegible]3159	10.9616841	46
15	9.0368958	9.9974110	9.0394848	10.9605152	45
16	9.0380477	9.9973971	9.0406506	10.9593494	44
17	9.0391966	9.9973833	9.0418134	10.9581866	43
18	9.0403424	9.9973693	9.0429731	18.9570269	42
19	9.0414852	9.9973551	9.0441299	10.9558701	41
20	9.0426249	9.997341[illegible]	9.0452836	10.9547164	40
21	9,0437617	9.997327[illegible]	9.0464343	10.9535657	39
22	9.0448954	9.997313[illegible]	9.0475821	10.9524179	38
23	9.0460261	9.997299[illegible]	9.0487270	10.9512730	37
24	9.0471538	9.997285[illegible]	9.0498689	10.9501311	36
25	9.0482786	9.997270[illegible]	9.0510078	10.9489922	35
26	9.0494005	9.997256[illegible]	9.0521439	10.9478561	34
27	9.0505194	9.997242[illegible]	9.0532771	10.9467229	33
28	9.0516354	9.997228[illegible]	9.0544074	10.9455926	32
29	9.0527485	9.997213[illegible]	9.0555349	10.9444651	31
30	9.0538588	9.997199[illegible]	9.0566595	10.9433405	30
31	9.0549661	9.997184[illegible]	9.0577813	10.9422187	29
32	9.0560706	9.997170[illegible]	9.0589002	10.9410998	28
33	9.0571723	9.997155[illegible]	9.0600164	10.9399836	27
34	9.0582711	9.997141[illegible]	9.0611297	10.9388703	26
35	9.0593671	9.9971268	9.0622403	10.9377597	25
36	9.0604604	9.9971122	9.0633482	10.9366518	24
37	9.0615509	9.9970976	9.0644533	10.9355467	23
38	9.0626386	9.9970829	9.0655556	10.9344444	22
39	9.0637235	9.9970682	9.0666553	10.9333447	21
40	9.0648057	9.9970535	9.0677522	10.9322478	20
41	9.0658852	9.9970387	9.0688465	10.9311535	19
42	9.0669619	9.9970239	9.0699381	10.9300619	18
43	9.0680360	9.9970090	9.0710270	10.9289730	17
44	9.0691074	9.9969941	9.0721133	10.9278867	16
45	9.0701761	9.9969792	9.0731969	10.9268031	15
46	9.0712421	9.9969642	9.0742779	10.9257221	14
47	9.0723055	9.9969492	9.0753563	10.9246437	13
48	9.0733663	9.9969342	9.0764321	10.9235679	12
49	9.0744244	9.9969191	9.0775053	10.9224947	11
50	9.0754799	9.9969040	9.0785760	10.9214240	10
51	9.0765329	9.9968888	9.0796441	10.9203559	9
52	9.0775832	9.9968736	9.0807096	10.9192904	8
53	9.0786310	9.9968584	[illegible].0817726	10.9182274	7
54	9.0796762	9.9968431	[illegible].0828331	10.9171669	6
55	9.0807189	9.9968278	[illegible].0838911	10.9161089	5
56	9.0817590	9.9968125	[illegible].0849466	10.9150534	4
57	9.0827966	9.9967971	[illegible].0859996	19.9140004	3
58	9.0838317	9.9967817	[illegible].0870501	10.9129499	2
59	9.0848643	9.9967662	[illegible].0880981	10.9119019	1
60	9.0858945	9.9967507	[illegible].0891438	10.9108562	0
	Sine Comp.	Sine	[illegible]ang.Comp.	Tang.	Min.

83 De[illegible]ees

7 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9.0858945	9.9967597	9.0891438	10.9108562	60
1	9.0869221	9.9967352	9.0901869	10.9098131	59
2	9.0879473	9.9967196	9.0912277	10.9087723	58
3	9.0889700	9.9967040	9.0922660	10.9077340	57
4	9.0899903	9.9966884	9.0933020	10.9066980	56
5	9.0910082	9.9966727	9.0943355	10.9056645	55
6	9.0920237	9.9966570	9.0953667	10.9046333	54
7	9.0930367	9.9966412	9,0963955	10.9036045	53
8	9.0940474	9.9966254	9.0974219	10.9025781	52
9	9.0950556	9.9966096	9.0984460	10.9015540	51
10	9.0960615	9.9965937	9.0994678	10.9005322	50
11	9.0970651	9.9965778	9.1004872	10.8995128	49
12	9.0980662	9.9965619	9.1015044	10.8984956	48
13	9.0990651	9.9965459	9.1025192	10.8974808	47
14	9.1000616	9.9965299	9.1035317	10.8964683	46
15	9.1010558	9.9965138	9.1045410	10.8954580	45
16	9.1020477	9.9964977	9.1055500	10.8944500	44
17	9.1030373	9.9964816	9.1065557	10.8934443	43
18	9.1040246	9.9964655	9.1075591	10.8924409	42
19	9.1050096	9 9964493	9.1085604	10.8914366	41
20	9.1059924	9 9964330	9.1095594	10.8904406	40
21	9.1069729	9.9964167	9.1105562	10.8894438	39
22	9.1079512	9.9964004	9.1115508	10.8884492	38
23	9.1089272	9.9963841	9.1125431	10.8874569	37
24	9.1099010	9.9963677	9.1135333	10.8864667	36
25	9.1108726	9.9963513	9.1145213	10.8854787	35
26	9.1118420	9.9963348	9.1155072	10.8844928	34
27	9.1128092	9 9963183	9.1164909	10.8835091	33
28	9.1137742	9.9963018	9.1174724	10.8825276	32
29	9.1147370	9.9962852	9.1184518	10.8815482	31
30	9.1156977	9.9962686	9.1194291	10.8805709	30
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.

82 Degrees

7 D[illegible]rees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
30	9.1156977	9.9962686	[illegible]194291	10.8805709	30
31	9.1166562	9.9962519	[illegible]204043	10.8795957	29
32	9.1176125	9.9962352	[illegible]213773	10.8786227	28
33	9 1185667	9.9962185	[illegible]223482	10.8776518	27
34	9.1195188	9.9962017	[illegible]233171	10.8766829	26
35	9.1204688	9.9961849	9[illegible]42839	10.8757161	25
36	9.1214167	9.9961681	9[illegible]52486	10.8747514	24
37	9.1223624	9.9961512	9[illegible]62112	10.8737888	23
38	9.1233061	9.9961343	9[illegible]71718	10.8728282	22
39	9.1242477	9.9961174	9.[illegible]81303	10.8718697	21
40	9.1251872	9.9961004	9.[illegible]90868	10.8709132	20
41	9.1261246	9.9960834	9.[illegible]00413	10.8699587	19
42	9.1270000	9.9960663	9.[illegible]09937	10.8690063	18
43	9.1279934	9.9960492	9.[illegible]19442	10.8680558	17
44	9.1289247	9.9960321	9.[illegible]28926	10.8671074	16
45	9.1298539	9.9960149	9.[illegible]38391	10.8661609	15
46	9.1307812	9.9959977	9.[illegible]47835	10.8652165	14
47	9.1317064	9.9959804	9.[illegible]57260	10.8642740	13
48	9.1326297	9.9959631	9.[illegible]66665	10.8633335	12
49	9.1335509	9.9959458	9,[illegible]76051	10.8623949	11
50	9.1344702	9.9959284	9.[illegible]85417	10.8614583	10
51	9.1353875	9.9959111	9.[illegible]94764	10.8605236	9
52	9.1363028	9.9958936	9.[illegible]04092	10.8595908	8
53	9.1372161	9.9958761	9.[illegible]3400	10.8586600	7
54	9.1381275	9.9958586	9.[illegible]22689	10.8577311	6
55	9.1390370	9 9958411	9.[illegible]1959	10.8568041	5
56	9.1399445	9.9958235	9.[illegible]1210	10.8558790	4
57	9.1408501	9.9958059	9.[illegible]0442	10.8549588	3
58	9.1417537	9.9957882	9.[illegible]9655	10.8540345	2
59	9.1426555	9.9957705	9.[illegible]8850	10.8531150	1
60	9.1435553	9.9957528	9.[illegible]8025	10.8521975	0
	Sine Comp.	Sine	Ta[illegible]omp.	Tang.	Min.

82 Degre[illegible]

Min.	8 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,1435553	9,9957528	9,1478025	10,8521975	60
1	9,1444532	9,9957350	9,1487182	10,8512818	59
2	9,1453493	9,9957172	9,1496321	10,8503679	58
3	9,1462435	9,9956993	9,1505441	10,8494559	57
4	9,1471358	9,9956815	9,1514543	10,8485457	56
5	9,1480262	9,9956635	9,1523627	10,8476373	55
6	9,1489148	9,9956456	9,1532692	10,8467308	54
7	9,1498015	9,9956276	9,1541739	10,8458261	53
8	9,1506864	9,9956095	9,1550769	10,8449231	52
9	9,1515694	9,9955915	9,1559780	10,8440220	51
10	9,1524507	9,9955734	9,1568773	10,8431227	50
11	9,1533301	9,9955552	9,1577748	10,8422252	49
12	9,1542076	9,9955370	9,1586706	10,8413294	48
13	9,1550834	9,9955188	9,1595646	10,8404354	47
14	9,1559574	9,9955005	9,1604569	10,8395431	46
15	9,1568296	9,9954822	9,1613473	10,8386527	45
16	9,1577000	9,9954639	9,1622361	10,8377639	44
17	9,1585686	9,9954455	9,1631231	10,8368769	43
18	9,1594354	9,9954271	9,1640083	10,8359917	42
19	9,1603005	9,9954087	9,1648919	10,8351081	41
20	9,1611639	9,9953902	9,1657737	10,8342263	40
21	9,1620254	9,9953717	9,1666538	10,8333462	39
22	9,1628853	9,9953531	9,1675322	10,8324678	38
23	9,1637434	9,9953345	9,1684989	10,8315911	37
24	9,1645998	9,9953159	9,1692839	10,8307161	36
25	9,1654544	9,9952972	9,1701572	10,8298428	35
26	9,1663074	9,9952785	9,1710289	10,8289711	34
27	9,1671586	9,9952597	9,1718989	10,8281011	33
28	9,1680081	9,9952409	9,1727672	10,8272328	32
29	9,1688559	6,9952221	9,1736338	10,8263662	31
30	9,1697021	9,9952033	9,1744988	10,8255012	30
31	9,1705465	9,9951844	9,1753622	10,8246378	29
32	9,1713893	9,9951654	9,1762239	10,8237761	28
33	9,1722305	9,9951464	9,1770840	10,8229260	27
34	9,1730699	9,9951274	9,1779425	10,8220575	26
35	9,1739077	9,9951084	9,1787993	10,8212007	25
36	9,1747439	9,9950893	9,1796546	10,8203454	24
37	9,1755784	9,9950702	9,1805082	10,8194918	23
38	9,1764112	9,9950510	9,1813602	10,8186398	22
39	9,1772425	9,9950318	9,1822106	10,8177894	21
40	9,1780721	9,9950126	9,1830595	10,8169405	20
41	9,1789001	9,9949933	9,1839068	10,8160932	19
42	9,1797265	9,9949740	9,1847525	10,8152475	18
43	9,1805512	9,9949546	9,1855966	10,8144034	17
44	9,1813744	9,9949352	9,1864392	10,8135608	16
45	9,1821960	9,9949158	9,1872802	10,8127198	15
46	9,1830160	9,9948964	9,1881196	10,8118804	14
47	9,1838344	9,9948769	9,1889575	10,8110425	13
48	9,1846512	9,9948573	9,1897939	10,8102061	12
49	9,1854665	9,9948377	9,1906287	10,8093713	11
50	9,1862802	9,9948181	9,1914621	10,8085379	10
51	9,1870923	9,9947985	9,1922939	10,8077061	9
52	9,1879029	9,9947788	9,1931241	10,8068759	8
53	9,1887120	9,9947591	9,1939529	10,8060471	7
54	9,1895195	9,9947393	9,1947802	10,8052198	6
55	9,1903254	9,9947195	9,1956059	10,8043941	5
56	9,1911299	9,9946997	9,1964302	10,8035698	4
57	9,1919328	9,9946798	9,1972530	10,8027470	3
58	9,1927342	9,9946599	9,1980743	10,8019257	2
59	9,1935341	9,9946399	9,1988941	10,8011059	1
60	9,1943324	9,9946199	9,1997125	10,8002875	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.
	81 Degrees				

Min.	9 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,1943324	9,9946199	9,1997125	10,8002875	60
1	9,1951293	9,9945999	9,2005294	10,7994706	59
2	9,1959247	9,9945798	9,2013449	10,7986551	58
3	9,1967186	9,9945597	9,2021588	10,7978412	57
4	9,1975110	9,9945396	9,2029714	10,7970286	56
5	9,1983019	9,9945194	9,2037825	10,7962175	55
6	9,1999913	9,9944992	9,2045922	10,7954078	54
7	9,1998793	9,9944789	9,2054004	10,7945996	53
8	9,2006658	9,9944587	9,2062072	10,7937928	52
9	9,2014509	9,9944383	9,2070126	10,7929874	51
10	9,2022345	9,9944180	9,2078165	10,7921835	50
11	9,2030167	9,9943975	9,2086191	10,7913809	49
12	9,2037974	9,9943771	9,2094203	10,7905797	48
13	9,2045766	9,9943566	9,2102200	10,7897800	47
14	9,2053545	9,9943361	9,2110184	10,7889816	46
15	9,2061309	9,9943156	9,2118153	10,7881847	45
16	9,2069059	9,9942950	9,2126109	10,7873891	44
17	9,2076795	9,9942743	9,2134051	10,7865949	43
18	9,2084516	9,9942537	9,2141980	10,7858020	42
19	9,2092224	9,9942330	9,2149894	10,7850106	41
20	9,2099917	9,9942122	9,2157795	10,7842205	40
21	9,2107597	9,9941914	9,2165683	10,7834317	39
22	9,2115263	9,9941706	9,2173556	10,7826444	38
23	9,2122914	9,9941498	9,2181417	10,7818583	37
24	9,2130552	9,9941289	9,2189264	10,7810736	36
25	9,2138176	9,9941079	9,2197097	10,7802903	35
26	9,2145787	9,9940870	9,2204917	10,7795083	34
27	9,2153384	9,9940659	9,2212724	10,7787276	33
28	9,2160967	9,9940449	9,2220518	10,7779482	32
29	9,2168536	9,9940238	9,2228298	10,7771702	31
30	9,2176092	9,9940027	9,2236065	10,7763935	30
31	9,2183635	9,9939815	9,2243819	10,7750181	29
32	9,2191164	9,9939603	9,2251561	10,7748439	28
33	9,2198680	9,9939391	9,2259289	10,7740711	27
34	9,2206182	9,9939178	9,2267004	10,7732996	26
35	9,2213671	9,9938965	9,2274706	10,7725294	25
36	9,2221147	9,9938752	9,2282395	10,7717605	24
37	9,2228609	9,9938538	9,2290071	10,7709919	23
38	9,2236059	9,9938324	9,2297735	10,7702265	22
39	9,2243495	9,9938109	9,2305386	10,7694614	21
40	9,2250918	9,9937894	9,2313024	10,7686976	20
41	9,2258328	9,9937679	9,2320650	10,7679350	19
42	9,2265725	9,9937463	9,2328262	10,7671738	18
43	9,2273110	9,9937247	9,2335863	10,7664137	17
44	9,2280481	9,9937030	9,2343451	10,7656549	16
45	9,2287839	9,9936813	9,2351026	10,7648974	15
46	9,2295185	9,9936596	9,2358589	10,7641411	14
47	9,2302518	9,9936378	9,2366139	10,7633861	13
48	9,2309838	9,9936160	9,2373678	10,7626322	12
49	9,2317145	9,9935942	9,2381203	10,7618797	11
50	9,2324440	9,9935723	9,2388717	10,7611283	10
51	9,2331722	9,9935504	9,2396218	10,7603782	9
52	9,2338992	9,9935285	9,2403708	10,7596292	8
53	9,2346249	9,9935065	9,2411185	10,7588815	7
54	9,2353494	9,9934844	9,2418650	10,7581350	6
55	9,2360726	9,9934624	9,2426103	10,7573897	5
56	9,2367946	6,9934403	9,2433543	10,7566457	4
57	9,2375153	9,9934181	9,2440972	10,7559028	3
58	9,2282349	9,9933959	9,2448389	10,7551611	2
59	9,2389532	9,9933737	9,2455794	10,7544206	1
60	9,2396702	9,9933515	9,2463188	10,7536812	0
	Sine Comp.	Sine	Tang.Comp.	Ta g.	Min.
	80 Degrees				

Min.	10 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,2396702	9,9933515	9,2463188	10,7536812	60
1	9,2403861	9,9933292	9,2470569	10,7539431	59
2	9,2411007	9,9933068	9,2477939	10,7522061	58
3	9,2418141	9,9932845	9,2485297	10,7514703	57
4	9,2425264	9,9932621	9,2492643	10,7507357	56
5	9,2432374	9,9932396	9,2499978	10,7500022	55
6	9,2439472	9,9932171	9,2507301	10,7492699	54
7	9,2446558	9,9931946	9,2514612	10,7485388	53
8	9,2453632	9,9931720	9,2521912	10,7478088	52
9	9,2460695	9,9931494	9,2529200	10,7470800	51
10	9,2467746	9,9931268	9,2536477	10,7463523	50
11	9,2474784	9,9931041	9,2543743	10,7456257	49
12	9,2481811	9,9930814	9,2550997	10,7449003	48
13	9,2488827	9,9930587	9,2558240	10,7441760	47
14	9,2495830	9,9930359	9,2565472	10,7434528	46
15	9,2502822	9,9930131	9,2572692	10,7427308	45
16	9,2509803	9,9929902	9,2579901	10,7420099	44
17	9,2516772	9,9929673	9,2587099	10,7412901	43
18	9,2523729	9,9929444	9,2594285	10,7405715	42
19	9,2530675	9,9929214	9,2601461	10,7398539	41
20	9,2537609	9,9928984	9,2608625	10,7391375	40
21	9,2544532	9,9928753	9,2615779	10,7384221	39
22	9,2551444	9,9928522	9,2622921	10,7377079	38
23	9,2558344	9,9928291	9,2630053	10,7369947	37
24	9,2565233	9,9928059	9,2637173	10,7362827	36
25	9,2572110	9,9927827	9,2644283	10,7355717	35
26	9,2578977	9,9927595	9,2651382	10,7348618	34
27	9,2585832	9,9927362	9,2658470	10,7341530	33
28	9,2592676	9,9927129	9,2665547	10,7334453	32
29	9,2599509	9,9926895	9,2672613	10,7327387	31
30	9,2606330	9,9926661	9,2679669	10,7320331	30
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.
	79 Degrees				

Min.	10 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
30	9,2606330	9,9926661	9,2679669	10,7320331	30
31	9,2613141	9,9926427	9,2686714	10,7313286	29
32	9,2619941	9,9926192	9,2693749	10,7306251	28
33	9,2626729	9,9925957	9,2700772	10,7299228	27
34	9,2633507	9,9925722	9,2707786	10,7292214	26
35	9,2640274	9,9925486	9,2714788	10,7285212	25
36	9,2647030	9,9925250	9,2721780	10,7278220	24
37	9,2653775	9,9925013	9,2728762	10,7271238	23
38	9,2660509	9,9924776	9,2735733	10,7264267	22
39	9,2667232	9,9924539	9,2742694	10,7257306	21
40	9,2673945	9,9924301	9,2749644	10,7250356	20
41	9,2680647	9,9924063	9,2756584	10,7243416	19
42	9,2687338	9,9923824	9,2763514	10,7236486	18
43	9,2694019	9,9923585	9,2770434	10,7229566	17
44	9,2700689	9,9923346	9,2777343	10,7226257	16
45	9,2707348	9,9923106	9,2784242	10,7215758	15
46	9,2713997	9,9922866	9,2791131	10,7208869	14
47	9,2720635	9,9922626	9,2798009	10,7201991	13
48	9,2727263	9,9922385	9,2804878	10,7195122	12
49	9,2733880	9,9922144	9,2811736	10,7188264	11
50	9,2740487	9,9921902	9,2818585	10,7181415	10
51	9,2747083	9,9911660	9,2825423	10,7174577	9
52	9,2753669	9,9921418	9,2832251	10,7167749	8
53	9,2760245	9,9921175	9,2839070	10,7160930	7
54	9,2766811	9,9920932	9,2845878	10,7154122	6
55	9,2773366	9,9920689	9,2852677	10,7147323	5
56	9,2779911	9,9920455	9,2859466	10,7140534	4
57	9,2786445	9,9920201	9,2866245	10,7133755	3
58	9,2792970	9,9919956	9,2873014	10,7126986	2
59	9,2799484	9,9919711	9,2879773	10,7120227	1
60	9,2805988	9,9919466	9,2886523	10,7113477	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.
	79 Degrees				

Min.	11 Degrees Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,2805988	9,9919466	9,2886523	10,7113477	60
1	9,2812483	9,9919220	9,2893263	10,7106737	59
2	9,2818967	9,9918974	9,2899993	10,7100007	58
3	9,2825441	9,9918727	9,2906713	10,7093287	57
4	9,2831905	9,9918480	9,2913424	10,7086576	56
5	9,2838359	9,9918233	9,2920126	10,7079874	55
6	9,2844803	9,9917986	9,2926817	10,7073183	54
7	9,2851237	9,9917737	9,2933500	10,7066500	53
8	9,2857661	9,9917489	9,2940172	10,7059828	52
9	9,2864076	9,9917240	9,2946836	10,7053164	51
10	9,2870480	9,9916991	9,2953489	10,7046511	50
11	9,2876875	9,9916741	9,2960134	10,7039866	49
12	9,2883260	9,9916492	9,2966769	10,7033231	48
13	9,2889636	9,9916241	9,2973395	10,7026605	47
14	9,2896001	9,9915990	9,2980011	10,7019989	46
15	9,2902357	9,9915739	9,2986618	10,7013382	45
16	9,2908704	9,9915488	9,2993216	10,7006784	44
17	9,2915040	9,9915236	9,2999804	10,7000196	43
18	9,2921367	9,9914984	9,3006383	10,6993617	42
19	9,2927685	9,9914731	9,3012954	10,6987046	41
20	9,2933993	9,9914478	9,3019514	10,6980486	40
21	9,2940291	9,9914225	9,3026066	10,6973934	39
22	9,2946580	9,9913917	9,3032609	10,6967391	38
23	9,2952859	9,9913717	9,3039143	10,6960857	37
24	9,2959129	9,9913462	9,3045667	10,6954333	36
25	9,2965390	9,9913207	9,3052183	10,6947817	35
26	9,2971641	9,9912952	9,3058689	10,6941311	34
27	9,2977883	9,9912696	9,3065187	10,6934813	33
28	9,2984116	9,9912440	9,3071675	10,6928325	32
29	9,2990339	9,9912184	9,3078155	10,6921845	31
30	9,2996553	9,9911927	9,3084626	10,6915374	30
31	9,3002758	9,9911670	9,3091088	10,6908912	29
32	9,3008953	9,9911412	9,3097541	10,6902459	28
33	9,3015140	9,9911154	9,3103985	10,6896015	27
34	9,3021317	9,9910896	9,3110421	10,6889579	26
35	9,3027485	9,9910637	9,3116848	10,6883152	25
36	9,3033644	9,9910378	9,3123266	10,6876734	24
37	9,3039794	9,9910119	9,3129675	10,6870325	23
38	9,3045934	9,9909859	9,3136076	10,6863924	22
39	9,3052066	9,9909598	9,3142468	10,6857532	21
40	9,3058189	9,9909338	9,3148851	10,6851149	20
41	9,3064303	9,9909077	9,3155226	10,6844774	19
42	9,3070407	9,9908815	9,3161592	10,6838408	18
43	9,3076503	9,9908553	9,3167950	10,6832050	17
44	9,3082590	9,9908291	9,3174299	10,6825701	16
45	9,3088668	9,9908029	9,3180640	10,6819360	15
46	9,3094737	9,9907766	9,3186972	10,6813028	14
47	9,3100798	9,9907502	9,3193295	10,6806705	13
48	9,3106849	9,9907239	9,3199611	10,6800389	12
49	9,3112892	9,9906974	9,3205918	10,6794082	11
50	9,3118926	6,9906710	9,3212216	10,6787784	10
51	9,3124951	9,9906445	9,3218506	10,6781494	9
52	9,3130968	9,9906180	9,3224788	10,6775212	7
53	9,3136976	9,9905914	9,3231061	10,6768939	8
54	9,3142975	9,9905648	9,3237327	10,6762673	6
55	9,3148965	9,9905382	9,3243584	10,6759416	5
56	9,3154947	9,9905115	9,3249832	10,6750168	4
57	9,3160921	9,9904848	9,3256073	10,6734927	3
58	9,3166885	9,9904580	9,3262305	10,6737695	2
59	9,3172842	9,9904312	9,3268529	10,6731471	1
60	9,3178789	9,9904044	9,3274745	10,6725255	0
	Sine Comp.	Sine	Tang. Comp.	Tang	Min.
	78 Degrees				

Min.	12 Degrees Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,3178789	9,9904044	9,3274745	10,6725255	60
1	9,3184728	9,9903775	9,3280953	10,6719047	59
2	9,3190659	9,9903506	9,3287153	10,6712847	58
3	9,3196581	9,9903237	9,3293345	10,6706655	57
4	9,3202495	9,9902967	9,3299528	10,6700472	56
5	9,3208400	9,9902697	9,3305704	10,6694996	55
6	9,3214297	9,9902426	9,3311872	10,6688128	54
7	9,3220186	9,9902155	9,3318031	10,6681969	53
8	9,3226066	9,9901883	9,3324183	10,6675817	52
9	9,3231938	9,9961612	9,3330327	10,6669673	51
10	9,3237802	9,9901339	9,3336463	10,6663537	50
11	9,3243657	9,9901067	9,3342591	10,6657409	49
12	9,3249505	9,9900794	9,3348711	10,6651289	48
13	9,3255344	9,9900521	9,3354823	10,6645177	47
14	9,3261174	9,9900247	9,3360927	10,6639073	46
15	9,3266997	9,9899973	9,3367024	10,6632976	45
16	9,3272811	9,9899698	9,3373113	10,6626887	44
17	9,3278617	9,9899423	9,3379194	10,6620806	43
18	9,3284416	9,9899148	9,3385267	10,6614733	42
19	9,3920206	9,9898873	9,3391333	10,6608667	41
20	9,3295988	9,9898597	9,3397391	10,6602609	40
21	9,3301761	9,9898320	9,3403441	10,6596559	39
22	9,3307527	9,9898043	9,3409484	10,6590516	38
23	9,3313285	9,9897766	9,3415519	10,6584481	37
24	9,3319035	9,9897489	9,3421546	10,6578454	36
25	9,3324777	9,9897211	9,3427566	10,6572434	35
26	9,3330511	9,9896932	9,3433578	10,6566422	34
27	9,3336237	9,9896654	9,3439583	10,6560417	33
28	9,3341955	9,9896374	9,3445580	10,6554420	32
29	9,3347665	9,9896095	9,3451570	10,6548430	31
30	9,3353368	9,9895815	9,3457552	10,6542448	30
31	9,3359062	9,9895535	9,3463527	10,6536473	29
32	9,3364749	9,9895254	9,3469494	10,6530506	28
33	9,3370428	9,9894973	9,3475454	10,6524546	27
34	9,3376099	9,9894692	9,3481407	10,6518593	26
35	9,3381762	9,9894410	9,3487352	10,6512648	25
36	9,3387418	9,9894128	9,3493290	10,6506710	24
37	9,3393065	9,9893845	9,3499220	10,6500780	23
38	9,3398706	9,9893562	9,3505143	10,6494857	22
39	9,3404338	9,9893279	9,3511059	10,6488941	21
40	9,3409963	9,9892995	9,3516968	10,6483032	20
41	9,3415580	9,9892711	9,3522869	10,6477131	19
42	9,3421190	9,9892427	9,3528763	10,6471237	18
43	9,3426792	9,9892142	9,3534650	10,6465350	17
44	9,3432386	9,9891856	9,3540530	10,6459470	16
45	9,3437973	9,9891571	9,3546402	10,6453598	15
46	9,3443552	9,9891285	9,3552267	10,6447733	14
47	9,3449124	9,9890998	9,3558126	10,6441874	13
48	9,3454688	9,9890711	9,3563977	10,6436023	12
49	9,3460245	9,9890424	9,3569821	10,6430179	11
50	9,3465794	9,9890137	9,3575658	10,6424342	10
51	9,3471336	9,9889849	9,3581487	10,6418513	9
52	,3476870	9,9889560	9,3587310	10,6412690	8
53	9,3482397	9,9889271	9,3593126	10,6406874	7
54	9,3487917	9,9888982	9,3598935	10,6401065	6
55	9,3493429	9,9888693	9,3604736	10,6395264	5
56	9,3498934	9,9888403	9,3610531	10,6389469	4
57	9,3504432	9,9888113	9,3616319	10,6383681	3
58	9,3509922	9,9887822	9,3622100	10,6377900	2
59	9,3515405	9,9887531	9,3627874	0,6372126	1
60	9,3520880	9,9887239	9,3633641	10,6366359	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.
	77 Degrees				

Min.	13 Degrees Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,3520880	9,9887239	9,3633641	10,6366359	60
1	9,3526349	9,9886947	9,3639401	10,6360599	59
2	9,3531810	9,9886655	9,3645155	10,6354845	58
3	9,3537264	9,9886363	9,3650901	10,6349099	57
4	9,3542710	9,9886070	9,3656641	10,6343359	56
5	9,3548150	9,9885776	9,3662374	10,6337626	55
6	9,3553582	9,9885482	9,3668100	10,6331900	54
7	9,3559007	9,9885188	9,3673819	10,6326181	53
8	9,3564426	9,9884894	9,3679532	10,6320468	52
9	9,3569836	9,9884599	9,3685238	10,6314762	51
10	9,3575240	9,9884303	9,3690937	10,6309063	50
11	9,3580637	9,9884008	9,3696629	10,6303371	49
12	9,3586027	9,9883712	9,3702315	10,6297685	48
13	9,3591409	9,9883415	9,3707994	10,6292006	47
14	9,3596785	9,9883118	9,3713667	10,6286333	46
15	9,3602154	9,9882821	9,3719333	10,6280667	45
16	9,3607515	9,9882523	9,3724992	10,6275008	44
17	9,3612870	9,9882225	9,3730645	10,6269355	43
18	9,3618217	9,9881927	9,3736291	10,6263709	42
19	9,3623558	9,9881628	9,3741930	10,6258070	41
20	9,3628892	9,9881329	9,3747563	10,6252437	40
21	9,3634219	9,9881029	9,3753190	10,6246810	39
22	9,3639539	9,9880729	9,3758810	10,6241190	38
23	9,3644852	9,9880429	9,3764423	10,6235577	37
24	9,3650158	9,9880128	9,3770030	10,6229970	36
25	9,3655458	9,9874827	9,3775631	10,6224369	35
26	9,3660750	9,9879525	9,3781225	10,6218775	34
27	9,3666036	9,9879223	9,3786813	10,6213187	33
28	9,3671315	9,9878921	9,3792394	10,6207606	32
29	9,3676587	9,9878618	9,3797969	10,6202031	31
30	9,3681853	9,9878315	9,3803537	10,6196463	30
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.
	76 Degrees				

Min.	13 Degrees Sine	Sine Comp.	Targ.	Tang. Comp.	
30	9,3681853	9,9878315	9,3803537	10,6196463	30
31	9,3687111	9,9878012	9,3809100	10,6190900	29
32	9,3692363	9,9877708	9,3814655	10,6185345	28
33	9,3697608	9,9877404	9,3820205	10,6179795	27
34	9,3702847	9,9877099	9,3825748	10,6174252	26
35	9,3708079	9,9876794	9,3831285	10,6168715	25
36	9,3713304	9,9876488	9,3836816	10,6163184	24
37	9,3718523	9,9876183	9,3842340	10,6157660	23
38	9,3723735	9,9875876	9,3847858	10,6152142	22
39	9,3728940	9,9875570	9,3853370	10,6146630	21
40	9,3734139	9,9875263	9,3858876	10,6141124	20
41	9,3739331	9,9874955	9,3864376	10,6135624	19
42	9,3744517	9,987464[illegible]	9,3869869	10,6130131	18
43	9,3749696	9,9874339	9,3875356	10,6124664	17
44	9,3754868	9,9874631	9,3880837	10,6119163	16
45	9,3760034	9,9873722	9,3886312	10,6115688	15
46	9,3765194	9,9873413	9,3891781	10,6108219	14
47	9,3770347	9,9873103	9,3897244	10,6102756	13
48	9,3775493	9,9872793	9,3902700	10,6097300	12
49	9,3780633	9,9872482	9,3908151	10,6091849	11
50	9,3785767	9,9872171	9,3913595	10,6086405	10
51	9,3790894	9,9871860	9,3919034	10,6080966	9
52	9,3796015	9,9871549	9,3924466	10,6075534	8
53	9,3801129	9,9871236	9,3929893	10,6070107	7
54	9,3806237	9,9870924	9,3935313	10,6064687	6
55	9,3811339	9,9870611	9,3940727	10,6059273	5
56	9,3816434	9,9870298	9,3946136	10,6053864	4
57	9,3821523	9,9869984	9,3951538	10,6048462	3
58	9,3826605	9,9869670	9,3956935	10,6043065	2
59	9,3831682	9,9869356	9,3962326	10,6037674	1
60	9,3836752	9,9869041	9,3967711	10,6032289	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.
	76 Degrees				

14 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,3836752	9,9869041	9,3967711	10,6032289	60
1	9,3841815	9,9868726	9,3973089	10,6026911	59
2	9,3846873	9,9868410	9,3978463	10,6021537	58
3	9,3851924	9,9868094	9,3983830	10,6016170	57
4	9,3856969	9,9867778	9,3989191	10,6010809	56
5	9,3862008	9,9867461	9,3994547	10,6005453	55
6	9,3867040	9,9867144	9,3999896	10,6000104	54
7	9,3872067	9,9866827	9,4005240	10,5994760	53
8	8,3877087	9,9866509	9,4010578	10,5989422	52
9	9,3882101	9,9866191	9,4015910	10,5984090	51
10	9,3887109	9,9865872	9,4021237	10,5978763	50
11	9,3892111	9,9865553	9,4026558	10,5973442	49
12	9,3897106	9,9865233	9,4031873	10,5968127	48
13	9,3902096	9,9864913	9,4037182	10,5962818	47
14	9,3907079	9,9864593	9,4042486	10,5957514	46
15	9,3912057	9,9864273	9,4047784	10,5952216	45
16	9,3917028	9,9863952	9,4053076	10,5946924	44
17	9,3921993	9,9863630	9,4058363	10,5941637	43
18	9,3926952	9,9863308	9,4063644	10,5936356	42
19	9,3931905	9,9862986	9,4068919	10,5931081	41
20	9,3936852	9,9862663	9,4074189	10,5925811	40
21	9,3941794	9,9862340	9,4079453	10,5920547	39
22	9,3946729	9,9862017	9,4084712	10,5915288	38
23	9,3951658	9,9861693	9,4089965	10,5910035	37
24	9,3956581	9,9861369	9,4095212	10,5904788	36
25	9,3961499	9,9861045	9,4100454	10,5899546	35
26	9,3966410	9,9860720	9,4105690	10,5894310	34
27	9,3971315	9,9860394	9,4110921	10,5889079	33
28	9,3976215	9,9860069	9,4116146	10,5883854	32
29	9,3981109	9,9859742	9,4121366	10,5878634	31
30	9,3985996	9,9859416	9,4126581	10,5873419	30
31	9,3990878	9,9859089	9,4131789	10,5868211	29
32	9,3995754	9,9858762	9,4136993	10,5863007	28
33	9,4000625	9,9858434	9,4142191	10,5857809	27
34	9,4005489	9,9858106	9,4147383	10,5852617	26
35	9,4010348	9,9857777	9,4152570	10,5847430	25
36	9,4015201	9,9857449	9,4157752	10,5842248	24
37	9,4020048	9,9857119	9,4162928	10,5837072	23
38	9,4024889	9,9856790	9,4168099	10,5831901	22
39	9,4029734	9,9856460	9,4173265	10,5826735	21
40	9,4034554	9,9856129	9,4178425	10,5821575	20
41	9,4039378	9,9855798	9,4183580	10,5816420	19
42	9,4044196	9,9855467	9,4188729	10,5811271	18
43	9,4049009	9,9855135	9,4193874	10,5806126	17
44	9,4053816	9,9854803	9,4199013	10,5800987	16
45	9,4058617	9,9854471	9,4204146	10,5795854	15
46	9,4003413	9,9854138	9,4209275	10,5790725	14
47	9,4068203	9,9853805	9,4214398	10,5785602	13
48	9,4072987	9,9853471	9,4219515	10,5780485	12
49	9,4077766	9,9853138	9,4224628	10,5775372	11
50	9,4082539	9,9852803	9,4229735	10,5770265	10
51	9,4087306	9,9852468	9,4234838	10,5765162	9
52	9,4092068	9,9852133	9,4239935	10,5760065	8
53	9,4096824	9,9851798	9,4245026	10,5754974	7
54	9,4101575	9,9851462	9,4250113	10,5749887	6
55	9,4106320	9,9851125	9,4255194	10,5744806	5
56	9,4111059	9,6850789	9,4260271	10,5739729	4
57	9,4115793	9,9850452	9,4265342	10,5734658	3
58	9,4120522	9,9850114	9,4270408	10,5729592	2
59	9,4125245	9,9849776	9,4275469	10,5724531	1
60	9,4129962	9,9849438	9,4280525	10,5719475	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

75 Degrees

15 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,4129962	9,9849438	9,4280525	10,5719475	60
1	9,4134674	9,9849099	9,4285575	10,5714425	59
2	9,4139381	9,9848760	9,4290621	10,5709379	58
3	9,4144082	9,9848420	9,4295661	10,5704339	57
4	9,4148778	9,9848081	9,4300697	10,5699303	56
5	9,4153468	9,9847740	9,4305727	10,5694273	55
6	9,4158152	9,9847400	9,4310753	10,5689247	54
7	9,4162832	9,9847059	9,4315773	10,5684127	53
8	9,4165506	9,9846717	9,4320789	10,5679211	52
9	9,4172174	9,9846375	9,4325799	10,5674201	51
10	9,4176837	9,9846033	9,4330804	10,5669196	50
11	9,4181495	9,9845690	9,4335805	10,5664195	49
12	9,4186148	9,9845347	9,4340800	10,5659200	48
13	9,4190795	9,9845004	9,4345791	10,5654209	47
14	9,4195436	9,9844660	9,4350776	10,5649224	46
15	9,4200073	9,9844316	9,4355757	10,5644243	45
16	9,4204704	9,9843971	9,4360733	10,5639267	44
17	9,4209330	9,9843626	9,4365704	10,5634296	43
18	9,4213950	9,9843281	9,4370670	10,5629330	42
19	9,4218566	9,9842935	9,4375631	10,5624369	41
20	9,4223176	9,9842589	9,4380587	10,5619413	40
21	9,4227780	9,9842242	9,4385538	10,5614462	39
22	9,4232380	9,9841895	9,4390485	10,5609515	38
23	9,4236974	9,9841548	9,4395426	10,5604574	37
24	9,4241563	9,9841200	9,4400363	10,5599637	36
25	9,4246147	9,9840852	9,4405295	10,5594705	35
26	9,4520726	9,9840503	9,4410222	10,5589778	34
27	9,4255299	9,9840154	9,4415145	10,5584855	33
28	9,4259867	9,9839805	9,4420062	10,5579938	32
29	9,4264430	9,9839455	0,4424975	10,5575025	31
30	9,4268988	9,9839105	9,4429883	10,5570117	30
31	9,4273541	9,9838755	9,4434786	10,5565214	29
32	9,4278089	9,9838404	9,4439685	10,5560315	28
33	9,4282631	9,9838052	9,4444579	10,5555421	27
34	9,4287169	9,9837701	9,4449468	10,5550532	26
35	9,4291701	9,9837348	9,4454352	10,5545648	25
36	9,4296228	9,9836996	9,4459232	10,5540768	24
37	9,4300750	9,9836643	9,4464107	10,5535893	23
38	9,4305267	9,9836290	9,4468978	10,5531022	22
39	9,4309779	9,9835936	9,4473843	10,5526157	21
40	9,4314286	9,9835582	9,4478704	10,5521296	20
41	9,4318788	9,9835227	9,4483561	10,5516439	19
42	9,4323285	9,9834872	9,4488413	10,5511587	18
43	9,4327777	9,9834517	9,4493260	10,5506740	17
44	9,4332264	9,9834161	9,4498102	10,5501898	16
45	9,4336746	9,9833805	9,4502940	10,5497060	15
46	9,4341223	9,9833449	9,4507774	10,5492220	14
47	9,4345694	9,9833094	9,4512602	10,5487398	13
48	9,4350161	9,9843735	9,4517427	10,5482573	12
49	9,4354623	9,9832377	9,4522246	10,5477754	11
50	9,4359080	9,9832019	9,4527061	10,5472939	10
51	9,4363532	9,9831661	9,4531872	10,5468128	9
52	9,4367980	9,9831302	9,4536678	10,5463522	8
53	9,4372422	9,9830942	9,4541479	10,5458521	7
54	9,4376859	9,9830583	9,4546276	10,5453724	6
55	9,4381292	9,9830223	9,4551069	10,5448931	5
56	9,4385719	9,9829862	9,4555857	10,5444143	4
57	9,4390142	9,9829501	9,4560641	10,5439359	3
58	9,4394560	9,9829140	9,4565420	10,5434580	2
59	9,4398973	9,9828778	9,4570194	10,5429806	1
60	9,4403381	9,9828416	9,4574964	10,5425036	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

74 Degrees

16 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,4403381	9,9828416	9,4574964	10,5425036	60
1	9,4407784	9,9828054	9,4579370	10,5420270	59
2	9,4412182	9,9827691	9,4584491	10,5415509	58
3	9,4416576	9,9827328	9,4589248	10,5410752	57
4	9,4420965	9,9826964	9,4594001	10,5405999	56
5	9,4425349	9,9826600	9,4598749	10,5401251	55
6	9,4429728	9,9826236	9,4603492	10,5396508	54
7	9,4434103	9,9825871	9,4608232	10,5391768	53
8	9,4438472	9,9825506	9,4612967	10,5387033	52
9	9,4442837	9,9825140	9,4617697	10,5382303	51
10	9,4447197	9,9824774	9,4622423	10,5377577	50
11	9,4451553	9,9824408	9,4627145	10,5372855	49
12	9,4455904	9,9824041	9,4631863	10,5368137	48
13	9,4460250	9,9823674	9,4636576	10,5363424	47
14	9,4464591	9,9823306	9,4641285	10,5358715	46
15	9,4468927	9,9822938	9,4645990	10,5354010	45
16	9,4473259	9,9822569	9,4650690	10,5349310	44
17	9,4477586	9,9822201	9,4655386	10,5344614	43
18	9,4481909	9,9821831	9,4660078	10,5339922	42
19	9,4486227	9,9821462	9,4664765	10,5335235	41
20	9,4490540	9,9821092	9,4669448	10,5330552	40
21	9,4494849	9,9820721	9,4674127	10,5325873	39
22	9,4499153	9,9820351	9,4678802	10,5321198	38
23	9,4503452	9,9819979	9,4683473	10,5316527	37
24	9,4507747	9,9819608	9,4688139	10,5311861	36
25	9,4512037	9,9819236	9,4692801	10,5307199	35
26	9,4516322	9,9818863	9,4697459	10,5302541	34
27	9,4520603	9,9818490	9,4702112	10,5297888	33
28	9,4524879	9,9818117	9,4706762	10,5293238	32
29	9,4529151	9,9817744	9,4711407	10,5288593	31
30	9,4533418	9,9817370	9,4716048	10,5283951	30
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

73 Degrees

16 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
30	9,4533418	9,9817370	9,4716048	10,5283952	30
31	9,4537681	9,9816995	9,4720685	10,5279315	29
32	9,4541939	9,9816620	9,4725318	10,5274682	28
33	9,4546192	9,9816245	9,4729947	10,5270053	27
34	9,4550441	9,9815870	9,4734571	10,5265429	26
35	9,4554686	9,9815494	9,4739192	10,5260808	25
36	9,4558926	9,9815117	9,4743808	10,5256192	24
37	9,4563161	9,9814740	9,4748421	10,5251579	23
38	9,4567392	9,9814363	9,4753029	10,5246971	22
39	9,4571618	9,9813986	9,4757633	10,5242367	21
40	9,4575840	9,9813608	9,4762233	10,5237767	20
41	9,4580058	9,9813229	9,4766829	10,5233171	19
42	9,4584271	9,9812850	9,4771421	10,5228579	18
43	9,4588480	9,9812471	9,4776009	10,5223991	17
44	9,4592684	9,9812091	9,4780592	10,5219408	16
45	9,4596884	9,9811711	9,4785172	10,5214828	15
46	9,4601079	9,9811331	9,4789748	10,5210252	14
47	9,4605270	9,9810950	9,4794319	10,5205681	13
48	9,4609456	9,9810569	9,4798887	10,5201113	12
49	9,4613638	9,9810187	9,4803451	10,5196549	11
50	9,4617816	9,9809805	9,4808011	10,5191989	10
51	9,4621989	9,9809423	9,4812566	10,5187434	9
52	9,4626158	9,9809040	9,4817118	10,5182882	8
53	9,4630323	9,9808657	9,4821666	10,5178334	7
54	9,4634483	9,9808273	9,4826210	10,5173790	6
55	9,4638639	9,9807889	9,4830750	10,5169250	5
56	9,4642790	9,9807505	9,4835286	10,5164714	4
57	9,4676938	9,9807120	9,4839818	10,5160182	3
58	9,4651081	9,9806735	9,4844346	10,5155654	2
59	9,4655219	9,9806349	9,4848870	10,5151130	1
60	9,4659353	9,9805963	9,4853390	10,5146610	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

73 Degrees

Min.	17 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9.4659353	9.9805963	9.4853390	10.5146610	60
1	9.4663483	9.9805577	9.4857907	10.5143093	59
2	9.4667609	9.9805190	9.4862419	10.5137581	58
3	9.4671730	9.9804803	9.4866928	10.5133072	57
4	9.4675848	9.9804415	9.4871433	10.5128567	56
5	9.4679960	9.9804027	9.4875933	10.5124067	55
6	9.4684069	9.9803639	9.4880430	10.5119570	54
7	9.4688173	9.9803250	9.4884924	10.5115076	53
8	9.4692273	9.9802860	9.4889413	10.5110587	52
9	9.4696369	9.9802471	9.4893898	10.5106102	51
10	9.4700461	9.9802081	9.4898380	10.5101620	50
11	9.4704548	9.9801690	9.4902858	10.5097142	49
12	9.4708631	9.9801299	9.4907332	10.5092668	48
13	9.4712710	9.9800908	9.4911802	10.5088198	47
14	9.4716785	9.9800516	9.4916269	10.5083731	46
15	9.4720856	9.9800124	9.4920731	10.5079269	45
16	9.4724922	9.9799732	9.4925190	10.5074810	44
17	9.4728985	9.9799339	9.4929646	10.5070354	43
18	9.4733043	9.9798946	9.4934097	10.5065903	42
19	9.4737097	9.9798552	9.4938545	10.5061455	41
20	9.4741146	9.9798158	9.4942988	10.5057012	40
21	9.4745192	9.9797764	9.4947429	10.5052571	39
22	9.4749234	9.9797369	9.4951865	10.5048135	38
23	9.4753271	9.9796793	9.4956298	10.5043702	37
24	9.4757304	9.9796578	9.4960727	10.5039273	36
25	9.4761334	9.9796182	9.4965152	10.5034848	35
26	9.4765359	9.9795785	9.4969574	10.5030426	34
27	9.4769380	9.9795388	9.4973991	10.5026009	33
28	9.4773396	9.9794991	9.4978406	10.5021594	32
29	9.4777409	9.9799593	9.4982816	10.5017184	31
30	9.4781418	9.9794195	9.4987223	10.5012777	30
31	9.4785423	9.9793796	9.4991626	10.5008374	29
32	9.4789423	9.9793398	9.4996026	10.5003974	28
33	9.4793420	9.9792998	9.5000422	10.4999578	27
34	9.4797412	9.9792599	9.5004814	10.4995136	26
35	9.4801401	9.9792198	9.5009203	10.4990797	25
36	9.4805385	9.9791798	9.5013588	10.4986412	24
37	9.4809366	9.9791397	9.5017969	10.4982031	23
38	9.4813342	9.9790996	9.5022347	10.4977653	22
39	9.4817315	9.9790594	9.5026721	10.4973279	21
40	9.4821283	9.9790191	9.5031092	10.4968908	20
41	9.4825248	9.9789789	9.5035459	10.4964541	19
42	9.4829208	9.9789386	9.5039822	10.4960178	18
43	9.4833165	9.9788983	9.5044182	10.4955818	17
44	9.4837117	9.9788579	9.5048538	10.4951462	16
45	9.4841066	9.9788175	9.5052891	10.4947109	15
46	9.4845010	9.9787770	9.5057240	10.4942760	14
47	9.4848951	9.9787365	9.5061586	10.4938414	13
48	9.4852888	9.9786960	9.5065928	10.4934072	12
49	9.4856820	9.9786554	9.5070267	10.4929733	11
50	9.4860749	9.9786148	9.5074602	10.4925398	10
51	9.4864674	9.9785741	9.5078933	10.4921067	9
52	9.4868595	9.9785334	9.5083261	10.4916739	8
53	9.4872512	9.9784927	9.5087586	10.4912414	7
54	9.4876426	9.9784519	9.5091907	10.4908093	6
55	9.4880335	9.9784111	9.5096224	10.4903776	5
56	9.4884240	9.9783702	9.5100539	10.4899461	4
57	9.4888142	9.9783293	9.5104849	10.4895151	3
58	9.4892040	9.9782883	9.5109156	10.4890844	2
59	9.4895934	9.9782474	9.5113460	10.4886540	1
60	9.4899824	9.9782063	9.5117760	10.4882240	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.
	72 Degrees				

Min.	18 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9.4899824	9.9782062	9.5117760	10.4882240	60
1	9.4903710	9.9781653	9.5122057	10.4877943	59
2	9.4907592	9.9781241	9.5126351	10.4873649	58
3	9.4911471	9.9780830	9.5130641	10.4869359	57
4	9.4915345	9.9780418	9.5134927	10.4865073	56
5	9.4919216	9.9780006	9.5139210	10.4860790	55
6	9.4923083	9.9779593	9.5143490	10.4856510	54
7	9.4926946	9.9779180	9.5147766	10.4852234	53
8	9.4930806	9.9778766	9.5152039	10.4847961	52
9	9.4934661	9.9778353	9.5156309	10.4843691	51
10	9.4938513	9.9777938	9.5160575	10.4839425	50
11	9.4942361	9.9777523	9.5164838	10.4835162	49
12	9.4946205	9.9777108	9.5169097	10.4820903	48
13	9.4950046	9.9776693	9.5173353	10.4826647	47
14	9.4953883	9.9776277	9.5177606	10.4822394	46
15	9.4957716	9.9775860	9.5181855	10.4818145	45
16	9.4961545	9.9775444	9.5186101	10.4813899	44
17	9.4965370	9.9775026	9.5190344	10.4809656	43
18	9.4969192	9.9774609	9.5194583	10.4805417	42
19	9.4973010	9.9774191	9.5198819	10.4801181	41
20	9.4976824	9.9773772	9.5203052	10.4796948	40
21	9.4980635	9.9773354	9.5207282	10.4792718	39
22	9.4984442	9.9772934	9.5211508	10.4788492	38
23	9.4988245	9.9772515	9.5215730	10.4784270	37
24	9.4992045	9.9772095	9.5219950	10.4780050	36
25	9.4995840	9.9771674	9.5224166	10.4775834	35
26	9.4999633	9.9771253	9.5228379	10.4771621	34
27	9.5003421	9.9770832	9.5232589	10.4767411	33
28	9.5007206	9.9770410	9.5236795	10.4763205	32
29	9.5010987	9.9769988	9.5240999	10.4759001	31
30	9.5014764	9.9769566	9.5245199	10.4754801	30
31	9.5018538	9.9769143	9.5249395	10.4750605	29
32	9.5022308	9.9768720	9.5253589	10.4746411	28
33	9.5026075	9.9768296	9.5257779	10.4742221	27
34	9.5029838	9.9767872	9.5261966	10.4738034	26
35	9.5033597	9.9767447	9.5266150	10.4733850	25
36	9.5037353	9.9767022	9.5270331	10.4729669	24
37	9.5041105	9.9766597	9.5274508	10.4725492	23
38	9.5044853	9.9766171	9.5278682	10.4721318	22
39	9.5048598	9.9765745	9.5282853	10.4717147	21
40	9.5052339	9.9765318	9.5287021	10.4712979	20
41	9.5056077	9.9764891	9.5291186	10.4708814	19
42	9.5059811	9.9764464	9.5295347	10.4704653	18
43	9.5063542	9.9764036	9.5269505	10.4700495	17
44	9.5067268	9.9763608	9.5303661	10.4696339	16
45	9.5070992	9.9763179	9.5307813	10.4692187	15
46	9.5074712	9.9762750	9.5311961	10.4688039	14
47	9.5078428	9.9762321	9.5316107	10.4683893	13
48	9.5082141	9.9761891	9.5320250	10.4679750	12
49	9.5085850	9.9761461	9.5324389	10.4675611	11
50	9.5089556	9.9761030	9.5328526	10.4671474	10
51	9.5093258	9.9760599	9.5332659	10.4667341	9
52	9.5096956	9.9760167	9.5336789	10.4663211	8
53	9.5100651	9.9759736	9.5340916	10.4659084	7
54	9.5104343	9.9759303	9.5345040	10.4654960	6
55	9.5108031	9.9758870	9.5349161	10.4650839	5
56	9.5111716	9.9758437	9.5353278	10.4646722	4
57	9.5115397	9.9758004	9.5357393	10.4642607	3
58	9.5119074	9.9757570	9.5361505	10.4638495	2
59	9.5122749	9.9757135	9.5365613	10.4634387	1
60	9.5126419	9.9756701	9.5369719	10.4630281	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.
	71 Degrees				

Min.	19 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9.5126419	9.9756710	9.5369718	10.4630282	60
1	9.5130086	9.9756265	9.5373821	10.4626129	59
2	9.5133750	9.9755830	9.5377920	10.4621080	58
3	9.5137410	9.9755394	9.5382017	10.4617983	57
4	9.5141067	9.9754957	9.5386110	10.4613890	56
5	9.5144721	9.9754521	9.5390200	10.4609800	55
6	9.5148371	9.9754083	9.5394287	10.4605713	54
7	9.5152017	9.9753646	9.5398371	10.4601629	53
8	9.5155660	9.9753208	9.5402453	10.4597547	52
9	9.5159300	9.9752769	9.5406531	10.4593469	51
10	9.5162936	9.9752330	9.5410606	10.4589394	50
11	9.5166569	9.9751891	9.5414678	10.4585322	49
12	9.5170198	9.9751451	9.5418747	10.4581253	48
13	9.5173824	9.9751011	9.5422813	10.4577187	47
14	9.5177447	9.9750570	9.5426877	10.4573123	46
15	9.5181066	9.9750129	9.5430937	19.4569063	45
16	9.5184682	9.9749688	9.5434994	10.4565006	44
17	9.5188295	9.9749246	9.5439048	10.4560952	34
18	9.5191904	9.9748804	9.5443100	10.4556900	42
19	9.5195510	9.9747361	9.5447148	10.4552852	41
20	9.5199112	9.9747018	9.5451193	10.4548807	40
21	9.5202711	9.9747475	9.5455236	10.4544764	39
22	9.5206307	9.9747031	9.5459276	10.4540724	38
23	9.5209899	9.9746587	9.5463312	10.4536688	37
24	9.5213488	9.9746142	9.5467346	10.4532654	36
25	9.5217074	9.9745697	9.5471377	10.4528623	35
26	9.5220656	9.9745252	9.5475405	10.4524595	34
27	9.5224235	9.9744806	9.5479430	10.4520570	33
28	9.5227811	9.9744359	9.5483452	10.4516548	32
29	9.5231383	9.9743913	9.5487471	10.4512529	31
30	9.5234953	9.9743466	9.5491487	10.4508513	30
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.
	70 Degrees				

Min.	19 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
30	9.5234953	9.9743466	9.5491487	10.4508513	30
31	9.5238518	9.9743018	9.5495500	10.4504500	29
32	9.5242081	9.9742570	9.5499511	10.4500489	28
33	9.5245640	9.9742122	9.5503519	10.4496481	27
34	9.5249196	9.9741673	9.5507523	10.4492477	26
35	9.5252749	9.9741224	9.5511525	10.4488475	25
36	9.5256298	9.9740774	9.5515524	10.4484476	24
37	9.5259844	9.9740324	9.5519521	10.4480479	23
38	9.5263387	9.9739873	9.5523514	10.4476486	22
39	9.5266927	9.9739422	9.5527504	10.4472496	21
40	9.5270463	9.9738971	9.5531492	10.4468508	20
41	9.5273997	9.9738519	9.5535477	10.4464523	19
42	9.5277526	9.9738067	9.5539459	10.4460541	18
43	9.5281053	9.9737615	9.5543438	10.4456562	17
44	9.5284577	9.9737162	9.5547415	10.4452585	16
45	9.5288097	9.9736709	9.5551388	10.4448612	15
46	9.5291614	9.9736255	9.5555359	10.4444641	14
47	9.5295128	9.9735801	9.5559327	10.4440673	13
48	9.5298638	9.9735346	9.5563292	10.4436708	12
49	9.5302146	9.9734891	9.5567255	10.4432745	11
50	9.5305650	9.9734435	9.5571214	10.4428786	10
51	9.5309151	9.9733980	9.5575171	10.4424829	9
52	9.5312649	9.9733523	9.5579125	10.4420875	8
53	9.5316143	9.9733067	9.5583077	10.4416923	7
54	9.5319635	9.9732610	9.5587025	10.4412975	6
55	9.5323123	9.9732152	9.5590971	10.4409029	5
56	9.5326608	9.9731694	9.5594914	10.4405086	4
57	9.5330090	9.9731236	9.5598854	10.4401146	3
58	9.5333569	9.9730777	9.5602792	10.4397208	2
59	9.5337044	9.9730318	9.5606727	10.4393273	1
60	9.5340517	9.9739858	9.5610659	10.4389341	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.
	70 Degrees				

20 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,5340517	9,9729858	9,5610659	10,4389341	60
1	9,5343986	9,9729398	9,5614588	10,4385412	59
2	9,5347452	9,9728938	9,5618515	10,4381485	58
3	9,5350915	9,9728477	9,5622439	10,4377561	57
4	9,5354375	9,9728016	9,5626360	10,4373640	56
5	9,5357832	9,9727554	9,5630278	10,4369722	55
6	9,5361286	9,9727092	9,5634194	10,4365806	54
7	9,5364737	9,9726629	9,5638107	10,4361893	53
8	9,5368884	9,9726166	9,5642018	10,4357982	52
9	9,5371628	9,9725703	9,5645925	10,4354075	51
10	9,5375069	9,9725239	9,5649831	10,4350169	50
11	9,5378508	9,9724775	9,5653733	10,4346267	49
12	9,5381943	9,9724310	9,5657633	10,4342367	48
13	9,5385375	9,9723845	9,5661530	10,4338470	47
14	9,5388804	9,9723380	9,5665424	10,4334576	46
15	9,5392230	9,9722914	9,5669316	10,4330684	45
16	9,5395653	9,9722448	9,5673205	10,4326795	44
17	9,5399073	9,9721981	9,5677091	10,4322909	43
18	9,5402489	9,9721514	9,5680975	10,4319025	42
19	9,5405903	9,9721047	9,5684856	10,4315144	41
20	9,5409314	9,9720579	9,5688735	10,4311265	40
21	9,5412721	9,9720110	9,5692611	10,4307389	39
22	9,5416126	9,9719642	9,5696484	10,4303516	38
23	9,5419527	9,9719172	9,5700355	10,4299645	37
24	9,5422926	9,9718703	9,5704223	10,4295777	36
25	9,5426321	9,9718233	9,5708088	10,4291912	35
26	9,5429713	9,9717762	9,5711951	10,4288049	34
27	9,5433103	9,9717291	9,5715811	10,4284189	33
28	9,5436489	9,9716820	9,5719669	10,4280331	32
29	9,5439873	9,9716348	9,5723524	10,4276476	31
30	9,5443523	9,9715876	9,5727377	10,4272623	30
31	9,5446630	9,9715404	9,5731227	10,4268773	29
32	9,5450005	9,9714931	9,5735074	10,4264926	28
33	9,5453376	9,9714457	9,5738919	10,4261081	27
34	9,5456745	9,9713984	9,5742761	10,4257239	26
35	9,5460110	9,9713509	9,5746601	10,4253399	25
36	9,5463472	9,9713035	9,5750438	10,4249562	24
37	9,5466832	9,9712560	9,5754272	10,4245728	23
38	9,5470189	9,9712084	9,5758104	10,4241896	22
39	9,5473542	9,9711608	9,5761934	10,4238066	21
40	9,5476893	9,9711132	9,5765761	10,4234239	20
41	9,5480240	9,9710655	9,5769595	10,4230415	19
42	9,5483585	9,9710178	9,5773407	10,4226593	18
43	9,5486927	9,9709701	9,5777226	10,4222774	17
44	9,5490266	9,9709223	9,5781043	10,4218957	16
45	9,5493602	9,9708744	9,5784858	10,4215142	15
46	9,5496935	9,9708265	9,5788669	10,4211331	14
47	9,5500265	9,9707786	9,5792479	10,4207521	13
48	9,5503592	9,9707306	9,5796286	10,4203714	12
49	9,5506916	9,9706826	9,5800090	10,4199910	11
50	9,5510237	9,9706346	9,5803892	10,4196108	10
51	9,5513556	9,9705865	9,5807691	10,4192309	9
52	9,5516871	9,9705383	9,5811488	10,4188512	7
53	9,5520184	9,9704902	9,5815282	10,4184718	8
54	9,5523494	9,9704419	9,5819074	10,4180926	6
55	9,5526801	9,9703937	9,5822864	10,4177136	5
56	9,5530105	9,9703454	9,5826651	10,4173349	4
57	9,5533406	9,9702970	9,5830435	10,4169565	3
58	9,5536704	9,9702486	9,5834217	10,4165783	2
59	9,5539999	9,9702002	9,5837997	10,4162003	1
60	9,5543292	9,9701517	9,5841774	10,4158226	0
	Sine Comp.	Sine	Tang.Comp	Tang	Min.

69 Degrees

21 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,5543292	9,9701517	9,5841774	10,4158226	60
1	9,5546581	9,9701032	9,5845549	10,4154451	59
2	9,5549868	9,9700547	9,5849321	10,4150679	58
3	9,5553152	9,9700061	9,5853091	10,4146909	57
4	9,5556433	9,9699574	9,5856859	10,4143141	56
5	9,5559711	9,9699087	9,5860624	10,4139376	55
6	9,5562987	9,9698600	9,5864386	10,4135614	54
7	9,5566259	9,9698112	9,5868147	10,4131853	53
8	9,5569529	9,9697624	9,5871904	10,4128096	52
9	9,5572796	9,9697136	9,5875660	10,4124340	51
10	9,5576060	9,9696647	9,5879413	10,4120587	50
11	9,5579321	9,9696158	9,5883163	10,4116837	49
12	9,5582579	9,9695668	9,5886912	10,4113088	48
13	9,5585835	9,9695177	9,5890657	10,4109343	47
14	9,5589088	9,9694687	9,5894401	10,4105599	46
15	9,5592338	9,9694196	9,5898142	10,4101858	45
16	9,5595585	9,9693704	9,5901881	10,4098119	44
17	9,5598829	9,9693212	9,5905617	10,4094383	43
18	9,5602071	9,9692720	9,5909351	10,4090649	42
19	9,5605310	9,9692227	9,5913082	10,4086918	41
20	9,5608546	9,9691734	9,5916812	10,4083188	40
21	9,5611779	9,9691241	9,5920539	10,4079461	39
22	9,5615010	9,9690746	9,5924263	10,4075737	38
23	9,5618237	9,9690252	9,5927985	10,4072015	37
24	9,5621462	9,9689757	9,5931705	10,4068295	36
25	9,5624685	9,9689262	9,5935423	10,4064577	35
26	9,5627904	9,9688766	9,5939138	10,4060862	34
27	9,5631121	9,9688270	9,5942851	10,4057149	33
28	9,5634335	9,9687773	9,5946561	10,4053439	32
29	9,5637546	9,9687276	9,5950269	10,4049731	31
30	9,5640754	9,9686779	9,5953975	10,4046025	30
31	9,5643960	9,9686281	9,5957679	10,4042321	29
32	9,5647163	9,9685783	9,5961380	10,4038620	28
33	9,5650363	9,9685284	9,5965079	10,4034921	27
34	9,5653561	9,9684785	9,5968776	10,4031224	26
35	9,5656756	9,9684286	9,5972470	10,4027530	25
36	9,5659948	9,9683786	9,5976162	10,4023838	24
37	9,5663137	9,9683285	9,5979852	10,4020148	23
38	9,5666324	9,9682784	9,5983540	10,4016460	22
39	9,5669508	9,9682283	9,5987225	10,4012775	21
40	9,5672689	9,9681781	9,5990908	10,4009092	20
41	9,5675868	9,9681279	9,5994588	10,4005412	19
42	9,5679044	9,9680777	9,5998267	10,4001733	18
43	9,5682217	9,9680274	9,6001943	10,3998057	17
44	9,5685387	9,9679771	9,6005617	10,3994383	16
45	9,5688555	9,9679267	9,6009289	10,3990711	15
46	9,5691721	9,9678763	9,6012958	10,3987042	14
47	9,5694883	9,9678258	9,6016625	10,3983375	13
48	9,5698043	9,9677753	9,6020290	10,3979710	12
49	9,5701200	9,9677247	9,6023953	10,3976047	11
50	9,5704355	9,9676741	9,6027613	10,3972387	10
51	9,5707506	9,9676235	9,6031271	10,3968729	9
52	9,5710656	9,9675728	9,6034927	10,3965073	8
53	9,5713802	9,9675221	9,6038581	10,3961419	7
54	9,5716946	9,9674713	9,6042233	10,3957767	6
55	9,5720087	6,9674205	9,6045882	10,3954118	5
56	9,5723226	9,9673697	9,6049529	10,3950471	4
57	9,5726362	9,9673188	9,6053174	10,3946826	3
58	9,5729495	9,9672679	9,6056817	10,3943183	2
59	9,5732626	9,9672169	9,6060457	10,3939543	1
60	9,5735754	9,9671659	9,6064096	10,3935904	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

68 Degrees

22 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,5735754	9,9671659	9,6064096	10,3935904	60
1	9,5738880	9,9671148	9,6067732	10,3932268	59
2	9,5742003	9,9670637	9,6071366	10,3928634	58
3	9,5745123	9,9670125	9,6074997	10,3925003	57
4	9,5748240	9,9669614	9,6078627	10,3921373	56
5	9,5751356	9,9669101	9,6082254	10,3917746	55
6	9,5754468	9,9668588	9,6085880	10,3914120	54
7	9,5757578	9,9668075	9,6089503	10,3910497	53
8	9,5760685	9,9667562	9,6093124	10,3906876	52
9	9,5763790	6,9667048	9,6096742	10,3903258	51
10	9,5766892	9,9666533	9,6100359	10,3899641	50
11	9,5769991	9,9666018	9,6103973	10,3896027	49
12	9,5773088	9,9665503	9,6107586	10,3892414	48
13	9,5776183	9,9664986	9,6111196	10,3888804	47
14	6,5779275	9,9664471	9,6114804	10,3885196	46
15	6,5782364	9,9663954	9,6118409	10,3881591	45
16	9,5785450	9,9663437	9,6122013	10,3877987	44
17	9,5788535	9,9662920	9,6125615	10,3874385	43
18	9,5791616	9,9662402	9,6129214	10,3870786	42
19	9,5794695	9,9661884	9,6132812	10,3867188	41
20	9,5797772	9,9661365	9,6136407	10,3863593	40
21	9,5800845	9,9660846	9,6140000	10,3960000	39
22	9,5803917	9,9660326	9,6143591	10,3856409	38
23	9,5806986	9,9659806	9,6147180	10,3852820	37
24	9,5810052	9,9659285	9,6150766	10,3849234	36
25	9,5813116	9,9658764	9,6154351	10,3845649	35
26	9,5816177	9,9658243	9,6157934	10,3842066	34
27	9,5819236	9,9657721	9,6161514	10,3838486	33
28	9,5822292	9,9657199	9,6165093	10,3834907	32
29	9,5825345	9,9656677	9,6168669	10,3831331	31
30	9,5828397	9,9656153	9,6172243	10,3827757	30
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

67 Degrees

22 Degrees

Min.	Sine	Sine Comp.	Targ.	Tang. Comp.	
30	9,5828397	9,9656153	9,6172243	10,3827757	30
31	9,5831445	9,9655630	9,6175815	10,3824185	29
32	9,5834491	9,9655106	9,6179385	10,3820615	28
33	9,5837535	9,9654582	9,6182953	10,3817047	27
34	9,5840576	9,9654057	9,6186519	10.3813481	26
35	9,5843615	9,9653532	9,6190083	10,3809917	25
36	9,5846651	9,9653006	9,6193645	10,3806355	24
37	9,5849685	9,9652480	9,6197205	10,3802795	23
38	9,5852716	9,9651953	9,6200762	10,3799238	22
39	9,5855745	9,9651426	9,6204318	10,3795682	21
40	9,5858771	9,9650899	9,6207872	10,3792128	20
41	9,5861795	9,9650371	9,6211423	10,3788577	19
42	9,5864816	9,9649843	9,6214974	10,3785026	18
43	9,5867835	9,9649314	9,6218520	10,3781480	17
44	9,5870851	9,9648785	9,6222066	10,3777934	16
45	9,5873865	9,9648256	9,6225609	10,3774391	15
46	9,5876876	9,9647726	9,6229150	10,3770850	14
47	9,5879885	9,9647195	9,6232690	10,3767310	13
48	9,5882892	9,9646665	9,6236227	10,3763773	12
49	9,5885896	9,9646133	9,6239763	10,3760237	11
50	9,5888897	9,9645602	9,6243296	10 3756704	10
51	9,5891897	9,9645069	9,6246827	10,3753173	9
52	9,5894893	9,9644537	9,6250356	10,3749644	8
53	9,5897888	9,9644004	9,6253884	10,3746116	7
54	9,5900880	9,9643470	9,6257409	10,3742591	6
55	9,5903869	9,9642937	9,6260932	10,3739068	5
56	9,5906856	9,9642402	9,6264454	10,3735546	4
57	9,5909841	9,9641868	9,6267973	10,3732027	3
58	9,5912823	9,9641332	9,6271491	10,3728509	2
59	9,5915803	9,9640797	9,6275006	10,3724994	1
60	9,5918780	9,9640261	9,6278519	10,3721481	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

67 Degrees

23 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,5918780	9,9640261	9,6278519	10,3721481	60
1	9,5921755	9,9639724	9,6282031	10,3717969	59
2	9,5924728	9,9639187	9,6285540	10,3714460	58
3	9,5927698	9,9638650	9,6289048	10,3710952	57
4	9,5930666	9,9638112	9,6292553	10,3707447	56
5	9,5933631	9,9637574	9,6296057	10,3703943	55
6	9,5936594	9,9637036	9,6299558	10,3700442	54
7	9,5939555	9,9636496	9,6303058	10,3696942	53
8	9,5942513	9,6635957	9,6306556	10,3693444	52
9	9,5945469	9,9635417	9,6310052	10,3689948	51
10	9,5948422	9,9634877	9,6313545	10,3686455	50
11	9,5951373	9,9634336	9,6317037	10,3682963	49
12	9,5954322	9,9633795	9,6320527	10,3679473	48
13	9,5957268	9,9633253	9,9324015	10,3675985	47
14	9,5960212	9,9632711	9,6327501	10,3672499	46
15	9,5963154	9,9632168	9,6330985	10,3669015	45
16	9,5966093	9,9631625	9,6334468	10,3665532	44
17	9,5969030	9,9631082	9,6337948	10,3662052	43
18	9,5971965	9,9630538	9,6341426	10,3658574	42
19	9,5974897	9,9629994	9,6344903	10,3655097	41
20	9,5977827	9,9629449	9,6348378	10,3651622	40
21	9,5980754	9,9628904	9,6351850	10,3648150	39
22	9,5983679	9,9628358	9,6355321	10,3644679	38
23	9,5986602	9,9627812	9,6358790	10,3641210	37
24	9,5989523	9,9627266	9,6362257	10,3637743	36
25	9,5992441	9,9626719	9,6365722	10,3634278	35
26	9,5995357	9,9626172	9,6369185	10,3630815	34
27	9,5998271	9,9625624	9,6372646	10,3627354	33
28	9,6001181	9,9625076	9,6376106	10,3623894	32
29	9,6004090	9,9624527	9,6379563	10,3620437	31
30	9,6006997	9,9623978	9,6383019	10,3616981	30
31	9,6009901	9,9623428	9,6386473	10,3613527	29
32	9,6012803	9,9622878	9,6389925	10,3610075	28
33	9,6015703	9,9622328	9,6393375	10,3606625	27
34	9,6018600	9,9621777	9,6396823	10,3603177	26
35	9,6021495	9,9621226	9,6400269	10,3599731	25
36	9,6024388	9,9620674	9,6403714	10,3596286	24
37	9,6027278	9,9620122	9,6407156	10,3592844	23
38	9,6030166	9,9619569	9,6410597	10,3589403	22
39	9,6033052	9,9619016	9,6414036	10,3585964	21
40	9,6035936	9,9618463	9,6417473	10,3582527	20
41	9,6038817	9,9617909	9,6420908	10,3579092	19
42	9,6041696	9,9617355	9,6424342	10,3575658	18
43	9,6044573	9,9616800	9,6427773	10,3572227	17
44	9,6047448	9,9616245	9,6431203	10,3568797	16
45	9,6050320	9,9615689	9,6434631	10,3565369	15
46	9,6053190	9,9615133	9,6448057	10,3561943	14
47	9,6056057	9,9614576	9,6441481	10,3558519	13
48	9,6058923	9,9614020	9,6444903	10,3550597	12
49	9,6061786	9,9613463	9,6448324	10,3551676	11
50	9,6064647	9,9612904	9,6451743	10,3548257	10
51	9,6067506	9,9612346	9,6455160	10,3544840	9
52	9,6070362	9,9611787	9,6458575	10,3541425	8
53	9,6073216	9,9611228	9,6461988	10,3538012	7
54	9,6076068	9,9610668	9,6465400	10,3534600	6
55	9,6078918	9,9610108	9,6468810	10,3531190	5
56	9,6081765	9,9609548	9,6472217	10,3527783	4
57	9,6084611	9,9608987	9,6475624	10,3524376	3
58	9,6087454	9,9608426	9,6479028	10,3520972	2
59	9,6090294	9,9607864	9,9482431	10,3517569	1
60	9,6093133	9,9607302	9,6485831	10,3514169	0
	Sine Comp.	Sine	Tang Comp.	Tang.	Min.

66 Degrees

24 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,6093133	9,9607302	9,6485831	10,3514169	60
1	9,6095969	9,9606739	9,6489230	10,3510770	59
2	9,6098803	9,9606176	9,6492628	10,3507372	58
3	9,6101635	9,9605612	9,6496023	10,3503977	57
4	9,6104465	9,9605048	9,6499417	10,3500583	56
5	9,6107293	9,9604484	9,6502809	10,3497191	55
6	9,6110118	9,9603919	9,6506199	10,3493801	54
7	9,6112941	9,9603354	9,6509587	10,3490413	53
8	9,6115762	9,9602788	9,6512974	10,3487026	52
9	9,6118580	9,9602222	9,6516359	10,3483641	51
10	9,6121397	9,9601655	9,6519742	10,3480258	50
11	9,6124211	9,9601088	9,6523123	10,3476877	49
12	9,6127023	9,9600520	9,6526503	10,3473497	48
13	9,6129833	9,9599952	9,6529881	10,3470119	47
14	9,6132641	9,9599384	9,6533257	10,3466743	46
15	9,6135446	9,9598815	9,6536631	10,3463369	45
16	9,6138250	9,9598246	9,6540004	10,3459996	44
17	9,6141051	9,9597676	9,6543375	10,3456625	43
18	9,6143850	9,9597106	9,6546744	10,3453256	42
19	9,6146647	9,9596535	9,6550112	10,3449888	41
20	9,6149441	9,9595964	9,6553477	10,3446523	40
21	9,6152234	9,9595393	9,6556841	10,3443159	39
22	9,6155024	9,9594821	9,6560204	10,3439796	38
23	9,6157812	9,9594248	9,6563564	10,3436436	37
24	9,6160598	9,9593675	9,6566923	10,3433077	36
25	9,6163382	9,9593102	9,6570280	10,3429720	35
26	9,6166164	9,9592528	9,6573636	10,3426364	34
27	9,6168944	9,9591954	9,6576989	10,3423011	33
28	9,6171721	9,9591380	9,9580341	10,3419659	32
29	9,6174496	9,9590805	9,6583692	10,3416308	31
30	9,6177270	9,9590229	9,6587041	10,3412960	30
31	9,6180041	9,9589653	9,6590387	10,3409613	29
32	9,6182809	9,9589077	9,6593733	10,3406267	28
33	9,6185576	9,9588500	9,6597076	10,3402924	27
34	9,6188341	9,9587923	9,6600418	10,3399582	26
35	9,6191103	9,9587345	9,6603758	10,3396242	25
36	9,6193864	9,9586767	9,6607097	10,3392903	24
37	9,6196622	9,9586188	9,6610434	10,3389566	23
38	9,6199378	9,9585609	9,6613769	10,3386231	22
39	9,6202132	9,9585030	9,6617103	10,3382897	21
40	9,6204884	9,9584450	9,6620434	10,3379566	20
41	9,6207634	9,9583869	9,6623765	10,3376235	19
42	9,6210382	9,9583288	9,6627093	10,3372907	18
43	9,6213127	9,9582707	9,6630420	10,3369580	17
44	9,6215871	9,9582125	9,6633745	10,3366255	16
45	9,6218612	9,9581543	9,6637069	10,3362931	15
46	9,6221351	9,9580961	9,6640391	10,3359609	14
47	9,6224088	9,9580378	9,6643711	10,3356289	13
48	9,6226824	9,9579794	9,6647030	10,3352970	12
49	9,6229557	9,9579210	9,6650346	10,3349654	11
50	9,6232287	9,9578626	9,6653662	10,3346338	10
51	9,6235016	9,9578041	9,6656975	10,3343025	9
52	9,6237743	9,9577456	9,6660288	10,3339712	8
53	9,6240467	9,9576870	9,6663598	10,3336402	7
54	9,6243190	9,9576284	9,6666907	10,3333093	6
55	9,6245911	9,9575697	9,6670214	10,3329786	5
56	9,6248629	9,9575110	9,6673519	10,3326481	4
57	9,6251346	9,9574522	9,6676823	10,3323177	3
58	9,6254060	9,9573934	9,6680126	10,3319874	2
59	9,6256772	9,9573346	9,6683426	10,3316574	1
60	9,6259483	9,9572757	9,6686725	10,3313275	0
	Sine Comp.	Sine	Tang.Comp	Tang.	Min.

65 Degrees

25 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,6259483	9,9572757	9,6686725	10,3313275	60
1	9,6262191	9,9572168	9,6690023	10,3309977	59
2	9,6264897	9,9571578	9,6693319	10,3306681	58
3	9,6267601	9,9570988	9,6696613	10,3303387	57
4	9,6270303	9,9570397	9,6699906	10,3300094	56
5	9,6273003	9,9569806	9,6703197	10,3296803	55
6	9,6275701	9,9569215	9,6706486	10,3293514	54
7	9,6278397	9,9568623	9,6709774	10,3290226	53
8	9,6281090	9,9568030	9,6713060	10,3286940	52
9	9,6283782	9,9567437	9,6716345	10,3283655	51
10	9,6286472	9,9566844	6,6719628	10,3280372	50
11	9,6289160	9,9566250	9,6722910	10,3277090	49
12	9,6291845	9,9565656	9,6726190	10,3273810	48
13	9,6294529	9,9565061	9,6729468	10,3270532	47
14	9,6297211	9,9564466	9,6732745	10,3267255	46
15	9,6299890	9,9563870	9,6736020	10,3263980	45
16	9,6302568	9,9563274	9,6739294	10,3260706	44
17	9,6305243	9,9562678	9,6742566	10,3257434	43
18	9,6307917	9,9562081	9,6745836	10,3254164	42
19	9,6310589	9,9561483	9,6749105	10,3250895	41
20	9,6313258	9,9560886	9,6752372	10,3247628	40
21	9,6315926	9,9560287	9,6755638	10,3244362	39
22	9,6318591	9,9559689	9,6758903	10,3241097	38
23	9,6321255	9,9559089	9,6762165	10,3237835	37
24	9,6323916	9,9558490	9,6765426	10,3234574	36
25	9,6326576	9,9557890	9,6768686	10,3231314	35
26	9,6329233	9,9557289	9,6771944	10,3228056	34
27	9,6331889	9,9556688	9,6775201	10,3224799	33
28	9,6334542	9,9556087	9,6778456	10,3221544	32
29	9,6337194	9,9555485	9,6781709	10,3218291	31
30	9,6339844	9,9554882	9,6784961	10,3215039	30
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min

64 Degrees

25 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
30	9,6339844	9,9554882	9,6784961	10,3215039	30
31	9,6342491	9,9554280	9,6788211	10,3211789	29
32	9,6345137	9,9553676	9,6791460	10,3208540	28
33	9,6347780	9,9553073	9,6794708	10,3205292	27
34	9,6350422	9,9552469	9,6797953	10,3202047	26
35	9,6353062	9,9551864	9,6801188	10,3198802	25
36	9,6355699	9,9551259	9,6804440	10,3195560	24
37	9,6358335	9,9550653	9,6807682	10,3192318	23
38	9,6360969	9,9550047	9,6810921	10,3189079	22
39	9,6363601	9,9549441	9,6814160	10,3185840	21
40	9,6366231	9,9548834	9,6817396	10,3182604	20
41	9,6368859	9,9548227	9,6820632	10,3179368	19
42	9,6371484	9,9547619	9,6823865	10,3176135	18
43	9,6374108	9,9547011	9,6827098	10,3172902	17
44	9,6376731	9,9546402	9,6830328	10,3169672	16
45	9,6379351	9,9545793	9,6833557	10,3166443	15
46	9,6381969	9,9545184	9,6836785	10,3163215	14
47	9,6384585	9,9544574	9,6840011	10,3159989	13
48	9,6387199	9,9543963	9,6843236	10,3156764	12
49	9,6389812	9,9543352	9,6846459	10,3153541	11
50	9,6392422	9,9542741	9,6849681	10,3150319	10
51	9,6395030	9,9542129	9,6852901	10,3147099	9
52	9,6397637	9,9541517	9,6856120	10,3143880	8
53	9,6400241	9,9540904	9,6859338	10,3140662	7
54	9,6402844	9,9540291	9,6862553	10,3137447	6
55	9,6405445	9,9539677	9,6865768	10,3134232	5
56	9,6408044	9,9539063	6,6868981	10,3131019	4
57	9,6410640	9,9538448	9,6872192	10,3127808	3
58	9,6413235	9,9537833	9,6875402	10,3124598	2
59	9,6415828	9,9537218	9,6878611	10,3121389	1
60	9,6418420	9,9536602	9,6881818	10,3118182	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

64 Degrees

26 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9.6418420	9.9536602	9.6881818	10.3118182	60
1	9.6421009	9.9535985	9.6885023	10.3114977	59
2	9.6423596	9.9535369	9.6888227	10.3111773	58
3	9.6426182	9.9534751	9.6891430	10.3108570	57
4	9.6428765	9.9534134	9.6894631	10.3105369	56
5	9.6431347	9.9533515	9.6897831	10.3102169	55
6	9.6433926	9.9532897	9,6901030	10.3098970	54
7	9.6436504	9.9532278	9.6904226	10.3095774	53
8	9.6439080	9.9531658	9.6907422	10.3092578	52
9	9.6441654	9.9531038	9.6910616	10.3089384	51
10	9.6444226	9.9530418	9.6913809	10.3086191	50
11	9.6446796	9.9529797	9.6917000	10.3083000	49
12	9.6449365	9.9529175	9.6920189	10.3079811	48
13	9.6451931	9.9528553	9.6923378	17.3076622	47
14	9.6454496	9.9527931	9.6626565	10.3073435	46
15	9.6457058	9.9527308	9.6929750	10.3070250	45
16	9.6459619	9.9526685	9.6932934	10.3067066	44
17	9.6462178	9.9526061	9.6936117	10.3063883	43
18	9.6464735	9.9525437	9.6939298	10.3060702	42
19	9.6467290	9.9524813	9.6942478	10.3057522	41
20	9.6469844	9.9524188	9.6945656	10.3054344	40
21	9.6472395	9.9523562	9.6948833	10.3051167	39
22	9.6474945	9.9522936	9.6952099	10.3047991	38
23	9.6477492	9.9522310	9.6955183	10.3044817	37
24	9.6480038	9.9521683	9.6958355	10.3041645	36
25	9.9482582	9.9521055	9.6961527	10.3038473	35
26	9.6485124	9.9520428	9.6964697	10.3035303	34
27	9.6487665	9.9519799	9.6967865	10.3032135	33
28	9.6490203	9.9519171	9.6971032	10.3028968	32
29	9.6492740	9.9518541	9.6974198	10.3025802	31
30	9.6495274	9.9517912	9.6977363	10.3022637	30
31	9.6497807	9.9517282	9.6980526	10.3019474	29
32	9.650033	9.9516651	9,6983687	10.3016313	28
33	9.6502868	9.9516020	9.6986847	10.3013153	27
34	9.6505395	9.9515389	9.6990006	10.3009994	26
35	9.6507920	9.9514757	9.6993164	10.3006836	25
36	9.6510444	9.9514124	9.6996320	10.3003680	24
37	9.6512966	9.9513492	9.6999474	10.3000526	23
38	9.6515486	9.9512858	9.7002628	10.2997372	22
39	9.6518004	9.9512224	9.7005780	10.2994220	21
40	9.6520521	9.9511590	9.7008930	10.2991070	20
41	9.6523035	9.9510956	9.7012080	10.2987920	19
42	9.6525548	9.9510320	9.7015227	10.2984773	18
43	9.6528059	9.9509685	9.7018374	10.2981626	17
44	9.6530568	9.9509049	9.7021519	10.2978481	16
45	9.6533075	9.9508412	9.7024663	10.2975337	15
46	9.6535581	9.9507775	9.7027805	10.2972195	14
47	9.6538084	9.9507138	9.7030946	10.2969054	13
48	9.6540586	9.9506500	9.7034086	10.2965914	12
49	9.6543086	9.9205861	9.7037225	10.2962775	11
50	9.6545584	9.9505223	9.7040362	10.2959638	10
51	9.6548081	9.9504583	9.7043497	10.2956503	9
52	9.6550575	9.9503944	9.7046632	10.2953368	8
53	9.6553068	9.9503303	9.7049765	10.2950235	7
54	9.6555559	9.9502663	9.7052897	10.2947103	6
55	9.6558048	9.9502022	9.705602	10.2943973	5
56	9.6560536	9.9501380	9.7059156	10.2940844	4
57	9.6563021	9.9500738	9.7062284	10.2937716	3
58	9.6565505	9.9500095	9.7065410	10.2934590	2
59	9.6567987	9.9499452	9.7068535	10.2931465	1
60	9.6570468	9.9498809	9.7071659	10.2928341	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.

63 Degrees

27 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9.6570468	9.9498809	9.7071659	10.2928341	60
1	9.6572946	9.9498165	9.7074781	10.2925219	59
2	9.6575423	9.9497521	9.7077902	10.2922098	58
3	9.6577898	9.9496876	9.7081022	10.2918978	57
4	9.6580371	9.9496230	9.7084141	10.2915859	56
5	9.6582842	9.9495585	9.7087258	10.2912752	55
6	9.6585312	9.9494938	9.7090374	10.2909626	54
7	9.6587780	9.9494292	9.7093488	10.2906512	53
8	9.6590246	9.9493645	9.7096601	10.2903399	52
9	9.6592710	9.9492997	9.7099713	10.2900287	51
10	9.6595173	9.9492349	9.7102824	10.2897176	50
11	9.6597634	9.9491700	9.7105933	10.2894067	49
12	9.6600093	9.9491051	9.7109041	10.2890959	48
13	9.6602550	9.9490402	9.7112148	10.2887852	47
14	9.6605005	9.9489752	9.7115254	10.2884746	46
15	9.6607459	9.9489101	9.7118358	10.2881642	45
16	9.6609911	9.9488450	9.7121461	10.2878539	44
17	9.6612361	9.9487799	9.7124562	10.2875438	43
18	9.6614810	9.9487147	9.7127662	10.2872338	42
19	9.6617257	9.9486495	9.7130761	10.2869239	41
20	9.6619702	9.9485842	9.7133859	10.2866141	40
21	9.6622145	9.9485189	9.7136956	10.2863044	39
22	9.6624586	9.9484535	9.7140051	10.2859949	38
23	9.6627026	9.9483881	9.7173145	10.2856855	37
24	9.6629464	9.9483227	9.7146237	10.2853763	36
25	9.6631900	9.9482572	9.7149329	10.2850671	35
26	9.6634335	9.9481916	9.7152419	10.2847581	34
27	9.6636768	9.9481260	9.7155508	10.2844492	33
28	9.6639199	9.9480604	9.7158595	10.2841405	32
29	9.6641628	9.9479947	9.7161682	10.2838318	31
30	9.6644056	9.9479289	9.7164767	10.2835233	30
31	9.6646482	9.9478631	9.7167851	10.2832149	29
32	9.6648906	9.9477973	9.7170933	10.2829067	28
33	9.6651329	9.9477314	9.7174014	10.2825986	27
34	9.6653749	9.9476655	9.7177094	10.2822906	26
35	9.6656168	9.9475995	9.7180173	10.2819827	25
36	9.6658586	9.9475335	9.7183251	10.2816749	24
37	9.6661001	9.9474674	9.7186327	10.2813673	23
38	9.6663415	9.9474013	9.7189402	10 2810598	22
39	9.6665828	9.9473352	9.7192476	10.2807524	21
40	9.6668238	9.9472689	9.7195549	10.2804451	20
41	9.6670647	9.9472027	9.7198620	10.2801380	19
42	9.6673054	9.9471364	9.7201690	10.2798310	18
43	9.6675459	9.9470700	9.7204759	10.2795241	17
44	9.6677863	9.9470036	9.7207827	10.2792173	16
45	9.6680265	9.9469372	9.7210893	10.2789107	15
46	9.6682665	9.9468707	9.7213958	10.2786042	14
47	9.6685064	9.9468042	9.7217022	10.2782978	13
48	9.6687461	9.9467376	9.0220085	10.2779915	12
49	9.6689856	9.9466710	9.7223147	10.2776853	11
50	9.6692250	9.9466043	9.7226207	10.2773793	10
51	9.6694642	9.9465376	9.7229266	10.2770734	9
52	9.6697032	9.9464708	9.7232324	10.2767676	8
53	9.6699420	9.9464040	9.7235381	10.2764619	7
54	9.6701807	9.9463371	9.7238436	10.2761564	6
55	9.6704192	9.9462702	9.7241490	10.2758510	5
56	9.6706576	9.9462032	9.7244543	10.2755457	4
57	9.6708958	9,9461362	9.7247595	10.2752405	3
58	9.6711338	9.9460692	9.7250646	10.2749354	2
59	9.6713716	9.9460021	9.7253695	10.2746305	1
60	9.6716093	9.9469349	9.7256744	10.2743256	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.

62 Degrees

28 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9.6716093	9.9459349	9.7256744	10.2743256	60
1	9.6718468	9.9458677	9.7259791	10.2740209	59
2	9.6720841	9.9458005	9.7262837	10.2737163	58
3	9.6723213	9.9457332	9.7265881	10.2734119	57
4	9.6725583	9.9456659	9.7268925	10.2731075	56
5	9.6727952	9.9455985	9.7271967	10.2728033	55
6	9.6730319	9.9455310	9.7275008	10.2724992	54
7	9.6732684	9.9454636	9.7278048	10.2721952	53
8	9.6735047	9.9453960	9.7281087	10.2718913	52
9	9.6737409	9.9453285	9.7284124	10.2715876	51
10	9.6739769	9.9452609	9.7287161	10.2712839	50
11	9.6742128	9.9451932	9.7290196	10.2709804	49
12	9.6744485	9.9451255	9.7293230	10.2706770	48
13	9.6746840	9.9450577	9.7296263	10.2703737	47
14	9.6749194	9.9449899	9.7299295	10.2700705	46
15	9.6751546	9.9449220	9.7302325	10.2697675	45
16	9.6753896	9.9448541	9.7305354	10.2694646	44
17	9.6756245	9.9447862	9.7308383	10.2691617	34
18	9.6758592	9.9447182	9.7311410	10.2688590	42
19	9.6760937	9 9446501	9.7314436	10.2685564	41
20	9.6763281	9.9445821	9.7317460	10.2682540	40
21	9.6765623	9.9445139	9.7320484	10.2679516	39
22	9.6767963	9.9444457	9.7323506	10.2676494	38
23	9.6770302	9.9443775	9.7326527	10.2673473	37
24	9.6772640	9.9443092	9.7329547	10.2670453	36
25	9.6774975	9.9442409	9.7332566	10.2667434	35
26	9.6777309	9.9441725	9.7335584	10.2664416	34
27	9.6779642	9.9441041	9.7338601	10.2661399	33
28	9.6781972	9.9440356	9.7341616	10.2658384	32
29	9.6784301	9.9439671	9.7344631	10.2655369	31
30	9.6786629	9.9438985	9.7347644	10.2652356	30
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.

61 Degrees

28 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
30	9.6786629	9.9438985	9.7347644	10.2652356	30
31	9.6788955	9.9438299	9.7350656	10.2649344	29
32	9.6791279	9.9437612	9.7353667	10.2646333	28
33	9.6793602	9.9436925	9.7356677	10.2643323	27
34	9.6795923	9.9436238	9.7359685	10.2640315	26
35	9.6798243	9.9435549	9.7362693	10.2637307	25
36	9.6800560	9.9434861	9.7365699	10.2634301	24
37	9.6802877	9.9434172	9.7368705	10.2631295	23
38	9.6805191	9.9433482	9.7371709	10.2628291	22
39	9.6807504	9.9432792	9.7374712	10.2625288	21
40	9.6809816	9.9432102	9.7377714	10.2622286	20
41	9.6812126	9.9431411	9.7380715	10.2619285	19
42	9.6814434	9.9430720	9.7383714	10.2616286	18
43	9.6816741	9.9430028	9.7386713	10.2613287	17
44	9.6819046	9.9429335	9.7389710	10.2610290	16
45	9.6821349	9.9428643	9.7392707	10.2607293	15
46	9.6823651	9.9427949	9.7395702	10.2604298	14
47	9.6825952	9.9427255	9.7398696	10.2601304	13
48	9.6828250	9.9426561	9.7401689	10.2598311	12
49	9.6830548	9.9425866	9.7404681	10.2595319	11
50	9.6832843	9.9425171	9.7407672	10.2592328	10
51	9.6835137	9.9424476	9.7410662	10.2589338	9
52	9.6837430	9.9423779	9.7413650	10.2586350	8
53	9.6839720	9.9423083	9.7416638	10.2583362	7
54	9.6842010	9.9422386	9.7419624	10.2580376	6
55	9.6844297	9.9421688	9.7422609	10.2577391	5
56	9.6846583	9.9420990	9.7425594	10.2574406	4
57	9.6848868	9.9420291	9.7428577	10.2571423	3
58	9.6851151	9.9419592	9.7431559	10.2568441	2
59	9.6854432	9.9418893	9.7434540	10.2565460	1
60	9.6855712	9.9418193	9.7437520	10.2562480	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.

61 Degrees

29 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,6855712	9,9418193	9,7437520	10,2562480	60
1	9,6857991	9,9417492	9,7440499	10,2559501	59
2	9,6860267	9,9416791	9,7443476	10,2556524	58
3	9,6862542	9,9416090	9,7446453	10,2553547	57
4	9,6864816	9,9415388	9,7449428	10,2550572	56
5	9,6867088	9,9414685	9,7452403	10,2547597	55
6	9,6869359	9,9413982	9,7455376	10,2544624	54
7	9,6871628	9,9413279	9,7458349	10,2541651	53
8	9,6873895	9,9412575	9,7461320	10,2538680	52
9	9,6876161	9,9411871	9,7464290	10,2535710	51
10	9,6878425	9,9411166	9,7467259	10,2532741	50
11	9,6880688	9,9410461	9,7470227	10,2529773	49
12	9,6882949	9,9409755	9,7473194	10,2526806	48
13	9,6885209	9,9409048	9,7476160	10,2523840	47
14	9,6887467	9,9408342	9,7479125	10,2520875	46
15	9,6889723	9,9407634	9,7482089	10,2517911	45
16	9,6891978	9,9406927	9,7485052	10,2514948	44
17	9,6894232	9,9406219	9,7488013	10,2511987	43
18	9,6896484	9,9405510	9,7490974	10,2509026	42
19	9,6898734	9,9404801	9,7493934	10,2506066	41
20	9,6900983	9,9404091	9,7496892	10,2503108	40
21	9,6903231	9,9403381	9,7499850	10,2500150	39
22	9,6905476	9,9402670	9,7502806	10,2497194	38
23	9,6907721	9,9401959	9,7505762	10,2494238	37
24	9,6909964	9,9401248	9,7508716	10,2491284	36
25	9,6912205	9,9400535	9,7511669	10,2488331	35
26	9,6914445	9,9399823	9,7514622	10,2485378	34
27	9,6916683	9,9399110	9,7517573	10,2482427	33
28	9,6918919	9,9398396	9,7520523	10,2479477	32
29	9,6921155	9,9397682	9,7523472	10,2476528	31
30	9,6923388	9,9396968	9,7526420	10,2473580	30
31	9,6925620	9,9396253	9,7529368	10,2470632	29
32	9,6927851	9,9395537	9,7532314	10,2467686	28
33	9,6930080	9,9394821	9,7535259	10,2464741	27
34	9,6932308	9,9394105	9,7538203	10,2461797	26
35	9,6934534	9,9393388	9,7541146	10,2458854	25
36	9,6936758	9,9392671	9,7544088	10 2455912	24
37	9,6938981	9,9391953	9,7547029	10,2452971	23
38	9,6941203	9,9391234	9,7549969	10,2450031	22
39	9,6943423	9,9390515	9,7552908	10,2447092	21
40	9,6945642	9,9389796	9,7555846	10,2444154	20
41	9,6947859	9,9389076	9,7558783	10,2441217	19
42	9,6950074	9,9388356	9,7561718	10,2438282	18
43	9,6952288	9,9387635	9,7564653	10,2435347	17
44	9,6954501	9,9386914	9,7567587	10,2432413	16
45	9,6956712	9,9386192	9,7570520	10,2429480	15
46	9,6958922	9,9385470	9,7573452	10,2426548	14
47	9,6961130	9,9384747	9,7576383	10,2423617	13
48	9,6963336	9,9384024	9,7579313	10,2420687	12
49	9,6965541	9,9383300	9,7582242	10,2417758	11
50	9,6967745	9,9382576	9,7585170	10,2414830	10
51	9,6969947	9,9381851	9,7588096	10,2411904	9
52	9,6972148	9,9381126	9,7591022	10,2408978	8
53	9,6974347	9,9380400	9,7593947	10,2406053	7
54	9,6976545	9,9379674	9,7596871	10,2403129	6
55	9,6978741	9,9378947	9,7599794	10,2400206	5
56	9,6980936	9,9378220	9,7602716	10,2397284	4
57	9,6983129	9,9377492	9,7605637	10,2364363	3
58	9,6985321	9,9376764	9,7608557	10,2391443	2
59	9,6987511	9,9376035	9,7611476	10,2388524	1
60	9,6989700	9,9375306	9,7614394	10,2385606	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

60 Degrees

30 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,6989700	9,9375306	9,7614394	10,2385606	60
1	9,6991887	9,9474577	9,7617311	10,2382689	59
2	9,6994073	9,9373847	9,7620227	10,2379773	58
3	9,6996258	9,9376116	9,7623142	10,2376858	57
4	9,6998441	9,9372385	9,7626056	10,2373944	56
5	9,7000622	9,9371653	9,7628969	10,2371031	55
6	9,7002802	9,9370921	9,7631881	10,2368119	54
7	9,7004981	9,9370189	9,7634792	10,2365208	53
8	9,7007158	9,9369456	9,7637702	10,2362298	52
9	9,7009334	9,9368722	9,7640612	10,2359388	51
10	9,7011508	9,9367988	9,7643520	10,2356480	50
11	9,7013681	9,9367254	9,7646427	10,2353573	49
12	9,7015852	9,9366519	9,7649334	10,2350666	48
13	9,7018022	9,9365783	9,7652239	10,2347761	47
14	9,7020190	9,9365047	9,7655143	10,2344857	46
15	9,7022357	9,9364311	9,7658047	10,2341953	45
16	9,7024523	9,9363574	9,7660949	10,2339051	44
17	9,7026687	9,9362836	9,7663851	10,2536149	43
18	9,7028849	9,9362298	9,7666751	10,2333249	42
19	9,7031011	9,9361360	9,7669651	10,2330349	41
20	9,7033170	9,9360621	9,7672550	10,2327450	40
21	9,7035329	9,9359881	9,7675448	10,2324552	39
22	9,7037486	9,9359141	9,7678344	10,2321656	38
23	9,7039641	9,9358401	9,7681240	10,2318760	37
24	9,7041795	9,9357660	9,7684135	10,2315865	36
25	9,7043947	9,9356918	9,7687029	10,2312971	35
26	9,7046099	9,9356177	9,7689922	10,2310078	34
27	9,7048248	9,9355434	9,7692814	10,2307186	33
28	9,7050397	9,9354691	9,7695705	10,2304295	32
29	9,7052543	9,9353948	9,7968596	10,2301404	31
30	9,7054689	9,9353204	9,7701485	10,2298515	30
31	9,7056833	9,9352459	9,7704373	10,2295627	29
32	9,7058975	9,9351715	9,7707261	10,2292739	28
33	9,7061116	9,9350969	9,7710147	10,2289853	27
34	9,7063256	9,9350223	9,7713033	10,2286967	26
35	9,7065394	9,9349477	9,7715917	10,2284083	25
36	9,7067531	9,9348730	9,7718801	10,2281199	24
37	9,7069667	9,9347983	9,7721684	10,2278316	23
38	9,7071801	9,9347235	9,7724566	10,2275434	22
39	9,7073933	9,9346486	9,7727447	10,2272553	21
40	9,7076064	9,9345738	9,7730327	10,2269673	20
41	9,7078194	9,9344988	9,7733206	10,2266794	19
42	9,7080323	9,9344238	9,7736084	10,2263916	18
43	9,7082450	9,9343488	9,7738961	10,2261039	17
44	9,7084575	9,9342737	9,7741838	10,2258162	16
45	9,7086699	9,9341986	9,7744713	10,2255287	15
46	9,7088822	9,9341234	9,7747588	10,2252412	14
47	9,7090943	9,9340482	9,7750462	10,2249538	13
48	9,7093063	9,9339729	9,7753334	10,2246666	12
49	9,7095182	9,9338976	9,7756206	10,2243794	11
50	9,7097299	9,9338222	9,7759077	10,2240923	10
51	9,7099415	9,9337467	9,7761947	10,2238053	9
52	9,7101529	9,9336713	9,7764816	10,2235184	8
53	9,7103642	9,9335957	9,7767685	10,2232315	7
54	9,7105753	9,9335201	9,7770552	10,2229448	6
55	9,7107863	9,9334445	9,7773418	10,2226582	5
56	9,7109972	9,9333688	9,7776284	10,2223716	4
57	9,7112080	9,9332931	9,7779149	10,2220851	3
58	9,7114186	9,9332173	9,7782012	10,2217988	2
59	9,7116290	9,9331415	9,7784875	10,2215125	1
60	9,7118393	9,9330656	9,7787737	10,2212263	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

59 Degrees

31 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,7118393	9,9330656	9,7787737	10,2212263	60
1	9,7120495	9,9329897	9,7790599	10,2209401	59
2	9,7122596	9,9329137	9,7793459	10,2306541	58
3	9,7124695	9,9328376	9,7796318	10,2203682	57
4	9,7126792	9,9327616	9,7799177	10,2200823	56
5	9,7128889	9,9326854	9,7802034	10,2197966	55
6	9,7130983	9,9326092	9,7804891	10,2195109	54
7	9,7133077	9,9325330	9,7807747	10,2192253	53
8	9,7135169	9,9324567	9,7810602	10,2189398	52
9	9,7137260	9,9323804	9,7813456	10,2186544	51
10	9,7139349	9,9323040	9,7816309	10,2183691	50
11	9,7141437	9,9322276	9,7819162	10,2180838	49
12	9,7143524	9,9321511	9,7822013	10,2177987	48
13	9,7145609	9,9320746	9,7824864	10,2175136	47
14	9,7147693	9,9319980	9,7827713	10,2172287	46
15	9,7179776	9,9319213	9,7830562	10,2169438	45
16	9,7151857	9,9318447	9,7833410	10,2166590	44
17	9,7153937	9,9317679	9,7836258	10,2163742	43
18	9,7156015	9,9316911	9,7839104	10,2160896	42
19	9,7158092	9,9316143	9,7841949	10,2158051	41
20	9,7160168	9,9315374	9,7844794	10,2155206	40
21	9,7162243	9,9314605	9,7847638	10,2152362	39
22	9,7164316	9,9313835	9,7850481	10,2149519	38
23	9,7166387	9,9313065	9,7853323	10,2146677	37
24	9,7168458	9,9312294	9,7856164	10,2143836	36
25	6,7170526	9,9311522	9,7859004	10,2140996	35
26	9,7172594	9,9310750	9,7861844	10,2138156	34
27	9,7174660	9,9309978	9,7864682	10,2135318	33
28	9,7176725	9,9309205	9,7867520	10,2132480	32
29	9,7178789	9,9308432	9,7870357	10,2129643	31
30	9,7180851	9,9307658	9,7873193	10,2126807	30
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

58 Degrees

31 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
30	9,7180851	9,9307658	9,7873193	10,2126807	30
31	9,7182912	9,9306883	9,7876028	10,2123972	29
32	9,7184971	9,9306109	9,7878863	10,2121137	28
33	9,7187030	9,9305333	9,7881696	10,2118304	27
34	9,7189086	9,9304557	9,7884529	10,2115471	26
35	9,7191142	9,9303781	9,7887361	10,2112639	25
36	9,7193196	9,9303004	9,7890192	10,2109808	24
37	9,7195249	9,9302226	9,7893023	10,2106977	23
38	9,7197300	9,9301448	9,7895852	10,2104148	22
39	9,7199350	9,9300670	9,7898681	10,2101319	21
40	9,7201399	9,9299891	9,7901508	10,2098492	20
41	9,7203447	9,9299112	9,7904335	10,2095665	19
42	9,7205493	9,9298332	9,7907161	10,2092839	18
43	9,7207538	9,9297551	9,7909987	10,2090013	17
44	9,7209581	9,9296770	9,7912811	10,2087189	16
45	9,7211623	9,9295989	9,7915635	10,2084365	15
46	9,7213664	9,9295207	9,7918458	10,2081542	14
47	9,7215704	9,9294424	9,7921280	10,2078720	13
48	9,7217742	9,9293641	9,7924101	10,2075899	12
49	9,7219779	9,9292857	9,7926921	10,2073079	11
50	9,7221814	9,9292073	9,7929741	10,2070259	10
51	9,7223848	9,9291289	9,7932560	10,2067440	9
52	9,7225881	9,9290504	9,7935378	10,2064622	8
53	9,7227913	9,9289718	9,7938195	10,2061805	7
54	9,7229943	9,9288932	9,7941011	10,2058989	6
55	9,7231972	9,9288145	9,7943827	10,2056173	5
56	9,7234000	9,9287358	9,7946641	10,2053359	4
57	9,7236026	9,9286571	9,7949455	10,2050545	3
58	9,7238051	9,9285783	9,7952268	10,2047732	2
59	9,7240075	9,9284994	9,7955081	10,2044919	1
60	9,7242097	9,9284205	9,7957892	10,2042108	0
	Sine Comp.	Sine	Tang.Comp	Tang.	Min.

58 Degrees

Min.	32 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,7242097	9,9284205	9,7957892	10,2042108	60
1	9,7244118	9,9283415	9,7960703	10,2039297	59
2	9,7246138	9,9282625	9,7963513	10,2036487	58
3	9,7248156	9,9281834	9,7966322	10,2033678	57
4	9,7250174	9,9281043	9,7969130	10,2030870	56
5	9,7252189	9,9280251	9,7971938	10,2028062	55
6	9,7254204	9,9279459	9,7974745	10,2025255	54
7	9,7256217	9,9278666	9,7977551	10,2022449	53
8	9,7258229	9,9277873	9,7980356	10,2019644	52
9	9,7260240	9,9277079	9,7983160	10,2016840	51
10	9,7262249	9,9276285	9,7985964	10,2014036	50
11	9,7264257	9,9275490	9,7988767	10,2011233	49
12	9,7266264	9,9274695	9,7991569	10,2008431	48
13	9,7268269	9,9273899	9,7994370	10,2005630	47
14	9,7270273	9,9273103	9,7997170	10,2002830	46
15	9,7272276	9,9272306	9,7999970	10,2000030	45
16	9,7274278	9,9271509	9,8002769	10, 997231	44
17	9,7276278	9,9270711	9,8065567	10,1994433	43
18	9,7278277	9,9269913	9,8008365	10,1991635	42
19	9,7280275	9,9269114	9,8011161	10,1988839	41
20	9,7282271	9,9268314	9,8013957	10,1986043	40
21	9,7284267	9,9267514	9,8016752	10,1983248	39
22	9,7286260	9,9266714	9,8019546	10,1980454	38
23	9,7288253	9,9265913	9,8022340	10,1977660	37
24	9,7290244	9,9265112	9,8025133	10,1974867	36
25	9,7292234	9,9264310	9,8027925	10,1972075	35
26	9,7294223	9,9263507	9,8030716	10,1969284	34
27	9,7296211	9,9262704	9,8033506	10,1966494	33
28	9,7298197	9,9261901	9,8036296	10,1963704	32
29	9,7300182	9,9261096	9,8039085	10,1960915	31
30	9,7302165	9,9260292	9,8041873	10,1958127	30
31	9,7304148	9,9259487	9,8044661	10,1955339	29
32	9,7306129	9,9258681	9,8047447	10,1952553	28
33	9,7308109	9,9257875	9,8050233	10,1949767	27
34	9,7310087	9,9257069	9,8053019	10,1946981	26
35	9,7312064	9,9256261	9,8055803	10,1944197	25
36	9,7314040	9,9255454	9,8058587	10,1941413	24
37	9,7316015	9,9254646	9,8061370	10,1938630	23
38	9,7317989	9,9253837	9,8064152	10,1935848	22
39	9,7319961	9,9253028	9,8066933	10,1933067	21
40	9,7321932	9,9252218	9,8069714	10,1930286	20
41	9,7323902	9,9251408	9,8072494	10,1927506	19
42	9,7325870	9,9250597	9,8075273	10,1924727	18
43	9,7327837	9,9249786	9,8078052	10,1921948	17
44	9,7329803	9,9248974	9,8080829	10,1919171	16
45	9,7331766	9,9248161	9,8083606	10,1916394	15
46	9,7333731	9,9247349	9,8086383	10,1913617	14
47	9,7335693	9,9246535	9,8089158	10,1910842	13
48	9,7337654	9,9245721	9,8091933	10,1908067	12
49	9,7339614	9,9244907	9,8094707	10,1905293	11
50	9,7341572	9,9244092	9,8097480	10,1902520	10
51	9,7343529	9,9243277	9,8100253	10,1899747	9
52	9,7345485	9,9242461	9,8103025	10,1896975	7
53	9,7347440	9,9241644	9,8105796	10,1894204	8
54	9,7349393	9,9240827	9,8108566	10,1891434	6
55	9,7351345	9,9240010	9,8111336	10,1888664	5
56	9,7353296	9,9239191	9,8114105	10,1885895	4
57	9,7355246	9,9238373	9,8116873	10,1883127	3
58	9,7357195	9,9237554	9,8119641	10,1880359	2
59	9,7359142	9,9236734	9,8122408	10,1877592	1
60	9,7361088	9,9235914	9,8125174	10,1874826	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.
	57 Degrees				

Min.	33 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,7361088	9,9235914	9,8125174	10,1874826	60
1	9,7363032	9,9235093	9,8127939	10,1872061	59
2	9,7364976	9,9234272	9,8130794	10,1869296	58
3	9,7366918	9,9233450	9,8133468	10,1866532	57
4	9,7368859	9,9232628	9,8136231	10,1863769	56
5	9,7370799	9,9231805	9,8138993	10,1861007	55
6	9,7372737	9,9230982	9,8141755	10,1858245	54
7	9,7374675	9,9230158	9,8144516	10,1855484	53
8	9,7376611	9,9229334	9,8147277	10,1852723	52
9	9,7378546	9,9228509	9,8150036	10,1849964	51
10	9,7380479	9,9227684	9,8152795	10,1847205	50
11	9,7382412	9,9226858	9,8155554	10,1844446	49
12	9,7384343	9,9226032	9,8158311	10,1841689	48
13	9,7386273	9,9225205	9,8161068	10,1838932	47
14	9,7388201	9,9224377	9,8163824	10,1836176	46
15	9,7390129	9,9223549	9,8166580	10,1833420	45
16	9,7392055	9,9222721	9,8169335	10,1830665	44
17	9,7393980	9,9221891	9,8172089	10,1827911	43
18	9,7395904	9,9221062	9,8174842	10,1825158	42
19	9,7397827	9,9220232	9,8177595	10,1822405	41
20	9,7399748	9,9219401	9,8180347	10,1819653	40
21	9,7401668	9,9218570	9,8183098	10,1816902	39
22	9,7403587	9,9217738	9,8185849	10,1814151	38
23	9,7405505	9,9216906	9,8188599	10,1811401	37
24	9,7407421	9,9216073	9,8191348	10,1808652	36
25	9,7409337	9,9215240	9,8194096	10,1805904	35
26	9,7411251	9,9214406	9,8196844	10,1803156	34
27	9,7413164	9,9213572	9,8199592	10,1800408	33
28	9,7415075	9,9212737	9,8202338	10,1797662	32
29	9,7416986	9,9211902	9,8205084	10,1794916	31
30	9,7418895	9,9211066	9,8207829	10,1792171	30
31	9,7420803	9,9210229	9,8210574	10,1789426	29
32	9,7422710	9,9209393	9,8213317	10,1786683	28
33	9,7424616	9,9208555	9,8216060	10,1783940	27
34	9,7426520	9,9207717	9,8218803	10,1781197	26
35	9,7428423	9,9206878	9,8221545	10,1778455	25
36	9,7430325	9,9206039	9,8224286	10,1775714	24
37	9,7432226	9,9205200	9,8227026	10,1772974	23
38	9,7434126	9,9204360	9,8229766	10,1770234	22
39	9,7436024	9,9203519	9,8232505	10,1767495	21
40	9,7437921	9,9202678	9,8235244	10,1764756	20
41	9,7439817	9,9201836	9,8237981	10,1762019	19
42	9,7441712	9,9200994	9,8240719	10,1759281	18
43	9,7443606	9,9200151	9,8243455	10,1756545	17
44	9,7445498	9,9199308	9,8246191	10,1753809	16
45	9,7447390	9,9198464	9,8248926	10,1751074	15
46	9,7449280	9,9197619	9,8251660	10,1748340	14
47	9,7451169	9,9196775	9,8254394	10,1745606	13
48	9,7453056	9,9195929	9,8257127	10,1742873	12
49	9,7454943	9,9195083	9,8259860	10,1740140	11
50	9,7456828	9,9194237	9,8262592	10,1737408	10
51	9,7458712	9,9193390	9,8265323	10,1734677	9
52	9,7460595	9,9192542	9,8268053	10,1731947	8
53	9,7462477	9,9191694	9,8270783	10,1729217	7
54	9,7464358	9,9190845	9,8273513	10,1726487	6
55	9,7466237	9,9189996	9,8276241	10,1723759	5
56	9,7468115	9,9189146	9,8278969	10,1721031	4
57	9,7469992	9,9188296	9,8281696	10,1718304	3
58	9,7471868	9,9187445	9,8284423	10,1715577	2
59	9,7473743	9,9186594	9,8287149	10,1712851	1
60	9,7475617	9,9185742	9,8289874	10,1710126	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.
	56 Degrees				

Min.	34 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,7475617	9,9185742	9,8289874	10,1710126	60
1	9,7477489	9,9184890	9,8292599	10,1707401	59
2	9,7479360	9,9184037	9,8295323	10,1704677	58
3	9,7481230	9,9183183	9,8298047	10,1701953	57
4	9,7483099	9,9182329	9,8300769	10,1699231	56
5	9,7484967	9,9181475	9,8303492	10,1696508	55
6	9,7486833	9,9180620	9,8306213	10,1693787	54
7	9,7488698	9,9179764	9,8308934	10,1691066	53
8	9,7490562	9,9178908	9,8311654	10,1688346	52
9	9,7492425	9,9178051	9,8314374	10,1685626	51
10	9,7494287	9,9177194	9,8317093	10,1682907	50
11	9,7496148	9,9176336	9,8319811	10,1680189	49
12	9,7498007	9,9175478	9,8322529	10,1677471	48
13	9,7499866	9,9174619	9,8325246	10,1674754	47
14	9,7501723	9,9173760	9,8327963	10,1672037	46
15	9,7503579	9,9172900	9,8330679	10,1669321	45
16	9,7505434	9,9172040	9,8333394	10,1666606	44
17	9,7507287	9,9171179	9,8336109	10,1663891	43
18	9,7509140	9,9170317	9,8338823	10,1661177	42
19	9,7510991	9,9169455	9,8341536	10,1658464	41
20	9,7512842	9,9168593	9,8344249	10,1655751	40
21	9,7514691	9,9167730	9,8346961	10,1653039	39
22	9,7516538	9,9166866	9,8349673	10,1650327	38
23	9,7518385	9,9166002	9,8352384	10,1647616	37
24	9,7520231	9,9165137	9,8355094	10,1644906	36
25	9,7522075	9,9164272	9,8357804	10,1642196	35
26	9,7523919	9,9163406	9,8360513	10,1639487	34
27	9,7525761	9,9162539	9,8363221	10,1636779	33
28	9,7527602	9,9161673	9,8365929	10,1634071	32
29	9,7529442	9,9160805	9,8368636	10,1631364	31
30	9,7531280	9,9159937	9,8371343	10,1628657	30
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.
	55 Degrees				

Min.	34 Degrees				
	Sine	Sine Comp.	Tang.	Tang. Comp.	
30	9,7531280	9,9159937	9,8371343	10,1628657	30
31	9,7533118	9,9159069	9,8374049	10,1625951	29
32	9,7534954	9,9158200	9,8376755	10,1623245	28
33	9,7536790	9,9157330	9,8379460	10,1620540	27
34	9,7538624	9,9156460	9,8382164	10,1617836	26
35	9,7540457	9,9155589	9,8384867	10,1615133	25
36	9,7542288	9,9154718	9,8387571	10,1612429	24
37	9,7544119	9,9153846	9,8390273	10,1609727	23
38	9,7545949	9,9152974	9,8392975	10,1607025	22
39	9,7547777	9,9152101	9,8395676	10,1604324	21
40	9,7549604	9,9151228	9,8398377	10,1601623	20
41	9,7551431	9,9150354	9,8401077	10,1598923	19
42	9,7553256	9,9149749	9,8403776	10,1596224	18
43	9,7555080	9,9148604	9,8406475	10,1593525	17
44	9,7556902	9,9147729	9,8409174	10,1590826	16
45	9,7558724	9,9146852	9,8411871	10,1588129	15
46	9,7560544	9,9145976	9,8414569	10,1585431	14
47	9,7562364	9,9145099	9,8417265	10,2582735	13
48	9,7564182	9,9144221	9,8419961	10,1580039	12
49	9,7565999	9,9143342	9,8422657	10,1577343	11
50	9,7567815	9,9142464	9,8425351	10,1574649	10
51	9,7569630	9,9141584	9,8428046	10,1571954	9
52	9,7571444	9,9140704	9,8430739	10,1569261	8
53	9,7573256	9,9139824	9,8433432	10,1566568	7
54	9,7575068	9,9138943	9,8436125	10,1563875	6
55	9,7576878	9,9138061	9,8438817	10,1561183	5
56	9,7578687	9,9137179	9,8441508	10,1558492	4
57	9,7580495	9,9136296	9,8444199	10,1555801	3
58	9,7582302	9,9135413	9,8446889	10,1553111	2
59	9,7584108	9,9134530	9,8449579	10,1550421	1
60	9,7585913	9,9133645	9,8452268	10,1547732	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.
	55 Degrees				

35 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,7585913	9,9133645	9,8452268	10,1547732	60
1	9,7587717	9,9132760	9,8454956	10,1545044	59
2	9,7589519	9,9131875	9,8457644	10,1542356	58
3	9,7591321	9,9130989	9,8460332	10,1539668	57
4	9,7593121	9,9130102	9,8463018	10,1536982	56
5	9,7594920	9,9129215	9,8465705	10,1534295	55
6	9,7596718	9,9128328	9,8468390	10,1531610	54
7	9,7598515	9,9127440	9,8471075	10,1538925	53
8	9,7600311	9,9126551	9,8473760	10,1526240	52
9	9,7602106	9,9125662	9,8476444	10,1523556	51
10	9,7603899	9,9124772	9,8479127	10,1520873	50
11	9,7605692	9,9123882	9,8481810	10,1518190	49
12	9,7607483	9,9122991	9,8484492	10,1515508	48
13	9,7609274	9,9122099	9,8487174	10,1512826	47
14	9,7611063	9,9121207	9,8489855	10,1510145	46
15	9,7612851	9,9120315	9,8492536	10,1507464	45
16	9,7614638	9,9119422	9,8495216	10,1504784	44
17	9,7616424	9,9118528	9,8497896	10,1502104	43
18	9,7618208	9,9117634	9,8500575	10,1499425	42
19	9,7619992	9,9116739	9,8503253	10,1496747	41
20	9,7621775	9,9115844	9,8505931	10,1494069	40
21	9,7623556	9,9114948	9,8508608	10,1491392	39
22	9,7625337	9,9114051	9,8511285	10,1488715	38
23	9,7627116	9,9113155	9,8513961	10,1486039	37
24	9,7628894	9,9112257	9,8516637	10,1483363	36
25	9,7630671	9,9111359	9,8519312	10,1480688	35
26	9,7632447	9,9110460	9,8521987	10,1478013	34
27	9,7634222	9,9109561	9,8524661	10,1475339	33
28	9,7635996	9,9108661	9,8527335	10,1472665	32
29	9,7637769	9,9107761	9,8530008	10,1469992	31
30	9,7639540	9,9106860	9,8532680	10,1467320	30
31	9,7641311	9,9105959	9,8535352	10,1464648	29
32	9,7643080	9,9105057	9,8538023	10,1461977	28
33	9,7644849	9,9104155	9,8540694	10,1459306	27
34	9,7646616	9,9103251	9,8543365	10,1456635	26
35	9,7648382	9,9102348	9,8546034	10,1453966	25
36	9,7650147	9,9101444	9,8548704	10,1451296	24
37	9,7651911	9,9100539	9,8551372	10,1448628	23
38	9,7653674	9,9099634	9,8554041	10,1445959	22
39	9,7655436	9,9098728	9,8556708	10,1443292	21
40	9,7657197	9,9097821	9,8559376	10,1440624	20
41	9,7658957	9,9096915	9,8562042	10,1437958	19
42	9,7660715	9,9096007	9,8564708	10,1435292	18
43	9,7662473	9,9095099	9,8567374	10,1432626	17
44	9,7664229	9,9094190	9,8570039	10,1429961	16
45	9,7665985	9,9093281	9,8572704	10,1427296	15
46	9,7667739	9,9092371	9,8575368	10,1424632	14
47	9,7669492	9,9091461	9,8578031	10,1421969	13
48	9,7671244	9,9090550	9,8580694	10,1419306	12
49	9,7672996	9,9089639	9,8583357	10,1416643	11
50	9,7674746	9,9088727	9,8586019	10,1413981	10
51	9,7676494	9,9087814	9,8588680	10,1411320	9
52	9,7678242	9,9086901	9,8591341	10,1408659	8
53	9,7679989	9,9085988	9,8594002	10,1405998	7
54	9,7681735	9,9085073	9,8596661	10,1403339	6
55	9,7683480	9,9084159	9,8599321	10,1400679	5
56	9,7685223	9,9083243	9,8601980	10,1398020	4
57	9,7686966	9,9082327	9,8604638	10,1395362	3
58	9,7688707	9,9081411	9,8607296	10,1392704	2
59	9,7690448	9,9080494	9,8609954	10,1390046	1
60	9,7692187	9,9079576	9,8612610	10,1387390	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

54 Degrees

36 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,7692187	9,9079576	9,8612610	10,1387390	60
1	9,7693925	9,9078658	9,8615267	10,1384733	59
2	9,7695662	9,9077740	9,8617923	10,1382077	58
3	9,7697398	9,9076820	9,8620578	10,1379422	57
4	9,7699134	9,9075901	9,8623233	10,1376767	56
5	9,7700868	9,9074980	9,8625887	10,1374113	55
6	9,7702601	9,9074059	9,8628541	10,1371459	54
7	9,7704332	9,9073138	9,8631195	10,1368805	53
8	9,7706063	9,9072216	9,8633848	10,1366152	52
9	9,7707793	9,9071293	9,8636500	10,1363500	51
10	9,7709522	9,9070370	9,8639152	10,1360848	50
11	9,7711249	9,9069446	9,8641803	10,1358197	49
12	9,7712976	9,9068522	9,8644454	10,1355546	48
13	9,7714702	9,9067597	9,8647105	10,1352895	47
14	9,7716426	9,9066671	9,8649755	10,1350245	46
15	9,7718150	9,9065745	9,8652404	10,1347596	45
16	9,7719872	9,9064819	9,8655053	10,1344947	44
17	9,7721593	9,9063892	9,8657702	10,1342298	43
18	9,7723314	9,9062964	9,8660350	10,1339650	42
19	9,7725033	9,9062036	9,8662997	10,1337003	41
20	9,7726751	9,9061107	9,8665644	10,1334356	40
21	9,7728468	9,9060177	9,8668291	10,1331709	39
22	9,7730185	9,9059247	9,8670937	10,1329063	38
23	9,7731900	9,9058317	9,8673583	10,1326417	37
24	9,7733614	9,9057386	9,8676228	10,1323772	36
25	9,7735327	9,9056454	9,8678873	10,1321127	35
26	9,7737039	9,9055522	9,8681517	10,1318483	34
27	9,7738749	9,9054589	9,8684160	10,1315840	33
28	9,7740459	9,9053656	9,8686804	10,1313196	32
29	9,7742168	9,9052722	9,8689446	10,1310554	31
30	9,7743876	9,9051787	9,8692089	10,1307911	30
31	9,7745583	9,9050852	9,8694731	10,1305269	29
32	9,7747288	9,9049916	9,8697372	10,1302628	28
33	9,7748993	9,9048980	9,8700013	10,1299987	27
34	9,7750697	9,9048043	9,8702653	10,1297347	26
35	9,7752399	9,9047106	9,8705293	10,1294707	25
36	9,7754101	9,9046168	9,8707933	10,1292067	24
37	9,7755801	9,9045230	9,8710572	10,1289428	23
38	9,7757501	9,9044291	9,8713210	10,1286790	22
39	9,7759199	9,9043351	9,8715848	10,1284152	21
40	9,7760897	9,9042411	9,8718486	10,1281514	20
41	9,7762593	9,9041470	9,8721123	10,1278877	19
42	9,7764289	9,9040529	9,8723760	10,1276240	18
43	9,7765983	9,9039587	9,8726396	10,1273604	17
44	9,7767676	9,9038644	9,8729032	10,1270968	16
45	9,7769369	9,9037701	9,8731668	10,1268332	15
46	9,7771060	9,9036757	9,8734302	10,1265698	14
47	9,7772750	9,9035813	9,8736937	10,1263063	13
48	9,7774439	9,9034868	9,8739571	10,1260429	12
49	9,7776128	9,9033923	9,8742204	10,1257796	11
50	9,7777815	9,9032977	9,8744838	10,1255162	10
51	9,7779501	9,9032031	9,8747470	10,1252530	9
52	9,7781186	9,9031084	9,8750102	10,1249898	8
53	9,7782870	9,9030136	9,8752734	10,1247266	7
54	9,7784553	9,9029188	9,8755365	10,1244635	6
55	9,7786235	9,9028239	9,8757996	10,1242004	5
56	9,7787916	9,9027289	9,8760627	10,1239373	4
57	9,7789596	9,9026339	9,8763257	10,1236743	3
58	9,7791275	9,9025389	9,8765886	10,1234114	2
59	9,7792953	9,9024438	9,8768515	10,1231485	1
60	9,7794630	9,9023486	9,8771144	10,1228856	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

53 Degrees

37 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,7794630	9,9023486	9,8771144	10,1228856	60
1	9,7796306	9,9022534	9,8773772	10,1226228	59
2	9,7797981	9,9021581	9,8776400	10,1223600	58
3	9,7799655	9,9020628	9,8779027	10,1220973	57
4	9,7801328	9,9019674	9,8781654	10,1218346	56
5	9,7803000	9,9018719	9,8784281	10,1215719	55
6	9,7804671	9,9017764	9,8786907	10,1213093	54
7	9,7806341	9,9016808	9,8789533	10,1210467	53
8	9,7808010	9,9015852	9,8792158	10,1207842	52
9	9,7809677	9,9014895	9,8794782	10,1205218	51
10	9,7811344	9,9013938	9,8797407	10,1202593	50
11	9,7813010	9,9012980	9,8800031	10,1199969	49
12	9,7814675	9,9012021	9,8802654	10,1197346	48
13	9,7816339	9,9011062	9,8805277	10,1194723	47
14	9,7818002	9,9010102	9,8807900	10,1192100	46
15	9,7819664	9,9009142	9,8810522	10,1189478	45
16	9,7821324	9,9008181	9,8813144	10,1186856	44
17	9,7822984	9,9007219	9,8815765	10,1184235	43
18	9,7824643	9,9006257	9,8818386	10,1181614	42
19	9,7826301	9,9005294	9,8821007	10,1178993	41
20	9,7827958	9,9004331	9,8823627	10,1176373	40
21	9,7829614	9,9003367	9,8826246	10,1173754	39
22	9,7831268	9,9002403	9,8828866	10,1171134	38
23	9,7832922	9,9001438	9,8831484	10,1168516	37
24	9,7834575	9,9000472	9,8834103	10,1165897	36
25	9,7836227	9,8999506	9,8836721	10,1163279	35
26	9,7837878	9,8998539	9,8839338	10,1160662	34
27	9,7839528	9,8997572	9,8841956	10,1158044	33
28	9,7841177	9,8996604	9,8844572	10,1155428	32
29	9,7842824	9,8995636	9,8847189	10,1152811	31
30	9,7844471	9,8994667	9,8849805	10,1150195	30
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

52 Degrees

37 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
30	9,7844471	9,8994667	9,8849805	10,1150195	30
31	9,7846117	9,8993697	9,8852420	10,1147580	29
32	9,7847762	9,8992727	9,8855035	10,1144965	28
33	9,7849406	9,8991756	9,8857650	10,1142350	27
34	9,7851049	9,8990784	9,8860264	10,1139736	26
35	9,7852691	9,8989812	9,8862878	10,1137122	25
36	9,7854332	9,8988840	9,8865492	10,1134508	24
37	9,7855972	9,8987867	9,8868105	10,1131895	23
38	9,7857611	9,8986893	9,8870718	10,1129282	22
39	9,7859249	9,8985919	9,8873330	10,1126670	21
40	9,7860886	9,8984944	9,8875942	10,1124058	20
41	9,7862522	9,8983968	9,8878554	10,1121446	19
42	9,7864157	9,8982992	9,8881165	10,1118835	18
43	9,7865791	9,8982015	9,8883775	10,1116225	17
44	9,7867424	9,8981038	9,8886386	10,1113614	16
45	9,7869056	9,8980060	9,8888996	10,1111004	15
46	9,7870687	9,8979082	9,8891605	10,1108395	14
47	9,7872317	9,8978103	9,8894214	10,1105786	13
48	9,7873946	9,8977123	9,8896823	10,1103177	12
49	9,7875574	9,8976143	9,8899432	10,1100568	11
50	9,7877202	9,8975162	9,8902040	10,1097960	10
51	9,7878828	9,8974181	9,8904647	10,1095353	9
52	9,7880453	9,8973199	9,8907254	10,1092746	8
53	9,7882077	9,8972216	9,8909861	10,1090139	7
54	9,7883701	9,8971233	9,8912468	10,1087532	6
55	9,7885323	9,8970249	9,8915074	10,1084926	5
56	9,7886944	9,8969265	9,8917679	10,1082321	4
57	9,7888565	9,8968280	9,8920285	10,1079715	3
58	9,7890184	9,8967294	9,8922890	10,1077110	2
59	9,7891802	9,8966308	9,8925494	10,1074506	1
60	9,7893420	9,8965321	9,8928098	10,1071902	0
	Sine Comp.	Sine	Tang.Comp.	Tang.	Min.

52 Degrees

38 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9.7893420	9.8965321	9.8928098	10.1071902	60
1	9.7895036	9.8964334	9.8930702	10.1069298	59
2	9.7896652	9.8963346	9.8933306	10.1066694	58
3	9.7898266	9.8962358	9.8935909	10.1064091	57
4	9.7899880	9.8961369	9.8938511	10.1061489	56
5	9.7901493	9.8960379	9.8941114	10.1058886	55
6	9.7903104	9.8959389	9.8943715	10.1056285	54
7	9.7904715	9.8958398	9.8946317	10.1053683	53
8	9.7906325	9.8957406	9.8948918	10.1051082	52
9	9.7907933	9.8956414	9.8951519	10.1048481	51
10	9.7909541	9.8955422	9.8954119	10.1045881	50
11	9.7911148	9.8954429	9.8956719	10.1043281	49
12	9.7912754	9.8953435	9.8959319	10.1040681	48
13	9.7914359	9.8952440	9.8961918	10.1038082	47
14	9.7915963	9.8951445	9.8964517	10.1035483	46
15	9.7917566	9.8950450	9.8967116	10.1032884	45
16	9.7919168	9.8949453	9.8969714	10.1030286	44
17	9.7920769	9.8948457	9.8972312	10.1027688	43
18	9.7922369	9.8947459	9.8974910	10.1025090	42
19	9.7923968	9.8946461	9.8977507	10.1022493	41
20	9.7925566	9.8945463	9.8980104	10.1019896	40
21	9.7927163	9.8944463	9.8982700	10.1017300	39
22	9.7928760	9.8943464	9.8985296	10.1014704	38
23	9.7930355	9.8942463	9.8987892	10.1012108	37
24	9.7931949	9.8941462	9.8990487	10.1009513	36
25	9.7933543	9.8940461	9.8993082	10.1006918	35
26	9.7935135	9.8939458	9.8995677	10.1004323	34
27	9.7936727	9.8938456	9.8998271	10.1001729	33
28	9.7938317	9.8937452	9.9000865	10.0999135	32
29	9.7939907	9.8936448	9.9003459	10.0996541	31
30	9.7941496	9.8935444	9.9006052	10.0993948	30
31	9.7943083	9.8934439	9.9008645	10.0991355	29
32	9.7944670	9.8933433	9.9011237	10.0988763	28
33	9.7946256	9.8932426	9.9013830	10.0986170	27
34	9.7947841	9.8931419	9.9016422	10.0983578	26
35	9.7949425	9.8930412	9.9019013	10.0980987	25
36	9.7951008	9.8929404	9.9021604	10.0978396	24
37	9.7952590	9.8928395	9.9024195	10.0975805	23
38	9.7954171	9.8927385	9.9026786	10.0973214	22
39	9.7955751	9.8926375	9.9029376	10.0970624	21
40	9.7957330	9.8925365	9.9031966	10.0968034	20
41	9.7958909	9.8924354	9.9034555	10.0965445	19
42	9.7960486	9.8923342	9.9037144	10.0962856	18
43	9.7962062	9.8922329	9.9039733	10.0960267	17
44	9.7963638	9.8921316	9.9042321	10.0957679	16
45	9.7965212	9.8920303	9.9044910	10.0955090	15
46	9.7966786	9.8919289	9.9047497	10.0952503	14
47	9.7968359	9.8918274	9.9050085	10.0949915	13
48	9.7969930	9.8917258	9.9052672	10.0947328	12
49	9.7971501	9.8916242	9.9055259	10.0944741	11
50	9.7973071	9.8915226	9.9057845	10.0042155	10
51	9.7974640	9.8914208	9.9060431	10.0939569	9
52	9.7976208	9.8913191	9.9063017	10.0936983	8
53	9.7977775	9.8912172	9.9065603	10.0934397	7
54	9.7979341	9.8911153	9.9068188	10.0931812	6
55	9.7980906	9.8910133	9.9070773	10.0929227	5
56	9.7982470	9.8909113	9.9073357	10.0926643	4
57	9.7984034	9.8908092	9.9075941	10.0924059	3
58	9.7985596	9.8907071	9.9078525	10.0921475	2
59	9.7987158	9.8906049	9.9081109	10.0918891	1
60	9.7988718	9.8905026	9.9083692	10.0916308	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.

51 Degrees

39 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9.7988718	9.8905026	9.9083692	10.0916308	60
1	9.7990278	9.8904003	9.9086275	10.0913725	59
2	9.7991836	9.8902979	9.9088858	10.0911142	58
3	9.7993394	9.8901954	9.9091440	10.0908560	57
4	9.7994951	9.8900929	9.9094022	10.0905978	56
5	9.7996507	9.8899903	9.9096603	10.0903397	55
6	9.7998062	9.8898877	9.9099185	10.0900815	54
7	9.7999616	9.8897850	9.9101766	10.0898234	53
8	9.8001169	9.8896822	9.9104347	10.0895653	52
9	9.8002721	9.8895794	9.9106927	10.0893073	51
10	9.8004272	9,8894765	9.9109507	10.0890493	50
11	9.8005823	9.8893736	9.9112087	10.0887913	49
12	9.8007372	9.8892706	9.9114666	10.0885334	48
13	9.8008921	9.8891675	9.9117245	10.0882755	47
14	9.8010468	9.8890644	9,9119824	10.0880176	46
15	9.8012015	9.8889612	9.9122403	10.0877597	45
16	9.8013561	9.8888580	9.9124981	10.0875019	44
17	9.8015106	9.8887547	9.9127559	10.0872441	43
18	9.8016649	9.8886513	9.9130137	10.0869863	42
19	9.8018192	9.8885479	9,9132714	10.0867286	41
20	9.8019735	9.8884444	9.9135291	10.0864709	40
21	9.8021276	9.8883408	9.9137868	10.0862132	39
22	9.8022816	9.8882372	9.9140444	10.0859556	38
23	9.8024355	9.8881335	9.9143020	10.0856980	37
24	9.8025894	9.8880298	9.9145596	10.0854404	36
25	9.8027431	9.8879260	9.9148171	10.0851829	35
26	9.8028968	9.8878221	9.9150747	10.0849253	34
27	9.8030504	9.8877182	9.9153322	10.0846678	33
28	9.8032038	9.8876142	9.9155896	10.0844104	32
29	9.8033572	9.8875102	9.9158471	10.0841529	31
30	9.8035105	9.8874061	9.9161045	10.0838955	30
31	9.8036637	9.8873019	9.9163618	10.0836382	29
32	9.8038168	9.8871977	9.9166192	10.0833808	28
33	9.8039699	9.8870934	9.9168765	10.0831235	27
34	9.8041228	9.8869890	9.9171338	10.0828662	26
35	9.8042757	9.8868846	9.9173911	10.0826089	25
36	9.8044284	9.8867801	9.9176483	10.0823517	24
37	9.8045811	9.8866756	9.9179055	10.0820945	23
38	9.8047336	9.8865710	9.9181627	10.0818373	22
39	9.8048861	9.8864663	9.9184198	10.0815802	21
40	9.8050385	9.8863616	9.9186769	10.0813231	20
41	9.8051908	9.8862568	9.9189340	10.0810660	19
42	9.8053430	9.8861519	9.9191911	10.0808089	18
43	9.8054951	9.8860470	9.9194481	10.0805519	17
44	9.8056472	9.8859420	9.9197051	10.0802949	16
45	9.8057991	9.8858370	9.9199621	10.0800379	15
46	9.8059510	9.8857319	9.9202191	10.0797809	14
47	9.8061027	9.8856267	9.9204760	10.0795240	13
48	9.8062544	9.8855215	9.9207329	10.0792671	12
49	9.8064060	9.8854162	9.9209898	10.0790102	11
50	9.8065575	9.8853109	9.9212466	10.0787534	10
51	9.8067089	9.8852055	9.9215034	10.0784966	9
52	9.8068602	9.8851000	9.9217602	10.0782398	8
53	9.8070114	9.8849945	9.9220170	19.0779830	7
54	9.8071626	9.8848889	9.9222737	10.0777263	6
55	9.8073136	9.8847832	9.9225304	10.0774696	5
56	9.8074646	9.8846775	9.9227871	10.0772129	4
57	9.8076154	9.8845717	9.9230437	10,0769563	3
58	9.8077662	9.8844659	9.9233004	10.0766996	2
59	9.8079169	9.8843599	9.9235570	10.0764430	1
60	9.8080675	9.8842540	9.9238135	10.0761865	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.

50 Degrees

40 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9.8080675	9.8842540	9.9238135	10.0761805	60
1	9.8082180	9.8841479	9.9240701	10.0759299	59
2	9.8083684	9.8840418	9.9243266	10.0756734	58
3	9.8085188	9.8839357	9.9245831	10.0754169	57
4	9.8086690	9.8838294	9.9248396	10.0751604	56
5	9.8088192	9.8837232	9.9250960	10.0749040	55
6	9.8089692	9.8836168	9.9253524	10.0746476	54
7	9.8091192	9.8835104	9.9256088	10.0743912	53
8	9.8092691	9.8834039	9.9258652	10,0741348	52
9	9.8094189	9.8832974	9.9261215	10.0738785	51
10	9.8095686	9.8831908	9.9263778	10.0736222	50
11	9.8097182	9.8830841	9.9266341	10.0733659	49
12	9.8098678	9.8829774	9.9268904	10.0731096	48
13	9.8100172	9.8828706	9.9271466	10.0728534	47
14	9.8101666	9.8827638	9.9274028	10.0725972	46
15	9.8103159	9.8826568	9.9276590	10.0723410	45
16	9.8104650	9.8825499	9.9279152	10.0720848	44
17	9.8106141	9.8824428	9.9281713	10.0718287	34
18	9.8107631	9.8823357	9.9284274	10.0715720	42
19	9.8109121	9.8822285	9.9286835	10.0713165	41
20	9.8110609	9.8821213	9,9289396	10.0710604	40
21	9.8112096	9.8820140	9.9291956	10.0708044	39
22	9.8113583	9.8819067	9.9294516	10.0705484	38
23	9.8115069	9.8817992	9.9297076	10.0702924	37
24	9.8116554	9.8816918	9.9299636	10.0700364	36
25	9.8118038	9.8815842	9.9302195	10.0697805	35
26	9.8119521	6.8814766	9.9304755	10.0695245	34
27	9.8121003	9.8813689	9.9307314	10.0692686	33
28	9.1122484	9.8812612	9.9309872	10.0690128	32
29	9.8123965	9.8811534	9.9312431	10.0687569	31
30	9.8125444	9.8810455	9.9314989	10.0685011	30
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.

49 Degrees

40 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
30	9.8125444	9.8810455	9.9314989	10.0685011	30
31	9.8126923	9.8809376	9.9317547	10.0682453	29
32	9.8128401	9.8808296	9.9320105	10.0679895	28
33	9.8129878	9.8807215	9.9322662	10.0677338	27
34	9.8131354	9.8806134	9.9325220	10.0674780	26
35	9.8132829	9.8805052	9.9327777	10.0672223	25
36	9.8134303	9 8803970	9.9330334	10.0669666	24
37	9.8135777	9.8802887	9.9333890	10.0667110	23
38	9.8137250	9.8801803	9.9335446	10.0664554	22
39	9.8138721	9.8800719	9.9338003	10.0661997	21
40	9.8140192	9.8799634	9.9340559	10.0659441	20
41	9.8141662	9.8798548	9.9343114	10.0656886	19
42	9.8143131	9.8797462	9.9345670	10.0654330	18
43	9.8144600	9.8796375	9.9348225	10.0651775	17
44	9.8146067	9.8795287	9.9350780	10.0649220	16
45	9.8147534	9.8794199	9.9353335	10.0646665	15
46	9,8148999	9.8793110	9.9355889	10.0644111	14
47	9.8150464	9.8792021	9.9358444	10.0641556	13
48	9.8151928	9.8790930	9.9360998	10.0639002	12
49	9.8153391	9.8789840	9.9363552	10.0636448	11
50	9.8154854	9.8788748	9.9366105	10.0633895	10
51	9.8156315	9.8787656	9.9368659	10.0631341	9
52	9.8157776	9.8786563	9.9371212	10.0628788	8
53	9.8159235	9.8785470	9.9373765	10.0626235	7
54	9.8160694	9.8784376	9.9376318	10.0623682	6
55	9.8162152	9.8783281	9.9378871	10.0621129	5
56	9.8163609	9.8782186	9.9381423	10.0618577	4
57	9.8165066	9.8781090	9.9383975	10.0616025	3
58	9.8166521	9 8779994	9.9386527	10.0613473	2
59	9.8167975	9.8778896	9.9389079	10.0610921	1
60	9.8169429	9.8777799	9.9391631	10.0608369	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.

49 Degrees

41 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,8169429	9,8777799	9,9391631	10,0608369	60
1	9,8170882	9,8776700	9,9394182	10,0605818	59
2	9,8172334	9,8775601	9,9396733	10,0603267	58
3	9,8173785	9,8774501	9,9399284	10,0600716	57
4	9,8175235	9,8773401	9,9401835	10,0598165	56
5	9,8176685	9,8772300	9,9404385	10,0595615	55
6	9,8178133	9,8771198	9,9406936	10,0593064	54
7	9,8179581	9,8770096	9,9409486	10,0590514	53
8	9,8181028	9,8768993	9,9412036	10,0587964	52
9	9,8182474	9,8767889	9,9414585	10,0585415	51
10	9,8183919	9,8766785	9,9417135	10,0582865	50
11	9,8185364	9,8765680	9,9419684	10,0580316	49
12	9,8186807	9,8764574	9,9422233	10,0577767	48
13	9,8188250	9,8763468	9,9424782	10,0575218	47
14	9,8189692	9,8762361	9,9427331	10,0572669	46
15	9,8191133	9,8761253	9,9429879	10,0570121	45
16	9,8192573	9,8760145	9,9432428	10,0567572	44
17	9,8194012	9,8759036	9,9434976	10,0565024	43
18	9,8195450	9,8757927	9,9437524	10,0562476	42
19	9,8196888	9,8756816	9,9440072	10,0559928	41
20	9,8198325	9,8755706	9,9442619	10,0557381	40
21	9,8199761	9,8754594	9,9445166	10,0554834	39
22	9,8201196	9,8753482	9,9447714	10,0552286	38
23	9,8202630	9,8752369	9,9450261	10,0549739	37
24	9,8204063	9,8751256	9,9452807	10,0547193	36
25	9,8205496	9,8750142	9,9455354	10,0544646	35
26	9,8206927	9,8749027	9,9457900	10,0542100	34
27	9,8208358	9,8747912	9,9460447	10,0539553	33
28	9,8209788	9,8746795	9,9462993	10,0537007	32
29	9,8211217	9,8745679	9,9465539	10,0534461	31
30	9,8212646	9,8744561	9,9468084	10,0531916	30
31	9,8214073	9,8743443	9,9470630	10,0529370	29
32	9,8215500	9,8742325	9,9473175	10,0526825	28
33	9,8216926	9,8741205	9,9475720	10,0524280	27
34	9,8218351	9,8740085	9,9478265	10,0521735	26
35	9,8219775	9,8738965	9,9480810	10,0519190	25
36	9,8221198	9,8737844	9,9783355	10,0516645	24
37	9,8222621	9,8763722	9,9485899	10,0514101	23
38	9,8224042	9,8735599	9,9488443	10,0511557	22
39	9,8225463	9,8734476	9,9490987	10,0509013	21
40	9,8226883	9,8733352	9,9493531	10,0506469	20
41	9,8228302	9,8732227	9,9496075	10,0503925	19
42	9,8229721	9,8731102	9,9498619	10,0501381	18
43	9,8231138	9,8729976	9,9501162	10,0498838	17
44	9,8232555	9,8728849	9,9503705	10,0496295	16
45	9,8233971	9,8727722	9,9506248	10,0493752	15
46	9,8235386	9,8726594	9,9508791	10,0491209	14
47	9,8236800	9,8725466	9,9511334	10,0488666	13
48	9,8238213	9,8724337	9,9513876	10,0486124	12
49	9,8239626	9,8723207	9,9516419	10,0483581	11
50	9,8241037	9,8722076	9,9518961	10,0481039	10
51	9,8242448	9,8720945	9,9521503	10,0478497	9
52	9,8243858	9,8719813	9,9524045	10,0475955	8
53	9,8245267	9,8718681	9,9526587	10,0473413	7
54	9,8246676	9,8717548	9,9529128	10,0470872	6
55	9,8248083	9,8716414	9,9531670	10,0468330	5
56	9,8249490	9,8715279	9,9534211	10,0465789	4
57	9,8250896	9,8714144	9,9536752	10,0463248	3
58	9,8252301	9,8713008	9,9539293	10,0460707	2
59	9,8253705	9,8711872	9,9541834	10,0458166	1
60	9,8255109	9,8710735	9,9544374	10,0455626	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.

48 Degrees

42 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,8255109	9,8710735	9,9544374	10,0455626	60
1	9,8256512	9,8709597	9,9546915	10,0453085	59
2	9,8257913	9,8708458	9,9549455	10,0450545	58
3	9,8259314	9,8707319	9,9551995	10,0448005	57
4	9,8260715	9,8706179	9,9554535	10,0445465	56
5	9,8262114	6,8705039	9,9557075	10,0442925	55
6	9,8263512	9,8703898	9,9559615	10,0440385	54
7	9,8264910	9,8702756	9,9562154	10,0437846	53
8	9,8266307	9,8701613	9,9564964	10,0435306	52
9	9,8267703	9,8700470	9,9567233	10,0432767	51
10	9,8269098	9,8699326	9,9569772	10,0430228	50
11	9,8270493	9,8698182	9,9572311	10,0427689	49
12	9,8271887	9,8697037	9,9574850	10,0425150	48
13	9,8273279	9,8695891	9,9577389	10,0422611	47
14	9,8274671	9,8694744	9,9579927	10,0420073	46
15	9,8276063	9,8693597	9,9582465	10,0417535	45
16	9,8277453	9,8692449	9,9585004	10,0414996	44
17	9,8278843	9,8691301	9,9587542	10,0412458	43
18	9,8280231	9,8690152	9,9590080	10,0409920	42
19	9,8281619	9,8689002	9,9592618	10,0407382	41
20	9,8283006	9,8687851	9,9595155	10,0404845	40
21	9,8284393	9,8686700	9,9597693	10,0402307	39
22	9,8285778	9,8685548	9,9600230	10,0399770	38
23	9,8287163	9,8684396	9,9602767	10,0397233	37
24	9,8288547	9,8683242	9,9605305	10,0394695	36
25	9,8289930	9,8682088	9,9607842	10,0392158	35
26	9,8291312	9,8680934	9,9610378	10,0389622	34
27	9,8292694	9,8679779	6,9612915	10,0387085	33
28	9,8294075	9,8678623	9,9615452	10,0384548	32
29	9,8295454	9,8677466	9,9617988	10,0382012	31
30	9,8296833	9,8676309	9,9620525	10,0379475	30
31	9,8298212	9,8675151	9,9623061	10,0376939	29
32	9,8299589	9,8673992	9,9625597	10,0374403	28
33	9,8300966	9,8672833	9,9628133	10,0371867	27
34	9,8302342	9,8671673	9,9630669	10,0369331	26
35	9,8303717	9,8670512	9,9633204	10,0366796	25
36	9,8305091	9,8669351	9,9635740	10,0364260	24
37	9,8306464	9,8668189	9,9638275	10,0361725	23
38	9,8307837	9,8667026	9,9640811	10,0359189	22
39	9,8309209	9,8665863	9,9643346	10,0356654	21
40	9,8310580	9,8664699	9,9645881	10,0354119	20
41	9,8311950	9,8663534	9,9648416	10,0351584	19
42	9,8313320	9,8662369	9,9650951	10,0349049	18
43	9,8314688	9,8661203	9,9653486	10,0346514	17
44	9,8316056	9,8660036	9,9656020	10,0343980	16
45	9,8317423	9,8658868	9,9658555	10,0341445	15
46	9,8318789	9,8657700	9,9661089	10,0338911	14
47	9,8320155	9,8656531	9,9663623	10,0336377	13
48	9,8321519	9,8655362	9,9666157	10,0333843	12
49	9,8322883	9,8654192	9,9668692	10,0331308	11
50	9,8324246	9,8653021	9,9671225	10,0328775	10
51	9,8325609	9,8651849	9,9673759	10,0326241	9
52	9,8326970	9,8650677	9,9676293	10,0323707	8
53	9,8328331	9,8649504	9,9678827	10,0321173	7
54	9,8329691	9,8648331	9,9681360	10,0318640	6
55	9,8331050	9,8647156	9,9683893	10,0316107	5
56	9,8332408	9,8645981	9,9686427	10,0313573	4
57	9,8333766	9,8644806	9,9688960	10,0311040	3
58	9,8335122	9,8643629	9,9691493	10,0308507	2
59	9,8336478	9,8642452	9,9694026	10,0305974	1
60	9,8337833	9,8641275	9,9696559	10,0303441	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.

47 Degrees

43 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
0	9,8337833	9,8641275	9,9696559	10,0303441	60
1	9,8339188	9,8640096	9,9699091	10,0300909	59
2	9,8340541	9,8638917	9,9701624	10,0298376	58
3	9,8341894	9,8637737	9,9704157	10,0295843	57
4	9,8343246	9,8636557	9,9706689	10,0293311	56
5	9,8344597	9,8635376	9,9709221	10,0290779	55
6	9,8345948	9,8634194	9,9711754	10,0288246	54
7	9,8347297	9,8633011	9,9714286	10,0285714	53
8	9,8348646	9,8631828	9,9716818	10,0283182	52
9	9,8349994	9,8630644	9,9719350	10,0280650	51
10	9,8351341	9,8629460	9,9721882	10,0278118	50
11	9,8352688	9,8628274	9,9724413	10,0275587	49
12	9,8354033	9,8627088	9,9726945	10,0273055	48
13	9,8355378	9,8625902	9,9729477	10,0270523	47
14	9,8356722	9,8624714	9,9732008	10,0267992	46
15	9,8358066	9,8623526	9,9734539	10,0265461	45
16	9,8359408	9,8622338	9,9737071	10,0262929	44
17	9,8360750	9,8621148	9,9739602	10,0620398	43
18	9,8362091	9,8619958	9,9742133	10,0257867	42
19	9,8363431	9,8618767	9,9744664	10,0255336	41
20	9,8364771	9,8617576	9,9747195	10,0252805	40
21	9,8366109	9,8616383	9,9749726	10,0250274	39
22	9,8367447	9,8615190	9,9752257	10,0247743	38
23	9,8368784	9,8613997	9,9754787	10,0245213	37
24	9,8370121	9,8612803	9,9757318	10,0242682	36
25	9,8371456	9,8611608	9,9759849	10,0240151	35
26	9,8372791	9,8610412	9,9762379	10,0237621	34
27	9,8374125	9,8609215	9,9764909	10,0235091	33
28	9,8375458	9,8608018	9,9767440	10,0232560	32
29	9,8376790	9,8606821	9,9769970	10,0230030	31
30	9,8378122	9,8605622	9,9772500	10,0227500	30
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min

46 Degrees

43 Degrees

Min.	Sine	Sine Comp.	Tang.	Tang. Comp.	
30	9,8378122	9,8605622	9,9772500	10,0227500	30
31	9,8379453	9,8604423	9,9775030	10,0224970	29
32	9,8380783	9,8603223	9,9777560	10,0222440	28
33	9,8382112	9,8602022	9,9780090	10,0219910	27
34	9,8383441	9,8600821	9,9782620	10,0217380	26
35	9,8384769	9,8599619	9,9785149	10,0214851	25
36	9,8386096	9,8598416	9,9787679	10,0212321	24
37	9,8387422	9,8597213	9,9790209	10,0209791	23
38	9,8388747	9,8596009	9,9792738	10,0207262	22
39	9,8390072	9,8594804	9,9795268	10,0204732	21
40	9,8391396	9,8593599	9,9797797	10,0202203	20
41	9,8392719	9,8592393	9,9800326	10,0199674	19
42	9,8394041	9,8591186	9,9802856	10,0197144	18
43	9,8395363	9,8589978	9,9805385	10,0194615	17
44	9,8596684	9,8588770	9,9807914	10,0192086	16
45	9,8398004	9,8587561	9,9810443	10,0189557	15
46	9,8399323	9,8586351	9,9812972	10,0187028	14
47	9,8400642	9,8585141	9,9815501	10,0184499	13
48	9,8401959	9,8583929	9,9818030	10,0181970	12
49	9,8403276	9,8582718	9,9820559	10,0179441	11
50	9,8404593	9,8581505	9,9823087	10,0176913	10
51	9,8405908	9,8580292	9,9825616	10,0174384	9
52	9,8407223	9,8579078	9,9828145	10,0171855	8
53	9,8408537	9,8577863	9,9830673	10,0169327	7
54	9,8409850	9,8576648	9,9833202	10,0166798	6
55	9,8411162	9,8575432	9,9835730	10,0164270	5
56	9,8412474	9,8574215	9,9838259	10,0161741	4
57	9,8413785	9,8572998	9,9840787	10,0159213	3
58	9,8415095	9,8571779	9,9843315	10,0156685	2
59	9,8416404	9,8570561	9,9845844	10,0154156	1
60	9,8417713	9,8579341	9,9848372	10,0151628	0
	Sine Comp.	Sine	Tang. Comp.	Tang.	Min.

46 Degrees

Minut.	Sine	Sine Complem.	Tang.	Tangent Complem.	
	44 Degrees				
0	9,8417713	9,8569349	9,9848372	10,0151628	60
1	9,8419021	9,8568121	9,9850900	10,0149100	59
2	9,8420328	9,8566900	9,9853428	10,0146752	58
3	9,8421634	9,8565678	9,9855956	10,0144044	57
4	9,8422939	9,8564455	9,9858484	10,0141516	56
5	9,8424244	9,8563232	9,9861012	10,0138988	55
6	9,8425548	9,8562008	9,9863540	10,0136460	54
7	9,8426851	9,8560784	9,9866068	10,0133932	53
8	9,8428154	9,8559558	9,9868596	10,0131404	52
9	9,8429456	9,8558332	9,9871123	10,0128877	51
10	9,8430757	9,8557106	9,9873651	10,0126349	50
11	9,8432057	9,8555878	9,9876179	10,0123821	49
12	9,8433356	9,8554650	9,9878706	10,0121294	48
13	9,8434655	9,8553421	9,9881234	10,0118766	47
14	9,8435953	9,8552192	9,9883761	10,0116239	46
15	9,8437250	9,8550961	9,9886289	10,0113711	45
16	9,8438547	9,8549730	9,9888816	10,0111184	44
17	9,8439842	9,8548499	9,9891344	10,0108656	43
18	9,8441137	9,8547266	9,9893871	10,0106129	42
19	9,8442423	9,8546033	9,9896399	10,0103601	41
20	9,8443725	9,8544799	9,9898926	10,0101074	40
21	9,8445018	9,8543564	9,9901453	10,0098547	39
22	9,8446310	9,8542329	9,9903981	10,0096019	38
23	9,8447601	9,8541093	9,9906508	10,0093492	37
24	9,8448891	9,8539856	9,9909035	10,0090965	36
25	9,8450181	9,8538619	9,9911562	10,0088438	35
26	9,8451470	9,8537381	9,9914089	10,0085911	34
27	9,8452758	9,8536142	9,9916616	10,0083384	33
28	9,8454045	9,8534902	9,9919143	10,0080857	32
29	9,8455332	9,8533662	9,9921670	10,0078330	31
30	9,8456618	9,8532421	9,9924197	10,0075803	30
	Sine Complem.	Sine	Tangent Complem.	Tang.	Minut.
	45 Degrees				

Minut.	Sine	Sine Complem.	Tang.	Tangent Complem.	
	44 Degrees				
30	9,8456618	9,8532421	9,9924197	10,0075803	30
31	9,8457903	9,8531179	9,9926724	10,0073276	29
32	9,8459188	9,8529936	9,9929251	10,0070749	28
33	9,8460471	9,8528693	9,9931778	10,0068222	27
34	9,8461754	9,8527449	9,9934305	10,0065695	26
35	9,8463036	9,8526204	9,9936832	10,0063168	25
36	9,8464318	9,8524959	9,9939359	10,0060641	24
37	9,8465599	9,8523713	9,9941886	10,0058114	23
38	9,8466879	9,8522466	9,9944413	10,0055587	22
39	9,8468158	9,8521218	9,9946940	10,0053060	21
40	9,8469436	9,8519970	9,9949466	10,0050534	20
41	9,8470714	9,8518721	9,9951993	10,0048007	19
42	9,8471991	9,8517471	9,9954520	10,0045480	18
43	9,8473267	9,8516220	9,9957047	10,0042953	17
44	9,8474543	9,8514969	9,9959573	10,0040427	16
45	9,8475817	9,8513717	9,9962100	19,0037900	15
46	9,8477091	9,8512465	9,9964627	10,0035373	14
47	9,8478365	9,8511211	9,9967154	10,0032846	13
48	9,8479637	9,8509957	9,9969680	10,0030320	12
49	9,8480909	9,8508702	9,9972207	10,0025793	11
50	9,8482180	9,8507446	9,9974734	10,0022266	10
51	9,8483450	9,8506190	9,9977260	10,0022740	9
52	9,8484720	9,8504933	9,9979787	10,0020213	8
53	9,8485989	9,8503675	9,9982314	10,0017686	7
54	9,8487257	9,8502417	9,9984840	10,0015160	6
55	9,8488524	9,8501157	9,9987367	10,0012633	5
56	9,8489791	9,8499897	9,9989893	10,0010107	4
57	9,8491057	9,8498637	9,9992420	10,0007580	3
58	9,8492322	9,8497375	9,9994947	10,0005053	2
59	9,8493586	9,8496113	9,9997473	10,0002527	1
60	9,8494850	9,8494850	10,0000000	10,0000000	0
	Sine Complem.	Sine	Tangent Complem.	Tang.	Minut.
	45 Degrees				

SINE *of incidence*, in *Catoptrics* and *Dioptrics*, is used for the *sine* of the angle of INCIDENCE.

SINE *of reflection*, in *Catoptrics*, is used for the *sine* of the angle of REFLECTION.

SINE *of refraction*, in *Dioptrics*, is used for the *sine* of the angle of REFRACTION.

SINE *assensu capituli*, in *Law*, a writ that lies where a bishop, dean, prebendary, or master of an hospital, aliens the lands holden in right of his bishopric, deanery, house, &c. without the assent of the chapter or fraternity; in which case his successor shall have this writ.

SINE-CURES are ecclesiastical benefices, without cure of souls.

No church where there is but one incumbent can properly be a *sine-cure*: and, though the church being down, or the parish being become destitute of parishioners, the incumbent may be thereby necessarily acquitted from the actual performance of public duty, yet he is still under an obligation to do it, whenever a church shall be built, and there are a competent number of inhabitants; and, in the mean while, if the church be presentative, as most such churches are, the incumbent is instituted into the cure of souls. Such benefices are rather depopulations than *sine-cures*; and it will be proper for the new incumbent to read the thirty-nine articles, and the liturgy, in the church yard, &c. and to do whatever other incumbents usually do.

But a rectory, or a portion of it, may properly be a *sine-cure*, if there be a vicar under the rector, endowed and charged with the cure; in which case it does not come within the statute of *pluralities*, 21 Hen. VIII. c. 13. Here, therefore, no dispensation is necessary to hold the *sine-cure* with a former living; nor need the incumbent read the articles, or divine service, as required by 13 Eliz. c 12. which extends only to a benefice with cure.

A *sine-cure* donative wants no institution and induction, but one presentative must have both, especially if it consist in glebe and tithes, and not in a portion of money; but the institution must not run *in curam animarum*, but *in rectoriam, sive portionem rectoriæ de* A B, &c.

By the above mentioned statute 21 Hen. VIII. not only prebends, and rectories with vicarages endowed, but deaneries, and archdeaconries, are declared to be benefices *without cure*.

SINE DIE, in *Law*; when judgment is given against the plaintiff, he is said to be *in misericordia pro falso clamore suo*; and for the defendant, it is said, *eat inde sine die*; i. e. he is dismissed the court.

The phrase is also used in parliament, for the adjournment of any debate, without fixing the day when it shall come on again; which is looked upon as a genteeler dismission of the thing in question.

SINEW properly denotes what we call a *nerve*; though, in common speech, it is rather used for a *tendon*.

SINEW, in the *Manege*; to *unsinew* a horse, called in French *enerver*, is to cut the two tendons on the side of the head, about five inches under the eyes; which two join in one at the tip, or the end of the nose, in order to perform its motion. This tendon at the tip of the nose is likewise cut. We *unsinew*, in order to dry the head, and make it smaller.

SINEW-*shrunk*, is said of a horse that is over-rid, and so worn down with fatigue, that he becomes gaunt-bellied, through a stiffness and contraction of the two *sinews* that are under his belly.

SINEW-*sprung*, is a violent attaint, or over-reach, in which a horse strikes the toe of his hinder feet against the *sinew* of the fore-legs.

SINF, in the *Materia Medica* of the ancients, a word used to express the same as *agalochum*, or lignum aloes.

SINGERS, in the *Jewish Antiquities*. See CHANTOR.

SINGING, the act of making divers inflexions of the voice, agreeable to the ear, and correspondent to the notes of a song, or piece of melody.

The Greek musicians, says Dr. Smith in his Harmonics, p. 3. note *c*, rightly describe the difference between the manner of *singing* and that of talking. They considered two motions in the voice; the one continued, and used in talking; the other discrete, and used in *singing*. In the continued motion, the voice never rests at any certain pitch, but waves up and down by insensible degrees; and in the discrete motion it does the contrary, frequently resting or staying at certain places, and leaping from one to another by sensible intervals. Euclid's Introductio Harmonica, p. 2. In the former case, the vibrations of the air are continually accelerated, and retarded by turns, and by very small degrees, and in the latter by large ones.

The first thing done, in learning to *sing*, is to raise a scale of notes, by tones and semitones, to an octave; and descend again by the same notes; and then to rise and fall by greater intervals, as a 3d, 4th, and 5th, and to do all this by notes of different pitch.

Then these notes are represented by lines and spaces, to which the syllables *fa*, *sol*, *la*, *mi*, are applied, and the pupil is taught to name each line and space thereby; whence this practice is usually called *sol-fa-ing*. The nature, reason, defects, &c. whereof, see under the article SOL-FA-ING.

For the history of *singing*, as a part of religious worship, see *Choral* SERVICE.

SINGING *of birds*. See SONG *of birds*.

SINGLE, among *Sportsmen*, the tail of any of the deer kind.

SINGLE *bond* or *obligation*, *simplex obligatio*, in *Law*, is a deed, whereby the obligor obliges himself, his heirs, executors, and administrators, to pay a certain sum of money to another at a day appointed. See OBLIGATION.

SINGLE *caft*, in *Hufbandry*, a term ufed by farmers for that fort of fowing, that difperfes the neceffary quantity of corn at one bout.

SINGLE, *echo*, *fine*, *pofition*, *propofition*, *rafters*, *tenaille*, and *voucher*, fee the fubftantives.

SINGLES. See PETTY *fingles*.

SINGULAR *number*, in *Grammar*, the firft manner of declining nouns, and conjugating verbs; ufed when we only fpeak of a fingle perfon or thing. See NUMBER.

SINGULAR *Hiftory*. See HISTORY.

SINGULAR *propofition*. See PROPOSITION.

SINGULATOR, among the Romans, a horfeman who rode with one horfe only.

SINGULTUS, in *Medicine*, a convulfive motion of the midriff, commonly called the HICKUP.

SINICAL *quadrant*. See QUADRANT.

SINISTER, fomething on, or towards the left hand.

Hence fome derive the word *finifter*, *a finendo*, becaufe the gods, by fuch auguries, permit us to proceed in our defigns.

SINISTER is alfo ufed among us for unlucky; though, in the facred rites of divination, the Romans ufed it in an oppofite fenfe. Thus *avis finiftra*, or a bird on the left hand, was efteemed a happy omen; whence, in the law of the Twelve Tables, *Ave finiftra populi magifter efto*.

SINISTER, in *Heraldry*. The *finifter* fide of an ESCUTCHEON, is the fide anfwering to the right hand of the perfon who looks at it.

SINISTER *chief* and *bafe*. See ESCUTCHEON.

SINISTER *bend*. See BEND.

SINISTER *afpect*, among *Aftrologers*, is an appearance of two planets, happening according to the fucceffion of the figns; as Saturn in Aries, and Mars in the fame degree of Gemini.

SINISTRI, a fect of ancient heretics, thus called, becaufe they held the left hand in abhorrence, and made it a point of religion not to receive any thing therewith.

What in us is a piece of civility, in them was a fuperftition. Balfamon obferves, that they were likewife called SABBATIANS and NOVATIANS.

SINKING *of the earth*. See ABSORPTIONS *of the earth*.

SINKING *fund*. See FUND.

SINKOO, in the *Materia Medica*, a name given by fome authors to the lignum aloes, or agallochum, ufed in medicine.

SINNET, aboard a *fhip*. See SENNIT.

SI NON OMNES, a writ on affociation of juftices, whereby, if all in commiffion cannot meet at the day affigned, it is permitted, that two or more of them may finifh the bufinefs.

SINOPER, or SINOPIS, in *Natural Hiftory*. See SINOPICA *terra*.

SINOPICA *terra*, in *Natural Hiftory*, the name of a red earth of the ochre-kind, called alfo *rubrica finopica*, and by fome authors *finopis*.

It is a very clofe, compact, and weighty earth, of a fine glowing purple colour, but in fome fpecimens much deeper than in others, and in fome degenerates into palenefs; but even in its worft condition, the colour is very fine. It is of a pure texture, but not very hard, and of an even but dufty furface. It adheres firmly to the tongue, is perfectly fine and fmooth to the touch, does not crumble eafily between the fingers, and ftains the hands. It melts very flowly in the mouth, and is perfectly pure and fine, and of a very auftere aftringent tafte, and ferments very violently with aqua fortis. In the fire it acquires a great hardnefs, but does not change colour.

It was dug in Cappadocia, and carried for fale to the city Sinope, whence it had its name. It is now found in plenty in the New Jerfeys, in America, and is called by the people there *blood-ftone*, from its ftaining the hands to a blood colour, and may probably be had in many other places; and this deferves thoroughly enquiring into, fince there feems not one among the earths more worthy notice. Its fine texture and body, with its high florid colour, muft make it very valuable to painters, and its powerful aftringency equally fo in medicine.

The ancients were well acquainted with it in fluxes and hæmorrhages, and experience fhews it poffeffes the fame virtues at this time. The deepeft coloured is ever the moft aftringent. Hill's Hift. of Foff. p. 60.

SINOPLE, or SENOPLE, in *Heraldry*, denotes *vert*, or the green colour in armories: thus called by the ancient heralds; though Pliny and Ifidore, by *color finopicus*, or *finople*, mean a brownifh red, fuch as that of our ruddle.

F. Meneftrier derives the word from the Greek *prafina hopla*, *green armories*; by corruptedly retrenching the firft fyllable *pra*: which is no new thing among oriental words, witnefs Salonica for Theffalonica.

Sinople is fuppofed to fignify love, youth, beauty, rejoicing, and liberty: whence it is, that letters of grace, abolition, legitimation, &c. are always to be fealed with green wax.

SINOVIA. See SYNOVIA.

SINUATED *leaf*, in *Botany*. See LEAF.

SINUOSITY, a feries of bends and turns in arches, or other irregular figures; fometimes jetting out, and fometimes falling in. Such as defcribed by the motion of a ferpent, &c.

It is the *finuofity* of the fea-coafts that forms bays, ports, capes, &c. Du Loir obferves, that the courfe of the river Meander, creeping in a thoufand agreeable *finuofities*, ferved Dædalus as a model to form his labyrinth by.

SINUOUS *ulcers*. See ULCER.

SINUS, in *Surgery*, a little cavity or facculus, frequently formed by a wound, or ulcer, wherein pus is collected.

A *finus* is properly a cavity in the middle of a flefhy part, formed by the ftagnation and putrefaction of the blood or humours, and which has wrought itfelf fome vent or exit.

Deep *finufes* that flope downwards, Scultetus obferves, are difficult to heal: yet that furgeon undertakes to cure any *finus* in a week, by the medicaments he defcribes page 338, and by an agglutinative bandage. He adds, that he never comes to the incifion till he finds, that the pharmaceutic applications are ineffectual; and that, for the dilatation of *finufes*, he does not ufe the deceitful fcalpel, as being more apt to deceive the operator than the patient.

SINUS, in *Anatomy*, denotes a cavity in certain bones, and other parts, the entrance whereof is very narrow, and the bottom wider, and more fpacious.

Of thefe *finufes*, we find feveral in divers parts of the body, particularly in the bafis of the fkull, on the offa petrofa; where the ancients imagined their ufe was to render the bones more light. In feveral of the joints of the body, they ferve to receive the epiphyfes of the other bones.

SINUS is alfo an appellation given to the duplicatures of the dura mater.

Thefe *finufes*, Dr. Drake obferves, are venous channels, formed for the reconveyance of the blood. There are four of them chiefly confiderable, viz. the *finus longitudinalis*, which, running along the middle of the convex part of the brain, fends out a branch on each fide, between the brain and cerebellum, called the *lateral finufes*, and the torcular Herophili, formed out of a concourfe of the *lateral finufes*, and pineal gland. They are all formed of the feveral venous branches, which return the blood from the brain and cerebellum, and deliver their contents into the jugular veins; whereof they are, as it were, the roots. Their coats are furnifhed with ftrong fibres, by means whereof they are dilated by the influx of the venous blood, and again contracted with a reciprocal motion, like the pulfe of an artery. See *Tab. Anat.* (*Ofteol.*) *fig.* 4. *litt. b. b. c. c.*

SINUS *of an artery*, is ufed by fome for any part of an artery, where its fides are ftretched out beyond the ordinary proportional dimenfions elfewhere.

Morgagni has obferved four fuch *finufes* in the aorta; three of them anfwering to the femilunar valves, and the fourth is all that part of the aorta, between the former *finufes* and the origin of the common trunk of the right fubclavian and carotid arteries. He gives fome reafons to prove, that the nervus acceffiorius arifes from the eighth pair, to be joined to the medulla fpinalis. Med. Eff. Edinb. abr. v. ii. p. 410.

SINUS *of the womb*, is ufed for any cavity within its fubftance. Thefe *finufes* are much of the fame texture with the cells of the fpleen, or rather of the corpora cavernofa penis; being membranous cavities communicating with each other, and having numerous arteries fpread on them, whofe lateral branches open into the cells, from which veins go out to be joined to other veins, that return the blood from the other parts of the womb.

Thefe *finufes* are diftended with blood in the time of the menfes, and their orifices are then alfo enlarged.

During the time of pregnancy the *finufes*, and their canals that open into the womb, are gradually diftended and enlarged; fo that, at the end of nine months, the *finufes* will contain the largeft fingers, and the canals from them will receive the little finger. Vide Monro, in Medic. Eff. Edinb. vol. ii. art. 9.

SION-*college*. See COLLEGE.

SIPHAC, a name ufed by fome authors for the *peritonæum*.

SIPHILIS. See SYPHYLIS.

SIPHITA, a word ufed by Paracelfus, and his followers, with the addition of *parva* and *magna*, for two diforders. The *fiphita parva* fignifies the *chorea fancti Viti*, or *St. Vitus's dance*; and the *fiphita magna*, walking in time of fleep.

SIPHNIUS *lapis*, in the *Natural History* of the ancients, a ſubſtance found in great plenty in the iſland Siphnus, in the Ægean Sea. It was dug up in large maſſes in the neighbourhood of the ſea, and when freſh might be cut or worked into any ſorts of veſſels by reaſon of its ſoftneſs, but when afterwards burnt and oiled over, became black and ſolid, and fit for any ſervice: and the veſſels made of it bore the fire very well. The ſame ſubſtance is ſtill found in many parts of Europe, and called *lapis lebitum*, and applied to the ſame uſe. It is no other than the *ſteatites*, or our SOAP-*rock*.

SIPHON, or SYPHON, in *Hydraulics*, a crooked tube, one leg or branch whereof is longer than the other; uſed in the raiſing of fluids, emptying of veſſels, and in various hydroſtatical experiments.

The word in the original Greek, σιφων, ſignifies ſimply *tube*, whence ſome apply it to common tubes or pipes. Wolfius particularly deſcribes two veſſels under the name of *ſiphons*; the one cylindrical in the middle, and conical at the two extremes; the other globular in the middle, with two narrow tubes fitted to it axis-wiſe; both ſerving to take up a quantity of water, &c. and to retain it when up.

But the moſt uſeful and celebrated *ſiphon* is that which follows: a crooked tube ABC (*Tab.* VI. *Hydraulics*, *fig.* 64.) is provided of ſuch a length, and with ſuch an angle, or ſo bent at the vertex, as that when the orifice A is placed on an horizontal plane, the height of A B may not exceed thirty-two or thirty-three feet. For common uſes a foot or half a foot high ſuffices. If, now, the leſs arm A B be immerged in water, or any other liquid, and the air be ſucked out of it by the aperture C, till the liquor follow; the liquor will continue to flow out of the veſſel, through the tube B C, as long as the aperture A is under the ſurface of the liquor.

Note, inſtead of ſucking out the air, the event will be the ſame, if the *ſiphon* be at firſt filled with the fluid, and the aperture C ſtopped with the finger, till the aperture A be immerged.

The truth of the phenomenon is known by abundance of experiments; nor is the reaſon of part of it far to ſeek. In ſucking, the air in the tube is rarefied, and the equilibrium deſtroyed; conſequently, the water muſt be raiſed into the leſſer leg, A B, by the preponderating preſſure of the atmoſphere.

The *ſiphon* being thus filled, the atmoſphere preſſes equally on each extremity thereof; ſo as to ſuſtain an equal quantity of water in each leg: but the air not being able to ſuſtain all the water in the longer leg, and being more than able to ſuſtain that in the ſhorter leg; with the exceſs of force, therefore, it will raiſe new water into the ſhorter leg; and this new water cannot make its way, but by protruding the firſt before it; by this means is the water continually driven out at the longer leg, as it is continually raiſed by the ſhorter.

The cauſe of the *ſiphon's* running may be otherwiſe explained in the following manner: the air which paſſes into the veſſel A B C D, (*fig.* 65.) repreſented by the column K L, ſuſtains the column of water L D in the ſhort leg of the *ſiphon*, preſſing againſt that air with its perpendicular height D F; whilſt the column of air M S preſſing upwards againſt the hole of the long or iſſuing leg D S, which acts according to the height D C, muſt yield and ſuffer the water to run out as long as the leg D S is longer, or rather perpendicularly higher than D G. For ſince K and M are ſuppoſed to be at the top of the atmoſphere, the columns K L and M S are equal in height and preſſure (for the height of L above S is of no account with reſpect to the whole height of the atmoſphere), as long as M S is acted upon by the deſcending water D S, whoſe height is from D to S, (e. g. fifteen inches) an height ſuperior to that of the column D G (e. g. ſeven inches) ſupported by the column of air K L, the column M S muſt yield to the water iſſuing out at S; and however the ſurface of the water E F deſcends, the column K L, by its preſſure, will always overcome the reſiſtance of the column M S, becauſe it has a leſs height of water to ſuſtain than M S has. If the mouth of the iſſuing leg had been at T, the water would hang *in equilibrio*, filling both legs of the *ſiphon*, when the water is come down in the upper veſſel to I H T; becauſe then the two columns of air K L and M S will be acted againſt by an equal height of water in the legs of the *ſiphon*; but if you raiſe the iſſuing end of the *ſiphon* (now ſuppoſed at T) up to the level of *u* V above I H, the water will run back up from V to D, and ſo out at H in the upper veſſel; becauſe then the column M S, having only the height V D to ſuſtain, will be acted againſt with leſs force than the column K L, which is preſſed againſt by the whole height D H ſuperior to V D. Since, therefore, the preſſure of the air is the cauſe of the water being puſhed up into the *ſiphon*, and the difference of its preſſure (as one column is acted againſt by the water in the ſhort leg more weakly than another column of air is acted upon by the water in the long leg) is the cauſe of its running continually from one veſſel into another, when once ſet agoing; it follows, that the bend D of the upper part of the *ſiphon* muſt not be above thirty-two feet higher than the water in the upper veſſel, becauſe the air cannot ſuſtain a column of water, whoſe height exceeds thirty-two feet.

Mercury will run in a *ſiphon* in the ſame manner as water; but in this caſe, the bend of the *ſiphon* muſt not be more than $30\frac{8}{10}$ inches above the ſtagnant mercury in the upper veſſel; becauſe, as it is about fourteen times ſpecifically heavier than water, it will be lifted up by the preſſure of air but the fourteenth part of the height to which water is lifted. Deſag. Exp. Phil. vol. ii. ſect. 8.

But ſome authors aſſert, that the water continues to flow through the *ſiphon*, even when placed under a receiver, and the air exhauſted from it.

Some will have it, that there is ſtill air enough left in the evacuated receiver, to raiſe the water to an inch or two. But as both mercury and water are found to fall entirely out of the Torricellian tube, *in vacuo*; the preſſure of the thin remaining air there can never be the cauſe of the aſcent, both of mercury and water, in the ſhorter leg of the *ſiphon*. Hence, as the height of the *ſiphon* is limited to thirty-two feet; for this only reaſon, that air cannot raiſe water higher; ſome have queſtioned, whether or no we are in the right in rejecting Hero's method of carrying water, by means of a *ſiphon*, over the tops of mountains, into an oppoſite valley. For Hero only orders the apertures of the *ſiphon* to be ſtopped, and water to be poured through a funnel into the angle or meeting of the legs, till the *ſiphon* be full: when ſhutting the aperture in the angle, and opening the other two, the water, he ſays, will continue to flow. Now if there only need air for the firſt riſe of the water into the leſs leg, not for the continuation of the motion, it were poſſible to raiſe the water much higher than the height of the atmoſphere would carry it.

Wolfius (Elem. Matheſ. tom. ii. p. 348. ed. 1733.) expreſly ſays, that this propoſed artifice of Hero is very juſtly rejected; becauſe air is neceſſary not only for the elevation of the water in the ſhorter leg, but for the continuance of its motion; and he adds, that this method was unſucceſsfully tried, where the height was greater than thirty-two feet.

Deſaguliers alſo obſerves, that in a crane or *ſiphon* (ſuch as that propoſed by Hero) of about forty feet high, the water, inſtead of running from the upper veſſel into the lower, as it would do if the height of the ſhort leg were much under thirty-two feet, will in the two legs fall back to the height of thirty-two feet, above the reſpective veſſels, where it will hang; the air not being able to ſuſtain the water above thoſe heights, and conſequently to drive it up over the bend.

In an experiment of this kind, the water in the legs of the *ſiphon*, unleſs it be purged of its air, will not reſt at a height of quite thirty feet above the water in the veſſels, becauſe air will extricate itſelf out of the water, and getting above the water in the legs preſs it downwards, ſo that its height will be leſs to balance the preſſure of the atmoſphere. However, this is certain, that a *ſiphon* of a particular kind, once ſet a running, will periſh in its motion, though removed into the moſt perfect vacuum our air-pumps will make: or, if the lower orifice of a full *ſiphon* be ſhut, and the whole be thus placed in a receiver, with a contrivance for opening the orifice when the air is exhauſted; the water will be all emptied out of the veſſel, as if it had been in open air.

This fact has been ſufficiently aſcertained by many approved hydroſtatical writers.

Deſaguliers informs us, that he made the experiment, both with water and mercury; for having filled a *ſiphon*, recurved at the extremities of its legs, ſucceſſively with thoſe liquors, and ſuſpended it by a ſlip-wire in the receiver of an air-pump, over two ſmall jars containing mercury to unequal heights (and water, when water was uſed in the *ſiphon*), he exhauſted the air out of the receiver, and then letting down the *ſiphon*, ſo that its two ends went into the liquor in the jars, the liquor ran from the higher into the lower veſſel. He alſo made an experiment in the open air, where the mercury ran through a *ſiphon*, whoſe bend was more than thirty-one inches above the lower orifice of the ſhort leg of the *ſiphon*. But neither of theſe experiments affords a juſt objection againſt the doctrine advanced in the preceding part of this article, viz. that the air is the cauſe of the diſcharge of liquors from one veſſel into another by means of *ſiphons*; for its running *in vacuo* was only owing to the attraction of coheſion, which acts for a ſmall height; becauſe,

because, the experiment will not succeed *in vacuo*, if the *siphon* used for mercury has its bend six inches higher than the orifice of the short leg, and if the bend of the *siphon* for water be two or three feet high; neither will the last mentioned experiment with mercury in the open air answer, if the bend of the *siphon* be forty inches high: and in all the experiments the bores of the *siphons* must be very small. Exp. Phil. ubi supra, p. 168.

The figure of the *siphon* may be varied at pleasure (see *fig.* 66, 67, 68,) provided only the orifice C be below the level of the surface of the water to be drawn up; but still the farther it is distant from it, the faster will the fluid be carried off. And if, in the course of the flux, the orifice A be drawn out of the fluid; all the liquor in the *siphon* will go out at the lower orifice C; that in the leg CB dragging, as it were, that in the shorter leg A B after it.

If a filled *siphon* be so disposed, as that both orifices A and C, be in the same horizontal line: the fluid will remain pendant in each leg, how unequal soever the length of the legs may be. Fluids, therefore, in *siphons*, seem, as it were, to form one continued body; so that the heavier part descending like a chain, pulls the lighter after it.

Lastly, it must be observed, that the water will flow out, even through a *siphon* that is interrupted, by having the legs A D and F C, joined (*fig.* 68.) together, by a much bigger tube full of air.

The SIPHO *Wirtembergicus* is a very extraordinary machine of this kind, performing divers things which the common *siphon* will not reach. E. gr. in this, though the legs be in the same level, yet the water rises up the one, and descends through the other; the water rises, even though the aperture of the less leg be only half immerged in water; the *siphon* has its effect after continuing dry a long time; either of the apertures being opened, the other remaining shut for a whole day, and then opened, the water flows out as usually. Lastly, the water rises and falls indifferently through either leg.

Muschenbroek, in accounting for the operation of this *siphon*, observes, no discharge could be made by it, unless the water applied to either leg cause the one to be shorter, and the other longer by its own weight. Introd. ad Phil. Nat. tom. ii. p. 853 ed. 4to. 1762.

The project of this *siphon* was laid by Jordanus Pelletier, and executed at the expence of prince Frederic Charles, administrator of Wirtemberg, by his mathematician Shahackard, who made each branch twenty feet long, and set them eighteen feet apart; the description thereof was published by Reiselius, the duke's physician.

This gave occasion to M. Papin to invent another, that did the same things, described in the Philosophical Transactions; and which Reiselius, in another paper in the Transactions, ingenuously owns to be the very same with that of Wirtemberg. Its structure will appear from its figure, which is represented (*Tab.* VI. *Hydraulics*, *fig.* 69.)

SIPHONANTHUS, in *Botany*, a genus of the *tetrandria monogynia* class. Its characters are these: the flower consists of one petal, it is tubulated and divided into several segments at the edge; the pistil arises from the cup, and finally becomes a fruit resembling four berries, divided into four cells, in each of which there is one large greenish yellow seed. This genus, which was established by Dr. Amman, under the denomination of *siphonanthemum*, has only one species. Art. Petrop. vol. viii. p. 216.

SIPTACE, in *Natural History*, the name given by the ancients to a beautiful bird, of which they are very fond, and which was often kept in their houses. Some have conjectured this to be the goldfinch, from the fine yellow they describe about it; but Pliny plainly makes it the parrot: he tells us, among other things, that it imitated the human voice the best of all birds.

SIPUNCULUS, in *Natural History*, a genus of the *intestina* class of worms in the Linnæan system. Its characters are: that the body is round and elongated; the mouth attenuated and cylindric; and the lateral aperture of the body rugged. There are two species; one found under stones in the European, and the other in the Indian ocean.

SIRA, a name by which some of the chemical writers have called orpiment.

SIRACAUSTUM, a name given by Mesue to a medicine he recommends in acute diseases.

SIRÆUM, a word used by some to express a sweet decoction, whether given in that form, or first inspissated into a sort of rob by evaporation.

SIRE, a title of honour in France, now given to the king only, as a mark of sovereignty. In all placets and petitions, epistles, discourses, &c. to the king, he is addressed under the title of *sire*.

Some derive the word from the Latin *herus*, *master*; of which opinion seems Budæus, who, in speaking to king Francis I. always called him *here*, *q. d. master*, or *sire*; others derive it from the Greek κυριος, *lord*; of which opinion is Pasquier, who adds, that the ancient Franks gave the same title to God, calling him *beau sire Dieu*: others fetch the word from the Syriac; and maintain it was first given to the merchants who traded to Syria: Menage will have it come from *senior*, *elder*; whence *seigneur*, then *seignor*, and *sire*.

SIRE was likewise anciently used in the same sense with *sieur* and *seigneur*, and applied to barons, gentlemen, and citizens.

SIREN, σειρην, in *Antiquity*, *mermaid*; a name given to a kind of fabulous beings represented by the moderns, as sea-monsters, with women's faces and fishes tails; but by the ancient poets, &c. as having the upper part human, and the lower like birds; and decked with a plumage of various colours.

The three *sirens* are supposed to have been the three daughters of the river Achelous; and are called *Parthenope*, *Lygea*, and *Leucosia*. Homer only makes mention of two *sirens*, and some others reckon five. Virgil places them on rocks where vessels are in danger of splitting. Pliny makes them inhabit the promontory of Minerv, near the island Capreæ. Others fix them in Sicily, near Cape Pelorus.

Claudian says, they inhabited harmonious rocks; that they were charming monsters; and that sailors were wrecked on their rocks without regret, and even expired in raptures: *Dulce malum in pelago siren.*

Pausanias tells us, that the *sirens*, by the persuasion of Juno, challenged the Muses to a trial of skill in singing; and these, having vanquished them, plucked the golden feathers from the wings of the *sirens*, and formed them into crowns, with which they adorned their own heads.

This description is, doubtless, founded on a literal explication of the fable, that the *sirens* were women who inhabited the shores of Sicily; and who, by all the allurements of pleasure, stopped passengers, and made them forget their course.

The name, according to Bochart, who derives it from the Phœnician language, implies a *songstress*: and hence, it is probable, that in ancient times there might have been excellent singers, but of corrupt morals, on the coast of Sicily, who, by seducing voyagers, gave rise to this fable.

Some interpreters of the ancient fables will have the number and the names of the three *sirens* to have been taken from the triple pleasure of the senses, wine, love, and music, which are the three most powerful means of seducing men; and hence, so many exhortations to avoid the *sirens* fatal song.

Probably, it was hence, that the Greeks fetched their etymology of *siren*, viz. from σειρα, a *chain*; as if there was no getting free of their enticement.

Others, who do not look for so much mystery in the fable, maintain that the *sirens* were nothing but certain streights in the sea, where the waves whirling furiously around, seized and swallowed up vessels that approached them too near.

Lastly, others hold the *sirens* to have been certain shores and promontories, where the winds, by the various reverberations and echoes, cause a kind of harmony that surprises and stops passengers. This, probably, might be the origin of the *sirens* song, and the occasion of giving the name of *sirens* to these rocks.

The learned Mr. Bryant says, that the *sirens* were Cuthite and Canaanitish priests, who had founded temples in Sicily, which were rendered infamous on account of the women who officiated. They were much addicted to cruel rites, so that the shores, upon which they resided, are described as covered with the bones of men, destroyed by their artifice. Virgil. Æneid. lib. v. v. 864.

The ancients represent their songs as so fatally winning, that nobody could withstand their sweetness; all were soothed with it; though their life was the purchase of the gratification. See Homer's Odyss. M. v. 39.

Mr. Bryant observes, that the story of the *sirens* relates to these people, who with their music used to entice strangers into the purlieus of their temples, and then put them to death. Nor was it music only with which persons were seduced to follow them; the female part of their choirs were maintained for a two-fold purpose, both on account of their voices and their beauty. They were accordingly very liberal of their favours, and by these means enticed sea-faring persons, who paid dearly for their entertainment. Analysis of Ancient Mythol. vol. ii. p. 17, &c.

SIREN, in *Ichthyology*, a name given by Artedi to the sea-monster often described by authors, but either not existing

ing at all, or not ſo like man as their deſcription make it. Artedi ſuppoſes it to conſtitute a peculiar genus of the plagiuri, or cetaceous fiſhes. The characters he gives of it are theſe: it has no pinnated tail; the head, neck, and breaſt, down to the navel, repreſent thoſe of the human ſpecies; there are only two fins on the whole body, and thoſe ſtand on the breaſt.

Bartholine, in his Hiſtory of Curioſities, deſcribes ſuch a fiſh as this under the name of *ſyrene*, and Barchewitz under the name of *homo marinus*. See MERMAID, SEA-*calf*, SEA-*cow*, and SEA-*man*.

SIREN, in *Zoology*, a genus of the order of *meantes*, in the claſs of *amphibia*. Its characters are: that its body is biped, naked, and furniſhed with a tail; the feet are brachiated with claws. This animal was diſcovered by Dr. Garden in Carolina; it is found in ſwampy and muddy places, by the ſides of pools, under the trunks of old trees that hang over the water. The natives call it by the name of *mud-inguana*. Phil. Tranſ. vol. lvi. p. 189.

Linnæus firſt apprehended, that it was the larva of a kind of lizard; but as its fingers are furniſhed with claws, and it makes a croaking noiſe, he concluded from theſe properties, as well as from the ſituation of the anus, that it could not be the larva of the lizard, and, therefore, formed of it a new genus under the name of *ſiren*. He was alſo obliged to eſtabliſh for this uncommon animal a new order, called *meantes*, or *gliders*: the animals of which are amphibious, breathing by means of gills and lungs, and furniſhed with arms and claws. See *Tab. Serpents*.

SIREN is alſo a name given by Mouffet, and other authors, to a ſpecies of bee; of which they diſtinguiſh two kinds, a larger and a ſmaller. Theſe differ greatly from the common bee, in that they live ſolitary, and never unite into ſwarms, or build neſts, or make combs.

SIREX, in the Linnæan ſyſtem of *Zoology*, a genus of the *hymenoptera* claſs of inſects. Its characters are: that the mouth has two ſtrong jaws; that it has two truncated palpi or feelers, filiform antennæ, an exſerted, ſtiff, ſerrated ſting, a ſeſſile, mucronated abdomen, and lanceolated wings. There are ſeven ſpecies.

SIRI, among the Romans, were ſubterranean caves or vaults, in which wheat could be kept ſound and freſh for fifty years.

SIRIASIS, a name given by medical writers to a diſeaſe to which children are ſubject; it conſiſts in an inflammation of the brain and its membranes, and is attended with a depreſſure of the fontanella, or hollowneſs of the eyes, a burning fever, a paleneſs and dryneſs of the whole body, and an utter loſs of appetite.

SIRICON *plumbi*, a name given by ſome chemical writers to calcined lead, or the grey powder made of lead by a ſlight calcination in an open fire.

SIRIUS, σειριος, in *Aſtronomy*, the *Dog-ſtar*; a very bright ſtar of the firſt magnitude, in the mouth of the conſtellation *Canis Major*, or the Great Dog.

This, indeed, is the brighteſt of all the ſtars in our firmament, and therefore, probably, ſays Mr. Maſkelyne, the aſtronomer royal, in a paper recommending the diſcovery of its parallax, Phil. Tranſ. vol. li. p. 889. the neareſt to us of them all. Some, however, ſuppoſe *Arcturus* to be the neareſt.

The Arabs call it *Aſchere*, *Elſchecre*, *Scera*; the Greeks, *ſirius*; and the Latins, *Canicula*, or *Canis candens*. See CANICULA.

SIRNAME. See SURNAME.

SISARUM, or SISER, in *Botany*. See SKIRRET.

SISKIN, in *Ornithology*. See SPINUS.

SISON, in *Botany*. See *Baſtard-ſtone* PARSLEY.

SISON *Syriacum*, in *Botany*, a name given by ſome authors to the ammi, or biſhop's weed, a plant whoſe ſeeds were once much uſed in medicine.

SISSITIEPTERIS, in *Botany*, a name uſed by Pliny, and ſome others of the old authors, for the pimpinella, or burnet.

SISTROID *angle*. See ANGLE.

SISTRUM, or CISTRUM, an ancient kind of muſical inſtrument uſed by the prieſts of Iſis and Oſiris.

Spon deſcribes it as of an oval form, made in manner of a racket, with three ſticks traverſing it breadthwiſe, which, playing freely by the agitation or beating of the inſtrument, yielded a kind of ſound, which, to the ancients, ſeemed melodious. The upper part was adorned with three figures; that of a cat with a human face in the middle, the head of Iſis on the right-ſide, and the head of Nephthys on the left. See *Tab. Muſic*, *fig.* 11.

Mr. Malcolm takes the *ſiſtrum* to have been no better than a kind of rattle. Jer. Boſius has an expreſs treatiſe on the *ſiſtrum*, intituled, Iſiacus de *Siſtro*.

Oiſelius obſerves, that the *ſiſtrum* is found repreſented on ſeveral medals; and alſo on taliſmans. Oſiris, on ſome medals, is painted with the head of a dog, and with a *ſiſtrum* in his hand.

SISYMBRIUM, in *Botany*. See *Water* CRESSES.

Siſymbrium, among the Romans, was one of the ingredients, whereof the nuptial garlands were compoſed.

SISYMBRIUM, in *Botany*, is alſo a name uſed to expreſs the wild water-mint. See MINT.

SISYRA, among the *Ancients*, a woolly ſkin uſed for a covering to beds.

SISYRINCHIUM, *Bermudiana*, in *Botany*, a genus of the *gynandria triandria* claſs. Its characters are theſe: the ſheath, which incloſes the flowers, faces both ways, and is compoſed of two compreſſed, keel-ſhaped leaves; the flower has ſix oblong petals, and three very ſhort ſtamina, terminated by bifid ſummits, which are fixed to the baſe of the ſtyle; with an oval germen, ſituated under the flower, ſupporting an awl-ſhaped ſtyle, crowned by a trifid, reflexed ſtigma; the germen afterward turns to an oval, three-cornered capſule, with three cells, filled with roundiſh ſeeds. There are three ſpecies, natives of America.

SI TE *fecerit ſecurum*, in *Law*, a ſpecies of original writ, called peremptory, which directs the ſheriff to cauſe the defendant to appear in court, without any option given him, provided the plaintiff gives the ſheriff ſecurity effectually to proſecute his claim. This writ is in uſe, where nothing is ſpecifically demanded, but only a ſatiſfaction in general; to obtain which, and miniſter complete redreſs, the intervention of ſome judicature is neceſſary. Such are writs of treſpaſs, or on the caſe, wherein no debt, or other ſpecific thing, is ſued for in certain, but only damages to be aſſeſſed by a jury. See PRÆCIPE.

SITE, or SCITE, *ſitus*, denotes the ſituation of a houſe, meſſuage, &c. And ſometimes the ground-plot, or ſpot of earth it ſtands on.

SITE, *ſitus*, in *Logic*, one of the predicaments, declaring a ſubject to be ſo and ſo placed.

SITHCUNDMAN, in our *Old Writers*, one whoſe province it was to lead the men of a town or pariſh. Leg. Inæ. cap. 56.

Dugdale ſays, that in Warwickſhire the hundreds were formerly called *ſytheſoca*, and that *ſitheſocundman*, and *ſithcundman*, was the chief officer within ſuch a diviſion, i. e. the high-conſtable of the hundred.

SITHESOCA, in our *Old Writers*, is uſed to denote the diſtrict now called a *hundred*. The word is Saxon, ſignifying a *franchiſe*, or *liberty*.

SITICINES, among the Romans, perſons who founded a kind of trumpet, having a very mournful tone, at the burying of the dead.

SITONÆ, Σιτωναι, among the Athenians, officers appointed to lay in corn for the uſe of the city, for which purpoſe the ταμιας της διοικησεως or the public treaſurer, was to furniſh them with as much money as they had occaſion for. Potter, Archæol. Græc. lib. i. cap. 15. tom. i. p. 83.

SITOPHYLAX, Σιτοφυλαξ, formed from σιτος, *corn*, and φυλαξ, *keeper*, in *Antiquity*, an Athenian magiſtrate, who had the ſuperintendance of the corn; and was to take care, that nobody bought more than was neceſſary for the proviſion of his family.

By the Attic laws, particular perſons were prohibited buying more than fifty meaſures of wheat a man; of thoſe meaſures, we mean, called φορμοι, and the *ſitophylax* was to look to the obſervation of this law. It was a capital crime to prevaricate in it.

There were fifteen of theſe *ſitophylaces*; ten for the city, and five for the Piræus.

SITTA, in the Linnæan ſyſtem of *Ornithology*, the name of a diſtinct genus of birds, of the order of *picæ*. The characters of this genus are, that the bill is awl-ſhaped, tapering, ſtraight, extended and entire, with the upper mandible a little longer than the lower, and a compreſſed apex; the tongue is jagged, the noſtrils covered with feathers, and the feet formed for walking; having three toes forward, and one backward; the middle toe being joined at the baſe to both the outmoſt, and the back toe as large as the middle one. Linnæus reckons three ſpecies; the *picus cinerius*, or grey woodpecker, or *ſitta Europœa*, is called in Engliſh the NUT-*hatch*, or *nut-jobber*.

The bill is ſtrong and ſtraight; the upper mandible black, the lower white; the crown of the head, back, and coverts of the wings, are of a fine bluiſh grey; a black ſtroke paſſes over the eye from the mouth; the cheeks and chin are white; the breaſt and belly of a dull orange colour; the quill-feathers duſky; the wings underneath are marked with two ſpots, one white, the other black: the tail conſiſts of twelve feathers, the two middle are grey, the two exterior tipt with grey, to which

succeeds a transverse white spot; beneath that the rest is black; the legs are of a pale yellow; the back-toe very strong, and the claws large.

It is a small bird, not quite so large as the chaffinch. It builds in holes of trees, and when their entrance is too large, artfully stops them up with mud. It feeds on insects and fruits. It hoards nuts for the winter, and breaks them by sticking them in a cleft of the tree, and striking them with its beak. In autumn it begins to make a chattering noise, being silent for the greatest part of the year.

The two other species are found, the one in Canada, the other in Jamaica.

SITUS, in *Geometry* and *Algebra*, denotes the situation of lines, surfaces, &c.

Wolfius gives us some things in geometry, which are not deduced from the common analysis; particularly, matters depending on the *situs* of lines and figures. M. Leibnitz has even invented a particular kind of analysis thereon, called *calculus situs*.

SIVAN, in *Chronology*, the third month of the Jewish ecclesiastical year, answering to part of our May and June.

SIUM, in *Botany*. See SKIRRET.

SIXAIN, SIXTH, SEXAGENA, in *War*, an ancient order of battle, wherein six battalions being ranged in one line, the second and fifth were made to advance, to form the vanguard; the first and sixth to retire, to form the rear-guard; the third and fourth remaining on the spot, to form the corps, or body of the battle.

The word is French, signifying the same thing.

SIX-CLERKS, officers in chancery of great account, next in degree below the twelve masters; whose business is to inroll commissions, pardons, patents, warrants, &c. which pass the great-seal, and to transact and file all proceedings by bill, answer, &c.

They were anciently *clerici*, and forfeited their places, if they married; but when the constitution of the court began to alter, a law was made to permit them to marry. Stat. 14 & 15 Hen. VIII. cap. 8. They are also solicitors for parties in suits depending in the court of chancery.

Under them are six deputies and sixty clerks, who, with the under *clerks*, do the business of the office.

SIXHINDEMEN. See SYXHINDEMEN.

SIXTH, in *Music*, is not properly, as some have supposed, an original concord, since it arises from the subtraction of the third from the octave. There are properly but three original concords, the octave, fifth, and third major. See FUNDAMENTAL and INTERVAL.

The *sixth* is of two kinds, *greater* and *less*; and hence it is esteemed one of the imperfect concords; though each of the two species arises from a division of the octave.

The greater SIXTH, called by the Greeks *hexachordon majus*, is the concord resulting from a mixture of the sounds of two strings, that are to each other as 5 to 3.

The less SIXTH, *hexachordon minus*, results from two strings, which are to each other as 8 to 5.

The less *sixth* is composed diatonically of six degrees, whence its name; and of five intervals, three whereof are tones; and two semitones; chromatically of eight semitones; five whereof are greater, and three less. It has its form or origin from the *ratio super-tri-partiens quintas*: as of 8 to 5.

The greater *sixth* is composed diatonically, like the less, of six degrees and five intervals; among which are four tones, and a semitone: and chromatically of nine semitones; five whereof are greater, and four less: of consequence it has a less semitone more than the former. It has its origin from the *ratio super-bi-quartiens tertias*; as 5 to 3.

Anciently, the *sixth* had only one repetition, which was the 13th; but, in the modern system, it has several, as the 20th, 27th, &c. all marked indifferently in the thorough bass, by the figure 6. And even the *sixth* itself, both greater and less, when natural, is not expressed any otherwise than by a simple 6. But when it is greater or less, by accident, to the 6 is added the mark of a sharp or a flat: as may be seen in M. Brossard.

Besides the two kinds of *sixths* here described, which are both good concords, there are two others that are vicious and dissonant.

SIXTH, *the first, is the defective*, composed of two tones and three semitones, or of seven semitones, five whereof are greater, and two less.

SIXTH, *the second, is the redundant*, composed of four tones, a greater semitone, and a less. Whence some call it *pentatonon*, as comprehending five tones.

These two, being both discords, should never be used in melody, and very rarely in harmony.

As to the two consonant *sixths*, they were anciently used very sparingly: at present they are allowed to be used as often as one pleases: as is the case with thirds; the *sixths* being, in reality, no other than inverted thirds: but care is usually taken, that the first *sixth* that occurs be a less, and the last a greater; and that from the greater, we rise to the octave; and, from the less, fall to the fifth.

SIXTH, in the *military Art*. See SIXAIN.

SIXTH *pair of nerves*. See NERVE.

SIXTH *Rates*. See RATE.

SIZE, the name of an instrument used to find the bigness of fine round pearls.

It consists of thin pieces, or leaves, about two inches long, and half an inch broad; fastened together, at one end, by a rivet. In each of these are several round holes drilled, of different diameters. Those in the first leaf serve for measuring pearls from half a grain to seven grains. Those of the second, for pearls from eight grains, or two carats, to five carats, &c. and those of the third, for pearls from six and a half to eight and a half.

SIZE, is also used for a kind of weak GLUE. The shreds and parings of leather, parchment, or vellum, by being boiled in water, and strained, make *size*. Common *size* is made of leather boiled in water till it becomes of a viscid consistence. If it is wanted in painting for nicer purposes, it should be prepared by taking any quantity of the shreds or cuttings of glovers leather, and putting to each pound a gallon of water; let these be boiled for six or eight hours, supplying water so that it may not diminish to less than two quarts. Then strain the hot fluid through flannel, and afterwards evaporate it, till it is of the consistence of a jelly when cold. The *size* used in burnish gilding, and made of cuttings of parchment, is prepared much after the same manner. This substance is useful in many trades. Mr. Boyle mentions, among other uses, that fine red stands, and hanging-shelves, are coloured with ground vermillion tempered with *size*, and when dry, are laid over with common varnish.

SIZE, *Gold*. See GOLD-*size*.

SIZE, *Isinglass*. See ICHTHYOCOLLA.

SIZE *Painting*. See DISTEMPER.

SIZE *for Silvering*. See SILVERING.

SIZEL, in *Coining*, is used where pieces of money are cut out from the flat bars of silver, after having been drawn through a mill into the respective sizes or dimensions of the money to be made; the residue is called *sizel*, and melted down again.

SIZING, in *Mineralogy*, a term used by the Cornish miners for a peculiar method of separating the purer from the impurer parts of an ore by means of sieves. When the ore has been powdered, they put it into a wire-sieve with fine holes, and in this they sift it till the fine part goes through: this is properly what is called *sizing*. They send the larger, or coarser part, to be powdered again, and putting the rest into a sieve with a close bottom, they let in a stream of water from a cock, and by means of continued shaking it about, they cause the lighter and fouler parts to be washed over the rims of the sieve, and the remaining powder is the black tin.

SKATE, in *Ichthyology*, the English name of a species of the ray-fish, called by the generality of authors *raia undulata*, and *raia lævis*, and by some *rubus*.

It is distinguished by Artedi by the name of the variegated *ray-fish*, with the middle of the back smooth, and with only one row of spines in the tail.

This species, which is the RAIA *Batis* of Linnæus, is the thinnest in proportion to its bulk of any of the genus, and also the largest, some weighing near two hundred pounds. The nose, though not long, is sharp-pointed; above the eyes is a set of short spines; the whole upper part of a pale brown, and in some species streaked with black; the lower part white, marked with many small black spots; the jaws covered with small granulated but sharp-pointed teeth; the tail is of a moderate length; near the end are two fins; along the top of it is one row of spines, and on the edges are irregularly dispersed a few others. In the males of this species the fins are full of spines. *Skates* generate in March and April, at which time they swim near the surface of the water, several males pursuing one female. The females begin to cast their purses, as the fishermen call the bags in which the young are included, in May, and continue to do it till September. In October they are very poor and thin, but begin to improve in November, and grow gradually better till May, when they are in the highest perfection. The males go sooner out of season than the females. Pennant.

SKEETS, in the *Sea Language*, narrow oblong ladles, or scoops, for wetting the sails, decks, or sides of a ship.

SKEGG, in a *Ship*, that small and slender part of the keel, which is cut slanting, and left a little without the stern-post. It is now much out of use.

SKELETON, Σκελετὸν, formed from σκελλω, *I dry*, in *Anatomy*, an assemblage or arrangement of all the bones of a dead animal, dried, cleaned, and disposed in their natural situation; and kept in that disposition by

by means of wires, &c. See *Tab. Anat. (Osteol.) fig.* 3. 7.

Skeletons serve for good purpose in learning the osteology. For the several bones of which a *skeleton* consists, see BONE.

We have, in the Philosophical Transactions, an account of a human *skeleton*, all the bones of which were so united, as to make but one articulation from the back to the os sacrum, and downwards a little way. On sawing some of them, where they were unnaturally joined, they were found not to cohere throughout their whole substance, but only about a sixth of an inch deep all round. The figure of the trunk was crooked, the spinæ making the convex, and the inside of the vertebræ the concave part of the segment. The whole had been found in a charnel-house, and was of the size of a full grown person.

SKELETON, *Vegetable.* The preparations of leaves, fruits, roots, &c. called *vegetable skeletons*, are made in this manner. Choose for this purpose the leaves of trees or plants, which are somewhat substantial and tough, and have woody fibres, such as the leaves of orange, jasmine, bay, laurel, cherry, apricot, peach, plum, apple, pear, poplar, oak, and the like; but avoid such leaves as have none of the woody fibres, which are to be separated and preserved by this method; such are the leaves of the vine, lime-tree, and the like. The leaves are to be gathered in the months of June or July, and such to be chosen as are found and untouched by caterpillars, or other insects. These are to be put into an earthen or glass vessel, and a large quantity of rain-water to be poured over them; and after this they are to be left to the open air, and to the heat of the sun, without covering the vessel; when the water evaporates, so as to leave the leaves dry, more must be added in its place: the leaves will by this means putrefy, but they require a different time for this: some will be finished in a month, and others will require two months or longer, according to the hardness of the parenchyma of them. When they have been in a state of putrefaction some time, the two membranes will begin to separate, and the green part of the leaf to become fluid; then the operation of clearing is to be performed. The leaf is then to be put upon a flat white earthen plate, and covered with clear water; and being gently squeezed with the finger, the membranes will begin to open, and the green substance will come out at the edges; the membranes must be carefully taken off with a finger, and great caution must be used in separating them near the middle rib. When once there is an opening towards this separation, the whole membrane always follows easily; when both membranes are taken off, the *skeleton* is finished, and it is to be washed clean with water, and then preserved between the leaves of a book.

The fruits are divested of their pulp, and made into *skeletons* in a different manner. Take, for instance, a fine large pear that is soft, and not strong; let it be nicely pared without squeezing it, and without hurting either the crown or the stalk; then put it into a pot of rain-water, cover it, set it over the fire, and let it boil gently till it is perfectly soft, then take it out, and lay it in a dish, filled with cold water; then hold it by the stalk with one hand, and with the other hand rub off as much of the pulp as you can with the finger and thumb, beginning at the stalk, and rubbing it regularly towards the crown. The fibres are most tender toward the extremities, and are therefore to be treated with great care there. When the pulp is thus cleared pretty well off, the point of a fine penknife may be of use to pick away the pulp sticking to the core. In order to see how the operation advances, the foul water must be thrown away from time to time, and clean poured on in its place. When the pulp is in this manner perfectly separated, the clean *skeleton* is to be preserved in spirit of wine.

Skeletons of roots which have woody fibres, such as turnips, and the like, must be made by boiling the root without peeling it till it be soft, that the pulp may be squeezed away by the fingers in the same manner, in a dish of water. Many kinds of roots are thus made into elegant *skeletons*, and the same method succeeds with the barks of several kinds of trees; which when thus treated, afford extremely elegant views of their constituent fibres. Philos. Trans. N° 416.

SKEPLE, or SKUTTLE, in rural affairs, a sort of flat broad basket for winnowing corn.

SKEW, or SKILL *facets*, among *jewellers*. See FACETS.

SKIDS, or SKEEDS, in *Sea Language*, are long compassing pieces of timber, notched below so as to fit closely upon the wales, extending from the main-wale to the top of the side, and retained in this position by bolts or spike-nails. They are intended for preserving the planks of the side, when any heavy body is hoisted or lowered.

SKIFF, or SQUIFF, the less of two ship-boats, resembling a YAWL, serving chiefly to go ashore in when the ship is in harbour.

SKIMMER, in *Ornithology*. See RYNCHOPS.

SKIN, in *Anatomy*, a large thick membrane, spread over the whole body, serving as the external organ of feeling, and as a cover and ornament of the parts underneath.

The *skin* consists of three parts; the external one called the CUTICLE, EPIDERMIS, or *scarf-skin*. The middlemost is called the *corpus reticulare*, or RETICULAR *body*, because pierced through with a great number of holes, like a net or sieve. The innermost, called the CUTIS, is a fibrous substance, woven out of the extremities of arteries, veins, nerves, tendons, &c. Whence also arise abundance of little eminences, called PAPILLÆ *pyramidales*. See *Tab. Anat. (Myol.) fig.* 8.

It is likewise set with an infinity of glands, called MILIARY *glands*, each whereof has its excretory duct passing along with the pyramidal papillæ, through the holes of the corpus reticulare, and terminating at the cuticle.

The papillæ are held by the moderns to be the organ of FEELING; and the excretory vessels serve to carry off the matter of PERSPIRATION, which is separated from the blood in the miliary glands.

The cuticle, or scarf-*skin* of the human body, is remarkable for its scales, and for its pores. Its scales are wholly a microscopical discovery, for being so very minute, that two hundred of them may be covered with a grain of sand, they never could have been discovered by the naked eye. These are placed on our *skin* as on fishes, that is three deep, or each scale so far covered by two others, that only a third part of it appears; and their lying in this manner over one another seems to be the reason of the *skin*'s appearing white; for about the mouth and lips, where they only just meet together, and do not fold over, the blood-vessels are seen through, and the parts appear red. The perspirable matter is supposed to issue from between these scales, which lie over the pores, or excretory vessels, through which the watery and oily matters perspire; and these may find vent in a hundred places round the edges of each scale; so that if a grain of sand can cover two hundred of these scales, it may cover twenty thousand places through which perspiration may issue forth.

A piece of the *skin* taken from between the fingers, from the forehead, neck, arms, or any other soft part of the body, which is not hairy, serves to shew these scales; for where the skin is become hard and callous, they are fastened confusedly together. They are generally composed of five sides, and may be seen very distinctly if scraped off with a penknife, and applied to the microscope in a drop of water.

Every part of the *skin* of the human body is also full of excretory ducts, or pores, which continually emit the superfluous humours from the mass of the circulating fluid. In order to view these pores, cut a slice of the upper *skin* with a sharp razor, as thin as possible, then immediately cut also a second slice from the same place, which apply to the microscope; and in a piece of this, not larger than what a grain of sand can cover, there may be discovered innumerable pores as plainly as little holes pricked in paper by a fine needle may be perceived, when it is held up against the sun. The scales of the upper *skin* prevent any distinct view of the pores, unless they are thus cut off first, or else scraped away with a penknife; but if a piece of the *skin* between the fingers, or in the palm of the hand, be so prepared, and then examined, the light will be seen very beautifully through its pores.

Mr. Leewenhoeck has attempted to give some slight notion of the number of the pores in the human body: he supposes that there are a hundred and twenty such pores in a line one tenth of an inch long; however, to keep within compass, he reckons only a hundred; an inch in length will then contain a thousand in a row, and a foot twelve thousand. According to this computation, a foot square must have in it a hundred and forty-four millions; and supposing the superficies of a moderate sized man to be fourteen feet square, there will be in his *skin* two thousand and sixteen millions of pores. Leewenhoek, Epist. Phys. supra Nat. Arcanis, tom. iv. p. 413.

Dr. Grew has observed that the pores, through which we perspire, are more remarkably distinguishable in the hands and feet; for if the hands be well washed with soap, and examined with but an indifferent glass in the palm, or upon the ends and first joints of the thumb and finger, there will be found innumerable little ridges parallel to each other, and of equal bigness and distance; and upon these ridges the pores may be discovered by a very good eye, even without a glass, lying in rows, but viewed through a good glass, every pore seems like a little fountain, with

the ſweat ſtanding therein as clear as rock water; and this, when wiped away, will be found to be immediately renewed again.

Probably fleas, gnats, and other inſects, which feed on our blood and humours, make no new holes, but prey upon us through theſe pores. Philoſ. Tranſ. Nº 159. Baker's Microſcope, p. 172, &c.

Nutrition, M. Perrault obſerves, is ſometimes taken in throughout the whole body of animals, at the pores of the *ſkin*. The ſubtle ſubſtances of nutritious matters, applied externally to thoſe bodies, are found to penetrate them, to mix with the blood and juices, and they are there aſſimilated. On this account, he adds, it is, that butchers dogs, turnſpit dogs, &c. are generally very fat, and even butchers, cooks, &c. themſelves. M. Dodart takes it, that plants thus receive a great part of their food by the external bark, not all of it by the ROOT.

SKIN, in *Commerce*, is particularly uſed for this membrane ſtripped off the animal, to be prepared by the tanner, ſkinner, currier, parchment-maker, &c. and converted into LEATHER, &c.

The uſe of *ſkins* is very ancient; the firſt garments in the world having been made thereof. The Danes and other northern nations, have a long time dreſſed in *ſkins*.

MOROCCOES are made of the *ſkins* of a kind of goats. PARCHMENT is uſually made of ſheep-*ſkins*; ſometimes of goat-*ſkins*. VELOM is a kind of parchment made of the *ſkin* of an abortive calf, or at leaſt of a ſucking calf. The true SHAMMY is made of the *ſkin* of an animal of the ſame name; though frequently it is counterfeited with common goats and ſheep-*ſkins*.

The Indians in Carolina and Virginia dreſs buck and doe-*ſkin* in this manner: the felt being taken off, they ſtrain them, with lines or otherwiſe, much like the clothiers racks, in order only to dry them. When the hunting time is over, the women dreſs the *ſkins*, by putting them in a pond, or hole of water, to ſoak them well; then with an old knife, fixed in a cleft ſtick, they force off the hair whilſt they remain wet. This done, they put them into a kettle, or earthen-pot, and a proportion of deers brains, dried and preſerved for this purpoſe, is put along with them; this veſſel is ſet on the fire till they are more than blood-warm, which will make them lather and ſcour clean; after this, with ſmall ſticks, they wreſt and twiſt each *ſkin*, as long as they find any wet to drop from them, letting them remain ſo wreſted for ſome hours, and then they untwiſt and ſtretch each of them in a ſort of rack, ſo that every part is extended; and as the *ſkin* dries they take a dull hatchet, or ſome ſuch inſtrument, and rub them well over to force all the water and greaſe out of them, till they become perfectly dry, and then their work is done.

In this manner one woman (for the men never employ themſelves in this work) will dreſs eight or ten *ſkins* in a day, that is, begin and finiſh them. Phil. Tranſ. Nº. 194. See BUFF.

For the manner of preparing Shagreen. See SHAGREEN.

SKINS, *lacquering* and *gilding*. See LACQUER.

SKINK. See SCINCUS.

SKINKER, a cup-bearer, or butler. See ARCH *Butler*.

SKINUS, σκινος, a name given by the ancient naturaliſts to the lentiſk-tree, and alſo to a peculiar ſpecies of the ſquill, or ſcilla, which was not nauſeous and emetic as the common ſquill, but eſculent and pleaſant to the taſte.

SKIPPER. See SHIPPER.

SKIPPER, an Engliſh name for the common gar-fiſh. See ACUS.

SKIRMISH, in *War*, a diſorderly kind of combat, or encounter, in preſence of two armies, between ſmall parties, or perſons, who advance from the body for that purpoſe, and introduce to a general, regular fight.

The word ſeems formed from the French, *eſcarmouche*, which ſignifies the ſame, and which Nicod derives from the Greek χαρμη, which ſignifies, at the ſame time, both *light*, *combat*, and *joy*: Menage derives it from the German, *ſchirmen* or *ſhermen*, *to fence* or *defend*: Du-Cange, from *ſcaramuccia*, a *light engagement*, of *ſcara* and *muccia*, a body of ſoldiers hid in ambuſh; in regard many *ſkirmiſhes* are performed by perſons in ambuſcade.

SKIRRET, *Sium*, in *Botany*, a genus of the *pentandria digynia* claſs; the characters of which are theſe: it hath an umbellated flower; the general umbel is various in different ſpecies; the ſmall ones are plain and ſpreading; the general involucrum is compoſed of ſeveral ſhort, ſpear-ſhaped, reflexed leaves; thoſe of the ſmaller are very ſmall narrow leaves; the general umbel is uniform; the flowers have five inflexed petals, which are equal; they have five ſtamina, terminated by ſingle ſummits, and a ſmall germen ſituated under the flower, ſupporting two reflexed ſtyles, crowned by obtuſe ſtigmas; the germen afterward becomes a roundiſh, oval, ſtreaked fruit, ſplitting in two, each part containing one ſtreaked ſeed, plain on one ſide, and convex on the other. Miller reckons ſix, and Linnæus nine ſpecies.

The common *ſkirret* may be propagated either by ſowing the ſeeds, or by planting the ſlips and off-ſets, but the firſt is much the beſt method. It ſhould be ſowed on a moiſt rich ſoil, in the latter end of March, or beginning of April; and in five or ſix weeks the young plants will come up, when the ground ſhould be hoed to deſtroy the weeds, as is practiſed for carrots; and when the ſeeds are ſown in broad-caſt, the plants ſhould be cut up, leaving them at the ſame diſtance as carrots. Thoſe ſown in the drills ſhould alſo be thinned to the diſtance of four inches, and the ground cleared of weeds. This ſhould be repeated three times, after which their leaves will ſpread, and prevent the growth of weeds. In autumn, when the leaves begin to decay, they ſhould be taken up for uſe; but this ſhould only be done as they are wanted, for they ſpoil with lying out of the ground. The leaves decay in October, and from that time till the middle of March the roots are in ſeaſon; after this the roots begin to ſhoot, and become good for little. Miller.

The taſte of the *ſkirret*-root has ſomewhat of a bitterneſs and ſubaſtringency in it. It is eſteemed a wholeſome root, affording good nouriſhment; but it generates flatulence, and its very ſweet taſte is diſagreeable to many.

SKITTISH, in the *Manege*. A horſe is ſaid to be *ſkittiſh*, in French *ecouteux*, or *retenu*, that leaps inſtead of going forward; that does not ſet out, or part from the hand freely, nor employ himſelf as he ought to do.

SKOUT, in *Ornithology*. See LOMWIA.

SKRABBA, in *Ichthyology*, a name given by ſome to a fiſh called by Jonſton and Schoneveldt the *ſcorpius marinus*, but wholly different from the *ſcorpæna* of other authors. See FATHER-*laſher*.

SKREEN. See SCREEN.

SKUA, in *Ornithology*. See CATARACTA.

This bird inhabits Norway, the Ferro iſles, Shetland, and the noted rock Foula, a little weſt of them. It is alſo a native of the South Sea. It is the moſt formidable GULL; its prey being not only fiſh, but the leſſer ſort of water-fowl, as teal, &c. and it is alſo ſaid to prey on ducks, poultry, and even young lambs; it has all the fierceneſs of the eagle in defending its young: when the inhabitants of the Ferro iſlands viſit the neſt, it attacks them with great force, ſo that they hold a knife erect over their heads, on which the *ſkua* will transfix itſelf in its fall on the invaders. In Foula it is a privileged bird, becauſe it defends the flocks from the eagle, which it beats and pierces with great fury; and the natives impoſe a fine on any perſon who deſtroys one of theſe birds. Pennant.

SKULL, *Cranium*, in *Anatomy*, that great bony cavity of the head, which contains the brain. See *Tab. Anat.* (*Oſteol.*) *fig.* 1 & 2.

The *cranium* is divided into two tables, or laminæ, laid or applied over each other; between which is a thin ſpongeous ſubſtance, made of bony fibres detached from each lamina, and full of little cells of different bigneſſes, called *diploe*, or *meditullium*.

The tables are hard and ſolid, the fibres being cloſe to one another; the diploe is ſoft, in regard the bony fibres are here at a greater diſtance: a contrivance whereby the *ſkull* is not only made lighter, but leſs liable to fractures.

The external lamina is ſmooth, and covered with the pericranium; the internal is likewiſe ſmooth, abating the furrows made by the pulſation of the arteries of the dura mater, before the *cranium* be arrived at its conſiſtence.

It has ſeveral holes, through which it gives paſſage to the ſpinal marrow, nerves, arteries, and veins, for the conveyance and re-conveyance of the blood, &c. between the heart and the brain.

Its figure is round, which is an advantage to its capacity; but a little depreſſed, and longiſh; advancing out behind, and flatted on the two ſides, which form the temples; which contributes to the enlargement of the ſight and hearing.

It is compoſed of eight bones, ſix whereof are *proper*, and two *common*. The *proper*, or thoſe which are wholly employed in forming the globe of the *ſkull*, are the bone of the forehead, *os frontis*, that of the back of the head, *os* OCCIPITIS, the two *oſſa* PARIETALIA, and the two of the TEMPLES, *oſſa temporum*.

Within the eminences of the bones of the temples, is contained the organ of hearing, with the four little bones belonging

belonging thereto, viz. the malleolus, incus, ſtapes, and os orbiculare. See EAR.

The *common* bones of the *cranium*, or thoſe which contribute to form the face as well as the *ſkull*, are the *os* SPHENOIDES, and ETHMOIDES: but Winſlow obſerves, that this diviſion is not juſt, becauſe the *os frontis* and *oſſa temporum* deſerve as much to be called *common*, as thoſe that are reckoned ſuch; and thus, inſtead of ſix, there would be only three proper bones, and inſtead of two, there would be five common ones. Anat. vol. i. p. 21.

The *cranium* has three *common* ſutures, which divide it from the jaw: it has others *proper*, whereof there are three genuine, the coronalis, ſagittalis, and lambdoides; the reſt ſpurious, called *ſquammoſæ*, or *temporales*.

This diviſion of the *cranium* into pieces by ſutures, is of good uſe, as it makes it leſs liable to break, gives paſſage to the membranes which ſuſtain the pericranium, and affords vent to the matter of inſenſible perſpiration.

It is not uncommon to find in ſome human *ſkulls* a different ſtructure and conformation from that which nature has given to others, or to the generality of the ſpecies.

Frequently there are met with heads, the ſagittal ſuture of which is prolonged to the root of the noſe, and divides the coronal bone into two parts: and there have been anatomiſts, who have judged this ſort of conſtruction of the *ſkull* peculiar to one ſex, rather than common to both.

To find the true cauſe of this, we are to have recourſe to the ſtate of the *ſkull* in infancy. The bone is, at that time, always found divided into two lateral portions; ſo the ſame ſeparation, which is found between the two ſides, is found alſo between the two pieces, which afterwards compoſe the coronal bone. The two pieces of this coronal bone unite one with another, by means of their indented edges, and theſe afterwards coaleſce ſo perfectly, that the ſuture is obliterated; and this coaleſcence, which thus in proper time takes place in the coronal bone, ſometimes extends itſelf alſo, to almoſt all the other bones of the *ſkull*; but this only happens in old age. But if, on the contrary, the two pieces, of which the coronal bone is compoſed, acquire their full thickneſs and hardneſs before this coaleſcence is brought about, the ſuture remains, and is not obliterated, except in extreme old age. This reflection may be alſo carried much farther.

In the *ſkulls* of a great number of infants, the coronal and the two ſides ſo perfectly unite, as not to leave the leaſt trace of their original ſeparation. It ſeems as if the bones, having expanded and grown in theſe early ſtages too faſt for the brain, have been united to one another while yet ſoft and tender: but when the brain, on the other hand, grows too faſt for the bones of the *ſkull*, theſe bones preſſed more from within outwards than any other way, have little diſpoſition to unite with one another; and thus acquiring their thickneſs and hardneſs before their coaleſcence, they become much leſs inclined to coaleſce than before.

From theſe conſiderations we may conclude, that in thoſe infants, in which the growth of the brain is ſlow, and that of the bones of the *ſkull* quick, the ſuture, which is between the two portions of the coronal bone, is very quickly obliterated; and, on the contrary, when the increaſe of the brain is quick, and the growth of the bones is ſlow, the ſuture, which divides the coronal bone into two pieces, is found to a great age.

That which is the *ſkull* in the more advanced ſtate of the infant, is originally no other than a membrane, which is afterwards to oſſify: not unfrequently the oſſification is impeded in different parts of this membrane; and in the *ſkulls* of young ſubjects it is common to ſee theſe diſtinct parts, which remain membranous while the reſt of the *ſkull* has acquired its proper bony hardneſs. If the cauſe, which impeded the progreſs of the oſſification, ſubſiſts ſo long, as till the other parts of the *ſkull* are hardened into bone, and have their full growth and hardneſs, then will that, which ſhould have been naturally only one bone, form two.

This is the origin of the ſingular and unnatural ſutures, found in ſome human *ſkulls*, and called by ſome *ſupernumerary ſutures*. Sometimes there are, from this cauſe, ſuch ſupernumerary ſutures in almoſt all the bones of the *ſkull*. The os planum frequently is found thus divided into two; and from the ſame principle in nature it is, that a ſmall ſuture is ſometimes found in the maxillary bone, below the orbit, along the canal, which forms the lower orbitary cavity: the place where this little ſuture is found has happened to remain a long time membranous, and the oſſification at laſt taking place on the two edges of the remaining membrane, there has been formed a ſuture.

In other bones of the *ſkull* we alſo frequently meet with larger or ſmaller ſpaces which have continued membranous; and there are inſtances in which the oſſification may be plainly perceived juſt begun in the centre of the membranous ſpots.

It might be ſuppoſed that the brain was little liable to an unnatural growth, or expanſion, when we conſider that the brain is no other than a vaſt aſſemblage of pipes, or tubes, of a moſt extreme fineneſs, and that the particles, which compoſe theſe tubes, have but a very weak band of union one with another. Indeed we know very well, that when an injection has penetrated to the cortical ſubſtance of the brain, if that ſubſtance be macerated a little in water, its parts detach themſelves from one another, the veſſels become wholly deſtroyed, and there remains nothing but a number of extremely fine filaments of the matter of the injection, which has found its way into theſe veſſels, and been formed into their ſhape by cooling in their cavities. As there are found, however, a great number of *ſkulls* which have a ſingular and odd configuration, it cannot but be, that the brain muſt be expanded into the ſame form. We are informed, that the people of ſome nations preſs the fore part of the heads of their children, as ſoon as born, with conſiderable violence, and continue this, in order to reduce the forehead to a flatneſs; but theſe *ſkulls* are always found to get in length behind what they want before.

Sometimes there has been obſerved, in the *ſkulls* of perſons of an advanced age, in the middle of the ſagittal ſuture, a deep impreſſion, or ſinking in, which had remained there from infancy; but nature, in this caſe, ſupplies the cavity with two protuberances of bone from the ſides of the adjoining parts; and ſome *ſkulls* are found very narrow, and of a remarkable length, nature giving one way the room ſhe denied the other. Many other ſingular conſtructions of the *ſkull* have been obſerved by anatomiſts; and probably in the perſons, to whom they have belonged, the brain has been able to perform its functions but badly. Be that as it will, it is certain that the brain has expanded, and formed itſelf to the ſhape of the *ſkull* in all theſe its unnatural figures; and neceſſarily the parts, of which the brain in ſuch caſes is compoſed, have taken a very different figure and arrangement from what nature intended: and in this caſe it cannot be, but that ſome portions of the brain have extended themſelves farther than they naturally ſhould have done and others much leſs than was allotted to them. Mem. Acad. Scienc. Par. 1740.

The adheſion of the pericranium to the *ſkull* has been thought a ſure ſign of the bone's being entire, but this is a miſtake; and the ſeparation of the cranium from the *ſkull*, is as uncertain a ſign of the cranium's being broken. Mem. de l'Acad. de Chirurg. tom. i.

We have ſome very particular obſervations on the bones of the human *ſkull*, by Mr. Hunauld, in the Memoires de l'Acad Royale de Sciences, an. 1730.

SKULL, *concealed injuries of the*. When a blunt inſtrument is the occaſion of an injury on the cranium, if the injured part does not ſufficiently appear of itſelf, great induſtry is to be uſed to diſcover it. Where the common integuments appear tumid and ſoft, they are in this caſe to be divided to the bone; but in making the inciſion, great care muſt be taken not to lay too much ſtreſs upon the knife, leſt ſplinters of the fractured cranium ſhould by that means be forced in upon the brain. The beſt way to make this inciſion is in form of the letter X, and about an inch and a half in length, lifting up the ſkin at each angle, and leaving the bone bare. The blood that is ſpilt is to be taken up with a ſpunge, and dry lint ſtuffed between the ſkin and the cranium; and having thus found out the injured part of the cranium, the trepan is to be applied, if it be found neceſſary. If ſplinters of the bone are now found, they muſt be removed either with the fingers or the forceps, or, when they hang to the pericranium, with ſciſſors; but when they adhere pretty firmly to the neighbouring parts of the cranium, it is more adviſeable to replace them than to endeavour to remove them by violence. Heiſter's Surgery, p. 85.

SKULL, *fiſſures of the*, cracks in the bone of the *ſkull*, made by falls, blows, or other injuries. When theſe are attended with no other bad ſymptoms but white, yellow, or brown ſpots upon the face of the bone, they may be remedied with boring ſeveral ſmall holes through the ſurface of the *ſkull*, down to the diploe, and dreſſing with balſamic medicines: but where violent ſymptoms come on, which demonſtrate an extravaſation of blood in the cavity of the cranium, the trepan is to be uſed without delay.

SKULL, *depreſſions of the*, are dentings in of the bone of the *ſkull* by a blow, without any manifeſt fracture, or, at the utmoſt, with ſuch a fracture, that, from its flexibility, it does not ſtart out by means of it, but continues to adhere

here firmly to the neighbouring bones. The *ſkulls* of infants are frequently ſubject to theſe, but in adults this caſe cannot happen, for the bones in them are become ſo rigid, that it is impoſſible to beat in any part of the cranium, without beating the bone to pieces. Theſe injuries of the cranium are called by the ſurgeons *fractures*, and the brain is frequently injured by theſe accidents, and its actions diſturbed. The firſt thing to be done to give relief in this diſorder, is to lift up any part of the bone that is depreſſed, or beaten in upon the brain, or to remove any other body by which it is compreſſed. Sometimes a ſplinter, which is quite ſeparated from the reſt of the bone, is driven into the cavity of the cranium, and lies conſtantly vellicating the brain and its membranes with its pointed parts; this is to be removed without delay.

When ſlight depreſſions are made in the *ſkulls* of infants, without bringing on any bad ſymptoms, the forcible methods of raiſing the depreſſed part are not to be uſed, but medicated bags, boiled in ſpirit of wine, warm fomentations, and ſuch remedies, are to be applied; and laſtly, a plaſter of melilot to cover all. Theſe ſlight applications frequently cure ſuch little depreſſions, and prevent the miſchievous conſequences which might be expected from them. When a very large depreſſion, however, happens to infants, the elevation, or reſtitution of the parts is to be performed in the following manner. After ſhaving the part, apply a plaſter made of gummy and very ſticking ingredients, and ſpread upon very ſtrong leather, with a cord faſtened to the middle of it: this plaſter is to be laid on pretty warm, and left in its ſituation till grown cold; the ſurgeon then taking hold of the cord, which is faſtened to it, is to pull it directly upwards, and with it the depreſſed part of the cranium will often riſe, and be reſtored to its place. When this method does not ſucceed at the firſt trial, it is to be repeated; and when this fails, the application of a cupping-glaſs to the depreſſed part will ſometimes ſucceed, eſpecially if you ſtop the patient's breath, both at the noſe and mouth, during the operation; but if neither the plaſter nor cupping prove ſucceſsful, it will be neceſſary to take in the aſſiſtance of an inſtrument.

But when the cranium is ſo depreſſed, whether in adults or infants, as to ſuffer a fracture or diviſion of its parts, it muſt inſtantly be relieved. Some praiſe very much the uſe of a ſternutatory powder on this occaſion, affirming, that the diſtenſion of the brain is ſo violent in the act of ſneezing, that it will reſtore the depreſſed parts of the bone to their former ſituation: but the ill conſequences that may attend this practice, are ſo grievous, that it ought wholly to be rejected, and the trepan and elevatories always to be uſed. Heiſter's Surgery, p. 87.

SKULL, *wounds of the*. In wounds of the cranium, or *ſkull*, the firſt buſineſs is to find whether they are terminated in the external parts of the cranium, or whether they penetrate into its cavity. This is to be known, 1. By the eye. 2. By the probe, which, however, muſt be uſed very gently here, for fear of bringing on farther miſchief. 3. By examining the inſtrument with which the blow was given, and conſidering the degree of force with which it was impelled. And laſtly, by the preſence, or abſence of violent bad ſymptons. A violent blow upon the head will always be attended with vomitings and vertigoes, and blood will be diſcharged by the noſe, ears, and mouth, and the wounded perſon will loſe alſo his ſpeech and ſenſes. Theſe diſorders will appear ſometimes ſooner, ſometimes later, but always are more violent than otherwiſe, when the wound is made by a fall, or by ſome blunt inſtrument; in which caſes the cranium is uſually much ſhattered. The blood which diſcharges itſelf by the wound, when that is made by a ſharp inſtrument, will inſinuate itſelf between the common integuments and the cranium: in the contuſions that are made with blunt inſtruments, ſometimes it will be concealed under the cranium, and, by corrupting the perioſteum and cranium, will bring on ulcers, and caries of the bone, and frequently occaſions fevers, convulſions, and death. Heiſter's Surgery, p. 82.

SKULL-*cap*, *ſcutellaria*, in *Botany*, a genus of the *didynamia gymnoſpermia* claſs. Its characters are theſe: the flower has a very ſhort tubulous empalement, whoſe brim is entire, having an incumbent ſcaly operculum, which ſeems cloſed; it is of the lip-kind, with a very ſhort crooked tube, long compreſſed chaps, and a concave trifid upper lip; the under lip is broad and indented; it has four ſtamina hid under the upper lip, two of which are longer than the other, terminated by ſmall ſummits, and a four-pointed germen ſupporting a ſlender ſtyle ſituated with the ſtamina, crowned by a ſingle recurved ſtigma; the empalement afterwards becomes a helmet-ſhaped capſule, including four roundiſh ſeeds. Miller enumerates ſix, and Linnæus fourteen ſpecies.

Theſe plants are all of them propagated by ſeeds; if theſe are ſown in autumn, ſoon after they are ripe, they will more certainly ſucceed than when they are ſown in the ſpring; for theſe ſometimes miſcarry, and if they ſucceed, the plants ſeldom come up the ſame ſeaſon. They require no other care but to thin them, and keep them clear from weeds. Miller.

SKUNK, in *Zoology*. See *American* POLE-*cat*.

SKY, the blue expanſe of AIR, or ATMOSPHERE.

The azure colour of the *ſky*, ſir Iſaac Newton attributes to vapours beginning to condenſe therein, which have got conſiſtence enough to reflect the moſt reflexible rays, viz. the violet ones; but not enough to reflect any of the leſs reflexible ones.

M. de la Hire attributes it to our viewing a black object, viz. the dark ſpace beyond the regions of the atmoſphere, through a white or lucid one, viz. the air illumined by the ſun; a mixture of black and white always appearing blue. But this account is not originally his; it is as old as Leonardo da Vinci. See BLUENESS and COLOUR of the *Clouds*.

SKY-*colour*. To give this colour to glaſs, ſet in the furnace a pot of pure metal of fritt from rochetta, or barilla, but the rochetta fritt does beſt; as ſoon as the metal is well purified, take for a pot of twenty pounds of metal ſix ounces of braſs calcined by itſelf, put it by degrees, at two or three times, into the metal, ſtirring and mixing it well every time, and diligently ſcumming the metal with a ladle: at the end of two hours the whole will be well mixed, and a proof may be taken; if the colour be found right, let the whole ſtand twenty-four hours longer in the furnace, and it will then be fit to work, and will prove of a moſt beautiful *ſky-colour*. Neri's Art of Glaſs, p. 40.

SKY-*flower*. See CINERARIA.

SKY-*rocket*. See ROCKET.

SLAB, an outſide ſappy plank or board ſawed off from the ſides of a timber-tree: the word is alſo uſed for a flat piece of marble.

SLAB-*line*, in *Sea Language*, a ſmall cord paſſing up behind a ſhip's main-ſail or fore-ſail, and being reeved through a block attached to the lower part of the yard, is thence tranſmitted in two branches to the foot of the ſail, to which it is faſtened.

It is uſed to truſs up the ſail as occaſion requires, and more particularly for the convenience of the pilot or ſteerſman, that they may look forward beneath it as the ſhip advances. Falconer.

SLABBERING-*bit*, in the *Manege*. See MASTIGADOUR.

SLABS *of tin*, the leſſer maſſes, which the workers at the tin-mines caſt the metal into: theſe are run into moulds made of ſtone.

SLACK *a leg*, in the *Manege*, called in French *mollir la jambe*, is ſaid of a horſe when he trips or ſtumbles.

SLACK *the hand*, is to *ſlack* the bridle, or give a horſe head.

SLACK-*water*, in *Sea Language*, denotes the interval between the flux and reflux of the tide, or between the laſt of the ebb and the firſt of the flood, during which the current is interrupted, and the water apparently remains in a ſtate of reſt.

SLACKEN, in *Metallurgy*, a term uſed by the miners to expreſs a ſpungy and ſemivitrified ſubſtance, which they uſe to mix with the ores of metals, to prevent their fuſion. It is the ſcoria, or ſcum, ſeparated from the ſurface of the former fuſions of metals. To this they frequently add lime-ſtone, and ſometimes a kind of coarſe iron-ore, in the running of the poorer gold-ores.

SLAG, in *Metallurgy*, &c. denotes vitrified cinder. See SMELTING.

SLANDER, in *Law*. See SCANDALUM *magnatum*.

SLATCH, at *Sea*. When a rope or cable hangs ſlack, the ſeamen call the middle part, which hangs down, *the ſlatch of the cable*, or rope: ſo alſo, after long foul weather, if there come a ſmall interval of fair, they ſay, *this is a ſlatch of fair weather*. But the term is generally applied to the period of a tranſitory breeze of wind.

SLATE, a bluiſh fiſſile ſtone, very ſoft when dug out of the quarry, and on that account eaſily cut and ſplit into thin long ſquares or eſcallops, to ſerve in lieu of tiles for the covering of houſes: ſometimes alſo to make tables of and for paving.

Mr. Da Coſta defines *ſlates* to be ſtones of a cloſe compact texture, of a laminated ſtructure, and ſplitting only horizontally, or into plates.

The ancients were unacquainted with the uſe of *ſlate*, and inſtead thereof, covered their houſes with ſhingle, as we read in Pliny. Beſides the blue *ſlate*, we have in England a greyiſh *ſlate*, called HORSHAM-*ſtone*, from a town in Suſſex of that name, where the greateſt quantities of it are found.

The blue *ſlate* is a very light, laſting, and beautiful covering;

ing; but it is chargeable withal, in regard the roof must be first boarded over, and the *slates* hung on tacks, and laid with finer mortar than tiles. The grey *slate* is chiefly used in the covering of churches, chapels, chancels, &c.

It is dearer than tiles, but far more durable. The timber of the roof needs to be very strong for this grey *slate*, it being almost double the weight of tiles.

Mr. da Costa has distributed *slates* into eight sections or classes, according to their different colours. 1. Of the *black slates* he has enumerated four sorts, which are not acted upon by acids. The first species is of a black colour, heavy and very hard, of a fine smooth, but not glossy surface, and capable of a very good polish, of a close compact texture, and impenetrable by water: when written on, the characters are white. This *slate* will not strike fire with steel, and burns to a pale brown colour. It is not found in this kingdom; but in Sweden and Germany there are many mountains and strata of it: however, that dug in Switzerland, where it abounds, is esteemed the finest and best in Europe. Where it rises in small plates, it is chiefly used for covering houses, churches, &c. as in Germany; but the Switzerland *slates*, which rise in large plates, are sent down the Rhine to Holland, where they form a considerable branch of trade, and they are only used for tables, pavements, writing-*slates* for schools, &c. The second species, which is incapable of a polish, and on which the written characters are black, and which burns to a pale reddish colour, is sometimes, but very rarely, found in some parts of England and Wales. The third species, on which the written characters are white, is vulgarly called SHALE. The fourth sort, which is of a jet black, forms a stratum above coal in the places where it is found, especially in Somersetshire and Yorkshire, &c. and it is always full of the impressions of vegetables. 2. The *white slates*, which are alkaline, comprehend three different sorts, the two first of which have frequently between the plates fine impressions of skeletons and fish, and of several kinds of crustaceous animals, as well as elegant superficial dendritæ, and are found in different parts of Germany; the third, which is generally thick-set with veins of coarse spar, is dug in several parts of this kingdom. 3. The *ash* and *grey slates* include two sorts of those which are alkaline, one found in the alps of Savoy, the other in Schwartzburg and Saxony, and three species of such as are not acted upon by acids; one found in Wales, and applied to no use, because it breaks into short slips like wooden lathes, but used in some parts of England, where it is found, as a whet-stone; another found in Carnarvonshire, and other parts of the kingdom, which splits into laminæ of about $\frac{1}{4}$ of an inch, and makes both an elegant and excellent covering for houses; it is sometimes found of a pale bluish grey, and sometimes of a deep grey colour with a cast of purple.

The strata of this stone, according to Dr. Woodward, usually lie very much inclining, and are of a considerable extent. At Mullinecke, in Wales, the *slate* lies thus, and reaches from near the surface to the level of the tide that flows up the river, in the cliffs of which it lies. It may go much deeper, for it has not been examined to the bottom there; but what is observable in this place is, that there are evident flexures or bendings in several parts of the strata, and these always run from the top downwards; in the other parts of the same strata there are several perpendicular fissures or cracks, but they are narrow like cracks, and always empty.

It appears from this, that at the time when the bed of *slate* cracked in some places, it was so tough as to abide being bent in others, by which means these flexures were formed. Sometimes the beds of *slate* are cracked at the angles of these flexures, the intermediate mass, though parted from the rest, lying obliquely. It is observed thus cracked also in many parts of Yorkshire.

The third species belonging to this class is composed of a grey earthy matter, indurated by crystal, and on being first dug is solid and hard, but on being exposed to the weather, readily falls into shivers: it is always full of curious impressions of vegetables, chiefly of a blackish colour, and is found in the coal counties of this kingdom, and in most other parts of Europe where coal is dug: this *slate* is applied to no use. 4. The *red slates* are not acted upon by acids, of which there are two species; one of a fine dark purple colour, of a smooth and even surface, and composed of a number of thin plates, impenetrable by water, and, when written on, bearing white characters with a slight reddish cast: of this *slate* there are vast quarries in the northern counties of England, and in Caernarvonshire in Wales, as well as in other parts of Europe; and the other, which is a coarse earthy *slate*, of a deep brownish red colour, and rough surface, but glittering with small spangles of a silvery talc, and frequently adorned with some rude black dendritæ: the characters written on it are of the same colour as the *slate*: it is dug in great quantities in some parts of Germany. The *slate* mentioned by Woodward, Cat. c. b. 26. and found near Hereford, is probably a variety of this species. 5. The *yellow slates*, which are alkaline, and to which belongs that species ranked by most writers, on account of its elegant polish and beauty, as a species of marble, and from the delicate black arbuscular delineations or dendritæ with which it is adorned, called the *Florentine dendrites marble*. This *slate* is dug near Florence, and found in thin strata; it is greatly valued for inlaying all kinds of ornamental works of cabinets, tables, &c. 6. The *blue slates*, which are not acted upon by acids; to this class belongs the greyish blue *slate*, impenetrable by water, and on which the written characters are whitish, which is dug in great quantities in many parts of England and Wales, and is a well known and useful stone for the covering of houses: it is supplied also by most parts of Europe; but the English *slate* is most esteemed, and quantities of it are annually exported; those of Caernarvonshire in Wales, as being more durable and light, are chiefly valued.

To judge of the goodness of *slate*, Mr. Colepress, in the Philosophical Transactions, orders it to be knocked against any hard body, to make it yield a sound; if the sound be good and clear, the stone is firm and good; otherwise it is friable and soft.

Another method of proving its goodness is, by weighing it exactly, then letting it lie six or eight hours under water, and wiping it very clean; if it weighs now more than it did before, it is of that kind that soaks in water, and therefore will not long endure without rotting the laths or timber.

Another method of trial is, by placing a *slate* half a day perpendicularly in a vessel of water, so as to reach a considerable height above the level thereof: if the *slate* be firm and close; then it will not draw water, that is, the water will not have ascended above half an inch above the level of that in the vessel, nor that perhaps any where but at the edges, the texture whereof might be loosened by hewing; but a bad stone will have drawn the water to the very top, be it as high as it will.

There are *slates* in several places, which the most experienced *slaters*, or coverers, conjecture to have continued on houses several hundreds of years, and which are yet as firm as when first put up.

7. The *green slates*, not acted upon by acids, are dug in Cumberland and in some other parts of England and Wales, and also in Sweden, and several parts of Germany, where they are used with other kinds for slating houses: they are impenetrable by water, and the characters written on them are white. When burnt they acquire a purple colour, and much resemble the purple *slate*; and therefore it has been suggested, that the purple kind owes its origin to this species, which acquires that colour and hardness by heats, exhalations, and other subterranean causes. 8. The *variegated slates*, which are alkaline, to which belongs the *graptolithus* of Linnæus; a species which, on account of its polish and beauty, has been reckoned a species of marble by most authors. Its colour is generally a pale yellowish brown, elegantly variegated with spots of different shades, of a deep reddish brown colour, which are divided into compartments by straight lines, or fine cracks or flaws in the stone, and represent ruins of castles, towers, &c. whence this stone has generally obtained the name of the Florentine ruined marble. Of this *slate* Mr. Da Costa enumerates three varieties. It is dug in the same quarries near Florence, with that described under the fifth class; and is much used for inlaid works, cabinets, tables, &c. Hist. of Fossils, p. 165, &c.

M. Leibnitz informs us, in the history of the French academy, that in several parts of the duchy of Brunswick, particularly about Osteroda, &c. there are horizontal veins of *slate*, wherein are found very exact and finished representations of various kinds of fishes and plants, appearing in their natural breadth and length, but without any thickness. The same impressions are also frequently found on other substances, as on the black *slate* that lies over veins of coals.

M. Leibnitz accounts for this appearance, by supposing the lakes and meadows of these places to have been covered over with a kind of earth, which has buried the fishes and plants; or that some very muddy water, much impregnated with earth, has covered them up, or carried them away. This earth he takes to have since hardened into *slate*; and by length of time, or some other cause, to have consumed the delicate matter of the fish, &c. much as the bodies of flies or ants, which are found inclosed in amber, are quite dissipated, and nothing left, but, as it were, a mere delineation.

The matter of the fish, or plant, thus consumed, has left its form impressed in the *slate*, by means of the cavity remaining therein; which cavity hath sometimes been afterwards filled up with a metallic matter: whether by reason that the subterranean fire, in baking the earth into *slate*, has separated a metal therefrom, or that a metallic vapour, penetrating the *slate*, has become fixed in these cavities. See DENDRITIS and *Adventitious* FOSSILS.

SLATE, *Irish*, *Lapis Hybernicus*, a stone of the *slate*-kind, so strongly impregnated with alum, as to deserve the name of an alum-ore. It is often likewise found to contain a large portion of vitriol; and, from Dr. Rutty's experiments, it appears to be a matrix of ferrugineous vitriol.

It is found in great abundance in many parts of Ireland, as also in several of our own counties. Many prescribe it in powder as a styptic, in hæmorrhages of all kinds, with success; and accordingly it has been sometimes taken by the common people, powdered and mixed with spruce beer, against inward bruises: but perhaps it would be full as prudent for the person who knows to what salt or salts it owes this virtue, to give those salts alone, in a dose that he can depend upon, and without the load of earthy matter which is always to be found in this powder.

This substance beaten to powder, and infused twelve hours in water, will impart so much of the vitriolic salt it contains to the water, that being mixed with an infusion of galls the liquor will become reddish, in the same manner that the medicinal waters of many parts of this kingdom do, which not containing vitriol enough to make ink with, the infusion of galls yet turn reddish with them. It is hence not improbable, that many of these waters owe their virtues to this very substance.

This on being calcined, in order to try whether it be an iron ore, does not, after burning, answer to the magnet, so that it seems to contain no iron at all in the state of metal. But this is observable, that it calcines to a sort of ochre, becoming of a yellow colour, and marking as ochres will do. The yellow of this *slate* being burnt too far, becomes of an orange colour, exactly like the sediment of yellow matter, which we find about the ferrugineous waters; and this sediment is hence esteemed by some to be the remains of this *slate* dissolved by the water, rather than iron ore. It is even doubted by some, whether the yellow ochres are indeed iron ores, or not; for many of them will not answer to the magnet, even after several days and nights continued calcination. It is indeed very certain, that all the naturally red ochres do contain iron, all of them having particles that answer to the magnet after a much slighter calcination than this given in vain to the yellow kinds. Phil. Transf. N° 243. p. 272.

It may be presumed, says Dr. Lewis, that this fossil consists of argillaceous earth impregnated, like the pyritæ, with sulphur and iron; and that, like the pyritæ also, it is capable of becoming vitriolic by long exposure to the air and moisture. Mat. Med.

SLAVE, a person in the absolute power of a master, with regard to his life and fortune. See SERVANT.

Menage and Vossius derive the word from *Sclavus*, the name of a Scythian people, whom Charlemagne condemned to perpetual imprisonment. See SCLAVONIC.

The Romans called their *slaves*, *servi*, from *servare*, *to keep*, or *save*; as being such as were not killed, but saved to yield money either by sale, or by their work. Though other authors are of opinion, that the Roman name *servi* might come from that of *Serbi*; as that of *slaves* from *Sclavi*, *a people*.

We find no mention of *slaves* before the deluge, but immediately after, viz. in the curse of Canaan, Gen. ix. 25. whence it is easily inferred, that servitude commenced soon after that time; for in Abraham's days we find it generally established. Some will have it to have commenced under Nimrod, because it was he who first began to make war, and of consequence to make captives; and to bring such as he took either in his battles, or irruptions, into slavery.

Among the Romans, when a *slave* was set at liberty, he changed his name into a surname; he took the nomen or prenomen of his master, to which he added the cognomen he had been called by when a *slave*. See NAME.

By the civil law, the power of making *slaves* is esteemed a right of nations, and follows, *jure gentium*, as a natural consequence of captivity in war.

This is the first origin of the right of *slavery* assigned by Justinian, Inst. i. 3, 4. whence *slaves* are called *mancipia quasi manu capti*.

The conqueror, say the civilians, had a right to the life of his captive; and having spared that, has a right to deal with him as he pleases. But this position, taken generally, is denied by judge Blackstone; who observes, that a man has a right to kill his enemy only in cases of absolute necessity for self-defence; and, it is plain, this absolute necessity did not subsist, since the victor did not kill him, but made him prisoner. Since, therefore, the right of making *slaves* by captivity depends on a supposed right of slaughter, that foundation failing, the consequence drawn from it must fail likewise. Farther, it is said, that *slavery* may begin "*jure civili*," when one man sells himself to another: but this when applied to strict *slavery*, in the sense of the laws of old Rome or modern Barbary, is also impossible. Every sale implies a price, a *quid pro quo*, an equivalent given to the seller in lieu of what he transfers to the buyer; but what equivalent can be given for life and liberty, both of which, in absolute *slavery*, are held to be in the master's disposal? His property also, the very price he seems to receive, devolves *ipso facto* to his master, the instant he becomes his *slave*: and besides, if it be not lawful for a man to kill himself, because he robs his country of his person, for the same reason he is not allowed to barter his freedom: the freedom of every citizen constitutes a part of the public liberty. In this case, therefore, the buyer gives nothing, and the seller receives nothing; of what validity then can a sale be, which destroys the very principles upon which all sales are founded? Lastly, we are told, that besides these two ways by which *slaves* "*fiunt*," or are acquired, they may also be hereditary, "*servi nascuntur*;" the children of acquired *slaves* are, *jure naturæ*, by a negative kind of birth-right, *slaves* also; but this being founded on the two former rights, must fall together with them. If neither captivity, nor the sale of one's self, can by the law of nature and reason reduce the parent to *slavery*, much less can they reduce the offspring. Blackst. Com. b. i. c. 14. Montesquieu's Spirit of Laws, b. 15. c. 2. &c.

The Lacedemonians, say some, or as others say, the Assyrians, first introduced the practice; which the Romans not only approved of, but they even invented new manners of making *slaves*; for instance, a man born free among them might sell his freedom, and become a *slave*. This voluntary *slavery* was first introduced by a decree of the senate, in the time of the emperor Claudius, and at length was abrogated by Leo.

The Romans had power of life and death over their *slaves*, which no other nations had; but this severity was afterwards moderated by the laws of the emperors; and by one of Adrian, it was made capital to kill a *slave* without a cause.

The *slaves* were esteemed the proper goods of their masters, and all they got belonged to them: but if the master were too cruel in his domestic corrections, he was obliged to sell his *slave* at a moderate price.

As *slavery* was not formally abolished by the gospel, the custom of keeping *slaves* lasted a long time in Christendom. In the time of Louis le Gros, they were so numerous in Egypt, that it was found a difficult matter to quell a body of them, who had made head against their masters: yet Bartolus, who lived in 1300, observes, there were none left in his days.

For the custom of marking, or stigmatizing *slaves*, see STIGMATIZING.

Slavery is absolutely abolished in England and France, as to personal servitude; our servants are not *slaves*, but only are subject to certain determinate services. It is said, that the moment a *slave* steps on English ground, he by law becomes free. See NEGRO.

When an attempt was made to introduce *slavery* within this nation, by stat. 1 Edw. VI. c. 3. which ordained, that all idle vagabonds should be made *slaves*, and fed upon bread, water or small drink, and refuse of meat; should wear a ring of iron round their necks, arms, or legs; and should be compelled by beating, chaining, or otherwise, to perform the work assigned them, were it ever so vile; the spirit of the nation could not brook this condition, even in the most abandoned rogues; and, therefore, this statute was repealed in two years afterwards. 3 & 4 Edw. VI. c. 16.

SLAVES make a very considerable article of traffic in America and the West Indies.

SLAUGHTER. See MANSLAUGHTER, HOMICIDE, MURTHER, BUTCHER, &c.

SLAUGHTER-*skins*, a term used by our curriers and leather-dressers for the skins of oxen, or other beasts, when fresh, and covered with the hair: such as they receive them from the *slaughter*-houses where the butchers flay the carcase.

SLEASY *holland*, a kind of holland thus called, because made in Silesia in Germany; and which, from its slightness, occasions all thin, slight, ill-wrought hollands to be called *sleasy*.

SLEDGE, a kind of carriage, without wheels, for the conveyance of very weighty things, as huge ſtones, bells, &c. The *Sledge* for carrying criminals, condemned for high treaſon, to execution is called HURDLE.

The Dutch have a kind of *ſledge*, whereon they can carry a veſſel of any burden by land. It conſiſts of a plank of the length of the keel of a moderate ſhip, raiſed a little behind, and hollow in the middle; ſo that the ſides go a little aſlope, and are furniſhed with holes to receive pins, &c. The reſt is quite even.

SLEDGE is a large ſmith's hammer, to be uſed with both hands: of this there are two ſorts, the *up-hand ſledge*, which is uſed by under workmen, when the work is not of the largeſt ſort; it is uſed with both the hands before, and they ſeldom raiſe it higher than their head. But the other, which is called the *about-ſledge*, and which is uſed for battering or drawing out the largeſt work, is held by the handle with both hands, and ſwung round over their heads, at their arm's end, to ſtrike as hard a blow as they can.

SLEDGE, among *Miners*. See DIGGING.

SLEEP, that ſtate wherein the body appearing perfectly at reſt, external objects move the organs of ſenſe as uſually, without exciting the uſual ſenſations.

Sleep, according to Rohault, conſiſts in a ſcarcity of ſpirits, which occaſions that the orifices or pores of the nerves in the brain, whereby the ſpirits uſed to flow into the nerves, being no longer kept open by the frequency of the ſpirits, ſhut of themſelves. For, this being ſuppoſed, as ſoon as the ſpirits, now in the nerves, ſhall be diſſipated, the capillaments of thoſe nerves, having no ſupplement of new ſpirits, will become lax, and cohere as if cemented together; and ſo be unfit to convey any impreſſion to the brain: beſides, the muſcles, being now void of ſpirits, will be unable to move, or even to ſuſtain the members: thus will ſenſation, and motion, be both for the time deſtroyed.

Sleep is broken off unnaturally when any of the organs of ſenſe are ſo briſkly acted on, that the action is propagated to the brain: for, upon this, the few ſpirits remaining in the brain are all called together, and unite their forces to unlock the pores of the nerves, &c. But if no object ſhould thus affect the organ, yet *ſleep* would in ſome time be broken off naturally; for the quantity of ſpirits generated in *ſleep* would at length be ſo great, that ſtretching out the orifices of the nerves, they would open themſelves a paſſage.

With regard to medicine, *ſleep* is defined, by Boerhaave, to be that ſtate of the medulla of the brain, wherein the nerves do not receive ſo copious, nor ſo forcible an influx of ſpirits from the brain, as is required to enable the organs of ſenſe, and voluntary motion, to perform their offices.

The immediate cauſe hereof appears to be the ſcarcity of animal ſpirits, which being ſpent, and requiring ſome time to be recruited, the minute veſſels, before inflated, become flaccid, and collapſe: or elſe, it is owing to ſuch a preſſure of the thicker blood againſt the cortex of the brain, as that the medulla, becoming likewiſe compreſſed by its contiguity with the cortex, the paſſage of the ſpirits is obſtructed.

The natural cauſe of *ſleep*, then, is any thing that may contribute to theſe two. And hence its effects may be underſtood: for in *ſleep* ſeveral functions are ſuſpended, their organs and muſcles are at reſt, and the ſpirits ſcarce flow through them; therefore there is a leſs conſumption of them; but the ſolid villi and fibres of the nerves are but little changed, and an equilibrium obtains throughout; there is no difference of preſſure on the veſſels, nor of velocity in the humours: the motion of the heart, lungs, arteries, viſcera, &c. is increaſed. The effects of which are, that the vital humours circulate more ſtrongly and equably through the canals, which are now freer, laxer, and opener, as not being compreſſed by the muſcles. Hence, the blood is driven leſs forcibly, indeed, into the lateral veſſels, but more equably; and through the greater veſſels, both more ſtrongly, and more equably. Thus are the lateral fibres ſenſibly filled, as being leſs traverſed, and at length they remain at reſt, with the juices they have collected: and hence the lateral adipoſe cells become filled and diſtended with an oily matter. By this means the circulation, being almoſt wholly performed in the larger blood-veſſels, becomes gradually ſlower, and at length ſcarce ſenſible, if the *ſleep* be too long continued: thus, in moderate *ſleep*, is the matter of the chyle beſt converted into *ſerum*; that into thinner humours; and thoſe into nouriſhment. The attrition of the ſolid parts is leſs conſiderable; the cutaneous ſecretion is increaſed, and all the reſt diminiſhed. The parts worn off are now beſt ſupplied, as an equable, continual repletion reſtores the humours, and repairs the ſolids, the preventing and diſturbing cauſes being then at reſt. In the mean time, while the nutritious matter is beſt prepared, there is an aptitude in the veſſels to receive, and the humours to enter, and the means of application, and conſolidation, are at liberty: hence, a new production, and accumulation of animal ſpirits, in all the humours, as to matter; and in the minuteſt veſſels, as to repletion: the conſequence of which is, an aptitude for waking, and an inaptitude for *ſleep*; ſo that upon the firſt occaſion the man awakes. For inſtances of extraordinary *ſleep*. See Phil. Tranſ. Abr. vol v. p. 353. Mem. Ac. Abr. vol. iv. p. 360. Med. Obſ. vol. i. 280.

Some of the more extraordinary phenomena of *ſleep* yet to be accounted for, are, that when the head is hot, and the feet cold, *ſleep* is impracticable: that ſpirituous liquors firſt bring on drunkenneſs, then *ſleep*: that perſpiration, during the time of *ſleep*, is twice as great as at other times: that, upon *ſleeping* too long, the head grows heavy, the ſenſes dull, the memory weak, with coldneſs, pituitouſneſs, an indiſpoſition of the muſcles for motion, and a want of perſpiration: that much *ſleeping* will ſuſtain life a long time, without either meat or drink: that upon a laudable *ſleep* there always follows an expanſion of all the muſcles, frequently a repeated yawning, and the muſcles and nerves acquire a new agility: that fœtuſes always *ſleep*; children often; youth more than grown perſons, and they more than old men; and that people, recovering from violent diſtempers, *ſleep* much more than when perfectly at health.

SLEEP, *Somnus*, in *Mythology*, the ſon of Erebus and of Night, according to Homer and Heſiod, and the brother of *Mors*, or *Death*.

Virgil (*Æn.* vi. v. 278), aſſigns to this deity an abode with Death, in the ſubterraneous or inviſible world.

Statius and Ovid place the chief reſidence, or great palace of *Somnus*, on our earth, in the country of the Cimmerians. Theb. x. v. 84 to 117. Met. xi. v. 592 to 645.

This deity is moſt commonly repreſented by the artiſts as a ſoft youth, ſtretched at his eaſe on a couch, reſting his head on a lion's ſkin, and ſometimes on a lion; with one arm either a little over or under his head, and the other dropping negligently by the ſide of the couch, and either holding poppies, or a horn with the juice of poppies in it. He is often winged, and much reſembles a little Cupid, from whom he is diſtinguiſhed by the lizard (an animal ſuppoſed to *ſleep* half the year) placed at his feet. There is ſcarce any one of the deities that is more fully and particularly deſcribed by the poets than this deity of *Sleep*. Spence's Polymetis, p. 263, &c.

SLEEP *of plants*. See PLANTS.

SLEEP *of the ſoul*, in *Theology*, denotes that inſenſible, unconſcious, and inactive ſtate, into which ſome have ſuppoſed, that mankind are removed at death, and in which they remain till the period of the general reſurrection and laſt judgment. The term *ſleep* has been uſed by way of contradiſtinction to that which has been commonly called the intermediate or ſeparate ſtate. Of the advocates of this opinion, ſome have allowed the eſſential diſtinction between body and ſpirit, and the natural immortality of the human ſoul; ſo that, being a ſubſtance and not a mode, it will go on to exiſt, till by ſome poſitive act of the Creator it is annihilated. They cannot admit the ſuppoſition, that the whole man becomes extinct at death, or that death deſtroys or annihilates the thinking ſubſtance; becauſe, they ſay, the reſurrection, on this hypotheſis, will not be a reſurrection, but a creation of a new ſet of beings: if death annihilates us in this ſenſe, there can be no future ſtate; becauſe, a being who has loſt his exiſtence cannot be recovered. Accordingly, they maintain, that what happens to the ſoul at death can be no more than a ſuſpenſion of the exerciſe of its faculties, or an incapacitation, from which it will, by the power of Chriſt, be delivered at the reſurrection: and they alledge, that there is an infinite difference between the annihilation of the ſoul at death, and its incapacitation; becauſe, one who believed the former, could not poſſibly entertain the hope of a future ſtate; but one who believes the latter, might reaſonably entertain ſuch a hope. Death, they ſay, is a diſtreſs in which our ſpecies has been involved by extraordinary cauſes, and from which we have obtained the hope of being ſaved by the moſt extraordinary means, viz. by the interpoſition of Jeſus Chriſt, who, taking upon him our nature, and humbling himſelf to death, has acquired the power of deſtroying death, and is on this account ſtyled the Saviour of the world. However, moſt of thoſe who deny the notion of an intermediate ſtate of conſcious perception between death and the general reſurrection, reject the ſuppoſition of two diſtinct natures in man, and conſider that principle, which is called the *ſoul*, not as a ſpiritual ſubſtance, but as a quality, or property, either ſuperadded to matter by the Creator of our frame, or reſulting

sulting from the organization of the human body, and particularly of the brain. See Soul.

Accordingly, they alledge, that when the organized system, to which the power of thinking, &c. is annexed, on which it depends, and from the organization of which, as some maintain, it necessarily results, is dissolved by death; all the percipient and thinking powers of man, all his capacities of action, and of suffering, or of enjoyment, must be extinguished, and cease of course. And if the property of thinking necessarily attends the property of life, as some apprehend, nothing can be requisite to the restoration of all the powers of the man, but the restoration of the body (no particle of which can be lost) to a state of life. Whatever is decomposed, it is said, may certainly be recomposed by the same Almighty Power that first composed it, with whatever change in its constitution, advantageous or disadvantageous, he shall think proper; and then the powers of thinking, and whatever depended upon them, will return of course, and the man will be, in the most proper sense, the same being that he was before. Those who hold this opinion maintain, that, according to the Scriptures, life and immortality were brought to light by the gospel of Christ, in a sense exclusive of all other teachers, and all other revelations, at least from the birth of Moses downwards; exclusive, likewise, of all information from the light of nature, or the result of philosophical disquisition on the substance or qualities of the human soul. They hold, moreover, that the sentence pronounced upon our first parents, imported a total deprivation of life, without any reserve, or saving to the life of the soul; and consequently, that eternal life, or a restoration and redemption from the consequences of this sentence, was effected for, revealed, consigned, and insured to man, in and through Christ, and will be accomplished in no other way than that spoken of by Christ and his apostles, who, they say, have left no room to conclude, that there is a separate or intermediate life for the soul, when disunited from the body.

The learned Dr. Law, bishop of Carlisle, having, with a particular view to the controversy concerning the intermediate state, enumerated the several passages both in the Old and New Testament, in which the words, that are translated soul or spirit in our version, occur, maintains, that none of them ever stand for a purely immaterial principle in man, or a substance wholly separable from, and independent of the body; and after examining the account which the Scriptures give of that state to which death reduces us, he observes, that it is represented by *sleep*, by a negation of all life, thought, or action; by rest, resting-place, or home, silence, oblivion, darkness, destruction, or corruption. He adds, that the Scripture, in speaking of the connection between our present and future being, doth not take into account our intermediate state in death; no more, than we, in describing the course of any man's actions, take in the time he *sleeps*: and that, therefore, the Scriptures (in order to be consistent with themselves) must affirm an immediate connection between death and judgment. As for those texts, that are usually alledged on the other side of the question, which he has cited and endeavoured to accommodate to his own opinion, he thinks that they are either quite foreign to the point, or purely figurative, or capable of a clear and easy solution on the principle which he adopts, viz. that the times of our death and resurrection are coincident: and that they cannot be fairly opposed to the constant, obvious tenor of the sacred writings. With respect to philosophical arguments, deduced from our notions of matter, and urged against the possibility of life, thought, and agency, being so connected with some portions of it as to constitute a compound being or person, he imagines that they are merely grounded on our ignorance, and that they will equally prove against known fact and observation, in the production of various animals, as against the union of two such heterogeneous principles as those of the soul and body are supposed to be. With respect to the consequences of either opinion, he says, that, on the one side, there is nothing more than a temporary cessation of thought, which can hurt nobody, except the self-interested papist, or the self-sufficient deist; but on the other side, there is a manifest derogation from, if not a total subversion of that positive covenant, which professes to entitle us to everlasting life. He adds, that all proper and consistent notions of death, resurrection, and a future judgment, are confounded, and in fine, all the great sanctions of the gospel rendered unintelligible or useless.

The doctrine of the New Testament, say another writer against a separate state, is, that man shall become immortal, by the way of a resurrection of the dead, a restoration of the whole man to life; and the New Testament is so far from acknowledging any intermediate consciousness in man, between death and the resurrection, that it always speaks of that interval as a *sleep*, which implies a suspension of the thinking faculty, a rest from those labours, which require thought, memory, consciousness, &c. during which those faculties are useless.

Besides, the scriptural system of immortality supposes, that man had forfeited his original title to immortality, and would never have received it, but for the interposition of a Redeemer. The consequence of this doctrine is, that between the time of the forfeiture and the actual appearance of the Redeemer, the dead could have life in no sense at all; and that neither before nor after the appearance of the Redeemer, dead men were, or would be restored to life, otherwise than in the way revealed by him, namely a resurrection of the dead.

On the other hand, the advocates of a separate state insist, that the soul, being an active, simple, uncompounded, immaterial substance, is immortal in its own nature, and capable of an active and conscious existence, in a state of disunion and separation from the body: that this natural capacity of the soul was not impaired, or at all affected by any thing that happened upon the transgression of our first parents; that the death to which they were condemned was only the death of the body: hence, they infer, that there is, and would have been a future immortal state of being beyond the present life, and (the moral attributes of God presupposed) a just retribution therein, independent of the doctrine of a resurrection of the dead; and that in the interval between death and the general resurrection, there is an intermediate state, in which the departed souls of good men are supposed to have an imperfect reward, and the souls of the wicked an imperfect punishment; but that every one, at the period of the reunion of the soul and body and of final judgment, will receive a full and complete recompence for the deeds done in the body.

In proof of this opinion, they alledge a variety of passages both from the Old and New Testament, the principal of which we shall here enumerate; several of which they think cannot be consistently explained on the other hypothesis. Gen. ii. 7. xv. 15. xxxvii. 35. Exod. iii. 6. 1 Sam. xxviii. 11.—19. 1 Kings xvii. 21, 22. Ps. xxxi. 5. Eccles. iii. 21. xii. 7. Matt. x. 28. xvii. 3. Luke xvi. 19. xx. 38. xxiii. 43. xxiv. 39. Acts i. 25. vii. 59. 2 Cor. v. 8. xii. 2. Phil. i. 21.—24. 1 Pet iii. 19. iv. 6. Heb. xi. 40. xii. 23. Rev. vi. 9, 10. xiv. 13.

To these authorities of Scripture, they add the testimony of the fathers of the church, who lived in or near the times of the apostles, who are said to be unanimous in this opinion, and persuaded that the soul of every man upon the dissolution of the body died not, but had a proper place to go to, and that accordingly this doctrine is to be found in the most ancient Christian liturgies.

Great stress has been laid, in this controversy, on the meaning of the term death, as it occurs in Scripture, and particularly in the sentence denounced against the first parent of the human race. The bishop of Carlisle observes, that the word *death*, in its original and obvious sense, implies a cessation of all natural life, or a real dissolution and destruction of the whole man. But Mr. Farmer, a well known and excellent writer, in the introduction to his learned work of the General Prevalence of the Worship of Human Spirits, &c. 1783, has taken some pains to ascertain the meaning of the word death, in the threatening denounced against Adam. To this purpose, he says, that if human spirits were worshipped in the age of Moses, particularly in Egypt and Phœnicia, the word death could not at that time, and in those countries, denote more than the destruction of bodily life; for, if this term had farther included in it the insensibility or extinction of the soul, the dead would not have been honoured as gods. And if Moses had used it in this extensive sense, he would have been misunderstood by the Egyptians, who asserted the immortality of the soul, and by the Hebrews, who dwelt among them, and had adopted their system of religion.

This learned writer, in confirmation of this interpretation of death, observes, that, although one great design of Moses in giving an account of the introduction of death into the world, was to guard against the worship of departed spirits, and though nothing could have answered this design more effectually than representing the soul of Adam as a mere quality, or as the result of the peculiar structure and organization of his body, yet, so far is he from supposing this to be the case, that according to him, after the body of the first man was perfectly organized by the immediate hand of the Almighty, he did not become a living soul or person, till God breathed into his nostrils the breath of life; a principle distinct from the dust out of which his body was formed, and, there-

therefore, capable of ſubſiſting in a ſtate of ſeparation from it. Nor does Moſes uſe the ſame language in relating the formation of any other living creatures; which proves that the principle of life in man is of a ſuperior kind to that in brutes.

Beſides, the ancient patriarchs did not believe that the ſoul of man periſhed with his body. Agreeably to the moſt ancient opinion concerning departed ſpirits, the ſacred writers ſuppoſed the ſouls of the dead to exiſt in *ſheol*, or *hades*, a place inviſible to human ſight, and that, in the diſtribution of them, regard was had to the former relation in which they ſtood to one another. Moreover, Moſes himſelf believed the ſeparate ſubſiſtence of the ſoul, and has even given it a divine ſanction. Gen. xv. 15.

Nor do any of the ſacred writers ever deſcribe death in terms different from thoſe uſed by perſons, who certainly acknowledged the continuance of the ſoul after it. *Sleep*, by which it is deſcribed, is not a ſtate of nonexiſtence, but of reſt; and it is well known, that this ſoft image of death was commonly uſed to expreſs the thing itſelf by thoſe who aſſerted the exiſtence of ſouls in hades. Silence, oblivion, darkneſs, and corruption, by which the ſtate of the dead is deſcribed, refer only to the body, or to the ſuppoſed ſtate of the ſoul while it was in ſheol, and are not peculiar to the ſacred writers, but were common in all countries, where both the popular belief, and the eſtabliſhed worſhip, were inconſiſtent with the notion of the ſoul's periſhing with the body.

And many of the terms, by which death was deſcribed in all countries, clearly imply, and are built upon, a belief of the diſtinction between ſoul and body, and of their being ſeparated at death.

According to the Greeks, to die was to depart, to go away; and the writers of the New Teſtament deſcribe death by a departure, Luke ix. 31. that is, of the ſoul from the body to another ſtate. To all which it may be added, that the Jews, from the time of their return from Babylon, aſſerted the ſeparate exiſtence of the ſoul after death; as appears from their imitation of the heathen idolatry, from their evocation of the dead, and from the early references in Scripture to the receptacle of departed ſouls, and many other proofs. This was the opinion, not only of a few eminent individuals, ſuch as Philo, but of the learned ſects, the Eſſenes, and Phariſees, and of the whole body of the people, almoſt without exception, in the time of our Saviour. To this principle the Phariſees, whoſe doctrine formed the popular creed, added another, viz. the reſurrection of the dead. The Sadducees believed the extinction of the ſoul at death, and did not admit the reſurrection: the Phariſees, on the other hand, admitted the latter and denied the former. By the term reviviſcence, or return to life, by which the reſurrection is deſcribed, the Jews could not mean creating anew the ſoul that had been deſtroyed, becauſe, if it were poſſible, they did not allow that the former ſoul periſhed at death. Nor did they believe, that man had no ſoul; and, therefore, that his reſurrection conſiſted in the re-organization of his former body, or in furniſhing him with a new body, organized as that was; becauſe this is a flat contradiction to their belief of the diſtinction between ſoul and body, and the ſeparate exiſtence of the former. What then did they, or could they mean by the reſurrection to life, but the reſtoration of that kind of life which they had loſt, by the reunion of their ſouls to a human body, either the ſame which they had before, or one in effect the ſame? In virtue of this reunion, the *dead* man became a *living* man, the ſame as he was before he died, with the ſame conſciouſneſs and recollection, the principle of conſciouſneſs having never periſhed. And if, in or near the time of Chriſt, the terms reſurrection, reviviſcence, or living again, as uſed both by Jews and Gentiles, denoted the reunion of a ſoul to a human body, the ſame terms, when adopted by Chriſt and his apoſtles, muſt have the ſame meaning: and every one would underſtand them in their common and ordinary ſignification. Conſequently, if life, as expreſſing the reſurrection, ſignifies the ſoul's return to a human body, death its oppoſite, denotes its ſeparation; both terms imply the continuance of the ſoul after death: a principle, ſays Mr. Farmer, held in the moſt ancient times, by Heathens and Jews, by patriarchs and prophets, and by the people, particularly in the times of Moſes and the Meſſiah, and which gives great probability to the doctrine of a reſurrection.

The advocates of the *ſleep of the ſoul*, on the other hand, earneſtly contend, that it was the opinion of the apoſtles and early Chriſtians, that, whatever be the nature of the ſoul, its percipient and thinking powers ceaſe at death; and that they had no hope of the reſtoration of thoſe powers, but in the general reſurrection of the dead.

2

Before the council of Florence, held in 1439, under pope Eugenius IV. the ancient doctrine, both of the Greek and Latin churches, is ſaid to have been, that the ſouls of the ſaints were in *abditis receptaculis*, or in *exterioribus atriis*, where they expected the reſurrection of their bodies, and the glorification of their ſouls; and though the fathers believed all of them to be happy, yet they did not think they would enjoy the beatific viſion before the reſurrection. But in this council it was decreed, that the ſouls of thoſe, who, after baptiſm, have incurred no ſtain of ſin, and alſo thoſe ſouls, which having contracted the ſtain of ſin, whether in their bodies or diveſted of their bodies, have been purged by the ſacrifice of the maſs, prayer, and alms, are received into heaven immediately, &c.

In the Lateran council, held under Leo X. in 1513, it was decreed, that the ſoul is not only truly, and of itſelf, and eſſentially the form of the human body, as is expreſſed in the canon of pope Clement V. publiſhed in the general council of Vienne, but likewiſe immortal, and according to the number of bodies into which it is infuſed, is ſingularly multipliable, multiplied, and to be multiplied.

However, Peter Pomponatius, a philoſopher of Mantua, publiſhed a book in 1516, on the immortality of the ſoul, in which, after ſtating the moral arguments againſt the mortality of the ſoul, and endeavouring to ſhew that they are weak and inconcluſive, infers upon the whole, that the immortality of the ſoul, being a problematica queſtion, we can have no aſſurance of it but from revelation, and that they who would build immortality upon any other foundation, only verify the character given to certain ſelf-ſufficient reaſoners by the apoſtle, viz. profeſſing themſelves wiſe, they became fools.

In 1520, Luther, in the defence of his propoſitions, which had been condemned by a bull of Leo X. ranks the natural immortality of the ſoul among the monſtrous opinions of popery; and he afterwards made uſe of the doctrine of the *ſleep of the ſoul* as a confutation of purgatory and ſaint-worſhip, and he is ſaid to have continued in that belief to the laſt moment of his life.

William Tyndall alſo, the famous tranſlator of the Bible into Engliſh, in defending Luther's doctrine againſt ſir Thomas More's objections, conſiders the *ſleep of the ſoul* as the doctrine of the proteſtants in his time, and founded on the Scriptures: though in conſequence of the oppoſition given to this doctrine by Calvin, in his Pſychopannychia, publiſhed in 1534, and the turn hereby given to the ſentiments of the Reformed in general, he ſeems to have recanted his opinion. Calvin, however, ſeems to have been embarraſſed with the ſouls of the wicked, and ſays, he would only be reſponſible for the faithful.

The firſt expreſs condemnation of the doctrine of the *ſleep of the ſoul*, in a proteſtant confeſſion, occurs in the fortieth of king Edward's Articles, compoſed in 1552.

After the long prevalence of the doctrine of the intermediate ſtate, that of the *ſleep of the ſoul* has of late years been revived, and as one of its zealous advocates affirms, gains ground, not ſo much from conſiderations of philoſophy, as from a cloſer attention to the ſenſe of the Scriptures.

We ſhall cloſe this article with obſerving, that a ſingular hypotheſis was advanced a few years ago by Dr. Caleb Fleming, and of late vindicated by an anonymous writer; and this is, that the reſurrection takes place immediately after death. On this ſubject ſee Law's Appendix and Poſtſcript to his Conſiderations on the Theory of Religion, &c. 1774. Hiſtorical View of the Controverſy concerning an intermediate State, &c. 1772. Prieſtley's Diſquiſitions on Matter and Spirit, 1777. Correſpondence between Dr. Price and Dr. Prieſtley, 1778, and the publications of Steffe, Warburton, Goddard, Coward, Peckard, Jortin, &c. on both ſides of the queſtion, cited by the author of the Hiſtorical View, &c. Fleming's Search after Souls.

SLEEPERS, in *Natural Hiſtory*, a name given to ſome animals which ſleep all the winter: ſuch as bears, marmotes, dormice, bats, hedge-hogs, &c. Theſe do not feed in winter, have no ſenſible evacuations, breathe little, or not at all, and moſt of the viſcera ceaſe from their functions. Some of theſe creatures ſeem to be dead, and others to return to a ſtate like unto that of the fœtus before birth. In this condition they continue, till by length of time maturating the proceſs, or by new heat, the fluids are attenuated, the ſolids ſtimulated, and the functions begin where they left off. See Dr. Stevenſon in Med. Eſſ. Edinb. vol. v. art. 77. See Migration.

Sleeper, in *Building*, a name uſed for the oblique rafter, that lies in a gutter.

Sleepers, in the *glaſs trade*, are the large iron bars croſſing the ſmaller ones, and hindering the paſſage of the coals, but leaving room for the aſhes.

Sleepers,

SLEEPERS, in the *Military Art*. See PLATFORM.

SLEEPERS, in a *Ship*, a name formerly given by shipwrights to the thick stuff placed longitudinally in a ship's hold, opposite to the several scarfs of the timbers. It is now properly applied to the knees which connect the transoms to the after-timbers on the ship's quarter. Falconer.

SLEETS, in *Gunnery*, are the parts of a mortar, passing from the chamber to the trunnions, for strengthening that part.

SLEEVE, *Hippocrates's*. See HIPPOCRATES.

SLICH, in *Metallurgy*, the ore of any metal, particularly of gold, when it has been pounded, and prepared for farther working.

The manner of preparing the *slich* at Chremnitz, in Hungary is this; they lay a foundation of wood three yards deep, upon this they place the ore, and over this there are four and twenty beams, armed at their bottoms with iron; these, by a continual motion, beat and grind the ore, till they reduce it to powder: during all this operation, the ore is covered with water. There are four wheels used to move these beams, each wheel moving six; and the water, as it runs off, carrying some of the metalline particles with it, is received into several basons, one placed behind another; and finally, after having passed through them all, and deposited some sediment in each, it is let off into a very large pit, of almost half an acre of ground; in this it is suffered to stand so long, as to deposit all its sediment, of whatever kind, and after this it is let out. This work is carried on day and night, and the ore taken away, and replaced by more, as often as occasion requires. That ore which lies next the beams, where it was pounded, is always the cleanest or richest.

When the *slich* is washed as much as they can, a hundred weight of it usually contains about an ounce, or perhaps but half an ounce of metal; which is not all gold, for there is always a mixture of gold and silver; but the gold is in the largest quantity, and usually is two thirds of the mixture: they then put the *slich* into a furnace with some lime-stone, and flaken, or the scoria of former meltings, and run them together. The first melting produces a substance, called *lech*; this lech they burn with charcoal, to make it lighter, to open its body, and render it porous, after which it is called *rost*; to this rost they add sand in such quantity as they find necessary, and then melt it over again.

They have at Chremnitz many other ways of reducing gold out of its ore, but particularly one, in which they employ no lead during the whole operation; whereas, in general, lead is always necessary, after the before mentioned processes. See GOLD.

SLIDING, in *Mechanics*, *superincessus radens*, is, when the same point of a body, moving along a surface, describes a line on that surface.

Such is the motion of a parallelepiped, protruded along a plane.

SLIDING *rule*, a mathematical instrument, serving to work questions in gauging, measuring, &c. without the use of compasses; merely by the *sliding* of the parts of the instrument one by another, the lines and divisions whereof give the answer, by inspection.

This instrument is variously contrived, and applied by various authors, particularly Everard, Coggeshall, Gunter, Hunt, and Partridge; but the most usual and useful ones, are those of Everard and Coggeshall; the description and uses whereof are as follow:

SLIDING *rule*, *Everard's*, is principally used in gauging; being ordinarily made of box, a foot long, an inch broad, and $\frac{6}{10}$ of an inch thick. It consists of three parts: a rule, on each side whereof, *a b*, and *c d* (*Tab.* III. *Surveying*, *fig.* 51.) is a groove, and two small scales, or *sliding* pieces, *m n*, *slide* in the grooves. When both these pieces are drawn out to their full extent, the instrument is three feet long.

On the first broad face of the instrument *a b*, are four lines of numbers; for the properties, &c. whereof, see GUNTER's *line*. The first, marked A, consisting of two radiuses numbered 1, 2, 3, 4, 5, 6, 7, 8, 9, 1; and then 2, 3, 4, 5, &c. to 10. On this line are four brass centre-pins, two in each radius; one in each whereof is marked M B, to signify that the number it is set against, 2150.42, is the number of cubic inches in a malt-bushel; the other two are marked with A, to signify that the numbers they are set against, viz. 282, are the cubic inches in an ale-gallon. The second and third lines of numbers are on the *sliding* pieces, and are exactly the same with the first. They are distinguished by the letter B. Close to the figure 7, in the first radius, is a dot marked *S i*, set exactly over .707, denoting .707 to be the side of a square inscribed in a circle, whose diameter is unity. Close to 9 is another dot, marked *S e*, set over .886, which is the side of a square, equal to the area of a circle, whose diameter is unity. Another dot, nigh W, is set over 231, the number of cubic inches in a wine-gallon; and another near C, is set over 3.14 the circumference of a circle, whose diameter is unity. The fourth line of numbers, marked M D, to signify *malt depth*, is a broken line of two radiuses, numbered 2, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1, 9, 8, 7, &c. the number 1 being set directly against M B on the first radius.

On the second broad face, marked *c d*, are 1°, A line of numbers of one radius, numbered 1, 2, 3, &c to 10, noted by the letter D. On this are four centre-pins; the first, marked W G, is the gauge-point for a wine-gallon, i. e. the diameter of a cylinder, whose height is an inch, and content 231 cubic inches, or a wine-gallon, which is 17.15 inches: the second centre-pin A G stands at the gauge-point for an ale-gallon, which is 18.95 inches. The third M S stands at 46.3 the side of a square, whose content is equal to the inches in a solid bushel. The fourth M R is the gauge-point for a malt-bushel, which is 52.32 inches. 2°, Two lines of numbers on the *sliding* piece, which are exactly the same as those on the *sliding* piece on the other side, called C. Close to the division 8 is a dot marked *c*, which is set to .795, the area of a circle whose circumference is unity; and another, marked *d*, stands at .785, the area of a circle, whose diameter is unity. 3°, Two lines of segments, each numbered 1, 2, 3, to 100; the first, for finding the ullage of a cask, taken as the middle frustum of a spheroid, lying with its axis parallel to the horizon; and the other, for finding the ullage of a cask standing.

Again, on one of the narrow sides, noted *e*, are 1°, A line of inches, numbered 1, 2, 3, &c. to 12, each subdivided into ten equal parts. 2°, A line, by which, with that of inches, we find a mean diameter for a cask, in the figure of the middle frustum of a spheroid: it is numbered 1, 2, 3, &c. to 7, and marked *spheroid*. 3°, A line for finding the mean diameter of a cask, in the figure of the middle frustum of a parabolic spindle, which gaugers call the *second variety of casks*; it is numbered 1, 2, 3, &c. and noted *second variety*. 4°, A line, by which we find the mean diameter of a cask of the third variety, i. e. of a cask in the figure of two parabolic conoids, abutting on a common base; it is numbered 1, 2, 3, &c. and noted *third variety*.

On the other narrow face, marked *f*, are 1°, A foot divided into 100 equal parts, marked F M. 2°, A line of inches, like that before mentioned, noted I M. 3°, A line for finding the mean diameter of the fourth variety of casks, which is the middle frustum of two cones, abutting on a common base. It is numbered 1, 2, 3, &c. and noted F C, signifying frustum of a cone.

On the backside of the two *sliding* pieces are a line of inches, from 13 to 36, when the two pieces are put endwise; and against that, the correspondent gallons, or hundred parts, that any small tub, or the like open vessel (from 13 to 36 inches diameter), will contain at one inch deep.

Mr. Overley, and other writers on this subject, have suggested some improvements in the construction of this instrument. See Overley's Young Gauger's Instructor, p. 108.

SLIDING *rule*, *use of Everard's*. 1°, To multiply one number by another. Suppose 4 required to be multiplied by 6: set 1 on the line of numbers B, to 4 on the line A; then, against 6 upon B is 24, the product sought upon A. Again, to multiply 26 by 68, set 1 on B to 26 on A; then, against 68 on B is 1768 on A, the product sought.

2°, To divide one number by another. Suppose 24 to be divided by 4: set 4 on B to 1 on A; then against 24 on B is 6 on A, which is the quotient. Again, to divide 952 by 14; set 14 on A to 1 on B, and against 952 on A you have, on B, 68, which is the quotient.

3°, To work the rule of three. If 8 give 20, what will 22 give? set 8 on B to 20 on A, then against 22 on B stands 55 on A, the number sought.

4°, To find a mean proportional between two numbers, suppose between 50 and 72: set 50 on C to 72 on D; then against 72 on C you have 60 on D, which is the mean required.

5°, To extract the square root of a number. Apply the lines C and D to one another, so that 10 at the end of D be even with 10 at the end of C; then are these two lines a table, shewing the square root of any number less than 100000 by inspection: for against any number on C, the number answering to it on D, is the square root thereof. Note, if the given number consists of 1, 3, 5, or 7 places of integers, seek it on the first radius, on the line C, and against it is the root required at D.

6°, Either the diameter or circumference of a circle being given, to find the other. Set 1 on the line A against 3,141 (to which is written C), on the line B; and against any

any diameter on the line A, you have the circumference on B, and contrariwise: thus, the diameter being 20 inches, the circumference will be 62.831 inches; and the circumference being 94.247, the diameter will be 30.

7°, The diameter of a circle given, to find the area in inches, or in ale or wine gallons. Suppose the diameter 20 inches, what is the area? set 1 upon D, to .785 (noted *d*) on C; then against 20 on D is 314.159 the area required. Now to find that circle's area in ale-gallons, set 18.95 (marked A G) upon D, to 1 on C; then against the diameter 20 upon D, is the number of ale-gallons on C, viz. 1.11. The same may serve for wine-gallons, regard being only had to the proper gauge-point.

8°, The two diameters of an ellipsis being given, to find the area in ale-gallons. Suppose the transverse diameter 72 inches, and the conjugate 50; set 359.05 the square of the gauge-point on B, to one of the diameters (suppose 50) on A; then against the other diameter 72 on B, you will have the area on A, viz. 10.02 gallons, the content of this ellipsis at one inch deep. The like may be done for wine-gallons, if instead of 359.05 you use 249.11 the square of the gauge-point for wine-gallons.

9°, To find the area of a triangular surface in ale-gallons. Suppose the base of the triangle 260 inches, and the perpendicular let fall from the opposite angle 110 inches; set 282 (marked A) upon B to 130, half the base on A; then against 110 on B is 50.7 gallons on A.

10°, To find the content of an oblong in ale-gallons. Suppose one side 130 inches, and the other 180; set 282 on B to 180 on A; then against 130 upon B is 82.97 ale gallons, the area required.

11°, To find the content of a regular polygon in ale-gallons, one of the sides being given. Find the length of the perpendicular let fall from the centre to one of the sides: this multiplied by half the sum of the sides, gives the area. For an instance; suppose a pentagon, whose side is 1 inch, here the perpendicular will be found .837, by saying, as the sine of half the angle at the centre, which in this polygon is 36°, is to half the given side .5, so is the sine of the complement of 36°, viz. 54°, to the perpendicular aforesaid. Whence the area of a pentagon, whose side is unity, will be found 1.72 inches, which divided by 282, gives .0061, the ale-gallons in that polygon.

12°, To find the content of a cylinder in ale-gallons. Suppose the diameter of the base of the cylinder 120 inches, the perpendicular height 36 inches: set therefore the gauge-point (A G) to the height 36 on C; then against 120, the diameter on D, is found 1443.6, the content in ale-gallons.

13°, The bung and head diameters of any cask, together with its length, being given; to find its content in ale or wine-gallons. 1°, Suppose the length of a cask taken (as the middle frustum of a spheroid, which is the first case or variety) be 40 inches, its head diameter 24 inches, and bung diameter 32 inches: subtract the head diameter from that of the bung, the difference is 8. Look, then, for 8 inches on the line of inches, on the first narrow face of the rule; and against it, on the line *spheroid* stands 5.6 inches, which, added to the head-diameter 24, gives 29.6 inches for that cask's mean diameter: set therefore the gauge-point for ale (marked A G) on D, to 40 on C; and against 29.6 on D, is 97.45, the content of the cask in ale-gallons. If the gauge-point for wine (marked W G) be used instead of that for ale; you will have the vessel's content in wine-gallons.

2°, If a cask, of the same dimensions as the former, be taken (as the middle frustum of a parabolic spindle, which is the *second variety*), see what inches, and parts, on the line marked second variety, stand against the difference of the bung and head diameters, which in this example is 8; and you will find 5.1 inches, which added to 24, the head diameter, makes 29.1 inches, the mean diameter of the cask: set therefore the rule, as before, and against 29.1 inches, you will have 94.12 ale-gallons for the content of the cask.

3°, If the cask taken be the middle frustum of two parabolic conoids, which is the third variety; against 8 inches, the difference of the head and bung diameters, on the line of inches, you will find 4.57 inches on the line called *third variety*; this added as before to 24, gives 28.57 for the cask's mean diameter: proceeding as before, you will find the content 90.8 gallons.

4°, If the cask taken be the frustums of two cones, which is the *fourth variety*, against 8 inches on the line of inches, you will find on the line marked F C, 4.1 inches to be added to 24 inches: the rest, carried on as before, gives the content of the cask 87.93 ale-gallons.

14°, A cask partly empty, lying with its axis parallel to the horizon; to find the quantity of liquor therein. Find its whole content as above; which suppose 97.455 gallons, and suppose the inches left dry, 8, and the bung diameter 32: then, as the bung diameter on C is to 100 on the line of segments L, so are the dry inches on C to a fourth number on the line of segments: and as 100 upon B is to the cask's whole content on A, so is that fourth number to the liquor wanting to fill up the cask, which, subtracted from the whole content of the cask, gives the liquor remaining therein, e. g. set 32, the bung diameter on C to 100 on the segment line L, then against 8, the dry inches on C, stands 17.6 on the segment line: set, therefore, 100 on B to the cask's whole content on A; and against 17.6 on B, you have 16.5 gallons on A: subtracting therefore the said gallons from 97.45, the vessel's whole content, the liquor in the cask will be 80.95 gallons.

15°, A cask standing upright, or with its axis perpendicular to the horizon, to find the liquor therein. Suppose the length of the cask 40 inches, and 10 of them dry; set 40 inches on the line C, to 100 on the segment line S; and against 10, the dry inches on the line C, stands 24.2 on S, the segment line. Set, then, 100 on B, to 97.455, the cask's whole content on A; and against 24.2 on B, you will have 23.5 gallons, which is what is wanting to fill up the cask: this, therefore, subtracted from the whole content 97.455, gives 73.955 gallons, for the quantity of liquor remaining in the cask.

16°, To find the content of any right-angled parallelepiped (*e. gr.* a cistern, uting-fat, or the like) in malt bushels. Suppose the length of the base 80 inches, the breadth 50, and depth 9 inches: set the breadth 50 on B, to the depth 9 on C; then against the length 80 on A, stand 16.8 bushels on B, the number required.

SLIDING *rule, Coggeshal's* is principally used in measuring of the superficies and solidity of timber, &c.

It consists of two rulers, each a foot long, which are framed or put together, various ways: sometimes they are made to *slide* by one another, like glaziers rules: sometimes a groove is made in the side of a common two-foot joint rule, and a thin *sliding* piece put in, and Coggeshal's lines added on that side: but the most usual and commodious way is, to have one of the rulers *slide* in a groove made along the middle of the other, as it is represented in *Tab.* III. *Surveying, fig.* 52.

On the *sliding* side of the rule are four lines of numbers, three whereof are double, that is, are lines to two radiuses, and one, a single broken line of numbers: the three first, marked A, B, C, are figured, 1, 2, 3, &c. to 9; then 1, 2, 3, &c. to 10. Their construction, use, &c. are the same as those on Everard's *sliding* rule. The single line, called the *girt-line*, and noted D, whose radius is equal to the two radiuses of any of the other lines, is broken for the easier measuring of timber, and figured 4, 5, 6, 7, 8, 9, 10, 20, 30, &c. from 4 to 5. It is divided into ten parts, and each 10th subdivided into 2, and so on from 5 to 10, &c.

On the backside of the rule, are, 1°, A line of inch-measure, from 1 to 12; each inch being divided and subdivided.

2°, A line of foot-measure; consisting of one foot, divided into 100 equal parts, and figured 10, 20, 30, &c. The backside of the *sliding* piece is divided into inches, halves, &c. and figured from 12 to 24; so that when slid out, there may be a measure of two feet.

SLIDING *rule, in measuring plain superficies; use of Coggeshal's.* 1. To measure a square. Suppose, e. gr. the sides be each 5 feet: set 1 on the line B, to 5 on the line A; then against 5 on the line B, is 25 feet, the content of the square on the line A.

2. To measure a long square. Suppose the longest side 18 feet, and the shortest 10: set 1 on the line B, to 10 on the line A; then against 18 feet, on the line B, is 180 feet, the content on the line A.

3. To measure a rhombus. Suppose the side 12 feet, and the length of a perpendicular let fall from one of the obtuse angles to the opposite side, 9 feet: set 1, on the line B, to 12, the length of the side, on the line A; then against 9, the length of the perpendicular on the line B, is 108 feet, the content.

4. To measure a triangle. Suppose the base 7 feet, and the length of the perpendicular let fall from the opposite angle to the base 4 feet; set 1 on the line B, to 7 on the line A: then against half the perpendicular, which is 2, on the line B, is 14 on the line A, for the content of the triangle.

5. To find the content of a circle, its diameter being given. Suppose the diameter 3.5 feet: set 11 on the girt-line D, to 95 on the line C; then against 3.5 feet on D is 9.6 on C, which is the content of the circle in feet.

6. To find the content of an oval or ellipsis. Suppose the longest diameter 9 feet, and the shortest 4. Find a mean proportional between the two, by setting the greater 9 on the girt line, to 9 on the line C; then, against the less number 4, on the line C, is 6; the mean proportional sought. This done, find the content of a circle, whose diameter is 6 feet; this, when found, by the last article, will be equal to the content of the ellipsis sought.

Sliding *rule, in measuring timber, use of Coggeshall's.* 1°, To measure timber the usual way. Take the length in feet, half feet, and, if required, quarters; then measure half-way back again; there girt the tree with a small cord or line; double this line twice, very evenly; and measure this fourth part of the girt or perimeter, in inches, halves, and quarters. The dimensions thus taken, the timber is to be measured as if square, and the fourth of the girt taken for the side of the square, thus; set 12 on the girt-line D, to the length in feet on the line C; then against the side of the square, on the girt-line D, taken in inches, you have, on the line C, the content of the tree in feet.

For an instance: suppose the girt of a tree, in the middle, be 60 inches, and the length 30 feet, to find the content: set 12 on the girt-line D, to 30 feet on the line C; then against 15, one fourth of 60, on the girt-line D, is 46.8 feet; the content on the line C. If the length should be 9 inches, and the quarter of the girt 35 inches, here, as the length is beneath a foot, measure it on the line of foot-measure, and see what decimal part of a foot it makes, which you will find .75: set 12, therefore, on the girt-line to 75 on the first radius of the line C, and against 35 on the girt-line is 6.4 feet on C, for the content.

2°, To measure round timber the true way. The former method, though that generally in use, is not quite just. To measure timber accurately, instead of the point 12 on the girt-line, use another, viz. 10.635; at which there should be placed a centre pin. This 10.635 is the side of a square equal to a circle, whose diameter is 12 inches. For an instance: suppose the length 15 feet, and ¼ of the girt 42 inches: set the point 10.635 to 15 the length; then against 42 on the girt-line is 233 feet for the content sought; whereas, by the common way, there arises only 184 feet. In effect, the common measure is only to the true measure, as 11 to 14. See Timber.

3°, To measure a cube. Suppose the sides to be 6 feet each; set 12 on the girt-line D, to 6 on C; then against 72 inches (the inches in 6 feet) on the girt-line, is 216 feet on C, which is the content required.

4°, To measure unequally squared timber; that is, where the breadth and depth are not equal. Measure the length of the piece, and the breadth and depth (at the end) in inches: then find a mean proportional between the breadth and depth of the piece. This mean proportional is the side of a square, equal to the end of the piece: which found, the piece may be measured as square timber. For an instance: let the length of the piece of timber be 13 feet; the breadth 23 inches, and the depth 13 inches: set 23 on the girt-line D, to 23 on C; then against 13 on C is 17.35 on the girt-line D, for the mean proportional. Again, setting 12 on the girt-line D, to 13 feet, the length on the line C, against 17.35, on the girt-line is 27 feet, the content.

5°, To measure taper timber. The length being measured in feet, note one third of it; which is found thus: set 3 on the line A, to the length on the line B; then against 1 on A is the third part on B: then if the solid be round, measure the diameter at each end in inches, and subtract the less diameter from the greater; add half the difference to the less diameter; the sum is the diameter in the middle of the piece. Then set 13.54 on the girt-line D to the length on the line C, and against the diameter in the middle, on the girt-line, is a fourth number on the line C. Again, set 13.54 on the girt-line to the third part of the length on the line C; then against half the difference on the girt-line, is another fourth number on the line C: these two fourth numbers, added together, give the content. For an instance: let the length be 27 feet (one third whereof is 9), the greater diameter 22 inches, and the less 18; the sum of the two will be 40, their difference 4, and half the difference 2, which, added to the less diameter, gives 20 inches for the diameter in the middle of the piece. Now, set 13.54 on the girt-line, to 27 on the line C, and against 20 on D is 58.9 feet. Again, set 13.54 of the girt-line to 9 on the line C; and against 2 on the girt-line (represented by 20) is .196 parts; therefore, by adding 58.9 feet to .196 feet, the sum is 59.096 feet the content.

If the timber be square, and has the same dimensions; that is, the length 27 feet, the side of the greater end 22 inches, and that of the lesser 18 inches; to find the content: set 12 on the girt-line to 27, the length on the line C; and against 20 inches, the side of the mean square on the girt-line, is 75.4 feet. Again, set 12 on the girt-line to 9 feet, one third of the length, on the line C, and against 2 inches, half the difference of the sides of the squares of the ends on the girt-line, is .25 parts of a foot: both together make 75.65 feet, the content of the solid.

The girt or circumference of a tree, or round piece of timber, given; to find the side of the square within, or the number of inches of a side, when the round timber is squared. Set 10 on A to 9 on B; then against the girt on A are the inches for the side of the square on the line B. See Dendrometer.

SLING, *funda*, a string instrument, serving for the casting of stones with the greater violence.

Pliny, l. lxxvi. c. 5. attributes the invention of the *sling* to the Phœnicians; but Vegetius ascribes it to the inhabitants of the Balearic islands, who were famous in antiquity, for the dextrous management thereof. Florus and Strabo say, those people bore three kinds of *slings*; some longer, others shorter, which they used according as their enemies were nearer or more remote. Diodorus adds, that the first served them for a head-band, the second for a girdle, and that the third they constantly carried with them in the hand.

SLINGING is used variously at sea; but chiefly for the hoisting up casks, or other heavy things, with slings, i. e contrivances of ropes spliced into themselves at either end, with one eye big enough to receive the cask, or other thing to be slung.

There are other *slings*, which are made longer, and with a small eye at each end; one of which is put over the breech of a piece of ordnance, and the other eye comes over the end of an iron crow, which is put into the mouth of the piece, to weigh and hoise the gun as they please.

There are also *slings* for the yards; which is done by binding them fast to the cross-tree aloft, and to the head of the mast, with a strong rope or chain, that if the tie should happen to break, or to be shot to pieces in fight, the yard, nevertheless, may not fall upon the hatches.

Slinging *a man overboard*, in order to stop a leak in a ship, is done thus: the man is trussed up about the middle in a piece of canvas, and a rope to keep him from sinking, with his arms at liberty, a mallet in one hand, and a plug, wrapped in oakum and well tarred in a tarpawling-clout in the other, which he is to beat with all dispatch into the hole or leak.

SLIP, among *Ship-builders*, denotes a place lying with a gradual descent on the banks of a river, convenient for *ship-building*.

SLIPPER. See Plinth.

Slipper, *lady's*, in *Botany*. See Lady's *slipper*.

SLIPPING, among *Gardeners*, the tearing off a sprig from a branch, or a branch from an arm of the tree. These sorts of slips take root more readily than cuttings.

SLIT *grafting*. See Engrafting.

SLOANEA, *apeiba* of the Brasilians; in *Botany*, the name of a genus of plants, of the *polyandria monogynia* class, described by Linnæus and Plumier, the characters of which are these: the calyx is five-leaved and deciduous; the corolla has five petals; the stigma is perforated, and the fruit is an echinated, polyspermous, gaping berry. There are two species.

SLOATH, or Sloth, in *Zoology*, the name of an animal remarkable for its slow motion. Of this animal there are two species. See Bradypus.

The *three-toed sloth* has a blunt black nose, a little lengthened; very small external ears; small, black, and heavy eyes, with a dusky line from the corner of each; the colour of the face and throat a dirty white; hair on the limbs, and body long, and very uneven, of a cinereous brown colour, with a black line along the middle of the back; each side, about the shoulders, is dashed with rust colour; the rest of the back and limbs spotted irregularly with black; the tail short; legs thick, long, and aukwardly placed; the face naked; and three very long claws on each foot. Pennant. See *Tab.* V. *Quadrupeds*, N° 57.

This creature, which grows to the bulk of a middle-sized fox, is so very tedious in all its motions, that it will be three or four days in climbing up, and coming down a tree, and does not go the length of fifty paces upon even ground in a day. It never stirs till compelled by hunger: its food is fruit, or the leaves of trees: its motion is attended with a very moving and plaintive cry, so that beasts of prey avoid it with horror.

The sound of its voice seems only to express the word *haii*, for which reason the Brasilians call him by that name; but he usually repeats the sound about six times together, descending, as if one should sing *la, sol, fa, mi, re, ut*.

Its look is so piteous as to move compassion, and accompanied with tears. Whatever he takes hold of, he does it so strongly, or rather so stiffly, that he will sometimes sleep securely while he hangs at it.

Clusius, Margrave, Piso, and others, have given descriptions of this animal, but they none of them mention the

the length of his fore-feet; which, according to the animal preserved in the Museum of the Royal Society of London, is double that of the hinder pair.

From the shag of his body, the shape of his legs, and his having little or no tail, as also from the slowness of his gate, and his climbing up trees, as little bears use to do, he seems to come near the bear-kind, from which he differs chiefly in having but three claws upon a foot.

This creature breeds principally in Florida and Brasil. Grew's Mus. p. 11.

The *two-toed sloth* has a round head; short projecting nose; ears like the human; two long strong claws on the fore feet, and three on the hinder; long and rough hair on the body, in some parts curled and woolly; in some, of a pale red above, and cinereous below, in others of a yellowish white below, cinereous brown above; it has no tail. This animal inhabits South America, and the island of Ceylon. Pennant.

SLOATS *of a cart*, the under pieces which keep the bottom of the cart together.

SLOE, *prunus sylvestris*, the English name for the wild PLUM.

The juice expressed from the fruit of the *sloe*-bush while unripe, inspissated by a gentle heat to dryness is called *German* ACACIA. It differs from the Egyptian most remarkably in this property, that it gives out its astringency in good measure to rectified spirit as well as to water, whereas that of the other is not at all dissoluble in spirit.

A conserve of this fruit is prepared in the shops, by mixing the pulp, pressed out through a sieve after the *sloes* have been steeped in water over the fire, till they are sufficiently soft without bursting, with thrice its weight of double refined sugar.

In some places, the unripe *sloes* are dried in an oven, and then fermented with wines or malt liquors, for a restringent diet drink in alvine and uterine laxities. The bark, both of the branches and roots, is said to be successfully given in intermitting fevers, and it has been recommended by some as equal to the Peruvian bark. It is apparently a strong styptic. The watery infusion of the flowers, sweetened with sugar, or made into a syrup, is said to be a very useful purgative for children. Lewis's Mat. Med.

SLOE-*worm*, in *Natural History*, the name of an insect found on the leaves of the *sloe*, or black thorn, and sometimes on those of the garden plum.

This, and a like worm, found on the leaves of the oak, both remarkable for the hairs which cover them, each of which is forked, or divided into two at the ends, are usually esteemed caterpillars, but they are in reality animals of a very different class; the caterpillar has, at the utmost, but sixteen legs, these have twenty-two, and have all the other characters of that class of insects called by the French naturalists *fausses chenilles*, or *bastard caterpillars*.

All the animals of that class are very remarkable for the different figure they make after the last change of their skins, but this is in none seen so obviously, as in these two species; that of the oak is of a greenish colour, and its hairs, which are so stiff that they almost deserve the name of spines, are black: that of the *sloe* is of a greyish hue, and its spines longer, and of a deep brown; every one of these is, toward the extremity, divided into two, in the manner of the tines of a fork. These give the animal a very remarkable figure, and are cast off with the several skins, while the new skins have others in their place; but in the last change, before that into the nymph state, the change made in the creature is such, that it could never be suspected to be the same animal by any one, who was not an eye-witness of the change.

The creature in this, throwing off its skin, becomes perfectly smooth, and of a dirty yellowish colour, with not the lightest variegation on it, nor the least appearance even of the remains of the spines. In this state it remains till it goes into the nymph state, and from that, after about sixteen days, it comes out in the shape of a four-winged fly. The whole process of the change is the same, in the two species of the oak and the *sloe*, but the flies they produce are very different. Reaumur's Hist. Inf. vol. ix. p. 119.

SLOOP, in *Sea Language*, a small vessel furnished with one mast, the main-sail of which is attached to a gaff above, to the mast on its foremost edge, and to a long boom below; by which it is occasionally shifted to either quarter.

SLOOP *of war* is a name given to the smallest vessels of war, except cutters. They are rigged either as ships or snows. See RATE.

SLOPING *alley*. See ALLEY.

SLOT, in the *Sportsman's Language*, a term used to express the mark of the foot of a stag, or other creature proper for the chace, in the clay or earth, by which they are able to guess how long the creature has been gone by, and which way he went. The *slot*, or treading of the stag, is very nicely studied on this occasion; if the *slot* be large, deep printed in the ground, and with an open cleft, and, added to these marks, there is a large space between mark and mark, it is certain that the stag is an old one. If there be observed the *slots*, or treadings of two, the one long, and the other round, and both of one size, the long *slot* is always that of the larger beast.

There is also another way of knowing the old ones from the young ones by the treading; which is, that the hinder feet of the old ones never reach to their fore feet, whereas those of the young ones do.

Old stags also are long-jointed, and they never tread doubly, or falsely, as the young ones do, because the tendons, that hold the joints of their feet, are stronger; but the feet of the young ones are sometimes forced, for want of these strong sinews, to turn away double.

It is to be observed also, that there is a great difference between the *slot* of a stag or hart, and that of a hind; for there is no hart of the second head so young, but that he leaves a larger and wider *slot* than the hind, excepting when the hinds are big with young, for on that occasion their claws will open as wide as those of the hart.

Another method of knowing the age of a stag is by his fumets, though some general rules are to be known, before any thing can be judged from this article. These are, that in April and May they cast their fumets as it were in cakes, and in June and July they cast them in thin, long, and large crotels, and from thence to the end of August they hold the same form and size; but they are in this last month always hard and knotty. In all these cases, the largest and longest fumets are esteemed to be the marks of the largest and oldest stags. If they have been disturbed, or if they have received any hurt, they usually cast them sharp at one end, and dry. This also is constantly the case, when their new horns are just grown to their hardness, and they rub them against the trees to get off the cracked membranes, which were the velvetings in their first state.

There is always also a difference between the fumets of the morning and those of the evening: those made at night, when they go to relief, are better digested, and consequently moister than those made in the morning, because having taken their rest all day, there is a more perfect digestion made than can be in the night, as they are, during that time, seeking food.

There are also several other ways of judging of the growth and size of a stag, as by his carriage, or bearings, according to the huntsman's phrase; that is, according to the breaking of the tender branches of trees which he makes with his horns in passing through. When the boughs are found bruised and broken very high, and to a good width, there is no doubt of his being an old one; but this judgment is not to be made in the months of March, April, May, and June, because their horns are at that time either wholly wanting, or they are young and velvety. The height of the creature's entries into the woods is also another mark of his size, for the old ones are always proud and stately, and go in erect, but the young ones will creep.

The older the stag is the sooner he goes to fray, and the larger are the trees he chooses for this use; the young ones go later into it, and always choose the weaker and lower trees. Notwithstanding that, after the sixth year, the age is not certainly known by the horns, as there is, after this time, no increase in the number of their branches, yet a probable guess may be made from their being all thicker and more robust, and the tops more open.

SLOT, *drawing on the*. See DRAWING.

SLOTH, in *Zoology*. See SLOATH.

SLOUGH, a deep muddy place. The cast skin of a snake, the damp of a coal-pit, and the scar of a wound, are also called by the same appellation.

SLOUGH *of a wild boar*, is the bed, soil, or mire, wherein he wallows, or in which he lies in the day-time.

SLOUGH-*silver*, in *Old Writers*, a rent paid in some places in lieu of certain days work in harvest, heretofore reserved to the lord from his tenants.

SLOUTH, or SLOUGHT, in *Hunting*, is used for a company of some sorts of wild beasts. As, a *slouth* of bears.

SLOW *fevers*. See FEVER.

SLOW *pulse*. See PULSE.

SLOW-*worm*, the English name of the *cæcilia*, or *anguis fragilis* of Linnæus, called also the *blind-worm*, and by some the *deaf adder*, which, in the Linnæan system, is a species of the *anguis* or SNAKE: the *cæcilia* being a distinct genus of SERPENTS.

It is distinguished from all our snakes by its smallness, and by the shape of its tail, which runs out a great way beyond the anus, and yet is blunt and considerably thick at the end.

The colour of the back is cinereous, marked with small lines composed of minute black specks; the sides are of a reddish cast; the belly dusky; both marked like the back; the tongue is broad and forky; the teeth small, but numerous, and the scales small. It is slow in its motion, and inoffensive in its nature.

These snakes lie torpid in the winter, and are sometimes found in vast numbers twined together.

It resembles the viper in its manner of producing its young, which are brought forth alive.

Dale, from Gesner, gives an account of a theriaca being prepared of this serpent and treacle water, for a sudorific in the plague. James.

SLUDS, a term used by the miners in Cornwall for half-roasted ores.

SLUE, *to*, is to turn any cylindrical or conical piece of timber about its axis, without removing it. This term, in sea-language, is generally applied to the movement by which a mast or boom is turned about, in its cap or boom-iron.

SLUG. See LIMAX.

SLUICE, a frame of timber, stone, or other matter, serving to retain and raise the water of a river, &c. and, on occasion, to let it pass.

Such is the *sluice* of a mill, which stops and collects the water of a rivulet, &c. to let it fall, at length, in the greater plenty upon the mill-wheel: such also are those used as vents or drains to discharge water off land. And such are the *sluices* of Flanders, &c. which serve to prevent the waters of the sea overflowing the lower lands, except when there is occasion to drown them.

Sometimes there is a kind of canal inclosed between two gates or *sluices*, in artificial navigations, to save the water, and render the passage of boats equally easy, and safe, upwards and downwards: as in the *sluices* of Briare in France, which are a kind of massive walls built parallel to each other, at the distance of twenty or twenty-four feet, closed with strong gates at each end, between which is a kind of canal, or chamber, considerably longer than broad; wherein a vessel being inclosed, the water is let out at the first gate, by which the vessel is raised fifteen or sixteen feet, and passed out of this canal into another much higher. By such means a boat is conveyed out of the Loire into the Seine, though the ground between them rise above one hundred and fifty feet higher than either of those rivers.

Sluices are made different ways, according to the use for which they are intended; when they serve for navigation, they are shut with two gates, presenting an angle towards the stream; when they are made near the sea, two pair of gates are made, the one to keep the water out and the other in, as occasion requires: in this case, the gates towards the sea present an angle that way, and the others the contrary way; and the space inclosed by those gates is called the *chamber*. When *sluices* are made in the ditches of a fortress, to keep up the water in some parts, instead of gates, shutters are made so as to slide up and down in grooves; and when they are made to raise an inundation, they are then shut by means of square timbers let down in cullises, so as to lie close and firm.

The word *sluice* is formed of the French *escluse*, which Menage derives from the Latin *exclusa*, found in the Salic law in the same sense. But this to be restrained to the *sluices* of mills, &c. for as to those serving to raise vessels, they were wholly unknown to the ancients.

SLUR, in *Music*, a mark like the arch of a circle, drawn from one note to another, comprehending two or more notes in the same or different degrees. If the notes are in different degrees, it signifies that they are all to be sung to one syllable; for wind instruments that they are to be made in one continued breath; and for stringed instruments, that are struck with a bow, as a violin, &c. that they are made with one stroke. If the notes are in the same degree, it signifies that it is all one note, to be made as long as the whole notes so connected; and this happens most frequently betwixt the last note of one line, and the first of the next; which is particularly called SYNCOPATION.

SMACK, is a small vessel only rigged as a sloop, or hoy, and used in the coasting or fishing trade; or as a tender in the king's service.

SMALL-*craft*, in the *Sea Language*. See CRAFT.

SMALL-POX, *variolæ*. See POX, and VARIOLÆ.

SMALL *repeat*. See REPEAT.

SMALL *stones*, among *Jewellers*, denote diamonds under the weight of a carat.

SMALL-*work*, among *Jewellers*, is used to denote the star and shell-FACETS of diamonds.

SMALLAGE, in *Botany*, a species of APIUM.

Smallage is what the physicians intend when they prescribe *apium*. It grows naturally by the sides of ditches in many parts of England; and is therefore rarely cultivated in gardens: it is biennial, and flowers in August. Care should be taken to distinguish *smallage* from the poisonous water-hemlock, which grows naturally in the same places with it; the latter has its leaves deeply divided, quite to the pedicle, into three long narrow sharp pointed segments; whereas, those of *smallage* are only slightly cut into three roundish obtuse ones.

The root is chiefly used in medicine: it is about the thickness of a thumb, whitish, fibrous, of a warm taste, and a fragrant smell; being one of the five greater openers of the shops. It is grateful and detergent, promotes urine, dislodges gravel, and is also recommended in disorders of the breast, and to promote expectoration.

The fresh roots, especially when produced in their native watery places, are supposed to participate, in some degree, of the ill quality of those of the hemlock kind, and to be particularly hurtful to epileptic persons and pregnant women.

Its seed is also of the number of the lesser hot seeds, and appears to possess greater virtues as a carminative and aperient than the root: its leaves have been given in decoction, or the expressed juice of them in nephritic complaints. The root is greatly recommended against suppressions of the menses, and of the lochia, and is said to be alone a remedy for the king's evil; but this wants proof.

SMALT, the last produce of cobalt, a kind of mineral matter, prepared and purified abroad, and brought hither, sometimes in form of a blue powder, and sometimes in lumps; chiefly used along with starch, to give linens the finer and clearer cast; and best known by the name of *powder*-BLUE. See COBALT.

The preparation of *smalt*, as practised in Hermanduria, we find described in the Philosophical Transactions by Dr. Krieg; who tells us, that the matter it is made of is the mineral stone called cobalt, or cadmia mineralis; which being pulverized, and the lighter stuff washed away, the remainder is laid on a furnace, and by a fire, underneath and aside it, the flames whereof are reverberated over it, a matter is separated from it in form of a smoke; which, sticking to the walls, makes what we call ARSENIC.

When the cobalt has done smoking, it is cooled, mixed with pot-ashes and powder of white flint stones; the mixture is put in pots, and melted for five or six hours in a furnace. By this means, the matter is formed into a blue glass, which, being put in cold water, cracks, and grows tender; and is, at length, powdered by an engine, the finest part separated by a sieve, put into a mill, and ground in water, into a very fine powder; which, by washing, is still farther separated from the coarser, then dried in warm chambers, barrelled up, and sent away.

There is not a more precarious process in all metallurgy than the preparation of this fine blue glass from cobalt, nor any manufacture in which so expert workmen are necessary. The carrying the heat to too great a degree, in the roasting of the cobalt, is a very mischievous error, and the suffering as much of the arsenic as may be, to remain in the earth, is greatly to the advantage of the *smalt*; and its colour may be greatly heightened by adding common arsenic to it while it is in fusion.

It is always necessary to make careful and repeated experiments on a new ore, or a kind of cobalt, which has not been worked before; by trying it with various degrees of heat in the roasting, and with different proportions of the flints and pot-ash in the fusion. On comparing the several products of these experiments, it will easily be seen which yields the finest colour, and this must be always after followed in the great operations.

It is well known, that the beautiful blue glass, called *smalt*, is prepared from the fixed earth of cobalt; but experiments have proved, that this earth alone will not acquire that fine colour. Dr. Link tried some of it, by keeping it eight hours in the most intense heat, yet on taking it out, it was only a grey glass, excepting that there were a few blue specks in it near the edges of the crucible. These specks make no objection to this doctrine, when properly considered; for they were owing, doubtless, to the same substance which is found necessary to be used, in order to procure the blue colour.

Flints are the necessary addition to cobalt for the making of the blue glass, or *smalt*; and the crucible being made of earth, might easily contain some particles of sand. Every piece of sand is a small stone, of the nature of flint; that is, a piece of crystal debased by earth; and these small flints mixing with the glass of the cobalt-earth, while in fusion, rendered the small specks, where they were mixed,

mixed, true *smalt*, while the rest remained grey and unaltered.

This earth of cobalt evidently contains some portion of copper, though so small in quantity, that it can never be discerned by the common signs, and so intimately blended with the earth, that it can never be procured separate. The lightness of this earth also, in which the copper resides after the sublimation of the arsenic, is a proof that its quantity must be very small; yet that it exists there, is evident from the colours it affords.

Copper is well known to yield a green colour with acids, and a fine blue with alkalies. Thus a solution of this earth in aqua fortis is of a deep green, and its glass, when mixed with the alkali of flints and of pot-ash, is the deep blue *smalt*: nor is it wonderful, that the vitrified earth of cobalt will never become blue by calcination alone, since, if it owes this colour to copper, it cannot be supposed to shew itself till called forth by an alkali.

Some cobalt yields *smalt* before roasting, even better than it would afterwards; this is a peculiar kind of cobalt, but is so like the rest, that it cannot be distinguished by the eye, but experiment alone shews this property in it.

Though cobalt in general requires roasting, in order to fit it for yielding the *smalt*, yet its different kinds require some more, and some less roasting; and the degree can never be judged of by the inspection of the mineral, but is only known by the experienced artist in the process. Hence it is, that expert and intelligent persons are necessary in the *smalt*-works more than in almost any other branch of this sort of business.

The addition of a small quantity of arsenic, or of the arsenical flowers, during the time that the *smalt* is in fusion, adds greatly to the beauty of the colour: this is a practice kept secret by the workmen of some places; and by this means their *smalt* is always rendered better than that of their neighbours.

It is easy to see from this, that the roasting of cobalt is the necessary beginning of the *smalt*-work, not the divesting it of its arsenic, which only happens accidentally in that process; and it would be much better if it did not happen, since we find the arsenic added afterwards exalts the colour. From hence it is evident, that those cobalts which will make *smalt* without previous roasting, must, as they are found to do, make the very finest *smalt*, because their arsenic is yet left in them in great part: and from this also appears the necessity of having expert workmen for the *smalt*-making; since the knowing the degree of fire necessary to the ore is a most essential article, and after the roasting has been carried to a sufficient degree, every moment's heat divesting it of more of its arsenic than was necessary, makes the colour of the *smalt* to be made afterwards so much the worse.

From this also appears the reason why the blue, made by precipitation from a solution of cobalt, is so much superior to the common *smalt* made by fire; because in this the arsenic is all preserved, whereas in the common way of preparing it by fire, it is driven off. Philos. Transf. N° 396. See AZURE and ZAFFRE.

SMARAGD, σμαραγδος, a precious stone of a green colour, very beautiful and brilliant; called also the EMERALD.

SMARIS, in *Ichthyology*, the name of a small fish caught in the Mediterranean, and common in the markets of Rome, Venice, and elsewhere, and sold to the poorer sort of people at a very small price. This, in the Linnæan system, is a species of the SPARUS.

It is seldom of more than a finger's length, and of a round, not flatted body, of a dusky blackish green on the back and sides, and not marked with any variegations, but having on each side, near the middle of the body, one large black spot; its gill-fins and tail are of a faint red; the iris of the eyes is of a brownish white, and the tail is forked.

SMATCH, in *Ornithology*, a name by which the common OENANTHE is called in many parts of England.

SMEAR-*dab*, in *Ichthyology*, is a name given to a species of DAB among the fishmongers of London, which is of equal goodness with the common *dab*.

SMECTIS, in *Natural History*, a name used by several authors for the common FULLER's *earth*, more commonly called *cimolia purpurascens*.

SMECTYMNUUS, a cant term that made some figure in the time of the civil wars, and during the interregnum. It was formed of the initial letters of the names of five eminent Presbyterian ministers of that time, viz. Stephen Marshal, Edmund Calamy, Thomas Young, Matthew Newcomen, and William Spurstow; who, together, wrote a book against episcopacy, in the year 1641, whence they and their retainers were called *Smectymnuans*.

SMEGMA, a kind of wash in use among the ancients. See DETERSORIUM.

SMELL, *odor*, with regard to the organ, is an impression made on the nose by little particles continually exhaling from odorous bodies.

SMELL, with regard to the object, is the figure and disposition of odorous effluvia, which, sticking on the organ, excite the sense of *smelling*.

SMELL, with regard to the soul, is the perception of the impression of the object on the organ; or the affection in the soul resulting from it.

The ancient chemists teach, that sulphur is the principle of all *smells*; and that these are more or less strong, as the sulphur in the odorous body is more or less dried and exalted. Sulphur, they say, is the foundation of odours, as salt is of savours, and mercury of colours.

Smell, like taste, consists altogether in the arrangement, composition, and figure of the parts, as appears from the following experiments of Mr. Boyle.

1°, From a mixture of two bodies, each whereof is, of itself, void of all *smell*; a very urinous *smell* may be drawn; this is done by the grinding of quick-lime with sal ammoniac.

2°, By the admixture of common water, which of itself is void of *smell*, or inodorous; another inodorous body may be made to emit a very rank *smell*. Thus, camphor dissolved in oil of vitriol is inodorous, yet mixed with water it immediately exhales a very strong *smell*.

3°, Compound bodies may emit *smells* which have no similitude to the *smells* of the simples they consist of. Thus, oil of turpentine, mixed with a double quantity of oil of vitriol, and distilled; after distillation, there is no *smell* but of sulphur; and what is left behind in the retort, being again urged by a more violent fire, yields a *smell* like oil of wax.

4°, Several *smells* are only to be drawn forth by motion, and agitation. Thus, glass, stones, &c. which, even when heated, yield no *smell*; yet, when rubbed and agitated in a peculiar manner, emit a strong *smell*: particularly beech-wood, in turning, yields a kind of rosy *smell*.

5°, A body that has a strong *smell*, by being mixed with an inodorous one, may cease to have any *smell* at all. Thus, if aqua fortis, not well dephlegmated, be poured on salt of tartar, till it cease to ferment; the liquor, when evaporated, will yield inodorous crystals, much resembling nitre: yet these, when burnt, will yield a most noisome *smell*.

6°, From a mixture of two bodies, one whereof *smells* extremely ill, and the other not well, a very pleasant aromatic odour may be gained, viz. by a mixture of aqua fortis, or spirit of nitre, with an inflammable spirit of wine.

7°, Spirits of wine, by mixing with an almost inodorous body, may gain a very pleasant aromatic *smell*. Thus inflammable spirits of wine, and oil of Dantzick vitriol, mixed in equal portions, then digested, and at last distilled, yield a spirit of a very fragrant *smell*.

8°, A most fragrant body may degenerate into a fetid one, without the admixture of any other body. Thus if the spirit mentioned in the former experiment, be kept in a well-closed receiver, it will soon acquire the rankness of garlic.

9°, From two bodies, one whereof is inodorous, and the other fetid, a very pleasant *smell* may arise, much resembling musk, viz. by putting pearls into spirit of vitriol; for, when dissolved they yield a very agreeable *smell*.

SMELL is used as the name of a peculiar sort of wine, of which there are two species; the one sort is very fragrant, muscatelline, and aromatic; this is called simply the *smell-wine*: but the other, which is very rank and offensive to the nose, is called by the Germans *smelbruntzer*. Many have been the conjectures about the occasion of the rank smell of this wine.

The *smell* is truly urinous, and is that of a volatile alkali; which not being embodied in, or subdued by the acid of the grape in this imperfect fermentation, vents itself in this rank manner.

It is evident, that the *smell* is of a volatile nature, for it is often lost in the drawing of the wine several times out of one vessel into another, evaporating during the time of drawing it out.

SMELLING, the act whereby we perceive *smells*, or whereby we become sensible of odorous bodies, by means of certain effluvia thereof, which, striking on the olfactory organ, briskly enough to have their impulse propagated to the brain, excite a sensation in the soul.

The principal organs of *smelling* are the nostrils and the olfactory nerves; the minute ramifications of which latter are distributed throughout the whole concave of the former: their descriptions see under their proper heads.

Smelling is performed by the odorous effluvia, floating in the air, being drawn into the nostrils, in inspiration, and

and ſtruck with ſuch force againſt the fibrillæ of the olfactory nerves, which the figure of the noſe, and the ſituation of the little bones, render oppoſite thereto, as to ſhake them, and give them a vibratory motion; which action, being communicated hence to the common ſenſory, occaſions an idea of a ſweet, or fetid, or ſour, or an aromatic, or a putrefied object, &c.

The matter in animals, vegetables, foſſils, &c. which chiefly affects the ſenſe of *ſmelling*, Boerhaave obſerves, is that ſubtile ſubſtance, inherent in the oily parts thereof, called *ſpirits*: becauſe, when this is taken away from the moſt fragrant bodies, what remains, has ſcarce any *ſmell* at all; but this, poured on the moſt inodorous bodies, gives them a fragrancy.

Willis obſerves, that brutes have, generally, the ſenſe of *ſmelling* in much greater perfection than man; as by this alone, they diſtinguiſh the virtues and qualities of bodies unknown before; hunt out their food at a great diſtance, as hounds and birds of prey; or hid among other ſubſtances, as ducks, &c.

Man, having other means of judging of his food, &c. did not need ſo much ſagacity in his noſe; yet have we inſtances of a great deal, even in man. In the Hiſtoire des Antilles, we are aſſured, there are Negroes who, by the *ſmelling* alone, can diſtinguiſh between the footſteps of a Frenchman and a Negro.

It is found, that the laminæ, wherewith the upper part of the noſtrils is fenced, and which ſerve to receive the divarications of the olfactory nerves, are always longer, and folded up together in greater numbers, as the animal has this ſenſe more accurate: the various windings and turnings of theſe laminæ detain and fetter the more of the odoriferous particles.

The ſenſe of *ſmelling* may be diminiſhed or deſtroyed by diſeaſes; as the moiſture, dryneſs, inflammation or ſuppuration of the olfactory membrane, the compreſſion of the nerves which ſupply it, or ſome fault in the brain itſelf at their origin. A defect, or too great a degree of ſolidity of the ſmall ſpungy bones of the upper jaw, the caverns of the forehead, &c. may likewiſe impair this ſenſe; and it may be alſo injured by a collection of fetid matter in theſe caverns, which is continually exhaling from them, and alſo by immoderate uſe of ſnuff.

When the noſe abounds with moiſture, after gentle evacuations, ſuch things as tend to take off irritation, and coagulate the thin ſharp ſerum may be applied, as the oil of aniſe, mixed with fine flour, camphor diſſolved in oil of almonds, &c. the vapours of amber, frankincenſe, gum-maſtic, and benjamin, may likewiſe be received into the noſe and mouth. For moiſtening the mucus when it is too dry, ſome recommend ſnuff made of the leaves of marjoram, mixed with oil of amber, marjoram, and aniſeed; or a ſternutatory of calcined white vitriol, twelve grains of which may be mixed with two ounces of marjoram water, and filtrated. The ſteam of vinegar upon hot iron, and received up the noſtrils, is alſo of uſe for ſoftening the mucus, removing obſtructions, &c. If there be an ulcer in the noſe, it ought to be dreſſed with ſome emollient ointment, to which, if the pain be very great, a little laudanum may be added. If it be a venereal ulcer, twelve grains of corroſive ſublimate may be diſſolved in a pint and a half of brandy, and a table-ſpoonful of it taken twice a day. The ulcer ought likewiſe to be waſhed with it, and the fumes of cinnabar may be received up the noſtrils.

If there be reaſon to ſuſpect that the nerves which ſupply the organs of *ſmelling* are inert, or want ſtimulating, volatile ſalts, or ſtrong ſnuffs, and other things which occaſion ſneezing, may be applied to the noſe; the forehead may likewiſe be anointed with balſam of Peru, to which may be added a little oil of amber. Buchan's Dom. Med. p. 504, &c. 1776.

SMELT, *apua phalerica*, or *ſalmo eperlaus* of Linnæus, in *Ichthyology*, a fiſh which is claſſed, by the generality of writers, among the truttaceous kinds, and is acknowledged to have a general external reſemblance to the ſalmon. Its characters, by which it is diſtinguiſhed from all the reſt of the truttaceous kinds, are, 1. That it is much ſmaller than any other. 2. It is longer and ſlenderer, in proportion to its ſize: and, 3. It has a very grateful ſmell, which ſome have compared to that of the violet. Some authors have hence called it the viola, and others, particularly Schonefeldt, calls it the *ſpirinchus*.

The *ſmelt* is a fiſh of a very beautiful form and colour; the head is tranſparent, and the ſkin in general ſo thin, that, with a good microſcope, the blood may be obſerved to circulate.

It inhabits the ſeas of the northern parts of Europe, and Mr. Pennant apprehends, is never found as far ſouth as the Mediterranean.

Smelts inhabit the ſeas that waſh theſe iſlands the whole year, and never go very remote from ſhore, except when they aſcend the rivers. In ſome rivers they appear a long time before they ſpawn, being taken from November to January in the Thames and Dee, but in others not till February, and in March and April they ſpawn; after which they all return to the ſalt water, and are not ſeen in the rivers till the next ſeaſon.

Theſe fiſh will live almoſt any where, but they are very apt to degenerate. They are common in the rivers of New England, and are as large as with us, often weighing two ounces and a half; but a pail-full of theſe being taken from one of their rivers, and put into an adjoining pond, they all degenerated in ſuch a manner, that they were afterwards found ſo ſmall, that the largeſt did not weigh more than five pennyweights. Though thus ſmall, however, they are much valued, and are better taſted than the others. Philoſ. Tranſ. N° 374. p. 232.

They are called *ſmelts*, becauſe they melt, as it were, or diſſolve between the fingers in handling them; or, as others ſay, on account of their ſcent, *quaſi ſmell it*. The name *ſparling*, by which they are called in Wales and the North of England, is taken from the French *eperlan*: *ſmelts* are often ſold in the ſtreets of London ſplit and dried, and called *dried ſparlings*.

SMELT *fiſhing*. See FISHING, *ſmelt*.

SMELT, among the fiſhermen in Yorkſhire, and ſome other parts of England, is alſo a name given to the ſalmon, while in its firſt year. See SALMON.

SMELTING, among *Metalliſts*, the melting of a metal from the ore, in a *ſmelting* furnace; in order to ſeparate the metallic parts from the ſulphur and arſenic, and the earthy and ſtrong ſubſtances of all kinds with which they are combined.

Smelting, in propriety, is reſtrained to large works, wherein ores from the mines are melted down, and ſeparated.

In ſpeaking of works in a leſſer way, we do not ſay *ſmelting*, but melting.

The art of *ſmelting* the ores of all metallic ſubſtances was, probably, at firſt very imperfect; hence the uſe of iron has every where been of a more recent date than that of the other metals, becauſe it requires the application of a much ſtronger fire to *ſmelt* the ores of iron than thoſe of any other metal. We have no certain accounts when, or by whom the ſeveral metals were diſcovered. Wallerius ſays, that, as far as he knew, Pliny was the firſt who enumerated the ſix metals; but they were certainly known long before his age, and were mentioned both by Homer and by Moſes, a much more ancient author, Numb. xxxi. 22. From this teſtimony we may certainly infer that all the metals anciently mentioned were known, at leaſt in the country of the Midianites, above fourteen hundred and fifty years before the birth of Chriſt, or near nine hundred years after the deluge. Moreover, iron and copper were, without doubt, known before the deluge, and, probably, all the other metals, which are more eaſily extracted from their ores than the former.

In the time of Abraham, however, gold and ſilver were eſteemed, as they are at preſent, precious metals, Gen. xxiii. 16. Gen. xiii. 2. and hence it is reaſonable to conclude, that Noah was able to inſtruct his deſcendants in the art of *ſmelting* metallic ores; this art was afterwards loſt among the various colonies, which quitted the plains of Aſia in ſearch of ſettlements; and as the earth ſoon after the deluge, and long before it could have been peopled by the poſterity of Noah, muſt have become covered with wood, and in proceſs of time different countries might have been cleared by ſetting the wood on fire, which might flux metallic ores contiguous to the ſurface of the earth, it is not improbable that the firſt idea of *ſmelting* ores might have been thus ſuggeſted to many nations. See Creech's Lucretius, vol. ii. p. 572.

We may hence conjecture, that the firſt rude proceſs by which metals were extracted from their ores, was that of putting a quantity of ore upon a heap of wood, and ſetting the pile on fire, in conformity to the manner in which ores were *ſmelted* during the burning of foreſts; but as the force of fire is greatly diminiſhed by the diſperſion of its flame, and as the air acts more forcibly in exciting fire, when it ruſhes upon it with greater velocity, it is likely, that the heap of wood and ore would ſoon be ſurrounded with a wall of ſtone, in which ſufficient openings would be left for the entrance of the air, and thus a kind of furnace would be conſtructed.

The Peruvians, we are told, had diſcovered the art of *ſmelting* and refining ſilver, either by the ſimple application of fire, or where the ore was more ſtubborn, and impregnated with foreign ſubſtances, by placing it in

ſmall

small ovens or furnaces on high grounds, so artificially constructed, that the draught of air performed the function of a bellows, a machine with which they were totally unacquainted. This method of *smelting* ores on high grounds, without the assistance of a bellows, or at least of bellows moved by water, seems to have been formerly practised in other countries as well as in Peru. There are several places in Derbyshire, called *boles* by the inhabitants, where lead has been anciently smelted, before the invention of moving bellows by water; these boles were always situated upon high grounds, and mostly upon that side of a hill which faces the west, probably because the wind proceeds most frequently from that quarter.

From a pig of lead, dug up in 1766, at one of these boles near Matlock, and bearing an inscription in relievo, from which it appears to have been *smelted* in the age of Adrian; many of the boles in Derbyshire seem to be of high antiquity. However, this method of *smelting* ore by the variable action of the wind, being a very troublesome and precarious process, has been universally disused, and the more regular blast of a bellows has been introduced in its stead.

The invention of the BELLOWS is attributed by Strabo to Anacharsis, the Scythian; but he was probably the improver of this machine; for Homer, who lived long before his time, describes Vulcan as employing twenty pair of bellows at once in the formation of the shield of Achilles. Iliad, lib. xviii. v. 470.

When the art of moving bellows by means of a water wheel, was first discovered, is uncertain: the ancients seem to have been unacquainted with it; but we learn from Agricola (De Re Metal. published in 1550, p. 165. 338.) that it was very generally known, at least among the Germans, in his time; for he speaks of it often, without hinting at its being a recent invention. By this advantageous contrivance, however, the moderns have, in many instances, worked over again, with considerable profit, the heaps of iron and other kinds of slag, from which the metal has been but imperfectly extracted, before the moving of bellows by water was discovered.

About fifty years ago, the blast, or hearth furnace, was the only one in use for *smelting* lead ore in Derbyshire. In this furnace, ore and charcoal, or ore, and what is called *white coal*, which is wood dried but not charred, being placed in alternate layers, upon a hearth properly constructed, the fire is raised by the blast of a bellows, moved by a water-wheel; the ore is soon *smelted* by the violence of the fire, and the lead, as it is produced, trickles down a proper channel, into a place contrived for its reception. These *ore hearths* are now very rare; though they are frequently applied to the extracting lead from the slag, which is produced, either at the ore hearth, or the *cupola* furnace, and they are then called *slag-hearths*, and the lead thus obtained is called *slag-lead*: the fire in a slag-hearth is made of the cinder of pit-coal, instead of charcoal; the furnace called a *cupol*, or *cupola*, and *reverberatory* furnace, and by the Germans a *wind-furnace*, in which ores are *smelted* by the flame of pit-coal, is said to have been invented about the year 1698, by a physician named Wright; though Becher may, perhaps, be thought to have a prior claim to its invention, or introduction from Germany. But whoever was the first inventor of the cupola, it is now in general use, not only in Derbyshire and other countries for the *smelting* of ores of lead, but both at home and abroad, where it is called the *English furnace*, for the *smelting* of copper ores. This furnace is so contrived, that the ore is melted, not by coming into immediate contact with the fuel, but by the reverberations of the flame upon it. The bottom of the furnace, on which the lead ore is placed, is somewhat concave, shelving from the sides towards the middle; its roof is low and arched, resembling the roof of a baker's oven; the fire is placed at one end of the furnace, upon an iron grate, to the bottom of which the air has free access; at the other end, opposite to the fire place, is a high perpendicular chimney; the direction of the flame, when all the apertures in the sides of the furnace are closed up, is necessarily determined, by the stream of air which enters at the grate, towards the chimney, and in tending thither it strikes upon the roof of the furnace, and being reverberated from thence upon the ore, soon melts it. This furnace does not require the use of bellows, and may, therefore, be constructed any where. In *smelting* lead ore, they generally put into the cupola furnace a ton of ore, previously beat small and dressed, at one time, which quantity they call a *charge*; and they work off three charges of ore in every twenty-four hours. In about six hours from the time of charging, the ore becomes as fluid as milk. In order to obtain the lead free from the slag which swims over it, the smelters usually throw in about a bushel of lime, which dries up the slag, and prevents its running out with the lead. The slag, thus thickened, is raked up towards the sides of the furnace, and the lead gushes out through a hole in one of the sides of the furnace, which, having been properly stopped during the *smelting* of the ore, is opened for this purpose, into an iron pot, from which it is laded into iron moulds, containing what they call a PIG of lead; the pigs, when cold, being ordinarily stamped with the maker's name, are sold under the name of *ore lead*. After the lead has all flowed out of the furnace, they stop up the tap-hole, and drawing down the slag and lime into the middle of the furnace, they raise the fire, till the mixture of slag and lime, which they simply term *slag*, is rendered very liquid; upon this mass they throw another quantity of lime, and proceed as before. When the lead thus obtained, amounting generally to twenty or thirty pounds, is let out of the furnace, a new charge of ore is put in, and the operation renewed.

In order to spare the time and expence of fuel, they have, in some furnaces, lately contrived a hole, through which they suffer the main part of the liquid slag to flow out, before they tap the furnace for the lead; upon the little remaining slag, they throw a small portion of lime, and draw the mixture out of the furnace without *smelting* it. This kind of furnace they have nick-named a *maccaroni*.

Dr. Watson has suggested some improvements in the construction of this furnace, and in the process of *smelting* above described. He proposes to substitute an horizontal chimney in the place of the perpendicular one now in use, and that the end farthest from the fire, should be turned up by a tube of earthen ware, or otherwise; so that the sulphureous acid, set at liberty during the burning of the sulphur, may issue out in a direction parallel to the flue of the chimney, and at the distance of about one foot and a half above it. Let a number of large globular vessels be made either of glass or lead; each of which must have two necks, so as to be capable of being inserted into one another: let these vessels be placed in the flue of the chimney, the neck of the first being inserted into the above mentioned tube, and the neck of the last being left open, for fear of injuring the draught of the furnace. Let each of these globular vessels contain a small quantity of water, in which case, he apprehends, that the heat of the flue will raise the water into vapour, and that this watery vapour will be the means of condensing the sulphureous acid vapour, in such a degree, as to render the undertaking profitable. When the sulphur is all consumed, the draught of the furnace may be suffered to have its ordinary exit at the end of the horizontal chimney, by a very slight contrivance of a moveable damper.

The same ingenious writer also observes, that very sulphureous ores should be roasted for a long time with a gentle heat. He also proposes, to leave as little lead as possible in the slag; for this purpose he suggests, that it might be useful to throw a quantity of charcoal dust upon the liquid scoria in the cupola furnace, in order that the calcined lead might be converted into lead, by uniting itself to the inflammable principle of the charcoal; and that it might be also useful to flux sulphureous lead ores in conjunction with the scales or other refuse pieces of iron, or even with some sorts of iron ore.

The smelter might farther find it worth his while to reduce the slag into a powder by a stamping-mill, or to grind it by any other contrivance, and then he may separate the stony part of the slag from the metallic, by washing the whole in water, inasmuch, as the metallic part is heavier than the other. Watson's Chem. Ess. vol. iii. p. 253, &c.

The other furnaces used in *smelting* are supplied with large bellows, moved by the arbour of a wheel, which is turned round by a current of water. These have obtained different names, according to some difference in their construction. Their greater or less height gives occasion also to the distinction of *high furnaces* and *middle furnaces*. The high furnaces are of modern invention; they were first introduced at Mansfeldt in 1727, and are now used in almost all countries where ores are smelted, as in Saxony, Bohemia, Hungary, &c. They contribute, by their great height, being above eighteen feet high, which allows the ore to undergo a roasting by different degrees of heat, before it is melted, to simplify and diminish the labour. They are chiefly employed for crude fusions, and particularly for the slate copper ore.

In order to facilitate the extraction of metallic substances from the ores and minerals containing them, some operations,

rations, previous to the fufion or *fmelting* of thefe ores and minerals, are generally neceffary. Thefe operations confift of, 1. The *feparation* of the ores and metallic matter from the adhering unmetallic earths and ftones, by hammers, and other mechanical inftruments, or by wafhing with water. 2. Their *divifion* or reduction into fmaller parts by contufion and trituration, that by another wafhing with water they may be more perfectly cleanfed from extraneous matters, and rendered fitter for the fubfequent operations. 3. ROASTING, or *calcination*, the ufes of which operation are to expel the volatile, ufelefs, or noxious fubftances, as water, vitriolic acid, fulphur, and arfenic; to render the ore more friable and fitter for the fubfequent contufion and fufion; and, laftly, to calcine and deftroy the viler metals; for inftance, the iron of copper ores, by means of the fire, and of the fulphur and arfenic. Stones, as quartz, and flints, containing metallic veins or particles, are frequently made red hot, and then extinguifhed in cold water, that they may be rendered fufficiently friable and pulverable, to allow the feparation of the metallic particles.

Roafting is unneceffary for native metals; for fome of the richer gold and filver ores; for fome lead ores, the fulphur of which may be feparated during the fufion; and for many calciform ores, as thefe do not generally contain any fulphur and arfenic.

In the roafting of ores, the following attentions muft be given, 1. To reduce the mineral previoufly into fmall lumps, that the furface may be increafed; but they muft not be fo fmall, nor placed fo compactly, as to prevent the paffage of the air and flame. 2. The larger pieces muft be placed at the bottom of the pile, where the greateft heat is. 3. The heat muft be gradually applied, that the fulphur may not be melted, which would greatly retard its expulfion; and that the fpars, fluors, and ftones, intermixed with the ore, may not crack, fly, and be difperfed. 4. The ores not thoroughly roafted by one operation muft be expofed to a fecond. 5. The fire may be increafed towards the end, that the noxious matters more ftrongly adhering may be expelled. 6. Fuel which yields much flame, as wood and foffil coals free from fulphur, is faid to be preferable to charcoal or coaks. Sometimes cold water is thrown on the calcined ore at the end of the operation, while the ore is yet hot, to render it more friable.

No general rule can be given concerning the duration or degree of the fire, thefe being very various according to the difference of the ores. A roafting during a few hours or days is fufficient for many ores; while fome, fuch as the ore of Rammelfberg, require that it fhould be continued during feveral months.

Schlutter enumerates five methods of roafting ores. 1. By conftructing a pile of ores and fuel placed in alternate ftrata, in the open air, without any furnace. 2. By confining fuch a pile within walls, but without a roof. 3. By placing the pile under a roof, without lateral walls. 4. By placing the pile in a furnace confifting of walls and a roof. 5. By roafting the ore in a reverberatory furnace, in which it muft be continually ftirred with an iron rod.

Several kinds of *fufions of ores* may be diftinguifhed. 1. When a fulphureous ore is mixed with much earthy matter, from which it cannot be eafily feparated, by mechanical operations, it is frequently melted, in order to difengage it from thefe earthy matters, and to concentrate its metallic contents. By this fufion, fome of the fulphur is diffipated, and the ore is reduced to a ftate intermediate betwixt that of ore and of metal. It is then called a *matt* (*lapis fulphureo-metallicus*), and is to be afterwards treated like a pure ore by the fecond kind of fufion, which is properly the *fmelting*, or *extraction of metal by fufion*. 2. By this fufion or *fmelting*, the metal is extracted from the ore previoufly prepared by the above operations, if thefe be neceffary.

The ores of fome very fufible metals, as of bifmuth, may be fmelted by applying a heat fufficient only to melt the metals, which are thereby feparated from the adhering extraneous matters. This feparation of metals by fufion, without the vitrification of extraneous matters, may be called *eliquation*. Generally, a complete fufion of the ore and vitrification of the earthy matters are neceffary for the perfect feparation of the contained metals. By this method, metals are obtained from their ores, fometimes pure, and fometimes mixed with other metallic fubftances, from which they muft be afterwards feparated. To procure this feparation of metals from ores, thefe muft be fo thinly liquefied, that the fmall metallic particles may difengage themfelves from the fcoria; but it muft not be fo thin as to allow the metal to precipitate before it be perfectly difengaged from any adhering extraneous matter, or to pervade and deftroy the containing veffels and furnace. Some ores are fufficiently fufible; but others require certain additions called *fluxes*, to promote their fufion, and the vitrification of their unmetallic parts; and alfo to render the fcoria fufficiently thin to allow the feparation of the metallic particles.

Different fluxes are fuitable to different ores, according to the quality of the ore, and of the matrix, or ftone adherent to it.

The matrixes of two different ores of the fame metal frequently ferve as fluxes to each other; as, for inftance, an argillaceous matrix with one that is calcareous; thefe two earths being difpofed to vitrification when mixed, though each of them is fingly unfufible. For this reafon, two or more different ores to be fmelted are frequently mixed together.

The ores alfo of different metals require different fluxes. Thus calcareous earth is found to be beft fuited to iron ores, and fpars and fcoria to fufible ores of copper.

The fluxes moft frequently employed in the *fmelting* of ores are calcareous earth, fluors or vitreous fpars, quartz, and fand, fufible ftones, as flates, bafaltes, the feveral kinds of fcoria, and pyrites.

Calcareous earth is ufed to facilitate the fufion of ores of iron, and of fome of the poorer ores of copper, and, in general, of ores mixed with argillaceous earths, or with feltfpar. This earth has been fometimes added with a view of feparating the fulphur, to which it very readily unites: but by this union, the fulphur is detained, and a hepar is formed, which readily diffolves iron and other metals, and fo firmly adheres to them, that they cannot be feparated without more difficulty than they could from the original ore. This addition is therefore not to be made till the fulphur be previoufly well expelled.

FLUORS, OR FUSIBLE SPARS, facilitate the fufion of moft metallic minerals, and alfo of calcareous and argillaceous earths, of fteatites, afbeftus, and of fome other unfufible ftones, but not of filiceous earths without a mixture of calcareous earth.

Quartz is fometimes added in the fufion of ferruginous copper ores, the ufe of which is faid chiefly to be, to enable the ore to receive a greater heat, and to give a more perfect vitrification to the ferruginous fcoria.

The FUSIBLE STONES, OR SLATES, BASALTES, are fo tenacious and thick when fufed, that they cannot be confidered properly as fluxes, but as matters added to leffen the too great liquidity of fome very fufible minerals.

The fcoria obtained in the fufion of an ore is frequently ufeful to facilitate the fufion of an ore of the fame metal, and fometimes even of ores of other metals.

Sulphurated pyrites greatly promote the fufibility of the fcoria of metals, from the fulphur it contains. It is chiefly added to difficultly fufible copper ores, to form the fulphureous compounds called *matts*, that the ores thus brought into fufion may be feparated from the adhering earthy matters, and that the ferruginous matter contained in them may be deftroyed, during the fubfequent calcination and fufion, by means of the fulphur.

As in the ores called *calciform*, the metallic matter exifts in a calcined ftate; and as calcination reduces the metals of mineralifed ores (excepting the perfect metals) to that ftate alfo; therefore all calciform and calcined ores require the addition of fome *inflammable fubftance* to reduce them to a metallic ftate. In great works, the charcoal or other fuel ufed to maintain the fire produces alfo this effect.

Metals are fometimes added in the fufion of ores of other more valuable metals, to abforb from thefe fulphur and arfenic. Thus iron is added to fulphurated cupreous and filver ores. Metals are alfo added in the fufion of ores of other more valuable metals, to unite with and collect the fmall particles of thefe difperfed through much earthy matter, and thus to affift their precipitation. With thefe intentions, lead is frequently added to ores and minerals containing gold, filver, or copper.

Ores of metals are alfo fometimes added to affift the precipitation of more valuable metals. Thus antimony is frequently added to affift the precipitation of gold intermixed with other metallic matters. Chem. Dict. Eng. edit. art. *Smelting*, Note *m*. See COPPER, GOLD, IRON, LEAD, SILVER, TIN, &c. See alfo Schlutter's Treatife on the *Smelting* of Ores, tranflated from the German into French by M. Hellot, and Chem. Dict. art. *Smelting*, Eng. ed. notes *n*, *o*, *p*, *q*.

SMELTING-*houfe*, a houfe where they run and melt the ore into lead; one of thefe will run a ton in ten or twelve hours; a fodder is their ufual day's work, that is, twenty-two hundred and an half weight.

SMEW, in *Ornithology*, the Englifh name of the common MERGUS, known among authors by the name *albellus*, and *mergus cirratus*.

SMILAX, *rough bindweed*, in *Botany*, a genus of the *dioecia hexandria* clafs. Its characters are; that it is male

male and female in different plants; the male flowers have a six-leaved empalement; they have no petals, but have six stamina, terminated by oblong summits; the female flowers have the like empalement, but they fall off; they have no petal nor stamina, but have an oval germen supporting their very small styles, crowned by oblong reflexed stigmas; the germen turns to a globular berry, with two cells, containing two globular seeds.

Miller enumerates sixteen, and Linnæus thirteen species.

SMILAX *aspera*, is used for the great scarlet OAK, or *ilex*.

SMILAX *lævis*, in *Botany*, a name given by many authors to our common great white bind-weed. See CONVOLVULUS.

SMINTHEAN, SMINTHEUS, σμινθευς, in *Antiquity*, an epithet given to Apollo: from the Greek σμινθος, a *rat*. There are two different accounts of the origin of this appellation: the first is, that, in the city of Chrysa in Mysia, was a priest of Apollo, called *Crinis*, with whom that god being offended, sent a herd of rats to spoil all his lands; but Crinis appeasing the deity, he came in person to his assistance, took up his lodgings with Crinis's shepherd, told him who he was, and destroyed all the rats with his arrows: in memory whereof, Crinis built a temple to his deliverer, under the name of *Apollo Smintheus*.

Clemens Alexandrinus, in his exhortation to the Greeks, gives us a different story. The Cretans, says he, intending to send out a colony, consulted the oracle of Apollo, as to the place: the answer was, that they should fix their colony where those born of the earth should oppose them. Upon their arrival in the Hellespont, the rats, in the night-time, gnawed asunder all the strings of their bows: this they deemed an accomplishment of the oracle, and there built a city called *Sminthia*.

SMIRIS, in *Natural History*. See EMERY.

SMITING-*line*, in a *Ship*, is a small rope fastened to the mizen-yard-arm, below at the deck, and is always furled up with the mizen-sail, even to the upper end of the yard, and from thence it comes down to the poop. Its use is to loose the mizen-sail without striking down the yard, which is easily done, because the mizen-sail is furled up only with rope-yarns; and therefore when this rope is pulled hard, it breaks all the rope-yarns, and so the sail falls down of itself. The word of art is, *smite the mizen* (whence this rope takes its name) that is, hale by this rope that the sail may fall down.

SMOKE, or SMOAK, *fumus*, a humid matter, exhaled in form of vapour by the action of heat, either external or internal; or *smoke* consists of palpable particles, elevated by means of the rarefying heat, or by the force of the asending current of air, from bodies exposed to heat; and these particles vary much in their properties, according to the substances from which they are produced. See FLAME.

Smoke, Sir Isaac Newton observes, ascends in the chimney by the impulse of the air it floats in: for that air, being rarefied by the fire underneath, has its specific gravity diminished; and thus, being determined to ascend itself, it carries up the *smoke* along with it. The tail of a comet that great author takes also to ascend from the nucleus after the same manner. See COMET.

Smoke of fat unctuous woods, as fir, beech, &c. makes what we call *lamp*-BLACK.

There are various inventions for preventing and curing *smoking* chimneys: as the æolipiles of Vitruvius, the ventiducts of Cardan, the windmills of Bernard, the capitals of Serlio, the little drums of Paduanus, and several artifices of De Lorme, &c. See CHIMNEY and FIRE-*places*.

In the Philosophical Transactions we have the description of an engine, invented by Monsieur Dalesme, which consumes the *smoke* of all sorts of wood, and that so totally, as the most curious eye cannot discover it in the room, nor the nicest nose smell it, though the fire be made in the middle of the room. It consists of several iron hoops, four or five inches in diameter, which shut into one another, and is placed on a trevet. A brand taken out of the fire *smokes* instantly, but ceases as soon as returned: the most fetid things, as a coal steeped in cat's piss, which stinks abominably when taken out of the fire, yet in it makes not the least ill scent; no more than red-herrings broiled, &c.

SMOKE *farthings* were the pentecostal or customary oblations offered by the inhabitants within any diocese, when they made their processions to the cathedral church; which came, by degrees, into an annual standing rent, called *smoke farthings*. See PENTECOSTALS.

SMOKE *jack*. See JACK.

SMOKE-*silver*, in our *Old Writers*. Lands were held in some places by the payment of the sum of six pence yearly to the sheriff, called *smoke-silver*.

Smoke-silver, and *smoke-penny*, are to be paid to the ministers of divers parishes as a modus, in lieu of tithe-wood; and in some manors, formerly belonging to religious houses, there is still paid, as appendant to the said manors the ancient Peter-pence, by the name of *smoke-money*.

SMORZATO, in the *Italian Music*, is used to signify that the bow, or fiddle-stick, should be drawn to its full length, not with the same strength of hand throughout, but bearing lighter and lighter on it by degrees, till at last scarce any sound be heard. This term is not much used at present.

SMUGGLING, a cant term for the running of goods, or the offence of importing them without paying the duties imposed thereon by the laws of the CUSTOMS and EXCISE.

This is restrained by a great variety of statutes, which inflict pecuniary penalties, and seizure of the goods, for clandestine *smuggling*; and affix the guilt of felony, with transportation for seven years, upon more open, daring, and avowed practices: but the last of them, 19 Geo. II. c. 34. is for this purpose *instar omnium*: for it makes all forcible acts of *smuggling*, carried on in defiance of the laws, or even in disguise to evade them, felony, without benefit of clergy; enacting, that if three or more persons shall assemble, with fire arms, or other offensive weapons, to assist in the illegal exportation or importation of goods, or in rescuing the same after seizure, or in rescuing offenders in custody for such offences; or shall pass with such goods in disguise; or shall wound, shoot at, or assault any officers of the revenue, when in the execution of their duty, such persons shall be felons, without the benefit of clergy.

But the laws relating to *smuggling* still need revisal; and the wisdom of the legislature is at this time (viz. 1784) devising methods for preventing the frauds attending the evasion of them.

SMUSH-*pot*, among *Painters*, is the vessel into which they rub off the paint from the pencils, and put the scrapings of the pallet.

SMUT, in *Husbandry*, a disease in corn, in which the grains, instead of being filled with flower, are full of a black stinking powder. See BLIGHT and RUST *of corn*.

Many things have been suspected as the causes of this distemperature in corn; but Mr. Tull seems convinced by experiment, that it is caused only by too much moisture, the several plants of corn, which he had taken up by the roots, and planted in troughs of very moist earth, all bringing forth *smutty* ears, while very few such were found in the corn of the field from whence these plants were taken. It is observable, also, that those ears, the grains of which are to be *smutty*, never send up any flowers at all.

The two things, recommended by writers of husbandry as remedies, or preventions of this disease, are brining, and changing the seed. The first of these methods was accidentally discovered about a century ago: a ship's load of wheat was, about autumn, sunk near Bristol, and afterwards was taken up at the ebbs at several times, after being thoroughly soaked in sea water. When the wheat was all taken up, it was found unfit to make bread of, but a farmer trying some of it for sowing, found it answer very well, and himself, and the neighbouring farmers, bought it all up at a small price; the country all about was sown out of this cargo. It happened that *smuttiness* in the wheat corn was a reigning distemper in all parts of the kingdom at that time, but it was remarkable, that all the fields sown with this salt wheat, were absolutely free from the mischief: this easily introduced the practice of soaking wheat, before sowing, in a brine of salt and water, to prevent it in other places, and it has succeeded well.

Mr. Tull gives an instance of the certainty of its effect, in the case of two farmers whom he personally knew, and whose farms lay intermixed: these men bought the same seed between them from a very good change of land, and parted every land between them in the field; the oldest farmer believed the brining to be a fancy, and sowed his seed unbrined, the other brined all his seed, and the consequence was, that the old farmer had a great deal of *smut* in his corn, while the other had not one *smutty* ear.

When wheat is intended for drilling, it must be soaked in no other brine than that of pure salt and water, for if there be any grease among it, it will never be dry enough for this manner of sowing. If seed-wheat be soaked in urine, it will not grow, and if it be only sprinkled with it, it will most of it die, unless it be planted presently. The most expeditious way of brining wheat for drilling, is to lay it in a heap, and wash it with a strong brine sprinkled on it, stirring it up with a shovel, that it may be all equally brined, or wetted with it; after this sift on some fine lime all over the surface, and stir it up, still sifting on more in the same manner till the whole is dusted with the lime, it will then be soon dry enough to be drilled without farther trouble. It must be quicklime, in its full strength, that is used on this occasion.

Bad years will cause *smut* in corn, and good years will prevent it: it is, however, observable, that the crops in which there is *smutty* corn will, if used for seed, be liable to produce *smutty* corn again, rather than other seed. The brining is a defence against bad years, and against the mischiefs attending the sowing of corn among which there has been *smut*.

Mr. J. Reynolds ascribes this disease to insects, and recommends a pickle for effectually destroying their breed: this pickle he pronounces, after thirty years experience, to be a sure remedy. See BRINING *of corn*.

The other method of changing the seed is by many held effectual to prevent *smuttiness* in the crop; several, who have tried this with due care, have found perfect success from it: and it is to be observed, as to the great success of the drowned wheat at Bristol, that it was owing to a change of feed to the lands on which it was sown, as well as a brined seed.

Seed-wheat should be bought from the crop on a strong clay-land, whatever kind of land it is to be sowed upon. A white clay is a good change for a red clay, and a red clay for a white; but whatever the land be, from which the seed is taken, it may be infected, if that be not changed there the preceding year, and then there may be danger, though it be had from ever so proper a land.

It is a rule among the farmers, never to buy seed-wheat from a sandy soil, they express their dislike of this by the coarse rhime; sand is a change for no land.

A crop of wheat, very early planted, is not so apt to be *smutty*, as one planted less early; and the farmers have observed, that the largest and plumpest ground fat wheat is more liable to be *smutty* than the small ground wheat. Tull's Horse-hoeing Husbandry.

The *smut* of corn usually happens after rain, followed by a bright sunshine; and when the *smutted* stalks are examined, they are found to be spotted, and pricked as it were with small burnt places. The cause of the malady, therefore, probably is, that those small drops of rain, which remain upon the stalks before they are dried up by the sun, act as so many lenses, or small burning-glasses, and their focus being very near them, their effect falls upon the stalk which supports them; wherefore the sun's rays, collected in this point, must burn, and this burning dries up the stalk, and prevents the ear from graining, or producing its proper seeds.

Smutty corn is of a very mischievous nature to those who eat it. Schober has published a dissertation on a terrible epidemical malady that raged, in the year 1722, in many parts of Germany, and carried off a great many people of all ages and sexes: this he attributes wholly to their eating flour and bread made of corn, among which a larger than ordinary quantity of this *smut* had been produced the year before, and ground down with it. From this it appears, that these black ears have a stupefactive and narcotic quality, depending on a peculiar sulphur they are endowed with, and to this sulphur it is owing that they are so inflammable beyond other corn.

This sulphureous principle is very hurtful to the nerves, and never fails to cause disorders of them, of various kinds, when taken in any quantity; contractions, and convulsions of the limbs, vertigos, sleepiness, and, in fine, light-headedness, were the symptoms of the diseases brought on by the eating it on the occasion above mentioned; and sometimes true and incurable epilepsies come on. Some were seized with fevers, and children in particular were found more subject to the small-pox that year, than they had been observed to be, and they had commonly very bad kinds.

SMYRHIZA, in *Botany*, a name used by Pliny, and some other old authors, for the common myrrhis, or chervil.

SMYRNIUM, in *Botany*. See ALISANDERS.

SMYRUS, in *Ichthyology*, a name sometimes given by Pliny to the fish called by authors *myrus*, the MURÆNA *myrus* of Linnæus, and by Willughby the *sea-serpent*, with a compressed tail.

It is a species of the muræna according to Artedi, and is distinguished from all the others by that author, under the name of the *muræna* with a sharp snout, variegated with white spots, and with the edge of the back-fin black. See MYRUS.

SMYTHAM, in *Mineralogy*, lead-ore stamped and pounded down, like powder or sand, to cleanse the stones and earth from the ore.

SNAFFLE, in the *Manege*, a well known kind of bridle. The *snaffle*, after the English fashion, is a very slender bit-mouth without any branches; they are much used in England instead of true bridles, which are only employed in the service of war. The French call them *bridons*, by way of distinction from *brides*, *i.e. bridles*.

The *snaffle*, or small watering bit, is commonly a scatch-mouth, accoutred with two little very straight branches, and a curb, and mounted with a head-stall, and two long reins of Hungary leather.

The *snaffle* is much recommended by Mr. Berenger in his History and Art of Horsemanship, vol. ii. p. 225, &c.

SNAIL, in *Ichthyography*. See LIPARIS *nostras*.

SNAIL, *helix*, in *Natural History*, is a genus of the *testacea* order of worms. Its characters are; that its animal is a slug, the shell univalve, spiral, sub-pellucid, and brittle, and that it has a semi-lunar aperture. Linnæus enumerates sixty species.

The *garden snail*, or *helix lucorum* of Linnæus, is a well known species: it abounds with a viscid slimy juice, which it readily gives out by boiling to milk or water, so as to render them thick and glutinous. The decoctions in milk are apparently very nutritious and demulcent, and have been recommended in a thin acrimonious state of the humours; in consumptive cases and emaciations.

The *exotic snail*, or *pomatia helix* of Linnæus, is also celebrated on account of its naturalization in this country, by Sir Kenelm Digby, and its use, as a food, in several parts of Europe during Lent. See POMATIA.

It was also much valued by the ancient Romans.

Perrault doubts of *snails* having eyes, and Dr. Brown denies it; but according to Dr. Porterfield, a good microscope shews them distinctly.

The eyes of *snails* are lodged in their horns, one at the end of each horn, which they can retract at pleasure. Med. Eff. Edinb. vol. iii. art. 12.

The manner of examining these eyes, which are four in number, is this; when the horns are out, cut off nimbly the extremity of one of them, and placing it before the microscope, you may discover the black spot at the end to be really a semiglobular eye.

The dissection of this animal is very curious; for by this means the microscope not only discovers the heart beating just against the round hole near the neck, which seems the place of respiration, but also the liver, spleen, stomach, and intestines, with the veins, arteries, mouth, and teeth, are plainly observable; the guts of this creature are green, from its eating of herbs, and are branched all over with fine capillary white veins; the mouth is like a hare's, or rabbit's, with four or six needle-teeth, resembling those of leeches, and of a substance like horn.

Snails are all hermaphrodites, having both sexes united in each individual; they lay their eggs with great care in the earth, and the young ones are hatched with shells completely formed. Cutting off a *snail's* head, a little stone appears, which is supposed to be a great diuretic, and good in all nephritic disorders. Immediately under this stone the heart is seen beating, and the auricles are evidently distinguishable, and are membranous, and of a white colour; as are also the vessels which proceed from them.

Snails discharge their excrements at a hole in their neck, they also breathe by this hole, and their parts of generation are situated very near it. The penis is very long, and in shape resembles that of a whale.

In the process of generation, it has been observed, that with the male and female part there issues, at the aperture of the neck, a kind of spear, shaped like the head of a lance, and terminating in a very acute point: and when the two *snails* turn the clefts in their necks towards each other, the spear issuing from one pricks the other, and then either drops to the ground, or is carried off by the *snail* it has pricked. This *snail* instantly withdraws, but soon after rejoins the other, which it pricks in its turn, and after such mutual puncture, the copulation never fails of being consummated.

Snails are said to couple three times at the distance of about fifteen days from each other, nature producing a new spear for each time of copulation, which lasts ten or twelve hours; at the end of about eighteen days they bring forth their eggs, by the aperture of their neck. Baker's Microscope, p. 217. Mem. R. A. Abr. vol. iii. p. 85.

So small an animal as the *snail* is not free from the plague of supporting other smaller animals on its body; and as in other animals we find these secondary ones either living only on their surface, as lice, &c. or only in the intestines, as worms, it is very remarkable that this creature infests the *snail* in both these manners, being found sometimes on the surface of its body, and sometimes within its intestines.

There is a part of the common garden *snail*, and of other of the like kinds, commonly called the *collar*; this surrounds the neck of the *snail*, and is considerably thick, and is the only part that is visible when the animal is retired quietly into its shell. In this state of the animal these insects, which infest it, are usually seen in considerable numbers marching about very nimbly on this part: besides the *snail*, every time it has occasion to open its anus, gives them a place by which to enter into its intestines,

inteſtines, and they often ſeize the opportunity. Mem. R. A Abr. vol. iii. p. 377, &c.

Snails are great deſtroyers of fruit in our gardens, eſpecially the better ſorts of wall-fruit. Lime and aſhes ſprinkled on the ground where they moſt reſort, will drive them away, and deſtroy the young brood of them; it is a common practice to pull off the fruit they have bitten, but this ſhould never be done, for they will eat no other till they have wholly eat up this, if it be left for them.

The Romans were fond of *ſnails*, and had them fed on purpoſe for their tables. The POMATIÆ were preferred for this purpoſe; and they were fed with bran and ſodden wine. Fulvius Hirpinus was the firſt inventor of this luxury, a little before the civil wars between Cæſar and Pompey.

Their taſte is not delicious, but rather diſagreeable; but this they diſguiſed by means of good ſauces, and had other reaſons for the receiving them into the liſt of foods. They uſed them as provocatives, or inciters to venery.

Ariſtotle, and the old Greeks, had no idea of the generation of theſe inſects, in the manner of other animals, but ſuppoſed them produced ſpontaneouſly; but the Romans ſhew, by many paſſages in their writings, that they had got over this error, and even ſeem, by the preference they gave to the neck of this animal in this intention, to have underſtood the hermaphrodite ſtructure of this inſect, which much later ages have pretended to make a new diſcovery.

The Eaſtern nations at preſent run much into the opinions of the Romans of old, as to provocatives; they uſe, as the others did, every thing that ſerves to the purpoſes of generation in other animals, and every thing that has but the reſemblance of the external figure of the parts ſubſervient to it.

SNAIL, *ear*. See SHELLS.

SNAIL, *naked, limax*. See SLUG and LIMAX.

SNAIL, *oat*, a name given by Dr. Liſter, in the Philoſophical Tranſactions, to a ſmall *ſnail*, which he obſerved under the looſe bark of old willows, elms, and other trees, and which is of a very ſingular ſtructure; the ſhell reſembling an oat-corn, whence the name, and its volutæ, or wreaths, running contrary to the direction of them in other *ſnails*, that is eaſt and weſt, as the philoſophers expreſs it, referring it to the motion of the ſun; but theſe ſhells, to uſe that language, have the turns weſt and eaſt, or more plainly, they have the turns running from the right hand to the left, not from the left to the right as other *ſnails*. Phil. Tranſ. N° 250.

SNAIL, *trefoil*, in *Botany*. See TREFOIL.

SNAIL is alſo the name of the animal inhabiting many kinds of ſhells, as the patella, cochlea, nerite, buccinum, turbo, trochus, voluta, murex, purpura, lyra, and concha Veneris. See PATELLA, COCHLEA, &c.

SNAKE, *anguis*, in the Linnæan *Syſtem of Zoology*, is a genus of SERPENTS, the characters of which are, that the animals belonging to this genus have abdominal and ſubcaudal ſcales. Here we may obſerve, that Linnæus has diſtinguiſhed the ſmall ſcales, with which the back and ſides of the animals belonging to the claſs of SERPENTS are covered, by the name of *ſquamæ*, and the oblong, narrow, tranſverſe plates, with which the bellies of ſome of them are covered, by the denomination of *ſcuta*. Thoſe that have both *ſquamæ* and *ſcuta*, he diſtributes under the genus of *coluber*; thoſe that have only *ſquamæ* under the appellation of *anguis*. In conformity to this diſtribution, he has ranked the *common ſnake* as well as the VIPER, &c. under the genus of *coluber*; and claſſed ſixteen different ſpecies, as the four-footed Javan *ſnake*, the common SLOW-*worm*, &c. under that of *anguis*.

SNAKE, *annulated*. See AMPHISBÆNA and SERPENTS.

SNAKE, *common*, or *ringed*, *coluber natrix* of Linnæus. See NATRIX.

The following account of an eaſy method of preſerving *ſnakes* may not be unacceptable. When the *ſnake* is killed, it muſt be waſhed clean, and put into a glaſs of a proper ſize, the tail firſt, and afterwards the reſt of the body, winding it in ſpiral aſcending circles, and diſpoſing the back, which is always the moſt beautiful, outwardly. A thread connected with a ſmall bead is then, by a needle, to be paſſed through the upper jaw from within outwardly, and then through the cork of the bottle, where it muſt be faſtened; by this means the head will be drawn into a natural poſture, and the mouth kept open by the bead, whereby the teeth, &c. will be diſcovered: the glaſs is then to be filled with rum, and the cork ſealed down. In this manner the *ſnake* may be preſerved for many years; nor will the ſpirits impair or change the luſtre of its colour.

SNAKE, *blood*, *hæmorrhous*, the name of a peculiar ſpecies of ſerpent, ſo called, becauſe it was ſuppoſed, that on a perſon's being bit by it the blood flowed out of every part of the body.

It is a ſmall ſerpent, ſeldom arriving to more than a foot long; its eyes are remarkably vivid, bright, and ſparkling; its ſkin is very gloſſy, and its back variegated with a great number of black and white ſpots; its neck is very ſlender; its tail extremely ſharp, and it has a ſort of ſmall horns placed over its eyes: it is found in Egypt.

There is alſo an American kind of this, found in the ſouthern parts, and called by the natives *ahucyatli*, which is larger than the other, and reſembles the rattle-*ſnake* in many particulars, but wants the diſtinguiſhing character in the tail. See *Tab. Serpents*, and Ray's Syn. An. p. 287.

SNAKE, *horned*. See CERASTES.

SNAKE, *oak*. See DRYINUS.

SNAKE, *rattle*, *crotalus*, a very dreadful genus of SERPENTS. Its characters are, that the animals of this genus have abdominal ſcuta, or ſhields, and ſubcaudal *ſcuta* and *ſquamæ*, or ſcales, and that the tail terminates in a horny rattle. Linnæus enumerates five ſpecies, which are all inhabitants of America, and venomous.

The *rattle-ſnake*, or *horridus crotalus*, is a very dreadful ſpecies of ſerpent, whoſe bite is fatal, if not timely remedied, and which is diſtinguiſhed from other ſerpents by the *rattle* in its tail. This is compoſed of ſeveral ſcaly ſubſtances, and is ſaid to increaſe by the creature's age; every year adding one ſcale to it. It moves over the rocks and mountains with prodigious ſwiftneſs, but is leſs nimble on even ground, than many other *ſnakes*.

It grows to four or five feet long, and ſometimes, though rarely, more; Cateſby ſays, that ſome of them are eight feet long, and weigh about eight or nine pounds; one of more than four feet long having been diſſected, and accurately deſcribed by Dr. Tyſon, the account that gentleman gives of it may not be unacceptable to the reader. The body where largeſt, which was near the middle, meaſured ſix inches and a half round; its neck only three inches; its head was flat, as that of the viper; and as the jaws are very broad and protuberant, and the noſe ſharp, it ſomewhat reſembles the head of an arrow; at the end of the noſe are placed the noſtrils, and between theſe and the eyes there are two other holes which may be miſtaken for ears; but they only go into a hollow of the bone of the ſkull, without any perforation into the brain. The viper has nothing of theſe holes. The eyes are round, and wholly reſemble thoſe of the viper; the whole body of the creature greatly alſo reſembles the viper, but for the ſingularity of the *rattle*; and over the eyes there are two large ſcales, looking like eye-brows.

The ſcales which cover the head are very ſmall, thence they become gradually larger as they reach toward the middle of the body, and from the middle to the tail they grow leſs and leſs again; and all in ſhape much reſemble the broad and flat ſeeds of the common garden-parſnip. There is ſome variety in the colours of this creature, whether according to the difference of age or ſex, or from leſſer accidents: the moſt uſual colours are theſe; the ſcales are of a duſky greeniſh, like the feathers of the back of the green-finch, and are variegated with ſmall black ſpots in great numbers; there alſo are four large ones of the ſame colour.

The back is of a mixt colour, of a dead yellowiſh brown, variegated with blotches of black and yellow, and with a number of ſmall dots of the ſame colours; the larger blotches being laid in great regularity, and making a very beautiful teſſelated figure; the ſcales become darker as they approach the tail, where they are almoſt black; and thoſe on the ridge of the back all along, are raiſed into a ſort of ſharp prominence in their middle, like the ſcales of a crocodile; thoſe on the ſides are plain and flat; the belly is all along covered with oblong parallelogram ſcales, laid tranſverſely, and joined to each other by diſtinct muſcles; theſe are very bright and gloſſy, and are yellow, ſpotted with black. From the neck to the anus there were one hundred and ſixty-eight; beyond the anus two half ſcales, and thence nineteen whole ſcales of a black lead colour, with yellowiſh edges; from thence to the rattle, ſix orders, or rows of ſmaller ſcales of the ſame colour.

The head is ſmall in proportion to the body, but the mouth is capable of opening to a prodigious width; the tongue is wholly like that of the viper, compoſed of two oblong portions, joined towards the baſes, but ſeparate as they approach the end; the teeth are of two kinds, the ſmaller ones deſigned for its eating with, the larger and longer for biting and poiſoning what it ſeizes; theſe are only placed in the upper jaw, but all the teeth of the mouth are of the canine kind, as the creature, never

chewing

chewing its prey, has no use for dentes molares, or grinders.

The poisonous teeth are situated on the outside of the jaw, in the anterior part of the mouth; not fixed in the sockets of the jaws, as the others, but fixed to two bones. These, in their natural state, are not visible, even when the creature's mouth is opened, unless it be with an intent to wound; for they lie back under a membranaceous covering, and the creature has a power of erecting, and wounding with them at pleasure, as the lion and cat-kind can retract, or thrust out their claws. These teeth are crooked, and have a hollow at their bottom, and at their point a very plain and evident slit, looking like the nib of a writing pen; the teeth are hollow all the way from this slit to their bottom, and on pressing the gums in a dead *rattle-snake*, the poisonous juice may be seen to ascend by degrees up the tooth, and at length to be discharged out of the slit at the point; this makes it very plain in what manner the poison is conveyed into the flesh, when the creature bites. See VIPER.

The rattle is affixed to the last vertebra of the tail, and is composed of a series of small bones; that next the tail is usually of a bluish grey colour, the rest of a pale brown. These bones are hollow, very thin, hard, and dry, and of a brittle texture, and very sonorous. They are all of the same figure, representing, in some degree, the os sacrum in the human skeleton, and are all nearly of the same size. The last of these is seen to have a rigid extremity, in manner of a tail, and all the others have the same, though it is not distinguishable in them, as in the joining it runs under two others; and by means of this structure they are all moveable with the smallest force, and the sound is the more vigorous, as each of these tails strikes on two of the hollow joints, when put in motion.

The age of the creature, as some authors have asserted, is known by the number of joints of this rattle, which are found to be from one to twenty, or more. The use of this seems not to the creature, but to other animals, that they may be alarmed at the approach of so terrible an enemy, and get out of its way in time; besides, if a single *snake* be surprised and rattles, others that are near take the alarm, and rattle in like manner. Phil. Trans. Abr. vol. ii. p. 797, &c. See Phil. Trans. Abr. vol. viii. p. 410—416, &c. See *Tab. Serpents.*

The general food of *rattle-snakes* consists of toads, frogs, crickets, grasshoppers, and other insects, but chiefly of ground-mice; and they again serve for food to bears, and even hogs. These animals are viviparous, and commonly bring forth about twelve, in the month of June. They couple in August, and are then the most dangerous. They shed their skins every year in June, and turn it inside out, when they throw it off. They generally den among the rocks in great numbers together, retiring about the middle of September, and coming abroad about the middle of May.

The charming or fascination of the *rattle-snake*, as this is usually called, has exercised the wits of many naturalists in vain, and many have disbelieved the fact.

Sir Hans Sloane mitigates the matter, by supposing the creature first to seize or bite its prey, which it then suffers to escape, as far as the poison will let it, watching its death, that it may devour it without trouble; and that it is in this poisoned state that people have seen the squirrels, &c. dancing about before the *rattle-snake*, and dying convulsed; all which they have attributed to the power of charming in the eye of the *snake*, not conceiving that it was the effect of the creature's having before bitten them. This, though a very plausible account, yet however wants experience to confirm it, and the general testimony of people, who have seen the facts, makes against it.

The same author gives us, however, from colonel Beverley, the whole process of the charm. The colonel acquaints us, that some company he was with once saw a hare, about half grown, sitting quietly in an orchard, and striking at her, she only removed a few yards, when wondering at the cause, they saw a *rattle-snake* about ten feet distance, eying the hare as his destined prey. The poor creature was, by this time, in agonies and convulsions, often getting up on its legs, as if intending to run away, but always immediately falling down again, and growing worse and worse, soon lost the use of its hinder legs, and panting vehemently, fell on its side. In about half an hour more the hare seemed to have done with all struggles, and to be dead, on which the *snake* uncoiled itself, and moved gently towards it, but the poor hare starting again he stopt; but when all was again quiet, he moved up to it, and, raising his head, looked all over his prey, his colours looking at that instant more beautiful than before, and his eyes sparkling. The hinder part of the hare had been toward the *snake* all this time, and it had perished without much looking at its enemy. The *snake* wetted the body all over with his slaver, and then, with great difficulty, taking first the head into his mouth, swallowed that, and afterwards the whole body, sucking it gently down, and not getting in the shoulders without great difficulty.

It is certain, upon the whole, that there is much in this account to favour Sir Hans Sloane's opinion of the hare's having been first bitten, though that was not seen, since the convulsions, and loss of the use of the hinder legs, seem a very natural effect of poison; but we are assured by persons who have been eye-witnesses to the fact, that a bird hopping about in all this agony and terror, has, on the frightning the *rattle-snake* away, flown off without any difficulty; so that the whole seems yet not understood. Sloane's Hist. Jamaica. Phil. Trans. Abr. vol. ix. p. 55, &c.

Mr. Dudley (Phil. Trans. Abr. vol. viii. p. 410.) observes, that though he dares not answer for the truth of every story, yet he is abundantly satisfied from many witnesses, both English and Indian, that a *rattle-snake* will charm both squirrels and birds from a tree into his mouth; and others have ascribed the effect, accounted for by fascination, to excess of fear, observing, that the unguarded rage and surprize which birds and squirrels are in at the sight of animals capable of hurting them or their young, and the fear and confusion at being disturbed in their retreats, or at the time of gathering their food, put them into the power of their enemies, and bring them so near the *snake*, that he may easily reach them when placed on a coil. For an account of the poison, &c. of the *rattle-snake*, see VIPER.

SNAKE, *sand*, the English name of a kind of serpent found in Lybia, and some parts of Italy. See AMMODYTES.

SNAKE, *sea*, *serpens marinus*, the name of a fish of the eelkind, being the cylindric MURÆNA, with the tail naked and acute, usually of five or six feet in length, and a furrowed body, continuing all the way of the same thickness, till near the tail. See *Tab.* IV. *Fishes*, N° 50. Its back is of a dusky yellow, and its belly a shining blue; its snout is long, slender, and pointed, and the opening of its mouth extremely large; near the end of the under jaw it has four or five large sharp teeth, which bend backwards, the rest of the teeth are very small, and stand close together: at the very extremity of the upper jaw it has four very large teeth, and all the rest are small, and like those in the under one; but the largest teeth of all are placed in a row, in the middle of the palate; it has only one pair of fins, which are placed near the gills; the openings of the gills are at a considerable distance from the head, and it is marked with dotted lines down its sides; it is common in the Mediterranean, and its flesh is very fine tasted, but full of small bones. Willughby, Hist. Pisc. p. 108.

Bishop Pontopiddan mentions (in his Hist. of Norway, vol. ii. p. 195, &c.) a *sea-snake* of a very prodigious size; for the particulars of its dimensions, &c. we must refer to the testimonies which he has recorded. These animals, some of which are said to be no less than six hundred feet long, are dangerous to navigators, as they throw themselves over vessels of some hundred tons burthen, and sink them to the bottom by their weight. The preservative against them is castor, the smell of which they are said to avoid. The bishop apprehends, that this creature, which inhabits the North Sea, is the leviathan mentioned in Scripture. Isaiah xxvii. 1. Job xxvi. 13.

SNAKE, *sleep*. See HYPNOTICUS *serpens*.

SNAKE, *spectacle*. See COBRAS *de capello*.

SNAKE-*stones*, *ammonitæ*, in *Natural History*, the name of a large genus of fossil shells, very few, if any, of which are yet known in their recent state, or living either on our own, or any other shores, so that it seems wonderful whence so vast a number and variety of them should be brought into our subterranean regions. They seem indeed dispersed in great plenty throughout the world, but no where are found in greater numbers, beauty, and variety, than in our own island.

These are frequent in many parts of the world, beside the plenty we have of them in England, and elsewhere. The accurate observer, Mr. Harenberg, found prodigious numbers of them on the banks and among the sand of a river in Germany. He traced this river through its several windings for many miles, and among a great variety of belemnitæ, cornua ammonis, and cochlitæ, of various kinds, he found also great quantities of wood, of recent petrifaction, carrying in it at that time the plain marks of the axe, by which it had been cut from the trees then growing on the shore. The water of this river he found, in a dry season, and when the supplies of

of its natural springs were not diluted with rains, to be considerably heavier than common water; and many experiments shewed him that it contained ferruginous, as well as stony particles, in great quantity, whence the petrifactions in it appeared the less wonderful, though many of them of recent date.

Of the cornua ammonis, or *serpent-stones*, he there observed more than thirty different species, and doubts not but there are many more yet unobserved. They lie immersed in a bluish fossil stone, of a soft texture, and fatty appearance. They lie in this in prodigious numbers, and of a great variety of sizes, from the larger known sorts, down to such as could not be seen without very accurate inspection, or the assistance of a microscope. Such as lie in the softest of these stones, are soft like their matrix, and easily crumble to pieces; others are harder. In a piece of this stone, of the bigness of a finger, it is common to find thirty or more of these fossils; and often they are seen only in form of white specks, too minute to shew their figure, till examined by the microscope. But what is most observable of the cornua ammonis of this place is, that they are often found growing not only to, but into one another, in such a manner, that they cannot be supposed ever to have been inhabited by any living fish, especially the specimen which is pierced by the other. This author is of opinion, that they grow, and are formed where they are; and attempts to prove it by affirming, that they have an actual increase in size there in a little time, and that not only if left in their beds but if taken out, and put into a glass of the water. This is an opinion wholly different from the received one at present in the world, and perhaps will be found erroneous on farther trials. Act. Erudit. 1727. p. 140.

They are of very different sizes, as well as species, some being found of the size of a sixpence, or less than that, and others of more than two feet in diameter; they are all made up of several circles, like those of a *snake* when rolled up, the tail lying in the centre, and the larger end, where was the mouth of the fish, at the other. Some of them are rounded, others greatly compressed, or flatted, and they are at times found lodged in almost all the different strata of earth or stone.

They all consist of several volutæ, which are different in number in the different species, and their striæ also are extremely various, some very deep with very high ridges between them, others very slight; some straight, others crooked; others undulated, and some terminating in dots, tubercles, or cavities, towards the back, and others having tubercles in two or three places.

They are all composed of a great number of chambers, or cells, in the manner of the *nautilus Græcorum*, each having a communication with the others, by means of a pipe or siphunculus. There is a small white shell-fish of Barbadoes, which seems truly a recent animal of this genus; and in the East-Indies there is another also, small and greyish; but the large, and beautifully marked ones, are found only fossil.

They are composed of various fossil bodies, often of quarry-stone, sometimes of the matter of the common pyrites, and of a great variety of other substances; and though they appear usually mere stones, yet in some the pearly part of the original shell is preserved in all its beauty. Sometimes also, while the outer substance is of the matter of the pyrites, or other coarse stony, or mineral matter, the inner cavity is filled with a pure white spar of the common plated texture. This gives a great beauty to the specimen. Hill's Hist. of Foss. p. 649—650.

The cornua ammonis, or *snake-stones*, are found in many parts of England, particularly in Yorkshire, where they are very plentiful in the alum-rocks of several sizes. See *Tab. of Fossils, class* 9. See CORNU *ammonis*.

SNAKE-*root*, *serpentaria*, the root of a species of *aristolochia*, or BIRTHWORT.

The ancients were only acquainted with two kinds of *serpentaria*, the *great* and the *small*: but since the discovery of America, botanists have added several others; as, the *serpentaria Virginiana*, or *Virginia snake-root*: besides that of Canada, and that of Brasil.

They are supposed to be alexipharmics, or counter-poisons; and as such are ingredients in the Venice-treacle. The herb *dragons*, is also called, by some writers, the *great serpentaria*, by the ancients *dracunculus major*; this has its stem very straight, smooth, and marked with red spots, like the skin of a serpent; whence, probably, as much as from its virtues, it is, that it takes its name. Its root is big, round and white, covered with a thin skin. The *smaller serpentaria*, of this kind, has its stalk much like that of the larger, only its leaves are like those of ivy, whereas those of the larger are digitated, after the manner of bastard hellebore. Its root is round and bulbous.

The *serpentaria of Virginia*, called also *colubrina Virginiana*, *asarum Virginianum*, *serpentaria nigra*, and the *contrayerva of Virginia*, has its leaves green and large, almost in figure of a heart; its fruit round, and its root, which is of a very strong aromatic smell, has, at bottom, an infinite number of long small filaments, representing a kind of beard, of a brownish colour on the outside, and paler or yellowish within.

It was first brought into Europe from Virginia by the English; and is by the Americans esteemed a sovereign antidote against the bite of the rattle-snake.

We are told by travellers, that this root not only cures the bite of a rattle-snake, but that that animal flies the very smell thereof; for which reason the Indian, and other travellers, always carry it with them on the end of a staff, by way of a preservative from that creature.

This root is a warm diaphoretic and diuretic. It is reckoned one of the principal medicines of the alexipharmic kind; and as such, is in general use, in low and malignant fevers and epidemic diseases, for raising the pulse, promoting a diaphoresis, and correcting a putrid disposition of the humours. It is given, in substance, from a few grains to a scruple, or half a dram; in decoction, or infusion, to a dram and upwards.

Tinctures of it are prepared in the shops, by macerating two or three ounces of the root in a quart of proof spirit, or of a spirituous alexiterial water, mixed with one-sixth its quantity of distilled vinegar, which last ingredient is an excellent addition to this kind of medicines in acute diseases. See ARISTOLOCHIA.

SNAKE-*weed*. See BISTORT.

SNAKE-*root*, *rattle*. See MILK-*wort*.

SNAKE-*wood*, in the *Materia Medica*, is the wood or root of the tree which affords the *nux vomica*, or of other trees of the same genus. It is brought from the East-Indies under the name of LIGNUM *colubrinum*, in pieces about the thickness of a man's arm, covered with a rusty-coloured bark, internally of a yellow colour, with whitish streaks. This wood, in rasping or scraping, emits a faint but not disagreeable smell, and when chewed for some time discovers a very bitter taste.

From the experiments of Cartheuser, water appears to be the proper menstruum of its active matter.

Snake-wood has been recommended, in small doses, not exceeding half a dram, as an anthelminthic, and in obstinate quartans, jaundices, cachexies, and other chronical disorders: it is said to operate most commonly by sweat, sometimes by stool, and sometimes by vomit. It appears, however, to be possessed, in a lower degree, of the same ill qualities with the NUX *vomica*. Lewis.

SNAP-*dragon*, or CALF'S *snout*, *antirrhinum*, in *Botany*, a genus of the *didynamia angiospermia* class. Its characters are these: the empalement is of one leaf, cut into five parts; the flower is ringent, having an oblong tube, and divided at the top into two lips, which are closed at the jaw; in the bottom is situated an obtuse nectarium, which is not prominent; in the centre is placed a roundish germen, which becomes a round obtuse capsule, having two cells, which are full of small angular seeds.

To this genus Linnæus has joined the *linaria* and *asarina*; but as the flowers of the linaria have spurs to their petals, and the nectarium being very prominent, which are not so in this genus, it should be separated from it: especially as there are many species of both kinds, which cannot so well be distinguished when the genera are united. Linnæus has enumerated forty, and Miller six species.

These plants grow very well upon old walls or buildings, in which places they will endure for several years; whereas those planted in gardens seldom last longer than two, unless in a very poor soil, and when the flowers are not suffered to seed. Wherever they are designed to grow on walls, or on a rocky barren soil, the seed should be sown the beginning of March, where they are designed to remain; for when they are transplanted from a better soil, they seldom succeed. Miller.

SNAP-*dragon of America*. See RUELLIA.

SNAP-*tree*, in *Botany*, a species of the JUSTICIA.

SNATCH-*block*, in a *ship*. See BLOCK.

SNEAD, or SNEATH, in *Agriculture*, the handle of a scythe, or like tool.

SNEEZING, *sternutatio*, a convulsive motion of the muscles of the breast used in expiration; wherein, after suspending the inspiration begun, the air is repelled from the mouth and nose with a momentary violence and noise.

The cause is, an irritation of the upper membrane of the nose, which communicates with the intercostal nerve by means of the twigs that it detaches to it.

This irritation is performed either externally, by strong smells, as marjoram, roses, &c. or by dust floating in the air, and taken in by inspiration; or by sharp pungent medicines, as cresses, and other sternutatories, which vellicate

vellicate the membrane of the nose; or internally, by the acrimony of the lympha, or mucus, which naturally moistens that membrane.

The matters cast forth in *sneezing*, come primarily from the nose and throat; the pituitary membrane continually exuding a mucus thither; and, secondarily, from the breast, the trachea, and the bronchia of the lungs.

F. Strada, in an express treatise of *sneezing*, has discovered the original of the custom of saluting those who *sneeze*. He shews it to be a relic of Paganism; though he owns it was in use among the Jews, as well as among the Romans. From an epigram in the Anthology it appears, that, among the ancients, a person after *sneezing* made a short prayer to the gods; as Ζευ σωζε, *Jupiter save me*.

SNEEZE-*wort*, in *Botany*, a species of ACHILLEA. See YARROW.

SNEEZE-*wort, Austrian*, in *Botany*, a species of *xeranthemum*. See ETERNAL *flower*.

SNET, among *sportsmen*, the fat of all kinds of deer. Dict. Rust.

SNIEGULKA, in *Natural History*, a name given by the common people of Poland to a bird of passage, that only comes to them in the colder months.

The name signifies the SNOW-*bird*, and Rzaczinski, in his History of Poland, calls it *nivalis avis*. The people presage, from its coming, the mildness or severity of their winter.

SNIGGLING, a method of fishing for eels, chiefly used in the day-time, when they are found to abscond themselves near wears, mills, or flood-gates: it is performed thus; take a strong line and hook, baited with a lob or garden-worm, and observing the holes where the eels lie hid, thrust your bait into them by help of a stick, and if there be any, you shall be sure to have a bite; and may, if your tackling hold, get the largest of eels.

SNIPE, *gallinago minor*, or SCOLOPAX *gallinago* of Linnæus, in *Ornithology*, a bird well known among the sportsmen, and which, though in general a bird of passage, yet sometimes remains with us the whole year, and builds and breeds here. Its young are so often found in England, that Mr. Pennant doubts whether it ever entirely leaves this island. It lives in marshy places, and builds among reeds in winter, but in the summer is found in our highest mountains as well as low moors; it lays four or five eggs at a time, of a dirty olive colour marked with dusky spots.

When *snipes* are much disturbed, particularly in the breeding season, they soar to a great height, making a peculiar bleating noise, and when they descend, dart down with great rapidity. The cock is observed (while his mate sits on her eggs) to poise himself on his wings, making sometimes a whistling and sometimes a drumming noise. Their food is the same with that of the woodcock, and they are found in every quarter of the globe, and in all climates.

The breast and belly of the *snipe* are white; its back covered with long feathers, which are variegated with black and a reddish brown; its tail is short, and hid by the wings when folded; it has a line of a reddish white running along the middle of the head; its beak is about three fingers breadth long, and is black at the end, and has several rough tubercles on it.

These birds are easily taken, by means of lime-twigs in this manner: take fifty or sixty birchen twigs, and lime them all very well together; take these out into places where there are *snipes*, and having found the places which they most frequent, which may be seen by their dung, set the twigs in these places, at about a yard distance one from another. Other places are those where the water lies open in hard frost and snowy weather; in these places also, and wherever they are suspected to come to feed, let more lime-twigs be placed in the same manner. The twigs are not to be placed perpendicularly in the ground, but sloping, some one way, some another; the sportsman is then to retire to a distance, and watch the coming of the birds to these places. When they fly to them, they naturally take a sweep round the earth, and by this means, they will almost always be caught by one or other of the twigs. When a first *snipe* is taken, the sportsman is not to run to take it up, for it will feed with the twig under its wings, and this will be a means of bringing down more of them to the place. When three or four are taken, they may be taken up, only leaving one fast to entice others; and thus the sport may be continued, as long as there are any birds of this kind about the place. It may be very proper, when the twigs are planted, to go about, and beat all the open and watery places near, that they may be raised from thence, and fly to those places where the twigs are placed to receive them.

SNIPE, *great*, in *Ornithology*, a species very rarely found in England. It weighs eight ounces; the head is divided lengthways by a testaceous line, bounded on each side by another of black; above and beneath each eye is another; the neck and breast are of a yellowish white, finely marked with semicircular lines of black; the belly with cordated spots; and the sides are undulated with black; the back, coverts of the wings, and scapulars testaceous, spotted with black, and edged with white; the primaries dusky; tail rust-coloured, barred with black; and legs black. This species was shot in Lancashire. Pennant.

SNIPE, *mire*. See BITTERN.

SNIPE *bills*, in *Maritime Affairs*, a kind of hooks for fastening the axle-trees of chain pumps to the bits.

SNIPE, *jack*. See JACK *snipe*.

SNORING. This affection is otherwise called *stertor*, which is a sound like that of the *cerchnon*, but greater and more manifest.

Many confound those affections, and make them to differ only in place and magnitude, calling by the name of *stertor* that sound, or noise, which is heard, or supposed to be made in the passage between the palate and the nostrils, as in those who sleep; that boiling or bubbling noise, which in respiration proceeds from the larynx, or head, or orifice of the aspera arteria, they call *cerchon*; but if the sound comes from the aspera arteria itself, they will have it called *cerchnos*, that is, as some understand it, a rattling, or as others a stridulous or wheezing roughness of the aspera arteria. In dying persons this affection is called by the Greeks ῥεγχος, *rhenchos*, which is a *snoring* or rattling kind of noise, proceeding, as it were, from a conflict between the breath and the humours in the aspera arteria.

This and such like affections are owing to a weakness of nature, as when the lungs are full of pus or humours, to which purpose we read in the Prognostics of Hippocrates: "it is a bad sign when there is no expectoration, "and no discharge from the lungs, but a noise, as from "an ebullition, is heard in the aspera arteria, from a ple-"nitude of humour." Expectoration is suppressed either by the viscidity of the humour, which requires to be discharged, and which adhering to the aspera arteria, and being there agitated by the breath, excites that bubbling noise or stertor; or by an obstruction of the bronchia; or, lastly, by a compression of the aspera arteria and throat; whence the passage is straitened, in which the humours being agitated, excite such a kind of noise as before described. Hence Galen calls those who are strait-breasted stertorous. That author assigns but two causes of this symptom, which are either the straitness of the passage of respiration, or redundance of humours, or both together; but it is necessary to add a third, which is the weakness of the faculty, which is the cause of the *rhenchos* in dying persons, where nature is too weak to make discharges.

From what has been said, we conclude, that this symptom, or this sort of fervor, or ebullition in the throat, is not always mortal, but only when nature is oppressed with the redundance of humour, in such a manner, that the lungs cannot discharge themselves by spitting; or the passage appointed for the breath, being the aspera arteria, is very much obstructed, upon which account many dying persons labour under a stertor with their mouths gaping. James.

SNORT, in the *Manege*, called in French *ebrouer*, denotes a certain sound which a horse of fire makes by breathing through his nostrils; as if he had a mind to expel something that was in his nose, and hindered him to take breath.

This noise or sound is performed by means of a cartilage within the nostrils, called in French *souris*. Horses of much mettle *snort*, when you offer to keep them in. See SOURIS.

SNOTTER, in a *ship*. See SPRIT.

SNOW, *nix*, a meteor formed, in the middle region of the air, of a vapour raised by the action of the sun, or subterraneous fire; there congealed, its parts constipated, its specific gravity increased, and thus returned to the earth in form of little white villi, or flakes.

The *snow* we receive, may properly enough be ascribed to the coldness of the atmosphere through which it falls. When the atmosphere is warm enough to dissolve the *snow* before it arrives at us, we call it *rain*; if it preserve itself undissolved, it makes what we call *snow*. See EVAPORATION.

Dr. Grew, in a discourse of the nature of *snow*, observes, that many parts thereof are of a regular figure, for the most part so many little rowels, or stars of six points; and are perfect and transparent ice, as we see on a pond, &c. Upon each of these points are other collateral points, set at the same angles as the main points themselves; among which there are divers other irregular ones, which are chiefly broken points, and fragments

ments of the regular ones: others, also, by various winds, seem to have been thawed, and frozen again into irregular clusters; so that it seems as if the whole body of *snow* were an infinite mass of icicles irregularly figured. A cloud of vapours being gathered into drops, the said drops forthwith descend; upon which descent, meeting with a freezing air as they pass through a colder region, each drop is immediately frozen into an icicle, shooting itself forth into several points; but these still continuing their descent, and meeting with some intermitting gales of warmer air, or, in their continual wastage to and fro, touching upon each other, some of them are a little thawed, blunted, and again frozen into clusters, or entangled so as to fall down in what we call flakes.

Clouds of *snow*, signior Beccaria observes, differ in nothing from clouds of RAIN, but in the circumstance of cold, which freezes them. Both the regular diffusion of *snow*, and the regularity in the structure of the parts of which it consists (particularly some figures of *snow* or hail, which he calls *rosette*, and which fall about Turin) show the clouds of *snow* to be actuated by some uniform cause, like electricity. He even endeavours, very particularly, to shew in what manner certain configurations of *snow* are made, by the uniform action of electricity. He adds, that his apparatus never failed to be electrified by *snow*, as well as by rain; and that a more intense electricity unites the particles of HAIL more closely than the more moderate electricity does those of *snow*. Lett. dell' Elletricisimo, p. 520, &c. Priestley's Hist. &c. of Electricity, vol. i. p. 432.

The lightness of *snow*, although it is firm ice, is owing to the excess of its surface, in comparison to the matter contained under it; as gold itself may be extended in surface till it will ride upon the least breath of air.

The uses of *snow* must be very great, if all be true that Bartholine has said in its behalf, in an express treatise, De Nivis Usu Medico. He there shews, that it fructifies the earth (which, indeed, is a very old and general opinion); and that it preserves from the plague, cures fevers, colics, tooth-aches, sore eyes, and pleurisies (for which last use, his countrymen of Denmark usually keep *snow* water gathered in March). He adds, that it contributes to the prolongation of life; giving instances of people in the Alpine mountains, that live to great ages: and to the preserving of dead bodies; instances whereof he gives in persons buried under the *snow* in passing the Alps, which have been found uncorrupted in the summer, when the *snow* is melted.

He observes, that, in Norway, *snow* water is not only their sole drink in the winter; but *snow* even serves for food; people having been known to live several days without any other sustenance.

Indeed, the generality of the medicinal effects of *snow* are not to be ascribed to any specific virtue in *snow*, but to other causes.

It fructifies the ground, for instance, by guarding the corn, or other vegetables, from the intenser cold of the air, especially from the cold piercing winds; and it preserves dead bodies, by constipating and binding up the parts, and thus preventing all such fermentations, or internal conflicts of their particles, as would produce putrefaction.

It has been a vulgar opinion, very generally received, that *snow* fertilizes the lands upon which it falls more than rain, in consequence of the nitrous salts which it is supposed to acquire by freezing. But it appears from the experiments of Margraaf, in the year 1751, that the chemical difference between rain and *snow*-water is exceedingly small, and that the latter, however, is somewhat less nitrous and contains a somewhat less proportion of earth, than the former; but neither of them contain either earth or any kind of salt in any quantity which can be sensibly efficacious in promoting vegetation. Allowing, therefore, that nitre is a fertilizer of land, which many are, upon good grounds, disposed utterly to deny, yet so very small is the quantity of it contained in *snow*, that it cannot be supposed to promote the vegetation of plants upon which the *snow* has fallen. The peculiar agency of *snow* as a fertilizer, in preference to rain, may, without recurring to nitrous salts supposed to be contained in it, be rationally ascribed to its furnishing a covering for the roots of vegetables, by which they are guarded from the influence of the atmospherical cold, and the internal heat of the earth is prevented from escaping. *Snow* may also fertilize the earth, agreeably to the hypothesis of those who make oil the food of plants, by means of the oily particles which it contains: besides, *snow*, in melting, moistens and pulverizes the soil, which had been bound up by the frost; and as its water has a tendency to putrefaction, it seems, on many accounts, without admitting it to contain any nitre, to be admirably fitted to promote vegetation. Watson's Chem. Ess. vol. ii. p. 77, &c.

It is a popular error, that the first *snow* that falls in the year, has particular virtues. In Italy they cool their wines all the summer with *snow-water*.

Snow may be preserved by ramming it down in a dry place underground, and covering it well with chaff. At Leghorn they use barley-chaff for this purpose.

Snow and ice are also preserved with straw or reeds. Mr. Boyle has described the manner in his experimental history of cold. See ICE and ICE-*house*.

It is usual in hot countries to mix *snow* and ice with their wine. Hence Pliny says, *Hi nives, illi glaciem potant, pœnasque montium in voluptatem gulæ vertunt.*—

Signior Sarotti, in the Philosophical Transactions, mentions a *red* or *bloody snow*, which fell on the mountains La Langhe, near Genoa, on St. Joseph's day. This *snow*, when squeezed, yielded a liquor of the same red colour.

SNOW, in *Sea-language*, is generally the largest of all two-masted vessels employed by Europeans, and the most convenient for navigation. The sails and rigging on the main-mast and fore-mast of a *snow* are exactly similar to those on the same masts in a ship, only that there is a small mast behind the main-mast of the former, which carries a sail nearly resembling the mizen of a ship. The foot of this mast is fixed in a block of wood on the quarter-deck, abaft the main-mast, and the head of it is attached to the after-part of the main-top. The sail, which is called the try-sail, is extended from its mast towards the stern of the vessel. When the sloops of war are rigged as *snows*, they are furnished with a HORSE, which answers the purpose of the try-sail-mast, the fore-part of the sail being attached by rings to the said horse, in different parts of its height. Falconer.

SNOW-*bird*, the EMBERIZA *nivalis* of Linnæus, in *Ornithology*, is distinguished by the following characters: the bill and legs are black; the forehead and crown white, with some mixture of black on the hind part of the head; the back of a full black, the rump white; the bastard wing and ends of the greater coverts black, the others white; the quill-feathers black, their base white; the secondaries white, with a black spot on their inner webs; the middle feathers of the tail black, the three outermost white, with a dusky spot near their ends; from the chin to the tail of a pure white.

These birds are called in Scotland *snow-flakes*, because they appear in hard weather and in deep *snows*. Some few breed in the Highlands, on the summits of the highest hills, but the greatest number migrate from the extreme North. Their appearance is a certain forerunner of hard weather and storms of *snow*, being driven by the cold from their common retreats. Their progress southward is probably thus: Spitzbergen and Greenland, Hudson's Bay, the Lapland Alps, Scandinavia, Iceland, the Ferro isles, Shetland, Orknies, Scotland, and the Cheviot hills. They visit, at that season, all parts of the northern hemisphere, Prussia, Austria, and Siberia. They arrive lean and return fat. In their flights they keep close to each other, and fling themselves collectively into the form of a ball, at which instant the fowler makes great havock among them. Pennant.

SNOW-*ball tree*, in *Botany*, a species of *viburnum*. See WAYFARING *tree*.

SNOW-*berry bush*, in *Botany*, a species of *lonicera*. See *Upright* HONEYSUCKLE.

SNOW-*drop*, *galanthus*, in *Botany*, a genus of the *hexandria monogynia* class. Its characters are these: the spatha, or sheath of the flower is oblong, blunt, and compressed, which opens sideways, and becomes a dry skin; the flower has three oblong concave petals, which spread open; in the bottom is situated the three-leaved nectarium, which is cylindrical, obtuse, and indented at the top; under the flower is situated an oval germen, supporting a slender style, crowned by a single stigma, attended by six stamina, which are gathered together; the germen becomes an oval capsule, which is obtuse and three-cornered, opening in three cells filled with roundish seeds. We know but one species, which is valued for its early appearance in the spring: there is a variety of it with double flowers. Miller.

SNOW-*drop*, *great*, *leucoium*, in *Botany*, a genus of the *hexandria monogynia* class. Its characters are: that it has an oblong, obtuse, compressed spatha or sheath, which opens on one side; the flower is of the spreading bell-shape, cut into six parts, which join at their base; it hath six short bristly stamina, terminated by oblong, obtuse, four-cornered summits, which are erect; the roundish germen is situated under the flower, supporting a style thick and obtuse at the top, crowned by an erect bristly

briſtly ſtigma; the germen afterward becomes a turbinated capſule, with three cells, opening with three valves, and filled with roundiſh ſeeds. There are three ſpecies.

Snow-*drop tree*, *chionanthus*, in *Botany*, a genus of the *diandria monogynia* claſs. Its characters are theſe: it hath a permanent empalement of one leaf, erect, and cut into four acute parts; the flower is of one petal, divided into four very long narrow ſegments, which are erect, and it has two ſhort ſtamina inſerted in the tube of the petal, and terminated by upright heart-ſhaped ſummits; in the centre is placed an oval germen, ſupporting a ſingle ſtyle, crowned by an obtuſe trifid ſtigma; the germen becomes a round berry with one cell, encloſing one hard ſeed. Linnæus enumerates two ſpecies, but Miller only one, which is a very beautiful American tree, and bears the cold of our climate in the open air; but it is very difficult to increaſe, the layers being two years before they take root, nor will they ever take root at all unleſs they are well ſupplied with water in dry weather. Miller.

Snow-*ſtone*, in *Natural Hiſtory*, a name given by ſome to a very beautiful ſtone found in America; of which the Spaniards are very fond, making it into tables, and other ornaments, in their houſes. Alonſo Barba, who had ſeen much of it, tells us, that it is found in the province of Atocama, uſually in pieces of four feet long, and four or five inches broad; ſo that they are forced to join them in the working. Its general thickneſs is about two inches. It has a great variety of colours, which form clouds and variegations of a very beautiful kind. The principal colours are red, yellow, green, black, and white. The white is generally formed into ſpots on the very blackeſt parts of the maſs, and is ſo beautifully diſpoſed, that it repreſents *ſnow* falling in all its whiteneſs upon a jetty ſurface.

SNUFF, a preparation of tobacco, made by reducing it into a powder, fit to be taken in at the noſe, in order to purge or clear the head of pituita.

Ordinarily, tobacco is the baſis of *ſnuff*; other matters being only added to give it a more agreeable ſcent, &c. The kinds of *ſnuff*, and their ſeveral names, are infinite; and new ones are daily invented; ſo that it would be difficult, not to ſay impoſſible, to give a detail of them. We ſhall only ſay, that there are three principal ſorts: the firſt granulated; the ſecond an impalpable powder; and the third the bran, or coarſe part remaining after ſifting the ſecond ſort.

The many miſchiefs attending the unnatural practice of taking this powder of tobacco at the noſtrils, have been deſcribed by the writers in general on theſe ſubjects, ſince this pernicious cuſtom has reigned in the world: but one of the moſt remarkable accidents, occaſioned by it, is related in the Acta Eruditorum, which was the forming a polypus in the œſophagus, and which killed the patient, by ſtarving him, from an inability of ſwallowing. Act. Erudit. an. 1715, p. 475. See Pica *Naſi*.

Snuff, or Snuffler, in the *Manege*. See Snort.

SOAGGIO, the name of a fiſh common in the markets of Rome and of Venice, and of the turbot kind. See Lug-*a-leaf*.

SOAL, or Sole, in *Ichthyology*, the Engliſh name of the fiſh, called by the generality of authors the *bugloſſus*, by ſome *ſolea*, and the pleuronectes *ſolea* of Linnæus, with both eyes on the right ſide of the head, a rough oblong body, and the upper jaw longer than the lower. Some authors call it the *linguacula*.

The *ſoal* is found on all our coaſts, but thoſe on the weſtern ſhores are much larger than thoſe of the north. They are uſually taken in a trawl-net; they keep much at the bottom, and feed on ſmall ſhell-fiſh. The ſmall *ſoals* are much ſuperior in goodneſs to the large ones. They are common in the Mediterranean, Engliſh, and German ſeas. The chief fiſhery for them on the Engliſh coaſt is at Brixham in Torbay.

Soals may be taken at any time of the year, but they muſt not be under ſeven inches from the eye to the end of the tail. 1 & 2 Geo. I. cap. 18.

Soal, *ſmooth*, is a ſcarce ſpecies, but is found in Cornwall, where, from its tranſparency, it is called the lantern-*fiſh*.

SOAP, or Sope, a kind of paſte, ſometimes hard and dry, and ſometimes ſoft and liquid, much uſed in waſhing and whitening linens, cleanſing woollen cloths from oil, whitening ſilk, and freeing it from the reſinous varniſh with which it is naturally covered; and for various other purpoſes, by the dyers, perfumers, hatters, fullers, &c.

The alkaline lixiviums, being capable of diſſolving oils more effectually than *ſoap*, might be employed for the ſame purpoſes; but when this activity is not mitigated by oil, as it is in *ſoap*, they are capable of altering, and even deſtroying entirely, by their cauſticity, moſt ſubſtances, eſpecially animal matters, as ſilk, wool, and others; whereas *ſoap* cleanſes from oil almoſt as effectually as pure alkali, without danger of altering or deſtroying, which renders it very uſeful.

The manufacture of *ſoap* in London, firſt began in the year 1524; before which time this city was ſerved with white *ſoap* from foreign countries, and with grey *ſoap*, ſpeckled with white, from Briſtol, and ſold for a penny a pound, and alſo black *ſoap*, for a halfpenny the pound.

The principal *ſoaps*, of our own manufacture, are, the *ſoft*, the *hard*, and the *ball ſoap*. The *ſoft ſoap* again, is either *white* or *green*. The proceſs of making each kind is as follows.

Soap, *green ſoft*. The chief ingredients uſed in making this are, lees drawn from pot-aſh and lime, boiled up with tallow and oil. Firſt, the ley, of the proper ſtrength, of which they judge by the weight of the liquor, and tallow are put into the copper together, and, as ſoon as they boil up, the oil is added; then the fire is damped, or ſtopped up, while the ingredients lie in the copper to unite, or incorporate; which done, the copper is again ſet on boiling, being fed or filled with lees as it boils, till there be a ſufficient quantity put therein; then it is boiled off, with all convenient ſpeed, and put into caſks.

When this *ſoap* is firſt made, it appears uniform; but in about a week's time, the tallow ſeparates from the oil into thoſe white grains which we ſee in common *ſoap*. *Soap* thus made would appear yellow, but, by a mixure of indico added at the end of the boiling, it is turned green, that being the colour which reſults from the mixture of yellow and blue.

Soap, *white ſoft*. One ſort of *white ſoap* is made after the ſame manner as *green ſoft ſoap* is, oil alone excepted, which is not uſed in *white*. The other ſort of *white ſoft ſoap* is made from lees of aſhes of lime boiled up at twice with tallow. Firſt, a quantity of lees and tallow are put into the copper together, and kept boiling, being fed with lees as they boil, until the whole grains, or is boiled enough; then the lees are ſeparated or diſcharged from the tallowiſh part, which part is removed into a tub, and the lees thrown away: this is called the firſt *half-boil*: then the copper is charged again with freſh tallow and lees, and the firſt half-boil is put out of the tub into the copper a ſecond time, where it is kept boiling with freſh lees and tallow, till it comes to perfection. It is then put out of the copper into the ſame ſort of caſks as are uſed for *green ſoft ſoap*.

The common ſoft *ſoap* uſed about London, generally of a greeniſh hue, with ſome white lumps, is prepared chiefly with tallow: a blackiſh ſort, more common in ſome other places, is ſaid to be made with whale oil.

Soap, *hard*, is made with lees from aſhes, and tallow, and is moſt commonly boiled at twice: the firſt, called the *half-boil*, hath the ſame operation as the firſt half-boil of ſoft white *ſoap*. Then the copper is charged with freſh lees again, and the firſt half-boil put into it, where it is kept boiling, and fed with lees as it boils, till it grains, or is boiled enough; then the ley is diſcharged from it, and the *ſoap* put into a frame to cool and harden.

Common ſalt is made uſe of for the purpoſe of graining the *ſoap*; for when the oil or tallow has been united with the ley, after a little boiling, a quantity of ſalt is thrown into the maſs, which readily diſſolving in water, but not in the oil or tallow, draws out the water in a conſiderable degree, ſo that the oil or tallow, united with the ſalt of the ley, ſwims on the top. When the ley is of a proper ſtrength, leſs ſalt is neceſſary to raiſe the curd than when it is too weak.

Note, There is no certain time for bringing off a boiling of any of theſe ſorts of *ſoap*: it frequently takes up part of two days.

Soap, *ball*, commonly uſed in the North, is made with lees from aſhes and tallow. The lees are put into the copper, and boiled till the watery part is quite gone, and there remains nothing in the copper but a ſort of ſaline matter (the very ſtrength or eſſence of the ley); to this the tallow is put, and the copper is kept boiling and ſtirring for above half an hour, in which time the *ſoap* is made; and then it is put out of the copper into tubs, or baſkets, with ſheets in them, and immediately (whilſt ſoft) made into balls. Note, it requires near twenty-four hours, in this proceſs, to boil away the watery part of the ley.

The making of *ſoap* depending only on the mixing the ſalt of pot-aſh with oil or fat, though this is at preſent procured by a tedious operation, and long boiling, it ſeems very practicable to ſhorten, and make the proceſs much eaſier, and leſs expenſive, by ſubſtituting motion

in

in the place of fire. This motion might be easily given by an engine to any quantities of the ingredients at a time; and we find it practicable to make *soap* by this means, only by mixing in a large phial half a pint of *soap*-lees, and an ounce or more of oil-olive; for by shaking these together for a quarter of an hour, an absolute *soap* is procured in a cake at the top of the liquor, which hardens on being exposed to the air. Shaw's Lectures, p. 160.

The finest hard *soap* for medicinal use is prepared with oil of almonds. See SAPO *Amygdalinus*.

The finest of the common *soaps* is that called *Spanish*, or *Castile soap*, which is made with oil-olive, and the alkaline salt called soda, or barilla; our *soap*-boilers find that this alkali gives a better consistence, or greater hardness to the *soap*, than the other pot-ashes or common vegetable alkalis.

That which is used in medicine is made without heat in the following manner: one part of quick-lime, and two parts of good Spanish soda, are boiled together during a short time, with twelve times as much water, in an iron cauldron. This lixivium is to be filtered, and evaporated by heat, till a phial, which is capable of containing an ounce of water, shall contain an ounce and three drams of this concentrated lixivium. Of this, one part is to be mixed with two parts of oil of olives, or of sweet almonds, in a glass or stone vessel: the mixture is to be stirred from time to time with an iron spatula, or pestle, and it soon becomes thick and white. The combination is gradually completed, and, in seven or eight days, a very white and firm *soap* is obtained.

Soap is made with heat in manufactures where large quantities of it are prepared. A lixivium of quick-lime and soda is made, concentrated to such a degree as that it may sustain a fresh egg: a part of this is to be diluted, and mixed with an equal weight of oil of olives. The mixture is to be put on a gentle fire, and agitated, in order to accelerate the union; when it begins to unite well, the rest of the lixivium is to be added to it, and the whole is to be digested with a very gentle heat, till the *soap* be completely made. Good *soap* of this kind ought to be firm and very white when cold, not subject to become moist by exposure to air, and entirely miscible with pure water, to which it communicates a milky appearance, but without any drops of oil floating on the surface. When the *soap* has not these qualities, the combination has not been well made, or the quantity of salt or oil is too great, which faults must be corrected. Dict. Chem. art. *Soap*.

Soaps, both hard and soft, have been applied to medical use. *Hard soap*, triturated with vegetable resins and thick balsams, incorporates with them into a compound soluble, like the *soap* itself, in watery liquors; hence it proves an useful ingredient in resinous pills, which of themselves are apt to pass entire through the intestines, but by the admixture of *soap* become dissoluble in the stomach. It renders unctuous and thick animal matters dissoluble in like manner in aqueous fluids, and hence may be presumed to act as a menstruum for these kinds of substances in the body, that is to attenuate viscid juices and resolve obstructions: such, in effect, are the virtues which it appears to exert in cachectic, hydropic, and icteric cases, in which last, particularly, its aperient and resolvent powers have been often experienced. Solutions of it have been likewise found to dissolve certain animal concretions of the harder kind, as the filaments which are sometimes seen floating in the urine of rheumatic and arthritic persons, the matter secreted in gouty joints, and the more compact urinary calculus; on these substances (at least in the latter) though *soap* of itself acts more languidly than LIME-*water*, yet, when joined to that menstruum, it remarkably increases its activity; the dissolving power of a composition of the two being, according to Dr. Whytt's experiments, considerably greater than that of the *soap* and lime-water unmixed: of the good effects of these medicines in calculous cases there are several instances; but what their effects may be in gouty and rheumatic ones is not yet well known. See LITHONTRIPTICS, STEPHENS's *Medicine*, &c. and STONE.

The usual dose of *soap*, as an aperient, is half a dram or a dram; as a lithontriptic, half an ounce, or an ounce or more, are taken in a day at proper intervals. It is given in the form of a bolus or pills, or made into an electary with some grateful syrup, or dissolved in milk or other liquids.

From the properties of *soap* we may know, that it must be a very effectual and convenient anti-acid. It absorbs acids as powerfully as pure alkalis and absorbent earths, without having the causticity of the former, and without oppressing the stomach by its weight like the latter. *Soap* is also one of the best antidotes to stop quickly, and with the least inconvenience, the bad effects of acid corrosive poisons, as aqua fortis, corrosive sublimate, &c.

Soap is employed externally for discussing rheumatic pains, arthritic tumors, the humours stagnating after sprains, &c. Some pretend that the indurated tophaceous concretions in arthritic joints, have been resolved by the external use of soapy cataplasms. Several compositions for external purposes are prepared in the shops. The *emplastrum e sapone* is formed by stirring one part of Spanish *soap*, shaved in thin slices, into six parts of common plaster melted over the fire, and boiling the mixture till it acquires the consistence of a plaster: some endeavour to promote the resolvent virtue of the *soap* by using, instead of the common plaster, a more compounded one, in which turpentine, galbanum, and ammoniacum are ingredients. But *soap* acts to much better advantage in the form of a cataplasm or liniment, than in the stiff one of a plaster. See LINIMENTUM *Saponaceum* and OPODELDOC.

The ANODYNE balsam, commonly called Bates's balsam, is prepared by digesting two ounces of *soap* and half an ounce of opium, in a gentle sand-heat, for three days, with eighteen ounces of rectified spirit of wine, and then adding six drams of camphor and one dram of oil of rosemary to the strained liquor. This composition, with the addition of opium, is supposed to be more effectual for allaying violent pains than the common opodeldoc: it is also given internally in nervous colics, jaundices, &c.

Soft *soap* is considerably more acrid than the hard *soap*; and it is, therefore, employed only for some external purposes: a mixture of equal parts of our common soft *soap* and quick-lime is used as a mild CAUSTIC. Lewis's Mat. Med.

SOAP, *almond*. See SAPO *Amygdalinus*.

SOAP-*lees*. See LIXIVIUM *Saponarium*.

SOAP, *Starkey's*, is a combination of fixed vegetable alkali with essential oil of turpentine. It is so called from its inventor, who combined salt of tartar with this oil, and obtained a saponaceous compound, to which many medicinal virtues have been ascribed. It enters also into the composition of pills, named also from Starkey. As fixed alkalis are very difficultly made to unite with essential oils, Starkey found no other expedient for the preparation of his *soap* than time and patience. His method consists in putting dry alkali into a matrass, and pouring upon it essential oil of turpentine to a height equal to the breadth of two or three fingers; in five or six months part of the alkali and oil will be thus combined together, and form a *soap*, which must be separated from the mixture, and more of it will be afterwards formed in the same manner. The most commodious method, says Dr. Lewis, of obtaining the combination, is by throwing the salt, red-hot, into a heated mortar, immediately reducing it to powder, then pouring on it, whilst hot, by little at a time, an equal quantity, or more, of the oil, and continuing to grind them together, so as to form a smooth soft mass. Stahl, Rouelle, Beaumé, &c. have published processes for this combination. Mr. Beaumé says, that it may be made in a few hours by triturating, during a long time, alkaline salt upon a porphyry, and adding to this salt, during the trituration, oil of turpentine. This medicine was formerly celebrated, under the denomination of *soap* of tartar, universal corrector, &c. as a diuretic in nephritic complaints, and as a corrector of certain vegetables, particularly of opium: its virtues have not been fully determined by experience, nor does the present practice pay any regard to it.

SOAP, *volatile*, is of three kinds, viz. one composed of fixed alkalis and volatile oils; another of volatile alkalis and oils of the grosser or more fixed kind; and the third, in which both the alkali and the oil are volatile. Of the first kind is Starkey's *soap*: those of the second sort are obtained more readily. See LINIMENTUM *volatile*, and EPITHEM *volatile*. Combinations of the latter kind, in a liquid form, have been described under SAL *alkalinus volatilis*; and compositions of the same kinds may be obtained in a solid state, by mixing the salt with the oil, and subliming them together.

Soap imported is subject by 10 Ann. cap. 19. to a duty of 2 *d.* a pound (over and above former duties); and by 12 Ann. stat. 2. cap. 9. to the farther sum of 1 *d.* a pound. And by the same acts, the duty on *soap* made in the kingdom is $1\frac{1}{2}$*d.* a pound. By 17 Geo. III. cap. 52. no person within the limits of the head office of excise in London, shall be permitted to make any *soap* unless he occupy a tenement of 10 *l.* a year, and be assessed to, and pay the parish rates; or elsewhere, unless he be assessed to, and pay to church and poor. Places of making are to be entered on pain of 50 *l.* and covers and locks to be provided under a forfeiture of 100 *l.*; the furnace door of every utensil used in the manufacture of *soap* that

ſhall be locked by the exciſe officer, as ſoon as the fire is damped or drawn out, and faſtenings provided, under the penalty of 50 *l.*; and opening or damaging ſuch faſtening incurs a penalty of 100 *l.* Officers are required to enter and ſurvey at all times, by day or night, and the penalty of obſtructing is 20 *l.*; and they may unlock and examine every copper, &c. between the hours of five in the morning and eleven in the evening, and the penalty of obſtructing is 100 *l.* Every maker of *ſoap* before he begins any making, if within the bills of mortality, ſhall give twelve hours, if elſewhere, twenty-four hours notice in writing to the officer, of the time when he intends to begin, on pain of 50 *l.* No maker ſhall remove any *ſoap* unſurveyed on pain of 20 *l.* without giving proper notice of his intention. And if any maker ſhall conceal any *ſoap* or materials, he ſhall forfeit the ſame, and alſo 500 *l.* Every barrel of *ſoap* ſhall contain 256 *lb.* avoirdupois, half-barrel 128 *lb.* firkin 64 *lb.* half-firkin 32 *lb.* beſides the weight or tare of each caſk: and all *ſoap*, excepting hard cake *ſoap* and ball *ſoap*, ſhall be put into ſuch caſks and no other, on pain of forfeiture, and 5 *l.* The maker ſhall weekly enter in writing at the next office the *ſoap* made by him in each week, with the weight and quantity at each boiling, on pain of 50 *l.*; and within one week after entry clear off the duties, on pain of double duty. See, beſides the ſtatutes above cited, 5 Geo. III. cap. 43. 12 Geo. III. cap. 46. 11 Geo. cap. 30. 1 Geo. ſtat. 2. cap. 36.

SOAP-*rock*, or SOAP-*earth*, *ſteatites*, or *lapis ollaris*, in *Natural Hiſtory*, names given to the ſubſtance, called by the ancients CIMOLIA *purpuraſcens*.

The latter ages finding the purple Cimolian earth of the old writers to be wholly different from their white kind, have given that name (though it is not eaſy to gueſs why) to the common FULLER's *earth*, which has no tinge of purple in its whole ſubſtance.

This earth, however, called by us *ſoap-earth*, and *ſteatites*, is well worth enquiring after, as a ſubſtance for imitating the fine porcelain ware of China. Dr. Woodward much recommends it on this account, and repeated trials have been made of it ſince his time, and ſome of them very lately, in all which it has afforded the fineſt earthen ware ever made with us, and promiſes fair, with good management, for the equalling any in the world. See HOACHE.

As the texture of theſe *ſoap-earths* is conſiderably hard, and they have a great admixture of talc in their conſtitution, Imperatus firſt, then Grew, Linnæus, and ſome other authors after him, range them among the talcky ſubſtances; but Dr. Hill, and Mr. Da Coſta, obſerving that they have all the properties of a harder clay, are of opinion that they ſtrictly and properly belong to the claſs of clays.

The *ſoap-earth*, or genuine *ſteatites*, is dug in many parts of Devonſhire and Cornwall, and the neighbouring counties; the cliff of the Lizard point is almoſt wholly compoſed of it, and the adjacent little iſlands abound with it; and from all theſe places it might be brought, at ſmall expence, in any quantities. It is known from all other earths by theſe characters: it is compoſed of extremely fine particles, and is of a firm, equal, and regular texture, and great weight: it is very firm and hard as it lies in the earth; but when it has been ſome time expoſed to the air, it becomes almoſt of a ſtony hardneſs: it is of a perfectly fine, ſmooth, and gloſſy ſurface, ſofter to the touch than any other ſpecies of earth, and does not at all adhere to the tongue, nor melt in the mouth, nor ſtain the fingers in handling; but drawn along a rough ſurface, as a piece of cloth, or the like, it marks it with a fine and even white line. In colour the fineſt is generally a clear white, ſometimes with a yellowiſh hue, veined and variegated very beautifully with purple of different degrees of deepneſs: at other times it is as elegantly variegated with red, and ſometimes, though rarely, has veins and ſpots of green; at other times the ground is red or purple, variegated with white; but in all theſe appearances it ſo much reſembles hard *ſoap*, that it has hence obtained its Engliſh name of *ſoap-earth*, or *ſoap-ſtone*, and that of *ſteatites*, from ςεαρ, *ſuet*, from its reſemblance to the hard fat of animals. It is of ſo fine a ſtructure of parts, that when cut into thin pieces it is in ſome degree tranſparent. It makes no effervefcence with acids, and burns to a pure white, even in its purple parts.

This ſubſtance may be formed into a paſte with water, ſufficiently ductile to be worked on the potter's wheel; and by fire it is hardened ſo as to ſtrike fire with ſteel. It has alſo the property of FULLER's *earth* in cleanſing cloths from greaſe: but it does not diffuſe in water ſo well as clays do; and when digeſted with vitriolic acid, it does not form alum, as clays do, but a ſalt ſimilar to Epſom ſalt; hence it contains a large portion of the earth called magneſia, as M. Margraaf has diſcovered.

This ſubſtance is ſo ſoft as to be cut with a knife, or with a tool turned by a lathe. Accordingly it is in ſome places made into pots for the uſe of the kitchen, and hence it is called *lapis ollaris*.

It is obſerved, that all the indurated talcky *ſoap* clays, as the *ſteatites*, the *morochtus*, the *galactites*, the *melitites*, ſucceed in a remarkable experiment, which is, that by writing with them on glaſs, they leave the letters, though inviſibly fixed upon it, yet not to be removed by waſhing, but always ready to appear, if the place be moiſtened by breathing upon it. Hill's Hiſt. Foſſ. p. 22. Da Coſta's Nat. Hiſt. Foſſils, p. 37, &c. Dict. Chem. art. *Steatites*, Eng. edit.

SOAP-*earth*, *Smyrna*. See FLOS *Aſiæ*, NATRON, and SAPONACEA *Terra*.

SOAPWORT, *ſaponaria*, in *Botany*, a genus of the *decandria digynia* claſs. Its characters are theſe: the flower has a permanent empalement of one leaf, which is cut into five points; it has five petals, whoſe tails are narrow, and the length of the empalement, their borders broad, obtuſe, and plain; it has ten awl-ſhaped ſtamina alternately inſerted into the petals, and terminated by obtuſe proſtrate ſummits; and a taper germen ſupporting two erect parallel ſtyles crowned by acute ſtigmas; the germen becomes a cloſe capſule the length of the empalement, having one cell filled with ſmall ſeeds. Miller enumerates five, and Linnæus ſeven ſpecies.

The common *ſoapwort* grows wild, but not very common, in moiſt grounds, and flowers in July.

The decoction of this plant is uſed to cleanſe and ſcour woollen cloths; and the poor people in ſome countries uſe it inſtead of ſoap for waſhing; from whence it had its title.

This ſmoothneſs or ſoapineſs is ſtrongeſt in the leaves. The plant, though diſregarded among us, may be preſumed to have conſiderable medicinal virtues: by the German phyſicians, the roots are uſed in venereal maladies, and ſuppoſed to be ſimilar, but ſuperior to thoſe of ſarſaparilla. Lewis.

SOAPBERRY-*tree*, *ſapindus*, in *Botany*, a genus of the *octandria trigynia* claſs. Its characters are theſe: the empalement of the flower is compoſed of four plain oval coloured leaves; the flower has four oval petals which are leſs than the empalement, and it has eight ſtamina which are the length of the petals, terminated by erect ſummits; alſo an oval germen, with three or four lobes, ſupporting a ſhort ſtyle crowned by a ſingle ſtigma; the germen afterward becomes one, two, or three globular berries, including nuts of the ſame forms; there is rarely above one of theſe pregnant, the others being abortive. Miller enumerates two, and Linnæus three ſpecies.

The ſkin or pulp of the berries of the *ſoapberry*-tree is uſed as ſoap; they are of the ſize of a muſket-bullet, with winged leaves, and are uſed in waſhing without any admixture of ſalt or oil. They perform the office of ſoap very well, as to the cleanſing of the linen, but being of a very acid nature, they rot it in time.

The Negroes in general uſe them for their coarſe apparel, which bears them much better than the finer linen worn by the Europeans.

It is ſaid that this fruit is a medicine of ſingular and ſpecific virtue in chloroſes, and that a tincture or extract is preferable to the berry in ſubſtance, whence it may be preſumed, that the ſoapy matter is diſſoluble in ſpirit. Its medicinal virtue was firſt publiſhed by Marloe, in a letter to Mr. Boyle; but it is unknown in practice, and in the ſhops. Lewis.

SOAR-*hawk*. See FALCON.

SOATTO. See SOAGGIO.

SOAVE, or SOAVEMENT, in the *Italian Muſic*, ſignifies to ſing or play in a ſweet and agreeable manner.

SOBIESKI's *ſhield*, in *Aſtronomy*. See SCUTUM *Sobieſki*.

SOBRE *buena*, a name given by the Spaniards in America to a ſpecies of vanilla, which is greatly ſuperior to all the other kinds.

The pods of this are of the ſame ſhape with thoſe of the common vanilla, but are nearly twice as large. A bundle of about fifty of theſe uſually weighs five ounces, and ſuch a bundle of the *ſobre buena* kind often weighs eight. Theſe are full of a blackiſh balſamic liquor, in which are contained a number of ſmall ſeeds.

SOC, or SOK, SOKA, in *Law*, denotes juriſdiction; or a power or privilege to adminiſter juſtice, and execute laws.

The word is alſo uſed for the ſhire, circuit, or territory, wherein ſuch power is exerciſed by him endued with ſuch juriſdiction.

Hence,

Hence, also, the law Latin *soca*, used for a seigniory or lordship infranchised by the king, with liberty of holding a court of his *soc-men* or *socagers*, that is, his tenants; whose tenure is hence called *socage*.

This kind of liberty still subsists in several parts of England, under the name of *soke* or *soken*. Skene defines *soc* to be, *secta de hominibus suis in curia secundum consuetudinem regni*. Brady makes mention of these liberties: *soc*, *sac*, *tol*, *team*, *infangthef*, and *utfangthef*.

In the laws of Henry I. *soca* is also used as synonymous with franchise, for a privileged place, refuge, asylum, or sanctuary, &c. from the Saxon *socn*, or *socne*.

SOCAGE, or SOCCAGE, in its most extensive signification, seems to denote a tenure by any certain and determinate service. And thus our ancient writers constantly put it in opposition to chivalry, or knight-service, where the render was uncertain.

Thus Bracton; if a man holds by a rent in money, without any escuage or serjeanty, *id tenementum dici potest socagium*. Littleton also defines it to be, where the tenant holds his tenement of the lord by any *certain* service in lieu of all other services, so that they be not services of chivalry, or knight-service: therefore he tells us, that whatsoever is not tenure in chivalry is tenure in *socage*. The service must therefore be certain, in order to denominate it *socage*; as to hold by fealty and 20 *s.* rent; or by homage, fealty and 20 *s.* rent; or by homage and fealty, without rent: or by fealty and certain corporal services, as ploughing the lord's land for three days; or by fealty only without any other service; for all these are tenures in *socage*.

Socage is of two sorts; viz. *free socage*, where the services are not only certain, but honourable; and *villein-socage*, where the services, though certain, are of a baser nature. See VILLENAGE.

Such as hold by the former tenure are called in Glanvil, and other subsequent authors, by the name of *liberi sokemanni*, or tenants in *free socage*. This, in the nature of its service, and the fruits and consequences appertaining to it, was always much the most free and independent species of any. On this account the learned judge Blackstone assents to Mr. Somner's etymology of the word; who derives it from the Saxon appellation *soc*, which signifies *liberty* or *privilege*, and, being joined to a usual termination, is called *socage*, signifying thereby a free or privileged tenure. This etymology, he says, seems to be much more just than that of our common lawyers in general, who derive it from *soca*, a *plough*; because in ancient time their *socage* tenure consisted in nothing else but services of husbandry, which the tenant was bound to do to his lord, as to plough, sow, or reap for him; but that, in process of time, this service was changed into an annual rent by consent of all parties, and that, in reference to its original, it still retains the name of *socage*, or plough-service. But this by no means agrees with what Littelton himself tells us, that to hold by fealty only, without paying any rent, is tenure in *socage*; for here is plainly no commutation for plough-service. Besides, even services, confessedly of a military nature and original, the instant they were reduced to a certainty, changed both their name and nature, and were called *socage*. It was the *certainty*, therefore, that denominated it a *socage*-tenure; and nothing surely could be a greater liberty or privilege, than to have the service ascertained, and not left to the arbitrary calls of the lord, as in the tenure of chivalry. Wherefore also Britton, who describes *socage*-tenure under the name of *fraunke ferme*, tells us, that they are lands and tenements, whereof the nature of the fee is changed by feoffment *out of chivalry* for *certain* yearly services, and in respect whereof neither homage, ward, marriage, nor relief can be demanded. Moreover, if *socage* tenures were of such base and servile original, it is hard to account for the very great immunities which the tenants of them always enjoyed; so highly superior to those of the tenants by chivalry, that it was thought, in the reigns of both Edward I. and Charles II. a point of the utmost importance and value to the tenants, to reduce the tenants by knight-service to *fraunke ferme*, or tenure by *socage*. It seems probable, therefore, that the *socage*-tenures were the relics of Saxon liberty, retained by such persons as had neither forfeited them to the king, nor been obliged to exchange their tenure for the more honourable, as it was called, but at the same time more burthensome, tenure of knight-service. This is peculiarly remarkable in the tenure, called gavel-kind, which is generally acknowleged to be a species of *socage*-tenure; the preservation whereof inviolate from the innovations of the Norman Conqueror is a fact universally known. And those who thus preserved their liberties were said to hold in *free* and *common socage*. This tenure will, therefore, include all other methods of holding free lands by certain and invariable rents and duties; and, in particular, *petit* SERJEANTY, tenure in BURGAGE, and GAVEL-*kind*. Blackst. Com. book ii. cap. 6. Lord Lyttelton's Hist. of Hen. II. vol. iii. p. 185, 8vo.

Skene defines *socage*, a tenure of lands, whereby a man is infeoffed freely, without wardship and marriage, paying to his lord some small rents, &c. which is called *free socage*, &c. Several divisions of *socage* are met with in law-writers, as *socage in capite*, &c. But by stat. 12 Car. II. it is ordained, that all tenures from and after the 24th of February, 1645, shall be adjudged and taken for ever, to be turned into *free* and *common socage*.

SOCAGE, *Guardian in*. See GUARDIAN.

SOCAGERS, in *our Old Writers*, such tenants as held by the tenure called *socage*. They were otherwise called SOCKMEN.

SOCCELLI, among the *Romans*, were swaths or bands, which covered the leg down to the SOCCUS.

SOCCUS, SOCK, in *Antiquity*, a kind of high shoe, reaching above the ancle, worn by the actors in the ancient drama, in the representation of comic characters.

The *soccus* was much lower than the cothurnus, and was the distinguishing wear of the comedians; as the cothurnus was of the tragedians; hence *soccus* is frequently used for comedy itself. Comedy, says M. Fenelon, must talk in a humbler style than tragedy; the *sock* is lower than the buskin.

SOCIAL *War*, in *Roman History*, commenced A. U. C. 663, on the following occasion. M. Livius Drusus, tribune of the people, influenced by a view to the public welfare, formed a scheme to reconcile all orders of men, and put an end to all discontents, which he foresaw would, in process of time, if not removed, produce a general insurrection. With this view he proposed a law for investing the Italian allies with all the privileges of Roman citizens. They remonstrated, that they paid considerable taxes; that in time of war their countries raised double the number of forces that were raised in Rome; that the commonwealth owed greatly to their valour that prodigious power which she had acquired; and that it was but just they should share the honour of a state, which they had helped to aggrandize both with their arms and treasures. But this law of Drusus in their favour was opposed with great violence, not only by the senators and knights, but even by the people, who could not bear the thoughts of making those their fellow-citizens, whom they looked upon as their subjects. In the mean time the Italian allies flocked to Rome from all parts to support their protector, and determined to effect by force what they could not gain by favour. The death of Drusus, who was basely assassinated for attempting to procure for them the right of citizenship, provoked the allies to such a degree, that they recurred to arms, in order to do themselves justice. The Marsi, Peligni, Samnites, Campanians, and Lucanians, and in short all the provinces from the Liris to the Adriatic, revolted at once. Rome had never engaged more formidable enemies. As they had all served in the same armies of the republic, they were as well disciplined as her legions, and their leaders had learnt the art of war under her most famous commanders. It is said of the Marsi in particular, that Rome had never gained a victory in which they had not a great share. The first steps they took in their revolt was to erect themselves into a republic in opposition to that of Rome. After many alternate successes and defeats, the consul Julius Cæsar, desirous to put an end to the war, drew up a law, which was confirmed by the senate, and enacted, that all the nations in Italy, whose alliance with Rome was indisputable, should enjoy the rights of Roman citizens. This law, called the Julian law, much abated the ardour of the enemy, and drew off several nations from the confederacy. The tribune, M. Plautius Sylvanus, in conjunction with Caius Papirius Carbo, one of his colleagues, put the last hand to the Julian law in favour of the allies, and got it confirmed by the people, and published in the following words: all the citizens of the allied cities, who shall be in Italy at the time of the promulgation of this law, shall be deemed citizens of Rome, provided they register their names with one of the three prætors within sixty days. This brought the Italians to Rome in such numbers, that the new citizens became more numerous than the old; but, lest this should make strangers masters of the elections, and consequently of the republic, the censors did not incorporate them in the thirty-five Roman tribes, but formed them into new tribes, who were to vote last. By this means all matters were determined by a majority of voices, before the new tribes gave their suffrages. The allies were sensible of this artifice, but dissembled their dissatisfaction, being resolved when an opportunity offered, to put themselves upon a level with the old inhabitants of Rome. The tribune, Sulpicius, proposed a law, that all the inhabitants

tants of Italy, who had lately obtained the right of citizenship, should be incorporated into the thirty-five tribes, and consequently have the same right of voting, each in his tribe, as others had, without any distinction, and got it passed. But when Sylla prevailed, all the laws of Sulpicius were declared void and null.

SOCIETY, SOCIETAS, an assemblage or union of several persons in the same place, for their mutual assistance, security, interest, or entertainment. See GOVERNMENT.

Of *societies* we have a great many kinds, distinguished by the different ends proposed by them: *civil societies, trading societies, religious societies, literary societies*, &c.

SOCIETY, in *Trade*, is a contract or agreement between two or more persons, whereby they bind themselves together for a certain time, and agree to share equally in the profits or losses which shall accrue in the affairs for which the *society* or copartnership is contracted.

We have several very considerable *societies* of this kind: as the Merchant Adventurers, the Turkey, East India, Muscovy, Eastland, Greenland, Spanish, African, South Sea, and Hudson's Bay, companies: the institutions, policies, &c. whereof, see under the article COMPANY.

By the Roman law, the social contract needs no other solemnity but the sole consent of parties, without any writing at all; but among us, articles of copartnership are required. There is no contract wherein probity is more required than in *society*; insomuch as the laws pronounce those null that are made contrary to equity, and with design to deceive.

The French distinguish three kinds of mercantile *society*: *ordinary society*, called also *collective* and *general*; *society in commendam* or *commandity*; and *anonymous society*, called also *momentary* and *inconnue*.

The first is, where several merchants act alike in the affairs of the *society*, and do all under their collective names, which are public, and known to every body.

SOCIETY *in commendam*, &c. is that between two persons, one of whom only puts his money into stock, without doing any other office of a copartner; the other, who is called the *complementary* of the *society*, dispatching all the business under his own name.

SOCIETY, *anonymous*, is that where all the members are employed, each particularly, in the common interest, and each is accountable for profits, &c. to the rest; but without the public's being informed thereof; so that the seller has only an action against the particular buyer, no other name appearing.

It is also called *momentary*, because frequently made on particular occasions, and ceasing with them: as in the making a purchase, the selling any commodity, &c.

Of this they distinguish four kinds: *society by participation*, which is usually formed by letters from one city to another, where a merchandize is to be bought or sold. The second is, when two or three persons go together to fairs to buy goods. The third, when two or three persons agree to buy up the whole of some commodity in any country, to sell it again at their own price. And the fourth is, when three or four persons make a journey together, to buy and sell the same commodity. Beside merchants, people of quality, &c. are admitted into these anonymous *societies*.

SOCIETIES, *religious*, are parties of persons formed either to live regularly together, or to promote the interest of religion, or to cultivate it in themselves.

Of the first kind are all congregations of religious; particularly the Jesuits, who are called the *society* of Jesus; though they more usually call themselves the *company* of Jesus; the *society* of the Sorbonne; the *society* of St. Thomas de Villeneuve, instituted in 1660, by F. Ange le Proust; the *society* of St. Joseph, instituted in 1638; the *society* of Bretagne, a reform of Benedictines in 1606; and the *society* of Jesus, a religious military order, instituted by Pius II.

SOCIETY of the *Cord*. See CORD.

Of the second kind are, the

SOCIETY *for the reformation of manners*, and putting in execution the laws against immorality and prophaneness. A *society* of this kind was set on foot about the time of the Revolution, by five or six private persons in London, and was afterwards exceedingly increased by numbers of members of all denominations.

Societies for this purpose have been occasionally established, not only in London, but in other principal towns, in a later period.

SOCIETY *for propagating the gospel in foreign parts* was instituted by king William III. in 1701, for securing a maintenance for an orthodox clergy, and making other provisions for the propagation of the gospel in the plantations, colonies, factories, &c. to that end he incorporated the archbishops, several bishops, and others of the nobility, gentry, and clergy, to the number of ninety, into a body, with privilege to purchase two thousand pounds a year inheritance, and estates for lives or years, with other goods, to any value.

They are directed by their charter to meet yearly, on the third Friday in February, to chuse a president, vice-president, and other officers; and the third Friday in every month, to transact business, depute fit persons to take subscriptions for the said uses, and of all monies so received to give account to the lord chancellor, &c. They now meet at queen Anne's bounty office, Dean's-yard, Westminster. They are trustees of Codrington college, in Barbadoes, supported by plantations in that island. A sermon, recommending the objects of the *society*, is annually preached in London.

SOCIETY *for propagating Christian knowlege* was begun in 1699, by some persons of worth, &c. Its original design was to propagate religion in the plantations, to secure the pious education of the poor at home, and to reclaim those that err in the fundamentals of Christianity.

In the year 1701, they had procured considerable charities, and had transmitted the same to the plantations, in libraries, bibles, catechisms, &c. with a voluntary maintenance for the several ministers to be employed in the plantations. But the *society* for propagating the gospel in foreign parts being then instituted, they were incorporated, by charter, into the same; and thus discharged, as a particular *society*, from the farther pursuit of that branch of their original design; whereupon they wholly turned themselves to the other, and became very considerable, by great accessions from among the clergy and laity.

They meet weekly, to concert measures for raising charity for the education of poor children, and setting up schools for that purpose; as also for the more regular disposal of pious books and catechisms, for instruction of the ignorant, erroneous, &c. By the assistance of members of other religious *societies*, they have procured subscriptions for the education of above three thousand children, who are placed out in schools about London, and taught reading, writing, psalmody, &c. They have dispersed great numbers of books among the poor, in the fleet, army, &c. and have procured several to be translated into Welsh, and other foreign languages, and dispersed accordingly.

SOCIETY, *New England*, was first incorporated by an ordinance of parliament in 1649, by the name of the *President and Society for the Propagation of the Gospel in New England*; and impowered to receive and dispose of monies in such manner as should best conduce to the preaching and propagation of the Gospel amongst the natives, and for the maintenance of schools for the education of their children: for which purpose a general collection was to be made in all the counties, cities, towns, and parishes of England and Wales. With the sum of money thus collected, the *society* was enabled to purchase an estate in land of between 5 and 600 *l.* a year. But upon the restoration of king Charles II. the charter became void, and colonel Bedingfield, a papist, who had sold an estate of 322 *l. per ann.* which had been settled for the uses of this *society*, repossessed himself of it, and refused to pay back the money which he had received for it. However, the corporation being revived in 1661, by an express charter, which ordained, that there be for ever within the kingdom of England, a *Society or Company for Propagation of the Gospel in New England and the Parts adjacent in America*, the estate which had been detained by Bedingfield, was restored by the chancellor's decree. The members of this *society* are not to exceed forty-five; these and their successors to be chosen by the *society*, are constituted one body corporate, with the powers and privileges usual in such cases: and a power is likewise given them to appoint commissioners residing in New England to transact their business in those parts. The honourable Mr. Boyle was appointed by charter the first governor of this company. See a copy of the charter in the Appendix to Dr. Birch's Life of Mr. Boyle.

SOCIETY of *the Sons of the Clergy* was incorporated by king Charles II. in 1678, by the name of *the Governors of the Charity for Relief of the poor Widows and Children of Clergymen*. This *society* is under the direction and management of a president and vice-president, three treasurers, and a court of assistants composed of forty members. Several hundreds of widows and children of the clergy have annually received considerable relief from this useful charity.

SOCIETY *for promoting religious knowledge among the poor* commenced in the year 1750, for the purpose of giving bibles, testaments, and other good books, to those who most needed them, and who were most likely to improve them. This *society* is supported by an annual subscription of the members, together with the donations and legacies

gacies of other contributors; and each subscriber is intitled to a nomination of books in turn, corresponding to the amount of his subscription. The *society* meets every month.

SOCIETY *for promoting Christian Knowledge in the Highlands and Islands of Scotland*, was first begun by the association of private contributors at Edinburgh about the year 1701; their design was approved and encouraged by queen Anne, who, in 1708, issued her royal proclamation for this purpose; and, in 1709, she granted a patent, constituting a certain number of the subscribers a *society*, or body politic, with full powers to receive donations and purchase lands, &c. not exceeding 2000 *l.* a year, and with the profits of the same to erect and maintain schools, &c. Accordingly the lords of session, under her majesty's commission, nominated eighty-two subscribers to be the first members of this *society*, who chose a president, treasurer, secretary, and other officers. They also chose a committee of fifteen, who were to meet every month, or oftener, as occasion required. There is a general meeting of the whole *society* every three months, when they admit members, make general regulations, give orders to the committee, and settle their accounts. In 1710 the *society* began to settle schools. In 1738, the king granted a new patent, to cause such children as were found proper to be instructed in husbandry, housewifery, and manufactures; in pursuance of which the *society* erected several working schools. The *society*'s first charter extends to popish and infidel countries beyond the seas, and four missionaries have been maintained for converting the native Indians in America to the Christian faith. The *society* has several corresponding members in London, who meet every quarter to receive subscriptions, donations, &c.

There is also a charitable SOCIETY in London, corresponding with the incorporated *society* in Dublin, for promoting the English protestant charter-schools in Ireland; under the management of a treasurer, a standing committee of fifteen, and secretary, who meet once a month.

Of the third kind are divers religious *societies*, very properly so called: these were first set on foot in London about the year 1678, by a few young men, who agreed to meet weekly, for prayer, psalmody, and spiritual conference. These afterwards increased to forty distinct bodies, who set up public prayers in many churches where they were not before frequent, procured frequent administrations of the sacrament, and maintained lectures on that subject, in one church or another, almost on every Sunday evening.

SOCIETY, *American Philosophical*, was established at Philadelphia in the year 1769, for promoting useful knowledge, under the direction of one patron, one president, three vice-presidents, one treasurer, four secretaries, and three curators. The first volume of their Transactions comprehends a period of two years, viz. from Jan. 1, 1769, to Jan. 1. 1771.

A *society* of a similar kind, under the title of the Academy of Arts and Sciences, &c. has been lately established at Boston.

An institution of the like kind, under the title of the Royal Academy of Sciences, was instituted at Stockholm in 1739, and since that time to 1783, has published forty-two volumes of Transactions, quarterly, in 8vo. in Swedish.

A *Royal Society of Sciences* was instituted at Upsal, about the year 1720: the meetings are monthly, and the Transactions are published quarterly, in 4to.

There is also another *society* at Gottenburg, called the *Royal Society* of Sciences and Belles Lettres.

The *Society* of Natural Historians at Berlin, was founded by Dr. Martini; in which place there is also a philosophical *society*.

The *Royal Society* of Gottingen was instituted by king George II. in 1751.

The *Imperial and Royal Academy* of Sciences and Belles Lettres of Brussels was founded in 1773. Three volumes of their Transactions have been published.

In France there have been several institutions of this kind for the improvement of science, besides those recounted under ACADEMY: as the Royal Academy at Soissons, founded in 1674; at Villefranche, Beaujolois, in 1679; at Nismes, in 1682; at Angers, in 1685; the Royal *Society* at Montpelier, in 1706, which is so intimately connected with the *Royal* ACADEMY of Sciences of Paris, as to form with it, in some respects, one body; the literary productions of this *society* are published in the memoirs of the academy: the Royal Academy of Sciences and Belles Lettres at Lyons, in 1700; at Bourdeaux, in 1703; at Marseilles, in 1726; at Rochelle, in 1734; at Dijon, in 1740; at Pau in Bearn, in 1721; at Beziers, in 1723; at Montauban, in 1744; at Rouen, in 1744; at Amiens, in 1750; at Toulouse, in 1750; at Besançon in 1752; at Metz, in 1760; at Arras, in 1773; and at Chalons sur Maine in 1775. For other institutions of a similar nature and their literary productions, see ACADEMY, JOURNAL, and TRANSACTIONS.

SOCIETY, *Edinburgh Philosophical*, a *society* which succeeded the *Medical* SOCIETY, and formed upon the plan of including all the different branches of natural knowledge and the antiquities of Scotland. The meetings of this *society*, interrupted in 1745, were revived in 1752; and, in 1754, the first volume of their collection was published, under the title of *Essays, or Observations, Physical and Literary*, which has been succeeded by other volumes. This *society* has been lately incorporated by royal charter, under the name of the *Royal Society* of Scotland, instituted for the advancement of learning and useful knowledge. The members are divided into two classes, viz. physical and literary; and those who are near enough to Edinburgh to attend the meetings, pay a guinea on admission, and the same sum annually. The first meeting was held on the first Monday of August, 1783; when were chosen a president, two vice-presidents, a secretary, treasurer, and a council of twelve persons.

There is also an *experimental society* at Dublin, for promoting natural knowledge, which was instituted in 1777: the members meet once every week, and distribute three honorary gold medals annually for the most approved discovery, invention or essay, on any mathematical or philosophical subject. The *society* is under the direction of a president, two vice-presidents, and a secretary.

A *Literary and Philosophical Society*, of considerable reputation, has been lately established at Manchester, under the direction of two presidents, four vice-presidents, and two secretaries. The number of members is limited to fifty; besides whom there are several honorary members, all of whom are elected by ballot; and the officers are chosen annually in April. Several valuable essays have been already read at the meetings of this *society*.

SOCIETY *of Antiquaries*. See ANTIQUARY.

SOCIETY *for the Encouragement of Arts, Manufactures, and Commerce*, was instituted in the year 1754, in pursuance of a plan formed in 1753, for the purpose of exciting emulation and industry in the improvement of ingenious and commercial arts, the various branches of agriculture, &c. by honourable and pecuniary rewards. It was set on foot by lord Folkstone, lord Romney, Dr. Hales, and a few other gentlemen; but its importance and utility soon gained a very considerable accession of members and subscribers. This *society*, according to its present constitution, is under the direction and management of one president, nine vice-presidents, the chairmen of the several committees of accounts, correspondence, polite arts, agriculture, manufactures, mechanics, chemistry, colonies, and trade; in each of which department there are two, a principal secretary, at a salary of 150 *l.* a year, assistant secretary, register, collector, and messenger. The office is in the Adelphi.

Every person, desiring to be a member, must be proposed by some member at one meeting, and ballotted for at a succeeding meeting, and if he be chosen by two thirds of the members present, he is deemed a perpetual member on payment of twenty guineas, or else a subscribing member on payment of any yearly sum not less than two guineas.

The proceedings of the society are regulated by a body of rules and orders established for this purpose; all questions are determined by holding up of hands or ballot, and no matter can be confirmed without the assent of the majority at two meetings. They invite the public in general to propose subjects for encouragement, and whatever is deemed deserving attention is referred to the consideration of a committee, which makes a report to the whole *society*, where it is approved, rejected, or altered. Their premiums, which have been very extensively bestowed, are either sums of money, or the *society*'s medals in gold or silver.

Their meetings are every Wednesday evening, from the second Wednesday in November to the end of May, and at other times on the first and third Wednesday in every month.

In the Memoirs of Agriculture, and other œconomical arts, by Mr. Dossie and Bailey's machines of the *Society* of Arts, we may see how various, extensive, and liberal the plan which this *society* has adopted and pursued.

Similar *societies*, particularly with a view to the improvement of agriculture, have been established in different parts of the kingdom.

SOCIETY *of Artists of Great Britain*, which consists of directors and fellows, was incorporated by charter in 1765, and empowered to purchase and hold lands, not exceeding 1000 *l.* a year. The directors of this *society*, annually elected, are to consist of twenty-four persons, including

including the president, vice-president, treasurer, and secretary; and it is required that they be either painters, sculptors, architects, or engravers by profession.

SOCIETY, *Humane.* See DROWNING.

SOCIETY, *Marine*, was instituted in 1756, and incorporated in 1772, for promoting the interest of the navy: it is under the direction of one president, five vice-presidents, a treasurer, and vice-treasurer.

This *society* was first established, and is still maintained by voluntary subscription, for cloathing landmen for the sea-service, providing cloaths, bedding, and other necessaries for boys, as fast as there is a demand for them from his majesty's ships, and for other similar purposes.

SOCIETY, *Medical.* To this class belong several *societies*, the principal of which in our own country are the following; viz. the *Medical Society* of London, instituted in the year 1752, on the plan recommended by lord Bacon (De Augm. Scient. lib. iv. cap. 2.), to revive the Hippocratic method of composing narratives of particular cases, in which the nature of the disease, the manner of treating it, and the consequences, are to be specified; to attempt the cure of those diseases, which, in his opinion, have been too boldly pronounced incurable; and lastly, to extend their inquiries after the powers of particular medicines in the cure of particular cases; the collections of this *society* have been already published, under the title of *Medical* Observations and Inquiries, in five volumes: *Society of Physicians* in London, instituted about the year 1764, the members of which, who must be merely licentiates of the College of Physicians, are elected by ballot, and meet once a fortnight, on Wednesday evening, for the purpose of conversing on the prevailing diseases, &c. and dine together once in a quarter: the *Medical Society* in Crane-court, instituted in 1773, under the direction of a council, consisting of a president, treasurer, librarian, three physicians, three surgeons, three apothecaries, and three secretaries; the members meet once a fortnight, on Tuesday evening, and their council is annually elected in January, when an oration is delivered by one of the members on some medical subject: *Society for the Improvement of Medical Knowledge* in London, established in 1782, for the purpose of collecting useful essays and observations for publication; the meetings of this *society* are held once a fortnight, on Tuesday evening, and the members dine together once a quarter; on which occasion candidates for admission are ballotted for; the *society* is under the direction of a president, treasurer, two secretaries, and a committee for revising and selecting papers for publication, who are elected annually by ballot: the *Medical Society* of Edinburgh, to which the public are indebted for six volumes of curious and useful essays, collected principally by the late Dr. Monro, from June, 1731, to June, 1736; but this *society* was afterwards united to another, called the *Philosophical* SOCIETY: the *Medical Society of Edinburgh*, incorporated by royal charter in 1778, under this title; this institution appears to have been coeval with the establishment of a regular school of physic in the university, though none of its records of an earlier date than 1737, are now preserved; the ordinary members of this *society* are elected by ballot, and three dissentient exclude a candidate; an ordinary member may also be elected an honorary member, who enjoys the privileges of the others, and receives a diploma, but is freed the obligation of attendance, delivering papers in rotation, &c. to which the ordinary members are subject, but in this case the votes must be unanimous; the meetings of this *society* are held every Saturday evening in their own hall, during the winter season, when papers on medical subjects are delivered by the several members in rotation; and four of these are annually elected to fill the chair in rotation, with the title of annual presidents.

The *Royal Medical Society* of Paris was instituted in 1776. The members are divided into associates ordinary, limited to thirty, honorary to twelve, extraordinary to sixty, and foreign to sixty, and correspondents. This *society* has published three volumes of Memoirs in 4to.

SOCIETY, *Royal.* See ROYAL *Society.*

SOCII, *allies*, among the Romans. See ALLIANCE and SOCIAL *War.*

SOCINIANS, in *Ecclesiastical History*, a sect of Antitrinitarians, who are said to have derived this denomination from the illustrious family of the Sozzini, which flourished a long time at Sienna, in Tuscany, and produced several great and eminent men; and, among others, Lælius and Faustus Socinus, who are commonly supposed to have been the founders of this sect. Lælius was the son of Marianus, a famous lawyer, and distinguished by his genius and learning, as well as by the lustre of an unblemished and virtuous conduct. Having conceived a disgust against popery, and disapproving many doctrines of the church, he left his country in 1547; and having passed four years in visiting France, England, Holland, Germany, and Poland, he at last fixed his residence at Zurich, in Switzerland, where he died in 1562, in the thirty-seventh year of his age. Although he adopted the Helvetic confession of faith, and professed himself a member of the church of Switzerland, he entertained doubts with respect to certain doctrines of religion, which he communicated to some learned men, whose judgment he respected, and in whose friendship he could confide. However, his sentiments were propagated, in a more public manner, after his death; as Faustus, his nephew and his heir, is supposed to have drawn from the papers he left behind him, that religious system, upon which the sect of the *Socinians* was founded. This Faustus Socinus was born at Sienna in 1539; and having continued many years in his own country, twelve of which he spent in the court of the grand-duke of Tuscany, he determined, in the year 1574, and the thirty-fifth of his age, to withdraw from Italy into Germany. During this period he had laboured under many disadvantages in the pursuit of knowledge, and his studies had been chiefly confined to the rudiments of logic and jurisprudence; but at Basil, where he first resided after his voluntary exile, he devoted himself for three years to the study of theology, under the direction and assistance of the writings of his uncle Lælius; and in 1577 he began to propagate his religious opinions without reserve or disguise. In 1578 he was invited by Blandrata, a person of eminence in Transylvania, to compose the commotions which were occasioned by a party, under the lead of Francis David, in the Antitrinitarian churches of that country. But failing of success, he removed to Poland in 1579, zealously wishing to join himself to the Unitarian churches; but here he suffered many vexations, and much opposition, from a considerable number of persons, who looked upon some of his tenets as highly erroneous. At length, however, he vanquished the animosity of his enemies by his gentleness and firmness, by his address and eloquence, and the favour and protection of the nobility, with which he was honoured, and lived to form the Unitarians into one community, under his own superintendency and direction. Having retired to a village about nine miles from Cracow, he there closed his life, in the year 1604; and the following epitaph was inscribed on his tomb:

> *Tota licet Babylon destruxit tecta Lutherus,*
> *Muros Calvinus, sed fundamenta Socinus.*

i. e. Luther destroyed the houses of Babylon, Calvin the walls, but Socinus subverted the foundations. The sentiments of Socinus, with regard to the principal theological subjects controverted among Christians, will appear in the following abstract of them from his own writings; some of which were published during his own life, and some after his death; and the collection of them, in two volumes, folio, forms part of the Bibliotheca Fratrum Polonorum. With regard to the nature and character of Christ, Socinus maintained, that he was a man, conceived and formed in the womb of the Virgin, without the intervention of a man, by the power of the divine spirit; on this account he was, in a peculiar sense, God's own and only begotten son, as no other person ever was the son of God in the same way, by the immediate origin of his being. Moreover, he was constituted the son of God by his resurrection from the dead, and was then begotten by God, when God raised him from the dead. As to those passages which have been supposed to assert Christ's existence in the heavenly world, previous to his birth and appearance among men, he explains them, by alledging, that Christ himself, after he was born, and before he entered on the office assigned him by his Father, was, in consequence of the divine counsel and agency, in heaven, and remained there for some time, that he might hear from God, and being with him, as the Scripture says, might see those things which he was to announce to the world, in the name of God himself; though he explains John iii. 13, as figurative language. Accordingly, in explaining the first words of St. John's gospel, *In the beginning was the word*, &c. he observes, that the terms, *in the beginning*, do not relate to eternity, but to the order of those things which John was about to write concerning Jesus Christ; imitating Moses, who, in writing his history, opens his introduction with this word, *beginning*, in reference to the transactions which he was about to record. And Jesus is called the Word, he supposes, not on account of his nature or substance, but because of the office he discharged when he revealed to us the word of the gospel from his Father. *The word was with God*, i. e. Jesus, as the word of God, before he was pointed out by the preaching of the Baptist, was known to God alone. And *the word was God*: the term God, says this commentator, does not denote substance, but

but authority, power, and beneficence, which were derived from the Father, and which entitled Christ, according to the opinion of this writer, to adoration and worship. His ideas of the efficacy of our Lord's death and mediation are utterly repugnant to those that have been generally entertained by persons called Calvinists. Nothing, he says, can be more incompatible with each other, than a free pardon and satisfaction. He adds, no man of judgment and piety ought to entertain the idea of a satisfaction for sin; since it plainly does very much derogate from the power and authority, or goodness and mercy of God; and though a propitiation be not the same thing as a satisfaction, and though God never refrained from the punishment of sin, on account of any real satisfaction given him, yet it is certain, that in remitting the punishment of our sins by Jesus Christ, no propitiation intervened; but God hath, from his free will, exhibited himself so propitious to us in Christ, as not to exact the punishment of our sins, though he might justly have done it. However, he allows not only that the death of Christ, and the pouring out of his blood for us, was an offering and sacrifice to God, but that this sacrifice may be said to have been offered up for our sins, in order to their being forgiven; yet he apprehended, that this sacrifice, as far as it was expiatory, was offered by Christ, not on the cross, but in heaven itself, after his resurrection. To which purpose he observes, that Christ did not obtain eternal redemption for us before he entered into the holy place, and there assumed the priesthood; and without a priesthood no expiatory offering could be made.

Socinus does also expressly deny the distinct personality of the Holy Ghost; understanding by the Holy Spirit, a divine energy or influence.

With respect to the nature and state of man, Socinus thought, that the progenitor of our race was mortal, i. e. liable to death, by reason of his frame, and incapable of exemption, without an exertion of the divine favour and influence, which was not granted to him at creation; and, therefore, when the apostle asserts, that by sin death entered into the world, he meant not natural mortality, but the necessity of dying, or eternal death. To this purpose he explains himself: Adam, if he had not sinned, might have been preserved from death by the kindness of God, though naturally mortal; or, if he had died, have been restored to life, and made immortal. By his sin he did, as it were, refuse to give himself and his posterity this blessing; and, therefore, unless the favour of God be renewed to us, we must all die, and remain in the state of the dead. As to the nature of the human soul, it seems to have been the opinion of Socinus, that, after this life, it doth not so subsist of itself, without the body, as to be capable of any reward or punishment, or any sensations at all. To the question, whether the first man had any original righteousness before he sinned? Socinus replies, that if by original righteousness be meant such a condition that he could not sin, this certainly was not the state of Adam, as it is clear he did sin. But if original righteousness consisted in this, that his reason had the absolute rule over his appetites and senses, and invariably directed them, then the opinion of those who ascribe it to Adam, is supported by no argument: hence it should seem, from Adam's fall, that there was no perfect harmony between them, and that his appetites and senses had the dominion over his reason. If it be asked, says Socinus, whether there is original sin? he answers, this is the same as the inquiry, whether men, when they are born, because they derive their origin from Adam, have, on account of his fall, contracted any guilt or punishment, or are obnoxious to either? Therefore, since the consent of the will must constitute guilt, and there can be no punishment without antecedent guilt, it seems not at all possible, that either of these should pertain to a man when he is born, as he neither has, nor could have before, any use of his own will. If by original sin be understood certain innate desires, or evil concupiscence in man, and a proneness to sin, this opinion Socinus denies, and labours to refute; concluding, upon the whole, that there is no such thing as original sin, i. e. a taint or pravity in consequence of the sin of the first man, necessarily produced, or by any means inflicted on the human race; and that no other evil necessarily flows to all his posterity from that first transgression, than by some means or other the necessity of dying; not indeed through the influence of that transgression, but because man, being naturally mortal, was on that account left by God to his own natural mortality, and what was natural became necessary as a punishment on the offender; consequently, they who are born of him, must be born in the same circumstances, for he was deprived of nothing he naturally had or could have. From reasoning on this subject, Socinus concludes, that there is a freedom of will in man, and that the powers of man are not so few and feeble, but that he may, with the assistance of God, obey the divine law by the right use and application of his powers. Divine assistance he considers as external and internal; and the latter, he says, is twofold; the one, when God by some means impresseth on the heart what he hath promised to them that obey him; and the other, when he instructs and illuminates the mind rightly to discern his will, in those instances which cannot be expresly contained in his written word: however, this internal assistance belongs only to those who have made good use of the external. The doctrine of predestination Socinus absolutely denies, and he endeavours to account for the prescience of the Deity, without admitting that notion of his decrees, which some divines have adopted. On the head of justification, Socinus observes, that God out of his mere mercy justifies us, i. e. pronounces us righteous, and grants us forgiveness of sins, and eternal life; but he requireth from us, before this be done, that we believe in Christ, i. e. confide in and obey him; and our good works, or the obedience we render to Christ, though not the efficient or meritorious cause, are the *sine qua non*, or indispensable pre-requisite of our justification before God, and eternal salvation. But if any should deviate from this obedience, by falling into sin, and continuing therein, they cease to be justified; nevertheless, by repentance, and amendment of life, they may be justified again; but this second repentance, he says, is not in our power, God granting an ability for it to whom he pleaseth.

Socinus denied the perpetuity of baptism, as an ordinance in the church, alledging that it was not prescribed for those who in any other way have publicly given their names to Christ, or from their earliest years have been educated in the Christian discipline; or if it is to be retained in these days, he apprehends it should be retained principally on account of those who have been converted from other religions to the Christian. He farther thought, that, in order to the right administration of baptism, it is previously necessary, that the baptized person should be a believer, and he, therefore, reckoned the practice of infant baptism unscriptural and erroneous.

After this compendious abstract of the chief theological sentiments of Socinus, it is proper to observe, that, according to the usual manner of speaking, all are denominated *Socinians*, whose opinions bear a certain affinity to the system of Socinus; but, in a strict and proper sense, they only are deemed the members of this sect, who embrace wholly, or with a few exceptions, the form of theological doctrine, which Socinus either drew up himself, or received from his uncle, and delivered to the Unitarian brethren, or *Socinians*, in Poland and Transylvania. Their sentiments are explained at large, in their Catechism, printed several times under the title of Catechesis ecclesiarum Polonicarum, unum Deum Patrem, illiusque Filium unigenitum, una cum Sancto Spiritu, ex Sacra Scriptura confitentium. See *Catechism of* Racow.

The *Socinians*, like other sects distinguished by one general denomination, are divided into several parties. Some differ from Socinus with regard to the worship of Christ; some deny the eternity of the future punishment of the wicked, and some apprehend it contradictory to maintain God's foreknowledge of future contingencies, &c. See Budnæans, Farnovians, and Semijudaizers.

The chief school of the *Socinians* was at Racow, where they obtained the grant of a settlement, and there all their first books were published. But in the year 1638, in consequence of the intemperate zeal of some students of the Unitarian academy in this city against popery, a law was enacted at Warsaw, by which it was decreed, that the academy of Racow should be destroyed, its professors banished, the printing-house of the *Socinians* destroyed, and their churches shut up. This law was immediately executed; and similar edicts were enacted in other parts of Poland. In 1658 another severe act was published by a diet held at Warsaw, requiring all the *Socinians* to leave the kingdom for ever, and denouncing capital punishment against all who should profess their opinions, or harbour their persons. This terrible edict was renewed in 1661; and, in consequence of these measures, the *Socinians* sought an asylum among their brethren in Transylvania; a considerable number was dispersed through the adjacent provinces of Silesia, Brandenburgh, and Prussia, where their posterity still subsist. Others repaired to Holland and England. In Transylvania they still continue numerous; and are much at their ease. In Holland their number is not considerable; and all who profess themselves such are by law excluded from the general toleration which prevails in that kingdom. They are called Collegians.

As to the present state of the *Socinians* in Poland, a late writer observes, that since their suppression they have had churches, which have assembled in private houses, woods,

or fields, as opportunity permitted; and these assemblies have been conducted under the inspection of regular ministers, educated at Leyden and Amsterdam. Since the edict of 1661, they have been included by the Romish party under the general name of DISSIDENTS: however, in those parts of Poland, which by the late partition fell to the lot of Prussia, Russia, or the emperor, they have now their liberty in common with their other dissident brethren, and their public places of worship. The only society of *Socinians* in England was that formed by Mr. John Biddle, under the patronage of Mr. Thomas Firmin, and his adherents were called Bidellians; but this name was lost in the more common appellation of *Socinians*, or, what they preferred, Unitarians. They differed from Socinus, and the foreign Unitarians, in maintaining the personality of the Holy Spirit. This society does not appear to have subsisted after the death of Biddle; nor have the *Socinians*, though their sentiments have been adopted by several, made any figure as a community in England. The most distinguished *Socinian* writers, in Poland, were Crellius, Smalcius, Volkelius, Slichtingius, Wolzogenius, Przipcovius, and Stanislaus Lubianicius: to this number some have added Grotius; and in later times we might enumerate Le Clerc, Biddle, Lardner, Lowman, Fleming, Lindsey, Priestley, &c. See on this subject Socini Oper. tom. i. & ii. passim. Mosheim's Eccl. Hist. vol. iv. p. 167, &c. 8vo. Toulmin's Life of Socinus, passim. See UNITARIANS.

SOCK. See SOCCUS.

SOCK and *sythe-land*. See HUSBAND-*land*.

SOCKET. Ball and *socket*. See BALL.

SOCKETS, in a *Ship*, are the holes which the pintles of the murthering pieces go into.

SOCLE, or ZOCLE, in *Architecture*, a flat, square member under the bases of pedestals, of statues, vases, &c. which it serves as a foot, or stand.

The word is French; formed from the Italian *zoccolo*, or the Latin *soccus*, the shoe of the ancient comic actors. Vitruvius calls it *quadra*; we, frequently, *plinth*.

SOCLE, *continued*, is a kind of continued stand, or pedestal, without either base, or corniche, ranging round the whole building; called, by Vitruvius, STEREOBATA; and, by the French, *soubassement*.

SOCMEN, or SOKEMEN, *socmanni*, such tenants as held their lands and tenements in *socage*; but the tenants in ancient demesne seem most properly to be called *socmans*. See SOC and VILLENAGE.

SOCNA, in our *Old Writers*, a privilege, liberty, or franchise. The word is Saxon.

SOCO, in *Ornithology*, the name of a Brasilian bird of the heron-kind, the *ardea Brasiliensis* of Linnæus, remarkable, beyond all the rest of that genus, for the length of its neck. It is very common in the Brasils; it is smaller than the common heron; its beak is strong, straight, and sharp; its tail short; its head and neck brown, and variegated with black; and its body is of the same colours in different variegations, but its wings have a mixture of whiteness. See *Tab*. V. *of Birds*, N° 54.

SOCOME, in our *Law Books*, &c. a custom of grinding corn at the lord's mill.

There is a *bond-socome*, where the tenants are bound to it; and *love-socome*, where they do it freely, out of affection to the lord. See MOLTA.

SOCRATIC *induction*, in *Rhetoric*. See INDUCTION.

SOCRATIC *philosophy*, the doctrines and opinions, with regard to morality and religion, maintained and taught by Socrates.

By the character of Socrates, left us by the ancients, particularly by his scholar Plato, Laertius, &c. he appears to have been one of the best and the wisest persons in the heathen world. To him is ascribed the first introduction of moral philosophy; which is what is meant by that popular saying, *Socrates first called philosophy down from heaven to earth*: that is, from the contemplation of the heavens, and heavenly bodies, he led men to consider themselves, their own passions, opinions, faculties, duties, actions, &c.

While young, he was exceedingly fond of natural knowledge, as he witnesses of himself, in Plato; but in his older age he cast aside this part of philosophy as obscure, uncertain, impracticable, and even useless and impertinent; and applied himself wholly to moral or active philosophy.

It was he, first, who when all the other philosophers boasted they knew all things, owned, ingenuously, he knew nothing but this, that he knew nothing; which Pyrrho, the father of the sceptic philosophy, improved on, when he said he knew nothing; not even this, that he knew nothing. Yet, in an answer to the oracle, it was pronounced, Ανδρων απαντων Σωκρατης σοφωτατος, *that Socrates was the wisest of all men*. He was accused by Anytus, Melitus, and Lycon, three persons, whose hatred he had incurred by his severe declamations against the poets, of which number the two first were, and the third an actor. His accusation was, that he corrupted the Athenian youth, and broached new superstitions. He was condemned to drink cicuta by two hundred and eighty-one votes, as we are told by Quintilian.

After his death, his fellow-citizens repented to that degree, that the gymnasia, courts of justices, &c. were all shut up: Melitus was put to death, Anytus was banished, and a statue was erected to Socrates.

He wrote nothing himself; yet almost all the Grecian sects of philosophers refer their origin to his discipline; particularly the Platonists, Peripatetics, Academics, Cyrenaics, Stoics, &c. But the greatest part of his philosophy we have in the works of Plato.

SODA, in *Medicine*. See CARDIALGIA, and HEART-*burn*.

It is to be observed, that what we understand by the word *soda* is to be distinguished from the *soda* of the ancients; for they expressed by this word a peculiarly sharp and terrible pain in the head.

The common opinion being, that this complaint is merely owing to an acid humour, has given rise to the use of chalk in it as an universal remedy; and people, who are afflicted with it, usually swallow chalk alone, and that in large quantities, for their cure. But this is by no means a safe, or advisable method; for the chalk meeting with an acid, becomes a violent astringent on mixing with it, and powerfully contracts the tender fibrillæ of the stomach. Whence it often happens, that instead of a cure, the consequences are more painful cardialgias, with obstructions of the viscera, anorexies, and often in women suppressions of the menses. Some give the powder of bricks instead of chalk; but this is more dangerous than the chalk, as it is in itself more astringent. In people, who are afflicted with this complaint from eating fat things, a draught of brandy often proves an immediate cure. Junker's Consp. Med. p. 589.

SODA *subethica*, a term used to express a heavy and dull pain in the head.

SODA, in *Natural History*. See KALI.

SODALES *Augustales*. See AUGUSTALES.

SODALITIUM, among the Anglo Saxons, was the name of a voluntary association, the object of which was the personal security of those who joined in it, and which the feebleness of government at the time rendered necessary. Among other regulations, which are contained in one of these still extant, the following deserves notice: if any associate shall either eat or drink with a person who has killed any member of the *sodalitium*, unless in the presence of the king, the bishop, or the count, and unless he can prove that he did not know the person, let him pay a great fine. Hicks. Diss. Epist. apud Thes. Ling. Septentr. vol. i. p. 21.

SODDER, or SODER. See SOLDER.

SODDERING. See SOLDERING.

SODDING *of brick*. See BRICK.

SODE-*shoots*, in *Botany*, a name given by some to the tree, whose inspissated juice is the gum tacamahacca of the shops.

SODOMY, the unnatural crime of buggery; thus called from the city of *Sodom*, which was destroyed by fire for the same.

The Levitical laws adjudged those guilty of this execrable evil to death, Lev. xviii. 22, 23. xx. 15, 16. and the civil law assigns the same punishment to it. Our laws also make it felony. 25 Hen. VIII. cap. 6. 5 Eliz. cap. 17.

SOFA, in the East, a kind of alcove raised half a foot above the floor of a chamber, or other apartment; and used as the place of state, where visitors of distinction are received.

Among the Turks, the whole floor of their state-rooms is covered with a kind of tapestry, and on the window-side is raised a *sofa* or *sopha*, laid with a kind of matrass, covered with a carpet much richer than the other. On this carpet the Turks are seated, both men and women, like the taylors in England, cross-legged, leaning against the wall, which is bolstered with velvet, sattin, or other stuff, suitable to the season. Here they eat their meals; only laying a skin over the carpet, to serve as a table-cloth, and a round wooden board over all, covered with plates, &c.

The ambassadors of France stood out a long while, and refused to visit the grand vizir, unless he would receive them on the *sofa*: at length he granted them the *sofa*.

SOFEE. See SOPHI.

SOFFIETTA, the bellows-fish, a name by which some have called the SCOLOPAX, a small sea-fish, common in the markets of Rome and Venice.

SOFFITA, SOFFIT, or SOFIT, in *Architecture*, any timber cieling, formed of cross beams, or flying corniches; the

the square compartiments or pannels whereof are enriched with sculpture, painting, or gilding.

The word is Italian, and signifies the same with the Latin *lacuna* and *laquear*; with this difference, that *lacunar* is used for any cieling with square, hollow pannels, called *lacus*; and *laquear* for compartiments interlaced with plat-bands, after the manner of knots or *laquei*.

Such are those we see in the basilics and palaces of Italy, in the apartments of Luxembourg, at Paris, &c. See *Tab. Archit. fig.* 10.

SOFFITA, or SOFFIT, is also used for the under-side or face of an architrave; and more particularly for that of the corona or larmier, which the ancients called *lacunar*, the French *plafond*, and we usually the *drip*.

It is enriched with compartiments of roses; and in the Doric order has eighteen drops, disposed in three ranks, six in each, placed to the right of the guttæ, at the bottom of the triglyphs.

SOFI, or SOPHI. See SOPHI.

SOFIT. See SOFFIT.

SOFT *pulse*, *roe*, and *soap*. See the substantives.

SOFTENING, in *Painting*, the mixing and diluting of colours with the brush or pencil.

To *soften* designs in black and white, made with the pen, &c. signifies to weaken the teint.

To *soften* a portrait, according to Felibien, is to change some of the strokes, and give a greater degree of sweetness and *softness* to the air thereof, which before had something rough and harsh in it.

SOGETTO, *subject*, in the *Italian Music*, is used for a song or melody, on which some counterpoint is to be made.

This may be done variously: thus, 1. *Contrapunto sopra il sogetto*, a counterpoint above the subject, is that of which the subject is the bass. 2. *Contrapunto sotto il sogetto*, when the given subject is the higher part. If the subject, in either case, does not change its notes, it is called *sogetto invariato*. But if the notes be changed, either in figure or position, it is called *sogetto variato*. 3. *Sogetto* is also used for the words to which a song is to be made. 4. *Sogetto* is likewise applied to a series of notes, from which a FUGUE is formed.

SOIL, *solum*, in *Agriculture* and *Gardening*, denotes earth, or ground, considered with regard to the quality of its mould for the production and growth of vegetables.

Mr. Bradley reduces all *soils* to three heads or kinds; viz. *sand*, *loam*, or *mother earth*, and *clay*.

Gravels, and all the open *soils*, till we come at loam, are of the sandy race; and the binding earths, from loam down to the stiffness of chalk, may be ranged under the clay kind.

Loam, or mother-earth, is the medium between the two, and includes all the intermediate kinds.

Each of these *soils* tends alike to VEGETATION, and has its peculiar plants, which will not grow in the other; but the peculiar plants of both the other two will grow in loam, as partaking equally of the qualities of both. Loam, then, must be allowed the best and most beneficial *soil*, where it can be had; and where it cannot, if, by a mixture of other earths, we can make a compost to resemble it, we have more to expect from it, especially in plantations of durable trees, than from a composition of dung, or other forcing ingredients, which, like excess of high intemperate foods and liquors, though they give a hasty growth, yet make the thing short-lived.

The land of England, as considered by the farmer, is reduced into nine sorts of *soils*; the sandy, the gravelly, the chalky, the stony, the rocky, the hazely, the black earth, the marsh, and the clay land. Of this last kind there are four varieties, distinguished by their colours; the black, the blue, the yellow, and the red.

In many places these *soils* are mixed and blended together, and where it is so, it is much better than where they are separate or single; especially where the mixtures happen to be of a right kind, as those of the hot and the dry *soils* blended with the cold and the moist. Nature does this often, and art may imitate it. All sands are hot, and all clays are cold, and therefore the laying clay upon sandy lands, or sand upon clayey lands, is the best of all manure; this alters and changes for the better the very nature of the land itself, whereas dung only improves it for a time, and after that leaves it as bad as it was before. Mixt *soils*, that tend to the clayey kind, are the best of all others for corn. It is not only the natural *soil* we are to consider, but the depth of it, and what *soil* is underneath; for the richest *soil*, if it be only eight or ten inches deep, and lies upon a cold clay, or upon stone, will not be so fruitful to the farmer as the leaner *soils* that lie upon better under-strata. Gravel and sand are the best under-strata of all others, to make the land above prolific.

Cold and wet clays are much more fruitful in the southern parts of England, than in the north. The climates, therefore, are to be considered, and the quantities or proportions of the different kinds in the mixed soils. The natural produce of the land, as to weeds or grass, is also to be greatly regarded by the person who intends to improve upon it. What is the effect of ploughing is next to be enquired into, and experiment must shew what kind of corn agrees best with it.

All land that moulders into dust with frost, with all sorts of warm lands, black mould, yellow clays, if not too spewy when wet, and all that turn black after rain, are in general good lands for corn. Land that produces large trees, as also such as produces black-thorn, weeds, thistles, rank grass, and the like, and that lies in bottoms open to the east or south, being well sheltered from other winds, may be always esteemed to bid fair for good land. Thyme, strawberries, betony, and wild sage, direct to the places where woods will thrive best; and chamomile is always an indication of a land being disposed to bear corn in large crops.

All land that binds after frost and rain, all that turns white, and is full of worms, or is very moist and cold, or that is too hot and dry, and that lies open to the north on the sides of hills, exposed to cold winds and frosts in winter, and to the sun's scorching heat in summer; and all that bears naturally holly, box, ivy, juniper, fern, or brakes, furzes, broom, and heath; and lands that bear mosses, rushes, yarrow, and wild tanzy, with flags, and other such weeds, which betoken a cold and damp ground, are less fit for corn, though other things may succeed on them. Where plants appear blasted, shrubby, and curled, these are distempers in them occasioned by sudden changes of wet and cold, and a dry heat. All these lands are, by their natural produce, to be judged less fruitful than the others. Blackish, dun, or yellow sand, and very hot stony gravel, are generally esteemed very unfruitful. Chalky lands are naturally cold, and therefore they require warm composts; and this is the reason why chalk itself is so good a manure for hot and dry lands. Sandy land, well manured with marl, will bear turneps, or white or blue pease, to great advantage. Mortimer.

The great article, in the culture of plants, trees, &c. is the *soil*; and in many cases it is not sufficient to have found a *soil*, which once tried proves convenient, and to suppose that it will always continue so. In course of time the *soil*, which was once proper for the nourishment of some peculiar vegetable, loses its virtue; and this sooner in some lands, and later in others. All who are conversant in husbandry, are well acquainted with this. If a good piece of ground be chosen for the sowing of wheat, and it produces very well the first year, it will not for ever continue to do so; the second year's crop will be perhaps good, and the third and fourth tolerable; all this while the land is in heart, as the farmers express it; but after this it becomes improper, and very little wheat will be raised if sown upon it; yet when it refuses to produce wheat, it will, without any alteration, produce barley in sufficient plenty for some years; when it will yield no more good crops of barley, it may be still sowed with oats, and will produce that grain as well as fresh land; and when it has been worn out with all these, it will produce pease. After this it is made quite barren, and can be of no farther use to the farmer, the vegetative quality of it being worn off by these successive crops, each sort of grain taking off that part which is more peculiarly fitted for its own nourishment; the wheat first, and the rest in their order. While one of these plants is taking up what belongs to its particular nature, the rest all remain quiet and undisturbed; and these are afterwards carried away by successive changes of plants, which require them; and at length, by the whole, all the vegetable matter is carried away, and the lands so drained of it, that there must be a supply of something in its room, before any thing more of any kind can be raised from it.

The supply of fresh vegetable matter, in the place of that which was drained away by the successive growths of plants, is done by several ways, but by none so well, as by letting it lie fallow for some time. The other means of giving a supply to the exhausted earth are the manures laid on it by the farmer, and these are, all of them, some animal or vegetable remains, and their use is to drain into the earth those particles from themselves, which may be again received into the bodies of new productions of the same kinds. Blood, urine, the excrements of animals, with their several parts, as horns, hoofs, hairs, feathers, calcined shells, and vegetable bodies in an altered state, such as lees of wine and beer, ashes of burnt vegetables, leaves, straw, roots, stubble, and the like, when in a decaying state, turned under the earth again by plowing, there become disunited into their component parts, and these again are carried up into other new plants. See MANURING *of ground*.

If we take off our thoughts from the fields, and look among

among the gardens, we there meet with farther confirmations of the same thing: the trees, shrubs, and herbs, cultivated in these, after they have continued in one station, till they have derived thence the greater part of the matter fitted for their increase and nourishment, will either decay or degenerate, unless they have a new supply of manure added to the earth about their roots, or are themselves translated into other earth, not so drained of that particular matter out of which they are to be fed.

The older trees have some more supplies of fit matter than the younger, by means of the length of their roots, which, when they have drained one spot of ground, usually are carried much farther into another, and reach a very great way; but at last they can reach no farther, and all fails, unless such a supply of manure, or the being removed into fresh earth, supply that nourishment they can no longer have where they stand. The gardeners, when they transplant trees, cut off these long roots; but though they only do this to prevent the trouble of opening a larger hole than necessary for their reception, yet there is in nature this good reason for it, that they have, when brought to a fresh *soil*, no occasion for those long roots to draw nourishment from afar off, when there is enough of it every where about them.

From the whole of this reasoning it is inferred, that the modern system is erroneous, which says that water is the only thing that gives nourishment and increase to plants; since, if this was the case, there could be no need of manures, nor any need of altering the crop, in order to its succeeding, or of transplanting trees to make them thrive: and that some sort of terrestrial matter, taken from among the *soil*, is what gives increase and bulk to plants; for were it only water, the rain falling in all places alike, all would alike be at all times suited to produce all plants; and if the earth, according to lord Bacon's system, served to no other purpose to plants and trees, but to keep their roots firm, and to defend them from over-heat, and over-cold, one earth would do as well for these uses as another, and the same earth would do as well for the same plant as a different earth. Phil. Trans. N° 255. p. 219.

Mr. Tull, who thinks that earth is the true food of plants, maintains, that the only difference of *soil*, except the richness, is the different degree of heat and moisture it has; the earth is equally proper, of whatever kind it be, and if these additions be properly adjusted, any *soil* will nourish any plant. See *Food* of PLANTS, and VEGETATION.

SOIL, *brickish*, a term used by our farmers to express a kind of hazely earth, or land, of a reddish cast. It is frequent in Essex, and some other counties, and approaches to the nature of a loam. It has no stones in it, and does not bind after wet as clay does, but lets all the water in that comes; whereas all clays hold the water till the sun exhales it, and after rain with a frost, moulder into dust.

These loams are an excellent mixture for other earths, being a happy medium between two extremes, uniting what is too loose, cooling what is too hot, and entertaining a moderate share of moisture.

The best produce of the brick-earth is rye; if well dunged it will bear white oats, turneps, barley, wheat, buckwheat, and pease. The natural produce in weeds, is broom, fern, quick-grass, and the like. If it be well dunged, it will produce large crops of clover, but it soon wears out of it, and should therefore be sowed mixed with rye-grass. The best manure for these lands is chalk, mixed with coal-ashes: marl makes a great improvement in them, and there is a stiff yellow kind of clay, that moulders with the frost, that answers the same purpose. Whatever amendment is bestowed upon this sort of land by dung, and other enriching things that do not absolutely alter the nature of the earth, lasts but a little while. These lands bind very much after rain, and turn whiter; no frost will dissolve the clod, and if they are newly ploughed up, and never so much rain comes on them, people may walk or ride over them almost as firm as over gravel. If they are not frequently ploughed, they are very subject to worms, which destroy the winter corn. They yield but poor crops in wet years; the weeds are generally very rank, and the wheat runs all into straw. Ploughing is a great improvement of them, they always grow well the year after it. These lands are to be ordered for corn in the same manner with the clay land, only as they are rank, and carry the crop much into straw, it is best to dung them on the etch crop, and to sow them with barley, and never to dung the fallows. Where the farmer has not a mind to plough them, but keep them for grass, they should be mowed one year, and then kept short fed with sheep, which will in time sweeten them very much. The red sandy lands in Northamptonshire are of this kind; they will not hold manure, so they plough but once for the year's crop, which is just before the sowing-time, and manure just before they plough it; for if they plough it oftener, and manure it sooner, they find a great quantity of the best mould washed away below the surface, and out of the reach of the roots of the corn.

In Oxfordshire they have a sort of red land which they begin fallowing as soon in the year as they can, before the sun is too high: if it is moderately moist, when fallowed, they esteem it the better, but it should not be too wet. They seldom give it a second stirring, and they reckon that if it is too fine and light, it runs to weeds. Mortimer.

SOIL, *Chalk*. Barley and wheat will succeed very well on the better sort of *chalky land*; and oats generally do very well on any kind of it.

The natural produce of this sort of land in weeds is that sort of small vetch called the tine tare, with poppies, may-weed, &c. Saintfoin and hop-clover will generally succeed tolerably well on these lands; and where they are of the better sort, the great clover will do. The best manure for these lands is dung, old rags, and the sheep-dung left after folding them on it. If rain happens to fall on these lands just after the sowing, the earth will bind so hard after it, that the shoots from the seed cannot pierce through it, and the greater part of the crop will be by this means lost. In Hertfordshire they manure the *chalk-lands* with pigeons-dung, ashes, and soot, and with some horse-dung: and in Oxfordshire they use no other manure than half-rotten dung, with which they mix sand; and this, they say, prevents the earth from binding. They generally sow these lands there with wheat, meslin, and barley, only after wheat they sow pease and vetches; in the sowing of these they are particularly forced to wait for fair weather, because of the land's binding. Mortimer.

SOIL, *Clay*. The *clay-lands* in different parts of England are of different colours, as blue, black, yellow, white, and red. Of these the black and the yellow are every where found the best for corn; the red is very good, but the white and blue are the worst. Some of the blue in particular is of such a nature and disposition, that nothing can subdue it; and is so greedy and voracious, that nothing willl satiate it without the utmost industry. Some *clay-lands* are more pinguid, and others more slippery, but all of them are very tenacious of water upon the surface, where it stagnates, and chills the plant, instead of penetrating and nourishing it; and in dry seasons they become so hard, that the dews cannot penetrate them. Wheat, barley, grey-pease, and horse-beans, are the principal produce of this sort of lands; and that the farmer may know which of his untried *lands* are of this kind, he must observe their natural productions, and if he finds goose-grass, or chivers, with wild tanzy, great daisies, thistles, May-weed, and some red poppies, he may be assured the *land* that produces them is of this kind.

Some of these *clays* will bear exceeding good crops of clover, or rey-grass, and if well manured and fed, they will answer the expence by the richness of the crop. The best manures for them are dung, particularly horse-dung, ashes, lime, soot, pigeons-dung, malt-dust, and the dung of sheep, by folding them upon the *land* in different places. Mortimer.

Clays hold the manure that is bestowed on them better than any other *lands* whatever, and yield the best grain of any, especially where there is a mixture of lime-stone with them. It is the common practice of the farmers of England to sow these *lands* at first breaking up with black oats; they then fallow them, and after this sow them with wheat or barley, and the etch-crop with either oats, pease, or beans.

SOIL, *Gravelly*. The farmers observe, that *gravelly* and sandy lands easily admit of heat and moisture, but that they have less advantage from the last than any other lands, because they let it pass too soon, if they have a loose under-stratum; or retain it too long, if they have a firm one, such as clay, or a cold solid stone. From these accidents it either parches or chills too much; but when *gravelly* ground has a thin coat of good mould at top, and a bottom of loose stone, it will produce excellent crops of *grass*, for it will receive heat and moisture enough; and if at any time it parches up the roots, the least rain refreshes it again, and the growth is quicker than before. Mortimer.

SOIL, *Maumy*, in *Agriculture*, an earth consisting of a white marly clay, chalk, and sand, which causes it to work very short, as the farmers call it, when any thing dry. This sort of land is usually sowed with wheat, meslin, or barley, and requires the same tillage that the clay-land does, and must be kept dry and warm.

Its most proper manure is the rottenest dung. As they frequently

frequently sow beans next after wheat in clayey grounds, so in these they choose to sow pease, choosing a fair and settled season for their seed-time; for if there happen a smart shower soon after their sowing, the earth will bind so firmly together after it, that most of the seed will be lost. Plot's Oxfordshire, p. 246.

Soil, *Marshy*. See Marshy *Lands*, Fen, Bog, &c.

Soil, *sandy*, a term used by our farmers to express such grounds as consist wholly of a pure sheer *sand*.

This is of different colours, as white, blackish, reddish, or yellowish, and is very different in its nature, and in the size of its particles, some being harsher and some milder, and some very light, seeming only to be mere dust. The grey, black, and ash-coloured *sand*-lands are the worst of all, and generally are found on heaths and commons. Gravelly lands approach much to the nature of these, and those which consist of largest stones, and are mixed with the harshest *sands*, are of all the most barren.

The properest plants for arable land, of this kind, are white oats, rye, black wheat, and turneps. The natural produce in weeds, is quick grass, sorrel, broom, furze, fern, and heath.

The best manure for them is either marl, or such clay as will break with the frosts. Cow-dung is also a good manure for these lands, and many use with success chalk, mud, and the half-rotten straw from dunghills.

When the farmer has a mind to raise corn on these lands, he must order them as the clays (see *Clay*-Soil); but where they are over-run with broom, furzes, and such sort of weeds, marl is to be laid on in great quantities. This is the practice in Staffordshire, and by it they rid themselves of these troublesome weeds, and procure good crops of corn, though at some expence.

The first sowing of this land is with black wheat, and for this they make three fallowings in winter, and stir them in the May following; at this time they sow them, allowing one bushel of seed to an acre, which generally yields them sixty again. Then once ploughing these lands, after this crop is off, they are fit to sow rye on.

In Oxfordshire they seldom give these lands more than two fallowings for wheat, except they are very much over-run with weeds; and they esteem the white and lammas wheat the most agreeable for this sort of land, and then after a fallow rathripe barley. They afterwards generally fallow them every other year, and reckon them unfit for beans and pease, though they sometimes sow them with winter vetches. If they sow pease on them, they esteem the rathripe kinds the best.

In Herefordshire they are much subject to moss growing upon their *sandy-lands*, and they make a great improvement by burning it on the ground, and mixing the ashes with lime, which they then plough in.

They generally sow them with rye after this manure, and that yields a very great increase upon them, and brings on a very good kind of grass, if they are laid down after a crop or two. Mortimer.

M. de la Quintinie attributes all the difference we find in soils, to the different quality of the *sands* mixed in them. *Soft sands*, according to him, make a soft gentle earth: *unctuous sands*, a stiff earth: *coarse sands*, a rough untractable earth, &c.

Soil, in some parts of England, is used as the name for the *phoca*, or Sea-*calf*.

This creature, in Cornwall, they frequently find sleeping on the shore, and kill him; sometimes by shooting, sometimes by striking over the head with long poles. He defends himself, when on shore, by throwing stones backward with great violence.

SOJOURNERS, among the *Athenians*, were permitted to dwell in the city, and follow their own business, without disturbance, provided they observed all the laws and customs of the country; but were allowed no share in the government. However, they were not allowed to act any thing, or manage any business in their own names, but were obliged to choose out of the citizens one, to whose care and protection they would commit themselves, whose duty it was to defend them from all violence and oppression. He was called prostates.

SOIT *fait il comme desiré*, be it done as it is desired; a form used when the king gives the royal assent to a private bill preferred in parliament.

SOK, Soke, Soc, in *Ancient Customs*. See Soc.

The word is sometimes also used for the privilege of tenants excused from customary impositions.

Also for a quit-rent, or payment made to the lord by his tenant, for acting in quality of *soc-man*, or freeholder. See Socage.

SOKEMANS. See Socmen.

SOKE-*reeve*, in our *Old Writers*, the lord's rent-gatherer in the *soke*, or *sokn*.

SOKHIO, in the *Materia Medica*, a name used by some authors for a peculiar species, if it may be so called, of the lignum aloes.

It is of a greyish colour, and seems to have been the blea, or outer part of the wood next the bark.

SOL, in *Music*, the fifth note of the gamut: ut, re, mi, fa, *sol*, la.

Sol, or Sou, *shilling*, a French coin, of billon, i. e. of copper with a little silver mixed, equal to twelve deniers, or French pence; and the twentieth part of the livre, or pound. See Shilling.

The word is formed from the Latin, *solidus*, a *shilling*. Bodin is mistaken when he derives it *à sole*, by reason of the sun struck on it.

The French *sol* is now worth upwards of an English halfpenny, or the twenty-third part of an English shilling.

The *sol* was first struck on the foot of twelve deniers Tournois, whence it was also called *donzain*, a name it still retains, though its ancient value be changed; the *sol* having been since augmented by three deniers, and struck with a punchion of a fleur-de-lys, to make it current for fifteen deniers. Soon after the old *sols* were coined over again, and both old and new were indifferently made current for fifteen deniers. In 1709, the value of the same *sols* was raised to eighteen deniers. Towards the latter end of the reign of Louis XIV. the *sols* of eighteen deniers were again lowered to fifteen, where they now stand. The *sol* of fifteen deniers is called *sol Parisis*.

The Dutch have also two kinds of *sols*: the one of silver, called *sols de gros*, and likewise *schelling*; the other of copper, called also the *stuyver*. See Coin.

In old authors we read of gold *sols*, which were different at different times. In the time of the Salic law, the gold *sol* was forty deniers; and thus it continued till the time of king Pepin, when it was reduced to twelve. Some have also imagined, that the French had anciently silver *sols*.

Sol, in *Astrology*, &c. signifies the *sun*. *Sol* in Aries, &c. See Sun.

Sol, *sun*, in *Chemistry*, is gold; thus called from an opinion, that this metal is, in a particular manner, under the influence of that luminary.

What should have been the principal inducement of torturing this metal, with so much violence, to obtain from it some medicinal virtues, Dr. Quincy observes, is not easy to be guessed.

Most, indeed, acknowledge, that gold in substance, or reduced into the smallest particles by the hammer, as in the leaf-gold, is not digestible in the stomach, so as to be transmitted into the blood, and be of any efficacy there. But there are nevertheless many, who are confident of its doing extraordinary matters, if reduced into a powder, by amalgamation with mercury, and by evaporating the mercury afterwards.

Zacutus Lusitanus is one of the smartest pleaders on this side the controversy, against Musa, Picus Mirandola, and Platerus; who, besides many instances of its efficacy, urges the authority of Avicen, Serapion, Geber, and many of the Arabian physicians, with those of other countries, and of later date. Quercetan, Schroder, Zwelfer, and Etmuller, with many other more modern practical physicians, have fallen into the same opinion. But, which side soever is right, the present practice rejects all pretensions to medicines from it. See Gold, in *Medicine* and *Chemistry*.

Sol, in the *Hermetical Philosophy*, signifies *sulphur*.

Sol, in *Heraldry*, denotes Or, the golden colour in the arms of sovereign princes.

SOLÆUS or Soleus, in *Anatomy*, a large fleshy fat muscle, nearly of an oval figure, and thicker in the middle than at the edges. It has its name from its supposed likeness to a sole. It is situated on the backside of the leg, lower down than the gastrocnemii, by which it is covered, and with which it forms the calf of the leg. It is fixed above, partly to the tibia and partly to the fibula: it is fixed to above one third of the upper part of the backside of the fibula, and a little to the articular ligament of the head of this bone. It is likewise fixed to the backside of the tibia from the oblique line, or impression, which terminates the insertion of the poplitæus, down to the middle of the internal angle of the bone; afterwards leaving these two bones, it ends in a broad strong tendon, which, together with that of the gastrocnemii, forms what is called the *tendo Achillis*. This strong tendon contracts a little in its passage to the os calcis, and then expanding a little, it is inserted obliquely in the backside of that bone all the way to the tuberosity. The fleshy body of the *solæus* seems to consist of, at least, two planes of fleshy fibres, that on the backside of the muscle being the most simple, and the other, or that next the bone, penniform. This muscle, with

with the two gastrocnemii, form what anatomists call a *true triceps*. Winslow.

SOLAND, or SOLAN-*goose*, in *Ornithology*, See GOOSE.

SOLANDERS, in *Farriery*. See MELANDERS.

SOLANOIDES, in *Botany*. See RIVINA.

SOLANDRA, in *Botany*, a genus of the *monoecia pentandria* class. Its characters are; that it has male and female flowers; the involucrum of the former is composed of four leaves and five flowers, and it has five petals; the involucrum of the latter is the same; it has six petals, two styles, and the fruit is a double-berried capsule. There is only one species.

SOLANUM, in *Botany*. See NIGHTSHADE.

SOLANUM *pomiferum*, *apple-bearing nightshade*, a name given by writers to the *night-shades*, and plants of several genera allied to those, and bearing large fruits. See MELONGENA and LYCOPERSICON.

SOLANUM *somniferum*, *sleepy night-shade*, a name given by Caspar Bauhine, and some others, to a species of *winter*-CHERRY, the whorled alkekengi with small fruit.

SOLAR, something belonging to the SUN.

Thus, we say SOLAR *fire* in contradistinction to *culinary fire*.

SOLAR *civil month*. See MONTH.

SOLAR *cycle*. See CYCLE.

SOLAR *comet*. See DISCUS.

SOLAR *eclipse*, is a privation of the light of the sun, by the interposition of the opake body of the moon. See ECLIPSE.

SOLAR *month*, *rising*, *spots*. See the substantives.

SOLAR *system*, the order and disposition of the several heavenly bodies, which revolve round the sun as the centre of their motion; viz. the planets, primary and secondary, and the comets. For a scheme of the *solar system*, see SYSTEM.

SOLAR *year*. See YEAR.

SOLATRUM. See NIGHTSHADE.

SOLDAN. See SULTAN.

SOLDANEL, *soldanella*, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the flower has an erect permanent empalement, cut into five parts, and has one bell-shaped petal; the brim is cut into acute segments, and it has five awl-shaped stamina, terminated by single summits; it has a roundish germen, supporting a slender style the length of the petal, which is permanent, crowned by an obtuse stigma; the germen turns to an oblong taper capsule of one cell obliquely streaked, opening at top with ten indentures, filled with small acute pointed seeds. We have but one species of this genus, which grows naturally on the Alps.

SOLDANELLA is also a name very improperly given by many authors to some of the proper and genuine species of bind-weeds; as the purging sea-bind-weed with roundish leaves and purplish flowers, the great Italian sea-bind-weeds with sinuated leaves, and the common round-leaved sea kind. See CONVOLVULUS.

SOLDER, SODDER, or SODER, formed from the French *soudure*, of the Latin *solidare*, *to strengthen*; is a metallic or mineral composition, used in *soldering* or joining together other metals.

For this purpose it is required that *solders* melt sooner than the metal to be soldered, and that they approach as near as may be to the metal soldered in hardness and colour.

The different *solders* are made of gold, silver, copper, tin, bismuth, and lead; usually observing, that in the composition there be some of the metal to be *soldered*, mixed with some higher and finer metals.

Goldsmiths usually make four kinds of *solder*; viz. *solder* of eight, where, to seven parts of silver, there is one of brass or copper: *solder* of six, where only a sixth part is copper; *solder* of four, and *solder* of three. It is the mixture of copper in the *solder* that makes raised plate always come cheaper than flat.

As mixtures of gold with a little copper are found to melt with less heat than pure gold itself, these mixtures serve as *solders* for gold: two pieces of fine gold are soldered by gold that has a small admixture of copper; and gold alloyed with copper is soldered by such as is alloyed with more copper: the workmen add a little silver as well as copper, and vary the proportions of the two to one another, so as to make the colour of the *solder* correspond, as nearly as may be, to that of the piece. A mixture of gold and copper is also a *solder* for fine copper as well as for fine gold.

Gold being particularly disposed to unite with iron, proves an excellent *solder* for the finer kinds of iron and steel instruments. See IRON.

The *solder* used by plumbers is made of two pounds of lead to one of block-tin. Its goodness is tried by melting it, and pouring the bigness of a crown-piece on a table; for, if good, there will arise little, bright, shining stars therein.

The *solder* for copper is made like that of the plumbers; only with copper and tin; and for very nice works, instead of tin, they sometimes use a quantity of silver.

Solder for tin is made of two thirds of tin and one of lead or of equal parts of each; but where the work is any thing delicate, as in organ-pipes, where the juncture is scarce discernible, it is made of one part of bismuth, and three parts of pewter.

The pewterers use a kind of *solder* made with two parts of tin and one of bismuth; this composition melts with the least heat of any of the *solders*.

Silver solder is that which is made of two parts of silver and one of brass, and used in soldering those metals.

Spelter solder is made of one part of brass and two of spelter, and is used by the braziers and copper-smiths, for soldering brass, copper, and iron. This *solder* is improved by adding to each ounce of it one penny-weight of silver. But as this *solder* does not melt without a considerable degree of heat, it cannot be used when it is inconvenient to heat the work red-hot; and therefore, in this case, copper and brass are soldered with silver.

Though spelter *solder* be much cheaper than *silver-solder*, yet workmen in many cases prefer the latter. And Mr. Boyle informs us, that he has found it to run with so moderate a heat, as not much to endanger the melting of the delicate parts of the work to be *soldered*; and if well made, this *silver-solder* will lie even upon the ordinary kind itself; and so fill up those little cavities that may chance to be left in the first operation, which is not easily done without a *solder* more easily fusible than the first made use of. Works Abridged, vol. i. p. 135.

As to iron, it is sufficient that it be heated red-hot, and the two extremities, in this state, be hammered together. By this means they become incorporated one with the other: when it is soldered it is usually done with brass.

The duke of Florence's nail, anciently so much admired as being half iron and half gold, whereas those two metals were deemed irreconcileable, was joined by a kind of *solder* made by Turneisser, an ingenious chemist of Venice; the secret whereof was never discovered till published by Tachenius. This *solder* is nothing but a little copper, or cyprus vitriol, put between the gold and the iron. For, naturally, the great acidity of the gold reduces the iron into a scoria or rust, when the two are applied over one another; but this inconvenience is removed, by the interposition of a little copper, be it in the smallest quantity imaginable. See SOLDERING.

SOLDERING, or SODDERING, among *Mechanics*, the joining and fastening together of two pieces of the same metal, or of two different metals, by the fusion and application of some metallic composition on the extremities of the metals to be joined.

In *soldering*, some artifice is necessary to make the *solder* and metals adhere. All the metals, except silver and gold, upon melting, or before, are covered with dross; and all the solders have some of these metals in them: this dross hinders the solder and metal from uniting, and it is necessary to remove it. This is not performed in every kind of *soldering* by the same materials. The plumbers effect this by greasing the lead, laying on the solder, and melting it with a hot iron, and thus the dross generated in fusion, unites with the grease, and flows away from the melted metal. The glaziers and tin-men use rosin in powder for the same purpose; for all inflammable substances that will melt, are equally conducive to this use. When copper and brass are soldered with pewter, the work is first washed with a solution of sal ammoniac in water, then heated just hot enough to melt the pewter, and the pewter applied to the joint to be soldered. In *soldering* that requires a greater heat, borax is used.

For a method of *soldering*, particularly useful to optical and mathematical instrument-makers, see GRINDING of *Metallic Specula*.

SOLDIDO, a name given to the TAMOATA.

SOLDIER, a military man, listed to serve a prince or state, in consideration of a certain daily pay.

The word is formed from the Italian, *soldato*, and that from the Latin, *solida* or *solidata*, of *solidus*, the *solde* or *pay*; though Pasquier chooses to derive it from the old Gaulish *soldoyer*, a *soldier*; and Nicod from *soldurius*.

The *soldier* is he who takes pay; the vassal is he who is obliged to serve at his own expence; the volunteer he who serves at his own expence, and of his own accord.

Du-Cange observes, that the ancient soldiers were not to be short of five feet and a half; and that this measure was called *incoma* or *incomma*.

Judge

Judge Blackſtone obſerves, that in a land of liberty it is extremely dangerous to make a diſtinct order of the profeſſion of arms. In abſolute monarchies this is neceſſary for the ſafety of the prince, and ariſes from the main principle of their conſtitution, which is that of governing by fear; but in free ſtates, the profeſſion of a *ſoldier*, taken ſingly and merely as a profeſſion, is juſtly an object of jealouſy. In theſe, no man ſhould take up arms but with a view to defend his country and its laws: he puts not off the citizen when he enters the camp; but it is becauſe he is a citizen, and would wiſh to continue ſo, that he makes himſelf for a while a *ſoldier*. The laws, therefore, and conſtitution of theſe kingdoms know no ſuch ſtate as that of a perpetual ſtanding *ſoldier*, bred up to no other profeſſion than that of war: and it was not till the reign of Henry VII. that the kings of England had ſo much as a guard about their perſons.

As *ſoldiers*, by the annual act of MUTINY, are put in a worſe condition than any other ſubjects, ſo, by the humanity of our ſtanding laws, they are in ſome caſes put in a much better. By ſtat. 43 Eliz. cap. 3. a weekly allowance is to be raiſed in every county for the relief of *ſoldiers* that are ſick, hurt, and maimed; and beſides, the *royal* HOSPITAL at Chelſea is eſtabliſhed for ſuch as are worn out in their duty. Moreover, officers and *ſoldiers*, that have been in the king's ſervice, are by ſeveral ſtatutes enacted at the cloſe of ſeveral wars, at liberty to uſe any trade or occupation they are fit for in any town in the kingdom (except the two univerſities), notwithſtanding any ſtatute, cuſtom, or charter to the contrary. And *ſoldiers* in actual military ſervice may make nuncupative wills, and diſpoſe of their goods, wages, and other perſonal chattels without thoſe forms, ſolemnities, and expences, which the law requires in other caſes. Blackſt. Com. book i. cap. 13.

The profits attending the profeſſion of a *ſoldier*, among the Romans, were very conſiderable. 1. Booty and plunder, with which they frequently returned home loaded, eſpecially after taking any cities or towns; for theſe were generally given up to be plundered. 2. The ſubdued countries, which were often divided among the *ſoldiers*. 3. Their pay. 4. Cloaths. 5. Proviſions. 6. Farms and houſes in provinces were alſo given them. 7. Many privileges and immunities, as that none could touch his goods in his abſence in the camp. 8. Legacies, which the emperors left to be diſtributed among them. 9. Donatives. 10. Promotions to military honours lay open to every brave man, though of the meaneſt birth.

Not only humanity but intereſt require that great care ſhould be taken of the health of *ſoldiers*. Much inſtruction may be drawn for this purpoſe from Dr. Pringle's excellent treatiſe, called Obſervations on the Diſeaſes of of Army. He there remarks, that the circumſtances of *ſoldiers* in time of war differ from thoſe of other people, in that they are more expoſed to the injuries of the weather, and always crouded together, whether in camp, barracks, or hoſpitals: wherefore the moſt general diviſion of theſe diſtempers, may be into ſuch as ariſe from the intemperature of the weather, and thoſe from infection.

Military diſeaſes depending on the weather, are reducible to two ſorts, viz. to thoſe of ſummer, and to thoſe of winter. However, as expoſitions to cold are unavoidable upon the firſt encampment, as alſo for ſome time before the army uſually goes into winter-quarters, the winter diſorders beginning about the end of autumn, will not entirely ceaſe before the ſummer is well advanced; and, on the other hand, as the heats of ſummer and damps of autumn diſpoſe the body to ſickneſs, the camp-diſtempers are never quite over with the campaign, but continue ſome time after the troops retire into winter-quarters.

The ſummer diſeaſes are all of a bilious or putrid nature, as thoſe of winter are inflammatory. See BILIOUS *Fever*, *Inflammatory* FEVER, HOSPITAL *Fever*, HEAT, and INFLAMMATORY *Diſeaſes*.

SOLDIERS, *diet of*. See DIET.

SOLDIRS, *exerciſe of*. See EXERCISE.

SOLDIERS, *liſting or inliſting of*. See LISTING.

SOLDIERS, *puniſhment of*. See *Military* EXECUTION.

For other particulars relating to *ſoldiers*, ſee DESERTER, *Royal* HOSPITAL, *Camp* HOSPITAL, *Martial* COURT, MARTIAL *Law*, MUTINY, &c.

SOLDIERS, *band of*. See BAND.

SOLDIER, in *Ichthyology*. See CANCELLUS.

SOLDIER'S *cullions*, in *Botany*. See ORCHIS.

SOLDIER, *freſh-water*, a name given in ſeveral parts of England to the STRATIOTES, a diſtinct genus of plants, called by Boerhaave *aloides*.

SOLDURII, in *Antiquity*, a kind of military clients, or retainers to the great men in Gaul, particularly in Aquitania, mentioned by Cæſar.

The *ſoldurii* were people who ſhared all the good and ill fortune of their patrons; to whom, if any diſaſter happened, they either underwent the very ſame or killed themſelves; and Cæſar aſſures us, that no one had ever been known to refuſe the alternative. Lib. iii. de Bel. Gall.

Vigenere takes them to have been more than common ſoldiers; and even gentlemen in penſion, or appointment. Athenæus calls them συναποθνησκοντες, q. d. dying together, or with their maſters.

SOLE, in the *Manege*, is a nail or ſort of horn under a horſe's foot, which is much more tender than the other horn that incompaſſes the foot, and, by reaſon of its hardneſs, is properly called the *horn* or *hoof*. A horſe's ſhoe ought to be ſo ſet upon the hoof, as not to bear upon the *ſole*, for otherwiſe the *ſole* would be hurt, and not only make the horſe lame, but corrupt the fleſh that ſeparates it from the coffin-bone.

To take out the *ſole*, is to do it without touching the horn of the hoof; for if you take off the horn, you make a *hoof-caſt*. We take out the *ſole* for ſeveral infirmities, as may be ſeen in Mr. Solleyſel's Complete Horſeman. A horſe that is *unſoled* may recover in leſs than a month.

High-ſoled, called in French *pied comblé*, is ſaid of a horſe whoſe *ſole* is round underneath, ſo that it is higher than the hoof, and oftentimes makes the horſe halt, and hinders the ſhoeing of him unleſs the ſhoe be vaulted.

SOLE, in a *ſhip*, a name ſometimes given to the lower ſide of a gun-port, which, however, is more properly called the port-ſell.

SOLE *corporation*. See CORPORATION.

SOLEA, the *ſole-fiſh*, a well known fiſh, and much eſteemed at table. See SOAL.

SOLEÆ, among the Romans, were a kind of ſandals or ſlippers, which covered only the ſole of the feet, and were bound on with thongs of leather; inſtead of which the women, and effeminate perſons of the other ſex, tied them on with purple-coloured ribbands, or ſuch as were variouſly adorned with gold and ſilver.

SOLECISM, SOLOECISMUS, in *Grammar*, a groſs impropriety in ſpeech, contrary to the uſe of language, and the rules of grammar, either in reſpect of declenſion, conjugation, or ſyntax. See PURITY.

The word is Greek, σολοικισμος, derived from the *Soli*, a people of Attica, who, being tranſplanted to Cilicia, loſt the purity of their ancient tongue, and became ridiculous to the Athenians for their improprieties therein.

An actor on the Roman theatre having made a falſe geſture, the audience immediately cried out, he had committed a *ſolecism* with his hand.

Cicero, ad Herenn. lib. iv. cap. 12. diſtinguiſhes in the following manner between BARBARISM and *ſolecism*. *Latinitas eſt quæ ſermonem purum conſervat, ab omni vitio remotum. Vitia in ſermone, quominus is latinus ſit, duo poſſunt eſſe*; ſolecifmus *et barbariſmus*. Solecifmus *eſt, cum verbis plurimus conſequens verbum ſuperiori non accommodatur. Barbariſmus eſt, eum verbum aliquod vitioſe effertur*.

SOLEIL. *Ombre de* SOLEIL. See OMBRE.

SOLEIL *de mer*, in *Ichthyology*, a name given by the French writers, and by Rondeletius, to a peculiar ſpecies of STAR-*fiſh*, of a ſmall ſize, the legs of which reſemble very much the tails of lizards, and are very brittle.

Geſner deſcribes alſo a ſpecies under the name of the ſea-moon, *luna marina*, which he ſays is remarkably fragile, and which, from what elſe he has ſaid of it in its deſcription, appears alſo to be the ſame creature. The great character, however, of the creature's legs reſembling, both in colour and figure, the end of the common brown land-newt's tail, is ſo expreſſive, that it cannot but be always known by it.

Theſe rays are ſo extremely friable, that it is ſcarce poſſible to touch them without their breaking, and they are not beſet with points in the manner of the common rays of the creatures of this kind.

The other rays of ſtar-fiſhes being furniſhed with many hundred legs, and theſe wanting them entirely, it follows, that in this ſpecies the rays themſelves muſt ſupply the place of legs, and aſſiſt the creature in walking; and thence its manner of walking muſt neceſſarily be different from that of any other kind. Theſe rays are five in number, and are inferted very near the mouth of the creature, which is always placed in the centre of the ſtar: the part where this aperture is ſituated, and which may be called the body of the animal, is of a roundiſh figure; the diameter of it is about a third part of the length of the rays; its under ſurface is flat, and its upper convex; and it is covered, both above and below, with ſcales, but they are arranged in different manners.

The common habitation of the ſea-ſtars, on the rough ſhores of the ſea, is no place for theſe tender creatures, every daſh of a wave againſt a ſtone, if they were in the way, would break off their limbs; they have the caution

tion, therefore, to fix their residence only in calm places, and where the shore is covered entirely with a deep smooth sand. When the water has forsaken them, they are often seen walking slowly on the shore; and in this case they use their rays as so many legs. As they divide the body of the fish into equal parts, there is no ray before or behind any where, so that the creature goes with equal ease to any side that it likes. The best motion they are able to make is, however, very slow, and the ground on which they march ought to be very even; for if they attempt to hasten their pace, or if they find any thing uneven in their passage, one or more of their legs usually breaks; and this is the reason why this species is seldom found with its rays perfect. They never bury themselves deep in the sand, but just get under it, so as to be covered; and this they do by advancing two of the rays together, and burrowing carefully with them, and then following them with the rest of the rays and the body. Mem. Acad. Par. 1712.

SOLEMN, Solennis, something performed with much pomp, ceremony, and expence. Thus we say, *solemn feasts*, *solemn funerals*, *solemn games*, &c.

Solemn, in *Law*, signifies something authentic, or that is clothed in all its formalities.

Solemn *acceptance*. See Acceptance.

Solemn *testament*, in the *Civil Law*, is to be attested by seven persons, and sealed with their seals.

Solemn *marriage*, is that performed in one's own parish-church, after publication of the bans, and in presence of witnesses.

SOLEN, the *razor shell-fish*, in *Natural History*, the name of a genus of shell-fish; the characters of which are these: they have bivalve shells with an oblong body, and are open at both ends; they are usually straight, but in some species crooked. It had its name, *solen*, from the Greek, in which language that word expresses a pipe or tube; this fish, when the shells are closed, very aptly resembling a tube. The Latin writers have called it *unguis*, from its resemblance in colour and consistence to the human nail. The common people, in many parts of France, call it *coutelier*, and in Italy it is commonly called *cannolichio*. See Shells.

Rondeletius observes that there are, among the *solens* of the same species, males and females, which are easily distinguishable from one another; and that the females are larger, have no variegations on the shells, and are much better tasted than the males. Rumphius has described a very remarkable species of *solen*, which always remains buried in sand, and which is not properly a bivalve, consisting only of one piece, though of the shape of the *solen*; he calls this *solen arenarius*. Lister has called the crooked species *solenes curvi*, and some call them the *scymitar solens*.

We have several species of the straight *solens*, though but few of the crooked ones. See *Tab. of Shells*, N° 23.

Of the crooked *solens*, two are the only known species. 1. The scymitar *solen*. 2. The *solen arenarius*, always found in sand.

The shell of this fish is composed of two pieces, which are the two halves of a hollowed cylinder, with an elliptic base, divided in a longitudinal direction. These two pieces are fastened together near one end by a ligament, like that which joins the shells of the muscle or the oyster. From the place where this ligament is fixed, quite to the other end of the shell, there is a membrane fastened to each edge of the shell, and this increases in breadth in proportion to its distance from the place of its origin; so that viewed externally, it forms a sort of isosceles triangle, the base of which has about two lines in breadth. The colour and consistence of this membrane give it very much the appearance of a piece of parchment; it has a considerable spring in it, and serves on occasion to open, or draw together the two sides of the shell.

There is another membrane of the same kind with this, fastened to the other side of the fish, there adhering to each shell, but this is of an equal breadth all the way down: this serves also to shut or open the edges of the shell. When the *solen* shuts its shell, it folds itself into several longitudinal wrinkles, which open again when the sides of the shells separate.

Hence it is to be observed, that though this shell has a power of opening and shutting, yet the body of the fish is always secured, and is no more exposed to sight at one time than at another, and there is no part where the fish can be seen but at the ends.

This fish lives in the sand on the sea-shore, where it buries itself often a foot and a half, or two feet deep; the length of the shell is, at this time, nearly in a vertical position, and the fish has a power of raising itself at pleasure up to the surface, and sinking down again, while the shell remains all the time buried in its place. Almost all other animals have a horizontal motion, and the shell-fish of the sea crawl along upon its bottom under water, as the common land animals do on dry ground; but this creature's progressive motion is only vertical, and that confined to a very small compass; all that it is able to do for itself being only to raise itself higher or lower, and sink deeper or rise higher in the sand, within the narrow compass of about two feet at the utmost, as the going beyond that must occasion its destruction. Where these shell-fish are buried in the sand, there is a hole reaching from every one of them to the surface, by means of which they have a free communication with the water: these holes generally are placed in great numbers near one another, and are easily distinguished at a time when the tide has left the shore uncovered. They are not round, but oblong, and somewhat resemble the key-hole of a lock, but that they have a roundness at each end, whereas that usually is rounded only at one.

When it has occasion to ascend out of its hole, nothing more is required than the putting out the end of the leg, swelling it, and thus thrusting itself up to the length of that leg; then retracting it into the shell again, and thrusting out, and inflating its end for a second movement of the same kind. These motions may be all perceived in the creature when out of the sand, particularly that by which it buries itself; for if held up in the fingers, it thrusts out the leg, and performs all the motions as if in the sand, making a fruitless attempt to save itself in its old way. Mem. Acad. Par. 1712.

Klein, and some others, have given the name *solen* to the several species of *tubuli marini*.

SOLE-TENANT, in *Law*, he or she who holds lands only in his or her own right, without any other person joined.

E. gr. If a man and his wife held lands for their lives, the remainder to their son; here, the man dying, the lord shall not have heriot, because he dies not *sole-tenant*.

SOLEUS, in *Anatomy*. Some have given this name to the gastrocnemius *internus*; but the *soleus* is a distinct muscle. See Soleus.

SOL-FA-ING, in *Music*, the naming and pronouncing of the several notes of a song, by the syllables *sol*, *fa*, *la*, &c. in learning to sing it.

For a view of the origin of these syllables, see *Harmonical* Hand.

Though this system of solmisation does not appear to have been wholly developed in the writings of Guido, to whom the invention of the gammut and *harmonical* hand has been commonly ascribed, yet Dr. Burney observes, that writers very near the period in which he lived, give him the honour of its discovery; and particularly Sigebert, a monk of Gemblours, in the diocese of Namur, in Brabant, in his Chronicle under the year 1028. John Cotton also, who lived about a century after Guido, says, that solmisation by the six syllables *ut*, *re*, *mi*, *fa*, &c. was practised by the English, French, and Germans; but the Italians, he adds, made use of other syllables; and by a passage from the Chronicle of Tours, under the year 1033, cited by Carpentier, in his Supplement to the Latin Glossary of Du-Cange, art. *Gamma*, Guido is put in full possession of the scale and solmisation. About the end of the last century the additional syllable *si* was universally received in France for the seventh of the key of C. The earliest English writer, mentioned by Dr. Burney, who takes notice of the omission of *ut* and *re* in solmisation, is Mr. Charles Butler, in his Principles of Music, published in 1636, and after his time the *ut* and *re* were rejected by all the English singing-masters: Dr. Holder, Dr. Wallis, and every writer on music in this kingdom, were unanimous in excommunicating these two syllables, till Dr. Pepusch endeavoured, and not unsuccessfully, to have them again restored.

An ingenious member of the academy of Arcadia in Rome, published a pamphlet in 1746, recommending a new method of solmisation by twelve syllables, formed into twelve ideal words, viz. *utparè*, *bomifa*, *tusoldè*, *lanosì*, and comprehending the whole scale of semitones from C to *c* exclusive. This method is approved by the celebrated composer Hasse, and by signor Giambatista Mancini, singing-master to the imperial family at Vienna. Signor Serra, in a treatise published at Rome in 1775, proposes to name the notes in singing by the seven first letters of the alphabet, distinguishing the flat, natural, and sharp notes by the addition of the three first vowels to the seven letters, as *ca*, *c* flat, *ce*, *c* natural, and *ci* for *c* sharp, by which means the student is disembarrassed from all the mutations, and every sound in the scale has a specific and invariable name appropriated to it.

it. This method has been approved by ſeveral of the beſt maſters in Rome. Burney's Hiſt. of Muſic, vol. ii. p. 95, &c.

Of the ſeven notes in the ſcale, *ut, re, mi, fa, ſol, la, ſi*; only four are in uſe among us, viz. *fa, ſol, la, mi.* Their office is principally in ſinging; that by applying them to every note in the ſcale, it may not only be pronounced more eaſily, but chiefly that, by them, the tones and ſemitones of the natural ſcale may be better marked out and diſtinguiſhed.

The deſign is obtained by the four ſyllables, *fa, ſol, la, mi*: thus, from *fa* to *ſol* is a tone; as alſo from *ſol* to *la*, and from *la* to *mi*, without diſtinguiſhing the greater or leſs tone; but from *la* to *fa*, alſo from *mi* to *fa* is a ſemitone.

If then theſe be applied in this order, *fa, ſol, la, fa, ſol, la, mi, fa*, &c. they expreſs the natural ſeries from C; and if that be to be repeated to a ſecond or third octave, we ſee by them how to expreſs all the different orders of tones and ſemitones in the diatonic ſcale; and ſtill above *mi* will ſtand *fa, ſol, la*; and below it, the ſame reverſed, *la, ſol, fa*; and one *mi* is always diſtant from another by an octave; which cannot be ſaid of any of the reſt, becauſe after *mi* aſcending, comes always *fa, ſol, la, fa, ſol, la*, which are repeated invertedly, deſcending.

To conceive the uſe of this: it is to be remembered, that the firſt thing in teaching to ſing, is to make one raiſe a ſcale of notes by tones and ſemitones to an octave, and deſcend again by the ſame notes, and then to riſe and fall by greater intervals, at a leap, as a third, fourth, fifth, &c. and to do all this by beginning at notes of different pitch. Then theſe notes are repreſented by lines and ſpaces, to which thoſe ſyllables are applied; and the learner is taught to name each line and ſpace by its reſpective ſyllable, which makes what we call *ſol-faing*; the uſe whereof is, that while they are learning to tune the degrees and intervals of ſound, expreſſed by notes ſet on lines and ſpaces, or learning a ſong to which no words are applied, they may do it the better by means of an articulate ſound; but chiefly, that by knowing the degrees and intervals expreſſed by theſe ſyllables, they may more readily know the true diſtance of notes.

Mr. Malcolm obſerves, that the practice of *ſol-fa-ing*, common as it is, is very uſeleſs and inſignificant, either as to the underſtanding or practiſing of muſic, yet exceedingly perplexing; the various applications of the ſeveral names, according to the various ſignatures of the clef, are enough to perplex any learner; there being no leſs than ſeventy-two different ways of applying the names *ſol, fa*, &c. to the lines and ſpaces of a particular ſyſtem.

SOLFEGGIAMENTO, in the *Italian Muſic*, compoſitions, of which the ſyllables *ut*, or *do, re, mi, fa*, &c. are the ſubject. See Solfeggiare.

SOLFEGGIARE, Solfizare, or Solmizare, in the *Italian Muſic*, is the uſing the ſyllables *do, re, mi, fa*, &c. in learning to ſing, otherwiſe called *ſolfaing*.

From this muſicians have made what is called a *ſolfeggiamento*, which properly intimates no more than the practice above mentioned; but the name is more particularly applied to certain compoſitions, be they fugues or others, of which theſe ſyllables are the ſubject. Several very fine pieces of this kind are extant.

However, the Italians in general more frequently teach ſinging by the vowels than by ſyllables, which they call *vocalizzare*, inſtead of *ſolfeggiare*; and the friends of this method ſay, that too frequent articulation in the firſt forming of the voice impedes its paſſage, occaſioning a want of ſteadineſs in the portamento, and a convulſive motion in the mouth, which can never afterwards be corrected. Nice obſervers pretend to diſcover this imperfection in ſingers of the Neapolitan ſchool, where the ſyllables are uſed. Burney's Hiſt. of Muſic, vol. ii. p. 101.

SOLID, in *Phyſics*, a body whoſe minute parts are connected together, ſo as not to give way, or ſlip from each other, upon the ſmalleſt impreſſion.

The word is uſed in this ſenſe, in contradiſtinction to *fluid*.

Solid *bodies, atmoſphere of.* See Atmosphere.

For the laws of gravitation of Solids immerged in fluids ſpecifically, either lighter or heavier than the *ſolids*, ſee Gravity and Fluid.

To find the ſpecific gravity of solids, and its ratio to that of fluids, ſee *Specific* Gravity.

For the laws of the reſiſtance of solids moving in fluids, ſee Resistance.

Solid, in *Geometry*, is a magnitude endued with three dimenſions, or extended in length, breadth and depth.

Hence, as all bodies have theſe three dimenſions, and nothing but bodies, *ſolid* and body are frequently uſed indiſcriminately.

A *ſolid* is terminated, or contained, under one or more planes or ſurfaces, as a ſurface is under one or more lines.

From the circumſtances of the terminating lines, *ſolids* become divided into *regular* and *irregular*.

Solids, *regular*, are thoſe terminated by regular and equal planes.

Under this claſs come the tetraedron, hexaedron or cube, octaedron, dodecaedron, and icoſaedron. See Tetraedron, Cube, &c.

Solids, *irregular*, are all ſuch as do not come under the definition of regular ones. Such are the ſphere, cylinder, cone, parallelogram, priſm, pyramid, parallelepiped, &c.

For the ratio of geometrical *ſolids*, all priſms, parallelepipeds, cylinders, pyramids, and cones, are in a compound ratio of their baſes and altitudes; ſo that if the baſes be equal, they are in the ſimple ratio of the altitudes; or, if the altitudes be equal, of the baſes: and as the baſes of cylinders and cones are circles, and circles are in the duplicate ratio of their diameters, it follows that all cones and cylinders are in a ratio compounded of the direct ratio of their altitudes, and the duplicate one of their diameters.

The geneſes, properties, ratios, conſtructions, dimenſions, &c. of the ſeveral *ſolids*, regular and irregular, ſpherical, elliptical, conical, &c. ſee under each reſpective article.

Solid, *meaſure of a.* See Measure.

Solid, *cubature*, or *cubing of a.* See Cubature and Solidity.

Solids, to *find the ſurfaces of.* See Area and Superficies.

Solid *of the leaſt reſiſtance.* See Resistance.

Solid *angle*, is that formed by three or more plain angles meeting in a point. See Angle. Or, more ſtrictly, a *ſolid angle*, as B (*Tab.* V. *Geometry*, *fig.* 112), is the inclination of more than two lines, A B, B C, B F, which concur in the ſame point B, and are in the ſame planes.

Hence, for *ſolid angles* to be equal, it is neceſſary they be contained under an equal number of equal planes, diſpoſed in the ſame manner.

And as *ſolid angles* are only diſtinguiſhable by the planes under which they are contained, and as planes thus equal are only diſtinguiſhable by com-preſence, they are ſimilar; and conſequently ſimilar *ſolid* angles are equal, and *vice verſa*.

The ſum of all the plain angles conſtituting a *ſolid angle*, is always leſs than 360°; otherwiſe they would conſtitute the plane of a circle, and not a *ſolid*.

Solid *figures, like.* See Like.

Solid *baſtion.* See Bastion.

Solid *place.* See Locus.

Solid *foot.* See Foot.

Solid *numbers* are thoſe which ariſe from the multiplication of a plain number, by any other whatſoever.

Thus 18 is a *ſolid number* made of 6 (which is plain) multiplied by 3; or of 9 multiplied by 2.

Solid *problem*, in *Mathematics*, is one which cannot be geometrically ſolved, but by the interſection of a circle, and a conic ſection; or by the interſection of two other conic ſections beſides the circle.

Thus, to deſcribe an iſoſceles triangle on a given right line, whoſe angle at the baſe ſhall be triple to that at the vertex, is a *ſolid problem*, reſolved by the interſection of a parabola and a circle.

Solid *root*, among *Botaniſts*, expreſſes the whole *root* to be one uniform lump of matter.

Solid *ſquare*, in *Military Language*, a body of foot where both ranks and files are equal.

Solid *theorem.* See Theorem.

SOLIDAGO, in *Botany.* See Golden *Rod.*

SOLIDITY, in *Phyſics*, a property of matter or body, whereby it excludes every other body from that place which itſelf poſſeſſes.

Solidity, in this ſenſe, is a property common to all bodies, whether ſolid or fluid. It is uſually called *impenetrability*; but *ſolidity* expreſſes it beſt, as carrying ſome what more of poſitive with it than the other, which is a negative idea.

The idea of *ſolidity*, Mr. Locke obſerves, ariſes from the reſiſtance we find one body make to the entrance of another into its own place. *Solidity*, he adds, ſeems the moſt extenſive property of body, as being that whereby we conceive it to fill ſpace; it is diſtinguiſhed from mere *ſpace*, by this latter not being capable of reſiſtance or motion.

It is diſtinguiſhed from *hardneſs*, which is only a firm cohesion

cohesion of the solid parts, so as they may not easily change their situation.

The difficulty of changing situation gives no more *solidity* to the hardest body than to the softest; nor is a diamond properly a jot more solid than water. By this we distinguish the idea of the extension of body, from that of the extension of space: that of body is the continuity or cohesion of solid, separable, moveable parts; that of space the continuity of unsolid, inseparable, immoveable parts.

The Cartesians, however, will, by all means, deduce *solidity*, or, as they call it, *impenetrability*, from the nature of extension; they contend, that the idea of the former is contained in that of the latter; and hence they argue against a vacuum. Thus, say they, one cubic foot of extension cannot be added to another without having two cubic feet of extension; for each has in itself all that is required to constitute that magnitude. And hence they conclude, that every part of space is solid, or impenetrable, inasmuch as of its own nature it excludes all others. But the conclusion is false, and the instance they give follows from this, that the parts of space are immoveable, not from their being impenetrable or solid.

For an account of a late controversy concerning the *solidity* of matter, see MATTER.

SOLIDITY, in *Geometry*, the quantity of space contained in a solid body; called also the *solid content*, and the cube thereof.

The *solidity* of a CUBE, PRISM, CYLINDER, or PARALLELEPIPED, is had by multiplying its basis into its height.

The *solidity* of a PYRAMID or CONE is had by multiplying either the whole base into a third part of the height, or the whole height into a third part of the base.

SOLIDITY *of any irregular body, to find the.* Put the body in a hollow parallelepiped, and pour water or sand upon it, and note the height of the water or sand AB (*Tab.* V. *Geometry, fig.* 113); then taking out the body, observe at what height the water (or sand when levelled) stands, as AC. Subtract AC from AB, the remainder will be BC. Thus is the irregular body reduced to a parallelepiped, whose base is FCGE, and its altitude BC. To find the *solidity* whereof, see PARALLELEPIPED.

Suppose, *e. gr.* AB to be 8, and AC, 5; then will BC be 3: suppose again, DB, 12, DE, 4; then will the *solidity* of the irregular body be found 144.

If the body be such as that it cannot be well laid in such a kind of channel, e. gr. if it be required to measure the *solidity* of a statue, as it stands; a quadrangular prism or parallelepiped is to be framed over it; the rest as before.

SOLIDITY *of a hollow body, to find the.* If the body be not comprised in the number of regular bodies, its *solidity* is found as in the preceding problem. If it be a parallelepiped, prism, cylinder, sphere, pyramid, or cone, the *solidity* first of the whole body, including the cavity, then that of the cavity, which is supposed to have the same figure with the body itself, is to be found, according to the respective methods delivered under the PARALLELEPIPED, PRISM, &c. For the latter being subtracted out of the former, the remainder is the *solidity* of the hollow body required.

For the centrobaryc method of measuring the *solidity* of bodies, see CENTROBARYC *Method*.

To *find* the SOLIDITY of *bodies by the method of fluxions.* Let ABC (*Tab.* III. *Analysis, fig.* 84.) represent any solid conceived to be generated by a plane PQ, passing over it with a parallel motion: let Hb perpendicular to PQ, be taken to express the fluxion of AH (x) or the velocity with which the generating plane is carried: also let the area of the part EmFn be denoted by A; then it follows, from the definition of a FLUXION, that the fluxion of the solid AEF will be expressed by A$\dot{x}$. Whence, by expounding A in terms of x (according to the nature of the figure), and then taking the fluent, the contents of the solid, which we may represent by s, will be given. But, when the proposed solid is that arising from the revolution of any given curve AEB about AHD, as an axis, the fluxion ($\dot{s}$) of the *solidity* may be exhibited in a manner more convenient for practice; for, putting the area (3,141592, &c.) of the circle, whose radius is unity, $=p$, and the ordinate EH $=y$, it will be $1^2 : y^2 :: p : py^2$ the area of the circle EmFn, which being substituted for A, we have $\dot{s} = py^2\dot{x}$.

Ex. 1. To *find the content of a cone* ABC. (*fig.* 85.) Let the given altitude AD be $=a$, and the semidiameter of its base BD $=b$, and the distance AF of the circle EG from the vertex A, $=x$; then we shall have, by similar triangles, $a : b :: x : \mathrm{EF}\ (y) = \frac{bx}{a}$. Whence $\dot{s}\ (=py^2\dot{x}) = \frac{pb^2x^2\dot{x}}{a^2}$; and, consequently, by the inverse method of FLUXIONS, $s = \frac{pb^2x^3}{3a^2}$; which, when $x = a$ ($=$AD) gives $\frac{pb^2a}{3} = p \times \mathrm{BD}^2 \times \frac{1}{3}\mathrm{AD}$ for the content of the whole cone ABC; which appears, from hence, to be just $\frac{1}{3}$ of a cylinder of the same base and altitude. See CONE.

Ex. 2. *To find the content of a spheroid* AFBH (*fig.* 86.) *and also of a sphere.* Let the axis AB, about which the solid is generated, be $=a$, and the other axis FH of the generating ellipse $=b$; it follows, from the property of the ELLIPSE, that $a^2 : b^2 :: x \times \overline{a-x}$ (AD$\times$BD): $y^2\ (\mathrm{DE}^2) = \frac{b^2}{a^2} \times \overline{ax - xx}$: whence we have $\dot{s} = (py^2\dot{x} =) \frac{pb^2}{a^2} \times \overline{ax\dot{x} - x^2\dot{x}}$, and $s = \frac{pb^2}{a^2} \times \overline{\frac{1}{2}axx - \frac{1}{3}x^3}$, $=$ the segment AIE. Which, when AD (x) $=$ AB (a), becomes $\frac{pb^2}{a^2} \times \overline{\frac{1}{2}a^3 - \frac{1}{3}a^3} = \frac{pb^2}{a^2} \times \frac{a^3}{6} = \frac{1}{6}pab^2 =$ the content of the whole spheroid. Where, if b (FH) be taken $=a$ (AB) we shall obtain $\frac{1}{6}pa^3$ for the true content of a sphere whose diameter is a. Hence, a sphere, or a spheroid, is $\frac{2}{3}$ of its circumscribing cylinder: for the area of the circle FH being expressed by $\frac{pb^2}{4}$, the content of the cylinder, whose diameter is FH and altitude AB, will, therefore, be $\frac{pb^2a}{4}$, of which $\frac{1}{6}pab^2$ is, evidently, two third parts. See SPHERE and SPHEROID.

Ex. 3. *To find the content of a parabolic conoid.* From the equation $a^{m-n}x^n = y^m$ of the generating curve, we obtain $y = a^{\frac{m-n}{m}} \times x^{\frac{n}{m}}$, and $\dot{s}\ (=py^2\dot{x}) = pa^{\frac{2m-2n}{m}} \times \dot{x}x^{\frac{2n}{m}}$, and, therefore, $s = pa^{\frac{2m-2n}{m}} \times \frac{x^{\frac{2n}{m}+1}}{\frac{2n}{m}+1} = pa^{\frac{2m-2n}{m}} \times \frac{mx^{\frac{2n}{m}+1}}{2n+m} = pa^{\frac{2m-2n}{m}} \times x^{\frac{2n}{m}} \times \frac{mx}{2n+m} = py^2 \times \frac{mx}{2n+m} =$ the content of the solid; which, therefore, is to py^2x the content of the circumscribing cylinder, as m to $2n+m$. Whence the solid generated by the conical parabola (in which $m=2$ and $n=1$) appears to be just $\frac{1}{2}$ of its circumscribing cylinder. See PARABOLIC *Conoid.*

Ex. 4. *To find the content of an hyperbolical conoid.* From the equation $y^2 = \frac{b^2}{a^2} \times \overline{ax + xx}$ of the generating hyperbola, we have $\dot{s}\ (py^2\dot{x}) = \frac{pb^2}{a^2} \times \overline{ax\dot{x} + x^2\dot{x}}$, and consequently $s = \frac{pb^2}{a^2} \times \overline{\frac{1}{2}ax^2 + \frac{1}{3}x^3} =$ the content of the conoid; which, therefore, is to $\left(\frac{pb^2}{a^2} \times \overline{ax + x^2} \times x\right)$ that of a cylinder of the same base and altitude, as $\frac{1}{2}a + \frac{1}{3}x$ to $a + x$. This ratio, if x be very small, will become as 1 to 2 very nearly: whence it may be inferred, that the content of a very small part of any solid, generated by a curve, whose ray of curvature at the vertex is a finite quantity, is half that of a cylinder of the same base and altitude very nearly; because any such curve, for a small distance, will differ insensibly from an hyperbola, whose radius of curvature, at the vertex, is the same.

Ex. 5. *To find the content of a parabolic spindle, generated by the rotation of a given parabola* ACB (*fig.* 87.) *about its ordinate* AB. Put CM the abscisse of the given parabola $=a$, and the semi-ordinate AM (or BM) $=b$; and, supposing ENF to be any section of the solid parallel to DC, let its distance MN or EP from DC be denoted by w: then, by the property of the curve, we shall have $\mathrm{AM}^2\ (b^2) : \mathrm{EP}^2\ (w^2) :: \mathrm{CM}\ (a) : \mathrm{CP} = \frac{aw^2}{b^2}$: therefore EN ($=CM-$CP) $= a - \frac{aw^2}{b^2} = \frac{a \times \overline{b^2 - w^2}}{b^2}$, and consequently $p \times \mathrm{EN}^2 = \frac{pa^2}{b^4} \times \overline{b^4 - 2b^2w^2 + w^4} =$ the area of the section EF: which, multiplied by $\dot{w}$ the fluxion of

of MN, gives $\frac{pa^2}{b^4} \times \overline{b^4\dot{w} - 2b^2w^2\dot{w} + w^4\dot{w}}$ for the fluxion of the solidity, whose fluent $\frac{pa^2}{b^4} \times \overline{b^4w - \frac{2}{3}b^2w3 + \frac{1}{5}w^5}$, when w becomes $= b$, is $\left(\frac{8pa^2b}{15}\right)$ half the content of the solid. See PYRAMIDOID.

For other examples of a similar kind, see Simpson's Fluxions, vol. i sect. 9. Hodgson's Flux. part iii. sect. 4. Rowe's Flux. c. 6.

SOLIDITY, in *Architecture*, is applied both to the consistence of the ground whereon the foundation of a building is laid, and to a mass of masonry of extraordinary thickness, without any cavity within. The *solidity* of the Egyptian pyramids is inconceivable.

SOLIDS, in *Anatomy*, &c. denote all the continuous and continent parts of the body; thus called, in opposition to the *fluids*, or parts contained therein.

Of the *solid* kind, are the bones, cartilages, ligaments, membranes, fibres, muscles, tendons, arteries, veins, nerves, glands, lympheducts, and lacteals.

Notwithstanding the great number and appearance of the *solids* of the body; we find from the microscope, injections, vesicatories, atrophies, &c. that the *solid* parts are exceedingly small and inconsiderable, in comparison of the fluids. Nay, it is almost demonstrable, from a consideration of the rise and generation of the vessels, and the resolution of the greatest vessels into their smallest constituent ones, that the whole mass of *solids* in the body, consists merely of fibres, as their common elements.

In effect, the whole mass of *solids*, as well as fluids, a minute stamen or animalcule only excepted, has arisen from a very subtile fluid colliquament, not unlike the nervous juice; as is shewn by Malpighi, in his treatise de Ovo Incubato.

The white of the egg never nourishes, till, from its natural thickness, it hath been brought, by incubation, through innumerable degrees of fluidity, to become subtile enough to enter the minute vesicles of the stamen or seed. The first, soft, tender *solids*, arising from this subtile humour, pass through infinite intermediate degrees, before they arrive at their utmost *solidity*.

All the *solids*, therefore, in our bodies (unless any one will be so nice as to except the first stamen) only differ from the fluids, out of which they arise, by their rest, cohesion, and figure; and a fluid particle will become fit to form a part of a *solid*, as soon as there is a force sufficient to effect its cohesion with the other *solid* parts.

SOLIDUS. See AUREUS.

SOLILOQUY, SOLILOQUIUM, a reasoning, or discourse, which a man holds with himself.

Papias says, that *soliloquy* is properly a discourse by way of answer to a question that a man has proposed to himself. *Soliloquies* are become very common things on the modern stage; yet can nothing be more inartificial, or more unnatural, than an actor's making long speeches to himself, to convey his intentions, &c. to the audience.

Where such discoveries are necessary to be made, the poet should rather take care to give the dramatic persons such confidants, as may necessarily share their inmost thoughts; by which means, they will be more naturally conveyed to the audience. Yet is even this a shift an accurate poet would not be found to have occasion for.

The use and abuse of *soliloquies* is well delivered by the duke of Buckingham, in the following lines:

> Soliloquies *had need be very few,*
> *Extremely short, and spoke in passion too.*
> *Our lovers talking to themselves, for want*
> *Of others, make the pit their confidant:*
> *Nor is the matter mended yet, if thus*
> *They trust a friend, only to tell it us.*——

SOLIS *via*. See VIA.

SOLITARY, SOLITARIUS, something retired, or in private; remote from the company or commerce of others of the same species. See HERMIT.

SOLITARY *column*, is a column that stands alone in any public place; as the Trajan COLUMN.

SOLITARY *worm*, SOLIUM, *tænia*, or *lumbricus latus*, is a worm sometimes found in the intestines, and which is always the only one of the kind there; as commencing from the pylorus, and extending thence, the whole length of the intestines; so that there is no room for another. See TÆNIA and WORM.

SOLITARIES, a denomination of the nuns of St. Peter of Alcantara, instituted in 1676, by cardinal Barberini, when abbot of Notre Dame de Farsa, in that city.

The design of their institute is to imitate the severe, penitent life of St. Peter of Alcantara, to keep a continual silence; never open their mouths to any body but themselves; employ their time wholly in spiritual exercises; and leave the temporal concerns to a number of maids, who have a particular superior in a separate part of the monastery. They always go bare-footed, without sandals, gird themselves with a thick cord, and wear no linen.

SOLICITATION *of gravity*. See PARACENTRIC.

SOLICITOR, or SOLLICITOR, *solicitator*, a person employed to follow, and take care of, other persons suits depending in courts of law or equity: formerly allowed only to nobility, whose menial servants they were; but now regularly admitted to practise in the court of chancery. See ATTORNEY.

The king has a *solicitor*-general, who holds his office by patent, during the king's pleasure. The attorney-general and he had anciently a right to their writs of summons, to sit in the lords house on special occasions, till the 13 Car. II. since which time, they have almost constantly been chosen members of the house of commons.

The *solicitor*-general has the care and concern of managing the king's affairs, and hath fees for pleading, besides other fees arising by patents, &c. He hath his attendance on the privy council; and the attorney-general and he were anciently reckoned among the officers of the exchequer: they have audience, and come within the bar, in all other courts.

To the queen's houshold there belongs also an officer with this appellation. See PRECEDENCE.

SOLIPUGA, or SOLIFUGA, in *Natural History*, the name given by the Romans to a small venomous insect of the spider-kind, called by the Greeks, *heliocentros*; both words signifying an animal which stings most in the country, and seasons, where the sun is most hot.

Solinus makes this creature peculiar to Sardinia; but this is contrary to all the accounts given us by the ancients. It is common in Africa and some parts of Europe.

Almost all the hot countries produce this venomous little creature. It lies under the sand, to seize other insects as they go by; and if it can meet with any uncovered part of a man, will bite him, and the wound will prove very painful and envenomed; it is said that the bite is absolutely mortal, but probably this is not true; Solinus writes the word *solifuga*, and so do many others, erroneously deriving the name from its flying from the sun's rays, and burying itself in the sand.

SOLITAURILIA, in *Antiquity*. See SUOVETAURILIA.

SOLIVE, *Fr.* among *Carpenters*, a joist, rafter, or piece of wood, either slit or sawed, with which the builders lay their ceilings.

SOLLECITO, in the *Italian Music*, is sometimes used to express that a piece is to be played in a mournful manner, fit to enforce grief upon the hearer; at other times, that it ought to be done carefully and with exactness.

SOLMIZARE, in the *Italian Music*. See SOLFEGGIARE.

SOLO, in the *Italian Music*, is frequently used in pieces consisting of several parts, to mark those that are to perform alone: as *flauto solo*, *violino solo*.

It is also used for *sonatas* composed for one violin, one German flute, or other instrument, and a bass: thus we say *Corelli's solos*, *Geminiani's solos*, &c.

When two, or three parts, play or sing separately from the grand chorus, they are called a *doi soli*, a *tre soli*, &c. *Solo* is sometimes denoted by *S*.

SOLOMON's *seal*, a plant called by authors *polygonatum*. See LILY *of the valley*.

SOLSEQUIUM, a word used by some chemical writers as a name for sulphur.

SOLOS, σολος, in *Antiquity*, an instrument with which the exercise of the quoit was performed, which some will have to be distinguished from the discus, because that was of iron, this of stone: but others, with more reason, report that the difference consisted in this, viz. that the σολος was of a spherical figure, and the discus broad.

SOLSTICE, SOLSTITIUM, in *Astronomy*, the time when the sun is in one of the *solstitial* points; that is, when he is at his greatest distance from the equator, which is twenty-three degrees and an half: thus called, because he then appears to *stand still*, and not to change his place in the degrees of the zodiac, any way: an appearance owing to the obliquity of our sphere, and which those who live under the equator are strangers to.

The *solstices* are two, in each year; the *æstival* or *summer solstice*, and the *hyemal* or *winter solstice*.

The *summer solstice* is when the sun is in the tropic of Cancer; which is on the twenty-first of June; when he makes the longest day.

The *winter solstice* is when he enters the first degree of Capricorn; which is on the twenty-second of December; when he begins to return towards us, and makes the shortest day.

This is to be understood, as in our northern hemisphere; for in the southern, the sun's entrance into Capricorn makes the *summer solstice*, and that into Cancer the *winter solstice*.

SOLSTITIAL *points*, are thoſe points of the ecliptic, whereby the ſun's aſcent above the equator, and his deſcent below it are terminated.

The firſt point, which is in the beginning of the firſt degree of Cancer, is called the *æſtival* or *ſummer point*; and the latter, which is in the beginning of the firſt point of Capricorn, the *winter point*. The *ſolſtitial points* are diametrically oppoſite to each other.

SOLSTITIAL *colure* is that which paſſes through the *ſolſtitial* points. See COLURE.

SOLUBLE, in *Medicine*, looſe, or apt to go to ſtool. In chemiſtry it ſignifies eaſily diſſolvible.

SOLUBLE *tartar*. See TARTAR.

SOLVENT, the ſame with *diſſolvent*. See DISSOLVENT and SOLUTION.

SOLUTIO *continui*, or SOLUTION *of continuity*, a term uſed by phyſicians, &c. to expreſs a diſorder common to the ſolid parts of the body, wherein their natural coheſion is ſeparated: as by a wound, or other cauſe.

If this happen to a ſimple, ſimilar part of the body; it is called ſimply *ſolutio continui*. If to a compound, or organical part, it acquires a particular denomination, from the nature of the part, the difference of the cauſe, or the manner of application; as, a *wound*, *rupture*, *fracture*, *puncture*, *fiſſure*, *contuſion*, *ulcer*, *corroſion*, *dilaceration*, *exfoliation*, *caries*, *&c.*

SOLUTION, SOLUTIO, in *Algebra* and *Geometry*, is the anſwering of a queſtion; or reſolving any problem propoſed. See RESOLUTION and REDUCTION *of equations*.

The *ſolution* of the problem of the quadrature of the circle, and that of the duplicature of the cube, by right lines, are held impoſſible.

SOLUTION *of continuity*, in *Surgery*. See SOLUTIO *continui*.

SOLUTION, in *Phyſics*, the reduction of a ſolid, or firm body, into a fluid ſtate, by means of ſome menſtruum. *Solution* is frequently confounded with what we otherwiſe call *diſſolution*, but there is a difference.

SOLUTION, in *Chemiſtry*, is ſometimes uſed for the analyſis, or reduction, of a natural body into its chemical principles.

In this ſenſe, *ſolution* is the ſame with what we otherwiſe call RESOLUTION.

Solution, as the term is commonly uſed by chemical writers, conſiſts in an union formed by the integrant parts of one body with thoſe of another body of a different nature; and this cannot be effected till the aggregation of one, at leaſt, of the two bodies is broken. And as bodies whoſe aggregation is broken, are neceſſarily in a ſtate of fluidity, or of vapours, an axiom has been formed, *corpora non agunt niſi ſint fluida*, *i. e.* bodies do not act unleſs they be fluid.

The two bodies which unite in *ſolution* are generally diſtinguiſhed by two different names. That body is generally called the *ſolvent*, which, by its fluidity or acrimony, appears to be active; and the body which, from its want of taſte, or from its ſolidity, appears to be altogether paſſive, is ſaid to be *diſſolved*. E. g. when metal or marble is diſſolved in aqua fortis, theſe ſolid bodies are conſidered as being diſſolved, and aqua fortis as the ſolvent. Nevertheleſs, it muſt be remembered, that two bodies which unite together in *ſolution*, act reciprocally upon one another, and their union is the effect of their mutual tendency to each other: and thus the marble and metal act as much upon the nitrous acid as this does upon them.

M. Gellert, however, repreſents as *ſolvents* the bodies which are generally conſidered as *diſſolved*, and hence, he ſays, that ſand diſſolves alkali. If, indeed, we allow the action of the combining bodies to be mutual, it ſignifies little which we call the *ſolvent*, and which the body *diſſolved*; though it ſeems more clear and accurate to call that body the *ſolvent*, whoſe integrant parts are already ſeparated before the *ſolution*, and that the body diſſolved, whoſe integrant parts are only diſunited during the act of *ſolution*. The *ſolution* of bodies may be effected either by the humid, or by the dry way; of the former kind are thoſe *ſolutions*, in which the integrant parts of one or both of the two bodies are diſtributed in an aqueous fluid, e. g. of acids; and thoſe *ſolutions*, in which one or both bodies are rendered fluid by fire, as in vitrification, and in allays of metals with each other, are of the latter kind. A perfect *ſolution* requires, that each of the integrant parts of one body be united to one of the integrant parts of another: hence, if one of them be tranſparent, we ought to have, after the mutual *ſolution*, a tranſparent compound, ſuch as occurs in the *ſolutions* of calcareous ſtones and acids, and thoſe of earths by alkalis: whereas the *ſolution* of ſoap in water is incomplete; and the ſame may be ſaid of glaſſes that are not perfectly tranſparent.

As the *ſolution* of two bodies can only be effected by the mutual attraction of their parts to each other, theſe parts, after the *ſolution*, are found to adhere together: ſo that heavy bodies, e. g. corroſive ſublimate, may be ſuſpended in the thinneſt and lighteſt liquids, e. g. ſpirit of wine, when they are truly diſſolved by each other. Chem. Dict. Eng. ed. Art. *Solution*. See DISSOLUTION.

The great Boerhaave has ſummed up the doctrine of *chemical ſolution*, by its ſeveral agents, in the following ſuccinct manner.

1. *Solution* is performed by water, by diluting, infuſing, boiling, diſtilling, mixing, fermenting, putrefying, and ſeparating.

2. With oil, by diluting, infuſing, boiling, diſtilling, mixing, ſeparating, but not by fermenting, or by putrefying.

3. With fire, by calcining, roaſting, burning, melting, ſubliming, mixing, ſeparating, and by the promoting ſeveral other operations.

4. With the aſſiſtance of air, by fermenting, putrefying, agitating, exciting, and adding other parts capable of diſſolving.

5. With fermented ſpirits, by diluting, infuſing, boiling, diſtilling, mixing, and making oils thinner.

6. With alkaline ſalts, by calcining, torrefying, burning, melting, mixing, and ſeparating, according to the various force of a dry fire employed.

7. By volatile alkaline ſalts, by ſubliming in the dry way, and by diluting, diſtilling, and digeſting in the moiſt way.

8. With fixed alkaline ſalts, aſſiſted, and moved by water and fire, by digeſting, boiling, diluting, ſeparating, and mixing.

9. With fixed acid ſalts, as thoſe of alum, ſulphur, and vitriol; either ſeparately in a liquid form, or in their calxes, by diluting, boiling, diſtilling, digeſting; or in a dry form, by calcining, roaſting, burning, and diſtilling.

10. With volatile acid ſalts, by diluting, digeſting, diſtilling, and inſinuating.

11. With compound ſalts and ſoaps, by calcining, ſubliming, diſtilling, and digeſting, either in a dry or a liquid form.

And, 12. with metals, by fuſion and amalgamation.

This ſeems an accurate and perfect table of the whole work of *ſolution*, and will eaſily be underſtood in every article, on recollecting the ſeveral chemical proceſſes. Boerh. Chem. part. ii. p. 338. See MENSTRUUM.

When *ſolutions* of ſalts are congealed, the ice often affords very pretty figures; but it is to be obſerved, that the ſame ſalt does not always give the ſame figures. Thus the ſame *ſolution* of verdigriſe, frozen by means of ſnow and ſalt, affords a different figure, from what is produced by the natural cold of the air. And the former ice being thawed, and left to freeze in the ſame vial, did not give the ſame figures as at firſt. See Boyle's Works Abridged, p. 168.

SOLUTION, in *Metallurgy*, is diſtinguiſhed into dry and moiſt. The dry *ſolution* is the blending imperceptibly a ſmall quantity of a metal, or mineral, with a very large one of ſome other body, dry, hard, and not fluid when cold. The moiſt *ſolution* is the diſtributing a body through the very minuteſt parts of an aqueous, or in great part aqueous fluid, in ſuch manner, that both may turn into a fluid, to appearance homogeneous, which goes through all filters, without being detained or ſeparated by them, and the ſmalleſt part of which contains in it a proportionable quantity of both the menſtruum or diſſolvent, and of the diſſolved body. The *ſolution* of gold in aqua regia, and of ſilver in aqua fortis, as alſo that of any of the ſalts in water, are *ſolutions* of this kind. Cramer's Art of Aſſaying, p. 194.

In the making of the ſeveral *metallic ſolutions*, for the neceſſary proceſſes in chemiſtry, the operator is ſubject to great danger in his health, from the noxious vapours. This has been an accident complained of indeed by many, but ſcarce attempted to be remedied or obviated by any, in a rational way, till Mr. Geoffroy, whoſe experiments ſubjected him greatly to the miſchief, employed his thoughts for his own ſake, as well as that of the world in general, to the effectual prevention of it.

The diſſolutions of the metals, in the corroſive acid ſpirits, are thoſe which ſend out the moſt copious and moſt dangerous vapours. The exhalations of quickſilver, of antimony, and of lead and copper, are all in themſelves greatly hurtful, as well as the fiery vapours of ſpirit of nitre, ſea-ſalt, or vitriol; and if either of theſe is ſingly ſo, how pernicious muſt they need be in thoſe caſes, where two of them are joined together in ſuch a manner, as that this union ſends up infinitely more vapours than would otherwiſe ariſe; in this caſe, the utmoſt care is neceſſary to prevent the chemiſt from falling a ſacrifice to his zeal for his diſcoveries.

The common way of avoiding this danger, is by making the *ſolution* either abroad in the open air, or in a chimney;

ney; but sometimes these cautions cannot be used, and under some circumstances they are ineffectual. This gave occasion to Mr. Geoffroy to use a method, which he afterwards proposed to the public, of stopping the rise of the vapours entirely, or at least of diminishing them so greatly, that they shall be harmless and unperceived. All that was necessary to this, seemed to him to be the contriving to cover the surface of the fluid with some body, capable of retaining those vapours, yet not capable of disturbing the operation of the menstruum on the metal; and the common expressed oils of fruits, as the oil of olives, almonds, or the like, were found capable of happily performing this effect; and that particularly, as they would easily receive into themselves the acid salts which arise in the conflict. The thing which gave this gentleman the hint of the discovery was, that in the boiling of sugars, honey, or the like substances, when there is any danger of their boiling over the vessel, the pouring in a little oil stops the swelling. In the *metallic solutions* it has the same effect; and that heightened by this good consequence, that by keeping in the fiery vapours of the acid, it returns them back upon the metal, and by this means does, in effect, add greatly to the power of the menstruum.

This method of using oil has indeed three advantages, 1. The preserving of the operator from the injuries of the vapours. 2. The greatly moderating of that violent rarefaction, which is often of ill consequence. And 3. the same quantity of the menstruum, by this means, dissolves more of the metal. The best method of making *solutions* with this advantage is this: first, wet the surface of the metal to be dissolved with water, or spirit of wine; then pour a little water, or spirit of wine, into the glass in which the *solution* is to be made, this will prevent the oil from sticking to the surfaces of either; then put the metal into the glass, and pour in the oil upon it; last of all, pour on the menstruum: this being greatly heavier than the oil, will sink to the bottom and work upon the metal, while the oil perfectly covers the whole surface. There is no need to be exact as to the quantity of the oil, but more or less is to be used, in proportion to the greater or less ebullition which the mixture is expected to make.

The air-bubbles, which arise to the surface with great impetuosity in the making of these *solutions*, are here seen to break by degrees as they enter the covering of oil, and generally are quite dissipated before they arise to the surface of it. The few of them which retain their figure till they arrive at the surface, there burst and give a slight exhalation; and one may continually see the drops of the menstruum falling back again out of the oil into it, after being deserted by the bubbles of the air which had raised them so far. On the contrary, in the common way of making *solutions*, the air-bubbles push one another up to the surface, where they form a sort of scum, which continually thickens by their fresh rising and supporting one another, till it often rises over the top of the vessel. These bubbles of air seem to be formed of small particles of air extremely condensed in the pores of the metal, which, when the particles of it are separated for *solution*, find themselves at liberty to dilate and expand, and arise to the surface in their proper form.

If it be thought necessary, in any *solution* which raises a more than ordinary quantity of vapours, to prevent the flying off of that small quantity which may escape through the oil, there is nothing more necessary than to pour a little spirit of wine upon the oil; for the acid vapours which pass the oil will then be received in the spirit, and will be dulcified in it, and instead of a disagreeable odour, will yield only a very sweet and safe one. Spirit of wine alone, used instead of oil, and poured gently on the *solution*, has very great effects; insomuch, that if used to the *solutions* in spirit of nitre, which usually send up very noxious and coarse red vapours, they by this means are made to send up only very fine light white ones, and those of a very agreeable smell: the bubbles raised in this case are very small, and usually burst before they arrive at the surface of the spirit. The only objection to this method is, that the spirit of wine soon mixes itself with the menstruum, and there are some cases in which this may be of ill consequence to the process. Mem. Acad. Par. 1719.

SOLUTIVE, *loosening*, or *laxative*. See LAXATIVE.

SOLUTIVE *diaprunum*. See DIAPRUNUM.

SOMASQUO, *fathers of*. See FATHERS.

SOMNABULI, or SOMNAMBULONES, formed from *somnus*, *sleep*, and *ambulo*, *I walk*; an appellation given to people who walk in their sleep; more usually called *noctambuli*. See NOCTAMBULATIO.

SOMNIFEROUS. See SOPORIFEROUS.

SOMNOLENTUM *coma*. See COMA.

SOMNUS, in *Mythology*. See SLEEP.

SON, a relative term, applied to a male CHILD, considered in the relation he bears to his PARENTS.

The children of the king of England are called *sons* and *daughters* of *England*. The eldest *son* is born duke of Cornwall, and created prince of Wales. The younger *sons* are called *cadets*.

The king of France's children were anciently called *fils* and *filles de France*, *sons* and *daughters of France*; and the grandchildren, *petits fils*, and *petites filles de France*. At present, the daughters are called *mesdames*; and the grand-daughters, *mesdemoiselles de France*.

SON, *natural*. See BASTARD.

SON, *adoptive*. ADOPTIVE.

SON *of God*, is a term used in various senses in the holy Scripture, as, 1°, For Jesus Christ, or the Saviour of mankind; who is thus called with respect to the manner of his generation; as being begotten of the Father.

Some suppose, that this title belongs to Christ on account of his possessing the same divine nature with the Father: others maintain, that it is ascribed to him on account of the supernatural manner of his birth, &c. and others again consider it as merely or principally a title of office. The appellation *Son* is applied to him both before and after his incarnation. Thus, it is said, The *Son* of God created the world; the *Son* of God was incarnate, and lived thirty-three years on earth, &c.

2°, Several creatures are also called SONS *of God*, not as being so by nature and generation, but on divers other accounts. Thus, the angels are called *sons of God* by Job; in respect of their creation, adoption, &c. And great men are called *sons of God* in the Psalms, as being his lieutenants, or the depositaries of his authority. Good men, and, particularly, the eminently pious, are also called *sons of God*, in various places of the sacred writings.

SON *of man*, is frequently used, in Scripture, to signify man; as expressing not only the nature of man, but his frailty.

The expression is very usual among the Hebrews and Chaldeans: Daniel, Ezekiel, and Jesus Christ, are particularly thus called; the first once, and the two latter frequently.

Sometimes the phrase *son of man* is also used for the wicked and reprobate; in contradistinction to those called *sons of God*.

SON, or *sun-plant*, the CROTALARIA *juncea* of Linnæus, in *Botany*, is cultivated in every part of Hindostan with great assiduity, and applied to various uses. The seeds reduced to powder, and mixed with oil, form a kind of unguent, which the black ladies apply to their hair, in order to make it grow; the bark of this plant furnishes all kinds of rope, packing-cloths, nets, &c. and from these, when old, most of the paper in that country is prepared. For this purpose, they cut them into small pieces, macerate them in water for about five days, wash them in water, and then throw them into a vessel of water strongly impregnated with a lixivium composed of six parts of sedgi mutti, which is an earth containing a large portion of fossil alkali, and supposed to be the NATRON of the ancients, and seven parts of quick-lime; here they remain eight or ten days, when they are again washed, broken into fibres by a stamping lever, and then exposed to the sun, and again steeped in a fresh lixivium as before. When they have undergone three operations of this kind, they are fit for making coarse brown paper: and after seven or eight operations, they are prepared for making paper of a tolerable whiteness. For a farther account of the process, see Phil. Tranf. vol. lxiv. p. 101. where it is minutely described and illustrated by figures.

SONATA, SUONATA, in *Music*, a piece, or composition, of music, wholly executed by instruments; and which is, with regard to the several kinds of instruments, what the *cantata* is in respect of voices.

The *sonata*, then, is properly a grand, free, humorous composition, diversified with a great variety of motions and expressions, extraordinary and bold strokes, figures, &c. And all this purely according to the fancy of the composer: who, without confining himself to any general rules of counter-point, or to any fixed number or measure, gives a loose to his genius, and runs from one mode, measure, &c. to another, as he thinks fit.

This species of composition had its rise about the middle of the seventeenth century: those who have most excelled in it were Bassani and Corelli.

We have *sonatas* of 1, 2, 3, 4, 5, 6, 7, and even 8 parts, but usually they are performed by a single violin, or with two violins, and a thorough bass for the harpsichord; and, frequently, a more figured bass, for the bass viol, &c.

There are a thousand different species of *sonatas*; but the Italians usually reduce them to two kinds.

Suonate de chiesa, that is, *sonatas* proper for church music,

fic, which ufually begin with a grave, folemn motion, fuitable to the dignity and fanctity of the place, and the fervice, after which they ftrike into a brifker, gayer, and richer manner. Thefe are what they more peculiarly call *fonatas*.

Suonate de camera, or *fonatas* for the chamber, are properly feriefes of feveral little pieces, for dancing, only compofed to the fame tune. They ufually begin with a prelude, or little *fonata*, ferving as an introduction to all the reft: afterwards come the allemand, pavane, courant, and other ferious dances; then jigs, gavots, minuets, chacons, paffecailles, and other gayer airs: the whole compofed in the fame tune or mode.

SONCHUS, in *Botany*. See Sow-*thiftle*.

SONG, in *Poetry*, a little compofition, confifting of fimple, eafy, natural verfes, fet to a tune, in order to be fung. Each ftanza of a *fong* is called a *couplet*.

The *fong* bears a great deal of refemblance to the madrigal, and more to the ode; which is, indeed, nothing but a *fong*, according to the ancient rules.

Its object is ufually either wine or love, whence M. le Brun defines a modern *fong*, to be either a foft and amorous, or a brifk and Bacchic thought expreffed in few words.

Indeed, this is to reftrain it to too narrow bounds; for we have devout *fongs*, fatyrical *fongs*, and panegyrical *fongs*. But, be the *fong* what it will, the verfes are to be eafy, natural, and flowing; and are to contain a certain harmony, which neither fhocks the reafon, nor the ear; and which unites poetry and mufic agreeably together.

Anciently, the only way of preferving the memory of great and noble actions, was by recording them in *fongs*; and, in America, there are ftill people who keep their whole hiftory in *fongs*.

Song, in *Mufic*, is applied, in the general, to any fingle piece of mufic, whether contrived for a voice or inftrument.

A *fong*, Mr. Malcolm obferves, may be compared to an oration: for, as in this latter there is a fubject, viz. fome perfon or thing the difcourfe is referred to, and which is always to be kept in view throughout the whole; fo, in every truly regular and melodious *fong*, there is one note which regulates all the reft, wherein the *fong* begins, and at laft ends; and which is, as it were, the principal matter, or mufical fubject, to be regarded in the whole courfe of the *fong*. And as, in the oration, there may be feveral diftinct parts, which refer to particular fubjects, yet muft they have an evident connexion with the principal fubject which regulates the whole; fo in melody, there may be feveral fub-principal fubjects, to which the different parts of the *fong* may belong; but thefe are themfelves under the influence of the principal fubjects, and muft have a fenfible connexion with it. This principal or fundamental note, is called the *key of the fong*.

Song *of birds*, is defined by the hon. Daines Barrington to be a fucceffion of three or more different notes, which are continued without interruption, during the fame interval, with a mufical bar of four crotchets in an adagio movement, or whilft a pendulum fwings four feconds.

It is obferved, that notes in birds are no more innate than language in man, and that they depend entirely upon the mafter under which they are bred, as far as their organs will enable them to imitate the founds which they have frequent opportunities of hearing: and their adhering fo fteadily, even in a wild ftate, to the fame fong is owing entirely to the neftlings attending only to the inftruction of the parent-bird, whilft it difregards the notes of all others that may perhaps be finging round him.

Birds in a wild ftate do not commonly fing above ten weeks in the year, whereas birds that have plenty of food in a cage, fing the greateft part of the year: and we may add, that the female of no fpecies of birds ever fings; and this is a wife provifion of nature, becaufe her fong would difcover her neft, and, in the fame manner, we may rationally account for her inferiority in refpect of plumage. The faculty of finging is confined to the cock-birds; and accordingly Mr. Hunter, in diffecting birds of feveral fpecies, found the mufcles of the larynx to be ftronger in the nightingale than in any other bird of the fame fize; and in all thofe inftances, where he diffected both cock and hen, the fame mufcles were ftronger in the cock. To the fame purpofe, it is an obfervation as ancient as the time of Pliny, that a capon does not crow.

Some have afcribed the finging of the cock-bird in the fpring to the motive only of pleafing his mate during incubation; nature, indeed, partly for this end, has given to the male the power of finging; but the finging of a bird in the fpring is more probably owing to the greater plenty of plants and infects, which (as well as feeds) are the proper food of finging birds, at that time of the year.

Mr. Barrington remarks, that there is no inftance of any bird's finging which exceeds our black-bird in fize; and this, he fuppofes, may arife from the difficulty of its concealing itfelf, if it called the attention of its enemies, not only by bulk, but by the proportionable loudnefs of its notes. This writer farther obferves, that fome paffages of the *fong* in a few kinds of birds correfpond with the intervals of our mufical fcale, of which the cuckow is a ftriking and known inftance; but much the greater part of fuch *fong* is not capable of mufical notations; partly, becaufe the rapidity is often fo great, and it is alfo fo uncertain when they may ftop, that we cannot reduce the paffages to form a mufical bar in any time whatfoever; partly alfo, becaufe the pitch of moft birds is confiderably higher than the moft fhrill notes of thofe inftruments, which comprehend even the greateft compafs; and principally, becaufe the intervals ufed by birds are commonly fo minute, that we cannot judge at all of them from the more grofs intervals into which we divide our mufical octave. This writer apprehends, that all birds fing in the fame key; and in order to difcover this key, he informs us, that the following notes have been obferved in different birds, A, B flat, C, D, F, and G; and therefore E only is wanting to complete the fcale: now thefe intervals, he fays, can only be found in the key of F with a fharp third, or that of G with a flat third; and he fuppofes it to be the latter, becaufe, admitting that the firft mufical notes were learned from birds, thofe of the cuckow, which have been moft attended to, form a flat third, and moft of our compofitions are in a flat third, where mufic is fimple, and confifts merely of melody. As a farther evidence, that birds fing always in the fame key, it has been found by attending to a nightingale, as well as a robin which was educated under him, that the notes reducible to our intervals of the octave were always precifely the fame.

Moft people, who have not attended to the notes of birds, fuppofe, that thofe of every fpecies fing exactly the fame notes and paffages, which is by no means true, though it is admitted that there is a general refemblance. Thus the London bird-catchers prefer the fong of the Kentifh goldfinches, but Effex chaffinches; and fome of the nightingale-fanciers prefer a Surry bird to thofe of Middlefex.

The nightingale has been almoft univerfally reckoned the moft capital of finging birds: and its fuperiority (deduced from a caged bird) confifts in the following particulars; its tone is much more mellow than that of any other bird, though at the fame time, by a proper exertion of its mufical powers, it can be exceffively brilliant. Another point of fuperiority is its continuance of *fong*, without a paufe, which is fometimes no lefs than twenty feconds; and when refpiration became neceffary, it has been taken with as much judgment as by an opera-finger. The fky-lark in this particular, as well as in compafs and variety, is only fecond to the nightingale. The nightingale alfo fings (if the expreffions may be allowed) with fuperior judgment and tafte. Mr. Barrington has obferved, that his nightingale, which was a very capital bird, began foftly like the ancient orators; referving its breath to fwell certain notes, which by this means had a moft aftonifhing effect. This writer adds, that the notes of birds, which are annually imported from Afia, Africa, and America, both fingly and in concert, are not to be compared to thofe of Europe.

The following table formed by Mr. Barrington, agreeably to the idea of M. de Piles in eftimating the merits of painters, is defigned to exhibit the comparative merit of the Britifh finging birds: in which twenty is fuppofed to be the point of abfolute perfection.

	Mellownefs of tone.	Sprightly notes.	Plaintive notes.	Compafs.	Execution.
Nightingale - -	19	14	19	19	19
Sky-lark - - -	4	19	4	18	18
Wood-lark - -	18	4	17	12	8
Tit-lark - - -	12	12	12	12	12
Linnet - - -	12	16	12	16	18
Goldfinch - - -	4	19	4	12	12
Chaffinch - - -	4	12	4	8	8
Greenfinch - - -	4	4	4	4	6
Hedge fparrow -	6	0	6	4	4
Aberdavine or fifkin	2	4	0	4	4
Red-poll - - -	0	4	0	4	4
Thrufh - - -	4	4	4	4	4
Blackbird - - -	4	4	0	2	2
Robin - - - -	6	16	12	12	12
Wren - - - -	0	12	0	4	4
Reed fparrow - -	0	4	0	2	2
Black-cap, or Norfolk mock nightingale	14	12	12	14	14

See Phil. Tranf. vol. lxiii. p. 2. art. 31. p. 249, &c.

Song, *reſponſary.* See Responsary.

SONNA, a book of the Mahometan traditions, wherein all the orthodox Muſſulmen are required to believe. See Mahometanism.

The word ſignifies, in Arabic, the ſame with *miſhna* in the Hebrew, that is, *ſecond law*; or, as the Jews call it *oral law.*

The adherents to the *Sonna* are called *Sonnites:* and as, among the Jews, there is a ſect of Caraites, who reject the traditions as fables invented by the rabbins; there are alſo ſectaries among the Mahometans, called *Schiites*, who reject the traditions of the *Sonnites*, as being only founded on the authority of an apocryphal book, and not derived to them from their legiſlator.

There is the ſame enmity between the *Sonnites* and Schiites, as between the rabbiniſt Jews and the Caraites. The Schiites reproach the *Sonnites*, with obtruding the dreams of their doctors for the word of God: and the *Sonnites*, in their turn, treat the Schiites as heretics, who refuſe to admit the divine precepts, and who have corrupted the koran, &c.

SONNET, Sonetto, in *Poetry*, a kind of compoſition properly contained in fourteen verſes; viz. two ſtanzas, or meaſures, of four verſes each, and two of three; the eight firſt verſes being all in two rhymes.

The *ſonnet* is of Italian origin, and Petrarch is allowed to be the father of it: it is held the moſt difficult and artful of all poetical compoſitions, as requiring the utmoſt accuracy and exactneſs. It is to end with ſome pretty ingenious thought: the cloſe muſt be particularly beautiful, or the *ſonnet* is defective.

In Malherb, and ſome other French poets, we meet with *ſonnets*, where the two firſt ſtanzas are not in the ſame rhyme; but they are held irregular; and, in effect, great part of the merit of theſe pieces conſiſts in a ſcrupulous obſervation of the rules.

Ronſard, Malherb, Maynard, and Gombaut, have compoſed abundance of *ſonnets*; but, among two or three thouſand, there are ſcarce two or three worth much.

Paſquier obſerves, that du Bellai was the firſt who introduced *ſonnets* into France. But du Bellai himſelf ſays, that Melin de S. Gelais firſt converted the Italian *ſonnets* into French.

Of twenty-three ſonnets which were written by our great poet Milton, that addreſſed to Henry Laws is one of the beſt; and yet this ſhews how difficult and unnatural the conſtruction of this ſpecies of poem is in the Engliſh language; whereas, from the great number of ſimilar terminations in the Italian tongue, and the ſucceſs of Petrarch, it has long been the favourite meaſure of Italy for ſhort compoſitions. However, Muratori thinks it extremely difficult for his countrymen to make a good *ſonnet*; and he compares this kind of poem to the bed of Procruſtes, where the legs of thoſe that were too ſhort were ſtretched, and thoſe too long were cut to the ſize of the bed.

Antonio a Tempo, a civilian at Padua, in his Treatiſe on Poetry, 1332, diſtinguiſhes ſixteen different kinds of *Sonnet.* Burney's Hiſt. Muſic, vol. ii. p. 324.

SONTAGE, in our *Old Writers*, a tax of forty ſhillings laid upon every knight's fee, according to Stow, p. 284.

SOOINS, a name given in the North to a kind of rural food, that has been found very beneficial in the scurvy.

This food is prepared by putting ſome oatmeal into a wooden veſſel, and pouring hot water upon it, and continuing the infuſion till the liquor begins to taſte ſouriſh, i. e. till a fermentation comes on, which in a place moderately warm may be in the ſpace of two days. The water is then poured off from the grounds, and boiled down to the conſiſtence of a jelly.

SOOP. See Soup.

SOOT, an earthy volatile matter, ariſing from wood, coals, and other fuel, along with the ſmoke, by the action of fire; or rather, it is the ſmoke itſelf, fixed and detained on the ſides of the chimney.

Soot is a collection of ſubſtances formed by the matter of the flame of inflammable bodies, but which have eſcaped combuſtion, from not having ſufficient contact with the air. This matter is always of a black colour, more or leſs browniſh, which colour it acquires from an oil that is burnt, and half reduced to the ſtate of coal. Its different qualities and appearances are owing to the nature of the inflammable ſubſtances which produce it, and the different manner in which they are burnt.

Soot is found an excellent manure for corn-lands, eſpecially where the ſoil is cold, and has been long over-run with moſs; but ſea-coal *ſoot* is much better for this purpoſe than wood-*ſoot*. They uſually allow forty buſhels to an acre, but ſome lands require more. It produces an extremely fine and ſweet graſs, and deſtroys weeds of all kinds.

The dyers make a conſiderable uſe of *ſoot*, for a kind of dun-colour; which, it is true, has no agreeable ſmell; but, in return, it has the property of ſaving cloaths, and other ſtuffs, from moths.

Soot *of frankincenſe* is the ſmalleſt and fineſt part of the incenſe, called *olibanum*, or *male incenſe*; burnt after the manner of roſin, to make *lamp*-black.

Soot, *wood*, has been long known as a good medicine in many caſes, but the principles upon which it acted as ſuch were never well underſtood, till Boerhaave gave a regular analyſis of it. The directions he gives for the proceſs are theſe.

Chooſe the blackeſt and drieſt *wood-ſoot* from the chimney of an oven, where nothing is baked but bread, and nothing burnt but vegetables; gather this in a dry day, and fill with it a glaſs retort almoſt up to the neck; clean the neck of the retort, and luting on a receiver, give a fire of a hundred and fifty degrees, and keep it up equably, a large quantity of tranſparent water will come over with conſiderable violence. When no more water will come over, cleanſe the receiver, and raiſing the fire to a little above two hundred degrees, there will then come over a whitiſh fat liquor; this alſo comes over with great violence, and the fire muſt be gradually increaſed, till no more of this will come. Change the receiver, and raiſe the fire to a yet greater degree, and a yellow, copious, volatile ſalt will come over, and ſtick all over the ſides of the new receiver. When no more of this ſalt will ariſe, increaſe the fire to the utmoſt that ſand can give, and with a heat of ſuppreſſion there will ariſe a black thick oil; when this is all come over, and the veſſels cooled, there will be ſound in the neck of the retort a ſalt, which could be raiſed no higher, even by that violent fire; and in the bottom of the retort there remains a black feculent matter, the upper ſurface of which is covered with a white ſaline cruſt, which, both in figure, colour, and the ſtructure of its ſtriæ, reſembles the common ſal ammoniac. If the milky liquor be rectified, it affords a very penetrating volatile ſpirit, and ſome ſharp volatile ſalt.

Here we are taught what the agitation of an open fire can move, change, expel, and drive through the air by burning; firſt in the form of ſmoak, then of flame, and laſtly of exhalation, and how high it is able to carry them; for a chimney is a kind of ſtill-head, converging in an open top, and *ſoot* is often carried up thirty or forty feet, or more, to the top of theſe, and after this a black ſmoak is diſcharged out of the orifice, which diſperſes in the air, and finally ſeems to vaniſh.

This ſmoak and *ſoot* conſiſt of ſeveral parts; as, 1. A fetid, oily, unpleaſant, bitter ſpirit, reſiding in the water that firſt comes over, and is afterwards found diſperſed alſo through all its other parts; this ſpirit ſeems to be the oily and more ſubtile part of the vegetable, acted on by the force of fire. 2. A water, which is here contained in great plenty in this ſpirit; in the firſt limpid, and in the ſecond milky liquor, as alſo in the ſaline ſpirit, and the volatile ſalt itſelf, and even in ſome degree in the oil. This water can ſcarce be ſeparated pure by any art, being always impregnated with the bitter taſte and nauſeous ſmell of the ſpirit. 3. A ſharp volatile alkaline oily ſalt, which firſt comes over, and ſticks to the ſides of the receiver. From this principle we are well aſſured, that ſuch a volatile alkaline ſalt always ſtrongly impregnates the whole air, where wood fuel is burnt. 4. A ſharp alkaline fat ſpirit, conſiſting of the ſalt juſt now mentioned, diſſolved in water, and ſo reſembling ſpirit in fluidity, pungency, volatility, and the other qualities. 5. A fetid, black, bitter, nauſeous, and almoſt cauſtic oil, mixed with an oily ſalt. 6. A true ſal ammoniac, raiſed to the neck of the retort, and covering the ſurface of the black matter left at its bottom. If this ſalt be carefully collected and ſeparated from the alkaline kind, it proves to be a perfect and genuine ſal ammoniac; it is of a whitiſh colour, ſomewhat tranſparent, and makes no effervеſcence with acids, and if mixed with fixed alkalis, it eaſily yields a volatile ſalt, wholly agreeing with that from the common ſal ammoniac; whence by the bye it is evident, that all ſal ammoniac owes its origin to *ſoot*. 7. The laſt ſubſtance found in *ſoot*, is the remaining black earth left at the bottom of the retort: this has an oil which tenaciouſly adheres to it, and when this is driven off in a ſtrong open fire, there remains a white calx.

By this accurate analyſis of *wood-ſoot*, we learn what parts of vegetables are volatile, and fly off by an open fire, and what are fixed and remain behind, and finally, what fire throws off from vegetables into the air; and hence, among other things, we may learn that even earth, which appears ſo very fixed in the fire when ſeparated from the other principles, yet when mixed with them is, by the force of fire, thrown up to the height of forty feet and more, in the air; whence it aſcends to yet greater heights, and finally diſperſes in form of a thin cloud. Hence, we may alſo learn, that *ſoot*, which contains ſo many

many active principles, must be qualified for a powerful medicine. Pills of dry *soot* are found very beneficial in all cold distempers; the volatile salt of *soot* possesses the virtues of the volatile salts of animals. The salt which rises last is recommended greatly by Hartman for giving relief in cancers; and this is very probable, since sal ammoniac of the common kind, properly applied, is known to be of great use in cases of running cancers. *Soots* of different fuels are not all to be supposed to possess the same virtues; that of pitcoal is found to be a substance of a very different kind from that of wood, and that of the common turf, or peat, and of the oak-wood, have also been found, on experiment, to be very different.

Boerhaave very justly observes, that the *soot* from kitchen-chimneys, where the smoak must have been impregnated with the effluvia of the victuals, must be very different from pure *wood-soot*. Boerhaave's Chemistry.

Wood-soot is directed in hysteric cases, and in different nervous disorders, as an antispasmodic and corroborant.

It is used chiefly in the form of a spirituous tincture, in conjunction, commonly, with asafœtida, or other materials of similar intention: the officinal tincture is drawn from two ounces of *soot* and one of asafœtida, with a quart of proof spirit.

The virtues of the *soot* are extracted almost equally by proof spirit, rectified spirit, and water, each of which, if the *soot* is of a good kind, dissolves about one fourth of it. The extracts, obtained by inspissating the filtered solutions, are very bitter, and the spirituous extract retains most perfectly the peculiar flavour of the *soot*. Lewis.

Dioscorides shews how to make a *soot* of butter, which has several uses in medicine. The *soot* found in furnaces of glass-houses is used by painters.

SOPE. See SOAP.

SOPHI, or SOFI, a title, or quality, given to the emperor of Persia; importing as much as wise, sage, or philosopher.

The title is by some said to have taken its rise from a young shepherd thus named, who attained to the crown of Persia in 1370; others derive it from the *sophoi*, or sages, anciently called *magi*. Vossius gives a different account of the word: *sophi*, in Arabic, he observes, signifies *wool*; and he adds, that it was applied by the Turks out of derision to the kings of Persia, ever since Ishmael's time; because, according to their scheme of religion, he is to wear no other covering on his head, but an ordinary, red, woollen stuff; whence the Persians are also called *kezelbaschs*, *q. d. red-heads*. But Bochart assures us, that *sophi*, in the original Persian language, signifies one that is pure in his religion, and who prefers the service of God in all things: and derives it from an order of religious called by the same name.

The *sophis* value themselves, and with some reason, on their illustrious extraction; the race being second to none in the East. They are descended in a right line from Houssein, second son of Ali, Mahomet's cousin, and Fathima, Mahomet's daughter.

There is no prince in the world whose authority is more absolute, than that of the *sophi* of Persia; his power is not even limited by any laws he himself can make; but he suspends, changes, and annuls them at pleasure.

SOPHIS, or *sofees*, a kind of order of religious among the Mahometans in Persia, answering to what are otherwise called DERVISES; and, among the Arabs and Indians, FAQUIRS.

Some will have them called *sophis*, from a kind of coarse camblet which they wear, called *souf*, from the city Souf, in Syria, where it is principally manufactured.

The more eminent of those *sophis* are complimented with the title SCHIEK, that is, *reverend*; much as in Romish countries the religious are called *reverend fathers*.

Scheic *sophi*, who laid the first foundation of the grandeur of the royal house of Persia, was the founder, or rather the restorer, of this order: Ishmael, who conquered Persia, was himself a *sophi*, and greatly valued himself on his being so. He chose all the guards of his person from among the religious of this order; and would have all the great lords of his court *sophis*.

The king of Persia is still grand-master of the order; and the lords continue to enter into it, though it be now fallen under some contempt.

The vulgar *sophis* are now chiefly employed as ushers and attendants of the court; and some even as executioners of justice: the emperor last reigning would not allow them, according to custom, to gird the sword on him.

This neglect into which the *sophis* are sunk, has occasioned the late emperors to disuse the title of *sophi*, or *sofi*: however, M. de la Croix is mistaken, when he says, that they never bore it.

SOPHIA *chirurgorum*, in *Botany*, a name sometimes given to a species of *water* CRESSES.

SOPHISM, Σοφισμα, in *Logic*, a captious and fallacious reasoning; or an argument, which, with some subtilty, carries much appearance of truth, but little solidity. See FALLACY.

A *sophism* is, properly, an argument false at bottom, and only invented to amuse and embarrass the person to whom it is used.

Logicians enumerate the following kinds of *sophism*, viz *ignoratio elenchi*, or a mistake of the question, i. e. when something else is proved, which has neither any necessary connection nor inconsistency with the thing enquired, and consequently gives no determination to the enquiry, though at first sight it may seem to determine the question: PETITIO *principii*; a CIRCLE; *non causa pro causa*, or the assignation of a false cause; *fallacia accidentis*, which pronounces concerning the nature and essential properties of any subject, according to something which is merely accidental to it. *A dicto secundum quid ad dictum simpliciter*, arguing from that which is true in particular circumstances to prove the same thing true absolutely, simply, and abstracted from all circumstances, and *vice versa*: the *sophisms* of composition and division, when we infer any thing concerning ideas in a compounded sense, which is only true in a divided sense, and *vice versa*: and the *sophisms* arising from an abuse of the ambiguity of words: to which may be added an imperfect enumeration, or false induction, when from a few experiments and observations, men infer general theorems and universal propositions. Watts's Logic, p. iii. c. 3. sect. 1.

SOPHISMS, or SOPHISTICAL *arguments*, among *Logicians*, are more particularly such as are not in form, or are founded on equivocals.

As, *You have every thing you have not lost*; *but you have not lost horns, therefore you have horns.*

SOPHIST, Σοφιστης, formed from σοφος, *wise*; or rather from σοφιστης, *impostor*, *deceiver*, a person who frames sophisms; that is, uses subtile arguments, with design to deceive those he would persuade or convince.

The term *sophist*, which is now reproachful, was anciently honourable, and carried a very innocent idea. St. Augustine observes, it signifies a rhetor, or professor of eloquence: such as were Lucian, Athenæus, Libanius, &c.

Suidas, and after him Olar. Celsius, in an express dissertation on the Greek *sophists*, tells us, that the appellation was applied indifferently to all who excelled in any art or science; whether divines, lawyers, physicians, poets, orators, or musicians.

However, as rhetoricians often employed their art rather to vindicate what was false and unjust, than to support truth and virtue, their conduct brought a discredit both upon themselves and their profession; and, therefore, the name *sophist*, or *sophister*, has been more generally used in an ill sense, to signify one skilled rather in the arts of cavilling, than qualified to speak well and accurately upon any subject.

Solon is the first who appears to have ever borne the appellation of *sophist*, which is given him by Isocrates: afterwards, it was scarce ever given except to philosophers and declaimers.

The title *sophista* was in great credit among the Latins in the twelfth century, and in the time of St. Bernard; but it began to lose ground in Greece as early as Plato's time; on account of Protagoras and Gorgias, who made a sordid traffic thereof, by selling eloquence for money. Hence Seneca calls the *sophists* quacks, or empirics. Cicero says, that the title *sophista* was in his time given to such as professed philosophy with too much ostentation, in order to make a trade of it, by running from town to town, to retail their deceitful science. A *sophist*, therefore, was then, as now, a rhetor, or logician, who makes it his business to ensnare and perplex people, by frivolous distinctions, vain reasonings, and captious discourses.

Nothing has conduced more to the increasing of the number of *sophists* than the contentious school-philosophy; people are there taught to puzzle and obscure the truth, by barbarous unintelligible terms; as, antipredicaments, great and little logicals, quiddities, &c.

The title *sophist* was given to Rabanus Maurus, by way of eminence. John Hinton, a modern English scholastic writer, endeavoured also to procure the splendid title of *sophist*.

SOPHISTICATION, in *Chemistry*, *Alchemy*, &c. a term particularly applied to the counterfeit works of fraudulent alchemists, who use indirect means of whitening copper, gilding silver, and giving other superficial tinctures to metals; as also of making augmentations, by divers mixtures, and other illegal operations, to delude those at whose expence they are employed.

Hence the term is also applied to merchandizes, and other

other goods adulterated, mixed, or altered, by the deceit of the seller.

SOPHORA, in *Botany*, a genus of the *decandria monogynia* class. Its characters are these; the flower has a short bell-shaped empalement, cut at the brim into five obtuse segments; it is of the butterfly kind, the standard oblong, broad, and reflexed on the sides; it has two oblong wings with appendages to their base; the keel is of two leaves like those of the wings, whose lower borders join like the keel of a boat; it has ten distinct stamina, which are awl-shaped, parallel, and the length of the petals hid in the keel, terminated by small summits; and a taper oblong germen supporting a style the length of the stamina, crowned by an obtuse stigma; the germen turns to a long slender pod, with swellings where each seed is deposited. Miller reckons three, and Linnæus twelve species.

This genus of plants agrees with the other papilionaceous and diadelphous genera, except that in this the stamina are distinct and separate.

SOPHRONISTÆ, σωφρονισται, among the *Athenians*, were ten officers appointed to take care that the young men behaved themselves with sobriety and moderation.

SOPHRONISTERIUM, σωφρονιστηριον, among the Athenians, a house of correction like our Bridewell.

SOPIO, a name used by some of the *old Writers* for opium, from its soporific virtue.

SOPORARIÆ *arteriæ*, a name given by some authors to the carotid arteries.

SOPORIFIC, or SOPORIFEROUS, a medicine that has the faculty of procuring sleep. Such are opium, laudanum, &c.

The word is formed from the Latin *sopor*, *sleep*. The Greeks, in lieu hereof, use the word *hypnotic*.

SOPOROUS, *sleepy*, or *drowsy diseases*, a term by which medical writers express the LETHARGY and COMA, and some others even the CARUS and APOPLEXY.

SOPRANO, in the *Italian Music*, signifies the treble.

SORA, in *Botany*, the name given by the people of Guinea to a kind of shrub which they use in medicine, boiling it in water, and giving the decoction in cases of pain of any kind.

The leaves of this shrub are of the size and shape of those of sena; they stand upon short foot-stalks, and are woolly underneath. Philos. Trans. N° 231.

SORBON, or SORBONNE, the house or college of the faculty of theology established in the university of Paris. It was founded in 1256, by St. Louis, or rather by Robert de Sorbonne, his confessor and almoner; first canon of Cambray, and afterwards of the church of Paris; who gave his own name to it, which he himself took from the village of *Sorbon*, or *Serbon*, near Sens, where he was born.

The foundation was laid in 1250, afterwards the king gave him all the houses he had in the same place, in exchange for some others in another.

The college has been since magnificently rebuilt by the cardinal de Richelieu. The design of its institution was for the use of poor students in divinity.

There are lodgings in it for thirty-six doctors and bachelors of the house; who are said to be of the *society of the Sorbonne*. Those admitted into it without being doctors, are said to be of the *hospitality of the Sorbonne*. Six regent doctors hold lectures every day, for an hour and half each: three in the morning, and three in the afternoon.

SORBONNE is also used in the general for the whole faculty of theology at Paris, in regard the assemblies of the whole body are held in the house of the *Sorbonne*: and that the bachelors of the other houses of the faculty, as the house of Navarre, &c. come thither to hold their *sorbonnique*, or act, for being admitted doctor of divinity.

SORBUS, in *Botany*. See SERVICE-*tree*.

SORCERY, the crime of witchcraft, or divination, by the assistance of evil spirits. See MAGIC and MAGICIAN.

Some hold *sorcery* to be properly what the ancients call *sorti-legium*, or divination, by means of SORTES, or *lots*. Lord Coke, 3d Inst. fol. 44. describes a *sorcerer*, *qui utitur sortibus, & incantationibus dæmonum*.

Sorcery is pretended to have been a thing formerly very common; at least the credulity of those ages made it pass for such; and people suffered frequently for it.

This supposed crime was made felony by 33 Hen. VIII. c. 8. and 1 Jac. I. c. 12. but this absurd law was very properly repealed by an act of George II. See CONJURATION.

SORE, among *Sportsmen*, denotes a buck of the fourth year.

SOREL, in the *language of Sportsmen*, a BUCK of the third year.

SOREL, in *Botany*. See SORREL.

SOREX, *shrew*, in the Linnæan system of *Zoology*, a genus of the order of *feræ*, and class of *mammalia*. Its characters are; that it has two fore teeth above, which are bifid, and four below; and several canine teeth on both sides. There are five species, viz. the crested of Pensylvania; the minute of Siberia, weighing a dram, and supposed by Linnæus to be the least of all quadrupeds, though Dr. Pallas reckons the pigmy, which weighs about half a dram, the smallest; the water-shrew, murine of Java, and the fetid or common. See SHREW-*mouse*.

SORGUM, in the *Materia Medica*, the name of the grain of the *milium arundinaceum*, called *Indian* MILLET.

SORITES, Σωρειτης, formed from σωρος, *cumulus*, *heap*, in *Rhetoric*, &c. a kind of argument, in which several middle terms are chosen to connect one another successively in several propositions, till the last proposition connects its predicate with the first subject. Whence Cicero calls it *syllogismus acervatus*, an *accumulative syllogism*.

Such was that merry argument of Themistocles, to prove, that his little son, under ten years old, governed the whole world. Thus: *My son governs his mother*; *his mother me*; *I the Athenians*; *the Athenians the Greeks*; *Greece commands Europe*; *Europe the whole world*: *therefore my son commands the whole world.*

This method of disputing prevailed much among the Stoics; especially with Zeno and Chrysippus; but it is very sophistical.

SORNI, a name given by some of the chemical writers to iron.

SORRANCES, among *Farriers*, signify two things; viz. either an ill state, or habit, of a horse's body, arising from some part diseased; or a loosening and solution of the continuity of the parts; which, according to the various circumstances thereof, acquire new names, as *fracture*, *wound*, *ulcer*, *rupture*, *convulsion*, *cramp*, *excoriation*, &c.

SORRANCE-*water*, a name given by our farriers to a solution of vitriol, and some other ingredients, in vinegar; a medicine much esteemed in many of the diseases of horses. It is prepared in the following manner.

Take Roman vitriol, and roach-alum, of each an ounce and half; verdigrise, an ounce; copperas, two ounces; reduce all these to powder together, and put them into a two-quart bottle, into which pour a quart of the strongest and best wine-vinegar; this is to be set in balneo Mariæ. The short way of doing which by the farrier, is this: he puts a wisp of hay into the bottom of a kettle, and then tying some pieces of lead or iron about the neck of the bottle, to make it heavy enough to sink in water, it is set upon the hay so, as to stand very upright; then three notches are cut lengthwise in the cork to give passage to some of the vapours when the bottle is heated, that it may not burst. When every thing is thus prepared, so much cold water is to be put into the kettle, that the neck of the bottle may stand two or three inches above it; the kettle is then to be set over the fire, and the water is to be made to boil, and kept boiling about half an hour, the bottle being at times taken out, and thoroughly shaken. When the salts are thus thoroughly dissolved in the vinegar, the whole is to be kept for use.

The method in which they use it is this: take an earthen pan, which will hold about twelve quarts; let this be filled with urine that has been made by sound, healthy, and young persons; the staler the urine is, the better it is for use, and it ought indeed always to stand, at least, three weeks before it is used. It is proper for the farrier, therefore, always to keep a quantity of this ready, and when the water is to be used, half a pint of it is to be mixed with a quart of the urine, or if it be required stronger, more of the water is to be added: these are to be thoroughly mixed together, and the legs, or other affected part of the horse, bathed with it with soft rags twice a day.

The virtues of this water are highly extolled; it is said to cure the malanders in two or three times dressing; it is also a sovereign remedy for the mange, either dry or wet, and for the rat-tails, scratches, gourded or swelled legs and heels; and it also cures horses when the grease is fallen into their heels, as the farriers express it. The farcy is also said to be often cured by a long continuance in the use of it, purging the horse two or three times, at different distances of time, during the time of his being under cure by the water. They also find it a good cleanser and healer of foul ulcers, and that it prevents the breeding of proud-flesh and worms in wounds, and drives away a flux of humours that were falling upon any part. They use it also in clefts and cracks of the heels, and in windgalls, especially in the prevention of the last, by its repellent qualities. The green water alone is an excellent remedy for fistulas, cankers, and the galled backs of horses; disposing such *sorrances*, as they are called, not to fester, rot, and grow worse, as all greasy and oily medicines do, but cleansing them, and preparing the way to a very sound and standing cure.

SORREL,

SORREL, *acetoſa*, in *Botany*. Its characters are theſe: it is male and female in different plants; the male plants have a three-leaved empalement, and ſix ſtamina, crowned with flat, oblong ſummits, but have no corolla or petals; the female flowers have alſo a three-leaved empalement, in the centre of which is ſituated a three-cornered germen, ſupporting a triſid ſtyle; the germen afterwards turns to a triangular ſeed.

The *ſorrels* and docks are by Linnæus included in the ſame genus, under the title of *rumex*; but they are more generally diſtinguiſhed from each other. Miller enumerates ſeven ſpecies; ſome of which grow wild in paſtures in many parts of England.

The common *ſorrel* is propagated either by ſeed, or by parting the roots.

The leaves of the common *ſorrel*, the ſheep's *ſorrel*, and the garden or French *ſorrel*, are mildly acid, and were all formerly directed as officinals, and occaſionally uſed for abating heat, quenching thirſt, and preventing or correcting a tendency to putrefaction, in febrile and ſcorbutic diſorders; but other vegetable acids have now, in a great meaſure, ſupplied their place. Schroder recommends a conſerve of the freſh leaves in the plague, and in all peſtilential, petechial, and malignant fevers. Mr. Morin, of the academy of Paris, who in the Hotel Dieu had many hundred ſcorbutic patients, cured the greater part of them only by *ſorrel*, boiled and eaten with eggs. The juice yielded by expreſſion from the leaves is one of the moſt elegant preparations of *ſorrel* for medicinal uſe, and may be advantageouſly joined, in ſcorbutic caſes, to the juices of the acrid herbs: the inhabitants of Greenland, who are very ſubject to theſe diſtempers, are ſaid to employ, with good ſucceſs, a mixture of *ſorrel* and cochlearia.

The greateſt part of the acid matter of *ſorrel* may be obtained, in the form of a concrete ſalt, by inſpiſſating the depurated juice to a due conſiſtence, and ſetting it to cryſtallize. The roots of the *ſorrels*, which have a roughiſh, bitteriſh taſte, without any acidity, have been looked upon as aperient and diuretic, and with theſe intentions have been made ingredients in watery infuſions and decoctions.

The ſeeds of *ſorrel* are very ſlightly, if at all, aſtringent, without acidity, or bitterneſs. They are now deſervedly excluded from the ſhops. Lewis's Mat. Med.

Sorrels, *Indian red*, and *Indian white*, are ſpecies of *hibiſcus*. See *Syrian* Mallow.

Sorrel, *wood*, *oxalis*, in *Botany*, a genus of the *decandria pentagynia* claſs. Its characters are theſe: the empalement of the flower is permanent, and cut into five acute parts; the flower is of one petal, cut into five obtuſe indented ſegments, and it hath ten erect, hairy ſtamina, and a germen with five angles, ſupporting five ſlender ſtyles; the germen becomes a five-cornered capſule, with five cells, which open longitudinally at the angles, containing roundiſh ſeeds, which are thrown out with an elaſticity on the touch, when ripe. Linnæus enumerates fourteen, and Miller ſeven ſpecies, one of which grows naturally in moiſt ſhady woods in many parts of England.

The leaves of the common *wood ſorrel* are uſeful, ſaline antiſeptics, and antiphlogiſtics; ſimilar, both in taſte and medicinal virtue, to thoſe of the common *ſorrels*, but ſomewhat more acid, and rather more grateful to the palate and ſtomach. Beaten with thrice their weight of fine ſugar, they form a grateful, ſub-acid conſerve. Their expreſſed juice, depurated, is a very agreeable acid; duly inſpiſſated, and ſet to ſhoot, it yields a cryſtalline acid ſalt, of the ſame nature with that of the *ſorrels*: the ſaline matter amounts to nearly one hundredth part of the weight of the freſh leaves. Lewis.

Externally, it is extolled againſt inflammatory eruptions of all kinds in decoction, which is to be uſed by way of fomentation.

Sorrel, in the *Manege*, is uſed for a reddiſh colour. The mane ought to be red, or white, in a horſe of this colour. It is diſtinguiſhed, according to the degrees of its deepneſs, into a *burnt ſorrel*, and a *bright*, or *light ſorrel*. Generally ſpeaking, it is a ſign of a good horſe.

Sorrel-*tree*, in *Botany*. See Andromeda.

SORTES, *lots*, in *Antiquity*, a method of deciding dubious caſes, where there appears no ground for a preference; by referring the deciſion to chance; as in caſting of dice, drawing of tickets, &c.

The *ſortes*, or *lots*, were of ancient uſe among the Jews; and in the books of the Old Teſtament we meet with divers ſtanding and perpetual laws, and divers particular commands, preſcribing and regulating the uſe thereof. Thus the Scripture informs us, that the *lot* fell on St. Matthias, when a ſucceſſor to Judas in the apoſtolate was to be choſen. Our Saviour's garment itſelf was caſt *lots* for.

The Sortes *Prœneſtinæ* were famous among the Greeks. The method of theſe was to put a great number of letters, or even whole words, into an urn; to ſhake them together, and throw them out; and whatever ſhould chance to be made out in the arrangement of the letters, &c. compoſed the anſwer of this oracle.

Cicero, de Divin. lib. ii. § 41. ſays, that a variety of predictions were inſcribed on pieces of wood, which were kept in a box or cheſt; and one of theſe drawn out by a child, after the box was ſhaken, contained the anſwer ſought. He alſo informs us, how theſe fragments of wood were firſt diſcovered; but he obſerves, *Tota res eſt inventa fallaciis, aut ad quæſtum, aut ad ſuperſtitionem.*

In lieu of this, another kind of *ſortes* was introduced into Greece and Italy; which was, to take ſome celebrated poet, as Homer, or Euripides, or Virgil, to open the book, and whatever firſt preſented itſelf to the eye upon opening, was taken for the ordinance of heaven. This made what they called the *ſortes Homericæ*, and *ſortes Virgilianæ*; which ſucceeded to the uſe of the *ſortes Prœneſtinæ*.

The bath *kol* among the Jews was much of the ſame kind, differing only in this circumſtance, that the Jews took their oracle from the firſt words which they heard any body pronounce; the heathen from the firſt they caſt their eyes upon, on opening Homer, &c. in which they endeavoured to diſcover a meaning ſuitable to the matter concerning which they enquired.

This ſuperſtition paſſed from paganiſm into Chriſtianity; and the Chriſtians took their *ſortes* out of the books of the Old and New Teſtament. The firſt paſſage that preſented itſelf upon opening a book of Scripture, was eſteemed the anſwer of God himſelf.

If the firſt paſſage did not happen to be any thing to the purpoſe for which the *ſortes* were conſulted, another book was opened; till a paſſage was met with that might be taken for an anſwer. This was called *ſortes ſanctorum.* St. Auguſtine (Epiſt. ad Jan. 109.) does not diſapprove of this method of learning futurity, provided it be not uſed for worldly purpoſes.

Gregory of Tours adds, that the cuſtom was firſt to lay the Bible on the altar, and to pray the Lord, that he would diſcover by it what was to come to paſs.

Inſtances of the uſe of the *ſortes ſanctorum* are very frequent in hiſtory. Heraclius, Mr. Fleury tells us, in his war againſt Coſroes, to learn where he ſhould take up his winter-quarters, purified his army for three days, and then opened the Goſpels, and found the place appointed for his winter-quarters was in Albania.

Gilbert of Nogent informs us, that, in his time (that is, about the beginning of the twelfth century), the cuſtom was, at the conſecration of biſhops, to conſult the *ſortes ſanctorum*, to learn the ſucceſs, fate, &c. of their epiſcopate.

The practice is founded on a ſuppoſition, that God preſides over the *ſortes*, and on Prov. xvi. 33. *The lot is caſt into the lap; but the diſpoſing thereof is of the Lord.*

In effect, many divines hold, that the *lot* is conducted in a particular manner by providence; that it is an extraordinary manner, wherein God declares his will by a kind of immediate revelation. The *ſortes ſanctorum*, however, were condemned by the council of Agda, in 506, at the time they were beginning to take footing in France, &c.

SORTILEGE, *ſortilegium*, a kind of divination by ſortes, or lots.

SORY, in *Natural Hiſtory*, the name of a foſſile ſubſtance, much ſpoken of by the ancients, but erroneouſly ſuppoſed to be now loſt.

It is a firm and not brittle ſubſtance, though of a ſpungy and cavernous ſtructure, and is conſiderably heavy. It is found in maſſes of no regular ſhape or ſize, ſome being roundiſh, others angular or flatted, and ſome of the ſize of a walnut, others of many pounds weight. It feels very harſh and rough to the touch, and is covered with no inveſtient coat or cruſt, but ſhews its natural ſurface, which is always corrugated or wrinkled, and uſually full of ſmall protuberances and cavities, and when broken, is found to be of a rugged and ſpungy ſtructure within.

Its natural colour is a ruſty black, but it is ſometimes reddiſh, and ſometimes bluiſh; and is commonly ſtained, in different places, with ſpots of a bluiſh or ruſt-colour, when black; and of a greeniſh hue, when it is of a reddiſh colour: in the places where it is free from theſe, it is uſually ſomewhat bright and ſparkling. It is of an acrid and diſagreeable taſte, and of a ſtrong and nauſeous ſmell; put into the fire it burns to a deep purple, and if boiled in water a great part of it becomes diſſolved in it; and this may again be ſeparated from the water by evaporation and cryſtallization, and then appears in the form of pure blue vitriol, forming regular rhomboidal cryſtals, and tinging iron to a copper-colour, on being firſt wetted, and then rubbed upon it.

It is found in many parts of the Turkiſh dominions, particularly in Gallo-Græcia; as alſo in ſome parts of Ger-

many. In this country it is boiled for the blue vitriol it contains. In Turky it is mixed with lime, and made into a paste with water, which is laid on such parts of the body as they would eradicate the hair from, and effects that purpose in a very few minutes. In the eastern nations, where it is thus used, it is known by the name RUSMA.

The ancients used it externally to take off pimples, and put a piece of it into a hollow tooth, as a remedy for the tooth-ach. There can be no doubt of their *sory* being the same substance with this; since Dioscorides has described it to be blackish in colour, full of small cavities, moist on the surface (as ours always is in moist weather), and of a disagreeable taste and smell.

This substance, as also the CHALCITIS, MISY, and MELANTERIA, are all properly ores of vitriol, the particles of those salts being so perfectly blended in them, as not to be at all distinguishable to the naked eye, yet being always regularly separable from them by water, which is to the saline ores what fire is to those of the metalline kind. Hill's Hist. of Foss. p. 606.

SOSPIRO, in the *Italian Music*, a pause or rest, equal to the time of a crotchet.

SOSPIRO, *canone al*. See CANONE *al sospiro*.

SOSTENUTO, in the *Italian Music*, denotes that the sound is to be held out in an equal and steady manner for the whole time of the note. Thus they say *arcate sostenute*. See Corelli, Concerto 8.

SOTERIA, formed from σωτηρ, *saviour*, in *Antiquity*, sacrifices offered to the gods, in gratitude for their having delivered a person from danger. See SACRIFICE.

The term is also applied to poetical pieces composed for the same end. Orpheus is the first who appears to have composed *soteria*.

Our Latin poets give the same name to poems in Latin verse, written to give thanks to God, or the saints, for having preserved them on any occasion. F. Petavius being delivered from a dangerous disease, by the intercession, as he supposed, of St. Genevieve, composed that fine piece in honour of that saint, still extant under the title of *Soteria*.

SOTIRELLA, a name given by some to a compound medicine, in form of a hard mass, and consisting of opium and some other narcotics, with camphor, wood-soot, and nutmeg. It is described in the Augustan Dispensatory, and is intended to be put into hollow teeth, as a remedy for the tooth-ach.

SOU. See SOL.

SOVEREIGN, *supreme*, the chief and highest Being, or the Almighty; a term, in strictness, only applicable to God.

The word is French, *souverain*; which Pasquier derives farther from the Latin *superior*, the first in any thing; or he who is superior to the rest. Hence,

In the ancient French customs we meet with *sovereign* master of the houshold; *sovereign* master of the forests; *sovereign* master of the treasury. Under Charles VI. the title *sovereign* was given to bailiffs and seneschals, with regard to their superiority over prevots, and chatelains.

SOVEREIGN, with regard to subjects, is applied to kings and princes, who are supreme and independent.

The authority of a *sovereign* is only bounded by the law of God, of nature, and the fundamental laws of the state. See KING.

SOVEREIGN is also a title given to such as are invested with certain rights and prerogatives, which belong only to *sovereigns*; as the power of coining money, sending agents to diets, to treat of war and peace, &c.

In which sense the feudatories of the empire, and the tributaries of the grand signior, are called *sovereigns*.

SOVEREIGN is also applied to courts and judges, who have a power from a prince to decide the processes of his subjects without appeal, or in the last resort.

At Paris there are five *sovereign* companies; the parliament, the chamber of accounts, the court of aids, the grand council, and the court of moneys.

In England we have but one *sovereign* court, which is the house of lords.

SOUGH, otherwise called an *adit*, in *Mineralogy*, is a passage like a vault cut out under the earth, to drain the water from the mines.

SOUL, *anima*, a spirit adapted to an organized body. See SPIRIT, and BODY.

Many of the ancient philosophers asserted an ANIMA *mundi*, a soul which moved and animated the machine of the universe, and gave action to all natural causes. This doctrine Plato handles very fully in his Timæus.

Others have given particular *souls* to all the heavenly bodies, the sun, stars, earth, &c. to regulate their motions.

The philosophers, many of them, allow of two, and others of three, kinds of *souls*; viz.

SOUL, *rational*, which they hold to be divine, and infused by the breath of God. This they call the spirit, and in this they suppose the intellect and will to be seated.

SOUL, *sensitive*, or *irrational*, which man has in common with brutes; which is formed out of the elements, and in which they apprehend the passions and appetites are seated.

SOUL, *vegetative*, which we have in common with plants; and which, as the first is the principle of reason and understanding, or that in us which thinks and understands; and the second, the principle of life; the third is the principle of growth, nutrition, and vegetation.

The Epicureans took the substance of the *soul*, we mean of the rational *soul*, to be a subtile air, composed of their atoms, or primitive corpuscles.

The Stoics held it to be a flame, or portion of heavenly light. Spinoza, and his followers, allowing only of one kind of substance, viz. matter; maintain the *soul* to be of the same substance with the body, viz. material. See SPINOZISM.

The doctrine of the materiality of the human *soul* has been adopted and maintained by several modern writers; and even by those who have distinguished themselves as able and zealous advocates in the cause of religion both natural and revealed. In this number we may reckon Dr. Priestley, who, rejecting the commonly received notion of MATTER, as an absolutely impenetrable, inert substance, and premising, that the powers of sensation or perception, and thought, as belonging to man, have never been found but in conjunction with a certain organized system of matter, maintains, that those powers necessarily exist in, and depend upon, such a system. In proof of this doctrine, it is alledged, that perception and thought are not incompatible with the properties of matter, considered as a substance extended and endued with the powers of attraction and repulsion; and, therefore, if one kind of substance be capable of supporting all the known properties of man, true philosophy, which will not authorize us to multiply causes or kinds of substance, without necessity, will forbid us to admit of any substance in the constitution of human nature essentially different from matter. The proper seat of the powers of perception and thought, according to this writer, is the brain; because, as far as we can judge, the faculty of thinking, and a certain state of the brain, always accompany and correspond to one another; and there is no instance of any man retaining this faculty, when his brain was destroyed; and whenever that faculty is impeded or injured, there is sufficient reason to believe that the brain is disordered in proportion. Dr. Priestley apprehends, that sensation and thought necessarily result from the organization of the brain, when the powers of mere life are given to the system, and that they follow of course, as much as the circulation of the blood follows respiration; but he professes to have no idea at all of the manner in which the power of perception results from organization and life.

To this reasoning it has been replied, in general, that Dr. Priestley's account of matter does not answer to the common ideas of matter, or that it is not solid extension, or an impenetrable and inert substance, which is the only matter that is the object of natural philosophy; but something not solid, that exists in space, and so far agreeing with spirit; and, consequently, if such matter is, as he asserts, the only matter possible, it will follow, not that we have no souls distinct from our bodies, but that we have no bodies distinct from our souls, and that all in nature is spirit. Besides, it has been farther urged, that a connection and dependence by no means prove sameness. From the dependence of actual sensations and thought on the brain, we have no more reason to conclude that the brain is the mind, than a savage who had never heard the music of a harpsichord, and did not see the hand that played upon it, would have to conclude, that it played upon itself, and was the musician; because he could trace all the sounds to the instrument, and found that when the strings were out of order, the music was disturbed or destroyed. What experience teaches us is, that the exercise of the mental powers *depends* on the brain and the nerves; not that the mind *is* the brain and the nerves. We are sure the mind cannot be the brain, because the brain is an assemblage of beings; whereas the mind is one being.

Dr. Priestley farther argues, that all our ideas either proceed from the bodily senses, or are consequent upon the perceptions of sense; and hence infers, that the notion of the possibility of thinking in man, without an organized body, is not only destitute of all evidence from actual appearances, but is directly contrary to them. Moreover, if the mind was naturally so independent of the body, as to be capable of subsisting by itself, and even of appearing to more advantage after the death of the body, as some of the advocates for an intermediate state

ſtate have maintained, it might, he ſays, diſcover ſome ſigns of its independence before its death, and eſpecially when the organs of the body were obſtructed, ſo as to leave the *ſoul* more at liberty to exert itſelf, as in a ſtate of ſleep or ſwooning, which moſt reſemble the ſtate of death, in which it is pretended that the *ſoul* is moſt of all alive, moſt active, and vigorous; but, judging by appearances, the reverſe of all this is the caſe. Beſides, if the mental principle was, in its own nature, immaterial and immortal, all its particular faculties would be ſo too; whereas we ſee that every faculty of the mind, without exception, is liable to be impaired, and even to become wholly extinct before death. Whence he infers, that the ſubſtance, or principle, in which theſe faculties exiſt, muſt be pronounced to be mortal too. He adds, if the ſentient principle in man be immaterial, it can have no extenſion, but every thing within it, or properly belonging to it, muſt be ſimple and indiviſible; and if this were not the caſe, the *ſoul* would be liable to corruption and death. But Dr. Prieſtley obſerves, that, whatever ideas are in themſelves, they are evidently produced by external objects, and muſt therefore correſpond to them; and ſince many of the objects or archetypes of ideas are diviſible, it neceſſarily follows, that the ideas themſelves are diviſible alſo; and hence he infers, that the ſentient principle in man, containing ideas which certainly have parts, and are diviſible, and conſequently having extenſion, cannot be that ſimple, indiviſible, and immaterial ſubſtance, that ſome have imagined it to be; but ſomething that has real extenſion, and therefore may have the other properties of matter. To this reaſoning an excellent writer replies, that it would be as proper to aſſert that ideas are hard or round, as to aſſert, that they are diviſible. Perception is a ſingle and indiviſible act; and though the object perceived may be diviſible, the perception of it by the mind cannot be ſo. Dr. Prieſtley farther adds, that the *ſoul* poſſeſſes a great variety of mental affections, which neceſſarily imply alteration, eſpecially melioration and depravation, which is ſomething ſo ſimilar to corruption, that it has univerſally obtained the ſame name, and which is certainly incompatible with natural and perfect ſimplicity. This writer alledges alſo, in favour of the ſyſtem of materialiſm, that we hereby get rid of many difficulties, which muſt embarraſs the oppoſite ſyſtem; ſuch, e. gr. as theſe—what becomes of the *ſoul* during ſleep, in a ſwoon, when the body is ſeemingly dead (as by drowning, or other accidents), and eſpecially after death? alſo what was the condition of it before it became united to the body, and at what time did that union take place? what are the nature and the ſtate of the *ſouls* of brutes? what is the uſe of the human body, &c. The ſyſtem of materialiſm, he ſays, which revelation uniformly ſuppoſes, is clogged with no difficulties of this kind. Man, according to this ſyſtem, is no more than what we now ſee of him. His being commences at the time of his conception, or perhaps at an earlier period. The corporeal and mental faculties, inhering in the ſame ſubſtance, grow, ripen, and decay together; and, whenever the ſyſtem is diſſolved, it continues in a ſtate of diſſolution, till it ſhall pleaſe that almighty Being, who called it into exiſtence, to reſtore it to life again. Accordingly the Chriſtian ſyſtem provides no reward for the righteous till the general reſurrection of the juſt, nor any puniſhment for the wicked till the end of the world. Hence alſo the doctrine of the pre-exiſtence of human *ſouls*, and that of the pre-exiſtence of Chriſt, are rejected, as having no other foundation than the notion of there being ſomething in man quite different from his corporeal organized ſyſtem.

Dr. Prieſtley argues in many parts of his work on the ſuppoſition, that, according to the ideas of modern immaterialiſts, ſpirit can have no relation to place, and is incapable of being preſent any where. But Dr. Clarke, and ſome others of the beſt modern writers, did not entertain theſe ideas of ſpirit. Time and place are neceſſary to the exiſtence of all things; and hence Dr. Clarke infers, that infinite ſpace and duration are the eſſential properties of the Deity. Sir Iſaac Newton was alſo of the ſame opinion; and Dr. Price obſerves, that if ſpirit exiſts at all, it muſt exiſt ſomewhere, as well as in ſome time.

Dr. Prieſtley deduces another argument in favour of the material ſyſtem, from the conſideration, that ſpirit and body have no common property, and that it muſt, therefore, be impoſſible for them to act upon one another: againſt which it has been objected, that his principles tend to prove, that the Deity is material, as well as all inferior beings: and if matter be a power of attraction and repulſion united to extenſion, the Deity muſt be the ſame. But if this maxim be not univerſally true, and the Deity be immaterial, as Dr. Prieſtley himſelf aſſerts, it will follow, that ſpirit may act upon matter, without having any other common property with it than being locally preſent to it; and one of his chief arguments for the materiality of the *ſoul* will be given up. Beſides, allowing this maxim, how is it poſſible to avoid aſſerting the impoſſibility of the creation of the world out of nothing? For what common property can the Creator have with *nothing*? Dr. Prieſtley has laboured to prove, that the Scriptures, both of the Old and New Teſtament, ſuppoſe and inculcate the doctrine of the uniform compoſition of man, or of the materiality of the human *ſoul*, and that, in conformity to this doctrine, the ſtate of retribution does not take place till after the general reſurrection. Accordingly his ſyſtem leads him to deny the natural immortality of the *ſoul*, and its conſcious exiſtence in the intermediate ſtate. To thoſe who object, that if the *ſoul* be not naturally capable of ſurviving the body, or if death is unavoidably its deſtruction, then the reſurrection muſt be the reſurrection of a non-entity; he replies, that though the power of thinking cannot exiſt without its ſubſtance, which is an organized ſyſtem, yet if this property of thinking neceſſarily attends the property of life, nothing can be requiſite to the reſtoration of all the powers of the man, but the reſtoration of the body to a ſtate of life. And he apprehends, that a reſurrection, properly ſo called (becauſe this can be only a reſurrection of ſomething that had been dead, viz. the body), is manifeſtly uſeleſs, upon the ſuppoſition of there being a *ſoul* diſtinct from the body; it being, upon this hypotheſis, the *ſoul*, and not the body, that is, the ſeat of all perception, and the ſource of all action. See Sleep *of the Soul*.

Dr. Prieſtley conceives, that the three doctrines of *Materialiſm*, of that which is commonly called Socinianism, and of philoſophical necessity, are equally parts of one ſyſtem, being equally founded on juſt obſervations of nature, and fair deductions from the Scriptures; and that whoſoever ſhall duly conſider their connection and dependence on one another, will find no ſufficient conſiſtency in any general ſcheme of principles, that does not comprehend them all. But it has been urged by another able writer, that, if man be the matter itſelf which conſtitutes the man, and not its form or arrangement, as Dr. Prieſtley allows, the man will always remain while the matter which conſtitutes him remains, however different its organization or arrangement may be; that ſince death does not deſtroy the matter which conſtitutes man, it does not deſtroy the man; and that, conſequently, he goes on to exiſt after death, or is naturally immortal: that, in order to the reſurrection of the ſame man, the ſame matter muſt ariſe: and that it is no leſs poſſible for man to have exiſted *before* his birth, than it is, that he ſhould exiſt *after* his death; and that, conſequently, all the ſupport to the Socinian ſcheme, which Dr. Prieſtley derives from his ſentiments of materialiſm, falls to the ground. To this reaſoning, however, he replies, that the pre-exiſtence of the materials of the man Jeſus is a very different kind of pre-exiſtence from that of thoſe who make Chriſt, or rather the principal part of him, to have pre-exiſted in an active ſtate. We ſhall here ſubjoin the following argument urged by the learned Dr. Clarke againſt Mr. Dodwell, in proof of the immateriality and natural immortality of the *ſoul*. That the *ſoul* cannot be material, he ſays, is demonſtrable from the ſingle conſideration even of bare ſenſe and conſciouſneſs itſelf. For matter being a diviſible ſubſtance, conſiſting always of ſeparable, nay, of actually ſeparate and diſtinct parts; it is plain, unleſs it were eſſentially conſcious, in which caſe every particle of matter muſt conſiſt of innumerable ſeparate and diſtinct conſciouſneſſes, no ſyſtem of it in any poſſible compoſition or diviſion can be an individual conſcious being: for ſuppoſe three, or three hundred particles of matter at a mile, or any given diſtance, one from another, is it poſſible that all thoſe ſeparate parts ſhould, in that ſtate, be one individual conſcious being? Suppoſe then all theſe particles brought together, into one ſyſtem, ſo as to touch one another, will they, thereby, or by any motion or compoſition whatſoever, become any whit leſs truly diſtinct beings, than they were at the greateſt diſtance? How then can their being diſpoſed in any poſſible ſyſtem, make them one individual conſcious being? If you ſuppoſe God by his infinite power ſuperadding conſciouſneſs to the united particles, yet ſtill thoſe particles, being really and neceſſarily as diſtinct beings as ever, cannot be themſelves the ſubject in which that individual conſciouſneſs inheres; but the conſciouſneſs can only be ſuperadded by the addition of ſomething, which, in all the particles, muſt ſtill itſelf be but one individual being. The *ſoul*, therefore, whoſe power of thinking is undeniably one individual conſciouſneſs, cannot poſſibly be a material ſubſtance. See on this ſubject Prieſtley's Diſquiſitions relating to Matter

Matter and Spirit, 8vo, 1777. Correſpondence between Dr. Price and Dr. Prieſtley, 8vo. 1778. Clarke's Demonſtration of the Being and Attributes of God. Anſwer to Dodwell. Controverſies with Collins; and Letters between him and Leibnitz. Butler's Analogy, chap. i. Baxter's Matho, vol. i. Enquiry into the Nature of the Human Soul, &c. vol. i.

The Carteſians make thinking the eſſence of the *ſoul*; and, from this principle, deduce its immateriality and mimortality. But, according to Mr. Locke, &c. the principle is falſe; nor is there any need to define the *ſoul* a ſubſtance that thinks to prove it immortal. It is enough that the *ſoul* be capable of thinking, and that it produce its own thoughts, without making thinking its eſſence. It is no more eſſential to the *ſoul* to think than to will; for a thing I can conceive the *ſoul* without, cannot be its eſſence.

Again, if thought be the eſſence of the *ſoul*, as a thing cannot produce itſelf, its own being, or eſſence; the *ſoul* does not produce its own thoughts, nor its own will: and thus is it brought to the condition of brutes, or even of inanimate bodies, without any action, any liberty, &c.

If the Carteſians only mean this of the faculty of thinking, they do wrong even to call this the eſſence of the *ſoul*. It is no more its eſſence than the faculty of willing is. And we conceive ſomething in the *ſoul* prior to both thoſe faculties.

The *ſoul* is a ſpiritual ſubſtance, proper to inform or animate a human body; and, by its union with this body, to conſtitute a reaſonable animal or man. This is its eſſence, and this its definition.

It muſt be owned, the Carteſians prove the ſpirituality and immortality of the *ſoul*, from its thinking, exceedingly well; but they are not to have the honour of this proof as their own invention. All the great philoſophers uſed it before them, and uſe it ſtill.

The philoſophers are not at all agreed as to the manner wherein the *ſoul* reſides in the body. Some hold it equally diffuſed throughout every part thereof. And others ſay it influences, and acts on every part of the body, though it has its principal reſidence in ſome particular part, called the SENSORY.

This principal part, Deſcartes maintains, is the PINEAL *gland* of the brain, where all the nerves terminate. See GLAND.

Borri, a Milaneſe phyſician, in a letter to Bartholine, De ortu Cerebri, & uſu Medico, aſſerts, that in the brain is found a very ſubtle, fragrant juice, which is the principal ſeat or reſidence of the reaſonable *ſoul*; and adds, that the ſubtlety and fineneſs of the *ſoul* depends on the temperature of this liquor, rather than on the ſtructure of the brain, to which it is uſually aſcribed. This liquor, we conceive, muſt be the ſame with what is uſually called the *nervous juice*, or *animal ſpirits*: the conſtitution whereof is, doubtleſs, of great importance, with regard to the faculties of the *ſoul*.

Mr. Locke diſtinguiſhes two principal faculties or powers of the rational or human *ſoul*, viz. *perception* and *willing*. See POWER.

To theſe other philoſophers add others; as *ſenſation*, *liberty*, *memory*, *imagination*, and *habit*.

The myſtic divines diſtinguiſh two principal parts of the *ſoul*: the *ſuperior part*, which comprehends the underſtanding and the will, and the *inferior part*, which comprehends imagination and ſenſation.

As to the *ſoul* of brutes, the Carteſians, and ſome others, deny its exiſtence in the common ſenſe of the word *ſoul*; that is, they ſtrip it of all the properties or faculties of the human *ſoul*: and the Peripatetics, on the contrary, inveſt it with the greateſt part, if not all of them.

In man, a particular agitation of the fibres of the brain is accompanied with a ſenſation of heat; and a certain flux of animal ſpirits towards the heart and viſcera, is followed by love or hatred.

Now the Peripatetics maintain, that brutes feel the ſame heat, and the ſame paſſions, on the ſame occaſions; that they have the ſame averſion for what incommodes them; and, in the general, are capable of all the paſſions, and all the ſenſations we feel.

The Carteſians deny they have any perceptions or notices at all, that they feel any pain or pleaſure, or love or hate any thing. The ground of their opinion is, that they allow of nothing in brutes but what is material; and that they deny ſenſations and paſſions to be any properties of matter.

Some of the Peripatetics, on the other hand, maintain matter, when ſubtilized, framed, ranged, and moved, in a certain manner, to be capable of ſenſation and paſſion; that beaſts may feel and perceive, by means of the animal ſpirits, which are a matter thus modified; and that even the human *ſoul* itſelf only becomes capable of ſenſation and paſſion by means thereof.

The maintainers of the contrary opinion urge that appearance of ſenſe, of fear, caution, love for their young, admirable ſagacity, both for their own preſervation and that of their ſpecies, viſible through the whole brute creation. And it is true, that all the actions of beaſts plainly expreſs an underſtanding, for every thing that is regular expreſſes it, even a machine or watch expreſſes it, and a plant much more; the radicle of the ſeed turning downwards, and the ſtem upwards, whatever ſituation the ſeed is ſown in; the young plant knitting from ſpace to ſpace to ſtrengthen it, its putting forth prickles, &c. to defend it, &c. mark a great underſtanding. All the motions of plants and brutes plainly diſcover an intelligence; but the intelligence does not reſide in the matter thereof; it is as diſtinct from the beaſt or plant, as that which ranged the wheels of the watch is diſtinct from the watch itſelf.

For, in effect, this intelligence appears infinitely great, infinitely wiſe, infinitely powerful; and the ſame which formed us in our mother's womb, which gave us our growth, &c. Thus, in brutes, there is not either underſtanding or *ſoul*, in the ſenſe we generally uſe the word; they eat without pleaſure, cry without pain, grow without knowing it. They fear nothing, know nothing, and, if they act in ſuch manner as ſhews underſtanding, it is becauſe God, having made them, to preſerve them, has formed their bodies ſo as to avoid whatever might hurt them mechanically.

Otherwiſe it might be ſaid, that there is more underſtanding in the vileſt inſect, nay, in the ſmalleſt grain, than in the moſt knowing men; for it is evident, either of them contains more parts, and produces more regular motions and actions than we are capable of underſtanding. Thus does the great F. Malebranche argue againſt the *ſouls* of brutes. Recherche de la Verite, liv. vi.

Mr. Locke (Eſſ. vol. i. p. 120. 148.) maintains, that the *ſouls* of brutes are wholly material; that they do not poſſeſs the power of abſtraction; and that the having general ideas is that which puts a perfect diſtinction between man and brutes. Dr. Prieſtley is of opinion, that as brutes have the ſame external ſenſes that we have, they have, of courſe, all the ſame inlets to ideas; and though, on account of their wanting a ſufficient quantity of brain, perhaps, chiefly, the combination and aſſociation of their ideas cannot be ſo complex as ours, and, therefore, they cannot make ſo great a progreſs in intellectual improvements, they muſt neceſſarily have, in kind, every faculty that we are poſſeſſed of. And ſince they evidently have memory, paſſions, will, and judgment too, as their actions demonſtrate, they muſt, of courſe, have the faculty of abſtraction as well as the reſt; though not having the uſe of words, they cannot communicate their ideas to us. However, he expreſſes a doubt whether they will ſurvive the grave, as there is no hint of this kind in Revelation, which alone informs us, that men will riſe again. Nevertheleſs, Dr. Prieſtley adds, that if the reſurrection be, in fact, within the proper courſe of nature, extenſively conſidered, and conſequently there be ſomething remaining of every organized body that death does not deſtroy, there will be reaſon to conclude, that they will be benefited by it as well as ourſelves. And the great miſery to which ſome of them are expoſed in this life, may incline us to think, that a merciful and juſt God will make them ſome recompence for it hereafter. Diſquiſitions, &c. p. 239. See BRUTES and INSTINCT.

SOULS, *cure of*. See CURE.

SOULS, *migration of*. See MIGRATION and METEMPSYCHOSIS.

SOUL, *ſleep of the*. See SLEEP *of the Soul*.

SOUL-*ſcot*, a certain fee paid by our Saxon anceſtors to the prieſt on opening a grave.

SOUL'S *cheat*, a legacy anciently bequeathed at their deaths by our ſcrupulouſly pious anceſtors, to the pariſh-prieſt, to compenſate for any tithes that might have been forgot in their lives.

SOUND, SONUS, a perception of the ſoul, communicated by means of the ear; or, the effect of a colliſion of bodies, and a tremulous motion, conſequent thereon, communicated thence to the circumambient fluid, and propagated through it to the organs of hearing.

To illuſtrate the cauſe of *ſound* we obſerve, firſt, that a motion is neceſſary in the ſonorous body for the production of *ſound*. Secondly, That this motion exiſts, firſt, in the ſmall and inſenſible parts of the ſonorous bodies; and is excited in them by their mutual colliſion and percuſſion againſt each other, which produces that tremulous motion ſo obſervable in bodies that have a clear *ſound*,

found, as bells, mufical chords, &c. Thirdly, That this motion is communicated to, or produces a like motion in the air, or fuch parts of it, as are fit to receive and propagate it, inafmuch as no motion of bodies, at a diftance, can affect our fenfes, without the mediation of other bodies, which receive thofe motions from the fonorous body, and communicate them immediately to the organ. Laftly, That this motion muft be communicated to thofe parts that are the proper and immediate inftruments of hearing.

Further, that motion of a fonorous body, which is the immediate caufe of *found*, may be owing to two different caufes; either the percuffion between it and other hard bodies, as in drums, bells, chords, &c. or the beating and dafhing of the fonorous body and the air immediately againft each other, as in wind-inftruments, flutes, trumpets, &c.

But, in both cafes, the motion, which is the confequence of the mutual action, and the immediate caufe of the fonorous motion which the air conveys to the ear, is an invifible, tremulous, or undulating motion, in the fmall and infenfible parts of the body.

To explain this, all fenfible bodies are fuppofed to confift of a number of fmall and infenfible parts or corpufcles, which are of the fame nature in all bodies, and are perfectly hard and incompreffible.

Of thefe are compofed others, fomewhat greater, but ftill infenfible; and thefe different, according to the different figures and union of their component parts. Thefe, again, conftitute other maffes bigger and more different than the former; and, of the various combinations of thefe laft, are thofe grofs bodies compofed that are vifible, tangible, &c. The firft and fmalleft parts, we have obferved, are abfolutely hard; the others are compreffible, and are united in fuch manner, that, being compreffed by an external impulfe, they have an elaftic or reftitutive power, whereby they reftore themfelves to their natural ftate.

A fhock, then, being made by one body upon another, the fmall particles, by their elaftic principle, move to and again with a very great velocity in a tremulous, undulating manner, fomewhat like the vifible motions of groffer fprings; as we eafily obferve in the chords of mufical inftruments. And this is what we may call the *fonorous motion*, which is propagated to the ear; but obferve, that it is the infenfible motion of thofe particles next the fmalleft, which is fuppofed to be the immediate caufe of *found*; and, of thefe, only thofe next the furface communicate with the air, the motion of the whole, or of the greater parts, being no farther concerned, than as they contribute to the other.

To apply this theory, ftrike a bell with any hard body, and you eafily perceive a fenfible tremor in the furface, fpreading itfelf over the whole, and that more fenfibly as the fhock is greater. Upon touching it in any other part, the motion and the *found* too are ftopped. Now this is apparently a motion of the fmall and infenfible parts, changing their fituations, with refpect to one another; which being fo many, and fo clofely united, we cannot perceive their motions feparately and diftinctly; but only a trembling, which we reckon to be the effect of the confufion of an infinite number of little particles, clofely joined, and only moving in infinitely little lines.

Mr. Perrault adds, that the vifible motion of the parts contributes no otherwife to *found*, than as it caufes the invifible motion of the fmaller parts, which he calls *particles*, to diftinguifh them from the fenfible ones, which he calls *parts*, and from the fmalleft of all, which we call *corpufcles*.

This he fupports from the inftance of a chord, which being ftruck, and the *found*, and fenfible undulations, at reft again, if you approach the chord foftly with the finger, you will find a fmall tremulous motion, which is the remains of the vibrations of the whole chord and the parts. Now the parts vibrate without any *found*; but no fooner is the vibration felt by the finger, than the *found* is heard again; which he afcribes to this, that the motion of the parts being infufficient to move the particles, whofe motion is the firft that ceafes, requires fome affiftance from dafhing againft the finger, whereby to become enabled to give the particle the motion neceffary for the producing of *found*. He finifhes his proof by the inftance of flutes, which, when made of different matters, as wood, metal, &c. whofe parts are very different, but their particles nearly the fame, if their lengths and bore be the fame, there is very little fenfible difference in their *founds*.

The fonorous body having made its impreffion on the contiguous air, that impreffion is propagated from one particle to another, according to the laws of pneumatics. A few particles, for inftance, driven from the furface of the body, drive their neighbouring particles into a lefs fpace; and the medium, as it is thus rarefied in one place, becomes condenfed in the other; but the air thus compreffed in the fecond place, is, by its elafticity, returned back again, both to its former place and its former ftate; and the air contiguous to that is compreffed; and the like obtains, when the air lefs compreffed expanding itfelf, a new compreffion is generated. From each agitation of the air, therefore, there arifes a motion of the air, analogous to the motion of a wave on the furface of the water; which we call a *wave*, or *undulation* of air.

In each wave the particles go and return back again, through very fhort, but equal fpaces; the motion of each particle is analogous to the motion of a vibrating pendulum, while it performs two ofcillations; and moft of the laws of the pendulum, with very little alteration, are applicable thereto.

Sounds are as various, as are the means that concur to their production. The principal varieties refult from the figure, conftitution, quantity, &c. of the fonorous body; the manner of percuffion, with the velocity, &c. of the vibrations confequent thereon; the ftate and conftitution of the medium; the difpofition, diftance, &c. of the organ; the obftacles between the organ and the fonorous object, and the adjacent bodies. The moft notable diftinction of *founds*, arifing from the various degrees and combinations of the conditions mentioned, are into *loud* and *low* (or ftrong and weak); into *grave* and *acute* (or fharp and flat, or high and low); and into *long* and *fhort*. The management whereof makes the office of mufic.

Mr. Euler is of opinion, that no *found* making fewer vibrations than 30, or more than 7520 in a fecond, is diftinguifhable by the human ear. According to this doctrine, the limit of our hearing, as to acute and grave, is an interval of eight octaves. Tentam. Nov. Theor. Muf. cap. i. fect. 13.

The velocity of *found* is the fame with that of the aereal waves, and does not differ much, whether it go with the wind or againft it. By the wind, indeed, a certain quantity of air is carried from one place to another; and the *found* is accelerated, while its waves move through that part of the air, if their direction be the fame as that of the wind. But as *found* moves vaftly fwifter than wind, the acceleration it will hereby receive is inconfiderable; and the chief effect we can perceive from the wind is, that it increafes and diminifhes the fpace of the waves, fo that by help hereof the *found* may be heard to a greater diftance than otherwife it would. See Wind, *& infra*.

That the air is the ordinary medium of *found*, appears from various experiments in rarefied and condenfed air. In an unexhaufted receiver, a fmall bell may be heard fome diftance; but when exhaufted, it can fcarce be heard at the fmalleft diftance. If the air be condenfed, the *found* will be louder proportionably to the condenfation, or quantity of air crouded in; of which we have many inftances in Mr. Haukfbee's experiments.

Befides, founding bodies communicate tremors to diftant bodies; e. g. the vibrating motion of a mufical ftring puts others in motion, whofe tenfion and quantity of matter difpofe their vibrations to keep time with the pulfes of air, propagated from the ftring that was ftruck. Galileo explains this phenomenon by obferving, that a heavy pendulum may be put in motion by the leaft breath of the mouth, provided the blafts be often repeated, and keep time exactly with the vibrations of the pendulum, and alfo by the like art in raifing a large bell.

Dr. Prieftley conftructed an apparatus in order to afcertain whether the intenfity of *found* is affected by any other property of the air in which it is made befides its mere denfity. The refult of his experiments with different kinds of air was, that the intenfity of *found* depends folely upon the denfity of the air in which it is made, and not at all upon any chemical principle in its conftitution. In inflammable air the *found* of the bell he ufed was hardly to be diftinguifhed from the fame in a pretty good vacuum; and this air is ten times rarer than common air. In fixed air the *found* was much louder than in common air, fo as to be heard about half as far again; and this air is in about the fame proportion denfer than common air. In dephlogifticated air the *found* was alfo fenfibly louder than in common air. Experiments and Obfervations, &c. vol. v. p. 296, &c.

But it is not the air alone that is capable of the impreffions of *found*, but water alfo, as is manifeft, by ftriking a bell under water, the *found* of which may plainly enough be heard, only not fo loud, and alfo a fourth deeper, according to good judges in mufical notes. And Merfenne fays, a *found* made under water is of the

the same tone or note as if made in air, and heard under water.

The space through which *sound* is propagated in a given time, has been very differently estimated by authors who have written concerning this subject. Roberval gives it at the rate of 560 feet in a second; Gassendus at 1473; Mersenne at 1474; Du Hamel, in the History of the Academy of Sciences at Paris, at 1172; the Academy del Cimento at 1148; Boyle, at 1200; Roberts, at 1300; Walker, at 1338; sir Isaac Newton, at 968; Dr. Derham, in whose measure Mr. Flamsteed and Dr. Halley acquiesced, at 1142.

The reason of which variety Dr. Derham ascribes partly to some of those gentlemen using strings and plummets instead of regular pendulums; and partly to there not being distance enough between the sonorous body and the place of observation; and partly to there being no regard had to the winds.

But by the accounts since published by M. Cassini de Thury, in the Memoirs of the Royal Academy of Sciences at Paris for the year 1738, where cannon were fired at various as well as great distances, under great variety of weather, wind, and other circumstances, and where the measures of the different places had been settled with the utmost exactness, *sound* was propagated at a medium at the rate only of 1038 French feet in a second. The French foot exceeds the English by nearly seven lines and a half, or is as 107 to 114; and consequently 1038 French feet are equal to 1106 English feet. The difference, therefore, of the measures of Dr. Derham and M. Cassini is 34 French, or 36 English feet, in a second. According to this last measure, the velocity of *sound*, when the wind is still, is settled at the rate of a mile, or 5280 English feet, in $4\frac{7}{10}''$.

Some of the most considerable queries, relating to the laws of *sounds*, Dr. Derham proposes; and answers several of them accurately, from experiments made for that purpose by himself, as follows:

How far does a *sound* move in a second of time? *Sound* moves 1142 feet, or 380 yards in a second, which is just an English mile, in $9\frac{1}{4}$ or 9.25 half seconds; two miles in $18\frac{1}{2}$; three miles, or a league, in $27\frac{3}{4}$, &c. and about 13 miles in one minute.

But sea miles are to land miles nearly as 7 to 6; and, therefore, *sound* runs a sea-league in about 12 seconds of time. It is a common observation, that persons in good health have about 75 pulsations, or beats, of the artery at the wrist, in a minute; consequently, in 75 pulsations, *sound* flies about 13 land miles, and about $11\frac{1}{7}$ sea miles, which is about one land mile in 6 pulses, and about 1 sea mile in near 7 pulses, or a league in 20 pulses. And hence the distance of objects may be found, by knowing the time which *sound* takes to move from those objects to an observer. E. g. upon seeing the flash of a gun at sea, if 56 beats of the pulse at the wrist were counted before the report was heard, the distance of that gun may be easily found by dividing 56 by 20, which gives 2.8 leagues, or about 8 miles.

Does the report of a gun, discharged with its mouth towards us, come sooner than when the muzzle is from the observer? By repeated experiments it appears, there is no difference in the *sound* from this different direction.

Do *sounds* move in the same time, through the same spaces, in all states of the atmosphere, and heights of the barometer, by day and by night, in summer and in winter, in snowy and in clear weather, in this or that climate? By repeated experiments, it does not appear there arises any difference from any of these different circumstances.

Do the winds affect the motion of *sounds*? By repeated experiments it appears, there is some, though a very small difference, in the velocity of *sounds*, with or against the wind; which is also augmented or diminished by the strength or weakness of the wind.

Do a great and intense *sound*, and a small or languid one, move with the same velocity? It appears that they do.

For by experiments, a cannon fired with a half-pound charge of powder, was heard at about the distance of $17\frac{1}{2}$ miles in the same time after the flash was seen, as when fired with a charge of 6lb.

Does the *sound* of a gun move equally swift at all elevations of the gun? It does.

Do different quantities or strengths of gun-powder occasion any difference as to the velocity of the *sound*? None.

Does *sound* move in a right line the nearest way, or does it sweep along the earth's surface? And is there any difference in the time, if the piece be discharged in an acclive and a declive position? *Sound* moves the nearest way; and the velocity appears to be the same in acclivities as in declivities.

Have all kinds of *sounds*, as those of guns, bells, &c. the same velocity? And are *sounds* equally swift in the beginning of their motion, and in the end? There appears no inequality in either of these respects; and, therefore, the times in which *sound* is heard are proportional to the distance; that is, at a double distance it is heard in twice the time, &c.

SOUND, *for the reflection, refraction, &c. of*, see ECHO and PHONICS.

SOUNDS, *articulate*. See ARTICULATE.

SOUND, in *Music*, denotes a quality in the several agitations of the air, considered as their disposition, measure, &c. may make MUSIC or HARMONY.

Sound is the object of music; which is nothing but the art of applying *sounds*, under such circumstances of tone and time, as to raise agreeable sensations.

The principal affection of *sound*, whereby it becomes fitted to have this end, is that whereby it is distinguished into *acute* and *grave*.

This difference depends on the nature of the sonorous body; the particular figure and quantity thereof; and even in some cases, on the part of the body where it is struck; and this is that which constitutes what we call *different tones*.

The cause of this difference appears to be no other than the different velocities of the vibrations of the *sounding* body. In effect, the tone of a *sound* is found, by abundance of experiments, to depend on the nature of those vibrations, whose differences we can conceive no otherwise than as having different velocities: and since it is proved, that the small vibrations of the same chord are all performed in equal time, and that the tone of a *sound*, which continues for some time after the stroke, is the same from first to last, it follows, that the tone is necessarily connected with a certain quantity of time in making each vibration, or each wave; or that a certain number of vibrations or waves, accomplished in a given time, constitute a certain and determinate tone. From this principle are all the phenomena of *tune* deduced.

If the vibrations be isochronous, the *sound* is called musical, and is said to continue at the same pitch; and is said to be acuter, sharper, or higher than any other *sound* whose vibrations are slower and graver, flatter or lower, than any other whose vibrations are quicker. See UNISON.

From the same principle arise what we call CONCORDS, &c. which are nothing but the results of frequent unions and coincidences of the vibrations of two sonorous bodies, and consequently of the waves and undulating motions of the air occasioned thereby.

On the contrary, the result of less frequent coincidences of those vibrations is what we call a DISCORD.

Another considerable distinction of SOUNDS, with regard to music, is that, whereby they are denominated *long* and *short*; not with regard to the sonorous body's retaining a motion once received, a longer or a less time, though gradually growing weaker, but to the continuation of the impulse of the efficient cause on the sonorous body, for a longer or shorter time, as in the notes of a violin, &c. which are made longer or shorter by strokes of different length or quickness.

This continuity is, properly, a succession of several *sounds*, or the effect of several distinct strokes, or repeated impulses, on the sonorous body, so quick, that we judge it one continued *sound*, especially if it be continued in the same degree of strength; and hence arises the doctrine of *measure* and *time*.

Sounds again are distinguished, with regard to music, into *simple* and *compound*, and that two ways. In the first, a *sound* is said to be *compound*, when a number of successive vibrations of the sonorous body, and the air, come so fast upon the ear, that we judge them the same continued *sound*; as in the phenomenon of the circle of fire, caused by putting the fired end of a stick in a quick circular motion; where, supposing the end of the stick in any point of the circle, the idea we receive of it there continues till the impression is renewed by a sudden return.

A *simple* SOUND then, with regard to this composition, should be the effect of a single vibration, or of so many vibrations as are necessary to raise in us the idea of *sound*. In the second sense of composition, a *simple sound* is the product of one voice, or one instrument, &c.

A *compound* SOUND consists of the *sounds* of several distinct voices or instruments all united in the same individual time, and measure of duration, that is, all striking the ear together, whatever their other differences may be. But in this sense again, there is a two-fold composition; a natural and an artificial one.

The natural composition is that proceeding from the manifold

nifold reflections of the first *sound* from adjacent bodies, where the reflections are not so sudden as to occasion echoes, but are all in the same tune with the first note.

The artificial composition, which alone comes under the musician's province, is, that mixture of several *sounds*, which being made by art, the ingredient *sounds* are separable, and distinguishable from one another. In this sense the distinct *sounds* of several voices or instruments, or several notes of the same instrument, are called *simple sounds*, in contradistinction to the compound ones, wherein, to answer the end of music, the simples must have such an agreement in all relations, chiefly as to acuteness and gravity, as that the ear may receive the mixture with pleasure.

Another distinction of *sounds* with regard to music is, that whereby they are said to be *smooth* and *even*, or *rough* and *harsh*, also *clear* and *hoarse*: the cause of which differences depends on the disposition and state of the sonorous body, or the circumstances of the place; but the ideas of the differences must be sought from observation.

Smooth and *rough sounds* depend principally on the *sounding* body; of these we have a notable instance in strings that are uneven, and not of the same dimension or constitution throughout.

M. Perrault, to account for roughness and smoothness, maintains, there is no such thing as a simple *sound*; but that the *sound* of the same chord or bell is a compound of the *sounds* of the several parts of it; so that where the parts are homogeneous, and the dimensions or figure uniform, there is always such a perfect mixture and union of all the *sounds*, as makes one uniform and smooth *sound*; contrary conditions produce harshness. In effect, a likeness of parts and figure makes an uniformity of vibrations, whereby a great number of similar and coincident motions conspire to fortify and improve each other, and unite, for the more effectual producing of the same effect.

This account he confirms from the phenomenon of a bell, which differs in tone according to the part it is struck in; and yet strike it any where, there is a motion over all the parts. Hence he considers the bell as composed of an infinite number of rings, which, according to their different dimensions, have different tones, as chords of different lengths have; and, when struck, the vibrations of the parts immediately struck specify the tone, being supported by a sufficient number of consonant tones in other parts. This must be allowed, that every note of a stringed instrument is the effect of several simple *sounds*; for there is not only the *sound* resulting from the motion of the string, but that from the motion of the parts of the instrument, which has a considerable effect in the total *sound*, as is evident from hence, that the same string, on different violins, *sounds* very differently.

But Perrault affirms the same of every string itself, and without considering the instrument. Every part of the string, he says, has its particular vibrations, different from the gross and sensible vibrations of the whole; and these are the causes of different motions and *sounds* in the particles, which, uniting, compose the whole *sound* of the string, and make an uniform composition, wherein the tone of the particular part struck prevails, and all the others mix under a due subordination with it, so as to make the composition smooth and agreeable. If the parts be unevenly or irregularly constituted, the *sound* is harsh; which is the case in what we call *false strings*, and various other bodies, which, for this reason, have no certain and distinct tone, but a composition of several tones, which do not unite and mix, so as to have one predominant to specify the total tone.

As to *clear* and *hoarse sounds*, they depend on circumstances that are accidental to the sonorous body; thus a voice or instrument will be hollow and hoarse if raised within an empty hogshead, that yet is clear and bright out of it: the effect is owing to the mixture of other and different *sounds*, raised by reflections, which corrupt and change the species of the primitive *sounds*.

For *sounds* to be fit to obtain the end of music, they ought to be smooth and clear, especially the first; since, without this, they cannot have one certain and discernible tone, capable of being compared to others, in a certain relation of acuteness, of which the ear may judge, and of consequence they can be no part of the object of music.

Upon the whole then, with Mr. Malcolm, we call that an *harmonic* or *musical sound* which, being clear and even, is agreeable to the ear, and gives a certain and discernible tune (hence called *tunable sound*), which is the subject of the whole theory of harmony.

SOUNDS, *harmonical*. See HARMONICAL.

The *harmonical sounds*, viz. the twelfth and seventeenth above the principal (as well as some others) have been long known to accompany every fundamental *sound*; and may naturally, and in general, be supposed to be produced by the partial or separate vibrations of the string or sonorous body, spontaneously dividing itself, according to a determinate law, into three, five, or other aliquot parts of the whole, considered as unity. The theory of M. Rameau, which has been so excellently illustrated by M. d'Alembert, in his *Elémens de Musique*, is founded on these *harmonical sounds*. See FUNDAMENTAL *Bass*.

SOUNDS, *harmonic*, denote also a singular kind of *sounds*, which are produced in certain instruments, such as the violin and violincello, by a particular motion of the bow, and by placing the finger lightly in certain divisions of the chord. These *sounds* are very different, both with regard to their tone and their modification, from such as would be produced by keeping the finger always immoveable. As to the tone, they will yield the 5th when they ought to have given the 3d, and the 3d instead of the 4th, &c. And with regard to their modification, they are much sweeter than those that are drawn full from the same division of the chord, and, on account of their sweetness, they are called *fluted sounds*. By sliding the finger lightly from sharp to flat, from the middle of a chord which is touched at the same time with the bow, we hear distinctly a succession of *harmonic sounds* from flat to sharp, which are very astonishing to those who are not acquainted with their theory.

The principle on which this theory is founded is, that if a chord be divided into two parts which are commensurable with each other, and consequently with the whole chord, and the obstacle placed at the point of division obstructs, in an imperfect manner, the communication of the vibrations from one part to another; when it is sounded, it will not yield the *sound* of the entire chord, nor that of its greater part, but that of the smaller part, if it exactly measures the other; or if it does not measure it, the *sound* of the greatest aliquot common to these two parts. Let a chord as 6 be divided into two parts, as 4 and 2, the *harmonic sound* will be produced by the small part 2, which is aliquot of the other 4; but if a chord, as 5, be divided into two parts, as 2 and 3, then, as the small part does not measure the greater, the *harmonic sound* will proceed from the half, 1, of the small part; unit being the greatest common measure of the two parts 3 and 2, and of the whole chord 5. By means of this law, which is conformable to the experiments of M. Sauveur and of Dr. Wallis, it is easy, by a very simple calculation, to assign to each tone the *harmonic sound* which answers to it. Whilst the finger slides the length of the chord, we obtain a series of *harmonic sounds*, which succeed each other rapidly according to the order of the divisions of the chord, to which the finger is successively applied.

The first column of the following table exhibits the *sounds* which the divisions of the instrument would yield when touched full, and the second column shews the fluted *sounds* corresponding to them when the chord is touched harmonically.

Table of Harmonic Sounds.

The whole chord	gives	the unison
The minor third		the 19th, or double octave of the 5th
The major third		the 17th, or double octave of the major third
The fourth		the double octave
The fifth		the 12th, or octave of the same 5th
The minor sixth		the triple octave
The major sixth		the 17th major, or double octave of the 3d
The octave		the octave.

After the first octave, i. e. advancing from the middle of the chord towards the bridge, we shall have again the same *harmonic sounds* in the same order on the same divisions, i. e. the 19th on the minor 10th, the 17th on the major 10th, &c. *Encyclopedie*, art. *Harmoniques* SONS.

SOUNDS, *third*, in *Music*, denote those which are produced by sounding two notes at the same time, either on the same or on two different instruments; and which are almost always graver than the lowest of the two tones that generated them, and are their proper fundamental bass.

The discovery of these *sounds* has been generally ascribed to Tartini who published an account of them in his Tratto di Musica, secundo la vera Scienza dell' Armonia, printed at Padua, 1754; but the Encyclopedie, art. *Harmonie*, attributes the first discovery, though probably un-

known

known to Tartini, to M. Romieu, of the Royal Society of Sciences of Montpellier, who published an account of it in a Memoir in 1752.

The experiment may be made by sounding the perfect interval of a 3d, 4th, or 5th, &c. either on two strings of the same violin, or on two violins played upon at the distance of about thirty feet, with a strong bow, and holding out the notes; or with two trumpets, hautbois, or German flutes; the hearer, in the last mentioned cases, placing himself in the middle of the interval between the two instruments. Thus e. g. the interval C *e*, or a major 3d, produces C, the octave below the lower note; C *sharp e*, a minor 3d, produces A, a tenth below the graver tone; B *e*, a 4th, gives E, the octave of the upper note; B *f sharp*, a 5th, produces an unison to B; B *g*, a 6th, generates the double octave below the upper note; and B *flat g*, or the major 6th, produces E *flat*, the 5th of the lower note, &c.

M. Tartini observes, that the *third sound* resulting from the 4th, from two 3ds, from two 6ths, whether major or minor, is the most easily distinguished, because this sound is always more grave than either of the two which produce it; that the *third sound* produced by the 5th is distinguished with greater difficulty, because it is an unison of a graver *sound*; and that it is more difficult to distinguish it in the tones major and minor, because these tones, differing little from one another, are easily confounded in the intonation; and for the same reason, with greater difficulty, in the semitones major and minor.

The author, in a song composed of two parts, discovers, by means of two corresponding *sounds*, the *third sound* resulting from them; and this, he says, is the true bass of the song; and every other bass will be a paralogism. From his experiments and reasoning he concludes, that if any adjoining two simple intervals in the harmonic series 1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, &c. be sounded, the *third sound* will always be that of half the string; and that the smaller the interval is, the farther distant is the *third sound*: so that e. g. the *third sound* to the interval of the semitone minor G G *sharp*, is the 26th below G *natural*.

M. Serre, of Geneva, in his Essai sur les Principes de l'Harmonie, printed at Paris in 1753, mentions this discovery of Tartini as a fact sufficiently ascertained; and adds, that he has produced the same effect by means of two fine female voices, as Tartini had done by instruments; but he mentions only the *third sound* produced by the third major, and that produced by the third minor; and there is this difference between the results of these two gentlemen. According to M. Tartini, the two sounds of a third major, as *ut mi*, produced the octave *ut* below *ut*; and according to M. Serre, a double octave: according to the former, the two sounds of a third minor, *la ut*, produced the tenth major, *fa* below *la*; but according to the latter, the seventeenth major below *la*, or the octave under the tenth *fa*. Mr. Serre takes no notice of a *third sound* produced by any other two *sounds*, and it does not appear that he made any trials of this kind.

As to the physical cause of these *third sounds*, it is much more difficult to offer any plausible conjectures concerning it, than concerning the harmonical notes mentioned in the preceding article; because all those of the latter kind being more acute than the principal, or generating tone, are, for that reason, capable of being actually and immediately produced by the vibrations of certain portions of the string or other sounding body; whereas, in the *third sounds*, a tone is heard always (except in the case of the fifth), and often considerably below the pitch of either of the bodies whose vibrations it accompanies, and which consequently cannot immediately proceed from either of these bodies. To take the first of the above mentioned intervals, that of the greater third, for an example: a *third sound* is here heard, such as would be produced by the actual vibration of a string of the same diameter and tension with, but of double the length of, that which produced the lowest note of the interval. As no such string, however, is employed in the experiment, we are obliged to seek for the cause of this new *sound* in the air, or other medium of *sound*, or in the organ of hearing, or in some internal modification of the sensitive faculty.

As the immense variety of our sensations of colour is justly supposed to be produced by an equal diversity of coloured particles of light, each highly qualified to excite one particular sensation and no other, so some, with M. Mairan, have supposed, that our numerous and diversified sensations of musical tones are not produced by the undulations of the air, considered in its whole mass, but by aerial particles, specifically different in elasticity, magnitude, figure, &c. each capable of exciting, by its motions or other modifications, the idea of only one determinate tone. Therefore we might say, that the two orders of particles which give the tones C and *e*, either by an harmonical congruity in their spring with that set of particles which give the *third sound* C below, or by some other peculiar affinity to them, are qualified, by their joint action on these last mentioned particles, to give them that particular modification, by which they excite in us the sensation of that specific tone to which they are adapted. Or, may we not conceive in general, that a mixture of two given tones may excite the idea of a third and different *sound*, in some such manner as two given colours, e. g. blue and yellow, nay, the past impressions of these colours excite the idea of green, different from both of them.

But if the effect is produced merely by the organ of hearing, we may observe, that, from a consideration of the spiral and conical structure of the cochlea, some physiologists have been tempted to imagine, that the branches or filaments of the auditory nerve, after passing out from the nucleus or axis of the cochlea, are strained upon the spiral plates, like the radii of a circle, and become gradually shorter and shorter towards its apex. It may be supposed likewise, that of these nervous strings, the longest, which are in the basis of the cochlea, are adapted to receive the tremors or other impressions, and convey to the mind the ideas, of grave tones; and the shorter nervous chords, fixed more towards the apex of the cone, those of acute *sounds*. This being allowed, and taking the former interval C *e* for an example, it may be said that the tone C, besides acting on the nervous chord appropriated to excite the idea of that tone, must act likewise on another nervous chord of double its length, situated towards the basis of the cochlea, &c. and which is naturally adapted to receive and transmit to the mind, C, the octave below; but which the upper tone C now divides into two equal parts, each giving tones unison to the said note C. The tone *e*, in like manner, will excite five equal vibrations in each of the halves of this nervous chord; all which, likewise, produce sensations unison with itself. These phenomena at least are invariably observed to be produced in musical strings. Thus we obtain the unisons to C and *e*: and farther, the last mentioned chord thus vibrating in two and in ten parts, and from one extremity of it to the other, may fairly be supposed to vibrate in its whole length; in which case it must excite in the mind the idea of its own fundamental tone, the *third sound* C, an octave below the first of these notes, and a tenth below the latter. See, on the subject of this article, Encyclopedie, art. *Basse* FONDAMENTALE. Principles and Power of Harmony, 4to. 1771, and Monthly Rev. vol. xlv. p. 371, &c.

SOUND, in the *Manege*. A horse is said to be *sound* that does not halt. When a jockey sells a horse he warrants him *sound* hot and cold; that is, that he does not halt either when you mount him or when he is heated, nor yet after alighting, when he stands and cools.

SOUND, in *Geography*, denotes a streight or inlet of the sea, between two capes or head-lands.

The SOUND is used, by way of eminence, for that famous streight which joins the German sea to the Baltic. It is situate between the island of Zealand and the coast of Schonen. It is about sixteen leagues long, and in general five broad, excepting against the castle of Cronenburg, where it is but one; so that there is there no passage for vessels but under the cannon of the fortress.

This was first erected for the better commanding of the *Sound*, as was also Helsinburg, on the opposite shore in Schonen, for the protection of ships from pirates, then numerous in that sea.

This has given occasion to the Danes to settle a toll on all vessels, which is said to be one of the best revenues of the crown of Denmark; and to forbid all pilots from passing through the Great and Little Belt, which are two other inlets into the Baltic, though somewhat less commodious than the former.

All nations who traffic into this part of the North are subject to this toll: the Swedes, indeed, were exempted from it by the treaty of 1644, but by the treaty of 1720, they are excluded the privilege, and put on the same footing with their neighbours.

By the treaty of Spire, made between the Danes and Charles V. in behalf of his Netherland subjects, the toll for this passage was fixed at two rose nobles for a ship of two hundred tons; yet, in the year 1640, the same was risen to upwards of five hundred rix-dollars.

The connivance of our king James I. who had married a daughter of Denmark, and the wars which the Hollanders had been long engaged in for their liberty, furnished the occasion for so grievous an exaction. Of late

late years the toll has been again reduced to an easier footing.

Cromwell was bent on extorting this passage from the Danes, and had probably effected it, but that, before the fleet for that purpose arrived there, he died.

However, in 1659, England, Holland, and France, by treaty, obliged Denmark to stipulate, that it shall never be increased upon the said three nations, who are mutual guarantees to this treaty.

The origin and progress of this imposition (which from an easy contribution, of which we have an account so early as 1348, voluntarily paid by merchants for maintaining lights on certain places of the coast, and for protection of ships from pirates, and whereof the king of Denmark was only treasurer or trustee, grew at length to be a heavy burden on trade, as well as a kind of servile acknowledgment of his sovereignty of these seas) is given in lord Molesworth's account of Denmark, chap. iii. p. 11. seqq.

As to the present state of this toll, Dr. Busching, in his New Geography, observes, that it is on an equal footing with all nations, excepting the Hamburghers, who pay more than others: the English, Dutch, Swedish, and, French ships are not searched when provided with proper passes, according to treaties; and pay down only 1 *per cent.* for such goods as are not specified in the tarif. But all other nations pay 1 ½ *per cent.* and must submit to be searched. With regard to the Hanse Towns, on the Baltic, there is a great variety in the toll they pay, for almost every one of those towns is treated with in particular.

SOUND-BOARD, the principal part of an ORGAN, and that which makes the whole machine play.

The *sound-board*, or *summer*, is a reservoir, into which the wind drawn in by the bellows is conducted by a port-vent, and hence distributed into the pipes placed over the holes of its upper part. This wind enters them by valves, which open by pressing upon the stops or keys, after drawing the registers, which prevent the air from going into any of the other pipes but those it is required in.

Organs, whose longest blind pipes are four feet, have their *sound-board* from five to six feet. Organs of sixteen feet have two *sound-boards*, which communicate the wind from one to the other by a pewter port-vent.

SOUNDING, in *Navigation*, the act of trying the depth of the water, and the quality of the bottom, by a line and plummet, or other artifice.

There are two plummets used for this purpose; one of which is called the hand-lead, weighing about 8 or 9 *lb.* and the other the deep-sea lead, which weighs from 25 to 30 *lb.* and both are shaped like the frustum of a cone or pyramid. The former is used in shallow waters, and the latter at a great distance from the shore, particularly on approaching the land after a sea voyage. Accordingly the lines employed for this purpose are called the DEEP-*sea*-lead line and the hand-lead line. The hand-lead line, which is usually twenty fathoms in length, is marked at every 2 or 3 fathoms; so that the depth of the water may be ascertained either in the day or night: at the depth of 2 and 3 fathoms there are marks of black leather; at 5 fathom, there is a white rag; at 7, a red rag; at 10, and at 13, black leather; at 15, a white rag; and at 17, a red one.

Sounding with the hand-lead, which the seamen call heaving the lead, is generally performed by a man who stands in the main-chains to windward. Having the line all ready to run out, without interruption, he holds it nearly at the distance of a fathom from the plummet, and having swung the latter backwards and forwards three or four times, in order to acquire the greater velocity, he swings it round his head, and thence as far forward as is necessary; so that, by the lead's sinking whilst the ship advances, the line may be almost perpendicular when it reaches the bottom. The person *sounding* then proclaims the depth of the water in a kind of song resembling the cries of hawkers in a city, thus, if the mark of 5 is close to the surface of the water, he calls, 'by the mark 5,' and as there is no mark at 4, 6, 8, &c. he estimates those numbers, and calls, 'by the dip four, &c.' If he judges it to be a quarter or a half more than any particular number, he calls, 'and a quarter 5,' and 'a half 4,' &c. If he conceives the depth to be three quarters more than a particular number, he calls it a quarter less than the next: thus, at 4 fathom ¾, he calls, 'a quarter less 5,' and so on.

The deep-sea-lead line is marked with two knots at 20 fathom, 3 at 30, 4 at 40, &c. to the end. It is also marked with a single knot at the middle of each interval, as at 25, 35, 45 fathoms, &c. To use this lead more effectually at sea, or in deep water on the sea-coast, it is usual previously to *bring-to* the ship, in order to retard her course: the lead is then thrown as far as possible from the ship on the line of her drift, so that, as it sinks, the ship drives more perpendicularly over it. The pilot feeling the lead strike the bottom, readily discovers the depth of the water by the mark on the line nearest its surface. The bottom of the lead being also well rubbed over with tallow, retains the distinguishing marks of the bottom, as shells, ooze, gravel, &c. which naturally adhere to it.

The depth of the water, and the nature of the ground, which are called the *soundings*, are carefully marked in the log-book, as well to determine the distance of the place from the shore, as to correct the observations of former pilots. Falconer.

For a machine to measure unfathomable depths of the sea, see ALTITUDE.

SOUNDING *the pump*, at *Sea*, is done by letting fall a small line, with some weight at the end, down into the pump, to know what depth of water there is in it.

SOUP, or SOOP, a kind of pottage made of bread, and broth, or of the juice of flesh, or other matters, usually served at the beginning of a meal.

The word is French, formed from the Italian, *zuppa*, or *suppa*, of the Latin, *sapa*, wine boiled away to a third part. Others derive it from the Celtic, *souben*, which signifies the same.

Soup is esteemed essential to a French dinner. Sometimes they heighten the relish by the addition of onions, or leeks, or cabbage, or turneps, &c.

SOUP, *portable*, is a kind of cake, formed of concentrated broth, which, being freed from all fat, and having by long boiling evaporated the most putrescent parts of the meat, is reduced to the consistence of a glue, as in reality it is, and will, like other glues, in a dry place, keep sound for years together. Sir John Pringle inclines to believe, that the gelatinous parts of animal substances, such as compose these cakes, are not of a nature much disposed to putrefy. But, however that be, captain Cook observes, that, in his voyage (see SCURVY), this *soup* was the means of making his people eat a greater quantity of greens than they would have done otherwise, and so far we must allow it to have been virtually antiseptic.

SOUR *kroute*. See CROUTE.

SOUR-*dock*, in *Botany*. See SORREL.

SOUR *land*, in *Agriculture*, a term used by the farmers to express a cold and somewhat wet clayey soil.

This must have its tilth according to its state and condition, when they set about it. If it hath a strong swarth upon it, then they give it a fallow, by turning it up when the sun is in Cancer; this they call a scalding fallow, and esteem it of great use, because it kills the grass-roots, and makes the land fine; but if it be light, and hath but a thin swarth, they leave it for a cooler tillage, and plough it early in the year, when their clay is fallowed.

Pigeon's dung and malt-dust are the most proper manures for this soil. The malt-dust is to be sown with the winter-corn, and ploughed in with it, for then it lies warm at the roots of the corn all winter. Plot's Oxfordshire, p. 246.

SOURDON, in *Natural History*, the name of a bivalve shell-fish found on the coast of Poitou, and other places. It is a small fish, its length being little more than an inch, and its breadth about three quarters of an inch; its shells are both considerably convex, the outer surface is deeply furrowed, but the inside is perfectly smooth: the fish buries itself lightly in the sand, and has a pipe of communication, which it raises to the surface; but as this creature never buries itself deep, the pipe is necessarily very short; but they are cut into several segments at the extremity, and appear as it were fringed, and have several hairs growing from these segments. The *sourdon* is capable of a progressive motion by means of a limb, somewhat resembling that of the other chamæ, but more than any approaching to the nature of a leg, as it in some measure represents, in miniature, a human leg with a clumsy boot upon it: by means of this limb the creature can easily bury itself in the sand, or rise up out of it, or move horizontally on the surface, and that as well backwards as forwards, and that with more swiftness than could well be supposed. Mem. Acad. Par. 1710.

SOUR *sop*, or SOWR *sop*, in *Botany*. See *Custard* APPLE.

SOURIS, in the *Manege*, is a cartilage in the nostrils of a horse, by means of which he snorts. See SNORT.

The cutting of this cartilage is called in French *essouriffer*.

SOUTH *Sea company*. See COMPANY and FUND.

SOUTHERN *hemisphere*. See HEMISPHERE.

SOUTHERN *ocean*. See OCEAN.

SOUTHERN *sign*. See SIGN.

SOUTHERNWOOD, *abrotanum*, in *Botany*, the name of a genus of plants, the characters of which are wholly the same with those of wormwood, and the plants are only to be distinguished by their very different general face and appearance.

The characters under which it is described by Mr. Miller, who enumerates sixteen species of it, are the following: it hath a compound flower, composed of many hermaphrodite flowers, which are tubulous, situated on the disk, with a border of female flowers surrounding them, which are naked; these are all inclosed in one common scaly empalement, each hermaphrodite flower being tubulous, and divided at the top into five parts, in the centre of which is situated a small germen, having a slender pointal, which is attended by five small stamina; the germen afterwards becomes one naked seed.

In the Linnæan system this is a genus of *artemisia*. See MUGWORT.

In distillation of the leaves of the common or greatest narrow-leaved *southernwood* with water, there arises an essential oil, of a bright yellow colour, in smell exactly resembling the plant. When rectified or distilled a second time with fresh water, this oil leaves a considerable quantity of an inodorous and almost insipid resinous matter. Infusions of the leaves are of a brownish hue, in taste and smell not unpleasant; decoctions are darker coloured, and very nauseous; tinctures made in rectified spirit are of a deep green colour, tasting strongly of the *southernwood*.

This bitterish pungent plant has been employed as a moderately stimulating deobstruent, in different cachectic disorders, as an anthelmintic, and as possessing some degree of an anodyne, or antispasmodic virtue depending on the oil or odorous matter. In the present practice, it is scarcely otherwise made use of than for external purposes, as an ingredient in discutient and antiseptic fomentations, in which intention it has considerable efficacy. It has likewise been recommended in unguents for promoting the growth of hair, a virtue to which, says Dr. Lewis, it does not seem to have much claim.

There are accounts of persons being cured of jaundices solely by the expressed juice of the tender tops of this plant. Matthiolus recommends the leaves dried, and taken in powder, as a remedy for the fluor albus.

SOUTHERNWOOD, *female*, in *Botany*, a species of the LAVENDER *Cotton*, which see for the characters.

The *female southernwood* has the same virtues ascribed to it with the *male southernwood*, and for fomentations, which is the principal use that either of them is applied to in the present practice, they may be looked upon as very nearly alike.

It is also particularly recommended in uterine complaints. It is used to destroy worms; for which purpose it has been customary, among the common people, to use a decoction of the leaves made in milk; and the powder of the dried leaves, half a drachm for the dose, and to be continued for a considerable time, is esteemed good in the fluor albus, also in pleurisies and peripneumonies.

SOUTHING, in *Navigation*, the difference of latitude a ship makes in sailing to the southward.

SOW, in *Zoology*. See HOG.

SOW, in the *Iron-works*, the name of the block or lump of metal they work at once in the iron-furnace. The size of these *sows* of iron is very different, even from the same workmen and the same furnace. These furnaces having sand-stone for their hearths and sides, up to the height of a yard, and the rest being made of brick, the hearth, by the force of the fire, is continually growing wider; so that if it at first contains as much metal as will make a *sow* of six or seven hundred weight, at last it will contain as much as will make a *sow* of two thousand weight.

SOW, in *Ancient Military Language*, a kind of covered shed, fixed on wheels, under which the besiegers filled up and passed the ditch, sapped or mined the wall, and sometimes worked a kind of ram.

SOW-*bread*, *cyclamen*, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the flower, which has a roundish permanent empalement of one leaf, divided into five parts at the top, hath one petal with a globular tube, which is much larger than the empalement; the upper part is divided into five large segments, which are reflexed; it hath five small stamina, situated within the tube of the petal, and a roundish germen supporting a slender style, which becomes a globular fruit with one cell, opening in five parts at the top, inclosing many oval angular seeds. Linnæus mentions two, and Miller six species.

There are several species of this plant cultivated in gardens, for the pretty appearance of its flower: they are propagated by the curious from seed, in the manner of the *xiphium*.

The roots of the round-leaved *sow-bread* with a purple under-side, have a nauseous, acrid, biting taste; by drying their acrimony is abated, nevertheless, when taken internally, they betray a great degree of irritating power. Dried and powdered they have been given in doses of a dram, and found to operate as a strong, inflammatory, but slow cathartic. The juice is said to purge when applied externally to the belly in ointments; and the juice or bruised root to be of great efficacy for softening and discussing indolent hard tumors. The flowers are of a different nature, and have not been used medicinally; and the use of the roots is now, among us, in a great measure, laid aside. Lewis.

SOW-*thistle*, *sonchus*, in *Botany*, the name of a genus of plants of the *syngenesia polygamia æqualis* class; the characters of which are these: the receptacle is naked, the calyx imbricated and ventricose, and the down hairy. The species of *sonchus* enumerated by Linnæus are nine. The common *sow-thistle* is greatly recommended by authors as a refrigerant and attenuant. It is prescribed by many of the old physicians in stranguries, and other disorders of the urinary passages; and is ordered externally in cataplasms, in all kinds of inflammations.

SOW-*thistle*, *downy*. See ANDRYALA.

SOWING, in *Agriculture*. One very great article in *sowing* to advantage, is to exactly know at what depth the seed may be planted, without danger of burying it. Seed is said to be buried when it is laid at a depth below what it is able to come up at. Different sorts of seed come up at different depths, some six inches, or more, and others will not bear to be buried at more than half an inch. The way to come at an accurate knowledge of the depth at which every seed will come up best from the *sowing*, is by making gages in the following manner: saw off twelve sticks of about three inches diameter, bore a hole in the end of each stick, and drive into each a taper peg; let the peg in the first stick be half an inch long, the next an inch, and so on, every peg being half an inch longer than the other, till the last is six inches long; then, in that sort of ground in which you intend to plant, make a row of twenty holes with the half-inch gage, put therein twenty good seeds, cover them up, and then stick the gage at the end of that row. Proceed in the manner with the eleven other gages, making the same holes in the same row all with the same gage, and sticking it at the end of the row: when the seeds begin to appear, it will be easy to see at what depth they come up best, by observing the most flourishing row, and taking up the gage at the end, and seeing what is its length.

By this means we not only know what is the depth in that sort of ground at which this sort of seed will come up best, but also we are able to judge of the nature of the seed; for by observing how many of the twenty seeds that were *sown* come up, and how many fail, it is easy to calculate how much bad seed there is among any given quantity, and to allow properly for it in the *sowing*, that the field may be neither overstocked with plants, nor too bare of them. The farmer often sustains great losses by *sowing* bad seed, or by burying good seed, and both might be effectually prevented by making these easy trials. One caution is to be observed in this, that it is not proper to *sow* the seeds of all plants at the greatest depths at which they will come up, because in wheat, and some other grain, a moist ground will rot the roots at this depth. Experience alone, added to these rules, can perfectly instruct the farmer in the certain way of succeeding; the nature of the land, the manner how it is laid, either flat or in ridges, and the season of planting, must all be considered.

The quantity of seed is to be different also, according to the manner of the *sowing*. The proper quantity to be drilled into an acre is much less than must be *sown* in the common way, not because the hoeing will not maintain as many plants as the other way, for, on the contrary, it will maintain many more, but the difference is upon many other accounts, as that it is impossible to *sow* it so evenly by hand as the drill will do. For let the hand spread it never so exactly, which yet is difficult enough to do with some seeds in windy weather, yet the unevenness of the ground will alter the situation of the seeds, the greatest part of them rebounding into holes, and the lowest places, or else the harrows, in covering, drawing them down thither; so that these low places may have ten times too much seed, and the highest may have much too little, or even none of it; and this inequality lessens in effect the quantity of the seed, because fifty seeds, in the room of one, will not produce so much as one will do; and where they are too thick,

 without

without being in these clusters, they cannot well be nourished, their roots not spreading to near their natural extent, for want of hoeing to open the earth, and give them way. In the common way of *sowing*, some of the seeds are buried out of all hope of ever coming up again, and some others are left naked upon the surface, where they become the food of birds and of vermin: as so many must, therefore, perish in the common way of *sowing*, and so few can be lost in the way by drilling, there is plain reason why the seed, necessary to *sow* any given quantity of ground, should be much less for the drill way than for the other. The farmers, in general, know nothing of the proper depth at which they should *sow* their seed, nor of the difference in quantity that is to be observed in different circumstances; they allow the same quantity to an acre of rough ground, as they do to an acre of fine, and forget that what is too little for one, may yet be too much for the other; it is all mere chance-work, and they put the confidence in good ground, and a large quantity of dung to cover their errors.

The farmers in Wiltshire allow more corn for the *sowing* than in any other part of England; they use sometimes eight bushels of barley to an acre, so that if it produce four quarters for an acre, there is but four grains for one increase. This is *sown* on land ploughed once, and double dunged, the seed only harrowed into the hard and stale ground, so that it is very probable that not so much as two bushels out of the eight take place, or come to any thing. Sometimes, in a very dry season, an acre scarce produces four bushels at the harvest.

Instead of all this uncertainty and loss in the common way, in drilling, all the seed lies just at the same depth, not one grain of it being placed deeper or shallower than the rest. As none of the seeds, therefore, can be lost by being buried, or by being exposed on the surface to vermin, no allowance is to be made for these accidents; all that is to be allowed for in the *sowing*, is the mischief that may happen from the worm, the frost, or the like unavoidable accidents, common to all seeds.

When a man has (by the use of the gages, and the growth of the seeds planted in the rows marked by them) proved the goodness of the seed, and found the depth it is to be planted at, he is to calculate what number of seeds a bushel, or any other weight or measure, contains; for one bushel, or one pound of small seed, may contain double the number of seeds of a bushel, or a pound of large seed of the same species. This calculation is made by weighing an ounce, and then calculating the number of seeds this ounce is composed of; then weighing a bushel, and multiplying the number of seeds in an ounce by the number of ounces in the bushel, and the product will give the number of seeds in the bushel with sufficient exactness. When this is known, the seeds are to be proportioned by the Rule of Three to the square feet in an acre; or else it may be done by dividing the seeds of the bushel by the square feet in an acre, and the quotient will give the number of seeds for every foot. Then the farmer is to consider how near he intends to plant the rows, and whether single, double, treble, or quadruple; for the more numerous the rows are, the more seed will be required. The narrow spaces between double, triple, or quadruple rows, suppose seven inches, the double having one, the treble two, and the quadruple three, are called PARTITIONS. The wide space, suppose of five feet, between any two of these double, treble, or quadruple rows, is called an INTERVAL.

Examine next what is the produce of one middle-sized plant of the annual, but the produce of the best and largest of the perennial sort, because that, by hoeing, will be brought to its utmost perfection; proportion the seed of both to the reasonable product, and when it is worth while adjust the plants to their competent number with the hand-hoe after they are up, and plant perennials generally in single rows. Lastly, plant some rows of the annual thicker than others, which will soon give experience, preferable to all the rules in the world, for the quantity of seed necessary for the drilling.

The distance of the rows is one extremely material point in the obtaining a good crop; but as a much larger distance is to be allowed in these than common practice has been used to, it is very difficult to persuade the farmer to venture a trial at such distances as he may have experience from. There is a method of planting the rows by the drill at very near distances, and in this work one horse may draw a drill with eleven shares, making the rows at three inches and a half distance from each other, and at the same time *sowing* in them three different sorts of seeds, which do not mix, and these at different depths. Thus the barley-rows may be seven inches asunder, and the barley four inches deep; a little more than three inches above that, in the same channels, clover-seed: and betwixt every two of these rows a row of saintfoin seed covered half an inch deep.

Mr. Tull, who tried this method, obtained the first year a very good crop of barley, the next year two crops of broad clover, where that was *sown*; and where hop-clover was *sown*, a mixture of that and of saintfoin, and every year afterwards a crop of saintfoin. But the same gentleman was afterwards so fully convinced of the folly of these, or any other mixed crops, and of *sowing* with these narrow spaces, that he never practised it afterwards.

Every row of vegetables to be horse-hoed, ought to have an empty space, or interval, of thirty inches, on one side of it at least, and of near five feet in all sorts of corn: this will seem a monstrous allowance to those who have not experienced the good effects of it, but all who have will readily come into the practice of it ever afterwards. The line of corn is called one row, though it be double, triple, or quadruple, because when four of these rows grow up in the spring, they unite, and seem to be all one row. Wide intervals are necessary for perfect horse-hoeing, and the largest vegetables have generally the greatest benefit by them, though small plants may have considerable benefit from much narrower intervals than those of five feet. See HUSBANDRY.

In hand-hoeing there is always less seed, fewer plants, and a greater crop *cæteris paribus*, than in the common *sowing*; yet there the rows must be much nearer than in horse-hoeing, because as the hand moves many times less earth than the horse, the roots will be sent out in a like smaller proportion; and if the spaces, or intervals, where the boad hoe only scratches a little of the surface, should be wide, they would be so hard and stale underneath, that the roots of perennial plants would be a great while in running through them, and the roots of annual plants would not be able to do it at all. The advantage of the horse-hoeing is principally owing to the depth to which it stirs the ground, and familiar instances have proved, that the stirring it to a like depth, by whatever instrument, is of the utmost advantage to whatever plants are set in the place. A poor fellow in Wiltshire was observed to have his cabbages much larger and finer than his neighbours, though his ground was no better, and he could afford less dung; but the reason was, that instead of clearing away the weeds between them with a hand-hoe, he used to dig between with a spade, which goes as deep as a horse-hoe, and comes the nearest answering its purposes of any instrument whatever. Tull's Horse-hoeing Husbandry. See INTERVALS.

Man has found out many advantageous ways of propagating, whether by *sowing* or planting such trees and herbs as he best knows the uses of; but nature as much excels him in this article as in all the rest, when any comparison can be made; and it appears evident to the naturalist, that she has taken more care to propagate and sow the most trivial weeds, as we esteem them, than we can employ in regard to the choicest plant. It is owing to this care that no one species of plant has ever been lost, notwithstanding all the accidents they are daily subject to.

Many instances of this kind are recited in Phil. Trans. N° 251, p. 116, &c. See SEMINATION.

SOWNE, a term used in the exchequer; seeming to be a corruption from the French *souvenu, remembered*.

Such estreats and casualties as the sheriff by his industry cannot get or levy, are said to be estreats that *sowne* not, that is, are not to be remembered, or are not in demand. On the contrary, estreats that *sowne*, are such as he may gather.

SPA, or SPAW, in *Geography*, a town in the bishoprick of Liege in Germany, famous for its mineral waters. Those of the Pouhon spring in *Spa* have been preferred, by our chief physicians, to any others in or near the country of Liege; particularly to the waters of Bru, which they complain have been imposed on the public, to their and their patients frequent disappointment.

However, as the *Spa* waters are impregnated with different proportions of the same ingredients, they may be chosen differently, according to the intentions with a view to which they are used. The Pouhon is the strongest chalybeate. This is in its most perfect and natural state in cold dry weather; but in warm moist weather it loses its transparence, appears turbid or wheyish, contains less fixed air, and is partly decomposed. This water, which is colder by many degrees than the heat of the atmosphere, is supposed to contain the greatest quantity of fixed air of almost any acidulous water; and in consequence of this ingredient it has a remarkable sprightliness and vinosity, and boils by mere warmth; but this soon flies off if the water be left exposed, though it may in a great measure be preserved in well-corked bottles.

bottles. It is capable of diſſolving more iron than it naturally contains, and of thus becoming a ſtronger chalybeate, on account of the great quantity of fixed air which it contains: and for the ſame reaſon an ebullition is raiſed in it on the addition of acids, which diſengage its fixed air. This water mixes ſmoothly with milk, whether it be cold or of a boiling heat.

The Tonnelet and Geronſterre waters are weaker chalybeates, but briſker and more ſpirituous. The Groeſbeck, Sauveniere, and Wartroz, are ſtill weaker chalybeates, but highly impregnated with calcareous and ſelenitical earths, and contain alſo a greater proportion of the foſſil alkali. The Geromont is likewiſe a weak chalybeate, but contains a great deal of calcareous and ſelenitical earth, and about three times as much alkaline ſalt as any of the others. The four laſt waters, therefore, will be better in diſorders ariſing from an acid cauſe, and as diuretics, particularly the Geromont. The Bru, or Churon water, approaches to the nature of the Tonnelet, and though it has been decried, is ſaid, in conſequence of every trial, not to be inferior to any of the *Spa* waters.

All the waters that are comprehended under this denomination, abound with fixed air; they alſo contain more or leſs iron, foſſil alkali, and calcareous and ſelenitical earths, together with a ſmall portion of ſea-ſalt, and an oily matter common to all waters.

All theſe ingredients are kept ſuſpended, and in a neutral ſtate, by means of the fixed air, on which their virtues chiefly depend; though they are probably rendered more active and penetrating both in the firſt paſſages, and alſo when they enter the circulation, by means of that ſmall portion of iron, earth, ſalt, &c. with which they are impregnated.

Theſe waters are diuretic, and ſometimes purgative; and, like other chalybeate waters, they tinge the ſtools black. They exhilerate the ſpirits much better than wine or ſpirituous liquors, and their general operation is by ſtrengthening the fibres. They cool and quench thirſt much better than common water.

They are found excellent in caſes of univerſal languor or weakneſs, proceeding from a relaxation of the ſtomach, and of the fibres in general, and where the conſtitution has been weakened by diſeaſes, or by a too ſedentary life; in weak, relaxed, groſs habits; in nervous diſorders; at the cloſe of fits of the gout and rheumatiſm; in ſuch aſthmatic diſorders and chronic coughs as proceed from too great a relaxation of the pulmonary veſſels; in obſtructions of the liver and ſpleen; in ſcorbutic and other putrid diſorders; in hyſterical and hypochondriacal complaints; in paralytic diſorders; in gleets; in the fluor albus; in fluxes of the belly; in the gravel and ſtone; in female obſtructions; in barrenneſs, and in moſt other caſes where a ſtrengthening and briſk ſtimulating reſolving chalybeate remedy is wanted: but they are generally hurtful in hot, bilious, and plethoric conſtitutions, when uſed before the body is cooled by proper evacuations; they are alſo hurtful in caſes of fever and heat, in hectic fevers, and ulcerations of the lungs, and of other internal parts, and in moſt confirmed obſtructions attended with fever. The uſual ſeaſon for drinking them is in July and Auguſt, or from May to September. The quantity to be drank is ſuch as the ſtomach can bear without heavineſs or uneaſineſs: but it is adviſeable to begin with drinking a glaſs or two ſeveral times in a day, and ſo increaſe the quantity daily, as the ſtomach can bear; and during the courſe to continue that doſe, and to diminiſh the quantity at the cloſe in the ſame degree as it was augmented at the beginning. Moderate exerciſe is proper after drinking. Previous to the uſe of the water the firſt paſſages ſhould be cleanſed by gentle purges, and, if neceſſary, an emetic ſhould be given; and, during the courſe, coſtiveneſs ſhould be prevented, by occaſionally adding Rochelle ſalts or rhubarb to the firſt glaſſes of water in the morning; and a cooling regimen ſhould be obſerved.

The *Spa* water is alſo uſed externally in a variety of caſes, with good ſucceſs. It is uſed as an injection in the fluor albus, and in ulcers and cancers of the womb, and alſo in the gonorrhœa; it is ſerviceable for waſhing venereal aphthæ, and ulcers in the mouth, phagædenic ulcers, by way of gargle for relaxed tonſils, and for faſtening looſe teeth, and in other caſes of relaxation. It is alſo ſaid to cure the itch, and ſimilar complaints, by waſhing and bathing, an internal courſe being obſerved at the ſame time. Elliot's Mineral Waters, p. 201, &c.

The town of *Spa* being reſorted to by perſons from all parts of Europe, on account of its waters, has always been allowed a neutrality during the hotteſt wars.

SPAAD, or Spalt, Spatum, a word uſed in ſeveral different ſenſes; ſometimes for a ſpecies of Engliſh fibroſe talc, or of gypsum; and ſometimes for spar.

The various kinds of *ſpaad* are found pretty frequently in England and Germany, and ſometimes brought from the Levant: they are all ſoft, and eaſily pulverized.

SPACE, Spatium, a ſimple idea, the modes whereof are diſtance, capacity, extenſion, duration, &c.

Space, conſidered barely in length between any two bodies, is the ſame idea which we have of diſtance.

If it be conſidered in length, breadth, and thickneſs, it is properly called *capacity*.

When conſidered between the extremities of matter, which fills the capacity of *ſpace* with ſomething ſolid, tangible, and moveable, it is then called *extenſion*.

So that extenſion is an idea belonging to body only; but *ſpace*, it is plain, may be conſidered without it.

Space, therefore, in the general ſignification, is the ſame thing with diſtance conſidered every way, whether there be any ſolid matter in it or not.

Each different diſtance is a different modification of *ſpace*; and each idea of any different *ſpace* is a ſimple mode of this idea. Such are an inch, foot, yard, &c. which are the ideas of certain ſtated lengths, which men ſettle in their minds for the uſe, and by the cuſtom of meaſuring. When theſe ideas are made familiar to men's thoughts, they can in their minds repeat them as often as they will, without joining to them the idea of body, and frame to themſelves the ideas of feet, yards, and fathoms, beyond the utmoſt bounds of all bodies; and by adding theſe ſtill to one another, they can enlarge their idea of *ſpace*, as much as they pleaſe.

From this power of repeating any idea of diſtance, without being ever able to come to an end, we acquire the idea of immenſity.

Another mode, or modification, of *ſpace*, is taken from the relation of the parts of the termination of extenſion, or circumſcribed *ſpace* amongſt themſelves; and this is what we call *figure*. This the touch diſcovers in ſenſible bodies, whoſe extremities come within our reach; and the eye takes, both from bodies and colours whoſe boundaries are within its view; where, obſerving how the extremities terminate, either in ſtraight lines, which meet at diſcernible angles, or in crooked lines, wherein no angles can be perceived; by conſidering theſe as they relate to one another in all parts of the extremities of any body or *ſpace*, it acquires the idea we call *figure*; which affords to the mind infinite variety.

Another mode belonging to this head is that of place.

Another mode of *ſpace*, is the idea which we get from the fleeting, and perpetually periſhing, parts of ſucceſſion, which we call duration.

Space is uſually divided into *abſolute* and *relative*.

Space, *abſolute*, is that conſidered in its own nature, without regard to any thing external, which always remains the ſame, and is infinite and immoveable.

Space, *relative*, is that moveable dimenſion, or meaſure of the former, which our ſenſes define by its poſitions to bodies within it; and this the vulgar uſe for immoveable *ſpace*.

Relative *ſpace*, in magnitude and figure, is always the ſame with abſolute; but it is not neceſſary it ſhould be ſo numerically: as if you ſuppoſe a ſhip to be, indeed, in abſolute reſt, then the places of all things within her will be the ſame abſolutely and relatively, and nothing will change its place; but ſuppoſe the ſhip under ſail, or in motion, and ſhe will continually paſs through new parts of abſolute *ſpace*: but all things on board conſidered relatively, in reſpect to the ſhip, may be, notwithſtanding, in the ſame places, or have the ſame ſituation and poſition, in regard to one another.

The Carteſians, who make extenſion the eſſence of matter, aſſert, that the *ſpace* any body takes up, is the ſame thing with the body itſelf; and that there is no ſuch thing as mere *ſpace*, void of all matter, in the univerſe: but this ſee diſproved under Vacuum.

The Carteſians, who do not allow of any diſtinction between *ſpace* and matter, were naturally enough led to the opinion, that *ſpace* or extenſion was a ſubſtance. Others, who admit a vacuum, and conſequently an eſſential difference between *ſpace* and matter, aſſert alſo that *ſpace* is a ſubſtance. Among theſe we find s'Graveſande, Introd. ad Philoſ. ſect. 19.

Others put *ſpace* into the ſame claſs of beings as time and number; that is, they make it to be no more than a notion of the mind. Hence, according to theſe authors, abſolute *ſpace*, of which the Newtonians ſpeak, is a mere chimera. See the writings of the late biſhop of Cloyne, paſſim.

Space and time, according to Dr. Clarke, are attributes of the Deity, and the impoſſibility of annihilating theſe,

even in idea, is the same with the necessary existence of the Deity. See Watt's Phil. Ess. Ess. i.

SPACE, in *Geometry*, denotes the area of any figure; or that which fills the interval or distance between the lines that terminate it.

The *parabolic space* is that included in the whole parabola. The *conchoidal space*, or the *cissoidal space*, are what are included within the cavities of the conchoid and cissoid. By the new methods now introduced, of applying algebra to geometry, it is demonstrated, that the conchoidal and cissoidal *spaces*, though infinitely extended, are yet finite magnitudes.

SPACE, *cycloidal*. See CYCLOIDAL.

SPACE, *elliptic*. See ELLIPTIC.

SPACE, in *Mechanics*, the line a moveable body, considered as a point, is conceived to describe by its MOTION.

SPADE, an instrument for digging up the ground; the handle or shaft is about three feet long; the head of it is all of iron, the upper part being flat, for the workman to set his foot on to force it into the ground; the length of the head is a foot, or fifteen inches, and the breadth six or eight.

SPADE, *turfing*. See TURFING.

SPADE also denotes any gelded beast, or a deer three years old.

SPADING. See SPAYING.

SPADIX, in *Botany*, was formerly used to denote the receptacle of a palm, produced within a spatha or sheath, or the branches that bear fruit; but it is now used in a more general sense, to express all flower-stalks that come out of a spatha.

SPADO, among the Romans, differed from an eunuch only in this, that the latter was deprived both of the penis and testes, but the *spado* of the testes only.

SPAID, or SPAYD, a term used by sportsmen for a red male deer three years old.

SPAGIRIC, an epithet given to chemistry; which is called the *spagiric art*, or *medicina spagirica*; and to chemical physicians, who are also called *spagirists*.

It is chiefly restricted to that species of chemistry which works on metals, and is employed in the search of the philosopher's stone.

Vossius derives the word from σπαω, *to extract*, and αγειρειν, *congregare, to collect*; which are the two principal offices of chemists. Paracelsus first introduced the word.

SPAGIRICAL *physicians*. See PHYSICIANS.

SPAHIS, from the Persian *espawhee*, q. d. *horseman*, horsemen in the Ottoman army; chiefly raised in Asia.

The great strength of the grand signior's army consists in the janizaries, who are the foot, and the *spahis*, who are the horse.

The aga, or commander of the *spahis*, is called *spahilar agasi*. See AGA.

SPAN, a measure taken from the space between the thumb's end and the tip of the little finger, when both are stretched out.

The *span* is estimated at three hands breadths, or nine inches.

SPAN, in a *ship*, a small line or cord, the middle of which is usually attached to a stay, from whence the two ends branch outwards to the right and left, and having either a block or thimble attached to their extremities.

The intention of the *span* is also to confine some rope which passes through the corresponding block or thimble, as well to increase the effect of the said rope, as to prevent it from swinging at too great a distance from the centre of its action in stormy weather. Such are the *spans* occasionally used for the top-gallant braces, or the fore-top-gallant bow-lines, &c. Falconer.

SPANGLES for *paper-hangings*. See PAPER-*hangings*.

SPANIEL, *Hispaniolus*, or *Canis Avicularius* of Linnæus, a variety of the *canis familiaris*, a species of DOG used in fowling.

From the name it may be supposed, that we were indebted to Spain for this breed. There are two varieties of this kind; the first formerly used in hawking to spring the game, the same with our starters; the other used only for the net, and formerly called *index*, or *setter*. This kingdom has been remarkable for producing dogs of this sort, particular care having been taken to preserve the breed in the utmost purity. They are distinguished by the name of English *spaniels*; so that, notwithstanding the derivation of the name, it is more than probable they are natives of Great Britain.

The pointer, which is a dog of foreign extraction, was unknown to our ancestors.

The aquaticus, or finder, in Dr. Caius's systematic arrangement (see DOG), was the same with our water *spaniel*, and used to find or recover the game that was lost. See *Water* DOG.

The *spaniel* is of great use, but subject to many distempers; among these the mange is a very frequent one, and is the most pernicious of all others to his quiet and his beauty, and is very apt, when one dog has it, to spread to others that come in its way. The best cure is a decoction of a large quantity of brimstone, with some common salt and wood-ashes, in water and urine, of each equal quantities; this is to be used three or four times a day, washing the creature well with it before the fire, or in the warm sun. If this is not strong enough, the same ingredients, with the addition of a considerable quantity of wood-soot, are to be boiled in strong vinegar, and the liquor used in the same manner; but this must never be used in cold weather, as it would then endanger the creature's life.

When this disease is not in a violent degree, it may be cured by the herb agrimony internally taken. The method is to pound the roots, leaves, and seeds of this plant in a mortar, and mix them with a large quantity of wheaten-bran; they are to be then made into dough in the common way, and baked in an oven; the dog is to have no other bread but this for some time, but he is to eat of this as often, and as much he will: this, without any farther care, has cured many.

Another very troublesome disorder in this creature, is what is called the *formica*: this infests only the ears, and is caused by flies, and by the dog's scratching for them. The best medicine for the cure of these is this: take a quantity of pure and clean gum tragacanth, infuse it in white-wine vinegar; let as much vinegar be used as will serve to soften it, and when it has lain a week in it, let it be taken out and ground on a marble, as the painters grind their colours, adding to it roch-alum and galls, reduced to powder, of each two ounces; all this is to be well mixed together, and the matter, if it grows too stiff in the grinding, is to be moistened with some of the vinegar in which the gum was soaked: when all is thoroughly mixed, and ground fine, it is to be put in a gallypot, and a small quantity of it applied to the creature's ear every night till the complaint is removed.

The swelling of the throat is another disease very common to *spaniels*, but the cure of this is easy; there needs only to bathe it well with oil of camomile, and afterwards wash it with a mixture of vinegar and salt; this done night and morning will, in a few days, wholly remove the complaint. *Spaniels* will sometimes, when they have much rest and good food, lose their sense of smelling, but this is recovered by a brisk purge and repeated airings; a very common dose, on this occasion, is a drachm of jalap, and two drachms of sal gem, mixed up into a bolus with oxymel of squills: this is to be rubbed over with some butter, and will be got down in that manner pretty easily, and will work briskly.

SPANIEL *gentle*. See LAP-DOG.

SPANISH *academy*, *bible*, *black*, *brown*, *coinage*, *coins*, *epocha*, *inquisition*, *language*, *measures*, *order*, *plough*, *silks*, *soap*, *wax*, and *white*, see the several articles.

SPANISH *flies*. See CANTHARIDES.

SPANISH *juice*. See LIQUORICE.

SPANSHACKLE, *aboard a ship*, a large clasp of iron, which goes round the end of the davit upon the forecastle.

SPAR, *spatum*, in *Natural History*, a shining stony substance, generally, though improperly, supposed to be compounded of crystal, incorporated with lac lunæ, or other mineral, earthy, stony, or metallic matter; frequently found in caves and grottos, and in the clefts of rocks, lead-mines, &c.

Spars are defined by Dr. Hill to be fossils not inflammable, nor soluble in water: when pure, pellucid, and colourless, and emulating the appearance of crystal, but wanting its distinguishing characters; composed of plane and equable plates, not flexile nor elastic; not giving fire with steel; readily calcining in a small fire, and fermenting violently with acids, and wholly soluble in them. See CRYSTALS and STONES.

Of this class of bodies Hill enumerates ten orders, and under those twenty-one genera, many of which, from their accidental admixtures, deviate greatly in appearance from the natural state of pure *spar*.

Of the first order are the pellucid crystalliform and perfect *spars*, composed of a column terminated at each end by a pyramid.

Of the second are those composed of two pyramids joined base to base, without any intermediate column.

Of the third are the crystalliform columnar *spars*, adhering by one end to some solid body, and terminated at the other by a pyramid.

Of the fourth are the pyramidal crystalliform *spars* without columns.

Of the fifth are the *spars* of a parallelepiped form.

Of

Of the ſixth are the *ſpars* externally of no regular form, but breaking into rhomboidal maſſes.

Of the ſeventh order are the cruſtaceous *ſpars*. Theſe are of a cryſtallino-terrene ſtructure, or debaſed from their natural pellucidity by an admixture of earth, and formed into plates or cruſts of a ſtriated figure within.

The eighth order comprehends the cruſtaceous terrene *ſpars*; bodies ſo highly debaſed with earth, as to appear merely earthy, of an irregular ſtructure, and not ſtriated within. Theſe often encruſt fiſſures of ſtone, and ſometimes vegetable and other extraneous bodies in ſprings.

Of the ninth order are the *ſpars* formed into oblong cylindric bodies, known by the name of *ſtalactitæ*, or ſtony icicles.

And the tenth comprehends thoſe formed into ſmall round figures, compoſed of various cruſts encloſing one another, and generally known by the name *ſtalagmitæ*; and adding to theſe the *ſpars*, influenced in their figures by metalline particles, we have the whole ſeries of theſe bodies. Theſe are, 1. The *cubic*, owing their figure to lead. 2. The *pyramidal*, with four planes, owing their figure to tin. 3. The *rhomboidal*, conſiſting of ſix planes, owing their figure to iron.

The genera of theſe ſeveral orders are theſe.

Of the firſt there are three, viz. the TRIEXAHEDRIA, the TRIPENTAHEDRIA, and the ENNEAHEDRIA.

Of the ſecond order there are three genera, viz. the DIOCTAHEDRIA, the DIEXAHEDRIA, and the DITRIHEDRIA.

Of the third order there are alſo three genera, viz. the HEXAEDROSTYLA, the PENTAEDROSTYLA, and the TRIEDROSTYLA.

Of the fourth order there are only two genera, viz. the HEXAPYRAMIDES, and TRIPYRAMIDES.

Of the fifth order there is alſo only one known genus, the PARALLELOPIPEDIA.

Of the ſixth order there is only one known genus, the ANOMORHOMBOIDIA.

Of the ſeventh order there are two known genera, viz. the PLACAGNODIAUGIA, and the PLACAGNOSCIERIA.

Of the eighth order there are two genera, viz. the CIBDELOSTRACIA, and CIBDELOPLACIA.

Of the ninth order there are two genera, viz. the STALACTAGNIA, and STALACTO-CIBDELA.

And of the tenth order there are alſo two genera, viz. the STALAGMODIAUGIA, and STALAGMOSCIERIA. Hill's Hiſt. of Foſſils, p. 201, &c.

The obſervation that *ſpar* is continually formed at this time in caves and grottos under ground, has given birth to many different conjectures as to the origin of that ſubſtance. We have accounts from Switzerland, and other places, that the ſnow by long lying on the earth, and being ſubject to repeated freezing, is at length hardened into *ſpar*: this is much of the nature of that opinion of the ancients concerning cryſtal, that it was water frozen by ſevere colds to a ſort of ice, much harder than the common kind; both are equally erroneous and abſurd. But more rational conjectures, as to its origin, are, that it is produced either by effluvia alone, or by the joint force of effluvia iſſuing up from the depths of the earth, and mixing with water ouzing out of rocks into their cracks and cavities, or by the ſame water or effluvia paſſing through beds of this *ſparry* matter contained in clay. In the firſt place we are to obſerve, that *ſpar* is capable of being diſſolved either by water or vapour, and ſuſpended imperceptibly in either; and that though it remains ſuſpended a long time, yet there are occaſions of its ſeparating itſelf from either of theſe vehicles, ſuch are long ſtanding ſtill, and evaporation. What is called the growth and formation of *ſpar*, therefore, is properly perhaps only the change of place in this ſubſtance, and all that theſe agents, waters and vapours, do, is only to waſh it out of the ſtrata of earth or ſtone, in which it lay in ſcattered particles, and bring it together into the cracks and crevices of ſtones, where it may again ſeparate itſelf, and become more pure and perfect.

The operation of nature, in this caſe, is very like that of art in the extracting of ſalts from the various bodies they are mixed with; and *ſpar* in its two ſtates, when blended in the ſtrata of ſtone, &c. and when pure, and in form of cryſtals in the cracks, may be compared to alum, for inſtance, in its bed, and when purified. The alum in the common ſtones, from which it is made, is not perceptible to the eye, but lies in ſcattered particles; water being added to this takes up the ſalt, and when it has been managed by evaporation and reſt, yields it again purified and alone, and it forms ſuch cryſtals on the ſides of the veſſel as the other does on the ſides of the fiſſures of ſtone, which are the veſſels where the water, out of which it was formed, was ſet to evaporate, and to reſt a proper time.

That ſome *ſpars* grow from vapours alone, is evident from the *ſtalactitæ*, or ſtony icicles, hanging down from the roofs of our caverns, which, though they grow downwards, yet have many times little plants of the ſame ſubſtance growing out at their ſides, and ſtanding upwards, contrary to the growth of the other, and evidently formed of the matter ſeparated from the vapours in their aſcent, as the ſtalactitæ themſelves are from ſuch as have aſcended to the roof, and there been condenſed into water, and ſent down again in drops. Nor is the *ſparry* matter alone thus raiſed in vapour, for even the metals, and other bodies, as little likely as thoſe to be thus raiſed, yet are found to form ſtalactitæ.

The mundics, in general, though they never form regular ſtalactitæ, yet often are found adhering to the ſides of them, and the metals, particularly iron and lead, form regular ſtalactitæ; the iron ones very common and very perfect; the lead leſs perfect and more rare; and Dr. Brown gives us abundant inſtances, of *ſpars* growing entirely from vapours in the baths of Buda in Hungary.

Mr. Beaumont is of opinion, that earth by degrees will ripen into *ſpar*; but this is an error. He founds his opinion on certain ſtalactitæ, and ſtalagmitæ, found in caverns, partly earth and partly *ſpar*, and ſuppoſes, that the whole would in time become *ſpar*; but there is nothing in nature to warrant this conjecture. Phil. Tranſ. N° 129.

Mr. de Juſſieu has given us, in the Memoirs of the Paris Academy, a very remarkable account of the recryſtallization, or reproduction of the parts of *ſpar*, after ſolution. Mem. Acad. Paris, 1719.

The denomination of *ſpars*, ſays the editor of the Chemical Dictionary, is given to many ſtones of different properties and appearances, which do not poſſeſs conſtantly any one common character or mark, by which they may be certainly diſtinguiſhed from other ſtones. In general, we may obſerve, that they are moſt frequently found in mines, and that they generally conſiſt of ſmooth and ſhining plates or laminæ; that ſome are tranſparent and others opake; that ſome are colourleſs and others coloured; that they are cryſtallized in various determinate figures, or poſſeſs no determinate ſhape; and, laſtly, that they differ ſo much in hardneſs, denſity, degree of fuſibility, and in their moſt eſſential chemical properties, that they cannot be conſidered as forming a diſtinct claſs of foſſil ſubſtances.

The ſeveral ſtones to which the name of *ſpar* has been given are, the calcareous, the gypſeous, the fluors, and felt *ſpar*. *Calcareous ſpars* are ſoft, heavy ſtones, which have the common chemical properties of CALCAREOUS earth. Their texture is laminated, ſome of them have no determinate figure, and others from their form are called rhomboidal. Some *ſpars*, called *dogs tooth ſpars*, have a pyramidal figure; but when theſe are broken, their fragments ſhew that they alſo conſiſt of rhomboidal particles. Some rhomboidal *ſpars* are tranſparent, others are opake; ſome are colourleſs, and others are coloured; and ſome of them have a property of doubly refracting the rays of light; this *ſpar* has been called *refracting ſpar*, or *iſland* CRYSTAL. Its figure is that of an oblique parallelepiped, contained within ſix parallelogrammic ſides, and eight ſolid angles. Each of the obtuſe angles of the parallelograms is 101° 52′; and each of the acute angles is 78° 8′. Theſe calcareous *ſpars* may be diſtinguiſhed from others by effervefcing with acids.

The *gypſeous*, or *ſelenitic ſpars*, are gypſeous earth, diſtinctly cryſtallized. The form of the cryſtals is rhomboidal. They are alſo called SELENITES and GLACIES *mariæ*. Theſe *ſpars* ſometimes aſſume other forms, and are very heavy.

Mr. Margraaf has ſhewn, that under this claſs are to be comprehended, thoſe white opake *ſpars*, which by calcination with inflammable matters are capable of receiving a phoſphoric quality, ſimilar to that of the Bolognian ſtone, which he alſo ſhews is a gypſeous *ſpar*. For the *ſpars* called *fluors*, ſee FLUOR.

The *felt-ſpar*, or *ſpatum ſcintillans*, differs from all the preceding, in being ſo hard as to be capable of ſtriking ignited *ſparks* from ſteel. For which reaſon it is referred by Cronſtedt to the ſiliceous claſs of earths, and by him called *rhombic quartz*, becauſe the particles of which it conſiſts ſeem to be parallelepipeds, each of which is contained within ſix rhomboidal ſides. Its colours are various, white, grey, and red.

Several other foſſil ſubſtances conſiſt of large plates, and are, therefore, ſaid to have a *ſparry* texture. Such are ſome kinds of talcs, of horn-blend, of quartz, of amianthus, and ſome calciform ores of metals.

SPARS, in *Medicine*, have from the earlieſt times been recommended in nephritic complaints. Some have uſed one kind, ſome another, as the *lapis judaicus*, the *ſparry* incruſtations of caverns, petrified oyſter-ſhells, and water in which large quantities of *ſpar* are ſuſtained. After all,

all, the nephritic virtues of *spar* want sufficient proof; some even suspect its use to be more hurtful than beneficial. See CRYSTAL.

SPARADRAP, SPARADRAPUM, in *Pharmacy*, &c. an ancient name for a kind of sear-cloth; or a linen-cloth smeared on both sides with some kind of plaster, or unguent.

The *sparadrap* is sometimes also called *tela Gualteriana*, or *tela Gualteri*; sometimes, *tela emplastica*.

It is prepared by melting a sufficient quantity of some plaster or unguent, and dipping a linen cloth therein, till such time as it hath imbibed its fill. It is then taken out, cooled, and polished on a marble.

SPARAGUS, or ASPARAGUS, *sperage*, in *Botany*. See ASPARAGUS.

SPARGANIUM, *burr-reed*, in *Botany*, a genus of the *monoecia triandria* class. Its characters are these; it has male and female flowers; in both which the calyx is a roundish amentum or catkin, and composed of three leaves, without a corolla; the stigma of the female is bifid, and the fruit a single seeded drupe. Linnæus enumerates two species.

SPARGANOSIS, a word used by some to express a milk-tumor in women's breasts.

SPARGUS, in *Ichthyology*, a name given by Gaza to the common sparus, which he calls also *fluta*.

Artedi calls it the plain yellow *sparus*, with an annular spot near the tail.

SPARLING, in *Ichthyology*. See SMELT.

SPARLING-*fowl*, in *Ornithology*, a name given in some places by the country people to the female MERGANSER, called more usually the DUNDIVER.

SPARRING, among *Cock-fighters*, is the fighting a cock with another to breathe him. In *sparring*, they put hotts on their spurs, that they may not hurt one another. To *spar the cock*, imports in general, to breathe him, in order to embolden him to fight. See HOTTS.

SPARROW, *passer*, in *Ornithology*, the name of a large order of birds. See PASSERES.

SPARROW, *common*, or *house*, the FRINGILLA *domestica* of Linnæus, is a well-known bird, and needs no description. *Sparrows* are proverbially salacious; they breed early in the spring, often in the nests of the martin, after expelling the owner; the martin, however, in revenge, is said to assemble its companions, and to assist in plaistering up the entrance with dirt, and thus leaves the invader to perish.

SPARROW, *hedge*, *curruca*, or MOTACILLA *modularis* of Linnæus, in *Ornithology*, a bird of the size of the red-breast, or of the titlark; its beak is longish, slender, and black. Its head is of a deep brown, mixed with ash-colour; the cheeks are marked with oblong spots of dirty white; the back and coverts of the wings are dusky, edged with reddish brown; the quill-feathers and tail dusky; the rump brown, tinged with green; the throat and breast are of a dull ash-colour; the belly of a dirty white; the sides, thighs, and vent-feathers are of a pale tawny brown; and the legs of a dull flesh colour. This bird frequents low hedges, particularly those of gardens; making its nest in some small bush, where it lays four or five eggs of a fine pale blue colour; and during the breeding season it has a remarkable flirt with its wings. The male has a short but very sweet plaintive note, which it begins with the first frosty mornings, and continues till a little time in the spring.

The bird which Linnæus supposes to be our *hedge-sparrow*, which he describes under the title of *motacilla curruca*, and to which he applies the denomination of *cannavarola*, differs in colour of plumage as well as eggs. Pennant.

It is in the nest of this bird that the cuckow hatches her eggs for the most part, though not always, the nests of turtle and wood pigeons being sometimes used by her for that purpose. Hence it was that the ancients made the cuckow an emblem of such men as made bold with the marriage-bed of others, who, on that account, were called *curruca*.

SPARROW, *reed*, *passer arundinaceus*, the EMBERIZA *schoeniclus* of Linnæus, in *Ornithology*, a bird that lives most commonly among reeds in marshy places, and known among authors by the name of *junco*.

Its nest is curiously contrived, being fastened to four reeds, and suspended by them like a hammoc, about three feet above the water. It lays four or five eggs of a bluish white, marked with irregular purplish veins. This bird is much admired for its song, and like the nightingale it sings in the night. In the male, the head, chin, and throat are black; the tongue livid; at each corner of the mouth commences a white ring, which encircles the head; at approach of winter the head changes to hoary, but on return of spring resumes its jet colour; the whole under side of the body is white; the back, coverts of the wings, and the scapular feathers are black, deeply bordered with red; the two middle feathers of the tail are of the same colours; the three next black; the exterior web, and part of the interior of the outmost feather is white; the head of the female is rust-coloured, spotted with black; it wants the white ring round the neck; but in most other respects resembles the male. Pennant.

SPARROW, *lesser reed*, *willow lark*, or *sedge-bird*, *passer arundinaceus minor*, the MOTACILLA *salicaria* of Linnæus, is a species of a slender elegant form; the head brown, marked with dusky streaks; over each eye a line of pure white, over that another of black; cheeks brown; throat, breast, and belly white; the two last tinged with yellow; hind-part of the neck and back of a reddish brown; the back spotted with black; coverts of the tail tawny; coverts of the wings dusky, edged with pale brown; quill-feathers dusky; tail brown, and in the form of a wedge, and making a circle when spread; and legs dusky. This bird is common in low wet gronnds; sits on the top of some spray, with its wings dishevelled: its song consists but of two notes, which are loud, querulous, and harsh. Pennant.

Ray observes, that the *lesser reed sparrow* sings sweetly, and some have called it *cannavarola*. See *Tab*. IV. *Birds*, N° 42.

SPARROW, *solitary*. See PASSER *solitarius*.

SPARROW, *tree*, *passer montanus*, or FRINGILLA *montana* of Linnæus, is inferior in size to the common *sparrow*; the bill is thick and black; the crown of the head, hind part of the neck, and lesser coverts of the wings are of a bright bay; the two first plain, the last spotted with black; the chin black; the cheeks and sides of the head white, marked with a great black spot beneath each ear; the breast and belly of a dirty white: just above the greater coverts is a row of feathers, black edged with white; the greater coverts are black edged with rust-colour; the quill-feathers dusky, edged with pale red; lower part of the back of an olive brown; the tail brown; and legs of a straw colour.

These birds are common in Lincolnshire, among trees, and collect like the common kind in great flocks. Pennant.

SPARROW, *water*, *passer aquaticus*, in *Ornithology*, a bird described by Nieremberg, which he says the Indians call *acototlequichitl*. It sings all day long without ceasing, but with no very pleasing note: it is, however, a well-tasted bird; it lives among sedge and bushes, and is of the size and shape of a swallow, but has a black bill and yellow legs; its breast and belly are white, and its back is of a brownish yellow, variegated with spots of black and white. This bird much resembles our reed-*sparrow*. Ray.

SPARROWGRASS, in *Botany*. See ASPARAGUS.

SPARROW *hawk*. See HAWK.

SPARROW-*wort*, *passerina*, in *Botany*, a genus of the *octandria monogynia* class. Its characters are these; the flower has no empalement, but has one withered petal, having a slender cylindrical tube swelling below the middle, and divided into four parts at the top, which spread open; and it has eight bristly stamina, sitting on the top of the tube, terminated by erect summits; it has an oval germen under the tube, having a slender style rising on one side of the germen, crowned by a headed stigma, set with prickly hairs on every side; the germen afterward turns to an oval seed, pointed at both ends, and inclosed in a thick oval capsule of one cell. There are four species. Miller.

SPARSE-*leaves*, *sparsa folia*, among *Botanists*. See LEAF.

SPARTIUM, in *Botany*. See BROOM-*tree*.

SPARTOPOLIAS *lapis*, in *Natural History*, a name given by some authors to a whitish agate, variegated with long and slender streaks of grey, disposed in a variously undulated order, and resembling grey hairs.

SPARUS, in the Linnæan system of *Ichthyology*, the name of a genus of fish of the general order of the *thoracici*, the characters of which are, that the opercula of the gills are scaly, and the mouth is furnished with strong cutting teeth, and that the grinders are obtuse and close set, covered with lips: the branchiostege membrane consists of five rays; the body is compressed; the lateral line is curved behind, and the pectoral fins are roundish. Of this genus there are twenty-six species, as the GILT *head*, the PAGRUS, SARGUS, MELANURUS, SMARIS, CANTHARUS, &c.

The name *sparus* is of Greek origin, being derived from the verb σπαίρειν, *to palpitate*, or *tremble*; and was given to this fish from its remarkable quality of trembling or palpitating all over the body, as soon as taken out of the water.

SPARUS, among the Romans, a kind of rustic weapon, bent backwards like the foot. It was likewise used for a small dart, or missive weapon.

SPASM, Spasma, or Spasmus, σπασμα, σπασμος, a Greek term, of equal import with the Latin *convulsio*, and English *convulsion*.

Cardan distinguishes two kinds of *spasms*; the first consisting in a constant contraction of the muscles, which renders the members rigid and inflexible. The second, in sudden, unnatural motions and palpitations, frequently intermitting and beginning again.

Accidental *spasms* are of short continuance: there are some arising from flatulencies; others from bites of venomous beasts, from the puncture of a nerve, the acrimony of the humours vellicating the stomach, excessive cold, hysteric vapours, &c.

A *spasm* may be either universal, extending itself over the whole body, which is a very rare case: or partial, occupying only some one part of the body; these are very frequent, and seize at times on every part, from the head to the foot.

Of the nature of the universal *spasms* are, 1. The TETANUS, which seizes upon the whole body, and makes it stiff and rigid in every part. 2. The EMPROSTHOTONOS, which bends the body forwards, so that the head is brought to meet the knees. 3. The OPISTHOTONOS, which inclines the whole body forcibly backwards: and, 4. The CATALEPSIS, which seizes the whole system in a moment, and fixes it rigidly and unalterably in that posture in which it finds it; so that the position of every limb, and the very turn of the countenance, and look of the eyes, is the same as when the patient was seized. This is a very rare case.

To the class of particular and partial *spasms* belong, 1. Many of the arthritic complaints. 2. The INCUBUS, or nightmare, which is a *spasm* of the breast. 3. The *convulsive* ASTHMA. 4. The CYNIC *spasm*, which is a peculiar distortion of the face, resembling that of a person while laughing. This endures usually many hours, and is often of very fatal consequence, frequently terminating in an apoplexy, or in the most terrible convulsions. 5. The SARDONIC *laugh*, which only differs from the former in that it is attended with an absolute delirium, which is not the case in the other. 6. The PRIAPISM, which is an involuntary and painful erection of the penis. 7. The spastic contraction of the colon in flatulent colics. 8. The *fixt spasms* of Paracelsus, which the author describes as often afflicting podagric and arthritic patients.

Spasms in general, beside these distinctions, are divided by authors into the sudden, or instantaneous, which seize upon any muscle in a moment, and keep it for a considerable time in a painful state of contraction, and the slow ones.

The *slow spasms* are also divided into two kinds. 1. The *muscular* and *tendinous*: and, 2. The *fibrillary*. In the first of these the whole muscle is affected with tensive pains, and the limb becomes finally contracted. In the other, the separate fibres in the muscle are only affected. This is usually the case in *spasms* in arthritic cases, which seize a few fibres only at first, but finally fasten upon more, and extend themselves over the whole muscle, in which case the pain usually becomes less. A tensive pain in the neck, occasioned by sitting or lying in an uneasy posture, usually called a *crick in the neck*, is also to be enumerated among the partial *spasms*; and finally, these affections are not restrained wholly to the external parts, but often seize also upon the internal, as the œsophagus, the stomach, the bladder, &c.

It is a common error to confound the word *spasm* with *convulsion*; their difference is evident, the one being stationary and immoveable, the other erratic, and flying from one part of a muscle to another, and from one muscle to another; the convulsion also usually extends itself farther than the *spasm*, and is greater in degree; and finally, the *spasm* is a much less dangerous complaint than the convulsion. Men are more subject to *spasms* in general than women, and among them, such as are of a sanguine and plethoric habit, are most of all subject to them. The general cause of *spasms* is an abundance of blood in a body where the vessels are small, and nature is endeavouring to throw off the load of the plethora from vessels, where it is troublesome to her, by this means; which, though an erroneous one, is therefore not without its end.

Spasms, *prognostics in.* The universal *spasms* are much the most dangerous, as they are frequently attended with internal inflammations; and the partial *spasms* too often degenerate into convulsions. If *spasms* are very frequent in young people, they are to be suspected of threatening arthritic complaints in old age; and when persons have been free from *spasms* in their youth, and become subject to them when old, it is much to be feared that they portend apoplexies, palsies, and suffocative catarrhs: and in general all *spasms*, as they are in reality no other than the incomplete attempts of nature to free herself of somewhat that offends her in particular parts, portend some worse mischief, when they are observed to return frequently, and with violence. *Spasms* happening in acute diseases, and from wounds, are all very dangerous symptoms, and threaten convulsions, and other mischiefs.

Method of cure. The means to be used, when the fits are off, are bleeding in any manner, by the lancet, by leeches, or by cupping, as may be most proper in regard to the part principally affected, and other circumstances; after this the primæ viæ are to be cleared by purges from any foulnesses that may adhere to them; and finally, such medicines are to be given, as are known to attenuate the blood; and with all this, gentle exercise is of great service; in the time of the fit, lenient and paregoric medicines, as amber, and the spirit of hartshorn: and to these are to be added the acrid vegetables, such as the more temperate carminatives, and the emulsive diluent medicines, with nitre and cinnabar.

This last drug is famous alone in all these cases, and indeed in all emotions of the blood; but neither this, nor any of the others, will take effect till after bleeding, if the *spasm* be violent. The volatile alkalis also succeed best when mixed with a fixed one; such as the spirit of hartshorn with the tincture of salt of tartar, or of antimony. Junker's Comp. Med. p. 608, &c. See CONVULSION.

SPASMODIC, something belonging to a *spasm*, or convulsion; as a *spasmodic medicine*, *spasmodic disease*, &c.

Hunger, according to M. Hecquet, is a *spasmodic* affection of the fibres of the stomach; unless it arise from the fibres being too much moistened by the liquor thereof, so as to incapacitate them for their office. See HUNGER.

SPAT, a term used by the fishermen for the spawn of OYSTERS, which is cast in the month of May.

SPATAGOIDES, in *Natural History*, the name of a genus of the *echini marini*, the characters of which are, that it has the aperture for the anus on one side of the upper surface, and has a large furrow on the back, which makes it of a cordated form; but has no furrows on the vertex, but only four or five smooth rays, made of a number of slight transverse striæ. See *Tab. of Testaceous Animals*, N° 14.

SPATANGI, in *Natural History*, the name of a genus of the *echini marini*, including all those which are marked in the shape of a heart, and have the aperture for the anus in one of the sides of the upper superficies. These have all a remarkable furrow on the back; their base is nearly flat, and they have several furrows on the vertex. By these characters they are distinguished from the brissi, with which they have in common the marks of two lips to their mouth, and want the teeth the other kinds have. See *Tab. of Testaceous Animals*, N° 11. Klein's Echin. p. 35.

SPATHA, is a word used by different authors in various senses; some express by it a rib; others the instrument called by surgeons a *spatula*, and used for spreading ointments and plasters; and Celsus calls a sort of incision-knife by this name. It is also used for the external covering of the fruit of the palm-tree, and by others for a sword. This last is indeed its proper signification, and all the others are only metaphorical applications of it to different things, which bear some resemblance to a sword.

Spatha, among *Botanists*, expresses that sort of cup which consists of a simple membrane growing from the stalk, or which bursts lengthways, and puts forth a spadix or receptacle. This kind of cup is of various figures; often diphyllous, or divided into two parts; often simple; sometimes more divided: it incloses sometimes a single flower, sometimes several flowers together, and these have often no perianthium. The *spatha* is of very different texture and consistence, in different plants.

SPATHALIUM, among the Romans, an ornament which the women wore about their hands, not unlike the coral ones of the moderns.

SPATHELIA, in *Botany*, a genus of the *pentandria trigynia* class. Its characters are, that the calyx is composed of five leaves; that it has five petals; that the fruit is a three-cornered capsule, with three cells, containing a single seed. There is only one species.

SPATHESTER, the name of a chirurgical instrument used to draw the prepuce over the glans.

SPATHINUS, in *Natural History*, a name given by the Greeks to the stag or deer, when in its second year. In the first, it was called *nebrus*; in the third year, *dicrotus*; and after this *cerastes*, as long as it lived.

SPATHOMELE, a word used by some to express the spatula, used by apothecaries and surgeons in mixing and spreading ointments and plasters.

SPATLING-*poppy*, a name given to the common field-lychnis, a species of *cucubalus*, from the white froth found on it in the spring. See FROTH-*spit*.

SPATTERDASHES, a kind of covering for the legs, made of leather, &c. Thofe of foldiers are made of coarfe linen, waxed over and buttoned tight.

SPATTS, a fmall fort of fpatterdafhes, reaching only a little above the ankle.

SPATULA, or Spathula, formed from *fpatha*, of the Greek, σπαθιον, which fignifies the fame; an inftrument ufed by furgeons and apothecaries; made flat at one end, and round at the other: ferving to fpread their plafters and unguents.

The furgeons have little fteel *fpatulas*. And the apothecaries have alfo large ones of wood, to ftir their drugs in diluting, tempering, or boiling them.

The *fpatula* is ufed by furgeons to deprefs the tongue, in order to examine the ftate of the tonfils, uvula, and fauces, when they are affected with any diforders. It is alfo ufed to fufpend the tongue, when the frænum is to be divided; for which purpofe it has a fiffure at its extremity, and fhould rather be made of filver than of any other metal. Thefe *fpatulæ* are made of different fhapes. Vide Heifter's Surg. Introd. fect. 36.

SPAVIN, formed from the French *efparvin*, which fignifies the fame; a difeafe in a horfe: being a fwelling or ftiffnefs, ufually in the ham, which caufes him to halt.

There are two kinds of *fpavins*, viz. the

Spavin, *ox*, which is a callous tumor, at the bottom of the ham, on the infide; hard as a bone, and very painful. While it is yet young, fome horfes only halt with it at the firft coming out of the ftable.

Spavin, *dry*, which is more eafily perceived, by the horfe's raifing one of his hind-legs, with a twitch, higher than the other; but fometimes it is found on both legs.

This kind, which fome alfo call *ftring-halt*, frequently degenerates into the *ox fpavin*; for which there is no remedy, but to apply the fire; and even this is not always fuccefsful.

There are two other kinds of *fpavin*, which have their feat in the hoof, viz.

Spavin, *blood*, a foft tumor, which grows through a horfe's hoof, and is ufually full of blood.

Spavin, *bone*, a crufty fubftance growing on the infide of the hoof under the joint.

SPAWS, mineral waters arifing out of the earth; impregnated with nitre, fulphur, alum, bitumen, copperas, or other mineral matter, in paffing through the ftrata thereof; and hence endued with fome medicinal qualities, cathartic, diuretic, emetic, alterant, or the like. See *Mineral* Waters and Spa.

SPAX, a name given by fome authors to the common tænia, a fmall fifh of the anguilliform-kind, frequent on the fhores of Italy.

SPAYING, or Spading, the operation of caftrating the females of the feveral kinds of animals, to prevent conception, and promote their fattening. It is performed, by cutting them in the mid-flank, on the left fide, with a fharp knife or lancet, taking out the uterus, and cutting it off, and fo ftitching up the wound, anointing the part with tar, and keeping the animal warm for two or three days.

The ufual way is, to make the incifion aflope, two inches and a half long, that the fore-finger may be put in towards the back, to feel for the ovaries, which are two kernels as big as acorns on both fides the uterus, one of which is drawn to the wound, the ftring thereof cut, and thus both taken out.

Spaying *of fifh*. See *Caftration of* Fish.

SPEAKER *of the houfe of commons*, a member of the houfe, elected by a majority of the votes thereof, to act as chairman, or prefident, in putting queftions, reading briefs or bills, keeping order, reprimanding the refractory, adjourning the houfe, &c.

The firft thing done by the commons upon the firft meeting of a parliament is to choofe a *fpeaker*, who is to be approved of by the king; and who, upon his admiffion, begs his majefty, that the commons, during their fitting, may have *free accefs to his majefty*, *freedom of fpeech in their own houfe*, and *fecurity from arrefts*. See Parliament.

The *fpeaker* is not allowed to perfuade, or diffuade, in paffing of a bill; but only to make a fhort and plain narrative; nor to vote, unlefs the houfe be equally divided. The lord chancellor, or keeper, or any other appointed by the king's commiffion, is ufually *fpeaker of the houfe of lords*; and if none be thus appointed, the houfe of lords (it is faid) may elect. The *fpeaker* of the houfe of lords, if a lord of parliament, may give his opinion, or argue any queftion in the houfe.

The *fpeaker of the convocation* is called prolocutor.

Speaker is ufed by *rhetorical* writers in the fame fenfe with orator. See Oratory. See alfo Elocution, Pronunciation, and Action.

As to the character and addrefs of an orator, it is neceffary that every thing appear eafy and natural, and the difpofition of the *fpeaker* be difcovered by his words: thus would he exprefs what Quintilian calls a propriety of manners: accordingly, the ancient rhetoricians made it a neceffary qualification in an orator, to be a good man; fince he fhould always be confiftent with himfelf, or, as we fay, talk in character. There are four qualities more efpecially fuited to the character of an orator, which fhould always appear in his difcourfes, in order to render what he fays acceptable to his hearers; thefe are wifdom, integrity, benevolence, and modefty. See an illuftration and inforcement of them in Ward's Orat. vol. i. lect. 10.

SPEAKING, the art, or act, of expreffing one's thoughts in articulate founds or words.

Pliny, Ælian, Plutarch, and other authors, make mention of feveral beafts that have *fpoken:* and Pliny himfelf fpeaks with affurance, in his hiftory, of an ox that *fpoke*. Philoftratus, in his life of Apollonius, gives the like quality to an elm, and even to fhips. Homer makes Xanthos, one of Achilles's horfes, fpeak; wherein he has been followed by Oppian. But thefe are all fabulous ftories; we have much better authority for a ferpent and an afs's *fpeaking*. See Language.

Speaking-*trumpet*. See Trumpet, and Stentorophonic.

SPEAR, in the *Manege*; the feather of a horfe, called the *ftroke of the fpear*, is a mark in the neck, or near the fhoulder of fome Barbs, and fome Turky and Spanifh horfes, reprefenting the blow or cut of a *fpear* in thofe places, with fome refemblance of a fcar. This feather is an infallible fign of a good horfe.

Spear-*hand*, or *fword-hand* of a horfeman, is his right hand.

Spear-*foot*, of a *horfe*, is the far-foot behind. See Far.

Spear-*mint*. See Mint.

SPEARWORT, the Englifh name of the ranunculus *flammeus*.

This is with us generally efteemed a poifon, but the Scots ufe it as a medicine. They beat it, and fqueeze out the juice, which they take as a purge, drinking a little melted butter or oil before and after it, to prevent its taking the fkin off from the throat. It operates very violently, but with robuft conftitutions it does very well. They ufe it alfo externally in cafes of pain in the head, or any other part of the body. They bruife the leaves to a fort of pafte, and apply them to the part; they foon raife a blifter, and a large quantity of water is difcharged, after which the pain goes off. This is a fhort way of bliftering, and anfwers as fafely and as well as ours by the cantharides: but it is a wonder that people, who fee this quality in the plant, fhould dare to take it into their mouths and ftomachs.

SPECIAL, fomething that is particular, or has a particular defignation; from the Latin *fpecies:* in oppofition to *general*, of *genus*. See General, Particular, Species, and Genus.

The king, in his letters, frequently fays, of our *fpecial grace*, full power, and royal authority.

Special *affife*, *attorney*, *bail*, *cafe*, *fee-tail*, *iffue*, *jury*, *plea*, *feffion*, *ftatute*, *verdict*, and *warrant*. See the Articles.

SPECIALTY, in *Law*, is moft commonly taken for a bond, bill, or other inftrument in writing. Accordingly, debts by *fpecialty*, or fpecial contract, are fuch whereby a fum of money becomes, or is acknowledged to be, due by deed or inftrument under feal: fuch as by deed of covenant, by deed of fale, by leafe referving rent, or by bond or obligation. Thefe are looked upon as the next clafs of debts after thofe of record, being confirmed by fpecial evidence under feal.

SPECIES, an idea, which relates to fome other more general one; or is comprifed under a more univerfal divifion of a genus; as in the definition of any thing, we obtain its general nature or genus, by comparing it with other things that are moft like to itfelf, and obferving wherein its effence or nature agrees with them; fo we obtain the effential or fpecific difference, by confidering the moft remarkable and primary attribute, property, or idea, wherein this differs from thofe other things that are moft like it: and this attribute, or fpecific difference, diftinguifhes each fpecies from one another, while they ftand ranked under the fame genus.

The word is Latin, formed from the ancient verb *fpecio*, *I fee*; as if a *fpecies* of things were a collection of all the things feen at one view.

Species is a mere term of relation: and the fame idea may be a *fpecies*, when compared to another more general one; and a genus, with regard to a more particular one. Thus body is a genus, with regard to an animate and inanimate body; and a *fpecies*, with regard to fubftance.

The laft *fpecies* is that which can only be divided into individuals.

Animal

Animal is a *ſpecies*, with regard to body, and man is a *ſpecies* with regard to animal. God deſtroyed mankind by the deluge; but he preſerved the *ſpecies*.

SPECIES, in *Logic*, is one of the five words, called by Porphyry, *univerſals*.

SPECIES, in *Rhetoric*, is that which comprehends under it all the individuals of the ſame nature. From hence, we may argue; he is a man, therefore he has a rational ſoul. And orators ſometimes take occaſion to deſcend from the theſis or genus, to the hypotheſis or *ſpecies*: that is, in treating upon what is more general to introduce ſome particular contained under it, for the better illuſtration of the general.

SPECIES, in the *ancient Muſic*, denotes a ſubdiviſion of one of the genera.

The genera of muſic were three, the ENHARMONIC, CHROMATIC, and DIATONIC; the two laſt of which were variouſly ſubdivided into *ſpecies*: nor was the firſt without *ſpecies*, though thoſe had not particular names, as the *ſpecies* of the other two had. Theſe *ſpecies* were alſo called the *chroai*, colours of the genera. See GENUS.

SPECIES is alſo applied by *ancient muſicians*, to the different diſpoſitions of the tones and ſemitones in a fourth, fifth, or octave. Hence they ſay there are three *ſpecies* of fourths, four of fifths, ſeven of octaves. Wallis's Append. Ptolm. Harm. p. 171.

The Grecians expreſſed this ſenſe of the term *ſpecies* by εἶδος, or by σχῆμα. The Latin word, *figura*, has alſo been taken in the ſame ſenſe. Ariſtox. p. 6, 74. Ed. Meib. Wallis, ibid. p. 170.

SPECIES, in *Optics*, the image painted on the retina by the rays of light reflected from the ſeveral points of the ſurface of an object, received in at the pupilla, and collected in their paſſage through the cryſtalline, &c.

Philoſophers have been in great doubt, whether the *ſpecies* of objects, which give the ſoul an occaſion of ſeeing, are an effuſion of the ſubſtance of the body; or a mere impreſſion which they make on all ambient bodies, and which theſe all reflect, when in a proper diſtance and diſpoſition; or, laſtly, whether they are not ſome other more ſubtile body, as light, which receives all theſe impreſſions from bodies, and is continually ſent and returned from one to another, with the different figures and impreſſions it has taken. But the moderns have decided this point by their invention of artificial eyes, wherein the *ſpecies* of objects are received on a paper or linen cloth in the ſame manner as they are received in the natural eye. The ancients have diſtinguiſhed the *ſpecies*, whereby objects become viſible, into *impreſſæ* and *expreſſæ*.

SPECIES, *impreſſed*, are ſuch, as come from without; or are ſent from the object to the organ; ſuch are thoſe we have already been ſpeaking of.

SPECIES, *expreſſed*, are thoſe, on the contrary, which proceed from within; or that are ſent from the organ to the object.

Le Clerc, in his ſyſtem of viſion, by one of thoſe revolutions very frequent in philoſophical opinions, has called upon the ſtage again the *ſpecies expreſſæ* of the ancient philoſophers. For, according to him, it is not by *ſpecies* or images impreſſed on the optic nerve, that the ſoul ſees objects; but by rays, which ſhe herſelf directs to them, and which ſhe uſes as a blind man does his ſtaff, to grope out objects.

The Peripatetics account for viſion, from a kind of *intentional ſpecies*, thus: Every object, ſay they, expreſſes a perfect image of itſelf on the air next to it. This expreſſes another leſs one on the air next to that; and this a third ſtill leſs. Thus are the images continued from the object to the cryſtalline, which theſe philoſophers hold the principal organ of ſeeing. Theſe they call *ſpecies intentionales*; and to account the better for their generation, they affirm, that objects exhibit them in the ſame manner, as mirrors do a man's face. See VISION.

SPECIES, in *Theology*, denote the appearances of the bread and wine in the ſacrament after conſecration. Or, as the Romaniſts define them, the accidents remaining in the bread and wine, whereby they become ſenſible to us, after their ſubſtance is deſtroyed.

The *ſpecies* of the bread, &c. are its whiteneſs, quantity, figure, friableneſs, &c. Of wine, its flavour, quickneſs, ſpecific gravity, &c.

The generality of Romiſh divines hold, that the *ſpecies* are abſolute accidents. And the Carteſians, who are bound to deny any ſuch things as abſolute accidents, are greatly puzzled to explain the *ſpecies*, without incurring the cenſure of hereſy. F. Magnan is forced to aſſert, that the *ſpecies* are mere deluſions and appearances, which God impreſſes on our ſenſes.

SPECIES, in *Commerce*, are the ſeveral pieces of gold, ſilver, copper, &c. which, having paſſed their full preparation, and coinage, are current in public.

SPECIES *decried*, or *cried down*, are ſuch as the ſovereign has forbidden to be received in payment.

SPECIES, *light*, are thoſe which fall ſhort of the weight preſcribed by law.

The weights of the current coins as coined are now as follow:

	dw.	*grs.*
Gold, guinea - - -	5	9½
half-guinea - - -	2	16¾
Silver, crown - - - -	19	8½
half crown - - -	9	16¼
ſhilling - - - -	3	21
ſix-pence - - - -	1	22
The current weight of gold:		
Guinea - - - -	5	8
Half ditto - - -	2	16

Under this weight no gold is allowed to paſs by the laſt proclamation.

SPECIES, *falſe*, are thoſe of different metal or alloy from what they ſhould be, &c.

SPECIES, in *Algebra*, are the ſymbols, or CHARACTERS, whereby quantities are repreſented.

SPECIES *aromaticæ*, a new name given in the late London Diſpenſatory to the compoſition uſually called *ſpecies* DIAMBRÆ. The College obſerved, that the intention of this medicine was beſt anſwered, by compoſing it of ſuch ſpices as the daily experience of the table ſhews were moſt grateful to the ſtomach, and by avoiding all ingredients which, though of the aromatic kind, are accompanied with any thing nauſeous and diſguſtful in their flavour, and therefore have ordered it to be now made in the following manner. Take cinnamon two ounces, cardamom-ſeeds, ginger, and long pepper, of each an ounce; make all together into a fine powder.

SPECIES *e ſcordio*, the ingredients of the diaſcordium electary in a dry form. The recipe is ſomething altered in the late London Pharmacopœia, and ſtands thus: take bole Armenic, four ounces; ſcordium, two ounces; cinnamon, an ounce and half; ſtorax, roots of tormentil, biſtort, gentian, dittany of Crete, galbanum, and gum arabic and red roſes, each an ounce; long pepper and ginger, each half an ounce; opium three drams; this may be left out at pleaſure; and all are to be beat to a fine powder.

SPECIFIC, in *Philoſophy*, that which is proper and peculiar to any thing; or that characterizes it, and diſtinguiſhes it from every other thing. See PROPER, &c.

Thus, the attracting of iron is *ſpecific* to the load-ſtone, or is a *ſpecific* property of the load-ſtone: a juſt definition ſhould contain the *ſpecific* notion of the thing defined, or that which ſpecifies and diſtinguiſhes it from every thing elſe.

SPECIFIC, in *Medicine*, a remedy, whoſe virtue and effect are peculiarly adapted to ſome certain diſeaſe; that is adequate thereto; and exerts its whole force immediately thereon.

Thus quinquina, or the Jeſuits bark, is held a *ſpecific* for intermitting fevers or agues; mercury for the venereal diſeaſe, &c.

Authors make mention of three kinds of *ſpecific* medicines.

1°, Such as are eminently and particularly friendly to this or that part; as to the heart, the lungs, the brain, the ſtomach, &c.

2°, Such as ſeem to attract, expel, or evacuate, ſome determinate humour, by a kind of *ſpecific* power with which they are endowed; as jalap is ſuppoſed to purge watery humours, rhubarb bile, &c. See PURGATIVE.

3°, Such as remove the cauſe of a diſeaſe, by ſome ſudden property, without our knowing how or why; or the manner of whoſe operation we are entirely ignorant of, and have only learnt their effects by experience.

In the uſe of theſe laſt, there is no enquiry into the nature of the diſeaſe; no regard had to the ſymptoms or phenomena: nor is the medicine to be at all adapted to the particular circumſtances thereof. All that we regard, is the name of the diſeaſe, and that of the remedy; as, immediately, upon finding an intermitting fever, we preſcribe the bark: to aſſuage pain, opium; or to expel poiſon, its particular antidote.

On this footing, a *ſpecific* medicine ſeems to ſtand in oppoſition to a *ſcientific* or *methodic* medicine.

The mild operation of ſome alterant medicines by inſenſible perſpiration, ſweat, and urine, may have led ſome men into this notion of *ſpecific* alteratives, or the tranſmutation of poiſonous into innocent juices. Phyſicians are apt to think they cure diſeaſes ſpecifically, when they do not bleed, purge, vomit, or ſalivate. But it is certain, mercury, when it cures the lues without ſalivation, does not act ſpecifically, any more than when the higheſt ſalivation

salivation is raised by it; when it does not salivate, it infallibly and sensibly passes off by the cutaneous and venous glands.

Several mineral and metalline substances, especially the compositions of sulphur and mercury, as the æthiops and cinnabar, may indeed cure many diseases; but then they do it by acting as evacuants, by attenuating, dissolving, and carrying off the viscid concretions and foulnesses of the stomach and intestines, and thus cleansing the foul passages, and restoring them to their natural action; not by any alterative or *specific* operation.

Dr. Martin endeavours to defend the doctrine of the *specific operations* of cathartic medicines, from the different nature of the drugs, and by an appeal to experience. See his Ess. Phys. and Medic.

Specific *gravity*, in *Hydrostatics*. See *Specific* Gravity.

Specific *gravity of living men*. Mr. Robertson, in order to determine the *specific gravity* of men, prepared a cistern seventy-eight inches long, thirty inches wide, and thirty inches deep; and having procured ten men for his purpose, the height of each was taken, and his weight; and afterwards they plunged successively into the cistern. A ruler, graduated to inches and decimal parts of an inch, was fixed to one end of the cistern, and the height of the water noted before each man went in, and to what height it rose when he immersed himself under its surface.

The following table contains the several results of his experiments.

No. of men.	Height. Feet. Inc.	Weight. Pounds.	Height of water before immersed. Inches.	Height of water when immersed. Inches	Water raised. Inches.	Solidity.	Weight of water. Pounds.
1	6 02	161	19,30	21,20	1,90	2,573	160,8
2	5 10⅜	147	19,25	21,16	1,91	2,586	161,6
3	5 9½	156	19,21	21,06	1,85	2,505	156,6
4	5 6¾	140	19,17	21,21	2,04	2,763	172,6
5	5 5⅞	158	19,13	21,21	2,08	2,817	176,0
6	5 5½	158	19,09	21,26	2,17	2,939	183,7
7	5 4⅜	140	19,05	21,06	2,01	2,722	170,1
8	5 3⅛	132	19,01	20,86	1,85	2,505	156,6
9	5 4⅛	121	18,97	20,76	1,79	2,424	151,5
10	5 3¼	146	18,93	20,66	1,73	2,343	146,4

One of the reasons, Mr. Robertson says, that induced him to make these experiments, was a desire of knowing what quantity of fir or oak timber would be sufficient to keep a man afloat in river or sea-water, thinking that most men were specifically heavier than river or common fresh water; but the contrary appears from the trials above recited: for, excepting the first and last, every man was lighter than his equal bulk of fresh water, and much more so than his equal bulk of sea-water: consequently, if persons, who fall into water, had presence of mind enough to avoid the fright usual on such accidents, many might be preserved from drowning; and a piece of wood not larger than an oar, would buoy a man partly above water as long as he had spirits to keep his hold. Phil. Trans. vol. l. art. 5.

Specific *gravity of metals*. See Metals.

Specific *names*, in *Natural History*, are those epithets composed each of one or more terms, and placed after the generical name, in the denomination of any species of plant, animal, or mineral, expressing those characters by which it differs from all the other species of that genus.

The more accurate of the modern naturalists have, in their several provinces, set about the reformation of the *specific* names of things. They first observe, that many of the *specific* names of the ancients no way answered the intent of their formation, but expressed the more trivial distinctions, or accidents, while they omitted the realities, and more essential grounds of distinction. On this foundation the critical writers of our times distinguish the old *specific* names into the genuine, or true, and the spurious, or false ones.

The genuine names are those which express those characters, by means of which the thing becomes a different species; these are invariable, and by these names the thing is, in some sort, described. The false ones are those *specific* names which do not, and cannot distinguish the species, called by them, from the others of the same genus, which may as well belong to some other species as to that, and which therefore are of no use to the student. The true formation of these names is on the real characters of the body to be named; but instead of this these false ones are often formed from accidental, or variable distinctions.

Specific *waters*. See Water.

SPECILLUM, or Speculum, an instrument, wherewith surgeons search and dilate wounds, &c. See Speculum.

SPECIOUS *arithmetic*. See Arithmetic.

SPECTABILES, among the Romans, a title of honour given to the second rank or degree of nobility under the Roman emperors, being unknown in the time of the republic. There were other two degrees; the first had the title of *illustres*, and the third that of *clarissimi*.

SPECTACLE, Spectaculum, *shew*; some extraordinary object, which draws the view and attention; and is not beheld without some emotion or passion of the mind.

The term is chiefly used, by the ancients, for theatrical and amphitheatrical performances; for comedies, combats of gladiators, and of beasts; and even for solemn processions, as those of the circus, &c.

The people of Rome were extremely fond of *spectacles*; and the Roman historians observe, there was no surer way of gaining their affections, and making parties to introduce tyranny and oppression, than by the use of *spectacles*.

SPECTACLES, an optic machine, consisting of two lenses set in a frame, and applied on the nose, to assist in defects of the organ of sight.

Old people, and all presbytæ, use *spectacles* of convex lenses, to make amends for the flatness of the eye, which does not make the rays converge enough to have them meet in the retina.

Short-sighted people, or myopes, use concave lenses, to keep the rays from converging so fast, on account of the great roundness of the eye, which is such, as to make them meet before they reach the retina.

In Spain, and at Venice especially, *spectacles* are used with a different view: all the people of note and fashion there have them continually on their noses; a folly, that has its source in the natural pride of those people, who value themselves on a profound wisdom; and affect to stare very near at every thing; as if their eyes were weakened, and worn out with excess of attention. Vign. de Marv.

F. Cherubin, a capuchin, describes a kind of *spectacle* telescopes, for the viewing of remote objects with both eyes; hence called *binoculi*. Though F. Rheita had mentioned the same before him, in his Oculus Enoch et Eliæ. See Binocle.

The same author invented a kind of *spectacles*, with three or four glasses, which performed extraordinarily.

Spectacles were certainly unknown to the ancients. Francisco Redi, in a very learned treatise on *spectacles*, will have them to have been invented in the thirteenth century, between the years 1280 and 1311 (probably about the year 1299 or 1300) and adds, that Alexander de Spina, a monk of the order of Predicants of St. Catharine, at Pisa, first communicated the secret, which was of his own invention; upon learning that another person had it as well as himself. This history is written in the chronicles of that convent.

The same author tells us, that in an old manuscript still preserved in his library, composed in 1299, *spectacles* are mentioned as a thing invented about that time: and that a famous Jacobin, one Jourdon de Rivalto, in a treatise composed in 1305, says expresly, that it was not yet twenty years since the invention of *spectacles*. He likewise quotes Bernard Gordon in his Lilium Medicinæ, written the same year, where he speaks of a collyrium, good to enable an old man to read without *spectacles*.

Muschenbroeck, Introd. vol. ii. p. 786. observes, that it is inscribed on the tomb of Salvinus Armatus, a nobleman of Florence, who died in 1317, that he was the inventor of *spectacles*.

Du-Cange, however, carries the invention of *spectacles* farther back; assuring us, that there is a Greek poem in manuscript in the French king's library, which shews, that *spectacles* were in use in the year 1150; nevertheless, the dictionary of the academy *della Crusca*, under the word *occhiale*, inclines to Redi's side; and quotes a passage from Jourdon's Sermons, which says, that *spectacles* had not been twenty years in use: and Salvati has observed, that those sermons were composed between the years 1330 and 1336.

It is probable, that the first hint of the construction and use of *spectacles* was derived from the writings either of Alhazen, who lived in the twelfth century, or of our own countryman Roger Bacon, who was born in 1214, and died in 1292, or 1294. The following remarkable passage occurs in Bacon's Opus Majus by Jebb, p. 352. *Si vero homo aspiciat literas et alias res minutas per medium crystalli, vel vitri, vel alterius perspicui suppositi literis, et sit portio minor sphera, cujus convexitas sit versus oculum et oculus sit in aere, longe melius videbit literas, et apparebunt ei majores.—Et ideo hoc instrumentum est utile senibus et habentibus oculos debiles: nam literam quantumcunque* parvam

parvam possunt videre in sufficienti magnitudine. Hence, and from other passages in his writings much to the same purpose, Molyneux, Plott, and others, have attributed to him the invention of reading-glasses.

Dr. Smith, indeed, observing that there are some mistakes in his reasoning on this subject, has disputed his claim. See Molyneux's Dioptr. p. 256. Smith's Optics, Rem. 86—89.

SPECTATOR, a person present at a spectacle.

Among the Romans, SPECTATORS, SPECTATORES, more particularly denoted a kind of GLADIATORS, who had received their discharge; and were frequently hired to be present, as *spectators*, at the combats of gladiators, &c. with which the people were entertained. See RUDIARIUS.

SPECTER, in *Conchyliology*, a name given by the French naturalists to a species of *voluta*, on which there are several reddish broad bands, composed of loose and irregular figures; the ground colour is a fine white. They are called by Latin writers CONCHA *spectrorum*.

SPECTRORUM *candela*, in *Natural History*, a name by which some have called the BELEMNITES.

SPECULA, among the Romans, were places whence a good view might be had of what was doing at a distance. The word is particularly used to signify watch-towers and beacons.

SPECULARES, in *Natural History*, the name of a genus of fossils of the class of the talcs.

The word is derived from the Latin *speculum*, *a looking-glass*; the bodies of this kind being naturally of bright, glossy, and polished surfaces, and in the thicker masses not transparent, but reflecting the images of things.

The *speculares* are talcs, composed of visibly separate plates of extreme thinness, and each fissile again into a number of others yet finer. See *Tab. of Fossils*, *class* 1.

The bodies of this genus are the common Muscovy talc; the *specularis lucida fusca*, or brown talc, a species little inferior to the former in beauty, and found in Germany and England; and the *specularis amethystina*, called *talc rouge*, or *red talc*, by the French. This is found in Muscovy and Persia, and no where else, as far as is yet known, and is often imported into France in masses, which are of a beautiful purple: we have of it brought into England, but only in thin flakes, fit for the covering of miniature pictures. In these flakes it has none of the redness natural to it in the lump, but is the finest and most transparent of all the talcs.

Pliny, and other of the ancient writers, as well as several of the moderns, use the term *specularis lapis* for that species of talc commonly known by the name of *isinglass*, or *Muscovy glass*.

This has been a substance in great use among mechanics, from the earliest times we have any accounts of. It is found in broad flat masses of ten or twelve inches in breadth, and from half an inch to three inches in thickness; and is composed in these of an almost infinite number of broad and beautifully even plates, or flakes, laid with a perfect regularity on one another, and seldom parting naturally from each other, though by art they may be divided, almost without end, into broad and extremely thin laminæ. These are very flexile and elastic, and make no effervescence with aqua fortis. By the last of these properties they are distinguished from the plated spars which some have confounded with them, and by their elasticity from all other fossil bodies.

It is found in many parts of the world. The island of Cyprus abounds with it. It is very common also in Russia, and has of late been discovered to abound in the Alps, the Apennines, and many of the mountains of Germany. It is imported in large quantities into England, and is used by the lanthorn-makers instead of horn, in their nicer works; by the painters to cover miniature pictures; and by the microscope-makers to preserve small objects for viewing by glasses. The ancients used it instead of GLASS in their windows. Hill's Hist. of Fossils, p. 72.

Some take the *lapis specularis* to have been a species of GYPSUM, and composed of the acid of vitriol and calcareous earth. It came into use at Rome in the age of Seneca (Ep. 90.) and, soon, after its introduction, was applied not only to lighten apartments, but to protect fruit trees from the severity of the weather; and it is recorded, that the emperor Tiberius was enabled, principally by its means, to have cucumbers at his table during almost every month in the year.

Dr. Watson apprehends it is still used in some countries in the place of glass; however, it is well known, that it was so used in the time of Agricola, for he mentions (De Nat. Fos. lib. v. p. 257) two churches in Saxony which were lighted by it. Agricola esteemed it to have been a species of plaster-stone, and in speaking of it he remarks, that though it could bear, without being injured, the heat of summer, and the cold of winter, yet the largest masses of it were wasted by the rain. However, it differs from plaster-stone in this property, that it does not after being calcined and wetted with water, swell and concrete into a hard stony substance. Watson's Chem. Ess. vol. ii. p. 297, &c.

SPECULARIA, among the Romans, a kind of window-casements, which were used before glass was introduced for this purpose. They consisted of transparent stones, called *lapides* SPECULARES.

SPECULARIA, the art of preparing and making *specula*, or mirrors. Or, the laws of mirrors, their phenomena, causes, &c. called also *catoptrics*.

SPECULARIS *lapis*, in *Natural History*. See SPECULARES.

SPECULATION.—*Certitude of* SPECULATION. See CERTITUDE.

SPECULATION-*shell*, in *Natural History*, a name given by the French writers to a very beautiful species of the VOLUTA, usually called by us the *Guinea-shell*, from its being brought from that part of the world.

SPECULATIVE *geometry*, *mathematics*, *music*, and *philosophy*, see the substantives.

SPECULUM, *mirror*, in *Optics*, any polished body, impervious to the rays of light: such as water in wells, and deep rivers, polished metals, and glasses lined with mercury, or any other opake matter, popularly called LOOKING-*glasses*.

For the several kinds and forms of *specula*, *plain*, *concave*, and *convex*, with their theory and phenomena, and the methods of preparing, grinding them, &c. see MIRROR and GRINDING.

For the laws and effects of *specula* of various forms, see REFLECTION and BURNING-*glass*

As for the *specula* of reflecting telescopes, we shall here observe, that the perfection of the metal of which they should be made consists in its hardness, whiteness, and compactness; for upon these properties the reflective powers and durability of the *specula* depend. There are various compositions recommended in Smith's Optics, book iii. chap. 2. sect. 787.

Three parts of copper, and one part and a quarter of tin, it is said, will make a very hard white metal, but it is very liable to be more porous than it should be, especially if the metal be too much heated in melting. Besides, Mr. Mudge observes, that it is not hard enough. Six parts of good shruff brass, and one part of tin, will make a whiter and harder metal; but the fume of the calamy stone in brass, often leaves streaks of scabrous parts in the surface of the metal, which, if numerous, utterly spoil it. Take two parts of the former mixed metal of copper and tin, and one part of the latter brass and tin; this composition will make a good metal: let the copper and the brass be first melted together, and keep them in fusion for half an hour or more; then clear the pot, and put in the proper quantity of tin for both, which will instantly melt; stir it well about, and pour it off immediately.

This mixture may be melted over and over again in case of necessity, provided always care be taken that the fire is not too violent. A common bellows-furnace has been found most convenient for governing the fire, and some metals have succeeded which have been cast by a common brass founder in their ordinary way of casting; the composition having been first made and melted together for the *speculum*, and delivered to them only for casting. There hath been tried also another mixture and another manner of casting, which succeeded better than any of the above mentioned; it was formed of copper, silver, regulus of antimony, tin, and arsenic; and the metal was cast in very hot moulds of brass; but this is too expensive to become common.

Mr. Mudge observes, that all these compositions have their several defects, and after repeated trials he infers, that nothing more is necessary in order to procure a metal that shall be white, as hard as it can be wrought, and perfectly compact, than to melt two pounds of Swedish copper, and when so melted, to add fourteen ounces and a half of grain-tin to it; then, having taken off the scoria, to cast it into an ingot. This metal must be a second time melted to cast the *speculum*; but as it will fuse in this compound state with a small heat, and, therefore, will not calcine the tin into putty, it should be poured off as soon as it is melted, giving it no more heat than is absolutely necessary. It is to be observed, however, that the same metal, by frequent melting, loses something of its hardness and whiteness; when this is the case, it becomes necessary to enrich the metal by the addition of a little tin, perhaps in the proportion of half an ounce to a pound. And, indeed, when the metal is first made, if instead of adding the fourteen one half ounces of tin to two pounds of melted copper, about one

ounce of the tin were to be reserved and added to it in the succeeding melting, before it is cast off into the moulds, the composition would be the more beautiful, and the grain of it much finer.

The best method for giving the melted metal a good surface is this: the moment before it is poured off, throw into the crucible a spoonful of charcoal dust, immediately after which the metal must be stirred with a wooden spatula, and poured into the moulds. Phil. Transf. vol. lxvii. part i. art. 16.

For the method of grinding and polishing, &c. *specula* of this kind. See GRINDING.

Mr. Hearne's method of cleaning a tarnished *speculum* was this; get a little of the strongest soap-ley from the soap-maker, and having laid the *speculum* on a table with its face upwards, put on as much of the ley as it will hold, and let it remain about an hour: then rub it softly with a silk or muslin, till the ley is all gone; then put on some spirit of wine, and rub it dry with another part of the silk or muslin. If after this the *speculum* will not perform well, it must be new polished. A few spots of faint tarnish may be rubbed off with spirit of wine only. Smith's Opt. Rem p. 107.

SPECULUM, *horizontal*. See HORIZONTAL.

SPECULUM, among *Surgeons*, the same with *specillum*. More particularly,

SPECULUM *ani*, is an instrument, wherewith they dilate the fundament to examine sores, extract bones, or let out any peccant matter that may be there lodged. It consists of a hollow cone or beak, which, being gently warmed or lubricated with oil, is passed into the anus; and by pressing together the two handles, the sides of the cone are thereby gradually separated, and dilate the parts for inspection.

SPECULUM *linguæ*, a chirurgical instrument. See GLOSSOSPATHA.

SPECULUM *indicum*, an affected term used by some chemical writers to express filings of iron.

SPECULUM *matricis*, is an instrument used to examine and dress corrupted places in the privy parts of women. Its form is the same with that of the *speculum ani*.

SPECULUM *oculi*, in *Surgery*, is an instrument used for holding the eyes firm, and opening their lids in couching and other operations for the eyes.

SPECULUM *oris*, is an instrument serving to examine disorders in the mouth. There are two kinds: the one common; the other bigger and stronger, fit not only to keep down the tongue, but also the lower jaw; while the mouth is surveyed to the very extremity of the throat, and the necessary remedies applied. For an account of these instruments, with figures, see Heister's Surgery, vol. i. p. 441. vol. ii. p. 309 and 441.

SPEECH, the act, or art of expressing a man's thoughts, by certain signs invented for that purpose.

These signs are principally sounds made by the voice, and letters. See LANGUAGE.

SPEECH, in *Grammar*, denotes an assemblage of several words ranged in order.

The grammarians generally make *eight parts of speech*, i. e. eight kinds of words used in discourse; viz. *noun*, *pronoun*, *verb*, *participle*, *adverb*, *conjunction*, *preposition*, and *interjection*; each of which see under its proper article.

F. Buffier, one of the last and best writers on grammar, only admits of three parts of speech, viz. *noun*, *verb*, and *modificative*; which last includes the *adverb*, *conjunction*, and *preposition*.

The ingenious Mr. Harris, after Aristotle, distributes all words into four species, viz. substantives, or nouns; attributives, or verbs; definitives, or articles; and connectives, or conjunctions: the two former are principals, or significant from themselves; and the two latter are accessories, or significant by relation. Under these four species are included pronouns, adverbs, prepositions, and interjections. Hermes, p. 31.

SPEEDWELL, *veronica*, in *Botany*, a genus of the *diandria monogynia* class. Its characters are these: the flower has a permanent empalement, cut into five acute segments, and it has one tubulous petal the length of the empalement; the brim is cut into four oval plain segments, which spread open, and two stamina, which are terminated by oblong summits; it has a compressed germen supporting a slender declining style, crowned by a single stigma; the germen becomes a compressed heart-shaped capsule, with two cells filled with roundish seeds. Miller reckons sixteen, and Linnæus thirty-five species.

The common male *speedwell*, or Paul's betony, is in great esteem among the Germans, in disorders of the breast, both catarrhous and ulcerous, and for purifying the blood and humours. Infusions of the leaves, which are not unpalatable, are drank as tea, and are found to operate sensibly by urine. See BROOKLIME.

SPEEDWELL, *female*. See ELATINE.

SPEISSE, in *Mineralogy*, a name given by the Germans, and other workers on cobalt, to a sort of impure regulus of bismuth, sometimes occurring in their processes.

It is not uncommon for ores of bismuth to be mixed with the cobalt in the smalt-works. Both this ore and the cobalt yield the blue vitrifiable earth of which smalt is made; but in one of them it is blended with arsenic, and in the other with the bismuth. The separating it from these two minerals requires different processes, and the workmen, therefore, separate the two minerals, and work each by itself; but it sometimes happens that the ore of bismuth is so like to the true cobalt, that it cannot be distinguished by the eye, and so intimately mixed with it, that it cannot be separated from it; in this case the whole is exposed to the fire together, and, after the arsenic is sublimed in form of meal, there remains a coarse and impure regulus of bismuth, which having mixed itself with the earth of the cobalt, and other extraneous substances, is of a reddish white colour, and very impure and friable. This gives them the trouble of a second operation, by which they separate the pure regulus of bismuth, and the remainder being a mixture of its earth and that of the cobalt, is run together into the blue glass, called *smalt*, the earth of bismuth ore being of the same nature with that of cobalt. Philos. Transf. N° 396, p. 199.

SPELL, a kind of CHARM, to drive away a disease, by hanging a word or sentence written on a paper about the neck.

SPELL, in the *Sea Language*, the period wherein a sailor, or gang of sailors, is employed in a particular exercise, from which they are relieved as soon the limited time expires. Such are the *spells* to the hand-lead in sounding, to the pump, to look out on the mast-head, &c. and to steer the ship, which last is generally called the *trick*.

Spell also implies the relief or return of duty to those services: thus it is said, *spell* the pump, *spell* the lead, &c.

SPELLING, that part of grammar properly called ORTHOGRAPHY.

Dr. Jones gives the following rules, or maxims of *spelling*.

1°, That all words were originally pronounced as *spelt*.

2°, That in all words, whose sounds have been since altered (the origin of the difficulty of *spelling*), the alteration was made for the sake of ease and pleasure.

And hence, 3°, All words that can be written several ways, must be *spelt* according to the hardest, harshest, and most unusual sound.

SPELTA, in the *Materia Medica*, a name used for the grain of the zea dicoccos, commonly called *spelt corn*.

SPELTER, or SPELTRE, a name sometimes given to ZINC.

SPENT, at *Sea*. The seamen say a ship hath *spent* any mast or yard, when it is broken down by foul weather, or any such accident; but if it be done by an enemy's shot in a fight, they say, *such a yard*, or *mast*, *was shot by the board*.

SPERAGE, *asparagus*, in *Botany*. See ASPARAGUS.

SPERGULA, in *Botany*. See SPURREY.

SPERM, SPERMA, σπερμα, the SEED whereof an animal is formed.

SPERMACETI, or *parmasitty*, in *Pharmacy*, is a whitish, flaky, unctuous substance, prepared from oil; principally from that of a cetaceous fish, called by some the *male whale*, by others CACHALOT, and by the Latins *orga*; distinguished from the common whale by its having teeth in lieu of whale-bone, and by a bunch on its back. See PHYSETER.

The ancients were strangers to the nature of this preparation; and even Schroder seems in doubt, whether to reckon it an animal or mineral substance.

It had its name *spermaceti*, seed or sperm of whale, given it, no doubt, to raise its value, by a notion of its scarcity: the oil it is properly to be made from, is found in a large trunk, four or five feet deep, and ten or twelve long, filling almost the whole cavity of the head, and seeming to supply the office of brain and cerebellum.

The method of preparing it is a secret in the hands of a very few. The process is said to be thus: the matter, being taken out of the animal, is melted over a gentle fire, and put into moulds, like those wherein sugar-loaves are formed. When cold, and drained, it is taken out, and melted over again, and this they continue to do till it be well purified, and become white. It is then cut with a knife for the purpose, and reduced into flakes, such as we have from the druggists. Some of our druggists have now got the art of making it from the sediment or fæces of any kind of oil. It must be chosen white, clear, and transparent, of a sweetish smell, which some fancy to partake

partake of that of the violet: ſome ſophiſticate it with wax; but the deceit is diſcovered, either by the ſmell of the wax, or by the dullneſs of the colour. Some alſo ſell a preparation of oil gained from the tail of the whale, inſtead of that from the brain; which laſt kind turns yellow, as ſoon as opened to the air. In the general, there is no merchandize that ſhould be kept cloſer from the air than *ſpermaceti*.

Spermaceti is of great uſe in medicine. Quincy ſays, it is a noble remedy in the aſthma, &c. though chiefly uſed in bruiſes, inward hurts, and after delivery. For internal uſe, it may be diſſolved in aqueous liquors into the form of an emulſion, by trituration with almonds, the yolk or white of an egg, and more elegantly by mucilages; or made into a lohoch, by mixing two drams of it with a ſuitable quantity of yolk of egg, then adding half an ounce of freſh drawn oil of almonds, and an ounce of balſamic ſyrup.

Spermaceti is not capable of being diſſolved by cauſtic alkalis, and of forming ſoaps, like other oily matters: but it is altogether ſoluble in oils, and unites by liquefaction with wax and reſins; and in theſe forms is applied externally.

But it is certain, its greateſt property, and that which makes it ſo much in vogue in many places, is its ſoftening the ſkin. Whence it comes to be uſed by the ladies in paſtes, waſhes, &c.

Spermaceti candles are of modern manufacture: they are made ſmooth, with a fine gloſs, free from rings and ſcars, ſuperior to the fineſt wax-candles in colour and luſtre; and, when genuine, leave no ſpot or ſtain on the fineſt ſilk, cloth, or linen.

SPERMACOCE, *button weed*, in *Botany*, a genus of the *tetrandria monogynia* claſs. Its characters are theſe: the flower has a permanent empalement, indented in four parts, ſitting on the germen; it has one cylindrical petal, whoſe tube is longer than the empalement, and the brim indented in four parts; and it has four awl-ſhaped ſtamina, ſhorter than the petal, terminated by ſingle ſummits; it has a roundiſh compreſſed germen, ſituated under the flower, ſupporting a ſingle ſtyle, divided into two parts at the top, crowned by obtuſe ſtigmas; the germen afterwards turns to two oblong ſeeds, which are joined, having two horns, and are convex on one ſide, and plain on the other. Linnæus enumerates ſix, and Miller two ſpecies, natives of Jamaica, where one of the ſpecies is known by the name of button-weed. Miller.

SPERMATIC, σπερματικος, in *Anatomy*, ſomething belonging to the ſperm or ſeed.

The ancients made a general diviſion of the parts of the animal body into *ſpermatic* and *ſanguineous*. *Spermatic parts* are thoſe, which by their colour, &c. bear ſome reſemblance to the ſeed; and were ſuppoſed to be formed thereof; ſuch are the nerves, membranes, bones, &c. *Sanguineous* are thoſe ſuppoſed to be formed of the blood after conception.

But the moderns, with much better reaſon, hold all the parts to be *ſpermatic* in this ſenſe, and either formed originally of the ovum of the female, or of the ſemen of the male. M. Andry ſpeaks of *ſpermatic worms* in the human body. See WORMS.

SPERMATIC *veſſels*, called alſo *vaſa præparantia*, are certain veſſels appointed for bringing the blood to the teſticles, &c. to be ſecreted and prepared into ſeed, and for carrying back again the blood remaining after the ſecretion is effected.

The *ſpermatic veſſels* are two arteries, and as many veins.

SPERMATIC *arteries, the*, ariſe from the fore part of the trunk of the aorta, below the emulgents. See *Tab. Anat.* (*Angeiol.*) *fig.* 1. *n.* 51. (*Splanch.*) *fig.* 1. *lit. p. p.* &c.

Their ſtructure is very ſingular, in that, contrary to the fabric of all other arteries, which are largeſt at their exit from the trunk, theſe are ſmalleſt at their origin, and grow bigger in their progreſs towards the teſtes. By this means the blood receives a check at its firſt going off for thoſe parts, which diſpoſes it for the future changes, &c. it is to paſs. The ſame end is anſwered in quadrupeds, by having theſe arteries curled and contorted in their paſſage like a ſcrew.

The reaſon why nature has taken another method in man, Mr. Cowper obſerves, is, that, in that caſe, the abdominal muſcles muſt have been larger than they are; by which means the inteſtines would have been frequently let down into the ſcrotum; an inconvenience which quadrupeds are ſecured from, by the horizontal poſition of their bodies.

The *ſpermatic arteries*, in their progreſs, ſend off to the common membrane of the kidney ſmall branches, named *arteriæ adipoſæ*, and, meeting with the *ſpermatic veins*, enter together with them the inner lamella of the peritonæum, where, inſinuating into the duplicature of the proceſs, and being clothed therewith, they paſs on to within three or four fingers breadth of the teſticles, where they divide into two unequal branches, the biggeſt of which goes to the TESTICLE, and is diſtributed therein: and the leſs in the paraſtata or epididymis.

In women, the *ſpermatic arteries* do not go out of the abdomen, but are diſtributed to the ovaria and uterus, and communicate with branches of the hypogaſtrica, at the jagged extremities of the tubæ Fallopianæ.

SPERMATIC *veins, the*, take the ſame courſe with the arteries; the right vein ariſing commonly from the trunk of the vena cava, and the left vein from the vena renalis ſiniſtra, only, a little above the teſticles, they ſplit into ſeveral branches, which, uniting, form a plexus, called *corpus varicoſum pampiniforme*, or *pyramidale*. They differ from the *ſpermatic* arteries, not only in that they are larger, and their coats thinner, but alſo in being more divided and multiplied, as they deſcend to the rings of the abdominal muſcles: and as they gradually produce a large faſciculus of ramifications, the ancients gave to them and the arteries the name of vaſa pyramidalia. The numerous convolutions formed by theſe ramifications, gave riſe to the name of vaſa pampiniformia, formerly given to theſe veſſels. The blood returned by the *ſpermatic veins* is delivered on the right ſide to the cava, and on the left into the emulgent vein. See *Tab. Anat.* (*Angeiol.*) *fig.* 6. *n.* 2.

SPERMATOCELE, in *Surgery*, a kind of rupture, occaſioned by a diſtenſion of the ſeminal veſſels, whereby they are let fall into the ſcrotum.

SPERMATOPŒA, a name given to ſuch medicines as are ſuppoſed to increaſe the ſemen.

SPERMATOSIS, is a term ſometimes uſed for the formation of ſeed.

SPERVERIUS, in *Ornithology*, a name by which Bellonius, and ſome other authors, have called the *ſparrow*-HAWK, more commonly known by the names of *niſus*, and *accipiter fringillarius*.

SPHACELUS, or SPHACELISMUS, formed, perhaps, of σφαττω, *I kill*, in *Surgery*, a total corruption or mortification of any ſort, occaſioned by an interception of the blood and ſpirits. See MORTIFICATION.

It is ſometimes, alſo called *necroſis*, and ſometimes *ſideratio*.

SPHÆCULÆ, among the Romans, were tickets of wood, *teſſeræ ligneæ*, by which the emperors ſcattered their preſents to people of both ſexes in the theatre, or circus.

SPHÆRANTHUS, in *Botany*. See GLOBE *Flower*.

SPHÆRISTERIUM, σφαιριςηριον, in *Antiquity*, the ſeventh part of the ancient gymnaſium; being that wherein the youth practiſed tennis-playing.

The *ſphæriſterium*, or tennis-court, was between the place named *palæſtra*, and that where they ran races, which was between the porticoes and the outer wall, though Vitruvius does not make mention of it in the deſcription he gives of the ancient gymnaſium.

The exerciſe here performed was called σφαιριςικη, *ſphæriſtica*, and σφαιρομαχια, *ſphæromachia*, which ſome will have to have differed from the modern tennis; but it is not known wherein the difference conſiſted.

The Mileſians were particularly averſe from this exerciſe; and the Athenians were as remarkably fond of it. Theſe latter frequently gave the freedom of their city to the *ſphæriſtæ*, or maſters in this art, by way of compliment.

SPHÆROMACHIA, σφαιρομαχια, in *Antiquity*, a particular kind of BOXING, wherein the combatants had balls of ſtone or lead in their hands, which were called σφαῖραι.

SPHAGITIDES, a name given by ſome authors to the jugular veins.

SPHAGNUM, in *Botany*, the name of a genus of the *cryptogamia* claſs of moſſes, the characters of which are theſe: they produce heads or capſules only of one kind, which differ alſo from thoſe of all the other moſſes, in that they have no calyptra, or other covering; theſe ſtand on very ſhort pedicles, and are therefore ſo guarded by the leaves, as not to need any other covering. The *ſphagna* are divided into two orders, the one comprehending the branched kinds, and the other the unbranched ones: theſe are diſtinguiſhed by ſome by the terms *cauliferous* and *acaulous*. See *Tab.* XIII. *of Botany*, N° 8. Dillon, Hiſt. Muſc. p. 242.

Of the firſt order there are nine known ſpecies.

Of the *ſphagna* of the ſecond order, or thoſe which have no branched ſtalks, there are only four known ſpecies. Linnæus enumerates three ſpecies.

SPHENOIDAL *future*, in *Anatomy*, a *future* thus called, from

from its encompaſſing the os ſphenoides, which it ſeparates from the os frontis, the os petroſum, and os occipitis.

SPHENOIDES, in *Anatomy*, os cuneiforme; a bone of the head, common to the cranium and upper jaw.

It is ſituate in the lower part of the ſkull, whereof it is, as it were, the baſis, and is connected to all the other members thereof by the *ſphenoidal ſuture*. See *Tab. Anat.* (*Oſteol.*) *fig.* 7. *n.* 5.

Its form is irregular, and not eaſy to be deſcribed, whence ſome have called it *multiforme*.

It has its name *ſphenoides*, from the Greek σφην, *cuneus*, *wedge*, by reaſon of the manner of its inſertion into the other bones of the ſkull.

In adults it is one continued bone; but in young children it ſometimes conſiſts of three, and ſometimes of four diſtinct pieces.

Its greateſt extent is tranſverſe, and it may in ſome manner be ſaid to repreſent a bat with its wings extended: its poſterior, or thickeſt part, by which it is joined to the apophyſis of the os occipitis, may be called its body; the reſt of it is wholly made up of eminences and cavities. And in order to examine theſe methodically, the bone muſt be divided into two ſides, the one external, the greateſt part of which may be ſeen in an entire ſkull; the other internal, which does not appear till the ſkull is opened.

The eminences on the outſide are theſe: two temporal apophyſes, which are the largeſt of all the proceſſes of this bone, and at the greateſt diſtance from each other, called *the great wings of the os ſphenoides*, and theſe are ſometimes, though rarely, ſeparated from the reſt of the bone by tranſverſe ſutures: two orbitary apophyſes, which form a conſiderable portion of the orbit next the temples: a ſmall ſharp proceſs, formed like a bird's bill between the orbitary apophyſes: two pterygoide apophyſes, each of which is divided into two alæ; one external, which is the largeſt, the other internal, the lower end of which is in the ſhape of a hook; and each of theſe alæ is again divided into two ſides, the one internal toward the palate, the other external toward the temples: two ſpinal apophyſes: a little anterior eminence above the ſharp proceſs, for the articulation of this bone with the os ethmoides; but in ſome ſubjects, inſtead of this eminence, there is only a little notch.

The external cavities of this bone are two portions of the temporal foſſæ; two portions of the orbitary foſſæ; two pterygoide foſſæ; the lower ends of theſe are divided by a little notch, or ſlit, of an irregular figure, which may be called the *fiſſura palatina*: a little oblong foſſula at the root of the internal ala; two ſuperior orbitary, or *ſphenoidal* fiſſures, a little notch at the end of each of theſe fiſſures, for the paſſage of an artery of the dura mater; two temporal notches; two maxillary notches, the edges of which help to form the two inferior orbitary fiſſures, which may be called *fiſſuræ ſpheno-maxillares*; two holes for the ſuperior maxillary nerves; two other holes on one ſide of the former, called *pterygoide*, which, in an entire ſkull, are hid by the other bones; two oval holes for the inferior maxillary nerves; two little ſpinal holes, each of which tranſmits an artery of the dura mater, but ſometimes theſe are only notches; a little hole between the two maxillary holes; and a little groove on one ſide of the ſpinal apophyſis, which forms part of the Euſtachian tube.

The internal eminences are two thin ſharp tranſverſe apophyſes, which form the ſuperior orbitary fiſſures, called *the little wings of the ſphenoidal bone*; a little proceſs, in ſome ſubjects, between theſe two thin apophyſes, for the articulation with the os ethmoides, which in ſome other ſubjects is a notch: four clynoide apophyſes, two anterior, two poſterior; which laſt are ſometimes united in one, and ſometimes run forward all the way to the anterior proceſſes, forming a kind of bridge, under which the internal carotid artery paſſes at its laſt curvature; this paſſage has alſo ſometimes been found divided into two by a thin bony ſeptum, beſide other varieties; one or two ſmall productions where the internal carotid enters the cranium; two little ſtyloide proceſſes, or hooks, which in ſome ſubjects join the extremity of the os occipitis, before the perfect union of theſe bones.

The internal cavities are two portions of the large middle foſſæ of the baſis cranii; two ſuperior, orbitary, or *ſphenoidal* fiſſures; two optic holes; a ſmall ſuperior orbitary hole, near the end of each *ſphenoidal* fiſſure, which is often no more than a notch; a ſmall groove at the extremities of the ſame fiſſures; a depreſſion between the clynoide apophyſes, called *ſella ſphenoidalis*, *ſella turcica*, and *foſſa pituitaria*. Here are alſo ſeen almoſt all the holes mentioned on its outſide, and it appears that the ſuperior maxillary hole ought more juſtly to be called a ſhort canal. Beſide theſe, there are alſo two very conſiderable cavities, called the *ſphenoidal ſinuſes*, ſituated in the thick portion of this bone, under the anterior part of the ſella turcica, and middle ſpace between the two optic holes, reaching as far as the ſharp proceſs, or bill, already deſcribed; theſe are commonly divided by a bony ſeptum, and they open before on each ſide of the ſharp proceſs, juſt behind the ſuperior conchæ of the noſe, or oſſa convoluta ſuperiora.

The figure, ſize, openings, and ſeptum of theſe vary greatly; ſometimes one is wanting, ſometimes both are ſo; ſometimes there are ſeveral cells without any ſeptum, and ſometimes the ſeptum is placed more on one ſide than the other. The ſubſtance of this bone is for the moſt part compact, having very little diploe; and what there is of this lies in diſtinct parts of the bone, viz. in the thick portion behind the ſella turcica, toward the ſymphyſis with the occipital bone, and in the orbitary apophyſes in a ſmall quantity. It is articulated with all the other bones of the cranium, with the oſſa malarum, oſſa maxillaria, oſſa palati, and vomer. Winſlow's Anatomy, p. 26.

SPHENOIDES *ſella*. See SELLA.

SPHENO-*maxillary artery*, in *Anatomy*, is the firſt branch of the internal maxillary artery; it paſſes to the *ſpheno*-maxillary fiſſure, and to the orbit, through the foramen *ſpheno*-palatinum.

SPHENO-*maxillary fiſſures*. See SPHENOIDES and PALATE.

SPHENO-*palatini*, in *Anatomy*, are thoſe muſcles which riſe (one on each ſide) from the os ſphenoides, and are inſerted into the glandula palati, and poſterior part of the uvula.

SPHENO-*palatinus*, is the name of a branch of the *fifth pair* of NERVES.

SPHENO-*pharyngæi*, in *Anatomy*, muſcles of the PHARYNX, inſerted partly in the os ſphenoides, directly above the internal ala of the apophyſis pterygoides, and partly in the neighbouring cartilaginous portion of the Euſtachian tube. For their uſe, ſee PETRO-*pharyngæi*.

SPHENO-*pterygo-palatinus*, is a muſcle belonging to the tuba Euſtachiana, which riſes from the os ſphenoides, and is inſerted into the fore-part of the PALATE.

SPHENO-*ſalpingo-ſtaphylini*, are two diſtinct muſcles; each of which is fixed by one extremity, partly to the ſphenoidal ſide of the bony portion of the Euſtachian tube, partly to the neareſt ſoft portion of the ſame tube. From thence it runs toward the external ala of the apophyſis pterygoides, into which one portion of this muſcle is inſerted. The other portion runs to the end of the ala, and turns round to the forked extremity thereof as over a pulley, and is afterwards inſerted in the ſeptum palati near the uvula.

SPHENO-*ſtaphylinus*, in *Anatomy*, a muſcle of the uvula. It deſcends from a round fleſhy origination, near the root of a proceſs of the os ſphenoides; and is implanted into the poſterior part of the uvula, where it joins its partner. It ſerves to draw the uvula upwards and backwards; and hinders the maſticated aliment from paſſing into the foramina narium in deglutition.

SPHERE, SPHÆRA, σφαιρα, in *Geometry*, a ſolid body contained under one ſingle ſurface, and having a point in the middle, called the *centre*, whence all lines, drawn to the ſurface, are equal.

The *ſphere* is ſuppoſed to be generated by the revolution of a ſemicircle A B C (*Tab.* IV. *Geometry*, *fig.* 114.) about its diameter A C, which is alſo called the *axis of the ſphere*, and the extreme points of the axis, A and C, the *poles of the ſphere*.

SPHERE, *properties of the*. 1°, A *ſphere* is equal to a pyramid, whoſe baſe is equal to the ſurface, and its height to the radius of the *ſphere*.

Hence, a *ſphere* being eſteemed ſuch a pyramid, its cube, or ſolid content, is found like that of a pyramid.

2°, A *ſphere* is to a cylinder, ſtanding on an equal baſis, and of the ſame height, as 2 to 3. Hence, alſo, may the cube, or content of the *ſphere* be found.

3°, A *ſphere* is equal to four times the cone, the baſe of which is equal to the generating circle, and the height of which is equal to the radius. Or a hemiſphere is equal to twice the cone of the ſame baſe and height. And a cylinder, of the ſame height and baſe, being triple of the cone, it follows, that the hemiſphere is two thirds of the cylinder, and conſequently the whole *ſphere* two thirds of the circumſcribing cylinder. Archim. de Sph. et Cycl. Apud Opera per Rivaltum, p. 67.

4°, The cube of the diameter of a *ſphere* is to the ſolid content of the *ſphere*, nearly as 300 to 157: and thus, alſo, may the content of the *ſphere* be meaſured.

5°, The ſurface of a *ſphere* is quadruple the area of a circle deſcribed with the radius of the *ſphere*. For ſince a *ſphere* is equal to a pyramid, whoſe baſe is the ſurface,

and

and its altitude the radius of the *sphere*; the surface of the *sphere* is had, by dividing its solidity by a third part of its semidiameter, or one sixth of the whole diameter.

But the solidity of the *sphere* is the product of $\frac{2}{3}$ of the greatest circle by the diameter; and if this product be divided by $\frac{1}{6}$ of the diameter, the quotient, or $\frac{12}{3}$ of the greatest circle, i. e. four times the greatest circle, will be the surface of the *sphere*.

Otherwise: the surface of a *sphere* is equal to the product of its diameter and the periphery of its generating circle; but the area of this circle is equal to the product of the semidiameter and half the periphery, or one fourth of the product of the diameter and periphery; and, therefore, the surface of the *sphere* is equal to four times the area of its generating circle.

Hence 6°, The surfaces of *spheres* are to one another as the squares of their diameters; because these surfaces, being four times their generating circles, are as these circles, i. e. as the squares of their diameters.

7°, *Spheres*, being $\frac{2}{3}$ parts of cylinders of equal base and altitude, and CYLINDERS being as the cubes of their altitudes, are as the cubes, or in the triplicate ratio, of their diameters.

8°, The surface of any portion of a *sphere*, greater or less than a hemisphere, is equal to the area of a circle, whose radius is a line drawn from the vertex of that portion to the circumference of the circle which is its base. Archimedes, ubi supra, p. 84, 85.

SPHERE, *the diameter of a, being given, to find its surface and solidity.* Find the periphery of the circle described by the radius of the *sphere*, or of the generating circle.

Multiply this, found, into the diameter, or the square of the diameter, by 3,1416, the product is the surface of the *sphere*. Multiply the surface by a sixth part of the diameter, or the area of the generating circle by $\frac{2}{3}$ of its diameter; or again (because the area of such circle is to the square of the diameter as ,7854 to 1), the cube of the diameter by ,5236 ($=\frac{2}{3}$ of ,7854); and the product is the solidity of the *sphere*.

Thus, supposing the diameter of the *sphere* 56, the periphery will be found 175,9, which multiplied by the diameter, the product 9852 is the surface of the *sphere*; which multiplied by one sixth part of the diameter, gives the solidity 91623,6.

Or thus;

Find the cube of the diameter 175616; then to 300,157, and the cube found, find a fourth proportional. This is the solidity of the *sphere* required.

For finding the surface and solidity of the *sphere* by the method of fluxions, see SUPERFICIES and SOLIDITY. For segments and sectors of *spheres*, see SEGMENT and SECTOR.

SPHERE, *doctrine of the*. See SPHERICS.

SPHERE, *projection of the*. See PROJECTION.

SPHERE *of activity*. See ACTIVITY.

SPHERE, in *Astronomy*, that concave orb or expanse which invests our globe, and in which the heavenly bodies, viz. sun, stars, planets, and comets, appear to be fixed at an equal distance from the eye.

This is also called the *sphere of the world*; and is the subject of the spherical astronomy.

This *sphere*, as it includes the fixed stars, whence we also occasionally call it the *sphere of the fixed stars*, is vastly great. The diameter of the earth's orbit is so small, in respect of the diameter hereof, that the centre of the *sphere* is not sensibly changed by any alteration of the spectator's place in the several parts of the orbit; but still, in all the points of the earth's surface, and at all times, the inhabitants have the same appearance of the *sphere*; that is, the fixed stars seem to possess the same points in the surface of the *sphere*. For our way of judging of the places, &c. of the stars, is to conceive right lines drawn from the eye, or the centre of the earth, through the centres of the stars, and continued thence till they cut the foresaid *sphere*; the points where these lines terminate therein are the apparent places of those stars.

The better to determine the places of the heavenly bodies in the *sphere*, several circles are imagined to be described in the surface thereof, hence called CIRCLES *of the sphere*.

SPHERE, in *Geography*, &c. denotes a certain disposition of the circles on the surface of the earth, with regard to one another, which varies in various parts thereof.

The circles originally conceived on the surface of the *sphere* of the world, are almost all transferred, by analogy, to the surface of the earth, where they are conceived to be drawn directly underneath those of the *sphere*, or in the same planes therewith; so that, if the planes of those of the earth were continued to the *sphere*, they would coincide with the respective circles thereon. Thus we have an horizon, meridian, equator, &c. on the earth.

As the equator in the heavens divides the *sphere* into two equal parts, the one north, and the other south, so does the equator on the surface of the earth divide the globe in the same manner.

And as the meridians in the heavens pass through the poles of the horizon, so do those on the earth, &c.

With regard, then, to the position of some of these circles in respect of others, we have a RIGHT, a PARALLEL, and an OBLIQUE *sphere*.

SPHERE, *armillary*, or *artificial*, is an astronomical instrument, representing the several circles of the *sphere* in their natural order; serving to give an idea of the office and position of each of them, and to solve various problems relating to them.

It is thus called, as consisting of a number of fasciæ or rings of brass, or other matter, called by the Latins *armillæ*, from their resembling of bracelets, or rings for the arm.

By this it is distinguished from the *globe*, which, though it hath all the circles of the *sphere* on its surface; yet is not cut into armillæ or rings, to represent the circles simply and alone; but exhibits also the intermediate spaces, between the circles.

SPHERE, *the armillary*, of Mr. Ferguson, constructed after the model of the glass *sphere* of Dr. Long, is represented (*Tab.* IV. *Astronomy*, *fig.* 89.)

The exterior parts of this machine are a compages of brass rings, which represent the principal circles of the heaven, viz. 1. The equinoctial A A, which is divided into 360 degrees (beginning at its intersection with the ecliptic in Aries); for shewing the sun's right ascension in degrees; and also into twenty-four hours, for shewing his right ascension in time. 2. The ecliptic B B, which is divided into 12 signs, and each sign into 30 degrees, and also into the months and days of the year, in such a manner, that the degree or point of the ecliptic in which the sun is, on any given day, stands over that day in the circle of months. 3. The tropic of Cancer C C, touching the ecliptic at the beginning of Cancer in *e*; and the tropic of Capricorn D D, touching the ecliptic at the beginning of Capricorn in *f*; each $23\frac{1}{2}$ degrees from the equinoctial circle. 4. The arctic circle E, and the antarctic circle F, each $23\frac{1}{2}$ degrees from its respective pole at N and S. 5. The equinoctial colure G G, passing through the north and south poles of the heaven at N and S, and through the equinoctial points Aries and Libra, in the ecliptic. 6. The solstitial colure H H, passing through the poles of the heaven, and through the solstitial points Cancer and Capricorn, in the ecliptic. Each quarter of the former of these colures is divided into 90 degrees, from the equinoctial to the poles of the world, for shewing the declination of the sun, moon, and stars; and each quarter of the latter, from the ecliptic at *e* and *f*, to its poles *b* and *d*, for shewing the latitudes of the stars.

In the north pole of the ecliptic is a nut *b*, to which is fixed one end of a quadrantal wire, and to the other end a small sun Y, which is carried round the ecliptic B B, by turning the nut: and in the south pole of the ecliptic is a pin at *d*, on which is another quadrantal wire, with a small moon Z upon it, which may be moved round by hand: but there is a particular contrivance for causing the moon to move in an orbit which crosses the ecliptic at an angle of $5\frac{1}{3}$ degrees, in two opposite points, called the *moon's nodes*; and also for shifting those points backward in the ecliptic, as the moon's nodes shift in the heaven.

Within these circular rings is a small terrestrial globe I, fixt on an axis K K, which extends from the north and south poles of the globe at *n* and *s*, to those of the celestial *sphere* at N and S. On this axis is fixt the flat celestial meridian L L, which may be set directly over the meridian of any place on the globe, and then turned round with the globe, so as to keep over the same meridian upon it. This flat meridian is graduated the same way as the brass meridian of a common globe, and its use is much the same. To this globe is fitted the moveable horizon M M, so as to turn upon two strong wires proceeding from its east and west points to the globe, and entering the globe at opposite points of its equator, which is a moveable brass ring let into the globe in a groove all around its equator. The globe may be turned by hand within this ring, so as to place any given meridian upon it, directly under the celestial meridian L L. The horizon is divided into 360 degrees all around its outermost edge, within which are the points of the compass, for shewing the amplitude of the sun and moon, both in degrees and points. The celestial meridian L L passes through two notches in the north and south points of the horizon, as in a common globe: but here, if the globe be turned round, the horizon and meridian turn with

with it. At the south pole of the *sphere* is a circle of 24 hours, fixt to the rings, and on the axis is an index which goes round that circle, if the globe be turned round its axis.

The whole fabric is supported on a pedestal N, and may be elevated or depressed upon the joint O, to any number of degrees from 0 to 90, by means of the arc P, which is fixed into the strong brass arm Q, and slides into the upright piece R, in which is a screw at *r*, to fix it at any proper elevation.

In the box T are two wheels (as in Dr. Long's *sphere*) and two pinions, whose axes come out at V and U; either of which may be turned by the small winch W. When the winch is put upon the axis V, and turned backward, the terrestrial globe, with its horizon and celestial meridian, keep at rest; and the whole *sphere* of circles turns round from east, by south, to west, carrying the sun Y, and the moon Z, round the same way, and causing them to rise above and set below the horizon. But when the winch is put upon the axis U, and turned forward, the *sphere* with the sun and moon keep at rest; and the earth, with its horizon and meridian, turn round from west, by south, to east; and bring the same points of the horizon to the sun and moon, to which these bodies came when the earth kept at rest, and they were carried round it; shewing that they rise and set in the same points of the horizon, and at the same times in the hour-circle, whether the motion be in the earth or in the heaven. If the earthly globe be turned, the hour-index goes round its hour-circle; but if the *sphere* be turned, the hour-circle goes round below the index.

And so, by this construction, the machine is equally fitted to shew either the real motion of the earth, or the apparent motion of the heaven.

To rectify the *sphere* for use, first slacken the screw *r* in the upright stem R, and taking hold of the arm Q, move it up or down until the given degree of latitude for any place be at the side of the stem R; and then the axis of the *sphere* will be properly elevated, so as to stand parallel to the axis of the world, if the machine be set north and south by a small compass: this done, count the latitude from the north pole, upon the celestial meridian L L, down towards the north notch of the horizon, and set the horizon to that latitude; then, turn the nut *b* until the sun Y comes to the given day of the year in the ecliptic, and the sun will be at its proper place for that day: find the place of the moon's ascending node, and also the place of the moon, by an Ephemeris, and set them right accordingly: lastly, turn the winch W, until either the sun comes to the meridian L L, or until the meridian comes to the sun (according as you want the *sphere* or earth to move) and set the hour-index to the XII, marked noon, and the whole machine will be rectified. Then turn the winch, and observe when the sun or moon rise and set in the horizon, and the hour-index will shew the times thereof for the given day. See Ferguson's Lectures, p. 194, &c.

Armillary spheres are of different kinds with regard to the position of the earth therein; whence they become distinguished into *Ptolemaic* and *Copernican spheres*: in the first whereof the earth is in the centre, and in the latter near the circumference, according to the position which that planet obtains in those systems.

SPHERE, *the Ptolemaic*, is that commonly in use, and is represented (*Tab. Astronomy, fig.* 21.) with the names of the several circles, lines, &c. of the *sphere*, inscribed thereon. In the middle, upon the axis of the *sphere*, is a ball, T, representing the earth, on whose surface are the circles, &c. of the earth. The *sphere* is made to revolve about the said axis, which remains at rest; by which means the sun's diurnal and annual course about the earth are represented according to the Ptolemaic hypothesis: and even by means hereof all problems relating to the phenomena of the sun and earth are solved, as upon the celestial globe, and after the same manner, which see described under GLOBE.

SPHERE, *the Copernican* (represented *Tab.* IV. *Astron. fig.* 90.) is very different from the Ptolemaic, both in its constitution and use; and is more intricate in both. Indeed, the instrument is in the hands of so few people, and its use so inconsiderable, except what we have in the other more common instruments, particularly the globe and Ptolemaic *sphere*, that we shall be easily excused the not taking up room with any description thereof.

SPHERES, *harmony of the.* See HARMONY.

SPHERE, *obliquity of the.* See OBLIQUITY.

SPHERE, *rectifying of the.* See RECTIFYING.

SPHERE, *dialling.* See DIALLING.

SPHERES, polished spherical masses of a mixt metalline composition, used in optics. The manner of making them is as follows:

Take of pure tin, three pounds; copper, one pound; melt these two metals together, and when in fusion cast upon the mass six ounces of burnt tartar, and an ounce and half of saltpetre; and lastly, a quarter of an ounce of alum, and two ounces of arsenic; let all these matters evaporate and burn away, and then cast the pure metal into the figure of a *sphere*, and it will be capable of a high and elegant polish. Neri's Art of Glass, p. 166. See STEEL-*glasses*.

SPHERICAL *angle*, is the mutual inclination of two planes, whereby a *sphere* is cut.

Thus the inclination of the two planes, C A F and C E F, (*Tab. Trigonometry, fig.* 12.) forms the *spherical angle* A C E.

The measure of a *spherical angle*, A C E, is an arch of a great circle A E, described from the vertex C, as from a pole, and intercepted between the legs C A and C E.

Hence, 1°, Since the inclination of the plane C E F to the plane C A F is every where the same, the angles in the opposite intersections, C and F, are equal.

2°, Hence the measure or a *spherical angle* A C E is described by the interval of a quadrant A C or E C, from the vertex C between the legs C A, C E.

If a circle of the sphere, A E B F (*fig.* 13.) cut another C E D F, the adjacent angles, A E C and A E D are equal to two right ones; and the vertical angles A E C and D E B are equal to one another. The former likewise holds of several angles formed on the same arch C E D, at the same point E. Hence, any number of *spherical angles*, as A E C, A E D, D E B, B E C, &c. made on the same point E, are equal to four right angles. See SPHERICAL *triangle*.

SPHERICAL *triangle*, a triangle comprehended between three arches of great circles of a sphere, intersecting each other in the surface thereof.

SPHERICAL *triangles, properties of.* 1. If in two *spherical triangles* (*Tab. Trigonometry, fig.* 14.) A B C and *a b c*, A=*a*, B A=*b a*, and C A=*c a*; then will B, *b*, and the sides including the angles, be respectively equal; the whole triangles are equal: that is, B C=*b c*, B=*b*, and C=*c*.

Again, if in two *spherical triangles* A=*a*, C=*c*, and A C=*a c*; then will B=*b*, A B=*a b*, and *b c*=B C. Lastly, if in two *spherical triangles* A B=*a b*, A C=*a c*, and B C=*b c*; then will A=*a*, B=*b*, and C=*c*: the demonstrations whereof coincide with those of the like properties in plain triangles; the theorems of the congruency of rectilinear triangles, extending to all other curvilinear, circular, parabolical, &c. provided their sides be similar. See TRIANGLE.

2. In an equicrural triangle A B C (*fig.* 15.) the angles at the base, B and C, are equal; and, if in any triangle, the angles B and C, at the base B C, are equal, the triangle is equicrural.

3. In every *spherical triangle*, each side is less than a semicircle: any two sides taken together are greater than the third; and all the three sides together are less than the periphery of a great circle: and a greater side is always opposed to a greater angle, and a less side to a less angle.

4. If in a *spherical triangle* B A C (*fig.* 16.) two legs A B and B C, taken together, be equal to a semicircle; the base A C being continued to D; the external angle B C D will be equal to the internal opposite one B A C. If the two legs together be less than a semicircle, the external angle B C D will be greater than the internal opposite one A; and if the legs be greater than a semicircle, the external angle B C D will be less than the internal opposite one A; and the reverse of all these holds, viz. if the angle B C D be equal to, greater, or less, than A, the sides A B and B C are equal to, greater, or less, than a semicircle.

5. If in a *spherical triangle* A B C two sides A B and B C be equal to a semicircle, the angles at the base, A and C, are equal to two right ones: if the sides be greater than a semicircle, the angles are greater than two right ones; and if less, less; and conversly.

6. In every *spherical triangle*, each angle is less than two right ones; and the three together are less than six right angles, and greater than two.

7. If in a *spherical triangle* B A C (*fig.* 16.) the sides A B and A C be quadrants, the angles at the base, B and C, will be right angles. And, if the intercepted angle A be a right angle, B C will be a quadrant: if A be obtuse, B C will be greater than a quadrant; and if acute, less; and conversly.

8. If in a *spherical* rectangular triangle, the side B C (*fig.* 17), adjacent to the right angle B, be a quadrant; the angle A will be a right angle; if B E be greater than a quadrant, the angle A will be obtuse; and if B D be less than a quadrant, the angle A will be acute; and conversly.

9. If

9. If in a *ſpherical* rectangular triangle, each leg be either greater or leſs than a quadrant, the hypothenuſe will be leſs than a quadrant; and converſly.

10. If in a *ſpherical triangle* A B C (*fig.* 18.) rectangular only at B, one ſide C B be greater than a quadrant, and the other ſide A B leſs, the hypothenuſe A C will be greater than a quadrant; and converſly.

11. If in a *ſpherical* oblique-angular triangle A C B (*fig.* 19.) both angles at the baſe, A and B, be either obtuſe or acute; the perpendicular C D, let fall from the third angle C to the oppoſite ſide A B, falls within the triangle: if one of them, A, be obtuſe; and the other, B, acute, the perpendicular falls without the triangle.

12. If in a *ſpherical triangle,* A C B, all the angles A, B, and C, be acute, the ſides are each leſs than a quadrant. Hence, if in an oblique angular *ſpherical triangle,* one ſide be greater than a quadrant, one angle is obtuſe, viz. that oppoſite to this ſide.

13. If in a *ſpherical triangle* A C B, two angles, A and B, be obtuſe, and the third, C, acute; the ſides A C and C B, oppoſite to the obtuſe angles, are greater than a quadrant; and that oppoſite to the acute angle, A B, is leſs than a quadrant. Hence, if the two ſides be leſs than a quadrant, the two angles are acute.

14. If in a *ſpherical triangle* the ſeveral ſides be each greater than a quadrant; or only two of them greater, and the third be equal to a quadrant, the ſeveral angles are obtuſe.

15. If in an oblique-angular *ſpherical triangle* two ſides be leſs than a quadrant, and the third greater; the angle oppoſite to the greateſt will be obtuſe, and the reſt acute.

SPHERICAL *triangles, reſolution of.* See TRIANGLE.

SPHERICAL *aſtronomy,* that part of aſtronomy which conſiders the univerſe ſuch as it appears to the eye. See ASTRONOMY.

Under *ſpherical aſtronomy,* then, come all the phenomena and appearances of the heavens and heavenly bodies, ſuch as we perceive them, without any inquiry into the reaſon, the theory, or the truth thereof. By which it is diſtinguiſhed from THEORICAL *aſtronomy,* which conſiders the real ſtructure of the univerſe, and the cauſes of thoſe phenomena.

In the *ſpherical aſtronomy,* the world is conceived to be a concave *ſpherical* ſurface, in whoſe centre is the earth, or rather the eye, about which the viſible frame revolves, with ſtars and planets fixed in the circumference thereof. And on this ſuppoſition all the other phenomena are determined.

The *theorical aſtronomy* teaches us, from the laws of optics, &c. to correct this ſcheme, and reduce the whole to a juſter SYSTEM.

SPHERICAL *compaſſes.* See COMPASSES.

SPHERICAL *geometry,* the doctrine of the ſphere; particularly of the circles deſcribed on the ſurface thereof, with the method of projecting the ſame on a plane; and meaſuring their arches and angles when projected.

SPHERICAL *numbers.* See CIRCULAR *numbers.*

SPHERICAL *trigonometry.* See *Spherical* TRIGONOMETRY.

SPHERICITY, the quality of a ſphere; or that whereby a thing becomes ſpherical, or round.

The *ſphericity* of pebbles, fruits, berries, &c. as alſo of drops of water, quickſilver, &c. and of bubbles of air under water, &c. Dr. Hook takes to ariſe from the incongruity of their particles with thoſe of the ambient fluid, which prevents their coaleſcing; and by preſſing on them, and encompaſſing them all round equally, turns them into a round form.

This, he thinks, appears evidently from the manner of making ſmall round ſhot of ſeveral ſizes, without caſting the lead into any moulds; from drops of rain being formed, in their fall, into round hail-ſtones; and from drops of water falling on ſmall duſt, ſand, &c. which ſoon produce an artificial round maſs; and from the ſmall, round, red-hot balls, formed by the colliſion or fuſion of flint and ſteel, in ſtriking fire.

But all theſe caſes of *ſphericity* ſeem better accounted for from the great principle of attraction; whereby the parts of the ſame fluid drop, &c. are all naturally ranged as near the centre as poſſible, which neceſſarily induces a ſpherical figure; and, perhaps, a repelling force between the particles of the drop, and of the medium, contributes alſo not a little thereto. See ATTRACTION and COHESION.

SPHERICS, the *doctrine of the ſphere,* particularly of the ſeveral circles deſcribed on the ſurface thereof; with the method of projecting the ſame in plano.

The principal matters ſhewn herein are as follow:

1. If a ſphere be cut in any manner, the plane of the ſection will be a circle, whoſe centre is in the diameter of the ſphere.

Hence, 1°, The diameter H I (*Tab. Trigonometry, fig.* 20.) of a circle paſſing through the centre C, is equal to the diameter A B of the generating circle; and the diameter of a circle, as F E, that does not paſs through the centre, is equal to ſome chord of the generating circle.

Hence, 2°, As the diameter is the greateſt of all chords, a circle paſſing through the centre is the greateſt circle of the ſphere; and all the reſt are leſs than the ſame.

Hence alſo, 3°, All great circles of the ſphere are equal to one another.

Hence alſo, 4°, If a great circle of the ſphere paſs through any given point of the ſphere, as A, it muſt alſo paſs through the point diametrically oppoſite thereto, as B.

Hence alſo, 5°, If two great circles mutually interſect each other, the line of ſection is the diameter of the ſphere; and therefore two great circles interſect each other in points diametrically oppoſite.

Hence alſo, 6°, A great circle of the ſphere divides it into two equal parts or hemiſpheres.

2. All great circles of the ſphere cut each other into two equal parts; and, converſly, all circles that thus cut each other are great circles of the ſphere.

3. An arch of a great circle of the ſphere, intercepted between another arch H I L (*fig.* 21.) and its poles A and B, is a quadrant. That intercepted between a leſs circle D E F, and one of its poles A, is greater than a quadrant; and that between the ſame, and the other pole B, leſs than a quadrant; and converſly.

4. If a great circle of the ſphere paſs through the poles of another, that other paſſes through the poles of this. And if a great circle paſs through the poles of another, the two cut each other at right angles; and converſly.

5. If a great circle, as A F B D, paſs through the poles A and B of a leſſer circle D E F, it cuts it into equal parts, and at right angles.

6. If two great circles A E B F and C E D F (*fig.* 26.) interſect each other in the poles E and F of another great circle A C B D; that other will paſs through the poles I and *i*, H and *h*, of the circles A E B F and C E D F.

7. If two great circles A E B F and C E D F, cut each other mutually; the angle of obliquity A E C will be equal to the diſtance of the poles H, I.

8. All circles of the ſphere, as G F and L K (*fig.* 27.) equally diſtant from its centre C, are equal; and the farther they are removed from the centre, the leſs they are. Hence, ſince of all parallel chords only two, G F and L K, are equally diſtant from the centre; of all the circles parallel to the ſame great circle, only two are equal.

9. If the arches F H and K H, and G I and I L, intercepted between a great circle I M H, and the leſſer circles G N F and L O K be equal, the circles are equal.

10. If the arches F H and G I of the ſame great circle A I B H, intercepted between two circles G N F and I M H, be equal, the circles are parallel.

11. An arch of a parallel circle I G (*fig.* 12.) is ſimilar to an arch of a great circle A E; if each be intercepted between the ſame great circles C A F and C E F.

Hence, the arches A E and I G have the ſame ratio to their peripheries; and conſequently, contain the ſame number of degrees. And hence the arch I G is leſs than the arch A E.

12. The arch of a great circle is the ſhorteſt line which can be drawn from one point of the ſurface of the ſphere to another: and the lines between any two points on the ſame ſurface are the greater, as the circles whereof they are arches are the leſs.

Hence, the proper meaſure, or diſtance, of two places on the ſurface of the ſphere, is an arch of a great circle intercepted between the ſame. See more on this ſubject in Theodoſii Elem. Sphær. apud Dechales Curſus Mathematicus, tom. i. p. 145, &c.

SPHEROID, SPHÆROIDES, Σφαιροειδης, formed from σφαιρα, *ſphæra,* and εἶδος, *ſhape,* in *Geometry,* a ſolid approaching to the figure of a ſphere, though not exactly round, but oblong; as having one of its diameters bigger than the other; and generated by the revolution of a ſemi-ellipſis about its axis.

When it is generated by the revolution of the ſemi-ellipſis about its greater axis, it is called an *oblong ſpheroid.* And when generated by the revolution of an ellipſis about its leſs axis, an *oblate ſpheroid.*

The contour of a dome, Daviler obſerves, ſhould be half a *ſpheroid.* Half a ſphere, he ſays, is too low to have a good effect below.

For the ſolid dimenſion of a *ſpheroid,* it is $\frac{2}{3}$ of its circumſcribing cylinder: or it is equal to quadruple of a cone,

cone, whose altitude is equal to half the great axis, and the base equal to the circle described upon the less axis of the generating ellipsis, as its diameter.

Or, a *spheroid* is to a sphere described on its greater axis, as the square of the less axis to the square of the greater: or it is to a sphere described on the less axis, as the greater axis to the less.

For the method of finding the superficies and solidity of a *spheroid*. See SUPERFICIES and SOLIDITY.

Dr. Halley has demonstrated, that in a sphere Mercator's nautical meridian line is a scale of logarithmic tangents of the half complements of the latitudes. But as the earth has been found to be a *spheroid*, this figure will make some alteration in the numbers resulting from Dr. Halley's theorem. Mr. Maclaurin has therefore given us a rule, whereby the meridional parts to any *spheroid* may be found with the same exactness as in a sphere. We have also an ingenious treatise of Mr. Murdoch's on the same subject. See Phil. Trans. N° 219.

Mr. Cotes has also demonstrated the same proposition, Harm. Mens. p. 20, 21. See MERIDIONAL *parts*.

SPHEX, in the Linnæan system of *Zoology*, a genus of the *hymenoptera* order of insects. Its characters are, that the mouth has mandibles without a tongue; that the antennæ have ten joints; that the wings are plano-incumbent and not folded; and the sting concealed. Linnæus enumerates thirty-eight species.

SPHINCTER, in *Anatomy*, a term applied to a kind of circular muscles, or muscles in form of rings, which serve to close and draw up several orifices of the body, and prevent the excretion of the contents.

The word is formed from σφιγκτηρ, *strictor*, or *constrictor*, something that binds and constringes a thing very closely; these muscles having an effect much like that of a purse-string.

SPHINCTER *ani* is a circular muscle, serving to shut the anus, and keep the excrements from coming away involuntarily.

It is near two inches broad, and is carried down below the rectum, near an inch. It is fastened on the sides to the bones of the coxendix, and behind to the os sacrum: and before, in men, to the accelerator urinæ; and in men to the vagina uteri. Some would have it to be two muscles, and some three. The one, according to Winslow, is intestinal, or orbicular, and consists merely in an augmentation of the inferior portion of the fleshy fibres of the extremity of the rectum: and the other two are cutaneous or oval, having each an anterior and posterior insertion, ending both ways in a kind of point, and comprehending the orifice of the anus, between their middle portions. They are distinguished from each other by their situation, by their size, and by a kind of white cellular line.

The greatest of the two appears to be double, and the smallest lies nearest the skin, and adheres most closely to it. They are inserted backward in the apex of the os coccygis, and partly in the contiguous portion of the cutaneous ligament of that bone. Forward, their chief insertion is in the middle tendon of the transversalis urethræ; and they have likewise some connexions with other muscles of the urethra.

SPHINCTER *cutaneus*, in *Anatomy*, a name given by Laurence, and some others, to the muscle of the anus, called by Albinus and Winslow *sphincter internus ani*.

SPHINCTER *intestinalis*. See INTESTINALIS *sphincter* and SPHINCTER *ani*.

SPHINCTER *labiorum*, in *Anatomy*, a name given by Douglas, and some others, to the muscle of the mouth, called by Riolanus and Albinus *orbicularis*, and *orbicularis oris*, and by Cowper CONSTRICTOR *labiorum*.

SPHINCTER *palpebrarum*, in *Anatomy*, a name given by Molinet, and some others, to the muscle of the eyelids, called by Winslow and Albinus the *orbicularis palpebrarum* and *orbicularis*.

SPINCTER *gulæ*. See OESOPHAGÆUS and PHARYNX.

SPHINCTER *vaginæ*, a constrictory muscle, serving to hinder the reflux of the blood from the clitoris, &c. in coition.

SPHINCTER *vesicæ*, is a muscle consisting of circular fibres, placed at the exit of the bladder, to prevent the perpetual dripping of the urine. See *Tab. Anat.* (*Splanch.*) *fig.* 9. *lit. k.*

It keeps the bladder constantly shut; and is only opened when, by the contraction of the abdominal muscles, the bladder is compressed, and the urine forced out.

SPHINX, σφιγξ, in *Sculpture*, &c. a figure or representation of a monster of that name, famed among the ancients, now mostly used as an ornament in gardens, terraces, &c.

It is represented with the head and breasts of a woman, the wings of a bird, the claws of a lion, and the rest of the body like a dog or lion.

It is supposed to have been engendered by Typhon, and sent by Juno to be revenged on the Thebans. Its office, they say, was to propose dark enigmatical questions to all passers by; and, if they did not give the explication thereof, to devour them.

It made horrible ravages, as the story goes, on a mountain near Thebes, and could not by any means be destroyed, till after Oedipus had solved the following riddle: What animal is it, that in the morning walks on four legs, at noon on two, and at night on three? The answer was MAN.

Among the Egyptians, the *sphinx* was the symbol of religion, by reason of the obscurity of its mysteries. And, on the same account, the Romans placed a *sphinx* in the pronaos or porch of their temples.

Sphinxes were used by the Egyptians to shew the beginning of the water's rising in the Nile: with this view, as it had the head of a woman and body of a lion, it signified that the Nile began to swell in the months of July and August, when the sun passes through the signs of Leo and Virgo. There are several of these still to be seen; one in particular, near the pyramids, much spoken of by the ancients; being of a prodigious size, and cut out of the rock; the head and neck appear only at present, the rest of the body being hid in the sand. This, according to Thevenot, is twenty-six feet high, and fifteen feet from the ear to the chin: but Pliny assures us, the head was no less than one hundred and two feet in circumference, and sixty-two feet high from the belly, and that the body was one hundred and forty-three feet long, and was thought to be the sepulchre of king Amasis.

The learned Mr. Bryant (Anc. Mythol. vol. iii. p. 532.) observes, that the *sphinx* seems to have been originally a vast rock of different strata; which, from a shapeless mass, the Egyptians fashioned into an object of beauty and veneration.

The Egyptians used this figure in their building; from them the Greeks derived it, and afterwards improved it into an elegant ornament. See *Tab. Archit. fig.* 40. *lit.* R.

SPHINX, in the Linnæan system of *Zoology*, a genus of the *lepidoptera* order of insects. Its characters are, that the antennæ are subprismatic, or thicker in the middle, and attenuated towards each end; the wings decline towards the sides; and they are apparently heavier and slower in their flight in the morning and evening. Linnæus enumerates forty-seven species.

SPHINX, a name given by Reaumur to a very singular species of caterpillar described in the second volume of his History of Insects.

The reason of the author's having given it that name is, that when it is not eating it erects its head, and with it more than a third part of its body, into a perpendicular situation upon the leaf on which it was before laid all along; it keeps itself a long time in this situation, looking around it with a seeming air of fierceness. There is also a series of broad belts upon the body, which contribute something towards its resemblance to the figure of that imaginary monster.

This caterpillar has a horn on the hinder part of its body, which seems to be of no sort of use, but merely a trouble to the creature. It is hollow, and encloses, in the manner of a sheath, the new horn which is to appear when the creature changes its skin. This the author found to be the case by cutting it several times, and always finding within it the new horn cut off also at the same place, and had often observed the great difficulty the animal had in changing its skin, when it came to the horn.

SPHINX, *simia*. See SIMIA.

SPHONDYLIUM, in *Botany*. See *Cow* PARSNEP.

SPHONDYLUS, in *Ichthyology*, a name given by Pliny, and others of the old authors, to a peculiar species of the syngnathus, or *acus Aristotelis*. It is the species, called by Artedi *syngnathus corpore medio hexagono cauda pinnata*; and by other authors the *acus secundæ species*; and by Bellonius and Gesner *typhle marina*.

SPHONDYLUS is also used by some authors, for the stones or bones found in the head of a mullet.

SPHRAGIS, the seal-stone, a name given by some authors to the single joints of the asteriæ, when found loose, not joined into a column. See STAR-*stone*.

SPHRAGIS is also used by some of the old Greek naturalists, to express the spots on the back and sides of a panther. The skin of this creature is of a pale colour, and these spots are all dark and round, and look like so many regular impressions of a seal, whence the name *sphragis*. The Romans called any thing that was variegated in this manner *pantherina*; and we meet with the phrase *mensæ pantherinæ*, used to express tables found of some wood, which was variegated with round spots, in the manner of those *sphrages* on the back of the panther.

SPHYGMICA, in *Medicine*, a term used by some for that part

part of the judgment of a phyſician, which regards the differences of the σφυγμος, or *pulſe*.

SPHYRÆNA, in *Ichthyology*, a name by which ſome authors have called the SUDIS, or *lucius marinus*, the *ſea-pike*.

SPHYRÆNA *altera*, in *Ichthyology*, a name given by Appian, and ſome other of the old Greek writers, to the *eſox*, or common PIKE.

SPICA *bandage*, in *Surgery*, is a kind of bandage, thus called from its interſections, which are ſuppoſed to reſemble an ear of corn. It is either ſimple or double. The *ſimple ſpica* applied to the clavicle, when fractured near the ſhoulder, conſiſts of a ſimple band, about five ells long, and three fingers breadth, rolled up either with one or with two heads. The *double ſpica*, which is uſed when the oſſa humeri of each arm are diſlocated, is a band about ſeven or eight ells long, and three or four fingers breadth, rolled up with two heads: the middle is fixed under the axilla, and the two heads croſs each other upon the ſhoulder, and go over the breaſt and back to the oppoſite axilla; here they croſs again, and then riſe up over the other ſhoulder as before, from whence they go acroſs the breaſt, and back again to the left axilla, where they began, forming an X by traverſing each other upon the ſternum and back.

For a farther deſcription of both theſe bandages, with an account of the method of applying them: ſee Heiter's Surgery, vol. ii. part. 3. chap. 4. ſect. 1 & 2.

SPICA *virginis*, a ſtar of the firſt magnitude in the conſtellation VIRGO.

SPICCATO, in the *Italian Muſic*, ſignifies that every note ſhould be well ſeparated from others, and diſtinctly ſounded. It is particularly uſed with regard to inſtruments played with a bow; and denotes that every note muſt have a diſtinct bow from that preceding, or ſucceeding. See STACCATO.

SPICE, any kind of aromatic drug, that has hot and pungent qualities: ſuch are pepper, nutmeg, ginger, cinnamon, and cloves. Some alſo apply the word to divers other medicinal drugs brought from the Eaſt; as ſenna, caſſia, frankincenſe, &c. See each under its proper article.

SPICE, *all*. See PIMENTO.

SPICE-*wood*, in *Botany*, a ſpecies of LAURUS.

SPICES, *garbler of*. See GARBLER.

SPICULUM, in *Roman Antiquity*, a kind of weapon which ſome will have to be the ſame with the haſta, or ſparus.

SPIDER, *aranea*, in *Zoology*, a genus of the *aptera* order of inſects. The characters of which are, that they have eight feet and eight eyes; the mouth is furniſhed with two claws; the two palpi are articulated; and the anus is provided with papillæ, or nipples, for weaving. Linnæus enumerates forty-ſeven ſpecies.

Of the *ſpider* we have a great number of ſpecies common among us, which all agree in the general marks and characters.

They all have weapons iſſuing out of the mouth, but theſe are of two kinds, according to the two principal diſtinctions of the *ſpiders*. They conſiſt, in ſome, of two ſpicula, in the manner of a forked hook: this is their ſtructure in all the kinds which have eight eyes. In others they are compoſed of two forcipated arms, or are divided into two claws, in the manner of the legs of a crab: theſe are the weapons of all thoſe *ſpiders* which have only two eyes.

The bodies of all *ſpiders* are covered with a ſort of cruſtaceous coat, but it is tender and brittle; and in the males of all the ſpecies, the forcipes, or weapons at the mouth, are larger and ſtronger than in the females.

All *ſpiders* have two antennæ, placed in the forepart of the head over the mouth; theſe are compoſed, like the legs, of a number of joints. The head of a *ſpider* is not ſeparated from the ſhoulders by any inciſure, but remains fixed to them as all of one piece.

The eyes of the *ſpider* differ greatly in magnitude, ſituation, and colour in the different ſpecies; and ſometimes the different eyes of the ſame *ſpider* are of different ſizes. All *ſpiders* have eight legs, which are all inſerted into the breaſt, but in the length and figure of theſe there is as much variety as in the eyes in the different ſpecies of *ſpiders*: they have all three joints in each leg, but in ſome the foremoſt pair are the longeſt, in others the hinder pair are ſo, and in others ſome of the intermediate pairs.

The belly of the *ſpider* is remarkably divided from the head and ſhoulders, ſo as to adhere only by a thread: this is the caſe in all, except the two-eyed kinds, and in the different ſpecies the body is variouſly painted. The appendages near the anus are very obſervable, they ſerve to ſpin the threads out at. Among the many ſpecies of theſe inſects, ſome are ſmooth, others are hairy, and ſome have a harder, ſome a tenderer ſkin.

Among the great number of ſpecies of this inſect, theſe are the principal diſtinctions among thoſe which have eight eyes. Some ſpin webs for the catching of flies of a rounded figure; theſe have all their eyes of the ſame ſize and figure; they have four middle ones placed in a quadrangular figure, and the other four beſide theſe, but ſtanding ſomewhat obliquely. The firſt pair of legs of theſe *ſpiders* are always the longeſt, the ſecond pair are the longeſt next to theſe, then the fourth pair, the third being much the ſhorteſt of all. Theſe *ſpiders* are always ſmooth, or nearly ſo, and are elegantly figured on the buttocks. Of theſe ſome always live in the centre of the web, others have their habitation in a neighbouring corner. Of the firſt of theſe ſorts we have five ſpecies.

1. The yellowiſh *ſpider* with white back and ſides, and a white head with large pellucid black eyes. This is of a middle ſize, and its legs are variegated with brown and white. The males in this ſpecies are ſlenderer than the females, and of a more reddiſh colour; and in both ſexes the head and ſhoulders are ſomewhat pellucid. 2. The hazel *ſpider* with a croſs on its back, and tubercles on the belly. This ſpecies ſpins very large nets. 3. The ſlender green and gold *ſpider* with a long body. This is of a middle ſize, and its fore-legs are extremely long. 4. The grey wood-*ſpider*, with the body terminating in a three-cornered point. This is a ſmall ſpecies, but it ſpins very large webs: its belly is black. 5. The green *ſpider*, with its tail marked with black ſpots, and the anus yellow. This is of a middle ſize; the eyes are black; the head pellucid, and the feet ſhort.

Of the ſecond kind of *ſpiders*, which ſpin round webs, and have their habitation at a corner of the web, not in its centre, there are five principal ſpecies.

Theſe are, 1. The grey full-bodied *ſpider* with various delineations on the back. This is a very large kind; its ſhoulders are hoary, its legs thick, not long, and ſpotted. 2. The ſmooth black croſs *ſpider* with an oval body. This is of a middle ſize, its legs are ſhort and ſpotted. It is very common among ruſhes and water plants. 3. The yellow *ſpider*, with four great white ſpots, and many ſmall ones. This is one of the largeſt *ſpiders*, and generally builds its habitation on the tops of plants. This is called by Mouffet, and ſome others, the *Colcheſter ſpider*; and there are two other ſpecies which much reſemble it, the one diſtinguiſhed by having a cheſnut-coloured head, and a black belly; the other, by a large brown ſtreak running from the ſhoulders to the tail. 4. The black *ſpider*, with figures like oak leaves upon its buttocks. It is a very large *ſpider*. 5. The grey round-headed *ſpider*, with foliaceous lines on the buttocks undulated at the edges. This is a middle-ſized one, and is common about houſes.

Spiders of another genus are diſtinguiſhed by their building conglobated webs; theſe are all ſmall, and have the fore legs longeſt of all, next theſe the hinder pair, and then the ſecond, the third being the ſmalleſt of all. Of theſe there are ſix principal kinds.

1. The black ſmooth houſe-*ſpider*: this is the largeſt of this genus, and has elevated ſhoulders. 2. The white *ſpider* with an oval body, ſurrounded with a ſcarlet-ring. 3. The brown *ſpider* with a round body, ornamented with foliaceous figures. 4. The reddiſh brown wood-*ſpider* with a round body, marked with the figure of a ſtar. 5. The ſmall grey *ſpider* with a black ſpot upon its buttocks: and, 6. The ſmall livid *ſpider* with denticulated figures on the rump. This uſually erects its conglobated nets on the top of the branches of furze buſhes.

A third genus of *ſpiders* is diſtinguiſhed by the thickneſs and cloſeneſs of the webs; ſome of theſe inhabit the bottom, or funnel-end of their webs, others live near them, but not in them. Of the firſt claſs there are two remarkable ſpecies.

1. The yellowiſh hairy long-legged houſe-*ſpider*. This is of a middle ſize, and its eyes are very black and ſparkling. 2. The great grey *ſpider* with the appendices of the anus very remarkably prominent. This is a very large kind, and is of a livid colour.

Of the ſecond claſs of theſe, which live at a diſtance from their webs, there are alſo two principal kinds.

1. The ſmooth cheſnut-coloured, or blackiſh *ſpider*, with elegant ſnow-white ſpots. This is of a middle ſize, and has long and ſlender legs. 2. The black *ſpider* with white ſhoulders, and a denticulated white mark upon the back. This is of the middle ſize. Its legs are hairy.

To theſe is to be added the cave-*ſpider* of Mouffet. This is a large black *ſpider* with a very large ſpot, of a deeper and more ſhining black upon the ſhoulders.

A fourth genus of *ſpiders* is diſtinguiſhed by the ſmallneſs of the webs they build: theſe are, however, of a very cloſe texture, and the creature always lives within them.

them. Of the *ſpiders* of this kind there are three principal ſpecies.

1. The grey woolly *ſpider*, with a broad black ſpot on the belly. 2. The plain livid, or yellowiſh *ſpider*. This is ſometimes of the one, and ſometimes of the other of theſe colours, but never has any variegations. 3. The yellowiſh cylindric-bodied *ſpider*. This is a large *ſpider*, and has ſix eyes. This has a long ſeries, or chain of ſpots on the back, and a yellowiſh line or ſtreak on each ſide. Ray's Hiſt. Inſect. p. 12—24—30. See OPILIO and PHALANGIUM.

The *ſpider* affords to the ſagacious obſerver, as well without as with the aſſiſtance of glaſſes, a great many extremely curious particulars. As the fly (which is the *ſpider*'s natural prey) is an animal extremely cautious and nimble, and uſually comes from above, it was neceſſary the *ſpider* ſhould be furniſhed with a quick ſight, and an ability of looking upwards, forwards, and ſideways, at the ſame time; and the microſcope ſhews, that the number, ſtructure, and diſpoſition of its eyes, are wonderfully adapted to the ſerving all theſe purpoſes.

Moſt *ſpiders* have eight eyes: two on the top of the head or body, for there is no diviſion between them, the *ſpider* having no neck; theſe look directly upwards: there are two more in front, placed a little below theſe, and diſcovering all that paſſes forwards, and on each ſide: a couple more, one whereof points ſideways forward, and the other ſideways backward; ſo that it can ſee almoſt quite round it. All kinds of *ſpiders* have not, however, this exact proviſion; for in ſome we find ten, and in others only ſix, or four. The eyes of the *ſpider* are not pearled; and the field-*ſpiders*, or long-legs, have no more than two eyes.

Whatever be the number of the *ſpider*'s eyes, they are however all immoveable and tranſparent, and are ſituated in a moſt curious manner. The beſt way of viewing them with the microſcope, is to cut off the legs and tail, and leave only the head for examination.

All *ſpiders* have eight legs, which they employ in walking, and two ſhorter, called *arms*, which they uſe in ſeizing their prey. All the legs are thickly beſet with hairs; each has ſix joints, and ends with two hooked claws, which are ſerrated on their inſide; by means of theſe teeth, or jags in their claws, they ſeize very faſt hold of any thing, and behind theſe there is a ſort of ſpur, which is perfectly ſmooth.

Beſide theſe, nature has allotted to this creature, for the ſeizing its prey, a pair of ſharp crooked claws, or forceps, in the forepart of its head. Theſe ſtand horizontally, and when not exerted for uſe, are concealed in two caſes contrived for their reception, in which they fold like a claſp-knife, and there lie between two rows of teeth, which are likewiſe employed to hold faſt the prey.

Each of theſe claws, or pincers, has a ſmall ſlit near its point, according to Leewenhoek, like that in a viper's tooth, through which he ſuppoſes that a poiſonous juice is, in like manner, thrown out. But Dr. Mead, in his Eſſay on Poiſons, diſſents wholly from this opinion, having never been able, on repeated examinations, to diſcover any ſuch opening, not even in the claws of the great American *ſpider*; which being above fifty times bigger than any of the European *ſpiders*, would more eaſily have afforded a view of this opening, if nature had allotted any to this part of the animal. Beſides, repeated obſervations alſo convinced him that nothing dropped out of the claws, which were always dry, while the *ſpider* bit any thing, but that a ſhort white proboſcis was, at the ſame inſtant, thruſt out of the mouth, which inſtilled a liquor into the wound. And the ſame author obſerves, that the quantity of liquor, emitted by our common *ſpiders* when they kill their prey, is viſibly ſo great, and the wounding weapons ſo minute, that they could contain but a very inconſiderable portion thereof, if it were to be diſcharged that way. Baker's Microſcope, p. 196.

Spiders frequently caſt their ſkins, which may be found in the webs perfectly dry and tranſparent; and from ſuch ſkins the forceps, or claws, for they are always ſhed with the ſkins, may eaſier be ſeparated, and examined with much greater exactneſs, than in the common *ſpider* while living.

The *ſpider*'s manner of weaving its web is very wonderful. The creature has five little teats, or nipples, near the extremity of the tail; from theſe there proceeds a gummy liquor, which adheres to every thing it is preſſed againſt; and being drawn out, hardens inſtantly in the air, and becomes a ſtring, or thread, ſtrong enough to bear five or ſix times the weight of the *ſpider*'s body. This thread is compoſed of ſeveral finer ones, which are drawn out ſeparately, but unite together at two or three hairs breadth diſtance from the creature's body. Theſe threads are finer or coarſer, according to the bigneſs of the *ſpider* that ſpins them. Mr. Leewenhoek has computed that a hundred of the ſingle threads of a full grown *ſpider* are not equal to the diameter of the hair of his beard; and, conſequently, if the threads and hair be both round, ten thouſand ſuch threads are not bigger than ſuch a hair. He calculates farther, that when young *ſpiders* firſt begin to ſpin, four hundred of them are not larger than one which is of a full growth; allowing which, four millions of a young *ſpider*'s threads are not ſo big as the ſingle hair of a man's beard.

The eggs of ſome *ſpiders* are a very pleaſing microſcopic object; they are round at one end, and flattiſh at the other, with a depreſſion in the centre of the flattiſh end, and a yellowiſh circle round it. The colour of theſe eggs is a pearly or bluiſh white, and when the young *ſpiders* hatch, they come out in their perfect form, and run about very nimbly.

The female *ſpider* depoſits her eggs, to the number of five or ſix hundred, in a bag compoſed of her own web, which ſhe either carries under her belly, or hides in ſome very ſafe receſs. Philoſ. Tranſ. Nº 272.

The young *ſpiders* are always very beautiful objects for the microſcope. The current of the blood may be eaſily diſcovered in their legs, and part of their bodies; and many other curious particulars occur in their diſſection. There are two or three ſpecies of this animal, peculiarly worthy the attention of the curious in microſcopic diſcoveries. 1. A little white field *ſpider* with ſhort legs. This is found plentifully among new hay, and its body appears like white amber with black knobs, out of which grow ſhort but ſharp prickles. The eyes of theſe may be very diſtinctly ſeen, being very briſk and lively, and ſome have ſix, ſome eight of them: each eye has a pupil of a violet blue, which is beautifully clear and tranſparent, and is ſurrounded by a circle of pale yellow. 2. The wandering, or hunting *ſpider*, that ſpins no webs, but runs and leaps by fits. This has two tufts of feathers fixed to its fore-paws, which make a very beautiful appearance before the microſcope. The variety and beauty of colouring alſo, all over this little creature, afford a very pleaſing ſight. 3. The *long-legs*, or ſhepherd-*ſpider*. This is a moſt wonderful creature: it has two fore-claws at a great diſtance from the head, tipped with black like thoſe of a crab, and opening and ſhutting like the ſcorpions; theſe are ſerrated or indented on their inſide. When all the legs are cut from this *ſpider*, and it is examined by the microſcope, it will be ſeen that the protuberance on the top of its back is furniſhed with two fine black eyes. Power's Microſ. Obſ. p. 13. Hook's Micrógr. p. 200.

The venom of many kind of *ſpiders* is greater than uſually ſuppoſed: we have, in the Philoſophical Tranſactions, an account of a perſon in New-England who was bitten by a ſmall *ſpider* a little above his ancle; he perceived the creature biting, and cruſhed it to death upon the wound, between his ſtocking and his leg; in half an hour he felt a pain in that leg, which in another half hour extended itſelf to the groin, and at the ſame time he had a creeping pain in the calf of his other leg; and in a quarter of an hour after this it affected his ſtomach, his back, and his head. The pains were not conſtant and fixed, but erratic, and very acute, and his pulſe was extremely low and heavy. He was relieved, by taking internally ſpirit and ſalt of hartſhorn in viper-wine, and applying a cataplaſm of garlic to the part, and in three or four days wholly recovered.

Boccone mentions a ſpecies of large *ſpider*, common in the iſland of Sardinia, whoſe bite proves mortal within the ſpace of a few hours; the whole body uſually ſwells almoſt immediately, in conſequence of this bite. The cure is performed by oil of olives, in which the creature is infuſed over the heat of a ſtove. This is a medicine they always keep ready in the houſe, and while they uſe this externally, they give large doſes of Venice treacle inwardly, diſſolved in ſtrong wine: but many die of this bite, either from the want of power in the remedies, or from their being uſed too late. Bacon. Muſ. de Fiſ.

Some think the white matter, we often find floating in the air towards the end of the ſummer, is produced by *ſpiders*. See *Air*-THREADS.

SPIDER, *red*, *acarus*, in the Linnæan ſyſtem of *Natural Hiſtory*, a genus of inſects of the *aptera* order. Its characters are, that it has two eyes placed on the ſides of the head, remote from one another; its mouth, or proboſcis, is formed by a ſmall pointed roſtrum incloſed in a ſheath; the antennæ are ſhorter than the proboſcis, and ſaid to be articulated and made like feet; the head uniform in ſize and united to the thorax; and the feet eight in number, and formed for running. There are many ſpecies of this genus, ſome live upon other animals (ſee ACARUS) others live in the water, others upon trees, plants, &c. They are oviparous.

Theſe inſects, which are often very troubleſome on plants

plants and in hot-houses, may be effectually destroyed by the mixture recommended for destroying those on the PINE-*apple*. The following mixture will also be equally efficacious: take two ounces of soft green soap, one ounce of common turpentine, and one ounce of flowers of sulphur; pour upon these ingredients a gallon of boiling water, and work the whole together with a whisk; and let the mixture be used warm. This mixture may also be of use for preventing the mil-dew on the peach and apricot. However, this method should never be practised on fruit-trees near the time when their fruits are ripening. A strong ley made of wood-ashes will likewise destroy the acari; but plants are greatly injured by this, and other briny and spirituous compositions. The acari may also be destroyed in plants, by brushing them with a common painting brush, by often dusting them with flowers of sulphur, by keeping a hot-house in a moist state, by dipping the tops of plants frequently in clear water, in which flowers of sulphur and tobacco have been infused, in the hot summer months, and always keeping the hot-house clean.

SPIDER-*shell*, a name given to some species of the MUREX.

SPIDERS *silk*. See SILK.

SPIDERS *web*. See WEB.

SPIDER-*wort*, *anthericum*, in *Botany*, a genus of the *hexandria monogynia* class. Its characters are these: the flower has no empalement, and is composed of six petals which spread open; and it has six upright stamina; the germen, which is situated in the centre, is three cornered, and becomes an oval smooth capsule, having three furrows opening in three cells, which are filled with angular seeds. Linnæus enumerates thirteen and Miller eleven species, which, growing naturally upon bogs, are with difficulty preserved in a garden.

SPIEI, in the *glass trade*, an iron instrument, hooked at the end and pointed, with which the workmen take the metal up out of the melting-pots for proofs or essays, to see whether it be fit to work.

SPIGELIA, *worm-grass*, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are, that the flower has a permanent empalement of one leaf, which is cut into five acute points; it has one funnel-shaped petal, whose tube is longer than the empalement, cut into five points at the brim, which spread open; it has five stamina terminated by single summits, and a germen composed of two globular lobes, supporting one oval-shaped style of the length of the tube, crowned by a single stigma; the germen afterwards becomes two globular seed-vessels, which are joined, sitting in the empalement, filled with small seeds. Linnæus mentions one species, and Miller enumerates two, one of which grows in most of the islands of the West-Indies, where it is esteemed a most efficacious medicine for expelling worms; and the other in North America, where it is called *Indian pink*, and employed for the same purpose. This last, in the Linnæan system is a species of the *lonicera*. See *Upright* HONEYSUCKLE.

The use of the root of this plant, as an anthelmintic, was communicated from the native Indians to the colonists, and its has been since much employed in that country. See an account of its virtues in a paper by Dr. Lining, Ess. Phys. & Lit. vol. i. confirmed by Dr. Garden, ibid. vol. iii.

The root is given both in powder and infusion; but the powder is esteemed most efficacious. The dose is not exactly ascertained, but extends from twelve to sixty or seventy grains of the powder. It is found to be most efficacious when it purges, for which purpose it requires some additions; the exhibition of a vomit previous to the use of it has proved of service.

It is said to act powerfully as a sedative, in abating the exacerbations of low remittent worm fevers.

SPIGNEL, *athamanta*, in *Botany*, a genus of the *pentandria digynia* class. Its characters are these: it is a plant with an umbellated flower; the involucrum of the great umbel is composed of many narrow leaves, which are shorter than the rays; those of the small ones are narrow and equal with the rays; each flower has five slender stamina of the same length with the petals; and the germen is situated below the receptacle, which afterward becomes an oblong channelled fruit, divided into two parts, each containing one oval channelled seed. Miller enumerates three and Linnæus nine species.

The common *spignel* is also called *meum* by medical writers; it is perennial, grows wild in some of the mountainous parts of England, and flowers in June; its root is esteemed by some a very great medicine in malignant diseases.

It is also esteemed an attenuant, and is prescribed wherever there are thick humours to be evacuated. It is given in asthmas, and all obstructions of the lungs, and is by many recommended in flatulencies, colics, and suppressions of urine, and of the menses.

Dioscorides and Galen tell us, that the too frequent use of this medicine, or the taking it in too large doses, will occasion violent pains in the head. It may be given in substance from half a dram to two scruples, or from a dram to two drams in infusion. Geoffroy, Mat. Med. vol. ii. p. 105.

It ought to be chosen as long and large as can be had, round, not flatted, plump, and full, and of an aromatic smell, and a somewhat acrid taste, and such as is not dusty or worm-eaten. It is sudorific and diuretic; but the principal use now made of it is only as an ingredient in the Venice treacle. It appears to be nearly of the same nature with that of LOVAGE: its spirituous extract, more aromatic than that of the lovage, is moderately warm, bitterish and pungent. Lewis Mat. Med.

SPIGNEL, *wild*, in *Botany*, a genus of the *pentandria digynia* class. Its characters are; that it hath an umbellated flower; the principal umbel is uniform, and hath no involucrum; the particular ones have a many narrow-leaved involucrum, which is as long as the umbel; the empalement of the flowers is scarce discernible; the flowers have five inflexed heart-shaped petals, and each hath five awl-shaped stamina, terminated by single summits; the germen is situated under the flower, supporting two reflexed styles, crowned by obtuse stigmas; and afterwards turns to a small, oval, channelled fruit, dividing into two parts, each containing one oval streaked seed, flat on one side and convex on the other. Miller reckons six and Linnæus twelve species. See SERMOUNTAIN and SESELI *seed*.

SPIGOLA, in *Ichthyology*, a name given by Paulus Jovius, and some others, to that species of pearch which is generally called the LUPUS *marinus*.

It is a genuine pearch, and is distinguished from the others by Artedi, by the name of the *pearch* with the thirteen rays in the second back fin, and fourteen in the pinna ani.

Authors have called two different fish by this name *lupus marinus*, which conveying no distinct idea of the characters of the fish, was applicable to either as much as the other: but this name of Artedi admits of no equivocation, and must always distinguish the fish.

SPIKE, or *oil of* SPIKE, a name given by our druggists to an essential oil, much used by the varnish-makers and the painters in enamel; and of some use in medicine.

This *oil*, when genuine, is brought from Provence, and some other parts of France, and is there made of lavender. This plant is called in Provence *aspic*, and thence came the name *oil of aspic*, which afterwards degenerated into *oil of spike*.

The manner of making the *oil* upon the spot is this: when the flowers are perfectly ripe, they put them into an alembic with a great quantity of water, and this they distil after several days maceration: there arises with the water a large quantity of an oil of a fine pale amber colour, and this separated from the water, is the true and genuine *oil of spike*.

The flower of this plant is the part which yields the largest quantity of oil; as is the case with all the plants with galeated flowers, of which the husk, or flower cup, usually contains almost all the oil of the plant. The aromatic plants, in general, yield indeed but a small quantity of oil, but the vast abundance of this plant, in these places, makes the expence of gathering it so small, that the oil is very cheap. The quantity required on several occasions, is, however, much greater than what all the lavender of the country can yield; and the price it is expected to be sold at is so small, that it is not to be wondered that there are several common adulterations of it.

The most usual ways of sophisticating it, however, are two; the one with the spirit of wine, which is esteemed the least hurtful, and the oil thus sophisticated is often called the very best of the country. The method Mr. Geoffroy took to discover the cheat was this: he procured a long and narrow vial, of an equal diameter all the way up, into this he first put an ounce of fair water, and to this he added an ounce of the *oil*; he marked the height of the water in the vial, then shook the two liquors together, and they became milky, and heated on the mixture, which alone would have been a sufficient proof that there was spirit of wine in the oil. After some standing the liquor became clear, and the oil floated at the top, but in a much smaller quantity than might have been expected, there being not more than a quarter of an ounce of it, the rest having been spirit of wine, which mixed with the water, and thus left all the true oil, which was only one fourth of the quantity, to float alone on the water, which was greatly increased in height in the vial. A pint of this *oil of spike*, therefore, contains only four

four ounces of the genuine oil, and twelve ounces of plain spirit of wine.

The second method of adulterating this oil, which the same gentleman had suspected, was easily discovered next: for on mixing this quarter of an ounce of pure *oil of spike* with three quarters of an ounce of oil of turpentine, there was produced an ounce of a liquor, which appeared wholly the same with the *oil of spike* commonly sold in the druggists shops. And indeed, much of what is usually sold is worse than this, being no other than oil of turpentine scented with a small quantity of the true *oil of spike*.

The ready way of discovering the oil, counterfeited with oil of turpentine, is to wet a paper in it, and set it on fire; the turpentine will here be discovered by the thick smoak it yields, it being, of all vegetable oils, that which yields much the thickest cloud in burning: and, on the contrary, that which has been adulterated with spirit of wine, will be distinguished by the same trial, by its yielding a much finer and thinner smoak, and burning with a bright blue flame. If they be tried by firing them in a spoon, that which is adulterated with spirit of wine will burn very bright, and yield no fume at first; but as it grows near the bottom it will smoak a little, and finally will leave no residuum, except that it varnishes over the inside of the spoon: that adulterated with the oil of turpentine will burn more vehemently, smoak more, and leave a coarser varnish upon the spoon; and if it be of the coarsest kind, that is, if it hath been adulterated with badly rectified oil of turpentine, the fume will be the more abundant, and there will be left in the spoon a fetid matter, resembling melted pitch.

Mr. Geoffroy tried whether, in the business of varnishing, the oil of turpentine alone might not do as well as the *oil of spike*; he found that it dried perfectly well, but that it left a stinking smell upon the work, which never went off; whereas the mixture of this oil, with that of *spike*, makes a smell like neither, and which soon goes off.

An ounce of oil of turpentine, with only twenty drops, either of our common oil of lavender, or the pure *oil of spike*, makes a liquor tolerably well scented, and which serves for the purposes of *oil of spike*. If two drams of our oil of lavender be added to six drams of spirit of wine, they immediately mix, and this afterwards mixed in a small proportion with oil of turpentine, makes a sort of *oil of spike*.

The most regular method, however, that the artificer can use, if he can get the genuine *oil of spike*, is to mix one ounce of it with three of oil of turpentine, which perfectly fits it for his purpose, and makes it the same with that in common use. The method of making this perfectly pure, is to redistil it in a balneum Mariæ; there will thus be procured an oil highly rectified, and pellucid as water, which will dry away as soon as touched on any thing. The great disadvantage attending the *oil of spike* adulterated with spirit of wine is, that it will not readily mix with all the sorts of varnish.

Having gone through the properties of *oil of spike*, in regard to varnish, it remains to enquire into them in regard to its other great use in enamel, and to consider the effects of the two usual methods of adulterating it in this work.

The *oil of spike*, which wants body, is not at all fit for enamelling, because it dries too suddenly, and does not at all assist the natural dryness of the enamel, which is only a sort of powder of glass; and the particles of this powder, with a fluid of too little body, are not manageable by the artists, so that the colour never is brought to a due consistence; and when the oil has too much body, the mixture becomes too tenacious, and is as unmanageable in that extreme as in the other; and this fault is attended with another very great mischief, which is, that the fume raised by this oil, when heated, is often so gross, as to destroy the beauty of the colours. In short, thick oil of turpentine is always destructive of enamels by its smoak.

The true composition for enamelling is *oil of spike* mixed with spirit of wine, but the proportions must be nicely regulated from repeated trials: for if the quantity of the spirit be too large, it is apt to separate itself from the oil and colour in the drying, and this always spoils the gloss and beauty of the work. Artificers observe, that *oil of spike* does best for their purposes, after it has been kept two or three years. But this is only owing to the oil's being adulterated with spirit of wine, and usually containing too large a proportion of the spirit when first sent over, it becomes better for use when a part of that spirit has had time to evaporate in the keeping. It would be a better way for these curious works, to procure the oil pure, and then occasionally mix it with such a proportion of spirit of wine, as experience shews to be the most proper. Mem. Acad. Par. 1716.

SPIKE, *hand*, in *Mechanics*. See HAND-*spike*.

SPIKE, *lavender*. See LAVENDER.

SPIKE, *winged, grass*, in *Botany*. See STIPA.

SPIKENARD, *bastard French*, *nardus*, in *Botany*, a genus of the *triandria monogynia* class; the characters of which are, that there is no calyx; that the flower is composed of two valves; the exterior is very slender, oblong, and ends in a beard or awn, and in some sort receives the other into a cavity in its fore part; the interior is small and straight, and is terminated by a much shorter awn; the stamina are three capillary filaments, shorter than the flower; the antheræ are oblong; the germen of the pistillum is oblong; the style is single, crowned with a single stigma; the flower continues firmly attached to the seed. The seed is single, long, straight, pointed at both ends, and narrower in its upper than in its under part. There are four species.

SPIKENARD, *celtic*, a species of VALERIAN.

SPIKENARD, *false*. See LAVENDER.

SPIKENARD, *ploughman's*. See BACCHARIS.

SPIKENARD, *ploughman's*, is also the name of a species of *conyza*. See FLEA-*bane*.

SPIKENARD, *nardus*, or SPICA *nardi*, in the *Materia Medica*, a kind of vegetable shoot growing even with the ground, and sometimes, in part, within the ground, belonging to an Indian grassy-leaved plant, of which we have no particular description. The nard, as it is brought to us, is a congeries of small, tough, reddish-brown fibres, forming a bunch, or *spike*, about the size of a finger.

The *spica nardi* is usually reckoned in the number of roots. It is also called *nardus Indica*; because brought from the East-Indies.

It is now kept in the shops chiefly as an ingredient in the mithridate and theriaca, but was formerly employed in the same intention as the *Celtic*, and is said to be used among the Orientals as a spice. It is moderately warm and pungent, accompanied with a flavour not disagreeable. Lewis.

There is also another kind, called *spica Celtica*, a species of VALERIAN, growing in the Alps, from whence the shops have been generally supplied with the dried roots, consisting of a number of blackish fibres. This root has been recommended as a stomachic, carminative, and diuretic: at present it is scarcely otherwise made use of, in this country, than as an ingredient in mithridate and theriaca, though its sensible qualities promise some considerable medicinal powers. It has a moderately strong smell, of which it is very retentive, and a warm, bitterish, subacrid taste, resembling those of common wild valerian. Lewis.

SPIKENARD, *ointment of*. See NARDINUM *unguentum*.

SPIKES, or, as the seamen call them SPEEKS, in a *ship*, are large long iron nails with flat heads. They are of divers lengths, some a foot or two long, and some are jagged, so that they cannot be drawn out again. They are used to fasten the planks and timbers. See MARLING-*spike*.

SPIKES, among *Botanists*, a term used to signify flowers set thick above each other.

SPIKING *up the ordnance*, a sea-phrase, used for fastening a quoin with *spikes* to the deck, close to the breech of the carriages of great guns; that they may keep close and firm to the ship's sides, and not get loose when the ship rolls, and by that means endanger the breaking out of the butt-head of a plank. See QUOIN.

SPIKY *roller*, in *Husbandry*. See ROLLER.

SPILANTHUS, in *Botany*, a genus of the *syngenesia polygamia æqualis* class. Its characters are, that the common empalement consists of many oblong leaves, the outer being longer than the others; the corolla is uniform and tubulous; the hermaphrodite corollæ are equal; and the proper corolla is funnel-shaped with its limb, divided into five segments; the stamina are five short filaments; the anthera is cylindric and tubulous; the pistil is an oblong germen; the style filiform, and of the length of the stamina; the stigmata are two, and recurved; it has no pericarpium; the seeds are single, oblong, compressed and bearded at their apex, and the receptacle is naked and conical. There are three species.

SPILES, in a *Ship*, are small wooden pins, which are driven into the nail-holes, when a ship's sheathing is taken off.

SPILL, *to*, in *Sea Language*, is to discharge the wind out of the cavity or belly of a sail, when it is drawn up in the brails, in order to furl or reef it. This is performed either by collecting the sail together, or by bracing its edge to the wind, so as to shiver or be laid aback. Falconer.

SPILLING-*lines*, in a *Ship*, certain ropes fixed occasionally to the main-sail and fore-sail, in tempestuous weather, for raising or furling them more conveniently. They are passed through blocks above the yard, and thence leading

leading down before the sail, come under its bottom, and return upwards behind it to the yard, where they are fastened; so that the sail by this effort is closely and immoveably confined to the yard. Falconer.

SPIN *hay, to*, in *Military Language*, is to twist it up in very hard ropes, for an expedition; so that it may be the less bulky for the cavalry to carry behind them.

SPINA *bifida*, in *Anatomy*, a parting of the *spinal* processes into two rows. The existence of such a case is doubted. See SPINE.

SPINA *bifida* is also the name of the hydrops medullæ *spinalis*; which is a tumor of the colour of the skin, seated upon the vertebræ of the neck, back, or loins, or on the sutures of the skull. The processes of the *spine* are wanting in this disorder, whence its name. It is known by its situation, its watery contents, and the palsy which usually attends it. It is deemed incurable.

SPINA *burgi*, in *Botany*, a name used by some authors for the *alaternus*, or ever-green PRIVET, a garden-shrub, the fruit of which is a mild astringent.

SPINA *ventosa*, is properly a caries of the bones, attended with a corruption of them, which takes its rise in their internal parts, and by degrees enlarges the bone, and raises it into a tumor.

The ancients were strangers to this name for this disorder, and called it *sideratio*, *gangræna*, or *cancer ossis*, and sometimes expressed it by the word *teredo*. Some among the French call it also an *exostosis*, though this is a term more properly denoting certain eminences, or preternatural acuminated excrescences in the bones, which happen after fracture, or other accident, and are sometimes attended with a caries.

The name of the disorder seems to have been borrowed from *spina, a thorn*, from the resemblance the eminences of the bone in this case bear to thorns, continually pricking the flesh, and producing the most grievous pains; and the epithet *ventosa* is added, because the tumor seems to the touch to be filled with air, though this is very rarely the case. This seems to have been the origin of the name *spina ventosa*, which some after-writers barbarously distorted into *spinæ ventositas*.

When this disorder happens to childern, Severinus, and many others, call it *pædarthroceacs*.

In the *spina ventosa* the caries, or erosion of the bone, is occasioned by a depravity of the contained fluids, and generally arises spontaneously, or without any external cause, and does not begin upon the surface of the bone, but between its lamellæ, or else in its internal cavity; from whence extending itself by degrees to the external parts, it at length either affects the whole bone, or a greater or smaller part of it, expanding itself to different widths, and rising to a tumor, which is sometimes hard, and without pain, and at others feels as if it were filled with wind, and is attended with a greater or lesser degree of pain, pricking and shooting, and at last grows red, and is attended with other bad symptoms, till the disordered bone being by degrees corroded, the common integuments, and other softer parts that lay over it, remaining at first entire, but at last partaking of the disorder, foul ulcers of a very terrible sort break out. When tumors of the bone are hard, and the soft parts about them not inflated, and are free from redness, inflammation, and pain, as is very frequently the case in ricketty disorders, the bad symptoms just described seldom come on. This is properly the pædarthrocaces, but the painful, red, inflated tumors happening equally to children, and to adults, are properly the *spina ventosa*.

It differs from a caries by being attended with a tumor, and from the rickets by its being accompanied with pain and erosion. It generally begins about the heads, or epiphyses of the larger bones, where they are most tender and spungy, and where the noxious matter may not only have sufficient room to lodge in the cellular substance, but where it will also meet with the least resistance in softening and expanding the parts. Sometimes, however, it also arises in the middle of the bones, between their lamellæ, especially in the tibia. The os frontis is also subject to disorders of this kind in venereal cases, and it is frequently situated in the bones of the face, neck, and breast; though those of the arms, legs, fingers, carpus, metacarpus, tarsus, and metatarsus, are more frequently the subjects of it.

Though this disorder usually arises from internal, yet it is sometimes found to be owing to external causes; especially in persons constitutionally addicted to a disorder of this kind, when the vessels between the lamellæ of the bone, or in the medulla itself, are by a blow, fall, or other external violence, injured, or torn, and their fluids extravasated, and by degrees putrefy, corrupt, and destroy the medulla, and soften the very substance of the bone, and corrode it; whence proceed pain, tumors, ulcers, and fistulas of the bone, and adjacent parts, and all the same train of mischiefs which attend these disorders, when begun spontaneously from internal causes.

The proximate cause of this disorder i a collection, or congestion, either of a viscid and thick, or of an acrimonious and corroding humour, or an inflammation arising in the medulla, or in the cellular substance of the bone, degenerating into an abscess, and forming matter or ichor. As these stagnating fluids can find no discharge from the bones, especially from their cavities, they continue confined there till they putrefy, and become acrimonious, and corrode and destroy the neighbouring parts, converting them, particularly the medulla, into a kind of sanies; and at length they attack the bone and destroy it. The collection of viscid and pituitous humours, and the expansion of the bones, sometimes happen without pain, as in ricketty cases, but the erosion of the parts can never happen without the most acute pains.

When the internal parts of the bones only are affected by this disorder, the pain does not increase upon external pressure; when the pain increases upon external pressure, the external parts are brought into consent; and when this happens, the periosteum, and parts which surround it, with the substance of the bone and tunica cellularis enlarge, from whence a sensation frequently arises, as if the parts were filled with air or wind. But when the tumor is opened, either spontaneously, or by the knife, the bone, if it lies bare, is found full of small erosions, resembling a sponge or pumice-stone.

Of this terrible disorder there are properly three degrees; the first is, when the patient complains of a continual grievous pain in the bone, which seems to him to proceed from the marrow, and torments him so that he can have no sleep, and all this while there is no external pain or tumor; in this case the disease is confined to the internal part of the bone. The second degree is when a tumor appears to be arisen on the surface of the bone, and is attended with external pain, more or less. The third degree is when, after the former symptoms, an ulcer is formed in the tumor, which discharges a fetid ichor, or purulent matter, smelling like rank butter or lard.

There are two methods of treating this disorder, one suited to the milder, the other to the more violent state of it, in which the bones, and the parts surrounding them, are entirely corroded and destroyed. In the milder stages, the acrimony of the blood must be endeavoured to be corrected by large draughts of the decoctions of the woods, with the china and sarsaparilla roots. The parts affected should also be fumigated with the steam of decoctions of aromatic herbs, and twice a day in the intermediate times, the part may be rubbed over with a mercurial ointment, and afterwards covered with the common mercurial plaster. Mercurial medicines should also be given internally, according to the strength of the patient, and sometimes a salivation is necessary.

Mercurial remedies seem indeed so peculiarly appropriated to this case, that nothing is to be done without them; and it hence looks very suspicious, that something venereal is always in the case, or else that the disorder is of itself very much akin to that disease. By diligently pursuing this method for some weeks, the first and second stages of this disease may be cured, even where there are bony tumors formed; and the tumors may either be reduced, or at least brought to that state, that they will remain as they are without farther increase, or without pain, or any farther inconveniency.

But when these tumors are so far advanced, as to be out of the reach of the remedies, the pain and tumors increasing, and abscesses forming; as there is great reason to fear the entire destruction of the bone, if the abscess does not burst of itself, the surgeon should not stay for its maturation, but lay the bone bare in the lowest, or in the most painful part. When the abscess is already burst, if the opening be too small, it must be enlarged with a knife, or if the patient too much dreads the knife, the caustic may supply its place; and after this several small holes must be made in the bone with a small piercer, perforating it into the medulla, to give way for the discharge of the confined matter; and when these small holes are not sufficient, a larger must be made by the trepan, if the bone will admit it: this will not only make more way for the discharge of the matter, but will also give room for the proper application of remedies better than any other method.

While this is under cure, the patient must use internally the decoctions of the woods, and mild mercurial, and antimonial medicines; and externally the wound must be treated with cleansing and balsamic remedies, such as decoctions of agrimony, sanicle, St. John's wort, or birthwort, and essence of myrrh and aloes. These should be injected warm with a syringe twice every day, as may also a solution of mercurius dulcis made in plan-

tane-water, or in lime-water. Honey of roses should be added in a small quantity to either of the decoctions, used as essences; and after the use of them, the wound should be dressed with the before mentioned essences, or with those of mastich or amber, spread upon lint, and covered with a mercurial, or other plaster: this method is to be continued till the parts are healed. The actual cautery is sometimes necessary to root out the disorder, especially when it is only between the lamellæ of the bone, for in other cases there is no getting to the bottom with it.

But when all these methods are unsuccessful, and the part is already too much corroded and destroyed, there is no hope of saving it, nor indeed of saving the life of the patient, by any other means than the taking off the limb. When the disorder is situated, however, in some small bone, as on the carpus, tarsus, metacarpus, or metatarsus, or fingers, it will not always be necessary to take off the whole limb, that is to say, the finger, foot, or hand, but it will frequently suffice to remove the corrupted bone alone. In larger bones, where the whole bone is not affected, but only a part of its external surface is disordered by either a caries, or *spina ventosa*, the whole limb is by no means to be taken off, but the diseased part of the bone only removed; but when a large bone, as the os humeri, tibia, or femur, or an entire joint of the arm, knee, or foot, is diseased, there is no remedy but amputating it in the sound parts just above. Heister's Surgery, vol. i. p. 28, &c.

Dr. Schlichting affirms, that the *spina ventosa* may be cured by rubbing the tumor twice a day with ung. Neapolit. preventing salivation by gentle cathartics. Phil. Transf. N° 466. sect. 10. See some Observations on the *Spina Ventosa* by Claudius Amyand, esq. in Phil. Trans. vol. xliv. p. 193.

SPINACH, or SPINAGE, *spinacia*, in *Botany*, a genus of the *diœcia pentandria* class. Its characters are these: it is male and female in different plants; the male flowers have an empalement cut into five oblong, obtuse, concave segments, but no petals; with five hair-like stamina longer than the empalement, terminated by oblong twin summits; these are barren; the female flowers have permanent empalements of one leaf, cut into four points, two of which are very small; they have no petals, but a compressed roundish germen, supporting four hair-like styles, crowned by single stigmas.

The germen turns to a roundish seed, which is shut up in the empalement; in some species they are almost smooth, and in others they have two or three sharp thorns. There are two species, including several varieties.

The common *spinach*, intended for winter use, should be sown on an open spot of ground in the beginning of August, observing to do it, if possible, when there is an appearance of rain. When the young plants are come up, the weeds must be destroyed, and the plants left at about three or four inches asunder. The ground being kept clear of weeds, the *spinach* will be fit for use in October. The way of gathering it to advantage, is only to take off the longest leaves, leaving those in the centre to grow bigger; and at this rate a bed of *spinach* will furnish the table for the whole winter, till the *spinach* sown in spring is become fit for use, which is commonly in April.

Spinach eaten freely is esteemed laxative, diuretic, and cooling.

SPINACH, *strawberry*. See BLITE.

SPINACHIA, in *Ichthyology*, a name given by some authors to our common stickleback, or banstickle, more usually known among writers by the names *pungitius*, or *aculeatus pisciculus*.

The *gasterosteus spinachia* of Linnæus has fifteen species. See STICKLE-*back*.

SPINAL *arteries*, in *Anatomy*, are two arteries, one anterior and one posterior, both produced by the vertebrales; each of which, as soon as it enters the cranium, sends out a small branch, by the union of which the posterior *spinalis* is formed. Afterwards the vertebrales advancing on the apophysis basilaris, or production of the occipital bone, detach backward two other small branches, which likewise meet, and by their union form the *spinalis* anterior. These *spinal* arteries run down on the fore and back sides of the medulla *spinalis*, and by small transverse ramifications, communicate with those which the intercostal and lumbar arteries send to the same part. Winslow.

SPINAL *marrow*. See MEDULLA *spinalis*.

In the History of the Royal Academy of Sciences, for the year 1714, we have an instance of a fœtus born without either brain, cerebel, or *spinal marrow*, though perfectly well formed in other respects. It had gone its natural time; lived two hours; and even gave signs of life, upon sprinkling the baptismal water on its head. Instances of this kind, as this is not the only one we meet withal, furnish a great objection against the existence of the animal spirits, which should be generated in the brain, or at least in the cerebel or *spinal marrow*; and which are generally allowed of such absolute necessity in the animal œconomy.

SPINAL *muscles*, in *Anatomy*, are those VERTEBRAL muscles, which are wholly fixed in the *spinal* apophysis.

SPINAL *nerves*. See NERVE.

SPINALIS, in *Anatomy*, a muscle on the side of the neck, arising from the five superior processes of the vertebræ of the thorax, and the inferior of the neck; and which in its ascent, becoming more fleshy, is inserted into the inferior part of the vertebræ of the neck laterally. It serves to draw the neck backwards.

SPINALIS *cervicis*, in *Anatomy*, a name given by Albinus to a muscle of the neck, called by Fallopius the *tertium par musculorum dorsi*, and by Cowper and Morgagni *spinalis colli*.

This is the muscle which the French anatomists call *les vertebraux externes du demi-epineux, ou le transversaire epineux ducal*. See TRANSVERSALIS, &c.

SPINALES *colli minores*, muscles lying between the six *spinal* apophyses of the neck, and between the last of the neck and first of the back; being inserted in these apophyses by both extremities on one side of the posterior cervical ligament, which parts them from those of the other side. They are likewise termed INTERSPINALES.

SPINALIS *dorsi*, in *Anatomy*, a name given by Albinus to a muscle of the back, figured by Eustachius, *Tab.* 37. and called by Fallopius *quinti paris dorsi musculorum pars implantata in spinas vertebrarum thoracis*.

Others, as Spigelius, have called it a part of the SEMI-SPINATUS, and others a part of the LONGISSIMUS *dorsi*. The French have named it *le grand epineux de dos*.

SPINALIS *dorsi major*, a pretty long and slender muscle, lying upon the lateral part of the extremities of the *spinal* apophyses of the back. It is composed of several muscular fasciculi of different lengths, which crossing each other, are inserted laterally by small tendons in the *spinal* apophyses from the second, third, or fourth vertebræ of the back; and sometimes, though seldom, from the last of the neck, or first of the back, all the way to the first or second vertebra of the loins, with several irregular decussations, which vary in different subjects. The longest fasciculi are all a little incurvated, and the whole muscle terminates in points at its ends, but is considerably broad in the middle. It communicates by some fibres with the longissimus dorsi, and *semispinalis*, and sends off fasciculi to several transverse apophyses of the back, from the fourth to the eleventh. It is called by some *semispinalis*, but very improperly. Winslow.

SPINALIS, *semi*, *colli*, and *dorsi*. See SEMI-SPINALIS.

SPINALES *dorsi minores*. These muscles are of two kinds; some go laterally from the extremity of one *spinal* apophysis to another, being often mixed with the short fasciculi of the *spinalis* major; the rest lie directly between the extremities of two neighbouring *spinal* apophyses, being separated from those on the other side by the *spinal* ligament. These are smaller and thinner than those of the neck, and are properly enough termed *interspinales*. Winslow.

SPINALES *et transversales lumborum*. There are some fasciculi which run up from the superior false *spines* of the os sacrum to the lower *spinal* apophyses of the loins, which may be looked upon as so many *spinales lumborum majores*; and there are also some *spinales lumborum minores* between the *spinal* apophyses of the loins, and *transversales minores* between the transverse apophyses, which are sometimes of a considerable breadth. Winslow.

SPINARELLA, in *Ichthyology*, a name given by Bellonius, and some other authors, to the little fish called by us the *lesser stickleback*. In the Linnæan system, this is a distinct species of the GASTEROSTEUS.

SPINATUS, in *Anatomy*, a name given by Riolanus, and others, to a muscle of the neck, called by Albinus *spinalis colli*, and by Winslow, and the other French writers, *les vertebraux externes du demi-epineux, ou transversaire epineux du col*. See SPINALIS and TRANSVERSALIS.

SPINALIS, *medulla*. See MEDULLA.

SPINDLE, in *Mechanics*. See *Double* CONE.

The axis of the wheel of a watch or clock is called the *spindle*, and its ends the *pivot*.

SPINDLE, *parabolic*. See PYRAMIDOID.

For the method of finding its solidity. See SOLIDITY.

SPINDLE, in *Sea Language*, a sort of iron pin, tapering at the upper end to a point. It is used to stick into the upper end of the top-gallant mast, so as to carry a vane, which, turning thereon horizontally, will shew the direction of the wind. It is usually crowned with a globular or conical piece of wood, called the ACORN, which prevents the vane from being blown off.

SPINDLE also denotes the lower end or foot of the capstern, which is shod with iron, and becomes the pivot or axis, upon which it turns in the saucer. See CAPSTAN.

SPINDLE, in *Mining*, is a piece of wood faftened into either ftow-blade. See STOWS.

Thefe ftows give a miner, or any other perfon that owns them, as good a right to a meer or meers of ground, (fo that every meer have a pair of ftows fet on them) as a deed of conveyance doth to any purchafer.

SPINDLE, *fhell*. See TRUMPET-*fhell*.

SPINDLE-*tree*, *euonymus*, in *Botany*, a genus of the *pentandria monogynia* clafs. Its characters are thefe: it has a fhort empalement of one leaf, which is divided into four or five parts; the flower has four or five oval petals, which fpread open, and four or five fhort ftamina, joined at their bafe to the germen, terminated by twin fummits; in the centre is fituated a large oval germen, fupporting a fhort ftyle, crowned by an obtufe ftigma; the germen becomes a fucculent four or five-cornered capfule, having five valves, and fo many cells as angles, each containing one oval feed. Linnæus reckons two, and Miller four fpecies.

This fhrub is common in our hedges, but if cultivated fingly with care, will grow to a much larger fize than is commonly met with. The wood is ufed by the mufical inftrument-makers, for toothing organs and virginal keys. The branches are cut into tooth-picks, fkewers, and fpindles; from which latter purpofe it derives its name: in fome countries it is called dogwood. Miller.

It is generally fuppofed that the *euonymus* of the ancients is the fame plant that we at this time call by this name. The words of Theophraftus have probably given occafion to this opinion; as they found at firft reading like words expreffing the characters of the fruit of this tree; but on a clofer infpection, they will be found to exprefs a fruit of a very different kind. This author fays, that the fruit of the *euonymus* is like the pod of the fefamum, marked with four protuberant ribs, and hard within, and divided into places for four orders of feeds. It is plain by this, that as their fefamum bore an oblong pod marked with four ribs, fo as to feem of a quadrangular figure; fo did their *euonymus*, and that in this long pod there were four orders of feeds, each of thefe orders containing a great many feeds. Now the fruit of our *euonymus* is fhort and not at all like a pod, and contains only four feeds, and not four orders of feeds: there is alfo this farther proof of our *euonymus* not being that of the ancients, that ours is a wholfome food to cattle, and they are very fond of cropping it whenever they can reach it, and never get any hurt by it; whereas the *euonymus* of the Greeks was poifonous to cattle, according to Theophraftus. See FUSANUS and TETRASTOECHON.

SPINDLE-*tree*, *African*, or *climbing*, in *Botany*. See STAFF-*tree*.

SPINDLE-*tree*, *baftard*. See KIGGELARIA.

SPINDLING, a term ufed by gardeners for the firft appearance or putting forth of flowers, ftems; or their running up in length.

SPINE, SPINA *dorfi*, in *Anatomy*, the feries or affemblage of vertebræ, or bones of the back, which fuftain the reft of the body, and to which are connected the ribs. See *Tab. Anat.* (*Ofteol.*) *fig.* 3. *lit. a a. fig.* 7. *lit. a a.*

It has its name *fpine*, becaufe the hind part thereof is edged, or *fpiny*. Some call it the *canalis facer*.

It reprefents a very compound folding pillar, round on the forefide, and on the backfide ftuck full of prickles or points, reprefenting fo many *fpines*. It has a canal in the middle through its whole length, into which a great number of holes open on each fide. When it is viewed directly on the forefide or backfide, it appears ftraight, and to be made up of different portions of pyramids, in a contrary fituation to one another; but viewed fideways, it prefents feveral different curvatures.

The pieces which compofe the *fpine* are of two kinds, one fimple, the other compound; the fingle pieces are generally twenty-four in number, called by the name of *vertebræ*; the compound pieces are two, the os facrum and os coccygis. The fingle pieces are alfo called *true vertebræ*, to diftinguifh them from the portions which compofe the other two, which are called *falfe vertebræ*. The true vertebræ are divided into three claffes, viz. feven of the neck, twelve of the back, and five of the loins; and to thefe are given the names *cervical*, *dorfal*, and *lumbar*. Winflow. See VERTEBRÆ.

This bone, when felt through the integuments, feems fometimes divided, and has given rife to the notion of a *fpina bifida*, or bifurcation of the *fpine*. But fome doubt of the exiftence of fuch a cafe; as a perfect *fpina bifida* fuppofes the very canal and *fpinal* marrow to divide into two branches, and the *fpinal* proceffes to divaricate into two rows. We have a cafe in the Philofophical Tranfactions, where the *fpinal* marrow of an infant was found bare, without any bony covering, and which was taken for a *fpina bifida*. See Phil. Tranf. Nº 472. fect. 2. and Nº 366. p. 98.

See in Mem. de l'Acad. Royale des Sciences, anno 1730, fome curious obfervations by Mr. Winflow, on the motions of the *fpine*.

SPINE, *cartilages of the*. The cartilages of all the vertebræ in general are of two kinds, one proper to each vertebra, the other common to two vertebræ which lie next one another; the firft may be termed the *cartilages of articulation*, the latter the *cartilages of fymphyfis*.

The proper articular cartilages of each vertebra of the whole *fpine*, are thofe four which cover the furfaces of the four fmall articular apophyfes. In the natural ftate they are very white and fmooth, and much thicker than in the dried bones. Their circumference is the fame with that of the articular fides of the apophyfes, except in thofe places where there are fmall fuperficial notches. The vertebræ of the back, befide the four cartilages of their fmall apophyfes, have others which do not belong to their articulation with one another, viz. thofe which cover the lateral foffulæ in the bodies of thefe vertebræ, and the foffulæ of their tranfverfe apophyfes, by both of which they are articulated with the ribs.

The cartilages of fymphyfis lie between the bodies of the vertebræ, one of them being contained between, and clofely joined to the lower furface of one vertebra, and to the upper furface of the next under it; the breadth and circumference of thefe anfwer exactly to thofe of the furfaces between which they are contained, but their height, or thicknefs, is different in each clafs of the vertebræ. In the vertebræ of the loins they are, according to the ftature of the fubject, a quarter or a third of an inch thick; in thofe of the neck they are not fo thick, and thinneft of all in thofe of the back. Neither are they of equal thicknefs in all their parts; thofe of the neck and loins appear to be thickeft on the forefide, and thofe of the back rather thickeft on the contrary part; but thefe differences are moft remarkable in the vertebræ that lie near the middle of each clafs.

The internal ftructure of thefe cartilages is different from that of all the other cartilages of the body, and indeed they refemble the reft in nothing but in whitenefs and in elafticity. When we view their circumferences only, they appear to be one uniform mafs like the reft, but when divided by an incifion, parallel to the furface of the vertebræ, we fee that they are made up of a great number of concentric cartilaginous rings, contained within each other, with a fmall fpace left between them. Thefe are clofeft and thinneft near the centre, and about the middle feem to degenerate into another fofter kind of fubftance. Thefe rings do not form an entire circumference, being turned inward on the back fide, anfwerably to the pofterior flope in the body of each vertebra. They lie horizontally, one edge being fixed to the lower fide of one vertebra, and the other to the upper fide of the vertebra next below the former.

The interftices between the rings are filled with a mucilaginous fubftance, lefs fluid than that of the joints, and their breadth, or heighth, is proportionable to the diftance of the vertebræ between which they lie.

Each cartilaginous lamina taken feparately is very pliable, according to its length, but taken altogether they are not fo eafily bent, partly becaufe of their circular figure, partly becaufe of their proximity and multiplicity. They yield, however, in the inflections of the *fpine*, and without any inflection to the weight of the head and upper extremities; but this is done by very fmall degrees, and moft of all, when the upper part of the body is loaded with any foreign weight. After thefe compreffions they reftore themfelves, merely by being freed from the preffure; fo that a man is really taller after lying fome time, than after he has carried a burden for a great while. Thefe fingular obfervations of the different heights of the fame perfon, at different times, which were firft made in England, and afterwards confirmed at Paris by Mr. Morand, are moft naturally and eafily accounted for, merely by the different ftate of the intervertebral cartilages.

The intervertebral cartilages of the neck lying, for the moft part, between the convex fide of one vertebra, and the concave fide of another, are of a greater extent, in proportion to the fize of thofe vertebræ, than thofe of the back and loins. The os facrum has no cartilage, except that between the upper fide of the firft falfe vertebra, and the laft vertebra of the loins; and thofe by which it is connected to the offa innominata, already defcribed as the cartilages of that bone. The cartilages, which join the different portions of the os coccygis, are preferved in fome fubjects to a very great age, but in others they very foon become entirely bony. Winflow.

SPINE, *ligaments of the*. The vertebræ are ftrongly connected to each other by three kinds of ligaments. Each vertebra is connected to thofe above and below it by a great number of very fhort and ftrong ligaments, which crofs

crofs each other obliquely, and are fixed round the edges of the body of each vertebra. Thefe crucial ligaments cover the circumference of the intervertebral cartilages, and adhere clofely to them.

The bodies of all the vertebræ, from the fecond of the neck to the os facrum, are covered by ligamentary half vaginæ on the convex fide, in which thefe vaginæ are fixed, furrounding all the crucial ligaments, and made up of ligamentary filaments, partly oblique, but for the moft part longitudinal. All the vertebræ are likewife ftrongly connected by a ligamentary tube, which lines the inner furface of the medullary canal from the occipital hole to the os facrum; it reprefents a long flexible funnel, its cavity at the upper part being equal to that of the occipital foramen, and ending in a point at the os facrum.

The firft vertebra is fixed to the os occipitis befide this, by a diftinct and very ftrong ligamentary covering; the fecond has two ligaments peculiar to it, one which connects the apophyfis dentiformis to the os occipitis, and another tranfverfe, which confines this apophyfis within the anterior portion of the cavity of the firft vertebra. The firft may be called the occipital, and the fecond the tranfverfe ligament of the odontoide apophyfis. Along the whole bony canal of the *fpine*, between the bafes of each *fpinal* apophyfis, lies a flat and very elaftic ligament, of a yellowifh colour, which fills up the pofterior great notches of the vertebræ, adhering to their edges, and to the neighbouring portions of the great ligamentary tube.

Between the extremities, or apices of the *fpinal* apophyfes, are fmall ligamentary ropes, which go from one *fpine* to the next, which are all really double, though they appear fo only in the neck, being there fixed feparately to the forked extremities of the *fpines*. Between all the *fpinal* apophyfes, from their apices to the middle of their bafes, lies a ligamentary membrane, going between each two; and there is a ligament of a like kind between the two tranfverfe apophyfes in all.

The articular ligaments of the *fpina* dorfi are thofe which tie the glenoide cavities of the firft vertebra to the condyles of the os occipitis; thofe that join the cartilaginous furface of the apophyfis dentiformis to the anterior cavity of the firft vertebra, and thofe by which all the oblique, or articular apophyfes, are connected together. Thefe are all fmall, fhort, and ftrong. The vertebral ligaments of the ribs, or thofe which connect the ribs to the vertebræ, are of the fame kind, and are inferted round the cartilaginous foffulæ in the body, and apophyfes of each vertebra. Befide all thefe ligaments of the *fpine*, there is one which goes in form of a membrane from the os occipitis, all the way to the laft two vertebræ of the neck: this is a true intermufcular ligament, and may be properly called the *ligamentum cervicale pofterius*. There are alfo two lateral ligaments of the fame kind, fixed to the tranfverfe apophyfes of the vertebræ of the neck. Winflow.

For the fractures and luxations of the vertebræ of the *fpine*, fee VERTEBRÆ.

SPINE, *curvature of the*, in *Medicine* and *Surgery*, a difeafe proceeding, as Mr. Pott has fhewn, not from a diflocation of the vertebræ, and a confequent preffure of the difplaced bones on the fpinal marrow, but from a ftrumous or fcrophulous indifpofition in the parts compofing the *fpine*, or thofe in its immediate vicinity, and not unfrequently attended with a partial, or a total lofs of the power of ufing, or even of moving the lower limbs: whence it has been generally, though very improperly, called a *palfy*, and treated as a paralytic affection.

This curvature is occafioned by means of a carious erofion of one or more of the bodies of the vertebræ; in confequence of which, that immediately above the feat of the difeafe, and that immediately below it, are brought nearer to each other than they fhould be; the body of the patient bends forward; the *fpine* is curved from within outwards, and the tuberofity appears behind on account of the protrufion of the fpinal proceffes of the diftempered vertebræ; and the curvature correfponds to the degree of carious erofion, and to the number of vertebræ affected.

Mr. Pott obferves, that the difeafe, to which the curvature of the *fpine* is owing, is the caufe of a great variety of complaints, both general and local; but when they are not attended with an alteration of the figure of the back-bone, neither the real feat, nor true nature of fuch diftemper, are pointed out by the general fymptoms; and, confequently, they are often unknown as long as the patient lives.

The caries, with curvature and ufelefs limbs, is moft frequently of the cervical or dorfal vertebræ: the caries without curve, of the lumbal, though this is by no means conftant and neceffary. In the former cafe, it often happens, that internal abfceffes and collections of matter are formed, which matter makes its way outward, and appears in the hip, groin, or thigh, or being detained within the body, deftroys the patient.

The *curvature of the fpine*, from within outward, of which the paralytic, or ufelefs ftate of the lower limbs, is a frequent confequence, is but one effect of a diftempered *fpine*; and, therefore, the generally received opinion, that all the attending fymptoms are derived from the curvature, confidered abftractedly, is by no means founded in truth, and may be productive of very erroneous conduct. Hence it appears, that when a caries has taken place, and the parts furrounding it are in a ftate of ulceration, no attempts to remove the diforder by means of fwings, fcrews, &c. can do any good, but, on the contrary, if they act fo as to produce any effect at all, it muft be a bad one.

The majority of thofe who labour under this difeafe are infants and young children: however, adults are not exempt from it; but Mr. Pott has never feen it at an age beyond forty. When it attacks a child who is old enough to have walked properly, its aukward and imperfect manner of ufing its legs is the circumftance which firft excites attention, and this is foon fucceeded by an incapacity of ufing them at all. Previous to this, the child is languid, liftlefs, and very foon tired; unwilling to move and apt to ftumble; and in quick motion his legs crofs each other involuntarily, by which he is fuddenly thrown down; and in ftanding his knees totter and bend under him: afterwards he complains of frequent pains and twitchings in his thighs, efpecially in bed, and of an uneafy fenfation at the pit of his ftomach: when he fits down, his legs are almoft always found acrofs each other, and drawn up under his feat; and in a little time he altogether lofes the power of walking. If the incurvation affect feveral vertebræ of the neck, the child finds it inconvenient and painful to fupport its own head, and is always defirous of laying it on a table or pillow, to be relieved of its weight. If the affection be of the dorfal vertebræ, the general marks of a diftempered habit, fuch as lofs of appetite, hard dry cough, laborious refpiration, quick pulfe, and difpofition to hectic, appear early; but thefe complaints are improperly afcribed to the mere deformity of the trunk, which is as much the effect of the original difeafe of the *fpine* as thefe complaints themfelves.

In an adult, the attack and progrefs of the difeafe are much the fame; but from him we learn, that his firft intimation of the diforder was a fenfe of weaknefs in his back-bone, accompanied with a heavy dull kind of pain, attended with a laffitude and fatigue after very moderate exercife, and fucceeded by an unufual fenfe of coldnefs in his thighs, and a palpable diminution of their fenfibility. In a little time, his limbs are frequently convulfed by involuntary twitchings, which are particularly troublefome in the night, and foon afterwards he becomes incapable of walking, his power of retaining or of difcharging his urine and fæces is confiderably impaired, and his penis is incapable of erection. The adult alfo finds all the offices of his digeftive and refpiratory organs much affected, and complains conftantly of pain and tightnefs at his ftomach.

The method of cure in this difeafe, (firft fuggefted to Mr. Pott, by a feemingly accidental abfcefs, and farther recommended by the authority of Hippocrates, who gives an account of a paralyfis of the lower limbs cured by an abfcefs in the back, as well as by the teftimony of Dr. Cameron of Worcefter, who, in a cafe of ufelefs limbs, attended with a curvature of the *fpine*, endeavoured to imitate this act of nature by exciting a purulent difcharge, and found it beneficial) confifts merely in procuring a large difcharge of matter from underneath the membrana adipofa on each fide of the diftempered bones forming the curvature, and in maintaining fuch difcharge till the patient recovers his health and limbs. It is a matter of little importance, by what means the difcharge be procured, provided it be large, and that it comes for a fufficient length of time. Mr. Pott, having tried the different means of fetons, iffues by incifion, and iffues by cauftic, found the laft in general to be preferable; being leaft painful, moft cleanly, moft eafily manageable, and capable of being continued for the longeft time. The cauftics fhould be applied on each fide of the curvature, in fuch a manner as to leave the portion of fkin covering the fpinal proceffes of the protruding bones entire and unhurt, and fo large, that each of the fores, upon the feparation of the efchars, may eafily hold three or four peas, in cafe of the fmalleft curvature; but in large curves at leaft as many more.

Thefe iffues fhould not only be kept open, but the dif- charge

charge from them ſhould be maintained by means of orange peas, cantharides in fine powder, ærugo æris, or any other kind of application that may beſt promote a large and long continued drain. Theſe iſſues muſt be continued long enough not only to effect a complete cure by reſtoring the health as well as the limbs, but a conſiderable time longer, eſpecially in infants and growing children. By means of theſe diſcharges, the eroding caries is firſt checked and then ſtopped; in conſequence of which an incarnation takes place, and the cartilages between the bodies of the vertebræ having been previouſly deſtroyed, the bones become united with each other, and form a kind of anchyloſis.

The time neceſſary for the accompliſhment of a cure, has differed according to different circumſtances; in ſome caſes it has been perfected in two or three months, and in ſome it has required two years, during two thirds of which time there has been no viſible amendment.

The curvature or deformity of the *ſpine*, which remains after recovery, is ſubject to conſiderable variety, as it depends on the degree of caries, and the number of bones affected: in general, it may be ſaid, that when one of the vertebræ only is affected, and the patient young, the curve will in length of time almoſt totally diſappear; but when two or three are affected, this cannot be expected; nay, the conſolidation and union of the bones, which had been carious, and are become ſound, will render the curvature and conſequent deformity permanent; the iſſues reſtoring the uſe of the limbs, but not the loſt figure of the *ſpine*: and hence it appears, that the curvature is the conſequence of a morbid *ſpine*, and not the cauſe either of the other ſymptoms, or of the uſeleſs ſtate of the limbs.

From a conſideration of the nature, cauſe, and method of cure of this diſorder, Mr. Pott is led to propoſe the uſe of iſſues by way of preventives, when ſymptoms appear which give reaſon to ſuſpect the formation of this diſeaſe in the *ſpine*, though it is not manifeſted by any external change.

See Pott's farther Remarks on the uſeleſs State of the Lower Limbs, in conſequence of a Curvature of the *Spine*; being a ſupplement to a former treatiſe on that ſubject. 8vo. 1782. See alſo Select Caſes of the Diſorder, commonly termed the Paralyſis of the Lower Extremities, by Dr. Jebb. 8vo. 1782.

SPINES *of echini*, in *Natural Hiſtory*. Theſe in their foſſil ſtate make a great appearance in the cabinets of the curious, and in the works of the learned, and are of an almoſt infinite variety of kinds; and many of them are of the ſame figures and dimenſions with thoſe of the echini now living in our own and other ſeas, and well known to us. But beſide theſe there is an almoſt infinite variety of others, which, though allowed on all hands to be truly *ſpines* of ſome echini or other, yet evidently differ from thoſe of all the known recent fiſh of that name, and have certainly belonged to a ſpecies of it, of which we have not now the leaſt knowledge. Theſe, however different in ſhape from one another, yet all agree in their texture and conſtituent matter. Hill's Hiſt. Foſſils.

SPINET, or SPINNET, a muſical inſtrument, ranked in the ſecond or third place among harmonious inſtruments.

It conſiſts of a cheſt or belly, made of the moſt porous and reſinous wood to be found; and a table of fir glued on ſlips of wood, called *ſummers*, which bear on the ſide. On the table is raiſed a little prominence, wherein are placed as many pins as there are ſtrings to the inſtrument.

The inſtrument is played by two ranges of keys; the foremoſt range being in the order of the diatonic ſcale; and the other range ſet backwards in the order of the artificial notes or ſemitones.

The keys are ſo many long, flat ſlips of wood, which, when touched and preſſed down at one end, make the other raiſe a jack, which ſounds the ſtrings by means of the end of a crow's quill, wherewith it is armed. The thirty firſt ſtrings are of braſs; the other more delicate ones ſhould be of ſteel, or iron wires. They are all ſtretched over two bridges glued to the table.

The figure of the *ſpinet* is a long ſquare, or parallelogram. Some call it an *harp couched*, and the harp an *inverted ſpinet*.

The *ſpinet* is generally tuned by the ear; which method of the practical muſicians is founded on this ſuppoſition, that the ear is a perfect judge of an octave and fifth. The general rule is, to begin at a certain note, as *c*, taken towards the middle of the inſtrument, and tune all the octaves up and down, and alſo the fifths, reckoning ſeven ſemitones to each fifth, by which means the whole is tuned.

Sometimes to the common or fundamental play of the *ſpinet*, which is the great octave, is added another ſimilar one in uniſon, and a third in octave to the firſt; to make the harmony the fuller. They are played either ſeparately or together, which is called the *double* or *triple ſpinet*. Sometimes a play of violins is added, by means of a bow, or a few wheels parallel to the keys, which preſs the ſtrings, and make the ſounds laſt as long as the muſician pleaſes; and heighten and ſoften them, as they are more or leſs preſſed. The harpſichord is a kind of *ſpinet*, only with another diſpoſition of the keys. See HARPSICHORD.

The inſtrument takes its name from the little quills ends, wherewith the ſtrings are drawn, which are ſuppoſed to reſemble *ſpinæ*, *thorns*.

SPINIS. *Attachiamenta de* SPINIS & *boſco*. See ATTACHIAMENTA.

SPINNING, in *Commerce*, the act, or art of reducing ſilk, flax, hemp, wool, hair, or other matter, into thread.

Spinning is either performed on the wheel, or with a diſtaff and ſpindle, or with other machines proper for the ſeveral kinds of working. Hemp, flax, nettle-thread, and other like vegetable matters, are to be wetted in *ſpinning*: ſilks, wools, &c. are *ſpun* dry, and do not need water; yet there is a way of *ſpinning* or reeling SILK as it comes off the caſes or balls, where hot, and even boiling water is to be uſed.

The vaſt variety, and the importance of thoſe branches of our manufactures, which are produced from cotton, wool, and flax, ſpun into yarn, together with the cheapneſs of proviſions, and the low price of labour in many foreign countries, which are our rivals in trade, have occaſioned many attempts at home to render *ſpinning* more eaſy, cheap, and expeditious.

About forty or fifty years ago, one Paul, and others of London, invented an engine for *ſpinning* of cotton, for which they obtained a patent; but the undertaking proved unſucceſsful. About twenty or thirty years ago, various engines were conſtructed, by different perſons, for *ſpinning* cotton, flax, wool, &c. into many threads at once, without producing any very conſiderable or durable advantage.

About the year 1767, one Hargrave of Blackburn, in Lancaſhire, conſtructed an engine, that would ſpin at once twenty or thirty threads of cotton into yarn for the fuſtian manufacture; but meeting with oppoſition, both before and after he obtained a patent for his engine, the inventor died in obſcurity and diſtreſs.

About the year 1768, Mr. Arkwright, a native of Lancaſhire, invented his new method of *ſpinning* cotton, and obtained a patent in 1769 for making cotton, flax, and wool into yarn. He alſo conſtructed engines in order to prepare the materials for *ſpinning*, for which he obtained a patent in 1775. The proprietors of theſe machines have applied them to the manufacture of ſtockings and callicoes to a very conſiderable extent; and many of Mr. Arkwright's patent machines have been diſperſed through the ſeveral counties of Derby, Leiceſter, Nottingham, Worceſter, Stafford, York, Hereford, and Lancaſter.

The art of *ſpinning*, which nature has given to many animals of different kinds for their preſervation, and other purpoſes, is not confined to the inhabitants of the earth or air alone, but is even extended to thoſe of the ſea. Mr. Reaumur has ſhewn, by a ſeries of curious experiments, that the common muſcle, and ſome other ſhell-fiſh of the ſea, poſſeſs it in a great degree of perfection. See MUSCLE.

But he obſerves, that though the workmanſhip is the ſame, the manner of producing it is very different. Spiders, caterpillars, and the like, make threads of any length that they pleaſe, by making the viſcous liquor, of which they are formed, paſs through a fine perforation in the organ appointed for this *ſpinning*: but the way in which the muſcles form their threads is very different, as the former reſembles the work of the wire-drawer, ſo does this that of the founder, who caſts metals in a mould. The canal of the organ deſtined for the muſcle's *ſpinning*, which, from its ſhape, is commonly called its tongue, is the mould in which its thread is caſt, and gives it its determinate length. Mem. Acad. Par. 1711.

SPINOLETTA, in *Ornithology*, the name of a ſmall bird of the lark-kind, the ALAUDA *ſpinoletta* of Linnæus, called *tordino* by the Venetians, and ſeeming to be the *ſtopparola*, as alſo the *griſola*, and *ſpipola* of Aldrovandus. It is ſmaller than the common lark; its head, neck, ſhoulders, and back, are of a greyiſh colour, with an admixture of green; its breaſt and belly white, and its throat ſpotted: the female differs from the male, in that her belly is yellow; the wing-feathers are of a duſky brown, with whitiſh or yellowiſh edges; its tail is moderately long, and part of the feathers are ſnow-white, the reſt brown or blackiſh; the length of the heel diſtin-

guishes this bird from all others, except the lark-kind, and it differs from all the species of larks in the colour of its beak and legs, which are black. It is common in the markets of Venice and other places. Ray.

SPINOSA, in *Zoology*, the name by which the Italians call the PORCUPINE.

SPINOSE-*leaf*, among *Botanists*. See LEAF.

SPINOSI *pisces*, in *Ichthyology*, such fishes as have some of the rays of their back-fins running out into thorns and prickles, as the pearch, &c. See FISH.

SPINOZISM, or SPINOSISM, the doctrine of *Spinoza*; or, atheism and pantheism proposed after the manner of *Spinoza*.

The great principle of *Spinozism* is, that there is nothing properly and absolutely existing, but matter and the modifications of matter; among which are even comprehended thoughts, abstract and general ideas, comparisons, relations, combinations of relations, &c.

Benedict Spinoza, or *Espinoza*, was a man well known in Holland. He was born a Jew at Amsterdam; but did not make profession of any religion, either the Jewish or Christian: though, it is said, that he observed, in his conduct, the rules of wisdom and probity much better than many who profess themselves Christians, nor did he ever endeavour to pervert the sentiments, or to corrupt the morals of those with whom he lived, or to inspire, in his discourse, a contempt of religion or virtue. He died at the Hague in 1677, being somewhat above forty-four years of age.

He composed several books in Latin; the most celebrated whereof is his Tractatus Theologico-Politicus, printed at Amsterdam in 1670, wherein he overturns the foundation of all religion: the book, accordingly, was condemned by a public decree of the states; though it has since been sold publicly, and even reprinted, both in Latin and French, in that country, and in English at London.

Spinoza here insinuates, that all religions are only political engines, calculated for the public good, to render the people obedient to magistrates, and to make them practise virtue and morality.

He does not here lay down his notion of the Deity openly, but contents himself with suggesting it. In his Ethics, published among his posthumous works, he is more open and express; maintaining, that God is not, as we imagine him, an infinite, intelligent, happy, and perfect Being; nor any thing but that natural virtue, or faculty, which is diffused throughout all creatures.

The life of *Spinoza* has been accurately written by Colerus, whose performance was published at the Hague in 8vo. in 1706. But a more ample and circumstantial account of this singular man has been given by Lenglet du Fresnoy, and is prefixed to Boulainvilliers's Exposition of the Doctrine of *Spinoza*, which was published at Amsterdam, in 12mo. in the year 1731. Fresnoy republished the work of Colerus, and added to it several anecdotes, borrowed from a Life of *Spinoza*, written by Lucas, a physician at the Hague.

The learned Fabricius, in his Bibliotheca Græca, lib. v. part iii. p. 119, and Jenichen, in his Historia Spinozismi Lehnhofiani, p. 38—72, have given an ample list of those writers who have refuted the system of *Spinoza*. Witsius in Holland, Majus in Germany, and De la Mothe in England, wrote against his Tractatus: but Bredenburg, according to Mr. Bayle, succeeded best on this subject; who, however, is said to have been afterwards a convert to *Spinozism*, and to have written a demonstration of the truth of it: a refutation of his defence by Isaac Orobio, a learned Jewish physician at Amsterdam, was published in 8vo. in 1703. See also Buddeus's Theses de Atheismo & Superstitione, c. i. sect. 26, and Fabricius's Syllab. Script. de Verit. Relig. Christ. p. 357, &c. Mr. Bayle and, above all Dr. Clarke, have distinguished themselves by their refutation of the System of *Spinoza*. See Bayle's Dict. art. *Spinoza*, and Clarke's Demonstration of the Being and Attributes of God, p. 25—45, &c. ed. 1725.

Spinoza, in his Tractatus above mentioned, is very full on the subject of the authors of the Scriptures; and endeavours to shew, that the Pentateuch is not the work of Moses; contrary to the common opinion, both of the Jews and Christians. He has also his particular sentiments as to the authors of the other books. This part of the work has been answered by M. Huet, in his Demonstratio Evangelica; and by M. Simon, in his Hist. Crit. du Vieux Test. See PENTATEUCH.

Spinozism is a species of naturalism, or pantheism, or hylotheism, as it is sometimes called, i. e. of the dogma which allows of no other God but nature, or the universe; and, therefore, makes matter to be God. Accordingly, Buddeus, in a dissertation De *Spinozismo* ante *Spinozam*, proves at large, that *Spinoza's* doctrine of God and the world, is far from being his own invention, but that it had been held by many philosophers of different sects, both among the Chaldeans and Greeks. It is certain, the opinion of the Stoics, and those who held an *anima mundi*, was not far from it. Lucan introduces Cato discoursing thus:

> *Estne Dei sedes nisi terra, & pontus, & aër,*
> *Et cœlum, & virtus? Superos quid quærimus ultra?*
> *Jupiter est quodcunq; vides, quocunq: moveris.*
> Luc. Pharf. l. 9. v. 578.

Strato likewise, and others among the Peripatetics, maintained something very like it; and, what is more, though no ancient sect seems farther removed from *Spinozism* than the Platonic, as they attributed the greatest freedom to God, and carefully distinguished him from matter; yet Gundlingius has proved at large, that Plato gave matter much the same origin with *Spinoza*. But the sect that approached nearest to *Spinozism* was that which taught, that all things were one, as Xenophanes the Colophonian, Parmenides, Melissus, and especially Zeno Eleates; whence it obtained the name of the *Eleatic system of atheism*. To the same may also be reduced the opinion of those who held the first matter for God, as Amalricus and David of Dinantum. Add, that the sect of Foe in China and Japan, and that of the Soufi in Persia, and that of the Zindikites in Turky, are found to philosophize much after the manner of *Spinoza*.

The chief articles in *Spinoza*'s system are reducible to these: that there is but one substance in nature; and that this only substance is endued with an infinite number of attributes, among which are extension and cogitation: that all the bodies in the universe are modifications of this substance, considered as it is extended; and that all the souls of men are modifications of the same substance, considered as cogitative: that God is a necessary and infinitely perfect Being, and is the cause of all things that exist, but is not a different being from them: that there is but one being, and one nature; and that this nature produces within itself, by an immanent act, all those which we call creatures: and that this being is at the same time both agent and patient, efficient cause and subject; but that he produces nothing but modifications of himself.

As *Spinoza* taught, that there is no difference of substances, he maintained, that the whole and every part of the material world is a necessarily existing being, and that there is no other God but the universe: and moreover, since it is absolutely impossible for any thing to be created or produced by another, and also absolutely impossible for God to have caused any thing to be in any respect different from what it now is; every thing that exists must needs be so a part of the divine substance, not as a modification caused in it by any will or good pleasure or wisdom in the whole, but as of absolute necessity in itself, with respect to the manner of the existence of each part, no less than with respect to the self-existence of the whole; consequently the material world, and every part of it, with the order and manner of being of each part, is, upon his scheme, the only self-existent, or necessarily existing being.

And he also maintains, that motion, as a dependent being, has been eternally communicated from one piece of matter to another; and, therefore, without having at all any original cause of its being, either within itself or from without: this, Dr. Clarke has proved, to be a plain contradiction, and, consequently, motion must of necessity be originally caused by something that is intelligent, or else there never could have been any such thing as motion in the world; and therefore the self-existent being, the original cause of all things, must of necessity be an intelligent being. Hence it follows, that the material world cannot possibly be the original self-existent being. For since the self-existent being is intelligent, and the material world plainly is not so, it follows, that the material world cannot possibly be self-existent.

Agreeably to *Spinoza*'s system, he is led to maintain that the supreme cause is a necessary agent, and, therefore, that no thing, or mode of existence of any thing, could possibly have been in any respect different from what it now actually is; because, he says, from an infinitely perfect nature, infinite things in infinite manners must needs proceed: if any thing could possibly be otherwise than it is, the will and nature of God must be supposed capable of change; and if all possible things in all possible manners do not always and necessarily exist, they never can all exist, but some things that do not exist, will still always be possible only, and never can actually exist; and so the actual omnipotence of God is taken away.

To this reasoning Dr. Clarke replies, that the first argument

ment is a plain begging of the question; for, that an infinitely perfect nature is able indeed to produce infinite things in infinite manners, is certainly true; but that it must always actually do so, by an absolute necessity of nature, without any power of choice, either as to time, or manner, or circumstances, does by no means follow from the perfection of its nature, unless it be first supposed to be a necessary agent, which is the very question begged that was to be proved.

The second argument, he says, is (if possible), still weaker; for, how does it follow, if God, according to his eternal unerring purpose and infinite wisdom, produces different things at different times, and in different manners, that, therefore, the will and nature of God are changeable? It might exactly as well be argued, that if God (according to *Spinoza*'s supposition) does always necessarily produce all possible differences and varieties of things; therefore his will and nature are always necessarily infinitely various, unequal, and dissimilar to themselves.

And as to the third argument, it is just such reasoning as if a man should argue, that if all possible eternal duration be not always actually exhausted, it can never be all exhausted; and that, therefore, so the eternity of God is taken away: a mode of arguing, the weakness of which must be discerned by every one at first sight. Besides the assertion itself, that no thing, or mode of existence of any thing, could possibly have been made in any respect different from what it is, is so palpably absurd and false, so contradictory to experience and the nature of things, and to the most obvious and common reason of mankind, that of itself it immediately, and upon the first hearing, sufficiently confutes any principle of which it is a consequence. For all things in the world appear plainly to be the most arbitrary that can be imagined, and to be wholly the effects not of an absolute necessity of nature, but merely of a necessity of fitness, or of wisdom and choice. Moreover, *Spinoza*, maintaining that the supreme cause is a necessary agent, is constrained to expose all final causes as the fictions of ignorant and superstitious men; and so laugh at those who are so foolish and childish as to fancy, that eyes were designed and fitted to see with, teeth to chew with, food to be eaten for nourishment, the sun to give light, &c. a mode of arguing to which reply is needless. See the article God.

Against *Spinoza*'s system it is alledged by Mr. Bayle, 1. That it is impossible the universe should be but one substance, since every thing that is extended must necessarily have parts, and what has parts must be compounded. And as the parts of extension do not subsist in each other, it follows, either that extension in the general is not substance, or that every part of extension is a different substance. Now, according to *Spinoza*, extension in general is an attribute of substance. And he allows, with other philosophers, that the attributes of substance do not differ really from the substance itself. He must therefore allow, that extension in general is substance; whence it will follow, that every part of extension is a particular substance; which overturns the whole system.

2°, If it be absurd to make God extended, as this robs him of his simplicity, and makes him be composed of parts, it is still worse to reduce him to the condition of matter, the lowest of all beings, and that which most of the ancient philosophers ranked immediately above nothing; matter, the theatre of all sorts of changes, the field of battle of contrary causes, the subject of all corruptions and generations; in a word, the being, of all others, most incompatible with the immutability of the Deity!

The *Spinozists* indeed maintain, that it is not susceptible of any division; but the argument they alledge in proof of it we have elsewhere shewn to be false: it is, that for matter to be divided, it is necessary that one of the parts be separated from the other by a void space, which is impossible; since, they say, there is no vacuum in nature. See Vacuum.

3°, If *Spinozism* appear extravagant, when we consider God as the subject of all the mutations, corruptions, and generations, in bodies, it will be found still worse, when we consider him as the subject of all the modifications of thinking. It is no small difficulty to unite extension and thinking in the same substance; since it is not an union like that of two metals, or of water and wine, that will serve the purpose: these last require only juxta position; whereas, to combine thinking and extension, requires an identity. Thinking and extended are two attributes identified with the substance, and, consequently, they are identified with each other by the fundamental rule of all logic.

Again, when we say, that a man *denies this*, *affirms that*, *likes that*, &c. we make all those attributes fall on the substance of his mind, not on his thoughts, which are only accidents or modifications of it: if, therefore, what *Spinoza* advances be true, that men are modalities of God, it would be false to say, *Peter denies*, *likes*, *wills*, &c. since, in reality, on this system, it is, that God denies, wills, &c. and, consequently, all the denominations which arise from the thoughts, desires, &c. of men, fall properly and physically on the substance of God. From whence it also follows, that God affirms and denies, loves and hates, wills and nills the same thing, at the same time, and under the same conditions; contrary to the great principle of reasoning, *opposita sunt quæ & neque de se invicem, neque de eodem tertio secundum idem, ad idem, eodem modo atque tempore verè affirmari possunt*; which must be false, if *Spinozism* be true; since it cannot be denied, but some men love and affirm what others hate and deny, under all the conditions expressed in the rule.

4°, But if it be physically absurd to say, the same subject is modified at the same time with all the different thoughts of all men; it is horrible when we consider it in a moral light; since it will follow, that the infinite, the all-perfect Being, is not constant, is not the same one moment, but is eternally possessed even with contrary passions: all the uniformity in him, in this respect, will be, that, for one good and wise thought, he will have twenty foolish and wicked ones. He will not only be the efficient cause of all the errors, iniquities, and impurities of men, but also the passive subject of them, the *subjectum inhæsionis*. He must be united with them in the closest manner that can be conceived, even by a penetrative union, or rather an identity, since the mode is not really distinct from the substance modified. Bayle, art *Spinoza*.

SPINSTER, in *Law*, an addition usually given to all unmarried women, from the viscount's daughter downwards.

Yet sir Edward Coke says, *generosa* is a good addition for a gentlewoman; and that, if such a person be named *spinster* in any original writ, appeal, or indictment, she may abate and quash the same.

Spelman says, that anciently, even queens used the distaff and spindle; whence *spinster* became a common appellation for all women.

SPINTHER, among the Romans, a kind of bracelet which the women, in the first ages of Rome, used to wear on the upper part of their left arm.

SPINUS, in the *Natural History of the Ancients*, the name of a fossil body of a very remarkable quality; for, according to the accounts of Theophrastus, and other authors of the greatest credit, if broke to pieces, and thrown in a heap exposed to the sun, it took fire and burnt, and that the more if moistened or sprinkled with water.

It seems to have been a substance nearly allied to what they call the *lapis thracius*, but with this remarkable quality, both of them seem to have been of the class of the harder bitumens, and are wholly unknown to us. Some late writers have imagined, that the common black slatestone, so frequent with us in the coal-pits, was the substance called by Theophrastus, and the ancients, by this name; but it has none of the qualities attributed to the *spinus*. Hill's Theophrastus, p. 35.

Spinus, in *Ichthyology*, a species of the sparus, with a bifid tail, and the dorsal spine recumbent. It is found in the Indian seas.

Spinus, the Fringilla *spinus* of Linnæus, in *Ornithology*, the name of a small bird, called by some *ligurinus*, and in English the *siskin*. Its head is black, and its neck and back green; the neck, however, has some slight admixture of a blackish tinge, and the roots of the back-feathers have also some blackishness; its rump is of a greenish yellow, as are also its breast and throat; its belly is white, and its tail is yellow underneath, with some brownish spots; the female is paler coloured than the male, and its throat, and its sides, under the wings, are whitish, with streaks of brown; the head and back are of a greenish ash-colour, marked with brown. It is common in Germany and England, which it visits at uncertain times, and is kept in cages for its singing. In winter these birds fly in large flocks. In Sussex it is called the barley-bird, because it comes to them in the barley-seed time.

SPIPOLA, in *Ornithology*, the name of a small bird of the lark-kind, of which there are, according to Aldrovand, three species, suspected by Mr. Ray to be only varieties of the spinoletta, or *tordino* of the Venetians.

Linnæus makes two of these distinct species, under the titles of *alauda trivialis*, and *alauda pratensis*; the last of which is our *tit-lark*. See Lark.

SPIRACLE. See Vent.

SPIRACULA, in the *Hiſtory of Inſects*, are little holes or pores placed ſingly on each ſide of every ſegment of the abdomen, through which the inſect breathes; and if oil be applied ſo as to ſtop them up, it proves fatal to moſt of them.

SPIRÆA, ARUNCUS, *greater meadowſweet*, or *ſpiræa frutex*, in *Botany*, a genus of the *icoſandria tetragynia* claſs. Its characters are theſe: the flower has a permanent empalement of one leaf, plain at the baſe, and cut into five acute ſegments at the top; it has five roundiſh oblong petals inſerted in the empalement, and twenty or more ſlender ſtamina, which are ſhorter than the petals, and are inſerted in the empalement, terminated by roundiſh ſummits; and it has five or more germina, ſupporting as many ſlender ſtyles, which are longer than the ſtamina, and crowned by headed ſtigmas; the germina turn to oblong compreſſed capſules, opening with two valves, containing a few ſmall acute pointed ſeeds. Linnæus enumerates eleven, and Miller twelve ſpecies, one of which is the common DROPWORT.

SPIRÆA, *African*, in *Botany*. See DIOSMA.

SPIRAL, in *Geometry*, a curve line of the circular kind, which, in its progreſs, recedes from its centre; as in winding from the vertex, down to the baſe of a cone.

It is called, from its inventor, *Archimedes's ſpire*, or *helix*, and is thus deſcribed: divide the periphery of a circle A P p A (*Tab.* V. *Geometry*, *fig.* 115.) into any number of equal parts, by a continual biſection in the points p. Into the ſame number of parts divide the radius C A, and make C M equal to one part, C m to two parts, &c. Then will the points M, m, m, &c. be points in the *ſpiral*; which, connected, will give the *ſpiral* itſelf.

This is more particularly called the *firſt ſpiral*; and the *ſpace* included between its centre and the point A, the *ſpiral ſpace*.

The firſt *ſpiral* may be continued to a *ſecond ſpiral*, by deſcribing another circle with double the radius of the firſt; and the ſecond may be continued to a *third*, by a third circle, &c.

Hence, 1°, Ap is to the periphery, as Cm to the radius: wherefore, if the periphery be called p, the radius $AC = r$, $Ap = x$, $pm = y$; then will $Cm = r - y$: conſequently, as $p : r :: x : r - y$, we ſhall have $pr - py = rx$.

2°, If $Cm = y$, then will $rx = py$; which equation the *ſpiral* has in common with the quadratrix of Dinoſtrates, and that of Tſchirnhauſen: and therefore $r^n x^m = p^n y^m$ will ſerve for infinite *ſpirals* and quadratrices. See QUADRATRIX.

The *ſpiral* line may be conceived to be thus generated: If a right line, as A B (*Tab.* V. *Geometry*, *fig.* 116.) having one end fixed at B, be equally moved round, ſo as, with the other end A, to deſcribe the periphery of a circle; and, at the ſame time, a point be conceived to move forward equally, from B towards A, in the right line A B, ſo as that the point deſcribes that line, while the line generates the circle; then will the point, with its two motions, deſcribe the curve B, 1, 2, 3, 4, 5, &c. Which is called a *ſpiral line*, and the plain ſpace contained between the *ſpiral line* and the right line B A, is called the *ſpiral ſpace*.

Again, if the point B be conceived to move twice as ſlow as the line A B, ſo that it ſhall get but half way along B A, when that line ſhall have formed the circle; and if then you imagine a new revolution to be made of the line carrying the point, ſo that they ſhall end their motion at laſt together, there will be formed a double *ſpiral line*, as in the figure: from the manner of which may be eaſily drawn theſe corollaries:

1. That the lines B 12, B 11, B 10, &c. making equal angles with the firſt and ſecond *ſpiral* (as alſo B 12, B 10, B 8, &c.) are in arithmetical proportion.
2. The lines B 7, B 10, &c. drawn any how to the firſt *ſpiral*, are to one another as the arches of the circle intercepted betwixt B A and thoſe lines; becauſe, whatever parts of the circumference the point A deſcribes, as ſuppoſe 7, the point B will alſo have run over 7 parts of the line A B.
3. Any lines drawn from B to the ſecond *ſpiral*, as B 18, B 22, &c. are to each other as the aforeſaid arches, together with the whole periphery added on both ſides: for at the ſame time that the point A runs over 12, or the whole periphery, or perhaps 7 parts more, ſhall the point B have run over 12, and 7 parts of the line A B, which is now ſuppoſed to be divided into 24 equal parts.

The area CABDE of the *ſpiral* of Archimedes (*Tab.* V. *Geometry*, *fig.* 117.) is equal to one third part of the circle, deſcribed with the radius C E.

In like manner, the whole *ſpiral* area, generated by the ray drawn from the point C to the curve, when it makes two revolutions, is the third part of a ſpace double of the circle deſcribed with the radius 2 C D; and the whole area, generated by the ray from the beginning of the motion, till after any number of revolutions, is equal to the third part of a ſpace that is the ſame multiple of the circle deſcribed with the greateſt ray, as the number of revolutions is of unit.

Any portion of the area of the *ſpiral*, terminated by the curve C m A, and the right line C A, is equal to one third of the ſector C A G, terminated by the right lines C A, and C G, the ſituation of the revolving ray, when the point that deſcribes the curve ſets out from C. See Maclaurin's Fluxions, Introd. p. 30, 31. See QUADRATURE of the *Spiral of Archimedes*.

SPIRAL, *logiſtic*, or *logarithmic*. See LOGISTIC and QUADRATURE.

SPIRAL *of Pappus*, a *ſpiral* formed on the ſurface of a ſphere, by a motion analogous to that by which the *ſpiral* of Archimedes is deſcribed in plano.

This *ſpiral* is ſo called from its inventor Pappus. Collect. Mathem. lib. ii. prop. 30.

Thus, if C be the centre of the ſphere (*fig.* 118.) A R B A a great circle, P its pole; and while the quadrant P M A revolves about the pole P with an uniform motion, if a point proceeding from P move with a given velocity along the quadrant, it will trace upon the ſpherical ſurface the *ſpiral* P F a.

Now if we ſuppoſe the quadrant P M A to make a complete revolution in the ſame time that the point, which traces the *ſpiral* on the ſurface of the ſphere, deſcribes the quadrant, which is the caſe conſidered by Pappus; then the portion of the ſpherical ſurface terminated by the whole *ſpiral*, the circle A R B A, and the quadrant P M A, will be equal to the ſquare of A B. In any other caſe, the area P M A a F Z P is to the ſquare of the diameter A B, in the ſame proportion as the arch A a is to the whole circumference A R B A. And this area is always to the ſpherical triangle P A a, as the inſcribed ſquare is to the circle. See Maclaurin's Fluxions, Introd. p. 31—33.

The portion of the ſpherical ſurface, terminated by the quadrant P M A, the arches A R, F R, and the *ſpiral* P Z F, admits of a perfect quadrature, when the ratio of the arch A a to the whole circumference can be aſſigned. See Maclaurin, ibid. p. 33.

SPIRAL, *parabolic*. See HELICOID.

SPIRAL, *proportional*, is generated by ſuppoſing the radius to revolve equably, and a point from the circumference to move towards the centre with a motion decreaſing in a geometric progreſſion. See LOGISTIC.

From the nature of a decreaſing geometric progreſſion, it is eaſy to conceive that the radius C A (*fig.* 119.) may be continually divided; and although each ſucceſſive diviſion becomes ſhorter than the next preceding one, yet there muſt be an indefinite number of diviſions or terms before the laſt of them becomes of no finite magnitude. Whence it follows, that this *ſpiral* winds continually round the centre, and does not fall into it till after an indefinite number of revolutions: and alſo that the number of revolutions decreaſes, or the number of the equal parts into which the circumference is divided increaſes.

It is alſo evident, that any *proportional ſpiral* cuts the intercepted radii at equal angles: for, if the diviſions A d, de, ef, fg, &c. of the circumference be very ſmall, the ſeveral radii would be ſo cloſe to one another, that the intercepted parts A D, D E, E F, F G, &c. of the *ſpiral* might be taken as right lines: and the triangles C A D, C D E, C E F, &c. would be ſimilar, having equal angles at the point C, and the ſides about thoſe angles proportional: conſequently, the angles at A, D, E, F, &c. being equal, the *ſpiral* muſt neceſſarily cut the radii at equal angles. Robertſon's Elem. of Nav. book ii. p. 87.

Proportional ſpirals, are ſuch *ſpiral* lines as the rhumb lines on the terreſtrial globe, which, becauſe they make equal angles with every meridian, muſt alſo make equal angles with the meridians in the ſterographic projection on the plane of the equator, and therefore will be, as Dr. Halley obſerves, *proportional ſpirals* about the polar point. From whence he demonſtrates, that the meridian line is a ſcale of log. tangents of the half meridian complements of the latitudes. See RHUMB, LOXODROMY, and MERIDIONAL *Parts*.

SPIRAL *pump*. See *Archimedes's* SCREW.

SPIRAL, in *Architecture and Sculpture*, denotes a curve that aſcends, winding about a cone, or ſpire, ſo that all the points thereof continually approach the axis.

By this it is diſtinguiſhed from the HELIX, which winds, after the ſame manner, around a cylinder. Ignorant architects confound the two, but the more knowing diſtinguiſh them carefully.

SPIRAL *ſtairs*, in *Building*. See STAIRS.

SPIRATION. See EXPIRATION, INSPIRATION, PERSPIRATION, RESPIRATION, and TRANSPIRATION.

SPIRE,

SPIRE, SPIRA, in the *Ancient Architecture*, is sometimes used for the base of a column, and sometimes for the astragal, or tore.

The word is formed from the Latin *spiræ*, the *folds of a serpent*, which bear some resemblance thereto; or from the Greek σπειρα, the *coil of a rope*.

SPIRINCHUS, a name by which some authors have called the SMELT.

SPIRIT, SPIRITUS, in *Medicine*, the most subtle and volatile part, or juice, of the body; by means whereof the functions and operations thereof are supposed to be performed.

The ancients made a four-fold division of *spirits*; into *vital*, *animal*, *natural*, and *genital*: whereof the first they placed in the heart; the second, in the brain; the third, in the stomach and liver; and the last, in the testicles; but as this division is founded on a false hypothesis, it is now deservedly set aside.

The moderns usually divide *spirits* into *vital* and *animal*.

SPIRITS, *vital*, are only the finest, and most agitated parts of the blood; whereon its motion and heat depend.

SPIRITS, *animal*, are an exceedingly thin, subtle, moveable fluid, juice, or humour, separated from the blood in the cortex of the brain, and thence received into the minute fibres of the medulla, and by them discharged into the nerves; by which it is conveyed through every part of the body, to be the instrument of sensation, muscular motion, &c.

The *animal spirits*, called also *nervous spirits*, and NERVOUS *juice*, only differ from the *vital spirits*, in that these last are still mixed and blended with the grosser parts of the blood, and circulate along with it: whereas the *animal spirits* are secreted thence by the glands, whereof the cortical substance of the brain is composed; and have a motion, circulation, &c. peculiar to themselves.

Dr. Willis conceives, that the *animal spirits* are prepared by a proper distillation of the subtilest part of the arterial blood, brought by the carotides into the cortex of the brain; and shews, that the blood contained in the sinuses of the dura mater acts, in this distillation, in the same manner as fire does in the chemical distillations performed by defluction, where, being placed over the matter to be distilled, it makes the subtilest parts thereof descend.

The existence of the *animal spirits* is controverted by some; but the infinite use they are of in the animal œconomy, and the exceedingly imperfect account we should have of any of the animal functions without them, will still keep the greatest part of the world on their side; and, in effect, the learned Boerhaave has gone a good way towards a demonstration of the reality.

The blood brought to the brain by the carotides and vertebral arteries, he shews, is wonderfully prepared, secreted, elaborated, and changed from its natural state, before it arrives there, insomuch as, contrary to the nature of the rest, instead of cohering by fire, it immediately resolves wholly into a thin vapour, without leaving any fæces behind; and is thus exceedingly well fitted for the formation of so extraordinary a fluid.

He shews, farther, that the *animal spirits* are not formed from the cruor, but from the serum of the blood; which Malpighi's history of the growth of the fœtus in an incubated egg, shews to be divisible into parts, or corpuscles, inconceivably smaller than the cruor.

He adds, that the nature of this juice is such, as that no salts or oils in the body can contribute any thing to it; and that, in all appearance, it is only a most subtle pure water; which liquor is found to resemble these *spirits*, in its extraordinary miscibility, mobility, solidity, softness, simplicity, and want of elasticity.

The same author shews, farther, from the magnitude of the carotides and vertebrals, their straight uninterrupted course, the great quantity of blood they bring, the bulk of the cortex, &c. that there must be a very great quantity of this liquor; that there is fresh prepared every moment of life; and that it is driven, every moment, by the action of heat, &c. from the brain and cerebel, to all the parts of the body furnished with nerves: which motion, he shews, from the exceeding fineness, crookedness, &c. of the ramifications, must be very gentle, equable, and constant, one part continually driving before it another.

Upon the whole, it is no wonder that this fluid escapes the notice of our senses; and that no ligatures, wounds, punctures, injections, or the like, make either it, or the apertures of the nerves through which it flows, visible: nor does it avail what some, who allow the existence of the *animal spirits*, urge against their being any coherent juice, or liquor; viz. that we should find it ouze out, and wet the adjacent parts, upon cutting a nerve, as we do in cutting a lymphatic, &c. or that, upon binding a nerve, the upper part would swell; that the agitations which objects make on the filaments, would be deadened, &c. that it is impossible a liquor should have two opposite motions at the same time; and that the velocity of the sensations, and rapidity of the motions of man, prove, that the *animal spirits* are rather an aura, or even light, than a liquor. See ANIMAL *spirits*.

For the secretion of the *animal* SPIRITS from the blood, and the apparatus in order thereto, see BRAIN and SECRETION. For the course of the *animal* SPIRITS, and the vessels through which they are carried, see NERVE and CIRCULATION. For the office of the *animal* SPIRITS in muscular motion and sensation, see MUSCULAR and SENSATION.

SPIRITS, *low*, in *Medicine*. See MELANCHOLY.

SPIRIT, SPIRITUS, in the *Newtonian Physics*, denotes a most subtle penetrative substance, which pervades all, even the densest bodies, and lies hid therein; and by the force and action whereof, the particles of bodies attract each other, at very small distances, and, when contiguous, cohere: and by which electrical bodies act at greater distances, both attracting and repelling the neighbouring corpuscles; and light is emitted, reflected, and inflected, and warms bodies; and all sensation is excited, and the members of the animals move at the instance of the will, viz. by vibrations of this *spirit*, propagated through the solid capillaments of the nerves, from the external organs of sense to the brain, and from the brain to the muscles.

SPIRIT, in *Chemistry*, is one of the principles of natural bodies, called also *mercury*.

The chemical principle *spirit* is a fine, subtle, volatile, penetrating, pungent liquor, which rises, ordinarily, before the phlegm, or water, and sometimes after it.

The great properties of this liquor are, that it penetrates and opens solid bodies; corrodes, breaks, and even dissolves, certain mixed bodies; coagulates others, and produces an infinity of other effects, many of them even contrary to one another.

In the general, the chemists give the denomination *spirits* to all the fine, subtle, not aqueous particles, raised from bodies by heat, and reduced into liquors by distillation. Such are, *spirit* of vitriol, of nitre, of salt, &c.

They also apply the name *spirits* to those aqueous liquors which are drawn by liquefaction, when they are impregnated with salts, or other active principles, raised, together with them, by the violence of the fire.

In this sense, the chemists are said to draw a *spirit* from sulphur, salt, and other bodies, when they extract the essence, or the subtilest part thereof, by distillation, or otherwise.

Spirits are of three principal kinds, viz. *inflammable spirits*, *acid spirits*, and *alkaline spirits*.

To the first class belong the most volatile and thinnest part of essential oils, the principle of smell, or *spiritus rector* of plants, and *ardent spirits*, or the *spirit* obtained from wine, beer, and all liquors which have undergone the spirituous fermentation.

The second class includes all acids obtained by distillation of minerals, vegetables, and animals; such are, 1. The acids of sulphur, vitriol, and alum, which are the same as vitriolic acid, and the acids of nitre and common salt. They are called *spirit of sulphur*, *spirit of vitriol*, *spirit of nitre*, &c. without specifying that they are acids. 2. The acids of vinegar, and of all liquors which have undergone the acetous fermentation, and the acids obtained in the distillation of vegetables, and of certain animals, as flies, ants, &c. These *spirits* are commonly called *acid spirits*, as the *acid spirit* of guaiacum, the *acid spirit* of ants, &c. because the substances which furnish them yield also *spirits* that are not acid. See ACID.

To the third class are referred liquid volatile alkalis, obtained from sal ammoniac, from all vegetable matters which have undergone a complete putrefaction, and from all animal matters. These are generally called *spirits*, without specifying their alkaline quality. Thus we say, *volatile spirit* of sal ammoniac, *spirit* of hartshorn, &c. As some of these substances, particularly sal ammoniac, contain also an acid which may be obtained from them, we ought, when we mention this *spirit*, to specify its acid quality, calling it *acid spirit* of sal ammoniac.

SPIRITS is also a general name, among distillers, for all distilled liquors that are neither oil nor phlegm.

SPIRITS, *proof*, or *common saleable goods*, are *spirits* of any kind of a determinate strength, being the same with those of good brandy, and the malt and sugar *spirits* of the distillery, as they are usually sold; containing equal quantities of rectified *spirit* and water.

The best *proof spirit* is that distilled from French wine; but

but for common use may be employed the *spirit* drawn from melasses.

The common method of examining whether *spirits* have this due degree of strength is this. Take a long vial, fill it half way with the common malt *spirit*, and give it a smart stroke by its bottom against the palm of the hand, there will then appear on the surface a chaplet, or crown of bubbles, which will go off again in a strong manner; that is, first remaining a while, and then going off by degrees without breaking into smaller bubbles, or swelling into larger.

By this experiment all the traders in *spirits* judge of the strength of the goods they purchase; yet this is a mere fallacy and deception; for if only a little vinous, or saccharine matter, as treacle, syrup, must, rob of fruits, or the like, be added to a quantity of highly rectified *spirit* of wine, this slight addition will give a brandy proof to that *spirit*. See BEAD *proof*.

Whether there be any secret for making weaker *spirits* shew this proof, as well as brandies, &c. is not certainly known; but the thing is certainly practicable, since arrack, which is but of half the strength of brandy, gives as fair a proof this way; and if a drop or two of any essential oil be added to a pint of brandy, it takes off its proof, and makes it appear much weaker than it is. The true strength, may, however, always be known, by carefully burning away a measured quantity of brandy, &c. since if it leaves one half water it is right; if more or less, it is too strong, or too weak.

But beside the false method of judging of brandies by what is called *proof*, there is another not less fallacious one of judging of their goodness, though kept as a great secret in the hands of some dealers, and imagined a certain criterion to determine whether foreign brandies are mixed with corn *spirits*. These distillers are provided with a certain yellow liquor, a few drops of which being poured into a glass of right French brandy gives it a beautiful blue colour, and, by the strength and goodness of this colour, they judge and buy; but if common malt *spirit* be tinged with oak, it would give this colour equally with French brandy, and might be purchased as such. This proof tincture is expeditiously made, by dissolving a little green vitriol, first calcined to a redness in a weak *spirit* of sea-salt, which thus becomes a yellow liquor, a single drop or two of which being added to a glass of any inflammable *spirit*, coloured yellow or brown with oak, or with long remaining in the cask, will instantly turn it of a bright and beautiful blue.

The best way of judging in these cases is by the nose and palate. Dilute a quantity of brandy considerably with water, and you will perceive the malt-taste, if mixed with malt *spirits*; or burn a little in a spoon, and by the smell and taste of the water it leaves, you will easily judge whether there be malt in it.

Proof spirits may be distinguished into three kinds, *perfect proof, more than perfect proof*, and *less than perfect proof*. By *perfect proof* is usually understood that crown of bubbles, before mentioned, of a certain size, arising as a head upon a small quantity of a well-qualified *spirit* shook in a slender vial.

Proof more than perfect, is that in which the bubbles, raised by shaking the *spirit*, are larger than those on the common or perfect proof, and go off more suddenly; that is, according as the *spirit* is higher, or approaches more to the nature of rectified *spirit*, or, as it is usually called, *spirit of wine*.

Proof less than perfect, is that wherein the bubbles are smaller, and go off quicker and fainter than in perfect proof; the *spirit*, in this case, being mixed with more than its own quantity of phlegm, or being too poor for sale.

The surest method of judging of the strength of *spirits* is by the hygrometer, water-poise, or balance; or 2. By distillation; or finally, by deflagration. The specific gravity of totally inflammable *spirit* is so much less than that of phlegm, or common water, that it is easily sensible upon the balance; whence an exact hygrometer, well balanced and graduated, and furnished with a proper scale and weights, may be of great use to assign the proportions in which pure *spirit* and water are mixed in any given liquor. Though perhaps a readier way than this may be that of Mr. Homberg's, mentioned in the Memoirs of the Paris Academy, 1718, for determining the different gravities of different fluids, by means of a bottle with a very long and slender neck; which being filled to a certain height with any mixture of *spirit*, is weighed against the same bottle filled with pure water.

The most exact of all methods of determining the *strength* of any *spirit* is by distillation, rectifying it up to an alcohol, or totally inflammable *spirit*; but this, though liable to no error, is too tedious to come into common use. And, upon the whole, the best method, of all others, seems to be that of deflagration, which Mr. Geoffroy has been at much pains to adjust and improve.

In commerce, with regard to *spirits*, it would certainly be a much better method to abolish such uncertain proofs, and to make all the goods of the strength of what we call *spirits of wine*; that is, a totally inflammable *spirit*, whose purity is much greater, whose strength may always be found out with exactness, and whose bulk, stowage, carriage, and incumbrance, would be only half in regard to that of *brandy*, or *proof spirit*; and it might at all times, as occasion called for it, be mixed into a great variety of extemporaneous liquors, and the exact degree of strength would be always precisely known.

This operation, indeed, in the common way, proves so tedious and expensive, and, after all, so short of expectation, and so generally unsatisfactory, that it is not to be expected that the common distillers, till they have fallen into a better manner of working, should come into the proposal. But if, instead of the common way of rectifying by the hot-still, they would try the using a large balneum Mariæ, made of a large rectangular boiler, and a set of tall conical vessels, they will find that little fire, and little attendance, and consequently very little expence, will, in this manner, furnish them with *spirits* reduced at once to this standard, and greatly superior, in all respects, to the common ones of the same strength. In this case there would be no need of any addition of salts; but the distiller may work more perfectly, and more expeditiously without them, and thus preserve the fine essential vinosity of the *spirit*, which, in the common way of working, they constantly lose.

The advantage of this method would be yet greater to the apothecaries, and the makers of compound cordial waters, who want only a pure *spirit* of such a strength, and suffer greatly in the fineness and perfection of their commodities, by the *spirit* they are obliged to use having in it a fulsome and nauseous oil of its own, which will always mix itself with their compositions, and the oils of the aromatics, &c. which they add to it. If *spirits* were brought to this standard for the market, there would be no possibility of deceit, and no farther examination need be made of it by the buyer, than its burning perfectly dry in a spoon. Shaw's Essay on Distillery.

It is, however, to be observed, that though the burning *spirits* away in a spoon may serve the trader in the common way, yet Mr. Geoffroy has observed that they are no proofs for the philosopher, or the chemist, being not at all determinate or exact, though commonly supposed so.

From what has been said, it appears that brandy is much more inflammable than wine, and *spirit* of wine much more so than brandy, and ought to burn away without leaving any remainder. Hence it is vulgarly supposed, that such *spirit* of wine as burns wholly away contains no phlegm, and that if two parcels of *spirit* both burn wholly away in this manner, they must be the same in strength, and in all their qualities; but Mr. Geoffroy has proved by experiment, that such *spirit* as burns wholly away, does yet contain a great deal of water, and two parcels both may burn thus away, and yet be very different; and that this trial is not determined by the entire absence of the phlegm, but by its proportion to the oil.

If the same *spirit* of wine, which in the common way of burning leaves no water, be again tried, by burning it in a hollow vessel set to float in a large quantity of cold water, it will then leave a considerable quantity of water; nay, all that is rectified only in the common way leaves a large portion of phlegm on this experiment. The plain reason of which is, that this is the only fair trial, the other in the common way being fallacious. In this there is no more water left than was in the *spirit*; but in the other, the vessel becoming heated by the burning of the *spirit*, that heat gradually evaporates the water, as the *spirit* burns away; so that the one is as soon gone as the other. But keeping the vessel cool by external water, prevents that evaporation, and consequently retains and discovers all that cannot burn of the *spirit*.

The quantity of water thus discovered in *spirit* of wine is very great, and it has always been found, that in proportion as the experiment has been made more and more perfect, the *spirit* has always appeared proportionably less and less so.

The quality of the phlegm that is left is also of use to judge of the *spirit* by; if that were perfectly fine, this ought to be perfectly limpid and clear, and without taste or smell: as it wants either of these properties, it is a proof of the want of perfection of the *spirit* it is obtained from; but the greatest of all its defects, is its having a coarse

coarse oil swimming upon it, and giving the colours of the rainbow in different lights. Mem. Acad Par. 1718. See BRANDY.

SPIRITS, *colouring of.* The art of giving to distilled liquors a colour, which takes off their watery appearance, and gives them a resemblance of the foreign brandies, &c.

The colouring is not only necessary on this account, but as we usually esteem the *spirits* by the proof of the crown of bubbles, it is found that the clean rectified *spirit* will not afford this proof till it has received its dose of the colour. The distillers dispense this colour in any proportion that they find convenient or necessary: it is always yellow, but, according to the degree, differs extremely in deepness, from the palest straw-colour to the deepest orange. This art of colouring was first introduced, from observing that all the fine and soft foreign brandies, that had the mellowness necessary to their perfection to the taste, had also a yellow colour. The colour, in this case, has indeed nothing to do with the flavour; but that being kept in casks the same age that was necessary to give them this mellowness, would also give them a colour from the wood. It was hence supposed, that the particular excellence of the foreign brandies depended on the woody colour, and accordingly pains have been taken to give the same colour to our *spirits* by various methods.

The way of obtaining it, by many years standing in the cask, proved too tedious for our hasty workmen, and accordingly they provided means of giving it extempore by strong tinctures of several ingredients; the chief of which are logwood, saffron, Japan earth, treacle, burnt sugar, and oak chips: the three former of these have but little to recommend them, but the others are found very ready, and very proper for the use.

Treacle gives a fine colour, not much unlike that of the foreign brandies, and being necessarily used in a large quantity, as its colour is but dilute, it not only mends the bubble, or bead proof, impaired by the rectification, but also gives it a fullness in the mouth; both which properties are very agreeable to the vulgar, who are the chief retail consumers of these coarse goods.

Burnt sugar, that is, sugar dissolved in a little water, and scorched over the fire till it turns black, goes much farther in the colouring than treacle, and at the same time gives no sweetness, but rather an agreeable bitterness; and thus recommends itself to the nicer palates, that are not for a luscious *spirit.* Indeed sugar, thus treated, tinges to a great perfection, and that without loss of time, and with as much cheapness as can well be desired.

The last article mentioned, namely, oak-chips, is of all others the most natural for imitating the dye of foreign *spirits,* as it is the very wood whereof the casks they come over in are made, and from which they take that colour we are so fond of. The colouring with oak has also this farther advantage, in *spirits* meant as sophistications of the foreign ones, that it will stand some tests usually had recourse to on the occasion, which the others will not stand.

Common *spirit* poured on oak-chips, and digested in a moderate heat, easily fetches out the resinous part of the wood, on which the colouring depends; but then it does not go near so far as the burnt sugar; a large quantity of oak being required to colour a small parcel of brandy, or *spirits.* It is adviseable not to make the tincture every time, but to have recourse to an extract of this wood in a liquid form: this extract is best made in two menstruums, alcohol and water, and may be evaporated to any strength, so that a very small dose of it will tinge a great quantity of liquor. The two liquid extracts must be mixed together, and as they will be apt to separate in standing, it will be proper to add to them, when newly made, a quantity of fine sugar; this will give a body to the whole, and it will keep better from mouldiness than it would without it. Shaw's Essay on Distillery.

SPIRITS, *convertibility of.* This is a doctrine that has obtained among many of the most curious experimenters, and, indeed, the most intelligent of our chemists have always allowed, that provided proper care were taken in the getting together the material, one *spirit* may always be changed into another, as brandy into rum, malt-*spirit* into brandy, and brandy into malt-*spirit.* The principles on which this is believed are these.

All simple *spirits* (as they are called) consist of four parts, water, oil, phlegm, and alcohol; the last of these is the essential part, and is what constitutes the whole a *spirit.* In reducing *spirits,* therefore, to their utmost degree of simplicity and purity, it is evident that the three superfluous parts are to be got rid of, and the fourth left alone; by this means the alcohol is procured distinct, and is a liquor *sui generis* of many peculiar qualities, not to be found in any other fluid.

Among others, it has these remarkable properties: 1. When absolutely purified, it is an uniform and homogene liquor, capable of no farther separation, without loss or destruction of some of its homogeneous parts. 2. It is totally inflammable, having no soot, nor any moisture behind. 3. It has no peculiar taste or flavour, any more than pure water, except what is owing to its nature as alcohol, or perfectly pure *spirit.* 4. It is an unctuous and crispy fluid, running veiny in the distillation, and its drops rolling on the surface of any other fluid, like pease upon a table, before they unite. 5. It appears to be the essential oil of the body it is obtained from, broken very fine, and intimately and strongly mixed with an aqueous fluid, which is assimilated, or changed in its nature in the operation. 6. And lastly, it seems to be a kind of universal fluid, producible with the same properties from every vegetable subject; but to produce it thus requires some care in the operation.

On these principles is founded the opinion, that all *spirits* may be reduced to a perfect similarity, or sameness, from whatever subject they were procured, and on this depends their *convertibility* into one another; for when once they are brought to this standard of simplicity, there needs nothing more than to add the oil of such of the finer *spirits* as is required to convert the *spirit* into that particular kind. By this means the same tasteless *spirit,* whether obtained from malt, sugar, or grapes, may be made either into malt-*spirit,* brandy, or rum, by adding the essential oil of the grape, sugar, or malt; and thus what was once malt-*spirit,* shall become brandy, or whatever else the operator pleases.

Many methods have been attempted to obtain the first point, that is, the reducing the *spirit* to perfect and pure alcohol. The most practicable means seem to be long digestion, and the repeated distillation from water into water, where the essential oil will at once be left upon two surfaces, and the acid imbibed. The shorter ways are those by rectifying from neutral absorbent salts and earths; such as sugar, chalk, and the like. And lastly, the use of fixed alkalis may be tried, for these very forcibly keep down both the phlegm and oil; insomuch that this last method promises to be the shortest of all, if the art were known of utterly abolishing the alkaline flavour, which the alcohol is apt to acquire in this operation, and which, for this purpose, is by no means suitable, as absolutely destroying all vinosity, which universally consists in a fine volatile pungent acidity. The distillers are the only people whose business would lead them to make the experiment. This method of converting one *spirit* into another, would be of immense profit to them if they could perfectly succeed in it; but as it would require time and slow processes to bring it about, there is but little hope of its ever being brought to bear among them, while they are in their present scheme of doing every thing with dispatch and hurry.

Dr. Shaw has said a vast deal in the praise of a tasteless *spirit,* which is producible from a vegetable substance, only overlooked, as he tells us, because it is too common, with which all the foreign *spirits* might be imitated to the utmost perfection by means of their essential oils, all thin fine wines raised to any due degree of strength, without giving them the brandy flavour, and many other things of great use performed; but he has not told us what the vegetable substance is from which we are to obtain this. Shaw's Essay on Distillery.

SPIRIT, *ardent,* called also *spirit of wine,* because it can only be obtained from substances which have undergone the vinous fermentation, is a very light, very volatile, very fluid liquor, perfectly white and limpid, and of a strong, penetrating, agreeable taste and smell.

Spirits drawn from wine, such as French brandy, may, in a great measure, be purified or rectified by simple distillation, in tall vessels, with a gentle heat, the pure spirituous parts rising before the phlegm: if French brandy be thus distilled to one half, the distilled *spirit* proves tolerably pure. See BRANDY.

But wine or brandy being in this country too dear an article for distillation, this purification is chiefly practised on the cheaper *spirits* of melasses and malt liquors. To separate the offensive oil with which these abound, after they have been freed by distillation from the greatest part of their phlegm, they are mixed with an equal quantity of spring water, and the *spirit* gently drawn off again: a considerable portion of the oil is thus left behind in the water, which now proves turbid and milky, and very nauseous both in smell and taste. By repeating this ablution with fresh quantities of water, the foulest and most offensive *spirits* may be purified from all ill flavour.

vour. To complete the purification, or free them from their remaining phlegm, or the watery vapour, which is raiſed even by the gentleſt heat in which they can be diſtilled, a little fixed alkaline ſalt, thoroughly dried and powdered, is added; which, imbibing the phlegm, is thereby diſſolved into a ponderous liquid, that does not mingle with the *ſpirit*, but ſettles at the bottom. If the *ſpirit* is very phlegmatic, four pints will require a pound of the alkali: if the diſtillation has been performed with due care, half this quantity, or leſs, will be ſufficient: in either caſe, if all the ſalt diſſolves, the *ſpirit* is to be digeſted with a little more, till at leaſt a part remains undiſſolved. The *ſpirit* now poured off, is to be again diſtilled, in order to ſeparate from it a portion of the ſalt which has united with it, and which, though extremely minute, may in ſome reſpects change its qualities. As ſome particles of the alkali are apt to be carried up with it, even in the diſtillation, ſo as to communicate an ill flavour, it is adviſeable previouſly to add a ſmall portion of calcined vitriol, or burnt alum, which will completely abſorb the alkali, without giving any new impregnation to the *ſpirit*. Lewis's Mat. Med. See *Combinatory* DISTILLATION.

When only a ſmall quantity of *ſpirit of wine* is to be rectified, the uſual operation for this purpoſe, by means of diſtillations of the *ſpirit* called AQUA *vitæ*, obtained from the firſt diſtillation of liquors that have undergone the ſpirituous fermentation, and which are overcharged with a large quantity of phlegm and light oil, is difficult. Theſe diſtillations, being ſlowly conducted with a gentle fire and water-bath, yield but a ſmall quantity of that liquor, which, being the moſt volatile, riſes firſt with the leaſt heat, and which is the true, or *rectified ſpirit of wine*. Several chemiſts, therefore, in order to obtain a larger quantity of the firſt *ſpirit*, propoſe to mix with the *ſpirit of wine* ſome intermediate ſubſtances, to abſorb and retain its phlegm and oil, ſuch as dried and calcined ſalts, very dry chalk, &c. Kunckel propoſes to ſeparate more effectually the oil, by adding to the *ſpirit* a large quantity of water, and by diſtilling this diluted *ſpirit* with a very gentle heat. But the trouble and inconvenience of depriving the *ſpirit of wine* of the water, with which it was diluted in this proceſs, may be avoided by rectifying at once a large quantity of *aqua vitæ*. Nothing more is required to obtain at once a conſiderable quantity of pure *ſpirit of wine*, than to ſet aſide the twelve or fifteen pints firſt drawn over from a large quantity, e. g. from three hundred pints of *aqua vitæ*, diſtilled with a very gentle fire in a large alembic. As the moſt ſpirituous, leaſt aqueous, and leaſt oily part of it always riſes firſt, theſe twelve or fifteen pints are perfectly *rectified ſpirit of wine*, eſpecially when the heat has been well conducted.

By thus keeping apart portions of the *ſpirit* obtained, at different times, we may have *ſpirit of wine* of the ſeveral degrees of ſtrength and purity. The weaker *ſpirit* may, by another diſtillation, be again rectified; and the *ſpirit* of moderate ſtrength may be preſerved for many uſes. This method is followed by M. Beaumé in the rectification of *ſpirit of wine*, and is certainly, ſays the author of the Chemical Dictionary, art. *Rectification*, the moſt convenient and the beſt.

A perfectly *rectified ſpirit of wine*, or ſuch as is entirely freed from water, is undoubtedly a thing of frequent and neceſſary uſe in the nice operations of chemiſtry.

It had uſed to be prepared, either by often diſtilling the *ſpirit*, and every time drawing over only half of it, and repeating this till the half remaining in the cucurbit appeared as ſtrong as that drawn over; or elſe by raiſing it to a great height from the body of the veſſel, and this in a very gentle heat, ſo that *ſpirit* alone could riſe, the water not being capable of being driven ſo far by that degree of heat.

But the accurate Boerhaave always found upon trial, that there was ſtill remaining ſome water in theſe *ſpirits*, whether prepared by the firſt or ſecond proceſs, or both. Boerhaave's Chem. part ii. p. 124.

The method he therefore invented is this: fill a ſtill half full with the *ſpirit* prepared for *alcohol* in one or the other of theſe ways, add to it half a pound of pure decrepitated, and perfectly dried ſea-ſalt; put this in hot, then place on the head, and carefully lute the junctures; leave this for twelve hours in a heat ſo ſmall, as not to make the *alcohol* boil, then diſtil off the *ſpirit*; keep the firſt two ounces apart, becauſe ſome aqueous vapour may have happened to lodge in the head, or worm of the ſtill, which this certainly waſhes off; after this receive two thirds of the following *alcohol* into a pure dry glaſs veſſel, and keep it perfectly ſtopped; then draw off the remainder, and keep that by itſelf: there will remain a moiſt ſalt in the ſtill, which has attracted the aqueous matter of the *alcohol*, and held it ſo down, that it could not riſe by the heat of boiling water, which is all that muſt be uſed in this diſtillation; and the ſalt having been firſt decrepitated, never makes any change in the *alcohol*, by adding any thing thereto. By this means an *alcohol* is prepared perfectly pure, and fit for all the uſes of chemiſtry.

For the teſts and properties of pure *alcohol*, ſee ALCOHOL.

Stahl and moſt chemiſts believe, that *ſpirit of wine* is compoſed of a very attenuated and very light oil, intimately united by means of an acid, with a larger quantity of water than that which enters as a principle in the combination of oil. Juncker, on the contrary, appears to admit no other inflammable matter in *ſpirit of wine* than phlogiſton, united with the aqueous principle by means of an acid. See ALCOHOL.

Whereas Mr. Cartheuſer poſitively affirms, that *ſpirit of wine* is compoſed of pure phlogiſton, not in an oily ſtate, but immediately united with the watery principle alone. This diverſity of opinions among the ableſt chemiſts, proves, that the true principles of *ſpirit of wine* are not yet perfectly known. And this proceeds from the difficulty of decompoſing it without an intermediate ſubſtance, and alſo from ſeveral phenomena; ſome of which ſeem to ſhew, that it is not a true oil that enters as a principle into the compoſition of *ſpirit of wine*, but phlogiſton alone, while others ſeem to indicate the preſence of a true oil, exiſting in that which is pureſt.

M. Reaumur diſcovered, that a mixture of *ſpirit of wine* and water acquired a ſpecific gravity greater than that which would arithmetically reſult from the proportions employed of each of theſe liquors. Thus, fifty meaſures of *ſpirit of wine*, and fifty meaſures of water, mixed together, were found to make only ninety-eight meaſures; but in what progreſſion the denſity is increaſed by mixing various proportions of the two liquors, had not been determined till M. Briſſon made a ſet of experiments with that view; an account of which is given in the Memoirs of the Academy of Sciences of Paris for the year 1769. From his experiments he has conſtructed the following table, which ſhews this progreſſion, and alſo enables us to diſcover the proportion of *ſpirit of wine* and water, in any given mixture of theſe (as brandies, rums, &c.) the ſpecific gravity of which is found to correſpond with any of the ſpecific gravities in the table. Thus, for inſtance, if we find upon accurate trial, that the ſpecific gravity of the rum, brandy, or other mixture, whoſe ſtrength is required to be known, be to that of water as $942\frac{1}{2}$ to 1000, we learn by inſpection of the table, that this ſpirituous mixture conſiſts of equal parts of water and *ſpirit of wine*, of which *ſpirit* the ſtrength is ſuch, that its denſity is to that of the water as 837 to 1000. The firſt column ſhews the proportion of well *rectified ſpirit of wine* in the mixture; the ſecond column ſhews the proportion of the water in the mixture; the third column ſhews the ſpecific gravity of the mixture; the fourth column ſhews the difference between the ſpecific gravity of the mixture and that of the preceding mixture; and the fifth column ſhews the proportion which the ſeveral augmentations of denſity, cauſed by penetration of the two liquors, have to each other, that is, their progreſſion.

Spirit of wine.	Water.	Specific gravity.	Differences.	Proportional augmentations of denſity from penetration.
16 parts	0 parts	837	0	0
15 ——	1 ——	$852\frac{1}{2}$	$15\frac{1}{2}$	$4\frac{51}{128}$
14 ——	2 ——	$867\frac{1}{3}$	$14\frac{5}{6}$	$8\frac{22}{128}$
13 ——	3 ——	$881\frac{1}{3}$	14	$11\frac{11}{128}$
12 ——	4 ——	$894\frac{1}{2}$	$13\frac{1}{6}$	$13\frac{108}{128}$
11 ——	5 ——	$907\frac{1}{3}$	$12\frac{5}{6}$	$15\frac{127}{128}$
10 ——	6 ——	$919\frac{2}{3}$	$12\frac{1}{3}$	$17\frac{98}{128}$
9 ——	7 ——	$931\frac{2}{3}$	12	$19\frac{21}{128}$
8 ——	8 ——	$942\frac{1}{2}$	$10\frac{5}{6}$	$19\frac{104}{128}$
7 ——	9 ——	$951\frac{2}{3}$	$9\frac{1}{6}$	$18\frac{123}{128}$
6 ——	10 ——	$959\frac{2}{3}$	8	$17\frac{14}{128}$
5 ——	11 ——	$967\frac{1}{4}$	$7\frac{7}{12}$	$15\frac{1}{128}$
4 ——	12 ——	$973\frac{1}{6}$	$5\frac{11}{12}$	$11\frac{68}{128}$
3 ——	13 ——	979	$5\frac{5}{6}$	$7\frac{119}{128}$
2 ——	14 ——	985	6	$4\frac{74}{126}$
1 ——	15 ——	$991\frac{3}{4}$	$6\frac{3}{4}$	$1\frac{93}{128}$
0 ——	16 ——	1000	$8\frac{1}{4}$	0

Chem. Dict. Eng. ed. art SPIRIT *ardent*, note *y*.

Spirit of wine is uſed, in dying, as a non-colouring drug; and though it gives no colour itſelf, it ſerves to prepare the ſtuffs to receive other colours. Its conſumption is alſo very conſiderable in ſeveral other works and manufactures, particularly the making of varniſh.

Proof ſpirit cannot be uſed for burning in lamps, for diſſolving reſins, and for making varniſh; and there is alſo a great number of tinctures, ſolutions, and mixtures,

tures, for which it cannot serve; but *rectified spirit*, or alcohol, besides its ready use for medicinal purposes, may, when the *spirit* is of a proper kind, be made into punch, and all other mixtures, with greater purity, and much greater certainty and exactness in point of strength. See next article and ALCOHOL.

SPIRITS, in *Medicine*. *Rectified spirit* coagulates all the fluids of animal bodies that have been tried, except bile and urine. It hardens the solid and consistent parts, and, being a powerful ANTISEPTIC, preserves them from corruption. Applied externally to living animals, it strengthens the vessels, contracts the extremities of the nerves, and deprives them of sensibility; hence its power of restraining hæmorrhages, abating superficial pains, &c. Received into the stomach undiluted, it produces the like effects; thickening the fluid, and contracting all the solid parts which it touches, and destroying, at least for a time, their use and office: if the quantity taken is considerable, a palsy, or apoplexy, follows, and speedily proves mortal. See ALCOHOL.

Proof *spirits*, and such as are diluted below the proof-strength, have the same effects in a lower degree. Externally they are of use in corroborant, anodyne, and antiseptic fomentations. Taken inwardly, in small quantity, they strengthen lax fibres, incrassate thin fluids, and warm the habit: in larger quantity, they disorder the senses, destroy voluntary motion, and produce, like the *rectified spirit*, a mortal apoplexy or palsy.

Vinous *spirits*, therefore, in small quantity, and properly diluted, may be applied to useful purposes in the relieving of some disorders, whilst in larger ones, or imprudently continued, they act as a poison of a particular kind. The moderate use of them is most serviceable to those who are exposed to heat and moisture, to corrupted air, or to other causes of colliquative and putrid diseases; and they are the most pernicious in opposite circumstances, and to those who are afflicted with hysterical and hypochondriacal complaints; for whatever temporary relief these spirituous cordials may afford in the lownesses to which hysterical and hypochondriacal persons are subject, there are none, as Dr. Pemberton observes, who feel so soon the ill effects arising from the habitual use of them. Lewis's Mat. Med.

The power of brandy, or any thing of this kind, in killing worms, is evident from this, that the children of the people in the northern islands of Scotland, who are accustomed from their infancy to drink that coarse sort of brandy which they call *aqua vitæ*, never are troubled with worms. It is a dangerous practice to use brandy in this general manner, but on some occasions it may be very serviceable. Philos. Trans. N° 233.

SPIRIT, *ætherial*, *of Frobenius*, *spiritus ætherius Frobenii*, a name given by Frobenius, and others, to a liquor famous for its extreme volatility, and many other qualities, for which see ÆTHER.

The use of this liquor in medicine is now well known: as a very thin and volatile inflammable matter, it acts powerfully on the nervous system. Frederic Hoffman was one of the first who employed it as a sedative and antispasmodic. See LIQUOR *mineralis anodynus*.

It is now often prescribed singly, in the dose of seven or eight drops upon a bit of sugar, which is to be eat, or to be dissolved in some proper liquor, and drank. It is given in flatulent colics, obstinate hiccups, convulsive, hysterical affections, and other disorders of this kind. Æther dissolves all essential and expressed oils, animal empyreumatic oil, resins, and almost entirely ambergrise. It dissolves difficultly petroleum and oil of amber. It precipitates regulus and antimony from aqua regia, and silver from nitrous acid: it takes spots of grease from silk, without affecting their colours.

We have several curious observations on this *æther of Frobenius* by Mr. Grosse, who has described three different methods of making it in the Memoirs of the Academy of Sciences, for the year 1734.

Æther was at first made with difficulty, and in small quantities, but it has more lately been made abundantly and easily; particularly since Mr. Hellot communicated to several artists a process which he received from a foreign chemist, and which was printed, with his consent, in the Encyclopedie.

The following process for making it, which is the best hitherto published, is extracted from Mr. Beaumé's dissertation on this subject. Put two pounds of perfectly rectified *spirit* of wine into a glass retort, and pour upon it at once two pounds of well concentrated vitriolic acid. This acid being much heavier than the *spirit* of wine, sinks immediately to the bottom, and does not mix with it: shake the retort gently and repeatedly, that the two liquors may mix; the mixture will boil, and become very hot; vapours will issue from it with a loud hissing noise, and a sweet penetrating smell: the mixture will then assume a yellow-reddish colour; place the retort in a sand-bath, warmed by degrees to the same heat with itself; lute to it a receiver, in the side of which is a small hole, and distil the mixture by a heat sufficiently intense to make it quickly boil and to keep it boiling. At first a very sweet *spirit* of wine will pass into the receiver, after which the æther will come, which may be distinguished by striæ formed on the upper part and neck of the retort. Continue the distillation with the same degree of fire, and from time to time unstop the small hole of the receiver, till you perceive, upon applying your nose near this small hole, a suffocating smell of volatile sulphureous acid. Then the receiver ought to be unluted, and the contained liquor, which will be nearly eighteen ounces, must be quickly poured into a glass bottle, which ought to be well stopped. This liquor is a mixture of a very dephlegmated part of the *spirit* of wine, of a sweet penetrating smell, which passes at first; of æther, which was formed during the distillation, of a little oil, and sometimes also of a small quantity of sulphureous acid; both which substances pass frequently with the last portion of the æther, particularly if the distillation has been too long continued. To separate the æther from these other substances, put the whole mixture into a glass retort, with a little deliquiated fixed alkali, to absorb and retain the sulphureous acid, and distil very slowly in a sand-bath, with a very gentle lamp-heat, till you have made one half of the liquor pass over. The liquor that rises in this distillation, called also rectification, is æther. For another process of making it, see ÆTHER.

SPIRIT *of amber*. See AMBER.

SPIRIT, *coal*. See COAL-*spirit*.

SPIRIT, *fœtid*, *spiritus fœtidus*, a new medicine introduced into the practice of physic, and directed to be made of any fixed alkaline salt, a pound and a half; sal ammoniac, a pound; assa fœtida, four ounces; and proof-*spirit*, three quarts, distilling off five pints with a gentle heat.

SPIRITS, *foreign*, a general name by which our dealers in these things call BRANDY, RUM, and ARRACK.

It is hard to purchase any of these genuine and pure, unless at the first hand, and in large quantities. The dealers generally mix our own *spirits* with them. When we had little other *spirit* but that of malt made with us, this cheat was easily discovered, for a nice palate would distinguish the mixture of only a tenth part of this foul *spirit* among the foreign clean ones; but since we have the melasses-*spirit* so common, and rectified to so great a perfection, the deceit is not easily found out, though a larger proportion is used.

All *foreign spirits* are to be suspected of this adulteration, which have not an uniform taste and grateful odour. But one of the best ways of discovering the mixture, is to burn away all that is inflammable in a small quantity by way of trial, and then examine the phlegm.

The great art of this sophistication consists in the purity, and well rectified state of the *spirit*; and when the distiller can furnish himself with such a *spirit* as will not be found out, though mixed in a large quantity with brandy or rum, he is very near the art of making brandy and rum himself. Shaw's Essay on Distillery.

By the several acts a general duty of excise is laid on every gallon of spirituous liquors imported (over and above the customs), as follows: viz. single brandy, *spirits* or aqua vitæ, 4 *s.* 8 *d.*; double brandy, *spirits*, or aqua vitæ, 8 *s.* 8 *d.*; which shall be raised as the other duties on exciseable liquors, 12 Car. II. cap. 23, 24. 4 & 5 W. III. cap. 3. 4 Ann. cap. 6. 6 Geo. II. cap. 17. Arrack from the British colonies in the East Indies is liable to the same duty with brandy and *foreign spirits* imported. And by 32 Geo. II. cap. 10. there shall be paid an additional duty of 12 *d.* in the pound, according to the value in the book of rates, on all foreign brandy and *spirits* imported, except rum or the produce of the British sugar plantations. And by 33 Geo. II. cap. 9. over and above all other duties, there shall be paid an additional excise duty of 1 *s.* for every gallon of single brandy, *spirits*, or aqua vitæ imported, and of 2 *s.* for every gallon of brandy, *spirits*, or aqua vitæ above proof, commonly called double brandy, imported. And by 6 Geo. III. cap. 47. for every gallon of single brandy, &c. imported, not being the produce of the British colonies or plantations, a farther excise duty of 6 *d.*; above proof 1 *s.* Landing of French brandy without paying or securing the duty, or a licence from the proper office, incurs a forfeiture of the same, and also double value; and an officer conniving at it, becomes incapable of holding any office in the revenue, and forfeits 500 *l.* 1 Ann. stat. 2. cap. 14. If any foreign brandy, arrack, rum, strong waters, or *spirits* of any kind shall be imported in any ship or vessel of a hundred tons burden, or under (except for the

the use of seamen, not exceeding 2 gallons each), such vessel, with her tackle, and also the *spirits* shall be forfeited: 5 Geo. III. cap. 43. except rum or other *spirits* of the growth and manufacture of the British sugar plantations, which may be imported in any vessel of not less burden than 70 tons: 6 Geo. III. cap. 46. No brandy shall be imported in any vessel not containing 60 gallons at least, on pain of forfeiture, 4 W. cap. 5. and no geneva or rum shall be imported in any vessel, not containing 60 gallons at least (except for the use of the seamen, not exceeding 2 gallons each), on pain of forfeiture, 5 Geo. III. cap. 43.

For every gallon of *home spirits*, made of imported wine or cyder, there shall be paid in the whole sum of 1 *s.* 3*d.* For every gallon of strong waters or aqua vitæ, made of any other materials, 7 ½ *d.*; but if from foreign, or home materials mixed with foreign, a farther duty of 6 *d.*; if from brewer's wash or tilts, 5 ½ *d*; if from drink brewed of malted corn, 5 ½ *d.*; if from other British materials, or any mixture therewith, 5*d.* For every gallon of low wines or *spirits* of the first extraction, made from foreign materials, 1*s.* 7 *d.*; from brewer's wash or tilts, 1 *s.* 4 *d.*; from drink of malt, 5 *d.*; from any other English materials, 7 *d.* But low wines or *spirits*, of the first extraction, drawn from melasses only, shall be liable only to 1 *s.* a gallon; and all *spirits* from low wines, &c. drawn from melasses only, shall be chargeable with 6 *d.* a gallon, 19 Geo. II. cap. 12.

Moreover, by 33 Geo. II. cap. 9. an additional duty is laid as follows: for every gallon of low wines, made from any sort of drink or wash, brewed or made from any sort of malt or corn, or from brewer's wash or tilts, or any mixture therewith, 5 *d.*; for every gallon of strong waters, or aqua vitæ, made for sale of the said materials, 1 *s.* 3 *d.*; for every gallon of low wines, made from any imported materials, or mixture therewith, 1 *s.* 3 *d.*; for every gallon of *spirits* made from such materials, 8 *d.*; for every gallon of low wines made from cyder or any British materials, except the above mentioned, or any mixture therewith, 6 ¾ *d.*; for every gallon of *spirits* made for sale from cyder or British materials, except the above, 1 *s.* 1 ¾ *d.* And by 2 Geo. III. cap. 5. there shall farther be paid for spirituous liquors made for home consumption, or imported (not being the produce of the British colonies), the following additional duties: for every gallon of low wines, made from any sort of drink or wash brewed, or from any sort of malt or corn, or from brewer's wash or tilts, or any mixture therewith, 1 *d.*; for every gallon of strong waters, or aqua vitæ, made for sale, of the materials aforesaid, 3 *d.*; for every gallon of low wines, or *spirits*, made from any imported materials, or any mixture therewith, 3 *d.*; for every gallon of *spirits* made from any imported materials, or mixture therewith, 2 *d.*; for every gallon of low wines, or *spirits*, made from cyder, or any kind of British materials, except those above mentioned, or any mixture therewith, 1 ½ *d.*; for every gallon of *spirits*, made for sale, from cyder or British materials, except as above, 2 *d*; for every gallon of single brandy, *spirits*, or aqua vitæ imported (not the produce of the British colonies), 6 *d.*; for every gallon of brandy *spirits*, or aqua vitæ, above proof, imported (not from British colonies), 1 *s.*

Spirits made for exportation shall be duty free.

An additional duty of 5 *l. per cent.* is laid by 19 Geo. III. cap. 25. By 20 Geo. III. cap. 35. an additional duty is laid upon the several kinds of spirituous liquors as followeth: for every gallon of low wines made for home consumption, from any sort of drink or wash, brewed from any sort of malt or corn, &c. 1 *d.*; for every gallon of strong waters, or aqua vitæ, made for sale, for home consumption, of the foresaid materials, 3 *d.*; for every gallon of low wines, made for home consumption, from any imported materials, or mixture therewith, 3 *d.*; for every gallon of *spirits* so made, 2 *d.*; for every gallon of low wines, made, for home consumption, of cyder or British materials, except the forementioned, or any mixture therewith, 1 ½ *d.*; for every gallon of *spirits* made for sale, for home consumption, from cyder, &c. 2 *d.*; for every gallon of single brandy *spirits*, or aqua vitæ, imported, 1 *s*; for every gallon of brandy *spirits*, or aqua vitæ, above proof, imported 2 *s.* See Distiller.

Spirit *of lavender.* See Lavender.

Spirit *of Libavius, smoking.* See Liquor *of Libavius.*

Spirit, *malt.* See Malt-*distillery.*

Spirit *of melasses.* See Molosses-*spirit.*

Spirit *of nitre.* See *Nitrous* Acid. The most common method of distilling *spirit of nitre*, especially in any great works, is to employ clay, which contains vitriolic acid, as an intermediate substance. For this purpose two parts of dry and powdered clay are to be well mixed with one part of nitre; the mixture is to be put into an earthenware retort, placed in a reverberating furnace; to this retort a receiver is to be fitted, which is to be well luted, and the distillation is to be promoted by a gradual heat, that is very gentle at first, and raised at last so much that the retort shall be red-hot.

Distillers of aqua *fortis* do not use retorts, but stoneware bottles, with short crooked necks; the receivers are vessels exactly of the same form: two rows of these vessels are disposed opposite to each other in an oblong furnace, called a galley, and a wood-fire is used for the distillation. The operation lasts twelve hours.

The *spirit of nitre* distilled by means of clay, is not so high coloured and smoking as that which is obtained by other methods, though it may be equally strong.

Spirit *of nitre, smoking*, may be obtained by means of martial vitriol, previously calcined till it becomes red-hot, and very pure nitre of the third or fourth boiling, well dried. These two matters are to be pounded and carefully mixed together in equal proportions: they are then to be poured into a good earthen-ware retort through a paper funnel, which passes into the belly of the retort, that none of the powder may adhere to the neck of it. The retort is placed in a reverberatory furnace, upon the bars of which is fixed an earthen dish filled with sand; to the retort a large glass balloon, in which is a small hole, is to be fitted and luted with a fat lute; this lute is to be covered with a cloth soaked with another lute made of quicklime flaked in air, and formed into a thin paste with whites of eggs; the whole luting apparatus is to be bound with a string; then the distillation is to be commenced with a very slow fire: the balloon will soon be filled with red vapours which are condensed there, while another portion of *spirit of nitre* distils gradually by drops. This distillation is to be continued till the retort is red-hot, and no more vapour is raised.

When the vessels are cooled, they are cautiously to be unluted, and the liquor in the balloon is to be quickly poured into a clean and dry glass bottle, through a glass funnel; which bottle ought to be quickly stopped with a glass stopple. This is the method of distilling smoking *spirit of nitre* used by Mr. Beaumé, and it is a very good one.

This process should be conducted with great caution, as the vapours of this *spirit* are very elastic and very corrosive.

Spirit *of nitre, Glauber's smoking*, is so called, because Glauber was the first chemist who thought of distilling nitrous and marine acids by means of pure vitriolic acid. The process is as follows: very pure nitre is to be put into a stone-ware or glass retort; upon this nitre, one-third part of its weight of pure vitriolic acid, rectified and highly concentrated, is to be poured through a glass funnel, the stalk of which ought to be long enough to go down into the belly of the retort; the apparatus of vessels is to be disposed of as in the preceding article, and the distillation to be promoted with the same precautions; but with this difference, that this distillation is sooner finished, and requires a less heat towards the end. The *spirit of nitre* distilled in these two ways, is the strongest and most smoking that can be obtained. This last is somewhat less red and smoking than the former, although it may be equal, or superior in strength. The former is rendered so smoking by the phlogiston of the iron of the martial vitriol. Some chemists add filings of iron in the distillation of the latter, to render the *spirit* more smoking.

The *spirit of nitre* obtained by either of these methods, may be purified, by adding some pure nitre to the acid, and distilling a second time; by which means the small portion of vitriolic acid mixed with the *spirit of nitre* is made to unite with the basis of the nitre, and is rendered so fixed that it cannot rise in distillation.

Spirit *of nitre, dulcified, spiritus nitri dulcis*, a form of medicine ordered to be made thus: take of rectified *spirit* of wine one quart, and of Glauber's *spirit of nitre* half a pound; or one part of nitrous acid and two parts of rectified *spirit* of wine; mix them by pouring the *spirit of nitre* on the other, and distil the mixture with a gentle heat, as long as what comes off will not raise any fermentation with a lixivial salt.

This is used medicinally, and considered as aperitive, and powerfully diuretic. It is added by drops to potions and juleps, till it has given them an agreeable acidity.

It is also much used by our distillers to give a vinosity to those *spirits*, whose natural flavour of that kind they have destroyed by the improper use of alkaline salts in the rectifications. Nothing can be more proper for this purpose than this *spirit*, as it really gives the brandy-flavour, and is not at all prejudicial to health, but very well falls in with the nature of the *spirit*, and promotes its medicinal properties as a diuretic, deobstruent, and lithontriptic.

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The method of making it for this purpose is improveable, by using in the preparation of a *spirit* of wine impregnated with some fine flavoured ingredient, which has not much oil, for acids do not readily mix where there is much oil.

In the preparation of this *dulcified spirit of nitre*, the longer it stands in digestion with the *spirit* of wine, the milder it grows; and by the same means also, the violently corrosive oil of vitriol may be so blunted, as to be rendered scarce perceptible to the taste. In fine, a *spiritus nitri dulcis* may be made, by a slow digestion, greatly superior to that commonly used, and of so fixed a nature, that it will not be subject to have its flavour fly off from the *spirit* it is mixed with, any sooner than the native vinosity of brandy will of itself fly off from that *spirit*, as it always will in time. A proper care in the preparation of this acid might free the distillers from that troublesome necessity they are under of adding their *spirit of nitre*, just before they send their goods away, for fear the flavour should be lost before the *spirit* is all used, and so the sophistication be found out. There is no fixing any certain proportion in which the acid is to be mixed with the *spirit*, but in general it is best not to overdo it; for though it will give an agreeable vinosity to any tolerably clean *spirit*, the person will be much deceived who attempts to drown the bad flavour of a foul one by it. Shaw's Essay on Distillery.

A *nitrous* ÆTHER is obtained by mixing nitrous acid with *spirit* of wine; the true method of obtaining it was first suggested by M. Navier; his process, communicated to the Academy of Sciences in 1742, consists in mixing together *spirit* of wine and *spirit* of nitre in a bottle, which is to be exactly closed, and left at rest, till the æther is formed and collected like an oil upon the surface of the liquor.

Mr. Beaumé's process is as follows: put six ounces of rectified *spirit* of wine into a bottle made of strong and thick glass, large enough to contain a pound of water; place this bottle in a bucket of fresh water, which will be still better for the purpose if it has been rendered colder by throwing into it two or three pounds of ice, in small bits; pour upon the *spirit* of wine, at four or five times, four ounces of smoking *spirit of nitre*, so concentrated, that a phial, capable of containing an ounce only of water, shall be capable of containing an ounce and a half of this *spirit of nitre*: observing, during the whole time of pouring the *spirit of nitre*, that the *spirit* of wine be kept in a state of perpetual rotation. As soon as the two liquors are mixed, stop the bottle quickly with a good cork, which must be driven firmly into the neck of the bottle, and covered and fastened with a piece of leather doubled, and bound with packthread. Leave it at rest in the cold water, which ought to be sometimes renewed.

Two or three hours afterwards the liquor loses some of its transparency by the interposition of many small drops of æther, which are disengaged throughout the liquor. This æther gradually collects and floats upon the surface. Within twenty-four hours the liquor will have become clear, and the æther formed, which will be about two ounces, may be separated; but as more æther will still be produced, the method is to leave it seven or eight days before any of it be separated. After this time no more æther is formed: pierce then the cork with a pointed instrument, and a considerable quantity of air will escape with a hissing noise, which had disengaged itself during the production of the æther, and which is compressed in the bottle. When the air has escaped, uncork the bottle, and pour quickly its contents into a glass funnel, that the æther may be separated.

The æther will amount to about four ounces, and the residuum will weigh five ounces and a half; so that half an ounce shall have been lost during the process. This æther ought to be put into a well closed crystal-glass bottle.

Mr. Woulfe describes an apparatus by which nitrous æther may be expeditiously obtained by distillation, with the heat only occasioned by mixing together the nitrous acid and the *spirit* of wine. This distillation is performed in a matrass with a high neck, to which is fitted a head, with a spout, communicating with the receiver by means of a long tube. The vapours that are not condensed in this receiver, or in a bottle joined to a spout in its bottom, are conveyed from the receiver through a bent tube into *spirit* of wine contained in a bottle. If any vapours pass uncondensed through this *spirit* of wine, they are conveyed through another bent tube into more *spirit* of wine contained in another bottle. The liquor collected in the bottle annexed to the receiver, being slowly rectified with slaked lime, furnishes very fine æther. The *spirit* of wine in which the vapours were condensed, contains so much æther, that this fluid may be separated from the *spirit* by adding water. This *spirit* of wine is by the operation changed into good *dulcified spirit of nitre*. Phil. Trans. vol. lvii. art. 50.

SPIRIT *of sal Ammoniac*. See AMMONIAC.

SPIRIT *of salt*. See *Marine* ACID. Ordinary *spirit of salt* is distilled by the mixture of one part of common salt with two parts of dried clay, in the manner already described for the distillation of SPIRIT *of nitre*. But in order to have the strongest *spirit of salt*, it is necessary to employ as an intermediate the pure vitriolic acid, as Glauber practised. However, this operation is very difficult and laborious. In order to obtain this *spirit*, on two pounds of dry sea-salt the college of London directs two pounds of oil of vitriol diluted with a pint of water, that of Edinburgh one pound of oil of vitriol diluted with equal its quantity of warm water, to be poured by little and little, under a chimney, that the operator may not be incommoded with the noxious fumes: the retort is placed in sand, and the distillation performed with a fire gradually increased till nothing more will arise. The *spirit* may be freed from its superfluous water, by a second distillation in a glass cucurbit; the phlegmatic part rising in a proper degree of heat, while the stronger acid remains behind.

The following is the process successfully practised by Mr. Beaumé: common salt is to be put into a tubulated stone-ware or glass retort, which is to be placed in a furnace for distilling; and to this retort a balloon is to be fitted, exactly in the same manner as for the distillation of *smoking* SPIRIT *of nitre*.

This apparatus is to be left till the lute has become firm; then through the tubulated opening of the retort, by means of a glass funnel, a quantity of rectified vitriolic acid, previously diluted with a little water, equal to a third part of the weight of the salt, is to be poured at several different times, and the opening is to be closed each time immediately after a part of the acid has been added.

As soon as the vitriolic acid is added, we see white vapours passing from the retort into the receiver. These are the smoking *spirit of salt* which this acid disengages, even without fire; for which reason these first vapours ought to be allowed to pass before the fire be kindled, which ought not to be done till they are considerably diminished, otherwise the distillation would go on too fast at first, and the vessels might be broken.

A very little fire is to be kept up in the furnace, and only as much as is necessary to continue the distillation: lastly, the distillation is to be conducted to the end with the same attentions that is required for smoking *spirit* of nitre; and when it is finished, the *spirit of salt* is to be collected in the same manner.

This *spirit of salt* may be dulcified by mixing this acid with twice its weight of rectified *spirit* of wine, and digesting this mixture during a month. Authors differ much concerning the methods of dulcification. The proportions are from two to five or six parts of *spirit* of wine to one part of *spirit* of salt. Some require a smoking *spirit*, others do not say whether it should be concentrated and smoking, or not. Some direct the distillation of the mixture, others are content with mere digestion. The Edinburgh Dispensatory directs this acid to be poured gradually into thrice its quantity of rectified *spirit* of wine, and the mixture, after digestion for some days, to be submitted to distillation in a sand-heat. This dulcified marine acid has been held by some in great esteem against weakness of the stomach, indigestion, and other similar complaints brought on by irregularities.

SPIRIT *of sulphur*. See *Spirit of* SULPHUR.

SPIRIT *of Venus*, is a name given by chemists to the acid obtained by distilling verdegrise, or crystals of verdegrise or of Venus, which are nothing else than combinations of copper with acetous acid. Nothing more is required for this purpose than to put verdegrise, or crystals of verdegrise, into a retort, one third part of which should remain empty: to this retort a receiver is to be adjusted, and the distillation begun with a very gentle fire: the first portions of liquor which pass are to be set apart, as they are nothing but phlegm: the distillation is to be promoted by gradually augmenting the fire till the retort begins to be red-hot, and nothing escapes from it. The acid of vinegar passes in this distillation partly in white clouds and partly in drops. This acid forms ÆTHER when distilled with *spirit* of wine.

SPIRIT *of vinegar*. See VINEGAR and ACETUM.

SPIRIT *of vitriol*, is a name given, in general, to every dilute *vitriolic* ACID. See CONCENTRATION and VITRIOL.

SPIRIT is also used for any incorporeal being, or intelligence. In which sense God is said to be a *spirit*; angels are *spirits*; and the devil is an *evil spirit*.

In this sense the human soul is also called a *spirit*, from its thinking and reflecting powers, which cannot be conceived to reside in any thing material. See SOUL.

F. Malebranche observes, it is extremely difficult to conceive what it is that should make the communication between the body and the *spirit*; for if the *spirit* have no material parts, it cannot move the body. But the argument must be false some how or other; for we believe that God can move bodies, and yet we do not attribute any material parts to him.

SPIRIT, in *Theology*, is used, by way of eminence, for the third person in the Holy Trinity, called *the Spirit*, *the Holy spirit*, or *Holy Ghost*.

The Socinians deny the personality of the *Spirit*; and the Arians his coequality with the father.

SPIRIT, *order of the*. See HOLY *Ghost*.

SPIRIT is also used, among *Divines*, for the divine power, and virtue, and the communication thereof to men.

In this sense the *Spirit* is said to have gone out on the face of the deep, Gen. i. 2. and the prophets to have been possessed with the *Spirit* of God. Providence, in this sense, is that universal *Spirit* whereby God makes all nature to act.

Thus the holy Virgin is said to have conceived of the *Spirit*.

SPIRIT, *private*, is a term that made a great figure in the controversies of the two last centuries. It signifies the particular sense or notion each person has of the dogmata of faith, and the truths of religion, as suggested by his own thoughts, and the persuasion he is under with regard to them.

The first reformers denying strenuously any infallible interpreter of the Scripture, or any settled judge of controversies, maintained, that every person was to interpret and judge of revealed truths by his own light, assisted by the grace of God; and this was what they called *private spirit*, or *judgment*.

Against this, the arguments used by the Romanists are, that revealed truths being one and the same for all believers; the rule God has given us for judging of them, ought to represent them to us uniformly, and the same; but the *private spirit* informs Luther one way, and Zuinglius another. It divides Oecolampadius, Bucer, Osiander, &c. And the doctrine it discovers to the Confessionites, is quite different from that it shews the Anabaptists and Mennonites, in the very same passage of Scripture.

SPIRIT, *spiritus*, is also used, in *Prosody*, to signify the greater or less degree of breath employed in the pronunciation of the initial Greek vowels, and of the letter ρ.

In founding the vowels we may observe, every vowel has its found by a simple conformation of the mouth, wherein the breath has little or no concern, as being confined in the arteria aspera: the *spirits*, or breaths, which are placed on the initial vowels in words, are to denote the force this initial vowel is to have from the breath when the word is pronounced. If the sound of this vowel be smooth, as all the sounds of the vowels naturally are, this is termed *spiritus lenis*, a MILD BREATH; but if this vowel be to be pronounced with a more vehement expulsion of the air, this is termed *spiritus asper*, or a rough breath, or aspirate; and when the aspirate and acute are in the same syllable, the mark of the breath, in this initial vowel, only signifies, that the vowel is to be pronounced with a stronger breath than the initial mild vowels; for aspirates do not alter the tone of any syllable, but only strengthen, increase, and swell the tone.

SPIRIT, *modes of*. See MODE.

SPIRITO, in the *Italian Music*, is used to signify that a performer should sing or play with vigour, life, and *spirit*. Hence we meet with *con spirito* in cantatas and sonatas.

SPIRITUAL *friars*. See FRANCISCANS.

SPIRITUALITIES of a bishop are such profits as arise to him from the benefit of his jurisdiction in his diocese, and not as a baron of parliament.

Such are those of his visitations, institutions, ordinations, presentation-money, &c.

SPIRITUALITIES, *guardian of the*. See GUARDIAN.

SPIRITUALIUM *custos*. See CUSTOS.

SPIRITUALIZATION, in *Chemistry*, the action of extracting spirits from natural bodies. See SPIRIT.

Spiritualization is an operation that belongs principally to fermented salts, and then to fermented juices and liquors; the fermentation rendering the spirits volatile and inflammable.

Spirit of wine is sometimes *spiritualized* to that degree, that upon throwing a quantity into the air, not a drop shall fall down; but the whole evaporate, and be lost.

SPIRITUS *aceti*. See ACETI *spiritus*.

SPIRITUS *Mindereri*. See VINEGAR.

SPIRITUS *rector of vegetables*. See ARCHÆUS.

SPIRITUS *tartari*, the name of a medicine very famous in Germany, and probably in the greater esteem because of the difficulty of preparing it. It is the *spirit* of salt of tartar volatilized; and is ordered by Langelot to be made in this manner: let two or three pounds of crude tartar be burnt to a blackness, in order to have what is most necessary, a ferment to ferment the tartar with; put this into a large pot, and pour to it so much water as will serve to stand an inch above it; make this mixture lukewarm, and then pour into it half a handful of crude tartar powdered; bubbles of air will arise upon this, and will continue some time; when they seem to decrease, more powdered tartar is to be added from time to time, to keep up this fermentation. The bubbles will be large, and rise in clusters, and resemble bunches of grapes in all but colour. The fire all this time must be carefully managed, and the tartar put in gradually, that the fermentation do not become too great, or the mass run over the pot.

After this the matter is to be put together into an iron retort, and a very gentle fire kept under it for some time, and gradually heightened, so as to force up all the salt; this being done, the volatilized salt is to be carefully separated, and it is remarkable, that the salt is so wholly volatilized by this fermentation, that there scarce remains any fixed salts in the caput mortuum in the retort.

The liquor in the receiver is to be rectified by another distillation, the water, necessarily used in the fermentation, rendering it too weak. When it is rectified so far, that it appears whitish, it is known to be of a due strength, and it is then the famous *spirit of tartar*, not only celebrated for its medicinal virtues, but famous for extracting tinctures that can be obtained from no other menstruum.

SPIRITUS *volatilis aromaticus*, a name given of late to what used to be called *sal volatile oleosum*. The modern way of making it is this: take essence of lemons, and oil of nutmegs, of each two drams; oil of cloves half a dram; dulcified *spirit* of sal ammoniac a quart; distil the whole with a very gentle heat. See *Spiritus salis* AMMONIACI.

SPIRKETTING, among *Ship-carpenters*, denotes that range of planks which lies between the water ways and the lower edge of the gun-ports, within the side of a ship of war.

SPIRTING *cucumber*, in *Botany*, a species of *momordica*. See *Male* BALSAM *apple*.

SPISSUM, in the *Ancient Music*, was used to signify those two smaller conjunct intervals of a tetrachord, which, taken together, were less than the third.

The Greek term for this was πυκνον. This happened in the enharmonic, and the three chromatic genera; in each of which the interval between the hypate and the lichanos, was less than the interval between the lichanos and the nete. To the *spissum* was opposed the *non-spissum*, απυκνον, or *rarum*, as Martianus Capella translates it. The απυκνον happened in the two diatonic genera, where the two smallest intervals were equal to, or greater than the third. They were supposed equal in the diatonicum molle, and greater in the intensum. See GENUS.

SPIT-*deep*, a term used among *Farmers* for a soil as deep as can be dug up at once with a *spit* or spade.

SPITTER, among *Sportsmen*, a red male deer near two years old, whose horns begin to grow up sharp and spitwise.

It is otherwise called a *brocket* and *pricket*.

SPITTLE. See SALIVA and SPUTUM.

SPITTLE, a corruption of the word HOSPITAL.

SPIZA, in *Ornithology*, a name by which the ancient naturalists called the CHAFFINCH.

SPLACHNUM, in *Botany*, a genus of the *cryptogamia* class of MOSSES. Its characters are, that the anthera rests upon a coloured apophysis; the calyptra soon falls, and the female flower is distinct, and of a star-like form. Linnæus enumerates four species.

SPLAIT-*shoulder*. See SHOULDER.

SPLANCHNICA, a name given to medicines appropriated to diseases of the bowels.

SPLANCHNOLOGY, formed from σπλαγχνον, *intestine*, and λογος, *discourse*, in *Anatomy*, a discourse on, or explication of the viscera. See *Tab. Anat.* p. 3. where the object of this branch is represented.

Sarcology is divided into three parts, viz. *splanchnology*, *myology*, and *angeiology*; of these, *splanchnology* is that which treats of the internal parts, and particularly of the viscera.

SPLEEN, σπλην, *lien*, in *Anatomy*, a soft, spongy viscus, of a darkish red, or rather livid, colour, ordinarily resembling the figure of a tongue; though sometimes triangular,

lar, and sometimes roundish, being about seven or eight fingers-breadth in length, and four or five in breadth. See *Tab. Anat.* (*Splanch.*) *fig.* 1. *lit. m.*

The *spleen* is usually single; though sometimes there are two, and sometimes three found. It is situate in the left hypochondrium, between the spurious ribs and the stomach, under the edge of the diaphragm, and above the left kidney; it is somewhat convex on the side towards the former, and concave towards the latter. It is connected to the omentum, and, by means of that, and the blood-vessels, to the stomach and left kidney, and sometimes to the diaphragm.

It is covered with two tunics; the external derived from the peritonæum, and connected to the internal only by intervention of the blood-vessels. The inner consists of fibres very curiously interwoven. From this, probably, are derived those innumerable cells, or little bladders, which make up the main bulk of the *spleen*; though Malpighi rather takes them to arise from the venous duct. The cells communicate with each other, and discharge themselves into the trunk of the *splenic* vein: their inside, according to Malpighi, is furnished with various minute glands adhering together; six, seven, or eight whereof form a kind of small conglomerate glands, wherein the arteries and veins seem to terminate.

Its blood-vessels are, the SPLENIC artery, which furnishes it with blood from the cœliac; and the SPLENIC vein, which carries it thence by the porta to the liver.

Its nerves come from the plexus lienaris, near the bottom of the stomach, and send out, at different distances, round all the arterial ramifications of the substance of the *spleen*, a great number of filaments, in form of an irregular net-work; the vessels are all, as soon as they enter the *spleen*, wrapt up in one common capsula, or membrane, and plentifully distributed together throughout the substance of the *spleen:* besides these, there are lymphatics in great abundance. The anastomases, between the arteries and veins of the *spleen*, are more apparent than in any other part of the body; and this viscus is observed to be furnished with a greater proportion of blood than any other part.

The use of the *spleen* has been disputed in all ages; both as no immediate use thereof appears from dissection, and as we find, that animals, from whom it has been cut, live very well without it: all the effects, e. gr. following the cutting it from a dog, are, that the animal grows more salacious than usual; that it urines more frequently; is more hungry than ordinary, and, for the first days, is troubled with a vomiting and nausea. It is added, that it is necessary the part be taken away, to make a good runner.

Hence some have imagined, that the *spleen* only served to make a balance in the weight of the body; others, that it was only intended for the sake of symmetry; others, hold it an useless load, and one of nature's redundances; others, a pit, or common sewer to discharge the fæces of the blood into; and others, a fire, by the heat whereof the action of the stomach is animated.

Many of the ancients took it to be the receptacle of the atra bilis, or melancholic humour; for which reason, some of them call it the *organ of laughter*.

Mr. Cowper, from the great quantity of blood, and the apparent inosculations of the *spleen*, draws a very natural conjecture of the use thereof; at least of the peculiar mechanism. He takes, then, the *spleen* to be only a subordinate organ, ministring to the circulation; and thinks, that by this congress of the arterial and venous blood, an impetus is communicated to the latter; by which its progress through the ramifications of the porta to the cava is promoted, which would otherwise be so broken by the double ramifications of the porta, as almost to want strength sufficient to carry it to the heart.

The action or effect of the *spleen*, according to Dr. Boerhaave is, to receive the fresh arterial blood, prepare it in its glands, and pour it into its cells; to return what blood is left, from this action, to the little veins, and thence to the *splenic* vein; to mix the humour, thus prepared, with the nervous juice; and to prepare, attenuate, and more intimately unite them together into one humour.

Malpighi, and afterwards Dr. Keill, Winslow, and some others, take the *spleen* to be a viscous assistant to the liver, in the secretion, &c. of the bile. We have observed, that by reason of the nearness of the liver and heart, and the swift motion of the blood in the aorta, a humour, consisting of particles that combine so slowly as those of the bile do, could not be prepared but by bringing the blood round about through the stomach, intestines, and omentum, &c. to the liver; to abate its velocity.

Now Dr. Keill conjectures, that those parts were not sufficient to receive all the blood necessary to be sent to the liver; and that, therefore, nature framed the *spleen*, into whose cavities the blood being poured from a small artery, moves, at least, as slowly as any that passes otherwise to the liver; by which means, the particles that compose the bile in the blood which passes through the ramus splenicus, by so long and slow a circulation, have more chances for uniting, than otherwise they would, had they been carried, by the branches of the cœliac, directly to the liver: consequently, without the *spleen*, such a quantity of bile as is now secerned, that is, as nature requires, could not have been separated by the liver.

Mr. du Vernoi has added one opinion more to the many already given, concerning the use of the *spleen*. From observing a large empty space near the *spleen*, in the abdomen of a dead body, the proportional largeness of its blood-vessels, and the structure of the *spleen* analogous to that of the penis, he concludes the *spleen* in a living person to be subject to inflations like a bellows; but how it is thus to be moved, or to what purpose, he does not tell us. See Comment. Acad. Petrop. tom. iv. p. 156, seq.

Mr. Lieutaud argues for the *spleen*'s being larger by a greater quantity of blood in it, when the stomach is empty, and that this blood is pressed out, when the stomach is full, to increase the secretion of bile. Hist. de l'Acad. des Scienc. 1733.

We have an account, in the Philosophical Transactions, N° 451, of the extirpation of part of the *spleen* of a man, which had begun to mortify, notwithstanding which the man recovered.

The *spleen* has been cut out of dogs without any damage. Mr. Boyle mentions his having seen the experiment tried on a young setter, who recovered in a fortnight. Works abridg. vol. i. p. 27.

Dr. Pozzi relates the phenomena he remarked in dissecting a dog, whose *spleen* was cut out when he was young. The liver, which was larger and more heavy than ordinary, was also more brittle; the vena portarum was enlarged; the gall-bladder was full of bile, more acrid than it is commonly. From these appearances he thinks the use of the *spleen* to be for separating a liquor like to spittle, which may dilute the bile, and prevent its too great acrimony. Med. Ess. Edinb.

The ingenious Mr. Hewson offers a variety of considerations, from which he concludes, that we have as strong proofs that the red or vesicular particles of the blood are completely formed by the *spleen*, as that the liver secretes bile, or the testicles semen; not that the *spleen* is the only organ which executes this function; but it serves as an auxiliary to the lymphatic system, in perfecting and expediting the formation of the vesicles, or red part of the blood: accordingly it may be cut out of the body of a living animal, without any considerable inconvenience to it. In that case, as well as when it is diseased, it is supposed, that the lymphatic vessels are excited to form a larger quantity than usual of red particles, in proportion to the exigencies of the habit. See LYMPHATICS.

The uncertainty we are in as to the real use of the *spleen*, has given ground, perhaps, to the notion that men might live without the *spleen*; and that, in many cases, it might contribute much to health to cut out this useless viscus. In the Journal des Sçavans, there is an account of a method of destroying it, without the terrors of the operation of opening the body.

This was done by a person who applied a wooden-knife to the surface of the body where the *spleen* is lodged, and striking forcibly on it with a mallet, told the patient that he had broken the substance of the *spleen*; and that after this it required only the taking certain medicines which he prepared, utterly to destroy and carry it out of the body.

The folly of a pretence of this kind, one would think, should have been alone sufficient to have laughed it out of the world; but numbers of people submitted to the operation, till a youth in Petersburg unhappily being killed by a blow of the kind here mentioned, and his belly swelling greatly, excited the curiosity of his relations to have it opened. The cause of his death was found to be an hæmorrhage, which had filled the cavity of the abdomen, and which proceeded from the *spleen*'s having been burst by the blow. This convinced them, that attempts to wound the *spleen* were no longer looked upon as the means of health. Act. Petrop. vol. i. p. 38.

SPLEEN, *infarction of the, infarctus lienis,* a disease consisting in an inflation of this lax and cellulose viscus, owing its origin to a restriction of the blood toward the *splenic* branch, in which nature seems to have intended the relieving herself from the load of a plethora, by the discharging a part of the mass through the vasa brevia.

The *infarctus lienis* differs from an obstruction of the *spleen*, in that this last is a total suppression of the blood in it, this only a partial one. It is too often confounded with nephritic complaints, and is indeed, in general, of the class of hypochondriac maladies, but only arises from

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a ſpecial and peculiar derivation of the blood to that one viſcus, not to any other of the circumjacent parts.

Signs of it. An *infarction of the ſpleen* is diſcovered by an inflation of the left ſide, a little below the ſpurious ribs, attended with permanent pains, but theſe not very acute or violent: theſe complaints have frequent remiſſions, ſeldom continuing above a day or two in the ſame ſtate. During the time of the ſymptoms being worſt, there is a difficulty of breathing, and an anxiety of the præcordia, and generally a lowneſs of ſpirits: to theſe it may be added, that there is uſually a dry cough, and frequent belchings.

Perſons ſubject to it. Men are in general much more ſubject to this diſeaſe than women, unleſs at the middle and more advanced periods of life, when they are more ſubject to it than the men. People of a melancholic habit alſo are moſt afflicted with it, and ſuch as have before had hypochondriac complaints, and have been injudiciouſly treated with aſtringents; and all perſons of a ſedentary and ſtudious life, or who employ much time in thinking.

Cauſes of it. Theſe are a ſedentary life, and a diet of too heavy and thick a kind; an omiſſion of habitual bleedings, or other evacuations, or a ſuppreſſion of the menſtrual or hæmorrhoidal diſcharges; an injudicious treatment of intermittent fevers with aſtringents, or of acute ones with too cooling medicines, and an habitual coſtiveneſs; and to theſe may be added an hereditary diſpoſition.

Prognoſtics in it. This is a diſeaſe of no immediate danger to the patient, and the more recent it is when taken in hand, the eaſier it is cured; if left to itſelf it becomes habitual, and brings no danger of death with it, but if improperly treated, it frequently becomes the baſis of the moſt obſtinate kind of quartans, or degenerates into a ſcirrhus, which may be a long time ſuffered without any danger of life; but finally, the whole too often ends in ſlow hectic fevers, and œdematous and aſcitic ſwellings. In women it often terminates in a vomiting of blood; and ſometimes, but very rarely, an inflammatory and ſuppurating ſtaſis ſupervenes, and a black, fetid, and purulent matter is voided by ſtool or by vomiting.

Method of cure. The plethoric habit, which gives riſe to this complaint, is to be taken down by copious bleedings in the right foot, and then ſhould be repeated every ſpring and autumn; and the menſes muſt be brought to a proper regularity in the uſual way, as muſt alſo the hæmorrhoids in the other ſex, by the application of leeches to the part. The ſpiſſitude of the blood is to be amended by decoctions of elecampane, hyſſop, and the like; and by moderate and repeated doſes of tartarum vitriolatum, gum ammoniacum, &c. and gentle doſes of rhubarb and ſena in infuſion muſt be taken at times. To theſe may be added the external uſe of reſolvents and ſtrengtheners, ſuch as ointment of marſh-mallows, the plaſter of gum ammoniacum, and the like; and finally, the preparations of ſteel are to be given; to theſe ſome add a number of things eſteemed ſpecifics, ſuch are madder and caper-roots, dodder, yarrow, white maiden-hair, and ſpleenwort, and the bark of the aſh-tree, and wood of the tamariſk. Junker's Conſp. Med. p. 194.

Spleen, *ſcirrhus of the.* This is an indurated tumor of the *ſpleen*, cauſed by a ſtagnation and inſpiſſation of the humours from the exhalation of their thinner parts. This complaint is ſometimes complete, and ſometimes incomplete; but in the moſt favorable caſes it is a much more dangerous complaint than an infarction of the *ſpleen*, and more difficult of cure.

Signs of it. Theſe are a ſenſible and palpable hardneſs under the ribs on the left ſide, extending towards the loins, with a ſenſe of a weight, as it were, hanging in this part; and hence the lying on the right ſide is always very painful and uneaſy. The face has a dull deadneſs in the look, which ſometimes is communicated alſo to the ſkin of the whole body, and there is uſually a blackneſs about the orbits of the eyes; there is alſo a ſenſation of a narrowneſs in the breaſt, with ſome difficulty of breathing, and a dry cough. The appetite is uſually voracious, but ſometimes it is affected with nauſeas, without any apparent cauſe. The bowels are uſually ſomewhat coſtive, but irregularly ſo. The mind alſo ſeems affected, and a gloomy moroſeneſs, ſilence, and anxiety, oppreſs the perſon, without any viſible cauſe. Finally, there uſually is a ſwelling in the right foot, which by degrees extends itſelf farther, and is ſeldom regarded at firſt.

Perſons of both ſexes are equally ſubject to this diſorder, but it is not, however, very common. Men who have long been ſubject to hypochondriac diſorders, and women ſubject to hyſteric complaints, are moſt ſubject to it; and to theſe may be added, perſons of an indolent, ſpeculative, and ſedentary life, and thoſe who have been imprudently treated with aſtringents in intermittent caſes.

Cauſes of it. Beſide thoſe before mentioned, a ſcirrhus is ſometimes brought on in the *ſpleen* by a violent blow, or other external injury; a too thick diet may alſo be very inſtrumental in laying the foundation for it; and not a little may be added to all theſe caſes, by violent paſſions of the mind.

Prognoſtis in it. In recent *ſcirrhuſes*, and ſuch as are yet incomplete, there is ſome hope of ſucceeding in the attempt of a cure; and, on the contrary, in old caſes and complete *ſcirrhuſes*, there is indeed very little hope: but there is this comfort for the patient, that even ſuch a one, when wholly left to itſelf, will remain many years without endangering life.

There is in a ſcirrhus an evident tendency to corruption, but this is rather to be expected from ſphacelation than from an inflammatory ſuppuration; but when emollients are uſed, there is great and imminent danger: for as theſe are nearly allied to the maturating remedies, they may produce their effect; and it is certain, that no laudable ſuppuration is ever to be expected in this caſe.

Method of treatment. This caſe is to be treated in the ſame general manner with the infarctions of the *ſpleen*, already mentioned; but the more powerful reſolvents are to be uſed in this, as the more ſtubborn caſe: gentian, bryony, and arum-root, with the five aperient roots, and the capillary herbs, with the powerful gums, as galbanum, ſagapenum, ammoniacum, and the reſt. Bleeding muſt alſo be ordered, as ſoon as the primæ viæ have been cleanſed; and externally the plaſter of cicuta, with ammoniacum, may be applied: but if the caſe is fixed and obſtinate, it is better to let all applications alone, and leave nature to do the beſt for herſelf. Junker's Conſp. Med. p. 202.

Spleen is alſo uſed for a diſeaſe, by phyſicians more uſually called the *hypochondriac diſeaſe*.

Spleen, in *Ichthyology*. The *ſpleen* in fiſhes is uſually ſituate near the ſtomach, in the left ſide of the abdomen. Its figure is generally triangular, ſometimes oblong. Its colour is always more duſky and obſcure than that of the liver.

Spleen-*wort*, *aſplenium*, in *Botany*. See Milt-*waſte*.

Spleen-*wort*, *rough*, *lonchitis*, in *Botany*, a genus of the *cryptogamia filices* claſs of plants: the characters of which are theſe; the flowers have not been diſcovered, but the ſeeds grow on the back part of the leaves; the leaves reſemble thoſe of the ferns in ſhape, but differ in that the pinnules are auriculated near their baſes.

The general character of the *lonchitis*, according to Linnæus is, that the fructifications are diſpoſed in lines of a lunulated figure, which are placed in the under part of the ſinuſes of the leaves. He enumerates four ſpecies. Miller mentions two ſpecies, one of which is very common in ſhady woods, by the ſides of ſmall rivulets, in ſeveral parts of England.

The root is aperient and diuretic.

SPLENECTOMIA, the name given to the chirurgical operation of cutting out the spleen.

SPLENETIC, σπληνικος, a perſon affected with oppilations and obſtructions of the ſpleen.

In *ſplenetic* people, the ſpleen is ſwelled beyond the natural bulk; or it is hardened ſo, as to ſhew a ſchirrous tumor therein.

Splenetic people are diſtinguiſhed by a livid, lead-coloured complexion; and their character is, to be very prone to laughter; which is an expedient nature is ſuppoſed to make uſe of, to evacuate the too redundant humour the ſpleen is charged withal; whence it is, that the ancients made the ſpleen the organ of laughter; and hence that popular ſaying, of a perſon laughing heartily, that he *vents his ſpleen*.

Splenetic *waters*. See Water.

SPLENIA, a word uſed by ſurgeons to expreſs compreſſes, or rags ſeveral times doubled, applied to wounds over the plaſters, or other dreſſings.

SPLENIC *veſſels*, a large artery, and vein of the ſpleen.

The *ſplenic artery*, *arteria ſplenica*, is a trunk of the left cœliac, paſſing under the ſtomach and pancreas, and ſerving to bring the blood from that artery to the ſpleen, to be there ſecreted, prepared, &c. Its progreſs is very much contorted; and, after its arrival at the ſurface of the ſpleen, it is diffuſed through the ſubſtance thereof in ſmall branches, which ſeem to terminate in the cells; but before it arrives at that viſcus, it gives two or three branches to the large extremity of the ſtomach, commonly called *vaſa brevia*, and one to the omentum, named *epiploica*.

The *ſplenic vein*, *vena ſplenica*, is formed out of the ſeveral minute veins of the ſpleen, uniting as they quit the ſurface thereof. It carries the blood ſecreted, &c. in the

the spleen, to the left branch of the vena porta, to be thence conveyed to the liver, there to be farther prepared, and converted into bile.

The *splenic vein* and *artery* manifestly communicate with each other: for water, being poured into one of them, presently discharges itself by the other.

SPLENII, in *Anatomy*, a pair of muscles, so called from a supposed resemblance to an ox's spleen, &c. called also, from their form, *triangulares*. See *Tab. Anat.* (*Myol.*) *fig.* 2. *fig.* 6. *n.* 5. *fig.* 7. *n.* 6. and SPLENIUS.

SPLENII *inferior*, in *Anatomy*, a name given by Cowper to a muscle, called by Albinus *splenicus colli*, and by Winslow, and others, *mastoidæus posterior*, and *portio inferior splenii*. See SPLENIUS.

SPLENITIS, in *Medicine*, the name of a species of fever, in which the blood is powerfully directed toward the spleen by nature, in order to break and dissolve congestions formed there. The *splenitis* differs from what authors call an *infarctus lienis* in degree, as in this the blood only stagnates in some degree, and is not wholly obstructed; and as there is no acute inflammatory fever here, as there is in the *splenitis*.

The *splenitis* is very various in degree; in some cases the whole parenchymatous substance of the spleen being affected, in others only its membranaceous and superficial parts. It is easy to conceive that the former case is much the more dangerous of the two.

Signs of it. This disease always first attacks people with a very remarkable shivering and coldness; this is succeeded by a very terrible heat, and intolerable thirst; and there is a pressive pain, and a sensible swelling in the left hypochondrium. If the patients expose themselves a little to the open air, the extremities grow cold almost immediately; if a hæmorrhage happens, it is always from the left nostril: and finally, the urine is reddish and turbid, and after the fourth day deposits a rose-coloured sediment, which has somewhat of the appearance of matter. Plethoric persons are more than all others subject to this disease.

Causes of it. The general cause is a plethora joined with a thickness of the blood, which forms stases, and fixed coagulations in the spleen; and the fever itself is no other, than the attempt of nature to break through those stases, by the additional velocity of the motion of the blood. The usual accidents that bring on this bad state of the blood, are the omission of habitual bleedings, or the suppression of the natural discharges of the menses or hæmorrhoids; and the occasional accidents that immediately bring on the disease in this state of the blood are, violent commotions of the mind, sudden chilling of the body when very hot, as by drinking cold water immediately after violent exercise, the taking violently astringent medicines in fevers, and an improper use of cooling external remedies in disorders of the spleen, as the infarctions of it, and the like.

Prognostics in it. It is always a very dangerous disease, though not so fatal as the hepatitis, or a like inflammatory state of the liver; but it is remarkable, that as the vomiting a black matter in the hepatitis is always a fatal symptom, so in this disease the same matter is frequently voided, but it is here salutary, and frequently carries off the disease. The appearance of the hæmorrhoids has also been frequently observed to have the same good effect. When the inflammation lies deep, it is most frequently fatal; when it is superficial, it is often carried off; but when it seems cured, it sometimes is found afterwards to have degenerated into an incurable scirrhus of the part.

Method of cure. The first thing to be done, is to open the bowels by a clyster, and they are afterwards to be kept from becoming costive, by a repetition of the same means. Bleeding is usually necessary, and may be performed once or more in the beginning of the disease; then gentle diaphoretics are to be given with juleps slightly acidulated. These are the proper medicines for the morning; and in the afternoon powders of nitre, vitriolated tartar, and crabs eyes, sated with lemon-juice, are to be given with the cooling emulsions; and if the pains be very violent, they may be mitigated, by giving small doses of a gentle anodyne, such as the storax-pill, with the before mentioned powders. If the suppression of the habitual hæmorrhoidal evacuations are suspected to be the cause of the disease, leeches must be applied to the parts, and no wine, or any other strong liquor, must be allowed, till the decline of the disease. Junker's Consp. Med. p. 299.

SPLENITIS is also used by some authors to express a tumor or inflammation of the spleen.

Splenitis is also used as the name of a vein in the left hand, the same as the *salvatella*. The vein of this kind in the right hand is called *jecoraria*.

SPLENIUS, called also *mastoidæus posterior*, in *Anatomy*, a flat, broad, oblong muscle, situated obliquely between the back part of the ear, and the posterior and lower part of the neck.

It is partly single, and partly made up of two portions, one superior, the other inferior. These two portions are closely united backward, making only one plain, but they are divided above.

The superior portion is fixed to the extremities of the three or four lowest spinal apophyses of the neck, and of the first, and sometimes the first and second of the back. It is not fixed immediately to the apophyses of the neck, which are above the last, but only by the intervention of the posterior cervical ligament. It is likewise fixed to the edge of the interspinal ligaments of the other vertebræ; from thence it runs obliquely toward the mastoide apophysis, and is inserted in its upper part, and along the neighbouring curve portion of the transverse ridge of the os occipitis.

The inferior portion of the *splenius* is fixed to three or four spinal apophyses of the back, beginning by the second or third, and afterwards running up till it reaches the superior and lateral part of the neck. It is inserted in the transverse apophyses of the three or four superior vertebræ of the neck, by the same number of extremities, a little tendinous; these, however, are sometimes only two in number. The two *splenii* represent a great Roman V, and the *splenius*, and sterno-mastoidæus of the same side, form a figure like a Roman A, or the legs of a pair of compasses, the points of which are an in horital plane.

The too *splenii* serve to support the head in an erect posture, whether in standing or sitting; to moderate the flexion of the head forward, and to bring it back again to its natural posture. They serve alternately to co-operate with either of the STERNO-MASTOIDÆI for the rotation of the head. The COMPLEXI are assistants to the *splenii* to keep the head straight in sitting or standing, to hinder it from inclining forward, and to raise it when inclined. When they act together, they, as well as the *splenii*, may move the head backward, while the trunk is bent forward, or when we lie upon the belly: this latter motion is commonly called *extension*, the other *flexion*. Winslow.

SPLENIUS *capitis*, in *Anatomy*, a name given by Albinus to a muscle, called by Winslow, and others, the *mastoidæus superior*, or upper portion of the *splenius*. Riolanus, and others, call it the *triangularis splenii*.

SPLENIUS *colli*, in *Anatomy*, a name given by Albinus to the muscle, called by Winslow, and others, *mastoidæus posterior*, or the lower portion of the *splenius*; and by Cowper the *musculus inferior splenii*.

SPLENT, or SPLINT, among *Farriers*, a callous, insensible excrescence, or gristle, that sometimes sticks to an horse's shank-bone; generally on the inside below the knee. If there be one opposite thereto on the outside, it is called a *pegged* or *pinned splint*; because it does, as it were, pierce the bone, and is extremely dangerous. Some call this a *double splent*, and others, a *thorough splent*.

SPLENTS, in *Surgery*, pieces of wood used in binding up broken limbs. See FRACTURE.

The word is also sometimes used for the pieces of a fractured bone.

SPLICE, *to*, in *Sea Language*, is to join the two ends of a rope together, or to unite the end of a rope to any other part thereof. There are several different methods of performing this operation, according to the services on which it is to be employed. The *short splice* is made by untwisting the ends of two ropes, or the two ends of one rope, and having placed each of the strands of one opposite to, and in the interval between two strands of the other, to draw them close together; and then interweave the strands of the one into the alternate strands of the other, by penetrating the latter with a fid or marline spike, parallel to the axis or length of the rope. This *splice* is used on the cables, slings, block-strops, and in general all ropes which are not designed to run through blocks, or where the *splice* is not in danger of being loosened or separated.

The *long splice*, being fixed in three places, occupies a greater extent of the rope; but by the division of the joinings, the bulk is also divided into different parts of its length. Hence, it is much neater and smoother than the *short splice*, and better adapted to run through the channel of a block, &c. for which use it is generally calculated.

The *eye-splice* being intended to make a sort of eye or circle at the end of a rope, the strands are untwisted, and their extremities thrust through the three strands in that part of the said rope whereon the *splice* is to be formed, and thence passing over the surface of the second strand, they are again thrust through the third, which completes the operation.

The *cut-splice* is constructed in the same manner as the *eye-splice*; being no other than the ends of two lines fastened together, at a short distance from each other, the extremities of either being interwoven into the bight of

of the other, fo that the line becomes double in the extent of the *fplice*. This is chiefly ufed in lead-lines, log-lines, and fifhing-lines, where the *fhort-fplice* would be liable to feparation, as being frequently loofened by the water. Falconer.

SPLICE, *to*, among *Gardeners*, is to graft the top of one tree into the ftock of another, by cutting them floping, and faftening them together.

SPLINT. See SPLENT.

SPLINTERS *of the bone*, in *Fractures*: in cafes of fractures the furgeon is frequently troubled with *fplinters of the bone* in the way, which vellicate and prick the neighbouring parts, and render the proper execution of his office very difficult. If thefe *fplinters* are loofe, and have no connection with the bone, they muft be carefully lifted out of the wound; if they hang to the bone in fome part by the periofteum, that muft be cut off with the fciffars; but if they adhere pretty firmly to the neighbouring parts, and do not hinder the reduction of the bone, it is beft to replace the bone, and leave them either to loofen, and come out of themfelves by the fuppuration of the parts, or to grow again, as they fometimes will fafely and firmly do, to the reft of the bone. When they adhere pretty firmly to the principal parts of the bone, they fhould never be extracted by force, but replaced with the greateft exactnefs; for when this is properly performed, they will frequently unite to the reft of the bone.

When the points of *fplinters of bone* ftick fo far out, that they are a great hindrance to the reduction of the bone, you are diligently to confider whether you can, by any means, contrive their reunion to the bone, which may be determined, by obferving at what diftance they are from the large bone, and what quantity of flefh there is intervening: when they cannot be reduced, or reunited to the bone, they muft be removed with a pair of ftrong forceps, or, if they ftick very firmly, with a fine faw. If the *fplinters* are buried under the fkin, and cannot be got at with hands, it is proper firft to try if they can be reduced to their natural fituation; and if they cannot, an incifion muft be made through the fkin, that they may be taken out. Heifter's Surg. p. 109.

SPLIT, in *Botany*, a name given by fome authors to the great *fumaria bulbofa*, or hollow root.

SPLIT, at *Sea*; when a fail is blown to pieces, the feamen fay it is *fplit*.

SPLIT, when applied to a fhip, denotes the ftate of being ftranded and bilged on a rock or fhore.

SPLITTING. To *fplit* a thin piece of metal, as an old filver groat, place the metal on the heads of three pins ftuck up triangularly, and let a heap of flower of brimftone burn out upon it; then throwing it hard againft the floor, the upper part will feparate from the lower. Boyle's Works, abr. vol. i. p. 134.

SPODIUM, in *Pharmacy*, a kind of abforbent calx, or afhes, efteemed drying, and by fome held to have the fame virtues with coral.

The *fpodium* of the ancient Greeks was a greyifh kind of recrement, found in form of afhes, on the hearths of furnaces, wherein brafs was made; and called by them σποδιον, which literally fignifies *afhes*.

Spodium is a metalline powder, nearly akin, both in origin and ufe, to tutia and pompholyx; only it is heavier than either.

The *fpodium* of the Arabian phyficians, as Avicenna and others, was made of the burnt roots of rufhes and reeds.

Some moderns alfo make a *fpodium* of ivory burnt and calcined to a blacknefs. This is fometimes counterfeited by burning bullocks or dogs bones; but thefe are of no value.

The *anti-fpodium*, which the ancients fubftituted for their *fpodium*, was made of myrtle-leaves, galls, and fome other ingredients calcined.

SPOILS, SPOLIA, whatever is taken from an enemy in war. Among the Greeks, the *fpoils* were divided in common among the whole army; only the general's quota was the biggeft.

By the military difcipline of the Romans, the *fpoils* belonged to the republic, particular perfons had no title to them: and fuch of the generals as valued themfelves on their probity, always carried them to the public treafury. Sometimes, indeed, the pillage was diftributed, by the general among the foldiery, to encourage them, or to reward them; but this was not done without great prudence, and refervednefs; otherwife, it came under the crime of peculation.

The confuls Romulus and Veturius, were condemned for having fold the *fpoils* taken from the Æqui. Livy, lib. viii.

SPOLIARIUM, among the *ancient Romans*, the third part of the bath, ufed for undreffing and dreffing in.

Spoliarium was likewife a part of the gladiatorial fchools, where their cloths and ornaments were laid, and where the wounded and killed were carried.

SPOLIATION, in *Law*, is an injury done by one clerk or incumbent to another, in taking the fruits of his benefice without any right thereunto, but under a pretended title. It is remedied by a decree to account for the profits fo taken. This injury, when the *jus patronatus*, or right of advowfon, does not come in debate, is cognizable in the fpiritual court; as if a patron firft prefents A to a benefice, who is inftituted and inducted thereto; and then, upon pretence of a vacancy, the fame patron prefents B to the fame living; and he alfo obtains inftitution and induction. Now, if A difputes the fact of the vacancy, then that clerk who is kept out of the profits of the living, whoever he be, may fue the other in the fpiritual court for *fpoliation*, in taking the profits of his benefice. And it fhall there be tried, whether the living were, or were not vacant; upon which the validity of the fecond clerk's pretenfions muft depend. But if the right of patronage comes at all into difpute, as if one patron prefented A, and another patron prefented B, there the ecclefiaftical court hath no cognizance, provided the tithes fued for amount to a fourth part of the value of the living, but may be prohibited at the inftance of the patron, by the king's writ of INDICAVIT. So alfo if a clerk, without any colour of title, ejects another from his parfonage, this injury muft be redreffed in the temporal courts; for it depends upon no queftion determinable by the fpiritual law (as plurality of benefices or no plurality, vacancy or no vacancy) but is merely a civil injury. Blackft. Com. b. iii. p. 91.

SPONDAULA, σπονδαυλης, formed form σπονδη, *libation*, and αυλος, *flute*, in *Antiquity*, a player of the lute, or other wind-inftrument of that kind; who, during the offering of facrifice, performed fome fuitable air in the prieft's ear, to prevent his hearing any thing that might diftract him, or leffen his attention.

SPONDEE, SPONDÆUS, in the *Greek* and *Latin Profody*, a foot of verfe, confifting of two long fyllables; as *vertunt*, *divos*, *campos*.

The *fpondee* is a grave meafure: all Greek and Latin hexameters regularly end with a *fpondee*.

There are alfo *fpondaic verfes*; that is, verfes compofed wholly of *fpondees*, or, at leaft, that end with two *fpondees*; as,

Conftitit, atque oculis Phrygia agmina circumfpexit.

SPONDIAS, in *Botany*. See *Jamaica* PLUM.

SPONDYLI, Σπονδυλοι, in *Antiquity*, pellets of brafs ufed in giving fentence, before the κυαμοι, or *beans*, came into ufe.

SPONDYLOLITHOS, a name given by authors to a ftone found in the country of Tyrol, and elfewhere, refembling the vertebræ of an animal. It is in reality no other than the vertebræ of fome fea-fifh petrified, as is common with us.

SPONDYLUS, σπονδυλος, a term anciently ufed for a vertebra of the fpina dorfi.

SPONDYLUS, in *Natural Hiftory*, the name given by Da Cofta to the fecond family of bivalve SHELLS, which have unequal valves and fhut clofe: the diftinguifhing character is the hinge, which in the upper fhell confifts of a triangular hollow and cartilage in the centre, on each fide of which is a large deep cavity, and a very large thick and prominent tooth, or joint, lies on each fide of the cavity; the fummit and beak of the under valve is alfo extremely thick and ftrong, and extends from the hinge outwards, into a broad triangular flope or flat. Some of the *fpondyli* are thickly and curioufly fet with long thorns or fpikes, and called thorny oyfters; thefe, when perfect, are much valued. The fpecies of this family are not very numerous.

Lifter, Woodward, Gualtieri, Linnæus, and Meufchen, rank thefe under a particular genus, which they call *fpondylus*; but Rumphius, Argenville, Seba, and Davila, rank them as OYSTERS.

SPONGE. See SPUNGE.

SPONGIOLI, a word ufed by fome authors to exprefs the fmall button mufhrooms, which are gathered before they expand or open their heads.

SPONGIOSA, in *Anatomy*, an epithet given to feveral parts of the body, by reafon of their texture, which is porous and cavernous, like that of the fpunge: as,

SPONGIOSA *penis*, *corpora*, called alfo *corpora cavernofa*, and *nervofa*. See CAVERNOSA *corpora*.

SPONGIOSA, *offa*, of the nofe, called alfo *offa tribunata*, and *cribriformia offa*. See CRIBROSUM OS.

SPONSIO *judicialis*. See *Feigned* ISSUE.

SPONSORS. See GOD-*fathers*.

SPONSUS, one of the many names given by the chemifts to mercury.

SPONTANEOUS, SPONTANEUS, formed from the Latin adverb *fponte*, *of one's own accord*, in the *fchools*, a term applied to fuch motions of the body and mind as we perform ourfelves without any conftraint.

Thus, in morality, thofe actions performed upon an inward and natural principle, conformable to our own inclinations,

clinations, excluding all conſtraint, are called *ſpontaneous actions.*

In medicine, an evacuation, effected without any application for that purpoſe, is called a *ſpontaneous evacuation.* And a laſſitude or wearineſs, not occaſioned by any preceding fatigue, is called a *ſpontaneous wearineſs.*

SPONTANEOUS *generation.* See EQUIVOCAL *generation.*

SPONTANEOUS *precipitation.* See PRECIPITATION.

SPONTOON, in *Military Language,* is a weapon reſembling a halberd, now uſed inſtead of a half-PIKE by the officers of foot. When the *ſpontoon* is planted, the regiment halts; when pointed forwards, the regiment marches; and when pointed backwards, it retreats.

SPOON-*bill, platea,* in *Ornithology,* the name of a bird of the long necked kind, approaching to the nature of the ſtork and heron, and called the *ſpoon-bill* from the remarkable figure of its beak, which is different from that of all other birds; being broadeſt at the extremity, and terminating in a large rounded, flat proceſs, reſembling a ſhovel; or, if it were hollow, a *ſpoon.* See *Tab.* V. *of Birds,* N° 55.

This bird has been called *leucorodias* and *albardeola,* and by ſome very improperly the *pelecanus.* In the Linnæan ſyſtem, it belongs to the genus *platalea,* of the order of *grallæ*: the characters of which are, that the bill is flatted, widening towards the end, circular and flat; the feet are ſemipalmated, and have four toes. Of this genus Linnæus enumerates three ſpecies, one of which is the *platalea leucorodias,* or *ſpoon-bill.* The whole bill of this bird is of a fine ſhining black, except a bright orange-coloured ſpot juſt above the point of the upper mandible, which is a little bent downward at its extremity: at the angles of the bill, on each cheek, there is alſo a ſpot of the ſame colour; the upper ſurface of the bill is elegantly waved with dotted protuberances; a depreſſed line, extending from the noſtrils, is continued round it near its edge; its ſubſtance appears like whalebone, being thin, light, and elaſtic; the tongue is ſhort, and heart-ſhaped, and when drawn back, ſerves as a valve to cloſe the entrance of the throat; when pulled forward, it has the appearance of a triangular button; the ears are large, and placed an inch behind the angles of the mouth; the plumage of the whole body, wings, and tail is white; on the back-part of the head is a beautiful creſt of white feathers, hanging behind the neck; the legs are black, and alſo the thighs, which are naked about half their length; and the toes are connected by a ſmall web, extending to the firſt joint on each.

This bird breeds on high trees, feeds on fiſh and water-plants, and can ſwim: it inhabits the continent of Europe, South America, and the Philippine iſlands.

A flock of theſe birds migrated into the marſhes near Yarmouth in Norfolk in April, 1774. Pennant.

SPOON-*drift,* in *Sea Language,* a ſort of ſhowery ſprinkling of the ſea water, ſwept from the ſurface of the waves in a tempeſt, and flying according to the wind like a vapour.

SPOON-*wort,* in *Botany.* See SCURVY-*graſs.*

SPOONING, or SPOOMING, in the *Sea Language,* was formerly uſed to denote that movement in ſailing, which is now called SCUDDING.

SPORADES, in *Aſtronomy,* a name which the ancients gave to ſuch ſtars as were not included in any conſtellation.

Theſe the moderns more uſually call *informes,* or *extra-conſtellary ſtars.*

Many of the *ſporades* of the ancients have been ſince formed into new conſtellations, e. gr. of thoſe between Leo and Urſa major, Hevelius has formed a conſtellation, called *Leo minor*; of thoſe between *Urſa minor* and *Auriga* the ſame perſon has formed another conſtellation, called *Lynx*; and of thoſe under the tail of Urſa minor, another called *Canis venaticus,* &c.

SPORADIC, σποραδικος, formed from σποραs, *diſperſed,* of σπειρω, *I ſtrew,* &c. in *Medicine,* an epithet given to ſuch diſeaſes as have ſome ſpecial or particular cauſe, and are diſperſed here and there, affecting only particular conſtitutions, ages, &c.

Sporadic ſtands in oppoſition to EPIDEMIC diſeaſes which are thoſe ariſing from a general cauſe, and that are common to all kinds of perſons, of what complexion and quality ſoever.

SPORTS, in the *Cuſtoms* of Flanders, were in great vogue through Flanders and the Low-Countries, ſome centuries ago. Every city had a ſolemnity of this kind peculiar to itſelf: thus Bruges had that called the *Foreſter*; Valenciennes the *Prince of Pleaſantry,* and the *Prince of the Horſe-comb*; Cambray, the *King of Ribaldry*; and Bouchain, the *Provoſt of Sots.* Liſle, one of the richeſt towns in Flanders, was not behind hand with its neighbours in celebrating *ſports,* by the magnificence and diverſions whereof, to draw together a vaſt concourſe of people from all parts. One of the chief of theſe divertiſements was called *the King of the Spinet, Roy d'Epinette,* which was celebrated with a great deal of pomp and ſhew. See Hiſt. Acad. Inſcript. tom. iv. p. 452, ſeq.

SPORTULA, in *Antiquity,* a dole, or largeſs, either of meat or money, given by princes, or great men, to the people or poor.

The *ſportula* was properly the pannier, or baſket, wherein the meat was brought, or wherewith the poor went to beg it: thence the word was transferred to the meat itſelf, and thence to money ſometimes given in lieu of it.

Sportula was alſo frequently uſed in oppoſition to *recta cœna,* a formal or plentiful meal; as in Martial—*Promiſſa eſt nobis* ſportula, *recta data.*

St. Cyprian gives the denomination *ſportulantes fratres,* to ſuch clergymen as then received gifts, or gratuities, for their maintenance.

SPOT, in *Ornithology,* the name of a particular ſpecies of pigeon, called by Moore the *columba maculata.* It is of the ſize of a ſmall common pigeon, and was brought over to England from Holland. This ſpecies has always a *ſpot* upon its head, juſt above its beak, from whence it has its name. The feathers of the tail are always of the ſame colour with this *ſpot,* and the reſt of the body is all white. The *ſpot* and tail are black in ſome, red in others, and yellow in others. They look very beautiful when they ſpread their tails and fly, and are a diſtinct ſpecies, as they always produce young ones of their own marks.

SPOTS, in *Aſtronomy,* dark places obſerved on the diſks, or faces, of the ſun, moon, and planets.

The *ſpots* in the ſun are only viſible through a teleſcope: ſome diſtinguiſh them into MACULÆ, or dark *ſpots*; and FACULÆ, or bright *ſpots*; but there ſeems but little foundation for any ſuch diviſion.

The *ſolar ſpots* have not been long obſerved. They are very changeable as to number, form, &c. and are ſometimes in a multitude, and ſometimes none at all.

Some imagine they may become ſo numerous, as to hide the whole face of the ſun, at leaſt the greateſt part of it; and to this aſcribe what Plutarch tells us, viz. that in the firſt year of the reign of Auguſtus, the ſun's light was ſo faint and obſcure, that one might look ſteadily at it with the naked eye.

To which Kepler adds, that in 1547, the ſun appeared reddiſh, as when viewed through a thick miſt; and hence conjectures, that the *ſpots* in the ſun are a kind of dark ſmoke, or clouds, floating on the ſurface thereof.

Others will have them ſtars, or planets, tranſiting the body of the ſun; but it is much more probable they are opake bodies, in manner of cruſts, formed like the ſcums on the ſurface of liquors.

Dr. Derham from a variety of particulars which he has recited, relating to the ſolar *ſpots,* (ſee Phil. Tranſ. abr. vol. iv. p. 235, &c.) and their congruity to what we obſerve in our own globe, infers, that they are cauſed by the eruption of ſome new volcano therein, which, at firſt, pouring out a prodigious quantity of ſmoke, and other opake matter, cauſeth the *ſpots*: and as that fuliginous matter decays and ſpends itſelf, and the volcano at laſt becomes more torrid and flaming, ſo the *ſpots* decay and become *umbræ,* and at laſt *faculæ*; which *faculæ* he ſuppoſes to be no other than more flaming lighter parts than any other parts of the ſun.

Dr. Franklin (in his Exper. and Obſerv. p. 266.) ſuggeſts a conjecture, that the parts of the ſun's ſulphur, ſeparated by fire, riſe into the atmoſphere, and there being freed from the immediate action of the fire, they collect into cloudy maſſes, and growing, by degrees, too heavy to be longer ſupported, they deſcend to the ſun, and are burnt over again. Hence, he ſays, the *ſpots* appearing on his face, which are obſerved to diminiſh daily in ſize, their conſuming edges being of particular brightneſs.

For another ſolution of theſe phenomena, ſee MACULÆ.

The lunar ſpots are fixed: and aſtronomers reckon about forty-eight of them on the moon's face; to each whereof they have given names. The twenty-firſt is one of the moſt conſiderable, and is called *Tycho.* See *Nature,* &c. *of the* MOON.

SPOTS, *circular,* in *electricity.* See CIRCULAR *ſpots* and COLOURS.

SPOTS, *planetary.* Aſtronomers find that the planets are not without their *ſpots.* Jupiter, Mars, and Venus, when viewed through a teleſcope, ſhew ſeveral very remarkable ones: and it is by the motion of theſe *ſpots,* that we conclude the rotation of the planets round their axes, in the ſame manner as that of the ſun is deduced from the motion of his maculæ.

SPOTS, *lucid,* in *the heavens,* are little whitiſh *ſpots,* of which there are ſeveral, that appear magnified, and more luminous when ſeen through teleſcopes; and yet without any ſtars in them. One of theſe is in Andromeda's girdle, and was firſt obſerved, A. D. 1612, by Simon Marius:

Marius: it has some whitish rays near its middle, is liable to several changes, and is sometimes invisible. Another is near the ecliptic, between the head and bow of Sagittarius; it is small, but very luminous. A third is in the back of the Centaur, which is too far south to be seen in Britain. A fourth, of a smaller size, is before Antinous's right foot, having a star in it, which makes it appear more bright. A fifth is in the constellation of Hercules, between the stars ζ and η, which *spot*, though small, is visible by the bare eye, if the sky be clear and the moon absent.

SPOUT, or *water*-SPOUT, in *Natural History*, an extraordinary meteor, or appearance, at sea, and sometimes at land, very dangerous to ships, &c. oftenest observed in hot, dry weather; and called by the Latins *typho*, and *sipho*; by the French, *trompe*, *&c.*

Its first appearance is in form of a deep cloud, the upper part whereof is white, and the lower black. From the lower part of this cloud there hangs, or rather falls down, what we properly call the *spout*, in manner of a conical tube, biggest at top. Under this tube is always a great boiling and flying up of the water of the sea, as in a jet d'eau. For some yards above the surface of the sea, the water stands as a column, or pillar; from the extremity whereof it spreads, and goes off, as in a kind of smoke. Frequently the cone descends so low, as to touch the middle of this column, and continue for some time contiguous to it; though sometimes it only points to it, at some distance, either in a perpendicular, or in an oblique line. See *Tab. Nat. Hist. fig.* 15.

Frequently it is scarce distinguishable, whether the cone or the column appear the first, both appearing all of a sudden against each other. But sometimes the water boils up from the sea to a great height, without any appearance of a *spout* pointing to it, either perpendicularly or obliquely. Indeed, generally, the boiling or flying up of the water has the priority, this always preceding its being formed into a column. Generally the cone does not appear hollow till towards the end, when the sea-water is violently thrown up along its middle, as smoke up a chimney: soon after this the *spout*, or canal, breaks and disappears; the boiling up of the water, and even the pillar, continuing to the last, and for some time afterwards; sometimes till the *spout* form itself again, and appear anew; which it sometimes does several times in a quarter of an hour. See a description of several *water-spouts* by Mr. Gordon, and by Dr. Stuart, in Phil. Transf. abr. vol. iv. p. 103, &c.

M. de la Pryme, from a near observation of two or three *spouts* in Yorkshire, described in the Philosophical Transactions, N° 281, or Abr. vol. iv. p. 106, concludes, that the *water-spout* is nothing but a gyration of clouds by contrary winds meeting in a point, or centre; and there, where the greatest condensation and gravitation are, falling down into a pipe, or great tube, somewhat like Archimedes's spiral screw; and, in its working and whirling motion, absorbing and raising the water, in the same manner as the spiral screw does; and thus destroying ships, &c.

Thus, June the 21st, he observed the clouds mightily agitated above, and driven together; upon which they became very black, and were hurried round; whence proceeded a most audible whirling noise, like that ordinarily heard in a mill. Soon after there issued a long tube, or *spout*, from the centre of the congregated clouds, wherein he observed a spiral motion, like that of a screw, by which the water was raised up.

Again, August 15, 1687, the wind blowing at the same time out of the several quarters, created a great vortex and whirling among the clouds; the centre whereof every now and then dropt down, in shape of a long, thin, black pipe, wherein he could distinctly behold a motion like that of a screw, continually drawing upwards, and screwing up, as it were, wherever it touched. In its progress it moved slowly over a grove of trees, which bent under it like wands, in a circular motion. Proceeding, it tore off the thatch from a barn, bent an huge oak-tree, broke one of its greatest branches, and threw it to a great distance. He adds, that whereas it is commonly said, the water works and rises in a column, before the tube comes to touch it, this is, doubtless, a mistake, owing to the fineness and transparency of the tubes, which do most certainly touch the surface of the sea, before any considerable motion can be raised therein; but which do not become opake and visible, till after they have imbibed a considerable quantity of water.

The dissolution of *water-spouts* he ascribes to the great quantity of water they have glutted; which, by its weight, impeding their motion, whereon their force, and even existence, depends, they break, and let go their contents; which use to prove fatal to whatever is found underneath.

A notable instance hereof we have in the Philosophical Transactions (N° 363, or Abr. vol. iv. p. 108.), related by Dr. Richardson. A *spout*, in 1718, breaking on Emmotmoor, nigh Coln, in Lancashire, the country was immediately overflowed; a brook, in a few minutes, rose six feet perpendicularly high; and the ground whereon the *spout* fell, which was sixty-six feet over, was torn up to the very rock, which was no less than seven feet deep; and a deep gulf was made for above half a mile; the earth being raised on either side in vast heaps. See a description and figure of a *water-spout*, with an attempt to account for it in Franklin's Exp. and Obs. p. 226, &c.

Signior Beccaria has taken pains to show that *water-spouts* have an electrical origin. To make this more evident, he first describes the circumstances attending their appearance, which are the following.

They generally appear in calm weather. The sea seems to boil, and send up a smoke under them, rising in a hill towards the *spout*. At the same time, persons who have been near them have heard a rumbling noise. The form of a *water-spout* is that of a speaking-trumpet, the wider end being in the clouds, and the narrower end towards the sea. The size is various, even in the same *spout*. The colour is sometimes inclining to white, and sometimes to black. Their position is sometimes perpendicular to the sea, sometimes oblique; and sometimes the *spout* itself is in the form of a curve. Their continuance is very various, some disappearing as soon as formed, and some continuing a considerable time. One that he had heard of continued a whole hour. But they often vanish, and presently appear again in the same place.

The very same things that *water-spouts* are at sea are some kinds of whirlwinds and hurricanes by land. They have been known to tear up trees, to throw down buildings, make caverns in the earth; and, in all these cases, to scatter earth, bricks, stones, timber, &c. to a great distance in every direction. Great quantities of water have been left, or raised by them, so as to make a kind of deluge; and they have always been attended with a prodigious rumbling noise.

That these phenomena depend upon electricity cannot but appear very probable from the nature of several of them; but the conjecture is made more probable from the following additional circumstances. They generally appear in months peculiarly subject to thunder-storms, and are commonly preceded, accompanied, or followed by lightning, rain, or hail; the previous state of the air being similar. Whitish or yellowish flashes of light have sometimes been seen moving with prodigious swiftness about them. And, lastly, the manner in which they terminate exactly resembles what might be expected from the prolongation of one of the uniform protuberances of electrified clouds, mentioned before, towards the sea; the water and the cloud mutually attracting one another: for they suddenly contract themselves, and disperse almost at once; the cloud rising, and the water of the sea under it falling to its level. But the most remarkable circumstance, and the most favourable to the supposition of their depending upon electricity is, that they have been dispersed by presenting to them sharp-pointed knives or swords. This, at least, is the constant practice of mariners, in many parts of the world where these *water-spouts* abound; and he was assured by several of them, that the method has often been undoubtedly effectual.

The analogy between the phenomena of *water-spouts* and electricity, he says, may be made visible, by hanging a drop of water to a wire communicating with the prime conductor, and placing a vessel of water under it. In these circumstances, the drop assumes all the various appearances of a *water-spout*, both in its rise, form, and manner of disappearing. Nothing is wanting but the smoke, which may require a great force of electricity to come visible.

Mr. Wilcke also considers the *water-spout* as a kind of great electrical cone, raised between the cloud strongly electrified, and the sea or the earth, and he relates a very remarkable appearance which occurred to himself, and which strongly confirms his supposition. On the 20th of July, 1758, at three o'clock in the afternoon, he observed a great quantity of dust rising from the ground, and covering a field, and part of the town in which he then was. There was no wind, and the dust moved gently towards the east, where appeared a great black cloud, which, when it was near his zenith, electrified his apparatus positively, and to as great a degree as ever he had observed it to be done by natural electricity. This cloud passed his zenith, and went gradually towards the west, the dust then following it, and continuing to rise higher and higher till it composed a thick pillar, in the form of a sugar-loaf, and at length seemed to be in contact with the cloud. At some distance from this, there came, in the same path, another great cloud, together with a long

long ftream of fmaller clouds, moving fafter than the preceding. Thefe clouds electrified his apparatus negatively, and when they came near the pofitive cloud, a flafh of lightning was feen to dart through the cloud of duft, the pofitive cloud, the large negative cloud, and as far as the eye could diftinguifh, the whole train of fmaller negative clouds which followed it. Upon this, the negative clouds fpread very much, and diffolved in rain, and the air was prefently clear of all the duft. The whole appearance lafted not above half an hour. See Prieftley's Electr. vol. i. p. 438, &c.

This theory of *water-fpouts* has been farther confirmed by the account which Mr. Forfter gives of one of them, in his Voyage round the World, vol. i. p. 191, &c. On the coaft of New Zealand, he had an opportunity of obferving feveral, one of which he has particularly defcribed. The water, he fays, in a fpace of fifty or fixty fathoms, moved towards the centre, and there rifing into vapour, by the force of the whirling motion, afcended in a fpiral form towards the clouds. Directly over the whirlpool, or agitated fpot in the fea, a cloud gradually tapered into a long flender tube, which feemed to defcend to meet the rifing fpiral, and foon united with it into a ftraight column of a cylindrical form. The water was hurled upwards with the greateft violence in a fpiral, and appeared to leave a hollow fpace in the centre; fo that the water feemed to form a hollow tube, inftead of a folid column; and that this was the cafe, was rendered ftill more probable by the colour, which was exactly like that of any hollow glafs tube. After fome time, this laft column was incurvated, and broke like the others; and the appearance of a flafh of lightning which attended its disjunction, as well as the hail-ftones which fell at the time, feemed plainly to indicate, that *water-fpouts* either owe their formation to the electric matter, or, at leaft, that they have fome connection with it.

In Pliny's time, the feamen ufed to pour vinegar into the fea, to affwage and lay the *fpout*, when it approached them: our modern feamen think to keep it off, by making a noife with filing and fcratching violently on the deck; or by difcharging great guns to difperfe it.

SPOUTING *fountain*. See FOUNTAIN.

SPRAIN. See STRAIN.

SPRAINTS, among *Sportfmen*, a term ufed for the dung of the otter.

SPRAT, in *Ichthyology*, a fpecies of the CLUPEA, with the lower jaw the longeft, and the belly very acute, and the dorfal fin confifting of thirteen rays.

The *fprat*, or *clupea fprattus* of Linnæus, has generally, but erroneoufly, been fuppofed a herring not grown to its full fize; its ufual length is about four or five inches, and the body much deeper than that of a young herring of equal length; the back fin is placed more remote from the nofe than that of the herring: but one great diftinction between this fifh, the herring, and the pilchard is the belly; that of the two firft being quite fmooth, that of the laft very ftrongly ferrated; and another is, that the herring has fifty-fix vertebræ, this only forty-eight. Befides, *fprats* vifit our coafts, and continue with us in large fhoals, when the others, in general, have retired to the great northern deeps. They come into the river Thames, below bridge, in the beginning of November, and leave it in March, and are, during their feafon, a great relief to the poor of the capital. At Gravefend and at Yarmouth they are cured like red herrings; they are fometimes pickled, and are little inferior in flavour to the anchovy, but the bone will not diffolve like thofe of the latter. Pennant.

SPRAY, in *Sea Language*, denotes the fprinkling of the fea, which is driven from the top of a wave in ftormy weather. It differs from SPOON-*drift*, as being only blown occafionally from the broken furface of a high wave, whereas the latter continues to fly horizontally along the fea, without intermiffion, during the excefs of a tempeft or hurricane. Falconer.

SPRING, *fons*, in *Natural Hiftory*, a fountain, or fource of water, rifing out of the ground.

The origin of *fprings*, or fountains, is a thing much controverted among our late naturalifts. Meff. Mariotte and Perrault afcribe them to rain: their doctrine is, that the rain-water penetrates the earth till fuch time as it meets a clayey foil, or ftratum; which proving a fufficient folid bottom to fuftain and ftop its defcent, it glides along it that way to which the earth declines, till meeting with a place, or aperture, on the furface, through which it may efcape, it forms the head of a river.

Now, that the rain is fufficient for this effect, appears hence; that, upon calculating the quantity of rain and fnow which falls yearly on the tract of ground that is to furnifh, for inftance, the water of the Seine, it is found that river does not take up above one-fixth part of it.

Springs ordinarily arife at the bottom of mountains: the reafon, fay they, is, that mountains collect the moft waters, and give them the greateft defcent the fame way; and that, if we fometimes fee *fprings* on high grounds, and even on the tops of mountains, they muft be brought from other remoter places, confiderably higher, along beds of clay, or clayey ground, as in their natural channels. If, then, there happen to be a valley between a mountain on whofe top is a *fpring*, and the mountain that is to furnifh it with water, the *fpring* muft be looked on as water conducted from a refervoir of a certain height, through a fubterraneous channel, to make a jet of an equal, or fomewhat lefs, height.

This theory M. de la Hire has taken under examination, in its moft effential article, and that where the authors feem to have been the leaft diftruftful. He has endeavoured to find, by experiment, whether rain or fnow-water could penetrate the earth as low as the clayey ftratum: the refult of his inquiry is, that they do not penetrate even fixteen inches deep, in a quantity fufficient to form the fmalleft collection of water on a folid bottom. Nay, this he found when the earth he made his experiment on, was quite naked of all herbs and plants; but as foon as ever any of thefe came up, and were grown to any bulk, fo far was the rain that fell from being able to gather itfelf at the depth of fixteen inches, that it was not fufficient even to feed the plants, but there was a neceffity for watering them. For the quantity of water expended in the ordinary fort of plants, fee *Food of* PLANTS.

Dr. Halley refers the origin of *fprings* merely to vapours raifed by the heat of the fun, or of fubterraneous fires, from the fea, lakes, rivers, &c.

Now, to fhew that vapour is a fufficient fund to fupply all our *fprings*, rivers, &c. the fame excellent author makes an eftimate of the quantity of vapour raifed from the fea, by the action of the fun: for the refult of which, fee EVAPORATION.

Yet the quantity of water thus raifed, great as it is, is only the remains of what is raifed another way; viz. by the winds, which fometimes fweep the water off much fafter than the fun takes it up.

To find, now, the quantity of water the Mediterranean receives, allow the moft confiderable rivers it receives; viz. the Iberus, Rhone, Tyber, Po, Danube, Neifter, Borifthenes, Tanais, and the Nile; each to furnifh ten times as much water as the Thames; not that any of them are in reality fo great, but fo to allow for the leffer rivulets; but the Thames is found, by calculation, to evacuate 20,300,000 tuns of water daily. All the nine rivers above mentioned, therefore, will only evacuate 1827 millions of tuns in a day; which is little more than a third of what is raifed in that time in vapour. Phil. Tranf. N° 189, or Abr. vol. ii. p. 110.

The prodigious quantity of water remaining, Dr. Halley allows to rains, which fall again into the feas, and for the purpofes of vegetation, &c. As to the manner in which this water is collected, fo as to form refervoirs for the different kinds of *fprings*, it feems to be this: the tops of mountains, in general, abound with cavities and fubterraneous caverns, formed by nature to ferve as refervoirs; and their pointed fummits, which feem to pierce the clouds, ftop thofe vapours which fluctuate in the atmofphere, and being condenfed thereby, they precipitate in water, and by their gravity eafily penetrate through beds of fand and lighter earth, till they are ftopped in their defcent by more denfe ftrata, as beds of clay, ftone, &c. where they form a bafon or cavern, and work a paffage horizontally, and iffue out at the fides of the mountains. Many of thefe *fprings* difcharge water, which running down between the ridges of hills, unite their ftreams, and form rivulets or brooks; and many of thefe uniting again on the plain, become a RIVER.

After all that can be faid in favour both of rain and vapour, it muft be owned, they are both ftill incumbered with great difficulties.

The perpetuity of divers fprings, always yielding the fame quantity of water, when the leaft rain or vapour is afforded as well as the greateft, is a ftrong objection to both. Dr. Derham mentions one in his own parifh of Upminfter, which he could never perceive by his eye to be diminifhed in the greateft droughts, even when all the ponds in the country, as well as an adjoining brook, had been dry for feveral months together; nor ever to be increafed in the moft rainy feafons, excepting perhaps for a few hours, or at moft for a day, from fudden and violent rains. Had this *fpring* its origin from rain or vapour, there would be found an increafe and decreafe of its water correfponding to thofe of its caufes; as we actually find in fuch temporary *fprings* as have undoubtedly their rife from rain and va-

pour: add to this, another considerable thing in this Upminster *spring*, and thousands of others; viz. that it breaks out of so inconsiderable an hillock, or eminence, as can have no more influence in the condensation of the vapours, or stopping the clouds, than the lower lands about it have. The very highest ground in the country he finds is not above a hundred and thirty-three yards above the level of the sea; and what is such an inconsiderable rise of land, to a perennial condensation of vapours, fit to afford so considerable a *spring?* or the high lands of the whole country, to the maintaining all its fountains and rivulets?

Other naturalists, therefore, have recourse to the sea, and derive the origin of *springs* immediately thence; but how the sea-water should be raised up to the surface of our earth, and even to the tops of the mountains, is a difficulty, in the solution of which they cannot agree. Some fancy a kind of hollow subterranean rocks to receive the watery vapours raised from channels communicating with the sea, by means of an internal fire, and to act the part of alembics, in freeing them from their saline particles, as well as condensing and converting them into water. This kind of subterranean laboratory, serving for the distillation of sea-water, was the invention of Descartes. Princip. part. iv. § 64. Others, as M. de la Hire (Mem. de l'Acad. an. 1703.) &c. set aside the necessity of alembics, and think it enough that there be large subterranean reservoirs of water at the height of the sea, whence the warmth of the bottom of the earth, or even the central fire (if there be such a thing), may raise vapours; which, pervading not only the intervals and fissures of the strata, but the bodies of the strata themselves, at length arrive near the surface; where, being condensed by the cold, they glide along on the first bed of clay they meet withal, until an aperture in the ground lets them out. M. de la Hire adds, that the salts of stones and minerals may contribute to the detaining and fixing the vapours, and converting them into water. But we have a still more natural and easy way of exhibiting the rise of the sea-water up into mountains, &c. by putting a little heap of sand, ashes, a loaf of bread, or the like, into a bason of water; in which case the sand, &c. will represent the dry land, or an island; and the bason of water, the sea about it. Here the water in the bason will rise to or near the top of the heap, in the same manner, and from the same principle, as the waters of the sea, lakes, &c. rise in the hills. The principle of ascent in both is accordingly supposed to be the same with that of the ascent of liquids in capillary tubes, or between contiguous planes, or in a tube filled with ashes; all which are now generally accounted for from the doctrine of attraction. See RIVER.

Against this last theory, M. Perrault and others have urged several unanswerable objections. It supposes a variety of subterranean passages and caverns, communicating with the sea, and a complicated apparatus of alembics, heat and cold, &c. of the existence of which we have no sufficient proof. Besides, the water that is supposed to ascend from the depths of the sea, or from subterranean canals proceeding from it, through the porous parts of the earth, as it rises in capillary tubes, ascends to no great height, and in much too small a quantity to furnish *springs* with water, as M. Perrault has sufficiently shewn. And though the sand and earth through which the water ascends may acquire some saline particles from it, they are nevertheless incapable of rendering it so fresh as the water of our fountains is generally found to be. Not to add, that in process of time the saline particles of which the water is deprived, either by subterranean distillation or filtration, must clog and obstruct those canals and alembics, by which it is supposed to be conveyed to our *springs*, and the sea must likewise gradually lose a considerable quantity of its salt.

SPRINGS, *different sorts of*. *Springs* are either such as run continually, called *perennial*; or such as run only for a time, and at certain seasons of the year, and therefore called *temporary springs*. Others, again, are called *intermitting springs*, because they flow and then stop, and flow and stop again; and *reciprocrating springs*, whose waters rise and fall, or flow and ebb, by regular intervals. In order to account for these differences in *springs*, let ABCDE (*Tab.* VI. *Hydrostatics*, *fig.* 70.) represent the declivity of a hill, along which the rain descends; passing through the fissures or channels BF, CG, DH, and LK, into the cavity or reservoir FGHKMI; from this cavity let there be a narrow drain or duct KE, which discharges the water at E. As the capacity of the reservoir is supposed to be large in proportion to that of the drain, it will furnish a constant supply of water to the spring at E. But if the reservoir FGHKMI be small, and the drain large, the water contained in the former, unless it is supplied by rain, will be wholly discharged by the latter, and the *spring* will become dry; and so it will continue, even though it rains, till the water has had time to penetrate through the earth, or to pass through the channels into the reservoir; and the time necessary for furnishing a new supply to the drain KE, will depend on the size of the fissures, the nature of the soil, and the depth of the cavity with which it communicates. Hence it may happen, that the *spring* at E may remain dry for a considerable time, and even whilst it rains; but when the water has found its way into the cavity of the hill, the *spring* will begin to run. *Springs* of this kind, it is evident, may be dry in wet weather, especially if the duct KE is not exactly level with the bottom of the cavity in the hill, and discharge water in dry weather; and the intermissions of the *spring* may continue for several days. But if we suppose XOP to represent another cavity, supplied with water by the channel NO, as well as by fissures and clefts in the rock, and by the draining of the adjacent earth; and another channel STV, communicating with the bottom of it at S, ascending to T, and terminating on the surface at V, in the form of a SIPHON; this disposition of the internal cavities of the earth, which we may reasonably suppose that nature has formed in a variety of places, will serve to explain the principle of *reciprocating springs*. For it is plain, that the cavity XOP must be supplied with water to the height QPT, before it can pass over the bend of the channel at T, and then it will flow through the longer leg of the siphon TV, and be discharged at the end V, which is lower than S. Now if the channel STV be considerably larger than NO, by which the water is principally conveyed into the reservoir XOP, the reservoir will be emptied of its water by the siphon, and when the water descends below its orifice S, the air will drive the remaining water out of the crooked channel STV and the *spring* will cease to flow. But in time the water in the reservoir will again rise to the height QPT, and be discharged at V as before. It is easy to conceive, that the diameters of the channels NO and STV may be so proportioned to one another, as to afford an intermission and renewal of the *spring* V at regular intervals. Thus, if NO communicates with a well supplied by the tide, during the time of flow, the quantity of water conveyed by it into the cavity XOP, may be sufficient to fill it up to QPT; and STV may be of such a size as to empty it, during the time of ebb. It is easy to apply this reasoning to more complicated cases, where several reservoirs and siphons, communicating with each other, may supply *springs*, with circumstances of greater variety. See Muschenbroek's Introd. ad Phil. Nat. tom. ii. p. 1010. Desag. Exp. Phil. vol. ii. p. 173, &c.

We shall here observe, that Desaguliers calls those *reciprocrating springs* which flow constantly, but with a stream subject to increase and decrease, and thus he distinguishes them from *intermitting springs*, which flow or stop alternately.

It is said that in the diocese of Paderborn, in Westphalia, there is a *spring* which disappears twice in twenty-four hours, and always returns at the end of six hours with a great noise, and with so much force, as to turn three mills not far from its source. It is called the *bolderborn*, or boisterous spring. Phil. Trans. N° 7. p. 127.

There are many *springs* of an extraordinary nature in our own country, which it is needless to recite, as they are explicable by the general principles already illustrated.

SPRINGS, *burning*, or *boiling*. The *burning-spring* near Grenoble, in Dauphiné, is famous. St. Augustin speaks of it as extinguishing lamps which are lighted, and lighting those which are extinct. But it is now cold like others; only near it is a spot of ground, which still emits a light flame; over which some imagine it might anciently have passed. August. de Civ. Dei, lib. xxi. cap. 7, & 11. Mem. Acad. Inscript. tom. ix. p. 565. Mem. Acad. Scienc. an. 1699. p. 26.

At Bosely, near Wenlock, in Shropshire, there is a famous boiling well, which was discovered in June, 1711, by an uncommon noise in the night, so great, that it awakened several people, who being desirous to find what it was owing to, at length found a boggy place under a little hill, not far from the Severn; and perceiving a great shaking of the earth, and a little boiling up of water through the grass, they took a spade, and digging up some part of the earth, the water flew to a great height, and was set on fire by a candle. This water was for some time afterwards constantly found to take fire, and burn like spirit of wine; and after it was set on fire, it would boil the water in a vessel sooner than any artificial fire, and yet the *spring* itself was as cold as any whatever. Phil. Trans. N° 334.

This well was at length lost for many years, and not recovered till May, 1746, when by a rumbling noise under ground, like to what the former well made, it was hit upon again, though in a lower situation, and thirty yards nearer the river.

The well is four or five feet deep, and six or seven wide; within that is another less hole of like depth, dug in the clay, in the bottom whereof is placed a cylindric earthen vessel, of about four or five inches diameter at the mouth, having the bottom taken off, and the sides well fixed in the clay, rammed close about it. Within the pot is a brown water, thick as puddle, continually forced up by a violent motion, beyond that of boiling water, and a rumbling hollow noise, rising and falling by fits five or six inches. It may be fired by a candle at a quarter of a yard distance; and it darts and flashes in a violent manner, about half a yard high. It has been left burning forty-eight hours, without any sensible diminution. It may be extinguished by putting a wet mop upon it, which must be kept there a small time. On the removal of the mop there succeeds a sulphureous smoke, lasting about a minute, and yet the water is very cold to the touch. Phil. Trans. N° 482. sect. 6.

SPRING, *lancarim*. See LANCARIM.

SPRINGS, *medicinal*. See WATER.

SPRING, *Ver*, in *Cosmography*, denotes one of the seasons of the year; commencing, in the northern parts of the world, on the day the sun enters the first degree of Aries, which is about the twenty-first day of March, and ending when the sun leaves Gemini.

Or, more strictly and generally, the *spring* begins on the day when the distance of the sun's meridian altitude from the zenith, being on the increasing hand, is at a medium between the greatest and least. The end of the *spring* coincides with the beginning of summer.

SPRING, *elater*, in *Physics*, denotes a natural faculty, or endeavour, of certain bodies, to return to their first state, after having been violently put out of the same by compressing, bending them, or the like.

This faculty philosophers usually call *elastic force*, or ELASTICITY.

Fleas only jump to those excessive heights, by means of a *springy* membrane, easily visible by a microscope; and whereof we have a curious figure in Dr. Hook's Micrography. By the elastic force of this *spring* they are enabled to leap two hundred times the height of their own body. See FLEA.

Nature has provided for the regular sowing of the seeds of several kinds of plants, by furnishing them with a *spring*, which is wound sometimes round the outside, and sometimes round the inside, of the case wherein the seeds are contained. See SEMINATION.

SPRING, in *Mechanics*, is used to signify a body of any shape, perfectly elastic.

SPRING, *elasticity of a*. See ELASTICITY.

SPRING, *length of a*, may, according to its etymology, signify the length of any elastic body, but it is particularly used by Dr. Jurin to signify the greatest length to which a *spring* can be forced inwards, or drawn outwards, without prejudice to its elasticity. He observes this would be the whole length, were the *spring* considered as a mathematical line; but in a material *spring*, is the difference between the whole length, when the *spring* is in its natural situation, or the situation it will rest in when not disturbed by any external force, and the length or space it takes up when wholly compressed and closed, or when drawn out.

SPRING, *strength*, or *force of a*, is used for the least force or weight, which, when the *spring* is wholly compressed or closed, will restrain it from unbending itself. Hence also the force of a *spring* bent, or partly closed, is used for the least force or weight, which, when the *spring* is bent through any space less than its whole length, will confine it to the state it is then in, without suffering it to unbend any farther.

The theory of *springs* is founded on this principle, *ut tensio, sic vis*; that is, if a *spring* be forced or bent inwards, or drawn outwards, or any way removed from its natural situation, its resistance is proportional to the space by which it is removed from that situation.

This principle was verified by the experiments of Dr. Hook, and since him by those of others, particularly by the accurate hand of Mr. George Graham. Lectures De Potentia Restitutiva, 1678.

For the better intelligence of this principle, on which the whole theory of *springs* depends, suppose a *spring* (*Tab.* VI. *Mechanics*, *fig.* 110.) CL, resting with the end L against any immoveable support, but otherwise lying in its natural situation, and at full liberty; then if this *spring* be pressed inwards by any force p, or from C towards L, through the space of one inch, and can be there detained by that force p, the resistance of the *spring*, and the force p, exactly counterbalancing one another; then will the force $2p$ bend the *spring* through the space of two inches, $3p$ through three inches, $4p$ through four inches, &c. The space Cl (*fig.* 111.) through which the *spring* is bent, or by which its end C is removed from its natural situation, being always proportional to the force which will bend it so far, and will detain it so bent.

And if one end L be fastened to an immoveable support, (*fig.* 112.) and the other end C be drawn outwards to l, and be there detained from returning back by any force p, the space Cl, through which it is so drawn outwards, will be always proportional to the force p, which is able to detain it in that situation.

And the same principle holds in all cases, where the *spring* is of any form whatsoever, and is in any manner whatsoever forcibly removed from its natural situation.

It may be here observed, that the *spring*, or elastic force of the air, is a power of a different nature, and governed by different laws from that of a material *spring*. For supposing the line LC (*fig.* 110.) to represent a cylindrical volume of air, which by compression is reduced to Ll, (*fig.* 111.) or by dilatation is extended to Ll, (*fig.* 112.) its elastic force will be reciprocally as Ll; whereas the force, or resistance of a *spring*, will be directly as Cl.

This principle being premised, Dr. Jurin gives us a general theorem concerning the action of a body striking on one end of a *spring*, while the other end is supposed to rest against an immoveable support. And lest any objection should be formed against the possibility of an immoveable support, since any body, how great soever, may be removed out of its place by the least force, he observes, that the objection may be easily removed. Thus, if the *spring* LM (*fig.* 113.) be supposed continued to N, so that $LN = LM$, if a body M, with any velocity in the direction ML, strikes one end of the *spring*, and a body N, at the same time, with an equal velocity, and a contrary direction NL, strikes the other end N of the continued *spring*, the point L, the end of the first supposed *spring*, will be immoveable.

Theorem. If a *spring* of the strength P, and the length CL, (*fig.* 114.) lying at full liberty upon an horizontal plane, rest with one end L against an immoveable support; and a body of the weight M, moving with the velocity V, in the direction of the axis of the *spring*, strike directly on the other end C, and thereby force the *spring* inwards, or bend it through any space CB; and a middle proportional CG be taken between the line $CL \times \frac{M}{P}$, and $2a$, a being the height to which a heavy body would ascend in vacuo, with the velocity V; and upon the radius $R = CG$ be erected the quadrant of a circle GFA: then,

1. When the *spring* is bent through any right sine of that quadrant, as CB, the velocity v of the body M is to the original velocity V, as the cosine to the radius; that is, $v = V \times \frac{BF}{R}$.

2. The time t of bending the *spring* through the same sine CB, is to T, the time of a heavy body's ascending in vacuo with the velocity V, as the corresponding arch to $2a$; that is, $t = T \times \frac{GF}{2a}$.

The doctor gives a demonstration of this theorem, and deduces a great many curious corollaries from it. These he divides into three classes. The first contains such corollaries as are of more particular use when the *spring* is wholly closed, before the motion of the body ceases.

The second comprehends those relating to the case, when the motion of the body ceases before the *spring* is wholly closed. And

The third, in case the motion of the body ceases at the instant that the *spring* is wholly closed.

We shall mention some of the last class, as the most simple; having first premised, that P = strength of the *spring*, L = its length, V = the initial velocity of the body closing the *spring*, M = its mass, t = time spent by the body in closing the *spring*, A = height from which a heavy body will fall in vacuo in a second of time a = the height to which a body would ascend in vacuo with the velocity V, C = the velocity gained by the fall, m = the circumference of a circle, whose diameter is 1. Then,

1. If the motion of the body striking the *spring* cease, when it is wholly closed, the initial velocity V is equal to $C\sqrt{\frac{PL}{2MA}}$.

2. The

2. The initial velocity V is proportional to $\sqrt{\frac{PL}{M}}$.

3. If PL be given, either in the ſame or in different *ſprings*, the initial velocity V is reciprocally as $\sqrt{M}$.

4. The product of the initial velocity, and the time ſpent in cloſing the *ſpring*, or V*t* is equal to $1'' \times \frac{mCL}{4A}$; and is proportional to L, the length of the *ſpring*.

5. The initial quantity of motion, or MV, is equal to $C\sqrt{\frac{PLM}{2A}}$.

6. MV is proportional to $\sqrt{PLM}$, or to P*t*. And if PL be given, either in the ſame or different *ſprings*, MV is as $\sqrt{M}$.

7. If $\frac{P}{L}$ be given, either in the ſame or in different *ſprings*, the initial quantity of motion is as the length of the *ſpring* into the time of bending it.

8. If a quantity of motion MV bend a *ſpring* through its whole length, and be conſumed thereby, no other quantity of motion equal to the former, as $nM \times \frac{V}{n}$, will cloſe the ſame *ſpring*, and be wholly conſumed thereby.

9. But a quantity of motion, leſs or greater than MV, in any given ratio, may cloſe the ſame *ſpring*, and be wholly conſumed in cloſing it; and the time ſpent in cloſing the *ſpring* will be reſpectively leſs or greater, in the ſame given ratio.

10. The initial *vis viva*, or MV^2, is equal to $\frac{C^2PL}{2A}$; and $2aM = PL$.

11. The initial *vis viva* is as the rectangle under the ſtrength and length of the *ſpring*; that is, MVV is as PL.

12. If $\frac{P}{L}$ be given, the initial *vis viva* is as P^2, or as L^2.

13. If the *vis viva* MV^2 bend a *ſpring* through its whole length; and be conſumed in cloſing it; any other *vis viva*, equal to the former, as $nnM \times \frac{V^2}{nn}$, will cloſe the ſame *ſpring*, and be conſumed thereby.

14. But the time of cloſing the *ſpring* by the *vis viva* $nnM \times \frac{V^2}{nn}$ will be to the time of cloſing it by the *vis viva* MV^2, as *n* to 1.

15. If the *vis viva* MV^2 be wholly conſumed in cloſing a *ſpring* of the ſtrength P, and length L; then the *vis viva* $nnMV^2$ will be ſufficient to cloſe, 1. Either a *ſpring* of the ſtrength *nn*P, and length L. 2. Or a *ſpring* of the ſtrength *n*P, and length *n*L. 3. Or of the ſtrength P, and length *nn*L. 4. Or if *n* be a whole number, the number *nn* of *ſprings*, each of the ſtrength P, and length L, one after another. We may add, that it appears from hence, that the number of ſimilar and equal *ſprings* a given body in motion can wholly cloſe, is always proportional to the ſquares of the velocity of that body. And it is from this principle that the chief argument, to prove the force of a body in motion to be as the ſquare of its velocity, is deduced. See FORCE.

The theorem above mentioned, and its corollaries, will hold equally, if the *ſpring* be ſuppoſed to have been at firſt bent through a certain ſpace, and by unbending itſelf, to preſs upon a body at reſt, and thereby to drive that body before it, during the time of its expanſion: only V, inſtead of being the initial velocity with which the body ſtruck the *ſpring*, will now be the final velocity with which the body parts from the *ſpring* when totally expanded.

It is alſo to be obſerved, that the theorem, &c. will hold equally good, if the *ſpring*, inſtead of being preſſed inward, be drawn outwards by the action of the body. The like may be ſaid, if the *ſpring* be ſuppoſed to have been already drawn outwards to a certain length, and in reſtoring itſelf draw the body after it. And laſtly, the theorem extends to a *ſpring* of any form whatever, provided L be the greateſt length it can be extended to from its natural ſituation, and P the force which will confine it to that length. See Phil. Tranſ. N° 472. ſect. 10. or vol. xliii. art. 10.

SPRING is more particularly uſed, in the *Mechanic Arts*, for a piece of tempered ſteel, put into ſeveral machines to give them motion, by the endeavour it makes to unbend itſelf.

In watches it is a fine piece of well-beaten ſteel, coiled up in a cylindrical caſe, or frame; which by ſtretching itſelf forth, puts the wheels, and the whole movement, in motion. See FUSEE, and WATCH.

The *ſpring* of a watch is prepared by forming a very thin plate of ſteel into a double ring, bending it round with wire, and putting it into a proper furnace, in order to give it a ſuitable degree of heat. When that is acquired, it is taken out, and dropped into a kettle of oil, or warm mutton ſuet, in conſequence of which proceſs it poſſeſſes a degree of hardneſs, very little inferior to that of glaſs. After this it is reduced or let down, if the ſteel be of a proper kind for the purpoſe, to a fine violet or blue colour; in which ſtate it becomes exceedingly elaſtic, inſomuch that to make it ſtand bent, it muſt be brought into a very acute curve; nor can it eaſily be brought by twiſting horizontally, to alter its form, without endangering its being broken to pieces. But as it afterwards requires to be planiſhed by the hammer, filed and poliſhed, it is again deprived in a conſiderable degree of its elaſticity; and, therefore, when it has received its laſt poliſh, it muſt again be blued upon a braſs plate over a lamp, by which means its former elaſticity is perfectly reſtored. Dr. Hook, in his Micrographia, ſays, that this blue covering is owing to the fine ſulphur, preſſed through the pores by heat, and fixed by the ambient air in a fine vitrified lamina upon the ſurface. See STEEL.

The *ſpring* of a lock, piſtol, or the like, is a piece of ſteel violently bent, which beats back the bolt, or ſtrikes down the cock, when ſet at liberty.

SPRING-*arbor*, in a *Watch*, that part in the middle of the *ſpring*-box, about which the *ſpring* is wound or turned, and to which it is hooked at one end.

SPRING-*box*, in a *Watch*, the cylindrical caſe, or frame, that contains within it the *ſpring* of the watch.

SPRING-*compaſſes*. See COMPASSES.

SPRING *of the air*, or its elaſtic force. See AIR, and ELASTICITY.

SPRING, in a *Ship*, is a rope paſſed out of one extremity of a ſhip, and attached to a cable proceeding from the other, when ſhe lies at anchor. It is uſually performed to bring the ſhip's broadſide, or battery of cannon, to bear upon ſome diſtant object; as another ſhip, or a fortreſs on the coaſt, &c.

SPRING is likewiſe a rope reaching diagonally from the ſtern of a ſhip to the head of another which lies alongſide or abreaſt of her, at a ſhort diſtance. This is generally performed to make one of the ſhips ſheer off to a greater diſtance from the other; or to make merchant-ſhips lie uniformly in the ſame tier. *Springs* of this ſort are, therefore, occaſionally applied from a ſhip to a wharf or key, for the ſame purpoſe. Falconer.

To SPRING *a leak*. See LEAK.

To SPRING *the luff*. See LOOF.

SPRING *a maſt*. See MAST.

SPRING-*tide* is the increaſing of a tide after a dead neap: or, the periodical exceſs of the elevation and depreſſion of the TIDE.

SPRINGER, in *Ichthyology*, a name given by authors to the GRAMPUS.

SPRINGES, a ſort of horſehair nooſes, made ſo as to run very eaſy, and planted in the places where birds run in ſome particular path, to take them as they paſs.

Thoſe birds that frequent the waters, or love to paddle and feed in wet and plaſhy places, are the moſt eaſily taken by theſe *ſnares*.

The ſportſmen who would uſe them to advantage, muſt firſt carefully ſearch out the haunts and places where the fowls come in flocks, or in couples, and feed in the morning and evening hours. The furrows and water-tracks in theſe places are principally to be regarded; and whereever the ſeveral furrows, or water-courſes, meet in one, and afterwards divide into ſeveral others, theſe places are to be remarked above the reſt: the places which have moſt marks of the birds feet, give alſo the ſureſt of all proofs, that they are well frequented. When theſe places are found, there ſhould be placed a number of ſmall and ſhort ſticks croſs-wiſe overthwart all the other paſſages, one ſtick being placed about half an inch from another, and making together a kind of fence, guarding every way, except that one through which it is intended the fowls ſhould paſs. This being done, a good ſtiff ſtick is to be provided, cut flat on each ſide; both ends of this ſtick are to be planted under water, ſo that the upper part of the flat ſide may only be upon a level with the ſurface; then a bow is to be made of a hazel, or willow, in the form of a pear, broad and round at one end, and narrow at the other, and at leaſt a foot long, and five or ſix inches wide; at the narrow end of this there is to be a nick or dent. Then a ſtiff young grown plant of hazel, elm, or withy, is to be choſen, being buſhy and clear, and without knots, three or four inches about at the bottom, and about an inch at the top. Having

ing made the bottom end of this ſharp, at the top of it there muſt be faſtened a very ſtrong loop, made of about a hundred horſe-hairs, platted very faſt together with ſtrong packthread, and made to ſlip any way with great eaſe. This nooſe or loop ſhould be juſt of the dimenſions of the pear-faſhioned hoop before mentioned. Then hard by this loop, and within an inch of the end of the plant, there is to be faſtened with ſtrong horſe-hair a broad and thin trigger, made ſharp at both ends. Then the bigger ſharp end of the plant being made faſt in the ground, juſt by the edge of the water, the ſmaller end, with the loop and the trigger, muſt be brought down juſt to the firſt bridge; and the pear-faſhioned hoop being ſet upon the bridge, one end of the trigger muſt be ſet upon the nick in the hoop, and the other end on the nick made on the ſmall end of the plate, which by the violence and bend of the plant will make them all ſtick together till the hoop be removed. This done, the loop is to be laid upon the hoop in ſuch faſhion as the hoop is proportioned: then from each ſide of the hoop little ſticks are to be pricked, as before directed, making as it were a kind of impaled path-way, widening it all the way as it goes farther from the hoop, and making it ſo conſiderably wide at the end, that any fowl that chances to come that way may be entered a conſiderable way in, before ſhe perceives the fence; by this means the bird will be enticed to go ſtraight on to the *ſpringe*, and as ſoon as ſhe touches it, either with head or feet, ſhe will be certainly caught; and thus if the plant be ſtrong enough, the largeſt bird may be caught as eaſily as the leaſt.

When the ſmaller fowls, that frequent watery places, are to be taken by this engine, it is to be made only a great deal ſlighter. When it is intended for ſnipes, woodcocks, or the like, the main plant may be of willow, hazel, or grown ozier, or any other pliant wood that will eaſily bend, and will recover its ſtraightneſs again. The uſe of this engine is limited to the winter-ſeaſon, and to times when there is much wet upon the ground. If there happen any great froſts, ſo that there is no advantage to be made of the wet places firſt deſcribed, then the ſportſman is to look for ſome place where there is a conſiderable fall, and where the current is not frozen, and in this place the *ſpringes* are to be ſet; and the greater the froſts are in this caſe, the more birds there will be taken.

There is another uſe of *ſpringes* for birds, which is the taking, by means of them, certain birds on the boughs of trees and in hedges, which is often attended with very great ſucceſs. The ſportſman, for this purpoſe, muſt firſt mark ſome tree where the birds very much reſort; then fix on ſome particular branch that is tolerably ſtraight, and cutting off all the twigs to within a foot or two of the top, he is there to bore a hole through the branch with a piercer or wimble, large enough to admit a gooſe-quill. Then another branch is to be pitched upon, at about a foot diſtance from the firſt, and all its boughs are to be pared away up to a certain height. There is to be fixed to this branch a packthread of half a foot long, and at the end of this is to be tied a nooſe of plated horſehair. The branch to which the packthread is faſtened, is then to be ſtooped ſo far, that the nooſe may be brought through the hole in the other branch, and faſtened there by means of a little ſtick four fingers long, and hooked at the end, juſt fitting the hole, and ſo brought into it, as juſt to ſtop the flying back of the other branch. Then there is to be placed beyond the nooſe ſome bait of a fruit, or inſect, as a cherry, a pear, or a worm, or any other thing which the bird, intended to be taken, is known to be fond of: this is to be ſet in ſuch a manner, that the bird can no way get at it but by ſetting its feet on the ſmall ſtick which ſupports the nooſe, and ſtops the hole. The weight of the bird will throw down the ſtick, and the bird will then be caught by the legs, and tied faſt to the branch where the hole is, by the flying back of the other branch where the packthread is faſtened.

There is yet another method in uſe for the taking many kinds of birds, from the partridge or pheaſant to the blackbird. This is made in the following manner, and is to be placed either on the ground, or on a tree, buſh, or hedge, according to the nature of the bird intended to be taken by it. A ſtraight and even piece of willow, or ſallow, is to be choſen, of about ſix feet long, and of the thickneſs of a walking cane; this is to be ſharpened at one end, and ſtuck down into the ground, and at the other end there is to be faſtened a ſmall crook; then two holes are to be made in the ſtick, the one big enough to admit a gooſe quill, the other ſmaller; and a piece of ſtick is to be choſen, which being bent will ſpring back to its ſtraightneſs again, ſuch as holly, or the like: this ſhould be about three feet long, and the larger end of it is to be fixed in the larger hole of the firſt ſtick; the ſmaller end muſt have faſtened to it a packthread, at the end of which there is a nooſe of horſehair: this is to be brought through the ſmaller hole, and be pegged in ſo ſlightly, as juſt to prevent its flying back of itſelf. Then the *ſpringe* or nooſe is to be ſpread on the peg, and a bait, proper for the bird to be taken, is to be placed at a proper diſtance; ſo that the bird cannot come at it but by treading on the peg, which will give way under its weight, and the ſtick, to which the packthread is faſtened, will fly back, and the bird will be conſequently caught in the nooſe, and have its legs drawn cloſe to the other ſtick.

SPRINGY or *elaſtic body*. See Elastic *Body*.

SPRIT, in *Sea Language*, is a ſmall boom, or pole, which croſſes the ſail of a boat diagonally, from the maſt to the upper hindmoſt corner of the ſail, which it is uſed to extend and elevate: the lower end of the *ſprit* reſts in a ſort of wreath or collar, called the *ſnotter*, which encircles the maſt in that place: ſails of this kind are accordingly called *ſprit*-ſails. See Sail.

SPROD, among the fiſhermen of many parts of England, a name given to the salmon while in its ſecond year's growth.

SPRUCE-*beer*, a kind of diet-drink made by infuſion or coction of the leaves and ſmall branches of the black and white *ſpruce*-fir, and reckoned antiſcorbutic. See Chowder-*beer*.

Spruce-*fir*. See Fir.

SPULLERS *of yarn*, in our *Old Writers*, perſons that work at the *ſpole*, or *wheel*. It alſo denotes triers of yarn, to ſee if it be well ſpun, and fit for the loom.

SPUN-*hay*, in the *Military Art*, hay twiſted in ropes, very hard, for an expedition in the winter time; each trooper carrying as much as he can behind him.

SPUNGE, or Sponge, *ſpongia*, in *Natural Hiſtory*, a kind of marine ſubſtance, found adhering to rocks, ſhells, &c. under cover of the ſea-water, or on the ſides of the rocks about the ſhore.

The ancients diſtinguiſhed two kinds, *male* and *female*: but the moderns make only one kind; which, however, they diſtinguiſh, with regard to its texture, into *coarſe* and *fine*.

Naturaliſts have been embarraſſed in all ages, whether to range *ſpunge* in the animal, mineral, or vegetable family? Some would have it a concretion formed of the ſea-mud; others have commonly ſuppoſed it to be a vegetable production; but it is now allowed to be, like the corallines, of animal origin; being the fabric and habitation of ſome ſpecies of worm or polype.

Dr. Peyſſonel has actually diſcovered and deſcribed the worms, that form four different ſpecies of *ſpunges*, without having it in their power to dilate and contract them, as ſome naturaliſts have ſuppoſed; the *ſpunges* being altogether inanimate bodies, and inſenſible to the touch, or to any motion of the ſea, or any other accident, and formed by the juice or ſlaver which is depoſited by the worms that inhabit them. Phil. Tranſ. vol. l. art. 78. p. 590, &c.

Mr. Ellis, to whoſe obſervations on productions of this kind the public are much indebted, informs us, that if we carefully examine a ſmall part of one of thoſe *ſpunges*, whoſe ramifications are large and diſtinct, in the microſcope, we ſhall find that they riſe from many ſmall tubes: theſe, as they extend themſelves upwards, ſend outſide branches in various directions, which inoſculate, and, uniting thus with each other, form a compound reticulation quite through the inſide of the whole maſs. In viewing the extremities of the upper or laſt ſhoots, we may perceive ſmall openings at the end of their fibres; and as we trace theſe fibres back from the opening downwards, we ſee a ſoft whitiſh ſubſtance, which fills the internal hollow part of all the ramifications through the whole *ſpunge*; which ramifications have much the appearance of tranſparent catgut of an amber colour, and are, without doubt, the lodgments of animals of a particular claſs. For though we cannot diſtinguiſh either veſicles, or cells, or diſcover any other kind of organization, than that of a hollow tube variouſly inflected, and wrought together into a multitude of agreeable forms, ſome branched like corals, ſome expanded like a fungus, ſome riſing up ſtraight like a column; others broad at top, with a narrow baſe, and hollow like a funnel, with regular cavities, entrances, or apertures, which are nearly alike in all *ſpunges* of the ſame ſpecies; yet, from many obvious reſemblances to divers other claſſes of ſea productions, which are found to be of animal conſtruction, and from the chemical analyſes of *ſpunges* in general, there ſeems ſufficient reaſon for referring them to the claſs of animal productions. Ellis's Nat. Hiſt. of Corallines, &c. p. 78.

In the Linnæan ſyſtem, the *ſpunge* is a genus of *zoophytes*, in the claſs of *worms*, including ſixteen ſpecies.

The greatest part of our *spunges* are brought from the Mediterranean, especially from Nicaria, an island thereof, near the coast of Asia.

The fine or small *spunges* however are the most esteemed; and usually come to us from Constantinople. Their goodness consists in their being very white and light, and the holes small and close; the larger and coarser come from the coasts of Barbary, particularly about Tunis and Algier.

The *spunge* is a very useful matter in the arts. In physic it serves to foment parts inflamed. Taken inwardly, it chokes; and is, for that reason, cut small, and fried or dipped in honey, and given to quadrupeds to kill them, which it seldom fails to do, by swelling, and preventing the passage of the food into the intestines.

Spunge, burnt in a close earthen vessel, till it becomes black and friable, has been given in doses of a scruple, against scrophulous complaints and cutaneous defedations; in which it has sometimes been of service, in virtue, probably, of its saline matter, the proper action of which, after the great reduction which the other matter of the *spunge* has suffered in the burning, is very large, by virtue of this saline matter; also the preparation, if ground in a brass mortar, corrodes so much of the metal, as to contract a disagreeable taint, and sometimes an emetic quality; and, therefore, the college of London expresly orders it to be powdered in a mortar of glass or marble.

The burned *spunge* is a principal article in what is called the *Coventry method of cure* in the BRONCHOCELE, and also in that of Mr. Prosser.

Some have pretended to cure the leprosy with it, and others extol it against the bite of a mad dog; but these last are virtues not universally received.

In *spunges* are found a kind of stones called *cystiolithi*, held good for the worms in young children, and to this purpose given in powder.

This species of sea-substance, when burnt, yields the same smell with hair or horns, or other parts of animal bodies.

A pound of *spunge*, when weighed in a humid season, on drying carefully in a stove, without injuring its texture, will be reduced to eleven ounces. This quantity being distilled by the retort in the common way, and the principles separated, and the salt and spirit rectified, there will be found an ounce and half of a reddish phlegm, or a spirit so weak, as scarce to afford any smell or taste; an ounce and half of a volatile urinous spirit; and an ounce four drachms and a half of a volatile urinous salt; half an ounce of a fœtid thick oil; half an ounce of a fixed salt, which, beside the common lixivial alkali, contains some sea-salt; and five ounces of a caput mortuum, in which the magnet discovers some particles of iron.

The weight of all these amounts to that of the dried *spunge* put in, within three drachms, which is a moderate loss from evaporation, and from some little remains which will always stick to the vessels. By this analysis we find, that *spunge* gives nearly as much volatile salt as raw silk, which yields the most of any known animal substance; and the difference between the quantity, yielded by that substance and this, is not more than four grains from the ounce. Mem. Acad. Par. 1706.

A *spunge* applied to bleeding-vessels has been found a very succesful method of stopping the effusion of blood. Phil. Trans. Nº 478. p. 33.

For this purpose a very dry and solid piece, of a cubical or conical form, should be applied in close contact with the vessel, and retained by proper compression; and it will soon adhere with great force. Very large arteries have been prevented from bleeding by this application.

Dry *spunge*, from its property of imbibing and swelling by moisture, is sometimes used as a tent for dilating wounds and ulcers; for this purpose, after being carefully freed from the small stones generally lodged in it, it is dipt in melted wax, and the wax squeezed out from it in a press. Lewis.

For the use of *spunge* in amputation, see AMPUTATION.

SPUNGE, *cotton*, a name given by some writers to a species of sea-*spunge* very fine and light, and resembling cotton in its texture. It is found at considerable depths, growing on the rocks in form of a coarsely-branched shrub; it is of a greyish colour, and very flexile; but it is often rendered coarse and rigid, by being covered in certain parts with that sort of tartarous, or crustaceous substance, which some of the ancients have described under the name of an *alcyonium*, and others of an *adarce*, and which the druggists of the late ages have taught us to call *lapis spongiæ*, the *spunge*-stone. It is formed itself of bundles of fibres, and though it has the appearance of a very open texture, yet it admits the water but very badly, and does not imbibe in it any thing like the quantity that the common *spunge* does, nor is it, when imbibed, so easily pressed out again.

When examined by the microscope, this substance appears not at all of the structure of the common *spunge*, but seems a mere assemblage of oblong and slender fibres, like those of cotton or wool, not hollow, and very closely amassed together: these are not capable of imbibing any other moisture than the little that can get between their interstices in the mass, and the yet much smaller quantity that can enter the substance of the filaments themselves. Hence it is no wonder that it will not imbibe water so readily as the common *spunge*, or retain it so well when imbibed, and yet will not yield so to the pressure of a hand as to part with it as that does.

The *spunge*-stone, or tartarous incrustation on this substance, when examined by the microscope, is found to be very like the incrustations of stony or sparry matter upon sticks or shells, in some of those waters which we call *petrifying springs*, for the whole thickness of it is composed of several thin laminæ; but then, as in these incrustations, each of these laminæ is of one simple piece, and generally of a transversely striated texture. In the *spunge*-stone each lamina is not thus striated, nor is indeed of one piece, but is a congeries of numbers of simple small cakes, resembling the scales of fishes. Marsigli, Hist. Phys. de la Mer.

SPUNGE, *loaf*, in *Natural History*, a name given by authors to a peculiar species of *spunge* of the marine kind. It is called by the French *eponge en mie de pain*.

It grows at considerable depths to the rocks among coral, and other sea-substances. Its shape is usually that of a common loaf, and its texture very much resembles that of the crumb of bread. It is very various in colour at different times, being usually of a fine scarlet; sometimes, however, it is purple, sometimes of a violet colour, and sometimes snow-white, but this more rarely than of any other colour. It is the softest and lightest of all the *spunge*-kind, being better suited to imbibe the water than any other. It would be greatly esteemed for the common uses of *spunge*, if it were produced in plenty enough to be had on the common occasions, but it is scarce. When examined by the microscope, it is found to be composed of an almost infinite number of cavities and protuberances, and is composed of an infinite succession of small fibres, which are arranged in a very beautiful manner, and seem held together by a sort of glutinous matter. Marsigli, Hist. Phys. de la Mer.

SPUNGE, in the *Manege*, is the extremity, or point of a horse's shoe that answers to the heel of his foot; upon it the calkins are made. Thick *spunge* ruins the horse's heels, and therefore ought never to be used.

SPUNGES, *pyrotechnical*, are made of the large mushrooms or fungous excrescences growing on old oaks, ashes, firs, &c. which, being boiled in common water, then dried and well beaten, are put into a strong ley, prepared with saltpetre, and again dried in an oven.

These make the black match or tinder brought from Germany, used to receive and sustain the fire struck from a flint and steel, &c.

SPUNGE is used, in *Gunnery*, for a cylinder of wood, from ten to twelve inches long, of the same diameter with the rammer, with a piece of sheep or lamb-skin wound about its end, to serve for scouring great guns when discharged, before they be charged with fresh powder; hence called *spunging*. In small guns it is commonly fixed to the other end of the handle of the RAMMER; but has a separate one in those of a larger calibre. See *Tab.* II. *Gunnery*, *fig.* 17.

SPUNGING, in *Gunnery*. See SPUNGE.

SPUNK, a term used indifferently for half-rotten wood, match for guns, and a substance growing on the sides of trees. See AGARIC.

SPUN-YARN, among *Sailors*, a small line or cord formed of two or three rope-yarns twisted together by a winch; the yarns, of which it is usually made at sea, are drawn out of the strands of old cables or other ropes, and are knotted together and tarred. It is employed for several purposes, particularly to fasten one rope to another, to seize block-strops to the shrouds, and to *serve* ropes which are liable to be chafed, &c.

SPUR was anciently a piece of the armour of a cavalier, fastened to the talary, that is, the hind part of that piece of a complete armour, which covers the legs and feet.

The word is derived from the German *spohr*; or rather the Saxon, *spora*; or Danish *spor*; which all signify the same.

At present, the *spur* is a piece of iron, or other metal, consisting

conſiſting of two branches encompaſſing the horſeman's heel, and a rowel in form of a ſtar, advancing out behind, to prick the horſe.

Louis le Debonnair forbad eccleſiaſtics the profane faſhion of wearing *ſpurs*. Anciently, the difference between the knight and eſquire was, that the knight wore gilt *ſpurs*, whence the appellation of *eques auratus*; and the eſquire, ſilvered ones.

SPUR-*ſhell*, a ſpecies of the COCHLEA.

SPURGE, *euphorbia*, in *Botany*, a genus of the *dodecandria trigynia* claſs. Its characters are theſe: the flower hath a permanent empalement of one leaf, which is ſwelling, rough, and divided into five parts at the brim; it has four or five thick truncated petals, and twelve or more ſtamina, which are inſerted in the receptacle; they are longer than the petals, and terminated by globular ſummits; in the centre is ſituated a three-cornered germen, ſupporting three bifid ſtyles, crowned by obtuſe ſtigmas, which afterwards becomes a roundiſh capſule with three cells, each containing one roundiſh ſeed. Linnæus enumerates ſixty-four, and Miller thirty-two ſpecies.

The curious in gardening propagate twelve or thirteen ſpecies of the *euphorbium* plant in their ſtoves; they are all natives of very warm climates, and being replete with a milky juice, they require very little water; nor muſt they ever be planted in a rich ſoil, which is very hurtful to them. The proper ſoil for them is a mixture of one quarter of ſea-ſand, one half of light freſh earth, and one quarter of lime-rubbiſh. This ſhould be mixed for a long while before it is uſed, and very frequently turned in the mean time.

The plants are propagated by planting in this ſoil their cuttings, taken from the old plants in the month of June. Theſe ſhould always be taken off from the old plant at a joint, and ſhould be laid by for ten days or a fortnight, in a dry ſhady place before they are planted, that the part cut off from the old plant may have time to harden and dry. They ſhould then be ſet in very ſmall pots, and have a little water to ſettle the earth to their roots. They are after this to be plunged into a hot-bed of tanner's bark, and ſhaded in the great heats of the day. In ſix weeks they will have ſhot out their roots, and if the bed be not very warm, the plants may remain there, provided they have free air admitted to them every day. During the ſummer ſeaſon they ſhould be watered two or three times a week, but not oftener than once a week in winter. The plants muſt conſtantly remain in the ſtove, giving them much air in warm weather, and in winter keeping the ſtove in a temperate degree of warmth. Miller. See EUPHORBIUM.

SPURGE-*laurel*, or *mezereon*, *laureola*, or *daphne*, in *Botany*, a genus of the *octandria monogynia* claſs. Its characters are theſe: the flower has no empalement; it is cylindrical, of one petal cut into four parts at the top, and it has eight ſhort ſtamina inſerted in the tube, terminated by erect bilocular ſummits; the oval germen is ſituated at the bottom of the tube, which becomes a roundiſh berry with one cell, incloſing one roundiſh fleſhy ſeed. Miller enumerates nine, and Linnæus thirteen ſpecies.

The *thymelæa*, or *ſpurge-flax*, grows on mountainous places in the ſouthern parts of Europe: the *laureola*, or *ſpurge-laurel*, is commonly found in the woods in many parts of England: the *mezereon*, or female *laureola*, which was ſuppoſed to be a native of Germany, but has been lately found plentifully in ſome woods near Andover in Hampſhire, is cultivated in our gardens on account of the elegance and earlineſs of its flowers, which ſometimes appear in the end of January. The berries of all the ſorts ripen in Auguſt and September.

The leaves of theſe plants have little or no ſmell, but a nauſeous, acrid, very durable taſte: taken internally, in ſmall doſes, as ten or twelve grains, they are ſaid to operate with violence by ſtool, and ſometimes by vomit, ſo as not be ventured on with ſafety, unleſs their virulence be previouſly abated by long boiling; and even then, they are not to be truſted. The flowers are of a different nature, being in taſte mucilaginous and ſweetiſh, and of a light pleaſant ſmell. The pulpy part of the berries ſeems alſo to be harmleſs, but the ſeeds, called *grana cnidia*, are as acrid, and as violently purgative as the leaves. Lewis.

Dr. Ruſſel has found, in a variety of caſes, that a decoction of the cortical part of the freſh root of the *mezereon*, has proved an effectual remedy for the venereal node, proceeding from a thickening of the membrane of the bones, and that it has been frequently of ſervice in the removal of thoſe nocturnal pains, with which venereal patients are afflicted; eſpecially when, in this latter intention, a few doſes of the ſublimate ſolution have been joined to it. The decoction was adminiſtered in the following ſimple form:

℞ Cort. radic. mezerei recent. ℥j.
Aq. fontan. cong. jß.
Coq. ad cong. i ſub fin. addend. rad. glycyrrhiz. inciſ. ℥j. doſ. ℔ß quater in die.

This decoction, he obſerves, is not nauſeous to the taſte, does not diſagree with any ſtomach or conſtitution, nor has been obſerved ſenſibly to increaſe any of the ſecretions more than the ſame quantity of any ſmall liquor would do. Under a courſe of it, patients have not uſually been confined to any particular regimen, more than to live upon plain food, and to avoid every kind of exceſs. London Med. Obſ. vol. iii. p. 189, &c.

The *laureola* has been uſed externally as a ſeton, to draw a copious diſcharge from the ear in inflammations of the eyes; and the bark of it, macerated in water, has of late, been much employed in France as a topical application to the ſkin, for the purpoſe of excoriating and exciting a diſcharge.

SPURGE, *olive*, the Engliſh name of a genus of plants, called by ſome botaniſts *chamelæa*. See WIDOW-*wail*.

Others have made the *ſpurge* olive a ſpecies of the *euphorbia* or SPURGE.

SPURGE, *ſun*, a name by which ſome call ſeveral ſpecies of *tithymalus*. See SPURGE.

SPURGE-*root*, in the *Materia Medica*. See ESULÆ *radix*.

SPURIOUS *diſeaſes* are ſuch as, in ſome ſymptoms, cannot be brought under any diſtinct head, and, therefore, are called by the name of others with which they moſt agree. Whence, alſo, they are often denominated *baſtards*, *nothi*.

Such are a *ſpurious* or baſtard pleuriſy, a *ſpurious* peripneumony, a baſtard quinſey, and the like. See PLEURISY, PERIPNEUMONY, &c.

SPURIOUS *fleſh*, is an appellation by ſome given to the FLESH of the lips, gums, and that of the glands, &c.

SPURIOUS *medals*. See MEDALS.

SPURIOUS *ribs*. See RIBS.

SPURIOUS *ſuture*. See SUTURE.

SPURKETS, in a *ſhip*. See SPIRKETTING.

SPURRE, in *Ornithology*, a name given by many to the bird more commonly called the *ſea*-SWALLOW.

SPURREY, *ſpergula*, in *Botany*, a genus of the *decandria pentagynia* claſs. Its characters are theſe: the flower has a ſpreading permanent empalement, compoſed of five oval concave leaves; it has five oval, concave, ſpreading petals, which are larger than the empalement, and ten awl-ſhaped ſtamina, ſhorter than the petals, terminated by roundiſh ſummits; it has an oval germen, ſupporting five ſlender, erect, reflexed ſtyles, crowned by thick ſtigmas; the germen turns to an oval cloſe capſule with one cell, opening with five valves, incloſing many depreſſed, globular, bordered ſeeds. Linnæus reckons five, and Miller three ſpecies, which are cultivated in Holland and Flanders for feeding their cattle.

Spurrey is ſown in the Low Countries twice in a ſummer. The firſt ſowing is in May; theſe plants flower in June and July, and the ſeed is ripe in Auguſt. The ſecond time of ſowing it is after the rye-harveſt; they uſually plough up the rye-grounds, and ſow them with this ſeed to ſerve the cows in winter, when the other ſorts of graſs are low or dead. The cows that feed on this plant are found to yield better milk, and finer butter is made from it, than from that of cows feeding on any other paſture. Poultry alſo are very fond of eating this plant, and the farmers, in ſome places, have an opinion, that it makes them lay more eggs. Mortimer's Huſbandry, p. 43.

The ſeeds being very ſmall, about twelve pounds will be ſufficient to ſow an acre of land; the ground ſhould be well harrowed before the ſeed is ſown, for if the larger clods are not broken, there will be an uneven crop of graſs. People in the low country ſow this ſeed after a crop of corn is taken off the land. Miller's Gardener's Dict.

SPUR-WAY, an horſe-way through a man's grounds, through which one may ride by right or cuſtom.

SPUTUM, in *Medicine*, &c. the ſpittle or excrement voided at the mouth. See SALIVA.

An examen of the *ſputum* is of great conſequence in phthiſical caſes; and Bennet, in his Theatrum Tabidorum, applies himſelf in a particular manner thereto. The *ſputum ſanguinis* is a very dangerous ſymptom in that diſeaſe.

SPY, a perſon paid to watch the actions, motions, &c. of another, particularly as to what paſſes in an army.

When a *ſpy* is diſcovered in a camp he is immediately hanged. Wicquefort ſays, an ambaſſador is an honourable *ſpy*, under the protection of the law of nations.

SPYRUS, the *dung of goats*. This is usually found in small round masses, and is recommended by Hippocrates as a fumigation in diseases of the womb.

SQUACCO, in *Ornithology*, the name of a large bird of the heron kind. Its head and neck are variegated with black, white, and yellow, and it has on the back part of its head a crest of the same colour. Its back is of a ferrugineous yellow, its breast and belly are white, as are also its wings and tail, at least in great part, and its legs are green. It is a bold and fierce bird.

SQUAD, in *Military Language*. See ESCOUADE.

SQUADRON, a body of horse, whose number of men is not fixed, but is usually from eighty to a hundred and twenty men.

The word is formed from the Italian *squadrone*; of the Latin *squadro*, used by corruption for *quadro*: in regard, at first, the *squadrons* were always square, and called also by the Latins, *agmina quadrata*.

The *squadron* usually consists of three troops, and each troop of about forty men: a greater number cannot be advantageously posted, nor have room to act in narrow grounds, woods, marshes, defiles, &c.

The eldest troop takes the right of the *squadron*, and the second, the left, the youngest being in the centre.

A *squadron* is always drawn up three deep, or in three ranks, with the length of a horse between each rank. The standard is always borne in the centre of the first rank.

SQUADRON *of ships*, denotes either a detachment of ships employed on any particular expedition, or the third part of a naval armament.

The number of ships in a *squadron* is not fixed: a small number of vessels, if they be in a body, and have the same commander, may make a *squadron*.

If there be a great number, they are usually divided into three *squadrons*; and if the *squadrons* be numerous, each *squadron* is divided into three divisions, distinguished by their flags and colours. See DIVISION and FLEET.

SQUAIOTTA, in *Ornithology*, the name of a bird of the heron kind. Its beak is yellow, but blackish at the extremity; its legs are green; its head is variegated with grey and black; and its back very elegantly with white and red. It seems to have had its name from its note, which it often repeats in flying.

SQUALL, in *Sea Language*, a sudden and violent blast of wind, usually occasioned by the interruption and reverberation of the wind from high mountains. These are frequent in the Mediterranean, particularly in the Levant, as produced by the repulsion and new direction which the wind meets with in its passage between the various islands of the Archipelago. Falconer.

SQUALLEY, a note of faultiness in the making of cloth. 43 Eliz. cap. 10. Blount, Cowel. See REWEY.

SQUALUS, in the Linnæan system of *Ichthyology*, the name of a distinct genus of fish of the order of the *nantes*, and class of *amphibia*.

The characters of this genus are, that it has five branchial apertures on the sides of the neck, an oblong roundish body, and the mouth in the anterior part of the head. Linnæus enumerates fifteen species, four of which have a prickly back, and no pinna ani, viz. the *squalus acanthias*, or GALEUS *acanthias*; the *squalus centrina*, or CENTRINE; the *squalus spinax*, with the nostrils at the extremity of the snout; and the *squalus squatina*, or MONK-*fish*; eight of the species have a back without prickles, with sharp teeth, and a pinna ani, viz. the *squalus zygæna*, or *hammer-headed* SHARK; the *squalus* TIBURO, the *squalus galeus*, CANIS *galeus*, or TOPE; the *squalus canicula*, or CATULUS *major*; the *squalus stellaris*, with the ventral fins separate, and the dorsal fins near the tail, or CATULUS *maximus*; the *squalus catulus*, with a variegated back and belly-fins growing together, CATULUS *minor*, or MORGAY; the *squalus maximus*, or *basking* SHARK; and the *squalus carcharias*, or *white* SHARK; and three with granulated teeth, viz. the *squalus mustelus*, or GALEUS *lævis*; the *squalus glaucus*, or *blue* SHARK; and the *squalus pristis*, or SAW-*fish*.

SQUALUS is also a name given by Varro, Columella, Salvian, and others, to a species of cyprinus, distinguished by Artedi by the name of the oblong *cyprinus* with long scales, and with the pinna ani containing eleven rays, and commonly known with us under the name of *chub* or *chevin*.

The generality of authors call it *capito* and *cephalus*, but it is very improper to give distinct generical names to fish, which are genuine species of other genera.

The name *squalus* is originally Latin; it is used by Pliny, and many other of the old Roman authors, and is derived from the word *squalor*, because this fish is found to delight in impure and dirty places.

SQUAMIS, in *Ichthyology*, a name given by Albertus, and others, to the fish called by us the MONK, or ANGEL-*fish*, by the generality of authors *squatina*, and by the old Greek writers *rhine*.

SQUAMMOUS, SQUAMMOSUS, in *Anatomy*, an epithet given to the spurious or false sutures of the skull, because composed of *squammæ*, or scales, like those of fishes, or like tiles, laid so as to reach over one another.

The *suturæ squammosæ* are also called *mendosæ*, and *temporales*, from their terminating the temples, or ossa temporis.

SQUAMOSE-*culm*. See STALK.

SQUAMOSE-*root*, among *Botanists*, one composed of, or covered with lesser flakes. See ROOT.

SQUARE, *quadratum*, in *Geometry*, a quadrilateral figure, whose angles are right, and sides equal.

SQUARE, *to find the area of a*; seek the length of one side; multiply this by itself; and the product is the area of the *square*.

Thus, if the length of a side be 345, the area will be 119025: and if the side of a *square* be 10, the area will be 100.

Since, then, a decempeda contains 10 feet, a foot 10 digits, &c. a *square* decempeda contains 100 *square* feet, a *square* foot 100 *square* digits, &c.

SQUARE, *the properties of a*, are, that its angles are all right, and, consequently, its sides perpendicular; that it is divided into two equal parts, by a diagonal; that the diagonal of a *square* is incommensurable to the side.

SQUARES, *for the ratio of*: they are to each other in the duplicate ratio of their sides. E. gr. a *square* whose side is double another, is quadruple of that other *square*.

SQUARE *of the cube*. } See POWER.
SQUARE *of the surdesolid*. }

SQUARE *number*, the product of a number multiplied by itself.

Thus 4, the product of 2 multiplied by 2; or 16, the product of 4 multiplied by 4, are *square* numbers.

Such number is called a *square number*, because it may be ranged into the form of a *square*, by making the root, or factor, the side of the *square*.

The difference of two *square* numbers, whose roots are not unity, is an uneven number, equal to double the root of the less, increased by unity.

Hence, we have an easy method of constructing *square* numbers for a number of roots proceeding in the natural series; the double of the root of the antecedent, increased by unity, being contiually to be added to the preceding *square*.

Thus, if $n=1$; $2n+1=3$: if $n=2$; then will $2n+1=5$: if $n=3$; then will $2n+1=7$: if $n=4$; then will $2n+1=9$, &c. Thus, by a continual addition of the uneven numbers, arise the *square* numbers.

SQUARE *root*, a number considered as the root of a second power or *square* number: or a number, by whose multiplication into itself, a *square* number is generated. See ROOT.

To extract the SQUARE *root out of any given number*; see EXTRACTION *of roots*.

SQUARE, *norma*, is also an instrument made of wood or metal, serving to describe and measure right angles; such is LEM (*Tab* V. *Geom. fig.* 120.)

It consists of two rules or branches fastened perpendicularly at one of their extremes. When the two branches are moveable on a joint, it is called a *bevel*.

To examine whether or no a *square* be exact, describe a semicircle, AEF, of any length, at pleasure; and therein, from each extreme of the diameter, A and F, draw right lines to a point taken at pleasure in the periphery, as E: to the sides of the angle, AEF, apply the *square*, so as its vertex may fall on F. If this be possible, that *square* is just.

SQUARE, *Tee*, an instrument used in drawing, which consists of a flat ruler *hg* (*fig.* 121.), at one end of which are fastened two transverse pieces; one of them, *ab*, fixed at right angles to it, and the other, *cd*, moveable round the centre *f*, so as to be fixed at any angle required. These transverse pieces are applied close to the side of the drawing-board, which is a smooth board made in the form of a *square*, or parallelogram, while the ruler lies upon it; and by sliding them along the board, lines may be drawn parallel to one another with much less trouble than by the help of a parallel ruler. By the fixed transverse, lines may be drawn parallel to one side of the board and perpendicular to the other; and, by the moveable transverse, lines that have any degree of obliquity to the sides of the board, may be drawn parallel to one another: and if, without moving the transverse, the ruler be removed to the other side of the board, lines may be drawn perpendicular to them. But if the obliquity be very great, it will be impossible to apply the *square*, so as to intersect the lines at right angles in some parts of the board. In this case recourse must be had to a PARALLEL *ruler*.

SQUARE, *geometrical*, a compartiment frequently added on the face of the quadrant, called alfo *line of* SHADOWS, and QUADRAT.

SQUARE, *gunner's*. See QUADRANT.

SQUARES, *magic*. See MAGIC *Square*.

SQUARE, in *Glafs-making*, an inftrument with which the conciator, or founder, ftirs and mixes together the metal when in fufion in the melting-pots. When this inftrument is grown red-hot, it is always to be quenched in a pail of water, otherwife the metal will ftick to it.

SQUARE, in the *Manege*, is ufed for working in a *fquare*. The pifte or tread of a volt, inftead of being always circular, and traced upon a circumference round a centre, ought to be imagined as if it formed four ftraight equal lines laid in a *fquare*, and equally removed from the centre, or the pillar, which reprefents it in the middle of the manege ground; fo that, to work in a *fquare*, is to ride along each of thefe four lines, turning the hand at every corner, and fo paffing from one line to another.

SQUARE *battalion*. See BATTALION.

SQUARE *cap*. See CAP.

SQUARE *character*. See HEBREW.

SQUARE *foot*, *nails*, *niche*, *pedeftal*, *pillar*, *roof*, and *winding-ftairs*, fee the fubftantives.

SQUARE, *hollow* and *folid*, in the *Military Art*. See BATTALION, HOLLOW, and SOLID.

SQUARE, in *Sea Language*, a term peculiarly appropriated to the yards and their fails, implying that they hang at right angles with the maft or keel, or that they are of greater extent than ufual.

Thus, when the yards are fo balanced by their lifts, as to hang at right angles with the maft, they are faid to be *fquare* by the lifts; when they hang perpendicular to the fhip's length, they are called *fquare* by the braces; but when they lie in a direction perpendicular to the plane of the keel, they are *fquare* by the lifts and braces; or, in other words, they hang directly acrofs the fhip, and parallel to the horizon.

The yards are faid to be very *fquare* when they are of extraordinary length; and the fame epithet is then applied to their fails, which by confequence acquire an additional breadth.

SQUARE-*rigged*, is an epithet applied to a fhip whofe yards are very long. It is alfo ufed in contradiftinction to all veffels whofe fails are extended by ftays or lateen-yards, or by booms and gaffs; the ufual fituation of which is nearly in the plane of the keel.

Hence, SQUARE-*fail* is a fail extended to a yard, which hangs parallel to the horizon, as diftinguifhed from the other fails which are extended by booms and ftays, placed obliquely. This fail is only ufed in fair winds, or to fcud under in a tempeft. In the former cafe it is furnifhed with a large additional part, called the bonnet, which is then attached to its bottom, and removed when it is neceffary to fcud. Falconer.

SQUARING, in *Mathematics*. See QUADRATURE.

SQUARING *the circle*, is the making a fquare whofe area fhall be equal to the area of a given circle.

The beft mathematians have found it impoffible to folve this problem fo as to be precifely exact; but they can eafily come fo near it as not to err fo much in the area as a grain of fand would cover in a circle, whofe diameter is equal to the diameter of Saturn's orbit. The following proportions are near enough to the truth for any real ufe that can arife from this problem.

As 100000000 is to the diameter of the given circle, fo is 88622692 to the fide of the fquare required. Therefore,

If the diameter of the circle be	the fide of the fquare will be
100000000	88622692.
10000000	8862269.2
1000000	886226.92
100000	88622.692
10000	8862.2692
1000	886.22692
100	88.622692
10	8.8622692
1	0.88622692

And, as 100000000 is to the fide of a given fquare, fo is 112837917 to the diameter of a circle very nearly equal to the fquare. Therefore,

If the fide of the fquare be	The diameter of the circle will be
100000000	112837917.
10000000	11283791.7
1000000	1128379.17
100000	112837.917
10000	11283.7917
1000	1128.37917
100	112.837917
10	11.2837917
1	1.12837917

See CIRCLE, DIAMETER, and QUADRATURE.

SQUARTIA, in *Ichthyology*, a fpecies of fifh found in the Eaft Indies, the fkin of which makes the SHAGREEN.

SQUASH, in *Botany*. See GOURD.

SQUATAROLA, in *Ornithology*, a name given by the Venetians to the grey plover, or *pluvialis cinerea*.

SQUATINATORIA, in *Ichthyology*, a name by which fome authors have called the RHINOBATOS, a fea-fifh of a fort of middle nature between the monk-fifh, or angel-fifh, and the ray.

SQUATINA, the *monk-fifh*, a fpecies of the *fqualus*, called, in Italian, the *pefce angelo*, and thence in Englifh the ANGEL-*fifh*. See MONK-*fifh*.

SQUATT, in *Mineralogy*, a term given by the Englifh miners to a peculiar fort of bed of ore, lefs valuable than a load or vein, becaufe of its reaching but a little way.

Though the ore of the *fquatts* is generally very rich and good, not inferior in quality to the beft vein-ore, the miners are often difappointed, on finding thefe *fquatts* inftead of the right veins, after a long fearch. In the tin countries, the way of fearching for mines is by looking after the SHOAD-*ftones*.

Thefe upper parts of the veins have been wafhed off, and carried down the fides of the hills, in which the mines ufually lie, into the flat country; but they always lie in a regular and continued train from the orifice of the mine to the fartheft part of the train; fo that when but one ftone of this kind is found, the miners are certain of coming to the bed of metal, on tracing it up to its head by the train. This is a laborious and expenfive work, becaufe the ftones never lie on the furface, but at the different depths of one to ten feet, or any depth between thefe. The *fquatts* have their trains of fhoad-ftones as well as the regular veins, and when thefe are traced to the orifice, there is the appearance of a rich load, which the proprietor is not thoroughly undeceived in till the diggers come to the end of it.

The *fquatt* is a bed of ore from three to ten fathom long, and ufually is about half as broad as it is long; few are larger than this ftandard, but many much lefs. This is always flat, and thence has its name; the round collections of ore of the fame kind being called *bonnies*. The *fquatt* communicates with no other load or vein, but is entire of itfelf, and its extremities terminate at once, without running into feveral little ftrings, in the manner of thofe of the right veins. It does not lie within walls as the loads or veins always do, though it is always depofited in the fhelf, or faft ground; that is, in ftrata that have not been moved. Phil. Tranf. N° 69.

SQUATUS, in *Ichthyology*, a name ufed by Pliny, and other of the old Roman authors, to exprefs the fifh called by the old Grecian writers *rhine*, and by the moderns *fquatina*.

SQUIBS. See FIRE-*works*.

SQUILACHI, in *Zoology*, the name by which the modern Greeks call the JACKALL, or *lupus aureus* of authors.

SQUILL, *fcilla*, or *fquilla*, in *Botany*, a genus of the *hexandria monogynia* clafs. Its characters are thefe: the flower has no empalement, but it has fix oval petals which fpread open like a ftar, and fix awl-fhaped ftamina, terminated by oblong proftrate fummits; it has a roundifh germen fupporting a fingle ftyle, and crowned by a fingle ftigma, which afterwards becomes a fmooth oval capfule, with three furrows, divided into three cells, filled with roundifh feeds. There are ten fpecies, one of which is the *fquill*, or fea-onion, whofe roots are ufed in medicine.

Of thefe roots there are two forts, the red and white, which are fuppofed to be accidental varieties; and for medicinal ufe they are both taken promifcuoufly. They grow naturally on fea fhores, or in ditches where the falt-water flows in with the tide, in moft of the warm parts of Europe.

Squills grow fpontaneoufly on fandy fhores in Spain and in the Levant, from whence we are annually fupplied with the roots. They fhould be chofen large, plump, frefh, and full of a clammy juice.

The root of *fquill* is to the tafte very naufeous, intenfely bitter and acrimonious; much handled, it exulcerates the fkin. Taken internally, it acts as a powerful attenuant and aperient: in dofes of a few grains it promotes expectoration and urine; in fomewhat larger ones it proves emetic, and fometimes purgative. It is one of the moft certain diuretics in hydropic cafes, and expectorants in afthmatic ones, where the lungs or ftomach are oppreffed by tenacious phlegm, or injured by the imprudent ufe of opiates.

Wagner recommends the powder of *fquills*, given with nitre, in hydropical fwellings, and in a nephritis, and mentions feveral examples of cures which he performed, by giving patients from four to ten grains with a double quantity of nitre.

Dr. Hess says, he has cured the asthma with the powder of *squills*. The efficacy of this powder, from four to twelve grains, in curing the asthma, is attested by several. Med. Ess. Edinb. Com. Norimb. 1737 and 1739.

This medicine, on account of its ungrateful taste, is most commodiously taken in the form of PILLS; and in whatever form *squills* are given, unless they are designed to act as an emetic, the addition of some grateful aromatic will prevent the nausea, which they are apt, even in small doses, to occasion.

The fresh root loses in drying about four-fifths of its weight, without any considerable loss of its taste or virtue: hence four grains, which are the mean dose of the dry root in powder, are equivalent to near a scruple of the fresh *squill*. The most convenient way of drying it is, after peeling off the outer skin, to cut the roots transversely into thin slices, and expose them to a gentle warmth. The ancients, in order to abate the acrimony of the *squill* for certain purposes, after separating the skin and fibres, enclosed it in a paste made of flour and water, and then baked it in an oven, till the paste became dry and the *squill* thoroughly soft and tender. The *squill* so prepared, was beaten with two thirds its weight of flour, the mixture formed into troches, and dried with a gentle heat. These troches were supposed to be alexipharmic, and on this account were used as an ingredient in theriaca, with which view they are still retained. Water, wine, proof spirit, and rectified spirit, extract the virtues both of the fresh and dry root. Alkalis considerably abate both the bitterness and acrimony of the *squill*: vegetable acids make little alteration in either of these respects. These acids extract its virtue equally with watery or spirituous menstrua; and, as an expectorant in disorders of the breast, excellently coincide with it. The college of London directs an acetous tincture, *acetum scilliticum*, to be prepared, by macerating a pound of the dry roots in six pints of vinegar, with a gentle heat; to the liquor pressed out, and, after settling, poured off from the fæces, one twelfth its quantity of proof spirit is added, to prevent its growing soon foul.

The college of Edinburgh, for the same preparation, directs the proportions of two ounces of dried *squills*, two pounds and a half of distilled vinegar, and three ounces of rectified spirit.

A *scillitic oxymel* is obtained by boiling a quart of the acetous tincture with three pounds of clarified honey, till the mixture acquires the consistence of a syrup: and a syrup of *squills*, by dissolving three pounds and a half of fine sugar in two pounds of the vinegar.

These preparations are used as expectorants, in doses of one, two, or three drams, along with cinnamon, or some other grateful water; where the first passages are overloaded with viscid phlegm, an ounce or more is given at once, to procure a more speedy and effectual evacuation by vomit. Lewis's Mat. Med.

SQUILL-*mixture*. See MIXTURE.

SQUILLS, *wine of*, is an infusion of the roots of *squills* in white wine for forty days, after which the *squills* are taken out, and the liquor preserved for use. It is a gentle emetic, and is good against defluxions of rheum.

SQUILL, *white lesser*, in *Botany*, a species of *pancratium*. See *Sea*-DAFFODIL.

SQUILL, *squilla*, in *Ichthyology*, a large genus of animals comprehending the shrimp or *squilla*, properly so called, the cray-fish, the crab, and lobster; all which, according to Dr. Hill, make only one genus of insects, of the PODARIA kind.

The characteristics of this genus are, that they have ten legs, the foremost pair cheliform, and made for pinching and holding things; that they have only two eyes, and that the tail is foliated.

The *squillæ*, according to Dr. Hill, may be conveniently arranged under three subdivisions. 1. The smaller long-tailed *squillæ*, commonly called *shrimps*. 2. The larger long-tailed *squillæ*, or the *lobster* and *cray-fish* kind. 3. The short-tailed kind, called also *canceres*, and in English crabs.

Of those denominated *shrimps* we have the following species: 1. The long-tailed *squilla*, with the snout serrated above, and tridentated below: this is the common *shrimp*. 2. The long-tailed *squilla*, with a smooth snout, called a smooth-nosed *shrimp*. 3. The long-tailed *squilla*, with a soft tail, and the right claw largest: this is called the *hermit*. 4. The larger, long-snouted sea-*squilla*. 5. The smaller narrow-snouted sea-*squilla*. 6. The fresh-water small *squilla*.

Of the second order of *squillæ*, commonly called *lobsters*, or *cray-fish*, we have the following species: 1. The common *lobster*. 2. The thick-horned, slender-bodied *lobster*. 3. The short and broad-bodied *lobster*. 4. The very long-bodied *lobster*. 5. The small-bodied *lobster*. 6. The great sea *cray-fish*. 7. The *cray-fish* with the snout serrated above, and with a single denticulation at the base. This last species, though only three inches and a half in length, greatly approaches to the figure of the common *lobster*.

Of those *squillæ*, called *crabs*, *canceres*, there are the following species: 1. The common large *crab*. 2. The *wart-crab*, *cancer verrucosus*. 3. The *spider-crab*, or long-legged, short-tailed *squilla*. 4. The *king-crab*, or *Molucca-crab*, called the *squilla clypeata*. 5. The rough-bodied, smooth-clawed *squilla*, called *cancer mœas*. 6. The smooth and long-clawed *crab*, called by Johnston the female of the common kind. 7. The little squall *crab*. 8. The little woolly *crab*. 9. The thick-bodied duck *crab*. 10. The round-bodied duck *crab*. 11. The common, or oval-bodied duck *crab*. 12. The very long-armed duck *crab*. 13. The very small-bodied, rough, long-armed *crab*. 14. The lunar *crab*. 15. The florid *crab*. 16. The frog *crab*. 17. The prickly and hairy long-armed *crab*. 18. The great prickly long-armed *crab*. 19. The short-bodied reticulated *crab*. 20. The elliptic-bodied *crab*. 21. The smooth long-legged *crab*. Vide Hill, Hist. Anim. p. 28, seq. and *Table of Crustaceous Animals*, N° 18, 19, &c.

The *squilla*, or white shrimp, in the Linnæan system, is a species of the *cancer*, or CRAB; to which genus Linnæus has also referred the CRAY-*fish*, the *common* SHRIMP, the LOBSTER, &c.

The *squilla crangon* of Rondeletius, or prawn, has a long serrated snout bending upwards, three pair of very long filiform feelers, small claws furnished with two fangs, smooth thorax, five joints to the tail, middle caudal-fin tubulated, and the two outmost flat and rounded. These are frequent on several shores, amidst loose stones; are sometimes found at sea, and taken on the surface over thirty fathoms depth of water: they are cinereous when fresh, and of a fine red when boiled.

SQUILLA *aquæ dulcis*, or *fresh water shrimp*. Few persons are aware of the damage done by the fresh water shrimp among the small fry of fish. This insect is commonly very plentiful in standing waters, and particularly in breeding-ponds, where they always have their prey in plenty before them; and often suffer none, or scarce any of the numerous young fry, hatched from the spawn of carp and tench, to live to grow up. They may be observed following the shoals of the young fry, and seizing multitudes one after another; and at other times lurking among the weeds, to seize such as straggle by themselves. If one of these insects be put into a bason of water with a dozen or two of these young fish, though as big as himself, he will very soon destroy them all. They kill numbers that they cannot eat, but leave them to rot.

SQUINANCY, or ESQUINANCY. See QUINZY.

SQUINTING, *strabismus*, στραβισμος, a disorder of the eye, which makes it look a-squint, either upwards, downwards, or sideways. The *strabismus* consists in the retraction of the ball of the eye towards one side.

A person is said to *squint*, when the axes of both his eyes are not directed to the same object. Philosophers and physicians have adopted various hypotheses to account for this defect in vision. It has been generally supposed to proceed from the want of a due correspondence in the muscles of the eyes, which, not acting in a proper concert with one another, are not able to point both eyes at one object. M. de la Hire apprehended, that this disorder proceeded from a defect in the eye itself, having the most sensible part of the retina not placed in the axis of the eye, but at some distance from it on one side or the other; and that, therefore, not the axis, but this more sensible part of the retina is turned towards the object on which the axis of the other eye is fixed, so that both axes are not directed to the same point.

He supposed *squinting*, also, sometimes to be owing to the oblique situation of the crystalline humour in one of the eyes. These hypotheses are examined and refuted by Dr. Jurin, who, in order to account for this defect, considers the disposition and situation of the eyes in a sound state. When we look directly forwards at a distant object, the pupil of each eye lies in the middle of the aperture formed by the eye-lids; so that the distance between the two pupils consists of the breadth of the nose and half the breadth of the aperture of each eye; and this distance between them is always preserved, however obliquely we turn our eyes. In looking at near objects, the distance between the pupils is somewhat less, but still it is always the same in all oblique directions of the eyes, as well as when we look straight forwards; by which means the axes of both eyes are directed forwards to the same point, in both these cases of looking at distant and near objects. But in those who *squint*, when the pupil of the undistorted eye is seated in the middle of the aperture, as in looking directly forwards, the pupil of the

the other eye is drawn cloſe to the noſe, and conſequently, the diſtance between the two pupils is conſiderably leſs than in other perſons; and this leſs diſtance continues the ſame in all oblique directions of the eyes; ſo that the two axes are never pointed at the ſame object, though the muſcles do ſo far act in concert with each other, as to move both eyes the ſame way at the ſame inſtant of time.

This vicious habit, Dr. Jurin obſerves, may eaſily be contracted by a child, if he is often laid into his cradle in ſuch a poſition as to be able to ſee either the light, or any other remarkable object, with one eye only: and when by this means he is brought to *ſquint*, and the habit is confirmed, he apprehends it will be in vain to attempt a cure by his wearing tubes, or ſhells, with ſmall holes to look through: for, notwithſtanding every help of this kind, he will continue to ſee through them diſtinctly with one eye only, and will ſtill diſtort the other. The true method of cure he takes to be the following: when the child is arrived at ſuch an age as to be capable of obſerving directions, place him, ſays he, directly before you, and let him cloſe the undiſtorted eye, and look at you with the other. When you find the axis of this eye fixed directly upon you, bid him endeavour to keep it in that ſituation, and open his other eye. You will now ſee the diſtorted eye turn away from you towards his noſe, and the axis of the other eye will be pointed towards you. But, with patience and repeated trials, he will, by degrees, be able to keep his diſtorted eye fixed upon you, at leaſt for ſome little time, after the other is opened; and when you have brought him to keep the axes of both eyes fixed upon you, as you ſtand directly before him, it will be time to change his poſture, and to ſet him firſt a little on one ſide of you, and then to the other, and ſo to practiſe the ſame thing; and when in all theſe ſituations he can perfectly and readily turn the axes of both eyes towards you, the cure is effected. An adult perſon, he ſays, may practiſe all this by a glaſs, without a director, though not ſo eaſily as with one; but the older he is the more patience will be neceſſary. Smith's Optics, Rem. p. 30.

M. Buffon infers, from a great number of obſervations, that the true and original cauſe of *ſquinting* is an inequality in the goodneſs, or in the limits of diſtinct viſion in the two eyes. When one of the eyes, he ſays, is much weaker than the other, we do not direct it towards the object, but make uſe of the ſtronger eye only: when the eyes are equally good, we ſee more diſtinctly with both eyes than with one, by about a thirteenth part; but when they are unequal in goodneſs, objects appear leſs diſtinct with both eyes than with one. It is no wonder, therefore, that perſons, ſubject to this inequality, chuſe to make uſe of one eye, and turn the other aſide. This inequality in the goodneſs of the eyes is the general cauſe of *ſquinting*, according to M. Buffon, and others with reſpect to this are accidental. All the perſons whom he examined, if they ſquinted at all, did ſo from this cauſe, and this effect is ſo neceſſary, that, he ſays, it is not poſſible to cure a perſon of *ſquinting* whoſe eyes differ much in point of goodneſs, except, perhaps, by firſt bringing them nearer to an equality by means of glaſſes. To the ſame purpoſe Dr. Reid obſerves, that, having examined above twenty perſons who ſquinted, he found in all of them a defect in the ſight of one eye. And this writer is of opinion, that the centres of the two eyes of *ſquinting* perſons correſpond with them as with others, ſo that if they could be brought to the habit of directing their eyes aright to an object, they would not only remove a deformity, but likewiſe improve their ſight.

In examining the limits of diſtinct viſion in ſeveral children who did not *ſquint*, M. Buffon found (contrary to Dr. Jurin's obſervation), that they did not ſee by any means either ſo far off, or ſo near as adult perſons; ſo that, as we advance in age, the limits of diſtinct viſion are extended both ways; and this, he ſays, is one reaſon why children *ſquint* more than adult perſons.

When the eyes of thoſe perſons who *ſquint* do not differ much in point of goodneſs, M. Buffon thought that the moſt ſimple, the moſt natural, and the moſt effectual method of curing it would be to cover the good eye for ſome time; for the diſtorted eye would thus be obliged to act and turn itſelf directly towards objects, and, by degrees, this would become natural to it.

The reaſon why thoſe perſons who *ſquint* generally turn the weak eye towards the noſe, he ſays, is that, in that ſituation, the direction of its axis is as diſtant as poſſible from that of the good eye: and beſides, in this place, the noſe conceals many objects from its view, ſo that this ſituation is the leaſt diſadvantageous to it of any other.

In ſome caſes, M. Buffon obſerves, that the eyes have what is commonly called a *caſt* only, in conſequence of the optic angle being too great or too ſmall, when they are of equal goodneſs. This, he ſays, is generally the reſult of habit, acquired very early, in conſequence of the miſmanagement of children, and that it is often eaſily cured. If the eye that *ſquints* be turned towards the temples, he ſays, he has generally found that there is no great inequality in the goodneſs of the two; and that, in this caſe, the cauſe being only a vicious habit, the cure has been completed by covering the good eye for a fortnight only. In order to judge with any certainty of the inequality of goodneſs in the two eyes, and the poſſibility of the cure of *ſquinting*, it is neceſſary, he ſays, to cover the good eye for ſome time, in order to exerciſe the bad eye, and give it an opportunity of gaining ſtrength, after which it will be more eaſy to judge whether the cure be poſſible or not. Acad. Par. 1743, p. 329. 342. Reid's Inq. into the Human Mind, p. 253—257.

SQUIRREL, *ſciurus*, formed of σκια, *ſhade*, and ουρα, *tail*, becauſe the tail ſerves this animal for an umbrella, in the *Linnæan Syſtem of Zoology*, makes a diſtinct genus of animals, of the order of *glires*, and claſs of *mammalia*; the characters of which are; that the creatures have two cutting teeth in each jaw, the upper in the form of a wedge, the lower compreſſed; to which we may add, that they have four toes on the fore-feet, and five on the hinder, and long tails clothed with long hair.

Linnæus has enumerated eleven ſpecies; viz. the *vulgaris*, *niger*, *cinereus*, *flavus*, *palmarum*, *getulus*, *ſtriatus*, *glis*, *æſtuans*, *volans*, and *ſagitta*.

The *common Engliſh ſquirrel* is well known, and is diſtinguiſhed from the others by its ſize and colour. It is ſomething larger than the weaſel, but ſhorter bodied; its ears are terminated with long tufts of hair; it has large, lively, black eyes; its head, body, legs, and tail, are reddiſh; its breaſt and belly white; and it generally carries its long hairy tail erect over its back, ſo that it ſerves for a ſhade. It is a neat, lively, and active animal, common in our woods, and feeds on all ſorts of fruit, but principally on hazel-nuts, which it gathers in the ſeaſon, and lays up for its winter ſtore. In ſummer it feeds on buds and young ſhoots, and is particularly fond of thoſe of fir, and the young cones; ſits up to eat, and uſes its fore-feet as hands.

There is great diverſion in hunting this little creature, and its fleſh is very delicate and well taſted. The only ſeaſon for hunting it is in autumn, and the beginning of winter, at which time the creature is fat; and the leaves being off the trees, it may be ſeen as it leaps from bough to bough, which, when purſued, it does with ſurpriſing agility.

In the ſummer they build their neſts, which the ſportſmen call *drays*, very artificially in the tops of trees, with ſticks, moſs, and ſuch other things as the woods afford; to their neſts they have two holes, and they ſtop up that on the ſide the wind blows, as Pliny has remarked; they fill this lodging, during the ſeaſon, with nuts and other fruits, which are to ſerve them in the ſevere weather, when the trees afford nothing. They ſleep in the midſt of this proviſion a great part of the winter, and that ſo ſound, that they will not be waked by ever ſo loud a noiſe made juſt under their drays; though at other times they fly out immediately on hearing any noiſe, even at a conſiderable diſtance.

In the ſpring the female is ſeen purſued from tree to tree by the males, feigning an eſcape from their embraces.

The tail of the *ſquirrel*, which is as large as the body, though compoſed almoſt entirely of hair, ſerves the creature, in ſome ſort, inſtead of wings; for by means of it the body is kept ſuſpended in the air, without any viſible ſinking, while the creature throws itſelf from the boughs of one tree to thoſe of another of equal height. But the more general leaps the *ſquirrel* takes, are from the outermoſt branches of a high tree to another ſomewhat lower at a diſtance; it is wonderful to ſee how far it will be carried in theſe leaps; and if it miſſes the tree it aims at, and by that means falls from the top of ever ſo high a tree to the ground, the tail ſupports it ſo well, that it comes ſoftly down, and receives no harm. The hunting of the *ſquirrel* is moſt agreeably performed in woods of a young growth, the trees of which may be ſhaken by the hand; and it is neceſſary to take out ſome means of diſlodging them from the clefts of trees, in which they will take refuge, and from which they will never be removed by mere noiſe.

Many people uſually go together on this expedition, and ſometimes they carry bows and arrows for the diſlodging the prey from theſe places; ſometimes bludgeons, or ſhort and thick ſtaves, loaded at one end with lead, to prevent their lodging in the trees when they are thrown up. The *ſquirrel*, which in her fright has taken refuge in any part of a tree, and is not to be diſlodged either by hallooing or ſhaking the tree, will always quit the place

as soon as an arrow, or bludgeon, has been well aimed at her, and will give a farther chace.

The *squirrel* is always fond of a large oak in time of danger, and runs to the nearest she can find as soon as she sees herself pursued: in some part of the upper boughs of this tree she sits secure from the men and dogs, and as it is too troublesome to the sportsmen to climb every tree, the only method is to shoot arrows, and throw bludgeons at her; she is very seldom hurt by these, unless hit just upon the head, for her back-bone is so strong, that she will bear nearly as hard a blow as a dog without danger of hurt. So long as the strength and spirits of the creature last, she always keeps in the tops of the highest trees, but when she grows weary she comes down, and takes shelter in the hedges; she then soon becomes a prey to the dogs, or is very often killed upon the ground, in attempting to gain the hedge in places where there is no continued chain of trees by which she can come at it.

It is observed, that the gullet of this animal is very narrow, to prevent it from disgorging its food in descending of trees, or in its leaps downwards.

The common *squirrel*, when it would cross a water, is often seen to get upon some light piece of wood, and sail over by means of her tail.

The common *squirrel* inhabits Europe, and the northern and temperate parts of Asia, and a variety is found, even as far south as the isle of Ceylon. In Sweden and Lapland it changes in winter into grey. In many parts of England, there is a beautiful variety with a milk-white tail. A white variety is found common in Siberia, and a beautiful black variety about the lake Baikal.

The *black squirrel* has plain ears; it is sometimes wholly black, but often marked with white on the nose, neck, or end of the tail: the tail is shorter than that of the grey *squirrel*, and its body about the same size. It inhabits the north of Asia, North America, and Mexico; it breeds and associates in separate troops, and forms magazines for winter food.

The *grey squirrel* has plain ears; its hair is of a dull grey colour, mixed with black, and often tinged with a dirty yellow; the belly and insides of the legs are white; the tail long, bushy, grey, and striped with black: it is about the size of a half-grown rabbit. It inhabits the woods of North America, Peru, and Chili; is very destructive to the plantations of maize, deposits its stock of winter provisions in holes underground, is easily tamed, and its flesh is esteemed delicate. The furs, which are imported under the name of *petit-gris*, are valuable, and used as linings to cloaks.

The *fair squirrel*, or *sciurus flavus*, has a body and tail of a flaxen colour, is of a very small size, has plain round ears, and a rounded tail. It inhabits the woods near Amadabad, the capital of Guzarat, in great abundance; and Linnæus says it is an inhabitant of South America.

The *palm squirrel* has plain ears; an obscure pale-yellow stripe on the middle of the back, another on each side, and a third on each side of the belly; the rest of the hair on the sides, back, and head, is of a black and red colour, very closely mixed; that on the thighs and legs more red; the belly, pale yellow; the hair on the tail encircles it, is coarse, and of a dirty yellow, barred with black. This species lives much in the coco-trees, and is fond of the sury, or palm-wine produced from them; and on this account called by the Indians *suricatsje*, or the *little cat of the sury*. This *squirrel*, it is said, expands its tail sideways, without erecting it.

The *Barbary squirrel*, or *sciurus getulus*, has full black eyes and white orbits; head, body, feet, and tail, cinereous, inclining to red; the sides are marked longitudinally, with two white stripes; the belly is white; the tail bushy, marked regularly with shades of black, one beneath the other: its size is that of the common *squirrel*. This and the former species inhabit Barbary, and other hot countries, living in the trees.

The *striped squirrel*, or *sciurus striatus*, has plain ears; the ridge of the back marked with a black streak; each side with a pale yellow stripe, bounded above and below with a line of black; head, body, and tail of a reddish brown; the breast and belly white; the nose and feet pale red; and the eyes full. This species inhabits the north of Asia, and abounds in the forests of North America. They burrow under ground, forming their retreat in the manner of a long gallery, with branches on each side, each of which terminates in a large chamber, where they store their winter provisions, viz. the maize, acorns, hickery-nuts, and chinquapin chesnut separately. They are very wild, bite severely, and are scarcely ever tamed: the skins are sometimes brought over to line cloaks.

The *fat squirrel*, or *sciurus glis*, inhabits France and the south of Europe, and is also found in the woods in the south parts of Russia; lives in trees, feeds on fruits and acorns, lodges in the hollows of trees, remains torpid in winter, and grows very fat. This animal was esteemed a great delicacy by the Romans, who had their *gliraria*, or places constructed for keeping and feeding them; and are said to be now eat by the Italians. See GLIS.

The *Brasilian squirrel*, or *sciurus æstuans*, has plain ears and a round tail; the head, body, and sides covered with soft dusky hairs, tipt with yellow; the hairs annulated with black and yellow; the throat cinereous; the inside of the legs and belly yellow; the belly divided lengthways with a white line, beginning on the breast, interrupted for a small space in the middle, and then continued to the tail; the length from nose to tail eight inches one quarter. This species inhabits Brasil and Guiana.

The *flying squirrel*, or *sciurus volans*, is much less than the common *squirrel*; it has round naked ears; full black eyes; a lateral membrane from the fore to the hind legs, and the fore legs are for the most part clear of the membrane; a tail with long hairs disposed horizontally, longest in the middle, and ending in a point; the colour above is a brownish ash, and beneath white, tinged with yellow. This species inhabits North America and New Spain; it lives in hollow trees, sleeps in the day, and is very lively during the night; it is gregarious, numbers being found in one tree; leaps from bough to bough even at the distance of ten yards; when it would leap, it stretches out the fore legs, and, extending the membranes, it is enabled to spring farther than other *squirrels*: this motion is improperly called flying, because the animal can only go forward, and even sinks considerably before it can reach the place at which it aims; and, on this account, the farther it wishes to go, the higher it mounts. This species is easily tamed.

The *European flying squirrel*, has naked ears, full eyes, eye-lids bordered with black, membranes which extend to the base of the fore feet, and form a large wing on the exterior side; a tail full of hair and round at the end; the colour of the upper part of the body is a fine grey, and that of the lower part a pure white; the length from nose to tail four inches and a quarter; of the tail to the tip of the hair five inches. This animal inhabits Finland and Lapland and the Russian dominions; lives solitarily in hollow trees; when at rest flings its tail over its back, but in leaping extends it.

The *sailing squirrel*, or *sciurus sagitta*, has a small rounded head, cloven upper lip, small blunt ears, two small warts at the outmost corner of each eye, with hairs growing out of them, short neck, four toes on the fore feet, and, instead of a thumb, a slender bone two inches and a half long, lodged under the lateral membrane, and serving to stretch it out; from thence to the hind legs extends the membrane, which is broad, and a continuation of the skin of the sides and belly; the membrane extends along the fore legs, and stretches out near the joint in a winged form; five toes on the hind feet, and on all the toes sharp, compressed, bent claws; tail long, and covered with long hairs, disposed horizontally; the colour of the head, body, and tail, a bright bay, inclining in some parts to orange; the breast and belly of a yellowish white; the length from nose to tail eighteen inches, and tail fifteen. This species inhabits Java and others of the Indian islands; it leaps from tree to tree as if it flew, and will catch hold of boughs with its tail. See *Tab. V. Quadrupeds*, N° 59.

Mr. Pennant has enumerated and described several other species and varieties of the *squirrel*, for which we refer to his History of Quadrupeds, vol. ii. p. 406, &c. 4to.

Mr. Ray has also, among other species, mentioned the black-backed *squirrel* of Ceylon, which is called *rukkia*, on account of the noise it makes; its ears are tufted with black; the cheeks, legs, and belly of a pale yellow; between the ears a yellow spot; the forehead, back, sides, and haunches black; the cheeks marked with a bifurcated stroke of black; the under side red; the tail twice as long as the body, of a light grey, and very bushy, and in size about thrice that of the European *squirrel*. Ray's Synops. Quad. p. 214, &c. and Pennant, &c. ubi supra.

ST, an indeclinable term, chiefly used to command silence.

The Romans had these two characters written over the doors of their eating-rooms, as who should say, *sed tace*, or *silentium tene*.

Porphyry observes, the ancients made a point of religion of it, not to speak a single word in passing in or out of the doors.

STABBING, in *Law*. See MANSLAUGHTER.

STABILES, in the *Ancient Music*, was a name given to the extreme chords of a tetrachord.

They were so called because they remained the same throughout all the genera and species of music. One of these chords was the hypate, and the other the nete. They

They are ſometimes alſo called *ſtantes*, *immobiles*, or *quieſcentes*; and by the Greeks ἑϛωτες, ἀκινητοι, ἠρεμοντες.

STABLE. Nothing conduces more to the health of a horſe than the having a good and wholeſome *ſtable*. The ſituation of a *ſtable* ſhould always be in a good air, and on a firm, dry, and hard ground, that in winter the horſe may come in and go out clean. It ſhould always be built ſomewhat on an aſcent, that the urine, and other foulneſſes may be eaſily conveyed away by means of drains or ſinks cut for that purpoſe.

As there is no animal that delights more in cleanlineſs than the horſe, or that more abominates bad ſmells, care ſhould be taken that there be no hog-ſtie, hen-rooſt, or neceſſary-houſe, near the place where the *ſtable* is to be built; for the ſwallowing of feathers, which is very apt to happen when hen-rooſts are near, often proves mortal to horſes, and the ſteams of a bog-houſe, or hog's-dung, will breed many diſtempers; and particularly, they will bring on the farcy and blindneſs in many horſes. It is much better to build the walls of a *ſtable* of brick than of ſtone, for the former is always dry, the other often ſweats, and is very apt to be damp, and to cauſe rheums and catarrhs to horſes that are ſet in the *ſtable* in damp weather.

The walls ought to be made of a moderate thickneſs, both for the ſake of ſafety and warmth in winter, and to keep off the heat of the ſun in the midſt of ſummer, which would ſpoil the horſe's appetite, and ſink his ſpirits. The windows ſhould be made on the eaſt and north ſides of the building, that the north air may be let in to cool the *ſtables* in ſummer, and for the benefit of the riſing ſun all the year round, eſpecially in winter.

The windows ſhould either be ſaſhed, or have large caſements, for the ſake of letting in air enough; and there ſhould always be cloſe wooden ſhutters, that the light may be ſhut out at pleaſure; by which means the horſe will be brought to ſleep in the middle of the day, as well as in the night, when it is judged proper that he ſhould do ſo.

Many pave the whole *ſtable* with ſtone, but it is much better to have that part, which the horſe is to lie upon, boarded with oak planks; for it will be not only eaſier, but more warm and comfortable to the creature.

The boards muſt be laid as even as poſſible, for this is the way to make the creature lie moſt at his eaſe, and in the moſt healthful poſture. The dealers in horſes generally, indeed, make the boards be laid higher toward the top, and ſlanting down: this ſhews a horſe to more advantage as he lies, but it is very uncomfortable to the creature, and his hinder parts are always ſlipping down, and the hind legs are often made ſubject to ſwellings by it.

The planks ſhould be laid croſſwiſe, not lengthwiſe, and there are to be ſeveral holes bored through them to receive the urine, and carry it off underneath the floor into ſome drain or common receptacle. The ground behind ſhould be raiſed to a level with the planks, that the horſe may always ſtand even, and the floor behind ſhould be paved with ſmall pebbles, and the place where the rack ſtands ſhould be well wainſcotted. There are to be two rings placed on each ſide of the ſtall for the horſe's halter to run through, and a logger is to be fixed to the end of this, ſufficient to poiſe it perpendicularly, but not ſo heavy as to tire the horſe, or to hinder him from eating. The beſt place for him to eat his corn in is a drawer, or locker, made in the wainſcot partition; this need not be large, and conſequently need not take up much room, ſo that it may be eaſily fixed, and taken out to clean at pleaſure: by this means the common dirtineſs of a fixed manger is to be avoided.

Many people are againſt having a rack in their *ſtables*; they give the horſe his hay ſprinkled upon his litter, and if they think he treads it too much, or too ſoon, they only nail up three or four boards, by way of a trough, to give it to him in. The reaſon of this is, that the continual lifting up the head to feed out of the rack is an unnatural poſture for a horſe, which was intended to take his food up from the ground, and makes him, as they expreſs it, withy-cragged. In the way of ſprinkling the hay on the litter, or laying it in a trough even with the ground, he not only takes it up as if from the earth in a natural way, but can eat as he lies, which is a piece of indulgence that a horſe takes great pleaſure in.

When there is *ſtable*-room enough, partitions are to be made for ſeveral horſes to ſtand in; theſe ſhould always allow room enough for the horſes to turn about, and lie down conveniently in, and they ſhould be boarded up ſo high toward the head, that the horſes placed in ſeparate ſtalls may not be able to ſmell at one another, nor moleſt each other any way. One of theſe ſtalls ought to be covered in, and made convenient for the groom to lie in, in caſe of a great match, or the ſickneſs of a valuable horſe. Behind the horſes there ſhould be a row of pegs to hang up ſaddles, bridles, and other neceſſary utenſils; and ſome ſhelves for the hanging up bruſhes, &c. and the ſtanding of pots of ointment, and other preparations.

The *ſtables* of the nobility are often incommoded by bins for oats, placed in them, which take up a great deal of room with very little advantage. Dr. Plot has given us, in his Hiſtory of Oxfordſhire, a very convenient method, uſed by a gentleman of that county, to prevent this. It is done by making a conveniency to let the oats down from above, out of a veſſel like the hopper of a mill, whence they fall into a ſquare pipe of about four inches diameter, let into the wall, which comes down into a cupboard alſo let into the wall, but with its mouth ſo near the bottom, that there ſhall never be more than about a gallon in the cupboard at a time; which being taken out, and given to the horſes, another gallon immediately ſucceeds it from above, without any trouble to the groom or any body elſe. By this means there is not an inch of room loſt in the lower part of the *ſtable* where the horſes ſtand: and there is this great conveniency beſide, that the oats are always kept ſweet by it, for every gallon that is taken away puts the whole quantity above in motion, by the running down of the gallon that ſupplies its place, and no muſtineſs ever comes, where there is this continual airing and motion. There may eaſily be contrived two of theſe, the one for the oats, the other for ſplit beans; and both of theſe may be let into the range of preſſes, the oats and beans being ſeparated above by partitions. The other requiſites for a *ſtable* are a dung-yard, a pump, and a conduit; and if ſome pond or running river be near, it is much the better.

STABLESTAND, in the *Foreſt-law*, is when a perſon is found at his ſtand in the foreſt, with a croſs-bow, or long-bow, ready to ſhoot at a deer, or elſe ſtanding cloſe by a tree with greyhounds ready to ſlip.

This is one of the four evidences, or preſumptions, by which a man is convicted of intending to ſteal the king's deer; the other three being back-berond, bloody-hand, and dog-draw. See FOREST.

STACCATO, or STOCCATO, in the *Italian Muſic*, intimates that every note ſhould be divided and ſeparated from the next in a very plain and diſtinct manner, and is much the ſame with SPICCATO. They are marked in modern muſic with ſtrokes, or dots, placed over or under notes.

STACHYS, in *Botany*. See *Baſe* HOREHOUND.

STACK, in *Huſbandry*, denotes a large quantity of corn, hay, ſtraw, &c. regularly piled up, and generally thatched, to defend the contents from the weather. Theſe by being erected on ſtones of a conical ſhape, covered at top with flat ſtones of about a foot ſquare, or round in proportion, will ſecure the corn, &c. not only from damp, but alſo from mice and rats.

STACK *of wood*, among *Huſbandmen*, is a pile of wood three feet long, as many broad, and twelve feet high.

STACTE, ϛακτη, in *Pharmacy*, a fatty reſinous liquid matter, of the nature of a liquid myrrh.

This liquor is very odoriferous, and is held very precious; making alone the perfume, called by Dioſcorides *ſtacte*, which, he ſays, ſmells finely, though very bitter to the taſte. We have none of it now, but what is ſophiſticated, and what the apothecaries call *ſtacte*, is uſually no more than liquid ſtorax.

STADIUM, ϛαδιον, an ancient Greek long meaſure, containing one hundred and twenty-five geometrical paces, or ſix hundred and twenty-five Roman feet; correſponding to our furlong.

The word is formed from the Greek ϛασις, *ſtation*; and it is ſaid, on this occaſion, that Hercules, after running ſo far at one breath, ſtood ſtill. The Greeks meaſured all their diſtances by *ſtadia*, which they call ϛαδιαζειν.

Eight *ſtadia* make a geometrical or Roman mile; and twenty, according to M. Dacier, a French league: but, according to others, eight hundred *ſtadia* make forty-one and two-thirds of a league.

Guilletiere obſerves, that the *ſtadium* was only ſix hundred Athenian feet, which amount to ſix hundred and twenty-five Roman, five hundred and ſixty-ſix French royal feet, or ſix hundred and four Engliſh feet; ſo that the *ſtadium* ſhould only have been one hundred and thirteen geometrical paces. It muſt be obſerved, however, that the *ſtadium* was different in different times and places.

STADIUM was alſo the courſe or career, wherein the Greeks ran their races.

Vitruvius deſcribes it as an open ſpace one hundred and twenty-five paces long, terminated at the two extremes with two poſts, called *carcer* and *meta*.

Along it was built a kind of amphitheatre, where the ſpectators

ſpectators were placed to ſee the athletæ exercife running, wreſtling, &c.

Pauſanias (lib. vi.) informs us, that the Olympic *ſtadium* was a terrace compoſed of earth; on one ſide of which was the ſeat of the HELLENODICS, and over againſt them on the other, was an altar of white marble, upon which the prieſteſs of Ceres Chamyne, and ſome virgins, had the privilege to ſit and view the games. At the farther end of the *ſtadium* was the barrier, whence thoſe who ran the ſimple foot race began their courſe; and there, according to the tradition of the Eleans, was the tomb of Endymion.

According to the deſcription given by Wheeler, in his travels, of the remains of the *ſtadium* at Athens, which was built by Herodes Atticus, it appears to have been a long place, with two parallel ſides, cloſed up circularly at the eaſt end, and open towards the other end, and about one hundred and twenty-five geometrical paces long, and twenty-ſix or twenty-ſeven broad, which gave it the name of a STADIUM.

Though the Olympic *ſtadium* does not ſeem to have been ſo ſplendid as this at Athens, or another at Delphi, built likewiſe of marble by the ſame magnificent citizen of Athens, yet we may ſuppoſe they were all formed upon the ſame model, as they were deſtined to the ſame uſe. In the *ſtadium* were exhibited thoſe games, which are properly called GYMNASTIC. At either end of the courſe ſtood a pillar, the one conſtituting the barrier where the race began, and the other the goal, where the ſimple foot race, inſtituted or revived by Iphitus, ended.

In the fourteenth Olympiad was added the DIAULOS, or double *ſtadium*, and the DIAULODROMOI, who ran this race, turned round the pillar erected for that purpoſe at the end of the *ſtadium*, and returned to the barrier, where their race terminated. But the *dolichodromoi*, or runners in the race, called DOLICHOS, or the long courſe, which was introduced in the fifteenth olympiad, and which conſiſted of ſeven or twelve, or even of twenty-four *ſtadia*, when they came to the barrier, turned again round the pillar erected at that end, in order to continue their courſe, which required many doublings of the *ſtadium*.

The *ſtadium*, or race-ground, called the *Olympian* HIPPODROME, conſiſted of two parts; the firſt reſembled in ſhape the prow of a ſhip, and was called the *barrier*. In this place were the ſtands for the horſes and chariots, and here they were matched and prepared for the courſe. The next partition was the liſts, or the ſpot on which the races were to be run. At the end of the courſe ſtood a pillar, which was the goal, round which the candidates were to turn; and that rider or driver who could make the narroweſt turn, and approach neareſt to it, had the faireſt chance, *cæteris paribus*, of ſurpaſſing his rivals. To this Horace alludes in the expreſſion, *Meta fervidis evitata rotis*. Beyond this goal, there was a figure, placed on purpoſe to frighten the horſes, called *Taraxippus*, or the *terrifier of horſes*. It is probable, that ſome tricks were practiſed under the diſguiſe of this figure, to render the victory more difficult, and of courſe more honourable, or to try and prove the reſolution and temper of the horſes. On each ſide of the courſe, from one end to the other, the ſpectators were placed; the moſt advantageous ſtations being aſſigned to the judges of the games, and other diſtinguiſhed perſons. In that place where the horſes ſtood, which were to run, a long cable was drawn from one ſide to the other, which ſerved the purpoſe of a barrier: about the middle of the prow already mentioned, an altar was erected, upon which ſtood a brazen eagle, with outſtretched wings, and the figure of a brazen dolphin was likewiſe placed at the entrance of it. This laſt was ſo contrived, that when the preſident of the races thought proper to put it in motion, it would aſcend at once to ſuch a height, as to be viſible to all the ſpectators. This eagle was dedicated to Jupiter, the patron god of the Olympic games, as the dolphin was ſacred to Neptune, the ſuppoſed creator of the horſe. In the moment when the eagle ſprang into the air, the dolphin ſunk under ground; and upon this ſignal, the cable was removed, and the horſes advanced from their ſtands into the courſe, where they ſtood ready to ſtart. The ſignal for ſtarting was probably the ſame as in the chariot races, and was given by the ſounding of a trumpet. The ſpace of ground round which the horſes were to run, and the number of times which they were required to run round it, will make their courſe or heat to amount to about four miles, or ſomewhat more. See on this ſubject Weſt's Odes of Pindar, and Preliminary Diſſertation on the Olympic Games, p. 43, &c. p. 84, &c.

There were *ſtadia* likewiſe covered over, and encompaſſed, with colonnades and porticoes, ſerving for the ſame exerciſes in ill weather. Captive children uſed to run the *ſtadium*.

A more natural derivation of the word *ſtadium*, from *ςαϛις*, *ſtation*, than that popular one mentioned in the laſt article, may be drawn from the athletæ ſtopping and reſting, when at the end of this courſe: whence the name might be applied to the ſame diſtance, meaſured in any other place.

STADTHOLDER, STADTHOULDER, or *ſtadholder*, a governor or lieutenant of a province, in the United Netherlands; particularly that of Holland: where the word is moſt uſed, by reaſon of the ſuperior importance of the government of that province.

Menage derives the word from *ſtadt*, *ſtate*; and *houlder*, *holding*, q. d. lieutenant of the ſtates: others will have it compounded of *ſtad*, or *ſtede*, *ſtead* or *place*; and *houlder*, *holding*; in regard this officer held the place of the counts, and repreſented them in their abſence.

The *ſtadtholder*, *i. e.* the *ſtadtholder* of Holland, is the firſt member of the republic: he is chief of all the courts of juſtice; and may preſide therein when he pleaſes. All ſentences, judgments, &c. are diſpatched in his name. When an office becomes vacant in any of the courts, the ſtates propoſe three perſons to the *ſtadtholder*, who is to chuſe one of them. He can even pardon criminals, which is a ſovereign prerogative; and he has the choice of ſcabines, or chief magiſtrates, in each city; to which end the council of the city always preſent him two perſons, one of whom he appoints.

In ſeveral cities, he has the ſame right of nominating the burgomaſters and counſellors; as at Rotterdam, Dort, &c. He has alſo a power to caſhier the magiſtrates, and put others in their room, when he finds it neceſſary for the public good, upon giving a reaſon for the ſame.

By article VI. of the union of Utrecht, the ſtates conſtitute him arbiter of all the differences that may ariſe between the ſtates of the ſeveral provinces, or between the cities and the members of the ſtates of the province.

To the dignity of *ſtadtholder* is inſeparably annexed, that of captain and admiral-general of the province; in which quality he names all the officers, and diſpoſes of all military poſts. It is he takes care of the execution of the ordinances of the ſtates; and his authority gives him a right to receive, and give audience to ambaſſadors from foreign princes, and even to ſend ambaſſadors on his own private affairs.

The office of *ſtadtholder* is very ancient: the counts, not being able to reſide in Holland, appointed *ſtadtholders* to command in their abſence in the ſeveral provinces; beſides a governor-general of all the ſeventeen provinces of the Netherlands.

William I. prince of Orange, was made *ſtadtholder* of Holland and Zealand in 1576, and ſoon after of the provinces of Guelders, Utrecht, and Overyſſel, at the time when the Dutch ſhook off the Spaniſh yoke; which enabled him to contribute greatly to that happy event.

In 1584, when William I. was aſſaſſinated, the ſame dignity was conferred, by the ſame provinces, on his ſon prince Maurice, who was ſucceeded by his brother Frederick-Henry in 1625: upon his death in 1643, his ſon, William II. became *ſtadtholder*, and he poſſeſſed this dignity till his death in 1650. The ambitious views of this prince having given offence to the provinces of the republic, they took meaſures to reduce the authority of the *ſtadtholder*, and the province of Holland formed a deſign of excluding his ſon William III. prince of Orange, afterwards king of England, from the dignity poſſeſſed by his anceſtors. However, in 1672, Holland, alarmed at the progreſs of Lewis XIV. declared William *ſtadtholder*, and captain-general of the forces of the republic, with the ſame power which his predeceſſors had enjoyed. Their example was followed by four other provinces; and, in 1674, on account of his ſignal ſervices to the ſtates of Holland, they declared him hereditary *ſtadtholder*, and determined that this dignity ſhould deſcend to his male heirs. He was ſucceeded by his appointed heir the prince of Naſſau-Dietz, hereditary *ſtadtholder* of the provinces of Frieſland and Groningen, from whom the dignity deſcended to his ſon William-Charles-Henry-Friſon: in 1722, he was named *ſtadtholder* by the province of Guelderland.

In 1747, the *ſtadtholderſhip* was extended to all the ſeven united provinces, and made hereditary in the male and female repreſentatives of the family of Orange.

STÆBIS, in *Botany*, a name given by the modern Greeks to a plant growing very plentifully in the iſland of Crete, and ſeeming to be the ſame with the *ſtæbe* of the ancient Greeks, when uſed as the name of the pheos or hippopheos; for the ancients uſed it alſo as the name of a low plant of the gnaphalium-kind, growing in marſhy places, and uſed to ſtuff beds, &c. with.

STÆBIUM, in *Botany*, a name given by the modern Greeks to the plant called *hippopheos* by Dioscorides; that author also sometimes called it *stæbe*.

STÆCHAS, in *Botany*. See CASSIDONY.

STÆHELINA, in *Botany*, a genus of the *syngenesia polygamia æqualis* class. Its characters are these: the common empalement of the flower is oblong, cylindrical, and imbricated; the scales are reflexed; the flower is composed of several uniform funnel-shaped florets, of one petal; the brim is cut into five equal acute points; they have five hair-like stamina, terminated by cylindrical summits, and a short crowned germen, supporting a slender style, crowned by a double oblong stigma; the germen becomes a short four-cornered seed, crowned with a feathery down, which ripens in the empalement. Linnæus enumerates five, but Miller only two species, natives of the Cape of Good-Hope.

STAFF, *baculus*, an instrument ordinarily used to rest on, in walking. Card. Bona observes, in his treatise of liturgies, that, anciently, those who used a *staff* in the church to lean on, were obliged to lay it by, and to stand alone, firm, and upright, while the Gospel was reading; to testify their respect by their posture; and to shew they were ready to obey Jesus Christ, and to go wheresoever he should command them.

The *staff* is also frequently used as a kind of natural weapon, both of offence and defence. The Lacedæmonians never wore any swords in the time of peace; but contented themselves with a thick, crooked *staff*, which was peculiar to them.

Among the Romans, M. St. Evremond observes, blows with a *staff* were the gentlest correction they gave their slaves; inasmuch as they received them over their cloaths. Among the masters of honour and arms, it is held a greater affront to be beaten with a *staff* than with a sword: because the sword is the instrument of war, the *staff* the instrument of outrage.

Blows with a *staff* are very severely punished by the French laws: by a regulation of the marshals of France, in 1653, for reparations and satisfactions of honour, it is adjudged, that a person who shall strike another with a *staff*, shall be imprisoned a whole year; unless six months be moderated, upon paying three thousand livres, applicable to the nearest hospital; beside which, the offender is to ask pardon of the offended on his knees, &c. ready to receive from him a like number of blows with a *staff*, which, on some occasions, the latter may be obliged to give; if he have too much generosity to do it of himself.

By another regulation of the marshals in 1679, he who strikes with a *staff*, after receiving blows with the fist in the heat of a fray, is condemned to two years imprisonment; and to four if he struck first with the fist.

STAFF, *a*, is used as an instrument for taking accessible, or inaccessible heights. For the manner of operation, in taking the height of an accessible object, see ALTITUDE.

Inaccessible heights may likewise be taken by means of two *staves*. This must be done at two stations in a right line from the object, at each of which the *staves* are to be placed in such a manner, that the summit, or top of the height, may be seen along their tops in the same right line. Thus, suppose A (*Tab.* V. *Geometry*, *fig.* 122.) the summit of the object whose height is to be measured, D E, F G, the two *staves* at the first station; and R N, K O, the same *staves* at the second, so placed, that the points F D A, K N A, are in the same right line. Through the point N let there be drawn the right line N P, parallel to F A: wherefore in the triangles K N P, K A F, the angles K N P, K A F, are equal; also the angle A K F is common to both; consequently the remaining angles K P N, K F A are equal. And PN : F A : : KP : KF. But the triangles PNL, FAS, are similar; therefore PN : FA : : NL : SA. Thence alternately KP : NL : : KF : SA; i. e. as the excess of the distance of the *staves* at the second station above their distance at the first, to the difference of their lengths; so is the distance of the two stations of the shorter *staves*, to the excess of the height sought above the height of the shorter *staff*. Wherefore S A may be found by the rule of three; to which add the height of the shorter *staff*, and the sum will give the whole inaccessible height A B. *Staves* may be used for measuring any distance: suppose A B, (*fig.* 123.) to one of whose extremities we have access. Let there be a *staff* fixed at the point A, then going back to some sensible distance, in the same right line; let another be fixed in C, so that both the points A and B may be covered or hid by the *staff* C. Likewise going off in a perpendicular, from the right line C B at the point A, let there be placed another *staff* at H; and in the right line C G K, perpendicular to the same C B at the point C, and at such a point of it K, that the points K, H, and B, may be in the same right line, let there be fixed a fourth *staff*. Let there be drawn, or supposed to be drawn, a right line H G parallel to C A. The triangles K H G, H A B, will be equiangular: wherefore K G : G H (=C A) : : A H : A B; i. e. as the excess of C K above A H is to the distance betwixt the first and second *staff*, so is the distance betwixt the first and third *staff* to the distance sought. Tr. Pract. Geom. p. 22—25.

STAFF; *Almucantar's*, *augural*, *back*, *cross*, *fore*, *pastoral*, *whip*, see the articles.

STAFF, *Jacob's*. See RADIUS *astronomicus*.

STAFF, *quarter*. See QUARTER.

STAFF, *ward*. See WARD-*staff*.

STAFF-*officers*, in *Military Language*, &c. See OFFICERS.

STAFF, *field*. See FIELD.

STAFF, *regimental*, consists of the adjutant, quarter-master, chaplain, and surgeon, &c.

STAFF, in *Heraldry*. See BASTON.

STAFF, in *Music*, five lines, on which, with the intermediate spaces, the notes of any song or piece of music are marked. Guido Aretin, the great improver of the modern music, is said to be the first who introduced the *staff*, marking his notes by setting points (.) up and down them, to denote the rise and fall of the voice; and each line and space he marked at the beginning of the *staff*, with Gregory's seven letters, a, b, c, d, e, f, g.

But others will have the artifice of an older date; and Kircher particularly affirms, that in the Jesuits library at Messina, he found an old Greek MS. book of hymns, above seven hundred years old; wherein some hymns were written on a *staff* of eight lines, marked at the beginning with eight Greek letters. The notes or points were on the lines, but no use was made of the spaces.

The ingenious and learned Dr. Burney has proved that parallel lines were of higher antiquity than the time of Guido. It appears from an ancient MS. treatise on music by Odo the monk, written about the year 920, that lines began to be used in the tenth century: they were eight or nine in number; and at first, the syllables of the psalm or hymn, that was to be sung, were placed in the spaces between these lines; after this an alphabetic character was placed at the beginning of each line, capitals for the grave sounds, and minuscules for the acute; to this kind of notation succeeded points, a scale formed of which Dr. Burney has given from a tract written by the great musical monk Hubaldus, who flourished about the year 880. He has also produced three examples from ancient missals, one of which was written about the year 900, cited by P. Martini, in which only one line is used to ascertain the predominant sound of the chant; a red line for the clef of F; and a yellow one for that of C: and this, he says, seems to have been the first time that a line was drawn through notes of the same elevation, and the origin of clefs, which are only Gothic letters corrupted or disfigured.

Vincenzo Gallilei says, that a little before the time of Guido, the points were placed on seven lines only, without using the spaces; perhaps, in imitation of the seven strings of the lyre. The regular *staff* of four lines was not generally used till the thirteenth century. Kircher, indeed, speaks of Guido's using five lines and five spaces, but, as Dr. Burney says, without authority. However, though lines without spaces, and spaces without lines had been used before the time of Guido, he seems to have first suggested the use of lines and spaces together: and thus the lines, which by some had been made as numerous as the notes, were reduced to four: a number which in missals and rituals of the Romish church has never since been exceeded. Indeed the use of a line for each note, above mentioned, may never have arrived at the knowledge of Guido, who speaks the language of an inventor, with respect to lines and spaces, more than on any other occasion: and, if he be allowed the invention of lines and spaces, clefs will of course accompany them. Burney's Hist. of Music, vol. ii. p. 34, &c. p. 87, &c.

STAFF, in a *Ship*, a light pole erected in different parts of a ship, whereon to hoist and display the colours. The principal of these is reared immediately over the stern, to display the ENSIGN; another is fixed on the bowsprit to extend the JACK: three more are erected at the three mast-heads, or formed by their upper ends, to shew the FLAG or PENDANT of the respective squadron or division to which the ship belongs.

STAFF, in *Surgery*. See CATHETER, and *Tab.* III. *Surgery*, *fig.* 28.

The process of cutting for the stone, called the *high operation*, having been attended with some inconveniencies, which occasioned its being hastily left off, Mr. Cleland has attempted to remedy these inconveniencies, by means of a *catheter* of a peculiar structure, which he is of opinion, had it been known at that time when this operation was set on foot and miscarried, would have turned the

the advantage of the methods to the side of the high operation, and made it allowed much preferable to any other method hitherto practised, and hopes that it will be yet brought into use, and revive that method.

The *catheter* is to be made either of silver or steel, and may be of different sizes to suit different ages. It has the outward appearance of the common *catheter*, and will answer all the same uses; but in respect of this operation it differs from the common one, in that it is composed of two legs with blunt points, a long tube, a sliding bolt, and a handle, which serves to open and shut the legs. The bolt, which is fixed to the extremity of the tube, goes into two holes fixed in the plate of the handle; the one serves to keep the legs close during the time it is to be introduced into the bladder, and the other to extend them to the distance of an inch or more, during the time that the operation is performing. The structure of this *catheter* is well expressed by some figures given in N° 401 of the Philosophical Transactions, or Abr. vol. ix. p. 179. and the manner of using it is this: after having taken the necessary precautions, and filled the bladder, the *catheter* is to be introduced into the bladder with its points shut; then unbolt it at the handle, and by holding the tube in one hand, and the handle that moves the legs in the other, turn or open the legs till the bolt becomes opposite to the second hole upon the plate, into which it must be thrust; then by pressing gently downward the handle between the patient's legs, the two blunt points will be easily felt above the os pubis in the protuberance made by the injection into the bladder.

The advantages proposed by using this *catheter* are these: first, it is a director to the operator, shewing the place in which the puncture is to be made into the bladder; it also serves as a support to the bladder when the water is run out, and keeps it from subsiding during the time of the operation, or till the stone is extracted. It serves also to resist the pressure of the abdominal muscles and the peritonæum, and hinders the intestines from being forced down upon the knife, keeping the orifice sufficiently open, till the stone or stones are taken out. And finally, it may always be discovered by the help of this instrument, whether the bladder be become scirrhous.

The method of performing the operation with this *catheter* is thus: after the *catheter* is introduced, and fixed with its legs open, the two points are to be felt for, above the os pubis; when these are found, the finger and thumb are to be placed gently upon them, and the handle is to be held by an assistant, to keep it firmly in that position; then with a knife in the other hand a puncture is to be made immediately into the bladder, directly in the middle between the two points; but for the more security, it may be made somewhat lower, nearer the os pubis: when the knife is thus introduced, a large incision is to be made downward, inclining under the arch of the pubis, in proportion to the bigness of the stone, taking care not to wound the cartilage that joins the bones together when the knife is withdrawn. The bladder being thus supported, the stone may be taken out either with the fingers, or with a pair of tenets, there being little danger of breaking it in this method. When the operation is finished, the handle of the *catheter* is to be raised; it is to be unbolted and shut close, then fixed in this position and drawn out, and the patient dressed in the usual way. Philos. Trans. N° 401. p. 786. See Lithotomy.

Staff, in *Surveying*, a kind of stand, whereon to mount a theodolite, circumferentor, plain table, or the like, for use. It consists of three legs of wood, joined together at one end, whereon the instrument is placed; and made peeked at the other, to enter the ground. Its upper end is usually fitted with a ball and *socket*.

Staff, *station*, in *Surveying*, an instrument consisting of two rulers that slide to ten feet, divided into feet and inches, with a moveable vane or sight, two of which are used with a level; and on the edges there are the links of Gunter's chain divided. Its chief use is for the easy taking off-sets. See Off-*set staff*.

Staff-*tree*, *celastrus*, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the flower hath a small one-leaved empalement, cut into five unequal blunt parts; it hath five equal oval petals, which spread open; it hath five stamina as long as the petals, terminated by small summits; and a small germen with a large receptacle, marked with ten deep channels, supporting a short style, crowned by an obtuse trifid stigma; the germen afterwards becomes an oval blunt five cornered capsule, opening in three cells, each containing an oval smooth seed. Miller enumerates five, and Linnæus six species.

Staff, *shepherd's*, in *Botany*. See Teazel.

Stag, or *red deer*, or *hart*, *cervus elaphus* of Linnæus, in *Zoology*, is a species of deer, with long upright horns, much branched, and slender sharp brow antlers.

The colour of the *stag* is generally a reddish brown, with some black about the face, and a black list down the hind part of the neck, and between the shoulders. It grows to a large size, weighing sometimes three hundred and fourteen pounds. The horns of some American *stags* weigh thirty pounds, and are above four feet high. The *stag* is common to Europe, Barbary, the north of Asia, and North America. It grows to a very large size in the southern tract of Siberia. *Stags* are still found wild in the Highlands of Scotland, in herds of four or five hundred together, one male being generally supreme in each herd. They are likewise met with on the moors that border on Cornwall and Devonshire, and in Ireland on the mountains of Kerry. These animals are furious and dangerous in rutting-time, which is in August: they are fond of the sound of the pipe, standing and listening to it attentively. The flesh of these animals is coarse and rank; the skin is useful for many purposes; and the horns yield hartshorn. *Tab.* V. *Quadrupeds*, N° 60. Pennant. See Hart, Hunting, and Slot.

Stag-*beetle*, in *Natural History*, is the *lucanus cervus* of Linnæus. *Lucanus*, according to his distribution, is a genus of the *coleoptera* order of insects, whose characters are, that the antenna are elevated, and that the maxillæ are extended, exserted, and dentated. It comprehends seven species, one of which is the *stag-beetle* or cervus *volans*.

Stag-*evil*, in the *Manege*. See Hart.

Stag-*worms*, in *Natural History*, a name given to a species of worms produced of the eggs of a fly, and lodged in a very strange place behind, and under the palate of the *stag*, or *deer's* mouth.

They are always found in great numbers together, and are contained in fleshy bags, which are placed as the almonds of the ears in the human species. The huntsmen are well acquainted with these *worms*, and are of opinion that they are the cause of the falling off of the creature's horns; they eat their way to these, according to their opinion, through the proper parts of the head, and then gnawing them round at the roots, they are forced to fall like a tree that is sawed off at the bottom. This however is a vulgar error.

M. Reaumur has abundantly proved that these *worms* never attempt so strange a passage; they always remain where they are first found till they are in a state to change into the flies, to whose eggs they owe their origin, and whose forms they are at length to assume. Reaumur's Hist. vol. ix. p. 8.

Stag-*horn tree*, in *Botany*. See Sumach.

STAGGARD, among *Sportsmen*, a male deer only four years old.

STAGE, in the *Modern Drama*, the place of action and representation; included between the pit and the scenes. The *stage* answers to the proscenium or pulpitum of the ancient theatre.

For an account of the English *stage*, see Mystery, Playhouse, and Scene.

Unlicensed *stage*-plays are deemed public nusances, and may upon indictment be suppressed and fined.

Stage, *laws of the*, are the rules and decorums to be observed, with regard to the œconomy and conduct of a dramatic performance to be exhibited on the *stage*. These relate, principally, to the unities, the disposition of the acts and scenes, the unravelling, &c.

STAGGERS, among *Farriers*, a giddiness in a horse's head, which ends in madness.

It is frequently occasioned, by turning out a horse to grass too soon, before he is well cold: where, by hanging down his head to feed, ill vapours and humours are generated, which oppressing the brain, are the proximate cause of this disease. Sometimes it comes by over exercise in hot weather, which inflames the blood, &c. and sometimes by noisome smells in the stable, excessive eating, &c.

The signs of it, are dimness of sight, reeling, and staggering, watery eyes, &c. At length, through extreme pain, he beats his head against the wall, thrusts it into the litter, rises and lies down with fury, &c.

The most approved remedy for this distemper, which shews itself in horses in a giddiness, and reeling about, in waterinefs of the eyes, and a variety of odd motions of the head, is the following method. The creature is first to be blooded largely, then a glyster is to be given him, composed of two quarts of emetic wine, and four ounces of the unguentum populneum. When he has reposed an hour or two after voiding this glyster, let another be given him, made of two ounces of the scoriæ of the liver of antimony finely powdered, boiled a little while in five pints of beer, and with the addition of four ounces of the same ointment, or of ointment of roses. This last

glyster is to be frequently repeated, and his legs are to be all the while rubbed strongly with whisps of hay, wetted in warm water, to make a revulsion. His food should be bran and white bread, and he should be walked from time to time in some temperate place. If these methods do not succeed, let an ounce of Venice-treacle be dissolved in a quart of some cordial waters and given him; and after this let the following glyster be given warm: take Venice treacle and sal polychrestum, of each two ounces; dissolve them in two quarts of a decoction of mallows and camomile flowers; add a quarter of a pint of oil of rue. This repeated two or three times after bleeding, and the other methods, will often cure the worst stages of this disease.

Mr. Boyle mentions a cure of this disease in horses, by rubbing their gums with the coach whip till they bleed. Work Abr. vol. i. p. 88.

STAGONIAS, a word used by the old authors to express that sort of male frankincense which is in round drops, and very clear and fine.

STAGONIUS, a name sometimes given to STORAX.

STAINING *of bone, horn, hair,* and *ivory*; see each article, and also DYING *of bone, &c.*

STAINING *of marble.* See MARBLE and *solutions*, &c. of STONES.

STAINING *of paper and parchment.* See PAPER and PARCHMENT.

STAINING *of porcelain.* See PORCELAIN.

STAINING *of stones.* See *Solution, and Colours of* STONES.

STAINING *of wood.* See WOOD, and DYING.

STAJOLUS, among the *Romans*, a measure of length used in surveying land; it was equal to five palms and three fourths of a palm.

STAIRCASE, an ascent inclosed between walls, or a balustrade, consisting of *stairs* or steps, with landing-places and rails; serving to make a communication between the several stories of a house.

The dimensions of *stairs* are differently assigned by different authors: in this however they agree, that they must not be more than six, nor less than four inches high; nor more than eighteen, nor less than twelve inches broad; nor more than sixteen, nor less than six feet long, each *stair*. But these measures have only regard to fine buildings, ordinary houses are excepted; yet even in these, the *stairs* are not to exceed eight inches in height; nor be less than nine inches in breadth; nor three feet in length.

To reduce the dimensions of *stairs* to some natural, or at least geometrical standard, Vitruvius borrows the proportions of the sides of a right-angled triangle, which the ancient school expressed by the numbers 3, 4, and 5. The first for the perpendicular height; the second for the horizontal breadth; and the third for the whole slope or inclination, from the edge of one *stair* to that of another.

But this rule is set aside, and with good reason, by the modern builders. For, on this principle, the lower the *stairs*, the narrower they must be; and *stairs*, for instance, four inches high (such as we find mentioned by ancient architects) must be but five and one third inches broad.

One rule to be regarded in the making of *stairs* is, that they be laid according to the Italian phrase, *con un tantino da scarpa, i. e.* somewhat sloping, or a little highest behind, that the foot may, as it were, both ascend and descend at once; which, though observed by few, is found a secret and delicate deception of the pains in mounting.

The construction of a compleat *staircase* is one of the most curious works in architecture. The common rules to be observed therein are as follow:

1°, That it have a full free light to prevent accidents of slipping, falling, &c.

2°, That the space over head be large and airy, which the Italians call *un bel sfocato*, good ventilation, because a man spends much breath in mounting.

3°, That the half paces, or landing places, be conveniently distributed for reposing in the way.

4°, That to prevent rencounters, &c. the *staircase* be not too narrow; but this last is to be regulated by the quality of the building.

5°, That care be taken in placing the *staircase*, so that the stairs may be distributed, without prejudice to the rest of the building.

The kinds of *staircases* are various: in some, the stairs are *straight*, in others *winding*, in others both ways or *mixed*.

Again, of *straight stairs*, called also *fliers*, some fly directly forwards; others are square; others triangular; and others are called *French flights*.

Of *winding stairs*, called also *spiral*, or *cockle-stairs*, some are square, some circular, and some elliptical. And these, again, are various; some winding round a solid, and others round an open newel.

Lastly, of *mixed stairs*, some are called *dog-legged*; others both wind about a solid newel, and fly about a square open newel.

STAIRS, *straight*, are such as always fly, that is, proceed in a right line; and never wind; whence their denomination.

Of these there are several kinds; as,

Direct fliers, or *plain fliers*, which proceed directly from one floor to another, without turning either to the right or left; these are seldom used, except for garret or cellar *stairs*.

Square fliers, which fly round the sides of a square newel, either solid or open, having at every corner of the newel, a square half step, taking up one fourth of a circle. So that they fly from one half step to another, and the length of the *stairs* is perpendicular to the side of the newel.

Triangular fliers, which fly round by the sides of a triangular newel, either solid or open, having at each corner of the newel a trapezial half step, taking up two thirds of a circle: so that they fly from one half step to another; and their length is perpendicular to the side of the newel.

French fliers, which fly first directly forwards, till they come within the length of a *stair* of the wall; and then have a square half pace, from which you immediately ascend to another half pace, from which the *stairs* fly directly back again, parallel to their first flight.

STAIRS, *winding*, are such as always wind, and never fly: of these there is great variety; as,

Circular winding stairs, whereof there are four kinds, viz. such as wind about a solid newel, the fore-edge of each being in a right line, pointing to the centre of the newel; commonly used in church steeples, and great old houses: such as wind round an open newel, the fore-side of each being in a right line, pointing to the centre of the newel; as those in the Monument, London: such as wind round a solid newel, only the fore side of each, an arch of a circle, either concave or convex, pointing near to the circumference of the newel: and such as resemble the last, in all other respects, save that they have an open newel. Any of these winding *stairs* take up less room than other kinds.

In *stairs* that wind round a solid newel, architects make the diameter of the newel either $\frac{3}{6}$ or $\frac{1}{4}$ or $\frac{1}{5}$ or $\frac{2}{7}$ of that of the *staircase*, according as that is in bigness. If very small, the newel is but $\frac{1}{6}$, and if large $\frac{3}{7}$, &c.

In *stairs* that wind round an open newel, Palladio orders the newel to be one half the diameter of the *staircase*; though there does not appear any reason why the newel here should not be proportioned to the *staircase*, as in the former.

As to the number of *stairs* in each revolution; Palladio orders, that, in a *staircase* six or seven feet diameter, the *stairs* in each revolution be twelve; if the diameter be eight, the *stairs* to be sixteen; if nine or ten, the *stairs* to be twenty; and if eighteen, to be twenty-four.

Elliptical winding stairs, whereof there are two kinds; the one winding round a solid, the other round an open newel: they are much of the same nature as circular *stairs*, excepting that, in the one, the newel is a circle, and, in the other, an ellipsis.

Square winding stairs, are such as wind round a square newel, either solid or open; the fore side of each square being in a right line, pointing to the centre of the newel.

Triangular winding stairs are such as wind round a triangular newel; the fore side of each being a right line, pointing to the centre of the newel.

Columniated winding stairs. Palladio mentions a *staircase* in Pompey's portico at Rome, set on columns, so as that the light they receive from above may distribute itself to all parts alike.

Double winding stairs. Scamozzi mentions a *staircase* in this form, made by Piedro del Bergo, and Jean Coffin, at Sciamburg in France, in the king's palace. It is so contrived, as that two persons, the one ascending, and the other descending, shall never meet.

Dr. Grew describes a model of this kind of *staircase*, kept in the Museum of the Royal Society. The foot of one of the *staircases*, he says, is opposite to that of the other; and both make a parallel ascent, and within the same cylinder. The newel in the middle is hollow, and built with long apertures, to convey light from candles placed at the bottom, and on the sides of the newel into both cases.

Quadruple winding stairs. Palladio mentions a *staircase* of this form, in the castle of Chambor, near Bloys. It consists of four *staircases*, carried up together, having each its several entrance, and going up one over another, in such manner, as that, being in the middle of the building,

building, the four ſerve to lead to four apartments: ſo that the people of the one need not go up and down the *ſtairs* of the other; yet, being open in the middle, they all ſee each other paſs.

Mixed ſtairs, are ſuch as partly *fly*, and partly *wind*; whence ſome call them *fliers* and *winders*. Of theſe there are ſeveral kinds; as,

Dog-legged ſtairs, which firſt fly directly forwards, then wind a ſemicircle, and then fly directly backwards, parallel to that.

Square fliers and winders have a ſquare newel, either ſolid or open; and fly by the ſides of the newel, winding a quadrant of a circle at each corner.

Solid and open newelled fliers and winders, are of two kinds; the one winds a quadrant of a circle about a ſolid newel; then flies by the ſide of a ſquare open newel; then winds again, by the ſide of a ſolid newel, then flies again, and ſo alternately. The other flies firſt, then winds, and then flies again alternately.

STAIRS, in *Building*, the ſteps whereby we aſcend and deſcend from one ſtory of a houſe to another. See STAIRCASE.

STAKE, the name of a ſmall anvil uſed by ſmiths; ſometimes it ſtands on a broad iron foot, on the work-bench, to be moved up and down occaſionally; and ſometimes it hath a ſtrong iron ſpike at the bottom, by which it is fixed to ſome place on the work-bench. Its uſe is to ſet ſmall and cold work ſtraight, by hammering it on the *ſtake*, or to cut and punch upon with the cold chiſſel, or cold punch.

STAKE *of a plough*; the *ſtake* is an upright piece of wood, paſſing at its bottom through that link of the tow-chain which paſſes through the box of the plough, and at its upper end receiving the end of what is called the *bridle-chain*, which ties it to the crow ſtaff, or if it be not long enough, a wyth, or cord, is uſed to tie it: it is alſo tied to it again, a little below the pillow of the plough, by another wyth or cord. See PLOUGH, PILLOW, CROW-STAVES, &c.

STAL-*boat*, a kind of fiſhing-boat, mentioned 27 Eliz. c. 21.

STALACTAGNIA, in *Natural Hiſtory*, the name of a genus of ſpars. The word is derived from the Greek σταλακτος, *ſtillatitious*, or formed by dropping, and αγνος, *pure*.

The bodies of this genus are formed by the dropping of water from the roofs of ſubterranean caverns, and are the purer ſort of what are called by authors *ſtalactitæ*. They are cryſtalline ſparry bodies, formed into oblong conical figures, compoſed of various cruſts, and uſually found in form of icicles. Of this genus there are three known ſpecies. Hill.

STALACTITES, or STAGONITES, in *Natural Hiſtory*, a ſparry ſort of icicles, which often hang down from the tops or arches of grottos and ſubterranean caverns; and from the roofs of buildings, and capitals of pillars of ſuch places as are built over hot ſprings, &c.

Of this kind are the *vitriolum ſtalacticum*; the *minera ferri ſtalactica*, and the common dropſtones of ſpar.

The *ſtalactites* which incruſtate or line the tops and ſides of caves, &c. are often manifeſtly formed of ſparry particles raiſed in vapour, and condenſed on the ſtones they hang from. Thoſe in the cave on the top of Bredon hill, Dr. Derham fancies, might be formed by the rain's ſoaking through, and carrying with it impregnations from the ſtones: the hill there being all rocky. See STONE.

STALACTOCIBDELA, in *Natural Hiſtory*, the name of a genus of ſpars. The word is derived from the Greek σταλακτος, *ſtillatitious*, or formed by the dropping of water, and κιβδηλος, *impure*.

The bodies of this genus are formed by the dropping of water from the roofs of ſubterranean caverns, and are the coarſer kinds of what authors have called *ſtalactitæ*. They are cryſtallino-terrene ſpars, formed into oblong bodies, and found hanging from the roofs of caverns and grottos. Of this genus there are only two known ſpecies. Hill.

STALAGMITÆ. See STALAGMOSCIERIA.

STALAGMODIAUGIA, in *Natural Hiſtory*, the name of a genus of ſpars. The word is derived from the Greek σταλαγμος, *a drop*, and διαυγης, *pellucid*. The bodies of this genus are the purer kinds of what authors call *ſtalagmitæ*, or *drop-ſtones*.

They are ſpars found in form of ſmall balls, each compoſed of numerous cruſts, and conſiderably pellucid and cryſtalline. Of this genus there are three known ſpecies. Hill.

STALAGMOS, a term uſed by authors to expreſs a diſtillation of rheum from the head.

STALAGMOSCIERIA, in *Natural Hiſtory*, the name of a genus of ſpars. The word is derived from the Greek σταλαγμος, *a drop*, and σκιερος, *opake*, and expreſſes an opake ſpar, which has received its form from the dropping of water.

The bodies of this genus are the coarſer kinds of what are called by authors *ſtalagmitæ*, and are ſmall round maſſes, compoſed of numerous thin cruſts, and of an opake and coarſe ſtructure.

Of this genus we have only two known ſpecies. Hill.

Scotland affords a vaſt variety of the *ſtalagmitæ*. One cave, about eight miles diſtant from Aberdeen, on the ſea ſide, has its whole roof cruſted over with *ſtalactitæ*, of a foot in length, hanging down like the fringe of a bed; the floor alſo is as deep covered with congeries of *ſtalagmitæ*; the upper coat, both of theſe and the *ſtalactites*, is of a ſea colour, but the inner parts are as white as ſal prunellæ; the water which drops from theſe is of a very peculiar nature, for it is ſo acrimonious, that if it touch the ſkin but ever ſo ſlightly, it makes it ſmart. Near this cave there is another hollow rock, in which the *ſtalactitæ* make a very beautiful figure: they are all formed into long and thick columns, and ſtand perpendicularly, ſo that they repreſent the pipes of an organ; when broken, they are all found to be hollow within. The rock, and all the ſtone thereabouts, is of the limeſtone kind.

STALE, the urine of cattle. See URINE.

STALE alſo denotes a living fowl, put in a place to allure and bring others where they may be taken. See DECOY.

For want of theſe, a bird, ſhot, his entrails taken out, and dried in an oven, in his feathers, with a ſtick thruſt through to keep it in a convenient poſture, may ſerve as well as a live one.

STALK, among *Botaniſts*, that part of a plant which riſes immediately from the root, and which uſually ſupports the leaves, the flowers, and the fruit.

The term *ſtalk* is uſed on all occaſions; but in ſpeaking of the graſſes, and gramineous plants, where the word CULM is uſed in its place, to diſtinguiſh that peculiar kind of *ſtalk* which is general to all theſe plants, and is not found in any others.

The terms uſed in deſcribing the *ſtalks* of plants are, a *ſimple ſtalk*, one which runs up undivided from the root to the top.

Naked ſtalk, one that has no leaves.

Folioſe ſtalk, one with leaves on it.

Ramoſe ſtalk, that which ſends out branches.

Erect ſtalk, that which riſes ſtraight up.

Oblique ſtalk, that which is ſlanting.

Voluble ſtalk, that which twiſts round other things.

Flexuous ſtalk, that which bends.

Reclinate ſtalk, that which ſtoops towards the ground.

Procumbent ſtalk, that which lies on the ground.

Creeping, or *ſarmentous ſtalk*, that which emits roots as it runs along.

If the *ſtalk* be rounded in ſhape, it is called *round*; if it make two angles, *ancipital*; if three, *trigonal*; if four, *ſquare*; if more, *polygonal*.

If the *ſtalk* be lightly ridged and furrowed on the ſurface, it is ſaid to be *ſtriated*; if more deeply, *canaliculate*; if full of protuberances, *ſcabrous*; if lightly hairy, *villoſe*; if more roughly, *hiſpid*.

In the *branched ſtalk*, if the branches riſe erect, it is expreſſed by *aſcendant*; if they ſpread, by *diffuſe*; if they are very large, it is called *branchiated*.

If the *ſtalk* divaricate, or, inſtead of ſending out branches, it divide into them, it is called a *compoſite ſtalk*. If theſe divarications proceed by pairs, or if every branch be divided only into two others, it is called *dichotomous*; if it part into two ſeries of branches, it is expreſſed by the term *diſtichous*; if it part into a multitude of ramifications, it is called *ſubdivided*.

All theſe terms are uſed alſo in expreſſing the different ſtates of the *culm*, which, having no articulations, is called *equal*; when ſcaly, *ſquamoſe*.

STALKING, a term of conſiderable import in fowling; applied to a kind of ſcreen, or device to hide the fowler, and amuſe the game, while he gets within ſhot.

Of ſuch devices there are ſeveral kinds.

STALKING-*horſe*, is a horſe trained up for the purpoſe. This horſe ſhould be choſen of the talleſt and largeſt kind; no matter how old he is, but he muſt be well trained, and ready at command. The horſe, being properly trained, will walk ſlowly along in any ſort of ground, as ſtubble-fields, mooriſh places, or the banks of rivers, and will always feed, or pretend to feed as he is directed. The ſportſman is to conceal himſelf and his gun behind the horſe's fore-ſhoulder, bending his body low by his ſide, and keeping the whole body of the horſe always full between the fowl and himſelf; when by this means the ſportſman is come ſo near to the birds, that the gun will

will reach them with ſtrength to kill, he is not to attempt advancing any nearer, that they may not be diſturbed. Some recommend the ſhooting over the horſe's buttocks, and ſome over his neck, but the beſt way is under the neck, and before the breaſt, for by this means the body of the ſportſman is covered by the ſhoulder, and his legs by the legs of the horſe. When the birds are ſhot, the dog will bring them to his maſter, and as they often fall in places where a man cannot come at them, this creature is of very neceſſary ſervice.

This is the beſt of all methods of *ſtalking*; but as ſuch a horſe is difficult to train, chargeable to keep, and is not always to be had, there are many contrivances introduced to ſupply the place of it; among theſe the principal are the *ſtalking* wheelbarrow, the *ſtalking* buſh, and the *ſtalking* hedge. The firſt of theſe is to be thus contrived; take a wheelbarrow, made on purpoſe of light fir, and ſet round about it boughs and buſhes in ſuch a manner, that you may ſit in it, and not be diſcovered by the fowl, and drive it along without giving them diſturbance.

The *ſtalking* buſh is to be contrived of ſeveral buſhes well platted together, with all their leaves on; it is to be faſtened to a ſtake, which is to have an iron point at the end; the whole is to be the height of a man, and thick ſet with boughs all the way, from top to bottom. When the ſportſman ſees his game before him, he is to advance ſlowly with this artificial buſh between him and them: when he is come within a proper diſtance, he is to fix the buſh into the ground, by running in the iron ſpike, and then to ſhoot through the boughs.

The *ſtalking* hedge is generally made about nine feet long, and a yard and half high: it is to be made of ſmall wands, ſo woven together, as to give room for the placing of green boughs among them, that it may reſemble a great growing hedge: this is to be carried before the ſportſman, and, in the manner of the buſh, it is to be faſtened down, when near enough for the gun to kill from it. As birds however are apt to have ſome apprehenſion of terror from ſeeing a tree or hedge move, theſe machines are to be carried on very ſlowly; and the reſemblance of a real animal, as a horſe, or cow, are better for the purpoſe: theſe may be made of canvas, ſupported on a ſlight frame, and with tails of hair. For pheaſants, woodcocks, and the like fooliſh birds, the common flat figure of a horſe will do; but the water-fowl are generally much more ſhy, and it is neceſſary, for the getting near them, to have the body made hollow, and ſtuffed with hay, or ſome other matter, to keep it out. The proper time to uſe theſe engines is either early in the morning, or late in the evening; for the ſun-ſhine in the middle of the day very ſoon diſcovers to the fowl the imperfection of the engine.

STALKER, in *Brick-making*. See BRICK.

STALKERS, in our *Old Writers*, a kind of fiſhing-nets. Stat. 13 Rich. II. cap. 20.

STALLAGE; *ſtallagium*, in our *Old Writers*, the liberty, or right of pitching and erecting ſtalls in fairs and markets, or the money paid for the ſame.

STALLION, in the *Manege*, in French *etalon*, a ſtone-horſe kept to breed. See *Breeding of* HORSES and MARE.

STAMINA, in *Botany*, thoſe fine threads, or capillaments, growing up within the flowers of tulips, lilies, and moſt other plants, around the ſtyle or piſtil.

The word is Latin, and literally ſignifies *threads*.

Theſe are the male organs of generation in flowers: they conſiſt of two parts, a filament and anthera, though ſometimes the latter ſtands alone; the filament is a ſlender body, ſupporting a tumid one, which is the anthera, on its head or top: the anthera is the great male organ of generation, is hollow, and contains in it a fine powder, called FARINA *fœcundans*. Accordingly M. Geoffroy, Mr. Bradley, and other late writers on plants, as well as ſome former, explain the generation of plants, in a manner analogous to that of animals; and maintain the uſe of the *ſtamina* to be to ſecrete, in their fine capillary canals, a juice, which, being collected, hardened, and formed into a farina or duſt in the tips or apices, is thence, when the plant arrives at maturity, diſcharged, by the burſting of the apices, upon the top of the piſtil; whence is a paſſage for it to deſcend into the uterus, where being received, it impregnates and fecundifies the plant.

On this principle, it may be ſaid, that the ſame flower contains both ſexes, which contribute each their part to the generation: that the *ſtamina* are the male part; and the farina, which is always found of an oily, glutinous nature, the ſeminal liquor; and that the piſtil is the female part, which conducts the ſemen to the ova or embryo. See *Generation of* PLANTS, and SEXUAL *Syſtem*.

STAMINA, in the *Animal Body*, are thoſe ſimple, original parts, which exiſted firſt in the embryo, or even in the ſeed; and by whoſe diſtinction, augmentation, and accretion by additional juices, the human body, at its utmoſt bulk, is ſuppoſed to be formed.

All that is eſſential to the animal, are the *ſtamina*, which exiſt *in ovo*; the reſt being foreign, additional, and even accidental.

The *ſtamina* ſeem to coincide with the ſolids, which are ſurpriſingly ſmall in quantity.

STAMINEOUS *flowers*, among *Botaniſts*, are ſuch as are ſo far imperfect, as to want thoſe coloured leaves, which we call *petala*; and which only conſiſt of a cup, and a piſtil ſurrounded by ſtamina. See *Tab.* X. *of Botany, claſs* 15.

This cup is ſometimes miſtaken for a flower, and its leaves thought to be true petals; but they remain when the *ſtamina* are fallen, and become the capſules containing the ſeed, which is the true character of a cup, not of a flower.

Such plants as bear *ſtamineous* flowers, Mr. Ray makes to conſtitute a large genus, which he calls *herbæ flore imperfecto, ſive apetalo, ſtamineove*. And theſe he divides into ſuch as,

1. Have their fruit or ſeed totally divided from the flower; which are ſuch plants as are ſaid to be of different ſexes; the reaſon of which is, that from the ſame ſeed, ſome plants ſhall ariſe with flowers, and no fruit; and others, with fruit, and no flowers: ſuch are hops, hemp, ſome ſtinging nettles, ſpinach, mercurialis, and phyllon.

2. Such as have their fruit only a little disjoined from their flowers; as the ambroſia, bardana minor, ricinus, and the heliotropium tricoccon.

3. Such as have their fruit immediately contiguous, or adhering to their flower: and the ſeed of theſe is either,

1. Triangular; of which ſort, ſome are lucid and ſhining; as the lapathum, rhabarbarum, and biſtorta, to which alſo may be added the perſicaria: others are rough, and not ſhining; as the helleborus albus, ſagopyrum, convolvulus niger, and the polygonum.

2. Such as have a roundiſh ſeed, a little flatted or compreſſed, or of any other figure but the former triquetrous or triangular one; and theſe have their flower, or the calyx of the flower, adhering to the bottom or baſis of the ſeed or fruit; as the potamogiton, blitum ſylveſtre, parietaria, atriplex, blitum ſativum, amaranthus holoſericus, and the ſaxifraga aurea.

3. Such whoſe flowers adhere to the top of the ſeed; as the beta, aſarum, alchimilla.

And to theſe kinds of plants, Mr. Ray reduces alſo the kali geniculatum, and ſedum fruticoſum, the ſcoparia or belvidere of the Italians.

STAMNOS, an urn, or veſſel for holding water. Some authors have made it ſignify the bucket-head, as it is called, of thoſe alembics which have no worm, but are cooled about the head by this means.

STAMP-*duties*, are a TAX impoſed upon all parchment and paper whereon any legal proceedings, or private inſtruments of almoſt any nature whatſoever are written; and alſo upon licences for retailing wines of all denominations; upon all almanacks, newſpapers, advertiſements, cards, dice, and pamphlets containing leſs than ſix ſheets of paper. Theſe impoſts are very various, according to the nature of the thing ſtamped, riſing gradually from a penny to ten pounds.

This tax, though in many inſtances very burdenſome, is of ſervice to the public in general, by authenticating inſtruments, rendering it much more difficult than formerly to forge deeds of any ſtanding; ſince, as the officers of this branch of the revenue vary their *ſtamps* frequently, by marks perceptibe to none but themſelves, a man that would forge a deed of king William's time, muſt know, and be able to counterfeit the *ſtamp* of that date alſo.

The firſt inſtitution of the *ſtamp-duties* was by ſtatute 5 & 6 Will. and Mar. cap. 21. and they have ſince, in many inſtances, been increaſed by ſubſequent ſtatutes to five times their original amount. It would far exceed the limits of this work to recite all the duties of this kind that already exiſt; but it may not be improper to mention ſome of thoſe that are moſt common.

By 5 W. c. 21. 9 & 10 W. c. 25. and 12 Anne ſtat. 2. c. 9. the following duties are enacted, viz. for every ſkin and piece of vellum, or parchment, or ſheet of paper, on which ſhall be written any grant, or letters patent under the great ſeal, or ſeal of the duchy of Lancaſter, or of any honour, dignity, &c. or exemplification of the ſame, 6*l.*; for a grant from the king of any ſum above 100*l.* which ſhall paſs the great or privy ſeal, 6*l.*; for a grant of any office above 50*l.* a-year, 6*l.*; for pardon of any crime or forfeiture, warrant of reprieve, or relaxation from any fine, corporal puniſhment, or forfeiture (general circuit, or Newgate pardon excepted), 6*l.*; for diſpenſation to hold two livings, or any other diſpenſation

tion or faculty from the archbishop of Canterbury, or master of the faculties, 6*l.* and a farther sum of 40*s.* by 19 Geo. III. cap. 66; for admittance of a fellow of the college of physicians, or of any attorney, clerk, advocate, proctor, notary, or other officer in any court (except annual officers in corporations, or inferior courts, whose office is under 10*l.* a year), 6*l.*; for appeals from the court of admiralty, arches, or prerogative courts, 6*l.*; for grant of lands in fee, lease for years, &c. under the great seal or privy seal, or seal of the duchy of Lancaster, 4*l.* by the two former acts; for presentation or donation under the great seal, collation, or any presentation or donation by any patron to any spiritual promotion of 10*l.* a year in the king's books, 4*l.* by the same statutes, and a farther sum of 40*s.* by 19 Geo. III. cap. 66; for letters patent for charity briefs, 40*s.* and general circuit or Newgate pardons, 40*s.* both by the first statute; for register, entry, testimonial, certificate of any degree in the universities or inns of court (except bachelor of arts), 40*s.* by the same, and by 2 Geo. III. cap. 36; for the register, entry, &c. of utter barrister in any of the four inns of court, 40*s.* more, and by 5 Geo. III. cap. 47. 6*l.* more; for institution or licence that shall pass the seal of any bishop, chancellor, or other ordinary, or ecclesiastical court (licences to schoolmasters or tutors excepted), 15*s.*; for letters of mart, 15*s.*; for exemplification that shall pass the seal of any court, 10*s.* and by 19 Geo. III. cap. 66. 5*s.* more; for licence to schoolmasters and tutors, 10*s.*; for probate of a will, or letters of administration for an estate above 20*l.* value (seamen or soldiers excepted), 10*s.* and by 19 Geo. III. cap. 66. if the estate is of 100*l.* value, an additional sum of 20*s.* if of 300*l.* value, 40*s.*; and by 20 Geo. III. cap. 28. for any receipt or discharge for any legacy left by will, or other testamentary instrument, or share of any personal estate, divided by the statute of distributions, and not exceeding the value of 20*l.* 2*s.* 6*d.*; not amounting to 100*l.* 5*s.*; and 100*l.* or above, 20*s.*; which stamped receipt shall be the only evidence admissible in a court of law or equity: for licence, or certificate of marriage (except that of a seaman's widow), 5*s.*; for matriculation in the universities, 2*s.*; for admission into the inns of court, 2*s.* and by 2 Geo. III. cap. 36. 40*s.* more, and by 5 Geo. III. cap. 47. 4*l.* more: for indenture (except parish apprentices) lease, or deed poll, charter party, policy of assurance, bond, release, contract, or other obligatory instrument, protest, procuration, order of attorney, or other notarial act, 1*s.* 6*d.* and by 30 Geo. II. cap. 19. for every instrument charged with a 6*d.* *stamp* by 12 Anne, over and above all other duties, 1*s.* and by 16 Geo. III. cap. 34. 1*s.* more, and by 17 Geo. III. cap. 50. 1*s.* 6*d.* more, except for policies of assurance; which, by 10 Anne, cap. 26. and 5 Geo. III. cap. 35. are chargeable with a farther duty of 2*s.* 6*d.*; and by 7 Geo. III. cap. 44. and 8 Geo. III. cap. 25. it shall be lawful to assure the properties of any number of persons, in any ship, cargo, or both, to the amount of 1000*l.* by a policy with a 5*s.* *stamp*; and to the amount of more than 1000*l.* with two 5*s.* *stamps*; and by 17 Geo. III. cap. 50. for a policy of assurance, whereby the property of one or more persons in houses and goods shall be insured to a greater amount than 1000*l.* 5*s.* more, under a penalty of 10*l.* and by 20 Geo. III. an additional duty of 1*s.* 6*d.* per 100*l.* on all houses and goods; for indentures of parish apprentices, 6*d.*; for pleadings in any court of law, and copy thereof, 3*d.* each; for copy of a will, 2*d.*; and by 19 Geo. III. c. 66. a farther sum of 1*d.*

Besides the duties above recited, and principally imposed by the three acts above mentioned, there are other duties arising from other statutes, some of which are as follow, viz.

For every entry in the court books, or record of any corporation or company of any admission into it, 2*s.* by 5 Geo. III. c. 46.; for every certificate or debenture for drawback of customs, 8*d.* by 9 Anne cap. 23. and by 19 Geo. III. cap. 66. 8*d.* more; for bill of lading for goods exported 4*d.* by 9 Anne, cap. 23. and by 19 Geo. III. cap. 66. 4*d.* more; for wine licences, 4*s.* by 9 Anne, cap. 23. and by 30 Geo. II. cap. 19. a farther duty of 5*l.* for persons not having ale or brandy licence; of 4*l.* for persons having an ale and not a brandy licence, and of 40*s.* for those who have both; and by 31 Geo. II. cap. 37. the same is extended to *sweets* or made wines: for licence for retailing beer, ale, or other exciseable liquors, 1*s.* by 9 Anne, c. 23. and 20*s.* more by 29 Geo. II. cap. 12. By 8 Anne, cap. 9. over and above the *stamp-duties* upon the indenture, there shall be paid by the master 6*d.* for every 20*s.* of every sum of 50*l.* or under; and the duty of 1*s.* for every 20*s.* of every sum above 50*l.* which shall be given or contracted for in relation to any clerk, apprentice, or servant (except parish apprentices), and proportionably for greater or less sums: persons admitted to sue or defend *in forma pauperis*, are not liable to *stamp-duties* by 5 Wil. cap. 21. Instead of several *stamps*, there may be one general *stamp* for the whole, 30 Geo. II. cap. 19. By the several acts, the commissioners shall make an allowance (of four per cent. for six months, 5 Geo. III. cap. 46.) for prompt payment, of 10*l.* or upwards, at any one time, except for *stamp* of wine licences, by 32 Geo. II. cap. 19.

The penalty of writing on any paper, &c. before it be duly stamped is 10*l.* by 5 Will.; and 9 & 10 Will. an officer offending shall, besides, forfeit his office, and an attorney be disabled to practise. The writing is required to be as near the *stamp* as possible, on pain of 10*l.* 1 Anne, st. ii. cap. 22.; nor is the same *stamp* to serve twice on pain of 20*l.* besides the penalty on unstamped paper; and by 12 Geo. III. cap. 48. the person so offending shall be guilty of felony, or liable to transportation for seven years. *Stamps* that are spoiled before the writing hath been executed, may, upon oath, be exchanged at the *stamp*-office, 5 Geo. III. cap. 46. Counterfeiting and fraudulently using the *stamps*, incurs the guilt of felony without benefit of clergy.

The *stamp-duty* on almanacks is as follows, viz.

For every sheet almanack for one year or less, printed on one side, 1*d.* by 9 Anne, cap. 23. and 1*d.* more by 30 Geo. II. cap. 19. and 2*d.* more by 21 Geo. III.; for every other almanack for one year 2*d.* by 9 Anne, cap. 23. and 2*d.* more by 30 Geo. II. cap. 19. and if for more than one year, 2*d.* a year to the amount of three years, by 9 Anne, cap. 23. and 2*d.* more for every such year, by 30 Geo. II. cap. 19. and 2*d.* more by 21 Geo. III.

By 11 Geo. I. cap. 8. for every journal, or public newspaper, a duty shall be paid of 1*d.* a sheet, and ½*d.* for every half sheet; and by 30 Geo. II. cap. 19. for every newspaper not exceeding one sheet ½*d.* more, and by 16 Geo. III. cap. 34. ½*d.* more; and by 13 Geo. III. cap. 65. if they be more than one sheet and a half, they shall pay for every sheet and half sheet as newspapers.

For every pamphlet contained in half a sheet of paper, ½*d.* 10 Anne, cap. 19.; larger than half, but not exceeding a sheet, for every printed copy, 1*d.*; above one sheet, not exceeding six in octavo, or under twelve in quarto, or twenty in folio, for every sheet contained in one printed copy, 2*s.* from which are exempt acts of parliament, proclamations, orders of council, forms of prayer, and other acts of state, printed votes, school books, books of devotion, daily accounts of exports and imports, and weekly bills of mortality, 10 Anne, cap. 19. the penalty of offence is 10*l.* A printed copy of every pamphlet, containing more than one sheet, shall be duly entered, and duty paid, under a penalty of 20*l.*; nor shall any pamphlet be exposed to sale without the name of printer or publisher, under the same penalty; and by 16 Geo. II. c. 26. if any person shall sell, or expose to sale any newspaper, or any book, pamplet, &c. unstamped, a justice of peace may commit him on conviction, by confession, or oath of one witness, to the house of correction, for any time not exceeding three months.

For every advertisement in the gazette, or other printed paper, published weekly or oftener, a duty shall be paid of 1*s.* by 10 Anne, cap. 19. and 1*s.* more by 30 Geo. II. cap. 19.; and for every advertisement contained in, or published with any paper or pamphlet yearly, monthly, or at any interval of time exceeding one week, 2*s.*; which duty shall be paid within thirty days after publication, on pain of treble duty, with full costs, 10 Anne, cap. 19. By 20 Geo. III. cap. 28. for every advertisement in the London Gazette, or other printed paper, to be published weekly or oftener, there shall be paid, over and above all other duties, an additional duty of 6*d.* and for every advertisement contained in or published with any paper or pamplet whatsoever, to be published yearly or monthly, an additional duty of 6d.

The duty on CARDS and dice is as follows, viz.

For every pack of cards made in Great Britain, 6*d.* by 9 Anne, cap. 23.; 6*d.* more by 30 Geo. II. cap. 13.; and 6*d.* more by 16 Geo. III. cap. 34.; and for every pair of dice, 5*s.* by the first, and 5*s.* more by the second, and 2*s.* 6*d.* more by the third statute above cited. Exposing to sale cards or dice not stamped, incurs a forfeiture, for every pack, and every one of such dice, of 5*l.* with full costs, 10 Anne, cap. 19. and by 6 Geo. I. cap. 21. 10*l.* with full costs. Taking off the *stamp* of playing cards or outside paper, with intent to use the same again, is felony, and transportation for seven years, by 12 Geo. III. cap. 48. Using any ace of spades, or wrapper, &c. that has been used before, incurs a forfeiture of 20*l.* 5 Geo. III. cap. 46. Selling waste cards, that

that are not rendered unfit for playing, incurs a forfeiture of 20*l.* 29 Geo. II. cap. 13. Selling second-hand cards, that are not rendered unfit for playing, is liable to a penalty of 5*l.* for each pack, 16 Geo. III. cap. 34. Counterfeiting, &c. the *stamps* on cards or dice is felony without benefit of clergy.

All receipts are charged with a *stamp*-duty of 2*d.* above 40*s.* and of 4*d.* above 20*l.* by 24 Geo. III.

For the *stamp-duty* on post-horses. See POST. See PROMISSORY *note.* See Burn's Justice, vol. iv. art. *Stamps.*

STAMP-*office,* is an office under the direction of five commissioners, with an annual salary of 500*l.* each, who are impowered to substitute inferior officers for the management of the *stamp*-duties, 5 Will. cap 21. 9 & 10 Will. c. 25. To this office belong a receiver-general, with an annual salary of 600*l.* a comptroller at 400*l. per annum,* a secretary at 300*l. per annum,* and a number of clerks, &c. &c.

STAMPS, in *Metallurgy,* a sort of large pestles lifted up by water-wheels, and serving to beat to powder the ores, and refuse of ores of metals.

STAMPING-*mill,* or *knocking-mill,* an engine used in the tin-works to bruise the ore small.

STANCH, or STAUNCH, a name given by the country people of Northamptonshire, and some other counties, to a species of fossil called SELENITES, from its supposed virtue in stopping fluxes of blood. See PACHODECARHOMBIS.

STANCHIONS, in *Building.* See PUNCHION.

STANCHIONS, in a *Ship,* those small pillars of wood or iron, which are used for various purposes; as to support the decks, the quarter-rails, the nettings, the awnings, &c. The first of these are two ranges of small columns fixed under the beams, throughout the ship's length between decks; one range being on the starboard, and the other on the larboard side of the hatchways. They are chiefly intended to support the weight of the artillery.

STANCHIONS *of the nettings,* are either slender bars of iron, whose lower ends are fixed in iron sockets at proper distances; or square wooden pillars let into the upper part of the ship's side. See QUARTER-*netting.*

STAND, STABLESTAND. See STABLESTAND.

STAND, in *Commerce,* a weight from two hundred and a half to three hundred of pitch.

STAND *of arms.* See ARMS.

STANDARD, in *Commerce,* the original of a weight, measure, or coin, committed to the keeping of the magistrate, or deposited in some public place, to regulate, adjust, and try the weights used by particular persons in traffick.

The justness of weights and measures is of that consequence to the security and good order of trade, that there is no civilized nation but makes it part of their policy to preserve the equality thereof by means of *standards.* The Romans and Jews even seem to have affixed a kind of religious worship to these *standards,* by laying them up in their temples, as it were under the eye of their deities.

The *standards* of weights and measures in England are appointed, by Magna Charta, to be kept in the exchequer by a special officer, called the CLERK, or *comptroller of the market.* See MEASURE and WEIGHT.

The *standard* of gold coin is 22 carats of fine gold and 2 carats of alloy, in a pound weight troy.

The pound weight is cut into forty-four parts and a half, each current for 21 shillings. So that the mint-price of fine gold is nearly 4*l.* 4*s.* 11½*d.* an ounce.

The proportion of ALLOY in other nations is various: according to the ASSAYS of sundry foreign coins, made at the Tower by the direction of sir Isaac Newton, and published in Arbuthnot's tables of coins, the moidores of Portugal, and their subdivisions, and the old pistoles and doubloons of Spain and Italy, are a little worse than our *standard,* but within the latitude allowed to our own mint-master. See REMEDY.

The new louis d'or of France is about a fifth of a carat below that latitude. The ducats of Germany, Holland, Sweden, and Denmark are a carat and a half better than *standard*; and the sequin of Venice, the finest of all the modern European coins, is a carat and seven-eighths better, or only the eighth of a carat worse than fine gold. The *standard* gold of England was formerly of the same fineness with the Venetian sequin, viz. 23 carats 3½ grains. Our present *standard* of 22 carats was introduced in 1527, about 270 years after the commencement of our gold coinage, for a particular sort of coin, called CROWNS, of equal value with those of silver, and hence this kind of gold has been often distinguished by the name of crown gold.

Both the old and new *standard* were continued to the year 1642, since which period only the latter has been used.

The *standard* of silver is 11 ounces and 2 penny weights of silver, and 18 penny-weight of alloy of copper. This pound of *silver* is cut into 62 shillings, whence the proportional value of fine gold to fine silver is, in our coinage, as 15 $\frac{1}{5}$ to 1. See GOLD and SILVER.

Whether gold or silver be above or below *standard,* is found by assaying.

STANDARD, in *War,* a sort of banner, or flags borne as a signal for joining together of the several troops belonging to the same body. See FLAG, &c.

Du-Cange derives the word from *standarum* or *stantarum, standardum* or *standale,* words used in the corrupt Latin, to signify the principal *flag* of an army. Menage derives it from the German, *stander,* or the English, *stand.*

The *standard* is usually a piece of silk, a foot and a half square, on which are embroidered the arms, device, or cypher of the prince, or of the colonel. It is fixed on a lance, eight or nine feet long, and is carried in the centre of the first rank of a squadron of horse by the cornet.

The *standard* is used for any martial ensign of horse; but more particularly for that of the general; or the royal *standard.* Those borne by the foot are rather called COLOURS.

The ancient kings of France bore St. Martin's hood for their *standard.* The Turks preserve a green *standard* borne by Mahomet, with a great deal of devotion, as believing it to have been brought down by the angel Gabriel. Every time it is displayed, all who profess the Mahometan faith are obliged to take arms; those who refuse are to be deemed as infidels.

STANDARD-*guard.* See GUARD.

STANDARDS, *for the Roman.* See SIGNA.

STANDARD, *royal,* in *Sea Language,* is a FLAG in which the imperial ensigns of Great Britain, and the arms of France and Ireland, together with the armorial bearings of Hanover, are united and quartered. This is never hoisted unless when the sovereign is aboard, and then it is displayed at the main-top-mast-head.

STANDARDS, or STANDELS, in *Husbandry,* are young trees, reserved at the felling of woods, for growth of timber.

Twelve such young trees are to be left standing in every acre of wood, at the felling thereof. 35 Hen. VIII. cap. 17. 13 Eliz. cap. 25. Blount.

STANDING, in *Navigation,* denotes the movement by which a ship advances towards a certain object, or departs from it: as the enemy *stands* in shore, the English fleet are *standing-off,* &c.

STANDING-*coins.* See COINS.

STANDING *of colours,* is used by painters for their durableness in opposition to FLYING.

STANDING-*marriage,* in the *Law* of Scotland, is used to express one actually subsisting, though perhaps reducible for adultery, or liable to be declared void for impotency, or contingency of blood; that is, consanguinity. Bayne's Crim. Law.

STANDING *part of the sheat,* in a *Ship,* that part of it which is made fast to a ring at the ship's quarter. When they say, *overhale the sheat,* they mean, *hale upon the standing part*; but when they say *hale the sheat* barely, they intend only of the running part.

STANDING *part of a tackle,* aboard a *Ship,* is the end of the rope where the block is seized or fastened; as the other which is haled, is called *fall.*

STANDING-*ropes,* in a *Ship.* See *Standing* ROPES.

STANNARIES, STANNARIA, the mines and works where tin is dug and purified; as in Cornwall, Devonshire, &c.

There are four courts of the *stannaries* in Devonshire, and as many in Cornwall, for the administration of justice among the tinners. These, which are courts of record, are held before the lord warden and his substitutes, in virtue of a privilege granted to the workers in the tin-mines there, to sue and be sued only in their own courts, that they may not be drawn from their business, which is highly profitable to the public, by attending their law-suits in other courts.

The privileges of the tinners are confirmed by a charter, 33 Ed I. and fully expounded by a private statute, 50 Ed. III. which has since been explained by a public act, 16 Car. I. cap. 15. All tinners and labourers in and about the *stannaries* shall, during the time of their working therein *bona fide,* be privileged from suits in other courts, and be only impleaded in the *stannary* courts in all matters, excepting pleas of land, life, and member. No writ of error lies from hence to any court in Westminster-hall, as was agreed by all the judges in 4 Jac. I. But an appeal lies from the steward of the court to the under-warden, and from him to the lord-warden, and thence to the privy-council of the prince of Wales, as duke

duke of Cornwall, when he hath had livery or investiture of the same; and from thence the appeal lies to the king himself, in the last resort. Blackst. Com. book iii. p. 80.

STANNEL, in *Ornithology*, an English name of a species of hawk, more commonly known by the names of the KESTREL, or the *windhover*; and called by Latin authors TINNUNCULUS and *cenchris*.

STANNUM, *tin*. See TIN.

STANZA, in *Poetry*, a certain stated number of grave verses, containing some perfect sense, terminated with a rest, or pause.

The word is Italian, and literally signifies a stand or station, because of the pause to be made at the end of each *stanza*, or complete sense.

What the *couplet* is in songs, and the *strophe* in odes, the *stanza* is in the greater and graver pieces, as epic poems, &c. Indeed, the Italians scarce write any poems but they divide them into *stanzas*. There are *stanzas* of four, six, eight, ten, twelve, and fourteen verses, and sometimes of an uneven number of verses, as five, seven, &c. But these last are somewhat more difficult to execute, by reason of the three verses to one rhyme. The French lay it down as a rule, that if the first *stanza* begin with a masculine, or a feminine verse, the second is to begin and end with the same.

Every *stanza* ought not only to contain a perfect sense, but to be terminated with some lively and ingenious thought, or some just and pertinent reflection.

Stanzas were first introduced from the Italian into the French poetry, about the year 1580, and thence they were transferred into the English.

The use of *stanzas* in tragedy, or comedy, is condemned by all the best critics; for though we speak verse on the stage, it is still presumed we are speaking prose. *Stanzas* shew a degree of ingenuity on the part of the poet, which has nothing of nature in it on the part of the actor. Add to this, that *stanzas* are not fit to express every thing: wrath, threatening, &c. sit very ill on a regular *stanza*: though irresolution, reveries, and every thing that leads the actor to think on what he is to resolve, agree well enough with the unequal cadence of the *stanza*.

STAPEDIUM, in *Anatomy*, a name given by Albinus to the muscle of the stapes in the ear, called by others *stapidis musculus*, and *stapidanus musculus*.

STAPELIA, *swallow-wort*, in *Botany*, a genus of the *pentandria digynia* class. Its characters are these: the flower has a permanent empalement of one leaf, cut into five acute segments; it has one large plain petal, cut into five acute segments above the middle; and a plain five-pointed starry nectarium, with linear segments, whose torn points surround the parts of generation; it has five plain, broad, erect stamina, with linear summits fastened on each side, and two oval plain germina, having no style, crowned by a blunt stigma; the germina turn to two oblong taper pods, filled with compressed seeds, crowned by a feathery down, lying over each other like the scales of fish. There are two species.

STAPES, in *Anatomy*, a little bone situated in a cavity of the fenestra ovalis; thus called from its resembling a stirrup. See EAR.

The *stapes* is one of the four little bones fastened to the tympanum of the ear, first discovered and published, as Fallopius tells us, by Jo. Phil. ab Ingrassia, a physician of Sicily. Its use is in stretching or relaxing the membrana tympani.

This bone is divided by anatomists into its head, legs, and basis. The head is placed upon a short flatted neck, the top of it being sometimes flat, sometimes a little hollow. The two legs, taken together, form an arch like that of a stirrup, in the concave side of which is a groove, which runs through their whole length; one of the legs is longer, more bent, and a little broader than the other.

The basis resembles that of a stirrup, both in its oval shape, and union with the legs, except that it is not perforated, as the stirrups now are, but solid, like those of the ancients. Round its circumference, next the legs, is a little border, which makes that side of the basis appear a little hollow; the other side is pretty smooth, and one half of the circumference is something more curve than the other. The subject being in an erect posture, the *stapes* is to be considered as lying on its side, with the head turned downward, near the extremity of the leg of the incus; the basis inward being fixed in the fenestra ovalis, the longest leg backward, the shortest forward, and both in the same place. By this situation it is easy to know the *stapes* of each ear. Winslow.

STAPHYLÆA, in *Botany*. See BLADDER-*nut*.

STAPHYLE, a word used by the old Greek writers, sometimes to express a grape, and sometimes a disorder of the uvula, which consists in an extenuation of its superior part, and a tumor of the inferior, whence it hangs down in the shape of a grape. The uvula, or gargareon, is also thus called by some writers.

STAPHYLEPARTES, the name of a chirurgical instrument, in use among the ancients for elevating the uvula. It is mentioned by Paulus Ægineta.

STAPHYLINI, in *Anatomy*, are two small fleshy ropes, closely united together, as if they made but one muscle, but distinguished in some subjects by a very fine white line. They are fixed by one extremity in the common point of the posterior edges of the ossa palati, and from thence run downward and backward along the middle of the septum, and likewise along the middle of almost the whole uvula. These two muscles, which Morgagni, the discoverer of them, considered as one, have been called AZYGOS *Morgagnii* & *epistaphylini*. See GLOSSO-*staphylini*, PALATOSTAPHYLINUS, PERISTAPHYLINUS, PTERYGOSTAPHYLINUS, SPHENO-*salpingo-staphylini*, SPHENOSTAPHYLINUS, and THYRO-*staphylini*.

STAPHYLINI, *pharyngo*, are two small muscles, each of which is fixed by one extremity to the lateral part of the THYRO-*pharyngæi*; from thence they run up obliquely forward along the two posterior half arches of the septum, and terminate in the septum above the uvula, where they meet together, and seem to form an entire arch by the union of their fibres. Winslow.

STAPHYLINI, *petro-salpingo*, or *salpingo-staphylini interni*, are those muscles which are commonly called *peri-staphylini interni*. Each muscle is fixed by one extremity, partly to the inner side of the bony portion of the Eustachian tube, or that next the apophysis petrosa, and partly along the cartilaginous portion of the same tube; from thence it passes a little way under the soft membranous part, and then, turning toward the septum, is fixed in the edge, and partly in the upper side of it. Winslow.

STAPHYLINUS, *peri, externus*, is a name commonly given to the *staphylinus externus*, or SPHENO-*salpingo-staphylinus*.

STAPHYLINUS, in *Botany*, a name given by some authors to the common *daucus sylvestris*, wild carrot, or bird's-nest.

STAPHYLINUS, in *Zoology*, the name of a genus of the *coleoptera* order of *insects*; the characters of which are, that the antennæ are slender and filiform; the elytra are dimidiated; the alæ are covered; the tail is simple, projecting two oblong vesicles.

Of this genus Linnæus enumerates twenty-six species, distinguished from each other by the colour of the several parts of their bodies.

STAPHYLIS, a name given by some authors to a sort of cup, or boat, made for feeding young children, and contrived with a spout in form of a grape or nipple.

STAPHYLODENDRON. See BLADDER-*nut*.

STAPHYLOMA, in *Surgery*, the name of a distemperature of the eye, which is of two kinds: in one the cornea is more than usually protuberant; and in the other the uvea breaks forth, and forms an unsightly tumor on the cornea, either from internal causes, or from some wounding instrument forced through the coat; in which last case the sight of the eye is usually destroyed.

This is a very dangerous disorder, as it not only deforms the face, and destroys the sight of the eye, but very often it induces violent inflammations, head-achs, restlessness, abscesses, and sometimes a cancer in these parts. In the cure of this disorder, the tumor and deformity are to be relieved by the application of compresses dipped in alum-water, together with a plate of lead and a bandage, or some proper instrument. If the uvea protrudes itself through a wound in the cornea, it should be returned with a probe, and the patient must be ordered to lie in a supine posture, and the wound must constantly be dressed with the white of an egg, and a mucilage of quince-seeds, till it is healed, and by this means the sight is often restored.

If this disorder is become inveterate and inflexible to all remedies, a needle, armed with a double thread, must be passed through the middle of the tumor, and the two ends of the thread are then to be tied on a knot, first on one side, and then on the other, by which means the tumor will gradually wither, and fall off along with the threads; but as this method occasions a continued pain, and from thence sometimes arise inflammations, it is better to cut off the tumor with a scalpel, or scissars. Heister's Surgery, p. 423.

STAPIDACEUS *musculus*, in *Anatomy*, a name given by Duverney, Douglas, and many others, to the muscle of the stapes of the ear, called by others *stapedis musculus*, and by Albinus, *stapedium*. See EAR.

STAPLE, STAPULA, primarily signifies a public place, or market, whither merchants, &c. are obliged to bring their goods to be bought by the people; as the Greve, or the

the places along the Seine, for the wines and corns at Paris; whither the merchants of other parts are obliged to bring thoſe commodities.

Voſſius and Menage derive the word from *ſtaplus*, which is found in the Ripuary laws, ſignifying a place where juſtice is adminiſtered. Others derive it from the German *ſtapel*, or Latin *ſtapula*, which Boxhornius derives further from the German *ſtapelen*, *to put in a heap*. Others again have obſerved, that the Engliſh word *ſtaple* is, in the civil-law Latin ſtyle of former times, termed *ſtabile emporium*, i. e. a fixed port or mart for the importing of merchandize. And hence probably they ſay, the contracted word *ſtaple* (uſed, with ſome ſmall variation in the orthography of it, all over Europe) had its derivation.

STAPLE alſo ſignifies a city or town, where merchants jointly agree to carry certain commodities, as wool, cloth, lead, tin, &c. in order to their being commodiouſly ſold by the great. In England *ſtaples* were ſettled and appointed to be conſtantly kept in ſeveral towns, to which places merchants and traders were to carry goods to ſell in thoſe parts. See *Merchants of the* STAPLE.

The *ſtaple* commodities of England were chiefly wool, leather, cloth, tin, lead, &c. though by *ſtaple goods* are now generally meant any proper ſaleable commodities, not eaſily ſubject to periſh; or ſuch wares and merchandize as are the natural and uſual product or manufacture of any city or country.

The *ſtaples* in the Levant, called by the French *eſchelles*, i. e. *ſcales*, are ſuch cities where the Engliſh, French, Dutch, Italians, &c. have conſuls, factors, and magazines; and whither they ſend veſſels regularly each year. The principal of theſe are Smyrna, Alexandretta, Aleppo, Seyda, Cyprus, Sallee, Alexandria, Cairo, Tunis, Algiers, Tripoli, the Morea, Candia, and the iſlands of the Archipelago. See FACTORY.

STAPLE, *law of the*. See LAW.

STAPLE, *merchants of the*, in the *Hiſtory of Engliſh Commerce*, a denomination given to the firſt and moſt ancient commercial ſociety in England, from their exporting the *ſtaple* wares of the kingdom, which were wool, ſkins, lead, and tin, in their rough ſtate for manufacture. This ſociety is ſaid to have had its riſe in the year 1248; and it appears to have had the legal form of a corporation before the 12th year of Edward II. A. D. 1319; as there are records in the pipe-office of the exchequer, which mention, that it was actually a corporation, with the title of the mayor and conſtables of the *ſtaple* of England, who then had their *ſtaple* at Antwerp, for conducting the ſale of Engliſh *ſtaple* wares, and the importation of ſuch foreign goods as were wanted at home. However, in 1328, by 2 Ed. III. cap. 9. it was enacted, that the *ſtaples*, on both ſides of the ſea, ſhould ceaſe, and that all merchant ſtrangers, &c. might go and come with their merchandize into England, after the tenor of the Great Charter. In 1336 the *ſtaple* of wool was again fixed in Brabant; in 1341, at Bruges; and in 1348, at Calais; whither, and to no other place, all merchandize exported from England, Wales, and Ireland, either by denizens or aliens, were to be ſhipped from England and there landed. The cuſtoms from this *ſtaple* are ſaid to have then amounted to upwards of 60,000 *l.* ſterling yearly. In 1353, Edward III. removed the *ſtaple* of wool from Bruges to Weſtminſter, Canterbury, Chicheſter, Exeter, Wincheſter, Briſtol, Lincoln, York, Norwich, Newcaſtle, and Hull, for England; and to Dublin, Cork, Waterford, and Drogheda, for Ireland: and it was enacted by 27 Edw. III. called the *ſtatute of the ſtaple*, that all *ſtaple* wares for exportation, ſhould be firſt brought to ſome of theſe places only, where the cuſtom ſhould be paid, and exported by merchant-ſtrangers only, under an oath not to hold any *ſtaple* thereof beyond ſea; which privilege was extended, by 31 Edw. III. to denizens alſo: Calais, however, ſtill remained a *ſtaple*.

In theſe *ſtaple*-towns, courts of *law-merchant* were eſtabliſhed, by the ſaid ſtatute, for determining all mercantile affairs, and for puniſhing and amercing offenders. The principal matters under the cognizance of theſe courts were ſuch as pertained to the five *ſtaple* commodities of England, viz. wool and wool-fels, or ſheep-ſkins, leather, lead, and tin. From the year 1375, the *ſtaple* of Weſtminſter ſeems to have been removed to the place called *Staple-Inn*, in Holborn. When Calais, which had been for many years a principal *ſtaple*-port for diſperſing, in more early times, the Engliſh wool, lead, and tin, and in latter times, the Engliſh woollen manufactures, under the conduct of the *merchant adventurers*, into the inland countries of the Netherlands, France, and Germany, was loſt to this country in 1588, the *ſtaple* for wool, &c. was eſtabliſhed at Bruges; and queen Elizabeth, in the third year of her reign, granted a new charter of confirmation to the corporation of the mayor and conſtables of the *ſtaple* of England, of all ſuch privileges as they did, might, or ought to have enjoyed before the loſs of Calais. However, king James I. in 1604, granted a new charter to the *Merchant* ADVENTURERS, and, in 1617, confirmed all their former powers and privileges for trading to the Netherlands and to Germany, with the woollen manufactures of England, excluſively of all who were not free of their company; in conſequence of which, the merchants of the *ſtaple*, who had before been declining, by the manufacture and exportation of our woollen cloth, were brought to ruin. And when at length it was judged expedient to enact a total prohibition of the exportation of our WOOL, it is no wonder that the *ſtaplers* company ſhould become extinct. At this day they exiſt only in name; though they maintain the form of a corporation by annually electing the officers of their company, according to the direction of their ancient charters. This nominal corporation is kept up by thoſe who deal in wool (ſtill called *wool-ſtaplers*), and who, in their corporate capacity, poſſeſs a ſmall ſum in the public funds, the intereſt of which ſerves to defray the expence of their meetings and elections. But they never had a hall, or office of their own, within the city of London, like other trading companies, although the inn of Chancery in Holborn is ſo denominated from their warehouſes, which were formerly ſituated there; as was alſo an office and warehouſe of theirs, which, ſince the erection of the new bridge at Weſtminſter, has loſt its place, as well as name of *wool-ſtaple*, at the upper part of Cannon Row. Anderſon's Hiſt. Com. vol. i. See CUSTOMS.

STAPLE, *ſtatute*. See STATUTE, and the preceding article.

STAR, STELLA, in *Aſtronomy*, a general name for all the heavenly bodies.

The *ſtars* are diſtinguiſhed, from the phenomena of their motion, &c. into *fixed* and *erratic*.

STARS, *erratic* or *wandering*, are thoſe whoſe diſtances and places, with regard to each other, are continually changing. Theſe are what we properly call PLANETS. Though to the ſame claſs may likewiſe be referred, what we popularly call *blazing ſtars*, or COMETS.

STARS, *fixed*, called alſo, by way of eminence, *ſtars*, are thoſe which have been generally obſerved to keep the ſame diſtance, with regard to each other.

The principal points that have come under the conſideration of aſtronomers concerning the *fixed ſtars*, are, their *diſtance*, *magnitude*, *number*, *nature*, and *motion*.

STARS, *diſtance of the fixed*. The fixed *ſtars* are bodies exceedingly remote from us; indeed, ſo remote, that we have no diſtances in the planetary ſyſtem to compare to them.

Their immenſe diſtance is argued hence, that they have no ſenſible PARALLAX; that is, that the diameter of the earth's orbit bears no ſenſible proportion thereto; but they are ſeen the very ſame in all the points thereof.

Mr. Huygens (Coſmotheor. lib. iv.) attempts to determine the diſtance of the *ſtars*, by making the aperture of a teleſcope ſo ſmall, as that the ſun, through it appears no bigger than Sirius. In this ſtate he found the ſun's diameter to be as 1 to 27664 of his diameter, when ſeen with the naked eye. Were the ſun's diſtance, then, 27664 times as great as it is, it would be ſeen of the ſame diameter with Sirius; ſo that, allowing Sirius to be equal in magnitude with the ſun (which is a very reaſonable ſuppoſition), the diſtance of Sirius from the earth will be found to be to that of the ſun from the earth, as 27664 to 1. On which principle, Sirius will be 657020000 ſemi-diameters of the earth diſtant from our earth.

Mr. James Gregory inveſtigated the diſtance of Sirius, by ſuppoſing it of the ſame magnitude with the ſun, and of the ſame diameter with Jupiter in oppoſition, as may be ſeen at large in Gregory's Art. lib. iii. prop. 47.

Caſſini (Mem. d'Acad. Ann. 1717), from comparing Jupiter and Sirius, when viewed through the ſame teleſcope, inferred, that the diameter of that planet was ten times as great as that of the *ſtar*, and the diameter of Jupiter being 50″, he concluded that the diameter of Sirius was about 5″; ſuppoſing then that Sirius is equal to the ſun in magnitude, and the diſtance of the ſun from us to be about 10000 diameters of the earth, and the apparent diameter of Sirius being to that of the ſun as 1 to 384, the diſtance of Sirius from the earth becomes equal to 3840000 diameters of the earth.

Theſe methods of Gregory, Huygens, and Caſſini, are conjectural and precarious, becauſe they ſuppoſe that the ſun and Sirius are equal in magnitude, and principally becauſe they take it for granted, that the diameter of Sirius is determined with ſufficient exactneſs.

Mr. Michel has propoſed an inquiry into the probable parallax

rallax and magnitude of the fixed *ſtars*, from the quantity of light which they afford us, and the peculiar circumſtances of their ſituation. With this view he ſuppoſes, that they are, at a medium, equal in magnitude and natural brightneſs to the ſun; and then proceeds to inquire what would be the parallax of the ſun, if he were to be removed ſo far from us, as to make the quantity of the light, which we ſhould then receive from him, no more than equal to that of the fixed *ſtars*. Accordingly, he aſſumes Saturn in oppoſition, excluſively of his ring (and when the earth and this planet are at their mean diſtances from the ſun) as equal, or nearly equal in light to the moſt luminous fixed *ſtar*. As the mean diſtance of Saturn from the ſun is equal to about 2082 of the ſun's ſemidiameters, the denſity of the ſun's light at Saturn will conſequently be leſs than at his own ſurface, in the proportion of the ſquare of 2082 or 4334724 to 1. If Saturn, therefore, was to reflect all the light that falls upon him, he would be leſs luminous in the ſame proportion; and, beſides, his apparent diameter, in oppoſition, is at moſt but 105th part of that of the ſun, and conſequently the quantity of light, which we receive from him, muſt be again diminiſhed in the proportion of the ſquare of 105 or 11025 to 1. By multiplying theſe two numbers together, we ſhall have the whole of the light of the ſun to that of Saturn, as the ſquare nearly of 220,000 or 48,400,000,000 to 1: and removing the ſun to 220,000 times his preſent diſtance, he would ſtill appear at leaſt as bright as Saturn, and his whole parallax upon the diameter of the earth's orbit would be leſs than two ſeconds: and this muſt be aſſumed for the parallax of the brighteſt of the fixed *ſtars*, upon the ſuppoſition that their light does not exceed that of Saturn.

By a ſimilar computation it may be found, that the diſtance, at which the ſun would afford us as much light as we receive from Jupiter, is not leſs than 46,000 times his preſent diſtance, and his whole parallax in that caſe, upon the diameter of the earth's orbit, would not be more than nine ſeconds; the light of Jupiter and Saturn, as ſeen from the earth, being in the ratio of about 22 to 1, when they are both in oppoſition, and ſuppoſing them to reflect equally in proportion to the whole of the light that falls upon them. But if Jupiter and Saturn, inſtead of reflecting the whole of the light, that falls upon them, ſhould really reflect only a part of it, e. g. a fourth or ſixth, which may be the caſe, their diſtances computed above, muſt be increaſed in the proportion of 2 or $2\frac{1}{2}$ to 1, to make the ſun's light no more than equal to their's; and his parallax would be leſs in the ſame proportion. Suppoſing then that the fixed *ſtars* are of the ſame magnitude and brightneſs with the ſun, it is no wonder that their parallax ſhould hitherto have eſcaped obſervation; ſince, if this is the caſe, it could hardly amount to two ſeconds, and probably not more than one in Sirius himſelf, though he had been placed in the pole of the ecliptic; and in thoſe that appear much leſs luminous, e. g. γ Draconis, which is only of the third magnitude, it could hardly be expected to be ſenſible with ſuch inſtruments as have hitherto been uſed. However, Mr. Michell ſuggeſts that it is not impracticable to conſtruct inſtruments, capable of diſtinguiſhing even to the 20th part of a ſecond, provided the air will admit of that degree of exactneſs. This ingenious writer apprehends, that the quantity of light which we receive from Sirius does not exceed the light which we receive from the leaſt fixed *ſtars* of the 6th magnitude, in a greater proportion than that of 1000 to 1, nor in a leſs proportion than that of 400 to 1, and the ſmaller *ſtars* of the ſecond magnitude ſeem to be about a mean proportional between the other two. Hence the whole parallax of the leaſt fixed *ſtars* of the 6th magnitude, ſuppoſing them of the ſame ſize and native brightneſs with the ſun, ſhould be from about $2'''$ to $3'''$, and their diſtance from about eight to twelve millions times that of the ſun: and the parallax of the ſmaller *ſtars* of the ſecond magnitude, upon the ſame ſuppoſition, ſhould be about $12'''$, and their diſtance about two millions times that of the ſun.

This author farther ſuggeſts, that, from the apparent ſituation of the *ſtars* in the heavens, there is the higheſt probability (the odds againſt the contrary opinion being many million millions to one) that the *ſtars* are collected together in cluſters in ſome places, where they form a kind of ſyſtems, whilſt in others there are either few or none of them, whether this diſpoſition be owing to their mutual gravitation, or to ſome other law or appointment of the Creator. Hence, it may be inferred, that ſuch *double ſtars*, &c. as appear to conſiſt of two or more *ſtars* placed very near together, do really conſiſt of *ſtars* placed near together, and under the influence of ſome general law: and he proceeds to inquire, whether if the *ſtars* are collected into ſyſtems, the ſun does not likewiſe make one of ſome ſyſtem, and which are thoſe, among the fixed *ſtars*, that belong to the ſame ſyſtem with himſelf.

Thoſe *ſtars*, he apprehends, which are found in cluſters, and ſurrounded by many others at a ſmall diſtance from them, belong probably to other ſyſtems and not to ours. And thoſe *ſtars*, which are ſurrounded with nebulæ, are probably only very great *ſtars*, which on account of their ſuperior magnitude, are ſingly viſible, while the others, which compoſe the remaining parts of the ſame ſyſtem, are ſo ſmall as to eſcape our ſight. And thoſe nebulæ, in which we can diſcover either none or only a few *ſtars*, even with the aſſiſtance of the beſt teleſcopes, are probably ſyſtems that are ſtill more diſtant than the reſt. For other particulars of this inquiry, we muſt refer to Phil. Tranſ. vol. lvii. art. 27. p. 234, &c.

As the diſtance of the fixed *ſtars* is beſt determined by their parallax, various methods have been purſued, hitherto without ſucceſs, for inveſtigating it: and the reſult of the moſt accurate obſervations has given us little more than a diſtant approximation, from which we may conclude, that the neareſt of the fixed *ſtars* cannot be leſs than forty thouſand diameters of the whole annual orbit of the earth diſtant from us.

The method pointed out by Galileo, and firſt attempted by Hooke, Flamſteed, Molineux, and Bradley, of taking diſtances of *ſtars* from the zenith that paſs very near it, has given us a much juſter idea of the immenſe diſtance of the *ſtars*, and furniſhed us with an approximation to the knowledge of their parallax, that is much nearer the truth than we ever had before.

Dr. Bradley aſſures us (Phil. Tranſ. N° 406. or Abr. vol. vi. p. 162.), that, if it had amounted to a ſingle ſecond, or two at moſt, he ſhould have perceived it in the great number of obſervations which he made, eſpecially upon *γ Draconis*; and that it ſeemed to him very probable, that the annual parallax of this *ſtar* is not ſo great as a ſingle ſecond, and conſequently, that it is above four hundred thouſand times farther from us than the ſun.

But Mr. Herſchel, to whoſe ingenuity and induſtry in exploring the heavens aſtronomy is already much indebted, and from which much more may be expected, remarks, that the inſtrument uſed on this occaſion, being the ſame with the preſent zenith ſectors, can hardly be allowed ſufficient to ſhew an angle of one or even two ſeconds with accuracy: and beſides, the *ſtar*, on which the obſervations were made, is only a bright *ſtar* of the third, or ſmall *ſtar* of the ſecond magnitude; and, therefore, its parallax is probably conſiderably leſs than that of a *ſtar* of the firſt magnitude: ſo that we are not warranted in inferring, that the parallax of the *ſtars* in general does not exceed $1''$, whereas thoſe of the firſt magnitude may have, notwithſtanding the reſult of Dr. Bradley's obſervations, a parallax of ſeveral ſeconds.

Moreover, the method of zenith diſtances is liable to conſiderable errors, on account of refraction, the change of poſition of the earth's axis ariſing from nutation, preceſſion of the equinoxes, and other cauſes, and the aberration of light.

Mr. Herſchel has propoſed another method, by means of double *ſtars*, which is free from theſe errors, and of ſuch a nature, that the annual parallax, even if it ſhould not exceed the tenth part of a ſecond, may ſtill become viſible and be aſcertained, at leaſt to a much greater degree of approximation than it ever has been done. This method, which was firſt propoſed, in an imperfect manner, by Galileo, and has been alſo mentioned by other authors, is capable of every improvement which the teleſcope and mechaniſm of micrometers can furniſh. In order to obtain a general idea of it, let O, E (*Tab. Aſtronomy, fig.* 55.) be two oppoſite points of the annual orbit, taken in the ſame plane with two *ſtars a, b* of unequal magnitudes. Let the angle *a* O *b* be obſerved when the earth is at O, and *a* E *b* be obſerved when the earth is at E. From the difference of theſe angles, if there ſhould be any, we may calculate the parallax of the *ſtars*, according to the theory ſubjoined. Theſe two *ſtars* ought to be as near each other as poſſible, and alſo to differ as much in magnitude as we can find them.

Mr. Herſchel's theory of the annual parallax of double *ſtars*, with the method of computing from thence what is generally called the *parallax* of the fixed *ſtars*, or of ſingle *ſtars* of the firſt magnitude, ſuch as are neareſt to us, ſuppoſes, *firſt*, that the *ſtars*, one with another, are about the ſize of the ſun: and, *ſecondly*, that the difference of their apparent magnitudes, is owing to their different diſtances, ſo that a *ſtar* of the ſecond, third, or fourth magnitude is two, three, or four times as far off as one of the firſt. Theſe principles, which he premiſes as poſtulata, have ſo great a probability in their favour, that they will hardly be objected to by thoſe who are in the leaſt acquainted with the doctrine of chances. See

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Mr. Michell's Inquiry, &c. already cited. Phil. Tranſ. vol. lvii. p. 234. 236, 237. 240. And Dr. Halley on the Number, Order, and Light of the Fixed *Stars*. Phil. Tranſ. vol. xxxi. or Abr. vol. vi. p. 148.

Accordingly, let O E (*Tab. Aſtronomy, fig.* 56.) be the whole diameter of the earth's annual orbit; and let *a, b, c*, be three *ſtars* ſituated in the ecliptic, in ſuch a manner, that they may be ſeen all in one line O *a b c*, when the earth is at O. Let the line O *a b c* be perpendicular to OE, and draw P E parallel to *c*O: then, if O *a*, *a b*, *b c*, are equal to each other, *a* will be a *ſtar* of the firſt magnitude, *b* of the ſecond, and *c* of the third. Let us now ſuppoſe the angle O *a* E, or parallax of the whole orbit of the earth, to be 1″ of a degree; then we have PE *a* = O *a* E = 1″: and, becauſe very ſmall angles, having the ſame ſubtenſe O E, may be taken to be in the inverſe ratio of the lines O *a*, O *b*, O *c*, &c. we ſhall have O *b* E = $\frac{1}{2}$″, O *c* E = $\frac{1}{3}$″, &c. Now when the earth is removed to E, we ſhall have P E *b* = E *b o* = $\frac{1}{2}$″, and PE*a* − PE*b* = *a*E*b* = $\frac{1}{2}$″: i. e. the *ſtars a, b*, will appear to be $\frac{1}{2}$″ diſtant. We alſo have P E*c* = E *c* O = $\frac{1}{3}$″, and P E *a* − PE *c* = *a* E *c* = $\frac{2}{3}$″; i. e. the *ſtars a, c*, will appear to be $\frac{2}{3}$″ diſtant, when the earth is at E. Now, ſince we have *b* E P = $\frac{1}{2}$″, and *c* E P = $\frac{1}{3}$″, therefore *b* E P − *c* E P = *b* E *c* = $\frac{1}{2}$″ − $\frac{1}{3}$″ = $\frac{1}{6}$″; i. e. the *ſtars b, c*, will appear to be only $\frac{1}{6}$″ removed from each other, when the earth is at E. Whence we may deduce the following expreſſion, to denote the parallax that will become viſible in the change of diſtance between the two *ſtars*, by the removal of the earth from one extreme of its orbit to the other. Let P expreſs the total parallax of a fixed *ſtar* of the firſt magnitude, M the magnitude of the largeſt of the two *ſtars*, *m* the magnitude of the ſmalleſt, and *p* the partial parallax to be obſerved by the change in the diſtance of a double *ſtar*; then will $p = \frac{m-M}{Mm}P$; and *p*, being found by obſervation, will give us $P = \frac{pMm}{m-M}$. e. g. Suppoſe a *ſtar* of the firſt magnitude ſhould have a ſmall *ſtar* of the twelfth magnitude near it; then will the partial parallax we are to expect to ſee be $\frac{12 \times 1\,P}{12-1}$, or $\frac{11}{12}$ of the total parallax of a fixed *ſtar* of the firſt magnitude; and if we ſhould, by obſervation, find the partial parallax between two ſuch *ſtars* to amount to 1″, we ſhall have the total parallax $P = \frac{1 \times 1 \times 12}{12-1} = 1''.0909$. If the *ſtars* are of the third and twenty-fourth magnitude, the partial parallax will be $\frac{24-3}{3 \times 24} = \frac{21}{72}P$; and if, by obſervation, *p* is found to be a tenth of a ſecond, the whole parallax will come out $\frac{.1 \times 3 \times 24}{24-3} = 0''.3428$.

Farther, ſuppoſe the *ſtars*, being ſtill in the ecliptic, to appear in one line, when the earth is in any other part of its orbit between O and E; then will the parallax ſtill be expreſſed by the ſame algebraic formula, and one of the maxima will ſtill lie at O, the other at E; but the whole effect will be divided into two parts, which will be in proportion to each other as radius − ſine to radius + ſine of the *ſtars* diſtance from the neareſt conjunction or oppoſition.

When the *ſtars* are any where out of the ecliptic, ſituated ſo as to appear in one line O *a b c* perpendicular to O E, the maximum of parallax will ſtill be expreſſed by $\frac{m-M}{Mm}P$; but there will ariſe another additional parallax in the conjunction and oppoſition, which will be to that which is found 90° before or after the ſun, as the ſine (S) of the latitude of the *ſtars* ſeen at O is to radius (R); and the effect of this parallax will be divided into two parts; half of it lying on one ſide of the large *ſtar*, the other half on the other ſide of it. This latter parallax, moreover, will be compounded with the former, ſo that the diſtance of the *ſtars* in the conjunction and oppoſition will then be repreſented by the diagonal of a parallelogram, whereof the two ſemi-parallaxes are the ſides; a general expreſſion for which will be $\sqrt{\left(\frac{m-M}{2mM}P\right)^2 \times \frac{SS}{RR} + 1}$; for the *ſtars* will apparently deſcribe two ellipſes in the heavens, whoſe tranſverſe axis will be to each other in the ratio of M to *m* (*fig.* 59.), and A *a*, B *b*, C *c*, D *d*, will be cotemporary ſituations. Now, if *b* Q be drawn parallel to A C, and the parallelogram *b q* B Q be completed, we ſhall have *b* Q = $\frac{1}{2}$ C A − $\frac{1}{2}$ *ca* = $\frac{1}{2}$ C*c* = $\frac{1}{2}$ *p*, or ſemi-parallax 90° before or after the ſun, and B *b* may be reſolved into, or is compounded of, *b* Q and *b q*; but *b q* = $\frac{1}{2}$ B D − $\frac{1}{2}$ *b d* = the ſemi-parallax in the conjunction or oppoſition. We alſo have R : S : : *b* Q : $bq = \frac{pS}{2R}$; therefore the diſtance B *b* (or D *d*) = $\sqrt{\left(\frac{p}{2}\right)^2 + \left(\frac{pS}{2R}\right)^2}$; and by ſubſtituting the value of *p* into this expreſſion we obtain $\sqrt{\left(\frac{m-M}{2Mm}P\right)^2 \times \frac{SS}{RR} + 1}$, as above. When the *ſtars* are in the pole of the ecliptic, *b q* will become equal to *b* Q, and B *b* will be .7071 P $\frac{m-M}{Mm}$. Again, let the *ſtars* be at ſome diſtance, e. g. 5″ from each other, and let them both be in the ecliptic. This caſe is reſolvable into the firſt; for imagine the *ſtar a* (*fig.* 64.) to ſtand at *x*, and in that ſituation the *ſtars x, b, c*, will be in one line, and their parallax expreſſed by $\frac{m-M}{Mm}P$. But the angle *a* E *x* may be taken to be equal to *a* O *x*; and as the foregoing formula gives us the angles *x* E *b*, *x* E *c*, we are to add *a* E *x* or 5″ to *x* E *b*, and we ſhall have *a* E *b*. In general, let the diſtance of the *ſtars* be *d*, and let the obſerved diſtance at E be D; then will D = *d* + *p*, and therefore the whole parallax of the annual orbit will be expreſſed by $\frac{DMm - dMm}{m-M} = P$.

Suppoſe the two *ſtars* now to differ only in latitude, one being in the ecliptic, the other e. g. 5″ north, when ſeen at O. This caſe may alſo be reſolved by the former; for imagine the *ſtars b, c* (*fig.* 56.) to be elevated at right angles above the plane of the figure, ſo that *a* O *b*, or *a* O *c*, may make an angle of 5″ at O; then, inſtead of the lines O *a b c*, E *a*, E *b*, E *c*, E P, imagine them all to be planes at right angles to the figure; and it will appear, that the parallax of the *ſtars* in longitude, muſt be the ſame as if the ſmall *ſtar* had been without latitude. And ſince the *ſtars b, c*, by the motion of the earth from O to E, will not change their latitude, we ſhall have the following conſtruction for finding the diſtance of the *ſtars a b*, *a c* at E, and from thence the parallax P. Let the triangle *a b β* (*Tab. Aſtronomy, fig.* 7.) repreſent the ſituation of the *ſtars*; *a b* is the ſubtenſe of 5″, the angle under which they are ſuppoſed to be ſeen at O. The quantity *b β* by the former theorem is found, $\frac{m-M}{Mm}P$, which is the partial parallax that would have been ſeen by the earth's moving from O to E, if both *ſtars* had been in the ecliptic; but on account of the difference in latitude it will be now repreſented by *a β*, the hypothenuſe of the triangle *a b β*: therefore, in general, putting *a b* = *d*, and *a β* = D, we have $\frac{\sqrt{DD - dd} \times Mm}{m-M} = P$. Hence D being taken by obſervation, and *d*, M, and *m*, given, we obtain the total parallax.

If the ſituation of the *ſtars* differs in longitude as well as latitude, we may reſolve this caſe by the following method. Let the triangle *a b β* (*Tab.* IV. *Aſtronomy, fig.* 91.) repreſent the ſituation of the *ſtars*, *a b* = *d* being their diſtance ſeen at O, *a β* = D their diſtance ſeen at E. That the change *b β*, which is produced by the earth's motion will be truly expreſſed by $\frac{m-M}{Mm}P$ may be proved as before, by ſuppoſing the *ſtar a* to have been placed at *α*. Now let the angle of poſition *b a α* be taken by a micrometer, or by any other method ſufficiently exact; then, by ſolving the triangle *a b α*, we ſhall have the longitudinal and latitudinal differences *a α* and *b α* of the two *ſtars*. Put *a α* = *x*, *b α* = *y*, and it will be $\overline{x + b\beta} = aq$, whence $D = \sqrt{\left(x + \frac{m-M}{Mm}P\right)^2 + yy}$; and $\frac{\sqrt{D^2 - y^2} \times M^2 m - xMm}{m-M} = P$.

If neither of the *ſtars* ſhould be in the ecliptic, nor have the ſame longitude or latitude, the laſt theorem will ſtill ſerve to calculate the total parallax whoſe maximum will lie in E. There will, moreover, ariſe another parallax, whoſe maximum will be in the conjunction and oppoſition, which will be divided, and lie on different ſides of the large *ſtar*; but as we know the whole parallax to be exceedingly ſmall, it will not be neceſſary to inveſtigate every particular caſe of this kind; for, by reaſon of the diviſion of the parallax, which renders obſervations taken at any other time, except where it is greateſt, very unfavourable, the formulæ would be of little uſe. Mr. Herſchel cloſes his account of this theory with a general obſervation on the time and place where the maxima of parallax will happen.

When two unequal *ſtars* are both in the ecliptic, or, not being in the ecliptic, have equal latitudes, north or ſouth,

and

and the largest *star* has most longitude, the maximum of the apparent distance will be when the sun's longitude is 90° more than the *stars*, or when observed in the morning: and the minimum when the longitude of the sun is 90° less than that of the *star*, or when observed in the evening. When the small *star* has most longitude, the maximum and minimum, as well as the time of observation, will be the reverse of the former. When the *stars* differ in latitudes, this makes no alteration in the place of the maximum or minimum, nor in the time of observation; i. e. it is immaterial whether the largest *star* has the least or the greatest latitude of the two *stars*. Phil. Trans. vol. lxxii. part i. art. 11.

The distance of the *star* γ *Draconis* appears by Dr. Bradley's observations, already recited, to be at least four hundred thousand times that of the sun, and the distance of the nearest fixed *star* not less than forty thousand diameters of the earth's annual orbit: i. e. the former is distant from the earth at least 38,000,000,000,000 miles, and the latter not less than 7,600,000,000,000 miles. As these distances are immensely great, it may not be unamusing to compare them with the velocity of some moving body by which they may be measured.

The swiftest motion we know of is that of LIGHT, which passes from the sun to the earth in eight minutes thirteen seconds, and yet this would be above six years traversing the first space, and near $1\frac{1}{4}$ year in passing from the nearest fixed *star* to the earth. A cannon ball discharged from a twenty-four pounder, with $\frac{2}{3}$ its weight of powder, which moves at the rate of about nineteen miles in a minute (see GUN), would be three million eight hundred thousand years passing from γ *Draconis* to the earth, and seven hundred and sixty thousand years passing from the nearest fixed *star*. Sound, which moves at the rate of about thirteen miles in a minute, would be five million six hundred thousand years traversing the former distance, and one million one hundred and twenty thousand passing through the latter.

The celebrated Huygens pursued speculations of this kind so far, as to believe it not impossible, that there may be *stars* at such inconceivable distances, that their light has not yet reached the earth since its creation.

Dr. Halley has also advanced, what he says (Phil. Trans. N° 364. or Abr. vol. vi. p. 148.) seems to be a metaphysical paradox, viz. that the number of fixed *stars* must be more than any finite number, and some of them more than at a finite distance from others: and Mr. Addison has justly observed, that this thought is far from being extravagant, when we consider that the universe is the work of infinite power, prompted by infinite goodness, having an infinite space to exert itself in; so that our imagination can set no bounds to it.

STARS, *the magnitudes of the fixed*, appear to be very different, which difference may probably arise, not only from a diversity in their real magnitudes, but principally from their distances, which are different.

The *stars* appear of a sensible magnitude to the bare eye, because the retina is affected not only by the rays of light which are emitted directly from them, but by many thousands more, which, falling upon our eye-lids, and upon the aerial particles about us, are reflected into our eyes so strongly, as to excite vibrations, not only in those points of the retina where the real images of the *stars* are formed, but also in other points at the same distance round about. This makes us imagine the *stars* to be much bigger than they would appear, if we saw them only by the few rays which come directly from them, so as to enter our eyes without being intermixed with others.

Any one may be sensible of this by looking at a *star* of the first magnitude through a long narrow tube, which though it takes in as much of the sky as would hold a thousand such *stars*, scarce renders that one visible.

The *stars*, on account of their apparently various magnitudes, have been distributed into several classes, called *magnitudes*.

The first class, or *stars* of the first magnitude, are those which appear largest, and may probably be nearest us. Next these, are those of the second magnitude, and so on to the sixth, which comprehends the smallest *stars* visible to the naked eye. All beyond these are called *telescopic stars*. Not that all the *stars* of each class appear justly of the same magnitude; there is great latitude in this respect; and those of the first magnitude appear almost all different in lustre and size. Other *stars* there are, of intermediate magnitudes, which astronomers cannot refer to one rather than another class, and therefore they place them between the two.

Procyon, for instance, which Ptolemy makes of the first magnitude, and Tycho of the second, Mr. Flamsteed lays down as between the first and second.

Thus, instead of six several magnitudes, we may say there are almost as many orders of *stars* as there are *stars*; such a difference being observable in the magnitude, colour, and brightness of them.

Whatever room there may be to hope, that we may some time or other be able to discover the parallax of a few among the fixed *stars*, yet at the same time it seems probable, that we shall never be able to discover any sensible magnitude in their apparent diameters, which even in Sirius, if his native brightness is not less than that of the sun, must be considerably less, whatever be his parallax, than the hundredth, probably than the two hundredth part of a second; so that it could scarcely be distinguishable with a telescope, upon the former supposition, that should magnify six, or, upon the latter, with one that should magnify twelve thousand times. Nor can we well expect to find their apparent diameters from any occultation by the moon, since the diameter of a hundredth part of a second would be covered by the moon, if it entered directly, in less than the fiftieth part of a second of time, and, therefore, a *star* can hardly enter so obliquely, as to appear to vanish by degrees: no *star*, probably, which the moon can pass over, subtending an angle half so great. Nor is it likely there can any thing be determined from occultations by any of the planets. And, therefore, there seems to be little chance of discovering with certainty the real size of any of the fixed *stars*, and we must be content to deduce it from their parallax (if that should ever be found) and the quantity of light which they afford us, compared with that of the sun. Mr. Herschel, however, informs us, that with a magnifying power of 6450, and by means of his new micrometer, he found the apparent diameter of α and Lyræ to be 0″.355.

The *stars* are likewise distinguished, with regard to their situation, into *asterisms*, or CONSTELLATIONS, which are nothing but assemblages of several neighbouring *stars*, considered as constituting some determinate figure, as of an animal, &c. and denominated therefrom; a division as ancient as the book of Job, wherein we find mention of Orion, and the Pleiades, &c.

Besides the *stars* thus distinguished into magnitudes and constellations, there are others not reduced to either. Those not reduced into constellations, are called INFORMES, or *unformed stars*; of which kind several, so left at large by the ancients, have been since formed into new constellations by the modern astronomers; as *Cor Caroli*, by Dr. Halley; *Scutum Sobieski*, by Hevelius, &c.

Those not reduced to classes or magnitudes, are called NEBULOUS *stars*, being such as only appear faintly in clusters, in form of little lucid nebulæ, or clouds.

Ptolemy sets down five cloudy *stars*, viz. one at the extremity of the right hand of Perseus, which appears, through the telescope, thick set with *stars*; one in the middle of the Crab, called *Præsepe*, or the Manger, in which Galileo counted above forty *stars*; one unformed near the sting of the Scorpion; the eye of Sagittarius, in which two *stars* may be seen in a clear sky with the naked eye, and several more with the telescope; and one in the head of Orion, in which Galileo counted twenty-one *stars*.

Flamsteed observed a cloudy *star* before the bow of Sagittarius, which consists of a great number of small *stars*, and the *star* *d* above Sagittarius's right shoulder is encompassed with several more.

Cassini and Flamsteed discovered one between the Great and Little Dog, which is very full of *stars*, visible only by the telescope.

But the most remarkable of all the cloudy *stars* is that in the middle of Orion's sword, in which Huygens, and since Dr. Long, observed twelve *stars*, seven of which (three of them, now known to be four, being very close together) seem to shine through a cloud, very lucid near the middle, but faint and ill defined about the edges. See GALAXY, MAGELLANIC *clouds*, and *lucid* SPOTS.

Cassini is of opinion, that the brightness of these proceeds from *stars* so minute, as not to be distinguished by the best glasses: others more probably think, they are large spaces in the æther through which a lucid medium is diffused. Although most of these spaces are but a few minutes of a degree in breadth, yet, since they are among the fixed *stars*, they are probable spaces not less than our whole solar system; in which there seems to be a perpetual uninterrupted day, which may furnish matter of speculation, as well to the curious naturalist, as to the astronomer.

There are also several *stars* which appear single to the naked eye, but are discovered by the telescope to be double, &c. Of these several have been observed by Cassini, Hooke, Long, Maskelyne, Hornsby, Pigott, Mayer, &c. but Mr. Herschel has been much the most successful in observations of this kind. Besides the skill

and induſtry by which he is no leſs diſtinguiſhed than other aſtronomers, who have been employed in celeſtial obſervations, his ſucceſs has been chiefly owing to the very extraordinary magnifying powers of the Newtonian ſeven feet reflector which he has uſed, and the advantage of an excellent micrometer of his own conſtruction. The powers which he has uſed, have been 146, 227, 278, 460, 754, 932, 1159, 1536, 2010, 3168, and even 6450. He has already formed a catalogue, containing two hundred and ſixty-nine double *ſtars*, two hundred and twenty-ſeven of which, as far as he knows, have not been noticed by any other perſon. Among theſe there are alſo ſome *ſtars*, that are treble, double-double, quadruple, double-treble, and multiple. His catalogue comprehends the names of the *ſtars*, and number in Flamſteed's Catalogue, or ſuch a deſcription of thoſe that are not contained therein, as will be found ſufficient to diſtinguiſh them; the comparative ſize of the *ſtars*; their colours as they appeared to his view; their diſtances determined in ſeveral different ways; their angle of poſition with regard to the parallel of declination: and the dates when he firſt perceived the *ſtars* to be double, treble, &c. His obſervations appear to commence with the year 1776, but almoſt all of them were made in the years 1779, 1780, 1781: and, therefore, much may be expected from his continued aſſiduity. See *Georgium* SIDUS.

Mr. Herſchel has diſtributed the double *ſtars* contained in his catalogue, into ſix different claſſes. In the firſt he has placed all thoſe which require a very ſuperior teleſcope, the utmoſt clearneſs of air, and every other favourable circumſtance to be ſeen at all, or well enough to judge of them: of theſe there are twenty-four, viz.

ε Bootis, Flamſteed's 36. ξ Urſæ Majoris, Fl. 53. σ Coronæ Borealis, Fl. 17. a treble *ſtar*. Fl. 16. Draconis. σ Caſſiopeæ, Fl 8. Fl. 12. infra oculum Lyncis, a curious treble *ſtar*. *b* Draconis, Fl. 39. ε Draconis, Fl. 63. Fl. 38. in cauda Lyncis media. Fl. 11. in ſiniſtro anteriore pede Monocerotis, a curious treble *ſtar*. Fl. 11. Cancri. *d* Serpentis, Fl. 59. Near Fl. 37. in Aquila, a curious treble *ſtar*. Fl. 24. in Aquila. *i* Bootis, Fl. 44. η Coronæ Borealis, Fl. 2. Near Fl 51. in Boote. Between θ and δ in Corona Boreale. *h* Draconis near Fl. 19. Fl. 52. in dextro humero Orionis. *c* Trianguli near Fl. 12 and 13. η Orionis, Fl. 33. In poſterioribus femoribus Canis Minoris following Procyon. ζ Cancri, Fl. 16. a very minute treble *ſtar*.

To the ſecond claſs belong all thoſe double *ſtars* that are proper for eſtimations by the eye, and very delicate meaſures of the micrometer. Of this claſs there are thirty-eight, viz.

α Geminorum, Fl. 66. α Herculis, Fl. 64. ρ Herculis, Fl. 75. *p* Serpentarii, Fl. 70. ε Lyræ, Fl. 4 and 5. a very curious double-double *ſtar*. ζ Aquarii, Fl. 55. ξ Coronæ Borealis, Fl. 7. λ Orionis, Fl. 39. quadruple, or a double *ſtar* with two more at a ſmall diſtance. σ Orionis, Fl. 48. a double-treble *ſtar* or two ſets of treble *ſtars*. α Piſcium, Fl. ult. μ Draconis, Fl. 21. ω Aurigæ, Fl. 4. ψ Cygni, Fl. 24. ξ Cephei, Fl. 17. In ſiniſtro anteriore pede monocerotis, Fl. 11. ξ Bootis, Fl. 37. *g* Serpentarii. Fl. 5. ξ Libræ, Fl. ult. double double. ε Perſei, Fl. 45. In Serpentario near Fl. 11. In Aquario, Fl. 108. *k* Cygni, Fl. 52. In Orione near Fl. 42. δ Geminorum, Fl. 55. In Aquila near Fl. 54. following *o*. In Aquila near Fl. 63. ζ Sagittæ, Fl. 8. In Dracone Fl. 56. In Sagitta near Fl. 4. β Orionis, Fl. 19. ι Trianguli, Fl. 6. In Triangulo near Fl. 6. In Eridano, Fl. 32. In capite Monocerotis. In Boote following Fl. 15.

The third claſs comprehends all thoſe double *ſtars*, that are more than five but leſs than 15″ aſunder; of which there are forty-ſix, viz.

θ Orionis, Fl. 41. quadruple, being the ſmall teleſcopic trapezium in the nebula. ζ Urſæ Majoris, Fl. 59. η Caſſiopeæ, Fl. 44. In extrem. pedis Caſſiopeæ, Fl. 55. being ſince found to be a treble ſtar of the firſt claſs. γ Andromedæ, Fl. 57. β Cephei, Fl. 8. β Scorpii, Fl. 8. π Bootis, Fl. 29. γ Arietis, Fl. 5. γ Delphini, Fl. 12. κ Bootis, Fl. 17. ι Orionis, Fl. 44. treble. ι Orionis, Fl. 44. double-treble, being the preceding or ſmalleſt of the two *ι*'s. μ Cygni, Fl. 78. In Delphino, Fl. 1. In extrem. caudæ Lacertæ, Fl. 1. γ Virginis, Fl. 29. ζ Cancri, Fl. 16. In Boote, determined by drawing a line through π and ζ to the ſmall *ſtar* under the right foot, and erecting a perpendicular towards the left foot of equal length, the end of which will mark out this double *ſtar*. In Equuleo, Fl. 1. Infra oculum Lyncis, Fl. 12. In Caſſiopæa, Fl. 34. θ Sagittæ, Fl. 17. treble. In Serpentario, Fl. 39. In Cerbero Fl. Herculis 95. In Nave, near Fl. 3. between η Canis Majoris and ξ Navis. In Nave near Fl. 9. being one of two teleſcopic *ſtars* under Monoceros. In naribus Monocerotis, Fl. 8. In Leone, Fl. 54. In Hercule over ι. In Aquila, Fl. 11. In Aquila, near Fl. 7 and 8. preceding the two ſmall *ſtars* north of *k* and *l*. In Aquario, Fl. 94. In Serpentario, Fl. 54. In Perſeo a little ſouth of γ. In Perſeo near Fl. 38. preceding the firſt *o*, double-double. *o* Perſei, Fl. 40. In Hercule, near Fl. 87. *i* Herculis, Fl. 43 In Triangulo north following δ. In ſiniſtro anteriore pede Monocerotis, ſouth of two teleſcopic *ſtars* preceding the treble *ſtar*. In ore Monocerotis. In Tauro near Fl. 10. In Monocerote, following the tip of the ear.

The fourth, fifth, and ſixth claſſes, contain double *ſtars* that are from 15″ to 30″, from 30″ to 1′, and from 1′ to 2′ or more aſunder.

The fourth claſs contains forty-four, viz.

α Urſæ Minoris, Fl. 1. [illegible] Lyræ, Fl. 20. ξ Capricorni. η Perſei in dextro brachio. In Ariete, Fl. 33. θ Serpentis, Fl. 63. ψ Draconis, Fl. 31. ζ Piſcium, Fl. 86. Ima, ad ψ Piſcium, Fl. 74. χ Tauri, Fl. 59. χ Cygni, Fl. 17. ψ Aquarii, Fl. 91. In Leone, Fl. 83. In Aquila, Fl. 57 In dextra aure camelopardali ult. Hevelii. In Caſſiopæa, Fl. 31. Cor Caroli, Fl. 12. Canum Venaticorum. In Cygno, Fl 61. In Auriga, Fl. 14. *o* Draconis, Fl. 47. ζ Orionis, Fl. 50. *f* Cygni, Fl. 63. IIda, ad ω Cygni, Fl. 45. IIItia, ad ω Cygni, Fl. 46. treble. In Ceto, near the place of the periodical *ſtar o*. In Nave, Fl. 19. In Coma Berenices, Fl. 24 In conſt. Geminorum, near γ towards ζ Tauri. *h* Urſæ Majoris, Fl. 23. In Lynce, Fl 44. In Cepheo, near Fl. 27. treble. In Serpentario, Fl. 61. In Aquila, treble, firſt of two *ſtars* preceding *υ*. In Aquila near Fl. 64. and preceding θ. β Delphini, Fl. 6. β Serpentis, Fl. 28. δ Equulei, Fl. 7. In Aquario, Fl. 24. In Cygno north following σ. *a* Trianguli, Fl. 10. μ Herculis, Fl. 86 In Hercule juſt by *ν*. λ Eridani, Fl. ult. In Tauro, near Fl. 4. a ſmall teleſcopic *ſtar* ſouth following *s*.

The fifth claſs contains fifty-one *ſtars*, viz.

δ Herculis, Fl. 11. ζ Lyræ, Fl. 6. β Lyræ, Fl. 10. δ Cephei, Fl. 27. β Cygni, Fl. 6. ν Scorpii, Fl. 14. μ Sagittarii, Fl. 13. treble. κ Herculis, Fl 7. ι Bootis, Fl. 21. δ Orionis, Fl. 34. ν Draconis, Fl. 24 and 25. λ Arietis, Fl. 9. φ Tauri, Fl. 52. In Monocerote, multiple, being a ſpot over the right foot, comprehending four or five ſmall *ſtars* within one minute. *c* Urſæ Majoris, Fl. 16. σ Piſcium, Fl. 76. π Andromedæ, Fl. 29. α Caſſiopeæ, Fl. 18. γ Herculis, Fl. 20. *e* Pegaſi, Fl. 1. τ Auri. Fl. 29. λ Aurigæ, Fl. 15. multiple, two *ſtars* being within about 30″. In Orione following *f*. In Ceto, Fl. 37. τ Orionis, Fl. 20. *h* Leonis, Fl. 6. In Libra, near Fl. 31. In Cepheo, near β. ν Serpentis, Fl. 53. In Serpentario, Fl. 53. In Aquila, next but one preceding δ. α Andromedæ. *h* Aquilæ, Fl. 15. In Aquila near Fl. 28. In Aquila near that which follows θ. *o* Scuti, Fl. 2. In Aquila. υ Coronæ, Fl. 18. treble. In Hercule, Fl. 23. α Lyræ, Fl. 3. ν Lyræ Fl. 8. treble. A Perſei. Fl. 43. In Lyra juſt by η. In Cygno, Fl. 76. In Cygno, Fl. 69. treble. In Cygno, ſouth of two teleſcopic *ſtars* following τ. *c* Cygni, Fl. 16. Ima. ad *c*. *c* Cygni, Fl. 26. IIda. ad *c*. In conſtell. Piſcium, a teleſcopic *ſtar* juſt by θ northwards. In Ariete, Fl. 30. γ Leporis, Fl. 13. In Sagitta north following ε.

The ſixth claſs contains ſixty-ſix *ſtars*, viz.

o Ceti, Fl. 68. *o* Serpentarii, Fl. 67. δ Lyræ, Fl. 11. α Capricorni, Fl. 5. In conſt. Arietis, Fl. 35. ε Capricorni, Fl. 39. τ Tauri, Fl. 94. κ Tauri, Fl. 59. ζ Geminorum, Fl. 43. *o* Cygni, Fl. 31. α Leonis, Fl. 32. τ Leonis, Fl. 84. *o* Leonis, Fl. 95. η Serpentis, Fl. 58. In conſt. Bootis near Fl. 6. δ Bootis, Fl. 49. μ Bootis, Fl. 51. ν Coronæ, Fl. 21. χ Perſei, multiple. μ Perſei, Fl. 51. η Pegaſi, Fl. 44. In conſt. Draconis, between α Draconis and the tail of Urſa Major. In Naribus Lyncis. *d* Caſſiopeæ, Fl. 4. treble. In conſt. Caſſiopeæ, Fl. 3. ε Sagittæ, Fl. 11. In conſt. Aquilæ north of θ. β Capricorni, Fl. 9. π Capricorni, Fl. 10. α Aurigæ, Fl. 13. *d* Tauri, Fl. 88. λ Cygni, Fl. 54. In conſt. Cygni, Fl. 32. θ Aurigæ, Fl. 37. In conſt. Camelopardali, Fl. 13. In conſt. Camelopardali, Fl. 10. *c* Draconis, Fl. 46. *e* Draconis, Fl. 64 or 65. α Orionis, Fl. 58. γ Leporis, Fl. 13. ρ Cancri Vta ad ρ, Fl. 67. β Geminorum, Fl. 78. multiple. θ Virginis, Fl. 51. ι Libræ, Fl. 24. In conſt. Andromedæ, near ι towards *o*. α Aquilæ, Fl. 53. In conſt. Aquilæ, near Fl. 35. one of the preceding *ſtars* of a ſmall quartile near *c*. In conſt. Aquilæ, near Fl. 35. as the former. In conſt. Aquilæ, the following *ſtar* of a trapezium near *l*. In conſt. Aquilæ as the former. In Monte Mænali Heveliana near the middle. In conſt. Bootis between ε and *f* In conſt. Bootis more ſouth than *i*. In conſt. Serpentarii more ſouth than *o*. In conſt. Caſſiopeæ, Fl. 2. *θ Lyræ, Fl. ult. In conſt.* Cygni, Fl. 79. In conſt. Aquarii, Fl. 5. In conſt. Cygni, near Fl. 28. near *b*. In conſt. Cygni near the *ſecond c*. In conſt. Piſcium near Fl. 7. preceding *b*. κ Piſcium, Fl. 8. In conſt. Sagittæ north following ε. In conſt. Eridani near ν. In capite Monocerotis, multiple, being one *ſtar* with at leaſt twelve around it. α Tauri, Fl. 87. the

apparent diameter of which, upon the meridian measured with a power of 460, at a mean of two observations 1″ 46‴, and with 932, 1″ 12″ a mean of two observations.

Mr. Herschel has distinguished those double *stars* in the preceding catalogue, which have been observed by others as well as by himself, with a peculiar mark. Phil. Transf. vol. lxxii. part i. art. 12.

The *number of* STARS appears to be vastly great, almost infinite; yet have astronomers long ago ascertained the number of those visible to the eye, which are found much fewer than one would imagine. See CATALOGUE of the *Stars*.

Of the 3000 contained in the Britannic Catalogue, there are many only visible through a telescope; nor does a good eye scarce ever see more than a thousand at the same time in the clearest heaven; the appearance of innumerable more, frequent in clear winter nights, arising from our sight's being deceived by their twinkling, and from our viewing them confusedly, and not reducing them to any order. Yet, for all this, the *stars* are really almost infinite. See Halley, on the Number, Order, and Light of the fixed *Stars*, Phil. Transf. N° 364, or Abr. vol. vi. p. 148.

Riccioli makes no scruple to affirm, in his new Almagest, that a man who should say there are above twenty thousand times twenty thousand, would say nothing improbable.

For a good telescope, directed to almost any point of the heavens, discovers numbers that are lost to the naked sight; particularly in the Milky Way, which some suppose to be an assemblage of *stars*, too remote to be singly seen, but so closely disposed as to give a luminous appearance to that part of the heavens where they are.

The fact, however is disputed, and the whiteness of the Milky Way must, therefore, be owing to some other cause.

In the single constellation of the PLEIADES, instead of 6, 7, or 8 *stars* seen by the best eye, Dr. Hooke, with a telescope twelve feet long, told 78, and with larger glasses many more of different magnitudes. And F. de Rheita, a Capuchin, affirms, that he has observed above 2000 *stars* in the single constellation of Orion.

The same author found above 188 in the Pleiades. And Huygens, looking at the *star* in the middle of Orion's sword, instead of one found it to be twelve. Galileo found eighty in the space of the belt of Orion's sword, 21 in the nebulous *star* of his head, and above 500 in another part of him, within the compass of one or two degrees space, and more than 40 in the nebulous *star* Præsepe. See *Magnitudes of the* STARS, *supra*.

If an ordinary telescope, therefore, will, in several parts of the heavens, discover ten times as many *stars* as are visible to the naked eye, what may not be expected from the improved magnifying powers of modern times.

The *changes that have happened in the* STARS are very considerable; contrary to the opinion of the ancients, who held, that the heavens and heavenly bodies were incapable of any change, the matter thereof being permanent and eternal, infinitely exceeding the hardness of diamonds, and not susceptible of any different form. And, in effect, till the time of Aristotle, and even two hundred years afterwards, there had no change been observed. The first was above 120 years before the incarnation; when Hipparchus, discovering a new *star* to appear, was first induced to make a CATALOGUE of the *stars*, that posterity might perceive any future changes of the like kind.

In the year 1572, Cornelius Gemma and Tycho Brahe observed another new *star* in the constellation Cassiopea, which was, likewise, the occasion of Tycho's making a new catalogue. Its magnitude and brightness, at first, exceeded that of the biggest of our *stars*, Sirius and Lyra; it even equalled that of Venus when nearest the earth, and was seen in fair day-light. It continued sixteen months; towards the latter end whereof, it began to dwindle, and at last, viz. March, 1574, totally disappeared, without any change of place in all that time.

Leovicius tells us of another *star* appearing in the same constellation, about the year 945, which resembled that of 1572, and quotes another ancient observation, whereby it appears, that a new *star* was seen about the same place in 1264.

Dr. Keil takes those to have been all the same *star*.

Fabricius, in 1596, discovered another new *star*, called the *stella mira*, or *wonderful star*, in the neck of the Whale, which has been since found to appear and disappear periodically, seven times in six years, continuing in the greatest lustre for 15 days together; and is never quite extinguished. Its course and motion are described by Bullialdus, in a treatise printed at Paris in 1667.

Mr. Herschel has lately, viz. in the years 1777, 1778, 1779, and 1780, made several observations on this *star* an account of which may be seen in the Phil. Transf. vol. lxx. part ii. art. 21.

In the year 1600, William Jansenius discovered a changeable *star* in the neck of the Swan, which, in time, became so small as to be thought to disappear entirely, till the years 1657, 1658, and 1659, when it recovered its former lustre and magnitude; but soon decayed, and is now of the smallest size.

In the year 1604, Kepler, and several of his friends, saw a new *star* near the heel of the right foot of Serpentarius, particularly bright and sparkling; and took notice, that it was every moment changing into some of the colours of the rainbow, except when it is near the horizon, at which time it was generally white. It surpassed Jupiter in magnitude, but was easily distinguished from it, by the steady light of that planet. It disappeared between October, 1605, and the February following, and has not been seen since that time.

Simon Marius discovered another in Andromeda's girdle, in 1612 and 1613, though Bullialdus says, it had been seen before in the 15th century.

In July, 1670, Hevelius discovered a second changeable *star* in the Swan, which, in October, was so decayed as to be scarce perceptible: in April following it regained its former lustre, but wholly disappeared in August: in March, 1672, it was again seen, but appeared very small, and has not been visible since.

In 1686 a third changeable *star* was discovered by Kirchius in the Swan, viz. the *star* χ of that constellation, which returned periodically in about four hundred and five days.

In 1672, Cassini saw a *star* in the neck of the Bull, which he thought was not visible in Tycho's time, nor when Bayer made his figures.

It is certain, from the old catalogues, that many of the ancient *stars* are not now visible. This has been particularly remarked with regard to the PLEIADES.

M. Montanari, in his letter to the Royal Society in 1670, observes, that there are now wanting in the heavens two *stars* of the second magnitude, in the stern of the ship Argo, and its yard, which had been seen till the year 1664. When they first disappeared is not known; but he assures us, there was not the least glimpse of them in 1668. He adds, he has observed many more changes in the *fixed stars*, even to the number of a hundred.

Many other changes in the *stars* have been taken notice of by Cassini, Maraldi, and other observers. See Gregory's Ast. lib. 2. prop. 30.

As none of these *stars* could ever be perceived to have tails, it is plain they could not be comets; especially as they had no parallax, even when largest and brightest. It is not improbable that the periodical *stars* have vast clusters of dark spots, and very slow rotations on their axes, by which means they must disappear when the side covered with spots is turned towards us. And as for those which break out on a sudden with such lustre, these may, perhaps, be suns whose fuel is almost spent, and again supplied by some of their comets falling upon them, and occasioning an uncommon blaze and splendor for some time; which has been conjectured to be one use of the cometary part of any system.

M. Maupertuis, in his Dissertation on the Figures of the Celestial Bodies (p. 61—63.), is of opinion, that some *stars*, by their prodigious swift rotation on their axes, may not only assume the figures of oblate spheroids, but that by the great centrifugal force arising from such rotations, they may become of the figures of mill-stones, or be reduced to flat circular planes, so thin as to be quite invisible when their edges are turned towards us, as Saturn's ring is in such position. But when very eccentric planets or comets go round any flat *star* in orbits much inclined to its equator, the attraction of the planets or comets in their perihelions must alter the inclination of the axis of that *star*; on which account it will appear more or less large and luminous, as its broad side is more or less turned towards us. And thus he imagines we may account for the apparent changes of magnitude and lustre of those *stars*, and likewise for their appearing and disappearing.

Hevelius (Cometograph. p. 380.) apprehends, that the sun and *stars* are surrounded with atmospheres, and that, whirling round their axes with great rapidity, they throw off great quantities of matter into those atmospheres, and thereby cause great changes therein; and that thus it may come to pass, that a *star*, which when its atmosphere is clear, shines out with great lustre, may at another time, when it is full of clouds and thick vapours, appear greatly diminished in brightness and magnitude, or even become quite invisible.

As for *the nature of the fixed* STARS, their immense distance leaves us greatly at a loss about it. What we can ga-

ther

ther for certain from their phenomena is as follows:

1. That the fixed *ſtars* are greater than our earth: becauſe, if that was not the caſe, they could not be viſible at ſuch an immenſe diſtance.

2. The fixed *ſtars* are farther diſtant from the earth than the fartheſt of the planets. For we frequently find the fixed *ſtars* hid behind Saturn's body, the moſt diſtant of the planets: and beſides, they have no parallax, which the planets have.

3. The fixed *ſtars* ſhine with their own light; for they are much farther from the ſun than Saturn, and appear much ſmaller than Saturn; but ſince, notwithſtanding this, they are found to ſhine much brighter than Saturn, it is evident they cannot borrow their light from the ſame ſource as Saturn does, viz. the ſun; but ſince we know of no other luminous body beſide the ſun, whence they might derive their light, it follows, that they ſhine with their own native light.

Beſides, it is known, that the more a teleſcope magnifies, the leſs is the aperture through which the *ſtar* is ſeen; and conſequently, the fewer rays it admits into the eye. Now ſince the *ſtars* appear leſs in a teleſcope which magnifies two hundred times, than they do to the naked eye, inſomuch that they ſeem to be only indiviſible points, it proves at once that the *ſtars* are at immenſe diſtances from us, and that they ſhine by their own proper light. If they ſhone by borrowed light, they would be as inviſible without teleſcopes as the ſatellites of Jupiter are; for theſe ſatellites appear bigger when viewed with a good teleſcope than the largeſt fixed *ſtars* do.

Hence,

1. We deduce, that the fixed *ſtars* are ſo many ſuns; for they have all the characters of ſuns.

2. That, in all probability, the *ſtars* are not ſmaller than our ſun.

3. That it is highly probable, each *ſtar* is the centre of a ſyſtem, and has planets or earths revolving round it, in the ſame manner as round our ſun, i. e. it has opake bodies illuminated, warmed, and cheriſhed by its light. As we have incomparably more light from the moon than from all the *ſtars* together, it is abſurd to imagine that the *ſtars* were made for no other purpoſe than to caſt a faint light upon the earth; eſpecially ſince many more require the aſſiſtance of a good teleſcope to find them out, than are viſible without that inſtrument. Our ſun is ſurrounded by a ſyſtem of planets and comets, all which would be inviſible from the neareſt fixed *ſtar*; and from what we already know of the immenſe diſtance of the *ſtars*, it is eaſy to prove, that the ſun, ſeen from ſuch a diſtance, would appear no bigger than a *ſtar* of the firſt magnitude.

From all this it is highly probable, that each *ſtar* is a ſun to a ſyſtem of worlds moving round it, though unſeen by us; eſpecially as the doctrine of a plurality of worlds is rational, and greatly manifeſts the power, wiſdom, and goodneſs of the great Creator.

How immenſe, then, does the univerſe appear! Indeed, it muſt either be infinite, or infinitely near it.

Kepler, it is true, denies that each *ſtar* can have its ſyſtem of planets as ours has; and takes them all to be fixed in the ſame ſurface or ſphere; urging, that were one twice or thrice as remote as another, it would appear twice or thrice as ſmall, ſuppoſing their real magnitudes equal; whereas there is no difference in their apparent magnitudes, juſtly obſerved, at all. But to this we oppoſe, that Huygens has not only ſhewn, that fires and flames are viſible at diſtances where other bodies, comprehended under equal angles, diſappear; but it ſhould likewiſe ſeem, that the optic theorem about the apparent diameters of objects, being reciprocally proportional to their diſtances from the eye, does only hold while the diameter of the object has ſome ſenſible ratio to its diſtance.

As for periodical *ſtars*, &c. ſee *changes*, &c. of Stars, ſupra.

Motion of the Stars. The fixed *ſtars* have two kinds of apparent motion; one called the *firſt*, *common*, or *diurnal motion*, ariſing from the earth's motion round its axis: by this they ſeem to be carried along with the ſphere, or firmament (wherein they appear fixed) round the earth, from eaſt to weſt, in the ſpace of twenty-four hours.

The other, called the *ſecond*, or *proper motion*, is that whereby they appear to go backwards from weſt to eaſt, round the poles of the ecliptic, with an exceeding ſlowneſs, as not deſcribing above a degree of their circle in the ſpace of 72 years, or 50 ſeconds in a year.

This apparent motion is owing to the receſſion of the equinoctial points, which is 50 ſeconds of a degree in a year backward, or contrary to the order of the ſigns of the zodiac.

Some have imagined, but it is unknown on what grounds, that when they are got round to the points, whence they firſt departed, nature will have finiſhed her courſe, and the *ſtars* having performed their career, the heavens will remain at reſt; unleſs the Being, who firſt gave them motion, appoint them to begin another circuit.

On the footing of this calculation, the world ſhould laſt about 30000 years, according to Ptolemy; 25816, according to Tycho; 25920, according to Riccioli; and 24800, according to Caſſini.

In conſequence of this ſecond motion, the longitude of the *ſtars* will be always increaſing.

Thus, e. gr. the longitude of Cor Leonis was found by Ptolemy, A. D. 138, to be 2° 30′; in 1115, it was obſerved by the Perſians to be 17° 30′; in 1364, by Alphonſus, 20° 40′; in 1586, by the prince of Heſſe, 24° 11′; in 1601, by Tycho, 24° 17′; and in 1690, by Mr. Flamſteed, 25° 31′ 20″: whence the proper motion of the *ſtars*, according to the order of the ſigns in circles parallel to the ecliptic, is eaſily inferred.

It was Hipparchus who firſt ſuſpected this motion, upon comparing the obſervations of Timocharis and Ariſtyllus, with his own. Ptolemy, who lived three centuries after Hipparchus, demonſtrated the ſame by undeniable arguments.

Tycho Brahe makes the increaſe of longitude in a century 1° 25′; Copernicus, 1° 23′ 40″ 12‴; Flamſteed and Ricciolus, 1° 23′ 20″; Bullialdus, 1° 24′ 54″; Hevelius, 1° 24′ 46″ 50‴; whence, with Flamſteed, the annual increaſe of the longitudes of the fixed *ſtars* may be well fixed at 50″.

From theſe data, the increaſe of the longitude of a *ſtar* for any given time is eaſily had; and hence the longitude of a *ſtar* for any given year being given, its longitude for any other year is readily found: e. gr. the longitude of Sirius, in Mr. Flamſteed's tables, for the year 1690, being 9° 49′ 1″; its longitude for the year 1724, is found by multiplying the interval of time; viz. 34 years by 50″, the product 1700″, or 28′ 20″ added to the given longitude, will give the longitude required, 10° 17′ 21″.

The principal phenomena of the fixed *ſtars*, ariſing from their common and proper motion, beſides their longitude, are their altitudes, right aſcenſions, declinations, occultations, culminations, riſings, and ſettings. See Altitude, Ascension, Declination, and Occultation.

Some have ſuppoſed that the latitudes of the *ſtars* are invariable; but this ſuppoſition is founded on two aſſumptions, which are both controverted among aſtronomers; one is, that the orbit of the earth continues unalterably in the ſame plane, and conſequently that the ecliptic is invariable, the contrary of which is now very generally allowed. See Ecliptic.

The other aſſumption is, that the *ſtars* are ſo fixed as to keep their places immoveably. Ptolemy, Tycho, and others, comparing the obſervations of ancient aſtronomers with their own, have adopted this opinion. But from the reſult of the compariſon of our beſt modern obſervations, with ſuch as were formerly made with any tolerable degree of exactneſs, there appears to have been a real change in the poſition of ſome of the fixed *ſtars*, with reſpect to each other; and ſeveral *ſtars* of the firſt magnitude have already been obſerved, and others ſuſpected to have a proper motion of their own.

Dr. Halley (Phil. Tranſ. N° 355, or Jones's Abr. vol. iv. p. 225) has obſerved, that the Bull's eye, Sirius, and Arcturus are now found to be about half a degree more ſoutherly than the ancients reckoned them: that this difference cannot ariſe from the errors of the tranſcribers, becauſe the declinations of the *ſtars*, ſet down by Ptolemy, as obſerved by Timocharis, Hipparchus, and himſelf, ſhew their latitudes given by him are ſuch as thoſe authors intended; and it is ſcarce to be believed, that thoſe three obſervers could be deceived in ſo plain a matter. To this he adds, that the bright *ſtar* in the ſhoulder of Orion has, in Ptolemy, almoſt a whole degree more ſoutherly latitude than at preſent: that an ancient obſervation, made A. D. 509, at Athens, as Bullialdus ſuppoſes, of an appulſe of the moon to the Bull's eye, ſhews that *ſtar* to have had leſs latitude at that time than it now has: that as to Sirius, it appears by Tycho's obſervations, that he found him 4 ½′ more northerly than he is at this time. All theſe obſervations, compared together, ſeem to favour an opinion, that ſome of the *ſtars* have a proper motion of their own, which changes their places in the ſphere of heaven: this change of place, as Dr. Halley obſerves, may ſhew itſelf in ſo long a time as 1800 years, though it be entirely imperceptible in the ſpace of one ſingle century; and it is likely to be ſooneſt diſcovered in ſuch *ſtars* as thoſe juſt now mentioned; becauſe

cause they are all of the first magnitude, and may, therefore, probably be some of the nearest to our solar system. Arcturus, in particular, affords a strong proof of this: for if its present declination be compared with its place, as determined either by Tycho or Flamsteed, the difference will be found to be much greater than what can be suspected to arise from the uncertainty of their observations. See ARCTURUS, and Mr. Hornsby's Enquiry into the Quantity and Direction of the proper Motion of Arcturus, Phil. Trans. vol. lxiii. part i. p. 93, &c.

For an account of Dr. Bradley's observations, see the sequel of this article.

Mr. Herschel has also lately observed, that the distance of the two *stars* forming the double *star* ν Draconis, Fl. 24 & 25, is 54′′ 48′′′, and their position 44° 19′ N. preceding. Whereas, from the right ascension and declination of these *stars* in Flamsteed's Catalogue, their distance, in his time, appears to have been 1′ 11′′, 418, and their position 44° 23′ N. preceding. Hence he infers, that as the difference in the distance of these two *stars* is so considerable, we can hardly account for it, otherwise than by admitting a proper motion in one or the other of the *stars*, or in our solar system: most probably he says, neither of the three is at rest. He also suspects a proper motion in one of the double *stars* in cauda lyncis media, Fl. 38, and in ο Ceti Fl. 68. Phil. Trans. vol. lxxii. part i. 117. 143. 150.

It is reasonable to expect, that other instances of the like kind must also occur among the great number of visible *stars* because their relative positions may be altered by various means. For if our own solar system be conceived to change its place with respect to absolute space, this might, in process of time, occasion an apparent change in the angular distances of the fixed *stars*; and in such a case, the places of the nearest *stars* being more affected than of those that are very remote, their relative position might seem to alter, though the *stars* themselves were really immoveable: and vice versa, we may surmise, from the observed motion of the *stars*, that our sun, with all its planets and comets, may have a motion towards some particular part of the heavens, on account of a greater quantity of matter collected in a number of *stars* and their surrounding planets there situated, which may perhaps occasion a gravitation of our whole solar system towards it. If this surmise should have any foundation, as Mr. Herschel observes, ubi supra, p. 103, it will shew itself in a series of some years; as that from that motion will arise another kind of hitherto unknown parallax (suggested by Mr. Michell, Phil. Trans. vol. lvii. p. 252.) the investigation of which may account for some part of the motions already observed in some of the principal *stars*; and for the purpose of determining the direction and quantity of such a motion, accurate observations of the distance of *stars*, that are near enough to be measured with a micrometer, and a very high power of telescopes, may be of considerable use, as they will undoubtedly give us the relative places of those *stars* to a much greater degree of accuracy than they can be had by transit instruments or sectors, and thereby much sooner enable us to discover any apparent change in their situation, occasioned by this new kind of secular or systematical parallax, if we may so express the change arising from the motion of the whole solar system.

And, on the other hand, if our system be at rest, and any of the *stars* really in motion, this might likewise vary their apparent positions; and the more so, the nearer they are to us, or the swifter their motions are, or the more proper the direction of the motion is to be rendered perceptible by us. Since then the relative places of the *stars* may be changed from such a variety of causes, considering the amazing distance at which it is certain some of them are placed, it may require the observations of many ages to determine the laws of the apparent changes even of a single *star*; much more difficult, therefore, must it be to settle the laws relating to all the most remarkable *stars*.

When the causes which affect the places of all the *stars* in general are known; such as the precession, aberration, and nutation, it may be of singular use to examine nicely the relative situations of particular *stars*, and especially of those of the greatest lustre, which, it may be presumed, lie nearest to us, and may therefore be subject to more sensible changes, either from their own motion, or from that of our system. And if, at the same time that the brighter *stars* are compared with each other, we likewise determine the relative positions of some of the smallest that appear near them, whose places can be ascertained with sufficient exactness, we may perhaps be able to judge to what cause the change, if any be observable, is owing. The uncertainty that we are at present under, with respect to the degree of accuracy wherewith former astronomers could observe, makes us unable to determine several things relating to this subject; but the improvements, which have of late years been made in the methods of taking the places of the heavenly bodies, are so great, that a few years may hereafter be sufficient to settle some points, which cannot now be settled, by comparing even the earliest observations with those of the present age.

Dr. Hooke communicated several observations on the apparent motions of the fixed *stars*; and as this was a matter of great importance in astronomy, several of the learned were desirous of verifying and confirming his observations. An instrument was accordingly contrived by Mr. George Graham, and executed with surprising exactness.

With this instrument the *star* γ, in the constellation Draco, was frequently observed by Messrs. Molyneux, Bradley, and Graham, in the years 1725, 1726; and the observations were afterwards repeated by Dr. Bradley, with an instrument contrived by the same ingenious person, Mr. Graham, and so exact, that it might be depended on to half a second. The result of these observations was, that the *star* did not always appear in the same place, but that its distance from the zenith varied, and that the difference of the apparent places of Themis, the third satellite of Jupiter, amounted to 21 or 22 seconds. Similar observations were made on other *stars*, and a like apparent motion was found in them, proportional to the latitude of the *star*. This motion was by no means such as was to have been expected, as the effect of a parallax; and it was some time before any way could be found of accounting for this new phenomenon. At length Dr. Bradley resolved all its variety, in a satisfactory manner, by the motion of light and the motion of the earth compounded together. See LIGHT, and Phil. Trans. N° 406. p. 364. or Abr. vol. vi. p. 149, &c.

Our excellent astronomer, Dr. Bradley, had no sooner discovered the cause, and settled the laws of the aberration of the fixed *stars*, than his attention was again excited by another new phenomenon, viz. an annual change of declination in some of the fixed *stars*, which appeared to be sensibly greater than a precession of the equinoctial points of 50′′ in a year, the mean quantity now usually allowed by astronomers, would have occasioned.

This apparent change of declination was observed in the *stars* near the equinoctial colure, and there appearing at the same time an effect of a quite contrary nature, in some *stars* near the solstitial colure, which seemed to alter their declination less than a precession of 50′′ required, Dr. Bradley was thereby convinced, that all the phenomena in the different *stars* could not be accounted for merely by supposing that he had assumed a wrong quantity for the precession of the equinoctial points. He had also, after many trials, sufficient reason to conclude, that these second unexpected deviations of the *stars* were not owing to any imperfection of his instruments. At length, from repeated observations, he began to guess at the real cause of these phenomena.

It appeared from the Doctor's observations, during his residence at Wansted, from the year 1727 to 1732, that some of the *stars* near the solstitial colure had changed their declinations 9′′ or 10′′ less than a precession of 50′′ would have produced; and, at the same time, that others near the equinoctial colure had altered theirs about the same quantity more than a like precession would have occasioned: the north pole of the equator seeming to have approached the *stars*, which come to the meridian with the sun about the vernal equinox, and the winter solstice; and to have receded from those, which come to the meridian with the sun about the autumnal equinox and the summer solstice.

From the consideration of these circumstances, and the situation of the ascending node of the moon's orbit when he first began to make his observations, he suspected that the moon's action upon the equatorial parts of the earth might produce these effects: For, if the precession of the equinox be, according to sir Isaac Newton's principles, caused by the actions of the sun and moon upon those parts; the plane of the moon's orbit being, at one time, above ten degrees more inclined to the plane of the equator than at another, it was reasonable to conclude, that the part of the whole annual precession, which arises from her action, would, in different years, be varied in its quantity; whereas the plane of the ecliptic, wherein the sun appears, keeping always nearly the same inclination to the equator, that part of the precession, which is owing to the sun's action, may be the same every year; and from hence it would follow, that although the mean annual precession, proceeding from the joint actions of the sun and moon, were 50′′; yet the apparent annual precession might sometimes exceed, and sometimes fall short

ſhort of that mean quantity, according to the various ſituations of the nodes of the moon's orbit.

In the year 1727, the moon's aſcending node was near the beginning of Aries, and conſequently her orbit was as much inclined to the equator as it can at any time be; and then the apparent annual preceſſion was found, by the Doctor's firſt year's obſervations, to be greater than the mean; which proved, that the *ſtars* near the equinoctial colure, whoſe declinations are moſt of all affected by the preceſſion, had changed theirs, above a tenth part more than a preceſſion of 50″ would have cauſed. The ſucceeding year's obſervations proved the ſame thing; and, in three or four years time, the difference became ſo conſiderable, as to leave no room to ſuſpect it was owing to any imperfection either of the inſtrument or obſervation.

But ſome of the *ſtars*, that were near the ſolſtitial colure, having appeared to move, during the ſame time, in a manner contrary to what they ought to have done, by an increaſe of the preceſſion; and the deviations in them being as remarkable as in the others, it was evident that ſomething more than a mere change in the quantity of the preceſſion would be requiſite to ſolve this part of the phenomenon. Upon comparing the obſervations of *ſtars* near the ſolſticial colure, that were almoſt oppoſite to each other in right aſcenſion, they were found to be equally affected by this cauſe. For whilſt γ Draconis appeared to have moved northward, the ſmall *ſtar*, which is the 35th Camelopardali Hevelii, in the Britiſh catalogue, ſeemed to have gone as much towards the ſouth; which ſhewed, that this apparent motion in both thoſe *ſtars* might proceed from a nutation of the earth's axis; whereas the compariſon of the Doctor's obſervations of the ſame *ſtars*, formerly enabled him to draw a different concluſion, with reſpect to the cauſe of the annual aberrations ariſing from the motion of light. For the apparent alteration in γ Draconis, from that cauſe, being as great again as in the other ſmall *ſtar*, proved, that that did not proceed from a nutation of the earth's axis; as, on the contrary, this may. Upon making the like compariſon between the obſervations of other *ſtars*, that lie nearly oppoſite in right aſcenſion, whatever their ſituations were with reſpect to the cardinal points of the equator, it appeared, that their change of declination was nearly equal, but contrary; and ſuch as a nutation or motion of the earth's axis would effect.

The moon's aſcending node being got back towards the beginning of Capricorn in the year 1732, the *ſtars* near the equinoctial colure appeared about that time to change their declinations no more than a preceſſion of 50″ required; whilſt ſome of thoſe near the ſolſticial colure altered theirs above 2″ in a year leſs than they ought. Soon after the annual change of declination of the former was perceived to be diminiſhed, ſo as to become leſs than 50″ of preceſſion would cauſe; and it continued to diminiſh till the year 1736, when the moon's aſcending node was about the beginning of Libra, and her orbit had the leaſt inclination to the equator. But by this time, ſome of the *ſtars* near the ſolſticial colure had altered their declinations 18″ leſs ſince the year 1727, than they ought to have done from a preceſſion of 50″. For γ Draconis, which in thoſe nine years would have gone about 8″ more ſoutherly, was obſerved, in 1736, to appear 10″ more northerly than it did in the year 1727.

As this appearance in γ Draconis indicated a diminution of the inclination of the earth's axis to the plane of the ECLIPTIC, and, as ſeveral aſtronomers have ſuppoſed, that inclination to diminiſh regularly; if this phenomenon depended upon ſuch a cauſe, and amounted to 18″ in nine years, the obliquity of the ecliptic would, at that rate, alter a whole minute in thirty years; which is much faſter than any obſervations before made would allow. The Doctor had therefore reaſon to think, that ſome part of this motion at leaſt, if not the whole, was owing to the moon's action upon the equatorial parts of the earth, which, he conceived, might cauſe a libratory motion of the earth's axis. But as he was unable to judge, from only nine years obſervations, whether the axis would entirely recover the ſame poſition that it had in the year 1727, he found it neceſſary to continue his obſervations through a whole period of the moon's nodes; at the end of which he had the ſatisfaction to ſee, that the *ſtars* returned into the ſame poſitions again, as if there had been no alteration at all in the inclination of the earth's axis; which fully convinced him, that he had gueſſed rightly as to the cauſe of the phenomenon. This circumſtance proves likewiſe, that if there be a gradual diminution of the obliquity of the ecliptic, it does not ariſe only from an alteration in the poſition of the earth's axis, but rather from ſome change in the plane of the ecliptic itſelf; becauſe the *ſtars*, at the end of the period of the moon's nodes, appeared in the ſame places, with reſpect to the equator, as they ought to have done if the earth's axis had retained the ſame inclination to an invariable plane.

The Doctor having communicated theſe obſervations, and his ſuſpicion of their cauſe, to the late Mr. Machin, that excellent geometer ſoon after ſent him a table, containing the quantity of the annual preceſſion in the various poſitions of the moon's nodes, as alſo the correſponding nutations of the earth's axis; which was computed upon the ſuppoſition that the mean annual preceſſion is 50″, and that the whole is governed by the pole of the moon's orbit only; and therefore Mr. Machin imagined, that the numbers in the table would be too large, as, in fact, they were found to be. But it appeared that the changes which Dr. Bradley had obſerved, both in the annual preceſſion and nutation, kept the ſame law, as to increaſing and decreaſing, with the numbers of Mr. Machin's table. Thoſe were calculated upon the ſuppoſition, that the pole of the equator, during a period of the moon's nodes, moved round in the periphery of a little circle, whoſe centre was 23° 29′ diſtant from the pole of the ecliptic; having itſelf alſo an angular motion of 50″ in a year about the ſame pole. The north pole of the equator was conceived to be in that part of the ſmall circle which is fartheſt from the north pole of the ecliptic at the time when the moon's aſcending node is in the beginning of Aries; and in the oppoſite point of it, when the ſame node is in Libra.

If the diameter of the little circle, in which the pole of the equator moves, be ſuppoſed equal to 18″, which is the whole quantity of the NUTATION, as collected from Dr. Bradley's obſervations of the *ſtar* γ Draconis, then all the phenomena of the ſeveral *ſtars* which he obſerved will be very nearly ſolved by his hypotheſis. But for the particulars of his ſolution, and the application of his theory to the practice of aſtronomy, we muſt refer to the excellent author himſelf; our intention being only to give the hiſtory of the invention.

The corrections ariſing from the aberration of light, and from the nutation of the earth's axis, muſt not be neglected in aſtronomical obſervations; ſince ſuch neglects might produce errors of near a minute in the polar diſtances of ſome *ſtars*.

As to the allowance to be made for the aberration of light, Dr. Bradley aſſures us, that having again examined thoſe of his own obſervations, which were moſt proper to determine the tranſverſe axis of the ellipſis, which each *ſtar* ſeems to deſcribe, he found it to be neareſt to 40″; and this is the number he makes uſe of in his computations relating to the nutation.

Dr. Bradley ſays, in general, that experience has taught him, that the obſervations of ſuch *ſtars* as lie neareſt the zenith, generally agree beſt with one another, and are therefore the fitteſt to prove the truth of any hypotheſis. Phil. Tranſ. N° 485. vol. xlv. p. 1, &c.

Monſieur d'Alembert has publiſhed a treatiſe, intitled, Recherches ſur la Preceſſion des Equinoxes et ſur la Nutation de la terre dans le Syſteme Newtonien, 4to. Paris, 1749. The calculations of this learned gentleman agree, in general, with Dr. Bradley's obſervations. But Monſieur d'Alembert finds, that the pole of the equator deſcribes an ellipſis in the heavens, the ratio of whoſe axes is as 4 to 3; whereas, according to Dr. Bradley, the curve deſcribed is either a circle or an ellipſis, the ratio of whoſe axes is as 18 to 16.

The ſeveral *ſtars* in each conſtellation, e. gr. in Taurus, Bootes, Hercules, &c. their longitudes, latitudes, magnitudes, names, places, &c. as fixed by Mr. Flamſteed, in the Britannic Catalogue, ſee under the proper article of each conſtellation, TAURUS, BOOTES, HERCULES, &c.

To learn to know the ſeveral fixed *ſtars* by the globe, ſee GLOBE.

The parallax and diſtance of the fixed *ſtars*, ſee under PARALLAX and DISTANCE.

STARS, *circumpolar*. See CIRCUMPOLAR.

STAR, *morning*. See MORNING.

STAR, *place of a*. See PLACE.

STAR, *pole*. See POLE.

STARS, *twinkling of the*. See TWINKLING.

STARS, *unformed*. See INFORMES.

A Catalogue of the moſt remarkable Fixed Stars, with their Magnitudes, Right Aſcenſions, Declinations, and Annual Variations.

Thoſe marked with an Aſteriſk are according to the lateſt Obſervations at Greenwich, in their Right Aſcenſions; and the reſt are taken from M. De la Caille's Ephemeris, rectified for A. D. 1750.

No.	Northern Stars Names, and Places in their Constellations.		Bayer's Letters.	Magnit.	Right Aſcenſion in Degrees, &c.			Right Aſcenſion in Time.			Ann. Var. +	Declination North.			Ann. Var. +
					°	′	″	H.	M.	S.	″	°	′	″	″
1	Tip of the Wing of Pegaſus	*	γ	2	0	13	35.5	0	0	54	3.08	13	47	6.3	20.04
2	Shoulder of Andromeda		δ	3	0	30	15.0	0	26	1	3.16	29	29	18.3	20.01
3	Breaſt of Caſſiepeia		α	3	6	37	4.8	0	26	28	3.30	55	9	37.9	20.00
4	Waiſt of Caſſiepeia		γ	3	10	27	14.2	0	41	49	3.49	59	21	19.2	19.70
5	Pole Star	*	α	2	10	40	56.0	0	42	44	10.05	87	59	59.0	19.69
6	Waiſt of Andromeda	*	β	2	14	5	40.0	0	56	22	3.29	34	17	15.[illegible]	19.43
7	Knee of Caſſiepeia		δ	3	17	25	14.5	1	9	41	3.71	58	55	27.1	19.07
8	Leg of Caſſiepeia		ε	3	24	10	22.9	1	36	42	4.13	62	25	20.6	18.27
9	Preceding of the North Triangle		α	4	24	43	28.0	1	38	54	3.49	28	20	59.3	18.19
10	Middle of thoſe at the Ear of the Ram		γ	4	24	57	46.3	1	39	51	3.27	18	3	34.0	18.16
11	Preceding Horn of the Ram		β	3	25	13	4.7	1	40	52	3.28	19	34	34.1	18.12
12	Foot of Andromeda	*	γ	2	27	19	17.0	1	49	16	3.61	41	7	0.5	17.82
13	Knot of the Fiſhes		α	3	27	17	7.0	1	49	8	3.09	1	32	50.2	17.80
14	Following Horn of the Ram	*	α	2	28	25	28.0	1	53	42	3.34	22	16	9.6	17.63
15	Northmoſt of the Triangle		β	4	28	41	15.6	1	54	45	3.48	33	47	28.2	17.56
16	Southmoſt of the Triangle		γ	4	30	38	0.7	2	2	32	3.52	32	40	37.7	17.22
17	Following in the Whale's Cheek		γ	3	37	35	34.0	2	30	22	3.12	2	10	10.5	15.87
18	Northern in the Fleur de Luce			4	38	16	0.0	2	33	4	3.53	28	11	26.3	15.73
19	Southern in the Fleur de Luce			4	38	49	39.5	2	35	19	3.50	26	12	44.4	15.61
20	Shoulder of Perſeus		γ	3	41	42	55.6	2	46	52	4.24	52	30	13.8	14.96
21	Whale's Jaw	*	α	2	42	26	24.0	2	49	46	3.13	3	5	32.0	14.81
22	Meduſa's Head		β	2	43	0	4.6	2	52	0	3.84	39	58	17.9	14.64
23	Brighteſt Star of Perſeus		α	2	46	39	22.5	3	6	37	4.19	48	56	46.6	13.74
24	Thigh of Perſeus		δ	3	51	18	33.3	3	25	14	4.17	46	57	40.0	12.52
25	Brighteſt of the Pleiades	*	υ	3	53	18	55.0	3	33	16	3.54	23	18	35.8	12.01
26	Extreme of the Foot of Perſeus		ζ	3	54	37	4.6	3	38	28	3.72	31	7	2.6	11.60
27	Knee of Perſeus		ε	3	55	17	24.1	3	41	10	3.94	38	15	41.6	11.41
28	Firſt of the Hyades		γ	3	61	23	56.2	4	5	36	3.39	15	0	6.8	9.59
29	Second of the Hyades		δ	4	62	8	17.3	4	8	33	3.44	16	56	2.8	9.35
30	Northern Eye of the Bull		ε	3	63	30	42.4	4	22	3	3.48	18	36	13.7	8.93
31	Southern Eye of the Bull, Aldebaran	*	α	1	65	32	39.0	4	22	11	3.43	15	59	3.2	8.33
32	Goat, Capella	*	α	1	74	44	59.0	4	59	0	4.40	45	42	36.7	5.33
33	Northern Horn of the Bull	*	β	2	77	47	7.0	5	11	8	3.78	28	22	6.2	4.29
34	Weſtern Shoulder of Orion		γ	2	77	56	2.2	5	11	44	3.22	6	5	55.7	4.19
35	Southern Horn of the Bull		ζ	3	80	40	42.9	5	22	43	3.58	20	57	52.7	3.24
36	Shoulder of the Coachman		β	3	85	17	57.8	5	41	12	4.41	44	53	16.5	1.64
37	Eaſtern Shoulder of Orion	*	α	1	85	32	47.0	5	42	11	3.25	7	20	10.6	1.60
38	Hand of the Coachman		θ	3	85	40	8.5	5	42	41	4.08	37	9	51.6	1.51
39	Foot of Caſtor		η	4	89	56	36.3	5	59	48	3.63	21	33	15.5	0.02
40	Foot of Pollux, not the brighteſt		μ	4	91	58	25.0	6	7	54	3.63	22	30	59.2	0.07
41	Bright Star in the Foot of Pollux	*	γ	2,3	95	57	40.0	6	23	51	3.48	16	15	16.9	2.02
42	Knee of Caſtor		ε	3	97	8	9.0	6	28	33	3.71	25	21	9.4	2.49
43	Knee of Pollux		ζ	3	102	18	49.4	6	49	15	3.58	20	54	45.1	4.27
44	Thigh of Pollux		δ	3	106	17	26.4	7	5	10	3.61	22	25	8.5	5.61
45	Neck of the Little Dog		β	3	108	23	46.5	7	13	35	3.27	8	46	20.2	6.32
46	Bright Star in the Head of Caſtor	*	α	1,2	109	48	46	7	22	16	3.87	32	24	34.5	6.73
47	Brighteſt in the Little Dog, Procyon	*	α	1	111	40	57	7	26	44	3.21	5	50	42.5	7.35
48	Head of Pollux	*	β	2	112	39	4	7	30	36	3.75	28	36	22.5	7.66
49	Southern Foot of the Crab		β	4	120	44	4.3	8	2	56	3.15	9	56	7.0	10.23
50	Northern Aſs		γ	4	127	11	42.2	8	27	47	3.52	22	20	59.3	12.11
51	Southern Aſs		δ	4	127	36	43.4	8	30	27	3.44	19	3	22.0	12.22
52	Northern in the Foot of the Great Bear		ι	3	130	29	7.9	8	41	57	4.25	48	59	58.7	13.00
53	Claw of the Crab		α	3	130	32	21.3	8	42	9	3.31	12	48	33.5	13.01
54	Southern in the Foot of the Great Bear		κ	4	131	36	28.0	8	46	26	4.20	48	7	16.6	13.30
55	Preceding Knee of the Great Bear		θ	3	138	59	39.2	9	15	59	4.22	52	47	42.3	15.11
56	Foot of the Lion		ο	4	141	56	46	9	27	47	3.24	10	40	56.5	15.79
57	Eye of the Lion		ε	3	142	54	6.0	9	31	36	3.45	24	24	35.2	15.99
58	Northern in the Head of the Lion		μ	3	144	37	21.0	9	38	29	3.47	27	10	8.5	16.33
59	Southern in the Neck of the Lion		η	3	148	24	53.8	9	53	40	3.31	17	58	18.4	17.07
60	Lion's Heart, Regulus	*	α	1	148	53	33	9	55	34	3.24	13	10	43.7	17.13
61	Northern in the Neck of the Lion		ζ	3	150	40	55.0	10	2	44	3.34	29	39	4.0	17.47
62	Following in the Neck of the Lion		γ	3	151	32	6.1	10	6	0	3.31	21	5	49.3	17.61
63	In the Belly of the Lion		ρ	4	154	54	20.0	10	19	37	3.18	10	35	6.4	18.14
64	Southern in the Square of the Great Bear		β	2	161	38	26.5	10	46	34	3.75	57	42	51.0	19.01
65	Northern following in the Great Bear		α	2	162	0	45.1	10	48	3	3.89	63	5	32.9	19.05
66	Thigh of the Lion	*	δ	2,3	165	19	26	11	1	18	3.18	21	53	28.6	19.37
67	Back of the Lion		θ	3	165	16	3.1	11	1	5	3.18	16	47	32.5	19.38
68	Tail of the Lion	*	β	2	174	12	0.0	11	36	48	3.12	15	58	7.2	19.93
69	Northern Wing of the Virgin		β	3	174	25	5.0	11	37	40	3.08	3	10	20.5	19.94
70	Southern following in the Square of the Great Bear		γ	2	175	8	7.1	11	40	32	3.24	55	5	0.7	19.98
71	Laſt in the Square of the Great Bear		δ	3	180	43	47.3	12	2	55	3.05	58	25	19.8	20.04
72	Southern Wing of the Virgin		η	3	181	46	48.1	12	7	7	3.07	0	43	31.1	20.02
73	Firſt in the Tail of the Great Bear		ε	2	190	44	5.6	12	42	56	2.69	57	19	15.1	19.69
74	Foremoſt in the Waiſt of the Virgin		δ	3	190	45	18.1	12	43	1	3.06	4	45	43.2	19.69
75	The brighteſt under the Great Bear			3	191	4	20	12	44	17	2.86	39	40	25.8	19.66
76	Northern Wing of the Virgin		ε	3	192	25	51.8	12	49	43	3.01	12	18	34.3	19.57
77	Middle of the Tail of the Great Bear		ζ	2	198	26	53.8	13	13	48	2.45	56	14	12.2	19.01
78	Following in the Waiſt of the Virgin		ζ	3	200	29	37.0	13	21	58	3.08	0	41	27.5	18.77
79	Extremity of the Tail of the Great Bear		η	2	204	24	58.6	13	37	40	2.41	50	34	5.4	18.24
80	Preceding Thigh of Bootes or the Clown		η	3	205	41	34.1	13	42	46	2.88	19	39	45.0	18.06
81	Extremity of the Dragon's Tail		α	3	209	24	28.7	13	57	38	1.50	65	34	32.5	17.45
82	Brighteſt in the Clown, Arcturus	*	α	1	211	10	53.0	14	4	44	2.82	20	29	39.2	17.16
83	Preceding Shoulder of the Clown		γ	3	215	29	55.5	14	22	0	2.43	38	24	19.0	16.31
84	Following Foot of the Clown		ζ	3	217	18	14.6	14	29	13	2.86	14	48	52.2	15.93
85	Following Thigh of the Clown		ε	3	218	32	15.8	14	34	9	2.63	28	8	27.0	15.67
86	Preceding in the Square of the Little Bear		β	3	222	55	42.3	14	51	43	0.36	75	10	51.2	14.66
87	Head of the Clown		β	3	223	8	0.0	14	52	32	2.28	41	23	15.7	14.62

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88	Following Shoulder of the Clown		δ	3	226 23 12.5	15 5 33	2.44	34 15 40.8	13.82
89	Preceding in the last Joint of the Dragon		ι	4	229 51 2.1	15 19 24	1.31	59 50 54.3	12.91
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90	Following in the Square of the Little Bear		γ	3	230 19 58.5	15 21 20	0.22	72 43 27.9	12.79
91	Preceding in the Neck of the Serpent		δ	3	230 43 9.0	15 22 53	2.87	11 23 32.0	12.68
92	Brightest in the Crown		α	2	231 1 40.2	15 24 7	2.05	27 34 18 2	12.60
93	Brightest in the Neck of the Serpent	*	α	2.3	233 7 0.0	15 32 28	3.01	7 13 50 5	12.06
94	Southern in the Neck of the Serpent		β	3	233 39 52.0	15 34 39	2.76	16 13 16.9	11.87
95	Following the Brightest in the Serpent		ε	4	234 35 30.2	15 38 22	2.98	5 14 56.2	11.62
96	Following of Southern in the Serpent's Neck		γ	3	236 13 52.5	15 44 55	2.75	14 29 41.4	11.14
97	Following in the last Joint of the Dragon		θ	4	239 18 37.2	15 57 14	1.14	59 14 17.5	10.23
98	Preceding arm of Hercules		γ	3	242 43 30.8	16 10 54	2.66	19 45 29.6	9.18
99	Preceding Shoulder of Hercules		β	3	244 52 29.7	16 19 30	2.59	22 3 7.1	8.51
100	Last in the Joint of the Dragon		η	4	245 9 46.9	16 20 39	0.78	62 5 2.5	8.41
101	Foremost in the Side of Hercules		ζ	3	247 58 6.2	16 31 52	2.30	32 4 19.4	7.51
102	Loins of Hercules		η	4	248 34 59.6	16 34 20	2.07	39 24 46.9	7.31
103	Following in the side of Hercules		ε	3	252 40 52.2	16 50 43	2.29	31 18 41.6	5.96
104	Head of Hercules		α	2	255 48 49.2	17 3 15	2.74	14 41 44.5	4.91
105	Following Shoulder of Hercules		δ	3	256 26 36.4	17 5 46	2.47	25 9 4.7	4.69
106	Head of Ophiuchus		α	2	260 50 5.3	17 23 20	2.78	12 45 47.9	3.17
107	Eye of the Dragon		β	3	261 12 6.8	17 24 48	1.36	52 29 44.5	3.06
108	Northern in the Shoulder of Ophiuchus		β	3	262 46 55.0	17 31 8	2.97	4 41 40.6	2.52
109	Southern in the Shoulder of Ophiuchus		γ	3	263 50 35.2	17 35 22	3.01	2 49 28.3	2.15
110	Elbow of Hercules		μ	4	264 10 9.5	17 36 41	2.38	27 53 3.9	2.03
111	Knee of Hercules		θ	3	266 55 25.6	17 47 42	2.06	37 17 56.4	1.08
112	Head of the Dragon		γ	3	267 42 3 0	17 50 48	2.21	51 31 37.9	0.80
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113	Brightest in the Harp	*	α	1	277 12 11.0	18 28 49	2.06	38 34 0.0	2 48
114	Preceding in the Lozenge of the Harp		β	3	280 12 47.3	18 40 51	2.22	33 5 23.4	3.55
115	Preceding in the Extremity of the Serpent's Tail		θ	4	280 56 51.2	18 43 47	3.00	3 54 6.0	3.80
116	Following in the Lozenge of the Harp		δ	3	281 26 36.3	18 45 46	2.11	36 35 48.6	3.97
117	Preceding in the Tail of the Eagle		ε	4	282 4 17.5	18 48 17	2.73	14 44 56.1	4.18
118	Following in the Lozenge of the Harp		γ	3	282 23 54.4	18 49 35	2.29	32 21 49.1	4.29
119	Following in the Tail of the Eagle		ζ	4	283 28 50.4	18 53 55	2.69	13 30 42.5	4.67
120	Second Joint of the Dragon		δ	3	288 6 23.0	19 12 26	0.06	67 13 17.1	6.22
121	Preceding Wing of the Eagle		δ	3	288 13 24.7	19 12 54	3.02	2 38 18.2	6.26
122	Beak of the Swan		β	3	290 9 25.3	19 20 38	2.43	27 27 4.0	6.90
123	Brightest in the Arrow		α	4	292 14 1.0	19 28 56	2.69	17 27 28.9	7.58
124	Preceding in the Neck of the Eagle		γ	3	293 35 30.2	19 34 22	2.28	10 1 22.0	8.02
125	Northern Wing of the Swan		δ	3	294 17 28.4	19 37 10	1.86	44 31 58.5	8.24
126	Brightest in the Eagle, Alcair	*	α	1,2	294 46 1.0	19 39 4	3.91	8 13 44.3	8.36
127	Following Shoulder of Antinous		η	4	294 55 55.0	19 39 44	3.07	0 23 5.4	8.45
128	Following in the Neck of the Eagle		β	3	295 45 31.0	19 43 2	3.02	5 48 10.6	8.71
129	Breast of the Swan		γ	3	303 18 50.0	20 13 15	2.16	39 8 12.8	11.00
130	Preceding in the Tail of the Dolphin		ε	4	305 18 56.4	20 21 16	2.88	10 28 20.0	11.58
131	Preceding in the Lozenge of the Dolphin		ζ	4	305 54 17.8	20 23 37	2.82	13 49 52.2	11.74
132	Southerly in the Lozenge of the Dolphin		β	3	306 27 34.3	20 25 50	2.82	13 44 32.6	11.91
133	Northerly in the Lozenge of the Dolphin		α	3	307 0 22.2	20 28 1	2.79	15 2 51.5	12.05
134	Southerly following in the Lozenge of the Dolphin		δ	4	307 56 44.9	20 31 47	2.81	14 11 36.6	12.32
135	Tail of the Swan	*	α	1,2	308 8 51.0	20 33 15	2.05	44 23 54.5	12.39
136	Last in the Lozenge of the Dolphin		γ	4	308 46 3.0	20 35 4	2.79	15 14 22.5	12.54
137	Brightest in the Southern Wing of the Swan		ε	3	309 1 19.6	20 36 5	2.40	33 2 50.4	12.62
138	Extremity of the Southern Wing of the Swan		ζ	4	315 34 26.4	21 2 18	2.55	29 12 50.7	14.31
139	Head of the Little Horse		α	4	315 49 36.0	21 3 18	3.01	4 14 8.1	14.27
140	First of Pegasus		e	4	317 37 25.3	21 10 30	2.79	18 44 53.7	14.80
141	Preceding Shoulder of Cepheus		α	3	318 8 41.8	21 12 34	1.43	61 31 55.7	14.92
142	Girdle of Cepheus		β	4	321 19 34.4	21 25 18	0.81	69 27 54.8	15.64
143	Mouth of Pegasus		ε	3	322 58 21.6	21 31 53	2.95	8 44 29.8	16.00
144	Lower part of Southern Wing of the Swan		μ	4	323 14 41.1	21 32 59	2.64	27 37 24.1	16.05
145	Neck of Pegasus		ζ	3	337 14 43.9	22 28 59	2.99	9 32 4.3	18.46
146	Northern Knee of Pegasus		η	3	337 49 37.7	22 31 18	2.80	28 55 14.5	18.55
147	Ring of Andromeda's Chain		o	4	243 36 49.0	22 50 27	2.72	40 59 22.0	19.12
148	Thigh of Pegasus	*	β	2	343 2 40.0	22 52 11	2.89	26 43 52.7	19.15
149	Wing of Pegasus	*	α	2	343 12 22.0	22 52 49	2.99	13 51 56.0	19.17
150	Following Foot of Cepheus		γ	4	352 19 22.1	23 29 17	2.31		19.86
151	Head of Andromeda	*	α	2	359 0 25.0	23 57 40	3.06	27 42 32.1	20.04
152	Chair of Cassiopeia		β	3	358 59 41.4	23 55 59	3.04	57 46 7.0	20.04

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1	Tail of the Male Hydra		β	3	3 2 58.3	0 12 12	2.72	78 39 50.3	20.01
2	Head of the Phenix		α	2	3 28 0.9	0 13 52	3.01	43 39 43.4	20.00
3	Brightest in the Whale's Tail		β	2	7 45 28.6	0 31 2	3.01	19 21 51,1	19.85
4	Thigh of the Phenix		β	3	13 43 21.7	0 54 53	2.73	48 4 42.1	19.46
5	Preceding towards the Whale's Tail		η	4	14 00 16.1	0 56 1	3.00	11 30 48.8	19.44
6	Following towards the Whale's Tail		θ	4	17 53 9.1	1 11 33	3.01	9 28 49.5	19.07
7	Following Wing of the Phenix		γ	3	19 22 10.7	1 17 29	2.67	44 36 18.8	18.90
8	In the Source of the River, Achernar		α	1	22 5 42.2	1 28 23	2.26	58 30 52.1	18.56
9	Head of the Male Hydra		α	3	27 43 22.5	1 50 53	1.87	62 47 36.3	17.73
10	Variable of the Whale		o	4	31 40 53.8	2 6 44	3.03	4 7 28.0	17.05
11	Preceding in the Cheek of the Whale		δ	3	36 40 35.4	2 26 42	3.08	0 45 50.2	16.07
12	Breast of the Whale		ε	3	36 52 22.9	2 27 30	2.90	12 56 51.9	16.03
13	First Turning of the River		θ	3	42 11 52.7	2 48 48	2.30	41 19 4.0	14.85
14	Third Turning of the River			4	45 21 58.8	3 1 28	2.54	29 59 13,7	14.07
15	River before the Whale		ζ	3	45 55 39.1	3 3 43	2.91	9 45 51.2	13.93
16	Following in the River		ε	3	50 17 32.0	3 21 10	2.89	10 19 12.0	12.79
17	Following still, in the River		δ	3	52 49 30.1	3 31 18	2.88	10 37 32.0	12.10
18	Fourth turning of the River		γ	4	56 35 48.3	3 46 23	2.79	14 14 21.6	11.02
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19	Middle of the Male Hydra		γ	4	57 51 51.2	3 51 27	1.14	74 59 55.9	10.66
20	Brightest in the rhomboidal Reticula		α	3	62 49 11.8	4 11 17	0.74	63 6 16.3	9.15
21	Tail of the Gold Fish, or Dorade		α	3	67 9 19.7	4 28 37	1.28	55 34 12.9	7.78
22	Last of the River		β	3	73 53 44.0	4 55 35	2.95	5 25 49.2	5.56
23	Bright Foot of Orion, Rigel	*	β	1	75 45 11.0	5 3 44	2.89	8 30 37.4	4.97

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24	Northern in the Sword of Orion	η	3	77	58	48.0	5	11	55	3.02	2	38	56.9	4.17
25	Belly of the Hare	β	4	79	23	11.8	5	17	33	2.58	20	58	43.1	3.69
26	Preceding of Orion's Girdle	δ	2	79	48	54.4	5	19	16	3.07	0	30	22.8	3.54
27	Brighteſt of the Hare	α	3	80	25	49.7	5	21	43	2.65	18	1	19.0	3.34
28	Middle of Orion's Girdle	ε	2	80	53	11.1	5	23	33	3.05	1	23	1.2	3.17
29	Laſt of Orion's Girdle	ζ	2	82	2	33.5	5	28	10	3.04	2	5	48.9	2.77
30	Preceding of the Brighteſt of the Dove	α	2	82	39	12.2	5	30	37	2.20	34	13	22.7	2.56
31	Belly of the Gold Fiſh, or Dorade	β	4	82	52	17.5	5	31	19	0.50	62	39	29.7	2.48
32	Southern in the Hare's Foot	γ	4	83	30	43.2	5	34	3	2.53	22	32	58.7	2.26
33	Knee of Orion	κ	3	83	58	48.2	5	35	55	2.85	9	46	38.3	2.10
34	Northern in the Hare's Foot	δ	4	85	8	46.0	5	40	35	2.57	20	55	16.1	1.68
35	Following of the brighteſt of the Dove	β	3	85	32	30.4	5	42	10	2.11	35	52	40.3	1.55
														+
36	Preceding foot of the Great Dog	ζ	3	92	40	58.9	6	10	44	2.31	29	58	11.8	0.94
37	Knee of the Great Dog	β	3	92	55	25.3	6	11	42	2.63	17	51	11.4	1.02
38	Brighteſt of the Ship Canopus	α	1	94	36	7.6	6	18	25	1.34	52	34	8.9	1.60
39	Summit of the Ship's Rudder	ι	3	97	11	44.4	6	30	7	1.84	42	59	25.2	2.62
40	Brighteſt of the Great Dog, Sirius *	α	1	98	38	37.0	6	34	34	2.69	16	23	36.6	2.97
41	Thigh of the Great Dog	ε	3	102	12	7.2	6	48	48	2.30	28	38	59.6	4.23
42	Back of the Great Dog	δ	2	104	33	26.8	6	58	14	2.45	26	0	56.1	5.03
43	Poop or Stern of the Ship	π	3	107	4	44.0	7	8	19	2.13	36	39	44.4	5.88
44	Tail of the Great Dog	η	2	108	33	3.6	7	14	12	2.39	28	49	59.7	6.37
45	Poop of the Ship	σ	3	110	19	40.5	7	21	19	1.94	42	48	25.6	6.96
46	Poop of the Ship	ζ	2	118	42	4.5	7	54	48	2.12	39	18	39.5	9.62
47	Preceding in the Body of the Ship	γ	2	120	27	48.0	8	1	51	1.85	46	36	34.9	10.16
48	Following in the Body of the Ship	ε	3	124	20	10.7	8	17	21	1.26	58	42	52.5	11.30
49	Brighteſt in the Middle of the Ship	δ	2	129	27	5.0	8	37	48	1.61	33	48	2.1	12.73
50	Sail of the Ship	λ	3	134	42	17.7	8	57	49	2.21	42	26	4.1	14.09
51	Brighteſt about the Oars of the Ship	β	1	137	35	26.0	9	10	22	0.75	68	41	26.5	14.79
52	Maſt of the Ship	ι	3	137	36	3.3	9	10	24	1.65	58	14	8.3	14.79
53	Brighteſt more Northerly	κ	3	138	35	52.9	9	14	24	1.86	53	57	0,1	15.03
54	Heart of the Female Hydra *	α	2	138	56	57.0	9	15	48	2.96	7	35	13.1	15.08
55	Oars of the Ship	υ	3	145	12	41.2	9	40	51	1.50	65	55	6.7	16.45
56	Southern in Section of the Ship	θ	3	158	31	34.9	10	34	6	2.12	63	5	24.9	18.64
57	Northern in Section of the Ship	η	2	158	51	29.3	10	35	26	2.27	58	22	39.2	18.68
58	Top of the Ship's Section	μ	3	159	1	11.4	10	36	5	2.55	46	6	15.0	18.81
59	Foot of the Cup	α	4	161	54	13.7	10	47	37	2.95	16	58	29.0	19.05
60	Preceding in the Crupper of the Centaur	δ	3	178	51	51.4	11	55	27	3.05	49	19	39.8	20.03
61	Beak of the Raven	α	4	178	53	31.4	11	55	34	3.07	23	20	6.0	20.03
62	Head of the Raven	ε	4	179	19	46.1	11	57	19	3.06	21	13	44.6	20.04
63	Preceding Arm of the Croſs	δ	3	180	30	34.7	12	2	2	3.10	57	21	30.0	20.04
64	Preceding Wing of the Raven	γ	3	180	44	44.5	12	2	59	3.09	16	9	32.5	20.04
65	Foot of the Croſs	α	1	183	13	53.7	12	12	56	3.22	61	42	47.4	20.01
66	Preceding in the following Wing of the Raven	δ	4	184	14	29.6	12	16	58	3.09	15	7	18.2	19.98
67	Head of the Croſs	γ	2	184	28	35.0	12	17	54	3.36	70	44	54.3	19.97
68	Foot of the Raven	β	3	185	19	30.9	12	21	18	3.14	22	0	40.0	19.95
69	Preceding of the Fly	α	4	185	38	41.6	12	22	35	3.42	67	46	17.2	19.94
70	Top of the Centaur's Crupper	γ	2	186	57	53.8	12	27	52	3.27	47	34	52.9	19.89
71	Southern in the Virgin's Girdle	γ	3	187	15	7.2	12	29	0	3.08	0	4	22.3	19.88
72	Head of the Fly	β	4	187	48	53.4	12	31	16	3.52	66	44	6.1	19.84
73	Following Arm of the Croſs	β	2	188	19	40.1	12	33	19	3.42	58	19	8.3	19.83
74	Southern Wing of the Virgin	θ	4	194	15	26.2	12	57	2	3.09	4	11	47.2	19.41
75	Tail of the Female Hydra	γ	3	196	20	46.6	13	5	23	3.22	21	50	43.8	19.22
76	Preceding Shoulder of the Centaur	ι	3	196	39	27.6	13	6	38	3.34	35	23	6.6	19.20
77	Spike of the Virgin	α	1	198	8	44.0	13	12	35	3.15	9	50	51.1	19.06
78	Belly of the Centaur	ι	3	201	3	30.4	13	24	14	3.69	52	10	55.2	18.70
79	Waiſt of the Centaur	ζ	3	205	1	46.6	13	40	5	3.66	46	2	38.3	18.15
80	Preceding Leg of the Centaur	β	2	206	36	41.8	13	46	27	4.09	59	9	1.8	17.91
81	Following Shoulder of the Centaur	θ	3	207	59	57.5	13	52	0	3.52	35	7	34.9	17.69
82	Robe of the Virgin	κ	4	209	53	57.8	13	59	36	3.19	9	5	43.3	17.37
83	Southern Foot of the Virgin	λ	4	211	24	18.4	14	5	37	3.22	12	2	29.0	17.20
84	Southern in the Shield of the Centaur	η	3	214	56	9.1	14	19	45	3.75	41	2	28.8	16.43
85	Head of the Compaſſes	α	3	215	39	45.4	14	22	39	4.68	63	51	48.2	16.26
86	Brighteſt in the Foot of the Centaur	α	1	215	42	31.1	14	22	50	4.41	59	47	9.4	16.26
87	Foot of the Wolf	α	3	216	21	48.0	14	25	27	3.89	46	17	40.1	16.14
88	Southern Scale of the Balance *	α	2	219	24	43.0	14	37	39	3.30	14	59	9.7	15.50
89	Extremity of the Foot of the Wolf	β	3	220	34	6.6	14	42	16	3.86	42	6	13.9	15.22
90	Following Foot of the Centaur	κ	3	220	45	12.7	14	43	1	3.84	41	4	45.6	15.17
91	Preceding Claw of the Scorpion	γ	4	222	22	28.5	14	49	30	3.48	24	16	53.5	14.70
92	Preceding of the Southern Triangle	γ	3	224	0	2.8	14	56	0	5.29	67	43	32.3	14.40
93	Northern Scale of the Balance *	β	2	226	1	55.0	15	4	8	3.30	8	26	30.5	13.94
94	Following in the Wolf's Shoulder	γ	3	229	38	36.2	15	18	34	3.94	40	18	4.6	12.97
95	Following in the North Scale of the Balance	γ	4	230	23	42.6	15	21	35	3.34	13	56	10.4	12.77
96	Top of the Southern Triangle	β	3	233	20	42.1	15	33	23	5.06	62	37	34.2	11.96
97	Southern Claw of the Scorpion	ρ	4	235	22	40.5	15	41	31	3.68	28	27	36.0	11.38
98	Southern in the Forehead of the Scorpion	π	4	235	56	38.8	15	43	47	3.60	25	22	18.7	11.32
99	Middle in the Forehead of the Scorpion	δ	3	236	23	52.2	15	45	35	3.52	21	53	17.6	11.09
100	Northern in the Forehead of the Scorpion *	β	2	237	52	49.0	15	51	31	3.50	19	5	55.2	10.69
101	Top of the Forehead of the Scorpion	υ	4	239	15	5.4	15	57	0	3.47	18	47	19.6	10.24
102	Preceding Foot of Ophiuchus	δ	3·	240	18	58.8	16	1	16	3.14	3	1	46.3	9.92
103	Following in the ſame Foot of Ophiuchus	ε	3	241	16	51.2	16	5	7	3.16	4	3	36.0	9.93
104	Preceding of the Scorpion's Heart	σ	4	241	30	40.7	16	6	3	3.62	24	58	2.9	9.56
105	Brighteſt in the Scorpion's Heart, Antares *	α	1	243	41	1.0	16	14	44	3.66	25	51	8.4	8.93
106	Following of the Scorpion's Heart	τ	4	245	5	32.3	16	20	22	3.70	27	40	14.7	8.44
107	Following in the Southern Triangle	α	3	245	37	5.0	16	22	28	6.16	68	31	24.3	8.26
108	Southern in the Knee of Ophiuchus	ζ	3	245	51	19.0	16	23	25	3.30	10	2	16.0	8.20
109	Firſt Joint of the Scorpion's Tail	ε	3	248	30	14.8	16	34	1	3.90	33	48	41.1	7.34
110	Second Joint of the Scorpion's Tail	μ	3	248	44	54.6	16	35	0	4.04	37	35	18.6	7.26
111	Brighteſt in the third Joint	ζ	3	249	15	51.0	16	37	3	4.20	41	54	3.6	7.09
112	Fourth Joint	η	3	253	34	34.1	16	54	18	4.28	42	52	39.2	5.66
113	Following Knee of Ophiuchus	η	2	254	0	53.9	16	56	4	3.44	15	23	28.4	5.52
114	Following Foot of Ophiuchus	θ	3	256	40	11.2	17	6	21	3.67	24	43	20.6	4.61
115	Middle of the Altar	α	3	258	8	27.0	17	12	34	4.61	49	38	31.8	4.12
116	Little Star in the Extremity of the Scorpion's Tail	υ	4	258	27	0.8	17	13	48	4.09	37	3	55.9	4.01
117	Brighteſt in Extremity thereof	λ	3	259	9	59.4	17	16	40	4.08	36	53	28.6	3.77

No.	Southern Stars Names, and Places in their Constellations.		Bayer's Letters.	Magnit.	Right Ascension in Degrees, &c. °	′	″	Right Ascension in Time. H.	M	S.	Ann. Var. + ″	Declination South. °	′	″	Ann. Var. + ″
118	Fifth Joint of the Scorpion's Tail		θ	3	259	50	56.1	17	19	24	4.30	42	48	23.2	3.53
119	Seventh Joint of the same		κ	3	261	18	19.3	17	25	13	4.13	38	52	14.6	3.03
120	Sixth Joint thereof		ι	3	262	31	53.5	17	30	8	4.18	39	59	49.0	2.60
121	In the last Joint of the Serpent		ζ	4	266	49	26.9	17	47	18	3.16	3	38	56.3	1.11
122	Following at the point of the Arrow of Sagittary		γ	4	267	26	21.5	17	49	45	3.87	30	23	53.7	0.89
123	Top of the Bow of Sagittary		μ	4	269	42	12.7	17	58	49	3.60	21	5	56.9	0.10
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124	Hand of Sagittary		δ	3	271	14	31.8	18	4	58	3.85	29	54	18.4	0.43
125	Southern Extreme of the Bow of Sagittary		ε	3	271	53	39.7	18	7	35	4.00	34	28	17.4	0.67
126	Northern Extreme of the Bow of Sagittary		λ	3	273	8	5.2	18	12	32	3.72	25	31	57.4	1.09
127	Arrow of Sagittary		φ	4	277	30	26.7	18	30	2	3.77	27	13	13 0	2.61
128	Preceding Shoulder of Sagittary	*	τ	2,3	280	5	40.0	18	40	23	3.74	26	34	51.0	3.45
129	Arm of Sagittary		ξ	3	281	40	16.6	18	46	41	3.84	30	12	36.0	4.06
130	Head of Sagittary		ο	4	282	25	19.1	18	49	41	3.60	22	5	0.8	4.31
131	Preceding Shoulder of Sagittary		τ	4	282	49	38.3	18	51	19	3.77	28	0	30.6	4.45
132	Following in the Head of Sagittary		π	3	283	35	45.4	18	54	23	3.59	21	23	48.8	5.70
133	Preceding of the two in the Foot of Sagittary		β	4	286	9	8.7	19	4	37	4.34	44	53	42.4	5.57
134	Leg of Sagittary		α	4	286	37	43.3	19	6	31	4.20	41	3	21.5	5.73
135	Side of Antinous		ι	4	290	58	30.6	19	23	54	4.01	1	49	12.2	7.17
136	Back of the Peacock		δ	4	295	58	55.0	19	43	56	5.92	66	46	50.8	8.78
137	Brightest preceding in the Head of Capricorn	*	α	3	301	2	24.0	20	4	10	3.55	13	18	2.8	10.30
138	Eye of the Peacock		α	2	301	25	20.0	20	5	41	4.89	57	30	27.4	10.44
139	Following in the Head of Capricorn	*	β	3	301	52	34.0	20	7	30	3.39	15	33	2.7	10.54
140	Zagaye of the Indian		α	3	304	57	56.9	20	19	52	4.29	48	8	14.0	11.48
141	Wing of the Peacock		β	3	305	31	18.6	20	22	5	5.65	67	4	8.5	11.64
142	Breast of the Peacock		γ	4	316	21	5.2	21	5	24	5.28	66	28	19.8	14.50
143	Preceding Shoulder of Aquarius		β	3	319	35	53.7	21	18	24	3.18	6	39	22.4	15.35
144	Preceding in the Tail of the Goat		γ	3	321	27	12.5	21	25	49	3.35	17	46	42.0	16.66
145	Following in the Tail of the Goat		δ	3	323	18	8.6	21	23	13	3.33	17	14	48.3	16.06
146	Head of the Crane		γ	3	324	40	33.5	21	38	42	3.70	38	31	28.7	16.35
147	Preceding Wing of the Crane		α	2	328	5	7.7	21	52	21	3.98	48	9	21.4	17.00
148	Following Shoulder of Aquarius	*	α	3	328	21	47.0	21	53	27	3.10	1	31	25.9	17.03
149	Back of the Toucan		α	3	330	16	46.0	22	1	7	4.31	61	29	34.0	17.40
150	Following Arm of Aquarius		γ	3	332	11	5.6	22	8	44	3.09	2	38	13.5	17.71
151	Thigh of the Crane		β	3	336	54	3.2	22	27	36	3.68	48	10	51.0	18.43
152	Water of Aquarius		λ	4	339	53	27.8	22	39	34	3.16	8	54	8.2	18.82
153	Leg of Aquarius		δ	3	340	20	14.6	22	41	21	3.22	17	8	39.9	18.87
154	Brightest of the Southern Fishes, Fomalhaut	*	α	1	341	5	5.0	22	44	20	3.34	30	56	24.8	18.94
155	Water of Aquarius		φ	4	345	20	23.1	23	1	22	3.13	7	23	31.2	19.38

Star, in *Electricity*, denotes the appearance of the electric matter on a point into which it enters. Beccaria supposes that the *star* is occasioned by the difficulty with which the electric fluid is extricated from the air, which is an electric. See Brush.

Star, in *Fortification*, a little fort, with five or more points, or saliant and re-entering angles, flanking one another, and their faces 90 or 100 feet long.

Formerly, *star* forts were frequently made in lines of circumvallation, after two or three redoubts. See Redoubt, and Sconce.

Star, in *Heraldry*, denotes a charge frequently borne on the shield, and the honourable ordinaries, in the figure of a *star*. It differs from the mullet, or spur-rowel, in that it is not pierced as this last is.

It usually consists of five rays, or spokes. When it has six or eight, as among the Germans and Italians, particular mention must be made thereof in blazoning.

Stars, on *Medals*, are marks of consecration and deification, being intended as symbols of eternity. F. Joubert says, they sometimes express the children of princes reigning, and sometimes the children dead; and placed in the rank of deities.

Star, in the *Manege*. *White stars in the forehead* are esteemed good marks in all horses, except white and grey ones: where nature fails to produce this good criterion, our jockeys have frequent recourse to art. See Horse.

The method of making *stars*, practised among the Dutch, is to roast a large onion in hot ashes, and, when near thoroughly done, to divide it in two, and dip it in scalding hot walnut-oil. This done, they immediately apply the flat side thereof to the place the *star* is to be on, and keep it there half an hour. After taking it off, they anoint the scalded place with ointment of roses: in a short time, the scarf-skin falls off, and white hair grows up in its room; but the middle always continues bare of hair, which is the certain characteristic of an artificial *star*.

The method most used among us is, to shave the hair from the place it is to be made on; then to apply a little oil of vitriol with a feather, or the like, passing it lightly over the bald place. This eats away the roots of the former hair, which will be succeeded by white. The sore is healed up with copperas, and green ointment.

Star, *to make a black*, on a white or other coloured horse, wash the place to be changed frequently, with fern-roots and sage, boiled in ley; and they say it will breed black hairs. The same may be done by beating four milk, galls, and rust, together, and anointing the part therewith.

Star, *a red*, is made with an ounce of aqua fortis, a penny-worth of aqua vitæ, and silver to the value of eighteen-pence, all heated together in a glass, and the place anointed therewith. This immediately turns the hair to a perfect red; but it lasts no longer than till the horse casts his coat; when it is to be renewed.

Star, or Starr, *starrum*, in our *Old Writers*. All the deeds, obligations, &c. of the Jews, were called *starrs*, and writ for the most part in Hebrew alone, or in Hebrew and Latin; one of which yet remains in the Treasury of the Exchequer, written in Hebrew without points, the substance whereof is expressed in Latin just under it, like an English condition under a Latin obligation: this bears date in the reign of king John; and many *starrs*, as well of grant and release, as obligatory and by way of mortgage, are pleaded and recited at large in the Plea Rolls.

Before the banishment of the Jews under Edward I. their contracts and obligations were denominated *starra*, or *starrs*; which by an ordinance of Richard I. preserved by Hoveden, were commanded to be enrolled and deposited in chests, under three keys, in certain places; one and the most considerable of which was in the king's exchequer at Westminster; and no *starr* was allowed to be valid, unless it were found in some of the said repositories.

The word *starr* is a contraction from the Hebrew *schetar*, a deed or contract.

Star, in *Pyrotechny*, a composition of combustible matters; which being borne, or thrown aloft into the air, exhibits the appearance of a real *star*.

Stars are chiefly used as appendages to rockets, a number of them being usually enclosed in a conical cap, or cover, at the head of the rocket, and carried up with it to its utmost altitude, where the *stars* taking fire, are spread around, and exhibit an agreeable spectacle.

Stars, *to make*, mix three pounds of salt-petre, eleven ounces of sulphur, one of antimony, and three of gunpowder-dust; or twelve ounces of sulphur, six of saltpetre, five and a half of gunpowder-dust, four ounces of olibanum, one of mastic, camphor, sublimate of mercury, and half an ounce of antimony and orpiment. Moisten the mass with gum-water, and make it into little balls, of the size of a chesnut, which dry either in the sun, or the oven. These set on fire in the air, will represent *stars*.

Star is also a badge of the orders of the Garter and Bath.

Star, *order of the*, or our *Lady of the* Star, an order of knighthood instituted by king John of France, in the year

year 1352, denominated from a *ſtar* they wore on the ſtomach.

At firſt there were but thirty knights; but the order, in time, became depreciated by the multitude of perſons admitted without any diſtinction. For which reaſon, Charles VII. when grand-maſter thereof, quitted it, and gave it the chevalier du Guet, knight of the watch at Paris, and his archers; who ſtill wear a *ſtar* on their coats. But this account is contradicted by others; who will have the order inſtituted by king Robert, in 1022, in honour of the Holy Virgin, and to have fallen into diſregard during the wars of Philip de Valois.

Juſtiniani mentions another *order of the Star*, at Meſſina, in Sicily, called alſo the *order of the creſcent*. This was inſtituted in the year 1268, by Charles of Anjou, brother of St. Louis, king of the Two Sicilies.

Others will have it inſtituted in 1464, by Renatus duke of Anjou, who took the title of king of Sicily. At leaſt, it appears, from the arms of this prince, that he made ſome alteration in the collar of the order; for, inſtead of fleurs-de-lys, and *ſtars*, he only bore two chains, whence hung a creſcent, with the old French word *loz*; which, in the language of rebus, ſignified *loz in a creſcent*.

The order, being ſunk into obſcurity, was raiſed again by the people of Meſſina, under the name of the *Noble Academy of the Knights of the Star*; reducing the ancient collar to a ſingle *ſtar*, placed on a forked croſs; and the number of knights to ſixty-two. Their device was, *Monſtrant regibus aſtra viam*: which they expreſſed by the four initial letters

M R
*
A V

with the *ſtar* in the middle.

STAR *of Alexandria*, in *Botany*. See STAR *of Bethlehem*.

STAR-*apple*, in *Botany*. See *Star*-APPLE.

STAR *of Bethlehem*, *ornithogalum*, in *Botany*, a genus of the *hexandria monogynia* claſs. Its characters are theſe: the flower has no empalement; it is compoſed of ſix petals, whoſe under parts are erect, but ſpread open above; it hath ſix erect ſtamina, about half the length of the petals, crowned by ſingle ſummits, with an angular germen, ſupporting an awl-ſhaped ſtyle, terminated by an obtuſe ſtigma; the germen turns to a round, angular capſule, with three cells, filled with roundiſh ſeeds. Linnæus enumerates twelve, and Miller thirteen ſpecies.

The ſeveral ſpecies of this plant produced in our gardens are all propagated with great eaſe by the off-ſets which the roots produce in very great abundance. The beſt time to tranſplant the roots is in July or Auguſt, when the leaves are decayed. They ſhould have a light, ſandy ſoil, which, if it be over-dunged, will decay and rot the roots: they continue flowering a long time, and are a very great ornament in gardens, but they ought to be tranſplanted once in two or three years, otherwiſe the roots grow luxuriant in off-ſets, and the flowers are weak. They may be alſo propagated from ſeeds, which ſhould be ſown and managed as other bulbous rooted flowers, and will produce their flowers in three or four years after ſowing. Miller.

STAR *of the earth*, in *Botany*, the name of a plant famous for its virtues in curing the bite of a mad dog; but unhappily there has been a very great miſunderſtanding among authors about the plant properly ſignified by this name; ſome calling by it the coronopus, or buckſhorn-plantain, an herb common every where; and others a ſpecies of lychnis, or catch-fly, which is a very ſcarce plant. The original account of its nature and virtues ſeems to be this: king James ſent to the Royal Society a dried ſpecimen of a plant, which had been ſent to him as the plant with which his dogs had been cured when bitten by a mad-dog, and the name, by which this was called, was *ſtar of the earth*.

This plant was ſo ill dried, that it was not eaſily diſtinguiſhed, but at length Mr. Ray found it to be the *ſeſamoides ſalamanticum magnum*. It does not ſeem, however, clear, that this was the plant vulgarly known by that name, but rather that it was gathered by ſome ignorant perſon; neither the name *ſtar of the earth* at all agreeing with it, nor any account having been given before of its having ſuch virtues. Dr. Grey, in his Complete Farrier, greatly recommends the *ſtar of the earth* in the cure of this bite, and the plant he means is plainly the coronopus, or buckſhorn-plantain; and, upon the whole, it ſeems that this laſt mentioned is the plant properly called by this name, as its virtues have always been celebrated even in this caſe, and its leaves always are diſpoſed on the earth in the form of the rays of a *ſtar*. It is to be added to this, that the counteſs of Suffolk's powder, ſo famous in many places for this terrible diſeaſe, and by which ſeveral perſons have been known to be cured, is principally compoſed of this plant. Phil. Tranſ. Nº 450. p. 455.

STAR-*board* denotes the right ſide of a ſhip, when the eye of the ſpectator is directed forward. See LARBOARD. They ſay, *ſtar-board the helm*, or *helm a ſtar-board*, when the man at the helm ſhould put the helm to the right-ſide of the ſhip.

STAR-*fiſh*, *aſterias*, or *ſtella marina*, in *Zoology*, a genus of naked inſects, in form of a radiated ſtar: the mouth is ſituated in the centre, on the under part, and the anus in the centre, on the upper part. The tentacula are extremely numerous, and in a manner cover, either the whole upper ſurface of the body, or the extremities of the ramifications.

The ſpecies of this genus being very numerous, are diſtinguiſhed according to the number of their rays; they are alſo of different ſizes, the largeſt or greateſt Magellanic *ſtar-fiſh*, forming a circle of three feet in diameter, when its rays are fully extended; while there are others not exceeding an inch in diameter.

In the Linnæan ſyſtem, the *ſtar-fiſh*, *ſea-ſtar*, or *aſterias*, is a genus of the *molluſca* order of *worms*, the characters of which are, that the body is depreſſed, covered with a coriaceous coat, and furniſhed with tentacula; the mouth is in the centre, and has five valves. Of this genus Linnæus has enumerated ſixteen ſpecies, one of which, or the *moon aſterias*, is entire, nine ſtellated, and ſix radiated.

The moſt frequent kind of *ſtar-fiſh*, is that which has five rays, which iſſue in the manner of ſo many vermiform, or worm-like proceſſes: theſe therefore are called *ſtellæ vermiformes*, or the worm-like *ſtar-fiſh*. Another kind, nearly approaching to the nature of theſe, has more than five rays, and from the ſides of theſe other tranſverſe proceſſes are produced, which are covered with an extremely fine kind of down, or hairineſs: theſe are called the *hairy ſtar-fiſh*. A third kind is called the *aſtrophyta*, or plant-like *ſtar-fiſh*: this is compoſed of a body from whence there ariſe a great number of branches, which divaricating more and more, are at length increaſed, or divided into a prodigious number; and theſe being cylindric in figure, reſemble very much the branches of plants.

This general diſtinction being eſtabliſhed, the general and particular arrangements are naturally deduced from the ſubordinate diſtinctions: from the moſt remarkable differences in each ſeries of *ſtellæ* of every claſs are conſtituted the genera; from the leſs remarkable difference among each genus, the ſubordinate diſtinctions, and from the minuter diſtinctions among theſe, the ſpecies are diſtinctly ſeparated from one another. The accurate Linkius has hence eſtabliſhed a very regular method of theſe animals, calling them by names expreſſive of their differences, as *oligactis*, for ſuch of the firſt general diviſion as have leſs than five lobes, or rays, and the like. Several of the ſpecies of the *ſtar-fiſh* are eatable, and ſome of them afford a very good nouriſhment. Some are preſcribed by phyſicians as ingredients in plaſters.

The common *ſtar-fiſh*, *aſterias glacialis* of Linnæus, with five heptagonal rays, and prickly angles, is frequent in our ſeas, feeds on oyſters, and is very deſtructive to the beds.

Every ray of the *ſtar-fiſh* is furniſhed with ſo very large a number of legs, that they cover the whole ſurface: they are diſpoſed in four ranges, each of which contains about ſeventy-four; ſo that the whole ray contains three hundred and four, and conſequently the fiſh has, upon all five of its rays, no leſs than fifteen hundred and twenty legs. With all this numerous train of legs, however, the animal moves but very ſlowly; and indeed they are ſo ſoft and feeble, that they ſcarce deſerve the name of legs, and, more properly ſpeaking, they are only a ſort of horns, like thoſe of our garden-ſnails, but they ſerve the animal to walk with, and are therefore called legs. Mem. Acad. Par. 1710.

The amazing property of reproducing the eſſential parts, when loſt, is not confined to the POLYPE, and ſome few others of the inſect world, but is extended to the *ſtar-fiſh*, and to the URTICÆ *marinæ* of various kinds, and probably to many others, in which we at preſent have no expectation of finding it. Mr. Reaumur, on the diſcovery of this property in the polype, obſerved theſe other animals, as they lay on the ſhores of Poictou, and other places, and often found that ſpecies of *ſtar-fiſh*, which is very commonly known, and which has naturally five rays or arms, with only three or four, one or two being wanting; and on taking up and examining theſe mutilated ones, nature was always found reproducing the limb that was wanting; and on cutting and breaking other *ſtar-fiſh* into ſeveral parts, it was but a very little while before the broken parts cicatriſed, and every part remained alive; and by the appearances of things there remained no doubt, but that theſe living pieces will all, in time, reproduce their wanting parts.

Mr.

Mr. Reaumur could not ſtay long enough on the ſpot to ſee this; but Mr. de Villars, on the coaſt of Rochelle, ſaw the whole proceſs very frequently in the urticæ marinæ, which he cut to pieces on purpoſe for the experiment, and which always reproduced the parts he had cut off; and the common fiſhermen of the coaſts, where Mr. Reaumur was in company with Mr. Juſſieu, ſeeing them making their experiments on the *ſtar-fiſh*, appeared to be well acquainted with their nature, and told them that they might cut and tear them as much as they pleaſed, but they would not be able to kill them; ſo familiarly was this piece of natural hiſtory known among theſe people, though unknown to thoſe who had employed their lives in the ſearches after ſuch things. Phil. Tranſ. N° 464. append.

The *arboreſcent ſtar-fiſh*, *ſtella arboreſcens*, or *caput* MEDUSÆ of Linnæus, is one of the curioſities of nature found in ſeveral cabinets of natural rarities. It is deſcribed as upwards of a foot in diameter, having its mouth in the middle; the figure of the trunk is pentangular, and from the five angles ariſe as many branches, which ſubdivide into ſeveral others, and thoſe again into other leſſer ones, till the laſt are ſcarce thicker than horſe-hairs, and in number, by a moderate eſtimate, above a thouſand. The *ſtella arboreſcens*, in ſwimming, ſpreads all his branches like a net to their full length; and, as he perceives any prey within them, draws them in again; and thus takes it with all the dexterity of a fiſherman. Grew, Muſ. Reg. Societ. part i. ſect. 5. cap. 4. p. 122. This has been found in the north of Scotland, and on the coaſt of Cornwall. See BASKET-*fiſh*.

STAR-*gazer*, in *Ichthyology*, the Engliſh name of the URANOSCOPUS.

STAR-*ſhot*, the common name of a gelatinous ſubſtance often found lying on the ſurface of the earth, and called by ſome *ſtar-jelly*, and *ſtar-fallen*.

The vulgar have been always of opinion, that this was produced from that meteor which they call a *falling*-STAR; others have imagined it a vegetable ſubſtance, and ſuppoſed it grew out of the earth: neither of theſe however appear, upon a cloſe examination, to be the caſe, but that it is really the half-digeſted food of herons, bitterns, crows, ſea-mews, and coddy-moddies, principally when they have fed upon frogs or earth-worms.

The heads of frogs have been found whole in maſſes of this matter, as have alſo parts of worms; and theſe birds, when ſhot, have been found, when dying, to diſgorge a ſubſtance of the ſame kind.

It is a gelatinous ſubſtance, reſembling a thick mucilage of gum tragacanth, and is cold to the touch. There are often yellow ſpecks, and ſmall clots, like grumous blood, in it. It ſtinks like putrid fleſh when kept, and is principally found in miſty mornings, and in wet weather in autumn, winter, and ſpring. Moreton's Northampt. p. 353.

Mr. Boyle ſays, he has ſeen this jelly reſolved, by digeſtion only, into a permanent liquor; and that a phyſician of his acquaintance extolled it as a ſpecific, outwardly applied, to wens. Works abr. vol. i. p. 310.

STAR-*ſhot*, in *Artillery*, conſiſts of four pieces of iron, whoſe baſes, when ſeparate, form the quadrant of a circle; ſo that the whole being joined, forms a cylinder equal to the *ſhot* of the cannon. Each of theſe pieces is furniſhed with an iron bar, the extremity of which is attached to a ſort of link, as keys are ſtrung upon a ring. Being diſcharged from the gun, the four branches or arms extend every way from the link in the centre. Theſe are uſed in the ſea-ſervice, and chiefly deſigned for deſtroying the ſails and rigging; but their flight and execution are very precarious at any conſiderable diſtance.

STAR-*ſtone*, *aſteria*, in *Natural Hiſtory*, the name of a kind of extraneous foſſil, of a very regular figure and ſtructure, and approaching very much to the nature of the *entrochi*, having the ſame ſubſtance and inner ſtructure, and being much of the ſame ſize, though different in form; and as thoſe foſſils have fragments of ſhelly bodies, to which they are ſometimes found affixed, and appendages like branches, or the rudiments of ſuch, growing from them, ſo theſe have both the one and the other; the firſt called *aſteropodia*, and the others the *appendiculæ*, or wires of the *aſteriæ*. *Tab.* II. *Foſſils*, *Claſs* 7.

The foſſile world has been greatly enriched by the fragments and remains of the ſeveral kinds of *ſtar-fiſh* which have been converted into ſtone, and have been variouſly gueſſed at in that ſtate, as to their origin. The aſteriæ are by many affirmed to be the foſſile radii of the *ſtar-fiſh* of the decempede, or ten-rayed kind; and others have thought it evident, that ſome ſpecies of them have been the remains of the common coriaceous kinds. The ENCRINOS, or LILIUM *lapideum*, ſeems to be a part of one of the ten-rayed kinds; and the TROCHITÆ, and ENTROCHI, are plainly owing to the fragments of ſeveral of theſe kinds. Linkius, de Stellis Marin.

Mr. Ellis has particularly deſcribed, and illuſtrated by figures, foſſils of this kind, as well as the animal or *ſtar-fiſh* to which they belong; but as the ſtem of the animal, the ſpecimen of which he examined, and from which his deſcription is taken, was broke off ſhort at the bottom; he is in doubt whether it moves about in the ſea, or is fixed to rocks and ſhells by a baſe, like corals, ſponges, and keratophytons Phil. Tranſ. vol. lii. part i. art. 56.

The ASTEROPODIA, in ſubſtance and inner ſtructure, agree perfectly with the ſhells of the ECHINITÆ, found in our chalk-pits, and with the *aſteriæ* and entrochi; theſe bodies being all compoſed of obliquely-arranged plates of a tabulated ſpar: they are uſually compoſed of ſeveral joints, but they are only very imperfect fragments of the body of the animal the *aſteriæ* have once been a part of; the ſeveral parts of which they are compoſed are all convex on one ſide, and concave on the other, but they are of very different ſhapes, being ſometimes roundiſh, ſometimes oblong, often quadrangular, and not unfrequently of different numbers of angles. They have frequently two, ſometimes more ridges running acroſs them, and ſometimes they have tubercles, or ſmall protuberances, ſtanding either on their upper or under ſide: they are ſometimes found ſingle, but more frequently compound, or arranged into ſmaller or larger parcels, being placed one over another in the manner of the tiles of a houſe, and ſeem truly to have been originally part of an imbricated ſhell, or cruſt of ſome ſpecies of ſea-fiſh. They are in theſe compound maſſes even very evidently fragments, and are uſually of irregularly broken figures, though ſometimes they reſemble, in ſome degree, parts of the rays of one or other of the kinds of *ſtar-fiſh*. They are uſually found looſe from the *aſteriæ*, though lying among them; but ſometimes the *aſteriæ* are regularly fixed on them, juſt as the entrochi on the modioli, and are plainly ſeen to have originally grown out of them.

The *encrinos* of authors is one kind of *aſteropodium*, and has been affirmed by ſome perfectly to agree in figure with a ray of the Magellanic *ſtar-fiſh*. This is, however, ſeldom found in ſuch a compound ſtate; it uſually is met with in ſingle joints, and then is what authors call the *aſteropodium minus*, or ſmall *aſteropodium*.

Theſe bodies are uſually of a pale bluiſh grey, or aſh colour; ſometimes they are whitiſh, and ſometimes, though more rarely, yellowiſh, or reddiſh.

Having thus far deſcribed the *aſteropodia*, which ſeem properly the baſes of the *aſteriæ*, we ſhall be more intelligible in the account of the *aſteriæ* themſelves, which are to be treated of merely as branches of them; though, from their being much more frequent than theſe their baſes, they are much more familiarly known, and uſually more regarded. The *aſteriæ* are ſhort, and commonly ſomewhat crooked angular columns, compoſed of ſeveral joints, each reſembling the figure of a radiated *ſtar*, with a greater or ſmaller number of rays in the different ſpecies: they are uſually found of about an inch in length, and of the thickneſs of a gooſe-quill. Some of them have five angles, or rays, and others only four, and in ſome the angles are equidiſtant, while in others they are irregularly ſo; in ſome alſo they are ſhort and blunt, while in others they are long, narrow, and pointed; and ſome have their angles ſo very ſhort and obtuſe, that at firſt ſight they may be taken for *entrocho-aſteriæ*. The ſeveral joints in the ſame ſpecimen are uſually all of the ſame thickneſs; this however is not always the caſe, but in ſome they are larger at one end, and in others at the middle, than in any other part of the body; and ſome ſpecies have one of the rays bifid, ſo as to emulate the appearance of a ſix-rayed kind.

All the *aſteriæ* are naturally ſulcated between the angles, but this in a very different degree; ſome are very little ſo, while others are cut ſo deeply, that the ſingle joints of them reſemble the rowels of a ſpur. One end of the column is frequently found finely engraved along the edges of the angles, or rays, while the other end is ſmooth, or nearly ſo; and the ſame is often the caſe alſo in the ſingle joints. Not unfrequently, alſo, one end of a column is indented, and the other has five ſtriæ, running from a hollow centre to the ſulci between the rays.

They are found of various bigneſſes and colours; the longeſt ſeldom arrive, however, at two inches, and they are found of all the intermediate bigneſs from this down to the length of a barley-corn: they are not unfrequently found, alſo, compreſſed and flatted, as is common to the foſſils that have been formed in animal moulds.

They are uſually bedded in ſtrata of clay, though not unfrequently

frequently in those of a lax sort of quarry-stone, and sometimes in a harder. They usually have sea-shells, and other marine remains, lying about them; and sometimes these shells adhere to the *asteriæ*, and when separated from them do no injury to the *asteriæ*, but themselves shew a mark of the figure of the body, or part of the column, when a part has been always wanting in the shell.

From the columns of the *asteriæ* there are sometimes propagated certain small branches, like those of the entrochi; these are called by authors *appendiculæ asteriarum*, or the wires of the *asteriæ*.

They are composed of several short cylindric joints, with obliquely-truncated ends, and each hollowed to the middle, where there stands a small tubercle. These branches are sometimes two inches long, and the largest or thickest joint always adheres to the *asteria*, all the succeeding ones growing smaller, and the branch taperer toward the end. In their natural situation on the *asteria*, they stand in regular circles at different distances, one above another: there is always one wire in each of the sulci, or channels of the body, and these stand evenly against one another.

These wires, or appendiculæ, are very seldom, however, found in this their native state, or fixed to the bodies of the *asteriæ*; they are commonly found broken off, and lying loose among them, and the rudiments only of them remaining on the *asteriæ*, and very rarely even these. The wires themselves are more frequently found wholly separate from them, and either in fragments of different lengths, or in single joints, immersed in stone, or lying among the strata of clay. Hill's Hist. of Foss. p. 654.

The *asteriæ* may be reduced to two kinds; the first, those whose whole bodies make the form of a *star*; the second, those which in the whole are irregular, but which are adorned, as it were, with constellations in the parts.

Dr. Lister, for distinction's sake, only gives the name *asteria* to the former sort, distinguishing the latter by the appellation of *astroites*; the other naturalists generally use the two indiscriminately. The *asteria*, spoken of by the ancients, appears to be this latter kind. Plott, Nat. Hist. Oxford. cap. 5. sect. 16. seq. Mercat. Metalloth. arm. 9. cap. 10.

The quality of moving in vinegar, as if animated, is scarce perceivable in the *astroites*, but is signal in the *asteria*. The former must be broken in small pieces before it will move; but the latter will move, not only in a whole joint, but in two or three knit together. Plott, Nat. Hist. Oxford. sect. 26, seq.

STAR *thistle*. See CENTAURY.

STAR-*wort*, *aster*, in *Botany*, the name of a genus of plants of the *syngenesia polygamia superflua* class; the characters of which are these: it has a compound flower, composed of several female and hermaphrodite florets, which are included in one common scaly empalement; the rays of the flower are composed of female flowers, whose upper parts are stretched out on one side like a tongue, and indented in three parts at the end; the hermaphrodite flowers form the disk or middle; these are funnel-shaped, divided at the top into five parts, which spread open, and have each five short slender stamina, crowned with cylindrical summits; in the bottom is placed a germen, which becomes an oblong seed, crowned with down; the female flowers have a germen, supporting a slender style, crowned by two reflexed, oblong stigmata, which have no stamina, but in other respects resemble the hermaphrodite flowers. Linnæus and Miller enumerate thirty-seven species.

STAR-*wort*, *American*, or *trailing*, of *Vera Cruz*, *tridax*, in *Botany*, a genus of the *syngenesia polygamia superflua* class. Its characters are these: the flower has a common, cylindrical, imbricated empalement; the scales are acute-pointed, and erect; the flowers are composed of hermaphrodite florets in the disk, and the rays of female half florets; the hermaphrodite florets are funnel-shaped, of one petal, cut at the brim into five points; these have five short hair-like stamina, terminated by cylindrical summits, joined together, and an oblong crowned germen, supporting a bristly style, crowned by an obtuse stigma; the germen afterward becomes an oblong, single seed, crowned with a simple down; the female half-florets are plain, of one petal, cut into three segments at the top; these have an oval germen, like the hermaphrodite florets, but no stamina, and are succeeded by single seeds of the same shape. We know but one species of this genus.

STAR-*wort*, *bastard*, in *Botany*, a species of *buphthalmum*. See OX-*eye*.

STAR-*wort*, *yellow*, in *Botany*, a species of *inula*. See ELECAMPANE.

STAR, *falling*, in *Meteorology*, a meteor, the explication of which has puzzled all philosophers, till our modern discoveries in electricity have led to the most probable account of it. Signior Beccaria makes it pretty evident, that it is an electrical appearance, and in proof of this position he recites the following fact. About an hour after sun-set, he and some friends that were with him, observed a *falling star* directing its course towards them, and apparently growing larger and larger, but it disappeared not far from them; when it left their faces, hands, and cloaths, with the earth, and all the neighbouring objects, suddenly illuminated with a diffused and lambent light, attended with no noise at all. During their surprize at this appearance, a servant informed them that he had seen a light shine suddenly in the garden, and especially upon the streams which he was throwing to water it. All these appearances were evidently electrical; and S. Beccaria was confirmed in his conjecture, that electricity was the cause of them, by the quantity of electric matter which he had seen gradually advancing towards his kite, which had very much the appearance of a *falling star*. Sometimes also he saw a kind of glory round the kite, which followed it when it changed its place, but left some light, for a small space of time, in the place which it had quitted. Priestl. Elect. vol. i. p. 434, 8vo. See IGNIS *fatuus*.

STAR-*chamber*, *court of*. See COURT.

STAR-*fort*, or *redoubt*, in *Fortification*. See STAR, REDOUBT, and FORT.

STARAPHAXAT, a name used by some of the old writers for any medicine that restrains fluxions upon the eyes, nose, or fauces.

STARCH, a fecula, or sediment, found at the bottom of vessels wherein wheat has been steeped in water; of which fecula, after separating the bran from it, by passing it through sieves, they form a kind of loaves, which, being dried in the sun, or an oven, is afterwards broken into little pieces, and so sold.

The best is white, soft, and friable, easily broken into powder. Such as require very fine *starch* do not content themselves, like the starchmen, with refuse of wheat; but use the finest grain. The process is as follows.

STARCH *of wheat*, *method of making*. The grain, being well cleaned, is put to ferment in vessels full of water, which they expose to the sun, when in its greatest heat; changing the water, twice a day, for the space of eight or twelve days, according to the season. When the grain bursts easily under the finger, they judge it sufficiently fermented. The fermentation perfected, and the grain thus softened, it is put, handful by handful, in a canvas bag, to separate the flour from the husks; which is done by rubbing and beating it on a plank, laid across the mouth of the empty vessel that is to receive the flour.

As the vessels are filled with this liquid flour, there is seen swimming on the top a reddish water, which is to be carefully scummed off from time to time, and clean water is to be put in its place; which, after stirring the whole together, is also to be strained through a cloth, or sieve; and what is left behind, put into the vessel with new water, and exposed to the sun for some time. As the sediment thickens at the bottom, they drain off the water four or five times, by inclining the vessel, but without passing it through the sieve. What remains at bottom is the *starch*, which they cut in pieces to get out, and place it to dry in the sun or stove. When dry it is laid up for use.

To use *starch*, they take as much as is needed, and steep it in water over night, changing the water four or five times. The starchmen, using the refuse of wheat, only observe a part of all these things in their process; but their *starch* falls far short of this.

In the History of the Royal Academy of Sciences, 1739, p. 24. edit. Paris, a kind of *starch* is mentioned, made of potatoes and red truffles. By the short account there given, this *starch* seems not to be so good as the common, but might be of use in case of a scarcity of wheat.

Starch yields in analysis the same principles with honey, sugar, and manna; viz. an acid, and an oil, which sinks; and it is the same substance in all vegetables containing it.

Starch is used along with smalt, or stone blue, to stiffen and clear linen. The powder thereof is also used to whiten and powder the hair.

It is also used by the dyers, to dispose their stuffs to take colours the better.

Starch is sometimes used instead of sugar-candy for mixing with the colours that are used in strong gum-water, to make them work more freely, and to prevent their cracking. It is also used medicinally for the same intentions with the viscous substance which the flour of wheat forms with milk, in fluxes and catarrhs, under various forms of powders, mixtures, &c. A dram of *starch*, with three ounces of any agreeable simple water, and a little sugar, compose an elegant jelly, of which a spoonful may be taken every hour or two. These gelatinous mixtures are likewise an useful injection in some diar-

diarrhœas, particularly where the lower inteſtines have their natural mucus abraded by the flux, or are conſtantly irritated by the acrimony of the matter.

By 10 Ann. cap. 26. and 12 Ann. ſtat. 2. cap. 9. for all *ſtarch* imported, ſhall be paid 4*d*. a pound, over and above all other duties; and all hair-powder made of *ſtarch*, or other powder that will ſerve for the ſame uſes as *ſtarch*, ſhall on importation pay the ſame duties as foreign *ſtarch* imported. 3 G. cap. 4. And by the ſaid acts, for all *ſtarch* made in the kingdom, a duty ſhall be paid of 3*d*. a pound. No perſon ſhall be a maker of *ſtarch* within the limits of the head office of exciſe in London, unleſs he occupies a tenement of 10*l*. a year or upward, for which he ſhall be aſſeſſed in his own name, and alſo pay to the poor rates; and elſewhere, unleſs he pay to the church and poor. Places of making *ſtarch* are to be entered, under penalty of 50*l*. Officers may at all times enter and ſurvey, and the penalty of obſtructing them is 50*l*. Notice of emptying the vats, and of taking the waters out of the tubs, ſhall be given, on pain of forfeiting 100*l*. 19 G. III. cap. 40. The maker ſhall uſe regular, ſquare, or oblong boxes only, for boxing and draining his green *ſtarch*, before it is dried in the ſtove, on pain of 10*l*.; and give notice of boxing, and an account of drying, &c. nor ſhall he remove any *ſtarch* after it is dried, before it be weighed, &c. by the officers, on pain of 200*l*. 4 G. II. cap. 14. 19 G. III. cap. 40.

Clandeſtine manufacture, or concealing of *ſtarch*, expoſes the party concerned, unleſs he can make it appear that the duty has been paid, to a forfeiture of 50*l*.; and obſtructing the officer in entering, ſeizing, &c. the ſame, incurs a forfeiture of 100*l*. 4 G. II. cap. 14. 23 G. II. cap. 21. And by 19 G. III. cap. 40. if the maker ſhall conceal any *ſtarch*, with intent to defraud his majeſty of the duties, he ſhall forfeit 100*l*. Weekly entry ſhall be made, on pain of 50*l*.; and the duties ſhall be cleared within ſix weeks, on pain of double duty. No *ſtarch* ſhall be imported, except in packages, containing 224 lb. on pain of forfeiture, and of 50*l*. from the maſter of the veſſel. *Starch* that hath paid the duties may be exported with a drawback of the duties, but no drawback ſhall be allowed on the exportation of foreign *ſtarch* imported. 10 Ann. cap. 26. 23 G. II. cap. 21. No perfumer, &c. ſhall make, uſe, or offer to ſale, any hair-powder made of or mixed with alabaſter, talc, plaiſter of Paris, whiting, lime, &c. (ſweet ſcents only excepted) on pain of forfeiting the ſame, and 50*l*. 12 Ann. ſtat. 2. cap. 9. And if any maker of hair-powder ſhall mix any powder of alabaſter, &c. (rice firſt made into *ſtarch*, and ſweet ſcents only excepted) or make or ſell any made, with ſuch materials, he ſhall forfeit the ſame, and 20*l*. Or if he ſhall have in his poſſeſſion, for making, mixing, or counterfeiting hair-powder, any material beſides *ſtarch*, or powder of *ſtarch*, or rice made into *ſtarch*, he ſhall forfeit the ſame, and 10*l*. Places for making hair-powder are to be entered, and officers may enter and ſurvey them, under a penalty of 20*l*. 4 G. II. cap. 14. The forementioned forfeitures ſhall be diſtributed half to the king, and half to the proſecutor. By 20 Geo. II. c. 52. for all *ſtarch*, and hair-powder made of *ſtarch*, or other powder that will ſerve for the ſame uſes, imported, ſhall be paid an additional duty of 2*d*. a pound. For all *ſtarch* made in Great Britain ſhall be paid an additional duty of 1*d*. a pound. Beſides the above duties, *ſtarch* is ſubject to 5*l*. *per cent.* impoſed by 19 G. III cap. 25.

STARLING, or STARE, *ſturnus*, in *Ornithology*, a diſtinct genus of birds, of the order of the *paſſeres*; the characters of which are, that the beak is awl-ſhaped, depreſſed, and obtuſe; the upper mandible is entire, with ſpreading margins; the noſtrils are guarded above by a prominent rim, and the tongue is ſharp. Of this genus Linnæus enumerates five ſpecies.

The common *ſtarling* is about the ſize of the common black-bird; the weight of the male being about three ounces, and that of the female ſomewhat leſs; the bill, in old birds, is yellow; the whole plumage black, very reſplendent, with changeable blue, purple, and copper; each feather being marked with a pale yellow ſpot; the leſſer coverts are edged with yellow, and ſlightly gloſſed with green; the quill-feathers and tail are duſky; the former edged with yellow on the exterior ſide, the laſt with dirty white; the legs are of a reddiſh brown. Theſe birds breed in hollow trees, eaves of houſes, towers, cliffs, and high rocks over the ſea; they lay four or five eggs of a pale greeniſh aſh-colour; they feed on worms and inſects, and, it is ſaid, will get into pigeon holes, and ſuck the eggs; in winter aſſemble in large flocks; their fleſh is ſo bitter, as to be ſcarce eatable; they are very docile, and may be taught to ſpeak. Pennant.

Mr. Ray mentions a beautiful ſpecies, deſcribed by Bontius under the name of the *Indian ſtarling*, or *ſturnus Indicus*. This is of the ſize and ſhape of our common *ſtarling*, but is variegated with a deep blue, a lead colour, and a pale grey, and has on its head a very beautiful yellow creſt. It learns to imitate the human voice, and talks much better than the parrot, but is troubleſome in being over noiſy.

STARO. See *Italian Dry* MEASURES.

STAROSTE, in *Modern Hiſtory*, a name given in Poland to the governors of cities and caſtles. They are appointed by the king to ſuperintend his revenues, and to adminiſter juſtice in his name. The diſtrict ſubject to the juriſdiction of each is called *ſtaroſty*. However, there are ſome *ſtaroſts*, who have no juriſdiction.

STARTING, among *Brewers*, the putting of new beer, or ale, to that which is decayed, to revive it again.

STARTING, in the *Manege*. A horſe is ſaid to be *ſtarting*, ſkittiſh, or timorous, that takes every object he ſees to be otherwiſe than it is; upon which he ſtops, flies out, and ſtarts ſuddenly to one ſide, inſomuch that the rider cannot make him come near the place where the object is. This fault is more common to geldings than ſtone-horſes. Such horſes alſo as have bad eyes are moſt ſubject to it, as well as thoſe that have been kept a long time in a ſtable without airing; but theſe laſt are eaſily cured of it. When you have a ſkittiſh horſe, never beat him in his conſternation, but make him advance gently, and with ſoft means, to the ſcare-crow that alarms him, till he recovers it, and gains aſſurance.

STARVING *to death*, a kind of puniſhment uſed by the people of Arragon ſome ages ago; and it is reported by Tavernier, that the chief ladies in the kingdom of Tonquin are at this day ſtarved to death for adultery.

STASIS, a word uſed by phyſicians to expreſs a ſtagnation of the humours.

STATE, or ESTATE, an empire, kingdom, province, or extent of country, under the ſame government. See ESTATE.

STATE, *civil*. See CIVIL.

STATE, *free*. See FREE.

STATE is alſo uſed for the policy or form of government of a nation. Hence, miniſters of *ſtate*, reaſons of *ſtate*, &c. See GOVERNMENT.

Politicians diſtinguiſh ſeveral forms of *ſtate*, viz. the *monarchic*, as that of England; ſee MONARCHY: the *democratic*, as that of Rome and Athens: ſee DEMOCRACY: the *oligarchy*, as that of Venice; ſee OLIGARCHY: and the *ariſtocracy*, as that of Sparta; ſee ARISTOCRACY.

STATE, *council of*, in *Modern Hiſtory*, was projected by the ſtates of Holland, Zealand, and Utrecht, in conjunction with William I. prince of Orange, and erected in 1584 with ample authority. All affairs of *ſtate*, the army, and revenue, were entruſted to the care of this council; but the ſtates, growing jealous of this extraordinary power, reduced it gradually; and by a new inſtruction in 1651, the diſpoſition of military affairs, and the command of the army, were in part transferred to the ſtates-general, with the advice of the council. In this council the provinces are repreſented by ſuch a number of deputies as bears ſome proportion to the quota of money which each contributes for the ſupport of the whole, Groeningen excepted. Guelderland has one, Holland three, Zealand two, Utrecht one, Friſeland two, Overyſſel one, and Groeningen two. Theſe are all changed every three years, except the deputy from the nobility of Holland, and the two from Zealand, who enjoy their poſts for life. Here every member has a deciſive voice, and preſides for a week in his turn, without regard to the rank of the provinces. The governors or STADTHOLDERS of the provinces have a ſeat, but no deciſive vote in this council, in which affairs are determined by a majority of voices.

STATE *of a diſeaſe*, the ſame with ACME.

STATED *wind*. See WIND.

STATELY, in the *Manege*. A horſe is ſaid to be *ſtately*, that goes with a proud, ſtrutting gait.

STATER, an ancient ſilver coin, weighing four Attic drachms, and worth about three ſhillings and a penny ſterling. See DRACHM.

There was alſo a gold coin under this name: that of Cyzicus was much valued, having on one ſide the figure of a woman's head, and on the other that of the head of a lion; in weight it was equal to two drachms, and in value to twenty-eight ſilver drachms of Athens. The gold *ſtater* of Athens was equal in value to twenty drachms, and a drachm of gold was equal to about ten of ſilver.

STATERA *Romana*, or ſteelyard, a name given to the Roman balance.

STATES, a term applied to the ſeveral orders, or claſſes, of a people, aſſembled to conſult of matters for the public good. See ESTATE.

STATES-GENERAL, the name of an assembly, consisting of the deputies of the Seven United Provinces.

In this assembly, the deputies of each province, of what number soever they be, have only one voice, and are esteemed as but one person, the votes being given by provinces. Each province presides at the assembly in its turn, according to the order settled among them: Guelderland presides first, then Holland, &c.

This assembly is the representative of the sovereignty of the Union, which resides properly in the general assembly of the states themselves of all the several provinces; but as that assembly ordinarily consists of seven or eight hundred persons, it was resolved, after the departure of the earl of Leicester, in order to avoid expence, and the confusion of so numerous a body, that the provincial estates should, for the future, be ordinarily represented by their deputies, under the name of the *States-general*; who were always to reside at the Hague, and who alone are now called *States-general*.

STATES *of Holland*, an assembly consisting of the deputies of the councils, or colleges, of each city; wherein resides the sovereignty of that province.

Originally, none but the nobility, and the six principal cities, had seats, or voices, in the *states*. At present there are the deputies of eighteen cities. The nobility have the first voice, which is pronounced by the grand pensionary, as pensionary of their order. The other provinces of the Union have likewise their *states*, representing their sovereignty; deputies from which make what they call the *States-general*.

STATHEUSIS, formed of ϛαθευω, *I heat*, a word used by the old writers to express the torrefaction, or roasting of some medicines before a slow fire, as is done frequently at present with rhubarb, &c.

STATHOLDER. See STADTHOLDER.

STATICAL *baroscope*. See BAROSCOPE, and BAROMETER.

STATICAL is sometimes applied in a peculiar sense to the experiments made as to the quantity of PERSPIRATION, and other excretions of the human body.

We have a very particular account of some experiments of this kind in the Philosophical Transactions, N° 472. or Abr. vol. ix. p. 475. made by Dr. John Lining of Charles-Town, in South Carolina.

STATICAL *hygroscope*. See HYGROSCOPE.

STATICE, in *Botany*. See THRIFT.

STATICS, *statice*, formed of ιϛημι, *I weigh*, a branch of mathematics, which considers weight or gravity, and the motion of bodies arising therefrom.

Those who define mechanics the science of motion, make *statics* a member thereof; viz. that part which considers the motion of bodies arising from gravity.

Others make them two distinct doctrines, restraining mechanics to the doctrine of motion and weight, in reference to the structure and power of machines; and *statics* to the doctrine of motion, considered merely as arising from the weight of bodies, without any immediate respect to machines. On which footing, *statics* should be the doctrine, or theory, of motion; and mechanics, the application thereof to machines.

For the laws of STATICS, see GRAVITY, DESCENT, &c.

STATICS, *statici*, in *Medicine*, a kind of epileptics, or persons seized with epilepsies.

Statics differ from *cataleptics*, in that these last have no sense of external objects, nor remember any thing that passes at the time of the paroxysm; whereas the *statici* are all the while taken up with some very strong, lively idea; which they remember well enough when out of the fit.

STATICULA, among the Romans, those little figures with which it was usual to adorn their drinking cups, called *scyphi*.

STATICULI, among the Romans, a kind of dancing pantomimes. See PANTOMIME.

STATION, in *Geometry*, &c. a place pitched upon to make an observation, take an angle, or the like.

An inaccessible height, or distance, is only to be taken by making two *stations*, from two places whose distances are known. In making maps of provinces, &c. *stations* are fixed on all the eminences, &c. of the country, and angles taken thence to the several towns, villages, &c.

In surveying, the instrument is to be adjusted by the needle, to answer the points of the horizon at every *station*; the distance from the last *station* to be measured, and an angle to be taken to the next *station*; which includes the whole business of surveying.

In levelling, the instrument is rectified, that is, it is placed level at each *station*, and observations made forwards and backwards.

We have a method of measuring distances at one *station*, in the Philosophical Transactions, N° 7. by means of a telescope. But the practice of this method does not answer to the theory.

STATION, *line of*, in *Perspective*. See LINE.

STATION, in *Astronomy*, the position, or appearance, of a planet, in the same point of the zodiac, for several days.

As the earth, whence we view the motions of the planets, is out of the centre of their orbits, the planets appear to proceed irregularly; being sometimes seen to go forwards, that is, from west to east, which is called their *direction*; sometimes to go backwards, or from east to west, which is called their *retrogradation*.

Now between these two states there must be an intermediate one, wherein the planet neither appears to go backwards nor forwards, but to stand still, and keep the same place in her orbit; which is called her *station*.

STATION, STATIO, in *Church History*, is applied to the fasts of the fourth and sixth days of the week, that is, Wednesday and Friday; which many among the ancients observed with much devotion, till three of the clock in the afternoon. S. Peter of Alexandria, in his Canonical Epistle, can. 15. observes, that it was appointed conformably to ancient tradition, to fast weekly on those days; on Wednesday, in memory of the counsel the Jews took to put our Saviour to death; and on Friday on account of his passion. Some regard to which is still had by the church of England. See ABSTINENCE.

STATION is also used in the church of Rome, for a church where indulgences are to be had on certain days.

It was St. Gregory that fixed the *stations* at Rome, i. e. the churches where the office was to be performed each day of Lent, and on solemn feast-days. These *stations* he marked down in his Sacramentary, as they now stand in the Roman Missal; appropriating them chiefly to the patriarchal and titular churches: but though the *stations* were fixed, the archdeacon did not fail, at each *station*, to publish to the people the following *station*.

STATION is also a ceremony in the Romish church, wherein the priests or canons go out of the choir to sing an anthem before the crucifix, or the image of our Lady. This ceremony is ascribed to St. Cyril.

STATION, *station*, ϛασις, in the *Ancient Music*, was sometimes used for any fixed pitch, or degree of sound, whether produced by intention or remission.

STATION-*line*, in *Surveying*. See LINE and SURVEYING.

STATIONARY, in *Astronomy*, the state of a planet when it seems to remain immoveable in the same point of the zodiac. The planets having sometimes a progressive, and sometimes a retrograde motion, there will be some point wherein they appear *stationary*. Now a planet will be seen *stationary*, when the line that joins the earth's and planet's centre is constantly directed to the same point in the heavens, that is, when it keeps parallel to itself. For all right lines drawn from any point of the earth's orbit, parallel to one another, do all point to the same star; the distance of those lines being insensible, in comparison of that of the fixed stars.

Saturn is seen *stationary* at the distance of somewhat more than a quadrant from the sun; Jupiter at the distance of 52°; and Mars at a much greater distance; Venus at 47°, and Mercury at 28°.

Saturn is *stationary* eight days, Jupiter four, Mars two, Venus one and a half, and Mercury an half; though the several stations are not always equal; because the orbits of the planets are not circles which have the sun in their centre.

STATIONARY *fevers*, a term used by Sydenham to express a peculiar kind of fever, adapted, and owing to some general constitution of the air and seasons. There are certain general constitutions of years, which owe their origin neither to heat, cold, dryness, nor moisture, but rather depend upon a certain secret and inexplicable alteration in the bowels of the earth, whence the air becomes impregnated with such kinds of effluvia as subject the human body to peculiar distempers, so long as that kind of constitution prevails, which after a certain course of years declines, and gives way to another. Each of these general constitutions is attended with its own proper and peculiar kind of fever, which never appears in any other; and this is thence called a *stationary fever*.

STATIVA, among the Romans, a standing camp kept for the defence of the frontiers of the empire. These camps gave rise to a great many towns, which took their names from the legion stationed there.

STATORES, among the Romans, made a part of the emperor's life-guard.

STEATOCELE, Στεατοκηλη, in *Medicine*, a rupture, or tumor, of the scrotum, consisting of a fatty substance, resembling suet, collected therein. See HERNIA.

STATUARY, STATUARIA, a branch of sculpture, employed in the making of statues.

Statuary is one of those arts wherein the ancients surpassed

passed the moderns: indeed it was much more popular, and more cultivated among the former than the latter. It is disputed between *statuary* and painting, which of the two is the most difficult, and the most artful. See SCULPTURE.

The invention of *statuary* was at first very coarse. Leon Battista Alberti, who has an express treatise on statues, imagines, that it took its rise from something casually observed in the productions of nature, that, with a little help, seemed disposed to represent the figure of some animal. The common story is, that a maid, full of the idea of her lover, made the first essay, by the assistance of her father's implements, who was a potter. This, at least, is pretty certain, that earth was the first matter *statuary* was practised upon.

STATUARY is also used for the artificer who makes statues. Phidius was the greatest *statuary* among the ancients; and Michael Angelo among the moderns.

STATUARY *column*. See COLUMN.

STATUARY *fountain*. See FOUNTAIN.

STATUARY *marble*, among our artificers, the name of the softer white marble usually wrought into *statues*, the same with the *Parian* MARBLE of the ancients.

STATUE, STATUA, a piece of sculpture in full relievo, representing a human figure.

Daviler more scientifically defines *statue* a representation in high relievo, and insulate, of some person distinguished by his birth, merit, or great actions; placed as an ornament in a fine building, or exposed in a public place, to preserve the memory of his worth.

In strictness, the term *statue* is only applied to figures on foot; the word being formed from the Latin *statura*, the size of the body; or from *stare, to stand*.

Statues are formed with the chissel, of several matters, as stone, marble, plaster, &c.

They are also cast of various kinds of metal, particularly gold, silver, brass, and lead. For the method of casting *statues*, see FOUNDERY *of statues*.

Dædalus, the son of Eupalmus, who lived not only before the siege of Troy, but even before the expedition of the Argonauts, among many other notable contrivances ascribed to him, is said to have been the inventor of *statues*. And yet it is certain, there were statuaries before him; only it was he who first found how to give them action and motion, and to make them appear as if alive. Before him, they made them with the feet joined together, never intending to express any action. He first loosened the feet of his, and gave them the attitudes of people walking and acting.

The Phœnicians are said to have been the first who erected *statues* to the gods. The Greeks succeeded in their *statues* beyond the Romans, both the workmanship and the fancy of the Roman *statues* were inferior to the Grecian. Indeed we have very few remaining that have escaped the injuries of time.

Statues are usually distinguished into four general kinds. The first are those less than the life; of which kind we have several *statues* of men, of kings, and of gods themselves.

The second, those equal to the life; in which manner it was that the ancients, at the public expence, used to make *statues* of persons eminent for virtue, learning, or the services they had done.

The third, those that exceed the life; among which, those which surpass the life once and an half, were for kings and emperors; and those double the life, for heroes.

The fourth kind were those that exceeded the life twice, thrice, or even more; and were called *colossuses*.

Every *statue* resembling the person it is intended to represent, is called *statua iconica*. See SCULPTURE.

STATUE, *allegorical*, that which, under a human figure, or other symbol, represents something of another kind, as a part of the earth, a season, age, element, temperament, hour, &c.

STATUE, *caryatic*. See CARYATIDES.

STATUE, *colossal*. See COLOSSUS.

STATUES, *curule*, those which are represented in chariots drawn by bigæ, or quadrigæ, that is, by two or four horses: of which kind there were several in the circuses, hippodromes, &c. or in cars, as we see some, with triumphal arches, on antique medals.

STATUE, *equestrian*, that which represents some illustrious person on horseback; as that famous one of Marcus Aurelius at Rome, and that of king Charles I. at Charing-cross.

STATUE, *Greek*, denotes a figure that is naked and antique, it being in this manner the Greeks represented their deities, athletæ of the Olympic games, and heroes. The reason of this nudity, whereby the Greek *statues* are distinguished, is, that those who exercised wrestling, wherein the Greek youth placed their chief glory, always performed naked.

The *statues* of heroes were particularly called *Achillean statues*, by reason of the great number of figures of that prince, in most of the cities of Greece.

STATUE, *hydraulic*, any figure placed as an ornament of a fountain, or grotto, or that does the office of a jet d'eau, a cock, spout, or the like, by any of its parts, or by any attribute it holds. The like is to be understood of any animal serving for the same use.

STATUE, *pedestrian*, a *statue* standing on foot; as that of king Charles II. in the Royal Exchange; and that of king James II. in the Privy-Gardens.

STATUE, *Persian*. See PERSIAN.

STATUES, *Roman*, is an appellation given to such as are clothed; and which receive various names from their various dresses.

Those of emperors, with long gowns over their armour, were called *statuæ paludatæ*; those of captains and cavaliers, with coats of arms, *thoracatæ*; those of soldiers, with cuirasses, *loricatæ*; those of senators and augurs, *trabeatæ*; those of magistrates with long robes, *togatæ*; those of the people with a plain tunica, *tunicatæ*; and lastly, those of women, with long trains, *stolatæ*.

The Romans had another division of *statues*, into *divine*, which were those consecrated to the gods; as Jupiter, Mars, Apollo, &c. *heroes*, which were those of the demigods; as Hercules, &c. and *Augusti*, which were those of the emperors; as those two of Cæsar and Augustus, under the portico of the Capitol.

STATUES, *foundery of*. See FOUNDERY.

STATUES, *pedestal of*. See PEDESTAL.

STATUES, *plinth of*. See PLINTH.

STATUE, *repairing a*. See REPAIRING.

STATURE, the size, or height of man. From the Latin *statura*, of *stare, to stand*.

The *stature*, or pitch, of a man, is found admirably well adapted to the circumstances of his existence. See DWARF and GIANT.

It is a common opinion, and has been so ever since Homer's time, that people, in the earliest ages of the world, much surpassed the moderns in *stature*; and, it is true, we read of men, both in sacred and profane history, whose pitch appears surprising: but then, it is true they were, even then, esteemed giants.

The ordinary *stature* of men, Dr. Derham observes, is, in all probability, the same now as at the beginning; as may be gathered from the monuments, mummies, &c. still remaining. The oldest monument in the world is that of Cheops, in the first pyramid of Egypt, which Mr. Greaves observes, scarce exceeds the measure of our ordinary coffins. The cavity, he says, is only 6.488 feet long, 2.218 feet wide, and 2.160 deep: from which dimensions, and those of several embalmed bodies, observed by him in Egypt, that accurate writer concludes, there is no decay in nature; but that the men of this age are of the same *stature* as those three thousand years ago.

To these, we have other and later instances to add from Hakewell: the tombs at Pisa, which are some thousands of years old, are yet no longer than ours. The same may be said of Athelstan's in Malmsbury church; and of Sheba's in Paul's, of the year 693, &c.

The like evidence we have from the ancient armour, shields, vessels, &c. dug up this day, e. gr. the brass helmet, dug up at Metaurum, fits one of our men; yet it is allowed to have been left there at the overthrow of Asdrubal. Add, that Augustus was five feet nine inches, which was the measure of our queen Elizabeth; only the queen exceeded the emperor by two inches, allowance being made for the difference between the Roman and our foot.

STATUS *de manerio*, in *Ancient Records*, denotes all the tenants, and legal men, within the lands of a manor, assembled in their lord's court to do their customary suit, and enjoy their rights and privileges.

STATUTE, STATUTUM, in its general sense, signifies a LAW, DECREE, ORDINANCE, &c.

STATUTE, in our *Laws* and *Customs*, more immediately signifies an act of parliament, made by the three estates of the realm; and having the force of a law. See LAW and PARLIAMENT.

Statutes were anciently proclaimed by the sheriff, but upon the invention of printing, this method was discontinued. Every body is obliged to take notice of an act of Parliament at his peril.

Statutes are either *general* or *special, public* or *private*. A general or public act is an universal rule, that regards the whole community; and of this the courts of law are bound to take notice judicially and *ex officio*; without the *statute* being particularly pleaded, or formally set forth by the party who claims an advantage under it. Special or private acts are rather exceptions than rules, being those which only operate upon particular persons, and private

private concerns; such as the Romans intitled, *senatus-decreta*, in contradistinction to the *senatus-consulta*, which regarded the whole community: and of these the judges are not bound to take notice, unless they be formally shewn and pleaded.

Statutes are also either DECLARATORY of the common law, or REMEDIAL of some defects therein; and there is also a subordinate division of remedial acts into enlarging and restraining *statutes*.

The principal rules laid down by the learned Blackstone for the construction of *statutes* are the following.

As there are three points to be considered in the construction of all remedial *statutes*, viz. the old law, the mischief, and the remedy; that is, how the common law stood at the making of the act; what the mischief was, for which the common law did not provide; and what remedy the parliament hath provided to cure this mischief: it is the business of the judges so to construe the act, as to suppress the mischief and advance the remedy.

A *statute*, which treats of things or persons of an inferior rank, cannot by any general words be extended to those of a superior. Penal *statutes* must be construed strictly.

Statutes against frauds are to be liberally and beneficially expounded. One part of a *statute* must be so construed by another, that the whole may (if possible) stand. A saving, totally repugnant to the body of the act, is void. Where the common law and a *statute* differ, the common law gives place to the *statute*; and an old *statute* gives place to a new one. If a *statute* that repeals another, is itself repealed afterwards, the first *statute* is thereby revived, without any formal words for that purpose. Acts of parliament derogatory from the power of subsequent parliaments bind not. And, lastly, acts of parliament that are impossible to be performed, are of no validity; and if there arise out of them collaterally any absurd consequences, manifestly contradictory to common reason, they are, with regard to such consequences, void.

The method of citing acts of parliament is various. Many of our ancient *statutes* are called after the name of the place, where the parliament that made them was held; as the *statutes* of Merton and Marlberge, of Westminster, Gloucester, and Winchester. Others are denominated entirely from their subject; as the *statutes* of Wales and Ireland, the *articuli cleri*, and the *prærogativa regis*. Some are distinguished by their initial words, as the *statute* of *quia emptores*, and that of *circumspecte agatis*. But the most usual method of citing them, especially since the time of Edward II. is by naming the year of the king's reign in which the *statute* was made, together with the chapter or particular act, according to its numeral order; as 9 Geo. II. c. 4. For all the acts of one session of parliament taken together make properly but one *statute*; and, therefore, when two sessions have been held in one year, it is usual to mention *stat.* 1 or 2. Thus the bill of rights is cited as 1 W. & M. *st.* 2. c. 2. signifying that it is the second chapter, or act of the second *statute*, or the laws made in the second session of parliament, held in the first year of king William and Queen Mary. Blackst. Com. book i. p. 85, &c.

Abridgments of the *statutes* have been made by several, from Magna Charta to the times of the respective abridgers. The first by Rastal, published in 1559; the second by Pulton in 1606; the third by Wingate in 1641; and others since by Hughes, Manby, Washington, Boult, Nelson, Cay, &c.

STATUTES *of a corporation*, are those bye-laws, or private regulations, which it is impowered to make for its own better government, and which are binding upon the members, unless contrary to the laws of the land, and then they are void. This right of making bye-laws, under the preceding restriction, was allowed by the law of the Twelve Tables at Rome; but no trading company is, with us, allowed to make bye-laws, which may affect the king's prerogative, or the common profit of the people, under penalty of 40*l.* unless they be approved by the chancellor, treasurer, and chief justices, or the judges of assize in their circuits; and even though they be so approved, still, if contrary to law, they are void. Bl. Com. book i. p. 476.

STATUTE, *accessory by*. See ACCESSORY.

STATUTE, *action upon the*. See ACTION.

STATUTE, *guardian by*. See GUARDIAN.

STATUTE-*merchant* is a bond of record, pursuant to the *statute*, 13 Edw. I. *de mercatoribus*, acknowledged before one of the clerks of the *statutes-merchant*, and mayor, or chief warden of the city of London; or two merchants of the said city for that purpose assigned; or before the mayor, chief warden, or master, of other cities or towns; or other sufficient men for that purpose appointed; sealed with the seal of the debtor, and of the king, which is of two pieces, the greater to be kept by the mayor, chief warden, &c. and the less by the said clerks. Its effect is, that if the obligor pay not the debt at the day, execution may be awarded against his body, lands, and goods; and that the obligee shall hold the same till the debt be levied. See STATUTE-*staple*.

STATUTE-*sessions*, called also *petit-sessions*, in *Law*, are meetings in every hundred, to which constables repair, and others, both masters and servants, for deciding differences between masters and servants, rating of wages, bestowing people in service, who, being fit to serve, either refuse to seek, or cannot get masters.

STATUTE-*staple* is a sort of *statute*-merchant, relating to merchants and merchandizes of the STAPLE.

The *statute-staple* is of two kinds; *proper* and *improper*.

The *proper* is a bond of record, acknowledged before the mayor of the staple, in the presence of one or more constables of the staple; by virtue of which the creditor may forthwith have execution of the body, lands, and goods, of the debtor, on non-payment.

This and the *statute*-merchant are both securities for debts, originally permitted only among traders for the benefit of commerce; whereby the lands of the debtor are conveyed to the creditor, till out of the rents and profits of them his debt may be satisfied, and during such time as the creditor so holds the lands, he is TENANT by *statute*-merchant, or *statute-staple*.

Improper is a bond of record, or recognizance, founded upon the *statute* 23 Hen. VIII. cap. 6. of the nature of a proper *statute-staple* as to the force and execution of it, and acknowledged before one of the chief justices; or, in their absence, before the mayor of the staple, and recorder of London; which extends the benefit of the mercantile transaction already mentioned, to all the king's subjects in general.

STATUTO *mercatorio*, a writ for the imprisoning him that has forfeited a *statute-merchant* bond, until the debt is satisfied: and of these writs there is one against lay persons, and another against persons ecclesiastical.

STATUTO *stapulæ*, a writ that lies to take the body to prison, and seize upon the land and goods of one who hath forfeited the bond called *statute-staple*.

STATUTUM *de laborariis*, an ancient writ for the apprehending such labourers as refuse to work according to the *statute*.

STAVERS. See STAGGERS.

STAVES, *flag*. See FLAG-*staves*.

STAVES, *levelling*. See LEVELLING-*staves*.

STAVES, *tip*. See TIP-*staves*.

STAVESACRE, *staphisagria*, in *Botany*; for the characters, see LARKSPUR.

Stavesacre grows in Provence, Languedoc, and many other parts of Europe; the leaves are large and fingered, the flower blue, and somewhat like that of the larkspur; the seed, which is the only part of the plant used in medicine, is a dusky brown, and very rough on the outside, and of a pale yellow within, and of a bitter, disagreeable, and very acrid taste. The seeds should be chosen new, clean, and plump. They were formerly employed sometimes as a cathartic, in doses of from twelve grains to a scruple, but they operate with so much violence both upwards and downwards, and are so liable, not only to disorder the bowels, but likewise to inflame the throat, that their internal use has been long laid aside. They are now used only in external application, for some kinds of cutaneous eruptions, and for destroying insects, particularly lice in children's heads, for which end they are powdered, and sometimes mixed with *cocculus indicus*. Some take them into their mouths also for the tooth-ach, and others have ventured to use gargarisms of them to cure phlegm, and as an errhine, snuffing them up the nostrils. They are also commended for the cleansing old ulcers.

STAUROPHORI, Σταυροφοροι, compounded of σταυρος, *a cross*, and φερω, *I carry*, in *Church History*, certain ecclesiastics, whose business it was to carry the cross in processions.

STAUROPHYLAX, Σταυροφυλαξ, derived from σταυρος, *a cross*, and φυλασσω, *I keep*, in *Church History*, a dignified officer in the church of Constantinople, to whose care the keeping of the cross, found by St. Helena, was committed.

STAXIS, a word used by the ancient physicians to express a distillation of blood in drops from the nose.

A *staxis*, in the doctrine of crises, is justly condemned as indicating a weakness and decay of strength in nature; whereas, on the contrary, free and copious discharges of blood from the nose are esteemed good indications, and often make happy crises.

STAY, in the *Sea Language*, a big strong rope employed to support the MAST on the fore part, by extending from its upper end towards the fore part of the ship, as the

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ſhrouds are extended to the right and left, and behind it. The *ſtay* of the fore-maſt, called the *fore-ſtay*, reaches from the maſt-head towards the bowſprit end: the *main-ſtay* extends over the fore-caſtle to the ſhip's ſtem; and the *mizen-ſtay* is ſtretched down to that part of the main-maſt which lies immediately above the quarter-deck: the *fore-top-maſt-ſtay* comes alſo to the end of the bowſprit, a little beyond the *fore-ſtay*: the *main-top-maſt ſtay* is attached to the head or hounds of the fore-maſt; and the *mizen-top-maſt-ſtay* comes alſo to the hounds of the main-maſt: the *fore-top-gallant-ſtay* comes to the outer end of the jib-boom; and the *main top-gallant-ſtay* is extended to the head of the fore-top maſt. See *Tab. Ship, fig.* 1. *n.* 29. 33. 78. 85. 120.

Stay-*ſail*, in a *ſhip*, a ſort of triangular sail extended upon a *ſtay*.

Stay *a ſhip, to*, or *bring her on the ſtays*, is to manage her tackle and ſails, ſo as that ſhe cannot make any way forwards, which is done in order to her tacking about.

Stay, in the *Manege*. To *ſtay*, or ſuſtain your horſe, is to hold the bridle firm and high. We likewiſe *ſtay* or ſuſtain a horſe with the in-leg, or in-heel, when he makes his croupe go before his ſhoulders upon volts: as alſo when we hinder him to traverſe, and ride him equally, keeping him always ſubject, ſo that his croupe cannot ſlip out, and he cannot loſe either his cadence, or his ground, but marks all his times equal.

STEADY, a word of command at ſea, given by the pilot to the man at the helm, in a fair wind, to keep the ſhip *ſteady* in her courſe, without deviating to the right or left, or making angles (or *yaws* as they call them) in and out. The helmſman accordingly anſwers *ſteady*; thus denoting his attention and obedience to the pilot's orders.

STEALING *an heireſs*. See Forcible *abduction*.

Stealing, in *Law*. See Larceny.

STEAM, denotes the ſmoke, or vapour, proceeding from any thing that is moiſt and hot. Subterranean *ſteams* often affect the ſurface of the earth in a very remarkable manner, and influence or prevent vegetation more than any thing elſe. The ſurface of ſome ground is ſo hollow and light, and ſo ſwoln by a warm and continually working ferment, that it muſt needs ſend up a warming *ſteam*, and that it does ſo, even in the coldeſt weather, is evident from the immediate melting of the ſnow that falls on it: nay, in many places, the effect of this *ſteam* is ſo great, that it melts the ſnow before it reaches the ground, ſo that it falls on it in form of rain.

Some ſtones alſo, and ſome waters, impregnate the earth by their innate warmth, ſending up a continual ſucceſſion of warm effluvia from all parts of their ſurfaces; and other ſtones have exactly a contrary effect, rendering the places where they lie barren and cold. Streams of water, which have in their ſubterranean courſe run through beds of lime ſtone, marl, or chalk, are always enriched, and warmed by the *ſteams* iſſuing from thoſe ſubſtances, and mixing with them as they paſs, and conſequently theſe waters enrich the ground wherever they run; and, on the contrary, ſome waters are uliginous, or corroſive, from the *ſteams* they have received in their channels from the veins of pyrites, or beds of metalline ores. It is even reported, that the very ſubſtances of metals and minerals are thus raiſed in *ſteams*, and that the juices of plants are found loaded with them; thus we are told, that in Italy crude quickſilver is found in the juices, and at the roots of plants; and that in Moravia, Hungary, and Peru, the ſubſtances of the metals are found in the bodies of plants, particularly lead and ſilver. The Miſcellanea Curioſa of Leipſick ſpeak of wonderful appearances of gold in the form of plants, which, if true, muſt be owing to that metal's having been raiſed in *ſteams*, and carried into the veſſels of the plants in ſuch quantity, as in fine to deſtroy the vegetable appearance, and leave the figure of the plant in metal. Phil. Tranſ. Nº 110.

Steam-*engine*, commonly called fire-*engine*, in *Hydraulics*, is one of the moſt curious and uſeful machines, which modern art can boaſt, for draining mines and raiſing water, &c. by the proper application and uſe of the *ſteam* of boiling water. The Marquis of Worceſter, in his Century of Inventions (printed A. D. 1663.) was probably the firſt perſon who propoſed raiſing great quantities of water by the means of fire, converting water into *ſteam*; and he mentions an engine of this kind, which he ſaw playing a continual ſtream in the manner of a fountain, forty feet high. He alſo ſays, that a perſon attending it turned two cocks; that, one veſſel of water being conſumed, another begins to force and refill with cold water and ſo ſucceſſively; the fire being tended and kept conſtant by the ſame perſon in the interim between the ſeveral occaſions of turning the cocks.

Captain Savery, having read this account, immediately attempted to raiſe water by fire, and was the firſt who erected an engine for this purpoſe, which he propoſed for the draining of mines. His engine is deſcribed in Harris's Lexicon (art. *Engine*) and being compared with the Marquis of Worceſter's deſcription, appears to have been taken from him. However, Capt. Savery, in order to ſecure the invention to himſelf, bought up, as Deſaguliers informs us, all the books of the Marquis which he could find, and burnt them: and then gave out that he diſcovered the power of *ſteam* by accident. He made many experiments to bring the machine to perfection, and erected ſeveral for gentlemen's ſeats, but could not ſucceed for mines; the depth from which water was to be raiſed in this caſe being ſo great, that it required the *ſteam* of ſuch a ſtrength as to be dangerous in its application.

Thus the progreſs of the engine was ſtopped, till Mr. Newcomen, an iron-monger, and Mr. John Cowley, a glazier, both diſſenters of the Baptiſt denomination at Dartmouth, contrived another way to raiſe water by fire, where the *ſteam* for this purpoſe, even at the greateſt depths of mines, is not required to be greater than the preſſure of the atmoſphere: and this is the ſtructure of the *fire-engine* as it is now uſed, and which has been of about ſeventy years ſtanding; the inventors, or improvers of this engine having begun to work with it in 1712.

In order to explain the principles, conſtruction, and uſe of this engine, let us ſuppoſe a well or mine, as *p* (*Tab.* VI. *Hydraulics, fig.* 71.) one hundred and fifty feet deep, from which water is to be raiſed with a pump, the diameter of whoſe barrel is $7\frac{1}{2}$ inches; and, therefore, in this caſe, the weight of a cylindric column of water one hundred and fity feet high, and $7\frac{1}{2}$ inches in diameter, will be about three thouſand pounds. If now the rod of this pump were hung by a chain to the end of a lever *h h*, as at H, and at the other end a power were applied, as at P, with a ſuperior force, the pump might be worked, and the water raiſed. It appears, that this power cannot be ſupplied by the ſtrength of man or beaſt; for it will require one hundred men to pull down the beam, each pulling with a force of thirty pounds; but as the pump in a mine muſt not ſtand ſtill, there ſhould be one hundred more to relieve theſe when weary: and even ſuppoſing two hundred men to be ſufficient, which is far from being the caſe, the expence would be too great. If we allow horſes, and one horſe equal to five men, there muſt be twenty horſes working at a time, and twenty more to relieve theſe, which number of horſes would be attended with too great an expence for moſt mines: and neither men nor horſes would be able to give more than fifteen or ſixteen ſtrokes in a minute; ſome other power, therefore, muſt be applied. The philoſopher will propoſe to fix a large barrel or cylinder C C, truly bored, about eight or nine feet long, and twenty-two inches wide, on the top of an air-pump; and in this a piſton well leathered, whoſe rod L is faſtened to a chain hanging from the end of a lever at P. Now, ſays he, allowing fifteen pounds of preſſure upon every ſquare inch, the whole preſſure of air upon ſuch a piſton will be five thouſand eight hundred pounds, which is near twice the force to be overcome. But this muſt be effected by exhauſting ſo large a barrel by the air-pump, and which he cannot do more than twice in an hour; ſo that he can produce only two ſtrokes of the pump, whereas we ought to have nine hundred and ſixty in the ſame time: ſixteen ſtrokes in a minute being neceſſary to keep the water in the mine from overflowing the works. But an effectual method has been found of making a vacuum under the piſton C, ſixteen times in a minute, which is as follows: B is a large boiler, whoſe water by the fire under it is converted into elaſtic *ſteam*. The great cylinder C C is fixed upon it, and communicates with it by the pipe D *d*; on the lower orifice of which (within the boiler) moves a broad plate, by means of the *ſteam*-cock or regulator E 10, ſtopping or opening the paſſage, to prevent or permit the *ſteam* to paſs into the cylinder, as occaſion requires. The diameter of the pipe D is about four inches. The *ſteam* in the boiler ought always to be a little ſtronger than the air, that when let into the barrel, it may be a little more than a balance to the preſſure of the external air, which keeps down the piſton at the bottom *d n*. The piſton being by this means at liberty, the pump-rod will, by its great weight, deſcend at the oppoſite end to fetch a ſtroke, which is more than double the weight of the piſton, &c. at the other end. The end of the lever at the pump, therefore, will always preponderate and deſcend, when the piſton is at liberty. The handle of the *ſteam*-cock E 10, being turned towards *n*, opens the pipe D to let in the *ſteam*; and being turned towards O, ſhuts it off, that no more can enter. The piſton is now raiſed towards the top of the cylinder at C, and the cylinder is full of *ſteam*. The lever O 1 muſt then be lifted up to turn, by its teeth, the injecting cock at N, which permits the water, brought from the ciſtern

g, by

g, by the pipe *g* M N, to enter the bottom of the cylinder at *n*, where it flies up like a fountain, and ſtriking againſt the bottom of the piſton, the drops, being driven all over the cylinder, will by their coldneſs condenſe the *ſteam* into water again, and precipitate it to the bottom of the cylinder.

Mr. Beighton made an experiment to determine the rarity of *ſteam*, and found the content of a certain cylinder of *ſteam* was one hundred and thirteen gallons; and ſince there were ſixteen ſtrokes in a minute, therefore, $113 \times 16 = 1808$ gallons of *ſteam* per minute. He alſo obſerved, that the boiler, proportioned to that cylinder, required to be ſupplied with water at the rate of five pints per minute, and ſince 282 cubic inches make a gallon, $35\frac{1}{4}$ make a pint, and $5 \times 35\frac{1}{4} = 176\frac{1}{4}$ in five pints; and the cubic inches of *ſteam* are $1808 \times 282 = 509856$: if then we ſay, as $176\frac{1}{4} : 509856 :: 1 : 2887$; or one cubic inch of water is expanded into 2887 inches of *ſteam*: conſequently the *ſteam* in the cylinder is reduced to $\frac{1}{2887}$ part, when converted into water by the jet of cold water; and, therefore, a ſufficient vacuum is made in the cylinder for the piſton to deſcend unbalanced, by the preſſure of the atmoſphere. The piſton, being forced down, raiſes the other end of the lever, and conſequently the piſton of the pump, which brings up and diſcharges the water at *p*. Now the whole operation of opening and ſhutting the *ſteam* regulator and injection cock, may be performed in ſuch a time as will produce very well ſixteen ſtrokes in a minute. That the ciſtern *g* may be always ſupplied with water, there is an arch *x* fixed near the arch H at the pump end, from which another pump rod *k* with its piſton draws water from a ſmall ciſtern near the mouth of the pit (ſupplied from the water raiſed at *p*) and forces it up the pipe *m m m* into the ciſtern *g*, which, therefore, can never want water. That the leathers of the piſton C may be always ſupple, and ſwelled out ſo as to be always air-tight, a ſmall ſtream of water is ſupplied from the injecting pipe M by the arm *z*. On the top of the cylinder is a cup L, to hold the water that lies on the piſton, leſt it ſhould overflow when the piſton is at its greateſt height, as at W; at which time if the cup be too full, the water will run down the pipe V to the waſte well at Y. The water in the boiler, which waſtes in generating *ſteam*, is ſupplied by a pipe F *f* about three feet long, ſupplied by the pipe W with water from the top of the piſton, which has the advantage of being always warm, and ſo not apt to check the boiling of the water. That the boiler may not have the ſurface of the water too low (which would endanger its burning) or too high, which would not leave room enough for *ſteam*, there are two gage-pipes at G; one going a little below the ſurface of the water when at a proper height, and the other ſtanding a little above it. When every thing is right, the ſtop-cock of the ſhorter pipe being opened, gives only *ſteam*, and that of the long one water; but if otherwiſe, both cocks will give *ſteam* when the ſurface is too low, and both give water when it is too high: and hence the cock which feeds the boiler at F may be ſo opened as always to keep the ſurface of the water to its due height. The cold water, conſtantly injected into the cylinder to condenſe the *ſteam*, is carried off by the eduction-pipe *d* T Y, going from the bottom of the cylinder to the waſte-well Y, where paſſing a little under water, it has its end turned up with a valve Y to keep out the air from preſſing up into the pipe, but allowing the injected water coming the other way to be diſcharged; whereby the cylinder is kept empty. Leſt the *ſteam* ſhould become too ſtrong for the boiler and burſt it, there is a valve fixed at *b*, with a perpendicular wire ſtanding up from the middle of it, on which are fixed weights of lead, for examining the ſtrength of the *ſteam* puſhing againſt it from within. Thus the *ſteam* is known to be as ſtrong as the air, if it will raiſe up ſo much weight on the valve as is at the rate of fifteen pounds to an inch ſquare. When the *ſteam* becomes ſtronger than what is required, it will lift up the valve and go out. This valve is called the *puppet-clack*. The *ſteam* is variable in ſtrength, but never one tenth ſtronger or weaker than common air; for it has been found that the engine will work well, when there is the weight of one pound on every ſquare inch of the valve *b*. This ſhews that the *ſteam* is then one fifteenth part ſtronger than the common air. Now as the height of the feeding pipe from the funnel F to the ſurface of the water S *s* is not above three feet, and $3\frac{1}{2}$ feet of water afford one tenth of the preſſure of the air; if the *ſteam* were one tenth part ſtronger than air, it would puſh the water out at F; which, not doing, cannot be ſtronger than air, even in this caſe, where the regulator being ſhut, it is moſt of all confined. When the regulator is opened, the *ſteam* gives the piſton a puſh, which raiſes it up a little way, then occupying a greater ſpace, it becomes of the ſame ſtrength, and ſo a balance to the atmoſphere: thus the piſton, being at liberty, riſes to the top W. The *ſteam*, now expanded into the whole capacity of the cylinder, is weaker than the air, and would not ſupport the piſton, if it were not for the greater weight at the other end of the lever, which keeps it up. The *ſteam*, at each ſtroke, drives the injected water of the preceding ſtroke out of the eduction-pipe *d* T Y, and would itſelf follow and blow out at the valve Y, which is not loaded, if it were ſtronger than the air, which it never does. If it were exactly equal to the ſtrength of the air, it would juſt drive out all the water at Y, but could not follow itſelf, the preſſure on each ſide of the valve being equal by ſuppoſition. If it be weaker than the air, it will not force all the water out of the pipe *d* T Y, but the ſurface will ſtand, e. g. at T, where the column of water T Y added to the ſtrength of the *ſteam* is equal to the preſſure of the air. When the *ſteam* is one tenth weaker than the air, the height T Y $= 3\frac{1}{2}$ feet. Now ſince the whole perpendicular diſtance from *d* to Y is but four feet, and the *ſteam* always ſufficient to expel the water; it is plain, that it can never be more than one tenth part weaker than the air, when weakeſt. There is air in all the water injected, and though that air cannot be taken out or condenſed with the *ſteam*, yet it will precipitate and fall through the *ſteam* to the bottom of the cylinder, as being much heavier. For it has been ſhewn, that *ſteam* is to water as 1 to 2887 in its denſity; but the denſity of air is to that of water as 1 to 864; therefore, the rarity of *ſteam* is to that of air as 2887 to 864: the air will therefore fall through the *ſteam* to the bottom, and from thence be driven out through a ſmall pipe opening into the cup at 4, on which is a valve. Now when the *ſteam* firſt ruſhes into the cylinder, and is a little ſtronger than the outward air, it will force the precipitated air to open the valve at 4 and make its eſcape, but the *ſteam* cannot follow, becauſe it is weaker than the outward air, as the piſton gives it room, by aſcending, to expand. This valve, on account of the noiſe it makes, is called the *ſnifting-clack*.

Among the greateſt improvements of this engine, we may reckon that contrivance, by which the engine itſelf is made to open and ſhut the regulator and injection cock, and even more accurately than any perſon attending could poſſibly do it: for this purpoſe there is fixed to an arch Z, at a proper diſtance from the arch P, a chain from which hangs a perpendicular piece or working beam Q Q, which comes down quite to the floor, and goes through it in a hole, which it very exactly fits. This piece has a long ſlit in it, and ſeveral pin-holes and pins, for the movement of ſeveral ſmall levers de[illegible] to the office of opening and ſhutting the cocks, after the fo[illegible]ng manner. Between two perpendicular pieces of wood on each ſide of P, there is a ſquare iron axis A B (*fig.* 72.), which has upon it ſeveral iron pieces of the lever kind. The firſt is the piece C E D, called the Y, from its repreſenting that letter inverted by its two ſhanks E and D; on the upper part is a weight F to be raiſed higher or lower, and fixed as occaſion requires. This Y is fixed very faſt upon the iron axis A B. From the axis hangs a ſort of iron ſtirrup I K L G, by its two hooks I, G, having on the lower part two holes K, L, through which paſſes a long iron pin L K, keyed in the ſame. When this pin is put in, it is alſo paſſed through the two holes in the ends E, N, of the horizontal fork or ſpanner E Q N, joined at its end Q to the handle of the regulator V 10. From Q to O are ſeveral holes, by which the ſaid handle may be fixed to that part of the end which is moſt convenient. Upon the axis A B is fixed at right angles to the Y a handle or lever G 4, which goes on the outſide of the piece Q Q, and lies between the pins. Another handle is alſo faſtened upon the ſame axis, viz. H 5, and placed at half a right angle to the former G 4; this paſſes through the ſlit of the piece Q Q lying on one of its pins. Hence we ſee, that when the working beam goes up, its pin in the ſlit lifts up the ſpanner H 5, which turns about the axis ſo faſt as to throw the Y with its weight F from C to 6, in which direction it would continue to move, after it paſſed the perpendicular, if it were not prevented by a ſtrap of leather fixed to it at *æ*, and made faſt at the ends *m* and *n*, in ſuch manner as to allow the Y to vibrate backwards and forwards about a quarter of a circle, at equal diſtances, on this ſide and that of the perpendicular. In the repreſentation here given, the regulator is open, its plate T Y being ſhewn on one ſide of the pipe S, which joins the cylinder and boiler. The piſton is now up, and alſo the working beam near its greateſt height: the pin in the ſlit has ſo far raiſed the ſpanner H 5, that the weight F on the head of the Y is brought ſo far from *n*, as to be paſt the perpendicular, and ready to fall over towards *m*; and when it does ſo,

it will by its ſhank E, with a ſmart blow, ſtrike the iron pin K L, and drawing the fork O N horizontally towards the beam Q, will draw the end 10 of the regulator towards *t*, and thereby ſhut it by ſtopping the plate Y under the holes of the throat-pipe S. Immediately after the regulator is ſhut, the beam riſing a little higher, with its pin *s*, on the outſide upon the lower part, lifts up the end *k* 1 of the handle of the injection cock, and opens it by the turning of the two parts with teeth. The jet immediately making a vacuum, the beam again deſcends, and the pin *r* depreſſing the handle *k* 1 ſhuts the injection cock: and the beam continuing to deſcend, the pin *p* bears down the handle G 4, and throwing back the Y, its ſhank D throws forward the fork N Q, and again opens the regulator to admit freſh *ſteam*; after this every thing returns as before, and thus the engine is wonderfully contrived for working itſelf.

After the engine had been made as above deſcribed, for many years, it received another improvement of very great advantage: that was, inſtead of feeding the boiler with warm water from the top of the cylinder by the pipe W (*fig.* 71.) above, and F *f* below, it was ſupplied with the ſcalding hot water which comes out of the eduction pipe *d* T Y, which now, inſtead of going to the waſte-well at Y, was turned into the boiler in the top part: and as the eduction-pipe before went out at the ſide of the cylinder, it was now inſerted in the bottom of the ſame: and though the preſſure of the *ſteam* in the boiler be ſomewhat greater in the cylinder, yet the weight of water in the eduction-pipe, being added to the force of *ſteam* in the cylinder, will carry the water down continually, by overcoming the reſiſtance in the boiler.

If the cylinder be forty-two inches in diameter, the piſton will be preſſed down with a force greater than twenty thouſand pounds, and will conſequently lift up that weight at the oppoſite end of the beam: and as the pump-rod with its plunger is fixed to that end, if the bore where the plunger works were ten inches diameter, the water would be forced up through a pipe of one hundred and eighty yards perpendicular height.

But, as the parts of this engine have a good deal of friction, and muſt work with a conſiderable velocity, and there is no ſuch thing as making a perfect vacuum in the cylinder, it is found that no more than eight pounds of preſſure muſt be allowed for, on every circular inch of the piſton in the cylinder, that it may make about ſixteen ſtrokes in a minute, about ſix feet each.

Where the boiler is very large, the piſton will make between twenty and twenty-five ſtrokes in a minute, and each ſtroke ſeven or eight feet; which, in a pump of nine inches bore, will raiſe upwards of three hundred hogſheads of water in an hour.

It is found by experience that a cylinder, forty inches diameter, will work a pump ten inches diameter, and one hundred yards long: and hence we can find the diameter and length of a pump, that can be worked by any other cylinder.

For the conveniency of thoſe who would make uſe of this engine for raiſing water, we ſhall ſubjoin part of a table calculated by Mr. Beighton, ſhewing how any given quantity of water may be raiſed in an hour, from forty-eight to four hundred and forty hogſheads; at any given depth, from fifteen to one hundred yards; the machine working at the rate of ſixteen ſtrokes per minute, and each ſtroke being ſix feet long.

One example of the uſe of this table, will make the whole plain. Suppoſe it were required to draw one hundred and fifty hogſheads per hour, at ninety yards depth; in the ſecond column from the right hand, I find the neareſt number, viz. 149 hogſheads 40 gallons, againſt which, on the right hand, I find the diameter of the bore of the pump muſt be 7 inches; and in the ſame collateral line, under the given depth 90, I find 27 inches, the diameter of the cylinder fit for that purpoſe. And ſo for any other.

A Table ſhewing the Power of the Engine for raiſing Water by Fire.

Diameter of the cylinder in inches.	The depth to be drawn in yards.												In one hour.		Diam. of pump.	This table is calculated to the meaſure of ale gallons, at 282 cubic inches per gallon.
	15	20	25	30	35	40	45	50	60	70	80	90	100	Hogſh.	Gal.	Inches.	
	18½	21¾	24	26½	28½	30½	32½	34¼	37¼	40	—	—	—	440		12	
	17	19¾	22	34¾	26¼	28	29¾	31¼	34¼	37	39½	—	—	369	33	11	
	15½	18	20	22	23¾	25¼	27	28¾	31¼	33¾	36	38¼	40	304	48	10	
	14	16¼	18	20	21½	23	24¼	25	28	30½	33	35	36½	247	7	9	
	13½	15¼	17¼	19	20¼	21¾	23	24	26¼	28½	31	32½	35¼	221	15	8½	
	12½	14½	16½	18½	19	20½	21½	23	25	27	29	30½	32½	195	22	8	
	12	14	15½	17½	18¾	19¾	21	22	24¼	26	28	29½	31½	182	13	7¾	
	11	13¾	15	16½	18	19	20	21¼	23¼	25	27	28½	30¼	172	30	7½	
	10¾	13	14	15½	16¾	18¾	19	20½	22	24	25½	27	28½	149	40	7	
	10	12	13	14	15½	16¼	18	19	20	22	23	24½	26¼	128	54	6½	
	9½	11	12	13	14	15½	16	17	19	20½	22	23	24½	110	1	6	
		10	11	12	13	14	15	15¾	17	19	20	21	22¼	94	30	5½	
			10	11	11¾	13	13¾	14	15½	16¾	18½	19¼	20¼	66	61	5	
				10	10	11¼	12	13½	14	15	16	17	18¼	60	60	4½	
					9	10	11	11½	12	13½	14	15	16	48	51	4	

See another uſeful table of a ſimilar kind in Pryce's Minerologia Cornubienſis, p. 160.

The method of conſtructing a *fire-engine* according to the directions ſuggeſted by the marquis of Worceſter, and firſt executed by capt. Savery, wherein the water was to be raiſed ſolely by the preſſure of elaſtic vapour or *ſteam* is very uſeful and cheap, compared with the other ſort; and when the height, to which the water is to be raiſed, does not exceed one hundred or one hundred and fifty feet, then this engine is applicable with great advantage; as it requires but a ſmall fire (not bigger than what is generally uſed in a parlour chimney) is of a very ſimple and eaſy ſtructure, and admirably adapted for playing of fountains to great heights. We ſhall, therefore, here ſubjoin an account of its ſtructure, with the laſt improvements made in it by Dr. Deſaguliers.

The boiler B B (*fig.* 73.) is a large copper body of a globular form, as being beſt adapted to withſtand the very great force of *ſteam*, that is in this caſe neceſſary: round the body of this boiler the fire and flame are conducted, as at T T T. It has a copper cover ſcrewed on, which contains the *ſteam*-pipe C D, and two gage-pipes N *n* and O *o*, which, by turning their cocks, ſhew the height of the ſurface of the water within, as in the other engine. On the ſame cover at P is a valve, over which lies a ſteelyard with its weight Q to keep it down, the ſtrength of the vapour being this way moſt exactly eſtimated: for being in the nature of a lever, of the third ſort, it is plain, if the beam of the lever be divided into ten equal parts, and the firſt of them be upon the middle of the valve, and the weight Q hangs at the 2d, 3d, &c. diviſions, that then the force of the *ſteam* which can raiſe up the valve will be 2, 3, &c. times as great as the weight. If the area of the valve be a ſquare inch, and Q = 15 lb hanging at the ſecond diviſion is raiſed by *ſteam* puſhing up the valve, it will ſhew the *ſteam* will then preſs with the force of two atmoſpheres, and ſo on to ten atmoſpheres: but great care muſt be taken leſt the *ſteam*, ſo very ſtrong, burſt the boiler to pieces. The *ſteam* is carried from the boiler to a copper veſſel A, by means of the pipe C D, and is let into the ſame by turning the handle K of the *ſteam*-cock D I. The key of this cock is kept down by the ſcrew I, held up by the gibbet D L. The handle turned from K to *k* admits a paſſage to the *ſteam* into the copper receiver A. This receiver communicates at bottom with the ſucking-pipe Z H going down to the water H in the well X; and above with the forcing pipe E E, which goes up a little above

above the water of the reservoir R: between these two pipes are two valves F and G, both opening upwards. The *steam* being let in upon the water of the receiver A, forces it up through the valve F, and the pipe F E to the reservoir, and then the said receiver is full of hot *steam*. This *steam* in the receiver is condensed by a jet of cold water coming from the forcing pipe by the small pipe M I, being let in and shut off by the cock at M. The *steam*, being condensed by this jet, will be reduced within a very small space, and so make a vacuum, upon which the water in the well will rush up the forcing-pipe to restore the equilibrium, and thus again fill the receiver A: the little air being compressed within a small compass at the top above *b c*. That there may be always water in the forcing-pipe for the jet, there is a little pipe which brings the water to it from the reservoir, with the small stop-cock Y, to shut it off upon occasion. The valves at F and G are examined at any time, by unscrewing the pin 1 to loosen the strap 2, and let down the flanch 3, all which parts are shewn larger under *fig*. 74. By the peculiar contrivance of the cock at D I, and its key, the water is made to pass from the forcing-pipe to the boiler, to supply the waste in *steam*. This is plainly shewn in the sections of the cock and key (*fig*. 74.) where 5 is the top of the key, 6 a hole on one side, which goes down to the bottom, to convey the *steam* or jet of water alternately to the receiver, 7 is a notch on the other side to take in the water from the force-pipe, and conduct it to the boiler B. How this is done, it is easy to conceive from a view of the two sections of the cock and key in two positions within it. The boiler may hold about five or six hogsheads, and the receiver one hogshead: it will work four or five hours without recruiting; about four strokes per minute will produce upwards of two hundred hogsheads per hour. This *steam* makes a vacuum so effectually, as to raise water from the well to the height of twenty-nine or thirty feet: and supposing the *steam* able to lift up the steelyard, with its weight hanging at the sixth division, it will then be able to raise a column of water about fifty yards high, as being then six times stronger than the pressure of the air. The elasticity of the *steam* increasing with its heat, and the space into which it endeavours to expand itself being as its elasticity or strength, and since we know by the preceding part of this article, that water expanded into vapour of the same strength with the air, occupies near three thousand times the space as before, it follows, that when the *steam* has twice that strength, it will be expanded into six thousand: if it be five times as strong as the air's spring, it will become expanded into fifteen thousand times that space, &c. whence it appears how near a perfect vacuum we may approach by this engine or any other, by means of rarefied vapour. For a fuller account of these engines, see Desagulier's Exp. Phil. vol. ii. sect. 14. p. 465, &c. or for an abstract, Martin's Phil. Brit. vol. ii. p. 74, &c.

For an account of the improvement made in the fire-engine by Mr. Payne, see Phil. Transf. N° 461, or Martin ubi supra, p. 87, &c.

Mr. Blake, communicated to the Royal Society in 1752, remarks on the best proportions for *steam*-engine cylinders of a given content: and Mr. Smeaton describes an engine of this kind, invented by Mr. De Moura of Portugal, being an improvement of Savery's construction, to render it capable of working itself; for both which accounts see Phil. Transf. vol. xlvii. art. 29. p. 197. and art. 72. p. 436.

We are informed in the new and much improved edition of the Biog. Brit. by Dr. Kippis (art. Brindley), that in 1756 Mr. Brindley, so well known for his concern in our inland navigations (see CANAL), undertook to erect a *steam*-engine near Newcastle under Line, upon a new plan. The boiler of it was made with brick and stone, instead of iron plates, and the water was heated by iron flues of a peculiar construction, by which contrivances the consumption of fuel, necessary for working a *steam*-engine, was reduced one half. He introduced likewise in his engine, cylinders of wood, made in the manner of cooper's ware, instead of iron ones; the former being not only cheaper but more easily managed in the shafts; and he substituted wood too for iron in the chains which worked at the end of the beam. He had formed designs of introducing other improvements into the construction of this useful engine; but was discouraged by obstacles that were thrown in his way.

Mr. Blakey, some years ago, obtained a patent for his improvement of Savery's *steam*-engine, by which it is excellently adapted for raising water out of ponds, rivers, wells, &c. and for forcing it up to any height wanted for supplying houses, gardens, and other places; though it has not power sufficient to drain off the water from a deep mine. The principles of his construction are explained by Mr. Ferguson, in the Supplement to his Lectures, p. 19, &c. and a more particular description of it, accompanied with a drawing, is given by the patentee himself in the Gentleman's Magazine for 1769, vol. xxxix. p. 392, &c.

Mr. Blakey is the only person who ever thought of making use of air as an intermediate body between *steam* and water; by which means the *steam* is always kept from touching the water, and consequently from being condensed by it. And on this new principle he has obtained a patent. The engine may be built for a trifling expence, in comparison of the common fire-engine now in use; it will seldom need repairs, and will not consume half so much fuel. And as it has no pumps with pistons, it is clear of all their friction; and the effect is equal to the whole strength or compressive force of the *steam*; which the effect of the common fire-engine never is, on account of the great friction of the pistons in their pumps.

Ever since Mr. Newcomen's invention of the *steam* fire-engine, the great consumption of fuel with which it is attended, has been complained of as an immense drawback upon the profits of our mines. It is a known fact, that every fire-engine of considerable size consumes to the amount of three thousand pounds worth of coal in every year. Hence many of our engineers have endeavoured in the construction of these engines to save fuel. For this purpose the fire-place has been diminished, the flame has been carried round from the bottom of the boiler in a spiral direction, and conveyed through the body of the water in a tube before its arrival at the chimney; some have used a double boiler, so that fire might act in every possible point of contact; and some have built a moor-stone boiler, heated by three tubes of flame passing through it. But the most important improvements which have been made in the *steam*-engine for more than thirty years past, we owe to the skill of Mr. James Watt; of which we shall give some account: premising, that the internal structure of his new engines so much resembles that of the common ones, that those who are acquainted with them will not fail to understand the mechanism of his from the following description: he has contrived to preserve an uniform heat in the cylinder of his engines, by suffering no cold water to touch it, and by protecting it from the air, or other cold bodies, by a surrounding case filled with the *steam*, or with hot air or water, and by coating it over with substances that transmit heat slowly. He makes his vacuum to approach nearly to that of the barometer, by condensing the *steam* in a separate vessel, called the *condenser*, which may be cooled at pleasure without cooling the cylinder, either by an injection of cold water, or by surrounding the condenser with it, and generally by both. He extracts the injection water, and detached air from the cylinder or condenser by pumps, which are wrought by the engine itself, or blows them out by the *steam*. As the entrance of air into the cylinder would stop the operation of the engines, and as it is hardly to be expected that such enormous pistons as those of *steam*-engines can move up and down, and yet be absolutely air-tight in the common engines; a stream of water is kept always running upon the piston, which prevents the entry of the air: but this mode of securing the piston, though not hurtful in the common ones, would be highly prejudicial in the new engines. Their piston is, therefore, made more accurately; and the outer cylinder having a lid covers it, the *steam* is introduced above the piston; and when a vacuum is produced under it, acts upon it by its elasticity, as the atmosphere does upon common engines by its gravity. This way of working effectually excludes the air from the inner cylinder, and gives the advantage of adding to the power, by increasing the elasticity of the *steam*.

In Mr. Watt's engines, the cylinder, the great beams, the pumps, &c. stand in their usual positions. The cylinder is smaller than usual, in proportion to the load, and is very accurately bored. In the most complete engines, it is surrounded at a small distance with another cylinder, furnished with a bottom and a lid. The interstice between the cylinders communicates with the boiler by a large pipe, open at both ends; so that it is always filled with *steam*, and thereby maintains the inner cylinder always of the same heat with the *steam*, and prevents any condensation within it, which would be more detrimental than an equal condensation in the outer one. The inner cylinder has a bottom and piston as usual: and as it does not reach up quite to the lid of the outer cylinder, the *steam* in the interstice has always free access to the upper side of the piston. The lid of the outer cylinder has a hole in its middle; and the piston-rod, which

which is truly cylindrical, moves up and down through that hole, which is kept *ſteam*-tight by a collar of oakum ſcrewed down upon it. At the bottom of the inner cylinder, there are two regulating valves, one of which admits the *ſteam* to paſs from the interſtice into the inner cylinder below the piſton, or ſhuts it out at pleaſure: the other opens or ſhuts the end of a pipe, which leads to the condenſer. The condenſer conſiſts of one or more pumps furniſhed with clacks and buckets (nearly the ſame as in common pumps) which are wrought by chains faſtened to the great working beam of the engine. The pipe, which comes from the cylinder, is joined to the bottom of theſe pumps, and the whole condenſer ſtands immerſed in a ciſtern of cold water ſupplied by the engine. The place of this ciſtern is either within the houſe under the floor, between the cylinder and the lever wall; or without the houſe, between that wall and the engine ſhaft, as conveniency may require. The condenſer being exhauſted of air by blowing, and both the cylinders being filled with *ſteam*, the regulating valve which admits the *ſteam* into the inner cylinder is ſhut, and the other regulator which communicates with the condenſer is opened, and the *ſteam* ruſhes into the vacuum of the condenſer with violence: but there it comes into contact with the cold ſides of the pumps and pipe, and meets a jet of cold water which was opened at the ſame time with the exhauſtion regulator; theſe inſtantly deprive it of its heat, and reduce it to water; and the vacuum remaining perfect, more *ſteam* continues to ruſh in, and be condenſed until the inner cylinder is exhauſted. Then the *ſteam* which is above the piſton, ceaſing to be counteracted by that which was below it, acts upon the piſton with its whole elaſticity, and forces it to deſcend to the bottom of the cylinder, and ſo raiſes the buckets of the pumps which are hung to the other end of the beam. The exhauſtion regulator is now ſhut, and the *ſteam* one opened again, which, by letting in the *ſteam*, allows the piſton to be pulled up by the ſuperior weight of the pump rods; and ſo the engine is ready for another ſtroke.

The working of theſe engines is more regular and ſteady than the common ones, and from what has been ſaid, their other advantages ſeem to be very conſiderable.

It is ſaid, that the ſavings amount at leaſt to two thirds of the fuel, which is an important object, eſpecially where coals are dear. The new engines will raiſe from twenty thouſand to twenty-four thouſand cubic feet of water, to the height of twenty-four feet, by one hundred weight of good pit coal: and Mr. Watt has propoſed to produce engines upon the ſame principles, though ſomewhat differing in conſtruction, which will uſe much leſs fuel, and be more convenient for the purpoſes of mining, than any kind of engine yet uſed. Mr. Watt has alſo contrived a kind of mill wheel, which turns round by the powers of *ſteam* exerted within it.

The improvements above recited were invented by Mr. James Watt, at Glaſgow, in Scotland, in 1764: he obtained his majeſty's letters patent for the ſole uſe of his invention in 1768; but meeting with difficulties in the execution of a large machine, and being otherwiſe employed, he laid aſide the undertaking till the year 1774, when, in conjunction with Mr. Boulton near Birmingham, he completed both a reciprocating and a rotative or wheel engine. He then applied to parliament for a prolongation of the term of his patent, which was granted by an act paſſed in 1775. Since that time Mr. Watt and Mr. Boulton have erected ſeveral engines in Staffordſhire, Shropſhire, and Warwickſhire, and a ſmall one at Stratford near London. They have alſo lately finiſhed another at Hawkeſbury colliery near Coventry, which is juſtly ſuppoſed to be the moſt powerful engine in England. It has a cylinder fifty-eight inches in diameter, which works a pump fourteen inches in diameter ſixty-five fathoms high, and makes regularly twelve ſtrokes, each eight feet long, in a minute. They have alſo erected ſeveral engines in Cornwall; one of which has a cylinder thirty inches in diameter, that works a pump of $6\frac{1}{2}$ inches in diameter in two ſhafts, by flat rods with great friction, three hundred feet diſtant from each other, forty-five fathoms high in each ſhaft, equal in all to ninety fathoms, and can make fourteen ſtrokes, eight feet long, in a minute, with a conſumption of coal leſs than twenty buſhels in twenty-four hours. The terms they offer to the public are, to take in lieu of all profits one third part of the annual ſavings in fuel, which their engine makes when compared with a common engine of the ſame dimenſions in the neighbourhood. The engines are built at the expence of thoſe who uſe them, and Meſſrs. Boulton and Watt furniſh ſuch drawings, directions, and attendance, as may be neceſſary to enable a reſident engineer to complete the machine. See the Appendix to Pryce's Mineralogia, &c. 1778.

The editor has been informed that ſome uſeful improvements have been made in the *ſteam*-engine by Mr. William Powel, who had lately the direction and care of an engine of this kind at a colliery near Swanſea, in Glamorganſhire.

It is hardly neceſſary to add, that Dr. Falck, in 1776, publiſhed an account and deſcription of an improved *ſteam*-engine, which, as he ſays, will, with the ſame quantity of fuel, and in an equal ſpace of time, raiſe above double the quantity of water raiſed by any lever-engine of the ſame dimenſions; as he does not ſeem to have conſtructed even a working model of his propoſed engine. The principal improvement, however, which he ſuggeſts is to uſe two cylinders; into which the *ſteam* is let alternately to aſcend, by a common regulator, which always opens the communication of the *ſteam* to one, whilſt it ſhuts up the opening of the other: the piſton-rods are kept (by means of a wheel fixed to an arbour) in a continual aſcending and deſcending motion, whereby they move the common arbour, to which is affixed another wheel moving the pump-rods, in the ſame alternate direction as the piſton-rods, by which continual motion the pumps are kept in conſtant action.

STEATITES, in the *Hiſtory of Foſſils*, a name given by late authors to a ſubſtance called in Engliſh SOAP-*earth*.

STEATOCELE, a term uſed by the ancients to expreſs a ſort of rupture, occaſioned by a large quantity of fat or fuety matter lodged in the ſcrotum.

STEATOMA, Στεατωμα, a kind of ſwelling, or abſceſs, conſiſting of a matter much like ſuet; ſoft, without pain, and without diſcolouring the ſkin; contained in a cyſtis, and eaſily turned out upon inciſion.

STEEL is iron reduced or converted by art to a particular ſtate, which occaſions ſome changes in its properties; though theſe are eſſentially the ſame as thoſe of IRON.

Stahl, Cramer, and all good chemiſts, juſtly conſider *ſteel* as an improved iron, poſſeſſing a larger quantity of the inflammable principle, ſo neceſſary to all metals, and containing fewer heterogeneous, and more metallic parts than an equal bulk of iron.

Steel may be made by fuſion or by cementation.

The firſt method is uſed to convert iron into *ſteel* immediately from the ore. All ores of iron are not uſed indifferently for this purpoſe; becauſe ſome of theſe, which are therefore, called *ores of ſteel*, are much fitter than others for affording good *ſteel*; and the *ſteel* extracted from them is called *natural ſteel*. But though *ſteel* is made ſometimes directly from the ore, it is more frequently produced from crude or caſt-iron.

Theſe methods of making *ſteel* are not known in England, but are practiſed in Sweden and other parts of Europe. The proceſs for making *ſteel* from caſt-iron is thus deſcribed by Swedenborgius, as it is performed in Dalecarlia.

The ore from which the crude iron to be converted into *ſteel* is obtained is of a good kind. It is black, friable, and compoſed of many ſmall grains, and it produces very tough iron. The converſion into *ſteel* is made upon a forge-hearth, ſomething ſmaller than common. The ſides and bottom are made of caſt-iron. The tuyere is placed, with very little inclination, on one of the ſide-plates. The breadth of the fire-place is fourteen inches; its length is greater. The lower part of the tuyere is ſix one half inches above the bottom. In the interior part of the fire-place there is an oblong opening for the flowing of the ſuperfluous ſcoria. The workmen firſt put ſcoria on the bottom, then charcoal and powder of charcoal, and upon theſe the caſt-iron run or cut into ſmall pieces. They cover the iron with more charcoal, and excite the fire. When the pieces of iron are of a red white, and before they begin to melt, they ſtop the bellows, and carry the maſs under a large hammer, where they break it into pieces of three or four pounds each. The pieces are again brought to the hearth, and laid within reach of the workman, who plunges ſome of them into the fire, and covers them with coal. The bellows are made to blow ſlowly till the iron is liquefied. Then the fire is increaſed; and when the fuſion has been long enough continued, the ſcoriæ are allowed to flow out; and at that time the iron hardens. The workman adds more of the pieces of crude iron, which he treats in the ſame manner, and ſo on a third and a fourth time, till he obtains a maſs of *ſteel* of about a hundred pounds, which is generally done in about four hours. This maſs is raiſed and carried to the hammer, where it is forged, and cut into four pieces, which are farther beat into ſquare bars four or five feet long. When the *ſteel* is thus forged, it is thrown into water that it may be eaſily broken; for it is yet crude and coarſe-grained. The *ſteel* is now carried to another hearth ſimilar to the former, and there broken in pieces. Theſe pieces are laid regularly in the fire-place, firſt two parallel, upon which

which seven or eight others are placed across, then a third row across the second, in such a manner that there is space left between those of the same row. The whole is then covered with charcoal, and the fire is excited. In about half or three quarters of an hour the pieces are made hot enough, and are then taken from the fire, one by one, to the hammer, to be forged into little bars from half a foot to two feet long, and while hot, are thrown into water to be hardened. Of these pieces sixteen or twenty are put together so as to make a bundle, which is heated and welded, and afterwards forged into bars four inches thick, which are then broken into pieces of convenient length for use.

The other method of making *steel*, or that which is called *artificial steel*, is by cementation, and according to Cramer, is performed in the following manner: choose some bars of pure iron, or of that which is most perfect and most malleable, either when it is hot or cold, and not too thick; prepare a cement capable of giving the iron much inflammable principle, as of charcoal dust, moderately pulverized, one part, and wood-ashes half a part; or of charcoal-dust two parts, bones, horns, skins, or hair of animals, burnt to blackness in a close vessel, and in a gentle fire, and afterwards reduced to powder, one part, wood-ashes half a part; mix them together. Prepare a cylindrical earthen vessel, or crucible, two or three inches higher than the bars are long; put into the bottom of this vessel the cement, prepared as before directed, so that being gently pressed down, it may cover the bottom of the vessel an inch and half deep; place then the iron bars perpendicularly, so that they may be every where an inch distant from the sides of the vessel, and from each other; fill the interstices with the cement, and cover the bars with it, that the vessel may be quite full, cover it with a tile, and stop the joints with a lure of clay mixed with sand; put this vessel into a furnace, and keep it moderately, but equally red hot, for six or ten hours: the iron will then be found to be converted into *steel*, which will be so much better, as the iron employed was of a better quality; it then only requires to be tempered. See Tempering. See also *Annealing of* Steel *infra*.

In this operation the iron suffers no diminution of weight, and no scoria appears on its surface, as Mr. Cramer remarks. And, therefore, by the sole addition of a new quantity of phlogiston, the iron acquires the quality of *steel*.

Thus, if this iron contained some parts of martial earth which was not metallised, by the cementation they are metallised, and the iron or *steel* are thereby improved: but if the iron contained some earthy unmetallic parts, they are not separated by this operation, because the metal has not been fused: and as the best forged iron which is usually sold, is never so well purified from these extraneous matters, as that which is converted into *steel* in the great works for procuring *steel* from the ore of iron; hence, in general, artificial *steel* made by cementation is not so perfect as that made by fusion.

We may observe that, in the cementation above described, the iron combines with a part of the phlogiston of the cement, without fusion; which effect proceeds from a peculiar property of the earth of iron, by which it is capable of combining with the inflammable principle, and of being metallised without fusion, which is, nevertheless, necessary for the reduction of all other metallic earths.

The furnaces generally made use of for converting iron into *steel*, says a manufacturer of this metal, are of different sizes; some capable of converting only three or four ton weight, while others are capacious enough to contain from seven to eight or ten tons. The outsides of these furnaces rise up in the form of a cone, or sugar-loaf, to the height of a very considerable number of feet. In the inside, opposite to each other, are placed two very long chests, made either of stone, or of bricks capable of bearing the strongest fire; which is placed between the two chests. The bars of iron, after the bottom is furnished with a necessary quantity of charcoal dust, are laid in *stratum super stratum*, with intermediate beds of the charcoal dust, to such a height of the chests, as only to admit of a good bed at top; which is then all covered over, to prevent the admission of the common air; which, could it procure an entrance, would greatly injure the operation. The iron being thus situated, the fire is lighted; which is some time before it can be raised to a sufficient degree of heat, to produce any considerable effect. After which it is continued for so many days as the operator may judge proper; only now and then drawing out what they call a proof bar. This is done by openings fit for the purpose, at the ends of the chest, which are easily and with expedition stopped up again, without occasioning any injury to the contents left behind. When the operator apprehends the conversion is sufficiently completed, the fire is suffered to go out, and the furnace, with its contents, is left gradually to cool. This may take up several days: after which the furnace is discharged, by taking out the bars of *steel*, and the remainder of the charcoal dust.

The appearance of the bars, as well upon the surface as in the interior parts, abundantly discovers the prodigious efficacy of this simple material, when urged by a strong and sufficiently continued fire. For the surface exhibits a great number of tumors, or blisters, which give it the denomination of *blistered steel*.

These excrescences, which we call *blisters*, Mr. Reaumur terms *bulles*, or *bouillons*; and apprehends they may be owing to a sort of boiling, or to a kind of motion similar to that of boiling, made in the iron; but a little farther on he intimates that these swellings may be owing to some parts of the iron not being so well closed, and rendered compact, while the bars were under the discipline of the hammer at the chafery. Horne's Essays concerning Iron and *Steel*.

There is another kind of *steel*, besides those which are produced from the ore and cast-iron, or from the forged iron, which is obtained by remelting bar-*steel* in crucibles, and casting it into ingots. This, which is of modern discovery, is called *cast-steel*, and being more uniform and similar in all its parts than any other sort of *steel*, is fitter for being wrought into the finer kinds of utensils for which *steel* is employed.

Anciently *steel* is said to have been made by immersing forged iron during some time in melted crude iron. Forged iron may also be changed into *steel*, as Wallerius affirms, by immersion in melted scoria; or by fusion with black flux, glass-gall, or borax; or by strewing sea-salt upon heated iron, and extinguishing it in dung.

Steel may be again unmade, or reduced to the state of iron by a management similar to that by which it is made, that is, by cementation. But the cement used for this purpose, must be composed of substances entirely free from inflammable matter, and rather capable of absorbing it, as calcareous earth and quicklime are; by a cementation with these matters, continued during eight or ten hours, *steel* is reduced to the state of iron; and cast-*steel*, when thus reduced to the state of forged iron by cementation with absorbent earths, is the most uniform, equal, and perfect iron which can be obtained.

By conversion of iron into *steel*, this metal acquires a darker and browner colour, a closer, more compact, and finer grained texture, greater hardness, elasticity, tenacity, density, sonorousness, and disposition to receive the magnetic property. Besides, *steel* is much more fusible than iron, on account of the greater quantity of phlogiston united with it; as phlogiston is known to be, in general, the cause of the fusibility of metals. Indeed soft forged iron can scarcely, without addition, be brought into perfect fusion by the heat of our furnaces, till the fuel has converted it into *steel*.

Moreover, some say, that iron converted into *steel*, acquires an increase both of bulk and weight.

M. Reaumur, in particular, observes, that a small bar, five inches long, increased one line and a half in length: and he makes the amount of the increase of weight to be $\frac{1}{156}$ part of the whole; but others concerned in the manufacture of *steel* have estimated it to be one hundred weight upon seven tons. *Steel* is likewise less liable to rust when exposed to air than iron, and less liable to emit sparkles when heated. It is well known, that polished plates of *steel*, put upon a gentle fire of charcoal, acquire different colours on their surface, and pass successively through several shades, as they become hotter, in the following order, viz. white, yellow, orange, purple, violet, and lastly blue, which disappears and leaves a water-colour, if the *steel* has been heated too much or too long. These different shades mark the degrees of heat, or of annealing, applied to different tools or utensils. The shade most generally used is the blue, such as that given to *steel*-springs.

These colours may also be produced by the same means on all other calcinable metals, as well as *steel* and iron; and proceed from a calcination, gradually advancing on that part of the metals which is exposed to air, whence the particles of the metals in their different degrees of calcination, are probably of different sizes, and, according to the Newtonian theory, acquire different reflective powers, and thus exhibit changes of colours.

There have been various opinions concerning the cause of the difference between iron and *steel*. The most general opinion attributes this difference to the presence of a larger quantity of phlogiston in the latter than in the former. Some authors, attending chiefly to the method of

of converſion by fuſion, conſider that operation only as a purification of the iron from earthy and heterogeneous particles, and *ſteel* merely as a more pure and perfect iron. Others, obſerving ſome ſimilitude in the texture of *ſteel* to certain kinds of caſt iron, and the hardneſs of both theſe, without attending to their eſſential differences, have imagined that the ſtate of *ſteel* was intermediate betwixt that of caſt and that of forged iron.

Mr. Reaumur, who has taken great pains in his inveſtigation of this ſubject, affirms, that *ſteel* differs in nothing from forged iron, except that it contains more ſulphurs and more ſalts. Hence, he ſays, it follows, that caſt iron ſhould be *ſteel*, ſince it evidently differs from forged iron in the ſame manner, and by the ſame properties; and in effect, caſt iron is *ſteel* ſuch as it is, eſpecially the white ſort, which is more pure, and more perfectly diveſted of its earth, than the browner ſorts: and this white kind may be accordingly brought to all the hardneſs of *ſteel*, by repeated heating and quenching in cold water. And it follows, according to this writer, that in order to convert iron into *ſteel*, we are to give it new ſalts and new ſulphurs. If it be aſked, where is the neceſſity of giving again that which the mere caſt iron poſſeſſes? It is replied, that *ſteel* is required to be malleable in ſome degree, which the mere caſt iron is not, and it may be poſſible to give to forged iron ſuch ſalts and ſulphurs as are more proper for the *ſteel* than thoſe which the caſt iron naturally poſſeſſes. Mr. Reaumur, after many trials, found that, for ſulphurs, powdered charcoal, and common ſoot, and for ſalts, ſea-ſalt alone, ſucceeded beſt, and that theſe were properly to be mixed with aſhes, as an intermediate ſubſtance, that they muſt be proportioned in quantity to each other, and that there muſt alſo be a proportional quantity of the whole employed according to the quantity of iron that is to be wrought upon; and in this, regard muſt alſo be had to the ſeveral ſorts of ores from which the iron was obtained, ſince the iron of ſome ores is much ſooner convertible into *ſteel* than that of others, and makes alſo a better *ſteel*. Mr. Reaumur alſo contrived a new ſort of furnace, by means of which theſe ſalts and ſulphurs might be beſt introduced into the body of the iron.

A bar of iron, when converted into *ſteel*, is not equally ſo converted in all its parts; the fire has always acted more ſtrongly upon its ſurface than on its central parts, and it is therefore more perfect *ſteel* there than in its inner parts; but a perfection in the operation is not neceſſary to the *ſteel's* being good and uſeful, and the whole bar is often very good *ſteel*, as are alſo many bars made at the ſame time, yet all perhaps ſomewhat differently affected.

If the compoſition, which is to convert the iron into *ſteel*, be too ſtrong, or if the fire be too violent, or the matter continued too long in it, in all theſe caſes the *ſteel* will be over-made; that is, there will be an over proportion of ſaline and ſulphureous parts added to the iron: theſe will therefore too far ſeparate the particles of the metal aſunder, and the conſequence will be, that the *ſteel* will be too brittle to bear hammering, and will be of great loſs to the proprietor in the great quantities that will be broken, beſide the loſs he will ſuſtain from the abundance of ſcales which will fly off in the working. The way to meliorate ſuch *ſteel* as this, muſt be to diveſt it of part of its ſalts and its ſulphurs, but peculiarly of the laſt; and Mr. Reaumur found, that the burying the bars of ſuch *ſteel* in lime, or any other alkaline ſubſtance that would readily abſorb the ſulphurs, and placing it for a proper time in the fire, it would be in a manner decompoſed again, and come out a very good and perfect *ſteel*; and this, he apprehends, is no trivial proof, that the account given of the manner of iron's becoming *ſteel* is the true one.

By this management *ſteel* may again be converted, or reduced to its primitive iron, and a body of any middle degree, between *ſteel* and iron, may be produced, by ſtopping this proceſs at different points of time, or continuing it till all the adventitious ſalts and ſulphurs are drawn off or abſorbed. Hardneſs and flexibility are the two great points in this operation, and what the metal gets of the one of theſe, it aſſuredly loſes of the other. The greater hardneſs is from the greater quantity of the adventitious ſalts and ſulphurs; and the greater flexibility, or, as the workmen call it, the *greater body*, is from the greater quantity of the metallic; and he who is able to calculate properly the quantities of his ſalt, charcoal, and ſoot, and to regulate exactly the degree of fire, is capable of making *ſteel* of what degree of temper or perfection he pleaſes.

If *ſteel*, after the tempering, be found too hard, there is a very familiar way of bringing it back to what ſtate one pleaſes, between that and iron, which is only the heating it in the fire; for it may be kept in the fire ſo long, as to be reduced wholly to iron again. It is eaſy to infer from hence, what was before obſerved, that caſt iron is *ſteel* of a peculiar kind; its properties plainly evince, that it is *ſteel* with an over proportion of all that makes it ſo, and conſequently of all its properties. It is not malleable, is very brittle, and too hard for the file, or any other tool, to cut. Theſe are the qualities of *ſteel* which is over tempered, or, as it may be called, too much *ſteel*; it owes theſe qualities to its being overcharged with thoſe ſulphurs and ſalts, which in a due proportion make *ſteel* of iron.

The method of reducing this to the ſtate of wrought iron, is the ſame with what we have before obſerved is to be uſed to untemper too high tempered *ſteel*, that is, keeping it in the fire till part of its ſalts and ſulphurs are driven off; and if the fire alone be thought too difficult, or too tedious a method, Mr. Reaumur has found that thoſe alkaline ſubſtances, which naturally abſorb ſulphurs, will aſſiſt the reducing this to the ſtate of wrought iron, as they do to the untempering of *ſteel*, and that the very ſame ſubſtances of this kind, which have been found beſt in the untempering *ſteel*, ſucceed beſt in the rendering this malleable; ſuch are lime, chalk, and the like.

Caſt iron may be taken for theſe operations in two ſtates; the one, that of ſimply melted iron in its firſt fuſion, the other that of the iron, which has been run into the mould. When a caſt piece of iron, in a certain form, is heated again with the calx of animal bones, which is one common way, this being a ſubſtance extremely diveſted of ſalts and ſulphurs, it abſorbs thoſe of the metal too greedily, and diveſts it of too great a quantity of them; ſo that when the piece comes afterwards to be filed, the fragments fly off in large ſcales, and the beauty of the caſt figure muſt be loſt: to remedy this difficulty, ſome powdered ſulphur is to be added in the heating; for this being a ſulphureous and ſaline body, checks and moderates the effects of the calx of bone.

Chalk in the ſame manner can only be employed with certain regulations; it ſucceeds very well, if the fire be not too violent, or too long continued, but if it be exceſſive in either of theſe particulars the chalk throws into the body of the iron ſalts and ſulphurs of its own, which lay hid in its ſtructure, and which would not have been diſlodged by a ſmaller fire; but which being diſlodged, and thrown into the iron, act upon it, and render the ſucceſs of the operation quite different from what was intended, the iron becoming more hard and brittle by it.

One great nicety in all theſe operations, is the underſtanding the ſigns by which it is known at what time caſt iron is ſufficiently ſoftened, or over tempered *ſteel* is ſufficiently reduced toward the ſtate of iron again; but this is only to be acquired by nice obſervation, and on this depends the whole certainty of the proceſſes, ſince every minute's continuance in the fire gives the operation a different turn in degree.

For other obſervations of this ingenious writer, on the nature and manufacture, and properties of *ſteel*, ſee Mem. Acad. Sc. Paris, 1722. See alſo TEMPERING.

It is obſerved by the author of the Dictionary of Chemiſtry, that the opinion of thoſe who ſuppoſe, that *ſteel* is in a ſtate intermediate betwixt that of caſt iron and ſoft forged iron, is manifeſtly erroneous. They have been deceived by the hardneſs and brittleneſs of caſt-iron, which are nearly as great as in *ſteel*. But theſe qualities proceed from a remaining part of the mineraliſing ſubſtances, which leave it a pyritous character, very different from that of true *ſteel*, ſince this can only be hardened by the temper, and ſince in the preparation of it all ſulphureous matter muſt be carefully avoided. The miſtake of theſe authors proceeded from their ignorance of the inflammable principle, the properties of which have been ſo well explained by the illuſtrious Stahl, and from their being led into an error by the old chemiſts, who perpetually confounded phlogiſton, or the pureſt and ſimpleſt inflammable principle of all bodies, with ſulphur, with ſulphureous matters, and with moſt other inflammable compounds.

Some metallurgiſts have maintained, that the converſion of iron into *ſteel* is effected not by abſorption of phlogiſton, but by expulſion of ſulphureous or acid particles. To ſupport this opinion, they obſerve, 1. That *ſteel* is leſs diſpoſed than iron to ruſt; the cauſe of ruſt being, as they think, an acid contained in iron: 2. That *ſteel* emits fewer ſparkles under the hammer than iron, which ſparkles are found to be moſt frequent in iron abounding with ſulphur, as in red-ſhort iron; 3. That iron may be converted into *ſteel* by cementation with alkaline ſalts, capable of attracting the acid and ſulphur: 4. That in the preparation of *ſteel* by fuſion, the metal is rather expoſed to a diſſipation of its inflammable parts and burnt, than farther phlogiſticated; and that this operation is accordingly called by workmen *the burning of ſteel*.

In the preparation of *ſteel* by fuſion, probably much of the

the earthy matters contained in the iron may be separated, and any contained acid or sulphur may be burnt or dissipated. But the conversion of *steel* into iron by cementation with absorbent earths, in which operation no acid or sulphur can be absorbed by the metal, shews that the difference between iron and *steel* does not consist in the presence of an acid or of sulphur in the iron, but rather in the presence of some substance in the *steel*, which the inflammable cementing substance can give to it, and of which absorbent earths can deprive it. This substance has been generally believed to be phlogiston; by the addition of which the metal acquires a new texture, together with the hardness, elasticity, and other peculiar properties of *steel*.

The affinities and medicinal virtues of *steel* are the same as those of IRON. Dict. Chem. Engl. ed. art. *Steel*.

STEEL, *annealing*, or *nealing of*, is by some used for the softening it, in order to make it work easier; which is usually done by giving it a blood-red heat in the fire, and then taking it out, and letting it cool of itself. Mox. Mecan. Exerc. p. 60.

Some have pretended to secrets in annealing, by which they could bring down iron or *steel* to the temper of lead: this was to be done by often heating the metal in melting lead, and letting it cool again out of the lead. But this method is found by Moxon to have no other effect than what is had from the former. Hought. Collect. N° 276.

Steel may indeed be made a little softer than in the common way, by covering it with coarse powder of cow-horn, or hoofs; thus enclosing it in a loam, heating the whole in a wood-fire till it be red hot, and then leaving the fire to go out of itself, and then the *steel* to cool. Mox. loc. cit. See TEMPERING and STEEL, *supra*.

For the expansion of *steel* by heat. See PYROMETER.

STEEL-*glasses*, a name given by some authors to the metalline SPHERES used in optics. These, according to Cardan, are made of three parts of brass, one part of tin, and one of silver, with an eighteenth part of antimony; but most either totally leave out the silver, or add only a twenty-fourth part, to save the expence. There are many other methods, directed by several authors, but most use arsenic and tartar, mixed with the metals. These are afterwards to be polished with emery, rotten-stone, putty, and the like.

STEEL *ore*, is used to signify a particular kind of LEAD-ore.

STEEL-*powder*. See POWDER.

STEEL, *salt of*. See SALT *of Steel*.

STEEL-*waters*. See *Mineral* WATERS.

STEEL, *Damascus*. See DAMASCUS.

STEEL, *engraving on*. See ENGRAVING.

STEEL, *faggot of*. See FAGGOT.

STEEL, in *Medicine*. See CHALYBEAT and IRON in *Medicine*.

STEEL-*wine*. See WINE.

STEELING, in *Cutlery*, the laying on a piece of *steel* upon a larger mass of iron, to make that part which is to receive the edge harder than the rest. The body of an ax may very well be of iron, as it never comes into use to cut with, and perhaps is stronger, and less liable to break, than if of *steel*; but it must have a quantity of *steel* at that part where the edge is to be made.

STEELYARD, or STILYARD, in *Mechanics*, a kind of balance, called also *statera Romana*, or the *Roman* BALANCE; by means whereof, the gravities of different bodies are found by the use of one single weight.

STEELYARD, *construction of the*. It consists of an iron beam A B (*Tab*. VI. *Mech. fig*. 115), wherein a point is assumed at pleasure, as C, and, on this, a perpendicular raised C D. On the shorter arm A C, is hung a scale or bason to receive the bodies weighed: the weight I is shifted this and that way on the beam, till it be a counterbalance to one, two, three, four, &c. pounds placed in the scale; and the points are noted wherein I weighs as one, two, three, four, &c. pounds. From this construction of the *steelyard*, the manner of using it is apparent. But the instrument, being very liable to deceit, is therefore not to be countenanced in commerce.

STEELYARD, *spring*, is a kind of portable balance, serving to weigh any matter, from about one to forty pounds.

It is composed of a brass tube, into which goes a rod, and about that is wound a spring of tempered steel in a spiral form. On this rod are the divisions of pounds and parts of pounds, which are made by successively hanging on to an hook fastened to the other end, one, two, three, four, &c. pounds.

Now the spring being fastened by a screw to the bottom of the rod; the greater weight is hung on the hook, the more will the spring be contracted; and, consequently, a greater part of the rod will come out of the tube; the proportions of which greater weights are indicated by the figures appearing against the extremity of the tube.

STEELYARD, *company of the*. See STILLYARD.

STEELYARD, *Chinese*. The people of China carry this statera about them to weigh their gems, and other things of value. The beam, or yard, is a small rod of wood or ivory about a foot in length; upon this are three rules of measure, made of a fine silver-studded work; they all begin from the end of the beam, whence the first is extended eight inches, the second six and one half, the third eight and one half. The first is the European measure, the other two seem to be China measure. At the other end of the yard hangs a round scale, and at three several distances from this end are fastened so many slender strings, as different points of suspension. The first distance makes eight fifths of an inch, the second is double to the first, and the third four inches and four fifths. When they weigh any thing, they hold up the yard by some of these strings, and hang a sealed weight, of about one ounce and one-fourth troy weight, upon the respective divisions of the rule, as the thing requires. Grew's Museum, p. 369.

STEELYARD-*swing*. In the Philosophical Transactions (N° 462, sect. 5.) we have an account of a *steelyard-swing*, proposed as a mechanical method for assisting children labouring under deformities, owing to the contraction of the muscles on one side of the body. The crooked person is suspended with cords under his arm, and these are placed at equal distances from the centre of the beam. It is supposed that the gravity of the body will affect the contracted side, so as to put the muscles upon the stretch; and hence by degrees the defect may be remedied.

STEEPING *of seeds*. See SEED.

STEEPLE, an appendage generally raised on the western end of a church to hold the bells.

Steeples are denominated from their form, either *spires*, or *towers*. The first are such as ascend continually, diminishing either conically or pyramidically.

The latter are mere parallelopipeds, and are covered a-top, platform like.

In each kind, there is usually a sort of windows, or apertures, to let out the sound; and so contrived, at the same time, as to drive it down.

Masius, in his treatise of bells, treats likewise of *steeples*. The most remarkable in the world is that at Pisa, which leans all one side, and appears every moment ready to fall; yet is in no danger. This odd disposition, he observes, is not owing to a shock of an earthquake, as is generally imagined; but was contrived so at first by the architect; as is evident from the cielings, windows, doors, &c. which are all in the level.

STEER, *hog-steer*. See HOG.

STEERAGE, in a *Ship*, is an apartment without the great cabin. In large ships of war it is used as a hall, through which it is necessary to pass to or from the great cabin. In merchant ships it is generally the habitation of the inferior officers and ship's crew. See *Tab. Ship. fig*. 2. N° 102.

STEERAGE, in *Sea Language*, is also used to express the effort of the helm: and hence

Steerage-way is that degree of progressive motion communicated to a ship, by which she becomes susceptible of the effect of the helm to govern her course.

STEERING, in *Navigation*, the art of directing a ship's way from one place to another, by means of the helm and rudder, or of applying the efforts of the helm to regulate her course when she advances.

He is held the best *steersman*, who uses the least motion in putting the helm over to and again, and who keeps the ship best from making yaws; that is, from running in and out.

For this purpose the helmsman should diligently watch the movements of the head by the land, clouds, moon, or stars; because, although the course is in general regulated by compass, yet the vibrations of the needle are not so quickly perceived, as the sallies of the ship's head to the right or left, which, if not immediately restrained, will acquire additional velocity in every instant of their motion, and demand a more powerful impulse of the helm to reduce them; the application of which will operate to turn her head as far on the contrary side of her course.

The phrases used in *steering* a ship, vary according to the relation of the wind to her course. Thus, if the wind is *fair* or *large*, the phrases, used by the pilot or officer who superintends the steerage, are PORT, STARBOARD, and STEADY. The first is intended to direct the ship's course farther to the right; the second is to guide her farther to the left; and the last is designed to keep her exactly in the line, on which she advances, according to her prescribed course. The excess of the first and second movement is called *hard-a-port*, and *hard-a-starboard*; the

the former of which gives the greatest possible inclination to the right, and the latter an equal tendency to the left.

If, on the contrary, the wind is *foul* or *scant*, the phrases are LUFF, THUS, and NO NEARER; the first of which is the order to keep her close to the wind; the second, to retain her in her present situation; and the third to keep her sails full. See FULL-*and-by*. See also COND.

In a ship of war, the exercise of *steering* the ship is usually divided amongst a number of the most expert sailors, who attend the helm in their turns; and are accordingly called *timoneers*, from the French term *timonier*, which signifies *helmsman*.

The *steerage* is constantly supervised by the QUARTER-*masters*, who also attend the helm by rotation. In merchant ships every seaman takes his turn in this service, being directed therein by the mate of the watch, or some other officer. Falconer.

For the theory and effect of *steering*, see SAILING, COURSE, &c.

STEEVING, in *Sea Language*, denotes the elevation of a ship's bowsprit above the stem, or the angle which it makes with the horizon.

STEEVING, in *Merchant ships*, is used for the stowing of cotton, or wool, by means of screws, to force it close together.

STEGANOGRAPHY, Στεγανογραφια, formed of στεγανος, *secret*, and γραφω, *I write*, the art of secret writing, or of writing in ciphers; known only to the persons corresponding. See CIPHER and DECIPHERING.

STEGNOSIS, Στεγνωσις, an obstruction of any natural discharge, especially that by the pores.

STEGNOTICS, Στεγνοτικα, formed from στεγω, *constipo*, *I close*, in *Medicine*, remedies proper to close and stop the orifices of the vessels, or emunctories, when relaxed, stretched, lacerated, &c.

Such are pomegranate leaves, red roses, plantain leaves, tormentil roots, &c. *Stegnotics* are proper in the hæmorrhoids, and other fluxes of blood.

STEINBIZA, in *Ichthyology*, a name given by Hildegard, and some other writers, to that small species of cobitis, called by others COBITIS *aculeata*, and *tænia cornuta*. It is the *cobitis* with a forked spine under each eye, described by Artedi.

STEINHUN, *stone-hen*, a name given by the Germans to a bird of the lagopus kind, more commonly known by the name of OTOMO, and in some places by that of *colmestre*.

It seems not to differ from the lagopus in any thing but colour, and that bird being known to change its colour in the summer months, it is probably no other species.

STELE, Στηλη, in *Antiquity*, a kind of punishment, being a pillar whereon a criminal was exposed, and on which was engraven an account of his crime.

The persons, thus exposed to the laughter and reproaches of the people, were called *stelitæ*. Potter, Archæol. Græc. lib. i. cap. 25. tom. i. p. 130.

STELECHEIA, a word used by some authors to express the vena portæ.

STELECHITES, in the *Materia Medica*, a name given by Dioscorides, and some other of the Greek writers, to a peculiarly fine kind of storax. It was the same with the calamite, only that this name was given to the larger, and the name *calamite* to the smaller or slenderer pieces. Pliny, Strabo, and many others, join in telling us, that the wood of the storax-tree, on account of its softness and sweet taste, was the most subject to be eaten by worms, of that of any tree in the world.

When the worms attacked the body of the tree, the dust they made by their erosion formed a hillock or heap round the tree, or at its foot, and the extravasated balsam running amongst this dust, made a mass that was called the *cymatius storax* at that time, and was the same with the common storax now in use.

STELECHITES *stibii facie*, in *Natural History*, a very uncouth name given by Aldrovandus, and some others, to the ENTROCHI. He gave them this name from the resemblance of some of the longest pieces to fragments of the trunks of trees, the arms parting out from the sides of these main branches, the rudiments of which are very frequent in many of the entrochi, passing for the remains of boughs, and the hollow in the middle, for the cavity where the pith of the tree was. The addition of *stibii facie*, was only from the observing that the top and bottom were radiated, or striated, from the central hole to the circumference, in the manner of antimony. These are truly no vegetable remains, but parts of the arms of that strange fish called *stella arborescens*. See STAR-*fish*.

STELENCHIS, a strigil, or an instrument used in the baths to rub off the sweat from the skin.

STELITÆ, Στελιται, in *Antiquity*. See STELE.

STELLA. See PSEUDA *stella*.

STELLA *crinita*, in *Natural History*, a name given by Linkius to a genus of star-fish, the characters of which are these; that they have more than five rays, and from these have several other lateral processes, which are covered with a fine down or hair.

STELLA *lapis*, in the *Materia Medica*, the name of a stone which has been very differently interpreted by different writers. Some have supposed it the *asteria* of Pliny, and some the common *coralloide astroites*; but Mesue explains it to be the *lapis* LAZULI.

STELLA *marina*. See STAR-*fish*.

STELLA *arborescens*. See BASKET-*fish* and STAR-*fish*.

STELLA *occidens*, a word used by some of the chemical writers to express sal ammoniac.

STELLA *scolopendroides*, in *Natural History*, a name given by Linkius to a kind of *star-fish* with an undivided body, and five rays, resembling the bodies of the scolopendræ, as those of the more usual kind, called *stella lumbricalis*, do the bodies of common earth-worms.

STELLA *vermiformis*, in *Natural History*, a name given by Linkius, and other authors, to a common kind of *star-fish*, which has five rays parting from the body, each somewhat resembling the body of a large worm.

STELLAR. See INTER-*stellar*.

STELLARIA, in *Botany*. See *Great* CHICK-*weed*.

STELLARIA is also a name used by some authors for the *carduus stellatus*, or *star-thistle*. See CENTAURY.

STELLARIS *lapis*, a name given by many authors to the various species of ASTROITES or STAR-*stone*.

STELLATE *plants*, such as have their leaves growing on the stalks, at certain distances, in the form of a star with rays; or such flowers as are star-like, or full of eyes resembling stars.

Mr. Ray makes the *stellate* plants, so called from the disposition of their leaves, the tenth genus of English plants; of which kind are cross-wort, mollugo, wild madder, asperula or woodruff, gallium or ladies bed-straw, aparine or cleavers, and rubia tinctorum or dyers madder.

STELLERA, *German groundsel*, in *Botany*, a genus of the *octandria monogynia* class. Its characters are, that it has no calyx; that the corolla is cut into four segments; that the stamina are very short; and that it has a single rostrated seed. There are two species.

STELLIO, in *Zoology*, the name by which authors call the swift, or spotted lizard. The spots which distinguish this kind are not, however, stellated, as might be supposed from the name, but round; some small, and scattered irregularly all over the body; and others larger, and disposed in thirteen zones, or semicircles. The spots are much more distinct and clear on the back than on the belly. It is common in Syria, and some other places. See EFT.

The bite of this animal is said to inspissate the humours and stupify the senses; to remedy which Venice treacle and volatile salts are recommended. The flesh is said to excite sweat, and resist poison.

STELLIO *adusta*, an affected term used by some chemical writers for cinnabar.

STELLIONATE, STELLIONATUS, in the *Civil Law*, a kind of crime committed by a fraudulent bargain, where one of the parties sells a thing for what it is not.

Cujas says, the word comes from *stellio*, a very subtile kind of lizard. We find mention hereof in the Code, leg. ix. tit. 34.

As, if I sell an estate for my own, which belongs to another; or convey a thing as free and clear, which is already engaged to another; or put off copper for gold, &c.

The Romans frequently used *stellionatus* to express all kinds of crimes that had no proper names.

STELLITES, in *Natural History*, a name given by some writers on fossils to a kind of white stone found on Mount Libanus, and in some other parts of Syria, containing the lineaments of the star-fish complete.

The same stones frequently contain the lineaments of other fish.

STELOCHITES, a name given to OSTEOCOLLA.

STELLULARIA, in *Botany*. See CHICK-*weed*.

STEM, in *Botany*, that part of a plant arising out of the root, and which sustains the leaves, flowers, and fruits.

In trees, the *stem* is called the *trunk*, or *stock*; in Latin *caudex*, and *truncus*.

In herbs, it is ordinarily called the STALK; by the Latins *caulis* and *scapus*, when straight like a column.

When slender, and creeping on the ground, as that of nummulary, some authors call it *viticulus*.

In the several kinds of corn and plants of that kind, it is more properly called *culmus*.

The *stem* of the plant, according to Dr. Grew, is no more than the cutis, or skin, which at first covers the

two

two ones, and the plume of the ſeed, and which is farther dilated as the plant grows.

Stem *of a ſhip*, is a circular piece of timber, into which her two ſides are united at the fore-end; the lower end of it is ſcarfed to the keel, and the bowſprit reſts upon its upper end.

The *ſtem* is formed of one or two pieces, according to the ſize of the veſſel; and as it terminates the ſhip forward, the ends of the wales and planks of the ſides and bottom are let into a groove or channel, in the middle of its ſurface, from the top to the bottom; which operation is uſually called rabetting.

The outſide of the *ſtem* is uſually marked with a ſcale, or diviſion of feet, according to its perpendicular height from the keel: the intention of which is to aſcertain the draught of water at the fore-part, when the ſhip is in preparation for a ſea-voyage, &c.

The *ſtem*, at its lower end, is of equal breadth and thickneſs with the keel, but it grows proportionably broader and thicker towards its upper extremity. Falconer. See *Tab. Ship. fig.* 1. *lit. b. fig.* 2. *n.* 1.

Stem, *falſe*, in a *Ship*, that fixed before the right one. When a ſhip's *ſtem* is too flat, ſo that ſhe cannot keep a wind well, they uſe to put a *falſe ſtem* above, which makes her rid more way, and bear a better ſail.

STEMMATA, in the *Hiſtory of Inſects*, are three ſmooth hemiſpheric dots, placed generally on the top of the head, as in moſt of the hymenoptera, and other claſſes. The name was firſt introduced by Linnæus.

STEMODIA, in *Botany*, a genus of the *didynamia angioſpermia* claſs. Its characters are theſe: the calyx is divided into two ſegments, the corolla is bilabiated, the ſtamina are four, with ſingle bifid filaments, and double antheræ; and the fruit is a bilocular capſule. There is one ſpecies.

STEMPHYLA, a word uſed by the ancients to expreſs the huſks of grapes, or the remains of the preſſings of wine. The ſame word is alſo uſed by ſome to expreſs the remaining maſs of the olives, after the oil is preſſed out.

STEMPHYLITES, a name given by the ancients to a ſort of wine preſſed hard from the huſks.

STEMPLES, in *Mining*, croſs bars of wood in the ſhafts which are ſunk to mines.

In many places the way is to ſink a perpendicular hole, or ſhaft, the ſides of which they ſtrengthen from top to bottom with wood-work, to prevent the earth from falling in: the tranſverſe pieces of wood, uſed to this purpoſe, they call *ſtemples*, and by means of theſe the miners in ſome places deſcend, without uſing any rope, catching hold of theſe with their hands and feet.

STEMSON, in a *Ship*, an arching piece of timber fixed within the apron, to reinforce the ſcarf thereof, in the ſame manner as the apron ſupports the ſcarf of the ſtern. In large ſhips it is uſually formed of two pieces.

STENCH. See Stink.

STENCILLING. See Paper-*hangings*.

STENO's *duct*, a name given from its diſcoverer to the ſuperior salival *duct*.

Several anatomiſts, particularly Heiſter and Palfyn, have diſputed whether *Steno's duct* is pervious in recent ſubjects, as well as in the ſkeleton. Dr. Kulm affirms, he has demonſtrated it to ſeveral to be pervious in deer, bears, wild goats, hares, calves, and in the human ſubjects, and mentions the manner of tracing it. See Med. Eſſ. Edinb. Abridg. vol. ii. p. 421.

STENOMARGA, in *Natural Hiſtory*, a name uſed by ſome authors for a light marly earth, more uſually called agaricus *mineralis*, and lac *lunæ* by the later writers, and *terra*, or *creta Seleneuſiaca*, by Dioſcorides and Galen.

STENTATO, in the *Italian Muſic*, is uſed to ſignify that the voice ſhould be forced in ſome part of a ſong, or on ſome particular ſound, to expreſs an extraordinary emotion.

STENTOROPHONIC *tube*, a *ſpeaking* trumpet, thus called from Stentor (a perſon mentioned in the fifth book of the Iliad, who, as Homer tells us, could call louder than fifty men), and φωνη, *voice*. The *ſtentorophonic* horn of Alexander the Great is famous; with this it is ſaid he could give orders to his army at the diſtance of 100 ſtadia, which is above twelve Engliſh miles.

STEP. See Pace, Stair, &c.

Steps, in a *Building*. See *Tab. Architecture, fig.* 40. WW.

Step, in a *Ship*, a block of wood fixed on the decks or bottom of a ſhip, and having a hole in its upper ſide fitted to receive the heel of a maſt or capſtern. The *ſteps* of the main and foremaſts of every ſhip reſt upon the kelſon, to which they are firmly ſecured by knees, bolts, or ſpike-nails. The *ſtep* of the mizen-maſt uſually reſts upon the lower deck.

Step and *leap*, in the *Manege*, one of the ſeven airs or artificial motions of a horſe, conſiſting, as it were, of three airs; viz. the pace or *ſtep* which is terra a terra; the raiſing, which is a curvet; and the whole finiſhed with a ſault or *leap*.

The *ſtep*, properly, puts a horſe on the hand, and gives him a riſe to leap; like one that runs before he leaps, that he may go the higher or the farther.

For leaps of all kinds the rider is not to give any aids or helps with his legs, only to hold the horſe well up with the bridle hand when he riſes before, that he may riſe the higher behind; when he begins to riſe behind, he is to put the bridle-hand a little forwards to hold him before, and ſtay him there on the hand, as if he hung in the air; timing the motion of the bridle-hand ſo as to take him like a ball on the bound, which is the great ſecret in leaping.

STEPHANITÆ, στεφανιται, in *Antiquity*, an epithet given to games and exerciſes, where the prize was only a garland.

STEPHANOPHORUS, στεφανοφορος, in *Antiquity*, the chief prieſt of Pallas, who preſided over the reſt. It was uſual for every god to have a chief prieſt; that of Pallas was the *Stephanophorus*, juſt mentioned, and that of Hercules was called *Dadouchus*.

Stephanophorus was alſo a prieſt that aſſiſted the women in the celebration of the feſtival Thesmophoria.

STEPHENS's *medicine for the ſtone*. Mrs. *Stephens* having ſold medicines for the ſtone in the bladder or kidneys, Dr. Hartley publiſhed ſeveral caſes of their ſucceſs; and ſo much was ſaid of them, that the parliament appointed truſtees to examine into the truth of what was alledged in their favour. The report of theſe truſtees being favourable, ſhe had 5000 *l.* ſterling ordered her, in 1739, for publiſhing the receipt.

Her medicines are a powder, a decoction, and pills. The powder is ſix parts of fine powder of hen-egg ſhells calcined till they become of a greyiſh white colour, and of an acrid ſalt taſte, then left two months in an open veſſel, till what is ſufficiently calcined falls into a fine powder, to be ſeparated from the groſſer parts by paſſing it through a hair-ſieve. To this egg-ſhell lime add one ſixth part of the powder of ſnails, with their ſhells burnt in a crucible till they have done ſmoking. A dram of this powder is to be taken thrice a day in a large tea-cup full of white wine, cyder, or ſmall punch, and half a pint of the decoction is to be drank after each doſe. If the patient feels pain, it is to be made milder by opiates; if he is coſtive, gentle laxatives are to be taken, and purging, is to be reſtrained: if the powder is too ſtrong in the above proportion of ſix parts of the powder of egg-ſhells to one of ſnail-powder, it is to be weakened by increaſing the proportion of the ſnail-powder.

To make the decoction, ſhe prepared balls compoſed of four ounces and a half of the beſt Alicant ſoap, a large ſpoonful of the powder of ſwines-creſſes, burnt to blackneſs, and as much honey as was neceſſary. She boiled one of theſe balls ſliced with cut green camomile, or camomile-flowers, ſweet fennel, parſley, and burdock-leaves, of each one ounce, in two quarts of water, half an hour, then ſtrained it off and ſweetened it with honey. When theſe herbs are not to be had green, ſhe takes the ſame quantity of their roots, cut and ſliced. Thoſe, whoſe ſtomachs cannot bear this decoction, may take one ſixth part of the ball formed into pills, with every doſe of the powder.

The pills are made by taking equal quantities by meaſure of ſnails calcined as before, of wild carrot-ſeeds, burdock-ſeeds, aſhen-keys, hips and haws, all burnt to blackneſs, and reduced to a fine powder: with a large ſpoonful of this powder, four ounces of ſoap, and as much honey as is neceſſary, bring them to the conſiſtence of pills, of which ſixty are to be formed out of every ounce of the compoſition. In fits of the gravel five of theſe pills are taken every hour awake, till the complaints are removed.

During the uſe of theſe medicines, the patient ought to abſtain from ſalt meats, red wines, and milk, drink few liquors, and uſe little exerciſe.

Dr. Hartley, leaving out the ſuperfluous part of Mrs. *Stephens*'s preſcription, reduces her receipt to a more ſimple form; to wit, to two ounces and a half of ſoap and ſeven ſcruples and a half of egg-ſhell powder, as the mean doſe of the medicines to be taken.

He has alſo recommended the following method of preparing and adminiſtering this medicine: take of Alicant ſoap eight ounces; powdered quick lime, a little ſlaked, one ounce; ſalt of tartar, or purified pot-aſh, a dram; and ſhaving the ſoap, and mixing it with the lime and ſalt, beat all into a maſs, with as much water as is neceſſary: of this maſs, the quantity of three to four ounces is to be taken every day, made into rolls taper at each end, which are to be laid lengthways on the tongue, and

and ſwallowed with a mouthful of water. In this way the quantity of ſoap, to be taken daily, is nearly from two ounces and five drams to three ounces and a half; of lime-powder, from three drams to near half an ounce; and of ſalt of tartar, or purified pot-aſh, from a ſcruple to near half a dram.

Dr. Hales, after ſeveral trials on the different ingredients, found that the diſſolving power of them lay in the lime, which Dr. Rutty confirmed; and Dr. Jurin having taken ſoap-lees, the ingredients of which are pot-aſhes and lime, beginning with a few drops, and increaſing the quantity till he took an ounce, or an ounce and a half every day, in a proper vehicle, was cured of bloody urine, pain, &c. and paſſed ſeveral ſmall ſtones; after which he had no uneaſineſs. Med. Eſſ. Edinb. vol. vi. p. 157. 489.

For other forms of adminiſtering ſoap and lime, and remarks on Mrs. *Stephens's* medicine, ſee LITHONTRIPTICS. See alſo LIME-*water* and STONE.

STERA, in *Anatomy*, a word uſed by ſome of the barbarous writers to expreſs the uterus. It ſeems to have been only a corruption of the word *hyſtera*.

STERCORARIANS, or STERCORANISTÆ, formed from *ſtercus, dung*, a name which thoſe of the Romiſh church anciently gave to ſuch as held that the hoſt was liable to digeſtion, and all its conſequences, like other food.

STERCORARIUS *piſcis*, the *dung-fiſh*, the name of an Eaſt Indian fiſh; ſo called from its frequenting neceſſary-houſes which are over the water, and other places, where the like naſtineſs is to be found. It is for this reaſon ſuppoſed unwholeſome by ſome, but is really a very well taſted fiſh, and eaten by moſt people where it is to be had. It is a broad and thin fiſh, of about ſix or ſeven inches long, and nearly as much in breadth. Its back is variegated with ſpots of deep brown; its belly is bluiſh.

STERCULIA, in *Botany*, a genus of the *monoecia adelphia* claſs. Its characters are theſe: it hath male and female flowers; the calyx of the male is divided into five ſegments; it has no corolla, and fifteen filaments; the calyx of the female is like that of the other; it has no corolla; the germen reſts upon a column, and the capſule has five cells, and is polyſpermous. There are two ſpecies.

STERCUMEZEFF, an affected word uſed by ſome of the chemical writers for litharge.

STERCUTIUS, in *Mythology*, a ſurname given to Saturn, becauſe he was the firſt who inſtructed men to dung the earth in order to render it fertile.

STEREOBATA, or STEREOBATES, formed from ϛερεοϐατης, *ſolid prop*, in the *Ancient Architecture*, the baſis, or foundation, whereon a column, wall, or other piece of building, is raiſed.

This anſwers pretty well to the continued SOCLE or baſement of the moderns.

Some confound it with the ancient *ſtylobata*, or PEDESTAL; but, in effect, the *ſtereobata* is that to the ſtylobata, which the ſtylobata is to the ſpire or baſe of the column.

STEREOGRAPHIC *projection of the ſphere* is, that wherein the eye is ſuppoſed to be placed in the ſurface of the ſphere.

Stereographic projection is, the projection of the circles of the ſphere on the plane of ſome one great circle; the eye being ſuppoſed placed in the pole of that circle. For the fundamental principles and chief properties of this kind of projection, ſee PROJECTION *ſtereographic*.

The method and practice of this projection, in all the principal caſes, viz. on the planes of the meridian, equinoctial, and horizon, are as follow:

STEREOGRAPHIC *projection on the plane of the meridian.* Let ZQNE (*Tab.* IV. *Perſpect. fig.* 85.) be the meridian, Z and N the poles, as alſo the zenith and nadir; EQ the equinoctial and horizon; ZN the equinoctial colure, and prime vertical circle: Z 15 N, Z 30 N, Z 45 N, &c. are hour-circles, or meridians, and alſo azimuths, becauſe the pole is in the zenith. To deſcribe theſe circles, find the points 15, 30, 45, 60, &c. in the equinoctial, by ſetting the half-tangent of their diſtance from ♈; and then their centres are found by ſetting their co-ſecants, both ways, from their points of interſection with the equator: ♋, ♋, and ♑, ♑, are the northern and ſouthern tropics, which are deſcribed by ſetting the half-tangent of 23° 30′ from ♈ each way; then the tangent of its complement, viz. 66° 30′, each way from from thence on the colure produced, gives their centres. By this method all parallels of declination may be drawn. Or you might have ſet the co-ſecant of the parallel from the centre of the primitive, which would alſo have found the ſame point for the centre of the parallel, whoſe radius is equal to the tangent of its diſtance from its pole.

The parallels in this projection are alſo almicantars, or parallels of altitude; ♋, ♑ is the ecliptic, which muſt be divided from the diviſion on the ſcale of half-tangents; but denominated according to the ſigns of the zodiac, reckoning 30° to each ſign.

STEREOGRAPHIC *projection on the plane of the equinoctial.* Let SC (*fig.* 86.) be the meridian, and ſolſtitial colure; EN the equinoctial colure, and hour-circle of 6; P the north pole; ♋♋, the northern tropic; E ♋ N the northern half of the ecliptic (whoſe centre is found by ſetting off the ſecant of 23 degrees 30 minutes from ♋); and its pole is at *a* the interſection of the polar circle and meridian, being the place through which all circles of longitude muſt paſs; and EZN the horizon of London, which is deſcribed thus: ſet the half-tangent of the co-latitude, from P to Z; then the tangent of the ſame, ſet from P to O, or its ſecant from Z to O, gives its centre; and its pole will be at *h*, 38 degrees 30 minutes (in the half-tangents) diſtant from P, where *h* is at the zenith.

To draw any other circles in this projection: 1. For circles of longitude, which muſt all paſs through *a*, and the ſeveral degrees of the ecliptic; ſet the tangent of 66 degrees 30 minutes, from *a* downwards, on the meridian produced; which will find a point, through which a perpendicular, drawn to the meridian, ſhall contain in it the centres of all the circles of longitude, whoſe diſtances, ſet off to the radius P *x*, ſhall be the tangents of the degrees of their diſtances from the meridian SPC (which is that belonging to 180 degrees.) 2. All parallels of declination are drawn by ſetting the *half-tangents* of their diſtances from P. 3. All azimuths, or vertical circles, muſt paſs through *h* at the zenith: ſince, therefore, the zenith is 38 degrees 30 minutes diſtant from P, ſet the co-ſecant of that (or the ſecant of 51 degrees 30 minutes) from *h* on the meridian extended below, and that will find the point *x*, the centre of the azimuth of eaſt and weſt; viz. E *h* N; and the centres of all the reſt are in a line that is perpendicular to the meridian, and drawn through *x*. 4. Circles of altitude, or almicantars, are leſſer circles, whoſe poles are not in the plane of the projection: thus the circle O *e* is a parallel of altitude 50 degrees above the horizon. 5. All hour-circles are ſtraight lines from the centre to the limb.

STEREOGRAPHIC *projection on the plane of the horizon.*— Firſt draw a circle repreſenting the horizon, and quarter it with two diameters; then will *z* be the zenith of the place, 12 *z* 12 the meridian; 6 *z* 6 the prime vertical, or azimuth of eaſt and weſt (*fig.* 87.); make *z*P = half tangent of 38° 30′ (or tangent of 19° 15′); and P ſhall be the pole of the world. Make *z*Æ = half-tangent of 51° 30 (or tangent of 25° 45′)
and Æ *o* = ſecant } of 38 degrees 30 minutes; then
z o = tangent }
ſhall *o* be the centre of the equinoctial 6 Æ 6.

In this projection almicantars are all parallel to the primitive circle; and azimuths are all right lines paſſing through *z* the centre of the primitive, to the equal diviſions in the limb. Parallels of declination are all leſſer circles, and parallel to the equinoctial, and their interſections with the meridian are found, by ſetting the half-tangent of their diſtance from the zenith, ſouthward or northward, or both ways from *z*. Their centres are found by biſecting the diſtance between thoſe two points; for the middle will be the centre of the parallel. Thus *z* ♋ = half-tangent of 28° 00′ = diſtance of the tropic of ♋ from the zenith.
And *z* ♑ = half tangent of 75° = diſtance of the tropic of ♑ from the zenith. } to the ſouthward, or downward from *z*.
And the interſection again with the north of the meridian, is at { 105° 30′ / 152° 30′ } for { ♑ / ♋ } to the northward, or upward from *z*.

For the hour-circles, make *z c* = tangent of 51° 30′, or P*c* = ſecant of 51° 30′: draw G*c*T perpendicular to the produced meridian; then, if from *c* with the radius *zc*, you ſet off the tangents of 15° 30° 45°, &c. both ways, you will have the centres of the ſeveral hour-circles, 7 and 5, 8 and 4, &c.

Note, In all *ſtereographic* projections, all diameters are meaſured on the ſcale of half-tangents; and this is the ground of all dialling, or the true projection of the hour circles of the ſphere on any given plane. See SPHERICS.

STEREOGRAPHY, formed from ϛερεος, *ſolid*, and γραφω, *I deſcribe*, the art of drawing the forms or figures of the ſolids upon a plane.

STEREOMETRY, Στερεομετρια, formed of ϛερεος, *ſolid*, and μετρον, *meaſure*, that part of geometry which teaches how to meaſure ſolid bodies, i. e. to find the ſolidity, or ſolid

solid content, of bodies; as globes, cylinders, cubes, vessels, ships, &c.

The methods hereof see under the respective bodies; as GLOBE, SPHERE, CYLINDER, &c. See also GAUGING.

STEREOTOMY, formed from στερεος, and τομη, *section*, the art, or act, of cutting solids, or making sections thereof; as walls and other membranes in the profiles of architecture.

STERILITY, formed from *sterilitas*, of *sterilis*, *barren*, the quality of a thing that is barren; in opposition to FECUNDITY.

Sterility was held a grievous affliction by the wives of the ancient patriarchs. Nature has annexed *sterility* to all monstrous productions, that the creation might not degenerate. Hence the *sterility* of mules, &c.

Women frequently become *sterile* after a miscarriage, or a difficult labour, by reason the uterus, or some other of the genital parts, are injured thereby.

The *sterility* of mercury, say the alchemists, resembles that of women who are too cold and moist; and who, by being purged and heated, would be cured of their *sterility*, as mercury is when purged according to the rules of art.

STERIS, in *Botany*, a genus of the *pentandria digynia* class. Its characters are these: the calyx is parted into five segments; the corolla is rotated, and the fruit is a single-celled polyspermous berry. There is only one species.

STERLING, a term frequent in the English commerce. A *pound*, *shilling*, or *penny sterling*, signifies as much as a pound, shilling, or penny, of lawful money of England, as settled by public authority.

Antiquaries and critics are greatly divided as to the origin of the word *sterling*. Buchanan fetches it from the castle of Striveling, or Sterling, in Scotland, where a small coin was anciently struck; that in time, according to him, came to give name to all the rest. Camden derives the word from *easterling*, or *esterling*; observing, that in the reign of king Richard I. money coined in the east parts of Germany begun to be of especial request in England, by reason of the purity thereof, and was called *easterling money*, as all the inhabitants of those parts were called *easterlings*; some of whom, skilled in coinage, were soon after, viz. in the reign of king John, sent for over to perfect the English money, or reduce it to its due fineness, which was thence forwards denominated from them, *sterling*, for *easterling*, or *esterling*: not, says Camden, from Striveling in Scotland, nor from *stella*, a *star*, which some dream to have been coined thereon; for in old deeds, the English species are always called *nummi easterlingi*, which implied as much as good and lawful money, &c. Clarke, in his Connexion of the Roman, Saxon, &c. Coins, p. 80. observes, that the Saxon or English pound was called the pound *sterling*, because their ancestors brought it from the most eastern parts of Europe, the shores of the Euxine; and that they called it *libra esterlingorum*, the pound *esterling* or *sterling*, to distinguish it from the Roman pound, which, to preserve the same distinction, was called *libra occidua*, or the western pound. Somner, again, derives the word from the Saxon *steore*, a *rule* or *standard*; intimating, that this, as to weight and fineness, was to be the common standard of all current money.

In Stow, and some other of our ancient writers, *sterling*, or *easterling*, is also used for a certain coin, in value amounting nearly to our silver penny; and on some occasions we find the same word *sterling* used in the general for a piece of money, it being observable, that for a good while together, there was no other coin but pennies, with which *sterlings* or *easterlings* were become synonymous: much as, among the ancients, the words *denarius* and *nummus* were used.

STERN *of a ship*, denotes her posterior face; or that part which is presented to the view of a spectator, placed on the continuation of the keel behind. It is terminated above by the *taffarel*, and below by the *counters*: it is limited on the sides by the quarter-pieces; and the intermediate space comprehends the galleries and windows of the different cabins.

STERN, among *Hunters*, is the tail of a wolf, or a grey-hound.

STERN *chase*. See CHASE.

STERN-*fast*, aboard a *Ship*, some fastenings of ropes, &c. behind the *stern* of a ship, to which a cable or hawser may be brought, or fixed, in order to hold her *stern* to a wharf, &c.

STERN-*most*, in *Sea Language*, usually denotes that part of a fleet of ships which is in the rear, or farthest *a-stern*, as opposed to *head-most*.

STERN-*post*, in a *Ship*, a great timber let into the keel at the *stern* of a ship, somewhat sloping, into which are fastened the after-planks; and on this post, by its pintle and gudgeons, hangs the rudder.

It is usually marked like the STEM, with a scale of feet from the keel upwards, in order to ascertain the draught of water at that part of the vessel. The difficulty of procuring a *stern-post* of sufficient breadth in one piece has introduced the practice of fixing an additional piece behind it, which is strongly bolted to the former. The hinges, which support the rudder, are accordingly fixed to this latter, which is also tenanted into the keel, and denominated the back of the post. It is half the breadth of the *stern-post* at the keel, but diminishes gradually towards the upper end, where it is one third narrower. The *stern-post* is strongly attached to the keel by a knee, of which one branch extends along the keel, being scarfed and bolted to the dead wood, and fore-locked under the keel; whilst the other branch inclines upwards, and corresponds with the inside, or fore-part of the *stern-post*, to which it is also bolted in the same manner. Falconer.

STERN-*sheets*, that part of a boat which is contained between the *stern* and the aftmost or hindmost seat of the rowers. It is generally furnished with benches to accommodate the passengers. Falconer.

STERN-*way*, in *Sea Language*, the movement by which a ship retreats, or falls backward, with her *stern* foremost.

STERN-*way*, *to make*. See MAKE.

STERNA, *tern*, in *Ornithology*, a genus of the order of *anseres*, in the Linnæan system. Its characters are, that the bill is toothless, subulated, straight, acute, and a little compressed on the sides; the nostrils are linear, and situated at the base of the bill; to which we may add from Pennant, that the tongue is slender and sharp, the wings very long, the tail forked, and that the birds of this genus have a small back toe. Linnæus enumerates seven species, some of wihch are referred by other writers to the genus of GULL. Of these there are the SCARE-*crow*, the greater and lesser *sea*-SWALLOW, PASSER *stultus*, black and brown TERN, &c.

STERNOCOSTALES, commonly called the *musculi triangulares sterni*, in *Anatomy*, are five pairs of fleshy planes, disposed more or less obliquely on each side the sternum, on the insides of the cartilages of the second, third, fourth, fifth, and sixth true ribs. They are inserted by one extremity in the edges of the inside of all the lower half of the sternum; from thence the first muscle on each side runs up obliquely, and is fixed in the cartilage of the second rib. The second runs less obliquely to its insertion in the cartilage of the third rib; and the rest are inserted, in the same manner, in the cartilages of the following ribs; their obliquity decreasing, and their length increasing, in proportion as they are situated lower down, so that the lowest of all is almost transverse. This last muscle, which is fixed by one extremity in the cartilage of the sixth true rib near the bone, seems to pass the appendix ensiformis, immediately above the insertion of the diaphragm in that appendix, and to join the muscle on the other side.

The use of these muscles appears from their insertions and direction to be for depressing the cartilaginous portions and anterior extremities of the ribs, especially the superior ribs, except the first; and, at the same time, for drawing the cartilages of the inferior ribs near the sternum, by reason of the curvature. They may, therefore, very well be called *depressores costarum*, as the *supra costales* are named *levatores*. The SUBCOSTALES, having the superior extremities of their fibres much more distant from the vertebral articulation of the ribs than the lower extremities, can more easily move the upper than the lower ribs; and consequently they are assistants to the *sterno-costales*.

The *sternocostalis* was called by some of the older anatomists *sextus thoracis*; and by Riolanus, and some others of the later writers, PECTORALIS *internus*.

STERNODACTYLÆUS, in *Anatomy*, a name given by Riolanus, and some others, to a muscle of the foot, called by Albinus the *flexor brevis digitorum pedis*, and by others the *sublimis flexor*, or PERFORATUS *pedis*.

STERNOHYOIDEUS, in *Anatomy*, is a long, thin, flat muscle, broader at the lower than at the upper part, and is situated, together with its fellow, on the foreside of the throat; from whence some have improperly named it *musculus bronchialis*. It is fixed by its lower extremity in the superior and lateral part of the inner, or posterior side of the sternum, in the posterior part of the sternal extremity of the clavicula, in the transverse ligament which connects those two bones, and in the inner, or backside of the cartilage of the first rib. All these other insertions are more considerable than that in the sternum, which is sometimes scarce perceivable. From hence it runs up to the foreside of the aspera arteria, joined to its fellow by a membrane which forms a sort of linea alba, and is inserted laterally in the lower edge of the basis of the os hyoides. There is sometimes a transverse tendinous line about the middle of the backside of this muscle. The *sterno-hyoidæi* draw the os hyoides directly

downward, and serve to counterbalance the different motions of the *stylo-hyoidæi*, *omo-hyoidæi*, and *genio-hyoidæi*. Winslow. See *Tab. Anat. (Myol.) fig.* 2. *n.* 7, 8.

STERNOMANTIS, Στερνομαντις, in *Antiquity*, a designation given to the Delphian priestess, more usually called Pythia.

Sternomantis is also used for any one that had a prophesying demon within him.

STERNOMASTOIDÆUS, in *Anatomy*, a muscle, called also simply *mastoidæus*, and *mastoidæus anterior*, or *externus*. It is long and narrow, pretty thick, and mostly fleshy, and is situated obliquely between the back part of the ear, and the lower part of the throat. It is in a manner composed of two muscles, united at the upper part through their whole breadth, and separated at the lower. It has two insertions below both of them, flat, and a little tendinous; the first is in the upper edge of the sternum, near the articulation of the clavicula; and the other in the clavicula, at a small distance from the sternum. These two portions run up obliquely, and unite together at about an inch above their lower insertions, the triangular space left between them being filled by a membrane. The sternal portion passes foremost, and covers the clavicular, both forming one body, or belly, which running in the same oblique direction to the apophysis mastoidæus, is inserted in the upper and back part of that process, over which it likewise sends off a very broad aponeurosis, which covers the splenius, and is inserted in the os occipitis. The two anterior mastoidæi represent a great Roman V, the angle being at the lower part of the throat, and the two crura running up behind the ears.

The action of these muscles is different, according as either both or only one of them acts, and according to the different situation of the head and trunk. When we keep the head and trunk straight, whether in standing or sitting, both muscles preserve the head in that posture against any force by which it would otherwise be moved backward. One of these muscles, acting alone, may have the same use, if the force to push the head back be applied between the anterior and lateral parts of it. In that case the *sternomastoidæus* on the same side, would oppose this force; but if it were applied directly on the side of the head, that opposition would have no effect, without the assistance of the splenius on the same side. They both serve likewise to perform the rotations of the head, and also to bring the head near the thorax when we lie on the back, or bend backward in sitting; and the lower the head is in these situations, the greater force must these muscles exert to raise it; and in great efforts they are aided by the musculi recti of the abdomen. Winslow.

STERNOTHYROIDEUS, in *Anatomy*, a pair of muscles of the larynx; arising in the sternum, or breast-bone, and terminating in the cartilago thyroides.

They are covered by the *sterno-hyoidæi*, and they cover the thyroide glands. Each muscle is fixed by its lower extremity, partly in the superior portion of the inner or backside of the sternum, partly in the ligament and neighbouring portion of the clavicula, and partly in the cartilaginous portion of the first rib. Sometimes it runs a great way down on the first bone of the sternum, and crosses the muscle on the other side. From thence it runs up on the aspera arteria, close by its fellow, passes before the thyroide glands, over the cricoide cartilage, and is inserted by its upper extremity in the lower part of the lateral side of the thyroide cartilage, and partly along that whole side. Winslow observes, that he has found this muscle double, one distinct portion of it being inserted in the basis, and the other laterally. The *sterno-thyroidæi* serve in general to pull down the thyroide cartilage, and the whole larynx along with it. They may likewise assist the sterno-*hyoidæi* in their actions, and compress the thyroide gland. Winslow.

STERNUM, Στερνον, in *Anatomy*, the breast-bone, a cartilaginous sort of bone, which makes the fore-part of the breast, and into which the ribs are fitted. See *Tab. Anat. (Osteol.) fig.* 3. *n.* 11.

This is a long flat bone, not all of the same breadth, but representing a kind of dagger. It is generally made up of three principal pieces; the first broad and short, the second longer and narrower, and the third a sort of small appendix, called by the Greeks *xyphoides*, from its resemblance to the point of a broad sword.

The first, or uppermost piece, is broad and thick at the top, but thinner and narrower below, being nearly of the figure of a triangle with the three angles cut off, or of an irregular square. The second is much longer than the first, and is flat on both sides, whereas the outside of the upper is unequally convex, and the inner a little concave. This is broader also toward the lower, than toward the upper part, and has sometimes several transverse lines, especially on its outside, which point out the places where the pieces, of which it is made up in children, are joined together. The two lateral edges of this bone have each one cartilaginous half notch, and five cartilaginous whole notches; the half notches are at the upper part of the lateral edges, and the five entire notches come nearer to each other, in proportion as they are lower, and part of the last properly belongs to the third piece.

The third piece, commonly called *cartilago ensiformis*, and *xyphoides*, is entirely cartilaginous in infants, and young subjects, but in an advanced age it generally ossifies, either wholly, or in part. This piece is joined to the lower extremity of the second, between the cartilages of the last true ribs, and is often more or less notched on each side, to form part of the articular notches of the *sternum*. Its figure and size vary, and in some subjects it is forked, and in others perforated. Sometimes also it is very large, and at others very small, hardly exceeding in some subjects the third part of an inch. The inner substance of the *sternum* is almost all cellulous, and very tender; it is covered with a thin, but compact lamina.

The *sternum* completes the fore-part of the cavity of the thorax, and sustains the anterior extremities of the ribs; being sufficiently fixed to resist compressions, and other outward accidents, and yet moveable enough, by means of its articulation with the cartilages of the ribs, not to obstruct the motions necessary to respiration. It serves also for the insertion of several muscles, and to support the mediastinum. Winslow.

We owe to Mr. Hunauld a very judicious account of the perforation which is sometimes found in the lower part of the *sternum*.

This perforation is sometimes larger, sometimes smaller; and a certain German author has found a very singular use for it, supposing that it gives passage to the mamillary veins and arteries; but Mr Hunauld, though he had often found the *sternum* thus perforated, never could observe any vessels passing it, but always found it filled up with a cartilaginous substance. The German author does not positively affirm that he saw the vessels passing through this perforation, and Mr. Hunauld supposes it to have been but a conjecture, that this might be its use. Its origin and formation, however, may be more rationally accounted for on much sounder principles.

The *sternum* is in its first state wholly cartilaginous, and the ossification begins afterwards in several different parts of it; the number of these ossifying spots is wholly uncertain, but as they increase they unite, sooner or later, into three pieces, and afterwards these three pieces unite themselves, so as to form only one. If therefore, when these different ossifications begin to unite, there be some place where the ossification has been impeded, this place, or spot, must remain only of a cartilaginous substance, and in making the skeleton, this cartilage will be separated from the bones, and will consequently leave a perforation in the *sternum*; and what makes this the more probable, is, that this perforation, which is so commonly seen in skeletons, is never found in dissecting the recent body. It may also have happened, that the three pieces of bone, which constitute the *sternum*, by uniting at their edges, may, in acquiring their growth and solidity, have naturally left a vacancy between them. We never find a perforation of this kind in the upper part of the *sternum*, which is probably owing to that part of it being only one piece in the earlier times, and not ossifying in different places and spots at the same time; as is always the case in regard to this lower part of the *sternum*, where the perforation is always found. Mem. Acad. Par. 1740.

Sternum, *cartilages of the*. The *sternum* of an adult subject has commonly sixteen cartilages; fourteen of the number are articular, the other two are symphyses. Of the former, two belong to the articulations of the clavicle, and twelve to those of the true ribs, from the second to the seventh inclusively; and the two symphyses are both between the *sternum*, and the first rib on each side. There is likewise another symphysis, by which the upper portion of the *sternum* is connected to the lower; but the cartilage of this is often obliterated in advanced age. The apophysis ensiformis is often bony toward the *sternum*, and more or less cartilaginous toward the other end. This has, in very aged persons, been sometimes found entirely ossified, and sometimes wholly cartilaginous even in adults. Winslow.

Sternum, *ligaments of the*. The *sternum* has several ligaments, by which it is connected with the clavicles and ribs. It is joined to the clavicles by strong short ligaments, fixed by one extremity round the edges of its two superior notches, and by the other in the extremity of each clavicle, and by the middle to the inter-articular cartilages, surrounding the particular ligaments which

go

go between the edges of theſe cartilages and the *ſternum*; and the capſular ligaments between them and the clavicles. Winſlow.

Sternum *fractured*. The *ſternum* is equally ſubject to depreſſions and fractures, from falls and blows, with the reſt of the bones. When either of theſe accidents happen to it, the part is not only uneven and painful, but the ſubjacent arteries and veins are alſo contuſed and ruptured; whence ariſe pains in the breaſt, difficulty of breathing, violent coughs, ſpitting of blood, or elſe extravaſations of it in the præcordia, or between the duplicatures of the mediaſtinum, with many bad ſymptoms of the like nature. The ſigns of a *fractured ſternum* will therefore be very evident by theſe, and by its being moveable to the touch, eſpecially when one part of it grates againſt another, and when there are a cavity and inequality very remarkably viſible there.

In order to reduce a fracture of this bone, the patient muſt be laid on his back on a bed, or hard even place, as a table, putting a hard pillow, a large parcel of cloth rolled up, or ſome other ſuch body, under his back, and preſſing down his ſhoulders, by which means the *fractured ſternum* will be elevated and extended; and to facilitate the reduction, the ſurgeon muſt preſs the bones of the *ſternum* together, and ſhake them very ſtrongly. But when this method is impracticable, or not proper, the ſkin muſt be divided, and the depreſſed part of the *ſternum* lifted up into its place, by means of an elevator, or elſe of a ſcrew gently wormed into the part, and afterwards pulled upwards; and when it has regained its natural ſituation, it muſt be kept in it by the proper bandages. If after the reduction violent pains continue under the *ſternum*, and if blood ſhould gather, and ſuppurate internally, between the duplicature of the mediaſtinum, the lower part of the *ſternum* ought to be trepanned, as the cranium on the like occaſions; and when the putrid matter is diſcharged, and the wound cleanſed, it muſt be healed with vulnerary balſams; and if any blood ſhould be found diſcharged into the cavity of the thorax, the cure muſt entirely depend on the evacuating that by the paracenteſis, in the manner of wounds of the thorax. Heiſter.

STERNUTATION. See Sneezing.

STERNUTATIVE, or Sternutatory, a medicine proper to produce ſneezing.

Sternutatives, alſo called *ptarmics*, are of two kinds, *gentle* and *violent*. Of the firſt kind are betony, ſage, marjoram, tobacco, and the whole faſhionable tribe of ſnuffs. Of the latter kind are euphorbium, white hellebore, pellitory, &c.

Sternutatives operate by their ſharp pungent parts vellicating the inner membrane of the noſe, which is exceedingly ſenſible, and occaſioning the ſerous matter contained in the glands of the noſe, and in ſeveral ſinuſes ſituate in the baſe of the cranium, and the os frontis, to be expelled.

STEW, a ſmall kind of fiſh-pond, the peculiar office whereof is to maintain fiſh, and keep them in readineſs for the daily uſes of the family, &c.

The fiſh bred in the large ponds are drawn out, and put in here. For two large ponds of three or four acres apiece, it is adviſeable to have four *ſtews*, each two rods wide, and three long. The *ſtews* are uſually in gardens, or at leaſt near the houſe, to be more handy, and the better looked to.

The method of making them is, to carry the bottom in a continual decline from one end, with a mouth to favour the drawing with a net. See Fish-*ponds*.

Stews, or Stues, were alſo places anciently permitted in England, to women of profeſſed incontinency, for the proffer of their bodies to all comers. Theſe were under particular rules and laws of diſcipline, appointed by the lord of the manor.

The word is probably borrowed from the French, *eſtuves*, hot baths, in regard proſtitutes are wont to prepare themſelves for venereal acts by bathing.

STEWARD, or Seneschal, an officer, whereof there are various kinds; thus called from the Saxon *ſteda*, *ſtead*, *place*, or *room*; and *ward*, *keeper*, q. d. a deputy, or perſon appointed in the place of another. See Seneschal.

Steward *of Great Britain*, *lord high*, is the firſt and higheſt officer of the crown; as having the power of what we call a *vice-roy*, the Danes, &c. *ſtadtholder*, and the Swedes, *reichs droſſet*, q. d. *vice rex*. Chamberlayne.

Common lawyers call him *magnus Angliæ ſeneſchallus*. His office, as expreſſed in an ancient record, is to ſuperviſe and regulate the whole kingdom, both in time of peace and war, immediately under the king, and after him; an authority ſo very great, that it has not been judged ſafe to truſt it any longer in the hands of any ſubject. The office was hereditary and permanent in the family of the dukes of Lancaſter, till the time of Henry IV. ſince whom it has only been made *pro hac vice*, occaſionally: as to officiate at a coronation; at the arraignment and trial of ſome nobleman for treaſon, or other great crime. And it hath been the conſtant practice (and therefore ſeems now to have become neceſſary) to grant it to a lord of parliament, elſe he is incapable of trying ſuch delinquent peer.

During his *ſtewardſhip* he bears a white ſtaff in his hand, and the trial, &c. ended, he breaks his ſtaff, and with it his commiſſion expires.

The court of the lord-high *ſteward* is a court inſtituted for the trial of peers indicted for treaſon or felony, or for miſpriſion of either. When ſuch an indictment is found by a grand jury of freeholders in the King's Bench, or at the aſſizes before the juſtices of oyer and terminer, it is to be removed by a writ of certiorari into the court of the lord-high *ſteward*, which only has power to determine it. A peer may plead a pardon before the court of King's Bench, and the judge have power to allow it, in order to prevent the trouble of appointing a *high-ſteward*, merely for the purpoſe of receiving ſuch plea. But he may not plead, in that inferior court, any other plea, as guilty or not guilty of the indictment, but only in this court; becauſe, in conſequence of ſuch plea, it is poſſible that judgment of death might be awarded againſt him. The king, therefore, in caſe a peer be indicted of treaſon, felony, or miſpriſion, creates a *lord-high ſteward pro hac vice*, by commiſſion under the great ſeal, which recites the indictment ſo found, and gives his grace power to receive and try it *ſecundum legem et conſuetudinem Angliæ*. Then, when the indictment is regularly removed by writ of certiorari, commanding the inferior court to certify it up to him, the *lord high-ſteward* directs a precept to a ſerjeant at arms, to ſummon the lords to attend and try the indicted peer. This precept was formerly iſſued to ſummon only eighteen or twenty, ſelected from the body of the peers; then the number came to be indefinite, and the cuſtom was, for the *lord high-ſteward* to ſummon as many as he thought proper (but of late years not leſs than twenty-three), and that thoſe lords only ſhould ſit upon the trial; which threw a monſtrous weight of power into the hands of the crown, and this its great officer, of ſelecting only ſuch peers as the then predominant party ſhould moſt approve of. But now, by ſtat. 7 W. III. cap. 3. upon all trials of peers for treaſon or miſpriſion, all the peers (the lords ſpiritual excepted) who have a right to ſit and vote in parliament, ſhall be ſummoned, at leaſt twenty days before ſuch trial, to appear and vote therein; and every lord appearing ſhall vote in the trial of ſuch peer, firſt taking the oaths of allegiance and ſupremacy, and ſubſcribing the declaration againſt popery.

During the ſeſſion of parliament, the trial of an indicted peer is not properly in the court of the *lord high-ſteward*, but before the court of our lord the king in parliament. In this caſe, however, a *lord high-ſteward* is always appointed to regulate and add weight to the proceedings; but he is rather in the nature of a ſpeaker *pro tempore*, or chairman of the court, than the judge of it; for the collective body of the peers are therein the judges both of law and fact, and the *high-ſteward* has a vote with the reſt, in right of his peerage. But in the court of the *lord high-ſteward*, which is held in the receſs of parliament, he is the ſole judge in matters of law, as the lord's triers are in matters of fact; and as they may not interfere with him in regulating the proceedings of the court, ſo he has no right to intermix with them in giving any vote upon the trial. Blackſt. Com. book iv. p. 260.

Steward *of the houſhold*, *lord*, is an officer to whom the ſtate of the king's houſe is committed, to be ruled and guided at his diſcretion. See Houshold and Lord *Steward*.

The court of *lord-ſteward*, treaſurer, or comptroller of the king's houſhold was inſtituted by ſtat. 3 Hen. VII. cap. 14. to enquire of felony by any of the king's ſworn ſervants, in the cheque-roll of the houſhold, under the degree of a lord, in confederating, compaſſing, conſpiring, and imagining the death or deſtruction of the king, or any lord, or other of his majeſty's privy council, or the *lord ſteward*, treaſurer, or comptroller of the king's houſe. The enquiry and trial thereupon muſt be by a jury according to the courſe of the common law, conſiſting of twelve ſad men (i. e. ſober and diſcreet perſons) of the king's houſhold.

There is another court of the *lord ſteward* of the king's houſhold, or (in his abſence) of the treaſurer, comptroller, and *ſteward* of the Marſhalſea, that was erected by ſtat. 33 Hen. VIII. cap. 12. with a juriſdiction to enquire of and determine all treaſons, miſpriſions of treaſon, murders, manſlaughters, bloodſhed, and other malicious

cious ſtrikings, whereby blood ſhall be ſhed in any of the palaces and houſes of the king, or in any other houſe where the royal perſon ſhall abide. The proceedings are alſo by jury, both a grand and a petit one, as at common law, taken out of the officers and ſworn ſervants of the king's houſhold. Blackſt. Com. book iv. p. 273. See *Marſhalſea* COURT and *Palace* COURT.

STEWARD *of the univerſities, lord-high.* See UNIVERSITY.

STEWARD *of a ſhip of war,* an officer appointed by the purſer to diſtribute the different kinds of proviſions to the officers and crew; for which purpoſe he is furniſhed with a mate and proper aſſiſtants.

He hath an apartment for himſelf in the hold, which is called the *ſteward's-room.* See *Tab. Ship. fig.* 2. *lit.* Y.

STEWARTIA, in *Botany,* a genus of the *monadelphia polyandria* claſs. Its characters are theſe: the flower has a permanent empalement, cut into five oval concave ſegments; it has five large oval petals, which ſpread open, and a great number of ſlender ſtamina, joined in a cylinder at bottom; theſe are ſhorter than the petals, to which they are connected at their baſe, terminated by proſtrate roundiſh ſummits, with a roundiſh hairy germen, ſupporting five ſtyles the length of the ſtamina, crowned by obtuſe ſtigmas; the germen afterwards turns to a five-cornered capſule, with five cells, opening with five valves, whoſe cells are cloſed, each containing one oval compreſſed ſeed.

We have but one ſpecies of this genus, which is a ſhrub growing naturally in Virginia.

STHENIA, Σθενια, in *Antiquity,* a feſtival of Argos, ſuppoſed to be kept in honour of Minerva, ſurnamed Σθενιας, from σθενος, *ſtrength.*

STIÆ, a word uſed by ſome of the old authors for pebbles found on the ſea-ſhore.

STIBADIUM, among the *Romans,* a low kind of table-couch, or bed of a circular form, which ſucceeded to the triclinia, and was of different ſizes, according to the number of gueſts they were deſigned for. They were called *hexaclina, octaclina,* or *enneaclina,* according as they held ſix, eight, or nine gueſts, and ſo of any other number.

STIBIALIA, a term uſed by ſome to expreſs the antimonial medicines.

STIBINUS *color,* a term uſed by St. Jerom, and others, to expreſs the falſe black colour which the ancient Jews, and other eaſtern people, gave to their eye-brows with *ſtibium,* or antimony.

STIBIUM. See ANTIMONY.

STIBIUM *ceratum.* See VITRUM *antimonii ceratum.*

STICA, a name given by ſome authors to all external aſtringents uſed in hæmorrhages.

STICA, in *our Old Writers,* a braſs Saxon coin, of the value of half a farthing, four of them making an helſing. Blount.

STICHOMANTIA, ϛιχομαντεια, in *Antiquity,* a ſort of divination by verſes (commonly thoſe of the Sibylline oracles), which being wrote on little pieces of paper, and thrown into a veſſel, the firſt drawn out was ſuppoſed to contain the will of the gods. See SORTES.

STICHOMETRY, formed of ϛιχος, *verſe,* and μετρω, *I meaſure,* in *Scripture Hiſtory,* a catalogue of books of ſacred Scripture, to which is added the number of the verſes which each book contains.

STICHOS, a name given by the old writers to a pectoral confection, the principal ingredient of which was the herb *marrubium,* or horehound.

STICKADORE, in *Botany.* See CASSIDONY.

STICKLEBACK, in *Ichthyology,* a name given by us to that ſmall fiſh called by authors by the ſeveral names of *ſpinachia, ſpinax,* and *pungitius piſcis*; as alſo *piſciculus aſper, piſciculus aculeatus,* and the like; and finally, by Artedi, by the much more expreſſive name of *gaſteroſteus,* expreſſing that great ſingularity it has in the bony ſtructure of its belly.

The common *ſtickleback,* or GASTEROSTEUS *aculeatus* of Linnæus, is diſtinguiſhed by Artedi by the name of the *gaſteroſteus* with three ſpines on the back; and by this character it differs from the other ſpecies of this genus.

It is a very well known fiſh, and is found every where in new dug ditches, &c. where no body can perceive how it comes. Hence the vulgar have an opinion, that it breeds there equivocally and of itſelf, without the help of parents of its own kind, and that from it all other fiſhes are bred.

Theſe are idle opinions; the ſmalleſt animalcule is not produced in putrid matter otherwiſe than by the egg of a parent animal; this origin will, therefore, hardly be believed of larger, and, as they are called, more perfect animals. Theſe ſmall fiſh are ſo far from peopling ponds with other fiſh, that they are very great devourers of the ſpawn of larger fiſh, and do infinite miſchief in ponds.

This ſpecies ſeldom reaches the length of two inches; the eyes are large; the belly prominent; the body near the tail ſquare; the ſides are covered with large bony plates, placed tranſverſely. On the back are three ſharp ſpines, that can be raiſed or depreſſed at pleaſure; the dorſal fin is placed near the tail; the pectoral fins are broad; the ventral fins conſiſt each of one ſpine, or plate, of unequal lengths; between both is a flat bony plate, reaching almoſt to the vent; beneath the vent is a ſhort ſpine, and then ſucceeds the anal fin. The tail conſiſts of twelve rays, and is even at the end: the colour of the back and ſides is an olive green; the belly white; but in ſome the lower jaws and belly are of a bright crimſon.

Theſe are found no where in ſuch great quantities as in the fens of Lincolnſhire, and ſome of the rivers flowing from them. At Spalding there are, once in ſeven or eight years, amazing ſhoals that appear in the Welland, and come up the river in the form of a vaſt column. Theſe are ſuppoſed to be the multitudes that have been waſhed out of the fens by the floods of ſeveral years, and collected in ſome deep hole, till overcharged with numbers, they are periodically obliged to attempt a change of place. The quantity is ſo great, that they are uſed to manure the land, and trials have been made to get oil from them. See Phil. Tranſ. N° 223.

The *leſſer ſtickleback,* or *gaſteroſteus pungitius* of Linnæus, is much ſmaller than the former, and of a more ſlender make. The back is armed with ten ſhort ſharp ſpines, which croſs each other; the ſides are ſmooth, not plated like thoſe of the former, which in other particulars it reſembles: the colour of the back is olive, and the belly ſilvery.

The *fifteen-ſpined ſtickleback,* or *gaſteroſteus ſpinachia* of Linnæus, is about ſix inches long; the noſe is long and ſlender; the mouth tubular and the teeth ſmall: the fore part of the body is covered on each ſide with a row of bony plates, forming a ridge; the body afterwards becomes very ſlender, and is quadrangular: between the head and the dorſal fins are fifteen ſmall ſpines; the dorſal fin is placed oppoſite the anal fin; the ventral fins are wanting; the tail is even at the end; the colour of the upper part is a deep brown, and the belly white. This ſpecies inhabits the ſea, and is never found in freſh water. Pennant.

STICKS, *foot,* in *Printing,* ſlips of wood that lie between the foot of the page and the chaſe, to which they are wedged faſt by the quoins, to keep the form firm, in conjunction with the *ſide-ſticks,* which are placed at the ſide of the page, and fixed in the ſame manner by means of quoins. See REGLET.

STICKLER, in *our Old Writers,* an inferior officer, who cuts wood within the king's parks of Clarendon.

STICK *of eels,* a quantity or meaſure of twenty-five. A bind of eels contains ten *ſticks,* and each *ſtick* twenty-five eels. Stat. Weights and Meaſures.

STIFFLE, or *great muſcle,* in the *Manege,* is the part of the hind leg of a horſe which advances towards his belly. This is a moſt dangerous part to receive a blow upon.

STIFT, in *Etching.* See ETCHING.

STIGMA, among *Botaniſts,* is the ſummit of the PISTIL, covered with a moiſture for the breaking of the pollen.

STIGMATA, in *Natural Hiſtory,* the apertures in different parts of the bodies of inſects communicating with the tracheæ, or air-veſſels, and ſerving for the office of reſpiration.

Nature has given to theſe minute animals a much larger number of tracheæ and bronchia, than to us. We have the ramifications of the trachea reaching no farther than into the breaſt, whereas, in the bodies of theſe inſects, we find them extended through the whole, and finely and admirably interlaced with one another. We have but one mouth to reſpire by; and the organization of the parts, inſervient to reſpiration, is very admirable in us; but in the inſect claſs, the mouths or openings to breathe at, are much more numerous, and the organization much more complex.

All the two-winged and four-winged flies, which have a ſingle or undivided corcelet, to which their legs are all fixed, have alſo four *ſtigmata* in that corcelet, two on each ſide. They have them alſo on the rings of their body, but thoſe on the corcelet are the moſt conſiderable.

Of the four on the corcelet, the two anterior ones are uſually the largeſt. The beſt way to find them, in the generality of flies, is to examine them firſt in the larger ſpecies of the libellæ, where they are very diſtinct and plain, and after their ſituation is well known in that ſpecies, they will be much the more readily found in the reſt.

These *ſtigmata* of the corcelet, as well the anterior, as the poſterior, are oblong, and placed obliquely to the length of the body; that end of them next the head is more elevated than the other, and their ſize is ſufficiently large to render them viſible, eſpecially the firſt pair. Each of theſe ſeems not a little to reſemble a ſea-muſcle with its ſhells a little open, or is ſomewhat like the opening of an eye. It is alſo ſurrounded by two eye-lids, proportionably thick; and beſide theſe, which make its outer circumference, one may diſcover two others within, which are bordered with hairs, and which, when cloſed, often quite ſhut up the opening.

The colour of the *ſtigmata* often is ſome help alſo to us for the diſcovering them; they are very frequently different in colour from the corcelet; ſome are yellowiſh, others of a coffee colour, or ſome degree of a fallow colour, in flies whoſe corcelet is brown, or black, or bluiſh.

Flies have, beſides theſe, ſeveral *ſtigmata* alſo in the rings of their bodies, perhaps in every one of them, though commonly thoſe in the two or three firſt are only to be diſtinguiſhed; theſe are not like thoſe of the corcelet, but are round, uſually a little eminent above the reſt of the ſurface, and reſembling pins heads; they are not eaſily diſcovered, becauſe they are not only ſmall, but uſually hid by the folds, or commiſſures of the rings. They are uſually two on each ring, placed on the two oppoſite ſides, and partly under the belly. Reaumur, Hiſt. Inſ. vol. iv. p. 248.

Malpighi firſt diſcovered, that thoſe eighteen openings, which are placed nine on each ſide of the caterpillar, and which are called by the name of *ſtigmata*, ſerve to give reſpiration to this claſs of animals. M. Reaumur repeated his experiments, and made ſeveral new ones; and he concluded that theſe apertures ſerved only for the inſpiration of the air, which the caterpillar afterwards expired through the whole ſuperficies of its body, becauſe he could never obſerve that any bubbles of air were ever driven out of theſe *ſtigmata*: but Mr. Bonnet, on the contrary, having ſeen bubbles of air coming out of theſe openings, was led to infer that the inſpired air was alſo reſpired or diſcharged through theſe ſame orifices; and he is of opinion that no part of it is expired through the pores of the body. From ſeveral experiments he alſo inferred, that of the eighteen *ſtigmata* with which the caterpillar is furniſhed, the two anterior and the two poſterior ones are of greater uſe for reſpiration than any of the others. Phil. Tranſ. vol. xlv. p. 300, &c.

Stigmata, in *Antiquity*, certain marks impreſſed on the left ſhoulder of the ſoldiers when liſted. See Stigmatizing.

Stigmata were alſo a kind of notes, or abbreviations, conſiſting only of points, diſpoſed various ways; as in triangles, ſquares, croſſes, &c.

Stigmata is alſo a term introduced by the Franciſcans, to expreſs the marks, or prints, of our Saviour's wounds, ſaid to have been miraculouſly impreſſed by him on the body of their ſeraphic father, St. Francis.

A ſolemn feaſt was hereupon appointed to be annually celebrated in memory of the miracle, called *the Feaſt of the* ſtigmata *of St. Francis*; and a peculiar maſs or office was compoſed for the ſame.

An archi-confraternity was erected on the ſame occaſion, by Frid. Pizzi, a Roman ſurgeon, in the year 1594.

STIGMATICI, among the Romans, were ſervants marked in the face for ſome crime.

STIGMATIZING, among the *Ancients*, was inflicted upon ſlaves as a puniſhment, but more frequently as a mark to know them by; in which caſe it was done by applying a red-hot iron, marked with certain letters, forming the name or ſome peculiar character belonging to their maſters, to their foreheads till a fair impreſſion was made, and then pouring ink into the furrows, that the inſcription might be the more conſpicuous.

Soldiers were branded in the hand with the name or character of their general.

After the ſame manner it was cuſtomary to *ſtigmatize* the worſhippers and votaries of ſome of the gods. The marks uſed on theſe occaſions were various; ſometimes they contained the name of the god, ſometimes his particular enſign, as the thunderbolt of Jupiter, the trident of Neptune, the ivy of Bacchus, &c. or they marked themſelves with ſome myſtical number, whereby the god's name was deſcribed. To theſe three ways of *ſtigmatizing* St. John is ſuppoſed to refer. Rev. chap. xiii. ver. 16, 17.

Theodoret is of opinion, that the Jews were forbidden to brand themſelves with *ſtigmata*, becauſe the idolaters, by that ceremony, uſed to conſecrate themſelves to their falſe gods.

Among ſome nations, *ſtigmatizing* was conſidered as a diſtinguiſhing mark of honour and nobility. In Thrace, as Herodotus tells us (lib. v.) it was practiſed by none but perſons of credit, nor omitted by any but perſons of the meaneſt rank.

The ancient Britons are alſo ſaid to have imprinted on the bodies of their infants the figures of animals, and other marks, with hot irons. Potter Arch. Græc. tom. i. p. 64, &c.

STIL *de grain*, in the *Colour Trade*, the name of a compoſition uſed for painting in oil or water, and is made of a decoction of the lycium, or Avignon berry, in alum-water, which is mixed with whiting into a paſte, and formed into twiſted ſticks. It ought to be choſen of a fine gold yellow, very fine, tender, and friable, and free from dirt.

STILAGO, in *Botany*, a genus of the *gynandria triandria* claſs. Its characters are, that it is monogynous, has a ſingle-leaved calyx, no corolla, and a globoſe berry. There is one ſpecies.

STILE, and Stilus. See Style.

STILES, in *Carpentry*, denote the upright pieces which go from the bottom to the top in any wainſcot, or the like.

STILL, is the name of an apparatus uſed in distillation. Thus, in caſes where it is neceſſary to put to diſtillation a great quantity of materials, and where the vapour is ſo copious as would require a receiver of immenſe bigneſs to contain it, a particular contrivance is made uſe of to condenſe the vapour in its paſſage. For this end the vapour is let paſs through a contorted pipe, or worm, lodged in a veſſel filled with cold water, by the coldneſs of which, what enters the worm in vapour runs out condenſed into a ſtream of liquor. The veſſel here uſed to hold the matter to be diſtilled is uſually made of copper, which being well tinned within, is ſufficiently ſecured from giving any tinge to thoſe kinds of ſubſtances for which this veſſel is made uſe of. This veſſel is commonly called a copper *ſtill*, and the pipe, through which the vapour paſſes, is fixed to a head, which lifts off from the body of the *ſtill*, for the convenience of putting the materials in and taking them out: this head is properly called the alembic. Theſe are the veſſels uſed by the diſtillers in drawing their ſpirits. In ſmall *ſtills* of this kind, a more compendious method is made uſe of for condenſing the vapour, which is by including the head itſelf in a veſſel of water.

There is alſo another method of performing the operations, for which theſe inſtruments are commonly uſed; which is by what is called the cold *ſtill*, becauſe here a much leſs heat is uſed. The material to be diſtilled is laid on a copper or iron plate, firſt covered over an inch thick with ſand or aſhes, or put into a leaden pot ſet upon ſuch a plate. Over this is placed a conical head to receive the aſcending vapour, which by a noſe fixed in this head deſcends into a receiver. The fire muſt be kept very low, that the vapour may riſe ſo ſlowly and ſo cool, as not much to heat the head, which receives it, that it may condenſe without any help, except, perhaps, in ſome caſes by laying a wet cloth upon the head of the *ſtill*. See Alembic, Retort, Worm, &c.

Dr. Lewis has contrived a *ſtill*, adapted to his *portable* furnaces, which is ſufficient for the purpoſes of an experimental laboratory. The body of the *ſtill* is a wide copper pan; and, for diſtillation in a water-bath, another veſſel of the ſame figure is received into it almoſt to the top, the ſpace between them being nearly filled with water. Both theſe veſſels are of the ſame width at the mouth, and either may be uſed as a *ſtill* equally with the other: either of them ſerves alſo, on other occaſions, as an evaporating pan, a boiler for experiments in dying, and other like purpoſes.

All the parts are made of thin copper plate, and well tinned on the inſide with pure tin; in conſequence of their thinneſs, they admit of ſome alteration of their figure about the edges, ſo that though they ſhould not be perfectly round, they are readily accommodated to one another, and fit cloſe: the juncture is eaſily made perfectly tight by applying round it narrow ſlips of moiſtened bladder, which are more convenient than luting, as being readily ſtript off when the operation is finiſhed. A ſhort pewter pipe, with a pewter ſtopper fitted to it, for returning the diſtilled liquor, or pouring freſh liquor occaſionally into the *ſtill*, without the trouble of unluting and ſeparating the veſſels, is ſoldered into the top of the head, which, in theſe kinds of inſtruments, is the moſt convenient place for it. For ſeparating, by diſtillation, ſpirituous from watery liquors, or the rectification of ſpirit of wine, the head is raiſed, by inſerting between it and the breaſt, a thin copper pipe about two feet long. A worm and refrigeratory are neceſſary, as for the common *ſtill*; and a glaſs head is requiſite for ſome uſes, particularly for the diſtillation of vinegar, and ſuch other liquors as would corrode a copper one, and

impregnate themselves with the metal; in which case the use of the metalline worm also is to be avoided, and the glass or stone-ware receiver joined to the pipe of the head. Lewis's Comm. of Arts, p. 9, 10.

STILL-*bottoms*, in the *Distillery*, a name given by the traders to what remains in the *still* after the working the wash into low wines.

These *bottoms* are procured in the greatest quantity from the malt wash, and are of so much value to the distiller in the fattening of hogs, &c. that he often finds them one of the most valuable articles of the business. They might also be put to other uses, such as the affording a large proportion of an acid spirit, an oil, a fuel, and a fixed salt; and with some address, and good management, a vinegar and a tartar. Another very advantageous use of them, is the adding them to the next brewing of the malt for more spirit: the increase of the produce from this is more than could easily be conceived. It also more readily disposes the new wash to ferment, and gives the spirit a vinosity that it cannot have without it; the proportion in this case, can never exceed that of a fifth or sixth part of the whole quantity of liquor employed. The liquor left behind in the *still*, after the rectifying the low wines into proof spirit, is also called by some by the name of *still-bottoms*; but this is little more than mere phlegm, or water impregnated with a few acid, and some oily parts, not worth separating, unless for curiosity. The liquor left in the *still*, after the rectifying the proof spirit into alcohol, is also of the same kind.

The *bottoms* of melasses spirits seem calculated for many uses. It is very probable that the vinegar-makers would find their account in trying them, and the strong and lasting yellow colour with which they tinge the hands, may recommend them to the dyers. A small proportion of them added to the new treacle to be fermented, greatly promotes the operation, and increases the quantity of spirit.

The *bottoms* of the wine spirit, that is the remainder after distilling the spirituous part from damaged wines, or wine lees, may be brought to afford Mr. Boyle's acid spirit of wine, and that substance, called by Becher, the *media substantia vini*. A parcel of tartar may also be procured in very great perfection; and the last remainder may be converted into excellent and genuine salt of tartar. The liquor may otherwise be serviceable in making vinegar and white lead. Shaw's Essay on Distillery.

STILL-*house*. The Dutch have much the advantage of us in the structure of their *still-houses*, and have every thing in great readiness and neatness. The general rules in building these houses should be these.

The first caution is to lay the floor aslope, not flat, where any wet work is to be performed; it should also be well flagged with broad stones, so that no wet be detained in the crevices, but all may run off, and be let out at the drains made at the bottom and sides.

The *stills* should be placed abreast on that side of the *still-house* to which the floor has its current. The largest *stills* in Holland, for their greatest works, are never of that monstrous size that we see them of in England, but much more manageable and convenient, as seldom containing more than six or eight hogsheads; and with such *stills*, a single hand will perform much more business than with one of a much larger size. Fronting the *stills*, and adjoining to the back wall, should be a stage for holding the fermenting backs, and these being placed at a proper height, may empty themselves, by means of a cock and a canal, into the *stills*, which are thus charged with very little trouble.

Near this set of fermenting backs should be placed a pump or two, that may readily supply them with water by means of a trunk or canal, leading to each back. Under the pavement, adjoining to the *stills*, should be a kind of cellar, wherein to lodge the receivers, each of which should be furnished with its pump, to raise the low wines into the *still* for rectification; and through this cellar the refuse wash, or *still*-bottoms, should be discharged by means of a hose, or other contrivance. These are the principal things to be regarded in the erecting a *still-house* for the original production of spirits; and if these rules are well observed, malt-spirit will be made with little more trouble than melasses; for by this means the business of brewing and cooling the wash, which, according to the method generally practised in England, takes up so much time and trouble, is entirely saved, fermentation is carried on to a much greater advantage, and the quantity of spirit increased. Shaw's Essay on Distillery.

STILLATITIOUS *oils*, are such as are procured by distillation,—in opposition to those got by infusion, expression, &c.

STILLATORY. See STILL-*house*.

STILLINGIA, in *Botany*, a genus of the *monoecia adelphia* class. The characters are, that it has male and female flowers; the calyx of the male is hemispheric and multiflorous, and the corolla tubulous and erose, or gnawed; the calyx of the female is single-flowered and inferior, the corolla superior, the style trifid, and the capsule consisting of five berries. There is one species.

STILLYARD, STILYARD, or STEELYARD, in *Commerce*. *The company of the* STILLYARD was a community, or corporation of foreign merchants, established at London; thus called from the place where they had their residence, called the *Stillyard*, near London bridge, which was assigned them by act of parliament; and which, in some records, is called *Guilhalda Teutonicorum*; being, as some write, a broad place or yard, where much steel had been used to be sold.

Lambecius thinks, that the name of *Steelyard*, or as he calls it *Staelhof*, is only a contraction of *Stapelhof*, whence comes *stafelhoff*, i. e. a place or general warehouse for keeping merchandize.

This company was created, as some say, in the year 1215, but, according to others, in 1232, under Henry III. in favour of the free cities of Germany, which had been assistant to him in his wars against France.

However, it is said, that foreign merchants, under this appellation, were fixed at London as early as the Norman Conquest, and that their privileges were considerably enlarged by Hen. III. at this time, and also in 1260. King Ed. I. in 1280, granted a charter to the *Steelyard* merchants, and to them it belonged to guard and keep in repair the gate called Bishopsgate, in London. The charter of Edward I. was confirmed by Henry V. in 1413; and in 1463, Edward IV. granted them a new charter, which was renewed in 1466. Their privileges were confirmed by stat. 19 Hen. VII. cap. 23.

It had rendered itself mistress of all the English manufactories, particularly those of cloth, which it was allowed not only to sell throughout the kingdom, but also to transport abroad.

The prejudice these privileges did, and by which the company frequently abused the nation, occasioned their being revoked by Edward VI. in 1552: they were restored by queen Mary in 1554, and soon after revoked. In the year 1578, their ancient immunities were totally and finally abrogated by queen Elizabeth; and in 1597, their house, which in former times had served as a bank for our princes in their exigence, was shut up, and its German inhabitants sent away.

STILOBATUM, in *Architecture*, denotes the body of the PEDESTAL of any column.

STIMULATING, STIMULANS, a property in angular or sharp bodies, whereby they vellicate, and cause vibrations and inflections of the fibres of the nerves, and a greater derivation of nervous fluid into the parts affected.

Stimulants produce pain, heat, redness, &c. They may be reduced to violent penetrating depilatories, gentle sinapisms, vesicatories, and caustics. See SINAPISM, VESICATORY, &c.

STING, *aculeus*, an apparatus in the body of certain insects, in form of a little spear, serving them as a weapon of offence.

The *sting* of a bee, or wasp, is a curious piece of mechanism; it consists of a hollow tube, at the root whereof is a bag full of sharp penetrating juice, which, in stinging, is injected into the flesh through the tube.

Within the tube, Dr. Derham has observed, there lie two small sharp-bearded spears: in the *sting* of a wasp, he told eight beards on the side of each spear, somewhat like the beards of fish-hooks. See *Tab. Nat. Hist. fig.* 16 and 17.

One of these spears in the *sting*, or sheath, lies with its point a little before the other, to be ready, as should seem, to be first darted into the flesh, which once fixed, by means of its foremost beard, the other then strikes in too; and so they alternately pierce deeper and deeper, their beards taking more and more hold in the flesh: after which the sheath or *sting* follows, to convey the poison into the wound, which, that it may pierce the better, is drawn into a point, with a small slit below that point, for the two spears to come out at.

By means of these beards it is, that the animal is forced to leave its *sting* behind it, when disturbed, before it can have time to withdraw the spears into their scabbard. See *Anatomy*, &c. of BEE.

STING *of a gnat*. See TRUNK.

STINK, or STENCH, a disagreeable smell exhaling from a corrupted, or other body, and which is prejudicial to the nose and brain.

A *stinking* breath is usually the result either of diseased lungs, or else of scorbutic gums, &c.

A *stinking* nose, *fœtor naris*, is the result of a deep ulcer within the nose, whence arise fœtid scabs, &c. Its cause, according

according to Galen, is a ſharp putrid humour falling from the brain, on the proceſſus mamillares. This is reckoned, by the civilians, one of the legal cauſes of annulling marriage.

STINK-*horns*, in *Botany*. See PHALLUS.

STINK-*pot*, an earthen ſhell charged with powder, and other inflammable and ſuffocating materials, with a lighted fuſe at the aperture, thrown on board an enemy's ſhip in the action of boarding.

STINT, *tringa cinclus* of Linnæus, in *Ornithology*, the name of a ſmall bird common about the ſea-ſhores in many counties of England, and ſeeming to be the ſame with the *cinclus prior* of Aldrovand, and the *ſchœniclos*, or *junco* of Bellonius, called by the French *alouette de mer*, the *ſea-lark*; and by Pennant, *purre*.

It is ſomewhat ſmaller than the common lark, and in ſhape reſembles the ſmaller ſnipe. Its beak is black, ſlender, and ſtraight; its legs of a duſky green, the toes being divided to their origin; the head and hind part of the neck are aſh-coloured, marked with duſky lines; a white ſtroke divides the bill and eyes; the chin white; under ſide of the neck mottled with brown; the back is of a browniſh aſh-colour; the breaſt and belly white; the coverts of the wings and tail of dark brown, edged with light aſh-colour or white; the greater coverts duſky tipt with white; the upper part of the quill-feathers duſky, the lower white; the two middle feathers of the tail duſky, the reſt of a pale aſh-colour, edged with white.

Theſe birds come in prodigious flocks to our coaſts during the winter; in their flight they perform their evolutions with great regularity; appearing like a white or duſky cloud, as they turn their breaſts or backs towards you. They leave our ſhores in ſpring, and retire to ſome unknown place to breed. They were formerly a well known diſh at our tables, under the name of *ſtints*. Pennant.

STIP *viſch*, in *Ichthyology*, a name given by the Dutch in the Eaſt Indies to a fiſh of the claſs of our European ones which have two back-fins, the anterior of which is prickly, the hinder not ſo. Its ſkin is ſpotted, and its fleſh very delicate, and well taſted. It is generally caught by hooks. Ray.

STIPA, *feather-graſs*, or *winged ſpike-graſs*, in *Botany*, a genus of the *triandria digynia* claſs. Its characters are theſe: the calyx is uniflorous and has two valves; the corolla has a ſmall valve, terminated by a beard, and articulated at the baſe. There are eight ſpecies.

STIPEND, STIPENDIUM, among the *Romans*, ſignified the ſame with *tribute*; and hence *ſtipendarii* were the ſame with *tributarii*.

STIPITE, *nativi de* STIPITE. See NATIVI.

STIPULATION, in the *Civil Law*, the act of *ſtipulating*, that is, of treating, and concluding terms and conditions to be inſerted in a contract.

Stipulations were anciently performed at Rome with abundance of ceremonies, the firſt whereof was, that one party ſhould interrogate, and the other anſwer, to give his conſent, and oblige himſelf.

By the ancient Roman law, no body could *ſtipulate* but for himſelf; but as the tabelliones were public ſervants, they were allowed to *ſtipulate* for their maſters; and the notaries, ſucceeding the tabelliones, have inherited the ſame privilege. The *ſtipulation* had its origin in the *lex Aquilia*, and another law of the emperor Arcadius. See SATISDATIO.

The word is formed from the Latin *ſtipula*, a *ſtraw*, becauſe in making a ſale, a ſtraw was given the purchaſer, in ſign of a real delivery. Which cuſtom is ſtill retained in ſome parts of France, particularly at Verdun. The cuſtom always has been on this occaſion, for the two parties to break a ſtraw between them, and each take his moiety, which they afterwards joined again to recognize their promiſe.

STIRK, or STURK, a term uſed among country people for a young ox or heifer.

STIRROP, or STIRRUP, in the *Manege*, a reſt or ſupport for the horſeman's foot, ſerving to keep him firm in his ſeat, and to enable him to mount.

The great art of a cavalier in the ancient tournaments was to make his antagoniſt loſe his *ſtirrup*.

For combating, it is a rule to have the right foot *ſtirrup* ſomewhat ſhorter than the other.

Stirrups are allowed to be a modern invention; no mention being made of them in any ancient Latin or Greek author; no figure of them to be ſeen in any ſtatue or monument, nor any word expreſſive of them to be met with in claſſical antiquity.

Menage obſerves, that St. Jerom is the firſt author who mentions them. This paſſage, however, is not to be found in his epiſtles; and if it were there, it would prove nothing, becauſe St. Jerom lived at a time when *ſtirrups* are ſuppoſed to have been invented, and after the uſe of SADDLES. Montfaucon denies the authenticity of this paſſage; and, in order to account for the ignorance of the ancients with regard to an inſtrument ſo uſeful and ſo eaſy of invention, he obſerves, that while cloths and houſings only were laid upon the horſes backs, on which the riders were to ſit, *ſtirrups* could not have been uſed, becauſe they could not have been faſtened with the ſame ſecurity as upon a ſaddle. But it is more probable, that in this inſtance, as in many others, the progreſs of human genius and invention is uncertain and ſlow, depending frequently upon accidental cauſes. Berenger's Hiſt. and Art of Horſemanſhip, vol. i. p. 65, &c.

To loſe one's *ſtirrups*, is to ſuffer them to ſlip from the foot.

The *ſtirrup-foot* is the near, or left foot before.

Stirrup-leather, is a thong of leather deſcending from the ſaddle down by the horſe's ribs, upon which the *ſtirrups* hang.

Stirrup-bearer, called in French *porte etrier*, is an end of leather made faſt to the end of the ſaddle, to truſs up the *ſtirrup* when the rider is alighted, and the horſe ſent to the ſtable.

STIRRUP *of a ſhip*, a piece of timber put upon a ſhip's keel, when ſome of her keel happens to be beaten off, and they cannot come conveniently to put, or fit in a new piece; then they patch in a piece of timber, and bind it on with an iron, which goes under the ſhip's keel, and comes up on each ſide of the ſhip, where it is nailed ſtrongly with ſpikes; and this they call a *ſtirrup*. See HORSE.

STITCH-*wort*, a name ſometimes given to the *alſine*, or *ſtellularia* of botaniſts, otherwiſe called CHICKWEED.

STITHY, or STUTHY, is uſed either for a ſmith's anvil, or a diſeaſe in oxen, cauſing the ſkin to ſtick ſo cloſe to the ribs that they cannot ſtir.

STIVER, a Dutch coin, twenty of which make a guilder. See COIN.

STOÆ, ϛοαι, in *Antiquity*, the PORTICOS at Athens. Theſe were full of exedræ, ἐξεδραι, and ſide buildings, furniſhed with ſeats fit for ſtudy or diſcourſe. Here it is probable philoſophers and their ſcholars uſed to meet. See EXEDRÆ.

STOAKED, in a *Ship*. When the water in the bottom cannot come to the well of the pump, they ſay, *the ſhip is aſtoak*, or *ſtoaked*: ſo they ſay alſo, *the limber holes are ſtoaked*, when the water cannot paſs through them; and that *the pump is ſtoaked*, when ſomething is got into it which choaks it up, ſo that it will not work.

STOAT, in *Zoology*, the name uſed by many for the animal whoſe ſkin is the ermin. See ERMINEUM *animal*, and *Tab. Quadrupeds*, N° 9.

STOC *and ſtovel*, in our *Old Writers*, a forfeiture where any one is taken carrying *ſtipites* and *pabulum* out of the woods; for *ſtoc* ſignifies *ſticks*, and *ſtovel*, *pabulum*.

STOCK, in *Gardening*, the ſtem or trunk of a tree. What *ſtock* is moſt proper for each kind of fruit, ought as well to be conſidered and known, as what ſoil is moſt ſuitable to trees; for on theſe two things the future vigour of trees, and the goodneſs of fruit equally depend. The beſt way for thoſe who intend to plant, is to raiſe their own *ſtocks*, by which they will be better aſſured of what they do; but if they ſhould buy their trees of nurſerymen, they ſhould diligently enquire upon what *ſtocks* they were propagated.

For *ſtocks* are, in ſome meaſure, a ſort of ſoil to the kinds of trees raiſed on them; as every part of a tree, let it be ever ſo minute, forms its roots upon the parts below: thus the taſtes of fruits may be improved by proper *ſtocks* as well as by proper ſoils.

Perhaps it may be the opinion of ſome, that all juices are changed by the pores or veſſels through which they paſs, and that all trees propagated upon any *ſtocks* whatſoever, will equally produce good fruit, provided that their growth is healthful and ſtrong; but if they will give themſelves the trouble to examine this point carefully, and without prejudice, they will find as conſiderable a difference, with reſpect to fruit, between *ſtocks* as between ſoils.

Their opinion, indeed, has ſome appearance of reaſon in it; for as the apricot, almond, peach, and nectarine, are generally budded upon plum-*ſtocks*, yet bear fruit of their own kind, which ſhews that juices are changed by paſſing through a ſmall bud, and the little quantity of rind joined to it (the compaſs of both of which is ſeldom above an inch in length, and the breadth about a tenth part thereof), yet, if different juices be applied, the taſte of the fruit will be different: an inſtance of this may be given in the nonpareil, viz. if one tree of this kind be planted in a wet clay ſoil, and another in a loam properly dry, and both propagated on the ſame kind of *ſtock*, and from one and the ſame branch, they will yield fruits very different from each other in ſize and goodneſs.

On the other hand, if two nonpareil branches are grafted, the one upon a paradise-*stock*, and the other upon a crab, and both planted in the same soil and situation, that upon the crab-*stock* will produce fruit so sour and ill-tasted, in comparison to the fruit of the other, that if a person should taste them both in the dark, he could not imagine them to be the same fruit.

A very great difference has been observed between the fruit of these trees, when one was grafted upon a paradise, and the other upon a codling *stock*; for though the juices were so far changed by passing through the buds and pores of nonpareil branches, as to produce fruit alike in shape, yet their tastes were different, and somewhat resembled the taste of that fruit which the *stocks* would have naturally produced. The juices of the crab and codling are known to be very acid, but the juice of the natural fruit of the paradise is sweet. Hill on Fruit Trees, chap. xii.

They that intend to buy their trees, should chuse such (after the *stocks* and kinds are known) as stand not too close in the nursery; for if they do, their shoots will be long jointed, tender, and spungy; beside, their buds will be very weak, especially the lowest, and will be long kept back from a bearing state, by having deprived each other of the sun's rays, of which no trees can have too much in a nursery; for they attract and carry off a great quantity of watery particles from them and the earth about them, when planted at proper distances; which, when they are not, prove very prejudicial to them: and if weeds have been suffered to grow among dwarfs, it will be as bad or worse than if the *stocks* themselves had stood too near each other. In short, the roots of all trees are much hurt by weeds, which keep off the sun's rays from warming the soil, and encouraging the proper growth of the trees.

It need not be much regarded from what kind of soil you take your trees, provided they have the following marks of health, viz. if their shoots at the extremities be very full of buds, and are plump, without any appearance of mildew or blight, and all their parts free from canker, gum, and moss; for all these are symptoms of defects in the roots. And though planting them in proper soils may restore them in time, yet it will not be prudent to chuse such trees, as there will be more time lost in their bearing than if they were at first free from such imperfections. Idem, chap. xx.

In the choice of young *stocks* for grafting, says Mr. Miller, you should always prefer such as have been raised from the seed, and that have been once or twice transplanted. Next to these are those *stocks* which have been raised from cuttings or layers, but those which are suckers from roots of other trees, should always be rejected; for these are never so well rooted as the others, and constantly put out a great number of suckers from their roots, whereby the borders and walks of the garden will be always incommoded by them during the summer season. If these *stocks* have been allowed a proper distance in the nursery where they have grown, the wood will be better ripened, and more compact than those which have grown close, and have been thereby drawn up to a greater height: the wood of these will be soft, and their vessels large, so that the cions grafted into them will shoot very strong; but they will be less disposed to produce fruit than the other; and when trees acquire an ill habit at first, it will be very difficult to reclaim them afterward.

As for old trees which are already growing in the places where they are to remain, whose fruit is intended to be changed, there is no other choice but that of the branches, which should be such as are young, healthy, well situated, and have a smooth bark. If these trees are growing against walls or espaliers, it will be proper to graft six, eight, or ten branches, according to the size of the trees, by which method they will be much sooner furnished with branches again, than when a less number of cions are put in; but in standard trees, four, or at most six cions, will be sufficient. Miller's Gard. Dict. art. *Grafting*. See ENGRAFTING, FRUIT-*trees*, and GRAFT.

STOCK, *brokers*. See BROKER.

STOCK, *capital*. See CAPITAL.

STOCK, *pen*. See PEN *stock*.

STOCK-*fish*, in the *Fish Trade*, a name given to the common COD-*fish* when cured in a particular manner, which makes it necessary to beat it with sticks before it is fit for dressing.

The commerce for *stock-fish* is very considerable in Holland, both from the great consumption thereof in the country, and from their victualling their vessels therewith. See *Cod*-FISHERY.

STOCK-*gilly flower*, and WALL-*flower*, *cheiranthus*, in *Botany*, a genus of the *tetradynamia siliquosa* class. Its characters are these; it hath a four-leaved compressed empalement; the two outer leaves are swelling at their base: the flower hath four petals in form of a cross, which are longer than the empalement; it hath six parallel stamina, two of which are between the swelling leaves of the empalement, the other are a little shorter, and are terminated by erect bifid summits, reflexed at the top; it hath a four-cornered prismatic germen, supporting a very short compressed style, crowned with an oblong divided stigma, which is reflexed and permanent; the germen afterward becomes a long compressed pod with two cells, opening with two valves, filled with compressed seeds. Miller enumerates fifteen, and Linnæus seventeen species.

The *stock*-gilly flowers are distinguished from the wall-flowers by their hoary leaves. Those of the latter sort, with single flowers, produce seeds in plenty, from which the plants are raised; but the largest and deepest coloured flowers should always be selected for seeds, which should be sown in April, upon poor or undunged soil; and when they are fit to be removed, they should be transplanted into nursery-beds, at about six inches distance every way, and watered and shaded till they have taken root. Till Michaelmas they need only be kept clean from weeds, and then transplanted into the borders of the flower-garden, that they may get good roots before the frost comes on. However, if the seeds are sown upon poor land, where they are designed to remain, and not transplanted, they will thrive and endure the frost of winter better than those which are removed. Upon ruins and rubbish, these plants, if properly disposed, will be very ornamental, and their flowers, having a strong odour, perfume the air to a considerable distance. Those with double flowers may be propagated by slips, planted in the spring; but the large bloody wall-flower will frequently rise with double flowers from seeds, carefully saved from such plants as have five petals, and produce larger spikes of flowers than those that are propagated by slips.

The ten weeks *stock*, formerly called the annual *stock*-gilly-flower, may be raised from seeds sown at two or three different times; and thus the flowers may be continued in succession near three months. The first sowing should be about the middle of February, upon a very slender hot-bed, guarded against frost; and when they are fit for removal, be transplanted into nursery-beds, at about three or four inches distance, watering and shading them till they have taken root, and afterwards keeping them clean from weeds: after remaining in these beds about six or seven weeks, they may be planted in the borders of the flower-garden where they are to remain. There should be another parcel sown in March to succeed the former; and again a fresh parcel towards the latter end of May; and if these last are planted upon a warm border, where they may be covered with glasses or mats, they may be continued in flower till Christmas; and with proper management, by putting them in pots, and placing them under a hot-bed frame in autumn, where they may enjoy the open air in mild weather, and be secured from hard rains and frost, they may be kept flowering all the winter, if it be not severe.

There are some who propagate the double *stock-gilly-flower* by slips and cuttings, which will take root when properly managed; but the plants so raised are never so strong as those which proceed from feeds, and their spikes of flowers are short, and consequently not so beautiful.

The queen's, Brompton, and white *stock-gilly*-flowers, and the white wall-flower, all which are biennial, may be raised from seeds, sown about the beginning of May, in ground that has no dung; in a dry season the beds should be shaded with mats every day, but the covering should be removed every evening to admit the dews of night; and they should be gently watered in the evening two or three times a week. To prevent their being injured by flies, when they first appear with their two seed-leaves, the covering should be continued over them during the heat of the day, and the plants frequently refreshed with water, that they may be kept in a growing state. When the plants have acquired strength, they will require no other care besides being kept clear from weeds, and being thinned to the distance of nine inches or a foot. Miller.

STOCK-*gilly-flower*, *dwarf*. See *Dame's* VIOLET.

STOCKER, in *Ichthyology*, a name given by the Germans to the *saurus* of the ancients, the *trachurus* of the later writers. It is a species of the *scomber*, known among us under the name of the *horse*-MACKREL.

STOCKING, that part of the cloathing of the leg and foot which immediately covers and screens them from the rigour of the cold.

Anciently, the only *stockings* in use were made of cloth, or of milled stuffs sewed together; but since the invention

tion of knitting and weaving *ſtockings* of ſilk, wool, cotton, thread, &c. the uſe of cloth *ſtockings* is quite diſcontinued.

Dr. Howel, in his Hiſtory of the World (vol. ii. p. 222.) relates, that queen Elizabeth, in 1561, was preſented with a pair of black knit ſilk *ſtockings*, by her ſilkwoman, and thenceforth ſhe never wore cloth ones any more. The ſame author adds, that king Henry VIII. ordinarily wore cloth hoſe, except there came from Spain, by great chance, a pair of ſilk *ſtockings*. His ſon, king Edward VI. was preſented with a pair of long Spaniſh ſilk *ſtockings* by ſir Thomas Greſham, and the preſent was then much taken notice of. Hence it ſhould ſeem, that the invention of knit ſilk *ſtockings* originally came from Spain.

Others relate, that one William Rider, an apprentice on London bridge, ſeeing at the houſe of an Italian merchant a pair of knit worſted *ſtockings*, from Mantua, took the hint, and made a pair exactly like them, which he preſented to William, earl of Pembroke, and that they were the firſt of that kind worn in England, anno 1564. Anderſon's Hiſt. Com. vol. i. p. 400.

The modern *ſtockings*, whether woven or knit, are a kind of plexuſes formed of an infinite number of little knots, called *ſtitches*, *loops*, or *maſhes*, intermingled in one another.

Stockings, *knit*, are wrought with needles made of poliſhed iron, or braſs wire, which interweave the threads, and form the maſhes the *ſtocking* conſiſts of.

This operation is called *knitting*; the invention whereof it is difficult to fix preciſely, though it has been uſually attributed to the Scots, on this ground, that the firſt works of this kind came from Scotland. It is added, that it was on this account, that the company of *ſtocking*-knitters, eſtabliſhed at Paris, 1527, took for their patron St. Fiacre, who is ſaid to have been the ſon of a king of Scotland: however, it is moſt probable, that the method of knitting *ſtockings* by wires, or needles, was firſt brought from Spain.

Stockings, *woven*, are ordinarily very fine; they are manufactured on the frame or machine made of poliſhed iron, the ſtructure whereof is exceedingly ingenious, but withal exceedingly complex; ſo that it were very difficult to deſcribe it well, by reaſon of the diverſity and number of its parts; nor is it even conceived, without much difficulty, when working before the face.

The Engliſh and French have greatly conteſted the honour of the invention of the *ſtocking-loom*; but the matter of fact, ſays Mr. Chambers, after M. Savary, in his Dictionary of Commerce, waving all national prejudices, ſeems to be this, that it was a Frenchman who firſt invented this uſeful and ſurpriſing machine; and who, finding ſome difficulties in procuring an excluſive privilege, which he required, to ſettle himſelf at Paris, went over into England, where his machine was admired, and the workman rewarded according to his merit.

The invention thus imparted to the Engliſh, they became ſo jealous hereof, that for a long time it was forbid, under pain of death, to carry any of the machines out of the iſland, or communicate a model thereof to foreigners. But as it was a Frenchman firſt enriched our nation with it, ſo a Frenchman firſt carried it abroad; and, by an extraordinary effort of memory and imagination, made a loom at Paris, on the idea he had formed thereof in a voyage he had made to England. This loom, firſt ſet up in the year 1656, has ſerved for the model of all thoſe ſince made in France, Holland, &c.

But this account of the original inventor of the *ſtocking-frame* ſeems to be erroneous, as it is now generally acknowledged, that it was invented in the year 1589, by William Lee, M. A. of St. John's college, in Cambridge, a native of Woodborough, near Nottingham. Soon after he had compleated the frame, he applied to queen Elizabeth for protection and encouragement, but his petition was rejected. Deſpairing of ſucceſs at home he went to France, under a promiſe of being patronized and recompenſed by Henry IV. and with nine of his ſervants, ſettled at Roan in Normandy. But Mr. Lee, diſappointed by the ſudden murder of the French monarch of the reward which he had reaſon to expect, died of a broken heart at Paris. After his death ſeven of his workmen returned with their frames to England, and in conjunction with one Aſton, who had been apprentice to Mr. Lee, and who had made ſome improvements in his maſter's invention, laid the foundation of this manufacture in England.

In the ſpace of fifty years the art was ſo improved, and the number of workmen ſo much increaſed, that they petitioned the protector to conſtitute them a body corporate, but their requeſt was refuſed. King Charles II. in 1663, granted them a charter, extending their juriſdiction to ten miles round London. See Company.

Such is the account given of this invention by Dr. Deering in his Hiſt. of Nottingham, p. 100, who has alſo deſcribed the *ſtocking-frame*, and exhibited ſeveral figures of this machine, and of the numerous parts of which it conſiſts.

Mr. Lee's invention, about twenty-eight years after we had firſt learned from Spain the method of knitting them by wires or needles, has proved a very conſiderable benefit to the *ſtocking* manufacture, by enabling England in after times to export vaſt quantities of ſilk *ſtockings* to Italy, &c. where, it ſeems, ſays Anderſon (Hiſt. Com. vol. i. p. 435.) by ſir Joſiah Child's excellent diſcourſes on trade, firſt publiſhed in 1670, they had not then got the uſe of the *ſtocking-frame*, though not much leſs than one hundred years after its invention. Yet Dr. Howell, in his Hiſtory of the World (vol. ii. p. 222.) makes this invention eleven years later, viz. anno 1600; and adds, that Mr. Lee not only taught this art in England and France, but his ſervants did the ſame in Spain, Venice, and in Ireland.

A late writer in the Bibliotheca Topographia Britannica, N° 7, ſays, that Mr. Lee, after ſome years reſidence in France, received an invitation to return to England, which he accepted, and that thus the art of frame-work knitting became famous in this country. This account of the invention, he adds, is moſt generally received, though it has alſo been attributed to a Mr. Robinſon, curate of Thurcaſton, in Leiceſterſhire. The firſt frame, we are told, was brought into Hinckley, before the year 1640, by William Iliffe; and now the manufacture of this town is ſo extenſive, that a larger quantity of hoſe, of a low price, in cotton, thread, and worſted, is ſuppoſed to be made there than in any town in England. The manufacture now employs about two thouſand five hundred and eighty-five working people; the number of frames is computed at about one thouſand, and there are alſo about two hundred in the neighbouring villages.

The editor is informed, that about the year 1756, Meſſrs. Jedidiah Strutt and William Woollatt of Derby, invented a machine, by which, when annexed to the *ſtocking-frame*, the turned ribbed *ſtockings* are made the ſame with thoſe made upon the common knitting-pins. Theſe, together with the manner of making the openwork mills, in imitation of the French mills, a curious ſort of lace for caps, aprons, and handkerchiefs, as well as a great variety of figured goods for waiſtcoats, &c. have ſprung from the ſame machine, and form a conſiderable additional branch of the *ſtocking* trade.

Stockings, *fulling of*. See Fulling.

STOCK-*jobbing*, denotes the practice of trafficking in the public funds, or of buying and ſelling *ſtock* with a view to its riſe or fall. The term is commonly applied to the illegal practice of buying and ſelling *ſtock* for time, or of accounting for the differences in the riſe or fall of any particular *ſtock* for a ſtipulated time, whether the buyer or ſeller be poſſeſſed of any ſuch real *ſtock* or not. See *Stock*-Broker.

STOCKS, *cippus*, a wooden machine to put the legs of offenders in, for the ſecuring of diſorderly perſons, and by the way of puniſhment in divers caſes ordained by ſtatute, &c. And it is ſaid that every vill within the precinct of a torn, is indictable for not having a pair of *ſtocks*, and ſhall forfeit 5 *l*.

Stocks, in *Ship Carpentry*, a frame erected on the ſhore of a river or harbour, on which to build ſhipping. It generally conſiſts of a number of wooden blocks, ranged parallel to each other, at convenient diſtances, and with a gradual declivity towards the water. See Launch.

Hence we ſay, *a ſhip is on the ſtocks*, when ſhe is building.

STOEBE, *baſtard Æthiopian elichryſum*, in *Botany*, a genus of the *ſyngeneſia polygamia ſegregata* claſs. Its characters are, that the flower is compoſed of many hermaphrodite florets, which are included in one common empalement, whoſe ſcales are awl-ſhaped and permanent; between each ſcale is ſituated one floret, whoſe empalement is compoſed of five narrow acute leaves, which are equal and erect; the florets are funnel-ſhaped, of one petal cut into five points at the brim, ſpread open; they have five ſhort hair-like ſtamina, terminated by cylindrical ſummits with five indentures, and an oblong germen, ſupporting a ſlender ſtyle, crowned by a bifid acute ſtigma; the germen afterward becomes a ſingle ſeed, crowned with a long feathery down, ſitting in the common empalement. There is one ſpecies.

STOECHAS, in *Botany*. See Cassidony.

STOICAL *fate*. See Fate.

STOICISM, the doctrines and opinions of Zeno's followers, called *Stoics*.

STOICS, a ſect of ancient philoſophers, the followers of Zeno; thus called from the Greek ϛοα, *portico*, in regard Zeno uſed to teach under a portico, or piazza.

The author of this ſect, Zeno, was of Cittium, a town in

in Cyprus, inhabited by a colony of Phœnicians, whence he is supposed to have borrowed many of his dogmata from Phœnician philosophy, which many learned men maintain was, itself, borrowed from the Jewish: though it must be allowed, there appear as many things in the *Stoic* philosophy, borrowed from Plato's and Socrates's school, as from that of Moses.

Zeno making a trading voyage from Cittium to Athens, richly freighted with Tyrian purple, was shipwrecked not far from port; upon which, we are told, consulting the oracle how he should best spend the rest of his life, he was answered, ει ξυγχρωτιζοιτο τοις νεκροις, *by becoming of the same colour with the dead*; upon which he applied himself to the study of the ancient philosophers, and became a hearer of Crates, the Cynic. But Laertius tells us, he had too much natural modesty to suffer him to give into the Cynic impudence.

From Crates he had recourse to Stilpon and Xenocrates, then to Diodorus Cronus and Polemon, and at length began to think of instituting a new sect. To this purpose a στοα, *portico*, called from the pictures of Polygnotus therein the *painted portico*, was pitched on.

Here, using to walk and philosophize, he was soon attended by a great number of disciples, hence called Στωικοι, *Stoici*.

He became exceedingly reverenced at Athens, for the probity and severity of his life and manners, and the consistency thereof with his doctrine; insomuch that the Athenians decreed him, when living, a golden crown, and used in dubious times to deposit the keys of the city with him; and, after his death, they consecrated an altar to him.

One of his chief followers was Cleanthes, who was succeeded by Chrysippus, and he by Diogenes Babylonius, Antipater, Panætius, and Posidonius, among the Greeks; and by Cato, Varro, Cicero, Seneca, the emperor Antoninus, &c. among the Romans; and by Pantenus and Clemens Alexandrinus, among the Christians. And the chief restorers of the *Stoic* philosophy among the moderns were Justus Lipsius, Scioppius, Heinsius, and Gataker.

The *Stoics* cultivated logics, physics, metaphysics, &c. but chiefly ethics. The principal of the dogmata of the former kinds are as follows:

That there are certain καταληψεις, *comprehensions* (which others call κοιναι εννοιαι, *common notices*, or *innate ideas*, or *principles*, and Cicero, *inchoatæ intelligentiæ, beginnings of understanding*), naturally found in the mind: that God is the seminal cause of the universe; that the world is an animal; which opinion the *Stoics* maintained in common with the Platonists, by reason of God's inhabiting and informing every part thereof, in quality of an ANIMA *mundi*: that nature is an artificial fire, tending to generation; and that the world is to be destroyed at last by a conflagration.

As for the morality of the *Stoics*, it was couched much in paradoxes: as, that a wise man is void of all passion or perturbation of mind: that pain is no real evil; but that a wise man is happy in the midst of the severest torture: that a wise man is always the same, and always joyful: that none but a wise man is free; all others are slaves: that none but a wise man is rich: that none but a wise man ought to be esteemed a king, magistrate, poet, or philosopher: that all wise men are great: that all things are a wise man's, who is contented with himself: that wise men are the only friends, and the only lovers: that nothing ever happens to a wise man beyond expectation: that all virtues are inviolably connected together: that all good things are equal, and equally to be desired; and that goodness admits of no increase or diminution.

Whether virtue might be lost or no, was warmly disputed among them? Chrysippus held it might, and by drunkenness and atra bilis; Cleanthes that it could not, by reason of the firmness of the καταληψεις, *comprehensions*.

They owned but one God, whom, however, they called by various names, as *Mind, Fate, Jupiter*, &c. by which they did not mean various things; but various powers and relations of the same things. Providence they expressed under the name of FATE, which Chrysippus defines to be a natural series or composition of things mutually following each other by an immutable nexus, or tie, fixed from all eternity; and which some have supposed to be different from what is now called absolute fatality, and not altogether inconsistent with free agency.

Lastly, they held that the human soul survived the body.

STOLE, STOLA, from στολη, signifying a *long robe*, or *vestment*, a sacerdotal ornament, worn by the Romish parish-priests over their surplice, as a mark of superiority in their respective churches.

The *stole* is worn by other priests over the alb, at celebrating of mass; in which case it goes across the stomach; and by deacons over the left shoulder, scarf-wise.

The *stola* is a broad swath, or slip of cloth or stuff, hanging from the neck to the feet, with three crosses thereon. The bishops anciently pretended, that the parish-priests were never to appear before them but in their *stoles*. In Flanders and Italy they always preach in *stoles*. It is supposed to be a representation of the borders of the long robe worn by the Jewish high-priests.

The *stola* of the ancient Romans, &c. was very different from that now in use; the former was a kind of robe fitter for women than men, though it was held a robe of honour among all nations. Kings themselves sometimes used it, and sometimes bestowed it as a reward of virtue.

STOLE, *groom of the*, the eldest lord of his majesty's BED-*chamber*, whose office and honour it is to present and put on his majesty's first garment or shirt every morning; and to order the things in the chamber.

STOLE, *order of the*, an order of knights instituted by the kings of Arragon; though, as to the particular author or time of the institution, we are in the dark. The first time we hear of it is under Alphonsus V. who mounted the throne in 1416. Justiniani takes it to have been instituted about the year 1332.

STOLE, *order of the golden*, a military order at Venice, thus called from a golden *stole*, which the knights wore over their left shoulder, reaching down to the knee, both before and behind, a palm and a half broad. None are raised to this order but the patricians, or noble Venetians. Justiniani observes, that the time of the institution of this order is unknown.

STOMACACE, a word used by some authors to express a symptom of the scurvy, which is a fœtor of the mouth, with a soreness and bleeding of the gums.

STOMACH, στομαχος, *ventriculus*, in *Anatomy*, a hollow, membranous, organical part of an animal, destined to receive the food after deglutition, and to convert it into chyle. See *Tab. Anat. (Splanch.) fig. 2. litt. d. d. b.*

Its form is oblong, incurvated, large, and capacious at one end, and small and contracted at the other, compared by some to a gourd, by others to a bag-pipe. It is situated partly in the left hypochondrium, and partly in the epigastrium.

It lies transversely, obliquely, and almost laterally, in such a manner, as that the great extremity, and the orifice next to it, are on the left hand, and the small extremity with its orifice or the pylorus on the right hand, and lower or more inclined than the former. Therefore we ought, with the ancient anatomists, to call one of these orifices superior, the other inferior. The great extremity of the *stomach* is in the left hypochondrium, and for the most part immediately under the diaphragm; yet the superior orifice is not in the left hypochondrium, but almost opposite to, and very near the middle of the bodies of the lowest vertebræ of the back. The small extremity of the *stomach* does not reach to the right hypochondrium. It bends obliquely backward toward the upper orifice, so that the pylorus lies about two fingers breadth from the body of the vertebræ, immediately under the small portion of the liver, and consequently lower down, and more forward than the other orifice by almost the same distance. This extremity of the *stomach* has sometimes a particular dilatation on the side next the great curvature.

According to this natural situation, the *stomach*, especially when full, lies so as that the great curvature is turned more forward than downward, and the small curvature more backward than upward. One of the lateral convex sides is turned upward, the other downward; and not forward and backward as they appear in dead bodies, where the intestines do not support them in their natural situation. If we divide the *stomach* along the two curvatures into two equal parts, we shall see that the two orifices do not both adhere to the same half of this division, as we would be apt to imagine according to the common notion; but that the diaphragmatic orifice is intirely in the upper half, and the intestinal orifice in the lower half. Therefore the body of the *stomach* is so far from lying in the same plane with the œsophagus, as it is commonly represented in figures drawn from a *stomach* taken out of a body and laid on a table, that it forms an angle or fold, immediately at the passage of the œsophagus through the small muscle of the diaphragm; and it is on account of this angle that the superior orifice is turned backward. Winslow.

The *stomach* has two orifices, one at each end. The left orifice is properly called στομαχος, from στομα, *mouth*; and also καρδια: this is joined to the œsophagus, of which it seems to be only a continuation. By this orifice, the aliments enter the *stomach*, where being digested, they ascend obliquely to the pylorus, or right orifice, which is united to the first of the intestines. See *Tab. Anat. (Splanch.) fig. 2. lit. 6.*

The *stomach* consists of four membranes or coats; the first and inmost (called *villosa*, because when it swims in clear water, some have imagined they saw something in

it

it like the pile of velvet) is formed of short fibres, which stand perpendicularly upon the fibres of the next coat, and are to be seen plainly towards the pylorus; when the *stomach* is distended with meat, these fibres become thick and short. Whilst they endeavour to restore themselves by their natural elasticity, they contract the cavity of the *stomach* for the attrition and expulsion of the aliments. This coat is much larger than the rest, being full of plaits and wrinkles, and that chiefly about the pylorus: these plaits retard the chyle, that it runs not out of the *stomach* before it be sufficiently digested. In this coat there are also a great number of small glands, which separate a liquor, which besmears all the cavity of the *stomach*, and helps the concoction of the aliments; for which reason this coat is called the *tunica glandulosa*; the ancients called it *tunica fungosa*. See *Tab. Anat.* (*Splanch.*) *fig.* 2. *lit.* i.

The second is much finer and thinner; it sustains on its convex side a very large reticular distribution of capillary vessels and nerves: on the concave side it seems to be of a loose texture, and, as it were, spongy, or filamentary, containing a great number of small glandular bodies, especially near the small curvature and small extremity of the *stomach*: it is of an exquisite sense, and is called *nervosa*. See *Tab. Anat.* (*Splanch.*) *fig.* 2. *lit. k.*

The third is muscular, being made of straight and circular fibres; the straight run upon the upper part of the *stomach*, between its superior and inferior orifices; and the circular run obliquely from the upper part of the *stomach* to the bottom. Of these the innermost descend towards the right side, and the outermost towards the left; so that, by their action, both ends of the *stomach* are drawn towards its middle, and the whole is equally contracted; by their contraction and continual motion, the attrition and digestion of aliments are in great measure performed.

The fourth tunic is common: it comes from the peritonæum. Between these two last coats there is a cellular substance, which adheres very closely to the external coat, and insinuates itself between the fleshy fibres of the third all the way to the second, as may be perceived by blowing it up. Some make it a distinct coat, and call it *tunica cellulosa*; but it is no more than the cellular portion of the membranous coat, like the cellular portion of the peritonæum.

The principal arteries of the *stomach* are the coronaria ventriculi, which runs along the small curvature; and the two GASTRIC arteries, which form one common artery that runs along the great curvature. The coronaria ventriculi becomes united in the same manner with the pylorica, and both make one common vessel. These two arterial arches send a great number of branches toward each other on both sides of the *stomach*, which are gradually ramified in different directions, and mostly communicate with those from the other artery. The arteries of the *stomach* come originally from the cœliaca, by means of the hepatica, splenica, and coronaria. The pylorica and mesenterica superior contribute to them by communications, more or less immediate. They communicate also with the mammariæ internæ and diaphragmaticæ, and by means of the epigastrica sinistra with the mesenterica inferior.

The veins of the *stomach* are ramifications of the vena portæ in general, and in particular of the meseraica major, splenica, and hæmorrhoidalis interna. They accompany the arteries more or less, and form nearly the same kinds of arches and reticular textures.

The eighth pair of nerves gives two considerable branches to the *stomach*, which are spread much about the upper orifice, by which it is rendered very sensible; whence also proceeds the great sympathy betwixt the *stomach*, head, and heart; on account whereof Van Helmont thought, that the soul had its seat in the upper orifice of the *stomach*.

As for the motion of the STOMACH; Dr. Pitt, in the Philosophical Transactions, acquaints us, that, in dissecting a dog, he found the peristaltic motion of the guts continued through the *stomach*; the pylorus, which is usually found as high as the diaphragm, being, in every undulation, brought below the very bottom of the *stomach*; and that he could manifestly observe a constriction in the middle of the *stomach*, at every motion downwards, pressing it in so as to be able to compress whatever was contained in its cavity. These motions, he observes, were as regular as any he ever observed in the guts; and adds, that he has since observed the same in three others; whence one may safely enough conclude it holds of all.

Hence, we easily see the reason of the quick distribution of the nourishment; the food being no sooner opened by the drink and spittle, &c. than it has a free motion through the pylorus into the intestines, from this compression in the middle of the *stomach*.

In order to understand the action of the *stomach*, in turning the aliments into chyle, we are first to thoroughly consider its form. It is easy to observe, that the two orifices of the *stomach*, the œsophagus, and pylorus, are not situated exactly over-against one another; but that if the *stomach* be regularly divided longitudinally into two halves, the œsophagus will be found wholly in the anterior half, and the pylorus, in great part, in the posterior. Near the insertion of the œsophagus there are two planes of muscles; the one is placed near the bottom of the *stomach*, and encompasses all that part of the œsophagus that is nearest that part. This muscle throws off obliquely several bundles of fibres, which run to the middle, both of the anterior and posterior sides of the *stomach*, and many of these extending even to the lower part of it, make what are there called *the oblique fibres of the stomach*. The other muscular plane encloses, in the same manner, the other part of the mouth of the œsophagus, or that which lies towards the pylorus; this terminates on each side near the bottom of the *stomach*. These two planes of fibres are, as it were, two fleshy bands about the mouth of the œsophagus, which cross one another both on the upper and under part of the *stomach*.

The longitudinal fibres are very slender, and appear about an inch from the pylorus, extending themselves along both the anterior and posterior sides of the *stomach*, quite to the orifice of the œsophagus; and finally, they are inserted round about the pylorus by two ligamentary bands, which authors have generally passed over without observing. These bands are much like those of the colon, and occupy all the length of the neck, and may be easily distinguished by the touch, and are not difficult to be seen on bending the part in an inflated *stomach*.

The fibres of the bottom of the *stomach*, when nicely examined, are found to be circular, all composing several small concentric circles, each series of which is independent of all the rest. There is one of these circles placed just in the centre of the bottom of the *stomach*, and from this the other circles spread, being of several different diameters, according to the places where they stand, and reaching to near the orifices where the fleshy fibres take another course, as before observed. The bodies, called *circular fibres of the stomach*, and supposed to part from the upper part of the *stomach*, close to one another, and taking the round of the *stomach* to return thither again, are truly a number of small muscles, or bundles of fibres, placed at small distances from one another, no one of which ever reaches perfectly round the *stomach*; from these several smaller fibres are propagated in an irregular manner, which fill up the interstices of the circular directions of these, and form a sort of net-like plexus, between the fibres of which the nervous membrane of the *stomach* is easily seen. These interstices, in general, are of a sort of lozenge-shape, and the whole of these fibres may be said to constitute a sort of muscular net, enveloping the whole *stomach*. All those bundles of fibres, or small muscles, which are situated below the upper orifice of the *stomach*, or near about it, form together a plane or series which runs in a straight line from the upper to the lower extremity of the *stomach*; whereas, on the contrary, those which are placed about the middle of the *stomach* seem to turn about, and form parts of circles, the convex part of all which stands toward the bottom of the *stomach*; and finally, those which are placed about the neck of the *stomach* are much bent, and their bending is always the greater as they approach nearer to the pylorus. This appears to be the true figure and arrangement of the fibres of the *stomach*; and as this is very different in many particulars, from the common accounts of anatomical authors, it was necessary to give this at large, in order to understaud and explain the action of this part in the great work of digestion; and according to this account, the offices of every part will be very easily understood.

The circular bands of muscular fibres placed round the orifice of the œsophagus, are designed to prevent the upper orifice of the *stomach* from being too much distended, whether by our carelessly swallowing too large morsels, or by the action of vomiting. The use of the muscular circles, at the bottom of the *stomach*, is as easily seen: the aliments received into this part of the *stomach*, were it not for these circular arrangements of fibres, would remain there, and have no tendency given them to go out of the *stomach*; but by this wonderful structure, the whole bottom of the *stomach* can at once be put into a safe and easy, though a powerful contraction, by means of which the aliments are naturally sent toward the pylorus for their discharge. These circles give the first principle of the peristaltic motion of the *stomach*, which is much the same with that of the intestines.

When the aliments have been thrown off these circles, they are not immediately, however, discharged into the pylorus, but are thrown upon those bundles of fibres, or small

ſmall muſcles, which make what has been before called the *reticular coat of the ſtomach.* That part of this coat which immediately receives them, is that compoſed of ſegments of circles, the convex parts of which are all placed toward the bottom of the *ſtomach*; and as theſe afterwards form their contractions, their middle naturally elevates, and throws off the aliment ſtill toward the pylorus, and this is done with the more force, as the action of theſe fibres is ſtrengthened by the longitudinal ones; and, in fine, thoſe longitudinal fibres, which are attached to the bands that ſurround the pylorus, when they act, contract, or pull the other parts of the *ſtomach* toward their inſertions; ſo that every thing tends to help the throwing the food upon the pylorus.

The reticular coat of the *ſtomach* has alſo other great advantages; it is eaſily capable of extenſion, and conſequently gives the *ſtomach* a capacity of enlarging, ſo as to hold a larger quantity of aliments than it otherwiſe could; and when they act, ſo as to be approaching toward their natural ſtate again after ſuch diſtention, this action, which is no other than their contraction, neceſſarily throws the aliments toward the pylorus; this contraction is always ſucceeded by a ſmall dilatation again, and that by another contraction, and theſe alternately ſucceeding one another, ſo long as any of the aliments continue in the *ſtomach*, conſtitute what authors call its periſtaltic motion. Although this motion is very ſlight, and only a kind of vermicular undulation, which is ſcarce ſenſible, yet there have not been wanting very great men who have thought it ſufficient for the great work of digeſtion. Theſe authors ſet aſide the uſe of any liquors, or juices of the *ſtomach*, mixing themſelves with the aliments, and give the whole to this motion, which they call a kind of trituration, which they ſay breaks the aliments into ſmall and fine parts, by rubbing them againſt one another, and that theſe fine broken particles make what is called chyle; but it is ſcarce conſonant to reaſon, that ſo weak a cauſe ſhould be productive of ſuch great effects.

This motion is no ſtronger than the periſtaltic motion of the inteſtines, and that is never ſuppoſed to have any ſuch effects on their contents, but only to puſh them forward. The liquor prepared from the food is known alſo to be grey at its paſſing out of the *ſtomach*, and only to acquire its white colour in the duodenum; and how is this accountable for on the plan of trituration only? And finally, if that were all that was required to digeſtion, to what purpoſe did nature, which does nothing in vain, ordain ſuch an abundance of fluids to be preſent in all places, where the aliments were deſtined to undergo any change? To know the abundant quantity of theſe we need only follow the courſe of the food from the time of its being taken into the mouth to that of its being changed into chyle.

All the time that the teeth are chewing the food, the parotid glands afford a prodigious quantity of ſaliva, which runs into the mouth, mixes with it, and paſſes with it into the *ſtomach*; beſide theſe, there are alſo many other ſources of the ſaliva, which all diſcharge it at the ſame time, but the quantity from theſe alone is not eaſily conceived. A ſoldier had, by a wound in the cheek, one of the parotids cut in two, and had the wound cloſed within, but not without; it was obſerved, that whenever he uſed his jaws in chewing, this one wounded gland alone diſcharged a quantity of lymph enough to wet ſeveral napkins; what then muſt be the quantity at every meal diſcharged from both, and from all the other ſources together? Though this is all carried down into the *ſtomach*, yet there freſh juices are added to it.

Wepfer diſcovered multitudes of glands in the human *ſtomach*, the orifices of which were very ſenſible; and beſide theſe, Mr. Ruyſch diſcovered ſeveral other eminences, which, by their reſemblance to thoſe in the ſecond *ſtomach* of an ox, ſeem to be only caſes encloſing cluſters of minute glands, all deſtined, with the others, to pour out their contents on the maſs of aliments. All theſe fluids, however, only change the food into a thick greyiſh liquor, which is too coarſe to be received into the lacteals, and needs a farther elaboration. This elaboration changes it into a white liquor, which we call chyle; and this is only performed in the duodenum, where there can be no trituration, but where there is a very remarkable aſſemblage of different liquors to affect it: for beſide the common ones, the liver and gall-bladder diſcharge into this inteſtine a great quantity of bile by the ductus choledocus; and the pancreas ſends thither alſo a great deal of its lymph. Brunderus has obſerved alſo, in this inteſtine, a vaſt number of glands, which, according to him, make a ſort of ſecond pancreas: theſe all furniſh alſo a great quantity of liquors to the duodenum, where this great change is made in the matter of the aliment: and it is very natural to conclude from the whole, that it is by means of theſe liquors that this change is effected; and if it appear, that the laſt change of the greyiſh liquor of the *ſtomach* into chyle be wrought by theſe fluids, why ſhould it be doubted but that nature, which is alike in all its works, has uſed the ſame means in the firſt change, and by the liquors mixt with the aliments in the *ſtomach*, has wrought them into that grey liquor they are found there changed into? Trituration does not at all ſeem the buſineſs of the *ſtomach*; nature we ſee has appointed another part, the mouth, for that office, and has furniſhed that with hard bodies, capable of tearing and grinding things to pieces. The moſt natural opinion, on the whole, ſeems therefore, that the office of the mouth was thus to rend and tear in pieces the aliments before their paſſage into the *ſtomach*, that there the juices might act more ſtrongly upon them; in the ſame manner as the chemiſt beats and breaks to pieces the ſubſtances, which he is going to throw into proper liquors, to extract their tincture. Mem. Acad. Par. 1719.

It may, however, be obſerved, that the operation which goes by the general name of digeſtion, and by which chylification begins, is performed partly by the *gaſtric juice*, which flows continually from the tunica villoſa, and partly by the continual contraction and relaxation of the muſcular coat; aided by the alternate motions of the diaphragm, or muſcles of the abdomen; and, accordingly, Mr. Winſlow obſerves, that trituration might be a term proper enough for expreſſing this operation, provided it be made to ſignify only a gentle agitation or action of the fleſhy fibres on a ſubſtance continually moiſtened by the gaſtric liquor, and not a violent grinding of a dry ſubſtance. See on this ſubject Chylification and Digestion.

Ruminating animals have four *ſtomachs*; yet it is obſerved, that ſome of theſe, which have four in Europe, have only two in Africa, probably by reaſon the herbs in Africa, are more nouriſhing. See Abomasus.

Birds that live ordinarily on ſeeds covered with a tough rind, have a kind of *ſtomach*, called the *gizzard*, conſiſting of four large muſcles withoutſide, and a hard callous membrane within. Such as live on fleſh, as eagles, vultures, &c. have only one *ſtomach*.

The digeſtive power of the *ſtomach* of ſome fowls is vaſtly greater than that in men, or any other animals. Cryſtal bullets, ſome hollow, and others ſolid, have been crammed down the throats of hens, and have been found afterwards ſtrangely eroded, and eaten by the juices there. Hollow bullets of glaſs have been alſo crammed down by the members of the Florentine Academy, and have been found afterwards not only eroded on their ſurface, but filled within with a whitiſh liquor like cream, which ſeemed to prey upon their ſubſtance. It is probable hence, that the ſtrong digeſtion of theſe fowls may be in ſome meaſure owing to a powerful menſtruum in their *ſtomach*; glaſs and cryſtal are two things wholly indiſſoluble by any menſtruums we are acquainted with, and yet they are corroded here.

This menſtruum in the *ſtomach* of theſe animals, aſſiſted by what the gravel-ſtones, which they ſwallow, are able to do in the manner of teeth, may very well deſtroy, and reduce ſubſtances of ſuch denſe texture, as we ſcarce know how to manage.

The glaſs drops with long tails, called *Prince Rupert's drops*, having been in the ſame manner forced down the throats of capons, were found entire in the *ſtomach* after many days, and burſt as uſual on breaking off the tail. Theſe loſt ſomewhat of their weight by remaining in the *ſtomach* ſome time, but the ſame ſort of drops, when untempered by heating in the fire, loſt a great deal in a very ſhort time. One of them, with which Redi made his experiments, loſt four grains of its weight in four days, and giving it to another fowl, it in ſix days time loſt nine grains more. This is an argument, not only of the vaſt power of digeſtion in the *ſtomach* of theſe fowls, but of the great difference of hardneſs there is between the ſame glaſs when tempered, by being dropped hot into water, and when untempered again by fire.

Experiments were alſo made by giving diamonds, topazes, leaden-bullets, jaſpers, and porphyry, to the ſame animals, and others of like kinds. The diamond loſt nothing of its weight; the topaz almoſt nothing, the loſs being ſcarce diſcernible with nice ſcales; other *ſtones* ſcarce loſt any thing, but the leaden-bullets loſt conſiderably. Hence it is eaſy to conclude, that the ſmall gravel-ſtones, which they pick up to ſerve for grinding the food in their *ſtomachs*, do their office without parting with almoſt any thing from themſelves: theſe little ſtones, though leſs beautiful, yet approaching in their nature to the gems. There is great difference, however, between theſe and pearls; for it was found that four pearls given to a pigeon loſt one third of their weight in twenty-four hours, and eight ſmall pearls given to another pigeon

pigeon loſt two thirds of their weight in two days. Redi, Eſperienz. See DIGESTION.

STOMACH *of fiſh*. The *ſtomach of fiſh* is very different in the various kinds, in reſpect of ſize, thickneſs, and its ſeveral properties and qualities; but its ſituation is generally longitudinal and it is ſingle in all the known fiſhes, except in the *ſtromateus* of Rondeletius, in which it is ſaid to be double.

The *ſtomach* in living fiſh is cold to the touch, but this is only a proof that it is leſs hot than our own fleſh. That there is heat in it, is evident enough from the digeſtion which is ſo powerful in it, the *ſtomachs* of many fiſh digeſting ſubſtances which ours could not at all effect; ſuch are the ſhells of ſhell-fiſh. It is not eaſy to ſuppoſe this could be performed without ſome degree of heat in the part, but at the ſame time we are informed by this how ſmall a degree of heat is neceſſary for working theſe effects, and how much may be done by the continual attrition of the fibres, and by a proper fluid. Artedi, Ichthyolog.

STOMACH *of flies*. In examining with care the bodies of theſe little animals one may perceive, that when the paſſage of the aliments is got beyond the lungs, and below the place where they form a ſort of diaphragm, the canal that ſerved for this paſſage, forms a large though ſhort body, the diameter of which three or four times exceeds that of the canal itſelf. This body is compoſed of three fleſhy lobes, and is unqueſtionably the *ſtomach* of the animal. The inteſtine goes out of it, very nearly from the ſame part where the other paſſage is admitted into it; the inteſtine then directs itſelf toward the anus, and afterward runs upward again toward the diaphragm, or bottom of the lungs; and thence, after many convolutions, many times running backward and forward, it terminates in the anus.

In caterpillars and butterflies, the canal from the mouth to the anus is only one ſtraight inteſtine; but it is much otherwiſe in theſe creatures, the inteſtines both in the fly, and in the worm it is produced from, always making a number of contortions and convolutions.

STOMACH-*bruſh*. See EXCUTIA *ventriculi*.

STOMACH, *inflammation of the*. See INFLAMMATION, &c.

STOMACHIC, Στομαχικος, a medicine that ſtrengthens the *ſtomach*, and promotes the office of DIGESTION.

Of this kind are wormwood, rhubarb, mint, maſtic, aloes, pepper, cinnamon, and aromatic bitters: good wine is alſo a *ſtomachic*.

STOMACHIC, in *Anatomy*, is applied to the arteries, veins, &c. of the *ſtomach*, called alſo GASTRIC.

The *ſtomachic* veins terminate in the trunk of the vena porta, and the ſplenic vein. The *ſtomachic* arteries ariſe from the cœliac. The *ſtomachic* nerves come from the eighth pair.

STOMACHIC *coronary*. See CORONARY.

STOMACHIC *elixir*. See ELIXIR *ſtomachic*.

STOMACHIC *pills*. See PILLS.

STOMACHIC *water*. See WATER.

STOMACHICA *febris*, the *ſtomachic fever*, a name given by Heiſter, and ſome others, to a ſpecies of fever, called by others a *meſenteric fever*, and by our Sydenham *nova febris*, in a peculiar treatiſe. See *Inteſtinal* FEVER.

STOMATIA, in *Natural Hiſtory*, the name of a genus of ſhell-fiſh, frequently confounded with the EAR-*ſhell*.

The ſhell of the *ſtomatia* is formed of one piece, has no perforations in any part of its ſurface, and is of a depreſſed flat figure; and its mouth is the moſt patent of all the univalve ſhells, the limpet only excepted. It has a ſhort ſpiral turn running into the mouth at the head.

There are ſeveral ſpecies of this genus. See Hill, Hiſt. Anim. p. 119, ſeq.

STOMATICA, a term uſed by ſome for all medicines uſed in diſorders of the mouth.

STONE, in *Natural Hiſtory*, a hard, ſolid body, neither malleable, nor ſoluble in water; formed by ſucceſſion of time, in the body of the earth, by earthy particles, which, in approaching to one another, acquire various degrees of connection and union. Bodies of this kind are infinitely various, according to their different conſiſtence, colour, form, and other properties.

Naturaliſts vulgarly define *ſtone* a foſſil incapable of fuſion, yet *ſtone* has been known to be melted, and when cold to become *ſtone* again. See SCIARRI.

Hence it ſhould ſeem not impoſſible for *ſtone* to be caſt, or run into the ſhape of columns, vaſes, ſtatues, or relievos; which experiment may perhaps, ſome time or other, be attempted by the curious, who following where nature has ſhewn the way, may poſſibly, by the aid of certain ſalts and minerals, arrive at a method for melting and running *ſtone*, both to their own profit, and that of the public.

STONES are of various kinds, with regard to the places they are produced in: the moſt common are formed under ground; others in the bodies of men, and other animals; others ſeem to be generated by the ſea, as pumice, &c. and others, to be the effect of a petrifying virtue in certain waters. Of theſe, ſome ſerve ſimply for magnificence and ornament, as all thoſe called,

Precious ſtones; which make the commerce of lapidaries and jewellers.

Others are much more uſeful, if one might credit all the virtues attributed to them, and are uſed in medicine; ſuch as bezoards, Jews *ſtone*, eagles *ſtone*, &c.

Others, again, are uſed in painting; either to prepare colours from, by calcining and grinding them, or to be uſed as crayons or pencils for deſigning: of which number are the Armenian *ſtone*, black lead, ruddle, &c.

Laſtly, much the greateſt quantity, and thoſe too of the moſt immediate and common uſe, are thoſe employed in building; ſuch as *free-ſtone*, *marble*, *lime-ſtone*, *fire-ſtone*, &c.

STONES are divided by biſhop Wilkins into *vulgar*, *middle-priced*, and *precious*.

1. *Vulgar ſtones*, or ſuch as are of little price, are diſtinguiſhable by their different magnitudes, uſes, and conſiſtence, into the

- Greater magnitudes of *ſtone*, uſed either about
  - Buildings, whether of
    - Walls; chiefly being of a
      - ſofter conſiſtence, whether natural or factitious,
        - 1 *free ſtone*, *brick*.
      - harder conſiſtence; not eaſily yielding to the tool of the workman, growing either in
        - great maſſes,
          - 2 *ragg*.
        - leſſer maſſes; whether ſuch as are for their figure,
          - more knobbed and unequal; uſed for the ſtriking of fire, either the more common, which is leſs heavy; or leſs common, which is more heavy, as having ſomething in it of a metalline mixture,
            - 3 *flint*, *marcaſite*, fire-*ſtone*.
          - more round and even,
            - 4 *pebble*.
    - Roof, or pavement, being of a laminated figure, either natural, or factitious,
      - 5 *ſlate*, *tyle*.
  - Metals either for the
    - ſharpening, or trying of them,
      - 6 *whet-ſtone*, *touch-ſtone*.
    - poliſhing, or cutting of them; being either of a more ſpongy and ſoft, or of a more hard conſiſtence,
      - 7 *pumice*, *emery*.
- leſſer magnitudes, either more, leſs, or minute,
  - 8 *ſand*, *gravel*.

2. *Middle priced ſtones*, are either of a

- ſhining politure, or capable of it; whether of a
  - ſimple white colour, and more ſoft conſiſtence,
    - 1 *alabaſter*.
  - ſometimes white, ſometimes black or green, and ſometimes variegated with veins, growing in greater or leſſer maſſes,
    - 2 *marble*, *porphyry*, *agat*.
  - ſpotted with red, upon a greeniſh colour, or with ſpots of gold colour upon blue,
    - 3 *jaſpis*, *heliotrope*, *lapis lazuli*.
- Tranſparency, either
  - brittle, whether natural or factitious,
    - 4 *cryſtal*, *glaſs*.
  - fiſſile into flakes, either greater or leſs,
    - 5 *ſelenite*, Muſcovia *glaſs*, or *iſing-glaſs*, *ſpar*.
- Relation to metals, attracting iron, or making of braſs,
  - 6 *load-ſtone*, *cadmia calaminaris*.
- Incombuſtible nature,
  - 7 *amiantus*, *aſbeſtus*.
- Strange original; not being properly minerals, though uſually reckoned amongſt them; but either a ſubmarine plant, or ſuppoſed to proceed from a liquid bitumen,
  - 8 *coral*, *coralline*, *amber*.

2. *Precious ſtones*. See GEM.

The ingenuity and induſtry of modern naturaliſts have led them to form a variety of ſyſtems in the arrangement of foſſils in general, and of *ſtones* in particular: ſome of the principal of theſe it may not be improper to enumerate. Some have founded the baſis of their ſyſtem on the

the figure, colour, ſtructure, and other external and viſible characters; calling in the aid of chemiſtry, ſo far at leaſt as the mineral acids would aſſiſt them. Others, as the profeſſed chemiſts and metallurgiſts, have eſtabliſhed their arrangement chiefly on chemical principles, as more immediately leading to the origin of foſſil bodies in general. And, at preſent, mineralogiſts ſeem more intent on this view than ever; and probably the due conſideration of the volcanic ſyſtem will open new ſources of information in this way.

With reſpect to the ſyſtematic arrangement of *ſtones*, Bromelius in 1730, diſtributes them into ſuch as are permanent in the fire, ſuch as the *lapis ollaris*, *amiantus*, *aſbeſtus*, and *fuſorii*; calcinable, ſuch as the *calcarius*, *ſuillus*, *marmor*, *gypſum*, *ſpatum*, *ſtalactites*, *fiſſilis*, and *ſpecularis*; and thoſe that are vitrifiable in the fire, ſuch as the *arena*, *arenarius*, *gemma*, *granatus*, *ſilex*, *quartzum*, *cryſtallus*, *and fluor*. The other foſſil bodies he ranges under the ſeveral claſſes of earths, ſalts, ſulphurs, figured *ſtones*, petrifactions, calculi, ſemi-metals, and metals.

Wallerius, in 1747, diſtributes *ſtones* into calcareous, as the *calcareus*, *marmor*, *gypſum*, and *ſpatum*; the vitreſcent, as *fiſſilis*, *cos*, *ſilex*, *petroſilex*, *quartzum*, and *cryſtallus*; the apyrous, as *mica*, *talcum*, *ollaris*, *corneus*, *amiantus*, and *aſbeſtus*; and ſaxa or rocky *ſtones*, as the *ſimplicia*, *mixta*, *griſea*, and *petroſa*. The other bodies, pertaining to the foſſil kingdom, he claſſes under the general heads of earths, lean, fat, mineral, and arenaceous, minerals, ſulphurs, ſemi-metals, metals, concrete ſubſtances ſuch as the pori, petrifactions, figured *ſtones*, and calculi.

Wolterſdorf, in 1748, divides *ſtones* into the vitreſcent, as *gemma*, *cryſtallus*, *quartzum*, *arenarius*, *corneus*, *ſpatum vitreſcens*, *ſaxum*, and *pumex*; the argillous, as the *ſmectis*, *aſbeſtus*, *talcum*, *mica*, and *ſchiſtus*; the gypſeous, as *gypſus*, *alabaſtrum*, and *ſpatum gypſeum*; and the alkaline, as *calcareus*, *marmor*, *ſpatum alcalinum*, *tophus*, *ſtalactites*, and *margodes*. The other foſſil ſubſtances he diſtributes under the titles of earths, argillous and alkaline; ſalts acid, alkaline and mean; bitumens, fluid, and ſolid; ſemi-metals, fluid and ſolid; metals noble and ignoble; and petrifactions of ſanguineous animals, of inſects, of teſtaceous animals, of vegetables, and of marine bodies.

Cartheuſer, in 1755, diſtributes *ſtones* into the lamellous, as *ſpatum*, *mica*, and *talcum*; filamentous, as *amianthus*, *aſbeſtus*, and *inolithus*; ſolid, as *ſilex*, *quartzum*, *calcareus*, *gypſeus*, *fiſſilis*, and *ſmectis*; and granulated, as *arenarius*, and *jaſpis*. The other foſſils he claſſes under earths diſſoluble and indiſſoluble; ſalts, alkaline, acid, mean, and ſtyptic; inflammables, both genuine and ſpurious; ſemi-metals, not malleable, ſub-malleable, and fluid; metals, flexile, hard, and fixed; and heteromorpha, including the true and ſpurious petrifactions, and the figured ſubſtances.

Juſti, in 1757, diſtributes terrene bodies into the noble, as the *adamas*, *ſapphirus*, *ſmaragdus*, *amethyſtus*, *topazius*, *turcois*, *opalus*, *chryſolithus*, and *hyacinthus*; the ſemi-noble, as *cryſtallus*, *cameolus*, *achates*, *chalcedonius*, *onyx*, *ſardonyx*, *malachites*, and *lazuli*; apyrous ignoble, as *talcum*, *mica*, *molybdæna*, *vitrum moſchouit*, *ſteatites*, *corneus*, *jaſpis*, and *aſbeſtus*; calcareous, as *marmor*, *gypſum*, and *ſpatum*; and vitreſcent, as *cos*, *quartzum*, *ſilex*, *ſchiſtus*, *ſerpentinus*, *tripela*, *pumex*, *granites*, *ſaxus*, *argilla*, *marga*, *limus*, and *umbra*. The other foſſils he ranks under the heads of metals, noble and ignoble; ſemi-metals, fluid, hard, and mineraliſed; ſalts, acid, alkaline and mean; and petrifactions, animal, plants, obſcure, figured, and cryſtal.

Cronſtedt, in 1758, arranges foſſils under the claſſes of earths, calcareous, ſiliceous, granate, argillaceous, micaceous, fluor, aſbeſtine, zeolitic, and magneſian; ſalts, acid and alkaline; phlogiſtic bodies; and metals, perfect and ſemi-metals.

Vogel, in 1762, diſtributes *ſtones* into the argillaceous, calcareous, margaceous, ſelenitic, pyromachous, ſchiſtous, folious, plumous, ſaline, metallic, fuſile, petræ, or rocky, and new: and the other foſſils under earths, argillaceous, calcareous, ſiliceous, margaceous, ſelenitic, talcous, micaceous, inflammable, ſaline, metallic, and mould; petrifactions of animals, plants, lithophytous, lithotomous, and pori; ſalts ſtyptic, fuſile, ſuch as are capable of being hardened, volatile, and alkaline; combuſtibles, as ſulphureous, bituminous, ſevum, and balſam; and metals, perfect, and ſemi-metals.

Pott, in his Lithogeogneſia, diſtributes *ſtones* into calcareous, gypſeous, argillous, and apyrous.

It has been doubted by ſome of the moſt reſpectable mineralogiſts, whether we ought to deſcend below what are called *generical diſtinctions* in the foſſil kingdom, becauſe the ſubjects are infinitely various, and the gradation by which they run into one another is in general imperceptible, in the various combined forms, in which they are found in the earth. Nevertheleſs, ſome diſtinctions of this kind ſeem to be quite neceſſary in ſyſtems eſtabliſhed principally on external characters.

Linnæus and Wallerius have been among the firſt who attempted the arduous taſk of fixing the ſpecific characters. For this purpoſe Linnæus has formed a ſet of terms that expreſs all differences in the figures of foſſil bodies, in their cruſt or outward appearance, their ſuperficies, their correſpondent particles or fibres, in their texture, whether plated, fiſſile, &c. in their hardneſs, or in their colour, and in the alterations they undergo by ſolution, both by acids and by fire.

The chemical ſyſtematics and metallurgiſts, in their arrangements, uſually begin with the earths, conſidering them as the baſis of *ſtones*: Linnæus begins with the latter, profeſſing to take a middle way between the mere metallurgiſt, and thoſe who characterize from external appearance only. He divides the whole *regnum lapideum* into three claſſes, under the names of *petræ*, *mineræ*, and *foſſilia*, each being ſubdivided into ſeveral orders, and comprehending in the whole fifty-four genera.

To the firſt claſs belong *petræ*, or *ſtones*, which he defines to be foſſil bodies, originating from a terrene principle by coheſion: theſe are ſimple, as in their compoſition they are deſtitute of ſaline, inflammable and metallic principles; they are fixed, as not being entirely and intimately ſoluble in any menſtruum; and ſimilar, as they conſiſt of homogeneous component parts. Of theſe there are five orders, viz.

1. The *humoſæ*, or *ſlaty ſtones*, which originate from vegetable earth, are combuſtible, and leave groſs light aſhes. Under this order there is one genus, viz. the *ſchiſtus*, or *ſlate*, including thirteen ſpecies, among which the moſt diſtinguiſhed are the table ſlate, black ſlate, blue houſe ſlate, and black crayon.

2. The *calcareæ*, or *calcareous ſtones*, which originate from calcareous marine animal bodies, become light and porous in the fire, and fall into an impalpable powder, and effervefce, and are ſoluble in acids, unleſs they are previouſly ſaturated with an acid, as the gypſum. This order comprehends four genera, viz. *marble*, of which there are fifteen ſpecies, ſuch as the black ſlaty marble, the Parian marble, and all its varieties; the Florentine marble, the white grain lime-ſtone, the ſcaly lime-ſtone, &c. *gypſum*, or *plaiſter-ſtone*, of which there are three ſpecies, ſuch as the common plaiſter, alabaſter, &c. *ſtirium*, or *fibrous alabaſter*, including four ſpecies, as the fibrous gypſum, or Engliſh talc, &c. and *ſpatum*, or *ſpar*, of which there are fourteen ſpecies, ſome ſoluble in aqua fortis, as the ſoft ſpar, refracting ſpar, or iſland cryſtal, ſubdiaphanous compact ſpar of different colours, pellucid coloured ſpar, as ſpurious topaz, emerald, and ſapphire, &c. and ſome not ſoluble in aqua fortis, as the felt-ſpat, &c.

3. The *argillaceæ*, or *argillaceous ſtones*, which originate from the viſcid ſediment of the ſea, are ſomewhat unctuous to the touch, and harden in the fire. To this order belong three genera, viz. *talcum*, or *ſoap earth*, including twelve ſpecies, as the ruddle, ſmectis, or French chalk, or ſoap-earth, ſerpent-*ſtone*, and horn-blend, &c. *amianthus*, or *earth-flax*, of which there are ten ſpecies, as the aſbeſtos, plumoſe aſbeſtos, mountain cork, and aluta, or mountain leather, &c. and *mica*, or *talc*, of which there are ten ſpecies, as Muſcovy glaſs, gold glimmer, and green talc, &c.

4. The *arenatæ*, or *ſand-ſtones*, which originate from the precipitation of rain water, are extremely hard, ſtrike fire with ſteel, and by triture yield a very rough powder. This order comprehends three genera, viz. the *cos*, or *whetſtone*, of which there are ſixteen ſpecies, as the grindſtone, filtring-*ſtone*, mill-*ſtone*, building *ſtone*, &c. the *quartz*, including eight ſpecies, as the pellucid rock quartz, coloured rock quartz, red, blue, yellow, &c. milky quartz, granulated quartz, pebble quartz, &c. and the *ſilex*, or *flint*, of which there are ſixteen ſpecies, ſome being vague or looſe flints, as the common flint, gun-flint, Ægyptian pebble or mochoa *ſtone*, opal, onyx, or cameyeu, chalcedony, carnelian, &c. and ſome being rock-flints, as the agate, petro-ſilex or chert, jaſper, &c.

5. The *aggregatæ*, or *rock* or *compound ſtones*, which originate from a mixture of the four preceding orders variouſly conglutinated; the interſtices uſually filled up with quartz, ſpar, or glimmer. Of this order there is only one genus, viz. the *ſaxum*, or *rock-ſtone*, including thirty-nine ſpecies, as the porphyry of different colours; the trapezum, or trap-*ſtone*, the granite, the fuſorium, or founder's *ſtone*, the ſilicinum, or pudding-*ſtone*, &c.

The ſecond claſs of foſſil bodies are the *mineræ*, or *minerals*, which Linnæus defines to be foſſil bodies, originating from a ſaline principle by cryſtallization; they are compound, as conſiſting of a baſe, united with ſaline, inflammable,

inflammable, or metallic principles; and they are soluble, perfectly, in an appropriate menstruum: of these there are three orders, viz.

1. *Salia, salts,* or *crystals,* which are sapid bodies soluble in water; distinguished from each other by their different effects on the organs of taste: under this order there are six genera, viz. *nitre,* of which there are nine species, as the saline, or native saltpetre; the quartzose, or mountain crystal; fluor, or coloured crystal, from the varieties of which are the true hyacinth, the false topaz, ruby, amethyst, sapphire, beryl, and emerald; and the calcareous, as the hexagonal truncated spar, the suillum, or sparry swine-*stone,* &c. *natron,* including fourteen species, as the saline, or native mineral alkali, aphronitrum, and Epsom salt; the lapidose, or spatose, decaedrous natron, the gypseous pellucid, fusiform natron, the selenite, or rhombic natron, the hyodon, or pyramidal, or dog-tooth spar, &c. *borax,* of which there are six species, as the saline, or tincal, or native borax; the lapidose, to which belong the gemma nobilis, or lapidose, prismatic, pellucid borax, with truncated pyramids, and as varieties of this species, the yellow or topaz, the pale green or chrysolite, the sea-green, or beryl, and the deep green, or emerald, the basaltes, the tourmalin, the garnet, and the margodes, or opake, argillaceous, tessellated borax; the *muria,* or *sea-salt,* of which there are nine species, as the saline, or sea, fossil, fountain, and hot bath salt; the lapidose, or Bononian *stone,* sparry fluor, or Derbyshire spar, &c. *alumen,* or *alum,* including six species, as the native, or native alum, plumose, &c.; soluble, or alum slate, *stone* alum, or calcareous alum *stone,* called *Roman alum;* and lapidose, to which belong the spatose alum, or false amethyst, the gemma preciosa, or diamond, ruby, and sapphire, &c.; *vitriolum,* or *vitriol,* of which there are eight species, as the simple, or those of iron, of copper, and of zinc; the compound, or triple vitriol of iron, zinc, and copper, the atramentarium, i. e. vitriols mineralised with friable *stone,* such as red chalcitis, grey sory, black melanteria, and yellow misy, &c.; and the lapidose, or spatose vitriol of zinc.

2. *Sulphura,* or *inflammable* bodies, flaming and odorous while burning; soluble in oil; and distinguished from each other by their different effect on the organs of smell: of this order there are five genera, viz. *ambra,* or *ambergrise,* including two species, as the grey and the brown; *succinum,* or *amber,* of which there is one species, as the electric amber, and the varieties of diaphanous, opake, yellow, brown, and that which includes insects; *bitumen,* of which there are ten species, as the naphtha, petroleum, or rock oil, maltha, or Jew's pitch, mumia, or sevum minerale, asphaltum, or fossil pitch, ampelites, or peat, lithanthrax, or common coal, or schistose bitumen, gagas, or jet, suillum, or calcareous fetid bitumen, of which there are the varieties of compact, granulated, squamose, and crystalline, and the hepaticum, or liver bitumen: *pyrites,* or *sulphurs,* including seven species, as native sulphur, orpiment, crystallised pyrites, or marcasite, figured pyrites, iron pyrites, copper pyrites, of which there are thirteen varieties, and aquose, or liver-coloured pyrites: and *arsenic,* comprehending eight species, as the solid testaceous arsenic, the sandaraca, or red arsenic mineralised with sulphur; the arsenical marcasite, the arsenicum albicans, or arsenic mineralised with iron, &c.

3. *Metalla,* or *metals,* which are shining heavy bodies, fusible in the fire, and soluble in appropriated acid menstrua; distinguished from each other by inspection: of this order, there are two subdivisions into semi-metals, not malleable, and metals malleable. The first subdivision includes six genera, viz. *hydrargyrum,* or *mercury;* of which there are five species, as virgin, or native quicksilver, cubic crystallized quicksilver, cinnabar, with the varieties of lamellated, granulated, and crystallized, and pyritical, cupreous, *stone* mercury, &c.; *molybdænum, wadd,* or *black lead,* of which there are three species, as plumbago, or black lead, or wad, or sulphur saturated with iron and tin, magnesia, or black manganese, and spuma lupi, or red manganese, or wolfram: *stibium,* or *antimony,* of which there are four species, such as native regulus of antimony, crystallized stibium, fibrous, or common antimony, and red antimony mineralized with sulphur and arsenic: *zinc,* or *tutenag,* of which there are eight species, as crystallized zinc, that mineralized with sulphur and lead, or iron, that mineralised with sulphurated iron, fibrose zinc, calamine, or *stone* zinc, or zinc mixed with martial ochre; blend, or mock-lead, or black jack, or semi-tessellated black zinc, and red zinc or micaceous, liver-coloured zinc: *vismutum,* or *bismuth,* of which there are four species, as native bismuth, common bismuth, mineralized with sulphur and arsenic, martial bismuth, and bismuth mineralised with sulphur only: and *cobalt,* of which there are four species, as crystallized cobalt with sulphur, arsenic, and iron, cobalt mineralized with arsenic and iron, pyriticose cobalt and slag-cobalt.

The second subdivision comprehends malleable metals, and of these there are six genera, viz. *stannum,* or *tin,* including four species, as crystallized tin or tin grains, tin-*stone,* spatose tin, &c. *plumbum,* or *lead,* of which there are ten species, as native lead, cubic lead crystallized, cubic lead mineralised with sulphurated silver, or galena, stibiated lead ore, greenish arsenical lead ore, sparry arsenical lead ore, &c.: *ferrum,* or *iron,* including twenty-seven species, as native iron in grains, crystallized iron, such as obey the magnet, to which denomination belong steel-grained iron ore, fine grained iron ore, common iron ore, pyriticose iron ore, talky iron ore, calcareous iron ore, emery, &c. such as do not obey the magnet, of which there are red micaceous iron ore, blood-*stone,* red blood-*stone,* spar-like iron ore, &c. and magnetical, or the magnet: *cuprum,* or *copper,* of which there are sixteen species, as copper precipitated upon iron, native copper, crystallized octaedral copper, pyriticose yellowish-green copper ore, pyriticose purple copper ore, soft pyriticose grey copper ore, sooty, pyriticose, arsenical copper ore, white arsenical, pyriticose copper ore, indurated ochraceous red copper ore, which is sometimes liver-coloured; sandy ochraceous copper *stone,* green and blue copper slate, lapis lazuli, lapis armenus or blue calcareous copper *stone,* malachites, or green gypseous copper *stone,* nickel, or copper mineralised with sulphur, arsenic, and iron, &c.: *argentum,* or *silver,* of which there are nine species, as native silver in various forms, horn silver ore, shining, submalleable, and somewhat diaphanous, mineralised with sulphur and arsenic, glass silver ore or lead-coloured malleable silver ore mineralised with sulphur, red silver ore mineralised with sulphur and arsenic, white silver ore mineralised with arsenic, copper, and sulphur, grey silver ore mineralised with sulphur, antimony, copper, and iron, silver ore mineralised with arsenic and iron, silver ore mineralised with sulphur and zinc, and sooty silver ore mineralised with arsenic and copper: and *aurum,* or *gold,* of which are two species, as native gold found in various forms, as in thin plates or leaves, solid, or in thick pieces, and a crystalline form; it is also found imbedded in quartz, talc, and cinnabar, and in rivers in loose grains and lumps, called *gold dust;* and mineralised pyritical gold ore.

The third class are fossils, which are bodies originating from different modifications of the subjects comprehended in the preceding classes: of these there are three orders, viz.

1. *Petrificata,* or such fossil bodies, as represent in figure certain animals or vegetables, or parts thereof. The true petrifactions are such as have the texture and organic parts of the bodies entirely filled up with stony particles, either of a calcareous or flinty, and sometimes marcasitical nature: there are others in which the bodies are preserved and unaltered, as having lost only the animal gluten; others again, are only bodies incrustated with stalactite, or calcareous matter: and frequently they are only impressions received in their soft state. Of this order there are eight genera, viz. *zoolithus,* or the petrifactions of mammalia, including four species, as bones of men, remains of the rein-deer, fossil ivory, and turquoise, or teeth tinctured by copper: *ornitholithus,* or petrifactions of birds, in whole or in part, and of their nests, of which the first species are scarce, and are usually stalactical incrustations; *amphibiolithus,* or petrifactions of amphibia, of which there are six species, as of an entire tortoise, of a toad, of the skeleton of a crocodile, of an entire serpent, of various nantes, as of the raia, balistes, &c. and glossopetræ, or shark's teeth: *ichthyolithus,* or petrifactions of fishes, including three species, as those of entire skeletons, with the fins in slate, and in marble, and the bufonites, or grinding teeth of the wolf-fish; *entomolithus,* or petrifactions of insects including three species, as the cancri or petrified crab, lobster, &c. paradoxus, or unknown insect, petrified, and insects inclosed in amber, which indeed are not proper petrifactions; *helmintholithus,* or petrifactions of worms, including twenty-four species, as the cornu ammonis, orthocerotes, or straight nautilus, anomites, or various anomiæ, gryphites, or crow-*stone;* Jew's *stone,* supposed to be spines of echini, echinites, madrepores of various kinds, entrochus, star-*stones,* belemnites, &c.; *phytolithus,* or petrifactions of plants, of which there are seven species, as of the entire plant in coal slate, of ferns in slate, of roots in marble, of wood in various slates, as of lime-*stone,* agate, flint, sand-*stone,* and slate, of leaves in slate and marble, of flowers in slate, and of fruits in coal strata, commonly cones of the pine, nuts, acorns, &c.; *graptolithus,* or *stones* resembling pictures, including eight species,

species, among which are Florentine marble or slate, resembling ruins, dendrites, representing woods, landscapes, &c. arising from vitriolic solutions insinuated between the plates of fissile *stones*, or in marble.

2. *Concreta*, which are slight conglutinations of different kinds of earths, whose specific differences arise principally from the nature of the component parts: of this order there are six genera, viz. *calculi*, or animal concretions, including eight species, as the *stone* in the kidney or bladder, tartar of the teeth, of the lungs, bezoar *stones*, formed in the abomasus, or fourth stomach of ruminating animals, ægagropila, or hair-balls, formed in the first stomach, bile stones, pearls, and crab's-eyes: *tartari*, or vegetable concretes, of which are two species, as yeast, and red and white tartar: *ætites*, or concretions within the cavity of stones, of which there are the true, having a loose nucleus, as the geodes with an earthy nucleus, and the aquilinus with a stony nucleus, and the spurious, as the hæmachates, or flinty ætites, with a fixed crystalline nucleus, marble ætites, including dog-tooth spar, and echinited ætites, including fluor crystals: *pumex*, or concretions by means of fire, including eight species, such as black slate pumice, white pumice of iron furnaces, red copper pumice, soot, ashes of volcanos, Rhenish mill-*stone*, vitreous pumice, or black and green Iceland agate, &c.: *stalactites*, or concretions by means of air, including twelve species, as vegetable incrustations, drop-*stone*, solid and branched marmoreous stalactite, solid spatose stalactite, red spatose stalactite, or zeolite, &c.: and *tophus*, or concretions in water, including twenty-two species, of which there are the metallic *tophs*, as the marly toph-*stone*, the tubular, marly, ochraceous toph-*stone*, the sandy ochraceous sea toph-*stone*, the bog iron ore in various forms, &c. and the simple tophs, as slum toph, concretions of tea-kettles, pea-*stone* of hot springs, osteocolla, or bone-binder, solid black schistose toph, &c.

3. *Terræ*, or *earths*, which are fossil substances not conglutinated, but usually in a slightly cohering or pulverized state: of this order there are five genera, viz. *ochra*, or *ochres*, or earths of metals, of which are fifteen species, some in the form of powder, as ochre of iron, green and blue ochres of copper, native cerus, ochre of cobalt, &c. and others plumose, or germinating ochres, as copper blue, or plumose copper, flowers of antimony, plumose silver ore, with sulphurated antimony and arsenic, &c.: *arenæ*, or *sands*, including fourteen species, as sea sand, coloured sands, sand of heaths, sabulum, or common sand, micaceous, or glittering, or writing sand; gold, iron, and flint sand, &c.: ARGILLÆ, or *clays*, boles, and marles, including twenty-one species, some simple, among which are porcelain clay, tobacco pipe clay, China porcelain earth, Lemnian earth, fuller's earth, tripoli, or rotten *stone*, brick clay, potter's clay, boles of different colours, &c. others mixed, as fermenting clay, marle, umbre, marle of the Nile, &c.: *calx*, or *chalk*, comprehending nine species, some soluble in acids, as creta or chalk, mineral agaric, shell-chalk, or mouldered shells, &c. some not soluble in acids, as true mineral agaric, gypseous gur, or lac lunæ, and others granulated or sandy, as alabaster chalk, soluble arenaceous calx of the isle of Ascension, and lenticular granulated calx: and *humus*, or *mould*, of which there are fourteen species, as the impalpable vegetable mould, common black mould, depauperated mould of heaths, spongy mould of marshes, alpine earth, turf, mould of lakes, or mud mould, red mould, animal mould, &c. See Linnæi Systema Naturæ, tom. iii. 1770. passim, and Pulteney's General View of the Writings of Linnæus, 1781, p. 131—166.

Mr. Da Costa, in his Natural History of Fossils, 1757, distributes *stones* into four general classes. The first class comprehends those *stones* which are found forming continued strata, coarse, harsh, and rough, of a lax texture, of a visible grit or grain, resembling sand in form, usually immersed in a cementitious matter, of little brightness, and scarce capable of any polish: of this class there are two genera, viz. *stones* harsh and rough, composed of a visible grit, not of a laminated structure, and splitting equally in any direction, called PSADURIA by Hill, of which there are the alkaline sand-*stones*, as the PORTLAND-*stone*, FREE-*stone*, &c. sand-*stones* not acted on by acids, as the WHET-*stone*, FILTRUM, MILL-*stone*, GRIND-*stone*, &c. and sand-*stones* imperfectly described by authors: and *stones* harsh and rough, composed of a visible grit, of a laminated structure, and splitting only horizontally or into plates, See FLAG.

The second class includes *stones* that are found forming continued strata, of a close, solid, smooth texture, or composed of no visible grit, and generally destitute of brightness, though in some degree capable of a polish: of this class there are two genera, viz. *stones* of a close, solid texture, of a plain uniform structure, and splitting with equal ease in any direction, distributed according to their colours into black, white, ash, and grey, red, brown, blue, green, and variegated, each of which is again subdivided into alkaline *stones*, and those which are not acted upon by acids, comprehending the PURBECK-*stone*, OIL-*stone*, &c. and *stones* called SLATES.

The third class comprehends MARBLES and MARMOROIDÆ.

The fourth class includes the MARMORO-*prosera*, the GRANITES, and the PORPHYRIES. See FOSSILS.

STONES, *for the origin and formation of*, M. Tournefort, on his return from the East, in the year 1702, proposed to the Royal Academy a new theory.

On a curious survey of the famous LABYRINTH of Crete, he observed, that several people had engraved their names in the living rock, whereof its walls are formed; and, what was very extraordinary, the letters whereof they consisted, instead of being hollow, as they must have been at first (being all cut with knife-points) were prominent, and stood out from the surface of the rock, like so many basso-relievos.

This, he says, is a phenomenon no otherwise accountable for, than by supposing the cavities of the letters filled insensibly with a matter issuing from out of the substance of the rock; and which even issued in greater abundance than was necessary for filling the cavity. Thus is the wound made by the knife healed up, much as the fracture of a broken bone is consolidated by a callus, formed of the extravasated nutritious juice, which rises above the surface of the bone: and this resemblance is the more just, as the matter of the letters was found whitish, and the rock itself greyish.

Something very like it is observed in the barks of trees, wherein letters have been cut with the knife; so that the poet had reason to say, that the characters grew as the trees themselves grew: *Crescent illæ; crescetis, amores.*

M. Tournefort supports his opinion by similar calluses apparently formed in several other *stones*, which had re-united after, by accident, they had been broken.

From these observations, he says, it follows, that there are *stones* which grow in the quarries, and of consequence that are fed; that the same juice which nourishes them, serves to rejoin their parts when broken; just as in the bones of animals, and the branches of trees, when kept up by bandages; and in a word, that they vegetate.

There is, then, he says, no room to doubt but that they are organized; or that they draw their nutritious juice from the earth. This juice must be first filtrated and prepared in their surface; which may be here esteemed as a kind of bark; and hence it must be conveyed to all the other parts.

It is highly probable, the juice which filled the cavities of the letters, was brought thither from the bottom of the roots; nor is there any more difficulty in conceiving this, than in comprehending how the sap should pass from the roots of our largest oaks, to the very extremities of their highest branches.

It must be owned, that the heart of these trees is exceedingly hard; and yet those of Brasil, called *iron wood*, guaiacum, and ebony, are much harder. Coral is as hard in the sea as out of it, and sea-mushrooms, which every body allows to grow, are true *stones*, and so, like the common *stones*, are used in America to make lime of.

Some *stones*, then, he concludes, must be allowed to vegetate and grow like plants: but this is not all; he adds, that probably they are generated in the same manner; at least, that there are abundance of *stones*, whose generation is inconceivable, without supposing that they come from a kind of seeds, wherein the organical parts of the *stones* are wrapped up in little; as those of the largest plants are in their seeds.

The *stones* called *cornu Ammonis*, *lapis Judaicus*, *astroites*, those of Bologna and Florence, the several kinds of pyrites, crystals of the rock, and an infinity of other *stones*, he supposes to have their several seeds: as much as mushrooms, truffles, and various kinds of mosses, whose seeds were a long time before they were discovered.

He continues, how should the cornu Ammonis, which is constantly in figure of a volute, be formed without a seed, containing that same structure in little? who moulded it so artfully? and where are the moulds? Far from this, these kinds of *stones* are found in the earth, like common flints. Nor were either their moulds, or any thing like them, ever discovered.

M. Tournefort examines the several kinds of *stones* above mentioned, and finds them under the same necessity of seed. Again, that immense quantity of pebbles, wherewith the Crau of Arles is covered, he thinks a strong argument in behalf of this theory.

The country there, for twenty miles round, is full of roundish pebbles; which are still found in equal abundance, to whatever depth you dig. M. Pieresc, who first proposed the generation of *stones* by means of seeds (though

(though he took the word *ſeed* in a very different ſenſe from M. Tournefort), firſt brought this extraordinary collection of them as a proof thereof. In effect, how could ſo many ſimilar pebbles be formed? There is no ſaying they are coeval with the world, without aſſerting at the ſame time, that all the *ſtones* in the earth were produced at once; which were to go directly contrary to the obſervations above mentioned.

Among the ſeeds of *ſtones*, M. Tournefort obſerves, there are ſome, which do not only grow ſoft by the juices of the earth, but even become liquid. Theſe, then, if they penetrate the pores of certain bodies, grow hard, petrify, and aſſume the figure or impreſſion of the body: thus what we call *pectinites*, *conchites*, *mytulites*, *oſtracites*, *nautilites*, *echinites*, &c. are real *ſtones*, the liquid ſeeds whereof have inſinuated into the cavities of the ſhells called *pecten*, *concha*, *mytulus*, *oſtrea*, *nautilus*, and *echinus*. On the contrary, if thoſe liquid ſeeds fall on flints, on ſhells, ſand, &c. they encloſe thoſe ſeveral bodies, and, fixing between them, form a kind of cement, which yet grows like other *ſtones*. It is highly probable, that ſuch rocks as are only an aſſemblage of cemented flints, have been formed by a number of theſe liquid ſeeds; in like manner as the quarries full of ſhells: unleſs the rocks have enveloped theſe bodies in their growth.

He even ſuppoſes, that there are ſeeds of real *ſtones* encloſed in the ſpawn of certain ſhell-fiſh; as well as that hard ſolid matter deſtined for the forming their ſhells.

There is, ſays he, a particular kind of ſhell-fiſh, called *pholas*, which are never found any where but in the cavities of flints, which are always found exactly fitted to receive them. Now, it is highly improbable the fiſh ſhould come and dig ſuch a nitch to ſpawn in; it is much more likely, the *ſtones* they are found encloſed in, were at firſt ſoft; and that the matter they are formed of, was originally found in the ſpawn, in like manner as the matter which forms the egg-ſhell, is really found in the ſeed thereof.

From the whole, he concludes, that the feed of *ſtones*, and even of metals, is a kind of duſt which probably falls from them while they are alive, i. e. while they continue to vegetate as above. This duſt may be compared to the ſeeds of ſeveral plants, which no microſcope ever yet diſcovered; though their exiſtence is not at all to be doubted.

Probably, flints and pebbles are among *ſtones*, what truffles are among plants: nor is this opinion new; Pliny aſſures us, that Theophraſtus and Mutianus believed, that *ſtones* produced *ſtones*: and Gregory Nazianzen adds, that there were authors who even believed, that *ſtones* made love, Ετι και αψυχοισιγαμος και δεσμος ερωτος. Poem. de Virgin. All this however is founded on the imperfect knowledge of thoſe times.

Since Mr. Tournefort's days we have diſcovered other ways of formation for the lapis Judaicus and cornu Ammonis, the firſt being only a petrifaction of the ſpines of an echinus marinus; and the other of a ſhell-fiſh nearly allied to the nautilus kind. See FOSSIL, JUDAICUS LAPIS, and CORNU AMMONIS.

M. Geoffroy accounts for the origin and formation of *ſtones*, in a different manner. He lays it down as a principle, that all *ſtones*, without exception, have been fluid; or at leaſt a ſoft paſte, now dried and hardened: witneſs the *ſtones* wherein are found foreign bodies; witneſs alſo figured *ſtones*, &c.

On this principle, he examines the formation of the different kinds of *ſtones*; and ſhews, that the earth alone ſuffices for the ſame, independent of all ſalts, ſulphurs, &c. The metallic particles contained in flints, give them their colour; but theſe are only accidents: for proof of which, he inſtances the ſapphires and emeralds of Auvergne, which loſe all their colour by a moderate fire conſuming their metallic parts; but without any damage to their tranſparence; they being hereby rendered mere cryſtals.

To view rock-cryſtal, indeed, one would not take it for earth; and yet earth it muſt be, not water congealed, as the ancients imagined.

M. Geoffroy conceives two kinds of primitive particles in the earth. Thoſe of the firſt kind are exceedingly fine, thin lamellæ, equal to each other, or nearly ſo. Now, when theſe meet together, from any cauſe whatever, in a ſufficient quantity; the regularity and equality of their figures determine them to range themſelves equally and regularly; and thus to form an homogeneous compound, which is very hard, from the immediate contact of the parts; and very tranſparent, by reaſon of their regular diſpoſition, which leaves a free paſſage to the rays of light every where: and this is cryſtal.

The parts of the ſecond kind have all ſorts of irregular figures; and muſt accordingly form aſſemblages that are much more opake, and leſs hard. Now cryſtal is formed wholly of parts of the firſt kind; and all other *ſtones* of a mixture of the two kinds of parts together: this mixture is abſolutely neceſſary, in order to unite and bind together the parts of the ſecond kind, and give them an hardneſs and conſiſtence, without which they would only make a ſand or duſt. Water now appears the fitteſt vehicle, to carry the parts of the firſt kind. This is ſeen from ſeveral petrifying ſprings, which incruſtate the pipes through which their waters are conveyed, or even ſolid bodies laid in them for ſome time. The water does not diſſolve thoſe earthy parts; it only keeps them in fuſion, as it does the juices wherewith plants are fed.

This water, thus charged with earthy particles of the firſt kind, M. Geoffroy calls the *ſtony*, or *cryſtalline juice*, whereof thoſe bodies are primarily formed. See CRYSTAL.

Some look upon *ſtones* as unorganized vegetables, and that they grow by the accretion of ſalts, which often ſhoot into angular and regular figures. This, it is ſaid, appears in the formation of cryſtals on the Alps; and that *ſtones* are formed by the ſimple attraction and accretion of ſalts, appears by the tartar on the inſide of a claret-veſſel, and eſpecially by the formation of a *ſtone* in the human body. Henkell has thrown together ſome very ingenious thoughts on this abſtruſe ſubject, in a treatiſe publiſhed in the year 1734, where he builds no opinions on any other baſis than that of facts, obſervations of nature, and experiments.

He ſuppoſes that the earth was at firſt every where ſoft on the ſurface, and that this ſoft matter, by degrees, hardened, and formed *ſtones* of ſeveral kinds. He ſeems to imagine, that the ſurface of the earth was a ſecond time all reduced to this ſoft ſtate by the univerſal deluge at the time of Noah, and that this matter, afterwards hardening into *ſtones* of various kinds, included the ſhells of ſea-fiſhes, and other animal remains of the produce of the ſeas, in flints, in lime-ſtone, or in whatever other ſubſtance the matter, among which they lay, chanced to harden. Thus may the ſea-ſhells, found ſingly in the middle of hard flints, or lodged in vaſt numbers in the ſtrata of earth, limeſtone, or marble, be accounted for.

Nor is water alone the agent that may have made theſe changes in the once ſoft parts of the earth's ſurface; we can by fire reduce the pooreſt earths into a ſort of glaſs, a hard tranſparent body, not a little reſembling the nature of flint, or the other ſemi-pellucid ſtones. Fire is of power to do great things in the bowels of the earth, and the way to learn what changes it may there make in *ſtones*, is to try its effect upon the ſeveral different kinds of *ſtones* and earths here. By experiments of this kind we learn, that of the ſeveral ſpecies of *ſtones* in their preſent ſtate ſome are reduced to a friable maſs, and finally to powder, by the force of fire; others are hardened by it; others are melted, and become a kind of glaſs: and by experiments, on the other foſſil ſubſtances, it appears, that the original matter of all *ſtones* has been earth, either of the nature of chalk, marl, or clay; and that many of them have been greatly altered by receiving metallic or other mineral matter into their earthy matter, at the time of their formation; and all ſeem to have owed their change into their hard ſtate, either to fire alone, or to ſaline, oily, metallic, or ſaline ſulphureous matters, either conjunctly with the force of this agent, or alone. Henkell, Lithogeneſia.

Thoſe *ſtones*, which are formed in their preſent ſtate, immediately out of fluids, have been produced either by congelation, a rude coalition, or cryſtallization; and that all the gems have been once fluid is plain, from their imperfections in certain inſtances, as from their containing grains of ſand, or the like extraneous ſubſtances, firmly embodied in them. If theſe, the hardeſt of all *ſtones*, have been once fluid, there is no reaſon to diſpute, but that all the other kinds may have been ſo, which are leſs hard and leſs perfect.

STONES, *formed*, among *Naturaliſts*, mineral, or *ſtony* matter, caſt in the cavities of certain ſea-ſhells, or other parts of marine animals.

Of theſe ſome are found quite naked and bare; others have the remainder of the ſhell about them: and among theſe there are alſo found many real ſhells, ſcarce at all altered from their recent ſtate, buried at great depths in the earth, far from ſeas, and even on the tops of mountains.

This is by moſt ſuppoſed an effect of the general deluge, and by many is thought a convincing proof of the truth of that hiſtory; but there have been many who have aſſerted, that theſe bodies can convey no ſuch proof, ſince, as they affirm, they are not, nor ever were marine bodies, or owed their form to ſuch, but mere *luſus naturæ*, *ſtones* formed in the places where they are found, having no relation to animals of any kind, but only accidentally reſembling them. But the aſſertors of the former opinion have rather the better ſide of the argument.

It

It ſeems indeed contrary to the great wiſdom of nature, which is in all its productions, to deſign every thing to ſome determinate end, that theſe bodies ſhould have been ſo nicely formed by a mere plaſtic virtue in the earth, or endued with all the characters and neceſſary parts of animal coverings, &c. for no other end but merely to exhibit ſuch a form, without having any relation to the uſes theſe particulars are appropriated to in the animal. But if the origin of *ſtones*, found in the ſhape of ſhells, be doubtful, yet the real ſhells found in the earth cannot be ſuppoſed to have been formed there: yet theſe are found at as great diſtances from the ſea, and not only in the lower grounds and hillocks, but in the higheſt parts of the loftieſt mountains, even without the leaſt particle of ſtony matter about them; mere ſhells, unpetrified, uncorrupted, and of the exact figure, ſtructure, and conſiſtence of the ſea-ſhells, which are now habitations of living animals of the ſame ſpecies.

That nature ſhould form real ſhells, without ever intending them for the covering of an animal, ſeems no way probable; and indeed, were it true, would give great ſtrength to the atheiſt's opinion, that all things exiſted by mere chance, and were intended for no end or uſe. Nor are the ſhells the only inſtances of theſe foſſil bodies perfectly reſembling animal ones, but we find with them other parts of animals, as the teeth of fiſhes and land animals; which, though met with buried in earth, or on the tops of mountains, are plainly the ſame with the ſubſtances produced by the fiſhes, &c. of this kind are the teeth of the ſeveral ſpecies of ſharks, called *gloſſopetræ*; thoſe of the wolf-fiſh, called *bufonitæ*; the vertebræ of ſeveral fiſh, and the like.

The very inſpection is abundantly ſufficient to prove, that theſe were once parts of animals; but were that inſufficient, they have not, even in this their foſſil ſtate, ſo far diveſted themſelves of their animal nature, but that they carry proofs of it; and Columna has evidently proved their true origin from theſe. He obſerves, that all animal and vegetable ſubſtances, whether of a woody, bony, or fleſhy nature, by burning, are changed firſt into a coal, before they go into a calx of aſhes; whereas *ſtony* ſubſtances, on the contrary, do not burn into a coal, but are reduced at once into their calx or lime, or elſe into glaſs. But theſe teeth, ſuppoſed by ſome mere productions of the earth, all burn firſt to a coal, while the *ſtony* matter adhering to them does not; whence alone it is ſufficiently plain, that they and that ſubſtance are of very different kinds, and that they are truly of a bony, not a *ſtony* matter. It is alſo repugnant to that great maxim, that nature does nothing in vain, to ſuppoſe theſe teeth formed in the earth where they are now found, ſince they could there have no uſe as teeth, nor the vertebræ, or other bones, as bones. It is very certain, that nature never made teeth without a jaw, nor ſhells without an animal inhabitant, nor bones without the reſt of the body they belong to; theſe things are not made in this ſeparate and uſeleſs ſtate in the element to which they naturally belong, much leſs in a foreign one.

Their very ſubſtance and place alſo evince plainly, that they were not formed where they are now depoſited, for they are uſually lodged in *ſtones*, and *ſtones* contain not the matter of which they are made: and as to their place, they might have been lodged there, either when formed, which proves our aſſertion, or elſe they muſt have been at ſome time generated all of a ſudden there, or have grown from a ſmall origin, increaſing by little and little, as the animal ſubſtances which they reſemble do. Now, if the *ſtone*, in which they lie, was formed before them, and they were formed on a ſudden in it, how came the cavity there juſt to correſpond to their ſize? and if they grew by little and little, how could they form a cavity in the *ſtone*, without burſting or cracking it?

It is alſo no ſmall proof of theſe teeth being of a marine or animal origin; that they are not regularly ſhaped at the baſe, but are all broken, and that in various manners; which proves very plainly, that there has been no vegetation in the caſe, becauſe in all other figured foſſils it is obſerved, that they are never found mutilous or imperfect. It cannot, with any ſhew of reaſon, be ſuppoſed, that theſe teeth were thus broken within the body of the *ſtone* where they now lie, but it is plain that they were lodged in the *ſtone* at a time when it was ſoft, and were before that broken off from the jaw of the creature in this irregular manner.

It is likewiſe no weak argument, that theſe bodies are not formed at this time in the *ſtone*, that they are all found perfectly alike; for, if they were continually increaſing in ſize or number, it is probable, that the new formed ones would be ſome way different from thoſe which were of older date. The variety of ſpecies in the *gloſſopetræ* alone may evince, that they belong to the animal to which they are attributed, ſince they are of very different kinds. See Glossopetræ and Serpent's *tongues*.

The perfection of the figures of theſe bodies is a farther proof of their origin from animals which they repreſent, ſince in all cryſtallizations there are many imperfect and mutilated figures, nay more than perfect ones.

To all this it may alſo be added, as an unanſwerable proof of the foſſil ſhells having been once marine, and having lived in the ſea, that they are found with injuries which could have been no way elſe received. The purpura, and ſome other ſhell-fiſhes, have bony tongues, with which they bore regular holes through the ſhells of ſhell-fiſh of other kinds, in order to make their way in, and prey upon their fleſh. Theſe holes are always eaſily known by their regularity and ſhape; and ſhells bored through in this manner are not only frequent on our ſhores, but there are ſuch alſo found foſſil, bedded in the ſtrata of earth or *ſtone*; and ſurely, if ſalts could be allowed to have ſhot into the figures of ſea-ſhells, they could never be ſuppoſed able to ſhoot into the figures of ſuch wounds, as a few of thoſe ſhells have received in their recent ſtate from other animals.

The general opinion is, that the deluge brought all theſe ſhells into the places where we ſee them; but this ſeems not eaſily conceived; and as there is no argument ſo good, but that being carried too far it will make againſt its purpoſe, ſo the laying too much to the effects of the general deluge, has made many believe it has done nothing at all.

Theſe *formed ſtones* and real ſhells are both found in vaſt ſtrata on the tops of the higheſt mountains, the Alps, Apennines, and others in different parts of the world. The deluge laſted only ten months, and probably the tops of mountains were not covered half that time; and theſe immenſe quantities of ſhells cannot be ſuppoſed either to have bred there in that time, or to have been carried ſo high in ſuch prodigious numbers. It is more probable that theſe tops of mountains were once not ſuch, but bottoms of the ſea. The hiſtory of the marine bodies they contain is then very plain, and earthquakes may have raiſed them, or they may indeed not be ſo high above the level of the ſea, as we at firſt ſight ſuppoſe. If indeed we adhere to the letter of the text, in the Scripture hiſtory of the creation, we can find no account for theſe bodies from that time; for if the creation of fiſhes ſucceeded the ſeparation of the land from the water in all parts of the globe, they could not be then depoſited there; but it is poſſible, that at the creation the whole earth was not all at once uncovered, but only thoſe parts where Adam and the animals were created, and the reſt gradually afterwards, perhaps not in many years, as there ſeems no neceſſity of underſtanding the account of the creation to have been in ſix natural days. If we may thus underſtand, and conjecture in this reſpect, it is not difficult to conceive, that during the years in which the earth remained covered with ſea-water, ſhell-fiſh might breed and multiply abundantly all over its bottom; and this bottom being afterwards elevated, deſerted by the ſea, and made dry land, theſe ſhells muſt be elevated with it, and retained in thoſe ſtrata, which afterwards hardened into the various kinds of earth and *ſtone*: and ſomething of this kind ſeems to have been the caſe, much rather than, according to Dr. Woodward, that all ſtony matter ſhould have been diſſolved by the deluge, and afterwards have concreted again. Ray's Phyſico-theological Diſcourſes.

For other hypotheſes and obſervations relating to this ſubject, ſee *Adventitious* Fossils, Marine *Remains*, Seminium and Shells.

Stones, *ſolution and colours of*. The various beauties of the form and colour of the ſeveral more precious *ſtones*, cannot but have been always the admiration of the curious part of the world, and the ingenuity of the ableſt chemiſts hath been tried, in attempting to counterfeit them; and much may be gathered even from their attempts, which have not ſucceeded, toward the learning the true nature and hiſtory of theſe beautiful bodies.

The beautiful figures of the Florentine marble, whoſe veins repreſent trees, rivers, and ruins of buildings, are well known; as are alſo the delineations of trees and ſhrubs in thoſe ſpecies of white agates, called *Mocoa ſtones*. All the *ſtones* of this kind are natural, for art has yet not been able to come up to any counterfeit of them; but it is not ſo in regard to thoſe agates which repreſent regular figures of beaſts, &c. theſe are all aſſiſted by art, and that by a very ſimple and eaſy proceſs; and Mr. Du Fay, in the Memoirs of the Paris Academy, has given at one view the ſeveral ways, then known, to penetrate into the ſubſtances of agate, marble, &c. and to lodge figures in them.

The *ſtones* ſubject to be tinged he divides into two claſſes, the harder and the ſofter. Of the harder kind are thoſe which

which resist the force of acids, even of the most powerful kind; and of this class are agates, onyxes, and all that are vulgarly comprehended under the general name of the gems, or precious *stones*, with crystal, porphyry, granite. These, and the like *stones*, are not soluble in any of the known acids, yet these same acids, impregnated with the solutions of metals, are capable of penetrating very deeply into them, and tinging them with different colours.

The simple agates and jaspers, and other *stones* of the like uniform structure, are easily coloured in an uniform manner; but those which are variegated with veins are composed of several different sorts of matter, and therefore are less easily, and less evenly stained. As the tinging matter does not penetrate the several beds, or veins, in the same manner, therefore all that can be done to these, is to add spots and veins to their natural ones, but they cannot be tinged throughout to one uniform colour, as the chalcedony or white agate may.

If a small quantity of a solution of silver in spirit of nitre, be poured upon one of these agates, and the *stone* exposed to the sun, it will in a few hours be tinged to a reddish brown colour; and if more of the same solution be added, and it be again exposed, the colour will become stronger, and will penetrate deeper into the body of the *stone*; and if the *stone* be not too thick (e. g. more than a sixth part of an inch), and the solution be rubbed on both sides, it will tinge it throughout. Nor is this all the effect, for it will give it several veins and lineations, which were not distinguishable in it before; the reason of which is, that in all these *stones* there are some parts harder than the rest, and consequently more difficultly coloured, and these remaining, therefore, paler than the rest of the mass, make the lines and veins in it.

If there be added to the solution of silver, used for this purpose, a fourth part of its quantity of soot, and as much salt of tartar, the colour becomes grey; and if, instead of this soot and tartar, the same quantity of plumose alum be used, the *stone* will be tinged to a deep violet colour, tending to black.

A solution of gold gives agate only a pale brown colour, and that penetrates but a little way into it; and a solution of bismuth gives a colour, which appears white when the light falls directly upon it, but brown when it is held against the sunshine, or a candle; and all the metallic and mineral solutions, employed in the same manner, affect the *stone* more or less in the same way.

The exposing the *stones* to the sun is a very necessary article in the process, since without that the tinge is but very faint, and penetrates but to a very little depth. To trace in the chalcedony, or white agate, figures of any determinate kind, the usual method is this: before the agate is polished, mark out the intended figure with the point of a fine needle, and afterwards with a brush, or a pen, follow those lines with a very strong solution of silver.

One would imagine that the dendritæ, or delineations of trees in Mocoa *stones*, might be imitated in this manner; but it is difficult to give the due blackness of colour, and to mark the figures with a like precision and exactness. See Agates.

If any *stone* should, however, be suspected to be adulterated, or counterfeited in this manner, it is easily brought to the trial; for if it be thus made, a small heat over the fire will almost entirely divest it of its colour, and the rubbing a little spirit of nitre, or aqua fortis over it, will have the same effect. In both cases the *stone* may, however, be restored again to its beauty; in the first, by tinging it afresh with the same liquor, and in the last, by only exposing it for several days to the sun.

It is well known, that by means of fire alone the amethyst, the sapphire, and the other gems, may also be wholly divested of their beautiful colours. The method of doing this is, to put the gems into a crucible, surrounding them with sand, or with steel filings; then putting them into the fire, they lose their colour as they become hot, and are taken out wholly colourless. If the white agate be calcined in this manner alone, it becomes of a cloudy or opake white; but if it has before been stained with the solution of silver, those spots or stains become of a yellow colour, which aqua fortis afterwards has no power to take away. If the agate be calcined first, and afterwards rubbed over with the solution of silver, it receives some spots and lines of brown. The cornelian loses a great part of its redness by calcination, and becomes of a dusky flesh-coloured white; and the Mocoa *stone*, treated in the same manner, loses all its colour, and the delineations of trees disappear.

There are many *stones* on which the solution of silver has no effect; of this number are all the gems, rock crystal, and the like. The dendrites of Catalonia is also of this kind; and of this *stone* the artificers relate an odd *phenomenon*, which is, that if it be sawn asunder there are very few delineations observed in it, but if it be split by a blow, it is usually found full of them. The reason of this is only that these delineations are so many flaws and cracks, and the *stone* breaks easiest in these places.

The effects of the solution of silver are different, as to degree of colour, on different *stones*. The Oriental agate receives from it a deeper and blacker tinge than the common chalcedony. Some agates, naturally distinguished by their yellow spots, receive a purple colour from it. The jade *stone*, used by the Turks, takes only a faint tinge of brown. The common prime emerald, or root of the emerald, becomes blackish with it. The Oriental granite is tinged in many places with a violet colour by it; this is principally effected in the white parts. The solution does not act much on the black ones, only that it takes some of them away. The serpentine marble receives an olive colour from it; but it is remarkable that the amianthuses, and the talcs, and other foliaceous *stones*, are wholly unaffected by it.

There is another method of staining *stones* of a colour more truly black than that which the solution of silver communicates to most of them, and with this farther difference, that the colour being produced by fire, has not been destroyed (says Dr. Lewis) either by moderate fire, or by aqua fortis. Pieces of different *stones*, marbles, pebbles, flint, &c. may be washed over with a saturated solution of copper made in aqua fortis; when dry let them be put into a crucible, and kept for a little time in a fire just sufficient to make the vessel almost red hot. All of them will be thus stained in the parts moistened with the solution of a black colour, durable, and pretty deep, though it penetrated only a very little way into the substance of the *stones*.

Dr. Lewis suspects, from some experiments on the solution of silver applied to different substances, which he has mentioned (Phil. Com. of Arts, p. 350.) that this solution stains *stones* only in virtue of their containing a calcareous earth, or such an earth as the acid is capable of dissolving: if this be the case, there is no wonder that some of the hard *stones* should be stained, and some of the soft unaffected by it.

Marble being a substance much softer than agate, receives the colours with much greater ease, and the doing this in an accurate manner has been the subject of the attempts of many eminent men.

Kircher has given some directions for the staining marble, which have been translated word for word in the Philosophical Transactions; but they are so indeterminate and uncertain, that nothing can in reality be learned from them. See *Colouring of* Marble.

Many others have written also on the same subject, but Mr. Du Fay is the only one whose experiments are plainly and clearly laid down, and may be followed by any body.

This gentleman chose the common white marble without veins for making his experiments, for the same reason that he chose the plain agates, because in the veined ones there are several different sorts of matter, all of which are not to be penetrated with equal ease. The solution of silver penetrates into marble to the depth of an inch, or more, and gives a tinge, reddish or purple at first, and afterwards brown, from which colour it never varies afterwards. It always takes off the polish of the marble, eating away a part of its surface. The solution of gold does not penetrate so deep into marble as that of silver, but it gives a beautiful violet colour.

Both these operations are much assisted by exposing the marble to the sun. The liquors usually diffuse themselves, and spread every way in the marble, so that it is not easy to make any figure with them that shall keep its outline tolerably regular. And this imperfection appears to be the less, according as the solution is the more saturated, so as to dry or crystallize the more speedily. An easy method of obviating this inconvenience, says Dr. Lewis, is suggested by the practice of the engraver; for the means, by which he confines the aqua fortis on his copper-plates to the minutest strokes, would doubtless answer the same intention here. The surface of the *stone* being coated with a proper tenacious substance, which the acid cannot act upon, as the composition called Etching-*wax*, which consists of resinous substances melted with wax, or boiled with oil to a due consistence; and the drawing being made in this ground, so that each stroke may reach down to the *stone*, it may be presumed that the solution of silver, afterwards applied, will no where spread farther than the parts thus laid bare. See *Colouring of* Marble.

The solution of copper gives marble a beautiful green tinge, but it does not penetrate deep, and on the applica-tion

tion of boiling water becomes black; when the surface is polished off afterwards, however, it becomes again of a beautiful green. Beside the powerful acid menstruums, there are many other liquors which have a power of penetrating deep into marble. Of this nature are all the oily fluids; but the expressed oils have this disadvantage, that they leave a fattiness in the marble which will not suffer it afterwards to take a good polish.

All substances which can penetrate marble, can carry colours into it; but such are most eligible, which having lodged the colours evaporate, and leave them there, without injuring the *stone*. Spirit of wine is of this number; it is excellently qualified for the extracting beautiful tinctures, and sinks them very deep. Oil of turpentine also has its value, but it does not take tinges so well as the spirit. Some have recommended lixiviums of the fixt alkaline salts, but they very rarely produce any beautiful colour. In the using these fluids the marble is to be gently heated, and the spirit is by that means evaporated before it is cooled, leaving its colour always behind.

White wax penetrates very deep into hot marble, and conveys colours into it in a very beautiful and determinate manner. There are however but a few bodies, which will impart their colours to wax, and therefore this valuable means is of a very limited use.

Several of the gums alone are also able to tinge marble very strongly. Dragon's blood, and gamboge, if rubbed on hot marble, penetrate to the depth of about a twelfth of an inch: the gamboge requires the marble to be hotter than the other, and tinges it to a very beautiful yellow; the dragon's blood tinges to a red in different degrees, according to the heat of the marble.

If these gums have been used to polished marble, there is no farther caution necessary, than the cleansing them off from the surface with a little spirit of wine: but the way to make them sink deeper into the *stone*, is to take off the polish by rubbing the surface with pumice, or the like, and then the gums sink much farther, and the colours appear very beautiful when the marble is polished again.

Though these gums act alone, yet they will succeed much better if dissolved in spirit of wine, and applied with a pencil; for by this means they sink deeper in, and the figures traced out will keep their determinate form and outlines, these solutions fixing immediately, without spreading any way. It is also remarkable, that the solution of dragon's blood hardens the marble, and renders it less soluble in acids than before; so that if a piece, stained in part with this solution, be afterwards rubbed over with an acid dissolvent, and its surface eaten away to some depth, the parts which are coloured will all stand out above the rest.

A tincture of Brasil wood in spirit of wine tinges marble red, and if the heat given to the marble be greater, it becomes purple; but both these colours fade a little in keeping. A tincture of cochineal gives a purplish red, and the more the marble is heated, the farther the colour penetrates, and the deeper it is.

In oil of turpentine the colour of cochineal penetrates much deeper into the marble, but it has a brownish cast. Alkanet root, by means of spirit of wine, gives also a red colour, which, if the heat be too great, changes to brown; and this, and most other of the like matters, tinge the marble, in tincture with spirit, to a slight depth; and in oil of turpentine they sink much deeper, but then the oil leaves a greasy look upon the marble.

If verdigrease be boiled a considerable time in white wax, it tinges marble, when rubbed hot upon it, to a beautiful green, little inferior to that of the coarser emeralds, and the colour spreads itself very equally, and penetrates to a third of an inch deep; if the marble be made too hot, the colour becomes that of the jade-*stone*. Alkanet boiled in white wax gives a flesh colour, which penetrates very deep; and the roucou boiled in wax makes a permanent yellow, which also sinks very deep. The best way of heating marble for this purpose, is to lay the piece, intended to be stained, upon a bed of sand, a fifth of an inch deep, upon an iron plate; this is to be set over the fire, and when of a proper degree of heat, the colour is to be applied. The just degree can only be found by experience, and it varies indeed in almost every colour; but in general, the finer colours require the marble to be of such a heat, that the hand can just bear to be laid upon it, and the others require a something greater degree than this.

Black is, of all colours, the most difficult to give in this manner to marble; and perhaps indeed it is impossible to give that colour in any degree of perfection, and that for this plain reason, that all these colours only fill the interstices between the granules of the marble, those granules themselves remaining unaltered: thus, in the other colours, the whiteness of the granules is only a heightning to the tinge, making it brighter, and a little paler; but the whiteness can never fail to appear distinguishably as such in black, and by that means destroy that colour.

Dr. Lewis observes, that he has stained the porous marbles, which admit water to sink into them, of a full black colour with common ink, either by applying on the warm marble an ink already made, or by the alternate application of astringent liquors and solutions of iron; but with the more compact marbles this method did not succeed, though they were heated so far as to make the liquors boil upon them: however, by solution of copper, managed as above related, and by a solution of the metallic part of cobalt in aqua regia, employed in the same manner, the most compact pieces were stained black; though the process requires too great a heat to be practised on marble without danger of injuring the *stone*. The colour which solutions of gold communicate to marble, in its deep shades, obtained by repeated applications of the solution, approaches very near to black.

Next to black, blue seems the most difficult, of all the colours, to give to marble. Mr. Du Fay, however, having found by Mr. Geoffroy's experiments, that oil of thyme, by long standing with spirit of sal ammoniac, acquired a blue colour, tried this mixture, and found it succeed very beautifully; but this is one of those colours which require the marble to have but a very small degree of heat, since a greater would evaporate them before the colour had time to penetrate.

When the oil of thyme is digested with the volatile spirit, it becomes first yellow, then red, then violet, and at last of a deep blue. In six weeks digestion it had acquired a pale blue, and in this state gave little colour to marble: after standing for six months, it was deepened almost to a black blue, and being now applied on warm marble, gave the stain desired.

Mr. Du Fay also stained marble of a blue colour with tincture of archel. The tincture of it in water is applied on cold marble, and renewed as it evaporates, till the colour is sufficiently deep. He says, that he saw pieces of marble thus stained, which in two years were not sensibly changed.

The colours of the gums may be laid on when the marble is cold, and on heating it afterwards they will sink into it. See *Colouring of* MARBLE.

There is another very elegant sort of workmanship to be employed on marble, that is, the tracing figures in relief in it; and this is done much more easily than might be imagined, there being nothing more required to it, than the saving the parts which are to be left in relief, by covering them with a varnish, and eating away the rest by means of an acid. For this purpose let the designed figures be traced in chalk upon the marble, and cover them with a bed of varnish, made by dissolving a piece of common red sealing-wax in spirit of wine; then pour on the marble a mixture of equal parts of spirit of salt and distilled vinegar, and this will eat down all the ground, and leave the figures standing, as if engraved with immense trouble. The adding the colours, before described, to these marbles afterwards, in a regular manner, will give them a surprising beauty. Mem. Acad. Par. 1728 and 1732. Lewis's Phil. Com. of Arts, p. 436, &c.

Mr. Muller, in grinding some aurum fulminans, made by dissolving gold in aqua regia, and precipitating it with salt of tartar, together with some red glass powdered, and a little water added, found that this mixture stained the onyx, or chalcedony, of which the mortar was made. He was rubbing this mixture together to make an enamel colour, and leaving it three or four days in this little mortar, he found, that not only where it had been rubbed against the bottom of the mortar, but where it had accidentally splashed against the sides of it, and on the surface of the pestle, it had tinged them both very deeply to a fine red, leaving the intermediate parts of a true onyx, or chalcedony colour, wholly unaltered. The polish of the *stone* was not injured in the places where it was thus *stained*, nor could any art get out the colour, though it was tried with alkalis, and other sharp liquors. This colour was not given to these parts of the *stone* of the mortar in simple blotches, but formed itself into regular lines, as we see the natural colours of *stones* do; but this not in the same degree of colour, but some of the lines were deeper, others paler.

This experiment was repeated in several other mortars of the same *stone*, but without success; on which the *stones*, of which they were composed, were examined with the help of glasses, and it was found that this mortar chanced to be made of a more flaky chalcedony than any of the others, though it appeared equally solid and beautiful to the naked eye, and bore a polish no way inferior

ferior to them. It may be worth while, on this occasion, strictly to examine *stones* of this chalcedony kind, and on meeting with a plate of one of them of this flaky kind, to cover it with this mixture, and by that means give it a series of lineations, which must make it a very beautiful and valuable *stone*. The polish will not be injured by this, or if it should, the adding a new polish will not at all affect the colours. In the same manner the texture of *stones*, intended for any other experiments in *staining*, should be considered, and the choosing proper ones may make this process succeed on them. Phil. Trans. N° 179.

STONE, *artificial*. See MORTAR and STUCCO.

STONE, *Bolognian*. See BONONIAN, LAPIS *Bononiensis* and PHOSPHORUS.

STONE, *butter of*. See BUTTER *of stone*.

STONE, *calamine*. See *Lapis* CALAMINARIS.

STONE, *caustic*. See CAUSTIC and LAPIS *infernalis*.

STONES, *chalk*. See CHALK.

STONE, *chich*. See CICERUM *lapis*.

STONE, *copperas*. See COPPERAS and PYRITES.

STONES, *corner*. See CORNER.

STONE, *eagle*. See ÆTITES.

STONES, *eft*. See EFT-*stones*.

STONE, *emery*. See EMERY.

STONE, *fire*. See FIRE-*stone*.

STONE, *flesh*. See SARCITES.

STONES, *free*, *grind*, *gritt*, *gypsine*, and *Horsham*. See FREE, &c.

STONES, *gall*. See BILIARY *concretions* and STONE, in *Medicine*.

STONE, *horn*. See LAPIS *corneus*.

STONE, *Jewish*. See JUDAICUS *lapis*.

STONE, *infernal*. See LAPIS *infernalis*.

STONE, *lime*. See LIME.

STONES, *medical*, a term used by some to express those particular *stones*, which for their real or imaginary virtues have, at one time or other, been made ingredients in medicinal preparations.

The opinions of the ancients, in regard to the virtues of gems and precious *stones*, were very whimsical; they supposed that they had certain sympathetic properties, and that the wearing them on the finger, or carrying them in the pocket, would cure diseases, render the gods propitious to their prayers, or save them from thunder. These have been deservedly laughed out of the world in our more enlightened times; but it has remained a question, and does so even to this time, whether or not some of the gems have real medical virtues, naturally resulting from their parts, and constituent matter. See GEM.

STONE, *moor*. See MOOR-*stone*.

STONE, *philosopher's*. See PHILOSOPHER'S *stone*.

STONES, *Portland*, *pumice*, *Purbeck*, and *roll-rich*. See PORTLAND, &c.

STONE, *rotten*. See TRIPOLI.

STONE, *sanguine*. See SANGUINE *stone*.

STONES, *shoad*. See SHOAD-*stones*.

STONE, *touch*. See TOUCH-*stone*.

STONE, *whet*. See COS and WHET-*stone*.

STONE also denotes a certain quantity, or weight, of some commodities.

A *stone* of beef at London, is the quantity of eight pounds: in Herefordshire, twelve pounds: in the North, sixteen pounds.

A *stone* of glass is five pounds; of wax, eight pounds.

A *stone* of wool (according to the statute of 11 Hen. VII.) is to weigh fourteen pounds; yet in some places it is more, in others less; as in Gloucestershire, fifteen pounds; in Herefordshire, twelve pounds.

Among horse-coursers, a *stone* is the weight of fourteen pounds.

The *stone troy*, in Scotland, contains sixteen pounds, the pound being two marks, or sixteen ounces.

STONES, *characters on tomb*. See CHARACTERS.

STONES, *engraving on*. See ENGRAVING.

STONE, *face of*. See FACE.

STONE, *oil of*. See OIL *of stone*.

STONE, *painting on*. See PAINTING.

STONE, *sculpture in*. See SCULPTURE.

STONES, *staining of*. See *Solutions*, &c. *of* STONES and MARBLE.

STONE *of scandal*. See SCANDAL.

STONE, in *Medicine*, is the denomination of a disease, called also *calculus*, *lithiasis* or *nephritis*.

It consists of a stony concretion, formed either in the bladder, in which case it is called LITHIASIS; or in the kidneys, when it is denominated NEPHRITIS; which prevents the discharge of urine, and occasions violent pains. The *stone*, Etmuller says, is not a disease, but the product of a disease: the disease, properly, is the *lithiasis*, or the disposition of the kidneys and bladder to generate *stones*.

When small *stones* are lodged in the kidneys, or discharged along with the urine, the disorder is called the GRAVEL; but if one of these *stones* happens to make a lodgment in the kidneys, or in the bladder for some time, so as to accumulate fresh matter, and become too large to pass off with the urine, or if it passes from the kidneys, and obstructs the ureter, or passes with great difficulty, the patient is said to have the *stone*. By a fit of the gravel, or *stone*, are understood the pain and other symptoms that usually attend stony concretions in the kidneys, &c. especially when nature makes an effort for their discharge.

The *stone* and gravel may be occasioned by high living; the use of strong astringent wines; a sedentary life; lying too hot, too soft, or too much on the back; the constant use of water impregnated with earthy or stony particles; aliments of an astringent or windy nature, &c. These disorders may likewise sometimes proceed from an hereditary disposition. Persons in the decline of life, and those who have been much afflicted with the gout and rheumatism, are most subject to them.

The *stone* is generated, according to some authors, of the earthy viscid parts of the blood, hardened, in course of time, by the heat of the kidneys; much after the manner as brick is baked in a kiln.

Dr. Quincy supposes it generated of the harder parts of the urine, pent up by the straitness of the ducts, and brought into contact and cohesion.

Etmuller ascribes the *stone*, sometimes to the stony and metallic particles of our foods and drinks, which the reins, through weakness and relaxation thereof, cannot eject; but more usually to the unequal strength of the kidneys, whence it is that we see one kidney often breeds *stones*, the other remaining sound.

The matter of the *stone* in the bladder is first formed in the pelvis of the kidneys; whence falling into the bladder, it becomes augmented by new lamellæ or coats.

Dr. Mead seems to think, that the proximate cause of this disease is a tartarous salt conveyed out of the blood into the small ducts of the kidneys, for it is the nature of these salts to contain a considerable quantity of that subtile matter which Newton has shewn to be the cause of the cohesion of bodies. Thus, the calculus is a substance composed of earth and a very large share of air concreted in the renal ducts; and either remains therein, or drops down into the urinary bladder.

Dr. Hales found, by distilling a human calculus in an iron retort, that half of it was raised by the action of the fire into elastic air. These particles of air, which are combined in it in an unelastic state, are firmly united together by sulphur and salt; the proportion of caput mortuum, or earth, being very small. And Mr. Boyle found in such a calculus a considerable quantity of volatile salt, with some oil.

Dr. Hales also found, that tartar of wine contained above five hundred times its bulk of air: and, therefore, this as well as the calculus yielded a much greater proportion of air in distillation than any other substances, whether animal, vegetable, or mineral. It was also remarkable, that a greater proportion of this new raised air from these two substances was resorbed, and lost its elasticity in standing a few days, than that of any other parts of animals or vegetables: from whence, as well from the great similitude observable in many other respects between these substances, he infers, that the calculus is a true animal tartar, of the same kind with gouty concretions.

As the tartar of urine is known constantly to adhere to urinals, and other vessels in which it is contained, he does not doubt that it would likewise adhere to the substance of the bladder, if it were not defended with a slimy coat. Accordingly, it is observed by modern physicians, that the more mucilaginous the urine itself is, the less apt it is to breed the *stone*, and *vice versa*? Hence, he infers, that the ancients were much mistaken, when they generally attributed the growth of the calculus to mucose, pituitous matter, which is sometimes separated plentifully from the scrophulous glands of the bladder, but is not found to harden into a calculus.

It was the general opinion of the learned in Beverovicius's time (who published what they wrote to him about one hundred years ago) that the matter of the calculus was a pituitous viscid matter, caused by the ill-disposed kidney, and hardened by the heat of the bed: but Helmont, in his treatise De Lithiasi, explodes this notion; and observes, on the contrary, that the viscid matter, which is sometimes found in those who have a *stone* in the bladder, arises from the mucilage which the *stone* rubs off the bladder; for when the calculus is out of the bladder, there is no more viscid matter in the urine; that if it arose from this mucus, the bladder would soon be filled with a calculus; that this mucus dried, makes only a little

little chalk *ſtone*; and that it cannot incruſt in the bladder to form a calculus; whence he concludes, that it does not ariſe from this mucus, but from a part of the urine which adheres to urinals. Though he filtrated urine through linen, yet it ſtill depoſited its tartar; and hence, he infers, that the tartar was not formed when the urine was firſt voided, but that it is formed, and adheres to the veſſel long after the urine is made, when it begins to putrefy, the very inſtant before it fixes: to which more and more is continually added; and he apprehends, that the calculus grows in the ſame manner. He obſerves this tartar to adhere ſooner, and in greater plenty, to a veſſel already incruſted with it, than to a clean veſſel; becauſe the fixed tartarine particles attract more ſtrongly than thoſe of the ſides of the veſſel. The reaſon he gives why urine long detained in the bladder does not depoſit its tartar on the ſides of the bladder as in a pot, is, becauſe in the bladder it is not ſo ſoon diſpoſed to putrefy, and that tartar will not adhere ſo well to the bladder as to a pot.

The urine that is made at the greateſt diſtance from drinking is obſerved to be moſt rancid, becauſe it has not only been longer digeſting in the blood, but alſo becauſe the more watery part goes off firſt in greater proportion. Hence, it ſeems probable, that the *ſtone* does not increaſe with an equable progreſſion in thoſe that are ſubject to it, but faſter or ſlower, in proportion to the more diuretic and diluted, or more rancid ſtate of the urine. Whence we may not unreaſonably conclude, that the *ſtone* increaſes faſter in the ſummer, when a greater proportion of moiſture is perſpired off, and the urine rendered thereby more rancid, than in the winter, when the perſpiration being diminiſhed, a greater quantity is diſcharged by urine. And, beſides, heat is known to contribute to the induration of many bodies. Aretæus, on the contrary, imagined the calculus to be increaſed moſt in winter and autumn, from a ſuppreſſed perſpiration. The laminæ, or coats, which are obſerved in many of the calculi, afford a farther confirmation of this reaſoning; for when the urine does not depoſit its tartar plentifully on the calculus, then its ſurface acquires, by rolling up and down in the bladder, a kind of hard poliſh; but when the urine returns again to its more rancid tartarine ſtate, then the calculus is covered with a new coat: the laſt poliſhed ſurface being the partition between the two laminæ, at which ſurface they more eaſily ſeparate than elſewhere.

Human calculi are known to vary in their ſtructure and compoſition: and it has been demonſtrated by Dr. Dawſon (Med. Tranſ. vol. ii. p. 105.) that ſome of them, which are ſoluble in an alkaline, are but little affected by an acid menſtruum; whilſt others will reſiſt the action of an alkali, and yet be readily diſſolved by an acid. Even in the ſame ſubject, he obſerves, there may be found calculi of oppoſite kinds, ſome of which will diſſolve in acids, ſome in alkalis, and ſome in neither. This writer has recommended an attention to the fragments, ſcales, or films, which the *ſtone* in the kidneys or bladder may caſt off, and alſo to the contents of ſediment of the urine, that a diſcovery may be made whether the proper ſolvent be an acid or an alkaline menſtruum.

Dr. Percival infers, from ſeveral experiments on urinary calculi, that an abſorbent earth often enters into the compoſition of them; for it is the peculiar property of this claſs of bodies to be convertible into quick-lime, by the action of fire. It does not ſeem probable, ſays this ingenious writer, that this ſubſtance is the product of animalization in the human ſpecies. The ſhells of ſeafiſhes and of ſnails furniſh it indeed in large quantity; but the bones, horns, blood, ſkin, and fleſh of animals, however ſtrongly calcined, are not changeable into lime.

M. Rouelle has lately diſcovered the fixed alkali in the ſerum of the blood; and Dr. Lewis (Neumann's Chem. p. 494.) has obſerved, that the aſhes of fleſh and blood are readily, perfectly, and plentifully ſoluble in the mineral acids; and that they form with them an auſtere, aſtringent liquor, approaching to an aluminous nature. The human calculus muſt, therefore, be conſidered as an heterogeneous ſubſtance, conſiſting of thoſe recrementitious parts which are ſeparated from the blood by the kidneys. Whether theſe parts differ eſſentially in different conſtitutions, or whether they vary only in the proportion they bear to each other, is a point of difficult ſolution.

Dr. Percival inclines to adopt the latter ſuppoſition; however, he thinks, it is very evident that calculi of the kidneys and bladder are not merely of animal origin, as they frequently contain an abſorbent earth, which is not generated in the human body. This ſubſtance is probably conveyed into the ſyſtem by the uſe of hard ſpring water, in which it commonly abounds. The effects of ſuch waters are known to be pernicious in habits which are ſubject to the *ſtone* and gravel.

Dr. Hales, conſidering the diſpoſition that moſt of the liquors which we drink have to depoſit tartarine concretions (as well as the great quantities of air that are in our food, whether animal or vegetable) is not ſurpriſed to find the urine of ſome perſons ſo much diſpoſed to breed the calculus: this quality of the urine he aſcribes in a greater meaſure to our drink than to our food: our food, eſpecially that which is boiled, being more mucilaginous than the greateſt part of the liquors which we drink, and conſequently leſs apt to depoſit its tartar. That waters are impregnated with theſe tartarine particles, more or leſs, according to the different nature of the ſeveral ſtrata of minerals, *ſtone*, &c. through which they percolate, he has evinced by ſeveral experiments: ſmall wines likewiſe, which abound with tartar, are well known to ſubject thoſe who drink them to the *ſtone* and gout.

Dr. Percival, at one time apprehending, in deference to ſeveral reſpectable authorities, that the calculi of the urinary organs partake not in the leaſt of a foſſil nature, but that their formation depended either upon ſome accidental nucleus, or upon a peculiar and often hereditary diſpoſition to concrete in the animal fluids, was led to conclude, that impure waters were only negatively favourable to this diſpoſition, by having no tendency to diminiſh it; as a menſtruum, ſuch as water is under every form in which it is uſed, already loaded, and perhaps ſaturated with different contents, cannot act ſo powerfully, as one which is free from all ſenſible impregnations. But when he found by ſubſequent experiments, that an abſorbent earth is often a component part of the human calculus, he became convinced that hard waters actually contribute to the formation of it. This is an opinion which the father of phyſic advanced, and which till of late has remained uncontroverted by his followers. *Damnantur imprimis fontes*, ſays Pliny, (lib. xxxi. c. 3.) *quorum aquæ decoctæ craſſis obducunt vaſa cruſtis*. It was obvious indeed to infer, that waters which depoſit a large earthy ſediment, either in the aqueducts through which they are conveyed, or in the veſſels in which they are boiled or preſerved, would let fall their groſſer particles in paſſing through the kidneys, and eſpecially whilſt retained in the bladder; and that theſe, by the continued appoſition of freſh matter, connected by the animal gluten, and compacted by the action of thoſe organs, would form the *ſtone* or gravel. But the ſeparation of earthy matter in the urinary paſſages may be better explained by the chemical doctrine of affinities. For the vitriolic acid contained in SELENITES, with which hard ſpring waters are uſually impregnated, will forſake its baſis, and combine with the alkaline ſalts, ſo copiouſly diſcharged by thoſe excretories. In order to account for the *ſtone* being a rare diſorder in this country, which abounds with calcareous waters, Dr. Percival obſerves, that internal affections of the human body are ſeldom produced by a ſingle cauſe, and the concurrence of many may be neceſſary to form a calculus in the bladder. This malady, however, is ſcarcely known in Switzerland, as he has been informed by a letter from Baron Haller. And the ſprings of that Alpine region are remarkably light, pure, and free from all mineral ingredients.

Dr. Saunders, of whom we ſhall have occaſion to ſpeak more particularly in the ſequel of this article, obſerves, that in all human calculi there is a very large proportion of animal mucus, and more eſpecially in thoſe of a laminated ſtructure; while ſuch as put on a more ſhining cryſtalline form, contain a larger proportion of ſaline and earthy matter.

The diagnoſtic ſigns of the *ſtone in the kidneys*, are, 1°, A fixed obtuſe pain in the region of the loins, ſeeming like a weight loading the reins, accompanied with coſtiveneſs and flatulency, ſickneſs, and ſometimes vomiting. As the *ſtone* falls out of the pelvis into the ureter, the pain is exceedingly acute and racking, which continues till either the *ſtone* be got into the bladder, or returned again to the pelvis. 2°, An inflexibility of the ſpina dorſi, from the extenſion and compreſſion of the nerves. 3°, A ſtupor of the thigh and leg of that ſide, from the conſent of parts. 4°, A retraction of the teſticle. 5°, A very ſmall quantity of urine, diſcharged frequently and with difficulty, either thin and limpid, or bloody; in this caſe the ſediment of the urine ſubſides directly. But as ſoon as the *ſtone* is got into the bladder, the urine becomes thick, turbid, blackiſh, and in great quantity.

The diagnoſtics of the *ſtone in the bladder*, are a ſenſe of heavineſs in the perinæum, and inguinal region, a perpetual and troubleſome deſire of making water, which is preceded and followed with a ſharp pain, and an itching principally in the glans of the penis, whence a prolapſus of the anus; and an inclination to go to ſtool during the diſcharge of urine; the urine's coming away by drops, or ſtopping ſuddenly when it was running in a full ſtream;

the patient's paffing his urine more eafily when lying than in an erect pofture; a kind of convulfive motion occafioned by the fharp pain in difcharging the laft drops of the urine; a white, thick, copious, ftinking, mucous fediment in the urine; and a violent pain in the neck of the bladder upon motion, efpecially on horfeback, or in a coach on a rough road.

But the fureft way of finding it is, by the touch; viz. by thrufting the finger, or a catheter, up the anus.

Mr. le Dran affures us, when a fmall *ftone* is lodged in the neck of the bladder, the patient only is pained in making water till the firft drops of urine come away; when the *ftone* is large, his greateft pain is while the laft drops are evacuated; but when the difficulty of uriningdepends on the difeafes of the coats of the bladder, the pain continues all the time of the evacuation. By obferving thefe fymptoms, he has declared people to have no *ftone* in the bladder, after feveral others had affured them there was a *ftone*; and his opinion was confirmed by probing with the catheter. He names one inftance of this, in a perfon who had laboured under what he calls a contracted hardened bladder, whom he cured after feveral bleedings and purges, by injecting into the bladder a decoction of marfhmallow-roots and linfeed, which he changed afterwards for barley-water, with fome honey of rofes. By thefe he removed the pain, and brought the bladder, which at firft could fcarce contain two fpoonfuls of liquor, to the ordinary capacity.

Stones have been diftinguifhed according to their colour, into red, white, and yellow; but the laft are the moft ufual.

As to the regimen proper to be obferved by perfons afflicted with the *ftone* or gravel, they fhould avoid aliments of a windy or heating nature, as falt meats, four fruits, &c. Their diet fhould be light and eafy of digeftion, and confift chiefly of fuch things as tend to promote the fecretion of urine, and to keep the body open. Artichokes, afparagus, fpinage, lettuce, parfley, fuccory, purflane, turnips, potatoes, carrots, and radifhes, may be eaten with fafety; onions, leeks, and celery, are reckoned medicinal.

Dr. Hales obferves, that onion-juice feems to have confiderable efficacy in diffolving the calculus; and where frequently eaten, fhould, if not wafte, at leaft prevent its increafe.

Dr. Lobb found leeks more effectual folvents than onions.

The moft proper drinks are whey, butter-milk, milk and water, barley-water; decoctions, or infufions of the roots of marfhmallows, parfley, HEATH, liquorice, or of other mild mucilaginous vegetables, as linfeed, &c. Pitcairn recommends the ufe of milk for common drink, in the *ftone*, with barley-water and a little fugar. He adds, that he cannot give any better reafon why milk is ferviceable to nephritics, than becaufe the fame is always found ferviceable to gouty perfons. The fymptoms of both difeafes are the fame, excepting what relates to the parts affected.

If the patient has been accuftomed to generous liquors, he may drink fmall gin and water without acid.

Dr. Mead allows either fmall wine and water, or new foft ale; which, he fays, will be rendered better and wholefomer, if ground-ivy leaves be infufed in it, while it is working: mead is likewife a proper drink, for honey is an excellent diuretic. A fpoonful alfo of honey in a glafs or two of the infufion of marfhmallow roots is an admirable cleanfer of the kidneys, if conftantly ufed. See HONEY.

The wines ought to be the fofteft and fmootheft that can be had, and the lighteft, cleareft river, or running water, is preferable to any other, except fuch as abound with fixed air, and may be taken medicinally.

Out of the fit the patient fhould ufe moderate exercife, without fatigue, or any violent motion, which is apt to occafion bloody urine. Indeed perfons afflicted with gravel often pafs a great number of *ftones* after riding on horfeback, or in a carriage, but thofe who have a *ftone* in the bladder cannot bear fuch exercife. Perfons who have an hereditary tendency to this difeafe fhould never indulge themfelves in a fedentary life. Much depends in the way of prevention, when the firft fymptoms of gravel, &c. appear, on a proper regimen of diet, and the ufe of fufficient exercife.

In a fit of the gravel, occafioned by the *ftone* fticking in the ureter, or fome part of the urinary paffages, the patient fhould be bled, warm fomentations fhould likewife be applied to the part affected, emollient clyfters adminiftered, and diluting mucilaginous liquors drank; and the treatment of this cafe is fimilar to that of an inflammation of the kidneys. See NEPHRITIS.

Dr. Whytt advifes patients who are fubject to frequent fits of gravel in the kidneys, but have no *ftone* in the bladder, to drink every morning two or three hours before breakfaft, a pint of oyfter, or cockle-fhell LIME-*water*, which, though it may not diffolve the *ftone*, may prevent its growth.

Dr. Mead obferves, that in order to prevent thofe tartarous falts which form the *ftone*, from fhooting into cryftals, lixivial falts feem to be very proper. Next, to keep the cryftals from coalefcing into a calculous fubftance, oily medicines are very efficacious; and this rule ought to take place with regard to diet as well as medicines.

But when calculous concretions are actually formed in the kidneys, and are to be brought away by the ureters, the cafe requires very prudent management. It is a very common error in practice to give ftrong forcing diuretics, with an imaginary view of driving out the gravel with the urine: whereas this intention is anfwered with greater fafety in moft cafes by relaxing and lubricating medicines; efpecially, if in cafe of violent pain, bleeding be premifed, and anodynes interfperfed. For a *ftone* is never forced out while the patient is in great torture; though when the pain ceafes it fometimes comes away unexpectedly, and almoft of its own accord, with the urine; and the reafon of this is, that pain conftringes the fibres of the parts, which refume their natural ftate, and perform their functions properly when the troublefome fenfation is over. Wherefore three or four grains of opium, diffolved in five or fix ounces of the common decoction, may be given by way of clyfter; which will greatly relieve the pain, and fometimes procure greater advantages. However, there are conjunctures, after the pain is abated, when powerful diuretics may be adminiftered; but with this precaution, that as foon as they have had their effect, they are no longer to be continued.

All this while the body fhould conftantly be kept open: wherefore, in cafe of coftivenefs, it will be expedient to give clyfters, and fometimes to purge gently with infufion of fena and manna: but ftrong cathartics are to be avoided.

Of all the purging medicines the oleum ricini, or CASTOR *oil*, is to be preferred in calculous diforders: this oil admirably conduces to relax the paffage from the kidneys to the bladder, and may be given by the mouth, or in form of a clyfter. As a fubftitute for this oil, manna with nitre, or fal cath. amar. mixed with oil of almonds, will ferve to empty the inteftines, allay the inflammation, and relax the fpafm occafioned by the pain. If the ol. ricini is taken in the fit fo as to keep the belly lax, and the lixiv. fapon. is taken at proper intervals, mixed in any fuitable vehicle, their efficacy in calculous diforders, it is faid, will equal that of the moft boafted noftrums.

Of the lubricating medicines above mentioned, the chief are oil of fweet almonds, fyrup of marfhmallows, emulfions made with almonds, and the like; to which may be added, the ufe of the warm bath. But among the powerful diuretics, turpentine and foap are the beft.

Such is the courfe to be purfued in the paroxyfm of the difeafe. But particular care fhould be taken, not to put the patient into a courfe of powerful diuretics, with a view of preventing the gravel from concreting in the kidneys: becaufe, whatever great things may be faid of this fort of medicines by ignorant pretenders, they certainly injure the parts by their heat and acrimony.

When a *ftone* is formed in the bladder, Dr. Whytt recommends Alicant foap, and oyfter or cockle-fhell lime-water. He advifes the patient to fwallow every day, in any form that is leaft difagreeable, an ounce of the internal part of Alicant foap, and to drink three or four pints of the lime-water. The foap is to be divided into three dofes; the largeft to be taken fafting in the morning early; the fecond at noon; and the third at five in the afternoon, drinking above each dofe a large draught of the lime-water; the remainder of which he may take at any time betwixt dinner and fupper. He fhould begin with a fmaller quantity of the lime-water and foap than that abovementioned: at firft a pint of the former, and three drams of the latter may be taken daily. The quantity fhould be increafed by degrees; and the patient muft perfevere in the ufe of thefe medicines for feveral months, and if the *ftone* be large, for feveral years. The diffolving power of the lime-water may be heightened by pouring it a fecond time on frefh calcined fhells. For cafes of the efficacy of this courfe, fee Philofoph. Tranf. vol. l. p. 205—227.

The cauftic alkali, or foap-lees, has been of late much extolled and much ufed as a folvent for the *ftone*. As it is of a very acrid nature, it ought to be given in fome gelatinous or mucilaginous liquor; as veal-broth, new milk, linfeed tea, a folution of gum arabic, or a decoction of marfhmallow roots. The patient muft begin with fmall dofes of the lees, as thirty or forty drops, and increafe by degrees, as the ftomach will bear. The cauftic alkali may be prepared by mixing two parts of quick-lime with one of pot-afhes, and fuffering them to ftand

ſtand till the lixivium be formed, which muſt be carefully filtrated before it be uſed. See LIXIVIUM *Saponarium*.

Mrs. STEPHENS's *medicines*, and Dr. Chittick's, which is ſuppoſed to be nothing more than a weak veal-broth without fat, medicated with a greater or leſs quantity as circumſtances require, of ſoap-lees, or ſome ſubſtance of which a fixed alkaline ſalt is the baſis, have been much recommended.

Dr. Cheyne (Nat. Method of Curing, p. 266) ſays, that ſoap-lees, ſoftened with a little oil of ſweet almonds, drank about a quarter of an ounce twice a day, on a faſting ſtomach; or ſoap and egg ſhell-pills, with a total milk and ſeed-diet, and Briſtol-water, will either diſſolve the *ſtone* in the kidneys or bladder, or make it eaſy. See LIME-*water* and LITHONTRIPTICS.

Since *fixed* AIR has become the object of the attention of phyſicians, it has been found to poſſeſs many conſiderable medicinal properties; and the happieſt effects have been experienced from the uſe of it in pulmonic diſorders, the gangrenous ſore throat, malignant fevers, foul ulcers, &c. It has alſo been found a ſolvent of the human calculus.

The firſt perſon who employed it in the year 1774, with this intention, and obſerved its efficacy, was Dr. W. Saunders, phyſician of Guy's Hoſpital in London, a gentleman diſtinguiſhed both by his chemical and medical knowledge; and to whom the public is alſo indebted for the late diſcovery of the peculiar efficacy of the red bark. Dr. Saunders was led to proſecute his inquiries into the ſolvent powers of fixed air by the experiments of Dr. Hales, undertaken with a view of diſcovering ſome fermenting mixture that would diſſolve the calculus without injuring the bladder.

Dr Hales, after repeated trials, found that the moſt powerful mixture for this purpoſe was formed of one cubic inch of water, one third of a cubic inch of ſolution of ſal tartar, and twenty-five or ſometimes thirty drops of oil of ſulphur; and alſo of ſix cubic inches of water, ¾ cub. of the ſolution of ſal tartar, and fifty drops of oil of ſulphur. Theſe proportions fermented briſkly, and made air-bubbles ariſe very faſt from the calculi for eight or ten minutes: and after ſeveral freſh affuſions of them, they diſſolved ſome calculi that were very hard to the touch; and alſo ſeveral gravel-*ſtones*, though not all; nor had they any effect on many of the hardeſt calculi. The liquor had no effect on the calculus after the ferment was over, as Dr. Hales found by laying ſeveral calculi to ſoak in it for a whole year.

Dr. Saunders repeated the experiments of Dr. Hales with the ſame ſucceſs: from which it appears, that the calculus was diſſolved during the efferveſcence from the application of the fixed air; for the ſolvent power ceaſed after the effervefcence was over, and the neutral ſalt formed by the combination of the acid and alkali had no power. In this opinion he was confirmed by the two following experiments. Having put ten grains of a human calculus into two ounces of diſtilled water, and letting them ſtand for ſome hours, there was found no diminution of its weight, and the water manifeſted no precipitation upon the addition of a ſolution of ſilver in the nitrous acid, or of a very cauſtic alkali, prepared by Mr. Lane. Ten grains of the ſame calculus were alſo added to two ounces of diſtilled water, ſaturated with fixed air; in which caſe it loſt three grains of its weight, and there was a precipitation upon the addition of the cauſtic alkali. This laſt experiment was repeated upon different calculi, which were always found diſſolved in a greater or ſmaller proportion, admitting of that variety which might be expected in the ſolubility.

Dr. Percival of Mancheſter, as ſoon as he was informed that Dr. Saunders had employed fixed air as a ſolvent of the *ſtone*, though ignorant of the manner in which his trials were conducted, and of the ſucceſs which had attended them, engaged in the purſuit of this remedy with a philanthropy and zeal, which do him much honour. Recollecting that Dr. Black and Mr. Cavendiſh had proved the ſolubility of various earthy bodies in water, either by abſtracting from or ſuper-adding to the fixed air which they contain, and knowing that the human calculus is diſſolved in the former way by lime-water, and the cauſtic alkali; it appeared highly probable that the like effect would be produced on the ſame ſubſtance, by the latter mode of operation: the hypotheſis ſuggeſted by analogy, was confirmed by experiment. A human calculus of fifty-two grains, ſuſpended in pure ſpring water, ſtrongly impregnated with fixed air, and continually ſupplied with freſh ſteams of it, after forty-eight hours maceration, being well dried, weighed forty-nine one-half grains, and became more friable in its texture. Another ſimilar calculus, from the ſame bladder, was immerſed for the ſame time in a quantity of the ſpring water before employed, but unimpregnated with fixed air: its weight before immerſion was forty-two one-half grains, but after it was taken out of the water and thoroughly dried, it weighed forty-two grains, and the texture and outward appearance of it were unchanged.

From theſe and ſeveral other experiments, Dr. Percival concluded, that water impregnated with fixed air is a powerful diſſolvent of the human calculus, and that its ſolvent powers are ſuperior to thoſe of lime-water, which has been long and juſtly celebrated as a lithontriptic; and as far as his obſervations reached, it acts upon every calculus that is ſuſpended in it. Of this new lithontriptic medicine, he ſays, that it is at once grateful to the palate, ſtrengthening to the ſtomach, and ſalutary to the whole ſyſtem. Lime-water often nauſeates the patient, deſtroys his appetite, and creates the heart-burn; and the ſoap-ley is ſo cauſtic and acrimonious, that it can be taken only in the ſmalleſt quantity, frequently produces bloody urine, and aggravates the tortures it is intended to relieve. Both theſe remedies alſo require a very ſtrict regimen of diet; and their qualities are liable to be changed either by acidities, or the fermentation of our food in the firſt paſſages. But the mephitic water may be drank in the largeſt quantity, without ſatiety or inconvenience: it requires no reſtrictions in diet, and its medicinal virtues will be undiminiſhed in the ſtomach or bowels.

Of this medicine Dr. Saunders alſo ſays, that it reaches the urinary paſſages in its full force, communicating its ſolvent power to the urine: and that it poſſeſſes every advantage over the lixivial, and other boaſted ſolvents now in uſe; being ſalutary to the conſtitution, and checking that tendency to putrefaction, which is ſo prevalent in calculous habits, and which is ſo much increaſed by alkaline ſalts, and the ſeptic regimen, generally recommended along with them.

If it be queſtioned, whether fixed air can be conveyed by the ordinary courſe of circulation to the kidneys and bladder? Dr. Percival replies, that in an elaſtic ſtate, it certainly cannot; but diſſolved in water, it may paſs through the vaſcular ſyſtem without creating the leaſt diſorder, and by its diuretic quality will be powerfully determined to the urinary organs. So ſtrong is the relation that ſubſiſts between mephitic air and water, that they remain firmly combined, although expoſed to conſiderable variations of heat and cold.

Dr. Percival confirmed this reaſoning as to the conveyance of fixed air in the courſe of circulation to the kidneys and bladder, by fact: for a young gentleman having taken daily large quantities of mephitic water, his urine, as long as he continued this courſe, was ſtrongly impregnated with fixed air, as appeared from the precipitation which it produced in lime-water, from the bubbles which it copiouſly emitted when placed under the receiver of an air-pump; and from the ſolution of ſeveral urinary *ſtones* which were immerſed in it.

Dr. Prieſtley has alſo expelled from a quantity of freſh made urine, by means of heat, about one-fifth of its bulk of pure fixed air; though it required ſeveral hours to expel this air by heat; and, after the proceſs, there was a conſiderable whitiſh ſediment at the bottom of the veſſel. This, he ſays, was probably ſome calcareous matter, with which the fixed air had been united; and by this fixed air, the calcareous matter, which would otherwiſe have formed a *ſtone* or gravel, may have been held in ſolution. And therefore, drinking water, impregnated with fixed air, may, by impregnating the urine, enable it to diſſolve calcareous matters better than it would otherwiſe have done; and may, therefore, be a means of preventing or diſſolving a *ſtone* in the bladder.

It is impoſſible, ſays Dr. Saunders, to determine abſolutely in what caſes one ſolvent ſhould be preferred to another, until the urine and its contents have been properly examined. We may reaſonably conclude, that when the urine of a particular perſon, impregnated with fixed air, does not depoſit its terreſtrial parts, or when it has depoſited them, the fixed air can be made to re-diſſolve them, the mephitic ſolvent is beſt adapted to ſuch a conſtitution. If on the other hand, ſuch be the nature of the calculous concretions, that they conſiſt chiefly of earthy matter laminated and cemented by animal mucus, the lixivial ſolvent will exert a more powerful operation in ſoftening and deſtroying the coheſion of the calculus, in ſuch a manner, as ſometimes to promote the ſeparation of its parts, and thereby facilitate its evacuation. Hence, Dr. Saunders thinks it highly probable, that advantages might ariſe from alternating the various ſolvents; and that after ſufficient trials have been made by the lixivial ſolvents, in many caſes the mephitic acid might be employed with additional advantage; the former diminiſhing the coheſion, and thereby facilitating the menſtrual power of the latter.

As to the manner of preſcribing this uſeful remedy, Dr. Saunders obſerves, that the patient ſhould be directed to prefer the

the use of such water as contains in it the largest quantity, such as Bristol-water, Seltzer-water, and Rathbone-place water, &c. and as it cannot be difficult to find water of this kind in most places, it should be made one chief article of his diet. All hard water which becomes softer, by being exposed to the air, or even by boiling, and deposits a calcareous earth, is of this kind; and the ACIDULÆ of all countries have been considered as the most powerful lithontriptics. The skilful physician may also suggest a great variety of forms in which this salutary acid may be introduced. The most eligible manner of prescribing it, is by impregnating water with it. See PYRMONT-*water*.

Saline draughts may be taken in their state of effervescence, and it may be still more agreeably prescribed in the form of brisk vinous liquors, such as Champagne, Perry, and the like.

Besides the powerful medicines for the *stone* above recited, there are some things of a more simple nature, which in some cases are found beneficial, and therefore deserve a trial. An infusion of the seeds of daucus sylvestris, or *wild* CARROT, sweetened with honey, has been found to give considerable ease, and is recommended by Mr. Boyle. A decoction of raw coffee-berries taken morning and evening, to the quantity of eight or ten ounces, with ten drops of sweet spirit of nitre, has likewise been found very efficacious in bring away large quantities of earthy matter in flakes. The UVA *ursi* has of late been greatly extolled both for the gravel and *stone*. It is generally taken in powder from half a dram to a whole dram, two or three times a day. It may, however, be taken, says Dr. Buchan, to the quantity of seven or eight drams a day, with great safety and good effect. We have somewhere read, that a glass of cold spring water, amounting to about a quarter of a pint, drank upon rising in the morning, and at night in going to bed, and continued for some time, has given relief in the *stone* and gravel. If this be a fact, the preceding observations on the efficacy of fixed air will account for it. For the removal of the *stone* by cutting, see LITHOTOMY.

Dr. Hales is of opinion, that all passable *stones*, which have lately fallen from the kidneys into the bladder, and which have broken off from larger ones, might readily and easily be brought out thence, by conveying into the empty bladder, by a catheter, some very mucilaginous substance, such as syrup of marsh-mallows, or a solution of gum arabic, or barley-water; such substances would bring away the *stone* soon, and with great ease to the patient; and thereby not only prevent much pain by the fruitless endeavours to bring them away with the weak force of the urine, but also effectually secure the patient from the danger of their growing too big to come away, by long continuing in the bladder. Phil. Trans. N° 477. vol. xliii. p. 502.

The same ingenious writer, suspecting that a principal cause of the first beginning of the growth of gravel in the kidneys is owing to the horizontal posture in which we lie in bed, in which posture one of the kidneys being lower than the bladder when we lie on one side, and both the kidneys when we lie on our backs, the pelvis, or cavity of the kidneys becomes thereby the sink for the tartarine parts of the urine to settle in, and that the pressure of the urine against the orifices of the excretory ducts of the kidneys retards its progress, and gives it more time to deposit its tartar, recommends lying in a reclined posture, with the head and upper parts of the body considerably higher than the feet and lower parts. He also advises to lie alternately; sometimes on one side and sometimes on the other, so that whatever sediment may have been deposited in the inferior kidney may, by inverting it, be washed out before it has time to fix into small sand and gravel, whence it too easily increases to a larger size. Dr. Hales has described a new instrument for extracting *stones* from the urethra, &c. See CATHETER.

Dr. Lister observes, that *stones* are found, not only in the bladder and kidneys, but also in the pituitary ducts, the brain, liver, lungs, stomach, intestines, and joints of the hands and feet; to which may be added, that, in the Philosophical Transactions, we have likewise accounts of *stones* in the pineal gland, heart, gall-bladder, &c.

Gall-stones are BILIARY *concretions*, which are generally found in the gall-bladder, though they are often found in the ductus communis choledochus. They often lie quiet in the gall-bladder, and until dissection after death, have been never known to exist; but when they are obstructed in their passage through the gall-ducts, they impede the passage of the gall into the intestines, and produce many other afflictive symptoms; the most usual of which are a loss of appetite, a sense of fulness in the stomach, sickness, vomiting, languor, inactivity, sleeplessness, and, if the obstruction continues, a wasting of the flesh, yellowness of the eyes, skin, and urine, whitish stools, a pain in the pit of the stomach, and the pulse in its natural state.

The pain is relieved by opium; an emetic should also be administered, and, if needful, repeated; purging medicines should also be used, and especially those which act with the greatest ease, as sea-water, the waters of purging springs, neutral salts, &c. which may be repeated every other day for several months, without palling the appetite or lessening the strength. A little rhubarb may also be taken occasionally. The Bath waters are excellent for resolving concretions of the bile, not so much (Dr. Percival apprehends) by a chemical operation, as by accelerating the secretions of the liver, stimulating the organs of digestion, and invigorating the whole animal system.

A remedy which would pass unchanged into the system of the liver, and medicate the bile so as to render it unapt to coagulate, or enable it to resolve the concretions already formed, would be a most valuable acquisition. Acids, alkalis, soap, ardent and dulcified spirits, with fresh vegetable juices, have been recommended. Valisnerius found, that a composition of alcohol and oil of turpentine destroyed the texture and cohesion of *gall-stones* more perfectly than any other menstruum, and Mr. W. White of York has confirmed this observation by several judicious experiments. Dr. Percival also once thought favourably of this remedy, but, upon farther reflection, he thinks the continued use of it is more likely to prove injurious than beneficial. Spirituous liquors have a very unfavourable effect on the liver, and it would be absurd to seek a specific medicine for the diseases of the bile in what experience has fatally shewn to be a specific poison to the organ which secretes it. It is probable that fixed air, under some form or other, may be the desideratum in this case. The virtues which the Bath waters possess may be partly owing to this ingredient in their composition; and when they cannot be employed, the mephitic water may be recommended as an innocent and efficacious substitute. When other methods for curing the *stone* fail, recourse must be had to LITHOTOMY. See on the subject of this article, Mead. Monit. & Pract. Med. p. 191, seq. Hale's Statical Ess. vol. ii. p. 187—250. Percival's Phil. Med. & Exp. Ess. 1776, p. 132—170, and Appendix, p. 295—321. Med. Ess. Edinb. vol. v. part ii. p. 156, &c. Priestley on Air, vol. ii. p. 360, &c. Buchan's Dom. Med. p. 352—357, ed. 5.

We have not only accounts of *stones* of various degrees of hardness taken out of the bladders of persons affected with this terrible malady, but even of extraneous matter lodged within, and serving for the nucleus of those *stones*. Thus, in the Philosophical Transactions, there is an account of a boy who for a long time voided hair by urine, and afterwards being troubled with the *stone*, on being cut for it, the *stone* taken away was very hard and heavy, and of the bigness of a goose's egg: it was covered with a crust, looking like the mortar of an old wall, and this was full of cracks and chinks, out of every one of which there was found to grow hair.

The hairs, which he had been used to void by urine, certainly grew also out of the clefts of this *stone*, for they would often hang out of the end of the penis; and, on pulling them away, seemed to grow fast to something, and to be pulled out by the roots.

In another boy of about five or six years of age, who was cut for the *stone*, the *stone* taken out being broken by accident, there was discovered within it a piece of flint, of the shape and figure, as well as bigness of the common pistol-flint. This served as the nucleus of the other *stony* matter which encrusted it over. It is utterly impossible that a flint of this shape should have been formed in the bladder, nor is it easy to account for its coming there; the boy must have swallowed it at some time, but then its making its way into the bladder is a very hard matter to account for. A person who used himself to swallow pistol bullets, is recorded in the same place to have voided them by urine, crusted over with *stony* matter; but all this is equally hard to account for. Philos. Transact. N° 266, p. 688.

We often meet with histories, in medical writers, of the *stone*, or human calculus, making its way through unusual places, as the perineum, scrotum, spinal muscles, &c. Philos. Trans. N° 456.

SONES *in animals*. We meet with great variety of forms and appearances in the *stones* produced by different animals, and in their different parts. Wedelius describes a vast number of various kinds taken from dogs, hogs, cows, and other animals which he had opened; but the most singular instance is of one which was taken from a cow, and was of the colour of burnished gold. Dr. Lister confirms this singular observation with another of a like kind, that came within his own knowledge: this was of two hundred small globular *stones*, the largest not

exceeding the size of a small tare, and the smaller not bigger than pins-heads. They were covered with a frothy substance in the bladder, and adhered to one side of it; but when cleaned and dried, they resembled seed-pearl in shape, and were of a fine gold colour. They were finely polished, even when viewed by the microscope; and when broken, and examined in the same manner, it was found to be only a thin skin of a gold colour that covered them in this manner, the inner substance being coarse and opake, somewhat resembling sugar-candy, but not so fine. Wedel. Observ. N° 106. Philos. Trans. N° 206.

Mr. Pennant mentions two instances of *stones* found in horses; the one of a horse that voided sixteen calculi, each of an inch and a half diameter: the other of a *stone* taken out of the bladder of a horse, and deposited in the cabinet of the late Dr. Mead, weighing eleven ounces. These *stones* are formed of several crusts, each very smooth and glossy; their form triangular, but their edges rounded as if by collision against each other. Brit. Zool. vol. i. p. 12.

STONE-*blue*, a preparation used in washing linen. See BLUE, INDIGO, and SMALT.

STONE-*break*, a name by which some writers call *alchemilla* or lady's mantle.

STONE-*brash*, in *Agriculture*, is a light lean soil, full of larger and smaller masses of rubble-stones. See STONY-*land*.

STONE-*chatter*, in *Ornithology*, the name of a small bird of the *œnanthe*, or fallow-finch kind, the MOTACILLA *rubicola* of Linnæus, called by some authors *rubetra* and *muscicapia*, and in some places the *stone-smich* and the *moor-titling*.

The head, neck and throat are black, but on both sides of the latter there is a white bar; the feathers on the back are edged with tawny; the lower part of the back just above the rump, is white; the end and exterior side of the two outmost feathers of the tail are of a pale rust-colour, the rest are black; the breast is of a deep reddish-yellow; the belly of a lighter hue; the quill feathers dusky, edged with dull red; those next the body marked with a white spot near their bottoms; and the coverts of the wings are adorned with another. The head of the female is ferruginous, spotted with black, and the colours in general less vivid: in both sexes the legs are black.

These birds are common during summer on heaths and gorsy grounds, but in winter disperse into marshes, &c. without quitting the island: they make a very loud and often repeated noise. Pennant.

STONE-*crop*, a name sometimes given to the *sedum*, or HOUSE-LEEK.

STONE-*crop-tree*, in *Botany*, the name by which some call the maritime shrubby blite, which is a species of *chenopodium*, or GOOSE-*foot*.

STONE-*curlew*, in *Ornithology*, the English name for the OEDICNEMUS, a bird of the colour of the curlew. See *Stone*-CURLEW.

STONE *mummy*. See RAUTY *mummy*.

STONE *parsley*. See BUBON.

STONE *parsley*, *bastard*. See PARSLEY.

STONE-*phosphorus*. See LITHOPHOSPHORUS.

STONE-*plant*. See LITHOPHYTON.

STONE-*smich*, a common English name for that species of œnanthe, which we more frequently call the STONE-*chatter*.

STONE, *toad*. See BUFONITÆ, and TOAD-*stone*.

STONE-*ware*. See POTTERY.

STONE-*sucker*, in *Ichthyology*. See PETROMYZON.

STONEHENGE, or STONE-HENG, in *Antiquity*, a famed pile or monument of huge stones on Salisbury plain, nine miles distant from that city.

It is described by Mr. Camden to be a huge and monstrous piece of work, such as Cicero termeth *insanam substructionem*. For within the circuit of the ditch, he says, there are erected, in manner of a crown, in three ranks or courses, one within another, certain mighty and unwrought stones, whereof some are twenty-eight feet high, and seven feet broad; upon the heads of which, others, like overthwart pieces, do bear and rest cross-wise, with small tenons and mortises, so that the whole frame seemeth to hang: on which account we call it *stone-heng*, as our old historians termed it, because of its magnitude, *chorea gigantum*, the *giants dance*. The perpendicular stones are called corse-stones, and the over-thwart ones are called cronets. This antiquity, says Mr. Inigo Jones, because the architraves are set upon the heads of the upright stones, and hang, as it were, in the air, is generally known by the name of *stone-heng*. The whole work, in general, being of a circular form, is a hundred and ten feet in diameter; double winged about, without a roof; anciently environed with a deep trench, still appearing about thirty feet broad: so that betwixt it and the work itself, a large and void space of ground being left, it had from the plain three open entrances, the most conspicuous of which ... north-east; at each of which was raised, on the outside of the trench, two huge stones, gate-wise; parallel to which, on the inside, are two others of less proportion. The inner part of the work, consisting of an hexagonal figure, was raised, by due symmetry, upon the bases of four equilateral triangles, which formed the whole structure. This inner part was likewise double, having, within it also, another hexagon raised; and all that part within the trench, situated upon a commanding ground, eminent and much higher than the surrounding plain; in the midst of which, upon a foundation of hard chalk, the work itself was placed; insomuch that, from whatsoever part they came into it, they rose by a hill of easy ascent. In the inmost part of the work is a stone, appearing not much above the surface of the earth, and lying towards the east, four feet broad, and sixteen feet long; which, whether it be an altar or no, this author refers to the judgment of others. The great stones, which made the entrances from the outside of the trench, are seven feet broad, three feet thick, and twenty feet high. The parallel stones, on the inside of the trench, are four feet broad, and three feet thick; but they are so broken, that their proportions in height cannot be exactly measured. The stones which make the outward circle are seven feet broad, three feet and a half thick, and fifteen feet and a half high; each stone having two tenons mortised into the architrave continuing upon them, throughout the whole circumference. For these architraves, being jointed exactly in the middle of each of the perpendicular stones, that their weight might have an equal bearing; and upon each side of the joint a tenon wrought (as remains yet to be seen) it may hence positively be concluded, that the architrave is continued round about this outward circle. The smaller stones of the inner circle are one foot and a half broad, one foot thick, and six feet high. These had no architrave upon them, but were raised perpendicular, of a pyramidal form. The stones of the greater hexagon are seven feet and a half broad, $3\frac{1}{4}$ thick, and twenty feet high, each stone having one tenon in the middle. The stones of the inner hexagon are two feet and a half broad, one foot and a half thick, and eight feet high, in form pyramidal, like those of the inner circle. The architrave lying round about upon the perpendicular stones of the outward circle is three feet and a half broad, and two feet and a half high. The architrave on the top of the great stones of the outward hexagon is sixteen feet long, $3\frac{1}{2}$ feet broad, and $3\frac{1}{2}$ feet high. This architrave, continuing only from stone to stone, left betwixt every two and two, a void space free to the air, uncovered. The vulgar have thought it ominous, and indeed absolutely impossible, to count the number of stones composing this ancient monument. To this legendary tale Sydney refers in his sonnet of the wonders of England; when he says,

> Near Wilton sweet, huge heaps of *stone* are found,
> But so confused, that neither any eye
> Can count them just, nor reason reason try,
> What force brought them to so unlikely ground.

In reference to this absurd superstition, Mr. Jones says, that if any one will observe the orders of the circles, as they now appear, without passing from one to another, confusedly, and note where he begins, he may easily find the number. Dr. Stukely computes them in the following manner: the great oval, he says, consists of ten uprights; the inner, with the altar, of twenty; the great circle of thirty; the inner of forty; which are a hundred upright stones; five imposts of the great oval; thirty of the great circle; the two stones on the bank of the area, the stone lying within its entrance, and that standing without; and another on the ground directly opposite to the entrance of the avenue; so that the whole number is a hundred and forty. This writer observes, that, according to the intention of the founders, the whole circle of this work was to consist of thirty stones, each stone to be four cubits (a cubit being $20\frac{3}{4}$ inches English measure) broad, each interval two cubits; 30 times 4 cubits will give twice 60, and 30 times 2 cubits 60; and, therefore, thrice 60 cubits complete a circle, whose diameter is 60. A stone, 4 cubits broad, and 2 thick, is double the interval, which is a square of 2 cubits.

Antiquaries are divided, as to the origin, use, structure, &c. of this wonderful fabric. Some of them take the stones to be artificial, and to have been made on the spot; arguing, that the ancients had the art of making stones with sand and a strong lime or cement; and as the stones seem too big for land-carriage, and yet are in a plain, which for some miles round scarce affords any stones

ſtones at all. Inigo Jones, however, a better judge than moſt antiquaries, is poſitive that the ſtones are all natural; and there is hardly any architect or naturaliſt who examines the grain of them exactly, but will be of his mind. As to their unwieldineſs, which is brought as an argument againſt their being portable, it is without foundation; they being really but trifles compared to many other ſtones which are known to have been thus carried.

Mr. Jones obſerves, that in ſeveral places about the plain the ſame kind of ſtone, of which this antiquity conſiſts, may be found; and ſtones of far greater dimenſions than any at *ſtone-heng*; particularly about Aibury, about fifteen miles from it. And it is well known that the ancients tranſported much heavier weights to a greater diſtance, and raiſed them to a greater height, than are obſerved in the preſent caſe. The moſt ancient and vulgar opinion concerning the firſt foundation of *ſtone-heng* is, that it was erected by the renowned Britiſh-Roman Aurelius Ambroſius, in memory of four hundred and ſixty noble Britons invited to a treaty of accommodation, held in or near the town of Ambreſbury, by Hengiſt the leader of the Saxons, and treacherouſly murdered by him and his confederates. Giraldus Cambrenſis relates, that there was in Ireland a pile of ſtones called the Giants dance, becauſe giants brought them from the remoteſt parts of Africa into Ireland, and miraculouſly ſet them up in the plains of Kildare. And (according to the Britiſh ſtory) Aurelius Ambroſius, king of the Britons, procured Merlin, by ſupernatural means, to bring them from Ireland into Britain, for the purpoſe above mentioned. The principal, if not the firſt author, who aſcribes *ſtone-heng* to Ambroſius, (Hiſt. Britann. lib. vi.) Mr. S. Gale inclines to this opinion, on account of the name Ambroſius, which is ſtill retained in the neighbouring town of Ambreſbury, once celebrated for its monaſtery of three hundred monks, founded here by Ambroſius, on condition that they ſhould pray for the ſouls of thoſe that were ſlain by the treachery of Hengiſt the Saxon. Another opinion is that which is founded chiefly on the authority of Polydore Virgil, (lib. iii.) who ſays, that the Britons erected this magnificent ſepulchre for their general Ambroſius, in the place where he was ſlain in battle; that his fortitude and achievements for the good of his country might neither be forgotten among themſelves, nor left unremembered by poſterity. This monument, he ſays, is yet remaining in the dioceſe of Saliſbury, near the town called Ambreſbury. To this opinion ſome circumſtances in his hiſtory, the ſtill remaining Latin name of the place (Mons Ambroſii), and that very ancient Welch proverb, *Mal gwaith Ambrys, like the work of Ambroſe*, give ſome countenance.

A third conjecture is that of Mr. Bolton, tranſlator of Lucius Florus, and author of Nero Cæſar, publiſhed in 1624, who ſays, that *ſtone-heng* was built by the old Britons, as a ſepulchral monument for their magnanimous but unfortunate queen Boadicea, who with all her principal nobility was totally overthrown in battle by a ſmall army of Romans, under the command of Suetonius Paulinus. Mr. Inigo Jones having recited theſe opinions, as well as that of thoſe who aſcribe the ſtructure of *ſtone-heng* to the Druids, and urged the improbabilities and objections to which each of them is liable, advances his own opinion; and this is, that *ſtone-heng* was a work of the Romans, built by them when they flouriſhed here in the greateſt peace and proſperity, probably betwixt the times of Agricola's government, and the reign of Conſtantine; not as a ſepulchral monument, but as a temple, and particularly conſecrated to the imaginary deity Cœlus, whence they derived the original of all things. That the Romans were the founders of *ſtone-heng* he argues from its magnificence, order, which is the Tuſcan, architectonical ſcheme, conſiſting of four equilateral triangles, inſcribed within a circle, double portico in the greater circle of ſtones, and another portico in the cell or hexagon, the manner and poſition of the columns of the building, and from the Roman reliques often found near the place. That it was a temple he infers, from the interval or ſpacious court round about, the cell and its porticos, the altar, and its poſition eaſtward, the mixed or compound order, the aſpect of the whole fabrick, and the ſkulls of beaſts digged up in the circumjacent ground. And that it was conſecrated to the god Cœlus he concludes, from the ſituation, the aſpect hypæthros, the manner or form, the order, the decorum of the ſtructure, the pyramidal figure of the ſtones, and from the kinds of beaſts cuſtomarily offered in ſacrifice to that deity.

Dr. Charleton has endeavoured to refute the claims urged by Mr. Jones in favour of the Romans, and to prove that *ſtone-heng* was a Daniſh ſtructure. For this purpoſe he alledges, that of all nations in the world, none were ſo much addicted to monuments of huge and unhewn ſtones as the Danes appear to have been for many hundred years together; that they uſed to ſet up ſuch not only in their own country, but alſo in all other places wherever the fortune of war had at any time made their adventures and atchievements memorable; and more particularly in England and Scotland; that in Denmark there are now ſtupendous piles of ſtones in moſt particulars reſembling *ſtone-heng*; that upon a ſtrict and impartial enquiry, neither the ancient Britons, nor Romans, nor Saxons, are found to have any juſtifiable title to the honour of founding this ſtructure; that none of our old hiſtorians mention any ſuch work till long after the Danes had acquired the ſovereign power in this iſland, and left ſeveral monuments of their victorious armies; that the great impairment of the fabrick ſince the time of the Daniſh conqueſt doth not evince it to be of greater antiquity; and that neither the magnificence of the ſame at firſt, nor the ſtrength and ſkill in engines required for the tranſportation and elevation of ſtones of ſuch prodigious weight, are ſufficient arguments to the contrary. This writer is of opinion, that this ſtructure was erected in the beginning of the reign of Alfred, when the Danes, having over-run the whole kingdom, encamped their main army in Wiltſhire, near two years together, and employed their time of reſt and ſecurity in erecting *ſtone-heng*, as a place in which to elect and inaugurate their ſupreme commander, king of England, according to the cuſtom of their country; which Dr. Charleton ſays, was to erect courts royal of huge ſtones for the election of their kings in all countries where the ſucceſs of their arms had given them a title to ſovereignty. The weakneſs of the diſtreſſed Alfred afforded them an opportunity, and the country in which they were encamped ſupplied them with fit materials for ſo great and ſtupendous a work.

Mr. Inigo Jones's opinion was afterwards vindicated from the objections of Dr. Charleton, and his hypotheſis invalidated by Mr. John Webb. See Jones's Antiquity of *Stone-heng* reſtored, drawn up by direction of King James I. in 1620, and publiſhed in 1655, after the author's death, by Mr. John Webb; Dr. Walter Charleton's Chorea Gigantum, compoſed from authorities and arguments furniſhed by Olaus Wormius, the celebrated antiquary of Denmark, and publiſhed in 1633; and Mr. John Webb's Vindication of *Stone-heng* reſtored, wherein the Roman architecture is diſcuſſed, publiſhed in 1664. Biſhop Nicholſon inclines to the opinion, if the true old writing of the name be *Stan-Hengiſt*, as the Monaſticon ſeems to tell us, that the Saxons have as juſt a title as any to the honour of it.

Sammes, in his Britannia Antiqua illuſtrata, 1676, p. 395, &c. apprehends, that *ſtone-heng* is of more ancient date than that of the Romans. The fable of the giants, recorded by Giraldus Cambrenſis, and already mentioned, is, in his opinion, founded on an ancient tradition; and by the giants he underſtands the Phœnicians; and that the art of erecting theſe ſtones, inſtead of the ſtones themſelves, was brought from the farthermoſt parts of Africa, the known habitations of the Phœnicians. The metal table, formed of a mixture of tin and lead, which was found near *ſtone-heng* in the time of Henry VIII. and upon which many letters are inſcribed that have puzzled our antiquaries, he ſuppoſes to have been of Phœnician compoſure, and the characters (which Dr. Charleton apprehends to have been Runic or Gothic, ſuch as were conſtantly uſed by the Danes in all their antique monumental inſcriptions) Phœnician. He is farther of opinion, that this pile was dedicated to Hercules, to whom the Phœnicians built altars and erected temples, as their tutelar deity, whom they adored as the ſun, and who is ſaid by ſome to have firſt diſcovered this nation.

Mr. Aubrey, in his Monumenta Britannica, conſiders *ſtone-heng* as a Britiſh work. Dr. Stukely, in his *Stone-henge*, a Temple reſtored to the Britiſh Druids, aſcribes it to the Druids; and the time he aſſigns for the building of it is not long after Cambyſes's invaſion of Egypt; when he committed ſuch horrid outrages there, and made ſuch dreadful havock with the prieſts and inhabitants in general, that they diſperſed themſelves to all parts of the world; ſome of whom, it is ſuppoſed, migrated as far weſtward as Britain, and introduced their learning, arts, and religion, among the Druids, who are ſaid to have been introduced into Britain about Abraham's time, and probably aſſiſted in this work. This conjecture is the more probable, ſays this author, becauſe, at the period now mentioned, the Phœnician commerce was at its height, and afforded a ready conveyance hither: it might be eaſily made, Dr. Langwith thinks, probable, at leaſt, that it was a temple dedicated to the ſun and moon, and

having taken his measures of it on the spot, he assures us, that he could by no means reconcile them with Mr. Inigo Jones's idea of a Roman temple.

The learned Mr. Bryant, in his Analysis of Ancient Mythology, vol. iii. p. 533. apprehends that there is not in the world a monument which is much prior to *stone-henge.* There is reason to think that it was erected by a foreign colony of Cuthites, or sons of Chush (see DISPERSION *of mankind)*, probably before the time when the Druids and Celtæ were first known, and one of the first which came into this island. With them it was usual to place one vast stone upon another for a religious memorial; and these they often placed so equably, that even a breath of wind would sometimes make them vibrate. Of such stones one remains at this day in the pile of *stone-henge.* The ancients distinguished stones erected with a religious view by the name of amber; by which was signified any thing solar and divine. The Grecians called them πετραι αμβροσιαι, *petræ ambrosiæ. Stone-henge*, according to Mr. Bryant, is composed of these amber stones; hence the next town is denominated Ambresbury, not from a Roman Ambrosius, for no such person existed; but from the *ambrosiæ petræ*, in whose vicinity it stood. Some of these were rocking stones; and there was a wonderful monument of this sort near Penzance, in Cornwall, which still retains the name of main-amber, or the sacred stones. Such a one is mentioned by Apollonius Rhodius, supposed to have been raised in the time of the Argonautæ, in the island Tenos, as the monument of the two-winged sons of Boreas, slain by Hercules; and there are others in China and other countries. See HIPPODROME.

STONY *land.* The farmers express by this term two sorts of land, the one full of large flints and pebbles, and the other full of fragments of free-stone, or other coarse stones.

These lands in many places yield good crops, and the general rule is, that in stiff and cold lands the stones should be as carefully picked out as may be, but in light and dry grounds they should be left. In Oxfordshire they have great quantities of a lean earth, and a small rubble-stone, or a four sort of land mixed with it; this is sometimes very full of weeds, and sometimes very clear of them; if they are weedy they fallow them late, but if they be seary, as they express it, that is, if they have no swerd upon them, they either fold them in winter, and add some hay-seed to the sheep's dung, to bring up grass, or else they lay old thatch or straw, and dung upon it; for they reckon, that if these lands have no swerd upon them before they are fallowed, they will by no means be brought to bear a good crop, but a great deal of May-weed, and other unprofitable herbs. In September, November, and December, they fallow as the swerd directs them: if this is done in either of the two last months, they call it a winter-fallowing, and never stir it again till they plough it, and sow it with barley; and these lands are reckoned to do better than if finely tilled. They will bear wheat and meslin in a kindly year, and large crops of barley, if they are well managed, and kept in good heart. They always fallow these lands every other year, unless they sow pease upon them; sometimes they sow them with lentils; and when they are quite worn out, they lay them down with clover, or rye-grass. Plot's Hist. Oxf. p. 247. Mortimer's Husbandry, p. 71.

STOOK, a term used in many parts of the kingdom for a shock of corn, containing twelve sheaves.

STOOL, *alvus*, in *Medicine.* A thing is said to be voided by *stool*, when it is discharged by the anus, or fundament. In the Philosophical Transactions, we have instances of sick persons voiding factitious stones, balls, &c. by *stool.* See ALVUS, and DEJECTION.

STOOLS, *bloody*, in *Medicine.* The spirit of vitriol, mixed with the patient's drink, has often been found beneficial in cures of *bloody stools.* See DYSENTERY and FLUX.

STOOLS, *retention of the first*, in infants. See INFANT.

STOOL, in *Mining*, is used when the miners leave digging deeper, and work in the ends forward. The end before them is called the *stool.*

STOOL, in *Ship Building*, the name of the supporters of the poop and top lanterns.

STOOL, *cucking.* See CUCKING.

STOOMING *of wine*, the putting bags of herbs, or other ingredients, into it.

STOOPING, in *Falconry*, is when a hawk, being upon her wings at the height of her pitch, bends down violently to take the fowl.

STOP, in the *Manege*, is a pause, or discontinuation of going. In order to *stop* a horse, the rider should, in the first place, quicken him a little, and at the instant, when he begins to go faster than the usual cadence, or time of his pace, bring-to the calves of his legs, to animate the horse, then flinging his shoulders backwards, hold the bridle more and more tight, till the *stop* is made; then vigorously extend the hams, and rest upon the stirrups, to make him form the times or motions of his *stop*, in falcading with his haunches three or four times. You should not form the *stops* of your horse short and precipitate, lest you spoil his hams and mouth. After *stopping*, a horse should be made to make two or three corvets.

With a raw and young horse very few *stops* should be made; and when they are made, they should be performed by degrees, very gently, and not all at once; because nothing so much strains and weakens the hocks of a stiff and aukward horse as a sudden and rude *stop.* If your horse has not readily obeyed in making his *stop*, make him go backwards, by way of punishing his fault. If in *stopping* he tosses up his nose, or forces the hand, keep your bridle-hand low and firm, and your reins quite equal; give him no liberty, press upon his neck with your right hand, till he has brought down his nose, and then immediately give him all his bridle: this is the surest method to bring him into the hand. To compel a horse to *stop* upon his haunches, nothing is so efficacious as a little sloping ground: nevertheless, you must examine, previously to this kind of exercise, if his feet, reins, shoulders, and legs, are able to bear it; for, otherwise, your horse would soon be spoiled. In this case the rider should put the stress of his aids rather in his thighs and knees than in the stirrups. The most certain method, says Mr. Berenger, to unite and assemble together the strength of a horse, in order to give him a good mouth, to fix and place his head as well as to regulate his shoulders, to make him light in the hand, and capable of performing all sorts of airs, depends entirely upon the perfection and exactness of the *stop.* Hist. and Art of Horsemanship, vol. ii. chap. 5.

The opposite term to *stop* is *parting.* In former times, the *stop* of a horse was called *parade.* See NAIL.

STOP, *half a*, is a *stop* not finished by a *pesate*; so that the horse, after falcading three or four times upon the haunches, resumes and continues his gallop, without making PESATES, or CORVETS.

STOP, at *Sea*, a word used by him that holds the half-minute glass, in heaving the log; for immediately when the glass is out, he calls *stop* to them that let run the line. See STOPPING.

STOP, *Saturday.* See SATURDAY.

STOPS, STOPPING, } in *Grammar.* See { POINT. PUNCTUATION.

STOPS *of an organ.* See ORGAN.

STOPE, or STEP, in *Mining.* When a sumph or pit is sunk down in a lode, they break and work it away in stairs or steps, which method of working is called *stoping*; and the height or step which each man breaks, is called a *stope.*

STOPPAROLA, in *Ornithology*, the name of a bird of the lark kind, described by Aldrovandus, and supposed by Mr. Ray to be the same with the SPIPOLETTA, or the TORDINO of the Venetians; but the *muscicapa grisola* of Linnæus. See FLY-*catcher.*

STOPPERS, in a *Ship*, certain short pieces of rope, which are usually knotted at one or both ends, according to the purpose for which they are designed. They are either used to suspend any heavy body, or to retain a cable, shroud, &c. in a fixed position. Thus, the anchors, when first hoisted up from the ground, are hung to the cat-head, by a *stopper* attached to the latter, which passing through the anchor-ring, is afterwards fastened to the timber-head; and the same rope serves to fasten it on the bow at sea; or to suspend it by the ring which is to be sunk from the ship to the bottom. The *stoppers* of the cable have a large knot, and a laniard, at one end, and are fastened to a ring-bolt in the deck, by the other. They are attached to the cable by the laniard, which is fastened securely round both by several turns passed behind the knot, or about the neck of the *stopper*; by which means the cable is restrained from running out of the ship, when she rides at anchor.

The *stoppers* of the shroud have a knot and a laniard at each end. They are only used when the shrouds are cut asunder in battle, or disabled by tempestuous weather; at which time they are lashed, in the same manner as those of the cables, to the separated parts of the shroud, which are thereby reunited, so as to be fit for immediate service. This, however, is only a temporary expedient. Falconer.

STOPPING *a leak*, at *Sea.* See LEAK.

STOPPING *a ship*, at *Sea.* When a ship comes to an anchor, and the cable is veered out by degrees till the ship is found to ride well, and then stopped, it is called *stopping the ship.*

STORAX *tree*, *styrax*, a genus of the *decandria monogynia* class. Its characters are these: the flower has a short cylindrical

lindrical empalement, indented in five parts; it has one funnel-shaped petal, with a short cylindrical tube, whose brim is cut into five large obtuse segments, which spread open; and it has ten or twelve awl-shaped stamina, disposed circularly, inserted in the petals, and terminated by oblong summits; it has a roundish germen, supporting a single style, the length of the stamina, crowned by a ragged stigma; the germen turns to a roundish fruit with one cell, including two nuts, which are plain on one side, and convex on the other.

We know but one species of this tree, which grows plentifully in the neighbourhood of Rome, and also in Palestine, and several islands in the Archipelago; from whence the fruit has been brought into England, where the plants have also been raised in several curious gardens.

The gum of this tree is used in medicine, which is obtained by making incisions in the tree. It is brought from Turkey, but is so adulterated, that it is very difficult to meet with any that is pure. It has a most pleasant fragrant odour, and is called *styrax calamita*, because it is said to be transported in hollow canes; or, according to others, because it exsudated from the tender twigs and young shoots of the tree, and coated them over, so as to resemble a reed or other hollow cylindric body, drawn on over the twigs. Miller.

Two sorts of this resin have been commonly distinguished in the shops; viz. 1. *Storax in the tear*, which is generally brought in masses, sometimes composed of whitish and pale reddish brown tears, and sometimes of an uniform reddish yellow, or brownish appearance; unctuous and soft like wax, and free from visible impurities. This is supposed to be the sort which the ancients received from Pamphylia, in reeds or canes, and which was thence, or for the reason above suggested, called calamita. 2. *Common storax*, in large masses, considerably lighter and less compact than the former, with a large admixture of woody matter like saw-dust. There is rarely any other in the shops, and therefore the London college directs the *styrax calamita* to be purified for medicinal use by softening it with boiling water, and pressing it out from the fæces betwixt warm iron plates. The pure *storax* in the tear is generally preferred, but the last, notwithstanding its impurities, is the most fragrant. *Storax* is one of the most agreeable of the odoriferous resins, of a mild taste, of no great heat or pungency, nearly similar in its medical and in its pharmaceutic qualities to BENZOIN and BALSAM *of Tolu*. It is not, however, much used in common practice, unless as an ingredient in some of the old compositions, and in an opiate pill, to which it gives its name. See PILLS *of storax*.

STORAX, *liquid*, is a resinous juice, obtained from a large tree, with leaves like those of the maple, called by Ray *styrax aceris folio*, a native of Virginia and Mexico, and lately naturalized to our own climate. The juice called liquid amber, is said to exude from incisions made in the trunk of this tree, and the *liquid storax* to be obtained by boiling the bark or branches in water. See LIQUID AMBER, and BALSAM *of liquid amber*.

Two sorts of *liquid storax* are distinguished by authors: one, the purer part of the resinous matter that rises to the surface in boiling, separated by a strainer, of the consistence of honey, tenacious like turpentine, of a reddish or ash-brown colour, moderately transparent, of an acrid unctuous taste, and a fragrant smell, resembling that of the solid *storax*, but somewhat disagreeable; the other, the more impure part, which remains on the strainer, untransparent, in smell and taste much weaker, and containing a considerable proportion of the substance of the bark. That which is commonly met with in the shops under this name, is of a weak smell and a grey colour, and is supposed to be an artificial composition. *Liquid storax* has been chiefly used in external applications. Among us, it is at present almost wholly in disuse, and accordingly discontinued by the London college; but retained by the Edinburgh as an ingredient in the mercurial plaster. Lewis's Mat. Med.

STORAX, *white*. See BALSAM *of Peru*.

STORE. *Bill of* STORES. See BILL.

STORES, *naval*. See NAVAL.

STORE-*room*, in a *Ship*, an apartment or place of reserve, of which there are several, to contain the provisions or stores of a ship, together with those of her officers, during a sea voyage.

STORE-*house*, a large building, in which goods, grain, utensils, &c. of various kinds, are deposited and preserved from injury. The *store-houses* of a fortress are constructed for the preservation of all kinds of artillery and ammunition; those of a dock-yard, or of a maritime town, for cables, anchors, timber, and other necessaries, to repair and furnish ships. And they are of different forms and sizes, according to the purposes for which they are intended.

STORE-*keeper* is an officer in the royal dock-yards, invested with the charge of the principal naval stores; as the sails, anchors, cordage, &c.

STORE-*ship*. See *Store*-SHIP.

STOREA, among the Romans, a kind of basket made of ropes or rushes, for gathering flowers or garden-fruits.

STOREA was likewise a kind of defence, made of large cables fashioned into a sort of nettings; which was so strong, that no weapon, though thrown out of an engine, could penetrate it.

STORGE, Στοργη, a Greek term, frequently used by naturalists, to signify that parental instinct, or natural affection, which animals bear toward their young.

The *storge* is an admirable principle implanted by the all-wise Creator throughout the animal world, for the preservation thereof; and is governed by such rules as make it best contribute thereto. By means of this, with what care and alacrity do animals nurse their young? and what dangers will they brave for their security? Even the most timorous creatures, which at other times fly the face of men, dogs, &c. will, for the sake of their young, expose themselves. Thus, hens, instead of flying from, will assault such as meddle with their brood; and partridges, before their young can fly, will frequently drop down before the dogs, first at less, then at greater distances, to dodge, and draw them off, from pursuing their young.

With what concern do others lead about their young in places of safety? and some even admit them for shelter into their bodies. Thus the opossum, Dr. Tyson observes, has a curious bag on purpose for the securing and carrying about her young. The same author adds, from Oppian, that the dog-fish, upon any storm or danger, receives her young into her belly, which come out again when the fright is over. And it is said the squatina and glaucus do the like.

With what tenderness do others seek and prepare the food for their young, teach them to suck, cherish, or lull them to rest, &c. like so many nurses, deputed by the Creator to take care of his creatures? and still in proportion, as they grow up, and become fit to look to themselves, this *storge* abates; and, at length, when no longer needed, becomes extinct. Mr. Ray observes, that young doves are fed with meat first eat by the dam, and sodden awhile in her prolobe. And Clusius observes, that the old female Ethiopian takes no food but from the male, after this manner.

The returns made by the young to the parent animal, when grown old, are not less considerable. Pliny says of rats, that they nourish their aged parents with eminent piety.

St. Ambrose, and after him Olaus Magnus, observe of the crane, that when the parents, through old age, are bereft of their feathers, and left half naked, their offspring stand around them, and cherish them with their own feathers; that they seek food for them; and when nature, as it often happens, repairs their decays, and restores them to strength again, they take them up by turns, on their wings, and habituate their unpractised limbs to their ancient art of flying. See INSTINCT.

STORK, *ciconia*, in *Ornithology*, a species of the HERON, or the *ardea ciconia*, in the Linnæan system.

The white *stork* is larger than the common heron, but its neck is shorter and thicker; its head, neck, breast, and belly, are white; its eye-lids are naked; its rump, and the outer feathers of the wings, are black; its tail is white, and its beak long and reddish; its legs also are red.

The black *stork*, or *ardea nigra* of Linnæus, is somewhat smaller than the white; its head, neck, back, and wings, are black, with a greenish cast among it; the eyelids naked; the belly, breast, and sides, are white, and the beak and legs are green. Many are of opinion, that this is the bird mentioned by Ovid under the name of mergus.

Naturalists have been much puzzled in assigning the winter abode of *storks*. Many authors have supposed that they go to the Nile at this season in quest of food; to which purpose Dr. Shaw observes, that in the middle of April he saw three flights of these birds, each of which took up more than three hours in passing by him, extending itself more than half a mile in breadth. These, he says, were then leaving Egypt, where the canals and the ponds that are annually left by the Nile, were become dry, and directed themselves towards the north-east. He adds, that they return again a little after the autumnal equinox, when the waters of the Nile returning within the banks, leave the country in a fit state to supply them with nourishment. But M. Klein controverts the opinion, that *storks* visit Egypt in the winter in search of food; observing, that if this were the case, they would not go in the winter, and remain till April, but in the summer; for the inundation of the Nile begins towards

towards the end of April, and about the month of September the waters diminiſh, and about the ſeventh or eighth of October quite retire into their channel, ſo that in the winter this river is extremely ſmall; and he apprehends that they take up their winter-quarters under water.

It is obſerved of the *ſtorks*, ſays Dr. Shaw, that for the ſpace of about a fortnight before they paſs from one country into another, they conſtantly reſort together from all the circumjacent parts in a certain plain, and there forming themſelves every day into a *dou-wanne* (according to the phraſe of the people), are ſaid to determine the exact time of their departure, and the places of their future abodes. See Jer. chap. viii. ver. 7.

The *ſtork* is held in the higheſt eſteem and veneration among the Mahometans, with whom it is no leſs ſacred than the IBIS was among the Egyptians; and no leſs profane would that perſon be deemed, who attempted to kill or moleſt it. The regard paid to theſe birds, Dr. Shaw ſuggeſts, may probably have ariſen, not ſo much from the ſervice they perform to a moiſt fenny country, in clearing it of uſeleſs reptiles and inſects, as from the ſolemn geſticulations they are obſerved to make, as often as they reſt upon the ground, or return to their neſts. Shaw's Travels, p. 428, fol.

STORM, in the *Military Art*. See ASSAULT.

STORM-*ſink*, *little petrel*, or PROCELLARIA *pelagica* of Linnæus, in *Ornithology*, the name of a ſmall bird deſcribed by Hoier, and ſaid to be ſeen principally at ſea, where it always is, except in breeding time, and is looked on as a foreteller of bad weather.

It is a little larger than the common ſparrow, and is all over black, except the coverts of the tail, and vent feathers, which are white; the bill is hooked at the end; the noſtrils tubular, and the legs long and ſlender; it has the ſame faculty of ſpouting oil from its bill, as the other ſpecies of *petrels*. It is very remarkable for its ſkimming very ſwiftly along the ſurface of the water. When large flocks of theſe appear, the mariners know they are to expect a *ſtorm*, and prepare for it.

STORYNE, the name of an inſtrument uſed by the ancients for drawing blood from the noſe; but we are not perfectly informed of its ſhape or ſtructure.

STOVE, in *Building*, a hot-houſe or room. The term *ſtove* is alſo uſed more reſtrictedly for a place in which fire is made, and by means of which heat is communicated to a room or building. See CHIMNEY.

Palladio obſerves, that the ancients uſed to warm their rooms with certain ſecret pipes, which came through the walls, conveying heat to ſeveral parts of the houſe, from one common furnace. Whether this were a general cuſtom, ſays ſir Henry Wotton, or a curioſity, we cannot determine; but it was certainly, both for profit and uſe, far beyond the German *ſtoves*.

STOVES, *American*, are contrivances for warming rooms, &c. by a continual introduction and exchange of dry freſh air: theſe *ſtoves* are called American, becauſe the firſt patterns in caſt iron upon this principle were the invention of Dr. Franklin, who then reſided in Philadelphia. See FIRE-*places*.

Notwithſtanding the acknowledged advantages of the conſtruction which he propoſes, the expence and trouble of it, and the difficulty of procuring workmen who underſtood the manner of executing it, have prevented the general uſe of his *ſtoves*. Mr. James Sharp, with a view of obviating theſe objections and difficulties, has propoſed ſeveral improvements, for which he has obtained his majeſty's patent. According to the method which he propoſes, they are eaſily accommodated to any rooms, where communication can be had with the external air; both to thoſe which have, and thoſe which have not chimneys: ſo that not only ſmall rooms, but the largeſt halls, libraries, or churches, may be warmed in a more effectual manner than had ever been done before, and the greateſt degree of heat produced from a given quantity of fuel. Mr. Sharp, by adding funnels to the top, renders theſe *ſtoves* fit for any chimney, and by lengthening the funnel, to any place without a chimney. By the hollow baſe with which his *ſtove*-grates are furniſhed, he is able to apply them with much greater effect to the external air, without any addition of brick-work; and by the alterations in the air-box, a much greater quantity of warm air is introduced than it was poſſible to introduce in their former ſtate. If a *ſtove* of this kind is to be placed in a common fire-place, a hole muſt be made through the back of the chimney, or through the hearth, to communicate with the external air; and this hole ſhould be made as large as poſſible, and in a deſcending poſition, ſo that the outward air may aſcend towards the *ſtove*. The hollow baſe of the *ſtove* muſt be placed againſt this hole, ſo as to cover it completely; and the bottom of the baſe muſt be fitted ſo cloſe to the earth, and pointed with lime or putty, that the air may not paſs. Upon the *ſtove* there muſt be put a few feet of iron funnel, to reach above the breaſt of the chimney; and the chimney encloſed by iron plates, ſo conſtructed and placed in a ſquare or oblong iron frame, that they may be eaſily removed when the chimney wants ſweeping. By this conſtruction the warm air, introduced by the *ſtove*, will be carried into the room, which would otherwiſe paſs up the chimney, and be loſt. But if the *ſtove* is to be fixed in a room where there is no chimney, it may be placed in any part of it, where communication may be had with the outward air; and nothing more is neceſſary than a ſufficient length of funnel to carry it through the roof, or wall, or window, or into any other chimney that may be convenient. If the fire-place be too ſmall for the *ſtove*, the chimney may be cloſed by the aforementioned frame and plates, and the *ſtove* ſtand before the fire-place, and the ſmoke be carried off, by the help of a circular elbow, into the chimney above the mantle-piece. Many of theſe *ſtoves*, it is ſaid, have been lately put up, in order to cure ſmoky chimneys, and have always ſucceeded. For farther particulars, ſee Sharp's Account of the Air *Stove* Grates, &c. For Dr. Lewis's method of heating a room with little fuel, ſee *Portable* FURNACES.

STOVES, *Chineſe*. See KANG.

STOVES, *Dutch* and *German*. See FIRE-*places*.

STOVES, in *Gardening*, are buildings erected for the preſervation of tender exotic plants, which, without that aſſiſtance, will not bear the cold of our winter, becauſe they require an artificial warmth.

The principal *ſtoves* for this purpoſe are of two kinds, diſtinguiſhed by the names of the *dry*, and the *bark-ſtove*.

The dry *ſtove* has the flues, in which the ſmoke is carried, either laid under the pavement of the floor, or erected in the back part of the houſe over each other, and returned ſix or eight times all along the whole length of the *ſtove*. In theſe *ſtoves* the plants are placed on ſcaffolds, and benches of boards, raiſed above one another; and the plants, principally preſerved in theſe, are the aloes, cereuſes, euphorbium, tithymals, and other ſucculent plants, which are impatient of moiſture in winter, and therefore are not to be kept among trees, or herbaceous plants, which perſpire freely.

The bark-*ſtoves* are made with a large pit, nearly of the length of the houſe, which is three feet deep, and ſix or ſeven feet wide. This pit is to be filled with freſh tanner's bark to make a hot-bed, and in this the pots, containing the tender plants, are to be plunged.

This invention of tanner's bark for hot-beds has been of prodigious ſervice to the curious in gardening, as many plants are, by this means, annually preſerved and raiſed, which no other method could have made to endure our climate.

The dimenſions of theſe *ſtoves* muſt be wholly directed by the number of plants intended to be preſerved; and for the dry *ſtove*, the floor muſt be raiſed above the ſurface of the earth, more or leſs, according to the dryneſs or wetneſs of the ſoil. In the front there is to be a walk about two feet wide, for the convenience of walking. The fire-place may be made either in the middle, or at one end, and the furnace muſt be contrived according to the nature of the fuel which is to be burnt there. The beſt firing, when it can be had, is turf; for it burns longer, and more moderately, than any other fuel, as alſo more uniformly, and therefore requires leſs attendance.

The entrance into the bark-*ſtove* ſhould always be either out of a green-houſe, or the dry *ſtove*, or elſe through the ſhed where the fire is made; becauſe in cold weather the front glaſſes muſt not, by any means, be opened, and the top ſhould be covered either with tarpaulins, or ſliding ſhutters, in bad weather.

The tender ſhrubs and exotic plants muſt be plunged in their pots into the bark-beds; ſuch are the caſhew, cabbage-tree, cocoa-tree, dumb-cane, fuſtic, logwood, mancinel, papaw-tree, ſour-ſop, and the like; and upon the top of the flues may be ſet the melon, thiſtle, the tender cereuſes, and the like.

The thermometer, by which the heat in the *ſtove* is regulated, muſt always be hung with its back to the ſun, and as far from the flues as may be. The proper ſtructure of theſe ſhelters, for the curious part of the vegetable creation, is to have a green-houſe in the middle, and two *ſtoves*, and a glaſs-caſe at each end. The particular rules for the ſtructure of all theſe, with plans of them, are accurately given by Mr. Miller in his Dictionary.

STOVE, among *Confectioners*, denotes a little cloſet well cloſed on all ſides, wherein are ſeveral ſtories or rows of ſhelves made of wires one above another, for the drying of ſweetmeats.

STOVES, at *Sea*, are square boxes made of plank, and lined with brick, for burning charcoal in to dress the admiral's victuals.

STOVER, a word used by country people for straw or fodder for cattle.

STOWAGE, in *Sea Language*, the general disposition of the several materials contained in a ship's hold, with regard to their figure, magnitude, or solidity. The casks which contain any liquid are, according to the sea-phrase, to be *bung-up* and *bilge-free*, i. e. closely wedged up in an horizontal position, and resting on their quarters; so that the bilges, where they are thickest, being entirely free all round, cannot rub against each other by the motion of the vessel. Dry goods are to be carefully enclosed in casks, bales, cases, or wrappers, and wedged off from the bottom and sides of the ship, as well as from the bows, masts, and pump-well. Due attention must likewise be had to their disposition with regard to each other, and to the trim and centre of gravity in the ship; so that the heaviest may be always nearest the keel, and the lightest gradually above them. Falconer. See ROLLING and TRIM.

STOWS, in *Mining*, are seven pieces of wood, set upon the surface of the earth, fastened together with pins of wood. See SPINDLE.

STRABISMUS, Στραβισμος. See SQUINTING.

STRAIGHT, STREIGHT, or STRAIT, in *Hydrography*, a narrow channel or arm of the sea, shut up between lands on either side, and affording a passage out of one great sea into another.

There are three kinds of *streights*. 1. Such as join one ocean to another. Of this kind are the *streights* of Magellan and Le Maire. 2. Those which join the ocean to a gulf: the *streights* of Gibraltar and Babelmandel are of this kind, the Mediterranean and Red Sea being only large gulfs. 3. Those which join one gulf to another; as the *streight* of Caffa, which joins the Palus Mæotis to the Euxine or Black Sea.

The passage of *streights* is commonly dangerous, on account of the rapidity and opposite motion of currents.

The most celebrated *streight* in the world is that of Gibraltar, which is about one hundred and thirty miles long, and twelve broad, joining the Mediterranean sea with the Atlantic ocean.

The *streights* of Magellan, discovered in 1520, by F. Magellan, were used some time, as a passage out of the North into the South Sea; but since the year 1616, that the *streight* of Le Maire has been discovered, the former has been disused; both because of its length, which is full three hundred miles, and because the navigation thereof is very dangerous, from the waves of the North and South Seas meeting herein, and clashing.

The *streight* at the entrance of the Baltic is called the SOUND. That between England and France, *Le pas de Calais*, or the *Channel*. There are also the *streights* of *Babelmandel*, of *Weigats*, of *Jesso*, of *Anian*, of *Davis*, and *Hudson*, &c.

STRAIGHT is also used in *Geography*, for an isthmus, or neck of land between two seas; preventing the communication thereof.

STRAIGHT, in the *Manege*. To part, or go *straight*, or right out, is to go upon a tread traced in a *straight* line. When you would push your horse fowards, make him part *straight*, without traversing, or bearing sidewise.

STRAIGHT *arches*, and *stairs*. See the substantives.

STRAIGHT *membered*, called in French *droit sur les jambes*. See LEGS.

STRAIKS, in the *Military Art*, are strong plates of iron, six in number, fixed with large nails, called *straik-nails*, on the circumference of a cannon-wheel, over the joints of the fellows, both to strengthen the wheel, and to save the fellows from wearing on hard ways or streets.

STRAIN, or SPRAIN, a violent extension of the sinews or tendons of some muscle.

STRAINED *sugar*. See SUGAR.

STRAINING, is the clarification of a liquor, by passing it through a sieve, or filtre.

The word is derived from the French, *estreindre*; which is formed from *ex*, *out of*, and *stringere*, *to press*.

STRAIT. See STRAIGHT.

STRAKES, or STREAKS, in a *Ship*, the uniform ranges of planks on the bottom and sides of a ship, or the continuation of planks joined to the ends of each other, and reaching from the stem to the stern-post and fashion-pieces; the lowest of these, which is called the *garboard-streak*, is let into the keel below, and into the stem and stern-post.

They say also a ship *heels a strake*, that is, hangs or inclines to one side the quantity of a whole plank's breadth.

STRAKES, or *streks*, in *Mining*, are frames of boards fixed on or in the ground, where they wash and dress the small ore in a little stream of water, hence called *straked* ore.

STRAMONIUM, in *Botany*. See THORN-*apple*.

STRAND *and stream*, in *Ancient Customs*, a freedom from all impositions upon goods or vessels by land or water.

STRAND, in *Sea-phrase*, denotes one of the twists or divisions of which a ROPE is composed.

STRAND also implies the sea-beach: hence a ship is said to be *stranded* when she has ran a-ground on the seashore.

Where a vessel is *stranded*, justices of the peace shall command constables near the sea-coast to call assistance for the preservation of the ship; and officers of men of war are to be aiding and assisting, 12 Anne, cap. 18.

STRANGER, in *Law*, denotes a person who is not privy, or party, to an act.

Thus, a *stranger* to a judgment is he to whom a judgment does not belong; in which sense the word stands directly opposed to *party* or *privy*.

STRANGALIDES, a word used by authors to express hard tumors in women's breasts, arising from coagulations of obstructed milk, after child-birth.

STRANGLES, in the *Manege*, is a collection of foul humours formed in the body of a young colt, which are voided by the nostrils, or by a suppuration of some glands or knots, that lie between the bones of the lower jaw, and are crowded with impurities.

The *false strangles* happen in old horses, that have not well cast the *strangles*. See GLANDERS.

STRANGULATIO, a word used to express that kind of suffocation which is common to women in hysteric disorders, and for the straitening of the intestines in hernias.

STRANGULATORIA, in the *Materia Medica*, a name by which Avicenna, and some other authors, have called the *doronicum*, or *leopard's bane*.

STRANGURY, ϛραγγουρια, formed from ϛραγξ, *gutta*, *drop*, and ουρον, *urine*, in *Medicine*, a disease occasioning a frequent and involuntary emission of urine, in very small quantities, and, as it were drop by drop; with an intense pain.

Some authors confound the *strangury*, which the Latins call *urinæ stillicidium*, with the *urinæ incontinentia*. The difference between them consists in this, that, in the former, the urine comes away with pain; in the latter without. The former proceeds from the acrimony of the urine; and the latter from a relaxation or palsy of the sphincter of the bladder, which cannot keep the neck thereof close shut.

The vulgar generally understand by this word the three several complaints called by physicians *strangury*, DYSURY, and ISCHURY; the differences of which are these.

The *strangury* is properly and distinctly a difficult excretion of urine, which comes away by drops, with a sensation of a spasmodic pain about the sphincter and neck of the bladder.

The *dysury* is a difficulty of making water, attended with a violent attempt and pressure of the parts. This sometimes has its origin from the kidneys, sometimes from the bladder.

The *ischury* is a total suppression of urine for some days, without the least drop being voided, or the patient's feeling the least stimulus toward attempting to void it.

These three distemperatures of the urinary organs, though very properly distinguished by their several names, are, however, in reality, all the same in their origin, and differ only in degree.

In the *strangury*, the difficulty of voiding the urine is somewhat tolerable, and is not attended with any sensation of heat, but rather with a coldness; and though the urine is voided only by drops, yet, as this is continual, there is more in quantity voided in this than in the same time in a *dysury*.

The *strangury* seems a sort of middle complaint, combined of the two others, the *dysury* and *ischury*; and it differs in point of duration, being sometimes only a complaint of a few hours, and sometimes fixing itself upon the patient for a long time. Sometimes also it is idiopathic, and is properly a disease in itself; but sometimes it is symptomatic, attending nephritic complaints of several kinds.

Physicians also distinguish the *ischury* into the proper and improper: the first is the denomination they give to this disease, when the bladder is full of urine all the time, and is so distended, that it brings on spasmodic affections, which prevent the natural efforts for the excretion of it. The improper *ischury* is that in which there is no such fullness of urine, but this fluid is, by some means, prevented from flowing as it ought into this receptacle. We must be careful not to confound with these distempers the natural imminution of urine, which happens after copious sweats, or diarrhœas, in which a great quantity of wet stools hath been voided: this

this is distinguished from these morbid affections, by its being attended with no pain, and always going off of itself.

Symptoms of a STRANGURY. These are frequent irritations to make water, which are succeeded either by a few drops, or a somewhat larger quantity, according to the nature and violence of the case; there is always a sensation of coldness while the urine is coming away, and a heat afterwards; and the whole body is very frequently affected with shiverings and sudden coldness.

In a *dysury* the difficulty of voiding the urine is great, and the pain violent; but in this case it does not go off as soon as the urine is voided, but continues afterwards.

In the *ischury*, where there is for several days together no attempt to the voiding any urine, if the complaint is in the bladder, the patient feels a weight and pressure upon the os pubis; but when the kidneys and ureters are in fault, the pain is felt in the loins; and sometimes this is attended with heart-burnings, ischiatic pains, and even with disorders of the stomach, and actual vomiting; and if the cause is some inflammable tumor, which is not unfrequently the case, then the pains are very violent, and the body is all over preternaturally hot.

The *dysury* more frequently attacks those who are subject to the stone in the kidneys or bladder, or to other nephritic complaints, and such as have taken cantharides internally, and by that means brought an erosion of the neck of the bladder; sometimes, also, this becomes a symptom in hysteric complaints.

The *ischury* principally attacks young men, and mostly those of plethoric habits; and those who have been too free with hot medicines, strong liquors, and powerful diuretics.

Causes. The cause of a *strangury* is a spasmodic contraction of the sphincter, and neck of the bladder, attempting to throw off something that is troublesome; and the fermentative state of the urine, accused by many as the cause of this disease, has indeed no share in the occasioning it. The *dysury* sometimes has its cause and origin in the kidneys, sometimes in the bladder, and when in the last place, a spasmodic constriction of the sphincter is often the case, and this is not unfrequently brought on by a high diet, the feeding on very salt foods, or using too much spices. The *ischury* is often occasioned by accidents, such as stone, gravel, a worm, a grume of blood, or a collection of purulent matter stopping up the passage in the neck of the bladder; sometimes it is occasioned by a venereal caruncle, or inflammatory tumor; sometimes by the weight of the uterus in women with child, when near the time of their delivery; sometimes by external violence; and sometimes by the sitting a long time drinking, without going to make water; but this last more rarely happens.

Prognostics in these Cases. A simple and idiopathic *strangury* is rather a painful than a dangerous disease; but if it often recurs upon the person, it bespeaks a calculous nephritic complaint for its cause; and, in general, it is a worse complaint in old people than in the young or middle-aged. The *dysury* is of the same nature with the *strangury* in its event, but the longer it continues the greater danger there is of its bringing on spasms and fevers. But though these two cases are not attended with any very imminent danger, the *ischury* is, especially when it is of some days standing; for if it is not cured before the seventh day, an inflammatory fever comes on, which is usually followed by a speedy mortification, and by the death of the patient with hiccups and violent convulsions. People subject to *ischuries* are also in danger of dropsies; and dropsical people are more subject to this complaint than any others, especially when the disease is increased to a considerable height.

Method of Cure. The *strangury* and *dysury* are to be treated in the same manner. The acrimony of the fermentitious matter in the blood, which might be apt to occasion new congestions, is to be obtunded, and the spastic motions taken off; both these purposes are excellently answered by nitre, whether given alone or mixed with some abstersive salt, or with an absorbent, mixed with a small quantity of an acid to saturate it, and with a little cinnabar. A compound powder may be prepared of these ingredients, and a scruple of it given four times a day, will usually soon take off the complaint. The cooling emulsions, made with barley-water and almonds, and with the cold seeds, are also of great service; and when there is farther occasion for medicines, gum arabic, and pills of boiled turpentine, are found very good ones; and decoctions of liquorice-root in barley-water, with syrup of marsh-mallows, may be drank in large draughts. Many people are also fond of external remedies, and recommend onions, roasted and buttered, to be applied to the pubes, and goat's suet to be rubbed warm about the navel.

In cases of the *ischury* there is occasion for greater medicines, and the method must necessarily be varied, according to the state of the patient, and the cause of the disease. The first thing to be done is the injecting an emollient clyster to loosen the bowels, for when these are emptied, the other complaint will be much more easily removed: after the clyster, powders composed of cinnabar, nitre, and diaphoretic antimony, are to be given, to prevent an inflammation in the abdomen, and to attemperate the offending matter. When these things are done, the peculiar causes of the disease are to be examined. If a plethora and violent emotion of the blood be in fault, making a congestion of it at the kidneys; in this case, if the before mentioned methods do not take effect, bleeding in the foot will be of service, and an external use of camphorated ointments probably will complete the cure. When the cause is a spastic constriction of the the ureters and kidneys, then the relaxing medicines are to be given, and gentle purges of senna, manna, and the like, will be of great use. Externally warm baths, oily liniments and ointments, and emollient cataplasms, are also great assistants to the internal medicines.

If a small stone, or a grume of blood, or mucous matter, or a worm, have stopped up the passage, and prevented the urine from passing after the clyster, and the powders are found not to have the desired effect, the catheter is to be introduced; or if the stone be lodged in the urethra, the injecting a little oil may be of use to lubricate the passage, and ease its way out. When a genuine nephritis is the cause, this is first of all to be regarded, and treated in the common way. See NEPHRITIS and STONE.

If a venereal caruncle be in the way, it must be taken down by the surgeon with the septics usually employed on those occasions; and if the case be violent, and of this kind, the cure must be perfected by treating the patient in the usual method in venereal cases.

If an inflammatory tumor stops the neck of the bladder, this is to be discussed by resolvents internally taken, and externally applied to the pubes; and if there is an erosion, or ulceration, balsamics are to be given, and particularly the pills of boiled turpentine. *Ischuries*, in infants, are cured by giving crab's eyes, and the like powders, with the usual catarrhal medicines, to the nurse who gives them suck. Finally, in cases of grown people, as soon as the urine comes away at all, the common diuretics are to be given, as the daucus-seeds, and the like, with gentle purges at the intermediate times; but it is a very dangerous practice to give diuretics before the cause of the obstruction is removed, since they always add greatly to the pain and misery of the patient.

There is no medicine so useful in these cases as nitre, and it is better given in substance than any other way; for its dulcified spirit, though well known as a diuretic, is less safe than the salt itself. Many people have a great opinion of specifics in these cases, and golden-rod, and mouse-ear and ground-ivy, are accounted of that number, as also violet-seeds, and powder of egg-shells; but it is a very dangerous thing, in cases of so great importance, to rely upon uncertain remedies. A common *strangury* often is carried off by mere diluters, such as tea, barley-water, or any other watery liquor, drank in large quantities till a sweat comes on; and in the gentler cases, where these alone are not quite effectual, there is no better addition to them than a little nitre. Bleeding, in time, often prevents great mischiefs from these disorders; and in cases of a *dysury*, brought on by the taking cantharides, there is no remedy so powerful as warm milk alone, drank in large quantities. The great Mr. Boyle has also said much in favour of Venice soap on this occasion. Junker's Consp. Med. p. 534, 535. See SUPPRESSION *of Urine*.

Strangury is a well known effect of blisters; for preventing which Dr. Greenfield, about the beginning of this century, discovered, that camphor had a power of correcting this effect of cantharides: and Dr. Home, in his Clinical Experiments, has found the efficacy of camphor rubbed on blisters with this intention: and he has also removed, suddenly, a *strangury* in a typhus, by rubbing oil of camphor on the ancles. However, Dr. Heberden (Med. Trans. vol. i. p. 470.) suggests a query, whether experience sufficiently warrants that virtue sometimes ascribed to camphor, of preventing a *strangury*? Two scruples of it (he says) given to a woman in a clyster, proved so irritating, as to bring on pains resembling those of labour. Another woman was seized with a *strangury* soon after she had taken a camphor bolus, which she imputed to the camphor, and no other probable cause of it could be assigned. Camphor is in its nature nearly allied to spirit of turpentine, one dram

of which taken internally, brings on a *ſtrangury* as certainly as cantharides.

STRAP, among *Surgeons*, a ſort of band uſed to ſtretch out limbs in the ſetting of broken or disjointed bones. See BANDAGE.

STRAP, in a *Ship*, the rope which is ſpliced about any block, and made with an eye to faſten it any where on occaſion.

STRAPS, in the *Manege*. The *ſtraps* of a ſaddle are ſmall leather-*ſtraps*, nailed to the bows of the ſaddle, with which we make the girths faſt to the ſaddle.

STRAPADO, or STRAPPADO, a kind of military puniſhment, wherein the criminal's hands being tied behind him, he is hoiſted up with a rope to the top of a long piece of wood, and let fall again almoſt to the ground; ſo that, by the weight of his body in the ſhock, his arms are diſlocated. Sometimes he is to undergo three *ſtrapados*, or more.

The word is formed from the French *eſtrapade*, which ſignifies the ſame, and which is ſuppoſed to come from the old verb *eſtreper*, to *break*, *extirpate*, or from the Italian *ſtrappata*, of the verb *ſtrappare*, to *wreſt by force*.

STRAPAZINO, in *Ornithology*, the name of a bird of the wheat-ear kind, with a white rump and tail, and of a browniſh yellow on the head and back; its wings are variegated with black and yellow, and its beak is longer, and of a browniſh yellow colour; throat, breaſt, and belly, of a yellowiſh white. It is common in Italy, and is frequently brought to market among the ſmall birds. Bellonius de Avibus.

STRASITES, STASITES, or STAXITES, a ſtone deſcribed by the writers of the middle ages, and famed for its imaginary virtue of promoting venery, aſſiſting digeſtion, and the like, and that whether taken inwardly, or outwardly applied. It is not eaſy, from the accounts they have left us, to gueſs what ſtone they mean.

STRATA, in *Natural Hiſtory*, the ſeveral beds, or layers of different matters, whereof the body of the earth is compoſed. The *ſtrata* include all the layers of earths, minerals, metals, ſtones, &c. lying under that upper tegument or ſtratum, the turf or mould.

The time when thoſe ſeveral *ſtrata* were laid, was doubtleſs at the creation; unleſs, with ſome great naturaliſts, as Steno, Dr. Woodward, &c. we ſuppoſe the globe of earth to have been diſſolved by the flood.

At that time, ſays Dr. Derham, whenever it was that the terreſtrial globe was in a chaotic ſtate, and the earthy particles ſubſided, then theſe ſeveral beds were repoſited in that commodious order wherein they are now found; and that, as is aſſerted, according to the laws of gravity, the lower ſtill heavier than the upper.

But Dr. Leigh, in his Natural Hiſtory of Lancaſhire, ſpeaking of the coal-pits, denies the *ſtrata* to lie according to the laws of gravitation; obſerving, that the *ſtrata* there are firſt a bed of marle, then free-ſtone, next ironſtone, then coal, or channel-mire, then ſome other *ſtrata*, then coal again, &c. This determined Dr. Derham to make a nicer inquiry into the matter; accordingly, in 1712, he cauſed divers places to be bored, laying the ſeveral *ſtrata* by themſelves, and afterwards determined very carefully their ſpecific gravity. The reſult was, that in his yard the *ſtrata* were gradually ſpecifically heavier and heavier, the lower and lower they went; but, in another place in his fields, he could not perceive any difference in the ſpecific gravities.

Acquainting the Royal Society therewith, their operator Mr. Hawkſbee was ordered to try the *ſtrata* of a coal-pit, which he did to the depth of thirty *ſtrata*; the thickneſs and ſpecific gravity of each whereof, he gives us in a table in the Philoſophical Tranſactions; and from the whole makes this inference, that it evidently appears, the gravities of the ſeveral *ſtrata* are in no manner of order; but purely caſual, as if mixed by chance.

The moſt frequent opportunities we have of obſerving theſe in England, is in the coal-mines in coal-countries. Here we find them lying in a regular manner, on what appears to us a plane, as we ſee any ſmall part of it; but when we conſider the ſame *ſtrata*, according to the globular figure of the earth, and ſuppoſe the maſs of the earth to conſiſt of the foregoing, and perhaps in different parts, and at different depths of *ſtrata*, of ten thouſand other kinds, all originally, while in a ſoft and fluid ſtate, tending toward the centre, we ſhall find that it muſt mechanically, and almoſt neceſſarily follow, by the continual revolution of the crude maſs from weſt to eaſt, like the winding up of a jack, or the rolling up of the leaves of a paper book, that every one of theſe *ſtrata*, though they each reach the centre, muſt, in ſome place or other, appear to the day, or on the ſurface. In which caſe there needs no ſpecific gravitation to cauſe the lighteſt to be uppermoſt; and were it practicable to ſink to the centre of the earth, all the *ſtrata* that are would be found in every part, and, according to the poet, *ponderibus librata ſuis*. Add to this, that, according to an obſervation of Dr. Stukely, the precipices of all hills are to the weſtward, whereas the aſcent to the eaſt is more gradual. Philoſ. Tranſ. No. 391, p. 396.

STRATARITHMOMETRY, formed from *ϛρατος*, *army*, *αριθμος*, *number*, and *μετρον*, *meaſure*, in *War*, the art of drawing up an army, or any part of it, in any given geometrical figure; and of expreſſing the number of men contained in ſuch a figure, as they ſtand in array, either near at hand, or at any diſtance aſſigned.

STRATAGEM, *ϛρατηγημα*, formed from *ϛρατηγεω*, *I lead*, or *command an army*, a military wile, or a device in war, ſurpriſing or deceiving an enemy.

The ancients dealt very much in *ſtratagems*; the moderns wage war more openly, and on the ſquare. Frontinus has made a collection of the ancient *ſtratagems* of war.

STRATEGUS, *ϛρατηγος*, in *Antiquity*, an officer among the Athenians, whereof there were two choſen yearly, to command the troops of the ſtate.

Plutarch ſays, there was one choſen from out of each tribe; but Pollux ſeems to ſay, they were choſen indifferently out of the people. The people themſelves made the choice; and that on the laſt day of the year, in a place called Pnyx. The two *ſtrategi* did not command together, but took their turns day by day; as we find from Herodotus and Cornelius Nepos. Sometimes, indeed, as when a perſon was found of merit vaſtly ſuperior, and exceedingly famed in war, the command was given to him alone: but it was ever a rule, not to put any perſon in the office, but whoſe eſtate was in Attica, and who had children, that there might be ſome hoſtages and ſecurities for his conduct and fidelity.

Conſtantine the Great, beſides many other privileges granted to the city of Athens, honoured its chief magiſtrate with the title of Μεγας Στρατηγος, *Magnus Dux*.

STRATIFICATION, STRATIFICATIO, in *Chemiſtry*, the arrangement of different matters in ſeveral *ſtrata* or layers, alternately; called alſo by the Latins, *ſtratum ſuper ſtratum*, and marked in books of chemiſtry with SSS.

This operation is uſed in calcining of minerals or metals with ſalts, or other matters.

To purify gold by cementation, they *ſtratify* laminæ or plates of gold in a crucible, with a dry paſte called *cement*.

STRATIOTES, in *Botany*. See *Water* ALOE, and *Water* VIOLET.

STRATOR, among the *Romans*, an officer who took care of the horſes furniſhed by the provincials for the public ſervice.

STRATOR is alſo uſed for an officer in the army, whoſe buſineſs it was to take care there was nothing in the roads to hinder or incommode the army in its march. For which purpoſe he ordered banks and ſteep eminences to be levelled; laid bridges, cut down woods, and aſſiſted the quarter-maſter to find out places proper for tranſporting the army over rivers.

STRATOR is alſo uſed for an equerry, who held the bridle of the prince's horſe, and aſſiſted him in mounting. This officer was by the Greeks called ANABOLEUS.

STRATOR likewiſe denotes a ſurveyor of the highways.

STRAWBERRY, *fragaria*, in *Botany*, a genus of the *icoſandria polygynia* claſs. Its characters are theſe: the empalement of the flower is of one leaf, which is cut into ten parts at the top; the flower has five roundiſh petals, which are inſerted in the empalement, and ſpread open, and twenty ſtamina, terminated by moon-ſhaped ſummits, with a great number of germina, collected into a head, each having a ſingle ſtyle, inſerted in the ſide of the germen, crowned by ſingle ſtigmas; the head afterward becomes a large ſoft pulpy fruit, which, if left, falls away, leaving ſmall angular ſeeds in the empalement. There are four ſpecies.

The *common*, or *wood ſtrawberry*, is frequent in the woods of England, and is thence tranſplanted into gardens. Of this ſort there are three varieties, viz. the common ſort with red fruit; the white *wood-ſtrawberry*, which ripens later in the ſeaſon; and the green *ſtrawberry*, by ſome called the pine-apple *ſtrawberry*, on account of its rich flavour. The *ſcarlet ſtrawberry*, which was brought from Virginia, where it grows in the woods, is the ſort which is firſt ripe. The *hautboy ſtrawberry* came originally from America, but has been long cultivated in the Engliſh gardens: there is an improvement of this called the globe hautboy. The *Chili ſtrawberry* was firſt brought to Europe from America, by M. Fra-

zier, engineer to the French king, and cultivated in the royal garden at Paris, whence it was conveyed to Holland, and to England by Mr. Miller in 1727.

The proper ſoil for *ſtrawberries* is a light hazely loam, not over rich; the ground, which ſhould be moiſt, muſt be well dug, and very carefully cleared of all noxious weeds, but not much dunged; and when it is levelled even, it ſhould be marked out into beds about four feet wide, leaving a pathway between each bed of two feet broad. In each of theſe beds ſhould be planted four rows of plants, ſo that they may ſtand about a foot diſtant from each other in the rows, and they ſhould be planted at about a foot plant from plant in each: and if there be no rain ſoon after they are planted, they ſhould be well watered to ſettle the earth to their roots. This is the proper diſtance for the wood *ſtrawberry*, which is of the leaſt growth of any; but the ſcarlet and hautboy *ſtrawberries* ſhould have but three rows of plants in each bed, at fifteen inches diſtance from row to row and from plant to plant. And finally, the large Chili *ſtrawberry*, which is the largeſt grower of all, muſt be ſet at two feet diſtance plant from plant; and there ſhould be only two rows in a bed.

The whole ſucceſs in the management of *ſtrawberries* depends on the proper choice of all the ſorts of plants; many of them being blind, or having flowers without the female organs of generation, with few if any ſtyles, though they may abound with ſtamina. *Strawberry* plants ſhould therefore never be taken from old neglected beds, where they have a multitude of ſuckers: thoſe off-ſets, which ſtand neareſt to the old plants, ſhould be preferred to thoſe which are produced from the trailing ſtalks at a farther diſtance; and the wood *ſtrawberry* is beſt when the plants are taken freſh from the woods, if the plants are fruitful.

The beſt time to remove theſe plants is October, that they may take root before the froſt ſets in. When the plants have taken new roots, the next care is, if the winter proves ſevere, to cover them with tanner's bark, or ſaw-duſt, or ſea-coal aſhes, or the decayed leaves of trees. The following ſummer the plants ſhould be kept clean from weeds, and the runners pulled off as faſt as they are produced: in autumn the plants ſhould again be diveſted of any ſtrings or runners, and the beds cleared from weeds, and ſome earth laid over the ſurface of the beds between the plants, together with ſome old tanner's bark. In the ſpring, when the danger of froſt is paſt, the ſoil ſhould be looſened and ſtirred, and thus the bark will be buried, and afford a good dreſſing for the *ſtrawberries*: about the end of March, or beginning of April, the ſurface of the ground ſhould be covered with moſs, which will keep the ground moiſt. The ſoil in which the Chili *ſtrawberry* ſucceeds beſt is a very ſtrong brick earth, approaching near to clay. The ſorts which are proper for forcing early, are the ſcarlet and wood *ſtrawberries*, and this may be done on the borders of hot walls, or ſtoves, or even upon common hot-beds. The methods practiſed to retard this fruit are to plant them in the coldeſt part of the garden, and to cut off all the flowers when they firſt appear.

Theſe beds, however well managed, will not continue good above three years; and the beds of the firſt year bearing but few fruit, it is neceſſary to new-plant ſome freſh ground every third year, and deſtroy the old beds, but the new ones muſt be firſt of one year's growth.

Different palates prefer different ſpecies of *ſtrawberry*, but the white-fruited one is, of all others, the beſt flavoured, though it is but a very bad bearer. The great Chili *ſtrawberry* is cultivated in the fields in that country; it is a much ſtronger and larger plant than any of our kinds, and its fruit is as large as a walnut, but not ſo well taſted as our own *ſtrawberries*. Miller. See SUMMER *fruits*.

STRAWBERRY-*blite*. See BLITE.

STRAWBERRY *cinquefoil*. See CINQUEFOIL.

STRAWBERRY *ſpinach*. See BLITE.

STRAWBERRY-*tree*. See ARBUTUS.

STRAY. See ESTRAY.

STREAK-*fallowing*, in *Huſbandry*, a particular ſort of tillage. The way of doing it is to plough one furrow, and leave one, ſo that but half the land is ploughed, each furrow that is ſo lying on that which is not; when this is ſtirred, it is then clean ploughed, and laid ſo ſmooth that it will come, at ſowing time, to be as plain as before. This is done when lean or poor lands are not ſwardy enough to bear clean tillage, nor light enough to lie to get ſward. The intent of this tillage is to keep the ſun from ſcorching them too much; but in many places they think this wears the land too faſt, and therefore are not fond of having recourſe to it.

STREAM *anchor*. See ANCHOR.

STREAM *cable*. See CABLE.

STREAM *tin ore*, is a name given to the ſmaller and looſe particles of the mineral, in the form of ſmall pyramids of various planes, very broad at the baſe, and tapering to a point at the top; theſe are detached from the bryle or backs of ſundry lodes, which are ſituated on hilly grounds, and carried down from thence by the retiring waters of the deluge, or floods of ſubſequent dates, and collected in large heaps in the vallies. This is found in different places, at different depths, and ſometimes ſtratified between what is called a firſt, ſecond, or third ſhelf. The ſtratum of *ſtream*-tin may be from one to ten feet thickneſs or more; in breadth from one fathom to almoſt the width of the valley; and in ſize from a walnut to the fineſt ſand, which laſt makes the principal part of the ſtratum, being intermixed with ſtones, gravel, and clay, as it was torn from the adjacent hills. Hence,

STREAMING, or STREAM-*work*, denotes the management of the *ſtream* tin. The firſt part of this buſineſs, after ſecuring the ground which contains it, is to ſink a hatch or ſhaft, three, five, or ſeven fathoms deep, to the rocky ſhelf or clay on which the tin is ſtratified. If upon trying a ſhovel of it, it be worth working, the operator digs an open trench in the loweſt part of the valley, which he calls a level; and this ſerves to drain off all water from the workings. Thoſe places that are rich in ore are called beuheyle, or *living ſtream*. The *ſtreamer* next carries off what he calls the overburden, i. e. the looſe earth, rubble, or ſtone which covers the *ſtream*; and the *ſtream*-tin is dug up and waſhed at the ſame time, by caſting every ſhovel of it as it riſes into a *tye*, which is an inclined plane of boards for the water to run off, about four feet wide, four high, and nine feet long; in which with ſhovels they turn it over and over again under a caſcade of water that waſhes through it, and ſeparates the waſte from the tin, till it becomes one half tin. The beſt of the tin is collected by its ſuperior gravity, in the head of the tye under the caſcade; and the refuſe and ſoil are caſt into the beds of adjacent rivers, or buried under the gravel and ſtones that form the interior ſtrata. This kind of tin is dreſſed by waſhing it again in a ſmaller tye, called a gounce, with a leſs current of water and greater care. The richer part is put into large vats, and the waſte is dreſſed again, till what remains becomes refuſe; the tin is then ſifted through wood or wire ſieves, which ſeparate the greater and ſmaller particles: the ſmalleſt tin is put into another firmly weaved horſe-hair ſieve, called a dilluer, by which it is made ſaleable.

Some of the nodules of tin are ſmelted as they come out of the tye; but thoſe which are mixed with water, as well as the refuſe of the poor tin, which were in the tails of the tye and gounce, are triturated and pulveriſed in the ſtamping mill, ſo that all waſte may be cleared from the tin by ſeveral ablutions, as in the dreſſing of mine-tin. See *Dreſſing of* ORES.

Beſide theſe *ſtream-works*, there is another ſort occaſioned by the refuſe from the ſtamping-mills, &c. which are carried by the rivers into the lower grounds, and after lying ſome years and collecting there, yield ſome money to the laborious dreſſers, called *lappiors*, probably from the Corniſh word, lappior, or dancer, from the method of moving up and down with naked feet in the BUDDLES, to ſeparate the tin from the refuſe. *Stream*-tin is then carried to the blaſt-furnace, called the blowing-houſe, in which a fire is made with charcoal, excited by two large bellows, which are worked by a water-wheel. The tin and charcoal are laid in a furnace, made by moor-ſtones and clay, well cemented, and cramped together with iron, called the caſtle, ſtratum ſuper ſtratum, in ſuch quantities, that from eight to twelve hundred weight of tin, by the conſumption of eighteen to twenty-four ſixty-gallon packs of charcoal, may be ſmelted in a tide, or twelve hours time. The tin is forced out by the blaſt of the bellows through a hole at the bottom of the earth into a moor-ſtone trough, called the *float*; whence it is laded into leſs troughs or moulds, each of which contains about three hundred of metal, called ſlabs, blocks, or pieces of tin, in which ſize and form it is ſold in every market in Europe. This, on account of its ſuperior quality, is known by the name of *grain-tin*, which formerly fetched a price of 7*s.* and of late is advanced to 10*s.* or 12*s.* more per hundred than mine-tin is ſold for, becauſe it is ſmelted from a pure mineral by a charcoal fire; whereas mine-tin is uſually corrupted with ſome portion of mundick, or other minerals, and is always ſmelted with a bituminous fire, which communicates a harſh ſulphureous quality to the metal. Pryce's Mineral. p. 136, &c.

STREAMERS, in a *Ship*, the ſame with PENDANTS.

STREIGHT. See STRAIGHT.

STRENÆ, in *Antiquity*, *new years gifts*; preſents made out of reſpect on new year's day; as an happy augury for the enſuing year.

The ancient lawyers derive the word hence, that theſe

presents

presents were only given *viris strenuis*: Symmachus adds, that the use hereof was first introduced by king Tatius, Romulus's colleague, who received branches of vervain gathered in the sacred grove of the goddess Strenia, as a happy presage of the beginning year.

Anciently, a pound of gold was given to the emperors every new year's day, by way of *strena*. Du-Cange observes, that *strina*, or *strinna*, denoted a kind of tribute which the people of Dalmatia or Croatia paid to the Venetians, or to the kings of Hungary, whom they obeyed voluntarily.

STRENGTH, *vis*, force, or power.

The *strengths* of different animals of the same species, or of the same animal at different times, are demonstrated to be in a triplicate proportion of the quantities of the mass of their blood: the whole *strength* of an animal is the force of all the muscles taken together; therefore, whatever increases *strength*, increases the force of all the muscles, and of those serving digestion, as well as others. See MUSCLE.

Yet, notwithstanding the truth of this, the quantity of blood may be increased in such circumstances, as to abate the *strength*. The equilibrium between the blood and vessels being destroyed, wonderfully lessens the *strength*. The sudden suppression of perspiration, though it increases the quantity of the blood, as it must considerably do so, by Sanctorius's calculation, yet it lessens the *strength*; because the retained matter, being what ought to be evacuated, so alters the texture of the blood, as to make it unfit for muscular motion.

Suppose the increase of quantity to be connected with an extraordinary viscidity, the quantity of small separable parts decreasing, as the viscidity increases, the quantity of animal spirits separated in the brain will be less; and the tension of the fibres being in proportion to the animal spirits forced into them, they will not be able to counterpoise the great weight of the blood, and so the *strength* will be diminished.

Bellini proves, that if the blood be so vitiated, as to increase or diminish *strength*, it amounts to the same as if the blood were in a natural state, but its quantity increased or diminished in the same proportion: so that the blood, when vitiated, may so impair the *strength* of the muscles, as even to spoil digestion; and yet, in some cases, it may be so vitiated, as to help digestion, and increase *strength*.

M. De la Hire, in a calculation of the *strength* of a man in drawing and bearing, shews, that the *strength* of an ordinary man walking in an horizontal direction, and with his body inclining forwards, is only equal to twenty-seven pounds; which is much less than one would have imagined.

He adds, that this force would be much greater, if the man were to walk backwards; and that it is for this reason, the watermen fetch their ores from before backwards: and though, he observes, the gondoliers of Venice fetch them the contrary way, yet this is, because they choose to lose the advantage of *strength*, to have that of seeing the place they are going to, in the numerous turns and canals they there meet with.

It is known by experience, that a horse draws, horizontally, as much as seven men; consequently, his *strength* will be 189 pounds. A horse, as to pushing forwards, has a great advantage over a man, both in the strength of its muscles, and the disposition of the whole body; but the man has the advantage over the horse in ascending. M. de la Hire shews, that three men, laden with 100 pounds apiece, will ascend a pretty steep hill with more ease and expedition, than a horse loaden with 300 pounds.

Hakewell, in his Apology, p. 238, furnishes us with abundance of instances of extraordinary *strength*.

STRENGTHENERS, *corroborants*; such medicines as add to the bulk and firmness of the solids.

Strengtheners differ from *cordials*, as a bandage does from a flesh-brush: the latter are such as facilitate and drive on the vital actions; but the former, such as confirm the stamina, and maintain the solids in such a condition, as to exert themselves into action on all proper occasions, with the greatest force and vigour.

The continual waste which constant motion makes in the constitution, were it not for frequent and proper supplies, would soon wear the body quite out. The attritions and abrasions of the circulating fluids would quickly carry away the canals in which they circulate, were not somewhat furnished in their composition, which is suited to fall into, adhere with, and recruit, that which is washed off. And those particles must be much more disposed so to do, whose adhesions are greatest, when once they come into contact; such are those of bodies we call *glutinous*, and which easily form themselves into jellies, and such-like consistencies; for the parts of such bodies are very light, by the over-proportion of their surfaces to their solidities, whereby their motions are both more languid, when in circulation; and, when they stop, their cohesions will be much the stronger, with whatsoever they happen to fall into contact. See NUTRITION.

Medicines of this tribe are therefore of great service in hectics; where the swift motion of a thin, sharp blood, wears away the substance of the body, instead of nourishing it; for they not only retard the inordinate motion, but give such a weight and consistence to the juices, as fits them also for nourishment. There are likewise other causes, which may weaken the solids, by admitting or occasioning them to relax too much.

Whatsoever therefore acts as a stimulus, and crisps and corrugates the fibres into a more compacted tone, which most austere and pointed bodies do, will remove such weakness, and increase strength; and as too much moisture may also contribute to such a relaxation, what has no other quality but that of absorbing, and drying up, such superfluous humidities, may deserve, though accidentally, to come under this denomination.

An artificial method of procuring a powerful, safe, and innocent *strengthener*, is the following. Put half a pound of fine Peruvian bark, reduced to a subtile powder, into a long or tall glass body, and pour upon it two quarts of spirit of wine; shake them well together, and set them in a sand-heat two or three days, or till the spirit of wine is of a fine purple colour; pour off this tincture, and press the fæces very strongly, to get it all away; then return the powder into the same vessel, and pour upon it two quarts of strong white wine; set this in sand for two or three days, then pour off this tincture; mix it with the former, and putting the whole into a glass body, distil off a great part of the spirit of wine; then put the remainder into a glazed earthen pan, and evaporate it to the form of an extract, adding, toward the end, three ounces of syrup of orange-peel.

This is the invention of Charas, and seems the best preparation of bark known. Beside all the common cases in which the bark is given, this preparation may be tried in other weakening distempers, as well as intermitting fevers, as the inconveniencies attending the taking the bark in substance are obviated by this preparation, which is equally powerful and innocent. It may be aromatized at pleasure with any of the essential oils. Shaw's Lectures, p. 232.

STRENGTHENING *pills*. See PILLS.

STREPITOSUS, the name of a distemper common to the inhabitants of some parts of the Alps, in which the face, neck and arms, are so distended with flatulencies, as to make a noise, when struck, like a dry bladder half distended with wind.

STREPSICEROS, in *Zoology*. See SHEEP.

STRETCH. When at sea they are going to hoist the yard, or hale the sheet; they say, *Stretch forward the sheets*; meaning, that the part which the men are to hale by, should be put into their hands, in order to their haling.

STRETCHER, in *Sea Language*, a sort of staff fixed athwart the bottom of a boat, for the rower to place his feet against, in order to communicate a greater effort to his oar.

STRETCHING, in *Navigation*, is generally understood to imply the progression of a ship under a great surface of sail, when close-hauled. The difference between this term and STANDING, consists apparently in the quantity of sail, which, in the latter, may be very moderate; but in *stretching* generally signifies excess: as, we saw the enemy at day-break *stretching* to the southward, under a crowd of sail, &c. Falconer.

STRETTO, in the *Italian Music*, is sometimes used to signify that the measure is to be short and concise, and consequently quick. In this sense it stands opposed to LARGO.

STRETWARD, in our *Old Writers*, an officer whose business it was to take care of the streets, like our surveyor of the highways, or rather scavenger.

STREVER, in *Ichthyology*, a name given by many to the fish called by authors *asper pisciculus*. Gesner, in particular, calls this fish GOBIUS *asper*.

STRIÆ, in the *Ancient Architecture*, the list, fillets, or rays, which separate the striges or flutings of columns.

STRIÆ, among *Naturalists*, denotes the small grooves or channels in the shells of cockles, scollops, &c.

STRIATA *corpora*, a term used by anatomists to express two protuberances of the BRAIN upon the crura of the MEDULLA *oblongata*.

STRIATED *leaf*, among *Botanists*. See LEAF.

STRIATED *stalk*. See STALK.

STRIATULA, in *Natural History*, a name given by Mr. Lhuyd to a species of *fossile* PLANTS of the fern-kind, remarkable for their *striated* appearance.

STRIBILIGO, a name given by some authors to any sort of cutaneous efflorescence.

STRICKLÆ, or STRIKE, an instrument for striking off the over-measure of corn.

STRICTOR, in *Anatomy*, the same as SPHINCTER.

STRIDOR *dentium*, a grinding of the teeth. Prosper Alpinus, in his treatise De Præsag. Vit. et Mort. Ægrot. tells us, that a *stridor dentium*, which he calls a convulsion of the teeth, has been frequently observed to be a mortal symptom; and he confirms his observations by the authority of Hippocrates. James.

STRIGA, among the Romans, a space or interval in a camp, a hundred and twenty feet long, and sixty feet broad, used for currying and rubbing down the horses.

STRIGA is also used for a furrow drawn out at length, for a long row, or series of any thing, and by surveyors for a long measure.

STRIGES, in the *Ancient Architecture*, are what in the modern we call FLUTINGS.

They were thus denominated, as being supposed to have been originally intended to imitate the folds or plaits in women's robes; which the Latins call *strigæ*. The fillets or spaces between them were called *striæ*.

STRIGIL, an instrument used among the ancients in their baths, and at some of their gymnastic exercises.

It served to absterge the sweat, or other sordes from the body. Persons who intended to bathe, or to use any of these exercises, when they entered the gymnasium, put off their cloaths in the apodyterium; after which, such of them as intended to box, wrestle, or use any of the more violent exercises, went into the alipterium, where they were anointed, and thence returning into the place where the dust was, they were sprinkled with this as they passed along, and then entered upon their several exercises; after this they returned to the alipterium, where they had the sweat and sordes wiped off from their bodies by the alipta with an iron *strigil*.

The sordes taken off from the body, and consisting of oil, dust, and sweat, were preserved for medicinal purposes, and we find them used among the old physicians.

The *strigils* were of the shape of a gardener's knife; they were made of different materials, as ivory, horn, gold, silver, iron, brass, and the like; but in some after-times the word was only used to signify a linen cloth, or a piece of spunge, which every one carried about him for his own use. The sordes, saved for medicinal purposes, were called *strigmenta*.

STRIGMENTUM, the filth, dirt, or sordes, absterged from the skins of those that bathed in the baths and places of public exercise among the ancients, or from the walls of bathing places, or statues set up in them.

These were all reserved for medicinal purposes, and were properly of three kinds. The first, or bath *strigments*, consisted of the sweat, oil, and sordes, collected in those places. The second kind was the *strigments* of the palæstra, consisting of the same things, with the addition of dust, which was thrown upon the bodies of the persons before they entered on those exercises. The third kind was that collected from the walls of the gymnasia, and from the statues, of whatever materials they were made, which were placed there. Hence the nature of the first and second kind might always be ascertained, but that of the third was very different; for as it was often collected from brass and copper statues, it partook of the nature of the rust, or ærugo of those metals which was collected from them with it.

These *strigments* were supposed to be of a heating, drying quality, and discutient; they were, therefore, used for discussing the parotides, and for condylomata of the anus. Those of the palæstræ were used to discuss collections of matter about the joints; and applied in the manner of a cataplasm, were said to be of great use in the sciatica; and those collected from the walls and statues were used to cleanse old ulcers.

STRIGONIENSIS *terra*, earth of *Strigonium*, in the *Materia Medica*, a red earth of the bole-kind, found about the gold-mines at *Strigonium* in Hungary, and used in some places as an astringent and sudorific.

The characters by which it is known from the other earths, are these. It is but of a coarse and impure texture, and lighter than most of the boles; in colour it is of a strong, but dull red, and is of a tolerably smooth surface. It is apt to crumble to pieces between the fingers, and stains the skin in handling. It melts freely in the mouth, and has a remarkable smoothness, but very little astringency in its taste, and leaves a sensible grittiness between the teeth. It is sometimes veined and spotted with small moleculæ of an earth, like the whitish variegations of the red French bole. It makes a slight effervescence with aqua fortis, or any other acid menstruum, and suffers no change of colour by burning. Hill's Hist. of Foss. p. 11.

STRIGOSULA, in *Natural History*, a name given by Mr. Lhuyd to a species of fossile oyster-shell.

STRIKE, or STRYKE, a measure, containing four bushels; two of which make a quarter.

A STRIKE *of flax* is as much as can be heckled at one handful.

STRIKE, or STRIKING, is a sea-word, variously used.

When a ship in a fight, or upon meeting with a man of war, lets down, or lowers her top-sails, at least halfmast high; they say, *She strikes*: meaning, she yields or submits, or pays her devoir to that man of war, as she passes by. See JEERS, SAIL, and SALUTE.

When a top-mast is to be taken down, they say, *Strike the top-mast*.

And when any thing is let down or lowered into the hold, they call it *striking down into the hold*.

Also when a ship touches ground in a shoal-water, they say, *She strikes*.

STRIKE *a hull*. See HULL.

STRIKE *a nail*, in the *Manege*, is to drive through the horse's shoe, and the horn or hoof of his foot, and to rivet it for holding on the shoe.

STRIKE *a vein*, in the *Manege*. See BAR.

STRIKING. The punishment appointed by our laws, 33 Hen. VIII. cap. 12 for *striking* in the king's palace, where his royal person resides, whereby blood is drawn, is perpetual imprisonment, and fine at the king's pleasure; and also loss of the offender's right hand, the solemn execution of which sentence is prescribed in the statute at length. See *Lord*-STEWARD.

But *striking* in the king's superior courts of justice, in Westminster-hall, or at the assises, is made still more penal than even in the king's palace. By the ancient common law, before the Conquest, *striking* in the king's courts of justice, or drawing a sword therein, was a capital felony; and by our modern law, a stroke or a blow in such court of justice, whether blood be drawn or not, or even assaulting a judge, sitting in the court, by drawing a weapon, without any blow struck, is punishable with the loss of the right hand, imprisonment for life, and forfeiture of goods and chattels, and of the profits of his lands during life.

By 5 & 6 Edw. VI. cap. 4. if any person shall maliciously *strike* another with any weapon, in any church or church-yard, or shall draw any weapon with an intent to *strike* another with it, he shall upon conviction, by verdict of twelve men, or by his own confession, or by two lawful witnesses, at the assizes or sessions, be adjudged to have one of his ears cut off; and if he have no ears, he shall be burned in the cheek with a hot iron, having the letter F, whereby he may be known for a fray-maker and fighter; and besides shall be *ipso facto* excommunicated.

STRIKING-*watch*. See WATCH.

STRIKING-*wheel*, in a *Clock*, the same with that which by some is called the *pin-wheel*, because of the pins which are placed on the round or rim (which in number are the quotient of the pinion divided by the pinion of the detent-wheel.) In sixteen days clocks, the first, or great wheel, is usually the pin-wheel; but in such as go eight days, the second wheel is the pin-wheel, or *striking-wheel*. See CLOCKWORK.

STRILLOZZO, in *Ornithology*, a name by which some authors have called the emberiza alba, or bunting, or perhaps a bird somewhat different from our bunting, and common in Italy; for it is not yet ascertained, whether the *strillozzo* specifically differs from the bunting, or only by some accidental variegations.

STRING, in *Music*. See CHORD.

If two *strings* or chords of a musical instrument only differ in length; their tones, that is, the number of vibrations they make in the same time, are in the inverse ratio of their lengths. If they only differ in thickness, their tones are in the inverse ratio of their diameters. As to the tension of *strings*, to measure it regularly, they must be conceived stretched or drawn by weights; and then, cæteris paribus, the tones of two *strings* are in a direct ratio of the square roots of the weights which stretch them; that is, e. gr. the tone of a *string* stretched by a weight 4, is an octave above the tone of a *string* stretched by the weight 1.

It is an observation of very old standing, that if a viol or lute-*string* be touched with the bow, or hand, another *string* on the same, or another instrument, not far from it, if in unison to it, or in octave, or the like, will at the same time tremble of its own accord. See UNISON.

But it is now found, that not the whole of that other *string* doth thus tremble; but the several parts, severally, according as they are unisons to the whole, or the parts of the *string* so struck. Thus, supposing AB to be an upper

upper octave to *ac*, and therefore an unison to each half of it stopped at *b*;

A———B
a———c
1 b 2

if while *ac* is open, AB be ftruck, the two halves of this other, that is, *ab* and *bc*, will both tremble; but the middle point will be at reft; as will be eafily perceived, by wrapping a bit of paper lightly about the *ftring ac*, and removing it fucceffively from one end of the *ftring* to the other. In like manner, if AB were an upper twelfth to *ac*, and confequently, an unifon to its three parts *a* 1, 1 2, and 2 *c*; if, *ac* being open, AB be ftruck, its three parts *a* 1, 1 2, and 2 *c* will feverally tremble; but the points 1 and 2 remain at reft. This, Dr. Wallis tells us, was firft difcovered by Mr. William Noble of Merton college; and after him by Mr. T. Pigot of Wadham college, without knowing that Mr. Noble had obferved it before. To which we may add, that M. Sauveur, long afterwards, propofed it to the Royal Academy, at Paris, as his own difcovery, as it is like enough it might be; but upon his being informed, by fome of the members then prefent, that Dr. Wallis had publifhed it before, he immediately refigned all the honour thereof. Phil. Tranf. abr. vol. i. p. 606.

STRING, in *Ship Building*, the higheft range of planks in a fhip's cieling; or that which lies between the gunwale, and the upper edge of the upper-deck ports.

STRINGS *of metal*, a term ufed by our miners to exprefs thofe thin and fmall veins of ore, into which the beds or veins degenerate toward their terminations. Thefe are from an inch to a tenth part of that in thicknefs, and run through the folid rocks to a great diftance. The ore in them is ufually very pure and rich, and as they lie in the rocks, communicating with the larger veins of ore, they refemble the feveral fmall brooks and rivulets in a hilly country, which by degrees uniting all their ftreams, form the rivers.

STRING-HALT, a fudden twitching or fnatching up of a horfe's hinder leg, much higher than the other, as if he trod on needles; generally befalling only the beft mettled horfes, and ranked in the number of fpavins. See SPAVIN.

It frequently happens upon taking cold, after hard riding, or fore labour; efpecially upon wafhing him when too hot, which chills the blood, and fo benumbs the finews, as to take away the fenfe and feeling of the member.

To cure it, the middle vein is taken up above and underneath the thigh; under which is found a *ftring*, which is to be cut away, and the part anointed with butter and falt.

STRINSIA, in *Ichthyology*, a name given by authors to that fpecies of the gadus, which is called by fome *lota*, and by others *muftela fluviatilis*; by us in Englifh the EEL-*pout*. Olaus Magnus calls it the *borbocha*.

STRIP, at *Sea*. A chafe is faid to *ftrip* himfelf into fhort or fighting fails, when he puts out his colours in the poop; his flag on the main-top; his ftreamers or pendants at the end of his yard-arm; furls his fprit-fail; peeks his mizen; and flings his main-yard. In which cafe, the chafer muft prepare himfelf for fight.

To STRIP *the mafts*, is to unrig a fhip, or diveft the mafts of their machinery and furniture, otherwife called difmantling.

STRIPED *ftalk*. See STALK.

STRIPED *velvet*. See VELVET.

STRIVALE, in *Ichthyology*, the name ufed by many for the fifh more ufually known by the name of APER, the boarfifh. See *Tab. of Fifh*, N° 19.

STRIX. See OWL.

STROAKING, a method of cure which fome people have given into, in certain difeafes, confifting in a mere application of the hand to the part affected, in the way of friction or rubbing.

That FRICTION has very confiderable ufes in many difeafes, is allowed. But as to the particular efficacy of the *ftroak* of particular perfons; we fee little foundation for it in nature. Experience, indeed, feems to afford fome; to which we do not well know what to object.

Mr. Thoresby, in the Philofophical Tranfactions, N° 256. p. 332. or Abr. vol. iii. p. 11. gives feveral very remarkable inftances of cures performed by that famous *ftroaker*, Mr. Greatrix; and adds, that when Mr. Greatrix *ftroaks* only for pains, he ufes nothing but his hand; but that for ulcers, or running fores, he ufes fpittle on his hand or fingers.

STROBILE, a word ufed by chirurgical writers to exprefs a pledget of a twifted form.

STROBILITES *vinum*. See VINUM.

STROBILUS, among *Botanifts*, a kind of PERICARPIUM, formed of an amentum, or number of vaginæ with contorted points applied clofe to one another.

STROBULUS, among the *Ancients*, a kind of mitre, which rofe to a height by many windings and turnings, and ufed by the Barbarians; inftead of which the Romans wore the APEX, which had a high but ftraight top.

STROCAL, in *Glafs-making*, a long iron inftrument like a fire-fhovel, ufed to empty the metal out of a broken pot into a whole one.

STROKE, in *Sea Language*, a fingle fweep of the oars in rowing. Hence they fay *row a long ftroke*, which is intended to pufh the veffel forward the more readily.

STROKESMAN is the perfon who rows the hindmoft oar in a boat, and gives the *ftroke* which the reft are to follow; fo that all the oars may operate together.

STROMATEUS, in *Ichthyology*, a genus of fifh of the *malacopterygious*, or foft-finned kind, according to Artedi, but of the order of *apodes* in the Linnæan fyftem; the characters of which are thefe: the head is compreffed; it has no belly-fins, and has only one back-fin, which is extended over the whole back; the tail is very forked; the mouth is very fmall; the teeth are placed in the jaws and palate; and the tongue is fmooth and broad; the body is oval and flippery. There are two fpecies, viz. the *ftromateus fubfafciatus*, or *fiatola*, which is a broad, flat, and fhort fea-fifh, fomething refembling the turbot in figure, and thin both on the back and belly, but fwimming erect, not flatwife; the colour of the back is a pale blue, and that of the fides and belly a filvery white; its back and upper part of the fides are beautifully variegated with yellow lines and fpots, and towards the belly with others of a paler colour: on the fides there are two longitudinal lines, one ftraight and the other crooked; the fkin is thin and covered with fcales. Its common fize is about a pound and half weight. It is caught in the Mediterranean, and brought to market at Rome under the name of the *lampuga*, and is a very delicate fifh. Ray.

The other fpecies is the *ftromateus unicolor* or PARU of America.

STROMBUS, in *Conchyliology*, the name of a genus of fhells, nearly allied to the buccinums, and called by the generality of authors TURBO.

The *ftrombus*, in the Linnæan fyftem, is a genus of the *teftacea* order of worms; the characters of which are, that its animal is a flug; the fhell is univalve and fpiral; the opening much dilated, and the lip expanding and terminating in a groove. Linnæus enumerates twenty-nine fpecies. See SHELLS.

STROMLINGUS, in *Ichthyology*, a name given by fome writers to the *aras* of the Greeks, which is no other than the common herring.

There is no other difference between the *ftromling* and herring, but that the former is fmaller.

STRONG *place* and *pulfe*. See the fubftantives.

STROP, in a *Ship*, a piece of rope fpliced into a circular wreath, and ufed to furround the body of a block; fo that the latter may be hung to any particular ftation about the mafts, yards, or rigging.

Strops are alfo ufed occafionally to faften upon any large rope, for the purpofe of hooking a tackle to the eye, or double part of the *ftrop*, in order to extend, or pull with redoubled effort upon the faid rope; as in fetting up the rigging, where one hook of the tackle is fixed in a *ftrop* applied to the particular fhroud, and the other to its laniard. Falconer.

STROPHE, in the *Greek and Latin Poetry*, a ftanza, or certain number of verfes, including a perfect fenfe; fucceeded by another, confifting of the fame number and meafure of verfes, and in the fame difpofition and rhythmus, called ANTISTROPHE.

What the couplet is in fongs, and the ftanza in epic poetry; *ftrophe* is in odes.

The word is Greek, ϛροφη, formed from ϛρεφω, *I turn*; becaufe at the end of the *ftrophe*, the fame meafures returned again; or rather, as the term related principally to the mufic or dancing, becaufe, at firft coming in, the chorus, or the dancers, turned to the left; and, that meafure ended, they turned back again to the right.

STROPHIARIUS, among the Romans, a perfon who prepared and made the *ftrophia*. See STROPHIUM.

STROPHIUM, among the Romans, a fhort fwath or band, whereby the young women kept down the fwelling of their breafts.

STROPHIUM was likewife a bandage for the head, made of two or three garlands of flowers tied together.

STROPPUS, among the Romans, the thong with which the oars were tied to the SCALMUS.

STRUCTURE, in *Architecture*. See BUILDING.

STRUFERTARII, among the Romans, perfons hired to perform fome kind of facrifices near the trees that had been thunder-ftruck.

STRUMÆ, formed, as fome will have it, *a ftruendo*; becaufe they grow infenfibly, *ftructum affurgunt*, in *Medi-*

Medicine and *Surgery*, tumors ariſing moſt uſually on the neck and throat; called alſo *ſcrophulæ*, and popularly the *evil*, or *king's evil*.

The Greeks call them χοιράδες, *ſores*. See EVIL and BRONCHOCELE.

STRUMARIA, a name by which Galen has called the little burdock.

STRUMPSIA, in *Botany*, a genus of the *ſyngeneſia monogamia* claſs. Its characters are, that the calyx is quindentated; that the corolla has five petals, and that the fruit is a monoſpermous berry. There is only one ſpecies.

STRUMUS, in *Botany*, a name given by ſome of the old Roman authors to the *cucubalus*, or *berry-bearing* CHICKWEED.

It had this name from its being found of ſervice in *ſtrumous* and ſcrophulous ſwellings, when externally applied. The name *cucubalus* ſeems to have been derived from the word *halicaccabum*, or the winter-cherry, for the ancients eſteemed both theſe plants ſpecies of nightſhade; and ſome of them have plainly deſcribed the *cucubalus* under the name of *ſolanum hortenſe*.

STRUNTJAGGER, *arctic bird*, or LARUS *paraſiticus* in the Linnæan ſyſtem of *Ornithology*, is a ſpecies of GULL found in the Hebrides and Orkneys, with a duſky hooked bill, and narrow noſtrils. In the male, the crown of the head is black; the back, wings, and tail duſky; the hind-part of the neck and lower ſide of the body white; the tail conſiſts of twelve feathers; the legs are black, ſmall, and ſcaly: the female is entirely brown.

Theſe birds purſue the leſſer gulls till they mute for fear, and catch up their excrement, and therefore they are ſometimes called *dung-hunters*, as well as another ſpecies of the gull called MARTINAZZO.

STRUPPI, among the *Romans*, garlands or wreaths of vervain, wherewith the ſtatues of the gods were crowned.

STRUT, a term uſed by ſome builders for that BRACE which is framed into the king-piece and the principal rafters.

STRUTHIO, in *Ornithology*. See OSTRICH.

STRUTHIOLA, in *Botany*, a genus of the *tetrandria monogynia* claſs in Linnæus's mantiſſa, of which he enumerates two ſpecies, both of which are found at the Cape of Good Hope.

STRUTHIOMELA, a word uſed by Pliny and the ancients to expreſs a ſort of quinces, which were ſmaller than the common kind, and of a ſweeter juice and leſs aſtringent.

STRUTHIOPTERI, in *Natural Hiſtory*, a name given to a ſeries of flies, of the claſs of thoſe which do not feed on fleſh: theſe have remarkable ſhort wings, and are always found on flowers and leaves of plants. There are ſeveral ſpecies of theſe. The moſt frequent among us are a white-bodied one with black wings, which cover but a very ſmall part of the back, and with feathered wings; and two others with long bodies, of a duſky grey, ſtreaked with white. Theſe are all early flies, being found in the ſpring in hedges and buſhes.

STRUTHIOPTERIS, in *Botany*, a name by which Tragus, and ſome other authors, have called the *lonchitis*, or SPLEEN-*wort*.

STRUTHIUM, in *Natural Hiſtory*, a name given by the Greeks to a plant called by the Latins *lanaria herba*, from its uſe in the manufacture of their wool. Many have ſuppoſed the *chaſcuſa* of the ancients to be the ſame with this plant, but this is an error, for the *chaſcuſa* of the Greeks is the *antirrhinum* of the Latins, as is plain from Pliny; and the ſame author tells us, that it has leaves like thoſe of flax, ſmall, narrow, and ſmooth. All the accounts we have of the *ſtruthium* is from Dioſcorides, who ſays, that it was a kind of thiſtle, ſomewhat reſembling the ſcolymus, and having a large root, long, and of the thickneſs of two or three fingers, and very ſharp prickles on the leaves. This ſhort account, though not enough perhaps certainly to inform us what the plant was, is yet abundantly ſufficient to prove, that it was not the chaſcuſa, or antirrhinum.

We find the *ſtruthium* celebrated among the Romans for its virtues; but all the account we have of it from them is, that it was a prickly plant, and was very common in the Grecian iſlands. This however is ſufficient to convince us of the great error of thoſe who make this plant and the *oſtrucium* of the later writers to be the ſame plant. The oſtrucium is the Smyrnium, or Alexanders, and can by no means be ſuppoſed the ſame with this prickly plant; yet Macer has made them the ſame, and has attributed to the Smyrnium, or Alexanders, the virtues which Theophraſtus gives to the *ſtruthion*.

STRUTHIUM, in the *Materia Medica*, is uſed by modern authors as the name of the *luteola*, or DYERS-*weed*, a common wild plant with narrow leaves and yellow flowers.

STRUTHIUM is alſo uſed by ſome for the *ſaponaria*, or SOAP-*wort*.

STRYCHNUS, a name given by the ancients to the plant we call *ſolanum*, or NIGHTSHADE. Some of the old authors have alſo called this *tithymal*; and in the times of Theophraſtus we find that tithymal and nightſhade were ſynonymous terms. See MANICUM *ſtrychnum*.

Strychnus, in the Linnæan ſyſtem, is a genus of the *pentandria monogynia* claſs. Its characters are, that the corolla is divided into five ſegments, and the fruit is a ſingle-celled berry, with a woody bark. There are two ſpecies, which are the NUX *vomica*, and the LIGNUM *colubrinum*.

STRYKE. See STRIKE.

STUB, in the *Manege*, is uſed for a ſplinter of freſh-cut under-wood, that goes into a horſe's foot as he runs; and piercing the ſole through to the quick, becomes more or leſs dangerous, according as it ſinks more or leſs into the foot.

STUC, or STUCCO, in *Building*, a compoſition of white marble pulverized, and mixed with plaiſter or lime; the whole ſifted and wrought up with water; to be uſed like common plaiſter.

This is what Pliny means by *marmoratum opus*, and *albarium opus*. See MOSAIC, &c.

Of this are made ſtatues, buſts, baſſo relievos, and other ornaments of architecture. See STATUE, &c.

A *ſtucco* for walls, &c. may be formed of the GROUT or putty, made of good ſtone-lime, or the lime of cockle-ſhells, which is better, properly tempered and ſufficiently beat, mixed with ſharp grit ſand, in a proportion which depends on the ſtrength of the lime: drift ſand is beſt for this purpoſe, and it will derive advantage from being dried on an iron plate or kiln, ſo as not to burn; for thus the mortar would be diſcoloured. When this is properly compounded, it ſhould be put up in ſmall parcels againſt walls, or otherwiſe to mellow (as the workmen term it); reduced again to a ſoft putty, or paſte, and ſpread thin on the walls without any under coat, and well trowelled. A ſucceeding coat ſhould be laid on, before the firſt is quite dry, which will prevent joints of brick-work appearing through it. Much depends upon the workmen's giving it ſufficient labour and trowelling it down. If this *ſtucco*, when dry, is paid over with boiling linſeed oil, it will laſt a long time, and not be liable, when once hardened, to the accidents to which common *ſtucco* is liable.

Liardet's, or, as it is commonly called, *Adam's oil-cement*, or *ſtucco*, is prepared in the following manner: for the firſt coat, take twenty-one pound of fine whiting, or oyſter-ſhells, or any other ſea-ſhells calcined, or plaſter of Paris, or any calcareous material calcined and pounded, or any abſorbent material whatever proper for the purpoſe; add white or red lead at pleaſure, deducting from the other abſorbent materials in proportion to the white or red lead added; to which put four quarts, beer-meaſure, of oil; and mix them together with a grinding-mill, or any levigating machine: and afterwards mix and beat up the ſame well with twenty-eight quarts, beer-meaſure, of any ſand or gravel, or of both, mixed and ſifted, or of marble or ſtone pounded, or of brick-duſt, or of any kind of metallic or mineral powders, or of any ſolid material whatever, fit for the purpoſe.

For the ſecond coat, take ſixteen pounds and a half of ſuperfine whiting, or oyſter-ſhells, or any ſea-ſhells calcined, &c. as for the firſt coat; add ſixteen pounds and a half of white or red lead, to which put ſix quarts and a half of oil, wine-meaſure, and mix them together as before; afterwards mix and beat up the ſame well with thirty quarts, wine-meaſure, of fine ſand or gravel ſifted, or ſtone or marble pounded, or pyrites, or any kind of metallic or mineral powder, &c. This compoſition requires a greater proportion of ſand, gravel, or other ſolids, according to the nature of the work, or the uſes to which it is to be applied. If it be required to have the compoſition coloured, add to the above ingredients ſuch a proportion of painter's colours, as will be neceſſary to give the teint or colour required. In making the compoſition, the beſt linſeed or hempſeed, or other oils proper for the purpoſe are to be uſed, boiled or raw, with drying ingredients, as the nature of the work, the ſeaſon, or the climate requires, and in ſome caſes bees-wax may be ſubſtituted in place of oil; all the abſorbent and ſolid materials muſt be kiln-dried. If the compoſition is to be of any other colour than white, the lead may be omitted, by taking the full proportion of the other abſorbents; and alſo white or red lead may be ſubſtituted alone, inſtead of any other abſorbent material.

The firſt coat of this compoſition is to be laid on with a trowel, and floated to an even ſurface with a rule or darby (i. e. a handle-float.) The ſecond coat, after it is laid on with a trowel, when the other is nearly dry, ſhould be worked down and ſmoothed with floats edged with horn, or any hard ſmooth ſubſtance that does not

ſtain.

ſtain. It may be proper, previous to laying on the compoſition, to moiſten the ſurface on which it is to be laid by a bruſh with the ſame ſort of oil and ingredients which paſs through the levigating machine, reduced to a more liquid ſtate, in order to make the compoſition adhere the better. This compoſition admits of being modelled or caſt in moulds, in the ſame manner as plaiſterers or ſtatuaries model or caſt their *ſtucco* work. It alſo admits of being painted upon, and adorned with landſcape, or ornamental, or figure-painting, as well as plain painting. For the invention of this *ſtucco* Mr. Liardet obtained a patent in 1773 for fourteen years, the term of which was extended to eighteen years in conſequence of an act of parliament in 1776. For compoſitions very ſimilar to the preceding patents were granted to Dr. Wark in 1765, to Mr. Emerton in 1771, and to Mr. Rawlinſon 1772.

Dr. Shaw informs us in his Travels (p. 286), that the cement or mortar uſed in Barbary, which is apparently of the ſame conſiſtence and compoſition with thoſe of the ancients, is made in the following manner: they take two parts of wood-aſhes, three of lime, and one of fine ſand, which, after being well ſifted and mixed together, they beat for three days and nights inceſſantly with wooden mallets, ſprinkling them alternately and at proper times with a little oil and water, till they become of a due conſiſtence. This compoſition, he adds, is chiefly uſed in their arches, ciſterns, and terraces; but the pipes of their aqueducts are joined, by beating tow and lime together with oil only, without any mixture of water. Both theſe compoſitions quickly aſſume the hardneſs of ſtone, and ſuffer no water to pervade them: and will, therefore, anſwer the purpoſe of *ſtucco*.

For other compoſitions of a like kind, ſee Mortar, Mortar *for ſun-dials*, &c. and Plastering.

STUD, in the *Manege*, denotes a collection of breeding horſes and mares. See *Breeding of* Horses and Mare.

STUDDING-*ſails*, in a *Ship*, are certain light ſails extended, in moderate and ſteady breezes, beyond the ſkirts of the principal ſails, where they appear as wings on the yard-arms: hence ſome have called them goose-*wings*. The origin of the name has been variouſly aſſigned: ſome have derived *ſtudding* from *ſcud*, becauſe the ſmall ſails uſed in scudding are nearly of the ſame ſize and figure with the lower *ſtudding*-ſails: others have ſought its etymology in *ſteddy*, becauſe theſe ſails feel the effort of a breeze, and ſerve to puſh the ſhip forward, and to give her head way; ſo that ſhe becomes ſuſceptible of the power of the helm, and is retained in a ſteddy courſe; whence *ſtedding*-ſails, afterwards corrupted into *ſtudding*-ſails. Others again derive *ſtudding* from the Saxon *ſted, to aſſiſt*, whence theſe ſails which help the ſhip's courſe are called *ſteading, ſtedding*, or *ſtudding*-ſails.

The top-maſt *ſtudding*-ſails, or thoſe which are ſet on the outſide of the top-ſails, are ſpread below by a boom, which, ſliding out from the extremities of the main and fore-yards, puſhes out their lower corners; and their upper edges, which are attached to a light pole, are hoiſted up to the top-ſail-yard-arms. The lower *ſtudding*-ſails, which are ſpread beyond the ſkirts or leech of the main-ſail and fore-ſail, are fixed nearly in the ſame manner; only that the boom, which extends their bottoms, is generally hooked to the chains by means of a goose-*neck*; or elſe ſwings off along with the ſail, to which it is ſuſpended; being kept ſteddy behind by a rope called the guy. Falconer.

STUFF, in *Commerce*, a general name for all kinds of fabrics of gold, ſilver, ſilk, wool, hair, cotton, or thread, manufactured on the loom; of which number are velvets, brocades, mohair, ſattins, taffeties, cloths, ſerges, &c.

Stuff is particularly uſed for certain kinds of ſlight woollen ſtuffs, uſed principally for linings, and womens wear; as linſeys, rateens, &c.

Stuffs, *bleaching of*. See Bleaching.

Stuff, *croſs-grained*. See Cross-grained.

Stuffs, *fulling of*. See Fulling.

Stuff, in *Naval Language*, any compoſition, or melted maſs, uſed to ſmear or daub the maſts, ſides, or bottom of a ſhip. That which is chiefly uſed for the lower maſts is ſimply turpentine, roſin, or varniſh of pine: for the *top-maſts, tallow or butter: for the ſides*, turpentine, *varniſh of pine, tar and oil*, or tar mixed with oil and red oker; and for the bottom, a mixture of tallow, ſulphur, and roſin or tar; whale oil and broken glaſs; or any part of theſe ingredients: and this operation is called giving a new coat of *ſtuff* to the maſts, ſides, &c. Falconer. See Pay and Ship.

STUFFING, or Congestion, in *Medicine*, the name of a diſtempered ſtate of the body, in which there is a ſpecial and peculiar direction of the blood, in larger quantities than ordinary, to ſome particular places, in order to its there making its way out by an hæmorrhage, and relieving nature from an over-abundant quantity of it, that the reſt may circulate the more freely and eaſily.

Congeſtions differ in regard to the places where they appear; ſome are made in the head, others in the breaſt; ſome in the hypochondria, and ſome in the kidneys; and others in the hæmorrhoidal veſſels. In this alſo there is ſome regularity in regard to the age and conſtitution of the patient; for in young perſons *congeſtions* are uſually made in the head, in middle-aged people in the breaſt, and in thoſe ſomewhat farther advanced in years toward the abdomen.

Medical writers diſtinguiſh *congeſtions* into two kinds, the *complete*, and the *incomplete*. The complete *congeſtions* are thoſe in which the blood is directed to ſuch a part where it is natural and eaſy for it to be diſcharged by an hæmorrhage; ſuch are the head, the lungs, the uterus, and inteſtinum rectum; and in which it is carried in large quantities to the very parts.

The incomplete *congeſtions*, are thoſe in which the blood is indeed directed toward theſe, or the like parts, from whence it ought to be diſcharged, but never is carried to them, or indeed near them, but collecting itſelf at a diſtance from them, can never come to a diſcharge by a hæmorrhage. Something of this kind is obſerved in the rheumatiſm, gout, and what are called the *old catarrhs*.

Congeſtions are alſo divided into two kinds, from the matter they are occaſioned by: the one are called *ſanguineous*; in theſe the blood is always ready to appear in its own form in an hæmorrhage. The other are ſtyled *bechic*; theſe extend themſelves farther than the ſanguineous, and theſe have their origin from the blood: but when a paſſage is by any means denied to the whole ſubſtance of the blood, its ſerous parts only form the *congeſtions*; and theſe, as they are become either mucidoſeroſe, or ſeroſoſaline, are the occaſion of coryzæ, gravedines, moiſt coughs and aſthmas, cold, œdematous, ſcirrhous, and glandulous tumors.

Authors diſtinguiſh *congeſtions* from ſtaſes ſanguinis, by this, that in theſe the quality and progreſſive motion of the humours are greatly altered, in the others, as ſuch, they are not altered at all.

The ſigns of *congeſtions* are deduced from their effects, and are theſe. In the parts affected there is a diſtenſion of the veſſels, ſo that the very ſmall ones, which ſcarce appear at another time, are found turgid, with heavy and tenſive pains, and often, as it were, with a ſenſation of pricking; if the *congeſtion* be carried farther, there ſucceeds to theſe, redneſs, and preternatural heat in the part: when upon this there appears an hæmorhage, all the ſymptoms vaniſh; but if this diſcharge does not happen, there are frequently formed tumors, and running ulcers, with violent pain and inflammation. Theſe are the ſymptoms in the affected parts; in the more remote ones, there is a conſtriction of the veſſels, ſo that they appear leſs than natural, and a ſenſation of coldneſs in the fleſh.

The perſons moſt ſubject to *congeſtion* are thoſe of a plethoric habit, and ſuch as live ſedentary lives, and eat and drink high; and to theſe are to be added, ſuch as have been uſed to ſome habitual diſcharge of blood, whether natural, or by regularly bleeding in the arm at ſtated times of the year, and afterwards live wholly without theſe; and ſuch as have had iſſues, bliſters, or old natural ulcers dried up, without uſing the neceſſary precautions on ſuch occaſions.

Cauſes of congeſtions. Theſe are principally a plethoric habit of body, and an effort of nature to relieve herſelf from the load, by diſcharging part of it at ſome proper outlet. To theſe are to be added many external and occaſional ones; ſuch are a moiſt and cold air, and ſometimes a moiſt and hot one; a refrigeration of the remoter parts, or of thoſe oppoſite to ſuch as are proper for the *congeſtion*.

The effects of *congeſtions* are generally ſtagnations; and from theſe ſtaſes and corruptions of the blood and humours too frequently ariſe. When *congeſtions* are become habitual to a perſon, they very rarely yield to the effects of medicines, even though the material cauſe is removed, but often after this renew their ſymptoms in ſome different way. When *congeſtions* are ill treated, eſpecially when narcotics are given, or hot medicines, or a warm diet are indulged, they always return the more frequently upon the patient, or bring on a ſeries of other diſorders; and *congeſtions* in themſelves are not without danger, when they affect perſons at a certain time of life. Finally, *congeſtions* in the breaſt are always of more unhappy conſequence than thoſe of the head and abdomen, becauſe the evacuation of the blood, which is what nature aims at in a *congeſtion*, is not to be effected any way happily in the breaſt.

Method of treating them. In the time of the paroxyſm, the

the bowels, which are usually bound in this case, are to be loosened by a gentle emollient clyster, or by some of the gentle purges; and the too great expansion of the blood, and stricture of the fibres, are to be prevented by absorbents, and nitrous medicines, with the addition of cinnabar, and of the common diaphoretics: to this purpose powders are to be given three or four times a day, composed of crabs eyes, nitre, antimonium diaphoreticum, and cinnabar, either native or that of antimony; and if the pains are violent, a gentle opiate may be added to the powder to be taken at night. To these things are to be added the temperate alexipharmics, and the mild and diluent diaphoretics; such as tea made of the flowers of lavender, of sage, and the like: and when the blood begins to stagnate in the place of the *congestion*, topics may be used; such as camphorated spirit of wine, or a cataplasm of caraway seeds, juniper berries, salt, and crumb of bread: and in some cases repellents may be safely used; such as the vinegar of roses, and mixtures with nitre, and with saccharum saturni. Junker's Consp. Med. p. 92.

STUFFINGS *of the breasts*, in *infants*. See INFANT.

STUM, in the *Wine Trade*, a term for the unfermented juice of the grape, when it has been several times racked off, and separated from its sediment. The casks are for this purpose well matched, or fumigated with brimstone every time, to prevent the liquor from fermenting, as it would otherwise readily do, and become wine.

It is this fume of the sulphur from the match that prevents, in this case, all tendency to fermentation, and continues the natural juice of the grape in a sweet state, fit to be readily mixed with wines instead of sugar; for which purpose it is very much used in Holland, and some other countries, as also for giving a new fret, or briskness, to decayed wines. So that very large quantities of this *stum* are annually imported to all parts along with the foreign wines; and after the same manner a *stum* is prepared in England from the juice of apples which serves the ordinary purposes of the wine-cooper. In preserving this liquor in this state, we see the vast use of brimstone, for it could never be done otherwise than by the matching of the casks. Shaw's Lectures, p. 192. See MATCHING.

STUM, *artificial*, an artificial must, or *stum*, as good as the natural, and as fit for the re-fermenting, fretting, improving, or making of wines, vinegars, and spirits, may be prepared in the following manner.

Take three pounds of fine lump sugar, or such as has been well refined from its treacle, melt it in three quarts of water, and add in the boiling, of Rhenish tartar, finely powdered, half an ounce; this dissolves with a remarkable ebullition, and gives a grateful acidity to the liquor; take the vessel from the fire, and suffer it to cool, and you have an artificial must, which in all respects resembles the natural taste and sweet juice of a white flavourless grape, when well purified, and racked off from its sediment, in order to make *stum*. If this artificial must be stummed, that is, well fumigated with burning brimstone, it becomes a perfect *stum*, and may be made of any flavour, at the discretion of the artist. Shaw's Lectures, p. 202. See MUST.

STUMBLING, in the *Manege*, &c. a vice in a horse, either *natural* or *accidental*.

The *natural* arises from the sinews of the fore-legs being somewhat too strait, which cramps the horse, and prevents his using his legs with the necessary freedom and nimbleness. The way to cure him is, to cut him of the cords, i. e. to make a slit on the top of his nose, and with a cornet to raise up the great sinews, to cut them asunder, and heal them up again with a proper salve.

The *accidental* arises from a splint, wind-gall, being foundered, pricked, stubbed, gravelled, &c.

STUNG, *adder*-STUNG. See ADDERSTUNG.

STUPA. See STUPHA.

STUPEFIERS, in *Medicine*, the same as NARCOTICS, and OPIATES.

STUPHA, STUPA, STUPE, sometimes denotes a FOMENTATION.

STUPIO, a name given by some of the writers in chemistry to TIN.

STUPOR, a numbness, occasioned by an accidental bandage that stops the motion of the blood and nervous fluids, or by a decay in the nerves, as in a palsy, &c.

STURDY, in *Cattle*, a kind of distemper, otherwise called the TURNING-*evil*.

STURGEON, ACIPENSER *sturio* of Linnæus, in *Ichthyology*, a very well known, large, and fine-tasted fish, caught in many places, and sometimes in the river Thames, being one of those fishes called *anadromi* by authors, which spend a part of their time in the sea, and a part in rivers.

It never goes into the sea to any great distance, and never is caught there of any very great size. The sea serves for its production, but it is only in large rivers that it grows to its usual size.

This fish is admired for the delicacy and firmness of its flesh, which is white as veal, and extremely good when roasted. It is generally pickled. The *sturgeon* which we receive comes either from the Baltic rivers, or North America. Those cured at Pillau, were reckoned the best, though of late they are rivalled by those brought from America, in the rivers of which country they abound in May, June, and July; at which time they leap some yards out of the water, and falling on their sides make a noise to be heard in still weather at some miles distance.

The *sturgeon* grows to a great size, to the length of eighteen feet, and to the weight of five hundred pound; but in our rivers it is seldom taken of that bulk; the nose is long, slender, and pointed; the eyes very small, with the nostrils near them; in the lower part of the nose are four cirri; the mouth is placed far beneath, is small, without teeth, and unsupported by any jaw-bones; so that the mouth of a dead fish is always open, but when alive, closed or opened at pleasure by certain muscles; the body is long, pentagonal, and covered with five rows of large bony tubercles; the whole under-side of the fish is flat; on the back, near the tail, is a single fin; and it has also two pectoral fins, two ventral, and one anal fin; the tail is bifurcated, the upper part being much longer than the other; the upper part of the body is of a dirty olive colour, the lower part silvery; the middle of the tubercles white.

This fish, in the manner of its breeding, is an exception among the cartilaginous fish, being like the bony oviparous, spawning in winter. CAVEAR is made of the roes, and ICHTHYOCOLLA of the sound of the *sturgeon*. Ray and Pennant. See *Tab.* V. *Fish, fig.* N° 52.

Sturgeon is reckoned one of the ROYAL *fishes*.

STURK. See STIRK.

STURNUS, in *Ornithology*. See STARLING.

STUTHY. See STITHY.

STYE, or STITHE, in *Surgery*, the English name for a disorder on the eyelids, called by the physicians *hordeolum*, and by some *crithe*, *chalazium*, or *grando*.

It is a small encysted tumor, usually of about the bigness of a barley-corn, which sometimes degenerates into matter, and occasions great pain and uneasiness.

The tenderness of the organ of sight makes it necessary to be careful about these tumors, which, if situated in any other part of the body, would hardly deserve much attention. Some authors commend cataplasms, and the like applications, to these, but the eye is often hurt by those applications; and it is observed besides, that these tubercles seldom give way to topical applications of any kind.

When they are small, it is best to let them take their own course; but if so large as to occasion deformity, or danger of hurting the sight, the way to extirpate them, is to make a longitudinal incision on the part, and carefully take them out whole; or if they cannot be thus got out clean, they must be cut out, as far as may be, with scissars, and dressed with Ægyptian ointment, and a little red precipitate, or touched at times with the common caustic, till eaten thoroughly away, and then the wound dressed and healed in the common manner.

This is the method by which the flat and broad-bottomed tumors of this kind are to be extirpated; and in this great care must be taken that none of the sharp applications touch the eye, as they might injure the sight. It is common, however, with these tumors to hang by a sort of small root, and then they are much more easily managed, there being no more necessary than the cutting them close off with a pair of scissars, or the tying them firmly round with a piece of silk, or horse-hair. They are sometimes, if taken in time, dispersed by rubbing them with fasting spittle, or with applying the pulp of a roasted apple mixed with some saffron and camphor. Heister.

STYE, a place to keep swine in for fattening.

STYGIA *aqua*, a term used sometimes to express aqua regia; sometimes for the other strong acid spirits.

STYGIAN *liquors*, a term which some chemists apply to the corrosive acid spirits, as aqua regia, from their efficacy in destroying or dissolving mixt bodies.

STYLE, Στυλος, a kind of bodkin of gold, silver, brass, iron, or bone, pointed at one end, for cutting the letters, and flat and broad at the other, for erasing any thing to be altered; wherewith the ancients wrote on plates of lead, or on wax, &c. and which is still used to write on ivory leaves, and paper prepared for that purpose, &c.

This is the origin of all the other significations of the same word in English. See a Dissertation on the *Style* of

of the Ancients, in Phil. Trans. N° 420, p. 157. or Eames's and Martyn's Abr. vol. vii. part 4. p. 39.

STYLE, STYLUS, in *Botany*, the part rising up in the middle of a flower, and bearing, by its lower part, on the rudiment of the fruit, and serving to elevate the stigma from the germen.

This we more usually call the *pistil*; though Bradley makes a distinction, calling it *style*, when it is only joined or contiguous to the seed or fruit; and *pistil*, when it contains the seed or fruit within it, as the ovary does the egg. See PISTIL.

STYLE, STYLUS, in *Chirurgery*, denotes a long steel instrument, which diminishes to a point at one end, so as to be of a conical form; serving either to expand and open, or to be thrust into a part.

The *style* is frequently used to be thrust in red-hot, in cannulæ, and to be pulled out again immediately: it is put in and drawn out successively, as often as is necessary. In order to do this, it is useful to have two *styles*, to be put in alternately.

STYLE, in *Chronology*, denotes a particular manner of accounting time, with regard to the retrenchment of ten days from the calendar, in the reformation made thereof under pope Gregory XIII. See CALENDAR.

Style is either *old* or *new*.

STYLE, *old*, is the Julian manner of computing, which obtains in some protestant states, who refused to admit of the reformation.

STYLE, *new*, is the Gregorian manner, followed by the catholics, and others, in consequence of that reformation.

The Julian, or old *style*, agrees with the Julian year, which contains three hundred and sixty-five days six hours. The Gregorian, or *new style*, agrees with the true solar year, which contains only three hundred and sixty-five days five hours forty-nine minutes.

In the year of Christ 200, there was no difference of *styles*, but now there has arisen a difference of eleven days between the old *style* and the new, the latter being so much beforehand with the former: so that when the catholics, e. gr. reckon the twenty-first of May, those who use the old *style* reckon the tenth.

There are several places where the new *style* obtains even among protestants; and it is not unlikely that the old *style* may, in time, dwindle quite away.

At the diet of Ratisbon in 1700, it is decreed by the body of protestants of the empire, that eleven days should be retrenched from the old *style*, to accommodate it for the future to the new. And the same regulation has since passed into Sweden, Denmark, and into England, where it was established by 24 Geo. II. c. 23. which enacts, that in all dominions belonging to the crown of Great Britain, the supputation, according to which the year of our Lord begins on the twenty-fifth day of March, shall not be used from and after the last day of December 1751; and that from thenceforth, the first day of January every year shall be reckoned to be the first day of the year: and that the natural day next immediately following the second day of September 1752, shall be called and reckoned the fourteenth day of September, omitting the eleven intermediate nominal days of the common calendar, and that the several natural days succeeding the fourteenth, shall be called and reckoned forwards in numerical order from the fourteenth day of September. Moreover, it is enacted, that all kinds of writings, &c. shall bear date according to the new method of supputation, and that all courts and meetings &c. feasts, fasts, &c. shall be held, and observed accordingly. And for preserving the calendar in the same regular course for the future, it is enacted, that the several years of our Lord 1800, 1900, 2100, 2200, 2300, &c. except only every four hundredth year of our Lord, of which the year 2000 shall be the first, shall be common years of three hundred and sixty-five days, and that the years 2000, 2400, 2800, &c. and every other four hundredth year from the year 2000 inclusive, shall be leap years, consisting of three hundred and sixty-six days. See BISSEXTILE and CALENDAR.

The following table shews by what number of days the *new style* differs from the old, from five thousand nine hundred years before the year of CHRIST's birth, to five thousand nine hundred years after it. The days under the sign — (viz. from six thousand years before to two hundred years after Christ) are to be subtracted from the old *style* to reduce it to the new; and the days under the sign + (viz. from two hundred to 5900 years after Christ) are to be added to the old *style* to reduce it to the new.

N. B. All the years mentioned in the table are leap years in the old *style*; but those only which are marked with an L are leap-years in the new.

Years before Christ. New style	Days diff. —	Years before and after Christ. New style.	Days diff. — and +	Years after Christ. New style.	Days diff. +
5900	46	1900	16	L. 2000	13
5800	45	1800	15	2100	14
5700	44	1700	14	2200	15
L. 5600	44	L. 1600	14	2300	16
5500	43	1500	13	L. 2409	16
5400	42	1400	12	2500	17
5300	41	1300	11	2600	18
L. 5200	41	L. 1200	11	2700	19
5100	40	1100	10	L. 2800	19
5000	39	1000	9	2900	20
4900	38	900	8	3000	21
L. 4800	38	L. 800	8	3100	22
4700	37	700	7	L. 3200	22
4600	36	600	6	3300	23
4500	35	500	5	3400	24
L. 4400	35	L. 400	5	3500	25
4300	34	300	4	L. 3600	25
4200	33	200	3	3700	26
4100	32	100	2	3800	27
L. 4000	32	L. 0	2	3900	28
3900	31	Aft. Christ		L. 4000	28
3800	30	100	—1	4100	29
3700	29	200	+0	4200	30
L. 3600	29	300	1	4300	31
3500	28	L. 400	1	L. 4400	31
3400	27	500	2	4500	32
3300	26	600	3	4600	33
L. 3200	26	700	4	4700	34
3100	25	L. 800	4	L. 4800	34
3000	24	900	5	4900	35
2900	23	1000	6	5000	36
L. 2800	23	1100	7	5100	37
2700	22	L. 1200	7	L. 5200	37
2600	21	1300	8	5300	38
2500	20	1400	9	5400	39
L. 2[illegible]00	20	1500	10	5500	40
2300	19	L. 1600	10	L. 5600	40
2200	18	1700	11	5700	41
2100	17	1800	12	5800	42
L. 2000	17	1900	13	5900	43

STYLE, in *Dialling*, denotes the gnomon or cock of a dial, raised on the plane thereof, to project a shadow.

STYLE, in *Jurisprudence*, the particular form or manner of proceeding in each court or jurisdiction, agreeable to the rules and orders established therein. Thus we say, the *style* of the court of Rome, of the court of chancery, of parliament, of the privy council.

STYLE, in *Grammar*, is a particular manner of delivering a man's thoughts in writing, agreeably to the rules of syntax; or, as F. Buffier more accurately defines it, the manner wherein the words, constructed according to the laws of syntax, are arranged among themselves, suitably to the genius of the language.

This definition fixes the notion of *style* to something determinate, which before was very vague and arbitrary; whence many authors, even of note, confounded it with syntax itself.

From the definition it appears, that *style* supposes or includes the syntax; and that syntax does not extend so far as *style*; for the syntax may be very just, where the *style* is wretched.

Indeed, against what particular rule of grammar the fault is committed, it is scarcely possible always to determine precisely; the taste and use of a language being so exceedingly delicate and precarious. It is true, a fault in *style* is not less a fault against grammar, than is a fault in *syntax*; only the former is less precise and palpable than the latter.

A very common error in grammarians, F. Buffier adds, is to confound two kinds of *styles* in one: the *grammatical style*, or that directed by the rules of grammar; and the *personal style*, which depends less on the grammar, than on the person that writes; whether with regard to his particular taste and genius, or with regard to his matter, or the kind or character of his work.

There are a great many differences between the two: the most essential is, that the one may be diversified an infinite number of ways, and the other cannot. In effect, the personal *style* is naturally variable, according to the different geniuses, humours, and complexions.

It is the imagination that acts, that conceives, that proposes, and that expresses things, according to its character, which is different in all men; and which is to be varied, according to the particular kind of the work.

Hence arise the gay, the grave, the florid, the jejune, the copious, the concise, the poetical, the epistolary, and the burlesque *styles*.

These personal *styles* are all independent on the grammatical; and we have authors who excel in the one, yet are miserably

miserably defective in the other. The personal *ſtyle* is not under the direction of grammar; but of the imagination, or rather of rhetoric, that art having to do directly with our thoughts, as grammar with our words.

This, however, may be said, that grammar is far from being able to vary the ſame words of a phraſe with equal perfection; and that generally there is but one way of delivering them in the taſte and genius of the language. But in the perſonal *ſtyle*, where the imagination comes to be concerned, a ſentence may be varied infinite ways, according to the kind of the writing, whether oratorial, poetical, &c.

In a *philoſophical ſtyle*, the only end is accurately to explain our thoughts to others; thence the particular rules to be obſerved by a philoſopher, in delivering his doctrines, naturally follow: ſuch as,

1°, Not to deviate from the received ſignifications of terms.

2°, That the ſame terms be always taken in the ſame ſenſe.

3°, To fix the meaning of ſuch words as have only a vague ſenſe.

4°, To ſignify objects, eſſentially different, by different names.

From theſe rules, the uſe and neceſſity of terms of art appear, and we ſee with how little reaſon they are vulgarly condemned.

5°. The philoſopher ought always to make uſe of proper expreſſions, and uſe no more words than what are preciſely neceſſary to eſtabliſh the truth of his doctrines. Wolf. Diſ. Præelim. Logic. cap. v.

STYLE, in *Muſic*, denotes a peculiar manner of compoſing, or ſinging.

The *ſtyle* is, properly, the manner that each perſon has, either of compoſing, of performing, or teaching; which is very different, both in reſpect of the different geniuſes of countries and nations, and of the different matters, places, times, ſubjects, expreſſions, &c.

Thus we ſay, the *ſtyle* of the Chariſſimi, of Lully, of Lambert; the *ſtyle* of the Italians, the French, the Spaniards, &c. The *ſtyle* of gay pieces of muſic is very different from that of ſerious pieces; the *ſtyle* of church muſic very different from theatrical muſic. The *ſtyle* of the Italian compoſitions is poignant, florid, expreſſive; that of the French compoſitions, natural, flowing, tender, &c.

Hence, the various epithets, given to diſtinguiſh theſe various characters, as, the ancient and modern *ſtyle*, the Italian and German *ſtyle*, the eccleſiaſtical and dramatic *ſtyle*, the gay, grave, majeſtic, natural, ſoft, familiar, gallant, low, ſublime *ſtyles*, &c.

STYLO *recitativo*, or *dramatico*, in the Italian *Muſic*, is a *ſtyle* fit to expreſs the paſſions.

STYLO *eccleſiaſtico* is full of majeſty, very grave, and fit to inſpire devotion.

STYLO *motectico* is a various, rich, florid *ſtyle*, capable of all kinds of ornaments; and, of conſequence, fit to expreſs various paſſions, particularly admiration, grief, &c.

STYLO *madrigaleſco* is a *ſtyle* proper for love, and the other ſofter paſſions.

STYLO *hyperchematico* is a *ſtyle* proper to excite mirth, joy, dancing, &c. and, of conſequence, full of briſk, gay motions.

STYLO *ſymphoniaco* is a *ſtyle* fit for inſtrumental muſic; but as each inſtrument has its particular effect, there are as many different ſymphoniacal *ſtyles*. The *ſtyle* of violins, for inſtance, is uſually gay; that of flutes, melancholy and languiſhing; and that of trumpets, ſprightly and animated.

STYLO *meliſmatico* is a natural, artleſs *ſtyle*, which almoſt any body may ſing.

STYLO *phantaſtico* is a free, eaſy, humorous manner of compoſition, far from all conſtraint, &c.

STYLO *choraico* is the *ſtyle* proper for dancing; and is divided into as many different kinds as there are dances.

STYLE, in *Oratory* and *Poetry*, is reſtrained wholly to what F. Buffier calls the *perſonal ſtyle*.

Language refers principally to the matter of the diſcourſe, viz. the words; elocution to the particular members or parts thereof; and *ſtyle* to the whole compoſition.

The maſters of the art of rhetoric reduce the kinds of *ſtyle* to three, viz. the *low* or *plain*, the *middle*, *temperate*, or *equable*, and the *lofty* or *ſublime ſtyle*. Theſe ſeveral characters are diſtinguiſhed from one another, both by the thoughts and by the language.

Low, or *ſimple* STYLE, pertains to ſubjects that are either common things, or to ſuch as ſhould be treated in a plain and familiar way: and, therefore, plain thoughts are moſt ſuitable to it, and diſtinguiſh it from the other characters of *ſtyle*. By plain thoughts are meant ſuch as are ſimple and obvious, and ſeem to riſe naturally from the ſubject, when duly conſidered; ſo that any one, upon firſt hearing them, would be apt to imagine, they muſt have occurred to himſelf.

Cicero's account of the fight between Milo and Clodius, in which Clodius was killed, is a remarkable inſtance of natural plainneſs and ſimplicity. Pro. Mil. c. 10.

There are two properties of plain thoughts, one of which ought conſtantly to attend them in common with all thoughts, and the other is often neceſſary to animate and enliven this character. The firſt of theſe is juſtneſs and propriety, which is what reaſon dictates in all caſes; and the other property, which ſhould often accompany plain and ſimple thoughts, is, that they be gay and ſprightly; becauſe, the fewer ornaments this *ſtyle* admits of, the greater ſpirit and vivacity are requiſite to prevent its being dry and jejune: care, however, ſhould be taken, leſt, while fancy is too much indulged, the juſtneſs of the thoughts ſhould be overlooked.

As to the language proper for the *low ſtyle*, it may be obſerved, in general, that the dreſs ought to be agreeable to the thoughts, plain, ſimple, and unaffected; elegance, or a proper choice of words and expreſſions, including both PURITY and PERSPICUITY, ſhould be an object of primary attention. Epithets ſhould be uſed ſparingly, becauſe they enlarge the images of things, and contribute very much to heighten the *ſtyle*. The compoſition in this kind of *ſtyle*, does not require the greateſt accuracy and exactneſs. A ſeeming negligence, as it appears more natural, is ſometimes a beauty. Short ſentences, or thoſe of a moderate length, are beſt ſuited to this character. Such a harmony of numbers, proportion of the ſeveral parts, and ſtudied cadency, as are evidently the effects of art, ſhould be avoided: and yet it is neceſſary to obſerve ſome proportions in the members, ſo that neither the ears be too much defrauded, nor the ſenſe obſcured. As to order, the plaineſt and cleareſt diſpoſition, both of the words and members of ſentences, and what is moſt agreeable to the natural conſtruction, beſt ſuits with this character, of which perſpicuity is one of the principal beauties: and a proper connection likewiſe of ſentences, with a regular order in the dependence of things one upon another, very much contributes to this end. As to dignity of language we may obſerve, that tropes ſhould be uſed cautiouſly. Verbal figures, which ſerve chiefly to enliven an expreſſion, and give an agreeable turn, are often not improper for this character: nor are figures of ſentences wholly to be excluded, eſpecially ſuch as are chiefly uſed in reaſoning or demonſtration. But thoſe which are more peculiarly adapted to touch the paſſions, or paint things in the ſtrongeſt colours, are the more proper ornaments of the higher *ſtyles*.

Upon the whole, pure nature, without any colouring or appearance of art, is the diſtinguiſhing mark of the *low ſtyle*; the deſign of which is to make things plain and intelligible, and ſet them in an eaſy light. And, therefore, the proper ſubjects of it are epiſtles, dialogues, philoſophical diſſertations, or any other diſcourſes, that ought to be treated in a plain and familiar manner, without much ornament, or addreſs to the paſſions. A freedom and eaſe both of thought and expreſſion, attended with an agreeable humour and pleaſantry, are its peculiar beauties that engage us: and as the *plain ſtyle* admits of fewer ornaments than the *florid*, and has little more to recommend it than its own native beauty and ſimplicity, the greater is the art neceſſary to render it agreeable and entertaining.

Middle or *equable ſtyle*, pertains to ſubjects that are of weight and importance, and which, therefore, require both a gravity and accuracy of expreſſion: and the diſtinguiſhing marks of this *ſtyle* are fine thoughts. A fine thought, as diſtinguiſhed from plain thoughts on the one hand, and lofty thoughts on the other, may deſerve that character from ſome or other of the following properties, viz. 1. Gravity and dignity, an inſtance of which occurs in Cicero's ſpeech to Cæſar (Pro Marcell. c. 8.) when he ſays, *It has been often told me, that you have frequently ſaid, you have lived long enough for yourſelf. I believe it, if you either lived, or was born, for yourſelf only.*

2. Beauty and elegance: this property is exemplified in the fine compliment, which Pliny pays to the emperor Trajan, when he ſays, *It has happened to you alone, that you was father of your country, before you was made ſo.* Paneg. c. 21.

3. Delicacy. A delicate thought is that which is not wholly diſcovered at once, but by degrees opening and unfolding itſelf to the mind, diſcloſes more than was at firſt perceived. To this property Quintilian (Inſt. Orat. lib. viii. c. 2.) ſeems to refer, when he ſays, thoſe things are grateful to the hearers, which when they apprehend, they are delighted with their own ſagacity; and pleaſe themſelves, as though they had not heard, but diſcovered them; of this kind is that of Pliny

Pliny (Paneg. c. 22.) speaking of Trajan's entry into Rome; *Some declared upon seeing you, they had lived long enough; others, that now they were more desirous to live.* 4. Novelty, which is applicable not only to things absolutely new, but to the same thought set in a different light, or applied to a different occasion. Thus Cicero (De Orat. lib. iii. c. 1.) says of Crassus: *Crassus always excelled every other person, but that day he excelled himself:* and also of Cæsar (Pro Marcell. c. 4.) *You had before conquered all other conquerors by your equity and clemency, but to day you have conquered yourself: you seem to have vanquished even victory herself, therefore you alone are truly invincible.*

As to the language proper for the *middle style*, it may be observed in general, that as the proper subjects of it are things of weight and importance, though not of that exalted nature as wholly to captivate the mind, and divert it from attending to the diction; so all the ornaments of speech and beauties of eloquence have place here. Elegance, consisting in the choice of single words, of those that are most full and expressive, and of proper epithets, and the most accurate composition in all the parts of it, have place here. Periods the most beautiful and harmonious, and of a due length, and wrought up with the most exact order, just cadency, easy and smooth connection of the words, and flowing numbers, are the genuine ornaments, which greatly contribute to form this character. But the principal distinction of *style* arises from tropes and figures. By these it is chiefly animated, and raised to its different degrees or characters, as it receives a less or greater number of them; and those either more mild, or more strong and powerful. As to tropes, those which afford the most lively and pleasing ideas, especially metaphors, suit the middle character. Virgil's Eclogues are written in the *low style*, agreeably to the language of shepherds, and his Georgics in the *middle style*, suited to the nature of the subject, and the greatest men in Rome, amusing themselves in rural affairs, who were the persons for whom they were designed. Accordingly, in the former (Eclog. v. ver. 37.) the following verse occurs:

Infelix lolium et steriles nascuntur avenæ:

In English:

Wild oats and darnel grow instead of corn.

In the latter (Georg. lib. i. ver. 154.) the same sentiment is thus expressed:

Infelix lolium et steriles dominantur avenæ.

n English:

Where corn is sown, darnel and oats command.

Upon which some critics have remarked, that where the same sense is intended, instead of the proper word *nascuntur, grew*, the author substitutes a metaphor, *dominantur, command.*

Figures, both of words and sentences, also belong to this *style*; which admits of the finest description, most lively images, and brightest figures, that serve either for delight, or to influence the passions, without transport or extacy, which is the property of the *sublime*. The most considerable embellishments, that form the *middle* or *florid style*, are descriptions, the prosopopeia, similitudes and comparisons, and the antithesis. These, and such like florid figures, are sometimes found in historians, but more frequently in orators; and indeed this *middle* character, in the whole of it, is best accommodated to the subjects of history and oratory. Cicero has excellently described this *style* in the following passage: *Est stylus quidam interjectus, intermedius, et quasi temperatus; nec acumine inferioris, nec fulmine utens superioris, vicinus amborum, in neutro excellens, utriusque particeps.* The same author calls it the *florid* and *polished style*; as in this all the graces and beauties of language are principally to be used.

Style, *sublime*, is that which is the most noble as well as the most difficult part of the province of an orator: and indeed, the noblest genius and greatest art are both requisite to form this character; because the justest propriety, joined with the greatest strength and highest elevation of thought, is required to complete the *true sublime.* Lofty and grand sentiments are the basis of this character of *style*; and, therefore, Longinus advises those who aspire at this excellence, to accustom themselves to think upon the noblest subjects. Lofty thoughts are principally those which relate either to divine objects, or to power, wisdom, courage, beneficence, and such other things as are of the highest esteem among mankind. Of the former sort is Cicero's declaration to Cæsar, in his intercession for Ligarius, when he says, *Men in nothing approach nearer to deity, than in giving life to men:* and an instance of the latter sort occurs on the same occasion, when he says, *Your fortune has given you nothing greater than a power, nor your nature than a will to save many.* Of the same kind is the reply of Porus the Indian king, when after his defeat by Alexander, being brought before him, and asked how he expected to be treated, he answered, *Like a king:* or that of Cæsar chiding the pilot, who was afraid to set out with him in a storm, *Quid times? Cæsarem vehis.* It is proper to remark, that the *true sublime* is consistent with the greatest plainness and simplicity of expression: and generally speaking, the more plain and natural the images appear, the more they surprise us. Of this kind is the expression of Cæsar, upon his victory over Pharnaces, *I came, I saw, I conquered.* But there cannot be a greater or more beautiful example of this, than what Longinus has taken notice of from Moses: *The legislator of the Jews,* says he (sect. 9.) *no ordinary person, having a just notion of the power and majesty of the Deity, has expressed it in the beginning of his laws in the following words: And God said: What? Let there be light, and there was light. Let the earth be made, and it was made.* The image of a thing is sometimes much heightened, when it is expressed in so undetermined a manner, as to leave the mind in suspense what bounds to fix to the thought. An instance of this kind occurs in Milton's description of the fall of Satan. Parad. Lost, book ii.

——— *And to this hour*
Down had been falling.

As to the language proper for the *sublime style*, elegance, composition, and dignity, which comprehend all the properties of *style*, are to be particularly regarded. With respect to elegance, those words and expressions chiefly contribute to form the *sublime*, which are most sonorous, and have the greatest splendor, force, and dignity; and they are principally long words, which are preferable to short ones, and especially monosyllables; compound words rather than simple ones; and also epithets, the use of which contributes in a particular manner to this character. The force of composition is so great, as Longinus observes, (sect. 39.) that sometimes it creates a kind of *sublime*, where the thoughts themselves are but mean, and gives a certain appearance of grandeur to that which otherwise would seem but common. Sublimity arises from the several parts of a period so connected, as to give force as well as beauty to the whole. The periods, therefore, in this character of *style*, should be of a proper length; neither too short, so as to lose their just weight and grandeur; nor too prolix, so as to lose their force by becoming heavy and unwieldy. And more especially, nothing should be admitted that is superfluous, which very much enervates the force of a sentence. Besides, the order and disposition of the several words and members of a sentence should be regarded; as the different placing of one or two words will sometimes wholly destroy the grandeur of a sentence, and make it extremely flat. Another thing to be attended to in composition, is the connection of words, with regard to the sound; that the pronunciation, in passing from one to another, may be most agreeable to the ear, and best suited to the nature of the subject. Soft and languid sounds are very unsuitable to this character: and, in this respect, therefore, our tongue, by its multitude of consonants, is more suited for sublime discourses, than some other modern languages, which abound with vowels. The dignity of *style* depends on the proper use of tropes and figures, which, when they are lively and strong, give a force and energy to a discourse, on which its sublimity depends. Metaphors are peculiarly suited to raise and animate the *style*: and as to figures, whether verbal, or those which consist in the sense, the nature of this character will easily direct to such as are most proper. The chief figures that seem best suited for this purpose are description, enumeration, similitude, antithesis, and apostrophe. The *sublime style* is proper for laudatory discourses or panegyric; but the sublimity should appear rather from the elevation of the thought, attended with a simplicity of expression, than from the ornaments and dress of the language. Though, upon the whole, grandeur and majesty of expression constitute the proper marks of this character, with relation to the language, as beauty and splendor are of the *middle style*. Ward's Orat. vol. ii. lect. 35—39.

Of the five sources of the *sublime* assigned by Longinus, viz. boldness or grandeur in the thoughts, the pathetic, the proper application of figures, the use of tropes, and beautiful expressions, and a musical structure and arrangement of words; the two first are only allowed by a late excellent writer to have any relation to the *sublime*; the other three having no more relation to the *sublime* than to other kinds of good writing; perhaps less to this than to any other species whatever; because it requires less the assistance of ornament. The foundation, he observes, of the *sublime* in composition, must be always laid in

in the nature of the object described, which should be such, as if exhibited to us in reality, would raise ideas of that elevating, awful, and magnificent kind, which we call *sublime*. And, besides, it must be set before us in such a light as is most proper to give us a clear and full impression of it: it must be described with strength, with conciseness and simplicity. As for what is called the *sublime style*, it is, says this writer, for the most part, a very bad one; and has no relation whatever to the real *sublime*. Persons are apt to imagine, that magnificent words, accumulated epithets, and a certain swelling kind of expression, by rising above what is usual or vulgar, contributes to, or even forms the *sublime*. Nothing, he says, can be more false. In general, in all good writing, the *sublime* lies in the thought, not in the words; and when the thought is truly noble, it will, for the most part, clothe itself in a native dignity of language. The *sublime*, indeed, rejects mean, low, or trivial expressions; but it is equally an enemy to such as are turgid. The main secret of being *sublime* is to say great things in few and plain words: and it will be found to hold, without exception, that the most *sublime* authors are the simplest in their *style*.

The faults opposite to the *sublime* are chiefly two; the *frigid* and the *bombast*. The *frigid* consists in degrading an object, or sentiment, which is *sublime* in itself, by our mean conception of it; or by our weak, low, and childish description of it. The *bombast* lies in forcing an ordinary or trivial object out of its rank, and endeavouring to raise it into the *sublime*; or in attempting to exalt a sublime object beyond all natural and reasonable bounds. This is also called *fustian* or *rant*. Shakspeare is not unexceptionable in this respect. Dryden and Lee in their tragedies abound with it. Blair's Lectures on Rhetoric, vol. i. lect. 4.

Dr. Campbell, in his Philosophy of Rhetoric, vol. ii. p. 4. observes, that, besides purity, which is a quality entirely grammatical, the five simple and original qualities of *style*, considered as an object to the understanding, the imagination, the passions, and the ear, are perspicuity, vivacity, depending on the choice of words, their number, and their arrangement, elegance, which constitutes dignity of manner, animation, and music.

All the qualities of a good *style*, says Dr. Blair, may be ranged under the two heads of perspicuity and ornament. For all that can be required of language is, to convey our ideas clearly to the minds of others, and, at the same time, in such a dress, as by pleasing and interesting them, shall most effectually strengthen the impressions we endeavour to make.

PERSPICUITY, considered with respect to words or phrases, requires, according to this writer, these three qualities, PURITY, PROPRIETY, and PRECISION. The former is the use of such words, and such constructions, as belong to the idiom of the language which we speak; in opposition to words or phrases that are imported from other languages, or that are obsolete, or new coined, or used without proper authority. Propriety is the selection of such words in the language, as the best and most established usage has appropriated to those ideas which we intend to express by them. And as the words which a man uses to express his ideas, may be faulty in three respects; not expressing the idea which the author intends, but some other which resembles it; or expressing that idea incompletely; or again expressing it, together with something more than he intends; precision is opposed to all these three faults, but chiefly to the last. The proper opposite to precision is a *loose* STYLE. In the construction of sentences, according to this writer, the most essential properties are clearness and precision, unity, strength, and harmony. The first is opposed to ambiguity in the arrangement of words in a sentence; and is to be attained by observing exactly the rules of grammar, as far as these can guide us, and by placing the words, or members most nearly related, as near to each other as possible; so as to make their mutual relation clearly appear; particularly, that adverbs may always be made to adhere closely to the words which they are intended to qualify; that, where a circumstance is thrown in, it may be determined by its place to one or other member of it; and that every relative word which is used, may instantly present its antecedent to the mind of the reader without the least obscurity. In order to preserve the unity of a sentence, the scene, during the course of the sentence, should be changed as little as possible; things, which have so little connection, that they could admit of being divided into two or three sentences, should never be crowded into one sentence; all parentheses in the middle of sentences should be avoided, and the sentence should be always brought to a full and perfect close. The strength of a sentence, is such a disposition of the several words and members, as shall bring out the sense to the best advantage; as shall render the impression, which the period is designed to make, most full and complete, and give every word and every member its due weight and force. For this purpose, care should be taken to prune the sentence of all redundant words and members; particular attention should be had to the use of copulatives, relatives, and all the particles employed in transition and connection; the capital word or words should be disposed of in that place of the sentence, where they will make the fullest impression; the members of sentences ought to go on rising and growing in their importance above one another, so as to form a CLIMAX; the conclusion should seldom consist of an adverb, preposition, or any inconsiderable word; and in the members of a sentence, where two things are compared or contrasted to one another, where either a resemblance or an opposition is intended to be expressed, some resemblance in the language and construction should be preserved.

In the harmony of periods, we may consider agreeable sound, or modulation in general, without any particular expression, and the sound so ordered, as to become expressive of the sense. The first depends on the choice of words, and the arrangement of them, with respect to which no writer equals Cicero, who was fond, perhaps to an excess, of the *plena ac numerosa oratio*.

There are two things on which the music of a sentence chiefly depends, viz. the proper distribution of the several members of it, and the close or cadence of the whole, which should be so contrived, that the sound should be made to grow to the last; the longest members of the period, and the fullest and most sonorous words being reserved for the conclusion. This rule, however, ought to be observed with restriction; for all unmeaning words, introduced merely to round the period, or fill up the melody, *complementa numerorum*, as Cicero calls them, are great blemishes in writing. Of sound adapted to the sense there are two degrees, viz. the current of sound, adapted to the tenor of a discourse, and a particular resemblance effected between some object, and the sounds that are employed in describing it.

The second quality of *style* is ornament, which arises partly from a graceful, strong, or melodious construction of words, and partly also from figurative language, which is prompted either by the imagination or the passions. Figures contribute to the beauty and grace of *style*, by enriching the language and rendering it more copious; by bestowing dignity upon *style*; by giving us the pleasure of enjoying two objects presented together to our view without confusion; the principal idea, which is the subject of the discourse, along with its accessory, which gives it the figurative dress; and by giving us frequently a much clearer and more striking view of the principal object, than we could have if it were expressed in simple terms, and divested of its accessory idea. See FIGURE, TROPE, METAPHOR, &c.

With respect to the use of figures, Dr. Blair observes, that neither all the beauties, nor even the chief beauties of composition, depend upon tropes and figures; that, in order to their being beautiful, they must always arise naturally from the subject; that they must not be employed too frequently; and that, without a genius for figurative language, none should attempt it.

This writer considers the various kinds of *style*; the first and most obvious distinction is that which arises from an author's spreading out his thoughts more or less; and which forms what are called the *diffuse* and the *concise styles*. Each of these has its advantages, and each becomes faulty when carried to the extreme. Discourses that are to be spoken require a more copious *style* than books that are to be read. Of conciseness, the two most remarkable examples are Tacitus, and Montesquieu in l'Esprit de Loix. Of a beautiful and magnificent diffuseness, Cicero is the most illustrious instance: Addison also, and Sir William Temple, belong to this class.

The *nervous* and the *feeble* are generally held to be characters of *style*, of the same import with the concise and diffuse. They often coincide, insomuch that diffuse writers have generally some degree of feebleness, and nervous writers will generally be inclined to a concise expression. However, there are instances of writers, who, in the midst of a full and ample *style*, have maintained a great degree of strength. Livy is an example; and in the English language Dr. Barrow. One of the most complete models of a *nervous style* is Demosthenes in his Orations.

The restoration of king Charles II. seems to be the æra of the formation of our present *style* in Great Britain. Lord Clarendon began; Sir William Temple polished the language still more; and the author who formed it more than any one into its present state, is Dryden. Since his time, considerable attention has been paid to

purity and elegance of *ſtyle*; but it is elegance, rather than ſtrength, that forms the diſtinguiſhing quality of moſt of the good Engliſh writers.

Style, with regard to the degree of ornament employed to *beautify* it, ſeems to riſe in the following gradation, viz. a dry, plain, neat, elegant, and flowery manner. The *dry* manner excludes ornament of every kind; and content with being underſtood, it has not the leaſt aim to pleaſe either the fancy or the ear: Ariſtotle is a thorough example of a *dry ſtyle*. A *plain ſtyle* riſes one degree above a dry one. A writer of this character gives us his meaning, in good language, diſtinct and pure, but ſeeks no farther ornament; either, becauſe he thinks it unneceſſary to his ſubject; or becauſe his genius does not lead him to delight in it, or becauſe it leads him to deſpiſe it. Dean Swift is placed at the head of thoſe that have employed the *plain ſtyle*: and among our philoſophical writers, Mr. Locke comes under this claſs. The *neat ſtyle* makes uſe of ornament, but that not of the higheſt or moſt ſparkling kind. The attention of a writer of this character is ſhewn in the choice of his words, and in a graceful collocation of them, rather than in any high efforts of imagination or eloquence. A familiar letter, or a law paper on the drieſt ſubject, may be written with neatneſs; and a ſermon, or a philoſophical treatiſe, in a *neat ſtyle*, will be read with pleaſure. An *elegant ſtyle* expreſſes a higher degree of ornament than a neat one; and is, indeed, the term uſually applied to *ſtyle* when poſſeſſing all the virtues of ornament, without any of its exceſſes or defects. To this claſs we may refer Addiſon, Dryden, Pope, Temple, Bolingbroke, Atterbury, and a few more.

When the ornaments applied to *ſtyle*, are too rich and guaudy in proportion to the ſubject; when they return upon us too faſt, and ſtrike us either with a dazzling luſtre, or a falſe brilliancy; this forms what is called a *florid ſtyle*: a term commonly uſed to ſignify the exceſs of ornament. It is not only pardonable, but even a promiſing ſymptom in young people, that their *ſtyle* ſhould incline to the florid and luxuriant, but it is not entitled to the ſame indulgence from writers of maturer years. Without a foundation of good ſenſe and ſolid thought, the moſt *florid ſtyle* is but a childiſh impoſition on the public.

Among the characters of *ſtyle* we may reckon that of ſimplicity, or a *natural ſtyle*, as diſtinguiſhed from affectation. Simplicity, with reſpect to *ſtyle*, ſtands oppoſed to too much ornament or pomp of language, and in this ſenſe the *ſimple ſtyle* coincides with the *plain* or *neat ſtyle*. Simplicity, as it regards *ſtyle*, may alſo denote the eaſy and natural manner in which our language expreſſes our thoughts, and ſtands oppoſed to affectation of ornament, or appearance of labour about our *ſtyle*; and this is a diſtinguiſhing excellence in writing. Of this ſimplicity Homer, Heſiod, Anacreon, Theocritus, Herodotus, and Xenophon, among the Greeks; Terence, Lucretius, Phædrus, and Cæſar, among the Romans; and Tillotſon, Sir William Temple, and Addiſon, among Engliſh writers, are diſtinguiſhed models.

Dr. Blair mentions another character of *ſtyle*, which he diſtinguiſhes by the name of the *vehement*; which always implies ſtrength, and is not by any means inconſiſtent with ſimplicity; but in its predominant character is diſtinguiſhable from either the ſtrong or the ſimple manner. It has a peculiar ardour, it is a glowing *ſtyle*; the language of a man whoſe imagination and paſſions are heated, and ſtrongly affected by what he writes; who is therefore negligent of leſſer graces, but pours himſelf forth with the rapidity and fulneſs of a torrent. This belongs to the higher kinds of oratory; and, indeed, is rather expected from a man who is ſpeaking than from one who is writing in his cloſet. The orations of Demoſthenes furniſh the full and perfect example of this ſpecies of *ſtyle*. Among Engliſh writers, lord Bolingbroke has moſt of this character, though mixed indeed with ſeveral defects. Blair's Lectures on Rhetoric, &c. vol. i. paſſim.

As to the choice of *ſtyle*, in the general, the nature of the ſubject is to determine it. Such *ſtyle*, ſays Cicero, is to be choſen, as expreſſes great things magnificently, middle things moderately, and low things ſubtilely or acutely: but more particularly, as theſe are three branches of the duty of an orator, to teach, to delight, and to move; the ſimple *ſtyle* is uſed to teach, the middle to delight, and the ſublime to move.

Again, the ſimple or low *ſtyle* is fit for comedy; the ſublime for tragedy; and the middle for hiſtory. Cæſar, it is true, rather uſed the ſimple than the intermediate *ſtyle*, but then he wrote commentaries, not an hiſtory, as is obſerved by Tully.

Again, the ſimple *ſtyle* is fit for bucolics and eclogues; the intermediate *ſtyle* for georgics; and the ſublime for epics: which triple difference we eaſily diſcover in Virgil, though he ſometimes mixes them all in the Æneid itſelf, uſing the ſimple *ſtyle* in the fifth book, where he deſcribes games, and the intermediate in the beginning of the poem. Care is ſtill to be taken, that the *ſtyle* be not flat and dull on pretence of being ſimple.

M. Boileau obſerves, that in all languages a mean thought, expreſſed in noble terms, is better liked than the nobleſt thought expreſſed in mean terms: the reaſon he gives is, that every body cannot judge of the force and juſtneſs of a thought: but ſcarce any but perceives the meanneſs of words. The latter we find by our ſenſes, the former only by our reaſon.

It is neither eaſy nor neceſſary, ſays Dr. Blair, to determine what is preciſely the beſt *ſtyle*. Some general qualities, indeed, there are of ſuch importance, as ſhould always in every kind of compoſition be kept in view; and ſome defects we ſhould always ſtudy to avoid. An oſtentatious, a feeble, a harſh, and an obſcure *ſtyle*, for inſtance, are always faults; and perſpicuity, ſtrength, neatneſs, and ſimplicity, are beauties to be always aimed at. But as to the mixture of all, or the degree of predominancy of any one of theſe good qualities, for forming one peculiar diſtinguiſhing manner, no preciſe rules can be given; nor is it eaſy to point out any one model as abſolutely perfect. Dr. Blair propoſes the following directions concerning the proper method of attaining a good *ſtyle* in general; leaving the particular character of that *ſtyle* to be either formed by the ſubject on which we write, or prompted by the bent of genius. For this purpoſe, we ſhould ſtudy clear ideas on the ſubject concerning which we are to write or ſpeak; the frequent practice of compoſing with attention and care is indiſpenſibly neceſſary: we ought to render ourſelves well acquainted with the *ſtyle* of the beſt authors, and yet, at the ſame time, be cautious in avoiding a ſervile imitation of any one author whatever: we ſhould always ſtudy to adapt our *ſtyle* to the ſubject, and alſo to the capacity of our hearers, if we are to ſpeak in public: and it ſhould be remembered, that attention to *ſtyle* ought not to engroſs us ſo much, as to detract from a higher degree of attention to the thoughts. *Curam verborum*, ſays the great Roman critic, *rerum volo eſſe ſolicitudinem*. Lect. on Rhet. lect. xix.

The chief faults in *ſtyle* are, its being *tumid* and *ſwollen*, or *cold* and *puerile*, or *ſtiff*, or *looſe*, or *dry* and *jejune*.

STYLE, *a tumid*, is that immoderately ſtuffed with big words and ſentences; ſuch are thoſe verſes of the emperor Nero, ridiculed by Perſius:

> *Torva mimalloneis implerunt cornua bombis,*
> *Et raptum vitulo caput ablatura ſuperbo*
> *Baſſaris, & lyncem mænas flexura corymbis,* &c.

STYLE, *frigid*, or *puerile*, is that which affects certain trifling ornaments, inſipid jeſts, remote and ſtrained alluſions, redundant deſcriptions, &c. Such, e. gr. as a Centaur's riding himſelf; more golden than gold, &c. Of this vice, that paſſage of Virgil ſeems guilty.

> *Num capti potuere capi? Num incenſa cremavit*
> *Troja viros?*

In the *puerile ſtyle*, the writer runs on in a ſpecious verboſity, amuſing his reader with ſynonymous terms and identical propoſitions, well-turned periods, and highſounding words; but, at the ſame time, uſing thoſe words ſo indifferently, that the latter can either affix no meaning to them at all, or may almoſt affix any meaning to them he pleaſes. See *Sublime* STYLE *ſupra*.

STYLE, *looſe*, is that, which, wanting articles, numbers, &c. fluctuates here and there, not connected or joined together: or, a *looſe ſtyle*, in oppoſition to preciſion, generally ariſes from a ſuperfluity of words; and the great ſource of it is the injudicious uſe of ſynonymous words. This is a fault ſo frequent, eſpecially in young writers, that it is needleſs to give inſtances of it.

STYLE, *dry*, *jejune*, is that which is deſtitute of ornament, ſpirit, &c. The ancients made a notable diſtinction of *ſtyles* into *Laconic* and *Aſiatic*.

STYLE, *Aſiatic*, is that which is very florid, diffuſive, and prolix; or where abundance of words are uſed to expreſs a little matter: thus called by the Greeks from the people of Aſia, who affected ſuch redundancies, in oppoſition to the

STYLE, *Laconic*, which is diſtinguiſhed by its exceeding conciſeneſs; and by comprehending much matter under a few words.

Such, e. gr. is that anſwer returned by the Lacedæmonians, to a long epiſtle of an enemy, threatening to deſtroy them with fire and ſword; *ει*, *ſi*, *if*; that is, do *if* you can: or, that returned by the ſame people to king Philip, demanding ſome extravagant thing of them, ου, *non*, *no*. Or that of Cleomenes, the Spartan general, to

the

the ambassador of Samos; "As to what you have said, "the first part I do not remember; the middle I do not "understand; the last I do not approve." Or that epistle of Archidamus to the Elei, who were preparing war against him. Archidamus to the Eleans: "It is "good to be quiet." Or that of Cæsar to the Roman senate, after his conquering Pharnaces, king of Pontus: *Veni, vidi, vici, I came, I saw, I conquered.*

STYLE *of dialogues.* See DIALOGUE, and *Low* STYLE, *supra.*

STYLE, *epistolary.* See EPISTOLARY.

STYLE, *historical*, is of a middle nature between that of a poet and an orator, differing from both not only in the ornamental parts, but likewise in the common idioms and forms of expression. As HISTORY is a narrative of such facts, as are fit to be transmitted to posterity, for the use of mankind, and the better conduct of human life, the first law in writing it is, as Cicero observes (De Orat. lib. ii. c. 15.) not to dare to say any thing that is false; and the next not to be afraid to speak the truth: that on the one hand there be no suspicion of affection, nor of prejudice on the other. The superstructure on these foundations consists partly in things, and partly in the *style* or language. The former require an order of times, and description of places: and because in great and memorable events, we are desirous to know first their causes, then the actions themselves, and lastly their consequences; the historian should take notice of the springs or motives that occasioned them; and in mentioning the facts themselves, should not only relate what was done or said, but likewise in what manner; and in treating upon their consequences, shew if they were the effects of chance, wisdom, or imprudence. Nor should he only write the actions of great and eminent persons, but likewise describe their characters. As to the *style*, he says, (De Clar. Orat. c. 75.) that nothing is more agreeable in history, than brevity of expression, joined with purity and perspicuity. And he adds, in the place above cited, that it ought to be fluent, smooth, and even free from that harshness and poignancy, which are usual at the bar.

Dionysius (Epist. ad Cn. Pomp.) makes decency a principal virtue in an historian; which he explains by saying, that he ought to preserve the characters of the persons, and dignity of the actions of which he treats: and, therefore, an *historical style* should be animated with a considerable degree of life and vigour.

Painting and imagery form no small part of the historian's province, though his colours are not so strong and glittering as those of the poet or orator. He ought, therefore, to be well acquainted with the manners of men, and the nature of the passions, both of which he is often obliged to describe: in the former of which Herodotus excels, and Thucydides in the latter, as Dionysius has observed. From these several requisites, an *historical style* seems, upon the whole, to agree best with the middle character.

As to composition, which respects the structure of sentences, and the several parts of them, Demetrius (De Interpret.) remarks, that an historical period ought neither to rise very high, nor sink very low, but to preserve a medium; i. e. these periods should neither be so full and sonorous, as are frequent in oratory, nor yet so short and flat, as in dialogue. This simplicity, he says, becomes the gravity and credit of history, and distinguishes it from oratory on the one hand, and dialogue on the other.

The periods best suited for history are those which, being of a moderate length, will admit of a just rise and cadency, and may be pronounced with ease. The harmony of periods arising from such a position of the words as renders the sound pleasant and agreeable, ought also to be regarded in history. And as to dignity, which respects the use of tropes and figures, Dionysius says, that history should be embellished with such figures as are neither vehement, nor carry in them the appearance of art. This observation coincides with that of Cicero (De Orat. lib. ii. c. 14.) in comparing Xenophon and Callisthenes, two Greek historians.

Historical style, however, admits of considerable varieties from the different nature and dignity of the subject. The lives of particular persons do not require that strength and majesty of expression, nor all those ornaments of language, which suit an history of the Roman empire: and, accordingly we find, the *style* of Nepos and Suetonius very different from that of Livy: the former being smooth and easy, scarce rising above the low character, and the latter often approaching near to the sublime. And other historians have observed a medium between these. Ward's Orat. vol. ii. lect. 45.

STYLE, *lapidary* and *marotic.* See the adjectives.

STYLE *of an orator*, consists of the low, middle, and sublime characters, as they are applied by him in the different parts of his province. The orator has three things in view, viz. to prove what he asserts, to represent it in an agreeable light, and to move the passions: and each of these parts of his province require a different *style.* The *low style* is most proper for proof and information: the *middle style* is most suited for pleasure and entertainment; because it consists of smooth and well-turned periods, harmonious numbers, with florid and bright figures. But the *sublime* is necessary, in order to sway and influence the passions. Here the orator calls in all the assistance both of nature and art: the most raised and lofty thoughts, clothed with the brightest and strongest colouring, enter into this character.

The INTRODUCTION scarce rises above the *middle style*; and if it carry in it an air of pleasantry and good humour, it is generally the more apt to engage the attention.

The qualities of a good NARRATION, are clearness, brevity, and probability. The first arises from the choice of proper words, and such tropes as have been rendered most familiar by use; brevity requires moderate periods, whose parts are but little transposed: and a plain and simple dress, without ornament or colouring, is best suited to represent things probable: all which are the properties of the *low style.* In the PROPOSITION there can be no room for ornament. In the cool reasoning and debate of CONFIRMATION, the *low style* is certainly the most proper: but as the orator's method of reasoning often differs very much from that of the philosopher, and he endeavours not only to convince the judgment, but to affect the passions in a great variety of ways; his *style* is very different, according to the nature and circumstances of the cause. The *style* of CONFUTATION is much the same with that of confirmation.

In that part of the CONCLUSION, called RECAPITULATION, the language ought to be forcible and strong, rather than florid, because brevity and conciseness are necessary qualities. But in the other branch of the conclusion, which is an address to the PASSIONS, all the springs of eloquence, says Quintilian (Inst. Orat. lib. vi. cap. 1.) are to be opened. Now we are past the rocks and shallows, all the sails may be hoisted, and as the greatest part of the conclusion consists in illustration, the most pompous language and strongest figures have place here. Regard, however, must be had in every part of a discourse to the nature of the subject, the time, place, and persons, and other circumstances, by all which the *style* is to be regulated. Ward's Orat. vol. ii. sect. 46. See STYLE, *supra.*

STYLES *of hunting.* See HUNTING.

STYLET, STYLETTO, a small dangerous kind of poniard, which may be concealed in the hand; chiefly used in treacherous assassinations.

The blade is usually triangular, and so slender, that the wound it makes is almost imperceptible. The *styletto* is strictly prohibited in all well disciplined states.

STYLITES, *στυλιτης, sancti columnares*, or *pillar saints*, in *Ecclesiastical History*, an appellation given to a kind of solitaries, who stood motionless upon the tops of pillars, raised for this exercise of their patience, and remained there for several years, amidst the admiration and applause of the stupid populace.

Of these we find several mentioned in ancient writers, and even as low as the twelfth century, when they were totally suppressed.

The founder of the order was St. Simeon *Stylites*, a famous anachoret in the fifth century, who first took up his abode on a column six cubits high; then on a second of twelve cubits, a third of twenty-two, a fourth of thirty-six, and on another of forty cubits, where he thus passed thirty-seven years of his life.

The extremities of these columns were only three feet in diameter, with a kind of rail or ledge about, that reached almost to the girdle, somewhat resembling a pulpit. There was no lying down in it. The faquirs, or devout people of the East, imitate this extraordinary kind of life to this day.

STYLOBATON, or STYLOBATA, in *Architecture*, the same with the PEDESTAL of a column. It is sometimes taken for the trunk of the pedestal, between the cornice and the base, and then called *truncus.* It is also called by the name of *abacus.*

STYLOCERATOIDES, in *Anatomy*, a name given by Riolanus, and some others, to a muscle, more generally known by the name of STYLOHYOIDÆUS.

STYLOIDES, in *Anatomy*, an apophysis of the os petrosum, thus called from its resembling a style, or stylet. See *Tab. Anat. (Osteol.) fig.* 13. *lit. r.*

STYLOGLOSSI, in *Anatomy*, a pair of muscles, running off sharp and fleshy from the processus styloides, whence descending obliquely forwards, they are inserted into the

the root of the tongue, and form two portions of its lateral parts.

When either of the *stylo-glossi* acts, it turns the tongue toward the cheek, and forces the aliment between the upper and lower molares. When they act jointly with the lateral portions of the superior fleshy plane of the tongue, they turn the tongue obliquely upward to the teeth of the upper jaw, and near the cheeks, as when we bring down any part of the food that may have stuck there after mastication. When they act jointly with the lateral portions of the HYO-GLOSSI, they turn the tongue downward between the lower teeth and the cheek. Winslow.

STYLOHYOIDÆUS, in *Anatomy*, a small fleshy muscle, lying obliquely between the apophysis styloides, and os hyoides.

It is fixed laterally by one extremity to the root, or basis of the apophysis styloides, and by the other to the os hyoides, at the place where the basis and cornu unite, and likewise to the cornu itself, from whence it has been called *stylo-cerato-hyoidæus*. The fleshy fibres of this extremity are often parted, and enclose the middle tendon of the digastricus.

This muscle moves the os hyoides upward and backward in a middle direction, between those in which they lie; and they draw it more upward and backward when they act freely. When one acts more than the other, the bone is moved obliquely. Winslow.

STYLOHYOIDÆUS *novus*, a name given by Sanforini to a small muscle of the os hyoides, called by Albinus *stylohyoidæus alter*, and by Douglas *stylochondrohyoidæus*.

STYLOPHARYNGÆI, in *Anatomy*, a pair of muscles arising round and fleshy from the apophysis, or epiphysis styloides, and which in their oblique descent along the lateral part of the pharynx, cover and cross the other muscles. They extend gradually in breadth as they descend, and each forms two principal portions, one superior, which is narrow, and one inferior, which is broad. The narrow portion is spread among the muscular fibres above the thyroide cartilage, and the broad portion is inserted in the side of that cartilage; and thus the *stylopharyngæus* is partly a true *stylo-thyroidæus*. They serve to draw the pharynx laterally upward; but the use commonly assigned to them of dilating the pharynx seems conformable neither to their situation nor direction. Winslow.

STYMMATA, formed of στυφω, *I thicken*, a word used by some authors to express the stiff ointments. The ancients used the word both for the more solid and stiff ointments, and for the ingredients which gave those ointments that consistence: they also called by the same name the several sweet ingredients which they put into their ointments, to give them a fragrancy, and preserve them from corruption; such were the powders of spikenard, mint, amomum, and the several spices.

STYMPHALIA, στυμφαλια, in *Antiquity*, a festival at Stymphalus in Arcadia, in honour of Diana, called from that place *Stymphalia*.

STYMPHALIDES *aves*, in *Fabulous Antiquity*, birds of an extraordinary size, which, in their flight, are said to obscure the sun. They fed only on human flesh; but Hercules, by the help of Minerva, drove them out of Arcadia by the noise of cymbals.

STYPTIC, στυπτικον, formed of στυφω, *adstringo*, in *Medicine*, *astringent*; a remedy that has the virtue of stopping blood, or of binding up the aperture of a wounded vessel.

The service, nettle, Solomon's seal, &c. are *styptics*. There are various *styptic* waters, and powders of great efficacy, in most of which vitriol is the principal ingredient.

The usual *styptic* water is made of colcothar calcined, or vitriol dissolved with burnt alum, sugar-candy, the urine of a young man, &c.

Dr. Colbatch's *styptic* powder has been famed; though Mr. Cowper, in the Philosophical Transactions, gives us a number of instances, wherein it was applied with very little or ill success in human subjects; but he gives us others made in dogs, where it answered well.

M. Tournefort observes, from the analysis he has made of *styptic* and astringent plants, that acids and earths always prevail therein; though some of them yield an urinous spirit. On this principle he asserts, that their salt is analogous to alum, and that there is somewhat of sal ammoniac in their texture. But Chomel notes, that this does not hold universally.

STYPTIC *powder of Helvetius*, in *Pharmacy*, a composition of alum and dragon's blood. In the Edinburgh Dispensatory, two parts of alum are directed to be made into powder with one of the dragon's blood: others use equal parts of both. See Med. Ess. Edinb. vol. iv. art 7.

This medicine is said to be extremely serviceable in uterine hæmorrhages, either to correct the too frequent return of the menses, or their too great abundance; also to stop the flooding, to which women with child are subject, and to moderate the flow of the lochia. It has also been found to have surprising good effects in the fluor albus.

In violent bleedings it may be given in the quantity of half a dram every half hour, and it seldom fails of stopping the bleeding before the quantity of three drams, or half an ounce, has been taken.

Heister also, in his Compendium Medicinæ Practicæ, p. 143, recommends this powder, or alum alone, with a decoction of linseed, from Helvetius's Traité des Pertes de Sang.

STYPTIC, *Eaton's*, a medicine famous for curing fresh wounds in a very small time, and immediately stopping their bleeding.

The method of curing fresh wounds in a few days without suppuration, where neither nerves, large vessels, bones, nor any of the viscera are concerned, has been a practice long ago used.

The French were a long time very fond of a *styptic* ball, made of the filings of iron and tartar, mixed to a consistence with French brandy, which was afterwards published by Helvetius, and from him has been generally known by the name of Helvetius's *styptic*. This was extolled with us as one of the greatest medicines in the world for the cure of wounds, bruises, and external injuries of all sorts; but the author never said so much about it; he only modestly introduced it into the world as an useful thing for a first dressing of fresh wounds with people who lived too far off for the immediate assistance of a surgeon; and he mentions several cases in which it ought not to be used. In fine, he published it as a good medicine under proper restrictions; but we made it an universal one. The only universal remedy of this kind, that we have had recommended by the author as such, is the famous *styptic* of Dr. Eaton, which the inventor says is good to stop all manner of bleeding both without and within, without any manner of exception.

Sir Richard Blackmore, soon after the publication of this great secret, wrote a treatise on consumptions, in which he highly extols this *styptic* of Dr. Eaton, declaring positively, that it will be of more service to the world than all the discoveries that had been made before it. On this Dr. Sprengel, who had before examined Eaton's *styptic*, and judged it to be no other than that of Helvetius; which, after having been tried and discarded in France, Germany, and Holland, had been set on foot as an universal medicine here, thought it worthy a more strict and public examination, and ordering an apothecary of credit to prepare some of Helvetius's *styptic* in the common way, he produced, before a judicious audience, a bottle of that, and another of *Eaton's styptic*; and giving them both the same trial, they both answered in the same manner, and proved, beyond all possibility of doubt, that they were in effect the same medicine.

Upon the whole, the virtues of these *styptics* externally are too trifling to be trusted to, and internally too precarious to meddle with, without the greatest caution. Philos. Trans. Nº 383, p. 110.

STYRAX, στυραξ, in *Botany*. See STORAX.

STYX, in *Mythology*, a river of HELL, or ADES, over which was the passage called the hateful passage, from the previous region or suburbs of the realms of death into EREBUS.

It is represented as a torrent, pouring down a precipice, and then as rolling on, to take its course along the boundaries of Ades. On the hither side, the ghosts or souls of the departed are waiting in a croud, as Virgil (Æn. vi. ver. 306.) has described them; and Erebus commences with the bank on the other side the river. The sole governor of this part, and director of the passage, is Charon, whose dominion lies where the river has recovered itself from the turbulence occasioned by its fall, and begins to become navigable, and who is represented with his boat, both receiving passengers, and landing them on the farther shore. Virgil (Æn. vi. ver. 304.) describes him as strong, and in all the vigour and firmness of old age, meanly clad, and with a large rude beard, and matted grey hair, and his eyes fixed and fiery. He is represented as carrying over the souls of the departed, one freight after another, according to his own pleasure.

SUB, a Latin preposition, signifying *under* or *below*; frequently used in composition, in our language. E. gr.

SUB-BRIGADIER, an officer in the horse-guards, who ranks as cornet. See BRIGADIER.

SUB-CHANTOR, an officer in the choir, who officiates in the absence of the CHANTOR, &c.

SUB-DEAN, a dignity in certain chapters beneath the DEAN.

SUB-PRIOR, a clauſtral officer, who aſſiſts the PRIOR, &c.

SUB-DEACON, an inferior miniſter, who anciently attended at the altar, prepared the ſacred veſſels, delivered them to the deacons in time of divine ſervice, attended the doors of the church during communion-ſervice, went on the biſhop's embaſſies with his letters or meſſages to foreign churches, and was inveſted with the firſt of the holy orders.

They were ſo ſubordinate to the ſuperior rulers of the church, that, by a canon of the council of Laodicea, they were forbidden to ſit in the preſence of a deacon without his leave. See DEACON.

According to the canons, a perſon muſt be twenty-two years of age to be promoted to the order of *ſubdeacon*.

It is diſputed among the Romaniſts, whether the ſubdeaconhood be a ſacrament or not; in regard *ſubdeacons* are ordained without impoſition of hands, and that there is no mention made of them in Scripture. Yet Bellarmin holds the affirmative ſide of the queſtion.

By the papal canons, a married man may be ordained *ſubdeacon*, upon condition his wife conſent to it, make a vow of continence, and ſhut herſelf up in a monaſtery.

SUBALTERN, formed from *ſub* and *alter*, *another*, an inferior officer, or one who diſcharges his poſt under the command, and ſubject to the direction of another.

Such are lieutenants, ſub-lieutenants, cornets, and enſigns, who ſerve under the captain.

We alſo ſay, *ſubaltern* courts, juriſdictions, &c. Such are thoſe of inferior lords, with regard to the lord paramount; hundred-courts with regard to county-courts, &c.

For the *ſubaltern* perſons in an epic poem, F. Boſſu obſerves, there is no neceſſity to be very ſtrict in preſerving every one's character.

The patriarchs, M. St. Evremont tells us, had ſeveral wives, who did not all hold the ſame rank; but there were ſeveral *ſubaltern* to the principal wife.

SUBALTERN *genus*. See GENUS.

SUBARMALE, among the *Romans*, a coarſe and thick kind of caſſock worn by the ſoldiers under their arms, in order to keep them from being hurt with their weight

SUBBUTEO, in *Ornithology*, the name of a bird of the hawk kind, called in Engliſh the RINGTAIL: the male of which has been ſuppoſed to be the HEN-HARRIER. Some authors give it the name of *pygargus accipiter*. See HOBBY.

SUBCLAVIAN, SUBCLAVIUS, is applied to any thing under the arm-pit, or ſhoulder, whether artery, nerve, vein, or muſcle.

The two *ſubclavian arteries* are named from their ſituation near the clavicles; they ariſe from the arch of the aorta, on each ſide of the left carotid, which commonly lies in the middle between them. Theſe arteries terminate, or rather change their name, above the middle of the two firſt ribs, between the anterior inſertions of the muſculi ſcaleni.

The *ſubclavian* veins are two branches of the *vena* CAVA, *ſuperior* and *aſcendens*, ſo called becauſe they lie behind, and in ſome meaſure under the clavicles. They are of unequal lengths, becauſe the trunk of the vena cava does not lie in the middle of the thorax, but toward the right ſide, where the left *ſubclavian* ariſes as well as the right, and is conſequently longeſt.

The two *ſubclaviæ* run laterally or toward each ſide, and terminate as they go out of the thorax, between the firſt rib and clavicula, immediately before the anterior inſertion of the muſcular ſcalenus. The right *ſubclavian* ſends out four capital branches, viz. the *jugularis externa*, *jugularis interna*, *vertebralis*, and *axillaris*. The left *ſubclavian* covers the origin of three large arteries, which come from the curvature of the aorta, and ſends off four large branches, beſides the ſmall pectoral veins, and receives the ductus thoracicus.

Each *ſubclavian* vein, near the middle of the clavicula, ſends off a branch called *cephalica*. See CEPHALIC *vein*. Winſlow.

SUBCLAVIUS denotes a muſcle which ariſes from the lower ſide of the clavicula, near the acromium, and deſcends obliquely to be inſerted into the upper part of the firſt rib, near the *ſternum*. See *Tab. Anat.* (*Myol.*) *fig.* 2. *n.* 9.

It is fixed by one end in all the middle lower portion of the clavicle, at the diſtance of about an inch from each extremity; and by the other in the cartilage, and a ſmall part of the bone of the firſt rib. It ſeems likewiſe to adhere to the extremity of the clavicle, next the ſternum, by a kind of broad thin ligament.

The *ſubclavius* is a proper depreſſor of the clavicula, and an aſſiſtant depreſſor of the acromium, or of the ſhoulder in general, together with the pectoralis minor, rhomboides, and angularis; all which, in their turns, aſſiſt the *ſubclavius* in its action on the clavicula. Winſlow.

SUBCONTRARY *poſition*, in *Geometry*, is when two ſimilar triangles are ſo placed, as to have one common angle, O (*Tab.* V. *Geom. fig.* 124.), at their vertex, and yet their baſes not parallel.

If the ſcalenous cone A B L C K be ſo cut by the plane D I E H, as that the angle at $E=B$, the cone is then ſaid to be cut *ſubcontrarily* to its baſe B C: and in this caſe the ſection D I E H will be a circle.

For, through the vertex A and centre of the baſe, let the triangular ſection A B C be taken, ſo as to be at right angles to the planes of the baſe B K C L of the *ſubcontrary* ſection D I E H, and of the ſection F I G H taken parallel to the baſe, and cutting the *ſubcontrary* ſection in the line I O H: conſequently I O H is perpendicular to D E and F G, interſecting one another in O. The ſection F I G H, parallel to the baſe of the cone, is a circle; therefore $FO \times OG = OI^2$: and the triangles G O E and F O D, having $GEO = ABC = DFO$, and $GOE = DOF$, are ſimilar; therefore $EO : OG :: FD : DO$, and $EO \times DO = FO \times OG = OI^2$; conſequently O I is a mean proportional, either between F O and O G, or D O and E O: and as the ſame would happen wherever F G cuts D E, all the lines O I, both in the ſections F I G H and D I E H, are lines in a circle: conſequently the ſection D I E H is a circle.

SUBCOSTAL *muſcles*, in *Anatomy*, are fleſhy planes of different breadths, and very thin, ſituated more or leſs obliquely on the inſide of the ribs near their bony angles, and running in the ſame direction with the external INTERCOSTALS. They are fixed by both extremities in the ribs, the inferior extremity being always at a greater diſtance from the vertebræ than the ſuperior, and ſeveral ribs lying between the two inſertions. Theſe muſcles are more ſenſible in the lower ribs than in the upper, and they adhere cloſely to the ribs that lie between their inſertions. Winſlow. For their uſe ſee STERNOCOSTALES.

SUBCUTANEUS, in *Anatomy*, a thin membranous muſcle, running under the ſkin, called alſo QUADRATUS *genæ*, and *platyſma myoides*.

A convulſion herein is called a *ſpaſmus cynicus*. See CYNIC.

In ſome perſons it reaches to the ears, and in others not; which is the reaſon ſome folks have a faculty of moving their ears, which others want.

SUB-DOMINANTE, in *Muſic*, is a name given by M. Rameau to the fourth note of the tone, becauſe the dominant is immediately above it, or rather becauſe it has the ſame interval of the tonic in deſcending, as the dominant has in aſcending.

SUBDUCTION, in *Arithmetic*, the ſame as SUBTRACTION.

SUBDUPLE *ratio*, is when any number or quantity is contained in another, twice. Thus 3 is ſaid to be *ſubduple* of 6, as 6 is duple of 3. See RATIO.

SUBDUPLICATE *ratio* of any two quantities, is the RATIO of their ſquare roots.

SUBER, in *Botany*. See CORK and OAK.

SUBER *montanum*. See CORK *foſſil*.

SUBETH, the word uſed by the Arabian writers to expreſs a carus.

SUBETH *ſabala*, a term uſed by the Arabian writers to expreſs a coma vigil.

SUBFRONTALIS *ſutura*, a name given by ſome anatomical writers to the ſuture, by which the os frontis is connected with the bones of the ſuperior jaw.

SUBJECT, SUBDITUS, a perſon under the rule and dominion of a ſovereign prince or ſtate.

Of *ſubjects*, ſome are ſo by birth, others become ſo by acts of naturalization.

Anciently the lords called, abuſively, thoſe who held lands or fees of them, or owed them any homage, their *ſubjects*.

SUBJECT, SUBJECTUM, is alſo uſed for the matter of an art or ſcience, or that which it conſiders, or whereon it is employed. Thus the human body is a *ſubject* of medicine.

In this ſenſe, anatomiſts call the body they are diſſecting, and whereon they read lectures, their *ſubject*.

The *ſubject* of logic is thinking, or reaſoning; but more particularly in a ſyllogiſm, one of the terms of a propoſition is called the *ſubject*, and the other the *attribute*.

In poetry, the *ſubject* is the matter treated of, or the event related, or ſet to view, and enriched with ornaments.

SUBJECT alſo denotes the ſubſtance or matter to which an accident is added.

It is a maxim, that two contraries can never ſubſiſt in the ſame *ſubject*.

SUBJECT, in the *Manege*. To keep a horſe *ſubject*, is an expreſſion relating to volts; ſignifying, to keep the croupe of the horſe in the round, ſo that it may not ſlip out; that he may not traverſe, and that he may work in the manege, croupe in, marking his equal times, without loſing his ground.

SUBJECT, in *Muſic*. See SOGETTO.

SUBJECTION, *ſubjectio*, in *Rhetoric*. See HYPOBOLE.

SUBJECTION, *civil*, in *Law*. See CIVIL *ſubjection*.

SUBJECTIVE *part*. See PART.

SUBINFEUDATION, in *Law*, was where the inferior lords, in imitation of their ſuperiors, began to carve out and grant to others minuter eſtates than their own, to be held of themſelves, and were ſo proceeding downwards *in infinitum*, till the ſuperior lords obſerved, that by this method of *ſubinfeudation* they loſt all their feodal profits of wardſhips, marriages, and eſtreats, which fell into the hands of theſe meſne or middle lords, who were the immediate ſuperiors of the terre-tenant, or him who occupied the land. This occaſioned the ſtatute of QUIA *emptores*. Bl. Com. vol. ii. p. 91.

SUBJUNCTIVE, in *Grammar*, the fourth mood, or manner of conjugating verbs; thus called, becauſe uſually ſubjoined to ſome other verb, or at leaſt to ſome other particle, as, *if I loved: though this were true*, &c.

The Greek is almoſt the only language that properly has any *ſubjunctive* mood; though the French, Spaniſh, and Italian, have ſome ſhew thereof. In all other languages the ſame inflections ſerve for the optative and the *ſubjunctive* moods: for which reaſon the *ſubjunctive* mood might be retrenched from the Latin, and thoſe other grammars; it not being the different ways of ſignifying, which may be very much multiplied, but the different inflections, that conſtitute the different moods. See MOOD.

SUBINTRANTES *febres*, a term uſed by ſome medical writers to expreſs thoſe fevers in which one fit begins before the other is perfectly worn off.

SUBITO, in the *Italian Muſic*, is uſed to ſignify that a thing is to be performed quickly and haſtily: thus we meet with *volti ſubito*, turn over the leaf quickly.

SUBLAPSARY, or *Infralapſary*, in *Theology*, a term applied to ſuch as hold that God, having foreſeen and permitted the fall of Adam, and, in conſequence thereof, the loſs of mankind, reſolved to give a grace ſufficient for ſalvation to ſome, and to refuſe it to others.

Sublapſarian is uſed as ſynonymous with INFRALAPSARIAN, in oppoſition to SUPRALAPSARIAN.

SUBLIMABLE *bodies*, a term uſed by ſome of our chemical writers to expreſs ſuch ſubſtances as are capable of *ſublimation* in a dry form.

SUBLIMATE, a chemical preparation, the baſis whereof is mercury or quickſilver.

In making corroſive *ſublimate*, the quickſilver is extinguiſhed by trituration in calcined vitriol. But M. Lemery obſerves, that bole armenic and potters clay are cheaper, and extinguiſh the mercury ſooner.

It has been ſaid, that to try whether *ſublimate* has been ſophiſticated with arſenic or not, it was to be rubbed with ſalt, or oil of tartar; and that if ſophiſticated, it would turn black. But M. Lemery agrees with Barchuſen and Boulduc, that this is no trial; for the ſalt of tartar has the ſame effect on the good and the bad *ſublimate*. Mem. de l'Acad. des Scien. 1704. See MERCURY.

Liver of ſulphur is known to be an excellent antidote againſt the poiſonous effects of corroſive *ſublimate*, &c. See LIVER *of Sulphur* and POISON.

SUBLIMATE, *blue*, a preparation of mercury with ſome other ingredients, yielding a fine blue for painting. The method of making it is this: take quickſilver, two parts; flower of brimſtone, three parts; ſal ammoniac, eight parts; grind theſe upon a porphyry, and, with the quickſilver, put them into a long-necked glaſs veſſel, luted at bottom; place it in a ſand-heat, and when the moiſture is aſcended, you will have a fine *blue ſublimate* for painting. Neri's Art of Glaſs, p. 164.

SUBLIMATE, *refining gold by*. See REFINING.

SUBLIMATION, SUBLIMATIO, in *Chemiſtry*, an operation by which volatile and ſolid ſubſtances are collected and obtained, and differs little from diſtillation, excepting, that, in diſtillation, only the fluid parts of bodies are raiſed; but, in *ſublimation*, the ſolid and dry; and that the matter to be diſtilled may be either ſolid or fluid; but *ſublimation* is concerned only about ſolid ſubſtances.

There is alſo another difference, namely, that rarefaction, which is of very great uſe in diſtillation, has hardly any room in *ſublimation*; for the ſubſtances which are to be ſublimed, being ſolid, are incapable of rarefaction, and ſo it is only impulſe that can raiſe them.

However, it may not be improper to inquire a little more nicely into the reaſon of ſuch a diverſity in the elevation of bodies; why ſome do aſcend with a gentle heat, and others are not to be raiſed by the moſt vehement fire; and ſuch an inquiry will more properly come in here, becauſe this head contains all the buſineſs of volatility and fixation.

The cauſe of this elevation and aſcent, in the particles of bodies, is to be aſcribed to the fire, not only on account of impulſe, but of another property the fire has, namely, to inſinuate itſelf into all the interſtices of theſe bodies, and thereby break the coheſion of their parts, ſo that at laſt they become divided into very ſmall parts, if not into the ſmalleſt that art can reduce them into.

Particles, thus ſeparated and divided, loſe much of their gravity. For the gravity of the ſame particle decreaſes in the ſame proportion as the cube of the diameter is leſſened. Suppoſe, therefore, a body, whoſe diameter is 12; if, then, its diameter be made leſs by 1, viz. 11, the gravity of that body will be only 9 $\frac{1}{4}$, or thereabouts; a body, therefore, by being divided into very minute corpuſcles, becomes eaſy to be ſublimed.

Add, that the ſurface of a body decreaſes in a very different manner from gravity, only as the ſquare of the diameter is leſſened. Where the gravity decreaſes, in ſuch a ſeries, as is expreſſed by the numbers 1728, 1331, 1000, the diminution of the ſurface will obſerve this proportion; viz. 144, 121, 100; and when, upon reducing the diameter to 6, the gravity becomes leſs than 2, the ſurface will ſtill amount to 36.

How much this contributes to a quick aſcent, will appear from the *ſublimation* of camphor, benzoin, and arſenic; whoſe particles, as they cohere but looſely, are, for that reaſon, diffuſed into a larger ſurface; upon which account they are the eaſieſt to be ſublimed of any: nay, theſe ſolid particles, upon account of their ſurface, will ſooner aſcend than many fluids.

So flower of ſulphur riſes ſooner than oil, not only than that of vitriol, but any other, though ever ſo light.

By this contrivance of nature, viz. that the gravity of bodies decreaſes in a triplicate, but their ſurface in a duplicate, proportion of their diameters, it comes to paſs that bodies, which have a very different gravity, may be raiſed with the ſame force. Thus the ſalts of animals, as of hartſhorn, human blood, that of vipers, &c. being compoſed of very minute corpuſcles, as is found by experience, in diſtilling them, do eaſily aſcend, becauſe the ſurface in them is not leſſened ſo much as gravity is; and the ſalts of vegetables, as of tartar, balſams, &c. which are of a more cloſe texture, by reaſon of their larger ſurfaces, are alſo without much difficulty raiſed.

The corpuſcles alſo of minerals and metals, though very compact and heavy, do, in ſome meaſure, give way to the fire, and are capable of being ſublimed. In all theſe inſtances, the breadth of the ſurface, which expoſes the particles more to the impetus of the fire, is the reaſon why they are raiſed with as much eaſe as if their gravity had been leſſened by diminiſhing their ſurface; ſo that particles, though ever ſo different in weight, may be equally raiſed by the ſame degree of heat, if the proportion of their gravity be reciprocal to that of their ſurfaces.

Sublimation is employed to ſeparate volatile ſubſtances from others which are fixed or leſs volatile, to combine two volatile matters, as in the operation of the ſublimates of mercury, and to collect ſome volatile ſubſtances, as ſedative ſalt, ſulphur, and all the preparations called flowers.

The apparatus for *ſublimation* is very ſimple. A matraſs or ſmall alembic is generally ſufficient for the *ſublimation* of ſmall quantities of matter. But the veſſels, and the method of managing the fire, vary according to the nature of the matters that are to be ſublimed, and according to the form which the ſublimate is to receive.

When the matters to be ſublimed are volatile, a high cucurbit, to which is adapted a capital, and even ſeveral capitals placed one upon another, are to be employed. The *ſublimation* is performed in a ſand-bath, with only the preciſe degree of heat requiſite to raiſe the ſubſtance which is to be ſublimed, and the capitals are to be guarded as much as poſſible from heat.

When along with the dry matter, which is to be collected in theſe *ſublimations*, a certain quantity of ſome liquor is raiſed, as in the *ſublimation* of ſedative ſalt, and rectification of volatile concrete alkalis, a paſſage and a receiver for theſe liquors muſt be provided, which is conveniently done by uſing the ordinary capital of the alembic, furniſhed with a beak and a receiver.

Some ſublimates are required to be in as ſolid and compact maſſes as their natures will allow, as camphor, ſal ammoniac, and all the ſublimates of mercury. The moſt proper veſſels for theſe *ſublimations* are bottles or matraſſes, which are to be ſunk more or leſs deeply in ſand, according to the volatility and gravity of the matters that are to be ſublimed. The art of conducting theſe

these *ſublimations* conſiſts in applying ſuch a degree of heat, or in ſo diſpoſing the ſand (i. e. making it cover more or leſs of the matraſs) that the heat in the upper part of the matraſs ſhall be ſufficient to make the ſublimate adhere to the glaſs, and to give it ſuch a degree of fuſion as is neceſſary to render it compact, but not a heat ſo great as to force the ſublimate through the neck of the matraſs and diſſipate it.

Many ſubſtances may be reduced into flowers and ſublimed, which cannot be ſublimed in cloſe veſſels, but require a very great heat, with the acceſs of free air, and even the contact of coals; ſuch are moſt ſoots or flowers of metals, and even ſome ſaline ſubſtances. The matters from which theſe ſublimates are ſeparated, muſt be placed among burning coals in open air, and the flowers are collected in the chimney of the furnace in which the operation is performed. This proceſs is called *ſublimation* in the manner of Geber. Of this kind of ſublimates are the tutty, calamine, or pompholix, gathered in the tops of furnaces in which ores are ſmelted. Dict. Chem. Eng. edit. art. *Sublimation*.

SUBLIME, in *Diſcourſe*, ſomething extraordinary and ſurpriſing, which ſtrikes the ſoul, and makes a ſentiment or compoſition raviſh and tranſport.

This is what Longinus, who has written expreſsly on the ſubject, means by *ſublime*. The definition, indeed, is not his, but M. Boileau's; for the author, writing his book after another of Cecilius on the ſame ſubject, and employing himſelf almoſt wholly in ſhewing what the *ſublime* is, declined defining it, as ſuppoſing it well known.

By the definition, it may appear, that the *ſublime* is a very different thing from what the orators call the *ſublime* STYLE.

SUBLIME *geometry*. See GEOMETRY.

SUBLIMING *pots*. See ALUDELS.

SUBLIMIS, in *Anatomy*, a name given by Albinus, Hunaud, and others, to the muſcle of the wriſt, called by others the PERFORATUS.

SUBLINGUAL *artery*, is the ſecond branch from the external carotid; it ariſes a little above the ſuperior guttural artery, runs forwards, upwards, and over the cornu of the os hyoides, and ſinks into the tongue in order to ſupply all the adjacent muſcles. It is alſo called the ranine artery.

SUBLINGUAL *glands*, in *Anatomy*, two glands under the tongue, placed one on each ſide thereof.

They are of the ſame kind with the MAXILLARY *glands*, only ſmaller, ſomewhat oblong, and flatted like a blanched almond. They are ſituated under the anterior portion of the tongue, one on each ſide, near the lower jaw, on the lateral portions of the muſculi mylo-hyoidæi, which ſuſtain them. The two extremities of each gland are turned backward and forward, and the edges obliquely inward and outward. They are covered on the upper ſide by a very thin membrane, which is a continuation of the membrane that covers the under ſide of the tongue: they ſend out laterally ſeveral ſmall ſhort ducts, which open near the gums by the ſame number of orifices, all ranked in the ſame line, at a ſmall diſtance from the frænum, and a little more backward. Winſlow.

Theſe, called alſo *hypoglottides*, filtrate a ſerous humour of the nature of ſaliva, which they diſcharge by little ducts near the gums into the mouth.

SUBLINGUAL *veins*. See RANULARES.

SUBLINGUALIA, a term uſed by ſome authors to expreſs ſuch medicines as were intended to be laid under the tongue, and gradually diſſolving there.

Theſe have been principally intended either to cure coughs, or give a ſweet ſcent to the breath.

SUBLUXATION, in *Surgery*, is applied to a bone that is not quite out of its ſocket, but reſts upon the brim.

SUB-MARSHAL, an officer in the Marſhalſea, who is deputy to the chief marſhal of the king's houſe, commonly called the *knight-marſhal*, and hath the cuſtody of the priſoners there. He is otherwiſe termed *under-marſhal*. Crompt. Juriſ. 104.

SUBMARINE *navigation*. See *Submarine* NAVIGATION.

SUBMERSION, *ſubmerſio*. See DROWNING.

SUBMISSIO, a word uſed by medical writers to expreſs a remiſſion.

Sometimes it imports the ſame as *ſyſtole* with reſpect to the arteries, that is, their contraction.

SUBMULTIPLE, in *Geometry*, &c. A *ſubmultiple* number, or quantity, is that which is contained a certain number of times in another, and which, therefore, repeated a certain number of times, becomes exactly equal thereto.

Thus 3 is a *ſubmultiple* of 21. In which ſenſe a *ſubmultiple* coincides with an ALIQUOT part.

SUBMULTIPLE *ratio*, is that between the quantity contained, and the quantity containing. Thus the ratio of 3 to 21 is *ſubmultiple*.

In both caſes *ſubmultiple* is the reverſe of MULTIPLE: 21, e. gr. being a multiple of 3, and the ratio of 21 to 3 a multiple ratio.

SUBMULTIPLE *ſubſuperparticular*. } See RATIO.
SUBMULTIPLE *ſubſuperbipartiens*. }

SUBNORMAL, or *ſub-perpendicular*, in *Geometry*, a line which determines the point in the axis of a curve, where a normal or perpendicular, raiſed from the point of contact of a tangent to the curve, cuts the axis.

Or, the *ſubnormal* is a line, which determines the point wherein the axis is cut by a line falling perpendicularly on the tangent in the point of contact.

Thus TM (*Tab. Conics, fig.* 19.) being a tangent to a curve in M; and MR a normal or perpendicular to the tangent; the line PR intercepted between the ſemiordinate PM and the normal MR, is called the *ſubnormal*.

Hence, 1. In a parabola, as AM, &c. the *ſubnormal* PR is to the ſemiordinate PM, as PM is to PT, and as MR to TM.

2. In the parabola, the *ſubnormal* PR is ſubduple the parameter; and conſequently it is an invariable quantity: for $PR = \frac{PM^2}{PT} = \frac{PM^2}{2AP} =$ (calling the parameter *p*) $\frac{p \times AP}{2AP} = \frac{p}{2}$. In general, the *ſubnormal* may be found by dividing the ſquare of the ſemiordinate by the SUBTANGENT.

SUBORDINATED, and SUBORDINATING *affections*. See AFFECTIONS.

SUBORDINATION, a relative term, expreſſing the degree of inferiority between one thing and another.

There is a ſeries of *ſubordinations* running throughout all nature. In the church there are ſeveral degrees of *ſubordination*, as of deacons to prieſts, prieſts to prelates, &c. The like are obſervable in the ſecular ſtate, in offices of war, juſtice, &c. And, even

In the ſciences, trigonometry is *ſubordinate* to geometry; and in the virtues, abſtinence and chaſtity are *ſubordinate* to temperance: in muſic, ſome call the plagal tones, *ſubordinate tones*.

SUBORNATIO. See RAPE and RAVISHMENT.

SUBORNATION, SUBORNATIO, a ſecret or underhand preparing, inſtructing, or bringing in a falſe witneſs; or corrupting or alluring a perſon to do ſuch a falſe act. Hence, the *ſubornation* of perjury, mentioned in the act of general pardon, 12 Car. II. cap. 8. is the alluring or diſpoſing to PERJURY.

SUBPERPENDICULAR. See SUBNORMAL.

SUBPŒNA, in *Law*, a writ, whereby any perſon, under the degree of peerage, is called to appear in chancery, in caſes where the common law hath made no proviſion. See SUIT.

The name is taken from the words in the writ, which charge the party ſummoned to appear at the day and place aſſigned, *ſub pœna centum librarum*, on the penalty of a hundred pounds.

The peers, in the like caſes, are called by the lord chancellor's letter, giving notice of the ſuit intended againſt them, and requiring them to appear.

The writ of *ſubpœna*, returnable into the court of chancery only, was deviſed by John Waltham, biſhop of Saliſbury, and chancellor to king Richard II. by a ſtrained interpretation of the ſtat. Weſtm. 2. in order to make the feoffee to uſes accountable to his *ceſtuy que uſe*; which proceſs was afterwards extended to other matters wholly determinable at the common law, upon falſe and fictitious ſuggeſtions; for which, therefore, the chancellor himſelf is, by 7 R. II. cap. 6. directed to give damages to the parties unjuſtly aggrieved. In the reigns of Henry IV. and V. the commons were repeatedly urgent to have the writ of *ſubpœna* entirely ſuppreſſed, as a novelty deviſed by the ſubtlety of chancellor Waltham, againſt the form of the common law; but though Henry IV. gave a palliating anſwer to their petitions, and actually paſſed the ſtat. 4 Hen. IV. cap. 23. whereby judgments at law are declared irrevocable, unleſs by attaint or writ of error, yet his ſon put a negative at once upon their whole proceeding; and, in Edward IV's time, the proceſs by bill and *ſubpœna* was become the daily practice of the court. Bl. Com. book iii. p. 52.

There is alſo a *ſubpœna ad teſtificandum*, for ſummoning of witneſſes in other courts, as well as in chancery. See EVIDENCE.

The *ſubpœna duces tecum*, is a writ or proceſs of the ſame kind with the preceding, including a cauſe of requiſition, for the witneſs to bring and produce books and papers, &c.

&c. in his hands, belonging to the parties, or such wherein they are interested.

There is also a *subpœna* in the exchequer, as well in the court of equity there, as in the office of pleas.

SUBPOPLITÆUS, in *Anatomy*. See POPLITÆUS.

SUBREPTION, SUBREPTIO, formed from *sub*, *under*, and *repo*, *I creep*, the act of obtaining a favour from a superior by surprise, or a false representation.

Subreption differs from *obreption*, in that the latter denotes a false expression of the quality of a thing, or fact, &c. And *subreption*, a want of expression, or a fraudulent reticency or concealment of a thing, which would have tendered the obtaining of the favour more difficult. See OBREPTITIOUS.

SUBREPTITIOUS, or SURREPTITIOUS, a term applied to a letter, licence, patent, or other act, fraudulently obtained of a superior, by concealing some truth, which, had it been known, would have prevented the concession or grant.

The benefit of letters, licences, &c. is forfeited, when they are found contrary to the informations given; they being then reputed *subreptitious*.

Papal bulls and signatures are null and *subreptitious*, when the true state of the benefice, the manner of the vacancy, and other necessary matters, are not justly and properly signified to the pope.

SUBPRINCIPALIS, in some Latin writers of *Music*, is used for the note or chord called by the Greeks παρυπατη, *par-hypate*.

SUBPURGATION, *subpurgatio*, a word used by some writers to express a gentle purgation.

SUBROGATION, or SURROGATION, in the *Civil Law*, the act of substituting a person in the place, and intitling him to the rights of another.

In its general sense, *subrogation* implies a succession of any kind, whether of a person to a person, or of a person to a thing.

There are two kinds of *subrogation*; the one *conventional*, the other *legal*.

SUBROGATION, *conventional*, is a contract whereby a creditor tranfers his debt, with all appurtenances thereof, to the profit of a third person.

SUBROGATION, *legal*, is that which the law makes in favour of a person, who discharges an antecedent creditor; in which case there is a legal translation of all rights of the ancient creditor to the person of the new one.

This the civilians more usually call *succession*, as being wholly the work of the law; and to distinguish it from the conventional *subrogation*, which they also call *cession*. The word is formed from the Latin, *subrogatio*, of the verb *rogare*, which, among the ancient Romans, signified to *ask*, to *interrogate*; whence it was that they called the laws themselves *rogationes*, in regard the people made them, upon being asked by the magistrates.

And, as laws made by the people could not be changed without their consent, and without being asked anew; if they thought good to have the law wholly abolished, *lex abrogabatur*; if only a part of it were to be abolished, *lex derogabatur*; and if any clause or amendment were added to it, *lex subrogabatur*.

The new magistrates were also *subrogated* in the place of the old ones; for, during the time of the republic, no magistrate could be, but by consent of the people, nor of consequence but by law, since whatever the people thought good was law.

This is what occasioned Salmasius to say, that *subrogare* and *substituere per legem* were reciprocals.

SUBSCAPULARIS, in *Anatomy*, a muscle arising from the basis and side of the scapula; and, spreading itself under the whole convex or under side of it, being of the same breadth and length with it, is inserted by a semicircular tendon, into the neck of the os humeri. See *Tab. Anat. (Myol.) fig.* 1. *n.* 16.

It is thick, and made up of several penniform portions, nearly in the same manner with the deltoides. It is fixed in the internal labium of the whole basis, and in almost the whole internal surface of the scapula; its fleshy portions lying in the intervals between the bony lines, when these are found. Near the neck they leave the bone, and form a very broad tendon, which is inserted in the surface of the small tuberosity of the head of the os humeri, close by the bony channel. The lower edge of this tendon probably sends off the ligamentary frænum, mentioned in the descriptions of the latissimus dorsi, teres major, and coracho-brachialis. This muscle covers immediately the serratus major, being in a manner enclosed between it and the scapula: the upper edge of its tendon is joined to the lower edge of that of the supra spinatus, except at the upper part of the bony channel, where they give passage to one tendon of the biceps. It likewise adheres to the capsular ligament. The tendons of the supra spinatus, infra spinatus, teres minor, and *subscapularis*, being all joined by their edges, form a sort of cap, which covers the upper part of the head of the os humeri.

The use commonly ascribed to the *subscapularis* of pressing the arm against the ribs, from which it has the name of *porte-feuille* in French, is without foundation. When the arm hangs down in its natural situation, this muscle may turn it round its axis from without forwards, as it happens when in this situation we beat the breast with the fore arm bent; and it likewise strongly assists the latissimus dorsi, when we turn the hand behind the back. When the arm being raised, we move it backward, as in giving a back stroke with the elbow or fist, the *subscapularis* hinders the head of the os humeri from being luxated forwards, for which purpose it is well fitted both by its structure and the number of its fibres, this motion being sometimes performed with great violence. It may likewise, by means of the nearness and lateral union of its tendon with that of the *supra spinatus*, assist that muscle in keeping the head of the os humeri in the glenoide cavity, when the other extremity of the bone is raised. Winslow.

SUBSCRIPTION, the signature put at the bottom of a letter, writing, or instrument.

In church history we meet with instances of *subscriptions* written in the blood of Jesus Christ. Nicetas, in the life of Ignatius, speaking of the *subscriptions* made at the council, wherein that patriarch was deposed, says, they *subscribed*, not with common ink, but, what strikes a man with horror, with a pen dipped in the blood of Christ. The historian Theophanes tells us, that pope Theodore mixed the blood of Christ with ink, wherein he wrote the deposition of Pyrrhus.

SUBSCRIPTION, in the *English Commerce*, is used for the share or interest which particular persons take in a public stock, or a trading company, by writing their names, and the shares they require, in the books or register thereof.

The French have likewise adopted the word *subscription*, using it in speaking of the actions of their India company.

A *subscription* differs from an *action*; in that the first is properly only an action begun, or an engagement, by making the first payment to acquit the rest in the time limited; and that the other is the whole action, performed in all its parts.

SUBSCRIPTION, in the *Commerce of Books*, signifies an engagement to take a certain number of copies of a book going to be printed; and a reciprocal obligation of the bookseller or publisher, to deliver the said copies on certain terms. The usual conditions of these *subscriptions* are, on the part of the bookseller, to afford the books cheaper to a subscriber than to another, by one third or one fourth of the price; and on the part of the latter, to advance half the money in hand, and to pay the rest on the delivery of the copies; an agreement equally advantageous to the one and the other, as the bookseller is hereby furnished with money to carry on works which would otherwise be above his stock; and the subscriber, receives, as it were, interest for his money, by the moderate price the book stands him in.

Subscriptions had their rise in England, and it is but very lately that they are got into other countries. They were first set on foot in the middle of the last century, for the printing of Walton's Polyglott Bibles, which is the first book ever printed by way of *subscription*.

From England they passed a few years ago into Holland, and they have been since introduced into France.

In England they are become exceedingly frequent; and their frequency has rendered them liable to some abuses, which begin to discredit them.

SUBSCRIPTION *of witnesses*, in *Law*. A WILL of lands must, by stat. 29 Car. II. cap. 3. § 5. be attested or subscribed by three credible witnesses at least; but for other conveyances, the actual *subscription* of the witnesses is not required by law, though it is prudent in them so to do, in order to assist their memory when living, and to supply their evidence when dead.

SUBSEQUENT, something that comes after another, particularly with regard to the order of time. See POSTERIOR.

When two festivals happen on the same day, the principal one is celebrated; and the other transferred to the *subsequent* day, i. e. to the morrow.

SUBSEQUENT *condition*. See CONDITION.

SUBSESQUIALTERATE. See RATIO.

SUBSIDY, SUBSIDIUM, in *Law*, any aid, tax, or tribute granted, by authority of parliament, to the *king*, on

on preffing occafions of the ftate, levied on the fubjects, according to their feveral abilities, or the yearly produce of their lands, goods, &c.

The ancient Saxon kings had no *fubfidies* collected after the manner of ours; but, in lieu thereof, had feveral cuftoms, whereby they levied money or perfonal fervice on the people, for the repairing of cities, caftles, bridges, military expeditions, &c. which they called *burgbote, brigbote, herefare, heregold*, &c.

But, upon the land's becoming oppreffed by the Danes, king Ethelred, in the year 1007, agreed to pay them yearly 10000 *l.* for redemption of peace, which fum was afterwards increafed to 36000 *l.* and at length to 48000 *l.* which was called *Danegeld*, and was levied on land; each hide, or ploughland, that of the church only excepted, being ceffed 12 *d.*

Hence the tribute came to be called *hidage*, a name that afterwards became common to all taxes and *fubfides* impofed on lands, as thofe on cattle were called *hornegeld*.

Both thefe the Normans fometimes called *taxes*, from the Greek *τάξις, order*; fometimes from their own language *taillage*; and fometimes, according to the cuftom beyond fea, *fubfidia* and *auxilia*. See AID.

After the Conqueft, in 1066, thefe *fubfidies* feem to have been granted differently from what they now are, as every ninth lamb, every ninth fleece, every ninth fheep, &c. Sometimes the rate was every tenth, and fometimes every fifteenth, &c.

The various modes of raifing money by SCUTAGES upon knights fees, the affeffments of HIDAGE upon all other lands, and TAILLAGE upon cities and burghs, gradually fell into difufe, fays judge Blackftone, upon the introduction of *fubfidies*, about the time of king Richard II. and king Henry IV.

Thefe, he fays, were a tax, not immediately impofed upon property, but upon perfons, in refpect to their reputed eftates, after the nominal rate of 4*s.* in the pound for lands, and 2*s.* for their goods; and for thofe of aliens in a double proportion. But this affeffment was made according to an ancient valuation, which was fo low, that one *fubfidy* of this fort did not amount to more than 70000 *l.* It was anciently the rule never to grant more than one *fubfidy* and two FIFTEENTHS, at a time; but this rule was broken through for the firft time on occafion of the Spanifh invafion in 1588, when the parliament gave queen Elizabeth two fubfidies and four fifteenths. Afterwards, as money funk in value, more *fubfidies* were given; and we have an inftance, in the firft parliament of 1640, of the king's defiring twelve *fubfidies* of the commons, to be levied in three years.

The grant of fcutages, taillages, and *fubfidies*, by the commons, did not extend to fpiritual preferments, thofe being ufually taxed by the clergy themfelves in convocation; which grants of the clergy were confirmed in parliament; otherwife they were illegal and not binding. A *fubfidy* granted by the clergy was after the rate of 4*s.* in the pound, according to the valuation of their livings in the king's books, and amounted to about 20000 *l.*

Whilft this cuftom continued, convocations ufed to fit as frequently as parliaments; but the laft *fubfidies* thus given by the clergy, were thofe confirmed by ftat. 15 Car. II. cap. 10; fince which another method of taxation has generally prevailed, which comprehends the clergy as well as the laity; in recompence for which the beneficed clergy have from that period been allowed to vote at the election of knights of the fhire; and thenceforward alfo the practice of giving ecclefiaftical *fubfidies* has fallen into total difufe. The laft inftance of this kind of grant occurs in 1670. Blackft. Com. book i. p. 310, &c. See LAND-*tax*.

In France the king alone, by his own authority, impofes *fubfidies* on his people, at his own difcretion. What Grotius fays, that they who pay *fubfidies* to other fovereigns, to engage them in their defence againft powerful enemies, by fo doing acknowledge their own weaknefs, and that fuch an acknowledgement diminifhes fomewhat of their dignity; muft be underftood of fuch ftates as are too weak to defend themfelves, and who, in refpect hereof, render themfelves in fome meafure tributary; not of fuch as, fubfifting by their own ftrength, give *fubfidies* to their weaker neighbours, to prevent their being over-run by others.

Such, e. gr. as the kings of England and France are, with regard to Sweden, and feveral other princes; to whom they generally grant *fubfidies* in the treaties they conclude with them.

In the lift of Englifh duties, or impofitions, are divers kinds of *fubfidies*: as the *fubfidy inwards*, or *old fubfidy*, which is a duty compofed of a TONNAGE and POUNDAGE duty; names arifing from the different regulations whereby it is impofed and levied: the *new fubfidy*, which is to be raifed, levied, and collected by the fame rules and orders, and under the fame penalties and forfeitures as are fignified in the feveral acts contained in the book of rates: the *one-third fubfidy*, or the amount of *one-third* of the preceding *fubfidy*, or of the net *new fubfidy* of tonnage and poundage: the *two-thirds fubfidy*, which is an additional *fubfidy* of two third parts of the *new fubfidy*, upon all goods liable to the faid *new fubfidy*, except in certain cafes, excepted by acts of parliament, and contained in the book of rates: the *fubfidy* of 1747, which, over and above all *fubfidies*, additional duties, impofitions, &c. is a poundage duty of 12 *d.* in the pound, to be paid in ready money on goods and merchandize imported, except for tobacco, with refpect to which it may be fecured by bond; which duty is to be levied and collected by the fame means, and under the fame penalties, &c. as are directed for the *old fubfidy*: *fubfidies* on fpirits: *fubfidy outwards*, compofed of a tonnage and poundage, and paid in ready money before fhipping off in order to exportation: *fubfidy* granted in 1758-9, of poundage upon certain goods and merchandizes to be imported into this kingdom, &c. Poftlethwayt's Dict. art. *Subfidy*. See CUSTOMS.

SUBSISTENCE, in the *Military Art*, is the money paid to the foldiers weekly, not amounting to their full pay, becaufe their cloaths, accoutrements, tents, bread, &c. are to be paid; it is likewife the money paid the officers upon accompt, till their accompts be made up, which is generally once a year, and then they are paid their arrears.

SUBSTANCE, SUBSTANTIA, fomething that we conceive to fubfift of itfelf, *fub fe ftans*, independently of any created being, or any particular mode or accident.

Thus a piece of wax is a *fubftance*; becaufe we can conceive it as fubfifting of itfelf, and of its own nature, without any dependence on any other created nature, or without any particular mode, form, colour, &c. See MODE.

It is a being, however, which is the fubject of modes or accidents. Of *fubftances*, fome are thinking or confcious beings, and others are extended and folid, or impenetrable. Of the former clafs is the human foul, and of the latter philofophers confider matter only. If we feclude SPACE out of our confideration, there will remain but thefe two forts of *fubftances*, viz. matter and mind, or body and fpirit; at leaft we have no ideas of any other *fubftance* but thefe. See Watts' Logic, cap. ii. fect. 2. and Phil. Eff. eff. ii.

Spinofa maintains, that there is but one fubftance in nature, whereof all created things are fo many different modifications; and thus he makes the foul of the fame *fubftance* with the body. The whole univerfe, according to him, is but one *fubftance*; which *fubftance* he holds endowed with an infinity of attributes, in the number of which are thinking and extenfion. All bodies are modifications of this *fubftance*, confidered as extended; and all fpirits modifications of the fame *fubftance*, confidered as thinking. See SPINOZISM. See alfo MATTER and SOUL.

Mr. Locke's philofophy of *fubftances* is more juft: our ideas of *fubftances*, that great author obferves, are only fuch a combination of fimple ideas as is taken to reprefent diftinct things, fubfifting by themfelves; in which the confufed idea of *fubftance* is always the chief. Thus the combination of the ideas of a certain figure, with the powers of motion, thought and reafoning, joined to *fubftance*, make the ordinary idea of man: and thus the mind obferving feveral fimple ideas to go conftantly together, which being prefumed to belong to one thing, or to be united in one fubject, are called by one name, which we are apt, afterwards, to talk of, and confider as one fimple IDEA.

We imagine thefe fimple ideas do not fubfift by themfelves; but fuppofe fome fubftratum, wherein they fubfift, which we call *fubftance*.

The idea of pure *fubftances* is nothing but the fuppofed, yet unknown, fupport of thofe qualities which are capable of producing fimple ideas in us.

The ideas of particular *fubftances* are compofed out of this obfcure and general idea of *fubftance*, together with fuch combinations of fimple ideas as are obferved to exift together, and are fuppofed to flow from the internal conftitution, and unknown effence of that *fubftance*.

Thus we come by the ideas of man, horfe, gold, &c. Thus the fenfible qualities of iron, or a diamond, make the complex idea of thofe *fubftances*, which a fmith, or a jeweller, commonly knows better than a philofopher.

The fame happens concerning the operations of the mind, viz. thinking, reafoning, &c. which we concluding not to fubfift by themfelves, nor apprehending how they

they can belong to body, or be produced by it, think them the actions of some other *substance*, which we call *spirit*; of whose *substance* or nature we have as clear a notion as that of body; the one being the supposed substratum of the simple ideas we have from without, as the other of those operations, which we experience in ourselves within; so that the idea of corporeal *substance* in matter is as remote from our conceptions as that of spiritual *substance*.

Hence we may conclude, that he has the most perfect idea of any particular *substance*, who has collected most of those simple ideas which exist in it; among which we are to reckon its active powers, and passive capacities, though not strictly simple ideas.

Substances are generally distinguished by secondary qualities; for our senses fail us in the discovery of primary ones, as the bulk, figure, texture, &c. of the minute parts of bodies, on which their real constitutions and differences depend. And secondary qualities are nothing but powers with relation to our senses.

The ideas that make our complex ones of corporeal *substances*, are of three sorts: first, The ideas of primary qualities of things which are discovered by our senses; such as bulk, figure, motion, &c. Secondly, The sensible secondary qualities, which are nothing but powers to produce several ideas in us by our senses. Thirdly, The aptness we consider in any *substance*, to cause or receive such alterations in its primary qualities, as that the *substance*, so altered, should produce in us different ideas from what it did before.

Besides the complex ideas we have of material *substances*, by the simple ideas taken from the operations of our own minds, which we experience in ourselves, as thinking, understanding, willing, knowing, &c. co-existing in the same *substance*, we are able to frame the complex idea of a spirit; and this idea of an immaterial *substance* is as clear as that we have of a material one.

By joining these with *substance*, of which we have no distinct idea, we have the idea of spirit; and by putting together the ideas of coherent solid parts, and a power of being moved, joined with *substance*, of which, likewise, we have no positive idea, we have the idea of matter.

Farther, there are other ideas of *substances*, which may be called *collective*, which are made up of any particular *substances*, considered as united into one idea; as a troop, army, &c. which the mind does by its power of composition. These collective ideas are but the artificial draughts of the mind, bringing things remote and independent, into one view, the better to contemplate the discourse of them united into one conception, and signified by one name. For there are no things so remote which the mind cannot, by this art of composition, bring into one idea, as is visible in that signified by the name *universe*.

Such is the generally received doctrine of *substance*; but bishop Berkeley, in his Principles of Human Knowledge, and Mr. Collier, in his Clavis Universalis, have made great refinements thereon.

SUBSTANTIAL, in the *Schools*, something belonging to the nature of *substance*.

It is generally disputed, whether or no there be such things as *substantial* forms? i. e. forms independent of all matter; or forms that are substances themselves.

SUBSTANTIAL is also used in the same sense with *essential*, in opposition to *accidental*; in which relation it gives room for abundance of distinctions.

SUBSTANTIVE, in *Grammar*, is a quality ascribed to a noun or name, when the object it denotes is considered simply, and in itself, without reference to any other subject or idea.

When the object is considered, as clothed with certain qualities, the noun is said to be *adjective*.

For a more palpable criterion, all nouns, to which one cannot add the word *thing*, are *substantives*; and all those to which *thing* may be added, are adjectives.

Substantives, according to Mr. Harris, are all those principal words which are significant of substances, considered as substances. See SPEECH.

Some of these are primary, or *substantives* properly so called, and have number and gender, and denominated NOUNS; and others are secondary, which are otherwise called PRONOUNS. Hermes, ch. iv. and v.

Nouns *substantive* sometimes are used adjectively; and nouns adjective also sometimes become *substantives*. In effect, the nature of the adjective being to express the quality of an object; if that quality be the object itself spoken of, then, according to our definition, it becomes a *substantive*. If I say, a *good prince*, the word *good* is apparently an adjective, because it represents the prince having the quality of goodness. But if I say, the *good* ought to be preferred to the bad, it is evident, *good* is the subject spoken of; and, consequently, it is a *substantive*. Indeed, custom does not allow us to use all adjectives indifferently, as *substantives*; nor all *substantives*, as adjectives. The laws observed herein are as follow:

All nouns either signify an individual, as Socrates, Alexander, &c. or a species; as man, horse, &c. or an essential quality, as rational, material, &c. or an accidental one, as black, white, good, fair, &c. or a dignity, office, art, &c. as king, president, philosopher, &c.

Thus have we four kinds of nouns, whereof the first is very rarely taken adjectively; for as they signify individuals, or particular beings, they can scarce be applied to any thing but the thing they properly signify; yet we have sometimes known the name of Cato taken adjectively; as, "This is to be Cato, indeed." Nor does Malherbe scruple to say in French, "Plus Mars que le "Mars de la Thrace." Add, that proper names are sometimes converted into names of dignities, &c. as Cæsar, Augustus, &c. In which case they may be considered, in the same light, as nouns of the fourth kind. Nouns of the second kind are also sometimes taken adjectively, as "He is much a man," &c. The third kind are adjectives of themselves. For the fourth kind, all grammarians rank them among *substantives*, excepting F. Buffier, who will have them to be adjectives; or, to use his own term, modificatives. Be that as it will, they are frequently used adjectively: "He is more a king, and more a philosopher, than any of his predecessors."

Now, for adjectives taken *substantively*, 1. Participles passive are very rarely thus taken; though we sometimes say, "The loved are less happy than the lovers: the "taught have the advantage of the untaught: the be"sieged make a sally," &c. And, 2. Participles active are taken still more rarely for *substantives*. We scarce ever, e. gr. say, "The loving, the reading;" but "the lover, the reader:" yet we say, "the student, the "protestant, the tenant, the appellant, the opponent," &c. 3. For nouns adjectives, those applied to men are not only used *substantively*, but are even become *substantives* by use; whether they be such as regard religion, as "Christian, Pagan, Mahometan," &c. or opinion; as "Stoic, Peripatetic, Cartesian," &c. or country; as "the English, French, Italians:" or temperament; as, "the melancholic, phlegmatic, choleric," &c. Under the same rule are likewise comprehended abundance of adjectives, signifying a number of people agreeing in some common attribute; as, "the learned, "the great, the devout, the brave, the dissolute," &c. But use is here to be regarded; for we do not say "the "elegant,", as we say "the learned;" but "elegant "writers," &c. Custom, and the ear alone, are to decide about these differences.

Again, adjectives taken *substantively*, for other things, beside men, are either so used, to signify a number or set of things that have some common quality; or to express an abstract quality. In both which, as in those men, there are some authorized by custom, and others formed every day on their model.

With regard to which last, use, again, and the ear, are to decide. Here all the adjectives of colours are used *substantively*; as, "the white, black, green," &c. Some of those of qualities; as "the cold," &c. those of time; as "the past, present, future:" and many other matters; as "the agreeable, the sublime, the principal," &c. Nor is it only in the positive, but also in the comparative and superlative degrees, that adjectives are used *substantively*; as "the better of the two; the best of it," &c.

SUBSTANTIVE *verb*. See VERB.

SUBSTITUTE, SUBSTITUTUS, formed from *sub*, *under*, and *statuo*, *I appoint* or *establish*, a person appointed to officiate for another, in case of absence, or other legal impediment.

In the French law, the procureurs, or proctors, are obliged to name two of their brethren for *substitutes*, whose names are written after theirs in the list, to receive significations and summonses made in their absence.

SUBSTITUTE, in *Medicine*, denotes a drug, or remedy, that may be used in lieu of another; or that supplies the place of another of like virtue, which is not to be had; called also *succedaneum*.

The root of the great centaury, and sometimes rhaponticum, have been used as *substitutes* to rhubarb.

SUBSTITUTION, in *Grammar*, the using of one word for another; or one mode, state, person, or number, of a word for another. This the grammarians otherwise call a *syllepsis*.

SUBSTITUTION, in *the Civil Law*, a disposition of a testator

ſtator, whereby he ſubſtitutes one heir to another, who has only the uſufruit, and not the property of the thing left him.

Subſtitution is a kind of fiduciary inheritance, called alſo *fidei commiſſio*, in regard the immediate inheritor has only the uſe or produce of the thing; the body thereof being ſubſtituted and appropriated to certain perſons, who are likewiſe to have the uſufruit in their turns, but are never to have the property.

In ſome countries *ſubſtitution* is perpetual; in France it only holds to the fourth generation. *Subſtitution* anſwers to *remainder* in common law.

Among the Romans there were abundance of theſe fiduciary heirs, who enjoyed inheritances till they returned them into the hands of the right heir; and the reaſon why they did not likewiſe reſtore the fruits, or that the fruits were not deemed to make a part of the inheritance, but only of the thing, was, that the fiduciary or truſtee was obliged to run the riſk, and to ſtand the charge of the culture of the land.

SUBSTITUTION, in *Algebra*, &c. is the putting in the room of any quantity in an equation, ſome other quantity which is equal to it, but expreſſed after another manner. See REDUCTION of *Equations*.

SUBSTRACTION, or SUBTRACTION, in *Arithmetic*, the ſecond rule, or rather operation, in arithmetic, whereby we deduct a leſs number from a greater, to learn the preciſe difference:

Or, more juſtly, *ſubſtraction* is the finding a certain number from two homogeneous ones given, which, with one of the given numbers, is equal to the other.

The doctrine of *ſubſtraction* is reducible to what follows:

To SUBSTRACT *a leſs number from a greater.* 1. Write the leſs number under the greater, in ſuch manner, as that homogeneous figures anſwer to homogeneous, i. e. units to units, tens to tens, &c. as directed under ADDITION. 2. Under the two numbers draw a line. 3. *Subſtract*, ſeverally, the units from units, tens from tens, hundreds from hundreds; beginning at the right hand, and proceeding to the left; and write the ſeveral remainders in their correſpondent places, under the line. 4. If a greater figure come to be *ſubſtracted* from a leſs, borrow an unit from the next left-hand place; this is equivalent to 10, and, added to the leſs number, the *ſubſtraction* is to be made from the ſum; or if a cipher chance to be in the next left-hand place, borrow the unit from the next farther place.

By theſe rules any number may be *ſubſtracted* out of another greater. For example;

If it be required, from	9800403459
To *ſubſtract*	4743865263
The remainder will be found	5056538196

For, beginning with the right-hand figure, and taking 3 from 9, there remain 6 units, to be written underneath the line: going then to the next place, 6, I find, cannot be taken from 5; wherefore, from the place of hundreds 4, I borrow 1, which is equivalent to 10, in the place of tens; and from the ſum of this 10 and 5, viz. 15, *ſubſtracting* 6, I find 9 tens remaining, to be put down under the line. Proceeding to the place of hundreds, 2 with the 1 borrowed at the laſt, make 3, which *ſubſtracted* from 4, leave 1.

Again, 5, in the place of thouſands, cannot be *ſubſtracted* from 3; for which reaſon, taking 1 from 4, in the place of hundreds of thouſands, into the empty place of tens of thouſands, the cipher is converted into 10 tens of thouſands; whence one 10 being borrowed, and added to the 3, and from the ſum 13 thouſand, 5 thouſand being *ſubſtracted*, we ſhall have 8 thouſand to enter under the line; then *ſubſtracting* 6 tens of thouſands from 9, there remain 3. Coming now to take 8 from 4; from the 8 farther on the left, I borrow 1, by means whereof, the two ciphers will be turned each into 9. And after the like manner is the reſt of the *ſubſtraction* eaſily performed.

If heterogeneous numbers be to be *ſubſtracted* from each other, the units borrowed are not to be equal to ten, but to ſo many as there go of units of the leſs kind, to conſtitute an unit of the greater: for example:

l.	*s.*	*d.*
45	16	6
27	19	9
17	16	9

For ſince 9 pence cannot be *ſubſtracted* from 6 pence; of the 16 ſhillings, one is converted into 12 pence; by which means, for 6 we have 18 pence; whence 9 being *ſubſtracted*, there remain 9. In like manner, as 19 ſhillings cannot be *ſubſtracted* from the remaining 16; one of the 45 pounds is converted into 20 ſhillings, from which, added to the 15, 16 being *ſubſtracted*, the remainder is 16 ſhillings. Laſtly, 27 pounds *ſubſtracted* from 44 pounds, there remains 17.

If a greater number be required to be *ſubſtracted* from a leſs, it is evident the thing is impoſſible. The leſs number, therefore, in that caſe, is to be *ſubſtracted* from the greater; and the defect to be noted by the negative character. E. gr. If am required to pay 8 pounds, and am only maſter of 3, when the 3 are paid, there will ſtill remain 5 behind, which are to be noted,—5.

Subſtraction is to be proved by adding the remainder to the ſubtrahend, or number to be *ſubſtracted*: for if the ſum be equal to the number whence the other is to be *ſubſtracted*, the *ſubſtraction* is juſtly performed. For example:

		l.	*s.*	*d.*	
9800403459		156	11	$3\frac{1}{4}$	
4743865263	ſubtrahend	21	17	$2\frac{1}{2}$	ſubtrahend
5056538196	remainder	134	14	$0\frac{3}{4}$	
9800403459		156	11	$3\frac{1}{4}$	

SUBSTRACTION, in *Algebra*, is performed by connecting the quantities with all the ſigns of the ſubtrahend changed; and at the ſame time uniting ſuch as may be united; as is done in ADDITION.

Thus $+7a$ *ſubſtracted* from $+9a$, makes $+9a-7a$, or $2a$.

In the *ſubſtraction* of compound algebraic quantities; the characters of the ſubtrahend are to be changed into the contrary ones, viz. + into −; and − into +.

As the addition of algebraic quantities includes three caſes, viz. 1. the addition of like quantities with like ſigns, for which the rule is to add the co-efficients, to prefix the common ſign to their ſum, and to ſubjoin the common letter or letters: 2. The addition of quantities that are like with unlike ſigns, for which the rule is to ſubſtract the leſs co-efficient from the greater, to prefix the ſign of the greater to the remainder, and to ſubjoin the common letter or letters: and 3. The addition of quantities that are unlike, for which ſet them all down after one another, with their ſigns and co-efficients prefixed: the general rule for *ſubſtraction*, comprehending all the caſes that occur, is, change the ſigns of the quantity to be ſubſtracted into their contrary ſigns, and then add it ſo changed to the quantity from which it was to be ſubſtracted; the ſum ariſing by this addition is the remainder, becauſe, to ſubſtract any quantity, either poſitive or negative, is the ſame as to add the oppoſite kind.

From	$+5a$
Subtract	$+3a$
Rem.	$5a-3a$ or $2a$.

From	$+5a$
Subtract	$-3a$
Rem.	$+5a+3a=8a$.

From	$-5a$
Subtract	$+3a$
Rem.	$-5a-3a=-8a$.

From	$-5a$
Subtract	$-3a$
Rem.	$-5a+3a=-2a$.

From	$2a-3x+5y-6$
Subtract	$6a+4x+5y+4$
Rem.	$-4a-7x$ .. $0-10$.

Macl. Alg. part i. chap. ii. and iii.

SUBSTRACTION *of logarithms*. See LOGARITHMS.

SUBSTRACTION *of vulgar fractions*. See FRACTIONS.

SUBSTRACTION *of decimals*. See DECIMALS.

SUBSTRUCTION, in *Building*, denotes underpinning, ground-ſelling, &c. See FOUNDATION.

SUBSTYLE, or SUBSTYLAR *line*, in *Dialling*, a right line, whereon the ſtyle or gnomon of a dial is erected.

The angle included between this line and the ſtyle is called the elevation or height of the STYLE.

In polar, horizontal, meridional, and northern dials, the *ſubſtylar* line is the meridional line, or line of 12 o' clock; or interſection of a plane, whereon the dial is delineated, with that of the meridian.

In all declining *dials* the *ſubſtyle* makes an angle with the hour line of XII. and this angle is called the diſtance of the *ſubſtyle* from the meridian.

In eaſterly and weſterly dials, the *ſubſtylar* line is the line of 6 o'clock, or the interſection of the plane, whereon the dial is delineated, with the prime vertical.

SUBSUPERPARTICULAR. } See RATIO.
SUBSUPERPARTIENS. }

SUBTANGENT *of a curve*, the line that determines the inter-

intersection of a tangent with the axis; or that determines the point wherein the tangent cuts the axis, prolonged.

Thus, in the curve A M, &c. (*Tab. Anal. fig.* 10.) the line T P intercepted between the semiordinate P M, and the tangent T M, is the *subtangent.* And P R is to P M, as P M to P T; and P M to P T, as M R to T M. See SUBNORMAL.

It is a rule in all equations, that if the value of the *subtangent* comes out positive, the point of intersection of the tangent and axis falls on that side of the ordinate, where the vertex of the curve lies, as in the parabola and paraboloids.

If it come out negative, the point of intersection will fall on the contrary side of the ordinate, in respect of the vertex or beginning of the abscis; as in the hyperbola and hyperboliform figures.

And universally, in all paraboliform and hyperboliform figures, the *subtangent* is equal to the exponent of the power of the ordinate, multiplied into the abscis: thus, in the common parabola, whose property is $px = yy$; the *subtangent* is in length equal to x, the abscis multiplied by 2, the exponent of the power of yy, the square of the ordinate; that is, it is equal to twice the abscis; and by the former rule for paraboliform figures, it must be taken above the ordinate in the axis produced.

Thus, also, in one of the cubical paraboloids, where $pxx = yyy$; the length of the *subtangent* will be $\frac{2}{3}$ of the abscis: and in a parabola of any kind, the general equation being $a^m x^n = + y^{m+n}$, the *subtangent* is $= \frac{m+n}{n} \times x$, or its ratio to the abscis is constantly that of $m+n$ to n. See *Method of* TANGENTS.

In the parabola, the *subtangent* P T is double the abscis A P; and the subnormal is P R subduple of the parameter.

SUBTENSE, formed from *sub*, *under*, and *tendo*, *I stretch*, in *Geometry*, a right line opposite to an angle, and presumed to be drawn between the two extremities of the arch which measures that angle.

The *subtense* of the angle coincides with the chord of the arch.

In every right-angled triangle, the square of the *subtense* of the right angle is equal to the squares of the *subtenses* of both the other angles, by the 47th prop. of Euclid. See HYPOTHENUSE and TRIANGLE.

SUBTERRANEOUS, or SUBTERRANEAN, something underground.

Naturalists talk much of *subterranean* fires, as the cause of volcanos; and *subterranean* winds, as the cause of earthquakes.

Among the many places where *subterranean* fires are found, England is not wholly without them; though with us they appear only in the coal countries, and plainly feed on nothing but the upper stratum of the coal, called by the miners *day coal*, unless where they have by accidents been kindled by actual fires at great depths, or fired downward, by being pent in for room. See VOLCANO.

We have an account, in the Philosophical Transactions, of a *subterranean* town found at Portici, near Naples, in which many antique statues, paintings, and other curiosities, have been found.

This *subterranean* town is probably the ancient city of Herculaneum, which was swallowed up by an earthquake. See Phil. Trans. N° 458, sect. 4, 5, and 6.

It is remarkable, that some of the antique paintings found there are as fresh and perfect, as if lately painted. Ibid. sect. 6.

SUBTILE, in *Physics*, intimates a thing exceedingly small, fine, and delicate: such as the animal spirits, the effluvia of odorous bodies, &c. are supposed to be.

One kind of matter is only more *subtile* than another, in that, being divided into smaller parts, and those, too, more agitated; on the one hand, it makes less resistance to other bodies; and, on the other, insinuates itself more easily into their pores.

The Cartesians suppose a *subtile* matter for their first ELEMENT. See CARTESIAN, and MATERIA *subtilis*.

SUBTILIZATION, *subtilizatio*, the act of subtilizing, or rendering any thing smaller and subtiler; particularly, the dissolving or changing a mixt body into a pure liquor, or a fine powder, by separating the grosser parts therefrom.

SUBTRACTION. See SUBSTRACTION.

SUBTRACTION *of conjugal rights*, in *Law*, is where either the husband or wife lives separate from the other without sufficient reason; in which case the ecclesiastical jurisdiction, on a suit for restitution of conjugal rights, will compel them to come together again, if either party be weak enough to desire it, contrary to the inclination of the other.

SUBTRACTION *of legacies*, in *Law*, denotes the with-holding or detaining of legacies, for which the spiritual court administers redress, by compelling the executor to pay them. But in this case, the courts of equity exercise a concurrent jurisdiction with the ecclesiastical courts, as incident to some other species of relief prayed by the complainant; as to compel the executor to account for the testator's effects, or assent to the legacy, or the like.

SUBTRACTION *with regard to real property*, in *Law*, is an injury which happens, when any person, who owes any suit, duty, custom, or service, to another, withdraws or neglects to perform it. It differs from a DISSEISIN, in that *this* is committed without any denial of the right, consisting merely in non-performance; *that* strikes at the very title of the party injured, and amounts to an OUSTER or actual dispossession. *Subtraction*, however, being clearly an injury, is remediable by due course of law; but the remedy differs according to the nature of the services; whether they be due by virtue of any tenure, or by custom only. Black. Comm. vol. iii. p. 230, &c.

SUBTRACTION *of tithes*, in *Law*, is the with-holding of TITHES from the parson or vicar, whether the former be a clergyman or a lay appropriator. In this case, summary and expeditious assistance is given by the statutes of 27 Hen. VIII. cap. 20. and 32 Hen. VIII. cap. 7. which enact, that upon complaint of any contempt or misbehaviour to the ecclesiastical judge by the defendant in any suit for tithes, any privy counsellor, or any two justices of the peace (or in case of disobedience to any definitive sentence, any two justices of the peace) may commit the party to prison without bail or mainprize, till he enters into a recognizance, with sufficient sureties, to give due obedience to the process and sentence of the court. Black. Comm. vol. iii. p. 88. 102.

SUBTRIPLE *ratio.* See RATIO.

SUBVERSIO *stomachi*, a term used by some authors to express a violent vomiting, when what should pass through the intestines is voided constantly by the mouth.

SUBULARE *folium*, among *Botanists.* See LEAF.

SUBULARIA, *rough-leaved alysson*, in *Botany*, a genus of the *tetradynamia siliculosa* class. Its characters are, that the pericarpium is an entire, ovated, small pod, with concave ovated valves; and the style is also a shorter small pod. There is only one species.

SUBULATED *leaf*, among *Botanists.* See LEAF.

SUBULO, a term used by Pliny for two years old. See FERULÆ.

SUBULO, in *Natural History*, a word used by the ancients to express a deer, or stag, at that time of its life when the horns first begin to appear.

Others have understood it as the name of the oryx, whose horn was narrow at the summit, and thence gradually larger toward the base, so that it resembled the figure of the subula. This is the fabulous creature called the *unicorn*, and described as a nimble and terrible animal. But it is certain that no such animal ever existed, as is called by this name, and thus described: the only one-horned animal in the world is the rhinoceros, and this is an unwieldy heavy animal, not at all resembling the characters or figures we have of the *subulo*, or oryx.

It is to be observed, that the *subulo* of the most ancient writers was an instrument of iron, sharp at the point, used in the stone-quarries to break way through large masses.

SUBURBICARY, *suburbicarius*, formed from *sub*, *under*, and *urbs*, *city*, an epithet given to those provinces of Italy, &c. which composed the ancient diocese, or patriarchate, of Rome. They were also sometimes called *urbicary* provinces.

Authors usually reckon ten of these *suburbicary* provinces; whereof Italy, from the Po to the heel, made seven; and the isles of Sicily, Sardinia, and Corsica, the other three.

Yet Salmasius will have the *suburbicary* provinces confined to those four in the neighbourhood of Rome, to which the authority of the prefect of Rome extended; and these he makes the limits of the DIOCESE of ancient Rome.

F. Sirmond takes the other extreme, and comprehends all the West under the name of *suburbicary* provinces. Rufinus, who lived in the age of the council of Nice, explains the power ascribed to the pope, in the sixth canon of that council, by saying, that he had the care and superintendence of the *suburbicary* provinces. Hence the different sentiments of authors, with regard to the *suburbicary* provinces; some only considering the pope as bishop of Rome; others, as patriarch of the West, &c.

SUCCEDANEUM, formed from *succedo*, *to succeed*, in *Pharmacy*, a remedy substituted in the place of another first prescribed, when the ingredients are wanting, necessary for the composition of that other.

Substitute and *succedaneum*, are of equal import; unless, with

with some authors, we choose to use substitute, where a simple of like virtue is put for another; and *succedaneum*, where a compound is used with the same intention for another compound.

SUCCENTURIATI *renes*, in *Anatomy*. See RENES *succenturiati*.

SUCCENTURIATION, the act of substituting. See SUBSTITUTION.

SUCCENTURIATUS, in *Anatomy*, a muscle, called also PYRAMIDALIS.

SUCCESSION, *successio*, in *Philosophy*, an idea which we get by reflecting on that train of ideas constantly following one another in our minds when awake.

The distance between any parts of this *succession*, is what we call DURATION. When this *succession* of ideas ceases, we have no perception of time, or of the duration thereof; but the moment we fall asleep, and that wherein we awake, seem connected.

They who think we get the idea of *succession* from our observation of motion by our senses, will come into Mr. Locke's sentiment above, when they consider, that motion produces an idea of *succession* no otherwise, than by producing a continual train of distinguishable ideas.

A man that looks on a body moving, perceives no motion, unless that motion produces a constant train of successive ideas. But wherever a man is, though all things be at rest about him, if he thinks, he will be conscious of *succession*.

SUCCESSION, in *Astronomy*. The *succession of the signs*, is the order wherein they follow each other, and according to which the sun enters, successively, into one, then into another; called, also, *consequentia*.

This order is expressed in the two following technical verses:

Sunt Aries, Taurus, Gemini, Cancer, Leo, Virgo,
Libraque, Scorpius, Arcitenens, Caper, Amphora, Pisces.

When a planet is direct, it is said to go according to the order and *succession of the signs*, or *in consequentia*; that is, from Aries to Taurus, &c. When retrograde, it is said to go contrary to the *succession of the signs*, or *in antecedentia*; viz. from Gemini to Taurus, then to Aries, &c.

SUCCESSION, in the *Civil Law*, implies a right to the whole effects left by a defunct.

Of this there are several kinds, *ab-intestate*, *intestate*, &c.

SUCCESSION *ab-intestate*, is that which a person has a right to by being next of kin, which is, what we call, being *next heir at law*. See INTESTATE.

The statute of distributions bears some resemblance to the Roman laws of succession *ab intestato*; the general rule of which *succession* was this. 1. The children, or lineal descendants, in equal portions. 2. On failure of these, the parents, or lineal descendants, and with them the brethren or sisters of the whole blood: or, if the parents were dead, all the brethren and sisters, together with the representatives of a brother or sister deceased. 3. The next collateral relations in equal degree. 4. The husband or wife of the deceased. Black. Comm. vol. ii. p. 516.

SUCCESSION, *testamentary*, is that which a person comes to by virtue of a will.

SUCCESSION *in the direct line*, is that coming from ascendants or descendants. See LINE.

SUCCESSION, *collateral*, is that coming by uncles, aunts, or other collaterals. See COLLATERAL.

SUCCESSION, *adjacent*, or *abandoned*, is a burdensome or vexatious one, which nobody will accept of.

There is no real *succession* in benefices; for, here, nobody inherits.

In effects that cannot be divided, as kingdoms, &c. the *succession* falls on a single head; which is usually the eldest son of the deceased, as being supposed the indivisible representative of his father.

In effects that are divided, all the children represent their father. It was on this principle, M. Courtin observes, that each of the sons of Jacob had his share assigned him in the Land of Promise. It is true, Manasseh and Ephraim, the two sons of Joseph, had likewise their shares; but this was because a double portion had been allotted their father, wherein he was treated as elder brother, in consideration of the great services he had done his father and brethren.

SUCCESSION *to the crown*. See CROWN.

SUCCESSIVE *action*. See ACTION.

SUCCESSOR, a person who holds the place which another held before him; whether he arrived at it by election, collation, inheritance, or otherwise.

The king of the Romans is presumptive *successor* to the empire.

The canonists say, a coadjutor is a necessary *successor* to a prelature; a resignee to the resignant.

Civilians say, a titular usufructuary can do nothing to the prejudice of his *successor*.

SUCCIFERA *vasa*, in *Natural History*, a name given by those who have written of the anatomy of plants, to those vessels which contain the juices, by way of distinction from those which only give passage to the air, and are called *tracheæ*. Leewenhoek tells us, that the microscope discovers the *succiferous* vessels of plants to be, in all respects, analogous to those of animals, and that they are of two kinds, veins and arteries: the latter receiving the juices from the root, and carrying them all over the plant; and the others receiving the juice from their extremities, and carrying it back again to the root, where it is again delivered to the arteries. See *Anatomy of* PLANTS.

SUCCINUM, in *Pharmacy*. See AMBER.

SUCCISA, a medicinal alexipharmic herb; called also *morsus diaboli*, or the *devil's bit*. See SCABIOUS.

It is a powerful sudorific, insomuch that sir Theodore Mayerne observes, in the Philosophical Transactions, laying a person sick of a plague, or other malignant fever, on a bed thereof, moderately hot, he shall sweat till they take him off; and much more, if he drink of the decoction or juice of the same herb. But, with all these supposed virtues, the *succisa* is now little used.

SUCCORY, in *Botany*. See ENDIVE.

SUCCORY, *gum*, *chondrilla*, in *Botany*. See GUM-*succory*.

SUCCOTRINE *aloes*. See ALOES.

SUCCOUR, in the *Military Art*, denotes assistance for relieving a place, that is, raising the siege and forcing the enemy from it.

SUCCUBUS, or SUCCUBA, a term used by some visionary writers to signify a *demon*, or spirit, who assumes the shape of a woman, and, as such, lies with a man.

Some authors use INCUBUS and *succubus* indiscriminately; but they ought to be distinguished; *incubus* being only properly used, where the demon is supposed to be in form of a man, and, as such, lies with a woman.

SUCCULA, in *Mechanics*, an axis, or cylinder, with staves in it to move it round; but without any tympanum, or peritrochium.

SUCCULENT *plants*, among *Botanists*, such whose leaves are thick and full of juice.

SUCCUS *pancreaticus*. See PANCREATIC *juice*.

SUCCUS *nervosus*. See NERVOUS *juice*.

SUCKERS, *off-sets*, in *Agriculture* and *Gardening*, young shoots proceeding from the root of a tree; being of the same kind with the tree from which they spring; because such as grow from trees raised by grafting or inoculation, follow the nature of the stock.

They sometimes spring forth near the body of the mother-plant; but other *suckers* at a greater distance from it are better: yet the former, removed when there is least sap in the top, and preserving what fibrous roots are upon them, often prosper.

When they are taken up, the ground is to be well opened; and if they grow from the body of the tree, or great roots, they must be cut off close to the stem, and set presently. See STOCK.

It forwards much the springing out of *suckers*, to bare the roots of trees, and slip them in some places.

SUCKER, or SUCK-*fish*, in *Ichthyology*. See REMORA.

SUCKER, in *Ichthyology*, is also a name given to the LUMP-*fish*.

SUCKER, *bimaculated*, in *Ichthyology*, is a new species of *sucker* discovered near Weymouth, and described by Mr. Pennant. Its head is flat and tumid on each side; the body taper; the pectoral fins placed unusually high; it has only one dorsal fin, placed near the tail; the tail is even at the end; the colour of the head and body is a fine pink, that of the fins whitish; on each side of the belly is a round black spot.

SUCKER, *stone*, the English name of a genus of fish. See PETROMYZON.

SUCKER, *unctuous*, in *Ichthyology*. See LIPARIS.

SUCKER, *goat*, *caprimulgus*, in *Ornithology*, a genus of the order of *passeres* in the Linnæan system. Its characters are, that the beak is a little hooked, very small, awl-shaped, and fluted at the base; the mouth very wide, with several stiff bristles on the edges of the upper part, and the tongue acute and entire. Linnæus enumerates two species, viz. the European and American. This genus, in its characters, resembles the swallow, whence Klein has ranked the common goat-*sucker* among the swallows, calling it the *swallow with an undivided tail*. See *Churn*-OWL.

SUCKING-*pump*. See PUMP.

SUCTION, SUCTIO, the act of sucking, or of drawing up a fluid, as air, water, or the like, by the mouth and lungs. Air is sucked in at the mouth, by the muscles of the thorax and abdomen distending the cavity of the lungs and abdomen, by which means the air included therein is rarefied, and ceases to be a counterbalance to

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the external air, which, of consequence, is driven in by the pressure of the atmosphere through the mouth and nostrils. See Respiration.

Air is sucked through a pipe, in the same manner as with the naked mouth; it being here the same as if the mouth were extended the length of the pipe.

The *suction* of heavier liquors is performed after the same manner, e. gr. in lying prone to drink out of a spring, &c. the lips are applied close to the surface of the water, so as to prevent any passage of the air between them; then the cavity of the abdomen, &c. being distended as before, the pressure of the air incumbent on the surface of the water without the circumference of the mouth prevailing over that upon the water within the same, the fluid is raised, from the same principle as water in a pump.

In sucking a heavy liquor, as water, through a pipe, the longer the pipe is, the greater difficulty is found in the *suction*; and the bigness or diameter of the pipe makes a farther alteration therein. The reason of this arises from that great principle in hydrostatics, that fluids press in the compound ratio of the bases, and perpendicular altitudes.

From what we have said, it evidently enough appears, that what we call *suction*, is not performed by any active faculty in the mouth, lungs, &c. but is performed by the mere impulse and pressure of the atmosphere.

A very curious and intelligent person distinguishes two different sorts of *suction* performed after two quite different manners; a distinction which, however hitherto overlooked by authors, seems absolutely necessary.

Suction, then, according to him, is performed either, 1°, By the dilatation of the thorax; or, 2°, By that of the cavity of the mouth.

In the former case, the lungs are kept continually distended; for if the breath be let go ever so little, the liquor in the tube will begin to subside.

On the contrary, when *suction* is performed by enlarging the cavity of the mouth, we may suck with our utmost force, and yet breathe freely through the nostrils at the same time. This is the true and proper *suction*; the other ought rather to be called *supping* than sucking through a tube.

Note, The cavity of the mouth is enlarged by being a little opened, while the lips are close shut, the tongue being at the same time contracted, and drawn backwards towards the throat.

SUCU, in *Botany*, a species of apple-tree, said to be frequent in the province of Canton in China. The fruit is dried like figs to be kept all the year, and is brought into Europe. It is somewhat larger than our apple, almost round, and of a reddish colour, or sometimes green. When it is dry, it has a crust resembling honey or sugar.

SUCULA, in *Mechanics*. See Succula.

SUDAMINA, little heat-pimples in the skin, like millet-grains, frequent in youth; especially those of an hot temperament, and that use much exercise.

SUDARIUM, in *Ecclesiastical Writers*, the same with brandeum.

SUDATORY, Sudatorium, a name given by the ancient Romans to their hot or sweating-rooms; sometimes also called *laconica*.

The *sudatory* was a species of their hypocausta or stoves. See Hypocaustum. See also Sweating-*house*.

SUDIS, Esox *sphyræna* of Linnæus, in *Ichthyology*, a name used by most authors for the sea-pike, a fish called by others *lucius marinus*, and *sphyræna*. See *Tab.* V. of *Fish*, N° 53.

It in some degree resembles the common river-pike, but is thinner in proportion to its length, and in some degree approaches to the *acus*, or tobacco-pipe-fish, in that particular. Its scales are small, and its nose long, and of a conic form, the under jaw running out a good way beyond the upper, and ending in a sharp point; its mouth is very wide and yellow within; its tongue large and narrow, and armed with small sharp teeth; each of the jaws is furnished with a single row of large and sharp teeth, and in the middle of the lower jaw is one tooth longer than the rest, which has a hollow in the upper jaw for receiving it; it has two fins on the back, which are both very deeply forked. It is caught in the Mediterranean, and usually swims in shoals together. Its usual length is ten or twelve inches; and it is esteemed a very well tasted fish. Ray.

SUDOR, in *Medicine*. See Sweat.

Sudor *Anglicanus*, the *English sweat*. See Sweating Sickness.

SUDORIFIC, in *Medicine*, a remedy that causes or promotes sweat.

Sudorifics only differ from diaphoretics in the degree of their action; the one promoting sensible perspiration, the other insensible.

To the class of *sudorifics* belong, 1°, All things that, moving violently through the body, attenuate the humours, and accelerate their motion.

2°, Such things, as at the same time diminish the resistance in the sudatory vessels about the cutis.

To which some add a third kind; viz. such as absorb the acidities of the blood, and thus set at liberty the matter of the sweat.

The first intention is chiefly effected by a copious drinking of very hot waters; by acids drawn from vegetables by fermentation and distillation; or those of fossils attenuated by repeated distillations, especially if these be drunk mixed with hot water; by alkalis both volatile and fixt, diluted with hot water; by all compound salts dissolved in water; by sapas, metallic crystals, or the attenuated parts of metals themselves, as stibium diaphoreticum, fixt sulphur of Tachenius, bezoardic mineral, diaphoretic mercury, diaphoretic gold, &c. by sharp, subtile, acrimonious aromatics, as absynthium, abrotonum, opium, asparagus, anise, asclepias, aristolochia, gum ammoniac, carduus benedictus, caraways, cinnamon, camomile, saffron, capillus veneris, china, dittany, eupatorium, gentian, hyssop, laurel, mint, leeks, rosemary, sage, savin, sassafras, scordium, thyme, veronica, nettle, and other medicines compounded of these and the like, as venice-treacle, mithridate, diascordium, orvietan, &c. The second is chiefly effected by cleansing the skin, by vaporous lotions, baths, and frictions; by relaxing the cutaneous and subcutaneous vessels, which is best done by hot water sprinkled all over the body, the head excepted; by increasing the external heat about the naked body, as by the warmth of a bed, a vapour bath, &c.

The third is effected by absorbents; as corals, crabs-eyes, diaphoretic antimony, bezoar, &c. See each under its proper article.

Sudorifics, if taken in time, are the best medicines for preventing inflammatory and feverish disorders of all kinds. Sir John Pringle condemns the use of treacle, given with this intention, on account of its heating quality. However, he observes, that it is rendered more *sudorific* and less narcotic, by adding ten grains of salt of hartshorn to a common dose, and promoting the sweat by a large draught of vinegar-whey. Instead of this composition, two scruples of salt of hartshorn, saturated with about three spoonfuls of common vinegar, may be given at bedtime. Pringle's Obs. on the Diseases of the Army, p. 131.

A safe, easy, and effectual *sudorific*, may be prepared in the following manner. Take an ounce of refined camphor, beat it in a marble mortar with two ounces of blanched almonds, till it be reduced to a smooth and even paste. This may be formed into pills, or boluses, and given, according to the strength of the patient, and other considerations, from three grains to forty.

Sudorific, perspirative, and alexipharmic medicines, make a large part of the common dispensatories. A few medicines, well chosen, might supply the place of all these; and of these one principal one would prove to be camphor, which trial will always shew to be greatly superior to bezoar, Gascoign's powder, lapis contrayerva, and the like. Shaw's Lectures, p. 227.

SVEGLIATO, in the *Italian Music*, is used for a brisk, lively, gay manner of singing or playing. Thus they say *maniera svegliata*.

SUET, Sevum, a kind of fat, found in deer, sheep, oxen, hogs, &c. which, melted down and clarified, makes what we call tallow, used in the making of candles.

The word is formed from the Latin, *suedum*, *sebum*, or *sevum*, which signify the same; and these *a sue*, by reason of the fatness of that beast.

Anatomists, &c. distinguish four kinds of fat in the body of an animal. The first, which fixes itself, and, after melting, cools into a very firm consistence, they call *suet*. It is found in greatest abundance in the lower belly, and about the kidneys. See Adeps and Fat.

F. le Comte mentions a tree in China, that bears a kind of *suet* or tallow. See Tallow-*tree*.

SUETA, in *Ichthyology*, a name given by Bellonius, and some other writers, to the nasus, a species of cyprinus, according to the Artedian and Linnæan systems, and distinguished by the name of the *cyprinus nasus*, with the snout standing prominent, in form of a nose, and with fourteen rays in the pinna ani.

SUFFERANCE, in *Ancient Customs*, a delay or respite of time, which the lord granted his vassal, for the performance of fealty and homage, so as to secure him from any feodal seizure.

Sufferance, say the customs, is equivalent to fealty and homage, while it holds.

The word is also used for a delay which the lord grants his vassals, to quit their hands of fees or inheritances they have acquired, till they have paid the due of indemnity, &c.

Sufferance, *bill of.* See Bill.

Sufferance, *eſtate at,* in *Law*, is where one comes into poſſeſſion of land by lawful title, but keeps it afterwards without any title at all. As if a man takes a leaſe for a year, and after the year is expired, continues to hold the premiſes without any freſh leave from the owner of the eſtate. Or, if a man maketh a leaſe at will and dies, the eſtate at will is thereby determined; but if the tenant continueth poſſeſſion, he is tenant at *ſufferance.* This eſtate, in the caſe of a ſubject, may be deſtroyed, whenever the true owner ſhall make an actual entry on the lands and ouſt the tenant; for, before entry, he cannot maintain an action of treſpaſs againſt the tenant by *ſufferance*, as he might againſt a ſtranger; becauſe the tenant being once in by a lawful title, the law will ſuppoſe him to continue upon a title equally lawful; unleſs the owner of the land by ſome public and avowed act, ſuch as entry, will declare his continuance to be tortious or wrongful. Thus ſtands the law, with regard to tenants by *ſufferance*; and landlords are obliged in thoſe caſes to make formal entries upon their lands, and recover poſſeſſion by the legal proceſs of ejectment; and, at the utmoſt, by the common law, the tenant was bound to account for the profits of the land ſo by him detained: but now, by 4 Geo. II. c. 28. in caſe any tenant for life or years, or other perſon claiming under, or by colluſion with ſuch tenant, ſhall wilfully hold over after the determination of the term, and demand made in writing for recovering the poſſeſſion of the premiſes, by him to whom the remainder or reverſion thereof ſhall belong; ſuch perſon, ſo holding over, ſhall pay, for the time he continues, at the rate of double the yearly value of the lands ſo detained. This has almoſt put an end to the practice of tenancy by *ſufferance*, unleſs with the tacit conſent of the owner of the tenement. Bl. Com. vol. ii. p. 150. See Ejectione *firmæ.*

SUFFIBULUM, among the Romans, a name given to the prætexta of the pontiffs, and palla of the Veſtal virgins.

SUFFIMENTA, *fumigations*, in *Pharmacy.* See Fumigation.

SUFFITION, *ſuffitio*, among the Romans, a kind of luſtration, practiſed by perſons who had attended a funeral; it was performed by walking over fire, and being ſprinkled with water.

SUFFITUS, Suffiment, or Suffumigation, in *Medicine*, a thickiſh powder, prepared of odoriferous plants, gums, &c. which being thrown on coals, the vapours or *ſteam* thereof are received by ſmelling. See Perfumes.

SUFFOCATION, Suffocatio, in *Medicine*, a privation or obſtruction of reſpiration.

Suffocation ſometimes ariſes from a too great abundance of blood thrown on the lungs, or the muſcles of the larynx, and preventing the ingreſs of the air; as is the caſe in quinzies, ſuffocating catarrhs, peripneumonies, &c.

The fumes of wines, or ſtrong beers, when boiling, cauſe *ſuffocation*, by interrupting the circulation of the blood. And the ſame may be obſerved of the fumes of lime, wherewith walls are whitened; and thoſe of charcoal, antimony, ſulphur, vitriol, and ſpirit of nitre.

The *ſuffocation* under water is owing partly to the paſſage of air being ſtopped up, and partly to the irruption of the water into the breaſt.

In France they diſpatch their people that are raving mad by *ſuffocating* them between two pillows: the ſame has been alſo ſometimes practiſed here in caſes of hydrophobiæ, &c.

Suffocation *of the womb*, or *matrix*, is a diſeaſe pretty frequent in women, called alſo *fits of the mother.* In this, the patient imagines a malignant vapour riſing from the matrix, and ſo preſſing againſt the lungs and the diaphragm, as to prevent the free motion neceſſary to reſpiration.

Its true cauſe is a convulſion of the muſcles of the larynx, which ſtreighten the wind-pipe, and prevent the air's paſſing into the lungs. Hence it is, that hyſteric women feel conſtrictions in the throat, as if one were ſtrangling them with a cord. See Hysteric *affection.*

SUFFOCATIO *ſtridula.* See Croup.

SUFFOCATIVE *catarrh.* See Catarrh.

SUFFOLK *powder*, the name of a medicinal powder, good for the bite of a mad dog. It had its name from a Counteſs of Suffolk, who uſed to give it with great ſucceſs. It is ſtill kept as a ſecret in ſome private families, but ſeems to be only the ſtar of the earth, or the common buckſhorn plantain dried and powdered, or this powder with ſome very trifling addition. This plant has been famous for its virtues in this caſe a great while among us, and De Grey, in his Complete Farrier, gives the method by which he had cured dogs by it with great ſucceſs. See Phil. Tranſ. N° 450, p. 455.

SUFFRAGAN, Suffraganeus, in the *Eccleſiaſtical Polity*, a term applied (but not very properly) to a biſhop, with reſpect to his archbiſhop, on whom he depends, and to whom appeals lie from the biſhop's official.

In this ſenſe, the archbiſhop of Canterbury has twenty-one *ſuffragans*, and the archbiſhop of York four.

The term was never heard of before the eighth century. Some derive it hence, that the biſhops are to help and aſſiſt the archbiſhop; *quia archiepiſcopo* ſuffragari & *aſſiſtere tenentur.* Others ſay, it is becauſe eccleſiaſtical matters are determined by their votes, or ſuffrages; & ſuffraganei *dicuntur, quia eorum* ſuffragiis *cauſa eccleſiaſticæ judicantur.* Others hold, they are called *ſuffragans*, becauſe, when called by the metropolitan to a ſynod, they have a right of ſuffrage, or of voting; or becauſe they could not be conſecrated without his ſuffrage or conſent.

Suffragan is alſo more properly uſed for a chorepiscopus, or an aſſiſtant biſhop, or coadjutor, who has a title *in partibus infidelium*, and aſſiſts another in the diſcharge of his function, or diſcharges it himſelf in the abſence of that other. They were conſecrated, like other biſhops, by the archbiſhop of the province, and appointed as titular biſhops, to execute ſuch power and authority, and to receive ſuch profits as were limited in their commiſſions by the biſhops or dioceſans, whoſe *ſuffragans* they were; and whom they aſſiſted in duties merely epiſcopal, as the conferring of orders, confirmation, and conſecrations of divers kinds: and in this reſpect, it is ſaid, they differed from the coadjutors who aſſiſted their biſhops in matters chiefly of juriſdiction, as in collating to benefices, granting inſtitutions, diſpenſations, and the like, and who for theſe purpoſes need not have been epiſcopally ordained. This was the practice here in England eſpecially: the two ends of orders, and of juriſdiction voluntary, in caſe of the inability of a biſhop, were anſwered by two different perſons; the firſt under the name of *ſuffragans*, and the ſecond under that of coadjutor.

Theſe *ſuffragans* are by ſome alſo called *ſubſidiary biſhops.*

By ſtatute 26 Henry VIII. c. 14. every archbiſhop or biſhop, diſpoſed to have any *ſuffragan*, is allowed to name two proper perſons, and to preſent them to the king; who was impowered to give to one of them the title, ſtyle, and dignity of biſhop of ſuch of the ſees as are mentioned in the ſtatute, as he thought fit: and every ſuch perſon ſhould be called biſhop *ſuffragan* of the ſame ſee, and be conſecrated accordingly. This act ſpecifies the places for which ſuch *ſuffragans* were to be nominated, and fixes the place of their reſpective reſidence. Their profits and juriſdiction were to be limited by the commiſſion of the archbiſhop, or biſhop, to whom they were *ſuffragans*, and the time of the exerciſe of their office was alſo limited by the ſame commiſſion: and they were forbid to exerciſe it otherwiſe than ſuch commiſſion directed, on pain of a premunire. *Suffragans* have now been diſcontinued for many years.

Du-Cange obſerves, that the title *ſuffragan* has alſo been given to ſuch prieſts as are ſubject to the viſitation of the archdeacon: and *ſuffragans of the pope*, to the biſhops of ſuch dioceſes as are immediately ſubject to the pope.

SUFFRAGE, Suffragium, a voice or vote given in an aſſembly, where ſomething is deliberated on, or where a perſon is elected to an office or benefice.

The word is formed from the Latin, *ſuffragium*, which anciently ſignified money, as appears in the eighth novel of Juſtinian; *ut judices ſine* ſuffragio *fiant:* and the ſixth novel, *qui emerit præſulatum per* ſuffragium, *epiſcopatu & ordine eccleſiaſtico excidat.*

Suffrages are ſometimes given by word of mouth; and ſometimes in writing, as at elections liable to a scrutiny.

The preſident or chairman of the aſſembly uſually collects the *ſuffrages.*

Suffrages *of the ſaints*, in the *Romiſh Church*, denote the prayers and interceſſions which the ſaints are ſuppoſed to make to God in behalf of the faithful.

SUFFRUTEX, *under-ſhrub*, among *Botaniſts*, a name given to the loweſt ſort of woody, perennial plants; ſending no leaves from their root, and beginning to be branched from the bottom of the ſtalk. Such are lavender, rue, ſage, &c.

SUFFUMIGATION, Suffumigatio, formed from *ſub*, *under*, and *fumus*, *ſmoke*, in *Medicine*, a term applied to all remedies that are received into the body in form of fumes, i. e. of ſmoke, vapour, or perfume.

Suffumigations are compoſed of different matters according to the nature of the diſeaſe. Their intentions are to ſoften ſharp, ſerous humours, to provoke or check the courſe of the menſes, to raiſe a ſalivation in venereal evils, &c. See Fumigation and Fumigator.

SUFFUSION, Suffusio, in *Medicine*, an overflowing of ſome humour, ſhewing itſelf in the ſkin; particularly that of the blood or bile.

That redness ordinarily arising from shame, is only a *suffusion* of blood appearing in the cheeks. See BLUSHING.

The JAUNDICE is a *suffusion* of bile over the whole body.

SUFFUSION is also used for a little film or pellicle, formed in the aqueous humour of the eye, before the pupil; called also CATARACT.

SUGAR, SACCHARUM, a very sweet, agreeable saline juice, expressed from a kind of canes, or reeds, growing in great plenty in the East and West Indies. See SUGAR-*cane*.

It is a question not yet decided among botanists, &c. whether the ancients were acquainted with this cane, and whether they knew how to express the juice from the same? What we can gather from the arguments advanced on either side is, that if they knew the cane, and juice, they did not know the art of condensing, hardening, and whitening it; and, of consequence, they knew nothing of our *sugar*.

Some ancient authors, indeed, seem to mention *sugar*, under the name of *Indian salt*; but they add, that it oused out of the cane of itself, and there hardened like a gum; and was even friable between the teeth, like our common salt; whereas *sugar* is expressed by a machine on purpose, and coagulated by the fire.

Theirs, Salmasius (Plinianæ Exercit. tom. i. p. 716. G.) tells us, was cooling and loosening; whereas ours, the same author asserts, is hot, and excites thirst. Hence some have imagined, that the ancient and modern *sugar* plants were different: but Matthiolus on Dioscorides, c. 75. makes no doubt they were the same; and others are even of opinion, that ours has a laxative virtue, as well as that of the ancients, and that it purges pituita.

The generality of authors, however, agree, that the ancient *sugar* was much better than the modern; as consisting of only the finest and maturest parts, which made themselves a passage, and were condensed in the air. The interpreters of Avicenna and Serapion call *sugar*, *spodium*; the Persians, *tabaxir*; and the Indians, *mambu*. Salmasius (Com. de Sacchar. apud Plin. Exercit. vol. ii. p. 257. an. Dom. 1689.) assures us, that the Arabs have used the art of making *sugar*, such as we now have it, above nine hundred years.

Others produce the following verses of P. Terentius Varro Atacinus, to prove that it was known before Jesus Christ:

Indica non magna nimis arbore crescit arundo:
Illius e lentis premitur radicibus humor,
Dulcia cui nequeant succo contendere mella.

Dr. William Douglas, in his summary, &c. of the first planting of our American settlements, printed at Boston in 1751, and reprinted at London in 1755, affirms, that *sugar* was not known among the ancient Greeks and Romans, who used only honey for sweetening. Paulus Ægineta, he says, a noted compiler of medical history, and one of the last Greek writers on that subject, about anno 1625, is the first who expresly mentions *sugar*: it was at first called *mel arundinaceum*, *i. e. reed or cane honey*. He adds, that it came originally from China, by way of the East Indies and Arabia into Europe, and was formerly used only in syrups, conserves, and such Arabian medicinal compositions.

Another question among the naturalists is, whether the *sugar*-canes be originally of the West Indies, or whether they have been translated rather from the East?

The learned of these last ages have been much divided on the point; but F. Labat, a Dominican missionary, in a dissertation published in 1722, asserts, that the *sugar*-cane is as natural to America as India; and that the Spaniards and Portuguese first learnt from the orientals the art of expressing its juice, boiling it, and reducing it into *sugar*.

Other writers, however, have maintained, that it was not known in America, till the Europeans transplanted it thither. Its origin appears to have been from the inland continent of Asia, very probably as far east as China, where it still greatly abounds. From that continent it was first transplanted to Cyprus, and thence (according to various authors) into Sicily, where considerable quantities of it were produced about the year 1148, and whither, as some have asserted, it was brought from India by the Saracens. From Sicily it was transplanted by the Portuguese to Madeira about the year 1420, and from Sicily, or the southern coasts of Africa, or as Herrera, the American historian, observes, from Granada, which derived it from Valencia, whither it might have been transplanted by the Arabian Moors, it was brought to the Canaries; from the Canary isles to Brasil; where, indeed, some suppose *sugar* was originally and spontaneously produced. Others are of opinion, that the Portuguese, before they discovered, or at least planted in Brasil, being in possession of the coast of Angola in Africa, first transplanted the *sugar*-cane from Angola to Brasil. About the year 1506, *sugar*-canes were brought from Brasil and the Canaries, and planted in the island of Hispaniola, where many *sugar*-mills were gradually erected. In 1641, they were transplanted from Brasil to Barbadoes, and thence to our other West India isles: as from Brasil they were also caried to the Spanish West India isles, and also the Spanish dominions in Mexico, Peru, and Chili; and lastly to the French, Dutch, and Danish colonies.

The boiling and baking of *sugars*, says Dr. Heylin in his Cosmography, the first edition of which was printed in 1624, as it is now used, is not above two hundred years old; and the refining of it more new than that, first found out by a Venetian in the days of our forefathers, who got one hundred thousand crowns by the invention. Before which art of boiling and refining it, our ancestors made use of it rough as it came from the canes, but they most commonly used honey instead of it. The first account we have of *sugar*-refiners in England is in the year 1659. Anderson's Hist. of Com. vol. i. p. 82. 246. 331. 334. vol. ii. p. 72—105.

SUGAR-*cane*, *saccharum*, in *Botany*, a genus of the *triandria digynia* class. Its characters are these: it hath no empalement, but a woolly down longer than the flower that encloses it; the flower is bivalve; the valves are oblong, acute-pointed, concave, and chaffy; it has three hair-like stamina, the length of the valves, terminated by oblong summits; and an awl-shaped germen, supporting two rough styles, crowned by single stigmas; the germen becomes an oblong acute-pointed seed, invested by the valves.

We have but one species of this genus, which grows naturally in both the Indies, where it is cultivated for its juice, which when boiled affords that sweet salt which is called *sugar*.

Linnæus enumerates two species.

The root of this plant is jointed like those of the other sorts of canes and reeds, from which arise four, five, or more shoots, according to the age or strength of the root; these grow from eight or ten to twenty feet high, according to the richness of the ground; but those of middling growth are the best.

The canes are also jointed, and the length as well as the size of the joints depend upon the weather and the soil; at each joint are placed leaves, the lower part of which embraces the stalk or cane to the next joint above their insertion, before they expand. The first joint, which comes out either at the third, fourth, or fifth month, according to the season and soil, always keeps in its first place near the earth; out of this comes the second, and out of the second a third, &c. each week producing its joint, or very nearly, and a corresponding leaf likewise drying and falling off nearly every week.

A cane of thirty-two joints, which is fit to be cut, has from five to twenty-eight of them which have lost their leaves; the next five or six still have them, in a withered state and ready to fal off; and the remaining joints, surrounded with green leaves, form the head, which is cut off after the last leaf has withered. In a cane, whose length is from seven to nine feet, and which grows in a new or a very moist and favourable soil, the number of useful joints is between forty and fifty, the first above the ground generally appearing at the end of three months, or with frequent showers a fortnight sooner; and many canes in such a soil are found rotten or almost dried up at the end of thirteen months: in a good soil, favourably exposed, well drained, and worked for a number of years, canes not shorter than four feet and a half have thirty-eight or forty joints, the first joint appearing about the fourth or middle of the third month, and many canes that have been cut in such a soil at the end of fourteen or fifteen months being found rotted or dried: in a dry but good soil, not manured, but well worked and seconded by the season, the canes have been from three to four feet long, and have had from thirty to thirty-four joints; the first joint coming out at the end of four or four months and a half, and canes of this kind have been found standing at the end of fifteen months, but very dry, and sometimes a little changed: in a soil which is still drier and more parched, canes which have been about two feet high have had from twenty-four to twenty-eight joints, the first of which appears at the end of the fifth month, and many of these canes have been dried at the end of fifteen months. From these and similar observations on the growth of canes in various kinds of soil, it has been inferred, that if there be any in which they can exist till the fifteenth or sixteenth month, they never grow to any kind of purpose in any after the thirteenth, or even after the twelfth.

A deep soil and light land are most suitable to the *sugar*-*cane*;

cane; and the rainy ſeaſon is the proper time for planting it: the ſooner they are planted after the rains begin to fall, the more time they have to get ſtrength before the dry weather ſets in.

If the ground is proper for the *ſugar-canes*, and they are planted at a good diſtance from each other, and the land is carefully managed by changing the crops to other ſpecies, or allowing a fallow to reſt and recover itſelf, the ſame plantation, ſays Mr. Miller, may be continued above twenty years without replanting, and produce good crops the whole time: whereas in the common method, they are generally replanted in ſix or ſeven years, and in ſome of the poor land they are continued but two or three years. The canes are propagated by cuttings or joints of proper lengths, from fifteen to twenty inches, in proportion to the nearneſs of the joints; which are generally taken from the tops of the canes, juſt below the leaves: but Mr. Miller ſays, that if they were choſen from the lower part, where they are leſs ſucculent and better ripened, they would not produce canes ſo luxuriant, but their juice would be leſs crude, and contain a greater quantity of ſalts, which would be obtained by leſs boiling than that of thoſe commonly planted. However, Mr. Cazaud, a late writer, and a planter of *ſugar-canes*, obſerves, that the upper part, commonly called the head, is the beſt part that can be uſed for propagating them: and he recommends to put the plant in the ground as ſoon as it is cut. The diſtance which the canes are uſually allowed in planting is from three to four feet, row from row; and the hills are about two feet aſunder in the rows, in each of which hills they plant from four to ſeven or eight cuttings: inſtead of which number, productive often of blights, Mr. Miller is of opinion, that if one good cutting were planted in each hill, or two at moſt; and if both ſucceeded, the weakeſt were drawn out ſoon after they had taken, blights would be prevented, and the quantity of *ſugar* would be full as great, and require little more than a fourth part of the fuel to boil it. In the proper ſeaſon for planting, the ground ſhould be marked out by a line, that the rows of canes may be ſtraight and at equal diſtances: and the whole ſhould be divided into pieces of fixty or ſeventy feet broad, leaving intervals between each of about twenty feet, for the convenience of paſſage, and for the admiſſion of the ſun and air between the canes.

The common method of planting the canes now practiſed, is to make a trench with the hoe, which is performed by the hand; into this a negro drops the number of cuttings intended to be planted, which are planted by other negroes, and the earth drawn about the hills with the hoe, all which is performed by the hand: but if the right uſe of the plough was introduced, the work would be both better and cheaper performed. If, therefore, inſtead of a trench drawn by the hoe, a deep furrow is made with a plough, and the cuttings properly planted therein, the ground being deeper ſtirred, will be more favourable to the growth of the canes.

If the ground is afterward to be kept clear by the horſe-hoe, the rows of canes ſhould be five feet aſunder, and the hills be two and a half feet diſtant; and but one cane left in each hill. After they have made ſome ſhoots, the ſooner the horſe-hoe is uſed, the more they will thrive, by keeping the weeds under, and well ſtirring the land.

When the canes are from ſeven to ten feet high, and of proportionable ſize, the ſkin ſmooth, dry, and brittle; if they are heavy, their pith grey or inclinable to brown, the juice ſweet and glutinous; they are eſteemed in perfection.

Mr Cazaud obſerves, that the withering and fall of a leaf is the only and a ſufficient criterion of the maturity of the joint to which it adhered; and that the eight laſt joints of two canes, which are cut the ſame day, have exactly the ſame age and the ſame degree of ripeneſs, notwithſtanding one of the canes may be fifteen, and the other only ten months old: to which purpoſe he adds, that each joint of the cane of a ſuppoſed growth of ten months, contained the ſame quantity of *ſugar* as that of a cane of the ſuppoſed growth of fifteen.

The time for cutting them is uſually after twelve or fifteen months growth, but this varies according to the ſoil and the ſeaſon. Thoſe which are cut toward the end of the dry ſeaſon before the rains begin to fall, produce better *ſugar*, than thoſe cut in the rainy ſeaſons, when they are more replete with watery juice, and require a greater expence of fuel to boil it.

In thoſe plantations where the number of negroes is ſmall, *ſugar* is made in almoſt all ſeaſons indifferently, and conſequently the canes are planted when the planter is beſt prepared for his work, rather than at the moſt advantageous time. The ſyſtem of cultivation among planters, who are better ſupplied in reſpect of labourers, conſiſts in planting a fourth or a fifth of their land in October, November, and December; in digging very deep trenches, for the greater nouriſhment of the root; in planting at great diſtances, for the benefit of a freer circulation of the air; and in cutting the canes in the four fineſt months, viz. February, March, April, and May, becauſe the *ſugar* is then the fineſt, the canes are cut with the leaſt trouble, and ſupply (as is ſuppoſed) greater quantities of it. Thoſe who adopt this method, cut about three fourths of their plantations, the remainder being made up of young canes, to be cut the following year, and for new plants.

Mr. Cazaud, who has made many judicious obſervations and experiments on the cultivation of the *ſugar-cane*, has adopted a new method. He employs the whole of the ſix firſt months of the year in the buſineſs of the crop, and in May and June plants the canes which have been cut in January. This of courſe induces a neceſſity of cutting the rattoons (or the canes proceeding from the old ſtumps) at the end of the eleventh inſtead of the end of the twelfth month, and the planted canes, which ſhould ſtand fifteen months, at the end of the year; ſo that the whole plantation is cut every year; and he only plants a ſixth part of his land every year. He has largely illuſtrated the reaſons and advantages of this method; the fundamental principle of which is the neceſſity of planting the canes in the only ſeaſon fitted to accelerate and preſerve them: as in the windward iſlands, the weather is commonly dry from the fifteenth of February to the fifteenth of May, and the rains are moderate till Auguſt, and copious the two or three following months, and afterwards decreaſe till February: and, therefore, the progreſſion of the rain keeps pace, as it were, with that of the canes, when they are planted in May. With regard to the maturity of the cane, as far it is of conſequence to the *ſugar*, this, he ſays, does not depend on the age but on the ſeaſon. In February, March, and April, all the canes, whatever be their age, are as ripe as the nature of the ſoil ever allows them to be, and accordingly he never fails to make the greateſt part of his *ſugar* at this ſeaſon. He obſerves, that the dryneſs of the weather (and not the age of the canes) which increaſes from January to April, is the cauſe, that in January four hundred gallons of juice commonly yield forty-eight gallons of *ſugar* and molaſſes one with another; in February from fifty-ſix to ſixty-four; in March from ſixty-four to ſeventy-two; in April ſometimes eighty; after which period the *ſugar* ferments, and even burns when the refiner is not very expert at his buſineſs. The greateſt relative maturity of his canes he infers to be, when the juice of them was made up of four parts water, and one part of ſugar and molaſſes: and in canes perfectly ripe, the quantity of *ſugar*, he ſays, is equal to that of the molaſſes. After a trial of this plan for five years, he is convinced, that there is a difference of above one ſixth in its favour. Miller's Gard. Dict. Phil. Tranſ. vol. lxix. part 1. art. xix. p. 207, &c.

When the rattoons or canes are ripe, as they ordinarily are in twelve or fifteenth months, or, as Mr. Cazaud apprehends, in eleven or twelve months, they are cut, and carried in bundles to the mills. The mills conſiſt of three wooden rollers, covered with ſteel plates; and have their motion either from the water, the wind, cattle, or even the hands of ſlaves.

Sugar, *preparation of*. The juice coming out of the canes, when preſſed and broken between the rollers, runs through a little canal into the *ſugar*-houſe, which is near the mill; where it falls into a veſſel, whence it is conveyed into the firſt copper, or caldron, to receive its firſt preparation, only heated by a ſlow fire to make it ſimmer. With the liquor is here mixed a quantity of aſhes and quick-lime, called *temper*; the effect of which mixture, aſſiſted by the action of the fire is, that the unctuous parts are ſeparated from the reſt, and raiſed to the top, in form of a thick ſcum, which is kept conſtantly ſcumming off, and ſerves to feed the poultry, &c.

The juice, in the next place, is purified in a ſecond copper; where a briſker fire makes it boil; and all the time the caſting up of its ſcum is promoted by the means of a ſtrong ley, compoſed of lime-water, and other ingredients.

This done, it is purified and ſcummed in a third boiler, wherein is caſt a kind of ley, that aſſiſts in purging it, collects together its impurities, and makes them riſe to the ſurface, whence they are taken with a ſkimmer.

From the third it is removed to a fourth boiler, where the juice is farther purified by a more violent fire: and hence to a fifth; where it is brought to the conſiſtence of a ſyrup. In a ſixth boiler, the ſyrup receives its full coction; and here all the impurities left from the former leys are taken away by a new ley, and a water of lime and alum caſt into it. In this laſt copper there is ſcarce found

found one-third of what was in the first; the rest being wasted in scum.

By thus passing, successively, a number of coppers, the *sugar* juice is purified, thickened, and rendered fit to be converted into any of the kinds of *sugar* hereafter mentioned. The size of the several coppers always diminishes from the first to the last; each being furnished with a furnace, to give an heat proportionable to the degree of coction the juice has received. In some large *sugar*-works there are also particular coppers for the boiling and preparing of the scums.

F. Labat mentions several different *kinds of sugars*, prepared in the Caribbees, viz. *Crude sugar*, or *muscovado*; *strained*, or *brown sugar*; *earthed*, or *white sugar* in powder; *refined sugar*, either in powder or loaves; *royal sugar*; *candied sugar*; *sugar of fine syrup*; *sugar of coarse syrup*; *sugar of the scum*.

SUGAR, *crude*, or muscovado, is that first drawn from the juice of the cane; and whereof all the rest are composed. The method of making it is that already described as for *sugar* in the general. We need only add, that when taken out of the sixth copper, it is put into a cooler, where, stirring it briskly together, it is let stand to settle, till a crust of the thickness of a crown-piece be formed thereon. The crust being formed, they stir it up again, then put it into vessels, where it stands to settle till it be fit to barrel.

SUGAR, *strained*, or *brown*, though somewhat whiter and harder, does not differ much from the crude *sugar*; though it is held a medium between this last and the earthed *sugar*; which is the white powder *sugar*.

The preparation of this is the same as that of the muscovado, with this difference, that, to whiten it, they strain the liquor through blankets, as it comes out of the first copper. The invention of strained *sugar* is owing to the English, who are more careful than their neighbours in the preparation thereof; for they not only strain it, but, when boiled, put it into square wooden forms, or moulds, of a pyramidal figure; and when it has purified itself well, they cut it in pieces, dry it in stoves, and barrel it up. See *Refining of* SUGAR, *infra*.

SUGAR, *earthed*, is that which is whitened by means of earth laid on the top of the forms it is put in to purge itself. See *Refining of* SUGAR.

SUGAR *of the scum*. This is all made of the scum of the two last coppers; those of the former being reserved for the making of rum.

The scum destined to make *sugar* is kept in a vessel for that purpose, and is boiled every morning in a copper set apart for that use. With the scum, is put into the copper a fourth part of water, to retard the boiling, and give time for its purging; when it begins to boil, the usual ley is put in, and it is carefully scummed: when almost enough boiled, lime and alum-water are thrown in; and when it is ready to be taken out, they sprinkle it with a little powdered alum.

SUGAR *of syrup*, or *treacle*. There are three kinds of syrups that run from *sugar*. The first from the barrels of raw *sugar*, which is the coarsest of all; the second, from the forms, or moulds, after they are perforated, and before they receive their earth; the third, that coming from the forms after they have had their earth; which last is the best.

The coarse syrups should only be used for rum, but *sugar* being grown dear, endeavours have been used to make some hereof, and that with tolerable success. They are first clarified with lime-water: and, when boiled, are put up in barrels, with a *sugar*-cane in the middle, to make them purify themselves. After twenty days, a quantity of coarse earth is thrown in, to make them cast the remainder of their syrup, and fit them to be returned into a crude *sugar*. The Dutch and German refiners first taught the islanders how to turn their treacle into *sugar*.

The second syrup is wrought somewhat differently: after the copper it is to be boiled in is half full, eight or ten quarts of lime-water are cast in; it is then boiled with a brisk fire, and carefully scummed; some add a ley, and others none. F. Labat takes the former method to be the better, though it requires more trouble and attention. This *sugar* may be earthed alone, or at least, with the heads of loaves, the dried tops, and such other kinds of *sugars* as may not be mixed with the true earthed *sugar*, nor yet with the crude *sugar*.

For the third syrup, after boiling and scumming it as the former, they put it instantly into coolers, the bottoms whereof are covered half an inch thick with white *sugar* very dry, and well pounded; and the whole is well stirred to incorporate the two together. This done, they strew the surface over with the same pounded *sugar*, to the thickness of one-fifth of an inch, this assisting the *sugar* in forming its grain. When settled, and the crust gathered at the top, a hole is made in the crust five or six inches diameter.

By this aperture they fill the cooler with a new syrup, poured gently in, which insensibly raises up the former crust. When all the syrups are boiled, and the cooler is full, they break all the crusts; and, after mixing them well, put them up in forms or moulds.

The rest is performed in the same manner as for the earthed *sugar*; from which it only differs, in that it falls short of its gloss and brightness; being in reality, sometimes whiter and finer, though of a flatter and duller white. For the use and management of the *syrup of sugar*, see *Refining of* SUGAR.

SUGAR, *refined*. Crude *sugar*, strained *sugar*, and the heads or tops of loaves that have not whitened well, are the basis, or ground, of this *sugar*. See *Refining of* SUGAR.

SUGAR, *royal*. The basis of this sort ought to be the purest refined *sugar* to be found. This they melt with a weak lime-water; and, sometimes, to make it the whiter, and prevent the lime from reddening it, they use alum-water. This they clarify three times, and pass as often through a close cloth, using the very best earth. When prepared with these precautions it is whiter than snow, and so transparent, that we see a finger touching it, even through the thickest part of the loaf.

The curious in the whole art of *sugar*-making, or the reducing vegetable juices to what we call *sugar*, by expression, decoction, clarification, graining, claying, and crystallization, will find farther accounts and directions, in the several processes of this art, in Piso's Hist. Ind. in Angelus Sala's Saccharologia; in Dr. Slare's Treatise on *Sugars*; and in Sir Hans Sloane's History of Jamaica. There are also several valuable papers on these subjects in the Philosophical Transactions.

SUGAR, *refining of*, is the art of purifying *sugar*, and of giving it a superior degree of whiteness and solidity. The excellence of *Muscovado sugars*, or such as have not been refined by the planter, but are sent home in the most crude state, consists in their whiteness, dryness or freeness, cleanness, and sharpness or strength. The judicious refiner decides upon these several qualities by the eye, the touch, and the taste.

The first operation in the process of refining is that of *clearing the pans*; previous to which they are charged, by throwing about six quarts of fresh bullock's blood (called *spice*) into each pan, and filling it with lime-water to about half the height from the bottom to the part in which the brace is fixed; and when these are well stirred together, the pan is filled to the brim with raw *sugar*. This mass, with a moderate fire, will in about two hours be brought to the verge of boiling heat; but it should not be allowed actually to boil; and in this time the earthy particles of the *sugar*, and other adventitious impurities, will be separated from it by the effect of the heat, and the cleansing quality of the spice, and thrown up to the surface. About two quarts of spice are added to each pan, within the first hour after the fires are lighted. The scum thus produced, which is usually from four to ten inches thick, is fit to be taken off, when the surface appears black and dry, and not greasy; and it is gently removed with a broad skimmer into a portable tub, and conveyed into the scum cistern. Having done this, the panman stirs together a ladle full of spice (e. gr. about a quart), and a quantity of lime-water (e. gr. one or two gallons as the case may require); and pours this mixture into each pan. When the *sugar* is again brought to a scalding heat, it throws up a second scum, not so foul as the first, which is removed as before. He then adds a fresh quantity of spice, but less than the former, and repeats this operation, till the *sugar* casts up a clean milky froth, which indicates that the impurity is wholly extracted. The liquor is also sometimes examined with a bright silver or metal spoon, that any remaining foulness may be discovered. In the making of double loaves, powder loaves, or very fine single loaves, it is usual to heighten the natural colour of the *sugar* by the addition of a little blue. For this purpose, when the pans are almost clear, the quantity of about six pennyweights troy of the finest indigo, finely powdered and filtered through a piece of woollen or blanketing in a bason of fresh water, and well stirred together in the bason, is thrown into each pan. The *sugar* being once raised in the pan after this infusion, the grosser particles of the colour are taken off in the last scum, and the remainder is incorporated with the *sugar* in the pan.

The panman, having brought the *sugar* to the cleanest state, prepares to *skip it off*, or to shift it from one vessel to another: this is done by means of a wooden gutter laid along the pans, and opening into the clarifying cistern. Over this cistern, upon large iron bars, is fixed an

an oblong basket, about sixteen inches deep, in which a large thick blanket is fastened; and through this blanket and basket the *sugar* liquor passes out of the gutter; and to the mass a quantity of syrup is usually added. Having measured the quantity of liquor in the cistern with a rod graduated by inches, the panman pumps back into the pans either the sixth or ninth part of the whole, as he is directed by the supervisor or boiler; and the pans are all supplied together by means of a trough. When this is done, the fire is stirred up to a considerable degree of fierceness; and then commences a new operation, viz. the *evaporation*. In this part of the process (the day's work being divided into three fillings), the panman pumps into the pan one-ninth part of the quantity in the cistern, which in a few seconds begins to boil, and must be continued in a boiling state, but not with too intense a fire; and to prevent the *sugar* from boiling up to the surface of the pan, or from boiling over, he casts a small quantity (viz. a piece as large as a nutmeg or walnut, as the case may require) of butter or grease into the boiling liquor. Here it is to be observed, that *sugar* should boil low in the pan, and yet not too flat like water; for by rising hollow from the bottom, the necessary evaporation is retarded, and the *sugar* is exposed to the action of the fire for a longer time than it ought to be. In a space of time from twelve to thirty minutes, the evaporation will have produced its effect, and the *sugar* acquire the requisite degree of viscousness. This state will be indicated by various circumstances; as by the bubbles dragging heavily over the surface of the boiling mass, and by the clammy liquid falling in ropes from the proof-stick; but principally by that test which is called the *proof*. For this purpose the boiler draws the stick out of the boiling liquor with his right hand, and placing his left thumb upon the *sugar*, draws it across the stick, carrying away upon the end of his thumb as much of the *sugar* as will hang upon it; he then by means of a candle placed in a black box, called the proof-box, and by repeated trials (drawing the *sugar* to a thread between his thumb and fore-finger) determines when the evaporation is complete; and when this is decided, the fire is smothered, and nearly quenched. The hot *sugar* liquor is then removed by means of basons out of the pans into coolers, two or three gallons being left in each pan to prevent the bottom from being scorched; and the pans are again supplied with a quantity of liquor for the next evaporation. The liquor in the coolers is gently stirred to prevent a crust from forming on its surface. When the second quantity is brought to proof, and skipped off into the coolers, the pans are supplied with a similar quantity; and while this is boiling, that part of the process of refining, called *granulation*, is pursued. For this purpose the *sugar* is disturbed in the coolers by an instrument, called an *oar*, and resembling the oar of a boat: the violent motion thus continued for several minutes, serves to destroy the viscousness of the fugar, and to complete the granulation. Upon this operation much of the beauty and success of the manufacture depends; for if the *sugars* are not stirred enough, the grain of the refined *sugar* will be large and loose, and its colour not sufficiently white; but if it be stirred too much, the grain will be broke, the *sugar* will be disunited in its parts, and though close and smooth, without lustre; and it will lose considerably of its due weight. When the third skipping is boiled, and the coolers sufficiently stirred, the contents of the pans are removed to the coolers as before; and thus the first stage of boiling for the day is completed. The course with the other two fillings is precisely the same.

The next operation in refining is conducted in that part of the ground floor of a *sugar-house*, which is denominated the *fill-house*, because all the upper floors of the house are to be filled from this; and this operation consists in *filling* the moulds with the three skippings contained in the coolers. The moulds, in the form of inverted cones, previously prepared by soaking and washing them, and stopping their apertures with wet linen rags, are placed side by side, and in rows two or three deep: their number is to suffice for the quantity of liquor in the coolers, which is estimated by the number of basons which were skipped off from the pans; and they are propped up by other moulds (commonly such as are broken) placed with the broad end downwards, in front of the outward rank, by way of abutment: these are called *stayers*. The *sugar*, being previously stirred in the coolers, in order thoroughly to mix each skipping, is ladled out of the coolers in succession, and not all at once (unless the fillings are small, in loaves, and always in lumps) into basons conveniently situated; and these are carried into the fill-house, where as much of the *sugar* is poured into each mould as will fill about one-third of its capacity; the same quantity is again poured into each; and at the third time they are filled to the brim. The moulds being filled, the next operation, which is that of stirring the *sugar* in them, is called *hauling*, and is designed to prevent an adhesion to the mould, and to lay the grain of the mass even and regular through all its parts. In this business each man takes a tool, made of wainscot, and called a knife, and in size proportioned to that of the mould to be stirred: with this tool, keeping his hand over the centre of the mould, he scrapes the *sugar* from its sides by successive strokes downwards, carried all round; and when two revolutions are performed, the *sugar* is allowed to rest some minutes, until it has acquired some firmness. The moulds, being stirred round three or four times according to the direction of the boiler, are no more disturbed till they are pulled up.

The process already described relates to *sugar once refined*, called single loaves; double loaves are usually cleared with the whites of eggs instead of spice (two hundred of which are necessary to each pan) and with fresh water instead of lime-water. With respect to the proof, one rule only can be laid down; viz. the *sugar* must be boiled higher as the moulds which contain it are increased in size.

The order of a refining is uniformly this: to begin the first day with the finest *sugar* intended to be wrought, and to proceed daily with *sugar* of a lower quality, and of course to begin with small loaf-moulds, and to use larger moulds progressively; so that the brownest *sugar* will be put into large lump moulds; for this *sugar* works best in large masses, and it is likewise more in demand in England than the finer kinds. The use of this distribution of a refining is to enable the boiler to make a more advantageous disposition of his syrups and scums. The order of the first twelve days is usually as follows: first day, double loaves; second and third days, powder loaves; fourth, fifth, and sixth, single loaves; seventh, Prussian lumps; eighth, Canary, or pattern lumps; ninth, tenth, eleventh, and twelfth days, large lumps. To these twelve days are added four or five more in a part of the process called *bastard boiling*; and these sixteen or seventeen days constitute a complete series, denominated a complement or refining.

From this digression let us now return to the fill-house; where the second and third fillings having been boiled off, and passed from the coolers into the moulds, in the manner already described, the panman proceeds to make over the scum which was taken off the pans in the morning, in order to extract the remaining *sugar* from it: the method of doing this will be hereafter explained. When it is finished, the pans are loaded for the work of the following day. In the evening, when the new made goods are cool, and fit for removal without damage, they are pulled up into that floor of the house which is best suited for receiving them, and where a proper number of well sorted pots are placed in ranks for this purpose. The up-stairs man plucks out from the point of every one the stopper or rag; and pricks them in the point with an awl, the size of which is proportioned to the mould; and they are then set upon the pots.

The contents of the moulds, cleared by the preceding operations of their earthy particles and water, consist of the vegetable salt, and an oily matter, now called *syrup*, but which, after the final extraction of the salts, will be called *melasses*. For the separation of these there is required a series of operations, which may be distinguished by the name of *filtering* or *draining*. In twenty-four hours after the loaves have been placed upon the pots, the quantity of syrup which will have exuded from the aperture of each, will fill more than half of the pot on which it stands. When the state of the loaves has been examined, by drawing one or two loaves of each filling out of their moulds, if the syrups are not in a digesting state, they are left unclayed for two or three days longer, and the warmth of the room in which they stand is somewhat increased; but if they manifest a proper appearance, they are prepared for receiving the first clay, which is laid on either the next or the third day. The green new made loaves are judged to bear a healthy and promising appearance, when the syrups have quitted the broad part of the loaf, and are evenly drawn together; and when the whole surface has a compact and smooth appearance, they are fit to receive clay. When the syrup hath scarcely descended from the top or face of the cone; when the head, i. e. the narrow and moist end, is not evenly drawn off to a line; it is concluded, that the *sugar* is overboiled, or of an ill quality; the syrups are not in a state of digestion; and time is given, and heat added, to make them fit to receive the clay. On the other hand, if the moisture is shrunk and settled, and of a pale colour just round the apex of the cone, there

there is reaſon to apprehend that the *ſugar* is under-boiled, or too free; in which caſe the ſurface or coat will appear looſe, and want that ſmoothneſs which the well-boiled loaves exhibit. When this is the caſe, they muſt be lightly clayed, and care muſt be taken, that the clay be not too thin or wet. Before the clay is laid on, the thin cruſt, which had been formed round the edge of the mould by the motion of the hauling knife, is ſcraped from each loaf into the receiving box, and by preſſing the face of the loaf with that part of the hand which is neareſt the wriſt, a ſmall concavity is made for receiving the firſt clay, as well as a proper ſolidity to the bed on which it is intended to reſt.

The firſt or green ſyrup is now taken away, and poured into large earthen jars, called *gathering-pots*; and the empty pots are returned to receive the moulds which had been taken from them. When they are returned to their proper places, a ſmall ladle-full of wet clay is poured on the face of each loaf. This firſt, or green clay, dries up in five or ſix days, and forms a cake, which is taken off, and laid by for future uſe. When the clay is removed, the whole ſurface of the loaf will be found to have ſhrunk under it, and the loaf is become concave in the middle. With a tool, called a *bottoming trowel*, the *ſugar* which adheres to the ſides of the mould is cut away by an horizontal movement; and a ſmall quantity of ſcrapings, or of lumps broken down for this purpoſe, is added to the looſe *ſugar* which the trowel had cut; and they are preſſed down together on the ſurface, till the whole has been brought to a good level, and to a moderate degree of firmneſs for bearing the next clay.

On the following day the loaves are clayed a ſecond time; and when this clay is dry, it is removed like the former; and each loaf is drawn out of its mould, and carefully examined; and this part of the proceſs is called *overſeeing*. Double loaves, fine powder loaves, and fine ſingle loaves, will ſometimes, under this clay, be found *neat*, i. e. the redneſs or browneſs will have quitted the loaf, and the head, though ſtill moiſt, will appear perfectly free from diſcolouration. The workman, however, in order to be farther ſatisfied, cuts off the heads of two or three loaves with the trowel; and if he is ſatisfied, theſe loaves are to be clayed no more; but he proceeds to the operation of *bruſhing off*, i. e. of ſcraping off the irregularities and impurities occaſioned by the contact with the clay with an iron tool, called a *bruſhing hook*; and with one corner of this a number or letter is ſcratched upon the level face of the loaf. To thoſe loaves, which are not found neat, the workman gives a third clay; which is uſually laid on in a thinner maſs than the former. If his loaves are not yet quite finiſhed, he puts a little freſh moiſture on the back of the overſeen clay, and thus effects his purpoſe.

The loaves being now rendered neat and bruſhed off, muſt ſtand ſome days in the moulds to acquire *face*, or that ſtony hardneſs of ſurface, which will enable them to ſtand firm, when they are turned down out of the moulds; and during this time they are once or twice looſened in the moulds by a gentle blow on a ſtool, or againſt a poſt; and thus the coats are improved by preventing adheſion to the moulds, and facilitating the precipitation of the remaining moiſture. The windows are opened to let in air, if the weather be dry; and the points or noſes are alſo examined, which will ſometimes melt away, whilſt the above operation is effecting. When theſe ſymptoms appear, the workman proceeds to turn down his loaves, by taking the moulds from the pots, covering the floor with clear brown paper, and turning each loaf down with its mould over it. They are uſually turned down either upon the ſtove-head, or in ſome warm place; becauſe by being left uncovered, and expoſed to the action of cold air, the moiſture remaining in the head will not deſcend into the body of the loaf, and be equally diſperſed; but remaining in the head, would ſpoil and disfigure the loaf; partly by the ſyrup's coagulating, and becoming unfit to deſcend between the fine interſtices of the concrete body, and partly from the aſtriction of the ſolid particles. With theſe precautions, in twenty-four hours the moiſture is apparently diſperſed, and the cone aſſumes throughout an uniform appearance. The loaves are then taken off the floor, ſeparately examined, and cleared of any diſcoloured ſpecks with a ſmall knife; and are either papered and ſet in the ſtove, or elſe are placed in the ſtove without paper, as the caſe may require. If any of them have ſtill a remaining yellowneſs in the head, the point is cut off, and they are then called ſpot-loaves. They remain in the ſtove five, ſix, or ſeven days, till they are entirely dry, and are then fit for ſale and uſe. The management above ſtairs in the courſe of this one day's work is nearly the ſame, whether the *ſugar* be fine or coarſe.

Brown *ſugars* wrought in large moulds require more clay than fine *ſugars* in ſmall moulds: nor is it neceſſary that lumps ſhould be made neat; but it is the conſtant practice to cut off the wet head from every lump, ſo as to leave no remaining redneſs; theſe wet tips, called *lump headings*, are received into a large mould, and placed upon a pot to drain, and when dry are melted for making double loaves, or for improving powder loaves; or elſe they are bruiſed and mixed with bruſhings to *bottom up*, i. e. to defend the face of loaves, or other goods, before they receive clay. Large lumps frequently need claying four times. And it may be obſerved in general, that *ſugars* of every kind require more heat to bring them forward, as they ſink in quality.

The materials for double loaf boiling are made from refined *ſugar*, and frequently from loaves or lumps bought for that purpoſe. But thoſe who are moſt curious in this fabrick, chuſe to make lumps for this purpoſe, which are called *melters*: they are low boiled, and ſtirred but little (though ſome boilers ſtir them much), in order to preſerve the ſtrength of the *ſugar* unimpaired. Fine double loaves are kept in a room of the temperature of a common parlour; a little warmth is ſufficient for powder loaves, and fine ſingle loaves; inferior loaves, and lumps of a middling quality, require warmth; but the browneſt lumps and *baſtards* thrive in a glowing heat. Every ſort of refined *ſugar* will bear and require more heat in proportion as it is higher boiled; for the brown ſyrupy matter will not quit the denſer, unleſs it be kept in a fluid ſtate; and this can only be effected by the action of heat; and, moreover, the fluid parts of high boiled goods muſt be more viſcous than thoſe of goods which have been leſs bound up by fire.

The *ſyrups* which are diſcharged from refined *ſugar* during the operation of *draining*, exceed in bulk and weight the whole quantity of loaf or lump *ſugar*, and are, therefore, of great importance in this manufactory; and upon the proper management of them much of its ſucceſs depends. It will be proper, therefore, to purſue the inquiry relating to the uſe of *ſyrups*, produced from a day's work of *ſugar* once refined in loaves. When the loaves are prepared to receive the firſt clay, the ſyrup is collected into gathering pots, each of which contains from fifty to ſixty pounds of ſyrup: this is called *green ſyrup*, on account of the new or green ſtate of the loaves from which it runs, and the quantity of it is uſually about fifteen gathering pots from each pan of goods. The next ſyrup, called *ſecond runnings*, is commonly collected when the ſecond clay is removed, and amounts in quantity to about eight gathering pots per pan. The third and laſt collection is made after the moulds are finally removed from the pots; it is called *drippings*, and is about five gathering pots per pan. However, ſome workmen collect their ſyrups oftener than thrice. The ſyrups of every kind of refined *ſugar* increaſe in fineneſs and value, the later they exude from the moulds. As for the appropriation of them, the green or low ſyrups are boiled away on the days next after the concluſion of refining: they are taken into the pans without the addition of any *ſugar*, and after a ſufficient evaporation are poured into large moulds; and under the name of *baſtard ſugar* form a principal article in the *ſugar* trade. The finer ſyrups are all incorporated with *ſugar*, and a proportion of them is daily brought down through the ſyrup pipes into the ciſtern at the ſame time in which the *ſugar* is firſt ſkipped from the pans; the ſyrup pipe diſcharging its contents into the clarifying baſket, ſo that the ſyrup, as well as the *ſugar*, paſſes through the blanket; and it is pumped back from the ciſtern into the pans.

The following eſtimates exhibit the quantity of ſyrup that may be allowed *(cæteris paribus)* to a given quantity of *ſugar*; viz. for double loaves, ſix gathering pots per pan; for powder loaves, ten ditto; for fine ſingle loaves, fifteen ditto; for middling ditto, twenty ditto; for brown ſingle loaves, and Canary lumps, twenty-five ditto; for lumps, thirty or forty ditto.

With the neceſſary allowances for particular circumſtances, the ſeveral ſorts of ſyrups may be duly appropriated in the following manner. Green ſyrups of every kind may be mixed with raw *ſugar*, or applied to the making of goods, two degrees in quality lower than thoſe from which theſe ſyrups were produced. Second runnings of every kind are fit to be incorporated with goods one degree below thoſe from which they were produced. Drippings may be uſed with raw *ſugar*, or with other proper materials, in making the ſame kind of goods from which they had been ſupplied. In other words, the green ſyrup of double loaves would be uſed in making ſingle loaves; the ſecond runnings would go into the compoſition of powder loaves, and the drippings would enter into the ſubſtance of other double loaves. Again, the green ſyrup of large lumps would be boiled off in *baſtards*, the ſecond running would make *pieces*, and the

dripping,

dripping, added to proper *fugar*, would be united therewith in the production of other lumps.

Pieces are a better kind of baftards, which are either boiled from fyrups that are too good to make baftards, or are made of fuch fyrups, and a fmall portion of cheap and bad *fugar* which is too poor to make lumps. In the latter cafe they are called *fugar pieces*; but in either all the fyrup that comes from them is boiled again either to make baftards, or other pieces, according to its goodnefs; whereas the fyrup that runs from baftards is always confidered as a caput mortuum, and no efforts are made to obtain any *fugar* from it, but it is put into cafks, and fold under the denomination of melaffes. It is, therefore, worth the boiler's attention to keep all the weight of *fugar* poffible in his baftards; and for this purpofe he boils them as high as he may venture, without incurring the danger of making ftopped baftards, i. e. baftards from which the melaffes will not run; which may be owing either to the ill quality of the materials, or to overboiling. But as the fyrup of pieces is to be boiled again, a good workman never exhaufts it by overboiling. The materials, of which baftard and pieces are compofed, not abounding with falts like thofe already treated of, have not an equal difpofition to concrete; and, therefore, it is found neceffary to give them fome aid, in order to effect the neceffary granulation: this is done by taking *grain* (which we fhall prefently explain) into the coolers. Thefe inferior productions are ftirred, neither in the coolers nor in the moulds, any more than by a fmall movement round the coolers, with an iron fcraper, juft fufficient to incorporate the grain with the hot fluid mafs.

In order to illuftrate the formation of this grain, we may obferve, that the ftrong particles of *fugar* which are capable of concretion, have evidently a greater degree of denfity than the oily or aqueous. When the hot fluid is poured into a baftard or piece mould, thefe denfer particles defcend, and would pafs into the pots if there were any paffage for them; but the ftopper is not taken out of the moulds of thefe goods until five, fix, feven, or eight days after they have been pulled up; for they want time to harden, and cannot fafely be left unftopped. Having reached the lower part of the mould, they are formed into fmall ftony fubftances of the nature of candy, and when the ftoppers are withdrawn, thefe fmall ftones remain near the point of the mould, and form what is properly called *baftard grain*.

Baftards and pieces are ufually clayed but twice, and when dry enough, are knocked out of the moulds, their wet heads being cut off into a large mould placed to receive them, and they are called *baftard-heading*, or *fmear*; in another mould is preferved the grain, which ufually forms a ftratum about two inches broad, beginning about four inches from the point of the mould. The baftards and pieces are then put into the ftove, and in five, fix, or feven days, will be found dry enough; for they muft not, like lumps and loaves, be rendered perfectly dry. They are then taken out and piled in a room, as near the mill as poffible, and ground all together: or the brown tip is cut off, and the other two parts called the *middle* and *face*, are ground together; or fometimes the baftard or piece is divided into three parts, which are ground feparately, and fold at different prices.

We fhall now clofe this article with a fhort account of the method of making over *fcums*, and the application of their produce. The refiner extracts from the fcum of his *fugars* every particle of *fugar* which it is in his power to obtain, and after he has reduced the fcum to fuch a ftate that it appears to be a mere earth refembling garden mould, he fells it to a fcum-boiler, who again tries it over the fire, and extracts a fmall quantity of fweet liquor out of it. The fcum of fine treble or double loaves is often put into the pans again without any procefs, and mixed with raw *fugar* for the production of inferior goods: but, in general, the fcum of each day's work is made over in the fame day after the boiling of the *fugar* is finifhed. The method is this: the panman, having put about three quarts of fpice into his pan, draws lime-water until the pan be four fifths full without the pan brace; to this he adds about four tubs of the fcum, each tub containing about three fourths of a hundred weight. Having ftirred the liquor well, he makes a moderate fire, and the fcum will feparate from the fluid and float upon the top of it: with a fmall iron fcraper he prevents any foulnefs from adhering to the bottom of the pans; and then fuffers the fire to increafe, and the liquid, upon the verge of boiling, is feen through the openings of the dirty furface. Having kept it fimmering for feveral hours, and having provided a cooler or receiver, over which is placed a ftrong wooden frame, and upon this a bafket, to which a coarfe bag called the *fcum-bag* is fitted, he pours the contents of his pan into this bafket and bag; and then the mouth of the bag is drawn up, and well twifted together, and a ftrong board, called a *fcum-board*, is laid upon the bags with feveral weights upon the board to prefs down the fcum. In the fpace of an hour or an hour and a half, the bag fhould be twifted and preffed; and the liquor, which ouzes plentifully through the bag, is ufually taken into the pans the next morning; its thinnefs renders it ufeful in clearing the pans, and if any grofs matter hath paffed through the bags, it is drawn off with the reft of the fcum of the *fugar* when cleared. The fcum, as it is taken from the pan, is called *fat fcum*, and the liquid matter drawn from it bears the fame appellation; in contradiftinction to the poor meagre liquor, which is expreffed from the fame fcum when they are made over a fecond time, by an operation much like the former. After preffing and draining, the exhaufted remains, under the name of *rubbifh fcum*, is either burnt in the cockell, or delivered to the fcum-boiler at a very low rate. The produce of over-made fcums muft be ufed immediately, or it muft be fhortened i. e. boiled thick; otherwife it will turn four and do great harm: for acidity is a conftant enemy and deftroyer of *fugar*.

The liquor drawn from thefe fcums is commonly ufed in baftard boiling, or in the browneft lumps. There is a large proportion of the fat fcum ufually left of every refining, to be made over during the baftard boiling: it is common to fet by the firft or groffeft fcum for this purpofe, and to keep feparate the finer and later fcums, which are made over day by day in the manner already defcribed: the liquor thus obtained from the fat fcums, being full of *fugar*, is very ufeful to the baftards, fortifying the fyrups, and promoting their ftrength and adhefion.

The Editor is indebted for the materials which have fupplied this article, and thofe on the manufacture of SUGAR-*candy*, and the conftruction of a SUGAR-*houfe*, to the kind communication of Mr. Griffin, an eminent *fugar*-refiner in London.

The duty on raw *fugar* imported is 12*s*. 3$\frac{3}{20}$*d*. per hundred, which is allowed on exportation. The drawback on exportation of lumps, fingle loaves, powder ditto, and double loaves is 1*l*. 6*s*. per hundred, and on tips, middles, faces, and candy 11*s*. 8*d*. per hundred.

SUGAR-*candy*, *faccharum candum*, or *cryftallinum*, is *fugar* depurated and cryftallized. See CANDY.

The *fugar* to be ufed herein is firft diffolved in a weak lime-water, then clarified, fcummed, ftrained through a cloth, and boiled, and put in forms or moulds, that are traverfed with little rods, to retain the *fugar* as it cryftallizes. Thefe forms are fufpended in an hot ftove, with a pot underneath, to receive the fyrup that drops out at the hole in the bottom, which is half-ftopped, that the filtration may be the gentler. When the forms are full, the ftove is fhut up, and the fire made very vehement. Upon this, the *fugar* faftens to the fticks that crofs the forms, and there hangs in little fplinters of cryftal. When the *fugar* is quite dry, the forms are broken, and the *fugar* is taken out candied. Red *fugar*-candy they make, by cafting into the veffel, where the *fugar* is boiling, a little juice of the Indian fig; and, if it is defired to have it perfumed, they caft a drop of fome effence in, when the *fugar* is putting into the forms.

This method of making *fugar*-candy is that of F. Labat, practifed in the Caribbees.

The method among our manufacturers is as follows. A ftove is fet apart for this purpofe, the entrance into which is in the ground-floor, and as near as poffible to the pans, and the top is ufually from ten to fourteen feet above the ground, and covered like the top or crown of an oven. Beams are faftened into the walls, at the diftance of about twenty-fix inches from each other, and fufficient to bear a large weight: upon which ftrong planks are laid when they are wanted, and upon the planks the candy-pots are fet: when the ftove of candy is finifhed, the planks are removed. The pots are ufually made of thin copper, without feet, and with an iron rim round the top to ftrengthen them: the bottoms are hammered into the moft perfect flatnefs, that they may ftand firm and fteady: they are perforated in rows on two fides with holes about one tenth of an inch in diameter. According to the old method of piercing, the holes were very clofe laterally, and the candy of each ftring united with that of the next, and the whole formed a ftrong cake: but according to the improved method, the holes are kept at a proper diftance apart, i. e. at the diftance of one inch and a half in the upper rows, and widening downwards to two inches; and the candy is formed in diftinct bars, more convenient for package and fale, and much more beautiful than the former.

When a ftove of candy is intended to be made, the cockell fhould be moderately heated, at leaft twenty-four hours before the operation begins; and the candy-pots are ftrung, i. e. a coarfe white thread is drawn by a needle through the firft hole of the bottom row, and the end being faftened there, the thread is led acrofs the in- fide

side of the pot to the opposite hole, and continued from side to side till that row is finished: the next row above it is then strung in the same manner, &c. till every row is finished. The pots, being all strung (viz. about forty to each pan of sugar) must be pasted, i. e. the holes must be stopped either by pasting papers over them on the outside, or by brushing any glutinous matter over the outside. When the stoves and pots are ready, the workman places five pots upon the pavement, beginning either at the right or the left hand corner of the stove opposite to the cockell.

The management of the pans is nearly the same as has been described under *refining of* SUGAR, with some small difference. The *sugar* intended for candy should be cleared with less water than other goods: the lime-water for brown candy should be of the greatest strength; and the workman endeavours to extract the scum as soon as possible, because it is imagined that the strength of the *sugar* may be impaired if it be suffered to lie too long dissolved. No scum is ever incorporated with the *sugar* intended for candy; indeed four or six gathering pots to a pan are sometimes taken; but it is apprehended, that it would be better to omit even this. The *sugar* melted for candy should be the strongest that can be obtained.

When these precautions have been observed, let us imagine the *sugar* cleared off and skipped into the cistern. The panman pumps back about the usual quantity: the boiler carries the evaporation to the point he judges proper; and it is immediately skipped off into basons, which are carried directly to the stove; and the pots are then filled in the following manner. The fill-house man receives the first bason, and pours its contents into N° 1, proceeds to N° 2, and so on till he has reached N° 5; and then proceeds to fill N° 5, 4, 3, 2, and 1. When this set is filled, the fill-house man goes on, till he has covered the whole pavement: he then lays two planks upon the lowest beams, and places a series of pots upon the farther one, standing upon the other to fill them: he then lays down another strong plank, and covers that on which he stood, and so proceeds to build up row after row till the whole is finished. In the whole progress of this business he moves slowly and cautiously, and causes all the doors to be shut, so that no currents of air may approach him; as stillness is of the greatest consequence, and the least concussion of the air is sufficient to disturb and break the crystallization. When the pots are filled, the stove-door is fastened up, and covered with a blanket, or stopped with wet clay. The cockell is stoked to such a degree, that the candy may stand in a blood-heat; at the end of six or seven days, the crystallization of brown candy will be complete. The pots are then removed from the planks and the floor, and the operation commences, which is called *stirring* or *breaking up* a stove of candy. Each pot is brought to the side of a cooler, upon which over a frame a clean basket is laid, into which all the *sugar* that has not crystallized is poured off, and along with it the *crust*, which is a coat of candy, that had formed itself upon the surface; the syrup or uncrystallized *sugar* runs through the basket into the cooler, but the crust remains in the basket, in which it is washed and dried, and afterwards packed for sale with the candy. As soon as the syrup is poured off, the pot is brought to the side of the pan, and ladles of clean water, blood-warm, are poured in till it be nearly filled; the pot is then smartly shook round, and the water is returned into the pan. The candy being thus worked, the boiler examines it. If it be strong and good, it presents a beautiful appearance; the sides of the pot are every where covered with a coat about half an inch thick, the front of which is cut in starry forms, reflecting the light in various directions: and upon every line the crystals fasten in the most varied and capricious forms. If the pots were pierced, as they formerly were, so that the strings might lie but an inch asunder, the candy of each line would then run into the next, their sides become united, and the whole form a strong cake not to be separated without force: but the modern improved pots are so pierced, that the crystals are suspended upon every thread in distinct bars, without either lateral or perpendicular cohesion.

The washing above described is necessary to cleanse from the face of the crystals every particle of syrupy matter, which would otherwise occasion a clamminess in the candy, and obscure its lustre. After washing, each pot is turned down into a cooler or other receiver to drain, and when they are washed and drained, they are again put into the stove to be dried; for this purpose they are placed in the stove aslant, resting against the wall, or against each other, with the mouth downwards; and under each pot is placed a small earthen pan, called a *candy-bason*, to receive the remaining moisture which will drip from them: the stove is again fastened up, and the cockell stoked so as to produce a fierce fire, which must be well kept up for three days: at the end of which time the candy will be dry enough to quit the pot; they are therefore taken out of the stove, and turned down upon the floor, previously covered with clean paper; and with a little shaking or a gentle blow, the whole mass of candy quits the pot, retaining the form of it complete: and then the candy is returned to the stove for the third and last time, where in three or four days, with a good fire, it will become perfectly dry and fit for sale. It is generally packed in boxes of about fifty-six pounds each: at the bottom of the box is a layer of the bottoms of the pots, which have the least beauty or fineness; then a course of bars of candy; upon that a stratum of crust, and so on to the top of the box; finishing with bars of the handsomest candy, neatly laid with the face upwards. At the bottom of the candy there are often found masses of *sugar* which hath not crystallized, but is become concreted in small round grains of a lighter colour than the candy; this is called *foot*, and is either sold at a lower rate, under the name of *candy-foot*, or melted with other *sugar* for the making of lumps and loaves. The syrup of candy is fit to be taken copiously with raw *sugar* in lump-boiling. The washings and the drips from the basons are applicable to the same uses.

White candy is made like the former, but from fine lump or loaf *sugar*, cleared as for double loaves. It is boiled to lower proof; stands in a milder warmth; forms in three days instead of seven; and the value depending upon the whiteness, it must be managed with the utmost delicacy in every stage of the process.

White sugar-candy, and also *sugar*, are used as ingredients to render water a vehicle for colours in miniature-painting. The intention of using them is to prevent the colours from cracking when mixed with gum arabic, and also to make the gum-water work more kindly with the pencil. See STARCH.

SUGAR-*house*, is a brick or stone building, constructed for a *sugar*-refining manufactory. A house intended to contain one or two pans should be square, or nearly square: but a house of larger dimensions ought to be of an oblong form; as it may be conveniently heated, by placing the chimney of the stove and of the pans at opposite angles. A house to contain one pan should consist of six floors besides the ground-floor; the dimension about twenty-seven feet square: a two-pan house about thirty-six feet by forty feet: a house of four pans, about forty feet by sixty or sixty-five feet. The stove is a brick building from eight to fourteen feet square, usually placed in one corner of the building. The height of the several stories should be as follows: the fill-house, or ground-floor, nine feet below the girders; the next floor above it, called the *warehouse*, of the same height: and every other floor upwards, six feet at most between the girders and the floor. In every floor must be left an aperture, through which a rope is suspended upon a brass pulley on the uppermost floor for drawing up the *sugars*: and provided due attention be given to the strength of the building, and to the exclusion of damps and a cold air, a *sugar-house* cannot be rendered too light. The utensils necessary to a *sugar-house* are of copper, lead, iron, carpentry, back-maker's work, wicker-work, pottery, &c. The copper utensils are the pans, coolers, cisterns, syrup pipes, basons, ladles, skimmers, and, in some cases, candy-pots, &c.

The pans are usually made of a conic form, five to six feet diameter at the top, decreasing to a diameter of about two feet six inches, or three feet. The coolers are vessels of thin copper of six feet in diameter, and about twenty inches high: the number of pans and coolers is usually the same. The clarifying cistern is a large receiver either of copper or lead, placed as near as possible to the sides of the pans, and capable of containing at least one-third more than the contents of all the pans collectively. The syrup-pipes are tubes of four inches diameter, made of thin copper, or tin plates, and suspended perpendicularly over the clarifying cistern, from the upper floor through the whole building. The basons are vessels containing from four to six gallons each, in which the boiled *sugar* is carried from the pans to the coolers, and from the coolers to the moulds. The ladles are of several sizes. Skimmers are of fourteen inches diameter, pierced with holes like a cullender; and likewise a small one of the same kind. Cullenders are of eighteen inches diameter, and fourteen inches deep, through which the clay is to be strained: and there is also another, which is smaller, for the purpose of straining spice.

The leaden utensils and plumbers ware, are such as follow: the bench is a ledge about one foot broad, running before the pans, and rising in front, whereby it is capable of receiving the *sugar* which is spilled before the pans.

The scum cistern is a wooden receiver, usually lined with lead, and nearly as large as the clarifying cistern. The water-pipes are a pewter or hard metal pipe from the lime cistern to the pans, and leaden pipes for the conveyance of common water or liquor to the pans, and to the lime cisterns. The pumps are a copper pump fixed in the clarifying cistern, and a spare pump of the same kind.

The iron-founder supplies bars of a triangular form to be laid under the pans, and the cockell, which is an iron trunk, used to dry the goods in the stove; and also iron doors, stove-door, and pan-doors, &c.

The carpenter raises the steam-vent over the pans, which is a hood of thin boards, so formed as to conduct the steam to the two brick funnels, which are led up on either side of the pan-chimney to the top. He also furnishes the racks of the stove, a trough to convey the *sugar* from the pans to the cistern, and another to return it from the cistern to the pans, syrup-stools, blocks, cooler oars, &c.

The back-makers supply two or more tubs or backs for lime-water, which are round, oval, or square, and whose capacity varies from thirty to two hundred barrels. The liquor-back, is any vessel large enough to hold a considerable quantity of common water. The mould cistern is a large oblong vessel, in which the moulds are soaked before they are used: it is usually about four feet six inches deep, and should be capable of containing at once as many moulds as are used in one day's refining.

The clay cisterns are supplied either by the back-maker or carpenter, and also the clay star, which is made of oak or elm, its club end being stuck full of iron points: its use is to macerate and fine the clay.

The wicker-work consists of refining baskets, scum baskets, pulling up baskets, coal and clay baskets, &c.

The *sugar*-mill is one of the most simple machines of the kind: the runner is sometimes made of cast-iron and sometimes of stone: the former is preferable, because a larger diameter and a broader surface may be had with the same weight. The runner and the centre post should have a brass collet within them, for the iron spindle to turn upon. The mill should stand on a solid foundation; either on the earth, or on the centre of a brick or stone arch. The vessels of pottery are of various sizes, and of two different forms and denominations, viz. pots and moulds.

The construction of the pan-chimney requires peculiar attention; it should be placed on iron bases, and the horizontal bars on which it rests must be wrought in the walls of the building, and clenched down on the outside. But the setting of the pans is the most difficult work; for it is necessary, that they should be so fixed, as that the stones, which burn away under them three or four times in a year, should be taken out and replaced, without pulling down the whole work.

After all, a principal consideration in the construction of a *sugar-house*, is the obtaining a sufficient degree of heat. Various degrees of heat are required for different sorts of goods, and occasionally for the same sort: accordingly each floor may be made more or less warm as the case requires. The heat is introduced through the pan-chimney, the stove-chimney, and sometimes through iron or brick flues raised on purpose. It is communicated from the chimneys by shutting the register-plates, after the fires are extinguished, or when they are nearly out, and the remaining ashes are perfectly clear. After shutting the register-plates, the small iron doors (one of which is fixed in the chimnies both of the cockell and the pans upon every floor) are opened, to convey heat where it is wanted.

Labourers in *sugar-houses* are very subject to dysenteries: the VITRUM *antimonii ceratum* is an effectual remedy in these cases.

SUGAR, *barley*, *saccharum hordeatum*, is a *sugar* boiled till it be brittle, and then cast on a stone anointed with oil of sweet almonds, and formed into twisted sticks, about the length of the hand, and the thickness of a finger.

It should be boiled up with a decoction of barley, whence it takes its name; but, in lieu thereof, they now generally use common water, to make the *sugar* the finer. To give it the brighter amber colour, they sometimes cast saffron into it. It is found very good for the cure of colds and rheums.

SUGAR, in *Chemistry* and *Medicine*, denotes a crystallizable essential salt, of a sweet agreeable taste, contained more or less plentifully in many kinds of vegetables, as well as in the SUGAR-*cane*, which furnishes the greatest quantity of it.

Mr. Margraaf has obtained *sugar* from the roots of several plants, as from carrots, parsnips, white and red beets. Considering that *sugar* is soluble in spirit of wine, and that the mucilaginous parts of plants are not soluble in that fluid, he easily obtained a pure *sugar* by digesting the dried roots in that spirit, and by evaporating the liquor. It is also presumed, that much *sugar* may be obtained from other vegetables, as from green peas, cabbage, green farinaceous grains, and from several trees, as the sycamore and birch trees. Green MAIZE contains a liquor from which the American savages are said to extract *sugar*. It may also be extracted from the *asclepias caule erecto simplici annuo*, and from any flowers collected while the morning dew is upon them. But the vegetable which yields the largest quantity of *sugar*, next to the *sugar-cane*, is the *sugar*-MAPLE. The methods employed for extracting *sugar* from this tree in Canada are related by M. Gautier, in the Mem. des Scav. Estrang. tom. ii. and by Mr. Kalm, in the Swedish Mem. for 1757. By discovering a menstruum, that would dissolve the *sugar* and not the slimy substance, the saccharine and mucilaginous parts of plants might be separated from one another with advantage.

Sugar dissolves by the assistance of heat in rectified spirit; but as the greatest part of it separates again in the cold, and concretes into a crystalline form, saccharine concretions are thus obtained from saturated spirituous tinctures of several of the sweet plants of our own growth. *Sugar* is also soluble in water, and is one of those salts that is soluble in the smallest quantity of water. *Sugar* when distilled yields a phlegm, an oily empyreumatic acid, a small portion of coloured empyreumatic oil, and leaves a considerable quantity of residuous coal.

Sugar-candy consists of an acid united with a large quantity of a very attenuated and mucilaginous earth, and with a certain quantity of sweet and not volatile oil, which is in a state perfectly saponaceous, or entirely soluble in water by means of the acid.

Solutions of *sugar* mingle uniformly with those of other saline substances, whether acid, alkaline, or neutral, without making any visible alteration in the infusions of the coloured flowers of vegetables, or other liquors, in which acids or alkalis produce a change of colour or a precipitation. *Sugar* appears to be completely neutral, and unites with most humid bodies, without altering their native qualities, and serves as a medium for uniting together some bodies naturally repugnant, as distilled oils and water. It impedes also the coagulation of milk, and the separation of its butyraceous part. This salt is very susceptible of the spirituous fermentation, when it is diluted in a sufficient quantity of water. And from these properties, it is supposed to unite the unctuous part of the food with the animal juices: hence, some have concluded, that it is nutritive to animals, and increases corpulence; others have ascribed to it a contrary effect, as it is said to prevent the separation of the oily matter, which forms fat from the blood; and others again have charged it with rendering the juices thicker and more sluggish, retarding circulation, obstructing the natural secretions, and thus occasioning or aggravating scorbutic, cathartic, hypochondriacal, and other disorders. However, experience seems to shew, that the moderate use of it is at least innocent.

Sugar preserves both animal and vegetable substances from putrefaction; and Dr. Lewis says, that it possesses this power in a higher degree than the common alimentary salt. On account of this property, it has been sometimes applied externally as a balsamic and antiseptic.

The impure brown *sugars*, by virtue of their oily or treacly matter, prove emollient and gently laxative. The crystals or candy are most difficult of solution, and hence are most proper where this soft lubricating sweet is wanted to dissolve slowly in the mouth, as in tickling coughs and hoarseness. Dict. Chem. Art. *Sugar*. Lewis's Mat. Med.

Sugar has been said to be a specific against the famous Indian poison mentioned by Mr. de la Condamine; but this seems a mistake. See POISON.

Coarse *sugar*, in which there is more oil than in refined *sugar*, is recommended as a good medicine in collyria for discharging ulcers of the cornea, in which astringents are hurtful.

SUGAR, *maple*. See MAPLE.

SUGAR *of milk*. See MILK.

SUGAR *of roses*, *saccharum rosatum*, is white *sugar* clarified, and boiled into a consistence in rose-water; when boiled, they form it into lozenges, sometimes into little grains, of the size of peas, by keeping it stirring till it be cold and dry. It is reputed good to soften and allay acrimonies, &c. of the breast. See ROSE.

SUGAR, *acid of*, a new acid lately discovered by M. Bergman. The process of procuring it is this: to one ounce of the finest *sugar* are added three ounces of the strongest spirit of nitre, in a tubulated retort. After the most phlogisticated part of the nitrous acid has exhaled, a receiver

receiver is to be adapted to the neck of the retort, and the solution made to boil gently, till it acquires a brown or chesnut colour; when three more ounces of nitrous acid are to be added, and the ebullition is to be continued till the tinged and smoking acid has nearly disappeared. The liquor remaining in the retort is now to be put into a broad vessel; and, on cooling, quadrilateral prismatic crystals will be formed, which, after being dried on a bibulous paper, will weigh about a dram and a half and nineteen grains. The remaining liquor, in which the crystals were formed, is to be treated in the same manner, with two ounces more of spirit of nitre; and will furnish half a dram and thirteen grains of fresh crystals. To the glutinous fluid now remaining, two more ounces of nitrous acid are to be added in small portions at different times; and the whole is to be evaporated to dryness; when a saline mass is left, which, when dry, weighs about half a dram. These different products mixed together are purified by repeated solution and crystallization. The crystals, thus prepared, are the *acid of sugar:* the process for obtaining which is expensive; as to produce one ounce of it from three ounces of *sugar*, thirty ounces of strong spirit of nitre must be employed. It may also be extracted from honey and other saccharine juices; and from gum-arabic, and the most highly rectified spirit of wine.

For a farther account of this acid, its chemical properties and affinities, and combinations with other substances, see T. Bergman, Chemiæ Professoris, &c. Opuscula Physica & Chemica, &c. vol. i. diss. 8. Upsal, 1779.

SUGAR-*spirit*, a name given by our distillers to a spirit made in England, Holland, and other places, from the washings, scummings, dross, and waste of a *sugar*-baker's refining-house. The manner of preparing it is the same with that used for the malt and melasses spirits. The refuse of the *sugar* is fermented with water in the usual manner, then distilled into what is called *low wines*, and afterwards rectified, without any addition, into proof spirit.

When the operation is well performed, and no foul, fœtid, or foreign matter has got in among the wash, this is a tolerably clean spirit. We usually make it such, but in Holland it is usually made very nauseous and disagreeable; though capable, by an easy rectification, familiar with us, though not much known abroad, of being brought to a fine and clean spirit. With us this *sugar* spirit is used to mix with, and adulterate brandy, rum, and arrack, which will receive a large dose of it without its being at all discoverable; but the Dutch, who have it very coarse, can only adulterate rum with it, and even that will bear but a small proportion, without being betrayed by its nauseousness.

This *sugar-spirit*, reduced to alcohol, makes one of the purest spirits we are acquainted with, much superior to that of melasses, and much more to that of malt. Shaw's Essay on Distillery.

We have, in the Philosophical Transactions, an account of a volatile and pungent spirit of sugar, which was made from what the *sugar*-bakers call *sugar-water*; which is no other than the water in which the aprons, moulds, and other utensils, employed in the refining of *sugar*, are washed. This was so extremely pungent, that a man could not smell to a large quantity of it without danger of suffocation; and so volatile, that no stopping it up could preserve its spirit for any length of time. Phil. Transf. N° 130.

SUGAR, *cask of.* See CASK.

SUGAR, *chest of.* See CHEST.

SUGAR *of Saturn.* / SUGAR *of lead.* } See SACCHARUM *Saturni.*

SUGGESTION, SUGGESTIO, the act of hinting, or furnishing another with a thought or design, or of insinuating it artfully into his mind.

In the French law, a testament is said to be made by *suggestion*, when it is made by surprise, and contrary to the intention of the testator.

If *suggestion* be proved, the testament becomes null. Articles of *suggestion* are not admittable against a testament written with the testator's own hand, which is never suspected.

SUGGESTION *for prohibition*, in *Law*. See PROHIBITION.

SUGGESTION, *prosecution by information or.* See INFORMATION.

SUGGESTUS, among the Romans, a place in the *campus martius* raised higher than the rest, where every magistrate, according to his rank, was allowed to harangue the people; but private persons could not, unless they first obtained leave from some magistrate to do it.

SUGGRUNDARIUM, among the Romans, a place where infants, not exceeding forty days old, were buried; it being unlawful to burn them.

SUGILLATION *of the eye*, in *Surgery*, is an inflammation, usually called the *blood-shot eye*. See OPHTHALMIA.

SUGITIVA, a term used by some authors to express medicines, which suck up and absorb the serosities in dropsical persons.

SUICIDE. See FELO *de se*.

SUIT, SUTE, SECTA, in *Law* (from the French *suite*, a following another), is used in divers senses. As, SUIT *in law*, which is of two kinds, *real* and *personal*: the same with what we call *real* and *personal actions:* from which also proceed *mixed actions*. See ACTION.

SUIT *in equity or chancery*, commences by preferring a BILL to the lord chancellor in the style of a petition, praying relief at his hands, and also process of subpœna against the defendant, to compel him to answer upon oath to all the matter charged in the bill. And if it be to grant the possession of lands, to stay waste, or to stop proceedings at law, an INJUNCTION is also prayed, commanding the defendant to cease. The bill must call all necessary parties before the court, otherwise no decree can be made to bind them, and must be signed by counsel, as a certificate of its decency and propriety. When the bill is filed in the office of the SIX *clerks*, if an injunction be prayed therein, it may be had at various stages of the cause, according to the circumstances of the case. But, upon common bills, as soon as they are filed, process of SUBPOENA is taken out; which is a writ commanding the defendant to appear and answer to the bill, on pain of 100*l.* And if the defendant, on service of the subpœna, does not appear within the time limited by the rules of the court and plead, demur, or answer to the bill, he is said to be in CONTEMPT, and is liable first to ATTACHMENT, then to an *attachment* with proclamations, next to COMMISSION *of rebellion*, afterwards to the search of a serjeant at arms, and lastly to a SEQUESTRATION. After an order for sequestration issues, the plaintiff's bill is to be taken PRO CONFESSO, and a decree to be made accordingly. But if the defendant is taken upon any of this process, he is to be committed to prison till he puts in his appearance or answer, performs what this process is designed to enforce, and clears his contempts by paying the charges.

The process against a body corporate is by *distringas*, to distrain them by their goods and chattels, rents and profits, till they shall obey the summons of the court. And for the process against a peer and member of the house of commons, see LETTER *missive*.

If the defendant appears regularly and takes a copy of the bill, he is next to demur, plead, or answer. See DEMURRER and PLEA.

The most usual defence that is made to the plaintiff's bill is an answer given in upon oath, or the honour of a peer or peeress; but where there are amicable defendants, their answer is usually taken without oath, by consent of the plaintiff. If the defendant lives within twenty miles of London, he must be sworn before one of the masters of the court; if farther off, there may be a DEDIMUS *potestatem* to take his answer in the country, where the commissioners administer to him the usual oath; and then, the answer being sealed up, either one of the commissioners carries it up to the court, or it is sent by a messenger, who swears he received it from one of the commissioners, and that the same has not been opened or altered since he received it. An answer must be signed by counsel, and must either deny or confess all the material parts of the bill; or it may confess and avoid, i. e. justify or palliate the facts. If one of these is not done, the answer may be excepted to for insufficiency, and the defendant be compelled to give another. A defendant cannot pray any thing in this his answer but to be dismissed the court; if he has any relief to pray against the plaintiff, he must do it by CROSS-*bill*.

After answer put in, the plaintiff, upon payment of costs, may amend his bill, either by adding new parties or new matter, or both, and the defendant is obliged to answer afresh to such amended bill. But this must be before the plaintiff has replied to the defendant's answer, whereby the cause is at issue; for afterwards, if new matter arises, which did not exist before, he must set it forth by a *supplemental bill*. There may be also a bill of REVIVOR, and likewise a bill of *interpleader*, where a person who owes a debt or rent to one of the parties in *suit*, but, till the determination of it, he knows not to which, desires that they may interplead, that he may be safe in the payment. In this case it is usual to order the money to be paid into court, for the benefit of such of the parties, to whom, upon hearing, the court shall decree it to be due.

If the plaintiff finds sufficient matter confessed in the defendant's answer to ground a decree upon, he may proceed to the hearing of the cause upon bill and answer only; in which case he must take the defendant's answer to be true in every point. Otherwise the course is for the

the plaintiff to reply generally to the answer, averring the bill to be true, certain, and sufficient, and the defendant's answer to be directly the reverse, which he is ready to prove as the court shall award; upon which the defendant rejoins, averring the like on his side, which is joining issue upon the facts in dispute. These are proved by examination of witnesses, and taking their depositions in writing. For the purpose of examining witnesses in or near London, there is an EXAMINER's office, and elsewhere it is done by COMMISSION. When the depositions of witnesses are taken, they are transmitted to the court with the same care that the answer of a defendant is sent. When they are all examined, the depositions may be published, by a rule to pass publication; after which they are open to the inspection of all the parties, and copies may be taken of them. The cause is then ripe to be set down for hearing, which may be done at the procurement of the plaintiff or defendant, before either the lord chancellor or the master of the rolls, according to the discretion of the clerk in court, regulated by the nature and importance of the *suit*, and the arrear of causes depending before each of them respectively. Either party may be summoned to hear judgment on the day fixed for the hearing; and then, if the plaintiff does not attend, his bill is dismissed with costs; or if the defendant makes default, a decree will be made against him, which will be final, unless he pays the plaintiff's costs of attendance, and shews good cause to the contrary on a day appointed by the court. A plaintiff's bill may also at any time be dismissed for want of prosecution, which is in the nature of a nonsuit at law, if he suffers three terms to elapse without moving forward in the cause. For the method of hearing causes, see HEARING.

The chancellor's decree is either interlocutory or final. If any matter of fact is strongly controverted, it is referred to a jury, upon a *feigned* ISSUE.

If a question of mere law arises in the course of a cause, it is referred to the opinion of the judges of the court of king's bench, upon a case stated for that purpose.

Another thing also retards the completion of decrees. Frequently long accounts are to be settled, incumbrances and debts are to be inquired into, and a hundred little facts to be cleared up, before a decree can do full and sufficient justice. These matters are always by the decree on the first hearing referred to a master in chancery to examine, which examinations frequently last for years, and then he is to report the fact, as it appears to him, to the court. This report may be excepted to, disproved, and overturned, or otherwise is confirmed, and made absolute by order of the court.

When all issues are tried and settled, and all references to the matter ended, the cause is again brought to hearing upon the matters of equity reserved; and a final decree is made, the performance of which is inforced (if necessary) by commitment of the person, or sequestration of the party's estate. And if by this decree either party thinks himself aggrieved, he may petition the chancellor for a REHEARING. But unless a rehearing be desired, the decree is signed by the chancellor, and enrolled of course. 3 Geo. II. cap. 30. However, a *bill of* REVIEW may be had on sufficient cause alledged: and from this court the dernier resort is a PETITION *of appeal* to the house of lords. Bl. Com. vol. iii. p.442, &c.

SUIT *of court*, or *suit of service*, an attendance which the tenant owes the court of his lord. See SECTA and SERVICE.

SUIT *covenant*, when your ancestor hath covenanted with mine to sue to his court.

SUIT *custom*, when I and my ancestors owe *suit* time out of mind.

SUIT *real*, or *regal*; when men come to the sheriffs turn or leet. See SECTA *regalis*.

SUIT-*silver*, in *our Old Writers*, a small rent, or sum of money, paid in some manors to excuse the appearance of freeholders at the courts of their lords.

SUIT also signifies the following one in chase, as FRESH *suit*.

SUIT, again, signifies a PETITION made to the king, or any great person.

SUKOTYRO, in *Natural History*, the Chinese name of a very large and remarkable horned animal, which seems to be the same with the carnivorous bull of Pliny and the ancients.

It is of the size of a large ox; its head is shaped like that of a hog; its ears are long and hairy; and its tail is bushy. On each side of the head, near the eyes, there stands a large horn, resembling the ivory tusk of the elephant, but not altogether so thick. Nieuhoff, who gives this account, adds, that it is very rarely caught, and that it feeds on grass; but this last observation may possibly have been spoken of course, without any one's having certainly known it. All that we have ever seen of this animal, is a pair of horns of an enormous size, formerly in the possession of sir Hans Sloane, and of which he has given an account to the Academy of Sciences at Paris, 1727.

The captain of an East Indian ship, on seeing these horns, assured sir Hans, that they belonged to a large species of bull in the East, which he had seen, and which, by his account, seemed to be the same with the creature before mentioned, as described by the ancients; but as none of the modern naturalists have seen it, it has been left out of their accounts.

The pair here mentioned seem not to be the only ones preserved in Europe, for Gesner tells us of one of an enormous size, which is still hung up in the cathedral church of Strasburg.

SULA, in *Ornithology*, a name given by Hoier, and some others, to a bird, described as a distinct species of the webfooted water-fowl, but seeming to be no other than the *anser bassanus*, or *soland* GOOSE.

SULCATED *leaf*, among *Botanists*. See LEAF.

SULL, a word used in the western parts of England for a plough.

SULPHUR, in a *general sense*, is a term that has been used by the ancient chemists to denote all inflammable substances, of whatever nature they might be. *Sulphur*, according to them, is one of the principles of bodies, and they call the inflammable principle itself the principal *sulphur*.

Accordingly, they speak continually of the *sulphurs* of metals, of the *sulphurs* of plants, and of the *sulphurs* of animals: and oils, ardent spirits, resins and bitumens were, in this extensive application of the term, all *sulphurs*.

But, by the more accurate distinction, suggested by Beccher, and more fully illustrated and established by Stahl and modern chemists, between the pure and simple inflammable principle, called PHLOGISTON, and the more compounded bodies which contain it, and owe their inflammability to it, we acquire a knowledge of the true theory of *sulphur* and all inflammable substances. Hence we learn, that the inflammable principle is always alike, and the same in every body, and that this principle, by its combination with different substances, produces all the inflammable matters with which we are acquainted.

Oils, fats, resins, bitumens, ardent spirits, coals, metals, *sulphur* properly so called, or common *sulphur*, are so many compounds, all which have the common property of burning, because they all contain the principle of inflammability; but which differ in other respects, because this principle is united to different substances, and in different proportions.

SULPHUR, *in a more confined and proper sense*, denotes that concrete mass, which is formed by the combination of the vitriolic acid with the inflammable principle or phlogiston.

Nature probably forms, and combines daily, mineral *sulphur* within the earth. This substance, commonly called *brimstone*, is abundantly diffused in many places, especially where metallic minerals exist.

Sulphur almost pure, denominated *native*, or *virgin sulphur*, *sulphur vivum*, is found in volcanos and grottos, where it is sublimed in form of transparent crystals. But the greatest quantity of *sulphur*, which exists naturally, is combined with metals in ores, and especially in PYRITES. And as it is fusible and volatile, it is procured from these minerals by distillation and sublimation.

Sulphurs, considered in their native state, are defined to be dry, solid, but friable fossil bodies, melting with a small heat, when fired in the open air, burning almost wholly away with a blue flame and noxious vapour, endued with an electric power, and not dissoluble in acids.

Of this genus of fossils, Dr. Hill enumerates four known species. 1. The yellow native *sulphur*, which, in its purest state, is of a pale straw-colour, and as pellucid as the finest amber; but is more frequently found coarser, and more opake. It is found in the gold mines of Peru, in Hungary, and some other places. 2. The green native *sulphur*. This is harder than the other, and is usually found in small masses composed of several crusts. It is found, so far as is yet known, only about mount Vesuvius. 3. The grey native *sulphur*, which is common in Iceland, and many other places, and is the coarsest and worst of all the kinds. And, 4. The most rare and beautiful of all the kinds, the red native *sulphur*. This is of a fine glowing red, like cinnabar, and very bright and transparent, and is found, so far as is yet known,

known, only in the gold mines of Peru. Hill's Hist. of Foss. p. 400.

Dr. Heberden found some native *sulphur* exceedingly pure on peak Teneriffe.

Dr. Lister has given it as his opinion, that there is no such thing as pure mineral *sulphur* found native, or in its original state, in the earth. He supposes all the pyrites to contain a vast quantity of *sulphur*, as indeed experience proves; and is of opinion, that as we by art can, by means of fire, melt and separate pure *sulphur* from the pyrites, so nature, acting by subterranean fires, can do, and frequently does the same; and that the *sulphur*, found pure about the burning mountains, and in mines, is all of this kind. He supposes, also, that thunder, lightning, and earthquakes, are all owing to this matter; and that it is owing to the exhalations of the pyrites, which are in effect the pyrites itself. Philos. Trans. N° 156.

Sulphur, such as it is in commerce and the arts, is of a pale yellow colour, and of a disagreeable and peculiar smell, which is rendered more sensible when the *sulphur* is heated or rubbed. The specific gravity is much greater than that of water, and less than that of earths and stones. Mr. Kirwan (Phil. Trans. vol. lxxii. part i. p. 235.) by weighing flowers of *sulphur* in a perforated brass box in water, found its specific gravity to be 1,294. Mr. Petit weighed it in oil, and found its specific gravity 2,344, which Mr. Kirwan believes to be nearly the truth.

Sulphur is brittle and pulverable, although it may be easily softened. The greatest part of the *sulphur* met with in the shops, is extracted from certain ores by a kind of distillation, or prepared from minerals abounding with vitriolic acid, by stratifying them with wood, which being set on fire, the *sulphur* is collected in cavities made in the upper part of the pile. The largest quantities are brought from Saxony, in irregular masses, which are afterwards melted and cast into cylindrical rolls.

Sulphur seems to be incapable of receiving any alteration from air or from water, separately or jointly, and even from fire in close vessels. By exposure to fire and to air it is inflamed and burnt; when it is very hot and burns quickly, its flame is ardent and capable of kindling inflammable bodies, but always bluish, not very luminous, and not accompanied with any soot or smoke, but with an acid vapour of a penetrating and suffocating smell. If, on the contrary, *sulphur* is burnt very slowly in open air, its flame can only be seen in the dark, like a small bluish glimmering light, and its heat is so inconsiderable, that it cannot kindle the most inflammable substances. Accordingly M. Beaumé has contrived to burn all the *sulphur* that is contained in gun-powder, without kindling the powder, by heating a tile to such a degree, that the powder, which is thrown upon it, may not fulminate, but only emit a white smoke. If the tile and powder be carried in this state to a dark place, the vapour which seemed to be a white smoke, will then appear to be a true flame, but very bluish and faint; and this flame will continue till all the *sulphur* of the powder be consumed, if the tile remains sufficiently hot for that purpose.

Sulphur heated so much as to burn, and thrown while melted and burning into water, is very soon rendered solid, acquiring first a considerable degree of softness, and then recovering its natural consistency and brittleness.

Pure acids seem to have no action upon *sulphur*, though M. Beaumé has observed, that if concentrated vitriolic acid be poured upon it, and heated to a certain degree, the *sulphur* will liquefy, and appear in the water like oil, and when it is cooled, appear to have a green colour.

Spirit of wine does not sensibly act upon this concrete substance, unless they be applied to each other (as the count de Lauraguais discovered) in the state of vapour. But *sulphur* dissolves, by the assistance of heat, in oils both expressed and distilled, and in the mineral petrolea; and when dissolved, yields a very offensive smell, and discovers to the taste a nauseous pungency and heat. However, expressed oils and petroleum dissolve it more readily and more plentifully than the distilled, taking up so much as to become thick and almost consistent. *Sulphur* is also dissolved by alkalis fixed and volatile, and even by calcareous earths.

Sulphur unites easily, but with different degrees of affinity, with all metallic matters, excepting gold, platina, and zinc. See *Tables of* AFFINITY.

The compounds formed by *sulphur* with different metals are different; but all of them possess a metallic lustre, without any ductility; and these combinations of *sulphur* and of metals are very frequently found in a natural state.

The purest gold, when melted with common *sulphur*, remains perfectly the same as before; it lets the *sulphur* burn freely away, remaining itself entire, and in a mass. Silver, when it begins to grow red hot in a crucible, melts immediately on adding common *sulphur*; and when poured out, it proves a mass that cuts very easily, is very malleable, and is of the colour and consistence of lead: this mass, however, being a second time exposed to a very strong fire for a considerable time, is freed from its *sulphur*, which becomes dissipated, and the silver germinates into a kind of woolly substance, if the fire be slackened toward the end of the operation.

Tin, granulated and stratified with an equal, or double quantity of *sulphur*, deflagrates in the fire as if nitre had been added, and leaves the fluid, which becomes solid and consistent while it is yet red in the fire; whence it is plain that the fusion of tin is retarded by *sulphur*. The remaining regulus is very brittle under the hammer, much like a semi-metal, and is of the colour of lead; but the part of the tin, thus turned into scoriæ, looks like ashes and dust upon the surface, but is darker coloured, and cleaner within. The whole quantity of the tin will be converted into these scoriæ, by repeating the burning with fresh quantities of brimstone.

Lead melted with brimstone, after the deflagration, is reduced to a mass which is hardly fusible by a great fire, but forms a friable mass, consisting of very bright and glittering particles.

Copper, stratified with *sulphur*, melts immediately in the fire, and turns to a black brittle mass. The same thing also happens, if *sulphur* be put upon copper when red hot. Iron being taken red hot out of the fire, and rubbed with *sulphur*, melts into a spungy dross; it afterwards quits this *sulphur* with difficulty, but melts very easily with it. There is no metal, or semi-metal, that seems so nearly allied to iron as *sulphur*, or that melts so easily and remains so intimately mixed with it. Regulus of antimony being well powdered, and mixed with *sulphur*, and stirred with an iron while in fusion, returns into crude antimony again. The fusion of crude antimony is also greatly promoted and assisted by common *sulphur*; but it does not mix so readily with the *sulphur* as the regulus.

Bismuth melted with common *sulphur* runs into a mass resembling antimony, of a faint grey colour, consisting of minute and very bright needles, each cutting the others across: this mass is extremely brittle.

Zinc melted with *sulphur* does not readily mix with it, but if it be kept a long time in a moderate fire, and *sulphur* be many times poured over it, so as to cover the whole surface, and it be continually stirred together, it at last produces a very brittle dark-coloured shining substance.

From these experiments with *sulphur* on the metals, it appears, 1. That iron being very greedy of *sulphur*, all the other metals, and semi-metals, may be freed from *sulphur*, by adding iron to them. 2. That a very small quantity of iron, a greater quantity of copper, and a much larger of lead, or tin, are necessary to absorb the same proportion of *sulphur*. Cramer's Art of Assaying, p. 43.

Sulphur may be separated from metallic substances by several methods; as by the mere action of fire, in the operation of ROASTING of ores, the ore of mercury and the combinations of arsenic with *sulphur* excepted; by means of acids, which serve to decompose several combinations of *sulphur* with metals, as in the separation of this substance from crude antimony with aqua regia; and also by means of other metals, to which the *sulphur* has a greater affinity, as in the *dry* PARTING, the purification of gold by antimony, and the decomposition of cinnabar, of orpiment, and of crude antimony.

From the analysis of *sulphur* effected by combustion, chemists have been led to infer, that its two constituent principles are an inflammable matter and the vitriolic acid; for, during its combustion, nothing is perceptible but two matters, one of which is destroyed or dissipated by the inflammation, and another which has the the properties of this acid. Besides, *sulphur* may actually be made by combining its acid with the inflammable principle or phlogiston.

The process by which the celebrated Stahl formed *sulphur* exactly similar to the native *sulphur*, consists in mixing and melting together in a crucible equal parts of fixed alkali, and of vitriolated tartar, to which is added a quantity of powdered charcoal, equal to a fourth part of the weight of the salts. The matter is to be stirred with an iron rod, that the charcoal may be well mixed with the salts; the crucible is to be covered, and a pretty strong heat is to be immediately applied, and continued for a very short time: the crucible is then to be removed from the fire, and the melted matter is to be poured

upon

upon a stone previously greased. This matter, which sparkles when it is poured, is coagulated by cold, and becomes a brittle mass, of a deeper red colour than ordinary liver of *sulphur*; but it has the smell, the solubility, the deliquescency, and all the other properties of liver of *sulphur*. By dissolving it in water, and by adding any acid to the solution, an artificial *sulphur* will be precipitated, which being collected and dried, is found not to differ from natural *sulphur*. But we are not to conclude with Glauber and Boyle in similar operations, that the *sulphur* thus obtained existed ready formed in any of the substances employed, and that it is only extracted from these. On the contrary, it is certainly known, that not a particle of *sulphur* exists in vitriolic acid, nor in neutral vitriolic salts, with the basis of fixed alkali, nor in very pure alkalis, nor in any oil, nor in any vegetable coal, and consequently, the *sulphur* obtained in these operations is a new product, resulting from the union of the vitriolic acid with the inflammable principle of the vegetable coal, as Stahl has advanced.

The fixed alkali is not absolutely necessary to the success of this process, but it is useful for facilitating the fusion of the vitriolated tartar, and for preventing the dissipation and combustion of most of the *sulphur* as soon as it is formed.

From the process above recited we may infer, that vitriolic acid, and the inflammable principle, cannot form *sulphur* by combining together, unless they be both perfectly dry; that the inflammable principle of all bodies is always capable of forming *sulphur* with the vitriolic acid, provided it be, or can be made dry, and therefore, that the inflammable principle is always the same, whether it resides in resins, bitumens, oils, and fat, coals or metals: that the vitriolic acid quits any body with which it happens to be combined, when it can unite with the inflammable principle of any other body, and with this principle forms *sulphur* when it is properly applied: that the principles and properties of *sulphur* being known, we may deduce from these a more accurate knowledge of the particular nature of the inflammable principle, by comparing the difference between *sulphur*, volatile sulphureous acid, and pure vitriolic acid; hence it is found, that the smell and colour of *sulphur*, its volatility, its constant dryness, its insolubility in water, which are properties that do not belong to vitriolic acid, are produced by the inflammable principle, that possesses all these qualities in itself, or that is, at least, capable of communicating them to the compounds in the combination of which it enters: and finally, that the inflammable principle possesses eminently the above mentioned properties; for we know that the quantity of it in *sulphur* is much less than the quantity of the vitriolic acid. In order to determine the proportion of the two principles of *sulphur*, Stahl made the following experiment. He put a quantity of powdered liver of *sulphur* upon an earthen-ware plate, and placed this plate upon fire, so gentle, that the liver of *sulphur* might not be melted, nor even so softened as to run into lumps. This powder must be stirred, and the fire increased toward the end, till no smell be perceived. The remaining matter is to be dissolved in water, and, by crystallization, a very pure vitriolated tartar is formed. In this operation the inflammable principle of the *sulphur* is gradually dissipated without any sensible combustion, and its acid combines, or remains combined, with the alkali of the liver of *sulphur*.

Mr. Brandt, who carefully repeated this experiment, found, from the quantity of vitriolated tartar thus obtained, that, in *sulphur*, the proportion of inflammable principle is to that of the vitriolic acid as 3 to 50; or, that the *sulphur* contains only one sixteenth of its weight of inflammable principle.

Neumann, from a similar experiment, infers, that in 16 ounces of *sulphur*, there are upwards of 15 $\frac{3}{4}$ ounces of pure acid, and not quite $\frac{1}{4}$ of an ounce of the inflammable principle. Others have concluded, that *sulphur* contained $\frac{1}{7}$ of phlogiston.

The ingenious Mr. Kirwan (Phil. Trans. vol. lxxii. part i. p. 233.) has endeavoured to find the quantity of phlogiston in *sulphur*, by estimating the quantity of fixed air produced during its combination; and the result of his experiment is, that 100 grains of *sulphur* contain 40,61 grains of phlogiston, and 59,39 of vitriolic acid.

The composition of *sulphur* may be obviously and compendiously illustrated, by pouring upon melted lead the acid of *sulphur*, and collecting the rising vapour in a large glass, or other vessel, held over the melted lead; and as soon as the vapour is condensed, we may observe several filaments of *sulphur* sticking to the sides of the glass. When lead is in a state of strong fusion, its phlogiston is in a state of dispersion; the acid of *sulphur* instantaneously unites itself with this phlogiston, and forms *sulphur*.

The author of the Chemical Dictionary remarks, on the subject of the name *sulphur*, that as other acids besides the vitriolic can also contract an intimate union, and form compounds with pure phlogiston, this name may be generally applied to all compounds of pure acid and phlogiston, which may be distinguished from each other by adding the name of the acid; as *vitriolic sulphur*, *nitrous sulphur*, and *marine sulphur*, if any such *sulphur* does exist: but he also remarks, that the name of *sulphur* can be given to those compound bodies only which do not contain any oil; this condition being essential to the sulphureous combination, and consequently that we cannot admit of *acetous sulphur*, or *tartareous sulphur*, or of others of this nature containing vegetable acids, on account of the oil which enters into their composition as an essential principle.

The uses of *sulphur* are very extensive in chemistry, in medicine, and in the arts. The LIVER *of sulphur* is employed in chemistry for several solutions. *Sulphur* is also useful for several fusions, precipitations, and separations of metals and minerals. And as *sulphur* contains a very large quantity of vitriolic acid, a method is now practised of extracting from it this acid, by burning *sulphur* in close vessels with the addition of nitre. See CLYSSUS *of sulphur*.

Sulphur is employed in medicine, both internally and externally: the internal preparations are flowers of *sulphur*, washed *sulphur*, magistery of *sulphur*, tablets, balsams, &c. (see the following articles), in some of which this substance is not altered, but only purified and divided, and in others it is combined with other substances. The native *sulphurs* should never be used internally without purification, because they almost always participate of arsenic, which is discoverable in some by their having naturally more or less of a red colour, and in others by their exhibiting this colour after a part of the pure *sulphur* has been separated by sublimation. Pure *sulphur*, taken in doses of ten grains to a dram or more, gently loosens the belly, and promotes perspiration. Some physicians and chemists, indeed, considering that *sulphur* is unsoluble in water, and capable of resisting the action of most menstrua, have advanced, that it can produce no effect when taken internally, single and unaltered; but this notion seems to be groundless, and *sulphur*, which is attached by all oily and saponaceous substances, and consequently by almost all animal liquors, is much more soluble than is generally believed. It seems to pass through the whole habit, and manifestly transpires through the skin, as appears from the sulphureous smell of persons who have taken it, and from silver being stained in their pockets to a blackish hue, as by the vapour of sulphureous solutions.

Sulphur is principally recommended against the piles, in disorders of the breast, and in cutaneous eruptions: in the ITCH it is a certain remedy, whether internally or externally used, in which case its efficacy probably depends, not so much on its purifying the blood, as on its fumes being destructive to the cuticular animalcules to which the present theory ascribes that distemper. It remarkably corrects or restrains the power of certain mineral substances of the more active kind: by the admixture of *sulphur* mercury becomes inert, the virulent antimonial regulus mild, and arsenic itself almost innocent.

Several mineral waters, which are drank or used as baths for some diseases of the breast or of the skin, owe their good qualities to the *sulphur* contained in them. And *sulphur* combined with other substances may contribute to their medicinal powers.

Sulphur is also used in several arts. By means of it fine impressions of engraved stones are taken. See BRIMSTONE, and *Impressions of* MEDALS.

The utility of this substance as an ingredient in the preparation of GUNPOWDER and FIRE-*works* is well known; and it is also used for whitening wool, silk and many other matters exposed to its vapour during its combustion, the colours and redness of which could not be destroyed by any other substance, but are quickly effaced by this acid vapour. In this case it must be burnt, as Stahl has observed, very slowly. See BLEACHING.

The vapours of *sulphur* also whiten red roses; and even young rooks, taken out of the nest and exposed to them, are said to become perfectly white. They have the same effect on gold, which is to be restored to its colour by boiling it in water with tartar. See on the subject of this article Dict. Chem. art. *Sulphur*. Watson's Chem. Ess. vol. i. p. 167, &c. Lewis's Mat. Med. art. *Sulphur*.

There is a preparation of common *sulphur*, strongly recom-

commended by Mortimer for preserving timber from being worm-eaten, as it is very subject to be when felled before the sap is wholly at rest. A quantity of common yellow brimstone is to be put into a common retort of glass, and covered three fingers deep with aqua fortis; this is to be distilled off to a dryness, and the same repeated three times. The *sulphur* then is to be taken out, and laid on a marble, or put into an open flat glass vessel, where it will soon run into an oil by deliquium. This oil is to be rubbed on any curious piece of wood that is in danger of worms; it will destroy them if they have begun to breed in it, and wholly prevent them if not yet begun. It also gives the wood an agreeable tinge or colour, which no art can ever rob it of afterwards. It is also a great preservative of wood that is to be set in the earth, or under water; and may be used with success to rub over the cables in shipping, or any other ropes that are endangered by lying much in the water. Mortimer's Husbandry, vol. ii. p. 104.

SULPHUR *of antimony*. See ANTIMOMY.

The method of Angelus Sala for preparing the *sulphur of antimony*, seems, according to Dr. Plummer, preferable to the common way. The curious may find the description of Sala's in the Medic. Ess. Edinb. vol. i. art. 6. The doctor thinks, that, in the common preparation, much of the true *sulphur* is consumed by the deflagration, and the precipitated powder consists of many of the gross earthy parts of the salts in antimony. However, the *sulphur of antimony*, used by the doctor in the preparation of his *æthiops*, was made in the common way. See PLUMMER's *æthiops*.

SULPHUR *auratum*, a name given by some chemists to a preparation of *sulphur* and arsenic, called by others *rubinus arsenicalis*. See REALGAR.

SULPHUR, *balsam of*. See BALSAM *of sulphur*.

The college of London directs one part of flowers of *sulphur* and four of oil olive, and the same proportions of the flowers and of the petroleum, called Barbadoes tar; and that of Edinburgh, four ounces of the flowers and a pint of linseed oil, to be boiled together till they unite into the consistence of a balsam. When two ounces of the flowers are digested in ten of oil of turpentine, or in a mixture of six of oil of turpentine and four of oil of aniseeds, which last acts the most powerfully of any of the essential oils that have been tried, a considerable part of the *sulphur* remains undissolved.

The process for preparing these balsams requires caution, because when the *sulphur* is strongly acted on either by expressed or essential oils, in a boiling heat, the matter rarefies and swells much, and throws out great quantities of an elastic vapour, which, without a free exit, would produce violent explosions. A more elegant composition of this kind (says Dr. Lewis) might be obtained by adding to the essential oil a proper quantity of the balsam made with expressed oils, which will unite with it by a gentle warmth. These balsams have been employed externally for cleansing and healing foul ulcers; and they are recommended internally in some cachectic and hydropic cases, and also in coughs and consumptions, in which they promise (says Dr. Lewis), by their manifest heat and acrimony, to be oftener injurious than beneficial, as they have been frequently observed to hurt the appetite, and excite febrile symptoms.

SULPHUR, *clyssus of*. See CLYSSUS.

SULPHUR, *embryonatum*. See EMBRYONATUM.

SULPHUR, *fixed*. *Fixed sulphur* is used by the enamellers, and is prepared in the following manner. Boil flower of brimstone in common oil for an hour; take the matter off the fire, and pour on it a quantity of very strong vinegar, the flower of brimstone will on this sink to the bottom; pour off the liquors, and repeat the operation to the third time, and the powder then separated is the *fixed sulphur*. Neri's Art of Glass, p. 188.

SULPHUR, *flowers of*. See FLOWERS *of sulphur*.

Those who prepare the flowers in the way of trade, use for the subliming vessel a large iron pot, capable of holding two or three hundred weight, which is placed under an arched chamber, lined with glazed tiles, serving for the recipient. Some small portion of *sulphur* that rises first, especially when the vessels are large, or the air not sufficiently excluded, is apt to take fire, and give out its acid, which adhering to the flowers that sublime afterwards, communicate to them a sensible acidity or roughness; in consequence of which they are sometimes found to coagulate milk; when taken internally to produce gripes, and to receive from some metalline vessels a disagreeable taint: and, therefore, the London college directs such of the flowers, as may happen to concrete or melt together from the vicinity of the receiver to the fire, to be reduced to powder, not with metalline instruments, but either in a wooden mill, or in a marble mortar with a wooden pestle. From this superficial acid they are freed by boiling them in water, and afterwards carefully washing them with cold water.

The flowers of *sulphur* in substance seem to be preferable, for internal use, to any of the preparations: they are certainly more safe, and perhaps not less effectual, as they do not heat or irritate the first passages, and yet are evidently dissolved in the body and carried through the habit. They are most commodiously taken in the form of troches. Lewis. See *Troches of* SULPHUR.

SULPHUR, *liver of*. See LIVER *of sulphur*.

SULPHUR *metallorum*, or *sulphur of metals*, called also *sulphur figens*, is used, among *Chemists* and *Alchemists*, for a peculiar matter, which enters the composition of all metals.

Metals are supposed to consist of two essential parts or principles; mercury as the basis, or metallic matter; and *sulphur*, as the binder, or cement, which fixes the fluid mercury into a coherent malleable mass.

Some chemists, particularly Mons. Homberg, will have this *sulphur* to be no other than fire. It is now known to be the inflammable principle, called phlogiston. See SULPHUR.

SULPHUR, *milk of*, *lac sulphuris*, is directed by some to be prepared with fixt alkalis, which will dissolve *sulphur*; and this method is the most expeditious and least troublesome, provided the *sulphur* has been thoroughly united with a sufficient quantity of the alkali. But the preparation by quick-lime affords a more saleable whiteness, and accordingly it is directed to be made by the London Dispensatory in the following manner: boil flowers of *sulphur* in water, with three times their weight of quick-lime, till they are thoroughly dissolved; filtre the solution through paper, and pour on it weak spirit of vitriol, till a precipitation is procured; separate the precipitated matter, by pouring off the water, and wash it with fresh water, till it is become quite insipid.

The pure *lac* is not different in quality from pure *sulphur* itself, to which it is preferred, in external applications, only on account of its colour.

SULPHUR, *oil of*. See OIL *of sulphur*. Some think there is an essential difference between the acid of *sulphur* and its succedaneum, the oil of vitriol; but a late author asserts, notwithstanding the experiments brought to support this opinion, that if the two acid liquors be reduced to the same strength, and perfectly freed from all heterogeneous substances, they will be perfectly similar, and not to be distinguished. See Essay for Reforming of the London Pharmacopœia, London, 1774, p. 64.

It is evident, from numerous experiments, that vitriol and *sulphur* are things very nearly allied to one another. The vitriolate salt, in common *sulphur*, differs scarce at all from common vitriol, and the acid liquors obtained from both, under the different names of *spirit of sulphur*, and *oil of vitriol*, are the same, except in degree of strength.

The effects of these two acids in the body, and also on metals, &c. are exactly the same. It is observed, that the *sulphur* yields but a very small quantity of this acid, in comparison of the vitriol; but the reason of this is, that in the operation the rapid motion of the flame sublimes the far greatest part of the substance, unseparated in the form of flowers.

There are ways, however, of remedying this, and by some such means it was that the famous Drebbel obtained, at the rate of eight, and sometimes ten ounces of spirit, from a pound of *sulphur*; whereas, in the common process, one ounce is a considerable quantity to obtain. Possibly the grand secret, possessed by Mr. Ward, of making oil of vitriol, as he calls it, cheaper than others, may depend on this sort of contrivance. The vessels he uses are vast spheres of glass, of three feet in diameter, which must serve as well at least, if not much better, than bells; and oil of *sulphur*, and oil of vitriol, are so much the same, that there is no deceit in selling the one for the other.

In all the operations for the making oil of *sulphur*, the weather is a material thing to be regarded; for when the operation is performed in moist weather, there is always a greater quantity of spirit or oil prepared, than when in dry; and Drebbel acknowledged, that he could obtain one fourth more in these than in other seasons. This great chemist tells us, that he was convinced the contrivance he used was capable of very great improvements, and that he made no doubt of carrying it so far, at length, as to obtain an equal weight of acid spirit to that of the *sulphur* used in the experiment; the humidity of the air, at least, adding as much as the quantity of the *sulphur* lost in the operation. There are several common menstrua, by means of which *sulphur* may be reduced into the form of a highly rectified acid, and corrosive

corrosive liquor; and even spirit of nitre, or aqua fortis, well rectified, being digested upon the flowers of brimstone, and then distilled in ashes, and the process repeated five or six times, after the last operation, there will remain with the flowers nearly an equal weight of an acid spirit, in all things resembling that made by the bell, the spirit of nitre being scarce at all changed from what it was before the operation; and it seems, from experiment, that if the process were frequently reiterated, and the spirit of nitre changed, the whole might be thus transmuted into an acid spirit, abating only for some small proportion of earthy or metalline particles. Phil. Transf. N° 104.

SULPHUR, *ointment of.* See UNGUENTUM.

SULPHUR *præcipitatum*, a name given in the London Pharmacopœia to the medicine called by other authors *lac sulphuris*, or *milk of* SULPHUR.

SULPHUR, *purified*, is used in the making of GUN-*powder*, and other occasions. The method of preparing it at the powder-mills is this: they dissolve the *sulphur* by a very gentle heat, and then skim it, and pass it through a strainer. If the brimstone should happen to take fire in the melting, they have an iron cover that fits close to the melting-flame, and damps the vessel. The brimstone is judged to be sufficiently refined if it will melt without yielding any fœtid odour between two hot iron plates, and be changed into a kind of red substance. Shaw's Lectures, p. 389.

SULPHUR *rapax*, in *Chemistry*, a name given to arsenic, from its carrying off a great quantity of many metals in the fire, which it carries up with it, and sublimes in form of flowers, called by some CADMIA *fornacum*.

SULPHUR, *salt of*, is a chemical preparation, very improperly so called, being no other than the sal polychreston, impregnated with spirit of *sulphur*, and reduced to an acid salt, by evaporating its humidity. Some hold it a powerful febrifuge.

SULPHUR, *spirit of*, is nothing else than vitriolic acid obtained from *sulphur* by burning. This was formerly obtained by burning *sulphur* in an open crucible, placed upon a stand in an earthen dish filled with hot water, a large capital, or glass bell being suspended above this dish. The acid of the burning *sulphur* meeting the vapour of the hot water, united with this water, and fell down along the sides of the bell, or by the beak of the capital. The weak acid thus procured, was afterwards concentrated.

But the true method of obtaining much acid of *sulphur*, is to burn it in close vessels by means of a small quantity of nitre.

The greatest part of the vitriolic acid now employed is obtained by burning *sulphur*. The vapours of burning *sulphur* are the volatile, vitriolic, or sulphureous acid. These are very difficultly condensible. For which reason, very large vessels, and much time, are required in this operation. In great works leaden vessels are used, called *houses*, of a prismatic form, of which the altitude is about ten feet, and the base, which is a rectangle, is six feet long and four feet broad. The bottom of each of these vessels is covered with a little water to assist the condensation of the vapour. Above the water is placed a small vessel, capable of containing a few pounds of *sulphur*, to which a small portion of nitre is added; because, by this addition, a larger quantity of *sulphur* may be burnt without access of fresh air. The vessels are to be filled with the vapour of hot water, and their sides wetted with the condensed steam; then the *sulphur* is to be kindled by touching it with a red-hot iron: the vapour of the burning *sulphur* rises slowly; and when it has risen as high as the mouth of the great vessel, this must be stopt, or very nearly stopt, that the vapour may be confined. The *sulphur* continues to burn till the air contained within the vessel and the nitre be no longer capable of maintaining the combustion. The vapour remains a considerable time before it be entirely condensed, notwithstanding that this condensation is facilitated by the water in the vessel, and especially by the steam of water with which the vessel was previously filled. When all the vapour of the sulphureous acid is at last condensed, the *sulphur* is to be again kindled, and more added if it be necessary, and the process repeated as before. When a sufficient quantity of acid is collected, it is to be taken out of the vessel; and after it has lost its sulphureous, or volatile quality, by exposure to air, it is concentrated and rectified by distillation.

The usual methods of preparing the acid *spirit of sulphur*, or oil of *sulphur*, by the bell, are so tedious and expensive, that few are at the pains to make it. Both the methods, described by M. Charras in the Pharmacop. Royale, p. 883, are liable to many uncertainties and inconveniencies, as well as that recommended by M. Homberg, in the Memoirs de l'Acad. des Sciences, anno 1703.

In the Medical Essays of Edinburgh, vol. v. art. 14, we have an essay on extracting the acid of *sulphur* in an easy manner, by placing a crucible, with about three ounces of flowers of *sulphur* in it, under a retort. The *sulphur* being fired by throwing a lighted coal into it, the crucible is then gradually raised till it be just received within an orifice cut in the bottom of the bole of the retort, to which a large receiver with a spout is adapted. When the *sulphur* is consumed, the same quantity of new lighted *sulphur* is to be put into another crucible; and thus the process may be continued, till as much acid is obtained as is required.

This method is indeed an improvement on the common one; but there are two other more elegant and easy ways of extracting the acid from *sulphur*. The first is by Stahl, who directs woollen-cloths to be moistened in a solution of fixed alkaline salt, and then dried. These are to be suspended over the fume of burning *sulphur*, which will be imbibed and locked up in the salt, from whence it may be easily separated by the addition of oil of vitriol, and the assistance of common glass-distilling vessels.

The second is by Mr. Seehl, who pours oil of vitriol on a *hepar sulphuris* placed in a glass retort, to which he adapts a receiver, and by a small heat draws off the acid liquor. See Improvement on making Volatile Spirit of Sulphur, by Ephr. Rinh. Seehl, Lond. 1744, and Medic. Ess. Abridg. vol. i. p. 164. Not.

A pound of flowers of *sulphur* may be burnt in about seven or eight hours, and will yield about seven drams, or an ounce of pure acid. But it is observable, that the quantity of acid liquor varies greatly with the weather, being, as before mentioned, considerably more when the air is moist, than when it is dry.

It is said that *sulphur* may be made by combining a fat, oily, or bituminous substance, with any mineral acid-salt; but, in reality, the difficulty of making *sulphur* with every acid is very great, if not impossible. With the vitriolic acid, indeed, the inflammable part of bodies easily combines into a true *sulphur*; but it does not appear that any way has yet been found, by which the marine or nitrous acid may directly be combined into such a substance. Stahl is expresly of this opinion in his Opuscul. Phys. Medic. 4to.

SULPHUR, *volatile acid of.* The *volatile acid of sulphur*, according to some, contains not only the oil of *sulphur*, but, at the same time, the pure native *gas*, or highly volatile spirit of the *sulphur*. Mr. Seehl has given us an easy method of procuring this *volatile acid of sulphur*, which he thinks of superior virtue, both as a menstruum and as a medicine, to the oil of *sulphur* by the bell. For this purpose he gives us two processes; one with an alkaline salt *per se*, mentioned above; and the other, which he prefers, by means of the same salt, with the addition of quick-lime. See Phil. Transf. N° 472. The spirit, obtained thus by quick-lime, is stronger, more acid, and more volatile, although specifically heavier than the former.

The caput mortuum, remaining after distillation, makes an excellent tartar of vitriol, by solution, filtration, and crystallization.

SULPHUR, *syrup of*, is formed of a solution of the liver of *sulphur* in water, mixed with sugar, into the consistence of a syrup.

SULPHUR, *tincture of*, is formed by throwing the liver, whilst hot from the fire, into rectified spirit of wine, in the proportion of about four ounces to a pint, and digesting it about twenty-four hours, which communicates a rich gold colour, a particular, not ungrateful smell, and a hot somewhat aromatic taste.

The syrup above mentioned, and a few drops of this tincture mixed with a glass of Canary, or other rich wine, to which it communicates a milky hue, have been sometimes given in the same intentions as the balsams, and seem to be accompanied with the same inconveniencies.

The tincture, commonly called *volatile tincture of sulphur*, may be obtained by boiling half a pound of flowers of *sulphur* with a pound of quick-lime, in a gallon of water, till half the liquor is wasted, then putting the remainder into a retort, with eight ounces of powdered sal ammoniac, and distilling with a gradual fire. The spirit comes over loaded with the *sulphur*, and has a strong offensive smell.

Hoffman says, a mixture of it with thrice its quantity of spirit of wine, given in doses of thirty or forty drops, proves a powerful diaphoretic; and that applied externally as a fomentation, with the addition of camphor, it alleviates gouty pains. Lewis.

SULPHUR, *troches of*, are directed by the college of London to be made by beating together two ounces of the washed flowers and four of double refined sugar, and making up the mass with mucilage of quince-seeds: but that of Edinburgh directs, one ounce of the flowers of *sulphur*, a dram of flowers of benzoin, and three ounces of fine sugar, to be formed with mucilage of gum tragacanth; by the addition of the flowers of benzoin, the medicine is supposed to be rendered more efficacious in some disorders of the breast. Lewis.

SULPHUR-*water*. See AQUA *sulphurata*.

SULPHUR-*wort*, in *Botany*. See *Hog's* FENNEL.

SULPHURATED *iron*. See IRON.

SULPHURATED *silver*. See SILVER.

SULPHURATED *wine*. See WINE.

SULTAN, or SOLDAN, a title or appellation given to the emperor of the Turks.

It had its rise under Mahmoud, son of Sebecteghin, the first emperor of the dynasty of the Gaznevides, toward the close of the fourth century of the æra of the hegira: when that prince going to Segestan to reduce Kalaf, governor of that province, who affected the sovereignty; Kalaf was no sooner advertised of his coming, than he went out to meet him, delivered the keys of his fortress, and owned him his *sultan*; that is, his lord or commander. The title pleased Mahmoud so well, that he assumed it ever afterwards; and from him it passed to his descendants, and to other Mahometan princes.

Vattier will have the word Turkish, and to signify king of kings; adding, that it was first given the Turkish princes Angrolipex and Masgud, about the year 1055: others will have it originally Persian, alledging, in proof hereof, an ancient medal of Cosroe; others derive it from *soldanus*, *quasi solus dominus*; others from the Hebrew שלט, *schalat*, *to rule*, *reign*.

In the Roman ceremonial, we also find mention made of a *soldan*, or marshal, who is to attend the pope when he marches in state. He is also to apprehend malefactors.

SULTANS, *epocha of the*. See *Gelalæan* EPOCHA.

SULTAN *flower*, *cyanus*, a species of *centaurea*. See BLUE *bottle* and CENTAURY.

SULTAN-*scheriff*. See SCHERIF.

SULTANA, the wife of a sultan. The favourite *sultana* is called *hhaseki-sultana*, i. e. private *sultana*. See ASEKI.

The *sultana* queen is the emperor's chief wife. The old *sultana*, mother of the emperor reigning, is called *sultana valide*.

If any of the virgins of the seraglio, whom the grand signior makes choice of for his bed-fellow, by walking between two ranks of them, and throwing a handkerchief into her hand, conceives by him and brings forth his first begotten child, she is called by the name of *sultana* queen: and if this child be a son, she is confirmed and established by great feasts and solemnities, and hath a separate dwelling assigned unto her of many stately rooms well furnished, and many servants to attend upon her. She is likewise allowed a large revenue, and acknowledged in the seraglio as queen, by every expression of duty and respect. The other women (though they may have issue) are not called queens; but they are called *sultanas*, because they have had carnal commerce with the king: but she only is honoured with the title of queen, who is the mother of the first begotten son, heir to the empire. If this son should die, and another of the *sultanas* should have a second son; then her son being to succeed the deceased heir, she is immediately made queen, and the former shall remain a *sultana* only, and be deprived of her revenue and royalty: and thus the title of queen is transferred from one *sultana* to another, by virtue of the son's succession. Greaves's Works, vol. ii. p. 638, &c.

SULTANA, also, denotes a strong Turkish vessel of war.

SULTANIN, a gold coin, called also SEQUIN.

SULTZ, or SULZ. See SALZ.

SUM, SUMMA, in *Mathematics*, signifies the quantity that arises from the addition of two or more magnitudes, numbers, or quantities, together.

This is sometimes called the *aggregate*; and, in algebra, it is sometimes denoted by the letter Z, which stands for *zuma*, or *suma*; and sometimes by the letter S.

SUM *of an equation* is when the absolute number being brought over to the other side, with a contrary sign, the whole becomes equal to 0: this Descartes calls the *sum of the equation* proposed.

SUMA, a name given by some of the chemical writers to tartar.

SUMACH, *rhus*, in *Botany*, a genus of the *pentandria trigynia* class: its characters are these. The empalement of the flower is permanent, erect, and cut into five parts; the flower has five oval, erect, spreading petals, and five short stamina, terminated by small summits; it has a roundish germen, as large as the petals, with scarcely any style, crowned by three small stigmas; the germen afterwards becomes a roundish hairy berry, enclosing a single hard seed of the same form. Linnæus enumerates sixteen, and Miller fifteen species, natives of various parts of the world.

The elm-leaved *sumach*, or *rhus folio ulmi*, grows naturally in India, Spain, and Turkey: the branches of this tree are used instead of oak for tanning of leather, and it has been said that the Turkey leather is all tanned with this shrub. See MOROCCO. The berries of *sumach* have an acid austere taste: they were formerly used for restraining bilious fluxes and hæmorrhages, and colliquative hectic sweats. Some direct an infusion of half an ounce of the berries, and others two or three drams of an extract made from them by water, for a dose. The leaves and young twigs are strong astringents, and have been directed in the same intentions. Lewis.

The ancients used *sumach*, instead of salt, for seasoning their meat: whence the Latins call the tree *rhus obsoniorum*: and from its use in dressing of leather, it has been called *rhus coriaria*.

SUMACH *myrtle-leaved*, *coriaria*, a genus of the *dioecia decandria* class. Its characters are these: it is male and female in different plants; the male flowers have five-leaved empalements; the flower has five leaves which are joined to the empalement, which have ten slender stamina, terminated by oblong summits; the female flowers have the like empalement, and the same number of petals; and in the centre are placed five pointals, which turn to a berry, enclosing five kidney-shaped seeds. There are two species. The sort with male flowers is the most common in England; the other being very rarely seen in our gardens. These grow wild in great plenty about Montpelier in France, where they are used for tanning of leather: and from this use it has been intitled by botanists, *rhus coriariorum*, i. e. tanner's *sumach*. Miller.

SUMAGE, SUMAGIUM, or SUMMAGIUM, in our *Old Writers*, toll for carriage on horseback. *Pro uno equo portante* summagium *per dimidium ann. obolum*. Chart. de Forest. c. 14.

SUMEN, a word used by some anatomical writers to express the hypogastrium.

SUMMARY, an abridgment, containing the sum and substance of a thing in a few words.

The *summary*, placed at the head of a book, a chapter, a law, or the like, is very useful to the reader, to facilitate the understanding thereof.

A recapitulation is to contain a *summary* of the whole preceding discourse.

SUMMARY *conviction*, in *Law*. See CONVICTION.

SUMMATORIUS *calculus*, the method of summing differential quantities; that is, from any differential given, to find the quantity, from whose differencing the given differential results.

This method we more usually call *the inverse method of fluxions*; and foreigners *integralis calculus*. See CALCULUS, and FLUXIONS.

SUMMER, one of the seasons of the year, commencing, in these northern regions, on the day the sun enters Cancer; and ending when he quits Virgo.

Or, more strictly and universally, the *summer* begins on the day when the sun's meridian distance from the zenith is the least. It ends on the day when his distance is a mean betwixt the greatest and smallest.

The end of *summer* coincides with the beginning of WINTER.

It is said, that a frosty winter produces a dry *summer*; and a mild winter a wet *summer*. It often happens so, in fact; but why it should be so, is perhaps a question difficult to determine. The curious may, on this subject, consult the Philosophical Transactions, N° 458. sect. 10.

SUMMER *flowers*. See FLOWERS.

SUMMER *fruits*, *fructus horæi*, comprehend strawberries, currants, mulberries, raspberries, &c. These mild, sweet, subacid fruits, are sometimes used medicinally, as refrigerants, antiseptics, relaxants, attenuants, and aperients. Boerhaave considers the continued use of them as one of the principal remedies in cases of obstruction and viscidity, and in putrid disorders: and Hoffman furnishes instances of some obstinate diseases being cured by them. They apparently promote the alvine and urinary excretions; and, in some fevers, where watery liquors run off almost unchanged, these fruits, or their juices, render the urine coloured. As dietetic articles, they afford little nourishment, and are liable to produce flatulencies: to persons of a bilious temperament and rigid fibres, and where the habit is disposed, naturally or from extrinsic causes, to an inflammatory or putrescent

cent ſtate, the moderate or even plentiful uſe of them is ſalubrious; but by thoſe of a cold inactive diſpoſition, where the veſſels are lax, the circulation languid, and the digeſtion weak, they ſhould be uſed very ſparingly. The juices, extracted from fruits by expreſſion, contain their medicinal parts, freed from the groſſer indigeſtible matter. On ſtanding they ferment, and change to a vinous or acetous ſtate; but by a proper addition of ſugar and by boiling, their fermentative power is ſuppreſſed, and their medical qualities preſerved. The inſpiſſated juices are found to be leſs flatulent, and leſs diſpoſed, when taken freely, to produce gripes and fluxes, than an equivalent quantity of the fruits in ſubſtance, or of the juices unboiled. Theſe juices, purified by ſettling and ſtraining, are made into ſyrups by a leſs proportion of ſugar than water, or the common watery infuſions require. For a quart of the depurated juices of mulberries, raſpberries, &c. fifty ounces at moſt are ſufficient; whereas vegetable infuſions, in general, require fifty-eight. The more juicy berries give out their juice by heat without expreſſion: thus, if equal parts of picked CURRANTS and ſugar be ſet over a gentle fire, the ſugar diſſolves in the juice of the fruit, and by boiling for a little time, an elegant JELLY is formed, which may be freed from the ſkins by ſtraining. Theſe preparations may be occaſionally diſſolved in water, and uſed as diluents, reſolvents, &c. in acute and other diſeaſes. Lewis.

SUMMER *ſolſtice*. See SOLSTICE.

SUMMER *teal*, in *Ornithology*, the name of a bird, the ſmalleſt of all the duck kind, called by Geſner the *anas circias*. See TEAL.

SUMMER, formed from the French *ſommier*, which ſignifies the ſame thing, in *Architecture*, is a large ſtone, the firſt that is laid over columns and pilaſters, in beginning to make a croſs vault; or it is a ſtone, which, being laid over a piedroit or column, is hollowed, to receive the firſt haunce of a platband.

SUMMER, in *Carpentry*, is a large piece of timber, which, being ſupported on two ſtone piers, or poſts, ſerves as a lintel to a door, window, &c.

There are alſo *ſummers* uſed in various engines, &c. ſerving to ſuſtain the weight, &c.

SUMMER *tree* denotes a beam into which the ends of joiſts are faſtened, and to which the girders are framed. See BREST-SUMMER and GIRDER.

SUMMER *of an organ*. See SOUND-*Board*.

SUMMIT, formed from the French *ſommet*, which ſignifies the ſame, the vertex or point of any body or figure; as of a triangle, a pyramid, a pediment, &c.

SUMMITS *of flowers*, the ſame with the ANTHERÆ, or tops of the ſtamina. See FLOWER.

SUMMONER, SUMMONITOR, an apparitor, or petty officer, who is to cite perſons to appear at a certain time and place, to anſwer to the charge exhibited againſt them. See APPARITOR, and SUMMONS.

SUMMONS, SUMMONITIO, in *Law*, a citing or calling a perſon to any court, to anſwer a complaint, or even to give in his evidence.

This is the ſame with the *vocatio in jus*, or the *citatio*, of the civilians: hence alſo our old word *ſumner*, or *ſummoner*.

SUMMONS *in terra petita* is that made on the land which the party, at whoſe ſuit the *ſummons* is ſent out, ſeeks to have. This warning on the land is given, in real actions, by erecting a white ſtick or wand on the defendant's grounds (which ſtick or wand, among the northern nations, is called the *baculus nunciatorius*); and by ſtat. 31 Eliz. c. 3. it muſt alſo be proclaimed on ſome Sunday before the door of the pariſh church.

SUMMMONS *ad warrantizandum* is a proceſs, whereby the vouchee in a common recovery is called.

SUMMONS to *parliament*. See PARLIAMENT.

SUMMONS, *in War*.—To *ſummons* a place, is to ſend a drum, or trumpet, to command the governor to ſurrender; or, in defect thereof, to proteſt to make an aſſault, and to lay all in fire and blood. See CAPITULATION and CHAMADE.

SUMMUM *bonum*, in *Ethics*. See *Chief* GOOD.

SUMMUM *genus*. See GENUS.

SUMP, in *Metallurgy*, a round pit of ſtone lined with clay within, for the receiving the metal on its firſt fuſion from the ore.

SUMP, in the *Engliſh Salt Works*, where ſea-water is boiled into ſalt, is uſed as the name of a ſort of pond, which they make at ſome diſtance from the ſaltern on the ſeaſhore, between full ſea and low water mark. From this pond they lay a pipe, through which, when the ſea is in, the water runs into a well adjoining to the ſaltern; and from this well they pump it into troughs, through which it is carried to their ciſterns, in order to be ready to ſupply the pans. See SALT.

SUMPH, in *Mining*, denotes a pit ſunk down in the bottom of the mine, to cut or prove the lode ſtill deeper than before; and in order to ſlope and dig it away if neceſſary, and alſo to drive on the lode in depth. The *ſumph* principally ſerves as a baſon or reſervoir, to collect the water of a mine together, that it may be cleaned out by an engine or machine.

SUMPTER-*horſe*, is a horſe that carries proviſions and neceſſaries for a journey. Ruſt.

SUMPTUARY *laws*, *leges* SUMPTUARIÆ, are laws made to reſtrain exceſs in apparel, coſtly furniture, eating, &c.

Moſt ages and nations have had their *ſumptuary* laws; and ſome retain them ſtill, as the Venetians, French, &c. But it is obſerved, that no laws are worſe executed than *ſumptuary* laws.

Political writers have been much divided in opinion with reſpect to the utility of theſe laws to a ſtate. Baron Monteſquieu obſerves, that luxury is neceſſary in monarchies, as in France; but ruinous to democracies, as in Holland. With regard to England, whoſe government is compounded of both ſpecies, it may ſtill be a dubious queſtion, ſays judge Blackſtone, how far private luxury is a public evil; and as ſuch cognizable by public laws.

The *ſumptuary* laws of that ancient Locrian legiſlator Zaleucus, are famous: by theſe it was ordained, that no woman ſhould go attended with more than one maid in the ſtreet, except ſhe were drunk: that ſhe ſhould not go out of the city in the night, unleſs ſhe went to commit fornication: that ſhe ſhould not wear any gold or embroidered apparel, unleſs ſhe propoſed to be a common ſtrumpet: and that men ſhould not wear rings, or tiſſues, except when they went a whoring, &c.

The Engliſh have had their ſhare of *ſumptuary* laws, chiefly made in the reigns of Edw. III. Edw. IV. and Hen. VIII. againſt picked ſhoes, ſhort doublets, and long coats; though all repealed by ſtatute 1 Jac. I. c. 25. As to exceſs in diet, there remains ſtill one law unrepealed. See DIET.

Under king Henry IV. Camden tells us, pride was got ſo much into the foot, that it was proclaimed, that no man ſhould wear ſhoes above ſix inches broad at the toes. And their other garments were ſo ſhort, that it was enacted, 25 Edw. IV. that no perſon, under the condition of a lord, ſhould, from that time, wear any mantle or gown, unleſs of ſuch length, that, ſtanding upright, it might cover his privy members and buttocks.

Among the Romans, the *ſumptuary* and cibary laws were very numerous: by the lex Orchia, the number of gueſts at feaſts was limited, though without limitation of the charges thereof. By the Fannian law, made twenty-two years afterwards, it was enacted, that more than ten aſſes ſhould not be ſpent at any ordinary feaſt: for the ſolemn feaſts, as the Saturnalia, &c. an hundred aſſes were allowed; ten of which, Gellius informs us, was the price of a ſheep; and a hundred, of an ox.

By the Didian law, which was preferred eighteen years after, it was decreed, that the former *ſumptuary* laws ſhould be of force, not only in Rome, but throughout all Italy; and that, for every tranſgreſſion, not only the maſter of the feaſt, but all the gueſts too, ſhould be liable to the penalty.

SUN, SOL, in *Aſtronomy*, the great luminary which enlightens the world, and by his preſence conſtitutes day.

The *ſun*, which, in the infancy of aſtronomy, was reckoned among the planets, ſhould rather be numbered among the fixed STARS. It appears bright and large in compariſon with them, becauſe we keep conſtantly near the *ſun*, whereas we are at an immenſe diſtance from the ſtars. For a ſpectator, placed as near to any ſtar as we are to the ſun, would ſee that ſtar a body as large and bright as the *ſun* appears to us; and a ſpectator, as far diſtant from the *ſun* as we are from the ſtars, would ſee the *ſun* as ſmall as we ſee a ſtar, diveſted of all its circumvolving planets; and would reckon it one of the ſtars in numbering them.

According to the Copernican hypotheſis, which is now generally received, and which has even demonſtration on its ſide, the *ſun* is the centre of all the planetary and cometary ſyſtem; round which all the planets and comets, and our earth among the reſt, revolve, in different periods, according to their different diſtances from the *ſun*. See this motion illuſtrated and demonſtrated under EARTH and PLANET.

But the *ſun*, though thus eaſed of that prodigious motion, whereby the ancients imagined him to revolve daily round our earth, yet is not a perfectly quieſcent body.

From the phenomena of his maculæ or ſpots, it evidently appears, that he has a rotation round his axis; like that of the earth, whereby the natural day is meaſured; only

only ſlower.—Some of theſe ſpots have made their firſt appearance near the edge or margin of the *ſun*, and have been ſeen ſome time after on the oppoſite edge; whence, after a ſtay of about fourteen days, they have reappeared in their firſt place, and taken the ſame courſe over again; finiſhing their intire circuit in twenty-ſeven days $12^h\ 20'$: which is hence deduced to be the period of the *ſun*'s rotation round his axis; and, therefore, the periodical time of the *ſun*'s revolution to a fixed ſtar is $25^d\ 15^h\ 16^m$; becauſe in $27^d\ 12^h\ 20^m$ of the month of May, when the obſervations on which this calculation is founded were made, the earth deſcribes an angle about the *ſun*'s centre of $26^\circ\ 22'$; and, therefore, as the angular motion of $360^\circ + 26^\circ\ 22'$ is to 360°, ſo is $27^d\ 12^h\ 20'$ to $25^d\ 15^h\ 16'$. This motion of the ſpots is from weſt to eaſt: whence we conclude that of the *ſun*, to which the other is owing, to be from eaſt to weſt.—For the various appearance of the ſolar ſpots, their cauſe, &c. ſee MACULÆ. Beſides this motion round his axis, the *ſun*, on account of the various attractions of the ſurrounding planets, is agitated by a ſmall motion round the centre of gravity of the ſyſtem. See *Motion of the* EARTH, and GRAVITY. Whether the *ſun* and ſtars have any proper motion of their own in the immenſity of ſpace, however inconſiderable, is not abſolutely certain. Some very accurate obſervers have intimated conjectures of this kind. See STARS.

As for the apparent annual motion of the SUN *round the earth*; it is eaſily ſhewn, by aſtronomers, that the annual motion of the earth will occaſion ſuch an appearance.

A ſpectator in the *ſun* would ſee the earth move from weſt to eaſt, for the ſame reaſon as we ſee the *ſun* move from eaſt to weſt: and all the phenomena reſulting from this annual motion, in which ſoever of the bodies it be, will appear the ſame from either.

Let S, for inſtance (*Tab. Aſtron. fig.* 39.), repreſent the *ſun*, ABCD the earth's orbit, which it paſſes through from weſt to eaſt, in the ſpace of a year.—Now, a ſpectator in S, viewing the earth at A, will refer it to the point of the ſphere of the ſtars, ♈: when arrived in B, the ſpectator will ſee it, as in the point ♋: when in C, as in the point ♎, &c. till, after its whole circuit, it will be again ſeen in ♈. Thus will the earth appear to deſcribe the whole ecliptic, and to paſs, ſucceſſively, from ſign to ſign.

Suppoſe, now, the ſpectator removed from the *ſun* to the earth, which imagine in C, the diſtance of the fixed ſtars, we have ſhewn, is ſo vaſt, that that of the *ſun* is but a point to it. The ſpectator, therefore, now ſituate on the earth, will ſee the ſame face of the heavens, the ſame ſtars, &c. as before: the only difference will be, that as before he imagined the earth in the heavens, and the *ſun* in the centre; he will now ſuppoſe the *ſun* in the heavens, and the earth in the centre.

The earth, therefore, being in C, the ſpectator will ſee the *ſun* in ♈; and the ſpectator, being carried along with the earth, and partaking of its annual motion, will not perceive either his own motion, or that of the earth; but obſerving the *ſun*, when the earth is arrived at D, the *ſun* will be ſeen at ♋. Again, while the earth proceeds to A, the *ſun* will ſeem to have moved through the ſigns ♋, ♌, and ♍; and while the earth deſcribes the ſemicircle ABC, the *ſun* will appear to have moved, in the concave ſurface of the heavens, through the ſix ſigns, ♎, ♏, ♐, ♑, ♒, ♓; ſo that an inhabitant of the earth will ſee the *ſun* go through the ſame orbit, or circle, in the heavens, and in the ſame ſpace of time, as a ſpectator in the *ſun* would ſee the earth deſcribe the ſame.

Hence ariſes that apparent motion of the *ſun*, whereby he is ſeen to advance, inſenſibly, towards the eaſtern ſtars; inſomuch that, if any ſtar, near the ecliptic, riſe any time with the *ſun*; after a few days, the *ſun* will be got more to the eaſt of the ſtar, and the ſtar will riſe and ſet before him.

For the ſeveral phenomena reſulting from the *ſun*'s apparent motion, or the earth's real motion, as the diverſity of day and night, of ſeaſons, &c. ſee EARTH.

Nature, properties, figure, &c. of the SUN. See MACULÆ and FACULÆ.

Thoſe who have maintained that the ſubſtance of the *ſun* is fire, argue in the following manner: the *ſun* ſhines, and his rays, collected by concave mirrors, or convex lenſes, burn, conſume, and melt, the moſt ſolid bodies; or elſe convert them into aſhes, or glaſs: wherefore, as the force of the ſolar rays is diminiſhed, by their divergency, in a duplicate ratio of the diſtances reciprocally taken; it is evident, their force and effect are the ſame, when collected by a burning lens, or mirror, as if we were at ſuch diſtance from the *ſun*, where they were equally denſe. The *ſun*'s rays, therefore, in the neighbourhood of the *ſun*, produce the ſame effects, as might be expected from the moſt vehement fire: conſequently, the *ſun* is of a fiery ſubſtance.

Hence it follows, that its ſurface is every where fluid; that being the condition of flame.

Indeed, whether the whole body of the *ſun* be fluid, as ſome think; or ſolid, as others; they do not preſume to determine: but as there are no other marks, whereby to diſtinguiſh fire from other bodies, but light, heat, a power of burning, conſuming, melting, calcining, and vitrifying; they do not ſee what ſhould hinder, but that the *ſun* may be a globe of fire, like ours, inveſted with flame; and ſuppoſing that the maculæ are formed out of the ſolar exhalations, they infer, that the *ſun* is not pure fire; but that there are heterogeneous particles mixed along with it.

Philoſophers have been much divided in opinion with reſpect to the nature of fire, light, and heat, and the cauſes that produce them: and they have given very different accounts of the agency of the *ſun*, with which, whether we conſider them as ſubſtances, or qualities, they are intimately connected, and on which they ſeem primarily to depend. Some, among whom we may reckon ſir Iſaac Newton, conſider the rays of light as compoſed of ſmall particles, which are emitted from ſhining bodies, and move with uniform velocities in uniform mediums, but with variable velocities in mediums of variable denſities. Theſe particles, they ſay, act upon the minute conſtituent parts of bodies, not by impact, but at ſome indefinitely ſmall diſtance; they attract and are attracted; and in being reflected or refracted, they excite a vibratory motion in the component particles. This motion increaſes the diſtance between the particles, and thus occaſions an augmentation of bulk, or an expanſion in every dimenſion, which is the moſt certain characteriſtic of fire. This expanſion, which is the beginning of a diſunion of the parts, being increaſed by the increaſing magnitude of the vibrations proceeding from the continued agency of light, it may eaſily be apprehended, that the particles will at length vibrate beyond their ſphere of mutual attraction, and thus the texture of the body will be altered or deſtroyed; from ſolid it may become fluid, as in melted gold; or from being fluid, it may be diſperſed in vapour, as in boiling water. According to this theory, we are led to infer, that the conſtituent parts of all bodies are in perpetual motion. The temperature of the atmoſphere is different in different latitudes, and it changes, almoſt every inſtant, in the ſame. The temperature of bodies, which is ever proportionable to that of the ſurrounding atmoſphere, muſt, therefore, be perpetually varying. The bulk of every body, which is proportionable to its temperature, muſt alſo be ſubject to a perpetual viciſſitude: and this variation of dimenſions cannot be effected without a perpetual vibratory motion of its conſtituent parts.

Others, as Boerhaave, repreſent fire as a ſubſtance *ſui generis*, unalterable in its nature, and incapable of being produced or deſtroyed; naturally exiſting in equal quantities in all places, imperceptible to our ſenſes, and only diſcoverable by its effects, when, by various cauſes, it is collected for a time into a leſs ſpace than that which, from its tendency to an univerſal and equable diffuſion, it would otherwiſe occupy. The matter of this fire is not ſuppoſed to be derived from the *ſun* in any wiſe: the ſolar rays, whether direct or reflected, are of uſe only as they impel the particles of fire in parallel directions: that paralleliſm being deſtroyed, by intercepting the ſolar rays, the fire inſtantly aſſumes its natural ſtate of uniform diffuſion. According to this explication, which attributes heat to the matter of fire, when driven in parallel directions, a much greater muſt be given it, when the quantity ſo collected, is amaſſed into a focus; and yet the focus of the largeſt ſpeculum does not heat the air or medium in which it is found, but only bodies of denſities different from that medium.

M. de Luc, in his Lettres Phyſiques, is of opinion, that the ſolar rays are the principal cauſe of heat; but that they only heat ſuch bodies as do not allow them a free paſſage. In this remark he agrees with Newton; but then he differs totally from him, as well as from Boerhaave, concerning the nature of the rays of the *ſun*. He does not admit the emanation of any luminous corpuſcles from the *ſun*, or other ſelf-ſhining ſubſtances, but ſuppoſes all ſpace to be filled with an ether of great elaſticity and ſmall denſity, and that light conſiſts in the vibrations of this ether, as ſound conſiſts in the vibrations of the air. Upon Newton's ſuppoſition, ſays an excellent writer, the cauſe by which the particles of light, and the corpuſcles conſtituting other bodies, are mutually attracted and repelled, is uncertain. The reaſon of the uniform diffuſion of fire, of its vibration, and repercuſſion, as ſtated in Boerhaave's opinion, is equally inexplicable; and in the laſt mentioned hypotheſis, we

may

add to the other difficulties attending the supposition of an universal ether, the want of a first mover to make the *sun* vibrate. Of these several opinions concerning elementary fire it may be said, as Cicero remarked concerning the opinions of philosophers concerning the nature of the soul: *Harum sententiarum quæ vera sit, Deus aliquis viderit; quæ verisimillima, magna quæstio est.* Watson's Chem. Ess. vol. i. p. 164.

For a farther account of these opinions, see Fire, Heat, and Light.

The figure of the *sun* is a spheroid, higher under its equator, than about the poles. This we prove thus: the *sun* has a motion about its own axis; and therefore the solar matter will have an endeavour to recede from the centres of the circles wherein it moves; and that with the greater force, as the peripheries of the circles are greater: but the equator is the greatest circle; and the rest, towards the poles, continually decrease; therefore the solar matter, though at first in a spherical form, will endeavour to recede from the centre of the equator farther than from the centres of the parallels.

Consequently, since the gravity, whereby it is retained in its place, is supposed to be uniform throughout the whole *sun*; it will really recede from the centre more under the equator, than under any of the parallels; and hence the *sun's* diameter, drawn through the equator, will be greater than that passing through the poles, i. e. the *sun's* figure is not perfectly spherical, but spheroidical.

Sun, *diameter, distance, magnitude, and parallax of the.* See Parallax and Planets.

Sun, *apparent diameter of the.* See Diameter.

Sun *at the horizon, apparent magnitude of the.* See *Apparent* Magnitude.

Sun, *altitude of the.* See Altitude and Meridian *altitude.*

Sun's *altitude, tables of the.* See Dial.

Sun, *angle at the.* See Angle.

Sun, *diurnal and nocturnal arch of the.* See Arch.

Sun, *cycle of the.* See Cycle.

Sun, *declination of the.* See Declination.

Sun, *eclipses of the.* See Eclipse.

Sun, *nadir, place, retrogradation, and vertical of the.* See the several articles.

Sun, *raisins of the.* See Raisin.

Sun-*burning*, in *Medicine.* See Ephelis.

SUNDAY, the first day of the week; thus called by our idolatrous ancestors, because set apart for the worship of the sun.

It is now more properly called the *Lord's day, dies Dominicus*, because kept as a feast in memory of our Lord's resurrection on this day; and *sabbath-day*, because substituted under the new law in the place of the sabbath in the old law. See Sabbath.

In the breviary, and other offices, we meet with *Sundays* of the *first* and *second class*. Those of the first class are, *Palm, Easter, Advent*, and *Whitsunday*, those of *Quasimodo* and *Quadragesima*; each whereof see under its proper article. Those of the second class are the common *Sundays*.

Anciently each *Sunday* in the year had its particular name, which was taken from the introit of the day; which custom has only been continued to some few in lent: as *Reminiscere, Oculi, Lætare, Judica.*

It was Constantine the Great who first made a law for the proper observation of *Sunday*; and who, according to Eusebius, appointed it should be regularly celebrated throughout the Roman empire.

Before him, and even in his time, they observed the Jewish sabbath, as well as *Sunday*; both to satisfy the law of Moses, and to imitate the apostles, who used to meet together on the first day.

Indeed some are of opinion, that the *Lord's-day*, mentioned in the Apocalypse, is our *Sunday*; which they will have to have been so early instituted by the apostles. Be this as it will, it is certain, a regard was had to this day, even in the earliest ages of the church; as appears from the first apology of Justin Martyr, where he describes the exercise of the day not much unlike to ours.

By Constantine's laws, made in 321, it was decreed, that, for the future, the *Sunday* should be kept a day of rest in all cities and towns, but he allowed the country people to follow their work. In 538, the council of Orleans prohibited this country labour, but because there were still many Jews in the Gauls, and the people gave into a good many superstitious usages in the celebration of the new sabbath, like those of the Jews among that of the old; the council declares, that to hold it unlawful to travel with horses, cattle, and carriages, to prepare foods, or to do any thing necessary to the cleanliness and decency of houses or persons, savours more of Judaism, than Christianity.

It is well observed by judge Blackstone, (book iv. p. 63.) that besides the notorious indecency and scandal of permitting any secular business to be publicly transacted on this day, in a country professing Christianity, and the corruption of morals which usually follows the profanation of it; the keeping one day in seven holy, as a time of relaxation and refreshment as well as for public worship, is of admirable service to a state, considered merely as a civil institution. It humanizes, by the help of conversation and society, the manners of the lower classes, which would otherwise degenerate into a sordid ferocity and savage selfishness of spirit: it enables the industrious workman to pursue his occupation in the ensuing week with health and chearfulness: it imprints on the minds of the people that sense of their duty to God, so necessary to make them good citizens; but which would be worn out and defaced by an unremitted continuance of labour, without any stated times of recalling them to the worship of their Maker. Accordingly the laws of king Athelstan (c. 24.) forbad all merchandizing on the Lord's day under very severe penalties. And by 27 Hen. VI. c. 5. no fair or market shall be held on the principal festivals, Good-friday, or any *Sunday* (except the four *Sundays* in harvest) on pain of forfeiting the goods exposed to sale. Moreover, by 1 Jac. c. 22. no shoemaker is to expose to sale any shoes, &c. on pain of 3*s*. 4*d*. a pair: and by 1 Car. I. c. 1. no persons shall assemble out of their own parishes for any sport whatsoever upon this day; nor, in their parishes, shall use any bull or bear-baiting, interludes, plays, or other unlawful exercises or pastimes, on pain that every offender shall pay 3*s*. 4*d*. to the poor. By 29 Car. II. c. 7. no person is allowed to work on the Lord's day, or use any boat or barge, (unless allowed by a justice of peace, or forty watermen allowed to ply on the Thames) or expose any goods to sale; except meat in public houses, milk, and mackarel at certain hours, and works of necessity or charity, on forfeiture of 5*s*. Nor shall any drover, carrier, or the like, travel upon that day, under pain of 20*s*. No arrest can be made, nor process served upon a *Sunday*, except for treason, felony, or breach of the peace: nor can any proceedings be had nor judgment given, nor supposed to be given on *Sunday*; nor shall any hundred be answerable for a robbery on this day.

For the penalty of killing game on *Sunday*, see Game.

For the penalty of not attending public worship, see Nonconformists.

Sunday, *quinquagesima.* See Quinquagesima.

Sunday, *trinity.* See Trinity.

Sunday *letter.* See Dominical *letter.*

Sun *crown, American.* See American, &c.

Sun *dew, drosera, ros solis*, in *Botany*, a genus of the *pentandria pentagynia* class; the characters of which are these: the calyx is divided into five segments; the petals are five; the capsula is single celled, with five valves at the apex, and contains many seeds.

The species of *sun dew*, enumerated by Linnæus, are six. *Ros solis* is commended by some as a great cordial, and good for consumptions, convulsions, and the plague. Formerly a cordial water, in which this herb, with several spices, as a principal ingredient, was in great repute, under the name of *rosa solis*, though now almost out of date. Miller's Bot. Off.

Sun *fish, mola*, the tetraodon *mola* of Linnæus, and a species of ostracion in the Artedian system, in *Ichthyology*; a fish of a very singular figure. Its body is broad and short, and its hinder extremity is terminated by a circular fin, which serves it for a tail; so that it looks like the head of a large fish severed from its body; it is frequently of two feet in length, and sometimes very much exceeds that size, growing even to two hundred weight. It has no scales, but is covered with a hard, harsh, and rough skin. Its back is black, and its belly white; the sides are of a middle colour between both. Its back and belly both terminate in a narrow edge. Its mouth is very small for the size of the fish, and, when open, is round. Its jaws are hard, and edged like a knife within; externally they are rough, as if beset with several rows of small teeth. The head does not at all project from the rest of the body. The eyes are very small. The gills are only two elliptic holes, covered with their proper membranes. Its flesh is very soft, and its bones are all grisly and tender. The skin sticks very firmly to the flesh, and is not easily taken off. It is caught in the Mediterranean, and sometimes in the British seas. See *Tab.* V. *of Fish*, N° 54. Willughby's Hist. Pisc. p. 151.

Mr. Pennant describes the *sun-fish* of Mount's-bay, under the title of the *oblong diodon*; in form, he says, it resembles a bream, or some deep fish cut off in the middle: the mouth is very small, and contains in each jaw two broad teeth with sharp edges; the eyes are little, having before

before each a ſmall ſemilunar aperture; the pectoral fins are very ſmall, and placed behind them: the dorſal fin, and the anal fin, are high, and placed at the extremity of the body; the tail fin is narrow, and fills all the abrupt ſpace between thoſe two fins; the colour of the back is duſky and dappled; the belly ſilvery; between the eyes and the pectoral fins are ſtreaks pointing downwards: the ſkin is free from ſcales; the meat of the fiſh is uncommonly rank: it feeds on ſhell-fiſh. Care, ſays Mr. Pennant, muſt be taken not to confound this fiſh with the *ſun-fiſh* of the Iriſh, which in all reſpects differs from it. The former, or TETRAODON *mola* of Linnæus, which he calls the *ſhort diodon*, differs from the other in being ſhorter and deeper: the back and anal fins are higher, and the aperture to the gills not ſemilunar, but oval: the ſituation of the fins is the ſame in both.

One of theſe fiſh, of five hundred weight, was taken in 1734, near Plymouth, and on boiling a piece of the fleſh, to try how it would taſte, (as ſome authors have deſcribed it as a fine fiſh for the table) it was found, inſtead of a firm maſs, to be all converted, in a few minutes, into a perfect jelly, ſo that it could not be taken out otherwiſe than with a ſpoon. In colour and conſiſtence this jelly reſembled boiled ſtarch when cold, and had little or nothing of a fiſhy flavour, but a very agreeable taſte; it ſtuck firmly to the lips, however, and to the fingers, appearing very remarkably glutinous: and as the ancients had no other glue than one made of fiſh, this jelly was tried, as to its ſticking quality, on leather, and on paper, and was found to anſwer as well as common paſte; but by ſome accident it was not tried upon wood.

It will be extremely worth while, on ſome other opportunity, to try whether a true ichthyocolla may not be prepared by boiling down its jelly. Philoſ. Tranſ. N° 456. p. 343. Abr. vol. ix. p. 73, &c.

SUN-*fiſh*, is alſo a name ſometimes given to the *baſking* SHARK.

SUN-*flower*, *helianthus*, in *Botany*, a genus of the *ſyngeneſia polygamia fruſtranea* claſs. Its characters are theſe: it has a compound radiated flower, the border or rays being compoſed of female half florets, which are barren, and the diſk of hermaphrodite florets, which are fruitful, contained in one common ſcaly empalement. The hermaphrodite florets are cylindrical, and cut at the brim into five acute ſegments, which ſpread open; theſe have five ſtamina, curved at the bottom, as long as the tube, and terminated by tubulous ſummits, ſwelling at their baſe: the germen, which is ſituated at the bottom of the tube, ſupports a ſlender ſtyle of the length of the tube, crowned by a reflexed ſtigma divided into two parts, and afterwards becomes an oblong blunt four cornered ſeed. The female half florets, which compoſe the border, are ſtretched out on one ſide like a tongue, have a germen in the bottom, but no ſtyle or ſtamina, and are not fruitful. Linnæus enumerates twelve, and Miller ten ſpecies.

All the ſpecies of *ſun-flowers* enumerated by Miller are natives of America, from whence we are often ſupplied with new kinds. The firſt ſort, or corona ſolis, is commonly called *annual ſun-flower*. It is eaſily propagated by ſeeds, which ſhould be ſown in March, upon a bed of common earth; and when the plants are grown ſix inches high, they may be taken up with balls of earth to their roots, and planted in the large borders of the pleaſure garden, watered, and kept clear from weeds; and after that will require no farther care. In July the flowers appear, and ſtand a conſiderable time: the largeſt of theſe ſhould be left to ſtand for feed; the birds are very apt to devour this ſeed, but it ſhould be carefully guarded from them, and the head left on the plant till October, at which time it ſhould be cut off, and hung up to dry in an airy place, and in a month more the ſeeds will be perfectly hardened. The ſeeds are excellent food for domeſtic poultry.

Several ſpecies of this plant alſo are perennial, and increaſe greatly by the root. Among theſe the common ſmaller-flowered one is a very valuable plant in gardens, as it requires no culture, will grow in all ſoils and ſituations, and is a very ornamental flower, continuing in bloom from July to October. Miller's Gard. Dict.

Etmuller ſays, that the ſeed-veſſel taken when the ſeeds are almoſt ripe, and cut and boiled, affords a copious gum, which reduced into the form of a plaſter, is extolled as a moſt ſingular vulnerary. The pulp of the ſeeds is ſweet, and greedily coveted by birds, which are fattened by it. According to Hernandez, the ſeeds, though they excite a head-ach when eaten too freely, are lenitive to the breaſt, and extinguiſh burning heats. In ſome countries they are bruiſed and made into bread; though they are ſaid to prove incentive to venery. James.

SUN-*flower*, *baſtard*, *helenium*, in *Botany*, a genus of the *ſyngeneſia polygamia ſuperflua* claſs. Its characters are theſe: the flower is compoſed of ſeveral hermaphrodite florets, forming the diſk, and female half-florets, compoſing the rays. The former are tubulous, and cut at the brim into five parts; they have each five ſhort hairy ſtamina, terminated by cylindrical ſummits, with an oblong germen, ſupporting a ſlender ſtyle, crowned by a bifid ſtigma; the germen becomes an angular ſingle ſeed, crowned by a ſmall five-pointed empalement; the female half-florets have ſhort tubes, ſtretched out like a tongue, and cut into five ſegments at their points; the female flowers have no ſtamina, but an oblong germen, which turns to a ſingle feed: they are all included in one common empalement, which ſpreads open, and is cut into ſeveral ſegments. Miller enumerates two ſpecies, which are natives of America; Linnæus mentions only one.

SUN-*flower*, *dwarf*, *helianthemum*, or *ciſtus*, in *Botany*. Its characters are theſe: the flower has a three-leaved empalement, which is permanent, afterward covering the ſeed-veſſel; and has five roundiſh petals, which ſpread open, with a great number of erect ſtamina, terminated by ſmall roundiſh ſummits: in the centre is ſituated an oval germen, ſupporting a ſingle ſtyle, crowned by an obtuſe ſtigma, which afterward becomes a roundiſh or oval capſule with one cell, opening in three parts, filled with ſmall roundiſh ſeeds. There are twenty-four ſpecies. Miller.

This genus is joined by Linnæus to that of *ciſtus*. See *Rock*-ROSE.

The root of *helianthemum*, taken internally, is eſteemed good againſt the bites of ſerpents; and the tops are effectual for the ſame purpoſe. The plant is aſtringent, and a good demulcent, in the form of a decoction, particularly in diarrhœas, hæmorrhages, and diſeaſes of the fauces. J. Bauhine ſays, it is good in all diſorders attended with a flux of any kind. James.

SUN-*flower*, *dwarf American*, *rudbeckia*, in *Botany*, a genus of the *ſyngeneſia polygamia fruſtranea* claſs. Its characters are theſe: it hath female and hermaphrodite florets, encloſed in one common empalement, compoſed of two orders of leaves, the ſcales of which are plain, broad, and ſhort: the border of the flower is compoſed of female half-florets, which are ſtretched out on one ſide like a tongue, and end with two or three indentures: theſe have germina ſitting upon proper receptacles, but have neither ſtyle nor ſtamina, and are barren. The hermaphrodite florets are tubulous, funnel-ſhaped, and indented in five parts at the brim; they have five ſhort hair-like ſtamina in each, terminated by cylindrical ſummits, and a germen ſitting in the common empalement, having a ſlender ſtyle crowned by a reflexed ſtigma, divided into two parts: the germen becomes ſingle, oblong, four-cornered ſeeds, crowned by their proper cup, which has four indentures. There are ſix ſpecies.

Dwarf ſun-flower is alſo a name given to the *tetragonotheca*, which Miller deſcribes as a diſtinct genus, but which Linnæus in the laſt edition of his Syſtema Naturæ, has made a ſpecies of POLYMNIA.

SUN-*flower*, *tick-ſeeded*. See COREOPSIS.

SUN-*plant of Hindoſtan*. See SON.

SUN-*ſcorched*, a term uſed by our *Gardeners*, in ſome parts of England, to expreſs a diſtemperature of fruit trees, owing to the *ſun*'s affecting them too forcibly and too ſuddenly; the conſequence of which is the loſs and withering of the fruit. Such trees only are ſubject to this, as are planted in places ſheltered from the ſpring *ſun*, and only open to the ſummer's, and it may be always cured by proper waterings.

Mr. Merret gives us an account of three cherry-trees, of that kind we call *May-dukes*, which he cured in this manner. Theſe trees were planted in a very rich mould, which lay to a ſouth wall, ſhaded four months of the winter from the *ſun* by a high building, ſo that the *ſun* never came upon them till the latter end of March; when being high, and ſhining ſomewhat fiercely upon them, from that time the fruit had been always uſed to wither. In a very hot ſummer, when theſe trees ſeemed going into a worſe way than ordinary, the roots of one of them was bared, and a hole being made about it, a gallon of water was poured into it every morning and evening for about a fortnight before the cherries came to a redneſs.

The effect of this was, that the fruit was full and good, while the two trees that ſtood next it had their fruit withered and ſcorched up. One of theſe was taken into conſideration more late, and being watered from time to time, the fruits which were moſt withered on it fell off, and the reſt grew ripe of themſelves, and proved very good ones. The third tree, which was left to itſelf, produced not one ripe good cherry. Phil. Tranſ. N° 23.

SUN-*ſpurge*, in *Botany*, a ſpecies of SPURGE.

SUNCOPULLY, in *Natural Hiſtory*, a name given by the people of the Eaſt-Indies to a kind of ſparry ſubſtance of a whitiſh

a whitish colour, which they calcine, and afterwards give in agues, and other intermittent cases.

It is erroneously by some supposed to be a species of arsenic; for it has none of its qualities.

SUONATA, in *Music*. See SONATA.

SUONATINA, or SONATINA, in the *Italian Music*, a little, short, easy SONATA.

SUOVETAURILIA, or SOLITAURILIA, a solemn sacrifice among the ancient Romans; wherein they offered three victims of three different kinds, viz. a bull, a ram, and a boar.

Livy, describing it, calls it *suovetaurilia*; as composed of *sus*, *ovis*, and *taurus*; the names of the three victims sacrificed

Dion. Halicarnasseus, describing the same, calls it *solitaurilia*; in regard it was required, that the victims were perfect, and without any defect; *sollus*, or *solus*, in the language of the Osci, signifying *integer*, *intire*. See AMBARVALIA.

SUPERBIPARTIENS. See RATIO.

SUPERBUS *musculus*, in *Anatomy*, a name given by some to the ELEVATOR *oculi*, or the muscle whose office is to raise and lift up the eye; that motion giving a haughty look.

The *superbus musculus* is one of the muscles called by Albinus the *quatuor recti oculi*. See EYE.

SUPERCARGO, an officer charged with the accounts of the cargo, and all other commercial affairs in a merchant-ship.

SUPERCILII *corrugator*. See CORRUGATOR.

SUPERCILIUM, in *Anatomy*, the *eye brow*. See EYE.

SUPERCILIUM, in the *Ancient Architecture*, denotes the uppermost member of the cornice; called by the moderns *corona-crown*, or *larmier*.

Mr. Evelyn conceives, it should rather have been called *stillicidium*, or *drip*; to denote its office of sheltering the order from rain, &c.

SUPERCILIUM is also used for a square member under the upper tore, in some pedestals.

Some authors confound it with the TORE itself.

SUPERCILIUM *terræ*. See ADIANTUM.

SUPEREROGATION, in *Theology*, what a man does beyond his duty, or more than he was commanded to do.

The Romanists stand up strenuously for works of *supererogation*; and maintain, that the observance of evangelical counsels is such. By means hereof, a stock of merit is laid up, which the church has the disposal of, and which she distributes in indulgences to such as need.

This monstrous and absurd doctrine was first invented towards the close of the twelfth century, and modified and embellished by St. Thomas in the thirteenth: according to which it was pretended, that there actually existed an immense treasure of merit, composed of the pious deeds and virtuous actions, which the saints had performed beyond what was necessary for their own salvation, and which were, therefore, applicable to the benefit of others; that the guardian and dispenser of this precious treasure was the Roman pontiff; and that, of consequence, he was empowered to assign to such as he thought proper a portion of this inexhaustible source of merit, suitable to their respective guilt, and sufficient to deliver them from the punishment due to their crimes.

The reformed church do not allow of any work of *supererogation*; but hold with the apostles, that when we have done our best, we are but unprofitable servants.

SUPERFETATION, SUPERFOETATIO, formed from *super*, *over*, and *fœtus*, *embryo*, in *Medicine*, an after or second conception; happening when the mother, already pregnant, conceives of a later coition; so that she bears at once two fœtuses of unequal age and bulk, and is delivered of them at different times.

We meet with instances of *superfetations* of women, in Hippocrates, Aristotle, Pliny, Du Laurens, &c. But they are much more frequent in hares and sows.

We also meet with something like a *superfetation* in plants; there being a kind of lemon found to grow enclosed in the body of another.

SUPERFICIAL *content*. See SUPERFICIES, AREA, and MEASURING.

SUPERFICIAL *fourneau*, in *Fortification*, the same with CAISSON, which is a wooden chest, or box, with three, four, five, or six bombs, in it. Sometimes it is filled only with powder, and used in sieges, by being buried under ground, with a train to it, to blow up any lodgment that the enemy may make.

SUPERFICIALIS *sphincter*, in *Anatomy*, a name given by Riolanus, and some others, to the muscle of the anus, called by Winslow and Albinus *sphincter internus ani*. This author, and some others, call it also SPHINCTER *cutaneus*.

SUPERFICIES, or SURFACE, in *Geometry*, a magnitude, considered as having two dimensions; or extended in length and breadth, but without thickness or depth.

In bodies, the *superficies* is all that presents itself to the eye. A *superficies* is chiefly considered as the external part of a solid: when we speak of a surface simply, and without any regard to body, we usually call it *figure*.

SUPERFICIES, *rectilinear*, is that comprehended between right lines.

SUPERFICIES, *curvilinear*, that comprehended between curve lines.

SUPERFICIES, *plane*, is that which has no inequality, but lies evenly between its bounding lines.

SUPERFICIES, *convex*, is the exterior part of a spherical or spheroidical body.

SUPERFICIES, *concave*, is the internal part of an orbicular or spheroidical body.

The measure or quantity of a surface is called the AREA thereof.

The finding of this measure, or area, is called the QUADRATURE thereof.

To measure the surfaces of the several kinds of bodies, as spheres, cubes, parallelepipeds, pyramids, prisms, cones, &c. See AREA and SPHERE, CUBE, &c.

In order to evince the use of fluxions in finding the *superficies* of solid bodies; let F A F (*Tab.* IV. *Analysis*, *fig.* 88.) represent a solid generated by the revolution of any given curve A F about its axis A H; also let a circle, whose diameter is the variable line (or ordinate) R B R, be conceived to move uniformly from A towards F F, and to dilate itself so, on all sides, at the same time, as to generate, by its periphery, the proposed *superficies* R A R: then, the length of that periphery, or the generating line, being expressed by 3,141592, &c. ×RR ($=2py$) and the celerity with which it moves by $\dot{z}$, the fluxion of the superficies R A R, or the space that would be uniformly generated in the time of describing $\dot{z}$, will therefore be truly represented by $2py\dot{z}$.

Hence, if w be taken to represent the whole surface R A R, generated from the beginning, we shall have $\dot{w}=2py\dot{z}=2py\sqrt{\dot{x}^2+\dot{y}^2}$; whence w itself may be found: as in the following examples.

1. *To determine the convex superficies of a cone:* the semi-diameter of the base B D or C D (*fig.* 85.) being put $=b$, the slanting line, or hypothenuse, A C$=c$, and F G parallel to D C$=y$, &c. we shall, from the similarity of the triangles A D C and G mg, have $b:c::\dot{y}\,(mg):\dot{z}$ $(\text{G}g)=\frac{c\dot{y}}{b}$: whence $\dot{w}\,(2p\dot{z})=\frac{2pcy\dot{y}}{b}$; and consequently $w=\frac{pcy^2}{b}$. This, when $y=b$, becomes equal $pcb=$ $p\times$ D C × A C = the convex superficies of the whole cone A B C: which therefore is equal to a rectangle under half the circumference of the base and the slanting line.

2. *To find the superficies of a sphere* A E B H (*fig.* 89.) In this case, putting the radius O H$=a$, A F$=x$, H m $=\dot{x}$, &c. we shall (by reason of the similar triangles O H F and H mh) have y (FH) : a (O H) :: $\dot{x}$ (H m) : $\dot{z}$ (H h) $=\frac{a\dot{x}}{y}$: therfore $\dot{w}\,(2py\dot{z})=2pa\dot{x}$; and consequently the superficies (w) itself$=2pax=$A F × periphery A E B H. Which, if the whole sphere be taken, will become A B × periph. A E B H = four times the area B E A H O.

Hence the *superficies* of a sphere is equal to four times the area of its greatest circle: and the convex *superficies* of any segment thereof, is to that of the whole, as the axis (or thickness) of the segment to the diameter of the sphere.

3. *To determine the superficies of a spheroid.* Let ACFHG (*fig.* 90.) represent one half of the proposed spheroid, generated by the rotation of the semi-ellipsis F A G, about its axis A H; put A H$=a$, F H (or H G) $=c$, B H$=x$, B C$=y$, F C$=z$, and the superficies generated by F C (or G D)$=w$: then, from the nature of the ellipsis, we have $y=\frac{c}{a}\sqrt{a^2-x^2}$; whence $\dot{y}=-\frac{cx\dot{x}}{a\sqrt{a^2-x^2}}$, and consequently $\dot{z}$ $\Big(=\sqrt{\dot{x}^2+\dot{y}^2}=$

$$\sqrt{\dot{x}^2+\frac{c^2x^2\dot{x}^2}{a^2\times\overline{a^2-x^2}}}=\frac{\dot{x}\sqrt{a^4-\overline{aa-cc}\times xx}}{a\sqrt{aa-xx}}=$$

$$\frac{\dot{x}\sqrt{a^4-b^2x^2}}{a\sqrt{a^2-x^2}}=\text{(by putting the eccentricity)}\sqrt{a^2-c^2}=b\Big)$$

$$=\frac{b\dot{x}\sqrt{\frac{a^4}{bb}-x^2}}{a\sqrt{a^2-x^2}}$$: therefore, in this case, $\dot{w}\,(2py\dot{z})$

$$=\frac{2pbc\dot{x}}{aa}\sqrt{\frac{a^4}{bb}-x^2}$$; whose fluent, in an infinite

series

is $2pc\dot{x} \times \overline{1 - \frac{b^2x^2}{2.3a^4} - \frac{b^4x^4}{2.4.5a^8} - \frac{3b^6x^6}{2.4.6.7a^{12}}}$. But the same fluent may be, otherwise, very easily exhibited by means of the area of a circle: for, if from the centre H, with a radius equal to $\frac{aa}{b}$, a circle SER be described, and the ordinate BC be produced to intersect it in E, it is evident that $BE = \sqrt{\frac{a^4}{bb} - xx}$, and that the fluxion of the area ESHB will be expressed by $\dot{x}\sqrt{\frac{a^4}{bb} - x^2}$; which being to $\frac{2pbc\dot{x}}{aa} \times \sqrt{\frac{a^4}{bb} - x^2}$, the fluxion before found, in the constant ratio of 1 to $\frac{2pbc}{a^2}$, their fluents must therefore be in the same ratio; and so the latter, expressing the *superficies* CFGD, will consequently be $= \frac{2pbc}{aa} \times BESFH = 2p \times \frac{FH}{HS} \times BESFH$. This solution, it may be observed, obtains only in case of an oblong spheroid, generated by the rotation of the ellipsis about its greater axis; for, in an oblate spheroid, generated about the lesser axis, the value of b $(\sqrt{a^2 - c^2})$ will be impossible; since, in this case HF is greater than HA. But, if we, here, put $b = \sqrt{c^2 - a^2}$, and $d = \frac{a^2}{b}$, the value of $\dot{w}$ (found above) will become $= \frac{2pbc\dot{x}}{a^2}\sqrt{\frac{a^4}{bb} + x^2} = \frac{2pc\dot{x}}{d}\sqrt{d^2 + x^2} = \frac{2pc}{d} \times \dot{x}\sqrt{a^2 + x^2}$: whose fluent may be brought out by the help of a table of logarithms: for, let the variable part $\dot{x}\sqrt{d^2 + x^2}$ be transformed to $\left(\frac{\dot{x} \times \overline{d^2 + x^2}}{\sqrt{d^2 + x^2}} = \frac{d^2\dot{x} + x^2\dot{x}}{\sqrt{d^2 + x^2}} = \frac{d^2x\dot{x} + x^3\dot{x}}{\sqrt{d^2x^2 + x^4}} = \right)$ $\frac{\frac{1}{2}d^2x\dot{x} + x^3\dot{x}}{\sqrt{d^2x^2 + x^4}} + \frac{\frac{1}{2}d^2x\dot{x}}{\sqrt{d^2x^2 + x^4}}$, so that the numerator of the first term $\frac{\frac{1}{2}d^2x\dot{x} + x^3\dot{x}}{\sqrt{d^2x^2 + x^4}}$ (now in a given ratio to the fluxion of the quantity under the radical sign) may be had by the common rule; by which means we get $\frac{1}{2}\sqrt{d^2x^2 + x^4}$, for the true fluent of the said term; to which adding the fluent of the other term $\frac{\frac{1}{2}d^2x\dot{x}}{\sqrt{d^2x^2 + x^4}}$ or $\frac{\frac{1}{2}d^2\dot{x}}{\sqrt{d^2 + x^2}}$ there arises $\frac{1}{2}x\sqrt{d^2 + x^2} + \frac{1}{2}d^2 \times$ hyp. log. $x + \sqrt{d^2 + x^2}$, for the fluent of $\dot{x}\sqrt{d^2 + x^2}$: and this, corrected and multiplied by $\frac{2pc}{d}$, gives $\frac{pcx}{d}\sqrt{d^2 + x^2} + pcd \times$ hyp. log. $\frac{x + \sqrt{dd + xx}}{d}$, for the superficies in this case, where the proposed spheroid is an oblate one. Simpson's Fluxions, vol. i. p. 187, &c.

Superficies, *line of*, a line usually found on the sector, and Gunter's scale. The description and use hereof, see under Sector and Gunter's *scale*.

Superficies *of the earth, internal*, a term used by Tull, and others, to express that part of the earth which affords the pabulum, or what is called the *pasture of plants*. Plants themselves are the pasture of animals; but it is from this *internal superficies of the earth* that vegetables first receive the nourishment which they afterwards give to animals. This inner *superficies of the earth* is the *superficies* of the pores, cavities, and interstices of the divided parts of the earth; and these are of two kinds, natural and artificial. Tull is the first who has used this term, and he justifies himself from the imputation of having used an absurd phrase, as it might at first seem, the adjective expressing something within, and the substantive something without, by observing, that though the vegetable pasture is within the earth, yet it is also on the outsides of the divided parts of the earth.

Of the natural and artificial pasture of plants, or the natural and artificial cavities, pores, and interstices of the earth, the natural alone will suffice to furnish a country with vegetables for the maintenance of a few inhabitants: but if the artificial, that is, if agriculture, the sole business of which is the making this artificial pasture for plants, were abolished out of the world, it is much to be feared, that the people of all populous countries, especially of those toward the borders of the frigid zones, (for there the trees often fail of producing fruit) would be reduced to the utmost necessity for this proper kind of food.

The artificial pasture of plants is that inner *superficies* of the earth, which is made by dividing the soil by art. This, on all parts of the globe where it is used, maintains many more people than the natural one; in the colder countries it maintains ten times as many as the natural one, and when the art of agriculture is more advanced to perfection, it will maintain twice as many as it does at present; and this improvement is easy, and to be done by simple means.

The natural pasture is not only less than the artificial, in an equal quantity of ground; but the little there is of it consisting also of the *superficies* of pores and cavities not having a free communication with one another, they are less pervious to the fine roots of all vegetables, which require a greater force to break through their partitions; and by that means roots, especially of weak plants, are excluded from many of those cavities; so that the benefit of a great part of the pasture that really is there, is lost to the husbandman.

The artificial pasture, on the other hand, consists in *superficies* of cavities that are pervious to all roots, and give them free passage throughout the whole extent of the cultivated place; and consequently, the fine horizontal roots of plants, which run much farther than is generally supposed, (those of a turnep, for instance, running six feet distant from the main root every way (see Root), will find an easy passage in every part to the utmost extent to which nature allows them to run.

The *internal superficies of the earth*, which is the pasture of plants, is not like the external surface, which is the pasture of animals, in that it cannot be enlarged without the addition of more surface taken from land adjoining to it, by enlarging its bounds or limits: but the *internal superficies*, or artificial pasture of land, may be enlarged without addition, or more land, only by division of the same earth: and this artificial pasture may be increased in proportion to the division of the parts of the earth, whereof it is the *superficies*.

A cube of earth of one foot has but six square feet of *superficies*; but divide this cube into cubical inches, and then its *superficies* will be increased twelve times, that is, it will be seventy-two *superficial* feet. Divide these cubes again into such others, as bear the same proportion to an inch that an inch does to a foot, and then the same quantity of earth, which had at first only six feet *superficies*, will have a *superficies* of eight hundred and sixty-four feet of natural pasture: and in the same manner is the soil divisible, and consequently this pasture increasable *ad infinitum*.

Poor land does not afford an *internal superficies* so well stocked with these fruitful particles as rich land does, but this we may compensate by dividing it more, and then what it wants in quality may be made up in quantity.

The common method of dividing the soil is by dung, or by tillage, or by both; and none of the natural pasture is ever lost, or injured by the use of the artificial means, but, on the contrary, it is mended by such means, a free communication being made by them between pore and pore. Tull's Horsehoeing Husbandry, p. 18.

SUPERFINE, in the *Manufactories*, a term used to express the superlative fineness of a stuff.

Thus a cloth, a camblet, &c. are said to be *superfine*, when made of the finest wool, &c. or when they are the finest that can be made.

The term is particularly used, among gold wire-drawers, for the gold or silver wire, which, after being drawn through an infinite number of holes, each less and less, is at length brought to be no bigger than a hair.

SUPERFLUOUS *interval*, in *Music*, is one that exceeds a true diatonic interval by a semitone minor. See Interval. Thus the

Superfluous *second*, or *tone*, contains a semitone minor more than a tone, or greater second; and will therefore be expressed by $\frac{125}{108}$, or by $\frac{75}{64}$. The first of these expressions is a tone minor, and a semitone minor; since $\frac{10}{9} \times \frac{25}{24} = \frac{125}{108}$: and the other is a tone major, and semitone minor; for $\frac{9}{8} \times \frac{25}{24} = \frac{75}{64}$. This last occurs in practice, and is one of the intervals of the chromaticum toniæum. See Chromatic and Second.

In the temperate scales these two *superfluous* tones coincide. Thus from B♭ to C sharp, or from F to G sharp, are *superfluous* tones.

Superfluous *third* is greater than the third major by a semitone minor, and will therefore be expressed by $\frac{125}{96} = \frac{5}{4} \times \frac{25}{24}$. It is not in use. It seems a fourth on our harpsichords. Thus from B♭ to D sharp is, properly speaking, a *superfluous third*; but D sharp and E♭ being confounded, it passes for a fourth.

Superfluous *fourth*. This interval is expressed by $\frac{25}{18} = \frac{4}{3} \times$

$\frac{4}{3}\times\frac{25}{24}$. It is by practitioners, and in temperate ſcales, confounded with the tritonus. See INTERVAL.

SUPERFLUOUS *fifth* is expreſſed by $\frac{25}{16}=\frac{3}{2}\times\frac{25}{24}$. This is equal to two thirds major, for $\frac{5}{4}\times\frac{5}{4}=\frac{25}{16}$. The *ſuperfluous fifth* occurs in practice, as from C to G ſharp.

SUPERFLUOUS *ſixth.* This interval is of two kinds; being the reſpective complements of the two diminiſhed thirds to the octave. One only, ſtrictly ſpeaking, anſwers to the general definition of a *ſuperfluous* interval, which is that interval which exceeds the ſixth major by a ſemitone minor, and is therefore expreſſed by $\frac{125}{72}=\frac{5}{3}\times\frac{25}{24}$. But the other interval which is a comma more than the former, and is two ſemitones major leſs than the octave, is chiefly uſed in harmony, as between B♭ and *a* ſharp, where it has a fine effect. It is expreſſed by $\frac{225}{128}=\frac{2}{1}:\frac{16}{15}:\frac{16}{15}=\frac{2}{1}::\frac{256}{225}$. See INTERVAL and DIMINISHED *third.*

SUPERFLUOUS *ſeventh* is expreſſed by $\frac{15}{8}\times\frac{25}{24}=\frac{125}{64}$. This is a dieſis leſs than the octave. See INTERVAL.

SUPERFLUOUS *octave* is a ſemitone minor more than the octave, as from C to *c* ſharp. It ſometimes occurs in the baſſes of inſtrumental pieces.

SUPERGEMINANS, a name given by ſome anatomical writers to the EPIDIDYMIS.

SUPERGENUALIS, a name given by ſome authors to the PATELLA, or knee-pan.

SUPERINCESSUS *radens.* See SLIDING.

SUPERINCESSUS *volvens.* See ROLLING.

SUPERINSTITUTION, SUPERINSTITUTIO, denotes one upon another. As if A be admitted and inſtituted to a benefice upon one title, and B be admitted, inſtituted, &c. by the preſentation of another.

SUPERINTENDENT, in the *French Cuſtoms,* an officer who has the prime management and direction of the finances or revenues of the king.

The term is alſo uſed for the firſt officer in the queen's houſehold, who has the chief adminiſtration thereof.

They have alſo a *ſuperintendent* of the buildings, anſwering to the ſurveyor of the works among us.

The cardinal de Richelieu made himſelf *ſuperintendent* of commerce.

SUPERINTENDENT alſo denotes an eccleſiaſtical ſuperior in ſeveral reformed churches where epiſcopacy is not admitted; particularly among the Lutherans in Germany, and the Calviniſts in ſome other places.

The *ſuperintendent* is, in effect, little other than a biſhop; only his power is ſomewhat more reſtrained that that of our dioceſan biſhops.

He is the chief paſtor, and has the direction of all the inferior paſtors within his diſtrict or dioceſe.

In Germany they had formerly *ſuperintendents general,* who were ſuperior to the ordinary *ſuperintendents.* Theſe, in reality, were archbiſhops; but the dignity is ſunk into diſuſe; and, at preſent, none but the *ſuperintendent* of Wirtemberg aſſumes the quality of *ſuperintendent general.*

SUPERIOR, or SUPERIOUR, ſomething raiſed above another, or that has a right to command another. Thus an abbot is called the *ſuperior* of an abbey, and a prior the *ſuperior* of a convent.

The canoniſts hold, that a perpetual ſuperiority conſtitutes a title; but a *ſuperior* may be continued by thoſe who conſtituted him ſuch, yet without the ſuperiority's being rendered by that means perpetual.

The church of France allow the ſuperiority and primacy of the pope, not his infallibility; as all the other Romiſh churches do. See POPE, ABBOT, and PRIOR.

SUPERIOR *auriculæ muſculus,* in *Anatomy,* a name given by Santorini, and by Winſlow, to one of the muſcles of the ear, called by Albinus and Cowper the *attollens auriculam,* and by many *auriculæ primus.*

SUPERIOR *courts of record.* See COURT.

SUPERIOR *capitis obliquus, maxillæ, oculi obliquus, planets, poſticus ſerratus,* and *reſpondeat.* See the reſpective articles.

SUPERIOR *ſcapularis.* See SUPRASPINATUS.

SUPERIORIS *labii elevator.* See ELEVATOR.

SUPERJURARE. Anciently, when a criminal endeavoured to excuſe himſelf by his own oath, or by that of one or more witneſſes, and yet the crime was ſo notorious, that he was convicted by the oaths of many more witneſſes; this was called *ſuperjurare.*

SUPERLATIVE, in *Grammar,* an inflexion of nouns adjective, ſerving to augment and heighten their ſignification, and ſhew the quality of the thing denoted to be in the higheſt degree.

In Engliſh, the *ſuperlative* is uſually formed by the addition of *eſt;* as richeſt, holieſt, &c. rarely by the addition of *iſſimo,* as generaliſſimo; more frequently by the prefixing of *moſt;* as *moſt* honourable, *moſt* amiable, *&c.*

The French are generally forced to form their *ſuperlatives* by prefixing of *le plus,* ſometimes of *tres,* and ſometimes of *fort.*

The Italians and Spaniards have great advantages over them in this reſpect; their language abounding with magnificent words, for exaggerating things with auxiliary particles: yet the Hebrews are more poor than the French in this reſpect, as having neither comparatives, nor *ſuperlatives.* They uſe to expreſs theſe degrees by the particles *joter* and *mood;* ſometimes by the prepoſition *min,* and ſometimes by redoubling the word; of which we find frequent inſtances in the Bible.

SUPERNATURAL *grace.* See GRACE.

SUPERNATURAL *theology.* See THEOLOGY.

SUPERNUMERARII, in the latter times of the Roman empire, ſoldiers added to the legion after it was compleated. They were the ſame with thoſe in former times called ACCENSI.

SUPERNUMERARY, ſomething over and above a fixed number. In ſeveral of the offices are *ſupernumerary* clerks, to be ready on extraordinary occaſions.

There are alſo *ſupernumerary* ſurveyors of the exciſe, to be ready to ſupply vacancies, when they fall: theſe have but half-pay.

In muſic, the *ſupernumerary,* called, by the Greeks, *proſlambanomenos,* is the loweſt of the chords of their ſyſtem; anſwering to *a, mi, la,* of the loweſt octave of the moderns. See DIAGRAM.

SUPERNUMERARY *bones of the head:* anatomiſts diſtinguiſh by this appellation ſeveral bony pieces found in ſome ſkuils, chiefly between the parietal and occipital bones. They form breaks in the lambdoidal ſuture, and are joined by the ſutures to the bones already mentioned.

Their figure, number, and ſize, vary extremely; ſometimes they are triangular, or approaching to that form, but oftener they are of no determinate figure: in ſome ſubjects they incroach on the occipital bone, and in others on the parietal bones; and ſometimes they extend themſelves every way. They are commonly indented, and broader on the outſide of the ſkull than on the inſide, in which they have no viſible indentations; and ſometimes, when they are ſmall on the outſide, are hardly at all to be ſeen within. They have by ſome been termed keys, a name uſed by joiners for the pieces which ſerve to ſtrengthen the joints of boards; but this can agree to them only in reſpect to their ſituation, not in reſpect to their uſes with regard to the other bones of the head. Some ſuch bones have alſo been found in the joints, between the bones of the head and face; and between thoſe of the bones of the face with each other. Winſlow.

SUPERONERATIONE *paſturæ.* See SURCHARGE.

SUPERPARTICULAR. See RATIO. Ptolemy, in his Harmonics, ſeems to lay a great ſtreſs on *ſuperparticular ratios,* beyond the ſuperpartient in muſic. He does not call the intervals which may be expreſſed by the former ratios, excepting 2 : 3 and 3 : 4, diſſonants, as the Pythagoreans did, but concinnous, as if they were of a middle nature between conſonant and diſſonant. But all the doctrine of *ſuperparticular ratios* is a precarious hypotheſis. The two thirds, major and minor, expreſſed by 5 : 4 and 6 : 5, are *ſuperparticular,* and concords. Their octaves, 5 : 2 and 12 : 5, are *ſuperparticular,* and concords alſo. Ptolemy himſelf refutes the Pythagoreans for excluding the diapaſon diateſſaron, expreſſed by 8 : 3, from the number of concords, becauſe its proportions were ſuperpartient; yet his own doctrine is equally precarious. Vid. Euler, Tentam. Nov. Theor. Muſic, p. 63, 64.

SUPER-PARTIENT *ratio.* See RATIO.

SUPER-PRÆROGATIVA *regis,* a writ which formerly lay againſt the king's widow for marrying without the ſucceſſor's licence.

SUPERPURGATION, *hypercatharſis,* in *Medicine,* an exceſſive, over-violent purging.

SUPERQUADRIPARTIENS. See RATIO.

SUPERSCAPULARIS *inferior,* in *Anatomy,* is called alſo INFRASPINATUS.

SUPERSCAPULARIS *ſuperior,* in *Anatomy,* a muſcle, called alſo SUPRASPINATUS.

SUPERSEDEAS, *in Law,* a writ iſſued in divers caſes, importing, in general, a command to ſtay or forbear ſome ordinary proceedings in law, which, in appearance, ought to be done, or purſued, were it not for the cauſe whereon this writ is granted.

Thus a man regularly, is to have a ſurety of peace againſt him of whom he will ſwear he is afraid; and the juſtice required hereunto cannot deny it him: yet, if the party be formerly bound to the peace, either in chancery, or elſewhere; this writ lies, to ſtay the juſtice from doing that, which otherwiſe he ought not to deny.

Clerk of the SUPERSEDEAS. See CLERK.

SUPERSEDING a *commiſſion* of *bankrupt.* If ſuch a commiſſion

miſſion iſſues, and there is ſufficient to pay all the creditors, and the charges, and ſatisfaction is made to all the creditors, the commiſſion may be *ſuperſeded*. A commiſſion is alſo ſometimes *ſuperſeded*, when the creditors agree with the bankrupt, and conſent to a *ſuperſedeas*.

SUPER-STATUTO, 1 Ed. III. cap. 12, 13. is a writ that lay againſt the king's tenants holding in chief, who aliened the king's land without his licence.

SUPER-STATUTO *de articulis cleri, cap.* 6. a writ lying againſt the ſheriff, or other officer, that diſtrains in the king's highway, or in the lands anciently belonging to the church.

SUPER-STATUTO *fact. pour ſeneſchal & marſhal de roy, &c.* a writ that lies againſt the ſteward or marſhal for holding plea in his court, or for treſpaſs or contracts not made, and ariſing within the king's houſhold.

SUPER-STATUTO *verſus ſervantes & laboratores*, a writ which lies againſt him who keeps any ſervants, departed out of the ſervice of another contrary to law.

SUPERSTITION, extravagant devotion, or religion wrongly directed, or conducted.

Superſtition conſiſts in falſe and abject notions of the deity, in the gloomy and groundleſs fears of inviſible beings, and in the abſurd rites which theſe notions and fears naturally produce: and, generally ſpeaking, it is the effect of ignorance, or of a judgment perverted by a ſour and ſplenetic temper.

The author of the article *fanaticiſm* in the Dict. Encyclop. Paris, defines *fanaticiſm* as a blind and paſſionate zeal, which ariſeth from ſuperſtitious opinions, and leads its votaries to commit ridiculous, unjuſt, and cruel actions, not only without ſhame, but even with certain internal feelings of joy and comfort; from which he concludes that *fanaticiſm* is really nothing more than *ſuperſtition* ſet in motion.

The difference between true religion and *ſuperſtition* ſeems to be this: that the former is the exerciſe of the underſtanding and affections, and the regulation of the conduct, founded on juſt notions of God, and the of method of averting his diſpleaſure and ſecuring his favour; and the latter is the reſult of fancy and paſſion undirected and ungoverned, and originating either in the deluſive hope of pleaſing God by ſome opinion or practice entirely diſtinct from and contrary to thoſe notions, or the diſtreſſing fear that he will not be pleaſed without the addition of ſomething which ſuch notions neither require nor juſtify.

Superſtition has been often uſed, eſpecially by the Ancients, for an exceſs of religion, agreeably to that verſe of Aulus Gellius, lib. iv. cap. 9.

Religentem eſſe opertet; religioſum nefas.

It was a piece of *ſuperſtition*, in the ancient Romans, to obſerve the flight of birds, the entrails of victims, *&c.* It has been obſerved by ſome excellent critics, that the Greek word δεισιδαιμονια, which occurs in the New Teſtament, though it is often uſed in a bad ſenſe, has alſo a good, or at leaſt an innocent, meaning. Accordingly they think that it ſhould be rendered *religion* and not *ſuperſtition*, in Acts xxv. 19. alledging, that it cannot be ſuppoſed Feſtus would ſpeak contemptuouſly to Agrippa of the Jewiſh, that is, of Agrippa's own religion, when Agrippa was come to Cæſarea, with his ſiſter Bernice, to ſalute him. Thus alſo it is apprehended that the word δεισιδαιμονεϛερȣς, Acts xvii. 22. ſhould be tranſlated *very devout*, or exceedingly addicted to the worſhip of inviſible powers,and not too *ſuperſtitious*. The word in the former ſenſe, it is urged, would give no offence at Athens; it was the peculiar character of the Athenians, and conveyed an encomium which they were fond of above any other. The latter harſh ſenſe of the word is inconſiſtent with the whole deſign of St. Paul's argument. Lardn. Cred. vol. i. p. 429, *note s.* Doddr. in loc.

Monſ. Thiers has an expreſs treatiſe, Des ſuperſtitions *populaires*. Women, he obſerves, are naturally more inclined to *ſuperſtition*, than impiety. Plutarch has endeavoured to ſhew, that *ſuperſtition* is worſe than atheiſm. The puniſhment allotted, by ſeveral councils, for the ſuperſtitious, is, to faſt a month in priſon.

SUPERSTITIOUS *magic.* See MAGIC.

SUPERSTITIOUS *uſes*, in *Law*. See MORTMAIN.

SUPERVISOR ſignifies a SURVEYOR, or OVERSEER.

It was formerly, and ſtill remains, a cuſtom among ſome, eſpecially of the better ſort, to make a *ſupervíſor* of wills; to overlook the executors, and ſee their wills truly performed: but it is to little purpoſe; as being now ſo careleſly executed.

SUPINATION, SUPINATIO, in *Anatomy*, the action of a ſupinator muſcle; or the motion whereby it turns the hand ſo, as that the palm is lifted upwards. See PRONATION.

SUPINATOR, in *Anatomy*, a denomination given to two muſcles of the arm; the one called *ſupinator longus*, the other *ſupinator brevis*; both ſerving to turn the palm of the hand upwards.

The firſt is a long flat muſcle, lying on the external condyle of the os humeri, and on the convex ſide of the radius from one end to the other. It is fixed by fleſhy fibres to the external intermuſcular ligament, and to the criſta of the external condyle of the os humeri, for five or ſix fingers breadth above the condyle, between the brachiæus and anconæus externus; from thence it runs along the whole convex ſide of the radius, and is inſerted by a flat narrow tendon, a little above the ſtyloide apophyſis, in the angle between the concave and flat ſides of the extremity of this bone. This muſcle was believed to be concerned only in the motion of SUPINATION, till Mr. Heiſter juſtly obſerved, that it was likewiſe a flexor of the fore-arm; for which uſe it is much better fitted than for the firſt. Winſlow. See *Tab. Anat. (Myol.) fig.* 1. *n.* 20, *fig.* 2. *n.* 19. *fig.* 6. *n.* 16. *fig.* 7. *n.* 44.

The ſecond is a ſmall thin fleſhy muſcle, ſurrounding a great portion of the upper third part of the radius. It is fixed by one end to the lower part of the external condyle of the os humeri, to the external lateral ligament of the joint, to the annual ligament of the radius, and to part of the lateral eminence in the head of the ulna; from thence it paſſes obliquely over the head of the radius, covering ſome part of it, and running down upon, and in ſome meaſure ſurrounding the neck, it turns in under the bicipital tuberoſity, and is inſerted by the ſide of the interoſſeous ligament, in the inſide of the ſuperior quarter of the bone, and even a little lower. In ſome ſubjects we may obſerve the marks of the paſſage of this muſcle over the outſide of the bone. It makes an angle with the pronator teres, reſembling the Roman V. Winſlow. See *Tab. Anat. (Myol.) fig.* 7. *n.* 10. and 45. This muſcle ſeems to have no other uſe than what is expreſſed by its name; and as it is a ſhort ſmall muſcle, it muſt be very weak. Its uſe is chiefly owing to the obliquity of its fibres: but Mr. Winſlow obſerves, that neither this nor the former muſcle would be able to perform ſupination, where a great force is required, without the aſſiſtance of the BICEPS, which is the moſt powerful of all the *ſupinators*, and the chief actor in this motion.

SUPINE, in the *Latin Grammar*, a part of the conjugation of a verb, of like effect with the infinitive mood.

There are two kinds of *ſupines*: the one in *um*, whoſe ſignification is active, and marks a motion, as *dare nuptum*; the other in *u*, having a paſſive ſignification, as *horrendum auditu*, &c. The *ſupines* have neither number, nor perſon.

They have their name, ſays Probus, and after him Voſſius, *quod ad inſtar* ſupinorum *& otioſorum hominum omnia habent confuſa*: or, according to Priſcian, *quod naſcantur a participiis paſſivis, quæ* ſupina *appellata ſunt, quia in infimo loco ſita, totam conjugationis molem ſuſcipiant.*

SUPPLANTALIA, or SUPPEDANEA, among *Phyſicians*, plaſters, or other medicaments, applied to the ſoles of the feet; generally made of leaven, muſtard, horſe-radiſh, ſalt, ſoap, gunpowder, *&c.*

SUPPLE. To *ſupple* a horſe in the manege, is to make him bend his neck, ſhoulders, and ſides, and to render all the parts of his body more pliable.

SUPPLEMENT *of an arch*, in *Geometry*, or *Trigonometry*, is the number of degrees that it wants of being an intire ſemicircle: as *complement* ſignifies what an arch wants of being a quadrant.

SUPPLEMENT, in *Matters of Literature*, an appendage to a book, to ſupply what is wanting therein.

Freinſhemius has written divers *ſupplements*, to reſtore the books of ſeveral ancient authors, part whereof had been loſt. The French have alſo uſed the word *ſupplement* for a kind of tax, or after-payment, charged on lands, offices, *&c.* that are pretended to have been ſold beneath their value.

SUPPLEMENTAL *bill*, in *Law*. See SUIT *in equity*.

SUPPLETORY *oath*, in *Law*. When there is only one witneſs (the civil law univerſally requiring the teſtimony of two) to make up the neceſſary complement of two, the civil courts admit the party himſelf (plaintiff or defendant) to be examined in his own behalf; and adminiſter to him what is called the *ſuppletory oath*; and if his evidence happens to be in his own favour, this immediately converts the half-proof into a whole one. Blackſt. Com. vol. iii. p. 371.

SUPPLICATION, *ſupplicatio*, in *Antiquity*, a religious ſolemnity obſerved on account of ſome remarkable ſucceſs againſt an enemy; and eſpecially when the army had conferred the title of *imperator* on their general, in whoſe name the ſenate ordered the temples to be opened for the reception

reception of the people, and thanks to be rendered to the gods.

On such an occasion the *imperator* sent messengers crowned with laurel with letters to the senate, which were likewise adorned with laurel, to demand of them the title of *imperator*, and the honour of a *supplication*. This solemnity consisted in sacrificing and feasting in the temples, with giving thanks to the gods for the success obtained, and praying for the continuance of their assistance. At first there were only a few days taken up in such festivals; but afterwards they were increased gradually, till they came to no less than fifty. On subduing the Sabines, in the year of the city 304, a *supplication* of one day only was ordained; on the taking of Veii, Camillus had a *supplication* of four days decreed him; Pompey had twelve on putting an end to the Mithridatic war; Cæsar had fifteen, and afterwards twenty, for reducing Gaul; Octavianus and Pansa had fifty days of *supplication* for delivering the colony of Mutina.

SUPPLICAVIT, a writ, issuing out of the court of king's bench, or chancery, for taking surety of the peace when one is in danger of being hurt in his body by another.

It is directed to the justices of the peace, and sheriff of the county; and is grounded on the statute 1 Ed. III. which appoints, that certain persons shall be assigned by the lord chancellor to take care of the peace. See GOOD-*abearing*.

SUPPLIES, called also AIDS and SUBSIDIES, are extraordinary grants made by the commons of Great Britain, in parliament assembled; who, when they have voted a *supply* to his majesty, and settled the *quantum* of that *supply*, usually resolve themselves in what is called a committee of ways and means, to consider of the ways and means of raising the *supply* so voted. And in this committee every member (though it is looked upon as the peculiar province of the chancellor of the exchequer) may propose such schemes of taxation as he thinks will be least detrimental to the public. The resolutions of this committee (when approved by a vote of the house) are in general esteemed to be (as it were) final and conclusive. For though the *supply* cannot be actually raised upon the subject till directed by an act of the whole parliament, yet no monied man will scruple to advance to the government any quantity of ready cash, on the credit of a bare vote of the house of commons, though no law be yet passed to establish it; and which requires the assent of the other two branches of the legislature. The general reason given for this exclusive privilege of the house of commons, is, that the *supplies* are raised upon the body of the people, and, therefore, it is proper that they alone should have the right of taxing themselves. This reason, says judge Blackstone, would be unanswerable, if the commons taxed none but themselves; but it is notorious, that a very large share of property is in the house of lords, which is equally taxed with the property of the commons; and, therefore, he says, the commons not being the *sole* persons taxed, this cannot be the reason of their having the *sole* right of raising and modelling the *supply*. The true reason, arising from the spirit of our constitution, he apprehends to be this. The lords being a permanent hereditary body, created at pleasure by the king, are supposed more liable to be influenced by the crown, and when once influenced to continue so, more than the commons, who are a temporary elective body, freely nominated by the people. It would, therefore, be extremely dangerous to give the lords any power of framing new taxes for the subject. It is sufficient that they have a power of rejecting, if they think the commons too lavish or improvident in their grants. See PARLIAMENT and MONEY-*bills*. Blackst. Com. vol. i. p. 170. 308.

SUPPLY, in *Sea-language*, a fresh recruit of provisions or stores sent to a ship or fleet.

SUPPOPLITÆUS, in *Anatomy*, a name given by Spigelius, and some others, to the muscle more generally known by the name of the POPLITÆUS.

SUPPORTED, in *Heraldry*, a term applied to the uppermost quarter of a shield, when divided into several quarters; these seeming, as it were, *supported*, or sustained, by those below.

The chief is also said to be *supported* when it is of two colours, and the upper colour takes up two thirds of it: in this case it is *supported* by the colour underneath.

SUPPORTERS, in *Heraldry*, figures, standing on the scroll, and placed by the side of the escutcheon, and seeming to *support* or hold up the same.

Supporters are, chiefly, figures of beasts: figures of human creatures, used for the like purpose, are more properly called *tenants*.

Some make another difference between *tenant* and *supporter*: when the shield is borne by a single animal, it is called *tenant*; when by two, they are called *supporters*.

The figures of things inanimate, sometimes placed aside of escutcheons, but not touching, or seeming to bear them, though sometimes called *supporters*, are more properly called *cotises*.

Supporters have formerly been taken from such animals as are borne in the shields; and sometimes they have been chosen as bearing some allusion to the names of those whose arms they are made to support. F. Menestrier traces their origin to the ancient tournaments, in which the knights caused their shields to be carried by servants or pages under the disguise of lions, bears, griffons, blackamoors, &c. who also held and guarded the escutcheons, which the knights were obliged to expose to public view some time before the lists were opened. But Sir G. Mackenzie says, that the first origin and use of them are derived from the custom of leading such as are invested with any great honour, to the prince who confers it, and of his being supported by two of the quality, when he receives the symbols of such honour: and in remembrance of that solemnity, his arms were afterward supported by any two creatures which he chooses.

The *supporters* of the English arms are, a lion, and an unicorn: some of the former kings have had a leopard, and an unicorn; others, gryphons; others, eagles. See ARMS.

The *supporters* of the French arms are angels; which are said to have been first introduced by Philip VI. his device being an angel overthrowing a dragon; the dragon being, at that time, the device of the kings of England.

Those of the prince of Monaco are, Augustine monks; those of the family of the Ursini, bears; in allusion to their names.

In England *supporters* are the prerogative first, of those called nobiles majores, viz. dukes, marquisses, earls, viscounts, and barons; secondly, of all knights of the Garter, though they should be under the degree of barons; thirdly, of knights of the Bath, who both receive on their creation a grant of *supporters*: and lastly, of such knights as the king chuses to bestow this honour upon. *Supporters* are not hereditary, except to the elder branches of some knights of the Garter, whose ancestors had this honour granted them; and to the eldest sons of peers, above the degree of a baron, who bear their father's arms and *supporters* with a label, &c. See CROWN.

The Germans permit none but princes, and noblemen of rank, to bear them: among the French, the use of them is more promiscuous.

SUPPOSITI *medium*. See MEDIUM.

SUPPOSITION, in *Music*, is when one of the parts dwells on a note, while another part makes two or more lesser notes equivalent to it, by conjoint degrees.

Supposition is defined, by a late author, the using of two successive notes, of the same value, as to time; the one whereof, being a discord, *supposes* the other a concord.

The harmony, Mr. Malcolm observes, is always to be full on the accented parts of the bar, or measure; but, on the unaccented, discords may transiently pass, without any offence to the ear. This transient use of discords, followed by concords, make what we, after the French, call *supposition*.

Concords by *supposition* are those where the continued bass adds, or supposes, a new sound below the fundamental bass; whence such concords always exceed the extent of the octave. Of these concords there are three sorts, all which are concords of the seventh: the first, when the added sound is a third below the fundamental sound; such is the concord of the ninth: and if the concord of the ninth is formed by the mediant, added below the sensible concord in the minor mode, then the concord is called the superfluous fifth. The second kind is, when the supposed sound is a fifth below the fundamental sound, as in the concord of the fourth or eleventh; and if the concord is sensible, and the tonic be supposed, this concord is called the superfluous seventh. The third kind is that where the supposed sound is below a concord of the diminished seventh: if it is a fifth below, i. e. if the supposed sound be the mediant, the concord is called the concord of the fourth and superfluous fifth: if it is a seventh below, i. e. if the supposed sound be the tonic, the concord is called the lesser sixth and superfluous seventh. Encyclopedie, art. *Supposition*. See FUNDAMENTAL *Bass*.

SUPPOSITION, in *Arithmetic*. See POSITION.

SUPPOSITORY, SUPPOSITORIUM, in *Pharmacy*, a solid medicine thrust up the fundament, in lieu of a liquid one, or clyster, where that would not be so convenient. The Latins call it *balanus*, because anciently made in figure of an acorn.

It is usually composed of common honey, mixed up with either soap or oil, and formed into pieces of the length and thickness of the little finger, only pyramidal. To

the compofition is fometimes alfo added powder of fcammony, euphorbium, colocynthis, falt, aloes, &c. according to the cafe of the patient.

On fome occafions, *fuppofitories* are only a cut of bacon, a piece of tallow-candle, the ftem of a leek, or the like matter, thruft, like a tent, up the anus, to irritate the fpincter mufcle, and oblige it to extrude the excrements. Some ufe a lozenge of fugar, or a piece of linen rolled up, and dipt in falt-butter, which will occafionally produce effect. For ulcers of the rectum, the beft *fuppofitories* are made of *mel. rofar. cum pulv. maftic. myrrh. vel colophon.*; thofe compounded with euphorbium, aloes, and fubftances which give a ftrong ftimulus, are advantageoufly ufed to promote a difficult birth, or to expel the fecundines, when they are preternaturally retained in the uterus.

The *fuppofitory* was invented for the convenience of fuch as have an averfion to the taking of clyfters; or to be ufed when the difeafe does not allow thereof.

SUPPRESSION, formed from *fub*, and *premo*, *I prefs under*, in *Law*, the extinction or annihilation of an office, right, rent, or the like.

SUPPRESSION, in *Grammar*, denotes an omiffion of certain words in a fentence, which yet are neceffary to a full and perfect conftruction. As, "I come from my father's;" that is, "from my father's houfe."

Suppreffion is a figure of fpeech very frequent in our language; chiefly ufed for brevity and elegance. Some rules relating hereto are as follow:

1°. Whenever a word comes to be repeated in a fentence oftener than once, it is to be fuppreffed. Thus we fay, "This is my mafter's horfe;" not, "This horfe is "my mafter's horfe."

2°. Words that are neceffarily implied may be fuppreffed.

And, 3°, All words that ufe and cuftom fupprefs in other languages, are to be fuppreffed in Englifh; unlefs there be particular reafons to the contrary.

SUPPRESSION, in *Medicine*, is applied to the humours that are retained in the body by fome obftruction or ftoppage of the ufual outlet.

We fay, a *fuppreffion* of urine, of the menfes, *&c.* See ISCHURIA, URINE, MENSES, *&c.*

SUPPRESSION *of urine*. There are commemorated in the Philofophical Tranfactions, three cafes of an actual and total *fuppreffion of urine*, fuppofed to proceed from a ftone lodged in the neck of the bladder; but in all which, on introducing the catheter, it was found that there was no ftone there, nor any urine in the bladder. In all thefe cafes the fame remedy was ufed; that is, a great quantity of acids diluted largely with water; and in confequence of this the urinary fecretion was immediately reftored, and the patient foon voided it in a proper manner, and was reftored to health without any farther ufe of medicines. Philof. Tranf. N° 253.

A *fuppreffion of urine* fometimes happens to women with child, by the womb falling down, and preffing on the urethra.

It is alfo occafioned by an INFLAMMATION *of the bladder*, a fwelling of the hæmorrhoidal veins, hard fæces lodged in the rectum, a ftone in the bladder, excrefcences in the urinary paffages, a palfy of the bladder, hyfteric affections, &c. each of which cafes requires a particular treatment. It may be obferved, in general, that in all of them mild and gentle applications are the fafeft, as ftrong diuretic medicines, or things of an irritating nature, generally increafe the danger. Buchan. See ISCHURIA and STRANGURY.

Fire of SUPPRESSION, in *Chemiftry*. See FIRE.

SUPPURATION, formed from *fub*, *under*, and *pus*, *puris*, in *Medicine*, the action whereby extravafated blood, or other humours in the body, are ripened, or changed into pus. See ABSCESS.

The change is begun by a diffipation of the moft fubtile and fpirituous parts of the blood; what is left behind, thickens and purifies by little and little; that is, its falts and fulphurs difengage themfelves from the groffer parts wherein they were embarraffed: thefe parts, thus difengaged, and acting on one another, bruife and break each other, and thus excite a fermentation, which increafes the heat of the part; whereby the matter is farther digefted, and a pain and tenfion produced: at length the blood lofes its natural colour, and becomes quite white, by the mixture of its acid, fulphurous, and acrimonious particles; as we fee happen to fulphurous alkalis, when mixed with acids.

In *fuppuration* the folids are ruptured, the fluids are extravafated, and entering into a procefs of refolution with the broken fibres, procure for themfelves an evacuation, by pufhing outwardly through the teguments. In this cafe the indications are to dilute and foften the fluids, that the pus may be formed free from irritation, and to relax the folids, that they may yield kindly, and without violence.

When in tumors and phlegmons nature fhews a tendency to *fuppuration*, or ripening, all the refolving or difperfing medicines muft be laid afide, and great care muft be taken to forward the maturity of the inflammation, that is, to convert the ftagnating blood into laudable matter; then to give a difcharge, or vent, to this *fuppurated* matter, afterwards to cleanfe the part, and finally to incarn, and heal it.

The firft of thefe intentions, the ripening of the fwelling, is to be promoted by fuch of the emollient medicines as obftruct the pores of the fkin, as fats, oils, and glutinous medicines; as alfo the fharp, pungent, and, in fome degree, cauftic medicines, which may be ufed in form of cataplafms, or plafters. Of the firft kind are mallows, marfhmallows, figs, linfeed, honey, crumb of bread, the various animal fats, and the oils of lilies, chamomile, &c. and of the latter, or the fharp and pungent ripeners, are garlic, onions, faffron, turpentine, and many of the gums, as galbanum, and ammoniacum; and laftly, four leaven of bread.

Medicines compounded of thefe are to be applied hot to the part, and the application frequently repeated, till the matter within is found to be fufficiently ripened, by the foftnefs and whitenefs of the tumor. But when the abfcefs is fmall, it is more convenient and fufficient, to apply fome of the ripening plafters, as diachylon, with the gums, or the like, till the *fuppuration* is perfected.

Mr. Goulard recommends faturnine applications for fuppurating tumors, though, Mr. Aikin obferves, they do not feem to anfwer any one indication: for this purpofe, nothing can have a greater fanction from practice than the application of warm emollient fomentations and cataplafms.

Nor are internal remedies wholly to be neglected in cafes of this kind, efpecially where the tumors are large, or of confequence. In thefe cafes, when the blood moves too flowly, which may be known by the pulfe, the patient muft be allowed to eat meat, and muft take fuch medicines as are warm and ftimulating; by means of which, and by the increafed motion of the blood, the infpiffated particles contained in the fmaller veffels will be the more eafily converted into matter.

Strong broths are very proper for this purpofe, as alfo the ufe of wine, or ale, in moderation; and Venice treacle, diafcordium, and the confection of alkermes, are to be the medicines taken three or four times a day, and medicated teas, made of fanders-wood, faffafras, or cinnamon. But, on the contrary, when the motion of the blood is too violent, and the heat too great, cooling medicines are to be given, fuch as the thin and watery drinks, the fubacid medicines, and nitre: bleeding, in a fmall quantity, is alfo often neceffary in this cafe. But when the conftitution is found, and the blood's motion regular, the ufe of internal medicines, to promote *fuppuration*, is trifling, and may be altogether rejected. When by thefe means the matter is perfectly formed, the abfcefs is to be carefully opened by the furgeon, and the matter difcharged, after which the wound is to be cleanfed and healed in the common way. Heifter's Surg. p. 183. Aikin's Obf. on the external Ufe of Preparations of Lead, &c. p. 49, &c.

SUPPURATIVES, or SUPPURATING *medicines*, are ripeners, or medicines that promote fuppuration.

Suppuratives are all hot; by which means, increafing the warmth of the part, they refolve the humour into a pus.

Such are mallows, melilot, lily-roots, diachylon, pellitory, figs, aromatic gums, meals, *&c.*

SUPPUTATION. See COMPUTATION.

SUPRACOSTALES, in *Anatomy*, mufcles irregularly triangular, and fituated on the back part of the ribs, near the vertebræ, commonly called *levatores coftarum*.

Each of thefe is fixed by one tendinous extremity in the tranfverfe apophyfis, which lies above the articulation of each rib, and to the neighbouring ligament; the firft being inferted in the tranfverfe apophyfis of the laft vertebra of the neck, and the laft in that of the eleventh vertebra of the back. From thence the flefhy fibres run down obliquely, increafing in breadth as they defcend, and are inferted in the back part of the outfide of the following rib: fome of the fibres often pafs beyond that rib, and are fixed in one or more of the ribs below it by feveral digitations, which lie at a greater diftance from the vertebræ, in proportion as they run lower. In the inferior ribs thefe digitations are more confiderable than in the fuperior.

The *fupracoftales* are powerful affiftants to the INTERCOSTALS in their common action, and are therefore very juftly termed *levatores coftarum*. Winflow.

SUPRACOSTALES *longi*, in *Anatomy*, a name given by Verheyen to thofe mufcles of the loins, which Albinus has defcribed

described under the name of the LEVATORES *longi costarum.*

SUPRALAPSARIANS, in *Theology*, persons who hold that God, without any regard to the good or evil works of men, has resolved, by an eternal decree, *supra lapsum*, antecedently to any knowledge of the fall of Adam, and independently of it, to save some, and damn others: or, in other words, that God intended to glorify his justice in the condemnation of some, as well as his mercy in the salvation of others; and for that purpose decreed that Adam should necessarily fall, and by that fall bring himself, and all his offspring, into a state of everlasting condemnation.

These are also called *antelapsaries*; and are opposed to sublapsaries and infralapsaries.

According to the *supralapsarians*, the object of predestination, is, *homo creabilis & labilis*; and, according to the SUBLAPSARIANS and INFRALAPSARIANS, *homo creatus & lapsus*.

SUPRASPINATUS, in *Anatomy*, a thick, narrow muscle, thus called from its fleshy origination at the upper end of the basis of the scapula *above the spine*. See *Tab. Anat.* (*Myol.*) *fig.* 7. *n.* 32.

This muscle fills all the *supra-spinal* cavity of the scapula, and is fixed to all the posterior half of the *supra-spinal* fossa, and sometimes its insertion reaches near the neck of the bone. Then the fibres leave the surface of the bone, and being, as it were, supported by the fat, or cellulous substance, pass between the acromium, and neck of the scapula, under the arch formed by the acromium and extremity of the clavicle, and under the ligament between the acromium and apophysis coracoides; being afterwards inserted in the superior surface of the great tuberosity of the head of the os humeri, very near the bony channel. This muscle is covered by the trapezius. The *supra-spinatus* is commonly supposed to join with the deltoides in lifting up the arm; this muscle beginning that action, and the deltoides continuing it. But Mr. Winslow observes, that this muscle is not only very small, but it seems to be too near the articulation of the head of the os humeri, to be able to raise the whole upper extremity, which is of a considerable weight and length. It has, however, he says, two other very remarkable uses, when the arm is raised from the thorax to the head by the action of the deltoides. The strong deltoide muscle, he observes, in the first instant of its action to raise the arm, would thrust the head of the os humeri upwards out of the cavity, if something did not supply the place either of a bony fulcrum or ligamentary frænum. Besides, the broad orbicular ligament would be apt to be entangled and bruised between the edges of the two articulated bones, if this inconvenience were not prevented. The *supra-spinatus* answers both these ends. When it contracts its tendon, which runs over the convex part of the head of the os humeri, to be inserted in the upper surface of the great tuberosity, it presses very strongly on the head of the bone, hereby supplying the place of a fulcrum, and hindering the head to rise, during the beginning of the action of the deltoides. For preventing the second inconveniency, its tendon is a kind of band, which adheres closely to the outside of the orbicular ligament, and several of its fibres do not go so far as the head of the os humeri, but are gradually inserted in the outer surface of the ligament; and serve to pull the orbicular ligament uniformly, and thereby prevent its running into irregular folds, and being entangled between the two articulated bones.

The INFRA-SPINATUS, being inserted by its tendon in the middle surface of the great tuberosity of the os humeri, must perform different motions, according to the different situations of that bone. If it acts while the arm hangs down, parallel to the trunk of the body, it may move the os humeri round its axis from before outward, and consequently, if the fore-arm be at the same time bent, it will turn the hand from the body If while the arm is kept raised by the deltoides, the posterior portion of that muscle draws the arm backward, the *infra-spinatus* has the same use with respect to the orbicular ligament, as that of the *supra-spinatus* already described. And as these two muscles adhere closely by the edges of their tendons, they may in some measure co-operate in their actions on that ligament. When the arm, already raised, is strongly pulled forward by the pectoralis major, a considerable force is necessary to prevent the head of the os humeri from being thrown backward out of the glenoide cavity: the structure of the *infra-spinatus*, and the number of its fibres, fit it for answering this purpose: it may likewise assist the teres major in great efforts. Winsl. Anat. vol. i. p. 292, &c.

SUPREMACY, in the *English Polity*, the superiority or sovereignty of the king over the church, as well as state, of England, whereof he is established head. See KING.

The king's *supremacy* was first established, or, as others say, recovered, by king Henry VIII. in 1534, after breaking with the pope. Stat. 25 Hen. VIII. cap. 12. 20. 1 Eliz. cap. 1. It is since confirmed by several canons, as well as by the articles of the church of England; and is passed into an OATH, which is required as a necessary qualification for all offices and employments, both in church and state, from persons to be ordained, from the members of both houses of parliament, &c.

This oath, as finally established by 1 W. cap. 8. is as follows: "I A. B. do swear, that I do from my heart "abhor, detest, and abjure, as impious and heretical, "that damnable doctrine and position, that princes ex-"communicated or deprived by the pope, or any autho-"rity of the see of Rome, may be deposed or mur-"dered by their subjects, or any other whatsoever. "And I do declare, that no foreign prince, person, pre-"late, state, or potentate, hath or ought to have any "jurisdiction, power, superiority, pre-eminence, or au-"thority, ecclesiastical or spiritual, within this realm. "So help me God." By stat. 5 Eliz. cap. 1. to refuse the oath of *supremacy* will incur the pains of PRÆMUNIRE.

This right of *supremacy* consists chiefly in the following articles: 1°. That the archbishops of either province cannot summon the bishops and clergy to convocation, or enact any canons, without the king's express consent, by 25 Henry VIII. cap. 19. whereas, before that act, the convocation was often called, and laws made by it for governing the church, without any authority from the crown.

2°, In that there lies now an appeal from the archbishop to the king in chancery; and, on such an appeal, a commission, under the seal, is to be directed to certain persons, whereof commonly half are laymen, and half clergymen, which is called the COURT *of delegates*, and which finally determine all ecclesiastical causes, by 25 Hen. VIII. cap. 19. though sometimes a review is granted. Before this statute, the appeal from the archbishop's court lay to the pope only.

3°. The king can grant commissions for visiting such places as are exempt from the jurisdiction of bishops, or archbishops; and appeals lie from thence to the king in chancery: whereas before 25 Henry VIII. the pope only could visit them, and receive appeals from those courts.

4°, Persons in holy orders are not, as formerly, exempt from the king's temporal laws, any more than laymen.

5°, The bishops and clergy do not swear, or pay any obedience to the pope; but must take the oaths of allegiance and *supremacy* to the king.

SUPREME *pear*, a name given by the gardeners to a small pear, called also by some the *little musk pear*. It is of a roundish shape, and is usually produced in clusters; the stalk is short, and when it is ripe, the skin is yellow; the juice is somewhat musky. If it be not suffered to hang till too ripe, it is an excellent pear. It ripens in the beginning of July, and continues but a few days. The French call it *le petit muscat.*

SURA, in *Anatomy*, the calf, or fleshy part of the leg.

The word is also used, by some, for the FIBULA.

SURA is also the name of a drink used in the East-Indies, and made of the juice that flows from the cocoa-tree.

This juice being evaporated, and exposed to the sun, forms a sugar, but it is little esteemed.

SURALIS. See MUSCLE.

SURBATING, among *Farriers*, is when the sole of an horse's foot is worn, bruised, or spoiled, by beating the hoof against the ground in travelling without shoes, or going in hot sandy lands, or with a shoe that hurts the sole, lies too flat to it, or the like.

Sometimes, also, it happens by over-riding a horse while young, before his feet are hardened; and sometimes by the hardness of the ground, and high-lifting his feet.

The signs hereof are, his halting on both fore-legs, and going stifly, and creeping as if half-foundered.

In the general, there is nothing better for *surbated* feet than tar melted into the foot; or vinegar boiled with soot to the consistence of a broth, and put into the foot boiling hot, with hurds over it, and splints to keep it in.

SURCHARGE of the forest, is when a commoner puts more beasts in the forest than he has a right to. See FOREST.

SURCHARGE *of common*, is a disturbance of common of pasture, by putting more cattle therein than the pasture and herbage will sustain, or the party hath a right to do. This injury can only happen where the common is appendant or appurtenant, and of course limitable by law; or where, when in gross, it is expresly limited and certain; for where a man hath common in gross, sans nombre,

bre, or without ſtint, he cannot be a *ſurcharge*. In this caſe, indeed, there muſt be left ſufficient for the lord's own beaſts.

The uſual remedies for *ſurcharging* the common are by the lord's diſtraining the ſurplus number, or by his bringing an action of treſpaſs, or by a ſpecial action on the caſe, in which any commoner may be plaintiff. The ancient and moſt effectual method of proceeding is by writ of ADMEASUREMENT *of paſture*.

SURCHARGE, *writ of ſecond, de ſecunda ſuperoneratione*, is given by the ſtatute of Weſtm. 2. 13 Ed. I. cap. 8. when, after the ADMEASUREMENT of paſture hath aſcertained the right, the ſame defendant *ſurcharges* the common again; and thereby the ſheriff is directed to enquire by a jury, whether the defendant has in fact again ſurcharged the common; and if he has, he ſhall then forfeit to the king the ſupernumerary cattle put in, and alſo ſhall pay damages to the plaintiff.

SURCINGLE, a girdle, wherewith the clergy of the church of England uſually tie their caſſocks. See GIRDLE.

SURCOAT, a coat of arms, to be worn over body armour. See COAT *of arms*.

The *ſurcoat* is properly a looſe thin taffety coat, with arms embroidered or painted on it. Such as is worn by heralds, anciently alſo uſed by military men over their armour, to diſtinguiſh themſelves by.

SUR CUI *in vita*, in *Law*, a writ that lies for the heir of a woman, whoſe huſband aliened her land in fee, and ſhe neglected to bring the writ *cui in vita* for recovery thereof, her heir may bring this writ againſt the tenant after her deceaſe.

SURCULUS, in the *Anatomy of Plants*, a word uſed to expreſs that part of the branching of the ribs of a leaf which is of the middle kind, between the great middle rib and the ſmalleſt reticular ramifications. The middle rib is, by the writers on theſe ſubjects, called *petiolum*.

The firſt diviſions that go off laterally from theſe, are called *rami*, or branches; the next diviſion of theſe, into more minute ones, are called *ſurculi*; and the final divarications of theſe into the reticular work, that ſpreads itſelf over the whole leaf, are called *capillamenta*.

Many, however, confound theſe two laſt diviſions, and call all beyond the ſecond diviſion, or lateral branches of the middle rib, by this name of *ſurculi*. See PETIOLE and RAMUS.

SURD, in *Arithmetic*, denotes a number or quantity that is incommenſurate to unity; or that is inexpreſſible by any known way of notation, otherwiſe than by its radical ſign or index.

This is otherwiſe called an *irrational* or *incommenſurable number*; and an *imperfect* POWER.

When any number or quantity hath its root propoſed to be extracted, and yet is not a true figurate number of that kind; that is, if its ſquare root be demanded, and it is not a true ſquare, if its cube root be required, and itſelf be not a true cube, &c. then it is impoſſible to aſſign, either in whole numbers, or in fractions, any exact root of ſuch number propoſed.

And whenever this happens, it is uſual, in mathematics, to mark the required root of ſuch numbers, or quantities, by prefixing before it the proper mark of radicality, which is $\surd$, and placing above the radical ſign the number that denominates what kind of root is required.

Thus $\sqrt[2]{2}$ ſignifies the ſquare root of 2, and $\sqrt[3]{16}$, ſignifies the cubic root of 16: which roots, becauſe they are impoſſible to be expreſſed in numbers exactly (for no effable number, either integer or fraction, multiplied into itſelf, can ever produce 2; or, being multiplied cubically, can ever produce 16), are properly called *ſurd roots*.

There is alſo another way of notation, now much in uſe, whereby roots are expreſſed without the radical ſign, by their indices: thus, as x^2, x^3, x^5, &c. ſignify the ſquare, cube, and fifth power of x; ſo $x^{\frac{1}{2}}$, $x^{\frac{1}{3}}$, $x^{\frac{1}{5}}$, ſignify the ſquare root, cube, &c. of x.

The reaſon of which is plain enough; for ſince $\sqrt{x}$ is a geometrical mean proportional between 1 and x, ſo $\frac{1}{2}$ is an arithmetical mean proportional between 0 and 1; and therefore as 2 is the index of the ſquare of x, $\frac{1}{2}$ will be the proper index of its ſquare root, &c.

Obſerve alſo, that, for convenience, or brevity's ſake, quantities or numbers, which are not *ſurds*, are often expreſſed in the form of *ſurd* roots. Thus, $\sqrt{4}$, $\sqrt{\frac{9}{4}}$, $\sqrt[3]{27}$, &c. ſignify, 2, $\frac{3}{2}$, 3, &c.

But though theſe *ſurd* roots (when truly ſuch) are inexpreſſible in numbers, they are yet capable of arithmetical operations (ſuch as addition, ſubtraction, multiplication, diviſion, &c.); how readily to perform which the algebraiſt ought not to be ignorant.

For the method of performing theſe operations, ſee the ſequel of this article.

Surds are either *ſimple* or *compound*.

SURDS, *ſimple*, are thoſe which are expreſſed by one ſingle term, as $\sqrt[3]{c}$.

The *ſurds* $\sqrt[2]{2}$, $\sqrt[2]{3}$, $\sqrt[2]{5}$, &c. though they are themſelves incommenſurable with unit, according to the definition, are commenſurable in power with it, becauſe their powers are integers, i. e. multiples of unit. They may be alſo ſometimes commenſurable with one another; as the $\sqrt{8}$, and the $\sqrt[2]{2}$, becauſe they are to one another as 2 to 1. Theſe incommenſurables are called by ſome communicable: and when they have a common meaſure, as $\sqrt[2]{2}$ is the common meaſure of both, then their ratio is reduced to an expreſſion in the leaſt terms, by dividing them by their greateſt common meaſure. This common meaſure is found as in commenſurable quantities, only the root of the common meaſure is to be made their common diviſor. Thus, $\frac{\sqrt{12}}{\sqrt{3}}=\sqrt{4}=2$; and $\frac{\sqrt{18a}}{\sqrt{2}}=3\sqrt{a}$.

SURDS, *compound*, are thoſe formed by the addition or ſubtraction of ſimple *ſurds*: as $\sqrt{5}+\sqrt{2}$: $\sqrt{5}-\sqrt{2}$, or $\sqrt[3]{7+\sqrt{2}}$: which laſt is called an *univerſal* root, and ſignifies the cubic root of that number, which is the reſult of adding 7 to the ſquare root of 2.

1. *To reduce rational quantities to the form of any* SURD *roots aſſigned*. Involve the rational quantity according to the index of the power of the *ſurd*, and then prefix before it the radical ſign of the *ſurd* propoſed. Thus, $a=\sqrt[2]{a^2}=\sqrt[3]{a^3}=\sqrt[4]{a^4}=\sqrt[n]{a^n}$; and $4=\sqrt{16}=\sqrt[3]{64}=\sqrt[4]{256}=\sqrt[n]{4^n}$.

And by this way may a ſimple *ſurd* fraction, whoſe radical ſign refers only to one of its terms, be changed into another, which ſhall reſpect both numerator and denominator. Thus, $\frac{\sqrt{2}}{5}$ is reduced to $\sqrt{\frac{2}{25}}$, and $\frac{5}{\sqrt[3]{4}}$ to $\sqrt[3]{\frac{125}{4}}$: thus alſo a reduced to the form of $\overline{x}|^{\frac{1}{n}}$ is $\overline{a^n}|^{\frac{1}{n}}$.

And roots with rational co-efficients may thus be reduced ſo as to be wholly affected by the radical ſign. Thus, $a\times e^{\frac{1}{n}}=\overline{a^n e}|^{\frac{1}{n}}$.

2. *To reduce ſimple* SURDS, *having different radical ſigns (which are called heterogeneal* ſurds), *to others that may have one common radical ſign, or which are homogeneal: or to reduce roots of different names into thoſe of the ſame name*. Involve the powers reciprocally according to each others indices, for new powers; and let the product of the indices be the common index. Otherwiſe, as *ſurds* may be conſidered as powers with fractional exponents, reduce theſe fractional exponents to fractions having the ſame value, and a common denominator. Thus, by either rule, $\sqrt[n]{a}$ or $a^{\frac{1}{n}}$ and $\sqrt[m]{e}$ or $e^{\frac{1}{m}}$, will be $\sqrt[nm]{a^m}$ or $\overline{a^m}|^{\frac{1}{nm}}$ and $\sqrt[nm]{e^n}$ or $\overline{e^n}|^{\frac{1}{nm}}$.

Alſo $\sqrt[2]{3}$ and $\sqrt[3]{2}$ are reduced to other equal *ſurds* $\sqrt[6]{27}$ and $\sqrt[6]{4}$, having a common radical ſign.

3. *To reduce* SURDS *to their moſt ſimple expreſſions, or to the loweſt terms poſſible*. Divide the *ſurd* by the greateſt power denoted by the index, which you can diſcover is contained in it, and will meaſure it without any remainder; and then prefix the root of that power before the quotient, or *ſurd* ſo divided; this will produce a new *ſurd* of the ſame value with the former, but in more ſimple terms. Thus, $\sqrt{16aab}$, by dividing by $16aa$, and prefixing the root $4a$, will be reduced to this, $4a\sqrt{b}$, and $\sqrt{12}$, will be depreſſed to $2\sqrt{3}$. Alſo $\sqrt[3]{cb^3r}$ will be brought down to $b\sqrt[3]{cr}$.

To reduce $a^{\frac{1}{n}}$ to its loweſt term: ſuppoſe x^n the greateſt n power, that will divide a without a remainder; and let $y=\frac{a}{x^n}$; then will $a^{\frac{1}{n}}=x\times y^{\frac{1}{n}}$; for $a=x^n y$, therefore $a^{\frac{1}{n}}\left(=\overline{x^n y}|^{\frac{1}{n}}=\overline{x^n}|^{\frac{1}{n}}\times y^{\frac{1}{n}}\right)=x\times y^{\frac{1}{n}}$.

Alſo $\sqrt[2]{75}$ or $\overline{75}|^{\frac{1}{2}}=5\times 3^{\frac{1}{2}}$ or $5\sqrt{3}$, and $\sqrt[3]{81}$ or $\overline{81}|^{\frac{1}{3}}=\sqrt[3]{27\times 3}$ or $27^{\frac{1}{3}}\times 3=3\sqrt[3]{3}$ or $3\times 3^{\frac{1}{3}}$.

This reduction is of great uſe whenever it can be performed; but if no ſuch ſquare, cube, biquadrate, &c.

let

can be found for a diviſor, find out all the diviſors of the power of the *ſurd* propoſed; and then ſee whether any of them be a ſquare, cube, &c. or ſuch a power as the radical ſign denotes; and if any ſuch can be found, let that be uſed in the ſame manner as above, to free the *ſurd* quantity in part from the radical ſign. Thus if $\sqrt{288}$ be propoſed, among its diviſors will be found the ſquares, 4, 9, 16, 36, and 144; by which, if 288 be divided, there will ariſe the quotients 72, 32, 18, 8, and 2; wherefore inſtead of $\sqrt{288}$, you may put $2\sqrt{72}$, or $3\sqrt{32}$, or $4\sqrt{18}$, or $6\sqrt{8}$, or laſtly, $12\sqrt{2}$, and the ſame may be done in ſpecies.

By the two laſt problems we may determine, whether any two roots are commenſurable one to another; and alſo find their ratio. For after reduction into the loweſt terms and the ſame name, if the powers are equal, the roots are commenſurable, and their ratio is equal to that of the rational co-efficients. Thus, $\sqrt{75}$ and $\sqrt{27}$ reduced, will be $5\sqrt{3}$ and $3\sqrt{3}$, which are commenſurable; and $5\sqrt{3} : 3\sqrt{3} :: 5 : 3$.

4. *To add and ſubtract* Surds. When they are reduced to their loweſt terms, if they have the ſame irrational part, add or ſubtract their rational co-efficients, and prefix the ſum or difference to the common irrational part. Thus, $\sqrt[2]{75}+\sqrt[2]{48}=5\sqrt{3}+4\sqrt{3}=9\sqrt{3}$: and $\sqrt{a^2x}+\sqrt{b^2x}=a\sqrt{x}+b\sqrt{x}=\overline{a+b}\times\sqrt{x}$: And $\sqrt[2]{150}-\sqrt[2]{54}=5\sqrt{6}-3\sqrt{6}=2\sqrt{6}$. If they have not the ſame irrational part, they can only be connected by the ſign + or −.

Hence it appears, that the ſum or difference of any two ſquare roots is equal to the ſquare root of the ſum, or difference, of the ſum of the powers, and twice the product of their roots.

E. g. $\sqrt{75}+\sqrt{48}=\sqrt{75+48+2\times 5\sqrt{3}\times 4\sqrt{3}}=\sqrt{75+48+2\times 20\times 3(120)}=\sqrt{243}=9\sqrt{3}$. For if $\sqrt{aa}$ and $\sqrt{ee}$ be any given quantities, it is plain that $\overline{aa}|^{\frac{1}{2}}\pm\overline{ee}|^{\frac{1}{2}}=a\pm e=\overline{aa+2ae+ee}|^{\frac{1}{2}}$.

5. *To multiply and divide* Surds. If they have the ſame rational quantity, they are multiplied by adding their indices, and divided by ſubtracting them. Thus, $\sqrt[2]{a}\times\sqrt[3]{a}=a^{\frac{1}{2}}\times a^{\frac{1}{3}}=a^{\frac{3+2}{6}}=a^{\frac{5}{6}}=\sqrt[6]{a^5}$; and $\sqrt[2]{2}\times\sqrt[3]{2}=\sqrt[6]{2^5}=\sqrt[6]{32}$. Alſo, $\frac{\sqrt[3]{a}}{\sqrt[5]{a}}=\frac{a^{\frac{1}{3}}}{a^{\frac{1}{5}}}=a^{\frac{1}{3}-\frac{1}{5}}=a^{\frac{5-3}{15}}=a^{\frac{2}{15}}=\sqrt[15]{a^2}$; and $\frac{\sqrt[2]{2}}{\sqrt[3]{2}}=\sqrt[6]{2}$.

If they have different rational quantities, and the ſame ſign, multiply theſe rational quantities into one another, or divide them by one another, and ſet the common radical ſign over their product: thus, $\sqrt[n]{a^2}\times\sqrt[n]{b^3}=\sqrt[n]{a^2b^3}$ and $\sqrt[2]{2}\times\sqrt[2]{5}=\sqrt[2]{10}$: alſo, $\frac{\sqrt[m]{a^4}}{\sqrt[m]{b^3a}}=\sqrt[m]{\frac{a^4}{b^3a}}=\sqrt[m]{\frac{a^3}{b^3}}$; and $\frac{\sqrt[3]{9}}{\sqrt[3]{24}}=\sqrt[3]{\frac{9}{24}}=\sqrt[3]{\frac{3}{8}}=\frac{1}{2}\sqrt[3]{3}$.

But if the *ſurds* have not the ſame radical ſign, reduce them (by prob. 2.) to ſuch as ſhall have the ſame radical ſign, and proceed as before. Thus, $\sqrt[m]{a}\times\sqrt[n]{b}=\sqrt[nm]{a^n b^m}$; and $\sqrt[2]{2}\times\sqrt[3]{4}=2^{\frac{1}{2}}\times 4^{\frac{1}{3}}=2^{\frac{3}{6}}\times 4^{\frac{2}{6}}=\sqrt[6]{2^3\times 4^2}=\sqrt[6]{8\times 16}=\sqrt[6]{128}$. Alſo, $\frac{\sqrt[m]{a}}{\sqrt[n]{x}}=\sqrt[mn]{\frac{a^n}{x^m}}$; and $\frac{\sqrt[3]{4}}{\sqrt[2]{2}}=\frac{4^{\frac{1}{3}}}{2^{\frac{1}{2}}}=\frac{4^{\frac{2}{6}}}{2^{\frac{3}{6}}}=\sqrt[6]{\frac{4^2}{2^3}}=\sqrt[6]{\frac{16}{8}}=\sqrt[6]{2}$. If the *ſurds* have any rational co-efficients, their product or quotient muſt be prefixed. Thus $2\sqrt[2]{3}\times 5\sqrt[2]{6}=10\sqrt[2]{18}$; and $\frac{8\sqrt[2]{5}}{2\sqrt[2]{6}}=4\sqrt[2]{\frac{5}{6}}$.

6. *Involution and evolution of* Surds. The powers of *ſurds* are found by multiplying their indices by the index of the power required. Thus, the ſquare of $\sqrt[3]{2}$ is $2^{\frac{1}{3}\times 2}=2^{\frac{2}{3}}=\sqrt[3]{4}$, and the cube of $\sqrt[2]{5}=5^{\frac{1}{2}\times 3}=5^{\frac{3}{2}}=\sqrt[2]{125}$. Or, raiſe the quantity under the radical ſign to the power required, continuing the ſame radical ſign; unleſs the index of that power is equal to the name of the *ſurd*, or a multiple of it, and in that caſe the power of the *ſurd* becomes rational. Thus, the cube of $\sqrt[3]{4}=\overline{\sqrt[3]{4}}|^3=4$.

Evolution is performed by dividing the fraction which is the index of the *ſurd* by the name of the root required. Thus, the ſquare root of $\sqrt[3]{a^4}$ is $\sqrt[3]{a^2}$ or $\sqrt[6]{a^4}$.

Simple *ſurds* are commenſurable in power, and by being multiplied into themſelves give, at length, rational quantities. But compound *ſurds*, multiplied into themſelves, commonly give irrational products. Yet, in this caſe, when any compound *ſurd* is propoſed, there is another compound *ſurd*, which, multiplied into it, gives a rational product. Thus, if $\sqrt[3]{a}-\sqrt[3]{b}$ were propoſed, multiplying it by $\sqrt[3]{a^2}+\sqrt[3]{ab}+\sqrt[3]{b^2}$, the product will be $a-b$.

The inveſtigation of that *ſurd*, which multiplied into the propoſed *ſurd*, gives a rational product, is made eaſy by three theorems, delivered by Mr. Maclaurin, in his Algebra, p. 109, ſeq. to which we refer the curious. This operation is of uſe in reducing *ſurd* expreſſions to more ſimple forms. Thus: ſuppoſe a binomial *ſurd* divided by another, as $2\sqrt{20}+2\sqrt{12}$ by $2\sqrt{5}-2\sqrt{3}$, the quotient might be expreſſed by $\frac{2\sqrt{20}+2\sqrt{12}}{2\sqrt{5}-2\sqrt{3}}$. But this might be expreſſed in a more ſimple form, by multiplying both numerator and denominator by that *ſurd*, which multiplied into the denominator, gives a rational product: thus, $\frac{\sqrt{20}+\sqrt{12}}{\sqrt{5}-\sqrt{3}}=\frac{\sqrt{20}+\sqrt{12}}{\sqrt{5}-\sqrt{3}}\times\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}=\frac{\sqrt{100}+2\sqrt{60}+6}{5-3}=\frac{16+2\sqrt{60}}{2}=8+2\sqrt{15}$. To do this generally, ſee Maclaurin, lib. cit. p. 113.

When the ſquare root of a *ſurd* is required, it may be found, nearly, by extracting the root of a rational quantity that approximates to its value. Thus, to find the ſquare root of $3+2\sqrt{2}$, firſt calculate $\sqrt{2}=1,41421$. Hence, $3+2\sqrt{2}=5,82842$, the root of which is found to be nearly 2,41421.

In like manner we may proceed with any other propoſed root. And if the index of the root, propoſed to be extracted, be great, a table of logarithms may be uſed. Thus, $\sqrt[7]{5+\sqrt[13]{17}}$ may be moſt conveniently found by logarithms.

Take the logarithm of 17, divide it by 13; find the number correſponding to the quotient; add this number to 5; find the logarithm of the ſum, and divide it by 7, and the number correſponding to this quotient will be nearly equal to $\sqrt[7]{5+\sqrt[13]{17}}$.

But it is ſometimes requiſite to expreſs the roots of *ſurds* exactly by other *ſurds*. Thus, in the firſt example, the ſquare root of $3+2\sqrt{2}$ is $1+\sqrt{2}$: for $\overline{1+\sqrt{2}}\times\overline{1+\sqrt{2}}=1+2\sqrt{2}+2=3+2\sqrt{2}$.

For the method of performing this, the curious may conſult Mr. Maclaurin's Algebra, p. 115, ſeq. where alſo rules for trinomials, &c. may be found.

For extracting the higher roots of a binomial, whoſe two members being ſquared are commenſurable numbers, we have a rule in ſir Iſaac Newton's Arithmetica Univerſalis, p. 59, but without demonſtration. This is ſupplied by Mr. Maclaurin, in his Algebra, p. 120, ſeq. as alſo by 'sGraveſande, in his Matheſeos Univerſalis Element. p. 211, ſeq.

It ſometimes happens, in the reſolution of cubic equations, that binomials of this form $a\pm b\sqrt{-9}$ occur, the cube roots of which muſt be found. To theſe ſir Iſaac's rule cannot always be applied, becauſe of the imaginary, or impoſſible factor $\sqrt{-9}$; yet, if the root be expreſſible in rational numbers, the rule will often lead to it in a ſhort way, not merely tentative, the trials being confined to known limits. See Maclaur. loc. cit. p. 127, ſeq.

It may be farther obſerved, that ſuch roots, whether expreſſible in rational numbers, or not, may be found by evolving the binomial $a+b\sqrt{-9}$ by the Newtonian theorem, and ſumming up the alternate terms. Maclaur. loc. cit. p. 130.

Thoſe who are deſirous of a general and elegant ſolution of the problem, *to extract any root of an impoſſible binomial* $a+\sqrt{-b}$, *or of a poſſible binomial* $a+\sqrt{b}$, may have recourſe to Mr. de Moivre's Letter to Dr. Saunderſon, inſerted by way of Appendix to his Algebra, and to the Philoſophical Tranſactions, Nº 451; or to Dr. Martyn's Abridgment, vol. viii. p. 1. ſeq. See alſo on the management of *ſurds*, Kerſey's Algebra. Ward's Mathem. part ii. cap. 4. Jones's Synopſis. Palm. Math. part i. ſect. 3. cap. 6. Saunderſon's Algebra, vol. ii.

Surds *commenſurable*. See Commensurable.

Surds *heterogeneous*. See Heterogeneous.

Surds *homogeneous*. See Homogeneous.

SURDESOLID. See Sursolid.

SURETY, in *Law*, a bail that undertakes for another man in a criminal case, or action of trespass, &c. See Fide-*Jussor*.

Surety *of the peace*, an act whereby a person in danger of hurt from another, is secured by a bond, or recognizance acknowledged by the other to the king, and bail bound with him, for keeping the peace. See Securitate *pacis*.

This security a justice of the peace may command, either as a minister, when commanded thereto by higher authority; or as a judge, when he doth it of his own power, derived from his commission.

It differs from *surety of good abearing*, in that whereas the peace is not broken without an affray, or such like; the *surety de bono gestu* may be broken by the number of a man's company, or by his or their weapon, or harness. See Peace, and Good *abearing*.

SURF *of the sea*, the swell of the sea which breaks upon the shore, or any rock lying near the surface of the sea; and which renders such places dangerous.

SURFACE, in *Geometry*. See Superficies.

A *surface* is not a body of the least sensible magnitude, as some have imagined, but it is the termination, or boundary of a body; neither is a line to be considered as a *surface* of the least sensible breadth, but as a termination, or limit of a *surface*: nor is a point to be considered as the least sensible line, but as the termination of a line; and in this sense it is plain that a point cannot be conceived to have parts, or magnitude. See Magnitude. See also *Maclaurin's* Fluxions, vol. i. p. 245, and Mr. John Bernoulli's Letter to Monsieur Crouzas, concerning his Comment on the Analyse des Infiniment petits. Jo. Bernoul, Oper. vol. iv. p. 160, seq.

SURFEIT, an indisposition caused by excess in eating or drinking, that is, by over-charging the stomach; and usually attended with eruptions, and sometimes with a fever.

Surfeit-*water*, is a water distilled from poppies, and other herbs, proper to cure indigestions.

SURGE. The sailors call a wave, or billow of the sea, a *surge*.

Also, when they are heaving at the capstan, if the cable happen to slip back a little, they say, *the cable surges*.

SURGEONS, *company* of. See Company. See also Physicians.

SURGERY. See Chirurgery.

The principal instruments used in *Surgery* appear in *Tab.* I. II. III. of *Surgery*, and the description and use of them occur either under their respective titles, or the operations to which they belong.

SURIANA, in *Botany*, a genus of the *decandria pentagynia* class. Its characters are these: the empalement of the flower is permanent, and composed of five spear-shaped small leaves; the flower has five oval petals, which spread open; it has five slender stamina shorter than the petals, terminated by single summits, and five roundish germina supporting a slender style, crowned with an obtuse stigma; the germina become five roundish seeds joined together. There is only one species.

SURMOUNTED, in *Heraldry*, is when one figure is laid over another. As the pile *surmounted* of a chevron, in *Tab.* II. *Herald. fig.* 84.

SURMULLET, in *Ichthyology*, a name used both by the French and English, for the *mullus major*, a fish of the cuculus kind, and in the Linnæan system the mullus *cirris geminis*, &c. in many things resembling the mullus barbatus, but differing from it, in that it is twice as big, being often caught of twelve or fourteen inches in length. Its fins also are yellowish, and have a slight blush of red mixed with that colour. Its scales are large and broad, and thick, and are more firmly joined to the flesh. It has also three or four straight yellow lines, running parallel with one another down its sides. It is caught in the Mediterranean, and in the British seas, especially on the coast of Cornwall, and is every where esteemed a very delicate fish. Ray.

Mr. Pennant calls this species of mullus the *striped surmullet*, but he expresses a doubt whether this is not a variety, as Gronovius apprehends, of the red *surmullet*, or *mullus barbatus*. This last, he observes, was highly esteemed by the Romans, and bore a very high price. See Hor. Sat. lib. ii. sect. 2. 33. and Juvenal, Sat. iv.

SURNAME, or Sirname, a name added to the proper or baptismal name, to denominate the person of such a family. They were the Romans who first introduced the use of hereditary names; and that on occasion of their league with the Sabines; for the confirmation whereof, it was agreed, that the Romans should prefix Sabine names, and the Sabines, Roman names, to their own.

These new names became family names, or *surnames*, and the old ones continued personal names. The former they called *cognomina*, and *gentilitia nomina*; and the latter *prænomina*. See Name.

When the former came to be used among the French and English, they were called *surnames*, or *sirnames*, not because they are the names of the sire, or father; but, according to Camden, because they are superadded to the personal name; or, rather, with Du-Cange, because at first, this family name was written over (*Sur*) the other name, thus:

de Bourbon
Louis.

In lieu of *surnames*, the Hebrews, to keep up the memory of their tribes, use the name of their father, with the addition of *Ben*, son; as *Melchi Ben Addi*, *Addi Ben-Cosam*, &c. so the Greek, Ικαρος τε Δαιδαλε; Icarus, the son of Dædalus; Dædalus, the son of Eupalmus, *&c.*

So also, the ancient Saxons, *Ceonred*, *Ceolwalding*, *Ceolwald Cuthing*, that is, Ceonred, son of Ceolwald, son of Cuth: and in the same sense, the Welsh use *ap* for *mab*, son; as *ap Owen*, *Owen ap Harry*, *Harry ap Rhys*; and the Irish, *Mac*, as *Donald Mac Neal*, *Neal Mac Cen*, &c. and the old Normans, *Fitz*, as *John Fitz Robert*, *Robert Fitz Ralph*, &c.

Scaliger adds, that the Arabs used their father's name, or *surname*, without their personal name; as, *Aven-Pace*, *Aven-Zoar*, &c. q. d. son of Pace, son of Zoar, *&c.* As, if Pace had a son at his circumcision called *Haly*, he would be called *Aven-Pace*, concealing Haly; but his son, however he were named, would be called *Aven-Haly*, &c.

The Romans, in time, multiplied their *surnames*: besides the general name of the race, or family, called *gentilitium*, they took a particular one, to distinguish the branch of the family, called also *cognomen*; and sometimes a third, on account of some personal distinction; as that of *Africanus*, by Scipio; of *Torquatus*, by Manlius.

These three different kinds of *surnames* had also their different names, viz. *nomen*, *cognomen*, and *agnomen*: but these last were not hereditary; being, in effect, a kind of sobriquets, or nick-names, if that word be indifferent with respect to good and evil. See the subject of the Roman names and *surnames* accurately treated of by Spanheim, de Præst. and Usu Numism. Diss. 10.

In these, too, they have been imitated by later times: thus, in our English history, we find that Edgar was called the *Peaceable*; Ethelred, the *Unready*; Edmund, *Ironside*; Harold, *Hare-foot*; William, *the Bastard*; Henry I. *Beauclerk*; John, *Lackland*, &c.—But as these names were never borne by the sons, Camden, and others, think it strange, that Plantagenet should be accounted the *surname* of the royal family of England, till Henry VII. or *Tydur*, or *Tudor*, that from Henry VII. to king James I. or that of *Steward* from king James I. to king George; or that *Valois* should be esteemed the *surname* of the late family of French kings; or *Bourbon* of the present; or *Oldenberg* of the kings of Denmark; or *Hapsburg* of the emperors.

Du Chesne observes, that *surnames* were unknown in France before the year 987, when the lords began to assume the names of their demesnes.—Camden relates, that they were first taken up in England, a little before the Conquest, under king Edward the Confessor: but he adds, they were never fully established among the common people, till the time of Edward II. till then they varied with the father's name; if the father, e. gr. was called *Richard*, or *Roger*, the son was called *Richardson*, or *Hodgson*; but from that time they were settled, some say, by act of parliament.

The oldest *surnames* are those we find in *Domesday-Book*, most of them taken from places, with the addition of *de*; as Godefridus *de* Mannevilla, Walterus *de* Vernon, Robert *de* Oyly, *&c.* Others from their fathers, with *filius*, as Gulielmus *filius* Osberni; others from their offices, as Eudo *Dapifer*, Gulielmus *Camerarius*, Gislebertus *Cocus*, &c. But the inferior people are noted, simply, by their Christian names; without any *surnames* at all.

In Sweden, till the year 1514, nobody ever took *surnames*; and the common people there have none to this day, nor have even the native Irish, Poles, and Bohemians, *&c.*—It is very late that the Welsh have had any; and those they have, are generally only formed, by leaving out the *a* in *ap*, and annexing the *p* to their father's name; as in lieu of *Evan ap Rice*, they now say *Evan Price*; for *ap Howel*, *Powel*, &c. Du Tillet maintains, that all *surnames* were originally given by way of sobriquets, or nick-names; and adds, that they are all significant and intelligible to those who understand the ancient dialects of the several countries. The greatest part of our *surnames*, and those of greatest account, Camden

shews, are local, and borrowed from the places in Normandy, &c. where the respective persons who came over with the Conqueror, and first bore them, had their possessions, or their births: such as *Mortimer*, *Warren*, *Albigny*, *Piercy*, *Devereux*, *Tankervil*, *Nevil*, *Tracy*, *Montfort*, &c. He adds, that there is not a village in Normandy, but gives name to some family in England.—Others were taken from places in England, as *Aston*, *Sutton*, *Wotton*, &c.

The Saxon common people generally took their father's or their mother's Christian name, with the addition of *son*: though many were *surnamed* from their trade, as *Smith*, *Carpenter*, *Taylor*, *Weaver*, *Fuller*, &c. others from their offices, as, *Porter*, *Shepherd*, *Carter*, *Cook*, *Butler*, &c. others from their complexions, as *Fairfax*, i. e. fair hair; *Blunt* or *Blond*, i. e. flaxen, or yellow; others from birds, as *Wren*, *Finch*, &c. others from beasts, as *Lamb*, *Hare*, *Hart*, &c. others from the winds; others from saints, &c.

SURO, in *Ichthyology*, a name given by some to a fish of the cuculus kind, much resembling the mackrel in taste and in shape, and more usually known by the name of the TRACHURUS.

SURPLICE, the habit of the officiating clergy in the church of England. By Can. 58, every minister saying the public prayers, or ministering the sacrament or other rites of the church, shall wear a decent and comely *surplice* with sleeves, to be provided at the charge of the parish. But by 1 Eliz. c. 2. and 13 and 14 Car. II. the garb prescribed by act of parliament, in the second year of king Edward the sixth, is enjoined; and this requires that in the saying or singing of matins and even song, baptizing and burying, the minister in parish churches and chapels shall use a *surplice*. And in all cathedral churches and colleges, the archdeacon, dean, provosts, masters, prebendaries, and fellows, being graduates, may use in the choir, besides their *surplices*, such hoods as pertain to their several degrees. But in all other places every minister shall be at liberty to use any *surplice* or no. And hence in marrying, churching of women, and other offices not specified in this rubric, and even in the administration of the holy communion, it seems that a *surplice* is not necessary. Indeed for the holy communion the rubric appoints a white ALB plain, which differs from the *surplice* in being close-sleeved, with a vestment or cope.

SURPLUSAGE, in *Common Law*, signifies a superfluity, or addition of more than is needful; which sometimes is the cause that a writ abateth.—But in pleading it is frequently set aside; the rest remaining good.

SURPLUSAGE is sometimes also applied to matters of accounts, and denotes a greater disbursement than the charge of the accountant amounteth to.

SURPLUSAGE *of intestate's effects*. See INTESTATE.

To SURPRISE, in *War*, is to fall on an enemy unexpectedly, in marching through narrow and difficult passes, as in the passage of rivers, woods, inclosures, &c. There are various ways of surprising an enemy or place. See STRATAGEM.

SURREBUTTTER, in *Law*, is second rebutter; or the replication of the plaintiff to the defendant's REBUTTER.

SURRECTORIUM, the name of a surgical instrument, mentioned by Ambrose Pare, and intended to keep the arm in an erect situation when required.

SURREJOINDER, is a second defence of the plaintiff's declaration; by way of answer to the defendant's REJOINDER.

SURRENDER, in *Common Law*, a deed or instrument testifying, that the particular tenant of lands and tenements for life, or years, doth sufficiently consent and agree, that he, who has the next or immediate remainder or reversion thereof, shall have the present estate of the same in possession; and that he hereby yields and gives up the same to him, so that the estate for life or years may merge or drown by mutual agreement of the parties. Of *surrenders* there are three kinds; a *surrender* properly taken at common law, a *surrender* of copyhold or customary estates; and a *surrender* improperly taken, as of a deed, a patent, &c. The first is the usual *surrender*, and it is usually divided into that in *deed*, and that in *law*.

SURRENDER, *in deed*, is that which is really made by express words in writing, where the words of the lessee to the lessor prove a sufficient assent to *surrender* his estate back again.

SURRENDER, in *Law*, is that wrought by operation of the law, and which is not actual.—As if a man have a lease of a farm for life, or years; and during the term, he accepts a new lease; this act is, in law, a *surrender* of the former.

SURRENDER of a *bankrupt*. See PETITION of *Bankruptcy*.

SURRENDER *of copyholds* is the yielding up of the estate by the tenant into the hands of the lord, for such purposes as are expressed in the *surrender*: as to the use and behoof of A and his heirs, to the use of his own will, and the like. This method of conveyance is so essential to the nature of a copyhold estate, that it cannot possibly be transferred by any other assurance. No feoffment, fine, or recovery (in the king's courts) hath any operation upon it. If I would exchange a copyhold with another, I cannot do it by an ordinary deed of exchange at the common law, but we must surrender to each other's use, and the lord will admit us accordingly. If I would devise a copyhold, I must *surrender* it to the use of my last will and testament; and in my will I must declare my intentions, and name a devisee, who will then be entitled to admission. Blackston's Com. v. ii. c. 22.

SURRENDER of *letters patent* and *offices*. A *surrender* may be made of letters patent to the king, so that he may grant the estate to whom he pleases, &c. and a second patent for years to the same person for the same thing, is a *surrender* in law of the first patent. 10 Rep. 66. If an officer for life accepts of another grant of the same office, it is in law a *surrender* of the first grant; but if such an officer takes another grant of the same office to himself and another, it may be otherwise.

SURRENDER, in *War*, is to lay down one's arms, and yield yourself prisoner.

To *surrender* a place, see CAPITULATION.

SURREPTITIOUS. See SUBREPTITIOUS.

SURROGATE, SURROGATUS, a person substituted or appointed in room of another; most commonly of a bishop, or bishop's chancellor. By 26 Geo. II. c. 33. no *surrogate* deputed by any ecclesiastical judge, who hath power to grant licences of marriage, shall grant any such before he hath taken an oath before the said judge, faithfully to execute his office according to law, to the best of his knowledge; and hath given security by his bond in the sum of 100*l*. to the bishop of the diocese, for the due execution of his office.

SURROGATION. See SUBROGATION.

SURSOLID, or SURDESOLID, in *Arithmetic*, the fifth power of a number, or the fourth multiplication of any number, considered as a root.

The number 2, for instance, considered as a root, and multiplied by itself, produces 4, which is the square, or second power of 2; and 4 multiplied by 2, produces 8, the third power, or cube, or solid number of 2; 8, again, multiplied by 2, produces 16, the fourth power, or quadrato-quadratum of 2; and 16 multiplied once more by 2, produces 32: the fifth power or *sursolid*, or *surdesolid* number of 2.

SURSOLID *problem*, is that which cannot be resolved, but by curves of an higher kind than the conic sections.

Thus, e. gr. to describe a regular endecagon, or figure of eleven sides in a circle, it is required to describe an isosceles triangle on a right line given, whose angles at the base shall be quintuple to that at the vertex; which may easily be done by the intersection of a quadratrix, or any other curve of the second gender, as they are by some called, but not by any lower curve.

SURVEY, in *Law*, is the ascertaining not only of the boundaries and royalties of a manor, or estate in lands; but also of the tenure of the respective tenants, and the rent and value of the same. In this last sense it is taken for a court, because in the falling of an estate, consisting of manors, to a new lord, where there are tenants by lease and copyholders, a court of *survey* is generally held; and sometimes upon other occasions, to apprize the lord of his right and interest, &c.

SURVEY, in *Sea-language*, denotes an examination made by several naval officers, into the state of the provisions or stores, belonging to a ship, or fleet of men of war.

SURVEYING, the art, or act, of measuring lands; i. e. of taking the dimensions of any tract of ground; then laying down the same in a map or draught; and finding the content or area thereof.

Surveying, called also GEODÆSIA, is a very ancient art; it is even held to have been the first, or primitive part of geometry, and that which gave occasion to, and laid the foundation of, all the rest.

Surveying consists of three parts or members; the first is the taking of the necessary measures, and making the necessary observations on the ground itself: the second, is the laying down of these measures and observations on paper: and the third, the finding the area or quantity of the ground thus laid down.

The first is what we properly call *surveying*: the second we call *plotting*, or *protracting*, or *mapping*: and the third *casting up*.

The first, again, consists of two parts, viz. the making of observations for the angles, and the taking of measures for the distances.

The former of these is performed by some one or other of the

the following inſtruments; viz. the theodolite, circumferentor, ſemicircle, plain-table, or compaſs: the deſcription and manner of uſing each whereof, ſee under its reſpective article, THEODOLITE, CIRCUMFERENTOR, PLAIN-TABLE, COMPASS, &c.

The latter is performed by means either of the chain, or the perambulator: the deſcription and manner of applying each whereof, ſee under CHAIN, and PERAMBULATOR.

It is uſeful in *ſurveying* to take the angles which the bounding lines form with the magnetic needle, in order to check the angles of the figure, and to plot them conveniently afterwards. Nevertheleſs, as the difference between the true meridian and magnetic meridian perpetually varies in all places, and at all times; it is impoſſible to compare two *ſurveys* of the ſame place, taken at diſtant times, by magnetic inſtruments, without making due allowance for this variation. See obſervations on this ſubject, by Mr. Molyneux, Phil. Tranſ. Nº. 230, p. 625, or Abr. vol. i. p. 125.

Large maps, repreſenting conſiderable extents of ground, are ſubject to a good many inconveniencies, eſpecially if carried into the fields, to be compared with them; ſuch maps become very troubleſome in the wind, and it is difficult to find out the part you want. To remedy this, a general and ſmall map of the manor or county, &c. ſhould be firſt made on one ſheet of paper, the ſeveral parts may be ſet off on other ſeparate ſheets, and the general map being divided into as many ſquares as there are of theſe particular ſheets, the relation of the whole to the ſeveral parts is eaſily ſeen; and all theſe maps may then be bound up in a book. See Mr. Baighton's Deſcription and Uſe of his New Plotting Table, in Phil. Tranſ. Nº 461. ſect. 1.

The ſecond branch of *ſurveying* is performed by means of the protractor, and plotting ſcale: the uſe, &c. whereof, ſee under PROTRACTOR, PLOTTING, &c. See alſo MAP.

If the lands to be plotted are hilly, and not in any one plane, the lines meaſured cannot be truly laid down on paper, without being reduced to one plane, which muſt be the horizontal, becauſe angles are taken in that plane.

In viewing objects, if they have much altitude or depreſſion, either write down the degree and decimal, ſhewn on the double ſextant, or the links ſhewn on the back ſide, which laſt ſubtracted from every chain in the ſtation line, leaves the length in the horizontal plane; but if the degree is taken, the following table will ſhew the quantity.

A TABLE *of the links to be ſubtracted out of every chain in hypothenuſal lines of ſeveral degrees, altitude, or depreſſion, for reducing them to horizontal.*

degrees.	links.	degrees.	links.	degrees.	links.
4.05	$\frac{1}{4}$	14.07	3	23.074	8
5.73	$\frac{1}{2}$	16.26	4	24.495	9
7.02	$\frac{3}{4}$	18.195	5	25.84	10
8.11	1	19.95	6	27.13	11
11.48	2	21.565	7	28.36	12

Let the firſt ſtation line really meaſure 1107 links, and the angle of altitude, or depreſſion, be 19° 93′; looking in the table, I find 19° 95′ is 6 links; now 6 times 11 is 66, which ſubtracted from 1107 leaves 1041, the true length to be laid down.

The third is performed by reducing the ſeveral diviſions, incloſures, &c. into triangles, ſquares, trapeziums, parallelograms, &c. but eſpecially triangles; and finding the areas or contents of theſe ſeveral figures, by the rules delivered under the articles AREA, TRIANGLE, SQUARE, &c.

A *ſurveyor* ought to be provided with an off-ſet ſtaff, equal in length to ten links of the chain, and divided into ten equal parts. He ought likewiſe to have ten arrows, or ſmall ſtraight ſticks, near two feet long, ſhod with iron-ferrils. When the chain is firſt opened, it ought to be examined by the off-ſet ſtaff. In meaſuring any line, the leader of the chain, is to have ten arrows at firſt ſetting out. When the chain is ſtretched in the line, and the near end touches the place from which you meaſure, the leader ſticks one of the ten arrows in the ground at the far end of the chain. Then the leader leaving the arrow, proceeds with the chain another length; and the chain being ſtretched in the line, ſo that the near end touches the firſt arrow, the leader ſticks down another arrow at his end of the chain. The line is preſerved ſtraight, if the arrows be always ſet ſo, as to be in a right line with the place you meaſure from, and that to which you are going. In this manner they proceed till the leader have no more arrows. At the eleventh chain the arrows are to be carried to him again, and he is to ſtick one of them in the ground, at the end of the chain, and the ſame is to be done at the 21, 31, 41, &c. chains, if there are ſo many in the right line to be meaſured. In this manner an error can hardly be committed in numbering the chains, unleſs of ten chains at once. See farther under CHAIN, FIELD-*book*, OFF-SETT, STAFF, and THEODOLITE.

The method of *ſurveying* harbours, and of forming maps of theſe, and of the adjacent coaſts, ſands, &c. depends on the ſame principles, and is in general conducted like that of common *ſurveying*. The operation is, indeed, more complicated and laborious; as it will be neceſſary to erect a number of ſignals, and to mark a variety of objects along the coaſt, with different bearings from one another, and the ſeveral parts of the harbour; and likewiſe to meaſure a great number of angles at different ſtations. The angles and diſtances are meaſured and plotted as in other caſes; and the map of a harbour may be conſtructed much after the ſame manner with that of any particular diſtrict of land. Mr. Michell recommends the uſe of Hadley's quadrant, for the *ſurveying* of harbours, or ſuch ſands, as lie within ſight of land, which he ſays, may oftentimes be performed by it, not only with greater eaſe, but alſo with much greater preciſion, than can be hoped for by any other means; as it is the only inſtrument in uſe, in which neither the exactneſs of the obſervations, nor the eaſe with which they may be made, are ſenſibly affected by the motion of a veſſel: and hence a ſingle obſerver, in a boat, may generally determine the ſituation of any place, at pleaſure, with a ſufficient degree of exactneſs, if with this inſtrument, he takes the angles ſubtended by two or three pairs of objects properly choſen upon the ſhores round about him; but it will be ſtill better to have two obſervers, one of whom, being in a boat, muſt, at the time he takes the angle ſubtended by ſome two objects upon the ſhore, make a ſignal to the other obſerver; who, being placed at one of the objects, as a ſtation, muſt at the ſame time obſerve the angle ſubtended by the boat and the other object. By this means, two angles in a plain triangle being given, together with the diſtance between the two objects, as a baſe, the whole triangle, and the ſituation of every part of it, will be given likewiſe. By ſuch obſervations, provided the boat be at reſt during the time of making them, and they be made carefully with good quadrants, though without the aſſiſtance of teleſcopic ſights, the ſituation of places may be eaſily determined to twenty or thirty feet, upon every three or four miles. Phil. Tranſ. vol. lv. p. 70, &c.

SURVEYING *croſs*. See CROSS.

SURVEYING *quadrant*. See QUADRANT.

SURVEYING *ſcale*, the ſame with reducing SCALE.

SURVEYING *wheel*. See PERAMBULATOR.

SURVEYOR, one that hath the overſight and care of conſiderable works, lands, or the like. See SUPERVISOR.

Such are the *ſurveyor* general of the king's manors; *ſurveyor* of the king's exchange, mentioned in the ſtat. 9 Hen. V. ſtat. 2. c. 4. *ſurveyor* general of the works; *ſurveyor* general of his majeſty's woods and parks; *ſurveyor* general of the crown-lands, &c.

SURVEYOR *of the highways*. See HIGHWAY.

SURVEYOR, *marine*. See MARINE *ſurveyor*.

SURVEYOR *of the melting*, is an officer of the mint, whoſe buſineſs is to ſee the bullion caſt out; and that it be not altered after the delivery of it to the melter.

SURVEYORS *of the navy*, are two officers who ſit at the navy-board, being inveſted with the charge of building and repairing his majeſty's ſhips, at the different dock-yards of the kingdom, for which purpoſe they are trained to the theory and practice of ſhip-building. It is alſo their office to know the ſtate of the navy; to audit the accounts of all boatſwains and carpenters ſerving therein, and to enquire into the condition of all naval ſtores, at home or abroad, in order to ſupply whatſoever may be deficient.

SURVEYOR *of the ordnance* is an officer, whoſe charge is to ſurvey all the king's ordnance, ſtores, and proviſions of war, in the cuſtody of the ſtore-keeper of the tower of London; to allow all bills of debts, to keep checks on labourers and artificers works, &c.

There are alſo many other officers called *ſurveyors*, in the different departments of the ſtate and revenue; as the *ſurveyor* of the pictures in the royal houſhold; *ſurveyor* of the private roads, and *ſurveyor* of gardens and waters, belonging to the board of works, &c. *ſurveyor* general of the duchy of Cornwall; ten general *ſurveyors*, and one hundred and ſeventy-three *ſurveyors* of counties, belonging to the tax-office; *ſurveyors* of land and woods, belonging to the duchy court of Lancaſter; *ſurveyor* general, *ſurveyor*, *ſurveyors* general, reſident in London, and

and also of the riding officers; ten land *surveyors*, *surveyors* of paper, keys, baggage, land carriage officers, buildings, coast waiters, king's warehouse, East-India warehouse, and navigation, belonging to the customs; five general *surveyors*; five general *surveyors* of distillery; *surveyors* of glass and coaches, in the excise-office; two *surveyors* of the salt-office; two resident *surveyors* of the general post-office, and bye-letter office; eight *surveyors* of the stamp duties; fifteen *surveyors* of the hawkers and pedlars office; *surveyor* of the royal hospital at Greenwich; *surveyor* of the victualling-office, &c.

SURVEYOR is also used for a gauger.—And also for a person who measures and makes maps of lands. See SURVEYING and GAUGING.—And also for a person who directs and superintends private and public buildings. See BUILDING and PARTY-*walls*.

SURVIVOR, in *Law*, signifies the longer liver of two joint tenants; or any two persons joined in the right of any thing.

Thus, when two or more persons are seised of a joint estate of inheritance, for their own lives, or *pur auter vie*, or are jointly possessed of any chattel interest, the entire tenancy upon the decease of any of them, remains to the *survivors*, and at length to the last *survivor*; and he shall be entitled to the whole estate, whatever it be, whether an inheritance or a common freehold only, or even a less estate. This right of survivorship is called by our ancient authors the *jus accrescendi*, because the right upon the death of one *joint-tenant*, accumulates and increases to the *survivors*; or, as they themselves express it, *pars illa communis accrescit superstitibus, de persona in personam, usque ad ultimum superstitem*. And this *jus accrescendi* ought to be mutual; which judge Blackstone apprehends to be the reason why neither the king, nor any corporation, can be a joint-tenant with a private person: for here is no mutuality; the private person has not even the remotest chance of being seised of the entirety, by benefit of survivorship; for the king and corporation can never die. For the encouragement of husbandry and trade, it is held that a stock on a farm, though occupied jointly, and also a stock used in a joint undertaking, by way of partnership in trade, shall always be considered as common and not as joint property; and there shall be no survivorship therein. Blackst. Com. B. ii. p. 183, &c. p. 399.

SURVIVORSHIP. Payments which are not to be made till some future period, are termed *reversions*, to distinguish them from payments which are to be made immediately.

Reversions are either *certain*, or *contingent*. Of the former sort are all sums or annuities, payable *certainly* at the expiration of any terms, or the extinction of any lives. Of the latter sort are all reversions, the title to which depends on any contingency; as, particularly, the *survivorship* of any lives beyond other lives. An account of the former may be found under the articles ASSURANCE, ANNUITIES, and LIFE-*annuities*. The latter form the most intricate and difficult part of the doctrine of reversions and life-annuities; and the books in which this subject is treated most at large, and at the same time with the most precision, are Mr. Simpson's Select Exercises; Mr. Morgan on Annuities and Assurances on Lives and *Survivorships*; and Dr. Price on Reversionary Payments.

The whole likewise of the third volume of Mr. Dodson's Mathematical Repository is on this subject; but all Mr. Dodson's investigations being founded on a false hypothesis, we do not think them fit to be recommended. The hypothesis we mean is, Mr. De Moivre's hypothesis of an equal decrement of life through all its stages, explained under LIFE-*annuities*. This hypothesis, as has been observed under life-annuities, does not correspond sufficiently to fact; and therefore the rules deduced from it cannot be sufficiently correct. For this reason, Dr. Price, and also the ingenious Mr. Maseres, cursitor baron of the exchequer (in two volumes just published, entitled the Principles of the Doctrine of Life Annuities), have discarded the valuations of lives grounded upon it; and the former, in particular, in order to set aside all occasion for using them, has substituted in their room a great variety of new tables of the probabilities and values of lives, at every age, and in every situation; calculated, not upon any hypothesis, but in strict conformity to the best observations. These tables, added to other new tables of the same kind in Mr. Baron Maseres's work just mentioned, form a complete set of tables, by which all questions relating to annuities on lives and *survivorships*, may be answered with as much correctness as the nature of the subject allows.

It is necessary to mention farther here, that in calculating the values of reversions depending on *survivorships*, there is particular danger of being led by Mr. De Moivre's authority into other very great incorrectnesses, as will appear from the following quotation from the third essay in Dr. Price's Treatise on Reversionary Payments.

Question. A, aged 40, expects to come to the possession of an estate, should he survive B, aged likewise 40. In these circumstances he offers, in order to raise a present sum, to give security for 40*l.* *per ann.* out of the estate at his death, provided he should get into possession; that is, provided he should survive B. What is the sum that ought now to be advanced to him, in consideration of such security, reckoning compound interest at 4 per cent.?

Mr. De Moivre's directions in his Treatise on Annuities, problems 17th and 20th, lead us to seek the required sum in this case, by the following process.

Find first, the present sum A should receive, for the reversion of 40*l.* *per annum* for ever after his death; supposing it *not* dependent on his surviving B. The present value of such a reversion is "the value of the life subtracted from the *perpetuity*, and the *remainder* multiplied by the annual rent." The value of the life is, by Table IV. (under LIFE-*annuities*) 13.196. This subtracted from 25, the *perpetuity*, leaves 11.80; which, multiplied by 40, gives 472*l.* the value of the supposed estate, after the life of A. But, as Mr. De Moivre observes, the lender having a chance to lose his money, a compensation ought to be made him for the risk he runs, which is founded on the possibility, that a man of forty years of age may not survive another person of the same age. This chance is an *equal* chance; and, therefore, half the preceding sum, or 236*l.* is the money which should be advanced now on the expectation mentioned.

This solution carries a plausible appearance; and most persons will, probably, be ready to pronounce it right; nor will this be at all wonderful, as so great a master of these subjects as Mr. de Moivre appears to have been misled by it. Nothing more is necessary to prove it to be fallacious, than proceeding in the same way to solve the following similar question.

"A. aged 40, offers to give security for 40*l.* *per annum*, "to be entered upon at his death, provided it should "happen *before* the death of B, aged likewise 40. "What sum should now be advanced to him for such a "reversion, interest being reckoned at 4 *per cent.*"

In solving this problem, agreeably to the method just described, we are to find the value of 40*l.* *per annum*, to be entered upon *certainly* at the death of A; and then to multiply this value by the chance that A shall not survive B, or by $\frac{1}{2}$; and in this way the answer comes out the same with that already given.

Now it may be easily seen, that this must be wrong. The value of a reversion, to be received when a person of a given age dies, cannot be the same, whether the condition of obtaining it is, that he shall die *before*, or that he shall die *after* another person. That is, whether it is provided, that a purchaser, if he succeeds, shall get into possession *sooner* or *later*. The reversion in the latter case must, without doubt, be of less value than in the former.

The first question here proposed, resolves itself into the following general question.

"What is the present value of a given reversionary "estate, to be entered upon after the failure of two "lives, provided one *in particular* of them should be the "*longest life*?"

Now, the present value of an estate to be enjoyed for ever, after the failure of the *longest* of two lives, is "the "value of the *longest* of the two lives, subtracted from "the *perpetuity*; and the remainder multiplied by the "annual rent of the estate." The value of the *longest* of two lives is (as is well known) the value of the two *joint* lives, subtracted from the *sum* of the values of the two *single* lives. In the present case, therefore, it is 9.82, (the value of two joint lives at the age of 40, by Table VII. under LIFE-*annuities*) subtracted from twice 13.196; (the value of a *single* life at the same age by Table VI.) that is, 16.57 year's purchase. And this subtracted from 25 (the perpetuity), gives 8.43; which, multiplied by 40, gives *l.* 337.2, the value of the given estate, were it *certainly* to be enjoyed, after the extinction of the longest of two lives both 40; that is, whether *one* or *other* of them failed last. But that A's life in particular should fail last, rather than B's, is an even chance. The true value of the reversion, therefore, is half the last value, or *l.* 168.6.

In like manner. The second question is the same with the question, "What is the present value of 40*l.* *per ann.* "for ever, to be entered upon after the extinction of "two *joint* lives both 40; that is, whenever *either* of "them shall fail; provided the first that fails should "happen to be A's life in particular?" And the answer is found

found by subtracting the present value of the *two joint* lives from the *perpetuity*, and multiplying the remainder by $\frac{1}{2}$, or by the chance that A. in particular shall die first; and this will give the required value, *l.* 303.4.

In short, it appears in *both* these cases, that, according to the first method of solution, we are to subtract from the *perpetuity* the value of *one* of the single lives; when, in the *former* case, the value of the *longest* of the two lives; and, in the *latter* case, the value of their *joint continuance*, ought, in reality, to be subtracted. We need not say what prodigious errors may often arise from hence; and how unfit such a method of solution is for practice.

Rules for calculating correctly, in most cases, the values of reversions depending on *survivorships*, may be found in the three treatises just mentioned. Mr. Morgan, in particular, has gone a good way towards exhausting this subject, as far as any questions can involve in them any *survivorships* between two or three lives, either for terms, or the whole duration of the lives.

There is, however, one circumstance necessary to be attended to in calculating such values to which no regard could be paid till lately. This circumstance is the shorter duration of the lives of males than of females; and the consequent advantage in favour of females in all cases of *survivorship*. In the fourth edition of Dr. Price's Treatise on Reversionary Payments, this fact is not only ascertained, but separate tables of the duration and values of lives, are given for males and females.

This edition of this treatise having been but just published, we could not insert these tables in the former parts of this work. We shall, therefore, insert some of them here.

TABLE I.

Shewing the probabilities of the duration of human life among males and females, deduced from observations of the proportions of the living to the numbers that have died at all ages for twenty-one years, from 1755 to 1776, in the kingdom of Sweden.

	Males. Born 10,282—282 born dead.			Females. 10,277-217 born dead.		
Ages.	Living.	Decr.	Expectat.	Living.	Decr.	Expectat.
Born alive	10,000	2300	33.20	10,000	2090	35.70
1 year	7,700	500	42.45	7,910	518	44.00
2	7,200	337	43.83	7,392	350	46.05
3	6,863	240	44.96	7,042	250	47.31
4	6,623	150	45.57	6,792	135	48.04
5	6,473	125	45.62	6,657	120	48.00
6	6,348	105	45.50	6,537	105	47.87
7	6,243	90	45.26	6,432	85	47.64
8	6,153	75	44.91	6,347	70	47.28
9	6,078	65	44.46	6,277	60	46.80
10	6,013	55	43.94	6,217	52	46.25
11	5,958	45	43.26	6,165	46	45.55
12	5,913	45	42.58	6,119	40	44.85
13	5,868	40	41.91	6,079	35	44.15
14	5,828	40	41.24	6,044	35	43.46
15	5,788	39	40.56	6,009	35	42.76
16	5,749	39	39.83	5,974	40	42.04
17	5,710	39	39.11	5,934	40	41.31
18	5,671	44	38.39	5,894	42	40.59
19	5,627	44	37.67	5,852	43	39.87
20	5,583	50	36.95	5,809	43	39.15
21	5,533	50	36.28	5,766	43	38.43
22	5,483	50	35.62	5,723	43	37.72
23	5,433	55	34.96	5,680	44	37.01
24	5,378	55	34.30	5,636	45	36.29
25	5,323	55	33.63	5,591	45	35.58
26	5,268	55	32.98	5,546	50	34.90
27	5,213	55	32.32	5,496	52	34.21
28	5,158	55	31.66	5,444	55	33.53
29	5,103	56	31.00	5,389	55	32.85
30	5,049	59	30.34	5,334	60	32.17
31	4,988	60	29.69	5,274	60	31.54
32	4,928	60	29.04	5,214	65	30.91
33	4,868	60	28.39	5,149	65	30.28
34	4,808	60	27.74	5,084	65	29.66
35	4,748	60	27.09	5,019	60	29.03
36	4,688	60	26.43	4,959	56	28.26
37	4,628	60	25.76	4,903	56	27.50
38	4,568	60	25.09	4,847	56	26.74
39	4,508	60	24.42	4,791	58	25.97
40	4,448	65	23.75	4,733	65	25.21
41	4,383	72	23.15	4,668	75	24.68
42	4,311	80	22.54	4,593	76	24.75
43	4,231	80	21.93	4,517	76	23.62
44	4,151	80	21.32	4,441	75	23.10
45	4,071	80	20.71	4,366	72	22.57
46	3,991	80	20.12	4,294	67	21.91
47	3,911	80	19.52	4,227	65	21.24
48	3,831	80	18.92	4,162	65	20.58
49	3,751	85	18.32	4,097	70	19.92

	Males.			Females.		
Ages.	Living.	Decr.	Expectat.	Living.	Decr.	Expectat.
50	3,666	95	17.72	4,027	75	19.26
51	3,571	95	17.17	3,952	80	18.64
52	3,476	95	16.63	3,872	85	18.01
53	3,381	95	16.08	3,787	85	17.39
54	3,286	95	15.53	3,702	85	16.77
55	3,191	95	14.98	3,617	85	16.15
56	3,096	95	14.43	3,532	85	15.53
57	3,001	100	13.87	3,447	90	14.92
58	2,901	100	13.33	3,357	90	14.31
59	2,801	100	12.79	3,267	100	13.69
60	2,701	105	12.24	3,167	110	13.08
61	2,596	110	11.72	3,057	118	12.56
62	2,486	115	11.21	2,939	120	12.04
63	2,371	115	10.73	2,819	120	11.52
64	2,256	115	10.26	2,699	120	11.01
65	2,141	115	9.78	2,579	120	10.49
66	2,026	115	9.30	2,459	120	9.97
67	1,911	120	8.84	2,339	120	9.46
68	1,791	125	8.40	2,219	120	8.94
69	1,666	125	7.99	2,099	120	8.42
70	1,541	125	7.60	1,979	130	7.91
71	1,416	125	7.22	1,849	140	7.53
72	1,291	120	6.87	1,709	150	7.16
73	1,171	120	6.53	1,559	160	6.78
74	1,051	110	6.22	1,399	150	6.40
75	941	105	5.89	1,249	140	6.03
76	836	100	5.56	1,109	130	5.73
77	736	90	5.25	979	120	5.43
78	646	85	4.92	859	110	5.11
79	561	80	4.59	749	100	4.79
80	481	75	4.27	649	95	4.47
81	406	70	3.96	554	90	4.13
82	336	65	3.69	464	85	3.84
83	271	60	3.45	379	80	3.59
84	211	50	3.30	299	75	3.42
85	161	40	3.16	224	55	3.40
86	121	30	3.04	169	40	3.34
87	91	22	2.88	129	30	3.22
88	69	17	2.64	99	23	3.05
89	52	14	2.34	76	18	2.82
90	38	12	2.02	58	15	2.55
91	26	9		43	12	
92	17	7		31	10	
93	10	6		21	8	
94	4	3		13	6	
95	1	1		7	4	
96	0	0		3	2	
97	0	0		1	1	

TABLE II.

Shewing the probabilities of the duration of human life among males and females, taken collectively, deduced from the preceding table.

Born 10,249—249 born dead.							
Age.	Living	Decr.	Expect.	Age	Living	Decr.	Expect.
Born alive	10000	2195	34.42	40	4591	65	24.66
1 year	7805	509	42.95	41	4526	73	24.05
2	7296	344	44.92	42	4453	78	23.44
3	6952	245	46.11	43	4375	78	22.83
4	6707	143	46.78	44	4297	78	22.22
5	6564	122	46.79	45	4219	76	21.61
6	6442	105	46.66	46	4143	74	20.98
7	6337	87	46.43	47	4069	72	20.35
8	6250	73	46.07	48	3997	73	19.72
9	6177	62	45.61	49	3924	78	19.09
10	6115	54	45.07	50	3846	85	18.46
11	6061	45	44.38	51	3761	87	17.87
12	6016	42	43.70	52	3674	90	17.29
13	5974	38	43.01	53	3584	90	16.70
14	5936	37	42.33	54	3494	91	16.12
15	5899	37	41.64	55	3403	91	15.53
16	5862	40	40.92	56	3312	92	14.95
17	5822	40	40.19	57	3220	95	14.37
18	5782	42	39.47	58	3125	95	13.79
19	5740	43	38.74	59	3030	100	13.21
20	5697	47	38.02	60	2930	108	12.63
21	5650	47	37.33	61	2822	114	12.12
22	5603	48	36.64	62	2708	118	11.62
23	5555	48	35.96	63	2590	118	11.11
24	5507	50	35.27	64	2472	118	10.61
25	5457	50	34.58	65	2354	118	10.10
26	5407	52	33.91	66	2236	118	9.62
27	5355	54	33.23	67	2118	121	9.15
28	5301	55	32.56	68	1997	124	8.67
29	5246	55	31.88	69	1873	124	8.20
30	5191	59	31.21	70	1749	127	7.72
31	5132	60	30.57	71	1622	133	7.32
32	5072	62	29.94	72	1489	135	6.89
33	5010	63	29.30	73	1354	140	6.53
34	4947	63	28.67	74	1214	130	6.23
35	4884	59	28.03	75	1084	121	5.91
36	4825	58	27.31	76	963	115	5.59
37	4767	58	26.68	77	848	105	5.28
38	4709	58	26.01	78	743	95	4.96
39	4651	60	25.33	79	648	90	4.61
				80	558	90	4.28

Age

Age.	Living.	Decr.	Expect.	Age.	Living.	Decr.	Expect.
81	468	84	4.01	89	62	15	2.43
82	384	75	3.80	90	47	14	2.05
83	309	65	3.57	91	33	12	1.71
84	244	55	3.39	92	21	10	1.40
85	189	45	3.23	93	11	6	
86	144	35	3.09	94	5	3	
87	109	27	2.92	95	2	1	
88	82	20	2.71	96	1	1	

TABLE III.

Shewing the values of annuities on single lives among males and females, according to the probabilities of the duration of life in the kingdom of Sweden. See Table I.

	Males.		Females.		Lives in general.	
Ages.	4 per Ct.	5 per Ct.	4 per Ct.	5 per Ct.	4 per Ct.	5 per Ct.
1	16.503	14.051	16.820	14.271	16.661	14.161
2	17.355	14.778	17.719	15.034	17.537	14.906
3	17.935	15.279	18.344	15.571	18.139	15.425
4	18.328	15.624	18.780	15.951	18.554	15.787
5	18.503	15.786	18.927	16.088	18.715	15.937
6	18.622	15.901	19.045	16.203	18.833	16.052
7	18.693	15.977	19.131	16.291	18.912	16.134
8	18.725	16.021	19.162	16.335	18.943	16.178
9	18.715	16.030	19.151	16.343	18.933	16.186
10	18.674	16.014	19.109	16.325	18.891	16.169
11	18.600	15.970	19.041	16.286	18.820	16.128
12	18.491	15.896	18.952	16.229	18.721	16.062
13	18.378	15.819	18.840	16.153	18.609	15.986
14	18.246	15.724	18.707	16.059	18.476	15.891
15	18.105	15.624	18.568	15.960	18.336	15.792
16	17.958	15.517	18.424	15.856	18.191	15.686
17	17.803	15.404	18.290	15.761	18.046	15.582
18	17.643	15.285	18.151	15.662	17.897	15.473
19	17.492	15.175	18.013	15.563	17.752	15.369
20	17.335	15.059	17.872	15.462	17.603	15.260
21	17.192	14.955	17.725	15.356	17.458	15.155
22	17.042	14.846	17.573	15.245	17.307	15.045
23	16.887	14.732	17.414	15.129	17.150	14.930
24	16.742	14.627	17.252	15.009	16.997	14.818
25	16.592	14.517	17.087	14.886	16.839	14.701
26	16.436	14.402	16.915	14.757	16.675	14.579
27	16.274	14.282	16.751	14.636	16.512	14.459
28	16.105	14.156	16.588	14.515	16.346	14.335
29	15.930	14.024	16.427	14.396	16.178	14.210
30	15.751	13.889	16.261	14.272	16.006	14.080
31	15.575	13.756	16.104	14.156	15.839	13.956
32	15.395	13.619	15.941	14.035	15.668	13.827
33	15.208	13.477	15.787	13.923	15.497	13.700
34	15.014	13.327	15.629	13.806	15.321	13.566
35	14.812	13.170	15.465	13.684	15.138	13.427
36	14.601	13.006	15.278	13.542	14.939	13.274
37	14.382	12.833	15.070	13.382	14.726	13.107
38	14.154	12.652	14.854	13.213	14.504	12.932
39	13.916	12.462	14.629	13.036	14.272	12.749
40	13.668	12.261	14.401	12.856	14.034	12.558
41	13.426	12.065	14.185	12.687	13.805	12.376
42	13.196	11.880	13.994	12.538	13.595	12.209
43	12.984	11.710	13.798	12.387	13.391	12.048
44	12.763	11.532	13.596	12.229	13.179	11.880
45	12.535	11.347	13.383	12.061	12.959	11.704
46	12.297	11.153	13.151	11.876	12.724	11.514
47	12.051	10.951	12.894	11.668	12.472	11.309
48	11.795	10.738	12.620	11.443	12.217	11.090
49	11.528	10.516	12.333	11.205	11.930	10.860
50	11.267	10.298	12.049	10.970	11.658	10.634
51	11.030	10.100	11.769	10.737	11.399	10.418
52	10.785	9.895	11.492	10.507	11.138	10.201
53	10.531	9.682	11.220	10.280	10.875	9.981
54	10.269	9.460	10.937	10.042	10.603	9.751
55	9.998	9.229	10.642	9.792	10.320	9.510
56	9.717	8.988	10.334	9.529	10.025	9.258
57	9.425	8.736	10.012	9.253	9.718	8.994
58	9.140	8.489	9.692	8.976	9.416	8.732
59	8.845	8.232	9.358	8.687	9.101	8.458
60	8.540	7.963	9.039	8.406	8.789	8.184
61	8.241	7.700	8.739	8.144	8.490	7.922
62	7.950	7.442	8.453	7.895	8.201	7.668
63	7.669	7.193	8.166	7.643	7.917	7.418
64	7.382	6.938	7.870	7.382	7.626	7.160
65	7.090	6.676	7.566	7.111	7.328	6.893
66	6.792	6.408	7.252	6.831	7.022	6.619
67	6.489	6.134	6.930	6.541	6.709	6.337
68	6.201	5.872	6.596	6.239	6.398	6.055
69	5.933	5.628	6.253	5.926	6.093	5.777
70	5.670	5.389	5.897	5.599	5.783	5.494
71	5.418	5.158	5.564	5.293	5.491	5.225
72	5.180	4.940	5.261	5.013	5.220	4.976
73	4.940	4.719	4.998	4.770	4.969	4.744
74	4.724	4.521	4.792	4.581	4.758	4.551
75	4.487	4.302	4.582	4.388	4.534	4.345
76	4.253	4.084	4.367	4.189	4.310	4.136
77	4.024	3.871	4.145	3.983	4.084	3.927
78	3.768	3.631	3.913	3.767	3.840	3.699
79	3.512	3.390	3.668	3.536	3.590	3.463
80	3.260	3.152	3.402	3.285	3.331	3.218
81	3.017	2.921	3.145	3.041	3.081	2.981

	Males.		Females.		Lives in general.	
Ages.	4 per Ct	5 per Ct.	4 per Ct.	5 per Ct.	4 per Ct.	5 per Ct
82	2.792	2.706	2.905	2.812	2.848	2.759
83	2.600	2.523	2.699	2.615	2.649	2.569
84	2.473	2.403	2.559	2.480	2.516	2.441
85	2.371	2.306	2.552	2.476	2.461	2.391
86	2.281	2.222	2.518	2.446	2.399	2.334
87	2.154	2.103	2.431	2.365	2.292	2.338
88	1.955	1.912	2.294	2.236	2.124	2.074
89	1.698	1.664	2.108	2.059	1.903	1.861
90	1.417	1.392	1.873	1.833	1.645	1.612
91	1.154	1.136	1.628	1.596	1.391	1.366
92	0.835	0.824	1.349	1.325	1.092	1.074
93	0.477	0.471	1.071	1.054	0.774	0.762
94	0.240	0.238	0.799	0.788	0.519	0.513
95	0.000	0.000	0.544	0.537		
96	0.000	0.000	0.320	0.317		

TABLE IV.

Shewing the values of annuities on two joint lives, according to the probabilities (in Table II.) of the duration of human life among males and females collectively, reckoning interest at 4 per cent.

Interest 4 per cent.

Differences of age 0, 6, 12, and 18 years.

Ages.	Values.	Ages.	Values.	Ages.	Values.	Ages.	Values.
1- 1	12.252	1- 7	13.989	1-13	13.894	1-19	13.389
2- 2	13.583	2- 8	14.780	2-14	14.557	2-20	14.008
3- 3	14.558	3- 9	15.323	3-15	14.988	3-21	14.417
4- 4	15.267	4-10	15.685	4-16	15.259	4-22	14.671
5- 5	15.577	5-11	15.817	5-17	15.326	5-23	14.725
6- 6	15.820	6-12	15.887	6-18	15.354	6-24	14.740
7- 7	16.003	7-13	15.914	7-19	15.351	7-25	14.727
8- 8	16.109	8-14	15.888	8-20	15.310	8-26	14.673
9- 9	16.152	9-15	15.824	9-21	15.244	9-27	14.590
10-10	16.141	10-16	15.729	10-22	15.149	10-28	14.484
11-11	16.087	11-17	15.617	11-23	15.033	11-29	14.357
12-12	15.982	12-18	15.477	12-24	14.889	12-30	14.202
13-13	15.855	13-19	15.327	13-25	14.736	13-31	14.045
14-14	15.701	14-20	15.164	14-26	17.566	14-32	13.874
15-15	15.535	15-21	15.001	15-27	14.392	15-33	13.700
16-16	15.361	16-22	14.832	16-28	14.216	16-34	13.520
17-17	15.196	17-23	14.665	17-29	14.042	17-35	13.340
18-18	15.023	18-24	14.491	18-30	13.860	18-36	13.141
19-19	14.854	19-25	14.320	19-31	13.687	19-37	12.934
20-20	14.682	20-26	14.144	20-32	13.512	20-38	12.720
21-21	14.525	21-27	13.976	21-33	13.345	21-39	12.505
22-22	14.360	22-28	13.807	22-34	13.173	22-40	12.286
23-23	14.194	23-29	13.635	23-35	12.997	23-41	12.073
24-24	14.020	24-30	13.455	24-36	12.801	24-42	11.873
25-25	13.849	25-31	13.284	25-37	12.599	25-43	11.683
26-26	13.671	26-32	13.108	26-38	12.387	26-44	11.485
27-27	13.495	27-33	12.935	27-39	12.170	27-45	11.284
28-28	13.323	28-34	12.763	28-40	11.953	28-46	11.072
29-29	13.148	29-35	12.586	29-41	11.742	29-47	10.847
30-30	12.965	30-36	12.390	30-42	11.543	30-48	10.606
31-31	12.795	31-37	12.192	31-43	11.359	31-49	10.365
32-32	12.624	32-38	11.988	32-44	11.170	32-50	10.[illegible]28
33-33	12.456	33-39	11.779	33-45	10.978	33-51	9.905
34-34	12.286	34-40	11.568	34-46	10.775	34-52	9.679
35-35	12.109	35-41	11.361	35-47	10.557	35-53	9.452
36-36	11.904	36-42	11.156	36-48	10.314	36-54	9.207
37-37	11.683	37-43	10.953	37-49	10.059	37-55	8.951
38-38	11.452	38-44	10.741	38-50	9.805	38-56	8.683
39-39	11.209	39-45	10.519	39-51	9.558	39-57	8.404
40-40	10.964	40-46	10.286	40-52	9.308	40-58	8.124
41-41	10.732	41-47	10.049	41-53	9.066	41-59	7.839
42-42	10.531	42-48	9.813	42-54	8.830	42-60	7.569
43-43	10.346	43-49	9.581	43-55	8.597	43-61	7.318
44-44	10.154	44-50	9.351	44-56	8.354	44-62	7.075
45-45	9.954	45-51	9.129	45-57	8.101	45-63	6.836
46-46	9.736	46-52	8.897	46-58	7.841	46-64	6.586
47-47	9.497	47-53	8.658	47-59	7.563	47-65	6.323
48-48	9.236	48-54	8.402	48-60	7.281	48-66	6.048
49-49	8.966	49-55	8.139	49-61	7.008	49-67	5.764
50-50	8.707	50-56	7.874	50-62	6.749	50-68	5.487
51-51	8.469	51-57	7.613	51-63	6.505	51-69	5.221
52-52	8.230	52-58	7.351	52-64	6.256	52-70	4.953
53-53	7.994	53-59	7.083	53-65	6.004	53-71	4.694
54-54	7.748	54-60	6.814	54-66	5.743	54-72	4.455
55-55	7.495	55-61	6.555	55-67	5.474	55-73	4.231
56-56	7.229	56-62	6.299	56-68	5.204	56-74	4.043
57-57	6.924	57-63	6.045	57-69	4.936	57-75	3.844
58-58	6.678	58-64	5.788	58-70	4.664	58-76	3.637
59-59	6.388	59-65	5.519	59-71	4.395	59-77	3.430
60-60	6.104	60-66	5.249	60-72	4.149	60-78	3.210
61-61	5.844	61-67	4.984	61-73	3.927	61-79	2.974
62-62	5.600	62-68	4.729	62-74	3.747	62-80	2.744
63-63	5.367	63-69	4.482	63-75	3.563	63-81	2.557
64-64	5.128	64-70	4.231	64-76	3.370	64-82	2.396
65-65	4.881	65-71	3.982	65-77	3.180	65-83	2.252
66-66	4.626	66-72	3.750	66-78	2.974	66-84	2.123
67-67	4.362	67-73	3.527	67-79	2.743	67-85	2.010
68-68	4.103	68-74	3.340	68-80	2.514	68-86	1.910
69-69	3.851	69-75	3.147	69-81	2.324	69-87	1.798
70-70	3.593	70-76	2.946	70-82	2.155	70-88	1.661
71-71	3.345	71-77	2.752	71-83	2.004	71-89	1.464

Interest

Intereſt 4 per cent.

Ages.	Values.	Ages.	Values.	Ages	Values.	Ages.	Values.
72-72	3.128	72-78	2.558	72-84	1.875	72-90	1.189
73-73	2.935	73-79	2.355	73-85	1.768	73-91	0.937
74-74	2.797	74-80	2.172	74-86	1.692	74-92	0.708
75-75	2.648	75-81	2.017	75-87	1.605	75-93	0.575
76-76	2.490	76-82	1.877	76-88	1.497	76-94	0.481
77-77	2.340	77-83	1.756	77-89	1.339	77-95	0.421
78-78	2.170	78-84	1.639	78-90	1.097		
79-79	1.967	79-85	1.524	79-91	0.863		
80-80	1.758	80-86	1.416	80-92	0.638		
81-81	1.600	81-87	1.320	81-93	0.511		
82-82	1.472	82-88	1.225	82-94	0.427		
83-83	1.364	83-89	1.094	83-95	0.379		
84-84	1.276	84-90	0.902				
85-85	1.212	85-91	0.725				
86-86	1.172	86-92	0.556				
87-87	1.127	87-93	0.459				
88-88	1.071	88-94	0.396				
89-89	0.949	89-95	0.364				
90-90	0.718						
91-91	0.516						
92-92	0.326						
93-93	0.236						
94-94	0.190						
95-95	0.024						

TABLE V.

Shewing the values of two joint lives, according to the probabilities (in Table II.) of the duration of human life among males and females collectively.

Intereſt 4 per cent.

Differences of age 24, 30, 36, and 42 years.

Ages.	Values.	Ages	Values.	Ages.	Values.	Ages.	Values.
1-25	12.832	1-31	12.196	1-37	11.465	1-43	10.546
2-26	13.409	2-32	12.730	2-38	11.913	2-44	10.946
3-27	13.778	3-33	13.066	3-39	12.164	3-45	11.168
4-28	14.003	4-34	13.264	4-40	12.284	4-46	11.260
5-29	14.037	5-35	13.277	5-41	12.242	5-47	11.183
6-30	14.033	6-36	13.242	6-42	12.185	6-48	11.064
7-31	14.006	7-37	13.170	7-43	12.112	7-49	10.915
8-32	13.944	8-38	13.059	8-44	12.004	8-50	10.743
9-33	13.855	9-39	12.913	9-45	11.865	9-51	10.560
10-34	13.741	10-40	12.743	10-46	11.694	10-52	10.357
11-35	13.604	11-41	12.563	11-47	11.493	11-53	10.140
12-36	13.428	12-42	12.379	12-48	11.259	12-54	9.898
13-37	13.234	13-43	12.196	13-49	11.011	13-55	9.644
14-38	13.023	14-44	11.997	14-50	10.759	14-56	9.371
15-39	12.798	15-45	11.787	15-51	10.514	15-57	9.087
16-40	12.570	16-46	11.562	16-52	10.264	16-58	8.799
17-41	12.351	17-47	11.328	17-53	10.018	17-59	8.503
18-42	12.146	18-48	11.076	18-54	9.761	18-60	8.208
19-43	11.951	19-49	10.819	19-55	9.500	19-61	7.928
20-44	11.751	20-50	10.567	20-56	9.228	20-62	7.658
21-45	11.550	21-51	10.332	21-57	8.953	21-63	7.396
22-46	11.335	22-52	10.092	22-58	8.675	22-64	7.127
23-47	11.107	23-53	9.852	23-59	8.385	23-65	6.851
24-48	10.862	24-54	9.602	24-60	8.097	24-66	6.566
25-49	10.612	25-55	9.347	25-61	7.823	25-67	6.275
26-50	10.364	26-56	9.080	26-62	7.557	26-68	5.986
27-51	10.130	27-57	8.807	27-63	7.297	27-69	5.702
28-52	9.894	28-58	8.534	28-64	7.032	28-70	5.415
29-53	9.659	29-59	8.250	29-65	6.761	29-71	5.136
30-54	9.413	30-60	7.967	30-66	6.481	30-72	4.881
31-55	9.167	31-61	7.702	31-67	6.197	31-73	4.646
32-56	8.912	32-62	7.446	32-68	5.917	32-74	4.453
33-57	8.651	33-63	7.196	33-69	5.642	33-75	4.251
34-58	8.389	34-64	6.942	34-70	5.364	34-76	4.040
35-59	8.114	35-65	6.679	35-71	5.093	35-77	3.833
36-60	7.833	36-66	6.402	36-72	4.840	36-78	3.605
37-61	7.561	37-67	6.115	37-73	4.603	37-79	3.352
38-62	7.296	38-68	5.828	38-74	4.405	38-80	3.098
39-63	7.033	39-69	5.543	39-75	4.195	39-81	2.889
40-64	6.763	40-70	5.254	40-76	3.975	40-82	2.710
41-65	6.492	41-71	4.977	41-77	3.762	41-83	2.553
42-66	6.225	42-72	4.730	42-78	3.539	42-84	2.418
43-67	5.957	43-73	4.507	43-79	3.295	43-85	2.305
44-68	5.689	44-74	4.322	44-80	3.052	44-86	2.203
45-69	5.426	45-75	4.128	45-81	2.854	45-87	2.083
46-70	5.153	46-76	3.921	46-82	2.684	46-88	1.933
47-71	4.884	47-77	3.715	47-83	2.533	47-89	1.708
48-72	4.633	48-78	3.489	48-84	2.396	48-90	1.385
49-73	4.398	49-79	3.238	49-85	2.277	49-91	1.090
50-74	4.205	50-80	2.990	50-86	2.171	50-92	0.818
51-75	4.008	51-81	2.792	51-87	2.050	51-93	0.662
52-76	3.803	52-82	2.623	52-88	1.901	52-94	0.551
53-77	3.605	53-83	2.475	53-89	1.681	53-95	0.468
54-78	3.389	54-84	2.344	54-90	1.366		
55-79	3.150	55-85	2.232	55-91	1.078		
56-80	2.909	56-86	2.130	56-92	0.810		
57-81	2.710	57-87	2.010	57-93	0.655		
58-82	2.539	58-88	1.864	58-94	0.546		
59-83	2.385	59-89	1.644	59-95	0.464		
60-84	2.248	60-90	1.333				
61-85	2.135	61-91	1.050				

SUR

Intereſt 4 per cent.

Ages.	Values	Ages.	Values.	Ages.	Values.	Ages.	Values
62-86	2.037	62-92	0.789				
63-87	1.926	63-93	0.639				
64-88	1.790	64-94	0.533				
65-89	1.585	65-95	0.456				
66-90	1.290						
67-91	1.017						
68-92	0.764						
69-93	0.617						
70-94	0.514						
71-95	0.411						

The values of *joint* lives in theſe Tables have been computed for only one rate of intereſt; and of *ſingle* lives in Table III. for only two rates of intereſt. The following rules will ſhew, that it would be a needleſs labour to compute theſe values (in ſtrict conformity to the obſervations) for any other rates of intereſt.

ACCOUNT of a method of deducing, from the *correct* values (according to any obſervations) of any ſingle or joint lives at *one* rate of intereſt, the ſame values at *other* rates of intereſt.

PRELIMINARY PROBLEMS.

Problem I. The *expectation* given of a ſingle life by any table of obſervations, to find its value, ſuppoſing the decrements of life equal, at any given rate of intereſt.

Solution. Find in Table III. under ANNUITIES, the value of an annuity certain for a number of years equal to twice the expectation. Multiply this value by the perpetuity increaſed by unity, and divide the product by twice the expectation. The quotient ſubtracted from the perpetuity will be the value required.

Example. The expectation of a male life aged ten, by the Sweden obſervations (ſee Table I.) is 43.94. Twice this expectation is 87.88. The value of an annuity certain for 87.88 years is, by Table III. under ANNUITIES (reckoning intereſt at 4 *per cent.*) 24.200. The product of 24.200 into 26 (the perpetuity increaſed by unity) is 629.2, which, divided by 87.88, gives 7.159. And this quotient ſubtracted from 25 (the perpetuity) gives 17.84 years purchaſe, the value of a life aged ten, deduced from the expectation of life at that age, according to the Sweden obſervations.

Problem II. Having the expectations given of any two lives by any table of obſervations, to deduce from thence the value of the joint lives at any rate of intereſt, ſuppoſing an equal decrement of life.

Solution. Find the difference between twice the expectation of the youngeſt life, and twice the expectation of the oldeſt life increaſed by unity and twice the perpetuity. Multiply this difference by the value of an annuity certain for a time equal to *twice* the expectation of the *oldeſt* life; and by twice the ſame expectation divide the product, reſerving the quotient.

From twice the perpetuity ſubtract the reſerved quotient, and multiply the remainder by the perpetuity increaſed by unity. This laſt product divided by twice the expectation of the *youngeſt* life, and then ſubtracted from the perpetuity, will be the required value.

When twice the expectation of the youngeſt life is *greater* than twice the expectation of the oldeſt life increaſed by unity and twice the perpetuity, the reſerved quotient inſtead of being *ſubtracted* from twice the perpetuity, muſt be added to it, and the *ſum*, not the *difference*, multiplied by the perpetuity increaſed by unity.

Example. Let the joint lives propoſed be a female life aged 10, and a male life aged 15, and let the table of obſervations be the Sweden table for lives in general, and the rate of intereſt 4 *per cent.* Twice the expectations of the two lives are 90.14 and 83.28. See Table I.

Twice the expectation of the *oldeſt* life, increaſed by unity and twice the perpetuity, is 134.28, which leſſened by 90.14 (twice the expectation of the *youngeſt* life) leaves 44.14 for the *reſerved* remainder. This remainder multiplied by 24.045 (the value of an annuity certain for 83.28 years) and the product divided by 83.28 (twice the expectation of the *oldeſt* life) gives 12.744 the quotient to be *reſerved*; which ſubtracted from double the perpetuity, and the remainder (or 37.255) multiplied by the perpetuity increaſed by unity (or by 26) gives 968.630, which divided by 90.14 (twice the expectation of the *youngeſt* life) and the quotient ſubtracted from the perpetuity, we have 14.254 for the required value.

The value of an annuity certain, when the number of years is a whole number with a fraction added (as will be commonly the caſe) may be beſt computed in the following manner.

In this example the number of years is 83.28.

The value of an annuity certain for 83 years is (by Ta-

ble III. see Annuities) 24.035. The same value for 84 years is 24.072. The difference between these two values is .037; which difference multiplied by .28 (the fractional part of the number of years) and the product (.0103) added to the *least* of the two values, will give 24.045 the value for 83.28 years.

General Rule. Call the *correct* value (supposed to be computed for any rate of interest) the first value.

Call the value deduced (by the preceding problems) from the *expectations* at the same rate of interest, the second value.

Call the value deduced from the *expectations* for any other rate of interest the third value.

Then, the difference between the *first* and *second* values added *to* or subtracted *from* the *third* value, just as the *first* is *greater* or *less* than the *second*, will be the value at the rate of interest for which the third value has been deduced from the expectations.

The following examples will make this perfectly plain.

Example I. In the two last tables the correct values are given of two joint lives among mankind at large, without distinguishing between males and females, according to the Sweden observations, reckoning interest at 4 *per cent.* Let it be required to find from these values the values at 3 *per cent.*; and let the ages of the joint lives be supposed 10 and 10.

The correct value by Table IV. (reckoning interest at 4 *per cent.*) is 16.141. The expectation of a life aged 10 is (by Table II.) 45.07. The value deduced from this expectation at 4 *per cent.* by Prob. II. is 14.539. The value deduced by the same problem from the same expectation at 3 *per cent.* is 16.808. The difference between the *first* and *second* values, is 1.602, which, added to the *third* value (the first being *greater* than the second) makes 18.410, the value required.

Example II. Let the value be required of a single male life aged 10, at 3 *per cent.* interest, from the correct value at 4 *per cent.* according to the Sweden observations. First, or correct value at 4 *per cent.* (by Table III.) is 18.674. The expectation of a male life aged 10, is (by Table I.) 43.94.

The *second* value (or the value deduced from this expectation by Prob. I.) is 17.838.

The *third* value (or the value deduced from the same expectation at 3 *per cent.*) is 21.277.

The difference between the first and second is .836; which (since the first is greater than the second) must be added to the *third*; and the *sum* (that is, 22.113) will be the value required.

The *third* value at 5 *per cent.* is 15.286; and the difference added to 15.286 makes 16.122 the value of a male life aged 10 at 5 *per cent.* according to the Sweden observations. The exact value at 5 *per cent.* is (by Table III.) 16.014.

Again. The difference between 16.014 (the correct value at 5 *per cent.*) and 15.286 (the value at the same interest deduced from the expectation) is .728; which, *added* (because the first value is greater than the second) to 13.335 (the value deduced at 6 *per cent.* from the expectation) gives 14.063, the value of the same life, reckoning interest at 6 *per cent.*

These deductions, in the case of single lives particularly, are so easy, and give the true values so nearly, that it will be scarcely ever necessary to calculate the *exact* values (according to any given observations) for more than *one* rate of interest.

If, for instance, the correct values are computed at 4 *per cent.* according to any observations, the values at 3, 3½, 4½, 5, 6, 7, or 8 *per cent.* may be deduced from them by the preceding rules, as occasion may require, without much labour or any danger of considerable errors. The values thus deduced will seldom differ from the true values so much as a tenth of a year's purchase. They will not generally differ more than a 20th or 30th of a year's purchase. In joint lives they will differ less than in *single* lives; and they will come equally near to one another *whatever* the rates of interest are.

All this has been distinctly shewn in the new edition of the Treatise on Reversionary Payments; and it seems to be an improvement in the doctrine of life-annuities of so much use, that, not having had it in our power to give it in the proper place, we have thought it necessary to introduce it here. We shall now return to the main purpose of this article.

The preceding tables furnish the means of determining the exact differences between the values of annuities, as they are made to depend on the *survivorship* of any *male* or *female* lives; which hitherto has been a *desideratum* of considerable consequence in the doctrine of life-annuities. What has made this of consequence is chiefly the multitude of societies lately established in this and foreign countries for providing annuities for *widows*. The general rule for calculating from these tables the value of such annuities is the following.

Rule. "Find in Table III. the value of a *female* life at "the age of the wife. From this value subtract the va-"lue in Table IV. of the joint continuance of two lives "at the ages of the husband and wife. The remainder "will be the value in a *single present* payment of an an-"nuity for the life of the wife should she be left a wi-"dow. And this last value divided by the value of the "joint lives increased by unity, will be the value of the "same annuity in *annual* payments during the joint lives, "and to commence immediately."

Example. Let the age of the wife be 24, and of the husband 30. The value in Table III. (reckoning interest at 4 *per cent.*) of a *female* life aged 24, is 17.252. The value in Table IV. of two joint lives aged 24 and 30, is 13.455, which subtracted from 17.252 leaves 3.797, the value, in a *single present* payment, of an annuity of 1*l.* for the life of the wife after the husband; that is, for the life of the *widow*. The annuity, therefore, being supposed 20*l.* its value, in a *single payment*, is 20 multiplied by 3.797, that is, *l.* 75.94. And this last value divided by 14.455 (that is, by the value of the joint lives increased by unity) gives 5.25, the value in *annual payments* beginning immediately, and to be continued during the joint lives of an annuity of 20*l.* to a wife aged 24 for her life, after her husband aged 30.

In order to give as full directions as possible in this important case, we shall here insert the following table, taken from the Treatise on Reversionary Payments, vol. ii. p. 165.

TABLE VI.

Shewing the value of an annuity for the life of a wife after the death of her husband, deduced from the Sweden observations, on the *separate* probabilities of the duration of life among males and females.

Annuity 10*l.* Interest 4 *per cent.*

Wife's age.	Husb. age.	Value of the Ann. Single Paym. C.	Value of the Ann. Ann paym. C.
16	16	30.63	1.87
	22	35.92	2.26
	28	42.08	2.76
	34	49.04	3.38
	40	58.54	4.31
	46	68.62	5.46
	52	81.60	7.24
	58	96.25	9.82
20	20	31.90	2.03
	26	37.28	2.46
	32	43.60	3.00
	38	51.52	3.80
	44	61.21	4.80
	50	73.05	6.31
	56	86.44	8.36
	62	102.14	11.79
24	24	32.32	2.15
	30	37.97	2.62
	36	44.51	3.22
	42	53.79	4.18
	48	63.90	5.38
	54	76.50	7.21
	60	91.55	10.06
28	28	32.64	2.28
	34	38.25	2.77
	40	46.35	3.58
	46	55.16	4.57
	52	66.94	6.14
	58	80.54	8.45
	64	95.56	11.90
32	32	33.16	2.43
	38	39.52	3.04
	44	47.71	3.92
	50	58.13	5.22
	56	70.29	7.09
	62	84.95	10.05
	68	100.24	14.49

Wife's age.	Husb. age.	Value of the Ann. Single payment. C.	Value of the Ann. Ann. paym. C.
36	36	33.74	2.61
	42	41.81	3.86
	48	49.64	4.38
	54	61.71	6.04
	60	74.44	8.43
	66	88.76	12.00
42	42	34.62	3.00
	48	41.81	3.86
	54	51.63	5.25
	60	64.25	7.49
	66	77.69	10.75
	72	92.63	16.16
46	46	34.15	3.18
	52	42.54	4.29
	58	53.10	6.00
	64	65.65	8.65
	70	79.97	12.99
50	50	33.42	3.44
	56	41.75	4.70
	62	53.00	6.83
	68	65.62	10.11
54	54	31.89	3.63
	60	41.23	5.27
	66	51.94	7.70
	72	64.82	11.88
58	58	30.14	3.92
	64	39.04	5.75
	70	50.28	8.87

In most of the societies for providing annuities for widows, the right to the annuity is made to depend on the continuance of the husband's life for a given term. In this case the value of the annuity is to be obtained by the following rule.

Rule. "Find the value of the annuity for two lives "greater by the given term of years than the given lives. "*Discount* this value for the given term (that is, multi-"ply it by the value of 1*l.* due at the end of the given "term), and then multiply it again by the probability "that the two given lives shall *both* continue the given "term. This last product will be the answer in a *single* "*present payment*. And this answer divided by the va-"lue of the joint lives increased by unity, will be the "answer

" anfwer in *annual* payments, to commence immedi- " ately, and to be continued during the joint lives."

Example. The value is required of an annuity of 1*l.* for the life of a wife aged 20, after her hufband aged 26; provided the hufband lives four years. Intereft at 4 *per cent.*

Anfwer. The given lives increafed by four years become 24 and 30. The value of an annuity for the life of a wife aged 24, after her hufband aged 30, has been juft found to be 3.797, which difcounted for four years (that is, multiplied by .8548, the value of 1*l.* due at the end of four years, by Table II. under Annuities) becomes 3.245. The probability that a female life aged 20 fhall continue four years is (by Table I.) $\frac{5636}{5809}$. The probability that a *male* life aged 26 fhall continue four years is $\frac{5040}{5268}$. The probability, therefore, that the two lives fhall *both* continue four years is $\frac{5636}{5809}$ multiplied by $\frac{5040}{5268}$. The product is [illegible], which multiplied by 3.245 gives 3.017, the anfwer in a fingle payment. And 3.017 divided by 15.144 (the value increafed by unity of two joint lives aged 20 and 26, by Table IV.) gives .199, the value in annual payments, to commence immediately, and to be continued during the joint lives of the hufband and the wife. The annuity, therefore, being fuppofed 20*l.* (to be enjoyed for life by a wife aged 20, after her hufband aged 26, *provided* he lives four years) the value is, in a *fingle prefent payment*, *l.* 60.34; and, in *annual payments*, *l.* 3.99.

Problems in the doctrine of reverfionary fums and annuities payable on *furvivorfhips.*

Problem I. To find the value of an *annuity* payable for what fhall happen to remain of a given life, after it has furvived another given life.

Solution. From the value of the life of the expectant fubtract the value of the joint lives. The remainder will be the number of years purchafe which ought to be given for the annuity.

Example. Let the expectant be a male aged 24, who is to enjoy 20*l.* *per annum* for his life, after a female aged 30. The value of his life, reckoning intereft at 4 *per cent.* is (by Table III.) 16.742. The value of the joint lives is (by Table IV.) 13.455; which fubtracted from 16.742, leaves 3.287, the number of years purchafe to be given for the annuity; which being 20*l* its value is 65.74*l.* in a *fingle payment.* And *l.* 65.74, divided by 14.455 (that is, by the value of the joint lives increafed by unity) gives *l.* 4.54, the value, in *annual payments*, to commence immediately, and to be continued during the joint lives.

N. B. It has been before fhewn, that had the *expectant* been a female aged 24, and the *poffeffor* a male aged 30, the former value would have been 75.94; and the latter *l.* 5.25. Such is the difference in this cafe depending on the *furvivorfhip* being that of a female rather than a male. In many other cafes the difference is much greater.

Problem II. To find the prefent value of an *eftate* of a given yearly value, to be entered upon on the *furvivorfhip* of a given life beyond another.

Solution. Find the value of an annuity on two equal joint lives, whofe common age is equal to the age of the oldeft of the two propofed lives, which value fubtract from the perpetuity, and take *half* the remainder. Then fay as the *expectation* of the youngeft of the two lives is to that of the oldeft, fo is the faid half remainder to a fourth proportional, which will be the number of years purchafe required when the life of the expectant is the oldeft of the two. But if the *expectant* is the youngeft, then add the value fo found to that of the joint lives, and let the fum be fubtracted from the perpetuity, and the anfwer will be obtained in this cafe.

The value thus found, divided by the value of the joint lives, increafed by unity, will give the value in *annual* payments, beginning immediately, and to be continued during the joint lives.

N. B. In this and all the following folutions, no diftinction is made between the lives of males and females.

Example. Suppofe the ages of the two lives to be 30 and 24, the former of which is the expectant. Let the yearly value (or *net rent*) of the eftate be 20*l.* and the rate of intereft 4 *per cent.* The value of two equal joint lives, aged 30, is (by Table IV.) 12.965; the perpetuity is 25; the difference is 12.035; the *half* of which is 6.017; the expectation of the *youngeft* life is (by Table II.) 35.27; and of the *oldeft* life, 31.21. Therefore, as 35.27 is to 31.21, fo is 6.017 to 5.324 years purchafe, which multiplied by 20 (the rent of the eftate), gives 106.48, the required value *in a fingle payment* of a reverfionary eftate to come to a perfon aged 30, provided he furvives a perfon aged 24. And 106 48, divided by 14.455 (the value of the joint lives increafed by unity), quotes 7.36, the value required in annual payments during the joint lives.

Had the youngeft life been the expectant, the value juft found in years purchafe (that is, 5.324) muft have been added to 13.455, the value (by Table IV.) of the joint lives, which would have made 18.779, and this fum fubtracted from 25 (the perpetuity), would have given 6.221, the value in years purchafe of the eftate, fuppofing it to come to the youngeft of two lives aged 24 and 30, provided it furvives the oldeft.

Problem III. To find the value in prefent money of a legacy or any grofs fum, payable to a perfon of a given age, on his furviving another perfon, whofe age is alfo given.

Find by the laft problem the value in years purchafe of an eftate whofe net rent is the fame with the intereft of the given fum; and this value divided by 1*l.* increafed by its intereft for a year, and the quotient multiplied by the intereft of the given fum will be its value in a *fingle payment.* And this *fingle payment,* divided by the value increafed by unity of the joint lives, will be the value in *annual payments*, to commence immediately.

Example. Suppofe, as in the laft example, the ages of the two lives to be 30 and 24, the former of which is expectant. Let the legacy be 500*l.* the intereft of which, at 4 *per cent.* is 20*l.* The value of an eftate of 20*l.* *per ann.* to come to a perfon aged 30, if he furvives a perfon aged 24, is, by the folution of the laft problem, 5.324 years purchafe, which divided by 1.04 (that is, 1*l.* increafed by its intereft at 4 *per cent.* for a year), and multiplied by 20*l.* gives 102.2, the required value in a fingle payment of 500*l.* payable to a perfon aged 30, on his furviving a perfon aged 24. The value in annual payments, during the joint lives, is *l.* 7.01. The reafon of the difference between the value of an *eftate*, and a *fum* equivalent to it, may be feen in the Treatife on Reverfionary Payments, vol. i. chap. 1. queft. 10.

Problem IV. To find the annuity payable during life to a perfon of a given age, if he furvives another perfon whofe age is given, and which is equivalent in prefent value to a given fum or legacy payable on the fame condition.

Solution. Find the difference between the value of the fingle life of the expectant, and the value of the joint lives. Find alfo, by the laft problem, the value in a fingle payment of the given fum or legacy. The latter divided by the former will give the required life-annuity.

Example. Let the ages be 30 and 24, the former of which is expectant. Let the fum be 500*l.* and the rate of intereft 4 *per cent.* The value of the life of the expectant (in the columns for lives in general, in Table III.) is 16.006; the value of the joint lives is (by Table IV.) 13.455; the difference is 2.551. The value, by the laft problem, of 500*l.* payable, if a life aged 30, furvives a life aged 24, is 102.2, which divided by 2.551, gives 40.06, the life-annuity, equivalent in value to the fum, reckoning intereft at 4 *per cent.*

The following table has been computed by the two laft rules.

TABLE VII.

Shewing the value of 100*l.* depending on the contingency of one life furviving another, according to the Northampton Table of Obfervations (fee Table III. under Life-*annuities)*, reckoning intereft at 3 *per cent.*

Poffeffor.	Expectant.	Single Premium.	Annual Premium.	Equivalent Annuity.	Poffeffor.	Expectant.	Single Premium.	Annual Premium.	Equivalent Annuity.
	10	24.749	1.427	5.723		60	14.083	1.439	14.264
	15	24.198	1.444	6.213	15	65	12.092	1.407	17.086
	20	23.498	1.455	6.738		70	9.973	1.373	21.219
	25	22.531	1.437	7.197		10	29.461	1.824	5.345
	30	21.468	1.417	7.746		15	28.786	1.838	5.760
	35	20.317	1.399	8.422		20	27.961	1.848	6.207
10	40	19.070	1.383	9.272		25	26.811	1.819	6.582
	45	17.696	1.364	10.314		30	25.546	1.788	7.027
	50	16.214	1.346	11.652		35	24.176	1.759	7.570
	55	14.631	1.324	13.362	20	40	22.692	1.733	8.246
	60	12.925	1.299	15.671		45	21.058	1.703	9.059
	65	11.098	1.273	18.935		50	19.294	1.674	10.085
	70	9.153	1.246	23.651		55	17.410	1.640	11.356
	10	26.979	1.609	5.505		60	15.381	1.603	13.029
	15	26.365	1.625	5.954		65	13.206	1.564	15.341
	20	25.602	1.635	6.435		70	10.892	1.523	18.634
	25	24.549	1.612	6.849		10	31.789	2.027	5.316
15	30	23.391	1.588	7.340		15	31.093	2.042	5.729
	35	22.136	1.564	7.944		20	30.254	2.052	6.178
	40	20.778	1.544	8.698	25	25	29.053	2.020	6.557
	45	19.281	1.520	9.617		30	27.683	1.982	6.998
	50	17.666	1.497	10.791		35	26.198	1.946	7.540
	55	15.941	1.469	12.271		40	24.590	1.913	8.215

Possessor.	Expectant.	Single Premium.	Annual Premium.	Equivalent Annuity.
	45	22.819	1.876	9.027
	50	20.907	1.841	10.055
25	55	18.866	1.799	11.329
	60	16.667	1.755	13.004
	65	14.310	1.710	15.313
	70	11.803	1.662	18.595
	10	34.404	2.271	5.282
	15	33.694	2.287	5.689
	20	32.843	2.299	6.136
	25	31.640	2.266	6.526
	30	30.209	2.223	6.974
	35	28.589	2.177	7.510
30	40	26.834	2.135	8.183
	45	24.901	2.088	8.995
	50	22.815	2.044	10.025
	55	20.588	1.993	11.307
	60	18.188	1.939	12.997
	65	15.616	1.885	15.330
	70	12.880	1.829	18.642
	10	37.375	2.573	5.236
	15	36.647	2.590	5.632
	20	35.794	2.604	6.073
	25	34.588	2.569	6.464
	30	33.166	2.526	6.924
	35	31.472	2.474	7.466
35	40	29.540	2.419	8.128
	45	27.413	2.359	8.930
	50	25.116	2.302	9.952
	55	22.664	2.237	11.227
	60	20.022	2.170	12.917
	65	17.191	2.102	15.255
	70	14.179	2.034	18.590
	10	40.763	2.956	5.178
	15	40.023	2.974	5.560
	20	39.164	2.991	5.986
	25	37.969	2.954	6.371
	30	36.560	2.909	6.830
	35	34.888	2.857	7.384
40	40	32.868	2.794	8.048
	45	30.301	2.715	8.825
	50	27.946	2.639	9.821
	55	25.218	2.555	11.064
	60	22.278	2.468	12.714
	65	19.128	2.382	15.005
	70	15.776	2.296	18.274
	10	44.511	3.430	5.124
	15	43.766	3.450	5.491
	20	42.921	3.471	5.903
	25	41.753	3.433	6.278
45	30	40.369	3.386	6.730
	35	38.735	3.333	7.287
	40	36.775	3.273	7.974
	45	34.306	3.183	8.762
	50	31.432	3.080	9.727
	55	28.364	2.968	10.940

Possessor.	Expectant.	Single Premium.	Annual Premium.	Equivalent Annuity.
	60	25.057	2.854	12.552
45	65	21.514	2.740	14.797
	70	17.744	2.629	18.012
	10	48.705	4.044	5.064
	15	47.968	4.066	5.415
	20	47.144	4.091	5.809
	25	46.017	4.052	6.170
	30	44.680	4.004	6.608
	35	43.101	3.950	7.153
50	40	41.208	3.891	7.838
	45	38.846	3.807	8.657
	50	35.853	3.691	9.634
	55	32.353	3.535	10.791
	60	28.581	3.778	12.338
	65	24.540	3.224	14.491
	70	20.239	3.075	17.570
	10	53.170	4.810	5.012
	15	52.454	4.834	5.349
	20	51.668	4.867	5.727
	25	50.596	4.826	6.074
	30	49.329	4.776	6.497
	35	47.829	4.721	7.027
55	40	46.034	4.664	7.702
	45	43.800	4.583	8.530
	50	40.993	4.479	9.569
	55	37.357	4.303	10.771
	60	33.002	4.080	12.272
	65	28.336	3.863	14.383
	70	23.370	3.656	17.409
	10	58.087	5.836	4.960
	15	57.403	5.863	5.282
	20	56.669	5.905	5.643
	25	55.675	5.863	5.975
	30	54.499	5.811	6.379
	35	53.103	5.755	6.887
60	40	51.437	5.699	7.539
	45	49.367	5.622	8.352
	50	46.777	5.529	9.402
	55	43.439	5.371	10.695
	60	38.923	5.117	12.274
	65	33.419	4.795	14.315
	70	27.563	4.490	17.283
	10	63.570	7.285	4.906
	15	62.870	7.313	5.213
	20	62.203	7.367	5.556
	25	61.311	7.325	5.871
	30	60.251	7.271	6.253
	35	58.990	7.213	6.734
65	40	57.484	7.159	7.353
	45	55.620	7.085	8.130
	50	53.293	7.002	9.149
	55	50.302	6.858	10.446
	60	46.279	6.640	12.156
	65	40.576	6.270	14.321
	70	33.466	5.787	17.150

N. B. This is one of the tables of the Equitable Society for Assurances on Lives and *Survivorships*. See ASSURANCES.

Explanation. The annual premium in this table is supposed to be payable during the *joint continuance* of the lives of the *possessor* and *expectant*; and the first payment is supposed to be made at the time of purchasing the assurance.

The *equivalent annuity* signifies that annuity to which either the *single* premium specified in the table, or the *annual* premium, will entitle an *expectant* during his *survivorship*, should such an annuity be preferred to a gross sum payable on *survivorship*. Thus, the payment of either *l.* 34.588 (34*l.* 11*s.* 10*d.*) in hand, or of *l.* 2.569 (2*l.* 11*s.* 5*d.*) annually, during the joint lives of a wife aged 25 and a husband aged 35, the first payment to be made immediately, will, according to this table, entitle the wife, should she survive the husband, either to 100*l.* payable to her when she becomes a widow, or to an annuity payable during her life, after becoming a widow, of *l.* 6.464 (6*l.* 9*s.* 4*d.*) If she is 35 (or of the same age with her husband) a single payment of *l.* 31.472, or an annual payment of *l.* 2.474 will, by the table, entitle her either to 100*l.* payable on her *survivorship*, or to an annuity for her life of *l.* 7.466, after *survivorship*.

Any payments greater or less will entitle to gross sums or annuities proportionably greater or less.

Problem V. To find the value of an estate to be entered upon at the decease of B, provided he survives A.

Answer. Find the value of an annuity on the *longest* of two equal lives (see LIFE-*annuities*), whose common age is that of the older of the two lives A and B, which value subtract from the perpetuity, and take *half* the remainder. Then it will be as the expectation of the duration of the younger of the lives A and B is to that of the older, so is the said half remainder to the number of years purchase required, when B is the oldest of the two. But if B be the youngest, then to the number of years purchase thus found, add the value of an annuity on the longest of the lives A and B, and subtract the sum from the perpetuity for the answer in this case.

The value of the reversion in *annual* payments, till the claim is *determined*, is found by dividing the *single present* payment by the value of the two joint lives; and the same value in *annual* payments, till the claim *becomes due*, is found by dividing the single payment by the value of the life of B.

Example. Let the age of A be 30, and that of B 60 years. Let the given estate be 40*l.* *per ann.* and interest at 4 *per cent.* The value of the longest of two lives whose common age is 60, is, according to column 3, Table III. and by Problem VI. under LIFE-*annuities*, 11.474, which taken from 25, the perpetuity, leaves 13.526 for the remainder: therefore it will be as 31.21, the expectation of A, by Table II. is to 12.63, the expectation of B, so is 6.762, the half remainder, to 2.733, the number of years purchase required, which being multiplied by 40, gives 109.32 for the value in one present payment.

But if A had been 60, and B 30, the value required would have been 5.433, multiplied into 40, or 217.42, because the value of the longest of the two lives A and B (by column 3, Table III. and the rule in Prob. VI. under LIFE-*annuities*) is 16.828 years purchase.

These problems include all the cases of *survivorship* between two lives for *their whole duration*. The two following problems relate to cases of *survivorship* between two lives, when the *survivorship* is restricted to a term of years less than the whole duration of the lives.

Problem VI. "B, expectant, will lose a given sum, "should he survive A, *within a given time*. What "ought he to pay for the *assurance* of it?" In other words: "What ought he to pay for a given sum to be "received at the death of A, should he happen to sur-"vive him within a given time?"

Answer. Divide the *sum* of the decrements of life in the Table of Observations from the age of A, for the given time, by the given time; and, by the *quotient*, divide the number of the living in the table at the age of A; and, again, by this *second* quotient, divide the given sum, reserving the *third* quotient.

(N.B. When the age of A is under 60, and the term so large as to exceed the difference between it and 70, it will be best, when the London table is used, to divide the given sum, not by the second quotient here mentioned, but by the *complement* of the life of A.)

Find the value of an annuity on the life of B, for the given time. To this value add the *quotient*, that will arise from dividing the value of an annuity certain, for the given time, by twice the *complement* of the life of B; and the *sum*, multiplied by the *reserved quotient*, will be the required value in a single present payment.

Example. Let the Table of Observations be Mr. Simpson's for London (see EXPECTATION). Let the rate of interest be 3 *per cent.* A, seven years of age. B, 30. The given time 14 years; the given sum 100*l.* The sum of the *decrements* for 14 years from the age of 7, is 73, which, divided by 14, gives 5.2. The number of the living at seven is 430, which, divided by 5.2, and 100*l.* divided by the quotient, gives *l.* 1.21, the *quotient* to be *reserved*.

The value of an annuity for 14 years on the life of B, is, by Prob. IV. under LIFE-*annuities*, 9.5. The value of an annuity certain for 14 years, is by Table III. under ANNUITIES, 11.296, which, divided by 94.4 (twice the *complement* of the life of B), gives .12, which, added to 9.5, gives 9.62; and this again multiplied by 1.21, the *reserved quotient*, gives 11.64, the *present* value in *one* payment of 100*l.* payable at the death of A, aged 7, to B, aged 30, should A die and leave B the survivor within 14 years.

(N. B. The expectation of B is 23.6, by the Table under EXPECTATION; and it should be remembered, that twice the expectation is always the complement of a life.)

The present value for 14 years of two joint lives, one 7, and the other 30 years of age, may be found in the method explained under LIFE-*annuities*, to be nearly 9 years purchase; and, *l.* 11.64 divided by this value, with unity added, or by 10, gives 1.164, the foregoing value in *annual payments* during the joint lives for 14 years, the *first* payment to be made immediately, and the *last* payment at the end of 14 years, should the joint lives not fail.

Scholium. It deserves particularly to be remembered, that in this method likewise may be calculated, what sums

sums ought to be paid on any *survivorship*, within a given time, of one life beyond another, in consideration of any given sum now advanced. The following example of this is a case which has offered itself in practice.

"A person, aged 30, has in expectation an estate which " is to come to him, provided he survives a *minor*, aged " 7, before he is out of his minority; that is, provided " he should be himself living at the time of the minor's " death, should that happen before he is 21. In these " circumstances, he wants to borrow 1000*l*. on his *ex-* " *pectation*. What *reversion* out of the estate depending " on such a *survivorship*, is a proper equivalent for this " sum now advanced, interest being reckoned at 3 *per* " *cent.* and the probabilities of life being supposed the " same with those in Mr. Simpson's Table of London " Observations?"

Answer. It appears from what has been just determined, that for *l*. 11.64 now advanced, the proper equivalent in such circumstances, is, 100*l*. to be paid, in case the *survivorship* should take place; or as much of the estate as 100*l*. will buy at 3 *per cent.* supposing the first rent to be received immediately, that is, *l*.2.912 *per annum*. By the rule of proportion, therefore, for 1000*l*. the proper equivalent will be 8591*l*. in money, or 250*l*. *per annum* out of the estate.

Problem VII. "100*l*. will be lost to B's heirs, should " he happen to die after A, *within a given time*. What " is the price of the *assurance* of it?—That is: what is " the present value of 100*l*. payable at the death of B, " provided his death should happen *after* A's death, " *within a given time*?"

Answer. Divide the sum of the decrements of life in the Table of Observations, from the age of B, for the given time, by the given time; and by the *quotient* divide the number of the living at the age of B; and again, by this *second quotient*, divide the given sum, reserving the *third quotient*.

Find the value of an annuity on the life A for a number of years, less by *one* year than the given time, which subtract from the value of an annuity certain for the same number of years. Multiply the *remainder* by the *reserved quotient*, and divide the *product* by the amount of 1*l*. for one year, and let this be a *second* reserved quotient.

Again. Multiply into one another the *first* reserved quotient, and the value of an annuity certain for the given time; and divide the product by twice the *complement* of A's life. This *last* quotient, added to the *second* reserved quotient, will be the *answer* in a present single payment.

Example. Let the age of B be 40. Of A 30. The sum 100*l*. Rate of interest 4 *per cent*. The given time 20 years. The Table of Observations, Mr. Simpson's. See Expectation.

The sum of the decrements of life, in this table, from the age of 40 for 20 years, is 127, which, divided by 20 (the given time), gives 6.38. The number of the living at 40 is 229, which, divided by 6.38, gives 35.8; and 100*l*. (the given sum) divided by 35.8, gives 2.79, the *first* quotient to be reserved.

The value of an annuity for 19 years on a life at 30 years of age, is 10.3; which, subtracted from 13.134, the value of an annuity *certain* for 19 years, by Table III. under Annuities, and the remainder multiplied by 2.79, gives 7.89. This product divided by 1.04 (the amount of 1*l*. in one year) gives 7.60; the *second* reserved quotient.

2 79 multiplied by 13.59, (the value of an annuity certain for 20 years) gives 37.916; and this *product* divided by 94.4 (twice the complement of A's life) gives .401, which, added to 7.60, gives 8*l*. the answer; or, the value of 100*l*. payable at the death of B, on the contingency of his surviving A, aged 30, and *both* dying in 20 years.

It is plain, that this is likewise the sum that ought to be lent to B now, on the expectation of 100*l*. at his death, provided it should happen after A's death in 20 years.

This rule gives the just solution in all cases, except when B, the expectant, is the *youngest* of the two lives, and at the same time the term of years *greater* than the complement of A's life. In this particular case the following rule must be used.

Find, by the preceding rule, the value of the assurance of the given sum for a term of years, equal to the complement of A's life, and let this value be *reserved*. Multiply by one another the given *sum*; the *value* of 1*l*. to be received at the end of a number of years equal to the complement of A's life; and the value of an *annuity certain* for as many years as the given term exceeds this complement; and the *product*, divided by the complement of B's life, and the *quotient* added to the *value reserved*, will be the true value sought.

Example. Let the age of B be 30; of A 40. The term 47 years; and every thing else as in the last example. The complement of A's life is 39.2. The value of 100*l*. to be received at the death of B, if he survives A within 39 years, may be found by the preceding rule to be *l* 16.15; the value to be reserved. The value of 1*l*. to be received at the end of 39 years is, by Table II. under Annuities, .2166. The value of an annuity *certain* for 8 years (the excess of the given term above the complement of the life of B,) is 6.733.

And these two values multiplied by one another, and by 100*l*. give 145.83; which, divided by 47.2 (the complement of the life of B), and 16.15, added to the quotient, make *l*.19.23, the value sought.

Remark. As after finding the present value of an estate, or annuity, it is necessary to *divide* that value by the amount of 1*l*. in one year, in order to find the present value of a *sum* equivalent to the *annuity*; so, after finding the value of a sum, it is necessary to *multiply* that value by the said amount, in order to find from it the value of an equivalent annuity.

In the first example, therefore, the value of an estate of 4*l*. *per annum*, would be £8.32. In the second example, 20*l*. And this is, as it ought to be, the value for the whole duration of the lives.

The cases of *survivorships* between three lives are so numerous, that an account of them cannot be given here. We must, therefore, refer for this to Mr. Morgan's Treatise.

SUS, in *Zoology*. See Hog.

Sus *agrestis*. See *Wild* Boar.

Sus-*piscis*, in *Ichthyology*, a name given by Ovid, and some other of the ancient writers, to the fish called also *us* and *mus*, and by the later writers *capriscus*. See Goat-*fish*.

SUSCEPTOR, among the Romans, a citizen chosen by the decuriones to collect the debts belonging to the public.

Susceptor is also a term used by ecclesiastical writers for sponsor.

Susceptor *aurarius*, in *Middle Age Writers*. See Auraria.

SUSPENSE, Suspensio, in *Common Law*, denotes a temporary stop or cessation of a man's right for a time. As, when the rent, or other profits of land, by reason of the unity of possession of the rent, and the land out of which it issues, is not in esse for a certain time, but *tunc dormit*, or *remains asleep*; but so as it may be revived or awaked. By which, *suspension* differs from *extinguishment*, where the right dies for ever.

SUSPENSION, Suspensio, the act of preventing the effect or course of any thing for a certain time.

The principal point urged in the philosophy of the Sceptics and Pyrrhonians, is a *suspension* of mind.

Suspension *of arms*, in *War*, is a short truce which the contending parties agree on, for the burial of their dead, the waiting for succours, or the order of their masters, &c.

In rhetoric, *suspension* is a keeping the hearer attentive and doubtful, in expectation of what the speaker will conclude with.

Suspension, in *Mechanics*. *Points of suspension* in a balance, are those points in the axis or beam wherein the weights are applied, or from which they are suspended.

Suspension, in *Law*, denotes a censure inflicted by way of punishment, on an ecclesiastic, for some considerable fault.

It is of two kinds, viz. *ab officio*, and *a beneficio*.

Suspension *ab officio*, is that whereby a minister is, for a time, forbidden to execute the office of a minister.

Suspension *a beneficio*, is when a minister is, for a time, deprived of the profits of his benefice.

Where the fault is more notorious, the two kinds of *suspension* are sometimes joined; and the person both *suspended ab officio*, and *a beneficio*.

The penalty upon a clergyman officiating after *suspension*, if he shall persist therein after a reproof from the bishop, is (by the ancient canon law) that he shall be excommunicated all manner of ways, and every person who communicates with him shall be excommunicated also.

There is another sort of *suspension*, which extendeth also to the laity; *suspension ab ingressu ecclesiæ*, or from hearing of divine service, and receiving the holy sacrament; which may be, therefore, called a *temporary* excommunication.

SUSPENSOR *testiculi*, in *Anatomy*, a muscle called also cremaster.

SUSPENSORIUS, in *Anatomy*, a muscle of the eye. It is so called, from its use in such animals as go much with their head hanging down. Vesalius has described it as belonging to man, in whom it is never found. Fishes and

and fowls are commonly without it, as well as man; but oxen, and, so far as has been observed, all quadrupeds, are provided therewith; though it is not of the same structure in all. Dr. Porterfield, in Med. Eff. Edinb. vol. iii. art. 12.

The doctor thinks, that the use of this muscle is not only to suspend the eye, and preserve the optic nerve from being too much stretched, but principally to assist the straight muscles in moving the eye, according as its different fibres act.

SUSPIRAL, a spring of water, passing under-ground towards a conduit or cistern. Also a breathing-hole, or VENTIDUCT.

SUSSEX *marble*, a name given by many to a peculiar species of marble found in the county, the name of which it bears, and formerly much used in the pillars of churches, and other buildings, but now less regarded. The ground of this *marble* is grey, with a faint cast of green, and it is very thick set in all parts with shells; these are chiefly of the turbinated kind, and they are generally filled with a white spar, which adds very greatly to the beauty of the stone.

SUTE, SUYTE, or SUTE. See SUITE.

SUTH-DURE, in *Ancient Customs*, denotes the south door of a church, mentioned in old authors, as the usual place where canonical purgation was performed. That is, when a fact could not be proved by sufficient evidence, the party accused came to the *south door* of the church; and there, in the presence of the people, made oath that he was innocent.

This was called *judicium Dei*. And it is for this reason that large porches were anciently built at the *south doors* of churches.

SUTLER, in *Military Language*, denotes one who follows the army, and furnishes provisions for the troops. The *sutlers* pitch their tents and build their huts in the rear of each regiment, and about head-quarters.

SUTORIUS, in *Anatomy*, a name given by Riolanus to a muscle of the leg, called by Cowper, Albinus, and others, the *sartorius*. The French authors call it the *couturier*; Vesalius, and others of the more early anatomical writers, have called it the *primus tibiam moventium*.

SUTTON's *quadrant*. See QUADRANT.

SUTURE, SUTURA, in *Anatomy*, a peculiar kind of juncture, or articulation, of certain bones in the animal body; thus called, as resembling a seam.

There are two kind of *suture*; one called the *true* or *genuine suture*; wherein bones are indented like saws, and reciprocally received into each other.

The other, called *false*, *spurious*, or *squammous suture*; wherein the bones are laid over each other, like the scales of fishes.

The bones of the cranium are usually joined by three genuine *sutures*; the *coronal*, reaching across from one temple to the other. See *Tab. Anat.* (*Osteol.*) *fig.* 1. *lit. g. fig.* 2. *lit. h.* and the article CORONALIS. The *sagittal*, joining the ossa parietalia. See *Tab. Anat.* (*Osteol.*) *fig.* 1. *lit. f. fig.* 2. *lit.* i. and the article SAGITTAL. And the *lamboidal*; thus called from its resembling the Greek Λ, lambda.

Besides these, there is a fourth *suture*, of the spurious or squammous kind, supposed, though falsely, to have no indentures: it joins the ossa temporum to the os sphenoides, occipitis, &c. and is also called the *temporal suture*. See *Tab. Anat.* (*Osteol.*) *fig.* 2. *lit. k.* See also SQUAMMOUS.

Natural historians tell us, that in Persia it is frequent to have people without any *sutures* at all in the skull; but the whole one solid bone; yet without any apparent inconvenience: and M. Flechier, in his Life of cardinal Ximenes, affirms the same of that cardinal: yet it should seem, that great disorders must arise therefrom; as the perspiration can be but very imperfectly effected; whence heaviness and swimming in the head. See SKULL.

SUTURE, *sphenoidal*. See SPHENOIDAL.

SUTURE, in *Surgery*, denotes a seam made to close the lips of a wound, in order to its healing.

All wounds are not to be united by the needle, but those only that are oblique, transverse, or angular, and at the same time very large and deep; or in cases where a part is very nearly cut off; or if a wound is so circumstanced, that it cannot be kept in a proper situation by plasters and bandages. Wounds that are to be stitched, should be in their recent state, and must be first well cleansed from extravasated blood, and all extraneous bodies; there should also be no loss of substance, except in those fleshy parts that are easily elongated; and no contusion, nor any sign of inflammation.

The ancients invented a great variety of *sutures*, which they reduced to three kinds; *incarnatives*, *restrictives*, and *conservatives*.

SUTURE, *incarnative*, is thus called, because, by rejoining the edges of a wound, and keeping them together by means of a thread run across them with a needle, they grow together, and incarnate as before.

This they subdivided into five kinds, viz. the *interrupted*, *intertwisted*, *pinned*, or *feathered*, *with clasps*, and the *dry suture*.

Of these five, two are altogether disused, viz. the *feathered suture*, and the *suture with clasps*, as being too barbarous, and at the same time unnecessary. The first was called *pinned*, when little pins were made use of; and *feathered*, when the barrels were of feathers or quills.

To perform it, two or three needles threaded with a double thread, were passed through the lips of the wound, at a finger's breadth from each other, and a pin or feather put in the stitch; and another pin or feather bound with the ends of the same thread, that the feather might keep the lips of the wound close together.

To perform the second, they had large, crooked clasps, pointed at each end; one of which they thrust into the upper part of the wound, the other into the lower, to bring the lips together.

These *sutures*, cruel as they were, are yet known to be useless; for in the only cases where they should seem serviceable, viz. in deep wounds, where the contraction of the fleshy parts keeps the lips far asunder, and in wounds of tendons; they expose the patient to terrible convulsions and shudderings, which are avoided by diminishing the dilatation of the wounds, by moderate compressions, and patiently waiting till the fibres relax.

SUTURES, *restrictive*, were those wherewith they endeavoured to stop the flux of blood from large wounds, where any considerable vessels were cut.

To this end they invented several kinds, in the number whereof were the *shoemakers*, *taylors*, *skinners*, and other *seams*, each more impertinent than the other. It is evident, the very design of such a *suture* is blameable; for, supposing the wound so exactly sewed up, that no blood could escape through the lips thereof; yet will it still flow out of the vessels; and will thus be forced to make its way between the laminæ of the muscles, by which means the part will swell, rot, and gangrene. Yet the *skinners suture*, *sutura pellionum*, is still in use for wounds of the intestines: it is thus called, because the skinners use the like, in sewing up the holes made by the butchers, in flaying off the skin.

SUTURE, *conservative*, is that kind of ancient *suture*, whereby the lips of large wounds, wherein there was a loss of substance, were prevented from receding too far. But a bandage now suffices.

SUTURE, *bloody*. In large wounds, especially transverse ones, as their lips cannot be kept in their situation by means of the dry *suture*, which is frequently the case in wounds of the thigh, or in the abdomen, nates, or arms; or when pieces hang from the wounded part, as often happens in wounds of the forehead, cheeks, nose, or ears; or when wounds are large, and made in an angular or cruciform manner, the needle must be used to bring their lips together; and this is called the *bloody*, or the *true suture*. This operation is also distinguished in two kinds, the simple, and compound.

The simple *suture* is that which is performed only by the assistance of the needle and thread: to this class belong the interrupted *suture*, the glover's *suture*, and the twisted *suture*; the last of these is seldom used but in cases of the hare-lip, and the second only in wounds of the intestines; but the first is in common use for all wounds which require the true, or *bloody suture*.

The compound *suture*, is that which requires other assistances besides the needle and thread.

The best method of making the common, or interrupted *suture*, is this: take a double thread, well waxed, pass it through a strong crooked needle; when the lips of the wound are brought together, and held firmly in their proper situation by an assistant, with one stroke pierce through them both, passing the needle through the lower lip from without inwards almost to the bottom, and so on from within outwards, observing to make the punctures at a finger's breadth distance from the wound, which in this case we will suppose to be in length two fingers, varying this distance according to the size of the wound. After taking off the needle, tie the ends of the thread first in a single knot, and then in a slip knot, covering all with the same dressings, as are used in the dry *suture*. But if the wound be so large, that one stitch will not be sufficient, then two or more are to be made, according to the length of it, at about a finger's breadth distance one from the other. To prevent the knots from bringing on any mischief, lay a small linen compress over the single knot, and make the slip-knot over that; which, if any pain or inflammation should succeed, may be afterwards easily loosened at pleasure.

This is the method to be obferved in ftraight, oblique, or tranfverfe wounds; but where there are angles, as in a triangular wound, you are to proceed in the fame manner, but obferve to let the *future* begin at the angle, and the other ftitches be taken about the middle, both ways; but if the wound be quadrangular, or have two angles, like the Greek letter Π, which fometimes happens in the face, then the *futures* muft be made in both the angles; and when the wound is fo large, that thefe are not fufficient, then as many more, as are neceffary, muft be made in the midway between them. When you meet with a cruciform wound, and the lips of it cannot be kept together by the ufe of plafters, the *bloody future* muft be made, by paffing the needle through the lips, near the end of each extremity of the wound; and when the ftitches are all thus made, the threads muft be tied as in the other cafes. Heifter.

SUTURE, *compound*. Some of the furgeons among the ancients ufed a *compound future* for large wounds, inftead of the interrupted *future*, now generally practifed: they preferred this method, becaufe it prevented the lips of the wound from being lacerated, which fometimes happened when the other method was ufed, and not only prevented the wound from uniting, but frequently brought on other grievous diforders; and though this method has of late years been rejected, and particularly by Dionis, in his Surgery, yet many ftill prefer it in feveral cafes to the common interrupted *future*: but inftead of the pieces of wood ufed by the ancients, thofe who now practife it ufe pieces of plafter rolled up in a cylindrical form, of the length of the wound, and of about the fize of a goofe-quill, from whence it is called by fome the *quilled future*. This method prevents tumors, pain, and inflammations, which might be brought on by the hardnefs and preffure of wood.

Palfynus performs this operation, in deep wounds of the mufcular parts, with a large and ftrong crooked needle, furnifhed with a double thread well waxed, which has alfo a bow at one end. The needle thus fitted being paffed through both lips of the wound, in the fame manner as in the other operations of the true *future*, and afterwards a fecond, and a third, paffed in the fame manner, a roll of plafter is to be introduced into the bow ends of the thread, which are left hanging out; then when the needle is taken out at the other fide, another roll of plafter is to be placed between the ends of the thread; and the lips of the wound being brought together, thefe ends are to be gently tied over the roll, firft in a fingle and then in a flip-knot. If there are three of thefe threads, you are to tie the middle one firft, and afterwards the reft in the fame manner.

On the firft days after the operation of the *future* is performed, in whatever method that be done, the bandage and comprefs are to be gently removed, and the ftate of the wound examined: if every thing now looks well, and there is little or no pain, or inflammation, the *futures* are to be left alone for fix or feven days, or longer, and the wound dreffed till there appears a ftrict union in the lips. If, in any of thefe examinations, the ftitches of the *future* are feen to be loofe, they muft be tightened, if too tight, loofened. When the lips of the wound appear to be enlarged or bruifed, they muft be dreffed with a digeftive ointment, the continuance of which ufually foon takes off thofe fymptoms; but if the wound be attended with great inflammation and a fever, the ftitches muft be loofened, and the patient blooded, kept on a thin diet, and the body kept open; if this method remove the fymptoms, the ftitches muft be tightened again, and the wound dreffed and managed as before; but if this method proves fruitlefs, and the fymptoms continue and increafe, the ftitches muft then be cut, and the wound treated as if there were a lofs of fubftance.

If the wound heals by the affiftance of the *future*, the threads of it are to be cut with fciffors, near the knots, and the lower lip of the wound to be fufpended with one hand, while the threads are gently drawn out with the other. The punctures that are left from them will eafily heal, by injecting the arquebufade-water, or fpirit of wine, or lime-water, and laying on compreffes dipt in the fame liquors. But larger wounds are to be dreffed with fome vulnerary balfam, and the lips kept firm together with fome fticking plafter, till a firm cicatrix is formed. Heifter.

SUTURE, *intertwifted*, is thus called, becaufe the needles being left fticking in the wound, the thread is wound around them; much after the fame manner as the taylors do the threaded needles they keep in their fleeves, &c. This *future* is performed two ways; for either the needles are paffed acrofs the wound, or they are ftuck on the fides thereof. This kind of *future* is ufed in the cure of a *hare*-LIP.

All the *futures* hitherto mentioned are made with needle and thread: but, befide thefe, there is another kind, called *dry* or *baftard futures*, which are performed with plafters; or other proper vifcous matter, to keep the lips of the wound united.

SUTURE, *the dry*, is ordinarily made with fmall pieces of leather, or linen cloth, indented like a faw, fo that the teeth may fall between each other, and the whole row may be clofed. The cloth, before it is cut into this form, is fpread with fome proper plafter in order to its firm adhefion.

This is to be ufed in flight wounds, and efpecially when they happen in the face; and indeed, wherever it may appear of force enough to keep the lips of the wound together; and as it gives no frefh pain, and occafions no fcar, it is much fitter for wounds of the face than the needle. The plafters, which are to form the *dry future*, fhould be of a fufficient length, and fhaped like the part to which they are to be applied, fo as to furround the greateft part of it, but not the whole, left they fhould retard the circulation of the blood, and bring on tumors, and mifchiefs of that kind: they muft alfo be fuch as will ftick very faft; the diachylon, if good, or the common fticking plafter, are fitteft for this purpofe. The hæmorrhage being well ftopped, and the wound well cleanfed, fome vulnerary balfam of the gummy kind, as the balfam of Peru, or the like, is to be applied; and over all a fticking plafter is to be laid, adapted to the fize of the part. Two or more of thefe may be applied, as occafion fhall require, leaving a fpace between, and they are to be fecured in their place by the application of proper bolfters and bandages.

Petit's method of making the *future* of this kind, is by letting the plafters have one, two, or more openings in the middle, through which the furgeon may difcover, as by the fpaces left between in the former method, whether the lips of the wound are properly united or not; and may alfo be able to apply proper remedies to the part, without removing the plafters. Thefe plafters are applied in the fame manner as the former, and left on till the work is completed.

But there is alfo yet another manner of performing the *dry future*, viz. fpread two plafters upon ftrong cloth, anfwering in fize to the wound; to the fides or margins of thefe faften three or four tape ftrings, according to the length of the wound, and then, after warming the plafters, apply them on each fide of the wound, at about a finger's breadth from it; after this bring the lips of the wound together, drefs it as in the former method, and while an affiftant keeps the lips of the wound together in a proper fituation, tie the ends of the tapes, firft in a fingle, and afterwards in a flip-knot, to keep the part in contact; over each of thefe fhould be laid an oblong comprefs, and over all a large fquare one, and the whole kept on by a proper bandage. The day following the wound is to be again examined, and if the tapes are loofened, they muft be drawn tighter again; but if they are not loofened, let them remain untouched, and only moiften the parts with a few drops of balfam, and cover them up again with the compreffes and bandages, as before. Some, inftead of the tape, ufe clafps of brafs, or fteel; but this method is much lefs convenient than the former, and therefore is little ufed. Heifter.

In the other kinds of *futures*, the ftitches ought always to be taken of a depth proportionable to that of the wound; care being had to avoid the nerves as much as poffible. In long wounds they are beft begun at the ends; but in fhort ones at the middle.

SUTURE *of the abdomen and inteftines*. See GASTRORAPHY, and *Wounds of the* INTESTINES.

SUTURE *of the tendons*. See TENDON.

SUTURE, in *Anatomy*. See SYNOTHROSIS.

SWAB, a fort of mop formed of a large bunch of old rope yarn, and ufed to clean the decks and cabins of a fhip. Hence

SWABBER, the title of an inferior officer on board a man of war, whofe office is to take care the fhip be kept neat and clean.

In order to this, he is to fee her wafhed well once or twice a week at leaft; efpecially about the gun-wales and chains.

He ought alfo to burn pitch, or fome fuch thing, now-and-then between decks, to prevent infection, and to acquaint the captain with fuch of the men as are nafty and offenfive.

SWAIN. See BOATSWAIN and COCKSWAIN.

SWAINMOTE. See SWANIMOTE.

SWALLOW, *hirundo*, in *Ornithology*, a diftinct genus of birds of the order of the *pafferes*. The characters are, that the beak is extremely fmall, a little bending, pointed, and depreffed at the bafe, and the opening of the mouth larger than the very head of the bird.

The characters of this genus, according to Ray, are thefe:

these: they have very large heads, and very short beaks, but very wide mouths, adapted to the swallowing large insects, which are their food: their tails are long and forked, their eggs are white, they are birds of passage, and with us are the fore-tellers of summer. Linnæus enumerates twelve species.

We have in England four species of swallows: 1. The *hirundo domestica*, or *house swallow*. 2. The *hirundo agrestis*, or *martin*. 3. The *hirundo riparia*, called the *sand-martin*, or *shore-bird*. 4. The *hirundo apus*, called the *black martin*, or *swift*. Beside these, there are also the *hirundo marina*, or *sea swallow*; the *hirundo Americana*, called TAPERA; the Chinese *swallow*, or *hirundo esculenta* of Linnæus, whose nest is eaten in soups, &c. The common house or chimney *swallow*, or *hirundo rustica* of Linnæus, is well known every where with us, and is sometimes seen all over of a fine white. This species is distinguished from all others by the superior forkiness of its tail, and by the red spot on the forehead and under the chin. It is observed, that the exterior feathers of the tail are much longer in the male than in the female. Its food is the same with that of others of its kind, viz. insects, for the taking of which in their swiftest flight, nature hath admirably contrived their several parts: their mouths are very wide to take in flies, &c. in their quickest motion; their wings are long, and adapted for distant and continual flight; and their tails are forked, to enable them to turn the more readily in pursuit of their prey. The first brood of *swallows* are observed to quit the nest the last week in June, or the first in July, and the last brood towards the middle or end of August. The *swallow* has a sweet note, which it emits in August and September, perching on house-tops.

This species appears in Great Britain near twenty days before the martin, or any other of the *swallow* tribe. They leave us the latter end of September. See MIGRATION.

The martin, or martlett, or *hirundo urbica* of Linnæus, has a very broad and flat head, and a very broad beak pointed at the end; its legs are very short and its claws white; the head and upper part of the body, except the rump, are black glossed with blue; the breast, belly, and rump are white; it is inferior in size to the former species, and its tail is much less forked; its toes are all covered to the very claws, with a white downy plumage, by which it is distinguished from all the other *swallows*.

The sand-martin, the *hirundo riparia* of Linnæus, or shore-bird, or sand-*swallow*, is the smallest of all the *swallow* kind. Its head, neck, and back are of a mouse-colour; its breast and belly white; and it has a ring of brown round the lower part of its throat. It builds in the banks of rivers, and makes its nest of straw, the stalks of plants, &c. and covers it with feathers. It is not uncommon with us, but is extremely plentiful in Spain, in the summer months, where it is eaten, and is called by the common people, *papilion di montana*.

The black martin, or swift, the *hirundo apus* of Linnæus, by some called the diveling, is the largest of all the *swallow* kind; its head is remarkably broad and flat; its beak is very small, short, and weak; but its mouth opens to an immense width, like that of the goat-sucker, or churn-owl; it is all over of a brown colour, with a slight admixture of green, and has no other variegation, but a greyish white spot at the top of its throat; its legs are extremely short, and its feet remarkably small; it feeds on beetles and other insects, and seldom alights on the ground, the shortness of its legs making it not easy for it to rise again.

It is more on the wing than any other of the *swallows*; its flight is more rapid, and attended with a shrill scream. This species appears in our country about fourteen days later than the sand-martin; but differs greatly in the time of its departure, retiring invariably about the tenth of August. Swifts delight in sultry weather, when they fly in small parties with particular violence; and, as they pass by steeples, towers, &c. where their mates perform the office of incubation, emit a loud scream, which is, as some suppose, a sort of serenade to their respective females. Ray and Pennant.

SWALLOW, *water*, *hirundo aquatica*, a name very improperly given by Besler, and some others, to the northern colymbus, commonly known by the name of the LUMME.

SWALLOW, *sea*, *hirundo marina*, or *pratincola* of Linnæus, the name of a large bird of the *swallow* kind. Its belly is all white; its head and back of a dusky brown; its wings and tail are very long and blackish, but somewhat brown underneath; its tail is forked; its beak black and strong, and its mouth very wide and red within; a black line forms a kind of ring round the throat, passing by the eyes to the ears; the legs are lead-coloured or reddish.

SWALLOW, *sea*, is also a name given to the STERNA *hirundo* of Linnæus. See TERN.

SWALLOW-*fish*, *hirundo piscis*, or, as it is called in Cornwall, the *tub-fish*, a sea-fish of the *trigla* kind, remarkable for the size of its gill-fins. See *Sapphirine* GURNARD, and *Tab.* V. *Fish*, Nº 55.

SWALLOW-*fly*, in *Natural History*, the name of the CHELIDONIUS, a fly very remarkable for its swift and long flight.

SWALLOW-*stone*, *chelidonius lapis*, in *Natural History*, the name of a stone which Pliny, and many other authors affirm to be found in the stomachs of young *swallows*. It is always described to be small, roundish, convex on the outside, and concave on the other, and of a brownish, yellowish, or blackish colour: this, and the figures given of it, plainly shew that it is either a small species of the lycodontes, or bufonitæ, or else a detached piece of one of the compound ICHTHYPERIA, or, as they are vulgarly called, *siliquastra*.

De Boot tells us, that he cut up several young *swallows*, but never found any such stones in them; and indeed it is no wonder, since they are not to be looked for there, but in the jaws of the wolf-fish, or in the palates of some of the less known kinds.

SWALLOW-*wort*, *hirundinaria*, or *asclepias*, in *Botany*, a genus of the *pentandria digynia* class. Its characters are these: the flower hath an empalement of one leaf, which is cut into five acute segments; and the petal is also of one leaf divided into five oval parts, which are reflexed: in the centre are situated five nectariums, which encompass the parts of generation; these have horns which turn towards the stamina, which are joined in a truncated body enclosed by five scales, and are scarcely visible; it has two oval pointed germina, which become two large oblong swelling pods ending in a point, which open with two valves in one cell, filled with compressed seeds, lying over each other like tiles in a house, and are crowned with a soft down. Miller enumerates twenty, and Linnæus nineteen species.

The common *swallow-wort* of the shops, with a white flower, called *vincetoxicum* and *hirundinaria*, is also denominated tame-poison, because it has been deemed a powerful counter-poison. The flowers appear in June, and the seeds ripen in September. It grows naturally in the south of France, Spain, and Italy; and is said also to grow wild in gravelly grounds in some parts of England. The root has, when fresh, a moderately strong but agreeable smell, approaching to that of wild valerian, which in drying is in a great degree dissipated; chewed, it impresses first a considerable sweetness, which is soon succeeded by an unpleasant subacrid bitterishness: an extract made from it by water is moderately sweetish, balsamic, and bitterish; the spirituous extract is stronger in taste, proportionably smaller in quantity, and retains a part of the specific flavour of the root. It is recommended as resolvent, sudorific, and diuretic; in catarrhal, cachectic, and scrophulous disorders, and in uterine obstructions; in doses of from a scruple to a dram or more in substance, and three or four drams in infusion. It has been employed by some of the Germans as an alexipharmic, and hence received the name of *contrayerva Germanorum*. Some, however, have suspected it to possess noxious qualities, and observe that when fresh it excites vomiting. Among us it is scarcely ever made use of in any intention. Lewis.

SWALLOW-*wort*, in *Botany*, is also a name given to the STAPELIA.

SWALLOWING. See DEGLUTITION.

SWALLOWING, *difficulty of*, in *Infants*. See INFANT.

SWALLOWS-TAIL, in *Fortification*. See QUEUE *a aronde*.

SWALLOWS-TAIL, in *Joinery* and *Carpentry*, denotes a particular way of fastening together two pieces of timber, so strongly as that they cannot fall asunder. See DOVE-*tail*.

SWAN, in *Astronomy*. See CYGNUS.

SWAN, *cygnus*, in *Ornithology*, a species of the ANAS or DUCK kind in the Linnæan system, of which there are two varieties, viz. the wild and the tame *swan*.

The *wild swan*, or *anas cygnus ferus* of Linnæus, called also *elk* and *hooper*, is less than the tame sort; the lower part of the bill is black; the base of it, and the space between that and the eyes is covered with a naked yellow skin; the eye-lids are bare and yellow; the whole plumage in old birds is of a pure white; the down is very soft and thick; and the legs black.

The cry of this bird is very loud, whence its name *hooper*. The wild *swan* frequents our coasts in hard winters in large flocks, but Mr. Pennant apprehends that it does not breed in Great Britain. *Swans* come in October in great numbers to Lingey, one of the western isles, and continue there till March, when they retire more north-

 ward

ward to breed. At Main-land, one of the Orkneys, *ſwans* are the countryman's almanack; as on their quitting the iſland, they preſage good weather, and on their arrival, they announce bad.

The *tame ſwan*, or *anas cygnus manſuetus* of Linnæus, is the largeſt of the Britiſh birds. It is diſtinguiſhed externally from the wild *ſwan*, firſt, by its ſize, being much larger; ſecondly, by the bill, which is red, and the tip and ſides black, and the ſkin between the eyes and bill is of the ſame colour. Over the baſe of the upper mandible projects a black callous knob; the whole plumage in old birds is white; in young aſh-coloured till the ſecond year; the legs duſky, and in ſome varieties red. The *ſwan* lays ſeven or eight eggs, and is near two months in hatching. It feeds on water-plants, inſects, and ſhell-fiſh. No bird perhaps makes ſo inelegant a figure out of the water, or has the command of ſuch beautiful attitudes in that element as the *ſwan*: thus deſcribed by Milton, Paradiſe Loſt, book vii.

The ſwan with arched neck
Between her white wings mantling, proudly rows
Her ſtate with oary feet.

In former times this bird was ſerved up at every great feaſt: and it is ſaid that cygnets are to this day fattened at Norwich about Chriſtmas, and ſold for a guinea a-piece. *Swans* were formerly held in ſuch great eſteem in England, that by an act of Edw. IV. c. 6. no one, that poſſeſſed a freehold of leſs clear yearly value than five marks, was permitted to keep any, other than the ſon of our ſovereign lord the king; and by 11 Hen. VII. c. 17. the puniſhment for taking their eggs was impriſonment for a year and a day, and a fine at the king's will. It is alſo ſaid, that if *ſwans* be lawfully marked, it is felony to ſteal them, though at large in a public river; and that it is likewiſe felony to ſteal them, though unmarked, if in any private river or pond, otherwiſe it is only a treſpaſs.

Theſe birds were by the ancients conſecrated to Apollo and the Muſes; and upon this idea ſeems to have been ingrafted the notion which they had of *ſwans* being endowed with a muſical voice: and the fable might likewiſe ariſe from the doctrine of the tranſmigration of ſouls into the bodies of animals, under the perſuaſion that the body of the *ſwan* was allotted for the manſion of departed poets. In time a *ſwan* became a common trope for a bard. Beſides theſe opinions, the ancients apprehended that the *ſwan* foretold its own end; for explaining which Mr. Pennant ſuggeſts the conſideration of the twofold character of the poet, viz. *vates* and *poeta*, which the fable of the tranſmigration might aſcribe to the bird, or they might be ſuppoſed to derive that faculty from Apollo their patron deity, the god of prophecy and divination. As to their being ſuppoſed to ſing more ſweetly at the approach of death, Plato (Pſeudo, Ed. Cant. l. 683. p. 124.) attributes that unuſual melody to the ſame ſort of extacy that good men are ſometimes ſaid to enjoy at that awful hour, foreſeeing the joys that are preparing for them on putting off mortality. The notion, however, was a popular one long before the time of Plato; for Æſchylus alludes to it in his Agamemnon; Clytemneſtra ſpeaking of Caſſandra ſays——

—— η δε τοι, κυκνε δικην
Τον υςατον μελψασα θανασιμον γοον,
Κειται.

——*She, like the ſwan*
Expiring, dies in melody.

Pennant Brit. Zool. vol. ii. p. 565, &c.

Bartholine has given an accurate account of the anatomy of the wild *ſwan*, and of the ſtructure of its œſophagus, and the wind-pipe, which is very remarkable. Theſe are ſo framed that they go down together into the ſternum; and, after reaching its bottom, they turn up again, and the windpipe riſing out of the ſtreights of the ſternum, climbs up the intermediate clavicles, on which it leans, as on a baſe, and then bends to the thorax; but before it comes to the thorax and lungs, it forms a ſort of larynx, with an os hyoides, covered with a thick membrane, and reſembling a muſical pipe, wide above, but with a narrow ſlit, and ſtraight, and depreſſed below: under this larynx, before the windpipe enters into the lungs, it is divaricated into two branches like unto bronchia, thicker in the middle, but narrower where they are near the lungs. In this particular it differs from the human aſpera arteria, which, it is true, is divided into branches, but that is not before it has entered into the lungs. Bartholin, Diſſert. de Cygni Anatom. See remarks on the wind-pipe of the wild *ſwan* in Phil. Tranſ. vol. lvi. p. 205, &c. See alſo CRANE, COLUM, &c.

SWAN-*ſhell*. See CIGNE.

SWANIMOTE, or SWAINMOTE, a court touching matters of the foreſt, kept, by the charter of the foreſt, thrice in every year, before the verderers, as judges.

This court is as incident to a foreſt as a court of piepowder to a fair.

Its juriſdiction is to enquire into the oppreſſions and grievances committed by the officers of the foreſt, and to receive and try preſentments certified from the court of ATTACHMENTS againſt offences in vert and veniſon.

SWARTH, among *country people*, the ſame with *ſwath*.

SWATH, a word uſed by *country people* for a row of graſs or corn, as laid by the mower.

SWATH, *faſcia*, among *Surgeons*, a long and broad band to bind up any diſeaſed member, or part. See BANDAGE.

SWARDY, in *Agriculture*, a term uſed by the farmers for a ſoil well covered with graſs.

SWARM, denotes a large body or number of bees, or of other ſmall animals: the term is particularly applied to a number of bees that emigrate in a body from a hive. Every *ſwarm* is compoſed of a queen, many common bees, both old and young, and drones, the number of which is uncertain.

The nature of the annual new *ſwarms* of bees, which we ſee depart from old hives, is not to be truly underſtood, otherwiſe than by knowing the hiſtory of the propagation of the ſpecies among theſe animals, for which ſee BEE and QUEEN-*bee*.

Some have ſuppoſed that thoſe *ſwarms* which have moſt drones are the moſt likely to proſper; but this has been controverted by others. The multitude of *ſwarms* does not forebode the proſperity of an apiary: neither do thoſe earlieſt *ſwarms*, ſuch as thoſe that riſe towards the latter end of April or the beginning of May, prove the beſt or proſper moſt; but thoſe that happen at the latter end of May, or beginning of June, are the moſt promiſing.

If a hive has been very well peopled during the winter, the young progeny go out early in the ſpring; and if it hath been very thinly peopled, it is ſometimes as late as the middle of June before they go out, even without any accidental delay from the want of a queen. But the two principal ſwarming months are May and June.

The people who manage bees, are informed of the time when they are going to ſend out new *ſwarms* by ſeveral ſigns. One is, when the hive is ſo peopled, that many of the bees cannot find room within, but ſtand in cluſters on the outſide of the hive; another, is the appearance of a large number of drones, or male bees, eſpecially if the weather be clear, calm, and warm; for in a cloudy, wet, and ſtormy ſeaſon, the firſt *ſwarms* ſeldom or never riſe, though the caſts, or ſecond *ſwarms*, often riſe in indifferent weather: theſe, however, are not certain ſigns, nor do they point out the very day of the *ſwarming*; but there is one which declares it very punctually, which is the obſerving, that though the hive be very full, and the day very fine, yet very few bees go out in ſearch of honey; in this caſe it is a certainty that they are aſſembling themſelves in the hive, and preparing to be gone in a very little time. If a perſon go near the hives, that are ready to ſend out *ſwarms*, in the evening, or even in the night, he will hear a ſort of humming noiſe in them, which is not to be heard at ſuch times on any other occaſion: in ſhort, the whole is in agitation on the occaſion, and the tumult never ceaſes till the new colony goes out.

The ſignal of the going out of a *ſwarm* from a hive is ſometimes only a humming noiſe made by one ſingle bee, but that a very particularly acute, and clear ſound: this ſeems to be the voice of the new queen, or female bee, calling together the *ſwarm* that is to follow her out, and animating them with a ſort of martial muſic for the great adventure they are going to engage in.

It is rare to hear theſe previous notices given for a firſt *ſwarm*; but the time of ſecond *ſwarms* may generally be fixed within a day or two, by means of theſe diſtinct and muſical notes, which are always heard two or three days before they riſe. Eight or nine days after the firſt *ſwarm* is gone, one of the young princeſſes addreſſing herſelf to the queen-mother, petitions for leave to withdraw and erect a new empire, with a ſelect body of the populace. For a day or night the regent gives no anſwer, but the young princeſs perſiſts in her ſuit, and at laſt ſucceeds. The ſecond night the queen, with a very audible voice, iſſues her royal grant, and proclaims it through the whole kingdom; and the following day, the weather being tolerable, you may expect the *ſwarm*. When it is ready to come forth, the notes are louder, quicker, and more conſtant; when the greater part of the *ſwarm* is out, the muſic is then at an end.

All the different modulations of ſounds made by the bees, are the effect of the different vibrations of their wings

wings in the air. It has been ſuppoſed by Swammerdam, that the air iſſuing from the ſtigmata of the body was very inſtrumental to the making of this ſound; but this is proved to be an erroneous conjecture, by the eaſy experiment of cutting off a bee's wings, which always renders the creature perfectly mute, though this could not be the caſe, if the voice proceeded from other parts. It is evident, therefore, that all the ſounds of the bee are made by the ſtriking of its wings againſt the air; and it ſeems very eaſy to imagine, that when the motion of the wings can make a ſound, the more quick or ſlow motion of them can modulate it in a different manner, and the moving them in ſeveral different directions, may alſo add greatly to the variety.

The hours of going out of *ſwarms* are generally between eleven in the morning and one or two in the afternoon: the air is at this time very hot, and the ſun often ſhines brightly on the ſurface of the hive; the effect of this, in cauſing them to go out, is eaſily conceived. The few who are neareſt the mouth of the hive, and are ready to follow their queen, ſoon find that this is a pleaſant ſeaſon for their expedition, and the numbers of others, which remained irreſolute in the inner parts of the hive, now find the natural heat of the place increaſed to ſo great a degree by the action of the external warmth, that it is very natural for them to reſolve at once to depart with thoſe which are going off, in order to find a place where they may be more at eaſe, or leſs crowded and heated in their habitation. People, who have the care of bees ſhould attend to their *ſwarming*, or going out on theſe occaſions; and if they are not at leiſure to watch them in the hours before mentioned, ſhould defend the hives, during that part of the day, from the heat of the ſun, that they may not go off and be loſt.

Immediately before the going out of a *ſwarm* there is heard a prodigious humming in the hive, much greater than what is heard at any other hive, and immediately after this, the openings of the hive are crowded with bees, in a violent hurry to get out; thoſe which firſt come out immediately take flight, and if the female, or queen, be among theſe, vaſt numbers immediately follow, and the air is ſeen as full of them, as it is of flakes of ſnow in a winter ſtorm; and, in fine, it is not a minute before all the bees, that are to make the new *ſwarm*, are out of the hive: when the body is thus joined, they riſe and fall in the air, and ſeem very curious in chooſing a place where to fix themſelves. It does not appear that the female bee chooſes the place for them, but they all ſeem to be aſſiſtant in it; and as ſoon as they have fixed upon a proper branch of a tree, or the like, they all fly towards it, and begin to form a cluſter in one part of it. The female does not place herſelf at the head of this cluſter, but ſits on the branch near it, to ſee how ſhe approves the management; as ſoon as the cluſter is of a proper ſize, ſhe adds herſelf to it, and from that inſtant it thickens in a ſurpriſing manner, all trying firſt to fix themſelves to the reſt, ſo that in a quarter of an hour they are all collected together in a vaſt maſs, hanging to one another by the legs. In this condition they remain abſolutely quiet, though expoſed to the open air, and there are no more of them ſeen flying looſe about, than there are about the hives in a ſummer's day.

When the time of a *ſwarm's* going out of the hive is expected, the people, who have the care of them, ſhould always be prepared with a hive to receive them; and when the *ſwarm* ſettles upon ſome branch of a buſh, or low tree, the hiving of them is an eaſier matter than could be imagined. See Hiving.

The hives of bees are commonly placed in gardens, that the bees may have ſome flowers at leaſt in their own neighbourhood, and not be compelled to go far in ſearch of food; and the *ſwarms* from theſe hives always ſucceed beſt, when there are ſome buſhes, as of filberts, barberries, or the like, in the garden, as well as high trees; for when the bees take a high flight, they often take a very long one before they ſettle, and ſometimes go ſo far, that the eye cannot trace them to the place of their ſettling; in which caſe, all attempts to ſearch for them are uſually vain, and they are loſt entirely. The low buſhes in view uſually determine them to low flights, and if they are ſeen to be aſcending too high, the cuſtom is to throw handfuls of duſt and ſand upon them; this uſually brings them down, as they probably miſtake the particles for drops of rain.

Another very ancient cuſtom, and which is continued to this day, is the beating on inſtruments of braſs, and the like, to make a great noiſe, while they are gathered in the air: it is pretended, that this diſpoſes to fix themſelves the ſooner. The origin of this cuſtom has been an obſervation, that thunder always ſends thoſe bees, which are abroad, from the flowers back to the hive, and it is ſuppoſed that this artificial noiſe may have the ſame effect; but in all probability, the bees are better acquainted with thunder than to be thus deceived: there is indeed much more probability of their miſtaking the particles of duſt, falling upon their backs, for drops of rain, than taking ſo unlike a ſound for thunder; for it is found by experience, that the making all the noiſe that can be conceived, this way, never was able to drive one bee from a flower where it was buſy, or to ſend one ſtraggler home. Reaumur Hiſt. Inſ. vol. x. p. 290. Thorley's Enquiry, &c. c. 6.

Swarm, *after*. See After-*ſwarm*.

SWAYING, in *Sea Language*. See Jeers.

SWEALING *a hog*, a term uſed in many parts of the kingdom for ſingeing a hog.

SWEARING, *profane*. See Profaneness.

Swearing *the peace*. See Peace.

SWEAT, a ſenſible moiſture iſſuing out of the pores of the ſkins of animals, through too much heat, exerciſe, or weakneſs; or through the action of certain medicines called *ſudorifics*. See Perspiration.

Sweat is either the conſequence of an acceleration of the blood's motion, by ſtimuli, or exerciſe; or of a relaxation of the pores of the cutis; by means of either whereof, the matter which before perſpired inſenſibly, is now rendered ſenſible. The former is the caſe in natural and medicinal *ſweats*, and the latter in morbid, fainting, and cold *ſweats*.

The principal organs of *ſweat* are the miliary glands; which are ſpread over the whole ambit of the body; and furniſhed each with a vein, artery, and nerve, beſides an excretory duct, through the orifice whereof the *ſweat* is caſt out under the cuticle. This duct is covered with a little round valve, lying immediately under the cuticle, whereby the *ſweat* is occaſionally either retained or tranſmitted.

The *ſweat*, thus ſecreted, is various, according to the variety of the weather, ſoil, ſex, age, temperament, emunctory, diet, time of digeſtion, &c. as in the urine. In a ſound body, *ſweat* is ſcarce ever found, but from a fault in ſome of the ſix non-naturals: its immediate effect is always hurtful; by accident ſometimes it does good.

The phyſicians order *ſweats* in cold and inveterate diſeaſes, as the palſy, rheumatiſm, ſciatica.

Many diſtemperatures of the body have their riſe, as well as their cure, by means of the differences of this evacuation.

Sweating is indicated by the beginning of a critical *ſweat*, to carry off the diſeaſe; by the tenuity of the morbid matter diſperſed through all the veſſels, as in the plague, a venomous bite, or the French diſeaſe, before it is yet fixed; by the particular temperature of the patient, and by various obſtructions to be removed in the ſeveral parts of the body; particularly in ſubcutaneous diſeaſes, the itch, pſora, leproſy, &c.

The faults of our *ſweats*, in regard to the general health of the body, are reduced principally to three kinds. 1. They are too exceſſive: they uſually happen early in the morning, as ſoon after three o'clock, and are in ſome degree periodical; but in others they are rather continual, or have very few intermiſſions. 2. The uſual and habitual ſecretions by *ſweat* are ſubject to be impeded, or retarded, and hence many diſtempers take their riſe. And, 3. There is in ſome particular people a remarkable difficulty of being brought to *ſweat* at all.

The perſons principally ſubject to too profuſe *ſweats*, are men of a plethoric and ſanguineo-phlegmatic temperament; theſe, on the ſlighteſt motion of the body, are uſually thrown into profuſe *ſweats*; and the ſame perſons are uſually ſubject to violent nocturnal *ſweats* in the ſpring and autumn ſeaſons. Perſons in hectics alſo, when near the time of their death, uſually fall into profuſe nocturnal *ſweats*, which are always a fatal prognoſtic.

The perſons principally ſubject to a natural difficulty of *ſweating*, are thoſe who have a mucous and thick dyſcraſy of the humours; and ſometimes perſons of very tender and delicate conſtitutions, who are ſubject to emotions of the blood, and are continually thin in fleſh.

Prognoſtics in ſweats. A profuſe *ſweat*, though it conſiderably waſtes the fleſh and ſtrength, yet is leſs dangerous when left to itſelf, than when raſhly ſuppreſſed. The conſequences of habitual *ſweats* being ſuppreſſed, are uſually according to the habit and diſpoſition of the patient, either cutaneous eruptions, as the itch, and the like; as catarrhs, coryzas, and gravedos; and ſometimes they bring on congeſtions, inflammations, and convulſions.

Method of treatment. So long as *ſweats* bring on no bad ſymptoms in illneſſes, they are to be rather promoted than checked, even though they may ſeem profuſe in quantity; and in this caſe, the proper regimen is a mode-rate

rate warmth, a quiet ſtate of the body, and frequent draughts of warm liquors; but when the ſtrength is found to be too much exhauſted by theſe *ſweats*, ſmall doſes of nitre are found of great ſervice.

When different diſorders ariſe from the ſuppreſſion of *ſweats*, nothing is of greater ſervice than the compound powder of antimonium diaphoreticum, crabs eyes, and nitre, given in ſmall doſes every three hours; and a quiet poſture of the body is to be ordered, which greatly tends to promote *ſweating*; and frequent draughts of warm and weak liquors are to be taken, and the bowels are to be relaxed with a clyſter, or a gentle purge, if there be no ſymptom neceſſarily forbidding it. In regard to thoſe perſons, who are naturally very difficult to be *ſweated*, a draught made of freſh arum-root and wine, or vinegar, uſually brings on profuſe *ſweating*, if they are put to bed, and warm liquors drank afterwards. It is a very good general caution, that profuſe *ſweats*, if they have continued ever ſo many months, are never to be repreſſed by aſtringents; for in that caſe they are uſually attended with ſymptoms much worſe than the original complaint. The common method of forcing out ſuppreſſed *ſweats* by the hot alexipharmics, and volatile ſalts, is by no means adviſeable in any caſe. Bleeding, judiciouſly timed, is often of very great ſervice in promoting *ſweats*. When the natural *ſweats* of children are repelled, they become ſuddenly feveriſh and ill, and nothing relieves them till the *ſweats* are recalled. This may be done ſimply, by keeping them warmer than before, in moſt caſes; but when that fails, the gentle abſorbents are to be preſcribed, and if they ſuck, the nurſe may take the common alexipharmic medicines: crabs-eyes are as proper as any thing for the child in this caſe, and for the nurſe the lapis contrayerva. The convulſions of children very often ariſe from the ſuppreſſion of their *ſweats*, and are always then taken off by making them *ſweat* again. Junker's Conſp. Med. p. 330.

Matthiolus tells us, that the *ſweat* of all quadrupeds, as horſes, aſſes, &c. is venomous; and that that of other beaſts is unwholeſome. Tachenius adds, that the *ſweat* of horſes, particularly, is ſo acid, that it pierces the ſtrongeſt and firmeſt boots, which are proof againſt all water. Some naturaliſts affirm, that dogs and cats never *ſweat*, how hot ſoever they be, becauſe they are not found to have any pores in the cuticle.

The *ſweat* of human bodies has ſometimes been obſerved to be phoſphoraceous. This once happened to a perſon who uſed to eat great quantities of ſalt, and who was a little ſubject to the gout, after ſweating with violent exerciſe. Stripping himſelf in the dark, his ſhirt ſeemed to be all on fire; and, upon examination, red ſpots were found upon his ſhirt, and the phyſician who was preſent perceived an urinous ſmell, though it had nothing in it of volatile alkali, but of the muriatic acid; ſuch as iſſues from cabbage much ſalted and ſtrongly fermenting. This fact indicates the connection that ſubſiſts between the light of PHOSPHORUS, and that of putreſcent ſubſtances.

SWEATH, the ſame with SWATH.

SWEATING-*houſe*. The natives of North-America, when we firſt ſettled among them, had a great many houſes to *ſweat* in, it being their general remedy for diſeaſes of whatever kind; but at preſent they are leſs uſed among them.

The cave, or *ſweating-houſe*, was uſually eight feet in diameter, and four feet high, the roof being ſupported by ſticks, or boards. They uſually dug theſe caves in the ſide of a hill, and as near as could be to ſome river, or pond. The entrance into the cave was ſmall, and when any perſon was *ſweating* in it, the door was covered with a blanket or ſkin. Near the cave they uſed to make a large fire, and heat in this a quantity of ſtones, perhaps five hundred weight; theſe they rolled into the cave, and piled up in a heap in the middle. When this is done the Indians go in naked, as many as pleaſe, and ſit around the heap of ſtones; and as ſoon as they begin to grow faint, which is uſually in a quarter of an hour, they come out, and plunge themſelves all over in the water, remaining in it a minute or two; and repeating this a ſecond time, they dreſs themſelves and go about their buſineſs.

This has been for many ages uſed among them with ſucceſs, in caſes of colds, ſurfeits, ſciaticas, and pains fixed in their limbs, and the Engliſh have often uſed the ſame means, and found relief by it. It is practiſed equally at all times of the year, and the Indians do it not only in ſickneſſes, but by way of refreſhment after long journies, and other fatigues, and to ſtrengthen themſelves for any expeditions. Philoſ. Tranſ. N° 384. p. 131.

SWEATING-*turf*. See TURF-*ſweating*.

SWEATING-*iron*, in the *Manege*, is a piece of a ſcythe about a foot long, and of the breadth of about three or four fingers, very thin, and ſuch as cuts only with one ſide. When a horſe is very hot, and the grooms have a mind to leſſen the *ſweat*, or make it glide off, they take this knife or iron in their two hands, and gently run the cutting edge along the horſe's ſkin, commonly with the grain, or as the hair lies, and but ſeldom againſt it; with intent to ſcrape off the *ſweat*, and dry the horſe.

SWEATING-*room*. See an account of the remains of a Roman *ſweating-room* in the Philoſophical Tranſactions, N° 461. ſect. 29. See HYPOCAUSTUM.

SWEATING *ſickneſs*, the name of an epidemic diſeaſe, firſt perceived in England in 1485. It was properly a ſort of plague, thus called, becauſe attended with an extraordinary kind of ſweat. It made its return four times in the ſpace of ſixty-ſix years, viz. in 1506, 1517, 1528, and 1551.

It began with a ſweat, which never ended but either with the death of the patient, or his recovery. If he ſurvived twenty-four hours he was ſafe. Few people eſcaped of it at firſt; too much care, and too little, were found equally deſtructive.

The patient was to continue without ſtirring, either in his bed, or in his cloaths, according to the condition nature was ſurpriſed in; without burthening him either with remedies or with foods; without clothing either too much or too little; and, if poſſible, without either eating or drinking. The ſweat to be kept up, without either promoting it, by any extraordinary heat, or checking it by the leaſt cold.

This was what was found by experience, and which was at length practiſed with happy ſucceſs. The diſeaſe was firſt felt on the twenty-firſt of September, and in the ſame day ſpread itſelf all over England; where, after a great mortality, it ſtopped all at once towards the end of October.

Its ravages were ſo great, that in ſome parts it took off a third part of the people in a very little time.

At its return under Henry VIII. in 1506, it was as general, and as dangerous as before, and again diſappeared all at once. At the attack in 1528, it was leſs fatal, inſomuch that Bellay, biſhop of Bayonne, then ambaſſador in England, who ſweated like the reſt, tells us, that of forty thouſand ſouls, ſeized with it in London, only two thouſand died. In 1534, it paſſed over into Ireland, where it killed great numbers.

SWEDISH *coins*, and *meaſures*. See the ſubſtantives.

SWEEP, among *Refiners*, the almond-furnace. See ALMOND, and FURNACE.

SWEEP, among *Goldſmiths*, *Moneyers*, &c. See WASHING.

SWEEP, in the *Sea Language*. The ſeamen call the mold of a ſhip, when ſhe begins to compaſs in at the rung-heads, the *ſweep* of her, or the *ſweep* of the futtock.

SWEEP-*bar of a waggon*, is that which is fixed on the hind-part of the fore-guide, and paſſes under the hind-pole, which ſlides upon it.

SWEEPING, at *Sea*, ſignifies dragging along the ground, the bight, or looſe part of a ſmall rope, in a harbour or road, in order to hook or recover ſome anchor, wreck, or other material ſunk at the bottom. It is performed by faſtening the two ends of this rope to the ſides of two boats which are abreaſt of each other, at ſome diſtance. To the middle of the rope are ſuſpended two cannon-ſhot, or ſomething which weighs heavy, in order to ſink it to the ground; ſo that, as the boats advance, by rowing a-head, the rope drags along the bottom, to hook any anchor, &c. for which they are ſearching.

SWEET. By a *ſweet* is underſtood any vegetable juice, whether obtained by means of ſugar, raiſins, or other foreign or domeſtic fruit, which is added to wines, with a deſign to improve them. It is plain, from the making of artificial muſt, or ſtum, by means of fine ſugar, with a ſmall addition of tartar, that the art of *ſweet*-making might receive a high degree of improvement, by the uſing pure ſugar, as one general wholeſome *ſweet*, inſtead of thoſe infinite mixtures of honey, raiſins, ſyrups, treacle, ſtum, cyder, &c. wherewith the *ſweet*-makers ſupply the wine-coopers to lengthen out, or amend their wines: for pure ſugar being added to any poor wine, will ferment therewith, and improve it, and bring it to a proper degree of ſtrength and vinoſity. If the wine that is to be amended is tart of itſelf, no tartar ſhould be added to the ſugar, but if it be too *ſweet* or luſcious, then the addition of tartar is neceſſary. Shaw's Lectures, p. 203. See *Artificial* STUM.

The duty on *ſweets* made for ſale is 12*s*. a barrel, 10 Geo. II. c. 17. to which is added another duty of 6*s*. by 20 Geo. III. c. 52. See STAMP-*duties*.

SWEET *almonds*. See ALMONDS.

SWEET-*briar*, a ſpecies of the ROSE.

SWEET *gum*. See LIQUIDAMBER.

SWEET-

SWEET-*johns.* See PINK.

SWEET *fublimate of mercury.* See MERCURY.

SWEET *corn,* a term ufed by the Indians to exprefs a fort of corn they are very fond of, and generally keep in their houfes.

While the ear of the maize, or Indian corn, is yet green, but full, they gather it, and firft boil, and afterwards dry it, and lay it up for ufe in bags, or bafkets. When they eat it, they boil it again, either whole, or grofsly beaten in a mortar; they then mix it with fifh, or with venifon, or beaver flefh, and account it a very fine difh. The green ears, or frefh *fweet corn,* they alfo fometimes eat, as foon as it is gathered, roafting it before the fire, and then picking out the grains. This is a new fupply of food for them many times, when their winter, or laft harveft-ftore is exhaufted. Their foldiers alfo commonly go out to war againft their enemies about this time of the year, and find this fupply in their enemies fields. See MAIZE.

SWEET *root.* See LIQUORICE.

SWEET *fop,* a fpecies of *annona.* See *Cuftard* APPLE.

SWEET *fultan,* a fpecies of CENTAURY.

SWEET *weed.* See CAPRARIA.

SWEET-*williams,* the Englifh name of feveral fpecies of pink. See DIANTHUS and PINK.

SWEET-*william of Barbadoes.* See *Scarlet* CONVOLVULUS.

SWEET *willow.* See WILLOW.

SWELL *of an organ.* See ORGAN.

SWELL, in *Sea Language,* generally denotes a heavy and continual agitation of the waves, according to a particular direction; as there is a great *fwell* fetting into the bay. It is, however, more particularly applied to the fluctuating motion of the fea, which remains after the expiration of a ftorm: and alfo to that which breaks on the fhore, or on rocks and fhallows, called SURF. Falconer.

SWELLED *columns.* See COLUMN.

SWELLED *hoof.* See HOOF.

SWELLING. *Swellings* in the face and falivary glands, without any fever, or rednefs of the fkin, fometimes happen in fummer months, and often give way to a gentle purge or two.

Thefe *fwellings* are fometimes eryfipelatous, and fall chiefly on the forehead and eyelids, and yield to purges and blifters. Med. Eff. Ed. Abr. vol. i. p. 65.

There is a *fwelling* in one or both of the lower extremities, which fometimes happens to lying-in women; this diforder has been little noticed by the writers of our country. Mr. White has lately defcribed it. The fymptoms of this diforder, when in its fimpleft ftate, are thefe: generally in about twelve or fifteen days after delivery, the patient is feized with great pain in the groin of one fide, accompanied with a confiderable degree of fever; and this part foon becomes affected with *fwelling* and tenfion, which extend to the labium pudendi of the fame fide, and down the infide of the thigh to the ham, leg, foot, and whole limb; and the progrefs of the *fwelling* is fo quick, that in a day or two the limb becomes twice the fize of the other, and is moved with great difficulty, is hot and exquifitely tender, without any external inflammation. The pain in the groin is generally preceded by a pain in the fmall of the back, and fometimes in the bottom of the belly on the fame fide: the parts which fuffer the greateft pain are the groin, the ham, and the middle of the back part of the leg. In a day or two the pain abates. The *fwelling* is equal over the whole limb, and in every ftage is harder and firmer than in the anafarca; and does not pit when preffed by the finger, nor yield any water when punctured. It is fmooth, fhining, and pale, and in every part even to the touch, except where the conglobate glands are fituated, which are fometimes knotty and hard, as in the groin, ham, and middle of the back part of the leg. The parts that firft begin to mend, both as to pain and *fwelling,* are the groin and labium pudendi, the thigh next, and laftly the leg.

Several of the French authors in midwifery, have attributed this diforder to a depofition of milk on the glands of the groin, and upper part of the thigh. But Mr. White fays, this notion is fufficiently refuted by the obfervation, that it happens under every poffible ftate of that fecretion, whether copious or deficient, encouraged or repreffed: nor are our beft writers on puerperal diforders difpofed to admit, that the re-abforption of the milk is fo general, or common a caufe of difeafe as foreign writers have maintained. According to Mr. White, the proximate caufe of this diforder is an obftruction, detention, and accumulation of lymph in the limb. In inveftigating the remote caufe, he finds that a common trunk of the lymphatics of the leg and thigh paffes over the bones of the pelvis in its way towards the thoracic duct. This, he apprehends, may in fome fubjects be preffed upon by the child's head as it defcends into the pelvis during labour. Such a preffure would caufe an obftruction to the paffage of the lymph flowing through the veffel; and as it cannot regurgitate on account of the valves, but is ftill receiving frefh acceffions of fluid from below, he fuppofes it would be fo diftended as fometimes to burft. The extravafated lymph would, he imagines, be re-abforbed; and little or no inconvenience would enfue, till the wound of the lymphatic were clofed. But as this cannot happen without a great contraction of the diameter of the veffels, he conceives that the whole fyftem of lymphatics, below the cicatrix, would now become fuddenly diftended; and not being able to free themfelves, would occafion a large and painful tumefaction of the limbs, which would not fubfide till the confined lymph had found a new paffage by collateral and anaftomofing branches, as in the cafe of an arterial trunk tied, on being wounded. The cure of the diforder, on Mr. White's hypothefis, muft be effected by nature, and art can only be in a fmall degree auxiliary to it: the method of treatment is propofed and explained in his Inquiry into the Nature and Caufe of that *Swelling,* in one or both of the Lower Extremities, which fometimes happens to Lying-in Women. 8vo. 1784.

SWELLING, *white.* See *Fungous* TUMORS.

SWELLING, *diameter of the.* See DIAMETER.

SWERTIA, in *Botany,* a genus of the *pentandria digynia* clafs: its characters are, that the corolla is rotated, and has at the bafe of its fegments, nectariferous pores; and the fruit is a fingle-celled, double-valved capfule. There are five fpecies.

SWIETERIA, *mahogany tree,* in *Botany,* a genus of the *decandria monogynia* clafs. Its characters are, that the calyx is divided into five fegments; it has five petals; the nectarium is cylindric, and bears antheræ; the capfule is five-celled, ligneous, and opens at the bafe, and the feeds are imbricated and winged. There is only one fpecies. See CEDAR.

SWIFT, in *Ornithology.* See SWALLOW.

SWIFT, in *Zoology,* a name given by many to the common newt, or EFT.

SWIFTER, in a *Ship,* a rope ufed to confine the bars of the capftern in their fockets, whilft the men are heaving it about; for which purpofe it is paffed through holes in the extremities of the bars, fo as to ftrain them firmly together like the fpokes of a wheel, which is accordingly called *fwifting.*

SWIFTER is alfo a ftrong rope fometimes ufed to encircle a boat longitudinally, as well as to ftrengthen and defend her fides, fo as to enable her the better to refift the impreffion of other boats which may run againft her occafionally. It is ufually fixed about a foot under the boat's upper edge or gunnel.

SWIFTERS are likewife two fhrouds fixed on the ftarboard and larboard fide of the lower mafts, above all the other fhrouds, as an additional fecurity to the mafts. Falconer.

SWIFTEST *defcent, line of the.* See CYCLOID and DESCENT.

SWIFTING *of a fhip.* See SWIFTER.

SWIGGING, a particular way of caftrating rams.

The operation is performed by throwing the creature on his back, in which pofture he is held; then a ftring is drawn about his tefticles as tight as poffible, and fixing it there, the part is anointed with frefh butter. The beaft is then left to feed, and in two or three days the tefticles grow fo rotten, as to fall off with the ftring, or may be plucked away with a fmall force. Boyle's Works abr. vol. i. p. 87.

SWIMMING, the act, or art, of fuftaining the body in water, and of advancing therein by the motion of the arms, legs, &c.

Man alone learns to *fwim;* all other perfect animals feem to take it naturally; though feveral of the imperfect *fwim* not at all.

Among the ancient Greeks and Romans, *fwimming* made fo effential a part of the difcipline of their youth, that to reprefent a man perfectly rude and uneducated, they ufed to fay proverbially, he had neither learned to read nor to *fwim.*

In fifhes, it is the tail that is the grand inftrument of *fwimming,* not the fins, as has been generally imagined; for this reafon fifhes are more ftrong and mufculous in that part than in all the reft of their body; according as we find it in all other animals; the motive parts whereof are ftill the ftrongeft, as the thighs of men for walking, the pectoral mufcles of birds for flight, &c.

The manner wherein fifhes row themfelves forwards by the tail, is well explained by Borelli de Motu Animal. part. i. cap. 23. The fins of fifhes ferve only to keep the body well poifed and balanced, and to prevent vacillation. See AIR-*bladder* and SWIMMING *of fifh.*

M. Thevenot has publifhed a curious piece in French, called L'Art de Nager, the art of *fwimming,* demonftrated by figures. Before him, Everard Digby, an Englifhman, and Nicholas Winman, a Dutchman, had alfo laid

laid down the rules of this art: Thevenot has done little more than copy from them. Had he but read, with half that application, Borelli's treatise de Motu Animalium, he would scarce have maintained, as he has done, that men would *swim* naturally, like other animals, were they not prevented by fear, which magnifies their danger. We have abundant experience against this: thorw any brute, newly born, into a river, and it *swims*; throw an infant in before it is yet capable of fear, and it *swims* not, but is drowned. The reason is, that the human machine differs very notably in its structure and configuration from that of brutes; and particularly, which is very extraordinary, in the situation of its centre of gravity. In man, the head is exceedingly heavy, with regard to the rest of the body; by reason the head is furnished with a very great quantity of brain, and has, besides, a deal of flesh and bones, and no cavities only filled with air: so that the head immerging under water by its own gravity, the nose and ears are soon filled: thus the heavy carrying down the light, the man soon is drowned, and lost. But in brutes it is otherwise: for the head, here, having but little brain, and there being abundance of sinuses therein; its weight, with regard to the rest of the body, is much less considerable; so that they are easily able to keep their nose above water; and thus respiring freely, are out of danger of being drowned, on the principles of statics.

In effect, the art of *swimming*, which is no otherwise to be acquired but by exercise, consists principally in keeping the head above water, so that the nose and mouth being at liberty, respiration may be carried on: for as to the feet and hands, it is enough to stir them, and to use them as oars to conduct the vessel.

SWIMMING *of fish*. The *swimming of fish*, in general, is greatly assisted by their air-bladder. Those kinds which have not this bladder, either have regular lungs, and contain air in them, as is the case in the cetaceous fishes; or they have remarkably thin and flat bodies, as the rays and thornbacks, and the pleuronecti; or remarkably long and flexuous ones, as the petromyza; and by these means are capable of easy flexuous motions, which, with the help of the fins, thrust them any way at pleasure; though their bodies are not so nicely poised, as to the weight of the water, as those of such fish as have the assistance of these air-vessels.

It has been supposed by some, that the motion of fish in the water depended principally upon the pectoral fins, but this is easily proved false by experiment; for if the pectoral fins of a fish are cut off, and it be again put into the water, it will be found to move forward or sideways, upward or downward, as well as it did when it had them on. If a fish be carefully observed, while *swimming* in a bason of clear water, it will be found not to keep these pectoral fins constantly expanded, but only to open them at such times as it would stop or change its course, this seeming to be their principal, if not their only use. The pectoral and ventral fins, in the common fish of the cathetoplateous or compressed form, serve in the same manner in the keeping the fish still, and serve in scarce any other motion than that toward the bottom: so that this motion of the fish, which has been generally attributed to their fins, is almost wholly owing to their muscles, and to the equipoise of their air-bladder. That the use of the pectoral and ventral fins is to keep the fish steady and upright in the water, is evident from the consequences of their loss: if they are cut off, and the fish put again into the water, it cannot continue in its erect natural posture, but staggers about, and rolls from side to side. The fins of the back and anus are also of great use to the keeping the creature in its natural position, as is easily seen by cutting them off, and observing the motions of the fish afterwards.

Though a great deal depends on the motion of the muscles of the several parts of the body in the *swimming* of the fish, yet the tail, and those muscles which move the lower part of the body, to which it is affixed, are the great instruments by which their swift motions in the water are performed. The moving the tail, and that part of the body to which it adheres, backward and forward, or sideways any one way, throws the whole body of the fish strongly the contrary way; and even in *swimming* straight forward, the motion and direction are both greatly assisted by the vibrations of this part, as may be experienced in the motion of a boat, which when impelled forward, may be firmly guided by means of an oar held out at its stern, and moved in the water as occasion directs. The dorsal muscles, and those of the lower part of the body between the anus and tail, are the principal that are used in the motion of this part, and these are therefore the most useful to the fish in *swimming*. The muscles of the belly seem to have their principal use in contracting the belly and the air-bladder. They have been supposed of use to move the belly-fins; but there are too many of them for such a purpose, and these fins have each its peculiar muscle fully sufficient to the business. The use of the tail in *swimming* is easily seen, by cutting it off, and committing the fish to the water without it, in which case it is a most helpless creature. See AIR-*bladder*.

SWINE, in *Zoology*. See HOG.

SWINE's *cress*. See CRESSES.

SWINE-*pipe*, in *Ornithology*, a name used in many parts of England for the red-wing.

SWINE-*pox*. See POX.

SWING, *to*, in *Sea Language*, is to turn round the anchors, or moorings, at the change of the wind or tide. It is usually expressed of a ship, either when she is moored by the head or riding at a single anchor.

SWING-*tree*, of a *waggon*, is the bar fastened across the fore guide, to which the traces of the horses are fastened.

SWING-*wheel*, in a *royal pendulum*, that wheel which drives the pendulum. In a watch, or balance clock, it is called the *crown-wheel*.

SWINGING was prescribed by ancient physicians, as a good exercise in some cases. See AGITATION.

SWINGLE, in the *Wire-works* in England, the wooden-spoke which is fixed to the barrel that draws the wire, and which, by its being forced back by the cogs of the wheel, is the occasion of the force with which the barrel is pulled.

SWINGLING. See BRAKE.

SWIT, in *Natural History*, a name given by the people of the Philippine Islands to a very small bird of the humming-bird kind, frequent in that part of the world. It is beautifully coloured, and lives on the honey of flowers.

SWIVELS, a kind of rings made to turn round in a staple, or other ring. These are used when a ship lies at her moorings; also in tedders for cattle, that they may turn round without unwarping the tedder.

SWIVEL-*cannon*, is a small piece of artillery, belonging to a ship of war, which carries a shot of half a pound, and is fixed in a socket on the top of the ship's side, stern, or bow, and also in her tops. The trunnions of this piece are contained in a sort of iron crotch, whose lower end terminates in a cylindrical pivot resting in the socket, so as to support the weight of the cannon. The socket is bored in a strong piece of oak, reinforced with iron hoops, in order to enable it to sustain the recoil. By means of this frame, which is called the *swivel*, and an iron handle on its cascable, the gun may be directed by the hand to any object. It is, therefore, very necessary in the tops, particularly when loaded with musket balls, to fire down on the upper decks of the adversary in action.

SWOONING, a kind of LIPOTHYMIA, or fainting, wherein the patient loses all his strength, as well as sense and understanding.

Swooning may be occasioned by any thing that alters, corrupts, or dissipates the vital spirits; as long watching, violent pains, great and sudden evacuations, putrid vapours arising from abscesses in the noble parts, &c.

SWORD, an offensive weapon, worn at the side, serving either to prick, or cut, or both.

Its parts are the blade, guard, hand or grasp, and pummel; to which may be added, the bow, scabbard, hook, and chape. The masters of defence divide the *sword* into the *upper*, *middle*, and *lower* part; or the *fort*, *middle*, and *foible* or small and weak part.

Anciently, there were a kind of two-handed *swords*, called *spados*, which were to be managed with both hands; and which in those days they accustomed themselves to brandish so nimbly, as to cover the whole body therewith.

The savages of Mexico, when first visited by the Spaniards, had a kind of wooden swords; which would do as much execution as ours. In Spain, *swords* are only allowed of such a length, determined by authority. The ancient cavaliers gave names to their *swords*; *Joyeuse* was that of Charlemagne; *Durandal* that of Orlando, &c.

SWORD-*bearer*, an officer in the city of London, who attends the lord mayor at his going abroad, and to carry the *sword* before him, as the emblem of justice.

It is observed by an ancient writer of armoury, that the bearer must carry it upright, the hilts being holden under his bulk, and the blade directly up the middle of his breast, and between the *sword-bearer*'s brows.

The *sword* is likewise carried before the principal officers of boroughs, and other corporate towns, to represent the state and princely office of the king, as the chief governor.

SWORD, *broad*, sometimes called a *back-sword*, has only one edge, and is basket-handled.

SWORD-*bearers*. See PORT-GLAIVE.

SWORD-*belt*. See BELT.

SWORD-*blades*, *mills for*. See MILL.

SWORD, *pleas of the*. See PLEAS and JUS *gladii*.

SWORD, *St. James of the*. See JAMES.

SWORD-

SWORD-*hand*, in the *Manege*. See HAND.

SWORD-*fish*, *xiphias*, in *Ichthyology*, the name of a genus of fish of the order of *apodes*.

The characters of this genus, according to Linnæus, are, that the membrane of the gills has eight bones, and the point or extremity of the nose, snout, or upper jaw of the fish, is shaped like a *sword*, and the body taper and without scales. There is only one species, viz. the *xiphias gladius*.

According to the Artedian system of ichthyology, the characters of this genus of fish are these: the branchiostege membrane on each side contains about eight bones; the snout is extended into a very long and depressed point, imitating the figure of a *sword*, and of a bony substance; the body is oblong and roundish, the back-fin is small, and is very low in the middle; there are no belly-fins at all. The air-bladder in this fish is remarkably long, and the anus very near the tail.

The *sword-fish* is so remarkable for the shape of its snout, which is extended in form of a *sword*, that it has been called by all nations by a name expressive of that character. Its common name *xiphias* is from the Greek ξιφος, *a sword*, and it is called *gladius* in Latin, and in English the *sword-fish*.

It grows to a very considerable size, so as sometimes to weigh an hundred pounds. It is of a long and rounded body, largest near the head, and tapering by degrees toward the tail; its skin is considerably rough, its back black, and its belly of a silvery white; its mouth is of a moderate size, and has no teeth; its snout runs out into the figure of a *sword* in the upper jaw, the under is much shorter, and terminates in a very sharp point; it has one only fin on the back, running almost the whole length of it; its tail is very remarkably forked; it has only one pair of fins at the gills, having none on the belly. It is common in the Mediterranean, and some other seas, and is esteemed by many a very delicate fish for the table. The manner of fishing for it is the same at this time that the old writers have described it to be in theirs, by the harping-iron. Willughby's Hist. Pisc. p. 161. See *Tab*. V. *Fish*, N° 57.

The ancient manner of taking this fish is particularly described by Strabo (lib. i. p. 16.) and agrees exactly with that practised by the moderns. A man ascends one of the cliffs that overhangs the sea; as soon as he spies the fish, he gives notice of the course he takes. Another that is stationed in a boat, climbs up the masts, and on seeing the *sword-fish*, directs the rowers towards it: as soon as he thinks they are got within reach, he descends, and taking a spear in his hand, strikes it into the fish, which, after wearying itself with its agitation, is seized and drawn into the boat. It is much esteemed by the Sicilians, who buy it eagerly for about *6d*. per pound, at its first coming into season. The season lasts from May till August. This fish is said to be very voracious, and a very great enemy to the tunny, which (according to Belon) are as much terrified by it as sheep are at the sight of a wolf. Ovid Halieut. 97. Pennant.

SWORD-*grass*, in *Botany*. See *Sweet* RUSH.

SYCABIS, in *Ornithology*, a name by which some authors have called the ATRICAPILLA, or BLACK-*cap*, a small bird well known in England.

SYCAMINOS, a word used by some for the mulberry fruit, and by some for the tree.

SYCAMORE, a species of the *ficus*, or FIG-*tree*.

SYCAMORE-*tree*, a name improperly given by us to the *acer majus*. See MAPLE.

SYCAMORE-*moth*, in *Natural History*, the name of a peculiarly large and beautiful moth, or night-butterfly, so called from its caterpillar feeding on the leaves of the *sycamore*. This caterpillar is remarkably large, very often growing to three inches and an half long, and three quarters of an inch in diameter.

These caterpillars being put into a box, each spun itself a strong and firm case, which it fastened to the side of the box, and in it waited the time of its last transformation: in each of these shells there was left a small aperture, by means of which the creature was to get out when in its butterfly state, and the head of this animal was placed exactly against this aperture. In this state they lie all the autumn, winter, and spring, and in the beginning of summer come out in the shape of a very elegant moth. The wings, when expanded, measure more than five inches, and each has an eye, like that on the peacock's tail, near the extremity. The horns are of the feathered kind, and are very large and elegant; and the body and origins of the wings are covered with very long hairs. Mem. Acad. Par. 1692.

SYCION, a word used by some authors to express a decoction of dried figs.

SYCITES, the *fig-stone*, a name given by some authors to such natural nodules of flint or pebbles, as happen to approach to a fig in shape.

SYCITES *vinum*, a term used by the ancients to express a wine impregnated with figs.

SYCOMANTIA, συκομαντεια, in *Antiquity*, a species of divination performed with fig-leaves; for which see Potter, Archæol. Græc. lib. ii. cap. 18. tom. i. p. 353.

SYCOPHANT, συκοφαντης, formed from συκος, *a fig*, and φαινω, *I discover*, a Greek term, originally used at Athens, for persons who made it their business to inform against those who stole figs to the owners, or against those who, contrary to the law, which prohibited the exportation of figs, practised the thing, and deceived the officers, the inspectors of the ports, &c.

At length, the term became used, in the general, for all informers, tale-bearers, parasites, flatterers, &c. especially those in the courts of princes: and at last, for liar, impostor, &c.

SYCOPHANTIC *plants*. See PARASITES.

SYCOSIS, a term used by some authors to express a tumor of the anus, differing only in bigness from the thymus. It had this name from the resemblance of the flesh about its edges to a ripe fig. The ancients understood two sorts of ulcerated tumors by this name, though both attending the same part; the one was hard and round, the other softer, and of an irregular figure: from the first there was discharged only a small quantity of matter, from the latter a very large quantity, and that of a very ill smell. Some other of the ancient physicians make the same word also express two sorts of ulcerated tumors of the head, or beard, which they distinguish by the same characters into a hard and a soft one.

SYCOTA, a word used by some of the ancients to express a sort of food prepared of figs.

SYCOTON, a name given by the ancients to the liver of a pig fed with figs. This was esteemed a very elegant dish among the old Greeks.

SYDEROPŒCILUS, in *Natural History*, the name of a stone mentioned by the ancients. It was found in Arabia, and seems to have obtained this name from its being spotted with a ferruginous colour. The descriptions of the ancients are, however, in this, as in many other instances, too short to suffer us to guess what stone they meant. This might possibly be a granite with spots of this peculiar colour.

SYENITES, in the *Natural History of the Ancients*, a name given by many to the granite, the same with the oriental granite of the moderns. It had this name from its country; but our artificers have of late learned to call a different substance by that name that sounds very like this, the beautiful purple and yellow marble, so frequent with us now in tables, &c. being called among them *Sienna marble*.

SYLLABIC, in the *Greek Grammar*. There are two kinds of augments; the first called *syllabic*, which is when the word is increased by a *syllable*; the other *temporal*, which is when a short syllable becomes long.

SYLLABLE, SYLLABA, in *Grammar*, a part of a word, or an articulate sound, consisting of one or more letters which are pronounced together; or which of itself conveys either no idea, or part only of what is denoted by the word. The word is derived from the Greek συλλαβη, which literally denotes comprehension, or assemblage.

Or, a *syllable* is a complete sound, uttered in one breath consisting either of a vowel alone, or of a vowel and one or more consonants, not exceeding seven.

Scaliger defines a *syllable* to be an element under one tone or accent, that is, which can be pronounced at once.

Priscian, more intelligibly, calls it a comprehension of several letters falling under one accent, and produced at one motion of the breath. But some grammarians reject this definition, as excluding all *syllables* of one letter.

Another defines *syllable*, a literal or articulate voice, of an individual found.

The learned bishop Lowth defines *syllable*, a sound, either simple or compounded, pronounced by a single impulse of the voice, and constituting a word or part of a word.

In every word, therefore, there are as many *syllables* as there are vocal sounds; and as many vocal sounds, as there are simple or compound vowels, each whereof requires a distinct motion of the pectoral muscles. Thus, *a*, *a*, *a*, make three *syllables*, formed by so many motions, distinguished by small stops betwixt each expiration.

In the Hebrew, all the *syllables* begin with consonants allowing aleph to be one; nor has any *syllable* more than a single vowel.

From the number of *syllables* in words, they become denominated *monosyllables*, *bisyllables*, *trisyllables*, and *polysyllables*. *q. d.* words of one *syllable*, two *syllables*, three *syllables*, and many *syllables*.

As it is the number of *syllables* that constitutes the measure of English verse, it were to be wished we had fixed and settled rules to determine the precise number of *syllables* in each word; for we have words very dubious in that respect; and there are even some which have more *syllables* in verse than in prose. Many of the words ending in

in *ious*, occaſion great embarraſſment to ſuch as pique themſelves on exactneſs; as odious, precious, &c.

With reſpect to the diviſion of *ſyllables* we may obſerve, that any letter, or combination of letters, which will begin a word, may likewiſe begin a *ſyllable* in the middle of a word, and no other; for each *ſyllable* being as much a perfect ſound, as a monoſyllable word, can properly commence with ſuch letters only as will ſuit the beginning of a word. Accordingly, there is no letter in the Engliſh language, that may not begin a word, except *e* mute, which therefore in the middle of words always goes with the former *ſyllable*. Moreover, every *ſyllable* ends in the middle of a word, when the ſound is complete, and the next letter or letters will begin a new *ſyllable*, of which the firſt at leaſt is a conſonant, unleſs where two vowels meet, which do not unite in a diphthong. However, there are ſome few exceptions to this general rule.

A *ſyllable* in the beginning or middle of a word ends in a vowel, unleſs it be followed by *x*, or by two or more conſonants, which are for the moſt part to be ſeparated; and at leaſt one of them always belongs to the preceding *ſyllable*, when the vowel of that *ſyllable* is pronounced ſhort. Particles in compoſition, though followed by a vowel, generally remain undivided in ſpelling. A mute generally unites with a liquid following; and a liquid, or a mute, generally ſeparates from a mute following: *le* and *re* are never ſeparated from a preceding mute, *e.g. ma-ni-feſt, ex-e-cra-ble, un-e-qual, miſ-ap-ply, diſ-tin-guiſh, cor-reſ-pon-ding*. But the beſt and eaſieſt rule for dividing the *ſyllables* in ſpelling, is to divide them as they are naturally divided in a right pronunciation; without regard to the derivation of words, or the poſſible combination of conſonants at the beginning of a *ſyllable*. See this ſubject purſued in Ward's Eſſays upon the Engliſh Language, p. 44, &c. See alſo Lowth's Introduction to Engliſh Grammar, p. 23.

With regard to the accenting of *ſyllables*, to what has been delivered under ACCENT we may here add, that all words of one *ſyllable* have either an acute or circumflex accent, agreeably to their quantity. In words of more than one *ſyllable*, the Latin and Greek language differ very much from each other, as to the uſe of accents. Many words of two or more *ſyllables* are accented on the laſt *ſyllable* in Greek, but none in Latin, except a few compounds of *fio*, as *malefit*, &c. In words of more than two *ſyllables*, if the penultima is long, the Latin accent is placed there, otherwiſe on the antepenultima. But in Greek words it is ſometimes placed on the antepenultima when the penultima is long, and at other times on the laſt *ſyllable*, but when this is long, it is never carried farther back than the penultima. No word in the Latin or Greek language is accented farther from the end than the antepenultima.

Engliſh words are not only accented upon each of the three laſt ſyllables, but ſeveral upon the fourth, and ſome few upon the fifth from the end. In pronouncing long words, a variation of the tone is neceſſary upon ſome other *ſyllable*, beſides that where the accent is placed, though not equally high, both for the ſake of eaſing the voice, and modulating the ſound. Many Engliſh nouns and verbs written alike, are diſtinguiſhed from each other, by pronouncing the former with an acute accent on the penultima, and the latter on the laſt *ſyllable*; as *ábſent* and *abſént*, *cónteſt* and *conteſt*, &c. In the inflection of verbs, the accent always remains on the root, as *lóve, lóveth, lóved, &c.* In derivatives the accent is always on the theme, except ſubſtantives from the French, ending in *eer* and *ier*, where it is carried to the termination, as *voluntéer*, &c. Moſt compound words have their accent on the former part, unleſs that be a prepoſition, and then oftener on the latter. But the exceptions from either are more eaſily known from obſervation than reduced to any certain rules. Ward ubi ſupra, p. 32, &c.

SYLLABLES, *quantity of*. See QUANTITY.

SYLLABUB, a kind of compound drink, moſt affected in the ſummer ſeaſon; ordinarily made of white wine and ſugar, into which is ſquirted new milk with a ſyringe, or wooden cow.

Sometimes it is made of canary, in lieu of white wine; in which caſe the ſugar is ſpared, and a little lemon and nutmeg are added in lieu of it.

To prepare it the beſt way, the wine and other ingredients, excepting the milk, are to be mixed over night, and the milk or cream added in the morning. The proportion is, a pint of wine to three of milk. For

SYLLABUB, *whipt*, to half a pint of white wine or rheniſh, is put a pint of cream, with the whites of three eggs. This they ſeaſon with ſugar, and beat with birchen rods, or work with a ſyringe. The froth is taken off as it riſes, and put into a pot; where, after ſtanding to ſettle two or three hours, it is fit to eat. Ruſt.

SYLLEPSIS, in *Grammar*, *conceptio*, a figure whereby we conceive the ſenſe of words otherwiſe than the words import; and thus make our conſtruction, not according to the words, but the intention of the author. See SUBSTITUTION.

The *ſyllepſis*, ſays an ingenious author, is a figurative conſtruction, which agrees rather with our ideas than with the words; and expreſſes rather the ſenſe of our mind than the ſenſe of the terms themſelves.

SYLLEPSIS is alſo uſed for the agreement of a verb, or adjective, not with that word next it, but with the moſt worthy in the ſentence: as *rex & regina beati*.

Some authors call the *ſyllepſis*, *ſyntheſis*; others, *ſubſtitution*. It is a figure of conſiderable uſe for the well underſtanding of authors. Scioppius divides it into two kinds, *ſimple* and *relative*.

SYLLEPSIS, *ſimple*, is when the words of a diſcourſe either diſagree in gender, or number, or both.

SYLLEPSIS, *relative*, is, when the relative is referred to an antecedent which is not expreſſed; but which we conceive by the ſenſe of the whole period.

SYLLOGISM, *συλλογισμος*, in *Logic*, an argument, or form of reaſoning, conſiſting of three propoſitions; having this property, that the concluſion neceſſarily follows from the two premiſes: ſo that if the firſt and ſecond propoſitions be granted, the concluſion muſt be granted in like manner; and the whole allowed for a demonſtration.

If the premiſes be only probable, or contingent, the *ſyllogiſm* is ſaid to be *dialectical*; if they be certain, *apodictical*; if falſe, under an appearance of truth, *ſophiſtic* or *paralogiſtic*.

As often as the mind obſerves any two notions to agree to a third, which is done in two propoſitions; it immediately concludes, that they agree to each other: or if it find, that one of them agrees, and the other diſagrees, which is likewiſe done in two propoſitions; it immediately pronounces, that they diſagree to each other. And ſuch is a *ſyllogiſm*; which, it hence appears, is nothing but a mental diſcourſe, or reaſoning, whereby, from any two propoſitions granted, a third is neceſſarily deduced.

Hence, as the Greeks call it *ſyllogiſm*, the Latins call it *collectio*, or *ratiocinatio*, as being a kind of computation, which, either by adding, or ſubſtracting, gathers either the ſum or the remainder: for, as if we add two and three, we may thence collect five; ſo, if to this propoſition, "man is an animal," you add this, "every animal thinks," you thence deduce this, "therefore man thinks."

Of the three propoſitions whereof a *ſyllogiſm* conſiſts; the firſt is, by way of eminence, called the *propoſition*, as being propoſed for the baſis of the whole argument; the ſecond is called the *aſſumption*, as being aſſumed to aſſiſt in inferring the third: though they are both called *ſumptiones*, becauſe aſſumed for the ſake of the third; and both *premiſes*, as being premiſed to it; and for the ſame reaſons both are called *antecedents*, only the firſt the *major*, and the latter the *minor*.

The third is called the *concluſion*, as being the cloſe of the whole argumentation; and ſometimes *complexio*, as including the two notions, before ſeparately compared; and *conſequens*, becauſe it follows from the antecedents; and laſtly, *illatio*, becauſe inferred from the premiſes by means of the illative particle *ergo*, therefore, &c.

As the concluſion is the principal part of a *ſyllogiſm*, it hence ariſes, that though both the propoſition and aſſumption conſiſt each of its ſubject and attribute; yet the ſubject and attribute of a *ſyllogiſm* are properly underſtood of thoſe of the concluſion.

Again, in the inſtance above mentioned, *animal* being uſed both as ſubject and attribute, it is held a kind of intermediate between the two, and frequently called *medium*; in reſpect to which, both the ſubject and attribute, *man* and *thinks*, are called *extremes* or *terms*; only the ſubject *the greater extreme*, and the attribute *the leſs*.

In the conſtitution of a *ſyllogiſm*, we may conſider the matter and the form of it. The matter is three propoſitions, made up of three ideas, or terms variouſly joined. The three terms are named the major, minor, and middle. The predicate of the concluſion is called the *major term*, becauſe it is generally of larger extent than the minor term, or the ſubject. The major or minor terms are called the *extremes*. The middle term, or medium, is the third idea invented and diſpoſed in two propoſitions, in ſuch a manner as to ſhew the connection between the major and minor term in the concluſion; whence the middle term is ſometimes called the ARGUMENT. The propoſition which contains the predicate of the concluſion, connected with the middle term, is uſually called the *major propoſition*, whereas the minor propoſition connects the middle term with the ſubject of the concluſion, and is ſometimes called the *aſſump-*

tion. The major propoſition is generally placed firſt, and the minor ſecond, and the concluſion in the laſt place, when the *ſyllogiſm* is regularly compoſed and repreſented.

The FORM of a *ſyllogiſm*, is the framing and diſpoſing of the premiſes according to art, or juſt principles of reaſoning, and the regular inference of the concluſion from them.

Syllogiſms are diſtributed, with regard to the queſtion to be proved, into *univerſal affirmative, univerſal negative, particular affirmative* and *particular negative:* and with reſpect to their nature and compoſition, into *ſingle* and *compound. Single ſyllogiſms* are made up of three propoſitions, and may be divided into *ſimple, complex,* and *conjunctive.*

Simple, or *categorical ſyllogiſms,* are made up of three plain, ſingle, or categorical propoſitions, wherein the middle term is evidently and regularly joined with one part of the queſtion in the major propoſition, and with the other in the minor, whence follows a plain ſingle concluſion. For *complex ſyllogiſms,* ſee COMPLEX.

Conjunctive ſyllogiſms, are thoſe, in which one of the premiſes, viz. the major, has diſtinct parts, joined by a conjunction, or ſome ſuch particle of ſpeech; the chief of which are CONDITIONAL, *disjunctive,* which have the major propoſition DISJUNCTIVE, *relative,* requiring the major propoſition to be RELATIVE, and *connective,* or *copulative,* which require that two or more ideas be ſo connected either in the complex ſubject, or predicate of the major, that if one of them be affirmed or denied in the minor, common ſenſe will ſhew what will be the conſequence.

Compound ſyllogiſms are made up of two or more ſingle ones, and may be reſolved into them: the chief kinds are EPICHIREMA, DILEMMA, PROSYLLOGISMUS, and SORITES. Watts's Logic, part iii. c. 3.

A *ſyllogiſm,* wherein one of the premiſes is ſuppreſſed, but ſo as to be underſtood, is called an ENTHYMEME, e. gr. "every animal thinks, therefore man thinks;" wherein the propoſition, "man is an animal," is underſtood.

The demonſtrations of mathematicians, it is obſerved, are only ſerieſes of enthymemes: ſo that every thing in mathematics is concluded or proved by *ſyllogiſm*; only omitting ſuch premiſes, as occur of their own accord, or as are referred to, by the citations. See SOPHISM.

There are two general methods of reducing all *ſyllogiſms* to a teſt of their truth or falſehood. The firſt is, that the premiſes muſt contain the concluſion, or one of them muſt contain the concluſion, and the other muſt ſhew that the concluſion is contained in it; and the ſecond is this, as the terms in every *ſyllogiſm* are uſually repeated twice, they muſt be taken preciſely in the ſame ſenſe in both places. Watts ubi ſupra.

For the uſe SYLLOGISM *is of to reaſon,* Mr. Locke obſerves, that of four things, which reaſon is employed about; viz. the finding out of proofs, the regular diſpoſition of them ſo as their connection may appear, the perceiving their connection, and the making a right concluſion; *ſyllogiſm* only aſſiſts in one, viz. ſhewing the connection of the proofs in any inſtance. Nor is it of any great uſe even here; ſince the mind can perceive ſuch connection, where it really is, as eaſily, nay, perhaps better, without it. We ſee men reaſon very ſtrongly, who do not know how to make a *ſyllogiſm.*

Indeed, *ſyllogiſm,* the ſame author adds, may ſerve to diſcover a fallacy in a rhetorical flouriſh, or by ſtripping an abſurdity of the cover of wit, and good language, ſhew it in its natural deformity. But it only ſhews the weakneſs or fallacy of ſuch a diſcourſe by the artificial form it is put into, to thoſe who have thoroughly ſtudied mood and figure, and have ſo examined the many ways three propoſitions may be put together in, as to know which of them does certainly conclude right, and which not, and upon what grounds they do ſo.

The mind is not taught to reaſon by theſe rules; it has a native faculty of perceiving the coherence or incoherence of its ideas, and can range them right, without ſuch perplexing repetitions. Add, that to ſhew the weakneſs of an argument, there needs no more, than to ſtrip it of the ſuperfluous ideas, which, blended and confounded with thoſe on which the inference depends, ſeem to ſhew a connection where there is none; or at leaſt hinder the diſcovery of the want of it: and then to lay the naked ideas, on which the force of the argumentation depends, in their due order. In this poſition, the mind taking a view of them, ſees what connection they have, and ſo is able to judge of their inference, without any need of *ſyllogiſm* at all.

Nor muſt it be omitted, that *ſyllogiſms* are as liable to fallacies, as the plainer ways of argumentation; for which one might appeal to common obſervation; which has always eſteemed theſe artificial methods of reaſoning, more adapted to catch and entangle the mind, than to inſtruct and inform the underſtanding. And if it be certain, that fallacy can be couched in a *ſyllogiſm,* as nobody will deny but it may; it muſt be ſomething elſe, and not a *ſyllogiſm,* that muſt diſcover it.

The ſame author proceeds to ſhew, that this way of reaſoning diſcovers no new proofs, nor makes any diſcoveries; but is wholly converſant in the marſhalling and ranging thoſe we already have: a man muſt know, before he be able to prove *ſyllogiſtically*; ſo that the *ſyllogiſm* comes after knowledge, when we have but little need of it. See REASON and LOGIC.

SYLLOGISM, *figure and mood of a.* See FIGURE and MOOD.

SYLLOGISMS, *reduction of.* See REDUCTION.

SYLLOGISTIC *form.* See FORM.

SYLLUK, the principal of the Hebrew ACCENTS, uſed to cloſe a period, and called *king* and *pauſe.* It is marked under a letter thus (ֽ).

SYLVA, among the Romans, a ludicrous kind of hunting exhibited in the circus; ſo called, becauſe the circus was really planted with trees, which had been dug up with the roots by the ſoldiers and brought thither, and fixed to large beams, after which earth being thrown upon their roots, the circus actually reſembled a wood; then being filled with all ſorts of herbivorous animals, the people were let looſe upon them, and carried all clear off.

SYLVANS, in *Mythology.* See FAUNS, SATYRS, and SILENI.

SYLVA, or SILVA, in *Poetry,* a poetical piece compoſed, as it were, at a ſtart; or in a kind of rapture or tranſport, and without much thought or meditation. Such are the *ſylvæ* of Statius, which, he aſſures us, were all compoſed after this manner.

Quintilian extends the uſe of the word *ſylva* to any writing done in haſte, and on the ſpot.

The word is Latin, and literally ſignifies *foreſt*; whence its chief uſe, in our language, is metaphorically to expreſs certain collections of poetical pieces, of various kinds, and on various ſubjects; as a foreſt is an aſſemblage of trees of different ſorts.

SYLURUS, in *Ichthyology,* a name given by Geſner to the *ſilurus* of Willughby, and others, which we call in Engliſh the *ſheat-fiſh.* See SILURUS.

SYMBACCHI, συμϐακχοι, in *Antiquity,* a deſignation given to the two men, who purified the city of Athens at the feſtival THARGELIA.

SYMBOL, SYMBOLUM, formed from συμϐολον, a *mark, ſign,* or *badge,* of συμϐαλλειν, *to compare,* a ſign or repreſentation of any moral thing, by the images or properties of natural things.

Thus we ſay, the lion is the *ſymbol* of courage; the pelican of paternal love, &c. *Symbols* were in very great repute among the ancient Hebrews, and eſpecially among the Egyptians; and ſerved to cover a great part of their moral myſteries; being uſed not only to repreſent moral things by natural; but even natural by natural.

Symbols are of various kinds, as types, ænigmas, parables, fables, allegories, emblems, hieroglyphics, &c. each whereof ſee under its reſpective article, TYPE, ÆNIGMA, PARABLE, FABLE, &c.

The Chineſe letters are moſt of them abſolute *ſymbols,* or ſignificative. The *ſymbols* in algebra, &c. are arbitrary. Medaliſts alſo apply the term *ſymbol* to certain marks or attributes peculiar to certain perſons or deities. The thunder-bolt, for inſtance, accompanying the heads of certain emperors, is a ſign or *ſymbol* of the ſovereign authority, and of a power equal to that of the gods: the trident is the *ſymbol* of Neptune; the peacock of Juno; a figure ſeated on an urn, of a river, &c. See MEDAL.

SYMBOL, among *Chriſtians,* is particularly uſed for the creed, or the articles of religion, which every Chriſtian is to know and believe. See *Apoſtle's* CREED.

In the emperor's library is a Greek MS. of the *ſymbol* of the apoſtles, divided into twelve articles, with the names of the reſpective apoſtles, who are ſaid to have compoſed each article. The firſt is attributed to St. Peter, and the reſt ſucceſſively to Andrew, James major, John, Thomas, James minor, Philip, Bartholomew, Matthew, Simon, Thaddeus, and Matthias.

But the teſtimony of that MS. does not much confirm the opinion, that each apoſtle compoſed an article of the *ſymbol*; yet the opinion is, at leaſt, as old as St. Leo, who ſeems to have believed it.

Authors are in doubt why the name *ſymbol* ſhould be given to this compendium of the articles of the Chriſtian faith: ſome ſay, it is thus called in alluſion to a military cuſtom; that as ſoldiers were known by ſigns and tokens, this was to be the mark or characteriſtic of a Chriſtian.

To this purpose Ruffinus says, that the Greek word συμβολον may be rendered in Latin by *indicium*. Others derive it from an assembly or conference of the apostles, where each expressing his sense of the faith, and what each had chiefly preached, the creed was framed, and called by the Greek word συμβολον, which signifies *collation* or *conference*.

Lord King derives the signification of the word with greater probability from the *sacra*, or religious services of the heathens, where those who were initiated into mysteries had certain signs or marks, called *symbola*, delivered to them, by which they might know each other, and claim admission to the secret worship and rites of that god, whose *symbols* they had received. He produces many instances of the common use of *symbols*, both mute and vocal: and in allusion to these he apprehends the creed is thus called, because it was studiously concealed from the Pagan world, and not revealed to the catechumens themselves, till they were initiated by baptism into the visible church; when it was delivered to them, as that secret mark or sign, by which they should be known from all others, and mutually know each other. Hist. of Apostle's Creed, p. 11, &c.

SYMBOLICAL *characters, column, fountain, freezes.* See the substantives.

SYMBOLICAL *philosophy*. See HIEROGLYPHIC.

SYMBOLICAL *physics*. See PHYSICS.

Clemens Alexandrinus, Eusebius, &c. observe, that the Egyptians had two ways of representing their *symbolical* mysteries; one by the virtues of animals, herbs, &c. the other by geometrical figures. Thus, the sun and moon were represented, in the first manner, by the beetle and ibis; and in the latter by their own figures. Again, the four elements they represented after the first manner, by four animals which have qualities corresponding thereto; and after the second manner by +.

SYMBOLISM, a word used by some of the chemical writers to express a consent of parts.

SYMBOLOGICE, is used by some for that part of the science of medicine, which treats of the symptoms of diseases.

SYMMETRY, συμμετρια, formed from συν, *with*, and μετρον, *measure*, the relation of parity, both in respect of height, length, and breadth of the parts necessary to compose a beautiful whole.

Symmetry, according to Vitruvius, consists in the union and conformity of the several members of a work to their whole, and of the beauty of each of the separate parts to that of the intire work; regard being had to some certain measure: so that the body is framed with *symmetry*, by the due relation which the arm, elbow, hand, fingers, &c. have to each other, and to their whole.

Symmetry arises from that proportion which the Greeks call *analogy*, which is the relation of conformity of all the parts of a building, and of their whole, to some certain measure; whereupon depends the nature of *symmetry*.

SYMMETRY, *uniform*, in *Architecture*, is that where the same ordonnance reigns throughout the whole.

SYMMETRY, *respective*, is that where only the opposite sides are equal to each other.

SYMPARATAXIS, a word used by Hippocrates to express the conflict between nature and a disease, and the aliments or medicines given in it.

SYMPASMA, a word used by many authors to signify a cataplasm.

SYMPATHETIC, συμπαθητικος, something that has a sympathy; or that acts, or is acted on by sympathy.

SYMPATHETIC, is particularly applied to all diseases which have two causes; the one remote, the other near. In which sense, the word is opposed to *idiopathetic*.

Thus, an epilepsy is said to be *sympathetic* when produced by a remote cause; i. e. when the disorder in the brain, embarrassed with blood, is preceded and produced by some other disease.

There is a *sympathetic* palpitation of the heart, and an idiopathetic one. There is but one idiopathetic cause of the palpitation; but there are several *sympathetic* ones.

Among chemists and alchemists, the term *sympathetic* is principally applied to a kind of powder and of ink.

SYMPATHETIC *ink*. See INK.

SYMPATHETIC *powder*, a powder once very much famed; supposed to have this wonderful property, that if spread on a cloth dipt in the blood of a wound, the wound would be cured, though the patient be any number of miles off.

This powder, M. Lemery tells us, is nothing but Roman vitriol, opened by the sun-beams penetrating it, and imperfectly calcining it, in the middle of summer.

But it is now generally allowed a mere piece of charletanery, whatever sir Kenelm Digby, and others before him, and after, plead in its favour.

The composition of the *famous sympathetic powder*, used at Gosselaer by the miners in all their wounds, is this. Take of green vitriol eight ounces, of gum tragacanth, reduced to an impalpable powder, one ounce; mix these together, and let a small quantity of the powder be sprinkled on the wound, and it immediately stops the bleeding. The vitriol is to be calcined to whiteness in the sun, before it is mixed with the gum.

SYMPATHY, συμπαθεια, formed from συν, *with*, and παθος, *passion*, q. d. *compassion*, *fellow-feeling*; an agreement of affections and inclinations, or a conformity of natural qualities, humours, temperaments, &c. which make two persons pleased and delighted with each other. A late ingenious writer has endeavoured to account for the origin of our moral sentiments from *sympathy*, denoting our fellow-feeling with any passion whatever. When we approve of any character or action, the sentiments which we feel, are, according to this system, derived from four sources, which are in some respects different from one another. First, we sympathize with the motives of the agent; secondly, we enter into the gratitude of those who receive the benefit of his actions; thirdly, we observe, that his conduct has been agreeable to the general rules by which those two *sympathies* generally act; and, last of all, when we consider such actions as making a part of a system of behaviour, which tends to promote the happiness either of the individual or of the society, they appear to derive a beauty from this utility, not unlike that which we ascribe to any well contrived machine. There is another system that traces our moral sentiments to *sympathy*, different from the former. It is that which places virtue in utility, and accounts for the pleasure with which the spectator surveys the utility of any quality from *sympathy*, with the happiness of those who are affected by it. This *sympathy*, however, is different both from that by which we enter into the motives of the agent, and from that by which we go along with the gratitude of the persons who are benefited by his actions. It is the same principle with that by which we approve of a well contrived machine. But no machine can be the object of either of those two last mentioned *sympathies*. Smith's Theory of Moral Sentiments. Ed. 3. 1767. See VIRTUE.

SYMPATHY is also used with regard to inanimate things; intimating some propension they have to unite, or to act on one another.

In this sense, naturalists say, there is a *sympathy* between the vine and the elm; between the loadstone and iron; the two poles of a loadstone, &c.

The alchemists talk much of the powder of *sympathy*. See SYMPATHETIC *powder*.

SYMPATHY, in *Medicine*, an indisposition befalling one part of the body, through the defect or disorder of another; whether it be from the affluence of some humour, or vapour sent from elsewhere; or from the want of the influence of some matter necessary to its action.

We have some practical remarks on the *sympathy* of the parts of the body, in the Medical Essays of Edinburgh, vol. v. part 2. art. 45.

For the force and effect of *sympathy*, in the production of monsters, see MONSTER.

SYMPESIS, a word used by the old Greek writers to signify *concoction* or *digestion*.

SYMPHONIACA, in *Botany*, a name given by some authors to the common *hyosciamus*, or *henbane*.

SYMPHONIALE, in the *Italian Music*, is sometimes prefixed to a canon, or fugue, to shew that it is at unison, i. e. that the second part is to follow, or imitate the first in the same intervals, sounds, notes, &c. the third to observe the same with regard to the second, and so on.

SYMPHONIACO *stylo*. See STYLE.

SYMPHONY, συμφωνια, formed from συν, *with*, and φωνη, *sound*, in *Music*, properly denotes a consonnance, or concert of several sounds agreeable to the ear; whether they be vocal or instrumental, or both; called also HARMONY.

Some authors restrain *symphony* to the sole music of instruments: in this sense, say they, the recitativos in such an opera were intolerable, but the *symphonies* excellent.

The *symphony* of the ancients went no farther than to two or more voices or instruments set to unison; for they had no such thing as music in parts; as is very well proved by M. Perrault: at least, if ever they knew such a thing, it must be allowed to have been early lost.

It is to Guido Aretine, about the year 1022, that most writers agree in ascribing the invention of composition: it was he, they say, who first joined in one harmony several distinct melodies; and brought it even to the length of four parts, viz. bass, tenor, counter-tenor, and treble. But there is nothing, says the ingenious Dr. Burney, more difficult than to fix such an invention as this upon any

any individual; an art utterly incapable of being brought to any degree of perfection, but by a slow and gradual improvement, and the successive efforts of ingenious men during several centuries, must have been trivial and inconsiderable in its infancy; and the first attempt at its use necessarily circumscribed and clumsy. This excellent writer has impartially examined and recited the evidence for and against the antiquity of harmony or COUNTERPOINT, and after an elaborate detail expressed his own opinion against it: and he has also given a list and analysis of the writings of Guido, in order to ascertain how much modern music has been indebted to this celebrated monk of Arezzo. Hist. Music, vol. i. p. 112, &c. vol. ii. p. 72, &c.

The word *symphony* is now applied to instrumental music, both that of pieces designed only for instruments, as sonatas and concertos, and that in which the instruments are accompanied with the voice, as in operas, &c. A piece is said to be in grand *symphony*, when, besides the base and treble, it has also two other instrumental parts, viz. tenor and fifth of the violin.

SYMPHORICARPOS, in *Botany*. See *Upright* HONEYSUCKLE.

SYMPHYSIS, συμφυσις, denoting *a natural coherence or connection*, in *Anatomy*, one of the manners of articulating, or joining the bones. See ARTICULATION.

Symphysis is a natural union, whereby two separate bones coalesce, and grow together; so that neither retains any proper distinct motion.

Such are most of the junctures of the epiphyses, and many others of bones, which in children are separate, but with age grow together; as the os ethmoides, the bones of the cranium, os sacrum, &c.

The *symphysis*, or natural union of bones, is of two kinds, either *with a medium*, or *without*.

SYMPHYSIS *without a medium*, is where the articulated bones support themselves in their situation, without any other assistance than that of their conformation only: thus, the parietal bones are mutually fixed by their indentations, and furnish an example both of articulation and *symphysis*: in the same manner the bones in the basis of the skull are supported by those which make the convex part of it.

This union is effected much after the same manner as that of a graft and a tree.

The SYMPHYSIS *with a medium*, is of three kinds, called *synneurosis*, *syssarcosis*, and *synchondrosis*; each whereof see under its proper article SYNNEUROSIS, &c.

SYMPHYTUM, in *Botany*. See COMFREY.

SYMPLEXIUM, in *Natural History*, the name of a genus of fossils, of the class of the selenitæ, but not of the determinate and regular figure of most of the genera of those bodies, but composed of various irregular connections of differently shaped, and usually imperfect bodies. The different bodies that form this kind are seldom quite perfect, having usually fallen together before they were wholly hardened; but generally, whether they form a larger or a smaller mass, they together affect the external figure of a flat hexaedral column, though variously notched at the sides, and truncated at the ends. Hill.

SYMPLOCE, συμπλοκη, in *Rhetoric*, a figure, where the same word is repeated several times in the beginning and end of a sentence, including the ANAPHORA and EPITROPHE: thus, *Quis legem tulit? Rullus. Quis majorem populi partem suffragiis privavit? Rullus. Quis comitiis præfuit? Idem Rullus.*

SYMPLOCOS, in *Botany*, a genus of the *polyandria monogynia* class. Its characters are, that the calyx is divided into five segments; it has five petals, and the stamina are inserted in the petals. There is only one species.

SYMPOSIAC, συμποσιακον, formed from συμποσιον, *feast*; a conference or conversation of philosophers at a banquet.

Plutarch has nine books, which he calls *symposiacs*; or *symposiac* questions, q. d. disputations at table.

SYMPOSIARCH, συμποσιαρχος, in *Antiquity*, the director, or manager of an entertainment. This office was sometimes performed by the person at whose charge the entertainment was provided; sometimes by another, named by him; and at other times, especially in entertainments provided at the common expence, he was elected by lot, or by the suffrages of the guests. He was otherwise called *basileus*, *rex*, and *modimperator*, &c. and determined the laws of good fellowship, observed whether every man drank his proportion, whence he was called *ophthalmus*, *oculus*, the *eye*.

SYMPTOM, συμπτωμα, in *Medicine*, is ordinarily confounded with *sign*, and defined an appearance, or assemblage of appearances in a disease, which shew and indicate its nature and quality; and from which one may judge of the events thereof.

In this sense, a delirium is held a *symptom* of a fever. Pain, waking, drowsiness, convulsions, suppression of urine, difficulties of breathing and swallowing, coughs, distastes, nauseas, thirsts, swoonings, faintings, looseness, costiveness, dryness and blackness of the tongue, are the principal *symptoms* of diseases.

Boerhaave gives a more just notion of *symptom*: every preternatural thing arising from a disease, as its cause, in such manner, however, as that it may be distinguished from the disease itself, and from its next cause, is properly a *symptom* of that disease.

If it arise after the same manner, from the cause of the disease, it is called a *symptom of the cause*.

If it arise from some former *symptom* as its cause, it is properly called a *symptom of a symptom*.

Whatever happens to a disease, from any other causes than those mentioned, is more properly an *epigennema*.

Hence it appears, that the *symptoms* above-recited are really diseases themselves. They are various as to number, effect, &c. though, after the ancients, they may be conveniently enough reduced to faults in the functions, excretions, and retentions.

Under the first come all diminutions, abolitions, increases, and depravations of animal actions; particularly with regard to hunger and thirst, sleeping and waking.

Under the second come nauseas, vomitings, lienteries, cœliac affections, diarrhœas, dysenteries, iliac passions, &c.

Under the third come the jaundice, stone, dropsy, fever, ischuria, strangury, asthma, catarrh, &c. See HUNGER, NAUSEA, LIENTERY, DIARRHOEA, JAUNDICE, DROPSY, STONE, FEVER, &c.

SYMPTOMS, *critical*. See CRITICAL.

SYMPTOMATICAL, in *Medicine*, is a term often used to denote the difference between the primary and secondary diseases. Thus a fever from pain is said to be *symptomatical*, because it rises from pain only; and therefore the ordinary means in fevers are not, in such cases, to be had recourse to; but to what will remove the pain; for when that ceases, the fever will cease, without any direct means taken for it.

SYMPTOMATICAL *classification of diseases*. See NOSOLOGY.

SYNÆRESIS, συναιρεσις, *contraction*, in *Grammar*, a figure, whereby two syllables are united in one. As *vemens* for *vehemens*. See CONTRACTION.

SYNAGOGUE, SYNAGOGA, συναγωγη, literally importing *assembly*, *congregation*; a particular assembly of Jews, met to perform the offices of their religion. Also, the place wherein they meet.

The Jews use the term in the primary sense, when they speak of the great *synagogue*; meaning the court of seventy elders, which they pretend to have been instituted originally by Moses, and the members of which they afterwards increased to one hundred and twenty.

Some authors take the use of *synagogues* to be of no old standing among the Jews; and maintain, that it was not till after their return from the Babylonish captivity, that the opinion first got footing, that the worship of God was not so restrained to the temple at Jerusalem, that it could not be held any-where else. The consequence of which new opinion was, that the Jews began to build them *synagogues* in all their cities.

Others hold, that there were *synagogues* even in the time of David. But be this as it will, no assemblies of the Jews appear to have been called *synagogues* till a little before the coming of Jesus Christ; who is said to have preached in the middle of the *synagogue*.

The *synagogues* were used, not only for divine service, but for holding courts of justice, especially upon ecclesiastical affairs. To this use of *synagogues*, some have supposed that St. James refers, ch. ii. 2—4.

There were reckoned four hundred and eighty *synagogues* in the single city of Jerusalem. There are *synagogues* at London, Amsterdam, Rotterdam, Avignon, Metz, &c.

SYNAGRIS, in *Ichthyology*, a fish caught in the Archipelago, and some other seas, and much resembling the *dentex*. Some have used it as a synonym for that fish, and others accounted it only a name applied to the *dentex* while young, but it is properly a distinct species.

According to Artedi, it is a species of the sparus, and is distinguished by him by the name of the variegated *sparus* with a sharp back, and with four large teeth. Linnæus also makes it a species of SPARUS, with a bifid red tail, and purple body, with seven golden-coloured lines on each side.

SYNALŒPHA, συναλοιφη, from συν, *together*, and αλειφω, *I anoint*, in *Grammar*, a contraction of syllables, performed principally, by suppressing some vowel or diphthong at the end of word, on account of another vowel or diphthong at the beginning of the next. As, *ill' ego*, for *ille ego*, &c.

Conticuer' omnes intentiqu' ora tenebant. Virg.

It is called by the Latins *collisio*.

SYNANCHE, συναγχη, formed from συν, *with*, and αγχειν, *to conſtringe* or *ſuffocate*, in *Medicine*, a kind of QUINSY, wherein the internal muſcles of the fauces, or pharynx, are attacked. See ANGINA.

When the external muſcles of the ſame part are ſeized, it is called a PARASYNANCHE.

SYNARTHROIDALIS *diarthroſis*. See DIARTHROSIS.

SYNARTHROSIS, συναρθρωσις, formed from συν, *with*, and αρθρον, *articulus*, *joint*; in *Anatomy*, a kind of articulation, or jointure of the bones of the body; wherein they remain without any, at leaſt, apparent motion.

The *ſynarthroſis* is when the bones are bound ſo faſt together, that they are rendered immoveable with regard to each other. In which view it ſtands oppoſed to *diarthroſis*.

It is divided into two kinds: one is made by engrailing, and the other in the ſame manner as a nail or pin is fixed in wood. The firſt may be again ſubdivided into the deeper, and the more ſuperficial kind.

The deep kind is obſervable in the articulation of the broad bones; the ancients termed this a SUTURE, from the reſemblance it bears to a coarſe ſeam, as is ſeen in the upper bones of the ſkull. It is made by jags, notches, and holes, in each of the articulated bones, by which they are mutually indented, much after the ſame manner as what is called *dove-tailing* among the joiners. By the ancients this was called alſo *unguis*, probably becauſe the indented pieces are rounded like nails. Sutures have been divided alſo into the true and the falſe. See SKULL.

The other kind is that which is obſerved in bones joined together by more extended ſurfaces, in which no indentation appears outwardly. This kind of articulation the ancients termed *harmonia*, and the articulation of ſome of the bones of the upper jaw were given as examples of it. But though they deſcribe this as running in a ſingle line, they did not mean this in a ſtrict ſenſe, but only that the joint was like that of two rough boards without grooves; for they have expreſsly told us, that ſome ſmall inequalities might be obſerved in theſe joints, and ſome of them have uſed the terms *ſuture* and *harmony* indifferently. The other kind of *ſynarthroſis*, an example of which we have in the teeth, is called GOMPHOSIS, a Greek term ſtill retained. Winſlow.

To theſe three kinds of *ſynarthroſis*, ſome add ſeveral others, as *ſymphyſis*, *ſyntenoſis*, and *ſynneuroſis*. See SYMPHYSIS, &c.

SYNATHROISMUS, συναθροισμος, in *Rhetoric*, a figure which, in order to magnify a thing, whether good or bad, enumerates a great many different perſons, actions, &c. to which it relates: thus Cicero, *qui mihi fratrem optatiſſimum, me fratri amantiſſimo, liberis noſtris parentes, nobis liberos; qui dignitatem, qui ordinem, qui fortunas, qui ampliſſimam rem-publicam, qui patriam, qui nihil poteſt eſſe jucundius; qui denique noſmet ipſos nobis reddidiſtis*. See Voſſ. Rhet. lib. v. p. 372.

SYNALIA, συναυλια, in the *Ancient Muſic*, a concert of ſeveral pipes, or flutes, performing alternately, without voices.

Mr. Malcolm, who doubts whether the ancients had properly any ſuch thing as inſtrumental muſic, that is, muſic compoſed wholly for inſtruments, without any ſinging; yet quotes the practice of the *ſynaulia* from Athenæus.

SYNCAMPE, formed of συν, and καμπη, *bending*, a word uſed by the old writers to expreſs the joint, or flexure, where the upper part of the arm is joined to the lower.

SYNCATEGOREMA, συγκατηγορημα, in *Logic*, denotes a word, which, ſignifying little or nothing of itſelf, yet, when joined with others, adds force thereto: as *all*, *none*, *certain*, &c.

SYNCAUSIS, formed of συν, and καυσις, *burning*, a word uſed by ſome medical writers to expreſs the drying, and, as it were, burning up of the excrements within the body by a febrile heat.

SYNCELLUS, or SINCELLUS, an ancient officer in the family of the patriarchs, and other prelates of the eaſtern church.

The word, in the corrupt Greek, συγκελλος, ſignifies a perſon who lies in the chamber with another; a *chamber-fellow*, or *chum*.

The *ſyncellus* was an eccleſiaſtic, who lived with the patriarch of Conſtantinople, to be a witneſs of his conduct; whence it is, that the *ſyncellus* was alſo called the *patriarch's eye*, becauſe his buſineſs was to obſerve and watch.

The other prelates had alſo their *ſyncelli*, who were clerks living in the houſe with them, and even lying in the ſame chamber, to be witneſſes of the purity of their manners.

Afterwards the office degenerated into a mere dignity; and there were made *ſyncelli* of churches. At laſt it became a title of honour, and was beſtowed by the emperor on the prelates themſelves; whom they called *pontifical ſyncelli*, and *ſyncelli Auguſtales*.

There were alſo *ſyncelli* in the weſtern church, particularly in France. The ſixth council of Paris ſpeaks with a great deal of indignation of ſome biſhops who aboliſhed the office of *ſyncelli*, and lay alone; and ſtrictly injoins them, that, for the future, to take away all occaſion of ſcandal, they made the office of *ſyncelli* inſeparable from that of biſhops.

SYNCHYSIS, formed of συν and χυσις, *effuſion*, a word uſed by the old medical writers to expreſs a confuſion and perturbation of all the humors in concoction, from the imbecility of the ſtomach. It is alſo uſed to expreſs a diſeaſe of the eye, which conſiſts in a confuſion of the humors: this generally proceeds from a violent blow; ſometimes from an inflammation of the uvea, occaſioning a rupture of the veſſels, and an effuſion of the humors.

SYNCHONDROSIS, συγχονδρωσις, formed from συν, *with*, and χονδρος, *cartilage*, in *Anatomy*, a kind of articulation of the bones of the body; being a ſpecies of SYMPHYSIS.

The *ſynchondroſis* ſignifies the union of two bones by means of a cartilage: and is either moveable, as in that by which the bodies of the vertebræ are kept together, or which joins the firſt rib to the ſternum; or immoveable, as that of the oſſa pubis, in an ordinary ſtate.

SYNCHORESIS, συγχωρησις, in *Rhetoric*, the ſame with PERMISSION.

SYNCHRONISM, συγχρονισμος, formed from συν, and χρονος, *time*; the being or happening of ſeveral things together, at or in the ſame time.

The happening or performing of ſeveral things in equal times, as the vibrations of pendulums, &c. is more properly called *iſochroniſm*: though ſome authors confound the two.

SYNCHYSIS, συγχυσις, in *Rhetoric*, a confuſed manner of expreſſion, where the natural order of the words is perverted. Horace affects it much: thus, lib. i. ſat. 5.

Pœne macros arſit dum turdos verſat in igne.

SYNCOMISTERIA, συγκομιστηρια, in *Antiquity*, the ſame with THALYSIA.

SYNCOMISTON, formed of συν, and κομιζω, *I nouriſh*; a name given by Athenæus, and ſome other authors, to the coarſer ſort of bread eaten by the poor in many countries, and made of unſifted meal, the bran being mixed up among the reſt. This is a very nouriſhing food, and for laborious people, or thoſe who uſe much exerciſe, is highly preferable to all other ſorts of bread.

SYNCOPATION, in *muſic*, denotes a ſtriking or breaking of the time; whereby the diſtinctneſs of the ſeveral times or parts of the meaſure is interrupted.

SYNCOPATION, or SYNCOPE, is more particularly uſed for the connecting the laſt note of one meaſure or bar with the firſt of the following meaſure; ſo as only to make one note of both. See LEGATE-*note*, and SLUR.

A *ſyncope* is ſometimes alſo made in the middle of a meaſure.

SYNCOPATION is alſo uſed when a note of one part ends, or terminates, on the middle of a note of the other part. This is otherwiſe denominated *binding*.

SYNCOPATION is alſo uſed for *driving a note*; that is, when ſome ſhorter note at the beginning of a meaſure or half-meaſure is followed by two, three, or more longer notes, before another ſhort note occurs, equal to that which occaſioned the driving, to make the number even:—e. gr. when an odd crotchet comes before two or three minims, or an odd quaver before two, three, or more crochets.

In *ſyncopated*, or driving notes, the hand or foot is taken up, or put down, while the note is ſounding.

SYNCOPE, Συγκοπη, formed from συν, and κοπτειν, *to cut* or *ſtrike*, in *Medicine*, a deep and ſudden ſwooning, wherein the patient continues without any ſenſible heat, motion, ſenſe, or reſpiration: and is ſeized with a cold ſweat over the whole body, and all the parts turn pale and cold, as if dead.

There are ſeveral cauſes of *ſyncopes*: 1°, Too great an exhauſtion of ſpirits; as after long diets, exceſſive evacuations, violent exerciſes, long bathings, &c.—2°, The irregular motion of the ſpirits preventing their due influx into the parts; as ſometimes happens in fear, wrath, and other violent paſſions.—3°, Immoderate hæmorrhages.—4°, An ill conſtitution of blood; as in cacochymias, or in perſons who have taken ſomething that either diſſolves or coagulates the blood.—5°, Secret diſeaſes, as abſceſſes, or polypuſes of the heart, worms, &c.

In very numerous, crouded aſſemblies, people ſometimes fall into *ſyncopes*, merely through the hot, thick, impure air they breathe.—Some women are alſo liable to them upon the ſmell of muſk, civet, &c.

For *ſyncopes*, many give volatile ſpirits, and aromatics. Heurnius recommends treacle-water, and cinnamon-water; and Etmuller the volatile ſalt of vipers, ſpirit of ſal ammo-

ammoniac, oil of amber, and, sometimes, bleeding. See LIPOTHYMIA.

SYNCOPE, in *Grammar*, denotes an elision, or retrenchment, of one or more letters, or syllables, from a word.

As when we say, *virûm*, for *virorum*; and *manet alta mente repôstum*, for *repositum*.

SYNCRETISTS, formed of συγκρινω, *I compare* or *reconcile*, denote in general persons who from a variety of discordant opinions, either in philosophy or religion, form a kind of comprehensive and pacific system, with a view of uniting the several parties who maintain such opinions. The moderate men, as they are called, of every persuasion, may be comprehended under this denomination. The Platonic *Syncretists*, towards the close of the fifteenth century, were of this class; for they considered Plato as the supreme oracle of philosophy, and yet would by no means suffer Aristotle to be treated with indifference or contempt; and they proposed to reconcile the jarring doctrines of these two famous Grecian sages, and to combine them into one system. These moderate philosophers, both in their manner of teaching and in the opinions they adopted, followed the modern Platonic school, of which Ammonius was the original founder. Their sect was for a long time held in the utmost veneration, particularly among the mystics; while the scholastic doctors, and all such as were infected with the itch of disputing, favoured the Peripatetics. But, after all, these reconciling Platonists were chargeable with many errors and follies; they fell into the most childish superstitions, and followed, without either reflexion or restraint, the extravagant dictates of their wanton imaginations. The CALIXTINS, who, in the close of the seventeenth century, endeavoured to promote union and concord among Christians in the heathen churches, were also called *syncretists*. Mosheim's Eccl. Hist. vol. iii. p. 220, &c. vol. iv. p. 445, &c.

SYNCRISIS, συγκρισις, a word used by the chemical writers to express a concretion, or coagulation of any thing, effected by a spontaneous, or violent reduction of a liquid substance to a solid one, by a privation of the humid.

SYNCRISMATA, a sort of ointment of the nature of the acopa, in use among the ancients.

SYNCRITICA, a name given by some writers to such medicines as are of a coercive and astringent quality, whether used externally, or given internally.

SYNDESIS, formed of συνδεω, *I bind together*, a word used by the ancient physicians to express a binding, or straightening.

SYNDESMO-*Pharyngæi*, in *Anatomy*, are fasciculi of muscular fibres, very distinctly inserted by one end along the ligaments, by which the superior cornua of the cartilago thyroides are connected to the extremities of the great cornua of the os hyoides. From thence they run backward, and meet at the linea alba.

SYNDESMOSIS, in *Anatomy*, a connection of the bones, called also SYNNEUROSIS.

SYNDESMUS, in *Anatomy*, is sometimes used for a LIGAMENT. The word is συνδεσμος, which signifies a joining together.

In grammar, *syndesmus* is used for a conjunction.

SYNDIC, in *Government and Commerce*, an officer in divers countries, entrusted with the affairs of a city, or other community, who calls meetings, makes representations and solicitations, to the ministry, magistracy, &c. according to the exigency of the case.

The word is formed from the Latin *syndicus*; and that from the Greek συνδικος; which signifies the same.

The *syndic* is appointed to answer and account for the conduct of the body; he makes and receives proposals for the advantage thereof; controuls and corrects the failings of particular persons of the body; or, at least, procures their correction at a public meeting.—In effect, the *syndic* is, at the same time, both the agent and censor of the community. Almost all the companies in Paris, &c. as the university, companies of arts and trades, have their *syndics*; and so have most of the cities of Provence and Languedoc.

SYNDIC is also used for a person appointed to solicit some common affair, wherein he himself has a share; as happens particularly among the several creditors of the same debtor, who fails, or dies insolvent.

The chief magistrate of Geneva is also called *syndic*. There are four *syndics* chosen every year; the eldest of whom presides in the council of twenty-five, which is the chief council of the city, wherein all affairs are dispatched, both civil and political: thus the other three elect cannot all come at the office till the four years end; so that the *syndicate* rolls among sixteen persons, all chosen out of the council of twenty-five.

SYNDROME, Συνδρομη, the concourse, or combination, of symptoms, in any disease.

SYNECDOCHE, Συνεκδοχη, formed of συνεκδεχομαι, *I take together*, in *Rhetoric*, a kind of figure, or rather trope, frequent among orators and poets, whereby the whole of a thing is put for a part of it, or a part for the whole: and because a thing may be considered as a whole, in three different respects, which logicians call an universal, essential, and integral whole, there are six kinds of *synecdoche*: by the first the genus is put for the species: thus virtue in general is sometimes used for some particular part of virtue, and every creature, Mark xvi. 15, denotes every rational creature: by the second the species is put for the genus; thus bread denotes any sort of food: by the third, the essential whole is put for one of its parts, that is either for the matter or form: by the fourth, the matter or form is put for the whole being; thus silver and gold are used to signify money made of those metals; and by the fifth, the whole of any material thing or quantity, whether continued or discrete, is put for a part of it: thus the Roman empire is called the world, and our Saviour says he should be three days and three nights in the heart of the earth, Mat. xii. 40, meaning part of the first and third day, and the whole second day; and by this kind of *synecdoche*, the plural number is sometimes put for the singular, as Mat. xxvii. 44, compared with Luke xxiii. 39: by the sixth kind of *synecdoche*, part of any material thing or quantity is put for the whole of it, as the roof for the house, sails for ships, &c. and thus also the singular number is put for the plural, and a number less than the real number is used for any round number. Ward's Or. vol. ii. p. 2, &c.

SYNECHES, in *Medicine*, is the name of a fever of the next degree to the intermittent: it also seems to be something of kin to those, and is called the *continent*, or *remitting fever*. It is a continual fever in regard to duration, though not in degree, continuing many days together without intermission: but then it has its diminutions and augmentations; sometimes regular, sometimes irregular, though no true intermissions. Allen's Synopsis, p. 3.

SYNECPHONESIS, or SYMPHONESIS, in *Grammar*, a coalition, whereby two syllables are pronounced as one.

It is much the same thing as the SYNALOEPHA, or *synæresis*.

SYNECTICON, a word used by the old writers to express the proximate cause of a disease; called also the *causa continens*, and always remaining closely united with the disease.

SYNEDRIN, or SYNEDRION. See SANHEDRIN.

SYNEMMENON *nete*. See NETE.

SYNERGASMA, formed of συν, and εργαζομαι, *I work*, a word used by Libavius, and some other authors, to express any operation in chemistry. The operations are by this author divided into two classes, the energetic, and preparatory: the first producing such bodies as are of power to act on others as menstruums, to cure diseases, and the like; and the others producing no such things, but being necessary preparatives to them.

SYNERGISTS, formed of συνεργεια, *co-operation*, in *Ecclesiastical History*, a name given to those whose doctrine was almost the same with that of the SEMIPELAGIANS, and who denied that God was the only agent in the conversion of sinful man, and affirmed, that man co-operated with divine grace, in the accomplishment of this salutary purpose. The friends and disciples of Melancthon adopted expressions of this kind, in describing the nature of the divine agency in man's conversion; but the Lutherans considered this representation as subversive of the true and genuine doctrine of their master, relating to the absolute servitude of the human will, and the total inability of man to do any good action, or to bear any part in his own conversion.

SYNESTIC, formed of συνιστημι, *I render consistent*, is sometimes applied by physicians to express the stools when firm, and of a consistence; such as to make them remain in their shape, in opposition to liquid ones.

SYNGENESIA, in *Botany*, the nineteenth class of plants, with hermaphrodite flowers, whose stamina are naturally formed into a single regular congeries.

This class comprehends six orders, viz. *polygamia æqualis*, including such plants as have compound flowers, of which the florets are all hermaphrodite; of which there are forty-one genera, distinguished into such as have ligulate compound flowers, of which there are nineteen, and such as have tubulose compound flowers, of which there are twenty-two; *polygamia superflua*, including such plants as have the florets of the disk hermaphrodite, and those of the radius female, of which there are thirty-six genera, distinguished into tubulose, comprehending eight

eight genera, and radiate, of which there are twenty-eight: *polygamia fruſtranea*, including ſuch plants as have the florets of the diſk hermaphrodite, and thoſe of the radius neuter, of which there are ſeven genera, all radiate: *polygamia neceſſaria*, including ſuch plants as have the flowers of the diſk male, and thoſe of the radius female, of which there are fourteen genera, moſt being radiate: *polygamia ſegregata*, including ſuch plants as have many partial cups contained in the common calyx, which ſeparate and ſurround the floſculi; of which there are ſix genera, diſtinguiſhed into ſuch as have four floſculi in each partial calyx, ſuch as have many floſculi in the ſame, and ſuch as have one floſculus: and *monogamia*, including ſuch plants as have ſimple flowers, of which there are ſeven genera. See Fructification and Order.

The *ſyngeneſia* expreſſes the ſame claſs of plants with the compound flowered plants of Ray, and others. The general characters of the claſs are theſe.

The cup is the crown of the ſeed, and ſtands on the ſummit of the germen. The flower conſiſts of one petal, and has a very narrow and long tube placed upon the germen: this is either tubular, ligulated, or naked.

The ſeeds are, in the different genera of this claſs, of a very different appearance at the ends. Some are crowned with a downy matter, compoſed of a great number of ſingle ſhort filaments, placed circularly, or otherwiſe, on the head of the ſeed. In ſome the downy matter is radiated; in others it is ramoſe, or branched; and in ſome it is ſupported on a pedicle, while in others it ſtands immediately on the ſeed. In ſome genera the ſeeds have no down at all, but have a ſmall corona, formed of what was originally the cup of the flower: this is permanent, and divided uſually into five ſegments. In ſome genera the ſeed is wholly naked, having neither any down, nor this crown of a cup.

The ſexes of the plants of this claſs are very variouſly diſpoſed, and it is owing to this that there are among them ſeveral different kinds of flowers. The tubulated flower is called an hermaphrodite flower, when it contains both the ſtamina and piſtil. It is called a male flower, when it contains only ſtamina without any ſtigmata. It is called a female flower, when it contains a ſtigma and no ſtamina. And there is ſtill another ſort of flower, called neutral, among this claſs of plants; theſe have neither ſtamina, piſtil, nor ſtigma, nor indeed any other part of fructification. Theſe ſeveral kinds of flowers are, in the deſcriptions of the genera, called ligulated, campanulated, &c. from their ſhape. A flower compoſed of a great number of theſe ſmall flowers is called floſcular, or floſculoſe flower; each of theſe, from their being ſmall, and only making up a part of a general flower, being called a floſcule. The common receptacle of the fructification in the floſculous flowers contains always ſeveral floſcules; and in the various genera the diſk, on which theſe are received, is either concave, convex, plain, globoſe, or, finally, pyramidal. This receptacle is called by ſome *thalamus*.

The eſſential character of a floſculous flower conſiſts in its antheræ growing together into a cylindric body, and producing a ſingle ſeed, which ſtands under the receptacle of the ſeparate floſcule.

It is very remarkable that Plumier has no genus of compound flowers. Tournefort, though he had not the aſſiſtances of the later obſervations on the ſtamina and antheræ to guide him, yet has fixed very natural genera in the claſs of the *ſyngeneſious*, or compound flowered plants.

Vaillant made more obſervations on the nature of the flowers of theſe plants, than any one who went before him, and the only error he run into, was the making too many genera. Pontedera has rendered the method of this claſs very eaſy and clear, though he found it very confuſed. Linnæus.

Syngenesia is alſo the name of the tenth order of the claſs monoecia, and of the thirteenth order of the dioecia.

SYNGNATHUS, in *Ichthyology*, the name of a genus of fiſhes, of the order of *nantes* and claſs of *amphibia*; the characters of which are theſe: the coverings of the gills are on each ſide compoſed of a thin and ſingle bony lamella; the head is oblong and compreſſed; the jaws are cloſed up at the ſides; and the mouth is only capable of opening at the extremity of the ſnout, which is cylindric, and covered by the lower jaw: the body is long and very ſlender; the ſhape is ſometimes roundiſh, but more uſually angular. There are no belly fins. The ſpecies of this genus, enumerated by Artedi, are four, and by Linnæus ſeven; ſuch are the *pipe-fiſh, hippocampus, ophidion, typhle*, &c. The name *ſyngnathus* is of Grecian origin, and is formed of the word συν, which in compoſition ſignifies the ſame as the Latin *con, together*, and γναθος, a *jaw*. It is given to this fiſh from that remarkable ſtructure of its mouth, by which the jaws are made to grow together, and the very end of the mouth only opens.

SYNGNOME, Συνγνομη, in *Rhetoric*, the ſame with concession.

SYNGRAPH. See Chirograph.

SYNNAS, or Synnadium *marmor*, in the *writings of the Ancients*, the name of a ſpecies of marble uſed in the larger buildings of the Romans. It is by ſome confounded with the docimenum marmor, with which the temple of Jupiter, erected by Adrian, was built; but this is erroneous, ſince that elegant marble was always charactered as perfectly white, without blemiſh; and this was always ſpotted, and clouded with black, inſomuch that ſome writers have called it by an epithet, expreſſing thoſe variegations, *maculoſa ſynnas*.

SYNNEUROSIS, formed from συν, *with*, and νευρον, *nerve*, in *Anatomy*, a kind of articulation, or juncture of the bones.

The *ſynneuroſis* is reckoned a branch of the symphysis; and is when the bones are connected together by a ligament; as is the os femoris to the os iſchium, and the patella to the tibia: and in all the joints deſigned for motion.

SYNOCHA, in *Medicine*, the name of a ſpecies of fever, of which authors diſtinguiſh two kinds, the ſimple, and the compound. The ſimple *ſynocha* is very rare in our parts of the world. The compound one is a mixed diſeaſe of the *ſynochal* and ordinary continued fever, and has been called by ſome the *putrid* fever, and *ſynocha putrida* by the ancient medical writers.

Signs of it. The *ſynocha* always ſeizes people at once with a violent heat, without thoſe ſhiverings which frequently attend the firſt attacks of other fevers. It is attended with a violent thirſt, an univerſal languor, and laſſitude of the limbs; and often with anxieties, ſighings, and ſuffocative difficulties of breathing. Acute and violent pains are felt in the head, with a tumid redneſs of the face and eyes, noiſes in the ears, vertigos, and eternal reſtleſsneſs and toſſing about in the bed, with wildneſſes in the thoughts. The urine from the firſt is red and pellucid; it rarely admits of any breaking, or depoſits any ſediment before the fourth day, then it frequently precipitates a reddiſh matter. There is generally an obſtinate coſtiveneſs, and ſpaſmodic tenſions of the back and limbs are uſually very painfully felt during the whole time of the diſeaſe. The ſeventh day generally brings on a criſis in this diſeaſe, which in young people is uſually by an hæmorrhage of the noſe, in older by profuſe ſweats. The perſons moſt ſubject to this diſeaſe are thoſe of a plethoric habit, who eat high-ſeaſoned foods, and uſe little exerciſe; and eſpecially ſuch as have had any habitual evacuation of blood ſtopt upon them. It is more frequent in the ſpring and autumn, than at other ſeaſons.

Cauſes of it. Theſe are principally violent and unaccuſtomed exerciſe, drinking large quantities of ſpirituous liquors, long watchings, immoderate paſſions, violent ſweatings from hot medicines, and ſudden cooling the body when very hot, by drinking large draughts of cold water, or other weak liquors. All theſe occaſion the fever, by affecting the plethoric habit of the perſon; but this, which is the general and original baſis of the diſtemper, is uſually brought on by omiſſion of uſual bleedings at ſpring and autumn, and other ſeaſons, by ſuppreſſions of accuſtomed hæmorrhages by the noſe, and by ſtoppages of the menſtrual, or hæmorrhoidal evacuations.

Prognoſtics in it. The *ſynochal* fever, in itſelf, is ſeldom attended with any great danger; and when the criſis happens by profuſe ſweats, or by an hæmorrhage, on the ſeventh day, there is no fear of any ill accidents: but if this time paſs without a criſis, and the congeſtions remain, young perſons are uſually thrown into a violent phrenitis, and older ones into ſoporous affections; and even in ſome caſes, where the criſis comes regularly on by hæmorrhages, there is danger from their being too great in quantity, and too much impairing the ſtrength of the patient. There muſt be great caution, however, uſed in aſſuaging this hæmorrhage, if that be found neceſſary; ſince, when it is imprudently done, it often brings on terrible obſtructions in the viſcera, and hectics, dropſies, and cachectic complaints, that are very difficult to get rid of. The critical hæmorrhage is known to be coming on by a ſtricture and itching of the noſe, an intenſe pain in the head, a redneſs of the eyes and face, and ringing in the ears. Very frequently, alſo, the criſis is predicted by a remarkable perturbation of mind, but this is not the peculiar ſymptom of the hæmorrhage, but happens as often, when it is by ſweat. Often there is a dripping of blood from the noſe on the fourth day; and in this caſe, if nature be not diſturbed, there will certainly bear farther

farther bleeding on the seventh day. Complaints of an anxiety and uneasiness about the breast presage an unhappy event. Other very bad symptoms, also, are involuntary tears, great restlessness, no relief from sleep, and the appearance of livid, or brown spots. The thick state of the blood, in this fever, makes it very easily pass into slow continued fevers and hectics; and sometimes, when the crisis does not come on at the seventh day, and there appear clouds in the urine, it appears afterwards on the fourteenth day.

Method of cure. Bleeding is always necessary in the first stages of this fever, before the signs of coction appear in the urine; after this the violent emotions of the blood are to be quelled by nitrous and acid medicines, as the juice of lemons: to these must be added rest, and a frequent drinking of warm and weak liquors. The bowels, if much bound, must be gently loosened by an emollient clyster; and after the crisis, some gentle purgatives must be given to clear the primæ viæ. Bleeding is not to be ordered after the signs of coction appear in the urine, for it often prevents the critical hæmorrhage, and renders the patient soporous, or delirious; and in the compound, or putrid *synochal* fever, the patient is not to be blooded at all. Volatile salts are given by some in this case, but very improperly, for they are always attended with mischief, and often occasion cachectic tumors. Symptomatic quinseys often attend this disease, and are to be relieved by gargarisms, rendered astringent by an admixture of terra Japonica, or the like medicines; and in this particular case, wine is to be more cautiously forbid than at other times. Junker's Consp. Med. p. 267.

SYNOCHUS, Συνοχος, denotes a continent fever, which proceeds, without any remission, to the end, and is either of the ardent or putrid kind. See FEVER.

SYNOD, formed from συνοδος, *convention, assembly*, compounded of συν, *with*, and οδος, *via, way*, in *Astronomy*, a conjunction, or concourse, of two or more stars or planets, in the same optical place of the heavens.

SYNOD, SYNODUS, in *Church History*, a council; or a meeting or assembly of ecclesiastics, to consult on matters of religion.

Of these there are four kinds; viz

General, or *œcumenical*, where bishops, &c. meet from all nations.

These were first called by the emperors, afterwards by Christian princes; till in later ages the pope usurped to himself the greatest share in this business, and by his legates presided in them when called.

National, where those of one nation only come together, to determine any point of doctrine or discipline. The first of this sort which we read of in England, was that of Herudford or Hertford, in 673, and the last was that held by cardinal Pole, in 1555.

Provincial, where they of one only province meet, now called the *convocation*: and

Diocesan, where those of but one diocese meet, to enforce canons made by general councils, or national and provincial *synods*, and to consult and agree upon rules of discipline for themselves. These were not wholly laid aside, till by the act of submission, 25 Hen. VIII. c. 19. it was made unlawful for any *synod* to meet, but by royal authority. See COUNCIL and CONVOCATION.

SYNODS, *Provincial, in the Government of the Church of Scotland*, are composed of several adjacent presbyteries, of which there are fifteen in all. The members are a minister and a ruling elder out of each parish. These *synods* meet twice a year, and chuse a moderator, who is their prolocutor. The acts of the *synods* are subject to the review of the general assembly, which is the dernier resort of the kirk of Scotland; and consists of commissioners from presbyteries, royal burghs and universities. A presbytery of twelve ministers, sends two ministers and one ruling elder; a presbytery of between twelve and eighteen sends three and one ruling elder: of between eighteen and twenty-four, sends four, and two ruling elders; of twenty-four, sends five and two elders; every royal burgh sends one elder, and Edinburgh two; every university sends one commissioner, usually a minister. The general assembly meets once a year, in the month of May, and is opened and adjourned by the king's royal commission appointed for that purpose.

SYNODALS, or SYNODIES, were pecuniary rents (commonly of two shillings), paid to the bishop, or archdeacon, at the time of their Easter visitation, by every parish priest

They were thus called, because usually paid in synods; because, anciently, bishops used to visit and hold their diocesan synods at once.—For the same reason, they are sometimes also denominated *synodalica*; but, more usually, PROCURATIONS.

Constitutions made in the provincial or diocesan synods, were sometimes called *synodals*, which were required in many cases to be published in the parish churches.

SYNODALES *testes* was an appellation anciently given to the *urban and rural* DEANS; from their informing against, and attesting, the disorders of the clergy and people in the episcopal synod.

When these sunk in their authority, in their stead rose another sort of *synodal* witnesses, who were a kind of impanelled jury, consisting of a priest, and two or three laymen, for every parish; though, at length, two for every diocese were annually chosen; till, at last, the office came to be devolved on the church-wardens.

Some think our questmen, who are assistants to the church-wardens, were called *sidesmen*, quasi *synodsmen*. See SIDES-*men*, and QUEST-*men*.

SYNODALE *instrumentum*, a solemn oath, or engagement, that these synodical witnesses took: as our church-wardens now are sworn to make just presentments.

SYNODICAL, Συνοδικος, something belonging to a SYNOD.

SYNODICAL *epistles* are circular letters written by synods to the absent prelates and churches; or even those general ones directed to all the faithful, to inform them of what had passed in the synod.

In the collection of councils are abundance of these *synodical* epistles.

SYNODICAL *month* is the period or interval of time, wherein the moon, departing from the sun at a synod, or conjunction, returns to him again

Kepler found the quantity of the mean *synodical* MONTH, twenty-nine days, twelve hours, forty-four minutes, three seconds, eleven thirds.

This period is also called a LUNATION; in regard, in the course hereof, the moon puts on all her phases, or appearances.

SYNODIES. See SYNODALS.

SYNOD'S *men*, *testes synodales*. See SYNODALES, and SIDES-*men*.

SYNODON, or CYNODON, in *Ichthyology*, a name given by several authors to a fish caught in the Mediterranean, and more commonly known by the name of DENTEX.

It is a species of SPARUS, in the Linnæan system.

SYNODONTIDES, in *Natural History*, the name of a stone described by the ancients, and said to be taken out of the head of the fish, called by them *synodontes*, the *dentex* of the moderns.

SYNOECIA, Συνοικια, in *Antiquity*, a feast celebrated at Athens, in memory of Theseus's having united all the petty communities of Attica into one single commonwealth, the seat whereof was Athens; where all the assemblies were to be held.

The feast was dedicated to Minerva; and, according to the scholiast of Thucydides, it was held in the month Metagitnion.

SYNONYMOUS, SYNONYMUS, is applied to a word or term that has the same import, or signification, with another. Some severe critics condemn all use of *synonymous* terms in the same period; but this is to condemn all antiquity: so far is the use thereof from being vicious, that it is frequently necessary; as synonymas contribute both to the force and clearness of the expression. If the first word sketch out the resemblance of the thing it represents, the synonym that follows is, as it were, a second touch of the pencil, and finishes the image.

Indeed, they must be used with great discretion and œconomy. The stile must be raised and brightened, not stuffed or loaded, with *synonymous* terms. They must be used as ornaments, and to render the expression the more forcible, without making a shew of the riches thereof, or heaping synonymas on synonymas.

But, though *synonymous* words in some cases may be laudable, *synonymous* phrases are inexcusable: the reason is, that two *synonymous* phrases keep the mind at rest, and let it flag and languish.

The perplexity in the writings of the ancients, arising from the use of *synonymous*, as well as homonymous terms, is very great, when they use the same word as the name of two different things. The whole value of the accounts they have left us is lost, by our not being able to distinguish which of the two they mean.

The great source of this confusion has been in the love of secrets in medicine, which prevailed as strongly among the ancients, as it does among the moderns. In order to conceal the remedies they used, they often gave them new names, and often (which was worse) used for them the names of other things.

Thus they called the pine-tree *itea*, the universally received name of the willow, and so in many other instances; from which we have, at this time, the same word

in

in use in different authors, as the name of different things.

Galen gives a prescription for baldness, in which almost all the ingredients are called by names wholly different from those that the rest of the world knew them by at that time, and by that means passed upon the vulgar for new discovered medicines. The bay-tree is there called *ladonis*; the bear, *amorphon brephos*, from the story of its young cubs being shapeless till licked into form by the mother bear: the ladanum, or labdanum, is called *apotragopogon*, because of being gathered from the beards of goats; and the adarce is called *pericalamitis*, from its being found concreted about a reed.

The composition of Philo, called *cholice*, given in the same author, is thus given in the ænigmatical manner by the same means. The more learned and ingenuous people of these ages detested this idle practice, and gave all things their common names; but as the absurdities of one man will generally find followers in others of the same stamp, though the physicians discarded the practice, the succeeding race of chemists, famous for their love of secrets, continued and improved it to so great a degree, that were their writings of any value, it would be wholly impossible, in many of them, ever to arrive at the author's meaning.

The Arabian writers have fallen more into the use of *synonyms*, and that in a more erroneous manner, than any other authors.

SYNONYMISTS, among the *Botanical Writers*, such as have employed their care in collecting the different names, or *synonyma*, used by different authors, and reducing them to one another.

SYNONYMY, SYNONYMIA, formed from συν, *with*, and ονομα, *name*, in *rhetoric*, a *figure* whereby synonyms, or synonymous terms, that is, various words of the same, or nearly similar signification, are made use of, to amplify the discourse.

Such is that passage in Cicero, *Abiit, evasit, effugit, erupit*. He went off, he escaped, he run away, &c.

This figure sometimes adds force to an expression by enlivening the idea; and it often promotes the harmony and just cadence of a sentence, which otherwise would drop too soon, and disappoint the ear.

SYNOVIA, or SINOVIA, in *Medicine*, a term used by Paracelsus, and his school, for the nutritious juice proper and peculiar to each part.

Thus they talk of the *synovia* of the joints, of the brain, &c. Others use *synovia* for the gout, and other diseases in the joints, arising from a vice in the nutritious juice.

Others restrain the term to the ousing out of the nutritious juice through a wounded part, especially at a joint.

Van Helmont defines *synovia* a kind of transparent mucilage, like seed, such as issues from the legs of a calf upon cutting off the feet. See MUCILAGINOUS *glands*.

SYNTAGMA, Συνταγμα, the disposing, or placing, of things in an orderly manner.

SYNTAX, Συνταξις, in *Grammar*, the construction, or connexion of the words of a language into sentences or phrases.

F. Buffier more accurately defines *syntax*, the manner of constructing one word with another, with regard to the different terminations thereof, prescribed by the rules of grammar.

Some authors, as M. Vaulegas, &c. confound *syntax* with style; but there is a real difference.

The office of *syntax* is, to consider the natural suitableness of words with respect to one another; in order to make them agree in gender, number, person, mood, &c.

To offend in any of these points, is called to offend against *syntax*: and such kind of offence, when gross, is called a SOLECISM; and when more slight, a BARBARISM.

The several parts of speech are, with regard to language, what materials are with regard to a building. How well prepared soever they may be, they will never make a house, unless they be placed conformably to the rules of architecture. It is, properly, the *syntax* that gives the form to language; and it is that on which turns the most essential part of grammat.

There are two kinds of *syntax*; the one of *concord*, wherein the words are to agree in gender, number, case, and person. The other, of *regimen*, or *government*; wherein one word governs another, and occasions some variation therein. See CONCORD and REGIMEN.

SYNTENOSIS, a word used by anatomists to express an articulation of the bones when they are connected, as the ossa sesamoidea of the toes, only by a tendon.

SYNTERICE, denotes that branch of medicine which is concerned in preserving health.

SYNTEXIS, Συντηξις, in *Medicine*, an attenuation, or colliquation, of the solids of the body; such as frequently happens in atrophies, inflammations of the bowels, colliquative fevers, &c. wherein a fatty and uliginous matter is voided with the excrements, by stool. See COLLIQUATION.

SYNTHENA, a term used by Paracelsus to express an apoplectic, or epileptic disorder, attended with violent griping pains in the bowels. This is generally mortal.

SYNTHESIS, Συνθεσις, formed from συν, *with*, and θεσις, *positio*, *compositio*n, or the putting of several things together: as in making a compound medicine of several simple ingredients, &c. See COMPOSITION.

SYNTHESIS, in *Logic*, denotes a branch of METHOD, opposite to analysis.

In the *synthesis*, or *synthetic method*, we pursue the truth by reasons drawn from principles before established, or assumed, and propositions formerly proved; thus proceeding by a regular chain, till we come to the conclusion.

Such is the method in Euclid's *Elements*, and most demonstrations of the ancient mathematicians, which proceed from definitions and axioms, to prove propositions, &c. and from those propositions proved, to prove others.

This method we also call COMPOSITION, in opposition to *analysis* or *resolution*.

SYNTHESIS, in *Grammar*. See SYLLEPSIS.

SYNTHESIS, in *Surgery*, an operation whereby divided parts are reunited; as in wounds, fractures, &c.

SYNTHETIC, or SYNTHETICAL, is a term given to that part of chemistry, which, after the analytical chemistry has taken bodies to pieces, or reduced them to their principles, can, from these separated principles, either re-compound the same body again, or, from the mixtures of the principles of one or more bodies in various manners, form a large set of new productions, which would have been unknown to the world but for this art: such productions are brandy, soap, glass, and the like.

Synthetical chemistry, taken in the strict sense for the recomposition of bodies from their own principles, is rather of philosophical, than of ordinary use. This however is not easy, except in a few cases, nor are we to imagine, because it may be done in some, that nature has taken this way to compose them; her method of composition of bodies is a new subject, and worthy a diligent inquiry. Shaw's Lectures, p. 169.

SYNTHETIC *method*. See SYNTHESIS, and METHOD.

SYNTHETISMUS, a word used in chirurgical writings to express the four operations necessary to the restitution of fractures, which are extension, coaptation, reposition, and deligation, or the business of bandage.

SYNTONUM *diatonum*, in *music*. See GENUS.

SYNTROPHIC, formed of συν, and τρεφω, *I nourish*, an epithet used to certain diseases, which grow up with the patient. Of this kind is the epilepsy, which often first seizes the person in infancy, and continues growing up with him, and increasing in strength as he does.

SYNULOTIC, a word used by some writers in the same sense as EPULOTIC.

SYNUSIASTS, SYNUSIASTÆ, Συνουσιασαι, formed from συν, *with*, and ουσια, *substance*, a sect of heretics, who maintained that there was but one nature, and one single substance, in Jesus Christ.

The *Synusiasts* denied, that the Word assumed a body in the womb of the virgin; but held, that part of the divine Word, being detached from the rest, was there changed into flesh and blood.—Thus they taught that Jesus Christ was consubstantial to the Father, not only as to his divinity, but even as to his humanity, and very body.

SYNYMENSIS, a word used by some chirurgical writers to express a conjunction of two bones by means of a membrane, as the bones of the sinciput are connected to those of the forehead in young children.

SYPHAR, a word used by some naturalists in the same sense as exuviæ, to express the skins which many reptiles cast off at certain times. Thus the snake, the water newt, and all the caterpillar tribe, part with their skins during the time they remain in that state.

SYPHILIS, is a term used, by some writers, for the lues venerea, or pox.

Some derive it from συν, *cum*, *with*; and φιλια, *amor*, or *amicitia*, *love*, or *friendship*; because it proceeds from the infectious intercourse of lovers in coition. Others will have it come from the name of a shepherd, so called, who was remarkably afflicted with this disease.—How-

ever, divers authors of note use the term; particularly Fracastorius, a famous Italian physician, who uses it for the title of a fine poem, which he wrote upon that distemper.

SYPHON, or SIPHON. See SIPHON.

SYRENS, SIRENES, in *Antiquity*. See SIREN.

SYRIAC *Bible*, see BIBLE.

SYRIAC *Language*. See LANGUAGE.

SYRIAC *year*; see YEAR.

SYRIACUS *lapis*, in *Natural History*, a name given by Aetius, and many other authors, to the petrified spines of the *echini ovarii*, called by us the *Jew-stones*, and *petrified olives*, from their likeness to an olive in shape, and called by the ancients *tecolithus*.

It has been a common opinion, that this *stone* was good against the gravel and stone; but Aetius limits its efficacy to a particular case, which is that where the stony matter is lodged in the kidneys and ureters; but he frankly confesses it is of no power to dissolve or break the stone in the bladder.

This is contrary to the doctrine of Dioscorides, and the other old Greeks; but more consonant to reason and experience. Some have carried its virtue so far, as to pretend, that when rubbed to powder, and mixed in water, and that mixture rubbed on the groin and perinæum, it will break the stones concreted within, and bring them away in pieces by urine. This, though too gross for belief, is yet given us by Pliny. In most of the common editions the words stands thus, *lingentium frangit calculos*; but all the best copies have it *ungentium*; and the word *lingentium* is only made by dividing the two perpendicular lines in the letter U.

SYRICON, a word used by some authors in the same sense as sandyx. Pliny makes it a composition of equal parts of sinopis and sandyx; and Aetius gives it as the name of a collyrium, used in many disorders of the eyes.

SYRINGA, the *pipe-tree*, in *Botany*, see LILAC.

SYRINGA *of Pan*, a musical instrument formed of reeds or pipes of different length, joined together. The figure of it frequently occurs on medals. See PAN.

SYRINGE, formed from συριγξ; or *syrinx*, *pipe*, an instrument serving to imbibe, or suck in, a quantity of any fluid; and to squirt or expel the same with violence.

The *syringe* is made of a hollow cylinder, as ABCD (*Tab.* VII. *Hydraulics*, and *Hydrostatics*, *fig.* 75.) furnished with a little tube at the bottom EF. In this cylinder is an embolus K, made, or at least covered with leather, or some other matter that easily imbibes moisture; and so filling the cavity of the cylinder, as that no air or water may pass between the one and the other.

If, then, the little end of the tube F be put in water, and the embolus drawn up, the water will ascend into the cavity left by the embolus; and, upon thrusting back the embolus, it will be violently expelled again through the same tube EF: and still with the greater impetus will the water be expelled, and to the greater distance, as the embolus is thrust down with the greater force, or the greater velocity.

This ascent of the water the ancients, who supposed a plenum, attributed to nature's abhorrence of a vacuum: but the moderns, more reasonably, as well as more intelligibly, attribute it to the pressure of the atmosphere on the surface of the fluid.

For, by drawing up the embolus, the air left in the cavity of the cylinder must be exceedingly rarefied; so that being no longer a counterbalance to the air incumbent on the surface of the fluid; that prevails, and forces the water through the little tube, up into the body of the *syringe*.

In effect, a *syringe* is only a single pump, and the water ascends in it on the same principle, as in the common sucking pump; whence it follows, that water will not be raised in a *syringe* to an height exceeding thirty-two or thirty-three feet.

Syringes are of considerable use in medicine and surgery. By them clysters are administered: injections of medicinal waters, &c. made into wounds, &c. They also serve to inject coloured liquors, melted wax, &c. into the vessels of the parts of animals, to shew the disposition, texture, ramifications, &c. thereof. For a figure of Anel's *syringe* and *probe*. See *Tab. Surgery*, *fig.* 20.

The *syringe* is an instrument, that is used both in the rarefaction and condensation of air. In order to understand its use in both these respects, it will be proper to explain the construction of its embolus or piston. ABCD (*Tab.* VII. *Hydraulics*, *fig.* 76.) represents a small cylinder of brass, about one fourth of an inch thick, and of such a diameter as just to move up and down in the *syringe* without interruption, but so close as not to admit a thin paper between it and the *syringe*. It has a screw at the top and bottom of the same bigness, and of the same thread, but with this difference, that at the end C, a piece of bladder is tied on, which makes a valve, so fixed as to suffer all the air coming in the direction DC to pass by, but to stop all that endeavours to pass from C to D. The rod of the *syringe* whose end is represented at R, (*fig.* 77.) has a piece like a bell PP *ll*, with small holes through its upper part, and a female screw at bottom, to receive the end D of the screw of *fig.* 76. That piece being screwed in, as represented by the small letters *a b c d*, there must be another cylindric piece *gg* whose diameter is about $\frac{1}{20}$ of an inch smaller than the other screwed on to C or *c*: serving for two uses, the one to preserve the valve at C, from being damaged against the bottom of the *syringe* by its thickness, and the other (which is its principal use) to press a soft oiled leather *ff* against *ab*. This leather will never fold upwards for want of room between AB and the sides of the *syringe*, but will spread against them and AB, so as to drive all the air before it (which air is also stopped by the valve at C) forward through the nose of the *syringe* into any place where it is intended to be driven. But when the rod is drawn up, as the leather *ff* folds easily about the smaller cylindric plate *gg*, the air will easily pass by to fill the *syringe* that way, as well as through the valve in the direction *dc*. When the *syringe* is made use of for sucking, you must only invert the piece ABCD, so as to screw the end C with its valve into the bell PP with the soft oiled leather *ll* between; and then the reverse will happen of what has been just mentioned: for then in driving down the piston, the air from any vessel coming into the *syringe* will slip in the direction *al*, *bl* between the bell and sides of the *syringe* (the leather *ff* not being on now) and also through the valve piece, and the holes near PP: but in drawing up the valve will shut, and the leather *ll* will apply close to *ab*, so as to admit of no external air to go back into the *syringe*. In both cases, whether of injecting or exhausting air, such a double screw as ABCD (*fig.* 76) with its valve is to be used; but with the valve towards the rod in sucking; and the other way in forcing, that no air injected into any thing may return into the *syringe*. Desag. Exp. Phil. vol. ii. p. 391.

SYRINGITES, a stone mentioned by Pliny, and described as being always full of cavities. Some have supposed this author meant the osteocolla by this name; but it is more probable, that he meant the stone we now call *syringoides*, or the pipe-stone.

SYRINGOIDES *lapis*, the *pipe-stone*, in *Natural History*, the name of a very beautiful fossil substance, of which there are several different kinds. The *tubuli marini*, or cases of sea worms, lodged in any solid substance of the fossil kind, constitute what is called the *lapis syringodies*.

The most frequent kind is made of the common matter of the ludus Helmontii, or septaria, with tubuli of different kinds and dimensions in it; but the most beautiful sort is that made of the bottoms of ships, old boards, or piles of wood; which, having been long in the sea, have been pierced by the sea worms, which have made their several burrows, and left their shells behind in them: the whole of these substances becoming afterwards petrified, is found in form of wood, with all the knots, veins, and other characters, but wholly of the hardness of stone. This is usually of a blackish colour, and the pipes being of a pale yellow, the whole makes a very elegant appearance.

Our clay-pits about London afford also a *syringoides* of this kind, but the earth there abounding with the matter of the common vitriolic pyrites, that substance by degrees gets into the pores of the wood, and the whole seems a mass of pyrites with these pipes lodged in it in different directions. This has been called by authors *pyrites syringoides*. Hill's Hist. of Foss. p. 64.

SYRINGOTON, in *Surgery*, an instrument to lay open fistulæ. We have a proposal of a *syringoton*, of a new form, for laying open fistulæ in ano, by Mr. Freke. See Appendix to Barrowby's Translation of Astruc on the Fistula in Ano.

SYRINGOTOMY, in *Surgery*, a term used for the cutting for a FISTULA.

SYRITES, in *Natural History*, a name used by some for the sapphire; but by Pliny for a stone, which he says was generated in the bladder of a wolf.

SYRIUS, a word used by some authors for a very strong purge, a preparation of scammony; being no other than a resin, or magistery of that drug.

SYRMA, among the Romans, a long garment, common to both sexes, that reached to the ground. It was used in tragedies, that the persons of the heroes and heroines might appear the taller. Pitisc. in voc.

SYRMÆA, a name given by the ancients in general to a certain

certain root, said to be of the radish-kind, and to be frequently used to provoke vomiting.

Some have made it also the name of a sort of viand, prepared of honey, the fine fat of animals, and other ingredients, which was the prize bestowed at one of the Spartan games: others have used it to express a purging potion made only of salt and water, or plain brine. The Ægyptians frequently purged themselves with this radish-juice and salt, which operated gently both upwards and downwards, and these potions were called by the same name *syrmæa*.

SYRMÆA, Συρμαια, in *Antiquity*, was used as a designation of the games at Sparta, the prize in which was συρμαια, or a mixture of fat and honey.

SYRMÆSMUS, a word used by the antient medical writers to express a gentle purging of the stomach or bowels, either by stool or vomit. It had its name from *syrmæa*, a word expressing a medicine that acted in this gentle manner.

SYRUP, SYRUPUS, or SIRUPUS, in *Pharmacy*, an agreeable liquor, or composition, of a thick consistence, made of juices, tinctures, or waters of fruits, flowers, or herbs, boiled up, in order to preserve it from spoiling, by fermentation, or otherwise, with sugar or honey.

Menage derives the word from the Arabic, *elschorab*, potion; formed from the root *scherebe*, to drink.—Others derive it from the Greek, συρω, I draw; and οπος, juice. Esthius, from Συρια, and οπον; in regard these kind of liquors were much in use among the Syrians, a very delicate people. According to D'Herbelot, the words *syrup*, and *sherbet* or *sorbet*, come both from the Arabic, *scharab*, which signifies any kind of drink in the general.

There are various kinds of *syrups* denominated from the various fruits, &c. they are extracted from, or from their virtues; as *syrup* of violets, of elder, of wormwood, of poppies, &c. emetic *syrups*, lienteric and antinephritic *syrups*, and chologogue, phlegmagogue, *syrups*, &c.

Syrups, which were formerly looked upon as medicines of considerable value, are at present regarded chiefly as vehicles for medicines of greater efficacy, and are used for sweetening draughts, juleps, or mixtures, and for reducing the lighter powders into boluses, pills and electaries. But as all these purposes may be answered by the *simple* SYRUP alone, there is little occasion for any other. There seems to be no part of pharmacy, in which the writers of dispensatories have more erred than in their directions about the making of *syrups*; which seems the more strange, because this part is particularly easy.

The whole of the business of *syrup*-making may be, however, reduced to a few short and easy rules. As first, it is matter of experience that aqueous infusions, decoctions, or other aqueous liquors, require twice their own weight of dry sugar-candy to make them into a *syrup* of a just consistence, for keeping without candying or fermenting.

This rule, by directing the use of sugar-candy, fixes the consistence of *syrups* in an exacter manner than any way else, because all salts require a determinate proportion of water in crystallizing; so that sugar, in the form of candy, contains always one certain proportion of water, while different kinds of sugar may hold more or less aqueous matter, according to their different manner of refining, the accidents of the weather, &c. Hence, therefore, all such infusions for *syrups* as are of a delicate or destructible colour, which is impaired by boiling, such as violets, clove July flowers, &c. and all such infusions as contain any volatile parts, which would evaporate by a boiling heat, as those of cinnamon, orange-peel, &c. should have twice their own weight of sugar added to them, and be kept close covered in the gentle heat of a balneum Mariæ, till the sugar is dissolved; which, to hasten the solution, should be reduced to powder.

Secondly, the decoctions of all such vegetable substances, as lose no valuable parts by boiling, may be boiled down to the proper consistence with their own weight of sugar, the two being first clarified together with the whites of eggs in the usual way: but if the ingredients here contain any unctuous, or balsamic parts, whereon their medicinal virtues depend, let the sugar be added from the very first, and boiled along with the ingredients; afterwards straining and clarifying it, before it be near the consistence of a *syrup*. This rule is founded on the property in sugar of dissolving resins and oils, so as to make them intimately mix with water.

Thirdly, all vegetable juices are to be thoroughly purified, before they are boiled into *syrups*. Thus the juices of lemons, oranges, &c. are first to be filtered, and then made into *syrups* without boiling, according to the first rule; but the juices of mulberries, and the like, will not clarify without a beginning fermentation; wherefore they must first stand a day or two, and then they will pass through a flannel; after which these are to be made into *syrup* with an eighth part less than twice the quantity of sugar; that is, with one pound twelve ounces of sugar to a pint of the juice, on account of their being somewhat saccharine themselves. And wines, and vinegars, must be made into *syrups* with the same quantity. Shaw's Lectures, p. 205.

SYRUP, *balsamic*. See TINCTURE of *balsam of Tolu*.

SYRUP of *buckthorn*. See BUCKTHORN.

SYRUP of *ginger*. See GINGER.

This *syrup* may be made by infusing two ounces of bruised ginger in two pints of boiling water for twenty-four hours. After the liquor has been strained, and has stood for some time to settle, it may be poured off, and a little more than double its weight of fine powdered sugar dissolved in it. This *syrup* is sometimes of use as a warm vehicle for giving medicines to persons afflicted with flatulency.

SYRUP of *marshmallow*. See MARSHMALLOW.

The lubricating virtues of this *syrup*, may be supplied by adding to the common *syrup* a sufficient quantity of mucilage of gum arabic.

SYRUP *pectoral*, *syrupus pectoralis*, a new form of medicine, prescribed in the late London Pharmacopœia, and intended to stand in the place of the *syrup* of maiden-hair, and some others of that kind. It is to be made thus: take leaves of English maiden-hair dried five ounces, liquorice four ounces, boiling water five pints; steep the ingredients for some hours, and afterwards strain off the liquor; and when it is made clear by settling, add to it the necessary quantity of sugar to make it a *syrup* in the common way.

SYRUP of *poppy*. See MECONIUM.

If twenty-five drops of laudanum be added to an ounce of the simple *syrup*, it will supply the place of DIACODIUM, or the *syrup* of poppies, and will be found a more safe and certain medicine.

SYRUP *of saffron*. See SAFFRON.

SYRUP, *simple*, is made by dissolving in water, either with or without heat, about double its weight of fine sugar.

SYRUP *of Sapor* is an ancient medicament, the base whereof is apples, with juices of bugloss, anise, saffron, &c. thus called from Sapor king of Persia, who overcame the emperor Valerian, and who was supposed to be the inventor thereof.

SYRUP *of sugar*. See SUGAR.

SYRUP *of sulphur*. See SULPHUR.

SYRTITES, in *Natural History*, is used by some authors as the name of a gem of a very beautiful appearance, in the substance of which are interspersed faint stars of a saffron colour.

SYRUS *lapis*, a name given by the writers of the middle ages to a fossil, seeming to be the same with the THYRREUS of Pliny.

SYSSARCOSIS, compounded of συν, *with* and σαρξ, *flesh*, in *Anatomy*, a particular species of the kind of articulation, called also SYMPHYSIS.

The *syssarcosis* is a natural union of two bones, by means of flesh or muscles: such is that of the os hyoides, and omoplata.

Besides the use of this word to signify a kind of articulation of the bones, by means of flesh, when the muscles are extended from one bone to another; it is also used by some chirurgical writers to express a method of curing wounds of the head when the cranium is laid bare, and the interstice between the lips of the wound too wide for a contraction, by means of promoting the granulation, as it is called, or growth of new flesh. Paulus Ægineta uses it also to express a preternatural generation of flesh about the vessels and coats of the testes, which is sometimes the case in a sarcocele.

SYSTASIS properly only denotes the consistence of any thing, as of a syrup or ointment; but authors have used it also in a different sense. Hippocrates understands by it a collection of humours about the palate; and sometimes expresses by it a contraction of any part of the body from an uneasiness, or sensation of pain.

SYSTEM, *systema*, formed from συϛημα, *composition*, in the general, denotes an assemblage or chain of principles and conclusions: or the whole of any doctrine, the several parts whereof are bound together, and follow or depend on each other.

In this sense, we say, a *system* of philosophy; a *system* of motion; a *system* of fevers, &c. Divines have framed abundance of *systems* of grace; the *systems* of intermediate science, and predetermination, are invented to explain that of grace.

Among physicians, some follow the *system* of alkali and acid; others, that of the four qualities, &c. Dr. Wood-ward

ward accounts for most things on his *system* of the bile.

Descartes's *system* is held destructive to religion. Gassendus renewed the ancient *system* of atoms; which was that of Democritus, followed by Epicurus, Lucretius, &c. Sir Isaac Newton's doctrine of colours, M. Leibnitz's *protogæa*, and some discourses of M. Jussieu, in the Academy of Sciences, to shew, that there are bodies whose parts are not to be destroyed by any natural agents, are very favourable to the *system* of Gassendus.

Experiments and observations are the materials of *systems*; an infinity are required to build one.

SYSTEM, in *Astronomy*, denotes an hypothesis or supposition of a certain order and arrangement of the several parts of the universe; whereby astronomers explain all the phenomena or appearances of the heavenly bodies, their motions, changes, &c.

This is more peculiarly called *the system of the world*, and sometimes the *solar system*.

System and *hypothesis* have much the same signification; unless, perhaps, hypothesis be a more particular *system*; and *system* a more general hypothesis.

Some late authors, indeed, furnish another distinction: an hypothesis, say they, is a mere supposition or fiction; founded rather on imagination than reason; a *system* is only built on the firmest ground, and raised by the severest rules: it is founded on astronomical observations, and physical causes, and confirmed by geometrical demonstrations.

The most celebrated *systems* of the world are the *Ptolemaic*, and the *Copernican*; to which may be added, the *Tychonic*; the œconomy of each whereof is as follows.

SYSTEM, *Ptolemaic*, places the earth at rest, in the centre of the universe; and makes the heavens revolve round the same from east to west, and carry all the heavenly bodies, stars, and planets, along with them, in twenty-four hours.

For the order, distances, &c. of the several bodies in this *system*, see *Tab.* IV. *Astron. fig.* 92.

The principal asserters of this *system* are Aristotle, Hipparchus, Ptolemy, and many of the old philosophers, followed by the whole world, for a great number of ages, and long adhered to in divers universities, and other places, where free philosophizing was excluded; but the late improvements have put it out of all countenance; and we do not even want demonstration against it.

SYSTEM, *Copernican*. See COPERNICAN *system*.

SYSTEM, *the solar*, or *planetary*, is usually confined to narrower bounds; the stars, by their immense distance, and the little relation they appear to bear to us, being reputed no part thereof. It is highly probable, that each fixed star is, itself, a sun; and the centre of a particular *system*, surrounded with a company of planets, &c. which, in different periods, and at different distances, perform their courses round their respective suns; and are enlightened, warmed, and cherished, thereby: hence, we have a very magnificent idea of the world, and the immensity thereof: hence, also, arises a kind of *system* of *systems*.

The planetary *system*, described under COPERNICAN, is the most ancient in the world. It was the first, that we know of, introduced into Greece and Italy by Pythagoras; whence, for many ages, it was called the *Pythagorean system*. It was followed by Philolaus, Plato, Archimedes, &c. but lost under the reign of the Peripatetic philosophy; till happily retrieved above two hundred years ago, by Nic. Copernicus; whence its new appellation of *Copernican system*. For the œconomy of this *system*, see the scheme thereof, *Tab.* IV. *Astron. fig.* 93.

SYSTEM, *Tychonic*, was taught by Tycho Brahe, a noble Dane, who was born A. D. 1546. It supposed the earth to be fixed in the centre of the universe or firmament of stars, and that all the stars and planets revolve round the earth in twenty-four hours; but it differs from the *Ptolemaic* SYSTEM, as it not only allows a menstrual motion to the moon round the earth, and that of the satellites about Jupiter and Saturn, in their proper periods, but it makes the sun to be the centre of the orbits of Mercury, Venus, Mars, Jupiter, and Saturn, in which they are carried round the sun in their respective years, as the sun revolves round the earth in a solar year; and all these planets, together with the sun, are supposed to revolve round the earth in twenty-four hours. This hypothesis was so embarrassed and perplexed, that few persons embraced it. It was afterwards altered by Longomontanus and others, who allowed the diurnal motion of the earth on its own axis, but denied its annual motion round the sun. This hypothesis, partly true and partly false, is called the *Semi-Tychonic system*. For the order and œconomy of the Tychonic *system*, see the scheme in *Tab.* IV. *Astron. fig.* 94.

SYSTEM, in *Poetry*, denotes a certain hypothesis, or scheme of religion, from which the poet is never to recede. E. gr. Having made his choice either in the heathen mythology, or in Christianity, he must keep the two apart, and never mix such different ideas in the same poem. Thus, after invoking Apollo and the Muses, he must bid adieu to the language of Christianity, and not confound the two *systems*. The fabulous style, indeed, is the richer and more figurative; but a pagan god makes but a miserable figure in a Christian poem. The *system* of poetry, Bouhors observes, is itself wholly fabulous and pagan.

SYSTEM, in *Music*, denotes a compound interval; or an interval composed, or conceived to be composed, of several less intervals. Such is the *octave*, &c.

The word is borrowed from the ancients; who call a simple interval, DIASTEM, and a compound one *system*. As there is not any interval in the nature of things, so we can conceive any given interval, as composed of, or equal to, the sum of several others. This division of intervals, therefore, only relates to practice; so that a *system* is properly an interval which is actually divided in practice, and where, along with the extremes, we conceive always some intermediate terms. See INTERVAL.

The nature of a *system* will appear plain, by conceiving it as an interval, whose terms are in practice, taken either in immediate succession; or the sound is made to rise and fall, from the one to the other, by touching some intermediate degrees; so that the whole is a *system* or composition of all the intervals between one extreme and the other.

Systems of the same magnitude, and, consequently, of the same degree of concord and discord, may yet differ in respect of their composition; as containing, and being actually divided into, more or fewer intervals; and when they are equal in that respect, the parts may differ in magnitude. Lastly, when they consist of the same parts, or less intervals, they may differ as to the order and disposition thereof between the two extremes.

There are several distinctions of *systems*; the most remarkable is into *concinnous* and *inconcinnous*.

SYSTEMS, *concinnous*, are those consisting of such parts as are fit for music; and those parts placed in such an order between the extremes, as that the succession of sounds, from one extreme to the other, may have a good effect.

SYSTEMS, *inconcinnous*, are those, where the simple intervals are inconcinnous, or ill disposed betwixt the extremes.

SYSTEMS, again, are either *particular*, or *universal*.

SYSTEM, *universal*, is that which contains all the particular *systems* belonging to music; and makes what the ancients call the DIAGRAMMA, and we the SCALE *of music*.

The ancients also distinguished *systems* into *perfect* and *imperfect*. The disdiapason, or double octave, was reckoned the perfect *system*; because within its extremes are contained examples of all the simple and original concords; and in all the variety of order wherein their concinnous parts ought to be taken; which variety constitutes what they call the *species*, or *figures of consonances*. All the *systems*, less than the disdiapason, were reckoned imperfect.

The double octave was also called *systema maximum*, and *immutatum*; because they took it to be the greatest extent, or difference of time, that we could go in making good melody; though some added a fifth to it, for the greatest *system*; but the diapason, or simple octave, was reckoned the most perfect, with respect to the agreement of its extremes; so that how many octaves soever were put into the greatest *system*, they were all to be constituted or subdivided the same way as the first: so that, when we know how the octave is divided, we know the nature of the DIAGRAMMA or SCALE; the varieties whereof constituted the genera melodiæ, which were subdivided into species.

SYSTEMATICAL *qualities*, a term used by Mr. Boyle to express such qualities as are also called *cosmical*, and do not depend on the nature and constitution of the body itself, but on its being a member of this general system of the universe, in which capacity it is acted upon by agents unperceived by us, which occasions great changes in it.

SYSTEMATISTS, in *Botany*, those authors, whose works in this science are principally employed about the arranging plants into certain orders, classes, or genera. See BOTANY.

SYSTOLE, from συστέλλειν, *to contract*, in *Grammar*, denotes the shortening of a long syllable.

SYSTOLE, συστολὴ, in *Medicine*, the contraction of the heart of an animal; whereby the blood is driven out of its ventricles into the arteries, to be distributed throughout the body.

The *systole* of the heart is well accounted for by Dr. Lower; who shews, that the heart is a true muscle, the fibres

fibres whereof are acted on like those of other muscles, by means of certain branches of the eighth pair of nerves inserted into it, which bring the animal spirits from the brain hither. By a flux of these spirits, the muscular fibres of the heart are inflated, and thus are shortened; the length of the heart diminished, its breadth or thickness increased, the capacity of the ventricles closed, the tendinous mouths of the arteries dilated, those of the veins shut up by means of their valves, and the contained juice forcibly expressed into the orifices of the arteries.

And this we call συςολη, or the contraction of the heart; the opposite state to which is called the *diastole*, or dilatation of the heart.

The French anatomists have disputed, whether the heart is shortened in its *systole*, though all allow that it is then straitened. Hist. de l'Acad. des Scienc. 1731.

Dr. Drake adds to Dr. Lower's account, that the intercostal muscles, and diaphragm, contribute to the *systole*, by opening for the blood a passage from the right ventricle of the heart to the left through the lungs, to which it could not otherwise pass: by which means, the opposition the blood contained in that ventricle must necessarily have made to its constriction, is taken off.

Lower and Drake make the *systole* the natural state or action of the heart; and the diastole, the violent one. Boerhaave, on the contrary, makes the *systole* the violent, and the DIASTOLE the natural state.

SYSTREMMA, a word used by Hippocrates to express a collection of humours forming a hard tumor, or tubercle, in any part of the body; called also sometimes *systrophe*.

SYSTYLE, in *Architecture*, that manner of placing columns, where the space between the two fusts consists of two diameters, or four modules. See INTERCOLUMNIATION.

SYXHINDEMEN, or SIXHINDEMEN, a term purely Saxon, literally signifying six hundred men, or men worth six hundred shillings a-piece. See HINDENI.

SYZYGY, *syzygia*, formed from συζυγια, which properly signifies *conjunctio*, in *Astronomy*, a term equally used for the conjunction, and opposition, of a planet with the sun.

On the phenomena and circumstances of the *syzygies*, a great part of the lunar theory depends. See MOON.

For, 1. It is shewn in the physical astronomy, that the force which diminishes the gravity of the moon in the *syzygies*, is double that which increases it in the quadratures; so that, in the *syzygies*, the gravity of the moon, from the action of the sun, is diminished by a part, which is to the whole gravity as 1 to 89,36; for, in the quadratures, the addition of gravity is to the whole gravity, as 1 to 178,73.

2. In the *syzygies*, the disturbing force is directly as the distance of the moon from the earth, and, inversly, as the cube of the distance of the earth from the sun. And at the *syzygies*, the gravity of the moon towards the earth receding from its centre, is more diminished than according to the inverse ratio of the square of the distance from that centre.

Hence, in the motion of the moon, from the *syzygies* to the quadratures, the gravity of the moon, towards the earth, is continually increased; and the moon is continually retarded in its motion; and, in the motion from the quadratures to the *syzygies*, the moon's gravity is continually diminished, and its motion in its orbit is accelerated.

3. Farther, in the *syzygies*, the moon's orbit or circle, round the earth, is more convex than in the quadratures; for which reason the moon is less distant from the earth at the former than the latter. When the moon is in the *syzygies*, her apsides go backwards, or are retrograde.

When the moon is in the *syzygies*, the nodes move in antecedentia fastest; then slower and slower, till they become at rest when the moon is in the quadratures.

Lastly, when the nodes are come to the *syzygies*, the inclination of the plane of the orbit is the least of all.

Add, that these several irregularities are not equal in each *syzygy*, but are all somewhat greater in the conjunction than in the opposition. See *Physical cause of the* MOON'S *motions*.

T.

T, A consonant, and the nineteenth letter in the alphabet; the sound of which is formed by a strong expulsion of the breath through the mouth, upon a sudden drawing back of the tongue from the fore part of the palate, with the lips at the same time open.

The *T*, at the beginning and end of words, has always the same sound, nearly resembling that of D, for which reason they are often put for each other; and Quintilian even rallies those who made any scruple of writing the one indifferently for the other: as *at*, for *ad*, *set* for *sed*, *haut* for *haud*, &c.

The customary sound of *T* is that which occurs in the words *take*, *temptation*; but before an *i*, when followed by a vowel, it has the sound of an obscure *s*, as *nation*, *salvation*, except when *s* precedes *t*, as *Christian*; and in derivatives from *y*, as *mighty*, *mightier*.

The *T* is one of the five consonants which the abbot de Dangeau calls *palatal*: these five are, *D*, *T*, *G*, *K*, and *N*; the four first whereof have the same relation to each other, as the labials *B-P* and *V-F* have; *D*, for instance, having the same relation to *T*, that *B* has to *P*, and *V* to *F*.

The *T*, the same author observes, is a letter of a strong sound; so that a feeble one cannot be heard before it. Hence, to form the supine of *rego*, the *T* of *tum* changes the *g*, and strengthens it to the sound of a *c*, so that we say *rectum*; as in the preterperfect tense *rexi*, which we pronounce *reksi*.

T*h* has two sounds; the one soft, as *thus*; the other hard, as *thing*. The sound is soft in these words, *then*, *thence*, *there*, with their derivatives and compounds, *that*, *these*, &c. and in all words between two vowels, as *father*; and between *r* and a vowel, as *burthen*. In other words it is hard, as *thick*, *thunder*. Where it is softened at the end of a word, an *e* silent must be added, as *breath*, *breathe*. Johnson.

T is used as an abbreviature on ancient monuments, &c. for Titus, Titius, and Tullius.

T, among the *Ancients*, was used as a numeral letter, signifying 160, according to the verse

T quoque centenos & sexaginta tenebit.

When a dash was at the top, thus T̄, it signified 160 thousand.

T′, with a kind of acute accent over it, denoted among the Greeks 300; and if the accent was below it, thus *T*,, it denoted 300,000. The ט of the Hebrews signified 9, and with two points fixed horizontally over it, thus, ט̈, it signified 9000.

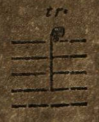
T, on the French coins, denotes those that were struck at Nantes.

When the Roman tribunes approved of the decrees of the senate, they testified their consent by subscribing a *T*.

T, in *Music*, is sometimes used to mark the tenor part, or pitch.

T, in the *Italian Music*, stands for TUTTI, all or altogether.

It is also used to mark the tenor, and has the words *primo*, *secundo*, or the figures 1°. 2°. added, to signify the first or second tenor.

The letters T, *t*, or *tr*, are often used likewise to signify a shake or trillo, to be made on any sound, and are to be placed over the note on which the shake is to be made; thus or  being an abbreviation of the word TRILLO.

T is also a mark, or brand, with which, by stat. 4 Hen. VII. every person convicted of felony, save murder, and admitted to the benefit of the clergy, shall be marked, on the brawn of the left thumb.

T, or TAU, in *Heraldry*, is a kind of cross-potent, or truncated; found in all the armories of the commanders of the order of St. Anthony.

The azure *T*, or TAU, is seen in arms above 400 years old. Its origin, according to some authors, is taken from the Apocalypse; where the same is a mark that the angel impresses on the foreheads of the elect: others take it to represent a crutch, a symbol proper enough for this order, which was sworn to hospitality. But the truth, F. Menestrier observes, is, that it is the top of a Greek crosier.

The bishops and abbots of the Greek church wear it still; and if it be found on the habit of St. Anthony, it is only to shew that he was an abbot.

T, in *Surgery*, is the name of a BANDAGE, so called on account of its figure.

TAAUT, or THOYT, in *Ancient Mythology*, the name of a deity among the Phœnicians, and probably the same with the Egyptian *Thoyt*, or Hermes: his cosmogony has been transmitted to us by the Phœnician writer Sanchoniatho, whose account is preserved by Eusebius, De Præp. Ev. lib. i. cap. 10. To him the Phœnicians ascribe the first invention of letters.

TABA, or *tabo-seil*, in *Modern History*, a name by which the Negroes, who inhabit the Gold-coast in Africa, describe their king, whose power is very arbitrary, insomuch that they regard him as a being superior in nature to themselves.

TABANUS, *ox-fly*, in the Linnæan system of *Zoology*, a genus of the *diptera* order of insects; the characters of which are, that the mouth has a fleshy proboscis, terminated by two lips, and two awl-shaped palpi, placed sideways, and parallel to the proboscis. Linnæus enumerates nineteen species.

TABACCO. See TOBACCO.

TABARD, or TABERD, derived from the low Latin, *tabarda*, denotes a short jacket, or coat, open on both sides, with a square collar and hanging-sleeves. From the wearing of this garment, some of those on the foundation of Queen's college, in Oxford, are called *Taberdarii*.

From an inn in Southwark, whose sign was the *Tabard*, afterwards changed to the TALBOT, Chaucer and his companion set out on a pilgrimage to the shrine of Becket at Canterbury; on which was founded his Canterbury Tales.

TABARZET, a word used by some writers to express highly refined sugar.

TABAXIR, and *arundo* TABAXIFERA, names by which some authors call the BAMBOO-*cane*.

TABBY, in *Commerce*, a kind of thick silk, usually watered. It is manufactured like the common taffety, excepting that it is stronger and thicker both in the woof and warp.

The watering is given it by means of a calender, the rolls whereof are of iron, copper, or wood, which, bearing unequally on the stuff, render the surface thereof unequal, so as to reflect the rays of light differently.

TABBYING, or *watering*, the passing a stuff under a calender, to make the representation of waves thereon, as on a tabby. It is usual to tabby mohairs, ribbands, &c. *Tabbying* is performed without the addition of any water, or dye; and furnishes the modern philosophers with a strong proof that colours are only appearances.

TABELLA, or TABLET, TABULARIUM, in *Pharmacy*, a solid kind of electary, or confection, made of dry ingredients, usually with sugar, and formed into little flat morsules, or squares, more usually called LOZENGES, and sometimes MORSELLI, TROCHES, &c.

Powders, fruits, salts, &c. are dissolved with sugar, and made into *tabulæ*, as those of the juice of liquorice for colds, &c.

We have *cordial*, *stomachic*, *aperitive*, and *hepatic tablets*.

Jellies and broths are sometimes reduced into a sort of *tablets*, to be carried in the pocket, and called *pocket-soup*. *Tabellæ manus Christi* are made of sugar of roses pearled. *Tabellæ magnanimitatis* are a sort taken by feeble old men, when matched with young wives, to assist them in the affair of generation.

TABELLÆ *votivæ*, in *Antiquity*, a name given to certain tablets, which were hung up in the temples: for, according to an ancient custom, which prevailed all over Greece, such as recovered from any distemper used to write in a tablet the nature and symptoms of their respective maladies, and the remedies which had been most successful. These tablets Hippocrates is said to have copied and followed when he first began to practise: and, if we believe Pliny (lib. vii. c. 37.), he learned from these the first rudiments of physic.

A tablet of this nature was discovered at Rome, not many years ago, among the ruins of the ancient temple of Æsculapius, with this inscription in Greek. Julianus being afflicted with vomiting of blood, and abandoned by men, the gods hastened to his relief, and having nourished him for the space of three days with honey, restored him to his health: for which favour he came to return them thanks in the presence of the people. *Tables* of a similar kind, under the same denomination, were hung up in the temples by those who had escaped shipwreck, &c.

TABELLIO, TABULARIUS, in the Roman law, a *scrivener*; a kind of officer often confounded with the NOTARY, *notarius*: yet the two differed in this; that the notaries only drew up and kept the minutes of acts and instruments on paper, and in notes, or short-hand; whereas the *tabelliones* delivered them engrossed fair, on parchment, in the full executory form. The same also put the seals to contracts, and rendered them authentic.

The domestic clerks of these *tabelliones*, who at first wrote under them, in process of time came to be called *notaries*.

Pasquier observes, that the *tabelliones* at Rome were public slaves, appointed for the keeping of contracts made between private persons. According to Loyseau, a contract written by a notary was not perfect, or obligatory, till the *tabellio* had written it fair: after which, the parties subscribed it, i. e. they wrote at bottom, that they approved the contents; for signatures were not then in use. See SIGNATURE.

Quoniam tabellionum *usus in regno Angliæ non habetur, propter quod magis ad sigilla authentica credi est necesse, ut eorum copia facilius habeatur, statuimus, ut sigillum habeant non solum archiepiscopi, et episcopi, sed eorum officiales.*

TABERNA *meritoria*, among the Romans, Mars's hospital, or a place where disabled soldiers were maintained at the charge of the government.

TABERNACLE, TABERNACULUM, q. d. *a tent*; among the *Jews*, was a kind of moveable chapel, so contrived as to be taken to pieces, and put together at pleasure, for the convenience of carrying it from place to place, during the migration of the Israelites in the wilderness for forty years. It was erected by Moses, in consequence of the express command of God, partly to be a palace of his presence as the king of Israel, and partly to be the medium of the most solemn public worship, which the people were to pay to him. It was erected on the first day of the first month of the second year after the Israelites exodus from Egypt. Exod. xl. 2. 17. 26. 29. 34, 35.

The *tabernacle* was of a rectangular figure, thirty cubits long, ten broad, and ten high; or, according to Dr. Cumberland's reduction to English measure, fifty-five feet long, eighteen broad, and eighteen high. The two sides and one end were composed of broad boards, standing upright; each board being about two feet nine inches broad, fastened at the bottom by two tenons in each board, fitted into two mortises on the foundation; at the top by links or hasps, and on the sides by five wooden bars, which run through rings or staples in each of the boards. Each side consisted of twenty of these boards, and the end of eight. Both the boards and bars were overlaid with gold; and the rings and hasps were of the same metal. The foundation, on which they stood, consisted of solid blocks of silver, two under each board; each of which was about sixteen inches long, and weighed a talent, or about an hundred weight. The number of these blocks was about an hundred; ninety-six of which were laid under the forty-eight boards, and the other four were the bases of the columns that supported the veil or curtain, which divided the inside of the *tabernacle* into two rooms. Hence some have derived the ancient fashion of setting porphyry columns on bases of white marble.

The *tabernacle* had four different coverings, or carpets, thrown over one another. The first and lowest was made of fine linen, richly embroidered with figures of cherubims, in shades of blue, purple, and scarlet: and consisted of ten breadths, which were joined together with blue loops and clasps of gold. The next over this was made of a sort of mohair, the breadths of which were joined with clasps of brass. The third carpet was made of ram's skin dyed red; and the uppermost of all was made of *tachash*, i. e. as has been generally supposed, badger's skins.

The east end of the *tabernacle* had no boards, but was sheltered with a fine embroidered curtain, hung upon five pillars of Shittim wood, overlaid with gold, and supposed by Philo to touch the ground.

The inside of the *tabernacle* was divided into two rooms, by means of a veil or curtain, hung upon four pillars: the veil was curiously manufactured of the richest stuff, and adorned with cherubims and other ornaments, embroidered upon it. By this veil the *tabernacle* was divided, as learned writers have reasonably conjectured, in the same proportion with the temple, afterwards built according to its model: that is, two thirds of the whole length were allotted to the first room, and one third to the second; so that the room beyond the veil, which was called the *holy of holies*, was exactly square, being ten cubits each way: and the first room, called the SANCTUARY, was twice as long as broad.

Round the *tabernacle* there was a spacious court, one hundred cubits long, and fifty broad, surrounded with pillars set in bases of brass, and filletted with silver, at the distance of five cubits from one another. The chief things in this court were the altar of burnt-offering, and the brazen laver. See Exod. ch. xxviii. and ch. xxx.

In the sanctuary, or first room of the *tabernacle*, were the altar of incense (Exod. xxx. 1—10.), the golden candlestick (Exod. xxv. 31, &c.) valued by Cumberland at upwards of five thousand and seventy-six pounds sterling, and the table of shew-bread, described Exod. xxv. 23—30. Within the second veil, in the holy of holies, was the ark of testimony, and its lid or cover, called the *mercy-seat*, described Exod. xxv. 10—21. See ARK *of the covenant*.

The learned Spencer (De Leg. Hebr. diss. 1.) suggests, that Moses projected the *tabernacle*, with its furniture and appurtenances, after the fashion of a similar structure, which he had observed in Egypt, and which was in use among other nations; or, at least, that God directed it to be made with a view of indulging the Israelites in a compliance with their customs and modes of worship, so far as there was nothing in them really sinful: and he alledges evidence of such portable temples among the heathens, in which they deposited the most valuable sacred, or religious utensils. But it has been replied to this conjecture, that it is not probable. But, on the other hand, it should seem more likely, that the heathens took these things from the Jews, who derived the whole of their religion from God, than that the Jews, or rather that God should take them from the heathens: and besides, the Jewish *tabernacle* was ordered to be directly the reverse of the heathen *tabernacles*, both in its form, which was capable of being taken to pieces, whereas theirs were carried about entire, and in its situation, which was accommodated to the people's worshipping towards the West; whereas it was the general practice of the heathens to worship with their faces towards the East. See Ezek. viii. 16. and Virgil Æneid. xii. l. 172—174.

The value of the gold and silver only, used for the work of the *tabernacle*, (Exod. xxxviii. 24, 25.) amounted, according to bishop Cumberland's reduction of Jewish talents and shekels to English coin, to upwards of one hundred and eighty-two thousand five hundred and sixty-eight pounds. Jenning's Jewish Ant. vol. ii. b. 2. c. 1. Anc. Univ. Hist. v. i. part 2. p. 651, &c. folio.

We have also an account of two other *tabernacles*, before the building of Solomon's temple, besides that above described. One of these was erected by Moses for himself; in which he gave audience, heard causes, and inquired of God; and perhaps, also, the public offices of religious worship were performed in it for some time; whence it was called the *tabernacle of the congregation*, Exod. xxxiii. 7. The other was that which David erected in his own city, for the reception of the ark, when he received it from the house of Obededom. 2 Sam. vi. 17. 1 Chron. xvi. 1.

TABERNACLES, *feast of*. See SCENOPEGIA.

TABERNACLE is also used, of late, for a place of religious worship, appropriated to the use of those that are called METHODISTS.

TABERNAEMONTANA, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the flower has a small empalement, cut into five acute parts;

it has one funnel-shaped petal, with a long cylindrical tube, which is bellied at both ends, and at the brim is cut into five oblique segments; and it has five small stamina in the middle of the tube, terminated by summits which join together; it has two germina supporting an awl-shaped style, crowned by decayed stigmas; the germina turn to two-bellied capsules, which are horizontally reflexed, opening with one valve, having one cell filled with oblong oval seeds, lying imbricatim, and surrounded with pulp. Linnæus reckons six, and Miller two species, natives of the West-Indies.

TABES, in *Medicine*, a general name for consumptions of all kinds. See CONSUMPTION.

TABES *dorsalis* is a kind of consumption proceeding sometimes from an excessive application to venery; the proximate cause of which is a general debility of the nerves.

Of the several kinds of consumptions incident to human bodies the *tabes dorsalis* is the slowest in its progress, but the most melancholy in its circumstances; and, unless timely obviated, for the most part fatal.

This disease is incident only to young men of salacious dispositions; and proceeds from too early venery, an immoderate use of it, or pollutions.

It seems therefore to derive its origin from too frequent venereal spasms. And the immoderate loss of the seminal fluid, has also a considerable share in producing the effect.

The symptoms of the *tabes dorsalis* are involuntary, nocturnal seminal emissions, a pain in the back, and often in the head; formication in the spine, an aching pain, rolling, and hanging down of the testicles, a weakness of memory and sight, and a mucous discharge from the urethra, especially after straining at the discharge of the excrements. The mucous discharge here mentioned, is called by Hippocrates *liquidum semen*; but it is no more than the mucus of the prostate glands. The patient has neither a fever nor loss of appetite: but after any violent exercise his head is heavy, and his ears tingle.

This disease is farther attended with great melancholy and dejection of mind; and a gutta serena often follows. The eyes grow hollow, the visage meagre and thin; the body emaciated and weak, a palpitation of the heart, and shortness of breath succeed; with a concourse of hectical complaints, ending in death.

For the cure of this distemper, a regularity of the non-naturals is of the utmost importance. Good air, rather cool than hot, is of great use. As to diet, high-seasoned meats, spirituous and fermented liquors should be avoided. No food is so beneficial as milk: chocolate also is esteemed, in such quantities as to sit easy on the stomach. Animal food of easy digestion at dinner, does no harm. Suppers should be avoided, at least milk only should be then taken, about two hours before going to bed. Sleep must be little, and in due season; that is, the patient should go to bed and rise early. Indulgence in bed in a morning is hurtful. The general rule should be, to rise immediately upon waking; which though irksome at first, will by custom be made familiar and agreeable. Moderate exercise, or so much as the patient's strength will admit of without weariness, ought to be used. Some recommend riding, especially a long journey, by such daily portions as to avoid extraordinary fatigue. The secretions of the body, if out of order, should be regulated: and the patient should be entertained with chearful company. As to medicines, the classes of balsamics and astringents are chiefly useful. Among the latter, the Peruvian bark, either in substance, extract, or tincture, the acid elixir of vitriol, and the *tinctura saturnina* or *antiphthysica*, are the most efficacious. Strengthening plasters may also be laid on the loins; and, chief of all, the cold bath should be used. See Pract. Essay on the *Tabes Dorsalis*, Lond. 1748.

TABLATURE, in *Anatomy*, a division or parting of the SKULL into two TABLES.

TABLATURE, TABLATURA, in *Music*, in general, is when, to express the sounds or notes of a composition, we use letters of the alphabet, or cyphers, or any other characters not used in the modern music.

TABLATURE, in its stricter sense, is the manner of writing a piece for a lute, theorbo, guitarre, bass viol, or the like; which is done by writing on several parallel lines (each whereof represents a string of the instrument) certain letters of the alphabet, referring to the frets on the neck of the instrument: whereof A marks, that the string is to be struck open, i. e. without putting the finger of the left-hand on the head; B shews, that one of the fingers is to be put on the first stop; C, on the second; D, on the third, &c.

The time of the notes is signified by marks over the letters of a hooked form, that answer to the minim, crochet, quaver, &c. in the French *tablature*; but the Italians and Spaniards, till of late years, made use of figures instead of letters.

The *tablature* of the lute is usually written in letters of the alphabet, and that of the harpsichord in the common notes.

TABLE, TABULA, a moveable, usually made of wood, or stone, supported on pillars, or the like; for the commodious reception of things placed thereon.

Moses made a *table*, in the TABERNACLE, for laying the shew-bread upon, described by Philo Judæus as two cubits long, one broad, and one and an half high.

Among Christians, the *table*, or *Lord's table*, signifies the sacrament of the Lord's supper. See COMMUNION.

TABLE, *round*, *Knights of the Round* TABLE, a military order, supposed to have been instituted by Arthur, the first king of the Britons, in the year 516.

They are said to have been twenty-four in number; all selected from among the bravest of the nation.

The *round table*, which gave them their title, was an invention of that prince, to avoid disputes about the upper and lower end, and to take away all emulation as to places.

Lesly assures us, he saw the *table* at Winchester; at least, he says, if he might believe the keepers thereof, who still shew it with great solemnity. He adds, that the names of a great number of knights, written around it, seemed to confirm the truth of the tradition.

Larrey also, and several other authors, make no scruple to relate this fable of knighthood as matter of history: but that it is a fable, is certain; F. Papebroch having shewn, that there was no such thing as an order of knights before the sixth century.

Camden also observes, that the *table* at Winchester is of a structure much more modern than the sixth century. It is to be added, that Arthur himself is esteemed by many no more than a fabulous prince.

An excellent historian observes, that Arthur was undoubtedly a great general, though his actions have given occasion to innumerable fables; and though the institution of the *knights of the round table* has served as a foundation for many fabulous relations, it is not to be deemed altogether chimerical. For where is the improbability that Arthur should institute an order of knighthood in Britain, when we learn from the letters of Cassiodorus, that Theodoric, king of the Ostrogoths, instituted one in Italy in the same century. Rapin's Hist. of Eng. vol. i p. 39. fol.

However, others have supposed that the *round table* was not any military order, but rather a kind of just, or military exercise, between two persons armed with lances. Several authors say, that Arthur, duke of Bretagne, renewed it. See Matthew Paris, the abbot Justiniani, and F. Helyot.

Paulus Jovius says, it was under the empire of Frederic Barbarossa that the knights of the *round table* first began to be talked of; others attribute their origin to the factions of the Guelphs and Gibellins. K. Edward I. built a house called the *Round Table*, the court whereof was two hundred feet in diameter. Du-Cange Gloss. *Tabula*.

TABLE, in *Architecture*, a smooth, simple member, or ornament, of various forms, but most usually in that of a long square. See PLATBAND.

TABLE, *projecting*, is such a one as stands out from the naked of the wall, pedestal, or other matter which it adorns.

TABLE, *raked*. See RAKING-*table*.

TABLE, *razed*, an embossment in a frontispiece, for the putting an inscription, or other ornament, in sculpture. This is what M. Perrault understands by *abacus* in Vitruvius. See *Tab. Archit. fig.* 39. *a.*

TABLE, *crowned*, that covered with a corniche, and wherein is cut a basso-relievo, or a piece of black marble incrustated, for an inscription.

TABLE, *rusticated*, that which is picked, and whose surface seems rough, as in grottoes, &c. See RUSTICS.

TABLE, *water*. See WATER-*table*.

TABLE, *plain*, a surveying instrument. See PLAIN *table*.

TABLE, in *Perspective*, denotes a plain surface, supposed to be transparent, and perpendicular to the horizon.

It is always imagined to be placed at a certain distance between the eye and objects, for the objects to be represented thereon by means of visual rays passing from every point thereof, through the *table* to the eye.

Whence it is also called *perspective plane*. See PERSPECTIVE.

TABLE, in *Anatomy*. The cranium is said to be composed of two *tables*, or laminæ; i. e. it is double, as if it consisted of two bones laid one over another. See SKULL.

TABLE *of Pythagoras*, called also *multiplication-table*, is a square, formed of an hundred lesser squares, or cells, containing the products of the several digits, or simple numbers, multiplied by each other.

As it is absolutely necessary those who learn arithmetic to have the several multiplications, contained in this *table*, off

off by heart, we have thought fit to subjoin it here; with an example to shew the manner of using it.

Table of Pythagoras, *or* Multiplication *Table.*

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100

Example. Suppose it were required to know the product of 6 multiplied by 8. Look for 6 in the first horizontal column, beginning with 1; then look for 8 in the first perpendicular column, beginning likewise with 1; the square or cell wherein the perpendicular column from 6, meets with the horizontal one from 8, contains the product required; viz. 48.

TABLES, *laws of the Twelve*, were the first set of laws of the Romans; thus called, either because the Romans then wrote with a style on thin wooden *tablets*, covered with wax; or, rather, because they were engraven on *tables*, or plates of copper, to be exposed in the most noted part of the public forum.

After the expulsion of the kings, as the Romans were then without any fixed or certain system of law; at least, had none ample enough to take in the various cases that might fall between particular persons; it was resolved to adopt the best and wisest laws of the Greeks.

One Hermodorus was first appointed to translate them; and the decemviri afterwards compiled and reduced them into ten *tables*. After immense care and application, they were, at length, enacted and confirmed by the senate, and an assembly of the people, in the year of Rome 303.

The following year they found some things wanting therein, which they supplied from the laws of the former kings of Rome, and from certain customs, which long use had authorized: all these, being engraven on two other *tables*, made the *law of the twelve tables*, so famous in the Roman jurisprudence; the source and foundation of the CIVIL or Roman law.

The laws of the twelve *tables* were also called *decemviral laws*, from the officers entrusted with the composing them.

It is a great pity, this system of law should have perished through the injuries of time: we have now nothing of it, but a few fragments dispersed in divers authors. J. Gothofred has collected them together, and we have them in Rosinus, and some other authors. The Latin is very old and barbarous, and remarkably obscure.

TABLES *of the Law*, in *Scripture History*. See DECALOGUE.

TABLES, *new*, TABULÆ *novæ*, an edict occasionally published, in the Roman commonwealth, for the abolishing all kinds of debts, and annulling all obligations.

It was thus called, in regard that all antecedent acts being destroyed, there were nothing but new ones to take place.

TABLE, among *Jewellers*. A *table diamond*, or other precious stone, is that whose upper surface is quite flat, and only the sides cut in angles: in which sense, a diamond cut *table-wise*, is used in opposition to a rose-diamond. See DIAMOND.

TABLE-*glass*. See GLASS.

TABLE is also used for an index, or repertory, put at the beginning or end of a book, to direct the reader to any passage he may have occasion for.

Thus we say, *table of matters*; *table of authors quoted*; *table of chapters*, &c. *Tables*, of themselves, sometimes, make large volumes: as that of Dravitz on the civil and canon laws.

TABLES *of the Bible* are called *Concordances*. See CONCORDANCE.

TABLE *rents*. See BORD-*lands*.

TABLES *of houses*, among *Astrologers*, are certain *tables*, ready drawn up, for the assistance of practitioners in that art, for the erecting or drawing of figures or schemes. See HOUSE.

TABLES, in *Mathematics*, are systems of numbers, calculated to be ready at hand for expediting astronomical, geometrical, and other operations. See CANON.

TABLES, *astronomical*, are computations of the motions, places, and other phenomena of the planets, both primary and secondary.

The oldest *astronomical tables* are the Ptolemaic, found in Ptolemy's ALMAGEST; but these now no longer agree with the heavens.

In 1252, Alphonso XI. king of Castile, undertook the correcting them, chiefly by the assistance of Isaac Hazen, a Jew; and spent four hundred thousand crowns therein. Thus arose the *Alphonsine tables*, to which that prince himself prefixed a preface. But the deficiency of these, also, was soon perceived by Purbachius and Regiomontanus; upon which Regiomontanus, and after him Waltherus and Warnerus, applied themselves to celestial observations, for the farther amending them; but death prevented any progress therein.

Copernicus, in his books of the celestial revolutions, instead of the *Alphonsine tables*, gives others of his own calculation, from the latter, and partly from his own observations.

From Copernicus's observations and theories, Eras. Reinholdus afterwards compiled the *Prutenic tables*, which have been printed several times, and in several places.

Tycho de Brahe, even in his youth, became sensible of the deficiency of the *Prutenic tables*; which was what determined him to apply himself, with so much vigour, to celestial observations: yet all he did, thereby, was, to adjust the motions of the sun and moon; though Longomontanus, from the same, to the theories of the several planets published in his Astronomia Danica, added *tables* of their motions, now called the *Danish tables*; and Kepler likewise, from the same, in 1627, published the Rudolphine *tables*, which are much esteemed.

These were afterwards, anno 1650, turned into another form, by Maria Cunitia, whose astronomical *tables*, comprehending the effect of Kepler's physical hypothesis, are exceedingly easy, and satisfy all the phenomena, without any trouble of calculation, or any mention of logarithms; so that the Rudolphine calculus is here greatly improved.

Mercator made a like attempt in his Astronomical Institution, published in 1676, and the like did J. Bap. Morini, whose abridgment of the Rudolphine *tables* was prefixed to a Latin version of Street's Astronomia Carolina, published in 1705.

Lansbergius, indeed, endeavoured to discredit the Rudolphine *tables*, and framed *Perpetual Tables*, as he calls them, of the heavenly motions; but his attempt was never much regarded by the astronomers; and our countryman Horrox warmly attacked him, in his defence of the Keplerian astronomy.

Since the *Rudolphine tables*, many others have been published; as the *Philolaic tables* of Bullialdus; the *Britannic tables* of Vincent Wing, calculated on Bullialdus's hypothesis; the *Britannic tables* of Newton; the French ones of the count De Pagan; the *Caroline tables* of Street, all calculated on Dr. Ward's hypothesis, and the *Novalmajestic tables* of Riccioius. Among these, however, the *Philolaic* and *Caroline tables* are esteemed the best; insomuch that Mr. Whiston, by the advice of Mr. Flamsteed (a person of undoubted authority in such cases), thought fit to subjoin the *Caroline tables* to his astronomical lectures.

The *Ludovician tables*, published in 1702, by M. De la Hire, are constructed wholly from his own observations, and without the assistance of any hypothesis; which, before the invention of the micrometer, telescope, and the pendulum clock, was held impossible.

Another set of *tables* Dr. Halley, the astronomer royal, long laboured to perfect.

M. le Monnier in 1746, published in his Institutions Astronomiques *tables* of the motions of the sun, moon, and satellites, of refractions, and of the places of the fixed stars. M. de la Hire has also published *tables* of the planets, and M. de la Caille *tables* of the sun; Mayer constructed *tables* of the moon; and we have many astronomical *tables* of various kinds, and computed with different views, in our modern books of astronomy, navigation, &c. For an account of several, and especially of those published annually under the direction of the commissioners of longitude, see ALMANAC, EPHEMERIDES, and LONGITUDE.

For TABLES *relating to annuities*, &c. see ANNUITIES, EXPECTATION *of life*, LIFE-*annuities*, MORTALITY, and SURVIVORSHIP.

TABLES, *sexagenary*. See SEXAGENARY.

For TABLES *of the stars*, see CATALOGUE.

TABLES *of sines*, *tangents*, and *secants*, of every degree and minute of a quadrant, used in trigonometrical operations, are usually called CANONS. See SINE.

TABLES *of logarithms*, *rhumbs*, &c. used in geometry, navigation, &c. see LOGARITHM, and RHUMB.

TABLES, *loxodromic*, are *tables* wherein the difference of longitude, and quantity of the way in any rhumb, are exhibited to every ten minutes of every degree of the quadrant variation of the latitude. See RHUMB.

TABLE, in *Heraldry*. Coats, or efcutcheons, containing nothing but the mere colour of the field, and not charged with any bearing, figure, or moveable, are called *tables d'attente*, *tables of expectation*, or *tabulæ rafæ*.

TABLET, in *Pharmacy*, &c. See TABELLA.

TABLING *of fines* is the making a table for every county where his majefty's writs run; containing the contents of every fine paffed each term.

It is to be done by the chirographer of fines of the common-pleas; who, every day of the next term, after engroffing any fuch fine, fixes one of the faid *tables* in fome open place of the faid court, during its fitting; and likewife delivers to the fheriff of each county, a content of the faid *tables* made for that refpective county, the term before the affizes, to be affixed in fome place in the open court, while the juftices fit.

TABLING, in a *Ship*, is a fort of broad hem formed on the fkirts and bottoms of a fhip's fails, to ftrengthen them in that part which is attached to the bolt-rope.

TABON, in *Natural Hiftory*, a name given by the people of the Philippine Iflands to a bird called in other places *daie*, and remarkable for the largenefs of its eggs; though fome accounts of thefe are certainly fabulous.

TABOR, TABOURIN, a fmall DRUM.

TABOURET, *privilege of the*, in France, is a privilege fome great ladies enjoy, to fit, or have a ftool, in the queen's prefence.

TABORITES, or THABORITES, a branch or fect of the ancient HUSSITES.

The Huffites, towards the beginning of the fifteenth century, dividing into feveral parties, and about the year 1420, into two great factions; one of them retired to a little mountain, or rock, fituate in Bohemia, fifteen leagues from Prague, and there put themfelves under the conduct of Zifka; building themfelves a fort, or caftle, and a regular city, which they called *Tabor*, or *Thabor*, either from the general word *thabor*, which in the Sclavonic language fignifies *caftle*; or from the mountain *Tabor*, mentioned in Scripture: and hence they became denominated *Thaborites*. Thofe of the other party were denominated CALIXTINS.

The *Taborites* not only infifted upon reducing the religion of Jefus to its primitive fimplicity, but required alfo that the fyftem of ecclefiaftical government fhould be reformed in the fame manner, the authority of the pope deftroyed, and the form of divine worfhip changed: they demanded the erection of a new church and hierarchy, in which Chrift alone fhould reign, and all things fhould be carried on by a divine direction and impulfe. In maintaining thefe demands, fome of their leaders went fo far as to flatter themfelves with the chimerical notion, that Chrift would defcend in perfon upon earth, armed with fire and fword, to extirpate herefy, and purify the church from its numerous corruptions. This enthufiaftic clafs of Huffites alone, Mofheim fays, we are to look upon as accountable for all thofe acts of violence, which are too indifcriminately laid to the charge of the Huffites in general, and to their two leaders Zifka and Procopius in particular. After the time of the council of Bafil, in 1433, which endeavoured, though without fuccefs, to reconcile the *Taborites* with the Roman pontiff, they began to review their religious tenets, and their ecclefiaftical difcipline, with a defign to render them more perfect. This review, conducted with great prudence and impartiality, gave a rational afpect to the religion of this fect, who withdrew themfelves from the war with Sigifmund, in which they were engaged, abandoned the doctrines, which, upon ferious examination, they found to be inconfiftent with the genius and fpirit of the Gofpel, and banifhed from their communion all thofe whofe difordered brains or licentious manners might expofe them to reproach. The *Taborites*, thus new modelled, were the fame with thofe Bohemian brethren (or Piccards, i. e. Beghards, as their adverfaries called them) who joined Luther and his fucceffors at the reformation, and of whom there are at this day many of the defcendants and followers in Poland and other countries. Mofh. Eccl. Hift. vol. iii. p. 263, &c. ed. 8vo.

TABULARIUM, among the Romans, the name of that part of the treafury where the ELEPHANTINE books were kept.

TABULARIUS. See TABELLIO.

TABULARUM *apertura*. See APERTURA.

TABULATUM. See TABELLA.

TABUM, a word ufed by medical writers, to exprefs a thin, fanious, and putrid humour, flowing from old ulcers, or from mortified parts, in cafes where the vital powers are not fufficient for the generation of a perfect or concocted matter.

TACAMAHACA, or TACAMACHA, a kind of refinous gum, diftilling from the trunk of a very large tree, a fpecies of POPLAR, growing in New Spain, Canada, and other parts of America; but in the greateft abundance, as it is faid, in the ifland of Madagafcar.

The tree is not unlike our poplar-tree, only bigger and taller; its leaves long and green, its fruit red, of the fize of our walnuts, exceedingly refinous, and containing a ftone like our peaches.

The wood of the tree makes good timber for fhips, and the gum it yields ferves there for their caulking, though its chief ufe with us is in medicine.

Two forts of this refin are fometimes to be met with. The beft, called *tacamahaca* in fhells, from its being collected in a kind of gourd fhells, is fomewhat unctuous and foft, of a pale yellowifh or greenifh colour, a bitterifh aromatic tafte, and a fragrant delightful fmell, approaching to that of lavender and ambergrife. This fort is very rare. That commonly found in the fhops is in tranfparent grains or globes, of a whitifh, yellowifh, brownifh, or greenifh colour, and of a lefs grateful fmell than the foregoing.

The firft is faid to exude from the fruit of the tree; the other from incifions made in the trunk. The tree, as raifed among us, affords in its young buds, or the rudiments of the leaves, a refinous juice of the fame kind of fragrance.

Tacamahaca is ufed chiefly as an ingredient in warm nervine plafters; though the fragrance and tafte of the finer fort indicate its being applicable to other purpofes, as an internal balfamic corroborant. Both kinds diffolve in rectified fpirit into a gold-coloured liquor, with a fmall quantity of remaining impurity: they alfo impregnate water confiderably with their fmell and tafte, but give out very little of their fubftance to this menftruum. Lewis. The Indians are faid to ufe it for all kinds of pains. Schroder affirms, that he has feen intolerable pains in the leg removed by it.

TACET, in the *Italian Mufic*, is often ufed to denote a long reft, or paufe. It ufually fignifies that a whole part is to lie ftill: thus, *Chrifte tacet*, *depofuit tacet*, intimates that while one or more parts are performing the *Chrifte*, or the verfe *depofuit*, &c. the part marked *tacet* fhould be filent.

TAC-*free*, in *Old Charters*, an exemption from payments.

TACHAS, in *Ichthyology*, a name given by fome authors to the manati, or SEA-*cow*.

TACHYGRAPHY, called alfo BRACHYGRAPHY, formed from ταχυς, *fwift*, and γραφη, *writing*; the art of quick or fhort writing.

There have been various kinds of *tachygraphy* invented: among the Romans, there were certain notes ufed, each whereof fignified a word.

The rabbins have a kind of *tachygraphy* formed by abbreviations, which make a kind of technical words; wherein each confonant ftands for a whole word: as רמבם, *rambam*; which expreffes *rabbi Mofes, fon of Maimon*: רשי, *rafchi*; which ftands for *rabbi Schelomoh Jarri*. See NOTARICON.

In France, &c. the only *tachygraphy* ufed is, the retrenching of letters, or even whole fyllables of words: as in *fdm* for *fecundum*, *aut* for *autem*, *d* for *fed*, *o* for *non*, *participaon* for *participation*, &c.

The firft printers imitated thefe abbreviations; but at prefent they are almoft laid afide, except among fcriveners, &c.

In England we have great variety of methods of *tachygraphy*, or fhort-hand; more, by far, and thofe too much better, eafier, fpeedier, and more commodious, than what are known in any other part of the world: witnefs Shelton's, Wallis's, Rich's, Mafon's, Webfter's, Wefton's, Macaulay's, Annet's, Gurney's, Lyle's, and feveral other fhort-hands.

TACIT *acceptance*. See ACCEPTANCE.

TACIT *community*. See COMMUNITY.

TACIT *decree*, in *Roman Antiquity*, fecret deliberations, to which none but old fenators were fummoned.

J. Capitolinus mentions a decree of this fecret kind, which he calls *S. C. tacitum*, and fays, that the ufe of them among the ancients was derived from the neceffities of the public, when upon fome imminent danger from enemies, the fenate was either driven to fome low and mean expedients, or to fuch meafures as were proper to be executed before they were publifhed, or fuch as they had a mind to keep fecret even from friends; on which occafions they commonly recurred to a *tacit decree*, from which they excluded their clerks and fervants, performing that part themfelves, left any thing fhould get abroad. Capitol. de Gordian. c. 12.

In the early times of the republic there are feveral inftances mentioned by hiftorians, of fuch private meetings of the fenate, fummoned by the confuls to their own houfes; to which none but the old or proper fenators were admitted, and of which the tribunes ufually complained. Vid. Dion. Halic. l. x. 40. l. xi. 55. 57. Middlet. of Rom. Sen. p. 90.

TACK, in a *Ship*, a rope used to confine the foremost lower corners of the courses and stay-sails in a fixed position, when the wind crosses the ship's course obliquely. The same name is also given to the rope employed to pull out the lower corner of a studding sail or driver to the extremity of its boom. The main-sail and fore-sail of a ship are furnished with a *tack* on each side, which is formed of a thick rope tapering to the end, and having a knot wrought upon the largest end, by which it is firmly retained in the clue of the sail. By this means one *tack* is always fastened to windward, at the same time that the sheet extends the sail to leeward. Falconer.

TACK is also applied, by analogy, to that part of any sail to which the *tack* is usually fastened. A ship is said to be on the starboard or larboard *tack*, when she is close hauled, with the wind upon the starboard and larboard side: and in this sense, the distance which she sails in that position is considered as the length of the *tack*; although this is more frequently called a board. Falconer.

TACK, *to*, in *Sea Language*, is to change the course from one board to another, or to turn the ship about from the starboard to the larboard *tack*, in a contrary wind.

Tacking is also used, in a more enlarged sense, to signify that manœuvre in navigation, by which a ship makes an oblique progression to the windward, in a zig-zag direction. This, however, is more usually called BEATING or TURNING to windward. In order to explain the theory of *tacking* a ship, recourse must be had to the two first laws of motion, recited under *laws* of NATURE: according to which, it is easy to conceive how a ship is compelled to turn into any direction, by the force of the wind acting upon her sails in horizontal lines. For the sails may be so arranged as to receive the current of air, either directly, or more or less obliquely: hence the motion communicated to the sails must necessarily conspire with that of the wind upon their surfaces. To make the ship *tack*, or turn round with her head to the windward, it is therefore necessary, after she has received the first impression from the helm, that the head-sails should be so disposed as to diminish the effort of the wind, in the first instant of her motion, and that the whole force of the wind should be exerted on the after-sails, which operating on the ship's stern, carries it round like a weather-cock. But since the action of the after-sails to turn the ship will unavoidably cease, when her head points to the windward, it then becomes necessary to use the head-sails to prevent her from falling off, and returning to her former situation. These are, accordingly, laid aback on the lee-side, to push the vessels fore-part towards the opposite side, till she has fallen into the line of her course thereon, and fixed her sails to conform with that situation.

The first effort to turn the ship in *tacking*, communicated by the helm, which is then put to the lee-side, being announced by the pilot, or commanding officer, who then calls out, *Helm's a-lee!* the head-sails are immediately made to shiver in the wind, by casting loose their sheets or bow-lines. The pilot then calls, *Up tacks and sheets!* which is executed by loosening all the ropes which confine the corners of the lower sails, in order that they may be more readily shifted to the other side. When the ship has turned her head directly to windward, the pilot gives the order to turn about the sails on the main and mizen-masts, by the exclamation, *Haul main-sail, haul!* the bow-lines and traces are then instantly cast off on one side, and as expeditiously drawn in on the other side, so as to wheel the yards about their masts: the lower corner of the main-sail is, by means of its *tack*, pulled down to its station at the chess-tree; and all the after-sails are, at the same time, adjusted to stand upon the other board. Finally, when the ship has fallen off five or six points, the pilot cries, *Haul of all!* or, *let go*, and *haul!* the sails on the fore-mast are wheeled about by their braces; and as the ship has then a tendency to fall off, she is checked by the effort of the helm, which for that purpose is put *hard-a-lee*. The fore-*tack*, or the lower corner of the fore-sail, being fixed in its place, the bow-lines are hauled; and the other sails, which have been neglected in the hurry of *tacking*, are properly arranged to the wind, which exercise is called *trimming the sails*. Falconer.

TACKLE, in a *Ship*, a machine formed by the communication of a rope with an assemblage of blocks, and known in mechanics by the name of PULLEY.

Tackles are used in a ship to raise, remove, or secure weighty bodies, to support the masts, or to extend the sails and rigging. They are either moveable, as communicating with a runner; or fixed, as being hooked in an immoveable situation; and they are more or less complicated, with blocks and sheaves, in proportion to the efforts which they are intended to produce. That part of the *tackle* which is fixed to one of the blocks, &c. is called the *standing part*; all the rest are called *running parts*; and that on which the men pull when employing the *tackle*, is called the *fall*. The application of the *tackle* to mechanical purposes is termed HOISTING or *bowsing*. Falconer.

For several kinds of these *tackles*, see *Tab. Ship*, *fig.* 1. *n.* 39, 40, 59. 61. 82. 93. and 103.

TACKLE, *burton*, in a *Ship*. See BURTON.

TACKLE, *ground*. See GROUND.

TACKLE, *gunners*, in a *Ship*, that which serves to hale the ordnance in or out.

TACKLE, *reef*. See REEF.

TACKLE, *relieving*. See RELIEVING.

TACKLE, *rolling*. See ROLLING.

TACKLE, *tack*, is a small *tackle* used occasionally to pull down the *tack* of the principal sails of a ship to their respective stations. There is also a *tackle* of this kind constantly fixed to the tacks of the main-sail in brigs, sloops, and schooners, for the same purpose. Falconer.

TACKLE, *winding*, in a *Ship*. See WINDING.

TACKLE *blocks*, *wind*. See WIND.

TACOMAR-*tree*, a name by which some authors call the sugar-cane.

TACTICKS, ταχτιχα, formed from ταξις, *order*; the art of disposing forces in form of BATTLE, and of performing the military motions and EVOLUTIONS. See also CAMP, EXERCISE, &c.

The Greeks were very skilful in this part of the military art; having public professors of it, called *tactici*, who taught and instructed their youth therein. We have an account of the progress of this art among them in Thucydides, Xenophon, and Polybius. Ælian also hath a particular book on this subject; and there is a great deal of it in Arrian, in his history of Alex. M. and in Mauritius, and Leo Imperator.

From the Greeks this art was transmitted to the Romans, among whom it arrived at its highest perfection. Vegetius has given us a compilation and abridgment of authors who have written on this subject; and his work contributed in a considerable degree to the establishment of military discipline in Europe; for which we are greatly indebted to Maurice prince of Orange, Alexander Farnese, duke of Parma, Coligny, Henry IV. Gustavus Adolphus, &c.

Vossius, De Scient. Mathemat. mentions twenty-four ancient authors on the subject of *tacticks*.

TACTICKS is also used for the art of inventing and making machines for throwing of darts, arrows, stones, fire-balls, &c. by means of slings, bows, and counter-poises. Vegetius, Hero, &c. have written on these machines; and we have them described and figured by Lipsius.

TACTILE, or TANGIBLE, in the *Schools*, something that may fall under the sense of feeling.

Though atoms be corporeal, yet are they not either *tactile*, or visible, by reason of their smallness.

The principal *tangible* qualities are, heat, cold, driness, hardness, and humidity. See HEAT, &c.

TACTION, in the *Schools*. See FEELING.

TACTION, in *Geometry*. See TANGENT.

TACTUS, the touch, in *Midwifery*, is the exploration of the state of the vagina and uterus, and of the situation of the fœtus, and whatever else is contained therein. Hippocrates in his Treatise on the Diseases of Women, has been very full and exact in his directions upon this subject. James.

TADORNA, the ANAS *tadorna* of Linnæus, in *Ornithology*, a name given by many authors to a species of duck, called by others *vulpanser*, and in English the *shiel-drake*, or *borough-duck*; and by some the *bergander*.

It is of a middle size between the duck and goose; its beak is broad, short, and red; and at the origin of the upper chop there is a large red tubercle of flesh; the head and upper part of the neck are of a fine blackish green, the lower part of the neck white; the breast and upper part of the back surrounded with a broad band of bright orange bay: the coverts of the wings and middle of the back are white; the nearest scapulars black, the others white; the greatest quill-feathers black; the exterior webs of the next are of a fine green, and those of the three succeeding orange; the coverts of the tail white, and the tail of the same colour, except the two outmost feathers, which are tipt with black; the belly white, divided lengthways by a black line; the legs are of a pale flesh-colour.

They inhabit the sea-coasts, and build in deserted rabbit-holes; but their flesh is not well tasted.

When a person attempts to take their young, they divert his attention by flying along the ground as if wounded, till the brood are secure, and then return and collect them together. Turner, therefore, concludes, that this bird is the chenalopex, or fox-goose of the ancients: and the natives of the Orkneys at this day call it the *fly-goose*. These birds lay fifteen or sixteen white roundish eggs. In winter they collect in large flocks. Ray and Pennant.

TADPOLE. The animal called by this name is no other than the frog it its firſt ſtate from the ſpawn; and this creature furniſhes the curious in microſcopic obſervations with a beautiful view of the circulation of the blood, eſpecially when young. See *Tab. of Microſcopical Objects.* claſs 1.

The method of procuring them for this purpoſe in the greateſt perfection, is this: let a ſmall quantity of frog's ſpawn be kept for ſome days in water, and from this will be produced a vaſt number of young *tadpoles*; theſe, while very young, are perfectly tranſparent, and when placed before the double microſcope, the heart may be eaſily ſeen, and its pulſation regularly obſerved; and the blood protruded thence may be beautifully ſeen circulating through the whole body; but particularly in the tail, where, though ſo very minute, more than fifty veſſels may be ſeen at one view. The young brood grow more and more opake every hour, and in a day or two the circulation of the blood can only be ſeen in their tail, or in the fins near the head. Baker's Microſcope, p. 126.

TÆDA, in *Pharmacy*, a term uſed by ſome authors to expreſs certain compoſitions made up in form of troches. Theſe are ſometimes meant as peſſaries to be introduced into the vagina, and therefore made into this form; ſometimes they are compoſitions of fragrant or other ingredients for fumigations.

TÆDA, in *Botany*, a name given by ſome authors to the pinaſter, or common wild-pine, or mountain-pine.

TAEL, an Eaſt-Indian weight, being the ſixteenth part of a *cati*. See CATY.

TAEL is alſo the name of a coin. See COINS *of Japan*.

TÆNARIA, ταιναρια, in *Antiquity*, a feſtival in honour of Neptune, ſurnamed *Tænarius*, from *Tænarus* a promontory in Laconia, where he had a temple.

TÆNARIUM *marmor*, the name of a marble uſed by the ancient architects and ſtatuaries. There were two kinds of it, very different in colour, but perfectly agreeing in hardneſs, and in the high poliſh they are capable of. The firſt or moſt frequent kind was black, and was dug from the promontory called *Tænarus*, in the Lacedæmonian ſtate; the other, which was more ſcarce, and much more beautiful, was of a green colour with a caſt of yellow; this was dug in the Tagetan quarries, and was called by ſome *marmor herboſum*, and *xanthon*.

TÆNIA, or TENIA, in *Architecture*, a member of the Doric architrave, reſembling a ſquare fillet, or reglet; and ſerving in lieu of a cymatium.

The word is Greek, ταινια, which literally denotes a *ſwathe*, *bandage*, *fillet*, or the like. Barbaro renders it by *liſtel*, but Palladio uſes the old name *tænia*.

Leon Baptiſta Alberti calls the *tænia*, regulæ, and faſciolæ; and Daviler, bandelettes. Philander ſays, there are two kinds, viz. that above-mentioned, which he calls the *lower*; and an *upper*, which ſerves for a capital to the triglyphs.

TÆNIA, in *Ichthyography*, the name of a fiſh of the anguilliform, or eel-ſhaped kind, common in the Mediterranean ſea, and brought to market in Italy and elſewhere. It is a very remarkable little fiſh, being of a pale fleſh-colour with a ſlight admixture of blue, and is free from ſcales; and its fleſh ſo tranſparent, that the vertebræ of the back may be eaſily counted through it. Its body terminates in a long and very ſlender tail; the mouth is ſmall, and has one row of ſharp teeth in each jaw, and is very ſingular in that the belly-fin is twice as wide as the back-one; and runs ſo far up to the head, that the anus, which is ſituated at its termination, is very near the angle of the under jaw. The inteſtines are all covered with a ſilvery peritonæum, which is ſeen alſo plainly through the fleſh. It is commonly of a foot long, and not more than a finger's breadth. Willughby's Hiſt. Piſc. p. 116.

This is a ſpecies of CEPOLA in the Linnæan ſyſtem. The other ſpecies is the SERPENS *rubeſcens*. Some alſo make the FALX, or *ſickle*-fiſh, a ſpecies of *tænia*.

TÆNIA *cornuta*, the *horned tænia*, in *Ichthyology*, a name given by many authors to the ſpecies of COBITIS, named by Artedi, the cobitis with a forked prickle placed under each eye. This fiſh is the *cobitis tænia* of Linnæus.

TÆNIA, in the Linnæan ſyſtem of *Zoology*, is a genus of the *zoophyte* order of worms; including four ſpecies. See TAPE-*worm*.

TAFFARAL, or TAFFEREL, in a *Ship*, the uppermoſt part of a ſhip's ſtern, being a curved piece of wood, uſually ornamented with ſculpture. See *Tab. Ship. fig.* 2. *n.* 97. *fig.* 1.

TAFFETY, or TAFFATY, in *Commerce*, a kind of fine, ſmooth, ſilken ſtuff; having, uſually, a remarkable luſtre, or gloſs.

ALAMODE, }
LUSTRING. } the *taffetas* noirs of Lyons.

TAFFETAS noir luſtre of the French, is our ALAMODE. Non luſtre is our LUSTRING.

There are *taffaties* of all colours; ſome plain, others ſtriped with gold, ſilver, ſilk, &c. others checquered, others flowered, others in the Chineſe point, others the Hungarian; with various others to which the mode, or the caprice of the workmen gives ſuch whimſical names, that it would be as difficult, as it is uſeleſs, to rehearſe them: beſides that they ſeldom hold beyond the year wherein they firſt roſe. The old names of *taffeties*, and which ſtill ſubſiſt, are, *taffeties* of Lyons, of Spain, of England, of Florence, of Avignon, &c.

The chief conſumption of *taffeties* is in the ſummer-dreſſes for women, in gowns, linings, window-curtains, &c.

There are three things which contribute chiefly to the perfection of *taffeties*, viz. the ſilk, the water, and the fire. The ſilk is not only to be of the fineſt kind, but it muſt be worked a long time, and very much before it be uſed: the watering is only to be given very lightly, and ſeems only intended to give that fine luſtre, by a peculiar property not found in all water: laſtly, the fire, which is paſſed under it to dry the water, has its particular manner of application, whereon the perfection of the ſtuff depends very much.

Octavio May, of Lyons, is held the firſt author of the manufacture of gloſſy *taffeties*; and tradition tells us the occaſion of it. Octavio, it ſeems, going backwards in the world, and not able to retrieve himſelf by the manufacture of *taffeties*, ſuch as were then made, was one day muſing on his misfortunes, and, in muſing, chanced to chew a few hairs of ſilk which he had in his mouth: his reverie being over, the ſilk he ſpit out ſeemed to ſhine, and, on that account, engaged his attention. He was ſoon led to reflect on the reaſon; and, after a good deal of thought, concluded, that the luſtre of that ſilk muſt come, *1ſt*, From his having preſſed it between his teeth. *2dly*, From his having wetted it with his ſaliva, which had ſomething glutinous in it. And, *3dly*, From its having been heated by the natural warmth of his mouth. All this he executed upon the next *taffeties* he made, and immediately acquired immenſe riches to himſelf, and to the city of Lyons the reputation, it ſtill maintains, of giving the gloſs to *taffeties* better than any other city in the world.

It will not, we conceive, be leſs uſeful than curious, to give here the deſcription of the engine contrived by Octavio to give the gloſs to *taffety*; and to add the manner of applying it, and the compoſition of the water uſed therein.

The machine is much like a ſilk-loom, except that, inſtead of iron points, here are uſed a kind of crooked needles, to prevent the *taffety* from ſlipping: at the two extremities are two beams, on one of which is rolled the *taffety* to take the gloſs; and on the other, the ſame *taffety*, as faſt as it had received it. The firſt beam is kept firm by a weight of about two hundred pounds, and the other turned by means of a little lever paſſing through mortiſes at each end. The more the *taffety* is ſtretched, the greater luſtre it takes: care, however, is to be uſed, it be not weakened by over-ſtretching.

Beſides this inſtrument for keeping the ſtuff ſtretched, there is another to give it the fire: this is a kind of carriage, in form of a long ſquare, and of the breadth of the *taffeties*: it moves on trundles, and carries a charcoal fire under the *taffety*, at the diſtance of about half a foot.

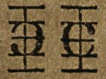
Theſe two machines prepared, and the *taffety* mounted, the luſtre is given it by rubbing it gently with a ball, or a handful of liſts of fine cloth, as it rolls from one beam to the other; the fire, at the ſame time, being carried underneath it to dry it. As ſoon as the piece has its luſtre, it is put on new beams to be ſtretched a day or two; and the oftener this laſt preparation is repeated, the more it increaſes the gloſs.

For black *taffeties*, the gloſs is given with double beer and orange or lemon-juice; but this laſt is the leaſt proper, as being apt to whiten them. The proportion of the two liquors is, a gallon of orange-juice to a pint of beer, to be boiled together to the conſiſtence of a rich broth. For coloured *taffeties*, they uſe gourd-water, diſtilled in an alembic.

There are alſo ſeveral different ſorts of *taffeties* manufactured in China; as corded *taffeties*, which wear well; and alſo ſome with flowers, and others beautifully ſtriped; and a particular *taffety*, of which they make drawers, and other kinds of wearing apparel. This laſt is thick, and yet ſo pliant, that it may be folded and preſſed with the hand, without leaving any mark in it. They alſo waſh it, like other ſtuffs, without its loſing much of its luſtre. The Chineſe workmen give the luſtre to this *taffety* with the fat of the river-porpoiſe, which they purify by waſhing and boiling; and then with a fine bruſh,

they give the *taffety* two beds in the ſame direction, on the ſide which they intend to render gloſſy.

TAGETES, in *Botany*. See *African* MARYGOLD.

TAGLIATO, in the *Italian Muſic*, is uſed for a meaſure called by the French *barré*; that is, when the character of common time is thus marked  with a perpendicular line drawn down through its middle. It ſignifies a pretty quick motion, and contains a breve, or its quantity in ſmaller notes, in each bar. Hence it is called *alla breve*.

TAJACU, or the SUS *tajacu* of Linnæus, in *Zoology*, the name of an animal common in ſome parts of America, called by many authors *aper moſchiferus*, or the muſk-boar.

It is of the ſhape of our hog, but much ſmaller, and has no tail, and its head is broader, and the ſnout much leſs pointed than in our hog; it has two tuſks in each jaw, thoſe in the upper jaw pointing down, and hardly apparent when the mouth is ſhut, the others hid; the neck is ſhort and thick, and the whole body of a griſly colour, or mixture of black and grey; its body is covered with hairs, much thicker and ſtronger than our hogs-briſtles, ſomething like the briſtles of the hedge-hog, and like them alſo variegated with circles of black and white; theſe are four or five inches long on the back, and gradually diminiſh to the ſides; on the middle of its head, between the ears, it has a ſort of creſt, made up of black briſtles; the belly almoſt naked; from the ſhoulders to the breaſt is a band of white; its ears are ſmall and erect, and its eyes ſmall; its ſnout, feet, and hoofs, are juſt like thoſe of the European hog; but the two poſterior or exterior hoofs are longer than in any other of the cloven-footed beaſts.

What is moſt ſingular, however, in this creature, is a certain gland which he has upon the back, and which has given occaſion to ſome to ſay its navel was placed there. This gland is ſituated on the very ridge of the back near the rump, and is ſo cloſely covered with long briſtles, that till they are removed by blowing, and keeping them back with the hand, the gland is not to be ſeen; when theſe are removed there is ſeen a ſpot almoſt naked, in the middle of which the top of the gland is ſeen; the lips of this gland uſually ſtand a little way above the fleſh, and its aperture eaſily admits a large ſtylus; and this gland, when lightly preſſed, ſpews out a liquid ſubſtance of a browniſh yellow colour, and ſcent ſomething like that of muſk or civet. The gland itſelf is placed between the ſkin and fleſh, and is not wholly covered by its conſtringing muſcle, but only ſurrounded by it at its bottom.

This animal inhabits the hotteſt parts of South America, and ſome of the Antilles; lives in foreſts, on the mountains, is very fierce, and if wounded, will turn on the hunter. It feeds on fruits and roots, toads and ſerpents, which it ſkins with great dexterity. It is reckoned very good food; but unleſs the dorſal gland be cut out as ſoon as it is killed, the fleſh will be infected by it. The Indians call this animal *pequaris*, whence its name *pecary*. *Tab.* V. *Quadrupeds*, N° 61. Ray and Pennant.

TAIIBI, in *Zoology*, the name of an American animal, deſcribed by Margrave and other authors, and ſuppoſed by ſome to be only the male of the OPOSSUM. The Portugueſe in America call it the *cachorro de mato*, and by the Dutch it is called *boſchratte*.

TAIL, *cauda*, that part of an animal which terminates its body behind.

The *tail* is different, both in figure and uſe, in the various ſpecies. In land-animals it ſerves to rid them of flies, and is uſually covered with hair, and ſtrengthened with bones: in fiſhes it is cartilaginous, and ſerves them as a helm to ſteer their courſe withal in ſwimming.

In birds it is covered with feathers, and greatly aſſiſts in all aſcents and deſcents in the air; as alſo to render their flight ſteady, by keeping the body upright in that ſubtile and yielding medium, by its readily turning and anſwering to every vacillation of the body.

TAIL *of fiſh*. This part in the fiſh-kind is the ſubject of very great diſtinctions, among the characters of the ſeveral genera. It differs in the ſeveral kinds of fiſh in a very obvious manner, in number, ſituation, and figure.

In regard to the firſt difference, the *acus lumbriciformis*, and one of the kinds of the *ſerpens marinus*, have no *tail* at all; in all other fiſh there is a *tail*, and it is never more than one on each fiſh.

In regard to ſituation, there is this great difference, that in ſome it is placed perpendicularly, in others horizontally. In almoſt all the known fiſhes it is placed perpendicularly, except in the dolphin, the phocæna, the orca, the manati, and all the whale-kinds; for in all theſe it is placed horizontally, when the body is laid in its natural poſture.

In figure it has many very remarkable differences, which are of great uſe in ichthyological diſtinctions. 1. In ſome fiſh it is rounded at the end; as in the cottus, and ſome others. 2. In ſome it is cut off even as it were at the end, ſo that the whole *tail* is a ſort of parallelogram; as in the tench, and ſome of the ſalmons. 3. In ſome fiſhes it is cuſpidated at the end, as is the caſe in the conger, the eel, and the petromyzon. 4. In others it has as it were a ſmall ſegment of a circle cut out at the end, and ſo is ſlightly hollowed out; this is the caſe in the caraſſius, and ſome of the ſalmons. 5. In many fiſh it is forked or opened into two points, making an acute angle: this is the figure of the *tail* in the pearches, the cyprini of many kinds, &c. 6. Finally, the *tail* is falcated in many fiſh, that is, it is of the ſhape of a creſcent; as in the ſword-fiſh, the tunny, mackrel, and the like. Artedi, Ichthyolog.

TAIL, in *Anatomy*, is uſed for that tendon of a muſcle which is fixed to the moveable part. In oppoſition to which, the tendon fixed to the immoveable part is called the *head*.

TAIL, *dove*, or *ſwallow's*-TAIL, among *Carpenters*. See DOVE-*tail*.

TAIL, *peacock's*, a term applied to all circular compartiments which go enlarging from the centre to the circumference; imitating, in ſome meaſure, the feathers of a peacock's *tail*, when ſpread.

TAIL, *dragon's*, *cauda draconis*, in *Aſtronomy*. See DRAGON and NODE.

The aſtrologers take care to put this in all their horoſcopes.

TAIL, *horſe's*, among the Tartars and Chineſe, is the enſign or flag under which they make war.

Among the Turks, it is the ſtandard borne before the grand viſier, the baſhaws, and ſangiacs; in order to which, it is fitted on the end of a half-pike, with a gold button, and is called *toug*.

There are baſhaws of *one*, others of *two*, others of *three horſes tails*. The *horſe's-tail* placed on the general's tent, is a ſignal of battle. For the original of this cuſtom, it is related, that in a certain battle, the ſtandard being taken by the enemy, the general of the army, or, as others ſay, a private horſeman, cut off the *tail* of his horſe, and faſtening it to the end of a half-pike, encouraged the troops, and gained the victory. In memory of which noble action, the grand ſignior appointed that ſtandard to be borne, for the future, as a ſymbol of honour. Ricaut.

TAIL, in *Heraldry*, &c. is particularly uſed for the *tail* of an hart; thoſe of ſeveral other creatures having peculiar and diſtinct names.

As, that of a buck, roe, or any other kind of deer, is called the *ſingle*; that of a boar, the *wreath*; of a fox, the *buſh*; of a wolf, the *ſtern*; and of a hare and rabbit, the *ſcut*.

TAIL *of a comet*. See COMET.

TAIL, or TAILE, in *Common Law*, ſignifies a limited fee, as oppoſite to fee-ſimple.

It is thus called from the barbarous word *taliare*, whence the French *tailler*, *to cut*; becauſe ſuch fee is ſo minced, or parted, as it were, that it is not in the owner's free power to diſpoſe of; but is, by the firſt giver, *cut*, *taille*, and divided from all others, and tied to the iſſue of the donee.

The limitation of *tail* is either *general* or *ſpecial*. See FEE-*tail*.

TAIL *after poſſibility of iſſue extinct*, is where land being given to a man and his wife, and the heirs of their two bodies, and the one outlives the other, without iſſue between them begotten: the ſurvivor upon this ſhall hold the land for term of his own life in quality of tenant in *tail after the poſſibility of iſſue extinct*.

This eſtate muſt be created by the act of God, i. e. by the death of that perſon out of whoſe body the iſſue was to ſpring; for no limitation, conveyance, or other human act, can make it. It partakes partly of the nature of an eſtate-*tail*, and partly of an eſtate for life. The tenant is, really, only tenant for life, but with many of the privileges of a tenant in *tail*; as, not to be puniſhable for waſte, &c. or he is tenant in *tail*, with many of the reſtrictions of a tenant for life; as, to forfeit his eſtate if he aliens it in fee-ſimple: whereas ſuch alienation by tenant in *tail*, though voidable by the iſſue, is no forfeiture of the eſtate to the reverſioner; who is not concerned in intereſt, till all poſſibility of iſſue be extinct. But, in general, the law looks upon this eſtate as equivalent to an eſtate for life only; and, as ſuch, will permit this tenant to exchange his eſtate with a tenant for life: which exchange can only be made of eſtates, that are equal in their nature. Blackſt. book ii. p. 124, &c.

TAIL, *fee*. See FEE-*tail*.

TAIL, *ſeveral*. See INHERITANCE.

TAIL,

TAIL, or TAILE, is alſo uſed for what we vulgarly call TITALLY, *taille de bois*.

[TAI]LA, in the *Manege*. Many affirm that the dock of a horſe's *tail* ſerves to point out his ſixth or ſeventh year; ſaying, that about the time that the black ſpeck, or eye of the bean begins to diſappear, and the cavity to be filled, the dock of the tail becomes longer, becauſe the vigour of the young years begins to abate; and nature has not ſtrength enough to nouriſh and keep up the joints or knots that form the dock; ſo that when the horſe is ſix years old, one of theſe joints ſlackens, and begins to fall down; and a year after, another deſcends in like manner. But this relaxation or downfalling happens ſooner in ſome than in others, according as they have been well or ill kept, with reference to feeding, houſing, and working. Accordingly we find the marks of a horſe's age, taken from his *tail*, are ſo erroneous, that many jockies maintain, that the firſt joint deſcends when he is nine, and the ſecond when he is ten years old.

TAIL *of the trenches*, in the *Military Art*. See TRENCH.

TAIL, in *Sea Language*, is a name given by ſailors to the extremities of a hurricane, wherein the violence is conſiderably exhauſted.

TAIL-*block*, in a *Ship*, a ſmall ſingle block, having a ſhort piece of rope attached to it, by which it may be faſtened to any object at pleaſure, either for convenience, or to increaſe the force applied to the ſaid object. Falconer.

TAILLE', or TAILLEE, in *Heraldry*. See TRANCHE'.

TAILLOIR, in *Architecture*, a term which ſome of our writers, after the French, uſe for ABACUS.

TAINT, in *Law*, ſignifies either, ſubſtantively, a conviction; or, adjectively, a perſon convicted of felony, treaſon, &c. See ATTAINT.

TAIPARA, in *Ornithology*, the name of a Braſilian ſpecies of PARROQUET. It is of the ſize of a lark, and of a pale green colour over its whole body; its tail is ſhort, not reaching beyond the tips of the wings when cloſed; its beak is red, and its legs are grey; near the origin of the beak it has a ſemilunar red ſpot on the head, and a yellow ſpot in the middle of each wing. It builds in the deſerted abodes of ants on trees. Marcgrave's Hiſt. Braſ.

TAINHA, in *Ichthyology*, a name given by ſome to a ſpecies of mullet caught in the American ſeas, and more uſually called the CUREMA.

TAKE *and Leave*, in the *Sea Language*: the ſailors ſay, a ſhip can *take and leave upon her when ſhe will*; when ſhe ſails ſo well that ſhe can come up with another, or outſail her at pleaſure.

TAKE, *thiſtle*. See THISTLE.

TAKERS—*carr*-TAKERS. See CARR.

TAKING-*in*, in *Sea Language*, denotes the act of brailing-up and furling the ſails at ſea, particularly when the wind increaſes. It is generally uſed in oppoſition to *ſetting*.

TAL, a name uſed by ſome writers on the materia medica to expreſs the dung of peacocks; and by ſome of the chemical writers, for any alkali ſalt.

TALA, in *Botany*, a name by which ſome authors call the plant whoſe ſeed is the ſeſamum or oily purging grain of the ſhops.

TALABONG, in *Natural Hiſtory*, a name given by the inhabitants of the Philippine Iſlands to a ſpecies of heron, common among them; which is much ſmaller than our heron, and perfectly white all over.

TALÆDITES, ταλαιδιτης, in *Antiquity*, gymnical exerciſes in honour of Jupiter ταλαιος.

TALARIUS *ludus*, among the Romans, a game ſomewhat reſembling our dice-playing, and performed with a kind of gold or ivory dice, which they ſhook as we do in a box, before they threw them. There was this difference, however, between their game and ours, that our dice have ſix ſides, becauſe they are cubical; but theirs had but four, and were conically ſhaped. They made uſe of them for divination, as well as playing; and they concluded upon a good or evil augury, according to what came up. As they uſually threw four of them at a time, the beſt chance was when four different ſides came up. The ſides were called by the name of ſome animal, as the dog, vulture, baſiliſk, &c. Or of ſome deity, as Venus, Hercules, &c. Some authors have been of opinion, that they were marked with the forms of animals, or images of gods, and not with numbers or dots, as our dice are.

TALASSIO, among the Romans, an acclamation uſed at marriages.

TALBOT, a ſort of dog, noted for its quick ſcent, finding out the tracks, lodgings, and forms of beaſts, and purſuing them with open mouth, and continual cry, with ſuch eagerneſs, that, if not taken off by the huntſmen, he is often ſpoiled.

TALC, or TALK, in *Natural Hiſtory*, a ſhining, ſquamous, fiſſile ſpecies of ſtone, eaſily ſeparable into thin tranſparent ſcales or leaves. See SPECULARES.

The *talcs* in general are defined to be foſſils, compoſed of broad, flat, and ſmooth laminæ or plates, laid evenly and regularly on one another; eaſily fiſſile, according to the ſite of theſe plates, but not all ſo in any other direction; flexile and elaſtic; bright, ſhining, and tranſparent; not giving fire with ſteel, nor fermenting with acid menſtrua, and ſuſtaining the force of a violent fire without calcining. See *Tab. of Foſſils, claſs* I.

By theſe characters, the *talcs* may be diſtinguiſhed from all other bodies which reſemble them; and, according to their ſeveral natural and eſſential differences among one another, they are themſelves divided into two ſeparate orders, and under thoſe into four genera.

The *talcs* of the firſt order are thoſe compoſed of plates of great extent, each making ſingly the whole horizontal ſurface of the maſs.

Thoſe of the ſecond order are thoſe compoſed of ſmall plates, in form of ſpangles, irregularly diſpoſed, and uſually many of them concurring in different directions, to the formation of one of the ſurfaces of the maſs. Hill's Hiſt. of Foſſ. p. 71.

Authors have hitherto been uſed to call alſo another ſet of bodies by the name of *talcs*, with the addition of the adjective *fibroſe*; but as theſe are found not at all of the nature of the true *talcs*, they are now diſtinguiſhed by the name FIBRARIÆ.

Talc is often confounded with ſimilar concretions, as with the *ſchiſtus* or *lapis fiſſilis*, with the *ſpathum* or *ſpatum*, and *gypſum*, Muſcovy-glaſs, or *glacies Mariæ*, and the *lapis ſpecularis*. Boyle takes it for an alkaline ſpathum, and others for other ſubſtances, from which nevertheleſs it differs. See Pott, in Mem. de l'Acad. de Berlin, 1746.

Anciently, *talc* was found only in Spain; but ſince, mines thereof have been found in Cyprus, Cappadocia, and ſince that in Arabia and Africa; and at preſent, they dig it in the Alps and Appennines, ſeveral mountains in Germany, and even in England, particularly in Northamptonſhire.

We uſually diſtinguiſh two kinds of *talc*, viz. *white talc of Venice*, and that called *red talc of Muſcovy*: to which ſome add, though improperly, *parget*, *plaſter-ſtone*.

That from Venice has been the moſt eſteemed in medicine: it is brought in large ſhining greeniſh ſtones; but becomes white, and exceedingly bright when wrought. It ſeems greaſy to the touch, though there is ſcarce any ſtone drier; yet, notwithſtanding its drineſs, it pulveriſes with difficulty; nor is it eaſily calcined. However, this *talc* does not appear capable of anſwering any medicinal intention, as not being diſſolved or ſenſibly affected by any known humid menſtruum.

The chief uſe of the Ruſſian is as a ſcreen or cover for paintings in miniature and crayons; to which purpoſe thin ſlices thereof are uſed. The Venetian is ſometimes alſo uſed for a fucus; in order to which, by reaſon of the difficulty of pulverizing it, &c. they content themſelves to raſp it with the ſkin of a ſea-dog, and to paſs the raſping through a ſieve.

Pliny, in his Natural Hiſtory, lib. xxxvi. c. 22. obſerves, that the Romans not only uſed the Ruſſian ſort for window-lights, but they alſo paved the circus with a kind of it. See GLASS.

The *talc* brought from Muſcovy is reddiſh when in the ſtone; but it ſeldom comes to us otherwiſe than in leaves, which are colourleſs, ſmooth, gloſſy, and exceedingly tranſparent: it is found in quarries in Muſcovy and Perſia, and is uſed to make lanterns, to cover paintings, &c. Many of the mountains in Hungary and Germany abound with the Muſcovy *talc*, not inferior to the *talc* of that country from whence it has its name. The mountain of Cliſſuro, which is a part of mount Hæmus, as alſo mount Pyrlipe, ſhine like ſilver in all parts both day and night, provided there be any moon.

The *talc* in theſe hills is the only occaſion of this: there are alſo *talc* rocks near Spittal in Upper Carinthia; and many other hills are ſaid alſo to contain great quantities of it; but there is a ſort of ſelenites ſo very like this *talc*, that people are eaſily deceived by its appearance. This ſelenites ſplits into flakes like the *talc*, but they are brittle.

Talc is uſed with great ſucceſs in the diſtillation of acid ſpirits; that of ſalt is always naturally impure, and can ſcarce be rendered pure but by an admixture of a *talky* earth in the retort.

The mixture of *talc* with different kinds and quantities of glaſs, may be ſucceſsfully performed with a violent fire, but not with a ſmaller degree: thus three parts of *talc* with one part of cryſtalline glaſs, make only a ſpongy and friable maſs in a common fire; but in a more violent

one they become a firm and solid mass of a brown colour. Minium, or glass of lead, mixed in equal quantities with *talc*, and set in a violent fire, run into a yellowish glass resembling the opake pieces of amber; and two parts of minium to one of *talc*, produce a clear and transparent yellow glass, which is of a hardness capable of giving fire with steel. The alkaline earths, mixed with *talc*, produce a mass scarcely vitriable by any fire: hence appears the reason why copels made of lime and *talc* are so very hard to vitrify. Minium, added to these mixtures, makes them combine into a firm mass, but without perfect fusion; but borax added to them, melts them readily into a true glass. The gypseous earths mixed with *talc*, will not unite into a mass in any degree of fire; but if borax be added, the *talc* readily melts. Thus two parts of *talc*, two parts of that spar or gypseous matter called *glacies Mariæ*, or the common plated spar, with one part of borax, run into a yellow mass resembling a topaz.

The argillaceous earths do not vitrify with *talc*; but they run into a mass of great hardness, which will give fire with steel, and is very serviceable to make crucibles of, these vessels not suffering the glass of lead to run through them. *Talc*, joined with the vitrifiable stones, forms no remarkable body, but the mass remains friable; but from these masses, by the addition of proper matters to render them fluid, great variety of elegant compounds may be made. Thus *talc* mixed in equal quantities with powder of flints, on adding to the whole a fourth part of crystal-glass, the whole unites into an opake but solid white mass. Alkali-salt, added in equal quantity to *talc* and flint, gives a transparent yellow glass; and white sand, *talc*, and a fixed alkali, in equal quantities, afford a green glass; with other mixtures of this kind, in different quantities, the resemblances of many beautiful stones are produced; and what is very remarkable, some grains of metalline matter are often found on the surface of the masses.

Cæsalpinus, Aldrovand, and some others affirm, that *talc* melted with copper, or added to copper, while in fusion, gave it a white colour; this being taken for granted, authors have hence agreed that *talc* contains an arsenical earth. But experiment shews this to have been a false assertion, in regard to *talc*; and probably it only owes its origin to the cant language of some of the alchemists, who have called the flowers of zinc *talc*, though these alone must render copper yellow, not white. Antimony and *talc*, first calcined with nitre, run in a violent fire into a sort of flint, which will give fire with steel. With regulus of antimony and the black flux, it runs into a black mass; and with bismuth it calcines into a grey powder. So little is there in the proposals of the chemists for the metallization of *talc* by antimony and bismuth. Mem. de l'Acad. de Berlin, Ann. 1746.

In what part of Mr. Boyle's works the learned author from whom the foregoing extract was taken, has found that *talc* may be reduced by common fire to a gypsum in an hour, we know not; but we find that Mr. Boyle says, that the calcination of *talc* is so very difficult, that eminent chemists have looked upon calxes of *talc* as counterfeits. Works abr. vol. i. p. 160.

Mr. Boyle mentions the extracting of gold from *talc*, as having sometimes succeeded. See Works abr. vol. i. p. 160. but *vide supra*.

Some chemists, and empirics, have held, that *talc* might be used for many more important purposes than it usually is; and pretend to draw from it that precious oil, so much boasted of by the ancients, particularly the Arabs, called *oil of talc*, which is supposed a wonderful cosmetic, and preserver of the complexion: but the truth is, the word *talc*, among many of them, signified no more than an equal disposition of the humours, which keep the body in good temperament and perfect health. Now, as nothing contributes more than health to the preserving of beauty, this has given occasion to the chemists to search out this *oil of talc*, which is to maintain the body in this disposition, and to engage the ladies to be at the expence of the search. See *Philosophic* TALC.

Some have also pretended, that yellow or ruddy *talc* contained the seeds of gold; and that an oil might be drawn from it, to transmute metals into gold or silver, to fix mercury, &c. but this is mere charletanery.

TALC, *Mexico*. There is a famous cave some leagues from Mexico, on the north-west side of the city, beyond the lake, the top and sides of which are said to be lined with leaf-gold; but that of such a kind, that the common methods of fluxing the ores have no effect upon it. The Spaniards, after many trials, have given it over, but are still persuaded by the Indians that it is gold, and that the famous Montezuma obtained a great part of his treasures from this cave. The leaves, as they are called, are no more than spangles of the size of a man's nail; and

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the account we have of it in the Philosophical Transactions, and the various methods attempted in vain to reduce it to metal, abundantly prove that it is only a yellow *talc*. Vide Phil. Trans. N° 39.

TALC, *Muscovy*, a kind of foliaceous body, well known by the English name of isinglass. See SPECULARES.

TALC, *philosophic*, a name given by some of the chemical writers to the flowers of zinc.

This substance, dissolved in vinegar, affords what they have in their unintelligible language called *oil of talc*, and extolled as a thing of vast power in the fixing of mercury, and many other imaginary operations; and beside this, they call it a sovereign remedy for all diseases.

The chemists of after ages, seeing such prodigious effects ascribed to oil of *talc*, and not conceiving that *talc* was a mere cant word in this place, have been at infinite pains, by means of a thousand differently varied menstruums, to obtain an oil from the common Venetian *talc*, a dry stone which in a very remarkable manner resists the force of all menstrua, and of fire; and from which, therefore, no oil can be obtained. In the various operations used to this purpose, some have really hit upon liquors of a considerable power; but that power has been wholly owing to the menstruums they employed, not to the stone; and even if it were, could have none of the effects of the oil of *talc*, mentioned by these dark writers, who meant by it so very different a substance as a solution of these flowers, which are only zinc in another form.

TALE, in *Law*. See COUNT and DECLARATION.

TALED, in the *Jewish Antiquities*, a sort of habit that the Jews wore, chiefly when they repeated their prayers in the synagogue. Numbers xv. 38. Deuteronomy xxii. 12.

It served instead of that square garment they wore heretofore, to which Moses had appointed that they should fasten borders of blue to the four quarters, and fringes or ribbands all along the borders. But at present, that they may not be exposed to the laughter of the people for the too great singularity of their dress, they content themselves with wearing a square piece of cloth underneath, with four tufts at the four corners, and when they meet in the synagogue to say their prayers, they cover their heads with a square woollen veil, which has four tufts at its four corners. It is this they call *thaled*, or *taled*. Calmet, Dict. & Leo of Modena, Ceremonies of the Jews, p. i. ch. 5. 11.

TALENT, TALENTUM, a weight, and a coin, both very famous among the ancients; but very different in different countries.

The value of the *talent* is very hard to assign in English money, as being used among all the people throughout the East, and its value, and the manner of computation, different among each. A difficulty abundantly shewed by Budæus, in his learned treatise De Asse.

There were various kinds of *talents*, both with regard to weight and to species; the value of these last still increasing, as the metal whereof it consisted was purer, though the *talent* weights contained the same number of pounds and drams. Accordingly, all *talent* weights are equally sixty minæ, and the mina one hundred drachmæ; but the drachma of one place exceeding that of another, there hence arose a difference in the *talents*.

The common Attic *talent* then (the *talent* weight we mean) contained sixty Attic minæ, or six thousand Attic drachmæ; equal, according to Dr. Arbuthnot's reduction, to fifty-six pounds, eleven ounces, seventeen and one seventh grains, English Troy-weight.

There was another Attic *talent*, by some said to consist of eighty, by others of one hundred minæ. The Egyptian *talent* was eighty minæ; the Antiochian also eighty; the Ptolemaic of Cleopatra eighty-six and two-thirds; that of Alexandria ninety-six; the Insular *talent* one hundred and twenty; and that of Antioch three hundred and sixty minæ. In the valuation of money, the Grecian *talent*, according to Dr. Arbuthnot, was equal to sixty minæ, or reckoning the mina at 3*l*. 4*s*. 7*d*. equal to 193*l*. 15*s*. the Syrian *talent* in this valuation consisted of fifteen Attic minæ; the Ptolemaic of twenty; the Antiochian of sixty; the Euboic of sixty; the Babylonic of seventy; the Greater Attic of eighty; the Tyrian of eighty; the Eginean of one hundred; the Rhodian of one hundred; and the Egyptian of eighty minæ. See Arbuthnot's Tables of Ancient Coins, &c. p. 33, and Tab. 18, 19. 23, 24.

But Mr. Raper makes the Attic *talent*, which consisted of sixty minæ, or six thousand drachmæ, each drachm being equal to sixty-six grains and a half Troy weight, or 3*l*. 17*s*. 4$\frac{6}{10}$*d*. sterling, equal to 232*l*. 3*s*. See DRACHM.

This ingenious writer also observes, that historians and others mention the Eginean and the Euboic *talent*. The former weighed ten thousand Attic drachms; but, like other *talents*, contained only six thousand of its own; which being

being ſo much heavier than the Attic, the Athenians called it παχειαν δραχμην, or the thick drachm. This *talent* was uſed at Corinth, and in a paſſage of Aulus Gellius, lib. i. c. 8. it is valued at ten thouſand Attic drachms; and was probably uſed in moſt of the cities of Peloponneſus. If the Attic drachm weighed ſixty-ſix and a half Troy grains, the Eginean ſhould weigh one hundred and ten and five ſixths, which Mr. Raper ſtates at one hundred and eleven. This Eginean *talent* he concludes from the mean drachm of ſix Macedonian coins, which he found to be one hundred and eleven grains and one fourth, muſt have been the ſtandard of the Macedonian money, till Philip changed it. And it appears likewiſe to have been the ſtandard of the Ptolemaic money in Egypt. Pliny indeed (Nat. Hiſt. lib. xxxiii. c. 3.) tells us, on the authority of Varro, that the Egyptian *talent* weighed eighty Roman pounds; but he ſuppoſes that this is a falſe reading, and that for Ægyptium we ſhould read Euboicum: for Pliny is ſpeaking of the riches of Aſia, where the Euboic *talent* was uſed for weighing gold; and it is known, that the weight of that *talent* was ſettled at eighty Roman pounds, by the treaty between the Romans and Antiochus. There is a paſſage in Pollux (lib. ix. c. 6. § 86.) which makes the Egyptian *talent* contain fifteen hundred Attic drachms. But this, he apprehends, is an injudicious interpolation in the laſt collection of that author.

The Euboic *talent*, ſays this writer, certainly came from Aſia; for Herodotus (lib. iii. ſect. 89.) tells us, the kings of Perſia weighed their gold by that *talent*: in the ſame place he informs us, that the Babylonian *talent* weighed ſeventy Euboic minæ. Pollux ſays, it weighed ſeventy Attic minæ. Therefore the Euboic *talent* ſhould be equal to the Attic. But Ælian (Var. Hiſt. lib. i. c. 22.) tells us, that it weighed ſeventy-two Attic minæ; and if ſo, the Euboic *talent* ſhould be heavier than the Attic, in the proportion of ſeventy-two to ſeventy. By two paſſages, cited by Mr. Raper, from Xenophon. Exped. lib. i. it appears probable, that the Babylonian *talent* weighed above ſeventy Attic minæ, and above ſeventy Euboic minæ; and if Pollux took his value of the Babylonian *talent* from Herodotus, as the text now ſtands, and Ælian his value of the ſame, from a more correct copy of that author, or from ſome better authority, the Euboic *talent* muſt have been equal to the Attic. Accordingly it contained ſix thouſand Attic drachms. Phil Tranſ. vol. lxi. part ii. p. 483, &c.

There is another *talent* much more ancient, and much leſs than any of thoſe already mentioned, which Dr. Arbuthnot calls the Homerical *talent* of gold, ſuppoſed, he ſays, to be equal to three Attic aurei. Pollux ſpeaks of ſuch a *talent*. Euſtathius upon Homer reckons it worth twenty-four drachmæ. That its value was ſmall, whether fixed or uncertain, is conjectured from the paſſage of Homer, where deſcribing the prizes at the funeral of Patroclus, two *talents* of gold are propoſed as a more inconſiderable prize than a mare with foal, &c. Hence Mr. Raper, *ubi ſupra*, p. 527, concludes, that it was the ſame that the Dorian colonies carried to Sicily and Calabria: for Pollux tells us, from Ariſtotle, that the ancient *talent* of the Greeks in Sicily contained twenty-four nummi, each of which weighing an obolus and a half, the *talent* muſt have weighed ſix Attic drachms, or three darics; but the daric weighed very little more than one guinea; and if two *talents* weighed about ſix guineas, we may reckon the mare with foal worth twelve; which was no improbable price, ſince we learn from a paſſage in the Clouds of Ariſtophanes, that, in his time, a running horſe coſt twelve minæ, or above forty-ſix pounds ſterling; therefore, this ſeems to have been the ancient Greek *talent*, before the art of ſtamping money had introduced the greater *talents* from Aſia and Egypt.

According to this ancient *talent*, ſays Dr. Arbuthnot, ſome reckon the treaſure of king David, particularly that mentioned 1 Chron. xxii. 14. which, according to the common reckoning, would amount in gold *talents* to the value of 547,500,000*l.* and the ſilver to above 342,000,000; or reckoning according to the decuple proportion of gold to ſilver, the two ſums would be equal. As David reigned in Judæa after the ſiege of Troy, it is not improbable but Homer and he might uſe the ſame numeral *talent* of gold.

Among the Romans there were two kinds of *talents*, the *little* and the *great talent*; the little was the common *talent*; and whenever they ſay ſimply *talentum*, they are to be underſtood of this: the little *talent* was ſixty minæ, or Roman pounds; the mina, or pound, eſtimated at one hundred drachmæ, or denarii: it was alſo eſtimated at twenty-four great ſeſterces, which amounted to ſixty pounds.

The great *talent* exceeded the leſs by one-third part. Budæus computes, that the little *talent* of ſilver was worth ſeventy-five pounds ſterling; and the greater 99*l.* 6*s.* 8*d.* ſterling. The greater of gold was worth 1125*l.* ſterling.

TALENT, *as a ſpecies, or money*, among the Hebrews, was ſometimes uſed for a gold coin, the ſame with the SHEKEL of gold, called alſo *ſtater*, and weighing only four drachms. The Hebrews reckoned by theſe *talents* as we do by pounds, &c. Thus a million of gold, or million of *talents* of gold, among them, was a million of ſhekels, or nummi; the nummus of gold being the ſame weight with the ſhekel, viz. four drachms.

But the Hebrew *talent* weight of ſilver, which they called *cicar*, was equivalent to that of three thouſand ſhekels, or one hundred and thirteen pounds, ten ounces, one penny weight, ten grains and two ſevenths, Engliſh Troy weight, according to Arbuthnot's computation.

TALES, in *Law*, a ſupply or addition of men for thoſe impanelled on a jury of inqueſt, and not appearing, or at their appearance challenged by either party as not indifferent.

In ſuch caſe, the judge, upon motion, grants ſupply to be made by the ſheriff, of one or more *tales*, ſuch as are preſent in court, equal in reputation to thoſe impanelled. For this purpoſe a writ of *decem tales*, *octo tales*, and the like, was uſed to be iſſued to the ſheriff at common law; and muſt be ſtill ſo done at a trial at bar, if the jurors make default; but at the aſſizes, or niſi prius, by virtue of the ſtatute 35 Hen. VIII. c. 6. and other ſubſequent ſtatutes, the judge is impowered at the prayer of either party to award a *tales de* CIRCUMSTANTIBUS, of perſons preſent in court, to be joined to the other jurors to try the cauſe; who are liable however to the ſame challenges as the principal jurors. This is uſually done, till the legal number of twelve be completed. The *tales de circumſtantibus* is in ſome meaſure rendered uſeleſs by the ſtatute for regulating juries, 3 Geo. II. c. 25. See CHALLENGE and JURY.

TALIO, *Lex* TALIONIS, or *Pœna* TALIONIS, a retaliation, or puniſhment, whereby an evil is returned perfectly like that committed againſt us by another—which is what we uſually expreſs by the words, *eye for eye, tooth for tooth.*

The *pœna talionis* was injoined by the law of Moſes, among the Jews: it was eſteemed a natural piece of juſtice, and yet the Romans ſet it aſide, inaſmuch as ſuch a parity or equality of puniſhment could not always be obſerved. For this reaſon the prætor allowed ſuch as had ſuffered an injury to make an eſtimate thereof in money, that juſtice might be done him that way; only reſerving to himſelf the power of moderating the ſame. And this was what was conſtantly practiſed, and thus the *pœna talionis* became quite diſuſed with them.

TALISMANS, magical figures engraven or cut under certain ſuperſtitious obſervances of the characteriſms and configurations of the heavens; to which ſome aſtrologers, hermetical philoſophers, and other adepts, attribute marvellous virtues, particularly that of calling down celeſtial influences.

The word is pure Arabic; though Menage, after Salmaſius, thinks it may come from the Greek τελεσμα, *operation*, or *conſecration*. Borel ſays, it is Perſian, and ſignifies literally an engraven conſtellation. Others derive it *a talamacis literis*, which are myſterious characters, or ciphers, uſed by ſorcerers, thus called from *talamaſca*, a phantom, or illuſion.

The author of a book, intituled, *Taliſmans juſtifiez*, ſays, a *taliſman* is the ſeal, figure, character, or image of a heavenly ſign, conſtellation, or planet, engraven on a ſympathetic ſtone, or on a metal correſponding to the ſtar, &c. in order to receive its influences.

The *taliſmans* of the Samothracians, ſo famous of old, were pieces of iron, formed into certain images, and ſet in rings, &c. They were held preſervatives againſt all kinds of evils.—There were other *taliſmans* taken from vegetables, and others from minerals.

In the general, we uſe to diſtinguiſh three kinds of *taliſmans*.—*Aſtronomical*, which are known by the ſigns or conſtellations of the heavens engraven thereon, with other figures, and ſome unintelligible characters.—*Magical*, which bear very extraordinary figures, with ſuperſtitious words and names of angels unheard of.—And *mixt*, which conſiſt of ſigns, and barbarous words; but have no ſuperſtitious ones, or names of angels.

Some rabbins maintain, that the brazen ſerpent, raiſed by Moſes in the wilderneſs, for the deſtruction of the ſerpents that annoyed the Iſraelites, was properly a *taliſman*.

All the miraculous things wrought by Apollonius Tyanæus are attributed to the virtue and influence of *taliſmans*: and that wizard is even ſaid by ſome to have been the inventor of *taliſmans*.

Some authors take ſeveral Runic medals, at leaſt medals whoſe inſcriptions are in Runic characters, for *taliſmans*; it being notorious, that the northern nations, in their heathen ſtate, were much devoted thereto. M. Keder, however, has ſhewn, that the medals here ſpoken of are quite other things than *taliſmans*.

TALK. See TALC.

TALKING. See SPEAKING.

TALLIAGE, TALLAGIUM, a certain rate, according to which barons and knights were anciently taxed by the king towards the expences of the ſtate, and inferior tenants by their lords, on certain occaſions.

That raiſed to the king was on his demeſnes, eſcheats and wardſhips, and upon the cities and burghs of the realm. When it was paid out of knights fees, it was called SCUTAGE; when by cities and burghs, *talliage*; when upon lands not of military tenure, hidage.

This latter *talliage* of the cuſtomary tenants was ſometimes fixed and certain, and ſometimes at the pleaſure of the lord; and was alſo ſometimes compounded for.

Talliages were anciently called *cuttings*; which name is ſtill retained in Ireland, though in a different ſignification.

Talliage, ſays Sir Ed. Coke, is a general name including all taxes; and is derived from the French *taille*, *tax*, founded on the TALLY of petty tradeſmen; as the country people appointed to collect it, not being able to write, ſcored down what they received on tallies. See LAND-TAX and SUBSIDY.

TALLOW, a ſort of animal fat, melted down, and clarified. There are ſcarce any animals but a ſort of *tallow* may be prepared from; but thoſe which yield the moſt, and whereof the moſt uſe is made, are the horſe, bullock, ſheep, hog, goat, deer, bear, and viper.—Some of which *tallows*, or fats, are uſed in medicine, and called AXUNGIÆ.

Moſt of the reſt are uſed in the making of ſoap, and the dreſſing of leather; but chiefly in making of candles.

For candles, the beſt compoſition is half ſheeps *tallow*, and half cows or bullocks *tallow*, without any mixture of other kinds of fat, which only ſerve to turn the candles yellow, make them run, and ſpoil the clearneſs of their light. See CANDLE.

TALLOW-TREE, in China, is a tree growing in great plenty in that country, which produces a ſubſtance like our *tallow*, and ſerving for the ſame purpoſe. See CROTON.

It is about the height of a cherry-tree; its leaves in form of a heart, of a deep, ſhining, red colour, and its bark very ſmooth. Its fruit is encloſed in a kind of pod, or cover, like a cheſtnut, and conſiſts of three round white grains, of the ſize and form of a ſmall nut, each having its peculiar capſula, and within that a little ſtone.

This ſtone is encompaſſed with a white pulp, which has all the properties of true *tallow*, as to conſiſtence, colour, and even ſmell: and accordingly the Chineſe make their candles of it; which would, doubtleſs, be as good as thoſe in Europe, if they knew how to purify their vegetable *tallow* as well as we do our animal kind, and to make their wicks as well.

All the preparation they give it, is to melt it down and mix a little oil with it, to make it ſofter, and more pliant.—It is true, their candles made of it yield a thicker ſmoke, and a dimmer light, than ours; but thoſe defects are owing, in a great meaſure, to the wicks, which are not of cotton, but only a little rod or ſwitch of dry light wood, covered with the pith of a ruſh, wound round it; which being very porous, ſerves to filtrate the minute parts of the *tallow*, attracted by the burning ſtick, which by this means is kept burning.

TALLY, or TAILE, TAILLE, a piece of wood, whereon retail traders uſe to ſcore or mark, by notches or inciſions, the ſeveral quantities of goods they deliver out on credit, to ſave the trouble of writing down ſo many little articles in books.

Each ſcore conſiſts of two pieces of wood, or rather of a ſingle piece cleft length-wiſe, the parts whereof falling in with one another, the things delivered are ſcored on both at the ſame time; the ſeller keeping one, and the buyer the other.

Tallies are taken as evidences in courts of juſtice, as much as books. The ancient way of keeping all accounts was by *tallies*; the debtor keeping one part, and the creditor the other. Hence the *tallier* of the Exchequer, now called the *teller*.

There are three kinds of *tallies* mentioned in our ſtatutes, and long uſed in the exchequer; viz.

TALLIES *of Loans*, one part whereof is kept in the exchequer, and the other part given to particular perſons, in lieu of an obligation for the monies they have lent to the government on acts of parliament.—This laſt part is called the *ſtock*, and the former the *counter-ſtock*, or the counter-tail.

The *tallies* are numbered, and bear the perſon's name, and the ſum lent: thus we ſay, the *tallies*, N°. have been paid, or diſcharged: *tallies* are riſen, fallen, 4, 5, &c.

TALLIES, or TAILES *of Debt*, are a kind of acquittances for debts paid to the king.

E. gr. the univerſity of Cambridge pays yearly 10*l.* for ſuch things as are by charter granted them in fee-farm. He that pays this, receives a *taile*, or *tally*, for his diſcharge, with which, or a note of it, he repairs to the clerk of the pipe, and there for the *tally* receives a full diſcharge on parchment.

TALLIES *of Reward*, or allowance: theſe are made to ſheriffs, for ſuch matters as (to their charge) they have performed in their office, or ſuch money as is by courſe caſt on them in their accounts, but which they cannot levy.

In the Exchequer there is a *tally*-court, where attend the two deputy chamberlains of the exchequer, and the *tally*-cutter.

TALLY-*counter*. See COUNTER.

TALLIES, *cutter of the*. See CUTTER.

TALLY, *petty*. See PETTY.

TALLIES, *writer of*. See WRITER.

TALLY *the ſheets*, at ſea, a word of command, when the ſheets of a main-ſail, or fore-ſail are to be haled aft. See SHEETS.

TALMUD, or THALMUD, from תלמוד *doctrine*, from למד *he taught*, a Jewiſh book, wherein is collected all that relates to the explication of their law.

The *Talmud* is the body of the Hebrew law: a compilation of expoſitions of the duties impoſed on that people, either in Scripture, or by tradition, or by authority of their doctors, or by cuſtom, or even by ſuperſtition: to ſpeak more plainly ſtill, it is the courſe of caſes of conſcience, or of moral theology, wherein the duties are explained, and the doubts cleared, not by reaſoning, but generally by authority, by the cuſtom of the nation, and by the deciſions of the moſt approved of the ancient doctors.

The *Talmud* conſiſts of two general parts: the one called the MISCHNA, the other the GEMARA; which firſt part is alſo frequently called abſolutely *the Talmud*, the general name of the whole work.

The Jews divide their law into *written*, which is that contained in the books of Moſes; and *unwritten*, which is that conveyed by tradition.—This latter is, in effect, no other than a gloſs or interpretation of the former, given by the ancient rabbins.

The *Talmud* then contains the traditions of the Jews, their polity, doctrine, and ceremonies, which they obſerve as religiouſly as the law of God itſelf: they would never put them in writing till they were compelled to it by the deſtruction of Jeruſalem, and till they ſaw themſelves diſperſed throughout the world.

They had two famous ſchools; the one at Babylon, and the other at Jeruſalem: in theſe they made two ſeveral collections of thoſe traditions; the firſt at Jeruſalem, the other at Babylon; but both called *Talmud*, and both exceedingly reverenced, eſpecially the Babylonian, though full of extravagancies. It was compiled by the Jews of Meſopotamia, about 500 years after Chriſt, according to Buxtorf; but Father Morinus offers ſeveral reaſons to prove, that it was not finiſhed till the year 700. The laſt edition of this *Talmud* at Amſterdam, is in twelve folios.

The *Talmud* of Jeruſalem is the leaſt eſteemed.—It was compiled by the Jews of that city, and particularly by Rabbi Jochanan, rector of the academy at Tiberias, about 300 years after Chriſt, according to Buxtorf; but Father Morinus in his Exercitationes Biblicæ, lib. ii. exerc. 6. judges from ſeveral barbarous terms found in it, of Vandalic or Gothic extraction, that it did not appear till the 5th century. This is publiſhed in one large folio.

The Babylonian *Talmud* conſiſts of two parts: the one the text, the other the gloſs or comment; the comment, called the *Gemara*, contains the deciſion of the Jewiſh doctors, and their expoſitions of the text.—This we find ſtuffed with dreams and chimæras; together with much ignorance, and many impertinent queſtions and diſputations: the ſtyle is alſo very coarſe.—On the contrary, the text, called the *Miſchna*, is written in a tolerably pure ſtyle, and the reaſonings generally much more ſolid.

The Jews pretend, that this was compoſed by rabbi Juda, ſurnamed the *Saint*; and that God revealed to him the doctrine and the chief myſteries thereof.—But this is only to be underſtood of the *Miſchna*, not of the *Gemara*,

Gemara, the compilation whereof was not begun till the ſixth century, after the deſtruction of the ſecond temple.

Rabbi Juda is ſaid to have compoſed the *Miſchna* under the empire of Antoninus, in the ſecond century; but they do not all agree about this antiquity, ſome carrying it back much farther.

It is the *Talmud* of Babylon that is uſually read, and moſt frequently conſulted, among the Jews; ſo that when they ſay ſimply the *Talmud*, they always mean this; never quoting the other without the addition of Jeruſalem.

Maimonides has made an abridgment of the *Talmud*, which Scaliger prefers to the *Talmud* itſelf; as being purged of many of the fables wherewith the other is full. It is a ſyſtem of the laws and cuſtoms of the Jews, both of their civil and their canon law, and the beſt of their traditions.

About the year 1236, a Jew of Rochelle, well verſed in the Hebrew, becoming Chriſtian, made a journey to pope Gregory IX. and diſcovered to him a number of errors in the *Talmud*: theſe the pope ſent, in thirty-nine articles, to the archbiſhops of France, with a letter, appointing them to ſeize the books of the Jews, and to burn all ſuch as ſhould contain thoſe errors; in conſequence of which order, about twenty cart-loads of Hebrew books were burnt. He wrote to the ſame effect to the kings of England, France, Arragon, Caſtile, &c.

His ſucceſſor, Innocent IV. giving commiſſion to his legate, Eudes de Chateauroux, to examine the *Talmud*, and other Jewiſh books, more carefully, and to tolerate ſuch errors as were not contrary to the Chriſtian religion; the legate wrote to the pope, that to tolerate them was to approve them; and the 15th of May 1248, he alſo condemned them juridically to the flames; and Paul IV. ordered 12,000 volumes of the *Talmud* to be conſumed; and Clement VIII. ordered all the talmudic books that could be found to be deſtroyed. A zeal worthy of the papal ſee! See Miſchna, Gemara, Caraites, and Rabbiniſts.

TALON, in *Ornithology*; the claw of a bird.

Talon, in *Architecture*, a kind of moulding, conſiſting of a cymatium, crowned with a ſquare fillet; frequently found to terminate ornaments of joiners-work, as thoſe of doors, &c.

The word is French, and literally ſignifies heel.

The *talon*, more properly ſo called, is a moulding concave at the bottom, and convex a-top; having an effect juſt oppoſite to the doucine.—See *Tab. Archit. fig.* 25. *fig.* 26. *fig.* 40. *lit.* E.

When the concave part is a-top, it is called an *inverted talon*. See *Tab. Archit. fig.* 7.

The *talon* is uſually called by our Engliſh workmen ogee, or *O.G.* and by authors an *upright* or *inverted* cymatium.

TALPA, in *zoology*, ſee Mole.

Talpa, in *Medicine and Surgery*, a tumor of the œdematous kind, called alſo *teſtudo*.

The *talpa*, and *nata*, chiefly ariſe about the head in conſequence of ſome venereal diſorder.

The *talpæ* elevate the ſkin from the pericranium, and generally denote a foulneſs in the ſubjacent bone of the ſkull.

TALSHIDE. See Talwood.

TALUS, in *Anatomy*, a bone of the foot, called alſo astragalus.

The foot is articulated with the leg, by the aſtragalus alone. This articulation is a true angular ginglymus, and confined entirely to the motions of flexion and extenſion. It is commonly thought, that two other motions are likewiſe performed by means of this articulation, viz. that of turning the toes inward or outward, and that of the lateral flexion of the foot, or the turning of the ſole of the foot toward either ankle. But Winſlow obſerves, that neither of theſe motions depends on the articulation of the foot with the leg, as the ſtructure of the parts and juſt obſervations evidently ſhew. The articulation of the aſtragalus with the ſeveral ſurfaces of the os calcis is a kind of obſcure arthrodia. By theſe articulations, the foot not being ſupported, makes the ſmall lateral motions already mentioned: but when the toes are turned outward or inward independently of the tibia, the os calcis makes ſmall half rotations under the aſtragalus, and obliges the os ſcaphoides to ſlide in the ſame direction with it on the anterior ſide of the aſtragalus; and this motion of theſe two bones is communicated to all the reſt. It is by the articulation of the os ſcaphoides with the aſtragalus, that the ſmall lateral flexions of the foot are performed, viz. when the ſole of one foot is turned toward the other foot, or the contrary way. In this caſe the os ſcaphoides makes ſmall rotations in the anterior ſide of the aſtragalus, while the os cuboides ſlides up and down in the fore-ſide of the great apophyſis of the os calcis.

The obliquity of the articular ſurfaces of theſe bones is perfectly ſuitable to ſuch a motion. In theſe motions the os calcis and aſtragalus are in a manner immoveable, but the other bones are carried along with the os ſcaphoides. Winſlow.

Talus, or Talud, in *Architecture*, the inclination or ſlope of a work; as of the outſide of a wall, when its thickneſs is diminiſhed by degrees, as it riſes in height, to make it the firmer.

Talus, or Talud, in *fortification*.—*Talus of a baſtion*, or *rampart*, is the ſlope or diminution allowed to ſuch a work; whether it be of earth, or ſtone; the better to ſupport its weight.

The *exterior talus* of a work is its ſlope on the ſide towards the country; which is always made as little as poſſible, to prevent the enemies eſcalade, unleſs the earth be bad, and then it is abſolutely neceſſary to allow a conſiderable *talus* for its parapet, and ſometimes to ſupport the earth with a ſlight wall, called a revetement.

The *interior talus* of a work, it is ſlope on the inſide, towards the place.

This is larger than the former, and has, at the angles of the gorge and ſometimes in the middle of the curtains, ramps or ſloping roads for mounting upon the terre-plain of the rampart.

Talus, *ſuperior*, of the *parapet*, is a ſlope on the top of the parapet, that allows of the ſoldiers defending the covert-way with ſmall-ſhot, which they could not do if it were level.

TALWOOD, *taliatura*, in our old writers, fire-wood cut and cleft into billets of a certain length: it is otherwiſe written *talghwood*, and *talſhide*. Stat. 34 and 35 Hen. VIII. c. 3. 7 Edw. VI. c. 7. 43 Eliz. c. 14.

TAMALAPATRA, in the *Materia Medica*, a name by which ſome authors have called the *folium Indicum*, or Indian leaf, uſed in medicine.

The tree which produces this leaf is the laurus *caſſia* of Linnæus, or *caſſia lignea tree*. It is a large and lofty tree, the flowers and fruit of which reſemble the cinnamon-tree. Its leaves, when full grown, are ten inches or more in length; and ſix or eight in breadth. The flowers ſtand in cluſters, in the manner of umbels on the tops of the branches, and are of a greeniſh white colour. The fruit is of the bigneſs of our currant.

The ancients recommended *Indian-leaf*, as ſtomachic, ſudorific, and cephalic. At preſent, it is utterly diſregarded, being only kept in the ſhops as an ingredient in mithridate and theriaca; and is, in its greateſt perfection, far inferior to the mace which our college directs as a ſuccedanum to it. See Caſſia-*lignea*.

TAMANDUA, in *Natural Hiſtory*, a creature called in Engliſh the ant-bear; and by the Braſilians *tamandua-guacu*; and the *tamanoir* of Buffon.

This animal has its Engliſh name from its feeding on ants, and having its hinder feet like a bear's. It has a very long and ſharp ſnout, and its tongue is ſlender, and extenſible to a very great length; it has no teeth, the body is covered with hair; from the neck acroſs the ſhoulders to the ſides is a black line bounded above with white: the tail, which is $2\frac{1}{2}$ feet long, is clothed with very coarſe black hairs about a foot in length. This animal, which is the *myrmecophaga jubata* of Linnæus, with four toes on the fore-feet, and five on the hinder ones, inhabits Braſil and the Cape of Good Hope.

The principal food of the *tamandua* is ants, which he catches by ſcratching open their ſubterranean hives, and thruſting his long tongue into them; when the ants are gathered in great numbers upon this, he draws it back and eats them; and this he repeats till he is ſatisfied.

His tail ſerves him for a ſort of cover; and he can, upon occaſion, ſpread it almoſt over his whole body.

Though this animal has no teeth, it is fierce and dangerous. It ſleeps in the day and preys by night. The fleſh has a ſtrong and diſagreeable taſte, but is eaten by the Indians. See Ant-*eater*.

The leſſer *tamandua*, or *myrmecophaga tetradactyla* of Linnæus, inhabits the ſame country with the former, and reſembles it in its manner. The leaſt *tamandua*, or white American coati, is the *myrmecophaga didactyla* of Linnæus, and the fourmillier of Buffon. Linnæus mentions another ſpecies under the title of *myrmecophaga tridactyla*, which lives on ants and inſects in the Eaſt Indies.

TAMARIND, *tamarindus*, in *Botany*, a genus of the *triandria monogynia* claſs. Its characters are theſe: the empalement of the flower is compoſed of five oval plain leaves, which are equal; the flower has five petals, which are almoſt like thoſe of the butterfly kind, one of them ſtanding erect, two placed like wings on each ſide, and two reflexed downward; it has three awl ſhaped ſta-

mina, ſituated in the ſinuſes of the empalement, and arched toward the upper petal, and terminated by ſingle ſummits; it has an oblong oval germen, ſupporting an awl-ſhaped aſcending ſtyle, crowned by a ſingle ſtigma; the germen becomes a long ſwelling compreſſed pod, having a double cover, and one cell containing three, four, or five angular compreſſed ſeeds, ſurrounded with a pulp. We know but one ſpecies of this genus, which is the common tamarind tree.

The Eaſt India *tamarinds* are longer than thoſe of the Weſt; the former containing ſix or ſeven ſeeds each, the latter rarely above three or four; nevertheleſs they ſeem to be the produce of the ſame plant: the oriental ſort is drier and darker coloured than the occidental, and has more pulp; the former is ſometimes preſerved without addition, but the latter has always an admixture of ſugar.

We owe the knowledge of the uſe of *tamarinds*, in medicine, to the Arabians. The ancient Greeks knew nothing of them; and Serapion, Meſue, and Avicenna, are the firſt authors who preſcribe them.

The fruit of the *tamarind*, which is what we uſe, is only the piſtil of the flower ſwelled into a pod; this is greeniſh at firſt, but grows browniſh or reddiſh, as it ripens; its common ſize is four inches in length, and one in breadth; and it is undulated on the back, and deeply notched in three or four places at the front, which is terminated by a large rib, which runs from the pedicle on which it grows, to the end of the pod, and there frequently terminates in a ſort of hook.

This fruit is, properly ſpeaking, compoſed of two pods, the one encloſed within the other; the outer pod is fleſhy, and of the twelfth of an inch in thickneſs when freſh, and the inner one is thin as a fine piece of parchment; betweeen theſe two there is an intermediate ſpace of about a quarter of an inch all the way; and this ſpace is filled up with a very ſoft and pulpy ſubſtance, of a tart but very agreeable taſte, which is what we uſe in medicine. This is blackiſh and of a viſcous texture, and is traverſed by three large veſſels, or rather bundles of veſſels, one of which runs all along the back of the pod, and the two others are placed on the oppoſite ſide, and often there are ſeveral ramifications of veſſels, which run off different ways from theſe. Theſe veſſels carry the vinous juice, which afterwards hardens into the viſcous matter of the pulp; but this is not all their office, for they alſo convey nouriſhment to the ſeeds in the inner pod.

We uſe the *tamarinds* only in medicine; but the Africans, and the people of many of the Oriental nations, where they are common, make them into a ſort of confection with ſugar, which they eat as a delicacy, and which cools them in the violent heats of their climates; and at the ſame time keeps their bowels in a proper ſtate of laxity. The ſour taſte of this fruit proves, that acid particles abound greatly in it, and a chemical analyſis of it gives farther proof of this. There is indeed no alkali to be obtained from *tamarinds*, otherwiſe than by diſtilling them in a retort with quick-lime. A ſimple analyſis of them yields no other principles but acid and ſulphur. Six pounds of *tamarinds* mixed with ſix pints of water will yield ſix drams of eſſential ſalt; this however requires a long time to cryſtallize, not fixing itſelf to the ſides of the veſſels under two months ſtanding; in all this time however the liquor never grows mouldy, as ſuch liquors uſually do; and it in this ſomewhat reſembles tartar, or the eſſential ſalt of grapes, which never ſeparates itſelf from their juice under a very long time. Indeed, to be aſſured of gaining all the eſſential ſalt of any plant, the liquor ought to be covered half an inch deep with oil, to prevent its ſpoiling, and ſuffered to ſtand a whole year unmoved in the ſame veſſel. The ſalt of *tamarinds* in all things reſembles cream of tartar; it is ſharp to the taſte, and will not diſſolve in cold water. It does not detonate on the fire, nor yield any vinous ſmell, when moiſtened with oil of tartar. *Tamarinds* diſſolved alſo in common water, and ſet in digeſtion for ſeveral months, yield on diſtillation only an acid ſpirit, like that from vinegar.

It is not uncommon in thoſe places where *tamarinds* are frequent, to find an eſſential ſalt cryſtallized on the branches of the tree, this greatly reſembles cream of tartar in all reſpects, and is no other than the genuine ſalt of the plant formed by the ſun's drying up the accidentally extravaſated juices; nor is this peculiar to this tree alone, but many others are at times found with their juices thus extravaſated, and their ſalts thus cryſtallized by the heat. The leaves of that large ſpecies of maple, which we vulgarly but improperly call the ſycamore, are often in hot ſeaſons found thus covered with cryſtals of their eſſential ſalt, which is ſweet, and very much of the nature of ſugar; and the lime-trees have their leaves often covered with a like ſaccharine matter, which being waſhed off from them and the liquor given to any perſon to drink, is found to have the taſte and the purgative virtue of manna. Mem. Acad. Par. 1699.

This ſalt, as Beaumé obſerves, may be obtained more expeditiouſly, by clarifying the decoction of the *tamarinds* with whites of eggs, then by filtering and evaporating it to a proper conſiſtence, and ſetting it to cool: the ſalt ſhoots into cryſtals of a brown colour, and very acid taſte, but in diſſolving and cryſtallizing them again, or barely waſhing them with water, they loſe almoſt all their acidity; the acid principle of the *tamarind* ſeeming not to be truly cryſtallizable.

The pulp of *tamarinds* is an agreeable laxative acid, of common uſe in inflammatory and putrid diſorders, for abating thirſt and heat, correcting putrefaction, and looſening the belly. The doſe, as a laxative, is two or three drams; an ounce or two prove moderately cathartic. It is an uſeful addition to the purgative ſweets, caſſia and manna, in increaſing their action, and rendering them leſs liable to produce flatulencies: the reſinous cathartics are ſaid to be ſomewhat weakened by it. Lewis.

TAMARISK *tree*, *tamarix*, in *Botany*, a genus of the *pentandria trigynia* claſs. Its characters are theſe: the empalement of the flower is obtuſe, erect, and permanent, and is cut into five parts; the flower has five oval concave petals which ſpread open, and five hair-like ſtamina, terminated by roundiſh ſummits; it has an acute-pointed germen without a ſtyle, crowned by three oblong, feathery, twiſted ſtigmas; the germen turns to an oblong acute-pointed capſule with three corners, having one cell opening with three valves, containing many ſmall downy ſeeds. There are two ſpecies.

The wood, bark, and leaves of the French *tamariſk* are uſed in medicine, and are accounted ſpecific for all diſorders of the ſpleen. The bark is ſometimes uſed for the rickets in children. Miller.

It is a very remarkable property of this tree, that its ſalts made in the way of other lixivial ſalts are no alkali, but a mere ſal ſalſus. The ſalt of guaiacum alſo approaches to the nature of this.

TAMATIA, in *Ornithology*, the name of a very ſtrange bird of the Braſils. It is a ſpecies of CANCROMA, or the *cancroma canchrophaga*, in the Linnæan ſyſtem.

Its head is very large; its eyes large and black; its beak is two fingers breadth long, and one broad, ſhaped ſomewhat like a duck's, but pointed at the end; its upper chap is black, its under one yellow; its legs are long, and the thighs in great part naked; its toes are long; its tail is very ſhort. Its head is black, and its back and wings of a plain duſky brown; its belly is of the ſame brown, variegated with white. See *Tab.* V. *of Birds*, N° 56.

TAMBAC, or TAMBAQUA, a mixture of gold and copper, which the people of Siam hold more beautiful, and ſet a greater value on, than gold itſelf.

Some travellers ſpeak of it as a metal found in its peculiar mines; but upon what authority we do not know. The abbé de Choiſy, in his Journal of Siam, doubts whether this may not be the *electrum* or amber of Solomon.

The ambaſſadors of Siam brought ſeveral works in *tambac* to Paris, in the reign of Louis XIV. but they were not found ſo beautiful as was expected. See TOMBAC and GOLD-*coloured metal*.

TAMBOS, in *Peruvian Antiquity*, buildings placed at certain diſtances for the lodging of the princes of that country, in their travels through their dominions. See M. de la Condamine, in Mem. de l'Acad. de Berlin, tom. ii. p. 435; who tells us (p. 438.) that he ſaw ſeveral remains of theſe *tambos*, in his journey from Quito to Lima.

TAMBOUR, in *Architecture*, a term applied to the Corinthian and Compoſite capitals, as bearing ſome reſemblance to a drum, which the French call *tambour*.

Some chooſe to call it the *vaſe*, and others *campana*, or the bell.

TAMBOUR is alſo uſed for a little box of timber work, covered with a cieling, within-ſide the porch of certain churches; both to prevent the view of perſons paſſing by, and to keep off the wind, &c. by means of folding-doors, &c.

TAMBOUR alſo denotes a round courſe of ſtone, ſeveral whereof form the ſhaft of a column, not ſo high as a diameter.

TAMBOUR, in the *Arts*, is a ſpecies of EMBROIDERY.

The *tambour* is an inſtrument of a ſpherical form, upon which is ſtretched, by means of a ſtring and buckle, or other ſuitable appendage, a piece of linen or thin ſilken ſtuff; which is wrought, with a needle of a particular form, and by means of ſilken or gold and ſilver threads into leaves, flowers, or other figures.

TAMBOURIN, is the name of a dance, performed on the French ſtage. The air is lively, and the movements are quick.

TAMOATA, in *Ichthyology*, the name of an American freſh water fiſh, called by the Portuguſe *ſoldido*.

It is a ſmall oblong fiſh, with a flat head, ſomewhat like that of a frog. Its mouth is ſmall, and from each angle of it there hangs a long ſingle filament, by way of a beard. It has no teeth, and its eyes are extremely ſmall. It has eight fins; two at the gills of one finger in length, and hard and firm like horns; two on the belly, of a ſofter ſubſtance; and one on the middle of the back, another near the tail, and another ſmall one oppoſite to it on the belly; its tail is the eighth; its whole head is covered above with a hard coat like a ſhell; and its body with a ſort of coat of mail made up of oblong, hard, ſquamoſe bodies, dented at their edges; its colour is a ſort of ruſty iron-colour. It is accounted a very well-taſted fiſh. It lives only in freſh-water rivers; and it is ſaid, when the water where it is dries up, it will crawl out upon the land, and go in ſearch of more. See *Table* V. *of Fiſhes*, Nº 58. Marcgrave's Hiſt. of Braſil.

TAMPING *a hole*, in *mining*, is uſed for filling the upper part of a hole, bored in the rock for blaſting with gunpowder, upon the charge of powder, with clay or ſtony matter rammed down very cloſe and tight: and the clay and ſtone are called the *tamping*. This operation is called, in the North of England, ſtemming a hole.

TAMPION, Tompion, Tamkin, or Tomkin, a kind of plug or ſtopple, ſerving to cloſe a veſſel.

The word is formed from the French *tampon*, a bung, ſtopper, &c. Some derive it from the Engliſh, tap.

In *Gunnery*, the *tampions* are wooden cylinders put into the mouth of guns, howitzers, and mortars, in travelling, to prevent the duſt or wet from getting in. They are faſtened round the muzzle of the guns, &c. by leathern collars. At ſea they are carefully encircled with tallow or putty, to prevent the penetration of the water into the bore, whereby the powder contained in the chamber might be damaged or rendered incapable of ſervice. They are alſo ſometimes uſed to put into the chamber of mortars, over the powder, when the chambers are not full. *Tampions* are alſo iron-bottoms to which the grape ſhot deſigned for ſea-ſervice are fixed.

TAMPOE, in *Natural Hiſtory*, the name of an Eaſt Indian fruit, approaching to the figure of the mangouſtan, but not near ſo agreeable to the taſte. This fruit is very much of the ſize, ſhape, and colour of ſome of our common ſummer-apples; but its ſkin is very thick and tough, and it has no crown. The Indians eat it in places where better fruits are ſcarce, and in ſome places call it the mangouſtan.

TAMUS, *black bryony*, in *Botany*, a genus of the *dioecia hexandria* claſs. Its characters are theſe: it has male and female flowers on different plants: the male plants have empalements, compoſed of ſix oval ſpear-ſhaped leaves, which ſpread wide at the top; they have no petals, but ſix ſhort ſtamina terminated by erect ſummits: the female flowers have bell-ſhaped empalements of one leaf cut into ſix ſpear-ſhaped ſegments, which ſit upon the germen; theſe have no petals, but have oblong punctured nectaria ſitting on the inſide of each ſegment of the empalement, and a large, oblong, oval, ſmooth germen under the empalement, with a cylindrical ſtyle, crowned by three reflexed indented ſtigmas; the germen afterward becomes an oval berry with three cells, including two globular ſeeds. There are two ſpecies.

TAMUZ, in *Chronology*, the fourth month of the Jewiſh eccleſiaſtical year, anſwering to part of our June and July. The 17th day of this month is obſerved by the Jews as a faſt, in memory of the deſtruction of Jeruſalem by Nebuchadnezzar, in the 11th year of Zedekiah, before Chriſt, 588.

TAN, the bark of the oak, chopped, and ground by a tanning-mill, into a coarſe powder; to be uſed in the tanning or dreſſing of ſkins.

New tan is the moſt eſteemed; when old and ſtale, it loſes a great deal of its effect, which conſiſts in condenſing or cloſing the pores of the ſkins; ſo that the longer the ſkins are kept in *tan*, the greater ſtrength and firmneſs they acquire.

This bark, which is more abundant in the gummy reſinous part than any of our common indigenous aſtringents, and which, on account of its aſtringent gummy-reſinous property, ſerves both to preſerve leather from rotting, and to render it impervious to water, is preferred to all other ſubſtances for the purpoſe of tanning. It is uſed either in the way of infuſion, which is called ooze; or the dry powder is ſtrewed between layers of hides and ſkins, when theſe are laid away in the tan-pits. The ooze is made by macerating the bark in common water, in a particular ſet of holes or pits, which by way of diſtinction from the other holes in the tan-yard, are called letches. See Tanning.

Every part of the oak-tree, of what age or growth ſoever, is fit for the *tanners* uſe, and all oaken coppice-wood, of any age or ſize, being cut and procured in barking-time, will *tan* all ſorts of leather, at leaſt as well as the bark alone. When this material is got at the proper ſeaſon, it muſt be very well dried in the ſun, more than the bark alone; thence it is to be cut up, and preſerved in a covered place for uſe.

When it is to be uſed, the greater wood muſt be firſt cleft ſmall, to fit it for the beating and cutting engine; and the ſmaller muſt be put into the engine as it is. Which done, it muſt be again dried upon a kiln, and after that ground in the ſame maner that the *tanners* grind their bark. Such wood as is to be uſed preſently after it is gotten, will require the better and the more drying upon the kiln; and if this is omitted it will blacken and ſpoil all the leather it is uſed about. Where oak is ſcarce, black-thorn, or ſloe-tree, will tolerably well ſupply its place; and where that is not to be had in ſufficient plenty, the white thorn will do. Phil. Tranſ. Nº 108.

Birch alſo, being ordered in the ſame manner with oak, is fit for ſome uſes in *tanning*, particularly it does very well for *tanning* of ſhoe-ſole leather. All theſe ingredients will *tan* much better than bark alone, and that with much leſs charge; ſo that this diſcovery may very well ſave the felling of trees when the bark is wanted, at a ſeaſon when the ſap is up, which, when it is done, cauſes the outſides of the trees to rot and grow worm-eaten; whereas if the trees had been felled in winter, when the ſap is down, they would have been almoſt all heart, as the people expreſs it, and not ſubject to worms. This manner of uſing the wood with the bark, in *tanning*, will alſo increaſe the value of underwoods very conſiderably. Phil. Tranſ. Nº 105.

The engine neceſſary for cutting the wood conſiſts of a long ſquare wooden block, and ſome pieces of iron to be faſtened on, and uſed about it, viz. a hammer, an anvil, an iron holding the wood to be bruiſed and cut, and a knife to cut it. The whole is a very ſimple and cheap machine, and is deſcribed at large, and figured in the above mentioned number of the Philoſophical Tranſactions.

By Mr. de Buffon's experiments upon different ſkins, it was found that a decoction of young oak-wood ſucceeded perfectly well in *tanning* ſheep and calves ſkins, but did not do equally well for ox, and the other harder ſkins. This, however, he imagines might be only for want of knowing the beſt method of uſing the wood. And certainly theſe trials deſerve to be farther proſecuted; ſince the ſmall branches of the oak, which are of little value, might be thus made to ſupply the place of a much dearer commodity, the bark; and as in many trees the bark of the young branches is found to be of greatly more virtue than that of the larger branches or the trunk, the uſe of theſe ſmall boughs, bark and all, might very probably be found to anſwer to all the effects of the bark, of the larger kind alone. Memoirs Acad. Scienc. Par. 1736.

The ſociety of arts, &c. granted a premium of 100*l*. in the year 1765, for the diſcovery of a method of tanning with oaken ſaw-duſt; but the acquiſition has not hitherto had its deſired effect; though it is ſaid that the uſe of oaken ſaw-duſt has been advantageouſly adopted in Germany. Doſſie's Mem. of Agr. vol. i. p. 227.

We are told in Phil. Tranſ. Nº 36, that the operation of tanning is performed, on leather, better in the Weſt-Indies than in England. They uſe three ſorts of bark, the mangrove-bark, the olive-bark, and another; and the whole buſineſs is ſo ſoon done, that a hide delivered to them, is in ſix weeks ready to be worked into ſhoes, though they beſtow leſs labour than we do.

Mr. Albert Geſner, firſt phyſician to the duke of Wirtemberg, having made ſome experiments on the duſt of heath, dried in an oven, and afterwards pulveriſed, as a ſubſtitute to that of oak-bark in tanning, found that the leather prepared by this method was very good; but he obſerves, that the operation is much more tedious. Hiſt. R. A. S. Paris, for 1756. Others have propoſed a trial of the ſmall branches of heath, and the leaves of oak.

The tanners bark is a ſubſtance of prodigious uſe in gardening. Its fermentation is very laſting and very equal: hence it is the moſt valuable of all things for the making of hot-beds; and when it has ſerved to this uſe, and is thoroughly rotted, it makes a very valuable manure for rotten land, one load of it doing as much ſervice as two loads of ſtiff dung: and if it is laid on cold graſs-ground in autumn, that the rains in winter may waſh it into the ground, it will greatly improve the graſs.

It has not been of very long uſe in England, and was brought to us from Holland in the reign of king William, and then uſed for the raiſing of orange-trees; but after this period it became diſuſed; and it is of a much later date, viz. about the year 1719, that it has been brought into uſe again for the raiſing the PINE-*apple*, ſince which time it is become generally uſed, wherever it is to be had, for all the purpoſes of the hot-bed, in raiſing tender plants.

There are ſeveral ſizes of this *tan*, which they heat in a different manner in proportion to their ſize, the ſmalleſt heating much quicker, and cooling again in a ſmaller time; and the largeſt acquiring its heat more gradually, but keeping it much longer. The ſkilful gardener therefore muſt uſe one or the other of theſe, or a mixture of both, according to the ſeveral occaſions he wants them for.

It ſhould always be taken within a fortnight or three weeks after it comes out of the pit, and laid up in a round heap for two or three days, to drain out the moiſture; after which it ſhould be formed into a bed, and ſhould be laid at leaſt three feet thick. HOT-*beds*, properly prepared, of this ſubſtance in pits, having brick walls round them, and a brick pavement at the bottom, three feet deep, ſix feet wide, and above ten feet long, will retain a moderate heat three months. Miller.

TAN, *flower of.* Flower of *tan* is a name given by the people employed in the tanning-trade, to a yellow ſubſtance, often found upon old *tan*, or oak-bark broken to pieces, which has been uſed as *tan*, and is of no farther ſervice.

The name, however, is very improper; and though every body converſant in *tan*-yards muſt have ſeen the thing, yet it has always paſſed as an eﬄoreſcene of the bark, till the curious Mr. Marchand inquired more accurately into its nature, and found it to be a plant of itſelf, wholly different from the matter of the *tan*; and to which the bark which had been often wetted and dried again, ſerved as a proper matrix. He found it to be more nearly allied to the ſpunge, than to any other genus of plants, and therefore named it *ſpongia fugax mollis flava & amœna in pulvere coriario naſcens*, ſoft, beautiful, yellow fading ſpunge, growing on *tanners*-bark.

It makes its appearance moſt frequently in the ſummer-months, and is then ſeen in ſmall tufts of a beautiful yellow colour, on different parts of the old heaps of bark. It appears at firſt in form of a thin yellow ſcum, and is of a ſort of jelly-like ſtructure; but it every day grows larger and thicker, till it ſtands above half an inch out from the ſurface of the bark. As it grows, its ſurface becomes more and more cavernous and ſpungy, the pores or holes being of different diameters, and the interſticial matter forming a ſort of net-work more or leſs regular, and often interrupted by irregular prominences in ſeveral parts; and, in fine, when the growth is complete, the whole more reſembles a ſpunge, than any other vegetable ſubſtance, and is of a deep yellow colour, and conſiderably thick and tough conſiſtence; there are no roots to be diſcovered iſſuing from it; its ſmell is like that of rotten wood, and its taſte is ſomewhat ſtyptic. It always appears in the warm months, and always upon ſuch old *tan* as has begun to ferment, and is in the ſtate in which our gardeners uſe it for hot-beds. If it happens to ſtand expoſed to the ſouth ſun, it is but of ſhort duration; but if it be in a ſheltered place, it will laſt a conſiderable time, and often ſpread itſelf to a great extent, and make a very beautiful figure for many weeks. Mem. Acad. Par. 1727.

TANACETUM, *tanzy*, in *Botany*. See TANZY.

TANAGRA, in *Ornithology*, a genus of the PASSERES: the characters of which are that the bill is conic, and a little inclining towards the point, the upper mandible ſlightly ridged, and notched near the end. Linnæus enumerates twenty-four ſpecies. The Braſilian name is *tangara*. The birds of this genus inhabit North and South America, but are moſt numerous in the latter. To this genus belong the JACAPU, JACARINI, TEITEI, SAYACU, &c. deſcribed by Marcgrave, Hiſtory of Braſil.

TANE. See TAROATAIHETOOMO.

TANGARAC, a poiſonous Braſilian plant; but the root, ſays Piſo, is an antidote to the leaves, flowers, and fruit. Boyle's Works abr. vol. i. p. 14.

TANGENT, in *Geometry*, a right line which touches a circle; that is, meets it in ſuch manner, as that though infinitely produced, it would never cut the ſame; that is, never come within the circumference.

Thus the line AD (*Tab.* V. *Geom. fig.* 125.) is a *tangent* to the circle in D.

It is demonſtrated in *Geometry*; 1. That if a *tangent* AD, and a ſecant AB, be both drawn from the ſame point A; the ſquare of the *tangent* will be equal to the rectangle, under the whole ſecant AB, and that portion thereof AC, which falls without the circle.

2. That if two *tangents* AD, AE, be drawn to the ſame circle from the ſame point A, they will be equal to each other.

As a right line is the *tangent* of a circle, when it touches the circle ſo cloſely, that no right line can be drawn through the point of contact between it and the arch, or within the angle of contact that is formed by them; ſo, in general, when any right line touches any arch of a curve, in ſuch a manner that no right line can be drawn through the point of contact, betwixt the right line and the arch, or within the angle of contact, that is formed by them, then is that line the *tangent* of the curve at the ſaid point.

The *tangent* of an arch is the right line that limits the poſition of all the ſecants that can paſs through the point of contact, though ſtrictly ſpeaking, it is no ſecant. Macl. Flux. Art. 181, 505.

TANGENT, in *Trigonometry.*—*A* TANGENT *of an Arch*, is a right line, raiſed perpendicularly on the extreme of the diameter, and continued to a point, where it is cut by a ſecant, that is, by a line, drawn from the centre through the extremity of the arch whereof it is a *tangent*.

A tangent of an arch EA (*Tab. Trigonom. fig.* 3.) is a part of a *tangent* of a circle (that is, of a right line, which touches a circle without cutting it) intercepted between two right lines, drawn from the centre C, through the extremes of the arch E and A.

Hence, the *tangent* FE is perpendicular to the radius EC.

And hence the *tangent* FE is the *tangent of the angle* ACE, as alſo of that ACI; ſo that two adjacent angles have only the ſame common *tangent*.

TANGENT, *co*; or TANGENT *of the Complement*, is the *tangent* of an arch which is the complement of another arch to a quadrant.

Thus, a *tangent* of the arch AH, is the *co-tangent* of the arch AE, or the *tangent* of the complement of the arch AE.

To find the length of the TANGENT *of any arch*, the ſine of the arch being given: ſuppoſe the arch AE, the given ſine AD, and the *tangent* required EF. Since both the ſine and *tangent* are perpendicular to the radius EC, they are parallel to each other. Wherefore as the coſine DC is to the ſine AD, ſo is the whole ſine to the *tangent* EF. See SINE.

Hence, a canon of ſines being had, a *canon of tangents* is eaſily conſtructed therefrom.

TANGENTS, *artificial*, are the logarithms of the *tangents* of arches.

TANGENTS, *line of*, is a line uſually placed on the ſector, and Gunter's ſcale; the deſcription and uſes whereof ſee under SECTOR.

TANGENT *of a conic Section*, as of a parabola, is a right line, which only touches or meets the curve in one point, and does not cut or enter within the curve. See CONIC *Section*.

TANGENTS, *method of*, a method of determining the quantity of the *tangent* of any algebraic curve; the equation defining that curve being given.

This method is one of the great reſults of the *calculus differentialis*, or *fluxions*.

Its uſe is very great in *Geometry*; becauſe in determining the *tangents* of curves, we determine at the ſame time the QUADRATURE of the curvilinear ſpaces: on which account it well deſerves to be here particularly inſiſted on.

To find the SUB-TANGENT *in any algebraic curve.*

Let the propoſed curve be AMO (*Tab. Anal. fig.* 18.) and the right line TMQ a tangent to it at the point M; let the ſemiordinate pm be infinitely near another PM, and MR parallel to AH; then the relative celerities of the point M, moving along the curve from A towards O, in the directions MR and PM, wherewith AP and PM increaſe in this poſition, will be truly expreſſed by MR and Rm; but the celerities by which quantities increaſe are as the fluxions of thoſe quantities; therefore

(Mm

(Mm being the fluxion of the curve line AM) MR and Rm are the correfponding fluxions of the abfcifs AP, and the ordinate PM; and, becaufe the triangles MmR and TMP are fimilar, we have Rm : MR : : PM : PT. Let, therefore, the abfcifs AP be put $= x$, and the ordinate PM $= y$, and we fhall have $\dot{y} : \dot{x} : : y : \frac{y\dot{x}}{\dot{y}}$ = PT.

By means of this general expreffion for the SUBTANGENT, and the equation of the curve expreffing the relation between x and y, the ratio of the fluxions $\dot{x}$ and $\dot{y}$ will be found, and from thence the length of the fubtangent; whence the *tangent* itfelf may be eafily determined and drawn. This we fhall illuftrate in the following examples.

I. The equation defining a circle is $ax - xx = y^2$; and by taking the fluxions of thefe quantities, $a\dot{x} - 2x\dot{x} = 2y\dot{y}$; confequently $\frac{\dot{x}}{\dot{y}} = \frac{2y}{a-2x} = \frac{y}{\frac{1}{2}a - x}$; and, multiplying both fides by y, we have $\frac{y\dot{x}}{\dot{y}} = \frac{y^2}{\frac{1}{2}a - x}$ = the *fubtangent* PT (fee *fig.* 24.); whence ($\frac{1}{2}a - x$), or AC − AP, i. e. CP : (y) PM : : (y) PM : PT; a property of the circle deduced from the principles of common geometry.

II. The equation defining the common parabola is $ax = y^2$, a being the parameter, x the abfcifs, and y the ordinate; hence $a\dot{x} = 2y\dot{y}$, and $\frac{\dot{x}}{\dot{y}} = \frac{2y}{a}$; confequently, $\frac{y\dot{x}}{\dot{y}} = \frac{2y^2}{a} = \frac{2ax}{a} = 2x$; therefore the *fubtangent* PT (*fig.* 18.) is the double of its correfponding abfcifs AP; which is a well-known property of the PARABOLA.

III. The general equation for parabolas of any kind being $a^m x^n = y^{m+n}$; we have $na^m x^{n-1}\dot{x} = \overline{m+n} \times y^{m+n-1}\dot{y}$; and, therefore, $\frac{\dot{x}}{\dot{y}} = \frac{\overline{m+n} \times y^{m+n-1}}{na^m x^{n-1}}$; whence $\frac{y\dot{x}}{\dot{y}} = \frac{\overline{m+n} \times y^{m+n}}{na^m x^{n-1}} = \frac{\overline{m+n} \times a^m x^n}{na^m x^{n-1}}$ (becaufe $y^{m+n} = a^m x^n$) $= \frac{\overline{m+n}}{n} \times x$ = the true value of the *fubtangent*; which, therefore, is to the abfcifs in the conftant ratio of $m+n$ to n.

IV. The equation defining an ellipfis is $b^2 \times \overline{ax - x^2} = a^2 y^2$, AP (*fig.* 26.) being $= x$, MP $= y$, AB $= a$, and the leffer axis $= b$; for, by the property of the ELLIPSIS, we have $a^2 : b^2 : : ax - x^2$ (AP×PB) : y^2 (MP^2); and, therefore, $b^2 \times \overline{ax - x^2} = a^2 y^2$; whence $b^2 \times \overline{a\dot{x} - 2x\dot{x}} = 2a^2 y\dot{y}$, and $\frac{\dot{x}}{\dot{y}} = \frac{2a^2 y}{b^2 \times \overline{a - 2x}}$; and, confequently, the *fubtangent* PT $\left(\frac{y\dot{x}}{\dot{y}}\right) = \frac{2a^2y^2}{b^2 \times \overline{a - 2x}} = \frac{a^2y^2}{b^2 \times \overline{\frac{1}{2}a - x}} = \frac{b^2 \times \overline{ax - x^2}}{b^2 \times \overline{\frac{1}{2}a - x}} = \frac{\overline{ax - x^2}}{\overline{\frac{1}{2}a - x}}$: whence the point T being given, through which the *tangent* muft pafs, the *tangent* itfelf may be drawn.

V. Becaufe the equation, exhibiting the nature of all kinds of ellipfes, (putting a and c for the two principal diameters) is $\overline{a-x}|^m \times x^n = \frac{c}{a} \times y^{m+n}$, we fhall have $-m\dot{x} \times \overline{a-x}|^{m-1} \times x^n + n\dot{x}x^{n-1} \times \overline{a-x}|^m = \frac{c}{a} \times \overline{m+n} \times y^{m+n-1}\dot{y}$; and, therefore, $\frac{y\dot{x}}{\dot{y}} =$

$$\frac{\frac{c}{a} \times \overline{m+n} \times y^{m+n}}{-m \times \overline{a-x}|^{m-1} \times x^n + nx^{n-1} \times \overline{a-x}|^m}$$

$= \frac{\overline{m+n} \times \overline{a-x}^m \times x^n}{-mx^n \times \overline{a-x}|^{m-1} + nx^{n-1} \times \overline{a-x}|^m}$ (becaufe $\frac{c}{a} \times y^{m+n} = \overline{a-x}|^m \times x^n$) $= \frac{\overline{m+n} \times \overline{a-x} \times x}{-mx + n \times \overline{a-x}} = \frac{\overline{m+n} \times \overline{ax - x^2}}{na - \overline{n+m} \times x}$ = the *fubtangent* required.

VI. The equation defining the HYPERBOLA is $c^2 \times \overline{ax + x^2} = a^2 y^2$, a and c being ufed to denote the two principal diameters; whence we have, $c^2 \times \overline{a\dot{x} + 2x\dot{x}} = 2a^2 y\dot{y}$; confequently $\frac{\dot{x}}{\dot{y}} = \frac{a^2 y}{c^2 \times \overline{\frac{1}{2}a + x}}$; and $\frac{y\dot{x}}{\dot{y}} = \frac{a^2y^2}{c^2 \times \overline{\frac{1}{2}a + x}} = \frac{c^2 \times \overline{ax + x^2}}{c^2 \times \overline{\frac{1}{2}a + x}} = \frac{\overline{ax + x^2}}{\frac{1}{2}a + x}$ = the *fubtangent*; whence the diftance of the point of interfection of the tangent and axis from the vertex, which is equal to the difference of the *fubtangent* and abfcifs, may be found; for $\frac{ax + x^2}{\frac{1}{2}a + x} - x = \frac{\frac{1}{2}ax}{\frac{1}{2}a + x}$; and, therefore, that point being given, the *tangent* may be eafily drawn.

The manner of drawing *tangents* to all forts of hyperbolas univerfally, will be the fame as in the ellipfes, the equations of the two kinds of curves differing in nothing but their figns.

After the manner above explained, the *fubtangent*, in curves whofe abfciffes are right lines, may be determined; but if the abfcifs, or line terminating the ordinate, on the lower part, be another curve, then the *tangent* may be drawn as in the following example.

VII. Let the curve BRF (*Tab.* IV. *Anal. fig.* 91.) be a cycloid; whofe abfcifs is here fuppofed to be the femicircle BPA, to which let the *tangent* PT be drawn, as above. Moreover, let rRH be a *tangent* to the cycloid, at the correfponding point R, and let GRe be parallel to TPv; putting the arch, or abfcifs, BP $= z$, its ordinate PR $= y$, AF $= b$, and BPA $= c$; then, by the property of the CYCLOID, we fhall have c (BPA) : b (AF) : : z (BP) : y (PR); therefore $y = \frac{bz}{c}$, and $\dot{y} = \frac{b\dot{z}}{c} = re$. But, by fimilar triangles, re ($\dot{y}$) : Re (= Pv = $\dot{z}$) : : PR (y) : PH $= \frac{y\dot{z}}{\dot{y}} = z$ (becaufe $y = \frac{bz}{c}$); confequently, if in the right line PT, there be taken PH equal to the arch PB, we fhall have a point H, through which the *tangent* of the cycloid muft pafs.

The preceding examples relate to curves whofe ordinates are parallel to each other. We fhall now briefly illuftrate the method of drawing *tangents* to curves of the SPIRAL kind, all whofe ordinates iffue from a point: fuch as the fpiral BAG (*fig.* 92.) whofe ordinates CB, CA, CG, are referred to the point C, called the centre of the fpiral. Let SAN be a *tangent* to the fpiral at any point A, and let CT be perpendicular to it; and let the arch CBA (confidered as variable by the motion of A towards G) be denoted by z, and the ordinate CA by y. Then $\dot{z} : \dot{y} : :$ AC (y) : AT $= \frac{y\dot{y}}{\dot{z}}$. Hence, if upon CA, as a diameter, a femicircle be defcribed, and in it, from A, a right line equal to $\frac{y\dot{y}}{\dot{z}}$ be infcribed, that right line will be a *tangent* to the fpiral at the point A.

VIII. Let the nature of the curve CBA be fuch, that the arch CBA may be, always, to its correfponding ordinate CA in a conftant ratio, viz. as a to b: then, becaufe $z : y : : a : b$, we have $z = \frac{ay}{b}$, and $\dot{z} = \frac{a\dot{y}}{b}$; and, confequently, AT $\left(\frac{y\dot{y}}{\dot{z}}\right) = \frac{by}{a} = \frac{b}{a} \times$ AC: therefore, AC and AT being in a conftant ratio, the angle CAT muft alfo be invariable; which is a known property of the *logarithmic* SPIRAL.

IX. Let BAA (*Tab.* III. *Anal. fig.* 81.) be the SPIRAL of Archimedes; whofe nature is fuch, that the part EA of the generating ordinate, intercepted by the fpiral, and a circle BED defcribed about the fame centre C, is always in a conftant ratio to the correfponding arch BE of that circle. Suppofe An perpendicular to AC; BC $= c$, CA $= y$, and the given ratio of AE to BE that of b to c; then $b : c : : y - c$ (AE) : $\frac{cy - cc}{b}$ = BE; whofe fluxion is $= \frac{c\dot{y}}{b}$. If the right line CEAa be fuppofed to revolve about the centre C, the angular celerity of the generating point A, in the perpendicular direction An, will be to that of E as AC to EC; and as the latter of thefe celerities is expreffed by $\frac{c\dot{y}}{b}$, the former will be expreffed by $\frac{y}{c} \times \frac{c\dot{y}}{b}$, or $\frac{y\dot{y}}{b}$; which is to $\dot{y}$, the celerity of A in the direction Aa, as $\frac{y}{b}$ to unit, or as y to b. Confequently CT and AT are in the fame ratio, and AC : CT : : $\sqrt{yy + bb}$: y; and AC : AT : : $\sqrt{yy + bb}$: b; whence CT and AT are given, equal to $\frac{y^2}{\sqrt{yy + bb}}$, and $\frac{by}{\sqrt{yy + bb}}$ refpectively; from either of which expreffions the *tangent* AT may be drawn: and, in the fame manner, may the pofition of the *tangent* of any other fpiral be determined. Simpfon's Flux. vol. i. fect. 3.

As to the method of inveftigating *tangents* by fluxions, fee Macl. Flux. book i. chap. 7. where it is demonftrated independently of infinitefimals.

To determine the *tangents* of curves, fuppofed to be defcribed by the interfections of right lines revolving about given

given poles, fee Mr. Maclaurin's Fluxions, art. 210, feq.
In finding the *tangents* of curves by the method of infinitefimal differences, it has been objected, that the conclufion is found by a double error. 1. By taking the curve for a polygon of an infinite number of fides. 2. By the falfe rule for taking the differential of a power. But there is no need of fuch fuppofitions in the method of fluxions, for it may be geometrically demonftrated, that the fluxions of the bafe, ordinate, and curve, are in the fame proportion to each other, as the fides of a triangle refpectively parallel to the bafe, ordinate, and *tangent*. When the bafe is fuppofed to flow uniformly, if the curve be convex towards the bafe, the ordinate and curve increafe with accelerated motions; but their fluxions at any term are the fame as if the point which defcribes the curve had proceeded uniformly from that term in the *tangent*. Any farther increment which the ordinate or curve acquires, is to be imputed to the acceleration of the motions with which they flow. See Maclaurin's Fluxions, book i. chap. vii. and viii.

Any two arches of curve lines touch together, when the fame right line is the *tangent* of both at the fame point. But when they are applied to each other in this manner, they never perfectly coincide, unlefs they be fimilar arches of fimilar and equal figures.

In the Philofophical Tranfactions, we have the following method of drawing *tangents* to all geometrical curves, without any labour, or calculation, by M. Slufius.

Suppofe a curve, as DQ (*Tab. Anal. fig.* 14.) whofe points are all referable to any right line given, as EAB, whether that right line be the diameter or not; or whether there be more given right lines than one, provided their powers do but come into the equation. In all his equations he puts v for the line DA, y for BA; and for EB, and the other given lines, he puts b, d, &c. that is, always confonants only.

Then, fuppofing DC to be drawn touching the curve in D, and meeting with EB produced in C, he calls the fought line CA, by the name of a.

To find which, he gives this general method. 1. Reject out of the equation all members, which have not either v or y in them; then put all thofe that have y on one fide, and all thofe which have v, on the other; with their figns + or −; and the latter, for diftinction and eafe fake, he calls the right, the former the left fide. 2. On the right fide, let there be prefixed to each member the exponent of the power, which v hath there; or, which is all one, let that exponent be multiplied into all the members. 3. Let the fame be done alfo on the left fide, multiplying each member there by the power of the exponent of y; adding this moreover, that one y muft, in each part, be changed into a. This done, the equation, thus reformed, will fhew the method of drawing the required *tangent* to the point D; for, that being given, as alfo y, v, and the other quantities expreffed by confonants, a cannot be unknown. Suppofe an equation $by-yy=vv$, in which EB is called b; BA $=y$, DA $=v$, and let a, or AC, be required fo as to find the point C, from whence CD being drawn, fhall be a true *tangent* to that curve QD in D. In this example, nothing is to be rejected out of the equation, becaufe y or v are in each member: it is alfo difpofed, as required by the rule 1; to each part, therefore, there muft be prefixed the exponent of the powers of y or v, as in the rule 2; and on the left fide, let one y be changed into a, and then the equation will be in this form, $ba-2ya=2vv$, which equation reduced, gives eafily the value of $a=\frac{2vv}{b-2y}=$ AC. And fo the point C is found, from whence the *tangent* DC may be drawn.

To determine which way the *tangent* is to be drawn, whether towards B or E, he directs to confider the numerator and denominator of the fraction. For, 1. If in both parts of the fraction all the figns are affirmative; or if the affirmative ones are more in number; then the *tangent* is to run towards B. 2. If the affirmative quantities are greater than the negative in the numerator, but equal to them in the denominator, the right line drawn through D, and touching the curve in that point, will be parallel to AB; for in this cafe, a is of an infinite length. 3. If in both parts of the fraction the affirmative quantities are lefs than the negative, changing all the figns, the *tangent* muft be drawn now alfo towards B; for this cafe, after the change, comes to be the fame as the firft. 4. If the affirmative quantities are greater than the negative in the denominator, but in the numerator are lefs, or *vice verfa*, then changing the figns in that part of the fraction where they are lefs, the *tangent* muft be drawn a contrary way; that is, AC muft be taken towards E. 5. But whenever the affirmative and negative quantities are equal in the numerator, let them be how they will in the denominator, a will vanifh into nothing; and, confequently, the *tangent* is either AD itfelf, or EA, or parallel thereto; as will eafily be found by the data. This he gives plain examples of, in reference to the circle, thus: let there be a femicircle, whofe diameter is EB; in which there is given any point; as D (*fig.* 15.), from which the perpendicular DA is let fall to the diameter. Let DA $=v$, BA $=y$, BE $=b$: then the equation will be $by-yy=vv$, and drawing the *tangent* DC, we have AC, or $a=\frac{2vv}{b-2y}$. Now, if b be greater than $2y$, the *tangent* muft be drawn towards B; if lefs, towards E; if it be equal to it, it will be parallel to EB, as was faid in the firft, fecond, and fourth rules.

Let there be another femicircle inverted; as NDD (*fig.* 16.), the points of whofe periphery are referred to the right line BE, parallel and = to the diameter. Let NB be called d, and all things elfe as before; then the equation will be $by-yy=dd+vv-2dv$; which being managed according to his rules, you have $a=\frac{2vv-2dv}{b-2y}$. Now, fince v here is fuppofed to be always lefs than d; if b be greater than $2y$, then the *tangent* muft be drawn towards E; if equal, it will be parallel to BE; if lefs, changing all the figns, the *tangent* muft be drawn towards B, as by rules fourth, fifth, and third. But there could be no *tangent* drawn, or at leaft EB would be it, if NB had been taken equal to the diameter. Let there be another femicircle, whofe diameter NB (*fig.* 17.) is perpendicular to EB, and to which its points are fuppofed to be referred. Let NB be called b, and all things elfe as above; the equation will be $yy=bv-vv$, and $a=\frac{bv-2vv}{2y}$. If, now, b be greater than $2v$, the *tangent* muft be drawn towards B; if leffer, towards E; if equal, DA will be the *tangent*, as appears by rules 4. and 5.

TANGENTS, *inverfe method of*, is a method of finding the equation, or the conftruction, of any curve; from the *tangent* of any other line, whofe determination depends on the *tangent* given.

This method is alfo one of the great refults of the new CALCULUS *integralis*.

Its application we fhall give in what follows. The fluxional expreffions of the *tangent*, *fub-tangent*, &c. being delivered under the laft article, if you make the given value equal to the fluxional expreffion, and either fum up the fluxional equation, or, if that cannot be, conftruct it, the curve required is had. For example:

1. *To find the curve-line, whofe* fub-tangent $=\frac{2y^2}{a}$.

Since the *fub-tangent* of an algebraic line is $=\frac{y\dot{x}}{\dot{y}}$; we have $\frac{y\dot{x}}{\dot{y}}=\frac{2y^2}{a}$, and $ay\dot{x}=2y^2\dot{y}$, and $a\dot{x}=2y\dot{y}$; therefore (taking the fluents by the *inverfe method of* FLUXIONS) $ax=y^2$.

The curve fought, therefore, is a parabola; whofe conftruction is fhewn under PARABOLA.

2. *To find the curve, whofe* fub-tangent *is a third proportional to* $\frac{1}{2}a-x$ and y. Since $\frac{1}{2}a-x:y::y:\frac{y\dot{x}}{\dot{y}}$, we have $\frac{1}{2}a-x:y\ (::y\dot{y}:y\dot{x})::\dot{y}:\dot{x}$; confequently $\frac{1}{2}a\dot{x}-x\dot{x}=y\dot{y}$, and, taking the fluents, $\frac{1}{2}ax-\frac{1}{2}x^2=\frac{1}{2}y^2$, i. e. $ax-x^2=y^2$. The curve fought is, therefore, a circle.

3. *To find a line, wherein the* fub-tangent *is equal to the femiordinate.* Since $\frac{y\dot{x}}{\dot{y}}=y$; $y\dot{x}=y\dot{y}$, and $\dot{x}=\dot{y}$; therefore $x=y$.

Hence it appears, that the line fought is a right line, which refpects the cathetus of an equicrural triangle, as an axis, or the hypothenufe of an equicrural rectangled triangle. If x had been taken for the arch of a circle, the fought line had been a CYCLOID.

TANGERE, *noli me*. See NOLI.

TANGIBLE. See TACTILE.

TANISTRY, *taniftria*, an ancient municipal law, or tenure, which allotted the inheritance of lands, caftles, &c. held by this tenure, to the oldeft and moft worthy and capable perfon of the deceafed's name and blood, without any regard to proximity. This, in reality, was giving it to the ftrongeft; and this naturally occafioned bloody wars in families; for which reafon it was abolifhed under king James I.

Sir John Davis defcribes it thus: *Quant afcun perfon moruft feifie des afcuns caftles, manors, terres ou tenements del* nature & tenure de teniftry; *que donques mefmes le caftles,* &c.

&c. doent descender, & de temps dont memory ne court ont use de descender, Seniori & dignissimo viro sanguinis & cognominis de tiel person, &c.

TANNED *hide*. See HIDE.

TANNER, a person who dresses hides by TANNING.

No person shall be a *tanner*, who hath not served seven years, except the wife or such son of a *tanner* as hath used the trade four years, or the son or daughter of a *tanner*, or such person who shall marry such wife or daughter, to whom he shall leave a tan-house and fats, on pain of forfeiting all leather tanned by him, or its value. No *tanner* shall be a butcher, on pain of 6*s.* 8*d.* a day; nor shall a *tanner* be of any craft exercised in cutting or working leather, on pain of forfeiting the same, or its value. No *tanner* shall suffer any hide to lie in the limes till they be over-limed, nor put it into any tan-fats, before the lime be perfectly wrought out of it, nor use in tanning any thing but ash-bark, oak-bark, tap-wort, malt, meal, lime, culver-dung, or hen-dung; nor suffer it to lie wet till it be frozen; nor dry it by the fire or summer sun, nor tan any hide and skin putrefied or rotten, nor suffer the hides for utter sole leather to lie in the oozes less than twelve months, nor the hides for upper leathers less than nine months, &c. on pain of forfeiting every such hide or skin, or its value. 1 Jac. cap. 22. Places of working used by *tanners*, tawers, curriers, or dressers of hides or skins, are to be entered, on pain of 50*l.*; and using any private tan-yard, &c. incurs a forfeiture of 20*l.* and the goods, or their value. And the refusal of entrance to officers is liable to a forfeiture of 10*l.*

Notice of removal to the place of drying shall be given to the officer; and entry, on oath, shall be made before removal from the place of drying, under a penalty of 20*l.* and forfeiture of the goods, or their value; and concealing goods, in order to avoid the duty, incurs the same forfeiture.

Tanners, &c. are to keep scales and weights, or forfeit 50*l.*; and false or insufficient scales and weights incur a penalty of 100*l.* The duty shall be ascertained, and the leather marked, before removal, under a penalty of 50*l.* and forfeiture of the goods; and persons counterfeiting the stamp, and knowingly selling goods with a counterfeit stamp, shall be guilty of felony, without benefit of clergy.

Persons within the bills of mortality shall pay off the duties in fourteen days to the commissioners, and elsewhere within six weeks, to the collectors, after the goods shall be marked, or forfeit double duty. And *tanners*, &c. are required to balance their accounts with the officers once in three months, if demanded, on pain of 50*l.* 9 Ann. cap. 11. 10 Geo. III. cap. 44.

By 9 Ann. cap. 11. and 10 Ann. cap. 26. tanned goods pay the following duties, viz. all tanned hides 1½*d.* a pound; calf, kips, hogs, and dog-skins tanned, 1½*d.* a pound; goat-skins, tanned with sumach, or otherwise, to resemble Spanish leather, 4*d.* a pound; sheep-skins tanned for roans, after the nature of Spanish leather, 2*d.* a pound; sheep-skins and lamb-skins tanned for glovers and basils 1½*d.* a pound: and by 9 Geo. III. cap. 39. seal-skins tanned or tawed 1½*d.* a pound; tanned skins not before charged, 30*l.* in the hundred, according to the real value. All these duties are to be paid by the *tanner*.

For other regulations relating to hides and skins, see LEATHER, TAWING, and VELLUM. Burn's Justice, *Excise* and *Leather*.

TANNER'S *bark*. See TAN.

TANNING, the preparing of skins, or hides, in a pit, with tan and water; after having first taken off the hair, by steeping in lime-water.

TANNING *oxen's hides, method of*. The process of *tanning* the thickest and best hides, which are usually termed sole-leather, and applied to the soles of shoes, is as follows. When the horns are taken out, they are laid quite smooth in a heap, consisting of twenty (more or less), for a few days; after which they are hung up in a close brick building, in which there is kept a small heat, without any vent for the smoke, and thus the hair will be made to move from the skin. In this stage of the operation great care is required. They are next removed to a wooden beam, over which each hide is laid, and the hair is scraped or forced from it with a crooked knife. When this is done, the hide is thrown into water, the clearer and purer the better; and in this state it is moved once or twice a day for two or three days, more or less, according to the quality of the water, or the season of the year. The hide is then laid on the wooden beam, and the loose flesh is pared from it, and the fat or grease scrubbed or worked out, with an instrument, called by the tanners a fleshing-knife. When this operation is finished, the hides are taken to a vat, in which is prepared a liquor made of oak bark, called ooze, the stronger the better, in which they are to be kept, almost constantly moved, for a space of time, from four to seven or eight hours, according to the strength of the ooze or quality of the hides. They are next removed to a vat, in which there is a preparation made with barley or rye-meal scalded, termed scourings, or workers, which fills the pores of the hides and thickens them, where they are to remain for a few days. The hides are then removed to another vat, in which is prepared a mixture of water with ooze, in which they are laid smooth, with ground oak-bark spread between one and another; and here they remain from five to seven or eight weeks, without being moved; after which time they are taken up, and a fresh one being prepared from the bark, by laying bark in a vat with a false bottom, to which the liquor is put, and from which it may be drawn off again without disturbing the bark in the vat, the hides are again laid in smooth as before, and usually lie from ten to twelve or fourteen weeks, when they are removed, with a repetition of the last process, and may lie from three to four months; and this process must be renewed once, twice, or thrice more, according to the substance of the hides.

When they are to be got ready for sale, they are hung up in a drying shed, on a fir or ash pole, and when in a proper state, the grain is pressed or squeezed down with a steel or brass pin, and they are also beat smooth with a wooden beetle in the course of their being dried.

Of late years, spirits of vitriol mixed with water have been applied for the same purpose with barley or rye-meal; but this is a method practised by very few of the tanners.

The inferior sortment of hides is tanned into that which is termed crop-leather, and some of them for dressing leather. Those intended for crops, when the horns are taken out, are put into water one night; the next day they are removed to a vat in which has been put lime with water; they are there moved every day from five to ten days, when the hair will easily be moved off, in the same manner, and with the sort of knife as before described: they are then thrown into clean water for one night, whence they are removed to the beam, and the loose flesh, &c. taken off, as in the case already described: they are then put into a vat, in which there is a preparation made with pigeon or hens-dung and water, where they remain a few days, being kept moved; during which time they are worked or scrubbed on the grain with a crooked knife, which extracts the filth or scum acquired in the limes; after this stage they are removed to the vats, out of which other leather has been taken, and there kept well moved, till they are in a proper state to be put into strong oozes, with fresh bark applied to them.

If leather manufactured in this manner be designed for dressing for coachmakers or other uses, more lime will be required, and likewise more time to be allowed in the pigeons-dung, &c. When these hides are fit to dry, they are hung up in the manner already described.

The process of manufacturing calf-skins is the same with that last mentioned.

The Editor is indebted for this account of the operation of *tanning* to one of the first men in that branch of business.

The late ingenious Dr. Macbride of Dublin, having invented a new method of *tanning*, by which the leather (as it is said) is not only improved in its quality, but tanned in much less time, and with a smaller quantity of bark than in any other method hitherto known or practised, has published instructions to tanners, from which the following particulars are extracted. His method depends on this principle, that lime-water extracts the virtues of oak-bark more completely than plain water; accordingly he begins with instructing the tanner in the preparation of lime-water. Having provided a cistern of sufficient dimensions, and fixed it in a convenient situation, he directs it to be filled with water, and to throw in ten or twelve pounds of unslaked lime for every hogshead of water contained in it. The lime is to be well mixed with the water, by stirring it with a bucket or plunger, till it is completely diffused, and the whole mixture becomes as white as milk; and then the liquor is left to settle for two days, that the undissolved lime may subside, and the water become perfectly limpid, and clear as rock-water, in which state it will be fit for immediate use, and may be drawn off by a cock, fixed at least twelve inches from the bottom of the cistern. When the first quantity of lime-water is expended, the cistern is to be filled with water a second time, the lime stirred from the bottom, and the liquor left to subside as before; and thus will be obtained a second brewing, and in like manner a third, fourth, fifth, or perhaps a sixth, or more, from the original quantity of lime; provided that the

the lime-water continues to be of sufficient strength. The strength of it may be determined either by the taste, or by observing a certain solid scum, like the flakes of very thin ice, which collects and forms itself on the surface of the lime-water; and whilst this continues to float on the water, there is no need of adding fresh lime. But if it is not sufficiently strong, the gross remains of lime must be drawn off by a hole in the bottom, stopped with a plug; and when the cistern is cleaned, the brewings of lime-water must be repeated as before. The ooze is prepared by steeping the bark in this lime-water instead of common water, running it through two letches, that the lime-water may completely spend its force in the bark, and used in the same way with the common ooze. The previous management, before the hides are fitted for the ooze; and the subsequent processes are conducted according to the common practice: observing, however, that the ooze is to be turned from one letch on another before it is used, without which precaution it will be apt to blacken the leather.

The process of *tanning*, as far as it is already recited, relates only to bulls and calf-skins.

Sole-leather is prepared for the ooze by steeping it in some sour liquor, in order to open its pores and *raise* it, according to the phrase of the tanners. The sourings commonly used are brewed from rye, or some other grain; but these, Dr. Macbride observes, are uncertain, with respect to the degree of their sourness or strength, which depend on the state of the weather and other variable circumstances, and are apt to rot the leather. He therefore recommends the use of a sour prepared by diluting the strong spirit of vitriol, vulgarly termed oil of vitriol, with a sufficient quantity of water. This, he says, is subject to no change from the state of the weather, and, instead of rotting, gives unusual firmness to the leather; besides, the same sour may serve for many parcels of leather, by adding a little vitriol to it. A wine pint of the strong spirit of vitriol is sufficient for fifty gallons of water, to prepare the souring at first; and in raising the soles they are previously prepared in the usual way, and when they are fit for the souring, a quantity of vitriol and water, in the proportion above stated is mixed together, according to the number of hides which are to be raised; and they are then left to lie in the souring till they are sufficiently raised; nor is there any danger of their rotting, as the vitriolic souring prevents putrefaction: they are then put into the ooze, and the process is pursued in the common way.

In large works, and in the ordinary course of business, sole-leather may be completely tanned and finished in a space of time from eleven to fifteen months, according to the different weight and thickness of the hides; butts in eight to twelve months, and calf-skins in six to twelve weeks; and, in general, the tanner may save at least a third of the time that has been hitherto required.

In making fresh ooze fresh lime-water must always be used, and the ooze run through two letches; and the lime-water ooze, when spent from lying on the leather, is never to be returned back upon the bark which is in the letches, but must be thrown away as entirely useless. The letches ought to be under cover, lest the rain get into them and weaken the ooze; but it is of no importance to cover the vats, provided that, when the leather is laid away in them, they are kept constantly full to the brim. A sufficient stock of unslaked lime should always be in reserve, which, if possible, should be procured fresh from the kiln, and immediately packed in any kind of old dry casks. The expence of lime will be amply compensated by the saving of bark, because lime-water so completely exhausts the bark, and makes it go much farther than when the ooze is made only of plain water. In proof of this, there may be made a pretty strong ooze from the tan or spent bark, which is now considered as completely exhausted, by infusing it in lime-water. See Philos. Trans. vol. lxviii. part i. art. 8.

Mr. Beal, in a letter to the secretary of the Royal Society, published by Dr. Birch, in the Hist. R. S. vol. i. p. 387. gives the following brief account of *tanning* and dressing dog-skins. He observes, that the skins of the biggest mastiffs are fittest to be tanned for boots or shoes, or thick riding-gloves, and are held to be stronger and to have a finer grain than any Spanish or Barbary leather; but they are cold and moist, and fittest for summer; and he says, that old fame reports, that they produce the palsy.

Hunting-hounds and grey-hounds, and water-spaniels yield the softest, most limber, and pleasant leather: the skins of lesser dogs are not so fit to be tanned, as to be dressed white for gloves.

In *tanning*, lime it quick, i. e. let it lie not above a fortnight or three weeks in lime, taking it out of the lime-pits once every day for an hour or more during this time; then put it for a week in a pit of weak ooze, or water in which the bruised bark of oak lies, taking the skins also, once every day, out of the ooze, for an hour, &c. as before. Then it should be tanned in the strongest ooze: the quicker it is tanned, the better it is, and stronger; by long *tanning* it rots. If it lie three weeks or a month in the strongest ooze (taking it out but once a week), it is best to take it up as soon as it is tanned enough; then hang it on poles, as plain as possible, till the sun and wind dry it, which may be in two days of good weather: if it should rain it must be dried within doors. If the horn (as they call it) be quite out, i. e. if it be not stiff and horny, you may take it out at the third laying of this strong ooze. If some parts obstinately continue horny, the horn may be taken out thus; take for each skin half a pound of alum, and the same quantity of salt, dissolve both in fair water, and bathe the horny parts often in this liquor, in some earthen or tinned vessel. This is necessary to be done to leather that is tanned for gloves, not for boots or shoes.

To dress white for gloves, it must be better limed, i. e. lie a week longer in the lime; after it is taken out of the lime it must lie in warm water mingled with bran; and thus let it lie three days together without stirring it; and let it lie one day in the infusion of alum and salt above mentioned; then dry it smooth upon poles.

Cat-skins are dressed like dog-skins; but if you would save their furs, you must not put them in lime at all, but in fair water, in which bran is boiled, and cooled before you put the skins in, in which they must lie for two or three days. So also squirrel's skins, and thus are drest seal-skins with the hair on, for the covers of saddles, &c. in which care must be taken that the bran-liquor be not too warm, but thoroughly cooled before the skin be put in. A boar's-skin will be thicker than a bull's-skin, and cannot be tanned limber; but is always horny. All castling-skins may be dressed (as above) for gloves.

If dog-skins be not tanned very quick, they will not hold any colour in perfection.

To take out the alum, mingle the yolks of eggs and oatmeal in fair water, and in that liquor let the leather lie a few hours, and then wash it well therein, and so dry it.

TANT, in *Natural History*, an English name for a small spider of the OPILIO kind, having only two eyes, and eight very long legs, and commonly supposed to be very poisonous.

It is all over of an elegant scarlet colour, resembling that of the flowers of the red poppy when full blown, except that the belly has a whitish cast. Four of its legs are inserted in the upper part of the breast, and the other four near the belly; and near the origin of each leg there is a small black spot. Its body is round and full, and it is all over covered with a fine short velvety down. It is not unfrequent in dry pastures in the spring-season. It is terribly dreaded by our farmers, who suppose that an ox will die who chances to swallow it. Ray's Hist. Insect. p. 44.

TANTALUS, one of the many names given by chemists to mercury.

TANTALUS, in *Mythology*, a king of Lydia, Phrygia, or Paphlagonia, according to some, but, according to others, the son of Jupiter by the nymph Plota, who is said to have presented the mangled members of his son Pelops, whom he murdered, to the gods, at a feast, in order to prove their divinity; or, according to the modern explication of this fable, he offered up his son as a sacrifice to the gods. Others, however, have charged him with revealing the secrets of the gods, i. e. the mysteries of their worship, of which he was the high-priest. But whatever was the nature of his crime, the poets represent him as condemned to hell, and tormented there with perpetual hunger and thirst in the midst of plenty of both meat and drink. Some represent him as standing up to the chin in water, which he was incapable of reaching; or as standing under a tree, some of the branches of which, loaded with the finest ripe fruits, hung down just before his mouth, which, the moment he endeavoured to take, always waved out of his reach. Others represent him as standing under a heavy stone, which was suspended over his head, and which he suspected would every moment fall and crush him.

Horace (lib. i. sat. i. v. 71.) sems to make *Tantalus* only an emblem of the covetous: as Lucretius (lib. iii v. 1015.) makes Sisyphus, who is represented as bending under the weight of a great stone, or labouring to heave it against the side of a steep mountain, and which always rolls precipitately down again before he can fix it on the top, as an emblem of the ambitious.

TANTALUS, in *Ornithology*, a genus of the order of *grallæ*. Its

its characters are, that the bill is long, thick at the base, and wholly incurvated; the face naked; the tongue short and broad; the nostrils linear, and the feet, with four toes, palmated at the base. Linnæus enumerates seven species, of which the Egyptian IBIS is one.

TANTALUS'S *cup*, in *Hydraulics*, is a cup, as A (*Tab.* VI. *Hydraulics*, *fig.* 10.) with a hole in the bottom, and the longer leg of the syphon BCED cemented into the hole; so that the end D of the shorter leg DE, may almost touch the bottom of the cup within. Then, if water be poured into this cup, it will rise in the shorter by its upward pressure, extruding the air before it through the longer leg; and when the cup is filled above the bend of the syphon at F, the pressure of the water in the cup will force it over the bend of the syphon; and it will descend in the longer leg CBG, and even through the bottom, until the cup be emptied. The legs of this syphon are almost close together, and it is sometimes concealed by a small hollow statue, or figure of a man placed over it; the bend E being within the neck of the figure as high as the chin. So that poor thirsty *Tantalus* stands up to the chin in water, according to the fable, imagining it will rise a little higher, and he may drink; but, instead of that, when the water comes up to his chin, it immediately begins to descend, and therefore, as he cannot stoop to follow it, he is left as much tormented with thirst as ever. Ferguson's Lect. p. 72, 4to.

TANTAMOUNT, something that amounts to, or is equivalent to some other.

TANTUM *decies*. See DECIES.

TANSY, or TANZY, *tanacetum*, in *Botany*, a genus of the *syngenesia polygamia equalis* class: its characters are these: it has a flower composed of hermaphrodite and female florets, contained in one common, hemispherical, imbricated empalement, whose scales are compact and acute pointed. The hermaphrodite florets which compose the disk of the flower, are funnel-shaped, and cut into five segments, which are reflexed; these have five short hair-like stamina, terminated by cylindrical tubulous summits, and a small oblong germen, supporting a slender style, crowned by a bifid revolved stigma; the germen becomes an oblong naked seed; the female florets are trifid, which compose the rays or border, and are deeply divided within; these have an oblong germen, with a slender style, crowned with two reflexed stigmas, but no stamina. Miller enumerates seven, and Linnæus eight species.

The common yellow *tansy*, of which there are three varieties, is easily propagated by its creeping roots, which, if undisturbed, will soon overspread any ground where they are permitted to grow. The slips are to be planted either in spring or autumn, and will thrive in almost any soil or situation. Miller.

This is perennial, grows wild about road-sides, and about the borders of fields, and flowers about June and July.

The leaves and flowers of *tansy* have a strong, not very disagreeable smell, and a bitter somewhat aromatic taste. They give out their virtue both to water and spirit, but most perfectly to the latter: the tincture, made from the leaves, is of a fine green; from the flowers, of a bright pale yellow colour. Distilled with water, they yield a greenish-yellow essential oil, smelling strongly of the herb: the remaining decoction, inspissated, affords a strong, bitter, subsaline extract.

This plant is used as a warm deobstruent bitter, in weakness of the stomach, and in cachectic and hysteric disorders; and likewise as an anthelmintic. The seeds have been chiefly recommended in this last intention, and supposed to be the *santonicum* of the shops, from which they differ not a little in quality as well as in appearance, being much less bitter, and of a more aromatic flavour. Lewis.

TANSY, *wild*. See CINQUEFOIL.

TAOS *lapis*, the *peacock-stone*, a name given by some of the ancient writers to a very beautiful variegated agate, resembling, in some degree, the great variety of colours in the peacock's tail.

TAP, among *Hunters*: a hare is said to *tap*, or beat, when she makes a particular noise at rutting-time.

TAP-*root*, in *Trees*, that part of the root that descends straight down.

In removing or transplanting young oaks, great care should be taken not to wound this root, much less to cut it off; but it must be dug up to the bottom, and the hole prepared deep enough to set it; otherwise the tree either dies, or, if not, it is always greatly stinted or impeded in its growth.

TAPASSANT, among *Hunters*, denotes *lurking* or *squatting*. Hence also, to *tappy*, is to lie hid, as deer may do.

TAPAYAXIN, in *Zoology*, the name of a very remarkable species of lizard, called by Hernandez the *lacertus orbicularis*.

It is not of the long and slender shape of the common lizards, but as broad as it is long, and much resembling the ray-fish in shape, though seldom exceeding four inches in length or breadth. It is a cartilaginous lizard, of a very beautiful variety of colours, always very cold to the touch, and so sluggish a creature, that it often will not move out of its place even on touching it. Its head is exceedingly hard and elate, and has a sort of crown of prickles for its defence; yet it is a perfectly harmless animal, and so far from having the fear of man, and shyness that other beasts have, that it loves to be taken up and played with, and will stand perfectly still, and seem very happy while played with. Hernandez, lib. ix. cap. 16.

TAPE-*worm*, a species of worm breeding in the human bowels, and called by authors, *tænia*, and *lumbricus latus*, or the broad worm.

In the Linnæan system, this is a genus of the order of *Zoophytes*, in the class of worms, the characters of which are, that the body is jointed in the form of a simple chain, and that each joint has its proper mouth, viscera, &c. This genus includes four species.

The Greek and Roman physicians, as well as those of our own time, have described those sorts of worms to which the human bowels are subject. The common long worms, which resemble earth-worms; the ascarides, or small worms; and this *tape-worm*, which they have also called *vermis cucurbitinus*, or the gourd-worm, from its resembling, in some degree, the seeds of that fruit.

The interpreters of some of the Greek physicians have, however, been guilty of a great error, in confounding the gourd-worms and the ascarides together, though nothing can be more unlike. The ancients seem to have had a very just opinion of this animal in calling it *vermis cucurbitinus*, since it is plain by this, that they understood every joint, as we call them, of this creature, to be a distinct worm; and what we call a single worm, to be a long series of these worms, joined together end to end.

The true history of this animal is, that it is short and broad. What is called a link of the long worm is really a distinct worm; and when one of these multiplies in the bowels, its young adhere to it, and to each other endwise, so as to form a sort of chain, which lengthens as they continue to increase, and in fine becomes immoderately long. Hence it is that the breaking, as it is called, of this worm, does not destroy it, and that the voiding large pieces of it is no cure, since it still recovers that length again by new young ones. Every separate link of such a chain, if examined, is found to be entire, lively, and brisk, and not at all injured by the separation.

Dr. Tyson, in the Phil. Trans. N° 146, gives a curious account of this worm: it is always single; it lies variously convoluted, being sometimes as long as all the guts, and sometimes it very much exceeds that length. Olaus Borrichius assures us, that a patient of his, in a year's time, voided eight hundred feet in measure of this worm, though in that length he did not meet with the head; in voiding, the patient always observed it to break off.

Dr. Tyson parallels this case with that of a patient of his, who discharged vast quantities of this worm for several years, but in various pieces, of two, three, four, six, or more yards long, but all put together, would (he says) much exceed the length of that of Borrichius.

The joints in this worm are very numerous in one of twenty-four feet long. Dr. Tyson numbered five hundred and seven joints. Above the middle of the edges of each joint, he observed a protuberant orifice. Those orifices he takes for so many mouths; the best microscopes discovering no mouth in that part which usually passes for the head. This worm is common in most kinds of animals, as dogs, oxen, crabs, herrings, pikes, &c.

Some authors have asserted, that it is not one, but many worms linked together, and included in a spolium of the intestines; and that this spolium is not animated, but receives its sense and motion from a sort of vermiculi cucurbitini enclosed in it. This Gabucinus, de Lumb. Com. says, he has plainly discovered; but Dr. Tyson abundantly evinces the contrary.

Authors who have treated of these worms as a disease, have given a canine appetite, or unnatural appetite to food, as one of the symptoms; but this is wrong, for it has never been found, in reality, that these worms, even where most numerous, have at all increased the natural appetite; and indeed it is very difficult to judge of their being in the body by symptoms, since they occasion none which

which are not alfo common in many other difeafes. Many people have had them a long courfe of time, without being fenfibly hurt by them; and there has never been a known inftance of their occafioning any one's death, or indeed any confiderable diforder.

Fern-root has been long known as a remedy againft worms. See FERN and WORMS.

However, it was funk into neglect till a few years ago, when it again came into notice, by being difcovered to be the remedy which had become greatly celebrated in Switzerland as a fpecific in the cure of the *tænia* or *tape-worm*. The fecret was purchafed by the king of France, after its efficacy had been attefted upon trial by fome of the principal phyficians at Paris.

The following has been publifhed as the mode of its exhibition. After the patient has been prepared by an emollient clyfter, and a fupper of panada with butter and falt, he is directed to take in bed in the morning a dofe of two or three drams of the powder of male fern-root. The dofe to infants is only one dram. The powder muft be wafhed down with a draught of water, but nothing elfe muft be taken till two hours after, when a bolus of calomel, joined with fome of the ftronger cathartics, is to be given. If this does not operate, it muft be followed by a dofe of purging falts. By this method the worm is commonly expelled in a few hours. If the trial does not fucceed, the procefs muft be repeated at due intervals. Lewis's Mat. Med. by Aikin, 1784.

TAPECON, in *Ichthyology*, a name given by fome to the fifh generally called the URANOSCOPUS, or *ftar-gazer*.

TAPER, TAPERING, is underftood of a piece of timber, or the like, when broad at one end, and gradually diminifhing to the other; as is the cafe in pyramids, cones, &c.

To meafure *taper* timber, &c. fee SLIDING-*rule*.

TAPER-BORED is applied to a piece of ordnance, when it is wider at the mouth than towards the breech.

TAPER alfo denotes a kind of tall wax-candle, placed in a candleftick, and burnt at funeral proceffions, and in other church folemnities.

Tapers are made of different fizes; in fome places, as Italy, &c. they are cylindrical; but in moft other countries, as England, France, &c, they are conical or *taper*; whence poffibly the name; unlefs we rather choofe to derive *taper* in the adjective fenfe from the fubftantive *taper*, in the Saxon *tapen* or *tapon*, *cereus*, *wax-candle*.

Both kinds are pierced at bottom, for a pin in the candleftick to enter.

The ufe of lights in religious ceremonies is of a long ftanding; the ancients, we know, ufed flambeaux in their facrifices, and particularly in the myfteries of Ceres; and they had *tapers* placed before the ftatues of their gods.

Some fuppofe that it was in imitation of this heathen ceremony, that lights were firft introduced into the Chriftian church; others take it, that the Chriftians borrowed the practice from the Jews; but recourfe need not be had to the one or the other. Doubtlefs, as in the firft ages of Chriftianity, they had their meetings in obfcure fubterraneous vaults, there was a neceffity for *tapers*, &c. and there was even occafion for them after they had the liberty of building churches, thofe being contrived in fuch a manner as only to receive very little light, that they might infpire the greater awe and refpect by the obfcurity.

This original of *tapers* in churches is the moft natural; but it is now a long time fince the ufe of *tapers*, which neceffity firft introduced, is become a mere ceremony. St. Paulinus, who lived at the beginning of the fifth century, obferves, that the Chriftians of his days were fo fond of *tapers*, that they even painted them in their churches.

There are two ways of making TAPERS, the firft with the *ladle*, the fecond by *hand*.

In the firft, after the wicks (which are ufually half cotton, half flax) have been well twifted, and cut of the due length, a dozen of them are hung, at equal diftances, around an iron hoop, directly over a large copper bafon full of melted wax.

Then taking an iron ladleful of the wax, they pour it gently over the wicks, a little below the tops thereof, one after another; fo that, the wax running down them, they become foaked and covered therewith, and the furplus returns into the bafon, under which is a pan of coals to keep it in fufion.

Thus they continue to caft on more and more wax for ten or twelve times, till the *tapers* be brought to the required dimenfions. The firft caft only foaks the wick, the fecond begins to cover it, and the reft give it the form and thicknefs; in order to which, they take care that every caft, after the fourth, be made lower and lower below the wicks to make them *taper*. The *tapers* thus formed, are laid, while yet hot, one againft another, in a feather-bed folded double, to preferve them foft; and afterwards taken out thence, one after another, to be rolled on a long fmooth table, with an oblong inftrument of box, polifhed at the bottom, and furnifhed with a handle above.

The *taper* thus rolled and polifhed, a piece of its larger end is cut off, and a conical hole bored therein, with a boxen inftrument, into which the pin, or point of the candleftick, is to be received.

While the broach is yet in the hole, they ufe to ftamp the maker's name and the weight of the *taper*, with a boxen ruler, whereon proper characters are cut. The *taper* is then hung up to harden, after which it is fit for ufe.

Making of TAPERS *by hand*. The wicks being difpofed, as in the former manner, they begin to foften the wax, by working it in hot water, in a narrow, deep, copper veffel. They then take a quantity of this wax out with the hand, and apply it gradually on the wick, which is faftened to a hook in the wall, at the end oppofite to the collet; fo that they begin to form the taper by the large end, and proceed, ftill leffening the thicknefs to the neck or collet.

The reft is performed after the fame manner as in *tapers* made with the ladle, except that they do not lay them in the feather-bed, but roll them on the table as faft as they are formed.

Two things there are to be obferved in the two kinds of *tapers*; the firft, that, in the whole procefs of *tapers* with the ladle, they ufe water to moiften the table, and other inftruments ufed therein, that the wax may not ftick; and that, in the other, they ufe oil of olives, or lard, for the fame end.

TAPER, *pafchal*, among the *Romanifts*, is a large *taper*, whereon the deacon applies five bits of frankincenfe, in holes made for the purpofe, in form of a crofs; and which he lights with new fire in the ceremony of Eafter-Saturday.

The Pontifical makes pope Zofimus the author of this ufage; but Baronius will have it more ancient; and quotes a hymn of Prudentius to prove it. That pope he fuppofes to have only eftablifhed the ufe thereof in parifh-churches, which, till then, had been reftrained to greater churches.

F. Papebroch explains the original of the *pafchal taper* more diftinctly in his *Conatus Chronico-Hiftoricus*, &c. It feems, though the council of Nice regulated the day whereon Eafter was to be celebrated, it laid it on the patriarch of Alexandria to make a yearly canon thereof, and to fend it to the pope. As all the other moveable feafts were to be regulated by that of Eafter, a catalogue of them was made every year; and this was written on a *taper*, *cereus*, which was bleffed in the church with much folemnity.

This *taper*, according to the abbot Chaftelain, was not a wax-candle made to be burnt; it had no wick, nor was it any thing more than a kind of column of wax, made on purpofe to write the lift of moveable feafts on; and which would fuffice to hold that lift for the fpace of a year.

For, among the ancients, when any thing was to be written to laft for ever, they engraved it on marble or fteel; when it was to laft a long while they wrote it on Egyptian paper; and, when it was only to laft a fhort time, they contented themfelves to write it on wax. In procefs of time they came to write the moveable feafts on paper, but they ftill faftened it to the *pafchal taper*; which practice is obferved to this day at Notre Dame, in Rouen, and throughout the order of Cluny. Such is the original of the benediction of the *pafchal taper*.

TAPERA, in *Ornithology*, a fpecies of SWALLOW.

TAPESTRY, or TAPISTRY, a curious kind of manufacture, ferving to adorn a chamber, or other apartment, by hanging or lining the walls thereof.

Some ufe *tapeftry* as a general name for all kinds of hanging, whether woven or wrought with the needle; and whether filken, woollen, linen, leathern, or of paper (in which they are countenanced by the etymology of the word, formed from the French *tapiffer*, *to line*; of the Latin *tapes*, a cover of a wall or bed, &c.). But, in the common ufe of our language, the term is now appropriated to a kind of woven hangings, of wool and filk, frequently raifed and enriched with gold and filver, reprefenting figures of men, animals, landfchape, &c.

The invention of *tapeftry* feems to have come from the Levant, and what makes this the more probable is, that formerly, the workmen concerned herein were called, at leaft in France, *Sarazins*, or *Sarazinois*.

Some have ſuppoſed that the Engliſh and Flemiſh, who were the firſt that excelled therein, might bring the art with them from ſome of the croiſades or expeditions againſt the Saracens. Accordingly they ſay, that thoſe two nations were the firſt who ſet on foot this noble and rich manufacture in Europe, which afterwards became one of the fineſt ornaments of palaces and churches, &c. At leaſt, if they be not allowed the inventors, they have the honour of being the reſtorers of this curious and admirable art, which gives a kind of life to wools and ſilks, in ſome reſpects not inferior to the paintings of the beſt maſters. However, it does not appear at what preciſe æra this manufacture was introduced into Europe; nor is it certain to whom it was owing.

Guicciardin, in his Deſcription and Hiſtory of the Netherlands, printed at Antwerp in 1582, aſcribes the invention of the art of making *tapeſtry* hangings to the Netherlanders, but he does not aſſign the time of the invention.

The art of weaving *tapeſtry* was brought into England by William Sheldon, eſq. about the end of the reign of Henry VIII. See Dugdale's Warwickſhire in Stemmate Sheldon, p. 584.

In the reign of king James the manufacture of *tapeſtry* was ſet up at Mortlake, in Surry. Aubrey, indeed, in his hiſtory of that county, dates its inſtitution in the ſubſequent reign; but Loyd (State Worthies, p. 953.) is not only poſitive for the former æra, but affirms, that at the motion of king James himſelf, who gave two thouſand pounds towards the undertaking, ſir Francis Crane erected the houſe at Mortlake for the execution of the deſign; and this is confirmed by authentic evidence; for, in Rymer's Fœdera, vol. xviii. p. 66, there is an acknowledgment from king Charles in the firſt year of his reign, viz. 1625, that he owes ſix thouſand pounds to ſir Francis Crane for *tapeſtry*: and he grants to him two thouſand pounds yearly, for ten years, towards the maintenance of the ſaid work.

Theſe works at Mortlake, which at firſt had been conducted after old patterns, were afterwards formed from deſigns both in hiſtory and groteſque, furniſhed by Francis Cleyn, and thus carried to ſingular perfection.

From the deed above recited it is plain, that the manufacture was then arrived at great perfection. See Mr. Walpole's Anecdotes of Painting in England, vol. ii. p. 36.

In the year 1663, a ſtatute was enacted (cap. 15.) for the encouragement of linen and *tapeſtry* manufactures of England, and diſcouragement of the very great importation of foreign linen and *tapeſtry*.

The firſt eſtabliſhment of a *tapeſtry* manufacture at Paris was under Henry IV. in the year 1606 or 1607, by means of ſeveral excellent artiſts, whom he invited from Flanders.

But this fell with the death of that prince. Under Lewis XIV. the manufacture was retrieved by the care and addreſs of the great M. Colbert, to whom is owing the eſtabliſhment of the Gobelins, a royal *tapeſtry* manufacture, which has produced works of this kind ſcarce inferior to the fineſt Engliſh or Flemiſh *tapeſtry*, either with regard to the deſign, the colours, or the ſtrength.

In this manufactory both wool and ſilk are uſed, and ſometimes gold and ſilver. The fineſt paintings may be copied in this work, and the greateſt maſters have been employed in draughts for the *tapeſtry* weavers.

The weavers of the Gobelins work behind, or on the wrong ſide of the loom, which ſtands upright, and the pattern is placed on either ſide of the workman.

As the *tapeſtry* of the Gobelins is made of pieces of a certain breadth only, there are other workmen called rentrayeurs, or fine-drawers, who are employed in ſewing or fine-drawing the ſeveral parts together, ſo that no ſeam is diſcernible, but the whole appears as one deſign, like a piece of ſilk from a loom. Theſe workmen are alſo uſeful in mending and cleaning *tapeſtry* when damaged or ſullied.

The *tapeſtry-men* diſtinguiſh two kinds of work; viz. *tapeſtry* of the *high* and the *low-warp*, though the difference is rather in the manner of working, than in the work itſelf, which is, in effect, the ſame in both, only the looms, and conſequently the warps, are differently ſituated; thoſe of the *low warp* being placed flat, and parallel to the horizon, and thoſe, on the contrary, of the *high warp*, erected perpendicularly.

The French have three conſiderable *tapeſtry* manufactures beſides that of the Gobelins; the firſt at Aubuſſon, in Auvergne; the ſecond at Felletin, in the Upper Marche; and the third at Beauvois: they were all equally eſtabliſhed for the *high* and the *low warp*; but have all laid aſide the former, excepting the Gobelins.

There are admirable *low warps* in Flanders, generally exceeding thoſe of France; the chief and almoſt only Flemiſh manufactories are at Bruſſels, Antwerp, Oudenard, Liſle, Tournay, Bruges, and Valenciennes.

At Bruſſels and Antwerp they ſucceed both in human figures and animals, and in landſcapes; and that both with reſpect to the deſigning and the workmanſhip. At Oudenard their landſcapes and animals are good, but their human figures naught. Liſle, and the other cities named, come behind Oudenard. The French manufacture of Felletin does tolerably well in landſcapes, Aubuſſon in figures, and Beauvois in both.

The uſual widths of *tapeſtries* are from two ells to three ells and a half, Paris meaſure.

The manufacture of *tapeſtry* of each kind is too curious to be here paſt over without a ſhort deſcription. We ſhall give each under its ſeparate article.

Manufacture of Tapestry *of the high warp.* The loom whereon this is wrought is placed perpendicularly: it conſiſts of four principal pieces; two long planks or cheeks of wood, and two thick rollers or beams. The planks are ſet upright, and the beams acroſs them, one atop, and the other at bottom, a foot diſtance from the ground. They have each their trunnions, by which they are ſuſpended on the planks, and are turned with bars. In each roller is a groove, from one end to the other, capable of containing a long round piece of wood, faſtened therein with hooks. Its uſe is to tie the ends of the warp to. The warp, which is a kind of worſted, or twiſted woollen thread, is wound on the upper roller; and the work, as faſt as woven, is wound on the lower.

Withinſide the planks, which are ſeven or eight feet high, fourteen or fifteen inches broad, and three or four thick, are holes pierced from top to bottom, in which are put thick pieces of iron, with hooks at one end, ſerving to ſuſtain the coat-ſtave: theſe pieces of iron have alſo holes pierced in them, by putting a pin in which, the ſtave is drawn nearer, or ſet farther off; and thus the coats or threads are ſtretched or looſened at pleaſure. The coat-ſtave is about three inches diameter, and runs all the length of the loom; on this are fixed the coats, or threads, which make the threads of the warp croſs each other. It has much the ſame effect here as the ſpring-ſtave and treddles have in the common looms. The coats are little threads faſtened to each thread of the warp, with a kind of ſliding-knot, which forms a ſort of maſh or ring. They ſerve to keep the warp open, for the paſſage of broaches wound with ſilks, woollens, or other matters uſed in the piece of *tapeſtry*.

Laſtly, there are a number of little ſticks, of different lengths, but all about an inch diameter, which the workman keeps by him in baſkets, to ſerve to make the threads of the warp croſs each other, by paſſing them acroſs: and that the threads thus croſſed may retain their proper ſituation, a packthread is run among the threads above the ſtick.

The loom thus formed, and mounted with its warp, the firſt thing the workman does, is to draw, on the threads of this warp, the principal lines and ſtrokes of the deſign to be repreſented on the piece of *tapeſtry*; which is done by applying cartoons made from the painting he intends to copy, to the ſide that is to be the wrong ſide of the piece; and then with a black lead pencil following and tracing out the contours thereof, on the thread of the right ſide; ſo that the ſtrokes appear equally both before and behind. As to the original deſign the work is to be finiſhed by, it is hung up behind the workman, and wound on a long ſtaff, from which a piece is unrolled, from time to time, as the work proceeds.

Beſides the loom, &c. here deſcribed, there are three other principal inſtruments required for working the ſilk, or wool of the woof within the threads of the warp. Theſe are a broach, a reed, and an iron needle.

The broach is of hard wood, ſeven or eight inches long, and two thirds of an inch thick, ending in a point, with a little handle. It ſerves as a ſhuttle, the ſilks, woollens, gold, or ſilver, to be uſed in the work, being wound on it. The reed or comb is alſo of wood, eight or nine inches long, and an inch thick at the back; whence it uſually grows leſs and leſs, to the extremity of the teeth, which are more or leſs apart, according to the greater or leſs degree of fineneſs of the intended work.

Laſtly, the needle is in form of a common needle, only bigger and longer. Its uſe is to preſs cloſe the wool and ſilks, when there is any line or colour that does not ſit well.

All things being prepared for the work, and the workman ready to begin, he places himſelf on the wrong ſide the piece, with his back towards the deſign; ſo that he works, as it were, blindfold, ſeeing nothing of what he does; and being obliged to quit his poſt, and go to the other ſide the loom, whenever he would view and examine the piece, to correct it with his preſſing-needle.

To put any ſilk, &c. in the warp, he firſt turns and looks

looks at his design; then taking a broach full of the proper colour, he places it among the threads of the warp, which he brings across each other with his fingers, by means of the coats or threads fastened to the staff: this he repeats every time he is to change his colour.

The silk or wool being placed, he beats it with his reed or comb; and when he has thus wrought in several rows over each other, he goes to see the effect they have; in order to reform the contours with his needle, if there be occasion.

As the work advances, they roll it up on the lower beam, and unroll as much warp, from the upper beam, as suffices them to continue the piece: the like they do of the design behind them. When the pieces are wide, several workmen may be employed at once.

We have but two things to add: the first, that this *high warp tapestry* goes on much more slowly than the *low warp*, and takes almost double the time and trouble. The second, that all the difference the eye can observe between the two kinds consists in this, that, in the *low warp*, there is a red fillet, about one twelfth of an inch broad, running on each side from top to bottom; which is wanting in the *high warp*.

Manufacture of TAPESTRY *of the low warp*. The loom or frame, whereon the *low warp* is wrought, is much like that of the weavers: the principal parts thereof are two strong pieces of wood forming the sides of the loom, and bearing a beam or roller at each end: they are sustained at bottom with other strong pieces of wood, in manner of tresses; and, to keep them the firmer, they are likewise fastened to the floor with a kind of buttresses, which prevent any shaking, though there are sometimes four or five workmen leaning on the fore-beam at once.

The rollers have each their trunnions, by which they are sustained: they are turned by large iron pins three feet long. Along each beam runs a groove, wherein is placed the wich, a piece of wood of about two inches diameter, and almost of the length of the roller: this piece fills the groove intirely, and is fastened therein, from space to space, by wooden pins. To the two wiches are fastened the two extremities of the warp, which is wound on the farther roller; and the work, as it advances, on the nearer.

Across the two sides, almost in the middle of the loom, passes a wooden bar, which sustains little pieces of wood, not unlike the beam of a balance: to these pieces are fastened strings, which bear certain spring-staves, wherewith the workman, by means of two treddles under the loom whereon he sets his feet, gives a motion to the coats, and makes the threads of the warp rise and fall alternately. Each loom has more or fewer of these spring-staves, and each staff more or fewer coats, as the *tapestry* consists of more or fewer threads.

The design or painting, the *tapestry-man* is to follow, is placed underneath the warp; where it is sustained from space to space with strings, by means of which the design is brought nearer the warp.

The loom being mounted, there are two instruments used in working of it; *viz.* the reed, and the flute. The flute does the office of the weaver's shuttle; it is made of an hard polished wood, three or four lines thick at the ends, and somewhat more in the middle, and three or four inches long. On it are wound the silks, or other matters, to be used as the woof of the *tapestry*. The comb or reed is of wood or ivory; it has usually teeth on both sides; it is about an inch thick in the middle, but diminishes each way to the extremity of the teeth: it serves to beat the threads of the woof close to each other, as fast as the workman has passed and placed them with his flute among the threads of the warp.

The workman is seated on a bench before the loom, with his breast against the beam, only a cushion or pillow between them; and, in this posture, separating, with his fingers, the threads of the warp, that he may see the design underneath, and taking a flute, mounted with a proper colour, he passes it among the threads, after having raised or lowered them, by means of the treddles moving the spring-staves and coats.

Lastly, To press and close the threads of the silk or yarn, &c. thus placed, he strikes each course (i. e. what the flute leaves in its passing and coming back again) with the reed.

What is very remarkable in the manufacture of the *low warp*, is, that it is all wrought on the wrong side; so that the workman cannot see the right side of his *tapestry*, till the piece be finished and taken out of the loom.

Mr. Le Blon, in endeavouring to fix the true harmony of colouring in painting, found that all visible objects may be represented by the three primitive colours, red, yellow, and blue; because out of these, all others, even black itself, may be compounded.

From the principle of producing any visible object with a small number of colours, as represented under the article MEZZO-TINTO, and from observing the compounded colours which were reflected from two pieces of silk of different colours, placed near to one another, he arrived at the skill of producing in the loom all that the art of painting requires. In weaving, indeed, he hath been obliged to make use of white and black threads, besides red, yellow, and blue; and though he found that he was able to imitate any picture with these five colours, yet for cheapness and expedition, and to add a brightness where it was required, he found it more convenient to make use of several intermediate degrees of colours.

In his new way of weaving *tapestry* in the loom with a draw-boy, it may be performed almost as expeditiously as fine brocades; for when the loom is once set and mounted, any common draught-weaver, unacquainted with drawing or painting, and indeed hardly knowing what figure he is about, may exactly produce what the painter hath represented in the original pattern: and thus a piece of *tapestry* may be woven in a month or two, which, in the common way of working, would take up several years: and what in the common way costs a thousand pounds, may, by this means, be afforded finer and better for a hundred.

The main secret of this art consists in drawing the patterns, from which any common draught-weaver can mount the loom; and when that is done, the piece may be made of any size, by only widening the reeds and the warp: and a reverse may be made with the same ease; which is done by the boy's pulling the lashes up again in the same order in which he pulled them down before: by which contrivance the *tapestry* may be suited to any room, whether the light comes in on the right, or on the left. The patterns are painted upon paper, whereon are printed squares from copper-plates, and these subdivided by as many lines as answer to the threads of the warp, which run lengthwise of the piece; then they try how many threads of the shoot answer in breadth to every subdivision of the squares. Every thread of the warp goes through a small brass ring called a *male*, or through a loop in the leish, and hath a small long weight or lingoe hung below, to counterbalance the packthreads, which going from the top of the rings or loops, are passed over the pullies in the table directly over the loom, and are continued nearly in an horizontal position on one side of the loom to a convenient distance; where they are all spread on a cross piece fastened to two staples: these are called the *tail of the mounture*; and from each of these packthreads, just by the side of the loom, are fastened other packthreads, called *simples*, which descend to the ground; so that by pulling these simple cords, you raise any of the threads of the warp at pleasure: wherefore they fasten a loop or potlart to as many of these simple cords as there are threads of the warp to be pulled up at every shoot, or every throw of the shuttle; by which means the shoot shews itself on the right side, where the warp is pulled up: and in ordering this, they are guided by the pattern, on which they count the distances of the subdivisions, which contain the same colours in the same line, and can be shot at once: then they fasten potlarts to the several simple cords that draw up the rings, through which those threads of the warp run, which are to lie behind this colour; they tie all these loops together, and fasten a piece of worsted or silk to the knot, of the same colour that the workman is to throw; and the boy, when he pulls each loop, names the colour, that the weaver may take the proper shuttle, and so on for every colour to be thrown. Phil. Trans. Abr. vol. vi. p. 469, &c.

In connection with this subject, we are naturally led to give a brief account of the manufacture of carpets. This is said to have been introduced into France from Persia in the reign of Henry IV. where it has been distinguished by extraordinary encouragement. The most considerable manufactory of this kind is that of Chaillot, or the royal manufactory of La Savoniere, or the Soap-house, about a league from Paris. This manufacture is altogether of wool, and worked in the manner of velvet. All sorts of figures of animals may be imitated in this work, but fruits and flowers answer best, and it is most successfully applied to the manufacture of carpets and all sorts of screens.

The carpets are, in some respects, wrought by the upright way of *tapestry*. The two rollers are placed the same way: the warp is braced from the top downward: the chain, with its loops, keeps all the threads of the warp equally perpendicular; the stick, which facilitates their crossing, runs through them in the same manner, and separates the foremost threads from the rest: the lizier-pole holds all the strings, which serve to draw the fore-threads in their turns, and then the opposite threads, in order to insert the spindles of wool. But the method of working

working in this manufactory differs from the upright way of *tapestry* in the following particulars.

The warp is divided, both before and behind, into parcels of ten threads, nine white and one blue; which is regularly continued through the whole width of the piece. The weaver works on the foreside, and consequently sees what he does. The design or pattern is traced in its proper colours on cartons, tied about the workman, who looks at it every moment, because every stitch is marked upon it, as it ought to be in his work. By this means he always knows what colours and shades he is to use, and how many stitches of the same colour. In this he is assisted by squares, into which the whole design is divided; each square is subdivided into ten vertical lines, corresponding with each parcel of ten threads of the warp; and besides each square is ruled with ten horizontal lines, crossing the vertical lines at right angles. The workman having placed his spindles of thread near him, begins to work on the first horizontal line of one of the squares. These lines marked on the carton are not traced on the warp, for this would be endless; because an iron-wire, which is longer than the width of a parcel of ten threads supplies the place of a cross-line. This wire is managed by a crook at one end, at the workman's right hand; towards the other end it is flatted into a sort of knife, with a back and edge, and grows wider to the point. The workman fixes his iron wire, or rod, horizontally on the warp, by twisting some turns of a suitable thread of the woof round it, which he passes forward and backward, behind a fore thread of the warp, and then behind the opposite thread, drawing them in their turn by their leishes. Afterwards, if it be necessary, he brings his woof-thread round the wire, in order to begin again to thrust it into the warp. He continues in this manner to cover the iron rod or wire, and to fill up a line to the tenth thread of the warp, which is the blue one. He is at liberty either to stop here, or go on with the same cross line in the next division. According as he passes the thread of the woof round the iron wire, and into the warp, the threads of which he causes to cross one another every instant; when he comes to the end of the line, he takes care to strike in, or close again all the stitches with an iron reed, whose teeth freely enter between the empty threads of the warp, and which is heavy enough to strike in the woof he has used. This row of stitches is again closed and levelled, by a dweet of blue thread doubled, which the workman puts into the warp, sliding his hand over the whole length of line he has wrought. He crosses the same threads of the warp, and then stretches through them another single blue thread. He beats in these two threads, one after another with his reed; these dweets of cross thread, which are a support to each line, will be hid by the pile on the fore-side, and they indeed diminish the beauty of the wrong side; but this is of no consequence. This done, the workman draws the iron rod or knife out of the loops of the woof that covered it; and as it is wider towards its end, these loops resist its passage; but being edged at its fore part, it cuts them through. Then the workman with his left hand lays a strong pair of shears along the finished line, cuts off the loose hairs, and thus forms a row of tufts perfectly even, which, together with those before and after it, form the shag. One line of this sort comprehending the row of stitches and woollen pile, with the two blue threads which support them, somewhat surpass in thickness the space between the first and second cross line of a square. By this means the workman always sees what he is doing. He follows, stitch for stitch and colour for colour, the plan of his pattern which he is at, and paints magnificently without having the least notion of painting or drawing.

The manufacture of carpets, after the manner of Chaillot, was introduced into London in the year 1750, by two workmen who left the manufactory in disgust, and came here to procure employment. They were encouraged and furnished with materials by Mr. Moore, to whose assiduity and zeal the establishment of this sort of manufacture has been principally owing. However, these men afterwards connected themselves with a Mr. Peter Parisot, who, under the patronage, and by means of the pecuniary assistance of his royal highness the late duke of Cumberland, pursued the manufacture of a carpet already begun at Paddington. This undertaking was soon removed to Fulham, and, under the munificence of the duke, promised to be durable and advantageous. In 1752, Parisot, the undertaker, proposed a plan of subscription, the nature of which it is now needless to recite; as the whole scheme, as far as he was concerned in it, soon came to nothing. But Mr. Moore, being provided with the necessary materials and engaging proper workmen, and risquing a very considerable expence, succeeded in establishing this important and useful manufacture, insomuch, that, in 1757, he obtained a premium from the Society of Arts, &c. for the best carpet in imitation of the Turky carpets; and by his ingenuity and perseverance in bringing this manufacture to perfection, it is now arrived at a very high degree of reputation.

Mr. Whitby and Mr. Passavant were also honoured with premiums for carpets of their manufacture by the Society of Arts in 1757 and 1758. We have also manufactories for carpets that are much esteemed at Axminster and Wilton; not to mention those of Kidderminster and other places.

TAPETI, in *Zoology*, the name of an animal common in the West Indies, and called by some *cuniculus Americanus*, the *American rabbit*. In the Linnæan system, this animal is a species of HARE, or *lepus Brasiliensis*. It has large ears like the common hare; a white ring round the neck, though some have not this ring; the face of a reddish colour; the chin white, the eyes black; colour of the body like that of the common hare, but darker; the body whitish, without a tail. These animals inhabit Brasil, live in woods, do not burrow, are very prolific, and afford good meat. The *tapeti* is found also in Mexico, where it is called *citli*. Pennant.

TAPHICESIUS *lapis*, a name given by Pliny and the ancients to a species of ætites, or eagle-stone, found in a place of that name near Leucadia.

TAPHNEUS, a word used by some writers to express any thing when depurated or purified to the greatest degree, as the salts by repeated solutions and crystallizations, and the like. Paracelsus uses it for a species of earth, the things produced from which, he says, never alter their nature by calcination or reverberation, or the like operations.

TAPIA, in *Botany*, a name given by Plumier to a genus of plants called afterwards by Linnæus CRATEVA.

TAPIIR, or TAPIJERETE, in *Natural History*, the name of an animal found in some parts of America, and called by the Portuguese *anta*. It is of the size of a young calf, and in shape somewhat approaching to the figure of the hog, and the back arched; its head is thicker than a hog's, and ends in a sharp ridge at top; and the male has a snout, or sort of proboscis, hanging over the opening of the mouth, in which he has a very strong muscle, serving to retract it at pleasure; the nose of the female is destitute of the proboscis, and the jaws are of equal length; the dentes incisores are ten in each jaw; from the end of these the jaw seems toothless for a little space; the grinders are large, and are placed five on each side; so that, on the whole, the creature has twenty of each sort of teeth; its eyes are small, and very like those of the hog; its ears roundish, bordered with white; and these he can draw forward at pleasure; its legs are thick, and not longer than those of our hogs; its fore-hoofs are divided into three portions, and a sort of false hoof behind; but its hind-hoofs into three; its tail is very small; the skin is hard and solid; and the hair short, and of a pale brown, and when young, variegated with white spots; and along the neck is a bristly mane, an inch and a half high. It lives in thick woods, on the eastern side of South America, from the Isthmus of Darien to the river of Amazons; and sleeps all day, but at night or early in the morning goes out for its prey: it feeds on vegetables, and is particularly fond of the stalks of the sugar-cane; it often takes the water, and swims excellently; the natives, in places where it is common, eat its flesh, which is said to be good: the Indians shoot it with poisoned arrows, and cut the skin into bucklers. This animal is salacious, slow-footed, and sluggish, and makes a kind of hissing noise. Ray and Pennant. See *Tab.* V. *Quadrupeds*, N° 62.

TAPINOSIS, ταπεινωσις, in *Rhetoric*, the same with DIMINUTION.

TAPIS. See TUNICA.

TAPLINGS, in the *English Salt Works*, the name given to certain bars of iron which support the bottom of the pan in which the brine is boiled.

These pans are very large, and cover a wide furnace; but as their width would make them apt to bend in the middle, which would spoil the working of the salt, there is a sort of wall of brick carried along the middle of the furnace; and on the top of this are placed these *taplings*: they are about eight inches high, and from four to six in thickness, being smallest at the top. These are placed at about three feet distance one from another, and the wall which supports them, and which is called the *mid-feather*, is broad at the base, and so narrow at the top, as barely to give room for the bases of the *taplings*.

TAPPING, the act of piercing an hole in a vessel, and applying a tube, or cannula, in the aperture, for the commo-

commodious drawing off the liquors contained therein.

Tapping, in *Agriculture*, is the making an incifion in the bark of a tree, and letting out the juice.

To tap a tree at the root is, to open it round about the root.

Ratray, the learned Scot, affirms, that he has found by experiment, that the liquor, which may be drawn from a birch-tree in the fpring-time, is equal to the whole weight of the tree, branches, roots, and all together.

In the *tapping* of trees, the juice, taken in from the earth, afcends from the root; and, after it is concocted and affimilated in the branches, &c. it defcends like a liquor in an alembic, to the orifice or incifion where it iffues out.

One of the moft effectual ways of *tapping*, fo as to obtain the greateft quantity of fap, in the fhorteft time, is, not only to pierce the bark, or to cut the body of the tree almoft to the pith, with a chiffel (as fome have directed), but to bore it quite through all the circles, on both fides of the pith; leaving only the outermoft and the bark on the north-eaft fide unpierced.

This hole is to be bored floping upwards, as large as the largeft augre will make; and that alfo through and under a large arm near the ground. So will it not need any ftone to keep open the orifice, nor tap to direct the fap into the receiver.

By this method the tree will, in a fhort time, afford liquor enough to brew withal; and with fome of this fweet fap, one bufhel of malt will make as good ale as four bufhels of malt with ordinary water. The large maple, which we call the fycamore, is faid to yield the beft brewing fap, its juice being very fweet and wholefome. See Birch-*tree*.

To preferve the Sap *for brewing*. Infolate it by a conftant expofure to the fun in proper veffels, till the reft be gathered and ready; otherwife it will contract an acidity: when there is enough, put into it as much very thin cut, and hard toafted rye-bread, as will ferve to ferment it; and when it works take out the bread, and bottle up the liquor. A few cloves in each veffel that receives the fap, as it oufes from the tree, will alfo, certainly, preferve it a twelvemonth. See Dr. Tonge's Obf. in the Philofophical Tranfactions, N° 43, 44. 46. 68. or Abr. vol. ii. p. 673, &c.

Tapping, *paracentefis*, in *Surgery*, confifts in opening a little hole in the abdomen to let out waters collected in the cavity thereof, or between the teguments, in an afcites or water-dropfy.

The ancients cut the aperture with a lancet, or by inferting a knife, whofe point was about a third part of an inch broad, into one fide of the abdomen, about four fingers breadth below the navel; having ufually perforated the fkin firft with a cauftic. Then introducing a cannula of lead, copper, or filver, they difcharged fo much of the water at a time as the patient's ftrength would allow; and when a fufficient quantity of water was difcharged, the cannula was left in the wound, and its orifice ftopped with a cork or doffil of lint, over which was applied a fticking plafter, comprefs, and bandage, with the napkin and fcapulary. And the next day they repeated the difcharge again. But by leaving the cannula in the wound, it is almoft impoffible to avoid inflammation, mortification, or other bad fymptoms. The moderns, in order to avoid this and other inconveniences, have contrived the inftrument, with the cannula and fharp-pointed needle or bodkin, called a trochar. This inftrument, the end of it being firft dipped in oil, is thruft into the cavity of the abdomen, in the middle of the fpace between the navel and angle of the *os ilium*; and after drawing out the fharp-pointed bodkin from the cannula, which is left in the wound, as much water may be drawn off at a time as the patient can well bear; and if he does not grow faint, the whole quantity may be drawn off at once.

In order to prevent his fainting, the furgeon, or his affiftant, prefs with both hands on each fide of the abdomen during the operation; or a fwath made of broad linen, perforated in the middle, may be put round the abdomen, and gradually drawn tighter till all the water is evacuated. After this may be applied to the abdomen a flannel comprefs, which has been fqueezed out of fpirits of wine, and retained by a tight roller; by which means Heifter obferves, the patient not only avoids fainting, but rather becomes more eafy and robuft, fo as to walk about after the operation.

In *tapping* for the dropfy, furgeons were formerly very careful to draw off only a fmall quantity of water at one time, and therefore repeated it often, till the whole was evacuated. The reafon of this was to avoid the fyncope, which ufually attended the operation when all the water was evacuated at once. But Dr. Mead having difcovered the true caufe of this fyncope to be owing to the removal of the preffure from the defcending aorta, it was foon found, that the bad confequences might be prevented by emptying the belly at one operation, and preferving a proper preffure at the fame time, which fhould be done equally and gradually, as the water runs out. Bandages have been contrived for this purpofe in England and in France; but, according to Mr. Monro, they are not fufficient, and he therefore invented a belt of fine flannel, covered with ftrong linen, which will better anfwer the purpofe. The body of the belt is only fo wide as to reach from the fpine of one os ilium to that of the other; to one end of this body ftrong tapes or ribbands are fewed at a little diftance from each other, and to the other end are put as many well polifhed buckles. Near the inferior fide of the belt, and at a fmall diftance from each end, a little window is cut, which can be fhut with two buckles and ftraps. This belt, however, being fubject to fome inconveniences in the application of it, when the belly is very much diftended, he has improved it by adding a flanting flap to its inferior edge, from which two ftraps, with buckles at their extremities, pafs between the patient's thighs, and are faftened to other ftraps, which come out from the upper edge of the circular band, or to a fcapular bandage brought over the patient's fhoulders: by which contrivance, the flanting flap will comprefs the hypogaftric region, which the circular belt could not reach, and the additional ftraps, being lightly drawn, will keep the circular band ftretched at its full breadth.

For the draught and defcription of this belt, we refer to the Medic. Eff. Edinb. vol. i. art. 18. or its abridgment, vol. ii. p. 102. where the curious may find feveral practical obfervations about this operation.

With contrivances of this kind for compreffing the abdomen, it is the advice and practice of modern furgeons, to draw off the whole quantity of water at the firft *tapping*, and to repeat it upon a return of the diforder. Accordingly, Dionis and Garengeot affert, that extracting all the water at the firft time has little or no effect in weakening the patient if a proper preffure and bandage be ufed; Garengeot, therefore, makes the evacuation at once, and cleans the emptied cavity, in order to remove the feculent part of the waters which fubfides therein, and is apt, by its acrimony, to occafion mortifications.

As to the place where the perforation with the trochar is to be made in *tapping* the belly, it has been commonly determined to be four or five inches below, and as much to a fide of the navel, or a point where a line at that diftance from, and parallel to the linea alba, would be interfected by another line drawn perpendicular to the linea alba, at four or five inches below the navel.

Mr. Monro obferves, that this rule of meafuring four or five inches, which, in healthy perfons of middle growth and ftature, would determine a very fafe and convenient place for making the puncture, cannot be applied to hydropic people, whofe abdomen is diftended. Garengeot fays, that the puncture ought to be made in the middle between the navel and fpine of the os ilium; but this rule is uncertain: and, according to Mr. Monro, *ubi fupra*, the precife point to be pierced may be determined in all fubjects and different degrees of diftenfion, by only remarking that in a found ftate, a point four inches below, and to a fide of the navel, is the middle betwixt the navel and anterior fpinal procefs of the os ilium, and that the mufcular parts of the abdomen are almoft equally ftretched in the *hydrops afcites apertus*; whence it follows, that this middle point between the navel and this fpinal procefs is nearly invariable, and therefore, is the part where the perforation ought always to be made in *tapping*. In the operation, having marked this point with ink, he applies the belt above mentioned, with the flannel-fide next the fkin, well charged with fumes of benzoin maftich, and other fimilar drying and corroborant medicines, the marked point of the fkin being in the middle of one of the windows or openings of the belt, after which a linen comprefs or piece of flannel is put on the back to defend it from being hurt by the buckles, and a long piece of flannel three or four fold is put under the buckles, that they may not fret the fkin; and, laftly, the tapes or ftraps are put through the buckle and drawn a little tight, fo that the water is preffed to the part of the abdomen where is the leaft refiftance, or the part in the open window, which becomes more prominent and fitter for perforation; and thus alfo on account of the increafed diftance of the vifcera, &c. there will be lefs danger of wounding the guts, &c. by the point of the trocar. As the water is drawn off, the ftraps are pulled ftraighter; and the fame preffure on the abdomen may be preferved in every ftage of the operation, by maintaining the fame difficulty of breathing to the patient. When all the water is evacuated, a pledget and plafter are to be applied to the orifice, from which the cannula is

is taken away; and a compress being put over these, the window is to be shut on this, and brought to the same tightness with the rest of the band. This window can be opened and shut at pleasure, and the wound dressed, and the whole belt, as occasion requires, may be slackened or straitened.

Though the trochar is a sharp pointed instrument, yet there is no danger of wounding the intestines by it, when thrust into the abdomen; because they are kept at a considerable distance from the instrument by the intervening water: and even if the instrument were to touch the intestines, they would receive no great injury, as they make but little resistance. But as early *tapping* has been much recommended, in which case the quantity of water may not afford sufficient resistance to the common instrument; Mr. Andree has obviated this inconvenience by a new TROCHAR, which may be introduced without force, and, therefore, a small quantity of water will prevent its point from doing mischief.

Before the operation of *tapping* is undertaken, the surgeon should be well assured, that there is a quantity of water in the abdomen, by applying his two hands on each side of the patient's belly, as he stands or sits, and shaking it from one side to the other; by which means he will perceive a fluctuation of the water from one side to the other; which cannot be observed when the lymph is not extravasated into the cavity of the abdomen.

Mr. Sharp observes, that if the navel protuberates, and not the intestines or omentum, and water is only lodged there, a small puncture made there with a lancet will discharge the water, without endangering a rupture of the part.

Mr. Warwick tells us, however, that notwithstanding the improvements introduced into this operation, an ascites shews, that the use of *tapping* is but precarious, by returning as constantly as ever this method alone is put in practice to remove it. He has therefore endeavoured at a farther improvement, whereby the *tapping*, instead of being a bare temporary relief of symptoms, becomes an absolute cure. This method is, after evacuating the waters, to make an injection of equal parts of Cahors wine, or claret, and Bristol water, blood-warm, into the emptied cavity. He mentions a cure he performed in this manner. See Phil. Transf. N° 472. sect. 3.

Dr. Hales has given us in the same Transaction, sect. 4. a method of conveying liquors into the abdomen during the operation of *tapping*, by means of two trochars fixed at the same time one on each side of the belly, one of them having a communication with a vessel full of the medicinal liquor, by means of a small leather pipe. This vessel might be raised high enough above the abdomen to force the liquor in by the laws of hydrostatics. The advantage proposed by this method, is to prevent a syncope from inanition. See a farther account of the success of injecting medicated liquors into the abdomen, in the case of an ascites, in Phil. Transf. N° 473. sect. 4.

It has been a common complaint that *tapping* has seldom proved more than a palliative and temporary remedy in dropsies. Indeed when the dropsy proceeds from a schirrosity of some of the viscera, and is attended with an internal abscess, and a consumption of the whole habit, the surgeon can expect no credit or success from undertaking the operation; neither can he expect it in those dropsies, which come upon the patient not by degrees but all at once, which is a sign of some large lymphatic vessels being burst. But in young and robust patients, who have not been long subject to the disorder, the operation may be used with success, and the patient perfectly recovered. And though *tapping* of dropsical patients fails often in radically curing the disorder, the operation is neither dangerous nor very troublesome, and it at least eases them of the oppression, difficulty of breathing, and other symptoms with which they are afflicted.

The late Dr. Fothergill observes, that *tapping* may have incurred some part of its disgrace, from its being delayed too long: and, therefore, he has recommended it as early as possible, after finding that the quantity of water was such as could not be removed by medicines, without doing great violence to the constitution; and that the fluctuation was so evident as to render the operation safe. Accordingly, when he has been called to a patient tending to a dropsy, the belly beginning to fill, the urine passing in small quantities, the appetite failing and thirst increasing, with the loss of flesh in the upper parts of the body, he has recourse to such diuretics, purgatives, and corroborants intermixed, as the state of the case, and the nature of its causes indicate. If by a reasonable perseverance in this course, no considerable benefit accrues; if the viscera do not evidently appear to be obstructed and unfit for the future purposes of life; if the complaints have not been brought on by a long and habitual train of intemperance, and from which there seems little hope of reclaiming the patient; if the strength and time of life are not altogether unfavourable; he desists from medicine, except of the cordial restorative kind; and lets the disease proceed, till the operation becomes safely practicable: when this is done, by the moderate use of the warmer diuretics, chalybeates, and bitters, and also the preparations of squills in doses below that point at which the stomach would be affected, he endeavours to prevent them from filling again. Dr. Fothergill also mentions a method of scarification that has often succeeded in anasarcous swellings of the legs and thighs; at least so far as to draw off large quantities of water, without either so much pain or danger as in the common way by incisions. He orders this operation to be performed with the common scarificator used in cupping, and the instrument to be placed so as to make the wounds transversely. By this method, a large quantity of water will often drain from the legs and thighs, without risk of inflammation, or deterring the patient from a repetition, if necessary. To proceed with all possible safety, he commonly orders the instrument first to be applied about the middle of the calf on each side of the leg, and either to one leg only, or to both, as occasion requires. The application of glasses, either to raise the skin, or promote the discharge afterwards, is unnecessary. The instrument is gently pressed upon the skin till a surface is formed sufficiently flat to admit the lancets in the scarificator to take effect equally. By making these little openings in the skin transversely, they give vent more freely to the fluid, and are longer before they unite. This kind of application will prevent much mischief in all anasarcous habits, where the serosa colluvies increases fast, and the skin is so stretched as to threaten a rupture, or inflammation and gangrene. Likewise, where the breath is extremely affected in such habits, a temporary relief may, in this manner, often be obtained, in order to give a fair chance to remedies administered internally. Lond. Med. Obs. vol. iv. art. 9.

The paracentesis, or perforation of the thorax, is performed in several disorders; particularly in the EMPHYSEMA and EMPYEMA: and also of the scrotum for the HYDROCELE, by means of a lancet or TROCHAR, which is generally preferred, and of which Mr. Andree has proposed some improvement in order to adapt it for this operation. See, besides the writers already named and cited on this subject, Heister's Surgery, part ii. p. 65. 70. 117. See THORAX.

TAP-TOO. See TAT-TOO.

TAR, or TARR, a gross pitchy liquor, issuing from the wood and bark of old pines, or firs, either naturally, or or by burning. See PINE.

Some modern writers inform us, that *tar* flows from the trunks of pines and firs, when they are very old, through incisions made in the bark near the root; that pitch is only *tar* inspissated, and both are the oil of the tree grown thick and black with age and the sun. The trees, like old men, being unable to perspire, and the secretory ducts obstructed, they are, as one may say, choaked and stuffed with their own juice. But the method used by our colonies in America for making *tar* and pitch, is, in effect, the same with that of the ancient Macedonians; as appears from the account given in the Philosophical Transactions. And the relation of Leo Africanus, who describes, as an eye-witness, the making of *tar* on mount Atlas, agrees in substance with the methods used by the Macedonians of old, and the people of New England of this day.

According to Theophrastus, not only the turpentine-trees, the pines, and the firs, yield resin or *tar*, but also the cedars and palm-trees: and the words *pix* and *resin* are taken by Pliny in so large a sense, as to include the weepings of the lentiscus and cypress, and the balms of Arabia and Judæa; all which perhaps are near of kin, and in their most useful qualities concur with common *tar*, especially the Norwegian, which is the most liquid and best for medicinal uses. Those trees that grow on mountains, exposed to the sun or north wind, are reckoned to produce the best and purest *tar*; and the Idæan pines were distinguished from those growing on the plain, as yielding a thinner, sweeter, and better scented *tar*.

There is also a kind of *tar*, the project of making which was suggested by Becher, the celebrated chemist, in the time of king Charles II. which has for several years been prepared from coal in the bishopric of Liege, and in other parts of Germany: we also make considerable quantities in England, especially near Broseley in Shropshire, and at Bristol. In the bishopric of Liege, the coal is distilled in a kind of still, composed of two large cast-iron pots. In England the coal is put into ovens, which are heated by fires lighted under their bottoms, and the liquid

liquid matter is forced through an iron pipe inſerted into the top of the oven, and which communicates with proper condenſing veſſels. Watſon's Chem. Eſſ. vol. ii. p. 346, &c.

The earl of Dundonald, in Scotland, has lately invented the art of extracting *tar* and pitch from pit-coal, by a new proceſs of diſtillation. See Addreſs and Propoſals by Sir John Dalrymple. 1784.

Tar in ſubſtance, mixed with honey, has been found an excellent medicine for coughs.

The ancients eſteemed *tar* good againſt poiſons, ulcers, the bites of venomous creatures; alſo for pthiſical, ſcrophulous, paralytic, and aſthmatic perſons. But the method of rendering it an inoffenſive medicine, and agreeable to the ſtomach, by extracting its virtues in cold water, was unknown to them. Siris, ſect. 9. 16, 17. 21. 28. See TAR-*water, infra*.

Tar is ſometimes given in ſubſtance, mixed with ſo much powdered liquorice, or other ſuch powdery matter, as is ſufficient to render it of a fit conſiſtence to be formed into pills. See UNGUENTUM *è pice*.

But the chief uſe of *tar* is for paying the ſides of ſhips and boats, and their rigging, in order to preſerve them from the effects of the weather, which would otherwiſe crack or rot them.

TAR, *Barbadoes*. See BARBADOES *Tar*.

TAR, in *Sea Language*, a figurative expreſſion for a ſailor of any kind.

TAR-*water*. As the cold infuſion of *tar* has been formerly much in vogue, and has been recommended by one of the moſt learned and ingenious writers of the age, it may not be improper to give ſome account of its virtues from the biſhop of Cloyne's Siris, or chain of reflections concerning the virtues of *tar-water*.

In ſome parts of America, *tar-water* is made by putting a quart of cold water to a quart of *tar*, and ſtirring them well together in a veſſel, which is left ſtanding till the *tar* ſinks to the bottom. A glaſs of clear water being poured off for a draught, is replaced by the ſame quantity of freſh water, the veſſel being ſhaken, and left to ſtand as before. And this is repeated for every glaſs, ſo long as the *tar* continues to impregnate the water ſufficiently, which will appear by the ſmell and taſte.

But as this method produces *tar-water* of different degrees of ſtrength, the author ſays, he chuſes to make it in the following manner: pour a gallon of cold water on a quart of *tar*, and ſtir and mix them thoroughly with a ladle or flat ſtick, for the ſpace of three or four minutes; after which the veſſel muſt ſtand eight and forty hours, that the *tar* may have time to ſubſide; when the clear water is to be poured off, and kept for uſe, no more being made from the ſame *tar*, which may ſtill ſerve for common purpoſes.

This cold infuſion of *tar* hath been uſed in ſome of our colonies as a preſervative or preparative againſt the ſmall-pox, which foreign practice induced the biſhop to try it in his own neighbourhood, when the ſmall-pox raged with great violence. He ſays, the trial fully anſwered his expectation; all thoſe within his knowledge, who took the *tar-water*, having either eſcaped that diſtemper, or had it very favourably. Several were preſerved from taking the ſmall-pox by the uſe of this liquor; others had it in the mildeſt manner; and others, that they might be able to take the infection, were obliged to intermit drinking *tar-water*. He ſays, he has found it may be drank with great ſafety and ſucceſs for any length of time, and this not only before, but alſo during the aforeſaid diſtemper.

The general rule for taking it, is about half a pint night and morning, on an empty ſtomach, which quantity may be varied according to the caſe and age of the patient, provided it be always taken on an empty ſtomach, and about two hours before or after a meal.

It has been found, that ſeveral perſons, infected with cutaneous eruptions and ulcers, were immediately relieved, and ſoon after cured by the uſe of this medicine. It is ſaid, that even in the fouleſt diſtempers, it proved much more ſucceſsful than ſalivations and wood-drinks had done. It alſo ſucceeded beyond expectation, in a tedious and painful ulceration of the bowels, in a conſumptive cough, and (as appeared by expectorated pus) an ulcer in the lungs, in a pleuriſy and peripneumony. And when a perſon who had been for ſome years ſubject to eryſipelatous fevers, perceived the uſual forerunning ſymptoms to come on, the drinking of *tar-water* prevented the eryſipelas.

Tar-water cures indigeſtion, and gives a good appetite. It is an excellent medicine in an aſthma; it imparts a kindly warmth, and quick circulation to the juices, without heating, and is therefore uſeful, not only as a pectoral and balſamic, but alſo as a powerful and a ſafe deobſtruent in cachectic and hyſteric caſes. As it is both healing and diuretic, it is very good for the gravel. The biſhop ſays, he believes it to be of great uſe in a dropſy, having known it cure a very bad anaſarca in a perſon whoſe thirſt, though very extraordinary, was in a ſhort time removed by the drinking of *tar-water*. From the ſucceſs of this medicine in five or ſix inſtances, the biſhop believes it to be the beſt and ſafeſt, either for preventing the gout, or for ſo ſtrengthening nature againſt the fit, as to drive it from the vitals.

It may likewiſe be ſafely uſed in inflammatory caſes; and, in fact, hath been found an admirable febrifuge, at once the ſafeſt cooler and cordial.

The ſalts and more active ſpirits of *tar* are got by infuſion in cold water; but the reſinous part is not to be diſſolved thereby. Hence the prejudice which ſome, perhaps, may entertain againſt *tar-water*, the uſe whereof might inflame the blood by its ſulphur and reſin, as a medicine, appears to be not well grounded. It is obſerved by chemiſts, that all ſorts of balſamic wood afford an acid ſpirit, which is the volatile oily ſalt of the vegetable. Herein is chiefly contained their medicinal virtues; and this author affirms, that by the trials he has made, it appears, that the acid ſpirit in *tar-water* poſſeſſes the virtues, in an eminent degree, of that of guaiacum, and other medicinal woods.

It is certain *tar-water* warms, and therefore ſome may perhaps ſtill think it cannot cool. The more effectually to remove this prejudice, let it be farther conſidered, that, as on one hand, oppoſite cauſes do ſometimes produce the ſame effect; for inſtance, heat by rarefaction, and cold by condenſation, do both increaſe the air's elaſticity; ſo, on the other hand, the ſame cauſe ſhall ſometimes produce oppoſite effects. Heat, for inſtance, in one degree thins, in another coagulates the blood. It is not therefore ſtrange, that *tar-water* ſhould warm one habit, and cool another; have one good effect on a cold conſtitution, and another good effect on an inflamed one; nor, if this be ſo, that it ſhould cure oppoſite diſorders.

A medicine of ſo great virtue in ſo many different diſorders, and eſpecially in that grand enemy the fever, muſt needs be a benefit to mankind in general. There are neverthelеſs three ſorts of people to whom the biſhop ſays he would peculiarly recommend it; ſea-faring perſons, ladies, and men of ſtudious and ſedentary lives. See Two Letters from the biſhop of Cloyne, &c. publiſhed in 1747.

If it be aſked, what preciſe quantity or degree of ſtrength is required in *tar-water?* it is anſwered, that the palate, the ſtomach, the particular caſe and conſtitution of the patient, the very ſeaſon of the year will diſpoſe and require him to drink more or leſs in quantity, ſtronger or weaker in degree. Preciſely to meaſure its ſtrength by a ſcrupulous exactneſs, is by no means neceſſary.

It is to be obſerved, that *tar-water* ſhould not be made in unglazed earthen veſſels, theſe being apt to communicate a nauſeous ſweetneſs to the water.

The ſame ingenious author recommends *tar-water* in the plague, and for the diſtemper among the horned cattle; with what ſucceſs muſt be left to experience.

Though this medicine, ſays Dr. Lewis, is undoubtedly very far inferior to the character that hath been given of it, it is apparently capable of anſwering important purpoſes, as a deobſtruent balſamic ſolution, moderately warm and ſtimulating. It ſenſibly raiſes the pulſe, and increaſes either perſpiration or the groſſer evacuations. He adds, "I have been informed of ſome late inſtances "of its good effects in diſorders of the leprous kind." Mat. Med.

TARABE, in *Ornithology*, the name of a Braſilian parrot, larger than the common green parrot. Its general colour is green; but its head, breaſt, and the origin of its wings, are red; its beak and legs are of a duſky grey. Marcgrave.

TARAE *lapis*, the name given by the writers of the middle ages to a ſtone which they ſay had the power of ſtopping all ſorts of fluxes. They have left us no deſcription of it, and it ſeems to have been loſt even in their times; for they obſerve that the phyſicians uſed the ſanguis draconis, or dragon's-blood, in its place.

TARAGUICO *aycuraba*, in *Zoology*, the Braſilian name for a ſpecies of lizard, much approaching to the nature of the taraguira; but its tail is covered from its beginning with ſmall triangular ſcales, and very regularly marked with four brown ſpots; the back alſo, particularly that part which is next the head, is variegated with undulated brown lines. Ray.

TARAGUIRA, in *Zoology*, the name of an American lizard. It grows to about a foot long; its body is rounded, and every where covered with ſmall triangular duſky grey ſcales; its back is ſmooth, and it has not that falſe gullet under the throat which the iguana has.

This is the ſpecies of lizard of which it is reported, that it will wake a ſleeping perſon, if it ſee him in danger of

being

being bitten by a ferpent. It is very common about houfes and gardens in South America, and runs very fwiftly, but with a waddling motion; and when it fees any thing at a diftance, has an odd way of nodding its head very fwiftly. Ray.

TARANDUS, in *Zoology*, a name given by Agricola, and fome other authors, to the *rein*-DEER.

TARANIOLO, in *Ornithology*, a name by which the whimbrel, or fmall curlew, called the *arquata minor* by authors, is known in the markets of Italy.

TARANIS, in *Ancient Mythology*, a name given by the Gauls to Jupiter, under which appellation they facrificed human victims to him.

Taranis correfponded to the *Jupiter Tonans* of the Romans.

TARANTISMUS, in *Medicine*, the difeafe or affection of thofe bit by the *tarantula*.

The patients under this malady are denominated *tarantati*.

Dr. Cornelio, in the Philofophical Tranfactions, reprefents this as an imaginary difeafe; and tells us, that the *tarantati*, or thofe who think themfelves feized with it (excepting fuch as for particular ends feign themfelves fo) are moft of them young wanton girls, fuch as the Italian writers call *Donne di fale*, who, falling from fome particular indifpofition, into melancholy madnefs, perfuade themfelves, according to vulgar prejudice, that they have been bitten by a *tarantula*.

But the evidence, on the other fide of the queftion, has gained confiderable credit, as will appear from the following article.

TARANTULA, or TARENTULA, in *Natural Hiftory*, a venomous infect, whofe bite gives name to a new difeafe called *tarantifmus*.

The *tarantula* is a kind of fpider, the *aranea tarantula* of Linnæus, fo denominated from the city of Tarentum in Apulia, near which it is chiefly found. It is alfo called *phalangium Apulium*. Valetta, a monk of Apulia, who had always refided about the places where this mifchievous animal is moft frequent, and had had many opportunities of tracing its feveral qualities, publifhed a fuccinct, but very accurate hiftory of it in the year 1706, under this name.

It has its name *phalangium*, from the three phalanges or joints of its legs, and this name equally fuiting many other fpiders, as well as this, it ceafed to be its appropriated name, and was applied as a generical term to feveral other fpiders of the larger kind; among which this fpecies was always diftinguifhed by the epithet *Apulian*, from the place where it was fo frequently found.

The *tarantula*, or *Apulian phalangium*, is frequent in all parts of this country, in uncultivated places, but more efpecially it breeds moft in funny dry hills, and particularly in fuch parts of them as are expofed to the fouth.

It is faid not to be found any where except in Apulia, but probably it is an inhabitant of many other places, though its poifon may not be violent enough any where elfe to bring on the effects it does there: as we find in vipers and many other poifonous creatures, that the ftrength of their poifon differs greatly in degree in different places.

Mr. Geoffroy fays, that it is the opinion of fome, that the *tarantula* is never venomous but in the coupling feafon; and Baglivi fays, that it is never fo but in the heat of fummer; particularly in the dog-days, when, becoming enraged, it flies on all that pafs by.

As this fpider is very tender, and eafily injured by cold winds and rain, it always digs itfelf a cave in the fide of a hill for its habitation; and ufually chufes for this purpofe the hardeft ground it can find, which is better able to defend it, and which it eafily works into with its forceps and claws. This always is hollowed upward in the hill, and by that means is fafe from wet, all the water in rainy feafons running down over its top. Sometimes it burrows itfelf a cave in a valley or plain, but then it always chufes a dry, ufually a chalky foil. In this cafe the entrance into its cave is fmall, and within there are feveral winding paffages: if it happens to be furprifed with wet in this place from hard rains, it quits the floor and hangs by its feet againft the top of the cave. It preys upon a number of fmall infects, with which the fields of Apulia abound, and feldom appears in the daytime, but creeps out about the time of fun-fet, and preys at large upon the animals which are then betaking themfelves to reft; without the danger it would be expofed to from its own enemies by day-light. If at any time he remains the whole evening in his cave or den, it is only to practife another method of hunting his prey. In this cafe he comes forward to the mouth of the hole, and there lies in wait; his fore-legs are placed at the extremity of the hole, and his eyes have a clear view all round. The other infects are not aware of this trick, but as they walk near his hole he burfts out upon them, and, feizing them, conveys them into his habitation; where, as foon as he has eaten them, he retires back into his cell to difpofe of the wings and other fragments, till he can carry them out at a more convenient time, and then places himfelf in his former pofture for another prey.

The peafants of Apulia have a method of getting him out of his hole in the day-time, in order to deftroy him. This they do by making a foft hiffing noife through an oat ftraw: whether it be that the creature loves this found, or rather that he takes it for the voice of fome infect that he is ufed to prey upon, he always comes out, and falls a facrifice to his greedinefs.

This creature has eight legs, and walks very well; his legs have each three joints, and are covered with a fine downy hairinefs; they are of a whitifh colour at the bottom, and variegated with black lines, and are wholly black in their upper part, where they are joined to the breaft; thefe all arife from a kind of oval fhield, which is placed upon the breaft, and is black, hairy, and very hard: this is called by fome the *fpeculum* of the *tarantula*. From the fhoulders there grow a pair of horns, at leaft they are ufually called fo, though they feem much better to deferve the name of *arms*; the ufe of thefe is to hold faft the prey, that it may not be able to efcape while he is killing it with his forceps: thefe horns or arms have the fame number of joints that the legs have, but they greatly differ from the legs, in that they are fhorter, and of a yellowifh colour; they are alfo covered with a longer and thicker hair, for the more certainly holding the prey, and are terminated by black claws, and they are much fmaller and more capable of motion every way. The belly is either white, or of a pale yellow, and is marked with a tranfverfe black ftreak: this is furrounded with feveral other fmall fpots of the fame colour, and is clothed with a very fine and fhort down; the whole body befide is covered with longer hairs, and is of a whitifh or brownifh colour; the apex of the head, the fhield of the breaft, and the ends of the forceps, are as hard as a crab's claws, but the reft of the body is covered with a tender fupple fkin: the eyes are very large, and of a fine fhining black; they are continually in motion, and, when feen in the night or in a dufky place, they fhine like the eyes of a cat. In the place where the mouth is placed in other animals, there arifes in this a black hard forceps; the upper part of this inftrument is covered with a yellow hairinefs, and it is terminated by extremely fine and fharp claws, which the creature can open or clofe up at pleafure. While the arms hold the prey in a proper pofition, thefe fharp points make wounds in the body, and the other parts of the forceps fqueeze the body til all its juices are preffed out, and the creature feeds on them: the mouth is placed much below thefe, and ftands exactly in the proper place to receive the juices expreffed by this operation. The *tarantula* fleeps in his cave the whole winter, and a great part of the autumn and fpring; and, if during this time he is ploughed up, as is often the cafe, or is any other way taken out of his hole, he is found quite torpid and numbed, and is unable to do any mifchief by biting.

The hole or mouth of a tarantalous cave always gives fome idea of the fize of the creature within: he makes it fmall if he enters while young; and as he grows larger he eats away more and more of the earth to widen it ftill more, fo that the diameter of it is ufually about equal to the diameter of the body. The fize of a chefnut is about the ftandard of a full grown *tarantula*; but there are fome old ones found much larger and more hairy. The female is known from the male by having longer legs and a larger belly. They copulate in June and July, and at that feafon the females are often met with in the fields carrying the males upon their back. In Auguft and September they lay their eggs, which remain the whole winter; and in the fummer after are hatched.

Pliny tells a ftory of the young ones always eating up their mother for the firft food, which is countenanced by the relation of the peafants in thofe parts, who fay that they all fwarm about her and fuck her juices from many places at once, till they leave her lifelefs carcafs on the field, and then go each their feveral way in fearch of other food. The bite of the *tarantula*, as it is called, is not properly a bite, but a wound inflicted in a very peculiar manner. The creature pierces the fkin with its forceps, and at that inftant injects from its mouth a poifon into the wound. The time in which their wounds are fatal, is that of their copulation; at this time they are in their utmoft vigour and power of hurting. People of

of fashion are rarely hurt by them, but principally the poor labourers, who sleep half naked in the field, and the women who travel the country with naked feet, gathering medicinal herbs.

The bite occasions a pain, which at first seems much like that felt on the stinging of a bee, or an ant: in a few hours the patient feels a numbness, and the part affected becomes marked with a little livid circle, which soon after rises into a very painful tumor; a little after this he falls into a profound sadness, breathes with much difficulty, his pulse grows feeble, and his senses fail; at length he loses all sense and motion; and dies unless relieved. But these symptoms come somewhat differently, according to the nature of the *tarantula*, and the disposition of the patient. An aversion for black and blue; and, on the contrary, an affection for white, red, and green, are other of the unaccountable symptoms of this disease.

All the assistance medicine has been able to discover by reasoning, consists in some chirurgical applications on the wound, and in cordials and sudorifics; but these are of little efficacy: a thing that avails infinitely more, is, what reason could never have discovered—music.

As soon as the patient has lost his sense and motion, a musician tries several tunes on an instrument; and when he has hit on that, the tones and modulations whereof agree with the patient, he is immediately seen to make a faint motion: his fingers first begin to move in cadence, then his arms, then his legs, by degrees his whole body, at length he rises on his feet, and begins to dance; his strength and activity still increasing. Some will continue the dance for six hours without intermission.

After this he is put to bed, and when he is judged sufficiently recruited from his first dance, he is called out of bed, by the same tune, for a second.

This exercise is continued for several days, six or seven at least; in which time the patient finds himself exceedingly fatigued, and unable to dance any longer; which is the characteristic of his being cured; for as long as the poison acts on him, he would dance, if one pleased, without any discontinuation, till he died of the mere loss of strength.

The patient, on this, perceiving himself weary, begins to come to himself; and awakes as out of a profound sleep; without any remembrance of what had passed in his paroxysm, not even of his dance.

Sometimes the patient, thus recovering from his first access, is quite cured; if he be not, he finds a melancholy gloom hanging on him; he shuns the sight of men, and seeks water; and, if he be not carefully looked to, throws himself into some river. If he do not die, the fit returns at that time twelvemonth, and he is driven to dancing again. Some have had returns regularly for twenty or thirty years.

Every *tarantula* has his particular and specific tune; but, in the general, they are all very brisk, sprightly ones, that work cures.

This account was given in the Royal Academy of Sciences, by M. Geoffroy, at his return from Italy, in 1702, and confirmed by letters from F. Gouye. The like history is given us by Baglivi, in an express dissertation on the *tarantula*, published in 1696.

Authors are divided about the nature of the poison of the *tarantula*. Cardan says it is a cold one, and Scaliger says it is a hot one; but, be this as it will, Valetta informs us, that its effect is very sudden; it is no sooner received into the flesh but the veins take it up and carry it to the heart, where it becomes diffused through the whole mass of blood, and gives an immediate trembling of the limbs, and a difficulty of breathing. The next part it seizes is the brain, where it produces different effects in different subjects; and, according to their state of health, and the condition of their juices, brings on various species of phrensies. The patient sees a thousand phantoms, sometimes all jovial and merry ones, and sometimes imaginary scenes of blood and cruelty. Some are fond of seeing little streams of water trickling down into a bason; others are never easy unless they have green leaves before them: this indeed is almost an universal symptom. Some are delighted with various colours, and some are fond of violent motion, such as dancing, leaping, and the like; and some are in love with slow and graceful movements, as walking majestically, bowing, and dancing slow dances. Some are military mad, and call out for the noise of drums and trumpets, and the clashing of swords; but all of them, as well the brisk and noisy, as the lethargic and dull, are pleased with music.

They will get up and dance to any instrument; and the moment it ceases playing they will fall down to the ground as if apoplectic, and not stir again till the music is renewed. Many people have laughed at the whole history of the bite of the *tarantula*, from this one accident of its poison being cured by music; but all who have been upon the spot attest it. Valett. de Phaleng. Apulo.

To such extraordinary facts, it is no wonder a few fables should be added; as, for instance, that the patient is no longer affected than while the insect lives; and that the *tarantula* itself dances, all the while, to the same air with the person bitten.

Dr. Dominico Cirillo, professor of natural history at the university of Naples, positively contradicts the testimonies above recited. Having had an opportunity of examining the effects of this animal, in the province of Taranto, where it is found in great abundance, he affirms that the surprising cure of the bite of the *tarantula* by music has not the least truth in it; and that it is only an invention of the people, who want to get a little money, by dancing when they say the tarantism begins. He makes no doubt but the heat of the climate contributes very much to warm their imagination, and to throw them into a delirium, which may be in some measure cured by music: but several experiments have been tried with the *tarantula*; and neither men nor animals, after the bite, have had any other complaint, except a very trifling inflammation on the part, like that produced by the bite of a scorpion, which goes off by itself without any danger at all. In Sicily, where the summer is still warmer than in any part of the kingdom of Naples, the *tarantula* is never dangerous, and music is never employed for the cure of the pretended tarantism. It is without doubt very extraordinary, says this writer, that a man of sense, and a physician of great learning, as Baglivi was, should have been satisfied with the account of this disorder; and that, instead of examining the facts by experiments, he should rather have tried to explain it: but even philosophers like very much to meet with wonderful and extraordinary things, and though they are against all reason, still they want them to be true, and endeavour to find out the cause of them. Every year this surprising disorder loses ground; and he is persuaded, that in a very little while it will entirely lose its credit. The Neapolitan physicians all look upon the *tarantula* in the same light, particularly after the ingenious book published on this subject by the learned Dr. Serao; who, by various experiments has proved, that the bite of the *tarantula* never produced any bad effects, and that music never had any thing to do with it. Philosoph. Trans. vol. lx. art. 22.

The bite of the *tarantula*, and the method of its cure, were, however, for many years subjects of elaborate discussion; and different theories were proposed for explaining them, some account of which it may not be improper to preserve.

Theory of the TARANTULA'*s bite*, by M. Geoffroy. The poisonous juice injected by the *tarantula*, M. Geoffroy conceives, may give the nerves a degree of tension, greater than is natural to them, or than is proportionate to their functions: and hence may arise a privation of knowledge and motion. But, at the same time, this tension, equal to that of some strings of an instrument, puts the nerves in unison to certain tones, and obliges them to shake, after being agitated by the undulations and vibrations of the air proper to those tones. And hence, this wonderful cure by music: the nerves, thus restored to their motion, call back the spirits thither, which before had abandoned them.

It may be added, with some probability, and on the same principles, that the patient's aversion for some colours arises hence, that the tension of his nerves, even out of the paroxysm, being still different from what it is in the natural state, the vibrations those colours occasion in the fibres of the brain, are contrary to their disposition, and occasion a kind of dissonance, the effect of which is pain.

Theory of the effects of the TARANTULA'*s bite*, by Dr. Mead. The malignity of the poison of the *tarantula* seems to consist in its great force and energy, whereby it immediately raises an extraordinary fermentation in the whole arterial fluid, by which its texture and crasis are considerably altered: the consequence of this alteration, when the ebullition is over, must necessarily be a change in the cohesion of its parts, by which the globules, which did before with equal force press each other, have now a very differing and irregular nisus, or action; so that some of them do so firmly cohere together, as to compose moleculæ, or small clusters: upon this account, as there is now a greater number of globules contained in the same space than before; and the impulse of many of these, when united together, differing according to the conditions of their cohesion, as to magnitude, figure, &c. the impetus, with which this fluid is driven towards the parts, will not only be at some strokes greater than ordinary, but

but the pressure upon the blood-vessels must be very unequal, and irregular; and this will be particularly felt in those which are most easily distended, as those of the brain, &c.

Upon this, the nervous fluid must necessarily be put into various undulatory motions, some of which will be like those, which different objects, acting upon the organs or passions of the mind, do naturally excite in it; whereupon such actions must follow in the body, as are usually the consequences of the several species of sadness, joy, despair, or the like determinations of thought.

This, in some degree, is a coagulation of the blood, which will, the more certainly, when attended with uncommon heat, as is the case in those countries where these creatures abound, produce such like effects as these: because the spirits separated from the blood thus inflamed, and compounded of hard, fixed, and dry particles, must unavoidably share in this alteration; that is, whereas their fluid consists of two parts, one more active and volatile, the other more viscid and glutinous, which is a kind of vehicle to the former; their active part will bear too great a proportion to the viscid; and consequently they must have more than ordinary volatility and force; and will, therefore, upon the least occasion imaginable, be irregularly determined to every part.

Whereupon will follow tumblings, anger, or fear, upon a light cause; extreme pleasure at what is trivial, as particular colours, or the like: and, on the other hand, sadness at what is not agreeable to the sight; nay, laughter, obscene talk and actions, and such other symptoms as attend persons bit; because, in this constitution of the nervous fluid, the most slight occasion will make as real a reflux and undulation of it to the brain, and present as lively species there, as the strongest cause and impression can produce in its natural state and condition; nay, in such a confusion the spirits cannot but sometimes, without any manifest cause at all, be hurried towards those organs, to which, at other times, they have been most frequently determined; and every one knows which these are in hot countries.

The effect of music on persons touched with this poison confirms the doctrine above delivered. For muscular motion, we know, is no other than a contraction of the fibres, from the arterial fluid's making an effervescence with the nervous juice, which, by the light vibration and tremor of the nerve, is derived into the muscle.

Thus there is a twofold effect and operation of the music, that is, upon the body and the mind: a brisk harmony excites lively species of joy and gladness, which are always accompanied with a more frequent and stronger pulse, or an increased influx of the liquor of the nerves into the muscles; upon which suitable actions must immediately follow.

As for the body, since it was sufficient to put the muscles into action, to cause those tremors of the nerves, by which their fluid is alternately dropped into the moving fibres, it is all one whether it be done by the determination of the will, or the outward impressions of an elastic fluid: such is the air; and that sounds are the vibrations of it, is beyond dispute: these, therefore, rightly modelled, may shake the nerves as really, as the *imperium voluntatis* can do; and, consequently, may produce the like effects. The benefit of music arises not only from their dancing to it, and so evacuating by sweat, a great part of the inflammatory fluid; but, besides this, the repeated percussions of the air hereby made, by immediate contact shaking the contractile fibres of the membranes of the body, especially those of the ear, which, being contiguous to the brain, communicate their tremblings to its membranes and vessels; by these continued succussions and vibrations, the cohesion of the parts of the blood is perfectly broken, and the farther coagulation prevented: so that the heat being removed by sweating, and the coagulation by the contraction of the muscular fibrillæ, the wounded person is restored to his former condition.

If any one doubts of this force in the air, he may consider, that it is demonstrated in mechanics, that the smallest percussion of the smallest body may overcome the resistance of any the greatest weight, which is at rest; and that the languid tremor of the air, which is made by the sound of a drum, may shake the largest edifices.

But, besides this, we must allow a great deal to the determinate force, and particular modulation of the trembling percussions; for contractile bodies may be acted upon by one certain degree of motion in the ambient fluid, though a greater degree of it, differently qualified, may produce nothing at all of the like effect: this is not only apparent in two common-stringed musical instruments, tuned both to the same height; but also in the trick which many have of finding the tone or note peculiarly belonging to any wine-glass, and, by accommodating their voice exactly to that tone, and yet making it loud and lasting, make the vessel, though not touched, first to tremble, and finally to burst; which it will not do, if the voice be either too low, or too high.

This makes it no difficult matter to conceive, why different persons, infected with this sort of venom, do require a different sort of music, in order to their cure; inasmuch as the nerves and distractile membranes have different tensions, and consequently are not all alike to be acted upon by the same vibrations.

TARANTULA, in *Zoology*, is also the name given by the Italians to a peculiar species of lizard, called by Aldrovand and some others, *lacertus facetanus*. See *Tab. Serpents*, Nº 36.

It is of a grey colour; its skin is extremely rough; and it is thicker and rounder bodied than the other lizards. It is found like our common eft, under old walls, and among the ruins of buildings, particularly in the neighbourhood of Rome, in great plenty; its colour looks dead and ghastly, and it is as odious to the sight among the Italians, as the toad is with us, being never seen without a sort of natural horror. It is esteemed also a poisonous creature, as the toad is with us, though it is not easy to find well-attested stories of any body's ever having been hurt either by the one or the other of these creatures. Ray.

TARAXIPPUS, formed of ταρασσω, *I frighten*, and ιππος, *horse*, a kind of evil genius, the statue of which was erected in the Grecian HIPPODROMES, in order to alarm and frighten the horses in their course. The shape and form of this strange deity are not described; but he certainly answered the end for which he was designed: it frequently happening, that the horses were so scared at his appearance, as to run away with the utmost violence, and expose the lives of their riders or drivers to the most imminent danger. Many conjectures have been formed concerning this strange deity, and the means he used to frighten the horses: but the most probable conclusion will be, perhaps, to suppose, that some tricks and artifices were practised under the disguise of this figure, either with a design to render the victory more honourable, in proportion to the difficulty of gaining it, or else that this horse-frightening deity was placed in the course as a touch-stone, to prove the resolution and temper of the horses; and to oblige the candidates to bring none into the field but such as by exercise and discipline were so assured and steady, as not to let their obedience be shaken upon the most trying occasions. Berenger's Hist. and Art of Horsemanship, vol. i. p. 54. See STADIUM.

TARBASON, a word used by some chemical writers as a name for antimony.

TARCHONANTHUS, *shrubby African flea-bane*, with sage-leaves smelling like camphor, in *Botany*, a genus of the *syngenesia polygamia æqualis* class: the characters of which are these: it has a flower composed of several hermaphrodite florets included in one common top-shaped empalement, which is short, permanent, and hairy: the florets are uniform, funnel-shaped, and of one petal indented in five parts at the top; they have each five very short hair-like stamina, terminated by cylindrical tubulous summits longer than the petal, and an oblong germen, supporting a style of the length of the stamina, crowned by two awl-shaped stigmas, which open lengthways; the germen afterwards turns to a single oblong seed, crowned with down, which ripens in the empalement. There is only one species, which grows naturally at the Cape of Good Hope.

TARDA *avis*, in *Ornithology*, a name given by many to the BUSTARD, more commonly known among authors by the name *otis*.

TARDO, in the *Italian Music*, is used to denote a slow movement, being much the same as LARGO.

TARE, in *Botany*. See VETCH.

TARE and *tret*, in *Commerce*, any defect, waste, or diminution in the weight, the quantity, or the quality of goods.

The seller is usually to account to the buyer for the *tare* and *tret*.

TARE is more particularly used for an abatement, or deduction, in the price of a commodity, on account of the weight of chests, casks, bags, &c. in which goods are put up, and whose weight may be known separately from that of the goods: and which being subtracted from the gross weight, or that of the cask, &c. and goods together, gives the weight of the goods alone, or the nett, or neat weight. But if the *tare* is not known separately, and an allowance made for it at so much per hundred weight, or hundred yards, &c. then the deduction of the *tare* is by the rule of three. The allowance, called TRET, is calcu-

calculated in the same way. Ex. 1. at 7 lb. *tare*, or tret, to 112 lb. gross, what is the *tare*, and also the nett weight, when 746 lb. gross was received? say, as 112 lb. to 7 lb. so is 746 lb. to the *tare* sought, which subtracted from 746 lb. the remainder is the nett weight.

Ex. 2. At 5 lb. *tret* to 112 lb. gross, what gross weight must be received, when 84 lb. nett was paid for; and, how much is allowed? subtract 5 from 112, then say, as 107 the remainder to 112, so is 84 to the gross weight sought; the difference of which and 84 is the allowance: or thus: as 107 to 5, so is 84 to the allowance sought, which, added to 84, gives the gross weight sought. Thus from the gross weight, nett weight, and allowance, or any two of these in one case given, with any one of them in another case, we may find the other two in that other case.

There are sometimes two allowances deducted out of the same quantity; first *tare*, and then *tret*: after the *tare* is deducted, the remainder is called particularly *subtle*, or *suttle weight*, out of which the tret is deducted, and the last remainder is called *nett weight*.

Ex. 3. *Tare* being allowed at 4 to 112, and tret at 5 to 112, what is the nett weight in 87 lb. gross? say, as 112 to 108 (=112−4) so is 87 lb. to the subtle; then as 112 to 107 (=112−5) so is the subtle to the nett. And if you multiply 108, 107, and 87 continually, and also 112 by 112, and divide that product by this, the quotient is the nett weight sought. Malcolm's Ar. p. 564.

The *tare* is very different, in different merchandizes: in some there is none at all allowed. It is a thing much more regarded in Holland than in England, or elsewhere: a modern author, M. Ricard, treating of the commerce of Amsterdam, observes, that the *tares* are one of the most considerable articles with which a merchant is to be acquainted, if he would trade with security.

Sometimes the *tare* is, as it were, regulated by custom; but generally, to avoid all dispute, the buyer and seller make a particular agreement about it. We shall here add, from the before mentioned author, some instances of *tares* allowed at Amsterdam, referring the reader for a more ample account to his Negoce d' Amsterdam, edit. 1722.

Spanish wools are subject to a kind of double *tare*: for, first, they deduct the *tare* marked on the bales; and, after that twenty-four pounds *tare* for every one hundred and seventy-five pound weight, besides the rebate for prompt payment. Indeed, for the common wools, the seller will seldom allow above fourteen *per cent*. for the whole *tare*; for which reason, the bargain is to be agreed on before.

TARE of Roman alum is 4 *lib. per* sack.
of Irish, &c. butter, 20 *per cent.*
of crude borax, 15 *lib. per cent.*
of cinnamon, 17 *lib.* the burden.
of capers, 33 *per cent.*
of white pepper, 40 *lib. per* barrel.
of black pepper, 5 *lib.* &c.

TAREIBOIA, in *Zoology*, the name of a species of serpent found in America, and called also *cacaboia*; though, according to some authors, the *tareiboia* and *cacaboia* are two different species.

They are both of the amphibious kind, and live in lakes and waters, as well as on land; but they are not very poisonous. They are small snakes and all over black; when offended they will bite; but the wound is easily curable. Authors have written differently of these serpents, some making the latter very different from the former, and of a yellow colour. Ray.

TAREIRA, in *Ichthyology*, the name of a fish caught in the American seas, and eaten, but of no fine flavour. It is of an oblong and thick body, gradually tapering toward the tail; its head resembles that of a snake, and is raised into two tubercles over the eyes; its eyes are yellow, with a black pupil; its nose pointed, and its mouth large and yellow within; it has extremely sharp teeth in both its jaws, and on its tongue; it has eight fins, the tail being accounted one, and this is forked; but this, as well as the rest, is of the consistence of a poppy-leaf, tender, thin, and soft, and sustained by soft rays; its scales are so nicely laid on one another, that it seems smooth to the touch; its belly is white, and its back and sides are variegated with longitudinal green and yellow lines. Marcgrave.

TARENTULA. See TARANTULA.

TARGAR, a name given by some of the chemical writers to oil of juniper.

TARGET, a *shield*; thus called from the Latin, *tergum*, *back*, because originally made of leather, wrought out of the back of an ox's hide.

TARGET, is also the name of a mark for the artillery to fire at in their practice.

TARGIONIA, *vetchcap*, in *Botany*, a genus of the *cryptogamia algæ*. Its characters are, that it has a bivalve calyx including a globular body. There is one species.

TARGUM, in the *sacred Literature*, a name which the Jews give to their Chaldee glosses, and paraphrases on the Scripture. See PARAPHRASE.

These Chaldee paraphrases, which were translations of the Scriptures of the Old Testament, from the Hebrew text into the language of the Chaldæans, were called *targums*: for the word *targum* signifies in Chaldee an interpretation or version of one language into another, and may properly be applied to any such version or translation: but it is most commonly by the Jews appropriated to these Chaldee paraphrases by way of eminence.

As the Jews, during their long captivity in Babylon, had forgot their ancient language, the Hebrew; and now understood nothing but the language of their masters the Chaldeans; there was a necessity of explaining the prophets in that language; and to this necessity is owing the first beginning of the Chaldee paraphrase.

To make the sense of the text understood, each doctor made a paraphrase of some part thereof in the vulgar tongue; and as these several interpretations, in time, became very voluminous, certain rabbins undertook to collect them together: and this collection they called the *Targum*.

The Jewish doctors do not agree about the antiquity of the *Targum*; for the more modern Jews having blended their own comments with those of the ancients, no certain age or æra can be fixed for the whole work.

It is commonly believed, that R. Jonathan, who lived under the reign of Herod the Great, made the first Chaldee version of the prophets; and with this version mixed the interpretations borrowed from tradition. Onkelos, it is certain, translated the Pentateuch almost word for word; and without any paraphrase; and another version of the Pentateuch is ascribed to Jonathan, but that without much certainty.

Dr. Prideaux thinks, that the version or *Targum* of Onkelos is the most ancient of all that are now extant: and the principal reason of his adopting this opinion is, that the style in which it is written approaches nearer to the style of that part of Daniel and Ezra, which is written in the Chaldee language, and which may be considered as a standard of its purity, more than any other. This *Targum* has been held in higher esteem among the Jews than all the other *Targums*, and being set to the same musical notes with the Hebrew text, it is thereby made capable of being read in the same tone in their public assemblies. The next to this in the purity of its style is the *Targum* of R. Jonathan Ben Uzziel. The third *Targum*, or that on the law, ascribed to Jonathan, is not his, because the style of it is wholly different from that of his true *Targum* on the Prophets, and several things are mentioned in it, which had no being, or at least no name till after Jonathan's time. The fourth *Targum* is on the law, written by an unknown author, and at an unknown period. It is called the *Jerusalem Targum*, probably because it was written in the Jerusalem dialect, which was spoken by the Jews after their return from Babylon, and which contains a mixture of Hebrew words with the Chaldee. This *Jerusalem Targum* is not a continued paraphrase, as all the rest are, but confined to select passages, as the author seems to have thought the text most wanted an explication. In many places it is taken word for word from the *Targum*, said to be Jonathan's, on the law: and contains several things which are delivered in the same words in the New Testament by Christ and his apostles. Dr. Prideaux accounts for this circumstance, by supposing that these were sayings and phraseologies which had obtained among the Jews in the time of our Saviour, and continued among them long after; and hence Christ and his apostles, and afterward the author of this *Targum* derived them from the same source. The fifth *Targum*, which is that on the Megilloth, i. e. Ruth, Esther, Ecclesiastes, Solomon's Song, and Jeremiah's Lamentations. The sixth which is the second *Targum* on Esther, and the seventh, which is that on Job, the Psalms, and the Proverbs, are all written in the most corrupt Chaldee of the Jerusalem dialect. Of the two former no author is named: but the author of the third is said to be Joseph the one-eyed, but who he was, or when he lived, we are not told: that on the Megilloth, which mentions the Mishna and the Talmud with the explication, must have been written after the Babylonish Talmud, or the year of Christ 500. The eighth, and last of these *Targums*, is that on the two books of Chronicles; published by Beckius at Augsburg in Germany, that on the first book in 1680, and that on the second in 1683.

That the *Targum* of Onkelos on the law, and that of Jonathan on the prophets, are as ancient as our Saviour's time, if not more ancient, is the general opinion of both Jews and Christians. As to all the other *Targums* besides these two, they are certainly of a much later date: the style of every one of them is more barbarous and impure than that of the Jerusalem Talmud, and they must,

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therefore, have been written after the composure of that work, i.e. after the beginning of the fourth century after Christ; and if the Talmudic fables with which they abound were taken out of the Babylonish Talmud, this will bring their date still lower, and prove them to have been written after that Talmud, or after the beginning of the sixth century after Christ.

The *Targums* of Onkelos and Jonathan are in such great esteem among the Jews, that they hold them to be of the same authority with the original sacred text; and for the support of this opinion, they feign them to be derived from the same fountain. The Chaldee paraphrase of Onkelos, they say, was delivered in the same manner with the real law, when God gave the written law unto Moses at Mount Sinai; and when by his holy Spirit he dictated to the prophets the prophetical books, he delivered severally to them upon each book the *Targum* of Jonathan at the same time. These were delivered by faithful hands, the first from Moses, and the other from the prophets, till they came down to Onkelos and Jonathan, who only put them into writing.

Agreeably to the high opinion, that was entertained of them, they were read every Sabbath day in their synagogues in the same manner as the original sacred Word itself, of which they were versions; and this use of them was continued to late times. Whether the *Targums* of Onkelos and Jonathan were received for this use so early as our Saviour's time is not certain; however, it seems, that these or some others were used for the instruction of the people, and were read among them in private as well as in public. These *Targums* are of great use for the better understanding not only of the Old Testament, on which they are written, but also of the New. As to the Old Testament they serve to vindicate the genuineness of the present Hebrew text by proving it to be the same that was in use, when these *Targums* were made, contrary to the opinion of those who think the Jews corrupted it after our Saviour's time. They help to explain many words and phrases in the Hebrew original, and they hand down to us many of the ancient customs of the Jews. And some of these, with the phraseologies, idioms, and peculiar forms of speech, which we find in them, do in many instances help as much for the better illustration and better understanding of the New Testament as of the Old: the Jerusalem Chaldee dialect, in which there are written, being the vulgar language of the Jews in our Saviour's time. They also very much serve the Christian cause against the Jews by interpreting many of the prophecies of the Messiah in the Old Testament, in the same manner as the Christians do. Many instances are produced to this purpose by Dr. Prideaux in his Connect. of the Hist. of the Old and New Test. vol. iv. p. 777, &c.

These *Targums* are published to the best advantage in the second edition of the great Hebrew Bible set forth at Basil by Buxtorf the father, anno 1610, for he has rectified the Chaldee text, and reformed the vowel pointings in it: the *Targums* having at first been written without vowel points, which were afterwards added very erroneously by some Jews.

TARIERA, in *Ichthyology*, the name of a river-fish caught in many parts of America.

It is an oblong fish, with a straight back, and a belly somewhat hanging down; its under jaw is longer than its upper, and its teeth are extremely sharp; among these are two longer than the rest in the middle of the under jaw, and four such in the upper; its scales are large, its back brown, and its belly and sides whitish. It is a well-tasted fish, but full of bones. Marcgrave.

TARIF, or TARIFF, *book of rates*; a table or catalogue, drawn usually in alphabetical order, containing the names of several kinds of merchandize, with the duties or customs to be paid for the same, as settled by authority, and agreed on between the several princes and states, that hold commerce together.

TARIFILON, in *Botany*, a name by which Avicenna, and some other authors, have called the *trifolium bituminosum*, or *stinking trefoil*.

TARIN, in *Commerce*, a money of account at Naples, Sicily, and Malta. Its value at Naples is estimated at eighteen sols of France, and at Malta it is reckoned worth twenty grains, which amount to the same value.

TARIN, in *Ornithology*, a name given by the French, and from them by many others to the CITRINELLA; a bird common in Italy, and kept in cages for its beauty and fine notes.

TARINGTING, in *Natural History*, a name given by the people of the Philippine islands, to a species of lapwing which is common on the sea-shores, and runs remarkably swift.

TARITH, one of the many names given by the chemists to MERCURY.

TARNISHING, a diminution of the natural lustre of any thing, especially of a metal.

Gold and silver, when *tarnished*, resume their brightness, by setting them over the fire, in certain leys. Copper, pewter, &c. that are *tarnished*, recover their lustre with tripoli and pot-ashes.

TAROATAIHETOOMO is the name of one of the two first or supreme deities at Otaheite: the other, who is supposed to have been a rock, is called *Tepapa*. These produced a son called *Tane*, to whom their prayers are generally addressed, and who is supposed to interest himself in the affairs of mankind; and a daughter called *Tollowmatatayo*, the *Year*, from whom proceed the months and days. From the two first beings they suppose also to have sprung an inferior race of deities called EATUAS. Hawkesworth's Voy. vol. ii. p. 238.

TARPAULIN, or TARPAWLING, is a piece of canvass, well pitched and tarred over, to cover the hatchways of a ship at sea, in order to prevent the penetration of the rain or sea-water, which may occasionally rush over the decks.

The term is also used in derision for a person bred at sea, and educated in the mariner's art. We also, of late, use it to express a painted floor-cloth.

TARPEIAN, TARPEIUS, in *Antiquity*, an epithet given to a rock in ancient Rome, of considerable height; whence, by the law of the Twelve Tables, those guilty of certain crimes were precipitated. It was on this rock that the Capitol was built.

The *Tarpeian* rock might formerly be steep enough on one side to break a man's neck; but it could never have been of that surprising height, mentioned by some writers, if any judgment can be formed from its appearance at present. See Burnet's Letters, p. 238, and Misson's N. Voyage, p. 103.

It took its name from a vestal, called *Tarpeia*, who betrayed the Capitol, whereof her father was governor, to the Sabines; on condition they would give her all they bore on their left arms, meaning their bracelets. But, instead of bracelets, they threw their bucklers (which were likewise borne on their left arm) upon her head, and crushed her to death.

Others ascribe the delivery of the Capitol to her father, Spurius Tarpeius; and add, that he was precipitated down this rock by Romulus's order, and that this henceforward became the punishment of all criminals of the like kind.

TARPEIAN *Games*, *Ludi* TARPEII, were games instituted by Romulus in honour of Jupiter Feretrius; and called also *Capitolini ludi*. See CAPITOLINE.

TARRACE, TARRASS, TERRACE, or TERRASS, a coarse sort of plaster, or mortar, durable in the wet, and chiefly used to line basons, cisterns, wells, and other reservoirs of water.

That which is called the Dutch *terrass*, is made of a soft rock stone, found near Collen, upon the lower part of the Rhine; it is burnt like lime, and afterwards reduced to powder by means of mills: from thence it is brought to Holland in great quantities, where it has acquired the name of Dutch *terrass*. It is of a greyish colour when it is not mixt, which is very seldom the case: because it is very dear, and the demand for it in aquatic works very great. It is said that in some parts of England there is found a soft stone, resembling that of Dutch *terrass*, and which might serve as well in aquatic works. Muller's Syst Math. vol. iv. p. 111.

An artificial *terrass*, resembling the true, may be formed of two parts of lime, and one part of plaster of Paris, well beaten together and used immediately. There is another sort of *terrass*, used for coarser uses, which is sometimes called *Welsh terrass*, formed of one part lime, and two parts of well-sifted coal ashes, thoroughly mixed by being well beaten together. Handm. to the Arts, vol. ii. p. 32.

TARRAGON, a name sometimes given to SOUTHERN-WOOD.

TARROCK, in *Ornithology*, the name of a sea-fowl of the larus or gull-kind, and distinguished by authors by the name of the *larus cinereus Bellonii*; and called by Linnæus the *larus tridactylus*.

It is of the size of the common pigeon, and is not much unlike it in shape, except that the head is larger and thicker. The bill is black, short, thick, and strong; the throat, neck, and under-side are white; near each ear, and under the throat is a black spot; on the hind part of the neck is a black crescent, with the horns pointing to the throat.

Its great distinction, however, from all the other birds of the gull-kind, is, that it has no hinder toe, but in lieu of it a small protuberance. It is very common on the coasts of Cornwal, and some other of the English shores. Ray and Pennant.

TARSI, in the *Materia Medica*, a name by which some authors have called the root of the *cyperus esculentus*, or *sweet* CYPERUS of the shops, and by which it is, in some places, usually called by the druggists. See AVELLANDA and HABHAZZIS.

TARSO, in the *Glass Trade*, a sort of white stone found in many rivers of Italy, and other places; and used instead of sand for the finest crystal-glass, being first burnt, and calcined with the salt of the polverine into frit. Neri's Art of Glass, p. 7.

Neri calls this stone a kind of white marble; and adds a general rule, that all stones that will strike fire with steel, are fit to vitrify; and those that will not strike fire with steel, will never vitrify.

The criteria or determinate characters of fossils were not at all fixed in this author's time, otherwise he had not called this stone a kind of marble; since his own general rule of trying stones by steel is, though liable to a few exceptions, a very good one; and, according to that, this *tarso* could be of no affinity to marble; for marble will not strike fire with steel, nor ever be converted into glass.

The *tarso*, therefore, of this and other authors, could be nothing of the marble-kind; but is truly a crystalline matter debased by an admixture of white earth, and found in form of small pebbles of a whitish, yellowish, or pale reddish colour; and this is common in all the gravel-pits of England, and in the beds of some of our rivers; and might be used with great advantage by our glass-makers, if they knew it was so easily to be had.

On comparing these stones of ours, with the cuogoli, or *tarso* of the foreign glass-makers, there is no difference distinguishable to the eye, nor will the nicest experiments by the fire, acid menstrua, &c. shew the least distinction between them. We are not to wonder, however, that the glass-makers did not hitherto distinguish this to be the true cuogoli, or *tarso*, since the characters of fossils have been hitherto so little ascertained, that the best and latest author on these subjects, Dr. Woodward, so far mistook the structure of this stone, as to call it a sparry pebble. It is certain that spar could never have any thing to do with glass-making; but this stone has no spar in its composition.

TARSUS, ταρσος, in *Anatomy*, is what we vulgarly call the *instep*; being the beginning of the foot, or the space between the ancle and the body of the foot, which is called *metatarsus*.

The *tarsus* answers to the wrist of the hand. It consists of seven bones: the first whereof is called ASTRAGALUS, and by the Latins *talus*, and *os balistæ*.

The second is called the *calx*, or *calcar pedis*, or *calcaneum*, or *os calcis*; the third NAVICULARE, and by the Greeks SCAPHOIDES; the fourth, fifth, and sixth, are generally called *innominata*, but by Fallopius, from their figure, CUNEIFORMIA; lastly, the seventh, the CUBOIDES.

The ligaments by which the bones of the *tarsus* are connected with each other, are short, flat, of different breadths, and run from one bone to another in various directions. They are all superficial except one, by which the astragalus is tied to the os calcis, and for the most part are either superior or inferior; the lateral ligaments being very few in number. The marrow of all the tarsal bones is dispersed in moleculæ, because their internal structure is spungy. Winslow's Anat. vol. i. p. 133.

TARSUS *luxated, bones of the.* If any of the small bones in the foot, the *tarsus* or *metatarsus*, happen to be luxated by some external violence, the ligaments with the adjacent nerves and tendons, are generally so affected as to excite not only the most acute pains, but also violent inflammations and convulsions, and even death itself has been known to be the consequence of accidents of this kind, unless the bones be speedily replaced. The foot is for this purpose to be extended on an even table, and the surgeon is to replace the dislocated bones with the pressure of the palms of his hands, adjusting them also with his fingers, where need requires. Compresses dipped in warm spirit of wine are then to be laid on the part, and both these and the reduced bones secured in their places, by means of the proper bandages; the patient is then to be enjoined to remain in bed till the new-set bones have acquired a sufficient strength. Heister.

TARSUS is also a name given by some anatomists to the cartilages which terminate the palpebræ, or eye-lids; and from which the cilia or hairs arise.

They are exceedingly thin and fine, which makes them light and flexible. Their form is semicircular: that of the upper eye-lid is somewhat longer than that of the under: they serve alike to close the eyes.

TARTAN, in *Sea Language*, a small coasting vessel navigated in the Mediterranean sea, and having only one mast and a bowsprit, the principal sail, which is extremely large, being extended by a lateen-yard.

When *tartans* put up a square sail, it is called *a sail of fortune*.

TARTAR, TARTARUS, or TARTARUM, in *Chemistry*, an acid concrete salt which rises from wines, after complete fermentation, and sticking to the top and sides of the casks, forms a crust, which hardens to the consistence of a stone.

Its goodness rather depends on the number of repeated fermentations, which a succession of new wines in the same cask for several years makes, than on the soil or climate where the wine is produced.

The sweet wines afford always less *tartar* than the sharp ones, and it is also less valuable. The *tartar* of Rhenish wine is better than that of any other; and in general, those wines which have the most acid in them, afford the greatest quantity of *tartar*, and that in the largest crystals. It is objected by some to this system, that vinegar affords no *tartar*; but this is easily answered, by observing, that the wine, from which vinegar is made, has before deposited its *tartar*.

Beside the usual way in which *tartar* is produced, there is a very remarkable account in the Memoirs of the Academy of Sciences at Paris, an. 1737, of its having been found in a more than ordinary beautiful state on a human skull; the discovery was owing to accident, and it was found that there had been lees of wine in the vessel in which the skull had been laid ten days in soak.

The formation of the crystals of this *tartar* on the skull, while the sides of the vessel had none concreted on them, shews that the skull had a disposition for receiving the crystals more than any other body; and their peculiar brightness proves, that it had some share in their formation.

Tartar is either *white*, or *red*, according to the colour of the wine from which it is produced. That brought from Germany is the best, as being taken out of those monstrous tuns, some whereof hold a thousand pipes of wine, so that the salt has time to come to its consistence, which is one of the chief qualities to be regarded in *tartar*. That of Montpelier is the next in order; then that of Lyons, Paris, &c.

White tartar is preferred to red, and is really better; as containing less of the drossy or earthy part: though both kinds, when purified, are exactly the same. The marks of good *tartar* of either kind are, its being thick, brittle, brilliant, and but little earthy.

According to Mr. Spielman's experiment, an ounce of distilled water can dissolve only three grains of cream of *tartar*, with the heat of 50° of Fahrenheit's thermometer; this salt is one of those which are most difficultly dissoluble in water, being scarcely affected by it in the cold, requiring ten or twelve times its own weight, when assisted by a boiling heat. From the saturated solution produced by a boiling heat, the *tartar* begins to separate almost as soon as the boiling ceases; if the quantity of water is greater, as about twenty times the weight of the salt, it continues long enough suspended to be passed, with due care, through a woollen strainer, or a filtre.

The usual method of refining *tartar* is this: take two pounds of common white *tartar* reduced to powder, and put it into five gallons of fair water; put it over the fire to boil, and in the mean time beat up the whites of two or three eggs, mix these among the liquor, and skim it as it heats; finally strain it and set it in a cool place for two days, at the end of which time a quantity of whitish crystals will be found sticking to the sides of the vessel.

This is a very troublesome and inconvenient process, the *tartar* requiring so very large a quantity of water to dissolve it; and the operation must also be repeated more than once, to make the crystals fine. Vessels of metal cannot be employed, because the *tartar* would corrode them; and earthen ones of size to make large quantities, are not easily procured. In many arts the crude *tartar*, particularly the purer sort of white *tartar*, obtained from Rhenish wine, does as well as the refined; but in many other occasions none but the refined can be used. It were therefore much to be wished, that we could get into a method of refining it here as they do in France. Shaw's Lectures, p. 158.

The purification of *tartar* at Montpelier, from whence our shops are generally supplied both with crystals and cream, consists in boiling *tartar* in pure water, in filtrating this water, and in allowing the saline matter to deposit by cold. By this first operation, the grosser impurities which adhere slightly to the *tartar* are separated; but the crystals obtained by this operation are still red, and charged with an oily matter extraneous to the *tartar*. From this matter the *tartar* is purified, by boiling it in water, in which clay is diffused. By a second filtration

tration and cryſtallization, very pure and white cryſtals of *tartar* are obtained, but, being quickly formed, they are ſmall and ill-ſhaped. This cryſtallization is partly performed by evaporation, and partly by cold. The part which cryſtallizes by evaporation forms a ſaline cruſt, or pellicle, upon the ſurface of the liquor, called *cream of tartar*; and the part which cryſtallizes by cold forms ſmall irregular cryſtals, called *cryſtals of tartar*: but both are comprehended under the general name of *cream of tartar*, which is alſo uſed at large to ſignify purified *tartar*.

A great aſſiſtance in the diſſolving of *tartar* is had from adding lime-water, pot-aſhes, or ſalt of *tartar*; and if the alkali be here too great, it may be taken off by a proper quantity of oil of vitriol. But where a very pure *tartar* is required, the beſt method of obtaining it is to diſſolve the common cryſtals or cream of *tartar* in water, made highly acid with oil of vitriol. For this ſolution, after a proper evaporation, will afford perfectly fine cryſtals of *tartar*, no way participating of the oil of vitriol.

The glaſs-men are very fond of a preparation, which they call burnt *tartar*. This is no more than the large lumps of red *tartar*, burnt or calcined in earthen pans in an open fire, till they have done ſmoaking, and is of a blackiſh purple colour. Neri's Art of Glaſs, p. 69.

Tartar, diſſolved in water, effervesces with fixt alkaline ſalts, and ſaturates of the vegetable alkalies near one third its own weight. The compound ſalt, reſulting from their union, is a neutral one, more purgative than the *tartar* itſelf, and far eaſier of ſolution, whence its name *ſoluble* TARTAR. Of the mineral fixt alkali or ſoda, this acid ſaturates, according to the faculty of Paris, four-fifths its own weight. Eight drams of the neutral ſalt, reſulting from this coalition, are reckoned by ſome to be equivalent, in cathartic power, to ſix of the ſoluble *tartar*. See RUPELLENSIS *ſal*.

Tartar forms likewiſe ſoluble compounds with all the abſorbent earths, and with ſome metallic bodies, but with theſe laſt it is with difficulty made to ſatiate itſelf completely; for after long boiling, a very conſiderable part of the *tartar* ſeparates on cryſtallization unchanged. If any of theſe combinations of *tartar*, with alkalies, with earths, or with metals, be diſſolved in water, and any other acid added, the pure *tartar* ſeparates and ſubſides, as acid and as difficult of ſolution, as at firſt; the ſubſtance that was combined with it being abſorbed by the acid ſuperadded. As the acids of the vegetable kingdom, whether native or fermented, vinegar, lemon juice, &c. have this effect of diſuniting *tartar* from all the bodies that are combinable with it, equally with thoſe of the mineral kingdom; it follows, that the tartareous acid is of a kind eſſentially different from all the other known vegetable ones, and that no acid, unleſs it be *tartar* itſelf, can be joined in preſcription to the *tartarum ſolubile*, the *ſel de ſeignette*, or the combinations of *tartar* with earths or metals.

Tartar is in a great meaſure decompoſed, and totally changed by the action of fire. If cream of *tartar* be diſtilled in a retort with a naked fire, a little phlegm will firſt riſe with a gentle heat. When the fire is gradually increaſed, which muſt be done very cautiouſly, on account of the prodigious quantity of air that is diſengaged during this diſtillation, an acid ariſes in form of white vapours, which are accompanied with an oil, at firſt thin, but afterwards more and more coloured, and empyreumatic. In the retort there remains a coal, ſtrongly alkaline, equal in weight to two-thirds of the *tartar* employed. Mr. Spielman thinks, that acids are changed into alkalies by the ſubſtraction of a part of their aqueous principle; and the nature and proportion of the conſtituent parts of *tartar* appear to favour this ſubtraction of the watery principle by the action of fire. It has been generally believed, that the alkali of *tartar*, and of other vegetable ſubſtances, is merely the effect of the combuſtion employed in the preparation of the alkali. But M. Margraaf contends, that it exiſts in ſuch vegetable ſubſtances previous to their combuſtion, and ſhews that a fixed alkali may be ſeparated from *tartar*, by means of acids, without combuſtion. He diſſolved a dram of cream of *tartar* in two gros (each gros being equal to $59\frac{1}{2}$ troy grains) of ſpirit of nitre; and from the ſolution, which was clear and tranſparent, he obtained cryſtals of ſalt-petre; and by digeſting, with a very gentle heat, mixtures of powdered cream of *tartar* with marine and vitriolic acids, he obtained a regenerated common ſalt, and a vitriolated *tartar*. As theſe neutral ſalts are known to conſiſt of their reſpective acids, united with the vegetable fixed alkali, it is evident they muſt have received the alkali from the *tartar*, with which the acids were mixed, and conſequently that this alkali exiſts in vegetable ſubſtances independently of combuſtion.

The medical characters of pure *tartar* are its acidity and laxative power. In doſes of half a dram or a dram, it is a mild cooling aperient: two or three drams gently looſen the belly; and ſix or eight prove moderately cathartic.

Tartar is of conſiderable uſe among the dyers, as it ſerves to diſpoſe the ſtuffs to take their colours the better. See on this article, Lewis's Mat. Med. by Mr. Aikin, 1784, and Chem. Dict. Eng. ed.

Cream of TARTAR, *cremor tartari*. See CREAM *of Tartar*, and TARTAR ſupra. Cream of *tartar* has a ſenſibly acid taſte; it reddens the blue colours of vegetables; it may be ſaturated by uniting with any of thoſe ſubſtances which are capable of forming with acids neutral ſalts; and it may be afterwards ſeparated from theſe ſubſtances, and recover its former appearance. Whence it may be inferred that this ſalt, which is concrete and cryſtallizable, on account of a portion of earth and oil, with which it is intimately combined, is an acid. But by the analyſis of Mr. Scheele, in the Swediſh tranſactions, Part iii. for 1770, it appears, that *cream of tartar* is not a pure acid, but a compound ſalt, containing the fixed vegetable alkali, united with a ſuperabundance of the tartareous acid; and, therefore, it differs from ſoluble *tartar*, only in the proportion of acid which it contains. The difficult ſolubility of *cream of tartar* being an objection to its medical uſe, ſome experiments were made by Dr. Peter Jonas Berg, for rendering it more ſoluble by certain additions, without altering its medicinal qualities. Borax was found to anſwer beſt for this purpoſe. To four parts of *cream of tartar* one of borax was added. Theſe were diſſolved in a ſufficient quantity of water, and the liquor ſtrained: about a ſixteenth part of impurities was left behind. The pure ſolution evaporated yielded an acid, and extremely ſoluble white ſalt. Nova Act. Phyſ. Med. Acad. Cæſ. Leop. Carol. Nat. Curioſ. tom. iv.

Cream of tartar is reputed a great ſweetener of the blood; for which ſome take it in whey or water-gruel in the ſpring-time, to the quantity of half an ounce every morning, for three or four weeks.

Its operation is by ſtool; and, by its ſaline particles, pretty much alſo by urine.—It is generally mixed with lenitive electaries, and other gentle cathartics, in nephritic and anti-venereal caſes, where it often proves ſerviceable.

TARTAR, *cryſtals of*. See CRYSTALS and TARTAR ſupra.

TARTAR, *emetic*, or *ſtibiated*, is formed of the acid of *tartar*, combined with the metallic part of antimony, when this is half deprived of its phlogiſton. This is the beſt and the moſt uſed of all the emetic preparations of antimony, becauſe the metallic part of this mineral, which gives the emetic quality, is in a ſaline ſtate, and is perfectly ſoluble in water: and on this account it is juſtly ſubſtituted for the golden ſulphur, for the regulus, for the liver and glaſs of antimony, and for the powder of algaroth; a conſiderable diverſity, however, has occurred in the method of preparing it, probably from want of conſidering, that the emetic quality of this preparation proceeds from the metallic earth being diſſolved by the acid of *tartar*, and forming with it a kind of ſoluble *tartar*, a true neutral ſalt, no leſs capable of a very exact ſolution than the vegetable ſalt, the ſalt of ſeignette, and all the other ſoluble *tartars*. By conſidering this ſaturation as a fixed point, there may be produced only one kind of emetic *tartar*, always equally ſtrong. See a detail of Mr. Geoffroy's experiments on this ſubject, in Mem. Acad. Par. for 1734. M. Beaumé directs it to be prepared by mixing together equal parts of cream of *tartar*, and of porphyriſed glaſs of antimony, or rather a larger quantity of the latter ingredient. This mixture is to be thrown gradually into boiling water; and the boiling muſt be continued gently, till there is no effervescence, and till the cream of *tartar* be entirely ſaturated. The liquor is to be filtrated; and when it is cooled, there will be formed in it fine cryſtals, in the form of pyramids with triangular baſes, which are a ſoluble *tartar* perfectly ſaturated with glaſs of antimony. Theſe are tranſparent, while moiſt; but by expoſure to a dry air, they loſe a part of the water of their cryſtallization, and become opake and white. *Emetic tartar*, thus prepared, very well produces an emetic effect when taken from a grain to two and a half, or three, according to the conſtitution of the patient. The reſult of M. Beaumé's experiments on the manner and duration of boiling this preparation is, that veſſels of iron and copper ought to be avoided, and thoſe of ſilver or glaſs uſed, becauſe in theſe it may be boiled for any length of

time,

time, without being decompofed; and that as the intention of the operation is to perfectly faturate the cream of *tartar*, the boiling muft be continued till this faturation be effected, which requires a long time, when the glafs of antimony is grofsly pounded, but a much fhorter time, when it is well porphyrifed. The author of the Chemical Dictionary obferves, that we are not certain, that the *emetic tartar*, prepared by faturating *tartar* with glafs of antimony, has always an uniform and conftant emetic power. And, therefore, he recommends the *powder of algaroth*, or mercury of life, which, however dangerous in itfelf, may be rendered fafe, by wafhing it with a little fixed alkali, which will feparate all that marine acid that communicates to it a certain degree of cauftic quality. The powder thus wafhed, he fays, is altogether foluble by cream of *tartar*, and convertible into a foluble emetic *tartar*, perfectly neutral, by boiling it, and faturating it with cream of *tartar*, and treating it in the manner above directed, for the preparation of *emetic tartar* with glafs of antimony. The powder of algaroth, thus prepared, is a calx of antimony conftantly of the fame degree of emetic ftrength. It is emetic, becaufe the regulus of antimony firft diffolved by marine acid, and afterwards feparated from that acid, retains the quantity of phlogifton that is neceffary to give an emetic quality to the calx of antimony: but the quantity of phlogifton which it retains, and, therefore its emetic power, muft be always the fame; for the marine acid of the corrofive fublimate, which afterwards becomes the acid of the butter of antimony, is always the fame in quantity, and in its degrees of concentration and of activity; confequently the calx of antimony, feparated from it, muft always contain an equal quantity of phlogifton, and is, therefore, much preferable to glafs of antimony, which contains fometimes more, and fometimes lefs phlogifton. Dict. Chem. Eng. ed. art. *Tartar Emetic.*

The college of London, for the preparation of this antimonial emetic, directs half a pound of crocus of antimony (reduced to a fubtle powder, and boiled and washed with water till it becomes perfectly infipid) to be boiled with an equal quantity of cryftals of *tartar*, in three pints of water, for half an hour; the liquor to be filtered, and, after due evaporation, fet by to cryftallize. The Edinburgh college orders fix ounces either of the wafhed crocus, or powdered glafs, and four of cream of *tartar*, to be boiled in four quarts of water for fix hours; the liquor, when cooled, to be filtered, and either cryftallized or evaporated to drynefs.

The total evaporation of the fluid appears to be the beft way of fecuring uniformity of ftrength to the medicine; and the folubility of the compound affords one of the beft means for eftimating its ftrength, or the degree of its impregnation with the antimony.

Dr. Saunders relates, that an ounce of cold water, about the middle temperature of the air, diffolved, of fome of the common *emetic tartars* of the fhop, not thirty-two grains, or one-fifteenth of its own weight: whereas of a well faturated fort, which he had himfelf prepared by long boiling, the fame quantity of water diffolved fifty-two grains, or near one ninth of its own weight.

The beft way, probably, of obtaining a faturated and uniform preparation of this kind, would be to digeft the common *emetic tartar* in eight times its weight, or lefs, of cold water, and evaporate the filtered yellow folution to drynefs; or to continue the boiling of the glafs of antimony and *tartar* for twelve hours, or longer, adding water occafionally to keep the *tartar* always diffolved, and at length to let the water wafte fo far, as not to exceed eight times the quantity of the *tartar* employed, after which the liquor is to be fuffered to cool, and then filtered and evaporated. The dofe of this preparation, as an emetic, is from two or three to fix or eight grains. It may be given alfo as an alterative, or diaphoretic, in dofes of a quarter of a grain, or half a grain, or more, and added, in the quantity of a grain or two, as a ftimulus to the milder vegetable cathartics. Lewis's Mat. Med. by Aikin.

TARTAR *Foliated*, is a preparation of *Tartar* with diftilled vinegar, which reduces it into white leaves. See TERRA *foliata*.

TARTAR, *oil of*, is the falt of *Tartar* expofed to the air for fome days, in an open veffel, in a moift place, till it diffolve into a fluid; though it is improperly called an oil, being no more than a diffolved falt.

Oil of *Tartar per deliquium* is held the beft counter-poifon to corrofive fublimate.

TARTAR *regenerated*. When cream of *tartar* has been made foluble by any alkaline fubftance whatever, it may be revived or regenerated into cream of *tartar* again; its acid in this ftate has diffolved the alkaline matter prefented to it, and that has been itfelf attenuated in fuch a manner as to render it capable of infinuating itfelf between the molecules or integrant parts of the conftituent matter of the cream of *tartar*; on this only depends the folubility of this preparation: and to render the whole of its primitive nature again, there requires no more than the addition of a new acid, which fhall free the *tartar from this alkali; but this muft neceffarily be* ftronger than that naturally in the *tartar*. Thus fpirit of nitre, or oil of vitriol, regenerate the *foluble tartar* in a moment, as being more powerful acids than that in the cream of *tartar*, and therefore taking from it all its alkali. The acid of diftilled vinegar, which is not only a vegetable acid, but the fame with that of *tartar*, is alfo able to regenerate the foluble *tartars*. It might feem wonderful that this fhould be able to effect this change without any fuperiority of force; but it is to be obferved, that in the cream of *tartar* the acid has a terreftrial and alkaline bafis, which is natural to it in that form; but in the ftate of *foluble tartar* it takes a new alkaline bafis; which is not natural to it: and when we view the procefs in this light, it does not appear wonderful, that an acid of its own kind fhould be able to take away from it this artificial alkaline bafis, though it was not able to take from it the natural one. Mem Acad. Par. 1733.

This fecond or artificial bafis is different, according to the different alkalies which have been employed to render the *tartar* foluble, and confequently the fame acid may attach itfelf more to one than to another of thofe alkalies, and quit them the more or lefs eafily. There is one kind of *foluble tartar*, however, which is not to be regenerated at all; this is that which is made with borax.

Dr. Huxham fays, he has often experienced the good effects of *regenerated tartar* in the cure of obftructions of the bowels, and for fluggifh humours. See TERRA *foliata*.

TARTAR, *falt of*, is made of *tartar* wafhed, ground, purified, and calcined, by a reverberatory fire; or it is made by pulverizing what remains in the retort after the diftillation of *tartar*, and calcining it as above by a reverberatory fire. On the one or the other of thefe preparations, they pour a great quantity of hot water, to make a ley of it; this they filtrate, and evaporate the liquor by a fand-heat, till the fixed falt be found at the bottom of the veffel. This is the pure alkali, or fixed falt of *tartar*.

TARTAR, *foluble*. The procefs for making *foluble tartar*, is this: take of an alkaline fixed falt, a pound; of water, a gallon; and having diffolved the falt in this water boiling, throw in cryftals of *tartar* in powder as long as any fermentation is raifed, which ufually ceafes before thrice the weight of the alkali is thrown in. Then ftrain the liquor through paper, and after due evaporation fet it by for the falt to cryftallize, or elfe evaporate the liquor wholly away, that the falt may be left dry.

This falt, by the action of the alkali on the acid of *tartar*, being freed from thofe grofs terreftrious parts, with which the cryftals of *tartar*, how pure foever, remain ftill charged, diffolves readily, and keeps fufpended in cold water. Pemberton's London Difpenfatory, p. 181, feq.

The feveral alkaline falts, that of *tartar* itfelf, the common pot-afhes, borax, &c. all make a very good *foluble tartar*; and not only thefe but the common terreftrial alkalies, whether of the mineral kingdom, as chalk or lime; or of the vegetable, as the afhes of plants after elixiviation; or of the animal, as oyfter-fhells calcined or not calcined, and hartfhorn: all thefe give a better or worfe *foluble tartar*; but of thefe none fucceeds fo well as the oyfter-fhell, after it has been calcined; the *foluble tartar*, prepared with this, cofts alfo greatly lefs than when prepared with falt of *tartar*.

In wood-afhes there is always a part, which when mixed with water fwims, and is fufpended in it a long time, and at length fubfides into a kind of foft and impalpable matter; and another part, which fubfides readily to the bottom, and feels rough and harfh. It is the firft of thefe fubftances alone, which being mixed with cream of *tartar*, renders it foluble: the other part will not mix with the cream of *tartar*, or produce any fuch effect, unlefs reduced to the nature of the firft, by repeated and violent calcinations, and then only a part becomes fo altered, the whole never is fo. It appears that the firft portion has been wholly divefted of its acid by the fire, and thence is become fufceptible of the impreffion of the weakeft acid, fuch as is that of the cream of *tartar*; but in the fecond, or coarfer part, the acid it naturally contained remains fixed and concentrated, fo that it is not fufceptible of any impreffion from the weak acid of the cream of *tartar*. Mem. Acad. Par. 1733.

The different kinds of *soluble tartar* have also their different degrees of solubility, or different readiness to run into a liquor *per deliquium*. The most easily soluble of all are those made with chalk, with lime, and with wood-ashes; and that which is most difficulty so, is the kind made with borax; it will at length run however, and is truly *soluble tartar*.

TARTAR *vitriolated*, which some call *magistery of tartar*, is a neutral salt, composed of a vitriolic acid, saturated with the fixed alkali of *tartar*, or with any other pure vegetable fixed alkali.

This salt is prepared by pouring vitriolic acid into a solution of vegetable alkali, till no more effervescence appears, or till the liquor becomes perfectly neutral, which may be known by the ordinary trial of syrup of violets. From this liquor, filtrated and evaporated, small crystals are obtained, the form of which is very inconstant.

Vitriolated tartar is one of the salts which crystallize better by evaporation than by cold. It requires a large quantity of water to dissolve it. Its taste is moderately saline, and somewhat disagreeable, but not acrid nor sharp. It decrepitates when heated suddenly and strongly; it contains only a small quantity of the water of crystallization, by means of which it cannot be liquefied; neither can it be fused but by a very intense heat. *Vitriolated tartar* may be decomposed by nitrous acid in the following manner, according to M. Beaumé. Equal parts of both are put into a matrass, and heated till the salt be dissolved. From the liquor when cold, true crystals of nitre may be obtained. And according to M. Margraaf, *vitriolated tartar* may, in the same method of treatment, be decomposed by marine acid.

This salt is not of any use in the arts, and little used in chemistry. It is chiefly employed in medicine. Like the other neutral salts, with bases of fixed alkali, it is aperitive in small doses, as a gros, or fifty-nine and a half grains, and it is laxative, when taken from six gros to twelve. Chem. Dict. Eng. ed.

The chemists have sometimes boasted of great virtues, in what they call the magistery of this salt; this is the earth precipitated in the making of it. It is the opinion of some ingenious authors, that all fixed salts are produced by a blending together of the acid and alkaline salts, which the plants they are obtained from originally contained, with some earth. The making of this preparation of *tartar* and vitriol gives great strength to this opinion by means of this magistery; which shews, that an earth necessary to the cementing a mixture of an acid and an alkali into a neutral salt, may exist even in one of the principles themselves, though unseen by us; and that, as in the present instance, in so large a quantity, as not only to be sufficient for the combining the two volatile substances into a fixed one, but even to leave a remainder of it that was not necessary.

While the acid of vitriol is poured upon the dissolved salt of *tartar*, or its oil *per deliquium*, for the making of this salt, during the great effervescence between the acid and the alkali, there is a precipitation made of an earth, for the separation of all which great care is to be had to the degree of saturation of the alkali with the acid. This earth afterwards may be severed by filtration. This earth is precipitated not out of the spirit of vitriol, but out of the salt of *tartar*; and this experiment shews, that this fixed salt did originally contain that earth, which, according to the system of the formation of fixed salts out of volatile ones originally residing in plants, must necessarily be mixed with them, and which not being able to mix with the acid, is separated and thrown off in the conflict, in which the acid mixes itself with the rest.

This earth is what is pompously called the *magistery of vitriolated tartar*; but it is very wrong to give that name to an earth, which has none of the properties of that or any other salt; and they greatly deceive themselves and their patients, who preferibe it instead of the salt itself. Its saline taste probably has induced them to think, that it possessed great virtues; but this is not innate but adventitious, and the effect only of the fluid in which it was precipitated: it cannot but have some of the salts of that fluid hanging about it, when first made; but these may, by repeated washings, be carried wholly off, and the magistery will then remain a pure simple earth, and shew itself to be no other than that earth which may be properly called the earth of all fixed salts; and which, though necessary to give the salt of *tartar* its form as a lixivial salt, yet being not necessary to it in its new form of a neutral salt, is deposited in the making it into that form. It yet remains to be proved by more numerous experiments, that the fixed salts of plants owe that form only to a fixing earth, combining their two original volatile principles into a fixed mass; for if this be truly the case, there then needs no more to the volatilizing them again, but the divesting them of this earth. Phil. Tran. Nº 90.

TARTARHAN, a word used by some authors to express spirit of tartar.

TARTARIZATUS *chalybs*. See IRON.

TARTARIZING, a term used, by some writers, for the act of refining or purifying, by means of salt of tartar.

TARTARON, a sort of fine cloth or silk, mentioned in the stat. 4 Hen. VIII. c. 6. Blount, Cowel.

TARTARUM *tartarisatum*, *tartarised tartar*, in *Chemistry*, the name of a preparation of *tartar*; the manner of doing which is given by Boerhaave, and is as follows: reduce some of the purest white *tartar* to powder, and boil this powder in ten times its weight of water in a large copper-vessel, till it appears perfectly dissolved: let it after this continue boiling till the liquor become tolerably transparent, and of an acid taste; then drop into it from on high oil of *tartar per deliquium*, the liquor being still kept boiling; upon the falling in of each drop there arises a great ebullition, occasioned by the meeting of the acid and alkali. Large bubbles appear on this, and in these the chemists have imagined they found the figures of clusters of grapes.

The operation is to be patiently continued till there is no more effervescence made by the falling in of the drops of the oil. The acidity of the *tartar* will be then so perfectly saturated with its own alkali, that it will appear neither acid nor alkaline, but a third salt; great caution however must be used in observing the true point of saturation, otherwise the salt will be when finished either a little acid, or a little alkaline, as the one or the other exceeds. The liquor is then to be strained several times through a flannel, till perfectly clear; it is of a deep brownish colour, and brackish saline taste, but has no scent. If this be evaporated to a pellicle, and set to crystallize, it forms a salt which is a *tartar*, easily soluble in water, even when cold; and is very properly to be called soluble *tartar*. Boerhaave Chem. part ii. p. 161.

TARTARUGA, In *Zoology*, a name by which the Portuguese in America call a species of tortoise, known among authors by its Brasilian name JURUCUA.

TARTARUS, in *Ancient Mythology*, is one of the general divisions of the subterraneous world, or the place of torments. The other two divisions of Ades, according to Virgil, are EREBUS and ELYSIUM. The prince, or judge, who presides over *Tartarus*, is Rhadamanthus. The miserable inhabitants of this horrid region are of two sorts, viz. the souls of such as are tormented, and the infernal deities, called the FURIES, who attend there either to inflict or aggravate their torments.

Virgil distinguishes those that are tormented in *Tartarus* into two general classes; the first, of such as have been ungrateful or impious towards the gods; and the second, of such as have been mischievous and hurtful among men: those of the latter, more particularly, who hated their brethren, used their parents ill, or cheated their dependents; who made no use of their riches; who committed incest, or disturbed the marriage union of others; those who were rebellious subjects, or knavish servants; who were despisers of justice, and betrayers of their country; and who made and unmade laws, not for the good of the public, but only to get money for themselves. All these, and the despisers of the gods, of whom the rebel giants occupied the chief class, Virgil places in *Tartarus*, and in that vast abyss, which was the most terrible part of this infernal region. The great road, that passes through Erebus, is represented as divided into two; of which, the right hand road leads to Elysium, or the place of the blest; and the left hand road to *Tartarus*, or the place of the tormented. Virgil Æn. vi. v. 540—549—566—580—607—624. Spence's Polymetis, p. 259, &c.

TARTI *lapis*, a stone mentioned by Ludovicus Dulcis, and some other authors, and said to be very beautiful, having all the colours of the tail of a peacock, and to have many medicinal virtues. It was probably some species of agate; but the short account given of it will not enable us to guess what particular kind.

TARTON *raire*, in *Botany*, a name used by some authors for the heath-spurge, or that species of the thymelæa which is called *sannamunda* in the catalogues of the Materia Medica.

TARUM, in *Botany*, a name given by Pliny to the AGALLOCHUM *sylvestre*, a species of aromatic plants.

TASIS, *τασις*, in *Rhetoric*, is used for the continuation of a period longer than the breath can bear. Voss. Rhet. l. iv. p. 66.

TASCHENMUL, in *Ornithology*, a name given by authors to the *anas clypeata*, a species of duck, remarkable for the breadth of the end of its beak, and called in English, the *shoveler*. See *Broad-beaked* DUCK.

TASSEL, a sort of pendant ornament, at the corners of a cushion,

cushion, or the lik e thing.—Also a small ribband of silk sewed to a book, to be put between the leaves.

TASSELS, in a *building*, these pieces of board that lie under the ends of the MANTLE-*trees*.

TASSEL, or TIERCELET, is also used in *Falconry* for a male hawk.

TASSELS are also a kind of hard burrs used by clothworkers in dressing cloth: they are the heads of the manured TEAZEL.

TASTATURA, in the *Italian music*, the whole range of keys of organs, harpsichords, &c.

TASTE, *savour*, a sensation, excited in the soul by means of the organ of *taste*; viz. the papillæ of the tongue, &c.

Dr. Grew, in a lecture on the diversity of *tastes*, before the Royal Society, distinguishes them into *simple* and *compound*.

TASTES, by *simple*, he understands such as are simple modes of *taste*, although mingled with others in the same thing; thus the *taste* of a pippin is aci-dulcis; of rhubarb, amar-astringent, and therefore compounded, in both; but yet in the pippin the acid is one simple *taste*, and the sweet another, as distinct as the bitter and astringent are in the rhubarb.

Two faults, he observes, have here been committed: the first, a defective enumerating of simple *tastes*; the second, a reckoning them indistinctly among such as are compounded.

Simple tastes, of which we usually only reckon six or seven sorts, are at least sixteen; 1. *Bitter*, as in wormood; whose contrary is, 2. *Sweet*, as in sugar. 3. *Sour*, as in vinegar; whose contrary is, 4. *Salt*. 5. *Hot*, as in cloves; to which is opposite. 6. *Cold*, as in sal prunellæ; for we may as properly say a cold *taste*, as an hot one, since there are some bodies which do manifestly impress the sense of cold upon the tongue, though not to the touch. 7. *Aromatic*: to which is contrary, 8. *Nauseous*, or malignant. 9. *Soft*, which are either vapid, as in water, starch, whites of eggs, &c. or unctuous, as in oils, fat, &c. 10. *Hard*, of which he reckons four kinds. 11. *Penetrant*, which worketh itself into the tongue without any pungency; as is found in the root and leaves of the wild cucumber. 12. *Stupefacient*, as in the root of black hellebore, which, being chewed, and for some time retained upon the tongue, affects that organ with a numbness, or paralytic stupor. 13. *Astringent*, as in galls: and, 14. *Pungent*, as in spirit of sal armoniac; which two last *tastes* he makes contrary to the unctuous, as penetrant and stupefacient are contrary to the vapid one.

TASTES, *the compound*, are very numerous; but we have words to express but six of them: 1. *Austere*, which is astringent and bitter, as in the green and soft stones of grapes. 2. *Acerb*, properly so called, which is astringent and acid, as in the juice of unripe grapes. 3. *Acrid*, which is pungent and hot. 4. *Muriatic*, which is salt and pungent, as in common salt. 5. *Lixivious*, which is saltness joined with some pungency and heat. 6. *Nitrous*, which is saltness joined with pungency and cold.

Taste constitutes one of the most obvious characters of bodies, and much is to be judged from it of the nature of many things. Dr. Abercromby, in a treatise partly written on this subject, has carried his observations so far, as to lay down a set of rules for the judging of any plant, or other body, without knowing what it is, merely from its *taste*, in regard to its virtues in medicine.

In order to judge of what he expresly means by the names of the several *tastes*, it is proper to add the list of them, with some of the things to which they are applied.

Plants, fruits, &c. are either sour as the common sorrel, harsh as the medlar, austere or rough as the quince, sweet as the fresh juice of ripe grapes, fat and oily as the sesamum, bitter as gentian or the wild cucumber, salt as common sea-salt, tart as garlic, or lastly, insipid as the gourd, or of some mixed *tastes*, made of two or more of these.

The harsh or acerb things are cold, repelling and binding, hardly concocted, and they may all be known upon the tongue by their contracting or drying it. The austere or rough things differ from these only in degree, as being somewhat milder in *taste*, and weaker in virtues.

The sour or acid things are always cooling; but this never to excess, by reason of their penetrating parts; this *taste* is known by a biting on the tongue, but without any heat. Sweet things are all nutritive; and, taking the word in its proper sense, they only have this quality. Their sweetness arises from their neither being too hot nor too cold upon the tongue.

Fat things are moderately hot, and, on this account they all, in some degree, moisten and relax; but they also obstruct: they are known from the sweet things by filling, and, as it were, anointing the tongue, without giving that sense of pleasure that the others do.

Salt things are astringent and detersive; the one quality they have from their earthy part, the other from their watery. Bitter things may be very beneficial to the stomach; but, in improper cases, they may also do hurt. The pungent bitters, such as the elaterium, or wild cucumber, are all hurtful, unless rendered safe by other means.

Tart things are hot, and often bad for the head; but good in heavy and phlegmatic constitutions; they are known by their heat in the mouth.

Lastly, insipid things in general have no peculiar quality, but are cold and watery; they are generally hurtful to the stomach, unless mixed with hotter and spicey things. Abercromb. Nov. Medic. Clavis.

It is observed by Sir John Floyer, that the *taste* is so good a judge for us, that all the chemical principles in plants may be discovered by it, before their distillation. All watery plants shew their phlegm, as well to the *taste* as by distilling; and in all dry woods, the *taste* discovers the earth they contain, as well as a chemical analysis; by the mucilaginous and gummy *taste*, and by the manifest oiliness in some plants, we distinguish their abounding in oil as well as by the retort. The smell also helps us greatly in an extemporary judging of plants, and we are able to declare upon the spot, that all the aromatic plants, and all the fœtid ones, contain a large quantity of a volatile oil and salt. By the acrimony and pungency, we are well assured, that there is a volatile salt in plants; and, by the burning taste of others, we find that there is a corrosive salt in them. By a crude rough acidity, we distinguish the tartar or essential salt of plants to be in large quantity; but if the acidity be of a vinous smell, we observe that it is of a middle state of digestion, and may be called a vinous tartar, and distinguished from the first; but if the tartar have a pungent smell, then it is evidently a volatile tartar, or an acid acrid tartar.

The sweet *tastes* are more numerous in plants, and more varied among themselves than any other kind. These, in general, shew their oil by thin slimy smoothness, and their tartar is evident in their extracts, as is very plain in the common liquorice-juice.

The grass-sweets, as the common dogs-grass, and the like, have much essential salt, and a moderate portion of oil; and the rush, reed, horse-tail, and cats-tail, are all sweet and rough; some of these have more oil, and others more acid; and the most crude among them have more oil than tartar. The corn-sweets, as barley, rye, wheat, oats, millet, and rice, have much oil and essential salt, and a little volatile; so bread, prepared of any of these, yields on analysis oil and essential and volatile salt.

It is to be observed here, that fermentation and fire severally produce a volatile salt, where it was not before, by subtilizing and volatilizing the essential salt; and the slimy mealiness in corn supplies the oil. The goats-beard and scorzonera-kind, have the same principles as the grasses, much oil and essential salt. The sub-acrid sweets, as rampions, campanulas, trachelia, and the like, contain much oil and essential salt; but the acrimony in these plants shews that they have also a volatile salt, and that in no small quantity; though Lemery, and the other chemical writers, have not observed this.

The ferns, polypodies, and all that class of plants, contain much oil and essential salt; but the chemists in general have omitted to mention an acrid principle in all these, which bespeaks a volatile salt; and fragrancy is observed in some of the harts-tongues, which bespeaks a volatile salt also, and volatile oil, though hitherto unobserved.

All the leguminous slimy sweets have more oil than tartar; but all of them have a large quantity of both. Beans, peas, and lentils, have also a volatile salt, as has also that strange fruit, eaten in Russia, and some other places, and called *lenticula aquatica* by some; but by the botanical writers, *tribulus aquaticus*; the other name belonging to the common duck-weed. The aromatic legumens, such as melilot, have an exalted oil, and volatile salt. The honeysuckle is said by Lemery, and the other chemists, only to have an essential salt and oil; but as there is a highly aromatic flavour, and great acrimony, there must be also a volatile salt.

These are some few instances, out of a vast number recited by the author, for the rest of which we refer to the paper itself in N° 280 of the Transactions. Philos. Transf. N° 299, p. 1160. See TASTING.

TASTE is also used, in a figurative sense, for the judgment and discernment of the mind.

We

We talk, and we hear every day, of *taste*, of *good taste*, and of *bad taste*, and yet without well understanding what we mean by the word: in effect, a *good taste* seems to be little else but right reason, which we otherwise express by the word *judgment*.

To have a *taste*, is to give things their real value, to be touched with the good, to be shocked with the ill; not to be dazzled with false appearances; but, in spite of all colours, and of every thing that might deceive or amuse, to judge soundly.

Taste and judgment then should be the same thing; and yet it is easy to discern a difference: the judgment forms its opinions from reflection; the reason, on this occasion, takes a kind of circuit to arrive at its end; it supposes principles, it draws consequences, and it judges; but not without a thorough knowledge of the case: so that after it has pronounced, it is ready to render a reason of its decrees.—*Taste* observes none of these formalities; before it has time to consult, it has taken its resolution: as soon as ever an object is presented to it, the impression is made, and the sentiment formed; and we ask no more of it. As the ear is wounded with an harsh sound, as the smell is soothed with an agreeable odour, before ever the reason have meddled with those objects, to judge of them; so the *taste* is struck at once, and prevents all reflection.

Reflections may come afterwards to confirm this *taste*, and discover the secret reasons of its conduct; but it was not in its power to wait for them. Frequently, it happens not to know them at all; and what pains soever we use, we cannot discover what it was that determined it to think as it did.

This conduct is very different from that which the judgment observes in its decisions; unless we choose to say, that *good taste* is, as it were, a first motion, or a kind of instinct of right reason, which hurries us on with rapidity, and conducts us more securely than all the reasonings we could use. It is a first glance of thought, which discovers to us the nature and relation of things, as it were, by intuition.

In effect, *taste* and judgment are one and the same thing, one and the same disposition and habitude of the soul, which we call by different names, according to the different manners wherein it acts: when it acts by sensation, by the first impression of objects, we call it *taste*; and when by reasoning, after having examined the thing by all the rules of art, &c. we call it judgment: so that one may say, *taste* is the judgment of nature, and judgment is the *taste* of reason.

Good taste, as defined by Madem. Scudery and Madem. Dacier, in an express treatise *of the corruption of taste*, is an harmony between the mind, and reason; and a person has more or less of this *taste*, as that harmony is more or less just.

One might, perhaps, improve on this hint, and say, that *good taste* is nothing else but a certain ratio or relation between the mind, and the objects presented to it. Right reason cannot but be moved and affected with things conformably thereto, and wounded by those contrary; there is, then, a kind of sympathy, which unites them as soon as ever they meet; and at their union, their good understandings discover each other.—Make a fine discourse; use only the richest and noblest expressions; if they contain an unhappy thought, or an incoherent reasoning, that thought, this reasoning, will immediately be felt by a person of *taste*: and the antipathy will shew itself by a movement of aversion, as sudden, as lively, and as natural, as that which nature inspires us withal for toads or spiders.

Dr. Gerard, in his ingenious and elaborate Essay on *Taste*, observes, that a fine *taste* is neither wholly the gift of nature, nor wholly the effect of art. It derives its origin from certain powers natural to the human mind, but these must be assisted by culture, in order to attain their full perfection. *Taste*, according to this writer, consists chiefly in the improvement of those principles, which are commonly called the powers of imagination, and are considered by modern philosophers as internal or reflex senses, supplying us with finer and more delicate perceptions, than any which can be properly referred to our external organs. The simple principles of *taste* are the senses of novelty, of sublimity, of beauty, of imitation, of harmony, of ridicule, and of virtue. Any one of the internal senses, existing in vigour and perfection, forms a particular branch of *taste*, and enables a man to judge in some one subject of art or genius; but all of them must at once be vigorous, in order to constitute *taste* in its just extent. *Taste* will also derive considerable assistance from another principle, distinct from all the internal senses; and this is such a sensibility of heart or delicacy of passion, as fits a man for being easily moved, and for readily catching as by infection any passion that a work is fitted to excite. Moreover, the most complete union of the internal senses is not of itself sufficient to form good *taste*, even though they be attended with the greatest delicacy of passion. They must be aided with judgment, the faculty which distinguishes things different, separates truth from falshood, and compares together objects and their qualities.—Good sense is an indispensible ingredient in true *taste*, which always implies a quick and accurate perception of things as they really are; and as the poet observes,

> Is, though no science, fairly worth the seven.

Taste, like every other human excellence, is progressive and improvable: and goodness of *taste* lies in its maturity and perfection; consisting, as Dr. Gerard says, in certain excellencies of our original powers of judgment and imagination combined. These may be reduced to four, viz. sensibility, refinement, correctness, and the proportion or comparative adjustment of its separate principles. All these must be in a considerable degree united, in order to form true *taste*. And this excellence of *taste* supposes not only culture, but culture judiciously applied. Want of *taste* unavoidably springs from negligence; false *taste* from injudicious cultivation. Sensibility of *taste*, we are told, depends very much on the original construction of the mind, and is less improvable by use than any other of the qualities of good *taste*. Refinement or elegance of *taste* is chiefly owing to the acquisition of knowledge, and the improvement of judgment. Refinement of *taste* exists only, where to an original delicacy of imagination, and natural acuteness of judgment, is superadded a long and intimate acquaintance with the best performances of every kind. And as sensibility of *taste* disposes us to be strongly affected with whatever beauties or faults we perceive; and refinement of *taste* makes us capable of discovering both, even when they are not obvious; so correctness of *taste* prevents our being imposed upon by false appearances, and either approving shining faults, or condemning chaste virtues, and enables us to assign to every quality its due proportion of merit or demerit: thus distinguishing the various kinds, and measuring the different degrees of excellence and faultiness. The last finishing and complete improvement of *taste* results from the due proportion of its several principles, and the regular adjustment of all its sentiments, according to their genuine value, so that none of them may engross our minds, and render us insensible to the rest. This due proportion of the principles of *taste* presupposes the correctness of each, and includes, besides, an enlargement and comprehension of mind. Dr. Gerard has also considered, how far *taste* depends on the imagination, evinced the connection of *taste* with genius, and the influence of *taste* on criticism, illustrated the objects and the pleasures of *taste*, and traced the effects of *taste* on the character and passions. *Taste* he says, may be conceived as employing itself about nature, art, and science. With regard to nature, which is the common subject of the other two, *taste* and reason are employed in conjunction: as reason investigates the laws of nature, *taste* alone discovers its beauties. In art, *taste* is the ultimate judge, and reason but its minister. Scarce any art is so mean, or so entirely mechanical, as not to afford subjects of *taste*. But the finer arts, which imitate the excellencies of nature, supply it with more proper materials; and thence derive their merit. Music, painting, statuary, architecture, poetry and eloquence, constitute its peculiar and domestic territory, in which its authority is absolutely supreme. In science, reason is supreme, but may sometimes reap advantage from using *taste* as an auxiliary, which serves to judge, not only of the manner in which science is communicated, but also of the subject matter itself. To this essay of Dr. Gerard are annexed three dissertations on the same subject; one by Voltaire; another by M. D'Alembert, read before the French academy, in 1757, and intended to shew the great advantages of philosophy in its application to matters of *taste*, and to justify it from the accusations that have been brought against it by ignorance and envy; and the third is a fragment of Montesquieu.

A late excellent writer has defined *taste* to be the power of receiving pleasure from the beauties of nature and of art. Though *taste*, says this writer, be ultimately founded on a certain natural and instinctive sensibility to beauty, yet reason assists *taste* in many of its operations, and serves to enlarge its power. In this sense it is a faculty common in some degree to all men. Quintilian however (Instit. lib. vi. c. 3.) seems to include *taste* under what he calls judicium. The characters of *taste*, when brought to its most perfect state, are all reducible to two, delicacy,

delicacy, which principally reſpects the perfection of that natural ſenſibility on which *taſte* is founded, and correctneſs, which chiefly reſpects the improvement that faculty receives through its connexion with the underſtanding; the former of theſe qualities is more the gift of nature; the latter, more the product of culture and art. Among the ancient critics, Longinus poſſeſſed moſt delicacy; Ariſtotle moſt correctneſs.—Among the moderns, Mr. Addiſon is a high example of delicate *taſte*; and Dean Swift, if he had written on the ſubject of criticiſm, would perhaps have afforded the example of a correct one. In determining the ſtandard of *taſte*, thoſe who ſay, that nature is this ſtandard, lay down a principle very true and juſt, as far as it can be applied: nevertheleſs conformity to nature is an expreſſion very often uſed, without any diſtinct or determinate meaning: in a more clear and preciſe ſenſe, nothing can be conſidered as the ſtandard of *taſte*, but the *taſte*, as far it can be known, of human nature. That which men concur the moſt in admiring muſt be held to be beautiful. His *taſte* muſt be eſteemed juſt and true, which coincides with the general ſentiments of men. In this ſtandard we muſt reſt. To the ſenſe of mankind the ultimate appeal muſt ever lie, in all works of *taſte*. But this ſenſe is founded on thoſe principles of reaſon and ſound judgment, which are applicable to matters of *taſte*; and yet the ultimate concluſions to which our reaſonings lead, refer at laſt to ſenſe and perception. Accordingly it is obſerved, that the difference between the authors who found the ſtandard of *taſte* upon the common feelings of human nature, aſcertained by general approbation, and thoſe who found it upon eſtabliſhed principles, which can be aſcertained by reaſon, is more an apparent than a real difference. For they who lay the greateſt ſtreſs on ſentiment and feeling, make no ſcruple of applying argument and reaſon to matters of *taſte*; they appeal to eſtabliſhed principles, and plainly ſhew that the general approbation to which they ultimately recur, is an approbation reſulting from diſcuſſion as well as from ſentiment. And they, on the other hand, who, in order to vindicate *taſte* from any ſuſpicion of being arbitrary, maintain that it is aſcertainable by the ſtandard of reaſon, admit, nevertheleſs, that what pleaſes univerſally, muſt on that account be held to be truly beautiful; and that no rules or concluſions concerning objects of *taſte* can have any juſt authority, if they be found to contradict the general ſentiments of men.

However, it is not pretended, that there is any ſtandard of *taſte*, to which, in every particular inſtance, we can reſort for clear and immediate determination. But it is ſufficient to conclude, that *taſte* is far from being an arbitrary principle, which is ſubject to the fancy of every individual, and which admits of no criterion for determining whether it be falſe or true. Its foundation is the ſame in all human minds. It is built upon ſentiments and perceptions, which belong to our nature; and which, in general, operate with the ſame uniformity as our other intellectual principles. When they are perverted by ignorance or prejudice, they are capable of being rectified by reaſon. Their ſound and natural ſtate is ultimately determined by comparing them with the general *taſte* of mankind.

The ingenious writer, to whom we are indebted for the preceding obſervations, has diſtinguiſhed between *taſte* and GENIUS. *Taſte*, he ſays, conſiſts in the power of judging; genius, in the power of executing. One may have a conſiderable degree of *taſte*, in poetry, eloquence, or any of the fine arts, who has little or hardly any genius for compoſition or execution in any of theſe arts. But genius cannot be found without including *taſte* alſo. Genius, therefore, deſerves to be conſidered as a higher power of the mind than taſte: genius always imports ſomething inventive or creative, which does not reſt in mere ſenſibility to beauty where it is perceived, but which can, moreover, produce new beauties, and exhibit them in ſuch a manner as ſtrongly to impreſs the minds of others. Refined *taſte* forms a good critic; but genius is farther neceſſary to form the poet, or the orator. Beſides, genius, in common acceptation, extends much farther than to the objects of *taſte*; but though it is a higher faculty than *taſte*, it is ever, according to the uſual frugality of nature, more limited in the ſphere of its operations. See Dr. Blair's Lectures on Rhetoric, and Belles Lettres, vol. i. Lect. ii. and iii. See alſo Hume's Eſſay of the ſtandard of *taſte*, in his Eſſays, &c. vol. i. Eſſ. xxiii. p. 253, edit. 1764.

TASTING, the ſenſe whereby we diſtinguiſh favours; or the perception which the ſoul has of external objects, by means of the organ of *taſte*.

Authors differ much as to the *organ of taſting*: Bauhin, Bartholin, Veſtingius, &c. place it in the laxer fleſhy parts of the tongue; Dr. Wharton in the glands at the root of the tongue; Laurentius in the thin tunic covering the tongue; others in the palate, &c. But the great Malpighi, and after him, all the lateſt writers, place it in the papillæ chiefly lying about the tip and ſides of the tongue. See TONGUE.

Theſe papillæ ariſe from the corpus nervoſum, which covers the muſcular fleſh of the tongue; whence, paſſing through the corpus reticulare, they ſtand up under the external membrane of the tongue, erect, and covered with vaginæ, or ſheaths of the ſaid membrane, to defend them from objects too violent. Theſe vaginæ are porous, and ſtick out ſo far, that when the aliment is ſqueezed, they enter within the ſame, to receive the object, or the matter of *taſte*.

Theſe papillæ, Boerhaave conjectures to ariſe from the ninth pair of nerves; and theſe, he aſſerts, are the only organ of *taſte*: the others, whether of the tongue, palate, or jaws, &c. he obſerves, contribute nothing thereto; though probably thoſe of the cheeks next the dentes molares may.

The *object of taſting*, is any thing, either in animals, vegetables, or minerals, from which ſalt or oils may be extracted. See SALT.

Taſting, then, is performed by the objects being attenuated and mixed with ſaliva, warmed in the mouth, and applied to the tongue; where, inſinuating into the pores of the membranous vaginæ of the nervous papillæ, and penetrating to the ſurface of the papillæ themſelves, it affects and moves them; by which means a motion is communicated along the capillaments of the nerve to the common ſenſory, and an idea excited in the mind, of ſalt, acid, ſweet, bitter, hot, aromatic, auſtere, or the like; according to the figure of the particles that ſtrike the papillæ, or the diſpoſition of the papillæ to receive the impulſe.

The *taſte*, conſidered in a medical view, may be diminiſhed by cruſts, filth, mucus, aphthæ, pellicles, warts, &c. covering the tongue: it may be depraved by a fault of the ſaliva, which, being diſcharged into the mouth, gives the ſame ſenſation as if the food which the perſon takes had really a bad *taſte*; or it may be entirely deſtroyed by injuries done to the nerves of the tongue and palate. Few things prove more hurtful, either to the ſenſe of taſting or ſmelling than obſtinate colds, eſpecially thoſe which affect the head. When the *taſte* is diminiſhed by filth, mucus, &c. the tongue ought to be ſcraped, and frequently waſhed with a mixture of water, vinegar and honey, or ſome other detergent. When the ſaliva is vitiated, which ſeldom happens, unleſs in fevers or other diſeaſes, the curing of the diſorder is the cure of this ſymptom. To relieve it, however, in the mean time, the following things may be of uſe: if there be a bitter *taſte*, it may be taken away by vomits, purges, and other things which evacuate bile: what is called a nidorous *taſte*, ariſing from putrid humours, is corrected by the juice of citrons, oranges, and other acids: a ſalt *taſte* is cured by plentiful dilution, with watery liquors: an acid *taſte* is deſtroyed by abſorbents, and alkaline ſalts, as powder of oyſter-ſhells, ſalt of worm wood, &c. When the ſenſibility of the nerves, which ſupply the organs of *taſte*, is diminiſhed, the chewing of horſe-radiſh, or other ſtimulating ſubſtances, will help to recover it. Buchan's Dom. Med. p. 505.

TASTO, in the *Italian Muſic*, the touch or part of any inſtrument, whereon, or by means of which its notes are made to ſound, be it on the neck, as lutes, viols, &c. which are called fixed and immoveable; or the front of organs, ſpinnets, or harpſichords, where the keys are diſpoſed to raiſe the jacks, called moveable touches; and is properly no more than the finger-board of each.

Taſto ſolo is often found in thorough baſſes, where it ſhews that the inſtruments accompanying, as the lute, organ, &c. are only to ſtrike a ſingle ſound, from that place, till they find cyphers, or the words *accordo* or *accompanimento* placed in their part. Theſe intimate, that the accords are to begin again in this place.

TATA *Youba*, in *Botany*, a name uſed by ſome for the tree which yields what the dyers call the fuſtic, or yellow wood uſed in dying.

TATH, in *Old Laws*, a privilege which ſome lords of manors enjoyed, of having their tenants ſheep folded at night on their demeſne lands, for the improvement of the ground.

TATIANITES, TATIANITÆ, in *Eccleſiaſtical Hiſtory*, a ſect of ancient heretics; thus called from Tatian, a diſciple of Juſtin Martyr.

This Tatian, who has the character of one of the moſt learned men of all antiquity, was perfectly orthodox during the life of his maſter. He was, like him, a Sa-

maritan,

maritan, by nation, not by religion, as Epiphanius seems to insinuate. They both belonged to the Greek colonies which were spread throughout the country of the Samaritans.

Justin being dead, Tatian is said by some to have inclined to some of the errors of the Valentinians; but Mosheim says, that his doctrine approached nearer to that of the oriental philosophy concerning the two principles. He adds, that it appears from the testimony of credible writers, that Tatian looked upon matter as the foundation of all evil, and therefore recommended, in a particular manner, the mortification of the body; that he distinguished the creator of the world from the supreme being; denied the reality of Christ's body; and corrupted the Christian religion with several other tenets of the oriental philosophy. He had a great number of followers, who were, after him, called *Tatianists*; but were nevertheless more frequently distinguished from other sects, by names relative to the austerity of their manners. For as they rejected, with a sort of horror, all the comforts and conveniencies of life, and abstained from wine with such a rigorous obstinacy, as to use nothing but water, even at the celebration of the Lord's supper; as they macerated their bodies by continual fasting, and lived a severe life of celibacy and abstinence; so they were called ENCRATITÆ or temperate, HYDROPARASTATÆ, or drinkers of water, and APOTACTITÆ or renouncers. Mosh. Eccl. Hist. vol. i. p. 180. 8vo. Eng. ed.

TAT-TOO, *q. d.* TAP-TO, a beat of a drum, at night, to advertise the soldiers to retreat, or repair to their quarters in a garrison, or to their tents in a camp. See RETREAT.

TATTOWING, in *Modern History*, a name given at Otaheite, to the operation of staining the body. For this purpose they prick the skin, so as just not to fetch blood, with a small instrument, somewhat in the form of a hoe: that part which answers to the blade is made of a bone or shell, scraped very thin, and from a quarter of an inch to an inch and a half wide: the edge is cut into sharp teeth or points, from the number of three to twenty, according to its size. When this is to be used, they dip the teeth into a mixture of a kind of lamp-black, formed of the smoke that rises from an oily nut which they burn instead of candles, and water: the teeth, thus prepared, are placed upon the skin, and the handle to which they are fastened, being struck by quick smart blows, with a stick fitted for the purpose, they pierce it, and at the same time carry into the puncture the black composition, which leaves an indelible stain. This operation is performed upon the youth of both sexes, when they are about twelve or fourteen years of age, in several parts of the body, and in various figures, according to the fancy of the parent, or perhaps the rank of the party. The women are generally marked with this stain, in the form of a z, in every joint of their fingers and toes, and frequently on the outside of their feet: the men are also marked with the same figure; and both men and women have squares, circles, crescents, and ill-designed representations of men, birds, or dogs, and various other unintelligible devices impressed upon their legs and arms. But the part on which these ornaments are lavished with the greatest profusion is the breech; this, in both sexes, is covered with a deep black; above which arches are drawn over one another, as high as the short ribs. These are often a quarter of an inch broad, and the edges are indented. These arches are exhibited both by the men and women, with singular ostentation. The face in general is left unmarked. Some old men had the greatest part of their bodies covered with large patches of black, deeply indented at the edges, like a rude imitation of flame. Hawkesworth's Voyages, vol. ii. p. 189.

TATU, in *Zoology*, the Brasilian name for the ARMADILLO, or shell-hedge-hog, or DASYPUS of Linnæus.

TATU-*Apara*, in *Zoology*, the name of a creature of the armadillo kind, being the three-banded or *tricinctus* DASYPUS of Linnæus: but differing from the others in many particulars; its head is oblong, and of a pyramidal figure; its ears are small, short, and roundish; and its feet, as well the fore ones as the hinder ones, have each five toes. The fore legs are about three fingers long, the hinder ones five; the tail of a pyramidal figure, and little more than two fingers breadth long. It is covered with a shelly coat of a foot long, and eight fingers wide; it is smaller at both ends than in the middle; and is convex on the outside, and concave within. In the middle, or a little toward the fore end, it has four junctures, which are placed transversely, and by means of which it can, at pleasure, expand its shell, or contract it together into a round figure. The whole crust is composed of pentangular pieces, very nicely fitted to one another, and the series of these between the commissures are parallelograms. The whole is composed of yellowish scales joined by an extremely tough skin. This animal burrows under ground, keeps its hole in the day, and rambles out at night: when it would sleep, or when it is afraid of being taken up, it contracts its crust into a round figure; and hiding its whole body within, it might sooner be taken for a sea-shell than a land-animal. It is hunted with little dogs, feeds on potatoes, &c. drinks much, grows very fat, and is reckoned delicious eating when young, but when old, has a musky disagreeable taste; breeds every month, and brings four at a time. Ray and Pennant. See *Tab.* III. *of Quadrupeds*, N° 21, and ARMADILLO.

TATU *Mustelinus*, the *weasel-headed armadillo*, in *Zoology*, the name of a small animal of the armadillo-kind. This is the *dasypus unicinctus* of Linnæus: it has a very slender head, small erect ears, the crust on the shoulders and rump consisting of square pieces; eighteen bands on the sides; five toes on each foot; length from nose to tail about fifteen inches; the tail five and a half. It inhabits South America. Ray, Pennant and Grew's Mus. Reg. Soc. p. 19.

TATU-*Peba* of Brasil, in *Zoology*, is the six-banded *dasypus* of Linnæus, having the crust of the head, shoulders, and rump, formed of angular pieces, and between the bands, and also on the neck and belly, a few scattered hairs; the tail thick at the base, tapering to a point, and not so long as the body, and five toes on each foot. It inhabits Brasil and Guiana. Pennant.

TATU *Porcinus*, in *Zoology*, the name of the pig-headed armadillo, or nine-banded *dasypus* of Linnæus, with long ears; crust on the head, shoulders and rump, marked with hexangular figures; the nine bands on the sides distinguished by transverse cuneiform marks; breast and belly covered with long hairs; four toes on the fore-feet, and five on the hind; the tail taper, and a little longer than the body; and length of the whole animal three feet. This animal inhabits South America: and one, that was brought into England a few years ago from the Mosquito shore, was fed with raw beef and milk, but refused our grains and fruit. Pennant.

TATUETE, in *Zoology*, the name of a species of *tatu*, or armadillo, being the nine-banded *dasypus* of Linnæus, though Buffon and Pennant ascribe to it only eight bands; it has upright ears, two inches long; small black eyes; four toes on the fore-feet, and five on the hinder ones; the length from nose to tail about ten inches, the tail nine: it is of an iron-colour on the back, and whitish at the sides; its belly also is whitish and naked, except for a few hairs. It inhabits Brasil.

The flesh of this is accounted more delicious than that of any other creature of this kind, though they may all be eaten. Ray and Pennant.

TATULA, in *Botany*, a name used by Clusius, and some other authors, for the stramonium, or thorn-apple.

TAU, in our ancient customs, signifies a CROSS. *Tradendo dicto comiti* Thau *eboreum*. So Mr. Selden, in his notes upon Eadmerus, p. 159. *Ego Eadgisa prædicti regis ava hoc opus egregium crucis* Taumate *consolidavi*. See Mon. tom. iii. p. 121.

TAU, or TAW, in *heraldry*, an ordinary, in figure of a T, supposed to represent St. Andrew's cross, or a cross potence, the top part cut off.

It is thus called from the name of the Greek T, *tau*.

TAVACCARÆ, in the *Materia Medica*, the name by which many authors call the *coccus Maldiviæ*, or Maldive-nut.

TAUGHT, or TAU'T, *Tight*, in the *Sea-language*, denotes the state of being extended or stretched out. Thus they say, *set taught* the shrouds, the stays, or any other ropes, when they are too slack and loose.

TAULACUM, in *Natural History*, a name given by the people of the East Indies to a species of orpiment, which is very common with them.

It is of a dirty-yellow colour, and is composed partly of an irregular mass, partly of fine flakes, like scales of fishes. These are of the best colour. The whole mass, on being exposed to the fire, burns, and emits copious fumes; but it does not melt readily. After it has been several times calcined, the Indians give it internally in intermittent fevers, with safety and success. Woodw. Catal. Foss. vol. i. p. 24.

TAUNT, a sea term, signifying high or tall.—When the masts of a ship are too tall for her, the sailors say, she is *taunt-masted*.

TAUREA, among the *Romans*, a punishment inflicted by whipping with scourges made of bulls hides.

TAURI *liberi libertas*.—In some ancient charters, *taurus liber* signifies a common bull kept for all tenants within such

ſuch a manor, or liberty.—*Cum libertate faldiæ, liberi tauri, & liberi apri*, &c. See *Free* BULL.

TAURIA, Ταυρεια, in *Antiquity*, a feſtival in honour of Neptune. Pott. Archæol. tom. i. p. 432.

TAURILIA, among the *Romans*, games in honour of the infernal gods. They were otherwiſe called *ludi taurii*.

TAUROBOLIUM, or TAUROBOLION, among the *ancients*, ſacrifices of bulls, which were offered to Cybele, the mother of the gods, to render thanks to the goddeſs of the earth, for her teaching men the art to tame thoſe animals, and fit them for labour.

The *Taurobolium* was a kind of ſacrifice of expiation and purification; of which no trace occurs before the reign of Antonine, and which ſeems to have terminated under Honorius and Theodoſius the younger. It was principally employed in the conſecration of the prieſts of Cybele.

TAUROCOLLA, *bull glue*, a ſort of glue much uſed among the ancients in works that required ſtrength, being accounted far ſtronger than any other kind. It was made by boiling down the ears and genital parts of a bull in water.

TAUROPOLIA, in *Antiquity*, feaſts, celebrated in honour of Diana and Apollo, in the Icarian iſles, viz. thoſe of the Archipelago and of the Ægean ſea.

TAURUS, in *Aſtronomy*, the *Bull*; one of the twelve ſigns of the zodiac, and the ſecond in order.

The ſtars in the conſtellation *Taurus*, in Ptolemy's catalogue are 44; in Tycho's catalogue 43; in Hevelius's catalogue 51; in the Britannic catalogue 141. The longitudes, latitudes, magnitudes, &c. whereof are as follow:

Names and ſituations of the ſtars.	Bayer's Char.	Signs.	Longitud.	Latitude.	Magnitude.
			° ′ ″	° ′ ″	
South of 4 in the ſection	o	♉	16 49 36	9 21 47 S	4
That following it	ξ		17 33 43	8 49 48 S	4
			21 32 28	2 59 57 N	6
That following this	s		18 44 58	7 28 29 S	6
North of 4 in the ſection	f		19 15 18	5 57 13 S	5
5.					
That fol. this in preced. ſhoulder	t		18 47 41	9 30 27 S	6
			22 50 12	5 02 40 S	6
			21 46 50	0 05 20 N	6
			23 06 10	3 41 37 N	6
Preced. inform. under the foot			17 38 38	18 27 41 S	4.5
10.					
			24 26 24	5 32 51 S	6
			19 03 08	16 04 57 S	6
			23 30 49	0 00 50 S	6
			23 50 29	0 07 15 S	6
	n		24 47 09	3 03 43 N	6
15.					
Preced. of ſquare of Pleiades	g		25 07 05	4 19 25 N	7
In weſt angle of ſquare	b		25 05 21	4 09 05 N	5
Moſt north of Pleiades	m		25 18 52	4 50 42 N	7
North of ſquare	e		25 14 42	4 29 02 N	5
	c		25 21 31	4 21 25 N	6
20.					
	k		25 25 16	4 31 33 N	6.7
	l		25 26 40	4 29 49 N	7
South of ſquare	d		25 22 30	3 54 47 N	4.5
	p		25 38 32	4 01 39 N	7
Lucida pleiadum	η		25 40 08	4 00 37 N	3
25.					
	s		25 56 00	3 41 45 N	7.8
In the eaſt angle	f		26 01 52	3 52 37 N	6
A leſs, contiguous to it	h		26 03 19	3 57 34 N	7.8
Preceding in the foot 1 at	u		21 13 06	13 30 06 S	6
Subſeq. in preced. ſhoulder	e		23 00 15	8 40 36 S	5
30.					
Subſequent in foot 2 at	u		22 54 17	13 22 57 S	6
			27 25 21	1 58 32 N	6
			27 36 33	2 38 20 N	7
			28 00 57	0 10 38 S	7
That in the breaſt	λ		26 17 31	7 59 57 S	4
35.					
			29 26 17	3 13 26 N	7
In the middle of the neck	A		29 07 19	1 13 20 N	5
In the heel of the preceding foot	ν		25 35 08	14 29 50 S	4
			29 15 00	1 08 01 S	6
			25 37 51	15 04 02 S	7
40.					
Preced. the ſquare of the neck		♊	0 36 10	6 33 07 N	6
North of ſquare of the neck	ψ		0 57 25	7 54 38 N	5
Preceding of 2 at the knee 1 at	ω	♉	29 40 52	1 23 58 S	6
Preced. of middle ones in the ſquare of the neck	φ	♊	1 19 32	5 16 41 N	6
		♉	27 32 58	15 21 10 S	7
45.					
			28 32 05	13 17 55 S	7
			28 55 38	11 47 39 S	7
That preced. 1ſt of the Hyades		♊	0 27 43	5 50 11 S	7
That in the preceding cheek	μ	♉	29 14 12	12 13 17 S	4
Subſequent of two at knee 2 at	ω	♊	1 43 40	0 47 26 S	6
50.					
			2 09 33	0 08 53 N	7
Subſeq. of middle ones in the ſquare of the neck	φ		3 32 59	5 46 12 N	5
			2 19 18	0 19 23 S	7
Firſt of the Hyades in noſtrils	γ		1 27 30	5 46 22 S	3
			1 39 52	4 45 35 S	7
55.					
			2 42 21	0 15 00 N	7
That under the 1ſt of the Hyades			1 13 31	7 20 32 S	6.7
	h		1 33 12	6 19 57 S	7
South of ſquare of the neck	χ		3 46 56	3 58 41 N	5
			1 38 53	7 22 00 S	7
60.					
Between the noſtr. and n. eye 1 at	δ		2 31 27	4 00 34 S	4
			3 53 21	2 37 06 N	7
			2 31 24	4 44 58 S	6
Second 2 at	δ		2 47 13	4 09 04 S	5
North of the ſouth in the ear 1 at	κ		3 51 53	0 35 21 N	5
65.					
In the heel of the hind foot	τ		1 24 57	12 01 21 S	5
South of ſouth in the ear 2 at	κ		3 51 37	0 29 46 N	5
Third and ſmall between noſtrils and ear 3 at	δ		3 11 42	3 43 27 S	6
Preced. of north in the ear 1 at	υ		4 09 42	1 04 06 N	5
			2 54 01	5 41 50 S	7
70.					
			3 02 10	6 02 44 S	7
Subſequent 2 at	υ		4 25 18	1 12 36 N	6
Preceding below the hyades	π		2 56 57	6 56 53 S	5
In north eye	ε		4 07 11	2 35 58 S	3.4
			3 39 12	5 23 43 S	7
75.					
			3 22 25	6 59 01 S	7
Double one between noſtrils and ſouth eye 1 at	θ		3 36 25	5 47 16 S	5
2 at	θ		3 36 51	5 52 55 S	5
In the following ſhoulder	b		3 12 31	8 40 32 S	5
			3 56 00	6 09 18 S	7
80.					
			4 03 47	6 07 13 S	7
			3 57 22	6 42 04 S	7
			3 44 57	8 04 25 S	7
			4 05 43	6 43 28 S	7
			4 22 3[illegible]	6 00 53 S	7
85.					
Middle, beneath the Hyades	S		4 42 07	7 05 06 S	5
South eye, palilicium, Aldebaran	α		5 27 00	5 29 49 S	1
In the following leg	d		4 27 10	11 46 45 S	5
			5 54 15	6 03 20 S	7
Preceding in the hind knee 1 at	c		5 24 30	9 32 32 S	5
90.					
1 at	σ		6 07 14	6 19 19 S	6
Subſequent beneath Hyades 2 at	σ		6 09 52	6 12 35 S	6
2 at	c		5 49 58	9 55 14 S	6
Subſequent in hind knee	τ		7 49 20	0 40 23 N	5
			8 23 08	1 44 11 N	6.7
95.					
In root of north horn			8 41 27	6 28 00 S	6
In root of ſouth horn	i		9 24 58	3 40 35 S	6
	k		11 40 58	2 19 03 N	6
			11 35 24	0 50 29 N	6
			10 41 58	6 19 06 S	6
100.					
			11 06 28	6 39 00 S	6
Preced. of 3 over ſouth horn	ι		12 27 36	1 14 34 S	4
			13 41 20	1 42 42 N	6
More ſouth in the ſouth horn	m		13 09 18	4 16 08 S	6
			13 35 20	1 14 06 S	6
105.					
1 at	l		13 26 55	2 30 59 S	6
More north 2 at	l		13 38 52	3 05 34 S	6
Middle of 3 over ſouth horn			15 22 54	0 48 04 S	7
In the middle of the horn	n		16 14 58	1 03 03 S	5
			16 54 06	6 30 25 S	7
110.					
			17 07 00	5 49 12 S	6.7
In extremity of north horn	β		18 13 56	5 21 34 N	2
			17 29 44	6 33 02 S	6
Hindmoſt of 3 over ſouth horn	o		18 10 06	1 20 12 S	5
			17 49 31	5 18 04 S	7
115.					
			17 50 11	7 23 00 S	6.7
			17 59 37	6 01 45 S	7
			18 42 56	1 51 14 N	6
			19 03 45	4 43 55 S	7
			19 22 21	4 48 10 S	7
120.					
Preced. of inform. fol. n. horn			20 03 55	0 40 32 N	6
			20 08 48	6 20 26 S	7
In extrem. of ſouth horn	ζ		20 27 28	2 14 21 S	3
		♊	20 51 03	0 07 26 S	7

Names and situation of the stars.	Bayer's Char.	Signs.	Longitud. ° ′ ″	Latitude. ° ′ ″	Magnitude.
Auriga, in Tycho inform.		♊	21 06 07	2 29 23 N	4.5
125 North under south horn			21 09 28	6 52 43 S	6
			21 36 56	4 25 54 S	6
			21 59 23	7 20 57 S	6
South below south horn			22 27 01	7 38 01 S	6
			22 39 22	5 43 23 S	6
130.			22 32 16	8 57 39 S	6
Inform. of Auriga			23 10 03	1 06 31 N	4
			22 38 44	9 33 28 S	6
			23 04 03	10 48 50 S	6
			23 19 48	9 09 37 S	6
135. Inform. of Auriga			24 10 37	4 08 15 N	4.5
			23 46 29	9 18 02 S	5
			23 46 54	9 31 13 S	6
Inform. of Auriga			25 12 28	2 28 05 N	5.9
			25 46 35	0 35 03 S	6
140.			26 03 40	1 04 43 S	6

TAURUS, in *some Ancient Customs*, signifies a HUSBAND. Leg. H. I. cap. 7. *Videtur autem matris ejus, cujuscunque* taurus *alluserit*—

TAURUS, in *Ornithology*, a name given by the ancients to the bittern or butter-bump, from its imitating the roaring of a bull in its noise.

TAURUS, in *Zoology*. See BULL.

TAURUS *Æthiopicus*, the *Æthiopian bull*, an animal described in a very remarkable manner by Pliny; but so contrary to the course of nature, that we may very justly rank it among the other extraordinary animals, such as the MANTICHORA, and the vermis cæruleus, of sixty or seventy foot long.

TAUTOLOGICAL *echoes*, are such echoes as repeat the same sound or syllable many times. See ECHO.

TAUTOLOGY, in *Grammar*, a needless repetition of the same thing in different words. Such, e. g. is that of Virgil:

——*Si fata virum servant, si vescitur aura*
Ætherea, neque adhuc crudelibus occubat umbris.

TAWING, *skinning*; the art or manner of preparing or dressing skins in white, to fit them for use in divers manufactures, particularly for gloves, &c.

All kinds of skins may be tawed; but it is chiefly those of sheep, lambs, kids, and goats, that are used to be dressed this way, as being those fittest for gloves.

Method of TAWING, *or drawing skins in white.* The wool or hair being well got off the skins, by means of lime, &c. (as described under the article SHAMMY) they are laid in a large vat of wood or stone set in the ground, full of water, wherein quick-lime has been slaked; in this they continue a month or six weeks, as the weather is more or less hot, or as the skins are required to be more or less soft and pliant.

While in the vat the water and lime are changed twice, and they are taken out and put in again every day. When taken out for the last time, they are laid all night to soak in a running water, to get out the greatest part of the lime; and, in the morning, they are laid, six together, on the wooden leg, to get off the flesh, by scraping them stoutly, one after another, on the flesh-side, with a cutting two-handed instrument, called a knife; and while this is in hand, they cut off the legs, and other superfluous parts about the extremes.

This done, they are laid in a vat or pit with a little water; where being well fulled with wooden pestles for a quarter of an hour, the vat is filled with up with water, and the skins are rinsed therein. They are next thrown on a clean pavement to drain; which done, they are cast into a fresh pit of water, where being well rinsed they are taken out, and laid on the wooden leg, six at once, with the hair-side outermost, over which they rub a kind of whetstone very briskly, to soften, and fit them to receive four or five more preparations given them on the leg, both on the flesh-side and the hair-side, with the knife, after the manner above mentioned.

They are then put into a pit with water and wheat-bran, and stirred about therein, with wooden poles, till the bran is perceived to stick to them, and then are left; after this, as they rise of themselves to the top of the water by a kind of fermentation, they are plunged down again to the bottom, and, at the same time, fire is set to the liquor, which takes as easily as if it were brandy, but goes out the moment the skins are all covered.

This operation is repeated as often as the skins rise above water; and when they rise no more, they are taken out, laid on the wooden leg, the flesh-side outermost, and the knife is passed over it to scrape off the bran. The bran thus cleared, the skins are laid in a large basket, where they are loaded with huge stones to promote their draining; and when sufficiently drained their feeding is given them, which is performed after the following manner: For a hundred large sheep-skins, and for smaller in proportion, they take eight pounds of alum and three of sea-salt, melt the whole with water in a vessel over the fire, pouring the solution out, while yet luke-warm, into a kind of trough, wherein are twenty-pounds of the finest wheat flour, with eight dozen yolks of eggs; of all this together is formed a kind of paste, a little thicker than children's pap, which, when done, is put into another vessel, to be used in manner following.

A quantity of hot water being poured into the trough wherein the paste was prepared, two spoonfuls of the paste are mixed therewith; in order to which they use a wooden spoon, which contains just what is required for a dozen skins; and when the whole is well diluted, two dozen of the skins are plunged therein; care being taken by the way that the water be not too hot, which would spoil both the paste and hurt the skins. Having staid some time in the trough, they are taken out, one after another, with the hand, and stretched out; this is repeated twice; when they have all had their paste, they are put into tubs, where they are fulled afresh with wooden pestles.

Then they are put into a vat, where they remain five or six days, or more, and are at last taken out in fair weather, and hung out to dry on cords or racks; the quicker they dry the better, for if they be too long in drying, the salt and alum within them are apt to make them rise in a grain, which is an essential fault in this kind of dressing.

When the skins are dry, they are put up into bundles, and just dipt in fair water; from which being taken out and drained, they are thrown into an empty tub, and, after some time, are taken out, and well trampled under foot.

They are then drawn over a flat iron instrument, the top whereof is round like a battledore, and the bottom fixed into a wooden block, to stretch and open them: when opened, they are hung in the air upon cords to dry; and when dry, they are opened a second time, repassing them over the same instrument.

Lastly, they are laid on a table, pulled out and laid smooth, and are thus in a condition for sale and use.

After the same manner are dressed horses, cows, calves-skins, &c. for the sadlers, harness-makers, &c. as also dogs, wolves, bears-skins, &c. excepting that in these the use of paste is omitted, salt and alum-water being sufficient. See TANNING.

By stat. 9 Ann. cap. 11. and 10 Ann. cap. 26. the following duties are imposed on hides or skins *tawed* or dressed in Great Britain. For horse-hides dressed in alum and salt, or meal, or otherwise tawed, 1*s.* 6*d.* a hide; hides of steers, cows, and all other (except horse-hides) dressed in alum and salt or meal, or otherwise tawed, 3*s.* a hide; calve-skins and kips, dressed in alum and salt or meal, or otherwise tawed, 1½*d.* a pound: skins so dressed or tawed with the hair on, 3*s.* a dozen; and without hair 1*s.* a dozen; dog-skins so dressed or tawed, 1*s.* a dozen; buck and doe-skins (except what paid the duty on importation) dressed in alum and salt or meal, or otherwise tawed, 6*d.* a pound; kid-skins, so dressed or tawed, except as before, 1*s.* a dozen; goat-skins so dressed or tawed, 2*s.* a dozen; beaver-skins so tawed, 2*s.* a dozen; sheep-skins and lamb-skins so dressed or tawed, 1½*d.* a pound; and all other tawed skins, not before charged, 30*l.* for every 100*l.* value. All these duties are to be paid by the tawers or makers.

For hides and skins dressed in oil, 6*d.* a pound; deer, goat, and beaver-skins, dressed in oil, 6*d.* a pound; calve-skins dressed in oil, 8*d.* a pound; sheep and lamb-skins dressed in oil, 3*d.* a pound; all skins dressed in oil, not before charged, 15*l.* in the 100*l.* according to the real value; all which are to be paid by the oil leather-dressers.

For other regulations, see LEATHER and TANNER.

TAWNY, in *Heraldry*. See TENNE'.

TAX, formed from τάξις, *order*, denotes a certain aid, subsidy, or supply, granted by the commons of Great Britain in parliament assembled, constituting the king's extraordinary REVENUE; and paid yearly towards the expences of the government. See MONEY-*bills*, PARLIAMENT, and SUPPLY.

Anciently the *tax* seems to have been imposed by the king at his pleasure; but Edward I. bound himself, and his successors,

successors, from that time forward, not to levy it but by consent of the realm.

The *taxes* which are raised on the subject are either annual or perpetual. The usual annual *taxes* are those upon land and malt.

The first of these is the land-*tax*, for an account of which, see LAND-*tax*.

See also HIDAGE, SCUTAGE, TALLIAGE, TENTH, FIFTEENTH, and SUBSIDY.

The other annual *tax* is the *malt-tax*, which is a sum raised every year by parliament ever since 1697, by a duty of 9*d*. in the bushel on MALT, and a proportionable sum on certain liquors, such as cyder and perry, which might otherwise prevent the consumption of malt. 12 Ann. stat. 1. cap. 2. 33 Geo. II. cap. 7. Malt for exportation is excepted by 12 Geo. III. cap. 4. And by 19 Geo. III. cap. 25. there is an additional duty of 15*l*. per cent. This duty is under the management of the commissioners of the excise.

The perpetual *taxes* are the CUSTOMS, which are a *tax* immediately paid by the merchant, although ultimately by the consumer: the EXCISE-*duty*, which is an inland imposition, paid sometimes upon the consumption of the commodity, or frequently upon the retail sale, which is the last stage before the consumption; the duty upon SALT; that for the carriage of letters or POST; the STAMP-*duties*; the duty upon houses and WINDOWS; the duty arising from licences to hackney-COACHES and chairs in London, and the parts adjacent; and the duty upon offices and pensions, which consists in a payment of 1*s*. in the pound (over and above all other duties) out of all salaries, fees, and perquisites of offices and pensions payable by the crown; this taxation was imposed by stat. 31 Geo. II. cap. 22. and is under the direction of the commissioners of the land-*tax*. Blackst. Com. book i. cap. 8.

The *tax* upon servants consists of 21*s*. to be paid yearly for every male servant, excepting any butler, manciple, cook, gardener, or porter of any college or hall in either of the universities, or of the colleges of Westminster, Eton, or Winchester, or of the hospitals of Christ, St. Bartholomew, Bridewell, Bethlehem, St. Thomas, or Guy's, or the Foundling hospital; and also the servants of his majesty, or any of the royal family, or of any ambassador, or foreign minister residing in this kingdom; and also any servant retained or employed *bona fide* for the purposes of husbandry or manufactures, or of any trade or calling by which the master or mistress earns a livelihood or profit.

The above sum of 21*s*. shall be charged on the master or mistress of every such servant, within every year ending the 25th day of March, and paid within six months subsequent to the same. This duty is under the management of the commissioners of the duties upon houses and windows, who shall appoint assessors; and these shall procure lists of servants liable to the duty, describing their number, and their Christian and surnames, and the office or capacity in which they are employed, signed by the master.

The surveyors of the duties upon houses and windows shall also be surveyors with respect to this duty. 17 Geo. III. cap. 39. 19 Geo. III. cap. 59.

For the duty on post-horses, &c. see POST-*horse*.

The revenue arising from the several *taxes*, which is annually paid to the creditors of the public, or carried to the sinking fund, is first deposited in the royal exchequer, and thence issued out to the respective offices of payment: for the manner in which it is applied, see FUND and NATIONAL *debt*. See also REVENUE.

The people of France were strangers to *tailles* or *taxes* till the time of St. Louis, when they were first imposed in form of subsidies necessary for the support of the war in the Holy Land. See CROISADE.

They were then extraordinary levies, and were raised by capitation; but they were afterwards made perpetual under Charles VII. and Philip the Fair, to raise money without disturbing the people, called the people, as a third estate, into the general councils of the realm.

TAX also denotes the tribute which tenants were occasionally to pay their lord.

Most lords had a right of *taxing* on four occasions; viz when the lord was taken prisoner in a just war; when he made his eldest son a knight; when he married his eldest daughter to a gentleman; and when he made the voyage of the Holy Land.

Naude shews the extravagant rise of this kind of *taxes*: those, he observes, which under Charles VI. only amounted to the sum of 40,000 livres, were increased under Charles VII. to the sum of 1,800,000 livres; under Louis XI. to 4,740,000 livres; under Charles VIII. to 6,000,000; and under Lewis XII. to 7,640,000 livres.

Taxes were distinguished into *free*, which were those due, in the four cases, by freemen, or those who held free lands; and *servile* and *base*, which were those due from persons of base condition.

They were also distinguished into *real* and *personal*. The *personal* were imposed on the head of the servant or man in mainmort, and so followed him wherever he went.

TAXERS, two officers yearly chosen in Cambridge, to see the true gauge of all weights and measures observed.

The name took beginning from *taxing* and rating the rents of houses, which was anciently the duty of their office.

TAXIS, τάξις, in the *Ancient Architecture*, signifies the same with ORDONNANCE in the new, and is described by Vitruvius to be that which gives every part of a building its just dimensions with regard to its use.

TAXUS, in *Botany*. See YEW.

TAXUS, in *Zoology*. See BADGER.

TAYL, in *Heraldry*. See TAIL.

TCHA. See TEA.

TCHELMINAR, TCHILMINAR. See CHILMINAR.

TEA-*tree*, *thea*, in *Botany*, the name of a genus of plants, of the *polyandria monogynia* class, the characters of which are these: the cup is a very small, plane, permanent perianthium, divided into five or six roundish, obtuse leaves; the flower consists of six or nine large roundish, concave, and equal petals; the stamina are numerous filaments, about two hundred, and are very slender, capillary, and shorter than the flower; the antheræ are simple; the germen of the pistil is globose and trigonal; the style is subulated, and of the length of the stamina; the stigma is simple; the fruit is a capsule, formed of three globular bodies growing together; it contains three cells, and opens into three parts at the top. The seeds are single, globose, and internally angulated.

From an original drawing taken of the tree when in its flowering state, it appears, that the *tea*-tree, as Mr. Miller first observed, belongs to the order of *trigynia*; and Linnæus was led to the mistake of placing it in that of *monogynia*, by not having had any opportunity of examining any other than dried specimens of this shrub.

Of this genus Linnæus enumerates two species; viz. the *bohea tea*, having flowers with six petals, and the *green tea*, having flowers with nine petals.

Dr. Lettsom, in his botanical description of the *tea*-plant, thinks it most probable, that there is only one species, and that the difference between the green and bohea *teas* depends on the nature of the soil, culture, age, and the manner of drying the leaves. He adds, that it has even been observed, that a green *tea*-tree, planted in the bohea country, will produce bohea, and on the contrary; and that on his examining several hundred flowers, brought both from the bohea and green *tea* countries, their botanical characters have always appeared uniform.

We are principally indebted to Kæmpfer, Le Compte, and Du Halde, for an authentic history of the culture of this exotic shrub, and the manner of preparing or curing its leaves.

The particulars of greatest importance that have been recited, have lately been judiciously collected, and the subject farther illustrated by additional observations by Dr. Lettsom.

The *tea*-tree loves to grow in vallies, at the foot of mountains, and upon the banks of rivers, where it enjoys a southern exposure to the sun; though it endures considerable variations of heat and cold, as it flourishes in the northern clime of Pekin, as well as about Canton; and it is observed that the degree of cold at Pekin is as severe in winter as in some of the northern parts of Europe. However, the best *tea* grows in a mild temperate climate, the country about Nankin producing better *tea* than either Pekin or Canton, betwixt which places it is situated.

The root resembles that of the peach-tree; the leaves are green, longish at the point, and pretty narrow, an inch and half long, and jagged all round. The flower is much like that of the wild rose, but smaller. The fruit is of different forms, sometimes round, sometimes long, sometimes triangular, and of the ordinary size of a bean, containing two or three seeds, of a mouse-colour, including each a kernel. These are the seeds by which the plant is propagated: a number from six to twelve or fifteen being promiscuously put into one hole, four or five inches deep, at certain distances from each other. The seeds vegetate without any other care, though the more industrious annually remove the weeds and manure the land. The leaves which succeed are not fit to be plucked before the third year's growth, at which period they are plentiful, and in their prime.

In about seven years the shrub rises to a man's height, and as it then bears few leaves, and grows slowly, it is cut down

down to the ſtem, which occaſions an exuberance of freſh ſhoots and leaves the ſucceeding ſummer; ſome, indeed, defer cutting them till they are of ten years growth. In Japan the *tea*-tree is cultivated round the borders of the fields, without regard to the ſoil; but as the Chineſe export conſiderable quantities of *tea*, they plant whole fields with it.

The beſt time to gather the leaves of *tea* is while they are yet ſmall, young, and juicy; and the different periods in which they are gathered are particularly deſcribed by Kæmpfer. They are plucked carefully one by one, and, notwithſtanding the ſeeming tediouſneſs of this operation, the labourers are able to gather from four to ten or fifteen pounds each in one day. The *tea*-trees that yield often the fineſt leaves, grow on the ſteep declivities of hills, where it is dangerous, and in ſome caſes impracticable to collect them. The Chineſe are ſaid to vanquiſh this difficulty by a ſingular contrivance. The large monkies which inhabit theſe cliffs are irritated, and in revenge they break off the branches, and throw them down, ſo that the leaves are thus obtained.

The buildings, or drying-houſes, that are erected for curing *tea*, contain from five to ten or twenty ſmall furnaces, about three feet high, each having at the top a large flat iron pan. There is alſo a long low table covered with mats, on which the leaves are laid, and rolled by workmen, who ſit round it: the iron pan being heated to a certain degree by a little fire made in the furnace underneath, a few pounds of the freſh gathered leaves are put upon the pan; the freſh and juicy leaves crack when they touch the pan, and it is the buſineſs of the operator to ſhift them as quick as poſſible with his bare hands, till they become too hot to be eaſily endured. At this inſtant he takes off the leaves with a kind of ſhovel reſembling a fan, and pours them on the mats before the rollers, who, taking ſmall quantities at a time, roll them in the palms of their hands in one direction, while others are fanning them that they may cool the more ſpeedily, and retain their curl the longer. This proceſs is repeated two or three times, or oftener, before the *tea* is put into the ſtores, in order that all the moiſture of the leaves may be thoroughly diſſipated, and their curl more completely preſerved. On every repetition the pan is leſs heated, and the operation performed more ſlowly and cautiouſly. The *tea* is then ſeparated into the different kinds, and depoſited in the ſtore for domeſtic uſe or exportation.

The Chineſe know nothing of *imperial tea*, *flower of tea*, and many other names, which in Europe ſerve to diſtinguiſh the goodneſs, and the price of this faſhionable commodity; but, beſide the common *tea*, they diſtinguiſh two other kinds, viz. the *voui* and *ſoumlo*, which are reſerved for people of the firſt quality, and thoſe who are ſick. We have two principal kinds of *tea* in Europe; viz.

Green Tea, which is the common *tea* of the Chineſe, &c. F. le Compte calls it *bing tea*, and ſays it is gathered from the plant in April. It is held very digeſtive, and a little aſtringent; it gives a paliſh green tincture to water, and its leaves are much twiſted. The ſecond is,

Bohea Tea, which is the *voui tea*, or *bou tcha* of the Chineſe. F. le Compte makes this only differ from the *green tea*, by its being gathered a month before it, viz. in March, while in the bud; and hence the ſmallneſs of the leaves, as well as the depth of the tincture it gives to water. Others take it for the *tea* of ſome particular province; the ſoil being found to make an alteration in the properties of the *tea*, as much as the ſeaſon of gathering it. It is all bought at Nankin, and thence brought into Europe, where it is now much in vogue.

As to the differences in colour and flavour peculiar to theſe two kinds, and to their varieties, Dr. Lettſom thinks that there is reaſon to ſuſpect that they are, in ſome meaſure, adventitious, or produced by art. He has been informed by intelligent perſons, who have reſided ſome time at Canton, that the *tea* about that city affords very little ſmell while growing. The ſame is obſerved of the *tea*-plants now in England, and alſo of the dried ſpecimens from China. We are not, however, as he obſerves, to conclude from hence, that art alone conveys to *teas*, when cured, the ſmell peculiar to each kind; for our vegetable graſſes, for inſtance, have little or no ſmell till they are dried and made into hay.

As to the opinion that the *green tea* owes its verdure to an effloreſcence acquired from the plates of copper on which it is ſuppoſed to be cured or dried, he ſhews that there is no foundation for this ſuſpicion. The infuſions of the fineſt imperial and bloom *teas* undergo no change on the affuſion of a volatile alkali, which would detect the minuteſt portion of copper contained in them, by turning the liquors blue.

The fine green colour of theſe *teas*, with as little reaſon, hath been attributed to green copperas; as this metallic ſalt would, on its being diſſolved in water, immediately act on the aſtringent matter of the leaves, and convert the infuſion into ink, as happens when a chalybeate water has been employed in the making of *tea*.

On the whole, Dr. Lettſom thinks it not improbable, that ſome green dye, prepared from vegetable ſubſtances, is employed in the colouring of the leaves of the green *teas*. And Neumann ſuſpects, that the brown colour and the flavour of the bohea ſorts, are introduced by art. Both the green and bohea *teas* have an agreeable ſmell, and a lightly bitteriſh ſubaſtringent taſte; with ſolution of chalybeate vitriol, they ſtrike an inky blackneſs. They give out their ſmell and taſte both to watery and ſpirituous menſtrua; to water, the green ſorts communicate their own green tincture, and the bohea, their brown; but to a rectified ſpirit they both impart a fine deep green. The extracts, obtained by gently drawing off the menſtrua, from the filtered tinctures, are very conſiderably aſtringent, and not a little ungrateful; but the ſpirituous moſt ſo.

Savary alſo ſpeaks of a ſort of *red tea*, or *Tartar tea*, called *bonan tcha*, which tinges the water of a pale red, and which is ſaid to be extremely digeſtive; by means hereof it is that the Tartars are ſaid to be able to feed on raw fleſh. Its taſte is earthy, and much the leaſt agreeable of them all; but this is ſcarce known in England.

Tea is to be choſen of the briſkeſt ſmell, and as whole as poſſible; and the greateſt care is to be taken that it have not been expoſed to the air to pall and evaporate.

The drink, *tea*, is made in China, and throughout the greateſt part of the Eaſt, after the ſame manner as in Europe; viz. by infuſing the leaves in boiling water, and drinking the infuſion hot. Indeed, among us, it is uſual to temper its bitterneſs with ſugar, but the Orientals uſe it without the addition of ſugar or milk.

However, the Japaneſe are ſaid to prepare their liquor a ſomewhat different way, viz. by pulverizing the leaves, ſtirring the powder in hot water, and drinking it as we do coffee.

From the account given by Du Halde, this method is not peculiar to the Japaneſe, but is alſo uſed in ſome provinces of China.

The common people, who have a coarſer *tea*, boil it for ſome time in water, and make uſe of the liquor for common drink. Early in the morning, the kettle, filled with water, is regularly hung over the fire for this purpoſe, and the *tea* is either put into the kettle encloſed in a bag, or by means of a baſket of proper ſize preſſed to the bottom of the veſſel, that there may be no hindrance in drawing off the water.

The Bantſjaa *tea* only is uſed in this manner, whoſe virtues, being more fixed, would not be ſo fully extracted by infuſion.

The Chineſe are always taking *tea*, eſpecially at meals: it is the chief treat wherewith they regale their friends. The moſt moderate take it at leaſt thrice a day; others ten times, or more; and yet it is computed, the conſumption of *tea* among the Engliſh and Dutch is as great in proportion as among the Orientals.

With regard to the commercial *hiſtory* of *tea*, we may obſerve that it was firſt introduced into Europe by the Dutch Eaſt India company, very early in the laſt century; and that a quantity of it was brought over from Holland by lord Arlington and lord Oſſory, about the year 1666, at which time it was ſold for 60*s*. a pound. But it appears, that before this time, drinking of *tea*, even in public coffee-houſes in this country, was not uncommon; for, in 1660, a duty of 8*d*. per gallon was laid on the liquor made and ſold in all coffee-houſes.

The preſent conſumption of it is immenſe. Dr. Lettſom tells us, that he has been informed, that at leaſt three millions of pounds are allowed for the annual home conſumption, not including the incredible quantity ſmuggled into the kingdom; and that the Eaſt India company have generally in their warehouſes a ſupply for three years. By 13 Geo. III. cap. 44. no licence ſhall be granted to the Eaſt India company to export *tea*, unleſs there remain in the warehouſes a quantity not leſs than ten millions of pounds weight.

As to the properties of *tea*, they are ſtrangely controverted; the eaſtern nations are at leaſt as much poſſeſſed with an idea of their extraordinary virtues as the Europeans; but it is, perhaps, becauſe imagination bears as great a ſway there as here. The reaſon why the gout and ſtone are unknown in China, is aſcribed to the uſe of this plant.

Tea is extolled as the greateſt of all medicines: moderately and properly taken, it acts as a gentle aſtringent and corroborative; it ſtrengthens the ſtomach and bowels, and is good againſt nauſeas, indigeſtions, and diarrhœas. It acts alſo as a diuretic and diaphoretic. The immoderate uſe of it, however, has been very prejudicial to many, who have been thereby thrown into the diabetes.

And alſo in Europe, infuſions of *tea*-leaves have been

extravagantly condemned by some and commended by others. From the contradictory opinions even of medical writers on this subject, the natural inference seems to be, that they possess neither noxious nor beneficial powers in any very considerable degree. They seem, when moderately used, to be for the most part innocent; in some cases they seem to be salutary; in some they are apparently prejudicial. They dilute thick juices, and quench thirst more effectually, and pass off by the natural emunctories more freely than more watery fluids; they refresh the spirits in heaviness and sleepiness, and seem to counteract the operation of inebriating liquors.

From their manifest astringency they have been supposed to strengthen and brace up the solids, but this effect experience does not countenance: as it is in disorders, and in constitutions, wherein corroborants are most serviceable, that the immoderate use of tea is peculiarly hurtful; in cold indolent habits, cachexies, chlorosis, dropsies, and debilities of the nervous system. Lewis's Mat. Med.

Dr. Lettsom has particularly enquired into the medical qualities and effects of *tea*; and having observed that infusions of bohea and green *tea* contribute to preserve sweet some small pieces of beef immersed in them, he infers that they possess an antiseptic power, when applied to the dead animal fibre, and from their striking a purple colour with salt of iron, he deduces their astringent quality.

From other experiments he concludes, that the activity of *tea* chiefly resides in its fragrant and volatile parts; and that if the use of it be beneficial or injurious to any particular constitution, it becomes so principally by means of this odorous fragrant principle. He apprehends that it is the safest course to use the infusion of the more ordinary kinds of this plant, which abound less with this fragrant principle. Or the *tea* may be boiled a few minutes in order to dissipate this volatile part, which stands charged as the cause of those nervous affections that are said to be produced, or aggravated, by the use of this liquor. By this process may likewise be extracted more copiously the more fixed, bitter, and stomachic parts of this vegetable.

Dr. Lettsom, who seems to be thoroughly persuaded of the occasionally noxious effects of this volatile principle, in the finer *teas* especially, recommends this last mentioned mode of making *tea*, or the substitution of the extract instead of the leaves; by the use of which the nervous relaxing effects, which follow the drinking of *tea* in the usual manner, would be in great measure avoided. This extract has been imported hither from China, in the form of small cakes, not exceeding a quarter of an ounce each in weight, ten grains of which might suffice one person for breakfast: but it might easily be made here by simple decoction and evaporation, by those who experience the noxious qualities of the volatile principles of this plant.

It may be farther observed, that the effect of drinking large quantities of any warm aqueous liquor would be to enter speedily into the course of circulation, and pass off as speedily by urine or perspiration, or the increase of some of the secretions.

Its effects on the solid parts of the constitution would be relaxing, and thereby enfeebling.

If this warm aqueous fluid were taken in considerable quantities, its effects would be proportionable, and still greater, if it were substituted instead of nutriment. The infusion of *tea*, however, has these two peculiarities. It is not only possessed of a sedative quality, but also of a considerable astringency; by which the relaxing power, ascribed to a mere aqueous fluid, is in some measure corrected on this account. It is, perhaps, less injurious than many other infusions of herbs, which, besides a very slight aromatic flavour, have very little, if any, stypticity, to prevent their relaxing debilitating effects.

So far, therefore, *tea*, if not too fine, if not drank too hot, nor in too great quantities, is perhaps preferable to any other known vegetable infusion. And if we take into consideration, likewise, its known enlivening energy, our attachment to it will appear to be owing to its superiority in taste and effects to most other vegetables. See Dr. Lettsom's Natural History of the *Tea*-tree, with Observations on the Medical Qualities of *Tea*, and Effects of *Tea*-drinking, 4to. 1772.

Tea may be considered as a very powerful aphrodisiac; and accordingly a physician of considerable eminence in his profession, imputes the amazing population of China amongst other causes, to the general use of it. Percival's Ess. p. 63.

No *tea* is allowed to be imported, except from the place of its growth, on pain of forfeiture, 11 Geo. cap. 30. and by 24 Geo. III. cap. 38. all the duties upon *tea* imported, sold, or used in this kingdom shall cease from September 15, 1784; at which period the East India company is discharged from the payment of duties on *tea* in their warehouses; and afterwards there shall be paid a duty of 12*l*. 10*s*. *per cent.* computed upon the gross prices for all *tea* delivered by the company to the purchasers, which duty shall be drawn back on exportation to any place where the drawback is already allowed. The company is required to make four sales in the year, and to sell such quantity as shall be sufficient to supply the demand, provided an advance of 1*d*. per ℔, be bid upon the prices at which the *teas* shall be put up; and at the four first sales after passing the act, these prices shall not exceed the following rates, viz. for bohea *tea* 1*s*. 7*d*. per ℔; for congo *tea* 2*s*. 5*d*. per ℔; for souchong *tea* 3*s*. 3*d*. per ℔; for singlo *tea* 3*s*. 3*d*. per ℔; and for hyson *tea* 4*s*. 11*d*. per ℔: and afterwards the whole price at which the *teas* are put up, shall not exceed the prime cost, with the freight and charges of importation, lawful interest from the time of the arrival of such *tea* in Great Britain, and the common premium of insurance. In lieu of the duties on *tea*, this act substitutes an additional duty on WINDOWS.

By this same act, the inland duties upon cocoa-nuts and coffee shall cease from September 15, 1784, and the following additional duties be paid, viz. for every pound of cocoa-nuts, the produce of British America, 6*d*. and the produce of any other place 1*s*. 6*d*.; and for every pound of coffee, the produce of British America, 6*d*. and the produce of any other place 2*s*. 6*d*.; and these duties are subject to an additional impost of 5 *per cent.* and 5 *per cent.* thereon imposed by 19 Geo. III. cap. 25. and 22 Geo. III. cap. 66.

No drawback shall be allowed on *tea* exported, except to Ireland, when the whole duty on importation shall be allowed. 18 Geo. II. cap. 26. 17 Geo. III. cap. 27.

Every person having in his custody more than six pounds weight of *tea* is a dealer; and selling without a licence, to be had for 12*d*. shall forfeit 5*l*. a month. 11 Geo. cap. 30. 15 Geo. II. cap. 11. Every person dealing in *tea*, &c. shall cause, to be painted or written over the door of his shop, the words, *dealer in coffee, tea, cocoa-nuts*, or *chocolate*, on pain of 200*l*. 19 Geo. III. cap. 69. and any dealer buying of any person who has not this inscription, incurs a forfeiture of 100*l*. and any other person 10*l*. By 20 Geo. III. cap. 35. no person shall trade in coffee, *tea*, or chocolate without a licence, at the price of 5*s*. under penalty of 20*l*. More than six pounds of *tea* cannot be removed without a PERMIT. 10 Geo. cap. 10. The adulteration of *tea* is subject to a penalty of 100*l*. besides the forfeiture of the same, and for every pound of dyed leaves of *tea*, 5*l*. 11 Geo. cap. 30. 17 Geo. III. cap. 29.

TEA, *German*, in *Botany*. See SPEEDWELL.

TEA, *Mexico*, *chenopodium ambrosioides* of Linnæus, in *Botany*, is a species of *chenopodium*, which, as well as the Jerusalem oak, or *chenopodium botrys*, are natives of the southern parts of Europe, and sown annually with us in gardens. Infusions of the leaves and flowery heads of both these plants, which are not unpalatable, drank as *tea*, are said to be of service in humoural asthmas and coughs, and other disorders of the breast; they are supposed to be antispasmodic and antihysteric. Lewis Mat. Med.

TEA, *New Jersey*, in *Botany*. See CEANOTHUS.

TEA, *Oswego*, in *Botany*. See MONARDA.

TEA, *Paraguay*, or *South Sea*, in *Botany*. See PARAGUAY.

TEAL, *querquedula*, in *Ornithology*, the ANAS *crecca* of Linnæus, the smallest of all the duck kind. Its beak is black, and its head and upper part of its neck of a reddish brown; but there runs on each side of the head a green streak from behind the eyes quite to the back part, and between these there is a black spot under the eyes; there is a white line which separates the reddish colour from the green. The lower part of the neck, the shoulders, and the sides, are very beautifully variegated with black and white streaks; the breast and belly are of a dusky greyish white: the first beautifully spotted with black; the vent black; the tail sharp-pointed and dusky; the coverts of the wings brown; the greater quill-feathers dusky; the exterior webs of the lesser marked with a glossy green spot, above which is another of black, and the tips white; the irides whitish, and the legs dusky. The female is of a brownish ash-colour, spotted with black, and has a green spot on the wing like the male. Ray and Pennant.

TEAL, *crested*, *querquedula cristata*, a name given by Bellonius and some others to a species of duck, remarkable for a tuft of feathers of an inch and a half long, hanging down from the back part of its head, and thence called the *tufted* DUCK; but more known among authors by the name of *capo negro*.

TEAL, *summer*, *anas circia* of Linnæus, is apprehended by Mr. Pennant to be no other than the female of our TEAL, though Linnæus has described it as a distinct species.

Summer teal is alſo a name given in ſome places to the GARGANEY.

TEAM, THEAM, or THAME, in *our Ancient Cuſtoms*, ſignifies a royalty granted by the king's charter to a lord of a manor, for the having, reſtraining, and judging bondmen, neifs, and villains, with their children, goods, and chattels in his court.

TEARS, *lacrymæ*, a watery humour, iſſuing out at the corners of the eye, by the compreſſion of the muſcles, ſerving to moiſten the cornea, and to expreſs our grief, and even to alleviate it. See LACHRYMAL and LACHRYMALIA.

Dr. Vaterus is of opinion, that the *tears* come from the white lines ſeen on the inſide of the palpebræ, deſcribed by Meibomius. He obſerved two ſmall ducts, beſides the common naſal duct, from the lacrymal ſac into the noſe; one of them opened into the upper part of the noſe; the other opened into the *antrum maxillare*. Miſcel. Barol. tom. iv. par. iii. ſect. 5.

The ancients had an opinion, that the *tears* of the living were of uſe, at leaſt of pleaſure, to the dead; for which reaſon they took great care to procure them abundance at their funerals, ſo much, as to introduce a profeſſion, or trade of weepers, as judging thoſe of their own families inſufficient.

Deer, when at bay, are commonly ſaid to ſhed *tears*; indeed, they ordinarily do yield a ſort of *tears*, which ouſing into the two clefts underneath, called *lacrymatories*, are there condenſed into a kind of yellow liquor, or gum, which diluted in white wine or carduus water, has been reputed a ſovereign remedy for fits of the mother, and the falling ſickneſs.

Virgil makes the horſe of Pallas ſhed *tears* at the funeral pomp of his maſter; this is one of the paſſages which the modern critics cenſure as a breach of probability.

TEAZEL, or TEASEL, *dipſacus*, or *carduus fullonum*, or the *fullers thiſtle*, in *Botany*, a genus of the *tetrandria monogynia* claſs. Its characters are theſe: it has many flowers collected in one common perianthium, which is permanent; they have but one petal, which is tubular, and cut into four parts at the top, which are erect, and they have four hairy ſtamina, as long as the petal, terminated by proſtrate ſummits: the germen is ſituated below the flower, ſupporting a ſlender ſtyle, crowned by a ſingle ſtigma; the germen becomes a column-ſhaped ſeed, encloſed in the common conical fruit, which is divided by long prickly partitions. Miller enumerates four, and Linnæus only three ſpecies, reckoning the cultivated *teazel*, or *carduus fullonum*, only a feminal variety of the common wild *teazel*.

Beſide the common wild ſpecies of this plant, there is a large kind of it, the heads of which are of ſingular uſe in raiſing the nap upon woollen cloth, for which it is propagated in great quantities in many parts of the Weſt of England. It is to be ſown in March, on a dry ſoil; a peck of the ſeeds is ſufficient to ſow an acre: the plants, being come up, muſt be hoed up firſt to ſix or eight inches, and ſome time after to a foot aſunder every way; and for the firſt ſummer the ground muſt be kept carefully cleared from weeds. The ſecond year after ſowing, the plants ſhoot up to heads, which are fit to cut in Auguſt, and tied up in bundles, and dried. The common produce of an acre of land is about a hundred and ſixty bundles, which are ſold at about a ſhilling a bundle. Some people ſow carraway among their *teazels*, but it only damages both. Miller.

The largeſt burs, and thoſe moſt pointed, are eſteemed the beſt, and are now called *male teazels*; they are moſtly uſed in the dreſſing and preparing of ſtockings and coverlets; the ſmaller kind, properly called the *fullers* or *drapers teazels*, and ſometimes the *female teazel*, are uſed in the preparation of the finer ſtuffs, as cloths, rateens, &c. The ſmalleſt kind ſometimes, called *linnets heads*, are uſed to draw out the knap from the coarſer ſtuffs, as bays, &c.

The leaves of the common wild *teazel* dried, and given in powder or infuſion, have been commended by ſome as a powerful remedy againſt flatuſes or crudities in the ſtomach.

TEBET, or THEVET, the fourth month of the civil year of the Hebrews, and the tenth of their eccleſiaſtical year. It anſwered to part of our December and January, and has but 29 days. The ſecond day of this month is the laſt of the octave of the dedication of the temple, after it was purified by Judas Maccabeus. Vide 1 Macc. iv. 59. John x. 22.

The 10th day of this month is obſerved by the Jews as a faſt, in memory of the ſiege of Jeruſalem by Nebuchadnezzar, in the ninth year of Zedekiah.

TECHNICAL, TECHNICUS, formed of τεχνικος, *artificial*, of τεχνη, *art*, ſomething that relates to ART.

In this ſenſe we ſay, *technical words*, *technical verſes*, &c. And in this ſenſe Dr. Harris intitles his dictionary of arts and ſciences, Lexicon Technicum.

TECHNICAL, is more particularly applied to a kind of verſes, wherein are contained the rules or precepts of any art, thus digeſted to help the memory to retain them. See *Artificial* MEMORY.

Technical verſes are uſed in chronology, &c. Such, e. gr. are thoſe expreſſing the order and meaſure of the calends, nones, &c. thoſe expreſſing the ſeaſons, and thoſe expreſſing the order, &c. of the ſigns.

F. Labbé has compoſed a ſet of *technical* Latin verſes, including all the epochas in chronology; and F. Buffier, after his example, has put both chronology and hiſtory into French verſe, and even geography alſo.

Technical verſes are commonly compoſed in Latin; they are generally wretched ones, and often barbarous; but utility is all that is aimed at in them: to give ſome idea hereof we will here add a few inſtances. The caſuiſts include all the circumſtances which make us partakers with another in a theft, or other crime, in theſe two *technical verſes*:

Juſſio, conſilium, conſenſus, palpo, recurſus,
Participans, mutus, non obſtans, non manifeſtans.

The firſt of F. Buffier's *technical* verſes of the Hiſtory of France, are theſe:

Ses lois en quatre cents Pharamond introduit,
Clodion Chevelu, qu' Aetius vanquit.
Merovée; avec lui combatit Attila;
Childeric fut chaſſé, mais on le rapella.

TECHNICAL *words*, are what we otherwiſe call *terms of art*.

TECOLITHOS, in *Natural Hiſtory*, the name of a gem, otherwiſe called *Syriacus lapis*, and *Judaicus lapis*, good for diſſolving the human *calculus*. See SYRIACUS and JUDAICUS.

It has this name from τηκω, *I diſſolve*, and λιθος, *a ſtone*; becauſe it diſſolves ſtones.

TECTRICES, in *Ornithology*, are the leſſer coverts of the wings of birds, or the feathers which lie on the bones of the wings.

TECUM *Duces*. See DUCES.

TE DEUM, a kind of hymn, or ſong of thankſgiving, uſed in the church; beginning with the words *Te Deum laudamus*, *We praiſe thee, O God*.—It is uſually ſuppoſed to be the compoſition of St. Auguſtine, and St. Ambroſe.

It is uſed to be ſung in the Romiſh church with extraordinary pomp and ſolemnity, upon the gaining a battle, or other happy event; and ſometimes even to conceal a defeat.

TEDDOR, or TETHER, a rope tied to a horſe's foot, to confine his grazing within a certain compaſs.

TEE, in the *Manege*. See BREAST-*plate*.

TEE-*ſquare*. See SQUARE.

TEETH, *dentes*, in *Anatomy*, little, hard, ſmooth bones, ſet in the gums, and ſerving to maſticate or chew the food, to bite, &c.—See *Tab. Anat.* (*Oſteol.*) *fig.* 2, *lit. d, e, f.*

The teeth are the hardeſt, moſt ſolid and whiteſt parts of the whole ſkeleton.

In adult perſons, the ordinary number of *teeth* is 32; ſixteen in each jaw; all fixed in peculiar ſockets, called *alveoli*, by the juncture or articulation called GOMPHOSIS, and by the joiners, *pegging*.

They are fixed in the ſockets like pins or nails, their roots being exactly ſurrounded by the ſpungy ſubſtance or diploe, and appearing like moulds for the cavities of the ſockets, which are rather porous vaginæ than ſpungy foſſulæ. The trunk of the root is ſurrounded by the common orifice of the ſocket at a ſmall diſtance from the circular line or collar. The upper and lower *teeth* meet in ſuch a manner as that the firſt, and eſpecially the inciſors, advance moſt forward, and run over the latter; the arch of the lower *teeth* appearing to be ſmaller than that of the upper.

The *teeth* are of three ſorts: thoſe in the fore part of each jaw are called *inciſores*, *cutters*; and are four in number in each jaw, broad, thin, and flat: ſome call them the *primores*, becauſe they appear the firſt; others the *adverſi*; and others the *ridentes*, *laughers*, becauſe they ſhew themſelves firſt in laughing.

Behind theſe, ſtand four, one on each ſide, in each jaw, which are a little more prominent, and pointed, called *canini*, by the common people *eye-teeth*, becauſe part of the nerve which moves the eyes is inſerted into them, whence the danger of pulling them out.

Behind theſe are five on each ſide, in each jaw, called the *molares*, or *grinders*, being thoſe which in men ſerve chiefly for maſtication.

In each tooth we diſtinguiſh two portions, one without the ſocket, called the body of the tooth, and in the dentes molares the crown; the other within the ſocket, called the root of the tooth. Theſe two portions are divided by a kind of circular line, which may be termed the

the collar of the tooth. In an adult perſon, the *teeth* in general are very compact and ſolid, not apparently laminated, nor ſubject to exfoliation. A very narrow cavity goes from the body to the point of the roots, where it ends in a ſmall hole, which at length becomes imperceptible, and even quite diſappears.

The *teeth* begin not to appear all at a time; but firſt appears one of the front inciſors of the lower jaw, then, after a little time, the other; a few months afterwards the great inciſors of the upper jaw come forth, both nearly at the ſame time; then come the two lateral inciſors of the lower jaw, and the two ſmall ones of the upper, one in a little time after the other; after them come out the canini, becauſe they are ſharper than the molares, but thicker than the inciſivi; and laſt of all the molares, becauſe they are thickeſt and blunteſt.

About the twentieth year, the two laſt of the molares ſpring up, and are called *dentes ſapientiæ*, becauſe they ariſe when the perſon is at years of diſcretion. See Dentition.

The *teeth*, according to Peyer, are formed of convolved ſkins, hardened and bound together by a viſcid mucus: and if we view the grinders of deer horſes, ſheep, &c. we ſhall find great reaſon to be of his opinion.

Others ſpeak of their formation otherwiſe. The ſockets, Dr. Quincy obſerves, are lined with a thin membrane, upon which are ſeveral veſſels, through which there paſſes a thick tranſparent humour, that, as it increaſes hardens in form of *teeth*; and within the firſt three or ſix months after birth, they begin to pierce the edge of the jaw, and tear the perioſteum and gums, which being very ſenſible, create a violent pain, and other ſymptoms incident to children in the time of dentition.

Of this viſcous tranſparent liquor, which is indurated into the ſubſtance of the *teeth*, there are two lays, one below the other, divided by the ſame membrane which covers all the cavity of the jaw: the uppermoſt lay forms the *teeth* which come out firſt: but about the ſeventh year of age they are thruſt out by the *teeth* made of the undermoſt lay, which then begin to ſprout; and if theſe *teeth* be loſt, they never grow again.

If ſome have been obſerved to ſhed their *teeth* twice they have had three lays of this viſcous humour, but this hardly ever happens.

The outer ſubſtance of the *teeth* is different from the inner; and that of the body from the root.

The *teeth*, M. de la Hire the younger has found to have all that part which ſtands out beyond the jaw, covered with a peculiar ſubſtance called *enamel*, quite different from and harder than the reſt of the bone.

This enamel, by ſome others called the *perioſteum*, is compoſed, as may be diſcerned through a microſcope, of an infinity of little fibres, which grow to the bone by their roots, much like nails or horns; the radiated extremities of which are turned both inwards and outwards. The roots have ſome ſmall ſhare of it, but not near ſo much as the bodies. It is of ſo ſolid a nature, that nothing can deſtroy it but the file or corroſive liquors.

This compoſition is very diſcernible in a broken *tooth*, where the origin and ſituation of theſe fibres are apparent. M. de la Hire is perſuaded, that the growth of theſe fibres is performed much like that of nails. If by any accident a little part of this enamel be broke off, ſo that the bone is left bare, that is, if the very roots of the fibres be taken away, the bone, in that part, will grow carious, and the *tooth* inevitably periſh; there being no BONE in the body that can bear the air.

Indeed, in ſome perſons the enamel is very much wore and injured, by rubbing them much with dentrifices, &c. ſo that the bone appears through, and yet the *tooth* keeps ſound; but the reaſon is, that the bone is not quite bare, but there is ſtill a thin lay of the enamel which preſerves it; but this lay being thin enough to be tranſparent, the yellow bone is ſeen through it.

Sometimes alſo a *tooth* breaks, and the bone is left bare, yet the perſon does not find any pain or aching from it: the reaſon is, that the hole in the root or fang of the *tooth* through which a little branch of a nerve enters that renders the *tooth* ſenſible, being quite ſtopped up by age, or the like, has pinched off the nerve, and taken away all communication between the *tooth* and the origin of the nerves, and, by conſequence, all ſenſibility.

It alſo happens in ſome *teeth*, that the fibres are only in little ſheaves, or bundles, whoſe upper extremities meet, but not their lower; as is the caſe in moſt of the grinders, where the ſeparation of the bundles is apparent. Here, if the upper extreme of the fibres chance to be broken, or wore off, the ſeparation between two of the bundles often enlarges itſelf, ſo as to admit ſome hard particle of the food, by which means a little aperture being made through the enamel, the bone is laid bare, and the *tooth* ſoon rots. This inconvenience is remedied a little by ſtopping up the hole with lead, which prevents the ſharp pungent parts of the food from penetrating to the bone, and there occaſioning pain.

The inner ſubſtance of the *teeth* is the ſame with that of the other bones, only harder than any of them, except the apophyſis petroſa of the os temporis.

What we have ſaid is illuſtrated by the figures in *Tab. Anat. (Oſteol.) fig.* 14, where ACFH expreſſes the extremity of the jaw the *teeth* are ſet in; AEC and FGH the roots or fangs of the *teeth* encloſed in the jaw; ADCB and FLHII the enamel compoſed of little fibres ranged aſide of each other, which cover all that part of the *tooth* without-ſide the jaw; II ſeveral threads joined at the upper extremity, but apart at the lower; MM holes through which the nerves enter the roots of the *teeth*; NN a *tooth* cloſed up.

The *teeth*, Dr. Derham obſerves, furniſh us with a notable inſtance of the wiſdom and goodneſs of the Creator: their peculiar hardneſs is very remarkable, conſidering the tender ſubſtance they are formed of.

The ancients, and even Riolanus among the moderns, have held them to be incombuſtible, and the only part of the body that was ſo; on which account they were placed with great care in the urns among the aſhes of the deceaſed: but the opinion is falſe, there having only been two found in the tombs of Weſtphalia, one of which was half calcined.

Another popular error is, that the *teeth* continue growing for ever, even in old people, to the hour of their death. M. de la Hire obſerves, it is only the enamel or poliſh that grows, which is a ſubſtance very different from the *teeth*.

Others, however, have obſerved, that this enamel, which is formed before the teeth appear above the gums, thickens, hardens, and is poliſhed until the age of twenty or twenty-five, and afterwards is incapable of being repaired or renewed, but gradually wears by continued uſe.

The *teeth*, conſidering their ſize, are plentifully ſupplied with nerves and blood veſſels, which enter through a ſmall hole at the point of each root, and after paſſing through a ſharp channel as far as the crown, are divided and diffuſed all over their ſubſtance. The arteries proceed from the internal carotids; the veins return to the jugulars, and the nerves are branches of the fifth pair.

In general, the *teeth* ſerve for maſtication or chewing. In particular, the inciſores tear and cut the food; the canini break it to pieces; and the molares cruſh and grind it.

The *teeth*, eſpecially the inciſores, contribute likewiſe to the articulation of ſounds.

The form, diſpoſition, and order of the *teeth*, are admirable: the foremoſt are weak and far from the centre, as being only preparers to the reſt; the others being to grind and mince, are accordingly ſtronger, and placed near the centre of motion.

Galen puts the caſe, that the order of the *teeth* ſhould have been inverted, and the grinders, e. gr. put in the place of the inciſores; and aſks, what uſe *teeth* had then been of, and what confuſion would not have ariſen by ſuch a ſlight overſight merely in the diſpoſal of them? Upon which he argues that if any perſon ſhould diſpoſe a company of thirty-two men, the number of the *teeth*, in a juſt order, we ſhould judge him an intelligent perſon; why then ſhould we not judge the ſame of the Creator? &c.

Again, their various forms, in various creatures, are no leſs conſiderable, being all curiouſly adapted to the peculiar food and occaſions of the ſeveral ſpecies of animals: thus in the rapacious they are fitted for the catching, holding, and tearing the prey; in herbaceous, for the gathering and comminution of vegetables; and in ſuch as have no *teeth*, as birds, the bill ſupplies the defect.

Add, that the temporary defect of them is no leſs obſervable in ſome: that children, for inſtance, ſhould have none while they are not able to uſe them, but to hurt themſelves, or the mother; and that at the very age when they can take in the more ſubſtantial food, and live without the breaſt, and begin to need *teeth* for the ſake of ſpeech; that then their *teeth* ſhould begin to appear, and gradually grow as they more and more ſtand in need of them.

Some perſons are born with all their *teeth*, as Marcus Curius Dentatus, and Cneius Papirius Carbo: others have only had one continued *tooth*, reaching the whole length of the jaw, as Pyrrhus king of Epirus, and Pruſias, ſon of the king of Bithynia.

Mentzelius, a German phyſician, aſſures us, that he ſaw an old man at Cleves, in 1666, aged one hundred and twenty years, who had a new ſet of *teeth* two years before, which were cut with great pain; and he ſaw an Engliſhman at the Hague, who cut a new ſet of *teeth* in his one hundred and eighteenth year. To the ſame purpoſe, Dr. Slare mentions the caſe of a relation, who had

had all his *teeth* at eighty years of age, and afterwards ſhed them all in two or three years, and had a new ſet quite round. Phil. Tr. Abr. vol. v. p. 353.

When the *teeth* are ſubject to be overſpread with a black or yellow cruſt, it is a very good method to rub them well every day with a mixture of tincture of gum-lac, honey of roſes, and ſpirit of ſalt, or vitriol, which will not only whiten the *teeth*, but render the gums more firm.

The world is fond of tooth-powders, and a moderate uſe of them may do ſervice; but the daily rubbing with them does more harm to the *teeth* than wholly neglecting them. Powders of this kind may be prudently uſed once in ſix or ſeven days, and will render the *teeth* white and ſplendid. The common powders, prepared for this purpoſe, are too hard, and wear away the gums; ſofter ſubſtances ſhould be employed, and when the gums are furred, a few drops of ſome acid ſpirit may be added to the powder. The following is a very efficacious and ſafe powder: take chalk in powder, myrrh, burnt hartſhorn levigated, and Florentine orrice-root, of each two drams; ſpirit of ſalt, ſix drops; mix all into a powder.

Notwithſtanding the danger that attends the powders, tinctures, electuaries, that have been too commonly uſed, it is very deſirable to preſerve the beauty and ſoundneſs of the *teeth* from infancy to old age. For this purpoſe, as ſoon as the ſecond *teeth* appear, children ſhould be accuſtomed to waſh their *teeth* every morning with common water, and a convenient tooth bruſh; and after meals to rince the mouth, and rub the *teeth* with their fingers, when a bruſh cannot be conveniently uſed. Thoſe who conſtantly obſerve ſuch inſtructions may expect to be free from tartarous matter, putrid ſlough, ſuperficial diſcolouring, flaccid gums, and from the pain and looſeneſs of the *teeth*, ariſing from theſe cauſes. When the *teeth* have been neglected at firſt, and tartarous matter has already faſtened to them, this ſhould be removed by inſtruments, and then the *teeth* ſhould be rubbed with a fine teſtaceous powder, in order to remove any remaining diſcolouring matter: and when the enamel is become perfectly clean, white, and poliſhed, even this fine powder ſhould be uſed very ſparingly at diſtant intervals, and the colour and ſweetneſs are to be preſerved by frequent bruſhing and waſhing.

The common trick of mountebanks, and other ſuch practicers, is to uſe various waſhes for the *teeth*, the ſudden effects of which, in cleaning and whitening the *teeth*, ſurpriſe and pleaſe people; but the effects are very pernicious. All the ſtrong acid ſpirits will do this. As good a mixture as any thing can be, on this occaſion, is the following: take plantane-water, an ounce, honey of roſes, two drams; ſpirit of ſalt, ten drops; mix the whole together, and rub the *teeth* with a piece of linen rag dipped in this, every day, till they are whitened. The mouth ought to be well waſhed with cold water, after the uſe of this or any other acid liquor; and indeed the beſt of all *teeth*-waſhes is cold water, with or without a little ſalt; the conſtant uſe of this will keep them clean and white, and prevent them from aching. Heiſter's Surgery, vol. ii. p. 27. Berdmore, on the Teeth and Gums, &c. ch. vi. p. 226, &c. See Dentrifice and Tooth-*ach*.

A Daniſh phyſician, named Hagerup, maintains in certain theſes, that one may hear with the *teeth*.

As to animals, there are ſome fiſhes which have *teeth* on their tongues, as trouts; others have them at the bottom of the gullet, as the cod-fiſh; ſome, as the great ſea-dog or ſhark, called *canis carcharias*, have three, four, or five rows of *teeth* on the ſame jaw; the crocodile three, and thoſe all inciſors; vipers have two large crooked canine *teeth*, which are moveable, and ordinarily lie flat, only being raiſed when they would bite. And the rana piſcatrix, ſea-frog, or ſea-devil, has whole rows of the like moveable *teeth*.—The toad and cuttle-fiſh have no *teeth*, and yet they can bite. See Teeth *of fiſh*.

Teeth, *artificial*, are thoſe ſet in lieu of natural ones which are wanting.—They are uſually made of ivory, or the tooth of the ſea lion; but in regard ivory, in a little time, grows yellow in the mouth, Fabricius adviſes them to be made of the ſhin-bone of a bullock, which preſerves its colour.

The cuſtom of wearing ivory *teeth*, and of binding them in with a gold wire, is very ancient: Lucian and Martial ſpeak of it as practiſed among the Romans. But ligatures of wire have been found to hurt the natural *teeth*, with which the artificial are connected: whereas ſilken twiſt cannot effect them to any conſiderable degree for ſeveral years.

Guilleman gives us the compoſition of a paſte for making *artificial teeth*, which ſhall never grow yellow: the compoſition is white wax granulated, and melted with a little gum elemi, adding powder of white maſtic, coral, and pearl.

When ſeveral *teeth* are out in the ſame place, it is beſt to make a ſet, or the number wanted, out of one piece, all adhering together, which may be faſtened to the two next, of the ſound or natural *teeth*. And even a whole ſet of artificial *teeth* may be made for one or both jaws; ſo well fitted to admit of the neceſſary motions, and ſo conveniently retained in the proper ſituation, by means of ſprings, that they will anſwer every purpoſe of natural *teeth*, and may be taken out, cleaned, and replaced by the patient himſelf with great eaſe. Heiſter, &c. p. 31. Berdmore, &c. p. 262.

Teeth, *canine*, *Canini Dentes*, in *Anatomy*, are two ſharp-edged teeth in each jaw; one on each ſide, placed between the inciſores and molares.

They are ſo called, becauſe they are naturally a little pointed, and appear longer than the reſt, almoſt in the ſame manner as in dogs. They might likewiſe be called angular, becauſe they make a ſort of angle, by which the inciſores are ſeparated from the grinders.

The two ſuperior have been named eye-*teeth*, from their ſituation. The bodies of the *dentes canini* are thicker, and more prominent than thoſe of the inciſores; they are convex, and a little rounded on the outſide, and end in a ſhort triangular point, one of the ſides of which is a continuation of the convexity of the outſide, and the other two are flatter and turned inwards.

Theſe points are often worn out by maſtication: their roots are commonly larger, thicker, longer, and more pointed than thoſe of the inciſores, and ſometimes perforate the bottom of the maxillary ſinus. Winſlow's Anatomy, p. 43.

For the peculiar uſe of the canine *teeth*, ſee Teeth *ſupra. Tab. Anat. Oſteol. fig.* 2. *lit. e.*

Teeth, *cutting*, *dentes inciſores*, have this name from their uſe; and are by ſome authors called *riſorii*, becauſe they appear in laughing: the four upper *inciſores* are larger and broader than the four lower; and of the upper, the two in the middle are larger than the other two: the bodies of theſe *teeth* reſemble large cutting wedges, and their roots are pointed. Their bodies are ſo diſpoſed that their ſharp ends lie all in a line, making one uniform edge; each body has properly four ſides; one anterior a little convex, one poſterior a little concave, and two lateral much narrower than the former, and almoſt flat: the anterior and poſterior ſides decreaſe in breadth towards the collar, the lateral ſides towards the edge, ſo that they repreſent in ſome degree four triangles, with their apices and baſes reciprocally oppoſite.

Theſe *teeth* have long roots, the lateral ſides of which are broad and flat, the anterior and poſterior narrow: they terminate by degrees in a point, in which a ſmall hole is obſervable, in children pretty conſiderable, but obliterated in old age. Winſlow. For the particular uſe of theſe, ſee Teeth, *ſupra. Tab. Anat. Oſteol. fig.* 2. *lit. d.*

Teeth, *grinding*, *dentes molares*. See Molares.

Teeth-*ach*, ſee Tooth-ach.

Teeth, *clenched*. The *teeth* are in ſome caſes found ſo cloſely and firmly ſhut, that they cannot be opened ſufficiently to give the perſon liberty to eat or ſpeak. This generally ariſes from a ſpaſm or cramp of the elevating muſcles of the lower jaw. The cauſe of this ſpaſm is various; ſometimes it ariſes from a wound or blow, even from injuries of the nerves and tendons in different parts of the body; as after an amputation of an arm or leg. Sometimes alſo it is owing to an inflammation of the fauces themſelves.

When this diſorder ariſes from a wound, the firſt thing to be done is to ſearch whether there be not ſome extraneous body left in it, which excites theſe ſpaſms; if this be found to be the caſe, they always ceaſe immediately, upon the pulling out ſuch offending matters. If there be no ſuch bodies in the wound, and medicines give no relief to the convulſions, you may be ſure that ſome nerve is wounded; and the method then is to cut the nerve in two, if that may be done, and immediately the ſpaſms will ceaſe. Sometimes however, the nerve lies inacceſſible, or cannot be divided without danger of the patient's life; which is a very deplorable caſe, and generally brings on a neceſſity of amputating the limb. Theſe ſpaſms when from amputations are leſs to be dreaded, ſince they generally go off on untying the ligatures about the veſſels, and taking away the vitriol or other cauſtic applied to reſtrain the hæmorrhage.

When an inflammation of the tonſils or jaw excites this ſpaſm, theſe are to be treated in the common method; and the cauſe being removed, as in the other caſes, the effect will ceaſe. But if this diſorder be of ſo long continuance

continuance as to threaten the patient with starving, he is to be supplied with broths and other liquid food, which may be sucked through the *teeth*.

The surgeons have an instrument, which they call SPECULUM *oris*, made to force open the mouth on these occasions, and some advise the breaking out a *tooth*, to give room for food and medicines; but both these practices are wholly to be rejected, as making the spasms more violent and obstinate. Heister's Surg. vol. ii. p. 26.

TEETH-*drawing*. See TOOTH-*drawing*.

TEETH, *hollow*. The *teeth* which are hollow and decayed are usually carious, and admit some parts of the food into their cavities, which by degrees putrefies, becomes acrimonious, and not only farther destroys the *teeth* themselves, but irritates the internal periosteum and nerves of the *teeth*, so as often to cause intolerable pain. Many methods have been contrived for relief in these cases: one is to clean the cavity, and then fill it up with mastic as often as there is occasion; and another is the filling up the cavity with a piece of lead or gold. The cavity may also be filled at times with oil of cloves, and the like, or cauterized with a red-hot iron; this generally proves a lasting remedy, and is attended with very little additional pain, if carefully performed, and no part of the mouth burnt. If all these methods fail, the last relief is the taking out the *tooth*, and afterwards replacing it again. Heister's Surg. p. 27. See TOOTH-*drawing*.

TEETH, *supernumerary*. These are sometimes the cause of great disorders, and may form the tumors which, without careful examination, are sometimes mistaken for exostoses or schirruses of the palate. See Med. Ess. Edinb. vol. v. art. 16. See, on the formation and prevention of *supernumerary teeth*, the article DENTITION.

TEETH, *mark of*, in the *Manege*. See MARK and EYE *of a bean*. See also TOOTH.

TEETH *of fish*, *dentes piscium*. The *teeth* in the fish-kind are so very various in their shape, and also so variously disposed, that they make a very notable mark of distinction among the several genera.

As to situation, they are, 1. sometimes placed only in the fauces and orifice of the stomach, the rest of the mouth being entirely smooth: we have examples of this in the cyprini, and the ammodytæ or sand-eels, and many other fish. 2. In some the *teeth* are placed only in the jaws; the tongue, the palate, and the inner part of the mouth being smooth. 3. In some they are placed in the jaws, and on the tongue, the rest of the mouth being smooth. 4. In some the tongue, the palate, and the jaws have *teeth*, but the back part of the mouth is smooth; the herring has them disposed in this manner. 5. Some have the fauces, tongue, palate, and jaws, all beset with *teeth*, as the salmons, &c. 6. Some have them in the fauces and jaws only, the tongue and the palate being smooth: this we have instances of in the pleuronecti. And finally, 7. Some fishes have *teeth* in the jaws, fauces and palate, and the tongue only remains smooth: this we see in the mackrel, &c. And all these are very essential marks and distinctions never varying in the same fish, and may serve as characters much better than the colours, and other such more obvious, but less essential things, remarked by the old authors.

The differences in the shape of the *teeth*, are as many as those in their situation, and may serve to as much purpose in their distinctions. 1. They are in some acute and sharp at the ends; this is the case in most fish. 2. In some they are obtuse, and as it were flatted at the end, as in the cyprini. 3. In some fish they are of a conic shape, as those in the upper jaw of the thymallus. 4. They are in some compressed or flatted at the sides, as in the gadi and esoces. 5. They are smooth and even at the sides, as in the greater part of fishes: or, 6. They are serrated or notched at the sides, as in the shark-kind, and some others. 7. They are in some straight, as in the common acus or needle-fish of Oppian. And, 8. They are sometimes crooked inwards, as in the osmeri, &c. Finally, they are sometimes convex on one side, and flat on the other, as in the caprifcus.

The *teeth* of fish differ in proportion also. 1. In some they are all of the same size in the same fish, as in the cottus, &c. 2. In some they are of very different sizes in the same mouth; we have instances of this in the pike, the lucioperca, and many of the gadi. 3. They differ also in number and arrangement, for in some fish they are placed only in single rows in the jaws, and other places allotted for them; but in others they are aggregated into several rows; the first is the case in the salmons, &c. the other in the cotti, and other fish. Artedi Ichthyology.

TEETH, *Mammoth's*, see MAMMOTH's *Teeth*.

TEETH, *Wolf's*, see WOLVES *Teeth*.

TEETHING, see DENTITION.

TEFTERDAR, the name of an office of dignity in the eastern nations. In Ægypt he is the lord high-treasurer of the tribute paid out of the lands to the grand signior. He is named for a year by the Porte; but is generally continued in his office many years. This office is sometimes given to one of the poorer beys, to help him to support his dignity; and frequently to a quiet one, who is not likely to enter into intrigues. For one party never cares that a stirring man of the opposite party should be invested with an office of this dignity. See DEFTARDAR.

TEGS, a term used in some part of the kingdom by the farmers, to express lambs of a year old. Among sportsmen it denotes a doe of two years old. When a flock of ewes and lambs are turned into a turnep-field, the young lambs of three weeks old will immediately fall to eating the turneps, and scoop them very prettily; but these *tegs* will not touch them for several days. They usually stay till almost starved to death before they begin, but when they have begun they soon grow fat.

TEGUMENT. See INTEGUMENT.

TEICHOPŒUS, τειχοποιος, among the Athenians, an officer who had the care of the city-walls; their number was the same with that of the tribes, every tribe having the choice of one.

TEINTS, and *Semi*-TEINTS, in *Painting*, denote the several colours used in a picture, considered as more or less high, or bright, or deep, or thin, or weakened, and diminished, &c. to give the proper relievo, or softness, or distance, to the several objects. See COLOURING.

The word is pure French, where it signifies the same.

TEIRCE, or TEIRS. See TIERCE.

TEITEI, in *Ornithology*, the name of a Brasilian bird, a species of TANAGRA, in the Linnæan system, called also *guiranheemegeta*, and *guroundi*.

It is of the size of our red-breast, and beautifully coloured.

It sings very sweetly, and is kept in cages, five or six together in the same cage. Marcgrave's Hist. Brasil.

TEJUGUACU, in *Zoology*, the name of a species of lizard, common in the Brasils, and called also TEMAPARA.

It much resembles the iguana, in its general figure, but differs from it in that its whole body is black, only variegated with some white spots. It lives principally on the sucking of eggs, but it is capable of bearing hunger a long time; Marcgrave having kept one alive seven months without eating. This species afforded also a certain testimony to that author, of the reproduction of the tail when cut off. Ray.

TEIUNHANA, in *Zoology*, the name of a small American lizard. It is about the thickness of one's little finger, and has a sharp nose. Its tail is very slender, six fingers breadth long, and terminates in a point almost as sharp as a needle. Its head is covered with scales; its back, sides, and legs, with a tender skin as soft as sattin to the touch; and its tail is covered with extremely minute scales, of a square figure. Ray.

TEKUPHÆ, or THEKUPHÆ, in the *Jewish Chronology*, are the times wherein the sun proceeds from one cardinal point to the next.

The same term is also applied to the moment wherein the sun enters a cardinal point: these four terms, or *tekuphæ*, into which the Jews divided their solar year, are observed among the Jews with a great deal of ceremony; the reason, as we are informed by Munster, is this:

That people have a notion, that in each *tekupha* the sun has a separate angel appointed to guard and direct it; and that in the very point wherein the sun finishes one *tekupha*, and enters upon another, before the one director has taken place of the other, the devils have a power to exercise all kinds of tyranny in the water.

And hence, they fancy, that if any body drinks the smallest quantity of water at that time, he will infallibly have a dropsy, or some other grievous distemper.

The *tekupha* of Tisri, corresponded to the autumnal equinox, that of Tebeth to the winter solstice, that of Nisan to the vernal equinox, and that of Tamuz to the summer solstice.

TELAMONES, a name given by the Romans to what the Greeks called *Atlantes*; viz. the figures of men supporting entablatures, and other projectures. See ATLAS.

The word, according to some, is derived from the Greek τελαμων, from τελαω, or τλαω, *I bear*.

Among the Greeks they were called *atlantes*, ατλαντες, which comes from the same word ταλαω, or τλαω, by the figure metathesis.

TELAMONES is also used by the chirurgical writers sometimes

times for lint, and sometimes for the fillets or bandages, which they apply over their dressings.

TELAUGIA, in *Natural History*, the name of a genus of SCRUPI, of a glittering appearance, usually containing flakes of talc, and emulating the structure of the granites. Hill.

Of this genus we have twelve species.

TELE, Τελη, among the Athenians, those revenues that were brought in by lands, mines, woods, and other public possessions, set apart for the use of the commonwealth; as also tributes paid by sojourners and freed-servants, and the customs laid upon certain trades and goods.

TELEOLOGY, formed of τελος, *end*, and λογος, *discourse*, the science of the final causes of things. This is an ample and curious field of inquiry, though pretty much neglected by philosophers.

TELEPHIUM, *true orpine*, in *Botany*, a genus of the *pentandria trigynia* class; its characters are, that the empalement is permanent, composed of five oblong leaves; the flower has five oblong petals, and five awl-shaped stamina, with a three-cornered acute germen, which turns to a short three-cornered capsule, with one cell, opening with three valves, containing many round seeds. There are two species.

TELESCOPE, formed of τηλε, *far*, and σκοπεω, *I observe*, an optical instrument, consisting of several glasses, or lenses fitted into a tube; through which remote objects are seen as if nigh at hand; or more generally, a *telescope* is an optical instrument, which serves for discovering and viewing distant objects, either directly by glasses, or by reflection, by means of specula or mirrors.

In refracting *telescopes*, the lens or glass turned towards the object, is called the *object-glass*; and that next the eye, the *eye-glass*; and if the *telescope* consists of more than two lenses, all but that next the object are called *eye-glasses*.

The invention of the *telescope* is one of the noblest, and most useful these ages have to boast of: by means hereof, the wonders of the heavens are discovered to us, and astronomy is brought to a degree of perfection, which former ages could have no notion of.

Indeed, the discovery was owing rather to chance than to thought; so that it is the good fortune of the discoverer, rather than his skill or ability, we are indebted to: on this account it concerns us the less to know, who it was first hit on this admirable invention. It is certain it must be casual, since the theory it depends on was not then known.

Johannes Baptista Porta, a noble Neapolitan, is asserted by Wolfius to be undoubtedly the first that made a *telescope*; from this passage in his *Magia Naturalis*, printed in 1560. "If you do but know how to join the "two (viz. the concave and convex glasses) rightly together, you will see both remote and near objects, "much larger than they otherwise appear, and withal "very distinct. In this way we have been of good help "to many of our friends, who either saw remote things "dimly, or near ones confusedly; and have made them "see every thing perfectly."

But it is certain, Porta did not understand his own invention, and therefore neither troubled himself to bring it to greater perfection, nor ever applied it to celestial observation. What is more, the account Porta gives of his concave and convex lenses is so dark and indistinct, that Kepler who examined it by particular command of the emperor Rudolphus, declared to that prince, that it was perfectly unintelligible.

Thirty years afterwards, or in 1590, a *telescope* sixteen inches long, was made, and presented to prince Maurice of Nassau, by a spectacle-maker of Middleburg; but authors are divided about his name. Sirturus, in a treatise of the *telescope*, printed anno 1618, will have it to be John Lippersheim: and Borellus, in an express volume on the inventor of the *telescope*, published in 1655, shews it to be Zacharias Jansen, or, as Wolfius has it, Hansen.

The invention of Lippersheim is fixed by some in the year 1609, and by others in 1605; Fontana, in his *Novæ Observationes cœlestium et terrestrium rerum*, printed at Naples, in 1646, claims the invention in the year 1608. But Borellus's account of the discovery of *telescopes* is so circumstantial, and so well authenticated, as to render it probable that Jansen was the original inventor.

In 1620, James Metius, of Alcmaer, brother of Adrian Metius, professor of mathematics at Franeker, came with Drebel to Middleburg, and there bought *telescopes*, of Zachary's children, who had made them public; and yet Adr. Metius has given his brother the honour of the invention; in which he is mistakenly followed by Descartes.

But none of these artificers made *telescopes* of above a foot and half: Simon Marius in Germany, and Galileo in Italy, first made long ones fit for celestial observations.

Le Rossi relates, that Galileo, being then at Venice, was told of a sort of optic glass made in Holland, which brought objects nearer: upon which, setting himself to think how it should be, he ground two pieces of glass into form as well as he could, and fitted them to the two ends of an organ-pipe; and with these shewed, at once, all the wonders of the invention to the Venetian noblesse, on the top of the tower of St. Mark. That author adds, that from this time Galileo devoted himself wholly to the improving and perfecting of the *telescope*; and that he thereby almost deserved all the honour usually done him, of being reputed the inventor of the instrument, and of its being denominated from him *Galileo's tube*.

Galileo himself, in his *Nuncius Sidereus*, published in 1610, acknowledges, that he first heard of the instrument from a German; and that, being merely informed of its effects, first by common report and a few days after by letter from a French nobleman, James Badovere, at Paris, he himself discovered the construction by considering the nature of refraction. He adds in his *Saggiatore*, that he was at Venice when he heard of the effects of prince Maurice's instrument, but nothing of its construction; that the first night after his return to Padua, he solved the problem, and made his instrument the next day, and soon after presented it to the Doge of Venice, who, in honour of his grand invention, gave him the ducal letters, which settled him for life in his lectureship, at Padua, and doubled his salary; which then became treble of what any of his predecessors had enjoyed before. Accordingly Galileo may justly be considered as the second inventor of the *telescope*.

F. Mabillon, indeed, relates, in his travels through Italy, that in a monastery of his own order, he saw a manuscript copy of the works of Commestor, written by one Conradus, who lived in the XIIIth century; in the third page whereof, was seen a portrait of Ptolemy, viewing the stars through a tube of four joints or draws: but that father does not say that the tube had glasses in it. In effect, it is more than probable, that such tubes were then used for no other purpose but to preserve and direct the sight, or to render it more distinct, by singling out the particular object looked at, and shutting out all the foreign rays reflected from others, whose proximity might have rendered the image less precise.

This conjecture is verified by experience; we having often observed, that without a tube, by only looking through the hand, or even the fingers, or a pin-hole in a paper, objects shall appear more clear and distinct than otherwise.

Be this as it will, it is certain the optical principles, whereon *telescopes* are founded, are contained in Euclid, and were well known to the ancient geometricians; and it is for want of attention thereto, that the world was so long without that admirable invention; as, no doubt, there are numerous others lying hid in the same principles, only waiting for reflection or accident to bring them forth.

To the preceding abstract of the History of the Invention of the *Telescope*, it will be proper to add some particulars relating to the claims of our own celebrated countryman, friar Bacon, who died in 1294. Mr. W. Molyneux in his Dioptrica Nova, p. 256, expresses his opinion, that Bacon did perfectly well understand all sorts of optic glasses, and knew likewise the way of combining them, so as to compose some such instrument as our *telescope*: and his son, the honourable Samuel Molyneux, asserts more positively, that the invention of *telescopes*, in its first original, was certainly put in practice by an Englishman, friar Bacon; although its first application to astronomical purposes may be justly attributed to Galileo. The passages to which Mr. Molyneux refers, in support of Bacon's claims, occur in his Opus Majus, p. 348, and p. 357. Jebb's ed. 1733. The first is as follows: *Si vero non sint corpora plana, per quæ visus videt, sed sphæria, tunc est magna diversitas: nam vel concavitas corporis est versus oculum vel convexitas*: whence it is inferred, that he knew what a concave and convex glass was. The second is comprised in a whole chapter, where he says, *De visione fracta majora sunt*; *nam de facili patet per canones supra dictos, quod maxima possunt apparere minima, et e contra, et longe distantia videbuntur propinquissime, et e converso. Nam possumus sic figurare perspicua, et taliter ea ordinare respectu nostri visus et rerum, quod frangentur radii, et flectentur quorsumcunque voluerimus, ut sub quocunque angulo voluerimus, videbimus rem prope vel longe, &c. Sic etiam faceremus solem et lunam et stellas descendere secundum apparentiam hic inferius, &c.* i. e. Greater things than these may be performed by refracted vision; for it is easy to understand by the canons above

above mentioned, that the greatest things may appear exceeding small, and on the contrary; also, that the most remote objects may appear just at hand, and on the contrary; for we can give such figures to transparent bodies, and dispose them in such order with respect to the eye and the objects, that the rays shall be refracted and bent towards any place we please; so that we shall see the object near at hand or at a distance, under any angle we please, &c. So that thus the sun, moon, and stars may be made to descend hither in appearance, &c. Mr. Molyneux has also cited another passage out of Bacon's Epistle ad Parisiensem, of the Secrets of Art and Nature, cap. 5. to this purpose, *Possunt etiam sic figurari perspicua, ut longissime posita appareant propinqua, et è contrario: ita quod ex incredibili distantia legeremus literas minutissimas, and numeraremus res quantumque parvas, et stellas faceremus apparere quo vellemus: i. e.* Glasses, or diaphanous bodies may be so formed, that the most remote objects may appear just at hand, and contrarily; so that we may read the smallest letters at an incredible distance, and may number things though never so small, and may make the stars appear as near as we please.

Moreover, Dr. Jebb in the dedication of his edition of the Opus Majus, produces a passage from a manuscript (Op. iii. ad Clement. MS. Cotton. Tib. c. v. fol. 6.) to shew that Bacon actually applied *telescopes* to astronomical purposes: *Sed longe magis quam hæc,* says he, *oporteret homines haberi, qui bene, immo optime, scirent perspectivam et instrumenta ejus—quia instrumenta astronomia non vadunt nisi per visionem secundum leges istius scientiæ.*

From these passages, it is not unreasonable to conclude, that Bacon had actually combined glasses, so as to have produced the effects which he mentions, though he did not complete the construction of *telescopes.* Dr. Smith, however, to whose judgment particular deference is due, is of opinion, that the celebrated friar wrote hypothetically, without having made any actual trial of the things he mentions: to which purpose he observes, that this author does not assert one single trial or observation upon the sun or moon (or any thing else), though he mentions them both: on the other hand, he conceives some effects of *telescopes* that cannot possibly be performed by them. He adds, that persons unexperienced in looking through *telescopes* expect, in viewing any object, e. gr. the face of a man, at the distance of one hundred yards, through a *telescope* that magnifies one hundred times, that it will appear much larger than when they are close to it; this, he is satisfied, was Bacon's notion of the matter; and hence he concludes, that he had never looked through a *telescope.* Smith's Optics, Rem. p. 22. 41.

Dr. Birch, in his History of the Royal Society, vol. iv. p. 156. informs us, that at one of the meetings of this Society, Dr. Hooke read a passage, which he had met with in Digges's Stratioticos, wherein he affirms, that his father had a method of discovering all objects pretty far distant, which lay round about in the country; and that this was by the help of a book or manuscript of Roger Bacon of Oxford, who, he conceived, was the only man besides his father who knew it: this was the more remarkable, because this Stratioticos was printed in 1579, more than thirty years before Metius or Galileo made their discovery of those glasses; and therefore it seemed evident, that Roger Bacon was the first inventor of *telescopes*, and Leonard Digges the next reviver of them, both Englishmen. Mr. Aubrey likewise remarked on the same occasion, that there was a passage in the preface of Leonard Digges's Pantometria, which mentions the same thing to be known by him, and that he had shewn it to several; which book was printed before the Stratioticos: but really, says Dr. Birch, twelve years after, or in 1591. To whomsoever we ascribe the honour of first inventing the *telescope*, the rationale of this admirable instrument, depending on the refraction of light in passing through mediums of different forms, was first explained by the famous John Kepler, (though something of the same kind is also said to have been done by Maurolycus, whose treatise, De Lumine et Umbra, was published in 1575), who also pointed out methods of constructing others, of superior powers, and more commodious application than that first used.

The principal effects of *telescopes* depend upon this plain maxim, viz. that objects appear larger in proportion to the angles which they subtend at the eye; and the effect is the same, whether the pencils of rays, by which objects are visible to us, come directly from the objects themselves, or from any place nearer to the eye, where they may have been united, so as to form an image of the object; because they issue again from those points in certain directions, in the same manner as they did from the corresponding points in the objects themselves. In fact, therefore, all that is effected by a *telescope* is, first to make such an image of a distant object, by means of a lens or mirror, and then to give the eye some assistance for viewing that image as near as possible; so that the angle, which it shall subtend at the eye, may be very large, compared with the angle which the object itself would subtend in the same situation. This is done by means of an eye-glass, which so refracts the pencils of rays, as that they may afterwards be brought to their several foci, by the natural humours of the eye. But if the eye was so formed as to be able to see the image, with sufficient distinctness, at the same distance, without any eye-glass, it would appear to him as much magnified as it does to another person who makes use of a glass for that purpose, though he would not in all cases have so large a field of view.

If no image be actually formed by the foci of the pencil without the eye, yet if, by the help of any eye-glass, the pencils of rays shall enter the pupil, just as they would have done from any place without the eye, the visual angle will be the same as if an image had been actually formed in that place. Priestley's History of Light, &c. p. 69, &c.

The first persons who distinguished themselves in grinding telescopic glasses, were two Italians, Eustachio Divini at Rome, and Campani at Bologna, whose fame was much superior to that of Divini, or that of any other person of his time; though Divini himself pretended, that in all the trials that were made with their glasses, his of a great focal distance performed better than those of Campani, and that his rival was not willing to try them fairly, viz. with equal eye-glasses. However, it is generally supposed, that Campani really excelled Divini, both in the goodness and the focal length of his object-glasses.

It was with *telescopes* made by Campani, that Cassini discovered the nearest satellites of Saturn. They were made by the express order of Lewis XIV. and were of 86, 100, and 136 Paris feet focal length.

Campani's laboratory was purchased, after his death, by pope Benedict XIV. who made a present of it to the academy called the *Institute*, established in that city; and by the account which M. Fougeroux has given, we learn that (except a machine, which M. Campani constructed, to work the basons on which he ground his glasses) the goodness of his lenses depended upon the clearness of his glass, his Venetian tripoli, the paper with which he polished his glasses, and his great skill and address as a workman. It does not appear, that he made many lenses of a very great focal distance. Accordingly Dr. Hooke, who probably speaks with the partiality of an Englishman, says that some glasses, made by Divini and Campani, of thirty-six and fifty feet focal distance, did not exceed *telescopes* of twelve or fifteen feet made in England. He adds, that Sir Paul Neille made *telescopes* of thirty-six feet pretty good, and one of fifty, but not of proportional goodness. Afterwards Mr. Reive first, and then Mr. Cox, who were the most celebrated in England, as grinders of optic glasses, made some good ones of fifty and sixty feet focal distance, and Mr. Cox made one of one hundred, but how good Dr. Hooke could not assert. Borelli, also, in France, made object-glasses of a great focal length, one of which he presented to the Royal Society. But, with respect to the focal length of *telescopes*, these and all others were far exceeded by M. Auzout, who made one object-glass of six hundred feet focus; but he was never able to manage it, so as to make any use of it. Hartsocker is even said to have made some of a still greater focal length. Phil. Transf. Abr. vol. i. p. 193. Hooke's Exp. by Derham, p. 261. Priestley *ubi supra*, p. 211, &c. See GRINDING.

Telescopes are of several kinds, distinguished by the number and form of their lenses, or glasses, and denominated from their particular uses, &c. such are the *terrestrial*, or *land telescope*, the *celestial* or *astronomical telescope*; to which may be added, the *Galilean* or *Dutch telescope*, the *reflecting telescope*, and the *aerial telescope*.

Galileo's, or the *Dutch* TELESCOPE, *tubus Batavus*, is a *telescope* consisting of a convex object-glass, and a concave eye-glass.

This, of all others, is the most ancient form, being the only kind made by the inventors, Galileo, &c. or known, before Huygens.

The first *telescope*, which Galileo constructed, magnified only three times: but he soon made another, which magnified eighteen times, and afterwards, with great trouble and expence, he constructed one that magnified thirty-three times, and with this he discovered the satellites of Jupiter, and the spots of the sun. The construction, perfections, imperfections, &c. of Galileo's *telescope*, are delivered in what follows.

Construction of Galileo's, or the *Dutch* TELESCOPE. In a tube prepared for the purpose (the structure whereof see under TUBE) at one end is fitted a convex object-lens, either a plain convex, or convex on both sides, but a segment of a very large sphere: at the other end is fitted an eye-glass, concave on both sides, and the segment of a less sphere; so disposed, as to be at the distance of the virtual focus before the image of the convex lens.

Let AB (*Tab.* VI. *Optics, fig.* 122.) be a distant object, from every point of which pencils of rays issue, and falling upon the convex glass, DE, tend to their foci at FSG. But a concave lens, HI, (the focus of which is at FG) being interposed, the converging rays of each pencil are made parallel when they reach the pupil; so that, by the refractive humours of the eye, they can easily be brought to a focus on the retina, at PRQ. The pencils, also, themselves diverging, as if they had come from X, MXO is the angle under which the image will appear, which is much larger than the angle under which the object itself would have appeared. Such is the *telescope* that was at first discovered, and used by philosophers: the great inconvenience of which is, that the field of view, which depends, not on the breadth of the eye-glass, as in the *astronomical* TELESCOPE, but upon the breadth of the pupil of the eye, is exceedingly small: for since the pencils of the rays enter the eye very much diverging from one another, but few of them can be intercepted by the pupil; and this inconvenience increases with the magnifying power of the *telescope*, so that philosophers may now well wonder at the patience and address, with which Galileo and others, with such an instrument, made the discoveries they did. And yet no other *telescope* was thought of for many years after the discovery. Descartes, who wrote thirty years after, mentions no other as actually constructed, though Kepler had suggested some.

Theory of Galileo's TELESCOPE. Now, in an instrument thus framed, all people, except myopes, or those short-sighted, must see objects distinctly in an erect situation, and increased in the ratio of the distance of the virtual focus of the eye-glass, to the distance of the focus of the object-glass.

But for myopes to see objects distinctly through such an instrument, the eye-glass must be set nearer the object-glass, so that the rays of each pencil may not emerge parallel, but may fall diverging upon the eye; in which case the apparent magnitude will be altered a little but scarce sensibly. The reason of these effects will appear from what follows:

For, 1°, since they are far distant objects that are to be viewed with a *telescope*, the rays proceeding from the same point of the object, will fall on the object-glass parallel; and, consequently, by their refraction through the convexity, will be thrown converging on the eye-glass; but by their refraction through the concavity hereof, they will be again rendered parallel, and in such disposition they will enter the eye.

But all, excepting myopes, see objects distinctly by parallel rays. Therefore the first point is clear.

2°, Suppose A (*Tab.* VI. *Optics, fig.* 123.) to be the focus of the object-glass BC; and suppose AC the farthest ray on the right hand of the object that passes through the tube: after refraction, this ray or CE will become parallel to the axis BI; and consequently after a second refraction through the concave lens, will diverge from the virtual focus. Wherefore, since all the rays coming from the same extreme to the eye placed behind the concave lens, are parallel to LE; and those from the middle of the object, parallel to FG (as observed in what went before); the middle point of the object will be seen in the axis GA; and the right extreme, on the right side; viz. in the line LN; or parallel to it; that is, the object will be erect: which is the second point.

3°, Since all right lines parallel to LN cut the axis under the same angle, the semidiameter of the object will be seen through the *telescope*, under the angle AFN or EFI; the rays LE and GI entering the eye in the same manner, as if the pupil were placed in F. If now the naked eye were in A, it would see the diameter of the object under the angle cAb or CAB. But since the object is supposed very remote, the distance AF in respect to this distance is nothing; and therefore the naked eye, even in F, would see the semidiameter of the object, under an angle equal to A; i. e. drawing FM parallel to AC, under the angle IFM.

The semidiameter of the object, therefore, seen with the naked eye, is to that seen through the *telescope*, as IM to IE. But it is demonstrated, that IM : IE : : I F : AB; that is, the semidiameter seen with the naked eye, is to that viewed through the *telescope*, in the ratio of the distance of the virtual focus of the eye-glass FI, to the distance of the focus of the object-glass AB; which was the third point.

Lastly, myopes have their retina too far from the crystalline humour; and diverging rays concur at a greater distance than parallel ones; and those that were parallel become diverging by bringing the eye-glass nearer the object-glass; by means of such approach, myopes will see objects distinctly through a *telescope*; which is the fourth point.

Hence, 1°, To have the whole object visible, the semidiameter of the pupil must not be less than the distance of the rays LE and GI; and therefore the more the pupil is dilated, the greater field of compass will be taken in by the *telescope*, and *vice versa*; so that coming out of a dark place, or shutting the eye for some time before you apply it to the glass, you will take in a greater field at first glance than afterwards, when the pupil is again contracted by the increase of light. See PUPIL.

2° Since the distance of the rays EL and IG is greater, at a greater distance from the lens, the compass taken in by the eye at one view, will be greater as the eye is nearer the concave lens.

3°, Since the focus of a plano-convex object lens, and the virtual focus of a plano-concave eye-lens, are at the distance of the diameter; and the focus of an object-glass convex on both sides, and the virtual focus of an eye-glass, concave on both sides, are at the distance of a semidiameter; if the object-glass be plano-convex, and the eye-glass plano-concave, the *telescope* will increase the diameter of the object, in the ratio of the diameter of the concavity to that of the convexity; if the object-glass be convex on both sides, and the eye-glass concave on both sides, it will magnify in the ratio of the semi-diameter of the concavity to that of the convexity; if the object-glass be plano convex, and the eye-glass concave on both sides, the semidiameter of the object will be increased in the ratio of the diameter of the convexity to the semidiameter of the concavity; and, lastly, if the object-glass be convex on both sides, and the eye-glass plano-concave, the increase will be in the ratio of the diameter of the concavity to the semidiameter of the convexity.

4°, Since the ratio of the semidiameters is the same as that of the diameters, *telescopes* magnify the object in the same manner, whether the object-glass be plano-convex, and the eye-glass plano-concave, or whether the one be convex on both sides, and the other concave on both.

5°, Since the semidiameter of the concavity has a less ratio to the diameter of the convexity than its diameter has, a *telescope* magnifies more if the object-glass be plano-convex, than if it be convex on both sides. The case is the same, if the eye-glass be concave on both sides and not plano-concave.

6°, The greater the diameter of the object-glass, and the less that of the eye-glass, the less ratio has the diameter of the object, viewed with the naked eye, to its semidiameter, viewed with a *telescope*, and consequently the more is the object magnified by the *telescope*.

7°, Since the semidiameter of the object is inceased in the ratio of the angle EFI, and the greater the angle EFI is, the less part of the object does it take in it at one view; the *telescope* exhibits so much a less part of the object, as it increases its diameter more.

And this is the reason that determined the mathematicians to look out for another *telescope*, after having clearly found the imperfection of the first, discovered by chance. Nor were their endeavours vain, as appears from the *astronomical telescope* hereafter to be described.

If the semidiameter of the eye-glass have too small a ratio to that of the object-glass, an object through the *telescope* will not appear sufficiently clear, because the great divergency of the rays will occasion the several pencils representing the several points of the object on the retina, to consist of too few rays.

This too is found, that equal object lenses will not bear the same eye-lenses, if they be differently transparent, or there be a difference in their polish. A less transparent object-glass, or one less accurately ground, requires a more spherical eye-glass than another more transparent, &c.

Hence, though it be found by experience, that a *telescope* is good, if the distance of the focus of the object-glass be six inches, and the diameter of the plano-concave eye-glass be one inch and one line, or of one equally concave on both sides one inch and an half; yet it is by no means expedient to recommend to the maker either this, or any particular combination, but to try several eye-glasses, both greater and smaller, with the same object-glass, and take that through which objects appear most clear and distinct.

Hevelius recommends an object-glaſs convex on both ſides, whoſe diameter is four Dantzick feet; and an eye-glaſs concave on both ſides, whoſe diameter is $4\frac{7}{10}$ digits or tenths of a foot. An object-glaſs, equally convex on both ſides, whoſe diameter is five feet, he obſerves, will require an eye-glaſs of $5\frac{1}{2}$ digits; and adds, that the ſame eye-glaſs will alſo ſerve an object-glaſs of eight or ten feet.

Hence, as the diſtance of the object-glaſs and eye-glaſs is the difference between the diſtance of the virtual focus of the eye-glaſs, and the diſtance of the focus of the object-glaſs; the length of the *teleſcope* is had by ſubtracting that from this. That is, the length of the *teleſcope* is the difference between the diameters of the object-glaſs and eye-glaſs, if that be plano-convex, and this plano-concave; or the difference between the ſemidiameters of the object-glaſs and eye-glaſs, if that be convex on both ſides, and this concave on both; or the difference between the ſemidiameter of the object-glaſs, and the diameter of the eye-glaſs, if that be convex on both ſides, and this plano-concave; or the difference between the diameter of the object-glaſs, and the ſemidiameter of the eye-glaſs, if that be plano-convex, and this concave on both ſides.

Thus, e. gr. if the diameter of an object-glaſs convex on both ſides be four feet, and that of an eye-glaſs concave on both ſides be four and an half digits or tenths of a foot; the length of the *teloſcope* will be one foot, $7\frac{1}{2}$ digits.

Telescope, *aſtronomical*, is a *teleſcope* conſiſting of an object-glaſs, and an eye-glaſs, both convex.

It has its name, from its being wholly uſed in aſtronomical obſervations.

The perſon, who ſuggeſted the firſt idea of this *teleſcope*, was Kepler, who alſo explained the rationale, and pointed out the advantages of it in his Catoptrics, in 1611; but the firſt perſon who actually made an inſtrument of this conſtruction, was father Scheiner, who has given a deſcription of it in his Roſa Urſina, publiſhed in 1630. To this purpoſe he ſays, if you inſert two ſimilar lenſes, both convex, in a tube, and place your eye at a convenient diſtance, you will ſee all terreſtrial objects, inverted indeed, but magnified and very diſtinct, with a conſiderable extent of view. He afterwards ſubjoins an account of a *teleſcope* of a different conſtruction, with two convex eye-glaſſes, which again reverſes the images, and makes them appear in their natural poſition. Father Rheita, however, ſoon after propoſed a better conſtruction, uſing three eye-glaſſes inſtead of two.

Telescope, *conſtruction of the aſtronomical*.—The tube being prepared, an object-glaſs, either plano-convex, or convex on both ſides, but a ſegment of a large ſphere, is fitted in at one end, and an eye-glaſs convex on both ſides, which is the ſegment of a ſmall ſphere, is fitted into the other end; at the common diſtance of the foci.

Thus, the rays of each pencil iſſuing from every point of the object ABC, (*Tab.* VI. *Optics*, *fig.* 124.) paſſing through the object-glaſs DEF, become converging, and meet in their foci at IHG, where an image of the object will be formed. If then another convex lens, KM, of a ſhorter focal length, be ſo placed, as that its focus ſhall be in IHG, the rays of each pencil, after paſſing through it, will become nearly parallel, ſo as to meet upon the retina, and form an enlarged image of the object at RST. If the proceſs of the rays be traced, it will preſently be perceived, that this image muſt be inverted. For the pencil that iſſues from A, has its focus in G, and again in R, on the ſame ſide with A. But as there is always one inverſion in ſimple viſion, this want of inverſion produces juſt the reverſe of the natural appearance. The field of view in this *teleſcope* will be large, becauſe all the pencils that can be received on the ſurface of the lens KM, being converging after paſſing through it, are thrown into the pupil of the eye, placed in the common interſection of the pencils at P.

Telescope, *theory of the aſtronomical*.—An eye, placed near the focus of the eye-glaſs, of ſuch a *teleſcope*, will ſee objects diſtinctly, but inverted, and magnified in the ratio of the diſtance of the focus of the eye-glaſs to the diſtance of the focus of the object-glaſs.

For, 1°, Since they are very remote objects that are viewed through theſe *teleſcopes*, the rays from any point of the object fall parallel on the object-glaſs; and, conſequently, after refraction, will meet in a point behind the glaſs, which point is the focus of the eye-glaſs. From this point they begin to diverge, and fall diverging on the eye-glaſs, where being refracted, they enter the eye parallel.

Hence, as all but myopes ſee diſtinctly by parallel rays, a *teleſcope*, thus diſpoſed, will exhibit remote objects diſtinctly. Suppoſe the common focus of the lenſes in F (*fig.* 1. 25); and make AB = BF. Since one of the rays AC, proceeding from the right ſide of the object, paſſes through A; the ray CE will be parallel to the axis AI; and therefore, after refraction in the eye-glaſs, will fall in with it in its focus G.

Since, then, the eye is placed near it, and all the other rays proceeding from the ſame point of the object with EG are refracted parallel to it; the point in the right ſide of the object will be ſeen in the right line EG.

After the like manner it appears, that the middle point of the object is ſeen in the axis GB, ſo that the object appears inverted.

3°, From what has been already ſhewn, it appears, that the ſemidiameter of the object will be ſeen through the *teleſcope*, under the angle EGI, which to the naked eye placed in A, is ſeen under the angle bAc, or BAC. Suppoſe, now, IF equal to the diſtance of the focus IG; ſince the right angles at I are equal, EGF = EFI. Therefore drawing FM parallel to AC, we ſhall have IFM = BAC. The ſemidiameter, therefore, viewed with the naked eye, is to that viewed through the *teleſcope*, as IM to IE. Draw KE parallel to FM; we ſhall have IM : IE :: IF : IK. But by reaſon of the paralleliſm of the lenſes, CE = BI = BF + FI = AB + FI; and by reaſon of the paralleliſm of the right lines CA, and EK, CE = AK; therefore BI = AK; conſequently AB = IK. And therefore IM : IE :: IF : AB; that is, the ſemidiameter, ſeen with the naked eye, is to the ſemidiameter viewed through the *teleſcope*, in the ratio of the diſtance of the focus of the eye-lens IF, to the diſtance of the focus of the object-glaſs AB. *Q. E. D.*

This may be otherwiſe demonſtrated by means of *fig.* 124; for, neglecting the length of the *teleſcope*, as bearing no ſenſible proportion to the diſtance of an object, the angle under which the object is viewed is AEC = KEM; but the angle with which the pencils, that form the image, come to the eye, is KPM = ILG (the pencil MP being refracted parallel to GL, and KP to IL), and theſe angles are to one another as LH to HE.

The magnifying power of *Galileo's* Telescope may be alſo eſtimated by the ſame rule; the only difference between them being this, that the pencils by which the extremities of any object are ſeen in this caſe enter the eye diverging, whereas in the other they enter it converging; but if the ſphere of concavity in the eye-glaſs of the Galilean *teleſcope* be equal to the ſphere of convexity in the eye-glaſs of another *teleſcope*, their magnifying power will be the ſame.

The concave eye-glaſs, however, being placed between the object-glaſs and its focus, the Galilean *teleſcope* will be ſhorter than the other, by twice the focal length of the eye-glaſs.

Conſequently, if the length of the *teleſcopes* be the ſame, the Galilean will have the greater magnifying power. Viſion is alſo more diſtinct in theſe *teleſcopes*, owing, perhaps, in part, to there being no intermediate image between the eye and the object. Beſides, the eye-glaſs being very thin in the centre, the rays will be leſs liable to be diſtorted by irregularities in the ſubſtance of the glaſs. Whatever be the cauſe, we can ſometimes ſee Jupiter's ſatellites very clearly in a Galilean *teleſcope*, not more than twenty-inches, or two feet long, when one of four or five feet, of the common ſort, will hardly make them viſible.

From what has been above delivered, it appears, 1°, As the *aſtronomical teleſcope* exhibits objects inverted; it ſerves commodiouſly enough for obſerving the ſtars (it mattering little, whether they be ſeen erect or inverted); but, for terreſtrial objects, it is much leſs proper, as the inverting frequently prevents their being known.

2. If between the eye-glaſs and its focus G, (*fig.* 125.) be a plain well-poliſhed metal ſpeculum LN, of the length of an inch, and of an oval figure, inclined to the axis under an angle of 45°, the rays EP and MQ will be reflected in ſuch a manner as that concurring in *g*, they make an angle P*g*Q, equal to PGQ; for LPE = *g*PQ = GPQ, and IQP = GQN = *g*QN, and therefore, PQG = PQ*g*, and conſequently PGQ = P*g*Q; and therefore the eye being placed in *g*, will ſee the object of the ſame magnitude as before, only in an erect ſituation. By the addition therefore of ſuch a ſpeculum, the *aſtronomical teleſcope* is rendered fit to obſerve terreſtrial objects.

3. Since the focus of the glaſs convex on both ſides is diſtant from the glaſs itſelf a ſemidiameter, and that of a plano-convex glaſs, a diameter; if the object-glaſs be convex on both ſides, the *teleſcope* will magnify the ſemidiameter

ſemidiameter of the object, in the ratio of the ſemidiameter of the eye-glaſs to the ſemidiameter of the object-glaſs; but if the object-glaſs be a plano-convex, in the ratio of the ſemidiameter of the eye-glaſs, to the diameter of the object-glaſs.

4. Wherefore, ſince the ſemidiameter of the eye-glaſs has a greater ratio to the ſemidiameter of the object-glaſs than to its diameter; a *teleſcope* magnifies the ſemidiameter of the object more, if the object-glaſs be a plano-convex, than if convex on both ſides.

For the ſame reaſon a *teleſcope* magnifies more when the eye-glaſs is convex on both ſides, than when it is plano-convex.

5. The ratio of the ſemidiameter of the eye-glaſs to the diameter or ſemidiameter of the object-glaſs, is the leſs, as the eye-glaſs is a ſegment of a leſs ſphere, and the object-glaſs of a greater. A *teleſcope* therefore magnifies more the diameter of the object, as the object-glaſs is a ſegment of a greater, and the eye-glaſs of a leſſer ſphere. And yet the ratio of the ſemidiameter of the eye-glaſs to the object-glaſs muſt not be too ſmall; if it be, it will not refract rays enough to the eye from each point of the object; nor will it ſeparate thoſe coming from different points ſufficiently; by which means the viſion will be rendered obſcure and confuſed. To this may be added what we have ſhewn, of the ratio of the object-glaſs to the eye-glaſs in the Dutch *teleſcope*.

De Chales obſerves, that an object-lens of $2\frac{1}{4}$ feet will require an eye-glaſs $1\frac{1}{2}$ digit or tenth of a foot; and an object-glaſs of eight or ten feet, an eye-glaſs of four digits; in which he is confirmed by Euſtachio de Divinis.

TELESCOPE, *to ſhorten the aſtronomical*, i. e. to conſtruct a *teleſcope* ſo, as that, though ſhorter than the common one, it ſhall magnify as much.

1. Having provided a drawing tube, fit in an object-lens E O (*fig.* 126.) which is a ſegment of a moderate ſphere; let the firſt eye-glaſs B D be concave on both ſides, and ſo placed in the tube, as that the focus of the object-glaſs A may be behind it, but nearer to the centre of the concavity G. Then will the image be thrown in Q, ſo as that G A : G I : : A B : Q I. Laſtly, fit in another object-glaſs, convex on both ſides, and a ſegment of a leſſer ſphere, ſo as that its focus may be in Q.

This *teleſcope* will magnify the diameter of the object more than if the object-glaſs were to repreſent its image at the ſame diſtance E Q; and conſequently a ſhorter *teleſcope*, conſtructed this way, is equivalent to a longer in the common way. The demonſtration may be ſeen in Wolfius. Elem. Math. vol. iii. p. 245.

Sir Iſaac Newton furniſhes us with another method of contracting the *teleſcope*, in his catoptrical, or reflecting *teleſcope*; the conſtruction whereof ſee hereafter. See *Achromatic* TELESCOPE.

TELESCOPE, *aerial*, a kind of *aſtronomical teleſcope*, the lenſes whereof are uſed without a tube.

In ſtrictneſs, however, the *aerial teleſcope* is rather a particular manner of mounting and managing long *teleſcopes* for celeſtial obſervation in the night-time, whereby the trouble of long unwieldy tubes is ſaved, than a particular kind of *teleſcope*: the contrivance we owe to the noble Huygens.

This invention was ſucceſsfully practiſed by himſelf and others, particularly with us by Dr. Pound and Dr. Bradley, with an object-glaſs of 123 feet focal diſtance, and an apparatus belonging to it, made and preſented by Huygens to the Royal Society, and deſcribed in his Aſtroſcopia Compendiaria Tubi Optici Molimine Liberata, printed at the Hague in 1684.

For although ſir Iſaac Newton's reflecting *teleſcopes* are now made in ſuch great perfection, that one of five feet is equivalent to the Huygenian glaſs of 123 feet, yet there is one conſiderable advantage in theſe dioptric *teleſcopes*, which the catoptric ones have not, viz. in applying a micrometer. For the diameters of the pictures of objects in both *teleſcopes* being as their lengths, the ſame micrometer will meaſure the larger image more exactly than the ſmaller, in the proportion of the lengths of the *teleſcopes*.

TELESCOPE, *conſtruction of the aerial*. 1. A tall pole or maſt, A B (*fig.* 127.) nearly of the length of the propoſed tube, is fixed perpendicularly in the ground. Before the pole is erected, one ſide is planed ſmooth, and upon it two rulers or ledges are fixed parallel to each other, an inch and half apart, including a kind of groove or channel between them, reaching from the top almoſt to the bottom. At the top of the pole, over againſt this long channel, is fixed a little pulley A, moveable on its axis, and over it is drawn a cord G g, double the length of the pole, and near half an inch thick, returning into itſelf, and furniſhed with a piece of lead H, equal in weight to the lens, and a moveable arm to be ſuſtained thereby.

Then a wooden lath C D, two feet long, is framed ſo as that it may ſlide freely in the channel, and in the middle thereof is affixed a wooden arm E, ſtanding out a foot from the pole, and on its extremity bearing another, F *f*, a foot and half long, fixed to it at right angles, and both of them parallel to the horizon.

2. An object-glaſs is included in a hollow cylinder I K, four inches long; to this cylinder is fixed a ſtaff K L, near an inch thick, and a foot long, which reſts on a braſs ball M, that moves freely in its cup or ſocket underneath; only, on occaſion, the ball and ſocket are fixed by a ſcrew. That the lens, thus equally balanced, may be moved with a ſmall force, a weight N of about a pound, is ſuſpended by a ſtrong wire N F, by bending of which the common centre of gravity of the weight and the lens, is eaſily made to coincide with that of the ball. To the ſtaff K L, is fixed a braſs ſtyle L, which is bent downwards, till its point be as much below the centre of the ſtaff as the centre of the ball is. To the point is tied a fine ſilken thread, L V, which of conſequence will be parallel to the ſtaff K L.

3. An eye-glaſs O, is included in a ſhort cylinder, and the ſtaff P V is fixed to the ſame. To this is hung a little weight S, ſufficient to make a balance. In Q is fixed a handle R, which carries a tranſverſe axis to be held in the obſerver's hand; and the ſtaff P V, directed toward the object-glaſs, is tied to the thread L V. The thread paſſed through a hole V, is wound about a little peg T, fixed in the middle of the ſtaff, by the turning whereof the thread is ſhortened or lengthened at pleaſure.

4. That the obſerver may be able to hold the eye-glaſs ſteady, he has a fulcrum or prop under his arm, the ſtructure whereof appears from inſpection of the figure. Laſtly, to keep off the feeble light flowing from the air upon the eye, it is conveniently covered with a circle Y, perforated in the middle, fitted on to a moveable and flexible arm.

In order to find a ſtar in the *teleſcope*, when the nights are dark, a lanthorn is uſed, which collects the light into a ſtream either by tranſmiſſion through a convex lens, or by reflection from a concave ſpeculum. For by directing this ſtream of light till it falls upon the object-glaſs, and makes it viſible, it is eaſy for the obſerver to change his place, till he finds the ſtar is covered by the middle of the object, and then to apply his eye-glaſs, which is ſooner done than with a *teleſcope* conſiſting of a long tube. By moonlight the object-glaſs is viſible without the help of the lanthorn.

M. de la Hire has contrived a little machine for managing the object-glaſs, which he has deſcribed Mem. de l' Acad. 1715. See Smith's Optics, book iii. chap. 10.

Hartſocker, who made *teleſcopes* of a very conſiderable focal length, contrived a method of uſing them without a tube, by fixing them at the top of a tree, a high wall, or the roof of a houſe. Miſcel. Berol. vol. i. p. 261.

Huygens's great *teleſcope*, wherewith Saturn's true face, and one of his ſatellites, were firſt diſcovered, conſiſts of an object-glaſs of 12 feet, and an eye-glaſs of a little more than three inches; though he frequently uſed a *teleſcope* of 23 feet long, with two eye-glaſſes joined together, each in diameter $1\frac{1}{2}$ inch; ſo that the two were equal to one of three inches.

The ſame author obſerves, that an object-glaſs of 30 feet requires an eye-glaſs of $3\frac{3}{10}$ inches; and gives us a table of proportions for the conſtructing of *aſtronomical teleſcopes*, an abridgment whereof we ſhall here give the reader.

Diſt. of Foc. of Obj. Glaſs. Rhinland. Feet.	Diam. of Apert. Inch. & Dec.	Diſt. of F. of E. Glaſs. Inch. & Dec.	Magn. Diam. or Power.
1	0.55	0.61	20
2	0.77	0.85	28
3	0.95	1.05	34
4	1.09	1.20	40
5	1.23	1.35	44
6	1.34	1.47	49
7	1.45	1.60	53
8	1.55	1.71	56
9	1.64	1.80	60
10	1.73	1.90	63
15	2.12	2.33	77
20	2.45	2.70	89
25	2.74	3.01	100
30	3.00	3.30	109
40	3.46	3.81	120
50	3.87	4.26	141
60	4.24	4.66	154
70	4.58	5.04	166
80	4.90	5.39	178
90	5.20	5.72	189
100	5.48	6.03	200
120	6.00	6.60	218
140	6.48	7.12	235
160	6.93	7.62	252
180	7.35	8.09	267
200	7.75	8.53	281
220	8.12	8.93	295
240	8.48	8.83	308
260	8.83	9.71	321
280	9.16	10.08	333
300	9.49	10.44	345
400	10.95	12.05	400
500	12.25	13.47	445
600	13.42	14.76	488

Dr.

Dr. Smith (Rem. p. 78.) observes, that the magnifying powers of this table are not so great as Huygens himself intended, or as the best object-glasses now made will admit of. For the author (in his Astroscopia Compendiaria) mentions an object-glass of 34 feet focal distance, which, in astronomical observations, bore an eye-glass of $2\frac{1}{4}$ inches focal distance, and consequently magnified 163 times. According to this standard, a *telescope* of 35 feet ought to magnify 166 times, and of one foot 28 times; whereas the table allows but 118 times to the former, and but 20 to the latter. Now $\frac{166}{118}$ or $\frac{28}{20}=1.4$; by which if you multiply the numbers in the given column of magnifying powers, you will gain a new column, shewing how much those object-glasses ought to magnify if wrought up to the perfection of this standard.

The new apertures and eye-glasses must also be taken in the same proportions to one another as the old ones have in the table; or the eye-glasses may be found by dividing the length of each *telescope* by its magnifying power. And thus a new table may be easily made for this or any other more perfect standard when offered.

The rule for computing this table depends on the following theorem, viz. that in refracting *telescopes* of various lengths, a given object will appear equally bright and equally distinct, when their linear apertures and focal distances of their eye-glasses are severally in a subduplicate ratio of their lengths or focal distances of their object-glasses; and then also their linear amplifications will be in a subduplicate ratio of their lengths.

The rule is as follows: multiply the number of feet in the focal distance of any proposed object-glass by 3000, and the square root of the product will give the breadth of its aperture in hundredth parts of an inch. And the same breadth of the aperture, increased by a tenth part of itself, gives the focal distance of the eye-glass in hundredth parts of an inch. And the magnifying powers are as the breadths of the apertures.

Huygens's standard *telescope* was 30 feet long, and bears an aperture whose breadth is 3 inches, and an eye-glass whose focal distance is $3\frac{3}{10}$ inches. Consequently, since the standard *telescope* has 30 feet focal distance of its object-glass, put F for the number of feet in any other focal distance, and say by the theorem, as $\sqrt{30}$ to $\sqrt{F}$, so is the standard aperture 3 inches, or 300 centesimals, or $\sqrt{300\times300}$, to the aperture sought; which, therefore, is $\sqrt{3000F}$ in centesimals of an inch. The focal distance of the eye-glass of the standard *telescope* is $3\frac{3}{10}$ inches, i. e. a tenth part more than the breadth of the aperture of the object-glass; consequently the focal distance of the new eye-glass must be a tenth part more than the linear aperture of the new object-glass.

N. B. The Rhinland foot is to the English foot as 139 to 135; so that taking the lengths of the refracting *telescopes* of as many English feet, their apertures and eye-glasses, and linear amplifications should be severally diminished in the subduplicate ratio of 139 to 135, i. e. nearly in the ratio of 139 to 137, or about $\frac{1}{69}$ or $\frac{1}{70}$th part of the whole. See Aperture.

If in two or more *telescopes*, the ratio between the object and eye-glass be the same, the object will be magnified the same in both.

Hence some may conclude the making of large *telescopes* a needless trouble. But it must be remembered, as we have already laid down, that an eye-glass may be in a less ratio to a greater object-glass than to a smaller: thus, e. gr. in Huygens's *telescope* of 25 feet, the eye-glass is three inches. Now, keeping this proportion in a *telescope* of 50 feet, the eye-glass should be six inches; but the table shews $4\frac{1}{2}$ are sufficient. Hence, from the same table it appears, that a *telescope* of 50 feet magnifies in the ratio of 1 : 141; whereas that of 25 feet only magnifies in the ratio of 1 : 100.

Since the distance of the lenses is equal to the aggregate of the distance of the foci of the object and eye-glasses; and the focus of a glass convex on each side is a semidiameter's distance, and that of a plano-convex, a diameter's distance from the lens; the length of a *telescope* is equal to the aggregate of the semidiameters of the lenses, if the object-glass be convex on both sides; and to the sum of the semidiameter of the eye-glass, and of the diameter of the object-glass, if the object-glass be a plano-convex.

But as the semidiameter of the eye-glass is very small, in respect of that of the object-glass, the length of the *telescope* is usually estimated from the distance of the object-glass; i. e. from its semi-diameter, if it be convex on both sides, or its diameter if plano-convex. Thus a *telescope* is said to be 12 feet, if the semidiameter of the object-glass, convex on both sides, be 12 feet, &c.

Since myopes see near objects best; for them the eye-glass is to be removed nearer to the object-glass, that the rays refracted through it may be the more diverging.

To take in the larger field at one view, some use two eye-glasses, the foremost whereof is a segment of a larger sphere than that behind; to this it must be added, that if two lenses be joined immediately together, so as one touch the other, the focus is removed to double the distance which that of one of them would be at.

Land Telescope, or *Day* Telescope, a *telescope* consisting of more than two lenses, commonly of a convex object-glass, and three convex eye-glasses; or a *telescope* that exhibits objects erect, yet different from that of Galileo.

It has its name from its being used to view objects in the day-time, on or about the earth.

In this *telescope*, after the rays have passed the first eye-glass, HI (*fig.* 128.) as in the former construction, instead of being there received by the eye, they pass on to another equally convex lens, situated at twice its focal distance from the other, so that the rays of each pencil, being parallel in that whole interval, those pencils cross one another in the common focus, and the rays constituting them are transmitted parallel to the second eye-glass LM; after which the rays of each pencil converge to other foci at NO, where a second image of the object is formed, but inverted with respect to the former image in EF. This image, then, being viewed by a third eye-glass, QR, is painted upon the retina at XZY, exactly as before, only in a contrary position: for the pencil that issues from A, after coming to a focus in F and N, forms the image of that point at last at Y, in the same position as it would have done without the intervention of any lens at all. For this construction we are indebted to father Rheita.

To construct a Land or Day Telescope. A tube being provided, fit in at one end an object-glass, which is either convex on both sides, or plano-convex, and a segment of a large sphere; to this add three eye-glasses, all convex on both sides, and segments of equal spheres; disposing them in such manner as that the distance of any two may be the aggregate of the distances of their foci.

Theory of a Land Telescope. Then will an eye applied to the last lens, at the distance of its focus, see objects very distinctly, erect, and magnified in the ratio of the distance of the focus of one eye-glass LK (*fig.* 129.) to the distance of the focus of the object-glass AB.

For 1. The rays, from what has been already said, falling on the object parallel, the image of the object will be represented invertedly at the distance of the principal focus; wherefore, since this image is in the focus of the first eye-glass, the rays, after a second refraction, will become parallel; and thus falling on the third lens, after a third refraction, they exhibit the inverted image invertedly, that is, an erect image of the object.

Since then this image is in the focus of the third eye-glass, the rays, after a fourth refraction, will become parallel; and in this disposition the eye will receive them, and consequently there will be distinct vision, and the object will appear erect.

2. If IQ=IK, that is, equal to the distance of the focus of the object-glass, an eye placed in M will see the semidiameter of the object increased in the ratio of LM to KI; but the ray AQ, proceeding from the focus Q of the object-lens AB, after refraction, becomes parallel to the axis IL; consequently the first eye lens CD joins it to the axis in M, the distance of a semidiameter.

And since the focus of the second eye-glass EF is also in M, the ray FH, after refraction, will be parallel to the axis NO; and therefore the third eye-glass will join it at the axis in P; but the semidiameters of the lenses GH and CD are supposed equal; therefore PO=LM. Wherefore, since the right angles at O and L are equal, as also HO=CL, the angle OPH is equal to CML. The semidiameter of the object therefore appears the same in P as in M, and is consequently magnified in the ratio of LM, or PO to KI.

Hence, 1°, An *astronomical telescope* is easily converted into a *land telescope*, by using three eye-glasses for one; and the *land telescope*, on the contrary, into an *astronomical* one, by taking away two eye-glasses, the faculty of magnifying still remaining the same.

2°, Since the distance of the eye-glasses is very small, the length of the *telescope* is much the same as if you only used one.

3°, From the construction, it is evident, that the length of the *telescope* is found by adding five times the semidiameter of the eye-glasses to the diameter of the object-glass, if a plano-convex; or to its semidiameter, if convex on both sides.

Huygens first observed, both in the *astronomical* and *land telescope*, that it contributes considerably to the perfection of

of the instrument, to have a ring of wood or metal, with an aperture, a little less than the breadth of the eye-glass, fixed in the place where the image is found to radiate upon the lens next the eye: by means hereof the colours, which are apt to disturb the clearness and distinctness of the object, are prevented, and the whole compass taken in at a view, perfectly defined.

We may here observe, in general, concerning vision through glasses, that the apparent distinctness, or confusion, of an object depends upon the mutual inclination of the rays in any one pencil to each other, when they fall upon the eye; the apparent magnitude depends upon the real situation of the extreme pencils; and lastly, the apparent brightness, or obscurity, depends upon the quantity of rays in every pencil.

Some make *land telescopes* of three lenses, which yet represent objects erect and magnified as much as the former. But such *telescopes* are subject to very great inconveniencies, both as the objects herein are tinged with false colours, and as they are distorted about the margin.

Some, again, use five lenses, and even more; but since some part of the rays is intercepted in passing every lens, objects are hereby exhibited dim and feeble.

Telescopes of this kind, longer than twenty feet, will be of hardly any use in observing terrestrial objects, on account of the continual motion of the particles of air, which by these long and magnifying *telescopes* become visible, and give a tremulous motion to the objects themselves.

The length of dioptric *telescopes*, adapted to any important astronomical purpose, rendered them extremely inconvenient for use; as it was necessary to increase their length in no less a proportion than the duplicate of the increase of their magnifying power: so that, in order to magnify twice as much as before, with the same light and distinctness, the *telescope* required to be lengthened four times, and to magnify thrice as much, nine times, and so on. This unwieldiness of refracting *telescopes*, possessing any considerable magnifying power, was one cause, why the attention of astronomers, &c. was directed to the discovery and construction of *reflecting telescopes*. And, indeed, a refracting *telescope*, even of a thousand feet focus, supposing it possible to make use of such an instrument, could not be made to magnify with distinctness more than one thousand times; whereas a reflecting *telecope*, not exceeding nine or ten feet, will magnify twelve hundred times. The perfection of refracting *telescopes*, it is well known, is very much limited by the aberration of the rays of light from the geometrical focus: and this arises from two different causes; that is, from the different degrees of the refrangibility of light, and from the figure of the sphere, which is not of a proper curvature for collecting the rays in a single point. Till the time of Sir Isaac Newton, no optician had imagined that the object-glasses of *telescopes* were subject to any other error besides that which arose from their spherical figure; and, therefore, all their efforts were directed to the construction of them, with other kinds of curvature: but Newton had no sooner demonstrated the different REFRANGIBILITY of the rays of light, than he discovered in this circumstance a new and a much more considerable cause of error in *telescopes*. Since, therefore, the pencils of each kind of light have their foci in different places, some nearer, and some farther from the lens, it is evident that the whole beam cannot be brought into any one point, but that it will be drawn the nearest to a point in the middle place between the focus of the most and least refrangible rays, so that the focus will be a circular space of a considerable diameter. Thus, let a beam of light (*fig.* 130.) pass through a lens, and the most refrangible of the rays have their focus at F, and the least refrangible at *f*. From the figure it is evident, that the smallest space into which the light can be drawn is a circle, the diameter of which is *i* I, passing through G the middle point between F and *f*.

Newton shews that this space is about the fifty-fifth part of the aperture of the *telescope*, and that the focus of the most refrangible rays is nearer to the object-glass than the focus of the least refrangible ones, by about the $27\frac{1}{2}$ part of the distance between the object-glass, and the focus of the mean refrangible rays. But he says, that if the rays flow from a lucid point, as far from the lens on one side as their foci are on the other, the focus of the most refrangible rays will be nearer to the lens than that of the least refrangible by more than the fourteenth part of the whole distance. Hence, he concludes, that if all the rays of light were equally refrangible, the error in *telescopes*, arising from the spherical figure of the glass, would be many hundred times less than it now is; because the error arising from the spherical figure of the glass, is to that arising from the different refrangibility of the rays of light as 1 to 5449. See ABERRATION.

Upon the whole he observes, that it is a wonder that *telescopes* represent objects so distinctly as they do. The reason of which is, that the dispersed rays are not scattered uniformly over all the circular space mentioned above, but are infinitely more dense in the centre than in any other part of the circle; and that, in the way from the centre to the circumference, they grow continually rarer and rarer, and at their circumference are infinitely rare; so that these dispersed rays are not copious enough to be visible, except in the centre of the circle, or very near it. If we suppose the little circle of aberrations arising from unequal refrangibility to be two hundred and fifty times narrower than the circular aperture of the object-glass, it would contain all the orange and yellow, which are the most luminous of the prismatic colours, and permit the other fainter and darker colours to pass by it, which perhaps scarce affect the sense; and yet even in this case the aberration caused by the sperical figure, would be to the aberration caused by the unequal refrangibility, in a one hundred feet *telescope*, with an aperture of four inches, only as one to twelve hundred; which, however, sufficiently shews, that it is not the spherical figure of the glasses, but the different refrangibility of the rays of light, which hinders the perfection of *telescopes*. He also mentions another argument to prove, that the different refrangibility of the rays of light is the true cause of the imperfection of *telescopes*. For the dispersions of the rays arising from the spherical figures of object-glasses are as the cubes of their apertures; and therefore, to make *telescopes* of various lengths magnify with equal distinctness, the apertures of the object-glasses, and the charges or magnifying powers, ought to be as the cubes of the square roots of their lengths, which doth not answer to experience. But the errors of the rays arising from the different refrangibility are as the apertures of the object-glasses, and thence to make *telescopes* of various lengths to magnify, with equal distinctness, their apertures and charges ought to be as the square roots of their lengths; and this answers to experience. For a *telescope* of sixty-four feet in length, with an aperture of two inches and two thirds, magnifies about one hundred and twenty times, with as much distinctness as one of a foot in length, with one third of an inch aperture, magnifies fifteen times.

If it were not for this different refrangibility of the rays, *telescopes* might be brought to a sufficient perfection, by composing the object-glass of two glasses, with water between them. For by this means the refractions on the concave sides of the glasses will very much correct the errors of the refractions on the convex sides, so far as they arise from their spherical figure: but on account of the different refrangibility of different kinds of rays, Newton did not see any other means of improving *telescopes* by refraction only, except by increasing their length. Newton's Optics, p. 73. 83. 89. ed. 3.

This important desideratum in the construction of dioptic *telescopes*, has been since discovered by the ingenious Mr. Dollond; of which we shall give an account in the next article.

TELESCOPE, *achromatic*, is a name given to the refracting *telescope*, invented by Mr. Dollond, and so contrived as to remedy the aberration arising from colours, or the different refrangibility of the rays of light. See ACHROMATIC.

The principles of Mr. Dollond's discovery and construction have been already explained under the article ABERRATION: the improvement made by Mr. Dollond in his *telescopes*, by making two object-glasses of crown-glass, and one of flint, which was tried with success when concave eye-glasses were used, was completed by his son Mr. Peter Dollond; who, conceiving that the same method might be practised with success, when convex eye-glasses were used, found, after a few trials, that it might be done. Accordingly, he finished an object-glass of five feet focal length, with an aperture of three inches and three fourths, composed of two convex lenses of crown-glass, and one concave of white flint glass. Afterwards, apprehending that the apertures might be admitted still larger, he completed one of three feet and a half focal length, with the same aperture of three inches and three fourths. Phil. Trans. vol. lv. p. 56.

But besides the obligation we are under to Mr. Dollond, for correcting the aberration of the rays of light in the focus of object-glasses, arising from their different refrangibility, he made another considerable improvement in *telescopes*, viz. by correcting, in a great measure, both this kind of aberration, and also that which arises from the spherical form of lenses, by an expedient of a very different nature, viz. increasing the number of eye-glasses. If any person, says he, would have the visual angle of a *telescope*

telescope to contain twenty degrees, the extreme pencils of the field must be bent or refracted in an angle of ten degrees; which, if it be performed by one eye-glass, will cause an aberration from the figure, in proportion to the cube of that angle: but if two glasses are so proportioned and situated, as that the refraction may be equally divided between them, they will each of them produce a refraction equal to half the required angle; and therefore, the aberration being in proportion to the cube of half the angle taken twice over, will be but a fourth part of that which is in proportion to the cube of the whole angle; because twice the cube of one is but one fourth of the cube of two: so the aberration from the figure, where two eye-glasses are rightly proportioned, is but a fourth of what it must unavoidably be, where the whole is performed by a single eye-glass. By the same way of reasoning, when the refraction is divided between three glasses, the aberration will be found to be but the ninth part of what would be produced from a single glass; because three times the cube of one is but one ninth of the cube of three. Whence it appears, that by increasing the number of eye-glasses, the indistinctness, which is observed near the borders of the field of a *telescope*, may be very much diminished, though not entirely taken away.

The method of correcting the errors arising from the different refrangibility of light is of a different consideration from the former: for, whereas the errors from the figure can only be diminished in a certain proportion to the number of glasses, in this they may be entirely corrected, by the addition of only one glass; as we find in the astronomical *telescope*, that two eye-glasses, rightly proportioned, will cause the edges of objects to appear free from colours quite to the borders of the field. Also, in the day-*telescope*, where no more than two eye-glasses are absolutely necessary for erecting the object, we find, by the addition of a third rightly situated, that the colours, which would otherwise confuse the image, are entirely removed: but this must be understood with some limitation; for though the different colours, which the extreme pencils must necessarily be divided into by the edges of the eye-glasses, may in this manner be brought to the eye in a direction parallel to each other, so as, by the humours thereof, to be converged to a point in the retina, yet if the glasses exceed a certain length, the colours may be spread too wide to be capable of being admitted through the pupil or aperture of the eye; which is the reason that, in long *telescopes*, constructed in the common manner, with three eye-glasses, the field is always very much contracted.

These considerations first set Mr. Dollond on contriving how to enlarge the field by increasing the number of eye-glasses, without any hindrance to the distinctness or brightness of the image: and though others had been about the same work before, yet observing, that the five-glass *telescopes*, sold in the shops, would admit of farther improvement, he endeavoured to construct one with the same number of glasses in a better manner; which so far answered his expectations, as to be allowed by the best judges to be a considerable improvement on the former. Encouraged by this success, he resolved to try if he could not make some farther enlargement of the field, by the addition of another glass, and by placing and proportioning the glasses in such a manner as to correct the aberrations as much as possible, without any detriment to the distinctness: and at last he obtained as large a field as is convenient or necessary, and that even in the longest *telescopes* that can be made. These *telescopes*, with six glasses, having been well received both at home and abroad, the author has settled the date of the invention in a letter addressed to Mr. Short, and read at the Royal Society, March 1, 1753. Phil. Trans. vol. xlviii. art. 14.

Of the *achromatic telescopes*, invented by Mr. Dollond, there are several different sizes, from one foot to eight feet in length, made and sold by his sons, Messrs. P. and J. Dollond. In the seventeen-inch improved *achromatic telescope*, the object-glass is composed of three glasses, viz. two convex of crown-glass, and one concave of white flint-glass: the focal distance of this combined object-glass is about seventeen inches, and the diameter of the aperture two inches. There are four eye-glasses contained in the tube, to be used for land-objects; the magnifying power with these is near fifty times; and they are adjusted to different sights, and to different distances of the object, by turning a finger-screw at the end of the outer tube. There is another tube, containing two eye-glasses that magnify about seventy times, for astronomical purposes. The *telescope* may be directed to any object by turning two screws in the stand on which it is fixed, one giving a vertical, and the other an horizontal motion. The stand may be enclosed in the inside of the brass tube.

The object-glass of the two feet and a half and three feet and a half *telescopes* is composed of two glasses, one convex of crown-glass, and the other concave of white flint-glass. The diameter of the aperture of the least is two inches, and that of the other two inches and three fourths. Each of them is furnished with two tubes; one for land objects, containing four eye-glasses, and another with two eye-glasses for astronomical uses. They are adjusted by buttons on the outside of the wooden tube; and the vertical and horizontal motions are given by joints in the stands. The magnifying power of the least of these *telescopes*, with the eye-glasses for land objects, is near fifty times, and with those for astronomical purposes eighty times: and that of the greatest for land objects is near seventy times, and for astronomical observations eighty and one hundred and thirty times; for this has two tubes, either of which may be used as occasion requires. This *telescope* is also moved by a screw and rackwork, and the screw is turned by means of a Hooke's JOINT.

These opticians also construct an achromatic pocket perspective glass, or Galilean *telescope*; so contrived that all the different parts are put together, and contained in one piece, four inches and a half in length. This small *telescope* is furnished with four concave eye-glasses, the magnifying powers of which are 6, 12, 18, and 28 times. With the greatest power of this *telescope*, the satellites of Jupiter and the ring of Saturn may be easily seen. They have also contrived an achromatic *telescope*, the sliding tubes of which are made of very thin brass, which pass through springs or tubes; the outside tube being either of mahogany or brass. These *telescopes*, which from their aptitude for gentlemen in the army are called *military telescopes*, have four convex eye-glasses, whose surfaces and focal lengths are so proportioned as to render the field of view very large. They are of four different lengths and sizes; usually called one foot, two, three, and four feet: the first are fourteen inches when in use, and five inches when shut up, having the aperture of the object-glass one inch and a tenth, and magnifying twenty-two times: the second twenty-eight inches for use, nine inches shut up, the aperture one inch and six tenths, and magnifying thirty-five times; the third forty inches, and ten inches, with the aperture two inches, and magnifying forty-five times; and the fourth fifty-two inches, and fourteen inches, with the aperture 2.75 inches, and magnifying fifty-five times.

Mr. Euler, who, in a Memoir of the Academy of Berlin for the year 1757, p. 323, &c. had calculated the effects of all possible combinations of lenses in *telescopes* and microscopes, published another long memoir on the subject of these *telescopes*, shewing with precision of what advantages they are naturally capable. See Miscellanea Taurinensia, vol. iii. par. ii. p. 92.

Mr. Caleb Smith, having given much attention to the subject of shortening and improving *telescopes*, thought that he had found it possible to rectify the errors which arise from the different degrees of refrangibility, on the principle that the sines of refraction of rays differently refrangible are to one another in a given proportion, when their sines of incidence are equal; and the method which he proposed for this purpose, was to make the specula of glass, instead of metal, the two surfaces having different degrees of concavity. The scheme, however, seems never to have been executed. For a particular account of it, see Phil. Trans. Nº 456. p. 326. or Abr. vol. viii. p. i. p. 113, &c.

Mr. Ramsden has lately described a new construction of eye-glasses for such *telescopes* as may be applied to mathematical instruments. The construction which he proposes, is that of two plano-convex lenses, both of them placed between the eye, and the observed image formed by the object-glass of the instrument, and thereby correcting not only the aberration arising from the spherical figure of the lenses, but also that arising from the different refrangibility of light. One plano-convex lens is placed with its plane side near the image of an object, formed by the object-glass of a *telescope*; and the magnified image is thus, from the position of the lens, free from colour; but the respective foci of a lens so placed, being very near each other, and on the same side, the emergent pencils of light diverge on the eye, and give indistinct vision; this is remedied by placing a second plano-convex lens a little within the focus of the former, the combined foci of the two lenses being in the place of the image, and the rays are thereby made to fall parallel on the eye, to shew the object distinctly. For a more particular account of this construction, its principle, and its effects, see Phil. Trans. vol. lxxiii. part i. art. 5.

A construction, similar at least in its principle to the preceding, is ascribed in the Synopsis Optica Honorati Fabri to Eustachio Divini, who placed two equal narrow plane-

plano-convex lenses, instead of one eye-lens, to his *telescopes*, which touched at their vertices; the focus of the object-glass, and the centre of the plano-convex lens next it coinciding. And this, it is said, was done in order to make the rays that came parallel from the object fall parallel upon the eye, to exclude the colours of the rain-bow from it, to augment the angle of sight, the field of view, the brightness of the object, &c. This was also known to Huygens, who sometimes made use of the same construction, and gives the theory of it in his Dioptrics. See Hugenii Opera varia, vol. iv. ed. 1728.

Telescope, *reflecting*, or *catoptric*, or *catadioptric*, is a *telescope* which, instead of lenses, consists chiefly of mirrors, and exhibits remote objects by reflection instead of refraction.

The *reflecting telescope* is an instrument of such importance and use, that it will not be improper to introduce in this place a brief account of the history of its invention. Mr. James Gregory of Aberdeen has been commonly considered as the first inventor of this *telescope*: but the first thought of a reflector seems to have been suggested by Mersennus, about twenty years before the date of Mr. Gregory's invention. A hint to this purpose occurs in the seventh proposition of his Catoptrics, which was printed in 1651: and it appears from the twenty-ninth and third Letters of Descartes, in vol. ii. of his Letters, which are said to have been written in 1639, though they were not published till the year 1666, that Mersennus proposed a *telescope* with specula to Descartes in that correspondence; though indeed in a manner so very unsatisfactory, that Descartes, who had given particular attention to the improvement of the *telescope*, was so far from approving the proposal, that he endeavoured to convince Mersennus of its fallacy. This point has been largely discussed by M. le Roi in the Enclopedie, art. *Telescope*. and M. Montucla in his Hist. des Mathem. tom. ii. p. 643.

Whether Gregory had seen the treatise of Mersennus on optics and catoptrics, and whether he availed himself of the hint suggested by the author or not, it is impossible to determine. He was led, however, to the invention, in seeking to correct two imperfections of the common *telescope*: the first was its too great length, which made it less manageable; and the second, the incorrectness of the image. It had been already demonstrated, that a pencil of rays could not be collected in a single point by a spherical lens; and also, that the image transmitted by such a lens would be in some degree incurvated. These inconveniences, he apprehended, might be obviated, by substituting for the object-glass a metallic speculum, of a parabolic figure, to receive the image, and to reflect it towards a small speculum of the same metal: this again was to return the image to an eye-glass placed behind the great speculum, which, for that purpose, was to be perforated in its centre. This construction he published in 1663, in his Optica Promota. But as Gregory, according to his own account, possessed no mechanical skill, and could find no workman capable of realizing his invention, after some fruitless trials, he was obliged to give up the thoughts of bringing *telescopes* of this kind into use. Sir Isaac Newton, however, interposed to prevent this excellent invention from perishing, and to bring it forward to maturity. Having applied himself to the improvement of the *telescope*, and imagining that Gregory's specula were neither very necessary, nor likely to be executed, he began with prosecuting the views of Descartes; who aimed at making a more perfect image of an object, by grinding lenses, not to the figure of a sphere, but to that of one of the conic sections. But, in the year 1666, having discovered the different refrangibility of the rays of light, and finding that the errors of *telescopes*, arising from that cause alone, were much more considerable than such as were occasioned by the spherical figure of lenses (see the preceding article), he was constrained to turn his thoughts to reflectors. The plague, however, interrupted his progress in this business; so that it was towards the end of 1668, or in the beginning of 1669, when, despairing of perfecting *telescopes* by means of refracted light, and recurring to the construction of reflectors, he set about making his own specula, and early in the year 1672 completed two small reflecting *telescopes*. In these he ground the great speculum into a spherical concave, being unable to accomplish the parabolic form proposed by Gregory; but though he then despaired of performing that work by geometrical rules, yet (as he writes in a letter that accompanied one of these instruments, which he presented to the Royal Society) he doubted not but that the thing might in some measure be accomplished by mechanical devices. With a perseverance equal to his ingenuity, he, in a great measure, overcame another difficulty, which was to find a metallic substance that would be of a proper hardness, have the fewest pores, and receive the smoothest polish: this difficulty he deemed almost insurmountable, when he considered that every irregularity in a reflecting surface would make the rays of light deviate five or six times more out of their due course than the like irregularities in a refracting surface. After repeated trials he at last found a composition that answered in some degree, and left it to those who should come after him to find a better. These difficulties have been lately obviated by Mr. Mudge, who was honoured with Sir Godfrey Copley's medal from the Royal Society, for the paper communicated to the Society, containing directions for making the best composition for the metals of *reflecting telescopes*, together with a description of the process for grinding, polishing, and giving the great speculum the true parabolic form. See Grinding and Speculum.

Sir Isaac Newton, having succeeded so far, communicated to the Royal Society a full and satisfactory account of the construction and performance of his *telescope*. The Society, by their secretary Mr. Oldenburgh, transmitted an account of the discovery to Mr. Huygens, celebrated as a distinguished improver of the refractor; who not only replied to the Society in terms expressing his high approbation of the invention, but drew up a favourable account of the new *telescope*, which he caused to be published in the Journal des Sçavans of the year 1672, and by this mode of communication it was soon known over Europe. See Hugenii Opera varia, tom. iv.

Notwithstanding the excellence and utility of this contrivance, and the honourable manner in which it was announced to the world, it seems to have been greatly neglected for nearly half a century. Indeed, when Newton had published an account of his *telescopes* in the Philosophical Transactions, M. Cassegrain, a Frenchman, in the Journal des Sçavans of 1672, claimed the honour of a similar invention, and said, that before he heard of Newton's improvement, he had hit upon a better construction, by using a small convex mirror instead of the reflecting prism. This *telescope*, which was the Gregorian *telescope* disguised, the large mirror being perforated, and which, it is said, was never executed by the author, is much shorter than the Newtonian; and the convex mirror, by dispersing the rays, serves greatly to enlarge the image made by the large concave mirror.

Newton made many objections to Cassegrain's construction, but several of them equally affect that of Gregory, which has been found to answer remarkably well in the hands of good artists.

Dr. Smith took the pains to make many calculations of the magnifying power both of Newton's and Cassegrain's *telescopes*, in order to their farther improvement, which may be seen in his Optics, Rem. p. 97, &c.

Mr. Short is also said to have made several *telescopes* on the plan of M. Cassegrain's.

Dr. Hooke constructed a reflecting *telescope* (mentioned by Dr. Birch in Hist. of R. S. vol. iii. p. 122.) in which the great mirror was perforated, so that the spectator looked directly towards the object, and it was produced before the Royal Society in 1674. On this occasion it was said that this construction was first proposed by Mersennus, and afterwards repeated by Gregory, but was thought never to have been actually executed before it was done by Dr. Hooke. A description of this instrument may be seen in Hooke's Experiments by Derham, p. 269.

The Society also made an unsuccessful attempt, by employing an artificer to imitate the Newtonian construction; however, about half a century after the invention of Newton, a reflecting *telescope* was produced to the world, of the Newtonian construction, which the venerable author, ere yet he had finished his much distinguished course, had the satisfaction to find executed in such a manner, as left no room to fear that the invention would longer continue in obscurity. This effectual service to science was accomplished by John Hadley, esq. who, in the year 1723, presented to the Royal Society a *telescope*, which he had constructed upon Newton's plan. The two *telescopes* which Newton had made were but six inches long, were held in the hand for viewing objects, and in power were compared to a six-feet refractor. But the radius of the sphere to which the principal speculum of Hadley's was ground was ten feet five inches and one-fourth, and consequently its focal length was sixty-two inches and five eighths. In the Phil. Trans. Abr. vol. vi. p. 133, &c. may be seen a drawing and description of this *telescope*, and also of a very ingenious, but complex apparatus by which it was managed. One of these *telescopes*, in which the focal length of the large mirror was not quite five feet one

fourth

fourth, was compared with the famous Huygenian *telescope*, the focal length of whose object-glass is one hundred and twenty-three feet; and it was found, that the former would bear such a charge, as to make it magnify the object as many times as the latter with its due charge; and that it represented objects as distinctly, though not altogether so clear and bright. With this reflecting *telescope* might be seen whatever had been hitherto discovered by the Huygenian, particularly the transits of Jupiter's satellites, and their shades over the disk of Jupiter, the black list in Saturn's ring, and the edge of the shade of Saturn cast on his ring. The five satellites of Saturn were also observed with this *telescope*, and it also afforded other observations on Jupiter and Saturn, which confirmed the good opinion which Mr. Pound and Dr. Bradley had conceived of it.

Mr. Hadley, after finishing two *telescopes* of the Newtonian construction, applied himself to make them in the Gregorian form, in which the large mirror is perforated. This scheme he completed in the year 1726.

Dr. Smith prefers the Newtonian construction to that of Gregory; but if long experience is allowed to be the final judge in such matters, we must adjudge the superiority to the latter; as that is now, and has been for several years past, the only instrument of the kind in request.

Mr. Hadley spared no pains, after having completed his construction, to instruct Mr. Molyneux and Dr. Bradley; and when these gentlemen had made a sufficient proficiency in the art, being desirous that these *telescopes* should become more public, they liberally communicated to some of the principal instrument-makers of London, the knowledge they had acquired from him: and thus, as it is reasonable to imagine, reflectors were completed by other and better methods than even those in which they had been instructed. Mr. James Short, in particular, signalized himself as early as the year 1734, by his work in this way. He first made his specula of glass; but finding that the light reflected from the best glass specula was considerably less than the light reflected from metallic ones, and that glass was very liable to change its form by its own weight, he applied himself to improve metallic specula; and, by giving particular attention to the curvature of them, he was able to give them greater apertures than other workmen could do; and by a more accurate adjustment of the specula, &c. he very much improved the whole instrument. By some which he made, in which the larger mirror was fifteen inches focal distance, he, and some other persons, were able to read in the Philosophical Transactions at the distance of five hundred feet; and they several times saw the five satellites of Saturn together, which very much surprised Mr. Maclaurin, who gave this account of it, till he found that M. Cassini had sometimes seen them all with a seventeen-feet refracting *telescope*. Mr. Short's *telescopes* were all of the Gregorian construction. Mr. Short is supposed to have discovered a method of giving the parabolic figure to his great speculum; a point of perfection which Gregory and Newton had wished for, but despaired of attaining, and which Hadley had never, as far as is known, attempted, either in his Newtonian or Gregorian *telescope*. However, the secret of working that configuration, whatever it was, as far as it then appeared, died with that ingenious artist. But it has lately been discovered, as we have already observed, by Mr. Mudge. See on the History of Reflecting *Telescopes*, Dr. Gregory's Elem. of Catoptr. and Dioptr. Appendix by Desaguliers. Smith's Optics, book iii. c. 2. Rem. on Art. 489, and Sir John Pringle's excellent Discourse on the Invention, &c. of the Reflecting *Telescope* in his Six Discourses published by Dr. Kippis, 1783. p. 203, &c.

Construction of a reflecting TELESCOPE *of the Newtonian form.* Let A B C D (*fig.* 131.) be a large tube, open at A D and closed at B C, and of a length, at least, equal to the distance of the focus from the metallic spherical concave speculum G H placed at the end B C. The rays E G, F H, &c. proceeding from a remote object P R, intersect one another somewhere before they enter the tube, so that E G, *e g* are those that come from the lower part of the object, and *f h*, F H from its upper part: these rays, after falling on the speculum GH, will be reflected, so as to converge and meet in *m n*, where they will form a perfect image of the object. But as this image cannot be seen by the spectator, they are intercepted by a small plane metallic speculum K K, intersecting the axis at an angle of 45°, by wich the rays tending to *m*, *n*, will be reflected towards a hole L L in the side of the tube, and the image of the object will thus be formed in *q* S; which image will be less distinct, because some of the rays which would otherwise fall on the concave speculum G H, are intercepted by the plane speculum: nevertheless it will appear in a considerable degree distinct, because the aperture A D of the tube, and the speculum G H are large. In the lateral hole L L is fixed a convex lens, whose focus is at S *q*; and, therefore, this lens will refract the rays that proceed from any point of the image, so at their exit they will be parallel, and those that proceed from the extreme points S, *q*, will converge after refraction, and form an angle at O, where the eye is placed; which will see the image S *q*, as if it were an object, through the lens L L; consequently the object will appear enlarged, inverted, bright, and distinct. In L L lenses of different convexities may be placed, which by being moved nearer to the image or farther from it, would represent the object more or less magnified, provided that the surface of the speculum G H be of a perfectly spherical figure. If, in the room of one lens L L, three lenses be disposed in the same manner with the three eye-glasses of the refracting *telescope*, the object will appear erect, but less distinct than when it is observed with one lens. On account of the position of the eye in this *telescope*, it is extremely difficult to direct the instrument towards any object: Huygens, therefore, first thought of adding to it a small refracting *telescope*, the axis of which is parallel to that of the reflector. This is called a *finder* or *director*. The Newtonian *telescope* is also furnished with a suitable apparatus for the commodious use of it.

In order to determine the magnifying power of this *telescope*, it is to be considered that the plane speculum KK is of no use in this respect: let us then suppose, that one ray proceeding from the object coincides with the axis G L I A (*fig.* 132.) of the lens and speculum; let *b b* be another ray proceeding from the lower extreme of the object and passing through the focus I of the speculum K H; this will be reflected in the direction *b i d*, parallel to the axis G L A, and falling on the lens *d* L *d*, will be refracted to G, so that G L will be equal to L I, and *d* G = *d* I. To the naked eye the object would appear under the angle I *b i* = *b* I A; but by means of the *telescope* it appears under the angle *d* G L = *d* I L = I *d i*: and the angle I *d i* is to the angle I *b i* : : *b* I : I *d*; consequently, the apparent magnitude by the *telescope* is to that by the naked eye as the distance of the focus of the speculum from the speculum, to the distance of the focus of the lens from the lens.

Construction of the Gregorian Reflecting TELESCOPE.

Let T Y Y T (*fig.* 133.) be a brass tube, in which L *l d* D is a metallic concave speculum, perforated in the middle at X; and E F a less concave mirror, so fixed by the arm or strong wire R T, which is moveable by means of a long screw on the outside of the tube, as to be moved nearer to, or farther from the larger speculum L *l d* D; its axis being kept in the same line with that of the great one. Let A B represent a very remote object, from each part of which issue pencils of rays, e. g. *c d*, C D, from A the upper extreme of the object, and I L, *i l*, from the lower part B; the rays I L, C D from the extremes crossing one another before they enter the tube. These rays, falling upon the larger mirror L D, are reflected from it into the focus K H, where they form an inverted image of the object A B, as in the Newtonian *telescope*. From this image the rays, issuing as from an object, fall upon the small mirror E F, the centre of which is at *e*, so that after reflection they would meet in their foci at Q Q, and there form an erect image. But since an eye at that place could see but a small part of an object, in order to bring rays from more distant parts of it into the pupil, they are intercepted by the plano-convex lens M N, by which means a smaller erect image is formed at P V, which is viewed through the meniscus SS, by an eye at O. This meniscus both makes the rays of each pencil parallel, and magnifies the image P V. At the place of this image all the foreign rays are intercepted by the perforated partition Z Z. For the same reason the hole near the eye O is very narrow. When nearer objects are viewed by this *telescope*, the small speculum E F is removed to a greater distance from the larger L D, so that the second image may be always formed in P V: and this distance is to be adjusted (by means of the screw on the outside of the great tube) according to the form of the eye of the spectator. It is also necessary, that the axis of the *telescope* should pass through the middle of the speculum E F, and its centre, the centre of the speculum L L, and the middle of the hole X, the centres of the lenses M N, S S, and the hole near O. As the hole X in the speculum L L can reflect none of the rays issuing from the object, that part of the image which corresponds to the middle of the object, must appear to the observer more dark and confused than the extreme parts of it. Besides, the speculum E F will also intercept many rays proceeding from the object; and, therefore, unless the aperture T T be large, the object must appear in some degree obscure.

The

The magnifying power of this *teleſcope* is eſtimated in the following manner. Let L D (*fig.* 134.) be the larger mirror, having its focus at G, and aperture in A, and F F the ſmall mirror with the focus of parallel rays in I, and the axis of both the ſpecula and lenſes M N, S S, be in the right line D I G A O K. Let *b b* be a ray of light coming from the lower extremity of a very diſtant viſible object, paſſing through the focus G, and falling upon the point *b* of the ſpeculum L D; which, after being reflected from *b* to F in a direction parallel to the axis of the mirror D A K, is reflected by the ſpeculum F ſo as to paſs through the focus I in the direction F I N to N, at the extremity of the lens M N, by which it would have been refracted to K; but by the interpoſition of another lens S S is brought to O, ſo that the eye in O ſees half the object under the angle T O S. The angle G *b* F, or A G *b*, under which the object is viewed by the naked eye, is to S O T, under which it is viewed by the *teleſcope*, in the ratio of G *b* F to I F *i* = *n* I N, of *n* I N to N K *n*, and of N K *n* to S O T. But G *b* F : I F *i* : : D I : G A; and *n* I N : *n* K N : : *n* K : I *n*; and N K *n* : S O T : : T O : T K; therefore G *b* F : S O T : : D I × *n* K × T O : G A × I *n* × T K. Muſchenbroek's Introd. vol. ii. p. 819, &c.

In *reflecting teleſcopes* of various lengths, a given object will appear equally bright and equally diſtinct, when their linear apertures and alſo their linear amplifications, are as the ſquare-ſquare roots of the cubes of their lengths; and conſequently when the focal diſtances of their eye-glaſſes are alſo as the ſquare-ſquare roots of their lengths. See the demonſtration of this propoſition in Dr. Smith's Optics, art. 361.

Hence he has deduced a rule, by which he has computed the following table for *teleſcopes* of different lengths, taking the middle eye-glaſs and aperture of Hadley's reflecting *teleſcope*, deſcribed in Phil. Tranſ. N° 376 and 378, for a ſtandard: the focal diſtances and linear apertures being given in thouſandth parts of an inch.

Length of the *Tel.* or foc. Diſt. of the Conc. Feet.	Foc. Diſt. of the Eye-glaſs. Mill. Inch.	Linear Amplification or magnif. Power.	Linear Apert. of of the Concave Metal. Mill. Inch.
½	0.167	36	0.864
1	0.199	60	1.440
2	0.236	102	2.448
3	0.261	138	3.312
4	0.281	171	4.104
5	0.297	202	4.848
6	0.311	232	5.568
7	0.323	260	6.240
8	0.334	287	6.888
9	0.344	314	7.536
10	0.353	340	8.160
11	0.362	365	8.760
12	0.367	390	9.360
13	0.377	414	9.936
14	0.384	437	10.488
15	0.391	460	11.040
16	0.397	483	11.592
17	0.403	506	12.143

Mr. Hadley's *teleſcope*, the admirable performances of which have been already mentioned in the preceding part of this article, magnified between 228 and 230 times; but we are informed that an object-metal of 3¼ feet focal diſtance was wrought by Mr. Haukſbee to ſo great a perfection as to magnify two hundred and twenty-ſix times, and therefore ſeems to be ſcarce inferior to Mr. Hadley's of 5¼ feet. If Mr. Haukſbee's *teleſcope* be taken for a new ſtandard, it follows that a ſpeculum of one foot focal diſtance ought to magnify ninety-three times, whereas the above table allows it but ſixty. Now $\frac{93}{60} = 1.55$, and the given column of magnifying powers multiplied by this number, gives a new column, ſhewing how much the object-metals ought to magnify if wrought up to the perfection of Mr. Haukſbee's. And thus a new table may be eaſily made for this or any other more perfect ſtandard, taking alſo the new eye-glaſſes and apertures in the ſame ratio to one another as the old ones have in this table. Smith's Optics, Rem. p. 79.

Dr. Smith has given the following dimenſions of one of Mr. Short's *teleſcopes* of the Gregorian form: the focal diſtance of the larger ſpeculum was 9.6 inches; its breadth or aperture 2.3; the focal diſtance of the leſſer ſpeculum 1.5; its breadth 0.6: breadth of the hole in the larger ſpeculum 0.5; diſtance between the leſſer ſpeculum and the next eye-glaſs 14.2; diſtance between the two eye-glaſſes 2.4; focal diſtance of the eye-glaſs next the metals 3.8; and focal diſtance of the eye-glaſs next the eye 1.1 inch. By experiment the *teleſcope* was found to magnify ſixty times in diameter, and by the time of the tranſits of ſtars over the viſible area, to take in an angle of nineteen minutes at the naked eye; therefore the magnified angle of viſion was $60 \times 19' = 19°$. Rem. p. 104.

The magnifying power of any *teleſcope* may be eaſily found by experiment, viz. by looking with one eye through the *teleſcope* upon an object of known dimenſions, and at a given diſtance, and throwing the image upon another object ſeen with the naked eye. Dr. Smith has given a particular account of the proceſs, Rem. p. 79.

But the eaſieſt method of all is to meaſure the diameter of the aperture of the object-glaſs, and that of the little image of it, which is formed at the place of the eye. For the proportion between theſe gives the ratio of the magnifying power, provided no part of the original pencil be intercepted by the bad conſtruction of the *teleſcope*. For in all caſes the magnifying power of *teleſcopes* or microſcopes is meaſured by the proportion of the diameter of the original pencil to that of the pencil which enters the eye. Prieſtley's Hiſt. of Light, &c. p. 747.

The moſt conſiderable, and indeed truly aſtoniſhing magnifying powers, that have yet been uſed, are thoſe of Mr. Herſchel's Newtonian ſeven-feet reflector. Some account of theſe, and of the diſcoveries made by them, has been already introduced under the article STAR. For his method of aſcertaining them, ſee Phil. Tranſ. vol. lxxii. par. i. p. 173, &c.

Mr. Herſchel obſerves, that though opticians have proved that two eye-glaſſes will give a more correct image than one, he has always (from experience) perſiſted in refuſing the aſſiſtance of a ſecond glaſs, which is ſure to introduce errors greater than thoſe we would correct. "Let "us reſign," ſays he, "the double eye-glaſs to thoſe who "view objects merely for entertainment, and who muſt "have an exorbitant field of view. To a philoſopher, "this is an unpardonable indulgence. I have tried both "the ſingle and double eye-glaſs of equal powers, and "always found that the ſingle eye-glaſs had much the "ſuperiority in point of light and diſtinctneſs. With "the double eye-glaſs I could not ſee the belts in Saturn, "which I very plainly ſaw with the ſingle one. I would, "however, except all thoſe caſes where a large field is "abſolutely neceſſary, and where power joined to diſ"tinctneſs is not the ſole object of our view." Phil. Tranſ. vol. lxxii. par. i. p. 95.

Mr. Green has lately added both to the reflecting and refracting *teleſcope* an apparatus, which fits it for the purpoſes of ſurveying, levelling, meaſuring angles and diſtances, &c. See his Deſcription and Uſe of the improved reflecting and refracting *Teleſcopes*, and Scale of Surveying, &c. 1778.

TELESCOPE, *binocular*. See BINOCLE.

TELESCOPE, *equatoreal*. See EQUATOREAL.

TELESCOPE, *meridian*, is a *teleſcope* fixed at right angles to an axis, and turned about it in the plane of the meridian. The vulgar uſe of it is to correct the motion of a clock or watch, by obſerving day after day the exact time, when the ſun or a ſtar comes to the meridian. It ſerves alſo for a variety of other uſes. The tranſverſe axis is placed horizontal by a ſpirit level, faſtened in a ſlender braſs box with very hard cement. For the farther deſcription and method of fixing this *teleſcope* by means of its level, &c. ſee Smith's Optics, p. 321, &c. See TRANSIT *inſtrument*.

TELESCOPE *ſhell*, in *Conchology*, the name of a ſpecies of TURBO, with plane, ſtriated, and numerous ſpires.

TELESCOPICAL *ſtars*, are ſuch as are not viſible to the naked eye; but diſcoverable only by the help of a *teleſcope*. See STAR.

All ſtars leſs than that of the ſixth magnitude, are *teleſcopic* to a middling eye.

TELESPHORUS, in *Mythology*, a deity invoked by the Greeks for health, together with Eſculapius and Hygeia. The figures of theſe three divinities occur on ſeveral medals; and on ſome we have *Teleſphorus* with Eſculapius alone, and on others with Hygeia.

The figure of *Teleſphorus* is invariably the ſame, viz. that of an infant clothed with a ſort of cloke without ſleeves, which infolds its arms, deſcends below the knees, and has a kind of hood or cowl covering its head. Montfaucon has given a particular deſcription of this deity, the worſhip of which is ſuppoſed to have paſſed from Epidaurus to Rome, with that of Eſculapius. Encycl.

TELETÆ, among the *Ancients*, were ſolemn rites perform-ed in honour of Iſis.

TELICARDIOS, in *Natural Hiſtory*, the name given by ſome authors to a ſtone found in the ſhape of a heart.

It owes this figure to its having been found in the shell of some large bivalve of the cockle-kind; and is more usually known among authors under the name of BUCARDITES.

TELIPHANO, in *Botany*, a name used by some authors for the doronicum, or leopard's bane.

TELLA *pashnum*, in *Natural History*, a name given by the people of the East-Indies to a kind of white arsenic, or rats-bane, found native among them.

It is well known to be a fatal poison, and used to destroy vermin. It lies in the cliffs of rivers among strata of stone in large white irregular lumps; when held to the fire it emits copious fumes smelling strongly of garlic and sulphur, but it does not readily melt or run.

TELLA *sagrum*, in *Natural History*, a name given by the natives of the East-Indies, to a kind of earth which they use externally to dry up ulcers, and internally in cases of coughs and colds. It is of the nature of the finer clays, and is found at the bottom of some of their rivers.

TELLER, an officer in the exchequer, of which there are four; whose business is to receive all monies due to the crown, and thereupon to throw down a bill through a pipe into the tally-court, where it is received by the auditor's clerks, who attend there to write the words of the said bill upon a tally, and then deliver it to be entered by the clerk of the pells, or his clerk.

The tally is then split or cloven by the two deputy chamberlains, who have their seals; and while the senior deputy reads the one part, the junior examines the other part with the other two clerks.

The *tellers* places are in the king's gift, and they have besides their chief clerk or deputy, three other clerks for the dispatch of business.

TELLINA, in *Natural History*, a sea-shell, by some of the latest writers on these subjects referred to the genus of MUSCLES. Linnæus makes the *tellina* a distinct genus of the class of *vermes*, and order of TESTACEA. Its characters are; that its animal is a *tethys*; the shell, a bivalve, generally sloping down on one side; with three teeth at the hinge. He enumerates twenty-nine species.

In Da Costa's Conchology the *tellinæ* form the ninth family of bivalve SHELLS; and he defines them to be shells more broad than long, rather flat, the hinge of which has two teeth set close together; of this family he reckons two genera, viz. the *tellinæ*, or shells with similar sides, whose beak and hinge are central, containing few species; and the cunei, or shells with dissimilar or unequal sides, whose beak and hinge are placed near to, or quite at one end; of this last genus there are several fossil species, which are not yet discovered, recent, or living from the sea, some of which are very elegant and curious; as the studded, the reticulated, the sulcated, &c. Elem. of Conchol. p. 269.

These shell-fish do not naturally live on the surface of the bottom of the sea, but bury themselves in the mud or sand, in the manner of the chamæ, keeping a communication with the water above by means of the same sort of tubes or pipes as those fish are possessed of; but as the tubes of the *tellinæ* are very short, the fish can only bear to be buried to a small depth. Mem. Acad. Par. 1710.

TELLONIUM. See THELONIUM.

TELLUS, *terra*, ⊕, in *Astronomy*. See EARTH.

TELON, a name given by the chemists to fire.

TELONÆ, τελωναι, among the Athenians, farmers of the public revenues; for the severity with which they were handled, in case they failed, see Potter, Archæol. Græc. lib. i. cap. 14. tom. i. p. 81.

TELONIUM. See THELONIUM.

TEMACHIS, in *Natural History*, the name of a genus of fossils, of the class of the gypsums; the characters of which are these: it is of a softer substance than many of the other genera, and of a very bright and glittering hue. The name is derived from the Greek τεμαχος, *frustulum*, a small irregular fragment; the bodies of this genus being composed of an assemblage of multitudes of irregular flaky fragments, as are all the gypsums; but no genus of them so visibly so as these. See GYPSUM.

There are but three known species of this genus.

We have not this species in England so far as is yet known. Hill's Hist. of Foss. p. 113, 114, 115, 116.

TEMAPARA, in *Zoology*, the name of a peculiar species of lizard, called also TEJUGUACU.

It approaches much to the nature of the IGUANA, but is black, spotted with white.

TEMBUL, in *Botany*, a name used by some authors, for the plant called BETEL.

TEMELO, in *Ichthyology*, a name used by some for the fish called in English the GRAYLING, and in some places the *umber*.

TEMPATLAHOAC, in *Ornithology*, the name of a broad-billed bird, of the West Indies, described by Nieremberg; and by him esteemed a species of duck. It is of the size of the common duck; is common on the lakes of Mexico, and is a good eatable bird. Ray.

TEMPER, in a *Physical Sense*. See TEMPERAMENT.

TEMPER, in a *Musical Sense*. See TEMPERAMENT in *Music*.

TEMPER, in a *Mechanical Sense*. See TEMPERING.

TEMPERAMENT, TEMPERAMENTUM, TEMPERATURE, in *Physics*, that habitude or disposition of body, arising from the proportion of the primary four elementary qualities it is composed of.

The notion of *temperament* arises from that of mixture, where different elements, as earth, water, air, and fire (or, to speak more justly in the Peripatetic way, hot, cold, moist, and dry), are blended together; by their opposition, they tend mutually to weaken and encroach on each other: and from the whole arises a sort of temperate crasis, or coalition of them all in this or that proportion, whence, according to the quality that prevails or predominates, we say an *hot* or *cold*, a *moist* or *dry temperament*.

It is controverted among the schoolmen, whether the *temperament* properly comprehends all the four primary qualities? or, whether those do not all cease, and a new one, a fifth, simple quality, result from the total alteration made in the other four, by their mutual action on each other.

Authors distinguish two kinds of *temperaments*, viz. *uniform* and *difform*: the first is that wherein all the qualities are mixed in an equal degree; the second, where they are mixed in an unequal degree.

The uniform *temperament* can only be one; the difform admits of eight different combinations, since either any one, or any two of the qualities may prevail; whence *hot* and *moist*, *cold* and *moist*, &c. Farther, some, considering that the qualities which do prevail, may not be in equal degree; and the like of those which do not prevail; make several other combinations or *temperaments*; and add twelve more to the number. In effect, as there are infinite degrees between the highest and lowest pitch of any one of the elements, the different *temperaments* may be said to be infinite.

TEMPERAMENT, in *Medicine*, is more particularly understood of the natural habitude and constitution of the body of man, or the disposition of the animal humours in any subject.

The notion of *temperament* arises hence, that the blood flowing in the veins and arteries is not conceived to be a simple fluid, but a sort of an imperfect mixt, or an assemblage of several other fluids: for it does not only consist of the four simple, or primary qualities, but of four other secondary ingredients compounded thereof, into which it is supposed to be resolvable, viz. *choler*, *phlegm*, *melancholy*, and *blood*, properly so called.

Hence, as this or that ingredient humour prevails in a person, he is said to be of a choleric, phlegmatic, melancholic, sanguine, &c. *temperament*.

The ancient physicians brought these animal *temperaments* to correspond with the universal *temperament* above described: thus the *sanguine temperament* was supposed to coincide with *hot* and *moist*, the *phlegmatic* with *cold* and *moist*, the *melancholic* with *dry* and *cold*, &c.

Galen introduced the doctrine of *temperaments* into physic from the Peripatetic school, and made it, as it were, the basis of all medicine; asserting, that the whole of curing diseases consisted in *tempering* the degrees of the qualities, humours, &c.

In the present state of medicine, the *temperaments* are much less considered. The mechanical writers retrench the greatest part of the Galenic doctrine, as useless and uncertain; and consider the *temperaments* as no other than those diversities in the blood of different persons, whereby it becomes more apt to fall into certain combinations in one body than another, whether into choler, phlegm, &c. whence, according to them, people are denounced *choleric*, *phlegmatic*, &c.

The ancients distinguished two kinds of *temperaments* in the same body: the one *ad pondus*, in respect of weight; the other *ad justitiam*.

The first is that where the elementary qualities are found in equal quantities, and in equal proportions; such as they are supposed to be in the skin of the fingers, without which those parts would want the power of distinguishing objects with sufficient accuracy.

The second is, that which contains unequal portions of those qualities, but yet in such proportion as is necessary for the discharge of the function proper to the part. Such is the *temperament* in a bone, which contains more earthy than aqueous parts, to make it more hard and solid for its office of sustaining.

Galen observes, that the *temperament ad pondus* is only imaginary; and that, though it were real, it could not subsist above one moment.

Dr.

Dr. Pitcairn looks on the *temperaments*, or conſtitutions, as ſo many native diſeaſes; according to him, any one endued with whatever *temperament* has the ſeeds of a real diſeaſe within him; a particular *temperament* ſuppoſing, that ſome ſecretions are in greater proportion than is proper for life indefinitely long.

As the diverſities of *temperaments* are no other than diverſities of proportion in the liquids, which may be diverſified infinite ways; ſo there may be an infinite number of *temperaments*: though authors have only ſuppoſed four. The ſanguine, which is uſually reckoned a *temperament*, the ſame author ſays, is no other than a plethora.

Temperament, Temperamento, in *Muſic*, generally denotes a rectifying or amending the falſe or imperfect concords, by transferring to them part of the beauty of the perfect ones.

The degrees of the octave, which may be called its *elements*, as being the ſmalleſt intervals it is reſolvable into, are two greater ſemitones, two leſs tones, and three greater tones.

Now the different ſituation of theſe elements, with reſpect to each other, occaſions that intervals or concords of the ſame name, as thirds, fourths, &c. do not conſiſt of the ſame degrees or elements, though there be always the ſame number of them: but one fourth, for inſtance, is agreeable and perfect, and another not.

To mend theſe imperfect concords, the muſicians have bethought themſelves to *temper*, i. e. give them part of the agreeableneſs of perfect ones. In order to this, they take a medium between the two, and this they call a *temperament*; which neceſſarily produces a new diviſion of the octave, or, which amounts to the ſame, new elements.

For inſtance, whereas naturally its elements are the greater ſemitone, and the greater and leſs tone; they take a middle tone formed of the greater and the leſs: and the only elements now are the greater ſemitone, and this mean tone, which renders the five intervals that are tones equal, and thoſe that are ſemitones leſs unequal to theſe.

One might alſo divide each of the five tones of the octave into ſemitones, which, joined to the two it naturally has, would make twelve: in which caſe, the whole octave would be divided into twelve equal parts, which would be mean ſemitones.

It is eaſy to form various other kinds of *temperaments*: all the difficulty is to find ſuch as are free from two great inconveniences, i. e. which do not alter either all the concords too much, or, at leaſt, ſome of them.

All ſuch diviſions of the octave are called *tempered* or *temperative ſyſtem*.

The *temperature* does, indeed, according to the definition above given, and conſidered in one view, correct ſome falſe concords, yet, in other reſpects, it ſpoils and falſifies both perfect and imperfect concords, and renders diſcords more harſh than they would otherwiſe be, if the intervals were juſtly taken. To explain this, we muſt conſider that all the intervals are founded on the primary proportions ariſing from the numbers 2, 3, and 5, that is, if we do not exceed the compaſs of an octave, $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{4}{5}$. See Interval.

The nearer we come in practice to the true intervals, the more perfect the melody and harmony will be; and it is certain, that the human voice, and ſome inſtruments, as violins, &c. which have no ſtops nor frets, will execute muſic to a great degree of exactneſs; but the caſe is not the ſame with fixed or fretted inſtruments, as harpſichords, organs, lutes, viols, &c. Accuracy is here impoſſible, unleſs we would content ourſelves with always playing in the ſame key, without any tranſition or tranſpoſition whatſoever. In this caſe, indeed, the harpſichord or organ might vie with the accuracy of the voice or violin. For inſtance; if we were to compoſe or play in the key of C, then we might make the ſeveral intervals of that key, to be in the following true proportions, 1 . $\frac{9}{8}$. $\frac{10}{9}$. $\frac{16}{15}$. $\frac{9}{8}$. $\frac{10}{9}$. $\frac{9}{8}$. $\frac{16}{15}$. that is, in whole numbers,

C. D. E. F. G. A. B. C.
24 . 27 . 30 . 32 . 36 . 40 . 45 . 48.

and the inſtrument tuned in this manner, would perform any piece of muſic in C, juſtly compoſed, with great beauty and exactneſs, taking for granted, that every key, fundamental note, or ſound ought to have its true fifth and fourth, and that theſe ought alſo to have their true fifths and thirds.

Now this being premiſed, it will preſently appear, that in making any tranſpoſition or tranſition from C, we ſhall find ſome falſe concord. Thus, for inſtance, if we proceed to G, and conſider it as a key, or fundamental ſound, we ſhall have the following ſeries of numbers for the octave of G, viz.

G . A . B . C . D . E . F . g
36 . 40 . 45 . 48 . 54 . 60 . 64 . 72.

But here the interval between 40 and 54 is falſe, being a comma too much, for the ſecond of a key muſt make a true fifth with the fifth of the ſame key. In like manner, if we were to proceed from C to A, as a new key, we ſhould find the following ſeries for the octave of A,

A . B . C . D . E . F . G . a.
40 . 45 . 48 . 54 . 60 . 64 . 72 . 80,

where the interval between A 40 and its fourth D 54 is falſe, being too great by a comma. If any other tranſition were examined, we ſhall always find ſome note falſe; as in F, the ſixth would be redundant by a comma: and in D the fifth would be deficient by a comma. All which ſhews the impoſſibility of truth and exactneſs of muſic on fixed inſtruments. Yet as theſe inſtruments have their uſe and convenience in ſome reſpects, it was proper to endeavour to find out a method of making them tolerable.

It has been obſerved under the head Interval, that the tone major exceeds the tone minor by a comma. Their difference is neceſſary for the truth and perfection of muſic; but yet if theſe tones were rendered equal, the ear would not be offended. And this has ſuggeſted the means of tempering fixed inſtruments. If we were to make all tones equal to the tone major, as ſome imagine the ancients did, then we ſhould find the ditonus, or third, exceeding a true third major by one comma, which would be intolerable. In like manner, if all tones were to be minor, we ſhould have thirds major defective by a comma, which would alſo be intolerable, not to mention other falſe intervals that muſt neceſſarily ariſe from ſuch a ſuppoſition.

Suppoſing then one tone increaſed, and the others diminiſhed by half a comma, we ſhould have our thirds major remain perfect. But ſtill it would be neceſſary to examine what fifths this ſuppoſition would give. Now it is evident that a tone major added to an octave, makes juſt two fifths, thus $\frac{2}{1} \times \frac{9}{8} = \frac{9}{4} = \frac{3}{2} \times \frac{3}{2}$. But the tone here added is a tone major, and the tone we have aſſumed is a temperate tone, deficient from the tone major by half a comma; hence the ſum of the two fifths, on this ſuppoſition, will fall ſhort of the truth by $\frac{1}{2}$ of a comma, and conſequently one fifth will be deficient $\frac{1}{4}$ of a comma. Which difference, although it be ſenſible, yet experience ſhews, that fifths ſo diminiſhed are tolerable.

This *temperature* is what is called the common or vulgar *temperature*, and conſiſts, as has been ſaid, in diminiſhing the fifth by $\frac{1}{4}$ of a comma, in preſerving the third major perfect, and dividing it into two equal tones. Which being ſuppoſed, it follows that the fourth muſt exceed the truth by $\frac{1}{4}$ of a comma; that the third minor will be deficient by the ſame quantity; that the ſixth minor will be perfect, and the ſixth major redundant by $\frac{1}{4}$ of a comma; and laſtly, that the ſemitone major will exceed the truth by $\frac{1}{4}$ of a comma. If we introduce chromatic notes, or flats and ſharps, the ſemitone minor will alſo exceed the truth by $\frac{1}{4}$ of a comma, and conſequently the difference between the two ſemitones, or the dieſis enharmonica, will be preſerved.

If then we had a harpſichord or organ, with each feint or half note divided, we ſhould have the following notes or ſounds, viz. . . C C✳. D^{b}. D . D✳ . E^{b} . E . F✳ . G^{b}. G . G✳. A^{b} . A . A✳ . B^{b} . B . c. in the compaſs of an octave. Yet this ſyſtem of notes, numerous as they ſeem, would not be ſufficient for all tranſitions and tranſpoſitions. For though a piece of muſic tranſpoſed to any of the natural keys C . D . E . F . G . A . B . and to the flats, as E^{b} and B^{b}, and ſome others, would do well; yet, in tranſpoſing to ſharps, as to G✳, we ſhould not find a true third major, unleſs we introduced E✳. And even in flats, as A^{b} and E^{b}, we ſhould not find a true third major in deſcending, or a ſixth minor in aſcending, unleſs we introduced F^{b} and C^{b}. And in like manner, tranſpoſitions to G✳ and E^{b} would oblige us to introduce B✳ and C^{b}. Nor would even this ſuffice, for if neceſſity required a tranſpoſition from the key of C to that of D✳, we ſhould not find a true third major without introducing F✳✳ and *c*. So that at laſt we ſhall come to a temperate ſyſtem, where, in aſcending, the notes C, D, F, G, A, would each have its ſharp and double ſharp, and the notes B and E each a ſingle ſharp. In deſcending, the notes E, D, B, A, G would each have their flat and double flat, and the notes F and C each a ſingle flat. And thus the octave would be divided into 31 intervals, whoſe deſignations are

C . D^{bb} . C✳ . D^{b} . C✳✳ . D . E^{bb} . D✳ . E^{b} . D✳✳ . E .
1 . 2 . 3 . 4 . 5 . 6 . 7 . 8 . 9 . 10 . 11
F^{b} . E✳ . F . G^{bb} . F✳ . G^{b} . F✳✳ . G . A^{bb} . G✳ .
12 . 13 . 14 . 15 . 16 . 17 . 18 . 19 . 20 . 21
A^{bb} . G✳✳ . A . B^{bb} . A✳ . B^{b} . A✳✳ . B . C^{b} .
. 22 . 23 . 24 . 25 . 26 . 27 . 28 . 29 . 30 .
B✳ . C.
. 31.

Where the letters C . D . E . F . G . A . B. ſignify the common diatonic notes; thoſe marked with a

ſingle

single * or b are the chromatic, and those marked with a double ** or bb are enharmonic notes; so called, because the interval between them and the next diatonic note is an enharmonic diesis; for which reason the notes E*. F♭. and B*. C♭ are also enharmonic.

But even in this division of the octave, all the notes would not have a third major in ascending and descending: thus, for instance, D** has no third major; for this would be F***, which is not in the scale, nor can any number of additional notes suffice in all cases. But this inconvenience is easily remedied, and the system considerably improved by making all the 31 intervals equal. We have already observed, that in the common temperature the semitones major and minor exceed the truth by $\frac{1}{4}$ of a comma, and that the enharmonic diesis is preserved true. Hence it follows, that the hyperoche, or difference between the chromatic and enharmonic diesis; for example, the interval between F♭ and E*, or D♭♭ and C*. &c. will also exceed the truth by $\frac{1}{4}$ comma. Now the hyperoche, by our table under INTERVAL, is equal to 1 . 37695, to which adding $\frac{1}{4}$ comma=0 . 25000, we have 1 . 62695, which differs from the enharmonic diesis 1 . 90917 only by 0 . 28222, or about $\frac{2}{7}$ of a comma. Neglecting this small difference, let us suppose all the 31 intervals of the octave equal, it will follow that transpositions to all the notes of the system, whether diatonic, chromatic, or enharmonic, will be equally good, and differ only in pitch or tone, as they ought, but not in accuracy, which must next be examined.

The division of the octave into 31 parts may be conveniently done by logarithms. Under the head INTERVAL, I find the logarithm of the octave=55 . 79763 commas; consequently each diesis, or division of the octave =1 . 79992 commas; hence the fifth, being 18 dieses, will be 32 . 399 commas. Now the true fifth being 32 . 640, the fifth consequently in this *temperature* is deficient by 0 . 241 parts of a comma, which is less than $\frac{1}{4}$ of a comma, by $\frac{1}{110}$ part; and therefore this fifth will, strictly speaking, be better than that of the vulgar *temperature* by $\frac{1}{110}$ of the comma; but this is insensible. Next, proceeding to examine the third, we shall find it equal to 10 dieses or divisions, that is 17 . 999 commas; and the true third major being 17 . 963 commas, the difference is 0 . 036, that is about $\frac{1}{27}$ of a comma. Now as the ear can bear a fifth, altered by $\frac{1}{4}$ of a comma, it will much more easily bear the alteration of $\frac{1}{28}$ of a comma in a third major. Again, in this *temperature*, the third minor is, indeed, strictly speaking, worse than in the vulgar, which differs from the truth but by $\frac{1}{4}$ comma, whereas here it differs by about $\frac{1}{3}$ of a comma more; but then this difference is insensible.

Thus we have been led from the consideration of the vulgar *temperature*, to the invention of the *temperature* which divides the octave into 31 equal intervals, commonly called, *Huygens's temperature*. This great mathematician was, indeed, the first who gave a distinct account of it, and shewed its use and accuracy. But here, as in many other inventions, we find the hint of the thing much older than the true knowledge of it. See Huygenii Opera omnia, vol. i. p. 748, 749. edit. 1. Lugd. Batav. 1724.

The division of the octave into 31 parts was invented in Italy about 200 years ago, by Don Nicola Vincentino. The title of his book is L'Antica Musica Ridotta alla Moderna Prattica, &c. Roma, 1555. fol. and an instrument, called *archicembalo*, was made upon this scheme, as Salinas informs us, who at the same time condemns it, as very disagreeable in practice. But this could be owing to nothing but its not being tuned according to the intention of the inventor. For if all the thirds major of this instrument were made perfect, and the fifths diminished by $\frac{1}{4}$ of a comma, it is evident that the instrument would be equally exact with any tuned according to the vulgar *temperature*, and would suffice for transpositions to any diatonic or chromatic notes, though not to all the enharmonic, as D**, &c. because we should not find its third major. And if the instrument were tuned according to Mr. Huygens's scheme, of making all the divisions equal, it would then have all the 31 keys equally good, and very near the truth. See Salinas, lib. iii. The title of his work is Francisci Salinæ Burgensis de Musica Libri Septem, Salmanticæ, 1577, folio. Mersennus's work is intitled Harmonicorum, Libri XII. authore F. M. Mersenno Minimo, Lutetiæ Parisiorum, 1648, fol. He published another book before this, the title of which is Harmonie Universelle, contenant la Theorie & la Pratique de la Musique. Paris, 1636, fol. 2 vol.

Hence it is plain, Salinas and Mersennus had not sufficiently examined this matter.

The use of this *temperature* of Mr. Huygens deserves to be introduced into the practice of music, as it will facilitate the execution of all the genera of music, whether diatonic, chromatic, or enharmonic; nor does the multiplicity of its parts render it impracticable, the author assuring us, that he had a harpsichord made at Paris with such divisions, which was approved of and imitated by some able musicians. Mersennus also gives a scheme for this purpose; and Salinas says, he saw and played upon such an instrument. See also Don Vincentino before cited, lib. v. p. 99, &c.

Mr. Huygens, to facilitate the tuning of instruments with such divisions, has given us a table of the parts of an octave, according to his system, together with their logarithms. The table is as follows:

The division of the octave into 31 equal parts. I.	II.	III.	IV.	V.	The division of the octave according to the common *temperament*. VI.
N. 97106450					
4,6989700043	50000	Ut²	C²	50000	4,6989700043
4,7086806493	51131				
4,7183912943	52278				
4,7281019393	53469	Si	B^x	53499	4.7283474859
4,7378125843	54678				
4,7475232293	55914	Sa	B	55902	4,7474250108
4,7572338743	57179	*	*	57243	4,7577249674
4,7669445193	58471				
4,7766551643	59794	La	A	59814	4,7768024924
4,7863658093	61146				
4,7960764543	62528	*	*	62500	4,7958800173
4,8057870993	63942	Sol^x	G^x	64000	4,806 799740
4,8154977443	65388				
4,8252083893	68666	Sol	G	66874	4,8252574989
4,8349190343	68378				
4,8446296793	69924				
4,8543403243	71506	Fa^x	F^x	71554	4,8546349804
4,8640509693	73122				
4,8737616143	74776	Fa	F	74767	4,8737125054
4,8834722593	76467				
4,8931829043	78196				
4,9028935493	79964	Mi	E	80000	4,9030899870
4,9126041943	81772				
4,9223148393	83621	Ma	E♭	83592	4,9221675119
4,9320254843	85512	*	*	85599	4,9324674685
4,9417361293	87445				
4,9514467743	89422	Re	D	89443	4,9515449935
4,9611574193	91444				
4,9708680643	93512	*	*	93459	4,9706225184
4,9805787093	95627	Ut^x	C^x	95702	4,9809224750
4,9902893543	97789				
4,9999999993	100000	Ut	C	100000	5,0000000000

The second column of this table contains the numbers expressing the length of chords making 31 equal divisions, the longest answering to C, being supposed to be divided into 100,000 parts.

In the third column are the syllables by which the notes are usually named in France; and the asterisc * shews some enharmonic notes, of which that near *sol* is most necessary.

In the fourth column are the letters commonly used to denote the sounds of the octave.

The numbers of the second column were found by means of those in the first, which are their respective logarithms; and these were found by dividing 0.30102999566 the logarithm of 2 by 31. The quotient 97106450 is marked N. and being continually added to the logarithm of 50000, that is to 4,6989700043, gives all the logarithms of the first column to the greatest 4.9999999993, which being extremely near to 5.0000000000 the logarithm of 100000, shews the operation to have been rightly performed.

The fifth column shews the lengths of the chords in the common *temperament*; and the sixth column contains their respective logarithms. Vide Huygenii Opera, vol. i. p. 752, 753.

The learned author of this *temperature* has not given the notes answering to all the divisions of the octave; but that may easily be supplied from what has been said above, when we derived this *temperature* from the consideration of the common.

As Huygens has not given the names of all the intervals that occur in his *temperate* scale, we shall here insert them in the octave, from C to *c*, with their respective measures in commas, and tenths of a comma.

Intervals.		Names.	Measures.
From C to D♭♭.	1.	Diminished second, extreme flat second, or enharmonic diesis,	1.8.
C*.	2.	Semitone minor, or chromatic diesis,	3.6.
D♭.	3.	Flat second, or semitone major,	5.4.

C.

C⁎⁎.	4.	Double semitone minor,	7.2.
D.	5.	Second, or tone,	9.0.
E^{bb}.	6.	Diminished third, or extreme flat third,	10.8.
D*.	7.	Superfluous second,	12.6.
E^{b}.	8.	Third minor, or flat third,	14.4.
D⁎⁎.	9.	Extreme superfluous second,	16.2.
E.	10.	Third major, or sharp third,	18.0
F^{b}.	11.	Diminished fourth,	19.8.
E*.	12.	Superfluous third,	21.6.
F.	13.	Fourth,	23.4.
G^{bb}.	14.	Extreme diminished fifth,	25.2.
F*.	15.	False fourth, or tritonus,	27.0.
G^{b}.	16.	False fifth, or semidiapente,	28.8.
F⁎⁎.	17.	Extreme superfluous fourth,	30.6.
G.	18.	Fifth,	32.4.
A^{bb}.	19.	Diminished sixth, or extreme flat sixth,	34.2.
G*.	20.	Superfluous fifth,	36.0.
A^{b}.	21.	Flat sixth, or sixth minor,	37.8.
G⁎⁎.	22.	Extreme superfluous fifth,	39.6.
A.	23.	Sharp sixth, or sixth major,	41.4.
B^{bb}.	24.	Diminished seventh, or extreme flat seventh,	43.2.
A*.	25.	Superfluous sixth,	45.0.
B^{b}.	26.	Flat seventh, or seventh minor,	46.8.
A⁎⁎.	27.	Extreme superfluous sixth,	48.6.
B.	28.	Sharp seventh, or seventh major,	50.4.
c^{b}.	29.	Diminished octave,	52.2.
B*.	30.	Superfluous seventh,	54.0.
c.	31.	Octave,	55.8.

The *temperate* diesis enharmonica of Huygens being 1.8 comma, nearly, which is easily remembered, the measure of any interval in the octave may be found by multiplying it by the number denoting the place of that interval. Thus the sixth minor, being the twenty-first interval, will be $=1.8\times21=37.8$. The octave being the thirty-first, will be $=31\times1.8=55.8$, which does not differ from the truth by more than 0.00237, that is not by $\frac{1}{400}$ of a comma, and therefore perfectly insensible. See INTERVAL.

All the intervals in the foregoing table, either have received names, or at least might receive them, from a perfect analogy to the names in use among practical musicians; but many of these intervals are as yet unheard of among practitioners. Perhaps, if all the genera of ancient music were restored, every interval here mentioned might be of use, either in melody or harmony, and thereby greatly add to the variety of composition.

We have already mentioned the advantages of Mr. Huygens's system; but its excellency will better appear by comparing it with the schemes of others. We may distinguish and name the different *temperatures* by the number of equal parts into which the octave is supposed to be divided. The *temperatures* that occur in books are *temperatures* of 12, 19, 31, 43, 50, 53, and 55 parts, of which in order.

The *temperature* of 12 parts is founded on the supposition that the semitones major and minor may be made equal. Hence the octave will be divided into 12 equal semitones, 7 of which will make the fifth, 4 the third, and 3 the third minor.

The *temperature* of 19 parts goes upon the supposition that the semitone-major is the double of the semitone-minor. Hence the tone will be 3, and the third major 6. The diesis enharmonica will be 1, and consequently the octave being 3 thirds major, and a diesis, will be 19. The fifth contains 11 parts. The harpsichord, in this scheme, will have every feint cut in two, one for the sharp of the lower note, and the other for the flat of the higher. Between B and C, and between E and F, will be interposed keys, which must serve for the sharps of B and E, and the flats of C and F respectively.

The *temperature* of 31 parts is Mr. Huygens's already described; here the semitones are as 3 to 2. The third major is 10, and the fifth 18.

The *temperature* of 43 is Mr. Sauveur's, and by him very fully described in the Memoirs of the Royal Academy of Sciences, ann. 1701, 1702. He supposes the proportion of the semitones to be as 4 to 3. Hence his tone is 7, the third major 14, the fifth 25, and the octave 43. What musical foundation this learned gentleman went upon in the investigation of this *temperature*, is not known: but it seems liable to insuperable difficulties; for here the diesis enharmonica is but the half of the difference between it and the chromatic diesis; whereas, in truth, this difference, instead of being double of, is really less than the enharmonic diesis, as was long ago objected to him by Mr. Hensling, and appears from the table under INTERVAL. Miscel. Berolin. tom. i. p. 285, 286.

Besides, his enharmonic diesis falls greatly short of the truth, being but 1.27 of a comma, which is an error of 0.64 or near $\frac{2}{3}$ of a comma. Whereas, in Mr. Huygens's *temperature*, the error of the diesis is almost insensible, being but $\frac{1}{10}$ of a comma. Nor are the practical advantages of Mr. Sauveur's system any ways comparable to Huygens's. His fifth is, indeed, strictly speaking, better; but so little, that the difference is not sensible, not being $\frac{1}{20}$ of a comma. On the other hand, his thirds are sensibly worse, the major being $\frac{1}{5}$ and the minor $\frac{2}{5}$ of a comma false. Whereas Huygens's third major does not differ sensibly from the truth, and the minor has no sensible difference from the third minor deficient by $\frac{1}{4}$ comma of the common *temperature*, which ought to be deemed the limit of the diminution of concords. If we add to this, that the much greater number of parts in Mr. Sauveur's octave, makes it much more intricate than Mr. Huygens's, and that these parts would be false or useless, even supposing the enharmonic genus restored, no musician will long hesitate which he ought to prefer.

The *temperature* of 50 parts is proposed by Mr. Hensling, in the Miscellan. Berolin. above cited: he takes the proportion of the semitone as 5 to 3; hence his tone is 8, the third major 16, the fifth 29, and the octave 50. The third major, and fifth in this system, will be worse than Huygens's, though the third minor be a little better. The third major is here less than the true, and the fifth deficient by more than $\frac{1}{4}$ comma, which is a fault, not to mention the inconveniency arising from dividing the octave into 50 parts; besides 5 : 3, the proportion of the semitones here assumed, although expressed in greater numbers, is not so near the truth as Mr. Huygens's of 3 : 2. See RATIO.

The *temperature* of 53 parts is mentioned by Mersennus. Here the tones will be unequal, 9 being the tone-major, and 8 the minor. Hence the third major will be 17, and the fifth 31, which last does not differ from the truth by above $\frac{1}{333}$ part of a comma. The third minor is also more perfect than in Mr. Huygens's system. But the multiplicity of parts in the octave of this system, renders it too intricate; and the distinction of tones-major and minor upon fixed instruments, is impracticable.

The last *temperature* we have mentioned is that of 55 parts, which Mr. Sauveur calls the *temperature* of practical musicians. Its foundation lies in assuming the proportion of the semitones, as 5 to 4; so the tone will be 9, the third 18, and the fifth 32. The fifth, in this system, as in that which makes the semitones equal, is nearer the truth than Mr. Huygens's, but this advantage is not $\frac{1}{15}$ of a comma; and on the other hand the thirds, both major and minor, are here greatly mis-tuned, as will appear by the annexed table, exhibiting the thirds and fifths of these several *temperatures*, as also the thirds and fifths of the common *temperature*, and two mentioned by Salinas, marked 1st. Salin. 2d. Salin. The letter V. stands for the fifth; III. for the third major, and 3. for the third minor. The fifths are all deficient, but the thirds are sometimes less than the true; the first are marked +, the others —.

Temperatures	V. Com.	Error	III. Com.	Error	3. Com.	Error.
of 12 parts.	32.549	0.091	18.599	0.636+	13.950	0.727—
19	32.304	0.336	17.620	0.343—	14.684	0.007+
31	32.399	0.241	17.999	0.036+	14.400	0.277—
43	32.440	0.200	18.167	0.204+	14.273	0.404—
50	32.363	0.277	17.855	0.108—	14.508	0.169—
53	32.637	0.003	17.897	0.066—	14.740	0.063+
55	32.464	0.176	18.261	0.298—	14.203	0.474—
Com. Temp.	32.390	0.250	17.963	0.000	14.427	0.250—
1st. Salin.	32.307	0.333	17.630	0.333—	14.677	0.000
2d. Salin.	32.354	0.286	17.520	0.143—	14.434	0.143—
True Scale.	32.640	0.000	17.963	0.000	14.677	0.000

Temperatures formed by the division of the octave into equal parts, may be called geometrical *temperatures*. The common, and the two mentioned by Salinas, do not proceed upon this foundation. The intention of the first inventors not having been to make transpositions to every note of the system equally good; but only to make the most usual transitions in the course of a piece of music tolerable. Hence the parts of the octave, in their supposition, were not all equal.

The common *temperature*, as we have said, preserves the third major perfect. The first of Salinas preserves the third minor perfect. In the second of Salinas, the semi-tone

tone minor is perfect. The foundation of his firſt *temperature* is making the temperate tone equal to the tone-minor and $\frac{1}{3}$ of a comma, or the tone-major leſs $\frac{2}{3}$ of a comma. Hence his fifth and third major will be deficient by $\frac{1}{3}$ of a comma; and the third minor conſequently will be true. The ground of his ſecond ſcheme is, to add $\frac{3}{7}$ of a comma to the tone-minor, or take $\frac{4}{7}$ from the tone-major, for his temperate tone. Hence the fifth will be deficient by $\frac{2}{7}$ of a comma, and the thirds major and minor each deficient by $\frac{1}{7}$ of a comma. Conſequently, the ſemitone, being their difference, will be preſerved.

As to Mr. Salmon's ſcale in the Philoſophical Tranſactions, there is nothing true in it, but the diatonic ſcale of C. His ſcale for A is falſe, the fourth being erroneous by a comma; moſt of his ſemitones are likewiſe falſe. In ſhort, it can neither be conſidered as a true ſcale, nor as a *temperature.*

Before we cloſe this article, it may be proper to add a few words about the method of invention of the foregoing geometrical *temperatures.* Mr. Huygens having had the hint of a diviſion of the octave into 31 parts, had nothing farther to do but to examine it by logarithms. But, ſuppoſing no ſuch hint had been given, he might have inveſtigated it directly by the method laid down by himſelf, and alſo by Dr. Wallis, and Mr. Cotes, for approximating to the value of given ratios, in ſmaller numbers. We have given Mr. Cotes's method under Ratio. The application of that method to the preſent purpoſe is thus: the ratio of the octave to the third major is 55.79763 to 17.96282, and the approximating ratios will be

1. Greater than the true 28 : 9, 87 : 28, &c.
2. Leſs than the true 3 : 1, 31 : 10, 59 : 19, 205 : 66, &c.

The ratios greater than the true muſt all be rejected; becauſe they give the third major leſs than true, and conſequently the tone (its half) deficient by above $\frac{1}{2}$ comma; which gives the fifth deficient above $\frac{1}{4}$ of a comma; but this ought not to be. The firſt of the ratios leſs than true is 3 : 1, or 12 : 4, which is the *temperature* of 12 parts before deſcribed, and too inaccurate. The next is 31 : 10, or Mr. Huygens's. The reſt divide the octave into too many parts.

The ſame may be alſo found thus: the ratio of the octave to the common temperate fifth, deficient by $\frac{1}{4}$ of a comma, is 55.79763 to 32.38952. The approximating ratios to which are,

1. Greater than the true 2 : 1, 7 : 4, 19 : 11, 50 : 29, &c.
2. Leſs than the true 1 : 1, 3 : 2, 5 : 3, 12 : 7, 31 : 18, 205 : 119. Where we have the *temperatures* of 12, 19, 31, and 50 parts, before examined.

And here all ratios greater than the true ought to be rejected, becauſe they give the fifth leſs than true, that is, in this caſe, deficient by more than $\frac{1}{4}$ a comma.

If we inveſtigate the approximating ratios to the ratio of the ſemitones major and minor, or 5.19529 to 3.28612, we ſhall have the ratios 1 : 1, 2 : 1, 3 : 2, 5 : 3, which reſpectively give the *temperatures* of 12, 19, 31, and 50 parts, before deſcribed.

Again, inveſtigating the approximating ratios of the fifth to the third major, we ſhall find 7 : 4, 9 : 5, 11 : 6, 29 : 16, which will alſo give the *temperatures* 12, 19, 31, 50, as before.

Laſtly, the approximated ratios of the octave to the true fifth are 12 : 7 and 53 : 31 greater than the true. The others being of no uſe, ſince the fifth muſt neceſſarily be diminiſhed. Here we find the *temperature* of 53 parts.

As to the *temperatures* of 43 and 55, being deſtitute of any muſical foundation, it is no wonder they do not appear by this method of inveſtigation.

Mr. Huygens, in his Coſmotheoros, ſays, that the tone or pitch of the voice cannot be preſerved, unleſs the conſonants be tempered, ſo as to deviate a little from the higheſt perfection. For the proof of this aſſertion he brings a melody conſiſting of the following ſounds, C, F, D, G, C; where, if the intervals were to be ſung perfect, by taking the interval from C to F a true fourth aſcending, from F to D a third minor deſcending, from D to G a true fourth aſcending, and laſtly, from G to C a true fifth deſcending, we ſhould fall a comma below the C from whence we began. Therefore, if we were to repeat this ſeries of notes nine times, we ſhould at laſt fall near a tone major below our firſt ſound.

Mr. Huygens's ſolution of this difficulty is, that we remember the note from whence we ſet out, and return to it by a ſecret *temperature,* thereby ſinging the intervals a little imperfect; which, he ſays, will be found neceſſary in almoſt all ſongs or melodies.

A like difficulty is mentioned in the Memoirs of the Royal Academy of Sciences; and is there urged for the neceſſity of a *temperature,* even for ſinging in the ſame key. And Mr. Huygens's ſolution of the difficulty is there approved of. Ann. 1707, p. 264.

But the ſolution of theſe learned gentlemen is, as yet, far from being deciſive. No experiment has yet been brought to ſhew that the human voice ſings tempered notes; not even when accompanied by tempered inſtruments. It ſeems to us, on the contrary, that an exerciſed voice guided by a good ear, ſings true, even though accompanied by a miſ-tuned inſtrument, as harpſichords moſt frequently are, eſpecially in tranſpoſed keys. And were theſe inſtruments always as well tuned as art could make them, yet their tones would be equal; and it ſeems evident to the ear, that the human voice ſinging naturally two tones in ſucceſſion, as C, D, E, never makes them equal; and cannot, without great difficulty, and by means of a variation of harmony, be brought to make them equal.

Another ſolution, therefore, of Mr. Huygens's difficulty, muſt be ſought for. The truth ſeems to be, that the ſecond of the key muſt be the true tone-major above the key, and therefore the third between the ſecond and fourth of the key muſt be ſung deficient by a comma. Thus in the key of C, from C to D will be a tone-major $=\frac{9}{8}$, and from D to F will be a deficient third $=\frac{32}{27}$. See Interval.

Mr. Huygens's melody, therefore, will ſtand thus:

C, F, D, G, C.

$\frac{4}{3}\times\frac{27}{32}\times\frac{4}{3}\times\frac{2}{3}=1$. And the voice would ſing the interval F, D, juſt as if the note E had been interpoſed; in which caſe the notes would be C, F, E, D, G, C.

$$\frac{4}{3}\times\frac{15}{16}\times\frac{9}{10}\times\frac{4}{3}\times\frac{2}{3}=1.$$

Theſe notes all come within the diatonic ſcale of C; and the voice naturally falls upon the note from whence it ſet out. The ſame anſwer will hold in the example, mentioned in the Memoirs of the Academy of Sciences; where the intervals ^{b}B, G, E, C, occur. And here the interval from ^{b}B to G ſhould be taken $=\frac{27}{32}=\frac{15}{16}\times\frac{9}{10}$, as in the former example; and for the ſame reaſon, the key being F.

There ſeems therefore no repugnancy between the practice and theory of muſic, while the melody is confined to one key; but it muſt be owned, that in tranſitions from key to key, eſpecially where ſeveral parts are to make harmony with each other, there ſtill remain difficulties, not mentioned by Mr. Huygens, or any other writer we know of, which might deſerve a farther examination.

We muſt not omit mentioning, that the learned Dr. Smith, in his Harmonics, has not only carried the theory of *temperaments,* or *temperatures,* far beyond all the authors that preceded him; but has ſhewn how to tune an inſtrument, according to any propoſed *temperament,* by the ear only, which is certainly a moſt ingenious diſcovery.

This learned author prefers what he calls the *temperament* of equal harmony, which differs inſenſibly from the diviſion of the octave into fifty parts, to all others; and inſiſts, that it labours under the feweſt defects, and is of all others the moſt agreeable in practice. In the ſyſtem of equal harmony the *temperaments* of the fifth, third major and third minor, are reſpectively, $\frac{5}{18}$ and $\frac{2}{18}$ and $\frac{3}{18}$ of a comma leſs than the truth.

It would be impoſſible here to do juſtice to the learned author's reaſonings on this ſubject; we ſhall only add, that he eſtabliſhes, contrary to the common opinion, that the leſs ſimple conſonances, generally ſpeaking, will not bear ſo great *temperaments* as the ſimpler conſonances.

Dr. Smith mentions a *temperament* communicated to him by the ingenious Mr. Harriſon, which conſiſts in making the proportion between the octave and third major equal to that of the circumference of a circle to its diameter. In this *temperament* the third major is diminiſhed by $\frac{1}{3}$ of a comma, but the third minor is very near the truth, and extremely beautiful.

A late author ſeems to think the diviſion of the octave into thirty-one parts, not to be of modern invention, but neceſſarily implied in the doctrine of the ancients. At firſt ſight it would ſeem, as if the ancients made but twenty-four dieſes or diviſions in the octave, viz. ten to each fourth, and four to the tone; which (the octave being equal to two fourths and a tone) gives twenty-four dieſes to the octave. But the author juſt quoted contends, that this diviſion is to be underſtood only in one tenſion, that is either aſcending or deſcending; but that accurately ſpeaking, if we conſider all the dieſes or diviſions of the fourth, both aſcending and deſcending, we ſhall find thirteen; five to each tone, and three to the ſemi-tone major; and conſequently thirty-one

one divisions in the octave. These indeed are not all naturally equal; but if we make them so, we shall have a *temperature* known by the moderns under the name of Huygens's *temperature*. Dr. Pepusch, in Phil. Transf. N° 481, p. 273. See the article DIESIS.

TEMPERATE *Zone*, see ZONE.

TEMPERATURE, in *Physics*, see TEMPERAMENT.

TEMPERATURE, or CLIMATE for plants. The difference of *climate*, or *temperature* of the air, has a very great effect on plants. The different degree of heat is the great cause of these changes, and the different degree of moisture somewhat assists in it. The American and Asian plants, famous in medicine when of the growth of their native soils, yet when removed into our *climate*, though they grow and even produce their flowers and ripen their seeds, which seems the last perfection of a plant, when put to the trial, have been always found to want their proper medicinal virtues.

Many of those plants and trees, which, though natives of another *climate*, will endure the open air with us, and grow in our gardens; yet lose much of their strength, and become dwarfs, in proportion to what they were when in their proper *climate*. But much less violent changes than these are able to produce the like effects, at least in some degree. The several parts of Europe are able to alter the quality of the same plant, even while it grows natural in them. Thus the blue aconite or napellus, the root of which is a terrible poison in the south of France; yet in Britany, a northern province of the same kingdom, the root of the same plant, though it seems to grow with equal vigour there, and is equally large and succulent, has no bad effects; but has been eaten by old people and by children, without any injury.

In general, the farther north we go, the less and less hurtful this plant becomes. It is common to almost all Europe, and we find the inhabitants of some places dreading it, and that with great justice, as a fatal poison; while those of others eat the leaves in their sallads, and even esteem them good to restore the appetite.

The common woad which succeeds well in many parts of England, is not so certain in France; but the different *climates* in different parts of that great kingdom, make strange alterations in its juices. In Upper Languedoc they raise great quantities of it, and it makes an extremely fine blue dye for stuffs of all kinds; but in Britany, though the plant grows as high, and seems to flourish as well, yet the leaves never are so succulent, and the colour obtained from them is not of so fine a blue, but is dusky and brownish.

This effect of the different *climates*, in changing the nature of things produced in them, is not confined to plants; but the animal kingdom shares in it. The whole serpent-kind are in general larger and more venomous, as we approach the hotter *climates*. The tarantula, so poisonous in the hot countries, is found greatly less so as it is found in more cold regions; and the scorpion, whose sting is fatal in some parts of Africa, is little more mischievous than the wasp or hornet in some of the coldest places where it lives. Nay, the Philosophical Transactions inform us, that the bite of the tarantula, even in those very places where most mischievous, does not exert its power in cold weather; but that a person bitten at such a time feels not the effect of the bite till the next sultry hot day, though that may not happen till after two or three weeks.

The differences made by variety of *climates* upon plants, are not limited to distance of place, but even in the same province the *climate* differs greatly in different years, by means of accidents, and more or less heat; and more or less moisture will do as much violence to plants sometimes, as change of place, which only operates by means of the same agents. Our farmers complain of great mischiefs, from long droughts; and the French husbandmen, in many of the provinces, always find, that when there has fallen very much rain, or thick fogs have been very frequent, all the bread-corn of every kind degenerates; the wheat and barley are poor and thin in the ear, and the grain small; but the rye becomes so altered, that it is pernicious to use it in making of bread; and the poor, who are obliged to eat the bread made with it, are subjected to many diseases by it. They call the rye thus vitiated *ergot*, and *ble cornu*. Desland's Trait. Phys.

TEMPERING, in the *mechanic arts*, the preparing of STEEL and IRON, so as to render them more compact, hard and firm; or even more soft and pliant; according to their respective occasions.

These metals are *tempered* by plunging them, while red-hot, in some liquor prepared for the occasion: sometimes pure water is used for that purpose; our lock-smiths, &c. scarce use any other.

Sometimes a composition of divers juices, liquors, &c. is used; which is various according to the opinion and experience of the workman; as vinegar, mouse-ear-water, nettle, or Spanish radish-water, the water oozing from broken glasses, suet, salt, oil, soot, distilled wine, sal armoniac, urine, &c.

To harden and *temper* English, Flemish, and Swedish steel, you must give them a pretty high heat; then suddenly quench them in water to make them hard; but Spanish and Venetian steel will need only a blood-red heat before they be quenched.

In consequence of this operation all the qualities of *steel* are changed; so that from being very ductile and soft, it becomes so hard and so stiff, that it is no longer capable of being cut by the file, but is itself capable of cutting or piercing very hard bodies, and that it does not yield to the hammer, but may be sooner broken in pieces than extended. It becomes also sonorous, brittle, very elastic, and capable of acquiring the most beautiful polish. This hardness and ductility of *steel* may be diversified by varying the *temper*. The hotter the *steel* is when tempered, and the colder the water into which it is plunged, the greater hardness it acquires. but at the same time, it becomes so much more brittle. The coldness of the water may be increased by dissolving salts in it: observing that water is always colder while the salts continue dissolving; and that the *steel* will cool sooner by being stirred about or placed in a stream, so as to come in contact with water not already made warm. On the contrary, the less hot the *steel* is when tempered, and the hotter the water is in which it is tempered, the less hard it becomes, and also the greater ductility it retains: and the proper degree of heat is always relative to the use for which the tools made of the *steel* are intended.

If the steel be too hard or brittle for an edge-tool, &c. let it down by rubbing a piece of grindstone or whetstone hard upon the work, to take off the black scurf: then brighten, or heat it in the fire; and as it grows hotter, you will see the colour change by degrees, coming first to a straw, or light goldish colour, then to a darker goldish colour, and at last to a blue colour. Choose such of these colours as the work requires; then quench it suddenly in water.

The light gold colour is for files, cold chissels, and punches that punch iron and steel: the dark goldish colour is for punches to use on brass, &c. The blue colour gives the *temper* for SPRINGS, &c. See STEEL.

The *tempering* of files and needles is performed in a peculiar manner.

Steel is usually sold tempered, because, in many manufactures, the custom is to *temper* it as soon as it is made, probably that the purchasers of it may be better able to judge of its quality. When this *steel* is to be used, it must be untempered by heating it more or less, and letting it cool slowly, that it may be extended, filed and receive the necessary form: after which every workman *tempers* it again in his own way.

M. Berthoud, in his treatise on marine clocks, recommends hardening the steel-balance-wheel, by daubing it over with soot (of wood) moistened with urine, putting it into a small box of thin iron-plate, and covering it over with the same composition. This box with its contents, is to be heated to a blood-red, and then the wheel taken out suddenly and quenched.

Mr. Harrison and M. Berthoud seem to agree upon the whole, that the balance-spring of time-pieces should be hardened and tempered after it has been coiled up in its proper form; and not tempered first and coiled up afterwards, as is the practice in making the main-spring.

Some curious workmen, in order to equally *temper* small steel instruments, employ melted lead as an intermedium. A plate of iron floats upon the melted lead, and receives from it, in all its parts, an equal heat: the pieces of steel, laid upon this plate, acquire all at once the same degree of heat, and are at once quenched in water; the blue, or other colours which they successively assume, affording sure marks of the proper points of heat at which they are to be quenched, according to the different degrees of hardness required in them. Lewis's Com. Phil. Techn. p. 32.

For the method of *tempering* steel bars for artificial magnets, practised by Mr. Canton, see *Artificial* MAGNET.

The ancients appear to some to have had a better method of *tempering* than any of the moderns are acquainted withal; witness their works in PORPHYRY; a stone so hard

hard, that scarce any of our tools make any impression upon it.

TEMPEST, Tempestas, a storm or violent commotion of the air, with or without rain, hail, snow, &c.

TEMPLARS, Templers, or *Knights of the* Temple, a religious military order, first established at Jerusalem, in favour of pilgrims travelling to the Holy Land.

The original of this order, the first military one in the world, is this: in 1118, some pious and noble persons devoted themselves to the service of God, in the presence of the patriarch of Jerusalem; promising to live in perpetual chastity, obedience, and poverty, after the manner of canons.

The two principal persons were Hugo de Paganis, and Geoffroy of St. Omers. Baldwin II. then king of Jerusalem, gave them an apartment in his palace, near the temple at Jerusalem, not far from the sepulchre of our Saviour; whence their denomination *Templars.*

Soon afterwards, the canons of the temple gave them a piece of ground near the said temple, on which to build regular houses; and the king, the lords, the patriarch, and the prelates, each gave them somewhat out of their revenue, for food and cloaths.

Their first undertaking, and what they had first in view at their institution, was, to guard the highway against robbers, &c. chiefly for the safety of pilgrims and croises.

The principal articles of their rule were: that they should hear the holy office throughout every day; or that, when their military duties should prevent this, they should supply it by a certain number of pater nosters: that they should abstain from flesh four days in the week, and on Fridays from eggs and milk-meats: that each knight might have three horses, and one esquire: and that they should neither hunt, nor fowl.

In the year 1228, this order acquired stability, by being confirmed in the council of Troyes, and subjected to a rule of discipline drawn up by St. Bernard.

In every nation they had a particular governor, called *master of the Temple*, or of the *militia of the temple.* Their grand-master had his residence at Paris.

The order of *Templars* flourished for some time, and acquired, by the valour of its knights, immense riches, and an eminent degree of military renown: but as their prosperity increased, their vices were multiplied, and their arrogance, luxury, and cruelty rose at last to such a monstrous height, that their privileges were revoked, and their order suppressed with the most terrible circumstances of infamy and severity. Their accusers were two of their own body, and their chief prosecutor Philip the Fair of France, who addressed his complaints to Clement V. The pope, though at first unwilling to proceed against them, was under a necessity of complying with the king's desire, so that, in the year 1307, upon an appointed day, and for some time afterwards, all the knights, who were dispersed throughout Europe, were seized and imprisoned. Such of them as refused to confess the enormities of which they were accused, were put to death; and those who, by tortures and promises, were induced to acknowledge the truth of what was laid to their charge, obtained their liberty. In 1312, the whole order was suppressed by the council of Vienne. A part of the rich revenues they possessed was bestowed upon other orders, especially on the knights of St. John, now of Malta, and the rest confiscated to the respective treasuries of the sovereign princes, in whose dominions their possessions lay.—The knights *Templars*, in order to justify the severity with which they were treated, were charged with apostasy to the Saracens, and holding correspondence with them, with insulting the majesty of God, turning into derision the Gospel of Christ, and trampling upon the obligation of all laws human and divine. Candidates, it is said, upon admission to this order, were commanded to spit, in token of contempt, upon an image of Christ, and after admission to worship either a cat, or a wooden head crowned with gold. It is farther affirmed, that, among them, the odious and unnatural act of sodomy was a matter of obligation; and they are charged with other crimes too horrible to be mentioned, or even imagined. However, though there be reason to believe, that in this order, as well as other of the same period, there were shocking examples of impiety and profligacy; yet that the whole order was thus enormously corrupt, is so far from being proved, that the contrary may be concluded even from the acts and records yet extant of the tribunals before which they were tried and examined. If to this we add, that many of the accusations advanced against them, flatly contradict each other, and that many members of this unfortunate order, solemnly avowed their innocence, while languishing under the severest tortures, and even with their dying breath; it would seem probable, that king Philip set on foot this bloody tragedy, with a view to gratify his avarice, and glut his resentment against the *Templars*, and especially against their grand-master, who had highly offended him. The principal cause of his invincible hatred against them was, that, in his quarrel with Boniface VIII. the knights espoused the cause of the pope, and furnished him with money to carry on the war. Mosheim's Eccl. Hist. vol. iii. p. 208, ed. 8vo. Bower's Hist. of the Popes, vol. vi. p. 393.

TEMPLE, *templum*, a public building, erected in honour of some deity, either true or false; and wherein the people meet to pay religious worship to the same.

The word is formed from the Latin *templum*, which some derive from the Greek τεμενος, signifying the same thing; and others from τεμνω, *abscindo, I cut off, I separate*, in regard a *temple* is a place separated from common uses; others with more probability derive it from the old Latin word *templare, to contemplate.* It is certain, the ancient augurs gave the name *templa* to those parts of the heavens which were marked out for the observation of the flight of birds. Their formula was this: *Templa tesqua sunto.*

Temples were originally all open, and hence received their name. See Phil. Trans. N° 471. sect. 5. where we have an account of an ancient *temple* in Ireland of the same sort as our famous Stonehenge.

The word *templum*, in its primary sense among the old Romans, signified nothing more than a place set apart, and consecrated by the augurs, whether enclosed or open; in the city, or in the fields.

Clemens Alexandrinus and Eusebius refer the origin of *temples* to the sepulchres built for the dead. This notion has been lately illustrated and confirmed by a variety of testimonies by Mr. Farmer, in his Treatise on the Worship of Human Spirits, p. 373, &c. Herodotus and Strabo will have the Egyptians to have been the first who built *temples* to the gods. The first erected in Greece is ascribed to Deucalion, by Apollonius, Argonaut. lib. iii.

In antiquity we meet with many people who would not build any *temples* to their gods, for fear of confining them to too narrow bounds. They performed their sacrifices in all places indifferently, from a persuasion, that the whole world is the *temple* of God, and that he required no other. This was the doctrine of the magi, followed by the Persians, the Scythians, the Numidians, and many other nations mentioned by Herodotus, lib. i. Strabo, lib. xv. and Cicero in his second oration against Verres.

The Persians, who worshipped the sun, believed it would wrong his power, to enclose him in the walls of a *temple*, who had the whole world for his habitation; and hence, when Xerxes ravaged Greece, the magi exhorted him to destroy all the *temples* he met with.

The Sicyonians would build no *temple* to their goddess Coronis; nor the Athenians, for the like reason, erect any statue to Clemency, who, they said, was to live in the hearts of men, not within stone walls.

The Bithynians had no *temples*, but the mountains, to worship on; nor had the ancient Germans any other but the woods.

Even some philosophers have blamed the use and building of *temples*, particularly Diogenes, Zeno, and his followers the Stoics. But it may be said, that if God hath no need of *temples*, men have need of places to meet in for the public offices of religion: accordingly, *temples* may be traced back even into the remotest antiquity. See Hospinian, de Origine Templorum.

The Romans had several kinds of *temples*; whereof those built by the kings, &c. consecrated by the augurs, and wherein the exercise of religion was regularly performed, were called, by way of eminence, *templa, temples.* Those that were not consecrated, were called *ædes.* The little *temples*, that were covered or roofed, they called *ædiculæ.* Those open, *sacella.* Some other edifices consecrated to particular mysteries of religion, they called *fana* and *delubra.*

All these kinds of *temples*, Vitruvius tells us, had other particular denominations, according to the form and manner of their construction; as will be hereafter specified.

Indeed, the Romans outdid all nations with regard to *temples*: they not only built *temples* to their gods, to their virtues, to their diseases, &c. but also to their emperors, and that in their life-time; instances whereof we meet with in medals, inscriptions, and other monuments. Horace compliments Augustus hereupon, and sets him above Hercules, and all the heroes of fable; in that those were only admitted into *temples* after their death, whereas

whereas Auguftus had his *temples* and altars while living.

Præfenti tibi maturos largimur honores;
Jurandafque tuum per nomen ponimus aras.
Epift. ad Aug.

Suetonius, on this occafion, gives an inftance of the modefty of that emperor, who would allow of no *temples* being erected to him in the city; and even in the provinces, where he knew it was ufual to raife *temples* to the very proconfuls, refufed any but thofe erected in the name of Rome as well as his own. Vide Suet. in Octav. cap. 52.

The moft celebrated *temples* among the Romans were the CAPITOL and PANTHEON. They had alfo the *temple* of Saturn, which ferved for the public treafury; and the *temple* of JANUS.

TEMPLE, *Delphian*. See DELPHOS.

TEMPLE, *Jewifh, at Jerufalem*, was an edifice erected much after the model of the TABERNACLE, but in a much more magnificent and expenfive manner. According to the opinion of fome, there were three different *temples*; the firft built by David and Solomon; the fecond, by Zerubbabel and Jofhua the high prieft; and the third, by Herod; this laft, however, the Jews will not allow to be a new *temple*, but only the fecond rebuilt. The expence of building Solomon's *temple* was prodigious: the gold and filver employed for this purpofe amounted to upwards of eight hundred millions fterling (1 Chron. xxii. 14. xxix. 4, 6, 7.), which, fays Dr. Prideaux, was fufficient to have built the whole *temple* with folid filver. But as the book of Chronicles was written after the return from the Babylonifh captivity, it is probable that the Jews might compute by the Babylonifh talent, which was little more than half the Mofaic talent, or perhaps by the Syriac talent, which was but one-fifth of the Babylonifh; and thus the whole quantity of gold and filver would be reduced to a comparatively moderate quantity, and yet fufficient for the purpofe.

Jofephus (lib. vii. xiv. ii.) acquaints us, that the two firft fums were only one-tenth part of what is expreffed in the prefent Hebrew; and Dr. Kennicott (State of the Hebrew Text, vol. ii. p. 355.) thinks it probable, that a cipher was added to them both in fome very ancient Hebrew copy.

This *temple* was furrounded, except at the front or eaft end, with three ftories of chambers, each five cubits fquare, which reached to half the height of the *temple*, and the front was graced with a magnificent portico, which rofe to the height of a hundred and twenty cubits. It was plundered by Nebuchadnezzar king of Babylon, and at length deftroyed, after it had ftood, according to Jofephus, four hundred and feventy years, fix months, and ten days, from its dedication. Others, however, as Calvifius and Scaliger, reduce the number of years to four hundred and twenty-feven or four hundred and twenty-eight, and Ufher to four hundred and twenty-four years, three months, and eight days.

The fecond *temple* was built by the Jews, after their return from the Babylonifh captivity, under the direction and influence of Zerubbabel their governor, and of Jofhua the high prieft, with the leave and encouragement of Cyrus the Perfian emperor, to whom Judæa was now become a tributary kingdom. According to the Jews this *temple* was deftitute of five remarkable appendages, which were the chief glory of the firft *temple*; viz. the ark and mercy-feat, the Schechinah, the holy fire on the altar, which had been firft kindled from heaven, the urim and thummim, and the fpirit of prophecy. This *temple* was plundered and profaned by Antiochus Epiphanes, who alfo caufed the public worfhip in it to ceafe; and afterwards purified by Judas Maccabæus, who reftored the divine worfhip; and after having ftood five hundred years rebuilt by Herod, with a magnificence approaching to that of Solomon's. Tacitus calls it *immenfæ opulentiæ templum*; and Jofephus fays, it was the moft aftonifhing ftructure he had ever feen, as well on account of its architecture as its magnitude, and likewife the richnefs and magnificence of its various parts, and the reputation of its facred appurtenances. This *temple*, which Herod began to build about fixteen years before the birth of Chrift, and fo far completed in nine years and a half, as to be fit for divine fervice, was at length deftroyed by the Romans on the fame month and day of the month, on which Solomon's *temple* was deftroyed by the Babylonians.

The Jewifh *temple* itfelf confifted of the portico, the fanctuary, and the holy of holies; and it was ornamented with fpacious courts, making a fquare of half a mile in circumference. The firft court was called the court of the Gentiles, becaufe they were allowed to come into it, but no farther. Within this was a lefs court, into which none but Ifraelites might enter, divided into the court of the women, and the inner court, in which the *temple* and altar ftood, and into which the priefts and all male Ifraelites might enter. Jennings's Jew. Ant. vol. ii. book ii. cap. 1.

TEMPLE, in *Architecture*. The ancient *temples* were diftinguifhed, with regard to their conftruction, into various kinds; as,

TEMPLE *in antæ, Ædes in antis*. Thefe, according to Vitruvius, were the moft fimple of all *temples*, having only angular pilafters, called *antæ*, or *paraftatæ*, at the corners, and two Tufcan columns on each fide of the doors.

TEMPLE, *tetraftyle*, or fimply *tetraftyle*, was a *temple* that had four columns in front, and as many behind. Such was the *temple* of Fortuna Virilis at Rome.

TEMPLE, *proftyle*, that which had only columns in its front, or forefide. As that of Ceres at Eleufis, in Greece.

TEMPLE, *amphiproftyle*, or *double proftyle*, that which had columns both before and behind, and which was alfo tetraftyle.

TEMPLE, *periptere*, that which had four rows of infulated columns around, and was exhaftyle, i. e. had fix columns in front; as the *temple* of Honour at Rome. See PERIPTERE.

TEMPLE, *diptere*, that which had two wings, and two rows or columns around, and was alfo octoftyle, or had eight columns in front; as that of Diana at Ephefus.

TEMPLE, *pfuedo-diptere*. See PSEUDO-*diptere*.

TEMPLE, *hypæthros*. See HYPÆTHROS.

TEMPLE, *monoptere*. See MONOPTERE.

TEMPLES, among us, denote two inns of court, thus called, becaufe anciently the dwelling-houfe of the *knights Templars*.

At the fuppreffion of that order, they were purchafed by fome profeffors of the common law, and converted into hofpitia, or inns of courts.

They are called the *Inner* and *Middle Temple*, in relation to Effex-houfe, which was alfo a part of the houfe of the *Templars*, and called the *Outer Temple*, becaufe fituate without Temple-Bar.

In the *Middle Temple*, during the time of the *Templars*, the king's treafure was kept: as was alfo that of the kings of France in the houfe of the *Templars* at Paris.

The chief officer was the mafter of the *Temple*, who was fummoned to parliament in 49 Hen. III. And from him the chief minifter of the *Temple* church is ftill called *Mafter of the Temple*.

TEMPLERS. See TEMPLARS.

TEMPLES, *tempora*, in *Anatomy*, a double part of the head, reaching from the forehead and eyes to the two ears. See HEAD.

The *temples* are chiefly formed of two bones, called *offa* TEMPORIS OF PETROSA.

Thefe parts, according to phyficians, were called *tempora*, from their fhewing the age or time of man, by the colour of the hair, which turns white in this part before any other; which Homer feems to have been aware of, by his calling fome men *poliocrotaphi*, q. d. *grey-templed*.

TEMPLUM *Softrati*, the name of a kind of chirurgical bandage, defcribed by Galen. He alfo defcribes another under the name of *templum parvum Apollonii Tyrii*.

TEMPO *di gavotta*, in *Mufic*. See *Tempo di* GAVOTTA.

TEMPORAL, *temporalis*, a term frequently ufed for *fecular*. In which fenfe it ftands oppofed to *ecclefiaftical*.

Pope Boniface wrote to Philip the Fair of France, that he was fubject to him, both in fpirituals and *temporals*. At prefent all the doctors on this fide the Alps own the fupremacy of kings in temporals.

TEMPORAL *action*. See ACTION.

TEMPORAL *augment*. See AUGMENT.

TEMPORALIS, in *Anatomy*, a mufcle, which refembles the quadrant of a circle, and occupies all the femicircular or femi-oval plane of the lateral region of the cranium, the *temporal* foffa, and part of the zygomatic. From this fituation it has its name, and likewife that of *crotaphites*. Through all the circumference of this femicircular plane, the pericranium is divided into two laminæ. The internal lamina, which is fometimes taken for a particular periofteum, covers immediately all the bony parts of this region; the external lamina feparated from the other, is fpread out like an aponeurotic, or ligamentary tent, by means of its adhefions to the external angular apophyfis of the os frontis, to the pofterior edge of the fuperior apophyfis of the os malæ, and to the upper edge of all the zygomatic arch all the way to the root of the maftoide apophyfis.

This mufcle is compofed of two planes of flefhy fibres fixed to the two fides of a tendinous plane, nearly of the fame breadth with them by which they are feparated; it being fpread quite through the mufcle, like a concealed middle tendon; and the body of the mufcle thus formed, is enclofed between the two aponeurotic or ligamentary laminæ, in the following manner.

The internal flefhy plane is fixed by a broad radiated infertion

fertion to all the femicircular plane of the cranium by the intervention of the internal lamina of the periofteum. Thus it is fixed to the lateral and external part of the os frontis, and to its external angular apophyfis, to the lower part of the os parietale, to the fquamous portion of the os temporis, to the great ala or temporal apophyfis of the fphenoidal bone by which the temporal foffa is formed, and a little to the backfide of the internal orbitary apophyfis of the os malæ, which forms part of the zygomatic foffa.

The external flefhy plane is fixed in the fame radiated manner to the infide of the external lamina of the pericranium, from the great femicircular circumference, all the way to a fmall portion of this lamina, more or lefs femicircular, above its infertion in the zygomatic arch; here the flefhy fibres leave the external lamina, and the void fpace is commonly filled with fat. The middle tendinous plane continues to contract by degrees, and ends at length in a very confiderable tendon, the extremity of which, which is in a manner double, enclofes the coronoide apophyfis of the lower jaw. There is another fmall plane, reckoned by fome to be a portion of this mufcle, but in reality is no other than the third portion of the mafseter. Winflow. See *Tab. Anat. (Myol.) fig.* 1. *n.* 12. *fig.* 6. *n.* 2. *fig.* 7. *n.* 1.

When the *temporal* mufcles are wounded, at the fame time that there is a contufion of the cranium, which is frequently the cafe, the patient will be attended with great diforders; not only as thefe mufcles are neceffary for the offices of dividing the food, and for forming of fpeech, but becaufe they are furnifhed with nerves, tendons, and arteries, all very confiderable, which will partake of the injury. Where there is no violent fymptom attending wounds on the external parts of the head, they are eafily cured by the common method ufed to frefh wounds, and there will be no occafion for futures, for fticking plafters will always anfwer the purpofe; but the dreffings muft always be finifhed with all poffible expedition; the medicines muft be always applied warm, and the air kept in a moderate heat with hot coals.

If there be any great degree of hæmorrhage from the wounded veffels, dry lint, or the ftyptic powders, are to be ufed, and the whole kept on by compreffes and a proper bandage; and after the hæmorrhage is ftopped, the wound muft be dreffed with mel rofarum, or fome digeftive medicines, till fufficiently deterged, and then with a vulnerary balfam, or dry lint, till it is healed. Heifter.

TEMPORALITIES, or TEMPORALTIES, the temporal revenues of an ecclefiaftic; particularly, fuch lands, tenements, or lay-fees, tithes, &c. as have been annexed to bifhops fees by our kings, or other perfons of high rank in the kingdom. See REVENUE.

The *temporalities* of a bifhop, &c. ftand oppofed to his fpiritualities. See VACATION.

The canonifts on the other fide the Alps, anciently gave the pope a power over the *temporalities* of kings. Yet pope Clement V. owned frankly, that his predeceffor Boniface VIII. had exceeded the juft bounds of his authority, in meddling with the *temporalities* of the king of France. Fevret.

TEMPORALIUM *cuftos.* See CUSTOS and VACATION.

TEMPORALIUM *reftitutione.* See RESTITUTIONE.

TEMPORARY *fortification.* See FORTIFICATION.

TEMPORARY *hours.* See HOUR.

TEMPOREGIATO, in the *Italian Mufic*, fometimes fignifies, that the muficians who accompany the voice, or the perfon who beats time, fhould prolong fome particular part thereof, to give the actor or finger room to exprefs the paffion he is to reprefent, or to introduce fome graces by way of ornament to the piece.

TEMPOREGIATO is alfo ufed in a different fenfe, for *à tempo*, or *à tempo giufto*.

TEMPORIS *os*, *temple-bone*, a bone on each fide the head: thus denominated from its fituation in the temples. See *Offa* PETROSA, and TEMPLES.

The figure of each of the *offa temporum* is partly femicircular, and partly like a fhapelefs rock, ending in feveral points. Each is divided into two portions; one fuperior, termed fquamous from its figure; the other called apophyfis petrofa, or the rock, from its hardnefs. They are alfo divided into two fides, one external and convex, the other internal and concave. Their external eminences are, the maftoide apophyfis in the lower and pofterior part of the bone; the zygomatic apophyfis in the anterior part; the ftyloide apophyfis under the bone, which feems originally to have been an epiphyfis; the capfular apophyfis, in which the bony ftilet feems as it were to be fet; the articular eminence of the zygomatic apophyfis, the lambdoidal angle, and the lower fide of the apophyfis petrofa.

Its external cavities are, the articular one immediately behind the eminence, called by the fame name; and which, with that, ferves for the articulation of the lower jaw: the crack in the articular cavities; the maftoide notch, in which the digaftric mufcle is inferted; the opening of the external *meatus auditorius*; the anterior indented border of that opening; the ftylomaftoide, or anterior maftoide hole, which is the orifice of the paffage of the *portio dura* of the auditory nerve, called from its form the aqueduct; the orifice or inferior hole of the carotide canal in the apophyfis petrofa, which alters its direction upward and forward, and ends at the point of the rock near the *fella fphenoidalis*; a portion of the jugular foffa, and a portion of the *foramen lacerum*.

Among the external cavities we are likewife to reckon a portion of the *ductus palatinus* of the ear, commonly called the Euftachian tube, and by fome the aqueduct; but by no means to be confounded with the other aqueduct, or ftylomaftoide; the zygomatic notch; the parietal notch; the fphenoidal notch; one or more little fulci, which receive the ramifications of the temporal artery; the groove in the apophyfis petrofa, by which it is connected to the great apophyfis of the *os occipitis*; the pofterior maftoide hole; but this hole is fometimes formed between this bone and the *os occipitis*, and is fometimes entirely wanting in one of the bones, and fometimes in both; and there is befide thefe, in fome fubjects, a fmall maftoide hole, which lofes itfelf in the fubftance of the bone.

In examining the internal eminences and cavities, we muft diftinguifh the fquamous portion from the apophyfis petrofa. In the former we fee the radiated indentations of the femicircular edge, which with the parietal bone forms the fquamous future; a portion of the middle foffa of the bafis cranii on the fame fide, and feveral inequalities in that foffa.

The apophyfis petrofa, or rock, is a fort of pyramidal body, with three fides fituated obliquely, fo that its bafis is turned backward and outward, and its apex forward and inward toward the *fella turcica*. Of the three fides, one is fuperior and inclined a little forwards, the fecond pofterior, and the third inferior: this laft belongs to the outfide of the whole bone. The upper fide affifts in forming the middle foffa of the bafis cranii; and we obferve here a fmall irregular hole appearing to be double, and partly covered by a fmall bony plate; this is a kind of break or interruption in the duct, through which the *portia dura* of the auditory nerve paffes.

In the back-fide of the rock we fee the internal auditory hole, and a portion of the foffa for the cerebellum; fmall, indeterminate, and pretty deep depreffions are fometimes feen in it in children; but thefe are gradually obliterated as they grow up. At the bafis of this apophyfis we fee a portion of the groove for the lateral finus, formed partly in this bafis, partly in the lambdoidal angle; as alfo a portion of the *foramen lacerum*, and a fmall point which as it were divides this hole in two, and diftinguifhes the paffage of the jugular vein, from that of the eighth pair of nerves.

As this apophyfis has three fides, three angles are to be obferved in it; the firft fuperior between the upper and back fides, the fecond pofterior between the back and lower fides, and the third anterior between the lower and fore-fide. The fuperior angle, which is the moft apparent, has a groove for the fmall finus of the dura mater. The pofterior angle is in a manner interrupted near the middle by the *foramen lacerum*, and from it proceeds the little bony point, which divides this hole; at the end of it is a groove by which it is connected with the great apophyfis of the *os occipitis*. Between the apex of the apophyfis petrofa, and the fuperior opening of the carotid canal, we fometimes meet with a fmall bone alfo of the fefamoide kind, mentioned long fince by Riolan. Almoft the whole fubftance of the *offa temporum* is compact; the fquamous portion is thin and tranfparent; the maftoide apophyfis is hollowed by confiderable cells; the apophyfis petrofa is very hard and folid, with feveral internal cavities for the organ of hearing contained in it. Winflow. See alfo *Tab. Anat. (Ofteol.) fig.* 2. *lit. b.* & *fig.* 13. *lit. a.*

TEMPTATION, *tentatio*, in *Theology*, an induction, or folicitation to evil; whether arifing from the world, the flefh, or the devil.

TEMPTATION, *tentatio*, in our *Ancient Law-books*, is ufed for a trial, proof, or affay. *Tentatio panis fiat bis in anno.* Chart. Edw. I. See ASSAY, &c.

TENABLE, formed from Fr. *tenir*, and that from the Latin *tenere*, *to hold*, in the *Military Art*, fomething that may be defended, kept, and held, againft affailants.

Tenable is little ufed, but with a negative: when a place is open on all fides, and its defences all beaten down, it is no longer *tenable*. When the enemy has gained fuch an eminence, this poft is not *tenable*.

TENACIOUS *bodies.* See TENACITY.

TENACITY, in *Natural Philofophy*, that quality of bodies

by which they sustain a considerable pressure or force without breaking. Mem. Acad. Berlin. 1745. p. 47.

Tenacity is the opposite quality to fragility or BRITTLENESS.

TENACULUM, in *Surgery*, an instrument used in amputation, for pulling out bleeding vessels that are to be tied by ligatures. See *Tab.* II. *Surgery, fig.* 19.

TENAILLE, in *Fortification*, a kind of outwork, consisting of two parallel sides, with a front, wherein is a re-entering angle.

In strictness, that angle, and the faces which compose it, are the *tenaille*.

The *tenaille* is of two kinds; *simple* and *double*.

TENAILLE, *simple*, or *single*, is a large outwork, consisting of two faces or sides, including a re-entering angle. See *Tab.* II. *Fortif. fig.* 21. *lit. d.*

TENAILLE, *double*, or *flanked*, is a large outwork, consisting of two simple *tenailles*, or three saliants, and two re-entering angles. See *Tab.* II. *Fortif. fig.* 21. *lit. e.*

The great defects of *tenailles* are, that they take up too much room, and on that account are advantageous to the enemy; that the re-entering angle is undefended; the height of the parapet hindering the seeing down into it, so that the enemy can lodge there under covert; and the sides are not sufficiently flanked.

For these reasons, *tenailles* are now excluded out of fortification by the best engineers, and never made, but where there wants time to form a HORN-*work*.

TENAILLE *of the place* is the front of the place, comprehended between the points of two neighbouring bastions; including the curtain, the two flanks raised on the curtain, and the two sides of the bastions which face one another.

So that the *tenaille*, in this sense, is the same with what is otherwise called the FACE *of a fortress*.

TENAILLE *of the ditch*, is a low work raised before the curtain, in the middle of the foss or ditch; the parapet of which is only two or three feet higher than the level ground of the ravelin.

There are three different sorts (*Tab.* VIII. *Fortification, fig.* 57.) The first are those which are made in the direction of the lines of defence, leaving a passage of three toises between their extremities and the flanks of the bastions, and likewise another of two toises in the middle for a bridge of communication to the ravelin. The second (*fig.* 58.) are those, whose faces are in the lines of defence; and sixteen toises long, besides the passage of three toises between them and the flanks of the bastions: their flanks are found by describing arcs from one shoulder of the *tenaille* as a centre, through the other, on which are set off ten toises for the required flanks. The third sort (*fig.* 59.) comprehends those whose faces are sixteen toises, as in the second sort, and the flanks parallel to those of the bastions.

The use of *tenailles*, in general, is to defend the bottom of the ditch by a grazing fire, and likewise the level ground of the ravelin, and especially the ditch before the redoubt within the ravelin, which cannot be so conveniently defended from any other place. The first sort do not defend the ditch so well as the others, because they are too oblique a defence; but as they are not subject to be enfiladed, M. Vauban has generally preferred them in the fortifying of places. Those of the second sort defend the ditch much better than the first, and add a low flank to those of the bastions; but as these flanks are liable to be enfiladed, they have not been much used. This defect, however, might be remedied, by making them so as to be covered by the extremities of the parapets of the opposite ravelins, or by some other work. Those of the third sort have the same advantage with the second, and are subject to the same inconveniences; and, therefore, they may be used with the same precaution.

Tenailles are esteemed so necessary, that there is hardly any place fortified without them, and it is not without reason; for when the ditch is dry, the part behind the *tenailles* serves as a place of arms, from which the troops may sally, destroy the works of the enemy in the ditch, oppose their descent, and retire with safety; and the communication from the body of the place to the ravelin becomes easy and secure, which is a great advantage; for by that means the ravelin may make a much better defence, as it can be supplied with troops and necessaries at any time. And if the ditch is wet, they serve as harbours for boats, which may carry out armed men to oppose the passage over the ditch whenever they please; and the communication from the *tenailles* to the ravelin becomes likewise much easier than it would be without them. Muller's Elem. of Fort. p. 34. See FORTIFICATION.

The RAMSHORN is a curved *tenaille*, raised in the foss before the flanks, and presenting its convexity to the covered way. This work seems preferable to either of the other *tenailles*, both on account of its simplicity, and the defence for which it is constructed.

TENAILLONS, in *Fortification*, are works constructed on each side of the ravelin, much like the LUNETTES: they differ, as one of the faces of a *tenaillon* is in the direction of the ravelin, whereas that of the lunette is perpendicular to it.

Tenaillons are constructed by producing the faces of the ravelin beyond the counterscarp of the ditch, at a distance MN (*Tab.* VIII. *Fortif. fig.* 60.) of thirty toises, and taking on the counterscarp of the great ditch fifteen toises from the re-entering angle *p* to *q*, and drawing N*q*; then *q*NM*p* will be the *tenaillon* required; its ditch is twelve toises, or the same as that of the ravelin. Sometimes there is made a retired battery, in the front of the *tenaillons*, as at B; this battery is ten toises from the front, to which it is parallel, and fifteen toises long. There are commonly entrenchments made in the *tenaillons*, such as O; their parapets are parallel to the fronts MN, or rather perpendicular to the side N*q*, and bisect the side *q*N; the ditch before this retrenchment is three toises, and there is a banquette before the parapet, next to the ditch, of about eight feet, called BERM, serving to prevent the earth of the parapet (which seldom has any revetement) from falling into the ditch. The ravelin, before which *tenaillons* are constructed, must have its saliant angle much greater than the former construction makes them; otherwise the saliant angles of the *tenaillons* become too acute; for which reason the capital of this ravelin is made forty-five toises, and the faces terminate within three toises of the shoulders. Muller's Elem. Fort. p. 37.

A *tenaillon* is a work capable of affording great defence to the besiegers; as at the siege of Lisle in 1708, where the besiegers were twice or thrice drove out of a *tenaillon* they had taken and retaken.

TENANCY, a habitation, or house to live in, or a tenement or possession held of another.

TENANCY, *entire*. See ENTIRE.

TENANCY *in tail*. See FEE-*tail*.

TENANT, or TENENT, *tenens*, in *Law*, one that holds or possesses lands and tenements of some lord or landlord, by any kind of right, either in fee, for life, years, or at will.

The term *tenant* is used with divers additions. Thus, *tenant in dower*, is she that possesses lands by virtue of her dower.

Tenant per statute-merchant, he that holds lands forfeited to him by virtue of a statute. See STATUTE-*merchant*.

Tenant in frank marriage, is he that holds lands or tenements by virtue of a gift thereof, made to him upon marriage, between him and his wife. See FRANK-*marriage*.

Tenant by courtesy holds for his life, by reason of a child begotten by him of his wife, being an inheritrix, and born alive. See COURTESY.

Tenant by elegit holds by virtue of the writ called an ELEGIT.

Tenant in mortgage holds by means of a MORTGAGE.

Tenant by verge, in ancient demesne, is he who is admitted by the rod in court to lands in ancient demesne. See VERGE.

Tenant by copy of court-roll is one admitted *tenant* of any lands, &c. within a manor, which, time out of mind, have been demised according to the custom of the manor. See COPYHOLD.

Tenant paravail. See PARAVAIL.

Tenant by charter, is he that holdeth by feoffment in writing, or other deed. See CHARTER, and FREEHOLD.

Tenant in capite, or *chief*, holdeth of the king in right of his crown. See CAPITE.

Tenant of the king, is he that holdeth of the person of the king.

TENANTS, *joint*, those who have equal right in lands or tenements, by virtue of one title. See JOINT *tenants*.

TENANTS *in common*, those who have equal right, but hold by divers titles.

TENANT, *particular*, he that holds only for his term.

TENANT, *sole*, is he who has no other joined with him.

TENANT *by execution*, is he who holds by virtue of an execution upon any statute, recognizance, &c.

TENANTS, *customary*. See CUSTOMARY.

TENANT, *terre*. See TERRE-*tenant*.

TENANT, *very*. See VERY.

Anciently, there were also *tenant by knight-service*, *tenant in burgage*, *tenant in socage*, *tenant in frank-fee*, *tenant in villenage*. And there are still *tenant* in FEE-*simple*, *tenant in* FEE-*tail*, *tenant upon* SUFFERANCE, &c.

TENANT *in tail after possibility of issue extinct*. See TAIL.

TENANT *to the præcipe*, in *Law*, is he against whom the writ

writ of præcipe is to be brought in ſuing out a recovery.

TENANT, or TENAN, in *Heraldry*, is uſed for ſomething that ſuſtains, or holds up, the ſhield, or armory; and is generally ſynonymous with the word SUPPORTER.

The difference which ſome authors make between the two is, that *tenants* are ſingle, and *ſupporters* double, one placed on each ſide the ſhield. But the proper diſtinction ſeems to conſiſt in this, that *tenants* are human figures, and ſupporters figures of beaſts.

There are various forms of *tenants*, as well as of ſupporters, viz. angels, maids, religious, ſavages, Moors, &c.

The firſt *tenants*, F. Meneſtrier obſerves, were trunks, or branches of trees; to which the eſcutcheons were faſtened by ſtraps and buckles. Afterwards, the knights were repreſented as holding their own eſcutcheons, which were either hung to their neck, or elſe they leaned on them.

The origin of *tenants* and ſupporters is, by many, referred to the ancient tournaments, wherein the cavaliers had their arms borne by ſervants diſguiſed like ſavages, Moors, fabulous deities, bears, lions, &c. See SUPPORTER.

TENAR, in *Anatomy*. See THENAR.

TENCH, in *Ichthyology*, the Engliſh name of the *tinca* of the modern authors, the *fullo* and *gnapheus* of the ancients.

It is, according to the Artedian and Linnæan ſyſtem, a ſpecies of the cyprinus, and is diſtinguiſhed by Artedi by the name of the blackiſh, mucous, or ſlimy cyprinus, with the end of the tail even. See *Tench* FISHING.

TEND, in our *Old Writers*, ſeems to ſignify as much as *tender* or offer; as to *tend* a traverſe, an averment, &c.

TENDER, in a *Legal Senſe*, ſignifies as much as to offer, or endeavour, the performance of any thing, in order to ſave the penalty, or forfeiture, incurred by non-performance.

Thus, to *tender* rent, is to offer it at the time and place when and where it ought to have been paid; which will ſave the condition of that time, though the landlord refuſe to accept it.

TENDER, in the *Sea Language*, is a veſſel attending on ſome other larger and more conſiderable one. It is employed in the king's ſervice on various occaſions; as to receive volunteers and impreſſed men, and to convey them to a diſtant place; to attend on ſhips of war or ſquadrons; and to carry intelligence or orders from one place to another, &c.

TENDERLING, a name given to the ſoft tops of deer's horns, when they begin to ſhoot forth.

TENDING, in *Sea Language*, denotes the movement by which a ſhip turns or ſwings round her anchor in a tide-way, at the beginning of the flood or ebb. Thus, if the flood ſets northerly, it is evident that the ſhip, unleſs when moored head and ſtern, will fall into the line of the current, turning her head to the ſouthward, and *vice verſa*. This tranſition from one ſituation to the other is called *tending* or ſwinging. Falconer.

TENDINOSUM *centrum*. See CENTRUM.

TENDON, *tendo*, in *Anatomy*, that hard, white, extreme part of a muſcle, whereby it is faſtened to the bone.

Moſt muſcles have, at leaſt, two *tendons*, one at each extreme: that faſtened to the part toward which the motion is to be performed, is called the *head of a muſcle*; and that faſtened to the part drawn toward the other, the *tail of the muſcle*.

The fibres, whereof the *tendons* conſiſt, have been ſuppoſed to be nervous; but they are now found to be no other than productions of the ſame fibres, which make the belly or body of the muſcle. All the difference between them is, that in the belly of the muſcle they are lax, and at a diſtance from each other; whereas, in the *tendon*, they are more cloſely and firmly connected.

Their whiteneſs proceeds wholly from the blood's being excluded, by the tightneſs of their contexture: in effect, there is the ſame difference between them, that there is between a ſkein of thread, and a cord made of the ſame thread.

The fibres of the *tendons* undergo no contraction, or dilatation, as thoſe of the belly of the muſcle do: they act as mere cords, to draw the parts towards each other; and by ſome late obſervations ſeem to be wholly inſenſible. See Med. Obſ. vol. iv. art. 27, 28.

TENDONS, *puncture of the*. See BLEEDING, and PUNCTURE.

TENDONS, *ſuture of*, in *Surgery*, is an operation performed, in order to join them when they have been cut aſunder.

When a *tendon* is wounded or divided, the part to which it belongs loſes its motion; but if it is divided only in part, the ſymptoms produced are much the ſame with thoſe ariſing from a nerve wounded in the ſame manner. The operation of joining the divided *tendons* by ſuture may be performed without much difficulty, when they are ſeated ſuperficially, or near the ſkin. The operation ſucceeds beſt when the wound is recent, or lately inflicted, but may be undertaken with ſucceſs on the ſecond, third, or fourth day after the accident. And though the difficulty is greater, when it has been ſo long neglected as to let the wound heal, yet even in this caſe it is practicable. In ſome caſes, however, a ſuture is impracticable, and in others unneceſſary. If a conſiderable part of a *tendon* is cut off or deſtroyed, or its parts recede much from each other, and lie concealed betwixt the adjacent muſcles, ſo that the two ends cannot be brought together, it will be in vain to attempt the operation. Nor can the ſuture of a *tendon* ſucceed well, if its ends are violently contuſed, as the conſequent inflammation, ſuppuration, and other malignant ſymptoms, will prevent their uniting and healing, and the ſymptoms be exaggerated by a ſuture. In this caſe it is beſt to wait till the inflammation and other forbidding ſymptoms are removed, and to promote a ſeparation of the unſound parts before the needle is uſed: beſides, ſome *tendons*, as thoſe of the extenſors in the back of the hand, may be generally united without ſuture, by bringing and retaining the divided ends to each other; the fingers being extended out a little backwards with bandage and compreſs. The divided *tendons* of the flexors and extenſors of the fingers and toes may be brought to unite by retaining them together with ſplints, compreſs, and bandage. But when a *tendon* is punctured, contuſed, or half divided, and convulſions, with other malignant ſymptoms, enſue; if they cannot be removed by proper remedies, as oil of turpentine, with a few drops of diſtilled oil of amber or lavender, it will then be neceſſary to make a total diviſion of them, and, when the ſymptoms ſubſide, to join them together again by ſuture.

The method of uniting divided *tendons* is as follows: the wounded member is to be inflected or extended, that the two extremities of the *tendon* may meet each other; but if the upper end of the *tendon*, attached to its muſcle, be contracted or drawn under the ſkin, ſo that it cannot be drawn down or entered by the needle, in that caſe an inciſion is to be made to take hold of it with the pliers, drawing it gently downwards. Garengeot, however, adviſes to draw down the *tendon* by paſſing a needle and waxed thread through it.

There are two methods of making the ſuture, either with one, or with two needles. The firſt method is by threading a ſmall, ſtraight, and common needle, either flat or round at the point, with ſlender but ſtrong double thread or ſilk, waxed, armed with a large knot at the end: this needle and thread are to be paſſed through a bit of leather up to the knot, that the knot may not eaſily ſlip through the *tendon*. The divided ends of the *tendons* being made to meet, the armed needle is to be paſſed through the middle of the upper end of the *tendon*, a little more than the tenth of an inch from the edge where it was divided; and applying a ſtitch quill or cannula to the oppoſite ſide of the *tendon*, the needle is to be entered from without towards the internal part, after which it is to be paſſed in like manner through the lower end of the ward; then placing a ſmall compreſs of linen, ſilk, or ſoft leather, either dry or ſpread with cerate, under the thread, as in the knotted ſuture, the thread is to be tied thereon with a ſingle knot, and then with another ſlip knot. After the wound has been cleanſed, it is to be dreſſed with balſ. capiv. or ſome other vulnerary balſam, applied warm with lint and compreſſes; faſtening under the whole a ferula, or a piece of ſtiff paſteboard, adapted to the form of the hand with compreſſes, to elevate the fingers; and concluding the operation with a proper bandage.

The kind of ſuture for *tendons* deſcribed by Dionis is the moſt ſimple; which is to paſs a convenient needle, furniſhed with a ſimple waxed thread, through the middle of the upper end of the divided *tendon* from without inwards, and then to paſs it through the other end from within outwards at one ſtitch: after which, the needle being removed, the thread is to be drawn ſo as to join together the two ends of the *tendon*, and then tied upon a round compreſs. But the preceding method, ſays Heiſter, is generally preferred. The other ſuture with two needles, was firſt deſcribed by Nucke; who directs that a thread of ſtrong and thick waxed ſilk is to be paſſed through the eyes of two ſlender and common needles, both which are to be paſſed inward through the upper part of the *tendon*, and outward through the lower end; but the two needles are paſſed through on each ſide the edge of each part of the *tendon*: then removing the needles, a knot is made with the thread upon a compreſs of leather, as before. When the ſuture is finiſhed,

ed, he ſprinkles *pulv. ex. tereb. coct.* and dreſſes the wound with *linimentum arcæi* or common digeſtive, and ſecures the parts from being diſplaced by compreſs, ſplints and bandage.

After the ſuture, the parts are to be firſt dreſſed with lint, dipped in *ol. tereb.* or *balſ. Capiv.* over which is to be applied a compreſs, dipped and expreſſed out of warm ſpirits of wine. The palm of the hand is to be expanded, and ſupported upon a ſtiff paſteboard, with compreſſes and bandage, and the whole arm is to be fomented with ſpirit of wine, or oxycrate, and wrapped up in linen cloths dipped therein. The parts are to be thus retained till the divided *tendon* appears to be united, which may be known by the looſeneſs of the retaining threads, which as well as the compreſs ſhould then be removed, and the hand ſuſtained in the paſteboard till the wound is healed with vulnerary balſams, or ſcraped lint. Heiſter's Surg. vol. ii. p. 335.

Tendo *Achillis*, in *Anatomy*, is ſometimes more peculiarly denominated *chorda Achillis*, and *chorda magna*, or the great *tendon*. See Achilles.

It is on the diſtance of the *chorda Achillis* from the point of ſupport, that the ſtrength of the foot depends. The farther this tendon is from the articulation, the ſtronger the part is found. Hence it is obſerved, that animals which run, or leap with the greateſt eaſe, are thoſe in which this *tendon* is fartheſt removed. And men with long heels are better able to walk than others; and ſtill the longer the foot, the more neceſſary is the length of the heel. Petit, in Mem. de l'Acad. R. des Scienc. 1722, p. 75.

The *tendo Achillis* is formed by an intimate union of the *tendons* of two muſcles; now if theſe two *tendons* are both broken, the rupture of the *tendon* is judged complete; if one only is torn, and the other remains whole, the caſe is then called an imperfect or incomplete rupture of that *tendon*.

There is a great difference between the complete and the incomplete ruptures of this *tendon*. The pain in the incomplete rupture is exceſſively great; whereas in the perfect one there is ſcarce any pain at all. When a *tendon* is wholly divided, the two ends draw back different ways, like the ſtring of a bow when cut, and this produces no pain, or any farther bad ſymptom, than the loſs of the *tendon*; which is ſo true, that, in order to take off the pain and other bad ſymptoms which attend the wounding, or imperfectly dividing a *tendon*, the beſt means is to cut it wholly aſunder.

The *tendo Achillis* is placed in a ſort of ſocket, where it plays freely every way, and has no connection or adherence with the adjacent parts; and hence a complete rupture of it is without pain. This, however, is not the caſe when only one of the two *tendons* which compoſe it is divided, for then the ſeparated ends of this retiring back as far as poſſible, cannot but violently affect the remaining entire *tendon*, which with them formed the *tendo Achillis*; and as the union of theſe two is very ſtrict, the pain ſucceeding the ſeparation of one, and the retraction of its ends, cannot but be propportionably violent and great.

The pain felt in the diviſion of one of theſe *tendons*, or the imperfect rupture of the *tendo Achillis*, is only perceived upwards or above the wound, not below it; the reaſon of which is, that the upper part of the divided *tendon* is forcibly drawn up by the muſcle by which it is contracted, while it is alſo drawn downward at the ſame time by the *tendon* to which it is intimately and firmly united, and which yet remains whole; and this contrary force muſt produce the moſt exquiſite pain in the fibres which reſiſt; while the inferior portion, having no force applied to it but what tends to draw it downwards, eaſily yields to that, and is in no condition to ſuffer a like pain. This difference between the ſenſation of the two extremities is, however, only to be felt at firſt; ſince, after ſome time, the inflammation ſpreading, affects the neighbouring parts, and the lower extremity muſt feel its ſhare; though even then the pain is much leſs acute in that portion than in the upper.

In caſe of a complete rupture of this *tendon*, the foot may be bent without cauſing any pain to the patient; the only effect is the increaſing the ſpace which is between the divided ends of the *tendon*: but the caſe is far otherwiſe in an imperfect rupture of this *tendon*; the foot then cannot be bent without the utmoſt pain and agony, becauſe the ſpace between the divided ends of the *tendon*, which muſt be enlarged by this bending, cannot be enlarged without a tearing, and violently forcing the imperfectly divided parts.

In the imperfect rupture of this *tendon*, the patient may walk, though it is with very violent pain; but in the perfect rupture, the perſon cannot walk, though he ſuffers no pain at all. In walking, at every ſtep that we take, the whole weight of the body is ſuſtained by the hinder foot; now the *tendo Achillis* is the only ſupport, by means of which the foot can ſuſtain that weight or regulate its preſſure; and therefore when that *tendon* can no more perform its office, we can no more walk. Theſe are the ſeveral ſymptoms by which the imperfect ruptures of this *tendon* may be known from the complete ones; a knowledge highly neceſſary to all who are to undertake their cure. Memoirs Acad. Par. 1728.

From the grievous ſympoms and excruciating pains that attend an imperfect rupture of this *tendon*, the ancients ſeem to have derived their notion, that wounds of the *tendo Achillis* muſt be mortal, or at leaſt highly dangerous; eſpecially as they had read or heard, that Achilles died of a wound in this part. If this *tendon* ſhould be imperfectly divided, and malignant ſymptoms intervene, they will diſappear upon cutting it quite through; and then it muſt be joined again by ſuture, which will not excite any of thoſe malignant ſymptoms. Inſtances have occurred of this *tendon* being conjoined, after diviſion, without ſuture. But if a ſuture be thought neceſſary, it may be performed much in the ſame manner with that of the *tendons* of the hand already deſcribed; except that the needle and thread are to be proportionably larger and ſtronger than for the ſmaller *tendons*. See Heiſter's Surgery, vol. ii. p. 339, &c.

Mr. Cowper (in the Philoſophical Tranſactions) gives us an account of a cure of the *great tendon*, or *tendon of Achilles*, above the heel, after an entire diviſion, by ſtitching.

Tendon, in the *Manege*, a ſort of griſtle that ſurrounds one part of a horſe's foot, and is ſeated between the hoof and the coffin-bone, near the coronet. When a horſe has a quitter-bone, the matter that gathers between the coffin-bone and the hoof, ſpoils the *tendon*, and makes it black; and the cure of ſuch a quitter-bone conſiſts in cutting and extirpating the *tendon*.

TENDRILL, a name given to the young ſhoots of the vine.

TENEBRÆ, *Darkneſs*, in the *Romiſh Church*, a ſervice performed on the Wedneſday, Thurſday, and Friday, before Eaſter, in commemoration of the agony of our Saviour in the garden; and the darkneſs that overſpread the earth, at the time of his crucifixion.

TENEBRIO, in *Zoology*, a genus of the *coleoptera* order of inſects, including thirty-three ſpecies. See *Stinking* Beetle.

TENEMENT, Tenancy, in *Law*, an houſe or lands, depending on a manor, or lordſhip; or a fee, or farm, held of a ſuperior lord, and which he may recall, when the term or condition is expired.

Tenement, *frank*, is any lands, houſe, office, or the like, wherein a man has eſtate for life, or in fee.

Tenement, *baſe*, is where a man holds lands, &c. at the will of the lord.

Yet Kitchin, Briton, &c. make *frank tenement* and *baſe tenement* oppoſites; on which footing, *frank tenement* ſhould be where the tenant is at liberty to quit it when he pleaſes.

TENEMENTARY *Lands*, among our anceſtors, were the outlands of manors, which the Saxon thanes, or nobles, let out to tenants under arbitrary rents and ſervices.

TENEMENTIS *Legatis*, in *Law*, a writ which lies in London, and other places, where the cuſtom is to deviſe *tenements* by laſt will as well as perſonal goods and chattels, for the hearing of any cauſe relating thereto.

TENENDUM, in *Law*, is a clauſe in a deed, wherein the tenure of the land is created and limited. The office of a *tenendum* is to limit and appoint the tenure of the land which is held, and how, and of whom it is to be held. The *tenendum* ſeems now to be incorporated with the *habendum*, for we ſay, to have and to hold, in which clauſe the eſtate is limited, &c.

TENENTES *nativi*. See Nativi.

TENENTIBUS *in aſſiſa non onerandis*, a writ which lies for him to whom a diſſeiſor has made over land, whereof he diſſeiſed another; requiring that he be not diſturbed in aſſize, for the damages awarded, if the diſſeiſor have wherewithal to ſatisfy them.

TENESMUS, Τεινεσμος, in *Medicine*, a continual painful inclination to go to ſtool, yet without voiding any thing; unleſs, ſometimes, a little purulent or bloody ſlime.

The word is formed from the Greek τεινειν, *tendere*, to *ſtretch*, *bend*; in regard thoſe attacked with this diſeaſe feel a continual tenſion in the fundament.

This diſorder is uſually attended with ſome tumor, ſometimes with a very conſiderable one in the part. This is properly no primary diſeaſe, but merely a ſymptomatic

tomatic one, and differs in degree according to the disease on which it is an attendant.

Signs of it. These are a titillation and itching about the anus, attended with a violent burning pain, and a desire of compressing and voiding something, and this attended usually either with no excrement, or only a pulpous and mucous matter, and very often a procidentia ani, or falling down of the rectum.

Persons subject to it. This disease very often happens to people labouring under hæmorrhoidal disorders, especially when the discharges attending them do not succeed regularly, though nature gives all the necessary motions for their excretion. It happens also to people who are subject to void an acrid and bilious matter by stool, and not unfrequently to those who have a stone in the bladder. Women in the latter part of their time, in going with child, have also very often terrible fits of it, attended with considerable swelling; this happens to them, from the pressure of the uterus, with its burden, upon the rectum and hæmorrhoidal veins. The procidentia ani happens also to all these subjects, and, beside these, is very familiar to infants, from their voiding an acrid matter by stool, and to all persons who are subject to great costiveness, and void their stools with great difficulty and pain; and finally, people who have paralytic weaknesses of the sphincter of the anus, incur this troublesome disorder after a time.

Causes of it. The causes of a *tenesmus*, beside those already mentioned, of suppressions of the hæmorrhoidal discharges, and voiding acrid matter by stool, are the ascarides, a small sort of worms which usually infest the rectum, and occasion a continual itching and tickling there; the abuse of resinous purging medicines; and, among these, the resinous parts of aloes, and black hellebore, are, above all, most subject to remain in the rectum, and bring on this complaint: much riding will also sometimes occasion it; and many people have been thrown into it by wiping their backside with paper in which pepper, ginger, or other hot and acrid things have been kept. The procidentia ani is owing usually to the same general causes, as also to the relaxation of the nervous and glandulous coat of the rectum, occasioned by long continued diarrhœas.

Those affected with the stone are also subject to the *tenesmus*, from the communication, or consent, between the bladder and the rectum.

Tenesmus, *prognostics in a.* When a hiccough comes on upon a person in a *tenesmus*, it is usually a bad omen; a violent *tenesmus* coming upon women with child, sometimes occasions them to miscarry. In the mildest symptoms of the falling down of the anus, which is a frequent attendant on a *tenesmus*, it is a very troublesome and painful disorder, especially when it continues some time, as it often does: and when there happens a tumor, and coldness in the part that is fallen, it very often becomes dangerous, threatening inflammation and mortification. In common cases, and where the distemperature has not before been frequent, the reducing the intestine to its place is usually an easy thing; but when there is any thing paralytic in the origin it is more difficult both to restore it, and to prevent relapses.

Method of cure. As the *tenesmus*, is merely a symptomatic disease, the primary disorder is to be examined, and treated, in order to a cure. Thus, when it is occasioned by ascarides, worm-medicines are to be given, and clysters of a proper kind injected, such as decoctions of tanzy, worm-wood, and myrrh: when the worms are by this means destroyed, the *tenesmus*, which was no more than a symptom, naturally ceases. In cases where it is caused by a flux of bilious matter by stool, or by a retention of the hæmorrhoidal discharges, it will be proper to give medicines to obtund the acrimony of the humours, and take off the spastic motions occasioned by them. To this purpose powders of nitre, crabs-eyes, and cinnabar, are to be given, and jellies of hartshorn, and the like, with gum-arabic, tragacanth, and such other agglutinants. The vapours of turpentine, and of the carminative seeds, received on the part, are also of great benefit; and hot fomentations of decoctions of the herbs of marshmallows and pellitory, and chamomile flowers. These ingredients may also be applied as a cataplasm; for beyond all things, external heat is of the most immediate service. The sitting over the steam of hot water is a very good thing, and the rubbing the part with an ointment made of mucilage of quince-seeds, with oil of mullin, and the yolk of an egg. In cases where there is a procidentia ani, the gut is to be replaced as soon as possible; the person is, to this end, to be laid upon his belly, and a moderate force to be used in putting it back, the fingers being first rubbed over with oil of sweet almonds, before they touch the gut. If this is not to be done at the first attempt, the patient must be suffered to lie down again in a natural posture, and spunges wetted with astringent decoctions, are to be applied to the part; powder of mastich, with a very small quantity of alum among it, is also useful to be sprinkled on the gut on this occasion. The sitting upon a bag of oatmeal, boiled to the consistence of pap, and sprinkled over with a small quantity of alum, is also a very good method. And so long as the intestine remains out of its place, it must be carefully kept warm, for fear of a mortification. If there is an inflammation attending it, this must be first carefully discussed by epithems of scordium, sage, chamomile, and rose and elder-flowers; and, after this, the usual methods of attempting a reduction are to be employed. And finally, when the sphincter has a paralytic weakness, the ordinary methods are to be assisted by bandages, to prevent its return; but in a case of this kind, all that is to be done, is simply palliative, since the cure is not to be expected. In cases where the *tenesmus* is owing to bilious stools, or to the suppressions of the hæmorrhoidal discharges, the patients are carefully to abstain from all medicines in which aloes is an ingredient, as the elixir proprietatis, and the like.

In cases of the *tenesmus* from the pressure of the womb in women with child, there is no cure but delivery; but the methods before proposed will palliate and give ease. When milk is given in clysters, in these cases, there must be great care taken that it is perfectly fresh, not the least turned sour. If there be a colic attendant on the *tenesmus*, provided that it be not a bilious one, it is always proper to inject clysters with a small quantity of common salt, to absterge the mucous humours; and when powders of the astringent kind are used, they must always be extremely fine, lest their particles, sticking to the inner coats of the intestine, should increase, instead of mitigating the disease. Alum must be added, but in very small quantities, to these powders, lest it astringe too violently, and by that means prevent instead of forwarding the reduction of the part. Hartman commends the beetles found in horse-dung, dried and powdered, as a very powerful remedy in all cases of this kind. Junk. Consp. Med. p. 583, seq.

The cure of a *tenesmus* depends on proper evacuations and astringents, the former always preceding the latter; such are bleeding, if plethoric; and gentle cathartics, especially of the powder of rhubarb, &c.—An emetic of the Indian root *ipecacuanha* has been found of great service in a long standing *tenesmus*; for the augmenting one evacuation, is the lessening of another; and, in this particular, becomes so much the more serviceable, as they happen to be contraries.

The restringents are such as are of use in other fluxes.

TENET, a particular opinion, dogma, or doctrine, professedly held by some divine, philosopher, &c.

The distinguishing *tenets* of the several sects in religion, and philosophy, see under the names of the sects themselves.

TENGA, in *Botany*, a name by which some authors have called the coco-nut-tree, or palma Indica nucifera of other writers.

TENIA. See Tænia.

TENMENTALE, or Tenmantale, in *our Ancient Customs*, originally signifies the number of ten men; which number, in the time of the English Saxons, was called a decennary; and ten decennaries made what we call an hundred.

These ten men were bound for each other to preserve the public peace; and if any of them was found guilty of a breach thereof, the other nine were either to make satisfaction, or to bring the criminal before the king.

Tenmentale was also used for a duty, or tribute, paid to the king, consisting of two shillings for each plough-land; probably thus called, because each person of the decennary was bound to see it paid.

TENNE', Tenny, or Tawny, in *Heraldry*, a bright colour, made of red and yellow mixed; sometimes also called *brusk*, and expressed in engraving by diagonal lines drawn from the dexter to the sinister side of the shield, traversed by perpendicular lines from the chief; and marked with the letter T.

In the coats of all below the degree of nobles, it is called *tenny*; but, in those of nobles, it is called *hyacinth*; and, in princes coats, the *dragon's head*.

TENON, in *Building*, &c. the square end of a piece of wood, or metal, diminished by one-third of its thickness, to be received into a hole in another piece, called the *mortise*, for the jointing or fastening the two together. Among joiners, &c. the *tenon* is made in various forms, square, dove-tailed, for double mortises, &c.

Vitruvius calls the *tenons*, *cardines*; dove-tail'd *tenons* he calls *subscudes*, or *securiculæ*.

Tenon-*saw*. See Saw.

TENOR, Tenour, the purport, or contents, or transcript, of a writing, or instrument, in law, &c.

Warrants issued for the confirmation of sentences, express, that they shall be executed according to their form, and *tenor.*—It was impossible to retain so long a speech word for word, but the substance, or the *tenor*, is this.

Tenor, Tenore, in *Music*, the first mean or middle part, or that which is the ordinary pitch, or *tenor*, of the voice, when not either raised to the treble, or lowered to the bass.

The *tenor* is frequently marked, in thorough-basses, with the letter T.—The *tenor* is a part which almost all grown persons can sing. But as some have a greater compass of voice upwards, others downwards; others are confined to a kind of medium; and others can go equally either higher or lower; hence the French musicians make a variety of *tenors*,—as, a *counter-tenor*, a *mean-tenor*, a *natural-tenor*, and an *upper-tenor*: to which is also added, a *re-acting tenor*, *viol tenor*, *violin tenor*, &c. The Italians usually distinguish no more than two kinds of *tenors*, viz. *tenore primo*, or 1° or I°, which answers to our *upper tenor*; and *tenore secundo*, or 2° or II°, which is our *natural tenor*; confounding the *counter-tenors*, &c. under the name *baritono*.

Tenor, or Tenorista, is also used for a person who sings the *tenor*-part in concert; and also for any instrument proper to play it.

TENORE *Indictamenti mittendo* is a writ whereby the record of an indictment, and the process thereupon, is called out of another court into the king's bench.

TENOUR. See Tenor.

TENSE, Time, in *Grammar*, an inflexion of verbs, whereby they are made to signify, or distinguish, the circumstance of time of the thing they affirm, or attribute.

The affirmations made by verbs are different as to point of time; since we may affirm a thing *is*, or *was*, or *will be*: hence, a necessity of a set of inflexions, to denote those several times; which inflexions our English grammarians call by a barbarous word *tenses*; from the French *temps*; most other languages call them simply *times*.

There are but three simple *tenses*: the *present*, as *I love*, *amo*; the *preter*, *preterit*, or *past*, as, *I have loved*, *amavi*; and the *future*, as, *I will love*, *amabo*.

But, in regard that in the *preter-tense* one may either express the thing as just done or past, or indefinitely and barely that it was done: hence, in most languages, arise two kinds of *preterits*; the one *definitive*, marking the thing to be precisely done; as, *I have written*, *I have said*: and the other *indefinite*, or *aorist*, denoting a thing done indeterminately; as, *I wrote*, *I went*.

The future *tense* admits also of the same variety.

Besides the three simple *tenses*, others have been invented, called *compound tenses*; expressing the relation of the simple ones to each other.—The first expresses the relation of the *past* to the *present*, and is called the *preter-imperfect tense*, because it does not mark the thing simply and properly, as done, but as imperfect, and present with respect to another thing past; as, *I was at supper when he entered*; *Cum intravit*, *cœnabam.*

The second compound *tense* marks the time past doubly, and is therefore called, the *plusquamperfect tense*; as, *I had supped*, *cœnaveram.*

The third compound *tense* denotes the future with respect to the past; as *I shall have supped*, *cœnavero.*

The several *tenses*, or times, it is to be observed, are properly denoted in the Greek and Latin by particular inflexions; in the English, French, and other modern tongues, the auxiliary verbs *to be*, and *to have*, *être*, and *avoir*, are called in. As to the Oriental languages, they have only two simple *tenses*, the *past*, and *future*, without any distinctions of imperfect, more than perfect, &c. but this renders those languages subject to abundance of ambiguities, which others are free from.

The ingenious Mr. Harris, in his Hermes, p. 119, &c. proposes the following theory of *tenses*. The *tenses*, he says, are used to mark present, past and future time, either indefinitely without reference to any beginning, middle or end; or else definitely, in reference to such distinctions. If indefinitely, then we have three *tenses*, an aorist of the present, an aorist of the past, and an aorist of the future. If definitely, then we have three *tenses* to mark the beginnings of these three times; three to denote their middle; and three to denote their ends; in all nine. The three first of these *tenses* he calls the inceptive present, the inceptive past, and the inceptive future. The three next, the middle present, the middle past, and the middle future. And the three last, the completive present, the completive past, and the completive future. Thus the *tenses* in their natural number appear to be twelve; three to denote time absolute, and nine to denote it under its respective distinctions. The following examples will illustrate the application and use of each *tense*. Aorist of the present, γραφω, *scribo*, *I write*: aorist of the past, ἔγραψα, *scripsi*, *I wrote*: aorist of the future, γράψω, *scribam*, *I shall write*. Inceptive present, μέλλω γράφειν, *scripturus sum*, *I am going to write*: middle or extended present, τυγχάνω γράφων, *scribo* or *scribens sum*, *I am writing*: completive present, γέγραφα, *scripli*, *I have written*. Inceptive past, ἔμελλεν γράφειν, *scripturus eram*, *I was beginning to write*: middle or extended past, ἔγραφον or ἐτυγχανον γράφων, *scribebam*, *I was writing*: completive past, ἐγεγράφειν, *scripseram*, *I had done writing*. Inceptive future, μελλήσω γράφειν, *scripturus ero*, *I shall be beginning to write*: middle or extended future, ἔσομαι γράφων, *scribens ero*, *I shall be writing*: completive future, *scripsero*, *I shall have done writing*. The author has particularly shewn what traces are discoverable in favour of this system, either in languages themselves, or in those authors who have written upon this part of grammar, or in the nature and reason of things. Dr. Ward enumerates seven *tenses*, viz. the present, past, and future imperfect; the past indefinite; the present, past, and future imperfect. See his Four Essays upon the English Language, p. 84.

TENSION, Tensio, the state of a thing bent, or the effort made to bend it.

Animals only sustain and move themselves by the *tension* of their muscles and nerves. A chord, or string, gives an acuter or deeper sound, as it is in a greater or less degree of *tension*.

Tension, *Tensio*, Τασις, in the *Ancient Music*, was used to signify any pitch of sound, whether produced by intension or remission. Vide Aristoxen. p. 10, 13. edit. Meibom.

Aristoxenus observes, there are five things to be considered about sounds, *viz.* τασις, tension; ἐπιτασις, intention; ἀνεσις, remission; οξυτης, acumen; and βαρυτης, gravitas.

TENSOR, in *Anatomy*, see Extensor.

Tensor *Tympani*, in *Anatomy*, a name given by Albinus to one of the muscles of the ear, called by Cowper, *internus auris*, and by others, *internus mallei*.

TENT, Tabernacle, a pavilion, or portable lodge, under which to shelter in the open field, from the injuries of the weather. See Tabernacle.

The word is formed from the Latin *tentorium*, of *tendo*, *I stretch*; in regard *tents* are usually made of canvas, stretched out, and sustained by poles, with cords and pegs.

Armies encamp under *tents*: these are made of canvas, and are of various sizes. A captain's tent and marquee is generally 10½ feet broad, fourteen deep, and nine high; those of the subalterns are a foot less; the major's and lieutenant colonel's a foot larger; and the colonel's two feet larger. The subalterns of foot lie two in a *tent*, and those of the horse one. The *tents* of private men are 6½ feet square, and five feet high, and accomodate five soldiers. The *tents* for the horse are seven feet broad, and nine feet deep; they hold five men, and their horse-accoutrements.

Tents, *bell*, are so called from their resemblance to a bell, and serve to shelter the fire-arms from rain.

To *pitch* the *tents*, is to fix them up ready for habitation, by the assistance of a ridge-pole, two standards, and a number of *tent*-pins.

Most of the Tartars and Arabs are wandering people, that always lodge under *tents*.

The Hebrews lodged forty years under *tents* in the desart; which gave occasion to the scenopegia, or feast of tabernacles.

Tent, *dark*. See Dark.

Tent, Turunda, in *Surgery*, is a roll of lint, made in a particular form, in the shape of a nail, with a broad flat head, and put into wounds whose suppuration is not perfect, and where there is a quantity of matter contained in the tumor, more than what comes out at the first dressing.

They are chiefly used in deep wounds and ulcers, and are of service. 1. To convey medicines to the inmost recesses and sinuses of the wound. 2. To prevent the lips of the wound from uniting before it is healed from the bottom. And 3. By their assistance grumous blood, sordes, and other foulnesses, are readily evacuated.

They are to be made extremely soft, that the cure of the wound may not be retarded, by the pain they would otherwise bring on; but, that the wound may not be kept open too long, it is adviseable, as soon as the part is sufficiently cleansed, and the sinuses are found to heal up, to lessen the sizes of the *tents* by degrees, and, as soon as safely and conveniently may be, to leave them entirely off.

Many ſurgeons of great note have entirely forbid the uſe of *tents*, from the frequent obſervation of the ill effects ariſing from the ſurgeon's neglecting, or not knowing theſe neceſſary cautions.

There are, however, beſide theſe *tents* of ſcraped lint, another kind, made of linen rags not ſcraped, worked up into a conical form, to the baſis of which is faſtened a ſtrong thread; the apex of it muſt be a little unravelled, to make it ſofter, that it may not become painful. The thread is faſtened to the baſis, that it may be recovered with the greater eaſe, if by any accident it ſhould be forced into the cavity of the thorax or abdomen; for theſe ſorts of *tents* are chiefly uſed to keep open wounds that penetrate into the thorax or abdomen; in order to make way for the proper diſcharge of blood, matter, &c. by the mouth of the wounds.

There is a third ſort of *tents*, whoſe office is not only to keep open, but to enlarge by degrees, the mouth of any wound, or ulcer, which ſhall be thought too ſtrait, by which means a freer paſſage may be procured for the blood or matter that was confined; and that the proper medicines may find a more ready admittance.

Theſe *tents* are uſually called *ſponge-tents*, and are made either of ſponge, or of the roots of gentian, calamus aromaticus, &c. for theſe kinds of things imbibe the matter that flows to them, and being enlarged, by that means, dilate the lips of the wound. Heiſter's Surg. Introd. p. 19.

Several chirurgical writers, and particularly the author of the *Hoſpital-Surgeon*, give us numerous inſtances wherein the uſe, eſpecially of hard *tents*, has proved prejudicial in protracting the cure; bringing on inflammations, ſinuſes, mortifications, &c. in wounds and ulcers.—To remedy this, he propoſes, that the liniments, &c. be made of a liquid conſiſtence, either naturally; or by warming them; and that where *tents* may ſeem indiſpenſably neceſſary, as in large cavities, the orifice may be enlarged, and ſoft doſſils put inſtead of them; which will prevent the miſchiefs commonly attending *tents*.

TENTATIVE is ſometimes uſed adjectively: thus we ſay, a *tentative method*, meaning a kind of unartful or indirect method, which only proceeds by trying.

Tentative is alſo uſed ſubſtantively, for an eſſay, or effort, whereby we try our ſtrength, or ſound an affair, &c. to ſee whether or no it will ſucceed.

In the French univerſities Tentative is the firſt theſis, or act, which a ſtudent in the theology-ſchool holds, to ſhew his capacity: if he anſwers well in this, the degree of bachelor is conferred on him.

TENTER, Trier, or Prover, a machine uſed in the cloth manufactory, to ſtretch out the pieces of cloth, ſtuff, &c. or only to make them even, and ſet them ſquare.

It is uſually about four feet and an half high, and, for length, exceeds that of the longeſt piece of cloth.—It conſiſts of ſeveral long, ſquare pieces of wood, placed like thoſe which form the barriers of a manege; ſo, however, as that the lower croſs-pieces of wood may be raiſed or lowered, as is found requiſite, to be fixed at any height, by means of pins.—Along the croſs-pieces, both the upper and under one, are hooked nails, called *tenter-hooks*, driven in from ſpace to ſpace.

To put a piece of cloth on the Tenter: while the piece is yet quite wet, one end is faſtened to one of the ends of the *tenter*; then it is pulled by force of arms towards the other end, to bring it to the length required: that other end being faſtened, the upper liſt is hooked on to the upper croſs-piece, and the loweſt liſt to the loweſt croſs-piece, which is afterwards lowered by force, till the piece have its deſired breadth.—Being thus well ſtretched, both as to length and breadth, they bruſh it with a ſtiff hair bruſh, and thus let it dry.—Then they take it off; and, till they wet it again, it will retain the length and breadth the *tenter* gave it.

Tenth, in *Engliſh Hiſtory*, ſee Land-*tax*. *Tenths* are ſaid to have been firſt granted under Henry II. who took advantage of the faſhionable zeal for croiſades to introduce this new taxation, in order to defray the expence of a pious expedition to Paleſtine, which he really or ſeemingly had projected againſt Saladine, emperor of the Saracens; whence it was originally denominated the Saladine *tenth*. But afterwards fifteenths were more uſually granted than tenths.

Tenth, *decima*. See First-*fruits* and Tithe.

Tenth *pair of nerves*. See Nerve.

TENTHREDO, in *Natural Hiſtory*, the name of a fly of the ſtinging kind. It is of the ſize and ſhape of the bee, but of the colour of the waſp. It loves to be among meat, as in kitchens and larders; it is a very gregarious animal, but makes no honey, though whole ſwarms live together.

The *tenthredo*, in the Linnæan ſyſtem, is a genus of the *hymenoptera* order of inſects. Its characters are, that the mouth has maxillæ without a proboſcis; the wings are plane and tumid; the ſting conſiſts of two laminæ, that are ferrated, and a little prominent; and the ſcutellum is formed of two grain-like bodies ſeparate from each other. Linnæus enumerates fifty-five ſpecies, diſtinguiſhed by the form of their antennæ.

Tenths, *office of*, is kept in the Temple, under the direction of a receiver and his clerks.

TENTORES, among the *Romans*, were perſons appointed to hold the cloaths of the charioteers that contended in the circus.

TENUIROSTRÆ, in *Ornithology*, the name of a genus of ſmall birds, which feed on inſects, and have ſlender and ſharp beaks; of this genus are the lark, ſwallow, red-breaſt, and a number of others. Ray's Ornithology, p. 148.

TENURE, Tenura, in *Law*, the manner or condition wherein a tenant holds lands, or tenements, of his lord; or the ſervices performed to the lord, in conſideration of the uſe and occupancy of his lands.

The kinds of ſervice, and, conſequently, of *tenures*, are almoſt infinite. See Service.

Thoſe for lands held of the king, are either *great*, or *petty ſergeanty, in capite, knight's-ſervice*, &c.

Thoſe held of the lords were very various, *baſe, frank*, &c. by *homage, ſocage*, &c. See Base, Frank, &c.

The common tenures, at this day, are fee-ſimple, fee-tail, by courteſy, in dower, for life, or for years, or by copy of court-roll.

Tenure, *barons by ancient*. See Baron.

Tenure, *diſturbance of*, in *Law*, is a ſpecies of injury which conſiſts in breaking that connection, which ſubſiſts between the lord and his tenant, and to which the law pays ſo high a regard, that it will not ſuffer it to be wantonly diſſolved by the act of a third perſon. If, therefore, there be a tenant at will of any lands or tenements, and a ſtranger either by menaces and threats, or by unlawful diſtreſſes, or by fraud and circumvention, or other means, contrives to drive him away, or inveigle him to leave his tenancy, this the law very juſtly conſtrues to be a wrong and injury to the lord; and gives him a reparation in damages againſt the offender by a ſpecial action on the caſe. Blackſt. Com. vol. iii. p. 242.

TEPAPA. See Taroataihetoomo.

TEPETOTOTL, in *Ornithology*, the name of a Braſilian bird, of the gallinaceous kind, more uſually called mituporanga.

TEPHRIA, in the *Natural Hiſtory of the Ancients*, a name given to the grey ophites.

TEPHROMANTIA, τεφρομαντεια, in *Antiquity*, a ſpecies of divination, performed with aſhes; for which ſee Potter, Archæol. Græc. t. i. p. 353.

TEPID, in *Natural Hiſtory*, a term uſed by writers on mineral waters, to expreſs ſuch of them as have a leſs ſenſible cold than common water.

They diſtinguiſh all the medicinal ſprings into three kinds; the hot, the *tepid*, and the cold; but the middle term might eaſily be miſunderſtood to mean a great deal more than they expreſs by it; all that have what can be called the leaſt ſenſible warmth, are called *hot*; and the *tepid* are diſtinguiſhed from the abſolutely cold, only by their being leſs cold.

Some of this claſs of mineral waters, and ſome few alſo of the cold ones, have a ſharpiſh vinous taſte, which is never obſerved in any of the hot ones. This taſte is loſt on giving the waters the ſlighteſt heat, and is therefore very difficult to be gueſſed at as to its origin. It is not only found in the aluminous and vitriolate waters, but alſo in thoſe which are manifeſtly nitrous, and which abound in ſulphureous ſalts, quite different in their nature from acids. It is therefore an additional ſomewhat, quite diſtinct from the ſaline properties of the fluid, and as eaſily connected with one kind of that as with the others.

The cauſe of heat in the mineral waters remains yet wholly unknown, notwithſtanding all that has been written concerning it. It is hard to believe, that there are continual ſubterranean fires near enough the ſurface, to give a heat that preſerves itſelf in ſo great a degree to the very place of their eruptions; and it is equally hard to conceive, that there can be beds of fermenting mineral matters, ſufficient in quantity and force to have given the ſame degree of heat to waters for ſo many ages, as ſome of our hot ſprings are known to have ſubſiſted. Duclos's Exam. des Eaux Miner.

TEPIDARIUM, among the Romans, a *tepid*, or blood-warm bath, which was joined to the cold and hot baths, and was a medium between the two; ſo that if any perſon wanted to go from the hot to the cold bath, or *vice verſa*, he always took the *tepid* bath in his way.

TERATOSCOPIA, formed of τερας, *prodigy*, and σκοπεω, *I consider*, a kind of divination by the appearance and view of monsters, prodigies, spectres, and phantoms.

TERBEDH, in the *Materia Medica*, a name given by Avicenna to the *turbith*, a purging drug, mentioned by all the authors of his time; but, in general, in a very confused manner.

Garcias tells us, that the Indians use it to purge phlegm, and that they add ginger to it by way of corrective; and Avicenna says the same thing of its use in his time.

TERDINA, in the *Materia Medica*, a name by which Paracelsus, and some other authors, have called the *great garden-valerian*. Ger. Emac. Ind. 2.

TEREBELLA, in the Linnæan system of *Natural History*, a genus of the *mollusca* order of worms. Its characters are: that the body is filiform, and from the mouth issues a tubulose gland; and the tentacula about it are numerous and capillary. There is one species, found in the clefts of the rocks in the Mediterranean sea.

TEREBINTHUS, in *Botany*. See MASTICH-*tree*.

TEREBINTHINA, in *Medicine*, *Natural History*, &c. See TURPENTINE.

TEREBOTIN, a word used by Paracelsus for the common turpentine.

TEBEBRA, the name of a chirurgical instrument, used for the perforation of bones, or for the extracting of bullets, or other the like extraneous bodies, out of wounds. See TREPAN.

TEREBRATULA, in *Natural History*, a name given by Mr. Lhuyd and Gualtieri to some species of the smooth conchæ anomiæ, which have near the head of the shell a small hole, which looks as if bored by art. See CONCHÆ *anomiæ* and SHELLS.

TEREDO, a name given by naturalists, to a species of sea-worm, which eats its way into the bottoms of ships, lining the hole it makes with a kind of shelly matter.

In the Linnæan system, the *teredo* is a genus of the *testacea* order of worms, the animal of which is a *terebella*; the two maxillæ are calcareous, hemispherical, cut off before, and angulated below; the shell is round, bending, and capable of penetrating wood. There is one species, called by Linnæus *calamitas navium*.

The head of this creature is well prepared by nature for the hard offices it is to undergo, being coated with a strong armour, and furnished with a mouth like that of the leech; by which it pierces wood; as that animal does the skin; a little above this it has two horns which seem a kind of continuation of the shell; the neck is as strongly provided for the service of the creature as the head, being furnished with several strong muscles; the rest of the body is only covered by a very thin and transparent skin, through which the motion of the intestines is plainly seen by the naked eye; and by means of the microscope, several other very remarkable particulars become visible there.

This creature is wonderfully minute, when newly excluded from the egg, and at its utmost bigness is a foot long; three or four inches are however its more frequent length.

When the bottom of a vessel, or any other piece of wood constantly under water, is inhabited and injured by ever so great a number of these worms, there is no sign of the damage to be perceived on the surface, nor are the creatures visible till the outer part of the wood is cut or broken away; then their shelly habitations come in sight: these lie so near the surface, however, as to have an easy communication with the water, and there are a multitude of little perforations in the very surface through which the inhabitant-insects throw out the extremities of their little shelly horns; these are of a reddish colour, and may be distinguished by an accurate observer in form of so many red prominent points; they all are retracted on the least touch, and are thrown out again as soon as all is quiet. From these points, or the small apertures which give them a way out, are the cells of the *teredines* to be traced. They are composed of a pearly or shelly matter, which forms a long tube with various windings and turnings, which marks the abode of the creature; but which usually neither adheres to the body of the animal, nor to the wood. These cases or tubes are always more or less loose in the wood, and there is ever a large space within them, for the body of the animal to be surrounded every way with water. They are very smooth on the inner surface, and somewhat rougher without; and are much harder and firmer in the cells of the older and larger animals than in those of the young ones.

These shelly tubes are composed of several rings, or annular parts; but these differ greatly in their length. There is an evident care in these creatures, never to injure one another's habitations; by this means each tubule or case is preserved entire, and in such pieces of wood as have been found eaten by them into a sort of honeycomb, there never is seen a passage or communication between any two of the tubules, though the woody matter between them often is not thicker than a piece of writing-paper.

The vast increase of these animals, and their shelly tubules, naturally lead to a consideration of the manner of their generation; and when we consider that each of these creatures is, from the time when it is produced from the egg, immediately lodged in a cell, in which it lives without the least possibility of getting into that of another animal of its own kind, or receiving one of them into its own, it is not easy to account for the propagation of the species in the common way. This, however, is solved by an accurate anatomical observation of the animals themselves, since in every individual the parts of generation of both sexes, and both the semen and ovula are found. Each individual therefore evidently serves by itself for the propagation of the species; and this is probably very often the case in earthworms, and other of the hermaphrodite animals. All the yet known kinds of these being soft-bodied; and probably, though they often meet one another, and copulate in pairs, yet when they have not opportunity, the parts copulate in the individual.

Eggs are found in great plenty in the bodies of these animals in June, and are discharged with the water into the sea, where the far greater part of them, doubtless, become food for other small marine animals; and the few that affix themselves to any piece of wood they are washed against, hatch and get into its substance in the manner of their parents.

The kind of wood in which these worms are lodged, makes a great difference in the appearance of their cells, as they work much more speedily and successfully in some kinds than in others. The fir and alder are the two kinds they seem to eat with the greatest ease, and in which they grow to the greatest size. In the oak they seem to make but a very slow progress, and usually appear very small and poorly nourished. The colour of their shelly tubules is often brown in this wood; which seems plainly owing to the effect of its juices.

Poisonous ointments are also found to be of some use in destroying them, on rubbing over the wood; some have thought that burning the surface was an effectual way of preserving them, but this has been found to be otherwise. The surest method of avoiding them in particular works, is the using bitter or very solid woods; the first kind they are found never to touch, and in the other they make but slow progress. Mixtures of lime, sulphur, and colocynth, with pitch, for covering over the surfaces of boards, &c. have been found of some use.

It seems very evident, that boards and other pieces of wood have been subject to be eaten by these animals, from all times that we have any knowledge of; for the stone called *lapis syringoides* is evidently no other than wood thus eaten, petrified by long lying in the earth, together with the tubules of the worms. The masses of this with the grain of wood yet plain in them, are common in many places among sea-shells, and other marine remains at great depths, and have evidently been brought thither in very distant times, and before those changes were made in the surface of the earth of which we have no accounts in our earliest histories. Sellii Hist. Natur. *Teredinis*.

TERENJABIN, in the *Materia Medica* of the ancient Arabians, a word used to express a kind of manna called by some *manna mastichina*, from its round globules resembling the drops of mastic, and by the physicians of many parts of the world at present MANNA *Persicum*. See farther about this drug in Philos. Trans. N° 472.

TERES, in *Anatomy*, a name given to two muscles of the arms, called also *rotundi*; distinguished by *major* and *minor*.

TERES, or *rotundus major*, arises from the lower angle of the basis of the scapula, and, ascending obliquely upwards, in a round, smooth body, under the head of the longus, is inserted, with a short flat tendon, below the os humeri. See *Tab. Anat. (Myol.) fig. 1. n. 40.*

The *teres major*, by being inserted in the os humeri in a direction parallel to the LATISSIMUS *dorsi*, becomes a congener to the superior and posterior portion of that muscle, and accordingly moves the os humeri in the same manner with it. It turns the bone around its axis, when the fore-arm is carried behind the back. It likewise pulls the arm directly backward, without moving it round its axis; for which purpose this muscle, as well as the latissimus dorsi, needs the assistance of other antagonist muscles, and particularly of the *teres minor*. The tendons of the *teres major* and latissimus dorsi are very near each other; being both inserted, according to their breadth, in the same line, along the edge of the bony channel of the os humeri, opposite to the intersection of the PECTORALIS *major* in the other edge of the same channel.

channel. These two tendons cross each other in the same plane, so that the *teres major* may become a particular antagonist to the superior portion of the pectoralis major, and the latissimus dorsi to the inferior portion; and both muscles, taken together, may be a common antagonist to the pectoralis major, when that whole muscle acts at the same time. The *teres major* may likewise move the scapula on the os humeri, by drawing the inferior angle downward, and bringing it nearer the arm; but in order to this, the arm must be kept immoveable by some considerable force. By this action it may likewise assist in raising the shoulder, or in preventing its sinking. Winslow.

The TERES, or *rotundus minor*, called also *transversalis*, is frequently wanting, or at least, is so confounded with the infraspinatus, that it is lost therein. It arises from the inferior angle of the scapula, and, ascending obliquely in a round fleshy body, passes over the upper head of the former; and is inserted by a short, flat tendon, below the os humeri.

This muscle may turn the arm, when depressed, round its axis, from before outward; as it happens when the fore-arm being bent, and applied to the fore-part of the breast, is removed from thence, without moving the elbow from the side. This rotation is in a contrary direction to that performed by the subscapularis and *teres major*. It may also pull the arm directly backward, whether raised or depressed; the subscapularis acting at the same time as a moderator to prevent the rotation. Winslow.

TERES *folium*. See LEAF.

TERES *pronator radii*. See PRONATOR.

TERETRON, the name of a chirurgical instrument, more usually called TEREBRA.

TERFEZ, in *Natural History*, the name given by the Africans to the truffles found in the desarts of Numidia, and other places in that part of the world, in great abundance.

These are much more delicately tasted than the European truffles, and are white on the outside. They are called by some of the Africans *kema*, and by the Arabian writers *cantha* and *camahe*.

TERGIFŒTOUS *plants*, such as bear their seeds on the backsides of their leaves. Such are the capillaries. See CAPILLARY.

TERM, TERMINUS, the extreme of any thing, or that which bounds and limits its extent. See EXTREME.

TERM, in *Geometry*, is sometimes used for a point, sometimes for a line, &c. A line is the *term* of a superficies, and a superficies of a solid.

This is what the schools call *terminus quantitatis*.

TERM, in *Law*, signifies a boundary, or limitation of time, or estate.

In this sense we say, a lease for *term* of life, for *term* of years, &c.

TERMS, TERMES, TERMINI, in *Architecture*, denote a kind of statues, or columns, adorned a-top with the figure of a man's, woman's, or satyr's head, as a capital; and the lower part ending in a kind of sheath, or scabbard. See HERMES, and *Tab. Archit. fig.* 39.

Some write the word *thermes*, from *Hermes*, a name the Greeks gave the god Mercury; whose statue, made after this manner, was placed in several of the cross ways in the city of Athens, &c. Others bring the etymology of the word from the Roman god *Terminus*, the protector of land-marks; whose statue (made without hands or feet, that he might not change his place) was used to be planted at the bounds of lands, to separate them.

Terms are sometimes used as consoles, and sustain entablatures; and sometimes, as statues, to adorn gardens.

Of these *termini* the architects make great variety; viz. *angelic, rustic, marine, double*, in *bust*, &c.

TERMS, *military, termini miliares*, among the ancient Greeks, were the heads of certain divinities, placed on square land-marks of stone, or on a kind of sheath, to mark the several stadia, &c. in the roads. These are what Plautus calls *lares viales*.

The were usually dedicated to Mercury, whom the Greeks believed to preside over the highways.

Some of them were represented with four heads, such as we still see in Rome, at the end of the Fabrician bridge; which is hence called, *ponte de quattro capi*. It is known, that Mercury was thus represented, and also called by the Latins *Mercurius quadrifrons*; as being supposed the first who invented the use of letters, music, wrestling, and geometry. See HERMES.

TERMS are also used for the several times or seasons of the year, wherein the tribunals, or courts of judicature, are open to all who think fit to complain of wrong, or to seek their rights by due course of law, or action; and during which the courts in Westminster-hall sit and give judgment. But the high court of parliament, the chancery, and inferior courts do not observe the *terms*; only the courts of King's-bench, Common Pleas, and Exchequer, which are the highest courts at common law. In contradistinction to these, the rest of the year is called *vacation*.

Of these *terms* there are four in every year, during which time matters of justice are dispatched.

Hilary-term, which, at London, begins the twenty-third day of January, or if that be Sunday, the next day after; and ends the twelfth of February following.

Easter-term, which begins the Wednesday fortnight after Easter-day, and ends the Monday next after Ascension-day.

Trinity-term, beginning the Friday next after Trinity-Sunday, and ending the Wednesday fortnight after.

Michaelmas-term, which begins the sixth of November, and ends the twenty-eighth of November following.

Each of these *terms* have also their RETURNS.

These *terms* are supposed by Mr. Selden to have been instituted by William the Conqueror; but Sir H. Spelman hath shewn, that they were gradually formed from the canonical constitutions of the church; being no other than those leisure seasons of the year, which were not occupied by the great festivals or fasts, or which were not liable to the general avocations of rural business. Throughout all Christendom, in very early times, the whole year was one continual *term* for hearing and deciding causes. For the Christian magistrates, in order to distinguish themselves from the Heathens, who were very superstitious in the observation of their *dies fasti* and *nefasti*, administered justice upon all days alike; till at length the church interposed, and exempted certain holy seasons from being profaned by the tumult of forensic litigations; as, particularly, the time of Advent and Christmas, which gave rise to the winter vacation; the time of Lent and Easter, which created that in the spring; the time of Pentecost, which produced the third; and the long vacation, between Midsummer and Michaelmas, which was allowed for the hay-time and harvest. All Sundays also, and some peculiar festivals, as the days of the Purification, Ascension, &c. were included in the same prohibition, which was established by a canon of the church, A. D. 517, and fortified by an imperial constitution of the younger Theodosius, comprized in the Theodosian code. Afterwards, when our own legal constitution was established, the commencement and duration of our law *terms* were appointed, with a view to these canonical prohibitions; and it was ordered by the laws of king Edward the Confessor, that from Advent to the octave of the Epiphany, from Septuagesima to the octave of Easter, from the Ascension to the octave of Pentecost, and from three in the afternoon of all Saturdays till Monday morning, the peace of God and holy church shall be kept throughout the whole kingdom.

And so extravagant was afterwards the regard paid to these holy times, that though the author of the Mirror mentions only one vacation of considerable length, containing the months of August and September, yet Britton says, that in the reign of king Edward I. no secular plea could be held, nor any man sworn on the Evangelists, in the time of Advent, Lent, Pentecost, harvest, and vintage, the days of the great litanies, and all solemn festivals. He adds, that the bishops and prelates granted dispensations for taking assizes and juries in some of these holy seasons, upon reasonable occasions; and soon after a general dispensation was established in parliament by stat Westm. 1. 3 Edw. I. cap. 51. that assizes of novel disseisin, *mort d'ancestor*, and darrein presentment, should be taken in Advent, Septuagesima, and Lent, as well as inquests; at the special request of the king to the bishops. The portions of time that were not included within these prohibited seasons, fell naturally into a fourfold division; and from some festival, or saint's day, that immediately preceded their commencement, were denominated the *terms* of St. Hilary, of Easter, of the Holy Trinity, and of St. Michael: which *terms* have been since regulated and abbreviated by several acts of parliament; particularly Trinity-*term* by stat. 32 Hen. VIII. cap. 2. and Michaelmas *term* by stat. 16 Car. I. cap. 6. and again by stat. 24 Geo. II. cap. 48. Blackst. Com. vol. iii. p. 276.

TERMS, *Oxford*. *Hilary* or *Lent term* begins January 14, and ends the Saturday before Palm-Sunday. *Easter term* begins the tenth day after Easter, and ends the Thursday before Whitsunday. *Trinity term* begins the Wednesday after Trinity-Sunday, and ends after the act, or 6th of July, sooner or later, as the vice-chancellor and convocation please. *Michaelmas term* begins October the 10th, and ends December the 17th.

TERMS, *Cambridge*. *Lent term* begins January the 14th, and ends Friday before Palm-Sunday. *Easter term* begins the Wednesday after Easter-week, and ends the week before Whitsunday. *Trinity term* begins the Wednesday

nesday after Trinity-Sunday, and ends the Friday after the commencement, or 2d of July. *Michaelmas-term* begins October the 10th, and ends December the 16th.

TERMS, *Scottish*. In Scotland, *Candlemas term* begins January the 23d, and ends February the 12th. *Whitsuntide-term* begins May the 25th, and ends June the 15th. *Lammas term* begins July the 20th, and ends August the 8th. *Martinmas term* begins November the 3d, and ends November the 29th.

TERMS, *Irish*. In Ireland the *terms* are the same as at London, except *Michaelmas-term*, which begins October the 13th, and adjourns to November the 3d, and thence to the 6th.

TERM, in *Grammar*, denotes some word, or expression, in a language. See WORD.

The word *term*, *terminus*, is borrowed metaphorically, by the grammarians and philosophers, from the measurers or surveyors of lands: as a field is defined and distinguished by its *termini*, or limits, so is a thing or matter spoken of, by the word or *term* it is denoted by.

TERM, in the *Arts*, or TERM *of art*, is a word which, besides the literal and popular meaning which it has, or may have, in common language, bears a farther and peculiar meaning in some art or science. See ART.

Or, a *term* is a word which has one or more meanings beside its grammatical one; or which has a peculiar force or import in the language of some particular science or art.

A word then becomes a *term* when its idea is rendered more complex, consists of more parts, and includes more special circumstances, on some occasions than others.

It is this greater complexness, this excess of constituent parts in the idea, that denominates it a *term* in the general. Farther, as the parts of the idea, signified by any word, are arbitrary; and as one may not only add new parts, to those contained in the literal meaning, but also superadd others to them, alter them, extend them, and otherwise modify them, at pleasure; hence the same word becomes a *term* of this or that art, or both, as the inventors or improvers of those arts have thought fit to adopt it for the common basis of certain ideas, and to modify and circumstantiate its meaning to the use of their respective arts.

See the nature and office of a *term* farther illustrated in the preface to this work. See DEFINITION.

TERMS, *abstract*, *complex*, *concrete*, *equivalent*, *equivocal*, *general*, *relative*, *synonymous*, *univocal*, see the adjectives.

TERM, in *Logic*. A PROPOSITION is said to consist of two *terms*, i. e. two principal and essential words, the *subject* and the *attribute*.

A SYLLOGISM consists of three *terms*, the *major*, *minor*, and *conclusion*.

TERMS *of an equation*, in *Algebra*. See EQUATION.

TERMS *of Proportion*, in *Mathematics*, are such numbers, letters, or quantities, as are compared one with another. See PROPORTION.

TERMS, or courses, in *Medicine*, the MENSES, or women's monthly purgations.

TERMES, in the Linnæan system of *Natural History*, a genus of the *aptera* order of insects. Its characters are: that it has six feet formed for running; two eyes; setaceous antennæ; and a mouth with two jaws. Linnæus enumerates three species, one of which is the DEATH-*watch*; another species is the *termes fatalis*; which he represents as the greatest calamity of both Indies, because of the havoc they make in all kinds of wooden buildings, utensils, and furniture, as nothing but metal or stone can escape their destructive jaws. The animals of this species have lately been minutely described by Mr. Smeathman, from whose account the following particulars are extracted.

The *termites*, which have been taken notice of by various travellers in different parts of the torrid zone, and called by the name of *white ants*, resemble the ants in their manner of living, which is in communities, forming extraordinary nests in the surface of the ground, and various subterraneous passages, and also in their provident and diligent labour; but in both respects much surpass them. This writer observes, that the insect in its perfect state has four wings without any sting, and should therefore be ranged under the *neuroptera*, and not under the aptera of the Linnæan system. The communities of *termites* consist of one male and one female, generally the parents of all the rest, and of three orders of insects, apparently of very different, though really of the same species. Those of the first order are the working insects or labourers; the second comprehends the fighting insects, or soldiers, which do no labour; and the third are the winged ones, or perfect insects, which are male and female, and capable of propagation, but neither labour nor fight; the kings and queens belong to this order, and within a few weeks after they are elected and elevated to this rank, they migrate, and either establish new kingdoms, or perish within a day or two. The largest species, called *termes bellicosus*, is the best known on the coast of Africa: it erects immense buildings of well-tempered earth or clay, which are constructed with signal ingenuity: it does infinite mischief in one respect, and in another it is peculiarly important and useful, by destroying those vegetable or animal substances which incumber the earth, and are noxious on account of their putridity. The buildings which these insects erect, are in their general form like sugar-loaves, and about ten or twelve feet high; and consist of an exterior part, which is large and strong; and an interior, which is the habitable part, divided into many apartments for the residence of the king and queen, the nursing of their progeny, the accommodation of the soldiers and labourers, or magazines of provision. There are other nests or habitations constructed by other species, which are in the form of turrets, or upright cylinders, and contain a number of cells: they are of two sizes, for the accommodation of a larger and smaller species: and again another kind of nest, which is the habitation of a distinct species; this is generally spherical or oval, and built in trees.

Of the three orders above mentioned, the labourers, which are about one fourth of an inch long, are the most numerous; the soldiers are about half an inch long, and equal in bulk to fifteen of the labourers; the mouth of the latter is evidently calculated for gnawing and holding bodies, whereas that of the former, or soldiers, has its jaws shaped like two sharp awls, a little jagged, and as hard as a crab's claws, so that they are incapable of any thing but piercing or wounding: in insects of the third order, which have arrived at their perfect state, the head, thorax, and abdomen, are wholly different from those of the other orders, and they are furnished with four large brownish transparent wings; their length is six or seven tenths of an inch, and each is equal in bulk to thirty labourers: they have now two eyes which are visible, whereas if they had them before they are not distinguishable. These insects are gathered and eat by the inhabitants, and reckoned both delicious and nourishing food. The king and queen are lodged in apartments, which are closed up, so that a passage remains merely for the ingress and egress of the labourers and soldiers, but at which neither of the royal pair can come out: and in the business of propagation the abdomen of the female extends to an enormous size, so that an old queen's will be fifteen hundred or two thousand times the bulk of the rest of her body, and twenty or thirty thousand times the bulk of a labourer, and by its peristaltic motion, are protruded eggs to the amount of sixty in a minute, or eighty thousand and more in twenty-four hours; the eggs are removed by the attendants into the nurseries, and after they are hatched, the young are provided with every thing necessary till they are able to shift for themselves. It is remarkable of all the different species of *termites*, that the working and fighting insects never expose themselves to the open air; but either travel under ground, or within such trees or substances as they destroy, or through pipes made of the same materials with their nests. The *termites* which build in trees, frequently construct their nests within the roofs and other parts of houses, to which they do considerable damage, unless soon extirpated; and the larger species enter under the foundations of houses, through the floors, or bore through the posts of buildings, making lateral perforations and cavities as they proceed. They are equally destructive when they get into a trunk containing cloaths and other things, and into stores, &c.

There is another species, called the *marching termites*, which is much larger, and seems to be less frequent than the other. For an account of those, and many other curious particulars, we must refer to Philos. Trans. vol. lxxi. par. i. art. 11. p. 139—192.

TERMINALIA, in *Antiquity*, feasts celebrated by the Romans, in honour of the god Terminus.

Varro is of opinion, that this feast took its name from its being at the *term* or end of the year: but Festus is of a different sentiment, and derives it from the name of the deity in whose honour it was held.

In reality, the *Terminalia*, or feasts of land-marks, were held in honour of Jupiter, considered in the capacity of conservator of land-marks or bounds. Dionysius Halicarnasseus tells us, that it was Numa Pompilius who first consecrated land-marks to Jupiter; and adds, that the same prince appointed an anniversary day, wherein the country-people, assembling together on the bounds of the lands, should offer sacrifices in honour of the tutelary gods thereof.

The *Terminalia* were held on the seventh, or, as Struvius will have it, on the tenth of the calends of March. No animal was to be sacrificed herein, it being deemed unlawful to stain the land-marks with blood: they only offered sacrifices of the first fruits of the earth; and this in the open air, and on the spot where the land-marks were.

TERMINALIA, in *Botany*, a genus of the *polygamia monoecia* class. Its characters are; that it has male and hermaphrodite flowers; the calyx of the male is divided into five segments; it has no corolla, and ten stamina; the hermaphrodite has the flower of the male, a single style; and the fruit is a boat-shaped drupe. There is one species.

TERMINANDO *et audiendo*. See AUDIENDO.

TERMINANS, *punctum*. See PUNCTUM.

TERMINATION, TERMINATIO, in *Grammar*, the ending of a word, or the last syllable thereof.

They are the different *terminations* of one and the same word on different occasions, that constitute the different cases, numbers, tenses, moods, &c.

TERMINATOR, in *Astronomy*, a name sometimes given to the CIRCLE of *illumination*, from its property of terminating the boundaries of light and darkness.

TERMINER, in *Law*. See OYER.

TERMINI, in *Architecture*. See TERMS.

TERMINISTS, TERMINISTÆ, in *Ecclesiastical History*, a sect or party among the Calvinists, whose particular tenets are reducible to five points:

1°, That there are several persons, both in and out of the church, to whom God has fixed a certain term before their death, after which he no longer wills their salvation, how long soever they live afterwards. 2°, That God has fixed this fatal term of grace by a secret decree. 3°, That this term once elapsed, he makes them no farther offer of repentance or salvation, but takes away from his word all the power it might have to convert them. 4°, That Pharaoh, Saul, Judas, most of the Jews, and many of the Gentiles, were of this number. 5°, That God still bears with several of this sort of people, and even confers benefits on them after the term expired; but that he does not do it with any intention they should be converted.

All the other Protestants, and particularly the Lutherans, look on these articles with abhorrence, as repugnant to the goodness of God, and destructive to all Christian virtue; and as contrary to Scripture, particularly the following texts, Ezek. xviii. 23, 30, 31, 32. xxxiii. 11. 1 Tim. iv. 1, 16. 2 Pet. iii. 9. Acts xvii. 30, 31. Mat. xi. 28. Isa. lxvi. 2. Heb. iii. 7, 13. Rom. ii. 5, &c.

TERMINUS, τερμα, signifies a bound or limit.

TERMINUS *a quo*, in *Metaphysics*, denotes the place, from whence any motion commences; in contradistinction from the other extreme, which is called the *terminus ad quem*.

The schoolmen call privation a *terminus a quo*, in speaking of generation, which they consider as a species of motion.

TERMINUM, *ad, qui præteriit*. See AD TERMINUM.

TERMINUM, *infra, quare ejecit*. See QUARE.

TERMITES. See TERMES.

TERMOR, *tenens ex termino*, in *Law*, he that holds lands or tenements for a term of years, or life.

TERN, *brown*, in *Ornithology*, or STERNA *nigra* of Linnæus, is by some authors called the *brown* GULL. Mr. Ray describes it as having the whole under-side white, the upper brown, the wings partly brown, partly ash colour; the head black; and the tail not forked: but Mr. Pennant conjectures, that this bird is the young of the greater *tern*. See STERNA.

TERN, *great*, or *sea-swallow*, *sterna hirundo* of Linnæus, has the bill and feet of a fine crimson, the former tipt with black, straight, slender, and sharp-pointed; the crown and hind-part of the head black; the throat and whole under-side of the body white; the upper part, and coverts of the wings, a pale grey; the tail consisting of twelve feathers, the outer edges of the three outmost grey, the rest white, and the exterior on each side two inches longer than the others, and closed in flying, so as to appear one slender feather.

These birds frequent the sea-shores, banks of lakes and rivers; they feed on small fish and water insects, hovering over the water, and suddenly darting into it to catch their prey. They breed among small tufts of rushes, and lay three or four eggs of a dull olive colour, spotted with black. All the birds of this genus are very clamorous. Pennant.

TERN, *black*. See SCARE-*crow*.

TERNA, a word used by some authors to express an IMPETIGO.

TERNA *folia*, among *Botanists*. See LEAF.

TERNARY *measure*. See MEASURE.

TERNARY *number*, in *Antiquity*, was esteemed a symbol of perfection, and held in great veneration among the ancient mythologists. Whence Virgil,

——— *Numero Deus impare gaudet.* Ecl. viii. ver. 75.

Servius on this place remarks, that the Pythagoreans ascribed the *ternary* number to the supreme God, as being the beginning, middle, and the end of all things. All the heathen gods had a threefold power attributed to them, as the *tria virginis ora Dianæ*, the three-forked thunderbolt of Jupiter, the trident of Neptune, the three-headed dog of Pluto. Again, the Parcæ were three, the Furies three, Hercules was three nights in begetting, the Muses were anciently three, the graces three, &c.

This number was likewise used in most religious ceremonies, but especially in lustrations; whence Virgil, Æn. lib. xi. ver. 188.

Ter circum accensos, cincti fulgentibus armis,
Decurrere rogos———————

TERNATE, in *Zoology*, a species of BAT. See VAMPYRE.

TERPENTARIA, in *Botany*, a name used by some authors for the *betonica aquatica*, or great water-figwort, called *water-betony*.

TERPSICHORE, in *Mythology*, the name of one of the nine MUSES.

TERRA, in *Geography*. }
TERRA, in *Chemistry*. } See EARTH.
TERRA, in *Natural History*. }

TERRA *alana*, a name given to the yellowish white TRIPOLI.

TERRA *Adamica*, a name given to the alkaline red MOULD. See ADAMIC *earth*.

TERRA *Armenia*. See *Armenian* BOLE.

TERRA *de Baira*, in *Natural History*, the name given by some to an earth of a white colour, found about Baira, near Palermo.

It is esteemed a very great medicine in the cure of malignant fevers, and in the stopping hæmorrhages of all kinds. The powder of it is commonly sold in Italy under the name of CLARAMONT-*powder*; a name it obtained from a person who first found out its virtues, and communicated them to the world in a treatise expresly written on the subject. Boccone, Mus. de Fisic.

TERRA *cariosa*. See TRIPOLI.

TERRA, *Chia*, in the *Materia Medica of the Ancients*, an earth of the marle-kind, found in the island of Chio, and given internally as an astringent; but its chief use among them was as a cosmetic, the ladies esteeming it the finest of all things for clearing the skin, and smoothing wrinkles. What title it has to these qualities, the world has not of late ages inquired into; but the substance is still in being, and to be had in any quantities from the same place. And the descriptions Dioscorides and Galen have left us of it are so accurate, that there is not the least room to doubt but that the earth now found there was the very kind they used. It is a dense compacted earth, yet very soft and of a texture easily disunited and broken by water.

TERRA, *Cilicia*. See CILICIA.

TERRA *cimolia*. See CIMOLIA.

TERRA, *cimolia purpurascens*. See SOAP-*earth*.

TERRA *Coloniensis*. See COLOGNE *earth*.

TERRA *damnata*. See CAPUT *mortuum*.

TERRA *foliata tartari*, *foliated earth of tartar*, is a name improperly given to a neutral acetous salt, with a basis of fixed vegetable alkali; or to a combination of the acid of vinegar, saturated with the alkali of tartar, or of other vegetable matters. This salt has also been called *regenerated* TARTAR, because the alkali of tartar is united with an acid, which is in some respects similar to the acid of tartar, but is in others very different.

The *terra foliata* is made by pouring upon a quantity of alkaline salt of tartar, in a glass-cucurbit, a sufficient quantity of good distilled vinegar, at different times, to saturate all the alkali, or even a little more than is necessary for that purpose, till the effervescence entirely ceases. This saturated liquor is to be filtrated and evaporated to dryness, with a gentle heat. The dry salt thus obtained, is to be dissolved in spirit of wine, and the solution again evaporated to dryness; by which means a salt is obtained more or less white, of a silky appearance, and composed of small scales or leaves, whence it has been called *foliata*. When the salt is dried, and while it is hot, it must be shut up in a well-closed bottle, because it quickly becomes moist by exposure to air.

When distilled vinegar is poured upon salt of tartar, little or no effervescence is made at first, because a part of the alkaline salt employed is generally caustic, or deprived of its gas, which part unites with the acid preferably

ably to the mild part of the alkali, and absorbs any gas that is extricated from the latter part; and, therefore, till all the caustic part of the alkali be nearly saturated, little or no effervescence can happen. But when more vinegar is added, the effervescence becomes so considerable, that some of the liquor will, without care, flow over the vessel. This effervescence is occasioned by a large quantity of air that is disengaged during the saturation. When the saturation is advanced to a certain degree, the effervescence diminishes; but the combination of the last portions of the acid and alkali may be facilitated by frequently agitating the liquor, which will renew the effervescence. The taste of the foliated earth is sharp, pungent, a little caustic, and partaking at the same time of the taste of vinegar and that of fixed alkali It is soluble in spirit of wine, and may be decomposed merely by the action of fire, and from it may be obtained by distillation, a very penetrating and concentrated radical vinegar. It is little used except in medicine. Dict. Chem.

Preparations of this kind are given in doses of ten or twenty grains as mild aperients, and to a dram or two as purgatives and diuretics. Lewis.

TERRA *Goltbergensis.* See GOLTBERGENSIS *terra.*

TERRA *Japonica.* See JAPAN *earth*, and CATECHU.

TERRA *Lemnia.* See LEMNIAN *earth.*

TERRA *Lignicensis.* See LIGNICENSIS *terra.*

TERRA *Livonica.* See LIVONICA *terra.*

TERRA *Melia.* See MELIA *terra.*

TERRA *Melitensis.* See MELITENSIS *terra.*

TERRA *merita*, in the *Materia Medica*, a name given by some authors to the curcuma, or TURMERIC-*root.*

It is from a false pronunciation of this name *terr merit*, that the English turmeric has its origin.

TERRA *miscella.* See THRAUSTOMICTHES.

TERRA *Noceriana.* See NOCERIANA.

TERRA *Samia.* See SAMIA *terra.*

TERRA *Seleneusiaca.* See SELENEUSIACA.

TERRA *sigillata.* See SIGILLATA.

TERRA *sigillata magni ducis.* See ETRUSCA *terra.*

TERRA *sigillata fusca*, a bole of a beautiful brown colour, found in Germany, England, and America.

It is of a dense texture, makes no fermentation with the strongest acids, and if thrown into water, it soon separates into a number of thin flakes.

The German give it in fluxes and malignant fevers, being an excellent astringent, and worthy to be introduced into our shops.

TERRA *Silesiaca*, *Silesian earth*, in the *Materia Medica*, a fine astringent bole, called by some authors *axungia solis.*

It is very heavy, of a firm compact texture, and in colour of a brownish yellow. It breaks easily between the fingers, and does not stain the hands, is naturally of a smooth surface, and is readily diffusible in water, and melts freely into a butter-like substance in the mouth; it leaves no grittiness between the teeth, and does not ferment with acid menstrua. These are the characters by which it is known from all other earths of a like colour; it is found in the perpendicular fissures of rocks near the gold-mines at Strigonium in Hungary, and is supposed to be impregnated with the sulphur of that metal. It is, however that be, a good astringent, and better than most of the boles in use. Hill.

The *terra Silesiaca* is also called *terra sigillata Strigoniensis.*

TERRA *sinopica.* See SINOPICA *terra.*

TERRA *solis*, in *Natural History*, a name given by the German naturalists to a kind of black spungy earth, somewhat approaching to the nature of that English black earth, which we call *kellow*, but containing gold. It is not properly an ore of gold, but is an earth into which some small particles of gold have been washed from some other place, and there detained. A good microscope will discover these particles in the richer pieces of the earth, and they are bright and pure, though very small: the earth is found in fissures of the other strata, not in any beds or strata of itself. It is not to be had in any great quantity, nor does it contain any large portion of gold.

TERRA *Strigoniensis.* See STRIGONIENSIS *terra.*

TERRA *Turcica.* See TURCICA *terra.*

TERRA *virgine aurea*, in *Natural History*, the name of a medicinal earth, mentioned by Boccone.

It is found at a place called Sancto Paolo, in the state of Modena; and is thence sent to Venice, and many other places, where it is esteemed a very famous medicine.

Its great use is in hæmorrhages of all kinds; but it is also given with success in malignant fevers. Boccone, Mus. de Fisic.

TERRA *viridis.* See TERRE *verte.*

TERRA *umbria.* See UMBER.

TERRA *zoica*, a name given to the alkaline red MOULD, called also ADAMIC *earth.*

TERRA *petita*, in *Law.* See SUMMONS.

TERRA, in our *Ancient Law-books*, occurs in the sense of land, or ground, joined with divers additions, as, *Terra Normannorum*, the lands of such Norman noblemen as were forfeited to the crown, by the owners taking part with the French king against Henry III. *Terra frusca*, such land as had not been lately ploughed. *Terra gilliflorata*, land held by the tenure of paying a gilliflower yearly. *Terra vestita*, land sown with corn, and the crop still remaining thereon. *Terra testamentalis*, land held free from feudal services, and devisable by will. *Terra culta*, land that is tilled and manured, in contradistinction to *terra inculta.* *Terra affirmata*, land let out to farm. *Terra dominica*, or *indominica*, demesne land of a manor. *Terra hydata*, was land subject to the payment of HYDAGE. *Terra lucrabilis*, land that may be gained from the sea, or enclosed out of a waste or common to particular uses *Terra wainabilis*, tillage-land. *Terra warecta*, fallow-land. *Terra boscalis*, wood-land, &c.

TERRA *extendenda*, is a writ directed to the escheator, &c. ordering him to inquire and find out the true yearly value of any land, &c. by the oath of twelve men, and certify the extent in chancery.

TERRA *firma*, in *Geography*, is sometimes used for a continent, in contradistinction to islands.

Thus Asia, the Indies, and South America are usually distinguished into *terra firma's* and islands.

TERRA *a terra.* Gallies and other vessels are said to go *terra a terra* when they never go far from the coasts.

The phrase is also applied, in the manege, to horses that neither make curvets nor balotades, but run smoothly on the ground in a pressed gallop, only making little leaps or risings with the fore-feet.

The GALLOP is the foundation of the *terra a terra*, for in these two motions the principle of the action is the same, since the *terra a terra* is only a shortened gallop with the croupe in, and the haunches following in a close and quick time. And as the MEZAIR is higher than the action of *terra a terra*, and lower than that of CURVETS, it may be concluded that the *terra a terra* is the foundation of the mezair, as well as of curvets.

In the *terra a terra* the horse should be more together than in the gallop, that he may mark his time and cadence more distinctly; although in a true *terra a terra* there are no times to be marked, for it is rather a gliding of the haunches, which comes from the natural springs in the limbs of a horse.

When a horse works *terra a terra*, he always ought, as in the gallop, to lead with the legs that are within the volte, his two fore-feet being in the air, and the moment they are coming down, his two hind feet following. The action of the gallop is always one, two, three and four; the *terra a terra* is performed upon two lines and in two times.

To work a horse *terra a terra* upon large circles, take care to keep the body straight, steady, and true in the saddle, without leaning to one side or the other. Lean upon the outward stirrup, and keep the outward leg nearer the side of the horse than the other leg, taking care to do it so as not to be perceived. If you go to the right, keep your bridle-hand a little on the outside of the horse's neck, turning your little finger up without turning your nails at the same time; although, if need be, you must turn them, in order to make the inner rein work, which passes over the little finger. Keep your arms and elbows to your hips; by this means you will assure and confine your hand, which ought to accompany, and, as it were, run along the line of the circle with the horse. Berenger's Art of Horsemanship, vol. ii. cap. 17.

The term is also applied by the French to dancers, who cut no capers, nor scarce quit the ground.

And hence, it is also figuratively applied to authors, whose style and direction is low and creeping.

TERRÆ *ager*, *aratrum*, *aratura*, *denariatus*, *legem amittere*, *lex*, *librata*, *obolata*, *quadrantata*, *quadrugata*, *trinoda*, and *uncia.* See the several articles.

TERRÆ *filius*, son of the earth, a student in the university of Oxford, formerly appointed in public acts to make jesting and satyrical speeches against the members thereof, and to tax them with any growing corruptions, &c.

TERRÆ *oleum.* See OIL *of the Earth.*

TERRÆJENBIN. See TERENJABIN.

TERRACE, or TERRAS, a walk or bank of earth, raised in a garden or court, to a full elevation for a prospect.

These elevations are so necessary in gardens, that those gardens which are flat, and have them not, are deficient; and

and when they are properly situated, their ascent not too steep, and are well made, are great ornaments.

There are several kinds of *terrace*-walks, as 1. The great *terrace*, which generally lies next the house. 2. The side, or middle *terrace*, which is commonly raised above the parterre, lawn, &c. 3. Those *terraces* which encompass a garden.

As to the breadth of side *terraces*, this is usually decided by its correspondence with some pavilion, little jettee, or building; but most of all by the quantity of materials to spare for this purpose.

The side *terrace* of a garden, ought not to be less than twenty feet, and seldom wider than forty feet.

The height of *terraces* is greatly subject to fancy, but five or six feet are a height seldom exceeded; but in a small garden, and a narrow *terrace* walk, three feet. For a *terrace* eighteen feet wide, three feet and a half are sufficient; and four feet for a *terrace* twenty feet wide. But when the garden is proportionably large, and the *terrace* thirty or forty feet wide, then it must be at least five or six feet high.

The noblest terrace is very deficient without shade, for which elm-trees are very proper. Miller's Gard. Dict.

TERRACE, *counter*, is a *terrace* raised over another to join two grounds, or raise a parterre.

TERRACE is also applied to the roofs of houses that are flat, and whereon one may walk; as also to balconies that project.

The *terrace* is properly the covering of a building which is in platform; as that of the peristyle of the Louvre, or that of the observatory, paved with flint and mortar.

All the buildings of the oriental nations are covered with *terraces*, to take the fresh air on, and even to lie on. See PAVEMENT *of Terrace*.

TERRACE, or TERRAS, used for mortar. See TARRACE.

TERRAGE, or TERRAGIUM, anciently signified a service, in which a tenant or vassal was bound to his lord, to plough and reap the ground for him.

Others will have it to have been money paid for digging, or breaking the ground in fairs and markets.

Quieti sint de thelonio, pavagio, passagio, lastagio, tallagio, carvagio, prisagio, & terragio.

TERRAIGNOL, in the *Manege*, a horse that cleaves to the ground, that cannot be made light upon the hand, that cannot be put upon his haunches, that raises his fore-quarters with difficulty, that is charged with shoulders, and, in general, one whose motions are all short, and too near the ground.

TERRAIN, in the *Manege*, is the manege ground, upon which the horse makes his piste, or tread.

TERRAQUEOUS, compounded of *terra* and *aqua*, *earth* and *water*, an epithet given to our globe or earth, considered as consisting of land and water, which together constitute one mass.

Some philosophers, particularly Dr. Burnet, tax the frame and fashion of the *terraqueous* globe as rude, unartful, and disorderly, and conclude it highly absurd to suppose it came thus out of the hands of the Creator; and, therefore, have recourse to the deluge for making it thus.

But others can perceive much art and conveniency, even in this apparent disorder: Dr. Derham particularly observes, that the distribution of land and water is admirable; the one being laid over the other so skilfully through all the world, that there is a just equipoise or balance of the whole globe. Thus the northern ocean balances the southern, and the American continent is a counterpoise to the European, African, and Asiatic.

And what some may object, that the waters occupy too great a part of the globe, which they imagine would be of more use if it were dry land, he obviates, by shewing that this would deprive the world of a due quantity of vapours and rain; for if the cavities which contain the sea and other waters were deeper, though the quantity of water were the same, and only the surface less and narrower, the evaporations would be so much the less, inasmuch as they are made from the surface, and consequently are in proportion to it.

TERRAR. See TERRIER.

TERRAS. See TARRACE and PAVEMENT.

TERRAS, *marble*. See MARBLE.

TERRE-PLEIN, in *Fortification*, the top, platform, or horizontal surface of the RAMPART, whereon the cannon are placed, and the defenders perform their office.

It is thus called as lying level, having only a little slope outwardly to bear the recoil of the cannon.

It is terminated by the parapet on that side towards the champaign; and by the inner talus on that side towards the place. Its breadth is from 24 to 30 feet.

TERRE-TENANT, is he who hath the actual possession of the land, otherwise called the *occupant*. See TENANT and OCCUPANT.

Thus a lord of a manor having a freeholder, who letteth out his freehold to another to be occupied; this occupier who has the actual possession is called the *terre-tenant*.

TERRE *verte*, in the *Colour-trade*, the name of a green earth much used by painters, both singly for a good standing green, and in mixture with other colours.

The name is French, and signifies *green earth*.

It is an indurated clay, of a deep bluish-green colour, and is found in the earth, not in continued strata or beds, as most of the other earths are, but in large flat masses of different sizes, imbedded in other strata; these break irregularly in the cutting, and the earth is generally brought out of the pit in lumps of different sizes. It is of a fine, regular, and even structure, and very hard. It is of an even and glossy surface, very smooth to the touch, and in some degree resembling the morochthus, or French chalk, but adhering firmly to the tongue. It does not stain the hands in touching it; but being drawn along a rough surface, it leaves an even white line, with a greenish cast.

It does not ferment with acids, and it burns to a dusky brown colour.

It is dug in the island of Cyprus, and in many parts of France and Italy. That from the neighbourhood of Verona has been used to be esteemed the best in the world; but of late there has been some dug in France that equals it. There is also an earth dug on Mendip Hills, in the sinking for coal, which, though wholly unobserved, is nearly, if not wholly, of equal value.

When scraped, and the finer parts separated, it is ready to be made up with oil for the use of the painters, and makes the most true and lasting green of any simple body they use. Hill and Da Costa. See BERG-*gruen* and VERDITER.

TERRELLA, *μικρογη*, *little earth*, is a magnet turned of a just spherical figure, and placed so that its poles, equator, &c. do exactly correspond with those of the world.

It was thus first called by Gilbert, as being a just repretation of the great magnetic globe we inhabit.

Such a *terrella*, if nicely poised, and placed in a meridian like a globe, it was supposed, would be turned round like the earth in twenty-four hours by the magnetic particles pervading it; but experience has shewn this to be a mistake.

TERRESTRIAL *birds*. See BIRDS.

TERRESTRIAL *globe*. See GLOBE.

TERRESTRIAL *line*. See LINE *Terrestrial*.

TERRESTRIAL *paradise*. See PARADISE.

TERRESTRIAL *roads*. See ROAD.

TERRIER, or TERRAR, in our *Ancient Customs*, a collection of acknowledgments of the vassals or tenants of a lordship, containing the rents, services, &c. they owe their lord, and serving as a title or claim for demanding and executing the payment thereof.

At present, by *terrier* we mean no more than a book or roll, wherein the several lands, either of a private person, or of a town, college, church, &c. are described. The *terrier* should contain the number of acres, and the site, boundaries, tenants names, &c. of each piece or parcel. See DOMES-*day*.

TERRIER also denotes the lodge or hole which foxes, badgers, rabbits, &c. dig themselves under ground, and wherein they save themselves from the pursuit of the hunters. Hence,

TERRIER, *terrarius*, is also used for a kind of little hound to hunt those animals, which, like a ferret, creeps into the ground, and by that means affrights and bites them; either tearing them with his teeth, or else haling them by force out of their holes. See DOG and HOUND.

TERRIFICATIO, a word used by some chemical writers to express the coalition of the earthy particles of some bodies after fermentation, or during the time of it.

TERRIS *bonis & catallis, rehabendis post purgationem*, a writ for a person to recover his lands, goods, or chattels, formerly seized, after having cleared himself of a felony, upon suspicion whereof he was convict, and delivered to his ordinary to be purged.

TERRIS *& catallis tentis ultra debitum levatum*, a writ judicial for the restoring lands or goods to a debtor, who is distrained beyond the quantity of the debt. See DISTRESS.

TERRIS *liberandis*, a writ lying for a man convicted by attaint, to bring the record and process before the king, and take a fine for his imprisonment, and deliver him his lands and tenements again, and release him of the strip and waste.

It is also a writ for the delivery of lands to the heir after homage

homage and relief performed; or upon security taken that he shall perform them.

TERRITORY, *district*, the extent or compass of land within the bounds, or belonging to the jurisdiction of any state, city, or other division. See DISTRICT.

It is a maxim, that the church has no *territory*, i. e. it has no temporal jurisdiction; and therefore an ecclesiastical judge cannot arrest any body, not even a priest. It is much in this sense that Cujas says, the church has an auditory, but no *territory*.

TERROR. The effect of *terror*, or of sudden frights, in diseases, is often very great.

It is generally observed, that people who are most afraid of the plague in times of contagion, catch the infection soonest, and that those who are most terrified and disheartened at first in the disease, generally die of it. It is indeed uncertain, whether this be attributed to the *terror*, or whether the *terror* itself, as a consequence of dejection of spirits, be not merely a symptom of the disease. Kerkring, Spicileg. Anat.

Sudden frights, in acute diseases, have evidently killed many, by the agitation into which they have thrown the spirits, already too much disordered. We have also accounts of persons absolutely killed by *terrors*, when in perfect health at the time of receiving the shock from them: people ordered to be executed, but with private orders for a reprieve, have expired at the block without a wound.

The general effects of *terror* are a contraction of the small vessels, and a repulsion of the blood in the large and internal ones, hence proceed the suppression of perspiration, the general oppression, trembling, and anguish of the heart and lungs ov ercharged with blood, &c. When a person is affected with *terror*, the principal endeavour should be to restore the ci rculation to its due order, to promote perspiration, and to allay the agitation of the patient. For these purposes he may drink a little warm liquor, as chamomile tea, &c. the feet and legs may be put into warm water, the legs rubbed, and the chamomile tea repeated every six or eight minutes, and when the skin is warm, and there is a tendency to perspiration, sleep may be promoted by a gentle opiate.

TERSION, TERSIO, formed of *tero*, *I wear*, the act of wiping or rubbing a thing. See ABRASION.

TERTHRON, a word properly signifying the extreme part of the sail-yard in shipping. Hippocrates uses it in a metaphorical sense, to express the extremity of a disease.

TERTIAN, TERTIANA, a fever or ague intermitting every day, so that there are two fits in three days.

The medical writers distinguish this disease into the single and double; besides these, into the legitimate and spurious and sub-continual.

In the spurious *tertian* the cold fits are shorter, and the chilliness less intense, and the heat scarce ever goes off at all; beside this, it is usually attended with a cough, and with violent lassitudes and pains in the limbs after the fits; a vertiginous disorder in the head, restlessness in bed, and a want of appetite.

The simple *tertian* is also carefully to be distinguished from those acute fevers, principally of the epidemic kind, which frequently affect the appearance of it, when they happen in the spring-season, and the patient is subject to crudities in the primæ viæ. These last, beside the appearance of the simple *tertian*, always carry with them the certain marks of malignity, and often are attended with petechial spots on the fourth day or later. The just distinguishing of all these appearances, in diseases that resemble the simple *tertian*, is extremely necessary, as the treatment of them, in the way of the simple *tertian*, must be attended with very bad consequences.

The signs of the simple tertian are these: it usually seizes people in the morning, frequently about 11 o'clock, and often earlier, and begins with a very remarkable horror and coldness, with which the patient trembles violently: this is first felt in the region of the loins, and thence propagates itself up the back, and so to every part of the body; this is succeeded by a nausea, and a straitness of the præcordia; and when the *tertian* is legitimate and genuine, this nausea proceeds to absolute vomiting, by which there is usually voided a thick viscous and mucous matter; but sometimes a bilious saburra; and, in the first fits, usually some of the food of the day before, indigested. Sometimes there are only violent reachings to vomit, without any thing coming up; and in some a diarrhœa comes on in the place of the vomiting. When these symptoms have continued an hour or two, the coldness goes off, and there succeeds an universal languor and soreness in the joints; and this is the more violent, as the nausea has been the less so. This languor is followed by a violent heat, which sometimes comes on at once, and sometimes slowly and gradually, and is attended with pains in the head, and a violent thirst, and bitter taste in the mouth. Junker's Consp. Med. p. 364.

As soon as the violence of the heat abates a little, a sweat comes on; but this is not great, and often does not appear at all in the first paroxysms. The more still and quiet the person is, the more quickly the heat goes off, and the sweating comes on. The whole fit rarely continues less time than six hours; usually it holds eight, and sometimes eleven hours; but when it continues longer than this, it may be suspected to be of the spurious kind, and to degenerate into a continual one. The fit returns in the same manner as at first every other day, or, as the medical writers term it, every third, including the days of both paroxysms; and usually, while undisturbed, returns on the patient at the very same hour.

The double tertain. The signs of this are, that the fits return every day; but then the succeeding paroxysms do not answer to one another, but the alternate ones; thus the third fit answers to the first, the fourth to the second, and so on. It is by this that this disease is distinguished from the quotidian, which has its fits every day coming on at the same hour; while, in the double *tertian*, if the first fit comes on in the morning, the second comes in the afternoon; then the third comes on in the morning as the first, the fourth in the afternoon as the second, and so on.

Double tertian, is also that fever which returns twice every other day.

The anomalous *tertian* observes no regular time of coming on at all, but will begin one day in the morning, another in the evening, a third at noon, and a fourth in the afternoon, and so on.

Persons subject to TERTIANS. Young people are much more frequently subject to this disease than older, and men oftener than women. People of an active life are more subject to it than those of a sedentary one: but no people fall so easily into it as those men who are apt to be sick after dinner, and make a custom of suppressing their inclination to vomit.

Causes of it. These are the eating immoderately of foods difficult of digestion, and especially when this is done against the stomach, or while that is afflicted with nauseas, violent commotions of anger, or the other passions, immediately after a full meal; and to these is to be added, a coldness of the abdomen after meals, by which digestion is impeded, and the driving back any cutaneous humour.

Prognostics and method of cure. It is commonly observed, that *tertians*, when not improperly treated, are rather conducive to health than injurious to it; and that people are usually much better after they are cured of them, than before they were attacked by them. If those who have a *tertian* use a moderate diet and good regimen, it often goes off of itself, without the assistance of medicines; but when ill-treated, as by giving violent sweating medicines in the time of the hot fit, the patients are greatly weakened, and sometimes very dangerous inflammations of the viscera, and acute fevers are brought on; and this the more certainly, as the patient is younger, of a more plethoric habit, and used to a high diet, and the use of wine, or other strong liquors.

The more the gentle sweat, which succeeds the hot fit, is encouraged, the weaker the fits become at every period, and the disease finally goes off much more safely by this means, than when violently thrown off at once by astringents.

The *double tertian* requires the same method of cure with the simple one; for which see *Intermitting* FEVER and AGUE. Junker's Consp. Med. p. 366.

Continual TERTIAN, in *Medical Writers*, a term used to express a kind of compound fever, which has paroxysms something like those of the *tertian*, but in which the heat never goes wholly off, but is often so extreme, as to continue in great violence from one fit to the time of another.

There are three species of these compound fevers; they are all composed of the intermittents of the several periods, and of an acute fever: the first is the *continual quotidian*, the second the *continual tertian*, and the third the *continual quartan*.

The first of these is the same with the *catarrhal* FEVER of the benign kind. The second here treated of, is what was called by the ancients, the *extended tertian*. See QUARTAN.

Signs of it. The paroxysms are begun in the same manner as in the simple *tertian*, that is, by a shaking coldness; and this is succeeded by a heat which is at first very violent, but afterwards grows more and more languid, yet never goes wholly off, but continues, in some degree, to the access of the next paroxysm. In this disease the appetite is lost, and the strength fails very sensibly,

bly, the sleep is troubled and unsound, and there is a continual head-ach; there is a quick pulse at all the times of the fever, and a dryness in the mouth and tongue, with great thirst. Junker's Consp. Med. p. 396.

Persons subject to it. This fever is very often the consequence of a common simple *tertian*, when injudiciously treated, especially when it has been suppressed by giving hot medicines just before the coming on of the fit, or when the patient has been cooled in the time of the sweat, or has been blooded during the time of the disease; it sometimes also attacks persons who have had violent cutaneous humours, as the itch, &c. struck in; and sometimes the air alone gives it, as being full of fermentative particles.

Prognostics in it. When this disease is of the epidemic kind, and arises from faults in the air, it is always attended with greater danger, and has worse symptoms than when proceeding from other causes; in this case it is sometimes attended with purple spots on the breast and other parts. When treated cautiously, and with a gentle regimen, it often changes to a common intermitting *tertian*, and is then easily cured; but even from this less dangerous state it sometimes changes into a hectic, when it has been treated with large doses of absorbents under that form; and finally, when it is treated with the common hot medicines and regimen, it too often degenerates into a violent and dangerous acute, and usually inflammatory fever.

Method of cure. Before the coming on of every fit, the patient should take a scruple of powder, prepared of diaphoretic antimony, oyster-shells sated with juice of lemons, nitre, and tartarum vitriolatum, each in equal quantities, and while the heat continues violent, he must drink plentifully of warm and weak liquors; and when this violent heat is gone off, he must be kept in a gentle sweat by the milder alexipharmics, till the return of the paroxysm again.

In cases where the heat is very violent, and the temperament of the body is hot and plethoric, the acids, such as lemon-juice, and the like, are of very singular service. During the whole course of the disease the bowels must be kept open by all means: but they must not be stimulated; and as the force of the distemper wears off, more powerfully laxative medicines are to be given, and at such times that their effect may not be over at the time of the access of the paroxysm.

The bark can properly have no place in the cure of this disease; and after the cure of it by the means above prescribed, the patient must continue the use of some of the medicines, and must harden himself to the air by degrees, for fear of a relapse. Junker's Consp. Med. p. 399.

TERTIAN, is also an old measure, containing eighty-four gallons, so called because it is the third part of a tun. 1 R. III. cap. 13. 2 H. VI. cap. 11.

TERTIANARIA, in *Botany*, a name given by some authors to the *scutellaria*, or hooded willow-herb. J. Bauhin, vol. iii. p. 435.

TERTIARY *canons*. See CANONS.

TERTIAS, a word used very frequently in the writings of physicians, with the addition of *ad*; but it is capable of a double signification. *Ad tertias* is often used to express how far the liquor is to be boiled away in medicinal decoctions; yet it may in this case signify either the boiling to two thirds, or to one third part, of the whole. The more usual sense, however, is to boil away one third part of the original liquor, and in the same manner to fill a vessel *ad tertias*, does not signify to fill a vessel one third part full, but two thirds, leaving only one empty.

TERTIATE, in *Gunnery*. To *tertiate* a great gun, is to examine the thickness of the metal at the muzzle, whereby to judge of the strength of the piece, and whether it be sufficiently fortified or not.

This is usually done with a pair of calliper compasses.

The term is also applied to any piece of ordnance for finding whether it has its due thickness at the vent, trunnions, and neck; if the trunnions and neck are in their due order, and the chase straight, &c.

TERTII *internodii pollicis extensor*. See EXTENSOR.

TERTIO *adjacente*, *propositio de*. See PROPOSITION.

TERTIUM *sal*, a *third salt*, a term used in *Chemistry* to express a salt resulting from the mixture of an acid and an alkali, which partakes so of the nature of both, as to be itself neither acid nor alkali, but neutral.

TERTIUS *adducens*, in *Anatomy*, a name given by Spigelius to one of the four muscles called the *quatuor recti oculi* by authors.

This is the muscle called the *adductor* by Molinett; and by some others the *bibitorius*.

TERTIUS *hyoidis musculus*, in *Anatomy*, a name given by Fabricius and others to the muscle generally known by the name of *stylohyoidæus*.

TERTIUS *oculum movens*, in *Anatomy*, a name given by Vesalius to one of the muscles called by Albinus, the *quatuor recti* of the eye; this is the same with the first of that author, the *attollens oculi*, the *superbus* of others.

TERTIUS *palpebrarum*, in *Anatomy*, a name given by some authors to the muscle, called by Albinus and others, *obliquus superior oculi*.

TERTIUS *scalenus*. See SCALENUS.

TERTIUS *thoracis*, in *Anatomy*, a name given by many of the earlier writers to a muscle now called SERRATUS *posticus superior*.

TERUNCIUS, in *Antiquity*, a very small brass coin in use among the Romans.

The inconvenience of such very small pieces being soon found, the *teruncius* became disused, but its name is still retained in reckoning, and thus it became a money of account.

The *teruncius* at first was a quarter of the *as*, or *libra*; hence, as the *as* contained twelve ounces, the *teruncius* contained three, whence the name, which is formed of the Latin, *tres unciæ*.

Teruncius was also used for the quarter of the denarius, so that when the denarius was at ten ases, the *teruncius* was worth two and a half; and when the denarius was risen to sixteen, the *teruncius* was worth four. See DENARIUS.

TERZETTO, in the *Italian Music*, a little tune or air in three parts. See TRIO.

TERZO, in the *Italian Music*, sometimes signifies a composition consisting of three parts, or designed for three voices or instruments.

It is also used for a third part of any thing, as *un terzo di battuta*, a third part of the bar. See TRIO.

TERZOLA, in *Botany*, a name by which some authors have called the *eupatorium cannabinum*, or water-hemp-agrimony.

TESSARACONTA, τεσσαρακοντα, among the *Athenians*, were forty men who went their circuits round the several boroughs, and had cognizance of all controversies about money, if not above ten drachms; as also of actions of assault and battery. Potter, Archæol. Græc. tom. i. p. 122.

TESSARACONTERIS, in the *Naval Architecture* of the ancients, a word used to express a sort of GALLEY, in which there were no less than forty tiers of rowers one above another. See ENNERIS and POLYCROTA.

TESSARACOSTON, τεσσαρακοςον, in *Antiquity*, a solemnity kept by women on the fortieth day after childbirth, when they went to the temple, and paid some grateful acknowledgments for their safe delivery. Pott. Archæol. Græc. tom. i. p. 432. and tom. ii. p. 335.

TESSELÆ, a word used in *Pharmacy*, to express lozenges cut into regular figures.

TESSELARII, among the Romans, artificers of chequered or MOSAIC work.

TESSELATED *pavement*, *pavimentum* TESSELATUM, a rich pavement of MOSAIC work, made of curious small square marbles, bricks, or tiles, called *tesselæ*, from the form of dies.

Tesselated pavements were much used in the tents of the Roman generals.

TESSARA-COSTA, in our *Ancient Writers*. See QUADRAGESIMA.

TESSERA, in *Roman Antiquity*, denoted in its primary sense a cube or dye; so called from the Greek word τεσσαρα, or τεσσερα, *four*; respect being had to its number of sides, distinct from the two horizontal planes, above and below. And it was thus distinguished from the *talus*, which being round at each end, contained only four planes or faces on which it could stand; and therefore, when thrown, had no more than two side faces in view. Hence *ludere talis et ludere tesseris* are spoken of by Roman writers as two different games. The syllable TES. occurs often in Roman inscriptions.

The word *tessera* was applied to many other things, not so much from a similitude in the figure, as from the relation they bore to some other thing of which they were the sign or token; as the points on the upper plane of the dye denoted the good or ill success of the cast.

The *tessera hospitalis* was either public or private. As to the former, we find among the inscriptions published by Gruter, instances of two municipal towns which put themselves under the patronage of the Roman governor; and the reciprocal engagement between them, engraved on two copper-plates in the form of an oblong square, with a pediment at the top, is called in both *tessera hospitalis*.

The design of the latter was to cultivate or maintain a lasting friendship between private persons and their families;

milies; and gave a mutual claim to the contracting parties, and their deſcendants, of a reception and kind treatment at each other's houſes, as occaſion offered. For which end thoſe *teſſeræ* were ſo contrived, as beſt to preſerve the memory of that tranſaction to poſterity. And one method of doing this was by dividing one of them lengthwiſe into two equal parts, upon each of which one of the parties wrote his name, and interchanged it with the other. From this cuſtom came the prevailing expreſſion *teſſeram hoſpitalem confringere*, applied to perſons who violated their engagements.

The *teſſeræ frumentariæ* were ſmall tallies given by the emperors to the populace at Rome, entitling them to the reception of a quantity of corn from the public at ſtated ſeaſons. The perſon who had the inſpection of theſe was called *teſſerarius*. They were made of wood and of ſtone.

There was another kind of *teſſera* which intitled perſons to a ſight of the public games and other diverſions, uſually made in the form of an oblong ſquare.

The *teſſera militaris* was a ſignal given by the general, or chief commander of an army, as a direction to the ſoldiers for executing any duty or ſervice required of them.

This, upon urgent occaſions, was only vocal; but, in ordinary caſes, it was written on a tablet, commonly made of wood. Beſide theſe civil and military *teſſeræ*, there are others which related to religious affairs, and may be called ſacred. Phil. Tranſ. vol. xlv. art. 12.

TEST, in *Metallurgy*, is a veſſel of the nature of a COPPEL, uſed for large quantities of metals at once, and formed of the ſame materials.

The coppels, or ſmall veſſels, ſerve for operations of this kind, when ſmall quantities only are concerned; but when larger are worked on, veſſels of a larger ſize and coarſer texture are employed, which are diſtinguiſhed by the name of *teſts*.

Theſe are uſually a foot and half broad, and are made of wood-aſhes, not prepared with ſo much care as for coppel-making, and mixed with finely powdered brick-duſt; theſe are made into the proper ſhape, either by means of a ſhallow veſſel, made of crucible earth, or caſt iron, of proper dimenſions, or only an iron ring, or hoop, with three bars arched downwards acroſs the bottom, about two inches deep, and of different widths, from three or four inches to fifteen or more, according to the quantity of metal to be teſted at once.

To make them in the firſt manner, an earthen veſſel is to be procured, not glazed within, and by its depth and breadth proportioned to the quantity of metal to be worked; the inſide of this veſſel is to be well moiſtened with fair water, that the aſhes to be put into it may adhere the better. Put into this veſſel, thus prepared, the aſhes and brick-duſt before mentioned, and firſt moiſtened either with water alone, or with water with a little white of an egg mixed in it; let the quantity of this be ſo much as will half fill the veſſel, then preſs the maſs with a wooden indented peſtle, or, if not for a very large *teſt*, with a wooden cylinder, only of an inch thick: when thus preſſed down add freſh aſhes, and preſs them in a ſecond time, as in the making of coppels, and repeat this addition of freſh aſhes till the earthen veſſel be nearly full; then remove the ſuperfluous aſhes with an iron ruler, and let the inequalities remaining at the border be ſmoothed with a wooden or glaſs ball rolled round about. This done, you are to cut the cavity with a bowed iron, that you may have a broad ſpherical ſegment, not very deep; and laſtly, by means of a ſieve, ſtrew this cavity carefully and regularly over with dry aſhes of bones of animals, ground extremely fine, and ſqueeze theſe hard in, by the rotation of the wooden or glaſs ball. Thus you have a *teſt* finiſhed, which, together with its earthen pot, muſt be ſet in a dry warm place.

To make the *teſts* in the other manner, or by means of an iron ring; let a ring of that metal be filled with aſhes mixed with brickduſt, and moiſtened as before mentioned, in ſuch manner that they may riſe conſiderably above the ring; then preſs them ſtrongly either with your hands or with an indented peſtle, and afterwards, with gentle blows of a rammer, preſs the aſhes from the circumference toward the centre, in a ſpiral line, and that in ſuch manner, that, after having been ſufficiently preſſed, they may be a ſmall matter higher than the brink of the ring. If there are now any vacancies in the maſs, empty the ring, and fill it again with more aſhes; for if you ſhould attempt to fill up theſe by adding, were it but ever ſo little aſhes, the ſecond, or additional quantities, will never cohere ſo firmly with the firſt, but that they may probably ſeparate in the operation.

This done, turn the ring upſide down, and on the other ſide, or bottom, take out the aſhes to the quantity of one third part of the depth of the ring, and again fill the vacuity with the ſame aſhes, in ſuch a manner that there may remain no ſenſible cavity.

When the maſs is thus prepared, cut out a cavity in the larger ſurface of the ring, with a bowed iron, as in the former method.

The Germans, have, beſide theſe, another kind of *teſts*, which they call *treibſcherben*. Theſe are a ſort of veſſels which reſiſt the moſt violent fire, and are ſo extremely compact, that they ſometimes will retain not only melted metals, but even the glaſs of lead itſelf.

The figure and ſize of theſe veſſels may be the ſame with that of the coppel, but they are uſually made larger; and the great difference of theſe *teſts* from coppels, and from the ordinary *teſts*, which are indeed only a kind of large and coarſe coppels, is, that the matter of theſe is more compact and coherent.

The matter for making theſe *teſts* is thus prepared: take of the pureſt and fineſt clay a ſufficient quantity, make it into balls, and dry them either in the air, or in the fire; when dried, beat them to powder in a mortar, and pour on the powder a great quantity of warm water; let this mixture reſt a while, and when the clay has ſubſided, pour off the water which ſwims at top; and let this waſhing be ſo often repeated, that all the moſt minute lumps of the clay be broken, and whatever ſalt it contains perfectly waſhed out: then add to this fine clay, of the pureſt ſand, of powder of calcined flints, ground, and well waſhed, of faulty, but clean Heſſian crucibles, or of any incombuſtible ſtones ground very fine, ſuch a quantity as will render the maſs thick, and hardly adhering to the hands in kneading it, or pliant when rolled into a thin lamina.

This is the matter for making this ſort of *teſts*; but, before any quantity of the veſſels he made of this earth, it will be prudent firſt to finiſh a ſingle one, and try it, by putting on it a quantity of glaſs of lead, and expoſing it for an an hour or more to the ſtrongeſt fire; by this trial you will be certain whether or not the maſs is capable of making veſſels that will reſiſt both the fire and the glaſs of lead; and by no other means but this trial is it poſſible to determine the due proportion of the mixture of the ingredients for this uſe, on account of the variety of the clays. Nature in ſome places affords a clay ſo well tempered, that it is extremely proper for the making of *teſts* without any preparation, or without the admixture of any other matter. Sometimes this only requires a ſimple waſhing, but commonly it is neceſſary to make it into balls, and powder or waſh them as before directed.

On the trial of a *teſt* made of this, or the former mixed clay, if it runs into glaſs, you muſt add to it of the powder of ſtones, eſpecially ſuch as beſt reſiſt the fire. Great care is to be taken not to add too much powdered chalk to theſe compoſitions, ſince if the matter is tempered with that alone, the *teſts* will indeed reſiſt the fire very well, but being two porous, they will yield a paſſage to litharge, which will ſoften them to ſuch a degree, that they will either fall aſunder of themſelves, or be totally cruſhed when taken hold of with the tongs.

Theſe veſſels are to be made in the following manner: rub over the ſides and bottom of a ſmall mortar, and alſo its peſtle, with oil, or with the fat of bacon; fill it two-thirds full of prepared clay, then make a ſlight impreſſion with your fingers in the middle of the clay; then place the bottom of the peſtle there, and force it down with blows of a hammer, the ſtronger the better. When thus properly hollowed, take it out of the mortar, and pare its edges, and dry it as the coppels are dried, in the air, in a dry warm place.

Teſts thus prepared may be uſed as ſoon as dry, unleſs for ſalts or litharge; but theſe bodies, when melted in veſſels, not firſt baked or hardened in the fire, always make their way through them.

Some of the German writers alſo recommend, both for *teſts* and coppels, a ſort of friable opake ſtone, called white ſpath, which appears to be a ſpecies of gypſum, or of the ſtones from which plaiſter of Paris is prepared. The ſpath is directed to be calcined with a gentle fire, in a covered veſſel, till the ſlight crackling, which happens at firſt, has ceaſed, and the ſtone has fallen in part into powder; the whole is then reduced into ſubtle powder, which is paſſed through a fine ſieve, and moiſtened with ſo much of a weak ſolution of green vitriol as is ſufficient for making it hold together. Gellert, however, finds, that if the ſtone is of the proper kind, which can be known only by trials, calcination is not neceſſary. Theſe *teſts* are liable to ſoften or fall aſunder in the fire, which inconvenience may be remedied, according to Scheffer, by mixing with the uncalcined ſtone ſomewhat leſs than equal its weight, as eight-ninths of ſuch as had been already uſed and penetrated by the ſcoria of the lead, taking that part of the old *teſt* which appears of

a green-grey colour, and rejecting the red cruſt on the top. But from his account it appears, that theſe *teſts* are leſs durable than thoſe made of the aſhes of bones, though much ſuperior to thoſe of wood-aſhes. Vegetable aſhes, which ſtand pretty well the teſting of ſilver, can ſcarcely bear any great quantity of gold, which requires a conſiderably ſtronger fire than the other; but bone-aſhes, ſays Dr. Lewis, anſwer ſo effectually, and are among us ſo eaſily procured, that it is unneceſſary for the refiner to ſearch for any other materials. Cramer's Art of Aſſaying, p. 60, 62. Lewis's Com. Ph. Techn. p. 144.

TEST-*liquor*, a term uſed by our dealers in brandies, &c. for a liquor which they uſe as a *teſt* of brandy, &c. to prove whether they be genuine, or mixed with home ſpirit. The people who uſe this, place great confidence in it, but it is really a very vague and uncertain thing. They pretend that this liquor will ſhew by the colour which it makes, on its being poured into brandy, whether it be genuine and unadulterated; or if not, in what proportion the adulterating ſpirit is mixed with it.

The whole fact is this; if a little common green or white vitriol be diſſolved in ſome fair water, it makes a *teſt-liquor*; a few drops of which being let fall into a glaſs of old French brandy, will turn the whole to a purple, or fine violet-colour; and by the ſtrength or paleneſs of this colour, the dealers judge the brandy to be genuine or mixed, in different proportions, with home ſpirits.

Old French brandy, having long lain in the caſk, takes a dilute tincture of the wood of the caſk, that is, of oak; and this being of the ſame nature with a ſolution or tincture of galls, naturally turns bluiſh or blackiſh with vitriol. A new diſtilled brandy, though wholly foreign, would not give this *teſt*; and a common malt ſpirit, with oak chips infuſed in it, will turn as dark as the fineſt brandy. While our diſtillers indeed had nothing in uſe for the colouring of their ſpirits but burnt ſugar, it was poſſible to make ſome gueſs at an adulteration with them, becauſe the brandy, in this caſe, would not become blackiſh in proportion to its former colour; the ſugar colour not turning to ink with the vitriol like the other; but our diſtillers have of late found a way of uſing an extract of oak for the colouring of their ſpirits, and, ſince that, this *teſt-liquor* is of very little uſe, our common ſpirits, of any kind, turning as deep with it as the foreign brandies.

The very beſt way of making this *teſt-liquor*, is with a calcined vitriol of iron, diſſolved in a dilute or aqueous mineral acid. The liquor, when well made in this manner, is of a fine yellow colour, and will give, for a time, the fineſt blue to any ſpirituous tincture of oak.

The Engliſh were, at one time, very fond of high coloured brandies, and it was then that the uſe of this *teſt-liquor* was moſt eſteemed; afterwards we, as well as other nations, finding that this colour was only owing to the caſk, began to diſlike it, and to favour the pale brandies: at length we fell into the uſe of ſuch as were wholly limpid and colourleſs, and the re-diſtilling of all the old brandies people were poſſeſſed of, took place; on this the *teſt-liquor* was found to be of no uſe at all, and accordingly rejected; but as we are of late again come into the eſteem of coloured brandies, and that with great juſtice, as the colour, when genuine, is a certain mark of the age of the liquor, this *teſt-liquor* is again got into more credit than it deſerves.

The famous Helvetian ſtyptic depended wholly on this accident for its colour; and it was no ſmall mortification to our chemiſts, when, ſome years ago, it was introduced into uſe among us, that they could not make it with our own ſpirits, but muſt be at the expence of true French brandy for it; our own ſpirits, though equally coloured, would never make that violet tincture, becauſe their colour was owing to burnt ſugar, not a tincture of oak. At length this myſtery was explained, and a little ſcrapings of galls made all thoſe quantities of this ſtyptic, which had been ſet by as good for nothing, perfectly fine and well coloured. Shaw's Eſſay on Diſtillery.

TESTA, in *Antiquity*, the ſame with *oſtracon*. See OSTRACISM.

TEST-*act*, in *Law*, is the ſtatute 25 Car. II. cap. 2. which directs all officers, civil and military, to take the oaths, and make the declaration againſt tranſubſtantiation, in the court of King's Bench or Chancery, the next term, or at the next quarter ſeſſions, or (by ſubſequent ſtatutes) within ſix months after their admiſſion; and alſo within the ſame time to receive the ſacrament of the Lord's ſupper, according to the uſage of the church of England, in ſome public church, immediately after divine ſervice or ſermon, and to deliver into court a certificate thereof, ſigned by the miniſter and churchwarden, and alſo to prove the ſame by two credible witneſſes, upon forfeiture of 500 *l.* and diſability to hold the ſaid office.

The word *teſt* ſignifies *proof* or *trial*, being formed of *teſtis*, *witneſs*; this act being eſtabliſhed with a view to exclude Roman catholics from any ſhare in the government, though it has operated to the excluſion of Proteſtant diſſenters in general.

It may here be obſerved, that the original deſign of the *teſt*, was not to exclude the Proteſtant diſſenters, but the papiſts. It was brought in by the patriots, in the reign of Charles the Second, under their apprehenſion of popery, and a popiſh ſucceſſor; and when, during the debate in the houſe of commons, it was obſerved, that it was drawn in ſuch a manner as to comprehend the Proteſtant diſſenters, the court greatly endeavoured to avail themſelves of that circumſtance in order to defeat the bill. But the diſſenting members diſappointed them, by declaring, that they had rather confide in the juſtice and generoſity of parliament, to paſs ſome future bill in their favour, than be the occaſion of retarding or defeating the ſecurity, which the preſent bill was calculated to afford to the liberties of their country. Their patriotiſm produced ſoon afterwards a bill for their relief, from the penal laws; but the parliament was prorogued, through the reſentment of the court, to prevent its paſſing: and when notwithſtanding this, a bill in favour of the diſſenters did afterwards paſs both houſes, and lay ready for the royal aſſent, the court ventured upon a very extraordinary expedient: the clerk of the crown was ordered to convey away the bill, and, accordingly, it was never afterwards to be found. The particular *teſt* of receiving the ſacrament according to the rites of the church of England, was calculated to exclude the papiſts rather than the proteſtant diſſenters; as it was no uncommon thing for the latter, at that time, to receive the ſacrament occaſionally in the church of England, in order to expreſs their charity towards it, as a part of the church of Chriſt. If it had been the deſign of the legiſlature to exclude all from civil offices, but thoſe who have a real affection for the conſtitution and worſhip of the church, it is apprehended they would have appointed the *teſt* to be, not merely once taking the ſacrament at church, but a ſtated and conſtant conformity to its religious ſervices. Furneaux's Letters, to judge Blackſtone, p. 133.

TESTA *ſepiæ*. See CUTTLE-*fiſh-bone*.

TESTACEA, in the Linnæan Syſtem of *Natural Hiſtory*, is a denomination given to the third order of *vermes* or *worms*; the characters of which are, that they are animals of the MOLLUSCA or ſoft kind, of a ſimple make, and commonly covered with a calcareous habitation.—This order comprehends the whole tribe of SHELLS, conſiſting of upwards of 800 ſpecies, under thirty-ſix genera, and diſpoſed by Linnæus in a new method.

TESTACEOUS, in *Natural Hiſtory*, an epithet given to thoſe fiſh, which are covered with a ſtrong, thick ſhell; as oyſters, pearl-fiſh, &c.

In ſtrictneſs, however, *teſtaceous* is only applied to fiſh whoſe ſtrong and thick ſhells are entire; thoſe which are ſoft, thin, and conſiſt of ſeveral pieces jointed, as the lobſter, &c. being called CRUSTACEOUS.

In medicine, all preparations of ſhells, and ſubſtances of the like kind, are called *teſtaceous*.—Such are powders of crabs claws and eyes, pearl, &c.

Dr. Quincy, and others, ſuppoſe the virtue of all *teſtaceous* medicines to be alike; that they ſeldom or never enter the lacteals, but that the chief of their action is in the firſt paſſages; in which however they are of great uſe in abſorbing acidities.

Hence they become of uſe in fevers, and eſpecially in rectifying the many diſtempers in children, which generally owe their origin to ſuch acidities.

TESTAMENT, TESTAMENTUM, in *Law*, a ſolemn and authentic act, whereby a perſon declares his will, as to the diſpoſal of his eſtate, effects, burial, &c.

Teſtaments, according to Juſtinian and Sir Edward Coke, are ſo called becauſe they are *teſtatio mentis*; an etymon, ſays judge Blackſtone, which ſeems to favour too much of the conceit, it being plainly a ſubſtantive derived from the verb *teſtari*. The definition of the old Roman lawyers is much better than their etymology; "*voluntatis noſtræ juſta ſententia de eo, quod quis poſt mortem ſuam fieri velit*," i. e. the legal declaration of a man's intentions, which he wills to be performed after his death. It is called *ſententia*, to denote the circumſpection and prudence with which it is ſuppoſed to be made; it is *voluntatis noſtræ ſententia*, becauſe its efficacy depends on its declaring the teſtator's intention, whence in England it is emphatically ſtyled his *will*: it is *juſta ſententia*, that is, drawn, atteſted and publiſhed with all due ſolemnities and forms of law: it is *de eo, quod quis poſt mortem ſuam fieri velit*, becauſe a *teſtament* is of no force till after the death of the teſtator. Blackſtone's Com. vol. ii. p. 500.

A *teſ-*

A *testament* has no effect till after death, and is always revocable till then. As *testaments* are acts, of all others the most subject to deceits, surprize, &c. it was found necessary to use all kinds of precautions to prevent the wills of the deceased from being eluded, and the weakness of dying persons from being abused. See WILL.

The most ancient *testaments* among the Romans were made *viva voce*, the testator declaring his will in the presence of seven witnesses; these they called *nuncupative testaments*; but the danger of trusting the will of the dead to the memory of the living soon abolished these: and all *testaments* were ordered to be in writing.

The French legislators thought holographic *testaments*, i. e. *testaments* written wholly with the testator's hand, an abundant security; but the Roman law, more severe, did not admit of *testaments* without farther solemnity.

The easiest, and most favourable, is the twenty-first law in the *code de testamentis*, which permits such as are unwilling to trust the secret of their *testaments* to others, to write it with their own hand, and to close it in the presence of seven witnesses, declaring to them, that it is their *testament*; after which it is to be signed by all the seven witnesses.

Otherwise, to make a solemn *testament*, it was required to be attested by seven witnesses, and sealed with their seals.

Yet the *military testament* was not subject to so many formalities: the soldier was supposed too much employed in defending the laws, to be subject to the trouble of knowing them. His tumultuary profession excused him from observing all the rules. See MILITARY.

Testaments, wherein fathers disposed of their estates among their children, had particular privileges, and were dispensed from most of the ordinary formalities.

Probate of a TESTAMENT. See PROBATE.

TESTAMENT, *Old* and *New*, in *Sacred History*. See BIBLE and CANON.

TESTAMENTARY *adoption*. See ADOPTION.

TESTAMENTARY *causes*, in *Law*, are those that relate to testaments, which were originally cognizable in the king's courts of common law, viz. the county-courts; and afterwards transferred to the jurisdiction of the church, by the favour of the crown, as a natural consequence of granting to the bishops the administration of intestates effects. This spiritual jurisdiction of *testamentary* causes is a peculiar constitution of this island; for in almost all other (even in popish) countries all matters, *testamentary* are of the jurisdiction of the civil magistrate. And that this privilege is enjoyed by the clergy in England, not as a matter of ecclesiastical right, but by the special favour and indulgence of the municipal law, and as it should seem by some public act of the great council, is freely acknowledged by Lindewode, the ablest canonist of the fifteenth century; and about a century before, in a canon of archbishop Stratford; also by the constitutions of cardinal Othobon; and likewise by archbishop Parker, in the time of queen Elizabeth. At what period of time the ecclesiastical jurisdiction of testaments and intestacies began in England is not ascertained by any ancient writer. It appears the foreign clergy were early ambitious of this power, though they were curbed by the edict of the emperor Justin, which restrained the insinuation or probate of testaments (as formerly) to the office of the *magister census*: but afterwards by the canon law it was allowed, that the bishop might compel by ecclesiastical censures the performance of a bequest to pious uses. And therefore it fell within the jurisdiction of the spiritual courts, by the express words of the charter of king William I. which separated those courts from the temporal. And afterwards, when king Henry I. by his coronation-charter directed, that the goods of an intestate should be divided for the good of his soul, this made all intestacies immediately spiritual causes, as much as a legacy to pious uses had been before. This therefore, says judge Blackstone, we may possibly conjecture, was the æra referred to by Stratford and Othobon, when the king by the advice of the prelates, and with the consent of his barons, invested the church with this privilege.

This jurisdiction is principally exercised with us in the consistory courts of every diocesan bishop, or in the prerogative court of the metropolitan, originally; and in the arches court, and court of delegates by appeal. It is divisible into three branches; the probate of wills, the granting of administrations, and the suing for legacies. The two former of which, when no opposition is made, are granted merely *ex officio et debito justitiæ*, and are then the object of what is called the voluntary, and not the contentious jurisdiction. But when a CAVEAT is entered against proving the will or granting administration, and a suit thereupon follows, in order to determine either the validity of the testament, or who hath a right to the administration, this claim and obstruction are remedied by the sentence of the spiritual court, either by establishing the will, or granting the administration. Blackstone's Com. vol. iii. p. 98. See SUBTRACTION of *legacies*.

TESTAMENTARY *Guardian*, *Succession*, and *Tutorage*. See the substantives.

TESTAMENTS of the *twelve patriarchs*, in *Ecclesiastical History*, a kind of apocryphal or supposititious book, in which those patriarchs are introduced, speaking their last dying words, containing predictions of things future, and rules of virtue and piety; which they deliver to their sons as a choice treasure, to be carefully preserved, and to be delivered by them to their children. We have several editions of these in Latin; they were first published in Greek, by Grabe, and from his edition republished by Fabricius; and translated into English by Mr. Whiston. Cave places the anonymous author of this book in the year 192, or nearer the beginning of the second century. They are cited by Origen, and, therefore, were probably written before his time. Grabe thinks they were written before the time of our Saviour, and afterwards interpolated by a Christian. But Mr. Whiston asserts, that they are really genuine, and one of the sacred apocryphal, or concealed books of the Old Testament. Cave supposes that this book was written by a judaizing Christian; Grabe apprehends, that it was writ in Hebrew: Beausobre is of opinion that it was forged at the end of the first, or beginning of the second century, by some Christian converted from Judaism. Dr. Lardner is positive, that these *testaments* are not the real last words of the twelve patriarchs; but the clear knowledge of Christian affairs and principless shew this book to have been written, or else very much interpolated, after the publication of the Christian religion. He says, there is nothing in this work that might not have been wrote by a learned Jew of the second century or later, though he thinks that the author was a Christian, and well versed in the Jewish learning: and moreover he is of opinion, that he is placed early enough by Cave, at the year 192. Lardners' Cred. vol. ii. p. 729, &c.

TESTAMENTO *annexo*, *administration cum*. If a testator makes his will, without naming any executors, or if he names incapable persons, or if the executors named refuse to act; in any of these cases, the ordinary must grant administration *cum testamento annexo*, to some other person.

TESTATOR, or TESTATRIX, the person who makes his or her will and testament.

M. Gillet shews, that a person incapable of a legacy cannot demand any sum which the *testator* in his testament declares himself indebted to him in; in regard such a declaration of debt is presumed a fraud, against the intention of the law.

TESTA NEVILLI, or TESTA DE NEVIL, an ancient record kept by the king's remembrancer in the exchequer, containing the king's fees throughout the greatest part of England, with inquisitions of land escheated, and serjeanties.

It was denominated from its compiler Johan. de Nevil, one of the itinerant justices under king Henry III.

TESTATUM, in *Law*, a writ in personal actions; where, if the defendant cannot be arrested on a capias in the county where the action is laid, but is returned *non est inventus* by the sheriff, this writ shall be sent into any other county, where such person is thought to be, or to have wherewithal to satisfy the demand.

It is called *testatum*, because the sheriff has before testified, that the defendant was not to be found in his bailiwick.

TESTE, a term commonly used in the close of a writ, where the date is contained, which begins with *teste meipso*, if it be an original writ; or, if, judicial, *Teste*, the *lord chief justice*, &c. according to the court whence it comes.—In some ancient formulas, we read *Teste custode Angliæ*. There must be at least fifteen days between the *teste* and return of every process, awarded from the king's bench into any foreign county. See WRIT.

TESTER. See TESTON.

TESTES, in *Anatomy*, two white, soft, oval bodies, serving for generation; usually called, diminutively, *testicles*. See TESTICLE.

These are wanting in most of the fish-kind. The spinose fishes in general have neither *testes* nor parastatæ; but all the cetaceous fishes have them, and not a few of the cartilaginous kinds. Those fish that have them, have always two, as in land-animals; but they differ much in figure and situation in the several kinds, particularly in the whale and flat fish.

TES

TESTES of the brain are two little, round, hard bodies, placed between the third and fourth ventricle, near the pineal gland. See BRAIN.

TESTES *ſynodales*. See SYNODALES.

TESTIBUS *hiis*. See HIIS.

TESTICLE, *teſtis*, a double part in animals of the male kind, ſerving for the office of generation. See *Tab. Anat. (Splanch.) fig.* 1, *lit. w. w.*

They are called *teſticles*, by diminution, of *teſtes*, witneſſes; as giving teſtimony of virility; they are what we properly call *genitores, genitalia*. The Greeks call them *didymi*, or twins.

In man, and moſt animals, the *teſticles* are exterior; in ſome, as fowls, interior.—Some men have only one, ordinarily they have two, and ſome have naturally had three; nay, anatomiſts aſſure us they have known four.

The *teſticles* are ſoft, white bodies, of an oval figure, and about the ſize of a pigeon's egg: from their office, they are defined glandular bodies; and from their compoſition, they are denominated ſpermatic and vaſcular bodies. Each *teſticle* is formed of the ſpermatic artery, the ſpermatic vein, the nutrient veſſel, and the excretory veſſels or tubuli ſeminiferi, which terminate in the epididymis: it likewiſe conſiſts of a very great, but uncertain number of lymphatic or abſorbent veſſels, and of ſome branches of nerves, belonging to, or derived from, the pelvis of the abdomen, and the loins. In the body of the *teſticle* is diſcoverable a whitiſh compact ſubſtance, called the nucleus, or axis of the *teſticle*, conſiſting of the tubuli ſeminiferi and thoſe intermediate membranes, by means of which theſe tubuli are connected. The extent of theſe tubuli is very conſiderable; they have been reckoned to amount to many ells, by taking the ſum of all their ſeveral portions; and they may be eaſily unfolded by a long maceration, which deſtroys the delicate ſubſtance that connects all their folds and convolutions. The epididymis is a part of each *teſticle*, originating in its ſubſtance by many diſtinct tubuli or excretory ducts, which terminate in it, and at length, form an excretory duct, called vas deferens; and this terminates obliquely in its reſpective veſicula ſeminalis. The epididymis is inſeparably connected, by one extremity, to the *teſtes*, of which it is a part; and the other extremity is as firmly connected to the VAS DEFERENS the body is looſely adherent to the body of the *teſtis*, by the duplicature of a very fine and almoſt tranſparent membrane, which is the continuation of the tunica albuginea and which afterwards inveſts it; and, indeed, the body of the *teſtis*, the nucleus, the tubuli, the epididymis, and the vas deferens, are continuations of each other, though they ſeem to be of different textures, are called by different names, and have different offices aſſigned them.

The *teſticles*, and epididymes or PARASTATÆ, are encloſed in three coats. The firſt is the *cremaſter* or *ſuſpenſorius teſtis*, compoſed of a thin ſeries of muſcular fibres, and called muſculoſa, which ſurround the ſpermatic chord, and deſcend to the *tunica vaginalis teſtis*, upon the upper and external parts of which this muſcular expanſion terminates, and becomes loſt. The ſecond is the *tunica* VAGINALIS, which is a continuation or proceſs of the peritonæum. The third, which is proper to the *teſticle*, immediately inveſting it, and having the epididymis for its appendage, is the TUNICA *albuginea*.

The uſe of the *teſtis* is to ſecrete the ſeed from a ſtream of pure blood that is conveyed to it for that purpoſe, by means of the SPERMATIC *artery*; whilſt the refluent blood is returned from the *teſticle* into the courſe of the circulation, by means of the correſponding SPERMATIC vein: the right ſpermatic vein generally diſcharging its contents into the vena cava deſcendens, whilſt the left almoſt always diſcharges itſelf into the left emulgent vein, by which means it eſcapes any inconvenience that might happen from paſſing over the aorta.

The ſemen, when ſeparated, is received or abſorbed by the tubuli ſeminiferi, and through theſe it is conveyed, in a thin and liquid ſtate, to the epididymis; from thence it is forwarded by the vas deferens, through the extremity of which it is obliquely diſcharged into the cells of the VESICULA *ſeminalis*, where it gradually acquires a viſcid conſiſtence. See SEED.

The uſe of the lymphatics is to abſorb the thinner parts of the blood, called lymph, and to return it, thus abſorbed, into the venal blood. The nerves give a due degree of ſenſibility and irritability to the *teſtis* and the tunica albuginea: and the nutrient veſſel is deſigned to give nouriſhment to the *teſtis* and epididymis.

The common capſula or membrane, including both *teſticles*, is the SCROTUM. Warner's Account of the *Teſticles*, p. 9, &c. Winſlow's Anat. vol. ii. p. 188.

TESTICLES, *tumors in the*. Tumors and inflammations of one or both the *teſticles* are not unfrequently the conſequence of falls, blows, and contuſions, and very often are alſo brought on by venereal diſorders.

The beſt external applications to diſperſe theſe are vinegar of litharge, lime-water, ſpirit of wine camphorated, and ceruſs, tutty, or lapis calaminaris mixed in it. But in the night-time, when the applications of fomentations are not ſo convenient, a plaſter of the mercurial kind, doubly ſated with mercury, or, in ſlight caſes, one of ſimple diachylon, may very properly be kept on. Internal medicines, ſuch as nitre, and the thin decoctions of diſcutient remedies, are to be uſed; and, if occaſion call for it, bleeding in the arm is very proper. Heiſter.

If the inflammation, ſays Mr. Warner, does not take place at the criſis or termination of a dangerous fever, nor appears to be of that livid complexion which indicates, or threatens a tendency to gangrene; ſuch method of treatment ſhould be purſued as may moſt probably tend to its ſpeedy removal by diſcuſſion; ſuch as copious and occaſionally repeated evacuations, by bleeding at the arm; by purges, clyſters, or emetics; by adhering to an abſtemious, liquid diet; by medicines of the cooling kind, and ſuch as promote a moderate and continued perſpiration from the whole body; by a free uſe of acidulated and diluting liquors; and by anodynes, occaſionally adminiſtered. This treatment may be farther aſſiſted by local fomentations every day, once or twice made uſe of for the ſpace of half an hour, joined with embrocations of the ſoft, cooling, anodyne, and moderately repellent kind; together with cataplaſms of the like tendency, made of equal parts of oil and vinegar, mixed with a ſufficient quantity of oatmeal, or linſeed meal, or cataplaſms of ſtrong-beer grounds and oatmeal, to which may be added a ſmall quantity of oil, hogs-lard, ointment of elder, or butter.

In tumors proceeding from venereal cauſes, it is always neceſſary to give briſk purges, with the addition of a proper doſe of calomel to each, and warm and weak drinks ſhould be taken frequently, and by this means theſe tumors are often diſperſed. But if either remedies are applied too late, or the inflammation is very violent, the tumor generally ends either in a ſuppuration or gangrene. In this caſe the maturating remedies are to be applied, ſuch as warm cataplaſms, and the like; and if the tumor does not break of itſelf at a proper time, from the application of theſe, it muſt be carefully opened with the knife, and the matter being diſcharged, the wound is to be cleanſed by ſome digeſtive ointment, injecting ſome ſtrong ſpirituous fomentations that reſiſt putrefaction, and afterwards healed by the balſams, as that of Peru, or the like.

The taint that occaſioned the tumor is ſometimes wholly eradicated, and the patient freed from it by a proper management of theſe abſceſſes. It not unfrequently happens indeed in them, that the ſcrotum is in part conſumed, ſo as to leave the part bare, but this loſs of ſubſtance may generally be reſtored by proper treatment, with digeſtive and balſamic remedies. Heiſter's Surg. vol. i. p. 209.

Inflammations and tumors of the *teſticles*, &c. ariſing from venereal cauſes, ſays Mr. Warner, are often attended with very acute pain, and a ſymptomatic fever, becauſe they originate in the tunica albuginea and *teſticle* itſelf; they are, in general, ſudden in their attack, and quick in their progreſs, and accompanied with a conſiderable enlargement, tenſion, and induration of the teſtis itſelf, the epididymis, and tunica albuginea. This enlargement and induration of the teſtis, and more frequently of the epididymis, often remain after the inflammation and pain have quite ſubſided; for removing which, it will be neceſſary to apply mercurial ointments, or mercurial ointments, mixed with a proper quantity of camphor, by rubbing the parts once or twice a day for ſome minutes, before the fire; or the proportion of half a dram, or one ſcruple, of the unguentum cœruleum fortius, at each time of uſing it; or to apply an adheſive plaſter, combined of ſoap, mercury, and warm gums, ſpread upon thin ſoft leather, or rag, which, in caſes where ſecrecy and employment render it neceſſary, is the moſt eligible as well as the moſt efficacious method for diſcuſſing the tumor. Emetics, occaſionally repeated, will be found very conducive to this purpoſe.

If an inflammation and tumor ſhould ariſe at the termination of a long and dangerous fever, the tumor ſhould be conſidered as critical, thoſe methods ſhould be purſued, which are moſt likely to promote the formation of matter, by increaſing the ſwelling; ſuch as the cataplaſma maturans of the London diſpenſatory, or a cataplaſm of bread and milk, mixed with a ſmall proportion of yellow baſilicon diſſolved in it, and applied warm to the part affected. It may be obſerved, in general, that

cataplasms, which are proposed as encouragers of suppuration, should be applied as warm as possible, and those, that are recommended as discutients, may with propriety be applied cold. The patient must be supported with a generous diet, and with medicines of the cordial kind, administered at proper intervals; such as the bark in substance, extract, decoction or infusion, the pulvis serpent. Virgin. & radicis contrayervæ, in decoction, given alone, or joined with the confectio cardiaca; occasionally adding opiates, when pain and restlessness, or a disposition to a diarrhœa, accompany the progress of the tumor; or, on the contrary, in cases of costiveness, occasional clysters should be administered, or a small quantity of pulvis Rhei, or of the sal Rupellensis, or tartar solubilis, or of some other gentle purgative, which may be added to each dose of the cordial medicine, and repeated till this inconvenience be removed. When the abscess arrives at a sufficient degree of maturity, which, in general, may be discovered by some or all of the following symptoms, viz. the size and prominence of the swelling, the softness of the integuments, their shining red complexion, the peeling off of the cuticle from the cutis, the mitigation of pain in the part itself, an œdematous appearance of the integuments, upon being pressed, and, above all, the fluctuation of matter under the fingers; the tumor must be opened by incision on its most fluctuating and depending part. When the contents of the tumor are evacuated, fill the wound loosely with short pieces of the most soft and downy lint, and over the whole continue the poultice, or apply a pledgit of tow or lint, spread with some emollient ointment, retaining the whole with a proper bandage. The future dressings should be composed of the yellow basilicon, linimentum arcæi, or any other efficacious digestive, spread upon layers of lint; which pledgits may be softened and rendered more effectual by dipping them in fresh sallad or linseed oil, made moderately warm; and previous to each dressing, which should be renewed twice in twenty-four hours, an emollient fomentation should be used for a quarter of an hour or a longer time. If the discharge from the wound be thin, sanious and corrosive, sprinkle some brandy, Hungary water, lavender water, or camphorated spirits of wine, upon each fomentation-cloth; and if, after the operation, any considerable hardness of the integuments remains, continue to apply the suppurative poultice at each time of dressing, or the pledgits of digestive, till the hardness be removed. The use of the bark alone, or joined with the pulvis rad. serpent. Virgin. or a strong decoction of the powder of serpentary and contrayerva, with or without the confect. cardiaca, as well as the spiritus vitrioli tenuis, mixed in proper quantities, in some diluting liquor, and used as common drink at proper intervals, will serve to support the patient's strength, and to alter the quality and quantity of the discharge. If the tumor should have been neglected, and the abscess of the scrotum has been not only left to break of itself, but the wound communicates with the urethra, the judicious introduction and use of bougies, made of a proper composition, size and stiffness, joined with mercurial frictions, applied upon or near the diseased parts, and continued at proper intervals for due length of time, with soft oily purges, and soft diluting drinks, will often render every severe operation unnecessary. If the suppuration or abscess be formed in the body of the testis, a simple incision made with the point of a lancet, on the most depending and soft part of the tumor, will generally be sufficient; or the abscess may be suffered to break of itself, observing to dress the wound in the most superficial manner, and continue an emollient and suppurating cataplasm, for removing the swelling and hardness of the affected part. If the disease be of the gangrenous species, we must have immediate recourse to local applications of the antiseptic kind, such as aromatic and spirituous fomentations, repeated twice a day, the cataplasm è cymino, large enough to cover the whole diseased part, scarifications to evacuate the confined air and acrimonious extravasated fluid, which is sometimes pent up in the cellular membranes; and these scarifications must be dressed with warm ointments, and oils of a sufficiently detersive and stimulating kind. The patient must be allowed wine in his common drinks; and the bark and serpentary, mixed in a cordial julep; and if he be faint and languid, one or more blisters should be applied, and occasionally repeated; the bowels being kept in a proper state. Warner's account of the *Testicles*, p. 13, &c. We have an account by Mr. Else, of an encysted tumor in the scrotum, which took its origin from the urethra, and contained a great number of calculous concretions as well as urine, in Med. Obs. vol. v. p. 336. For the method of applying turbith mineral, in the cure of swelled *testicles*; see TURBITH *mineral*.

TESTICULATED-*roots*, are those composed of two tuberose knobs, resembling a pair of testicles. Of this kind are the orchises, &c.

TESTICULI *musculus*, in *Anatomy*, the name given by Fallopius, and some others, to the muscle now generally known by the name of the CREMASTER.

TESTIMONIAL, a kind of certificate, signed either by the master and fellows of the college, where a person last resided, or by three, at least, reverend divines, who knew him well for three years last past; giving an account of the conduct, and learning, of the person.

Such a *testimonial* is always required before holy orders are conferred; and the bishop even ordinarily demands one of a PRIEST before he admits him to a benefice.

TESTIMONIAL is also a certificate under the hand of a justice of peace, testifying the time and place when and where a soldier or mariner landed, and the place of his dwelling, and whither he is to pass.

TESTIMONY. See EVIDENCE.

Testimony is a serious intimation from another of any fact or observation, as being what he remembers to have seen, heard, or experienced. The evidence of *testimony* is either oral or written. Some have unreasonably supposed, that this kind of evidence is solely and originally derived from experience. With regard to this it may be observed, that the evidence of *testimony* is to be considered as strictly logical, no farther than human veracity, in general, or the veracity of witnesses of such a character, and in such circumstances in particular, is supported, or hath not been refuted by experience. But that *testimony*, antecedently to experience, hath a natural influence on belief, is undeniable; in which respect it resembles memory. And in what regards single facts, it is a more adequate evidence than any conclusions from experience. When experience is applied to the discovery of the truth in a particular incident, the evidence is called *presumptive*; whereas ample *testimony* is accounted a positive proof of the fact. *Testimony* is capable of giving us absolute certainty even of the most miraculous fact, or of what is contrary to uniform experience. To this, when we have no positive reasons of mistrust or doubt, we are, by an original principle of our nature (analogous to that which compels our faith in memory), led to give an unlimited assent. As on memory alone is founded the merely personal experience of the individual, so on *testimony*, in concurrence with memory, is founded the much more extensive experience, which is not originally our own, but derived from others. See on this subject Campbell's Philos. of Rhet. vol. i. book i. chap. 5. and Dissertation on Miracles, part i. sect. i. and ii. See FAITH.

For the credibility of human *testimony*, see CERTITUDE.

TESTING, in *Metallurgy*, denotes the operation of refining large quantities of gold and silver, by means of lead, in the vessel called a TEST. This operation is performed by the destruction, vitrification, and scorification of all the extraneous and destructible metallic substances with which those noble metals are allayed. It consists in adding to the allayed gold and silver, a certain quantity of lead, and in exposing afterwards this mass to the action of the fire. The lead, by increasing the proportion of imperfect metals, prevents them from being so well covered and protected by the perfect metals: by uniting with these, it communicates to them a property it has of losing very easily a great part of its inflammable principle; and lastly, by its vitrifying and fusing property, which it exercises with all its force upon the calcined and naturally refractory parts of the other metals, it facilitates and accelerates the fusion, the scorification, and separation of these metals. The lead, which in this operation is purified, and scorifies along with it the imperfect metals, separates from the metallic mass with which it is then incapable of remaining united: it floats upon the surface of the melted mass; because by losing part of its phlogiston, it loses also part of its specific gravity, and lastly it vitrifies. The removal of the vitrified matter in the process is procured either by the nature of the vessel in which the melted matter is contained, and which, being porous, absorbs and imbibes the scorified matter as fast as it is formed; or by a channel cut in the edge of the vessel through which the matter flows out.

The process of *testing* is generally performed in the same manner as that of cupellation. See ASSAYING and COPPELLING.

But when great quantities of base metal are to be worked off from a little gold, recourse is had to a more expeditious method, that of *testing* before the bellows. An oval test is placed in a cavity, made in a hearth of a convenient height, and some moistened sand or ashes pressed round it to keep it steady: the nose of a bellows is directed along its surface, in such a manner, that if ashes are sprinkled in the cavity of the test, the bellows may

may blow them completely out; ſome have an iron-plate fixed before the bellows, to direct the blaſt downwards. To keep the ſurface of the teſt from being injured in putting in the metal, ſome cloths or pieces of paper are interpoſed. The fuel conſiſts of billets of barked oak, laid on the ſides of the teſt, with others laid croſs-wiſe on theſe: the bellows impels the flame on the metal, clears the ſurface of aſhes or ſparks of coal, haſtens the ſcorification of the lead, and blows off the ſcoria as faſt as it is formed, to one end of the teſt, where it runs out through a notch made for that purpoſe. About two thirds of the ſcorified lead may be thus collected; the reſt being partly abſorbed by the teſt, and partly diſſipated by the action of the bellows. Care muſt be taken not to urge the blaſt too ſtrongly, leſt ſome portion of the gold ſhould be carried away by the fumes impetuouſly forced off from the lead, and ſome minute particles of it entangled and blown off with the ſcoriæ. Chem. Dict. Art. *Refining*; Lewis's Com. Ph. Techn. p. 146.

TESTO, in the *Italian Muſic*, is applied to thoſe words of a ſong, to which ſome air or tune is to be compoſed.

It is a matter of great importance in muſic, to underſtand well how to appropriate or adapt the muſic to the words of a ſong, to expreſs the ſenſe, and make a juſt application of the long and ſhort ſyllables to the notes and times with which they are to be connected.

But this branch of the ſcience, which depends greatly on the knowledge of poetry, has lain a long time almoſt unregarded, and even at preſent very little care is taken with reſpect to this in the modern muſic.

TESTON, *Teſter*, the name of a coin ſtruck in France, by Louis XII. in 1513, and in Scotland, in the time of Francis II. and Mary queen of Scotland, ſo called from the head of the king, which was engraved upon it. The ſilver it contained was eleven deniers eighteen grains, its weight, ſeven deniers 11½ grains, and its value ten ſols. The coinage of it was prohibited by Henry III. in 1575, when the value of it was augmented to fourteen ſols ſix deniers. Encycl.

The *teſton* or teſter among us, was rated at 12d. in the reign of Henry VIII. and afterwards reduced to 6d.

TESTUDO, in *Antiquity*, was particularly uſed among the poets, &c. for the ancient lyre, or lyre of Amphion; becauſe it was ſaid to have been originally made, by its inventor Mercury, of the black or hollow ſhell of a *teſtudo aquatica*, or ſea-tortoiſe, which he accidentally found on the banks of the river Nile.

Dr. Molyneux has an expreſs diſcourſe, in the Philoſophical Tranſactions, to ſhew that the tortoiſe ſhell was the baſis of the ancient lyre, and that the whole inſtrument had thence the denomination *teſtudo*; which account lets ſome light into an obſcure paſſage in Horace, ode iii. lib. 4. miſtaken by all the commentators:

O, teſtudinis aureæ
Dulcem quæ ſtrepitum, Pieri, temperas!
O mutis quoque piſcibus
Donatura cygni, ſi libeat, ſonum!

TESTUDO, *tortoiſe*, in the *Military Art of the Ancients*, was a kind of cover, or ſcreen, which the ſoldiers, e. gr. a whole company, made themſelves of their targets, by holding them up over their heads, and ſtanding cloſe to each other.

Thus, if we ſuppoſe the firſt rank to have ſtood upright on their feet, and the reſt to have ſtooped lower and lower by degrees, till the laſt rank kneeled down on their knees, ſo that every rank covering with their targets the heads of all in the rank before them, they repreſented a tortoiſe-ſhell, or a ſort of ſloping-roof.

This expedient ſerved to ſhelter them from darts, ſtones, &c. thrown upon them, eſpecially thoſe thrown from above when they went to the aſſault. It was alſo uſed in field-battles, as well as in ſieges.

TESTUDO, was alſo a kind of large defenſive engine, of an oval figure, compoſed of boards, and wattled up at the ſides with wicker, which moved on ſeveral wheels, ſerving to ſhelter the ſoldiers when they approached the walls to mine them, or to batter them with rams.

TESTUDO, in *Medicine*, denotes a ſoft broad tumor, or gathering of impure humors between the ſkull and the ſkin, called alſo *talpa*, as reſembling the ſubterraneous windings of a tortoiſe or mole.

TESTUDO, in *Zoology*. See TORTOISE.

TESTUDO *veliformis quadrabilis*, an hemiſpherical vault, or cieling of a church, &c. wherein four windows are ſo contrived, as that the reſt of the vault is quadrable, or may be ſquared.

The determination of theſe windows was a problem propoſed to the great mathematicians of Europe, particularly the cultivators of the new calculus differentialis, in the Acta Eruditorum Lipſiæ, by Sig. Viviani, under the fictitious name of A. D. Piollſci puſillo-geometra, which was the anagram of poſtremo Galilæi diſcipulo.

It was ſolved by ſeveral perſons, particularly M. Leibnitz, the very day he ſaw it: and he gave it in the Leipſic Acts in a variety of ways; as alſo did M. Bernouilli, the marquis del'Hoſpital, Dr. Wallis, and Dr. Gregory.

TETANUS, τετανος, formed from τεινειν, *to ſtretch, ſtrain*, in *Medicine*, a kind of tonic ſpaſmus, or convulſion, wherein the anterior and poſterior muſcles of the head, neck and body, are rendered rigid and inflexible; ſo that the patient can neither bend one way nor the other, the head being much retracted. This diſeaſe is compounded of the EMPROSTHOTONOS and OPISTHOTONOS, and frequently ſupervenes in the laſt ſtage of the latter. In the *tetanus*, the general ſymptoms are nearly the ſame as in the opiſthotonos, except that, from the firſt attack, the lateral, abdominal, and other anterior muſcles, are equally contracted as the poſterior ones; and the arms become rigid as well as the lower extremities. The abdomen is always flat and rigid, as in the laſt ſtage of the other, and its contents ſeem to be thrown up into the thorax, which at the ſame time appears to be much dilated. There are here alſo ſome intervals between the ſpaſms, in which the cheeks are drawn towards the ears, ſo that all the teeth may be ſeen as in the SPASMUS *cynicus*. Deglutition is more free in this than in the other diſeaſe; and the patient is ſo far from being balanced between the contractions of the oppoſite muſcles, that the head is retracted, and the ſpine is recurvated, though not quite ſo much as in the opiſthotonos. And the ſpaſm, which commences under the ſternum, is likewiſe common to the *tetanus*, which terminates as the other, and on the ſame fatal days. But whoever recover from either, labour long under a general atonia, and cannot for ſome months raiſe themſelves from a ſupine or recumbent poſture without pain, nor without help. The method of cure in the *tetanus* is the ſame with that in the OPISTHOTONOS; and the abdomen may be often fomented with fourfold large flannels, ſqueezed out of an emollient decoction, as the patient lies in bed, taking care to guard the clothes about him from being damped by the ſteam. See Dr. Chalmers's account of this diſorder in the Med. Obſ. vol. i. art. 12.

Tetanus is alſo a name ſometimes given to a kind of partial ſpaſm, in which the anterior and poſterior muſcles of the head and neck are rendered inflexible, ſo that it can neither bend one way nor the other.

TETARTEMORION, among the *Ancients*, denotes the fourth part of the zodiac.

TETHALASSOMENOS, a term uſed by the old medical writers, to expreſs wine mixed with ſea-water.

TETHYS, in *Mythology*, the daughter of Cœlum and and Terra, and wife of Oceanus. Her chariot, which is repreſented as gliding over the ſurface of the waters, was a ſhell of an extraordinary figure, and whiter than ivory.

TETHYS, in *Zoology*, the name of a genus of naked ſea-inſects, the bodies of which are formed, as it were, of two lips, with an oblong cartilaginous body between them. They have four tentacula, ſhaped like ears, and there are two perforations in moſt ſpecies near the tentacula.

There are ſeveral ſpecies of this genus. Vide Hill, Hiſt. Anim. p. 92.

The *tethys*, in the Linnæan ſyſtem, is a genus of the *mollusca* order of worms; the characters of which are, that the body is oblong, fleſhy, and without feet; the mouth terminates in a cylindric proboſcis under the lip; and it has two foramina at the left ſide of the neck. Linnæus enumerates two ſpecies.

TETIMIXIRA, in *Ichthyology*, the name of an American fiſh, more uſually known by the name of the PUDIANO.

TETRACERA, in *Botany*, a genus of the *polyandria tetragynia* claſs. Its characters are theſe: the flower has a permanent empalement of ſix roundiſh ſpreading leaves; the three outer are alternate, and ſmaller than the other. It hath ſix ſmall petals which ſoon fall off, and a great number of ſtamina which are permanent, the length of the empalement, and terminated by ſingle ſummits. It hath four oval germina, ſupporting an awl-ſhaped ſtyle, crowned by an obtuſe ſtigma. The germina become four oval reflexed capſules, each having one cell, opening at the ſeam on the upper ſide, and encloſing one roundiſh ſeed. We have but one ſpecies of this ſhrub, which is a native of la Vera Cruz.

TETRACHORD, TETRACHORDON, formed of τετρα, *of* τετλαρα, *four times*, and χορδη, *a chord*, or *ſtring*, in the *Ancient Muſic*, a concord conſiſting of three degrees, tones, or intervals, or four ſounds or terms; called alſo by the ancients διατεσσαρων, and by the moderns a FOURTH. This interval had the name *tetrachord* given it with reſpect to the lyre, and its chords or ſtrings.

Ancient

Ancient authors make frequent mention of the ſynaphe, or conjunction; and diazeuxis, or disjunction, of *tetrachords*. To conceive their meaning, it muſt be obſerved, that two *tetrachords* were ſaid to be *joined*, when the ſame chord was the higheſt of the firſt, or loweſt inſtrument, and the loweſt of the ſecond; as was the caſe in the two *tetrachords* that compoſe the ancient heptachord, or ſeventh.

But when two *tetrachords* had no common chord; but, on the contrary, had each their different ones to begin and end withal, ſo that between the two there were two intervals of a tone, then the *tetrachords* were ſaid to be *disjoined*, which was the caſe in the two *tetrachords* that compoſed the octachord or OCTAVE.

The names of the ſounds of a *tetrachord*, conſidered by itſelf, were hypate, parypate, paranete, and nete. Ariſtoxenus calls them hypate, parypate, lichanus, and nete. Wallis's Append. Ptolem. Harm. p. 159, 160.

When *tetrachords* came to be joined, the parypate was ſometimes called *trite*, as being the third from the *nete*; and the paranete was ſometimes called LICHANUS, as in the fore-mentioned place of Ariſtoxenus.

The *tetrachord of Mercury*, contained four ſtrings or chords, in the proportions of 12, 9, 8, and 6; ſo as to give the fourth, fifth, and octave of the loweſt chord. This is the opinion of Boethius, and after him of Zarlino. Vide Wallis's Append. Ptolem. Harm. p. 178.

TETRACTIS, in *Natural Hiſtory*, a name given by Linkius, and other authors, to a kind of ſtar-fiſh, compoſed only of four rays, the more common kinds having five.

TETRACTYC *arithmetic*. See ARITHMETIC.

TETRACTYS, in the *Ancient Geometry*. The Pythagoric *tetractys* is a point, a line, a ſurface, and a ſolid.

TETRADIAPASON, *quadruple diapaſon*, a muſical chord, otherwiſe called a quadruple eighth, or a nine-and-twentieth. See DIAPASON.

TETRADECARHOMBIS, in *Natural Hiſtory*, the name of a genus of foſſils, of the claſs of the ſelenitæ.

The word is derived from the Greek τετρας, *four*, δεκας, *ten*, and ῥομβος, *a rhomboidal figure*, and expreſſes a rhomboidal body conſiſting of fourteen planes.

The characters of this genus are, that the bodies of it are exactly of the ſame form with the common ſelenitæ; but that in theſe each of the end planes is divided into two; and there are by this means eight of theſe planes, inſtead of four. Hill. See SELENITES.

Of this genus there are only three known ſpecies. See *Tab. of Foſſils, Claſs* 2.

TETRADRACHMA of *Tyre*, an ancient coin, which, according to Joſephus, was equal in value to four Attic drachmæ. It is ſuppoſed to have been the ſame with the Jewiſh SHEKEL.

TETRADITÆ, TETRADITES, in *Antiquity*, a name given to ſeveral different ſects of heretics, out of ſome particular reſpect they bore to the number four, called in Greek, τετρα. Thus the Sabbathians were called *tetraditæ*, from their faſting on Eaſter-day, as on the fourth day, or on Wedneſday.

The Manichees, and others, who admitted of a quaternity inſtead of a Trinity in the Godhead, or four perſons in lieu of three, were alſo called *tetraditæ*.

The followers of Petrus Fullenſis bore the ſame appellation of *tetraditæ*, by reaſon of the addition they made to the TRISAGION, to countenance an error they held, that in our Saviour's paſſion it was not any particular perſon of the Godhead, e. gr. the Son, that ſuffered, but the whole Deity.

The ancients alſo gave the name *tetraditæ* to children born under the fourth moon, and theſe they believed unhappy.

TETRADYNAMIA, in *Botany*, the fifteenth claſs of plants. See FRUCTIFICATION and ORDER; *and Tab.* I. *Botany*, &c.

The *tetradynamia* of Linnæus include thoſe called by Tournefort *cruciformes*, and by Ray *ſiliquoſæ*, and *ſiliculoſæ*. The general characters of the claſs are theſe: the perianthium is of an oblong figure, and is compoſed of four leaves, which are oval, oblong, hollow, obtuſe, and converging toward one another, and are gibbous at the baſe; theſe all fall off with the flower, and ſtand in pairs; the oppoſite ones being always equal in length; this cup is properly the nectarium of the plant, and it is on this occaſion that it is gibbous at the baſe. The flower is of that kind, called by Tournefort, *cruciform*; it conſiſts of four equal petals, which have ungues of the length of the cup, erect, and flat; the petals are broad at the top, and obtuſe, and ſcarce touch one another at the ſides; and the inſertion of the petals and of the ſtamina is in the ſame place.

The ſtamina are ſix ſubulated erect filaments, the two oppoſite ones are of the length of the cup, the other four are ſomething longer, and are of a leſs length however than the petals. The antheræ are oblong and pointed, thick at the baſe and erect, with apices bending ſideways. The nectariferous gland in the different genera of this claſs is differently ſituated. It uſually however is found near the ſtamina, and moſt frequently of all is affixed to ſome ſhort filaments, and ſtands near their baſe. Two of the ſtamina are often curved, that they may not preſs upon this gland; and it is often owing to this, that two are ſhorter than the reſt. The germen of the piſtil is placed above the receptacle, and is every day in its growth raiſed higher and higher. The ſtyle is ſometimes wanting, but in ſuch plants as have it, it is of the length of the longer ſtamina. The ſtigma is always obtuſe.

The fruit or capſule is always a bivalve pod, which often contains two cells; this, when ripe, opens by ſplitting from the apex to the baſe, and it has always a little membranous ſubſtance ſerving within as a ſeptum, when the pod is bilocular; this ſtands out beyond the apex, and is the rudiment of what was before the ſtyle. The ſeeds are roundiſh, and the pod uſually narrow and oblong.

This is a very natural claſs of plants, and has been received as ſuch, under whatever name, by all the ſyſtematical writers in botany.

The plants of this claſs are generally ſuppoſed to be all antiſcorbutics. This claſs of plants is naturally ſubdivided into two orders; the one containing the ſiliculoſe plants, and the other the ſiliquoſe. The firſt have a ſhort pod, the others a long and ſlender one. The firſt pods uſually have more of the remains of the ſtyle than the others. The firſt order comprehends fourteen, and the ſecond ſeventeen genera.

TETRAEDRON, or TETRAHEDRON, formed of τετρα, *four*, and ἑδρα, *ſide*, in *Geometry*, one of the five regular or Platonic bodies of ſolids, comprehended under four equilateral and equal triangles.

The *tetraedron* may be conceived as a triangular pyramid of four equal faces. Such is that repreſented, *Tab.* V. *Geomet. fig.* 126.

It is demonſtrated by mathematicians, that the ſquare of the ſide of a *tetraedron* is to the ſquare of the diameter of a ſphere, wherein it may be inſcribed, in a ſubſequialteral ratio: whence it follows, that the ſide of a *tetraedron* is to the diameter of a ſphere it is inſcribed in, as $\sqrt{2}$ to the $\sqrt{3}$; conſequently they are incommenſurable. See REGULAR *body*.

TETRAETERIS, τετραετηρις, in the Athenian *Chronology*, a cycle of four years; for which ſee Potter, Archæol. Græc. l. ii. c. 26. t. i. p. 459.

TETRAGON, τετραγωνος, formed from τετρα, *four*, and γωνια, *angle*, in *Geometry*; a quadrangle, or a figure with four angles.

Thus a ſquare, parallelogram, rhombus, and trapezium, are *tetragonal* figures.

TETRAGON, in *Aſtrology*, denotes an aſpect of two planets with regard to the earth, when they are diſtant from each other a fourth part of a circle, or 90°—as AD (*Tab. Aſtron. fig.* 3.)

The *tetragon* is expreſſed by the character □.

TETRAGONIA, in *Botany*, a genus of the *icoſandria pentagynia* claſs. Its characters are theſe: the flower has a permanent coloured empalement, compoſed of four oval plain leaves, ſitting upon the germen: it has no petals, but about twenty hair-like ſtamina, which are ſhorter than the empalement, terminated by oblong proſtrate ſummits; and a roundiſh four-cornered germen under the flower, ſupporting four awl-ſhaped ſtyles, which are recurved, and as long as the ſtamina, with hairy ſtigmas of the length of the ſtyles; the germen becomes a thick capſule with four cells, having four angles, which have narrow wings or borders, containing one hard oblong ſeed in each. Linnæus enumerates two, and Miller three ſpecies, natives of the Cape of Good Hope.

TETRAGONIAS, a name given to a meteor, whoſe head is of a quadrangular figure, and its tail or train long, thick, and uniform; this is not much different from the trabs or beam.

TETRAGONISM, τετραγωνισμος, a term which ſome authors uſe to expreſs the quadrature of the circle.

TETRAGONOTHECA, in *Botany*. See *Dwarf* SUN-*flower*.

TETRAGONUS, in *Anatomy*, a muſcle, called alſo QUADRATUS *genæ*.

TETRAGRAMMATON, τετραγραμματον, a denomination given by the Greeks to the Hebrew name of God יהוה, *Jehova*, becauſe in the Hebrew it conſiſts of four letters. See ADONAI.

TETRAGYNIA, formed of τέτρα, *four*, and γυνη, *wife*, a denomination given to several orders of plants, which have four styles.

TETRALOGIA, in the *Dramatic Poetry of the Ancients*, denoted four dramatic pieces of the same author, of which the three first were tragedies, and the last of the satyric kind. Their design was to celebrate a victory in the literary contests. Æschylus and Euripides have written some pieces of this kind. Encycl.

TETRAMETER, in the *Ancient Poetry*, an iambic verse consisting of four feet.

The word is formed from τέτρα, *four*, and μέτρον, *measure*; q. d. four metres.—We meet with none of these but in the comic poets, as Terence, &c.

TETRANDRIA, in *Botany*, the fourth class of plants, which have hermaphrodite flowers, with four stamina or male parts in each, of equal length. This class comprehends three orders, viz. the *monogynia*, of which there are sixty-two genera, the *digynia*, including six genera, and the *tetragynia*, containing seven genera. See FRUCTIFICATION, ORDER and *Tab. Botany*.

TETRANDRIA, in *Botany*, is also a denomination given to several orders of plants, which have four stamina.

TETRANGURIA, in *Botany*, a name used by some authors for the citrul, a plant of the gourd-kind, whose seeds are used in medicine.

TETRAO, in the *Linnæan System of Ornithology*, the name of a genus of birds of the order of the gallinæ; the distinguishing character of which is, that they have a naked spot near the eyes, full of fleshy tubercles. Of this genus are twenty species; such as the grouse, partridge, ptarmigan, quail, &c. See GROUSE, &c.

TETRAODON, in *Ichthyology*, a genus of the *amphibia nantes*; the characters of which are, that the maxillæ are bony, extended, and bipartite at the apex, the aperture is linear, the lower part of the body is full of prickles, and it has no ventrical fins. Of this genus there are seven species in the Linnæan system, several of which Artedi has referred to his genus of *ostracion*. The *mola*, or SUN-*fish*, belongs to this genus.

TETRAPETALOUS, in *Botany*, an epithet given to flowers that consist of four single petala, or leaves placed around the pistil.

These M. Jussieu calls *polypetalous* flowers.

Mr. Ray, who calls them *tetrapetalous*, makes them constitute a distinct class, which he divides into, 1°, Such as have an uniform *tetrapetalous* flower, and their seed vessels a little oblongish, which he therefore calls *siliquosæ*. 2°, Such as have their seed-vessels shorter, which therefore, for distinction sake, he calls *capsulatæ* and *siliculosæ*. 3°, Such as have a seeming *tetrapetalous* flower, that is, a monopetalous one, divided deeply into four partitions, which he particularizes also as *anomalous*.

TETRAPHARMACUM, τετραφαρμακον, compounded of τέτρα, *four*, and φαρμακον, *drug*, or *remedy*, in the general, denotes any remedy consisting of four ingredients.

TETRAPHOE, in *Botany*, a name given by the people of Guinea, to a plant, which they give in decoction as a cure for fluxes. This plant grows also in Malabar, where they use the roots boiled in whey in the piles; and in the colic they give the root in powder, about a scruple for a dose. It is called in this latter place *wellia cadavalli*, and by Petiver *xanthium Malabaricum capitulis lanuginosis*. The stalks of it are woody and hoary, especially about the tops. Its leaves stand by pairs on short foot-stalks, and while young they are hoary underneath, with a very soft and velvety down; the others are rough, like the spotted lungwort, but seldom are so large. The flowers grow in spikes, and consist each of fine green leaves filled with scarlet filaments; after these the fruit ripens, and is a sort of woolly bur covered with soft and hooked prickles, very like the common English burdock, but not of a third part of the bigness. Phil. Trans. N° 232.

TETRAPLA, formed from τετραπλοος, *quadruplex*, *four-fold*, in *Church History*, a Bible disposed by Origen, under four columns, in each whereof was a different Greek version, viz. that of Aquila, that of Symmachus, that of the Seventy, and that of Theodotion.

Sixtus of Sienna confounds the *tetrapla* with the hexapla; but the *tetrapla* is a different work, composed after the hexapla, and in favour of such as could not have the hexapla.

Some authors are of opinion, that the order wherein the four versions of the *tetrapla* were ranged, was different from that wherein we have rehearsed them; and particularly, that the Septuagint was in the first column; but St. Epiphanius says expresly to the contrary, and places it in the third.—He even gives us Origen's reason for putting it there, which was, says he, that the best version might be in the middle, that the others might be the more easily confronted therewith, and corrected from it.

Baronius, however, in his Annals for the year 231, takes the Septuagint to have been in the third place in the hexapla, but in the first in the *tetrapla*; but Epiphanius gives it the same place in both. See HEXAPLA.

TETRAPTOTE, TETRAPTOTON, in *Grammar*, a name given to such defective nouns as have only four cases: such are astus, &c.

TETRAPYRAMIDIA, derived from τετρας, *four*, and πυραμις, a *pyramid*, in *Natural History*, the name of a genus of spars.

The bodies of this genus are spars influenced in their shape by an admixture of particles of tin; and are found in form of broad bottomed pyramids of four sides.

Of this genus there is only one known species, which is usually of a brownish colour, and is found in Saxony; as also in Devonshire, Cornwal, and other counties of England, where there is tin. Hill.

TETRARCH, TETRARCHA, τετραρχης, formed of τέτρα, *four*, and αρχη, *rule*, *dominion*, a prince, who holds and governs a fourth part of a kingdom.

Such, originally, was the import of the title *tetrarch*; but it was afterwards applied to any petty king or sovereign; and became synonymous with *ethnarch*, as appears from the following considerations: 1°, That Pliny makes mention of six *tetrarchies* within the cities of Decapolis. 2°, That Herod's kingdom was only divided into three parts, which yet were called *tetrarchies*, and the sovereigns thereof, Luke iii. i. *tetrarchs*. 3°, Josephus, Antiq. Jnd. lib 14. c. 23 tells us, that, after the battle of Philippi, Antony, going into Syria, constituted Herod *tetrarch*; and on medals the same Herod is called *ethnarch*.

TETRASARIUS, a word used by some of the medical writers, to express half an ounce.

TETRASPASTON, τετράσπαστον, in *Mechanics*, a machine in which are four pullies. See PULLEY.

TETRASTICH, τετραστιχον, a stanza, epigram, or poem, consisting of four verses.

TETRASTŒCHON, in *Botany*, a term often used by the Greek writers, and generally misunderstood by those who copy their accounts. Pliny has made an error in the description of the euonymus, which has confounded two different shrubs together ever since, by mistaking the sense of this word, used by Theophrastus in his account of it. He says, that the fruit is divided within into four orders or series of seeds; this he expresses by the word *tetrastœchon*, which Pliny, supposing to be the same with the word *tetragonon*, has translated into *granum quadrangula figura*.

But this is by no means the sense of the word which was used by the Greeks, to express, that a thing had τεταρας ταξεις, four rows, orders, or series of seeds in it: nor does it at all express the seeds being square, much less its being single, for the original derivation of the word was from the term κατα στοιχον, used in dances. These were composed of several series of persons, called στοιχοι, *stœchi*; and every stœchon consisted of several persons, who all moved together. See SPINDLE-*tree*.

TETRASTYLE, formed from τέτρα, *four*, and στυλος, *column*, in the *Ancient Architecture*, a building, and particularly a TEMPLE, with four columns in its front.

TETRASYLLABICAL, a word consisting of four syllables.

TETRATONON, in *Music*; the superfluous fifth is sometimes thus called, as containing four tones.

TETRAX, in *Ornithology*, the name of a bird of the *otis* or bustard kind, called by some authors ANAS *campestris*, or the field-duck; and by others, the *canna*.

It is a very common bird in France, where it is called *canne patriere*: it is called anas, from its sitting on the ground, just as the duck does on the water. It is of the size of a pheasant, and has a beak like that of the common hen. It is taken with nets, as the partridge: it runs very swiftly, and, like the bustard, has no hinder toes. Its belly is white, and its back is variegated with grey, red, and black. It feeds on vegetables, and on small insects.

TETREUMA, in *Botany*, a name given by the people of Guinea to a species of shrub, very common among them, and used to cure whitlows. They dry the leaves, and reduce them to powder; and, moistening them with any liquor, apply them to the place. Petiver has called this *arbor Guineensis laurustini facie*, from its great likeness to the common shrub, which we call the laurustine. The leaves are opake and stiff, and are an inch and a quarter broad, and two inches and a half long. These stand alternately on all sides of the stalk, and are fixed on short pedicles. The flowers grow out of the bosoms of the leaves, and stand in clusters in the manner of those of the common laurustine. Phil. Trans. N°. 232.

TETTAR, in the *Manege*, is an ulcer almost as broad as one's hand, that appears commonly upon a horse's croupe, sometimes on his head, and sometimes on his neck. It proceeds from bilious blood, and consumes and eats through the hide or skin, and causes such a violent itching, that it is a hard matter to keep the horse from scratching, and so enlarging and spreading the ulcer.

TETTIGES, τέττιγες, grashoppers, in *Antiquity*, a title the Athenians assumed to themselves. See GEGENES.

TETTIGOMETRA, in *Natural History*, a name by which the ancients called the nymph of the cicada, or *tettyx*; and they named this nymph, from which they frequently saw that fly hatched, *tettigometra*, which signifies the *mother of the cicada*. See HARVEST-*fly*, CICADA, and VEGETABLE-*fly*.

TETTIGONIA, in *Natural History*, a word used by the ancients to express the smaller species of *cicada*, with which they were acquainted. They called the larger *acheta*.

It is generally supposed, that the *tettigonia* was the same with our smallest kind, called by the French *cigalon*; but Mr. Reaumur observes, that as the ancients knew two kinds of the *cicada*, we know three; and that our middle one seems to have been their *tettigonia* or small *cicada*, and that they were not acquainted with our smallest kind, or cigalon, which is not larger than a hornet. See HARVEST-*fly*.

TEUCHITES, in *Botany*, a name used by some for the scœnanth or schœnanth, camel's hay, which ought to be written *teuochitis*. There is a city *Teuochis* in Ægypt near the borders of Arabia, and the geographers all mention a lake in the neighbourhood of this city; in this lake it is probable the *schœnanth* might grow; and being gathered there, and sold in the adjoining city of *Teuochis*, the purchasers might distinguish it with an epithet formed of the name of the place where they bought it. See SCÆNANTH.

TEUCHTLACOT-*zauhqui*, in *Zoology*, a name by which the natives of some of the American nations call the *Rattle*-SNAKE.

TEUCRIUM. See GERMANDER.

TEUGA, in *Botany*, the name given in the Hortus Malabaricus to a genus of plants called by Linnæus and others, COCCUS.

TEUTHIS, in *Ichthyology*, a genus of the *abdominal* fishes: the characters of which are, that the head is a little truncated on the fore part, that the branchil membrane has five rays, and that the teeth are equal, rigid, and near each other, forming a regular series. Linnæus enumerates two species.

TEUTHOPHACE, a word used by the ancients, to express a sort of food made of beet-roots and lentils, often prescribed as a good diet for the sick.

TEUTONIC, something belonging to the *Teutons*, an ancient people of Germany, inhabiting chiefly along the coast of the German ocean. See GOTHIC.

TEUTONIC *language* is the ancient language of Germany, which is ranked among the mother-tongues.

The *Teutonic* is now called the *German* or *Dutch*, and is distinguished into *upper* and *lower*.

The *upper* has two notable dialects; viz. 1°, The Scandian, Danish, or perhaps Gothic; to which belong the languages spoken in Denmark, Norway, Sweden, and Iceland. 2°, The Saxon; to which belong the several languages of the English, Scots, Frisian, and those on the north of the Elbe.

To the *lower* belong the Low Dutch, Flemish, &c. spoken through the Netherlands, &c.

The learned Mr. Whitaker has lately, in his History of Manchester, controverted the opinion of those who affirm the English language to be genuine and unmixed *Teutonic*, and asserted it to be of Celtic origin. Mr. Drake, in his Essay on the Origin of the English language, Archæol. vol. v. has endeavoured to support the former opinion, by comparing part of Ulphilas's Gothic version of the Gospel of St. John, executed above 1400 years ago, with the same in our present translation, and evincing the striking affinity between the two languages; notwithstanding the different mediums through which they have descended, and the many ages that have elapsed since they have been separated. Every circumstance, he observes, that constitutes the true genius of a language is visibly derived to the English from the Goths and Saxons. The articles, flexure of the genitive case, prepositions and auxiliary verbs are all absolutely *Teutonic*. The English, he says, is clearly the natural descendant of the Gothic or *Teutonic*; and he challenges the deepest enquirer into the Celtic to produce so decisive a proof of any affinity of that tongue with ours. The British, he adds, has little or no resemblance to the English. Many of their terms may have gained admission among us, as from the vicinity and long intercourse we have had with that people, may necessarily be imagined, but their idioms and genus are as radically and essentially different as any two languages can possibly be.

TEUTONIC *order*, a military religious order of knights, established towards the close of the XIIth century; and thus called, because consisting principally of Germans, or *Teutons*.

The origin, &c. of this order were thus: the Christians, under Guy of Lusignan, laying siege to Acre, or Acon, a city of Syria, on the borders of the Holy Land; at which siege were present, Richard king of England, Philip Augustus of France, &c. some Germans of Bremen, and Lubec, touched with compassion for the sick and wounded of the army, who wanted common necessaries, set on foot a kind of hospital under a tent, which they made of a ship's sail; and here betook themselves to a charitable attendance on them.

This started a thought (about the year 1190) of establishing a third military order, in imitation of the Templars, and the Hospitalers.

The design was approved by the patriarch of Jerusalem, the archbishops and bishops of the neighbouring places, the king of Jerusalem, the masters of the Temple, and the Hospital, and the German lords and prelates then in the Holy Land; and by common consent, Frederic duke of Suabia, who was then at their head, sent ambassadors to his brother Henry, king of the Romans, to solicit the pope to confirm the new order.

Calixtus III. who then governed the church, granted it by a bull of the 23d of February, 1192, and the new order was called, *The order of* Teutonic *knights of the house of St. Mary of Jerusalem.*

The habit of this order was a white mantle, with a black cross.

The pope granted them all the privileges of the Templars, and the Hospitalers of St. John; excepting that they were to be subject to the patriarchs, and other prelates; and that they should pay tithe of what they possessed.

The first master of the *Teutonic* order, Henry Walpot, elected during the time of the siege of Acre, after the taking of that city, purchased a garden, wherein he built a church, and an hospital, which was the first house of the *Teutonic order*.

Such is the account given by Peter of Duisbourg, a priest of this order.

Jaques de Vitry differs a little from this account; and relates, that the *Teutonic order* was established at Jerusalem before the city of Acre was besieged.

The order made no great progress under the three first grand-masters; but under the fourth, Herman de Salza, it became very powerful; insomuch that Conrade duke of Mazovia and Cujavia, about the year 1230, sent an embassy to him, to solicit his friendship and assistance, offering him and his order the provinces of Culme and Livonia, with all the lands they could recover from the idolatrous Prussians, who harrassed him exceedingly with their continual incursions, and against whom he intended this new militia; his own knights of the order of *Christ*, or of Dobrin, instituted for the like purpose, being found too weak.

De Salza accepted the donation, and Gregory IX. confirmed it; and, to aid the knights in reducing the Prussians, Innocent IV. published a croisade. With this help, in a year's time, they subdued the provinces of Warmia, Natangia, and Barthia; the inhabitants whereof renounced the worship of idols; and, in the course of fifty years more, they reduced all Prussia, Livonia, Samogitia, and Pomerania, &c.

In 1204, duke Albert had founded the order of Sword-bearers, Port-glaives, which now became united to the *Teutonic* knights, and the union was approved by pope Gregory IX.

The order, thus masters of all Prussia, built the cities of Elbing, Marienburg, Thorn, Dantzick, Koningsberg, and some others: the emperor Frederic II. permitted them to add to the arms of their order, the imperial eagle; and St. Louis, in 1250, allowed them to quarter the fleur-de-lys.

After the city Acre had been recovered by the infidels, the grand-master of the *Teutonic order* removed his seat from that city to Marienburg. As the order grew in power, the knights took more state on them; and at length, instead of friers, brothers, as at first, would be called *lords*. And though the grand-master Conrade Zolnera, of Rotensteine, opposed this innovation, his successor

successor Conrade Wallerod not only approved it, but even procured himself to be treated with honours only rendered to the greatest princes.

Divisions being got into the order, the kings of Poland made their advantage of them: the Prussians revolted to them: and after several wars between the knights and the Poles, the former yielded to king Casimir the Upper Prussia, and did homage to him for the Lower.

At the time of the Reformation, Albert marquis of Brandenburg, then grand-master, becoming Lutheran, renounced the dignity of grand-master, dissolved the commanderies, and drove the knights out of Prussia.

Most of the knights followed his example, and embraced the reformation: the rest transferred the seat of their order to Margentheim, or Mariendahl, in Franconia, which they still retain.

They there elected Walter of Cromberg, their grand-master, formed a process against Albert, and the emperor put him to the ban of the empire. The order, however, could never recover their domains: but are now little more than the shadow of what they formerly were, having only three or four commanderies, scarce sufficient for the ordinary subsistence of the grand-master, and his knights.

The officers of the *Teutonic order*, when in its splendor, were the grand-master, who resided at Marienburg; under him were the grand-commander; the grand-marshal, who had his residence at Koningsberg; the grand-hospitaler, who resided at Elbing; the draper, who took care to furnish the habits; the treasurer, who lived at the court of the grand master; and several commanders, as those of Thorn, Culme, Brandenburg, Koningsberg, Elbing, &c.

They had also their commanders of particular castles and fortresses; advocates, proveditors, intendants of mills, provisions, &c.

Waissellus, in his annals, says, they had twenty-eight commanders of cities, forty-six of castles, eighty-one hospitalers, thirty-five masters of convents, forty stewards, thirty-seven proveditors, ninety-three masters of mills, seven hundred brothers or knights to take the field, one hundred and sixty-two brothers of the choir, or priests, and six thousand two hundred servitors or domestics.

TEXT, a relative term, contradistinguished to *gloss* or *commentary*; and signifying an original discourse, exclusive of any note or interpretation.

Infinite pains have been taken by the critics, to restore, reconcile, settle, explain, &c. the *text* of the Bible, and that of the classics.

Mr. Whiston accounts for all those misunderstandings between the Old and New Testament, particularly as to the prophecies in the Old, cited as fulfilled in the New, from the corruption of the *text* of the Old Testament; and to obviate objections made against Christianity on that head, has published an *Essay towards restoring the true* Text *of the Old Testament.*

This restoration he attempts to effect from the Samaritan Pentateuch, the Roman Psalter, the Apostolical Constitutions, &c.

It sufficiently appears from the learned and acceptable labours of the late Dr. Kennicott, in collating the Hebrew manuscripts of the Old Testament, that the alterations introduced into the *text*, &c. are mostly of a trivial nature, and by no means affect the authority of the sacred writings.

Text is particularly used for a certain passage of Scripture chosen by a preacher, to be the subject of his sermon.

Anciently, the lawyers began all their pleadings with like *texts* of Scripture.

A *text-book*, in several universities, is a classic author written very wide, by the students, to give room for an interpretation dictated by the master or regent, to be inserted in the interlines.

In this sense, the French say, proverbially, *Glosse d'Orleans plus obscure que le* texte.

The Spaniards gave the name *text* to a kind of little poem, or set of verses, placed at the head of a gloss, and making the subject thereof; each verse being explained, one after another, in the course of the gloss.

Text, in *ancient Law Authors*, is appropriated to the book of the Four Gospels, by way of eminence. These were written in gold letters, and carefully preserved in the churches.

> *Codex aurato conseptus grammate scriptus.*
> *Auctus evangelicum conservat corpore* textum.

TEXTUARIES, Textuarii, a name given the sect of the Caraites, among the Jews.

Hillel shone among the traditionaries, and Schammai among the *textuaries.*

The civil and canon lawyers sometimes also call a book containing the bare text, without any gloss or commentary, a *textuary*, *textuarium*.

TEXTUS *Roffensis*, is an ancient manuscript, containing the rights, customs, tenures, &c. of the church of Rochester, granted by the laws of Ethelbert, Hholthere, Eadred, and Withred, kings of Kent, collected by Ernulf the venerable bishop of Rochester, about the year 1100.

TEXTURE, Textura, formed of *texo*, *I weave*, properly denotes the arrangement and cohesion of several slender bodies or threads interwoven, or entangled among each other; as in the webs of spiders, or in cloths, stuffs, &c.

Texture is also used in speaking of any union or cohesion of the constituent particles of a concrete body; whether by weaving, hooking, knitting, tying, chaining, indenting, intruding, compressing, attracting, or any other way. In this sense, we say a close, compact *texture*; a lax, porous *texture*; a regular or irregular *texture*, &c.

A great deal depends on the *texture* of the component parts of a body: hence most of its particular properties, its specific gravity, colour, &c.

TFUOI, in the *Chinese Manufactory of Porcelain*, a word used to express a particular sort of varnish for that ware, with violet-colour and gold. The usual method of doing this at first, was by mixing gold with the common varnish, breaking the leaves very small, and then adding the common blue and the powder of calcined agate of a coarse kind, found in great plenty on the shores of their rivers. But they have since found, that the brown varnish called *tsekin* succeeds much better, for when the blue is mixed with this, its brown colour is lost, and the gold lies on much better than it would any other way.

They had once a method of a varied varnish, which was very beautiful, but is much neglected now; this was the giving a vessel the brown varnish on the outside with a large portion of gold, and the common white varnish within. They also varied the degree of colour on the outside, by laying on more or less of the varnish; and gave this way a variety, even in the same colour. Observ. sur les Coutumes de l'Asie, p. 308.

THABORITES. See Taborites.

THACAS, θακας, in *Antiquity*, a general name given to the place or seat where the augurs made their observations.

THACK *tyles.* See Tyle.

THAIS, a name given by Ægineta, to a cosmetic cerate, intended to give a beautiful red to the face. Galen uses the same word to express a sort of bandage.

THALAMEGUS, among the *Ancients*, a ship of pleasure, or yacht used by princes. It was always provided with a good cabin, or bed-chamber. See Ship.

THALAMI *nervorum opticorum*, in *Anatomy*, two oblong prominences of the lateral ventricles of the brain; medullary without, but a little cineritious within.

They are thus called, because the optic nerves rise out of them.

THALAMII, among the *Ancients*, those rowers who sat in the lowest part of the ship. See Thalamitæ.

THALAMITÆ, in the *Naval Architecture* of the *Ancients*, a term used to express those rowers in the polycrote galleys, or those which contained several series of rowers, who sat on the *thalamus* of the vessel, and made the lowest row. These moved their oars and hands under the seats of the row that sat next above them. See Polycrota.

THALAMIUM, among the *Ancients*, a port-hole, through which the oars of the rowers in the bottom of the ship went.

THALAMUS, in *Botany*, a term used to express that part of the flower in the capitated or flosculous-flowered plants, where the embryo-fruits of every separate floscule are lodged, and where afterwards the seeds are contained. This is the bottom of the cup, in the central part of which it adheres to the stalk.

THALASSOMELI, the name of a medicine used as a purge among the ancients. It was composed of equal parts of honey, sea-water, and rain-water, exposed to the sun in the dog-days, in a vessel pitched on the inside. It purged in the same manner that sea-water alone would do, but only in a milder way.

THALIA, in *Botany*, the name of a genus of plants, of the *monandria monogynia* class, called by Plumier, *cortusa*; the characters of which are these: the cup is a spatha of an oval figure, terminating in a point, and composed of only one valve; the flower is composed of five petals, which are of an oblong ovated figure, and are hollowed and undulated at the margin; two of these, which are nearest the cup, are small and convoluted; the others are nearly equal in size, and are straight and hollowed; the germen of the pistil is of an ovated figure, and the fruit

fruit is a berry of an oval figure, having only one cell, and within that a ſingle bony-ſeed which has two cells, in each of which is a thin kernel. There is one ſpecies.

THALIA, in *Mythology*, one of the nine *Muſes*, who preſided over comedy and paſtorals. She is diſtinguiſhed from the other Muſes by her maſk, and from the tragic Muſe by her ſhepherd's crook; her aſpect is likewiſe meaner than that of MELPOMENE, and her dreſs ſhorter and leſs noble than that of any of the other Muſes.

THALIA was alſo the name of one of the GRACES.

THALICTRUM, in *Botany*. See *Meadow* RUE.

THALLOPHORI, θαλλοφοροι, in *Antiquity*, the old men and women, who, in the proceſſion of the feſtival *panathenæa*, carried olive-boughs in their hands.

THALYSIA, θαλυσια, in *Antiquity*, a ſacrifice offered by the huſbandmen after harveſt. For the origin and ceremonies of which, ſee Potter, Archæol. Græc. tom. i. p. 400.

THAMALAPATHRA. See FOLIUM *Indicum*.

THAMAR, a word uſed by the Arabian phyſicians, to expreſs a date. Hence a pectoral decoction made with dates and other ingredients, was called *diathamyron*; and the word was afterwards corruptly written *dicameron*.

THAME. See TEAM.

THAMMUZ, in *Mythology*, is a name under which the Phœnicians worſhipped ADONIS or OSIRIS.

THAMMUZ, in *Chronology*, a name given by the Jews to the tenth month of their civil year, containing twenty-nine days, and anſwering to our June.

THANE, or THAIN, THANUS, the name of an ancient dignity among the Engliſh, or Anglo-Saxons.

Skene makes *thane* to have been a dignity equal with that of the ſon of an earl: Camden will have it, that *thanes* were only dignified by the offices which they bore.

There were two kinds or orders of *thanes*: the *king's thanes*, and the *ordinary thanes*. The firſt were thoſe who attended our Engliſh-Saxon kings in their courts, and who held lands immediately of the king: whence, in Domeſday-book, they are promiſcuouſly called *thani*, and *ſervientes regis*.

Soon after the Conqueſt, this name was diſuſed; and inſtead thereof they were called the *king's barons*, *barones regis*.

Their origin is referred to king Canutus, who, taking the chief of the Daniſh nobility, to the number of three thouſand, for his guard, and arming them with battle-axes and ſabres with gilt handles, called them *thing lith*, from the two Daniſh words *theing* or *thein*, *body of nobility*, and *lith*, *order of battle*.

The ordinary *thanes*, or *thani minores*, were the lords of manors, who had particular juriſdiction within their limits, and over their own tenants.

Theſe changed their name for that of barons; and hence their courts are called *courts baron* to this day.

In old authors, charters, &c. we alſo meet with THANE as ſignifying a nobleman; though ſometimes only a freeman, and ſometimes a magiſtrate.

THANE *lands*, were lands granted by charter of the Saxon kings to their *thanes*.

THAPSIA, *deadly carrot*, or *ſcorching fennel*, in *Botany*, a genus of the *pentandria digynia* claſs. Its characters are theſe: it has an umbellated flower, the general umbel is large, compoſed of about twenty rays which are nearly equal, theſe have no involucra, and the general umbel is uniform; the flowers have five ſpear-ſhaped incurved petals, and five hair-like ſtamina of the length of the petals, terminated by ſingle ſummits; it has an oblong germen ſituated under the flower, ſupporting two ſhort ſtyles, crowned by obtuſe ſtigmas; the germen becomes an oblong fruit, girt with a longitudinal membrane, dividing into two parts, each containing one oblong ſeed pointed at both ends, having plain borders on both ſides. Linnæus enumerates five, and Miller ſix ſpecies.

The roots of the *thapſia*, with a carrot-leaf, were formerly uſed in medicine: there are two kinds of it, the white and the black.

The white *thapſia*, called alſo by ſome *grey turbith*, is the root of a plant ſomewhat reſembling fennel. This is full of a milk-like juice, ſo very ſharp that it will bring off the ſkin, if ſuffered to touch the face. This root has been ſometimes ſold for the turbith-root. They may be diſtinguiſhed however, by the turbith's being of a reddiſh grey without, and of a whitiſh grey within, and heavy and hard to break; on the contrary, white *thapſia* is light, wrinkled, and of a ſilvery grey on the outſide, and ſo hot and acrid to the taſte, that, if new, it will bliſter the mouth.

The black *thapſia* is of too duſky a colour to be uſed as an adulteration of turbith, and too hot and acrid to be preſcribed internally.

The roots of this plant purge very violently both upwards and downwards, and are now baniſhed from among the number of medicinal ſimples. Boerhaave ſays, they have the ſame qualities with the euphorbium, burning the bowels, and cauſing a diarrhœa.

Beſide the poiſonous root known by the name *thapſia*, the ancients have deſcribed three other vegetable ſubſtances under it: the lycium-wood uſed at this time, as alſo of old in Crete, as a yellow dye; the *Scythica radix*, or liquorice; and the *luteola*, or dyers-weed. The Greek *thapſos* ſignifies a pale dead yellow colour, and is applicable either to the ſubſtance or the juice or tincture of all theſe.

THAPSOS, in the *Materia Medica of the Ancients*, a name given to a kind of wood of a pale yellow colour, uſed of old in dying linen and woollen cloths.

The people of Crete at this time uſe the lycium-wood in dying a yellow colour, and it is probable that the *thapſos* was this very tree. Dioſcorides tells us, that the wood of this tree was alſo uſed in his time to tinge the hair yellow, which was a favourite colour with the Greeks. The lycium is of a colour ſomewhat deeper than our box-wood, and parts with its ſtain ſo eaſily that it ſeems very proper for ſuch a purpoſe.

THAPSUM, among the *Old Roman Writers*, a common name for the *verbaſcum*, or mullein; but as there were many other plants, very different in their nature, yet whoſe names reſembled this; ſuch as the *thapſia*, or deadly carrot, and the *thapſum*, or *geniſtella tinctoria*; it was ſoon found neceſſary to add ſome other name, and it was then called *thapſum barbatum*, or *barbaſſum*.

The reaſon of the geniſtella being called *thapſum*, was, that its flowers were yellow, and were uſed to colour the ladies hair; that being the favourite colour of thoſe days. The flower of mullein are yellow, and ſeem more fit for the colouring of the hair, than thoſe of the geniſtella; their colour being more eaſily ſeparated, and continuing on ſo well that the glovers of many parts of England uſe them in the ſeaſon for colouring their yellow gloves.

It is probable, that the ladies of old uſed this, as well as the geniſtella, for this purpoſe; and it might hence obtain the common name *thapſum*. The other part of its diſtinction, *barbatum*, ſeems owing to the leaves being ſo covered with a woolly down that they look bearded. And when this word is written *barbaſſum*, it may probably be given as the name of ſome of thoſe ſpecies of mullein, which are not hairy, as our black or ſage-leaved mullein, and be a corruption of the word *verbaſcum*. This black mullein has no leſs title than the white or bearded kind, to the name *thapſum*: its flowers being of a yet finer yellow than thoſe of that kind, and being as fit for the uſe of ſtaining. The glovers of Hertfordſhire uſe this ſpecies for their leather-gloves.

THARGELIA, θαργηλια, in *Antiquity*, an Athenian feſtival, in honour of the Sun, and his attendants the Hours; or, as others think, of the Delian Apollo and Diana. For an account of the ceremonies of this ſolemnity, ſee Potter, Archæol. Græc. lib. ii. cap. 20. tom. i. p. 400. ſeq.

THARGELION, θαργηλιων, in *Chronology*, the eleventh month of the Athenian year. It contained thirty days, and anſwered to the latter part of our April, and the beginning of May.

It took its name from the feſtival *Thargelia*, kept in it.

THATCH, a common covering for houſes in moſt parts of the country.

The beſt kind of *thatch* is that called *helm*, or ſtiff unbruiſed wheat ſtraw, with the ears cut off, and bound up in bundles. This being diſpoſed in an uniform and longitudinal order on the roof, is fixed on with laths, withies, or ropes.

THAUGHTS, or THOUGHTS, in a *boat*, are the benches on which the rowers ſit to row.

THAUMATURGUS, formed from θαυμα, *wonderful thing*, and εργον, *work*, *worker of miracles*; an appellation which the Romaniſts give to ſeveral of their ſaints, eminent for the number and greatneſs of their miracles.

St. Gregory, called *Thaumaturgus*, or Gregory of Neocæſarea, was a diſciple of Origen, about the year 223, and afterwards biſhop of Cæſarea in Pontus; and in that capacity he aſſiſted at the firſt council of Antioch, and at that of Epheſus, againſt Paulus Samoſatenus. St. Leo of Catanea is alſo called *Leo Thaumaturgus*. He lived in the eighth century; and his body is ſtill honoured at Rome in the church of St. Martin de Tours. St. Francis Paul, and St. Francis Xavier, are the great *Thaumaturgi* of theſe laſt ages.

THAWING, the reſolution of ice into its former fluid ſtate, by the warmth of the air.

THEA, in *Botany*. See TEA.

THEANDRIC, θεανδρικος, *dei-virile*; a term ſignifying divine and human, formed from Θεος, *God*, and ανηρ, *man*.

St.

St. Dionyfius, bifhop of Athens, firft ufed the word *theandric*, to exprefs a double operation, or two operations united in Jefus Chrift; the one divine, the other human. The Monophyfites afterwards abufed it, to fignify the one only operation which they admitted in Jefus Chrift; in whom they believed there was a mixture of the divine and human nature, whence refulted a third nature, which was a compound of the one and the other whofe operations followed the effence and qualities of the mixture, and were neither divine nor human, both at once, or, in one word, *theandric*.

Θεανδρικη ενεργεια, *theandric*, or *dei-virile* operation, in the fenfe of Dionyfius, and Damafcenus, is thus exemplified by Athanafius. When Chrift healed the perfon who was born blind, the fpittle he voided was human, but the opening of the eyes was done by his divine power. And thus, in raifing Lazarus, he called as man, but awaked him from the dead as God.

The term *theandric*, and the dogma of *theandric* operations, were examined with great care and attention, at the council of Lateran, held in 649, where pope Martin folidly refuted the notion of *theandric* operations, and fhewed, that the fenfe wherein St. Dionyfius firft ufed the word, was catholic, and quite remote from that of the Monophyfites and Monothelites.

THEANTHROPOS, Θεανθρωπος, formed from Θεος, *God*, and ανθρωπος, *man*, denominated *God-man*; a term fometimes ufed in the fchools, to fignify Jefus Chrift, who is God-man; or reprefented by fome fcholaftic theological writers, as comprehending two natures in one perfon.

THEATER, or THEATRE, *theatrum*, formed from θεατρον, *fpectacle*, of θεαομαι, *I fee*, among the *Ancients*, a public edifice, for the exhibiting of fcenic fpectacles or fhews to the people.

Under the word *theater* was comprehended, not only the eminence whereon the actors appeared, and the action paffed, but alfo the whole area, or extent of the place, common to the actors and fpectators.

In this fenfe, the *theater* was a building encompaffed with porticoes, and furnifhed with feats of ftone, difpofed in femicircles, afcending gradually over one another; which encompaffed a fpace called the *orcheftra*, in the front whereof was the profcenium, or pulpitum, whereon the actors performed, and which is what we diftinctly call the *theater*, or ftage.

On the profcenium ftood the fcena, a large front, adorned with orders of architecture, behind which was the poftfcenium, or places where the actors made themfelves ready, retired, &c. So that the fcena, in its full extent, comprehended all the part belonging to the actors.

In the firft ages of the Roman commonwealth, *theaters* were only temporary, and formed of wood: the moft celebrated of thefe was that of M. Scaurus, mentioned by Pliny. The firft fixed *theater* was erected by Pompey the Great, who built it very magnificently with fquare ftone.

In the Greek *theaters*, the orcheftra made a part of the fcena; but in the Roman *theaters*, none of the actors ever defcended into the orcheftra; which was taken up by the feats of the fenators.

The moft celebrated *theaters* remaining of antiquity, are the *theater* of Marcellus, and that of Pompey; which are alfo called *amphitheaters*.

At Athens are ftill feen the remains of the temple of Bacchus, which was the firft *theater* in the world, and was a mafter-piece in architecture. All *theaters* were confecrated to Venus and Bacchus.

THEATER, among the *Moderns*, more peculiarly denotes the ftage, or place whereon the drama, or play, is exhibited; anfwering to the profcenium of the ancients.

In its full latitude, however, the *theater* includes the whole play-houfe: in which fenfe it is a fpacious room, or hall, part whereof is taken up by the fcena, which comprehends the ftage, the decorations, and the machines; and the reft is diftributed into a fpace, called the *pit*, or *parterre*, which is covered with feats, boxes, &c. and terminated with an elevation of one or two galleries, difpofed into benches afcending over one another. See PLAY-*houfe*.

THEATER is alfo ufed in *Architecture*, chiefly among the Italians, for an affemblage of feveral buildings, which, by a happy difpofition and elevation, reprefents an agreeable fcene to the eye.

Such are moft of the vineyards at Rome; but particularly that of Monte Dragone, at Frefcati; and in France, the new caftle of St. Germain en Laye.

THEATER, *anatomical*, in a fchool of *Medicine* and *Surgery*, is a hall, with feveral rows of feats, difpofed in the circumference of an amphitheater, having a table, bearing on a pivot, in the middle, for the diffection of bodies.

Such is the anatomical *theater* of the royal garden at Paris.

The THEATER at Oxford is a beautiful building, erected by archbifhop Sheldon, for the ufe of fcholaftic exercifes.

THEATINES, an order of nuns, under the direction of the *Theatins*.

There are two kinds of *Theatines*, under the title of *Sifters of the Immaculate Conception*, who form two different congregations, the one engaged by folemn vows, and the other only by fimple vows. Their common foundrefs was Urfula Benincafa. Thofe who make the fimple vows are the moft ancient, and are called abfolutely *Theatines of the Congregation*: they had their rife at Naples, in 1583.

The others are called *Theatines of the Hermitage*: the whole bufinefs of thefe is praying in retirement, and an auftere folitude, to which they engage themfelves by folemn vows.

The *Theatines* of the firft Congregation take care of the temporal concerns of thefe laft. Their houfes ftand together, and communicate by a large hall. Their foundrefs drew up their conftitutions, and laid the foundation of their houfe at Naples; but died before it was finifhed.

Gregory XV. who confirmed the new inftitute under the rule of St. Auguftine, appointed that they fhould be under the direction of the *Theatins*. Urban VIII. revoked this article by a brief in 1624, and fubjected them to the nuncio of Naples; but Clement IX. annulled this brief, and fubmitted them anew to the *Theatins* by a brief in 1668.

THEATINS, a religious order of regular priefts: thus called from their firft fuperior don John Pietro Caraffa, archbifhop of Chieti, in the kingdom of Naples, which was anciently called *Theate*.

The fame archbifhop became afterwards pope, by the name of Paul IV. after having been a companion of Gaetan, or Cajetan, a Venetian gentleman, the firft founder of this order, at Rome, in 1524.

The *Theatins* were the firft who affumed the title of *regular clerks*. They have not only no lands, or fixed revenues, either in common, or in propriety; but they do not even afk or beg any thing; but wait for what Providence fhall fend them for their fubfiftence.

They employ themfelves much in foreign miffions; and in 1627, they entered upon Mingrelia, where they have an eftablifhment: they have had the like in Tartary, Circaffia, and Georgia; but this they have fince abandoned.

Their firft congregation appeared at Rome in 1524, and was confirmed the fame year by Clement VII. Their conftitutions were drawn up at a general chapter in 1604, and approved by Clement VIII. They wear the priefts habit.

THEATRE. See THEATER, and AMPHITHEATER.

THEATRIC *bandages*, a term ufed by Hippocrates, to exprefs the parade of furgery in applying bandages for fhew, when there was no real ufe in them. All fuch bandages he called *theatric*, only proper to be looked at.

THEAVE, among country people, denotes an ewe lamb of the firft year.

THEBAID, *Thebais*, a famous heroic poem of Statius, the fubject whereof is the civil war of Thebes between the two brothers Eteocles and Polynices; or Thebes taken by Thefeus.

Statius was twelve years in compofing his *Thebaid*, which confifts of twelve books: he wrote under Domitian. He is cenfured by the beft critics, as Boffu, &c. for a vicious multiplicity of fables and actions, for too much heat and extravagance, and for going beyond the bounds of probability.

Several Greek poets had compofed *Thebaids*, or poems of this name, before him; the principal were, Antagoras, Antiphanes of Colophon, Menelaus the Ægean; and an anonymous author mentioned by Paufanias, lib. ix.

Ariftotle, praifing Homer for the fimplicity of his fable, oppofes to him the ignorance of certain poets, who imagined that the unity of fable or action was abundantly provided for by the unity of the hero, and who compofed Thefeids, Herculeids, &c. in each whereof they collected every thing that had ever happened to their principal perfon.

THEBANUS *ophites*, in *Natural Hiftory*, a name given by fome of the ancients to that fpecies of the OPHITES, or ferpentine marble, more commonly called *ophites niger*, the black ferpentine.

THEBET, in *Chronology*. See TEBET.

THEDO, in *Ichthyology*, a name given by Figulus and others to the TROUT.

THEFT, *furtum*, in *Law*, an unlawful, felonious taking away another man's moveable and perfonal goods, againft the

the owner's will, with an intent to steal them. See LARCENY.

Open *theft* from the person, or in the presence of the owner, is properly called ROBBERY.

THEFTBOTE, the receiving a man's goods again from a thief, or other amends, by way of composition, and to prevent prosecution, that the felon may escape unpunished; the punishment whereof is now fine and imprisonment.

This is frequently called compounding of felony. By 25 Geo. II. cap. 36. even to advertise a reward for the return of things stolen, with no questions asked, or words to the same import, subjects the advertiser and the printer to a forfeiture of 50*l*. each.

THEIOCRUS, in the *Materia Medica of the Ancients*, a name given by some to the MELANTERIA.

This name *theiocrus* signifies only sulphur-coloured, and was at first used with the name of vitriol, as expressive of the difference of this kind from others; but in time it became common to use it alone.

THEISM. See DEISM.

THEKUPHÆ. See TEKUPHÆ.

THELE, a word used by some to express the nipple, and by others for the whole breast.

THELIGONUM, in *Botany*. See *Dog's* CABBAGE.

THELONIUM, *telonium*, signifies toll.

Among the Romans, *telonium* denoted a custom-house, or place where the toll was collected.

Breve essendi quieti de THELONIO, a writ lying for the citizens of a city, or burgesses of a town, that have a charter or prescription to free them from toll, against the officers of any town or market, who would constrain them to pay it, contrary to the said grant or prescription.

THELONIO *rationabili habendo pro dominis habentibus dominica regis ad firmam*, a writ lying for him that hath of the king's demesne in fee-farm to recover reasonable toll of the king's tenants there, if his demesne hath been accustomed to be tolled.

THEME, *thema*, a subject or topic, to write or compose on.

THEME, among *Astrologers*, denotes the figure they construct when they draw the horoscope; representing the state of the heavens for a certain point, or moment, required; i. e. the places of the stars and planets, for that moment.

The celestial *theme* consists of twelve triangles, inclosed within two squares, and called the *twelve houses*.

THEME, in *Grammar*, denotes a verb, considered in its primary and absolute sense, and not limited to any particular mode or tense: or it is the verb in its primitive radical state, whence its different formations are derived.

THEMIS, in *Astronomy*, a name given by some to the third satellite of Jupiter.

THEMIS, in *Mythology*, the daughter of Cœlum and Terra, or of Uranus and Titaia, the eldest sister of Saturn, and aunt of Jupiter.

Themis, according to Diodorus, established divination, sacrifices, the laws of religion, and every regulation that contributed to maintain order and peace among men. She also applied herself to astrology, issued predictions, and after her death temples were erected to her, in which oracles were delivered. She had a temple on mount Parnassus, and another in the citadel of Athens.

THENAR, in *Anatomy*, a muscle whose office is to draw the thumb from the fore-finger; whence it is also denominated *abductor pollicis manus*.

It is fixed to the bone which supports the thumb, and to the neighbouring part of the great internal annular or transverse ligament of the carpus. It is in some measure bicipital; two distinct portions answering to the two insertions. As it runs along the first phalanx, these two portions unite, and diminishing in thickness, are both inserted by one tendon in the lateral internal part of the head of the first phalanx, in the lateral part of the basis of the second, and in the lateral ligament of that joint. The void space between the two portions of this muscle gives passage to the tendon of the *flexor pollicis longus*. That portion which lies nearest the hollow of the hand is largest; and its tendinous extremity is inserted in the first sesamoide bone, situated at the basis of the second phalanx.

There is a similar muscle belonging to the great toe, sometimes also called *thenar*, or *abductor pollicis pedis*.

The antagonists to these are called *antithenars*.

THENAR *pedis*, a muscle made up of several portions, and lying on the inner edge of the sole of the foot. It is fixed by three or four fleshy fasciculi to the lower and inner part of the os calcis, scaphoides, and cruciforme majus, and a little in the annular ligament under the inner ancle, which belongs to the tendon of the flexor longus. From all these insertions the fasciculi approach each other, as they advance under the first bone of the metatarsus, and are fixed in the internal sesamoide bone, and inside of the first phalanx near its basis; and there is another fasciculus fixed by one end to the os scaphoides, and cuneiforme majus; and by the other to the external sesamoide bone, and outside of the first phalanx of the great toe. Winslow.

THENOPSYCHITES. See THNETOPSYCHITES.

THENSA, among the Romans, a veil or canopy, used in the chariots at games; and likewise to cover a seat of state.

Thensæ could not be granted to any but by the express allowance of the senate. Hist. Acad. Inscript. vol. i. p. 359.

THEOBROMA, in *Botany*. See *Bastard* CEDAR, and CACAO, which, in the Linnæan distribution, form the two species of this genus. Their distinct characters, as given by Miller, may be seen under their respective titles.

THEOCATAGNOSTÆ, formed from Θεος, *God*, and καταγινωσκω, *I judge*, or *condemn*, a sect of heretics, or rather of blasphemers, who presumed to find fault with certain words and actions of God, and to blame many things in the Scriptures.

Marshal, in his tables, places these heretics in the seventh century; for what reason we know not. Damascenus is the only author that mentions them, but without taking any notice of the time of their appearance.

THEOCRACY, formed from Θεος, *God*, and κρατος, *power*, *empire*, a state governed by the immediate direction of God alone.

According to Josephus, the ancient government of the Jews was *theocratic*; God himself ordering and directing every thing belonging to the sovereign authority.

By the oracle of Jehovah himself, all laws were enacted, war was proclaimed, and magistrates were appointed; in which three particulars the *summa potestas*, or sovereign authority, of any state, consists. And as Jehovah was the king, as well as the god of Israel, the PRIESTS and LEVITES, who were the stated attendants on his presence, and to whom the execution of the law in many cases was committed, were properly ministers of state and of civil government, as well as of religion. The sacrifices also, besides their religious use, were intended for the support of the state, and civil government.

This *theocracy* lasted till the time of Saul; when the Israelites, weary thereof, desired they might have a king like other nations; and thence forward the state became monarchic.

There was also a kind of imaginary *theocracy* at Athens: while the sons of Codrus were disputing the succession, the Athenians, wearied out with the miseries of an intestine war, abolished the royalty, and declared Jupiter the only king of the people of Athens.

THEODOLITE, a mathematical instrument, much used in surveying, for the taking of angles, distances, altitudes, &c.

It is made variously; several persons having their several ways of contriving it, each attempting to make it more simple and portable, more accurate and expeditious, than others. It consists of a brass circle, about a foot diameter, cut in form of *fig.* 53. *Tab.* III. *Surveying*; having its limb divided into 360 degrees, and each degree subdivided either diagonally, or otherwise, into minutes.

Underneath, at *cc*, are fixed two little pillars *b b* (*fig.* 54) which support an axis, whereon is fixed a telescope, consisting of two glasses, in a square brass tube, for the viewing of remote objects.

On the centre of the circle, moves the index C, which is a circular plate, having a compass in the middle, whose meridian line answers to the fiducial line *a a*; at *b b* are fixed two pillars to support an axis, which bears a telescope like the former, whose line of collimation answers to the fiducial line *a a*. At each end of either telescope is fixed a plain sight for the viewing of nearer objects.

The ends of the index *aa* are cut circularly, to fit the divisions of the limb B; and when that limb is diagonally divided, the fiducial line at one end of the index shews the degrees and minutes upon the limb. The whole instrument is mounted with a ball and socket, upon a three-legged staff.

Most *theodolites* have no telescopes, but only four plain sights, two of them fastened on the limb, and two on the ends of the index.

The use of the *theodolite* is abundantly shewn in that of the SEMICIRCLE, which is only half a *theodolite*. And in that of the PLAIN *table*, which is occasionally made to be used as a *theodolite*.

Note, the index and compass of the *theodolite* likewise serve for a circumferentor, and are used as such.

This instrument is now commonly made use of by surveyors. One of the best of the kind seems to be Mr. Sisson's

Sisson's lateſt improved *theodolite*; a deſcription of which may be found in Mr. Gardner's Practical Surveying improved; from whence it has been inſerted in a late treatiſe of practical geometry, publiſhed at Edinburgh, 1745, in 8vo. under the care, as it is commonly thought, of the late celebrated Mr. Maclaurin.

In this inſtrument the three ſtaves, by braſs ferrils at top, ſcrew into bell-metal joints, moveable between braſs pillars, fixed in a ſtrong braſs plate; in which, round the centre, is fixed a ſocket with a ball moveable in it, and upon which the four ſcrews preſs that ſet the limb horizontal. Next above is ſuch another plate, through which the ſaid ſcrews paſs, and on which round the centre is fixed a fruſtum of a cone of bell-metal, whoſe axis, being connected with the centre of the ball, is always perpendicular to the limb, by means of a conical braſs ferril fitted to it, whereon is fixed the compaſs-box, and on it the limb, which is a ſtrong bell-metal ring, whereon are moveable three braſs indexes, in whoſe plate are fixed four braſs pillars, that joining at top, hold the centre pin of the bell-metal double ſextant, whoſe double index is fitted in the centre of the ſame plate. Within the double ſextant is fixed the ſpirit-level, and over it the teleſcope.

The compaſs-box is graved with two diamonds for north and ſouth, and with 20 degrees on both ſides of each, that the needle may be ſet to the variation, and its error alſo known.

The limb has two fleurs-de-lys againſt the diamonds in the box, and is curiouſly divided into whole degrees, and numbered to the left-hand at every 10° to twice 180°, having three indexes (with Nonius's diviſions on each for the decimals of a degree) that are moved by a pinion fixed below one of them without moving the limb, and in another is a ſcrew and ſpring under, to fix it to any part of the limb: it has alſo diviſions numbered for taking the quarter girt in round timber; to which a ſhorter index is uſed, having Nonius's diviſions for the decimals of an inch; but an abatement muſt be made for the bark, f not taken off.

The double-ſextant is divided on one ſide from under its centre (when the ſpirit-tube and teleſcope are level) to above 60 degrees each way, and numbered at 10, 20, &c. And the double index (through which it is moveable) ſhews on the ſame ſide the degree and decimal of any altitude or depreſſion to that extent, by Nonius's diviſions; on the other ſide are diviſions numbered for taking the upright height of timber, &c. in feet, when diſtant 10 feet, which at 20 muſt be doubled, and at 30 trebled; and alſo the quantities for reducing hypothenuſal lines to horizontal. It is moveable by a pinion fixed in the double index. See SURVEYING.

The teleſcope is a little ſhorter than the diameter of the limb, that a fall may not hurt it; yet it will magnify as much, and ſhew a diſtinct object as perfect, as moſt of treble its length; in its focus are very fine croſs wires, whoſe interſection is in the plane of the double-ſextant, and this was a whole circle, and turned in a lathe to a true plane, and is fixed at right angles to the limb; ſo that whenever the limb is ſet horizontal (which is readily done by making the ſpirit-tube level over two ſcrews, and the like over the other two) the double-ſextant and teleſcope are moveable in a vertical plane, and then every angle taken on the limb (though the teleſcope be ever ſo much elevated or depreſſed) will be an angle in the plane of the horizon, and this is abſolutely neceſſary in plotting an horizontal plane.

THEOGAMIA, Θεογαμια, in *Antiquity*, a Sicilian feſtival in honour of Proſerpine, which ſeems to have been inſtituted in memory of her marriage with Pluto.

THEOGONY, formed from Θεος, *God*, and γονη, *geniture*, *ſeed*, *offspring*, that branch of the heathen theology which taught the genealogy of their gods.

Heſiod gives us the ancient *theogony*, in a poem under that title. Among the moſt ancient writers, Dr. Burnet obſerves, that *theogony* and coſmogony ſignified the ſame thing. In effect, the generation of the gods of the ancient Perſians, fire, water, and earth, is apparently no other than that of the primary elements.

THEOLOGICAL *criticiſm*. See CRITICISM.

THEOLOGICAL *prebend*. See PREBEND.

THEOLOGIUM, formed from Θεος, and λογος, *ſpeech*, or *diſcourſe*, in the ancient theatre, was a place, or little ſtage, above that whereon the ordinary actors appeared. See THEATRE.

The *theologium* was the place where their gods appeared. It alſo included the machines whereon they deſcended, and from which they ſpoke.

There was a *theologium* required for the repreſentation of the Ajax of Sophocles, the Hippolitus of Euripides, &c. Scal. Poet. lib. i. cap. 1.

THEOLOGY, compounded of Θεος, *God*, and λογος, *diſcourſe*, *Divinity*; a ſcience which inſtructs us in the knowledge of God, and divine things; or which has God, and the things he has revealed, for its object.

Theology is a ſcience which ſhews us what we are to believe of God, and the manner wherein he would be ſerved. It is divided into two branches, the *natural*, and the *revealed* or *ſupernatural*.

THEOLOGY, *natural*, is the knowledge we have of God from his works, by the light of nature, and reaſon.

THEOLOGY, *ſupernatural*, is that which we learn from revelation.

THEOLOGY, *poſitive*, is the knowledge of the holy Scriptures, and of the ſignification thereof, conformably to the opinions of the fathers and councils; without the aſſiſtance of any argumentation. But ſome will have it, that this ought to be called *expoſitive*, rather than *poſitive*.

THEOLOGY, *moral*, is that which teaches us the divine laws relating to our manners and actions; in contradiſtinction to

THEOLOGY, *ſpeculative*, which explains and eſtabliſhes the doctrines of religion, as objects of faith.

THEOLOGY, *ſcholaſtic*, or *ſchool*, is that which proceeds by reaſoning; or that derives the knowledge of ſeveral divine things from certain eſtabliſhed principles of faith. See SCHOLASTIC *divinity*.

The ancients, according to Varro, Scævola, and Plutarch, had a three-fold *theology*; the firſt, μυθικη, *mythic*, *fabulous*, which flouriſhed among the poets; and was chiefly employed in the theogony, or genealogy, and hiſtory of the gods: to whom all things were attributed, which men, and even the vileſt of men, could be guilty of. Nevertheleſs, the popular religion and worſhip were in a great meaſure founded upon that mythology, which run through the whole of their religion, and was of great authority with the people. Many unexceptionable proofs of this are produced by Dr. Leland in his Advantage and Neceſſity of the Chriſtian Revelation, vol. i. part i. chap. 6.

The ſecond, πολιτικη, *political* or *civil*, was that eſtabliſhed by the Roman laws, and chiefly embraced by the politicians, prieſts, and people, as moſt ſuitable and expedient to the ſafety, quiet, and proſperity of the ſtate. This, though not the true, was the vulgar *theology*, and conſtituted the public and authorized religion. It was that, which the philoſophers themſelves, whatever private opinions or ſpeculations they might entertain, or diſpute of in their ſchools, univerſally conformed to in their own practice, and alſo exhorted others to do ſo. Varro informs us, that this *theology* particularly determined what gods they were publicly to worſhip, what ſacred rites they were to obſerve, and what ſacrifices to offer.

Although even the vulgar among the pagans ſeem, in general, to have had ſome notion of one ſupreme GOD, yet their *theology* was properly polytheiſm; and the providence they acknowledged was the providence not of one god, but of many gods. The learned Dr. Cudworth, who ſeems inclined to put the moſt favourable conſtruction upon the pagan *theology*, acknowledges, that the civil *theology*, as well as the poetical, had not only many phantaſtic gods in it, but an appearance of a plurality of independent deities; ſeveral being made ſupreme in their reſpective territories or functions. Ariſtotle (Oper. tom. i. p. 1246, ed. Paris, 1629.) intimates, that according to the laws of cities and countries, that is in the civil or political *theology*, there ſeems to be no one abſolutely powerful or all-perfect being, but a plurality of gods, one of whom is ſuppoſed to be more powerful in one reſpect, and another in another reſpect. Beſides, the public religion was made up partly of the phyſical and partly of the poetical *theology*. Thoſe poetical fables, which Varro cenſures as unworthy of the gods, and as aſcribing to them actions which none but the vileſt of men could be guilty of, were not only permitted to be acted on the public theatres, and heard with pleaſure by the people, but they were regarded as things pleaſing to the gods themſelves, by which they were propitiated and rendered favourable; and accordingly they were taken into the public religion. Games were celebrated, and plays were founded upon them; and the public games and plays were on certain occaſions conſidered as acts of religion, encouraged by their deities, and celebrated in honour of them. It is alſo juſtly obſerved, that the images, forms, habits, and ornaments of their gods, their different ſexes and ages, and the ſacred feſtivals inſtituted to their honour, had all of them a reference to the fables of the poets and mythologiſts, and were founded upon them; ſo that the civil and the fabulous *theology* might each of them be called civil, and each fabulous. Hence proceeded many abſurd and ridiculous, and many immoral and inhuman rites, which were made uſe of in the

the worship of their gods, and which were either prescribed by the laws, or were established customs, countenanced by the magistrates, and which had obtained the force of laws, and may, therefore, be regarded as belonging to the public religion of the pagans. See Leland's Christian Revelation, ubi supra, cap. 7.

The third, φυσικη, *natural*, was chiefly cultivated by the philosophers, as most agreeable to nature and reason. The physical or natural *theology* acknowledged one only supreme God; to which it added dæmons or spirits, as mediators between him and man.

Dr. Leland has urged a variety of considerations to prove, that, notwithstanding the high encomiums which have been bestowed upon the *philosophical theology* of the pagans, it was of little use for leading the people into a right knowledge of God and religion, and for reclaiming them from their idolatry and polytheism. To this purpose he observes, that, if the philosophers had been right in their own notions of religion, they could have but little influence on the people, for want of a proper authority to enforce their instructions. The affected obscurity of the pagan philosophers was another cause which rendered them unfit to instruct the people in religion: to which it may be added, that some of them used their utmost efforts to destroy all certainty and evidence, and to unsettle men's minds as to the belief of the fundamental principles of all religion; and even the best and greatest of them acknowledged the darkness and uncertainty they were under, especially in divine matters. The philosophers themselves were also for the most part very wrong in their own notions of the Divinity; they very much corrupted the ancient tradition relating to the one true God and the creation of the world, and endeavoured to account for the formation of all things without the interposition of a Deity. And the opinions of those philosophers who were of a nobler kind, were chargeable with great defects: they generally expressed themselves in the polytheistic strain, and instead of leading the people to the one true God, they spoke of a plurality of gods, even in their most serious discourses; ascribing those works to the gods, and directing those duties to be rendered to them, which properly belong to the supreme. The philosophers likewise referred the people for instruction in divine matters to the oracles, which were managed by the priests: this was particularly the case with Socrates, Plato, and the Stoics.

It was an universal maxim among them, that it was the duty of every wise and good man to conform to the religion of his country; and they not only worshipped the gods of their respective countries, according to the established rites, and exhorted others to do so, but when they took upon themselves the character of legislators, and drew up plans of laws and of the best forms of government, polytheism, and not the worship of the one true God, was the religion they proposed to establish. Moreover, they employed their learning and abilities to defend and justify the popular idolatry and polytheism. The worship of inferior deities was recommended by them under pretence that it tended to the honour of the supreme. Some of the most eminent of them endeavoured to colour over the most absurd part of the pagan poetical *theology* by allegorizing the most indecent fables. They apologized for the Egyptian animal worship, which the generality of the vulgar pagans in other nations ridiculed. They vindicated idolatry and image worship as necessary to keep the people from falling into irreligion and atheism; not to add, that some of the more refined philosophers were against any external worship of the supreme God.

Many of the philosophers, and of the learned and polite pagans, denied a Providence. Of those who professed to acknowledge it, some confined it to heaven and heavenly things; others supposed it to extend to the earth and to mankind, yet so as only to exercise a general care and superintendency, but not to extend to individuals: others, again, supposed all things, the least as well as the greatest, to be under the care of Providence; but they ascribed this not to the supreme God, who, they thought, was above concerning himself with such things as these, and committed the care of them wholly to inferior deities. See the illustration and proof of these several allegations by Dr. Leland, ubi supra, cap. 10—17.

THEOLOGY, *bachelor in*. See BACHELOR.

THEOLOGY, *mystic*. See MYSTIC.

THEOLOGY, *polemical*. See POLEMICAL.

THEOMANTIA, Θεομαντεια, in *Antiquity*, divination by the supposed inspiration of some deity. For a particular account of which, see Potter, Archæol. Græc. lib. ii. cap. 12. tom. i. p. 298.

THEOPASCHITES, *Theopaschitæ*, a sect of heretics in the fifth century, the followers of Petrus Fullensis, or Peter the Fuller, who usurped the see of Antioch; and after having been several times deposed, and condemned, on account of his opposition to the council of Chalcedon, was at last fixed in it, A. D. 482, by the authority of the emperor Zeno, and the favour of Acacius, bishop of Constantinople; whence they are sometimes also denominated *Fulloniani*.

Their distinguishing doctrine was, that the whole Trinity suffered in the passion of Jesus Christ.

This heresy was embraced by the Eutychian monks of Scythia, or, according to La Croze, of Egypt; who using their utmost efforts to make it obtain, raised great disorders towards the beginning of the following century.

It was condemned, at its first rise, in the councils of Rome and Constantinople, held in 483. It was again revived in the ninth century, and again condemned in a council at Rome, held in 862, under pope Nicolas I.

F. Le Quien, in his notes on Damascenus, says, that the same error had been taught before Fullensis, by Apollinarius, whose disciples were the first that were called *Theopatitæ*, or *Theopaschitæ*.

THEOPHANIA, Θεοφανεια, formed of Θεος, *God*, and φαινω, *I appear*, in *Antiquity*, a festival observed by the Delphians upon the day whereon Apollo first manifested himself to them.

THEOPHANY, in *Church History*, is sometimes used in the same sense with EPIPHANY.

THEOPHRASTA, in *Botany*, the name of a genus of plants of the *pentandria monogynia* class, the characters of which are these; the cup is a small perianthium, slightly divided into five obtuse segments, and remaining when the flower is fallen; the flower consists of a single petal, in form of a bell, slightly divided into five obtuse segments; the stamina are five tapering filaments, shorter than the flower; the antheræ are simple; the germen of the pistil is of an oval figure; the style is tapering, and shorter than the flower; the stigma is acute; the fruit is a very large globose capsule, containing only one cell; the seeds are numerous and roundish, and are affixed to every part of their receptacle, which is loose. There is one species.

THEOPHRASTICS, a name given to the followers of Paracelsus, from his name Theophrastus.

THEOPNEUSTÆ, Θεοπνευσται, formed of Θεος, *God*, and πνεω, *I breathe*, an epithet given to enthusiastical diviners.

THEOPROPIA, Θεοπροπια, formed of Θεος, *God*, and πρεπω, *I excel*, a designation given to oracles. See ORACLE.

THEOPSIA, Θεοπτια, formed of Θεος, *God*, and οπτομαι, *I see*, in *Mythology*, denoted the appearance of the gods. Cicero, Plutarch, Arnobius, and Chrysostom, mention appearances of this kind.

THEORBO, THIORBA, or TIORBA, a musical instrument, made in form of a large lute; except that it has two necks, or juga, the second and longer whereof sustains the four last rows of chords, which are to give the deepest sounds.

The word is formed from the French *teorbe*, or *theorbe*, and that from the Italian *tiorba*, which signifies the same; and which some will have to be the name of the inventor.

The *theorbo* is an instrument which for many years succeeded to the lute, in the playing of thorough basses: it is said by some to have been invented in France by the sieur Hotteman, and thence introduced into Italy, &c.

The only difference between the *theorbo* and the lute is, that the former has eight bass or thick strings twice as long as those of the lute; which excess of length renders their sound so exceedingly soft, and keeps it up so long a time, that it is no wonder many prefer it to the harpsichord itself. At least it has this advantage over it, that it is easily removed from place to place, &c.

All its strings are usually single; though there are some who double the bass-strings with a little octave, or the small strings with an unison; in which case, bearing more resemblance to the lute than the common *theorbo*, the Italians call it the ARCILEUTO, or *arch-lute*.

THEOREM, in the *Mathematical Method*, a proposition which terminates in theory, and which considers the properties of things already made, or done.

Or, a *theorem* is a speculative proposition, deduced from several definitions compared together. Thus, if a triangle be compared with a parallelogram standing on the same base, and of the same altitude, and partly from their immediate definitions, and partly from other of their properties already determined, it is inferred, that the parallelogram is double the triangle; that proposition is a *theorem*.

Theorem stands contradistinguished from PROBLEM.

There are two things to be chiefly regarded in every *theorem*, viz. the proposition, and the demonstration: in the first

first is expressed what agrees to some certain thing under certain conditions, and what does not.

In the latter, the reasons are laid down, by which the understanding comes to conceive, that it does or does not agree thereto.

Theorems are of various kinds: as

THEOREM, *universal*, is that which extends to any quantity without restriction, universally. As this, that the rectangle of the sum and difference of any two quantities is equal to the difference of their squares.

THEOREM, *particular*, is that which extends only to a particular quantity. As this: in an equilateral right-lined triangle, each of the angles is sixty degrees.

THEOREM, *negative*, is that which expresses the impossibility of any assertion. As, that the sum of two biquadrate numbers cannot make a square number.

THEOREM, *local*, is that which relates to a surface. As, that triangles of the same base and altitude are equal.

THEOREM, *plane*, is that which either relates to a rectilinear surface, or to one terminated by the circumference of a circle. As, that all angles in the same segment of a circle are equal.

THEOREM, *solid*, is that which considers a space terminated by a solid line; that is, by any of the three conic sections. E. gr. this: that if a right line cut two asymptotic parabolas, its two parts terminated by them shall be equal. See SOLID.

THEOREM, *reciprocal*, is one whose converse is true. As, that if a triangle have two equal sides, it must have two equal angles: the converse of which is likewise true, that if it have two equal angles, it must have two equal sides.

THEORETIC, THEORETICAL, or THEORIC, formed from θεωρεω, *I see*, or *contemplate*, something relating to *theory*, or that terminates in speculation. In which sense it stands opposite to *practical*.

The sciences are ordinarily divided into *theoretical*, as theology, philosophy, &c. and *practical*, as medicine, law, &c. See SCIENCE.

THEORETIC, THEORETICUS, is an appellation peculiarly given to an ancient sect of physicians, contradistinguished by it from the EMPIRICS.

Theoretic physicians were such as applied themselves to a careful study and consideration of what relates to health and diseases; the principles of the human body, and its structure and parts, with their actions and uses; whatever befals it either naturally or preternaturally; the differences of diseases, their nature, causes, signs, indications, &c. the textures, properties, &c. of plants, and other medicines, &c. In a word, the *theoretic* physicians were such as went on the foot of reason, in opposition to the empirical physicians, who went wholly on experience. See MEDICINE.

THEORETICAL *arithmetic* and *philosophy*. See the substantives.

THEORI, θεωροι, in *Antiquity*, an appellation given to those Athenians who performed the solemnity called *theoria*.

THEORIA, θεωρια, in *Antiquity*, a solemn annual voyage to Apollo's temple in the island Delos, performed by the Athenians always in the same ship in which Theseus went. For the particularities of this naval procession, see Potter, Archæol. Græc. lib. ii. cap. 9. tom. i. p. 284, seq.

THEORIC *money*, in *Ancient Authors*, was what was raised by way of tax on the people, to defray the expences of theatrical representations, and other spectacles.

There were particular questors and treasurers of the *theoric money*. By a law of Eubulus, it was made a capital crime to pervert the *theoric money* to any other use; even to employ it in the occasions of war.

THEORICAL *astronomy*, is that part of ASTRONOMY which considers the true structure and disposition of the heavens, and heavenly bodies; and accounts for their various phenomena therefrom.

It is thus called in opposition to that part which considers their apparent structure, or their disposition as viewed by the eye, which is called SPHERICAL *astronomy*.

The several parts of *theorical astronomy*, see under SYSTEM, SUN, STAR, PLANET, EARTH, MOON, SATELLITE, and COMET.

THEORY, a doctrine which terminates in the sole speculation, or consideration, of its object, without any view to the practice or application thereof.

To be learned in an art, &c. the *theory* suffices; to be a master of it, both the *theory* and practice are required. Machines, many times, promise very well in the *theory*, yet fail in the practice.

We say, *theory* of the moon, *theory* of the rainbow, of the microscope, the camera obscura, the motion of the heart, the operation of purgatives, &c.

THEORIES *of the planets*, &c. are systems or hypotheses, according to which the astronomers explain the reasons of the phenomena or appearances thereof.

THEOSOPHISTS. See FIRE-*philosophers*.

THEOTOCUS, *Deipara*. See MOTHER *of God*.

THEOXENIA, Θεοξενια, in *Antiquity*, a festival in honour of all the gods, and celebrated in many cities of Greece, but especially at Athens.

THEOXINI *malagma*, the name of a sort of cataplasm, good against pains of the feet.

THERAPEUTÆ, θεραπευται, a Greek term signifying servants, more especially those employed in the service of God. The Greeks gave the appellation *therapeutæ* to such as applied themselves to a contemplative life, whether it were from the great concern they had for their souls, or from the particular mode and manner of their religion; the word θεραπευειν, whence *therapeutæ*, signifying the care a physician takes of his patient, or the service any one renders another.

Philo, in his first book of the Contemplative Life, relates, that there were a people spread throughout most of the known world, but particularly throughout Egypt, and about Alexandria, who renounced their friends, their goods, &c. and who, after discharging themselves of all temporal concerns, retired into solitary places, where they had each their separate mansion, called *semneium*, or *monastery*.

There are two points relating to those *therapeutæ* exceedingly controverted among critics, viz. 1°, Whether they were Jews or Christians; and, 2°, If they were the latter, whether they were monks or seculars?

Mosheim affirms, that the *therapeutæ* were neither Christians nor Egyptians, as some have erroneously imagined: they were undoubtedly Jews; nay, they gloried in that title, and styled themselves, with particular affectation, the true disciples of Moses, though their manner of life was equally repugnant to the institutions of that great lawgiver, and to the dictates of right reason, and shewed them to be a tribe of melancholy and wrong-headed enthusiasts. Eccl. Hist. vol. i. p. 37. Eng. ed. 8vo.

Calmet also, in his Dictionary of the Bible, alledges a variety of reasons to prove, that the *therapeutæ* were Jews and not Christians; and that they were not monks in the sense which ecclesiastical writers affix to this term. See ESSENES.

THERAPEUTICE, THERAPEUTICS, θεραπευτικη, formed from θεραπευειν, *to attend*, *to nurse*, *cure*, &c. that part of MEDICINE which is employed in seeking out remedies against diseases, and in prescribing and applying them to effect a cure.

Therapeutice teaches the use of diet, pharmacy, surgery, and the *methodus medendi*.

THERAPEUTICE is also used figuratively, in speaking of the mind, and of discourses made to correct the errors and defects thereof.

Such is the *therapeutice* or *therapeutics* of Theodoret; being a treatise against the errors or unwholesome opinions of the Greeks, i. e. the heathens.

THERAPHIM, or TERAPHIM, an Hebrew term, which has given great exercise to the critics. We meet with it thirteen or fourteen times in Scripture, where it is commonly interpreted *idols*: but the rabbins are not contented to have it simply signify idols, but will have it denote a peculiar sort of idols or images intended for the knowledge of futurity, i. e. oracles.

R. David de Pomis observes, that they were called *theraphim*, from רפה, *raphah*, to leave, because people quitted every thing to consult them.

Others hold, that the *theraphim* were brazen instruments which pointed out the hours and minutes of future events, as directed by the stars.

R. Eliezer tells us the reason why the rabbins will have the *theraphim* to speak, and render oracles: it is, says he, because it is written in the prophet Zechariah, x. 2. The *theraphim* have spoken vain things.

The same rabbin adds, that to make the *theraphim*, they killed a first-born child, clove his head, and seasoned it with salt and oil: that they wrote on a plate of gold the name of some impure spirit, laid it under the tongue of the dead, placed the head against the wall, lighted lamps before it, and prayed to it, and that it then talked with them.

Vorstius also observes, that, beside the passage of Zechariah, just quoted, it appears likewise from Ezekiel xxi. 21. that the *theraphim* were consulted as oracles.

F. Kircher directs us to seek the origin of the *theraphim* in Egypt; adding, that the word is Egyptian. Spencer, in his dissertation on the *urim* and *thummim*, maintains the word to be Chaldee, and to signify the same with *seraphim*: the Chaldeans being frequently known to change the ש into ת, that is *s* into *t*. He adds, that those images were borrowed from the Amorites, Chaldeans, or Syrians; and that the *Serapis* of the Egyptians is the same thing with the *theraphim* of the Chaldeans. See Selden de Diis Syris, synt. i. cap. 2.

Calmet observes, that the figure of a winged serpent, called

called *feraph*, whence the name feraphim, has given rife to the appellation *theraphim*, becaufe in the abraxas and other talifmans of the ancients, which are real *theraphims*, we find the figures of ferpents both with and without wings; whence he infers, that the *theraphim* of Laban, which were ftolen by Rachel, were real talifmans. Jurieu conjectures, that thefe *theraphims* were the penates, or houfhold gods of Laban, which, he fays, were the fouls of the heroes of families, deified and worfhipped; and he adds, that the *theraphims* of Laban were the images of Noah, the reftorer of the human race, and of Shem, the chief of the family of Laban. But Calmet, in reply to this conjecture, obferves, that it is by no means credible, that the worfhip of the penates and lares was known in the time of Laban; and that it is not likely, that Laban fhould have ranked among the gods Noah and Shem, who had died fo near his own time: for Noah died A.M. 2006, and Shem A. M. 2158, about eighty-feven years before Jacob came to Mefopotamia after Laban.

THERAPIDION, in *Botany*, a name given by fome authors to the common oyfter-green, or fea-laver, a plant of the TREMELLA kind.

THERIACA, θηριακα, TREACLE, in *Medicine*, a name given by the ancients to various compofitions efteemed good againft poifons; but now chiefly reftrained to what, by way of diftinction, we call *theriaca Andromachi*, or *Venice treacle*.

This is a compound of no lefs than fixty-four drugs, prepared, pulverized, and reduced, by means of honey, into an electuary. The bafis or foundation of the compofition is viper's flefh. M. Charas has written a particular hiftory of the animals, plants, and minerals, which enter the compofition of this famed remedy.

It is faid to be fovereign againft the bites of venomous beafts, and in the wind-colic; and is alfo ufed in intermitting fevers, and in cafes requiring perfpiratives and diaphoretics; alfo in continual fevers, efpecially fuch as are malignant, and where the pulfe is low and ticking; and in the fmall-pox and meafles: and, as moft of the ingredients thereof are very hot, in all difeafes, where the natural heat is weak and languid.

Andromachus, Nero's phyfician, paffes for the inventor of the *theriaca*; at leaft, it was he who gave the firft defcription thereof in elegiac verfes: his fon did the fame in profe, and Democrates in iambics.

Anciently, the *treacle* made at Venice had all the vogue: and many ftill retain the ancient prejudice: but it is now prepared at Montpelier, at Paris, and at London, with as much advantage as at Venice.

There is another vulgar kind of *theriaca*, called DIATESSARON, becaufe it only confifts of four ingredients.

Treacle-water and *treacle-vinegar* are found good prefervatives againft putrid air, whether by only being fmelt at, or by rubbing the wrifts, temples, and nofe therewith.

THERIACA *rufticorum*, a name given to GARLIC, from its ufe as an antidote againft the contagion of peftilential and other putrid diforders.

THERMÆ, θερμαι, in *Architecture*, ancient buildings, furnifhed with baths, efpecially of the hot kind.

Among the nobleft monuments of ancient Rome, are reckoned the *thermæ*, or baths of Dioclefian.

Thermæ, or hot fprings, it is commonly argued, owe heat to a colluctation, or effervefcence, of the minerals in them. Though Dr. Woodward afcribes it to the fubterraneous heat, or fire, which communicates with them by fome fpiracle, or canal, whereby a greater quantity of heat is derived thither than to ordinary fprings. See BATHS.

THERMASMA, a word ufed by fome of the ancients to exprefs any thing that warms the body, and by others particularly for a warm fomentation, prefcribed by Hippocrates for removing pains in the fide, and giving eafe in pleurifies.

THERMOMETER, THERMOMETRUM, an inftrument fhewing, or rather meafuring, the increafe and decreafe of the heat and cold of the air.

The *thermometer* and THERMOSCOPE are ordinarily accounted the fame thing: Wolfius, however, makes a difference; but fhews, at the fame time, that what we call *thermometers* are, in reality, no more than *thermofcopes*.

The invention of the *thermometer* is attributed to feveral perfons by different authors, viz. to Sanctorio, Galileo, father Paul, and Drebbel. The invention is afcribed to Cornelius Drebbelius of Alcmar, about the beginning of the feventeenth century, by his countrymen Boerhaave (Chem. i. p. 152, 156.) and Mufchenbroeck, Introd. ad Phil. Nat. vol. ii. p. 625.

Fulgenzio, in his life of father Paul, gives him the honour of the firft difcovery. Vincenzio Viviani (Vit. de l'Galil. p. 67. See too Oper. di Galil. pref. p. 47.) fpeaks of Galileo as the inventor of *thermometers*. But Sanctorio himfelf Com. in Galen. Art. Med. p. 736—842. Com. in Avicen. Can. Fen. i. p. 22. 78. 219.) exprefsly affumes this invention: and Borelli (De Mot. Animal. ii. prop. 175.) and Malpighi (Oper. Pofth. p. 30) afcribe it to him without referve. Upon which Dr. Martine remarks, that thefe Florentine academicians are not to be fufpected of partiality in favour of one of the Patavinian fchool. But whoever was the firft inventor of this inftrument, it was very rude and imperfect; and as the various degrees of heat were indicated by the different contraction or expanfion of air, it was afterwards found to be an uncertain and fometimes a deceiving meafure of heat, becaufe the bulk of air was affected, not only by the difference of heat, but likewife by the variable weight of the atmofphere.

There are various kinds of *thermometers*, the conftruction, defects, theory, &c. of which are as follow.

Conftruction of the THERMOMETER, *depending on the rarefaction of the air.*

This *aerial thermometer* confifts of a glafs tube B E (*Tab.* III. *Pneumatics*, *fig.* 50.) connected at one end with a large glafs ball A, and at the other end immerfed in an open veffel, or terminating in a ball D E, with a narrow orifice at D; which veffel, or ball, contains any coloured liquor that will not eafily freeze. Aqua fortis tinged of a fine blue colour with folution of vitriol or copper, or fpirit of wine tinged with cochineal, will anfwer this purpofe. But the ball A muft be firft moderately warmed, fo that a part of the air contained in it may be expelled through the orifice D; and then the liquor preffed by the weight of the atmofphere, will enter the ball D E, and rife, e. g. to the middle of the tube at C, at a mean temperature of the weather; and in this ftate the liquor by its weight, and the air included in the ball A, &c. by its elafticity, will counterbalance the weight of the atmofphere. As the furrounding air becomes warmer, the air in the ball and upper part of the tube, expanding by heat, will drive the liquor into the lower ball, and confequently its furface will defcend; on the contrary, as the ambient air becomes colder, that in the ball is condenfed, and the liquor preffed by the weight of the atmofphere will afcend: fo that the liquor in the tube will afcend or defcend more or lefs, according to the ftate of the air contiguous to the inftrument. To the tube is affixed a fcale of the fame length, divided upwards and downwards from the middle C into one hundred equal parts; by means of which the afcent and defcent of the liquor in the tube, and confequently the variations in the cold or heat of the atmofphere may be obferved.

A fimilar *thermometer* may be conftructed by putting a fmall quantity of mercury, not exceeding the bulk of a pea, into the tube B C (*fig.* 51.) thus bent in wreaths, that taking up the lefs height, it may be the more manageable, and lefs liable to harm; divide this tube into any number of equal parts to ferve for a fcale.

Here the approaches of the mercury towards the ball A will fhew the increafe of the degree of heat. The reafon is the fame as in the former.

The defect of both thefe inftruments confifts in this, that they are liable to be acted on by a double caufe: for, not only a decreafe of heat, but alfo an increafe of weight of the atmofphere, will make the liquor rife in the one, and the mercury in the other; and, on the contrary, either an increafe of heat, or decreafe of weight of the atmofphere, will make it defcend.

In winter, for example, the liquor would rife and fink too much; for a froft condenfing the internal air, the liquor would afcend, but as the air is heavier in frofty weather, its preffure on the liquor in the veffel D E, (*fig.* 50.) being increafed, would raife the liquor ftill higher in the tube, and thus indicate a degree of cold greater than it really is. On the other hand, if the weather grows warm, as it does in rainy weather in winter, the air in the ball will expand, and the liquor defcend in the tube; but as the weight of the atmofphere is lefs in foul weather, the liquor in D E will be lefs preffed than it was, and fuffer the liquor to defcend more than it fhould do, and fhew a greater degree of warmth than that of the ambient air. The reverfe of this will happen in fummer: for warm weather being fair weather, and the atmofphere being then heavier than ufual, the liquor will be made to ftand higher in the tube than it fhould do, and fhew the degree of heat to be lefs than it really is. And as in fummer, the weather becomes cold with rain; but the weight of the atmofphere being diminifhed, the liquor will not afcend fo far as it ought to afcend by the condenfation of the internal air, and therefore indicate the cold to be lefs than it really is: and when the two caufes, thus contributing to the rife and fall of the liquor, act equally in oppofite directions, the liquor would appear neither to afcend nor defcend, whatever might be the changes in the temperature of the atmofphere, on account of equal correfponding variations in its gravity.

Befides,

Besides, the air in the ball, &c. is liable to be affected more or less in its elastic quality by the vapours that detach themselves from the included liquor according to the degree in which it is heated or cooled. For these and other reasons, *thermometers* of this kind have been long disused. However, M. Amontons, in 1702, with a view of perfecting the aerial *thermometer*, contrived his *universal thermometer*. Finding that the changes produced by heat and cold in the bulk of the air were subject to invincible irregularities, he substituted for these the variations produced by heat in the elastic force of this fluid. This *thermometer* consisted of a long tube of glass (see *fig.* 53.) open at one end, and recurved at the other end, which terminated in a ball. A certain quantity of air was compressed into this ball by the weight of a column of mercury, and also by the weight of the atmosphere. The effect of heat on this included air was to make it sustain a greater or less weight; and this effect was measured by the variation of the column of mercury in the tube, corrected by that of the barometer, with respect to the changes of the weight of the external air. This instrument, though much more perfect than those in the room of which it was substituted by its inventor, is nevertheless subject to very considerable defects and inconveniencies. Its length of four feet renders it unfit for a variety of experiments, and its construction is difficult and complex: it is extremely inconvenient for carriage, as a very small inclination of the tube would suffer the included air to escape: and the friction of the mercury in the tube, and the compressibility of the air, contribute to render the indications of this instrument extremely uncertain. Besides, the dilatation of the air is not so regularly proportional to its heat, nor is its dilatation by a given heat nearly so uniform as he supposed. This depends, as the abbé Nollet has suggested, much on its moisture; for dry air does not expand near so much by a given heat, as air stored with watery particles; which by being converted into steam, very much increase the seeming volume of the air. For these, and other reasons, enumerated by M. de Luc, (Recherches sur les Mod. de l'Atm. tom. i. p. 278, &c.) this instrument was imitated by very few, and never came to be of general use.

Construction of the Florentine THERMOMETER. The academists del Cimento, about the middle of the seventeenth century, considering the inconveniencies of the air *thermometers* above described, attempted another, that should measure heat and cold by the rarefaction and condensation of spirit of wine; though much less than those of air, and consequently the alterations in the degree of heat likely to be much less sensible.

The spirit of wine was enclosed in glass tubes, hermetically sealed; so that these *thermometers* could be subject to no inconvenience by the evaporation of the liquor, or the variable gravity of the incumbent atmosphere. Instruments of this kind were first introduced into England by Mr. Boyle, and they were soon universally used among philosophers in other countries. The *Florentine thermometer* consists of a small narrow tube B C D (*fig.* 52.) connected with a glass ball A. The tube should be procured as cylindric as possible; and it may be tried, by putting into one end of it as much mercury as will fill the length of one inch, and letting this quantity of mercury pass from one part of the tube to another, through its whole length; measure with compasses the length it occupies in every part of the tube; and if it every where takes up an inch, the tube is cylindric, and a scale of equal divisions will agree with it: otherwise it will be longer where the tube is smaller, and shorter than an inch where the tube is larger; and in this case the divisions must be suited to the contents of the bore. The glass ball may then be joined to the tube, and a small cavity be made at the other end. Fill the ball and tube with rectified spirit of wine to a convenient height, as to C, when the weather is of a mean temperature, which may be done by inverting the tube into a vessel of stagnant coloured spirit, under a receiver of the air-pump, or by many other ways. The spirit may be coloured by pouring a quantity of it on small pieces of turmeric, which will hereby receive a red tincture; and the spirit may be repeatedly filtrated through brown paper, in order to separate from it the coarser particles of the root. Some persons, in filling the ball and tube, for preventing the spirit from wholly descending into the ball in winter, recommend putting the ball into a lump of snow, mixed with salt; or if the instrument be made in summer, into spring-water impregnated with saltpetre, that the condensed spirit may shew how far it will retire in extreme cold. If it rises to too great a height from the ball, part of it is to be taken out; and that the tube may not be made longer than necessary, it is convenient to immerge the ball, filled with its spirit in boiling water, and to mark the farthest point to which it then rises. When the *thermometer* is properly filled, with a lamp heat the little bubble left at the end D red-hot, and seal it hermetically, leaving, as Dr. Desaguliers recommends, in the *thermometer* only the third part of the air that was in it, which will give room to the dilatation of the spirit; and this rarefied air will prevent the air left in the spirit, even after the air-pump has been applied, from dividing the spirit by its expansion. To the tube apply a scale, divided into one hundred equal parts from C towards D, and also from C towards B.

Now, spirit of wine rarefying and condensing very considerably; as the heat of the ambient air increases, the spirit will dilate, and consequently will ascend in the tube; and as the heat decreases, the spirit will descend: and the degree or quantity of ascent and descent will be seen in the scale. Yet as the ratio of yesterday's heat to to-day's is not hereby discovered, this instrument is not strictly a *thermometer*, any more than the former.

It is to be here observed, 1°, That as the natural gravity of the liquor makes it tend downwards, so it resists its ascent out of the ball into the tube; and that the more, as it rises higher: for which reason, some have advised to have the tube horizontal.

2°, Since there must of necessity be some air left in the void part of the tube over the liquor, that air, by its elasticity will tend downwards, and of consequence will resist the rise of the liquor, and be compressed by it as it does rise: its elasticity therefore is thus increased.

3°, Since it is found from experience, that a less degree of heat is communicated more easily to the spirit of wine in the ball than a greater, the rarefactions of the spirit of wine are not proportionable to their producing causes; especially since a greater degree of heat finds more liquor in the tube than a less does, to which, notwithstanding, the heat may be more easily communicated than to that stagnating in the ball.

4°, Spirit of wine is incapable of bearing very great heat or very great cold. It boils sooner than any other liquor, and, therefore, the degrees of heat of boiling fluids cannot be determined by this *thermometer*. And though it retains its fluidity in pretty severe cold, yet it seems not to condense very regularly in them: and at Torneao, near the polar circle, the winter cold was so severe, as Maupertuis informs us, that the spirits were frozen in all their *thermometers*. So that the latitude of heat and cold, which spirit of wine is capable of indicating, is much too limited to be of very great or universal use.

On these accounts, the Florentine *thermometer*, though it has been much used, is far from being an accurate measure of heat, &c. to which may be added what Dr. Halley observes in the Philosophical Transactions, that he has learned from those who have kept spirit of wine long, that it always loses part of its expansive force in course of time.

This objection, suggested by Dr. Halley, and often insisted on by others, has, according to Dr. Martine, no great weight. Well rectified spirit of wine, if sealed up in a glass, is in a considerable degree unalterable. It cannot evaporate; and by many years experience its force of expansion has continued the same; as, beside other observations, we know especially from the Annual Registers of M. de la Hire's spirit *thermometer*, that has been kept in the Observatory for many years.

Another great defect of these, and other *thermometers*, is, that their degrees are not comparable with each other. They mark, indeed, the different degrees of heat and cold; but each marks only for itself, and after its own manner; because they do not proceed from any point of heat, or cold, that is common to them all. It is with them as with two clocks, which for want of having been first set to the same hour by the sun, will, indeed, mark that one, two, or more hours are passed, but not what hour it is by the day. Nor can we be assured, that when the liquor is risen a degree in two different *thermometers*, they have both suffered the same impression of an equal additional heat; since the spirit of wine may not be the same in both; and, in proportion as the spirit is more or less rectified, it will rise more or less high by the same heat. Nor is this all; for in graduating *thermometers* they often take equal lengths of the tube for equal ascents of the spirit: whereas, supposing the diameters of the tube equal throughout, which very rarely happens, there are so many irregularities within-side, that a certain length of tube sometimes requires double the quantity of liquor to fill it, that the same length in another tube of the same diameter requires. All which arises from the unequal thicknesses of the parietes of tubes in different places; and from accidental prominences and cavities, always found in the inner surfaces of tubes; and especially from their being always bigger at one end than the other.

Besides

Besides, the divisions of the scale cannot accurately indicate the quantity of rarefaction, unless the proportion of the cavity of the tube D B to that of the ball A were known. Hence it is, that the comparison of *thermometers* becomes so precarious and defective. Yet the most curious and interesting use of *thermometers* is, what ought to arise from such comparison. It is by this we should know the heat or cold of another season of another year, another climate, &c. and what is the greatest degree of heat or cold that men and other animals can subsist in.

M. de Reaumur contrived a new *thermometer* for the purpose; wherein the inconveniences above recited are proposed to be remedied. He took a large ball and tube, and knowing the content of the ball as well as that of the tube in every part, he graduated the tube, so that the space from one division to another might contain a thousandth part of the liquor, which liquor would contain one thousand parts, when it stood at the freezing point: then putting the ball of his *thermometer*, and part of the tube into boiling water, he observed whether it rose eighty divisions; and if it exceeded these, he changed his liquor, and by adding water lowered it, so that on the next trial from the freezing point to the point of boiling water, it should only rise eighty divisions: but if the liquor being too low fell short of eighty divisions, he raised it by adding rectified spirit to it. The liquor thus prepared suited his purpose, and served for making a *thermometer* of any size, whose scale would agree with his standard. Such liquor, or spirits, being about the strength of common brandy, may easily be had any where, or made of a proper degree of density by raising or lowering it.

The abbè Nollet made many excellent *thermometers* upon M. de Reaumur's principle. Dr. Martine, however, expresses his apprehensions that *thermometers* of this kind are constructed on principles, that will by no means be found so accurate as were to be wished and expected. The balls, or bulbs, being large, as three or four inches in diameter, are neither heated nor cooled soon enough to shew the variations in the heat of bodies, and in the weather. Small bulbs and small tubes, he says, are much more convenient, and may be constructed with sufficient accuracy. Though it must be allowed, that Reaumur, by his excellent scale, and by depriving the spirit of wine of its air, and expelling the air by means of heat from the ball and tube of his *thermometer*, has brought it to as great a degree of perfection as it may possibly admit; yet it is liable to some of the inconveniences of spirit *thermometers*, and much inferior to the mercurial *thermometers*. *Thermometers* of this kind, and those of mercury do not agree in indicating the same degrees of severe cold; for when the mercury has stood at 22° below o, the spirit indicated only 18°, and when the mercury stood at 28° or 37° below o, the spirit rested at 25° or 29°. See the description of Reaumur's *thermometer* at large in Mem. de l'Acad. R. des Scienc. an. 1730, p. 645. Hist. p. 15. Ib. an. 1731, p. 354. Hist. p. 7.

In 1740, M. Micheli du Crest constructed a spirit *thermometer*, to which he annexes four scales besides its own, viz. that of the old *thermometer* in the Observatory at Paris, Reaumur's, de l'Isle's and Fahrenheit's. See *Fixed points of* THERMOMETERS.

THERMOMETER, *mercurial*. It is a circumstance of principal importance in the construction of *thermometers* to procure a fluid that measures equal variations of heat by corresponding equal variations in its own bulk or volume: and the fluid which possesses this essential requisite in the most perfect degree is mercury: the variations in its bulk approaching nearer to a proportion with the corresponding variations of its heat than any other fluid. This general proposition M. de Luc has very elaborately evinced, by shewing that the condensations of fluids, which increase in bulk, when they freeze, are not proportional to the diminutions of heat, and that the dilatations of fluids, which are easily converted into vapour by heat, are not proportional to the augmentations of heat: whereas the bulk of mercury is not enlarged when it freezes, and it resists evaporation more than every other liquid that has been used in the construction of *thermometers*. Besides, it is of all liquids the most easily purged of its air. It is also the most proper for measuring very considerable variations of heat; for, if a scale be graduated with o at the point of melting ice, and 80 at that of boiling water, mercury well purged of its air will indicate seven times this difference of heat, or 561 degrees in such a scale; as it will condense without freezing to —261 of this scale, and expand without boiling to 300 of the same scale. Mercury is also more sensible than any other fluid, air excepted, or conforms more readily to the several variations of heat. Moreover, as mercury is an homogeneous fluid, it will in every *thermometer* exhibit the same dilatation or condensation by the same variations of heat.

In order to render *thermometers* uniform and comparable, it is desirable, that mercury, so excellently adapted for this purpose, should be the only fluid used in the construction of them, more especially as a *thermometer* with mercury may be more easily constructed than any others, De Luc's Recherches, &c. vol. i. par. ii. cap. 2. passim.

Dr. Halley, though apprised only of some of the remarkable properties of mercury above recited, seems to have been the first who suggested the application of this fluid to the construction of *thermometers*. Phil. Trans. Abr. vol. ii. p. 34.

Boerhaave (Chem. i. p. 720.) says, these mercurial *thermometers* were first contrived by Olaus Roemer; but the claims of Fahrenheit of Amsterdam, who gave an account of his invention to the Royal Society in 1724, (Phil. Trans. N° 381, or Abr. vol. vii. p. 49) have been generally allowed. And though Prins and others, in England, Holland, France, and other countries, have made this instrument as well as Fahrenheit, most of the mercurial *thermometers* are graduated according to his scale, and are called *Fahrenheit's thermometers*. These are made of different lengths, and with some variation in the form of the bulb, according to the purposes for which they are designed. Instead of the ball, used in the spirit *thermometer*, a cone or cylinder is annexed to the tube, which may be easily enlarged or diminished, and made of such a magnitude, that its capacity may have a certain and known proportion to that of the tube; and by this means several *thermometers* may be constructed to the same scale: besides, the heat more easily penetrates and reaches the inmost parts of the cylindric bulb, and causes the whole content to expand uniformly, and the mercury to rise almost immediately; whereas in *thermometers* with a spherical bulb it is seen first to fall, and then to rise. This phenomenon has been long since noticed both in Florentine and mercurial *thermometers*, when they are suddenly plunged into a heated liquor, the spirit of wine or mercury first descends, and then ascends; and when they are plunged into a cold fluid, the included liquor first ascends and then descends; this is the more remarkable in *thermometers* whose bulb is made of thick glass; and the reason of the phenomenon is obvious. The bulb of glass is sooner affected by the heat or cold applied to it than the included fluid; and as the glass expands by heat, the capacity of the bulb is enlarged, and the liquor descends in the tube, but being condensed by cold and its capacity diminished, the liquor is pressed upwards in the tube; and both these effects continue, till the heat and cold equally affect the enclosed fluid. Hence it follows, that all the variations of ascent and descent, to which the spirit or mercury is subject in the *thermometer*, are only the difference of the rarefactions and condensations of glass, and of the contained fluid. Hist. Ac. Royal, 1705.

The cone, or cylinder, of the *thermometer* is made of glass of a moderate thickness, lest, when the exhausted tube is hermetically sealed, its internal capacity should be diminished by the weight of the ambient atmosphere. When the mercury is thoroughly purged of its air and moisture by boiling, the *thermometer* is filled with a sufficient quantity of it; and before the tube is hermetically sealed, the air is wholly expelled by heating the mercury, so that it may be rarefied and ascend to the top of the tube. To the side of the tube is annexed a scale (see *fig.* 53.), which Fahrenheit divided into six hundred parts, beginning with that of the severe cold which he had observed in Iceland in 1709, or that produced by surrounding the bulb of the *thermometer* with a mixture of snow or beaten ice and sal ammoniac or sea-salt. This he apprehended to be the greatest degree of cold, and accordingly he marked this, as the beginning of his scale, with o; the point at which mercury begins to boil, he conceived to shew the greatest degree of heat, and this he made the limit of his scale. The distance between these two points, he divided into six hundred equal parts or degrees; of which 32 reckoned from o, indicates the degree of cold when snow or ice thaws naturally, or water begins to freeze, and this is called the *freezing point*: and he marked the heat of boiling water with 212, &c. In order more particularly to explain the divisions of this scale, and to shew how the dilatation and condensation of the mercury are estimated by it, we may observe that the bulb is supposed to contain, according to Boerhaave and Muschenbroek, 11124 parts of quicksilver, which stands at the lowest mark or *gr.* o, in an intense cold, &c. as above determined; if the bulb be immerged in snow or ice thawing naturally, or in water beginning to freeze, the quicksilver is dilated, and rises in the tube 32 of these 11124 parts; and therefore the space of the tube from *gr.* o to the freezing point *gr.* 32, is divided into thirty-two equal parts. When the *thermometer* is placed in water brought to a strong boiling at a middle

ſtate of the atmoſphere in places near the level of the ſea, when the mercury in the barometer ſtands at about 30 inches or a very little under it, the quickſilver is dilated 212 of theſe parts beyond its original bulk of 11124, ſo as now to poſſeſs in the bulb and tube together a ſpace equal to 11336 ſuch parts; and the ſpace from *gr.* 32 to *gr.* 212, is divided into 180 equal parts or degrees of the *thermometer*; which, if the tube be long enough, may be protracted as far as is convenient. It may extend well enough to *gr.* 600, and not much farther, for with a heat but little greater than that the mercury begins to boil.

Dr. Boerhaave, in one place, makes the number of parts into which the mercury in the bulb is ſuppoſed to be divided to be 10782 inſtead of 11124, and in another place ſtates it at 11520, which Dr. Martine apprehends to be nearer the truth, or about 11790 parts; and he thinks the eaſieſt and ſureſt method is to fill the bulb and tube, without being ſolicitous about the bulk of the quickſilver, ſo that in freezing water, or melting ice, the mercury ſhall ſtand at a convenient height, which muſt be very nicely marked *gr.* 32; and then as accurately to obſerve where it ſtands when dilated by the heat of boiling water to *gr.* 212. The intermediate ſpace is then divided into 180 degrees, which ſcale may be protracted upwards or downwards as far as we ſhall judge convenient. See *Fixed points of* THERMOMETERS.

In the above method of graduating the ſcale, the bore of the tube is ſuppoſed to be perfectly cylindric, which cannot always be obtained. But though it be tapering or ſomewhat unequal, it is eaſy to manage that matter, in the manner propoſed by the abbé Nollet (Leçons de Phyſ. Exp. tom. iv. p. 376.), by making a ſmall portion of the quickſilver, e. g. as much as fills up an inch or half an inch, ſlide backward and forward in the tube; and thus to find the proportions of all its inequalities, and from thence to adjuſt the diviſions to a ſcale of the moſt perfect equality. See *Obſervations on the Conſtruction of* THERMOMETERS.

Other *thermometers* of a ſimilar conſtruction have been accommodated to common uſe, the ſcale of which is only a part of that above deſcribed. They have been made of a ſmall ſize and portable form, and the tube with its annexed ſcale has been encloſed in another thicker glaſs hermetically ſealed, in order to preſerve it from injury. Mr. Ramſden, at the deſire and for the uſe of Mr. Hunter in his experiments on the HEAT of animals and vegetables, conſtructed very ſmall *thermometers*, ſix or ſeven inches long, and not above two twelfths of an inch thick in the ſtem; having the external diameter very little larger than that of the ſtem, on which was marked the freezing point. The ſtem was embraced by a ſmall ivory ſcale, ſo as to ſlide upon it eaſily, and retain any poſition. Upon the hollow ſurface of this ſcale were marked the degrees which were ſeen through the ſtem. Phil. Tranſ. vol. lxviii. par. i. p. 8.

In 1733, M. de l'Iſle of Peterſburg conſtructed a mercurial *thermometer* (ſee *fig.* 53.) on the principles of Reaumur's ſpirit *thermometer*. In his *thermometer*, the whole bulk of quickſilver, when immerged in boiling water, is conceived to be divided into 10,000, or rather 100,000 parts; and from this one fixed point the various degrees of heat, either above or below it, are marked in theſe parts on the tube or ſcale, by the various expanſion or contraction of the quickſilver in all the imaginable variety of heat. Dr. Martine apprehends it would have been better if Mr. De l'Iſle had made the integer of 100,000 parts, or fixed point at freezing water, and from thence computed the dilatations or condenſations of the quickſilver in thoſe parts. All the common obſervations of the weather, &c. would have been expreſſed by numbers increaſing as the heat increaſed, which is the more natural way; nor would there have been any great incongruity, or inconvenience, in expreſſing after the manner of Reaumur, the few obſervations that occur below ſimple freezing by numbers of contraction below *gr.* 0, or 100,000. However, in practice, it will not be very eaſy to determine exactly all the diviſions from the alteration of the bulk of the contained fluid. And beſides, as glaſs itſelf is dilated by heat, though in a leſs proportion than quickſilver, ſo that it is only the exceſs of the dilatation of the contained fluid above that of the glaſs that is obſervable; if different kinds of glaſs be differently affected by a given degree of heat, this will make a ſeeming difference in the dilatations of the quickſilver in the *thermometers* conſtructed in the Newtonian method, either by M. de Reaumur's or Mr. De l'Iſle's rules. Accordingly, it has been found, that the quickſilver in *thermometers*, conſtructed in M. De l'Iſle's way, has ſtood at different degrees of the ſcale when immerged in thawing ſnow. In ſome it was at *gr.* 154, in others at 156, and in another at 158: and it appears by Mr. De l'Iſle's own account, that his *thermometers* diſagree conſiderably from one another. See *Fixed Points of* THERMOMETERS.

THERMOMETER, *metalline*, is a name given to a machine compoſed of two metals, which, whilſt it indicates the variations of cold and heat, ſerves to correct the errors that reſult from hence in the conſtruction of pendulum clocks. Inſtruments of this kind have been contrived by Graham, Le Roy, in 1738, Ellicot, Harriſon, &c. See *Compound* PENDULUM.

We have alſo an account of inſtruments of this kind invented by Mortimer, Frotheringham, and Fitzgerald, in the Phil. Tranſ. vol. xliv. p. 689. vol. xlv. p. 129. and vol. li. p. 823. to which we muſt refer for a particular deſcription of each, illuſtrated by figures.

M. de Luc has likewiſe deſcribed two *thermometers* of metal, which he uſes for correcting the effects of heat upon a barometer, and an HYGROMETER of his conſtruction connected with them. In one of theſe a ſtrong rod of well-hardened braſs, ſupports upon an edge, at a convenient diſtance from the centre of motion, a lever, which holds the ſcale of the barometer ſuſpended, and makes it riſe or fall by the dilatation or condenſation of the braſs rod, as the quickſilver riſes or falls in the barometer, by the correſponding variations of heat. This ſcale of the barometer, when it moves, draws, or looſens a thread of ſilk-graſs, which goes over a ſmall pulley placed upon the ſame axis with a much larger one, to which the ſcale of the hygrometer is hung likewiſe by a ſimilar thread, which thus varies, by the proportion of the diameters of the pullies, as the heat makes the quickſilver in the hygrometer vary. This inſtrument is convenient for meteorological obſervations: becauſe it ſaves one obſervation and two corrections for the heat; but it is neceſſary from time to time to correct an irregularity in it, which is eaſily perceived by means of an index, carried by the moveable ſcales of the two inſtruments, which, going over immoveable ſcales of the ſame ſort, ſhews their difference of height. When this difference is no longer conformable to the indication of the *thermometer*, it is eaſily rectified by turning ſmall pegs, on which is twiſted the thread of ſilk-graſs, which ſerves for the ſuſpenſion of the ſcales. The irregularity juſt mentioned conſiſts in this, that when the heat, after having varied, returns to the ſame point of the quickſilver *thermometer*, the metallic *thermometer* does not return to it exactly, but varies nearly in the following manner: during the ſummer the latter gains conſtantly on the former, i. e. amidſt its variations, it always preſerves a ſmall part of the lengthening, which is at that time its ordinary ſtate. In winter, on the contrary, it becomes inſenſibly a little too ſhort. The other metallic *thermometer*, which is more curious than uſeful, on account of its greater irregularity, conſiſts of a rod of lead, which, communicating by a thread of ſilk-graſs with a ſmall pulley fixed to the ſame axis with a greater one, conducts, by means of another pulley, a needle through whoſe axis, which is bored, paſſes another axis that carries the needle of a pulley barometer. Thus this inſtrument marks the heat and weight of the air upon two concentric circles, by means of two needles turning upon the ſame centre, as in clocks; beſides which, the needle of the *thermometer* points out upon a third circle the correction for the heat, to be made on the barometer. See Phil. Tranſ. vol. lxviii. par. i. p. 437, &c.

THERMOMETERS, *oil*. To this claſs belongs Sir Iſaac Newton's *thermometer*, conſtructed in 1701, with linſeed oil inſtead of ſpirit of wine. This liquor has the advantage of being ſufficiently homogeneous, and capable of a conſiderable rarefaction, not leſs than fifteen times greater than that of ſpirit of wine. It has not been obſerved to freeze even in very great colds, and it is able to bear a great heat, about four times that of water, without boiling. With theſe advantages it was made uſe of by Sir Iſaac Newton, who diſcovered by it the comparative degree of heat for boiling water, melting wax, boiling ſpirit of wine, and melting tin; beyond which it does not appear that this *thermometer* was applied. The method he uſed for adjuſting the ſcale of this *oil-thermometer* was as follows: ſuppoſing the bulb when immerged in thawing ſnow to contain 10,000 parts, he found the oil expanded by the heat of the human body ſo as to take up one thirty-ninth more ſpace, or 10256 ſuch parts; and by the heat of water boiling ſtrongly 10725; and by the heat of melting tin 11516. So that, reckoning the freezing point as a common limit between heat and cold, he began his ſcale there, marking it *gr.* 0, and the heat of the human body he made *gr.* 12; and conſequently, the degrees of heat being proportional to the degrees of rarefaction, or 10256 : 10725 i. e. 256 : 725 : : 12 : 34, the

the heat of boiling water was expressed by *gr.* 34 = $\frac{725 \times 12}{256}$; and that of melting tin by *gr.* 72. Phil. Trans. N° 270, or Abr. vol. iv. par. ii. p. 3.

Although in this graduation, Sir Isaac Newton does not specify any degree of cold below that of freezing water, yet it would be easy to protract his scale downward below *gr.* 0, or the freezing point, and thus to adapt it for estimating greater degrees of cold, like other *thermometers*. But there is another insuperable inconvenience that attends all *thermometers* made with oil, or any other viscid liquor, viz. that such liquor adheres too much to the sides of the tube. In a sudden cold or fall of the oil, much of it sticks by the way, and only sinks gradually afterwards, so that at first the surface appears really lower than the present temperature requires. And besides, as at all times some of the oil must continue to stick and moisten the inside of the tube, in different degrees of heat and cold, the oil, becoming alternately more or less viscid, will adhere sometimes more and sometimes less; and will, therefore, inevitably disturb the regularity and uniformity of the *thermometer*. Martine's Ess. Ess. iii.

THERMOMETERS, *fixed points of*. Various methods have been proposed by various authors, for finding a fixed point, or degree, of heat and cold, from which to reckon the other degrees, and adjust the scale; so that observations made at the same or different times, in different places, might be compared together. For want of this, notwithstanding all the numerous registers of the weather, &c. that have been kept and published by different authors, we are much at a loss to determine the comparative differences of heat and cold in different countries and climates, and the result of many other observations. If all the weather-glasses in the world had been made according to one determined scale, these inconveniences and uncertainties would have been prevented; which, indeed, are now unavoidable, and must still continue so, till all agree to graduate their *thermometers* in the same manner, or at least determine some fixed or unalterable points of heat, to which all the different scales of those instruments may be reduced. The honourable Mr. Boyle was very sensible of this inconvenience, and much laments it; and he proposed the freezing of the essential oil of aniseeds, as a term of heat and cold that might be of use in making and judging of *thermometers*, and so to graduate them from this point according to the proportional dilatations or contractions of the included spirits. He mentioned also the coldness requisite to begin the congelation of distilled water as another fixed term that might be adopted; for he was persuaded that among the ordinary waters some were apt to freeze more easily than others. But he was deterred from prosecuting this scheme of fixing a standard for making and graduating all *thermometers* in the same way. Experiments, &c. on cold, in his works abridged by Shaw, vol. i. p. 579.

Dr. Halley (Phil. Trans. Abr. vol. ii. p. 36.) seems to have been fully apprized of the bad effects of the indefinite method of constructing *thermometers*, and wished to have them adjusted to some determined points. What he seems to prefer for this purpose is the degree of temperature, which is found in subterranean places, where the heat in summer and cold in winter appears to have no influence. But this degree of temperature is shewn by Dr. Martine to be a term for the universal construction of *thermometers*, both inconvenient, as it cannot be easily ascertained; and a precarious one, as the difference of soils and depths may occasion a considerable variation. Another term of heat which he thought might be of use in a general graduation of *thermometers*, is that of boiling spirit of wine, that has been highly rectified: but a much more convenient term of heat, though less insisted on by Dr. Halley, is that of boiling water. The first trace that occurs of the method of actually applying fixed points or terms to the *thermometer*, and of graduating it, so that the unequal divisions of it might correspond to equal degrees of heat is the project of Renaldinus, professor of Padua, in 1694: it is thus described in the Acta Erud. Lipf. "Take a slender tube, about four palms long, with a ball fastened to the same; pour into it spirit of wine, enough just to fill the ball, when surrounded with ice, and not a drop over: in this state, seal the orifice of the tube hermetically, and provide twelve vessels, each capable of containing a pound of water, and somewhat more; and into the first pour eleven ounces of cold water, into the second ten ounces, into the third nine, &c. this done, immerge the *thermometer* in the first vessel, and pour into it one ounce of hot water, observing how high the spirit rises in the tube, and noting the point with unity; then remove the *thermometer* into the second vessel, into which are to be poured two ounces of hot water, and note the place the spirit rises to with 2: by thus proceeding till the whole pound of water is spent, the instrument will be found divided into twelve parts, denoting so many terms or degrees of heat; so that at 2 the heat is double to that at 1, at 3 triple, &c."

But this method, though plausible, Wolfius shews, is deceitful, and is built on false suppositions; for it takes for granted, that we have one degree of heat, by adding one ounce of hot to eleven of cold water; two degrees, by adding two ounces to ten, &c. it supposes, also, that a single degree of heat acts on the spirit of wine, in the ball, with a single force; a double with a double force, &c. lastly, it supposes, that, if the effect be produced in the *thermometer* by the heat of the ambient air, which is here produced by the hot water, the air has the same degree of heat with the water.

Soon after this project of Renaldinus, viz. in 1701, sir Isaac Newton constructed his oil *thermometer*, and fixed the base or lowest fixed point of his scale at the temperature of thawing snow, and twelve at that of the human body, &c. in the manner explained under the article *oil* THERMOMETERS.

M. de Luc observes, that the second term of his scale should have been at a greater distance from the first, and that the heat of boiling water would have answered this purpose better than that of the human body.

In 1702, M. Amontons contrived his universal *thermometer*, the scale of which was graduated in the following manner. He chose for the first term the weight that counterbalanced the air included in his *thermometer*, when it was heated by boiling water: and in this state he so adjusted the quantity of mercury contained in it, till the sum of its height in the tube, and of its height in the barometer at the moment of observation was equal to seventy-three inches. Fixing this number at the point to which the mercury in the tube rose by plunging it in boiling water, it is evident, that, if the barometer at this time was twenty-eight inches, the height of the column of mercury in the *thermometer* above the level of that in the ball was forty-five inches; but if the height of the barometer was less by a certain quantity, the column of the *thermometer* ought to be greater by the same quantity, and reciprocally. He formed his scale on the supposition that the weight of the atmosphere was always equal to that of a column of mercury of twenty-eight inches, and divided it into inches from the point 73 downwards, marking the divisions with 72, 71, 70, &c. and he subdivided the inches into lines.

But as the weight of the atmosphere is variable, the barometer must be observed at the same time with the *thermometer*, that the number indicated by this last instrument may be properly corrected, by adding or substracting the quantity of which the mercury is below or above twenty-eight inches in the barometer. In this scale, then, the freezing point is at $51\frac{1}{2}$ inches, corresponding to *gr.* 32 of Fahrenheit, and the heat of boiling water at 73 inches, answering to *gr.* 212 of Fahrenheit's: and thus they may be easily compared together.

The fixed points of Fahrenheit's *thermometer* (as we have already observed under *mercurial* THERMOMETER) are the congelation produced by sal ammoniac and the heat of boiling water. The interval between these points is divided into 212 equal parts; the first of these points is marked 0, and the other 212. Reaumur in his *thermometer*, the construction of which he published in 1730, begins his scale at an artificial congelation of water in warm weather, which, as he uses large bulbs for his glasses, gives the freezing point much higher than it should be, and at boiling water he marks *gr.* 80, which point Dr. Martine apprehends to be more vague and uncertain than his freezing point. The spirit in the *thermometer*, he observes, is absolutely incapable of such a great heat as Reaumur ascribed to it, and that not by a small or trifling difference. He finds, that highly rectified spirit of wine cannot be heated beyond, *gr.* 175 in Fahrenheit's *thermometer*, while boiling water raises the quicksilver 37 degrees higher; and common brandy was able to conceive a heat no greater than about *gr.* 190. So far, he concludes, was Reaumur in the wrong, when he thought that all spirits weak and strong, immerged in boiling water, received a given degree of heat, and that equal to the heat of the surrounding water. He supposes his standard heat could take a heat only of about *gr.* 180; less by thirty-two degrees than what he reckoned. In order to determine the correspondence of his scale with that of Fahrenheit, it is to be considered that his boiling water heat is really only the boiling heat of weakened spirit of wine, coinciding nearly, as Dr. Martine apprehends, with Fahrenheit's *gr.* 180. And as his *gr.* $10\frac{1}{4}$, is the constant heat of the cave of the observatory at Paris, or Fahrenheit's *gr.* 53, he thence finds his freezing point, instead of answering just to *gr.* 32, to be something above *gr.* 34.

The *thermometer* of Mr. de l'Isle, of which he presented an account to the Academy of Sciences at Petersburg in 1733, has only one fixed point, which is the heat of boiling water, and, contrary to the common order, the several degrees are marked downwards from this point, according to the condensations of the contained quicksilver, and consequently by numbers increasing as the heat decreases. In order to determine the extent of the degrees of this scale, Mr. de l'Isle first weighed the empty tube, and then weighed it full of mercury; and the difference of these two weights gave him that of the mercury. He then exposed the *thermometer* to the heat of boiling water, and took care to preserve the mercury, which this increase of heat forced out of it: this he accurately weighed, and deducting its weight from the total weight of the mercury, he made the remainder, or that which was left in the *thermometer*, equal to 10,000: he then found by calculation how many 10,000 parts of this residue that forced out of the tube contained, and these parts formed the divisions of the scale from the point, determined by the condensation of the mercury to the same point at which it stood before it was plunged in boiling water, to the upper end of the tube; and these divisions formed the extent of the degrees of Mr. de l'Isle's scale. According to his standards, the freezing point, says Dr. Martine, is near to his *gr.* 150, corresponding to Fahrenheit's *gr.* 32, by which means they may be compared; but M. Ducrest says, that this point ought to be marked at least at *gr.* 154.

M. Ducrest in his spirit *thermometer*, constructed in 1740, made use of two fixed points; the first, or 0 indicated the temperature of the earth, and was marked on his scale in the cave of the Royal Observatory at Paris; and the other was the heat of boiling water, which the spirit in his *thermometer* was made to endure, by leaving the upper part of the tube full of air. He divided the interval between these points into 100 equal parts; calling the divisions upwards degrees of heat, and those below 0 degrees of cold.

It is said that he has since regulated his *thermometer* by the degree of cold, indicated by melting ice, which he found to be 10 $\frac{2}{5}$.

The Florentine *thermometers* were of two sorts; in one sort the freezing point, determined by the degree at which the spirit stood in the ordinary cold of ice or snow (probably in a thawing state) and coinciding with *gr.* 32 of Fahrenheit, fell at *gr.* 20; and in the other sort at *gr.* 13 $\frac{1}{2}$: and the natural heat of the viscera of cows and deer, &c. raised the spirit in the latter, or less sort, to about *gr.* 40, coinciding with their summer heat, and nearly with *gr.* 102 in Fahrenheit's, and in their other or long *thermometer*, the spirit, when exposed to the great midsummer heat in their country, rose to the point at which they marked *gr.* 80.

In the *thermometer* of the observatory at Paris, made of spirit of wine by M. de la Hire, the spirit always stands at *gr.* 48, in the cave of the observatory, corresponding to *gr.* 53 in Fahrenheit's; and his *gr.* 28 corresponded with 51 inches six lines in Amontons's *thermometer*, and consequently, with the freezing point, or *gr.* 32 of Fahrenheit's.

In the *thermometer* of Poleni, made after the manner of Amontons's, but with less mercury, 47 inches corresponded, according to Dr. Martine, with 51 in that of Amontons, and 53 with 59$\frac{1}{5}$.

In the standard *thermometer* of the Royal Society, after which *thermometers* were for a long time constructed in England, Dr. Martine found that *gr.* 34$\frac{1}{2}$, answered to *gr.* 64 in Fahrenheit's, and *gr.* 0 to 89.

In the *thermometers* graduated for adjusting the degrees of heat proper for exotic plants, &c. in stoves and greenhouses, the middle temperature of the air is marked at *gr.* 0, and the degrees of heat and cold are numbered both above and below. Many of these are made on no regular and fixed principles. But in that formerly much used, called Fowler's regulator, the spirit fell, in melting snow, to about *gr.* 34 under 0; and Dr. Martine found, that his *gr.* 16 above 0, coincided with nearly *gr.* 64 of Fahrenheit.

Dr. Hales (Statical Essays, vol. i. p. 58), in his *thermometer*, made with spirit of wine, and used in experiments on vegetation, began his scale with the lowest degree of freezing, or *gr.* 32 of Fahrenheit, and carried it up to *gr.* 100, which he marked where the spirit stood when the ball was heated in hot water, on which wax swimming first began to coagulate, and this point Dr. Martine found to correspond with *gr.* 142 of Fahrenheit. But by experience Hales's *gr.* 100 falls considerably above our *gr.* 142.

In the Edinburgh *thermometer*, made with spirit of wine, and used in the meteorological observations published in the Medical Essays, the scale is divided into inches and tenths. In melting snow the spirit stood at 8 $\frac{2}{10}$, and the heat of the human skin raised it to 22 $\frac{2}{10}$. Dr. Martine found, that the heat of the person who graduated it was *gr.* 97 of Fahrenheit.

As it is often of use to compare different *thermometers*, in order to judge of the result of former observations, we have annexed from Dr. Martine's Essays, the table by which he compared fifteen different *thermometers*. See *Tab.* III. *Pneumatics*, *fig.* 53.

There is a *thermometer* which has of late been much used in London, called the *thermometer* of Lyons, because M. Cristin brought it there into use, which is made of mercury: the freezing point is marked *gr.* 0, and the interval from that point to the heat of boiling water is divided into 100 equal degrees.

From the above abstract of the history of the construction of *thermometers*, it appears, that freezing and boiling water have furnished the distinguishing points that have been marked upon almost all *thermometers*. The inferior fixed point is that of freezing, which some have determined by the freezing of water, and others by the melting of ice; and though the difference between these two temperatures is not commonly very considerable, yet it is not invariable.

It is now well known, that all, or almost all bodies, by changing from a fluid to a solid state, or from the state of an elastic to that of an unelastic fluid, generate heat; and that cold is produced by the contrary process.

In order to obtain this fixed point or limit, melting ice, or ice powdered and mixed with water, will produce the same temperature. And though there may be some trifling difference between the temperature of ice disposed to melt, and that of melted ice or the water produced by it, this difference, however, has no sensible effect on the *thermometer*; consequently, the temperature of water successively produced by ice, and accumulated in its interstices, or from powdered ice mixed with the water, which is produced by it in melting, affords, as De Luc observes, a fixed point, which is easily obtained, and which should be adopted in the construction of all *thermometers*.

The superior fixed point of almost all *thermometers*, is the heat of boiling water; but this point cannot be considered as fixed unless the heat be produced by the same degree of boiling, and under the same weight of the atmosphere. With regard to the first circumstance, it is observed, that water, when it begins to boil, has not attained to its greatest degree of heat, which is known by its bubbling or foaming from the bottom of the vessel, and over the whole surface of the water, with the greatest violence which it is capable of acquiring; and in this state the water discovers an augmentation of heat more than one degree above the heat it had when it began to boil. The temperature of water which boils with vehemence should, therefore, be the standard of the fixed point of *thermometers*: nevertheless, it is to be considered farther, that this degree of heat with which water violently boils, is invariably the same, only under a given pressure of the atmosphere; but if the pressure be diminished or increased, the boiling heat is diminished or increased. It is well known that water, placed under the exhausted receiver of an air-pump, will be converted into steam with a degree of heat far inferior to that, which is necessary to its boiling in the open air; and under the pressure of its own vapour, confined in Papin's digester, it is said to sustain a degree of heat, without boiling, far exceeding that which, in the open air, would convert it into steam. Hence it follows that, in climates where the pressure of the atmosphere is liable to considerable change, the heat of boiling water, in open air, will be different at different times. Consequently *thermometers*, made in different states of the barometer, will disagree; unless allowance has been made for the effect of the variation of the barometer upon accurate principles. That the heat of boiling was variable, according to the pressure of the atmosphere, seems to have been known to Fahrenheit as early as the year 1724. See Phil. Trans. N° 385.

Some time after this period, Messrs. le Monnier and Cassini (Mem. de l'Acad des Sc. for 1740) made some decisive observations, in order to shew that this quantity was very considerable.

M. de Luc, in 1762, made a much more complete series of experiments, which he has described and reduced into a system in his Recherches sur les Mod. de l'Atmosphere, vol. i. p. 382, &c. vol. ii. p. 338, &c. and these have been since verified by sir George Shuckburgh, in 1775 and 1778. See Phil. Trans. vol. lxix. part ii. p. 362, &c.

M. de Luc fixes the boiling point of his *thermometer* when the barometer is at 27 Paris, or 28,75 English inches, that being its mean height at Geneva. He divides the

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the fundamental interval; i. e. the whole extent of the ſcale, between melting ice and boiling water, after the French manner, into 80 equal parts; and by a great number of experiments on the heat of boiling water, at different heights above the level of the ſea, he hath found, that the height of his *thermometer*, plunged in boiling water, may be expreſſed, in all ſtates of the barometer, by the following formula, viz. $\frac{99}{200000}$ log. $y - a = \mathrm{T}$: in which y denotes the height of the barometer in ſixteenths of a Pariſian line, T the height of a *thermometer*, plunged in boiling water, above melting ice, in hundredths of a degree of his ſcale; and a the conſtant number 10387.

By logarithms he always means the tabular or Briggian logarithms, and conſiders the ſeven figures given by the tables, beſides the index, as integral figures, i. e. he conſiders the eighth figure of the logarithm as ſtanding in the place of units. But as it is more uſual with mathematicians, and, in general, more convenient, to conſider all the figures after the index as decimals, the number which M. de Luc expreſſes by $\frac{99}{200000}$ log. y, would in that caſe be $\frac{99 \times 100}{2}$ log. y; or $\overline{99 \times 50}$ log. y. However, in the ſequel, M. de Luc's notation is retained.

Now if care were taken by the above formula, or in any other way, to adjuſt the boiling point to the mean height of the barometer in every country, the inſtruments of the ſame country would always be conſiſtent; but thoſe of different countries would ſtill diſagree; that is, they would expreſs the ſame temperature differently, though their ſimilar intervals ſhould be ſimilarly divided; for in every ſcale, the number of degrees above or below melting ice, by which any given temperature is expreſſed, will be as the value of each degree inverſely; that is, if each be a given part of the fundamental interval, as the value of the fundamental interval inverſely; but if the degrees of different ſcales be different parts of the fundamental intervals, as the value of the fundamental interval inverſely, and the number of degrees contained in it directly.

In order, therefore, to compare the *thermometers* of different countries, the proportions of their fundamental intervals to each other muſt be aſcertained, or we muſt have ſome means of finding, upon one ſcale, the place of the boiling point of another. For this purpoſe a general ſolution is requiſite of the following problem, viz. the fundamental interval being given for a given height of the barometer, to find the fundamental interval for any other given height of the barometer. The ſolution is furniſhed by M. de Luc's reſearches; and his formula, above given, is reduced to Engliſh meaſures, and adapted to Engliſh inſtruments, by Dr. Horſley. As the ſubject is curious and important, we ſhall ſubjoin the proceſs he has purſued for this purpoſe. It is but ſeldom that the barometer in this country ſtands ſo low as 27 Paris inches. Its mean height upon the plane country about London is near 30 Engliſh inches. It may, therefore, be proper for the London workmen to fix their boiling point when the barometer is at 30 inches. Fahrenheit's diviſion of the ſcale, which makes 180 degrees between melting ice and boiling water, and places the point 0 at the 32d degree below melting ice, may be retained; and a *thermometer* thus conſtructed is called by Dr. Horſley, Bird's Fahrenheit, becauſe Mr. Bird, he apprehends, is the firſt workman who took the pains to attend to the ſtate of the barometer in making *thermometers*, and has always fixed the boiling point when his barometer has ſtood at 30 inches.

T, then, being put for the height of a *thermometer* plunged in boiling water, above melting ice, in 100ths of a degree of de Luc's ſcale, in any given ſtate of the barometer; let Θ denote the ſame height in 100ths of a degree of Bird's Fahrenheit; put y for the height of the barometer, in 16ths of a Paris line; v, for its height in Paris lines; x, in 10ths of a Paris inch; z, in 10ths of an Engliſh inch; and for 10387 put a; for 16, b; for 10, c; for 12, d; and let E and F repreſent numbers expreſſing the proportion of the Engliſh foot to the French foot.

M. de Luc hath found that, whatever be the value of y, $\frac{99}{200000}$ log. $y - a = \mathrm{T}$. But log. $y =$ log. $v +$ log. b; and log. $v =$ log. $x +$ log. $d -$ log. c; and log. $x =$ log. $z +$ log. E − log. F; therefore log. $y =$ log. z + log. E + log. d + log. b − log. F − log. c; and $\frac{99}{200000}$ log. $z + \frac{99}{200000}\,\overline{\text{log. E} + \text{log. } d + \text{log. } b - \text{log. F} - \text{log. } c} - a = \mathrm{T}$. But $\frac{99}{200000}\,\overline{\text{log. E} + \text{log. } d + \text{log. } b - \text{log. F} - \text{log. } c - a} = -4171{,}55$; the French foot being to the Engliſh as 2,1315 to 2. Therefore $\frac{99}{200000}$ log. $z - 4171{,}55 = \mathrm{T}$; and $\frac{99}{20000000}$ log. $z - 41{,}7155 = \frac{\mathrm{T}}{100} =$ the height of the *thermometer*, plunged in boiling water, above melting ice, in degrees of De Luc's ſcale, when the height of the barometer, in tenths of an Engliſh inch, is z. For z write 300; then $\frac{\mathrm{T}}{100} = 80{,}902$; which is therefore the height of the *thermometer*, in boiling water, above melting ice, in degrees of De Luc's ſcale, when the barometer is at 30 inches Engliſh. And in the ſame ſtate of the barometer, the height of the *thermometer* plunged in boiling water, above melting ice, in degrees of Bird's Fahrenheit, or $\frac{\Theta}{100}$, is 180. Hence the numbers T and Θ are in the conſtant proportion of 809 and 1800, whatever be the value of z. For the change produced in the heat of boiling water, by any change of z, being always the ſame for both *thermometers*, the temperature expreſſed by T in parts of one ſcale is always the ſame, as Θ expreſſes in parts of the other; and therefore, putting $\frac{1}{\mathrm{L}}$ and $\frac{1}{\mathrm{B}}$ for the values of the 100th part of a degree of the ſcales of De Luc and Bird reſpectively, the fractions $\frac{\mathrm{T}}{\mathrm{L}}$, $\frac{\Theta}{\mathrm{B}}$ are always equal, and T, Θ are in the conſtant proportion of the invariable numbers L, B: conſequently, when the proportion of T and Θ is determined for any particular value of z, it is found generally for all: conſequently T : Θ :: 809 : 1800. And $\mathrm{T} = \frac{809}{1800}\Theta = \frac{899}{2000}\Theta$ very nearly in all values of z: and ſubſtituting this value for T in the equation exhibiting the relation between z and T, we have, for the relation between z and Θ, $\frac{99}{20000000}$ log. $z - 41{,}7155 = \frac{899}{2000 \times 100}\Theta$; or, $\frac{99}{10000 \times 899}$ log. $z - 92{,}804 = \frac{\Theta}{100} =$ the height of the *thermometer* in boiling water above melting ice, in degrees of Bird's Fahrenheit, when the height of the barometer, in 10ths of an Engliſh inch, is z. And thus M. de Luc's formula, for the variation of the boiling point, is adapted to Engliſh inſtruments, and reduced to Engliſh meaſures of length.

For z write 287,7525, the length of 27 French inches in 10ths of an Engliſh inch, and $\frac{\Theta}{100}$, the height of De Luc's boiling point above melting ice, in degrees of Bird's Fahrenheit, comes out 177,989. Hence M. de Luc's boiling point falls upon 209,989 of Bird's ſcale, i. e. upon 210 very nearly, or inſenſibly more than two degrees below Bird's point of boiling. But as 899 is a troubleſome diviſor, the computation will be more eaſy and expeditious by writing for $\frac{11}{1000000}$ log. z, s. Then $s + \frac{1}{900}s - 92{,}804 = \frac{\Theta}{100}$ very nearly. Upon theſe principles Dr. Horſley has computed the table following, for finding the heights, to which a good Bird's Fahrenheit will riſe, when plunged in boiling water, in all ſtates of the barometer, from 27 to 31 Engliſh inches; which will ſerve, among other uſes, to direct inſtrument-makers in making a true allowance for the effect of the variation of the barometer, if they are obliged to finiſh a *thermometer*, when the barometer is above or below 30 inches; though it is beſt to fix the boiling point when the barometer is at the height preſcribed.

Equation of the boiling point.

Barometer.	Equation.	Difference.
31.0	+1,57	0,78
30.5	+0,79	0,79
30.0	0,00	0.80
29.5	−0,80	0.82
29.0	−1,62	0.83
28.5	−2,45	0.85
28.0	−3,31	0.86
27.5	−4,16	0.88
27.0	−5,04	

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The numbers in the first column of this table express heights of the quickfilver in the barometer in English inches and decimal parts: the second column shews the equation to be applied, according to the sign prefixed, to 212° of Bird's Fahrenheit to find the true boiling point for every such state of the barometer. The boiling point for all intermediate states of the barometer may be had with sufficient accuracy by taking proportional parts, by means of the third column of differences of the equations. See Phil. Transf. vol. lxiv. part i. art. 30. See also an excellent paper on this subject by Dr. Maskelyne, in the Phil. Transf. vol. lxiv. part i. art. 20. In the following table we have the result of fifteen different observations made by sir George Shuckburgh (ubi supra) compared with the result of M. de Luc's rules.

Height of the Barometer reduced to the same temperature of 50°,	Mean boiling Point by Observation.	Boiling Point by De Luc's Rules	Height of Barometer.	Boiling Point by Observation.	Boiling Point by De Luc's Rules.
Inch.	°	°	Inch.	°	°
26,498	207,07	208,54	30,008	213,22	213,47
27,241	208,64	208,84	30,207	213,58	213,79
27,954	209,87	210,03	30,489	214,15	214,23
28,377	210,50	210,81	30,763	214,37	214,66
28,699	211,27	211,34	30,847	214,83	214,79
28,898	211,50	211,67	30,957	214,96	214,96
28,999	211,60	211,85			
29,447	212,55	212,74			
29,805	212,95	213,15			

Sir George Shuckburgh has also subjoined the following general table for the use of artists in constructing the *thermometer*, both according to his own observations, and those of M. de Luc.

Height of the Barometer.	Correct. of the boiling Point.	Difference.	Correct. accord. to M. de Luc.	Difference.
	°		°	
26,0	—7,09	,91	—6,83	,90
26,5	—6,18	,91	—5,93	,89
27,0	—5,27	,90	—5,04	,88
27,5	—4,37	,89	—4,16	,87
28,0	—3,48	,89	—3,31	,86
28,5	—2,59	,87	—2,45	,83
29,0	—1,72	,87	—1,62	,82
29,5	—0,85	,85	—0,80	,80
30,0	0,00	,85	0,00	,79
30,5	+0,85	,84	+0,79	,78
31,0	+1,69		+1,57	

The Royal Society, fully apprized of the importance of adjusting the fixed points of *thermometers*, appointed a committee of seven gentlemen to consider of the best method for this purpose; and their report is published in the Phil. Transf. vol. lxvii. part ii. art. 37. From a variety of experiments and observations, relating to this subject, the committee have deduced the following practical rules, which they recommend in adjusting the fixed points of *thermometers*. The most accurate way of adjusting the *boiling point* is, not to dip the *thermometer* into the water, but to expose it only to the steam, in a vessel closed up in the manner represented (*Tab.* III. *Pneumatics*, *fig.* 54.) where A B *b a* is the vessel containing the boiling water, D *d* the cover, E a chimney made in the cover intended to carry off the steam, and M *m* the *thermometer* passed through a hole in the cover. In the pursuit of this method the following particulars must be regarded: the boiling point must be adjusted when the barometer is at 29.8 inches; unless the operator corrects the observed point in the manner directed in the sequel of this article. The ball of the *thermometer* must be placed at such a depth within the pot, that the boiling point may rise very little above the cover; and the surface of the water in the pot should be at least one or two inches below the bottom of the ball. Care must be taken to stop up the hole in the cover through which the tube is inserted, and to make the cover fit pretty close, so that no air shall enter into the pot that way, and that not much steam may escape. A piece of thin flat tin plate must also be laid on the mouth of the chimney, so as to leave no more passage than what is sufficient to carry off the steam.

If the artist pleases, he may tie each corner of this plate by a string to prongs fixed to the chimney and standing on a level with the plate, as it will be thus always kept in its place.

Fig. 55. is a perspective view of the chimney and tin-plate; A B C D is the plate, E the chimney, F *f*, G *g*, M *m*, and N *n*, the prongs fastened to the chimney, to which the four corners of the plate are to be tied by the strings A F, B G, C M, and D N; the ends F, G, M, and N of the prongs must be on a level with the plate, and the strings should not be stretched tight. The chimney ought not to be less than half a square inch in area, and not less than two or three inches in length. The cover should be made to take on and off easily, and a ring of woollen cloth may be placed under it, so as to lie between it and the top of the pot. The hole in the cover may be stopped up by a cork, with a hole bored through it, big enough to receive the tube, and then cut into two, parallel to the length of the hole. Another method more convenient in use, but not so easily made, is represented in *fig.* 56. which exhibits a perspective view of the apparatus: A *a* is the cover, H the hole through which the *thermometer* is passed, B *b* a flat piece of brass fixed upon the cover, and D *d* E *e* a sliding piece of brass, made so as either to cover the hole H, or to leave it uncovered as in the figure, and to be tightened in either position by the screw *s* sliding in the slit M *m*; a semicircular notch being made in the edge B *b*, and also in the edge D *d*, to enclose the tube of the *thermometer*; pieces of woollen cloth should also be fastened to the edges B *b* and D *d*, and also to the bottom of the sliding-piece D *d* E *e*, unless that piece and the cover are made sufficiently flat to prevent the escape of the steam. In order to keep the *thermometer* suspended at the proper height, a clip may be used like that represented in *fig.* 57. which by the screw *s* must be made to embrace the tube tightly, and may rest on the cover.

Another method, which is rather more convenient, when the top of the tube of the *thermometer* is bent into a right angle, in the manner often practised at present for the sake of more conveniently fixing it to the scale, is represented in *fig.* 58: G *g* F *f* is a plate of brass standing perpendicularly on the cover, and L *l* N *n* a piece of brass bent at the bottom into the form of a loop, with a notch in it, so as to receive the tube of the *thermometer*, and to suffer the bent part to rest on the bottom of the loop; this piece must slide in a slit K *k*, cut in the plate L *l* N *n*, and be tightened at any height by the screw T. Moreover, it is best to make the water boil pretty briskly, as otherwise the *thermometer* is apt to be a great while before it acquires its full heat, especially if the vessel is very deep; and the observer should wait at least one or two minutes after the *thermometer* appears to be stationary, before he concludes that it has acquired its full height.

Another way of adjusting the boiling point is to try it in a vessel of the same kind as the former, only with the water rising a little way, viz. from one to three or four inches above the ball, taking care that the boiling point shall rise very little above the cover. In this method there is no need to cover the chimney with the tin-plate, and there is less need to make the cover fit close, unless to prevent the operator from being incommoded by the steam. The height of the barometer in this method is 29 ½ inches.

It will be convenient to have two or three pots of different depths for adjusting *thermometers* of different lengths.

A third way of adjusting the boiling point is to wrap several folds of linen rags or flannel round the tube of the *thermometer*, and to try it in an open vessel, taking care to pour boiling water on the rags, in order to keep the quickfilver in the tube as nearly of the heat of boiling water as possible. In this method the barometer should be at 29,8 inches; the water should boil fast, and the *thermometer* should be held upright, with its ball two or three inches under water, and in that part of the vessel where the current of water ascends.

Whichever of these methods of adjusting the boiling point is used, it is not necessary to wait till the barometer is at the proper height, provided the operator will take care to correct the observed height according to the following table.

Height of the Barometer when the boiling Point is adjusted according to		Correction in 1000ths of the of the interval between 32° and 212°.		Height of the Barometer when the boiling Point is adjusted according to		Correction in 1000ths of the interval between 32° and 212°.	
1st. or 3d. Method.	2d Method.			1st or 3d Method.	2d Method.		
	30,64	10		29,69	29,39	1	
	53	9		58	28	2	
30,71	41	8		47	17	3	
59	29	7		36	06	4	
48	18	6	Lower.	25	28,95	5	Higher.
37	07	5		14	84	6	
25	29,95	4		03	73	7	
14	84	3		28,92	62	8	
03	73	2		81	51	9	
29,91	61	1		70		10	
80	50	0		59		11	

In uſing this table, ſeek the height of the barometer in the column anſwering to the method of adjuſting the boiling point, the correſponding number in the third column ſhews how much the point of 212° muſt be placed above or below the obſerved point: e. g. ſuppoſe the boiling point to be adjuſted in them when the barometer is at 29 inches, and that the interval between the boiling and freezing points is 11 inches; the neareſt number to 29 in the left-hand column is 29,03, and the correſponding number in the table is 7 higher, and therefore the mark of 212° muſt be placed higher than the obſerved point by $\frac{7}{1000}$ ths of the interval between boiling and freezing, i. e. by $\frac{11 \times 7}{1000}$, or ,077 of an inch.

This method of correcting the boiling point is not ſtrictly juſt, unleſs the tube is of an equal bore in all its parts; but the tube is ſeldom ſo unequal as to cauſe any ſenſible error, where the whole correction is ſo ſmall. The trouble of making the correction will be abridged by a diagonal ſcale, ſuch as is repreſented in *fig.* 58.

Although it is of no great conſequence what kind of water is uſed in adjuſting the boiling point, ſo that it is not ſalt, or, if it be hard, that it ſhould be kept boiling at leaſt ten minutes before it is uſed; yet the committee recommend, for the adjuſtment of *thermometers* intended for nice experiments, to employ rain or diſtilled water, and to perform the operation in ſteam.

It is obſerved, that though the boiling point be placed ſo much higher on ſome of the *thermometers* now made than on others, yet this does not produce any conſiderable error in the obſervations of the weather, at leaſt in this climate; for an error of $1\frac{1}{2}$° in the poſition of the boiling point, will make an error only of half a degree in the poſition of 92°, and of not more than a quarter of a degree in the point of 62°.

It is only in nice experiments, or in trying the heat of hot liquors, that this error in the boiling point can be of much ſignification.

In adjuſting the *freezing*, as well as the boiling point, the quickſilver in the tube ought to be kept of the ſame heat as that in the ball. When the freezing point is placed at a conſiderable diſtance from the ball, the pounded ice ſhould be piled to ſuch a height above the ball, that the error, which can ariſe from the quickſilver in the remaining part of the tube, not being heated equally with that in the ball, ſhall be very ſmall, or the obſerved point muſt be corrected, on that account, according to the following table.

Heat of the Air.	Correction.
42°	,00087
52	,00174
62	,00261
72	,00348
82	,00435

The correction in this table is expreſſed in 1000th parts of the diſtance between the freezing point and the ſurface of the ice: e. g. if the freezing point ſtands ſeven inches above the ſurface of the ice, and the heat of the room is 62, the point of 32° ſhould be placed 7 × ,00261, or ,018 of an inch lower than the obſerved point. A diagonal ſcale will facilitate this correction.

The committee obſerve, that in trying the heat of liquors, care ſhould be taken that the quickſilver in the tube of the *thermometer* be heated to the ſame degree as that in the ball; or if this cannot be done conveniently, the obſerved heat ſhould be corrected on that account; for the manner of doing which, and a table calculated for this purpoſe, we muſt refer to their excellent report in the Phil. Tranſ. vol. lxvii. part ii. art. 37.

Several experiments, made by governor Hutchins, at Albany fort, in Hudſon's bay, in 1782, in purſuance of a method ſuggeſted by Dr. Black and Mr. Cavendiſh, and for which he obtained ſir Godfrey Copley's medal from the Royal Society in 1783, have not only confirmed the obſervations before made, relative to the ſolid ſtate into which quickſilver can be brought by cold, its metalline ſplendor and poliſh when ſmooth, its roughneſs and cryſtallization where the ſurface was unconfined, its malleability, ſoftneſs, and dull ſound when ſtruck; but have alſo clearly demonſtrated, that its point of congelation is no lower than — 40°, or rather — 39°, of Fahrenheit's ſcale; that it will bear, however, to be cooled a few degrees below that point, to which it jumps up again on beginning to congeal; and that its rapid deſcent in a *thermometer*, through many hundreds of degrees, when it has once paſt the above mentioned limit, proceeds merely from its great contraction in the act of freezing. See Phil. Tranſ. vol. lxxiii. part ii. art. *20, 20, 21.

Obſervations on the Conſtruction of THERMOMETERS. It it abſolutely neceſſary that thoſe who would derive any advantage from theſe inſtruments, ſhould agree in uſing the ſame liquor, and in determining, according to the ſame method, the two fundamental points. If they agree in theſe fixed points, it is of no great importance whether they divide the interval between them into a greater or leſs number of equal parts. The ſcale of Fahrenheit, in which the fundamental interval between 212°, the point of boiling water, and 32° that of melting ice, is divided into 180 parts, ſhould be retained in the northern countries, where Fahrenheit's *thermometer* is uſed: and the ſcale, in which the fundamental interval is divided into 80 parts, will ſerve for thoſe countries where the *thermometer* of M. de Reaumur is adopted. But no inconvenience is to be apprehended from varying the ſcale for particular uſes, provided care be taken to ſignify into what number of parts the fundamental interval is divided, and the point where 0 is placed.

With regard to the choice of tubes, it is moſt deſirable to have them exactly cylindric through their whole length. See *Mercurial* THERMOMETER.

The capillary tubes are preferable to others, becauſe they require leſs bulbs, and they are alſo leſs brittle, and more ſenſible. Thoſe of the moſt convenient ſize for common experiments are ſuch as have their internal diameter about the fourth of a line; and thoſe made of thin glaſs are better than others, as the riſe and fall of the mercury may be more diſtinctly perceived. The length of nine inches will ſerve for all common occaſions; but for particular purpoſes the length both of the tubes and of the diviſions ſhould be adapted to the uſes for which they are deſigned.

In determining the beſt ſize of the balls or bulbs, it has been uſual to compare new tubes with ſuch *thermometers* as are well proportioned. But M. Durand has propoſed a formula for finding the proportion which the balls ought to bear to their reſpective tubes. With this view he expreſſes the length of the tube, meaſured in diameters of itſelf, by a; the whole capacity of the ball and tube by c; the capacity of the fundamental interval, expreſſed in the ſame parts with the whole capacity, by d; the number of degrees of the fundamental interval by m; the number of other degrees which the ſcale is to contain beſides thoſe of the fundamental interval both above and below it by n; and the diameter of the ball meaſured in diameters of the tube by b: and $b = \sqrt[3]{\frac{3}{2} a \times \frac{cm}{d \times \overline{m+n}}} - 1$. For two cylinders having equal baſes being as their heights, $m : n :: d : \frac{dn}{m}$, which is the capacity of that part of the tube which exceeds the fundamental interval, to which adding d, that interval, we have the total capacity of the tube $= \frac{dn}{m} + d$, or $\frac{dn+dm}{m}$. Subtracting this from c, we ſhall have the capacity of the ball $= c - \frac{dn+dm}{m} = \frac{cm-dm-dn}{m}$. If this quantity be divided by the capacity of the tube, the quotient will ſhew how often the capacity of the ball contains that of the tube; and this quotient is $= \frac{cm-dm-dn}{dm+dn}$. Conſequently the ball is equal to as many cylinders, having a diameters of the tube, for their reſpective height, and 1 diameter for the baſe, as are contained in this laſt quotient; and, therefore, its cylindric ſolidity expreſſed in the cylindric ſolidities of the tube will be $= a \times \frac{cm-dm-dn}{dm+dn}$. But the diameter of this ball is equal to the baſe of the cylinder in which it may be inſcribed, and the ſolidity of this cylinder is equal to $\frac{2}{3}$ the ſolidity of the circumſcribing ſphere. Conſequently the ſolidity of this cylinder will be $= \frac{2}{3} a \times \frac{cm-dm-dn}{dm+dn}$; and the diameter of its baſe, equal to the diameter of the ball, will be $= \sqrt[3]{\frac{2}{3} a \times \frac{cm-dm-dn}{dm+dn}}$ or $\sqrt[3]{\frac{2}{3} a \times \frac{cm}{d \times \overline{m+n}}} - 1$.

When a proper tube and ball are procured, and their proportion aſcertained, the next object which requires peculiar attention is that of filling the *thermometer*. For this purpoſe the tubes ſhould be clean and dry, and the mercury very pure. See MERCURY and BAROMETER. The mercury may be introduced into the tube by means of a kind of reſervoir fixed at the top of it, and proportioned in ſize to the bulk of the ball, or by rolling upon the tube a ſlip of fine paper, about two or three inches broad. In order to clear the tube of its air and moiſture,

it ſhould be held over a gentle fire, ſo diſpoſed, as that it may heat at once the whole extent of the tube, till its heat becomes too great for the operator's hand to bear, who therefore uſes a glove or nippers for this purpoſe; care being taken that the ball is not heated at the ſame time. After the encloſed air is thus rarefied, and the particles that might obſtruct the free motion of the mercury are made to float in vapours within the bore of the tube, the tube is to be held upright, and the ball ſuddenly heated, by which means the air contained in it will be dilated, and carry off the impurities of the tube, ſo that it will be rendered clean and free from air. When the ball is heated to a conſiderable degree, the mercury may be poured into the reſervoir fixed at the top of the tube, through a ſmall corner of the paper. When the reſervoir is almoſt full, the ball ſhould be withdrawn from the fire, and the air will then be condenſed, and the ſpace left by it will ſoon be occupied by the mercury. By alternately heating and cooling the ball, it may thus be filled with mercury; but when it is nearly full, the mercury contained in it muſt be made to boil, by placing it over burning coals, in order to purge it of its air. However, as a ſmall quantity of air will be left in the ball after this operation, it will be expedient to remove the mercury, which remains in the reſervoir, immediately after the *thermometer* is withdrawn from the fire; and thus the whole column, unſupplied with mercury from the reſervoir, will deſcend into the ball by the condenſation of that which is contained in it, and the tube being empty, the ſmall bubble of air will eſcape. Let the tube be again heated ſucceſſively through its whole length, commencing from the bottom, and preſerving the heat of the ball, that the mercury may occupy it entirely, and no air be allowed to enter. During this operation, when the mercury of the *thermometer* begins to appear in the reſervoir, let the mercury contained in a paper funnel be poured into it in ſuch a quantity as will more than fill the *thermometer*, which is then to be removed from the fire. The mercury of the tube, and that diſcharged from the funnel, will unite, and paſs together into the *thermometer*, and thus it will be wholly filled. In this ſtate it may be left for any time at pleaſure, without any apprehenſion of its imbibing either air or moiſture. Nothing now remains but to get rid of the ſuperfluous quickſilver, and to ſeal the tube. For this purpoſe the *thermometer* is held in the hand and heated, till a drop of mercury falls out of it, and it is then left to recover the temperature of the air; by which means there will remain at the top of the tube a ſmall empty ſpace. Then with a blow-pipe and the flame of a candle, let the end of the tube be formed into a fine point, of ſuch a length as will admit of its being properly ſealed. When this preparatory proceſs is completed, let the *thermometer* be gradually plunged into boiling water, ſo that the ſuperfluous mercury may iſſue from it ſlowly; and when it ceaſes to be diſcharged, withdraw the *thermometer* from the boiling water; wipe it dry, and, as ſoon as poſſible, put the ball of it over a ſmall fire, covered with aſhes, and previouſly prepared for the purpoſe. In this part of the operation, it is neceſſary to be quick, that the mercury may not have time to condenſe, and the air enter into the tube. In this ſtate the *thermometer* may be left to heat, till it parts with more or fewer drops of mercury, according to the proportion which the length of the tube bears to that of the ſcale applied to it. The *thermometer* is then ſealed, by melting only the end of the point above mentioned, and at the ſame inſtant withdrawing it from the fire.

The method of filling the *thermometer* with a paper tube, or funnel, is as follows. Let the ball be heated ſo that the mercury may riſe to the top of the tube; whilſt it approaches it, apply the tube of paper to the end of the tube, ſo that it may ſerve for a reſervoir. The *thermometer* being placed near the fire, ſo that it may always preſerve the ſame degree of dilatation, take ſome well purified mercury in a paper cornet, and communicate a little more heat to the ball. When the mercury riſes, and forms a ſmall drop at the end, pour the mercury of the cornet into the reſervoir of paper, and withdraw the ball from the fire. Having removed the paper reſervoir, place the ball again over the fire, and ſeal the point of the tube at the moment when the mercury riſes to it, and withdraw the *thermometer* from the fire. This operation will be acquired by uſe.

Thermometers that are deſired for meaſuring great degrees of heat, require to be filled with particular precautions, which M. de Luc has minutely deſcribed.

When the *thermometer* is filled and ſealed, nothing more is neceſſary than to mark the two fixed points, graduate the ſcale, and attach it to a proper frame. See De Luc's Recherches, &c. vol. i. p. 393, &c.

Thermometers, *Experiments with*. We ſhall here inſert a table of ſome obſervations made with the *thermometer* of Fahrenheit, Reaumur, ſir Iſaac Newton, and Dr. Hales.

Obſervations by Fahrenheit's *thermometer*.

Deg.	
at 600	Mercury boils. } According to Muſchenbroeck, the barom. being at 29 Rhinland inches.
546	Oil of vitriol boils.
242	Spirit of nitre boils.
240	Lixivium tartari boils.
213	Cow's milk boils.
212	Water boils.
206	Freſh human urine boils.
190	Brandy boils.
174	Alcohol boils.
176	———— according to Muſchenbroeck.
156	Serum of blood, and white of eggs hardens.
146	Killing heat for animals, in a few minutes.
108	A hen hatching eggs, but ſeldom ſo hot.
from 107 to 103	Heat of ſkin in ducks, geeſe, hens, pigeons, partridges, and ſwallows.
at 106	Heat of ſkin in a common ague and fever.
from 103 to 100	Heat of ſkin in dogs, cats, ſheep, oxen, ſwine and other quadrupeds.
from 99 to 92	Heat of the human ſkin in health.
at 97	Heat of a ſwarm of bees.
96	A perch died in three minutes, in water ſo heated.
80	Heat of the air in the ſhade, in very hot weather.
74	Butter begins to melt.
64	Heat of the air in the ſhade, in warm weather.
48	Temperate air, in England and Holland.
43	Oil of olive begins to ſtiffen and grow opake.
32	Water juſt freezing, or ſnow and ice juſt thawing.
30	Milk freezes.
28	Urine and common vinegar freezes.
25	Blood out of the body freezes.
20	Good Burgundy, ſtrong claret, and Madeira freezes.
7	One part of ſpirits of wine mixt with three parts water freezes.
5	Greateſt cold in Penſylvania in 1731-2, 40° lat.
4	Greateſt cold at Utrecht in 1728-9.
0	A mixture of ſnow and ſalt, which is able to freeze oil of tartar, *per deliquium*, but not brandy.
—39	Mercury freezes.

Martine's Eſſays, p. 284, &c.

We muſt here obſerve, that the heat of a hen hatching chickens is placed, by this table, at 108 of Fahrenheit's *thermometer*; but it appears from M. Reaumur's experiments, that eggs will hatch in a heat no greater than that of the human ſkin. See Hatching.

2. Obſervations by Reaumur's *thermometer*.

$97\frac{1}{2}$	Anſwers to the heat of boiling water.
80	Spirit of wine in Reaumur's *thermometer* boils.
at $29\frac{2}{3}$	Greateſt height of the air in the ſhade, obſerved at Paris in 1706, 1707, 1724.
$10\frac{1}{4}$	Conſtant heat of the caves of the obſervatory at Paris.
0	Artificial congelation of water.
$14\frac{1}{4}$	Lower than (0) greateſt cold at Paris, in 1709.

3. Obſervations by ſir Iſaac Newton's *thermometer*.

34	Water boils vehemently.
$28\frac{6}{11}$	Heat between water boiling and wax melting.
24	Heat of water on which floating wax melts.
$20\frac{2}{11}$	Heat of water on which floating melted wax begins, by cooling, to loſe its fluidity and tranſparency.
17	Heat of a bath ſupportable to the hand at reſt.
$14\frac{3}{11}$	Heat of a bath ſupportable to the hand in motion. The heat of blood juſt let out is almoſt the ſame.
12	Heat of *thermometer*, in contact with a human body. The heat of a bird hatching her eggs much the ſame.
6, 5, 4	Heats of the air in ſummer.
4, 3, 2	Heats of the air in ſpring and autumn.
2, 1, 0	Heat of the air in the winter.
0	Water begins to freeze.

Phil. Tranſ. Abr. vol. iv. part ii. p. 1.

4.

4. Obſervations by Dr. Hales's *thermometer*.

Deg.	
$146\frac{1}{3}$	Anſwers to the heat of boiling water.
100	Heat of water on which floating wax begins to melt.
88	Hotteſt ſunſhine in 1727.
85	Scorching heat of a hot-bed of horſe-dung, and probably the heat of blood in high fevers.
64	Heat of the blood of animals; whence the heat of the blood to that of boiling water is as 14,27 to 33.
58	Heat of urine.
56	Due healthy heat of a hot-bed of horſe-dung in February, that of the open air being 17°, and nearly the boſom heat, and heat for hatching of eggs.
55	Heat of milk from the cow.
54	External heat of the body.
50	Common noon heat in the ſun in July.
38	Mean heat of the air in the ſhade in July.
from 30 to 17	May and June heat; and the moſt genial heat for moſt plants, in which they flouriſh and grow moſt.
from 20 to 10	Autumnal and vernal heat.
from freezing point to 10	Winter heat.
18	Temperate point.
31	The moſt kindly heat for melon-thiſtle
29	——————— ananas or pine-apple.
26	——————— piamento.
24	——————— euphorbium.
$21\frac{1}{2}$	——————— cereus.
19	——————— aloe.
$16\frac{1}{2}$	——————— Indian fig.
14	——————— ficoides.
12	——————— oranges.
9	——————— myrtle.
0	Freſh water juſt freezing.

Hales's Statical Eſſ. vol. i. p. 58, &c.

For other ſimilar obſervations, ſee FREEZING *mixture*, and HEAT.

See on the general ſubject of *thermometers*, Martine's Eſſays, Medical and Philoſophical, printed at London in 1740, 8vo. Deſaguliers's Exp. Phil. vol. ii. p. 289, &c. Muſchenbroeck's Int. ad Phil. Nat. vol. ii. p. 625, &c. ed. 1762. De Luc's Recherches ſur les Modifications de l'Atmoſphere, tom. i. part ii. chap. 2. Nollet's Leçons de Phyſique, tom. iv. p. 375, &c.

THERMOMETERS *for particular Uſes*. In 1757 the right hon. the earl of Cavendiſh preſented to the Royal Society an account of a curious conſtruction of *thermometers*, of two different forms; one contrived to ſhew the greateſt degree of heat, and the other the greateſt cold, that may happen at any time in a perſon's abſence. The firſt conſiſts of a cylinder of glaſs joined to a tube, and differs from the common ſort only in having the top of the ſtem drawn out into a capillary tube, which enters into a glaſs ball C (*Tab.* III. *Pneumatics, fig.* 59.) joined on to the ſtem at the place where it begins to be contracted. The cylinder, and part of the tube, are filled with mercury, the top of which ſhews the common degrees of heat as uſual. The upper part of the tube above the mercury is filled with ſpirit of wine, and ſome of the ſame liquor is left in the ball C, ſo as to fill it almoſt to the top of the capillary tube.

When the *thermometer* riſes, the ſpirit of wine will be driven out of the tube, and will fall into the ball C. When the *thermometer* ſinks again, as the ſpirit cannot be returned back from the ball, the top of the tube will remain empty, and the length of the empty part will be proportional to the fall of the *thermometer*. Conſequently, by means of a proper ſcale, the top of the ſpirit of wine will ſhew how many degrees it has been higher than when obſerved, which being added to the preſent height, will give the greateſt degree of heat it has been at.

To fit this *thermometer* for a new obſervation, it is neceſſary to fill the upper part of the tube with ſpirits, by inclining the inſtrument till the ſpirits in the ball C cover the end of the capillary tube; for if the cylinder is then heated, by applying the hand to it, or by the flame of a lamp held at ſome diſtance, till the ſpirits riſe to the top of the tube, and run over into the ball C, and is then ſuffered to cool in the ſame poſition, the tube will remain full of ſpirits, and the *thermometer* will be fitted for a new experiment.

The ſcale of degrees at top, which ſhews the deſcent of the *thermometer* from the higheſt point it has arrived at, ought not, in ſtrictneſs, to be the ſame at all times of the year; for theſe degrees exceed the common degrees of heat pointed out by the top of the mercury, as much as the column of ſpirit of wine expands, and therefore are greateſt when that column is ſo; i. e. when the greateſt heat to which the inſtrument has been expoſed is leaſt. A difference of 30 degrees of Fahrenheit's ſcale, in the greateſt riſe of the *thermometer*, would require the ſcale to be altered one ſixtieth part; and the error ariſing from making uſe of the ſame ſcale, will be about one fixth of a degree, if the *thermometer* is obſerved when it has fallen ten degrees.

In the *thermometer* here deſcribed, the bore of the tube is about 0,027 inches; and one inch of it contains two grains of mercury, and anſwers to about ten degrees, the cylinder containing about 2280 grains. When the ſcale of degrees is large, the cylinder muſt be of a conſiderable bigneſs. The quickſilver in the ball C ſerves to ſupply the tube, in caſe any of it ſhould be driven into the ball by the *thermometer's* being expoſed to too great a heat.

If the weight of the mercury be thought inconvenient, it may be avoided by the conſtruction in *fig.* 60. where the bottom of the tube is bent ſo as to point upwards, and is joined to a ball A, which communicates with a cylinder placed above it. It is in all other reſpects the ſame as the former inſtrument. It is filled with ſpirits of wine and mercury; the quantity of the latter being ſufficient to fill the whole tube and the ball A.

The *thermometer* for ſhewing the greateſt degree of cold that happens in any place during the time the inſtrument is left in it, is repreſented in *fig.* 61. The tube is bent into the ſhape of a ſyphon, of unequal legs, ſtanding parallel to one another; the top of the ſhorter leg is bent to a right angle, and opens into a ball A, which, by means of a ſhort bent tube on the oppoſite ſide, communicates with a cylinder ſtanding parallel to the legs of the ſyphon, and pointing downwards. This cylinder contains the greateſt part of the fluid, and is added only to make the *thermometer* more ſenſible than it would be, if the ball A was made of a ſufficient ſize to contain the proper quantity of fluid. This inſtrument is filled with ſpirit of wine, with the addition of as much mercury as is ſufficient to fill both legs of the ſyphon, and about a fourth or fifth part of the ball A. The common degrees of heat are ſhewn by the top of the mercury in the longeſt leg, or by the top of the ſpirit, in caſe any of it is left above the mercury. When the mercury in the longeſt leg ſinks by cold, that in the ſhorter leg will riſe, and will run over into the ball A; from whence it cannot return back when the *thermometer* riſes again, as the ſurface of the mercury in the ball is below the orifice of the tube *n*. Therefore the upper part of the ſhorter leg will be filled with a column of ſpirits of a length proportional to the increaſe of heat; the bottom of which, by means of a proper ſcale, will ſhew how much the *thermometer* has been lower than it is; which being ſubtracted from the preſent height, will give the loweſt point that it has been at. In order to prevent the mercury from falling into the ball A in large drops, which would affect the accuracy of the inſtrument, the top of the ſhorter leg, cloſe to the ball, is contracted, by being held in the flame of a lamp, and the paſſage farther ſtraitened by a ſolid thread of glaſs placed within the tube, and extending from the bottom of the ſhorter leg to the part near the ball A, where it is moſt contracted. By this means, as ſoon as any ſmall portion of mercury is got beyond the thread of glaſs, it breaks off, and falls into the ball in very ſmall drops.

In order to fill the ſhorter leg with mercury, for a new experiment, it muſt be inclined till the mercury in the ball covers the orifice of the tube *n*. The cylinder being then heated, the mercury will be forced into the ſhorter leg, and will run down the thread of glaſs in drops, which will ſoon unite. Thus ſuch a quantity of mercury muſt be got into the ſhorter leg, as, upon the cooling of the inſtrument, will be ſufficient to drive all the ſpirit of wine into the ball, with a leſs degree of cold than what the *thermometer* is likely to be expoſed to. The ball A muſt always have ſome mercury in it, but never enough to fill it up to the orifice of the tube *n*. It will be beſt to leave a little of the ſpirit above the mercury in the longeſt leg; in which caſe the top of the ſpirit will ſhew the common degrees of heat. The ſcale of degrees on the ſhorter leg will, in different ſeaſons, be liable to an error ſimilar to that which was explained in the firſt mentioned *thermometer*; but it will be leſs conſiderable, as the ſpace between the two ſcales is filled with mercury, whoſe expanſion is about ſix times leſs than that of ſpirit of wine. In the *thermometer* now deſcribed, the bore of the tube is about 0,054 inches; and one inch of it contains eight grains of mercury, and anſwers to ſeven degrees of Fahrenheit's ſcale. The drops of mercury, which fall into the ball A, anſwer to about one-eighth of a degree.

Inſtruments of this kind, with ſome alteration in their conſtruction, would ſerve for finding the temperature of

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of the sea at great depths, and also for finding that of the air at considerable heights. Lord Charles Cavendish has shewn how to adapt them for such purposes. See Phil. Transf. vol. l. art. 38, p. 300, &c.

Since the publication of Mr. Canton's discovery of the compressibility (see COMPRESSION) of spirits of wine and other fluids, there are two corrections necessary to be made in the result given by Lord Charles Cavendish's *thermometer*. For in estimating, e. g. the temperature of the sea at any depth, the *thermometer* will appear to have been colder than it really was: and besides, the expansion of spirits of wine by any given number of degrees of Fahrenheit's *thermometer* is greater in the higher degrees than in the lower. For the method of making these two corrections by Mr. Cavendish, see Phipps's Voyage to the North Pole, p. 145.

Instruments of this kind, for determining the degree of heat or cold in the absence of the observer, have been invented and described by others. Van Swinden (Diss sur la Comparaison du Therm. p. 253 – 255) describes one, which, he says, was the first of the kind, made on a plan communicated by Mr. Bernouilli to Mr. Leibnitz. Mr. Krafft, he also tells us, made one nearly like it. Mr. Six has lately, viz. in 1782, proposed another construction of a *thermometer* of the same kind.

This is properly a spirit *thermometer*, though mercury is employed in it for the purpose of supporting a certain index: *ab (fig. 62.)* is a tube of thin glass, about sixteen inches long, and $\frac{5}{10}$ths of an inch in diameter; *cdefgh* is a smaller tube, with the inner diameter about $\frac{1}{20}$th, joined to the larger at the upper end *b*, and bent down first on the left side, and then, after descending two inches below *ab*, upwards again on the right, in the several directions *cde*, *fgh*, parallel to, and one inch distant from it. At the end of the same tube at *h*, the inner diameter is enlarged to half an inch from *h* to *i*, which is two inches in length. This glass is filled with highly rectified spirit of wine to within half an inch of the end *i*, excepting that part of the small tube from *d* to *g*, which is filled with mercury. From a view of the instrument it will be readily conceived, that when the spirit in the large tube is expanded by heat, the mercury in the small tube on the left side will be pressed down, and cause that on the right side to rise: on the contrary, when the spirit is condensed by cold, the reverse will happen. Fahrenheit's scale, which begins with 0 at the top of the left side, has the degrees numbered downwards, while that at the right side, beginning with 0 at the bottom, ascends. The divisions are ascertained by placing this *thermometer* with a good standard mercurial one in water, gradually heating or cooling, and marking the divisions of the new scale at every 5°. The divisions below the freezing point are taken by means of a mixture of sea-salt and ice, as described by Nollet, De Luc, and others. In order to shew how high the mercury has risen in the observer's absence, there is placed within the small tube of the *thermometer*, above the surface of the mercury on either side, immersed in the spirit of wine, a small index, so fitted as to pass up and down as occasion may require. One of these indexes is represented in *fig.* 63; *a* is a small glass tube, $\frac{3}{4}$ths of an inch long, hermetically sealed at each end, enclosing a piece of steel wire nearly of the same length; at each end *c*, *d*, is fixed a short piece of a tube of black glass, of such a diameter as to pass freely up and down within the small tube of the *thermometer*. The lower end, floating on the surface of the mercury, is carried up with it when it rises, while the piece at the upper end, being of the same diameter, keeps the body of the index parallel to the sides of the thermometrical tube. From the upper end of the body of the index at *c* is drawn a spring of glass to the fineness of a hair, about $\frac{5}{4}$ths of an inch in length, which, being set a little oblique, presses lightly against the surface of the tube, and prevents the index from following the mercury when it descends, or being moved by the spirit passing up and down, or by any sudden motion given to the instrument; but at the same time the pressure is so adjusted as to permit this index to be readily carried up by the surface of the rising mercury, and downwards, whenever the instrument is rectified for observation. This index, by not returning with the mercury when it descends, shews distinctly and accurately, how high the mercury has risen, and consequently what degree of cold or heat has happened. To prevent the spirit from evaporating, the tube at the end *i* is closely sealed. The daily rectification of this instrument is performed, by applying a small magnet to that part of the tube against which the index rests; by the action of which, the included piece of steel-wire, and consequently the index, is easily brought down to the surface of the mercury. When this has been done, the instrument is rectified for the next day's observation, without heating, cooling, separating, or at all disturbing the mercury, or moving the instrument. With a *thermometer* of this sort, Mr. Six observed the greatest heat and cold that happened every day and night throughout the year 1781. But for the more particular description of this instrument, the illustration of it by figures, and an account of its advantages, the limits of this work require our referring to Phil. Transf. vol. lxxii. part i. p. 72, &c.

M. De Luc has described the best method of constructing a *thermometer*, fit for determining the temperature of the air, in the mensuration of heights by the BAROMETER. He has also shewn how to divide the scale of a *thermometer*, so as to adapt it for astronomical purposes in the observation of refractions. See Recherches, &c. tom. ii. p. 35, &c. p. 265, &c.

Mr. Cavallo, in 1781, proposed the construction of a *thermometrical barometer*, which, by means of boiling water, might indicate the various gravity of the atmosphere, or the height of the barometer. This *thermometer*, he says, with its apparatus, might be packed up into a small portable box, and serve for determining the heights of mountains, &c. with greater facility than with the common portable barometer. The instrument, in its present state, consists of a cylindrical tin vessel, about two inches in diameter, and five inches high, in which vessel the water is contained, which may be made to boil by the flame of a large wax-candle. The *thermometer* is fastened to the tin vessel in such a manner as that its bulb may be about one inch above the bottom. The scale of this *thermometer*, which is of brass, exhibits on one side of the glass tube a few degrees of Fahrenheit's scale, viz. from 200° to 216°. On the other side of the tube are marked the various barometrical heights, at which the boiling water shews those particular degrees of heat which are set down in sir G. Shuckburgh's table. With this instrument the barometrical height is shewn within one tenth of an inch. The degrees of this *thermometer* are somewhat longer than one ninth of an inch, and therefore may be divided into many parts, especially by a Nonius. But the greatest imperfection of the instrument arises from the smallness of the tin vessel, which does not admit a sufficient quantity of water; but when the quantity of water is sufficiently large, e. g. 10 or 12 ounces, and is kept boiling in a proper vessel, its degree of heat under the same pressure of the atmosphere is very settled; whereas when a *thermometer* is kept in a small quantity of boiling water, the quicksilver in its stem does not stand very steady, sometimes rising or falling even half a degree. Mr. Cavallo proposes a farther improvement of this instrument, Phil. Transf. vol. lxxi. part ii. p. 524.

The ingenious Mr. Wedgwood, so well known for his various improvements in the different sorts of pottery-ware, has contrived to make a *thermometer* for measuring the higher degrees of heat, by means of a distinguishing property of argillaceous bodies, viz. the diminution of their bulk by fire. This diminution commences in a low red heat, and proceeds regularly, as the heat increases, till the clay becomes vitrified. The total contraction of some good clays which he has examined in the strongest of his own fires, is considerably more than one-fourth part in every dimension. If, therefore, we can procure at all times a clay sufficiently apyrous or unvitrescible and always of the same quality in regard to contraction by heat; and if we can find means of measuring this contraction with ease and accuracy, we shall be furnished with a measure of fire sufficient for every purpose of experiment or business. Some of the purest Cornish porcelain clays (which, by the analysis of Mr. Wedgwood, appear to contain no calcareous earth nor gypseous matter, but to consist of pure argillaceous or alum earth, and another indissoluble earth, which he apprehends to be of the siliceous kind, in the proportion of three parts of the former to two parts of the latter) seem the best adapted, both for supporting the intensity, and measuring the degrees of fire. This material is prepared for use by washing it over, and whilst in a dilute state, passing it through a fine lawn: it is then dried and put up in boxes. The dry clay is to be softened for use with about two-fifths its weight of water; and formed into small pieces, in little moulds of metal, $\frac{6}{10}$ths of an inch broad, with the sides exactly parallel; about $\frac{4}{10}$ths of an inch deep, and one inch long. The moulds are to be oiled and warmed. These pieces, when perfectly dry, are put into another iron mould or gage, consisting only of a bottom, with two sides, $\frac{5}{10}$ths of an inch deep, to the dimensions of which sides the breadth of the pieces is to be pared down. For measuring the diminution which they are to suffer from the action of fire, another gage is made of two pieces of brass, twenty-four inches long, with the sides exactly straight, divided into inches and tenths, fixed five-tenths of an inch asunder at one end, and three-tenths at the other, upon a brass plate; so that one of the thermometric pieces, when pared down in the iron gage, will just fit to the wider

wider end. If this piece be ſuppoſed to have diminiſhed in the fire one-fifth of its bulk, it will then paſs on to half the length of the gage; if diminiſhed two-fifths, it will go on to the narroweſt end; and in any intermediate degree of contraction, if the piece be ſlid along till it reſts againſt the converging ſides, the degree at which it ſtops will be the meaſure of its contraction, and conſequently of the degree of heat it has undergone. The thermometric pieces may be formed much more expeditiouſly than in the ſingle mould by means of an inſtrument, conſiſting of a cylindrical iron veſſel, with holes in the bottom, of the form and dimenſions required.—The ſoft clay, put in the veſſel, is forced by a preſs down through theſe apertures, in long rods, which may be cut while moiſt, or broken when dry, into pieces of convenient lengths. After which recourſe ſhould be had to the paring gage for aſcertaining and adjuſting their breadth when perfectly dry.

Each diviſion of the ſcale, though ſo large as a tenth of an inch, anſwers to $\frac{1}{600}$th part of the breadth of the little piece of clay. When one gage is accurately adjuſted to the proportional meaſures above ſtated, two pieces of braſs ſhould be made, one fitting exactly into one end, and the other into the other; which will ſerve as ſtandards for the ready adjuſtment of other gages to the dimenſions of the original, and thus we may be aſſured, that *thermometers* on this principle, though made by different perſons and in different countries, will all be equally affected by equal degrees of heat, and all ſpeak the ſame language. The ſcale, commences at a red heat, fully viſible in day light; and the greateſt heat which Mr. Wedgwood has hitherto obtained in his experiments is 160°. Swediſh copper has been found to melt at twenty-ſeven, ſilver at twenty-eight, and gold at thirty-two degrees of this *thermometer*. Braſs is in fuſion at twenty-one: the welding heat of iron is from ninety to ninety-five, and the greateſt heat that could be produced in a common ſmith's forge one hundred and twenty-five. Caſt iron melted at 130°: and the heat by which iron is run down among the fuel for caſting is 150°. A Heſſian crucible melted into a flag-like ſubſtance at about 150°. The ſonding heat of glaſs furnaces, or that by which the perfect vitrifications of the materials is produced, was at one of them 114° for flint-glaſs, and 124° for plate-glaſs. Delft ware is fired by a heat of 40 or 41°; Queen's-ware by 86°, and ſtone-ware by 102°, which degree of heat changes it to a true porcelain texture. The *thermometer* pieces begin to acquire a porcelain texture about 110°. A piece of an Etruſcan vaſe melted completely at 33°; pieces of other vaſes and Roman-ware about 36°; Worceſter china vitrified at 94°; Mr. Sprimont's Chelſea china at 105°; the Derby at 112°; the Bow at 121°; but Briſtol china ſhewed no appearance of vitrification at 135°. The common ſort of Chineſe porcelain does not perfectly vitrify by any fire which Mr. Wedgwood could produce: but began to ſoften about 120°, and at 156° became ſo ſoft as to ſink down and apply itſelf cloſe upon an irregular ſurface underneath. The true ſtone Nankeen does not ſoften in the leaſt, by this ſtrong heat; nor even acquire a porcelain texture. The Dreſden porcelain is more refractory than the common Chineſe, but not equally ſo with the ſtone Nankeen. The cream-coloured or queen's ware bears the ſame heat as the Dreſden. Mr. Pott ſays, that to melt a mixture of chalk and clay in certain proportions, which appear from his tables to be equal parts, is "among the maſter-pieces of art." This mixture melts into a perfect glaſs at 123° of this *thermometer*. For other curious particulars, ſee Phil. Tranſ. vol. lxxii. part. ii. p. 305, &c.

THERMOPOLIUM, formed of θερμος, *hot*, and πωλεω, *I ſell*, a name for a ſort of public houſes among the ancients, in which hot liquors were ſold, in the manner of our coffee-houſes.

THERMOSCOPE, an inſtrument ſhewing the changes happening in the air with reſpect to heat and cold.

The word *thermoſcope* is generally uſed indifferently with that of thermometer. There is ſome difference, however, in the literal import of the two; the firſt ſignifying an inſtrument that ſhews or exhibits the changes of heat, &c. to the eye; formed from θερμη, *heat*, and σκοπεω, *video, I ſee*; and the latter an inſtrument that meaſures thoſe changes, from θερμη, *heat*, and μετρειν, *to meaſure*; on which foundation the thermometer ſhould be a more accurate *thermoſcope*, &c. This difference the excellent Wolfius taking hold of, deſcribes all the thermometers in uſe as *thermoſcopes*; ſhewing, that none of them properly meaſure the changes of heat, &c. none of them do more than indicate the ſame. Though their different heights yeſterday and to-day ſhew a difference of a heat; yet, ſince they do not diſcover the ratio of yeſterday's heat to to-day's, they are not, ſtrictly, thermometers.

THESEA, or THESEIA, Θησεια, in *Antiquity*, feaſts celebrated, by the Athenians, in honour of Theſeus.

In ſpite of the important ſervices that hero had done his country, in delivering it from a ſhameful tribute of ſo many youths, of either ſex, ſent yearly to be devoured by the Minotaur in Crete (as the fable has it), or ſent as ſlaves to Minos, king of Crete, as the hiſtories have it; from which he freed them, by overturning Taurus, Minos's general, he was baniſhed for ſome time, and retired to Scyro, under the protection of Lycomedes, king of that iſland, who finally ſlew him out of jealouſy.

The gods, it is ſaid, revenged this treatment Theſeus received from the Athenians, by afflicting them with a famine, which the oracle aſſured them ſhould not ceaſe till they had avenged his death.—Upon this, they ſlew Lycomedes, brought Theſeus's bones to Athens, placed them in a temple erected to him, and appointed *Theſea* to be held every eighth day of each month, wherein largeſſes were diſtributed to the people, and the day was ſpent, by the rich, in feaſting and rejoicing, and with peculiar ſolemnity on the eighth day of the month PYANEPSION.

Plutarch, however, gives a different account of the origin of this feaſt; he ſays that the Athenians, imagining they ſaw Theſeus at the battle of Marathon under the form of a tutelary deity, conſulted the oracle on this prodigy; and being ordered to collect his bones in the iſland of Scyros, removed them with great pomp to Athens; and depoſited them under a magnificent monument erected in the middle of the city, which became afterwards an aſylum for ſlaves, in commemoration of the ſuccour afforded by this prince to the unfortunate during his life. They alſo erected a temple, where they offered ſacrifices, &c. At Rome, Theſeus was held in very different eſtimation, for Virgil (Æn. lib. vi.) places him in Tartarus, among thoſe who were tormented for their crimes.

THESIN.—*Per Arſin* and THESIN. See PER *Arſin*.

THESIS, θεσις, *poſition*, formed from τιθημι, *I put* or *lay down*, in the *Schools*, a general propoſition which a perſon advances, and offers to maintain.

In the college it is frequent to have placards, containing a number of theſe *theſes* in theology, in medicine, in philoſophy, in law, &c.—The maintaining a *theſis*, is a great part of the exerciſe a ſtudent is to undergo for a degree.

THESIS, in *Logic*, &c.—Every propoſition may be divided into *theſis*, and hypotheſis: *theſis* contains the thing affirmed or denied, and hypotheſis the conditions of the affirmation or negation.

Thus, in Euclid, if a triangle and parallelogram have equal baſes and altitudes (is the hypotheſis), the firſt is half of the ſecond (the *theſis*).

Arſis and THESIS. See ARSIS.

THESIS, in *Muſic*, denotes the fall of the hand in beating time. The Latin writers call it *depreſſio*.

THESIUM, *Baſtard toad flax*, in *Botany*, a genus of the *pentandria monogynia* claſs: its characters are, that the calyx, in which the ſtamina are inſerted, is ſingle-leaved; and that it has one ſeed. There are ſeven ſpecies.

THESMOPHORIA, Θεσμοφορια, in *Antiquity*, a feſtival in honour of Ceres, which was celebrated by many cities of Greece; but eſpecially the Athenians obſerved it with great devotion and pomp. For the ceremonies of this ſolemnity, ſee Potter, Archæol. Græc. tom. i. p. 403, ſeq. See CEREALIA and ELEUSINIA.

THESMOTHETÆ, Θεσμοθεται, in *Antiquity*, an appellation given to ſix of the nine Athenian *archons*; the firſt and chief of the nine was called, by way of eminence, ARCHON; the ſecond in dignity was called *baſileus*, the third *polemarchus*, and the other ſix *theſmothetæ*; for an account of whoſe power and juriſdiction, ſee Potter, Archæol. Græc. tom. i. p. 77.

THESPHATA, Θεσφατα, in *Antiquity*, an appellation given to oracles. See ORACLE.

THESPIADES, in *Mythology*, an appellation given to the Muſes, from the city of Theſpis, where they were honoured.

THESPIANA, the name of an antidote intended for internal abſceſſes.

THESSALICUM *ſedile*, the Theſſalian chair, ſo called from Theſſaly, where chairs of this figure were moſt in uſe; it is recommended by Hippocrates, lib. de Art. in place of a machine for reducing a recent luxation of the ſhoulder bone. The back of this chair is perpendicular to the ſeat, as Galen tells us, by which conſtruction it is diſtinguiſhed, and accommodated to the operation.

THESSALONIANS *Epiſtles to*, in *Scripture-hiſtory*. See EPISTLE.

THETA, Θ, among the *Ancients*, one of the Greek letters. It was uſed as a mark on the ballots of judges, by which they condemned the perſon to death, it being the

the first letter of the word Θανατος, *death*. Whence it had the epithet of *niger* and *infelix*, thus:

O multum ante alias infelix litera theta.

THETES, Θητες, in *Antiquity*, the lowest class of people at Athens. Aristides repealed Solon's law, by which the *thetes* were made incapable of bearing any office in the government.

THETIS, in *Mythology*, the name of the most beautiful of the NEREIDS.

THETYS. See TETHYS.

THEVET. See TEBET.

THEURGY, θεουργια, a name which the ancients gave to that sacred part of magic which we sometimes call *white magic*, or the *white art*.

The word is formed from Θεος, God, and εργον, work; q. d. the art of doing divine things, or things which God alone can do: or the power of working extraordinary and supernatural things, by invoking the names of God, saints, angels, &c.

Accordingly, those who have written of MAGIC in the general, divide it into three parts: the first whereof is called *theurgy*, as operating by divine or celestial means; the second, *natural magic*, performed by the powers of nature; and the third, *necromancy*, which proceeds by invoking dæmons.

This *theurgy*, or pretended art of so purging and refining that faculty of the mind, which receives the images of things, as to render it capable of perceiving the dæmons, and of performing many marvellous things by their assistance, was adopted by the disciples of Ammonius towards the close of the second century. Ammonius, the founder of the sect of modern Platonics (see PLATONISM) with a view of reconciling the popular religions of different countries, and particularly the Christian, with his own system, turned into mere allegory the whole history of the gods, and maintained that those beings, whom the priests and people dignified with this title, were no more than celestial ministers, to whom a certain kind of inferior worship was due. He acknowledged Christ to be a most excellent man, the friend of God, and the admirable *theurge*; but denied that it was his intention entirely to abolish the worship of dæmons, and of the other ministers of divine providence; affirming, on the contrary, that he merely purified the ancient religion, and that his followers had manifestly corrupted the doctrine of their divine master. Mosh. Eccl. Hist. vol. i. p. 142, 8vo.

THEXIS, a word used by the old medical writers, sometimes for wounds made by puncture with small instruments, and sometimes for the operation of the suture, or the sewing together the lips of a wound, to make it heal with a less scar.

THICK *intestines*. See INTESTINES.

THICKET, a bush or place full of bushes or brambles. Dict. Rust.

THIGH, a part of the body of men, quadrupeds, and birds, between the leg and trunk. See FEMUR.

We have an account in the Philosophical Transactions of a large piece of a young man's *thigh-bone* being taken out, and the place so well supplied by a callus, that he walked straight. See N° 461. sect. 2.

THIGH-*bone fractured*. The *thigh-bone*, though the largest and stoutest in the whole body, is yet frequently broken, both near its middle, and towards its ends or articulations; but more commonly near that part usually called its neck, near its articulation with the hip-bone; and when this is the case, it is very difficult to set it, and retain it in its place. When the bone is broke in two places at once, which sometimes happens, the danger is yet much greater; and if the patient, in this case escapes death, which he seldom does, he is commonly lame, ever afterwards.

Sometimes this bone is broken tranversely, sometimes obliquely, and at other times the ends slip over one another, which makes it a very bad case; for the muscles of this part being very robust, and strongly contracted, draw the lower end of the bone with a considerable force upwards, so as to make it require great strength to extend and replace it.

The oblique fracture of this bone more frequently slips out of its place again than the transverse, and generally leaves the *thigh* somewhat shorter than the other, notwithstanding all the caution the surgeon can use in the setting of it. It is therefore necessary, in these cases, beside the means that are common to all the fractures, to use a more strict and tight bandage in this than in the tranverse fracture, to prevent the bones from being easily removed. When a fracture of the *thigh-bone* happens in its middle, or towards its lower head, it is to be extended and replaced with the hands like other fractures, except that the extending force required is very great; and where the hands of a strong assistant are not sufficient, slings, napkins, or linen-bandages, are to be bound round each head of the *thigh*, whereby the fractured bone may be extended both ways, by the strength of three or four persons at once, while the surgeon cautiously reduces the fracture with his hands, and secures it with a proper bandage and dressing. There are sometimes cases where the joint strength of three or four men, applied in this manner, are not sufficient to make the necessary extension; in which case the surgeon is obliged to have recourse to ropes and pullies, by means of which one man will pull more forcibly and equally than several can without them. But cases that require this treatment are not common.

When the neck of the *thigh-bone* is fractured, to which, from its oblique or transverse direction, and spongy or brittle substance, it is very subject; it makes a fracture not only very difficult to reduce, but such a one also as can seldom be cured without leaving the limb shorter than it was before. The reasons of which are, that the fragments cannot but with great difficulty be pressed into their right places, by reason of the great thickness and strength of the muscles which cover them; and that it seldom happens that the bones can be retained in their natural position, after they have been ever so well reduced; because the muscles which pass over and are inserted below the neck of this bone, draw its lower part upwards; and both these accidents happen the more naturally and easily, because of the oblique position of the neck of this bone, which is inserted into its head in a direction not perpendicular, nor parallel, but as it were sloping on one side; so that it is no wonder that lameness, and other bad accidents, are the consequences of this sort of fracture.

To all these reasons we may also add, that it is very difficult to discover when the neck of the *thigh-bone* is fractured, this case being usually taken for the head of the bone being slipped out of its socket or acetabulum; and this indeed, till of late, has been almost a general error. When we can think the external force to have been strong enough to have produced a fracture, when the patient cannot bear any stress upon the limb, by setting his foot on the ground, when very acute pains are felt about the articulation itself; and when we find the affected limb shorter than the sound one, it being an easy matter to turn the foot almost round from one side to the other, and any cracking or grating of the bones is perceived in that motion, we may reasonably suppose the neck of the *thigh-bone* is fractured; the limb must then be extended very gently and gradually, till it be brought to the same length with the sound one; this may be easily done, either by means of a napkin, or the hands of an assistant in most cases, in such a manner, that the surgeon may be able to rejoin, in some measure, if not perfectly, the neck of the *thigh-bone* with its head, still firmly remaining in its socket: and though a shortness of the limb, or lameness, is generally left behind after this fracture; yet, because there are some cured without those misfortunes, it is always best to use, for that end, so strict or tight a bandage, that it may retain the neck and head of the bone together, so that they may be in a way of uniting evenly. The bandage called *spica inguinalis* is the most convenient for this purpose, and a large and broad napkin, or other linen-cloth, is, with this, placed between the *thighs* to keep the body of it from subsiding; and lastly, ligatures are put about the knee and ancle, by which the foot is fastened to the lower part of the bed, to prevent the limb from being contracted upwards.

If the fracture of the *thigh-bone* be accompanied with a wound, it makes the case very difficult and dangerous. And if these accidents happen to be inflicted on the neighbouring joint, death is generally the consequence, more especially when any of the large blood-vessels are also wounded, which will be readily enough known by the hæmorrhage. In these fractures, with a wound, the eighteen-headed bandage is to be used for the dressing; and if the wound be much contused, so that extravasated blood be lodged under the skin, and about its interstices, it is to be carefully opened by several incisions, of a sufficient depth, that the extravasated blood, which would in a short time putrefy, may be discharged. The injured parts are to be afterwards washed with lime-water, mixed with a fourth part of spirit of wine camphorated, till the contused parts are digested.

When this kind of fracture is accompanied with no very violent loss of blood, nor the bone near, the proper dressing is dry lint folded up, with which the wound is to be filled. If the flux be greater, rectified spirit of wine, or other astringent liquors are to be used; but if the hæmorrhage be very violent from an artery, the tourniquet is to be used, and the vessel secured by a ligature. After the

the blood is ſtopped, and the wound cleanſed, the fragments of the bone are to be replaced, and the limb carefully bound up with compreſſes, ſplints, and the eighteen-headed bandage, and defended by a caſe of ſtraw. But if the fracture is attended with a violent hæmorrhage, and great ſplintering of the bone, from gun-ſhot wounds, ſo as to indicate the great crural artery to be wounded, the beſt method is to amputate the *thigh*, and tie up the artery in time; for the crural artery is ſo large, that it ſeldom grows together; and if it does, the lower parts are ſoon ſeized with a gangrene. Heiſter, vol. i. p. 143. We have the deſcription and draught of a machine for reducing fractures of the *thigh-bone*, by Mr. Ettrick, in the Phil. Tranſ. N° 459. ſect. 4.

Thigh, *luxated*. It has been formerly imagined, that the head of the *thigh-bone* being diſplaced out of its acetabulum, was a very common caſe; but more knowledge in anatomy and ſurgery has convinced us now, that this accident is very rare. The reaſon why it was before ſuppoſed common, was, that a fracture of the neck of the *thigh-bone* was generally miſtaken for this luxation.

It will eaſily be conceived, that this is the true ſtate of the caſe, and that a real diſlocation of the *thigh-bone* is very rare, if we conſider how very deep the ſinus or acetabulum is, into which the head of this bone is received, with what a broad concave cartilage the head of this bone is covered, how extremely ſtrong the ligaments are with which it is faſtened, how greatly it is defended with thick and ſtrong muſcles, and at the ſame time reflect how very weak and brittle the neck of the *thigh-bone* is, in compariſon of any other part thereof; and from all theſe conſiderations, how vaſtly more eaſy it muſt be for the ſame force to break the bone off juſt under its head, than to diſplace it out of its ſocket. And indeed, when luxations of the *thigh-bone* do happen, it is much more frequently from internal than from external cauſes. For phyſicians have obſerved that the ligaments of the *thigh-bone*, though naturally of extreme ſtrength, may be, by various cauſes, and particularly by a flux of humours, ſo relaxed and weakened as to let the head of that bone ſlip ſpontaneouſly out of its acetabulum or ſocket; ſo that the *thigh*, though not eaſily luxated by external violence, may eaſily happen to be ſo without any external violence, and while the patient lies in his bed. This is an accident, however, that happens much more rarely to adults than to infants.

Whenever the head of the *thigh-bone* is thruſt out, it is almoſt always wholly diſplaced; ſo as to make a perfect luxation; the exact roundneſs of this head, with the great ſtrength of the circumjacent muſcles, and the narrowneſs of the ſides of the acetabulum, will not admit the bone to be partially diſlocated or thruſt out of its place a little way only; for as ſoon as the head of the bone is thruſt up to the edge of the acetabulum, it muſt unavoidably either turn quite out, or fall back again into its right place.

The *thigh* is found to be capable of luxation four ways, upward and downward, and backward and forward; but it is moſt frequently diſlocated downward and inward, toward the large foramen in the os pubis. For, beſides that the cartilaginous defence, on the lower part of the acetabulum, is not ſo high as the reſt, the ligamentum rotundum is ever found to give way more readily in that part than any other; and laſtly, the adjacent muſcles are found to be weakeſt in their reſiſtance on this part.—And there is, beſide all theſe, a certain eminence in this edge of the acetabulum, which prevents the head of the bone from falling back again eaſily into its right place, when once it is got this way out of it. But if the head of this bone be diſplaced outwards, it generally ſlips upwards at the ſame time, it being ſcarce poſſible but that the very ſtrong muſcles of the *thigh* muſt then draw the bone upwards; and there is no eminence in this edge of the acetabulum to reſiſt the head of the bone in that paſſage.

When the *thigh* is diſlocated forwards and downwards, which is what uſually happens, the leg hangs ſtradling outward, and is longer than the other; the knee and foot alſo both turn outwards, and the head of the bone itſelf will be felt near the lower part of the inguen and os pubis. Sometimes there is a ſuppreſſion of urine in this caſe, which is occaſioned by ſome nerve which communicates with the bladder being violently compreſſed; in the buttock there alſo may be perceived a cavity from the trochanter major, and the reſt of the bones being diſplaced; and if the *thigh-bone* be not timely reduced into its acetabulum, the whole limb withers ſoon afterwards. The patient, for this reaſon, can bear little or no ſtreſs upon that limb, but muſt always incline and throw the weight of his body upon the other; when he moves forward, he muſt move that limb in form of a ſemicircle, and ſupport his body by crutches under the arms; though there are not wanting particular caſes, where the head of the luxated *thigh-bone* has grown ſo firmly to the adjacent parts, without the acetabulum, as to become in proceſs of time, ſo ſtrong as to ſupport the body without crutches, though the perſon could not, in any of the caſes that have been known of this kind, walk without halting.

If the *thigh-bone* be diſplaced backward, it is uſually drawn upward alſo, as before obſerved, at the ſame time; hence there will be perceived, in this caſe, a cavity behind the inguen, and a tumor upon the buttock, becauſe the head, and trochanter of this bone, will be placed there. The tumor on the buttock being thruſt upward, the limb will become ſhorter than the other, and the foot will be inclined to turn inwards. The heel will not touch the ground, but the perſon ſeem to ſtand upon his toes; and laſtly, the luxated limb will be much more eaſily bent than extended.

It is extremely rare that the *thigh* is luxated forward or backward, without being alſo drawn upward or downward; but if it ſhould ſo happen, it will yet evidently be diſcovered by the rules before given, and by conſidering the nature of the articulation of the bone. As it is, however, at beſt very difficult to diſcover when the *thigh-bone* is diſlocated, and when it is fractured, either by feeling or inſpecting, becauſe of the great thickneſs of the muſcles and integuments, it is therefore a matter of ſome conſequence to propoſe the ſigns by which one of theſe caſes may be known from the other. There is reaſon to judge the *thigh-bone* to be luxated, when we find the ligaments of the bone have been relaxed by ſome preceding congeſtion of humours, when no external violence has been exerted upon it, when neither violent pain, tumors, nor inflammation follow, and laſtly, when the whole limb may be bent, and turned about at the acetabulum, without the ſurgeon's diſcovering any grating or cruſhing of the bones; and the contrary of theſe ſigns, which are what uſually take place in what have been uſed to be called luxations of this bone, are very ſtrong indications of a fracture.

When the bone is found to be really diſlocated, it is to be reduced in a method agreeable to the nature and direction of the diſlocation. When it is diſplaced forward and downward, the patient is to be laid flat upon his back on a table; then a linen-napkin, or ſtrong ſling, is to be made faſt over the groin, about the part affected, ſo that one end of the ſling may come over the belly, and the other over the nates and back, to be both tied together in a knot upon the ſpine of the os ilium, and afterwards either faſtened to a hook fixed in ſome poſt, or held firm by ſome aſſiſtance: in like manner at the bottom of the *thigh* a little above the knee, there muſt be faſtened another napkin or ſling, or elſe the girt of Hildanus, with a compreſs between it and the *thigh*; both theſe ſlings being drawn tight, the *thigh* is to be extended, not vehemently; but only ſo much as is ſufficient to draw the bone out of its ſinus, that it may be replaced into its acetabulum by the ſurgeon's hands; to this purpoſe the ſurgeon is, with one hand, to preſs the head of the *thigh-bone* outward, while the other conducts the knee inward. Or, the reduction may be made by napkins faſtened about the *thigh* near its extremities, in the manner of ſlings, and the limb extended that way, the knee being at the ſame time preſſed inward by the hands.

If theſe methods are not ſufficient, it will be neceſſary to have recourſe to the polyſpaſton or pulley, well known to the ſurgeons on theſe occaſions. If the *thigh-bone* is found to be luxated backward, the patient is to be placed flat on a table, with his face downward; the *thigh* is to be extended more ſtrongly than in the former caſe, and the reduction is then to be performed by the ſurgeon's hand, an aſſiſtant all the while extending the limb, and turning it inwards; and by this method the head of the *thigh-bone* generally ſlips very readily from this ſort of diſlocation into its proper place. The limb is then to be ſecured with proper bandages, and the patient to be kept to his bed for three or four weeks. Heiſter, Surg. vol. i. p. 183, &c.

Saltzmannus relates an inſtance of a luxation of the *thigh-bone*, without any fracture of its neck, and confirms what Ruyſch had obſerved of the epiphyſis of the os femoris, being as it were annihilated, or at leaſt changed ſo, as it could not be obſerved, when ſought after in one who had it broken.

Thigh, in the *Manege*. The effect of the horſeman's *thigh* is one of the aids that ſerves to make a horſe work vigorouſly. See Aid.

Fore-thigh, or *arm* of a horſe, is that part of the fore-leg that runs between the ſhoulder and the knee; though the *fore-thigh* does not bend or bow, yet we

commonly

commonly ſay, a horſe goes fine, that bends well the *fore-thigh*, importing thereby, that he bends well his leg.

THILL, the beam or draught-tree of a cart or waggon, upon which the yoke hangs.

THILLER, or THILL-*horſe*, the horſe immediately yoked to the *thill*.

THILYPTERIS, in *Botany*, a term uſed by Dillenius to expreſs the common female fern or brakes.

THIMBLE, a cover for the finger, made of braſs, ſteel or ſilver, and uſed by all people who ſow, as taylors, milliners, &c.

THIMBLE, in the *Sea-language*, a ſort of iron ring, the outſide of which is conſiderably hollowed to receive ropes. *Thimbles* are fixed as loops, to prevent the tackle-hook from galling the rope.

THIMHIO, in the *Materia Medica*, a name uſed by ſome authors for a peculiar ſort of lignum-aloes, which is blackiſh and very heavy, and extremely ſweet.

THIN, in the *Materia Medica*, a name given by the Arabian writers to earth of any kind.

Thus the bole Armenic of Galen is called by Avicenna *thin Armeni*; and hence the word *muthin*, an adjective ſignifying earthy, or approaching to the nature of earth; a term applied to many medicines of this kind.

THINA, in *Botany*, a name by which ſome authors have called the larix or larch-tree.

THINKING, *cogitation*, a general name for any act or operation of the mind.

Chauvin, with the Carteſians, will have *thinking* to conſiſt in a certain native, inherent motion or agitation of the human mind, whereof itſelf is conſcious.—*Native* and *inherent*, ſince he conceives it no other than the very eſſence of the mind itſelf, or, at leaſt, its principal and fundamental property: an *agitation*, ſince there is a new modification or change made in the mind, which we ſcarce know how to conceive without motion; add, that the origin and etymology of the word *cogitation*, according to Varro and Feſtus, implies as much; *cogito* being uſed for *coagito*.

When the mind turns its view inwards, upon itſelf, the firſt idea that offers, ſays Mr. Locke, is *thinking*; wherein it obſerves a great variety of modifications, and thereof frames to itſelf diſtinct ideas: thus the perception annexed to any impreſſion on the body, made by an external object, is called *ſenſation*.

When an idea recurs without the preſence of the object, it is called *remembrance*.

When ſought after by the mind, and brought again in view, it is called *recollection*.

When held there long under attentive conſideration, it is *contemplation*.

When ideas float in the mind without regard or reflection, it is called a *revery*; when they are taken expreſs notice of, and, as it were, regiſtered in the memory, it is *attention*; and when the mind fixes its view on any one idea, and conſiders it on all ſides, it is *ſtudy* and *attention*.

Theſe are the moſt obvious modes of *thinking*; but there are ſeveral others which we know of; and, doubtleſs, the mind is capable of infinite others, whereof we have no notion at all.

The ſchool-philoſophers uſually divide *thinking*, with regard to the objects it is employed about, into underſtanding, *intellectio*; and willing, *volitio*.

And hence, thoſe are ſaid to be the two powers or faculties of the human mind.

Intellectual *thinking* is farther ſubdivided into divers kinds: the firſt, when the mind merely apprehends or takes notice of a thing, called *perception*; the ſecond, when it affirms or denies a thing, called *judgment*; the third, when it gathers or infers a thing from others given, called *reaſoning*; the fourth, when the mind diſpoſes its own thought or ideas in order, called *method*.

Volitive *thinking*, or volition, admits of infinite different modifications, or new determinations.

Some authors extend the idea of *thinking* farther; and conſider it in God, angels, brutes, &c. whence a new diviſion of *thinking*, into divine, angelical, human, and animal or ſenſitive.

But the two firſt we know little or nothing of: the third is that we have already been treating of.—As to the laſt, viz. animal or ſenſitive thought, it is defined to be, an action of the ſoul attending to an external object, affected by means of the animal ſpirits duly agitated in the brain, to excite an idea.

The Carteſians maintain, that *thinking* is eſſential to the human ſoul; and, conſequently, that there is no time when the ſoul does not *think*: but this doctrine has been very vigorouſly attacked by Mr. Locke; who labours to ſhew, that in ſleep, without dreaming, there is an entire ceſſation of the modes of *thinking*.

I think, *cogito*, according to Deſcartes, is the firſt, and moſt certain, of all truths; from which, alone, we draw this conſequence, *therefore I am*, or exiſt, *ſum*.—One might alſo ſay, *cogito, ergo Deus eſt*; *I think, therefore there is a God*.—Logic is defined, the art of *thinking* methodically.

THIR, in *Chronology*, the name of the fifth month of the Ethiopians, which correſponds, according to Ludolf, to the month of January.

THIRD, *tertius*. See NUMBER and NUMERATION.

THIRD, in *Muſic*, a concord reſulting from a mixture of two ſounds containing an interval of two degrees.

It is called *third*, as containing three terms, or ſounds, between the extremes.

The *third*, in Italian *terza*, in French *tierce*, in Latin *tertia*, has no general name in the Greek: it is the firſt of the imperfect concords, i. e of ſuch as admit of majority and minority, without ceaſing to be concords. And hence it is, that it is diſtinguiſhed into two kinds.

The firſt, which the Italians call *ditono* (from the Greek *ditonos*), or *terza maggiore*, and we the *greater third*, is compoſed diatonically of three terms, or ſounds, containing two degrees, or intervals; one whereof, in the ancient ſyſtem, is a greater tone, and the other a leſſer tone; but in the modern temperate ſyſtem they are both equal; as *ut, re, mi*, or *ut, mi*.

Chromatically it is compoſed of four ſemitones; two whereof are greater, and the third leſs; it takes its form from the ratio ſeſquiquarta, 4 : 5.

The logarithm, or meaſure of the octave $\frac{2}{1}$ being 1.000000, the meaſure of the greater *third* $\frac{5}{4}$ will be, 0.321928. See INTERVAL.

The *third major* is by practitioners often taken for the *third* part of an octave; but this is a great error, ſince three greater *thirds* fall ſhort of the octave by a DIESIS: for $\frac{5}{4} \times \frac{5}{4} \times \frac{5}{4} \times \frac{128}{125} = \frac{2}{1}$; or by logarithms $3 \times 0.321928 + \text{log. dieſis} = 0.965784 + 0.034215 = 0.999999$ or 1.000000, the logarithm of the octave.

The ſecond *third*, which the Italians call *tribemituono*, or *ſemi-ditono*, or *terza minore*, and we the *leſſer third*, is compoſed, like the former, of three ſounds or terms, and two degrees or intervals; but theſe degrees, diatonically, are only a greater tone, and a ſemitone.

Chromatically it is compoſed of three tones, two greater, and one leſs; as *re, mi, fa*, or *re, fa*.

It takes its form from the ratio ſeſquinquinta, 5 : 6.

The logarithm or meaſure of the octave $\frac{2}{1}$ being 1.000000, the meaſure of the *third minor* $\frac{6}{5}$ will be 0.263034. Hence it appears that four leſſer *thirds* exceed the octave. But practical muſicians are apt to ſuppoſe them equal to the octave, as they are apt to confound three greater *thirds* with that interval. Four leſſer *thirds* exceed the octave by a dieſis and a comma; as is eaſily proved by logarithms. See INTERVAL.

Both theſe *thirds* are of admirable uſe in melody; and make, as it were, the foundation and life of harmony.

They are uſed agreeably both aſcending and deſcending; and that either running over all the degrees, as *ut, re, mi*, or *re, mi, fa*; or ſkipping the middle degree, as *ut, mi*, or *re, fa*.

But it is to be obſerved, that the *greater third* has ſomewhat gay and ſprightly in riſing, and ſomewhat heavy and melancholic in falling: the *leſſer third*, on the contrary, has ſomewhat ſoft and tender in riſing, and ſomewhat briſk in falling. For the uſe of the *greater* or *leſſer third* in the ſeries of the ſcale, ſee SCALE.

There are two other kinds of *thirds* that are diſſonant, and vicious; the firſt only compoſed of two greater ſemitones, and, by conſequence, of a ſemitone leſs than the *leſſer third*: this they call the *defective third*. See DIMINISHED *third*.

The ſecond, on the contrary, has a ſemitone more than the *greater third*; and this they call the *redundant third*. See SUPERFLUOUS *third*.

The *defective third* is very frequent in Italian ſongs, eſpecially thoſe compoſed for inſtruments; but is not to be uſed without neceſſity, and a great deal of diſcretion.

The *redundant third* is abſolutely forbidden.

THIRD *borough*, in our *Ancient Law-Books*, denotes a CONSTABLE.

THIRD *earing*, in *Huſbandry*, the tilling or plowing of the ground a *third* time.

THIRD *eſtate*. See ESTATE, COMMONS, &c.

THIRD *night-awn-hynd*. By the laws of Edward the Confeſſor, a gueſt, who had lain three nights in an inn, was reputed a domeſtic, and his hoſt was anſwerable for what offence he ſhould commit.

For one night he was accounted *uncuth*, for two nights *gueſt*, and the *third*, *awn-hynd*, or *hogen-hine*. *Prima nocte incognitus, ſecunda hoſpes, tertia domeſticus cenſetur.*

THIRD *order*, a ſort of religious order, that obſerves the ſame

ſame rule, and the ſame manner of life, in proportion as ſome other two orders inſtituted before.

The *third orders* are not originally religious orders, but aſſociations of ſecular, and even married perſons, who conform, as far as their condition will allow them, to the deſign, intention, and rules, of a religious order, which aſſociates and directs them.

The Præmonſtrantes, Carmelites, Auguſtines, and Franciſcans, diſpute, among themſelves, the honour of having firſt introduced *third orders*; but the pretenſions of the laſt appear to be the beſt founded.

The firſt contend, that the THIRD *order* of Præmonſtrantes began in the life-time of their founder St. Norbert, who died in 1134.

F. Diego de Coria Maldonado, a Spaniſh Carmelite, who has a particular treatiſe on the *third order* of Carmelites, derives them immediately, as well as the Carmelites themſelves, from the prophet Elijah.

The THIRD *order* of Auguſtines, if we credit F. Bruno, was inſtituted by St. Auguſtine himſelf; but the arguments he produces are ſo frivolous, that F. Helyot obſerves, they are not worth the refuting.

The THIRD *order* of Franciſcans was inſtituted by St. Francis, in 1221, in favour of people of both ſexes; who, being ſmitten with the preachings of that ſaint, demanded of him an eaſy manner of living a Chriſtian life: upon which he gave them a rule, the conſtitutions whereof are not now extant, as written by himſelf, but only as reduced and confirmed by pope Nicholas IV. ſixty-eight years afterwards.

The firſt order of this ſaint are the monks called *Minor Friers*, comprehending the Cordeliers, Capuchins, and Recollects; the ſecond comprehends the nuns of St. Clare; and the third, ſeveral perſons of both ſexes, who live at liberty; and theſe are what we call the *third order*. See FRANCISCANS, &c.

Of this order, which was only eſtabliſhed for ſecular perſons, ſeveral of both ſexes, to attain the greater perfection, have afterwards commenced religious, and formed various congregations, under various names; as *Religious Penitents of the third Order*, &c.

THIRD *point*, or TIERCE-*point*, in *Architecture*, the point of ſection in the vertex of an equilateral triangle.

Arches or vaults of the *third point*, called by the Italians *diterzo acuto*, are thoſe conſiſting of two arches of a circle, meeting in an angle at top. See ARCH.

THIRD *point*, in *Perſpective*. See POINT.

THIRD *rate*. See RATE.

THIRD *ſubſidy duty*. See DUTY.

THIRD *ſounds*, in *Muſic*. See *Third* SOUNDS.

THIRD *year*, *tithe of the*. See TITHE.

THIRDENDALE, a liquid meaſure uſed at Saliſbury, containing three pints.

THIRDINGS, the third year of the corn or grain growing on the ground at the tenant's death, due to the lord for an HERIOT, within the manor of Turſat, in Herefordſhire.

THIRST, a painful ſenſation, occaſioned by a vellication of the nerves of the throat or fauces, and producing a deſire of drinking.

Rohault accounts for *thirſt* thus: the liquor of the ſtomach, which ordinarily reſolves into a thick vapour, and aſcends from the ſtomach up into the throat, to moiſten it, being too much warmed and agitated, either from a want of ſome other liquor to temper and dilute it, or from any other cauſe, becoming converted into too thin, ſubtile, and penetrating, a vapour, is ſo far from moiſtening and cooling the throat, that, on the contrary, it dries and heats it: and hence that motion in the nerves, the ſenſation whereof we call *thirſt*.

Thirſt ſometimes alſo ariſes from a mere drineſs of the part, and ſometimes from ſharp ſalts more immediately vellicating the fibres of the throat.

There are various kinds of liquors which quench *thirſt*: ſome by tempering the ſtomach-liquor; others by diluting, and even diſſolving the ſalt; and others by moiſtening and ſuppling the fibres. Acids are particularly fitted for this end.

It is ſaid, that thoſe who travel through the ſcorching deſarts of Arabia, Perſia, &c. find that brandy, and the ſtrongeſt wines, quench their *thirſt* beſt.

We find warm drugs, as liquorice, ſometimes effectual in allaying *thirſt*: nay pepper will, in ſome caſes, have a like effect, by cauſing a more plentiful flow of the ſaliva.

Thirſt may be ſometimes eluded, by rolling a clean bullet, or a pebble in the mouth, which occaſions an extraordinary iſſue of ſaliva to moiſten the throat, &c.

Mr. Boyle mentions a man who could eaſily abſtain from drinking for nine days, and yet have his diet nothing more liquid than uſual; the ſecretions of urine, ſweat, &c. being performed all the while regularly, and in the ſame quantity as uſual.

In dropſical caſes, where there is not a right ſecretion of the urine by the renal glands, and the veſſels and parts of the body are loaded with too great a quantity of ſerous humours, a great moderation in drinking might be attended with good ſucceſs, provided ſome liquor could be found out to allay that uneaſy ſenſation. Probably this would be beſt performed by mucilages acidulated with ſpirit of vitriol or ſulphur, or jellies with juice of lemon, &c. and that a ſmall quantity of ſuch a compoſition, now-and-then uſed, might be of as much real ſervice, in quenching *thirſt*, as draughts of liquors, which increaſe the ſymptoms.

In feveriſh diſorders, the patient is frequently tormented with a violent *thirſt*, which is moderated by acidulating the barley-water, or ſage-tea, with ſpirit of vitriol, or with lemon-juice; but by nothing ſo much, as allowing the patient ſome ſlices of an orange. Pringle, Obſerv. on Diſeaſ. of Army, p. 135.

THISMA, a name uſed by ſome for any ſubterranean vein, or bed of a mineral.

THISTLE, *carduus*, in *Botany*, a genus of the *ſyngeneſia polygamia æqualis* claſs. Its characters are theſe: it has a compound flower made up of many hermaphrodite florets, which are fruitful, and are included in one common ſcaly empalement; the florets are funnel-ſhaped and of one leaf, and have each five ſhort hairy ſtamina; in the centre is ſituated an oval germen crowned with down, which becomes an oblong four cornered ſeed, crowned with down, and encloſed by the empalement; there are a great number of ſpecies, ſome of which are troubleſome weeds, both to gardens and fields. Miller.

Linnæus enumerates twenty-ſeven ſpecies.

THISTLE, *bleſſed*, *carduus benedictus*, *vel cnicus*, in *Botany*. See CNICUS.

Miller reckons four and Linnæus eight ſpecies.

The *bleſſed thiſtle*, which is the hairy wild *cnicus* of Miller, and the *centaurea benedicta* of Linnæus, is chiefly uſed in INFUSION, as a gentle emetic, in fevers and certain nauſeas.

Dr. Lewis has often obſerved excellent effects from a light infuſion of carduus, in weakneſs of appetite and indigeſtion, where the ſtomach was injured by irregularities, or oppreſſed by viſcid phlegm; nor has he found any one medicine of the bitter kind to ſit ſo eaſily on weak ſtomachs, or to heat ſo little. Theſe infuſions, taken freely, promote the natural ſecretions. Drank warm in bed, they commonly increaſe perſpiration or excite ſweat; and as they act with great mildneſs, not heating or irritating conſiderably, they have been uſed, in this intention, in acute as well as chronical caſes. The ſeeds, which, as well as the leaves, have a conſiderably better taſte, have ſometimes been uſed as ſudorifics or diaphoretics, in the form of an emulſion. Cold water poured on the leaves, extracts, in an hour or two, a light grateful bitterneſs; by ſtanding long upon the plant, the liquor becomes diſagreeable: a ſtrong decoction is very nauſeous and offenſive to the ſtomach. The extracts, obtained by inſpiſſating both the cold infuſion and decoction, have the ſame differences as the liquors themſelves. Rectified ſpirit extracts, in a ſhort time, the light bitter part of this plant, but does not take up the nauſeous near ſo eaſily as water. On keeping the watery extracts for ſome months, a conſiderable quantity of ſaline matter was formed on the ſurface, in ſmall cryſtals, reſembling in ſhape thoſe of nitre, in taſte bitteriſh, with an impreſſion of coolneſs. Lewis's Mat. Med.

Some diſtil a water from it, which they uſe in cordial and ſudorific potions.

THISTLE, *carline*, *carlina*, in *Botany*, a genus of the *ſyngeneſia polygamia æqualis* claſs. Its characters are theſe: it hath a compound flower, made up of many hermaphrodite florets, which are fruitful; included in a common ſwollen ſcaly empalement; the florets are funnel-ſhaped, cut into five parts at the brim, and have each five ſhort hairy ſtamina; in the centre is ſituated a ſhort germen crowned with down, which becomes a ſingle taper ſeed, crowned with a branching plumoſe down. Miller enumerates five, and Linnæus ſeven ſpecies.

The root of the *carlina acaulis* of Linnæus, is ſuppoſed to be diaphoretic, antihyſteric, and anthelmintic. It has been greatly eſteemed by ſome foreign phyſicians, in acute malignant as well as in chronical diſeaſes, and given in ſubſtance from a ſcruple to a dram, and in infuſion from one to two drams and more. It is rarely to be met with in our ſhops. See CARLINÆ *radix*.

THISTLE, *diſtaff*, *atractylis*, a genus of the *polygamia ſyngeneſia æqualis* claſs. Its characters are theſe: it hath a radiated compound flower, compoſed of many hermaphrodite florets, which are included in a common ſcaly empale-

empalement having no ſpines; the hermaphrodite florets compoſe the rays or border, and are ſtretched out on one ſide like a tongue; thoſe which compoſe the diſc are funnel-ſhaped, and in them is a ſhort crowned germen, which becomes a turbinated compreſſed ſeed, crowned with a plume of down ſhut up in the empalement. Linnæus enumerates three, and Miller four ſpecies.

The roots of the *atractylis gummifera* of Linnæus, or pine-*thiſtle*, which is a native of Italy and the iſland of Candy, yield, if wounded when freſh, a viſcous milky juice, which concretes into tenacious maſſes, at firſt whitiſh and reſembling wax, but when much handled growing black; ſuppoſed to be the *ixion*, and *acanthina maſtiche* of the ancients. The juice is ſaid to have been formerly chewed for the ſame purpoſes as maſtich, and the root itſelf of the ſame virtue with that of the *carline thiſtle*. Lewis.

Thistle, *fiſh*, a ſpecies of *carduus* or thistle.

Thistle, *fuller's*, *dipſacus*, in *Botany*. See Teasel.

Thistle, *gentle*, a ſpecies of *carduus*.

Thistle, *globe*, *echinops*, in *Botany*, a genus of the *ſyngeneſia polygamia ſegregata* claſs. Its characters are theſe: it has a permanent perianthium, oblong, angular, and imbricated; the flower has one funnel-ſhaped petal, included in an imbricated empalement, divided at the top into five parts; and has five ſhort hairy ſtamina terminated by cylindrical ſummits; in the bottom of the tube is ſituated an oblong germen, which becomes an oval oblong ſeed, narrowed at the baſe, but obtuſe and hairy at the top. There are four ſpecies.

Thistle, *golden*, *ſcolymus*, in *Botany*, a genus of the *ſyngeneſia polygamia æqualis* claſs. Its characters are theſe: it hath a flower compoſed of many hermaphrodite florets, included in an oval imbricated empalement, with many looſe ſharp-pointed ſcales; the florets are tongue-ſhaped, of one petal, torn, and ſlightly indented in five parts; they have five ſhort hair-like ſtamina, terminated by tubulous ſummits; the germen is ſituated under the floret, ſupporting a ſlender ſtyle longer than the ſtamina, crowned with two reflexed ſtigmas; the germen afterward becomes a ſingle ſeed, which is oblong and triangular, and ripens in the empalement, the ſeeds being ſeparated by plain, roundiſh, indented chaff. There are two ſpecies, which grow in the ſouthern parts of Europe.

Thistle, *hedge-hog*, a ſpecies of *cactus*, or *melon*-thistle.

Thistle, *ladies*, or *milk*, a ſpecies of *carduus*. See thistle.

Thistle, *melon*, *cactus*, in *Botany*, a genus of the *icoſandria monogynia* claſs. Its characters are theſe: the empalement of the flower is of one leaf, tubulous, and cut into ſix parts; the flower is compoſed of ſix petals, which reſt upon the embryo; and it has ſix long ſlender ſtamina, terminated by erect ſummits; the oval germen, which is ſituated below the petals, ſupports a cylindrical ſtyle, and becomes a pyramidal fleſhy fruit with one cell, filled with ſmall angular ſeeds, ſurrounded with pulp. Miller enumerates ſix, and Linnæus twenty-four ſpecies. The *melon-thiſtles* commonly grow upon the ſteep ſides of rocks in the warmeſt parts of America, where they have little or no earth to ſupport them; their roots ſhoot down into the fiſſures to a conſiderable depth, ſo that it is troubleſome to get the plants up, eſpecially as it is ſo very dangerous to handle them on account of their thorns.

The larger kinds of theſe plants are of a peculiar ſtructure; the fruit appears like a large fleſhy green melon, with deep ribs, ſet all over with ſtrong ſharp thorns; and when cut through the middle, their inſide is a ſoft pale green fleſhy ſubſtance, very full of moiſture; they are frequently eaten, and the taſte being an agreeable acid, renders them very grateful in a hot country. In times of drought the cattle are ſaid to repair to the barren rocks which are covered with theſe plants, and after having ripped them up with their horns, ſo as to tear off the thorns and outſide ſkin, they greedily devour all the fleſhy pulp, which affords them both meat and drink.

All the plants of this ſort require a very good ſtove to preſerve them through the winter in England; nor ſhould they be expoſed to the open air in ſummer. If they are plunged into a hot-bed of tanner's bark in ſummer, it will greatly forward their growth; but, in this caſe, there ſhould be ſcarce any water given to the plants. The beſt method to preſerve all the large kinds in winter, is to place the pots, either upon the top of the flues, or very near them, that they may have the warmeſt place of the ſtove, and never to water them; and when they are removed at the proper ſeaſon into a bed of tanners bark, they will grow and recover their verdure. The ſoil in which they are planted ſhould be of a ſandy nature, and if mixed with dry lime rubbiſh, it will be ſtill better. Stones placed in the bottoms of the pots will ſerve to drain off any moiſture. The great ſorts may be propagated by ſeeds; but as the plants which are raiſed from ſeeds in England, are ſome years arriving at any conſiderable ſize, it is the beſt way to procure ſome plants from the Weſt Indies. Miller.

For the ſpecies of cactus, referred by ſome writers to the diſtinct genus of *cereus*, ſee Torch-*thiſtle*.

Thistle, *ſow*, *ſonchus*, in *Botany*, a genus of the *ſyngeneſia polygamia æqualis* claſs. The characters of which are; that the receptacle is naked, the calyx imbricated and ventricoſe, and the down hairy. Linnæus enumerates nine ſpecies.

There are many of them weeds in England, ſo are not planted in gardens; for if their ſeeds are once permitted to ſcatter, they will ſoon ſtock it with plants; for this reaſon they ſhould always be extirpated, the ſeeds being furniſhed with a down, and thereby wafted to a conſiderable diſtance.

Sow-thiſtle, is alſo the name of a ſpecies of *prenanthes*. See *Wild* Lettuce.

Thistle, *downy ſow*. See Andryala.

Thistle, *ſtar*, in *Botany*. See Centaury.

Thistle, *torch*, in *Botany*, a ſpecies of *cactus*. See *Melon* Thistle and Torch-*thiſtle*.

Thistle, *woolly*, in *Botany*. See Onopordum.

Thistle-*fly*, in *Natural Hiſtory*, a ſmall fly produced from a fly-worm, hatching in the protuberances of the carduus hæmorrhoidalis. In the protuberances of this *thiſtle*, while they are cloſed in all parts, the worm of this fly, from whoſe injuring it, at the time of depoſiting the egg from which it was hatched, the protuberances aroſe, undergoes its laſt transformation. It here makes of its own ſkin a ſhell, in form of an egg, within which it puts on the nymph ſtate. When this nymph becomes a living fly, the leaſt part of its difficulty is the finding its way out of this ſhell; it has a ſtronger priſon than that, and before it can obtain its liberty, muſt force its way through the much more cloſely compacted fibres of the protuberance of the vegetable. It has, however, no other means of doing this difficult work, but that of inflating its head, and throwing out the bladder or muzzle with which all theſe creatures are provided in this ſtate. See Museau and Thistle-*galls*.

This a difficult operation, and many of the creatures periſh in the attempt, but what much forwards the ſucceſs of it, in many caſes is, that the ſtalk of the *thiſtle* often becomes naturally half rotten before the time of the fly's egreſs. Reaumur, Hiſt. Inſ. vol. iv. p. 338.

Thistle-*galls*, a name given by the more accurate authors to the protuberances on the ſtalks of a ſpecies of *thiſtle*, called by authors, *carduus hæmorrhoidalis*, from theſe tubercles, which are ſuppoſed to reſemble thoſe of the hæmorrhoidal veins, in perſons ſubject to the piles. Theſe have been ſuppoſed a natural production of the plant; but they are far otherwiſe. The whole hiſtory of them is, that a certain ſpecies of fly, always depoſits its eggs on the ſtalks; and the young ones, when hatched, gnaw their way into the ſubſtance of the ſtalk, and the copious derivation of the juice, occaſioned by their ſucking, produces the tubercles which are found on it. See *Tab. of Inſects*, N° 28.

Theſe tubercles are of a roundiſh or oblong figure, and are of various ſizes, from that of a pea to the bigneſs of a nutmeg; they are much harder than the reſt of the ſtalk, approaching to a woody ſtructure; when cut open, they are found to contain each ſeveral oblong and narrow cells; theſe have no communication with one another, and are each inhabited by a ſmall white worm, which has two hooks at the head; with theſe it breaks the fibres of the plant, in order to get at its juices. When it has arrived at the time of its change into the nymph-ſtate, it ceaſes to eat, and drawing up its body much ſhorter than uſual, its ſkin hardens, and forms a ſhell, under which it changes into a very beautiful two-winged fly; the wings are whitiſh and tranſparent in the middle; and at the edges ſurrounded with black in the form of a chain of figures like the letter Z; the body and breaſt of this fly are of a beautiful black, with ſome ſlight variations of yellow, with which the ſhoulders are ſtreaked; the anterior part of the head is white, and its back-part edged with a yellow down; the antennæ are reddiſh, and the legs are partly black, and partly of a fine clear brown.

In obſerving the changes of the worms of theſe galls, there are often obſerved ſome which go through them in a different manner from the reſt, and finally produce a very different ſpecies of fly. Theſe are the progeny of the eggs of ſome other ſpecies of fly, whoſe worm being carnivorous, is lodged by the art of its parent, while it is yet in the egg-ſtate, in the ſubſtance of this gall, there to prey upon the defenceleſs inhabitants.

There are many ſpecies of galls, the inhabitants of which are expoſed to enemies. In thoſe it is common to find

the proper inhabitant and the devourer in the ſame cell; the one feeding on the juices of the plant, the other on its juices; but this is not the caſe here, theſe worms immediately deſtroying the proper inhabitants, and being found always alone in their cells. Reaumur, Hiſt. Inſ. vol. vi. p. 221.

THISTLE, *order of the*, or of St. Andrew, is a military order in Scotland; inſtituted, as ſome ſay, by Hungus, or Hungo, king of the Picts, after a victory obtained over Athelſtan.

The legend is, that a croſs of St. Andrew (the patron of that kingdom) appearing to him at the time of the engagement, he bleſſed the happy augury, took the figure thereof into his ſtandard in honour of his protector; and inſtituted an order of knights whoſe collar is of gold interwoven with *thiſtle*-flowers and ſprigs of rue.

From the collar hangs a medal, on which is the image of St. Andrew with his croſs on his breaſt, with this motto, *Nemo me impune laceſſet, No body ſhall provoke me unpuniſhed.*

Others give a different account of its origin, and aſſure us, it was inſtituted after the concluſion of a peace between Charles VII. of France, and the then king of Scotland.

The abbot Juſtiniani goes up higher, and will have it to have been inſtituted by Achaius I. king of Scotland, in 809, who, after an alliance made with Charlemagne, took for his device the *thiſtle*, with the words *Nemo me impune laceſſet*, which, in effect, is that of the order. He adds, that king James IV. renewed the order, and took St. Andrew for its protector.

The order only conſiſts of twelve knights, beſides the king, who is the chief, or ſovereign. Their ordinary badge is a green ribband, to which hangs a *thiſtle* of gold, in which is the aforeſaid motto.

THISTLE, *our Lady of the*, was alſo a military order, inſtituted in 1370, by Louis II. duke of Bourbon. It conſiſted of twenty-ſix knights, whereof that prince and his ſucceſſors were the chiefs. Their badge was a ſky-blue girdle; and, on ſolemn occaſions, a mantle of the ſame colour, with a gold collar, interwoven with flower-de-luces; among which was the word *eſperance, hope*, in capitals.

THISTLE-*take*, a cuſtom in the hundred of Halton, in the county of Cheſter, whereby, if in driving beaſts over the common, the driver permits them to graze, or take but a *thiſtle*, he ſhall pay a halfpenny a beaſt to the lord of the fee.

At Fiſkerton, in Nottinghamſhire, by ancient cuſtom, if a native, or cottager, killed a ſwine above a year old, he paid the lord one penny, which was alſo called *thiſtle-take*.

THLASIAS, a term uſed by the ancients to expreſs an eunuch made by a compreſſion or contuſion of the teſticles, not by the cutting them out.

THLASIS, a word uſed by the ancients to expreſs either a contuſion without a wound, or a wound made by ſome blunt inſtrument, which contuſed the parts.

THLASMA, a word ſometimes uſed like *thlaſis*, to expreſs a contuſion either with without a wound; ſometimes applied particularly to a receſs of the cranium inward without a fracture, an accident principally affecting children.

THLASPEOS *ſemen*, in the *Materia Medica*, the name of a ſeed produced by the common *thlaſpi arvenſe ſiliquis latis*, or common treacle-muſtard. It is an ingredient in ſeveral of our ſhop compoſitions, and is eſteemed attenuating, deterſive, and aperient, and is ſaid to promote urine and the menſes, and to expel the after-birth.

THLASPI, *treacle-muſtard*, in *Botany*. See TREACLE-*muſtard*.

THLASPIDUM, in *Botany*. See *Buckler*-MUSTARD.

THLIBIÆ, in *Antiquity*, a kind of eunuchs. See THLASIAS and CASTRATION.

THLIPSIS, θλιψις, is uſed, by anatomiſts, for the compreſſion of any veſſel, or aperture, whereby its cavity is leſſened.

THNETOPSYCHITES, compoſed of θνητος, *mortal*, and ψυχη, *ſoul*; a ſect, in the ancient church, who believed the ſoul of man perfectly like that of brutes; and taught that it died with the body. See SOUL.

We meet with no account of theſe heretics any-where but in J. Damaſcenus Hæreſ. 90. unleſs they be the ſame with thoſe Euſebius ſpeaks of, Hiſt. Eccleſ. lib. ix. c. 38. who relates, that, in Origen's time, there were heretics in Arabia, who taught, that the ſoul of man died with the body; but that it ſhould riſe again with it at the end of the world. He adds, that Origen refuted them in a numerous council, and reclaimed them from their errors. St Auguſtine and Iſidore call them the Arabian heretics.

Marſhal, in his tables, uſes the word *Thenopſychites* inſtead of *Thnetopſychites*.

THOCOS, θωκος, in *Antiquity*, the ſame with THACAS.

THOKES, in *our Old Writers*, fiſh with broken bellies, forbid by ſtatute to be mixed or packed with *tale-fiſh*. 22 Ed IV. cap. 2.

THOLES, in *Sea Language*, denote ſmall pins driven perpendicularly into the upper edge of a boat. In rowing, the oar paſſes between the two *tholes*, in the ſpace called the ROW-*lock*. Sometimes there is only one pin to each oar, as in the boats navigated on the Mediterranean ſea: in that caſe the oar is hung upon the pin by means of a ſtrop.

THOMÆANS, THOMEANS, THOMITES, or *Chriſtians of St.* THOMAS, a people of the Eaſt Indies, in Cochin, and upon the coaſt of Malabar and Coromandel, who, according to tradition, received the Goſpel from the apoſtle St. Thomas. See CHRISTIANS *of St. Thomas*.

It appears by the teſtimony of Coſmas, who writ about A. D. 547, and whoſe work is tranſlated by F. Montfaucon, that Chriſtianity was eſtabliſhed in India in the ſixth century. We alſo find in the ſubſcriptions of the council of Nice, that of a prelate, who calls himſelf biſhop of Perſia. Moreover, an ancient author, cited by Suidas, ſays, that the inhabitants of interior India, (a name which Coſmas gives to the coaſt of Malabar) the Iberians and Armenians, were baptized under the reign of Conſtantine.

The princes of the country, and particularly Serant Peroumal, emperor of Malabar, the founder of the city of Calecut, A. D. 825, granted extraordinary privileges to theſe Chriſtians.

When Vaſco de Gama, the Portugueſe admiral, arrived at Cochin with a fleet, in the year 1502, theſe Chriſtians ſent deputies to him, imploring his protection, and that of the king his maſter. The admiral treated them kindly, but was in no condition to afford them any effectual aſſiſtance, in relieving them from the yoke of the Pagan kings to which they were then ſubject. The language they uſe *in ſacris*, is the Syriac, or as ſome ſay, the Chaldee; but their ordinary language is the ſame with that of their neighbours. The firſt miſſionaries, who attempted to proſelyte them to the church of Rome, were Cordeliers, but their endeavours proved ineffectual. The diſtinguiſhing opinions and religious rites of theſe Chriſtians are as follow.

They are charged with an invincible attachment to the doctrine of Neſtorius, and with an obſtinate refuſal to acknowledge, that the Virgin is the mother of God. They have no images in their churches; they believe that the ſouls of the bleſſed are not admitted into the preſence of God till after the day of univerſal judgment. They allow only of three ſacraments, viz. baptiſm, orders, and the euchariſt: they defer the baptiſm of infants for ſome time, as for a month, or even for ſeven, eight, or ten years, after they are born: they make no uſe of holy oil, neither in baptiſm, nor in the adminiſtration of the other ſacraments; but after baptizing their infants, they ſprinkle the oil of a ſpecies of Indian ſaffron all over their bodies: they allow of no auricular confeſſion, treat purgatory as a fable, and their prieſts are permitted to marry. They entertain an extraordinary affection for the Neſtorian patriarch of Babylon, but will not ſuffer any mention of the pope, or of the Romiſh churches in their aſſemblies. Their days of abſtinence are Wedneſday and Friday, and their faſt is very ſevere in Lent, during which time they go to church three times a day. They alſo faſt in the ſame manner during the time of Advent. Beſides theſe two greater faſts, which are enjoined on pain of excommunication, they have ſeveral others of a religious nature. Their women do not enter a church for forty days after their delivery of a male child, nor for eighty days after the birth of a daughter.

Theſe Chriſtians are in general poorly inſtructed, knowing only the Lord's prayer and the angelical ſalutation. Their churches are mean and unadorned buildings, and conſtructed after the manner of the pagodas. They appear to maintain many of the religious opinions and practices received among Proteſtants, and reject either wholly, or in a very great meaſure, thoſe of the church of Rome. They deny the ſupremacy of the pope, and tranſubſtantiation, and exclude from the number of ſacraments, confirmation, extreme unction, and marriage. Such are the errors proſcribed by the ſynod of Diamper, held in 1599 by Aleixo de Meneſes, archbiſhop of Goa, in order to unite the *Thomæans* to the Romiſh church. However, notwithſtanding the temporary ſucceſs that attended the vigorous exertions of the archbiſhop, for which he was recompenſed, after his return to Europe, with the archbiſhoprick of Braga, the viceroyſhip of Portugal, and the preſidency of the council of ſtate at Madrid, theſe Chriſtians, oppreſſed and abuſed by the Jeſuits, relapſed from the church of Rome ſoon after the death of the archbiſhop; and notwithſtanding the en-

deavours of Alexander VII. to conciliate them by the miſſion of four bare-footed Carmelites, they could no more be reduced to ſubmiſſion. At length when the Dutch took Cochin in 1663, the *Chriſtians of St. Thomas* recovered the liberty which they had formerly enjoyed; but they derived little advantage beſides from their new maſters. Encyclopedie, and Geddes's Hiſtory of the Church of Malabar and Synod of Diamper, in his Tracts, vol. v.

THOMAS. *Chriſtians of St.* THOMAS. See THOMÆANS.

THOMAS's *Hoſpital*. See HOSPITAL.

THOMISM, or THOMAISM, the doctrine of St. Thomas Aquinas, and his followers the *Thomiſts*; chiefly with regard to predeſtination and grace.

There is ſome doubt what the true, genuine *Thomiſm* is: the Dominicans pretend to hold pure *Thomiſm*; but there are other authors who diſtinguiſh the *Thomiſm* of St. Thomas from that of the Dominicans.

Others, again, make *Thomiſm* no other than a kind of Janſeniſm diſguiſed: but Janſeniſm, we know, has been condemned by the popes, which pure *Thomiſm* never was.

In effect, the writings of Alvarez and Lemos, who were appointed, by their order, to lay down and defend before the holy ſee, the dogmata of their ſchool, have ſince been reputed the rule of pure *Thomiſm*.

Thoſe two authors diſtinguiſh four claſſes of *Thomiſts*: the firſt, which they reject, deſtroys or takes away liberty; the ſecond and third do not differ from Molina. The laſt, which Alvarez embraces, admits a phyſical premotion, or predetermination, which is a complement of the active power, whereby it paſſes from the firſt act to the ſecond; that is, from complete and next power, to action.

This premotion, they hold, is offered in ſufficient grace: ſufficient grace is given to all men; and that they have a complete, independent, next power not to act, and even to reject the moſt efficacious grace.

THOMISTS, a ſect of ſchool-divines, who maintain *Thomiſm*.

The avowed antagoniſts of the *Thomiſts* are the SCOTISTS.

THOMITES. See THOMÆANS.

THOPH. See MACHUL and SISTRUM.

THOR, in *Mythology*, a deity worſhipped by the ancient inhabitants of the northern nations; particularly by the ancient Scandinavians and Celts. Julius Cæſar (Com. lib. vi. c. 17.) ſpeaks of a god of the Gauls, who was charged with the conduct of the atmoſphere, and preſided over the winds and tempeſts, under the name of Jupiter: but Lucan gives him a name, which bears a greater reſemblance to that of *Thor*, viz. *Taranis*, a word which to this day, in the Welſh language ſignifies *thunder*. The authority of this deity extended over the winds and ſeaſons, and particularly over thunder and lightning. In the ſyſtem of the primitive religion, the god *Thor* was probably one of thoſe genii, or ſubaltern deities, ſprung from the union of ODIN, or the Supreme Being, and the Earth. The EDDA calls him the moſt valiant of the ſons of Odin; and in the Icelandic mythology, he is conſidered as the defender and avenger of the gods. He always carried a mace, or club, which as often as he diſcharged it returned to his hand of itſelf; he graſped it with gauntlets of iron, and was poſſeſſed of a girdle which had the virtue to renew his ſtrength as often as was needful. With theſe formidable arms he overthrew the monſters and giants, when the gods ſent him to oppoſe their enemies. *Thor*, *Friga* or *Freya*, and Odin, compoſed the court or ſupreme council of the gods, and were the principal objects of the worſhip and veneration of all the Scandinavians. The Danes ſeem to have paid the higheſt honour to Odin. The inhabitants of Norway and Iceland appear to have been under the immediate protection of *Thor*: and the Swedes choſe for their tutelar deity Freya, or Frey, an inferior divinity, who, according to the Edda, preſided over the ſeaſons of the year, and beſtowed peace, fertility, and riches.

There was a day conſecrated to *Thor*, which ſtill retains his name in the Daniſh, Swediſh, Engliſh, and Low Dutch languages, viz. *Thurſday*. This word has been rendered into Latin by *dies Jovis*, or *Jupiter's day*; for this deity, according to the ideas of the Romans, was the god of thunder. Mallet's North. Ant. vol. i. p. 95.

THORA, in *Botany*. See WOLF's-*bane* and ANTHORA.

THORACIC, THORACICUS, in *Anatomy*, an epithet given to two branches of the axillary artery, on account of their conveying the blood into ſome parts of the thorax.

The *thoracic* arteries are diſtinguiſhed into *upper* and *lower*.

The upper, or external mammary artery, runs down in a winding courſe on the lateral parts of the thorax, and

croſſes the ribs; giving branches to the two pectoral muſcles, to the mamma, muſculus ſubclavius, ſerratus major, latiſſimus dorſi, and to the upper portions of the coraco-brachialis and biceps. The inferior *thoracic* artery runs along the inferior coſta of the ſcapula to the muſculus ſubſcapularis, teres major and minor, infra-ſpinatus, latiſſimus dorſi, ſerratus major, and the neighbouring intercoſtal muſcles, communicating with the ſcapular arteries.

There are likewiſe *thoracic* veins, an *upper* and *under*, deſtined for the reconveyance of the blood from the thorax to the axillary vein.

THORACIC *duct*, *ductus* THORACICUS, or *chyliferus*, is a thin tranſparent canal ariſing from, or rather it is a continuation of, the exit or mouth of the RECEPTACLUM *chyli*, and running along the ſpina dorſi, between the vena azygos and aorta, as high as the fifth vertebra of the back, or higher. From thence it paſſes behind the aorta toward the left hand, and aſcends behind the left ſubclavian vein, where it terminates, in ſome ſubjects, by a kind of veſicula; in others by ſeveral branches united together, and opens into the poſterior ſide of the ſubclavian vein, near the outſide of the internal jugular. It is ſometimes called *Pecquet's duct*, or *ductus Pecquetianus*, from M. Pecquet, ſuppoſed to be the firſt diſcoverer thereof.

Indeed the *thoracic* duct, Dr. Wharton aſſures us, was obſerved by Barthol. Euſtachio in 1563, but its uſe, and communication with the receptaculum chyli, were then unknown. And hence it is that Pecquet, a phyſician of Dieppe, is commonly held to have firſt diſcovered it, in 1651, whence its denomination, *ductus Pecquetianus*: though the deſcription he gives of its inſertion is faulty. Van Horne confounds it with the receptaculum, or, as he calls it, *ciſterna chyli*.

In its progreſs through the thorax, it is furniſhed with a proper integument from the pleura, beſides the membrane it has in common with the receptaculum.

Dr. Drake obſerves, that it has valves in different places of its tract; Euſtachio ſays glands. The valves, with which it is plentifully furniſhed, are ſemilunar turned upward. Its opening into the ſubclavian vein is, in the place of valves, covered by ſeveral pelliculæ ſo diſpoſed as to permit the entrance of the chyle into the vein, and hinder the blood from running into the duct. It is ſometimes double, one lying on each ſide, and it is ſometimes accompanied by appendices, called *pampiniformes*. Its uſe is, to carry the chyle and lympha from the receptaculum into the ſubclavian, by which it is forwarded to the cava, and thence to the heart.

THORACICI, in the *Linnæan ſyſtem of Ichthyology*, the name of the third order of bony fiſhes, reſpiring by means of gills only: the character of which is, that the ventral fins are placed underneath the pectoral fins. This order includes ſeventeen genera, and two hundred and eighteen ſpecies. The genera are, the *cepola*, *echeneis*, *coryphæna*, *gobius*, *cottus*, *ſcorpæna*, *zeus*, *pleuronectes*, *chætodon*, *ſparus*, *labrus*, *ſciæna*, *perca*, *gaſteroſteus*, *ſcomber*, *mullus*, and *trigla*.

THORACIS *primus*, in *Anatomy*, a name given by many of the anatomical writers to the muſcle called by the French the *ſouclavier*. See SUBCLAVIUS.

THORACIS *quartus*, in *Anatomy*, a name given by many of the earlier writers to a muſcle called by the modern writers *ſerratus poſticus inferior*. The ſame authors give the name of *tertius thoracis* to the *ſerratus poſticus ſuperior*.

THORÆ *radix*, in the *Materia Medica*, the name of a root which keeps its place in the catalogues of officinal ſimples, but is ſeldom uſed. See WOLF's-*bane*, and ANTHORA.

The plant which produces it is the *thora valdenſis* of Gerard. It is kept in the gardens of the curious, but grows wild in the mountainous parts of Germany. The root is compoſed of a number of granules or ſmall lumps, like that of the common ranunculus; the leaves are roundiſh and ſtand on ſmall pedicles, and the ſtalks are about ſix inches high, and the flowers yellow, and like thoſe of our common wild ranunculuſes.

The root is acrid and corroſive, and the juice of the leaves is ſaid to poiſon animals, and to have been uſed by the ancients for that purpoſe.

THORAX, θώραξ, in *Anatomy*, that part of the human body which forms the capacity of the breaſt, and wherein are included the heart and lungs. See *Tab. Anat. Oſteol. fig.* 3. *n.* 13. 13. *fig.* 7. *n.* 15. 15.

It has its name from the Greek θορεῖν, *ſalire*, *to leap*; by reaſon of the continual throbbing motion of the heart, which is contained therein. Galen calls it *cithara*, and ſays, it contains the parts that excite to love.

The *thorax* is alſo called the *ſecond* or *middle venter*, and properly the *cheſt*.

It is bounded at top by the clavicles, and at bottom by the

the cartilago xiphoides, and the diaphragm. Its fore-part is called the *ſternum*, or *breaſt-bone*; its ſide-parts the *coſtæ*, or *ribs*; its hind-parts are, the *ſpina dorſi*, and its *vertebræ*, with the *omoplate*.

Beſides the heart and lungs, the *thorax* likewiſe contains the aſcending cava, the aorta, the pulmonary vein and artery, the trachea, œſophagus, &c.

It is lined withinſide with a membrane called the *pleura*, and divided in the middle by another called the *mediaſtinum*.

Dr. Hoadly thinks it proved from Dr. Hales's experiments, in his Vegetable Statics and Hæmaſtatics, that there is air in the cavity of the *thorax*, between the lungs and the pleura. See his Lectures on Reſpiration, and Respiration.

Thorax, *abſceſſes in the*, or breaſt. One of the moſt remarkable accounts we have ever had of the effects of an abſceſs in the breaſt, is from Mr. Chicoyneau, of the academy of Montpelier, given in the Memoirs of the Academy of Sciences of Paris in 1731.

Mr. le Dran remarks, that whenever any conſiderable quantity of pus is contained in either cavity of the *thorax*, that ſide will appear larger than the other.

Thorax, *wounds of the*. The wounds of the *thorax*, or breaſt, are of three kinds; either the wound is inflicted on the external parts only, or it penetrates into the cavity of the breaſt; or thirdly, the contents of the *thorax* partake alſo of the wound.

It may be diſcovered whether wounds do or do not penetrate into the cavity of the *thorax*, either by the ſight or by the hearing; obſerving whether any ſound proceeds from the wound at the time of inſpiration; by feeling with a probe or a finger, and obſerving whether they paſs into the cavity, or meet with any reſiſtance; by injecting warm water, which if the wound does not penetrate, will return ſtrongly upon you; and laſtly, you will be convinced that it does not, by the abſence of bad ſymptoms, ſuch as difficulty of breathing, fainting, and ſick fits, which always attend a wound that penetrates into this cavity. If the wound is found not to penetrate, it is to be treated as a common ſlight wound. But ſometimes an external wound of this kind runs very deep, and obliquely, between the muſcles and the ribs, and is thereby rendered very difficult to be cleanſed from grumous blood and matter; and the matter in this caſe frequently deſtroys the neighbouring parts, and produces ulcers, and very dangerous or incurable fiſtulæ; nay, ſometimes it makes its way through the pleura, into the cavity of the *thorax*, and forms an empyema, or brings on a phthiſis, and death itſelf.

The great buſineſs in this caſe is to clear the ſinuſes from the blood and matter confined in them; and this is to be done either by preſſure, or by ordering the wound to be ſucked by a healthy perſon, or by drawing it out with a ſyphon, or making farther openings with a knife. A proper ſyringe with its mouth applied to the wound, and a ſtrong ſuction made, often will fill itſelf with the confined blood and matter, and, by repeating the operation, prove of very ſignal ſervice.

In wounds that penetrate into the cavity, when a large quantity of blood is ſpilt into the cavity of the *thorax*, the expanſion of the lungs, the office of reſpiration, and the courſe of the blood through the lungs are impeded, and the blood in the lungs being inſpiſſated by frequently being retarded there, life cannot be ſupported; but where the quantity of extravaſated blood is not ſo large as to occaſion theſe accidents, there ſtill is danger that it ſhould putrefy by degrees, and corrupt either the diaphragm, pleura, or lungs, which muſt occaſion very bad ſymptoms, and finally, in a ſhort time, death itſelf. When blood is extravaſated in the *thorax*, we muſt therefore uſe all diligence to get it away. If the wound is inflicted on the middle or lower part of the *thorax*, and has not a very narrow opening, it will be convenient to lay the patient upon the wounded ſide, and adviſe him to fetch his breath deep, or cough; and if the diſcharge is hindred by lumps of grumous blood ſtopping up the orifice, they muſt be removed with a probe, or with the fingers, or drawn out with a ſyringe. If the blood is become too thick to flow out of the wound, an injection of barley-water, with the addition of a little honey of roſes and a ſmall quantity of ſoap, muſt be uſed; this is to be injected, and the patient made afterwards to lie on the wounded ſide, to let it run out again; and this muſt be repeated, till it appears that all the grumous blood is waſhed away. But if the wound is ſo narrow and oblique that this method cannot be uſed, it muſt be enlarged with the inciſion-knife. Great caution is to be obſerved not to fatigue the patient too much, by attempting to diſcharge all the extravaſated blood at one time. It will be more ſafe to do it by intervals, at different times, eſpecially if he be ſubject to ſwoonings; but the wound muſt be kept open in the mean time, by introducing a ſilver or leaden pipe into it, or at leaſt a large tent with a ſtring faſtened to it. This method of cleanſing the cavity of the *thorax* is to be repeated, till the diſcharge ſhall entirely ceaſe, and the external wound can be conveniently healed.

When a wound is made in the upper part of the breaſt, the patient lying on the wounded ſide cannot at all let out the matter in the cavity; but an opening muſt be made in the lower part of the *thorax*, between the ſecond and third rib, counting upwards, if it is on the left ſide; but if it is on the right ſide, then between the third and fourth rib, about a hand's-breadth from the ſpine. The place where the opening is to be made ſhould be firſt marked with ink, and the inſtrument generally uſed to make it is the *trocar*, which muſt be driven above the rib into the *thorax* with great caution and gentleneſs; after it has penetrated, the ſteel-inſtrument is to be drawn out, and the pipe left in as a paſſage for the extravaſated blood to be let out by; and if it does not readily make its way out by this, its evacuation may be forwarded by the ſuction of a ſyringe. The trocar is in common uſe on this occaſion; but as the lungs are very liable to be wounded by the paſſing of this inſtrument forcibly into the cavity of the *thorax*, it is better to divide the common integuments with an inciſion-knife, as alſo the muſcles and pleura, carefully avoiding the lungs, which are very apt to adhere to the pleura in this part: when this perforation is properly made, it is carefully to be kept open as long as neceſſary, and the wound above to be healed up as ſoon as poſſible.

The cavity of the *thorax* being thus cleanſed, the wound is to be dreſſed once every day, and the dreſſing performed with all poſſible expedition; and the utmoſt diligence uſed to guard the contents of the *thorax* from the injuries of the external air. Heiſter's Surg. vol. i. p. 79, &c.

Thorax, *paracenteſis of the*, is a perforation of this part, uſually made between the ribs in ſeveral diſorders; particularly in the Empyema, Emphysema, Dropsy of the breaſt, and for diſcharging blood which has been extravaſated into the cavity of the thorax, in wounds of this part. Before this operation is undertaken, care ſhould be taken to determine whether the patient's ſtrength will admit of it, and his diſorder be hereby relieved. If the diſorder be recent and the patient ſtrong, the *thorax* may be perforated without danger by a ſkilful ſurgeon, who divides only the ſkin, fat, intercoſtal muſcles, and pleura. In order to diſcover in which ſide the peccant matter is contained, the ſurgeon ſhould obſerve in which ſide the pain or inflammation has been, and the weight or fluctuation has been perceived, on which ſide he can lie moſt eaſily, for that is uſually the ſide affected, and where the tumor and inflammatory heat are diſcovered. The operation may then be ſafely performed between the ſecond and third of the ſpurious ribs on the left ſide, or between the third and fourth on the right ſide, counting from below upwards, ſo as to be about five or ſix fingers' breadth from the ſpine of the back, and as much below the angle of the ſcapula. The ſurgeon having marked the place with ink, and taken up the integuments between his own fingers, and thoſe of an aſſiſtant, as in cutting iſſues, proceeds to make an inciſion about three inches long according to the courſe of the ribs: this part is then perforated with the trocar, which being introduced into the cavity of the *thorax*, its bodkin is extracted, and the tube left in the wound, whereby the humours are drawn off and diſcharged, as long as the patient's ſtrength will admit. When the patient is near fainting, or the matter appears to be totally evacuated, the cannula of the trocar may be removed, and a flexible tube of ſilver or lead inſerted in its place, and faſtened to the *thorax* with a piece of plaſter and a ligature. Over the mouth of the tube may be applied a compreſs, retained by the bandage, called a *napkin* and *ſcapulary*. Sometimes the trocar is introduced through the integuments and intercoſtal muſcles by one puſh againſt its triangular bodkin: but to prevent injuring the lungs, it is moſt prudent, after having prepared the integuments by inciſion, cautiouſly to divide the intercoſtal muſcles and pleura by a tranſverſe inciſion with a ſcalpel, and having introduced the cannula as before, the contained humours of the *thorax* are thereby diſcharged. The patient, during the operation, ſhould be in an inclined poſture. A ſufficient opening being made into the *thorax*, the finger is to be introduced, in order to ſeparate the lungs from its adheſion to the pleura, and to make way for the peccant humours. Petit recommends, inſtead of tubes or tents, ſtopping up the orifice of the wound with ſoft linen rolled up, whereby it may be kept open for future diſcharges. Over the wound is to be applied ſoft lint, faſtened to a thread, and retained with plaſter, compreſs, and bandage. After the operation the dreſſing may be applied

applied once or twice a day; the matter being discharged and washed out, by injecting some deterging liquor at each dressing. A decoction for this purpose may be made of vulnerary herbs, as veronica, scabiosa, solidago saracenica, with honey of roses and oil of myrrh. Garengeot recommends a decoction ex persicaria and althæa, when the disorder arises from a pleurisy or peripneumony: a tincture of sulphur of antimony, made with spirit of wine, is also very efficacious in deterging and healing these parts. Others extol a mixture of lime-water with honey of roses. These injections should be continued till they return clean and unmixed with bloody or purulent matter; whereupon the tube or lint may be withdrawn from the perforation of the *thorax*, and the cure completed as in wounds of the *thorax*. Heister's Surg. vol. ii. p. 65, &c.

THORN, a name characterizing several genera of prickly plants. Thus,

THORN *apple*, *datura*, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the flower has one funnel-shaped petal, with a long cylindrical tube, which is pentangular, each angle being pointed; the empalement of the flower is five-cornered and tubulous; it has five stamina and an oval germen, which becomes an oval capsule with four cells, filled with kidney-shaped seeds adhering to the partition. Linnæus enumerates six and Miller seven species.

The leaves are accounted cooling, and good for burns, scalds, and inflammations in any part. The seed of the *datura stramonium* is narcotic and soporiferous, but is rarely used.

Several instances are recorded of the bad effects of inadvertently eating it. Emetics and purgatives give the speediest relief in cases of this kind. The plant, which has been long known as a narcotic poison, has been introduced into the catalogue of medicines by Dr. Stoerck. An extract made from the expressed juice of the leaves is acrid and saline to the taste, and yields crystals of nitre on standing. This preparation given in doses from one to five grains twice or thrice a day, is said to be a powerful remedy in various convulsive and spasmodic disorders, epilepsy, and mania. An ointment prepared from the leaves has been found to give ease in external inflammations and hæmorrhoids. Lewis.

THORN, *black*, or SLOE *tree*, a species of the *prunus*, called *prunus sylvestris*. See PLUM-*tree* and SLOE.

THORN, *box*, *lycium*, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the flower, which hath a small obtuse empalement, erect, and divided into three parts at top, is funnel-shaped, of one petal, with an incurved tube, whose brim is cut into five obtuse segments; and it has five awl-shaped stamina, terminated by erect summits; in the centre is situated a roundish germen, supporting a single style, crowned by a thick bifid stigma, and the germen becomes a roundish berry, with two cells, enclosing kidney-shaped seeds, adhering to the partition. Linnæus reckons four, and Miller ten species. See LYCIUM, under which article occurs an account of the AVIGNON *berry*, which Du Hamel says, is the fruit of a species of *rhamnus*, or BUCKTHORN, gathered green; but Mr. Miller says, it is the fruit of the narrow-leaved *alaternus*, referred by Linnæus to the genus of *rhamnus*.

THORN, *buck*, in *Botany*. See BUCKTHORN.

The AVIGNON *berry* is the fruit of a species of *buckthorn*. See LYCIUM.

The berries of the common *buckthorn*, or *rhamnus catharticus* of Linnæus, operate briskly by stool, and occasion, at the same time, a thirst and dryness of the mouth and throat, and not unfrequently severe gripes, especially if water-gruel, or other soft diluents, are not freely drank soon after taking them. The dose is said to be about twenty of the fresh berries in substance; twice or thrice that number in decoction; a dram, or a dram and a half of the dried berries; an ounce of the expressed juice; or half an ounce of the rob or extract obtained by inspissating the juice. They have been employed with us only in the form of a syrup, in which they seem to operate more kindly, and which is given by itself in doses of three or four spoonfuls, or mixed in smaller quantities with other cathartics. The college of Edinburgh directs the syrup to be prepared by boiling the depurated juice with sugar to a due consistence: that of London adds a little cinnamon, ginger, and nutmegs, to cover the ill flavour of the *buckthorn*; but notwithstanding this improvement, it is still so unpleasant, that it has now almost fallen into disuse. Lewis.

THORN, *Christ*, *paliurus*, in *Botany*. Its characters are these: the flower has no empalement, but has five petals, which are ranged circularly, and end in acute points; it has five stamina, which are inserted in the scales under the petals, terminated by small summits; and a roundish trifid germen, supporting three short style crowned by obtuse stigmas; the germen becomes a buckler-shaped nut, divided into three cells, each containing one seed. We know but one species.

This plant grows naturally in the hedges near Palestine, and is supposed to be the plant from which the crown of thorns was composed, which was put on the head of our Saviour; which its being one of the most common shrubs of the country renders probable. It is kept in gardens as a curiosity, but has little beauty in it; and its seed does not ripen in England. Miller.

Linnæus makes this a species of the *rhamnus*, or BUCKTHORN.

THORN, *cockspur*, in *Botany*. See SERVICE-*tree*.

THORN, *Egyptian*, a species of the MIMOSA. See ACACIA.

THORN, *evergreen*, a species of *mespilus*. See MEDLAR.

THORN, *Glastenbury*, a variety of the *hawthorn*. See MEDLAR.

THORN, *goat's*, a species of ASTRAGALUS. See also GOAT's-*thorn*.

THORN, *haw*. See MEDLAR.

THORN, *lily*, *catesbæa*, in *Botany*, a genus of the *tetrandria monogynia* class. Its characters are these: it has a small permanent empalement of one leaf, with five sharp indentures; the flower is of one petal, funnel-shaped, having a very long tube, which gradually widens to the top, where it is four-cornered and spreads open; it hath four stamina rising in the neck of the tube; the roundish germen is situated under the flower, which afterward becomes an oval berry with one cell, filled with angular seeds. We know but one species of this shrub, which was discovered by Mr. Catesby near Nassau-Town in the island of Providence; where he saw two of them growing, which were all he ever saw; from these he gathered the seeds, and brought them to England. Miller.

THORN, *purging*, a species of *rhamnus*. See BUCKTHORN.

THORN, *scorpion's*, a species of ULEX.

THORN, *Spanish hedge-hog*, a species of ANTHYLLIS.

THORN, *white*, a species of *cratægus*. See SERVICE-*tree*.

THORNBACK, the English name of a species of ray-fish, the RAIA *clavata* of Linnæus, prickly on the back, and with tuberculose teeth, and a transverse cartilage in the belly; the young fish have very few spines on them, and their backs are often spotted with white, and each spot incircled with black. This species frequents our sandy shores, is very voracious, and feeds on all sorts of flat fish, and is particularly fond of herrings and sand-eels, and sometimes eats crustaceous animals, such as crabs. The *thornbacks* begin to generate in June, and bring forth their young in July and August, which (as well as those of the skate) before they are old enough to breed are called *maids*. They begin to be in season in November, and continue so later than skate; but the young of both are good at all times of the year. Pennant.

THOROUGH-*bass*, in *Music*, is that bass which continues quite through the composition. See BASS.

THOROUGH-*wax*, in *Botany*. See HARE's *Ear*.

THOS, THOUS, Θως, in *Zoology*, a name given to an animal of the wolf-kind, but larger than the common wolf, common in Surinam. It is a species of the CANIS, with a light bent tail and white belly. It never touches men or cattle, and rather provides its food by cunning than open force; preying chiefly on poultry and water-fowl.

THOUGHT, *sentiment*, a general name for all the ideas consequent on the operations of the mind, and even for the operations themselves.

As, in the idea of *thought*, there is nothing included of what we include in the idea of an extended substance; and that whatever belongs to body, may be denied to belong to *thought*; we may conclude, that *thought* is not a mode of extended substance, it being the nature of a mode not to be conceived, if the thing, whereof it is the mode, be denied. Hence we infer, that *thought*, not being a mode of extended substance, must be the attribute of some other substance very different.

F. Malebranche, with the spirit of a Cartesian, denies that a man, who thinks seriously on the matter, can doubt but that the essence of the mind consists altogether in *thought*, as that of matter does in extension; and that, according to the various modifications of *thought*, the mind sometimes wills, sometimes imagines, &c. as, according to the various modifications of extension, matter is sometimes water, sometimes wood, fire, &c. By the way, by *thought* he does not mean the particular modifications of the soul, i. e. such or such a *thought*, but *thought*, or thinking in the general, considered as capable of all kinds of modifications, or ideas; as by extension he does not mean such or such an extension, as a square, oval, or the like, but extension in the abstract, considered as susceptible of all kinds of modifications or figures.

He

He adds, that he takes it to be impossible to conceive a mind which does not think, though it be easy to conceive one which does not feel, or imagine, or will; in like manner as it is impossible to conceive a matter which is not extended, though it be easy to conceive one that is neither earth nor metal, nor square nor round, nor that is even in motion.

Hence it may be concluded, that as it is possible there may be matter which is neither earth nor metal; nor square, nor round, nor even in motion; it is also possible, that a mind may neither perceive heat nor cold, nor joy nor grief, nor imagine any thing, nor will any thing; so that these modifications are not essential to it. Thinking alone, therefore, according to this author, is the essence of the mind, as extension alone is the essence of matter.

But this doctrine is not now generally received. The followers of sir Isaac Newton, and the new philosophy, deny extension to be the essence of matter; and the followers of Mr. Locke deny *thought* to be the essence of the mind.

THOUGHTS, in a *Boat*, a name given by seamen to the benches on which the men sit down to row.

THOWLES, in a *Boat*. See THOLES.

THOYT. See TAAUT.

THOUSAND. See NUMERATION.

THOUSAND *years reign*. See MILLENNIUM.

THRACES, or THRACIANS, in *Antiquity*, were an order of GLADIATORS, reputed to be the most fierce and cruel of all. They were so called, either because they were natives of Thrace, or wore armour after the manner of that country. The particular weapon they used was the *sica*, or faulchion, and their defence consisted in a *parma*, or little round shield, proper to their country.

THRACIA *gemma*, a stone mentioned by Pliny, and described by him to be of three kinds; the one of a plain green, but a considerably deep and strong colour; the other of a paler green without variegation; and the third spotted with blood-coloured spots. This is a short description, but the stone seems to have been a jasper, of the nature of our green oriental jasper and heliotrope.

THRACIUS *lapis*, in the *Natural History* of the ancients, a stone often mentioned, and first called *Benæ lapis*, from the place where it was first found, which was in the neighbourhood of Bina, or Bena, a town in Thrace. It has been by some authors allowed a place in the catalogues of the materia medica; but it is impossible for us to say, with any certainty, which of several substances now known (which all answer in some degree to the accounts left us of it) is the real body they meant by that name.

It was an inflammable body, found in mines, and in the beds of rivers; and, in burning, afforded a very offensive smell.

Some of the late authors have supposed it was our common pit-coal the ancients expressed by this name; others, that it was jet; and others, the common cannel-coal. Hill's Theophrastus, p. 34.

THRANITÆ, in the *Roman Trireme-gallies*, or those which had three rows of rowers; those of the upper row were called by this name, the second the *zygitæ*, and the lowest *thalamitæ*.

The *zygitæ*, or middle row of men, in these vessels, took up but very little room, having a conveniency of moving their hands and oars under the seats of those who sat next before them. See ENNERIS and POLYCROTA.

THRASHING, or THRESHING, in *Agriculture*, the act of beating the corn out of the ears.

There are two ways of separating corn from the ear; the first by beating it with a flail, which is properly what we call *thrashing*.

Some authors will not, by any means, allow that we should call this by the Roman name *tritura*, or *trituration*; but *flagellatio*, of *flagellum*, a *scourge*, or *flail*.

The other manner, still practised in several countries, as we are informed by Liger, is to make mules or horses trample on it, backwards and forwards. This is, properly, what the ancients called *tritura*, and *trituratio*.

But they also used oxen therein; witness the Hebrews, who sometimes yoked four oxen together for this purpose.

Another way, among the ancients, was with a kind of sledge made of boards joined together, and loaden with stone, or iron, upon which a man was mounted, and the whole drawn over the corn by horses: this instrument was called *traha*, or *tribula*.

It is a rule among husbandmen, that the season for *thrashing* is as soon as the corn has sweated in the heap, or mow.

THRASOS, a term used by Hippocrates, to express a wildness and fierceness in the eyes of persons who approach to a delirium.

THRAVE, or THREAVE, *of corn*, in most parts of England, is twenty-four sheaves, or four shocks of six sheaves to the shock; though, in some counties, they only reckon twelve shocks to the *thrave*.

King Athelstan, anno 923, gave by charter, to St. John of Beverly, four *thraves* of corn for every plough-land in the East-riding of Yorkshire.

> *Ya sou threve be heaven king,*
> *Of ilka plough of est-riding.*

THRAUPIS, in *Ornithology*, a name given by many authors to the bird more commonly called CITRINELLA.

THRAUSMA, a name given by the ancients to a kind of gum ammoniacum, which was drier than the common, and more easily crumbled to pieces.

THRAUSTOMICTHES, in *Natural History*, the name of a genus of compound earths. The word is derived from the Greek θραυστος, *brittle*, and μικτος, *mixt*.

The bodies of this genus are loams composed of sand and a less viscid clay, and are therefore of a friable or crumbly texture.

The earths of this genus are generally used to make bricks; and there are several species of them. Hill's Fossils, p. 424.

THREAD, in the *Linen Manufacture*, a small line or twist of flax, the weaving of which composes cloth. There is a stronger kind made use of to sew the seams of linen garments, or to mend them.

The *thread* of the Laplanders is very fine, white, and strong, but it is of a very different nature from ours; they know nothing of flax or hemp, nor of any other plant whose stalks might supply the place of these in making *thread*, but theirs is made of the sinews of the rein-deer.

They kill of these animals a very great number continually, partly for food, partly for the skins, which they use in cloathing themselves, covering their huts, and on many other occasions; the sinews of all they kill are very carefully preserved, and delivered to the women, whose province it is to prepare this necessary matter. They beat the sinews very well, after having steeped them a long time in water, and then they spin them out.

The *thread* they thus make is of any degree of fineness they please; but it is never any longer than the sinew from which it is made. They use this in sowing their cloaths, shoes, gloves, &c. and the trappings of their rein-deer. The *threads* of the same sinew are laid up together, and are all of a length; and as the different sinews afford them very different lengths, they accordingly pick out such as the present use requires, both in regard to length and fineness. This sort of *thread* is made with much more labour than ours; but it is greatly superior to it on many occasions, where strength is rather required than beauty.

These people have, besides this, a way of making a sort of yarn of sheeps wool, which they weave into garters and a sort of ribbands, used by way of ornament; but they place no value on it, because of its want of strength. Scheffer's Hist. Lapland.

THREAD, in *Botany*, is understood of those capillaments usually found in the middle of flowers, as in the lily, tulip, rose, &c. There are two kinds, those which support apices, are particularly called STAMINA; and those which have none, PISTILLA.

THREAD, *gold*. See GOLD.

THREAD, *virgins*. See VIRGIN.

THREADY *marble*. See MARBLE.

Air THREADS, a term used by some to express those fine long white filaments, or thready substances which we meet with in vast numbers floating about in the air in August and September.

The world has been much perplexed about the generation of these, till it was known that they were the work of SPIDERS, and that they served those creatures to move from place to place by. They are long, downy, and very soft, and though they hold together when untouched, they stick to the fingers in handling, and easily break with a slight touch.

The general method of these creatures spinning and weaving the webs, is by letting down the thread, then drawing it after them, and so disposing it as they think proper; but in the midst of their work of this sort, if they are closely observed, they will be sometimes found to desist, and turning the tail to the contrary way of the wind, they will emit a thread with great violence, no less than that with which a jet of water is discharged from a cock. In this manner they continue darting forth the *thread*,

thread, which the wind takes, and carrying it forwards, it soon becomes many yards long. Soon after this the creature will throw herself off from the web, and trusting herself to the air with this long tail, will ascend swiftly, and to a great height with it. The fragments of these lines, or the whole lines, and the spiders attached to them though unobserved, make these *air-threads*, and the use nature destines them for, is evidently the wafting of the creature along the air, and giving it an opportunity of preying on gnats, and many other insects that inhabit the air, out of the reach of these creatures by any other means.

When the *threads* are newly spun, they are always single, and are generally seen ascending up higher and higher in the air; but when they are seen coming down, they are found sometimes composed of three or four others, and either without any spider at the ends, or with two or three, or more. It is plain that this happens from the meeting of these *threads* one with another in the air, and their tangling together; and this incommodes the creatures, and brings them down.

These are what fill the air with the loose *threads* we see in autumn; and as these soon entangle together, and bring one another down, it is no wonder that they are more frequent in the lower regions of the air, than those with the spiders adhering to them, which usually rise to great heights, and sustain themselves there. And hence the origin of the *threads* was much perplexed among the enquirers, because they were found without any mark of the animal to which they owed their existence. The business of feeding is not all the use of these threads, but the creatures evidently sport and amuse themselves by means of them, floating about in the air, and changing height and place at pleasure.

When a spider has once raised itself from the earth in this manner, it does not descend always on the same *thread* it arose by, but draws that up at times, and winds it up into a hank with its fore-feet, and darts out another by way of support; and the new *thread* is made more or less long, as it is intended for a higher or lower flight. Philos. Trans. N° 50.

THREATENING *letters*, in *Law*. By stat. 9 Geo. I. cap. 22. amended by stat. 27 Geo. II. cap. 15. knowingly to send any letter without a name, or with a fictitious name, demanding money, venison, or any other valuable thing, or *threatening* (without any demand) to kill any of the king's subjects, or to fire their houses, out-houses, barns, or ricks, is made felony without benefit of clergy. This offence was formerly high treason, by 8 Hen. V. cap. 6.

The offence of sending letters, *threatening* to accuse any person of a crime punishable with death, transportation, pillory, or other infamous punishment, with a view to extort from him any money or other valuable chattels, is punishable by stat. 30 Geo. II. cap. 24. at the discretion of the court, with fine, imprisonment, pillory, whipping, or transportation for seven years. Blackst. Com. book iv. p. 136. 144.

THREATS, in *Law*, a species of personal injury. *Threats* and menaces of bodily hurt, through fear of which a man's business is interrupted, are comprehended under this description. A menace alone, without a consequent inconvenience, does not constitute the injury; but, to complete the wrong, there must be both of them together. The remedy for this is in pecuniary damages, to be recovered by action of trespass, *vi et armis*; this being an inchoate, though not an absolute violence. Blackst. Com. book iii. p. 120.

THREAVE. See THRAVE.

THREEE-*legged-staff*, an instrument consisting of *three* wooden legs, made with joints, so as to shut all together, and to take off in the middle for the better carriage; and usually having on the top a ball or socket; its use is to support and adjust instruments for astronomy, surveying, &c.

THREE *chapters*. See CHAPTER.

Compasses of THREE *legs*. See COMPASSES.

Ombre by THREE. See OMBRE.

Rule of THREE. See RULE.

THRENGI, or THRENGES, in our *Antient Customs*, a denomination given to vassals, but not those of the lowest degree, but such who held lands of the chief lord; otherwise called *drengi*, or DRENCHES.

Quia vero non erant adhuc tempore regis Willielmi milites in Anglia, sed threnges; *præcipit rex, ut de eis milites fierent ad defendendam terram: fecit autem Lanfrancus* threngos *suo milites, &c.* Somn. Gavelk.

The name was imposed by the Conqueror; for when one Edward Sharnbourn, of Norfolk, and others, were ejected out of their lands, they complained to the Conqueror, insisting, that they were always on his side, and never opposed him; which, upon inquiry, he found to be true; and therefore he commanded that every one should be restored to their lands, and be for ever after called *drenches*, or *threnges*. Spelm. Du-Cange.

THRENODY, THRENODIA, formed of θρηνος, *mournful*, and ᾠδη, *song*, a mournful, or funeral song.

THRESHER, in *Ichthyology*, a name sometimes given to the *Sea*-FOX.

THREX, among the Romans. See THRACES.

THRIFT, *statice*, in *Botany*, a genus of the *pentandria pentagynia* class. Its characters are these: the flowers are collected in a roundish head, surrounded by a common scaly empalement, each flower has also a funnel-shaped empalement of one leaf; the flowers are funnel-shaped, the base of the petals narrow, the points broad, and spreading open; they have five stamina, which are shorter than the petals, terminated by prostrate summits, and a small germen supporting five styles, which stand apart, crowned by acute stigmas; the germen turns to one small round seed, enclosed in the empalement. Linnæus enumerates seventeen, and Miller three species, which have been used to be raised promiscuously for making the edges of flower-beds, instead of box; but the necessity of transplanting them every year to keep them within due bounds, has made them of late much disused.

They are all propagated by parting their roots; the best time for doing which is in autumn, and they will grow with very little trouble, and flower in the May following, continuing in flower about three weeks or a month, if the weather is not too dry.

THRIHING. See TRIHING.

THRIMSA, in *Antiquity*, a silver coin, the value of which has occasioned a variety of conjectures. Lambard, who gave the first estimate of it, makes it a three shilling piece, in which opinion he is followed by sir Henry Spelman. Bishop Nicholson apprehends, that it was the name of their common coin, and that the *thrimsa*, sceata, and penny were all of them the same. Somner, from the import of the word, and the value given to the *thrimsa* in the Saxon laws, rates it at three pence. Selden, Brady, and Hickes, are of opinion, that this coin was either the last tremissis of the Franks and Germans, and consequently four pence, or the third part of the Saxon shilling, i. e. three halfpence and one-third of a half-penny in their money. Mr. Clarke adopts, and endeavours to establish the opinion of Somner, who observed, from the laws of Athelstan, that the price of a thane's life was, by the Angli, valued at 2000 *thrimsas*, which, by the Mercian estimate, was 1200 shillings; and if each of these sums denotes the same value, which is probable, the *thrimsa* must be to the shilling as 2000 is to 1200, or three parts in five of a Saxon shilling, i. e. three pence.

The *thrimsa* was first coined in the reigns before Athelstan, during their greater affluence in cash, and designed merely for the convenience of exchange, as the most proper division that could be made in their money without a fraction, between the shilling and the penny. But when the shilling was reduced, it was of little use, and by degrees entirely laid aside.

Dr. Hickes observes, that the method of computing by *thrimsas* was chiefly used in the more mercantile parts of this kingdom, among the East and West and South Saxons, and possibly coined only among them; for it appears, that the inland provinces, the Mercians, reckoned generally by the shilling. Clarke's Conn. of the Roman, Saxon, and English Coins, p. 229, &c.

THRINIUM-*gild*. See TRINIUM-*gild*.

THRIO, θριω, in *Antiquity*, a festival in honour of Apollo.

THRIPS, in *Natural History*, a name used among the ancients, to express a sort of worm hatched from the egg of a beetle; which, while in the worm state, eats its way into wood, and forms cells and cavities in it of various shapes, and in various directions, often resembling the figures of letters or other things. See ENXYLON.

The ancient Greeks are said to have used small pieces of the wood thus eroded in particular forms, as seals, before the engraving of these utensils was invented, and indeed they must very well have served this purpose, since it is scarce possible to conceive how one of these pieces of corroded wood should be counterfeited, or the impression imitated.

Lucian mentions his marking his olives with a signature of one of these pieces of wood greatly eroded, and uses the word *thrips*, not as the name of the animal, but of the piece of wood eroded by it. Theophrastus, Pliny, and Aristotle, also use the same expression; and we find that the word *thrips* was as frequently used to signify the pieces of wood eroded, as the animal which eroded them.

In the Linnæan system the *thrips* is of the order of *hemiptera*: its characters are, that the rostrum is small and obscure,

obſcure, the antennæ as long as the thorax, the body ſlender, and of equal thickneſs, the abdomen reflexible, and often bent upwards, the four wings extended, incumbent, narrow, and croſſing one another at ſome diſtance from their baſe; the *thrips* has ſix feet, and the tarſus of each foot has only two articulations. Theſe inſects are common in many plants and flowers, and eſpecially on peaches and nectarines. They may be deſtroyed in the ſame manner as the aphides. See PEACH-*tree*.

THRISSA, in *Ichthyology*, the name given by the Greeks and by the modern Latin writers to the fiſh which we call the SHAD, or the mother of the herrings.

THROAT, the anterior part of an animal, between the head and the ſhoulders, wherein is the gullet.

Phyſicians include, under the word *throat*, all that hollow, or cavity, which may be ſeen when the mouth is wide open.

It is ſometimes alſo called *iſthmus*, becauſe it is narrow, and bears ſome reſemblance to what is called by the geographers *iſthmus*.

THROAT, in *Architecture*, *Fortification*, &c. See GORGE and GULA.

THROAT, in a *Ship*, is a name given to the inner end of a gaff, or to that part which is next the maſt. It is oppoſed to peek, which implies the outer extremity of the ſaid gaff, or that part which extends the ſail behind. Hence the ropes employed to hoiſt up, and lower a gaff, being applied to thoſe parts of it, are called the *throat*, and peek haliards. Falconer.

THROAT, *ſore*, in *Medicine*. See QUINZY.

THROAT-*wort*, *trachelium*, in *Botany*, a genus of the *pentandria monogynia* claſs. Its characters are theſe: the flower has a ſmall empalement cut at the top in five parts, ſitting upon the germen; it has but one petal, which is funnel-ſhaped, having a long ſlender cylindrical tube, cut at the top into five ſmall oval ſegments, which ſpread open; it has five hair-like ſtamina, of the length of the petal, terminated by ſingle ſummits, and a roundiſh three-cornered germen, ſituated under the flower, ſupporting a long ſlender ſtyle, crowned by a globular ſtigma; the germen turns to a roundiſh obtuſe capſule, with three lobes, having three cells, which are filled with ſmall ſeeds. We have but one ſpecies, which grows naturally in ſhady woods in many parts of Italy.

This plant yields, when wounded, a milky juice in great plenty, and this, if received into a ſhell or other ſmall veſſel, curdles immediately, and the whey runs from the thick part; this whey is of a brown colour, whereas that of the wild lettuce is of a fine purple, and dries into a cake that may be crumbled into a purple powder. The juice of the *throat-wort* ſmells ſour, and its curdled part, being dried, burns like reſin at the flame of a candle. Phil. Tranſ. N° 224.

THROMBUS, θρόμβος, a word uſed by ſome medical writers, to expreſs a grume or clot of blood.

THRONE, θρόνος, a royal ſeat, or chair of ſtate, enriched with ornaments of architecture and ſculpture, made of ſome precious matter, raiſed one or more ſteps, and covered with a kind of canopy.

Such are the *thrones* in the rooms of audience of kings, and other ſovereigns.

THROPPLE, among *Country People*, denotes the windpipe of a horſe.

THROSTLE, or *ſong-thruſh*, *mavis*, or TURDUS *muſicus* of Linnæus, in *Ornithology*, is called by authors the *turdus viſcivorus minor*, to diſtinguiſh it from the larger ſpecies, called in Engliſh the MISSEL-*bird*, and uſually known among us by the ſimple name of *thruſh*. It is called *viſcivorus* by authors, from its reſemblance in colour to the other *viſcivorus*, not from its feeding on the miſletoe-berries as that does.

It reſembles the miſſel-thruſh in colour, except that the inner coverts of the wings are yellow.

It feeds on worms, ſnails, and ſmall inſects, and remains with us the whole year. It builds with moſs and ſtubble, and lines the neſt with mud. On this it lays five or ſix eggs, which are of a bluiſh green, variegated with a few black ſpots. It ſits on hedges and buſhes, and ſings very agreeably.

The *throſtle* is the fineſt of our ſinging-birds, not only for the ſweetneſs and variety of its notes, but for the long continuance of its harmony; as it obliges us with its ſong for near three parts of the year. See TURDUS.

THROSTLING, a diſeaſe of black cattle, proceeding from humours gathering under their throats; by which means their throats are ſo dangerouſly ſwelled, that they will be choaked unleſs ſeaſonably relieved by bleeding.

THROW *the glove*. See GLOVE.

THROWED *ſilk*. See SILK.

THROWSTER, one who prepares raw ſilk for the weaver, by cleanſing and twiſting it. See MILLING.

THRUSH, in *Farriery*. See RUNNING-*thruſh*.

THRUSH, in *Medicine*. See APHTHÆ and INFANT.

THRUSH, in *Ornithology*, is the TURDUS *viſcivorus* of Linnæus, and the largeſt of the genus. See MISSEL-*bird*.

THRUSH, *wind*. See RED-*wing*.

THRUST, in *Fencing*, is an action of which there are three kinds. To *thruſt in carte*, is to throw your hand as far as poſſible on the inſide, with the point of your ſword towards your adverſary's breaſt: to *thruſt ſeconde*, is to have your arm in a perfect oppoſition to your adverſary's, holding your head inſide: to *thruſt tierce*, differs from carte only by the poſition of the hand, which muſt be reverſed.

THRYALLIS, in *Botany*, a name given by Nicander, and ſome other writers, to a ſpecies of mullein, uſed in the coronæ and garlands of the ancients; and, as he expreſsly ſays, different from the common wild mullein. Dioſcorides ſeems to make this his third ſpecies, and calls it *lychnitis*, from its uſe in lamps; the Greeks beating out its thready ſtalks, and uſing them for the wicks of lamps.

In the Linnæan ſyſtem, *thryallis* is a genus of the *decandria monogynia* claſs: the characters of which are, that the calyx is quinque-partite, that it has five petals, and a three berried capſule. There is one ſpecies.

THUIA, in *Botany*. See TREE *of Life*.

THUMB, *pollex*, in *Anatomy*, one of the members or parts of the HAND.

The firſt phalanx of the bones of the *thumb* is not like thoſe of the other fingers. Ancient authors reckon it among the bones of the metacarpus, which it reſembles very much, and by this means allow only two phalanges to the *thumb*, and make five metacarpal bones. The convex ſide of this phalanx is very much flatted, and is much broader toward the head than toward the baſis. On the concave ſide is a kind of angular line, which in ſome meaſure diſtinguiſhes it into two parts. Its head is like thoſe of the metacarpal bones, only flatted at top. The articular ſide of its baſis is proportioned to the digital ſide of the *os trapezium* of the carpus, and framed in ſuch a manner as that the ſigmoide cavities and eminences in the two bones croſs one another. This articulation has ſomething very particular in it; it is a kind of double ginglymus, which readily allows of flexion and extenſion, adduction and abduction, but with difficulty permits the oblique motions, becauſe then the two ſides run counter to each other.

The ſecond phalanx of the *thumb* is ſhorter than the firſt; its body is convex or ſemi-cylindrical on one ſide, flat on the other, and contracted between the edges. The articular ſide of the baſis is gently concave, and is ſurrounded near the edges by ſmall tuberoſities, as alſo near the angle of the phalanx. The head is a regular portion of a pulley, which projects more on the concave than the convex ſide; and on each ſide of it there is a ſmall foſſula, and ſome inequalities in form of tubercles. On the flat, or concave ſide of the phalanx are two rough lines, one near each edge; they are the impreſſions or marks of the articular vaginæ. The connection of this phalanx with the firſt, is by a kind of arthrodia or by a flat enarthroſis, which permits a motion in ſeveral directions, though more limited than in other articulations of the ſame kind. It is articulated with the third by a very perfect ginglymus.

The third phalanx of the *thumb* repreſents the half of a ſort of cone, cut lengthwiſe, and by joining it to the ſame bone of the other *thumb*, an entire cone is formed; the convex ſide is more even than the flat ſide, and on each edge there is a tuberoſity near the baſis: the baſis has two hollow ſides, which form a ginglymus with the head of the ſecond phalanx. The head is flat and ſmall, ending with a rough ſemicircular border, which on the flat ſide of the bone repreſents a horſe-ſhoe. Winſlow's Anat. p. 87.

THUMMIM, in the *Scripture-learning*. See URIM and THUMMIM.

THUNDER, a noiſe in the loweſt region of the air, excited by a ſudden exploſion of electrical clouds; which, on this account, are called *thunder*-clouds.

Seneca, Rohault, and other authors, both ancient and modern, account for *thunder* by ſuppoſing two clouds impending over one another, the upper and rarer whereof, becoming condenſed by a freſh acceſſion of air raiſed thither by warmth from the lower parts of the atmoſphere, or driven upon it by the wind, immediately falls forcibly down upon the lower and denſer cloud; by which fall, the air interpoſed between the two being com-

compressed, that next the extremities of the two clouds is squeezed out, and leaves room for the extremity of the upper cloud to close right upon the under; thus a great quantity of air is enclosed, which, at length, escaping through some winding irregular vent or passage, occasions that noise which we call *thunder*.

But this could only reach to the phenomena of *thunder* heard without lightning; and, therefore, recourse has been had to another solution. It has been said, that *thunder* is not occasioned by the falling of clouds, but by the kindling of sulphurous exhalations, in the same manner as the noise of aurum fulminans.

"There are sulphurous exhalations, says sir Isaac "Newton, always ascending into the air when the "earth is dry; there they ferment with the nitrous "acids, and, sometimes taking fire, generate *thunder*, "lightning, &c."

That, besides the vapours raised from water, &c. there are also exhalations carried off from sulphur, bitumen, volatile salts, &c. is past all doubt; the vast quantity of sulphurous and bituminous matter all over the surface of the earth, and the volatile salts of plants and animals, afford such an ample stock thereof, that it is no wonder the air should be filled with such particles, raised higher or lower, according to their greater or less degree of subtilty and activity; and more copiously spread in this or that quarter, according to the direction of the winds.

Now, the effects of *thunder* are so like those of fired gunpowder, that Dr. Wallis thinks we need not scruple to ascribe them to the same cause; and the principal ingredients in gunpowder, we know, are nitre and sulphur; charcoal only serving to keep the parts separate, for their better kindling.

Hence, if we conceive in the air a convenient mixture of nitrous and sulphurous particles, from the sources above mentioned; and those, by any cause, to be set on fire, such explosion may well follow; and with such noise and light, the two phenomena of *thunder*, as is the firing of gunpowder; and being once kindled, it will run from place to place, this way or that, as the exhalations happen to lead it; much as is found in a train of gunpowder.

This explosion, if high in the air, and remote from us, will do no mischief, but, if near us, may destroy trees, animals, &c. as gunpowder would do in the like circumstances.

This nearness, or distance, may be estimated by the interval of time between the flash and the noise. Dr. Wallis observes, that, ordinarily, the difference between the two is about seven seconds, which, at the rate of 1142 feet in a second of time, gives the distance about a mile and a half; but sometimes it comes in a second or two, which argues the explosion very near us, and even among us. And in such cases, the doctor assures us, he has more than once foretold the mischiefs that happened.

Upon the whole, that there is in lightning a sulphurous vapour, has been argued from the smell of sulphur which attends it, and from the sultry heat in the air which usually precedes it; and that there is a nitrous vapour along with it, the same author concludes hence, that we know of no other body so liable to a sudden and violent explosion. And as to the kindling of these materials, we know that a mixture of sulphur and steel filings, with a little water, will of itself break forth into actual flame. Nothing, therefore, is wanting to the explosion but some chalybeate or vitriolic vapour; and, among the various effluvia from the earth, the doctor does not doubt but there must be some of that kind; but, in proof of what he leaves as a probability, the following facts have been alledged.

In history, we meet with instances of its raining iron in Italy, and iron stones in Germany: Jul. Scaliger tells us, he had by him a piece of iron rained in Savoy. Cardan reports 1200 stones to have fallen from heaven, some of them weighing 30, some 40, and one 120 pounds, all very hard, and of the colour of iron.

The matter of fact is so well attested, that Dr. Lister, in the Philosophical Transactions, builds a whole theory of *thunder* and lightning on it; maintaining, that they both owe their matter to the vapour, or exhalation of the pyrites.

The noise of *thunder*, and the flame of lightning, are easily made by art. If a mixture of oil or spirit of vitriol be made with water, and some filings of steel added to it, there will immediately arise a thick smoak, or vapour, out of the mouth of the vessel; and if a lighted candle be applied to this, it will take fire, and the flame immediately descend into the vessel, and this will be burst to pieces with a noise like that of a cannon.

This is so far analogous to *thunder* and lightning, that a great explosion and fire are occasioned by it; but in this they differ, that this matter when once fired is destroyed, and can give no more explosions; whereas, in the heavens, one clap of *thunder* usually follows another, and there is a continued succession of them for a long time. Mr. Homberg explained this by the lightness of the air above us, in comparison of that here, which therefore would not suffer all the matter so kindled to be dissipated at once, but kept it for several returns.

Ever since the year 1752, in which the identity of the matter of lightning, and of the electric fluid, has been ascertained, philosophers have generally agreed in considering *thunder* as a concussion produced in the air by an electrical explosion. For the illustration and proof of this theory, see LIGHTNING. See also ELECTRICITY.

We shall here observe, that Mr. Henry Eeles, in a letter written in 1751, and read before the Royal Society in 1752, considers the electrical fire as the cause of *thunder*, and endeavours to account for it on this hypothesis; and he tells us, that he did not know of any person's having made the same conjecture. Phil. Trans. vol. xlvii. p. 524, &c.

That rattling in the noise of *thunder*, which makes it seem as if it passed through arches, or were broken variously, is probably owing to the sound being excited among clouds hanging over one another, and the agitated air passing irregularly between them.

See this phenomenon particularly accounted for under LIGHTNING.

THUNDERBOLT. If what we call lightning acts with extraordinary violence, and breaks or shatters any thing, it is called a *thunder bolt*, which the vulgar, to fit it for such effects, suppose to be a hard body, and even a stone.

But that we need not have recourse to a hard solid body to account for the effects commonly attributed to the *thunderbolt*, will be evident to any one, who considers those of the pulvis fulminans, and of gunpowder; but more especially the astonishing powers of electricity, even when collected and employed by human art, and much more when directed and exercised in the course of nature.

When we consider the known effects of electrical explosions, and those produced by LIGHTNING, we shall be at no loss to account for the extraordinary operations vulgarly ascribed to *thunderbolts*. As stones and bricks struck by lightning are often found in a vitrified state, we may reasonably suppose with signior Beccaria, that some stones in the earth, having been struck in this manner, first gave occasion to the vulgar opinion of the *thunderbolt*.

Places struck with *thunderbolts* were held sacred among the ancients. Nigidius has a curious treatise on the *thunderbolt*.

The ancient painters and poets have armed Jupiter with a sort of flaming dart, called a *thunderbolt*. Thus, it is said, he became master both of gods and men.

These *thunderbolts* are forged for Jupiter, according to the poets, by the CYCLOPES.

The *thunderbolt*, in antiquity, represented sovereignty, and a power equal to the gods; on this account Apelles painted Alexander, in the temple of Diana of Ephesus, holding a *thunderbolt* in his hand; and on medals, the *thunderbolt* is sometimes found to accompany the emperors heads, as that of Augustus.

Appian informs us, that the *thunderbolt* was the principal divinity of Seleucia; adding, that it was adored, even in his time, with various hymns and ceremonies.

THUNDER-*clouds*, in *Physiology*, are those clouds which are in a state fit for producing lightning and *thunder*. From signior Beccaria's exact and circumstantial account of the external appearances of *thunder-clouds*, we shall extract the following particulars.

The first appearance of a *thunder* storm (which generally happens when there is little or no wind), is one dense cloud, or more, increasing very fast in size, and rising into the higher regions of the air. The lower surface is black, and nearly level; but the upper finely arched, and well defined. Many of these clouds often seem piled one upon another, all arched in the same manner; but they keep continually uniting, swelling, and extending their arches.

At the time of the rising of this cloud, the atmosphere is generally full of a great number of separate clouds, motionless, and of odd and whimsical shapes. All these, upon the appearance of the *thunder-cloud*, draw towards it, and become more uniform in their shapes as they approach; till, coming very near the *thunder-cloud*, their limbs mutually stretch towards one another; they immediately coalesce, and, together, make one uniform mass. These he calls *adscititious* clouds, from their coming

coming in, to enlarge the ſize of the *thunder-cloud*. But ſometimes the *thunder-cloud* will ſwell, and increaſe very faſt, without the conjunction of any adſcititious clouds; the vapours in the atmoſphere forming themſelves into clouds wherever it paſſes. Some of the adſcititious clouds appear like white fringes, at the ſkirts of the *thunder-cloud*, or under the body of it, but they keep continually growing darker and darker, as they approach to unite with it.

When the *thunder-cloud* is grown to a great ſize, its lower ſurface is often ragged, particular parts being detached towards the earth, but ſtill connected with the reſt. Sometimes the lower ſurface ſwells into various large protuberances, bending uniformly towards the earth. And ſometimes one whole ſide of the cloud will have an inclination to the earth, and the extremity of it will nearly touch the earth. When the eye is under the *thunder-cloud*, after it is grown larger, and well formed, it is ſeen to ſink lower, and to darken prodigiouſly; at the ſame time that a number of ſmall adſcititious clouds (the origin of which can never be perceived) are ſeen in a rapid motion, driving about in very uncertain directions under it. While theſe clouds are agitated with the moſt rapid motions, the rain generally falls in the greateſt plenty, and if the agitation be exceedingly great, it commonly hails.

While the *thunder-cloud* is ſwelling, and extending its branches over a large tract of country, the lightning is ſeen to dart from one part of it to another, and often to illuminate its whole maſs. When the cloud has acquired a ſufficient extent, the lightning ſtrikes between the cloud and the earth, in two oppoſite places, the path of the lightning lying through the whole body of the cloud and its branches. The longer this lightning continues, the rarer does the cloud grow, and the leſs dark is its appearance; till, at length, it breaks in different places, and ſhows a clear ſky. When the *thunder-cloud* is thus diſperſed, thoſe parts which occupy the upper regions of the atmoſphere are equally ſpread, and very thin; and thoſe that are underneath are black, but thin too; and they vaniſh gradually, without being driven away by any wind.

Theſe *thunder-clouds* were ſometimes in a poſitive as well as negative ſtate of electricity. The electricity continued longer of the ſame kind, in proportion as the *thunder-cloud* was ſimple, and uniform in its direction, but when the lightning changed its place, there commonly happened a change in the electricity of the apparatus, over which the clouds paſſed. It would change ſuddenly after a very violent flaſh of lightning, but the change would be gradual when the lightning was moderate, and the progreſs of the *thunder-cloud* ſlow. Beccar. Lettere dell' Elettriciſmo, p. 107. or Prieſtley's Hiſt. Electr. vol. i. p. 397, &c. See LIGHTNING.

THUNDER-*houſe*, in *Electricity*, is an inſtrument invented by Dr. James Lind of Edinburgh, for illuſtrating the manner by which buildings receive damage from lightning, and to evince the utility of metallic conductors in preſerving them from it.

A (*Tab. V. Electricity, fig.* 43.) is a board about three quarters of an inch thick, and ſhaped like the gable-end of a houſe. This board is fixed perpendicularly upon the bottom board B, upon which the perpendicular glaſs pillar C D is alſo fixed in a hole about eight inches diſtant from the baſis of the board A. A ſquare hole I L M K, about a quarter of an inch deep, and nearly one inch wide, is made in the board A, and is filled with a ſquare piece of wood, nearly of the ſame dimenſions. It is nearly of the ſame dimenſions, becauſe it muſt go ſo eaſily into the hole, that it may drop off, by the leaſt ſhaking of the inſtrument. A wire L K is faſtened diagonally to this ſquare piece of wood. Another wire I H of the ſame thickneſs, having a braſs ball H, ſcrewed on its pointed extremity, is faſtened upon the board A: ſo alſo is the wire M N, which is ſhaped in a ring at O. From the upper extremity of the glaſs pillar C D, a crooked wire proceeds, having a ſpring ſocket F, through which a double knobbed wire ſlips perpendicularly, the lower knob G of which falls juſt above the knob H. The glaſs pillar D C muſt not be made very faſt into the bottom board; but it muſt be fixed ſo that it may be pretty eaſily moved round its own axis, by which means the braſs ball G may be brought nearer or farther from the ball H, without touching the part E F G. Now when the ſquare piece of wood I L M I K (which may repreſent the ſhutter of a window or the like) is fixed into the hole ſo that the wire L K ſtands in the dotted repreſentation I M, then the metallic communication from H to O is complete, and the inſtrument repreſents a houſe furniſhed with a proper metallic conductor; but if the ſquare piece of wood L M I K is fixed ſo that the wire L K ſtands in the direction L K, as repreſented in the figure, then the metallic conductor H O, from the top of the houſe to its bottom, is interrupted at I M, in which caſe the houſe is not properly ſecured.

Fix the piece of wood L M I K, ſo that its wire may be as repreſented in the figure, in which caſe the metallic conductor H O is diſcontinued. Let the ball G be fixed at about half an inch perpendicular diſtance from the ball H, then, by turning the glaſs pillar D C, remove the former ball from the latter; by a wire or chain connect the wire E F with the wire Q of the jar P, and let another wire or chain, faſtened to the hook O, touch the outſide coating of the jar. Connect the wire Q with the prime conductor, and charge the jar; then, by turning the glaſs pillar D C, let the ball G come gradually near the ball H, and when they are arrived ſufficiently near one another, you will obſerve, that the jar explodes and the piece of wood L M I K is puſhed out of the hole to a conſiderable diſtance from the *thunder-houſe*. Now the ball G, in this experiment, repreſents an electrified cloud, which, when it is arrived ſufficiently near the top of the houſe A, the electricity ſtrikes it, and as this houſe is not ſecured with a proper conductor, the exploſion breaks part of it, i. e. knocks off the piece of wood I M.

Repeat the experiment with only this variation, viz. that this piece of wood I M is ſituated ſo that the wire L K may ſtand in the ſituation I M; in which caſe the conductor H O is not diſcontinued; and you will obſerve that the exploſion will have no effect upon the piece of wood L M; this remaining in the hole unmoved; which ſhews the uſefulneſs of the metallic conductor.

Farther, unſcrew the braſs ball H from the wire H I, ſo that this may remain pointed, and with this difference only in the apparatus repeat both the above experiments, and you will find that the piece of wood I M is in neither caſe moved from its place, nor any exploſion will be heard, which not only demonſtrates the preference of conductors with pointed terminations to thoſe with blunted ones, but alſo ſhows that a houſe, furniſhed with ſharp terminations, although not furniſhed with a regular conductor, is almoſt ſufficiently guarded againſt the effects of lightning.

Mr. Henley, having connected a jar containing 509 ſquare inches of coated ſurface with his prime conductor, obſerved that if it was ſo charged as to raiſe the index of his electrometer to 60°, by bringing the ball on the wire of the *thunder-houſe*, to the diſtance of half an inch from that connected with the prime conductor, the jar would be diſcharged, and the piece in the *thunder-houſe* thrown out to a conſiderable diſtance. Uſing a pointed wire for a conductor to the *thunder-houſe*, inſtead of the knob, the charge being the ſame as before, the jar was diſcharged ſilently, though ſuddenly; and the piece was not thrown out of the *thunder-houſe*. In another experiment having made a double circuit to the *thunder-houſe*, the firſt by the knob, the ſecond by a ſharp-pointed wire, at one and one-fourth of an inch diſtance from each other, but of exactly the ſame height (as in *fig.* 44.) the charge being the ſame; although the knob was brought firſt under that connected with the prime conductor, which was raiſed half an inch above it, and followed by the point, yet no exploſion could fall upon the knob; the point drew off the whole charge ſilently, and the piece in the *thunder-houſe* remained unmoved. Phil. Tranſ. vol. lxiv. part i. p. 136. See POINTS in *electricity*.

THUNDER-*ſtone*, in *Natural Hiſtory*, the ſame with that called by authors BRONTIA.

THUNDER-*ſtorm*. See THUNDER-*clouds*.

THUNDERING *Legion*, *Legio Fulminans*, was a legion in the Roman army, conſiſting of Chriſtian ſoldiers; who, in the expedition of the emperor Marcus Aurelius Antoninus againſt the Sarmatæ, Quadi, and Marcomanni, A. D. 174, are ſaid to have ſaved the whole army, then ready to periſh with thirſt, by procuring, with their prayers, a very plentiful ſhower thereon; and at the ſame time, a furious hail, mixed with lightning and thunderbolts, on the enemy, and thus he obtained a deciſive victory.

This is the account commonly given by eccleſiaſtical hiſtorians; and the whole ſtory is engraven in bas-relievos on the Antonine column. And hence aroſe the denomination *thunderers*: though ſome ſay, that the legion thoſe Chriſtians were of, was called the *thundering legion* before.

This deliverance has been thought by many to have been miraculous, owing to the prayers of the Chriſtians, who were in the Roman army; and it has been ſuppoſed, that the emperor wrote a letter to the ſenate on this occaſion, which was very favourable to the Chriſtians; others, however, have thought, that the Chriſtians, by a pious

a pious sort of miſtake, attributed this unexpected and ſeaſonable ſhower, which ſaved the Roman army, to a miraculous interpoſition; and this opinion, ſays Moſheim, is indeed ſupported by the weightieſt reaſons as well as by the moſt reſpectable authorities: and the letter of Marcus Antoninus is allowed even by the defenders of the miracle of the *thundering legion*, to have in it manifeſt tokens of ſpuriouſneſs, to be the work of a man unſkilful in Roman affairs, and who probably lived in the ſeventh century. Moſheim ſums up the arguments on this ſubject in the following manner: it is certain, he ſays, that the Roman army encloſed by the enemy, and reduced to the moſt deplorable and even deſperate condition by the thirſt under which they languiſhed in a parched deſart, was revived by a ſudden and unexpected rain. It is alſo certain, that both the Heathens and the Chriſtians looked upon this event as extraordinary and miraculous; the former attributing it to Jupiter, Mercury, or the power of magic; the latter to Chriſt, interpoſing, thus unexpectedly, in conſequence of their prayers. It is ſtill farther beyond all doubt, that a conſiderable number of Chriſtians ſerved, at this time, in the Roman army, and it is extremely probable, that in ſuch trying circumſtances of calamity and diſtreſs, they implored the merciful interpoſition and ſuccours of their God and Saviour. And as the Chriſtians of theſe times looked upon all extraordinary events as miracles, and aſcribed to their prayers all the uncommon and ſingular occurrences of an advantageous nature that happened to the Roman empire, it will not appear ſurprizing, that, upon the preſent occaſion, they attributed the deliverance of Antoninus and his army to a miraculous interpoſition which they had obtained from above. But, on the other hand, it muſt be carefully obſerved, that it is an invariable maxim univerſally adopted by the wiſe and judicious, that no events are to be eſteemed miraculous, which may be rationally attributed to natural cauſes, and accounted for by a recourſe to the ordinary diſpenſations of providence; and as the unexpected ſhower, which reſtored the expiring force of the Romans, may be eaſily explained without riſing beyond the uſual and ordinary courſe of nature, the concluſion is manifeſt; nor can it be doubtful in what light we are to conſider that remarkable event. Eccl. Hiſt. vol. i. p. 125. 8vo. edit.

Mr. Moyle and Mr. King had a curious and intereſting controverſy on the ſubject of the *thundering legion*. The learned Dr. Lardner has collected into one view every thing relating to it of importance, in his collection of Jewiſh and Heathen teſtimonies, vol. ii. chap. xv. ſect. iii. p. 221, &c.

THURIBULUM, among the Romans, a cenſer, or veſſel, in which incenſe was burnt at ſacrifices.

THURIFICATI, in *Church-Hiſtory*, a deſignation given to thoſe, who, to avoid the perſecution of the Roman emperors, offered frankincenſe to the heathen gods.

THURSDAY, the fifth day of the Chriſtians week, but the ſixth of that of the Jews. See THOR and WEEK.

THURSDAY, *Holy*. See HOLY.

THURSDAY, *Maunday*. See MAUNDAY *Thurſday*.

THURSIO, in *Ichthyology*, a ſpecies of fiſh mentioned by Pliny, lib. ix. cap. 9. It is thought by ſome to be the *phocæna*, or PORPESSE; and by others the STURGEON.

THURUS, in *Natural Hiſtory*, the name of a creature deſcribed by Geſner, and ſome others, as a diſtinct ſpecies of wild bull; but the accounts of it ſeem either fabulous or miſtaken deſcriptions of the wild bull.

THUS. See FRANKINCENSE.

THUS, *Judæorum*, called alſo *caſcarilla* and *cortex eleutheriæ*, in the *Materia Medica*, is the bark probably of the ſhrub deſcribed by Cateſby, under the name of *ricinoides elæagni folio* or *ilathera*, the *croton caſcarilla* of Linnæus, which grows plentifully in moſt of the Bahama iſlands: thence it is brought to us in curled pieces, or rolled up into ſhort quills, about an inch wide; covered on the outſide with a rough whitiſh matter, and browniſh within; and exhibiting, when broken, a ſmooth, cloſe, blackiſh brown ſurface. The bark, freed from the outer coat, has a light agreeable ſmell, and a moderately bitter taſte, accompanied with a conſiderable aromatic warmth. It is eaſily inflammable, and yields, whilſt burning, a fragrant ſmell, ſomewhat reſembling that of muſk. Stiſſer was the firſt who employed this bark as a medicine in Europe; who relates that a tincture of it in alkalized vinous ſpirits, or in dulcified alkaline ſpirits, proved carminative and diuretic, and did ſervice in arthritic and ſcorbutic caſes. In 1694 and 1695, it was employed by Apinus in an epidemic fever of the intermittent kind. The gentlemen of the French academy found this bark of excellent ſervice againſt an epidemic dyſentery in 1719, when the ipecacuanha proved ineffectual. At preſent it is of great eſteem among the Germans, as a warm ſtomachic and corroborant, in flatulent colics, internal hæmorrhages, dyſenteries, the diarrhœa of acute fevers, and, mixed with the Peruvian bark, in common intermittents.—Among us it has been lately received into practice; but its uſe, ſays Dr. Lewis, is not yet become ſo general as it well deſerves to be. Its virtues are partial extracted by water, and totally by rectified ſpirit. Lewis's Mat. Med.

THUS, in *Sea-Language*, the order by which the pilot directs the helmſman to keep the ſhip in her preſent ſituation when ſailing with a ſcant wind, ſo that ſhe may not approach too near the direction of the wind, and thereby ſhiver her ſails, nor fall to leeward, and run farther out of her courſe. Falconer. See STEERING.

THUYA. See TREE *of Life*, and LIGNUM *Vitæ*.

THWAITE, in *Ichthyology*. See SHAD.

THWART *the hawſe*, in the *Sea-language*. See ATHWART.

THWART *ſhips*, acroſs the ſhip. See ATHWART.

THWART, in a boat, the ſeat or bench of a boat, whereon the rowers ſit to manage the oars. Hence THOUGHTS is uſed in the ſame ſenſe.

THYIA, Θυια, in *Antiquity*, a feſtival in honour of Bacchus, celebrated by the Eleans.

THYITES *lapis*, in the *Materia Medica* of the ancients, the name of an indurated clay, approaching to the nature of a ſtone. It was found in Egypt, and uſed in diſtemperatures of the eyes.

This ſubſtance has been very much miſunderſtood by the late writers, and by moſt of them ſuppoſed to be loſt at this time; but this was wholly owing to their miſtaking the claſs of bodies among which they were to look for it: ſome imagining it to have been a ſpecies of green marble; and others the turquoiſe-ſtone, that Diſcorides meant by this name. It is very plain, however, that it was no other than an indurated clay of the MOROCHTHUS kind, and no more a ſtone than that ſubſtance, that being alſo frequently called *lapis morochthus*.

It is of a ſmooth, even and regular texture, very heavy, of a ſhining ſurface, and of a pale green, without the admixture of any other colour. It does not at all adhere to the tongue, nor ſtain the fingers in handling; but drawn along a rough ſurface, leaves a ſlender white line. It melts ſlowly in the mouth, and is of a ſharp, acrid, and diſagreeable taſte; and when rubbed down with water on a marble, it melts into a milky liquor of a pure white, not the leaſt greenneſs being ſenſible in it. It is found at preſent in the great mine at Goſſelar in Saxony, and ſeems to owe its colour to particles of copper; to which alſo it owes the virtues attributed to it by Dioſcorides, acting as a weak kind of verdigriſe. Hill's Hiſt. of Foſſ. p. 36.

THYLACION, a word uſed by the ancient medical writers, to expreſs the bag formed by the membranes of the fœtus at the orifice of the pudenda, before the birth.

THYLLA, Θυλλα, in *Antiquity*, a feſtival in honour of Venus.

THYMALLUS, in *Ichthyology*. See GRAYLING.

THYMBRA, *Mountain hyſſop*, in *Botany*, a genus of the *didynamia gymnoſpermia* claſs. Its characters are theſe: it has an empalement of one leaf, cut at its brim into two lips, the upper broad, with three equal points; the under narrow and cut in two parts; the flower is of one petal, of the lip-kind; the upper lip is concave, and cut in two obtuſe ſegments, the lower ends with three almoſt equal points: it has four ſlender ſtamina, terminated by twin ſummits under the upper lip, and a four-pointed germen ſupporting a ſlender half-bifid ſtyle, crowned by obtuſe ſtigmas: the germen becomes four ſeeds, which ripen in the empalement.—There are two ſpecies.

THYME, *Thymus*, in *Botany*, a genus of the *didynamia gymnoſpermia* claſs. Its characters are theſe: the flower has a permanent empalement of one leaf, divided into two lips, whoſe chaps are hairy and ſhut; the upper lip is broad, plain, erect, and indented in three parts; the under lip ends in two equal briſtles: the flower is of the lip kind, and has one petal, with a tube of the length of the empalement; the chaps are ſmall, the upper lip is ſhort, erect, obtuſe, and indented at the point; the lower lip long, broad, and divided into three parts; it has four incurved ſtamina, two longer than the other, terminated by ſmall ſummits; and a four-pointed germen, ſupporting a ſlender ſtyle, crowned by a bifid acute ſtigma. The germen turns to four ſmall roundiſh ſeeds, ripening in the empalement. There are nine ſpecies.

We have three or four ſpecies of this plant propagated in

in our gardens, partly for uſe in the kitchen, and partly for curioſity. They are propagated either by ſowing, or by parting the roots, both which ſhould be done either in March or October.

The ſeeds ſhould be ſown on a bed of light earth, and muſt not be buried too deep. When they come up, they muſt be kept clear of weeds, and watered at times; and in June they ſhould be thinned, leaving the plants at about ſix inches aſunder. After this they will grow very faſt, and will require no farther care.

If they are to be propagated the other way, the roots ſhould be taken up, and parted into as many ſlips as can be, and each planted at ſix or eight inches diſtance, on beds of light earth, watering and ſhading them till they have taken root.

The common garden *thyme* is a moderately warm pungent aromatic. To water it imparts by infuſion its agreeable ſmell, with a weak taſte and yellowiſh or brown colour; in diſtillation, it gives over an eſſential oil, in the quantity of about an ounce from thirty pounds of the herb in flower, of a gold yellow colour if diſtilled by a gentle fire, of a deep browniſh red if by a ſtrong one, of a penetrating ſmell like that of the *thyme* itſelf, but leſs grateful, and in taſte exceedingly hot and fiery: the remaining decoction, inſpiſſated, leaves a bitteriſh, roughiſh, ſubſaline extract. The *ſerpyllum*, or mother of *thyme*, is an elegant aromatic plant, ſimilar to the preceding ſpecies, but milder, and in flavour rather more grateful. Its eſſential oil is both in ſmaller quantity and leſs acrid, and its ſpirituous extract comes greatly ſhort of the penetrating warmth and pungency of that of the other.— It is ſaid to afford an agreeable diſtilled water, more durable, but leſs active and penetrating, than peppermint. Lewis. This has been much extolled as a nervous ſimple. An infuſion of it has been ſaid to do wonders in tumors, lowneſs of ſpirits, and head-achs: and it has been much commended for the cure of the nightmare.

The *lemon-thyme*, which is a variety of the laſt, is leſs pungent than the firſt ſort, but more ſo than the ſecond, and much more grateful than either. Diſtilled with water, it yields a larger quantity than the other ſorts, of a yellowiſh very fragrant oil of the lemon flavour, containing nearly all the medicinal parts of the plant. It gives over alſo, with rectified ſpirit, its finer odorous matter. Lewis.

Maſtich Thyme, a ſpecies of *Satureia*. See *Herb* MASTICH.

THYMELÆA, in *Botany*, ſee SPURGE-*laurel*.

THYMELÆÆ *radix*, in the *Materia Medica*, the dried root of the *thymelæa foliis lini* of Tournefort and other authors.

It is a light root of different ſizes, of a reddiſh colour without, and greyiſh within, woody, and full of fibres, and taſtes ſweet at firſt, but is hot as fire when it has been held a little time in the mouth. It loſes however both this fiery taſte, and its acrid quality, in long keeping, and with them its virtues.

It is to be choſen new, well fed, and not worm-eaten. The fruit of this plant is the *granum cnidium* of the ſhops. They are both of an acrid quality, and are not in uſe in the ſhops at preſent. See SPURGE-*laurel*.

THYMELE, in the *Ancient Theatre*, a kind of pulpit, where the ſingers, called THYMELICI, performed.

THYMELICI, among the *Romans*, were muſicians, who ſung in the interludes, or who danced and kept time with their geſtures. The place where they performed was called *thymele*, whence Juvenal vi. 66.

Attendit thymele, thymele nunc ruſtica diſcat.

THYMIAMA, θυμιαμα, in *Antiquity*, an offering of INCENSE to God.

THYMIAMA, in the *Materia Medica*, a name by which ſome authors have called the *caſcarilla bark*; called by ſome *cortex thuris*, or Indian bark. See THUS *Judæorum*.

The *cortex thymiamatis* of the German ſhops is a bark, in ſmall browniſh grey pieces, intermixed with bits of leaves, brought from Syria, Cilicia, &c. and ſuppoſed to be the produce of the liquid *ſtorax-tree*. It has an agreeable balſamic ſmell, approaching to that of liquid ſtorax, and a ſubacid bitteriſh taſte accompanied with ſome ſlight aſtringency. Cartheuſer and Hoffman report, that it affords an excellent fumigation for œdemas, rheumatiſms, and catarrhs; and that the ſpirituous tincture and extract, and the diſtilled ſpirit, are uſeful anodynes or antiſpaſmodics in convulſive coughs and other diſorders. It is rarely met with in this country. Lewis.

THYMIAMATA, a kind of fumigations among the ancients, the ingredients of which were ſo various, that it appears they always conſulted utility as well as pleaſure, in their compoſition of them. We find the gum ammoniacum of the ancients, which had the ſmell of caſtor, uſed in them: whence it is evident that the ancients uſed ſalutiferous as well as ſweet-ſcented things in theſe fumigations. Galbanum has worſe ſmell than ammoniacum, and yet this alſo we find, together with the myrrh, and other gums, is made an ingredient in the oldeſt preſcriptions of this kind.— And Pliny mentions the ammoniacum with the ſchænanth, and other ſweets, uſed for this purpoſe.

THYMIC *artery*, in *Anatomy*, is a branch of the right ſubclavian communicating with the mammaria interna, and ſometimes ariſing from the anterior middle part of the common trunk of the ſubclavian and carotid.

THYMOXALME, in the *Materia Medica* of the ancients, was a compoſition uſed externally in the gout, and many diſorders of the limbs, and was given inwardly in diſtemperatures of the ſtomach, a quarter of a pint for a doſe. It operated as a purge, and was prepared in the following manner: take two ounces of bruiſed thyme, as much ſalt, a little meal, rue, and penny-royal.— Theſe were to be put into a pot, and three pints of water and fourteen ounces of vinegar are to be poured upon them; after which they are to be covered with a coarſe cloth, and ſet in the ſun for ſome time. Dioſcorides, lib. v. cap. 24.

THYMUS, θυμος, in *Anatomy*, an oblong glandular body, round on the upper part, and divided below into two or three lobes, of which that towards the left hand is the longeſt. The greateſt part of it lies between the duplicature of the ſuperior and anterior portion of the mediaſtinum, and the great veſſels of the heart, whence it reaches a little higher than the tops of the two pleuræ, ſo that ſome part of it is out of the cavity of the thorax; and in the fœtus and in children, it lies as much without the thorax as within it.

The *thymus* is that part which in a breaſt of veal we call the ſweetbread.—This gland is big in infants, and of a white colour, ſometimes mixed with red, but, as they grow in age, it becomes leſs, and generally of a dark colour; its arteries and veins are branches of the carotides and jugulars. It has nerves from the par vagum, and its lymphatic veſſels diſcharge themſelves into the ductus thoracicus. Its particular inward ſtructure and ſecretions are not as yet ſufficiently known to determine its uſes, which however ſeem to be deſigned more for the fœtus than for adults.

The learned Dr. Tyſon ſuppoſes the uſe of this gland to be for a diverticulum to the chyle in the thoracic duct of a fœtus; whoſe ſtomach, being always full of the liquor in which it ſwims, muſt keep the thoracic duct diſtended with chyle; becauſe the blood which the fœtus receives from the mother, fills the veins, and hinders the free entrance of the chyle into the ſubclavians.

Mr. Cheſelden obſerves, that where the *thymus* in men is very ſmall, the thyroid glands increaſe porportionably; but, in ſuch brutes as have fallen under his obſervation, it is juſt the contrary: from which he is inclined to believe, that they belong to the ſame lymphatics; and that either of them increaſing as much as both ought to do, if both increaſed, anſwers the ſame end as if both did; and that the reaſon why the *thymus* increaſes rather than the thyroid glands, in brutes, is, becauſe the ſhape of their thorax affords convenient room for it to lodge in; and that in men, the reaſon why the thyroid glands increaſe ſo much, is, becauſe there is no room in that part of the thorax where the *thymus* is ſeated, for a large gland to be lodged.

Dr. Pozzi ſays, that the *thymus* of a calf, ſoftened by maceration, diſcovers a lobe, from which a milky liquor runs out when wounded; and if air is afterwards blown into it, the whole *thymus* is diſtended, and may be dried, when it plainly appears to be compoſed of cells communicating with each other; upon the ſides of which muſcular fibres are to be ſeen: from which ſtructure he concludes, that the *thymus* in fœtuſes ſupplies the uſe of the lungs, ſerving as a receptacle for the chyle to be prepared in.

The *thymus* is thought by ſome to furniſh the liquor found in the thorax of fœtuſes. See Mem. de l'Acad. des Scienc. Par. 1733.

The ingenious Mr. Hewſon (Exp. Enquiries, part iii.) conſiders the *thymus* as an appendage to the *lymphatic glands*, for the more perfect and expeditious formation of the central particles of the blood, in the fœtus and during infancy.

THYMUS, in *Surgery*, is uſed for a kind of wart, growing on the parts of generation, the fundament, and ſeveral other places of the body, with cloven aſperities, like thoſe of the herb *thyme*; whence its name.

The ordinary method of curing a *thymus* is by ligature, and deſiccative lotions, or by cauſtics; and, if large, by inciſion;

incision; taking care first to secure the greater vessels, by tying them.

THYNNIA, Θυννια, in *Antiquity*, a sacrifice offered to Neptune by the fishermen, after a plentiful draught.

The word comes from Θυννος, a tunny, that being the sacrifice offered.

THYNNUS, in *Ichthyology*, see TUNNY.

THYOS, Θυος, in *Antiquity*, an offering of fruits, leaves, or acorns, which were the only sacrifices at first in use.

THYRO-*adenoidæus*, in *Anatomy*, a name given by Winslow, to a fasciculus of fibres detached from the *thyro-pharyngæus*, and inserted laterally in the thyroide gland.

THYRO-*arytenoidæi*, in *Anatomy*, are two very broad muscles, each of which is situated laterally between the thyroides and cricoides; and fixed by a broad insertion in the inside of the ala of the thyroide cartilage: the fibres contracting from thence run from before backward, and from below upward, towards the neighbouring arytenoide cartilage, in which they are inserted, from the glottis to the angle of the basis. In some subjects, these muscles cover almost both sides of the glottis.

The *thyro-arytenoidæi*, acting together, draw both the arytenoide cartilages forward, and consequently loosen the glottis, and render it capable of the smallest quaverings of the voice. They may likewise probably compress the lateral sinuses or ventricles of the larynx, and also the arytenoide glands. Winslow.

THYROIDÆI, *crico*. See CRICO-THYROIDÆUS.

THYRO-EPIGLOTTICI, are two muscles which cross the *thyro-arytenoidæi*, being inserted in the inner lateral part of the thyroides, and laterally in the epiglottis.— They serve with the *aryteno-epiglottici* to shut any lateral opening that may remain when the epiglottis is depressed by the basis of the tongue; and the *hyo-epiglottici* may pull it a little forward in strong respirations, as in sighing, yawning, &c.

THYRO-*hyoidæi*. See HYO-*thyroidæi*.

THYRO-*Pharyngæi*, in *Anatomy*, are muscles of the *pharynx*, very broad, and each muscle inserted along the outside of the ala of the cartilago thyroides; whence they run obliquely backward and meeting under the linea alba, they sometimes appear to be but one muscle without any middle tendon. They serve with the other muscles of the pharynx, chiefly for deglutition, and perhaps partly in modifying the voice. Winslow.

THYRO-*Staphylini*, in *Anatomy*, are two small muscles, which accompany the *pharyngo-staphylini* very closely, through their whole course, except that their posterior extremities are fixed in the thyroide cartilages near the other muscles.

THYROIDÆI *Sterno*. See STERNO-*Thyroidæus*.

THYROIDÆA *Glandula*, THYROIDE *Gland*, is a large whitish mass which covers the anterior convex side of the LARYNX. It seems at first sight to be made up of two oblong glandular portions, united by their inferior extremities below the cricoide cartilage, in such a manner as to have some resemblance of a crescent, with the cornua turned upward. It is of a moderate thickness, and bent laterally like the thyroide cartilage. The two lateral portions lie on the musculi thyro-hyoidæi, and the middle or inferior portion on the crico-thyroidæi.— The inferior thyro-pharyngæi send fibres over this gland, and they communicate on each side by some such fibres with the sterno-thyroidæi and hyo-thyroidæi. This gland seems to be of the same kind with the other salival glands, but more solid. Some anatomists thought they had discovered the excretory duct, but they mistook, says Winslow, a blood-vessel for it. There is sometimes a kind of glandular rope which runs before the thyroide cartilage, and disappears before the basis of the os hyoides. Winslow.

This gland receives nerves from the recurrents, arteries from the carotides, and veins which pass to the jugulars and lymphatics, and discharge themselves into the thoracic duct.

Its use is to separate a viscid moisture, serving to line and lubricate the larynx, to facilitate the motion of its cartilages, to obtund the acrimony of the saliva, and to soften the voice.

THYROIDES, Θυρεοειδης, formed from Θυρεος, *buckler*, and ειδος, *form*, in *Anatomy*, the first and largest of the five cartilages of the LARYNX; called also *scutiformis*.

This cartilage is large and broad, and folded in such a manner as to have a longitudinal convexity on the fore-side, and two lateral portions, which may be denominated alæ: the upper part of its anterior middle portion is formed into an angular notch; the upper edge of each ala makes an arch, and together with the middle notch, these two edges resemble the upper part of an ace of hearts in cards; the lower edge of each ala is more even, and the posterior edges of both are very smooth, being lengthened out both above and below by apophyses, which Winslow calls the cornua of the *thyroide* cartilage. The superior apophyses are longer than the inferior, and the extremities of all the four are rounded like small heads, which in the inferior apophyses have a shining surface on the inside, resembling an articular eminence. On the outside of each ala near the edge, is a prominent oblique line, running from behind forward. The upper extremity of this line is near the superior apophysis or cornua, and both that and the lower extremity terminate in a small tuberosity, the lowest being often the most considerable. These tuberosities serve for the insertion of muscles and ligaments. The inside of the alæ and the convex side of the anterior portion are very uniform; and this cartilage ossifies gradually in old age. Winslow.

THYRRÆUM *vinum*, a sort of wine among the ancients remarkable for its thickness and dark colour; it was sweet, and luscious, and not astringent.

THYRREUS *lapis*, in *Natural History*, the name of a fossil, which the writers of the middle ages have called *syrus*.

It has many virtues ascribed to it; but all the accounts we have of its real properties are from Pliny, who observes that it swam upon the water while whole; but when broken into small pieces, these sunk to the bottom. It seems to have been a sort of bitumen of a spongy structure.

THYRSUS, Θυρσος, in *Antiquity*, the sceptre which the ancient poets put in the hands of Bacchus, and wherewith they furnish the Mænades in their Bacchanalia.

The *thyrsus* was originally a lance or spear, wrapped up in vine leaves; wherewith Bacchus is said to have armed himself, and his soldiers in his Indian wars, to amuse and deceive the unpractised Indians, and make them suspect no hostilities.

Hence it was afterwards borne in the feasts and sacrifices of that god; and as the Satyrs, who were Bacchus's soldiers, were supposed to have fought with it, it became a custom to represent them therewith.

THYSSELINUM, in *Botany*. See *Milky* PARSLEY.

TIARA, Τιαρα, an ornament, or habit, wherewith the ancient Persians covered their heads; and which the Armenians, and kings of Pontus, wear on medals; these last, because descended from the Persians.

Latin authors call it indifferently *tiara*, and *cidaris*.

Strabo says, the *tiara* was in form of a tower; and the scholiast on Aristophanes's comedy, Αχαρνης, act i. scene 2. affirms, that it was adorned with peacocks feathers.—Some moderns, however, fancy the scholiast is here speaking of the casque which the ancient Persians wore in war, rather than of the habit which they wore on the head in the city.

The kings of Persia alone had the right of wearing the *tiara* straight and erect: the priests and great lords wore it depressed, or turned down, on the fore-side. Xenophon, in his Cyropædia, says, that the *tiara* was sometimes encompassed with the diadem, at least in ceremonies; and had frequently the figure of an half-moon embroidered on it: others are of opinion, that the diadem was in figure of a moon; and that it was hence the *tiara* was called *lunata*. Lastly, others think that the *tiara* itself was made sometimes in form of an half-moon. From what we have said, it appears, that there were different forms of *tiaras*; and, in effect, Paschalius, De Coronis, distinguishes no less than five different kinds. See DIADEM.

The *tiara* was also an ornament belonging to the Jewish priests. Exod. xxviii. 40. xxxix. 26.

TIARA, is also the name of the pope's triple CROWN; anciently called *regnum*.

The *tiara* and keys are the badges of the papal dignity; the *tiara* of his civil rank, and the keys of his jurisdiction: for, as soon as the pope is dead, his arms are represented with the *tiara* alone, without the keys.

The ancient *tiara* of the popes was a round high cap. Boniface VIII. first encompassed it with a crown. Benedict XII. added a second crown; and John XXIII. a third.

TIARELLA, in *Botany*, a genus of the *decandria digynia* class. Its characters are these: the flower has a permanent empalement divided into five oval acute parts; it has five oval petals, of the length of the empalement; and ten awl-shaped stamina, terminated by roundish summits, and a bifid germen, ending with two styles, which becomes an oblong capsule with one cell, opening with two valves, containing several oval seeds. There are two species.

TIBERIADES *water*, the water of a hot spring near *Tiberiades* in Egypt.

Dr.

Dr. Perry, when on the spot, tried some experiments on this water, which give us a much better idea of its nature, than we have from any other accounts of it. Half a dram of oil of tartar being mixed with an ounce and half of the water, it becomes turbid and muddy; and after twelve hours, three parts of the whole appear like white wool, only leaving a small portion of clear water at the top. The white woolly matter dried, produced only a small quantity of yellow ochre.

Spirit of vitriol added to the water in the same quantity, affords a large unctuous sediment of a white colour. A solution of sublimate being mixed in the same quantity, it became turbid and yellowish, and yielded an earthy sediment in small quantity; whence it seems evident, that it contains a sal murale. Saccharum saturni being added in the same quantity, the water deposited a lateritious sediment in a small quantity. Mixt with spirit of sal ammoniac, it turns to a bluish green turbid liquor, and finally yields a woolly sediment. Sugar of violets mixed with it, turned it to a yellow colour; and the scrapings of galls mixed with it, turned it to a deep purple; and on shaking, this became as black as ink.

It appears from these experiments, that the water contains a good deal of a gross fixed vitriolic salt, some alum, and a sal murale. It is too salt and nauseous for internal use; but it must be of use as a bath in all cutaneous foulnesses, especially in scorbutic and leprous cases; for it will powerfully deterge, scour, and cleanse the excretory pores, and it may be, by its weight and stimulus, restore them to their natural state and tone, and restore the true state of the vitiated solids in general. Phil. Trans. Nº 462. p. 52.

TIBIA, in *Anatomy*, the bony part of the leg, between the knee and the ankle.

The *tibia* consists of two bones, called *focils*, the one on the inside of the leg, called the FIBULA, or *little focil*: the other on the outside, called by the common name *tibia*, or the *great focil*, to which may be added the PATELLA.

TIBIA, is properly the inner and bigger bone of the leg, called also *focile majus*. See *Tab. Anat.* (*Osteol.*) *fig.* 3. *n.* 22. 22. & *fig.* 7. *n.* 26. 26.

The *tibia* is hard and firm, having a pretty large cavity in its middle, to contain the medulla, or marrow.

This is a long bone irregularly triangular, and much larger at the top than below. It is divided into two extremities and a middle part, or into the head, body and basis. The upper extremity or head consists of two condyles; the upper side of which is flat and divided into two cartilaginous surfaces, almost horizontal and a little hollow, one internal, the other external: between these lies a cartilaginous tuberosity, which appears to be double, and has inequalities for the insertion of ligaments. The two surfaces answer to the two condyles of the os femoris. The whole head taken transversely is oval, except toward the back part, where is a superficial notch, and the circumference is very rough. The external condyle is more prominent than the internal, and in its lower part there is a small cartilaginous surface for the articulation of the fibula. On the fore part of the head there is an unequal tuberosity, called the spine of the *tibia*, for the insertion of the tendinous ligament of the patella.

The lower extremity is neither so thick nor so broad as the upper: on its outside there is a longitudinal depression, broader at the lower than at the upper part, which receives the end of the fibula. On the inside of this basis there is an apophysis called the inner ankle, which runs down lower than any other part, and has towards its posterior side a groove or channel for the passage of a particular tendon. The basis of the *tibia* terminates in a transverse, oblong, cartilaginous, articular cavity, the capacity of which is increased on the inside by the inner ankle, the cartilage being continued over that side of it, which is turned toward the cavity.—Through the middle of this cavity runs a superficial eminence, by which it is divided into a right and left portion. The greatest breadth also of the basis of the *tibia* does not lie in the same plane with that of the head; the ankle lying a little more inward than the internal condyle: and this is an observation of great consequence in fractures and luxations.

The almost triangular body of the *tibia* is distinguished into three sides, internal, external, and posterior, and into three angles, one anterior called the crista of the *tibia*, and two posterior. The inner side is the broadest of the three, very equal, gently convex, and turned a little forward: the outer side is unequally flat, and narrower than the former: the back side is unequally rounded, and the narrowest of all; however at its upper part it is of a considerable breadth, in which is observed a long oblique muscular impression, beginning under the notch in the posterior part of the head, and from thence running downward toward the inner side. Immediately below the extremity of this impression there is another, less oblique. The anterior angle, called crista, is sharp, prominent about the middle, and almost round at the lower part: the internal posterior angle is somewhat rounded: the external is more acute, except toward the upper part, where it is more or less flatted.

The *tibia* is connected above with the condyles of the os femoris, by an articulation which is partly a ginglymus, for the extension and flexion of the leg, and partly an arthrodia for the rotation of the leg when bent. This is owing to two intermediate cartilages. Winslow.

Mr. Cheselden gives an instance of a boy of seven years of age, where both the epiphyses at the upper end of the *tibia* were so far separated, that no more than half each *tibia* was joined to half the epiphysis; which made his legs wholly useless. This had been occasioned by the nurse's holding him out to stool by the heels and back, when very young; which is, among them (as he observes) too common a practice.

Instances have occurred in which the greater part of the *tibia* has been taken out, and afterwards supplied by a callus, and regenerated. Edinb. Med. Ess. vol. i. p. 192, vol. v. p. 373.

TIBIA, *cartilages of the*. The *tibia* has four or five proper cartilages, and two additional ones. The two proper cartilages which cover the two superior surfaces of the head of the *tibia*, are the thickest. These are both gently hollow; but the internal, or that next the other *tibia*, is more depressed in the middle than the other.—The third proper cartilage covers the small surface which lies on the lower part of the external condyle. The fourth covers the lower surface of the basis of the *tibia*, being continued over the outside of the inner ankle. There are likewise superficial cartilaginous incrustations on the back part of this basis, behind the inner ankle, and likewise on the backside of the outer ankle, for the passage of tendons.

The additional cartilages of the *tibia* are two in number, called semilunar from their figure; and intermediate or interarticular, from their situation; each of these cartilages is in the shape of a crescent, or Roman C.—Their convexity, or greatest curvature, is very thick; their concavity, or smaller curvature, very thin, and something like the edge of a sickle. They lie on the two upper surfaces of the head of the *tibia*; each cartilage is broad enough to cover about two-thirds of the surface of the *tibia* on which it lies, leaving one-third bare in the middle; their under sides are flat, their upper sides hollow, and, together with the middle portions of the surfaces of the head of the *tibia*, they form cavities proportioned to the convexity of the condyles of the os femoris. Winslow.

TIBIA, *ligaments of the*. This bone is connected to the os femoris by several ligaments, two lateral, one posterior, two middle, and one capsular. The innermost and broadest of the two lateral ones is fixed pretty low down on the inner side of the superior part of the *tibia*. The external, which is narrower and thicker than the former, is fixed partly in the *tibia*, immediately above the fibula, and partly in the upper extremity of the fibula; both these ligaments lie a little behind the middle of the articulation. The posterior ligament is fixed by several expansions in the posterior part of the head of the *tibia*. One of the crucial ones is fixed by one end to the internal superficial impression in the notch of the os femoris, and by the other, to the notch in the head of the *tibia*: the other is fixed by one end to the external impression in the notch of the os femoris, and by the other between the anterior portions of the superior surfaces of the head of the *tibia*. The cornua of the semilunar cartilages degenerate into ligaments, short and strong, by which they are fastened, and communicate by some small portions with the crucial ligaments: they have likewise a common ligament, which like an arch runs transversely between their anterior convexities. The patella is fastened also to the tuberosity or spine of the *tibia* by a strong ligament; this runs directly down from the apex of the patella; and, besides this, it has several small lateral ligaments fixed in the lower part of its edge on each side, and inserted anteriorly and a little laterally in the edge of the head of the *tibia*.

The capsular ligament is fixed round the edge of the head of the *tibia*, and in the edge of the patella. The crucial ligaments, and those of the semilunar cartilages, are enclosed in this capsule; but the lateral and posterior ligaments, and those of the patella, lie without it. The capsule is also joined to a considerable portion of the circumference of the semilunar cartilages, and is strengthened

ſtrengthened by many ligamentary fibres. Its inſide is ſmooth, and ſhining; and where it is not covered with tendons, is very thin. There is likewiſe a very thin ligament, fixed by one end to the lower part of the cartilaginous ſide of the patella, and by the other to the anterior part of the great notch between the condyles of the os femoris. The uſe of which ſeems to be, to prevent the articular fat from being compreſſed in the motions of the knee. Winſlow.

TIBIA, *fracture of the.* See LEGS.

TIBIÆ *biceps*, ſee BICEPS.

TIBIÆ *quintus*, in *Anatomy*, a name given by the old authors to a muſcle called the *biceps cruris* by Albinus and Winſlow, and the reſt of the moderns.

TIBIA, in *Muſic*, was originally a FLUTE made of the ſhank, or ſhin-bone of an animal; and when the art of boring flutes was diſcovered, they were made of box-tree, laurel, braſs, ſilver, and even of gold.

TIBIA *articularis.* See BAGPIPE.

Dr. Burney (Hiſt. Muſ. vol. i. p. 521) apprehends that the union of this inſtrument with the ſyrinx ſuggeſted the firſt idea of an organ.

TIBIALIA, among the Romans, a kind of ſwaths with which they uſed to cover their legs.

TIBIALIS, or TIBIÆUS, in *Anatomy*, a name given to two muſcles of the leg; diſtinguiſhed by *anticus*, and *poſticus*.

TIBIALIS *anticus*, is a long muſcle, fleſhy at the upper part, and tendinous at the lower, ſituated on the foreſide of the leg, between the tibia and the extenſor digitorum longus. It is fixed above by fleſhy fibres in the upper third part of the external labium of the criſta tibiæ, and of the inſide of the aponeuroſis *tibialis*, or of that ligamentary expanſion which goes between the criſta tibiæ, and the anterior angle of the fibula. It is likewiſe fixed obliquely in the upper two-thirds of the outſide of the tibia, or that next the fibula. From thence it runs down, and ends in a tendon, which firſt paſſes through a ring of the common annular ligament, and then through another ſeparate ring, ſituated lower down; afterwards the tendon is fixed, partly in the inner and upper part of the os cuboides, and partly in the inſide of the firſt bone of the metatarſus.

It ſerves to bend the foot, or to turn the point of the foot toward the leg, by the ginglymoide articulation of the aſtragalus with the tibia and fibula: it likewiſe bends the leg on the foot, or hinders its extenſion. Of this laſt uſe we have an inſtance, whenever we ſtand or walk: when we ſtand, the foot being turned directly forward; this muſcle keeps the leg in equilibrio, and hinders it from falling backward. This uſe is ſtill more evident when we walk backward. Winſlow. See *Tab. Anat. (Myol.) fig.* 1. *n.* 62. *fig.* 2. *n.* 44.

TIBIALIS *poſticus*, is ſituated between the tibia and fibula, on the backſide of the leg, and covered by the extenſor digitorum longus. It is fixed above by fleſhy fibres, immediately under the articulation of the tibia and fibula, to the neareſt part of thoſe two bones, chiefly to the tibia, reaching to the lateral parts of that bone above the interoſſeous ligament, which is here wanting. From thence its inſertion is extended below the oblique line of impreſſion in the tibia, over all the neighbouring part of the interoſſeous ligament, and through more than the upper half of the internal angle of the fibula. Through all this place it is fleſhy and penniform, and is covered by the extenſor digitorum longus. After this, it forms a tendon which runs down below the inner malleolus through a cartilaginous groove, and an annular ligament, and is inſerted in the tuberoſity of the lower part of the os ſcaphoides. When this muſcle acts alone, it extends the foot obliquely inward. When it acts together with the gaſtrocnemii and ſoleus, it changes the ſtraight direction of their motion into an oblique one. When it acts with the *tibialis anticus*, the ſole of the foot is turned more directly inward, or toward the other foot.—Winſlow.

From the uſe which ſailors make of it, it is called *nauticus.* See *Tab. Anat.* (*Myol.*) *fig.* 1. *n.* 69. *fig.* 2. *n.* 53. *fig.* 7. *n.* 43.

TIBIALIS *gracilis*, a muſcle of the leg, called alſo PLANTARIS. It is a ſmall pyriform muſcle, ſituated obliquely in the ham, below the external condyle of the os femoris, between the poplitæus, and external gaſtrocnemius; and its tendon which is long, flat, and very ſmall, runs down on the ſide of the gaſtrocnemius internus all the way to the heel. The fleſhy body, which is no more than about two inches in length and one in breadth, is fixed by a ſhort flat tendon above the outer edge of the exterior condyle of the os femoris; from thence it runs obliquely over the edge of the poplitæus, and terminates in a very ſmall, but long flat tendon.—This tendon runs between the body of the gaſtrocnemius externus and ſoleus, all the way to the inner edge of the upper part of the tendo Achillis, and from thence continuing its courſe downwards, it joins this tendon, and is inſerted, together with it, in the outſide of the poſterior part of the os calcis, without communicating with the aponeuroſis plantaris. Sometimes this muſcle is wanting, and in ſome ſubjects it is ſituated lower down. Till the true uſe of this muſcle is evidently diſcovered by ſome fortunate obſervation, there is in the mean time ground to think, ſays Winſlow, that it hinders the capſular ligament of the knee from being compreſſed in the flexion of that joint: both becauſe of its adheſion to that ligament, and becauſe of the obliquity of its courſe, eſpecially as the neighbouring portion of the ſame ligament ſeems to require the ſame aſſiſtance from a tendinous expanſion of the ſemimembranoſus. Winſlow.

TIBICEN, in *Ichthyology*, a fiſh of the *trigla* kind, called by many authors, *lyra*, or the *harp-fiſh*; and in ſome parts of England, the *piper*.

The head of this fiſh runs out into two broad horns, which are ſerrated, or beſet with a ſort of teeth, or ſmall ſpines, all along their edges, which is its principal diſtinction from the hirundo or ſwallow-fiſh. Above the gill-fins it has on each ſide a long and ſharp ſpine. The forehead is elevated into a ſort of eyebrows over the eyes; and at the angles of theſe there are ſmall and ſhort ſpines; which are long and crooked. The ſide lines feel but very little rough to the touch, and the forehead between the eyes is not hollowed. The whole head is covered with a bony cruſt, which runs into two horns or ſpines behind. It has three fingers or filaments on each ſide, from the roots of the gill-fins; and its jaws are rough like files, but have no diſtinct teeth. The tail-fin, and the middle of the back, in this fiſh, are red. It is caught in the Mediterranean, and in ſome other ſeas. In our county of Cornwal it is not unfrequently caught about the ſhores, and from the noiſe it makes when taken out of the water is called the *piper*. Ray and Willughby.

TIBURO, in *Ichthyology*, a fiſh very badly and falſely deſcribed by ſeveral authors, and proving, on a ſtrict inquiry, to be no other than the lamia or *white* SHARK.

The *tiburo* of Linnæus is a ſpecies of SQUALUS, with a very broad and heart-ſhaped head, found in the American ſeas. Linnæus queries, whether it is not a variety of the *zygæna* or *hammer-headed* SHARK.

TICK, in *Natural Hiſtory*, a naſty little animal of a livid colour, with a blunt and roundiſh tail, elevated antennæ, a globoſe-ovate form, and full of blood; which infeſts cows, ſwine, goats, ſheep, and dogs. The *tick* or *ricinus* is, in the Linnæan ſyſtem a ſpecies of *acarus* in the *aptera* order of inſects.

TICK, in the *Manege*, a habit that ſome horſes take of preſſing their teeth againſt the manger, or all along the halter or collar as if they would bite it.

TICKING, in *Huſbandry*, denotes the act of ſetting up turfs in ſuch a manner as that they may be dried by the ſun, and fit for being burnt into aſhes on the land.

TICKLISH, in the *Manege.* A horſe is ſaid to be *ticklish* that is too tender upon the ſpur, and too ſenſible, that does not freely fly the ſpurs, but in ſome meaſure reſiſts them, throwing himſelf up, when they come near and prick his ſkin. A *ticklish* horſe has ſomewhat of the ramingues, *i. e.* the kickers againſt the ſpurs; but with this difference, that the latter put back, leap and kick, and yerk out behind, in diſobeying the ſpurs; whereas a *ticklish* horſe only reſiſts for ſome time, and afterwards obeys, and goes much better, through the fear of a vigorous ham, when he finds the horſeman ſtretch his leg, than he does upon being actually pricked.

TICKSEED, in *Botany.* See CORISPERMUM.

TICUNAS, *poiſon of*, is an active poiſon prepared by the native Indians, on the borders of the river of the Amazons, in three or four degrees of ſouth latitude, which, together with that of Lamas, Pevas and Yameos, is extracted by fire from plants, called by the French lianes, and uſed in poiſoning their arrows. See an account of the nature and effects of theſe poiſons by M. Heriſſant, in Phil. Tranſ. vol. xlvii. art. xii. and by M. Fontana, in Phil. Tranſ. vol. lxx. part. i. Append. art. ii. and alſo Fontana ſur les Poiſons, &c. Florence, 4to. See alſo POISON.

TIDE, the ſame with time, or ſeaſon. The word is originally Saxon, *tid*; which ſignifies the ſame.

TIDE, among *Miners*, denotes the ſpace of twelve hours.

TIDE, *ſhrove.* See SHROVE.

TIDE, *twelfth.* See TWELFTH.

TIDE, *Whitſun.* See WHITSUN-*tide.*

TIDES, two periodical motions of the waters of the sea; called also the *flux* and *reflux*, or the *ebb* and *flow*.

When the motion of the water is against the wind, it is called a *windward-tide*—when wind and *tide* go the same way, *leeward-tide*—when it runs very strong, it is called a *tide-gate*.

To tide it over or up into any place, is to go in with the *tide*, either ebb or flood, as long as that lasts; then to stay at anchor all the time of contrary *tide*; and thus to set in again with the return of the next *tide*.

It is said to *flow tide and half-tide*, allowing six hours to a *tide*, when the *tide* runs three hours in the offing longer than it does by the shore; but, by *longer*, they do not mean its running more hours; but that, if it be high water ashore at twelve, it will not be so in the offing till three. An hour and a half longer makes *tide* and quarter-*tide*, three-fourths of an hour longer makes *tide* and half-quarter *tide*, &c.

When the moon is in the first and third quarter, i. e. when she is new and full, the tides are high and swift, and are called *spring-tides*—when she is in the second and last quarter, the *tides* are lower and slower; and called *neap-tides*.

Tides, *phenomena of the*. The sea is observed to flow, for certain hours, from south towards north; in which motion, or flux, which lasts about six hours, the sea gradually swells; so that, entering the mouths of rivers, it drives back the river-waters toward their heads, or springs.

After a continual flux of six hours, the sea seems to rest for about a quarter of an hour; after which it begins to ebb, or retire back again, from north to south, for six hours more; in which time, the water sinking, the rivers resume their natural course. Then, after a seeming pause of a quarter of an hour, the sea again begins to flow, as before; and thus alternately.

Thus does the sea ebb twice a day, and flow as often; but not in the same hours thereof. The period of a flux and reflux is twelve hours forty-eight minutes; so that the *tides* return later and later each day, by forty-eight minutes, or three quarters of an hour three minutes.

Now twelve hours forty-eight minutes is a lunar day; i. e. the moon passes the earth's meridian later and later each day, by forty-eight minutes. So that the sea flows as often as the moon passes the meridian, both the arch above, and that below the horizon; and ebbs as often as she passes the horizon, both the eastern and western point thereof.

This farther agreement we observe between the moon and the sea, that the *tides*, though constant, are not equal; but are greatest, when the moon is in conjunction, or opposition to the sun; and least, when in quadrature thereto.

Lastly, those tides are the greatest, which happen in the new and full moon, at the time of the equinoxes.

Add, that the same things are observed throughout most of the coasts of Europe; only that the tides are so much the less, and happen the later, as the coasts are the more northerly.

These phenomena of the *tides* are admirably accounted for, from the principle of gravitation. All we require to their solution is, that the earth and moon, and every particle thereof, mutually gravitate towards each other: the reasonableness of which assumption, see under the article Gravity.

Indeed the sagacious Kepler, long ago, conjectured this to be the cause of the *tides*: "If, says he, the earth "ceased to attract its waters towards itself, all the water "in the ocean would rise and flow into the moon: the "sphere of the moon's attraction extends to our earth, "and draws up the water." Thus thought Kepler, in his Introd. ad. Theor. Mart. This surmise, for it was then no more, is now abundantly verified in the following theory, first amply deduced by Dr. Halley from the Newtonian principles.

However we may observe with M. de la Lande (Astronomie, vol. iv. Paris, 1781) that several of the ancients, and among others, Pliny, Ptolemy and Macrobius, were acquainted with the influence of the sun and moon upon the *tides*. And Pliny says expressly, that the cause of the ebb and flow is in the sun, which attracts the waters of the ocean; and adds, that the waters rise in proportion to the proximity of the moon to the earth.

Tides, *theory of the*.—1. It is obvious, that if the earth was entirely fluid, and quiescent, its particles, by their mutual gravity towards each other, would form themselves into the figure of an exact sphere.

Suppose then, that some power acts on all the particles of this earth with an equal force, and in parallel directions, the whole mass will be moved by such a power, but its figure will suffer no alteration by it; because all the particles, being equally moved by this power in parallel lines, they will still keep the same situation with respect to each other, and still form a sphere, whose centre will have the same motion as each particle. Upon this supposition, if the motion of the earth round the common centre of gravity of the earth and moon was destroyed, and the earth was left to the influence of its gravitation towards the moon, the earth falling toward the moon would still retain its spherical figure; all the parts being equally carried on, and retaining therefore the same situation with respect to each other. But the effects of the moon's action, as well as the action itself, on different parts of the earth, are unequal: those parts, by the general law of Gravity, being most attracted which are nearest the moon, and those being least attracted which are farthest from the moon; while the parts that are at a middle distance, are attracted by a mean degree of force: besides, all the parts are not acted on in parallel lines, but in lines directed towards the centre of the moon; and on these accounts, the spherical figure of the earth must suffer some change from the moon's action.

Supposing the earth to fall towards the moon, and abstracting from the mutual gravitation of its parts towards each other, and also from their cohesion; it will easily appear, that the parts nearest the moon would fall with the swiftest motion, being most attracted, and that they would leave the centre or greater bulk of the earth behind them in their fall, while the more remote parts would fall with the slowest motion, being less attracted than the rest, and be left a little behind the bulk of the earth, so as to be found at a greater distance from the centre of the earth than at the beginning of the motion. Whence it is manifest, that the earth would soon lose its spherical figure, and form itself into an oblong spheroid, whose longest diameter would point at the centre of the moon.

If the particles of the earth did not gravitate toward each other, but toward the moon only, the distances betwixt the parts of the earth that are supposed to be nearest the moon, and the central parts, would continually increase because of their greater celerity in falling; and the distance betwixt the central parts, and the parts that are farthest from the moon, would increase continually at the same time; these being left behind by the central parts, which they would follow, but with a less velocity. Thus the figure of the earth would become more and more oblong, that diameter of it which pointed toward the moon continually increasing.

But there is another reason why the earth would soon assume an oblong spheroidal form, if its parts were allowed to fall freely by their gravity toward the moon's centre; for the lateral parts of the earth, or those which are at the distance of a quarter of a circle from the point which is directly below the moon, and the central parts, descending with equal velocities toward the same point, viz. the centre of the moon, in approaching to it, would manifestly approach, at the same time, to each other; and, their distance becoming less, the diameters of the earth passing through them would be diminished, so that the diameter of the earth that points toward the moon would increase, and those diameters of the earth that are perpendicular to the line joining the centres of the earth and moon, would decrease at the same time, and render the figure of the earth still more oblong for this reason.

Let us now allow the parts of the earth to gravitate toward its centre; and, as this gravitation far exceeds the action of the moon, and much more exceeds the differences of her actions on different parts of the earth, the effect, resulting from the inequalities of these actions of the moon, will be only a small diminution of the gravity of those parts of the earth which it endeavoured in the former supposition to separate from its centre, and a small addition to the gravity of those parts which it endeavoured to bring nearer to its centre; that is, those parts of the earth which are nearest to the moon, and those which are farthest from her, will have their gravity toward the earth somewhat abated; whereas the lateral parts will have their gravity increased; so that, if the earth be supposed fluid, the columns from the centre to the nearest, and to the farthest parts, must rise, till, by their greater height, they be able to balance the other columns, whose gravity is either not so much diminished, or is increased by the inequalities of the action of the moon. And thus the figure of the earth must still be an oblong spheroid.

Let us now consider the earth, *instead of falling* toward the moon by its gravity, as projected in any direction, so as to move round the centre of gravity of the earth and

and moon; it is manifeſt, that the gravity of each particle toward the moon will endeavour to bring it as far from the tangent, in any ſmall moment of time, as if the earth were allowed to fall freely toward the moon; in the ſame manner as any projectile, at our earth, falls from the line of projection as far as it would fall by its gravity in the perpendicular in the ſame time. Conſequently the parts of the earth neareſt to the moon will endeavour to fall fartheſt from the tangent, and thoſe fartheſt from the moon will endeavour to fall leaſt from the tangent, of all the parts of the earth; and the figure of the earth, therefore, will be the ſame as if the earth fell freely toward the moon; that is, the earth will ſtill affect a ſpheroidal form, having its longeſt diameter directed toward the moon.

In order to underſtand this theory, it muſt be carefully conſidered, that it is not the action of the moon, but the inequalities in that action, that produce any variation from the ſpherical figure; and that, if this action were the ſame in all the particles as in the central parts, and operating in the ſame direction, no ſuch change would enſue.

For the farther illuſtration of the preceding obſervations, we muſt perceive, that the waters at Z (*Tab. Geography, fig.* 8.) on the ſide of the earth A B C D E F G H, next to the moon M, are more attracted than the central parts of the earth O by the moon, and the central parts are more attracted by her than the waters on the oppoſite ſide of the earth at *n*; and therefore, the diſtance between the earth's centre and the waters on its ſurface, under and oppoſite to the moon, will be increaſed. For let H, O, and D be three bodies, all equally attracted by the body M, and they will all move equally faſt toward it, their mutual diſtances from each other continuing the ſame. If the attraction of M is unequal, then that body which is moſt ſtrongly attracted will move faſteſt, and this will increaſe its diſtance from the other body. Conſequently, by the law of gravitation, M will attract H more ſtrongly than it does O, by which the diſtance between H and O will be increaſed; and a ſpectator in O will perceive H riſing higher toward Z. In like manner O, being more ſtrongly attracted than D, will move farther toward M than D does; and therefore the diſtance between O and D will be increaſed; and a ſpectator in O, not perceiving his own motion, will ſee D receding farther from him toward *n*; all effects and appearances being the ſame, whether D recedes from O, or O from D.

Suppoſe now there is a number of bodies, as A, B, C, D, E, F, G, H, placed round O, ſo as to form a flexible or fluid ring; then, as the whole is attracted toward M, the parts at H and D will have their diſtance from O increaſed; whilſt the parts at B and F, being nearly at the ſame diſtance from M as O is, will not recede from one another; but rather, by the oblique attraction of M, they will approach nearer to O. Hence the fluid ring will form itſelf into an ellipſe Z I B L *n* K F N Z, whoſe longer axis *n* O Z produced, will paſs through M, and its ſhorter axis, B O F, will terminate in B and F. Let the ring be filled with fluid particles, ſo as to form a ſphere round O; then, as the whole moves toward M, the fluid ſphere being lengthened at Z and *n*, will aſſume an oblong or oval form. If M is the moon, O the earth's centre, A B C D E F G H the ſea covering the earth's ſurface, it is evident that, whilſt the earth by its gravity falls towards the moon, the water directly below her at H will ſwell, and gradually riſe toward her; and alſo the water at D will recede from the centre, (or ſtrictly ſpeaking, the centre recedes from D), and riſe on the oppoſite ſide of the earth; whilſt the water at B and F is depreſſed, and falls below the former level. Hence, as the earth turns round its axis from the moon to the moon again in $24\frac{3}{4}$ hours, this oval of water muſt ſhift with it; and thus there will be two tides of flood and two of ebb in that time.

From the above reaſoning it appears, that the parts of the earth directly under the moon, or that have the moon in their zenith, and alſo thoſe in the nadir, or places diametrically oppoſite to each other, will have the flood, or high water at the ſame time.

Moreover, thoſe parts of the earth, where the moon appears in the horizon, or 90° diſtant from the zenith and nadir, will have the ebbs, or loweſt waters.

It is evident that, by the motion of the earth on its axis, the moſt elevated part of the water is carried beyond the moon in the direction of the rotation. The water continues to riſe after it has paſſed directly under the moon, though the immediate action of the moon there begins to decreaſe, and comes not to its greateſt elevation till it has got half a quadrant farther. It continues alſo to deſcend after it has paſſed at 90° diſtance from the point below the moon, though the force which the moon adds to its gravity begins to decreaſe there. For ſtill the action of the moon adds to its gravity, and makes it deſcend till it has got half a quadrant farther; the greateſt elevation, therefore, is not in the points which are in a line with the centres of the earth and moon, but about half a quadrant to the eaſt of theſe points in the direction of the motion of rotation. Thus in open ſeas, where the water flows freely, the moon M (*fig.* [illegible].) is generally paſt the north and ſouth meridian, as at *p*, when the high water is at Z and at *n*: the reaſon of which is plain, becauſe the moon acts with ſome force after ſhe has paſt the meridian, and thereby adds to the libratory or waving motion, which the water acquired when ſhe was in the meridian; and therefore, the time of high water is not preciſely at the time of her coming to the meridian, but ſome time after.

Beſides, the *tides* anſwer not always to the ſame diſtance of the moon from the meridian at the ſame places; but are variouſly affected by the action of the ſun, which brings them on ſooner when the moon is in her firſt and third quarters, and keeps them back later when ſhe is in her ſecond and fourth; becauſe, in the former caſe, the *tide* raiſed by the ſun alone would be earlier than the *tide* raiſed by the moon, and in the latter caſe later.

2. We have hitherto taken notice only of the action of the moon in producing *tides*; but it is manifeſt that, for the ſame reaſons, the inequality of the ſun's action on different parts of the earth, would produce a like effect, and that this alone would produce a like variation from the exact ſpherical figure of a fluid earth. So that, in reality, there are two *tides* every natural day from the action of the ſun, as there are in the lunar day from that of the moon, ſubject to the ſame laws; and the lunar *tide*, as we have obſerved, is ſomewhat changed by the action of the ſun, and the change varies every day on account of the inequality between the natural and the lunar day. Indeed, the effect of the ſun in producing *tides*, becauſe of his immenſe diſtance, muſt be conſiderably leſs than that of the moon, though the gravity toward the ſun be much greater. For it is not the action of the ſun or that of the moon, but the inequalities in the actions of each, which have any effect. The ſun's diſtance is ſo great, that the diameter of the earth is as a point compared to it, and the difference between the action of the ſun on the neareſt, and that on the fartheſt parts, becomes, on this account, vaſtly leſs than it would be if the ſun was as near as the moon.

However, the immenſe bulk of the ſun makes the effect ſtill ſenſible, even at ſo great a diſtance; and therefore, though the action of the moon has the greateſt ſhare in producing the *tides*, the action of the ſun adds ſenſibly to it when they conſpire together, as in the change and full of the moon, when they are nearly in the ſame line with the centre of the earth, and therefore unite their forces. Thus, in conjunction, or when the ſun and moon are on the ſame ſide of the earth, they both conſpire to raiſe the water in the zenith, and conſequently in the nadir; and when they are in oppoſition, that is, when the earth is between them, whilſt one makes high water in the zenith and nadir, the other does the ſame in the nadir and zenith. Conſequently, in the ſyzygies, or at new and full moon, the *tides* are the greateſt, and are what we call the *ſpring-tides*. Moreover, the action of the ſun diminiſhes the effect of the moon's action in the quarters, becauſe the one raiſes the water in that caſe where the other depreſſes it; and therefore, in the quadratures the *tides* are the leaſt, and are called *neap-tides*.

Sir Iſaac Newton has calculated the effects of the ſun and moon reſpectively upon the *tides*, from their attractive powers. The augmentation of the gravity of the lateral parts of the earth, produced by the action of the ſun, is a ſimilar effect to an augmentation, eſtimated by him on another occaſion, that is made to the gravity of the moon toward the earth by the ſame action, when the moon is in the quarters; only the addition made to the gravity of the lateral parts is about $60\frac{1}{2}$ times leſs, becauſe their diſtance from the earth's centre is ſo many times leſs than the diſtance of the moon from it. The gravity of thoſe parts of the earth that are directly beneath the ſun, and of thoſe oppoſite to it, is diminiſhed by a double quantity of what is added to the lateral parts; and as the diminution of gravity of the one, and augmentation of gravity of the other, conſpire together in raiſing the water under the ſun, and the parts oppoſite to it, above its height in the lateral parts; the whole force that produces this effect is to be conſidered as triple of what is added to the gravity of the lateral parts; and is thence found to be to the gravity of the particles as 1 to 12868200, and to the centrifugal force at the equator as 1 to 44527. The elevation of the waters by this force is conſidered by Newton as an effect ſimilar to the

elevation

elevation of the equatorial parts above the polar parts of the earth, arising from the centrifugal force at the equator; and, being 44527 times less, is found to be 1 foot and 11 $\frac{1}{30}$ inches, Paris measure. This is the elevation arising from the action of the sun upon the water.

Mr. Maclaurin makes this elevation to be 1 foot 10 $\frac{865}{1000}$ inches, of the same measure, which differs from the above estimate by the $\frac{1}{8}$th part of an inch; and the greatest elevation, when the sun is in the equinoctial, 1 foot 11 $\frac{1}{10}$ inches.

In order to find the force of the moon upon the water, Newton compares the *spring-tides*, at the mouth of the river Avon, below Bristol, with the *neap-tides* there, and finds their proportion to be that of 9 to 5; whence, after several necessary corrections, he concludes, that the force of the moon is to that of the sun, in raising the waters of the ocean, as 4,4815 to 1; so that the force of the moon is able, of itself, to produce an elevation of 8 feet and $7\frac{5}{22}$ inches, and the sun and moon together may produce an elevation of about 10 $\frac{1}{2}$ feet, in their mean distances from the earth, and an elevation of about 12 feet, when the moon is nearest the earth. The height to which the water is found to rise, upon coasts of the open and deep ocean, is agreeable enough to this computation.

Dr. Horsley estimates the force of the moon to that of the sun as 5,0469 to 1. Newton. Princip. lib. iii. sect. iii. prop. 36, 37, apud Newt. Op. Ed. Horsley, vol. iii. p. 104, &c. and Maclaurin's Diss. de Causa Physica Fluxus & Refluxus Maris apud Phil. Nat. Princ. Math. Comment. le Seur & Jacquier, tom. iii. p. 272.

3. It must be observed, that the *spring-tides* do not happen precisely at new and full moon, nor the *neap-tides* at the quarters, but a day or two after, because, as in other cases, so in this, the effect is not greatest or least when the immediate influence of the cause is greatest or least. As e. g. the greatest heat is not on the solstitial day, when the immediate action of the sun is greatest, but some time after.

That this may be more clearly understood, let it be considered, that though the actions of the sun and moon were to cease this moment, yet the *tides* would continue to have their course for some time; for the water, where it is now highest, would subside, and flow down on the parts that are lower, till, by the motion of descent, being there accumulated to too great a height, it would necessarily return again to its first place, though in a less measure, being retarded by the resistance arising from the attraction of its parts. Thus it would for some time continue in an agitation like to that in which it is at present. The waves of the sea, that continue after a storm ceases, and every motion almost of a fluid, may illustrate this.

4. The different distances of the moon from the earth produce a sensible variation in the *tides*. When the moon approaches the earth, her action on every part increases, and the differences of that action on which the *tides* depend, increase. For her action increases as the squares of the distances decrease; and though the differences of the distances themselves be equal, yet there is a greater disproportion betwixt the squares of less, than the squares of greater quantities; e. g. 3 exceeds 2 as much as 2 exceeds 1, but the square of 2 is quadruple of the square of 1, whilst the square of 3 (viz. 9) is little more than double the square of 2 (viz. 4).

Thus it appears, that, by the moon's approach, her action on the nearest parts increases more quickly than her action on the remote parts; and the *tides*, therefore, increase in a higher proportion as the distances of the moon decrease. Sir Isaac Newton shews, that the *tides* increase in proportion as the cubes of the distances decrease, so that the moon, at half her present distance, would produce a *tide* eight times greater.

The moon describes an ellipse about the earth, and in her nearest distance produces a *tide* sensibly greater than at her greatest distance from the earth: and hence it is, that two great *spring-tides* never succeed each other immediately; for if the moon be at her nearest distance from the earth at the change, she must be at her greatest distance at the full, having, in the intervening time, finished half a revolution; and, therefore, the *spring-tide* then will be much less than the *tide* at the change was: and for the same reason, if a great *spring-tide* happens at the time of full moon, the *tide* at the ensuing change will be less.

5°. The *spring-tides* are greatest about the time of the equinoxes, i. e. about the latter end of March and September, and least about the time of the solstices, i. e. toward the end of June and December; and the *neap-tides* are least at the equinoxes and greatest at the solstices; so that the difference betwixt the spring and the *neap-tides* is much less considerable at the solstitial than at the equinoctial seasons. In order to illustrate and evince the truth of this observation, it is manifest, that if either the sun or moon was in the pole, they could have no effect on the *tides*, for their action would raise all the water at the equator to the same height; and any place of the earth, in describing its parallel to the equator, would not meet, in its course, with any part of the water more elevated than another, so that there could be no *tide* in any place.

The effect of the sun or moon is greatest when in the equinoctial, ; for then the axis of the spheroidal figure, arising from their action, moves in the greatest circle, and the water is put into the greatest agitation; and hence it is that the *spring-tides* produced, when the sun and moon are both in the equinoctial, are the greatest of any, and the *neap-tides* are the least of any, about that time.

But the *tides* produced when the sun is in either of the tropics, and the moon in either of her quarters, are greater than those produced when the sun is in the equinoctial, and the moon in her quarters, because, in the first case, the moon is in the equinoctial, and, in the latter case, the moon is in one of the tropics; and the *tide* depends more on the action of the moon than that of the sun, and is, therefore, greatest when the moon's action is greatest.

However, it is necessary to observe, 6. That, because the sun is nearer the earth in winter than in summer, the greatest *spring-tides* are after the autumnal, and before the vernal equinox.

7. Since the greatest of the two *tides* happening in every diurnal revolution of the moon, is that wherein the moon is nearest the zenith, or nadir; for this reason, while the sun is in the northern signs, the greater of the two diurnal *tides* in our climates, is that arising from the moon above the horizon; when the sun is in the southern signs, the greatest is that arising from the moon below the horizon.

In proof of this observation, let it be considered, that when the moon declines from the equator toward either pole, one of the greatest elevations of the water follows the moon, and describes nearly the parallel on the earth's surface which is under that which the moon, on account of the diurnal motion, seems to describe; and the opposite greatest elevation, being antipodal to that, must describe a parallel as far on the other side of the equator; so that while the one moves on the north side of the equator, the other moves on the south side of it, at the same distance. Now the greatest elevation which moves on the same side of the equator, with any place, will come nearer to it than the opposite elevation, which moves in a parallel on the other side of the equator; and therefore, if a place is on the same side of the equator with the moon, the *day-tide*, or that which is produced while the moon is above the horizon of the place, will exceed the *night-tide*, or that which is produced while the moon is under the horizon of the place. It is the contrary if the moon is on one side, and the place on the other side of the equator; for then the elevation which is opposite to the moon, moves on the same side of the equator with the place, and, therefore, will come nearer to it than the other elevation. This difference will be greatest when the sun and moon both describe the tropics; because the two elevations in that case describe the opposite tropics, which are the farthest from each other of any two parallel circles they can describe.

Thus it is found, by observation, that the evening *tides* in the summer exceed the morning *tides*, and the morning *tides* in winter exceed the evening *tides*. The difference is found at Bristol to amount to fifteen inches, and at Plymouth to one foot. It would be still greater, but that a fluid always retains an impressed motion for some time; so that the preceding *tides* affect always those that follow them. Upon the whole, while the moon has north declination, the greatest *tides* in the northern hemisphere are when she is above the horizon, and the reverse while her declination is south.

To illustrate this matter by figures; let N E S Q (*fig.* 10, 11, 12) be the earth, N C S its axis, E Q the equator, T ♋ the tropic of Cancer, *t* ♑ the tropic of Capricorn, *a b* the arctic circle, *c d* the antarctic, N the north pole, S the south pole, M the moon, F and G the two eminences of water, whose lowest parts are at *a* and *d* (*fig.* 10.) at N and S (*fig.* 11.) and at *b* and *c* (*fig.* 12.) always 90° from the highest.

Now, when the moon is in her greatest north declination at M, the highest elevation G under her is on the tropic of Cancer, T ♋, and the opposite elevation F on the tropic of Capricorn *t* ♑; and these two elevations describe the tropics by the earth's diurnal rotation. All places

places in the northern hemiſphere ENQ, have the higheſt *tides* when they come into the poſition *b* ♋ Q under the moon; and the loweſt *tides* when the earth's diurnal rotation carries them into the poſition *a* T E, on the ſide oppoſite to the moon; the reverſe happens at the ſame time in the ſouthern hemiſphere E S Q, as is evident to ſight. The axis of the *tides a* C *d* has now its poles *a* and *d* (being always 90° from the higheſt elevations) in the arctic and antarctic circles; and, therefore, it is plain, that at theſe circles there is but one *tide* of flood, and one of ebb, in the lunar day. For when the point *a* revolves half round to *b*, in twelve lunar hours, it has a *tide* of flood; but when it comes to the ſame point *a* again in twelve hours more, it has the loweſt ebb. In ſeven days afterward, the moon M comes to the equinoctial circle, and is over the equator E Q, when both elevations deſcribe the equator; and in both hemiſpheres, at equal diſtances from the equator, the *tides* are equally high in both parts of the lunar day. All the phenomena being reverſed, when the moon has ſouth declination, to what they were when her declination was north, require no farther deſcription.

8. Such would the *tides* regularly be, if the earth were all over covered with ſea very deep, ſo that the water might follow the influence of the ſun and moon; but, by reaſon of the ſhoalneſs of ſome places, and the narrowneſs of the ſtreights in others, by which the *tides* are propagated, there ariſes a great diverſity in the effect, not to be accounted for, without an exact knowledge of all the circumſtances of the places; as the poſition of the land, and the breadth and depth of the channels, direction of the winds, &c. For a very ſlow and imperceptible motion of the whole body of water, where it is (for example) two miles deep, will ſuffice to raiſe its ſurface ten or twelve feet in a *tide's* time; whereas, if the ſame quantity of water were to be conveyed through a channel of forty fathom deep, it would require a very great ſtream to effect it in ſo large inlets as are the channel of England, and the German ocean; whence the *tide* is found to ſet ſtrongeſt in thoſe places where the ſea grows narroweſt, the ſame quantity of water being, in that caſe, to paſs through a ſmaller paſſage.

This is moſt evident in the ſtreights between Portland and C. la Hogue in Normandy, where the tide runs like a ſluice: and would be yet more between Dover and Calais, if the *tide*, coming round the iſland, did not check it.

This force, being once impreſſed upon the water continues to carry it above the level of the ordinary height in the ocean, particularly where the water meets a direct obſtacle, as it does in St. Maloes; and where it enters into a long channel, which running far into the land, grows very ſtrait at its extremity, as it does into the Severn ſea at Chepſtow and Briſtol.

This ſhoalneſs of the ſea, and the intercurrent continents, are the reaſons that in the open ocean the *tides* riſe but to very ſmall heights in proportion to what they do in wide-mouthed rivers, opening in the direction of the ſtream of the tide; and that high water is not at the time of the moon's appulſe to the meridian, but always ſome hours after it, as it is obſerved upon all the weſtern coaſt of Europe and Africa, from Ireland to the Cape of Good Hope; in all which a ſouth-weſt moon makes high water; and the ſame is reported to hold in the weſt of America.

So that *tides* happen to different places at all diſtances of the moon from the meridian, and conſequently at all hours of the lunar day.

It is to be conſidered that, in order to allow the *tides* their full motion, the ocean, in which they are produced, ought to be extended from eaſt to weſt 90° at leaſt. Becauſe the places, where the moon raiſes moſt, and moſt depreſſes the water, are at that diſtance from each other. Hence it appears, that it is only in the great oceans that ſuch *tides* can be produced, and why in the larger Pacific Ocean they exceed thoſe in the Atlantic Ocean. Hence alſo it is obvious, why the *tides* are not ſo great in the torrid zone, between Africa and America, where the ocean is narrower, as in the temperate zones on either ſide; and we may hence alſo underſtand, why the *tides* are ſo ſmall in iſlands that are very far diſtant from the ſhores. It is manifeſt, that, in the Atlantic Ocean, the water cannot riſe on one ſhore but by deſcending on the other; ſo that, at the intermediate diſtant iſlands, it muſt continue at a mean height betwixt its elevation on one and on the other ſhore. But when *tides* paſs over *ſhoals*, and through ſtraits into bays of the ſea, their motion becomes more various, and their height depends on many circumſtances.

The *tide* that is produced on the weſtern coaſts of Europe, in the Atlantic, correſponds to the ſituation of the moon already deſcribed. Thus it is high water on the coaſts of Spain, Portugal, and the weſt of Ireland, about the third hour after the moon has paſſed the meridian; from thence it flows into the adjacent channels, as it finds the eaſieſt paſſage. One current from it, *e. g.* runs up by the ſouth of England, another comes [illegible] by the north of Scotland; they take a conſiderable time to move all this way, and it is high water ſooner in the places to which they firſt come, and it begins to fall at thoſe places, while they are ſtill going on to others that are farther in their courſe. As they return, they are not able to raiſe the tide, becauſe the water runs faſter off than it returns, till, by a new tide propagated from the open ocean, the return of the current is ſtopped, and the water begins to riſe again. The tide, propagated by the moon, in the German Ocean, when ſhe is three hours paſt the meridian, takes twelve hours to come from thence to London Bridge; ſo that, when it is high water there, a new *tide* is already come to its height in the ocean; and, in ſome intermediate place, it muſt be low water at the ſame time.

Conſequently, when the moon has north declination, and we ſhould expect the *tide* at London to be the greateſt when the moon is above the horizon, we find it is leaſt; and the contrary when ſhe has ſouth declination.

At ſeveral places it is high water three hours before the moon comes to the meridi an; but that tide which the moon puſhes, as it were, before her, is only the *tide* oppoſite to that which was raiſed by her when ſhe was nine hours paſt the oppoſite meridian.

It would be endleſs to recount all the particular ſolutions which are eaſy corollaries from this doctrine; as, why the lakes and ſeas, ſuch as the Caſpian ſea and the Mediterranean ſea, the Black ſea and Baltic, have no ſenſible *tides*: for lakes are generally ſo ſmall, that when the moon is vertical ſhe attracts every part of them alike, and therefore, no part of the water can be raiſed higher than another: and having no communication with the ocean, it can neither increaſe nor diminiſh their water, in order to riſe and fall; and ſeas that communicate by ſuch narrow inlets, and are of ſo immenſe an extent, cannot, in a few hours time, receive and empty water enough to raiſe or ſink their ſurface any thing ſenſibly.

To demonſtrate the excellency of this doctrine, the example of the *tides* in the port of Batſha, in the kingdom of Tunquin in the Eaſt Indies, 20° 50′ north lat. which are ſo extraordinary and different from all others we have yet heard of, may ſuffice.

The day in which the moon paſſes the equinoctial, the water ſtagnates there without any motion; as the moon removes from the equinoctial, the water begins to riſe and fall once a day; and it is high-water at the ſetting of the moon, and low water at her riſing. This daily tide increaſes for about ſeven or eight days, and then decreaſes for as many days by the ſame degrees, till this motion ceaſes, when the moon has returned to the equinoctial. When ſhe has paſſed the equinoctial, and declines toward the ſouth pole, the water riſes and falls again as before; but it is high water now at the riſing, and low water at the ſetting of the moon.

Sir Iſaac Newton, in order to account for this extraordinary tide, conſiders that there are two inlets to this port of Batſha, one from the Chineſe ocean, betwixt the continent and the Manillas, the other from the Indian ocean betwixt the continent and Borneo. This leads him to propoſe, as a ſolution of this phenomenon, that a *tide* may arrive at Batſha, through one of theſe inlets, at the third hour of the moon, and another through the other inlet ſix hours after, at the ninth hour of the moon. For, while theſe *tides* are equal, the one flowing in as the other ebbs out, the water muſt ſtagnate; now they are equal when the moon is in the equinoctial; but as ſoon as the moon begins to decline on the ſame ſide of the equator with Batſha, it has been ſhewn that the diurnal *tide* muſt exceed the nocturnal, ſo that two greater and two leſſer *tides* muſt arrive at Batſha by turns. The difference of theſe will produce an agitation of the water, which will riſe to its greateſt height at the mean time betwixt the two greateſt *tides*, and fall loweſt at a mean time betwixt the two leaſt *tides*; ſo that it will be high water about the ſixth hour at the ſetting of the moon, and low water at her riſing. When the moon has got to the other ſide of the equinoctial, the nocturnal *tide* will exceed the diurnal; and, therefore, the high water will be at the riſing, and low water at the ſetting of the moon.

The ſame principles will ſerve to account for other extraordinary *tides*, which, we are told, are obſerved in places whoſe ſituation expoſes them to ſuch irregularities.

When the time of high water at any place is, in general, mentioned, it is to be underſtood on the days of the ſy-

zygies, or days of new and full moon; when the ſun and moon paſs the meridian of the place at the ſame time. Among pilots, it is cuſtomary to reckon the time of flood, or high-water, by the point of the compaſs the moon bears on, allowing $\frac{3}{4}$ of an hour for each point, at that time; thus, on the full and change days, in places where it is flood at noon, the tide is ſaid to flow north and ſouth, or at twelve o'clock; in other places, on the ſame days, where the moon bears 1, 2, 3, 4, or more points to the eaſt or weſt of the meridian, when it is high-water, the tide is ſaid to flow on ſuch point; thus, if the moon bears S. E. at flood, it is ſaid to flow S. E. and N. W. or three hours before the meridian, that is, at 9 o'clock; if it bears S. W. it flows S. W. and N. E. or at three hours after the meridian; and in like manner for other points of the moon's bearing.

The times of high-water in any place fall about the ſame hours after a period of about fifteen days, or between one ſpring tide and another; but during that period, the times of high-water fall each day later by about 48 minutes.

From the obſervations of many perſons, there have been collected the times when it is high-water on the days of the new and full moon, on moſt of the ſea-coaſts of Europe, and many other places; which are uſually put in a table againſt the names of the places; a ſpecimen of which is ſubjoined.

Names of Places.		Coaſt.	High water H.	M.
Abbrevrak,	France	Engliſh chann.	4	30
Aberdeen,	Scotland	German ocean	0	45
Aldborough,	England	Ditto	9	45
I. Alderney,	ditto	Engliſh chann.	12	00
R. Amazons, mouth,	Am.	Atlantic ocean	6	00
I. Ameyland,	Dutchland	German ocean	7	30
Amſterdam,	ditto	Ditto	3	00
St. Andrew's,	Scotland	Ditto	2	15
I. Anholt,	Denmark	Sound	0	00
Antwerp,	Flanders	River Schelde	6	00
Archangel,	Ruſſia	White ſea	6	00
I. Arran,	Ireland	St. Geo. chan.	11	00
R. Aſhley,	Carolina	Atlantic ocean	0	45
St. Auguſtine,	Florida	Ditto	4	30
Baltimore,	Ireland	Weſtern ocean	4	30
C. Barfleur,	France	Engliſh chann.	7	30
I. de Bas,	ditto	Ditto	3	45
Bayonne,	ditto	Bay of Biſcay	3	30
Beachy-head,	England	Engliſh chann.	0	00
N. Bear, } S. Bear, }	Labrador	Hudſon's bay	12	00
Belfaſt,	Ireland	Iriſh ſea	10	00
Belliſle,	France	Bay of Biſcay	3	30
I. Bermudas,	Bahama iſles	Atlantic ocean	7	00
Berwick,	England	German ocean	2	30
I. du Bic,	Acadia	R. St. Lawr.	2	00
Blackney,	England	German ocean	6	00
C. Blanco,	Negroland	Atlantic ocean	9	45
Blanchart-race,	France	Engliſh chann.	0	00
Port Louis,	ditto	Bay of Biſcay	3	00
C. Bojador,	Negroland	Atlantic ocean	0	00
Bourdeaux,	France	Bay of Biſcay	3	00
Boulogne,	ditto	Engliſh chann.	10	30
Bremen,	Germany	R. Weſer	6	00
Breeſound,	Dutchland	German ocean	4	30
Breſt,	France	Bay of Biſcay	3	45
Bridlington-bay,	Engliſh	German ocean	3	45
Brill,	Dutchland	Ditto	1	30
Briſtol,	England	St. Geo. chan.	6	45
Buchanneſs,	Scotland	German ocean	3	00
Button's iſles,	N. Britain	Hudſon's ſtraits	6	50
Cadiz	Spain	Atlantic ocean	4	30
Caen,	France	Engliſh chann.	9	00
Calais,	ditto	Ditto	11	30
I. Caldy,	England	St. Geo. chan.	5	15
Camfer,	Dutchland	German ocean	1	30
I. Canaria,	Canaries	Atlantic ocean	3	00
C. Cantin,	Barbary	Ditto	0	00
Caſkets,	I. Guernſey	Engliſh chann.	8	15
Caithneſs point,	Scotland	Weſtern ocean	9	00
Charles town,	Carolina	Aſhley river	3	00
I. of Charles,	Labrador	Hudſon's ſtraits	10	15
Chignectow,	Nova Scotia	Bay of Fundy	0	45
Cherbourg,	France	Engliſh chann.	7	30
C. and R. Churchill,	N. Wales	Hudſon's bay	7	20
C. Clear,	Ireland	Weſtern ocean	4	30
Concarneau,	France	Bay of Biſcay	3	00
Conquet	ditto	Engliſh chann.	2	15
I. Coquet,	England	German ocean	3	00
Corke,	Ireland	St. Geo. chan.	6	30
C. Corſe,	Guinea	Ethiopian ſea	3	30
Cromer,	England	German ocean	7	00
Dartmouth,	England	Engliſh chann.	6	30
St. David's Head,	Wales	St. Geo. chan.	6	00
Dieppe,	France	Engliſh chann.	10	30
Dort,	Dutchland	German ocean	3	00
Dover,	England	Engliſh chann.	11	30
Downs,	ditto	German ocean	1	15
Dublin,	Ireland	Iriſh ſea	9	15
Dunbar,	Scotland	German ocean	2	30
Dundee,	ditto	Ditto	2	15
Dungarvan,	Ireland	Atlantic ocean	4	30
Dungeneſs,	England	Engliſh chann.	9	45
Dunkirk,	France	German ocean	0	00
Dunnoſe,	I. of Wight	Engliſh chann.	9	45
Edinburgh,	Scotland	German ocean	4	30
Edyſtone,	England	Engliſh chann.	5	30
R. Elbe mouth,	Germany	German ocean	0	00
Embden,	ditto	Ditto	0	00
Enchuyſen,	Dutchland	Zuyder ſea	0	00
Eſtaples,	France	Engliſh chann.	11	00
Falmouth,	England	Ditto	5	30
Flamborough-head,	ditto	German ocean	4	00
C. Florida,	Florida	Gulf of Mexico	7	30
Fluſhing,	Dutchland	German ocean	0	45
I. Fly,	ditto	Ditto	7	30
N. Foreland,	England	Ditto	9	45
S. ditto,	ditto	Engliſh chann.	9	45
Foulneſs,	ditto	German ocean	6	45
Foye,	ditto	Engliſh chann.	5	15
R. Garonne,	France	Bay of Biſcay	3	00
Gaſpey-bay,	Acadia	Gulf St. Lawr.	1	30
Gibraltar,	Spain	Mediterran. ſea	0	00
C. Good Hope,	Caffers	Indian ocean	3	00
Granville,	France	Engliſh chann.	7	00
Graveline,	ditto	Ditto	0	00
Graveſend,	England	R. Thames	1	30
Groine, or C. Corunna,	Sp.	Bay of Biſcay	3	00
I. Guernſey,	England	Engliſh chann	1	30
Halifax,	Nova Scotia	Weſtern ocean	7	30
Hamburgh,	Germany	River Elbe	6	00
Haarlem,	Dutchland	German ocean	9	00
Hartlepool,	England	Ditto	3	00
Harwich,	ditto	Ditto	11	15
Havre de Grace,	France	Engliſh chann.	9	00
C. Henry,	Virginia	Atlantic ocean	11	15
Holyhead,	Wales	Iriſh ſea	1	30
Honfleur,	France	River Seine	9	00
Hull,	England	River Humber	6	00
R. Humber entrance	ditto	German ocean	5	13
Ice Cove,	N. Main	Hudſon'sſtraits	10	00
Fort St. John's,	Newfoundland	Atlantic ocean	6	00
St. John de Luz,	France	Bay of Biſcay	3	30
Port St. Julian,	Patagonia	S. Atlantic oc.	4	45
Kentiſh Knock,	England	German ocean	0	00
I. Kilduin,	Lapland	North. ocean	7	30
Kinſale,	Ireland	Atlantic ocean	5	15
Land's-end	England	St. Geo. chan.	7	30
Leith,	Scotland	German ocean	4	30
Leoſtoffe,	England	Ditto	9	45
Liverpool,	ditto	Iriſh ſea	11	15
I. Lewes, N. Port,	Scotland	Weſtern ocean	6	30
Lime,	England	Engliſh chann.	7	00
Liſbon,	Portugal	River Tagus	2	15
Lizard,	England	Engliſh chann.	7	30
London,	ditto	R. Thames	3	00
N. London,	New England	Weſtern ocean	1	30
Long Iſland,	ditto	Ditto	3	00
Longſand-head,	England	German ocean	10	30
I. Lundy,	ditto	St. Geo. chan.	5	15
Lynn,	ditto	German ocean	6	00
I. Madeira,	Canaries	Atlantic ocean	12	04
R. Maes Mouth,	Dutchland	German ocean	1	30
St. Maloe's,	France	Engliſh chann.	6	00
I. Man, weſt end	England	Iriſh ſea	9	00
Margate,	ditto	Engliſh chann.	11	15
Milford.	Wales	St. Geo. chan.	5	15
Mount's Bay,	England	Engliſh chann.	4	30
Nantes,	France	Bay of Biſcay	3	00
Naze,	Norway	Weſtern ocean	11	15
Needles,	England	Engliſh chann.	10	15
Newcaſtle,	ditto	German ocean	3	15
Nieuport,	Flanders	Ditto	12	00
Nore,	England	R. Thames	0	00
N. Cape,	Lapland	North. ocean	3	00
Orfordneſs,	England	German ocean	9	45
Orkney iſles, limits,	Scotl	Weſtern ocean	3	00
Oſtend,	Flanders	German ocean	12	00
Placentia,	Newfoundland	Atlantic ocean	9	00

Names of Places.		Coast.	High water H.	M.
Plymouth, -	England	English chann.	6	00
Portland, -	ditto	Ditto -	8	15
Portsmouth, -	ditto	Ditto -	11	15
Quebec, -	Canada	R. St. Lawr.	7	30
I. of Rhee, -	France	Bay of Biscay	3	00
Rochefort, -	ditto	Ditto -	4	15
Rochelle, -	ditto	Ditto -	3	45
Rochester, -	England	River Medway	0	45
Rotterdam, -	Dutchland	German ocean	3	00
Rouen, -	France	River Seine	1	15
Rye, -	England	English chann.	11	15
Sandwich, -	ditto	Downs	11	30
Scarborough-head,	ditto	German ocean	3	45
Scilly isles, -	ditto	St. Geo. chan.	3	45
R. Senegal, -	Negroland	Atlantic ocean	10	30
R. Severn, -	England	St. Geo. chan.	6	00
R. Seine, -	France	English chann.	9	00
Sheerness, -	England	R. Thames	0	00
Sierra Leona -	Guinea	Atlantic ocean	8	15
Shoreham, -	England	English chann.	10	30
I. Shetland, limits,	Scotland	Western ocean	3	00
I. Sky, -	ditto	Ditto -	5	30
Southampton, -	England	English chann.	0	00
Spurn, -	England	German ocean	5	15
Start-point, -	ditto	English chann.	6	45
Stockton, -	ditto	German ocean	5	15
Strongford bay,	Ireland	Irish sea	10	30
Sunderland, -	England	German ocean	3	30
Swin, -	ditto	Ent. Thames	12	00
Tamarin-town, -	Sokotra	Indian ocean	9	00
R. Tees, mouth,	England	German ocean	3	00
I. Teneriffe, -	Canaries	Atlantic ocean	3	00
I. Texel, -	Dutchland	German ocean	7	30
R. Thames, mouth,	Engl.	Ditto -	1	30
Tinmouth, -	ditto	German ocean	3	0
Topsham, - -	ditto	English chann.	6	00
Torbay, - -	ditto	Ditto -	5	15
I. Tory, -	Ireland	Western ocean	5	30
St. Valery, -	France	English chann.	10	30
Vannes, -	ditto	Bay of Biscay	3	45
I. Ushant, -	France	English chann.	4	30
Waterford, -	Ireland	St. Geo. chan.	6	30
Weymouth, -	England	English chann.	7	00
Whitby, -	ditto	German ocean	3	00
I. of Wight, N. S. E.&W.end		English chann.	0	00
Winchelsea, -	England	Ditto -	0	45
Wintertonness, -	ditto	German ocean	9	00
Yarmouth, -	ditto	Ditto -	9	45
York Fort	New Wales	Hudson's bay	9	10
New York -	-	Atlantic ocean	3	00
Youghall, -	Ireland	St. Geo. chan.	4	30

The following times serve for coasts of considerable extent, and nearly for the places on those coasts, viz. Finmark, or N. N. W. coast of Lapland, $1^h\ 30'$; Jutland isles, $0^h\ 0'$; Friesland coast, $7^h\ 30'$; Zealand coast, $1^h\ 30'$; Flanders coast, $0^h\ 00'$; Picardy and Normandy coasts, $10^h\ 30'$; Biscay, Gallician, and Portugal coasts, $3^h\ 00'$; Irish west coast, $3^h\ 00'$; Irish south coast, $5^h\ 15'$; Africa west coast, $3^h\ 00'$; America west coast $3^h\ 00'$; America east coast, $4^h\ 30'$.

The use of the preceding table is to find the time of high-water at any of the places contained in it: for this purpose find the time of the moon's southing on a given day, see MOON; and then add the time which the moon has passed the meridian on the full and change days, to make high-water at that place; and the sum shews the time of high-water on the given day.

E. g. at what time will it be high-water at London on the 25th of December, 1784? Moon souths at $9^h\ 36'$, to which add 3; the sum $12^h\ 36'$ shews that it will be high-water at about 36′ after noon.

See on the subject of this article Newton. Princ. Math. lib. iii. prop. 24. and De System. Mundi, sect. 38—54. Apud Opera Ed. Horsley, tom. iii. p. 52, &c. p. 203, &c. Maclaurin's Account of sir I. Newton's Discoveries, book iv. chap. 7. Ferguson's Astron. chap. xvii. Robertson's Navig. book vi. sect. vii. viii. ix.

TIDE-*dial*, is the name of an instrument contrived by Mr. Ferguson, for exhibiting and determining the state of the *tides*. It is represented in *Tab.* IV. *Dialling*, *fig.* 42. and the external parts of it consist of 1. an eight-sided box, on the top of which, at the corners, are shewn the phases of the moon at the octants, quarters, and full. Within these is a circle of 29½ equal parts, which are the days of the moon's age reckoned from the sun at new moon, round to the sun again. Within this circle is one of twenty-four hours divided into their halves and quarters. 2. A moving elliptical plate, painted blue, to shew the rising of the *tides* under and opposite to the moon, with the words *high-water*, *tide-falling*, *low water*, *tide-rising*, marked upon it. To one end of this plate is fixed the moon M by the wire W, which goes along with it. 3. Above this elliptical plate is a round one, with the points of the compass upon it, and also the names of above two hundred places in the large machine (but only thirty-two in the figure, to avoid confusion) set over those points on which the moon bears when she raises the *tides* to the greatest heights at these places, twice in every lunar day; and to the north and south points of this plate are fixed two indexes I and K, which shew the times of high water, in the hour-circle, at all these places. 4. Below the elliptical plate are four small plates, two of which project out from below its ends at new and full moon; and so, by lengthening the ellipsis, shew the *spring tides*: the other two of these small plates appear at low water when the moon is in her quadratures, or at the sides of the elliptic plate, to shew the neap-*tides*. When any two of these small plates appear, the other two are hid; and when the moon is in her octants, they all disappear. Within the box are a few wheels for performing these motions by the handle H. Turn the handle till the moon M comes to any given day of her age in the circle of 29½ equal parts, and the moon's wire W will intersect the time of her coming to the meridian on that day, in the hour-circle: the XII under the sun being mid-day, and the opposite XII mid-night: then looking for the name of any given place on the round plate (which makes 29½ rotations, whilst the moon M makes only one revolution from the sun to the sun again) turn the handle till that place comes to the word *high-water* under the moon, and the index which falls among the forenoon hours will shew the time of high-water at that place in the forenoon of the given day: then turn the plate half round, till the same place comes to the opposite high-water mark, and the index will shew the time of high water in the afternoon at that place. And thus, as all the different places come successively under and opposite to the moon, the indexes shew the times of high-water at them in both parts of the day; and when the same places come to the low-water marks, the indexes shew the times of low-water. For about three days before and after the times of new and full moon, the two small plates come out a little way from below the high water marks on the elliptical plate, to shew that the *tides* rise still higher about these times: about the quarters, the other two plates come out a little from under the low-water marks toward the sun, and on the opposite side, shewing that the *tides* of flood rise not then so high, nor do the *tides* of ebb fall so low, as at other times. For the description of the inside work of this machine, and the method of constructing it, see Ferguson's Astron. p. 297.

TIDE-*gage*. See GAGE.

TIDE-WAITERS, or TIDE-MEN, certain officers belonging to the custom-house, appointed to watch or attend on ships coming from abroad, to see that nothing be landed till the customs be paid.

They are thus called, because they go aboard the ships at their arrival in the mouth of the Thames, and come up with the *tide*.

TIER, in the *Sea-language*, the name of the several ranges of guns mounted on one side of a ship's deck; which, according as they are placed on the lower, middle, or upper decks, are called the lower, middle, or upper *tier*.

TIER *of the cable*, denotes a range of the fakes or windings of the cable, which are laid within one another in an horizontal position, so as that the last becomes the innermost.

TIER, *cable*, is the hollow space in the middle of a cable, when it is coiled.

TIERCE, or TEIRCE, a measure of liquid things, as wine, oil, &c. containing the third part of a pipe, or forty-two gallons.

TIERCE, in *Music*. See THIRD.

TIERCE, in *Gaming*, a sequence of three cards of the same colour.

TIERCE, in *Fencing*. See GUARD and THRUST.

TIERCE *order*. See THIRD *Order*.

TIERCE *point*. See THIRD *point*.

TIERCED, TIERCE, in *Heraldry*, denotes the shield to be divided by any of the partition lines, party, coupy, tranchy, or tailly, into three equal parts, of different colours or metals.

If the chief and base be of the same colour when divided by a fesse, they blazon it by expressing the colour, and mentioning the fesse; otherwise, they say, it is *tierce in fess*, and mention each of the colours, or *tierce in pale*, if so divided in pale.

TIERCEL, in *Falconry*, a name given to a male hawk, as being a third part less in size than the female.

TIER-

TIERCELET. See Tassel.

TIES, *aboard a Ship*, are thoſe ropes by which the yards hang; and, when the halliards are ſtrained to hoiſe the yards, theſe *ties* carry them up.

TIFACOUM, a word uſed by ſome of the chemical writers to expreſs quickſilver.

TIFATUM, a word uſed by ſome of the chemical writers to expreſs ſulphur.

TIFFE *de mer*, in *Natural Hiſtory*, a name given by count Marſigli to a ſpecies of ſea plant, as he ſuppoſes it to be, commonly but erroneouſly reckoned among the ſpunges, and called by authors, a *branched ſpunge*. This author has called it by this name from its reſemblance to the heads of the *typha paluſtris*, or cat's tail, when ripe in the month of September.

The ſpunges muſt be of a lax and cavernous texture; but this ſubſtance is ſmooth and firm, and has no inequalities on its ſurface, excepting a few ſhort hairs, which gives it a velvety look, when firſt taken out of the water. It is a very elegant and beautiful ſubſtance; it grows to two feet in height, and is very elegantly branched; it grows on rocks and ſtones, and, when firſt taken out of the ſea, is full of a viſcous water, as yellow as the yolk of an egg; but when this water is preſſed out, and the ſubſtance dries, it loſes its yellow, and becomes of a duſky brown colour: it is very tough and firm while in the water, but when dry it uſually breaks of itſelf into little pieces, and may be crumbled to powder between the fingers. This is a very ſtrong proof, among others, of its not being of the nature of the ſpunge.

When viewed by the microſcope, the whole ſurface is found to be covered with extremely fine and ſlender hairs; and, amongſt theſe, there are an infinity of little apertures, through which the ſea-water makes it way.

When a branch of it is cut tranſverſely, there are ſeen a number of long and fine canals, by means of which the water, received at theſe ſuperficial apertures, is conveyed to its whole ſubſtance. Marſig. Hiſt. de la Mer. p. 82.

Subſtances of this kind are now known to be of animal and not of vegetable origin. See Coral.

TIGE, in *Architecture*, a French term for the ſhaft or fuſt of a column, comprehended between the aſtragal and the capital.

TIGEGUACU, in *Ornithology*, the name of a ſmall Braſilian bird, of the ſize of a ſparrow, and with a ridged and triangular bill, in which it reſembles the moucherolle; its eyes are of a fine blue, and its legs and feet yellow; it is all over of a deep black, but that it has a large blood-red ſpot on the top of its head; its tail is ſhort and black.

TIGER, *tigris*, in *Zoology*, is a ſpecies of cat, or felis *tigris*, with a long tail and body marked with coloured ſtripes, in the Linnæan ſyſtem. See *Tab.* V. *Quadrupeds*, Nº 63.

The *tiger* has a ſmooth head and body, and prodigious ſtrength in its limbs; its colour is a pale yellow, beautifully marked with long ſtripes of black, from the back pointing to the belly, with others acroſs the thighs; the tail is a third ſhorter than the body, and annulated with black. This animal is often ſuperior in ſize to a lion: that called the *royal tiger* is of a tremendous bulk. The Chineſe *tiger* varies in colour, ſome being white, ſtriped with black and grey.

The ſkull of this creature, both as to the teeth and other particulars, very much reſembles that of the cat, except that, in the room of the tranſverſe ſutures of the cat's, there is in the *tiger's* one in the figure of a great Y, ſo cloſe and firm, that the bones ſeem contiguous.

Its tuſks are a little crooked, like thoſe of the dog and cat; their exerted part very white, and the bow of ſome of them very long, not leſs than five inches; its claws are whitiſh and ſemitranſparent, very flat, ſharp, and pointed, and extremely hooked, every way in colour and ſhape like the claw of a cat; uſually on the forepaws of the larger *tigers*, theſe are at the baſis an inch broad, and are two inches and a half long; the bone on which the claw is ſet receives it into a little groove, and is by a double epiphyſis itſelf inſerted into the claw; by which means the claw is firmly held in its place. Grew's Muſ. p. 13.

The *tiger* (formed of נִיר *ſagitta, a dart*, whence תִּגִיר) has its name from its ſuppoſed ſwiftneſs, and has been deſcribed by almoſt all authors as one of the ſwifteſt of all the wild carnivorous animals, but this has been contradicted by ſome modern authors, who declare that it is a ſlow and ſluggiſh animal, and is unable to overtake a man, or almoſt any animal that has an opportunity of running away from it. It will give two or three large leaps; but if it do not ſeize its prey in theſe, is but ill qualified to catch it afterwards. However, Mr. Pennant cites the authorities of two travellers of credit, viz. Mr. Bell and F. Gerbillon, who confirm the opinion of the *tiger's* ſpeed.

Margraave deſcribes three ſpecies of American *tigers*, the firſt called *jaguera* by the natives, and by the Portugueſe *onca*; the ſecond diſtinguiſhed by the natives by the name *jaguerete*, but called by the Portugueſe by the ſame name with the other; the third called by the Indians cugua-cuarana, and by the Portugueſe, the *tiger*, which is the felis *concolor* of Linnæus. But the two firſt ſeeming to be the ſame with what we know by the name of the *ounce*, and having round, not long variegations, ſeem properly of the panther, and not of the *tiger* kind.

The *tiger* is peculiar to Aſia, though Buffon ſays they are found in the South of Africa. It is found as far north as China and Chineſe Tartary, but the greateſt numbers, the largeſt, and the moſt cruel, are met with in India, and its iſlands. In Sumatra, the natives ſeldom kill them, apprehending that they are animated by the ſouls of their anceſtors. They are the ſcourge of the country, lurking among the buſhes, on the ſides of rivers, and almoſt depopulating many places; they are inſidious, blood-thirſty, and malevolent; and ſeem to prefer preying on the human race rather than any other animals: they do not purſue their prey, but bound on it from their ambuſh, with an elaſticity, and from a diſtance, that are ſcarcely credible; if they miſs the object, they make off; but if they ſucceed, they carry it off with ſuch eaſe, that it ſeems not the leaſt impediment to their flight. If they are undiſturbed, they plunge their heads into the bodies of the animals, which they ſeize, up to their eyes, as if it were to ſatiate themſelves with blood, which they exhauſt the carcaſes of before they tear them to pieces. There is, ſays Mr. Pennant, a ſort of cruelty in their devaſtations unknown to the generous lion; as well as a poltroonery in their ſudden retreat on any diſappointment. Hiſt. Quad. vol. i. p. 256.

The manner of carrying off the young brood of this animal is deſcribed by Pliny as follows: the Hircanians and Indians bring up the *tiger*, ſays he, an animal of a dreadful ſwiftneſs, which is moſt put to the proof when going to be taken; the whole brood, which is always very numerous, is carried off upon a horſe as ſwift as poſſible, and often removed to a freſh one. When the mother *tiger* finds the neſt empty, and the brood gone, for the males take no care of them, ſhe traces the ſcent with furious ſpeed; and when ſhe is arrived within hearing of the perſon who is carrying off her young, he throws down one of them; this ſhe takes up in her mouth, and, as if made more ſwift by her load, carries it back, and then returning, is treated in the ſame manner till the perſon gets on board a ſhip, and leaves her to vent her rage on the ſhore. Plin. Nat. Hiſt. lib. viii. cap. 18.

Tiger, *American*. See Onca and Jaguara.

Tiger-*cat*, a ſpecies of cat, about the ſize of the wild cat, with a coat as much ſtriped and varied as that of a *tiger*; its tail is long, ſtreaked with black; the body yellow, with black ſtripes above, and round black ſpots below; the ears are black, each marked with a white lunated ſpot. This animal, briefly deſcribed from its ſkin by Mr. Pennant, has been lately ſcientifically deſcribed by Dr. Forſter. It is found in all parts of Africa, from Congo to the Cape of Good Hope: lives in mountainous and woody tracts, and in its wild ſtate is a great deſtroyer of hares, rabbits, lambkins, young antelopes, and of all the feathered tribe. Its manners and œconomy are perfectly analogous to thoſe of our domeſtic cats. See the deſcription, illuſtrated by a figure, in Phil. Tranſ. vol. lxxi. par. i. p. 1. &c.

Tiger, *hunting*, or *leopard*. See Leopard.

Tiger, *man*. See Mantegar.

Tiger *ſhell*, a name given to the red voluta, with large white ſpots.

In the Linnæan ſyſtem, the *tiger-ſhell* is a ſpecies of the cypræa. See Shells.

TIGH, in *our Old Writers*, a cloſe or incloſure mentioned in ancient charters, and is ſtill uſed in Kent in the ſame ſenſe.

TIGHT, in *Sea Language*, expreſſes the quality whereby a veſſel reſiſts the penetration of any fluid, whether compreſſing its ſurface, or contained within it. Hence a ſhip is ſaid to be *tight*, when her planks are ſo compact and ſolid, as to prevent the entrance of the water in which ſhe is immerſed; and a caſk is called *tight*, when the ſtaves are ſo cloſe that none of the liquid contained in it can iſſue through or between them. In both ſenſes *tight* is oppoſed to leaky. Falconer.

TIGILLUM, a word uſed by ſome chemiſts to expreſs the tile with which they cover the mouth of their crucibles; and, by others, for the crucible itſelf.

TIGLIUM, in *Botany*. See PINEI *nuclei*, &c.

TIGRIS, in *Zoology*. See TIGER.

TIHOL, in *Natural Hiſtory*, a name given by the people of the Philippine Iſlands to a ſpecies of crane very frequent among them, and remarkable for its ſize, being taller than a man, when it ſtands erect, and holds up its neck. They call it alſo ſometimes *tipul*.

TIJEGUACU-*paroara*, in *Ornithology*, the name of a Braſilian bird, of the ſize of a lark; it has a ſhort and thick beak, brown above and whitiſh below; its head, throat, ſides, and the lower part of its neck, are of a fine yellow, variegated with red in the female, and all over of a perfect blood-red in the male; the upper part of the neck, and the whole back are grey, with a mixture of brown; the wings are brown tipped with white; the tail is of the ſame colour; and the ſides of the neck, the breaſt, belly, and thighs are white. Marggrave's Hiſt. Braſil.

TIJEPIRANGA, in *Ornithology*, the name of a Braſilian bird of the ſparrow-kind. It is a little larger than the lark; its whole body, neck, and head, are of a very fine red or blood colour, and its wings and tail black.

There is another ſpecies alſo of this bird, which is of the ſize of a ſparrow, and is of a bluiſh grey on the back, white on the belly, and of a ſea-green on the wings; the legs of this are of a pale grey. Marggrave's Hiſt. Braſil.

TIKE, the Zetland name for an OTTER, of which there are many to be found about that iſland. Phil. Tranſ. N° 473. ſect. 8.

TIKE is alſo uſed for a ſmall bullock or heifer, for a particular ſort of worm, and in Scotland for a dog.

TILBURY-*water*, in *Medicine*, is an acidulous or ſaline water, iſſuing from a ſpring, ſituated near a farm-houſe at *Weſt-Tilbury*, near *Tilbury Fort*, in Eſſex. This water is of a ſtraw-colour, ſoft and ſmooth to the taſte, but leaving, after agitation in the mouth, a ſmall degree of roughneſs on the tongue; it throws up a ſcum variegated with ſeveral colours, which feels greaſy; and effervesces with ſpirit of vitriol; it mixes ſmooth with milk, but curdles with ſoap; when boiled, it turns milky, but is fined by a fourth part of mountain-wine, and by acids; it operates chiefly by urine, though it is ſomewhat purgative, and increaſes perſpiration. This water is eſteemed for removing glandular obſtructions, and hence is alſo recommended in ſcurvies and cutaneous diſeaſes; it is good in bloody fluxes, purgings, and the like: in diſorders of the ſtomach ariſing from acidity, in the gravel, fluor albus, and immoderate flux of the menſes. As a diuretic, it is beneficial in dropſical complaints. It gently warms the ſtomach, ſtrengthens the appetite, and promotes digeſtion. The uſual doſe is a quart a day. This water is ſuppoſed to owe its virtues to a native alkaline ſalt, which may be obtained from it by evaporation, and to its fixed air, which, however, being very volatile, ſoon exhales when the water is heated or ſtands for ſome time expoſed. Elliot's Account of Mineral Waters, &c. p. 220.

TILE. See TYLE.

TILE, or TYLE, in *Aſſaying*, a ſmall flat piece of dried earth, uſed to cover the veſſels in which metals are in fuſion.

Theſe are made of a mixture of clay and ſand, or powder of flints, or broken crucibles, made into a paſte, and ſpread thin with a rolling-pin, on a table, or flat ſtone. From theſe cakes or plates, pieces are to be cut with a knife, to the ſhape and ſize of the mouths of the veſſels to be cloſed. It is beſt then to pare away the borders of the under ſurface of the piece thus cut off, that this ſurface may immediately touch all the way the edge of the mouth of the veſſel, leaving a prominent rim, by which means the *tile* fits cloſe upon the veſſel, and is not ſo eaſily diſplaced by accidents, as a touch of the poker, or of the coals put on to mend the fire, as it otherwiſe would be. Finally, put on the middle of the outer ſurface a ſmall bit of the ſame matter, which ſerves as a kind of handle, by means of which it may be conveniently managed by the tongs, and eaſily taken off and put on again at pleaſure. Cramer, Art. Aſſ. p. 66.

TILIA, the *lime-tree*, in *Botany*. See LIME-*tree*.

TILLS, a name given by our farmers to the lentil, a kind of pulſe propagated in ſome parts of the kingdom; they are the ſmalleſt of all pulſe. This is a ſpecies of the ERVUM. They require but an ordinary ground, but they produce a vaſt quantity, though they lie in a ſmall compaſs. They make a fine ſweet fodder, and are the beſt of all things of this kind for calves, or any other young cattle. They are alſo the beſt of all ſorts of food for pigeons.

TILLÆA, *ſmall annual houſe-leek*, in *Botany*, a genus of the *tetrandria tetragynia* claſs: the characters of which are theſe: the calyx is a flat perianthium, divided into three or four large oval ſegments; the flower is compoſed of three or four flat, oval, pointed petals, ſmaller than the ſegments of the cup; the ſtamina are three ſimple filaments, ſhorter than the cup; the antheræ are ſmall; the piſtillum has three germina; the ſtyles are three, and ſimple; the ſtigmata are obtuſe; the fruit conſiſts of three or four long-pointed capſules, of the ſame length with the flower, bent back, and ſplitting open longitudinally in their upper part; the ſeeds are of an oval figure; and two are contained in each of theſe capſules. There are two ſpecies.

TILLAGE, in *Huſbandry*. See TILLING.

TILLANDSIA, in *Botany*, a genus of the *hexandria monogynia* claſs. Its characters are, that the calyx is trifid and permanent, the corolla trifid and bell-ſhaped; the fruit a ſingle-celled capſule, and the ſeed downy. There are nine ſpecies.

TILLER, or TILLAR, in *Huſbandry*, a little young tree, left to grow till it be fellable.

TILLER, is alſo a term uſed by farmers to ſignify, that the produce of the grain branches out into ſeveral ſtalks. In which ſenſe, it denotes the ſame thing with the Latin word *fruticare*.

TILLER *of a ſhip*, is a ſtrong piece of wood faſtened to the RUDDER, and employed to turn it in ſteering. See *Tab. Ship*, *fig*. 2. N° 105.

TILLER-*rope*, a kind of tackle, communicating with the ſhip's ſide, and uſually compoſed of untarred rope-yarn, for the purpoſe of traverſing more readily through the blocks or pullies: this tackle ſerves to guide and aſſiſt the operations of the *tiller*, and in all large veſſels is wound about a wheel, which acts upon it with the powers of a crane or windlaſs.

TILLING, TILLAGE, in *Gardening* and *Agriculture*, a moving or ſtirring of the ground with a plough, ſpade, hoe, or other inſtrument; which, being performed on the ſurface, enters to a certain depth, and makes the lower and upper parts change place: by which means the goodneſs of the earth is kept from being ſpent in feeding uſeleſs plants: and the ground is divided by attrition, as the addition of dung does by fermentation.

The rule, as to gardening in general, is, that hot and dry earth ſhould be tilled in ſummer, either a little before, or while it rains, or ſoon after; and that neither too often, nor too deep: and, in hot weather, it is not to be performed, unleſs watered ſoon after; but for moiſt, cold, and ſtrong earth, it muſt never be tilled in time of rain, but rather in the greateſt heats. As to arable lands, that which is clayey, ſtiff, cold, and moiſt, is generally thrice tilled; in ſpring, ſummer, and at ſeed-time, for wheat; and four times for barley.

Theſe repeated ploughings are very advantageous to the ſoil, both as they deſtroy weeds, and as the ground is hereby laid in ridges, which prevents its being overdrenched in wet ſeaſons; ſaves it much from blights, and bleak weather; and makes the land lighter and fitter for the ſeed to take root in, and to imbibe the nitrous dews and influences of the air. See HOEING, HUSBANDRY, PLOUGHING, and *Internal* SUPERFICIES *of the Earth*. See alſo Tull's Horſe-hoeing Huſbandry, p. 24, &c. where it is obſerved, that by the pulveriſing and expoſing of the ſoil to good *tillage*, the nature of it may be changed, and the toughelt clay made as light and friable as common light earth, and as fit for the nouriſhment of the moſt tender plants as any other: though in its natural condition its pores were too ſmall to give way to their tender roots, and had no communication one with another.

The principal advantages propoſed by Mr. Tull's new method of huſbandry depend upon the *tillage*: too much of which, he ſays, the farmer can never beſtow on any ſort of ground.

TILMUS, τιλμος, a term uſed by ſome of the medical writers to expreſs the effect of a ſort of delirium, in which people pull the bed-cloaths, or pick out threads from the ſheets. This is uſually eſteemed a dangerous ſymptom.

TILT. See TURNAMENT.

TILT-BOAT, a boat covered with a *tilt*, i. e. a cloth, or tarpawling, ſuſtained by hails or hoops over the ſtern, for the ſheltering of paſſengers. Such are ſome of thoſe which carry paſſengers between London and Graveſend.

TILTH, a country term for tillage, manuring, or improving ground, or for the condition of the ſoil after ploughing, &c.

TIMAR, a tract or portion of land which the grand ſignor grants to a perſon on condition of ſerving him in war, on horſeback.

Some define the *timar* a portion of land aſſigned to a ſpahi, or other perſon fit to ſerve on horſeback, to enjoy, during life, for his ſubſiſtence.

Meninſki deſcribes it as a ſtipend or revenue, granted to old ſoldiers who have deſerved well, in lands, and poſſeſſions of caſtles, towns, villages, fields, or in tithes, and other fruits and incomes; ſometimes with the prefecture, juriſdiction, or ſignory, of the ſaid places.

The *timar* is a kind of fief granted for life. The whole Ottoman empire is divided into ſangiackies, or banneries, under

under which all ſuch as hold *timars*, who are called *timariots*, are bound to liſt themſelves when ſummoned upon any expedition. *Timars* may be reſigned as benefices among us, only obtaining the conſent of the beglerbey, or governor of the province. Indeed, for *timars* of above two thouſand aſpers *per annum*, called *zaim*, the grand vizir alone grants diſpenſations.

TIMARIOTS, thoſe who enjoy lands on the footing and tenure of timars. See TIMAR.

The *timariots* are obliged to ſerve in war, perſonally, with as many men and horſes for ſervice as their timar, by the eſtimate made thereof, contains two thouſand and five hundred aſpers, or about ſix pounds ſterling; and to maintain them conſtantly mounted and armed after their manner, to be ready to march at all hours when commanded, and that on pain of death; nothing, not even ſickneſs itſelf, being allowed to excuſe them.

Beſides this ſervice, they likewiſe pay an acknowledgment of one tenth of their revenue. If they have any children of age to bear arms, and fit for the ſervice after their deceaſe, or, in defect thereof, if they have any relations that have the leaſt intereſt, the timar is uſed to be continued to them on the ſame conditions, otherwiſe it is transferred to others.

If the revenue thus held of the grand ſignor exceed fifteen thouſand aſpers, or thirty-ſix pounds ſterling, they who hold it are not called *timariots*, but *ſubaſſi*, or *zaims*: theſe always have the adminiſtration of juſtice in the place, under the ſangiac of the province.

The *timariots* have different appointments, from four or five thouſand aſpers, equal to about twelve pounds ſterling, to twenty thouſand aſpers: but unleſs their *timar* exceed eight thouſand veſpers, they are never obliged to march, except when the grand ſignor goes to the army in perſon, on which occaſion none are exempted.

The origin of the *timariots* is referred to the firſt ſultans, who, being maſters of the fiefs or lands of the empire, erected them into baronies or commanderies, to reward the ſervices of their braveſt ſoldiers; and eſpecially to raiſe and keep on foot a number of troops without diſburſing any money.

But it was Solyman II. that firſt eſtabliſhed the order and diſcipline among theſe barons, or knights of the empire; and by his order it was, that the number of horſemen each ſhould maintain was regulated.

This body has heretofore been not only exceedingly powerful, but great and illuſtrious throughout all the empire; but avarice, the ordinary fault of the Orientals, has occaſioned their declenſion of late years.

The viceroys and governors of provinces manage their matters ſo at court, that timars, even out of their juriſdiction, are given to their domeſtics or to ſuch as will give them the moſt money for them.

There are two kinds of *timariots*, the one appointed by the Port, the other by the viceroy of the country; but the revenues of both are leſs than thoſe of the zaims, and their equipage and tents leſs in proportion.

Thoſe who have their patents from the court, have from five or ſix thouſand aſpers to nineteen thouſand nine hundred and ninety-nine aſpers *per annum*; if they have one aſper more, they become zaims. Thoſe who receive their patents from the viceroys, have from three to ſix thouſand aſpers *per annum*.

This cavalry is better diſciplined than that properly called the *ſpahis*, though the ſpahis be the neateſt and briſkeſt. Theſe laſt only fight in platoons; whereas the zaims and *timariots* are divided into regiments, and commanded by colonels, under the direction of baſhaws. The baſhaw of Aleppo, when in the army, is colonel general of this militia.

TIMBER includes all kinds of felled and ſeaſoned woods, uſed in the ſeveral parts of building; as carpentry, joinery, turnery, &c.

The kinds of TIMBER are numerous: we ſhall only mention ſome of the moſt uſeful, from Evelyn's Sylva, &c. As,

1, *Oak*, the uſes whereof need no enumeration; to endure all ſeaſons and weathers, there is no wood like it; hence its uſe in pales, ſhingles, poſts, rails, boards, &c. For water-works it is ſecond to none; and where it lies expoſed both to air and water, there is none equal to it.

2. *Elm*: this, felled between November and February, is all ſpine or heart, and no ſap; and is of ſingular uſe in places where it either is always wet, or always dry; its toughneſs likewiſe makes it of uſe to wheelwrights, millwrights, &c. nor muſt it be omitted, that its not being liable to break and fly in chips, makes it fit for dreſſers and planks to chop on.

3, *Beech*: its chief uſe is in turnery, joinery, upholſtery, and the like, as being of a clean, white, fine grain, not apt to bend, nor ſlit; it has been ſometimes, eſpecially of late, uſed for building *timber*, and if it lie conſtantly wet, is judged to outlaſt oak.

4. *Aſh*: its uſe is almoſt univerſal; it is good for building, or other occaſions where it may lie dry; it ſerves the carpenter, cooper, turner, ploughwright, wheelwright, gardener; as alſo it is uſed at ſea for oars, handſpikes, &c.

5. *Fir*, commonly known by the name of *deal*, is of late much uſed in building, eſpecially within-doors, for ſtairs, floors, wainſcot, and moſt works of ornament.

6. *Walnut-tree*, this is of univerſal uſe, excepting for the outſides of buildings; none is better for the joiners uſe, it being of a more curious brown colour than beech, and leſs ſubject to worms.

7. *Cheſnut-tree*, next to oak, is the *timber* moſt ſought for by joiners and carpenters: it is very laſting.

8. *Service-tree*, uſed in joinery, as being of a delicate grain, and fit for curioſities: it alſo yields beams of conſiderable bigneſs proper for building.

9. *Poplar, abel*: this and *aſpen*, differing very little from one another, are much uſed of late inſtead of fir: they look as well, and are tougher and harder.

10. *Alder*, much uſed for ſewers or pipes to convey water: when kept always wet, it grows hard like a ſtone; but where ſometimes wet, and ſometimes dry, it rots preſently.

The uſes of *timber* are ſo many, and ſo great, that the procuring of a ſufficient ſupply of it extremely well deſerves the care of every ſtate; as it muſt be a great diſadvantage to it to be obliged to have recourſe to its neighbours, and purchaſe at a very conſiderable and continually renewed expence, what might, by an eaſy œconomy, be ſufficiently ſupplied at home.

This œconomy, however, muſt be applied in time; for our natural indolence, our love to reap the advantages of every thing ourſelves, and our little care for poſterity, give great room to fear ſucceeding ages will want wood both for private and public exigencies. All our arts ſhould be employed on this ſubject, with two views, the one to preſerve and cheriſh our growing wood, the other to renew the trees which have been and are continually cut down.

The quantity of acorns that the oak bears, has made many people ſuppoſe, that nature has taken care for a renewal for us, and that of this vaſt quantity of ſeeds which annually fall, there will be always an over-ſufficient ſupply of young trees, which will grow up in the place of the old ones: but experience proves, that this is by no means the caſe. The greater number of theſe fallen acorns are devoured by many different animals, for whoſe nouriſhment nature has provided that abundance of them: and of thoſe which eſcape this fate, we are to conſider how few can come to good, from the natural accidents they are unavoidably expoſed to; they fall on a covered ground, where dead leaves, and decayed parts of branches of trees, uſually prevent their touching the earth, into which they are to ſhoot; or, if they can ſhoot here, it is merely from the ſurface, where they are, in their ſlow growth, liable, while very tender, to all the inclemencies of froſts; and add to this, that it is very difficult for ſuch tender plants as the young ſeedlings of theſe, to find room for growth or nouriſhment among the every-way ſpreading roots of other trees; and the continual ſhade and want of free air, muſt render them very weakly and irregular in their growth, even ſuppoſing them to get over all the other difficulties.

It is very certain, that *timber-trees* of oak are frequently met with among the underwood of foreſts; but we ſhall always find this to be the caſe, not in the cloſe places, but in certain ſpots where there has been a vacancy or opening; and that uſually where there are not, nor have at any time been, oaks in the neighbourhood of the ſpot. The acorns that fall from the oaks uſually come to nothing, from the before-mentioned accidents; and theſe trees which grow at diſtances, are owing to the acorns brought thither by birds, and accidentally dropped there. This is an inſtance familiarly verified, by obſerving, that there are frequently little buſhes near woods, which, though of white thorn or other trees, are uſually ſurrounded and ornamented with young oaks; the jays and the like granivorous birds are the authors of this crop; for, bringing the acorns from the adjoining woods, to eat under theſe buſhes, they drop many by the way, which they do not trouble themſelves to look for on the ground, and which having here a freer ground to ſtrike root into, and an open air to grow in, ſeldom fail of coming to good, unleſs deſtroyed when young.

In order to the preſerving of our growing *timber-trees*, it would be a very uſeful law, that all who cut down any number of oaks, ſhould alſo leave a number in good condition for after-cutting; and that no *timber* ſhould be cut down, but at a proper age, in regard to the nature of the ſoil; ſince it is certain, that trees grow to their perfection at very different periods of time, in proportion to

to the depth of ſoil they have to grow in; and that as it is, on the one hand, not for the intereſt of the ſtate to ſuffer trees to be cut till at their perfection for ſize and ſoundneſs, ſo after they are arrived at that perfection, it is equally certain that they gradually decay.

The quality of the ſoil the tree ſtands in, may be neceſſary to be obſerved to this purpoſe; but the quantity or depth of it is the great ſubject of enquiry; and a great number of obſervations have proved, that the proper ſeaſon for cutting oaks in a ſoil of two feet and a half deep, is at fifty years old; thoſe which ſtand in a ſoil of three feet and a half deep, ſhould not be cut down before ſeventy years; and thoſe which ſtand in a ſoil of four feet and a half deep, or more than that, will increaſe in goodneſs and in ſize till they are a hundred years old: and obſervation has proved, that after theſe ſeveral periods, the trees begin to decay.

This ſeems the beſt rule to eſtabliſh, in regard to the common ſoils; but thoſe which grow in a lighter or more ſandy ſoil, may have their periods changed from theſe to forty, to ſixty, and to eighty years at the greateſt depth; and after theſe times it is always beſt to fell the wood meant for public ſervice, whether then wanted or not, ſince it is much better to keep it in public magazines, than to leave it to be daily decaying.

Heaths, and other uncultivated places, where there is no regular growth of wood; but where fern, and uſeleſs plants alone ſeem to flouriſh, uſually afford alſo ſome ſtraggling trees of the oak. Theſe probably have had their origin from acorns dropped by birds; but they ſeldom grow tall or regular; ſince, not having been defended from the injuries of cattle, they are uſually browſed on, and ſtunted while young, and ſo become crooked and ſhort-trunked, or pollard-trees. Theſe though not of ſuch value as the more regular oaks, yet deſerve care, both with reſpect to their preſervation and felling; ſince they afford a number of trees naturally bent, and formed for many parts of ſhip-building.

The little care uſually taken of theſe trees, though on this occaſion of great value, ſeems to threaten a general loſs of them; but as trees, thus naturally crooked and bent, are of value, it is a laudable attempt to try at the finding of a regular method of producing ſuch; and this is eaſily practicable, by following the ſame methods by which theſe wild ones become ſo. They wholly owe their figure to the cattle's biting off their tops while young, and afterwards biting off again the tops of the ſhoots from the firſt wound. In this manner, if a number of young trees, ſet apart for the experiment, have their tops cut off at two, four, ſix, eight, ten, and twelve feet from the ground, and four years afterwards the ſhoots from theſe ſtunted tops are again cut in the ſame manner, the trees will be found afterwards to grow up in all the irregularly crooked figures that can be conceived, and by this means a ſupply of naturally crooked wood may be raiſed for all the occaſions of ſhip-building, with infinitely greater eaſe and more certainty than by the method propoſed by ſome, of bending them down with weights tied to their tops while young.

As to the ſupply of young wood in the place of what is cut down, there are ſome circumſtances which have not had the attention paid to them which they deſerve. The ſpring froſts, which come on at a time when the ſhoots, by which nature is to raiſe the ſupply for what is cut down, are juſt preparing to grow, are of prodigious injury, and do not leſs miſchief to theſe than to the young ſhoots of garden plants, though the diſtant hope of the ſucceſſion to the proprietor, and uſually alſo the diſtance of the place, and want of repeated obſervation, occaſion its not being perceived. This, however, may, in a great meaſure, be guarded againſt. Frequent experiments, and repeated obſervations, prove, that the miſchief done by theſe froſts affect in a much greater degree thoſe ſhoots which are expoſed to the ſouth, than thoſe which face the north; and that it is greatly more powerful againſt ſuch as are wholly expoſed to the wind, than againſt ſuch as are ſheltered. Theſe known circumſtances may give the hint to a method of ſaving, at leaſt a great part of the wood to be felled, from this deſtruction, to its renewal, by the making it a rule to begin cutting down on the north ſide; and, as the whole felling is a work of ſome years, the ſtanding wood of every ſeaſon will defend the young ſhoots of the newly cut ſtumps the following ſpring, not only from the ſouth expoſure, but will ſhelter them alſo from the wind.

Many prudent managers have made fine eſtates of their coppice-woods, by regularly felling a certain portion every year, and providing for a renewal of the firſt cutting, againſt the felling of the laſt portion, by proportioning the time of growth to the quantity to be cut every year; and there is great intereſt to be made of a true knowledge of the growth of wood in this manner. Whoever obſerves the growth of young trees, will find that the ſecond year's growth is much more conſiderable than that of the firſt; the third year is more than that of the ſecond, and ſo on for many years; the yearly growths of young wood greatly increaſing every ſeaſon up to a certain time or age of the tree, after which the increaſe in bulk, by growth, becomes gradually leſs. The great advantage to be made of coppice-wood, would be, by knowing this intereſting period, and ſeizing on it, always to cut down the trees juſt at that time when they arrived at the end of their quick growth, and ſo ſetting nature to work with new ſhoots, to employ the ſame on enriching again the owner. Regular obſervation and experiment alone can aſcertain this happy period; but any man who has much coppice-wood upon his eſtate, may aſſure himſelf of it, by cutting a given quantity every year, for ten years ſucceſſively, and then carefully reviewing the differences of the yearly produce. Memoirs Acad. Scienc. Ann. 1739.

TIMBER, *hardening of*. See HARDENING *of timber*.

TIMBER, *felling of*. The ſeaſon for this work uſually commences about the end of April, in regard the bark then generally riſes the moſt freely; ſo that where a quantity of *timber* for ordinary uſes is to be felled, the ſtatute (1 Jac. I. cap. 22.) requires it to be done between the firſt of April and the laſt of June, for the advantage of TANNING.

However, the opinions and practices of authors are very different, as to the beſt ſeaſon for felling *timber*: Vitruvius recommends an autumnal fall; others adviſe December and January: Cato was of opinion, that trees ſhould have borne their fruit before felled; at leaſt, that their fruit ſhould be firſt ripe; which falls in with the ſentiment of Vitruvius.

In effect, though *timber* unbarked be moſt obnoxious to worms, yet we find the wild oak, and many other kinds, if felled too late, when the ſap begins to be full, to be very ſubject to worms; whereas about mid-winter, it neither caſts, rifts, nor twines. It were happy, therefore, if a method of tanning without bark could be invented, that trees being felled more early, the *timber* might be the better ſeaſoned.

It is, indeed, the common opinion, that *timber*, which is felled in winter, is ſtronger and more laſting, as being more firm and cloſe, than that which is felled in ſummer. But M. Leewenhoeck apprehends, that there is no difference except in the bark, and outermoſt ring of the wood, which in the ſummer are ſofter, and more eaſily pierced by the worm: wood conſiſting of hollow pipes, which, both in ſummer and winter, are full of moiſture, and do not ſhrink in winter; and therefore the wood cannot be cloſer at one time than another, for if otherwiſe it would be full of cracks and clefts. The unexpected and ſudden rotting of ſome *timber*, he conceives to proceed from ſome inward decay in the tree before it was felled: having obſerved all trees to begin to decay at firſt in the midſt or heart of the tree. Phil. Tranſ. N° 213. or Abr. vol. i. p. 592.

The ancients had a great regard to the age of the moon in the felling of their *timber*. If their rules avail aught, they are theſe: fell *timber* in the wane, or four days after new moon; ſome ſay, let it be the laſt quarter. Pliny orders it to be in the very article of the change, which happening on the laſt day of the winter ſolſtice, the *timber*, ſays he, will be immortal: Columella ſays, from the twentieth to the twenty-eighth day; Cato, four days after the full: Vegetius, from the fifteenth to the twenty-fifth, for ſhip *timber*; but never in the increaſe, trees then moſt abounding with moiſture, the only ſource of putrefaction.

Some even have a regard to the temper and time of the day; the wind to be low, neither eaſt nor weſt, neither in froſty, wet, nor dewy weather, and finally, never in the forenoon.

Laſtly, ſome regard is had to the ſpecies: fir is beſt felled when it begins to ſpring, both, as it then quits its coat beſt, and as the wood, according to Theophraſtus, is by that means rendered wonderfully durable in water. Elm, ſays Mr. Worlidge, is to be felled between November and January, in which caſe it will be all heart, at leaſt the ſap will be very inconſiderable: this, he adds, is alſo the only good ſeaſon for felling aſh. Some authors add farther, that in felling *timber* care ſhould be taken, firſt, only to cut it into the heart, and ſo to let it ſtand till dry; by which means the moiſture is evacuated in drops, which would otherwiſe occaſion putrefaction.

M. de Buffon obſerves, as a circumſtance, which greatly increaſes the ſtrength and ſolidity of *timber*, that the trees

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intended to be felled for ſervice, ſhould firſt be ſtripped round of their bark, and ſuffered to ſtand and die upon the ſpot before the cutting. The ſappy part, or blea of the oak, becomes by this management as hard and firm as the heart, and the real ſtrength and denſity of the wood has been proved by many experiments to be greatly increaſed by it: nor is this practice detrimental to the proprietor, becauſe the remaining ſtumps of theſe trees ſend up their young ſhoots as vigorouſly, as if they had been cut down in their natural condition. Mem. de l'Acad. Sc. Par. 1739.

When any tree is to be cut down for *timber*, the firſt thing to be taken care of is a ſkilful diſbranching ſuch limbs as may injure it in its fall. In felling the tree, it ſhould always be cut as cloſe to the ground as poſſible, unleſs it is intended to be grubbed up; and this will be of advantage both to the *timber*, and the wood; for *timber* is never ſo much valued, if it be known to grow out of old ſtocks.

Timber, *ſeaſoning of*, a term uſed to expreſs the preparing of *timber* after it is felled, for cutting and working up for uſe.

As ſoon as felled, it ſhould be laid up in ſome dry airy place, but out of the reach of too much wind or ſun, which, when in exceſs, will ſubject it to crack and fly. It is not to be ſet upright, but laid along, one tree upon another, only with ſome ſhort blocks between, to give it the better airing, and prevent its becoming mouldy, which will rot the ſurface, and produce muſhrooms on it. Some perſons daub the trees all over with cow-dung, which occaſions their drying equally, and prevents their cracking, as they are otherwiſe very apt to do.

Some recommend the burying of *timber* in the earth, as the beſt of all ways of ſeaſoning it; and others have found it a fine preſervative to bury their *timber* under the wheat in their granaries; but this cannot be made a general practice.

In Norway, they ſeaſon their *deal* planks, by laying them in ſalt-water for three or four days, when new ſawed, and then drying them in the ſun; this is found a great advantage to them; but neither this, nor any thing elſe, can prevent their ſhrinking. And it has been recommended to lay boards, planks, &c. in ſome pool or running ſtream, for a few days, to extract the ſap from them, and afterwards to dry them in the ſun or air; by this means, it is ſaid, they will be preſerved from chopping, caſting, or cleaving: but againſt ſhrinking there is no remedy. Mr. Evelyn particularly recommends this method for fir.

The ſeaſoning of *timber* by fire is the beſt way of all, for piles and other pieces that are to ſtand under the earth, or water. The Venetians firſt found out this method, and the way by which they do it is this; they put the piece to be ſeaſoned into a ſtrong and violent flame, in this they continually turn it round by means of an engine, and take it out when it is every where covered with a black coaly cruſt; by this means the internal part of the wood is ſo hardened, that neither earth nor water can damage it for a long time afterwards. This method is practiſed in many places for ſeaſoning the poſts for paling of parks, &c. and has this to recommend it, that in the very oldeſt ruins we have ever been acquainted with, there have been found many times pieces of charcoal, all of which have been found uninjured, though buried in the earth for ever ſo many ages.

Timber, *preſerving of*. When boards, &c. are dried, ſeaſoned, and fixed in their places, care is to be taken to defend and *preſerve* them; to which the ſmearing of them with linſeed oil, tar, or the like oleaginous matter, contributes very much.

The ancients adviſe the ſmoke-drying of all inſtruments made of wood, by hanging them up in the chimnies where wood fires are uſed. The whole benefit ariſing from this ſeems to be, that the oil of the burnt wood enters as it aſcends in the ſmoke into the pores of that which is propoſed to be preſerved.

The Dutch preſerve their gates, portcullices, draw-bridges, ſluices, &c. by coating them over with a mixture of pitch and tar, whereon they ſtrew ſmall pieces of cockle and other ſhells, beaten almoſt to powder, and mixed with ſea-ſand, which incruſts and arms them wonderfully againſt all aſſaults of wind and weather.

Timber felled before the ſap is perfectly at reſt, is very ſubject to the worms; to prevent or cure which, Mr. Evelyn gives us the following ſecret, as moſt approved: put common ſulphur in a cucurbit, with as much aquafortis, as will cover it three fingers deep; diſtil it to a dryneſs, and let it have two or three rectifications.

Lay the ſulphur remaining at bottom on a marble, or in a glaſs, and, with the oil it diſſolves into, anoint the *timber*.

This, he adds, not only infallibly prevents or cures the wormyneſs, but preſerves all kinds of woods, and even many other things, as ropes, nets, and maſts, from putrefaction, either in air, water, or ſnow. See Sulphur.

For ſuch as would go a ſhorter way to work, two or three anointings with linſeed-oil may do very well.

As to the chaps, or clefts, green *timber* is liable to, after working, and which is a very great defect in many fine buildings, they are cloſed by anointing, ſuppling, and ſoaking it with the fat of beef-broth, twice or thrice repeated. — Some carpenters uſe greaſe and ſaw-duſt mingled for the ſame purpoſe.—But the former method is excellent. Mortimer's Huſbandry, vol. ii. p. 104.

Timber, *ſtrength of*. The celebrated Monſieur de Buffon has attempted a rational calculation of the ſtrength of *timber*, uſed in building, on the principles of his excellent demonſtration of the growth of trees. See Wood.

He has proved that all wood conſiſts of a ſeries of woody cones laid in woody beds, all along the tree, and connected by a ſort of reticular work of much leſs ſtrength than their own ſubſtance. He infers hence, very juſtly, that when there are, in any ſpecies of wood, more of theſe cones, which ſhew themſelves in ſo many concentric circles in a tranſverſe ſection of the wood, and conſequently more of theſe weaker reticular ſubſtances which connect them, that wood muſt neceſſarily be weaker than ſuch in which, in an equal thickneſs, there are much fewer of theſe cones, and conſequently fewer of theſe weaker inter-ſpaces.

If the irregularities of the ſtructure of wood were only theſe, it would be eaſy to compute, from the ſtrength of a ſtaff of an inch diameter, of any wood, what would be that of a beam of the ſame, and of any given ſize; but this is by no means the caſe; for the diſpoſition of the cones, beds, and interſticial matter, is by no means the ſame in a large beam, formed by the workman, as in a little branch in its natural ſtate of growth.

This is eaſily conceived, when we conſider that, in order to make a beam of *timber*, they ſquare a branch or part of the tree, or cut off four cylindric pieces from it, of what is called the blea. The heart of the wood lies now in the middle of the beam; this is the firſt woody bed, which all the others ſucceſſively cover, in form of ſo many concentric circles: the larger of theſe concentric circles is of the diameter of the whole piece of *timber* now cut, and the circles, which naturally ſurrounded this, are now no longer perfect, but form only portions of circles, diminiſhing all the way to the ribs of the beam. A beam, thus ſquared, is therefore compoſed of a cylindric complete piece of firm and hard wood, and of four angular portions, cut out of a much leſs ſolid and firm wood. This is the condition of a beam, ſquared out of a large arm of a tree, and made nearly of the diameter of that arm; but a beam of like ſize, cut out of the trunk of a larger tree, or out of one ſide of ſuch a trunk, is a very different thing, and is compoſed only of the longitudinal ſegments of the annual woody beds; and theſe ſegments ſometimes lie parallel to one of the ſurfaces of the beam, and ſometimes more or leſs inclined to one or the other ſide; they are alſo ſometimes longer, ſometimes ſhorter; and ſometimes more, ſometimes leſs, cut into the woody beds of the trunk of the tree they were cut from, and the beam is conſequently more or leſs ſtrong accordingly.

There are alſo two poſitions in a beam, the one of which is much ſtronger than the other; for theſe ſegments of the woody beds of the tree form ſo many parallel flats. If you place the beam in ſuch a poſition that theſe planes or flats are vertical, it will reſiſt a much greater force than if they are placed horizontally in the poſition of the beam.

From theſe obſervations, it is eaſy to ſee how very fallacious the calculations and tables of the ſtrength of different kinds of *timber* muſt be, while the authors have formed all their ſyſtems upon experiments made on pieces of one or two inches in diameter, and have given themſelves no trouble to enquire into either the number or diſpoſition of the woody beds in thoſe pieces, nor the directions in which the ſeveral beds were found on breaking them. Theſe, however, are extremely neceſſary and eſſential circumſtances; nor are theſe the only variations which they have omitted to obſerve; there are perhaps others equally neglected in all ſuch attempts, and yet equally neceſſary to make them of any real uſe. Young wood has always much leſs ſtrength than the older, and there is a great difference between the pieces cut out of the ſoundeſt part of the body of a tree, and thoſe from the young branches of the ſame tree. A piece cut out of the outer part of the trunk of a tree, near the blea, is alſo much weaker than one of equal diameter, cut

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out of the centre or heart of the tree. The different age and degree of dryneſs in wood, make alſo great differences in its ſtrength; for a green branch of a tree is always more tough, and leſs eaſily broken, than a dry one: and the time employed in putting wood to the trial, as to its ſtrength, is alſo a circumſtance very neceſſary to be conſidered; ſince a beam of *timber*, which will ſuſtain a certain weight for a few minutes, will not ſuſtain it perhaps for as many hours; and experiment has proved, that wood will often bear, for a ſhort time, a weight it cannot bear for a longer time; a beam having been found to bear a certain weight for one day, and the ſame beam afterwards having been broken in ſix months time by only two thirds of that weight. It is ſeen, from theſe conſiderations, that all the calculations in which theſe conſiderations have been neglected, can be of very little certainty; and that to make ſuch as may be certainly depended on, is a work of great difficulty.

As the advantages reſulting from ſuch calculations are, however, yet greater than the difficulties attending the attempt, this gentleman was encouraged to purſue the enquiry to the utmoſt. He cauſed certain pieces of wood to be broken by a determinate force, and calculating, according to that, what ought to be the force to break ſuch as were much larger; he tried afterwards what was the real force that would break them, and how far his calculations approached to the truth; in this he ever found extremely great differences between calculation and reality; and after many repeated trials, was never able to bring the fact any thing near the calculations. And trying according to the ſame rules, others of greater lengths and thickneſſes, in proportion to the ſtandard piece, he found the calculations as far faulty as before. The diſappointment in theſe attempts determined him, however, to try a complete courſe of experiments, from which a certain table of the force required to break the different kinds of wood might be eſtabliſhed, to which both himſelf, and the reſt of the world, might refer to upon occaſion. And this he executed in the following manner.

He began by chooſing in a certain ſpot of one of his own woods a hundred oaks, which were all ſound and lively growing trees, and ſtood as near to one another as they conveniently could. This caution was uſed, that the wood might be all of the growth of the ſame ſoil, ſince it is well known that the growths of different ſoils are, in the ſame ſpecies of wood, of very different ſtrengths; and miſtakes of this might have rendered the whole attempt fruitleſs. Theſe oaks were all of the ſame ſpecies, and were in ſize from two feet and a half to five feet round. They were choſen purpoſely of different growths, or ſizes, that the experiments might be the more ſimilar to the uſual cuſtoms of the workmen.— For when a carpenter has occaſion for a piece of four or five inches ſquare, he does not for this purpoſe cut a tree that might have furniſhed a piece of a foot ſquare, becauſe of the expence; and it too often is their cuſtom to uſe ſuch pieces as have a very large ſhare of the blea on them. Not unfrequently indeed they uſe alſo rafters, ſawed out of large pieces of *timber*; but theſe are, of all the very worſt; and the uſe of them in building ought to be prohibited, the ſmall wood being infinitely more advantageous for theſe purpoſes.

As the degree of dryneſs of wood alters its ſtrength very much, and as it is alſo very difficult to be aſſured with any degree of certainty, of the degree of drying or ſeaſoning of *timber*, ſince two trees cut down at the ſame time ſhall often be found to dry very differently; it appeared to this gentleman much more eligible to take wood perfectly green for his trials, than that in any degree dried or ſeaſoned.

The trees were felled one by one, and were carried into a proper place; the day after they were felled the carpenters were employed to ſquare them, and the joiners to take their exact dimenſions; and on the day afterwards, the pieces were put to the proof; and the following is the method in which moſt of the experiments were made. Two ſtrong treſſels were taken, of ſeven inches ſquare, three feet high, and three feet long, and ſtrengthened in their middle by a very ſtrong piece of *timber*. On theſe two treſſels were placed the two extremities of the piece of wood which was to be broken; there were alſo ready ſeveral ſquare iron buckles, or rings, made of round iron work, the largeſt of which was nine inches wide, and was made of iron of ſeven inches about; the next was ſeven inches wide, and the iron it was made of was five inches round, and others of different degrees below theſe.

The piece of wood deſtined for the experiment, was paſſed through theſe rings; the larger of which ſerved for the thicker pieces, the ſmaller for the thinner. Every one of theſe rings had on its upper part and on the inſide, a rib nicely filed, of two or three twelfths of an inch broad.

The intent of this was to prevent the ring from inclining one way or other, when in uſe; and on its under part it had two hooks of iron, of the ſame thickneſs with the ring itſelf; theſe were placed at ſuch a diſtance from each other, as to form another ring of about nine inches in diameter, into which there was to be put a key of wood of the ſame diameter, and of four feet long. This key carried a ſtrong table of fourteen feet long, and ſix feet broad, which was made of rafters of five inches thick, nicely fitted one to the other, and ſecured by ſtrong bars of wood. This was ſuſpended to the ring by means of the large wooden key, and ſerved to place the weights on; theſe conſiſted of three hundred quarters of ſtones, which were all numbered, and weighed from twenty-five to two hundred pounds each. Theſe ſtones were put up on the table, and a heap of ſtones were placed together as long and wide as the table, and as high as was neceſſary for the breaking of the piece.

There was always great care uſed to place the piece and the treſſels on a level; and they were then faſtened, to prevent their diſplacing themſelves. Eight men were employed continually to fill the table, and began by placing in the centre weights, firſt of two hundred, then of a hundred and fifty, next of a hundred; and ſo on to twenty-five pounds. Two men placed on a ſcaffold, ſuſpended in the air by cords, placed the fifty and twenty pound weights, which could not have been otherwiſe done, without danger of the men's being cruſhed to death; four other men held firm the four corners of the table, that they might not ſtir; and another, with a long ruler of wood marked how much the piece bent and gave way, as they loaded it with weights; while another marked the time, and wrote down the weight, which was often twenty, twenty-five, or twenty-ſeven thouſand pounds.

Mr. Buffon cauſed more than a hundred pieces of wood to be broken in this manner; ſome regular ſquare beams, others rafters ſawn out of large trunks, beſide three hundred bars; and this great number was but barely ſufficient to give a regular ſcale of the force and ſtrength of *timber*, in proportion to its length and thickneſſes.

This gentleman obſerved, that a large piece of wood never broke, without firſt giving ſome notice of it; that green wood broke with much more difficulty than ſuch as was dry; and in general, ſuch ſort of wood as had a ſpring, reſiſted more than ſuch as had none. The blea of the wood, the wood of the branches, that of the top of the tree, and in general all the young wood is weaker than that which is older.

The ſtrength of wood is not at all proportioned to its ſize; and a piece which is double or quadruple the thickneſs of another of the ſame length, is much more than of twice or four times its ſtrength; as for example, there required not quite four thouſand weight to break a piece of *timber* of ten feet long, and four inches ſquare; and yet there required ten thouſand to break a piece of double that meaſure; and to break one of four times the meaſure, it required twenty-ſix thouſand weight; that is, to break a piece of ten feet long, and eight inches ſquare.

The ſame obſervation is alſo made good, in regard to the different lengths, as well as the thickneſſes. The laws of mechanics would inform us, that a piece of *timber* of eight feet long, ought to bear juſt twice the weight of one of ſixteen feet. But experiment ſhews us here alſo, that the piece of eight feet long carries much more than the double of the other.

The wood which grows quickeſt, ſuppoſing the land the ſame, is always the ſtrongeſt: that which has grown more ſlowly, and the annual circles of which, that is, its ſeveral woody cones, are thin and ſlender, is always weaker than the wood in which they are thick.

The ſtrength of wood is proportionable to its weight, and a piece of wood of the ſame length and thickneſs with another, but conſiderably heavier than another, is found ſtronger alſo, and that very nearly in the ſame proportion. This is a remark of no ſmall conſequence; and, as the general weight of wood is eaſily known, it may ſave the expence of too much wood in building, as well as the danger from the greater error of uſing too little.

This accurate obſerver takes notice, that ſome may imagine his experiments to be the leſs concluſive, becauſe the *timber* he broke was looſe at the ends; and that in a wall, or building, it is uſually fixed at both ends. But he obſerves, that the difference of this circumſtance is not worth conſidering, becauſe the piece fixed in a wall

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is liable to bend in the middle, before it breaks; and because the fixtures have no power to retain the ends, when they are pulled by this force.

This gentleman took no notice of any pieces which had faults, as many of those he tried had, and broke with much less than their proportion of weight; but confined his observations and reasonings only to such pieces as were perfectly sound and firm.

It might be supposed, that so great a number of trials as these, and that on so easy a subject, should have left nothing farther to be done in it; but the author himself freely acknowledges that there is yet much to be known. The proportion of the longitudinal strength of wood to its transverse, is a subject deserving enquiry; as wood in buildings is often used in very different positions, and where the force acts upon it, not transversely, but longitudinally or obliquely in different directions. Mem. Acad. Scienc. Par. 1740. See Beam.

Timber-*trees*, the wood of *timber*, before it be felled, particularly that of oak, &c. See Trees.

For the raising, planting, transplanting, pruning, &c. of *timber-trees*, see Seminary, Nursery, Pruning, and Transplanting.

Timber-*lode*, in our *Old Writers*, a service by which tenants were to carry *timber* from the woods to the lord's house.

Timber-*measure*.—*Timber* is usually measured and estimated by the load or ton, which is a solid measure, containing forty feet of round *timber*, or fifty of hewn *timber*. The denomination of *load*, &c. we suppose arises hence, that forty or fifty solid feet of such *timber* weigh about a ton, *i. e* twenty hundred weight, which is usually accounted a cart-load.

1. *For the measuring of round timber*: the practice is, to gird the tree about, in the middle of the length; and folding the line twice, to take one length or quarter of the whole, and account that for the true side of the square; then, for the length, it is counted from the butt-end of the tree, so far up as the tree will hold *half a foot girt*, as they call it, *i. e.* so long as the line, twice folded, is half a foot.

The dimensions thus taken, the quantity of *timber* is had, either by multiplying the side of the square into itself, and that product by the length, by the method of cross multiplication:

Or, more easily and speedily, on Gunter's line, by extending the compasses from twelve to the side of the square, in inches; for that extent turned twice (the same way) from the length in feet, will reach to the content in feet.

Or, it may be done better still, on Coggeshal's sliding-rule, by setting twelve on the girt line D, to the length in feet on the line C. Then against the side of the square, on the girt-line D, taken in inches, you have on the line C the content of the *timber* in feet. See *Coggeshal's* Sliding-*rule*.

Note, 1°. This method of measuring round *timber*, though common, is yet erroneous; and the content found hereby, it is demonstrated, is less than the true content of measure in the ratio of eleven to fourteen. How to avoid this error, and measure it justly, we have shewn under the use of Coggeshal's *sliding-rule*.

2°. If the tree have any great boughs that are *timber*, as the phrase is, *i. e.* which will hold foot girt, they are commonly measured, and added to the rest: the solidity of the whole being thus found, they divide it by forty, which bring it into loads.

3°. In measuring round *timber* for sale, they usually cast away an inch out of the square for the bark, if oak: so that a tree ten inches square, they only account as if nine; but for ash, elm, beech, &c. an inch is too much.

4°. *For the measuring of hewn* or *squared timber*; the practice is, to find the middle of the length of the tree, and there to measure its breadth, by clapping two rules, or other straight things, to the sides of the tree, and measuring the distance between them: in the like manner they measure the breadth the other way. If the two be found unequal, they add them together, and take half the sum for the true side of the square. The dimensions thus taken, the content is found either by cross-multiplication, Gunter's scale, or the sliding-rule, after the manner already directed.

The content divided by fifty, gives the number of loads.

Note, if the *timber* be unequally sided, this method of measuring it is erroneous, always giving the content more than the truth; and the more so, as the difference of the sides is greater; yet custom has authorized it.

To measure such *timber* justly, a mean proportional should be found between the unequal sides, and this mean should be accounted the side of the square.

To measure round *timber* without the help of instruments: let the mean circumference be found in feet and decimals of a foot; square it, multiply this square by the decimal 0.079577 and the product by the length.—For instance, let the mean circumference of a tree be 10.3 feet, and the length 24 feet; then $10.3 \times 10.3 \times 0.079577 \times 24 = 202.615$ = the number of cubical feet in the tree. The foundation of this rule is, that, when the circumference of a circle is 1, the area is 0.0795774715, and that the areas of circles are as the squares of their circumferences. According to the method commonly used by artificers, the tree of the last example would only be computed at 159.13 cubical feet.

For the measuring of taper timber, and *timber* of other forms, as cubes, prisms, pyramids, &c. see Sliding-*rule*.

Timber, *bearing of*. See Bearing.

Timber-*work*, *casing of*. See Casing.

Timber, or Timmer *of furs*, as ermins, martens, sables, and the like, denotes forty skins.—Of other skins, fixscore. Rust.

Hæc civitas (sc. Cestriæ) nunc reddebat de firma 45 *libras & tres* timbrias *pellium martenarum*. LL. Edw. Conf.

Timbers *of ermin*, in *Heraldry*, denote the ranks or rows of ermin in noblemen's coats.

Timber, in *Falconry*. To *timber*, is to nestle, or make a nest, as birds of prey do.

Timber, *prick*, in *Botany*. See Spindle-*tree*.

Timbers, in *Ship-building*, the ribs of a ship or the incurvated pieces of wood, branching outward from the keel in a vertical direction, so as to give strength, figure and solidity to the whole fabric.

One *timber* in a ship is composed of several pieces united into one frame, which accordingly is called by the artificers a frame of *timbers*. The *timbers* whose planes are perpendicular to the keel are called square-*timbers*; and those which are placed obliquely on the keel, as at the extremities of a ship, are called cant-*timbers*. The foremost of those pieces on the ship's bow are called the *knuckle-timbers*; and the hindermost on the quarter, the fashion-pieces.

Timber and *Room*, or *room* and *space*, is the distance betwixt the moulding edges of two adjoining *timbers*, which must always contain the breadth of two *timbers*; and sometimes two or three inches between them.

TIMBRE, or Timmer, in *Heraldry*, denotes the crest of an armory, or whatever is placed atop of the escutcheon, to distinguish the degree of nobility, either ecclesiastical or secular.

Such is the papal tiara, cardinal's hat, the cross, mitre, coronet, mortier, and particularly the casques or helmets, which the ancients called more especially *timbres*, from their resembling a kind of bell without a clapper, which the French call *timbre*, or because they resounded like those *timbres*, when struck. This is the opinion of Loiseau, who derives the word from the Latin, *tintinnabulum*.

TIMBREL, *Tabret*, or *Tambour de Basque*, in *Music*, is an instrument of very high antiquity; having been in use among the Hebrews, Greeks and Romans. To the rim were hung bells or pieces of metal.

TIME, a succession of phenomena in the universe; or a mode of duration, marked by certain periods and measures; chiefly by the motion and revolution of the sun.

The idea of time in the general, Mr. Locke observes, we acquire, by considering any part of infinite duration, as set out by periodical measures: the idea of any particular *time*, or length of duration, as a day, an hour, &c. we acquire first by observing certain appearances at regular, and, seemingly, equidistant periods.

Now, by being able to repeat those lengths or measures of *time* as often as we will, we can imagine duration, where nothing really endures or exists; and thus we imagine *to-morrow*, *next year*, &c.

Some of the later school-philosophers define *time* to be the duration of a thing whose existence is neither without beginning nor end: by this, *time* is distinguished from eternity.

Aristotle, and the Peripatetics, define it, *numerus motus secundum prius & posterius*, or a multitude of transient parts of motion, succeeding each other, in a continual flux, in the relation of priority and posteriority.

Hence it should follow, that *time* is motion itself, or at least the duration of motion, considered as having several parts, some whereof are continually succeeding to others: but, on this principle, *time* or temporal duration would not agree to bodies at rest, which yet nobody

nobody will deny to exiſt in *time*, or to endure for a *time.*

To evade this inconvenience, the Epicureans and Corpuſcularians made *time* to be a ſort of flux different from motion, conſiſting of infinite parts, continually and immediately ſucceeding each other, and this, from eternity to eternity; but others directly explode this notion, as eſtabliſhing an eternal being, independent of God.—For how ſhould there be a flux before any thing exiſted to flow? and what ſhould that flux be, a ſubſtance, or an accident?

Time may be diſtinguiſhed, like place, into *abſolute*, and *relative.*

TIME, *abſolute*, is *time* conſidered in itſelf, and without any relation to bodies, or their motions.—This flows equally, i. e. it never proceeds either faſter or ſlower, but always glides on in a conſtant equable tenor.

TIME, *relative* or *apparent*, is the ſenſible meaſure of any duration by means of motion.—For ſince that equable flux of *time* does not affect our ſenſes, nor is any way immediately cognizable thereby, there is a neceſſity for calling in the help of ſome nearly equable motion to be a ſenſible meaſure, whereby we may determine its quantity, by the correſpondency of the parts of this with thoſe of that.

Hence as we judge thoſe *times* to be equal, which paſs while a moving body, proceeding with an equable velocity, paſſes over equal ſpaces; ſo we judge thoſe *times* to be equal which flow while the ſun, moon, and other luminaries, perform their revolutions, which, to our ſenſes, are equal.

But ſince the flux of *time* cannot be accelerated, nor retarded, whereas all bodies move ſometimes faſter, and ſometimes ſlower, and there is, perhaps, no perfectly equable motion in all nature; it appears, hence, to follow, that abſolute *time* ſhould be ſomething truly and really diſtinct from motion. For let us ſuppoſe the heavens and the ſtars to have remained without motion from the very creation: does it hence follow, that the courſe of *time* would have been at a ſtand? or rather, would not the duration of that quieſcent ſtate have been equal to the very *time* now elapſed?

Since abſolute *time* is a quantity uniformly extended, and, in its own nature, moſt ſimple; it hence comes to be repreſented by mathematicians, to the imagination, under the moſt ſimple, ſenſible magnitudes, and particularly, right lines and circles, with which it bears a near analogy, in reſpect of its geneſis, ſimilarity, &c.

It is not, indeed, neceſſary, that *time* ſhould be meaſured by motion; any conſtant periodical appearance in ſeemingly equidiſtant ſpaces, as the freezing of water, the blowing of a plant, &c. returning at ſet periods, might do as well. In effect, Mr. Locke mentions an American people, who count their years by the coming and going away of birds.

Some authors diſtinguiſh *time* into *aſtronomical* and *civil.*

TIME, *aſtronomical*, is that taken purely from the motion of the heavenly bodies, without any other regard.

TIME, *civil*, is the former *time* accommodated to civil uſes, and formed and diſtinguiſhed into *years, months, days,* &c.

Time makes the ſubject of CHRONOLOGY.

TIME, in *Muſic*, is an affection of ſound, whereby we denominate it *long*, or *ſhort*, with regard to its continuance in the ſame degree of tune.

Time and tune are the great properties of ſound, on whoſe difference or proportions muſic depends: each has its ſeveral charms; where the *time* or duration of the notes is equal, the differences of tune alone are capable of entertaining us with endleſs pleaſure.

And of the power of *time* alone, i. e. of the pleaſures ariſing from the various meaſures of long and ſhort, ſwift and ſlow, we have an inſtance in the drum, which has no difference of notes, as to tune.

Time, in muſic, is conſidered either with reſpect to the abſolute duration of the notes, i. e. the duration conſidered in every note by itſelf, and meaſured by ſome external motion foreign to the muſic; in reſpect to which the compoſition is ſaid to be *quick* or *ſlow*: or it is conſidered with reſpect to the relative quantity or proportion of the notes compared with one another. See NOTE.

The *ſigns* or characters by which the *time* of notes is repreſented, are ſhewn under the article CHARACTERS *in muſic*, where the names, proportions, &c. are alſo expreſſed.

A ſemi-breve, for inſtance, is marked to be equal to two minims, a minim to two crotchets, a crotchet to two quavers, and ſo on, ſtill in a duplicate ratio, *i. e.* in the ratio of 2 : 1. Now, where the notes reſpect each other thus, i. e. where they are in this ratio, the muſic is ſaid to be in *duple*, i. e. *double* or *common time.*

When the ſeveral notes are triple of each other, or in the ratio 3 : 1, that is, when the ſemi-breve is equal to three minims, the minim to three crotchets, &c. the muſic is ſaid to be in *triple time.*

To render this part as ſimple as poſſible, the proportions already ſtated among the notes are fixed and invariable; and to expreſs the proportion of 3 : 1, a point (.) is added to the right ſide of any note, which is deemed equivalent to half of it; and by this means a pointed ſemi-breve, O. becomes equal to three minims, and ſo of the reſt.

From hence ariſe ſeveral other ratios conſtituting new kinds of triple *time*; as 2 : 3 and 3 : 4, &c. but theſe, Mr. Malcolm obſerves, are of no real ſervice, and are not perceived without a painful attention. For the proportions of the *times* of notes, to afford us pleaſure, muſt be ſuch as are not difficultly perceived; on which account the only ratios fit for muſic, beſide that of equality, are the *double* and *triple.*

TIME, *common* or *duple*, is of two ſpecies.—The firſt, when every bar or meaſure is equal to a ſemi-breve, or its value in any combination of notes of a leſs quantity.

The ſecond, where every bar is equal to a minim, or its value in leſs notes. The movements of this kind of meaſure are various, but there are three common diſtinctions; the firſt *ſlow*, ſignified at the beginning by the mark C; the ſecond *briſk*, ſinified by Є; the third *very quick*, ſignified by Ↄ|.

But what that ſlow, briſk and quick, is, is very uncertain, and only to be learned by practice. The neareſt meaſure we know of, is to make a quaver the length of the pulſe of a good watch; then a crotchet will be equal to two pulſes, a minim to four, and the whole meaſure or ſemi-breve to eight. This may be reputed the meaſure of *briſk time*; as for the *ſlow*, it is as long again, and the quick is only half as long.

Some propoſe to meaſure it by imagining the bar as actually divided into four crotchets in the firſt kind, and ſo make the whole as long as one may diſtinctly pronounce theſe four words, *one, two, three, four*, all of equal length: ſo that the firſt crotchet may be applied to *one*, the ſecond to *two*, &c. and for other notes proportionally: and this is made the briſk movement of *common time.*

The whole meaſure then of common *time* is equal to a ſemi-breve, or a minim; but theſe are variouſly ſubdivided into notes of leſs quantities.

Now to keep the time equal, we make uſe of a motion of the hand or foot, thus: knowing the true *time* of a crotchet, we ſhall ſuppoſe the meaſure or bar actually ſubdivided into four crotchets for the firſt ſpecies of common *time*; then the half-meaſure will be two crotchets, therefore the hand or foot being up, if we put it down with the very beginning of the firſt note or crotchet, and then raiſe it with the third, and then down to begin the next meaſure; this is called BEATING *of time.*

By practice, they get a habit of making this motion very equal, and conſequently of dividing the meaſure or bar into equal parts, up and down; as alſo of taking all the notes in the juſt proportion, ſo as to begin and end them preciſely with the beating. In the meaſure of two crotchets, they beat down the firſt, and the ſecond up. Some call each half of the meaſure in common *time, a time*; and ſo they call this the mode or meaſure of *two times*, or the *dupla* meaſure.

Again, ſome mark the meaſure of two crotchets with a 2 or $\frac{2}{4}$, ſignifying it to be equal to two notes, whereof four make a ſemi-breve; and ſome mark it $\frac{4}{8}$ for quavers. Malcolm's Muſic, p. 385, &c.

TIME, *for triple*, ſee TRIPLE *Time.*

TIME, in *Fencing*. There are three kinds of *time*; that of the ſword, that of the foot, and that of the whole body.

All the *times* that are perceived out of their meaſure, are only to be conſidered as appeals, or feints, to deceive and amuſe the enemy. See FENCING.

TIME, in the *Manege*, is ſometimes taken for the motion of a horſe, that obſerves meaſure and juſtneſs in performing a manege; and ſometimes it ſignifies the interval between two of his motions. In the manege of a ſtep and a leap, the horſe makes by turns a corvet between two caprioles; and in that caſe the corvet is one *time* that prepares the horſe for the caprioles.

The *times* obſerved in making a ſtop, are nothing but ſo many falcades.

TIME alſo ſignifies the effect of one of the aids; thus, we ſay, a good horſeman diſpoſes his horſe for the effects of the heel, by beginning with one *time* of the legs, and never runs precipitately upon his *times.*

Time-*keepers*, in a general sense, denote instruments adapted for measuring time. See Chronometer.

In a more peculiar and definite sense, *time-keeper* is a term first applied by Mr. John Harrison to his watch, for the performance of which, in determining the longitude in a voyage to the West Indies, in compliance with the act of the 12th of queen Anne, he obtained from the British parliament a moiety of the reward of twenty thousand pounds offered by the said act. See Longitude.

This appellation is now become fashionable amongst artists, to distinguish such watches as are made with extraordinary care and accuracy for nautical or astronomical observations. The Principles of Mr. Harrison's *Time-keeper* were communicated by him, in writing, to the commissioners appointed to receive and publish the same, A. D. 1765, and are as follow:

"In this *time-keeper* there is the greatest care taken to "avoid friction as much as can be, by the wheels moving on small pivots, and in ruby-holes, and high "numbers in the wheels and pinions.

"The part which measures *time* goes but the eighth part "of a minute without winding up; so that part is very "simple, as this winding-up is performed at the wheel "next to the balance-wheel; by which means, there "is always an equal force acting at that wheel, and all "the rest of the work has no more to do in the measuring of *time*, than the person that winds up once a "day.

"There is a spring in the inside of the fusee, which I "will call a secondary main-spring. This spring is always kept stretched to a certain tension by the main-spring, and during the time of winding-up the *time-keeper*, at which time the main-spring is not suffered "to act, this secondary-spring supplies its place.

"In common watches in general, the wheels have about "one-third the dominion over the balance, that the balance-spring has; that is, if the power which the balance-spring has over the balance be called three, that from "the wheel is one: but in this my *time-keeper*, the "wheels have only about one-eightieth part of the power "over the balance that the balance-spring has; and it "must be allowed, the less the wheels have to do with "the balance, the better. The wheels in a common "watch having this great dominion over the balance, "they can, when the watch is wound-up, and the balance at rest, set the watch a-going; but when my "*time-keeper's* balance is at rest, and the spring is wound "up, the force of the wheels can no more set it a-going, "than the wheels of a common regulator can, when "the weight is wound-up, set the pendulum a-vibrating; nor will the force from the wheels move the "balance when at rest, to a greater angle in proportion "to the vibration that it is to fetch, than the force of "the wheels of a common regulator can move the pendulum from the perpendicular, when it is at rest.

"My *time-keeper's* balance is more than three times the "weight of a large sized common watch balance, and "three times its diameter; and a common watch balance goes through about six inches of space in a "second, but mine goes through about twenty-four "inches in that time: so that had my *time-keeper* only "these advantages over a common watch, a good performance might be expected from it. But my *time-keeper* is not affected by the different degrees of heat "and cold, nor agitation of the ship; and the force "from the wheels is applied to the balance in such a "manner, together with the shape of the balance-spring, "and (if I may be allowed the term) an artificial cycloid, which acts at this spring; so that from these "contrivances, let the balance vibrate more or less, all "its vibrations are performed in the same time; and "therefore, if it go at all, it must go true. So that it "is plain from this, that such a *time-keeper* goes entirely "from principle, and not from chance."

We must refer those who may desire to see a minute account of the construction of Mr. Harrison's *Time-keeper*, to the publication by order of the commissioners of longitude.

We shall here subjoin a short view of the improvements in Mr. Harrison's watch, from the account presented to the board of longitude, by Mr. Ludlam, one of the gentlemen to whom, by order of the commissioners, Mr. Harrison discovered and explained the principles upon which his *time-keeper* is constructed. The defects in common watches, which Mr. Harrison proposes to remedy, are chiefly these: 1. That the main-spring acts not constantly with the same force upon the wheels, and through them upon the balance: 2. That the balance, either urged with an unequal force, or meeting with a different resistance from the air, or the oil, or the friction, vibrates through a greater or less arch: 3. That these unequal vibrations are not performed in equal times: and, 4. That the force of the balance-spring is altered by a change of heat.

To remedy the *first* defect, Mr. Harrison has contrived that his watch shall be moved by a very tender spring, which never unrolls itself more than one-eighth part of a turn, and acts upon the balance through one wheel only. But such a spring cannot keep the watch in motion a long time. He has, therefore, joined another, whose office is to wind up the first spring eight times in every minute, and which is itself wound up but once a day. To remedy the *second* defect, he uses a much stronger balance-spring than in a common watch. For if the force of this spring upon the balance remains the same, whilst the force of the other varies, the errors arising from that variation will be the less, as the fixed force is the greater. But a stronger spring will require either a heavier or a larger balance. A heavier balance would have a greater friction. Mr. Harrison, therefore, increases the diameter of it. In a common watch it is under an inch, but in Mr. Harrison's two inches and two tenths. However, the methods already described only lessening the errors, and not removing them, Mr. Harrison uses two ways to make the times of the vibrations equal, though the arches may be unequal: one is to place a pin, so that the balance-spring, pressing against it, has its force increased, but increased less when the vibrations are larger: the other to give the pallets such a shape, that the wheels press them with less advantage, when the vibrations are larger. To remedy the *last* defect, Mr. Harrison uses a bar, compounded of two thin plates of brass and steel, about two inches in length, rivetted in several places together, fastened at one end, and having two pins at the other, between which the balance-spring passes. If this bar be straight in temperate weather (brass changing its length by heat more than steel) the brass side becomes convex when it is heated, and the steel-side when it is cold: and thus the pins lay hold of a different part of the spring in different degrees of heat, and lengthen or shorten it, as the regulator does in a common watch.

The principles, on which Mr. Arnold's *time-keeper* is constructed, are these: the balance is unconnected with the wheel-work, except at the time it receives the impulse to make it continue its motion, which is only whilst it vibrates 10° out of 380° which is the whole vibration; and during this small interval it has little or no friction, but what is on the pivots, which work in ruby-holes on diamonds: it has but one pallet, which is a plane surface formed out of a ruby, and has no oil on it. Watches of this construction, says Mr. Lyons, go whilst they are wound up; they keep the same rate of going in every position, and are not affected by the different forces of the spring; and the compensation for heat and cold is absolutely adjustable. Phipps's Voyage to the North Pole, p. 230. See Longitude.

Time *of peace*. See Peace.

Time, *in Grammar*. See Tense.

Time, *in Mechanics*. See Motion.

Time, *periodical*. See Period.

Time, *equation of*. See Equation.

Time, *kipper*. See Kipper.

Time, *unity of*. See Unity.

TIMMER. See Timber, and Timbre.

TIMONEER, *timonier*, Fr. in *Sea-language*, the helmsman, or person who manages the helm to direct the ship's course.

TIMOROSO, in the *Italian Music*, intimates that the song is to be played or sung in such a manner as to express an awe or dread, either to shew respect, or to represent fear.

TIMOROUS, in the *Manege*. See Starting, Skittish, &c.

TIMOTHY-*grass*, in *Botany*, a species of the *cat's tail* or phleum, cultivated in England, of which it is a native: though the seeds of it were carried from Virginia by one Mr. Timothy Hanson to North Carolina, whence it received its name. It thrives most in low, damp, marshy grounds, producing a fine turf in three weeks from the time of sowing the seed. Linnæus says, it is a proper grass to sow on lands that have been drained. It is very luxuriant, grows to the height of three or four feet, and resembles wheat or rye, having a broad blade or leaf. All sorts of cattle are fond of it both green and dry; but for hay it should be mown when in full sap, and just before it flowers. It abounds near London, but is scarce in many parts of England, particularly in Herefordshire, Berkshire, and Norfolk.

TIN, *Stannum*, *Jupiter*, a whitish metal, softer, less elastic, and less sonorous than any other metal, excepting lead. In the Chaldee language טין *tin*, signifies *slime*, *mud*, or *dirt*; and when the Phœnicians came into Cornwall,

Cornwall, and ſaw this metal in its ancient ſlimy ſtate, they called it "the mud"; and hence, ſome have ſaid, the name *tin*, in Cornu-Britiſh *ſtean*, is derived. Some of the ancients called it plumbum album, white lead, probably to diſtinguiſh it from common lead; not knowing that it was radically another metal.

The chemiſts, &c. hold *tin* a ſpecies of imperfect metal, generated of two different ſeeds, viz. that of ſilver, and that of lead; which render it a kind of compound of both; and they ſay accordingly it is ſometimes found both in lead and ſilver mines.

Tin, however, has alſo its proper mines, of which our counties of Cornwall and Devon are an abundant evidence: the greateſt part of the *tin* conſumed in Europe is procured from thence; and Camden even ſuppoſes this abundance of *tin*, in thoſe two provinces, to have given the original denomination *Britain* to the whole kingdom. In the Syriac language, *varatanac* or *baratanac* ſignifies *land of tin*; from which Bochart derives the name *Britain*.

The Phœnicians, it is well known, traded for *tin* to the weſt coaſts of Cornwall ſix hundred years before the commencement of the Chriſtian æra. Whether at this early period, and for many ages after any other country produced this metal, we cannot poſitively determine: but if it was then known in other nations, it was eſtimated as a ſtaple only in Cornwall. Pliny ſays, it was found in Gallicia and Luſitania, but not in quantity ſufficient to merit much attention. A tinner in the time of Richard, earl of Cornwall, about the year 1240, upon ſome diſguſt, went over to Germany, and taught the natives to ſeek for *tin*: but at this day their workings for *tin* are inconſiderable, and ſerve only for their own conſumption. The mines of Germany are thoſe of Miſnia, Bohemia, and Carinthia. Whole kingdoms, as Sweden, Denmark, Norway, &c. have no ſuch mines, but are ſupplied with *tin* from England. Alonſo Barba ſays, that they had rich veins of *tin* at Orouro and Potoſi; but their vicinity to the immenſe mines of ſilver has prevented their being worked to any purpoſe. A conſiderable quantity of *tin* has been imported into Europe in later years from the Moluccas, ſome bars of which are ſaid to be equal to the beſt Corniſh grain *tin*. Mr. Pryce ſtates the average produce of Cornwall to be three hundred weight of *tin* in one hundred ſacks of *tin-ſtuff*; allowing one ſack to weigh one hundred and a quarter, then one hundred ſacks will be ſix tons five hundred weight; conſequently there muſt be one ton of *tin* produced out of forty-one tons thirteen hundred weight. The country has been found to produce, annually, for ſome few years paſt, about three thouſand tons of pure *tin* metal, which multiplied by forty-two tons of *tin*-ſtuff gives the total ſum of one hundred and twenty-ſix thouſand tons of *tin*-ſtuff per annum.

Boerhaave concludes, that ſulphur is a prevailing ingredient in *tin*; and deduces ſeveral of its particular properties therefrom. He adds, that, could the metal be perfectly purged of this heterogeneous ſulphur, it is probable it would be found no other than ſilver.

Several authors alſo had before noted a great conformity, in divers particulars, between theſe two metals; as that both grow bitter, when diſſolved by acids; that, when fuſed together, there is ſcarce any ſeparating them again, not even by lead. Add, that Mr. Boyle, and others, give us ſeveral inſtances of ſilver being actually produced in conſiderable quantity from *tin* ore.

Some naturaliſts judge the analogy greater between *tin* and lead, and contend that *tin* is only lead under a leſs degree of coction; but, if there be ſome marks of agreement between them, there are as many of diſagreement. The calx of lead, for inſtance, eaſily fuſes and vitrifies; but that of *tin* not without the utmoſt difficulty: if *tin* and lead be mixed by a fierce fire, a vehement colluctation enſues, and they both run into a calx: add, that *tin* is eaſily revivified; but lead not without great labour.

The diſtinguiſhing properties of *tin* are as follow: *Tin*, when bent backwards and forwards, occaſions a crackling ſound, as if it was torn aſunder: and like other imperfect metals, has a ſmell and taſte. It is much leſs ductile than ſome harder metals, though it may be beat into very thin leaves. The tenacity of the parts of *tin* is not very conſiderable, ſince a wire of this metal, in diameter $\frac{1}{10}$th of an inch, can ſupport only a weight of $49\frac{1}{2}$ pounds. It is the lighteſt of all metals, as it loſes only $\frac{1}{7}$th part of its weight when immerſed in water. It is very fuſible, and requires for this purpoſe a heat much leſs than is ſufficient to make it red hot.—With the heat neceſſary for its fuſion, it may be alſo calcined, or at leaſt deprived of ſo much of its phlogiſton, that it appears in form of a grey calx, which cannot be entirely reduced to *tin* without the addition of ſome inflammable matter. This calx or aſhes of *tin* may be farther deprived of phlogiſton, by a continued calcination with a more intenſe fire, by which means it becomes more and more white, hard and refractory, called PUTTY, uſually, indeed, prepared with lead and *tin*: and when the calx of *tin* is very white, and well calcined, it forms with fuſible and vitrifiable matters a white ENAMEL, uſed as a white glazing for DELF-*ware*.

Nitre mixed with *tin* may be inflamed, and haſtens conſiderably the calcination of this, as well as other imperfect metals. The vapours which riſe during the ſeveral calcinations of this metal have generally the ſmell of garlick or arſenic; becauſe *tin* generally contains ſome arſenic, as Mr. Margraaf has obſerved. Although *tin* be one of the moſt calcinable metals by means of fire, it is much leſs apt to ruſt by the combined action of air and water, than iron and copper: and, therefore, it is advantageouſly employed in the operation of TINNING.

This metal, expoſed to the focus of a powerful burning-glaſs, melts, and emits a thick white fume, and if held there a long time, wholly diſſipates itſelf in that fume. If, on the contrary, this metal be fuſed in a coppel by the ſame heat, it fumes conſiderably, and its ſurface becomes covered with a white calx, which greatly rarefies and expands, and there finally appear numbers of cryſtalline and bright ſtriæ, like needles, in that calx. If this be continued in the focus on a piece of free-ſtone, theſe cryſtals ceaſe to fume, and remain fixed while the ſtone itſelf melts and runs. And in the coppel there is uſually a part of theſe that run into a reddiſh matter, reſembling a ſort of enamel. If the calx of *tin* (that is, *tin* reduced to a grey powder, by being diveſted of a part of its oil in the fire) be expoſed to the focus of the burning-glaſs, it fumes more than plain *tin*, and is very ſoon transformed into cryſtalline ſtriæ, or needles. And if theſe are again expoſed to the ſame focus, placed on a piece of charcoal, they readily melt, and again aſſume the form of common *tin*. The charcoal, in this caſe, furniſhes to the calx of *tin* that oily matter, or phlogiſton which the fire had diveſted it of; and it is well known, that if the calx of *tin* be made red-hot in a crucible, and any fatty or inflammable matter be added to it, it immediately reſumes the form of *tin* again; this reduction is wholly upon the ſame principle with the other, the oil of charcoal doing in the firſt, what the fat does in the laſt.

It appears, upon the whole, that *tin* contains an oily matter or phlogiſton which is eaſily driven off by fire, and very eaſily received again on the mixture of any fat ſubſtance; that the earthy matter, which is the baſis of *tin*, is of a cryſtalline nature, and very hard to fuſe, ſince no common fire can vitrify *tin* alone; and even the focus of the moſt powerful burning-glaſs does it but with great difficulty, and imperfectly; this ſemi-vitrification is what throws the calx into needles, whereas were it perfect, the whole would be one uniform maſs. Mem. Acad. Par. 1709.

Every acid is capable of attacking or diſſolving *tin*; though Dr. Boerhaave ſays, that it is ſcarce diſſoluble by acids, unleſs by the weaker ſorts. Vitriolic acid requires the aſſiſtance of a certain degree of heat to diſſolve *tin* efficaciouſly. Nitrous acid attacks *tin* with great violence, eſpecially when the metal is much divided; but when the acid is very pure, it rather corrodes and calcines, than diſſolves *tin*. The acid of common ſalt diſſolves *tin* perfectly well by the help of heat. But in the ſolutions of *tin* by the nitrous and marine acids we may obſerve, that the former acid deprives it of all its inflammable principle, but has no action upon its dephlogiſticated earth; and that the effects of the marine acid upon this metal are quite the reverſe. Accordingly, when theſe two acids are united together, forming an aqua regia, they compoſe a menſtruum, which acts very efficaciouſly upon *tin*, on account of the activity of the nitrous acid; but which does not deſtroy the metal, as nitrous acid ſingly does, becauſe the action of this acid is moderated by the marine acid. A good ſolution may be made of *tin* in aqua regia, by gradually adding the *tin* in ſmall quantities, and thus reſtraining the heat; in which caſe the menſtruum may be ſo charged with the metal, that it ſhall be thick and viſcid, like a liquid tranſparent reſin, with a yellow-reddiſh colour. All the ſolutions of *tin* are acid and corroſive, and may be decompoſed by being diluted with much water; and thus the *tin* is copiouſly precipitated in form of a white calx. A ſolution of *tin* mixed with a ſaturated ſolution of gold, and diluted with a large quantity of water, forms the precipitate, called purple powder of Caſſius and employed for painting on enamels and porcelain. See GOLD *precipitate with tin*, and *Chemical Hiſtory of* GOLD.

The

The solution of *tin* in aqua regia, added to the tinctures of cochineal, of gum-lac, and of some other red tinctures, heightens the colour of these, and changes it from a crimson or purple to a vivid reddish yellow, or fire-coloured scarlet. The new scarlet, or Bow dye, is obtained in this manner; and it is said, that our most beautiful and lasting coloured fine cloths owe their superlative excellence to the retentiveness given by our fine grain *tin*; insomuch, that the English superfine broad-cloths, dyed in grain by the help of this ingredient, are become famous in all markets of the known world.

Mr. Pryce apprehends, that the purple-dye of the Tyrians owed its reputation wholly, or in part, to the use of our *tin* in the composition of their dye-stuff, as the *tin* trade was solely under their own direction.

This colour, however, succeeds only with wool and other animal matters. Attempts have been made, but without success, to give this colour to thread, to cotton, and even to silk, though this latter substance has many properties of animal matters. The solution of *tin* made with marine acid alone, or with vitriolic acid, does only give to red tinctures a crimson colour, as alum does. Vegetable acids, as vinegar and cream of tartar, are also capable of dissolving *tin*.

Tin, according to M. Geoffroy's table of affinities, has a stronger AFFINITY with the acid of common salt than regulus of antimony, copper, silver, and mercury; because the combinations of this acid with these metals are decomposed by *tin*, which precipitates them, and unites with the acid.

Sulphur may be united with *tin* by fusion, and forms with it a brittle mass, more difficultly fusible than pure *tin*. *Tin* may be allayed with all metals by fusion, and in all proportions; but it absolutely destroys their ductility. And it is remarkable, that the most ductile metals, as gold and silver, are those the ductility of which is most injured by *tin*. The ductility of copper is less, though considerably, injured by *tin* than that of other metals; and in this allay we observe, that *tin*, although a very soft metal, and not at all sonorous, augments considerably the stiffness, the hardness, and the sonorousness of copper, as in BELL-*metal*. See also BRONZE.

The allay, or amalgamation with mercury, is used in the FOLIATING of LOOKING-*glasses*. See AMALGAMATION *of tin*.

Tin allayed with an equal quantity of lead forms the SOLDER of plumbers.

The method of getting, preparing, &c. the *tin* in the Cornish mines, much the best and most considerable in the world, is given us in the Philosophical Transactions, abr. vol. ii. p. 569, &c. and more distinctly and fully in Pryce's Mineralogy.

The working of the *tin* mines is very hard and difficult, not only by reason of the great depth which the veins descend to, even as low as sixty fathom; but also because the rocks, through which passages are frequently cut, are extremely hard. Nor is the soft shaking earth found in the *tin* mines, much less inconvenient to the workmen, both by reason of the fetid, malignant vapours it exhales, and of the current of water often met withal therein: these disadvantages often render it impracticable for the workmen to hold it above four hours together.

The existence of *native tin* has been always doubted, and till of late absolutely denied by all mineralists both ancient and modern: however, Mr. Borlase, in his Natural History of Cornwall, p. 185, suggested, that its existence was far from being improbable; but he afterwards discovered three specimens of this metal native or pure, of which he presented an account to the Royal Society. Mr. Mendes da Costa made several experiments on one of these specimens, with a view of proving that it was really *tin*; from which he infers, that it is perfectly ductile and malleable, and being bent between the teeth gives the same crackling noise as *tin* always does: in an open fire it melts easily, calcines on the surface, and smokes; but forced in a stronger fire with borax, it detonates with small phosphorescent sparks, which is a property of pure *tin*; and it is only corroded to a white calx in spirit of nitre, and oil of tartar per deliquium being added to the solution, none of it was precipitated: whence he concludes, that it was pure *tin*. Philos. Trans. vol. lvi. art. 7. and art. 39. Native *tin* is also said to have been found in Saxony and Malacca.

Although *tin* is the lightest of all metals, its ore, or *tin* stuff, as it is called by the tinners or miners, is, when rich, the heaviest of all metallic ores, which is probably owing to the quantity of mundick with which it is combined.

The ores of *tin* may be generally classed into shode, stream, and bal or mine *tin*. The shode is disjunct, and scattered to some distance from its parent lode, and is pebbly or smoothly angular, of various sizes, from half an ounce to some pounds weight. See SHOAD-*stones*.

Stream-*tin* ore is the same as shode, but smaller sized, &c. See STREAM-*tin* and STREAMING *of tin*.

Bal or mine *tin* ore often rises very rich, and instances frequently occur, in which it has been discovered in the richest and purest state imaginable. This kind of rich ore consists of the blackest grains or crystals, and is usually found at a moderate depth, or within the day-side of forty fathoms.

The *tin-stuff*, or ore, being dug and drawn out of the mine, and laid by the side of the shaft, is first spalled, or broken into pieces of a middling size; and when the best parts are sorted, they are divided into heaps by a hand-barrow, containing a sack and a half, or eighteen gallons. Each of these shares, called *doles*, being turned over, equally levelled and mixed, is then divided with a shovel into two equal parts; and after being bruised by large sledges to the size of an hazle-nut, is equally levelled and divided into four parts; the bruising and divisions are repeated at pleasure, till the quantity designed for sampling is well mixed, and made as fine as common sand.

To make a rough guess, or coarse essay, the sampler takes a handful of it, and washes it on a shovel, till the impure parts are carried off by the water, and the more solid and heavy particles, that are left behind, are bruised with a sledge on the shovel, till the whole assumes the appearance of mud. This is again washed, and by a peculiar motion the metallic particles are collected together on the fore-part of the shovel. By repeating these bruisings, washings, and motions, it becomes clean black *tin*, fit for the smelting furnace. This is called a *van* (probably from the French *avant, foremost*) as it is thrown upon the point of the shovel by the dexterity of the sample trier. After the *tin* is thus cleaned, it is dried; and if there be as much black *tin* as will cover a shilling, or equal the weight of a shilling, it is called *a shilling van*, which is not rich; but if the van will cover or equal the weight of a crown piece, it is good *tin*-stuff, and called a *crown van*. The shilling van, the tinners say, will produce one hundred avoirdupois weight of block or white *tin*; and the crown van will yield five hundred weight of block *tin*, for every hundred sacks in measure of the respective doles from which the sample or van was taken, and so in proportion, to the richest *tin*-stuff, called *scove*, which is reckoned at the rate of ten thousand of white *tin*-metal for every hundred sacks. But a better judgment may be formed from the measure of a wine half pint, than from a handful, which is indeed, accounted a half-pint. When the *tin*, thus measured, is reduced clean, and to a proper size, by using a large shovel, and taking off the sized *tin* on another shovel, the van is dried in a shovel upon the fire, and then weighed by pennyweights and grains: and for every pennyweight and half the van weighs, the produce will be one hundred weight of black *tin* for every hundred sacks of *tin*-stuff; and for three pennyweights two hundred weight, &c. in the same proportion; and if it be *tin* worth ten for twenty, or one for two, then the *tin*-stuff is valued at five hundred weight of block or white *tin* for every hundred sacks: if it be worth twelve for twenty, the stuff is valued at six hundred weight of white *tin* a hundred; or if it be worth only eight for twenty, it is only valued at four hundred weight of white *tin* a hundred, &c. This *black tin* is rather of a liver colour, though called black in contradistinction from white *tin*, or the metal produced from this black ore: it is very heavy, and may in general be computed to hold one half clean metal, and some of it will produce thirteen, or even fourteen parts in twenty; whence the mode of expressing so much white *tin* for twenty of black *tin*, i. e. eight for twenty, ten for twenty, twelve for twenty, &c. Thus if the van of one hundred sacks of *tin*-stuff weighs six pennyweights, being four hundred weight of black *tin* at twelve for twenty, the white *tin* or metal must be two hundred weight one quarter, sixteen pounds.

In this method of sampling, the tinners form a near conjecture of the quantity of white *tin*, which their doles of *tin*-stuff will produce at the smelting-house, when it is dressed, and brought into black *tin*. But if the black *tin* is combined with any bad mixture, as of mock-lead, copper, or mundick, after the van is bruised fine and washed, they lay the shovel over the fire, and burn the black *tin*, stirring it continually, till it has done smoking: they then wash it again on the shovel, and thus the heterogeneous matter, becoming light by being burnt, is carried off by the water: for when black *tin* is calcined or burnt, it still retains its specific gravity; but copper, lead, and other crude minerals, become much

much lighter by torrefaction, and are eaſily ſeparated from the *tin* by water. In the dreſſing and management of *tin* by ſtamping, &c. there are obtained two ſorts of black *tin*, viz. the crop and rough, or the crop and leavings of *tin*. The firſt is the prime *tin*, immediately ſeparable from the baſer parts by its ſuperior weight and richneſs. The latter is that which is carried off, and mixed with the lighter earthy parts, by being under ſize, and, therefore, more eaſily carried off by the water.

The *tin*-ſtuff, after this previous preparation and adjuſtment, is carried to the ſtamping-mill, in order to be dreſſed; which operation is performed after the manner deſcribed under *dreſſing of* ORES and BUDDLE. After repeated buddlings, the *tin* is carried to a large vat, called a *keeve*, about one third filled with water, where the dreſſer ſtirs round the water with a ſhovel, whilſt it is gradually and gently put into the veſſel; in which it is toſſed and ſtirred till the keeve is almoſt filled. The ſmall remaining waſte is thus made to ſwim about in the water. After this operation, the keeve is beat with mallets at the ſides near the top (which operation is called *packing*) till the whole is ſettled hard; the water is then poured off, and the waſte ſkimmed and laid by, to be again buddled, under the name of the *ſkimpings*. The *tin* is ſifted through a copper-bottomed ſieve into another keeve of water, by which the gravelly waſte ſtill remaining is ſeparated from the clean *tin*; and the *tin* that runs through the ſieve, if it requires no farther buddling, may be cleaned by repeatedly toſſing and packing it as before. If it be neceſſary to buddle it again, after it is ſifted, let it be buddled, and diſtributed in three parts, viz. the crop or pureſt, the creaſe, or next in purity, and the hind-creaſe, or tail, which is the moſt impure. The crop is to be cleanſed by toſſing, &c. and the creaſe muſt be buddled again, and out of this muſt be reſerved as much as may be cleanſed by toſſing and packing. The remainder muſt be cleanſed by an operation called *dilleughing*, from *dilleugh, to let go or ſend away.* A dilleugher is a large fine hair ſieve, which the dreſſer holds in a keeve one-third full of water, into which the *tin* is thrown by a ſhovel-full at a time, and which is ſhook ſo as to put the *tin* into motion; one ſide of this dilleugher is dipped in water, and raiſed again in ſuch a manner, that the waſte may run over, which is laid aſide to mix with the ſkimpings, to make the ſamples of low value, called the *rough* (or *row*) *tin*. This uſually undergoes another operation, in which by a rill of water paſſing over the buddle in which it is placed, it is farther cleanſed, and then dilleughed, ſo as to be fit to mix with the crop-*tin*.

As for the *tin*-ſtuff, which is incorporated with copper, lead, mundick, black-jack, and other ſemi-metals, this muſt be burnt after it is ſtamped, dreſſed, and cleanſed in the manner already deſcribed, in order to make it fit for calcination in the furnace, called *a burning-houſe*, which reſembles a ſmelting-furnace, though in ſome reſpects it is different.

The leavings of *tin*, conſiſting of the ſlime and tails, i. e. of *tin*-mud and *tin*-gravel, are dreſſed by a particular kind of apparatus, for the conſtruction and uſe of which, we muſt refer to Pryce's Min. Corn. p. 226, &c.

Each ſtamping-mill, which has conſtant work and water, will employ one man and five boys; and one hundred ſacks are carried, ſtamped and dreſſed, in the ſpace of a few days, at the average rate of about four pence *per* ſack, or one guinea and a half per hundred.

The next operation, pertaining to *tin*-ore, or black *tin*, is that of SMELTING it. The Phœnicians, who traded to Cornwall for *tin* in the earlier ages, probably conducted this proceſs by digging a hole in the ground, and ſtrewing the ore on a charcoal fire, which perhaps was excited by a bellows. But having no idea of confining the fire, and directing its force on the ſubſtance to be ſmelted, they made no uſe of furnaces, either ſimple or reverberatory. Charcoal was long uſed in the operation of ſmelting, till at length neceſſity ſuggeſted the introduction of pit-coal; and in the ſecond year of queen Anne, a patent was granted for ſmelting black *tin* with foſſil coal in iron furnaces. The invention of *reverberatory* FURNACES built with brick, ſtone, ſand, lime, and clay, ſoon followed this diſcovery; the form of which, being ſimple, has admitted of little improvement to the preſent time. The charge for one of the *tin* ſmelting furnaces is from five to ſix hundred weight of black *tin*, well mixed with a tenth or twelfth its weight of culm. The furnace is charged through a hole in its ſide with a ſhovel, and the *tin* levelled over the bottom with an iron rake or paddle. The apertures are then cloſed, and the fire raiſed to a very great ſtrength, in which ſtate it is left for four or five hours, when the door is taken off, and the whole charge well ſtirred together. The ſtate of the metal is examined, and more culm thrown in if neceſſary; the furnace is again cloſed, and the fire kept up till the end of about ſix hours from its receiving the charge; when it is again examined, and if proper, it is then tapped, and the metal let out into a fixed baſon made of clay, and large enough to hold ſomewhat more than the metal of the charge. The ſcoria in the bottom of the furnace is raked out at the mouth into a ſmall pit made for this purpoſe, where it generally forms itſelf into a cake. When cold, it is carried to the ſtamping mill, in order to ſeparate the globules of melted *tin* diſſeminated through the ſcoria or ſlag. This, being broke by hammers to the ſize of gooſe-eggs, is put into the firſt ſtamping-mill, and paſſed through ſmall iron bars; by which means the *pillion* (for ſo all *tin* recovered out of the ſlags is called) of the larger ſize is taken out and prevented from waſte by too much ſtamping. The refuſe of this firſt ſtamping is put into other ſtamping-mills of a ſecond, third, or even fourth ſize. Of the pillion, ſeparated from the ſcoria, all the rough or grainy parts are conſidered as metal, and refined accordingly, by being ſmelted without any flux, and the produce of this ſmelting refined, with the *tin* firſt tapped.

The *tin* in the baſon, or float (as it is called) as ſoon as it comes down to a moderate heat, is laded out into the moulds, in ſlabs or pigs of about three-fourths of a hundred weight.

The next proceſs is that of refining. The furnace having, by the ſide of the ſmall float now deſcribed, a larger one capable of holding twenty, or more blocks, is for this purpoſe ſuffered to cool to a certain degree, and then charged full with the ſlabs juſt mentioned, the tap-hole being kept open, ſo that as the *tin* melts in this moderate fire, it makes its exit through it into the float; where, while running out, it is frequently ſtirred and toſſed by a ladleful at a time held arm-high, letting it fall in a ſtream into the maſs of metal, when the ſcum which ariſes is taken off. While the metal already put into the furnace is melting, more is added, ſo as to be juſt enough to fill the float with good *tin*; and this, after being toſſed and ſkimmed as before, and ſuffered to cool to a proper temper, is carried in iron ladles to moulds holding generally ſomewhat above three hundred weight (then denominated *block-tin*) where they are marked as the ſmelters chuſe with their houſe-mark, which may be a pelican, plume of feathers, ſtag, or horſe, by laying braſs or iron ſtamps, in the face of the blocks while the *tin* is in a fluid ſtate, and yet cool enough to ſuſtain the ſtamping iron. The blocks are then ready to be weighed, numbered, and ſent to the neareſt coinage town to be coined.

The privileged towns for coinage of *tin*, were anciently Liſkeard, Loſtwithiel, Truro, and Helſton: but ſoon after the Reſtoration Penzance was added to the number; in which laſt place there is every quarter more *tin* coined than in the towns of Liſkeard, Loſtwithiel, and Helſton for a whole year. When the *tin* is brought to be coined, the aſſay-maſter's deputy aſſays it by cutting off with a chiſſel and hammer a piece of one of the lower corners of the block about a pound weight, partly by cutting and partly by breaking, in order to prove the roughneſs and firmneſs of the metal. If it is a pure good *tin*, the face of the block is ſtamped with the duchy ſeal, which ſtamp is a permit for the owner to ſell, and at the ſame time an aſſurance that the *tin* ſo marked has been examined and found merchantable. The ſtamping of this impreſſion by a hammer is COINING the *tin*, and the man who does it is called the *hammer-man*. The duchy ſeal is argent, a lion rampant gules, crowned or within a bordure garniſhed with bezants.

The droſſy part remaining in the furnace is by an increaſing fire wholly melted, which is then tapped into the ſmall float, where the *tin* ſubſiding, and the droſs riſing to the top, the latter is taken off, and the *tin* laded into ſmall ſlabs as at firſt, to be again refined. The *tin* that remains in and about the ſcoria and droſs of the laſt tappings, &c. is recovered by repeated ſmeltings, till at laſt being almoſt entirely drained of that metal, they become what the workmen generally call *hard-heads*, and eſteemed of no farther value.

The workmen diſtinguiſh ſeveral kinds of *tin*; as *moor-tin*, which is the beſt ſort, a fool whereof weighs eighty pounds; and *mine-tin*, which is the next, the fool thereof weighing about fifty-two or fifty pounds. The *tin* got from the ſoft, gravelly earth, they call *pryan-tin*, to diſtinguiſh it from that got from the ſtones, which is better by almoſt half. See STREAM-*tin ore*.

Grain-tin denotes the ore of *tin* that is ſometimes dug very rich in the form of grains or pebbles, or elſe in larger pieces, compoſed of many ſuch diſtinct grains, united in one maſs, always of a black or dark roſin colour, pointed like diamonds. *Grain-tin* is alſo uſed to

ſignify

signify the pureſt and fineſt block or white *tin*, ſmelted with charcoal in the blaſt or blowing-houſe furnace, which never had any brood or foreign mixture in the mine: whereas the mine-*tin* is uſually corrupted with ſome portion of mundick, or other mineral, and is always ſmelted with a bituminous fire, which communicates a harſh ſulphureous quality to the metal. *Grain-tin* is peculiarly produced from ſtream-work, and is worth ſeveral ſhillings per hundred more than mine-*tin*. See Streaming *of tin*.

See on this article Chem. Dict. art. *Tin*, and Pryce's Mineralogia Cornubienſis, fol. 1778.

There is a curioſity in the Corniſh mines, which is this: that in digging at the depth of forty or fifty fathoms, they frequently meet with large timber, ſtill entire. Childrey, in his Natural Hiſtory, goes back as far as the deluge to place them there; but, without having recourſe to ſo great antiquity, they who believe, that the mines, when exhauſted of their ore, or mineral matter, renew and fill again in courſe of time, will ſoon ſolve the difficulty, by ſuppoſing that, in the firſt working of theſe mines, theſe timbers had been let down to ſerve as props and pillars.

But there are other people will think this renewal of the mines itſelf a difficulty as great as the former. However, what the former author adds, viz. that in ſome places in the mines they likewiſe find pick-axes, &c. with wooden ſhafts, as alſo braſs nails, and that even a medal of Domitian has been found in one, ſeems to countenance the opinion.

For the uſe of *tin* in the compoſition of pewter, ſee Pewter.

Tin, *method of aſſaying*. To find whether *tin* be ſoft and ductile, or harſh and brittle, there are two kinds of aſſays; the firſt is, by putting the *tin* into a mould of caſt braſs, and there melting it. If the metal be harſh, it will be taken out heavier than before; if otherwiſe it will be lighter. The ſecond is, by caſting the melted *tin* into a little mould, made of a ſoft ſtone. This mould is to have a little canal of moderate length, which conducts the matter into a cavity, capable of containing half a billiard ball: if the *tin* be harſh, it appears whitiſh towards the entry of the mould, otherwiſe it is tinged ſuperficially with a very faint bluiſh brown.

Tin, *refining of*, or *ſeparating it from other metals*. Mr. Groſſe in the Memoirs of the Academy of Sciences of Paris, has delivered a method he had invented of ſeparating *tin* from lead or ſilver. Having tried an experiment on the ſcoriæ of metal, which contained with the *tin* a large quantity of ſilver, it ſeemed to him that one great ſtep toward the ſeparation of the ſilver, was the haſtening of the calcination of the *tin*, and with this view he tried a mixture of charcoal, ſalt-petre, and earth, which he put together into the coppel with the ſcoriæ. It is eaſy to ſee that a detonation would happen from this, and this muſt greatly add to the force of the fire, in acting upon the ſcoriæ, while the ferruginous matter well known to be contained in the charcoal mixed itſelf with the *tin*, and muſt greatly accelerate its calcination, divide its parts, and give the fire a new action over it. The conſequence of this perfectly anſwered expectation, and recovered a large quantity of ſilver from the ſcoriæ, in which the *tin* had before held it firmly imbodied; repeated experiments proved the truth of this obſervation, and it was found to be eaſy by this means at any time to ſeparate ſilver from *tin*, or to purify ſilver without loſs, by means of lead in which *tin* has accidentally been imbodied.

The ſcoriæ in which *tin* is mixed with ſilver, are compoſed of *tin* half calcined, and run into an opake vitrified ſubſtance, which forms a ſort of net-work, in which the ſilver is confined in extremely ſmall particles. If this is thrown into aqua fortis, the whole is diſſolved: but then it requires a very ſtrong fire to make the *tin* loſe its metallic form; finally, if the whole is finely powdered and then put into this menſtruum, the ſilver only is taken up or diſſolved, the *tin* remaining untouched at the bottom of the veſſel.

The ſame gentleman found alſo a method of ſeparating *tin* from ſilver, by means of corroſive ſublimate of mercury. To conceive the manner in which this ſeparation is effected, a piece of fine *tin* need only be caſt into a ſolution of ſublimate; in which caſe the acid of the ſea-ſalt is ſeen to leave the mercury in order to fix upon the *tin*.

And, according to the ſame principle, if ſublimate corroſive be added to a mixture of *tin* and ſilver, the ſame effect is produced, the acid affixes itſelf to the *tin*, and makes with it a butyrum joviale or butter of *tin*, the mercury becomes diſſipated in the mean time by the action of the fire, and the ſilver remains pure and alone; but in this experiment, if too much corroſive ſublimate be added, there is danger of loſing ſome of the ſilver; ſince the abundant acid will prey upon and carry off a part of that metal, making a ſort of luna cornea which diſſipates itſelf in the air, or if the operation be performed in a cloſe veſſel, a butyrum lunare.

Gold may alſo be purified from *tin* in this manner, and in this there is no riſk of loſs, ſince the acid which takes up the *tin* has not the leaſt power over that metal: in all theſe proceſſes, however, the operator muſt avoid the fumes iſſuing from the crucible, for they are very dangerous.

Theſe methods of ſeparating of *tin* from ſilver are very certain and infallible, but they are too expenſive to be employed in common, and in larger works.

The ſeparating of *tin* from lead to be employed in the refining of ſilver is a matter of great importance; and this may be done in the following manner: melt the lead, and when in fuſion throw into it a quantity of filings of iron, then increaſe the fire to a conſiderable degree, and the ſurface of the metal will be covered with a ſort of ſcum, which is no other than the iron and *tin*. At this time there ſhould be a little alkali ſalt thrown in, and by this means the ſcoriæ readily ſeparate themſelves, and the pure lead remains in form of a regulus at the bottom. The ſame method may be uſed to ſeparate *tin* from ſilver in the larger way, but it will be neceſſary for this purpoſe to add ſome lead, ſince otherwiſe the fuſion will be very ſlow and difficult, and the *tin* will calcine without ſeparating from the ſilver. This is a very eaſy and very cheap method, and will obviate moſt of the miſchiefs which happen to the refiners, of which they would have much leſs frequent reaſon to complain, if they nicely examined the lead they were to employ.

But if gold or ſilver be mixed with *tin*, the ſhorteſt method in ſmall quantities is to calcine the whole very briſkly, and in order to complete the vitrification and ſeparation of the *tin*, to caſt in a little glaſs of lead, which will immediately join itſelf with it and carry it off from the maſs.

It may ſeem ſingular that iron being one of the hardeſt of the metals to melt, and *tin* being of all the eaſieſt, they ſhould ſo readily and eaſily unite in theſe experiments; but this ſeems to be the reſult of one of thoſe natural and unexpected alliances which accident frequently diſcovers to us in bodies. There is one conjecture, however, that may be worthy a place in this reſearch, which is, that all *tin* ore contains a quantity of arſenic, and it is well known that iron very readily mixes with arſenic, and is employed to ſeparate the arſenic from other ores, and a regulus may be formed of arſenic and iron. It is eaſy to ſuppoſe, that *tin* is, in its metalline form, not wholly diveſted of the arſenic it contained when in the ore, and if this be allowed, it is no wonder that the two metals are eaſily brought together by the mediation of that principle. Memoirs Acad. Scienc. Par. 1737.

Mr. Cramer gives the practical rules of ſeparating ſilver from *tin*, thus: divide one centner of *tin* into two equal parts; put each of theſe into a ſeparate teſt, and add to each ſixteen centners of granulated lead, and one of copper; put the whole under the muffle, and make a very ſtrong fire; the *tin* will be calcined immediately, and will ſwim upon the lead. Then diminiſh the fire a little, till the aſhes of the *tin* that ſwim upon the ſurface do no longer ſparkle; when you ſee this, add with a ladle two centners of glaſs of lead to each teſt, in ſuch a manner that it may be ſpread wide over the whole ſurface of the rejected calx; the calx will then change its form of powder into that of glaſs; then increaſe the fire to its higheſt degree, ſtir up the whole with an iron rod made warm; and when the ſcorification is perfected, pour out the glaſs into a mould; the ſcoriæ being ſeparated, put both the reguluſes into two coppels well heated; and into a third put fixteen centners of lead, and one of the ſame copper uſed in the proceſs; examine all theſe beads after the coppelling is over; if the two firſt weigh exactly alike, it is a proof the proceſs has been well performed; and ſubtracting the weight of the bead, ſeparated from the third pan, from the joint weight of the other two, the remainder is the weight of the pure ſilver contained in the quantity of *tin* which was examined. Cramer's Art of Aſſaying, p. 228.

Tin, in *Chemiſtry* and *Medicine*. This ſubſtance, though greatly celebrated by the writers of former times, is not much eſteemed at preſent: more eſpecially ſince Margraaf diſcovered, that *tin* contains more or leſs of an arſenical matter, which probably proceeds from the ores of *tin*, all which contain arſenic.

M. Margraaf reports, that, by a gentle diſſolution in aqua regia, and ſlow evaporation, he obtained cryſtals, which, on being expoſed to the fire, with the addition of ſome fixt alkaline ſalt to abſorb their acid, ſublimed into a white concrete, and that this exhaled in the fire in fumes of a ſtrong garlick ſmell, formed with ſulphur yellow and red compounds, and whitened copper.

However, Dr. Lewis obſerves, that, notwithſtanding the

the arsenical impregnation in *tin*, the metal taken in substance has not been found to be noxious, though the fumes, which it emits in a red heat, are undoubtedly so.

The principal use of *tin* in the present practice is as an anthelmintic: even the flat WORMS, which too often elude the force of other medicines, are said to be effectually destroyed by powdered *tin*. The common dose of the powder is from a scruple to a dram; but Dr. Alston says, that its success depends on its being given in much larger quantities. See *Worm* POWDERS.

It is possible, says Dr. Lewis, that the anthelmintic virtues of *tin* may proceed not so much from the pure metal, as from a certain substance of a different, or arsenical nature, which the purest sorts of *tin* are found to participate of.

The principal preparations of *tin* are as follow:

TIN, *Butter of*, is a name given by some chemists to a combination of *tin* with the concentrated marine acid of corrosive sublimate. It is procured by reducing these substances into small parts, and mixing them together; this mixture will, by degrees, be moistened by attracting the humidity of the air. The decomposition of the corrosive sublimate by the *tin* is more speedily effected by distillation.

TIN, *Calx of*, is the metal reduced into powder, either by means of fire, or by being dissolved in an acid menstruum, and precipitated with an alkali.

TIN, *Cerus of*. See *Spanish* WHITE.

TIN, *Diaphoretic of*. See ANTIHECTICUM *Poterii*.

TIN, *Flowers of*, are a kind of white cosmetic, or paint for the complexion, drawn from *tin* with sal ammoniac, by means of sublimation.

TIN, *Gold-coloured preparation of*, is made by adding six ounces of mercury to twelve of melted *tin*, pulverising the cold mass, mixing with it seven ounces of flowers of sulphur and six of sal ammoniac, and subliming in a matrass.

This preparation is called AURUM *mosaicum*, and as a medicine is little regarded, though formerly much esteemed against hysterical and hypochondrical complaints, malignant fevers, and venereal disorders. Upon experiment, it appears to be little more than calx of *tin*.

TIN, *Salt of*, *Sal Jovis*, is prepared from twelve ounces of calx of *tin* and four of aqua regia, diluted with twenty-four of water; after digestion for two days, the vessel is to be shaken, the more ponderous part of the calx suffered to settle, the turbid liquor poured off, and evaporated almost to dryness, and the mass farther exsiccated on brown paper; to the remaining calx half the quantity of fresh menstruum is to be added, and the process repeated. Dr. Lewis's experience has not enabled him to pronounce on the virtues of this salt, which is in taste very sharp and corrosive: he thinks it needless to calcine the metal, as *tin* uncalcined dissolves much more easily and plentifully, and the solution is in both cases the same. According to Hoffman, the solution of *tin* is a strong purgative. Lewis's Mat. Med.

TIN is also a word used by some of the chemical writers to express sulphur.

TIN-*floors*, a contrivance used by our husbandmen who propagate hops, to dry them after the gathering. See OOST.

It is thus done: let a square brick room be built, with a door on one side, and a long fire-place of a foot wide in the middle, reaching almost across it; let holes be made at the sides of this fire-place, to let out the heat into the room; and at the height of five feet above this let a floor be made of laths of an inch thick, laid lattice-wise. Let this be covered with great plates of double *tin*, taking care that the joinings of the *tin* be well soldered, and lie upon the laths, not over the interstices, which may be about four inches wide. Let a row of boards be fitted round the edge of this floor, to keep the hops from falling off, then lay on a covering of hops of a foot thick; then make a small fire of charcoal in the mouth of the fire-place, and the hops will dry very quick and very regularly. They may be continually stirred about while drying, and, when enough, a part of the boarded edge of the kiln may be taken down, and the dried parcel thrust out, and a fresh parcel laid on in their place. A very small quantity of fuel is sufficient in this way, and any fuel will do, for the smoke never comes at the hops. There is a very great improvement still upon this method of drying hops, used by some people; this is the making of a wooden cover, of the size of the *tin-floor*; this is covered with plates of *tin* nailed on, and is suspended over the kiln in such a manner, that it may be let down at pleasure, when the lower parts of the hops are dry. This is to be let down within ten inches of their surface, and there it acts as a reverberatory, and drives back the heat on the upper ones, so that they are dried as soon as the lower ones. Thus all the trouble of turning is saved, and the hops are much better dried than in any other way. Mortimer's Husbandry, p. 186. See VENTILATOR.

TIN-*hatch*, in *Mining*, a term used by the people of Cornwall, to express the opening into a *tin*-mine. They also call it *tin-shaft*.

They make several openings in the sides of the hills where they suspect veins of ore to be. All these, except that which opens on the head of the mine, are called *essay-hatches*; but that which does so, is made their entrance afterwards, and changes its name to that of the *tin-hatch*. See HATCHES and SHAFT.

TIN-*ore*, called *tin*-stuff by the miners in Cornwall, is very seldom found pure, but almost always mineralised, and chiefly by arsenic. The richest ore is of an irregular form, of a black or tarnished colour, and almost the heaviest of all ores, as it contains much more arsenic than sulphur, whereas most ores contain more sulphur than arsenic.

The most common *tin*-ore is of the colour of rust, which proceeds from a quantity of iron, or of iron-ore mixed with it. One kind of *tin*-ore is semi-transparent, and like spar: and several kinds of garnets are enumerated by mineralogists among *tin*-ores, because they actually contain *tin*. All the ores of *tin* are of the calciform kind, except *black* LEAD, which appears to be *tin* mineralised by suphur and iron.

The calciform ores of *tin* are, 1. *Tin-stone*, which is of a blackish-brown colour, of no determinate figure; and *tin-grains*, or crystals of *tin*, which resemble garnets, and are of a spherical or polygonal figure, which they have probably acquired by the attrition of their angles. The *tin*-stone seems to consist of attrited *tin*-grains. This ore is calx of *tin* united with calx of arsenic, and frequently with calx of iron. 2. GARNETS are said to contain calx of *tin* united with calx of iron. 3. MANGANESE is said also to contain *tin*. See TIN *supra*, and STREAM-*tin-ore*.

The first process toward the separating of the metal from this ore, is the roasting it, which the assayer performs in this manner; put six centners of *tin*-ore, in coarse powder, in a test, under a muffle made thoroughly red-hot, shutting first the vessel for a few minutes, and then opening it. If the fire is pretty strong, the volatile part will be soon expelled in a thick white smoke, smelling like garlic. When this is over take out the test, and when the ore is cold, beat it to powder, and roast it again in a somewhat stronger fire, till it exhales no more arsenic, which may be known by putting upon the test, when just taken from the fire, a thick cold plate of iron, which will be covered on its under surface with a small whitish cloud, if the ore exhales any arsenic. Cramer's Art of Assaying, p. 332.

When the roasting is thus finished, the ore may be run into malleable *tin* in the common manner, as the common LEAD-*ore* is, only with this caution, that the fire in the operation be carried on as soon as possible to the highest degree that is necessary here, and the vessel taken out of the fire as soon as the operation is judged to be finished.

Upon this assay Cramer makes the following remarks:

1. *Tin*-ore, on account of its greater gravity, admits better of being separated, by elutriation or washing, from earth, stones, and lighter ores.

2. A most exact separation of earths and stones ought to be made, because the scorification of these by fluxes requires such a heat as would destroy the reduced *tin*.

3. The iron ought to be separated by a magnet.

4. By a previous roasting the arsenic is dissipated, which would otherwise carry off a great deal of *tin* along with it in a melting heat, would change another part of it into ashes, and would vitiate the remaining *tin*.

5. The assay of *tin* is very precarious and uncertain; because *tin* once reduced is easily destructible by the fire, and by the saline fluxes requisite for the reduction.

Mr. Gellert directs, that ores of *tin* should be assayed in the following manner: mix a quintal of *tin*-ore, washed, pulverised, and twice roasted, with half a quintal of calcined borax, and half a quintal of pulverised pitch; these are to be put into a crucible, moistened with charcoal-dust and water, and the crucible placed in an air-furnace: after the pitch is burnt, give a violent fire during a quarter of an hour, and then withdraw the crucible. If the ore be not very well washed from the earthy matter, as it ought to be, a larger quantity of borax is requisite, with some powdered glass, by which the too quick fusion of the borax is retarded, and the precipitation of the earthy matter is prevented. If the ore contains iron, to the above mixture may be added some alkaline salt. See MOOR-*stone*.

The method of assaying *tin*-ore, says Mr. Pryce, is very easy;

easy; for in its form and size of black *tin* (which is the ore dressed by stamping, several washings, and calcination, if mineralised with vitriolic, arsenical, or sulphureous pyrites) great part of the work is done, and little more remains than fusion, which is accomplished by a red heat in the following process: take four or five ounces of black *tin* as emptied from the sacks, mix it well with about one fifth part of its weight of powdered culm; put the mixture in a black-lead crucible, on the wind-furnace, and, in about twenty minutes, the metal will be found precipitated to the bottom of the crucible, the culm and scoria floating on the *tin*. On the surface of this matter there will be globules of *tin*; and therefore the mixture should be stirred with an iron-rod, to make them fall into the *tin* at the bottom. Close the furnace, and let the whole remain in fusion from three to five minutes. Keep in readiness an iron or brass mortar, and an ingot-mould about six inches long; pour the *tin* into the ingot, and empty the culm and scoria into the mortar, scraping off what remains in and about the crucible with a sharp iron. As soon as cold put them into another mortar, and pulverize them gently, so as to separate the scoria from the largest of the globules of *tin*. Select the larger globules, and pulverize the remainder a second time; then put this stuff twice powdered on a shovel, and passing it often through water, in the same manner as the lighter parts are washed from ores in vanning, and the smaller globules will remain on the shovel; and these, with the larger (both together being generally called *pillion-tin*), being added to, and weighed with the ingot, shew the produce in metal of the four or five ounces assayed. See Chem. Dict. English ed. and Pryce's Min. Corn. p. 269.

Tin-*plates*, an article of manufacture very common among us, and vulgarly called *tin*. It is iron plated over with *tin*. The French call it *fer blanc*, *white iron*, as we sometimes do in England. It was once known under a distinct name, LATTIN, under which article the process of manufacturing it is described.

We shall here add, with regard to the history of this manufacture, that in the year 1681 *tin*-plates were made in England by one Andrew Yarranton, who was sent to Bohemia to learn the manner of making them. But the manufacture was discontinued by his employers, and afterwards so much disregarded as to be reckoned among the projects, called bubbles of the year 1720; however it was revived, and brought to such perfection about the year 1740, that very little of it was imported from foreign parts; our own plates being of a finer gloss, or coat than that made beyond sea, the latter being hammered, and ours being drawn under a rolling-mill. And. Hist. Com. vol. ii. p. 175. 361.

TINA, a name given by the old medical writers to a bath made of a strong decoction of many carminative ingredients to be used in the colic.

TINCA, the *tench*. See TENCH.

TINCA-*marina*, the *sea-tench*, in *Ichthyology*, a name given by some authors to the common *turdus*, called in English the WRASSE, and PHYCIS.

TINCAL, is a name given to BORAX in the crude state in which it is brought from India, and before it is refined. It consists of small crystals of a yellowish colour, and it has a greasy or unctuous touch.

According to M. Cadet, it contains a larger quantity of the peculiar vitrescible earth of borax, than the refined salt commonly sold does. See BAURAC.

TINCTORUM *rubia*. See MADDER.

TINCTURE, TINCTURA, in *Pharmacy* and *Chemistry*, a separation of the finer and more volatile parts of a mixed body, made by means of a proper menstruum dissolving the same.

TINCTURE is more particularly used for an extract of part of the substance of a body, especially its flavour and colour, which are hereby communicated to the menstruum.

We have cephalic *tinctures*, antiscorbutic *tinctures*, stomachic *tinctures*, anticolic *tinctures*, invigorating *tinctures*, &c. and *tinctures* drawn from roses, from coral, &c.

To make a *tincture*, the matter is usually bruised, put into a matrass, and the menstruum, which commonly is spirit of wine, poured on it, to the height of two or three fingers above it. Then the glass is closed, and set for digestion, in a sand-heat, during five or six days, or till the spirit is well impregnated, and has received a high colour.

Thus are *tinctures* of odoriferous vegetables, as cinnamon, &c. drawn; and the same method serves for those of metals and minerals.

A general rule for the properly making of light *tinctures* may be taken from the following bitter. Take half an ounce of Seville orange-peel shaved thin, half a dram of gentian-root thin sliced, a scruple of the tops of Roman wormwood, half a dram of cardamom-seeds, and the same quantity of cochineal, each of them lightly bruised; put these ingredients into a pint of French brandy, let them steep for one night, and filter the liquor the next morning, and thus you have a fine light bitter.

These bitters are of the number of many other substances, where the goodness of a *tincture* does not more depend upon the choice of the ingredients than upon the manner of their being infused; for if such be suffered to remain too long in the menstruum, or if heat be used in extracting the *tincture*, the gross, terrestrial, and nauseous parts of the ingredients will be fetched out, and the *tincture* will thus be loaded with a heavy indolent matter of little virtue. Shaw's Lectures, p. 202.

If, however, a greater strength be required in the *tincture* than can be procured by so slight an infusion, when the ingredients are of this nature the matter should never be suffered to be heated, or stand long on the same ingredients, but should be, when strained off, poured on fresh ones, and so on till of any strength desired, yet perfectly free from the grosser parts.

Apothecaries usually commit the same error in their finer *tinctures* that they do in their cordial waters, saturating the liquor in both cases with the grosser and more useless part of the ingredients; whence the cordial waters of the shops too often abound with a gross heavy oil, and the *tinctures* with a gross heavy earth, or kind of bituminous matter, instead of the brisk, lively, and invigorating spirit, which alone is the thing required in both cases.

To extract the *tinctures* of hard, resinous, or gummy bodies, however, requires a different treatment, and must be effected in another manner. See LACCA.

Rectified spirit is the direct menstruum of the resins and essential oils of vegetables, and totally extracts these active principles from various substances, which yield them to water, either not at all, or only in part. It dissolves, likewise, those parts of animal substances in which their peculiar smells and tastes reside.

Hence the *tinctures* prepared with rectified spirits form an elegant and useful class of medicines, possessing many of the most essential virtues of simples, without being clogged with their inert or useless parts. Water, however, being the proper menstruum of the gummy, saline, and saccharine parts of medicinal substances, it will be necessary, in the preparation of several *tinctures*, to make use of a weak spirit, or a composition of rectified spirit and water. Buchan's Dom. Med. Appendix.

A great variety of *tinctures* may be given to common water, and many remarkable things occur in their changes on the addition of common menstruums. Take a large spoonful of the syrup of pomegranate-flowers, mix it with five spoonfuls of water; the mixture will be of a very lively and brilliant red: for a violet colour, take the same quantity of syrup of violets and the same of water. When these *tinctures* are thus prepared, have at hand a vial, in which is a small portion of oil of tartar, which will only look like water remaining after the washing of the vial. Pour the red or the violet *tincture* into this vial, and it immediately becomes a fine grass green. Dissolve the quantity of a walnut of crude sal ammoniac in a glass of water, pour all out except three or four drops at the bottom, and pour into this glass the fine red liquor, and it immediately becomes black as ink. In order to change the purple liquor red, only have a small quantity of spirit of vitriol in the bottom of a vial, and pour into this the violet water; it immediately on this becomes of a florid red.

Steep Brasil-wood in common water, or in white wine, twenty hours, the liquor will then look of the colour of red-wine; pour this into a glass washed with vinegar, and it becomes of a fine yellow, like sack. If this experiment be made with white wine, the wood and the vinegar make so little alteration in it, that it may be drank afterwards, and the whole process seems a way of turning red port into sack. Into this liquor, when yellow, drop a few drops of a *tincture* of benjamin made in spirit of wine, and it immediately loses its yellow colour and becomes white. Beat some galls to fine powder, and rub the powder on a towel, then put into a bason of water, in which any person is going to wash their hands and face, a small piece of common green vitriol, or copperas; after the person has washed, let them have this towel to wipe on, and the hands and face will be as black as if washed with the common writing-ink: the copperas in the water and the galls on the towel making real ink where they mix. This does no lasting injury to the skin, but will come off again upon washing with soap. Phil. Transf. N° 238, p. 88.

The *tinctures* of metals, so much talked of by the chemists and alchemists, are not proper *tinctures*; they are only dissolutions, wherein the metal is divided and attenuated to a greater degree than it is in its natural and ordinary dissolvents.

If the *tincture* were irreducible, that is, if the metal were dissolved to such a degree as that it could not be brought back again into metal; or, which comes to the same, if the principles which compose it were disunited; it would be what the chemists have so long and so earnestly wished for, and sought with such infinite pains, especially with regard to gold; the irreducible *tincture* whereof is what should be called *aurum potabile*.

But no such *tincture* has ever yet been discovered; the potable gold, described by them, being only gold extremely divided; and the case is the same with the *tinctures* of other metals.

The intention of metalline *tinctures* is, to rarefy and extend the sulphur of metal as much as possible, and so to render the fixed and earthy parts as subtle and volatile as may be; and if they are designed to be of use in medicine, some harmless and agreeable medium is to be used. See Tincture *of Metals*.

The alchemists give the name *grand mineral tincture* to the philosophers-stone; from an opinion, that all required to their operation is, to give the colour or *tincture* of gold to fixed mercury.

Marble, alabaster, and bones, receive *tinctures* from lixiviums and sharp juices; and Mr. Boyle thinks there is reason to hope the same may be done with precious stones: rock-crystal, it is certain, is tinged by subterraneous juices, and all the other coloured gems, even the sapphire itself. See Gems.

Tincture *of Amber*. See Amber.

Tincture *of Ambergris* is prepared, under the direction of the faculty of Paris, by digesting two scruples of ambergris in two ounces of a highly rectified spirit impregnated with roses.

They have also a compound *tincture* made from the same quantity of ambergris, with half as much musk, ten grains of civet, six drops of oil of cinnamon, and four drops of oil of rhodium, digested together in 4 ½ ounces of a spirit impregnated with roses and orange-flowers. This is a very high perfume.

The most advantageous mode of preparing these *tinctures*, with regard to the ambergris, is to make the spirit boil or simmer with it first, that this ingredient may be completely dissolved before the more soluble ones are added. Lewis. See Ambergris.

Tincture *of Antimony*, *tinctura antimonii*, is thus made: take salt of tartar, a pound; antimony, half a pound; rectified spirit of wine, a quart; reduce the antimony to powder, and mix it with the salt by fusion over a strong fire. When it is cold powder it, and pour on the spirit of wine; digest them together in a sand-heat, and then filtre off the clear *tincture* for use. The salt of tartar yields a *tincture* as well as antimony. It is a diaphoretic and attenuant.

This *tincture*, on an empty stomach, is said to have sometimes proved emetic.

Tinctura *antiphthisica*. See Tinctura *saturnina*.

Tincture, *aromatic*, may be prepared by infusing two ounces of Jamaica pepper in two pints of brandy, without heat, for a few days, and then straining off the *tincture*. This will answer all the intentions of the more costly preparations of this kind. Buchan.

Tincture *of the Bark* is made by macerating for some hours, without heat, four ounces of the powder in a quart or 2 ½ pounds of proof spirit, which will acquire a considerable degree both of bitterness and astringency; on applying heat the taste becomes stronger, the colour darker, and the liquor somewhat turbid.

Spirit of sal ammoniac, made with fixt alkaline salt, in the preparation of volatile *tincture* of bark, by maceration with powdered bark in the above proportion, receives from it very little taste and colour. The spirit prepared with quick-lime, and the dulcified spirit, extract, in a few hours, a very deep colour, and become strongly impregnated with its virtue. Lewis.

A compound *tincture* of the bark may be made by powdering two ounces of the bark, and bruising half an ounce of Seville orange-peel, and the same quantity of cinnamon; then, infusing the whole in a pint and a half of brandy for five or six days in a close vessel, and afterwards straining off the *tincture*.

This *tincture* is not only beneficial in intermittent fevers, but also in the slow, nervous, and putrid kinds, especially toward their decline. The dose is from one dram to three or four, every fifth or sixth hour; which may be given in any proper liquor, occasionally sharpened with a few drops of the spirit of vitriol. Buchan.

Tincture *of Cassia*. See Cassia.

Tinctura Foetida, the stinking *tincture*, a form of medicine in the late London Dispensatory prepared in this manner; take assafoetida, four ounces; rectified spirit of wine, a quart; digest them together for some time, and then strain off and filtre the *tincture* through paper.

The *tinctura fœtida* of the Edinburgh Pharmacopœia of 1783, is made by dissolving two ounces of assafœtida in a pound of dulcified spirit of sal ammoniac.

This *tincture* is beneficial in hysteric disorders, especially when attended with lowness of spirits and fainting. A tea-spoonful may be taken in a glass of wine or a cup of penny-royal tea.

Tincture *of Gold*. See Aurum *potabile*, and *Chemical History of* Gold.

Tincture *of Gum Guaiacum*, *volatile*, is made by infusing four ounces of the gum in a pint of volatile aromatic spirit, without heat, in a vessel well stopped, for a few days, and then straining off the *tincture*. In rheumatic complaints a tea-spoonful of this may be taken in a cup of the infusion of water-trefoil, twice or thrice a day. Buchan. See Guaiacum.

Tincture *of black Hellebore*. See Hellebore.

Tincture, *Japonic*. See Japan *Earth*.

Tincture *of Lacca*. See Lacca.

Tinctura *Martis cum spiritu salis*, a medicine thus prepared: take filings of iron, half a pound; Glauber's spirit of sea-salt, three pounds; digest all together without heat, as long as the spirit will work upon the filings; then, after the fæces have subsided, pour off the clear liquor, evaporating it to one pound, and adding of rectified spirit of wine three pints.

Some combine the acid and inflammable spirits first, and digest three ounces of iron filings in a quart of the dulcified compound. A few drops of this *tincture* are a sufficient dose.

This *tincture* is good in all the cases in which the sal *martis* is so.

Tincture *of martial flowers*. See Iron.

Tincture *of Metals*, called *Lilly of Paracelsus*, may be prepared by melting together in a crucible two parts of martial regulus of antimony, one part of fine tin, and one part of pure copper. The allay thus compounded is to be powdered, when cold, and mixed with thrice its weight of purified nitre. The mixture is to be thrown, at different times, into a red-hot crucible, where it detonates, and is exposed to a violent fire, till the metals be perfectly reduced to calces. The matter is to be taken from the crucible, while red-hot, and immediately thrown into a heated iron mortar, where it is quickly powdered. The powder, while hot, is to be put into a matrass, and upon it some rectified spirit of wine is to be poured to a height equal to the breadth of four fingers. The digestion is continued during some days, or till the spirit of wine has acquired a very deep yellowish-red colour. The spirit is to be decanted and kept in a bottle.

This *tincture*, although no part of the metals, reduced by calcination almost to the state of pure earth, can be dissolved by the spirit of urine, has a spirituous, saponaceous, acrid, and alkaline character, and has been successfully used when the fibres and vessels require to be excited and animated, as in apoplexies, palsies, and dropsies. It is also capable of accelerating the motion of the blood, and of increasing certain secretions and excretions, particularly sweat and urine. The dose is from six or twelve drops to forty, or even more, and must be administered in some proper cordial. Dict. Chem.

Tincture *of Musk* is directed, in the Edinburgh Pharmacopœia of 1783, to be made by dissolving two drams of musk in a pound of rectified spirit.

Tincture *of Myrrh*. See Myrrh.

Tincture *of Myrrh and Aloes* is prepared by pulverising an ounce and a half of myrrh, and one ounce of hepatic aloes, and infusing them in two pints of rectified spirits, for six days, in a gentle heat, and straining the *tincture*. This is principally used by surgeons for cleansing foul ulcers, and restraining the progress of gangrenes. It is also recommended by some, as a proper application to green wounds. Buchan.

Tincture of *Rhubarb*. See Rhubarb.

Tinctura Sacra, a *tincture* of aloes, called also *hiera picra*.

This *tincture* is made by digesting five ounces of the powder, called *hiera picra* in the London Dispensatory, or a powder formed of eight parts of aloes and two of canella alba, in five pints of mountain wine; or one ounce of aloes, with one dram of the lesser cardamon seeds, and the same quantity of ginger, in two pounds of the same wine. Lewis.

Dr. Buchan directs this *tincture* to be made by infusing an ounce of Socotrine aloes in powder, and two drams of Virginia snake-root, and as much ginger, in a pint of mountain wine and half a pint of brandy, for a week, frequently shaking the bottle, and straining off the *tincture*. This, he says, is a safe and useful purge for persons of a languid and phlegmatic habit; but it is thought to have better effects when taken in small doses as a laxative. The dose, as a purge, is from one to two ounces.

TINCTURE *of Saffron*. See SAFFRON.

TINCTURE *of Salt of Tartar*, is made by pouring some rectified spirit of wine, to a height equal to the breadth of three or four fingers, into a heated matrass, that contains some hot salt of tartar, which has been previously fused in a crucible and powdered. The matrass is to be closed, and the digestion continued for several days with a gentle heat, or till the spirit of wine has acquired a fine reddish-yellow colour.

This is essentially the same as TINCTURE of *metals*, their medicinal qualities being the same.

TINCTURA SATURNINA, the lead *tincture*, a name given in the late London Dispensatory to the *tincture* before called *tinctura antiphthisica*, because it was used to check the immoderate sweats in hectic complaints.

It is made of sugar of lead and green vitriol, of each two ounces; and of rectified spirit, a quart. The salts are separately to be reduced to powder and then put into the spirit, then the whole is to stand some days without heat to extract the *tincture*, and afterwards filtered through paper.

Many persons have found great perplexity in making this *tincture*, it having at first begun to shew a good colour, but afterwards lost it; this accident is owing to heat usually employed in making the *tincture*.

This *tincture* is a powerful styptic, and is often used with good success in hectic fevers, spittings of blood, heat of the kidneys, simple gonorrhœas, fluor albus, and tabes dorsalis.

It was first recommended by Etmuller; who, from its effect, gave it the name of *tinctura antiphthisica*, which our college of physicians have changed to that of *tinctura saturnina*. We also find it in the Pharmacopœia of Edinburgh, which directs it to be made of three ounces of the sugar and two of the vitriol, to a quart of spirit, and in the best of the foreign ones. Mr. Boyle recommends it, and our most eminent physicians use it; notwithstanding that some authors consider it as a dangerous medicine, on account of its principal ingredient, the *saccharum saturni*, which some call a slow poison. Whether it be so or not when given in substance, it is certain, that there is a great difference between a corrosive salt so given, and a *tincture* made of the same, in spirit of wine, and given in small doses, as Dr. Mead observes; who adds, that in slow hectic fevers attended with a looseness, profuse sweats, and a colliquation of the humours, he reckons two or three drams, given at different times, in cooling liquors, every twenty-four hours, to be a convenient dose. But the usual dose is from fifteen to thirty drops in Bristol water, or some temperate or cool julep.

Concerning the danger of saturnine preparations, when applied to the purposes of internal medicine, see sir George Baker's Farther Observations on the Poison of Lead, in Med. Trans. vol. ii. p. 446, &c. See also COLICA *Damnoniorum*, LEAD, SACCHARUM *Saturni*, and VINEGAR of *Lead*.

TINCTURE *of Sena*, is prepared by digestion for some days, with or without heat, in proof spirit. The proportions in the London Pharmacopœia are three ounces of sena to a quart of the spirit, to which are added four ounces of stoned raisins, three drams of caraway-seeds, and one dram of lesser cardamom-seeds husked: in the Edinburgh, two ounces of sena to three pounds and a half of the spirit, with the addition of one ounce of jalap, half an ounce of coriander-seeds, and four ounces of white sugar-candy in powder, which last is to be dissolved in the *tincture*, after straining it from the other ingredients. These *tinctures* are agreeable and useful carminative purgatives, especially to those who have accustomed themselves to spirituous liquors; and answer all the purposes of the ELIXIR *salutis* and Daffy's elixir.

TINCTURA *Serpentariæ*, or *Tincture of Snake-root*. See SNAKE-*root*.

TINCTURE *of Soot*. See SOOT.

TINCTURE *of Spanish Flies*, *tinctura cantharidum*, is made by bruising a little two drams of the cantharides, and digesting them two or four days in a pint and a half or two pints of proof spirit, with or without the addition of half a dram or more of cochineal, as a colouring ingredient.

These *tinctures* are usually given from fifteen to thirty or more drops, twice a day, beginning with the smaller dose, and increasing it by two or three drops at a time, till a little uneasiness is perceived in making water, then intermitting it for a day or two, and diminishing the dose, and continuing it just below the quantity which produced that effect. This is the safest and most commodious form for taking cantharides internally. Lewis.

TINCTURA *styptica*, a form of medicine made with very little trouble and apparatus, and serving to supply the place of that elaborate preparation the *tincture* of Helvetius; it is prescribed in the late London Pharmacopœia, and is to be made by mixing a dram of calcined *green* VITRIOL with a quart of French brandy *tinctured* by the cask; this is to be shook together that the brandy may turn black, and then strained off for use.

TINCTURE of *Sulphur*. See SULPHUR.

TINCTURA *thebaica*, a name now given to the *tincture* of opium, commonly called *laudanum*.

The method of making this is also much altered, as well as the name in the late London Dispensatory, where the saffron being looked on as an useless ingredient, is wholly left out, and the medicine ordered to be prepared in the following manner: take of opium strained, two ounces; of cinnamon and cloves, each a dram; mountain wine, a pint; infuse without heat a week, and then strain off the wine through paper.

The college of Edinburgh orders the same quantity of crude opium to be digested for four days in a pound and a half of spirituous cinnamon water. Of the first of the above *tinctures* twenty drops, and of the latter twenty-five drops, are reckoned to contain one grain of opium.

TINCTURE *of the Balsam of Tolu*, is made by infusing an ounce and a half of the balsam in a pint of rectified spirit of wine in a gentle heat, till the balsam is dissolved, and straining the *tincture*.

This *tincture* possesses all the virtues of the balsam; and in coughs, and other complaints of the breast, a tea-spoonful or two of it may be taken in a bit of loaf-sugar.

But it is best used in syrup. An ounce of the *tincture*, properly mixed with two pounds of simple syrup, will make what is commonly called the *balsamic syrup*. Buchan.

TINCTURE *of Valerian*. See VALERIAN.

TINCTURE is also applied by the *Heralds* to the colours used in escutcheons, or coats of arms; under which, with them, are likewise reduced the two metals, *or* and *argent*, because often represented by yellow and white.

Tinctures comprehend COLOURS and FURRS.

The writers on heraldry have had great disputes, which of these colours or *tinctures* are the most honourable. All agree in giving the pre-eminence to the metals gold and silver, that is to the yellow and white colours; as to the others, some esteem them more noble as they approach more to light, that is to whiteness. Upon this account ranges them thus; azure or blue, gules or red, purpure or purple, vert or green, sable or black; others wholly dissent from this, and prefer those colours most which can be seen at the greatest distance; with these, sable or black is the most honourable or first colour; and they alledge the imperial black eagle, placed in a white field, as an instance of this. Leigh prefers the red to the blue, as the red has some alliance to gold, and the blue to silver; the sable is generally preferred to green and purple, by those who give the red and blue the first places: it is in this esteem on account of its strong appearance; and green is preferred to purple, because the latter is but of very late use in heraldry, and is called a new colour.

All the precedence given to *tinctures* must however be considered with this special proviso, that there is no particular reason for bearing them otherwise in the arms of kingdoms and families. In all coats of arms there should be two colours or *tinctures*; and it is the general rule that the field should be of a nobler colour than the figures placed upon it: thus in the arms of Scotland the field is yellow, and the lion placed upon it red: and if the field consists of two different colours parted by fess or by pale, then the noblest colour must always be in the best place, as on the upper part, or on the right hand of the shield; but all these rules are to be understood with this limitation, that there are no other special reasons in the family for the contrary. Nesbit's Heraldry, p. 19.

TINE, denotes a tooth, or spike; hence the common phrase among husbandmen, of giving two or three *tinings*, which signifies drawing the harrow twice or thrice over the same spot of ground.

TINEA, in *Medicine*, a disease called by the Arab writers *sahafati*, and in English usually a *scald-head*, it is nearly a-kin to ACHOR.

The *tinea* is a disease of the leprous kind: authors usually reckon three species of it, viz. a dry, moist, and *lupinous*;

nous; but these, in reality, are only so many degrees of the same disease.

Turner defines the *tinea* an ulcer arising in the heads of children, from a vicious, corrosive, or saline humour, which, preying on the cutaneous glands, in time destroys their texture. It has its name *tinea*, q. d. *moth*, from the similitude it bears to the holes eaten by that insect in paper, &c. In the first stage it is covered with a white, dry, scurfy, or squamous matter: in the second the subjacent flesh appears granulated; and in the third it is ulcerous.

The internal remedies proper for the *tinea* are, mercurials, proper cathartics, and dietetics, with edulcorants; and sometimes a salivation, especially by unction, has been found efficacious, after all other methods have proved vain. The externals are fomentations made of roots of oxylapathum, birth-wort, horse-radish, wormwood, &c. boiled in water, and strained; to which are added, spirits of wine camphorated, &c. also liniments of hog's lard, white precipitate, mercurial ointments, with powdered brimstone; and sometimes powder of Roman and white vitriol, red precipitate, &c. but these last must be used with great caution.

Dr. Buchan says, that he has often known children seized with internal disorders, of which they died soon after their scabbed heads had been healed by the application of drying medicines. The cure, he observes, ought always to be first attempted by keeping the head very clean, cutting off the hair, combing and brushing away the scabs, &c. If this be not sufficient, let the head be shaved once a week or oftener, and washed daily with soap-suds, or lime-water. If these fail, a plaster of black pitch may be applied, in order to pull out the hair by the roots; and if there be proud flesh, it should be touched with a bit of blue vitriol, or sprinkled with a little burnt alum. In the progress of these operations, the patient may be confined to a regular diet, the body kept gently open, and cold, as far as possible, avoided. To prevent any consequence from stopping this discharge, especially in children of a gross habit, it will be proper to make an issue in the neck or arm, which may be kept open till the patient becomes more strong, and the constitution somewhat mended. Dom. Med. p. 605. ed. 5.

TINEA, in *Natural History*. See MOTH, &c.

TINEMAN, in our *Old Writers*, a petty officer in the forest, who had the nocturnal care of vert and venison, and other employments in the forest.

TINET, *tinettum*, in our *Old Writers*, is used for brushwood and thorns to make and repair hedges. In Herefordshire to *tine* a gap in a hedge is to fill it up with thorns, that cattle may not pass through it.

TINEWALD, the parliament or annual convention of the people of the Isle of Man, of which this account is given: the governour and officers of that island do usually summon the twenty-four keys, being the chief commons thereof, once every year, viz. upon Midsummer-day at St. John's chapel, to the court kept there, called the *tinewald*-court; where, upon a hill near the said chapel, the inhabitants of the island stand round about the plain adjoining; and here the laws and ordinances, agreed upon in the chapel of St. John, are published and declared unto them. At this solemnity the lord of the island sits in a chair of state with a royal canopy over his head, and a sword held before him, attended by the several degrees of the people, who sit on each side of him, &c.

TIN-GLASS, a name frequently given to the semi-metal BISMUTH.

TINKLING *of the ear*. See TINNITUS.

TINNING, the covering or lining any thing with melted *tin*, or with *tin* reduced to a very thin leaf.

Looking-glasses are foliated or *tinned* with thin leaves of beaten *tin*, applied and fastened thereto by means of quicksilver. See LOOKING-GLASS.

Kitchen utensils are *tinned* with melted *tin*; and locks, bits, spurs, &c. with leaf-*tin*, by the help of fire.

For the method of *tinning* iron-plates; see LATTIN.

Copper and brass are covered over with *tin* by the help of sal ammoniac, the acid of which cleans the surface of the metals to be *tinned*, and the oily matter contained in it furnishes the phlogiston that is necessary in this operation. The copper, or brass, being made hot enough to melt *tin* laid upon it, is strewed over with sal ammoniac, and the melted tin rubbed about the plate. The sal ammoniac takes up the dross of the tin, and leaves the tin to flow freely upon the metal. As the surface of copper is continually altered by the mere action of the air, the workmen, before the *tinning* of any vessel, scrape its surface with a steel instrument till it be clean and bright; then they place the vessel upon kindled coals, and heat it to a certain degree: as soon as it is hot, in some processes of *tinning*, they rub it with pitch, and apply the melted tin, which they spread upon the surface of the copper by means of hards. For this purpose pure tin is seldom used; but generally two parts of tin are allayed with one part of lead.

The pitch used in this latter mode of *tinning* is quite necessary, because the degree of heat given to the copper is sufficient to calcine its surface in some degree: and this alteration, however slight, would prevent the perfect adhesion of the tin, unless by means of the pitch the phlogiston was restored to it at the very instant of the application of the tin. The pitch also prevents the slight calcination which would happen on the surface of the tin, or revives the small particles of calx which are formed during the operation. In either way, or in the method of *tinning* iron plates, the success of the operation depends on the facility with which tin unites with these metals, which incorporates with them, dissolves in some measure their surface, and forms a kind of allay, at least when the *tinning* is well performed; and moreover, on the cleanness of the surfaces, both of the melted tin and of the copper or iron to which it is applied, for the metals cannot perfectly unite unless they are in a metallic state, and free even from their own earth or calx.

It has been alleged that COPPER vessels, so pernicious in themselves, are not perfectly preserved from rust or verdigrise by *tinning*; and, besides, tin itself is combined with arsenic, and lead is also used in *tinning*. M. Malouin has, therefore, proposed in his Memoirs on Zinc (Mem. de l'Acad. Sc. 1742.) to substitute that semimetal in place of lead and tin, for the *tinning* of iron and copper vessels: the greater hardness of the zinc, it is thought, would render it less liable to be worn, and the dangerous effects of lead and tin would be avoided. Dict. Chem. Engl. ed.

The plumbers, on some occasions, *tin* or whiten their sheets of lead: in order to which they have a *tinning* furnace, filled with live coal, at the two sides whereof two men are placed, who hold up the sheets over the fire to heat: and the tin leaves being laid over them, as fast as the sheets grow hot, and the tin melts, they spread it, and make it take by rubbing it with tow and resin.

TINNITUS *auris*, TINKLING or *buzzing of the ear*, a disease pretty frequent in the ear, consisting in the perception of a sound which is not, or at least is not external; and the ear being thus filled with a certain species of sound, cannot admit other sounds, unless they are very violent.

This perception may be occasioned by the beating of an artery in the ear, by an inflammation or abscess of the tympanum, or the labyrinth, by the admission of foreign bodies, by commotions of the cranium, or blows on the ear, &c. Extraordinary and irregular motions of the animal spirits are also found to occasion the *tinnitus*, as we find in deliriums, phrensies, vertigoes, &c. The *tinkling* of the ear is reckoned one of the diagnostic signs of the plague.

The ancients imagined that this symptom was produced by the motion and agitation of the air which was included in the ear, and supposed this agitation to be occasioned by flatulencies and vapours being conveyed into the ear, and that those flatulencies arose either from the whole body, as in fevers; or from any particular part, as the stomach or brain; or from pituitous humours lodged in the cavities of the ear; and from the differences of these they attempted to account for all the various noises heard in this disorder, as if they were in some sort real: but when we consider the nature of the noises heard in this distemperature of the ear, such as the loud roaring, or the murmuring of waters, and the jangling of bells, we shall easily conceive these can be no real sounds; and it is indeed very evident that they do not arise from either wind, or any other matter, striking the membranes externally.

As a *tinnitus* consists in the hearing of a sound which either is not real or exists only within the ear, in order to conceive the meaning of this, we are to consider that the action of hearing consists in the agitation of the immediate organ appointed for that purpose; and it is sufficient to produce a sound that that organ is agitated, whether it be by the air or not. In order to determine what may be the cause of this agitation, we need only examine what are the disorders in which a *tinnitus* usually occurs; we shall find these to be inflammations and abscesses of the tympanum and labyrinth, and the disorders of the meatus auditorius. Inflammations of the tympanum and labyrinth necessarily produce agitations in the spiral lamina and in the semicircular ducts, either

by tension of the membranes, or by the vapours which transpire, and mix themselves with the air in the tympanum.

Acrid substances, worms, extraneous bodies, a constriction of the meatus succeeding a distension of the glands, and in general every thing that can cause in the meatus auditorius, pain, and the other symptoms before described, agitate the membrane of the meatus, and the membrana tympani; and this agitation is able to communicate itself to the immediate organ of hearing.

The second species of *tinnitus* is when we perceive a real sound which is formed within the ear itself: thus we hear a humming noise when we stop our ears. This noise is caused by the friction of the hand, or by the compression which influences the skin and cartilages, whose parts being put into motion may produce an agitation there. The elasticity of the air also and the transpired matter from the hand, mixing with the internal air in the meatus, may also strike the organ, though not strongly, yet sufficiently to occasion a noise, as the offending matter is so near.

Commotions of the cranium, and disorders which contract the meatus, may also cause a *tinnitus* in the ear. Several persons also are subject to a peculiar noise in the ear, which is plainly a pulsation; this usually affects them most after exercise, and may very often be heard by other persons, who place their heads near the diseased person's ear: this is unquestionably the true pulsation of a dilated artery, since it always regularly keeps time with the heart.

There seem also to be some species of *tinnitus*, in which, though the humming noise is very strong, yet the organ of hearing is itself no way distempered; such are those of persons in deliriums in fevers, and of such as are subject to epileptic fits; these last usually hear a humming in their ears, before they are attacked with a fit, and this seems wholly produced by the agitated spirits, which disturb those parts of the brain where the extremities of the auditory nerve terminate.

The *tinnitus* are therefore of two kinds, the one proceeding from a distemperature of the organ of hearing, the other from a disorder of the brain; and the cure is to be attempted accordingly. In those of the sharper kind, which are usually occasioned by inflammations and pains in the ear, where the parts are usually very tense and dry, we must use the same means as in acute pains, and tensions of the membrana tympani; but in dull humming heavy noises, which are usually occasioned by rheums and suppurations, where the membranes are relaxed, we are to use the same remedies which give relief in pains occasioned by cold: after which it will be no difficulty to chuse the most proper, while we have a due regard to the circumstance, from which the more just indications may be taken.

TINNUNCULUS, in *Ornithology*, the name of one of the long-winged hawks, called by others *cenchris*, by Linnæus FALCO *tinnunculus*, and in English, *kestrel*, *stannel*, or *windhover*.

It is about the size of a common pigeon. Its bill is short, crooked, and very sharp, and covered with yellow skin at the top; near this the bill is white, elsewhere it is blue; its tongue is bifid; its mouth very wide, and its palate blue; its head is large and flatted, and is of an ash-colour, with longitudinal streaks of black; its back and wings are brown, variegated with black spots; its rump is grey, with some transverse black spots; and its breast and belly of a pale rust-colour, with a few longitudinal streaks of black; its tail is long and pointed, its tip of a pale ferruginous hue, with a broad transverse streak of black over it; and the rest of the tail is a mixed grey and brown, with black spots and streaks; its legs and feet are of a fine yellow.

The female of this species is larger than the male; the colours of the back and wings are less bright, and it differs also in the colours of the head and tail; the former being of a pale reddish brown, streaked with black; the latter of the same colour, marked with numerous transverse black bars; the breast is of a dirty yellowish white, and the middle of each feather has an oblong dusky streak pointing downwards.

The *tinnunculus*, or kestrel, breeds in the hollows of trees, in the holes of high rocks, towers, and ruined buildings: it lays four eggs, which are white, variegated with a number of red spots: its food is field mice, small birds, and insects.

This is the hawk which we so frequently observe in the air fixed in one place, and as it were fanning with its wings, at which time it is watching for its prey. It flings up the indigested fur and feathers in form of a round ball. When FALCONRY was in use in Great Britain, this species was trained for catching small birds and young partridges. Ray and Pennant.

TINTINNABULUM, among the *Ancients*. See BELL.

TINUS, in *Botany*, a genus of the *enneandria monogynia* class. Its characters are: that the calyx is divided into five segments; the corolla is also divided in the same manner; the nectarium is pitcher-shaped, including the germen; and the fruit a three-celled berry, containing single seeds. There is one species.

TIPHCA *princeps*, one of the Hebrew ACCENTS, sometimes serving for a comma, and marked under a letter thus (꜀).

TIPHLE, in *Ichthyology*, a name by which some authors express the acus, or tobacco-pipe fish.

TIPIOCA, a name given by some authors to a sort of cream or flour made from the yucca or manihot-root, by maceration of it in water, after expressing the juice.

TIPSTAVES, officers appointed by the marshal of the king's-bench, to attend the judges with a rod or staff tipped with silver, and take charge of such persons as are either committed, or turned over at the judge's chambers.

The denomination is also sometimes given to those more frequently called *bastons*; who are the warden of the Fleet's officers, attending the king's courts with a painted staff, for the taking into custody such prisoners as are committed by the court; and to attend such prisoners as go at large by licence.

TIPUL, in *Natural History*, a name given by the people of the Philippine islands, to a species of crane common there, and so tall, that when it stands erect, it can look over a man's head. See DONGON.

TIPULA, in *Natural History*, the name of a genus of fly, remarkable for the great length of its legs, and usually called by us the *long-legs*. See CRANE-*fly*.

In the Linnæan system this is a genus of the *diptera* order of insects: the characters of which are, that the head is long, and the upper jaw arched; that it has two bending feelers longer than the head, and a very short recurved proboscis. Linnæus enumerates fifty-eight species. Mr. Ray, in his History of Insects, describes fourteen species of this fly found in England.

The smaller species of this genus so much resemble gnats, that the generality of authors, not excepting even Goedart and Swammerdam, have confounded the two genera, and described these among the gnats.

The long form of the body, the position of the wings, and the length and position of the legs, are the circumstances that make the resemblance between the gnats and *tipulæ*; but the structure and organs of the head are alone a very sufficient distinction.

As the *tipulæ* differ from the gnats in the figure of the mouth, and in being without a trunk, they differ as much from the other flies of that character, by their resembling the gnat in the shape of their body. They differ also in the conformation of the mouth, and its several parts and organs. The opening of the mouth is a slit extending itself from the fore-part of the head toward the hinder-part, and its lips cannot be called upper and lower; but they are lateral ones. When the body of the creature is pressed, this mouth opens, and shews what seem to be a second pair of lips within. These are more firmly closed than the others, and resemble only certain duplications of the flesh. The exterior lips are cartilaginous, and are furnished with short hairs, the interior are perfectly smooth, and of a fleshy texture. The head of the *tipula* is of a long and slender figure; the lips are articulated at the extremity of this head, and on each side there stands, on the upper part, a sort of beard, which, when nearly examined, is found to be articulated in the manner of the antennæ of insects. These two beards, in their usual position, are placed close together, and bent forwards over the head; their office seems to be the covering of the aperture of the mouth. These seem constantly to be found in all species of the *tipulæ*, and placed exactly in the same manner.

The larger species of *tipulæ* are usually found in our meadows, and these are in no danger of being confounded with the gnat kind, their size alone being a sufficient obvious distinction. These are often found of nearly an inch in length from head to tail; but their bodies are very slender, and are composed of only nine rings. The male *tipula* is easily distinguished, at sight, from the female; it is much shorter in the body, and is thicker at the tail than any where else; this tail also usually turns upwards, whereas that of the female is placed in the same line with the body, and is slender, and composed of several scaly parts, proceeding from the last ring of the body. These creatures are found in our meadows through the whole summer; but the end of September and beginning of October is the time when they are most of all plentiful.

The legs of these creatures are greatly disproportioned to the body, according to the common rules of nature, especially the hinder pair, which are in the larger species usually three times the length of the body.

This large ſpecies is a creature of no great beauty; its body is of a browniſh colour, and its corcelet is ſo elevated, that the creature ſeems hump-backed; the head is ſmall, and the neck very ſhort; the reticulated eyes are ſo large, that they cover almoſt the whole ſurface of the head; theſe are of a greeniſh colour, with a caſt of purple, when viewed in ſome lights. Reaumur ſuppoſes that two very lucid ſpecks, on the anterior part of the breaſt, are eyes, though placed in ſo very ſingular a manner; the wings of this creature are long, but very narrow, and ſeem ſcarce well proportioned to the ſize of the animal; they are tranſparent, but have a ſlight caſt of brown; and their ribs, when viewed by the microſcope, appear beſet with ſcales, or feathers, in the manner of thoſe of the gnat kind. Some ſpecies of the *tipulæ* have them alſo fringed, with theſe ſcales at the edges; there are no ailerons, or petty wings, at the origin of theſe, but in the place of them there are two very fine balancers or mallets; theſe have long pedicles, and roundiſh or oval heads; the ſtigmata of the corcelet are four; one pair are placed immediately underneath theſe balancers, and the other immediately below the firſt pair of legs; the firſt pair are very long, the others ſmall, and thoſe on the rings of the body, if there be any, are too ſmall for our ſight, even with good glaſſes. Each ring of the body is compoſed of two half cylinders, which are joined into one, by means of a membrane, which gives them room to diſtend or cloſe up at the creature's pleaſure. The large *tipulæ* all carry two antennæ, or horns, upon their head; but theſe are of no remarkable ſtructure, they are only compoſed of a great number of joints, each covered with a fine downy hairineſs; and at the joining of each to the next, there is a tuft of longer and more ſtiff hairs. This is the deſcription of the common large *tipula* which we find in the meadows; and in almoſt all its parts, is applicable to the generality of the larger ſpecies of theſe inſects.

The ſmaller kinds are very numerous, and of great variety. Theſe are frequent in all places, and at all ſeaſons of the year: the ſpring ſhews us immenſe clouds of them, and even the coldeſt winter's day ſhews a great number of them in the ſun-ſhine about noon. Theſe creatures fly much better than the large *tipulæ*; they ſeem indeed to be almoſt continually upon the wing, and their manner of flight is very ſingular; they are continually mounting and deſcending again, and that without quitting the direction of the line they go forward in; this they will often do for many hours together. In tracing theſe flies from their origin, they are all found to be produced from worms which have no legs, and have a regular ſcaly head. Thoſe from which the larger *tipulæ* are produced, live under ground; they are moſt fond of marſhy places, but any ground will do that is not often diſturbed. They uſually are found at about an inch under the ſurface, and are ſo plentiful in ſome places, as greatly to injure the herbage.

Theſe creatures do not find it neceſſary to their living, that plants ſhould be upon the ſurface of the earth in which they live. There is frequently found in the hollows of the ſtumps of old trees, a ſort of earth which ſeldom produces any vegetables; yet the female flies of this ſpecies well know that their young will find a proper ſubſiſtence there; and there are uſually found great numbers of them in all theſe places. The hollow elms and willows, ſo common in our hedges, and by ditch ſides, afford innumerable proofs of this: but it muſt be obſerved, that they are only found in ſuch earth of this kind, as is continually ſomewhat moiſt.

Mr. Reaumur mentions a very ſingular ſpecies of large *tipula*, which was produced with him from one of the worms found in the earth of an old elm; this was of the larger kind, and had ſome beautiful ſpots on the wings. It had alſo a very elegant tufted antenna; whereas, in the common large *tipulæ*, theſe are plain and ſimply granulated ones, as well in the males as females. Reaumur's Hiſt. Inſ. vol. ix. p. 7, &c.

TIPULA, *waſp*. See WASP *tipula*.

TIRATA, in the *Italian Muſic*, is uſed to expreſs, in general, any quantity of notes, of whatever kind, provided they be of equal value, moving either upwards or downwards in conjoint degrees; thus they ſay, *tirata di ſemiminime*, when there are many crotchets following one another in the manner above mentioned; *tirata di ligature*, when there are many notes of the ſame value following one another, among which the laſt of one bar, and the firſt of the next, are tied together by a ſemicircle, thus, ⌒ or ‿.

Tirata is particularly uſed for a ſeries of quavers, or, in the modern notation, of demi-quavers or demi-ſemiquavers, aſcending or deſcending by gradual intervals.

Theſe *tiratæ* often, though not neceſſarily, begin with an unaccented note, and end on ſome accented one of greater duration. See the example annexed.

Muſicians diſtinguiſh ſeveral kinds of *tirata*, thus:

1. *Tirata mezza*, or *mezza tirata*, is that compoſed of three or four quick notes to aſcend, or deſcend to a note, a fourth, or fifth, higher or lower than the note from whence the *tirata* begins; as in the examples before given.

2. *Tirata defectiva* is when theſe running notes go beyond the fifth, but do not reach the octave.

3. *Tirata perfecta*, is when it runs through the notes of a whole octave, aſcending or deſcending.

4. *Tirata aucta*, or *excedens*, is when it goes beyond the compaſs of an octave.

The French call the *tirata*, *tirade*, and ſome call them *roulades*, but improperly, ſays Broſſard.

TIRE, or, as the ſeamen pronounce it, *teer of guns*. See TIER.

TIRING, in *Falconry*, is the giving a hawk the leg or pinion of a fowl to pluck at. Dict. Ruſt.

TIRSIO, in *Ichthyology*, a name given by Gaza and ſome other authors to the phocæna of Willughby and others, the PORPESSE, or *marſum*. Pliny, Bellonius, and many others call it TURSIO.

TISIPHONE, in *Mythology*, one of the three FURIES. She is repreſented by the poets, with vipers, ſometimes as looſe ſerpents, intermixed with her hair, and ſometimes as ſerpents growing from her head inſtead of hair. As ſhe is one of the chief of all the infernal executioners, her robe is deſcribed either as dropping with freſh blood, or ſtiff with human gore: this robe is faſtened round her with a ſerpent inſtead of a girdle; and ſhe has ſometimes vipers twiſted round her arms inſtead of bracelets. They ſometimes give her a torch in her hand, wet with blood; ſometimes a torch in one hand and a ſerpent in the other; and ſometimes ſerpents in both. Statius, Theb. i. v. 91. v. 111. v. 113. Theb. vii. v. 467. Ovid Met. iv. v. 483. v. 490. v. 495. v. 510.

TIRSITES, a word uſed by ſome to expreſs foſſile coral.

TISRI, or TIZRI, in *Chronology*, the firſt Hebrew month of the civil year, and the ſeventh of the eccleſiaſtical or ſacred year.

The Hebrews call it *raſh-haſhanna*, that is, the beginning of the year. It anſwered to part of our September and October. On the firſt day of this month was kept the feaſt of Trumpets, becauſe the beginning of the year was then proclaimed by ſound of trumpets. On this day they refrained from all ſorts of ſervile buſineſs, and offered in ſacrifice a calf, a ram, and ſeven lambs. Levit. xxiii. 24. Numb. xxix. 1.

The tenth day of this month was the great day of expiation, and on the fifteenth the feaſt of Tabernacles began, which laſted till the twenty-ſecond day incluſively. See SCENOPEGIA.

TITANS, TITANES, Τιτανες, in the *Ancient Mythology*, the ſons of Uranus or Cœlus, and Veſta, i. e. of heaven and earth, according to Heſiod and Apollodorus; or, which comes to the ſame thing, of Æther and Tellus, according to Hyginus. Apollodorus reckons ſix *Titans*; Oceanus, Cælus, Hyperion, Crius, Iapetus, and Saturn or Cronus: Hyginus alſo reckons ſix, viz. Briareus, Gyges, Sterope, Atlas, Hyperion, and Cottus; but he ſeems to include the hundred-handed giants in the number, which Apollodorus, and the generality of mythologiſts, diſtinguiſh from the *Titans*.

The tradition is, that Cœlus, by the ſame wife, Veſta, had Briareus, Gyges, and Cottus, the hundred-handed giants, and had chained them up in Tartarus: Veſta, the earth, their mother, reſenting this treatment, raiſed the *Titans* againſt their father, her huſband: all, excepting Oceanus, made war upon him, and dethroned him, ſetting up Saturn in his place.

Saturn, it ſeems, proved no more favourable to them than his father; but continued the giants in their priſon. Upon this Jupiter revolted againſt Saturn; ſerving him as he had done Cœlus; and reſcued the three giants; who afterwards proved of great ſervice to him in the war which the *Titans* waged againſt him.

This war laſted ten years: but at length the *Titans* were vanquiſhed; Jupiter remained in peaceable poſſeſſion of heaven, and the *Titans* were buried under huge mountains thrown on their heads.

Hyginus gives another origin of the *Titans*: he derives them from *Titan*, Saturn's eldeſt brother, by Cœlus and Veſta; who, though preſumptive heir of heaven, yet finding his father and mother more inclined for Saturn than for him, ſurrendered to him his right of ſucceſſion, on condition he ſhould not bring up any male child, that

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the empire of heaven might revert to his own issue the *Titans*.

But Jupiter, Neptune, and Pluto, having been afterwards saved by the artifice of Ops, *Titan*, and his sons the *Titans*, made war on Saturn, vanquished and imprisoned him; thus he continued in the power of his enemies, till Jupiter, being grown up, made war on the *Titans*, and delivered his father.

F. Pezron, in his Antiquity of the Celtæ, makes that people to be the same with the *Titans*; and their princes the same with the giants in Scripture. According to him the *Titans* were the descendants of Gomer, the son of Japhet. He adds, that the word *Titan* is perfect Celtic, and derives it from *tit, earth*, and *den* or *ten, man*; and hence it was the Greeks also called them very properly γηγενεις, *q. d. terrigenæ, earth-born.*

The *Titans*, according to the learned Mr. Bryant, were those Cuthites, or sons of Chus, called *giants*, who were employed in building the tower of Babel, and who were afterwards dispersed. See DISPERSION *of Mankind.*

He supposes that they were denominated from their religion and place of worship, *Titæa*, which is represented as the mother of these people, being compounded of *Tit-aia*, and signifying literally *a breast of earth*, analogous to τιτθος αιας of the Greeks, and therefore expressing the figure as well as the materials of the ancient altars, which consisted of a conical hill of earth, in the shape of a woman's breast. These altars were also called *Tit-an* and *Tit-anis*, from the great fountain of light, styled *An* and *Anis*. Hence many places were called *Titanis* and *Titana*, where the worship of the sun prevailed; for *Anes* and *Hanes* signified the *fountain of light* or *fire*. Titana was sometimes expressed Tithana, and by the Ionians Tithena, and Tithena was said to be the nurse of the *Titans*. But Titæa their mother, and Tithena their nurse, were all of the same nature, viz. altars raised of soil. Hesiod, in his account of the dispersion of the *Titans*, and of the feuds which preceded (Theogon. ver. 676, &c.), says, that the Deity at last interposed, and put the *Titans* to flight, and condemned them to reside in Tartarus at the extremities of the earth; but Mr. Bryant observes, that he has confounded the history by supposing the giants and *Titans* to have been different persons. The sons of Chus, he says, were the aggressors in those acts of rebellion, described by the poets as the war of the giants, who were also represented under the character of the *Titanians*. The fictions of the poets with regard to the banishment of the *Titans* after their war against heaven, took their rise from this true history. A large body of *Titanians*, after the dispersion, settled in Mauritania upon the Atlantic ocean, which is the region styled Tartarus, and represented as the realms of night, because it was situated in respect to Greece towards the regions of the setting sun. The term ζοφος, by which it was expressed, signified both the west and darkness; as did also Ereb, ערב, whence Erebus, which was also another name for Tartarus, to which the poets condemned the *Titans* and giants. The first war of the *Titans*, according to this ingenious writer, consisted in acts of apostacy and rebellion against heaven: and this refers to that part of the history of the sons of Chus, which represents them as building a mighty city in the region, which they had usurped, and erecting a lofty tower, to prevent their being scattered abroad: but there was another war in which they were engaged with men, which happened in consequence of the dispersion. This was no other than the war mentioned by Moses, which was carried on by four kings of the family of Shem, against the sons of Ham and Chus, to avenge themselves of these enemies by whom they had been greatly aggrieved. See Bryant's Analysis of Ancient Mythology. vol. iii. p. 48, &c. p. 71, &c.

The word *Titan* is also used by the poets for the sun—in which case it is likewise Celtic, though from another root, being formed from *ti, house*, or *habitation*, and *tan, fire*.

Hesychius observes, that *Titan* is likewise used for sodomite. He adds, that it is also one of the names of antichrist; in which sense it must be written *Teitan*, in Greek, to contain the numeral letters of 666, which in the Apocalypse xiii. 18. is the number of the beast.

TITANIA, τιτανια, in *Antiquity*, a festival in memory of Titanes.

TITANOS, a word used by some authors to express lime; by others for the calx of burnt gypsum or plaster of Paris, and by others a lixivium of quicklime.

TITE. See TIGHT.

TITHENIDIA, τιθηνιδια, in *Antiquity*, a Spartan festival, so called from τιθηναι, *nurses*, who at this time carried the male infants committed to their charge to the temple of Diana Corythallia. For the ceremonies observed on this occasion, see Potter, Archæol. Græc. lib. ii. cap. 20. tom. i. p. 432, seq.

TITHES, TYTHES, TENTHS, *decimæ*, or *dixmes*, the tenth part of the increase, yearly arising and renewing from the profits of lands, the stock upon lands, and the personal industry of the inhabitants; allotted to the clergy for their maintenance.

Tithes, with regard to their several kinds or natures, are *personal, predial*, and *mixt*.

TITHES, *personal*, are those due or accruing from the profits of labour, art, trade, navigation, and industry of men; and of these only the tenth part of the clear gains and profits is due.

TITHES, *predial*, are those which arise merely and immediately from the ground; as grain of all sorts, hay, wood, fruits, herbs; for a piece of land or ground, being called in Latin *prædium* (whether it be arable, meadow, or pasture), the fruit or produce thereof is called *predial*.

TITHES, *mixt*, are such as arise from beasts, and other animals fed with the fruits of the earth; as cheese, milk, wool, lambs, calves, fowls, &c.

Tithes, with regard to their value, are divided into *great* and *small*.

TITHES, *great*, are those of corn, hay, and wood.

TITHES, *small*, are the *predial tithes* of other kinds, together with those that are called *mixt* and *personal*. It is said, that this division may be altered by custom, which will make wood a *small tithe* in the endowment of the VICAR; by quantity, which will convert a *small tithe* into *great*, if the parish is generally cultivated with it; and by change of place, which makes the same things, e. g. hops in gardens, *small tithes*, in fields *great tithes*. But it has been admitted, that the quantity of land within any parish, that is cultivated for a particular produce, cannot change the nature of the *tithe*: and, according to this opinion, the law is now settled, that the *tithes* are to be denominated *great* or *small*, according to the nature and quality thereof, and not according to the quantity. It is a general rule, that of common right *tithes* are to be paid for every thing that yields an annual increase; but this rule admits of exceptions, e. g. *tithe* is due from saffron, though gathered but once in three years, and on wood that is felled or lopped, called *sylva cædua*, though it is not renewed every year: and on the other hand, *tithes* shall be paid for the produce of seeds, as of clover, sown on the same ground, though renewed oftener than once a year. No *tithes* shall be paid of common right for any thing that is of the substance of the earth, or which is not of annual increase, as stone, lime, coal, tin, lead, and such like; nor for creatures that are feræ naturæ, or of a wild nature, as deer, hawks, fish, &c. whose increase so as to profit the owner is not annual, but casual; unless *tithes* in either of these cases are payable by custom. Lands, and their occupiers, may be exempted or discharged from the payment of *tithes*, either in part or totally, by a real composition, or by custom or prescription.

A real composition is when an agreement is made between the owner of the lands, and the parson or vicar, with the consent of the ordinary or patron, that such lands shall for the future be discharged from payment of *tithes*, by reason of some land, or other real recompence given to the parson, in lieu and satisfaction thereof. But these compositions are now restrained by the disabling statute 13 Eliz. cap. 10. See LEASES *by statute*.

A discharge by custom or prescription is, where time out of mind such persons, or such lands, have been either partially or totally discharged from the payment of *tithes*. This custom, or prescription, is either *de modo decimandi*, (see MODUS *decimandi*) or *de non decimando*. A prescription *de non decimando*, is a claim to be entirely discharged of *tithes*, and to pay no compensation in lieu of them. Thus the king by his prerogative is discharged of all *tithes*. So a vicar shall pay no *tithes* to the rector, nor the rector to the vicar: but these privileges are personal to both the king and the clergy; for their tenant or lessee shall pay *tithes* of the same land, though in their own occupation it is not tithable. And, generally speaking, it is an established rule, that, in lay hands, *modus de non decimando non valet*. But spiritual persons or corporations, as monasteries, abbots, bishops, and the like, were always capable of having their lands totally discharged of *tithes*, by various ways, as, 1. by real composition; 2. by the pope's bull of exemption; 3. by unity of possession, as when the rectory of a parish, and lands in the same parish, both belonged to a religious house, those lands were discharged of *tithes* by this unity of possession: 4. by prescription, having never been liable to *tithes* by being always in spiritual hands; 5. by virtue of their order, as the knights Templars,

Cistercians,

Ciſtercians, and others, whoſe lands were privileged by the pope with a diſcharge of *tithes*. Though, upon the diſſolution of abbeys by Henry VIII. moſt of theſe exemptions from *tithes* would have fallen with them, and the lands become tithable again, if they had not been ſupported and upheld by the ſtatute 31 Hen. VIII. cap. 13. which enacts, that all perſons who ſhould come to the poſſeſſion of the lands of any abbey then diſſolved, ſhould hold them free and diſcharged of *tithes*, in as ample a manner as the abbeys themſelves formerly held them. And from this original have ſprung all the lands, which being in lay hands, do at preſent claim to be *tithe*-free: for if a man can ſhew his lands to have been ſuch abbey lands, and alſo immemorially diſcharged of *tithes* by any of the means before-mentioned, this is now a good preſcription *de non decimando*. But he muſt ſhew both theſe requiſites; for abbey-lands, without a ſpecial ground of diſcharge, are not diſcharged of courſe; neither will any preſcription *de non decimando* avail in total diſcharge of *tithes*, unleſs it relates to ſuch abbey-lands.

The things that are tithable are, for the moſt part, as follow: corn is a great predial *tithe*, and tithable according to the cuſtom of the place, commonly by the tenth ſhock, cock, or ſheaf. Beans and peaſe, expended in the houſe, are ſubject to no *tithes*, but if they are gathered to be ſold, or to feed hogs, they are tithable, and are in their nature great *tithes*. Hay is a predial great *tithe*, and is to be tithed in ſwathes or cocks, according to the cuſtom of the place. Clover, rape, and woad, are ſmall *tithes*: heath, furze, and broom are alſo tithable. The *tithe* AGISTMENT is a ſmall *tithe*, and due of common right. Wood is a predial *tithe*, but whether great or ſmall hath been queſtioned; but it has been reſolved, that if a vicar be only endowed with the ſmall *tithes*, and has always had *tithe*-wood, in ſuch caſe it ſhall be accounted a ſmall *tithe*, otherwiſe it is to be accounted among the great *tithes*. Timber fit for building of houſes and ſhips, and comprehending oak, elm, and aſh, are exempted from *tithes*, by 45 Edw. III. cap. 3. but *timber* trees, cut and corded for fuel, have been adjudged to pay *tithes*, as well as underwood; however, no *tithe* ſhall be paid for the roots of trees, for wood cut for huſbandry or fuel, for hurdles of ſheep, for hop-poles, and for making of bricks, and alſo fruit trees. When the wood is tithable, it is ſet out while ſtanding by the tenth acre, pole, or perch; or, when cut down, by the tenth faggot or billet. The *tithe* of flax and hemp is a ſmall *tithe*, and by ſtatute this is charged at 5 *s.* per acre, 11 & 12 Will. cap. 16. The *tithe* of madder is alſo a ſmall *tithe*, and charged at 5 *s.* per acre, by 31 Geo. II. cap. 12. The *tithe* of hops is predial, and reckoned among ſmall *tithes*; it is not to be paid till after they are picked, and before they are dried, every tenth meaſure. Out of gardens is paid *tithe* of all garden herbs and plants, which are ſmall *tithes*, and may be demanded in kind: potatoes and turnips are alſo ſmall *tithes*, as is likewiſe tobacco and ſaffron. However, in lieu of the *tithes* of gardens, a certain conſideration in money is paid, either by cuſtom, or by agreement with the parſon. Fruits of trees, as apples, pears, plums, cherries, and the like, are predial *tithes*, to be paid in kind when they are gathered, unleſs there is ſome modus, or rate *tithe* paid in lieu of them. The tenth calf is due to the parſon of common right; and if there are ſeven, he ſhall have one; if under ſeven, a halfpenny, or what cuſtom ſhall direct, for each calf. Colts and pigs are tithable in the ſame manner as calves; and the time of payment of theſe *tithes* is when they are ſo old that they may be weaned. Wool and lamb are generally reckoned mixt ſmall *tithes*. Milk is a mixt *tithe*; where *tithe* milk is paid in kind, no *tithe* cheeſe is due, and where *tithe* cheeſe is paid in kind, no *tithe* milk is due. Deer and conies, being feræ naturæ, are not tithable of common right, but by ſpecial cuſtom. Of fowls, which are domeſtic, as geeſe, hens, and ducks, *tithes* are to be paid, either by paying the tenth egg, or the tenth of their young, according to cuſtom. It hath been adjudged, that the paying of thirty eggs in Lent, is a good modus for all *tithes* of eggs. Bees are free of *tithes*, but the wax and honey are chargeable at the rate of the tenth meaſure of honey, and the tenth weight of wax. By the books of common law it appears, that ſome *tithe* or other is due for a mill. Fiſh in ponds and private fiſheries, and in common rivers, are tithable only by cuſtom. Fiſh taken in the ſea are chargeable by cuſtom as a perſonal *tithe*. Perſonal *tithes* are regulated by ſtat. 2 & 3 Edw. VI. cap. 13. but perſonal *tithes* are now ſcarce any where paid in England, unleſs for mills or fiſh caught in the ſea, and then payable where the party hears divine ſervice, and receives the ſacraments. *Tithes* are recoverable in the ſpiritual court by the canon law, and by divers ſtatutes, as the ſtatute of CIRCUMSPECTE *agatis*, 13 Edw. I. ſt. 4. the ſtatute of articuli cleri, 9 Edw. II. ſtat. 1. cap. 1. 18 Edw. III. ſtat. 3. cap. 7. 1 Rich. II. cap. 13, 14. 27 Hen. VIII. cap. 20. 32 Hen. VIII. cap. 7. 2 & 3 Edw. VI. cap. 13. 7 & 8 Will. III. cap. 6. 34. 1 Geo. ſtat. 2. cap. 6. 27 Geo. II. cap. 20.

Tithes in London are ſubject to particular regulations. By a decree made in 1545, according to the ſtatute 37 Hen. VIII. cap. 12. it is ordered, that the citizens and inhabitants of London and its liberties, ſhall yearly pay their *tithes* to the parſons, vicars, and curates, after the rate of 16½*d.* for every 10 *s.* annual rent, and 2 *s.* 9 *d.* for every 20 *s.* rent, and ſo above the rent of 20 *s.* by the year, aſcending from 10 *s.* to 10 *s.* according to the ſaid rate. The wife, children, ſervants, or others of their family, taking the rites of the church at Eaſter, ſhall pay 2 *d.* for their four offering days yearly, &c. Notwithſtanding the ſettlement of this decree, divers preſcriptions for the payment of leſſer rates than the parſons might require by it (as to pay 10 *s.* for the *tithe* of a houſe, although its rent was 40 *l.* a year, or more) have been gained and allowed. But by 22 & 23 Ch. II. cap. 15. after the fire of London, annual certain *tithes*, or ſums of money in lieu of *tithes*, for fifty-one churches, were appointed to be raiſed by aſſeſſments, in the manner preſcribed by the ſaid act. For the ſtipends of the miniſters of the fifty new churches, proviſion is made by the ſeveral acts of parliament relating to them, to be raiſed from the duties on coals. There are alſo particular ſtatutes for particular churches, in London and in other places.

Original and Hiſtory of Tithes.

The cuſtom of giving or paying *tithe* is very ancient; in Gen. xiv. 20. Abraham gives Melchiſedech the tenth of all the ſpoils he had taken from the four kings he had defeated: in Gen. xxviii. 22. Jacob makes a vow at Bethel, to give the tenth of all the riches he ſhall gather in that ſojourn, to God.

But theſe *tithes* were free and voluntary, and, beſides, differed in divers other reſpects from what was afterwards called *tithe*: what Melchiſedech received, was only the tenth of the ſpoils, not of Abraham's poſſeſſions; and this once, not annually; and beſide, not as maintenance, which Melchiſedech wanted not, but as homage: add, that this was only from one prieſt to another; for Abraham had not only a prieſt in his loins, but was a prieſt himſelf. And as to Jacob, who was alſo a prieſt, what he did was the effect of a vow, voluntarily taken, to offer the tenth of all he ſhould poſſeſs; not to any other prieſt, but to God himſelf upon an altar.

Tithe was firſt legally enjoined by Moſes, Lev. xxvii. 30. Numb. xviii. 21. Deut. xiv. 22. That legiſlator obliged the Iſraelites to the payment of ſeveral kinds of *tithes*; as,

1. The firſt *tithe* מעשר הראשון, which was a *tithe* of all the fruits given to the Levites: this was not taken till after the oblation called תרומה, *terumah*, which was a tenth part allotted to the prieſts, had been made.

2. The *ſecond tithe* was a tenth part of the nine remaining after payment of the firſt *tithe*. This *tithe* was ſet apart in each family; and the maſter of the family was obliged to carry it to Jeruſalem, and to uſe it there; or, in caſe he could not, he was to redeem it, or convert it into money: in which caſe he was to add a fifth to it, and carry the money to Jeruſalem.

3. The *tithe of the tithe*, was the tenth part of all the *tithes* that had been given to the Levites by the people: for the Levites after they had got all their *tithes* of the people, divided the whole into ten parts; and in their turn gave a *tithe* to the prieſts.

4. The *tithe of the third year* was another kind of *tithe*, not much different from the ſecond *tithe*, excepting that it was leſs troubleſome; becauſe they did not carry it to Jeruſalem either in kind, or in money, but kept it by them to be ſpent by the Levites, the ſtrangers, the fatherleſs, and the widows of the place, Deut. xiv. 28, 29. This was alſo called the *tithe of the poor*, and the *third tithe*; and theſe third years when it was paid, were called the *tithe years*. Several learned Jews and Chriſtians, however, conceive, that this was not a diſtinct *tithe*, but the ſame as the ſecond; ſo that, as Mr. Mede apprehends, what was wont in other years to be ſpent in feaſting, was every third year ſpent upon the poor. All theſe *tithes* are calculated to amount to above one ſixth of the revenue of each perſon.

Theſe matters are all farther explained in the Talmud, wherein are two books on *tithes*, alſo in the book of benedictions, ברכיון, in the commentaries of Bartenora, Maimonides, R. Schelomoh Jarrhi, in Scaliger, Amama, Selden, Friſchmuth, Quenſted, Varenius, Hottinger, Sigonius, Cunæus, Godwyn, Leidecker, &c.

Under the new law *tithes* are not eſtabliſhed by Jeſus Chriſt,

Christ, or Christian dispensation, as they were under the old law by the ministry of Moses: the Christian priests, and the ministers of the altar of the new covenant, lived, at first, wholly of the alms and oblations of the devout.

In after-times the laity gave a certain portion of their revenues to the clergy, but voluntarily, and not out of any constraint or obligation; the first instances we have of this, are in the fourth and fifth centuries.

This gift was called *tithe*, not that it was really a tenth part of their income, or near so much: but only in imitation of the *tithes* of the old law.

In the following age, the prelates in their councils, in concert with the princes, made an express law to the purpose; and obliged the laity to give a full tenth part of their revenues, their fruits, &c. to the ecclesiastics.

This the church enjoyed without disturbance for two or three centuries; but in the eighth century the laity got hold of part of these *tithes*, either by their own authority, or by grants and donations of the princes; and appropriated them to their own uses.

Some time afterwards they restored them, or applied them to the founding of monasteries or chapters, and the church consented, at least tacitly, to this restitution. In 1179, the third council of Lateran, held under Alexander III. commanded the laymen to restore all the *tithes* they yet held to the church.

In 1215, the fourth council of Lateran, held under Innocent III. moderated the matter a little; and, without saying any thing of the *tithes* which the laity already possessed, forbad them to appropriate or take any more for the future.

We may observe, that, upon the first introduction of *tithes*, though every man was obliged to pay *tithes* in general, yet he might give them to what priests he pleased, which were called *arbitrary consecrations of tithes*: or he might pay them into the hands of the bishop, who distributed among his diocesan clergy the revenues of the church, which were then in common. But when dioceses were divided into PARISHES, the *tithes* of each parish were allotted to its own particular minister; first by common consent, or the appointments of lords of manors, and afterwards by the written law of the land. However, arbitrary consecrations of *tithes* took place again afterwards, and became in general use with us till the time of king John. This was probably owing to the intrigues of the regular clergy, or monks of the Benedictine and other rules, and will account for the number and riches of the monasteries and religious houses, which were founded in those days, and which were frequently endowed with *tithes*. But, in process of years, the income of the laborious parish priests being scandalously reduced by these arbitrary consecrations of *tithes*, it was remedied by pope Innocent III. about the year 1200, in a decretal epistle, sent to the archbishop of Canterbury, and dated from the palace of Lateran, which enjoined the payment of *tithes* to the parsons of the respective parishes, where every man inhabited, agreeably to what was afterwards directed by the same pope in other countries. This epistle, being reasonable and just, and correspondent to the ancient law, was allowed of, and became *lex terræ*. This put an effectual stop to all the arbitrary consecrations of *tithes*; except some footsteps which still continue in those *portions of* TITHES, which the parson of one parish hath, though rarely, a right to claim in another: for it is now universally held, that *tithes* are due, of common right, to the parson of the parish, unless there be a special exemption. This PARSON of the parish, may be either the actual incumbent, or else the appropriator of the benefice: APPROPRIATIONS being a method of endowing monasteries, which seems to have been devised by the regular clergy, by way of substitution to arbitrary consecrations of *tithes*.

Fa. Paolo, in his Treatise of beneficiary matters, is of opinion, that the custom of paying *tithes*, under the new law, began in France; and affirms, that there are no instances of it before the eighth and ninth centuries: but he must be mistaken; for in the second council of Matiscona, held in 585, it is said expressly, that the Christians had a long time kept inviolate that law of God, whereby *tithe* of all their fruits was enjoined to be given to holy places, &c.

In effect, Origen, hom. xi. on Numb. thinks, that the old laws of Moses, touching the first-fruits and *tithes*, both of cattle, and of the fruits of the earth, are not abrogated by the gospel; but ought to be observed on their ancient footing.

The Vth canon of the council of Matiscona orders *tithe* to be paid to the ministers of the church according to the law of God, and the immemorial custom of the Christians, for the use of the poor, and the redemption of captives, and that upon penalty of excommunication: which is the first penalty we find imposed on such as would not pay *tithe*. On which grounds it is that many among the modern clergy hold their *tithes* to be *jure divino*.

Others, on the contrary, plead, that the recompence to be given church ministers, is differently ordained by God, according to the differences he has put between his two great dispensations, the law and the gospel: under the law he gave them *tithes*; under the gospel, having left all things in his church to charity, and Christian freedom, he has given them only what shall be given them freely, and in charity. That the law of *tithes* is in force under the gospel, all the protestant divines, except some among the English, deny; for, though hire to the labourer be of moral and perpetual right, yet that special kind of hire, the *tenth*, can be of no right or necessity, but to the special labour for which God ordained it: that special labour was the Levitical and ceremonial service of the tabernacle, Numb. xviii. 21, 31, which was abolished: the right therefore of the special hire must be abolished too.

That *tithes* were ceremonial, is evident from their not being given to the Levites till they had been first offered as an heave-offering to the Lord, ver. 24, 28.

He, then, who by the law brings *tithes* into the gospel, brings in likewise a sacrifice, and an altar; without which, *tithes*, by the law, were unsanctified and polluted, ver. 32. And therefore they were never thought of in the first Christian times, till ceremonial altars and oblations had been brought back.

The Jews themselves, ever since their temple was destroyed, though they have rabbies, and teachers of the law, yet pay no *tithes*, as having no proper Levites to whom, nor any altar whereupon to hallow them; which argues, that the Jews themselves never looked on *tithes* as moral, but merely ceremonial. Add, that *tithes* were not allowed to the priests and Levites merely for their labour in the tabernacle; but in consideration of this likewise, that they were not allowed to have any other part or inheritance in the land, ver. 20, 24, and, by that means, for a tenth, lost a twelfth.

Besides, it has been urged, that the priests and Levites were properly the officers and ministers of state under God, as king of Israel; and the Israelites paying through their hands one-tenth to him, was agreeable to the custom of almost all nations to pay one-tenth to their king. *Tithes*, therefore, are to be considered as an appendage to the theocracy, and it has been said, that it will be extremely difficult to prove, that Christian ministers have a divine right to demand them, from this circumstance of a constitution peculiar to the Jewish nation. As to the original of *tithes*, judge Blackstone observes, that he will not put the title of the clergy to them upon any divine right; though such a right certainly commenced, and, as he apprehends, as certainly ceased, with the Jewish theocracy; yet an honourable and competent maintenance for the ministers of the gospel is, undoubtedly, *jure divino*; whatever the particular mode of that maintenance may be. Accordingly all municipal laws have provided a liberal and decent maintenance for their national priests or clergy: ours in particular have established this of *tithes*, probably in imitation of the Jewish law; and perhaps, considering the degenerate state of the world in general, it may be more beneficial to the English clergy to found their title on the law of the land, than upon any divine right whatsoever, unacknowledged and unsupported by temporal sanctions.—But however beneficial this appointment may be to the clergy, it has been complained of as impolitic in a variety of respects, and peculiarly burthensome to the state. It is a great discouragement to the improvement of land, that a tenth part of the clear produce, without any deduction for the advanced expence of raising that produce, should be alienated from the cultivator of the land to any other person whatever. Some have proposed, as a better method for raising a revenue for the clergy, to lay an equivalent tax upon all estates, cultivated or not cultivated. It is well known and has often been lamented, even by the clergy themselves, that this method of raising a revenue for their subsistence is a continual source of dispute between the clergy and their parishioners, and contributes to obstruct the usefulness of their ministry. In Holland, and some other Protestant countries, the civil magistrates have adopted what some have thought a better plan, by allowing their ministers a fixed stipend, paid out of the public funds.

In effect, for the first three hundred years after Christ, no mention is made in all ecclesiastical history of any such thing as *tithes*; though, in that time, altars and oblations

oblations had been recalled, and the church had miſerably judaized in many other things. The churchmen confeſſedly lived all that time on free-will offerings: nor could the defect of paying *tithe* be owing to this, that there were wanting civil magiſtrates to enjoin it; ſince Chriſtians, having lands, might have given out of them what they pleaſed; and the firſt Chriſtian emperors, who did all things by advice of the biſhops, ſupplied what was wanting to the clergy, not out of *tithes*, which were never propoſed, but out of their own imperial revenues.

The firſt authority produced, ſetting aſide the Apoſtolical Conſtitutions, which few of the patrons of *tithes* will inſiſt on, is a provincial ſynod at Cullen in 356, where *tithes* are voted to be God's rent: but before that time, divers other abuſes and complaints had got ground, as altars, candles at noon, &c. And thus one complaint begot another: as it is certain, that *tithes* ſuppoſe altars.

It is not eaſy to aſcertain the time when *tithes* were firſt introduced into this country. About the year 794, Offa, king of the Mercians, made a law, whereby he gave to the church the *tithes* of all his kingdom, in order, as it is ſaid, to atone for the death of Ethelbert, king of the Eaſt Angles, whom, in the preceding year, he had cauſed to be baſely murdered. But that they were paid in England before this time by way of offering, according to the ancient uſage and decrees of the church, appears from the canons of Egbert, archbiſhop of York, about the year 750, and from an epiſtle of Boniface, archbiſhop of Mentz, written about the ſame time to Cuthbert, archbiſhop of Canterbury, and from the 17th canon of the general council held for the whole kingdom at Chalchuth, in the year 787. But the law of Offa firſt gave the church a civil right to them in this land by way of property and inheritance, and enabled the clergy to recover them as their legal due, by the coercion of the civil power. However, this eſtabliſhment of Offa reached no farther than to the kingdom of Mercia, over which he reigned; until Ethelwulph, about ſixty years after, enlarged it for the whole realm of England. See Revenue.

Judge Blackſtone ſays, that poſſibly *tithes* in this country were cotemporary with the planting of Chriſtianity among the Saxons, by Auguſtin the Monk, about the end of the 6th century. But the firſt mention of them, which he has met with, in any written Engliſh law, is in a conſtitutional decree, made in a ſynod held A. D. 786, wherein the payment of *tithes* in general is ſtrongly enjoined. This canon or decree, which did not at firſt bind the laity, was effectually confirmed by two kingdoms of the heptarchy, in their parliamentary conventions of eſtates, reſpectively conſiſting of the kings of Mercia and Northumberland, the biſhops, dukes, ſenators, and people. This was a few years later than the time when Charlemagne eſtabliſhed the payment of them in France, A. D. 778, and made the famous diviſion of them into four parts; one to maintain the edifice of the church, the ſecond to ſupport the poor, the third the biſhop, and the fourth the parochial clergy.

The next authentic mention of them is in the Fœdus Edwardi et Guthruni, or the laws agreed upon between king Guthrun the Dane, and Alfred and his ſon Edward the Elder, ſucceſſive kings of England, about the year 900. This treaty may be found at large in the Anglo-Saxon laws, and it not only enjoins the payment of *tithes*, but adds a penalty upon non-obſervance; which law is ſeconded by the laws of Athelſtan (cap. i.) about the year 930. This, he ſays, is as much as can be certainly traced out, with regard to their legal original. Blackſt. Com. b. ii. c. iii. ſect. 2. Burn's Eccl. Law, vol. iii. article *Tithes*.

The cuſtom of paying *tithe*, or of offering a tenth of what a man enjoys, or of what he reaps from it, has not only been practiſed under the old and the new law, but we alſo find ſomething like it among the heathens.

Xenophon, in the fifth book of the expedition of Cyrus, gives us an inſcription upon a column near the temple of Diana, whereby the people were warned to offer the tenth part of their revenues every year to that goddeſs.

The Babylonians and Egyptians gave their kings a tenth of their revenues: ſee Ariſtotle in his Oeconomics, lib. ii. Diodorus Siculus, lib. v. and Strabo, lib. xv.—Afterwards the Romans exacted of the Sicilians a tenth of the corn they reaped; and Appian tells us, that thoſe who broke up, or tilled, any new grounds, were obliged to carry a tenth of their produce to the treaſury.

The Romans offered a tenth of all they took from their enemies, to the gods; whence the name of Jupiter Prædator: the Gauls, in like manner, gave a tenth to their god Mars, as we learn in the Commentaries of Cæſar.—And Feſtus, de Verb. Signif. aſſures us, that the ancients uſed to give *tithe* of every thing to their gods: *Decima quæque veteres diis ſuis offerebant.*

Authors have been ſtrangely perplexed, to find the original of a cuſtom eſtabliſhed among ſo many people of different manners and religions, to give a *tenth* to their kings, their gods, or their miniſters of religion. Grotius takes it to ariſe hence, that the number ten is the moſt known, and the moſt common, among all nations; by reaſon of the number of fingers, which is ten. On this account he thinks it is, that the commandments of God were reduced to ten, for people to retain them with greater eaſe; that the philoſophers eſtabliſhed ten categories, &c.

Extra-parochial Tithes denote *tithes* which are not within the compaſs of any diſtinct pariſh. By the canon law, theſe were to be diſpoſed of at the diſcretion of the biſhop; but by the law of England, all extra-parochial *tithes*, as in ſeveral foreſts, belong to the king, and may be granted to whom he pleaſes. Accordingly they have been adjudged to him, not only by ſeveral reſolutions of law, but alſo in parliament 18th Edw. I. But extra-parochial waſtes and marſh lands, when improved and drained, are by 17th Geo. II. c. 37, to be aſſeſſed to all parochial rates in the pariſh next adjoining.

Tithes *impropriated and appropriated*, called alſo *infeodated tithes*, are thoſe alienated to ſome temporal or eccleſiaſtical lord, united to their fee, and poſſeſſed as ſecular goods. See Appropriation and Impropriation.

By the council of Lateran, held under Alexander III. in 1179, the alienation or infeodation of *tithes* is prohibited for the future: whence all infeodations made ſince that time are generally held, by the canoniſts, illegal.

Some attribute the original of theſe impropriated *tithes* to Charles Martel; and hold him damned for firſt giving the revenues of benefices to ſecular nobles: but Baronius will have this a fable, and refers their origin to the wars in the Holy Land; which is alſo the opinion of Paſquier.

The tribute, it ſeems, which the Romans impoſed on all the provinces of their empire, was a tenth part of all the fruits: hence ſeveral authors obſerve, that the Franks having conquered the Gauls, and finding the impoſition eſtabliſhed, they kept it on foot, and gave thoſe *tithes* in fee to their ſoldiers: and this, ſay they, was the origin of infeoffed, or impropriated or appropriated *tithes*. But the truth is, they are not ſo ancient; nor do we find any mention of them before the reign of Hugh Capet; even the very council of Clemont, held in 1097, as hot as it was in the intereſts of the church, does not ſay one word of them; which yet would undoubtedly have made loud complaints of ſuch an uſurpation, had it been then known.

Tithes, *portion of*, denotes *tithes* which the parſon of one pariſh hath a right to claim in the pariſh of another. Theſe portions, which might probably, at leaſt in part, have been owing to the lord of a manor's eſtate extending into diſtricts which are now apportioned into diſtinct pariſhes, are in law ſo diſtinct from the rectory, that if one who hath them purchaſes the rectory, the portion is not extinct, but remaineth grantable. The cognizance of theſe belongs like that of other *tithes*, to the eccleſiaſtical court.

Tithe-*rate*. See Rate-*tithe*.

Tithes, *ſubtraction of*. See Subtraction.

TITHING, *decenna*, or *decury*, a number or company of ten men, with their families, knit together in a kind of ſociety, and all bound to the king, for the peaceable behaviour of each other.

Anciently no man was ſuffered to abide in England above forty days, unleſs he were enrolled in ſome *tithing*.—One of the principal inhabitants of the *tithing* is annually appointed to preſide over the reſt, being called the *tithing-man*, the head-borough, and in ſome countries the borſholder, or borough's-ealder, being ſuppoſed the diſcreeteſt man in the borough, town, or *tithing*. The diſtribution of England into *tithings* and hundreds is owing to king Alfred. See Deciners, Frank-*pledge*, and Friburgh.

TITHYMALUS, in *Botany*, ſee Spurge.

TITILLARES *venæ*, a name given by ſome authors to the iliac veins.

TITILLATION, Titillatio, the act of *tickling*, i. e. exciting a ſort of pleaſurable idea, by a gentle application of ſome ſoft body, upon a nervous part; and which uſually tends to produce laughter.

TITILLICUM, a word used by some anatomical writers for the arm-pit.

TITLARK, in *Ornithology*, see LARK.

TITLE, TITULUS, an inscription put over any thing, to make it known.

The word is more particularly used for the inscription in the first page of a book, expressing the subject thereof, the author's name, &c.

What tortures abundance of authors, is to find specious *titles* for their books: a *title* should be simple, and yet clear: these are the two genuine characters of this kind of composition. Assuming *titles* are prepossession against the author.

TITLE, TITULUS, in the *Civil* and *Canon Law*, denotes a chapter or division of a book.

A *title* is subdivided into paragraphs, &c.—Each of the fifty books of the Digest consists of a number of *titles*; some of more, others of less.

TITLE is also an appellation of dignity, distinction, or pre-eminence, given to persons possessed of the same.

The *titles* of order or dignity, Loyseau observes, should always come immediately after the name, and before the *titles* of office.

The king of Spain has a whole page of *titles*, to express the several kingdoms and signories he is master of. The king of England takes the *title* of *king of Great Britain, France, and Ireland*: the king of France, the *title* of *king of France and Navarre*: the king of Sweden intitles himself *king of the Swedes and Goths*: the king of Denmark, *king of Denmark and Norway*: the king of Sardinia, among his *titles*, takes that of *king of Cyprus and Jerusalem*: the duke of Lorrain, the *title* of *king of Jerusalem, Sicily*, &c.

The cardinals take *titles* from the names of some churches in Rome: as of St. Cecilia, St. Sabina, &c. and they are called cardinals of the *title of St. Cecilia*, &c.

The emperor can confer the *title* of prince, or count of the empire; but the right of suffrage in assemblies of the empire depends on the consent of the estates.

The Romans gave the *titles* of Africanus, Asiaticus, Macedonicus, Numidicus, Creticus, Parthicus, Dacicus, &c. in memory of the victories obtained over the people of those countries.—The king of Spain, after the like manner, gives honourable *titles* to his cities, in recompence for their services, or their fidelity.

TITLE expresses also a certain quality ascribed by way of respect to certain princes, &c

The pope has the *title* of *holiness*; a cardinal prince of the blood, that of *royal highness*, or *most serene highness*, according to his nearness to the throne; other cardinal princes, *most eminent highness*; an archbishop, *grace* and *most reverend*; a bishop, *right reverend*; abbots, priests, religious, &c *reverend*.

As to secular powers, to the emperor is given the *title* of *imperial majesty*; to kings, *majesty*; to the king of France, *most christian majesty*; to the king of Spain, *catholic majesty*; to the king of England that of *defender of the faith*; to the Turks, *grand signor*, and *highness*; to the prince of Wales, *royal highness*; to the dauphin of France, *serene highness*; to electors, *electoral highness*; to the grand-duke, *most serene highness*; to the other princes of Italy and Germany, *highness*; to the doge of Venice, *most serene prince*; to the republic or senate of Venice, *signory*; to the grand-master of Malta, *eminence*; to nuncios, and ambassadors of crowned heads, *excellency*.

The emperor of China, among his *titles*, takes that of *tien su*, son of heaven. The Orientals, it is observed, are exceedingly fond of *titles*: the simple governor of Schiras, for instance, after a pompous enumeration of qualities, lordships, &c. adds the *titles* of *flower of courtesy*, *nutmeg of consolation*, and *rose of delight*.

TITLE, in *Law*, denotes a right which a person has to the possession of any thing.

A *title* to lands is thus defined by Sir Edward Coke: *titulus est justa causa possidendi id quod nostrum est*, or it is the means whereby the owner of lands hath the just possession of his property. There are several stages or degrees requisite to form a *complete title* to lands and tenements. The lowest and most imperfect degree of *title* consists in the mere naked possession, or actual occupation of the estate, without any apparent right, or any shadow or pretence of right, to hold and continue such possession. See DISSEISIN.

The next step to a good and perfect *title* is the right of possession, which may reside in one man, while the actual possession is either in himself or another. The third circumstance attending a *title* is the mere right of property, the *jus proprietatis*, without either possession or even the right of possession. It is possible that one man may have the possession, another the right of possession, and a third the right of property. But in the union of these three qualifications consists a complete *title* to lands, tenements and hereditaments. For it is an ancient maxim of the law, that no *title* is completely good, unless the right of possession be joined with the right of property; which right is then denominated a double right, JUS *duplicatum*, or *droit droit*. And when to this double right the actual possession is also united, when there is, according to the expression of Fleta, *juris et seisinæ conjunctio*, then, and then only is the *title* completely legal.

The statute 32 Hen. VIII. c. 9. hath provided, that no one shall sell or purchase any presented right or *title* to land, unless the vendor hath received the profits thereof for one whole year before such grant, or hath been in actual possession of the land, or of the reversion or remainder; on pain that both the purchaser and vendor shall each forfeit the value of such land to the king and the prosecutor.

A *title* to things personal may be acquired or lost by occupancy, by prerogative, by forfeiture, by custom, by succession, by marriage, by judgment, by gift, by contract, by bankruptcy, by testament, and by administration. Blackst. Com. b ii. p. 195, &c. p. 400, &c.—See POSSESSION and PROPERTY.

Title is also an authentic instrument, whereby a man can prove and make appear his right.

There must be at least a colourable *title* to come into possession of a benefice, otherwise the person is deemed an intruder. For prescription with *title*, see PRESCRIPTION.

TITLE, in the *Canon Law*, is that by virtue whereof a beneficiary holds a BENEFICE: such is the collation of an ordinary, or a provision in the court of Rome founded on a resignation, permutation, or other legal cause. The *title* of a benefice, or beneficiary, is either a true, or a colourable one. A true or valid *title* is that which gives a right to the benefice: such is that received from a collator who has a right to confer the benefice on a person capable thereof, the usual solemnities being observed. See COLLATION, &c.

Colourable *title* is a seeming one; i. e. such an one as appears valid, and is not. Such would that be founded on the collation of a bishop, in case the benefice in question were not in his collation.

By the canons, a colourable *title*, though false, produces two very considerable effects. 1. That, after peaceable possession for three years, the incumbent may defend himself by the rule *de triennali possessione*, against such as would dispute the benefice with him. 2. That in case he be prosecuted within three years, and obliged to surrender the benefice, he shall not be obliged to restore the produce of it, during the time he possessed it.

TITLE, is also used in several ancient synods and councils, for the church to which a priest was ordained, and where he was constantly to reside.

Nullus in presbyterum, nullus in diaconum, nisi ad certum titulum ordinetur. Concil. Londin. ann. 1125.

There are many reasons why a church might be called *titulus, title*: the most probable Cowel takes to be this, that in ancient days the name of the saint to whom the church was dedicated was engraven on the porch, as a token that the saint had a *title* to that church: whence the church itself became afterwards to be called *titulus*.

TITLES, or TITULAR *churches*, M. Fleury observes, were formerly the denomination of a particular kind of churches at Rome.

In the sixth and seventh centuries, there were four sorts of churches in that metropolis; viz. *patriarchal, titular, diaconal*, and *oratorial*. The *tituli, titular*, were as it were, parishes, each assigned to a cardinal priest, with a certain district or quarter depending thereon, and a font for the administration of baptism in case of necessity.

TITLE, *clerical* or *sacerdotal*, denotes a yearly revenue or income of the value of fifty crowns, which the candidates for priesthood were anciently obliged to have of their own, that they might be assured of a subsistence.

By the ancient discipline there were no clerks made, but in proportion as they were wanted for the service of the church, which is still observed with regard to bishops; none being consecrated, but to fill some vacant see.

But for priests, and other clerks, they began to make vague ordinations in the East as early as in the fifth century: this occasioned the council of Chalcedon to declare all vague and absolute ordinations null.

Accordingly, the discipline was pretty well observed till towards the end of the eleventh century; but then it began to relax, and the number of priests was exceedingly increased;

creaſed; either becauſe the people became deſirous of the privileges of the clericate, or becauſe the biſhops ſought to extend their juriſdiction.

One of the great inconveniencies of theſe vague ordinations was poverty, which frequently reduced the prieſts to ſordid occupations, and even to a ſhameful begging. To remedy this, the council of Lateran laid it on the biſhops to provide for the ſubſiſtence of ſuch as they ſhould ordain without *title*, till ſuch time as they had got a place in the church that would afford them a ſettled maintenance.

There was alſo another expedient found out to elude the canon of the council of Chalcedon; and it was appointed, that a prieſt might be ordained on the *title* of his patrimony; that is, it was not neceſſary he had any certain place in the church, provided he had a patrimony ſufficient for a creditable ſubſiſtence.

The council of Trent retrieved the ancient diſcipline in this reſpect, forbidding all ordinations, where the candidate was not in peaceable poſſeſſion of a benefice ſufficient to ſubſiſt him; and allowing nobody to be ordained on patrimony or penſion, unleſs where the biſhop declares it to be expedient for the good of the church: ſo that the benefice is the rule, and the patrimony the exception. See Ordination.

But this rule is not regarded, even in ſome catholic countries, particularly France, where the patrimonial *title* is the moſt frequent; and the *title* is even fixed to a very moderate ſum.

As to religious, the profeſſion they make in a monaſtery ſerves them for a *title*, in regard the convent is obliged to maintain them: and as to mendicants, they are maintained upon the *title of poverty*.

Thoſe of the houſe and ſociety of the Sorbonne are alſo ordained without any patrimonial *title*, and on the ſole *title* of poverty; it being ſuppoſed a doctor of the Sorbonne can never want a benefice.

Title *for orders*. See Deacon.

TITMOUSE, *parus*, in *Ornithology*, a diſtinct genus of birds, according to Linnæus, of the order of the *paſſeres*; the diſtinguiſhing characters of which are theſe: the extremity of the tongue is truncated, or as it were cut off, and terminated by three or four briſtles; and the beak is entire, and covered with briſtly feathers at the baſe. There are fourteen ſpecies.

The general characters of the *parus* kind, according to Mr. Ray, are, that they are very ſmall, and are fond of climbing about trees, where they feed on the ſmall inſects they find in their bark; though ſome of them will alſo eat ſeeds. They are always reſtleſs; their beaks are ſhort, and their tails long; they make a conſiderably loud noiſe, ſome of them ſinging very agreeably; and all lay a great number of eggs.

Titmouse, *American*. See Guiracenoia.

Titmouse, *bearded*, *parus biarmicus*, called by ſome *leaſt butcher-bird*, has a ſhort, ſtrong and very convex bill, of a box colour, the head of a fine grey; on each ſide of the bill, beneath the eye, a long triangular tuft of feathers; the chin and throat white; the middle of the breaſt fleſh-coloured; the ſides and thighs of a pale orange; and the hind part of the neck and back of an orange-bay.— The vent-feathers of the male are of a pale-black; thoſe of the female of a dull orange; the legs are of a deep ſhining black. The female wants the black mark on each cheek, and the fine fleſh-colour on the breaſt; the crown of the head is of a browniſh ruſt-colour, ſpotted with black: the outmoſt feathers of the tail, which in the male are of a deep orange-colour, are black tipt with white. Pennant.

Titmouse, *black*, *parus ater*. See Colemouse.

Titmouse, *blue*, *parus cæruleus*, called alſo nun, is a beautiful ſpecies, with a ſhort duſky bill, a fine blue crown of the head; a black line from the bill to the eyes; the forehead and cheeks white; yellowiſh green back; lower ſide of the body yellow; the wings and tail blue, the former being marked tranſverſely with a white bar, and the legs of a lead colour. This bird frequents gardens, and does great injury to fruit-trees by ſearching for inſects: it breeds in holes of walls, and lays about twelve or fourteen eggs. Pennant.

Titmouse, *great*. See Fringillago.

Titmouse, *long-tailed*, *parus caudatus*, has a black, very ſhort, thick, and very convex bill; the top of the head white, mixed with a few dark grey feathers, and ſurrounded with a broad ſtroke of black, riſing on each ſide of the upper mandible, paſſing over each eye, and uniting at the hind part of the head, and continuing along the middle of the back to the rump. The tail of this bird is the longeſt in proportion to the bulk of any Britiſh bird, being in length three inches, and of a white and black colour. The cheeks and throat are white: the breaſt and under ſide white, with a caſt of red; the legs, feet and claws are black. It forms an elegant neſt of an oval-ſhape, with moſſes and wool, and lays from ten to ſeventeen eggs. Pennant.

Titmouse, *marſh*, *parus paluſtris*, frequents wet places in woods, and early in February unites two notes, not unlike the whetting of a ſaw. It is bigger than the colemouse, wants the white ſpot on the head, has a larger tail, its under ſide white, leſs black under the chin, and wants the white ſpot on the coverts of the wings, though not always. Pennant.

TITUBATION, in *Aſtronomy*. See Trepidation.

TITULAR, or Titulary, denotes a perſon inveſted with a title, in virtue whereof he holds an office or benefice, whether he performs the functions thereof or not. In this ſenſe the term is uſed in oppoſition to ſurvivor, and to a perſon only acting by procuration, or commiſſion. An officer is always reputed *titular* till he hath reſigned his office, and the reſignation hath been admitted.

Titular is alſo ſometimes applied adjectively to a perſon who has the title and right of any office or dignity, but without having poſſeſſion, or diſcharging the function thereof.

It is ſometimes alſo uſed abuſively for a perſon who aſſumes and pretends a title to a thing, without either a right thereto, or a poſſeſſion thereof.

Titular *Churches*. See Titles.

TIZRI, in *Chronology*. See Tisri.

TIZZONAIOS, in the *Gloſs Art*, are two apertures, one on each ſide the working furnace, by which a ſervitor night and day puts in coals to maintain the fire.

TLACOOZELOTL, in *Zoology*. See Ocelot.

TLAM, or Slam, in the *Alum Works*, a word uſed by the workmen, to expreſs a ſort of mud or foulneſs which does great hurt to the alum, rendering it foul and coarſe. The *ſlam* is a muddy ſubſtance ſettling to the bottom of the veſſels; but in the boiling of the liquor it gives a reddiſh colour, and diſorders the whole works when in any great quantity. They always paſs their liquor over four parcels of the alum-rock, and the laſt if not carefully calcined generally gives it this diſadvantageous mixture. Phil. Tranſ. N° 142.

TLAQUACUM, in *Zoology*, the name given by the Spaniards, and ſome others to a very remarkable animal in America, commonly known among us by the name of the *poſſum* or opossum.

TLAQUATZIN, in *Zoology*, a name by which the natives in ſome parts of America call the opossum.

Tlaquatzin *ſpinoſum*, in *Zoology*, the name by which Hernandez has called the cuanda, a ſort of *Braſilian* porcupine.

TLANHQUACHUL, in *Ornithology*, the name of a Braſilian bird, very much approaching to the nature of the European platea, or spoonbill.

It is a very voracious bird, and feeds on live fiſh, but will not take or meddle with dead ones, and is all over of a beautiful red. It has a black ring round the upper part of its neck, and is common about the ſhores of the ſea and rivers.

TLAYOTIC, in *Natural Hiſtory*. See Colic-*ſtone*.

TLEUQUECHOLTOTOTL, in *Ornithology*, the Mexican name of a bird of the wood-pecker kind, deſcribed by Nieremberg, under the name of the *avis ſalutiferus*; the feathers of a red creſt it carries on its head being ſuppoſed a remedy for head-achs.

TMESIS, τμησις, formed from τεμνω, *I cut*, in *Grammar*, a figure whereby a compound word is ſeparated into two parts, and one or more words interpoſe between them.

Thus, when Terence ſays, *quæ meo cunque animo lubitum eſt facere*, there is a *tmeſis*; the word *quæcunque* being divided by the interpoſition of *meo*.

Lucretius abounds in *tmeſes*; as, *ſæpo ſalutantum tactu præterque meantum*: or, *diſſidio potis eſt ſejungi, ſeque gregari*; and *diſpectis diſque gregatis*.

TOAD, *rubeta*, *ranabufo*, of Linnæus, in *Zoology*, a creature ſufficiently known. It is larger than the frog, its body is thick, its back broad, and its belly ſwelled, and looking as if inflated, and its legs ſhort, whence it is too heavy and unwieldy to hop about as the frog does; its ſkin is conſiderably thick, and full of tubercles, of a duſky and blackiſh colour on the back, and ſpotted on the belly; and is naturally a loathſome and diſagreeable object. Nevertheleſs it has been obſerved, that it has fine eyes.

It feeds on the ſame things that the frog does, worms, ſnails, flies, and other inſects; it ſeems alſo that they are able to live on much lighter food, ſince there have been many inſtances of *toads* being found in the ſolid bodies of trees in holes, juſt big enough for them to turn about

about in; and where there could be no nourishment conveyed to them, except what they found in the juices of the tree. There are not wanting also instances of their having been found in the same manner in blocks of solid stone, if we can credit the generality of authors. Ray's Syn. Quad. p. 252.

The *toad* has been generally considered as a poisonous animal, but Mr. Pennant apprehends without sufficient reason. They have been taken up in the naked hand without the least injury, and quacks have even eaten them, and drank their juices without damage. Besides, they are a common food to many animals, as buzzards, owls, Norfolk plovers, ducks and snakes; of late, indeed, live *toads* have been applied to cancers, with a view of curing them: facts have been alledged in proof of their efficacy for this purpose. The mode of applying them has been to put the animal into a linen bag, and to hold its head, passing out of the bag, to the part, which it has soon laid hold of and sucked with greediness till it dropped off dead. The creature has swelled and appeared to be in great pain; often sweats much and turns pale; and sometimes disgorges, recovers and becomes lively again. For other particulars, we must refer to Mr. Pennant's appendix *ubi infra*. The time, when *toads* propagate, is early in spring; at which season the females are seen crawling about oppressed by the males, who continue on them for some hours, and adhere so fast as to tear the skin from the parts to which they stick. They impregnate the spawn as it is drawn out in long strings, like a necklace. And the female is assisted by the male, in discharging the spawn, who with his hinder feet pulls out the eggs, whilst his fore-feet embrace her breast. The eggs are included each in a membranous coat that is very firm, in which is contained the embryo, and these eggs, fastened to one another by a short but strong cord, form a kind of chaplet, the beads of which are distant from each other about half their length. The male by drawing this cord with his paw performs the functions of a midwife, and acquits himself in it, it is said, with a dexterity which could not be expected from so lumpish an animal. Pennant's Brit. Zool. vol. iii. p. 14, p. 385, &c.

The *toad* of Surinam, or *rana pipa* of Linnæus, has long been an object of attention to the curious, on account of its enormous bulk and ugly form. Dr Fermin, in his Traité des Maladies les plus frequentes à Surinam, &c. published at Maestricht, in 1764, has given some remarks on its mode of generation. Having put three males and a female into an open vessel of water, he observed that one of them had several spots on its back, which were eggs, each containing an embryo. At the end of three weeks, the animal seemed much agitated, and one of the cells on its back bursting open, a young one crept out of it. In five days no less than thirty-five of these cells opened in the same manner and produced as many animals. On the back of one of these which was dissected there were no less than one hundred and twenty of these cells, each of which he considers as a real matrix, in which its eggs is lodged and fecundated; and, indeed, in one of them he discovered an embryo completely formed, inveloped in a kind of placenta, accompanied by two thin transparent membranes seemingly analogous to the chorion and amnios in other animals.

Mr. Pennant has described a species of *toad*, called by some *natter jack*, the RANA *rubeta* of Linnæus, which frequents dry and sandy places: the upper part of the body is yellow, clouded with brown and covered with porous pimples; and on the back is a yellow line: the upper side of the body is of a paler hue, marked with black spots; on the fore-feet are four divided toes, and on the hind five, a little webbed.

TOAD-*fish*, *rana piscatrix*, in *Ichthyology*, see SEA *devil*.

TOAD-*flax*, *linaria*, in *Botany*, see FLAX.

TOAD-*stone*, see BUFONITÆ.

The more obvious properties of the *toad-stone* are, that it is of a brownish grey, and granulated texture, with several cavities filled with crystallized spar: it does not strike fire with steel, and melts to a black glass. The mode of its stratification has been fully and accurately described by Mr. Whitehurst, in his Inquiry into the original State and Formation of the Earth, 4to. 1778.

From the experiments of Dr. Withering on this stone with different acids, alkalies, and by fusion, it appears, that one hundred parts of it consist of $63\frac{1}{2}$ parts of siliceous earth, 16 of calciform iron, $7\frac{1}{2}$ of calcareous earth, and $14\frac{1}{2}$ of earth of alum. The aggregate of these ingredients is found to weigh $1\frac{1}{2}$ parts more than the original mass, which is ascribed to the substance capable of uniting with fixable air, not having been fully saturated with it, as they would be after their precipitation by the earth of alum. Phil. Trans. vol. lxxii. part ii. p. 335. This substance differs little from basaltes: it is softer, contains a smaller proportion of iron, and a larger of silex.

TOBACCO, *Nicotiana*, in *Botany*, a genus of the *pentandria monogynia* class; its characters are these: the empalement of the flower is permanent, of one leaf, cut into five acute segments; the flower has one funnel-shaped petal, with a long tube, spread open at the brim, ending in five acute points; it has five awl-shaped stamina, of the length of the tube, a little inclined, and terminated by oblong summits; and an oval germen supporting a slender style, crowned by an indented stigma; the germen turns to an oval capsule, with two valves, having two cells which open at the top, and filled with rough seeds, growing from the partition. Linnæus enumerates six, and Miller eleven species.

Tobacco was not known in Europe till after the discovery of America by the Spaniards, and first imported about the year 1560.

The Americans of the continent call it *petun*, those of the islands *yoli*. The Spaniards, who gave it the name *tobacco*, took it from Tabaco, a province of Yucatan, where they first found it, and first learned its use; or as some say, it derived its name from the island of Tabago or Tobago.

The French, at its first introduction among them, gave it various names; as *Nicotiana*, or the *ambassador's herb*, from John Nicot, then ambassador of Francis II. in Portugal, who brought some of it with him from Lisbon, and presented it to a grand prior of the house of Lorrain, and to queen Catharine de Medicis; whence it was also called *queen's herb*, and *grand prior's herb*.— They also gave it other names, which are now all reduced to the original name *tobaco*, or *tobacco*, from *Tabaco*, given it by Hernandez de Toledo, who first sent it into Spain and Portugal.

TOBACCO, *culture and preparation of*. *Tobacco* is cultivated in several parts of America, particularly in the Caribbee Islands, Virginia, &c. where they are forced to mix ashes with the soil, to prevent its rising too thick. After sowing, they water it every day, and on very hot days cover it up, to prevent its being scorched by the sun.

When it is risen to a convenient pitch, they transplant it, much as we do lettuces, only at a distance of three feet, and in a soil prepared with great care; when replanted, it is kept continually weeded, the stem frequently cleansed, and the lowest leaves, and the suckers it puts forth, taken off, that ten or fifteen of the finest leaves may have all the nourishment.

The leaves thus reserved being ripe, which is known by their breaking when bent, the stalks are cut, and left to dry two or three hours in the sun; after which they are tied two by two, and hung up on ropes under a shed to be dried by the air. When the leaves are sufficiently dried, they are pulled from off the stalks, and made up in little bundles; which, being steeped in sea-water, or, for want thereof, in common water, are twisted in manner of ropes, and the twists formed into rolls, by winding them with a kind of mill around a stick. In this condition the *tobacco* is imported into Europe, where it is cut by the tobacconists for smoking, or formed into snuff, and the like.

The principal kinds of *tobacco* imported into England are, the Maryland, called Oroonoko, and the Virginia *tobacco*. The former is not so agreeable to the British taste as the sweet-scented *tobacco* of the latter colony; but the northern nations of Europe are said to like it better.

Besides the *tobacco* of the West Indies, there are considerable quantities cultivated in the Levant, the coasts of Greece, and the Archipelago, the island of Malta, and Italy. The marks of good twist *tobacco*, are a fine shining cut, an agreeable smell, and that it has been well kept.

In the island of Ceylon, there are two kinds of *tobacco* cultivated for profit. They call both kinds *dunkol*, which signifies a leaf, the use of which is to be smoked. The one kind they call *hingele dunkol* or *singele dunkol*, for they make no difference between the letters S and H in their pronunciation; the other they call *dunkol kappada*; *kappada* signifies gelding, and is a word of Portugueze origin. This *kappada-tobacco* is much stronger and more intoxicating than the other; but both kinds are the produce of the same plant; only the single *tobacco* has very little care taken of it, being, after the sowing, in a manner left to itself, while the other has great pains bestowed upon it during the whole time of its growth, and till it is fit for use, in the following manner: they clear a little piece of ground, in which they sow the seed of the *tobacco*, and against the time that the young plants have

have got three leaves a-piece, they chooſe out another piece of ground into which to tranſplant them: this they hedge round, and turn their horned cattle into it, that their dung may fall upon it, and ſufficiently enrich it.—The ground is then dug with a ſharp hoe, or ſpade, in the form of a pick-ax, and the dung, by this means, thoroughly worked into it. When the earth is thus prepared, they take up the young plants, and ſet them in this new ground, at about a foot ſquare diſtant from one another.

The manner of giving more or leſs ſtrength to this *tobacco*, is by ſuffering the plants to grow to a greater or leſs height before they top them, or cut off the ſtalk at the ſummit. The uſual way is to cut off the top when the plant has fifteen leaves. If they intend the *tobacco* to be a little ſtronger, they do this when it has only thirteen; and when they would have it ſtrongeſt of all, they do it when there are only eleven or twelve leaves. On the contrary, when they would have a milder *tobacco*, they cut it not off till there be eighteen or twenty leaves; but in this way of counting the leaves, they never reckon the three or four loweſt, which do not grow ſo large and fine as the others. The cutting off of the top prevents the juice of the plant from being waſted in flowers and ſeeds, which are of no value; and, in conſequence of it, all being, after this time, employed to furniſh the growth of the leaves, they grow four times as large and thick as they otherwiſe would do.

To prevent all unneceſſary waſting of the ſap, theſe plants are tended every day; and as the young ſprouts appear in the joining of the leaves and ſtalk, they are continually cut off: this is done once in three days, till the leaves have their full bigneſs, which is about the time when the flowers would have been ripe, had the plant been ſuffered to grow in its natural way: they are immediately to be gathered when they are full grown, otherwiſe they waſte and decay. They cut down the whole plant, and bring them into their houſes, laying them in a heap. When they have lain a little time together they begin to ſweat and grow hot: when they have been a little while fermenting, they turn them, bringing thoſe which were in the middle to the ſurface, and placing thoſe which were at the ſurface in the middle; by this means the whole quantity of leaves ferments equally. The longer they lie in this manner, the darker-coloured the *tobacco* becomes. When they have left it thus to ſweat as long as they judge neceſſary, they hang every ſtalk ſeparately on cords; and when the whole is thoroughly dry, they carefully take off the leaves and lay them by in bundles, till they have occaſion for them. This is the manner of their preparing the *kappada*.

The ſingle *tobacco* is ſown in the ſame manner with this; but it is never tranſplanted nor tended, it grows as it pleaſes, and when the flowers are ripe, it is cut down, and laid careleſsly in heaps, where ſome of it ferments too much, and ſome too little. This is much weaker therefore than the *kappada*; and as both kinds are common in the place, the natives ſmoke them either ſeparately or together, mixed in different proportions, as they like. Some of the Ceyloneſe chew this ſtrong *tobacco* with their betle, and ſome, who ſmoke it alone, uſe no pipe, but, taking a long leaf of it, they roll it up into a long form, and cover it with the leaf of the wattukan-tree; they then light one end of it, and ſmoke by the other, till the whole is conſumed. Phil. Tranſ. N° 278, p. 1143.

There are four or five kinds of *tobacco* frequently raiſed by the curious in England. They are to be ſown in March, upon a moderate hot-bed, and when the plants are come up, they ſhould be tranſplanted to another hot-bed of moderate warmth, and ſet at four inches diſtance, watering and ſhading them till they have taken root: and as they grow ſtronger, giving them as much air as the ſeaſon will permit. In the beginning of May the plants will grow ſo large as to touch one another; and they are then to be taken up with a large ball of earth about their roots, and removed to a rich light ſoil, where they are to be planted in rows four feet aſunder, and the plants at the diſtance of three feet in the rows: watered till they have taken root; and when they ſhow their flower-ſtems, their tops ſhould be taken off; and in Auguſt they will be full grown, and ſhould be cut for uſe.

Tobacco is either taken by way of ſnuff, as a ſternutatory, or as a maſticatory by chewing it in the mouth, or by ſmoking it in a pipe.

It is ſometimes alſo taken in little longiſh pellets put up the noſe, where it is found to produce very good effects, to attract a deal of water or pituita, unload the head, reſolve catarrhs, and make a free reſpiration; for the ſubtile parts of the *tobacco* in inſpiration are carried into the trachea and lungs, where they looſen the peccant humours adhering thereto, and promote expectoration. Some have left this *tobacco* in their noſes all night; but this is found to occaſion vomiting uſually on the next morning. Another thing charged on this way of application, is, that it weakens the ſight.

Tobacco is held a firſt rate narcotic or opiate. When taken in great quantities in the way of ſnuff, it is found to prejudice the ſmelling: it alſo greatly diminiſhes the appetite, and in time often gives riſe to a phthiſis.

That, taken in way of ſmoke, often alſo dries and damages the brain. Borrhi, in a letter to Bartholine, mentions a perſon who, through exceſs of ſmoking, had dried his brain to that degree, that after his death there was nothing found in his ſkull but a little black lump, conſiſting of mere membranes.

The leaves of *tobacco* have a ſtrong diſagreeable ſmell, and a very acrid burning taſte: diſtilled in a retort, without addition, they yield an acrid empyreumatic, poiſonous oil. They give out their acrid matter both to water and ſpirit, but moſt perfectly to the latter: the aqueous infuſions are of a yellow or brown colour, the ſpirituous of a deep green. The ſeveral ſorts of *tobacco* imported from abroad are ſtronger in taſte than that of our own growth, and the extracts made from them much more fiery, but in leſs quantity.

Tobacco, taken internally, even in a ſmall doſe, or decoctions of it uſed as a clyſter, prove virulently cathartic and emetic, occaſioning extreme anxiety, vertigoes, ſtupors, and diſorders of the ſenſes: ſome have, nevertheleſs, ventured upon it both as an evacuant, and in minuter quantities as an aperient and alterant, in epilepſies and other obſtinate chronical diſorders; a practice, which, though in ſome caſes it may have been ſucceſsful, appears much too hazardous to be followed, particularly in the more irritable, hot, dry, and bilious conſtitutions. By long boiling in water, its deleterious power is abated, and at length deſtroyed: an extract made by long coction is recommended by Stahl and other German phyſicians, as the moſt effectual and ſafe aperient, detergent, expectorant, diuretic, &c. but the medicine muſt neceſſarily be precarious in ſtrength, and has never come into uſe among us. Lewis, Mat. Med.

Bates and Fuller give ſome receipts, in which *tobacco* is an ingredient, with mighty encomiums in aſthmatic caſes. A ſtrong decoction of *tobacco*, with proper carminatives and cathartics, given clyſter-wiſe, ſometimes proves of good effect in what is uſually called the *ſtone colic*, and alſo in the iliac paſſion.

The ſmoke of *tobacco*, received by the anus, is ſaid to be of ſingular efficacy in obſtinate conſtipations of the belly. Hoffman obſerves, that horſes have often been relieved by this remedy, but in human ſubjects it has been rarely tried; and ſays he has known ſome of the common people, who laboured under excruciating pains of the inteſtines, freed in an inſtant from all pain by ſwallowing the ſmoke. Both the decoction and the ſmoke have not unfrequently been injected in caſes of incarcerated herniæ, and often with ſucceſs. The ſmoke thus applied is recommended as one of the principal means for the revival of perſons apparently dead from DROWNING or other ſudden cauſes; but ſome ſuſpect the narcotic power of *tobacco* as unfavourable in theſe caſes. *Tobacco* is ſometimes employed externally in unguents and lotions, for cleanſing foul ulcers, deſtroying cutaneous inſects, and other like purpoſes: it appears to be deſtructive to almoſt all kinds of inſects, to thoſe produced on vegetables as well as on animals.—Lewis.

A ſtrong decoction of the ſtalks, with ſharp-pointed dock, and alum, is ſaid to be of good ſervice, uſed externally, in cutaneous diſtempers, eſpecially the itch: ſome boil them for that purpoſe in urine. The ſame decoction is ſaid to be infallible in curing the mange in dogs.

Tobacco beat into a maſh with vinegar or brandy, and laid on the ſtomach, has ſometimes good effects in removing hard tumors of the hypochondria. We have the hiſtory of two cures made by ſuch applications in the Medic. Eſſ. Edinb. vol. ii. p. 41.

The juice of this plant is ſaid to be good againſt ulcers and mortifications. Boyle's Works, abr. vol. i. p. 56.

Some caution, however, Dr. Lewis obſerves, is requiſite even in the external uſes of *tobacco*, particularly in ſolutions of continuity: there are inſtances of its being thus tranſmitted into the blood, ſo as to produce violent effects.

A drop or two of the chemical oil of *tobacco* being put on the tongue of a cat, produces violent convulſions, and death itſelf in the ſpace of a minute; yet the ſame oil

uſed in lint, and applied to the teeth, has been found of ſervice in the tooth-ach; though it muſt be to thoſe that have been uſed to the taking of *tobacco*, otherwiſe great ſickneſs, reaching, vomiting, &c. happen; and even in no caſe is the internal uſe of it warranted by ordinary practice. See experiments on the effects of oil of *tobacco* on pigeons by M. Fontana, in which he found vomiting to be a conſtant effect of this poiſon, as he calls it, and the loſs of motion in the part to which it is applied an occaſional or accidental effect, in Phil. Tranſ. vol. lxx. part i. append. p. 38, or Fontana ſur les Poiſons, &c. Florence, quarto.

Sim. Paulli, phyſician to the king of Denmark, in an expreſs treatiſe on *tobacco*, obſerves that the merchants frequently lay it in bog-houſes, to the end that, becoming impregnated with the volatile ſalt of the excrements, it may be rendered the briſker, more fetid, and ſtronger.

Amurath IV. emperor of the Turks, the grand-duke of Muſcovy, and the emperor of Perſia, have prohibited the uſe of *tobacco* in their ſtates. Our king James I. wrote a treatiſe expreſly againſt it, intitled, A Counter-blaſt to *Tobacco*. By a bull of pope Urban VIII. ſuch are excommunicated as take *tobacco* in churches.

Tobacco is not to be planted in England, on forfeiture of forty ſhillings for every rod of ground thus planted; but this ſhall not extend to hinder the planting of *tobacco* in phyſic gardens, in quantities not exceeding half a pole of ground, and alſo on forfeiture of 10*l.* for every rod. 15 Car. II. c. 7. 12 Car. II. c. 34. And juſtices of peace have power to iſſue warrants to conſtables, to ſearch after and examine whether any *tobacco* be ſown or planted, and to deſtroy the ſame; which they are to do under penalties, &c. 22 and 23 Car. II. c. 26. 5 Geo. c. 11. No perſon ſhall cut walnut-tree leaves, or other leaves (not being *tobacco* leaves) or colour them ſo as to reſemble *tobacco*; or ſhall ſell the ſame mixed or unmixed for *tobacco*; under a penalty of forfeiting 5*s.* a pound: and ſuch leaves, or engines for cutting, may be ſeized by the officers of the cuſtoms, &c. Alſo ſervants employed therein may be committed to gaol, or the houſe of correction, for any time not exceeding ſix months. 1 Geo. ſt. 2. c. 46.

Tobacco ſtalks or ſtems, ſtripped from the leaf, that are imported, ſhall be forfeited and burnt, and the officer ſeizing the ſame ſhall be allowed 1*d.* a pound; and perſons aſſiſting in unſhipping them, &c. ſhall forfeit treble value, with the veſſels, horſes, &c. which may be proſecuted and determined before two juſtices near the place where the ſeizure was made. 12 Geo. c. 28. 5 Geo. III. c. 43. 8 Geo. c. 18. By 24 Geo. II. c. 41. and 26 Geo. II. c. 13. no *tobacco* or ſtalks exceeding 24lb. weight, nor any ſnuff exceeding 10lb. ſhall be conveyed by land, without proper certificates, under penalty of forfeiture, together with horſes and carriages, and commitment of the carrier to the county gaol for one month by one juſtice. The ſeizure of horſes and carriages may be determined by two juſtices near the place where the ſeizure was made. The duty on Maryland *tobacco* imported is 1*s.* $2\frac{3}{8}$*d.* and on Virginia *tobacco* 1*s.* $4\frac{7}{20}$*d.* which is allowed as a drawback on exportation.

Tobacco, *Engliſh*, *Nicotiana minor* or *Nicotiana ruſtica* of Linnæus, is a ſpecies of *tobacco*, which was originally a native of America, but now propagates itſelf plentifully in England and other parts of Europe. The flowers are of an herbaceous yellow colour, appearing in July, and are ſucceeded by roundiſh capſules filled with ſmall ſeeds, which ripen in autumn. The leaves are ſaid by ſome to be of the ſame quality with thoſe of henbane; but by others, to be ſimilar to the preceding, but weaker. They have been ſometimes ſubſtituted in our markets, inſtead of the true *tobacco*; but are eaſily diſtinguiſhed by their ſmallneſs and oval ſhape, and by being furniſhed with pedicles. Lewis.

Tobacco, *kanaſter*. See Kanaster.

Tobacco-*pipe*. See Pipe.

Tobacco-*pipe-clay*. See Cimolia.

Tobacco-*pipe-fiſh*, the Engliſh name of the acus, or the syngnathus *acus* of Linnæus. See *Tab.* III. *of Fiſh*, No. 25. See alſo Petimbuara.

TOBACTLI, in *Ornithology*, a name which Nieremberg ſays is often given to the American bird, more commonly called hoactli.

TOBIANUS, in *Ichthyology*, a name given by Schoneveldt and others, to the ammodytes, or ſand-eel.

TOBIS, in *Ichthyology*, a name given by the Swedes to the ammodytes, or ſand-eel.

TOCCATA, in the *Italian Muſic*, is much the ſame as *ricercata* or *phantaſia*, *toſtatura*, &c. But what diſtinguiſhes the *toccata* from the other kinds of ſymphonies, is, firſt, its being uſually played on inſtruments that have keys, as organs, ſpinnets, &c. Secondly, that it is commonly compoſed to exerciſe both hands. Thus, ſometimes the baſs holds out a ſound, while the other part makes diminutions, paſſages, or tiratas; and afterwards this part does the ſame, while the baſs moves in its turn.

TOCCATINA, in the *Italian Muſic*, a ſhort reſearch, or *ricerata*. See Toccata and Research.

TOCCAVIENSIS *bolus*, *bole of Tokay*, in the *Materia Medica*, a fine medicinal earth, dug about Tokay in Tranſylvania, and eſteemed a powerful aſtringent — Kentman calls it the *bolus Pannonica vera*; and Crato, *bolus Hungarica*.

This laſt author eſteemed it ſuperior even to the bole armenic of Galen, and had a great opinion of it in malignant fevers. It is a fine and pure earth, and very heavy, moderately compact in its texture, but not very hard; and in colour of a conſiderably deep and ſtrong yellow. It is naturally of a ſmooth ſurface, and does not ſtain the fingers in handling. It ferments violently with acid menſtrua, and does not become red in burning. Hill. See Bole.

TOCKAY, in *Zoology*, the name of a ſpecies of Indian lizard, diſtinguiſhed from the other kinds, by being ſpotted all over.

TOCMOL, in *Natural Hiſtory*, a name given by ſome to the common turtle.

TOD *of wool* is mentioned in the ſtatute 12 Car. II. c. 32. as a weight containing twenty-eight pounds, or two ſtone.

Some will have the word derived from the French, *toilet*, a *wrapper*, within which, by uſage, two ſtone of wool are folded.

TODDA-*panna*, in *Botany*, the name by which many authors call the *palma farinifera*, or ſago-tree.

TODDI. See Palm *wine*.

TODDY *tree*. See Mammee-*tree*.

TODTENVOGEL, in *Ornithology*, a name by which Geſner and ſome other authors have called that ſpecies of œnanthe, known in England by the name of the stone-*chatter*, *ſtone-ſmich*, or *moor-titling*.

TODY, *Todus*, in *Ornithology*, a genus of the *picæ*; the characters of which are, that the bill is awl-ſhaped, depreſſed, obtuſe, ſtraight, and beſet with briſtles; and the feet are formed for walking. Linnæus enumerates two ſpecies, the green with a red breaſt, found in America; and the aſh-coloured with the under part of the body yellow, found in Surinam.

TOES, by *Anatomiſts* called *digiti pedis*, are the extreme diviſions of the feet; anſwering to the fingers of the hand, and reſembling them in figure, and make the third part of the foot.

Toes, *adheſions of the*. It is a frequent thing to meet with new-born infants with their fingers or *toes* cohering or growing together, either by a ſtrict adheſion of the fleſh, or elſe by ſome looſe productions of the ſkin, as in the feet of ducks and geeſe; and a diſorder of the ſame kind is alſo ſometimes found in adults, from accidents; as when the fingers or *toes* have been neglected, after an excoriation of them by burns or wounds. In both theſe caſes the ſurgeon's aſſiſtance is neceſſary, partly to remove the deformity, and partly to reſtore the proper uſe of the fingers.

Theſe adheſions, according to the nature of the diſorder, are to be ſeparated by cutting out the intermediate ſkin, or elſe barely by dividing them from each other with a pair of ſciſſars. When this is done, to prevent their coheſions again, each finger muſt be inveſted ſeparately with a ſpiral bandage about an inch broad, dipped in lime-water and ſpirit of wine.

Sometimes the fingers, inſtead of adhering to each other, grow to the palm of the hand, from wounds or burns, ſo that they cannot be by any means extended, or drawn back to open the hand. The method of relieving this diſorder is firſt very carefully to ſeparate the fingers from the adheſions to the palm, without injuring their tendons, then dreſs them with a vulnerary balſam, and ſcraped lint, and extend them on a ferula or thick paſteboard; and let them remain in this extended poſture, ſeparately to be dreſſed till they are perfectly healed; but at every dreſſing they muſt be gently moved, to prevent a rigidity or ſtiffneſs of the joints. Heiſter.

Toes, *bones of the*. Each of the *toes*, except the greater one, conſiſts of three phalanges. The great *toe* indeed has but two, whereas the thumb has three; but then there are five metatarſal bones, whereas there are but four metacarpal. The baſes of the phalanges remain for a long time epiphyſes. The firſt phalanx of the great *toe* is very like the ſecond of the thumb; but its baſis is more hollow, anſwerable to the convexity of the firſt bone of the metatarſus, by which it is ſupported; its head

head is in form of a pulley, as in the thumb, but much broader: the second, or last phalanx of the great *toe*, is like the third of the thumb, but bigger and broader, especially at its basis. The tuberosity, in form of a horse-shoe, which terminates this bone, is also more unequal and more flat than in the thumb.

The first phalanges of the other *toes* are the longest, but they are shorter and more convex than those of the fingers. Their bodies are very narrow, and contracted in the middle; the bases are generally excavated, and the heads made after the same manner as in the fingers.—Their articulation with those of the metatarsus is orbicular, and allows motion in different directions. The second phalanges are very short, and almost without shape; both their bases and heads are formed for articulations by ginglymi, but they are very imperfect. The bodies are of some length in the second and third *toes*; but they are very short in the other two, especially in the little *toe*, in which the body is broader than it is long. The third phalanges are nearly of the same figure with those of the fingers, but much shorter and thicker in proportion. In the two last *toes* they are often united with the second phalanges, which is owing, perhaps, to the continual action and compression occasioned by shoes. The articulation of the sesamoide bone is by a kind of ginglymus. See SESAMOIDEA *ossa*.

TOES, *cartilages of the*. See *Cartilages of the* FOOT.

TOES, *fractures and luxations of the*. See *Fractures of the* FOOT. See also FINGERS.

TOES, *ligaments of the*. The first phalanges of the *toes* are tied to the heads of the metatarsal bones, by a sort of orbicular ligament, set round the edges of the cartilaginous portions of the head, and those of the bases of the phalanges. In the four lesser *toes* of each foot, the inferior part of this ligament is very thick, and is crusted over as it were with a cartilaginous substance, fixed to the bases of the phalanges, and from thence continued over the head of the metatarsal bone next it. This substance grows hard with age like a sesamoide bone.

Of these sesamoide bones, as they are called, the great *toe* has two belonging to the first phalanx, which are largest, soonest formed, and most considerable of all.—The second and third phalanges of all the *toes* being articulated by ginglymi, have lateral ligaments which go between the sides of the bases, and thence to the sides of the heads: at the inferior edges of all these bases there is a cartilaginous matter joined to these ligaments, which hardens with age in the same manner with those of the first phalanges. Winslow.

TOE, in the *Manege*, is the stay of the hoof upon the fore-part of the foot comprehended between the quarters.

We commonly say the *toe* before, and the heel behind, in French, *pince devant et talon derriere*; implying, that in horses, the *toe* of the fore-feet is stronger than the *toe* of the hind-feet: and, on the other hand, that the heels behind are stronger than those before; and accordingly, in shoeing we drive highest in the *toes* of the fore-feet and in the heels of the hinder-feet.

A horse that does not rest his hinder-feet all equally upon the shoe, but raises his heels, and goes upon the *toes* of his hind-feet, is called in French RAMPIN.

TOE-*shell*, in *Conchylology*, see POLLICIPES.

TOFT, TOFTUM or TOFTA, in our *Law-books*, a parcel of land, or a place where a messuage hath stood, but is decayed, or casually burnt, and not re-edified.

TOFT, also signifies a grove of trees.

TOGA, in *Antiquity*, a wide woollen gown, or mantle, without sleeves, used among the Romans, both by men and women.

In process of time, none wore the *toga* but lewd women: whence that of Horace; *in matrona, ancilla, peccesve togata*. Lib. i. sat. ii. ver. 63.

The *toga* was of divers colours, and admitted of various ornaments: there was that called *toga domestica*, worn within-doors; *toga forensis*, worn abroad; *toga militaris*, used by soldiers, tucked up after the Gabinian fashion; and *toga picta*, or *triumphalis*, wherein the victorious triumphed: this was embroidered with palms: that without any ornaments was called *toga pura*.

The *toga picta*, &c. was an ancient habit of the Etruscans, and not brought to Rome till after Tarquinius Priscus had subdued the twelve states of that nation.

The *toga* was sometimes worn open, and called *aperta*; sometimes girt or tucked up, called *præcincta*; and this cincture or girding, again, according to Sigonius, was of three kinds; *laxior*, or the loose kind, where the tail trailed on the ground; *adstrictior*, the close kind, wherein it did not reach so low as the feet; and *Gabinia*, where one of the skirts or lappets was girt round the body.

Sigonius distinguishes the several *togæ*, or Roman gowns, into *pura*, *candida*, *pulla*, *picta*, *prætexta*, *trabea*, and *paludamentum*. See PRÆTEXTA, PALUDAMENTUM, &c.

The *toga pura* was also called *virilis*. Kennet's Rom. Ant. part ii. c. 8.

TOGA, is sometimes used metaphorically for peace. See TROPE.

TOGÆ, *jus*, or privilege of the *toga*, was the same with the privilege of a Roman citizen, i. e. the right of wearing a Roman habit, and of taking, as they explain it, fire and water through the Roman empire.

TOGETHER, in *Sea-language*, the order given to the men in the exercises of heaving, rowing, twisting, &c. to act all in concert, or at the same instant.

TOGGEL, in a *ship*, a small wooden pin, about five or six inches long, and usually tapering from the middle toward the extremities. It is used to fix transversely in the lower part of a tackle, in which it serves as a hook whereby to attach the tackle to a strop, slings or any body in which the effort of the tackle is to be employed. There are also *toggels* of another kind, employed to fasten the top-gallant sheets to the span, which is knotted round the cap at the top-mast-head. Falconer. See BECKETS.

TOGULA, among the *Romans*, a narrow kind of TOGA, used by the poorer sort of people.

TOILES, snares, or nets, set by hunters for catching of wild beasts; as deer, &c.

TOILET, a fine covering, of linen, silk, or tapestry, spread over the table in a bed-chamber, or dressing-room, to undress and dress upon.

The dressing-boxes, wherein are kept the paints, pomatums, essences, patches, &c. the pin-cushion, powder-box, brushes, &c. are esteemed parts of the equipage of a lady's *toilet*.

That of the men consists of comb-case, brushes, &c.—To make a visit to one at his *toilet*, is to come to entertain him while he is dressing or undressing.

Sattin, lace, velvet, brocade, point de France, &c. are now ordinarily used for *toilets*: anciently they were made much plainer: whence the name, which is formed from the French, *toillette*, a diminutive of *toile*, any thin stuff.

TOISE, a French measure, containing six of their feet, or a fathom. It is, however, of different length in different places.

TOISON *d'Or*, a term in *Heraldry* for a GOLDEN-*fleece*, which is sometimes borne in a coat of arms.

TOKAY-*wine*, derives its name from the town or village of Hungary, where it is produced. The vine-yards extend beyond the forty-eighth degree of northern latitude; the soil where the vines grow is a yellow clayish earth, extremely deep and interspersed with large loose limestones: the exposures most inclining to the south, the steepest declivities and the highest parts of these, produce the best wine. This wine, so far from its being found in so small a quantity as never to be genuine, unless when given in presents by the court of Vienna, is a common desert wine in all the great families at Vienna and in Hungary, and is very generally drank in Poland and Russia: nor is the *Tokay* wine altogether the property of the crown, but many of the German and Hungarian nobility, as well as gentlemen, and even peasants, have vine-yards at *Tokay*. The grapes are all white, and the vintage commonly begins about the twenty-eighth of October, sometimes as late as the eleventh of November. There are four sorts of wine made from the same grapes, distinguished at *Tokay* by the names of essence, auspruch, masslach, and the common wine.—The essence is made by picking out the half-dried and shrivelled grapes, and putting them into a perforated vessel, where they remain as long as any juice runs off by the mere pressure of their own weight. This is put into small casks. The ausspruch is made by pouring the expressed juice of the grapes from which the former had been picked on those that yielded the essence, and treading them with the feet. The liquor thus obtained stands for a day or two to ferment, and then is poured into small casks, which are kept in the air for about a month, and afterwards put into casks. The same process is again repeated by the addition of more juice to the grapes which have already undergone the two former pressures, and they are now wrung with the hands; and thus is had the masslach. The fourth kind is made by taking all the grapes together at first, and submitting them to the greatest pressure: this is chiefly prepared by the peasants. The essence is thick, and very sweet and luscious: it is chiefly used to mix with the other kinds. The ausspruch is the wine commonly exported, and which is known in foreign countries by the name of *Tokay*.—The goodness of it is determined by the following rules. The colour should neither be reddish nor very pale, but a light silver: in trying it, the palate and tip of the tongue

tongue should be wetted without swallowing it, and if it manifest any acrimony to the tongue, it is not good; but the taste ought to be soft and mild: when poured out, it should form globules in the glass, and have an oily appearance: when genuine, the strongest is always of the best quality: when swallowed, it should have an earthy astringent taste in the mouth, which is called the taste of the root. All *Tokay* wine has an aromatic taste, which distinguishes it from every other species of wine. It keeps to any age, and improves by time: but is never good till about three years old. It is the best way to transport it in casks; for when it is on the seas, it ferments three times every season, and thus refines itself. When in bottles, there must be an empty space left between the wine and the cork, otherwise it would burst the bottle. A little oil is put upon the surface, and a piece of bladder tied over the cork. The bottles are always laid on their sides in sand. Phil. Transf. vol. lxiii. part ii. p. 292, &c.

TOKENS, in *Pestilential Cases*, those livid spots which appear in the several stages of the disease, and are certain forerunners of death. They generally appear only under the most desperate circumstances, and when the patient would otherwise be declared dying; but Hodges gives us instances where they appeared before any other symptoms of the disease, and came out without any pain or trouble; yet even in these cases the person always died. These *tokens* are the mark by which the searchers conclude of the cause of the death of the person, and are the rule for ordering the house to be shut up, to prevent the spreading of the disease. But the nurses, and other crafty people, have a way of disguising this symptom after death, by covering the body with wet and cold sheets. These strike in the spots, so that the person may be thought to have died by some other disease.

TOL, in *Law*, a term signifying to defeat, or take away. From the Latin, *tollere*, which signifies the same.

Thus, to *tol the entry*, is to take away the right of entry.

TOL-BOOTH, or Toll-Booth, a place in a city, where goods are weighed, to ascertain the duties or import thereon.

TOLCESTER, *tolcestrum*, in our *Old Writers*, an old excise, or duty paid by the tenants of some manors to the lords, for liberty to brew and sell ale.

TOLERATION, in *Religion*, a term which has made a great figure in the disputes among protestants, who have been exceedingly divided about the measures of *toleration*, or the degrees to which heretics and schismatics are, or are not, to be suffered.

Many of the church of England have zealously opposed the *toleration* of presbytery, &c. nor has the church of Scotland been behind-hand with them in their zeal against episcopacy.

But all who have reasoned consistently from the principles of the Reformation, have been for *toleration*; as well perceiving they had no right to oblige any body to follow their particular sentiments; but the difficulty is, the setting of bounds to this *toleration*.

M. Basnage, and some others, distinguish *civil toleration* from *ecclesiastical*. The latter allows of different, and even opposite sentiments in the church; and the first permits them in civil society.

By *civil toleration*, is meant impunity and safety in the state for every sect which does not maintain any doctrine inconsistent with the peace and welfare of the state. This civil, or political *toleration*, implies a right of enjoying the benefit of the laws, and of all the privileges of the society, without any regard to difference of religion.

Ecclesiastical toleration is an allowance of certain opinions, which, not being fundamentals, do not hinder those who profess them from being esteemed members of the church. But as to the quality and number of these fundamental points, they never could, nor in all probability ever will be agreed upon.

In order to discover the genuine principles of *toleration*, it is necessary to consider that, antecedently to the formation of civil societies, mankind possess certain rights, independent of all human grant, not derived from any compact, and which are therefore to be acknowledged as the rights of human nature. A right to judge for themselves in points of religion is one of these rights; which, whilst it authorizes every individual to claim the exercise of this privilege to himself, obliges him to allow it in the same extent to all about him, and establishes one uniform regulation for his behaviour toward others, and their behaviour toward him: e. g. no apprehensions of the truth and certainty of any person's religious sentiments can justify him in attempting to impose them on his neighbour; for the same right of judgment, which any *one* can claim, belongs, on the same principle, equally to *all*, and ought to be equally sacred and inviolable in all; and no reason can be alledged by him for taking the religious liberty of others from them, but what will, at the same time, equally destroy his own title to it.

The injustice of similar encroachments upon *him* from *others* follows from the same principle, and with the same evidence.

Whether the claim of such a liberty of judgment in religion for ourselves is weakened by men's entering into civil society, is the next object of consideration.

The great end of government is to protect the subjects of it from the injuries to which they were exposed in a state of nature; and as all injuries imply rights of which they are violations, and the care taken to guard against the violation of these rights is an acknowledgment of the reality and importance of them; it evidently follows, that when they enter into society, if the primary and leading view of government be to prevent or restrain those injuries, to which men were exposed for want of its protection, they carry these rights with them; that they continue to retain them; and that, instead of supposing themselves to be deprived of them, the very design with which they put themselves under the authority of government is to secure them the more firmly. With this view they entrust the preservation of them to common guardians, by whose intervention, it is presumed, they will be more vigorously asserted and more effectually protected, than it is possible they should be in a state where there is no common umpire to check the evils of oppression on the one hand, and restrain the no less formidable evils of immoderate resentment on the other.

If we consider what are the rights which men give up to government, when they enter into civil societies, they will be found to be, not those which may most properly be styled the primary rights of human nature; not the right which every man has to live undisturbed, to enjoy the advantages which he justly possesses, and to be left to his freedom in all things not injurious to his fellow-creatures; but the consequential, though equally real and certain right which, where men are not subject to government, every person has to take the assertion of all his rights into his own hands, and correct the infringers of them by the inflicting of such pains, or the use of such other methods of deterring the authors of the wrong, as reason shall warrant for his future security: and, speaking precisely, even these rights are not absolutely extinguished and utterly lost, but suspended by such limitations as the order and well-being of society require, and so long as the succours of government shall be effectual. The primary rights of liberty, safety, and protection from oppression, still subsist in their full vigour. To suppose them abandoned, renounced, and annihilated, or that government can have any right to destroy them, is ascribing to it a right to defeat the end for which it is established, and betray the trust reposed in it. It is, indeed, totally inverting the principle upon which the power of rulers stands, and by which the acts of it ought to be guided.

Man was not made for government, but government for man; and the great object, to which all the operations of it should be directed, is to guard, as much as possible, the equal, impartial ease and freedom of all the subjects of it. To this purpose judge Blackstone observes, that the principal aim of society is to protect individuals in the enjoyment of those absolute rights, which were vested in them by the immutable laws of nature, but which could not be preserved in peace without that mutual assistance and intercourse, which are gained by the institution of friendly and civil communities: so that the primary end of human laws is to maintain and regulate these absolute rights of individuals. See Government and *Civil* Liberty.

Now, of all the rights inherent in human nature, that of thinking for ourselves, and following the conviction of own judgments in relation to the object of our faith, worship, and religious obedience, is the most sacred, incontestible, and in every view of it, intitled to the most careful protection. The preservation of these is one of the chief, perhaps the first end for which civil societies are instituted, and the rulers of them invested with power: and therefore, in all governments, the rights of conscience should have a principal place assigned them in the care of those, to whom the protection of their fellow-creatures is committed. If the securing of equal, impartial liberty, in all those instances of it in which it is not injurious to others, be so much the object of every equitable, wise, and well-constituted system of laws, that all needless encroachments upon it are deviations from the spirit, which ought to be diffused through all laws, and impair the benefit which they ought to confirm,

firm, can it be supposed that the rights of conscience ought not to be guarded from violation? Rights of this kind are the last which men can ever be imagined to give up to be modelled at the pleasure of others; nor (as it is argued) is there any one principle connected with their submission to governors in other respects, that can require or justify such a surrender. Does it follow that, because the magistrate is entrusted with authority to decide disputes between us and our fellow-citizens concerning property, he is to determine points which lie only between God and our own consciences? Because it is allowed to be his office to guard the peace of his subjects, and to inflict punishments for this purpose on those who unjustly disturb it; is it to be taken for granted, that he is to dictate to them what rule of faith they shall adopt, and in what manner they are to worship the Deity; when it is allowed on all hands, that of these things the will of God is the only rule, and that no worship can be acceptable to him, but what is accompanied with the sincere conviction of him who offers it? Besides, it is argued, that such is the nature of this right, and it so stands upon a foundation peculiar to itself, and is distinguished from every other right, that it *cannot* be given up. Property may be resigned, transferred, or submitted to the regulation of others; a man may relinquish his ease and subject himself to inconveniences, and be not only innocent but laudable; nay, he may sacrifice life itself, and merit the highest applause; but his conscience he cannot resign.

To prove all things, and hold fast that which is good, is not only a privilege but a duty; an obligation laid upon him by the very nature of religion and virtue, and from which he cannot discharge himself without departing from the principles of both. It must always remain entire to him; nor, while the principles of the most reasonable liberty are allowed to subsist in their due extent, can any attempt be consistently made to take it from him.

From these principles it has been inferred, that *toleration*, so far from being a matter of mere grace or favour, which government has a right to withhold, grant, abridge, or resume at pleasure, is the acknowledgment and confirmation of a right: not one of those adventitious rights, which are subsequent to the establishment of civil societies, and arise out of the peculiar forms and constitution of it; but of those higher rights which belong to men as such, and which ought to be preserved under all states and governments whatever, as effectually, universally, and impartially as any other right. With regard to the extent of *toleration*, it is urged, that if liberty of conscience be a right essential to human nature, all penalties in cases merely of a religious nature must be an infringement of a right, and a degree of oppression, though inflicted by a law. Farther, the inquiry concerning the persons entitled to *toleration* does not depend on the supposed truth or error of the sentiments which men may adopt, but upon the common right, which all men have, to be led in these points by the light of their own minds, and to enjoy all the securities and benefits of society, while they fulfil the obligations of it. All who can give good security to the government under which they live, and to the community to which they belong, for the performance of the duties of good subjects and good citizens, have an undoubted claim to it, and cannot with any just reason be deprived of it. It is not error, but injury to the state, or the individuals who are under the care of it, which justifies the animadversion of the magistrate; and all to whom this cannot be justly imputed, are the objects of his protection. See on this subject Fownes's Enquiry into the Principles of *Toleration*, &c. 8vo. 1772. Locke's Letters concerning *Toleration*, in his Works, vol. ii. p. 231, &c. Hoadley's Rights of Subjects, passim.

To the account above given of the general principles of *toleration*, it will be proper to add a few words concerning the state of *toleration* in our own country. With regard to the protestant dissenters in general, see DISSENTERS, NON-CONFORMISTS, and QUAKERS. See also CONVENTICLE, CORPORATION-ACT, SHERIFF, and TEST.

As for dissenting teachers, or ministers in particular, they were prohibited by 17 Car. II. cap. 2. from coming within five miles of a city, town-corporate, or borough, unless only in passing upon the road, or unless required by legal process, without taking an oath of allegiance therein mentioned, on pain of 40*l*. and of commitment by two justices, on oath of the offence, for six months. And by 22 Car II. cap. 1. preaching in any meeting or conventicle, in other manner than according to the practice of the church of England, incurred a forfeiture of 20*l*. for the first offence, and for every other offence 40*l*. Moreover, by 13 & 14 Car. II. cap. 4. no person shall presume to consecrate and administer the sacrament before he be ordained priest, according to the form of the church of England, on pain of 100*l*. But now by 1 W. cap. 18. commonly called the act of *toleration*, which, by 19 Geo. III. cap. 44. is declared to be a public act, they are exempted from the penalties of those statutes, upon taking the oaths of allegiance and supremacy, and subscribing the declaration against popery; and also, by 1 W. cap. 18. subscribing the articles of religion mentioned in the stat. 13 Eliz. cap. 12. (which only concern the confession of the Christian faith and the doctrine of the sacraments) with an express exception of those relating to the government and powers of the church, and to infant baptism; or if they scruple subscribing the articles, upon making and subscribing the declaration prescribed by stat. 19 Geo. III. cap. 44. professing themselves to be Christians and Protestants, and that they believe the Scriptures of the Old and New Testament, as commonly received among Protestant churches, to contain the revealed will of God, and that they receive the same as the rule of their doctrine and practice; for the register of which they shall pay 6*d*. to the officer of the court and no more, and 6*d*. for a certificate thereof signed by such officer.

Any preacher or teacher, duly qualified, shall be allowed to officiate in any congregation, although the same be not in the county where he was so qualified, provided that the place of meeting hath been duly certified and registered, and such teacher or preacher shall, if required, produce a certificate of his having so qualified himself, and before any justice of such county where he officiates, make and subscribe such declaration, and take such oaths as aforesaid, if required. 10 Ann. cap. 2. And every such teacher, having taken the oaths, and subscribed as above, shall from thenceforth be exempted from serving in the militia, or on any jury, or from being appointed to bear the office of churchwarden, overseer of the poor, or any other parochial or ward office, or other office in any hundred, city, town, parish, division, or wapentake.

For the state of dissenting school-masters, see SCHOOL-*master*.

For the laws relating to papists, see PAPISTS. See also TRINITY.

In consequence of the *toleration*-act, non-conformity is no longer a crime in the eye of the law, and the penalties to which it was obnoxious, are not only suspended, but absolutely annulled with regard to those dissenters who are qualified as the act directs. See Furneaux's Letters to Judge Blackstone, letter i.

TOLL, TELONIUM, a Saxon term, though derived originally from the Latin *tollere*, to *take away*, or rather the Greek τελος, *tribute, tax*. It has two acceptations, denoting, 1. A liberty to buy and sell within the bounds of a manor: and, 2.

TOLL is also used for a tax or custom paid for passage, or for vending goods in a market, fair, or the like.

Some records make mention of *toll thoro*, or *thorough toll*, which is money paid for passage in or through some highways, or over ferries, bridges, &c. *Toll travers*, for passing or driving cattle over a private man's ground. And *toll-turn*, or *turn-toll*, which is paid at the return of beasts from fairs and markets, though they are not sold.

By the ancient law, the buyers of corn and cattle in fairs or markets were made to pay *toll* to the lord of the market, in testimony of the contract there lawfully made in open market, because privy contracts were held unlawful.

Some interpret *toll* a liberty, as well to take, as to be free from *toll*; for that they who are infeoffed with *toll* are custom-free.

Of this freedom from *toll* the city of Coventry boasts an ancient charter, granted them by Leofrick, or Luriche, earl of the Mercians, in Edward the Confessor's time, who, at the importunity of Godeva, his lady, granted this freedom to the city.

TOLLENON, among the *Romans*, a warlike machine, formed in this manner: one beam was fixed very deep in the earth, and on the top of it another more than half as long, and moveable upon a centre. On one end of this cross-beam was placed a covering of hurdles or planks, within which a few soldiers were put, and, by pulling down the other end with ropes, these were raised above the walls of a besieged town.

TOLLENON, was also an engine for raising water out of a draw-well.

TOLLES, or TOLÆ, names given by some to the tonsils, and by others to the glandular abscesses sometimes affecting the limbs.

TOLLING *a Bell*. See RING.

TOLSEY, in *our Old Writers*, denotes the places where merchants meet in a city or town of trade.

The word is compounded of the Saxon *tol*, *tributum*, and *see*, *sedes*.

TOLT, in *Law*, a writ whereby a cause depending in a court-baron is removed into the county-court. Old. Nat. Br. 4. See PONE.

TOLTERCAIZTLI, in *Natural History*, the American name of a stone, much resembling the novacularum lapis, but variegated with red and black spots. They use the powder of this stone, and crystal calcined together, for diseases of the eyes.

TOLU *Balsam*. See BALSAM.

TOLU-*tree*, *balsam of*, *toluifera*, a genus of the *decandria monogynia* class: its characters are these: the flower has a bell-shaped empalement of one leaf, which is slightly indented in five parts at the brim; it has five petals inserted in the receptacle of the flower, four of which are narrow and equal, being a little longer than the empalement; the fifth is much larger, and almost heart-shaped, having a tail the length of the empalement; it has ten short stamina, terminated by oblong erect summits, and a roundish germen supporting a very short style, crowned by an acute stigma; the germen turns to a roundish fruit with four cells, each containing one oval seed. We know but one species of this tree, which grows naturally near Carthagena in America.

This tree may be propagated by seeds, and will succeed by the same treatment required for the coffee-tree.

TOMAN, or TOUMAN, a kind of imaginary money used among the Persians in the keeping of their books, and to facilitate the reduction of money in the payment of considerable sums.

The *toman* consists of fifty abassis, or a hundred mamoudis, or two hundred shahees, or ten thousand dinars; which amount to about three pounds six shillings and eightpence sterling.

D'Herbelot derives the word from the language of the Moguls, where it signifies the number of ten thousand. Eben Arabschah says, that the word *touman*, when used to express a weight, or money, contains ten thousand silver Arab drachmas, called *methkal*; which are a third lighter than the Attic.

The Moguls, &c. frequently use *toman* for ten thousand men; and say, e. gr. that the city Samarcand contains seven *tomans* of people fit to bear arms; and that of Andechan nine *tomans*.

TOMATO, the Portuguese name for the fruit of the LYCOPERSICON, or *love-apple*; a fruit cultivated in gardens for the singularity of its appearance, and eaten either stewed or raw by the Spaniards and Italians, and by the Jew families in England.

TOMB, includes both the grave or SEPULCHRE, wherein a defunct is interred, and the MONUMENT erected to preserve his memory.

The word is formed from the Greek, τυμβος, *tumulus*, sepulchre; or, according to Menage, from the Latin, *tumba*, which signifies the same.

Among the Romans, none but the emperors, vestals, and persons signalized by great actions, were allowed to have *tombs* in the cities, the rest were all in the country, near the high-roads; whence those common words, *Siste*, *& abi*, *viator*, which are still retained in the inscriptions of our monuments, though set up in churches, &c.

At Anchiale was anciently seen the *tomb* of Sardanapalus, with this inscription in verse: "Sardanapalus built "Anchiale and Tarsus in one day: go passenger, eat, "drink, and be merry; the rest is nothing." Vide Strab. Geog. lib. xiv.

The Romans had a kind of empty *tomb*, called *cenotaphium*, an *honorary tomb*, wherein the body of the deceased was not laid. See CENOTAPH.

The occasion hereof was a superstitious notion, that the souls of those who had not funeral honours, wandered a hundred years by the banks of the rivers of hell, before they were admitted to pass over. The κενόταφιον being made, the same ceremonies were practised as at real funerals.

The cenotaphia were inscribed with the words *ob honorem*, or *memoriæ sacrum*, whereas other *tombs*, wherein the ashes were really deposited, were inscribed D. M. S. q. d. *sacred to the manes*. When the words *tacito omine* were added, it declared the ashes enclosed therein belonged to a person infamous for some crime.

TOMB-*stones*, *Characters on*. See CHARACTER.

TOMB-*stones*, *Epitaphs on*. See EPITAPH.

TOMBAC, a name given by the French to a yellow metal, very nearly approaching to what we call *prince's*-METAL, and made by mixing and fusing together a large quantity of zinc with a smaller of copper. See GOLD-*coloured metal*.

TOME, τομος, a bound book, or writing that makes a VOLUME.

TOMEION, formed from τομη, *section*, a general name used to express any sharp or cutting instrument, used either in surgery or in the mechanic arts.

TOMENTOSE-*leaf*, among *Botanists*. See LEAF.

TOMENTUM, properly signifies flocks, or locks of wool, but by botanists is used for that soft downy matter which grows on the leaves of some plants, hence denominated *tomentose*; as *verbascum tomentosum*, *carduus tomentosus*, &c.

M. Winslow observed a kind of *tomentum* in the secretory vessels of the glands; and from this accounts for the secretion of the various fluids from the blood. See GLAND and SECRETION.

TOMEX, in *Botany*, a genus of the *tetrandria monogynia* class: its characters are; that the calyx is single-leafed and cylindric, the stamina are long, the stigma emarginated, and the fruit a berry. There is one species.

TOMIAS, τομιας, in *Antiquity*, an appellation given to the sacrifice offered at the ratification of solemn leagues. It was so called because they cut out the testicles of the victim, and took the oath standing upon them.

TOMIN, in our *Old Writers*, a weight of twelve grains, used by goldsmiths and jewellers.

TOMINEIO, in *Ornithology*, a name by which some authors have called the guainumbi, or HUMMING-*bird*, the smallest of all birds.

The name seems derived from the Spanish *tomino*, a grain weight, as if they would call it a bird of a grain weight.

TOMOTOCIA, a word used by some authors to express the Cæsarian section.

TOMOU, in *Modern History*, the name of a head-dress which the women wear at Otaheite, consisting of human hair plaited in threads, scarcely thicker than sewing silk, some of which are above a mile in length, without a knot. Hawkesworth's Voy. vol. ii. p. 193.

TON. See TUN.

TOMKIN *and* TOMPION. See TAMPION.

TONDIN, or TANDINO, in *Architecture*. See TORE.

TONE, or TUNE, in *Music*, a property of sound, whereby it comes under the relation of *grave* and *acute*; or, the degree of elevation any sound has, from the degree of swiftness of the vibrations of the parts of the sonorous body.

For the cause, measure, degree, difference, &c. of *tones*, see TUNE.

The variety of *tones* in human voices arises partly from the dimensions of the wind-pipe, which, like a flute, the longer and narrower it is, the sharper the *tone* it gives; but principally from the head of the larynx, or knot of the throat; the *tone* of the voice being more or less grave, as the rima, or cleft thereof, is more or less open.

The word *tone* is taken in four different senses among the ancients: 1. For any sound. 2. For a certain interval, as when it is said the difference between the diapente and diatessaron is a *tone*. 3. For a certain *locus* or compass of the voice; in which sense they used the Dorian, Phrygian, Lydian *tones*. 4. For tension, as when they speak of an acute, grave, or a middle *tone*. Wallis's Append. Ptolem. Harm. p. 172.

TONE is more particularly used, in *Music*, for a certain degree or interval of tune, whereby a sound may be either raised or lowered from one extreme of a concord to the other, so as still to produce true melody.

In tempered scales of music the *tones* are made equal, but in a true and accurate practice of singing they are not so. Dr. Pepusch, in Phil. Transf. N° 481. p. 274.

Musicians, beside the concords, or harmonical intervals, admit three less kinds of intervals, which are the measures and component parts of the greater, and are called *degrees*; the nature, origin, use, &c. whereof, see under the article DEGREES.

Of these degrees, two are called *tones*, and the third a *semitone*; their ratios in numbers are 8 : 9, called a *greater tone*; 9 : 10, called a *lesser tone*; and 15 : 16, a *semitone*.

The *tones* arise out of the simple concords, and are equal to their differences; thus the *greater tone* 8 : 9 is the difference of a fifth and a fourth: the *less tone* 9 : 10 the difference of a less third and fourth, or of a fifth and sixth greater; and the *semitone* 15 : 16, the difference of a greater third and fourth.

Of these *tones* and *semitones* every concord is compounded, and consequently every one is resolvable into a certain number thereof. Thus the less third consists of one *greater tone*, and one *semitone*. The greater third of one *greater tone*, and one *less tone*. The fourth of one

greater

greater tone, one *less tone*, and one *semitone*. The sixth of two *greater tones*, one *less tone*, and one *semitone*.

It is usual in the modern practice of music to divide the *tone*, whether major or minor, into two *semitones*. But a late learned musician contends, that the division of the *tone-major* is harsh and inelegant; so that, in dividing the fourth into its different species, the *tone-major* ought either to be an undivided interval, or make part of one. Phil. Transf. ubi supra. See SPECIES.

According to Mr. Euler, the *tone* contains two *semitones*, taken in a large sense; that is, including the greater and lesser limma, under the term *tone*. Thus the *tone-major* is the sum of the *semitone-major* and lesser limma; as also the sum of the lesser *semitone*, and greater LIMMA. And the *tone-minor* is the sum of the greater and lesser *semitones*. Lastly, the greatest *tone*, *tonus maximus*, is the sum of two greater *semitones*. Euler, Tentam. Nov. Theor. Mus. p. 109.

But what Mr. Euler calls *tonus maximus*, is more commonly known by musicians under the name of a diminished third. For thus they call the interval, for instance, between G※ and B♭; it being composed of two diatonic intervals G※ to A, and A to B♭.

TONE-*major*. Six *tone-majors* exceed the octave by more than a comma. Euler. Tent. Nov. Theor. Mus. p. 308.

For the use of *tones*, &c. in the construction of the scale of music, see SCALE.

TONE, in *Rhetoric*, denotes a certain inflection or modulation of the voice, sometimes called ACCENT, which corresponds to, and expresses the sensations and emotions of the mind. The skill and success of a reader or speaker very much depend on the proper management of these *tones*. See GESTURE, PRONUNCIATION, and VOICE.

TONE, *Diazeuctic*. See DIAZEUCTIC.

TONGUE, *Lingua*, in *Anatomy*, an oblong member, whose form and situation are sufficiently known, and whose use is to be the organ of taste, and the principal instrument of speech and deglutition.

It is fastened to the os hyoides, the larynx, and to the fauces, by means not only of muscles, but also of ligaments, which are for the most part membranous; the principal of which is that running along the lower side of it, about half way, called the FRÆNUM.

The other ligaments are the small membranous fold, which runs along the middle of the convex side of the epiglottis to the basis of the *tongue*, and the membranous folds, which cover the inferior half arches of the septum palati. The aponeurotic ligaments of the stylo-glossus may be considered as true lateral ligaments of the *tongue*, and they adhere a little to the lower part of the musculus pterygoidæus internus, or anterior.

The *tongue* is chiefly composed of very soft fleshy fibres, intermixed with a particular medullary substance, and disposed in various ways. Many of these fibres are confined to the *tongue*, without going any farther; the rest form separate muscles, which go out from it in different ways, and are inserted in other parts. The upper side of the *tongue* is covered with a papillary nervous substance, over which are spread two membranes. The outer of these membranes is pretty thick, and full of papillæ, of a pyramidical figure, especially towards the tip, which papillæ stand pointing towards the root of the *tongue* in a bending posture, which makes their figure to be concavo-convex. These apices, or papillæ, are so very minute and slender in men, that they make the coat appear on the upper part villous, especially as they approach nearer to the root. The figure of the papillæ, in human *tongues*, is not so plainly discernible to the naked eye as not to need the microscope. In brutes they are generally larger, stiffer, and more conspicuous; and in some almost cartilaginous, as may be felt in the *tongues* of cats and oxen, but more sensibly in lions. On the upper side, at a little distance from the tip, this membrane becomes thin, smooth, and glabrous, and, as it were, polished by the lower parts of the mouth whereon it slides.

Under this lies a thin, soft, reticular kind of coat, punched through with innumerable holes, and always lined with a thick and white, or yellowish mucus. This membrane is so exceeding tender, and full of mucus, that it is not to be examined by the naked eye, unless boiled; by which it grows tough, and easily separable from the external membrane, and from the nervous part of the *tongue*, which lies immediately under it. After boiling, it appears like a kind of gauze, between whose threads innumerable holes appear, through which the apices of the papillary body underneath it are exerted. This membrane on the upper side, next the outward, appears white, with a cast towards yellow, but is black on the side next the *tongue*.

Many authors do not allow this to be a membrane, and will only have it to be a mucus hardened by boiling; but since it has so much of the resemblance of a membrane, and that authors agree in allowing two membranes to the *tongue*, Dr. Drake does not scruple to number it among them, since there does not appear to be any other second membrane; reckoning, with Malpighi, the smooth part under the *tongue* a part of the outer membrane; some however, have considered it as a continuation of a distinct membrane, which covers that of a papillary texture.

Immediately under this appears a nervous papillary body spreading itself to a moderate thickness over the whole surface of the *tongue*. This body, on the under side, is every where level and smooth, except in some few places, where it is connected to the subjacent musculous part by some nervous twigs which it sends into it. Malpighi distinguishes the papillæ, which make the principal part hereof, into three kinds, from their different magnitudes and figures when observed with the microscope; of which, those seated on the sides and tip are very singular, resembling little round pyramids, with globes on their tips like the horns of snails. All these papillæ, which are the immediate organs of tasting, send their apices, or extremities, through the mucous membrane into the pyramidal papillæ of the outer membrane, which are hollow to receive them, and seem to be nothing else but a kind of cases to defend these nervous papillæ from injuries, which the salts and asperities of those bodies which we take into our mouths might do them.

The rest, and much the greatest part, of the body of the *tongue* is musculous, consisting of planes of fibres in different directions, which may be termed the intrinsic muscles of the *tongue*, and are the same which Spigelius named musculi linguales; the first, or external plane, consists of straight, or longitudinal fibres, which cover the *tongue* from one extreme to the other, and seem to be partly expansions of the musculi stylo-glossi, hyo-glossi, and genio-glossi. When these contract, they shorten it. Under this are several other planes, running from the under to the upper side, which serve to make it broad and thin. These two kinds of fibres lie *stratum super stratum*, a plate of the one, and then a plate of the other.

The vertical fibres seem to be in part produced by the genio-glossi, and the transverse by the mylo-glossi.

To discover all these different fibres, it is necessary only to cut the *tongue* longitudinally, after it has been boiled, or long macerated in strong vinegar.

Authors are not agreed about the number of muscles which compose the *tongue*; some, confounding those of the os hyoides with those of the *tongue*, reckon eight, others nine, others ten, and more pairs. Some number those proper to the *tongue* only six pair, others five, others four, and some no more than three. Of this last opinion is our accurate Mr. Cowper, who allows no more than three genuine pair of muscles to the *tongue*; viz. the *genioglossum*, which pulls the *tongue* forwards, and puts it out of the mouth; the *ceratoglossum*, which draws it into the mouth, or pulls it on one side; and the *styloglossum*, which draws the *tongue* up in the action of deglutition.

Winslow reckons four pair, viz. MYLO-*glossi*, STYLO-*glossi*, HYO-*glossi*, and GENIO-*glossi*.

The *genio-glossi* serve, by their posterior straight fibres, which go to the basis, to draw the *tongue* out of the mouth, and bring it back again by their anterior bent fibres, which go to the point. They can either successively, or all at once, make the *tongue* longitudinally hollow, or like a groove; and they can at the same time contract it by the lateral expansion of the middle fibres. For the use of the *stylo-glossi*, see STYLO-*glossi*.

When all the parts of the *hyo-glossi* act together, they shorten the *tongue*. They likewise turn the point of the *tongue* between the teeth and the under-lip, and make it pass over that lip. The superior fleshy plane of the body of the *tongue* bends it upward toward the palate, and makes it pass along, or lick the upper lip.

The *mylo-glossi* serve as a frænum to one side of the basis, while the point is turned to the other side. The ligamenta suspensoria of the *stylo-glossi* may answer the same purpose, and even supply the want of the *mylo-glossi*.

Besides these muscles, the *tongue* is also moved by a bone situated as its root, and making, as it were, its basis, called *os hyoides*.

Down the middle of the *tongue*, lengthwise, runs a seam, called *linea mediana*, which divides it to the bottom into two equal parts, but not so effectually but that the blood-vessels of one side communicate with those of the other. These vessels are arteries from the carotides and veins called *ranulæ*, and are very conspicuous about the frænum

num under the *tongue*, serving to reconvey the blood to the external jugulars. These veins are frequently opened in the angina, and are the last resort of old women in this case. See Ranulares and Sublingual.

Four nervous ropes are observed to go very distinctly to the basis of the *tongue*, and to continue their course through its whole substance to the point. Two of these ropes are rami of the inferior maxillary nerves, or of the third branch of the fifth pair from the medulla oblongata; the other two are nerves of the ninth pair. The two first are called by Mr. Winslow linguales, or *hypoglossi minores*, and the other two linguales, or hypoglossi *majores*. The latter are inferior and internal, the former superior and external, or lateral. The small portion, or first branch of the nervus sympatheticus medius, or of the eighth pair, sends likewise a nerve to each side of the *tongue*. The great lingual nerve on each side runs forward between the musculus mylo-hyoidæus and hyo-glossus, under the genio-glossus, and is distributed to the fleshy fibres all the way to the point of the *tongue*. Afterwards, separating more and more from the trunk, it passes under the lateral part of the *tongue*, over the sublingual gland. It supplies the nearest parts of the *tongue* as it passes, and then, entering its substance, terminates at the point, having sent a great number of filaments to the papillary membrane. It communicates with the lingualis major, and with the nerve from the eighth pair. This lingual nerve, soon after it leaves the maxillaris inferior, is accompanied by a small distinct nerve, which runs upward and backward toward the articulation of the lower jaw, passes through the tympanum by the name of chorda *tympani*, and, afterwards, perforating the posterior side of the tympanum, unites with the portio dura of the auditory nerve. The lingual nerve of the eighth pair, which is its first branch, runs first on the inside of the digastric muscle of the lower jaw, and supplies the genio-hyoidæi, the neighbouring muscles of the basis of the *tongue*, and those of the pharynx. After sending out ramifications, and forming several communications, it goes to the lower part of the *tongue*, where it communicates with the lingual ramus of the fifth pair, and with the lingual ramus of the ninth. Winslow. See Nerves.

However necessary an organ the *tongue* be in speech, &c. yet instances have occurred, in which persons, who have lost their *tongues*, have spoken distinctly.

We have had in England an instance of this kind in one Margaret Cutting. See Philos. Trans. N° 464. or Abr. vol. ix. p. 126. Idem, vol. xliv. p. 621.

Another occurs in Lamberti's Memoirs, and another in the Memoirs of the Academy of Sciences.

To the instances briefly mentioned above, we may add the following account of a man at Montagu, in the Bas Poictou, who being seized with the small-pox in his fifth or sixth year, lost his whole *tongue* by gangrene, or putrefaction; yet, notwithstanding, performed in perfection the five actions belonging to the *tongue*, viz. speaking, tasting, spitting, chewing, and swallowing; nature having, with infinite artifice, given a new conformation to the mouth, proper to supply the want of the last organ. See Jac. Rolandi Aglosstomographia, sive Descriptio Oris sine Lingua quod perfecte loquitur et reliquas suas Functiones naturaliter exercet; first published in French at Saumur, in 1630, translated into Latin by Car. Ruygerus, and published in the Ephem. German. D. an. 3.

For speech, instead of the ordinary provision, the little fleshy part of the *tongue* remaining was inflected in the middle towards the palate, the teeth inverted, and long inwards, the musculi buccinatores easily contracting between the dentes molares. In fine, there was a disposition in all the organs to produce speech without a *tongue*; for the breath issuing at the oval aperture of the larynx, was farther broken, and rendered vocal by the inflation of the fleshy body, the motion of the lips, the retraction of the buccinatores, the tremulous agitation of the uvula, and the commotion of the lower jaw. Lastly, by the inversion of the teeth, the depression of the palate, the abundance of saliva, and the capacity of the mouth, the sound was still farther modified and determined, so as to render it articulate. Habit, too, and the repeated attempts to speak at an age when the parts were easily flexible, had contributed greatly to the distinctness of it.

For tasting, it is evident from this, as well as other considerations, that the *tongue* is not the only organ of it, but that the palate is also a seat of this sense. For chewing, the office of turning the meat in the mouth was here performed by the lips and cheeks, the muscles whereof repelled towards the maxillares such parts, as in mastication, might fall from one side to the other. For the first morsel he took he could only chew on that side into which he put it with his hand; the second he put in like manner on the other side, and thus varied and supplied each alternately. For swallowing, the gravity of the food contributed something to this, which he farther promoted by stretching out his neck, inclining his head, and drawing back the buccinatores within his teeth; all which were seconded by the mouth and fauces being well moistened with plenty of saliva. In effect, divers animals, as the tortoise and the crocodile, stork, &c. swallow without any *tongue*; and fish, though their *tongue* is fixed immoveable to their palate. For spitting, it was performed by the lips, aided by the internal contraction of the mouth, and the retraction of the buccinatores over the grinders.

Roland's instance was singular at that time, but a parallel one has been since observed in a girl at Lisbon, fifteen years old; of which an account was given, in 1718, to the Royal Academy of Sciences, by M. de Jussieu. Upon inspecting the mouth of this girl, there appeared nothing in all that part ordinarily possessed by the *tongue*, but a little eminence in form of a papilla, between three and four lines high, in the middle of her mouth, scarce perceivable by the eye. Upon pressing this with the finger, a kind of motion of contraction and dilatation was perceived in it, which shewed, that though the *tongue* was wanting, the muscles of which it was formed, and which are destined to give it motion, were neverthelefs there. With the help of these she spoke as distinctly and easily as if nothing had been wanting: she distinguished tastes like other people. For mastication, it was chiefly effected by the motion of the lower jaw, which she drew nearer to, or farther from the grinders of the upper, under which the food to be chewed was. In this action she sometimes also made use of her fingers, but much more in the action of swallowing, in order to protrude the masticated food towards the orifice of the œsophagus. For drinking, she performed it like other people, excepting the attention she employed to prevent the liquor going down too fast; in order to which she kept her head a little inclined forwards. Lastly, the action of spitting was supplied by the muscles of the papilla, which filled the lower part of her mouth; these rising almost to a level with the teeth of the lower jaw, and the buccinatores approaching towards both jaws, expressed the saliva, and conducted it to the sphincter of the lips, from whence the air, driven with violence from the larynx, served as a vehicle to expel it out of the mouth. Mem. de l'Acad. Scienc. ann. 1718, p. 6—16. Jussieu, loc. cit. p. 7, seq.

Dr. Mortimer, from a MS. account of the life of the rev. Mr. Henry Wharton, chaplain to archbishop Sancroft, informs us, that he was born with two *tongues*. Phil. Trans. vol. xlv. p. 232.

Tongue-*grafting*. See Engrafting.

Tongue-*tied*, the popular name for a distemperature of the *tongue* in children, when it is tied down too close to the bottom of the mouth, by a ligament connected all along its middle, and called its frænulum, which requires to be divided to give the *tongue* its proper motion.

This is sometimes the case in adults, but oftener in children, who cannot then exert their *tongues* to suck. This is, however, by no means so common as the women usually imagine; not so much as one child in a thousand being afflicted with it; nor is the operation in cutting it of little consequence, since often bad accidents follow it, and sometimes the loss of a child's life. When the infant can put its *tongue* out of its mouth, the frænulum wants no incision; but when the *tongue* cannot be extended beyond the teeth, the operation is necessary.

To perform this, the end of the *tongue* should be covered with a linen rag, and held with the fingers to prevent its slipping, and the ligament of the *tongue* running between the ranular veins and internal salival ducts, it is to be divided by a pair of obtuse pointed scissars, till it give room enough for sucking or speaking, but in doing this, great care must be taken not to wound the salival ducts, or the proper veins and arteries of the *tongue*; for children have been known to perish upon the spot from cutting the ranular veins in this operation. Midwives often tear this ligament with their fingers as soon as the child is born; but this is a dangerous and bad practice. Heister.

Tongue *wounded*. The *tongue* is frequently bit in fits of the epilepsy, and in violent falls; and is sometimes wounded by a bullet.

If the wound is not very large, it will easily heal by the application of oil of almonds and sugar-candy mixt together, or of honey of roses and oil of myrrh made *per deliquium*; but large wounds of the *tongue* will not unite without the assistance of the suture. It is therefore no wonder

wonder that wounds near the root of the *tongue* always leave a fiſſure in the part, ſince their ſituation does not allow the uſe of the needle. To prevent the loſs of ſpeech enſuing upon large wounds on the fore-part of the *tongue*, the divided parts ſhould be brought together with a needle as ſoon and as neatly as poſſible, and afterwards anointed with oil of almonds and ſugar-candy, or honey of roſes and oil of myrrh, ſince ſticking-plaſters cannot take place here. Gun-ſhot wounds on the *tongue* can only be healed with thoſe unctions, ſince the ſuture can be of no uſe in them; the patient ſhould be kept from talking, and live upon ſpoon-meats during the cure, but more particularly at the time when the wound is about to unite. Heiſter.

TONGUE *of fiſh*. All fiſh have either a perfect *tongue* or the rudiments of one in their mouth; but this organ is very different in the various ſpecies, in its figure, mobility, and other qualities and properties; as to the figure, it is in ſome pointed before, as in the clupeæ; in others it is rounded in this part, as the perch and clariæ have it; and in others it is ſomewhat bifid, as in the pike. In ſome it is ſmooth on the upper part, as in the gadi, cyprini, and mackerel; in others it is rough and dentated in this part, as in the ſalmon, mullet, &c. In many fiſh the *tongue* is immoveable, adhering firmly to the bottom of the mouth, as in the perch, cyprinus, and, indeed, in the greater part of fiſh; in others it is looſe, as in the whale.

In the cetaceous fiſh, the *tongue* being looſe, as in quadrupeds, it is uſed by the animal in the ſame manner; but in other fiſhes it is of no uſe in the moving of the food about in the mouth, nor is it the genuine organ of taſte, being in many a cartilaginous ſubſtance, and therefore not proper for receiving the notices of that ſenſe. The principal uſe of the *tongue* in theſe fiſh ſeems to be in its ſerving as an aſſiſtant organ of ſwallowing, its being more elevated than the other parts of the mouth, rendering it fit for the toſſing of the food down the throat. The true uſe of the *tongue* in thoſe fiſh which have it dentated, is that it ſerves to retain the prey from running out of the mouth, and afterwards in the ſwallowing of it; what renders them more fit for this uſe is, that they have always the prickles turning inwards. It is the opinion of Mr. Ray, that the *tongues* of the cartilaginous kinds have ſome ſenſe of taſte, and this is more probable than that the more hard and rigid ones ſhould have any ſuch ſenſe. Artedi, de Piſcib.

TONGUE *of a muſcle*. What is vulgarly called the *tongue* in this fiſh from its ſhape, is truly an organ, by means of which it ſpins a ſort of threads in the manner of ſpiders or caterpillars, to fix itſelf to the rocks by. See MUSCLE.

TONGUE, in the *Manege*. The aid of the *tongue* or voice, is a ſort of agreeable clacking, or a certain ſound formed by the cavalier, in ſtriking his *tongue* againſt the roof of his mouth, when he means to animate the horſe, and ſuſtain him, and make him work well in the manege. See AID.

TONGUE, *to ſwallow the*, in the *Manege*. A horſe is ſaid to draw in, or ſwallow his *tongue*, when he turns it down his throat, which makes him wheeze as if he were ſhort-winded. This fault is cured by giving him a bit with a LIBERTY for the *tongue*.

TONGUE, *Serpent's*, in *Botany*. See ADDER's *tongue*.

TONGUES, *Serpent's*, in *Natural Hiſtory*. See SERPENT's *tongues* and GLOSSOPETRA.

TONGUES, *Confuſion of*. See CONFUSION.

TONIC, τονικος, formed from τεινειν, *to ſtretch*, in *Medicine*, is applied to a certain motion of the muſcles, wherein the fibres being extended, continue their extenſion in ſuch manner, as that the part ſeems immoveable, though in reality it be in motion. See MUSCLE.

Such is the caſe of a man ſtanding, of birds planing or ſwimming through the air, &c. Galen ſays, that the muſcles act even when at reſt; for after having made any contraction to fix themſelves in a certain ſtate or diſpoſition, the preſerving of that contraction is what we call the *tonic motion*.

TONIC, in *Muſic*. See GENUS.

TONIC *accent*. See ACCENT.

TONICAL *echo*. See ECHO.

TONNAGE. See TUNNAGE.

TONNAGE, *duty of*. See DUTY.

TONNAGE *of a ſhip*. See BURDEN *of a ſhip*.

TONNING. See TUNNING.

TONOS, a word uſed by Hippocrates, to expreſs in general any nerve, whether ariſing from the brain or ſpinal marrow. It is alſo uſed to expreſs a tenſion in any part.

TONQUIN *Medicine*. See MADNESS.

TONSÆ, among the *Romans*, the blades of oars, or that part of them which beats againſt the water.

TONSILS, TONSILLÆ, in *Anatomy*, two round glands, ſituate near the root of the tongue, on each ſide the uvula, under the common membrane of the fauces, with which they are covered; they are called alſo *amygdalæ*, or ALMONDS *of the ears*.

TONSILS, *inflammation of the*. This is a very common complaint from taking cold, and in its different degrees requires different methods of cure: in general, the ſame means are to be uſed as in quinſeys, except that ſuch copious bleedings are not neceſſary; nor, indeed, is there occaſion for bleeding at all, unleſs the patient is of a plethoric habit, or the inflammation be very violent; for, in that caſe, the taking away of a moderate quantity of blood often prevents its coming to ſuppuration. The patient is firſt to be purged with an infuſion of tamarinds, ſena, and cream of tartar, and this repeated to the third or fourth doſe, if there be occaſion; in the intermediate times the diaphoretic, attemperating, and nitrous medicines are to be given in powders, and a large quantity of diluting liquors allowed, which ſhould be gently acidulated, and have a ſmall quantity of nitre diſſolved in them. Gargariſms made of decoctions of biſtort-root, red roſes, and other gentle aſtringents, are to be frequently uſed; and the frequent waſhing of the feet in warm water often has a very remarkably good effect.

If after four or five days the diſtemper is found not to give way to theſe means, but the tumor ſtill remains, there is then but little hope to be had of its reſolution, and a very different end is to be attempted; emollient gargariſms are now to be uſed, and maturating plaſters externally applied, ſuch as diachylon with the gums, and the like; and ſuppurating cataplaſms are to be applied to the whole neck and throat: theſe methods are to be continued till the tumor either burſts of itſelf, or is ſo ripe to be fit for opening by the hand of the ſurgeon. After this has been done, and the matter is diſcharged, gargariſms muſt be uſed of decoctions of ſome vulnerary herb, or common green tea, ſweetened with honey of roſes, may be uſed to ſerve the purpoſe. The mouth and throat are to be frequently waſhed with this till the part is healed. It is to be obſerved, however, that the reſolution of theſe tumors is never to be deſpaired of, not even during the uſe of the ſuppurating medicines, for it is often ſeen that the tumor has been wholly diſcuſſed even during the uſe of theſe means, the reſolution often being extremely ſlow.

This is a very troubleſome complaint, and with ſome perſons is apt to return very frequently; the beſt preſervative againſt it is a moderate diet and bleeding about the time of the equinoxes, either in the arm or foot. Some have found it neceſſary to open an iſſue in the arm in this caſe, and have been by this means perfectly cured, but, on its drying up, have always found the diſeaſe return. Heiſter's Compend. Med. p. 131.

TONSILS, *ulcers of the*. See ULCERS.

TONSURE, formed from *tondere*, *to ſhave*, the art or act of cutting the hair, and ſhaving the head. See HAIR.

The *tonſure* was anciently a mark of infamy in France; inſomuch that, when they would render any prince incapable of ſucceeding to the crown, they cut off his hair and ſhaved him. See BEARD.

TONSURE, in the Romiſh church, is uſed for the entrance, or admiſſion, into holy orders.

In propriety, *tonſure* is the firſt ceremony uſed for devoting a perſon to God and the church, by preſenting him to the biſhop, who gives him the firſt degree of the clericate, by cutting off part of his hair, with certain prayers and benedictions.

Some hold the *tonſure* a particular order; others, as Loyſeau, only the mark and form of eccleſiaſtical orders in general.

The *tonſure* ſuffices to make a clerk; the reſt is only to qualify him for the holding of benefices. A perſon is capable of the *tonſure* at ſeven years of age; hence a benefice of ſimple *tonſure* is ſuch a one as may be enjoyed by a child of ſeven years old. The *tonſure* is the baſis of all the other orders.

TONSURE is alſo uſed for the corona, which prieſts, &c. wear, as the mark of their order, and of the rank they hold in the church. See CROWN.

The barbers have the meaſures and dimenſions of the different kinds of *tonſures*, or clerical crowns, to be practiſed according to the different degrees and orders. A clerk's *tonſure*, a ſubdeacon's *tonſure*, a deacon's *tonſure*, a prieſt's *tonſure*, are each ſucceſſively bigger than other.

TONTINE, denotes annuities on ſurvivorſhip. The name is derived from an Italian, called *Tonti*, who is ſaid to have firſt formed the ſcheme of theſe life annuities. Encyclopedie.

TOOLS, ſimple and popular inſtruments, uſed in the more

obvious

obvious operations, and particularly in the making of other more complex inſtruments.

Tools are divided into *edge-tools*, *ſpring-tools*, *pointed tools*, &c.

TOOTH, *Dens*, in *Anatomy*. See TEETH.

TOOTH, *wolf*. See WOLVES-*teeth*.

TOOTH, in the *Manege*. It is by an horſe's *teeth*, chiefly, that his age is known.

The *teeth* of a horſe are of four kinds, *viz.* twenty-four *jaw-teeth*, or *grinders*, at the bottom of the mouth, beyond the bars; twelve on each ſide the channel, ranged ſix above, and as many below; which never fall, nor are they uſed for the diſtinction of age: twelve *foal-teeth*, or *milk-teeth*, four *tuſhes*, twelve gatherers, divided into *nippers*, the two foremoſt above, and as many below; *middle teeth*, or *ſeparaters*, one on each ſide of the nippers above and below, and *outward*, or *corner teeth*, which are next the *tuſhes* above and below. See AGE *in Horſemanſhip*, EYE *of a bean*, *and* MARK.

TOOTH-ACH, a very common diſeaſe, by phyſicians called *odontalgy*.

As there are various cauſes of the *tooth-ach*, the method of relief ſhould, as far as poſſible, be adapted to theſe cauſes. This diſorder often ariſes from defluxions falling on the gums, the neighbouring perioſteum and bone, particularly after catching cold: in this caſe, recourſe is commonly had to chewing of acrid aromatic ſubſtances, as ginger, galangal, Florentine orris root, cloves, all-ſpice, mace, camphor, orange-peel, &c. in various forms, which being applied to the ſeat of inflammation, and the diſtracted irritable fibres, increaſe the repletion, tenſion, and pain. Chemical oils, as thoſe of origanum, cloves, tobacco, &c. have been of ſervice, but the free and continued uſe of them injurious.

The true and rational method of cure is comprehended under four general indications, viz. to leſſen the velocity, quantity, and inflammatory tendency of the blood, which is done by bleeding and purging, and frequent repetitions of nitrous draughts; to relax the affected parts by moiſtening them with emollient attenuating liquors, ſuch as decoctions of marſhmallows, comfrey, or ſatyrion roots, or of columbine, or quince ſeeds, with a little nitre; by applying poultices of bread and milk to the affected cheek externally, and boiled or roaſted figs internally; and alſo by ſcarification of the gums; to make a revulſion by the uſe of bliſters applied to the ears and nape of the neck; and, laſtly, to leſſen the ſenſibility of the pained parts by the external and internal uſe of ſedatives, for which purpoſe opium ſhould be added pretty freely to the above mentioned emollient liquors, and given in proper doſes at night, to procure reſt. Liniments of ointments of marſhmallows, elder, &c. mixed with rum, brandy, or ſpirit of wine camphorated, applied externally, ſerve to abate the ſwelling.

The *tooth-ach* is ſometimes owing to an obſtruction or inflammation of the nerves and vaſcular parts of the tooth itſelf, for relieving which acrid maſticatories, formed chiefly of the ſubſtances already mentioned are often of conſiderable ſervice; burning the ear with a hot iron has alſo been practiſed, as it is ſaid, with ſucceſs; but the more effectual and rational means are bliſters behind the ears, and on the nape of the neck, and ſedatives uſed externally and internally; and if theſe fail, extraction is the laſt reſource. When this diſorder ariſes from purulent or acrid matter generated in the gums, perioſteum, and veſſels of the teeth and ſockets, in conſequence of inflammation, extravaſation, or acrimony of the fluids, one or more inciſions ſhould be made to the bottom of the cavity in which the matter lodges, for giving it free paſſage, and the wound frequently dreſſed with ſtimulating balſamics, ſuch as balſam copaibæ, or tincture of myrrh, on a doſſil of lint; and when it is almoſt healed, the mouth ſhould be waſhed four or five times a day with ſome aſtringent gargle, as the decoction of tormentil or biſtort-root, &c. and if the pain be conſiderable, ſolutions of opium and camphor ſhould be added to the dreſſings and to the aſtringent waſhes. When the teeth are become looſe in their ſockets by the ſcurvy, &c. it is neceſſary to extract them.

The *tooth-ach* ariſing from fungous excreſcences and ulcers of the gums, may be relieved by removing the excreſcences with a knife, or ſciſſars, and dreſſing the wound as above; or by treating the ulcers of the gums, when they do not touch the teeth, or form cavities, with balſamic applications, and then with aſtringents, ſuch as tincture of myrrh, ſang. dracon. tormentil, biſtort, &c. as ſoon as they are diſpoſed to heal. The pain may be mitigated by opiate and camphorated applications; but if the inflammation and soreneſs are conſiderable, emollient gargles, ſuch as decoctions of quince ſeeds, barley-water, or milk and water, with a few drops of the thebaic tincture, ſhould be conſtantly kept in the mouth, till the ſtate of the parts admits of the above treatment. In ſome caſes, the *tooth-ach* is owing to receſs of the gums occaſioned by ſcorbutic, venereal, or putrid diſorders, by which the roots of the teeth are expoſed to external air and injury. If the expoſed roots are become carious, extraction is the only cure: otherwiſe, the original diſeaſe ſhould be removed by a due courſe of medicine, and the mouth often waſhed with antiſeptic and aſtringent liquors, as infuſion of roſes, betony, granate peel, biſtort, and tormentil-roots, acidulated with the juice of lemon or vinegar: the affected gums ſhould be pricked and ſcarified; and in the courſe of the cure, opiates, ſolution of camphor, or a few drops of the nitrous ether in common ſpirits may be cautiouſly uſed. If the diſorder proceeds from tartar of the teeth, this ſhould be removed by bruſhing and waſhing them, and rubbing them with proper teſtaceous powders, or by particular inſtruments uſed by dentiſts, and the other ſymptoms require the treatment already mentioned.

The *tooth-ach* owing to the looſeneſs of the teeth is often relieved by making them faſt and ſteady with ligatures, and by the uſe of aſtringent waſhes. The *tooth-ach* ſometimes proceeds from injuries by injudicious extraction, in which caſe, if a portion of the root is left behind, it is beſt relieved by extracting the ſtump; or the pain may ſometimes be removed by burning the nerve, or applying a ſmall bit of lint dipped in eſſential oil of cinnamon over the hollow part of the ſtump, or by introducing a bit of paſte made of opium, camphor, and eſſential oil of peppermint; a paſte made of ſoft bread, and the ſeed of ſtramonium, laid on the affected tooth, ſerves to abate the pain: as does alſo a compoſition of equal quantities of opium, myrrh, and camphor, made into a paſte with brandy or ſpirits of wine, when put into a hollow tooth in the quantity of a grain or two.

When the gums are bruiſed and torn, the method of cure conſiſts in replacing them, removing the inflammation, diſpoſing the part to heal, preſerving it from outward air and the relics of food, mitigating the pain, and uſe of ſuitable aſtringents. The *tooth-ach* occaſioned by exceſſive cold air, and the ſudden change of hot and cold liquors, is cured by keeping the mouth filled as long as poſſible with warm water, or ſpirituous peppermint-water, &c. In the *tooth-ach* ariſing from ſympathy with a diſordered tooth, the diſeaſe of the faulty tooth affecting ſound ones is generally caries or hollowneſs, which is to be treated with filing, burning, cleaning, acrid, camphorated, or ſedative applications, or filling it with lead or gold, as circumſtances require: or if theſe methods fail, the diſordered tooth muſt be extracted. When matter is collected in the maxillary ſinuſes, it will be neceſſary to draw a tooth immediately under the affected part, and then to pierce through the bottom of the ſocket into the ſinus, or antrum maxillare, with a triangular pointed inſtrument, ſo as to give a free vent to the corrupted matter, and then to waſh with balſamic, ſpirituous, and detergent injections: keeping a little lint wetted in any mild balſam in the ſocket to prevent the acceſs of external air. In caſe of an exoſtoſis of the bones which form the ſockets, the ſoft parts that lie over it muſt be divided quite to the bone, by a crucial inciſion, and the exoſtoſis cut away with a knife or cautery, or broken with pliers, and the wound treated as in caſes where a bone is expoſed. When a caries commences in the ſubſtance of the bone, the bone is to be laid bare, the cariated cruſt pierced through to the bone, an exfoliation promoted, and the wound healed. See CARIES.

When the enamel of the teeth is deſtroyed, and the nervous bony ſubſtance of them is expoſed, all that can be done is to uſe palliatives, or apply the inſtrument at once. See DENTITION. Berdmore's Treatiſe on Diſorders, &c. of the Teeth.

Mr. Cheſelden mentions one cured of the *tooth-ach* by applying a ſmall cauterizing iron to the anthelix of the ear, after he had undergone bleeding, purging, ſalivation, ſetons, &c. to no purpoſe: the caſe was very remarkable; for when he was ſeized with it, a convulſion of that whole ſide of his face followed, whenever the pain became acute, or whenever he attempted to ſpeak.

There are ſeveral methods of cauterizing: ſome, uſe a cautery prepared on purpoſe, others only a common ſmall iron nail, or a piece of iron-wire, and others heat a ſcalpel red-hot and plunge it into the part; others alſo affirm that as much ſervice is to be done by cutting there without cauterizing, ſuppoſing that the operation deſtroys a nerve going thence to the *tooth*, which is the occaſion of the ſenſe of pain in it. But it is to be doubted whether this ſevere remedy be as certain of ſucceſs as ſome pretend.

Scookius, in his treatise of butter, maintains, that there is no better means of keeping the teeth fair and sound, than by rubbing them over with butter: a medicine much less distasteful than that of the Spaniards, who wash their teeth every morning with urine.

To prevent and cure the scurvy in the gums, it is recommended to wash the mouth every morning with salt and water; and to hinder the teeth from spoiling or growing carious, some use only powder of hartshorn to rub the teeth with, and then wash the mouth with cold water; it is alledged, this is preferable to other dentrifrices, on this account, because their hard particles are apt to abrade that fine smooth polish, with which the surface of the teeth is covered, and which is their preservative from the ill effects of air, aliment, liquors, &c. which occasion ailments of the teeth when worn off. See DENTRIFICE and TEETH.

TOOTH-ACH-*tree*, *Zanthoxylum*, in *Botany*, a genus of the *dioecia pentandria* class. Its characters are: that it has male and female flowers, neither of which have any corolla; the calyx in both divided into five segments; the female have five pistils, and as many monospermous capsules. There are two species.

TOOTH-*drawing*; according to Cicero, (De Nat. Deorum, lib. iii. cap. 22.) was invented by Esculapius, in whose temple the ancients hung up a pair of leaden pincers, very properly signifying that no *teeth* were to be pulled out, but such as might be removed with a leaden forceps, that is such as were loose and ready to fall out of themselves; for they very little consult their own welfare, who pull out their *teeth* while firm and sound: for drawing the *teeth* is not only a painful operation, but often brings on bad accidents, and sometimes even hazards the patient's life.

Tooth-drawing, however wrong in many cases, yet is certainly right and necessary in others. 1. In children for the removing of their lacteal or deciduous *teeth*, for when these are left too long in their sockets, they displace the new ones and turn them awry. 2. In infants it is also necessary to draw such *teeth* as grow out of the palate, or out of improper parts of the mouth, and are placed so as to impede their speaking or sucking. 3. In the *tooth-ach* proceeding from a *tooth's* being carious, and giving way to no medicines, drawing is the last resort, and is absolutely necessary. 4. Those *teeth* ought to be drawn, which, by their irregular figure and position, lacerate the gums and lips, and cannot be brought into shape by the file. And, lastly, it is sometimes necessary to draw a *tooth* for the curing of a fistula, or ulceration the gums near the roots of the *teeth*.

The regular method of drawing them is this: if the *tooth* is in the lower jaw, the patient must be seated on a low seat on the floor, and if in the upper jaw, he must be placed on a high stool or table; then the proper instrument is to be selected, and the *tooth* carefully drawn as a nail out of a piece of wood. But this must never be done while the gums are inflamed, swelled, or otherwise distempered.

The instruments for extracting *teeth* are so various, that almost every operator is furnished with a particular one of his own; such are the PELLICAN, FORFEX, CROW'S-*bill*; and for drawing stumps the goat's-foot, and others described by Heister, Surgery, vol. ii. p. 30, &c.

The key instrument for drawing teeth in general, is exhibited in *Tab.* III. *Surgery, fig.* 47.

The paces used for extracting teeth that slightly adhere to the gums, &c. after being loosened from the socket of the jaw, are represented in *Tab. Surgery, fig.* 13.

TOOTHPICK, in *Botany*, a species of daucus. See CARROT.

TOOTH-WORT, *dentaria*, in *Botany*, a genus of the *tetradynamia siliquosa* class. Its characters are these: the empalement of the flower is composed of four oblong oval leaves, which fall off; the flower has four obtuse petals placed in form of a cross; and six stamina, four of which are as long as the empalement, the other two shorter: in the centre is situated an oblong germen, supporting a short thick style, crowned by an obtuse stigma; the germen becomes a long taper pod with two cells, divided by an intermediate partition opening with two valves, including many roundish seeds. Linnæus enumerates three and Miller four species.

TOOTH-*wort* is also a name given to a species of *plumbago*. See LEAD-*wort*.

TOP *of a ship*, a sort of platform, surrounding the lower mast-head, from which it projects on all sides like a scaffold. Its principal intention is to extend the topmast shrouds, so as to form a greater angle with the mast, and thereby give additional support to the latter. It is sustained by the TRESSEL-*trees* and CROSS-*trees*. The *top* is also convenient for containing the materials necessary for extending the small sails, and for fixing or repairing the rigging machinery. In ships of war it serves as a kind of redoubt, and is accordingly fortified for attack and defence, being furnished with swivels, musquetry, and other fire-arms, and guarded by a thick fence of corded hammocs. It is also used as a place for looking out, either in the day or night. The frame of the *top* is either close-planked like a platform, or open like a grating. In all ships of war, and in the largest merchantmen, the *top* is fenced on the aft-side by a rail about three feet high, stretching across and supported by stanchions, between which a netting is usually constructed.

The outside of this netting is generally covered with red bays, or red painted canvas, extended from the rail down to the edge of the top, and called the *top-armour*. By this name it seems to have been considered as a sort of blind, behind which the men may conceal themselves from the aims of the enemy's fire-arms in time of action, whilst they are charging their own muskets, carabines, or swivels. The dimensions of *tops* in the royal navy are as follow: the breadth of the *top* athwart ships is one-third of the length of its corresponding *top*-mast: the length of all *tops*, from the foremost to the after-edge, is equal to three-fourths of their breadth athwart; and the square-hole in the middle is five inches to a foot of those dimensions. The tressel-trees and cross-trees extend nearly to the edge of the *tops*. Falconer.

TOP-*armour*, in a *Ship of War*. See TOP, *supra*.

TOP-*block*. See BLOCK.

TOP-*chain*, a chain to sling the sail-yards in the time of battle, in order to prevent them from falling down when the ropes, by which they are hung, happen to be shot away, or rendered incapable of service. Falconer.

TOP-*lanthorn*, a large lanthorn placed in the after-part of the *top*, and supported on each side by iron-braces, in any ship where an admiral or commodore is aboard. Falconer.

TOP-*mast*, the second division of a MAST, or that part which stands between the upper and lower pieces.

TOP-*gallant-masts*, in a *Ship*, are two, *viz.* MAIN-*top-gallant-mast*, and FORE-*top-gallant-mast*, which are small round pieces of timber, set on their respective *top-masts*; on the top of which masts are set the flag-staffs, on which the colours, as flags, pendants, &c. hang.

TOP-*rope*, in a *Ship*, a rope employed to sway-up a *top*-mast, or *top*-gallant-mast, in order to fix it in its place; or to lower it in tempestuous weather, or when it is no longer necessary. The rope used on this occasion for the *top*-masts is furnished with an assemblage of pullies, at its lower end, called the *top-tackle*; the effort of which in erecting the *top*-mast is communicated from the head of the lower mast to the foot of the *top*-mast; and the upper end of the latter is accordingly guided into, and conveyed up through the holes between the tressel-trees and the cap. For this purpose, the *top-rope*, passing through a block, which is hooked on one side of the cap, and afterwards through a hole, furnished with a sheave or pulley, in the lower end of the top-mast, is again brought upwards on the other side of the mast, where it is at length fastened to an eye-bolt in the cap, which is always on the side opposite to the top-block. To the lower end of the *top-rope* is fixed the top-tackle, the effort of which being transmitted to the *top-rope*, and thence to the heel of the top-mast, necessarily lifts the latter upwards, parallel to the lower mast. When the top-mast is raised to its proper height, the lower end of it becomes firmly wedged in the square-hole, between the tressel-trees. A bar of wood or iron, called the FID, is then thrust through a hole in the heel of it, across the tressel-trees, by which the whole weight of the top-mast is supported. In the same manner, the top-gallant-mast is erected, and fixed at the head of the top-mast. Falconer.

TOP-*sail-lifts*, on *board a Ship*. See LIFTS.

TOP-*sails*, and TOP-*gallant sails*, in *a Ship*, are those belonging to the *top*-masts, and *top*-gallant-masts. The former are extended across the top-masts, by the *top-sail*-yard above, and by the yard attached to the lower mast beneath; being fastened to the former by *robands*, and to the latter by means of two blocks fixed on its extremities, through which the *top-sail* sheets are inserted, passing from thence to two other blocks fixed on the inner part of the yard, close by the mast; and from these latter the sheets lead downwards to the deck, where they may be slackened or extended at pleasure. The *top-gallant-sails* are expanded above the *top-sail*-yard in the same manner. Falconer. See SAIL.

TOP-*a-starboard* and TOP *the yard-arms*. See TOPPING.

TOPAN, in *Ornithology*, a name by which some have called the horned-beaked Indian raven, more usually known by the name of the RHINOCEROS-*avis*.

TOPARCHY,

TOPARCHY, formed from τοπος, *place*, and αρχη, *government*; a little state, or signory; consisting only of a few cities, or towns; or a petty country, governed and possessed by a *toparch*, or lord.

Judæa was anciently divided into ten *toparchies*. See Pliny, lib. v. cap. 14. and Joseph. lib. iii. cap. 2. de Bel. Jud. & lib. v. &c.

Procopius only gives the quality of *toparchy* to the kingdom of Edessa; to Abgarus, the *toparch* or lord whereof, there is a tradition, that Jesus Christ sent his picture, with a letter.

TOPAZ, a gem, or precious stone, esteemed the fourth in hardness after the diamond.

The *topaz* is transparent; its colour a beautiful yellow, or gold colour; it is very hard, and takes a fine polish; its texture is foliaceous; its form cubic, parallelipedal, or prismatic; its specific gravity from 3.46 to 4.56; it loses its colour only in a very strong heat, and of the usual fluxes it yields to only borax and microcosmic salt According to Bergman, one hundred parts of it contain forty-six of argill, thirty-nine of siliceous earth, eight of mild calcareous, and six of iron.

It is the true CHRYSOLITE of the ancients, and is found in several parts of the Indies, in Ethiopia, Arabia, Peru, and Bohemia.

It is always found in a pebble-like form; roundish or oblong, and flatted on one side, and of an irregular and uneven surface, but usually bright and of a good natural polish, unless where fouled by accidents. It is never found in a columnar or crystal-like form, notwithstanding that our dealers in gems carry on a large trade with what they call *topazes*, which are of this shape: but all these when brought to the wheel are found to be no more than common crystals, accidentally tinged to a yellow colour, as is very common for the crystals and spars to be, in and about mines, from an admixture of metalline particles; and almost all the common *topazes* worn in rings are of this false kind.

The colour of the *topaz* is ever a pure yellow; but, like the other gems, it has this in very different degrees: the finest *topazes* are of a true and exact gold-colour, and are of great splendor, but they vary from this in degree, up to the deepest saffron-colour, and down to that of the palest amber.

The oriental *topazes* are most esteemed; their colour borders on the orange: those of Peru are softer, but their colour much the same: the yellow of those of Bohemia is a little cloudy; and they are the softest of all, and their polish the coarsest; and deserve to be considered merely as rock-crystals coloured yellow, under a prismatic and hexagonal form.

Those of Madagascar were once in much esteem, but are now held good for little.

The Saxon *topaz* is found in Voigtland near Averbach, on a mountain called *Schneckenberg*: it is commonly of the colour of a light white wine, and in the form of prismatic crystals, composed of four unequal sides. It is said, that these *topazes* are not inferior to those of the East in lustre or hardness. Mr. Pott has made some curious experiments on the Saxon *topaz*. He found that the most violent fire could not melt it; and that it could not be fused with even eight times its weight of fixed alkali; but that it was vitrifiable by addition of half its weight of borax, or thrice its weight of chalk. It was also fused by calces of lead or of copper, and fusible spar, but not by nitre. M. Guetard informs us, that the *topazes* of Brasil, put in a crucible, and surrounded with ashes, lose their yellow colour and become red, and are thus transformed into rubies. Whence it may be inferred, that the colour of the *topaz* is owing to iron, which by calcination is developed and made red. The Oriental *topaz*, treated in the same manner, does not change its colour. The art of converting *topazes* into rubies is practised (say the authors of the Paris Encyclopedie) by many jewellers. Mr. Canton, in 1760, found that the Brasil *topaz* has the electrical properties of the TOURMALIN.

Tavernier mentions a *topaz*, in the possession of the great Mogul, weighing one hundred and fifty-seven carats, which cost 20300*l.* sterling: and Boetius de Boot, in his treatise of precious stones, affirms to have seen in the cabinet of the emperor Rudolphus, whose physician he was, a *topaz* above three feet long, and six inches broad. Probably, it might be some other stone a little transparent, of a *topaz* colour.

The *topaz* is easily counterfeited; and there are factitious ones, which, to the eye, do not come behind the natural ones.

To counterfeit the *topaz* in glass, see GLASS *resembling Topaz*.

To counterfeit the oriental *topaz* in paste: take crystal prepared, two ounces; ordinary minium or red lead, seven ounces; put these into a crucible luted, and bake them twenty-four hours in a potter's kiln. If the mass is not sufficiently clear and fine, cover it up again and give a second baking, and it will come out a of fine *topaz* colour. See PASTE.

If we might believe the ancients, the *topaz* has very notable virtues; but those are now in discredit. See GEM. Some say, it takes its name *topaz* from an island in the Red Sea, of the same name, where it was first found by Juba, king of Mauritania; but it was known to the Hebrews before, as appears from the 118th Psalm.

TOPE, in *Ichthyology*, an English name for a species of the squalus, according to the Artedian system, the SQUALUS *galeus* of Linnæus, distinguished from the other squali by the nostrils being placed extremely near the mouth, and by certain foramina, or apertures near the eyes. It is the fish called by the ancients γαλεος κυων, *galeus* CANIS and *canicula*.

TOPHUS, in *Medicine*, a stony or chalky concretion in any part of an animal body; as in the bladder, kidneys, &c. or in the joints.

Dr. Rutty, in his Treatise of the urinary passages, takes the stone to arise from the attraction between volatile saline particles; of which particles the stone, when viewed with a microscope, seems to be made up: he thinks the fault of these aggregates of saline particles ought generally to be supposed to begin in, or proceed from, the papillæ of the kidneys, and not from the sediment of urine in the bladder.

The reason why wine-drinkers are more subject to the stone, and other concretions, than malt or water-drinkers, he supposes to be that volatile and saline or earthy particles are contained in the wine in greater quantities than in the ale, &c. A calculus, he observes, reduced to a caput mortuum, will, upon the effusion of warm water, dissolve, and entirely mix; but in short time will again settle, and the particles thereof so closely unite or attract, as that, by repeated effusions, they cannot be brought again to dissolve. See STONE.

TOPHUS, in *Natural History*, is a species of sand-stone, called also *porus*, mostly of a grey colour; but it is also found of other colours, as whitish, brownish, &c. according to the soil in which it is imbedded. It much resembles the PUMICE in texture, being rough and brittle, and composed of a large angular grit, cemented by a very coarse terrene crystalline substance. It is too soft to strike fire with steel. It is common in Italy, and in Germany, where it is used for building, chiefly for cellars and turning arches. Da Costa's Hist. Fossils, p. 136.

TOPIARIA, in *Botany*, a name by which some authors have called the *acanthus*, or *bear's-breech*, a plant common in the gardens of the curious.

TOPIC, in *Rhetoric*, a probable argument, drawn from the several circumstances and places of a fact, &c. See ARGUMENT and LOCUS.

TOPICE, τοπικη, TOPICA, expresses the art or manner of inventing and managing all kinds of probable argumentations.

The word is formed from the Greek, τοπικος, of τοπος, *place*; its subject being the places, which Aristotle calls the *seats* of arguments.

Aristotle has written *Topics*; and Cicero a kind of comment on them, to his friend Trebatius, who, it seems, did not understand them. But the critics observe, that the *topica* of Cicero agree so little with those eight books of *Topics* which pass under the name of Aristotle, that it follows necessarily, either that Cicero was much mistaken, which is not very probable; or that the books of *Topics*, now attributed to Aristotle, are not wholly his.

Cicero defines *topica*, or *topice*, to be the art of finding arguments, *disciplina inveniendorum argumentorum*.

Rhetoric is sometimes divided into two parts; judgment, called also *dialectice*; and invention, called *topice*.

TOPICS, formed from τοπος, *place*, or TOPICAL *remedies*, in *Medicine*, are commonly used for what we otherwise call *external remedies*, *i. e.* such as are applied outwardly to some particular diseased and painful part.

Such are plasters, cataplasms, blisters, unguents, salves, collyriums, &c.

Topics are such medicines, as by the smallness and mobility of their particles, attended for the most part with gentle acrimony, are able to make their way into the substance of the parts to which they are applied, without eroding or wounding any of the solids; and thence are justly called *penetrating topics*.

It may be a question how *topics* in medicine act. It is commonly said, that this or that medicine penetrates the pores; but the ideas annexed to such expressions do not seem very distinct. Writers on this subject have seldom been at the pains to tell us what pores they mean. We have an essay on this subject in the Medic. Ess. Edinb. vol.

Vol. ii. art. 4. by Dr. Armstrong, who thinks that the effects of such medicines are not owing to their particles entering the orifices of the absorbent veins; nor to the opening of the exhalent vessels on the surface of the body by these medicines; nor will he allow the particles of penetrating *topics* to force their way through the coats of the vessels; but he supposes, that subtile medicines are conveyed by the exhalent vessels of the skin, to those parts of the smaller arteries, where the circulation is choaked by obstruction.

The gout is never cured by *topics*; they may asswage the pain for a time; but, for a cure, the source of the evil must be attacked with internals.

TOPOGRAPHY, formed from τοπος, *place*, and γραφω, *I describe*, a description or draught of some particular place, or small tract of land; as that of a city or town, manor or tenement, field, garden, house, castle, or the like; such as surveyors set out in their plots, or make draughts of, for the information and satisfaction of the proprietors.

Topography differs from CHOROGRAPHY, as a particular from a more general.

TOPPING *the lifts*, aboard a *Ship*, the same as haling the top-sail *lifts*, by slackening one of them, and pulling upon the opposite one, so as to place the yard at a greater or less obliquity with the masts. See LIFTS.

TOPPING-*lift*, in a *Ship*, a large and strong tackle, employed to suspend or top the outer end of a gaff, or of the boom of a main-sail and fore-sail; such as are used in brigs, sloops, or schooners. Falconer.

TORADOR. See BULL-*fighting*.

TORCH-*thistle*, *cereus*, in *Botany*, a species of plants belonging to the *cactus*-genus.

Mr. Miller makes a distinct genus of the *cereus*, or *torch-thistle*. The characters of which are these: it hath an oblong scaly empalement, covered with spines, and sitting upon the germen; the flower is composed of many narrow-pointed petals, which spread open like the sun's rays: it has a great number of declining stamina, inserted in the base of the petals, and terminated by oblong summits: the germen, situated under the empalement, supports a long cylindrical style, crowned with a multifid stigma, in form of a head; the germen afterward becomes an oblong succulent fruit, with a prickly skin, full of small seeds enclosed in the pulp. The upright long cereus with six angles, which are far distant, is the most common in the English gardens; it grows naturally in Surinam, whence it was brought to Holland in 1681, and thence most parts of Europe have been supplied with it. The usual time of its flowering with us is in July; but the flowers of this species are never succeeded here by fruit: nor indeed do the plants often produce their flowers. They may be preserved in a green-house, but should have no water in winter. As they naturally grow on dry rocky places, they should be planted neither in large pots nor in rich soil: the best compost for them is one third of light earth from a common, a third of sea-sand, and the other part sifted lime rubbish. The stem of this plant is twenty, thirty, or more feet high, and about five inches in diameter. See a particular description of it in Phil. Transf. N° 416.

Other species of *cereus* have been brought from the British islands of America, where they grow naturally: there is one sort, which is trained up, by the inhabitants of Barbadoes, against their houses, for the sake of its fruit, which is about the size of a bergamot pear, and of a very delicious flavour.

The propagation of all the kinds of this remarkable plant is by cuttings, which must be laid in a dry place ten days or a fortnight before they are planted, or if it be three weeks, there is less danger of their miscarrying. They are to be planted in small pots, filled with the mixture of earth above described, laying some stones at the bottoms of the pots to drain off the moisture. The pots are then to be placed in a gentle bed of tanner's bark, and once a week are to have a gentle watering; this is best done in June, or July: toward the middle of August, they must have air given them by degrees, and at the end of September they must be removed into the stove or green-house, where they are to remain the winter. They should always have a dry situation, and should never be exposed to the open air even in the midst of summer. When the top of an old plant has been cut off for propagating, it always throws out several young shoots from its angles, which may all be easily propagated in the same manner, and it will continue to do this in such a manner, that there will be a continual supply even from one stock. They may be brought in small pieces from the West Indies packed up in straw, and will grow when planted here, as well as if cuttings from our own plants. Miller's Gardener's Dict.

TORCH, *tæda*, a sort of luminary, properly, a stick of fir, or other resinous and combustible matter, as pine, linden, &c. more or less thick, and long; encompassed at one end with six wax candles, which, being lighted, yield a kind of gloomy brightness.

Torches are used in some church-ceremonies, particularly at the processions of the holy sacrament in the Romish church, and at the interments of the poorer people.

Formerly they were used at the funerals of those of the first rank; but tapers and flambeaux are now introduced in their stead; and frequently also called by their name.

TORCHENES, in the *Manege*, a long stick with a hole at the end of it, through which a strap of leather is run, the two ends of which being tied together, serve to straiten and closely tie up a horse's nose as long as the stick is stayed upon the halter or snaffle. This is done to keep the horse from being unruly, when he is dressed, or upon any other occasion.

TORCULAR, or TORCULARIS, among *Surgeons*, a contrivance for stopping bleedings in amputations.

TORCULAR *Herophili*, in *Anatomy*, a name given to a part in the duplicatures of the dura mater; formed of a concourse of a branch of the longitudinal sinus with the lateral sinuses.

It has its name *torcular* from its resembling a press, or screw: *Herophili* is added from the discoverer's name.

TORDINO, in *Ornithology*, a name by which the Venetians call a bird of the lark kind common in their markets, and called by authors SPINOLETTA.

TORDO *marino*, in *Ornithology*, the name of a bird of the starling kind, called also the *codirosso maggiore*, or *ruticilla major*, and by the Austrians the *stein-reitling*. Aldrovandus has named it the *merula saxatilis*, or *rock-blackbird*. It is of the size of our starling, and much resembles it in figure; its breast is greyish, and has a black transverse streak, and behind that the whole is of a yellowish hue; its head and back are of a blackish hue with some slight variegations of grey, from the tip of the feathers being of that colour; the tail is long and of a reddish orange colour, and the under-feathers of the wings are of the same hue; the females are of a less elegant colour than the males, viz. a mouse-colour variegated with white on the back, and ash-colour on the belly; what is yellow in the male birds is also very pale in the females; it is not uncommon in Germany, and may be taught like the starling to imitate the human voice. Ray.

TORDYLIUM, in *Botany*. See HART-*wort*.

TORGOCH, in *Ichthyology*. See CHARR.

TORE, TORUS, in *Architecture*, a large round moulding used in the bases of columns.

Daviler derives the word from the Greek, τορος, *a cable*, whereof it bears some resemblance; or from the Latin *torus*, *a bed*, as being supposed to represent the edge of a bed or quilt, swelled out with the weight of the incumbent column.

The *tore* is also called *gros baton*, and *tondin*. It is the bigness that distinguishes the *torus* from the astragal.

The bases of Tuscan and Doric columns have but one *tore*, which is between the plinth and the listel. In the Attic base there are two; the *upper*, which is the smaller; and an *under*, or bigger. See *Tab. Architect. fig.* 3. & *fig.* 24. & *fig.* 27.

TORENIA, in *Botany*, a genus of the *didynamia angiospermia* class. Its characters are: that the calyx is bilabiated, the upper lip being formed with three points; and the capsule bilocular. There is one species.

TOREUMATOGRAPHY, a Greek term, signifying the knowledge, or rather description, of ancient sculptures, and basso-relievos.

The invention of *toreumatography* is owing to Phidias, and its perfection to Polycletus: the Italian gravers have let a great deal of light into the *toreumatography*.

TOREUTICE, τορευτικη, formed from the Greek, τορνος, *lath*, of τορεω, *terebro*, *perforo*, that part of sculpture called *turning*.

TORGAW, *convocation of*. See *Form of* CONCORD.

TORIES, or TORYS, a party or faction in England, opposite to the whigs.

These two celebrated parties, which have so long divided our country, will make a considerable article in the English history, nothing inferior, in many respects, to that of the Guelfs and Gibellins. The division has gone so deep, that it is presumed, no Englishman, who has any concern or principles at all, but inclines more to one side than the other: for which reason, we shall borrow our account of them from the mouths of foreigners, who may be supposed more impartial; and particularly from M. de Cize, a French officer, some time in the service of England, who has written the History of Whiggism and Toryism, printed at Leipsic, anno 1717. and M. Rapin, whose Dissertation sur les Weighs & les Torys, printed at the Hague the same year, is well known; and reprinted at the close of the second volume of his History of England, fol. ed.

During the unhappy war, which brought king Charles I.

to the scaffold, the adherents of that king were first called *cavaliers*, and those of the parliament *round-heads*; which two names were afterwards changed into those of *tories* and *whigs*, on the following occasion.

A kind of robbers or banditti, in Ireland, who kept on the mountains, or in the islands formed by the vast bogs of that country, being called *tories*; a name they still bear indifferently with that of rapparees; the king's enemies accusing him of favouring the rebellion in Ireland, which broke out about that time, gave his partisans the name of *tories*; and, on the other hand, the *tories*, to be even with their enemies, who were closely leagued with the Scots, gave them the name of WHIGS, who living in the fields and woods, fed much on milk; *whig* signifying *whey*. But for a more probable etymology of *whig*, see WHIGS.

The cavaliers, or *tories*, had then principally in view the political interests of the king, the crown, and the church of England: and the round-heads, or whigs, proposed chiefly the maintaining of the rights and interests of the people, and of protestantism. Nor have the two factions yet lost their first views; though their first names, *cavalier* and *round-head*, be now entirely disused.

This is the most popular account; and yet it is certain the names *whig* and *tory* were but little known till about the middle of the reign of king Charles II. M. de Cize relates, that it was in the year 1678, that the whole nation was first observed to be divided into *whigs* and *tories*; and that on occasion of the famous deposition of Titus Oates, who accused the catholics of having conspired against the king, and the state—the appellation *whig* was given to such as believed the plot real; and *tory* to those who held it fictitious.

We should here confine ourselves to the *tories*; and for what regards the *whigs*, refer to that article; but since, by comparing and confronting the two parties together, both the one and the other will appear in the stronger light, it would be imprudent to separate them, so that we rather choose to say the less under the word *whigs*, and refer thence hither.

The factions we are speaking of, may be considered either with regard to the *state*, or to *religion*. The *state tories* are either violent or moderate: the first would have the sovereign to be absolute in England, as in other countries, and his will to be a law. This party, which is not very numerous, has yet been considerable; 1. On account of its leaders, who have been lords of the first rank, and generally ministers and favourites. 2. In that, being thus in the ministry, it engaged the church *tories* to maintain stiffly the doctrine of passive obedience. 3. Because they have been frequently supported by the crown.

The moderate *tories* would not suffer the king to lose any of his prerogatives: but neither would they sacrifice those of the people.

The *state whigs*, again, are republican or moderate: the first, according to our author, are the remains of the long parliament, who took in hand to change the monarchy into a commonwealth: these make so slender a figure, that they only serve to strengthen the party of the other *whigs*. The *tories* would persuade the world, that all the *whigs* are of this kind; as the *whigs* would make us believe, that all the *tories* are violent.

The moderate *state whigs* are much in the same sentiments as the moderate *tories*; and desire the government may be maintained on its ancient foundation, and that the king may be reduced to an incapacity of abusing his power, by leaving him the possession of his just rights; all the difference is, that the moderate *tories* lean a little more to the side of the king, and the moderate *whigs* to that of the parliament and people.

Before we consider our two parties with regard to religion, it must be observed, that the Reformation, as carried on to a greater or less length, divided the English into episcopalians, and presbyterians or puritans: the first contended, that the episcopal jurisdiction should be continued on the same footing, and the church in the same form, as before the Reformation: the latter maintained, that all ministers or priests had equal authority; and that the church ought to be governed by presbyteries, or consistories of priests and lay-elders. See PURITANS.

After long disputes, the more moderate of each party relaxed a little of their stiffness; and thus formed two branches of moderate *whigs*, and moderate *tories*, with regard to religion; but there were others who kept to their principles with inconceivable firmness: and these constituted two branches of rigid episcopalians and presbyterians, comprised under the general names of *whigs* and *tories*; in regard the first join the *tories*, and the latter the *whigs*.

The former consisted of rigid churchmen, who were against the least change in the discipline of the church, while the more moderate among the ecclesiastical *tories* were less scrupulous and obstinate, and may be called the low or moderate churchmen. See *High* CHURCH and NON-JURORS.

The latter were the rigid presbyterians, who would be contented with nothing less than the destruction of the hierarchy, while the more moderate among them would have been satisfied with much less, and put up, says Mr. Rapin, with a bare toleration.

From what has been observed, we may conclude, that as the names *tory* and *whig* have a regard to two different objects, they are equivocal, and of consequence ought never to be applied without expressing in which sense it is done—for the same person may be, in different respects, both *whig* and *tory*.

For the rest, the general motives that have formed and kept up the two parties, appear, in the main, to be no other than the private motives of particular persons: self-interest is the primum mobile of their actions; ever since the rise of these factions, each has struggled earnestly to get the advantage over the other; inasmuch as from such superiority accrue places, and honours, and promotions, &c. which the prevailing party usually distributes among its own members, exclusive of the contrary party.

There are, however, men belonging to each of these parties, though the distinction is almost worn out, who act from conviction: some of whom are for the extention, and others for the limitation of royal prerogative, with a view to the good of the state, as their principles lead them to form different notions of the most effectual method of promoting it. The names, it is true, are almost sunk into oblivion; but the operation of the distinguishing sentiments of *whigs* and *tories* is discoverable in every period of the English history: and the true interest of a limited monarchy, always inseparably connected with the rights of the people, renders the distinction of importance, and should prevent its ever being disregarded.

It is with the *whigs* and *tories* on those points, which have discriminated the two parties, says Dr. Gregory Sharpe, as it is with all other sects of men under the agitation of hope and fear, ambition and interest; they tighten or relax their principles as suits best their convenience. When the *tories* have had the exercise of the powers of the prerogative, they have been eager to extend those powers; when the edge has been turned against them, they have been as eager in the defence of popular liberty: and in like manner the *whigs*, who withstood the storm, have melted in the sun-shine, so that in point of court-complaisance, the administrations of the one have differed very little from those of the other. Holberg's Int. to Universal History, by Sharpe, p. 260.

As to the characters commonly attributed to the *whigs* and *tories*; the *tories*, says M. Rapin, appear fierce and haughty: they treat the *whigs* with the greatest contempt, and even sometimes with rigour, when they have the advantage over them: they are very hot and vehement, and proceed with a rapidity which yet is not always the effect of heat and transport, but has its foundation sometimes in good policy: they are very subject to change their principles, as their party prevails, or is humbled.

If the rigid presbyterians prevailed in the *whig* party, it would not be less hot and zealous than that of the *tories*; but it is said they have not the direction thereof; which gives room to affirm, that those at the head of the *whig* party are much more moderate than the chiefs of the *tories*: add, that they usually conduct themselves on fixed principles, proceed to their end gradually, and without violence; and their slowness is not less founded on good policy, than the hastiness and precipitation of the *tories*. Thus much, says our author, may be said to the advantage of the moderate *whigs*, that, in the general, they maintain a good cause, viz. the constitution of the government as by law established.

TORMENTIL, *tormentilla*, in *Botany*, a genus of the *icosandria polygynia* class. Its characters are these: the flower has a plain empalement of one leaf, divided into eight segments at the top; it has four oval heart-shaped petals, whose tails are inserted in the empalement; and many awl-shaped stamina also inserted in the empalement, terminated by single summits; it has eight small germina collected in a head, which have slender styles the length of the germina, inserted in their sides, and crowned by obtuse stigmas; the germina turn to a fruit, containing many small naked roundish seeds included in the empalement. There are two species.

The common *tormentil*, with an erect stalk, grows on dry pastures and commons in most parts of England; and

and the roots have been frequently uſed for tanning leather, in places where oak bark is ſcarce.

It is a ſmall trailing plant, and the leaves grow about ſeven at a joint; the flowers are ſmall but of a lively yellow; the root is generally crooked and knotty, brown or blackiſh without and within, of a very aſtringent taſte, and to be choſen from the druggiſts large, plump, and freſh dried. It is a cordial and a very valuable aſtringent; it makes a very good addition to the common white drink, changing it to a red colour and increaſing its virtue. It gives out its aſtringency both to water and rectified ſpirit, but moſt perfectly to the latter: the extracts, particularly the ſpirituous, obtained by inſpiſſation, are intenſely ſtyptic. It is generally given in decoction: an ounce and a half of the powdered root may be boiled in three pints of water to a quart, adding, toward the end of the boiling, a dram of cinnamon: of the ſtrained liquor, ſweetened with an ounce of any agreeable ſyrup, two ounces or more may be taken four or five times a day. Lewis.

TORMINA, in *Medicine*, a term ſometimes uſed to expreſs pains in the general; but more particularly a ſpecies of pain, called *tormina ventris*, or *alvi*, in Engliſh, the GRIPES.

Young children are very often troubled with gripes; it is upon this account, that nurſes, in order to prevent or remedy them, uſually mix with their ſpoon-meats, a little brandy, or ſome carminative ſeeds, as caraway-ſeeds, &c.

Some children breed their teeth with violent gripes, which are apt to bring on convulſions of the bowels. See *Diſtemperatures of* INFANTS.

In adults, the dry gripes are uſually cured by the exhibition of warm cathartics, ſuch as tincture of hiera picra, elixir ſalutis, tincture of rhubarb, &c. with the aſſiſtance of opiates.

TORNADO, or TURNADO, a ſudden and violent guſt of wind riſing ſuddenly from the ſhore, and afterwards veering round all points of the compaſs like a hurricane; very frequent on the coaſt of Guinea. See WHIRLWIND.

TORNESOL. See TURNESOL.

TORPEDO, *cramp-fiſh*, or *electric ray*, the RAJA *torpedo* of Linnæus, in *Ichthyology*, a ſea-fiſh, famed both among the ancient and modern naturaliſts, for a remarkable numbneſs wherewith it ſtrikes the arm of ſuch as touch it.

The *torpedo* is a flat fiſh, much of the figure of the thornback; its greateſt breadth is generally about two-thirds of its length, though the proportion varies in thoſe of different places; the weight of one, that meaſured four feet in length and two feet and a half in breadth, was fifty-three pounds avoirdupois; they are found, however, of different ſizes, uſually from ten to ſixty, ſeventy, and even eighty pounds weight on our own ſhores; the tail is pretty thick and round; the caudal fin broad and abrupt; the head and body indiſtinct, but nearly round; thick in the middle and attenuating to extreme thinneſs on the edges; below the body, the ventral fins form on each ſide a quarter of a circle; the two dorſal fins are placed on the trunk of the tail; the eyes are ſmall and placed near each other; behind each is a round ſpiracle, with ſix ſmall cutaneous rays on their inner circumference; the mouth ſmall, and teeth minute and ſpicular; there are five openings on the gills, as in others of the ſame genus; the ſkin is every where ſmooth, cinereous brown above, and white beneath. See *Tab.* V. *Fiſh*, N° 59.

This ſpecies is found in the Mediterranean, on the Atlantic coaſt of France, in the Engliſh ſeas, particularly at Torbay, near Waterford on the coaſt of Ireland, and in other places. See Anſon's Voyage, p. 266.

It is generally taken with the trawl, but an inſtance occurs of its taking a bait, which vindicates the fine account which Oppian has left us of this fiſh. It commonly lies in water about the depth of forty fathoms, in company with the congenerous rays; but its more frequent and favourite ſituation is the ſand, in which it will bury itſelf by flapping its extremities, and throwing the ſand in a light ſhower over its back. In this ſituation the *torpedo* gives his moſt forcible ſhock, which throws down the aſtoniſhed paſſenger, who inadvertently treads upon him. The food of the *torpedo* is fiſh, and they probably ſtupify their prey by the ſhock they give them; and yet the ſea-leech and common ſea-crab will venture to annoy them.

This fiſh is ſo far amphibious as to live in air twenty-four hours, and but little longer in freſh water. The beſt method of preſerving them is in well-boats kept in ſalt water, and not put into much motion.

Rondelet ſpeaks unfavourably of the *torpedo* as food, and tells us, that at Venice the prefect of health forbids it to be ſold in the market; but in deeming it wholeſome food we have the ſanction of Hippocrates and Galen, and it is ſold in the markets of France. The electrical organs, indeed, which make one half of the animal, though wholeſome, are an inſipid mucilage; but its muſcular part is at leaſt, as palatable as the fleſh of the other rays: among theſe the old and overgrown are always in little requeſt.

The *torpedo* brings forth its young at the autumnal equinox, as affirmed by Ariſtotle, though queſtioned by Lorenzini. In one diſſected at La Rochelle, on the tenth of September, were found in the matrices ſeveral of the foetuſes quite formed, and nine eggs in no ſtate of forwardneſs; ſuperfetation ſeems to be, therefore, a property of this fiſh: the eggs ſeemed to be deſtined for the ſpring brood, as they produce about the vernal as well as the autumnal equinox. There may be alſo another production at midſummer, but it principally takes place at the two equinoxes.

Upon touching this fiſh with the finger, it frequently, though not always, happens, that the perſon feels an unuſual painful numbneſs, which ſuddenly ſeizes the arm up to the elbow, and ſometimes to the very ſhoulder and head.

The pain is of a very particular ſpecies, and is not to be deſcribed by any words; yet meſſieurs Lorenzini, Borelli, Redi, and Reaumur, who all felt it ſeverely, obſerve it to bear ſome reſemblance to that painful ſenſation felt in the arm, upon ſtriking the elbow violently againſt a hard body: though M. Reaumur aſſures us, this gives but a very faint idea of it.

Its chief force is at the inſtant it begins; it laſts but a few moments, and then vaniſhes entirely. If a man do not actually touch the *torpedo*, how near ſoever he holds his hand, he feels nothing: if he touch it with a ſtick, he feels a faint effect: if he touch it through the interpoſition of any pretty thin body, the numbneſs is felt very conſiderably; if the hand be preſſed very ſtrong againſt it, the numbneſs is the leſs, but ſtill ſtrong enough to oblige a man ſpeedily to let go.

Oppian affirms, that it will benumb the aſtoniſhed fiſherman, even through the whole length of line and rod. See the paſſage cited and tranſlated by Pennant, Brit. Zool. vol. iii. p. 39.

But great as are the powers of this fiſh when in vigour, they are impaired as it declines in ſtrength, and totally ceaſe when it expires. The ſhocks in water are apprehended to be near a fourth of the force of thoſe at the ſurface of the water, and not much more than a fourth of thoſe entirely in air. This ſtrange power, with which the *torpedo* is endued, and which we ſhall preſently explain, ſeems to have a double uſe: the one, when it is exerted as a means of defence againſt voracious fiſh, who are by a touch deprived of all power of ſeizing their prey; the other is well explained by Pliny, who tells us, that by the ſame powers it attains its end with reſpect to thoſe fiſh, which it wiſhes to enſnare; for, concealing itſelf in the mud, and benumbing the fiſh that are careleſsly ſwimming about, it makes a ready prey of them.

M. Reaumur, having no fiſhes alive to examine what the *torpedo* would do to them, ſhut up a drake in water with it, and after ſome time it was taken out dead.

We ſhall now proceed to give a brief recital of the different theories that have been adopted in order to account for the extraordinary effects of the *torpedo*. This fiſh was early known to the Greeks; it is mentioned, as an eſculent fiſh, by Hippocrates, under the name *ναρκη*, which ſhews that the ancients had ſome knowledge of its torporific qualities. Plato alſo was acquainted with them, as appears by the humorous compariſon of Socrates to that animal, which he puts into the mouth of Menon. Ariſtotle likewiſe treats of the benumbing or ſtupefying qualities of this fiſh, though he ſeems to have no idea of their being communicated by the intervention of a ſtick, rope, or water.

Theophraſtus, according to Athenæus, obſerved that the *torpedo* conveyed the benumbing ſenſation through ſticks and ſpears into the hands of the fiſhermen that held them. Diphilus, of Laodicea, takes notice that the torpor was occaſioned, not by the whole, but by certain parts of the body of this fiſh: and Hero of Alexandria mentions it as emitting effluvia through braſs and iron, and other ſolid bodies.

Pliny's account, though partly true, is mingled with the marvellous and falſe. Plutarch is more full and juſt; for he repreſents the *torpedo* as not only benumbing all that touch it, but ſtriking a numbneſs through the net into the hands of thoſe who poured water upon it, if it happened to be laid on the ground alive. He adds, that whilſt the *torpedo* ſwims round his prey, he emits certain effluvia like darts, that firſt affect the water, and then

the fishes in it, which are thus disabled from defending themselves or escaping.

Before the days of Galen the *torpedo* was placed alive to parts affected, and particularly for the cure of an obstinate head-ach, as appears from Scribonius Largus, who lived under Claudian, and from Dioscorides, who flourished soon after. Galen conceived that the *torpedo* acted by a frigorific principle, for as cold occasions a numbness in an animated body, so does the shock given by that animal. Paulus of Ægina, one of the Galenic school, recommends the oil of the dead fish for tempering the hot humour of the gout, and for other ailments that required cooling applications.

Such are the unsatisfactory accounts of the philosophers and physicians of antiquity.

The Abyssinians, it is said, use *torpedos* for the cure of fevers, by tying down the patient to a table, and applying the fish successively upon all his members, which puts him to cruel torment, but effectually removes his disease. Bellonius assures us, that our own *torpedos* applied to the soals of the feet, have proved successful against fevers.

Oppian, like Diphilus, distinguishes the parts where the powers of this fish peculiarly reside; these he calls λαγονες, the flanks, from which he imagined the animal had a faculty of darting upon other fishes certain substances, called by a name κερκιδες, the meaning of which is obscure. In the sixteenth century, some members of the Academia del Cimento availed themselves of their vicinity to the sea to make experiments on the *torpedo*. Redi began, and was afterwards assisted by Borelli, and Steno the Dane; and Lorenzini, his scholar, engaged in the same pursuit, and published a curious treatise upon the subject. Redi, having endeavoured to distinguish between the real properties of the *torpedo*, and those erroneously ascribed to it, proceeded to the anatomy of it; and was the first who with any accuracy described those crooked substances lying on each side of the spine, near the head, which he considered as muscles (from thence named *musculi falcati*) that projected, according to him, certain effluvia, occasioning the sensation of numbness more or less, as the animal was excited to put these organs into action. This hypothesis of the transmission of effluvia was immediately embraced by Lorenzini, and afterwards by Claude Perrault. Borelli, not admitting the emission of benumbing particles, referred the sensation produced by this fish to a certain brisk undulation of the parts touched, which the animal could excite at will.

In 1714, M. Reaumur, being on the coast of Poitou, took an opportunity of making some experiments on the *torpedo*, which, with the result, he communicated to the Royal Academy of Sciences at Paris. His hypothesis, which was generally received by the ingenious naturalists over all Europe, is not very different from that of Borelli; for instead of the undefined vibrating parts of the latter, M. Reaumur substituted muscles (the *musculi falcati* of Redi and Lorenzini) which, by the vivacity of their action, impressed upon the hand, that touched these parts, a sensation of numbness, owing to the stoppage of the progression of the nervous fluid, or a repulsion of the same. But he denied, that this impression of numbness could be communicated through water, a net, or any other soft and yielding substance; nay, through a stick, except a very short one; whereas, it is certain, that the shocks of the *torpedo* are not less conducted through such media, than those from a charged electrical phial.

We have been lately furnished, by the experiments and observations of John Walsh, esq. with a theory, much more plausible and just than any above recited, which considers the electric fluid as the efficient cause of the amazing qualities of the *torpedo*. We shall be led to a brief account of the facts on which this theory is founded by the following preliminary remarks.

Soon after the discovery of the Leyden *phial*, the celebrated professor Allemand applied to M. 'sGravesande, governor of Essequibo, for an account of a fish in Surinam, resembling a conger-eel, and possessing properties similar to those of the *torpedo*; this account was received in 1754, and published in the second volume of the transactions of the Society at Haerlem. From this account it appears, that the shocks of the fish, which were so violent, when the fish was strong and lively, as to throw a person who touched it to the ground, were like those of the electrical phial, but unaccompanied with sparks of fire; and that the fish was a species of the *gymnotus* of Artedi. In the sixth volume of the same work, we have a more ample relation of the exertions of this animal by M. Vander Lott, dated from Rio Essequibo, in 1761. M. Adanson, about the same time with the discovery by M. 'sGravesande in America, met with the same, or a similar fish in the river of Senegal in Africa. The earliest account we have of this kind of eel is by M. Richer, recorded by M. du Hamel, in his History of the Royal Academy of Sciences for 1677. In the island of Cayenne, says M. du Hamel, there is a fish, not unlike a conger-eel, which, touched with the finger, or even with the end of a stick, affects the arm with a numbness, and the head with giddiness, and the eyes with a dimness of sight, which M. Richer had himself felt upon making the experiment. See Gymnotus.

We are indebted to Mr. Walsh for not only the first, but for a numerous series of experiments on the *torpedo*, in order to ascertain its electrical nature; together with some correct and elegant drawings of the entire animal, and of some of its principal organs, that appeared upon dissection. These experiments were made in the year 1772, partly at the isle of Rhé, and partly at Rochelle, in the presence of the members of the Royal Academy of Sciences at that place. They were conducted in a scientific manner, and properly diversified, and the result of them satisfactorily establishes the *torpedo* in the rank of an electrician, furnished with a power over the electric matter; by means of which, he can, without any foreign machinery, and almost in an instantaneous manner, collect, condense, and at his will dispense it to neighbouring bodies, through any of those substances that are known to be conductors of the electric fluid. The sensations occasioned by the *torpedo* and Leyden phial, in the human frame, are precisely similar; not only the shock, but the numbing sensation sometimes given by the animal, may be exactly imitated with the phial, by means of Lane's electrometer; the regulating rod of which, to produce the latter effect, must be brought almost into contact with the prime conductor which joins the phial. The first experiment of Mr. Walsh discovered the electrical quality of the *torpedo*, by his conveying its effect through the same conductors with electricity, such as metals, water, and animal fluids, and by intercepting it by the same non-conductors, as glass and sealing-wax. Besides, one of the most brilliant of his discoveries was, that this animal not only could accumulate in one part a large quantity of electric matter, but was furnished with a certain organization, disposed in the manner of the Leyden phial: thus, while one surface of the electric part (e. g. that on the back) was charged with this matter, or in a positive state, the other surface (that on the belly) was deprived of it, or in a negative state; so that the equilibrium could be restored, by making a communication between the two surfaces by water, the fluids of the human body or metals, in the same manner as by forming a circuit between the inside and outside surfaces of the Leyden phial. A living *torpedo* was laid on a table, upon a wet napkin; round another table stood five persons insulated; and two brass wires, each thirteen feet long, were suspended from the ceiling by silken strings. One of the wires rested by one end upon the wet napkin, the other end was immersed in a bason full of water, placed on a second table, on which stood four other basons full of water. The first person put a finger of one hand into the water in which the wire was immersed, and a finger of the other hand into the second; and so on successively till all the five persons communicated with one another by the water in the basons. In the last bason one end of the second wire was dipped, and with the other end Mr. Walsh touched the back of the *torpedo*, when the five persons felt a shock, differing in nothing from that of the Leyden experiment, except in being weaker. Mr. Walsh, who was not in the circuit, was not affected. This experiment was successfully repeated several times, even with eight persons. From this experiment it is evident, that the action of the *torpedo* is communicated through metals and water, or, in general, through the same media that transmit the electrical concussion. It follows, likewise, that the upper and under parts of the animal, like the upper and under surfaces of an electrified plate of glass, are in different states; for a person who touches only the upper or the under surface of the electric organs, will not receive the shock of the *torpedo*. This action evidently depends on the will of the animal, who, however, scarce exhibits any other sensible motion or effort at the time of exerting it, than a depression or winking of his eyes. The same motion is observed likewise to accompany his fruitless attempts to transmit a shock through non-conductors. The stock of electrical matter which the *torpedo* possesses appears to be very considerable: a *torpedo*, when insulated, has given to Mr. Walsh, insulated likewise, no less than fifty shocks in the space of a minute and a half.

Such are the operations performed by the *torpedo* in air. When a large fish, very liberal of his shocks, was held in water, with one hand on his breast and another on his back, he gave the operator shocks of the same kind as before

before, but about one fourth of the ſtrength of thoſe given in air. At the very inſtant of raiſing him out of the water, he conſtantly gave a very violent ſhock, and another, nearly as violent, when his lower ſurface firſt touched the water on dipping him into it. On briſkly and alternately plunging him a foot deep into water, and raiſing him an equal height into air, beſides one or two ſhocks which he gave during the ſhort time he was wholly in the water, and thoſe which he gave at the ſurface, he conſtantly gave at leaſt two when he was wholly in air: ſo that Mr. Walſh eſtimates that he gave above one hundred ſhocks during the minute in which the experiment was performed. The concluſions drawn from Mr. Walſh's experiments were farther confirmed by ſome experiments made on the *torpedo* at Leghorn, by Dr. Ingenhouz in 1773.

Mr. Walſh, obſerves, that the electricity of the *torpedo* reſides in thoſe parts that are called his electric organs; the parts bordering on theſe acting, more or leſs, as conductors, either through their ſubſtance, or by their ſuperficies: and of theſe, the parts which conduct the beſt are the two great lateral fins bounding the organs outwardly, and the ſpace lying between the two organs inwardly. All below the double tranſverſe cartilages ſcarcely conduct at all, unleſs when the fiſh is juſt taken out of water and is ſtill wet, the mucus, with which he is lubricated, ſhewing itſelf, as it dries, to be of an inſulating nature; and the organs themſelves, when uncharged, appeared to be, not interiorly but rather exteriorly, as Mr. Walſh ſuppoſes, conductors of a ſhock. We are indebted to Mr. John Hunter for an accurate anatomical deſcription of the *torpedo*, accompanied with two excellent drawings, who has thus ſupplied us with a valuable addition to the anatomical examination of this animal by Redi, Steno, and Lorenzini. From his account we learn, that the electric organs are placed on each ſide of the cranium and gills, reaching from thence to the ſemicircular cartilages of each great fin, and extending longitudinally from the anterior extremity of the animal to the tranſverſe cartilage, which divides the thorax from the abdomen; and within theſe limits they occupy the whole ſpace between the ſkin of the upper and under ſurfaces, being thickeſt at the edges near the centre of the fiſh, and becoming gradually thinner towards the extremities. Each organ, at its inner longitudinal edge, is unequally hollowed, and the outer longitudinal edge is a convex elliptical curve. The anterior extremity of each makes the ſection of a ſmall circle, and the poſterior extremity makes nearly a right angle with the inner edge. Each organ is attached to the ſurrounding parts by a cellular membrane, and alſo by ſhort and ſtrong tendinous fibres, which paſs directly acroſs from its outer edge to the ſemicircular cartilages. Each organ conſiſts of a congeries of columns, irregularly hexagonal, or pentagonal, or quadrangular, placed parallel to each other, divided by horizontal partitions, and extending from the breaſt, on both ſides, perpendicularly upwards, to the back of the animal. Mr. Hunter, in the diſſection of theſe electric organs, obſerved an uncommonly liberal diſtribution of nerves to theſe parts; ramifying in every direction between the columns, and ſending ſmall branches upon each of the numerous partitions into which every one of them is divided. Nerves are given to parts either for ſenſation or action; but the extraordinary number and magnitude of theſe nerves, which do not ſeem neceſſary for any ſenſation that can be ſuppoſed to belong to the electric organs, and which cannot be thought ſubſervient to muſcular action, as they exceed the proportion allowed to the moſt active animals, induce him to conclude, that they are in ſome manner concerned in the formation, collection, or management of the electric fluid.

Although Mr. Walſh's experiments leave little room to doubt, that the ſhock given by the *torpedo* is produced by the ſame agent that gives the ſhock in an electrical exploſion; yet there are ſome circumſtances which it is difficult to reconcile to the ſuppoſition that it is produced by the electric fluid. One of theſe difficulties is, that the fiſh is able to give a ſhock when he is in the water, and conſequently ſurrounded by a medium, through which the electric fluid is known to be tranſmitted with the greateſt facility. It has likewiſe been difficult to conceive why the ſhock of the *torpedo*, ſuppoſing it to be produced by the electric fluid, ſhould not, like that of an electrified jar, be accompanied with the appearance of light or ſparks, or ſhould not exhibit ſome ſigns of attraction or repulſion. But from Mr. Walſh's experiments it appears, that no light could poſſibly accompany the ſhock of the *torpedo*, becauſe this ſhock could never be made to paſs through the leaſt ſenſible ſpace of air, or the ſmalleſt interruption made in the circuit; not even through the imperceptible interval between the links of a ſlender braſs chain, apparently in contact with each other, nor over an almoſt imperceptible interval or ſlit formed by cutting through a ſlip of tin foil paſted on ſealing-wax, which conſtituted part of the circuit; nor are the moſt delicate pith-balls, or other light bodies, in what manner ſo ever applied, in the leaſt degree affected, at the time of the ſhock. Mr. Walſh obſerves that, with reſpect to the pith-balls, it is not ſurpriſing that no motion could be diſcovered in them, as all his experiments fully ſhewed that here was no gradual accumulation of the electric fluid, as in the caſe of charged glaſs; but that it was collected or condenſed in the very inſtant of the exploſion, by a ſudden energy of the animal. He alſo explains this and the other differences between the phenomena of the Leyden phial, and of the *torpedo*, or the abſence of light and ſound, in the experiments made with the latter, by the following conſiderations.

In a large fiſh, the number of columns above mentioned, contained in one electric organ, was found to be no leſs than eleven hundred and eighty-two. This immenſe collection of cylinders Mr. Walſh conſiders as ſomewhat analogous to a large number of jars in an electric battery, and as containing a very large area in conſequence of the great number and extenſive ſurface of the columns. Now it is known, from experiments made with artificial electricity, that though the electric matter violently condenſed, or crouded into a very ſmall phial highly charged, is capable of forcing a paſſage through an inch of air, and that it will afford, in a very conſpicuous manner, the phenomena of light, ſound, attraction, and repulſion; yet if the quantity, thus condenſed, be expanded and rarefied, by communicating it to, or dividing it amongſt a large number of jars, whoſe coated ſurfaces conſtitute a ſpace, e. g. four hundred times larger than that of the phial; this ſame quantity of electric matter, thus dilated, will now yield only the fainter, or, if they may be ſo called, the negative phenomena of the *torpedo*. It will not now be capable of paſſing over the one hundredth part of that inch of air, which, in its condenſed ſtate, it before ſprung through with caſe; it will not now be able to jump over the little gap made in its track by the interſection of the tin-foil; no ſpark, ſound, or attraction of light bodies, will now be perceived: and yet this portion of electric matter, in this dilated ſtate, and with its elaſticity thus diminiſhed, will, like that of the *torpedo*, to effect its equilibrium, run through a conſiderable circuit of different conductors, perfectly continuous, and will communicate a ſenſible ſhock.

The hon. Mr. Cavendiſh has endeavoured to remove the difficulties above ſtated, firſt by ſome ingenious reaſonings *a priori*, and afterwards by others drawn from the phenomena preſented by an artificial *torpedo* which he conſtructed, and by means of which he has imitated the effects produced by the living animal. With reſpect to the difficulty of conceiving how the *torpedo* can give a ſhock in water, he obſerves that thoſe electricians are miſtaken, who ſuppoſe that the electric fluid will only paſs along the ſhorteſt and beſt conductors. When different circuits are made (e. g. by means of iron wire, and the human body) between the poſitive and negative ſides of a charged jar, ſome parts of the electric fluid will paſs along each of them; though the greater quantity will paſs through thoſe in which it meets with the leaſt reſiſtance. Thus, a perſon may receive a part of the ſhock given by the *torpedo* in water, by holding one hand on the lower ſurface of an electric organ, and the other on the upper, or by applying his hands to other parts of the fiſh, or by dipping them into the water, ſo that one hand is nearer to the upper ſurface of the electric organs than the other; and yet the greater part of the ſhock or charge may paſs at the ſame time in all directions over the ſurface of the fiſh, or through the ſubſtance of its body, or through the water contiguous to it. With reſpect to the other difficulties, he ſolves them by reaſonings ſimilar to thoſe urged by Mr. Walſh, and by concurring experiments. Mr. Cavendiſh has confirmed theſe reaſonings by means of his artificial *torpedo*, which is a piece of wood A B CFGDE (*Tab.* V. *Electricity*, *fig.* 45.), of which the part A B C D E is cut into the ſhape of the *torpedo*, and is 16¾ inches long from A to D, and 10½ inches broad from B to E; the part C F G D is forty inches long, and ſerves for a handle. M N *nm* is a glaſs tube let into a groove cut in the wood: W *w* is a piece of wire paſſing through the glaſs tube, and ſoldered at W to a thin piece of pewter, R *r*, lying flat on the wood, and intended to repreſent the upper ſurface of the electric organs: on the other ſide of the wood there is placed ſuch another glaſs tube, with a wire paſſing through it, and ſoldered to another piece of pewter like R *r*, intended to repreſent the lower ſurface of thoſe organs. The whole part A B C D E is covered with a piece of ſheepſkin leather. In making experiments with this apparatus,

ratus, after thoroughly soaking it in water of the saltness of the sea, made by dissolving one part of common salt in thirty of water, the end of one of the wires is fastened to the negative side of a large battery, and when it is sufficiently charged, the positive side is touched with the end of the other wire; by which means the battery will be discharged through the *torpedo*. In experiments with this *torpedo* under water, Mr. Cavendish uses a trough, A B C D E (*fig.* 46.) the length BC of which is nineteen inches, the depth A B fourteen inches, and the breadth thirteen inches. The battery, which he used, was composed of forty-nine jars, of very thin glass, disposed in seven rows, and so contrived, that he could use any number of rows at pleasure. Mr. Cavendish was enabled, by means of this apparatus, when immersed in water, to give shocks much resembling those given by the living animal. He felt similar concussions likewise, when he dipt his hands in the water, at the distance of two or three inches from it: and as it is affirmed, that a person accidentally treading on the living fish, when buried in the sand, is sometimes shocked by it, he imitated this experiment with his artificial *torpedo*, and received shocks from it. The events, indeed, in the greater part of his experiments, too numerous to be recited in this place, with this artificial fish, relative to the shock, seem to agree sufficiently with those made by Mr. Walsh with the living animal. The experiments which Mr. Cavendish made with this machine, relative to the circumstance of the shock of the real *torpedo* not being able to pass through any sensible space of air, appear likewise to correspond with Mr. Walsh's trials. A piece of sealing-wax covered with tin-foil freely conducted a shock from the artificial *torpedo*; but on making as small a separation as possible through the metal with a penknife, the shock would not pass. See on the subject of this article for Mr. Walsh's papers, Phil. Trans. vol. lxiii. par. ii. p. 461. Id. vol. lxiv. par. ii. p. 464. For Mr. Hunter's paper, Id. vol. lxiii. par. ii. p. 481. For Dr. Ingenhousz's, Id. vol. lxv. par. i. p. 1. For Mr. Cavendish's, Id. vol. lxvi. par. i. p. 169. See also Sir John Pringle's Six Discourses, &c. by Dr. Kippis, p. 45, &c.

TORQUATA, in *Zoology*, a name given by many authors to the common or water-snake, from the remarkable ring it has about its neck. See NATRIX.

TORQUE, in *Heraldry*, a round roll of cloth twisted and stuffed; such is the bandage frequently seen in armories about the heads of Moors, savages, &c.

It is always of the two principal colours of the coat. The *torque* is the least honourable of all the enrichments worn on the helmet by way of crest.

TORQUILLA, in *Ornithology*, the name of a species of wood-pecker, more commonly known by the name *jynx*, and called in English the WRY-*neck*.

TORREFACTION, formed of *torrefacere*, *to roast*, in *Metallurgy*. See ROASTING.

TORREFACTION, in *Pharmacy*, a kind of roasting, or assation, wherein a drug is laid to dry on a metalline plate placed over or before coals, till it become friable to the fingers.

Torrefaction is particularly used, when, after reducing some drug, as rhubarb, or myrobalan, into powder, it is laid on an iron or silver plate, and that placed over a moderate fire till the powder begins to grow darkish; which is a mark, that those remedies have lost their purgative virtue, and have acquired a more astringent one.

Formerly they used to *torrefy* opium, to get out some malignant parts fancied to be in it, before they dared use it in medicine; but the effect was, that its volatile spirits and sulphur, wherein its greatest virtue consists, were hereby evaporated.

TORRENT, TORRENS, in *Hydrography*, a temporary stream of water, falling suddenly from mountains wherein there have been great rains, or an extraordinary thaw of snow; sometimes making great ravages in the plains.

TORRICELLIAN, a term very frequent among physical writers, used in the phrases, *Torricellian tube*, or *Torricellian experiment*, on account of the inventor, Torricelli, a disciple of the great Galileo.

TORRICELLIAN *tube*, is a glass tube, open at one end, and hermetically sealed at the other, about three feet long, and one tenth of an inch in diameter.

TORRICELLIAN *experiment*, is performed by filling the *Torricellian* tube with mercury, then stopping the open orifice with the finger, inverting the tube, and plunging that orifice into a vessel of stagnant mercury. This done, the finger is removed, and the tube sustained perpendicular to the surface of the mercury in the vessel.

The consequence is, that part of the mercury falls out of the tube into the vessel, and there remains only enough in the tube to fill from twenty-eight to thirty-one inches of its capacity, above the surface of the stagnant mercury in the vessel.

Those twenty-eight, &c. inches of mercury are sustained in the tube by the pressure of the atmosphere on the surface of the stagnant mercury; and according as the atmosphere is more or less heavy, or as the winds, blowing upwards or downwards, heave up or depress the air, and so increase or diminish its weight and spring, more or less mercury is sustained from twenty-eight inches to thirty-one.

There is a case, however, first taken notice of by Huygens (Journal des Sçavans, 1672, p. 111.) in which, if a glass tube of a small bore seventy or eighty inches in length, be well cleaned, and filled with mercury well purged of air, &c. in the manner described under *barometer*, and then carefully inverted into a vessel of stagnant mercury, the mercury, instead of coming down to the height just mentioned, at which the pressure of the atmosphere is able to sustain it, will continue to fill the tube, and stand at the height of seventy-five inches: but by striking the tube, or gently shaking it, the mercury will descend and settle at its proper height, as in the common barometer. This phenomenon is explained on the principles of the attraction of COHESION, which acts most powerfully in contact: for when the tube is clean, and the mercury well purged of air, many parts of the mercury, which, by the interposition of small air-bubbles, would be kept from touching the tube, are brought into contact with it, and those particles that are in the middle of the column, adhere to those that are next to the sides of the tube, and thus form a compact column. Besides the increase of attracting surface at the arched top of the tube, by means of which a greater number of mercurial particles may come into contact with the glass, than those that recede from the contact of one to another, will also give an advantage to the attraction of the glass, and cause the mercury, immediately in contact with it, to adhere to it. That the attraction of cohesion, as already explained, is the cause of this phenomenon is plain, because the experiment will not succeed when the mercury is not well purged of its air, nor even then if the bore of the tube is large.

The *Torricellian experiment* makes what we now call the BAROMETER.

TORRICELLIAN *vacuum*, is the vacuum produced by filling a tube with mercury, and allowing it to descend to such a height as is counterbalanced by the pressure of the atmosphere, as in the *Torricellian experiment* and BAROMETER. For the method of rendering this vacuum luminous by electricity, see ELECTRICITY, Exp. 17.

TORRID *Zone*. See ZONE.

TORT, in *Law*, denotes injustice, or injury, as, *de son tort meme, in his own wrong, &c.*

Hence also *tort-feasor*, &c. The word is pure French, where it signifies the same.

Actions upon *torts*, or wrongs, are all *personal* ACTIONS for trespasses, nuisances, assaults, defamatory words, and the like.

TORT, *executor de son*. See EXECUTOR.

TORTOISE, *testudo*, in the Linnæan system of *Zoology*, makes a distinct genus of animals, of the class of *amphibia*, and order of *reptiles*: the characters of which are; that the body has four feet, is defended by a thick crust, and is furnished with a tail; the mouth has naked mandibles without teeth.

The *tortoise* is a well known animal, of which Linnæus enumerates fifteen species, among which are the coriaceous *tortoise*, the green turtle, hawks-bill turtle, common Grecian or African *tortoise*, tessélated *tortoise*, &c. The shell, which covers this creature's body, is composed of a number of variously shaped pieces, usually pentangular; these are affixed to a bony substance, like the skulls of some animals, which surrounds the animal, and has two apertures; one before, which gives way to the going out of the head and the fore-legs; and the other behind, through which the hinder legs and thighs are protruded.

This bony substance is, in different parts, of very different thicknesses, in some places an inch and half, in others not an eighth part of an inch. It is composed of two pieces, the one covering the creature's back, the other its belly; these are joined at the sides with very strong ligaments, but not so rigidly closed but that they easily give way to the creature's motions. Ray's Syn. Quad. p. 253.

This is the general order of nature in the structure of the shell of this creature; of which we have several species in different parts of the world, the shells of which are of different value.

The sea *tortoise* is generally called *turtle*, which supplies a well-known delicious food. Dr. Parsons has remarked a singularity in the structure of the wind-pipe of the *land-tortoise*, which for a few inches from the epiglottis is single,

single, but soon divides into two; and as it descends with the œsophagus, forms a folded ring outward on each side, and turns down again to enter the lungs; so that this animal has the advantage of a double aspera arteria, with a volution in each; which shews that this provision is intended to contain a greater portion of air than ordinary, while he is under ground in winter. It has been observed likewise, that the principal use of the lungs in *tortoises* is to render them specifically lighter or heavier in the water, by their inflation and compression at pleasure, as fishes do by their swimming bladders; and such a power of long inspiration seems to be as necessary in the land-*tortoise* as in that of the sea; because, in many countries where they breed, they are known to go into the ground, and lie concealed for several months, and several species of land-*tortoises* go into ponds or canals in gardens, where they are kept, and remain long under water. Phil. Trans. vol. lvi. p. 213.

In generation, Rondeletius observes, that the embraces of the male and female *sea-tortoises* continue for a whole lunar month; and that they squirt water out of the nostrils in the same manner as the dolphin. On the Brasilian shore they are said to be so big as sometimes to dine fourscore men; and that in the Indian sea the shells serve the natives for boats. De Laet notes, that in the island of Cuba they are of such a bulk, that they will creep along with five men on their backs.

TORTOISE-*shell*, the shell, or rather scales of the testaceous animal, called a TORTOISE; used in inlaying, and in various other works, as for snuff-boxes, combs, &c. Mr. Catesby observes, that the hard strong covering, which encloses all sorts of tortoises, is very improperly called a shell; being of a perfect bony contexture; but covered on the outside with scales, or rather plates, of an horny substance: which are what the workmen call *tortoise-shell*. Phil. Trans. N° 438, p. 117.

There are two general kinds of *tortoises*, viz. the land, and *sea tortoise*; *testudo terrestris*, and *marina*.

The *sea-tortoise*, again, is of several kinds, but it is the caret, or *testudo imbricata* of Linnæus alone, which furnishes that beautiful shell, so much admired in Europe.

The shell of the caretta, or hawksbill tortoise, is thick; and consists of two parts, the upper, which covers the back, and the lower the belly: the two are joined together at the sides by strong ligaments, which yet allow of a little motion. In the fore-part is an aperture for the head and fore-legs, and behind for the hind legs and tail. It is the under-shell alone that is used: to separate it, they make a little fire beneath it, and, as soon as ever it is warm, the under shell becomes easily separable with the point of a knife, and is taken off in laminæ or leaves.

The whole spoils of the caret consist in thirteen leaves or scales, eight of them flat, and five a little bent: of the flat ones, there are four large ones, sometimes a foot long, and seven inches broad.

The best *tortoise-shell* is thick, clear, transparent, of the colour of antimony, sprinkled with brown and white: when used in marquetry, &c. the workmen give it what colour they please by means of coloured leaves, which they put underneath it.

Tortoise-shell colour may be given to *horn*, by first pressing the horn into proper plates or scales, and tempering two parts of quick-lime and one of litharge to the consistence of a soft paste with soap-ley. Let this paste be laid over all the parts of the horn, except such as are proper to be left transparent, and thus let it remain till it be thoroughly dry; when the paste being brushed off, the horn will be found partly opake and partly transparent, like *tortoise-shell*. Semi-transparent parts may be added, by mixing whiting with some of the paste to weaken its effect in particular places, by which means spots of a reddish brown will be produced, which will increase the beauty of the work as well as its resemblance of real *tortoise-shell*. Handmaid to the Arts, vol. i. p. 518.

TORTOISE, in the *Military Art*. See TESTUDO.

TORTURA, a word appropriated by many medical writers, to express only the distortions of the face, and particularly of the mouth, in convulsions.

TORTURE, a grievous pain inflicted on a criminal, or person accused, to make him confess the truth.

The forms of *torture* are different in different countries. In some they use water, in others iron, in some the wheel or rack, in some the boot, thumbkins, &c. See RACK, BOOT, &c.

In England the use of all *torture* is abolished, both in civil and criminal matters, and even in cases of high-treason.

In France the *torture* is not generally practised in civil matters; but by an ordonnance of 1670, if a person be accused of a capital crime, he may be put to the question, i. e. to the *torture*, if there be a considerable proof against him, and yet not proof enough to convict him.

There are two kinds of *torture*: the one *preparatory*, appointed before sentence passed; the other *definitive*, decreed by a sentence of death.

The *preparatory torture* is ordered *manentibus indiciis*; so that, if the accused doth not confess, he cannot be condemned to death, but only *ad omnia citra mortem*.

The *definitive torture* is that which a condemned criminal is put to, to make him confess his accomplices. The ordinary *torture* is given at Paris with six pots of water, and the little trestle; and the extraordinary, with six other pots, and the great trestle.

The *torture*, says M. Bruyere, is a sure expedient to destroy an innocent person of a weak complexion, and to save a criminal of a robust one. It was a noble saying of an ancient, *They who can bear the torture will lye, and also they who cannot bear it*.

The marquis Beccaria (chap. 16) with exquisite raillery proposes this problem: the force of the muscles and the sensibility of the nerves of an innocent person being given, it is required to find the degree of pain necessary to make him confess himself guilty of a given crime.

TORUS, in *Architecture*. See TORE.

TORUSCULA, a word used by some medical writers to express a drop.

TORY. See TORIES.

TORYNE, in *Pharmacy*, the name of a kind of spatula intended for the stirring up of the ingredients of decoctions while boiling.

TORYNETOS, a name given by some to a mixture of bread and water boiled together, whether meant as a kind of a panada, or for a pultice.

TOTANO, or TOTANUS, in *Ornithology*, the name of a bird, common in the Italian markets, and more usually known by the name of VETOLA.

The *totanus* of Linnæus is a species of SCOLOPAX, and the CREX of other authors. See RAIL.

TOTANUS is also used by some for the LIMOSA.

TOTAQUESTAC, in *Ornithology*, the name of a beautiful American bird, described by Nieremberg from Antonius Herrera. It is said to be something smaller than a pigeon, and all over of a most beautiful green; its tail feathers are of a very great length, and are greatly esteemed. The Indians value the bird so highly that it is death by their laws to kill it, so that when it is caught they only strip it and let it go again. Ray.

TOTTAVILLA, in *Ornithology*, a name by which some authors have called the *alauda arborea*, or common wood-lark. See LARK.

TOTTED; a good debt to the king is, by the foreign apposer, or other officer, in the exchequer, noted for such by writing the word *tot*, q. d. *tot pecuniæ regi debentur*; whence it is said to be *totted*. Also that which is paid is to be *totted*.

TOUCAN, otherwise called *anser Americanus*, in *Astronomy*, a modern constellation of the southern hemisphere, consisting of nine small stars.

The situation, longitude, latitude and magnitude of which are as follows:

Situation.	Sign.	Longitud. °	′	″	Latitude. °	′	″	Magnit.
At the end of the bill	♒	5	38	55	45	27	53	3
In the head		16	32	55	47	48	45	3
In the corner of the left wing superior		17	51	17	54	32	11	5
Ditto, inferior		16	27	47	55	33	21	5
In the middle of the wing		18	8	45	57	36	04	3
Preceding the former		14	50	15	56	35	22	4
In the back		22	43	32	57	15	38	3
In the tail		20	14	19	59	46	53	5
In the leaf, or nutmeg		3	16	34	49	50	44	4

TOUCAN, RAMPHASTOS, in *Ornithology*, is a genus of birds of the order of *picæ*: the characters of which are, that the bill is very large, convex, and serrated on the edges; both mandibles are bent at the apex; the nostrils are near the base of the bill; the tongue is feathered about the edges; and the feet are in most formed for climbing. Linnæus enumerates eight species, most of which are inhabitants of South America.

The *toucan* of Brasil, described by Ray, has a large head, black on the crown, but elsewhere as well as the neck and back variegated with white, its breast of a bright orange colour, its belly and thighs of a bright red, and the tail black but red at the end. This bird is singularly beautiful; it is said that it feeds on pepper; and Thevet affirms that it devours it greedily and returns it again undigested, and that the natives gather up that pepper, and use it in their food, as less hot and acrid than the fresh pepper. See *Tab. V. of Birds*, N° 57.

TOUCH,

TOUCH, in *Music*. An organ is said to have a good *touch*, or stop, when the keys close, and lie down well, being neither too loose, nor too stiff.

TOUCH *the wind*, in the *Sea-language*, is when the steersman at the helm is bid to keep the ship as near the wind as may be. See TOUCHING.

TOUCHING is sometimes used for the sense of FEELING. This sense may be injured by any thing that obstructs the nervous influence, or prevents its being regularly conveyed to the organs of *touching*, as pressure, extreme cold, &c. also by too great a degree of sensibility, when the nerve is not sufficiently covered with the scarf-skin, or where there is too great tension or it is too delicate. Whatever disorders the functions of the brain and nerves, hurts the sense of *touching*; and as it proceeds from the same general causes as palsy and apoplexy, it requires nearly the same method of treatment. In a defect of *touching*, which arises from an obstruction of the cutaneous nerves, the patient must be first purged, and then such medicines as excite the action of the nerves or stimulate the system may be used; for which purpose spirit of hartshorn, sal volatile oleosum, horse-radish, &c. may be taken inwardly; and the disordered parts often rubbed with fresh nettles or spirit of sal ammoniac. Blistering plasters and sinapisms applied to the parts will likewise be of use, as also warm bathing, especially in the natural hot baths. Buchan's Dom. Med. p. 507.

TOUCHING, in *Geometry*. See TANGENT.

TOUCHING, in *Sea-language*, denotes the state of a ship's sails when they first begin to shiver, with their edges in the direction of the wind. It is either occasioned by a sudden alteration of the ship's course, or by a change of the wind, in which it blows more obliquely along the surface of the sails, instead of falling into their cavities from behind, according to its usual direction. Falconer. See FULL-*and-by*.

TOUCHING-*at*, denotes the circumstance of stopping, or anchoring occasionally, at some intermediate port, in the course of a voyage.

TOUCH-*hole*, or VENT, in *Gunnery*, is the small hole at the end of the cylinder of a gun or musquet, by which the fire is conveyed to the powder in the chamber.

In a firelock, carabine, or pistol, it is called the *touch-hole*, but in a piece of cannon it is more properly called the VENT.

TOUCH-*needles*, small masses of gold, silver, and copper, each pure, and simple, and in all the different combinations, proportions, and degrees of mixture, prepared for the trying of gold and silver by the *touch-stone*; by comparison with the mark they leave on it.

The metals usually tried by the *touch-stone*, are gold, silver, and copper, either pure, or mixed with one another in different degrees, and proportions, by fusion. In order to find out the purity, or quantity of baser metal in these various admixtures, when they are to be examined, they are compared with these needles, which are mixed in a known proportion, and prepared for this use. The metals of these needles both pure and mixed, are all made into laminæ or plates, one twelfth of an inch broad, and of a fourth part of their breadth in thickness, and an inch and half long; these being thus prepared, you are to engrave on each a mark indicating its purity or the nature and quantity of the admixture in it.

The manner of making the *touch-needles* is by the proportions of the mark, a weight of half a pound, or eight ounces, being divided into sixteen half ounces, the half ounces each into four drams, the dram into four penny-weights, and this into two half penny-weights.

TOUCH-*needles*, *silver*; these must be only tempered with copper, and the proportion determined by the mark divided into half ounces and grains.

You must use therefore for this purpose one mark of such a weight that it may constitute a sufficient mass of metal for the making of one needle let it weigh for instance one dram, then weigh such a mark of the purest silver, wrap it up in a small paper, and upon this write sixteen half ounces, which will signify that the whole mark of this metal is the purest silver, and make the first needle of this mass.

Next weigh fifteen half ounces of pure silver, and one half ounce of pure copper, wrap these both in a paper, and write on it fifteen half ounces, which will signify that there are in that small mass fifteen parts of pure silver, and one part of pure copper; make of this the second needle. In the same manner go on with the rest, add two half ounces of copper to fourteen half ounces of silver, mark it fourteen half ounces, make the third needle of this; and in the same manner proportion the small masses of silver and copper for making the other needles, and put inscriptions upon every one in the following manner.

For the needle	half oz. of silver	half oz. copper
1.	16	0
2.	15	1
3.	14	2
4.	13	3
5.	12	4
6.	11	5
7.	10	6
8.	9	7
9.	8	8
10.	7	9
11.	6	10
12.	5	11
13.	4	12
14.	3	13
15.	2	14
16.	1	15

When you have the metals in each of their due proportions, each being wrapped up in its separate paper; put each separately, into a new crucible never used for any operation, and adding a little borax melt them together in a very quick fire, which must be well kindled before with bellows: or what is yet better, throw them suddenly into a hot crucible, and as soon as they melt, stir them with a dry wooden peg, burnt at the end, and pour them immediately into an ingot. When this is done, wrap up each mass, when cold, in its own paper again, and weigh them singly, in a nice ballance, if they still weigh a whole mark, they are good; but if there is any considerable deficiency in their weight, it is a sign that your fire having been too weak, or of too long duration, has consumed as much copper as is wanting in the weight; therefore this mass must be esteemed useless, and another made in its place in the same proportion.

When this is all finished, make with hammer out of each these small masses, a *needle*, making them a little hot; then engrave on each of these *needles*, the number of half ounces it contains, as before marked on its paper; that is, upon the first sixteen, upon the second fifteen, and so on, and then pierce them at one end, and running a silver wire through their eyes, collect them in order according to their different numbers. These are the *silver touch-needles*, made of the different alloys of silver and copper.

In Holland they make use of the mint mark, divided into grains for the making of their *needles*. The first *needle* made of pure silver is said to be of twelve penny-weights. The second is made of eleven penny-weights, and eighteen grains, by the addition of six grains of copper. The third is made of eleven penny-weights and twelve grains, by the addition of twelve grains of copper; and so on, the proportion of silver decreasing always six grains, that is, one quarter of a penny-weight at a time, and that of the copper being always increased in the same proportion, till at last the weight of the silver is reduced to one penny-weight, and that of the copper increased to eleven penny-weights, which proportion constitutes the last *needle*.

It is needless, however, to go through the whole series of the *needles*, by so small progressions to the very last, for very delicate proportions cannot be very accurately distinguished in the operation.

TOUCH-*needles*, *gold*. These must be mixt either with silver alone, or with silver and copper, variously intermixed.— This mixture is called alloying or carating, and is determined with a mark divided into twenty-four carats, or weights of two sixth parts of an ounce. There is nothing to be observed about the making of these *needles*, beside what has been already said in regard to the *silver needles*; except that the proportions of the weights are determined in another manner. These *needles* are made according to the following division and order; and they all weigh one mark.

The first is entirely of pure gold, or of 24 carats.

	pure gold	pure silver
2.	23 Car. 6 Gr.	6 Gr.
3.	23 Car.	1 Car.
4.	22 Car. 6 Gr.	1 Car. 6 Gr.
5.	22 Car.	2 Car.
6.	21 Car. 6 Gr.	2 Car. 6 Gr.
7.	21 Car.	3 Car.
8.	20 Car. 6 Gr.	3 Car. 6 Gr.
9.	20 Car.	4 Car.
10.	19 Car.	5 Car.
11.	18 Car.	6 Car.

The decrease goes on thus, by whole carats, till the weight of the gold is arrived at one carat, and that of the silver at twenty-three; for after the ninth *needle* you cannot make so exact a distinction of the half carats.

N. B. The carat is divided into twelve grains.

This mixture of the gold and silver is called the white alloy;

alloy; but when copper together with ſilver enters into the mixture of the gold, then it is called a mixt alloy. The *needles* for trial of pieces thus debaſed, are made of mixtures analogous to the former, except only that thoſe portions, which in the firſt caſe were pure ſilver, here conſiſt of copper and ſilver mixt. Therefore you have here a double ſeries; for the mixture is either of two parts of ſilver, and one of copper, or of two parts of copper and one of ſilver. For inſtance,

The firſt is of pure gold.

	of pure gold.	of pure ſilver.	of pure copper.
2	23 Car. 6 Gr.	4 Gr.	2 Gr.
3	23 Car.	8 Gr.	4 Gr.
4	22 Car. 6 Gr.	1 Car.	6 Gr.
5	22 Car.	1 Car. 4 Gr.	8 Gr.
6	21 Car. 6 Gr.	1 Car. 8 Gr.	10 Gr.
7	21 Car.	2 Car.	1 Car.
8	20 Car. 6 Gr.	2 Car. 4 Gr.	1 Car. 2 Gr.

and ſo on as in the foregoing.

If in this table you take pure copper inſtead of pure ſilver, and ſilver inſtead of copper, this gives you a third ſeries of golden *needles*. And you may have a fourth by mixing with gold equal quantities of ſilver and copper in the ſame proportion. Theſe alloys of gold are much in uſe, but workmen may eaſily employ a number of other variations, which compared with thoſe already mentioned will be diſtinguiſhed into a thouſand different ways by an experienced perſon, ſo that it is neither poſſible, nor neceſſary to imitate them all.

But that theſe *golden needles* may not be too expenſive, they may be made much ſhorter than thoſe of ſilver, and afterwards ſoldered to plates of copper, that may be ſufficiently long for uſe.

The uſe of theſe *needles* is by means of the touch-ſtone; and ariſes hence, that every metal when pure muſt have its ſpecific colour, that diſtinguiſhes it from the reſt: but metals being the moſt opake of all known bodies, the ſpecific colour of every one appears moſt diſtinctly when you rub it againſt a very black hard ſtone; and if the colours of two or more metals are expreſſed by large lively ſpots, made near each other on the ſame plane, by rubbing them againſt the ſurface of the ſtone, you will by that means eaſily diſcern their difference, or their likeneſs.

The ſtone adapted to this uſe, and called from its office the *touch-ſtone*, muſt have the following qualities. It muſt be of the deepeſt black, leſt the tincture of the metal ſhould be altered by ſpurious rays of light ſhining among it: it muſt be capable of being pretty well poliſhed, for when too rough, the colours of the metals rubbed againſt it cannot be nearly or regularly diſtinguiſhed; and if it is too ſmooth, the metals are but faintly, and too ſlowly abraded or ſcraped by it eſpecially when gold is tried. It muſt alſo be neither too hard, nor too ſoft. Tripoli, coal-duſt, and tin aſhes are uſed in rubbing off the thin metalline cruſts, and in a ſhort time the ſtone when very hard is apt to acquire too ſmooth a ſurface; and when it is too ſoft it eaſily wears, throws off a duſt, and contracts furrows.

The ſtone is made in the form of a quadrangular priſm, about an inch thick, and two or three inches long.

If the proper ſtone cannot be procured, moderately ſmooth pieces of flint are the beſt ſubſtitutes; and the more they approach in colour to the other, the better.

The method of uſing your *needles* and the ſtone is this: The piece of gold, to be examined, being well cleaned in ſome convenient part of its ſurface, a ſtroke is to be made with it on the ſtone; and another, cloſe by it, with ſuch of the *touch-needles* as appear to come the neareſt to it in colour. If the colour of both, upon the ſtone, is exactly the ſame, it is judged that the given maſs is of the ſame fineneſs with the *needle*: if different, another and another *needle* muſt be tried, till ſuch a one is found as exactly correſponds to it. To do this readily, practice only can teach.

In making the ſtrokes, both the given piece, and the *needle* of compariſon, are to be rubbed ſeveral times backwards and forwards upon the ſtone, that the marks may be ſtrong and full, not leſs than a quarter of an inch long, and about a tenth or an eighth of an inch broad: both marks are to be wetted before the examination of them, their colours being thus rendered more diſtinct. A ſtroke, which has been drawn ſome days, is never to be compared with a freſh one, as the colour may have ſuffered an alteration from the air; the fine atoms, left upon the *touch-ſtone*, being much more ſuſceptible of ſuch alterations than the metal in the maſs. If the piece is ſuppoſed to be ſuperficially heightened by art in its colour, that part of it, which the ſtroke is deſigned to be made with, ſhould be previouſly rubbed on another part of the ſtone, or rather on a rougher kind of ſtone than the common *touch-ſtones*, that a freſh ſurface of the metal may be expoſed. If it is ſuſpected to be gilt with a thick coat of metal finer than the internal part, it ſhould be raiſed with a graver, to ſome depth, that the exterior coat may be broken through: cutting the piece in two is a leſs certain way of diſcovering this abuſe; the outer coat being frequently drawn along by the ſheers or chiſel, ſo as to cover the divided parts.

The metallic compoſitions, made to reſemble gold in colour, are readily known by means of a drop or two of aqua fortis, which has no effect upon gold, but diſſolves or diſcharges the marks made by all its known imitations. See Touch-*ſtone*.

If gold is debaſed by an admixture of any conſiderable quantity of theſe compoſitions, aqua fortis will in this caſe alſo diſcharge ſo much of the mark as was made by the baſe metal, and leave only that of the gold, which will now appear diſcontinued or in ſpecks. Silver and copper are in like manner eaten out from gold on the *touch-ſtone*, and hence ſome judgement may thus be formed of the fineneſs of the metal from the proportion of the remaining gold to the vacuities.

Ercker obſerves that hard gold appears on the *touch-ſtone* leſs fine than it really is. It may be preſumed that this difference does not proceed from the ſimple hardneſs: but from the hardneſs being occaſioned by an admixture of ſuch metallic bodies, as debaſe the colour in a greater degree than an equal quantity of the common alloy. Silver and copper are the only metals uſually found mixed with gold whether in bullion or in coins; and the only ones, whoſe quantity is attempted to be judged of by this method of trial.

The Chineſe are ſaid to be extremely expert in the uſe of the *touch-ſtone*, ſo as to diſtinguiſh by it ſo ſmall a difference in the fineneſs as half a touch, or a two hundredth part of the mixt. The *touch-ſtone*, ſays Dr. Lewis, is the only teſt, by which they regulate the ſale of their gold to the European merchants; and in thoſe countries it is ſubject to fewer difficulties than among us, on account of the uniformity of the alloy, which there is almoſt always ſilver; the leaſt appearance of copper being uſed in the alloy gives a ſuſpicion of fraud. As an eſſay of the gold is rarely permitted in that commerce, it behoves the European trader to be well practiſed in this way of examination: by carefully attending to the above directions, and by accuſtoming himſelf to compare the colours of a good ſet of *touch-needles*, it is preſumed he will be able to avoid being impoſed on, either in the touch itſelf, or by the abuſes ſaid to be ſometimes committed, of covering the bar or ingot with a thick coat of finer metal than the interior part, or of including maſſes of baſe metal within it. A ſet of *needles* may be prepared, for this uſe, with ſilver alloy, in the ſeries of the Chineſe touches; or the *needles* of the European account may be eaſily accommodated to the Chineſe, by means of a table formed for that purpoſe on the principles already explained. It may be obſerved, that the gold ſhoes of China have a depreſſion in the middle, from the ſhrinking of the metal in its cooling, with a number of circular rings, like thoſe on the balls of the fingers, but larger: Dr. Lewis ſays, that when any other metallic maſs is included within, the fraud is diſcoverable at ſight, by the middle being elevated inſtead of depreſſed, and the ſides being uneven and knobby; but that the ſame kind of fraud is ſometimes practiſed in the gold bars, where it is not diſcoverable by any external mark. See Cramer's Art of Aſſaying, p. 116, &c. Lewis's Com. of Arts, p. 122, &c. See alſo Assaying.

Touch *me not*, in *Botany*. See Balsamine.

Touch-*ſtone*, a black, ſmooth, gloſſy ſtone, uſed to try metals upon.

The ancients call it *lapis* Lydius, the *Lydian ſtone*, from Lydia, a country of Aſia Minor, whence it was brought. See Touch-*needles*.

Touch-*ſtone*, *Iriſh*, called *baſanus Hibernicus*, by Molyneux and ſome others, is a black ſtone, found in the county of Antrim, in that kingdom, in angular columns, forming that amazing pile called by the vulgar, the giant's *cauſeway*. See Basaltes and Marmaro-*proſera*.

The baſaltes being an excellent *touch-ſtone*, authors have confounded it with the *touch-ſtone* of the ancient Greeks, called by them *baſanos*, *baſanites*, *lapis Lydius* or *Heraclius*, &c. which were, probably, only black jaſpers; and they have derived *baſanos* and *baſaltes* from the ſame Greek word, βασανιζω, to *try* or *prove*: but the *baſaltes* was not known to the Greeks, and Pliny expreſſly tells us, that it is an Ethiopic or Egyptian name: whence it is probable, that *baſaltes* is a corruption of the Hebrew word ברזל, *barzel*, which ſignifies iron, a very proper name for

for a ſtone, which they deſcribe to be of the colour and hardneſs of iron. Many authors affirm, that the *touch-ſtone* is a kind of black marble, or that moſt black marbles may ſerve for *touch-ſtones*: black marbles, it is true, take the colours of metals, and may be uſed as *touch-ſtones* in the ancient manner mentioned by Theophraſtus and Pliny; i. e. by touching them with needles of different alloys, which manner is ſtill practiſed in Germany, and other countries: but in the manner of trying them with aqua fortis, it is abſurd to uſe any calcareous ſubſtances, as the acid will immediately deſtroy the ſubſtance of the ſtone, and conſequently affect and ſomewhat deface the ſtrokes of the metals. For a good *touch-ſtone*, choice ſhould be made of a black ſtone of the genus of *marmaroproſera* or of the jaſper genus, on which the aqua fortis will only diſſolve the copper, ſilver, &c. without touching the gold, or affecting the ſtone. The firſt genus ſhould be preferred, as a nice *touch-ſtone* ſhould only have a certain degree of poliſh, and ſhould be of a compact fine texture, and neither too hard nor too ſoft; whereas the jaſpers are too hard, and do not ſhow with ſufficient exactneſs the different degrees of alloy; for the touches of the metal give them a higher luſtre than their natural poliſh, and that luſtre injures the diſtinctneſs of the ſtrokes made upon it. Coſta's Hiſt. Foſſ. p. 264. See TOUCH-*needles*.

TOUCH-*wood*, in *Botany*, a name given to SPUNK or AGARIC of the oak, on account of its readily catching fire.

TOUMAN. See TOMAN.

TOURMALIN, in *Natural Hiſtory*, a name given, as Dr. Watſon has evinced, to the *lyncurium* of the ancients. See LYNCURIUS *lapis*.

This ſtone is very common in ſeveral parts of the Eaſt Indies, particularly in the iſland of Ceylon, where it is called *tournamal*. The firſt account of this ſtone, that occurs of late years, is in the Hiſtory of the Royal Academy of Sciences at Paris, for 1717, where we are told that Mr. Lemery exhibited an uncommon ſtone, brought from Ceylon, which attracted and repelled ſmall light bodies. Linnæus, in his Flora Zeylonica, calls this ſtone *lapis electricus*, and takes notice of Lemery's experiments. Mr. Æpinus, having been informed of the attractive power of the *tourmalin* by Mr. Lechman, and furniſhed by him with two ſtones, made many experiments, the reſult of which was publiſhed in the Hiſtory of the Academy of Sciences, and Belles Letters, at Berlin for 1756. The ſubſtance of his Memoir is as follows: The *tourmalin* has always, at the ſame time, a poſitive and a negative electricity; one of its ſides being in one ſtate, and the other in the oppoſite; and this does not depend on the external form of the ſtone. Theſe electricities he could excite in the ſtrongeſt degree, by plunging the ſtone in boiling-water.

If one ſide of the *tourmalin* be heated more than the other (as if it be laid upon a hot cake of metal) each of the ſides acquires an electricity oppoſite to that which is natural to it; but if left to itſelf, it will return to its natural ſtate.

If one of the ſides of the *tourmalin* be rubbed, while the other is in contact with ſome conductor communicating with the ground; the rubbed ſide is always poſitive, and the other negative. If neither ſide be in contact with a conductor, both become poſitive. If, in the former of theſe caſes, the *tourmalin* be rubbed, ſo as to acquire a ſenſible heat, and the ſide which is naturally poſitive be made negative, it will upon ſtanding to cool, return to its natural ſtate; but if it have acquired no ſenſible heat, it will not return to its natural ſtate while any kind of electricity remains. If it be heated, even when it is rubbed and inſulated (in which caſe both ſides become poſitive), it will ſtill return to its natural ſtate upon cooling.

The duc De Noya, who in 1758, procured two of theſe ſtones in Holland, and made a number of experiments with them, an account of which he publiſhed, mentions the experiments of Mr. Æpinus, but does not admit of a *plus* and *minus* electricity belonging to the *tourmalin* when heated. On the contrary, he ſays, that both the ſides are electrified *plus*, but one of them more than the other. The *tourmalin* was introduced to the notice of the Engliſh philoſophers by Dr. Heberden, who procured one (and indeed, the only one known in England at that time) for Mr. Wilſon; whoſe experiments confirmed the opinion of its poſitive and negative power, advanced by Mr. Æpinus. Dr. Franklin likewiſe, in a letter to Dr. Heberden, in 1759, informs him of experiments on one of theſe ſtones, ſufficient for eſtabliſhing the ſame theory. About this time, Dr. Heberden procured ſome of theſe ſtones from Holland, and put them into the hands of Mr. Wilſon and Mr. Canton, gentlemen particularly converſant with the ſubject of electricity, and capable of uſing them with the greateſt advantage to this branch of ſcience. Mr. Wilſon's experiments and obſervations are very numerous; the reſult of which was, in the main, the ſame with that of Mr. Æpinus, eſtabliſhing the opinion of the two different powers of this ſtone; but he differs from him in aſſerting, that when the ſides of the *tourmalin* are unequally heated, it exhibits that ſpecies of electricity which is natural to the hotter ſide; i. e. the *tourmalin* is *plus* on both ſides, when the *plus* is the hotteſt, and *minus* on both ſides, when the *minus* ſide is the hotteſt. Both theſe gentlemen repeated their experiments, and each retained his own opinion; but Mr. Wilſon's apparatus was better calculated for the purpoſe of accurate experiments than that of Mr. Æpinus, and he uſed a greater variety of methods for communicating heat to his *tourmalin*. Mr. Wilſon imagined that this ſtone, as well as glaſs, was permeable to the electric fluid, and that the reſiſtance to its entering the ſubſtance of it was leſs on what he calls the negative than on the poſitive ſide; for rubbing the poſitive ſide of the ſtone ſlightly, he found both ſides electrified *plus*, but rubbing the negative ſide in the ſame manner, both ſides were electrified *plus*, more ſtrongly than before. Several experiments led Mr. Wilſon to conclude, that the *tourmalin* reſiſted the exit and entrance of the electric fluid conſiderably leſs than glaſs, or even than amber; and he infers upon the whole, that this ſtone differs in nothing from other electric bodies but in acquiring electricity by heat. Mr. Wilſon alſo conceived, that the *tourmalin* ſuffered the electric fluid to paſs through it only in one direction, bearing in this reſpect ſome analogy to the load-ſtone, and having, as it were, two electric poles, which are not eaſily deſtroyed or altered. He alſo apprehended, that the electric fluid, flowing through all the ſtones and gems, which reſemble the *tourmalin* in their electrical properties, moves in that direction in which the grain happens to lie; the reſiſtance, as he ſuppoſes, which the fluid meets with, being leſs in that direction than in any other.—Notwithſtanding the attention given to this ſubject by Mr. Æpinus and Mr. Wilſon, the moſt important diſcovery relating to the electricity of the *tourmalin* was reſerved for Mr. Canton, who, in a paper read before the Royal Society in December 1759, obſerves, that the *tourmalin* emits and abſorbs the electric fluid only by the increaſe or diminution of its heat; for if the *tourmalin*, he ſays, be placed on a plain piece of heated glaſs or metal, ſo that each ſide of it, by being perpendicular to the ſurface of the heated body, may be equally heated; it will, while heating, have the electricity of one of its ſides poſitive, and that of the other negative. This will, likewiſe, be the caſe, when it is taken out of boiling water, and ſuffered to cool; but the ſide, which was poſitive while it was heating, will be negative while it is cooling, and the ſide which was negative will be poſitive. In the Gentleman's Magazine for September 1759, (vol. xxix. p. 424,) he publiſhed the reſult of ſome experiments which he had made on a *tourmalin* procured from Holland in a ſeries of propoſitions, compriſing the principal part of what is known upon this ſubject. They are as follow: 1. When the *tourmalin* is not electrical or attractive, heating it, without friction, will make it ſo; and the electricity of one ſide of it (diſtinguiſhed by A) will be poſitive, and that of the other ſide (B) will be negative. 2. The *tourmalin* not being electrical will become ſo by cooling; but with this difference, that the ſide A will be negative, and the ſide B poſitive. 3. If the *tourmalin*, in a non-electrical ſtate, be heated, and ſuffered to cool again, without either of its ſides being touched; A will be poſitive, and B negative, during the whole time of the increaſe and decreaſe of its heat. 4. Either ſide of the *tourmalin* will be poſitive by friction, and both may be made ſo at the ſame time. He ſuggeſts that, if air be endued with ſimilar properties, or be capable of becoming electrical by the increaſe or diminution of its heat (as is probable by attending to its ſtate before and after a thunder-ſtorm), thunder-clouds, both poſitive and negative, as well as thunder-guſts, may be eaſily accounted for. Mr. Canton, with the *tourmalins* which he received from Dr. Heberden, made other new and curious experiments, firſt publiſhed by Dr. Prieſtley. He put one of them, which was of the common colour, into the flame from a blow-pipe and burnt it white; when he found that its electrical property was entirely deſtroyed. The electricity of another was only in part deſtroyed by fire. He joined two others, made ſoft by fire, without deſtroying their electrical property. The virtue of another was improved by being melted at one end; and he found (contrary to what Mr. Wilſon had obſerved of another *tourmalin*, heated in the ſame manner) that one *tourmalin* retained its electrical property,

perty, after it had been frequently made red-hot, and, in that state, put into cold water. But the most curious experiment was made on a large irregular *tourmalin*, about ½ an inch long, which he cut into three pieces; taking one part from the positive and another from the negative end. Trying these pieces separately, he found the outer side of the piece cut from the end that was negative, when cooling, was likewise negative when cooling, and that the outer side of that piece which was cut from the end that was positive when cooling was likewise positive when cooling; the opposite sides of both pieces being, according to the general law of the electricity of the *tourmalin*, in a contrary state. The middle part of the same stone was affected as it had been when it was entire; the positive end remaining positive and the negative end negative.

Dr. Priestley, about the close of year 1766, directed his attention to the *tourmalin*: being in possession of Dr. Heberden's large polished one, which weighed one hundred and twenty grains, of an oval form, plain on one side and convex on the other, and which had passed through the hands of Mr. Wilson and Mr. Canton, he pursued his investigation of the properties of this stone in a variety of experiments. Several of them were undertaken with a view of determining whether the *tourmalin* collected its electricity from the neighbouring air: he was led to this conjecture from the consideration of Mr. Wilcke's experiments on the production of spontaneous electricity, by melting one substance within another; and his experiments seem to prove that his conjecture was just. He also discovered a method of reversing all the experiments made upon the *tourmalin*, making that side which is positive in heating or cooling to be negative, and that which is negative to be positive: so that the kind of electricity shall be just what the operator shall direct, by the application of proper substances to the stone. Dr. Priestley not only tried how the *tourmalin* would be affected by being heated or cooled in contact with various substances, to which only one of its sides was exposed at once, but he also made other experiments in which the stone was entirely surrounded by them. Having covered the stone to the thickness of about a crown-piece with sealing-wax, he found it to act nearly, if not quite as well, through this coating of wax, as if it had been exposed to the air: hence, if a *tourmalin* be concealed in a stick of sealing-wax, the wax will seem to have acquired the properties of the *tourmalin*. See on this article Phil. Trans. vol. li. p. 308, &c. p. 394, &c. vol. liii. p. 436, &c. Franklin's Letters, &c. p. 376. Priestley's Electricity, vol. i. p. 347, &c. vol. ii. p. 308, &c. 8vo. ed.

The *tourmalin*, according to Mr. Kirwan, is a siliceous earth imperfectly united with from 1,05 to 1,47 of its weight of argill, from 0,3 to 0,4 of its weight of mild calcareous earth, and from 0,15 to 0,243 of its weight of iron. This stone has hitherto been found only in Ceylon, Brazil, and the Tyrol: a specimen of each has been examined by Mr. Bergman: that of Ceylon is of a dark brown, or yellowish colour, its specific gravity 3,065 or 3,295: that of Brazil is green, blue, red or yellow, and its specific gravity 3,07, or 3,18: that of Tyrol, by reflected light, is of a blackish brown, but by refracted light, yellowish, or in thin pieces, green; its specific gravity 3,05. In fire none of them decrepitate: but those of Ceylon and Tyrol melt per se into a black frothy slag. That of Brazil forms only a brittle scoria. Bergman's Ess. by Cullen, vol. ii. p. 120, &c. 1784. Kirwan's Elem. Mineral. p. 131.

In the Memoirs of the Royal Academy of Sciences at Berlin, for 1780, we have the following directions by Mr. Margraaf, for forming a composition, similar to the *tourmalin*. Take magnesia, or that earth which is the basis of the sal catharticus amarus; mix it with chalk, which has been dissolved in spirit of nitre, and precipitated from thence by a solution of salt of tartar, and then well edulcorated; add to this mixture equal quantities of flint and clay (taking a scruple of each of the four ingredients) and four grains of the precipitate of sublimate of fusible spar, or what is here called the fluor crust, i.e. the earth which is not only sublimed from the fluor, or Derbyshire spar, on heating it with oil of vitriol, but may also be precipitated from thence, and from the acid liquor in the receiver, by the addition of a solution of salt of tartar.

To two drams of the above mixture add five grains of crocus martis, calcined according to the method of Kunckel, during four months, in a glass-house furnace, and the result will be the formation of a vitreous stone, similar to the *tourmalin*.

TOURNAMENT. See TURNAMENT.

TOUR, *turn*, a French term, often used among English writers for a journey. Thus we say the *tour* of Paris, of Rome, &c.

TOUR *of hair*, a tress or border of hair, going round the head, which, mingled dextrously with the natural hair, lengthens and thickens it.

These *tours* are for men. The women likewise use *tours*, and false hair, either to hide their age, or to supply the thinness of their natural hair on the forehead and temples.

The form is different according to the mode, sometimes raised and curled, sometimes straight, and laid flat along the forehead.

TOURN, in *Law*. See TURN.

TOURNEFORTIA, in *Botany*, a genus of the *pentandria monogynia* class; its characters are these: the empalement of the flower is permanent, of one leaf, cut into five small segments at the top. The flower is of one petal, of the globular bell-shape, cut at the brim into five acute points, which spread open horizontally; and it has five awl-shaped stamina, the length of the tube, terminated by single summits; and a globular germen, supporting a single style the length of the stamina, crowned by a single stigma. The germen becomes a spherical succulent berry, enclosing four oblong oval seeds, resting upon the empalement. There are eight species.

TOURNIQUET, in *Surgery*, an instrument made of rollers and compresses with the help of a small stick, and used to stop the effusion of blood from large arteries in amputations by forcibly tying up the limb. The things necessary for this are a roller of a thumb's breadth, and of an ell in length, a small cylindrical stick, a conglomerated bandage two fingers thick and four long, some compresses of a good length, and about three or four fingers breadth, to surround the legs and arms, and a square piece of strong paper or leather about four fingers wide.

The manner of applying this instrument is this; the rolled bandage is to be applied to the trunk of the wounded artery length-ways, covering it in a contrary direction with compresses surrounding the leg, foot, or arm, as it were with a ring; the roller must be passed twice round these applications, and fastened in a knot, but so loosely that you may easily introduce your hand between it and the part: the leather or thick paper must now be nicely placed under it, upon the external part of the leg, and the roller tightened by degrees by turning round the stick, which is to be introduced into the knot; this to be done till the hæmorrhage is entirely stopped: the stick must now be kept in this situation till the wound is properly treated, and the return of the hæmorrhage prevented. When this end is acquired, the *tourniquet* is to be loosened, or entirely taken off, as shall be judged most convenient: but where it is applied to the arm, the rolled bandage is to be placed near the *axilla* in the internal part of the *humerus*, and the stick in this case is to be fastened to the opposite side, the situation of the artery there requiring this position; and when it is to be applied to the thighs, the bandage is to be put as the case shall require, either to the upper part of the thigh, or just over the knee. Heister's Surgery, p. 51. See AMPUTATION and *Tab.* II. *Surgery*, *fig.* 15.

M. Petit, a surgeon at Paris, invented another *tourniquet*, which is said to have this advantage, that it will preserve its situation without requiring the attendance of an assistant; and that it may be left upon the limb for any given time, without impeding the circulation of the blood; whereas the common one cannot be kept on long on this account. This is described, with improvements, by Heister; as are also other *tourniquets* by Morand, &c.

In a pamphlet entitled The Conductor and containing Splints, published in 1781, we have an account of two *tourniquets* upon a new construction, intended as improvements of Petit's, by Mr. Jonathan Wathen.

TOUT *temps prist & encore est*, that is, always ready, and so at the present time: a kind of plea in way of excuse or defence for him that is sued for any debt or duty belonging to the plaintiff.

TOUT, *ensemble*, in the *Arts*. See ENSEMBLE.

TOUT, *per my & per*. See PER MY.

TOW, *to*, derived from the Saxon *teon* or *teohan*, to *draw*, in *Sea-language*, is to draw a ship forward in the water, by means of a rope attached to another vessel or boat which advances by the effort of rowing or sailing.—*Towing* is practised either when a ship is disabled, and rendered incapable of carrying sail at sea; or when her sails are not fixed upon the masts as in a harbour; or when they are deprived of their force of action by cessation of the wind. When a ship of war is dismasted, or otherwise disabled from carrying sail at sea, she is usually towed

towed by a cable reaching from her bow to another ship a-head. In a harbour, *towing* is practised by one or more boats, wherein the force of all the oars is exerted to make her advance. Falconer.

Tow-*chain*, in *Husbandry*, a name given by our farmers to a chain, that makes a part of the structure of the PLOUGH, fastening the plough-tail to what they call the plough-head.

Tow-*line*, in *Sea-language*, a small hauser generally used to remove a ship from one part of a harbour or road to another, by means of anchors, capsterns, &c. It is also employed occasionally to moor a small vessel in a harbour, conveniently sheltered from the wind and sea.

Tow-*rope* is the name given to any cable or rope used in towing.

TOWAGE, is a term used for money, or other recompence, given by bargemen to the owner of the ground next the river where they *tow* a barge, or other vessel, for the liberty of passing along the side thereof.

TOWER, Turris, a high building, consisting of several stories, and usually of a round form, though sometimes square, or polygonal.

Before the invention of guns, they used to fortify places with *towers*, and to attack them with moveable *towers* of wood, mounted on wheels, to set the besiegers on a level with the walls, and drive the besieged from under the same.

These *towers* were sometimes twenty stories, and thirty fathom high: they were covered with raw skins, and a hundred men were employed to move them.

Towers are also built to enable people, by their elevation, to view to a great distance. These are of all figures, as square, round, pentagonal, &c. See Pharos. In China is a famous *tower* of porcelain, whereof the Dutch relate wonders.

Towers are also built for fortresses, prisons, &c. as the *tower* of London, the *towers* of the Bastile, &c.

The *tower* of London is not only a citadel to defend and command the city, river, &c. but also a royal palace where our kings with their courts have sometimes lodged. It contains a royal arsenal, wherein are arms and ammunition for 80000 soldiers; the offices of ordnance, a treasury for the jewels and ornaments of the crown; a mint for coining of money; the great archive, wherein are preserved all the ancient records of the courts of Westminster, &c. and is the chief prison for state criminals.

In the midst of it is the great square white *tower*, built by William the Conqueror, about the year 1079.—Within the *tower* is a parochial church, founded by king Edward III. and dedicated in the name of St. Peter in Chains, exempt from all jurisdiction of the archbishop, and a royal chapel, now disused.

The chief officer of the *tower* is a constable, or chief governor, with an annual salary of 1000*l.* under whom is the lieutenant-governor, who acts by his direction, and in his absence. He has, by grant of several of our kings, *unam lagenam*, two gallons and a pint of wine before, and as much behind the mast of all wine ships that come to London; and a certain quantity out of every boat laden with lobsters, oysters, and other shell-fish, and double the quantity out of every alien's boat passing by the *tower*. His salary is 200*l.* per annum, and his perquisites are large, which make his appointment 700*l.* a year. His usual fee for every prisoner sent to the *tower* is 20*l.* and 3*l.* a week for an earl, and 5*l.* for a knight; for a baron or a degree higher 50*l.* at his entrance; to whom the king allows weekly 10*l.* two parts of which go to the prisoner, and the other third to the lieutenant for lodging and diet: and 50*l.* to the lieutenant upon the prisoner's discharge. Under the constable, besides the lieutenant, are a deputy-lieutenant, at 365*l.* per annum, a *tower* major at 182*l.* 10*s.* per annum, a chaplain at 121*l.* 13*s.* 4*d.* a year, a physician at 182*l.* 10*s.* *per ann.* gentleman-porter at 84*l.* 6*s.* 8*d.* *per ann.* gentleman-gaoler at 70*l.* *per ann.* surgeon at 45*l.* 12*s.* 6*d.* *per ann.* and forty warders. The gentleman-porter has charge of the gates to lock and unlock them, and deliver the keys every night to the constable or lieutenant, and receive them of him the next morning: he commands the warders in waiting, and at the entrance of a prisoner has for his fee *vestimenta superiora*, or else a composition for the same. The gentleman-gaoler has also a fee of 40*s.* for a gentleman, and 5*l.* for a knight.

For the yeomen warders of the *tower*; see Warder.

In the *tower* is likewise kept a court of record by prescription, for the liberty of the *tower*, of debt, trespass, and other actions of any sum.

The *tower-liberty*, subject to no jurisdiction but that of the *tower* itself, includes both the *tower-hills*, part of East Smithfield, Rosemary-lane, Well-close-square, Little Minories, Artillery-street, French-alley, Duke-street, Steward-street, Gun-street, Fore-street, and the other courts and alleys within their compass, in Spitalfields.

Tower, in *Glass-making*. See Leer.

Tower-*bastions*, in *Fortification*, are small *towers*, made in the form of bastions by M. Vauban in his second and third method; with rooms or cellars underneath, for accommodating men and guns. See Fortification.

Tower, *hollow*, in *Fortification*. See Hollow *Tower*.

Towers, *inclined*, are those whose tops hang so far over, as to appear in danger, to people walking below Such is that of Pisa, 138 feet high, whose top overhangs the base 15 feet; and that of Bologna, 130 feet high, whose top overhangs the base 9 feet; and the reason why they do not fall is, that their centres of gravity are supported or the lines of direction in them fall within their base. But if *towers* of this kind, that incline, were to be elevated in height by any additional weight on their tops; in that case the centres of gravity would be raised and their lines of direction fall without the base, and the *towers* themselves must fall.

Tower *Mustard* and *Bastard* Tower *Mustard*, in *Botany*. See Mustard.

TOWN, a place inhabited by a considerable number of people, of an intermediate magnitude and degree between a city, and a village, &c.

It is hard to give a tolerable definition of a *town*, because the idea is a little arbitrary, and unfixed. A *town* is generally without walls, which is the character that usually distinguishes it from a city; but this does not hold universally.

Tithings, *towns*, and villages have the same signification in law; and are said to have had, each of them, originally a church and celebration of divine service, sacraments, and burials; though that seems to be rather an ecclesiastical than a civil distinction. The word *town* or vill is, indeed, by the alteration of times and language, now become a generical term, comprehending under it the several species of cities, boroughs, and common *towns*. A city is a *town* incorporated, which is or hath been the see of a bishop; a borough is now understood to be a *town*, either corporate or not, that sends burgesses to parliament: other *towns* there are to the number, according to sir Edward Coke, of 8803, which are neither cities nor boroughs; some of which have the privileges of markets, and others not; but both are equally *towns* in law. To several of these *towns* there are small appendages belonging, called hamlets.—Entire vills, sir H. Spelman conjectures, consisted of ten freemen, or frank-pledges, demi-vills of five, and hamlets of less than five. These little collections of houses are sometimes under the same administration as the *town* itself, sometimes governed by separate officers; in which last case they are, to some purposes in law, looked upon as distinct townships. These *towns* contained each originally but one parish and one tithing, though many of them now, by the increase of inhabitants, are divided into several parishes and tithings; and sometimes there is but one parish where are two or more vills or tithings. Blackst. Com. b. i. p. 114.

We have several kinds of *towns*, borough-*towns*, market-*towns*, county *towns*, &c. See Borough, &c.

Town-*clerk*, or *Common Clerk*, an officer in the city of London, who keeps the original charters of the city, the books, rolls, and other records, wherein are registered the acts and proceedings of the city. He is to attend the lord mayor and aldermen at their courts.

Town-*house*. See House.

Town, *freedom of a*. See Freedom.

Towns, *Hanse*. See Hanse.

Town-*adjutant*, in *Military language*, is an assistant to the *town*-major.

Town-*major*. See Major.

TOXICODENDRON, in *Botany*. See Poison-*wood*.

It has been debated between Mr. Miller and Mr. Ellis, whether our poison ash, or winged-leaf American *toxicodendron* be the true Japan varnish tree: Mr. Miller maintains the affirmative, and Mr. Ellis the negative: for the arguments on both sides, see Phil. Trans. vol. xlix. p. 160, p. 866, vol. l. p. 430, p. 441. See Varnish.

TOXICUM, τοξικον, a word particularly used to express a sort of poison, said to be used by the Indians to their arrows, in order to render wounds made by them incurable.

The word, in a more general sense, signifies any poison.

The Indians are supposed to poison their arrows, daggers, &c. with the virus of vipers, the mischievous effects whereof continue a long time after the matter is quite dried up.

TOXICUS, in *Botany*, a name by which ſome authors have called the *arundo farcta*, of which walking-canes are made.

TOXOTÆ, τοξόται, among the Athenians, bowmen, a ſort of inferior officers, or rather ſervants, who attended the lexiarchi.

They were much like the Roman lictors: there were a thouſand of them in the city of Athens, that lived in tents, erected firſt in the forum and afterwards in the areopagus. See LEXIARCHI.

TOZZIA, in *Botany*, a name given by Micheli, and continued by Linnæus to a genus of plants, of the *didynamia angio-ſpermia* claſs; the characters of which are theſe: the perianthium is very ſhort; it conſiſts of one leaf of a tubular figure, divided into five ſegments at the end, and remaining when the flower is fallen; the flower is one-leaved and open; the tube is cylindric, and longer than the cup; the extremity forms two lips; the upper lip is bifid and the lower trifid, and all the ſegments are nearly equal in ſize and of a roundiſh figure. The ſtamina are four filaments hid under the upper lip of the flower; the antheræ are roundiſh; the germen of the piſtil is oval; the ſtyle is capillary, of the length of the ſtamina; and the ſtigma is capitated; the fruit is a globoſe univalve capſule, having only one cell, in which is contained a ſingle oval ſeed. There is one ſpecies.

TRABEATION, TRABEATIO, in the *Ancient Architecture*, the ſame with ENTABLATURE.

TRACE, a mark or impreſſion which any thing leaves behind it in paſſing over another.

TRACES *of the brain*, among the Carteſian philoſophers, are thoſe impreſſions, more or leſs deep, which, they ſay, ſenſible objects make on the fine fibres of the brain, by means of the organs of ſenſe.

Theſe impreſſions are alſo called *traces of the object*; the courſe of the animal ſpirits, they ſay, ſerves to keep them up, and to renew them.

The vivacity of the imagination, they ſay, ariſes from the prodigious quantity of *traces* of different objects in the brain; which are ſo linked together, that the ſpirits cannot be ſent into one of them, but they run into all the reſt; by which means the ideas occaſioned by the application of the ſpirits to thoſe ſeveral *traces*, are all excited, as it were, at once.

Memory, according to the ſame, conſiſts in the *traces* which the animal ſpirits have impreſſed.

TRACE *of a hare*, among *Hunters*, is her footing in the ſnow; diſtinct from other treadings, called *doubling*, and *pricking*, &c.

TRACES alſo denote the tracts of ravenous beaſts, as wolves, wild beaſts, &c.

TRACES, *Lady's*, in *Botany*, ſee ORCHIS.

TRACHEA, in *Anatomy*, a large arterial veſſel, called alſo ASPERA *arteria*, and popularly the WIND-PIPE, being the canal or tube which carries the air into the lungs, for the uſe of reſpiration and ſpeech. See *Tab. Anat. (Splanch) fig.* 14, *lit. c c. e e. d d.* &c.

Galen gave it the name *trachea*, τραχεια, becauſe of its being rough and uneven; on which account the Latins alſo called it *aſpera*.

TRACHEÆ, in *Botany*, are certain air-veſſels evident in many plants, but in none more beautifully or diſtinctly obſervable than in the melon. See *anatomy of* PLANTS.

Mr. Bulfinger obſerved that in cutting the root of the common melon tranverſely, there appeared, beſide the bark and other commonly known parts of the root, a multitude of foramina, which were larger or ſmaller as the portions of the root were cut from a thicker or a thinner part. Theſe are eaſily viſible to the naked eye, for they are arranged into a number of faſciculi, which ſurround the axis of the root: there are uſually three circles of theſe diſtinguiſhable in the ſmaller parts of the root, and four in the larger; and the matter in which they are placed is different from that which ſurrounds it, being much harder and more firm than that.

Moſt of theſe faſciculi or foramina finally become divided into two or three portions, and the interſtitial matter in that caſe is always the ſame with that which ſurrounds them. If any number of theſe faſciculi are examined, the order and diſpoſition of the foramina, and even their numbers, are found the ſame in all; they are ſo regularly continued along the root, that air, and light fluids, may be ſucked into the mouth through pieces of the root from two to nine inches long, and this even when they are contorted and crooked in their growth: the caſe is the ſame alſo, whether the piece be cut from the root or from the ſtalk of the plant, or from both; for when ſuch a piece is cut, half of which is root and half ſtalk, the continuation of theſe foramina is found to be the ſame, and the air paſſes, whether it be blown in at one end or the other: this is plainly ſeen on immerſing one end in water, and blowing in at the other, the bubbles of air ariſing readily and in great quantities. Comment. Petropolit. vol. iv. p. 182.

Nothing ſhews the *tracheæ* of plants in ſo beautiful a manner as a tranſverſe ſegment of a young ſhoot of the vine. They may be in this diſcovered in a good light even by the naked eye; but with the help of but a ſmall magnifying glaſs they appear very beautiful and diſtinct. In the generality of other trees, theſe *tracheæ* are ſo ſmall, that even the largeſt magnifiers in our microſcopes cannot well diſtinguiſh them: ſo that Fontenelle and many other great men have doubted their exiſtence: but even where theſe are ſmalleſt of all, as in the petiola or middle ribs of the leaves of plants, they may, though wholly imperceptible to the ſight, be proved to exiſt, by experiments. If a ſmall cylindric glaſs be filled with water, and have all its air exhauſted from it by the air-pump; and the middle rib of a leaf be then cleared from the other parts, and cut off at both ends, and plunged at one end into this water, while yet in the exhauſted ſtate, the bottom of the petiolum being ſupported from touching the bottom of the glaſs, the ſituation and number of the *tracheæ* in it will be eaſily diſtinguiſhed by a ſtring of bubbles, which, ariſing from each of them will make a row of beads, as it were riſing in a continued chain to the ſurface. Act. Erudit. Ann. 1722. p. 24.

TRACHEAL *artery*, in *Anatomy*, a branch of the right ſubclavian, running up from it in a winding courſe, along the aſpera arteria, to the glandulæ thyroideæ and larynx, detaching ſmall arteries to both ſides; one of which runs to the upper part of the ſcapula. The *tracheal* artery may likewiſe be called *gutturalis inferior*.

TRACHELAGRA, formed of τραχηλος, *neck*, and αγρα, *ſeizure*, a term uſed by ſome medical writers to expreſs the gout in the neck.

TRACHELIUM, in *Botany*. See THROAT-*wort*.

TRACHELO-MASTOIDÆUS, in *Anatomy*, a name given by Albinus to a muſcle, called by Winſlow and others the *complexus minor*, or *maſtoidæus lateralis*.

TRACHELOS, a word uſed by ſome anatomical authors to expreſs the neck.

TRACHIDNA, in *Ichthyology*, a name given by Jovius and ſome others to the DRACO *marinus* of the old authors, called by us the WEEVER.

TRACHINUS, in the Linnæan ſyſtem of *Ichthyology*, the name of a genus of fiſh, of the order of the *jugulares*: the characters are, that the head is compreſſed and not ſmooth; the membrane of the gills has ſix rays, and the lower lamina of the opercula is ſerrated; and the anus is near the breaſt. Linnæus mentions one ſpecies, viz. the DRACO: Artedi refers the URANOSCOPE alſo to this genus.

The name is originally Greek, the word τραχεινος ſignifying rough, ſharp, or prickly. It was given to this fiſh from the rays of its back-fin being remarkably rigid, and ſharp like prickles.

TRACHINUS *lapis*, a ſtone mentioned by the writers of the middle ages, as poſſeſſing many great medicinal virtues. It ſeems to have been a kind of *lapis nephriticus*, being deſcribed as bright, but not tranſparent, and being of two kinds, the one blackiſh, and the other green.

TRACHOMA, τραχωμα, in *Medicine*, a roughneſs or aſperity of the inner part of the palpebræ, attended with an itching and redneſs, and frequently with puſtules reſembling millet ſeeds.

Its degrees are the ſycoſis, and tyloſis, or rather thoſe are higher diſorders, into which the *trachoma* is liable to degenerate.

TRACHURUS, in *Ichthyology*, the name of a fiſh of the *ſcomber* kind, called in Engliſh a *ſcad*, and by ſeveral authors, *ſuro*, *ſaurus*, and *lacertus marinus*. See *Horſe*-MACKREL.

TRACHURUS *Braſilienſis*, a name given by Mr. Ray to a fiſh of the ſcomber kind, the *ſcomber cordyla* of Linnæus, known among writers on theſe ſubjects by its Braſilian name GUARATEREBA.

TRACING, in *Huſbandry*, a term uſed by our planters for the method of preſerving the MAIZE, or Indian corn. This being a large grain, is apt to ſpoil, if not carefully preſerved.

Some thraſh out the corn as ſoon as the ears are gathered, and lay it up in holes of the earth, which are their granaries: but thoſe who have not opportunities of doing this, *trace* it, that is, they leave it in the ear, and weave, or faſten together a great number of ears by the ends of the huſks: theſe *traces* of corn they hang up within doors, on ſuch ſupports as will keep them from one another; and they will, in this manner, keep good the whole winter.

This is a method of our introducing; but their own, of burying the clean corn, was at leaſt as good, and was the

the same practised by the Egyptians of old, and by all the wisest nations of the East at this time. But whether we have improved their husbandry in this particular, or not, it is certain that we have greatly assisted them in the planting of this corn, which we do by the plough, instead of the troublesome method they had of doing it with the hoe. The manner of our planting it is this: we plough single furrows the whole length of the field, and at about six feet distance one from another; we then plough others across at the same distance, and then, wherever the furrows meet, the corn is thrown in; it is then covered either by the hoe, or by running another furrow behind it with the plough; and when the weeds begin to overtop the corn, they plough the spaces again, and by this means destroy and turn in all the weeds, and give the earth a stirring, that greatly assists vegetation.

The famous method of horse-hoeing husbandry, so celebrated by Mr. Tull, in a book written on that subject, is no other than a bringing home this method of our American planters, in the culture of the maize, and applying it to our European corn. The Indians, and our planters, join in the method of raising a hill of earth round every stalk of the maize; and when the ground is poor, or out of heart, they bury two or three fish, of a kind called by them the *aloofe*, under every hill, and by this means they have a crop double to what would otherwise have been produced. The English have learned this manure from the Indians; and in New England, where they are near the fishing-stages, they bury the heads and garbage of the cods, which succeeds as well as the aloofe, and costs nothing but the carriage.

The lands on which the maize or Indian corn has grown, are as well fitted for our European corn as if they had been laid fallow. The reason of this is, that the plants of the Indian corn standing at six feet distance from each other, the far greater part of the ground has remained unoccupied, and at the same time has had the advantage of often ploughing to kill the weeds, which is a benefit equal to that of dung and rest. All this, though it tends to prove the doctrine of horse-hoeing husbandry not new, yet it strengthens the system greatly. Phil. Trans. N° 142.

TRACING, among *Miners*. See TRAINING.

TRACING-*line*, in *Sea-language*, a small cord generally passing through a block or thimble, and used to hoist up any object to a higher station, in order to render it less inconvenient. Such are the *tracing*-lines of the awnings, and those of the yard-tackles, which, by hanging down in a cavity or bight, would be aukward and incommodious. Falconer.

TRACK *of a ship*. See WAKE.

TRACKING, denotes the art of pulling any vessel or floating body along the stream of a canal or river, by means of a rope extending from the vessel, &c. to the adjacent shore, and drawn along the banks of the river, by men or horses. Whence,

TRACK-*scout*, a vessel employed to carry goods or passengers up and down the rivers or canals in Holland, and the countries bordering on the Baltic sea. It is usually tracked by a horse, who trots along the margin to a limited distance, after which he is relieved by another. Falconer.

TRACT, TRACTUS, properly denotes an extent of ground, or a portion of the surface of the terraqueous globe.

TRACT, or TRACTATE, TRACTATUS, does also signify a small treatise, or written discourse, upon any subject.

TRACT, in *Hunting*, denotes the trace or footing of a wild beast.

TRACTION, *drawing*, the act of a moving power, whereby the moveable is brought nearer to the mover, called also ATTRACTION.

TRACTORIÆ, among the *Romans*, were diplomas or tickets given by the emperor to such as he sent into, or called out of the provinces; whereby they were entitled to the use of the public post, and to be maintained at the expence of the government.

TRACTRIX, in *Geometry*, a curve line, called also CATENARIA.

TRADE, *traffic*, *commerce*, the act, or art, of dealing, buying, selling, exchanging, &c. of commodities, bills, money, &c.

For the origin, progress, &c. of *trade*, see COMMERCE, and NAVIGATION.

The offences against *trade*, considered in a legal view, are *owling* or the offence of transporting wool or sheep out of this kingdom, to the detriment of its staple manufacture, (see OWLER), SMUGGLING, fraudulent BANKRUPTCY, USURY, *cheating*, (see CHEATS), FORESTALLING, *regrating* (see REGRATOR), ENGROSSING, MONOPOLY, exercising a *trade* in any town, without having previously served as an APPRENTICE for seven years, punishable by statute 5 Eliz. c. 4. with the forfeiture of 40*s*. *per* month; and transporting and seducing our ARTIFICERS and MANUFACTURERS to settle abroad.

TRADE, *balance of*. See BALANCE.

TRADE, *board of*. See BOARD.

TRADE-*winds* denote certain regular winds at sea, blowing either constantly the same way, or alternately this way and that; thus called from their great use in navigation, and the Indian commerce.

The *trade-winds* are of different kinds, some blowing three or six months of the year one way, and then the like space of time the opposite way: these are very common in the Indian seas, and are called MONSOONS.

Others blow constantly the same way: such is that general wind between the tropics, which off at sea is found to blow all day long from east to west. For the phenomena of each, with their physical causes, see WIND.

Dr. Lister has a conjecture in the Philosophical Transactions, N° 156, that the tropical or *trade-winds* arise, in great part, from the daily and constant exhalations of a sea-plant, called the *sargossa*, or *lenticula marina*, which grows in vast quantities from 36° to 18° north latitude, and elsewhere upon the deepest seas. For the matter of wind, coming from the breath of one only plant, must needs be constant and uniform; whereas the great variety of trees and plants at land furnishes a confused matter of winds. Hence, he adds, it is, that these winds are briskest about noon; the sun quickening the plant most then, and causing it to breathe faster, and more vigorously. Lastly, the direction of this wind of east to west, he attributes to the general current of the sea; for a gentle air is observed to be constantly led along with the stream of the river: nor must it be omitted, that every plant is, in some measure, an heliotrope, and bends itself, and moves after the sun, and consequently emits its vapour thitherward; so that the direction of the *trade-wind* is, in some measure, also owing to the course of the sun.

Dr. Gordon has another hypothesis: the atmosphere, which surrounds the earth, and moves along with it in its diurnal motion, he supposes to keep pace therewith; that part of it, at least, which is near the earth, if the remoter part should be judged to lose ground.

If then there were no changes in the atmosphere's gravity, he supposes it would always go along with the earth from west to east in an uniform motion, altogether insensible to us: but the portion of the atmosphere under the line being extremely rarefied, its spring expanded, and so its gravity and pressure much less than the neighbouring parts of the atmosphere, it is incapable of the uniform motion towards the east, and must therefore be pressed westwards, and make the continual breeze from east to west, between the tropics.

TRADESCANTIA, *Virginian Spider-wort*, in *Botany*, a genus of the *hexandria monogynia* class; its characters are these: the flower has a disordered sheath; the proper empalement is permanent, and composed of three oval concave leaves; the flower has three roundish equal petals which spread open, and six hairy slender styles, terminated by kidney-shaped summits, and an oval obtuse germen with three corners, supporting a slender style, crowned by a three-cornered blunt stigma; the germen afterward turns to an oval capsule shut up in the empalement, having three cells containing a few angular seeds. There are five species. Tournefort called this genus *ephemerum*, because the flower continued but one day before it faded; but Linnæus denominated it *tradescantia* after John Tradescant, who brought the plant from Virginia, where it grows naturally.

TRADING *society*. See SOCIETY.

TRADITA *nexu*. See ABALIENATION.

TRADITION, TRADITIO, the act of delivering a thing into the hands of another. The sale of a moveable is completed by a simple *tradition*.

TRADITION, in *Matters of Religion*, is applied to those laws, doctrines, relations, &c. which have been handed down to us from our forefathers, without being written.

Taking *tradition* in this sense, for every thing relating to faith, or the rites and ceremonies of religion thus derived down to us from the primitive church, there are two kinds, viz. *apostolical* and *ecclesiastical tradition*.

TRADITION, *apostolical*, which is what we properly call *tradition*, is defined by the Romanists to be the unwritten word of God, descended from the apostles to us, through a continual succession of the faithful.

By this *tradition*, ſay they, it is, that the Holy Scriptures have been kept entire, both as to the letter, i. e. the text, and as to the ſpirit or ſenſe thereof. This *tradition* the council of Trent declares to have the ſame authority with the Holy Scripture itſelf, and pronounces every one who rejects it an heretic.

TRADITIONS, *eccleſiaſtical*, are certain ſtatutes and regulations regarding the rites, cuſtoms, and circumſtances of religion, introduced ſince the time of the apoſtles, by councils, popes, &c. and continued to our time through a conſtant obſervance of the church.

The Romaniſts make another diviſion of *tradition*, viz. into *written* and *unwritten*.

TRADITION, *written*, is that whereof we find ſome traces in the ancient fathers and doctors.

TRADITION, *unwritten*, is that whereof there appear no ſigns or ſteps in any of the fathers extant.

The church of Rome pretends to be the depoſitary of each kind: *tradition* ſhe holds to be abſolutely neceſſary in the church, grounding this neceſſity on the promiſe of infallibility which Jeſus Chriſt is pretended to have made her.

Yet others of that communion deny *tradition*, how excellent ſoever it may be for the reclaiming of heretics, to be abſolutely neceſſary; maintaining, that the church would not be leſs infallible, nor leſs the rule of doctrine, &c. if the fathers had never written at all.

TRADITIONARY, TRADITIONARIUS, a name given among the Jews, to ſuch of them as acknowledge tradition, follow it, and explain the Scriptures thereby: in oppoſition to the CARAITES, who refuſe any thing but the pure Scriptures themſelves.

The *traditionaries* are what we more uſually call rabbins and rabbiniſts, or talmudiſts. Hillel ſhone among the *traditionaries*, and Schammai among the textuaries.

TRADITORES, a name given in the firſt ages of the church to ſuch Chriſtians, as, in times of perſecution, to avoid death and martyrdom, delivered up the ſacred writings to the perſecutors.

The enemies of religion, even under the old law, made their utmoſt efforts to deprive the world of the Holy Scriptures: in that cruel perſecution which Antiochus raiſed againſt the Jews, the books of the law were very ſolicitouſly ſought after, torn, and burnt, and ſuch as kept them were put to death; as we read in the firſt book of Maccab. chap. i. ver. 56, 57.

Diocleſian renewed the ſame impiety, by an edict publiſhed in the nineteenth year of his empire, commanding all the ſacred books to be brought to the magiſtrates and burnt.

Many weak Chriſtians, and even ſome biſhops, overcome by the fear of puniſhment, carried in their books to the perſecutors; which the church deteſting, made very ſevere laws againſt them, and gave them the infamous name of *traditores*, from *trado*, *I deliver*, *betray*.

As the great pretence of the ſchiſm of the Donatiſts was, that the Catholics tolerated the *traditores*, it was decreed in the council of Arles, held in 314, that ſuch as ſhould be found guilty of having delivered up any of the holy books or veſſels, ſhould be depoſed from the order of the clergy, &c.

TRADUCIANS, TRADUCIANI, a name which the Pelagians anciently gave the catholics, becauſe of their teaching, that original ſin was tranſmitted from father to children, or that it was communicated to the children by the father in the way of generation.

The word is formed of the Latin, *tradux*, which was made uſe of to expreſs that communication; and which comes from *traduco*, *I tranſmit*, or *propagate* from one to another.

At preſent ſome give the appellation *traduciani*, to ſuch as hold, that the ſouls are tranſmitted to the children by the father.

TRADUCTION, formed of *trans*, *beyond*, and *duco*, *I lead*, *draw*; the act of tranſlating, or turning out of one language into another. See TRANSLATION.

TRAFFICK. See TRADE and COMMERCE.

The word is formed from the French, *trafic*, and that from the Italian, *traffico*, which is again borrowed from the Arabic.

The principal *traffick* in Muſcovy and the North is in furs and ſkins: the great *traffick* of the Dutch in the Eaſt is in ſpices: the *traffick* of money is moſtly carried on at the Exchange.

TRAFINE. See TREPAN.

TRAGACANTH, or ADRACANTH, or *gum-dragon*, τραγακανθα, formed of τραγος, *goat*, and ακανθα, *thorn*, a kind of gum ouſing out at certain fiſſures in the trunk and larger branches of a prickly plant or little ſhrub of the ſame name, growing in many parts of the Levant.

For its botanical characters, ſee GOAT'S-*thorn*.

This plant is the ASTRAGALUS *tragacantha* of Linnæus. The naked hillocks of mount Ida in Candia, M. Tournefort tells us, produce much of the plant *tragacantha*, or goat's-thorn, which gives the gum ſpontaneouſly towards the end of June, and in the following months, when the nutritious juice of the plant, thickened by the heat, burſts moſt of the veſſels in which it is contained.

This juice coagulates in threads, which make their way into the pores of the bark, where being puſhed forwards by new juice, they get through the bark, and are at length hardened in the air, either into little lumps, or into twiſted pieces in form of little worms, more or leſs long, according to the quantity of the matter they are formed of.

It ſhould ſeem too, that the contraction of the fibres contributes to the expreſſion of the gum: thoſe fine fibres, like the fibres of hemp, laid bare and trampled under foot by men and horſes, contract themſelves, and facilitate the expreſſion of the extravaſated juice. The plant grows alſo in ſeveral places of the Levant, particularly about Aleppo.

There are ſeveral other ſpecies of the *tragacantha*, beſides that deſcribed by Tournefort, which are ſaid to yield this gum; and particularly that of Marſeilles, from whence the gum is often brought into England. But it is brought to us chiefly from Turkey.

The gum is of different colours and qualities, ſome being white, other ſome greyiſh, ſome reddiſh, and ſome almoſt black. The white is the beſt: it muſt be choſen clear, ſmooth, and twiſted, or vermicular. It is dry, and yet ſomewhat ſoft to the touch.

Gum-*tragacanth* differs from all the other known gums, in giving a thick conſiſtence to a much larger quantity of water; and in being much more difficultly ſoluble, or rather diſſolving only imperfectly. Put into water, it ſlowly imbibes a great quantity of the liquid, ſwells into a large volume, and forms a ſoft but not fluid mucilage; with the addition of more water, a fluid ſolution may be obtained by agitation, but the liquor appears turbid and wheyiſh, and on ſtanding the mucilage ſubſides.

It is ſmooth and ſoftening, and therefore is good to obtund the acrimony of any humours; which makes it of ſervice in ſuch coughs as proceed from catarrhs, and defluxions of rheum. It is alſo very ſtrengthening in ſome ſeminal weakneſſes, and is prevalent againſt the whites in women.

Tragacanth is uſually preferred to the other gums for making up torches, and other ſuch purpoſes, and is ſuppoſed likewiſe to be the moſt effectual as a medicine; but on account of its imperfect ſolubility is unfit for liquid forms. It is commonly given in powder with the addition of other materials of ſimilar intention: thus to three parts of gum-*tragacanth* are added three of gum arabic, three of marſhmallow root, one of liquorice, one of ſtarch, and ſix of ſugar. Lewis.

TRAGACANTHUM *venereum Indicum*, in *Natural Hiſtory*, a name given by ſome writers to the BIRDS *neſts* ſo famous in ſoops in China, and in ſome parts of Europe, for their cordial, reſtorative, and provocative virtues. They are the neſts of a kind of Indian ſea-ſwallow, and are made up of a ſubſtance reſembling gum-tragacanth, and, like it, melting in a jelly in any warm liquor.

TRAGASIAN *ſalt*, a term uſed among the ancients for a ſort of ſea-ſalt, very little different from the common kind, being made by the evaporation of the water of ſome ſalt ponds near the ſea-ſhores.

TRAGEA, in *Pharmacy*, an aromatic powder groſly beaten and mixed with ſugar; taken by way of carminative.

TRAGEDY, a dramatic poem, repreſenting ſome ſignal action performed by illuſtrious perſons, and which has generally a fatal iſſue or end.

Ariſtotle more ſcientifically defines *tragedy*, the imitation of one grave and entire action, of a juſt length, and which, without the aſſiſtance of narration, by raiſing of terror and compaſſion, refines and purges our paſſions.

This definition has given the critics ſome perplexity; and Corneille declares he cannot reconcile Ariſtotle with himſelf: the inſtances Ariſtotle cites, he thinks, defeat his own definition. He even denies the purging of our paſſions to be the end of *tragedy*.

Our Engliſh authors are more favourable to the definition; by the purging of our paſſions, they underſtand not the extirpating of them, but the reducing of them to juſt bounds; for by ſhewing the miſeries that attend a ſubjection to them, they ſay it teaches us to watch them more narrowly; and by ſeeing the great misfortunes of others, it leſſens the ſenſe of our own.

Tragedy, in its original, M. Hedelin obſerves, was only an hymn ſung in honour of Bacchus by ſeveral perſons, who, together, made a chorus of muſic with dances and inſtruments.

As this was long, and might fatigue the fingers, as well as tire the audience, they bethought themselves to divide the singing of the chorus into several parts, and to have certain recitations in the intervals.

Accordingly, Thespis first introduced a person to speak upon the stage with this view: Æschylus, finding one person insufficient, introduced a second to entertain the audience more agreeably by a kind of dialogue: he also clothed his persons more decently, and first put on them the buskin.

The persons who made their recitations on the scene, were called *actors*; so that *tragedy* at first was without many actors. And what they thus rehearsed, being things added to the singing of the chorus, whereof they were no necessary part, were called *episodes*.

Sophocles found that two persons were not enough for the variety of incidents; and accordingly he introduced a third: and here the Greeks seem to have stopped; at least, it is very rare that they introduce four speakers in the same scene.

Tragedy and comedy were at first confounded with each other; but they were afterwards separated; and the poets in general applied themselves to the cultivating of *tragedy*, neglecting comedy.

When *tragedy* was got into a better form, they changed the measure of its verse, and endeavoured to bring the action within the compass of a day, or of a revolution of the sun.

For the several parts of *tragedy*, see Act, Scene, Action, Fable, Character, and Manners.

The English received the first plan of their drama from the French, among whom it had its first rise towards the end of the reign of Charles V. under the title of the *chant-royal*; which consisted of pieces in verse composed in honour of the Virgin, or some of the saints, and sung on the stage: they were called by the title *chant-royal*, because the subject was given by the king of the year, or the person who had borne away the prize the year preceding.

The humour of these pieces took wonderfully among the people, insomuch that in a little time there were formed several societies, who began to vie with each other in them: and one of these, to engage the town from the rest, began to intermix various incidents or episodes, which they distributed into *acts* and *scenes*, and had as many different persons as were necessary for the representation.

Their first essay was in the Bourg St. Maur, and their subject the passion of our Saviour. The prevot of Paris prohibiting their continuing of it, they made application to court; and to render it the more favourable to them, erected themselves into a friery, or fraternity, under the title of *Brothers of the Passion*; which title has given some occasion to suspect them to have been an order of religious.

The king, on seeing and approving some of their pieces, granted them letters of establishment in 1402, upon which they built a theatre, and for an age and an half acted none but grave pieces, which they called *moralities*; till the people growing weary of them, they began to intermix farces or interludes taken from profane subjects.

This mixture of farce and religion displeasing many, they were re-established by an arret of parliament in 1548, on condition of their acting none but profane, yet lawful and decent subjects, without intermeddling with any of the mysteries of religion; and thus were the Brothers of the Passion despoiled of their religious character: upon which they mounted the stage no more in person, but brought up a new set of comedians, who acted under their direction.

Thus was the drama established, and on this foundation arrived in England. In process of time, as it was improved, it became divided into two branches, agreeable to the practice of the ancients, and the nature of things, viz. into *tragedy* and comedy properly so called; and this last again was subdivided into pure comedy and farce. See each under its proper head, Comedy, &c.

Tragedy, *hilaro*. See Hilaro-*tragœdia*.

TRAGELAPHUS, in *Zoology*, the name of an animal of the goat-kind, of which there are two species, the one described by Gesner, the other by Bellonius. See Musimon.

TRAGIA, in *Botany*, a genus of the *monoecia triandria* class: the characters of which are these: it produces male and female flowers on the same plant; in the male the perianthium is divided into three segments, which are ovated, acute, and expanded; there are no petals; the stamina are three capillary filaments, of the length of the cup, and the antheræ are roundish; Plumier makes this cup a monopetalous funnel-fashioned flower; but this does not appear to be really the case; in the female flowers the cup is divided into five segments, which are ovated and hollow; the germen of the pistil is roundish, and furrowed with three lines; the style is single, erect, and longer than the cup; the stigma is trifid and expanded; the fruit is a very large tricoccous three-celled capsule, of a roundish figure; the seeds are single and roundish. There are five species.

TRAGI-COMEDY, a kind of dramatic piece, representing some action passed among eminent persons, the event whereof is not unhappy or bloody, and wherein is sometimes admitted a mixture of less serious characters.

The ancients, M. Dacier observes, knew nothing of such compositions, wherein the serious and comic are blended; nor does the epithet M. Corneille gives them of heroic comedies, excuse their irregularity.

Their foundation is certainly bad; for, endeavouring both to make us laugh and cry in their turns, they endeavour at contrary emotions, which the heart can never undergo; every thing that disposes for the one, indisposing for the other.

The *tragi-comedy* was formerly very common on the English stage; there was scarce such a thing in the seventeenth century as a pure tragedy without a spice of comedy or farce to make the people laugh. Now, that the stage and our tastes are brought nearer to the model of nature, and the ancients, the *tragi-comedy* is disused.

Tragi-comedy is the only case, wherein comedy is allowed to introduce kings and heroes.

TRAGIC-*dance*, in *Antiquity*. See Emmelia.

TRAGICUS *musculus*, in *Anatomy*, a name given by Albinus to one of the muscles of the eye, called by Santorini and Winslow, *musculus tragi*.

TRAGIUM, in *Botany*, a name by which some authors have called the fraxinella, or bastard-dittany, the root of which is used in medicine.

Tragium *Germanicum*, in *Botany*, a name given by some authors to the *atriplex olida*, or stinking orach.

TRAGO *orchis*, in *Botany*. See Satyrion.

TRAGO-ORIGANUM, in *Botany*, a name given by some authors to the *marum Syriacum*, or Syrian herb mastic.

TRAGOPOGON, in *Botany*. See Goat's *Beard*.

TRAGOSELINUM, in *Botany*. See *Burnet* Saxifrage.

TRAGULA, among the Romans, a strong kind of javelin, with a barbed head.

TRAGUM, in *Ichthyology*, the name given by Aristotle, and others of the old Greek writers, to the *trugum* of Ælian, Athenæus, and Oppian. Both names are used to express the fish called by authors the pastinacha *marina*, and by us the *fire-flaw*, or *fire-flaire*.

TRAGUS, τραγυς, in *Anatomy*, one of the protuberances of the auricle, or external ear; called also *hircus*, because usually hairy.

The *tragus* is that protuberance next the temple. That on the opposite side, to which the soft lobe of the ear is annexed, is called the antitragus.

TRAJAN *column*, a famous historical column, erected in Rome, in honour of the emperor *Trajan*. See Column, *colossal*.

TRAJECTORY of a comet, is its path or orbit, or the line it describes in its motion.

This, Hevelius, in his Cometographia, will have to be very nearly a right line; but Dr. Halley concludes it to be a very excentrical ellipsis.

Sir Isaac Newton, in prop. xli. of his third book, shews how to determine the *trajectory* of a comet from three observations; and, in his last proposition, how to correct a *trajectory* graphically described.

This term is often used, in general, for the path of any body moving either in a void, or in a medium that resists its motion; or even for any curve passing through a given number of points. Thus Newton, Princip. lib. i. prop. 22. proposes to describe a *trajectory* that shall pass through five given points.

TRAIL-*board*, in a *Ship*, is a carved board on each side of her beak, which reaches from the main stem to the figure, or the brackets. See *Tab. Ship. fig.* 2. *n.* 4.

TRAIN, the attendance of a great person, or the trail of a gown, or robe of state.

In *Falconry*, it denotes the tail of an hawk.

Train is likewise used for the number of beats which a watch makes in an hour, or any other certain time. See Watch-*work*, &c.

Train is also used for a line of gunpowder laid to give fire to a quantity thereof, in order to do execution, by blowing up earth, works, buildings, &c.

Train, or Traile *of artillery*. See Artillery.

Train *oil*, the oil procured from the blubber of whales, by boiling. See Whale and *Whale*-Fishery.

Train-*bands*, or Trained-*bands*, a name given to the militia of England, particularly to those of the city of London.

TRAINING, or Tracing, in *Mineralogy*, a term used by our miners to express the tracing up of the mineral appearances

pearances on the surface of the earth to their head or original place, and there finding a mine of the metal they contain: or, *training* or *tracing* a lode, denotes the same with backing of it; that is, laying open the bryle, and discovering the back of the lode, by many pits, for several fathoms in length, east and west. The bryle of a lode is, that mineralised substance, which lies loosely upon the top of it under the loose mould and rubbish of the earth.

The principle on which this practice depends, is the change wrought in the face of the earth by the deluge, of the effects of which these remains are a very great proof. The superficial, or upper part of veins, or lodes of ore, is always the poorest, the richer ores lying deeper down, the poor ones only serving to lead the way. These poor ores, or stones impregnated with the metalline matter of the mine, and called by our workmen, SHOAD-*stones*, were, probably, at the creation of the earth, brought regularly up to the surface, and shewed the place of the metals below. But at the time of the covering of the earth by the waters of the deluge, they were, with the rest of the surface washed off, and carried, with the descent of the water, down into the plains, or into the beds of rivers, and there carried many miles down the stream. This being an allowed truth, the art of *training* a mine is easy; for though this carrying of the shoad-stones and poor ore, was done so many ages ago, yet all the way that some pieces were carried on, others would be deposited by the way, and the heaviest and richest falling first, the lightest would always be carried farthest, and there would be always left a stream of the matter all the way from the place where it was first produced, that is, where the mine now is; for the breaking of the surface of the earth, at this great catastrophe, was not so deep as to reach that; and this stream or train of matter will be found richer and richer as it approaches the mine, and finally will stop at the place where it is.

Where there is supposed to be a mine of any metal, the hills and country all about are diligently searched; the situations and descent of the lands, and the earth, stones, and other fossile bodies, are examined, particularly the colour and nature of the various sorts of earths and stones which are found on the hills where the mine is suspected to lie, that they may be readily known again if any of them are found in the neighbouring valleys. The stones which denote the lodes, and are called *shoad-stones*, are found two, three, four, or even five miles from the hills, where they originally lay; but if the same sort of stones are remembered on the hills, the train is to be made out

After any great land-flood, in which it is supposed there are usually some new frets made in the banks of the rivers, these are carefully examined, to see whether any metalline stones may be found in their sides and bottoms, all being then so clean, that the smallest shoad-stone may usually be seen. If no stones of this kind are found, it sometimes is of use, in order to farther researches, to examine whether any pieces of earth, of a different colour and nature from that of the rest of the bank, be found; for these being, if any such are found, washed also from the neighbouring hills, afford a great direction which side of the hill to search into.

If no shoad-stone or grewt of a different nature from the rest be found in these frets or newly worn banks, the miners leave the place for the present. For though the bed of the river afford many metalline stones, they never regard them, the continual change of place they receive from the current of the water rendering them only tokens that there is metal somewhere in the country; but they confound and perplex rather than instruct in the search after the places where it is.

If there be found indeed stones of the shoad-kind, full of protuberances, or having sharp angles, as if newly broken, it may be worth while to see whether they are not washed out of some part of the neighbouring banks by the late floods; as this sort of appearance is a token of their having been newly taken into the bed of the river. But if they are rounded and smooth, it may be concluded that they have been long subject to the action of the water, and brought, perhaps, many miles from the places where they were originally lodged in the earth, and where only they could have been of any use to the *tracer* of the mine.

When the frets in the sides of rivers have been traced in vain, the searcher after a mine goes up to the sides of the hills most suspected to have mines in them, and there seeks for a convenience of bringing a little stream of water to run down. When this is found, he cuts a trench about two feet over, and as deep as the shelf. The water is turned into this cut, and after two or three days running in it, all the filth will be washed away, and the loose part of the earth cleared off; and if any shoad-stones are lodged within the whole course of this cut, they will be found. If any such are found, it is an unquestionable proof that there is ore in the higher parts of the hill; this encourages the work, and there is always found a mine, or at least a squat, which will, without much danger, repay the expence and trouble. The squats are flat parcels of the ore, lying in different and distinct places of the hills, and not communicating with one another.

Sometimes a great deal of this labour is saved, and the shoad-stones are found on the surface of the ground, either turned up by the plough, or thrown up in small quantities in mole-hills, or raised by some other accident, for they are seldom found naturally lying on the very surface of the earth; for the putrid remains of vegetable and animal substances, and other adventitious matter, has raised the surface of the earth in all places, since the time of the flood, and made indeed a sort of new surface. These stones were certainly laid bare on the surface of the ground, at the time of their being carried down from the mines; but this adventitious matter has buried them in this long tract of time, and they are generally found under about a foot of a sort of vegetable mould. If, by any of these searches, a shoad is found, the miners have nothing to do but to follow it to its head, and there make the opening; but if no such direction can be had, nor any shoad found, and there is yet suspicion that there is a mine in the hill, the method is to make an *essay-hatch*, as it is called; this is sunk near the foot or bottom of the hill, and is an opening of about six feet long, and four feet broad, made in search of a vein as deep as the shelf; this is a caution that must be always carefully observed, for if they are made less deep than this, they may miss of the vein, though there is one. And the sinking thus deep is always attended with certainty, for if no shoad is found on this, it may be concluded there is none there; except that sometimes it is found that the shoad has been washed clean away, within two or three feet from the land; and then the load or vein is two feet farther or thereabouts up in the hill. If any shoad is found in the essay-hatch, there is a certainty of a vein of ore; neither doth it add a little toward the making of a conjecture how high up the hill, or how far off the vein-string, or bonny is, carefully to mark how deep from the surface of the earth the shoad lies, for this is held an infallible rule, that the nearer the shoad lies to the shelf or fast ground, the nearer the vein itself is, and *vice versa*.

When there is no shoad or appearance of a mine found in the first essay-hatch, if the conjecture of a mine being in the hill has any tolerable foundation, the *tracing* it does not end here; but they go ten or twelve fathom up the hill, and there open a second essay-hatch, and if no ore or shoad-stone is found in this, they go as many fathom on each hand at the same height with the second hatch; and there open a third and a fourth hatch, of the same depth and dimensions with the first; if in neither of these there is found any shoad-stone, they ascend proportionably with three more hatches, if the space of ground require, at every ten or twelve fathom, and in this manner open them three abreast, at twelve fathom distance up to the top of the hill. If no shoad is found in any of these, it is concluded then that there is no *tracing* of a mine there, and the hill is left.

If any shoad is found in any of these hatches or openings, the ascending hatches from this are kept on in a direct line, and the deeper the shoad lies the nearer the vein is. The shoad grows gradually deeper from the surface, but nigher the shelf as they approach the mine; as suppose it be but half a foot from the shelf and seven feet from the surface, the vein is then concluded to be within a fathom or two; and on this the first proportion of twelve fathom between every hatch is lessened, to six, four, two, one, or even less than that, as the vein is conjectured to be more and more near.

It often happens, for want of a good guess in this matter, that the diggers over-shoot the lode; that is, they open their next hatch too high up the hill, or above the lode or vein: this is a mistake easily discovered and easily rectified. If a shoad is found lying near the shelf in one hatch, and in the hatch above there is no shoad at all, it is a proof that the hatch is too high, and the remedy is only to sink a hatch at a middle distance between the last two, which will probably fall upon the very point of the lode, and finish the work of *tracing*.

Sometimes it happens, that in continuing the *tracing* of the first shoad, a second or new one is found; it is not uncommon for two shoads to be thus found in one hatch, and this is easily discovered without any danger of mistake; for suppose in the last hatch the shoad which they *trace* lay at eight feet deep, and in this it lies at ten feet, and beside this there is a shoad found at two feet depth; it is very certain that the shoad at ten feet deep is the same they were before *tracing*, and this is a new one pointing to another vein or lode, which is now first

discovered

diſcovered ſo near the ſurface of the earth. This has generally gravel or earth mixed with it, and is to be carefully examined; when the higher hatches are opened, this is continually found as well as the old lode; and when the firſt is *traced* to the point of the vein, this ſecond is to be continued in the ſame manner, by other hatches opened at the ſame diſtances above; it often happens that in *tracing* this ſecond ſhoad, the hatches dug for it diſcover another new one, or a third ſhoad; all theſe are to be *traced* one over the other by the ſame hatches, and will all be found worth the ſeeking after.

The old writers on mineralogy agree with us in this obſervation, and tell us, it is not uncommon in ſome places to find as far as ſeven lodes lying parallel to one another in the ſame hill. In theſe caſes, however, there is uſually one maſter-lode, or a grand vein; the other ſix, that is, three on each ſide, being the leſſer or concomitant veins. Five in the ſame manner, ſometimes lie in this order, the grand lode in the middle and two on each ſide, but the more common method is three, a large one, and two ſmaller.

Every lode has a peculiar coloured earth or grewt about it, which is found alſo with the ſhoad, and this always in a greater quantity the nearer the ſhoad lies to the lode, and becomes leſſened by degrees to the diſtance of about a quarter of a mile, farther than which that peculiar grewt is never found in any quantity with the ſhoad; ſo that this is a proof that the load or vein is near, when it is found in quantity.

A valley may chance to lie at the foot of three ſeveral hills, in ſuch a manner, as to contain three ſeveral grewts, or that earth which was moved with the ſhoad in the concuſſion of the ſtrata at the deluge, with as many different ſhoads or *trains* of ſhoad-ſtones in the midſt of each: in this caſe, it will be very neceſſary to know the caſt of the country, and of each hill in reſpect to its grewt, for the ſurer *training* of them one after another as they lie in order: according to the foregoing rules of eſſay-hatching, the uppermoſt in this caſe always directs which hill to begin with firſt.

It ſometimes happens, that after having *trained* the ſhoad found in a valley up to the upper parts of a hill, there is only a ſquatt, or bonny, found inſtead of a right vein of ore, for theſe detached parcels of ore have their ſhoads as well as the right veins. Theſe are uſually about two or three fathom long, and a fathom broad, few of them are larger, moſt leſs, and they never communicate with any other lode or vein, nor ever ſend forth any of their own. The extremities of theſe beds of ore terminate without ſending out any ſtrings, not lying within walls as the lodes; but though they are in the ſhelf or faſt ground, not moved by the flood, their ſurface is equal every where with that of the imaginary ſhelfy one, and they go down five or ſix fathoms deep, and there terminate at once. The ore contained in theſe is rich, and they are always wrought out to the conſiderable advantage of the owners.

Theſe are the general rules of *tracing* mines, and though ſomewhat tedious and expenſive, they are certain, and never liable to the error and diſappointment the other ſhorter ways, as they are called, are liable to. Theſe ſhort ways are by the VIRGULA *divinatoria*, or the hazel-wand, whoſe bending in certain places without any external viſible force, is to point out the place where the vein of ore lies: the waters thought to iſſue from the particular lodes are alſo uſed by ſome as a ſhort means of finding the veins; other of theſe ways are alſo by mineral ſtreams and effluvia, by the barrenneſs of the ſoil, and the pitching of nocturnal lights on the ſuppoſed orifices of mines. But theſe methods are too extravagant or too uncertain to be uſed in caſes of ſo much conſequence.

Another way of diſcovering lodes is by working DRIFTS acroſs the country, as it is called, that is, from north and ſouth, and *vice verſa*.

When the mine is found by the more certain rules of *tracing*, the DIGGING of it is a matter of leſs difficulty. Phil. Tranſ. Nº 69. See MINERALOGY, and Pryce's Mineral. Cornub. book iii. cap. 1.

TRAITOR. See TRAYTOR.

TRAITTE. See FOREIGN *traitte*.

TRAM, in the *Silk Trade*. See SILK.

TRAMBLING *of tin ore*, among *Miners*, is the waſhing of it very clean: which is done with a ſhovel, and in a frame of boards. See TIN.

TRAMEL, an inſtrument or device, ſometimes of leather, more uſually of rope, fitted to a horſe's legs, to regulate his motion, and form him to an amble.

It is alſo taken in many places for an iron moveable inſtrument in chimneys, to hang pots over the fire.

TRAMEL-*net*, or TRAMMEL, is a long net wherewith to take fowl by night in champain countries, much like the net uſed for the low-bell both in ſhape, bigneſs, and meſhes.

The word comes from the French *tremail*, formed of the Latin *tremaculum*, or *tremaclum*; of *tres* and *macula*, becauſe it is compoſed of three rows of meſhes.

To uſe it, they ſpread it on the ground, ſo as the nether or farther end, fitted with ſmall plumbets, may lie looſe thereon: then the other part being borne up by men placed at the fore-ends, it is thus trailed along the ground. At each ſide are carried great blazing lights, by which the birds are raiſed: and as they riſe under the net, they are taken. See LARK.

TRAMELLED, in the *Manege*. A horſe is ſaid to be *tramelled*, that has blazes or white marks upon the fore and hind foot of one ſide; as the far foot before and behind. He is ſo called from the reſemblance the white foot bears to a half *tramel*.

TRAMELLED-*horſe*, *croſs*, is one that has white marks in two of his feet that ſtand croſs-ways, like St. Andrew's croſs; as in the far fore-foot, and the near hind-foot, or in the near-foot before, and the far-foot behind.

TRAMMELS, in *Mechanics*, an inſtrument ſo called by the joiners, and uſed by them for drawing ovals upon boards. One part of it conſiſts of a croſs with two grooves at right angles; the other is a beam carrying two pins which ſlide in thoſe grooves, and alſo the deſcribing pencil. All the engines for turning ovals are conſtructed upon the ſame principles with the *trammels*: the only difference is, that in the *trammels* the board is at reſt, and the pencil moves upon it: in the turning engine, the tool, which ſupplies the place of the pencil, is at reſt, and the board moves againſt it. See a Demonſtration of the principal properties of theſe inſtruments by Mr. Ludlam, in Phil. Tranſ. vol. lxx. part ii. p. 378, &c.

TRAMIS, a word uſed by ſome medical writers, to expreſs the line running along the middle of the *ſcrotum*, from the *penis* to the *anus*.

TRAMONTANE, or TRAMONTAIN, formed from the Italian *tra*, of the Latin *trans*, which ſignify *beyond*; and *mons* or *mont*, *mountain*; ſomething beyond, or on the farther ſide, the mountains.

The term is particularly applied, by the Italian painters, to all ſuch as live on the other ſide the Alps, i. e. all out of Italy; as the Germans, Flemiſh, French, &c.

The French lawyers give the ſame title of *tramontane*, or *ultramontane* doctors to the Italian canoniſts, Gomez, Hoſtienſis, Panorm, &c. who go upon rules and maxims too favourable to the court of Rome, and contrary to thoſe of France, &c. On the Mediterranean, and in Italy, a north wind is called *tramontane*, a *tramontane wind*.

Some alſo call the pole ſtar, *tramontana*. Hence the proverb, to *loſe the tramontane*, that is, to be out of one's aim, to be diſconcerted.

TRANCHE', or TRENCHE', is uſed by the French armoriſts, to expreſs that manner of partition called among us, *party per bend dexter*.

A ſcutcheon is ſaid to be *tranché* cut, when it is divided in two diagonally, the diviſion coming from the dexter angle of the chief to the ſiniſter angle of the point. When it is divided contrariwiſe, it is ſaid to be *taillé*, or *party per bend ſiniſter*.

TRANGLE, in *Heraldry*, the diminutive of a feſſe, commonly called a *bar*.

TRANSACTION, TRANSACTIO, in the *Civil Law*, an ACCOMMODATION of ſome buſineſs or diſpute between two parties, by a mutual and voluntary agreement or contract between them.

TRANSACTIONS, *Philoſophical*, are a kind of journal of the principal things that come before the Royal Society of London. The *tranſactions* contain the ſeveral diſcoveries and hiſtories of nature and art, made by the members of the ſociety, or communicated by them from their correſpondents, with the ſeveral experiments, obſervations, &c. made by them, or tranſmitted to them, &c.

They were firſt ſet on foot in 1665, by Mr. Oldenburg, ſecretary of the ſociety, and were continued by him till the year 1677. Upon his death, they were diſcontinued till January 1678, when Dr. Grew reſumed the publication of them, and continued it for the months of December 1678, and January and February 1679, after which they were intermitted till January 1683. During this laſt interval they were ſupplied in ſome meaſure by Dr. Hooke's Philoſophical Collections. They were alſo interrupted for three years, from December 1687 to January 1691, beſide other ſmaller interruptions amounting to near one year and a half more, before October 1695, ſince which time the *Tranſactions* have been regularly carried on.

They were for many years published in numbers, and the printing of them was always, from time to time, the single act of the respective secretaries, till the year 1752, when the society thought fit that a committee should be appointed to reconsider the papers read before them, and to select out of them such as they should judge most proper for publication in the future *Transactions*. The members of the council constitute a standing committee for this purpose. They meet on the first Thursday of every month, and no less than seven of the members of the committee (of which number the president, or in his absence, a vice-president, is always to be one) are allowed to be a *quorum*, capable of acting in relation to such papers. The question with regard to the publication of any paper is always decided by the majority of votes taken by ballot.

They are published annually in two parts at the expence of the society, and each fellow is entitled to receive one copy *gratis* of every volume published after his admission into the society.

The *Philosophical Transactions* to the end of the year 1700, were abridged in three volumes by Mr. John Lowthorp: those from the year 1700 to 1720 were abridged in two volumes, by Mr. Henry Jones: those from 1719 to 1733, were abridged in two volumes by Mr. John Eames and Mr. John Martyn; Mr. Martyn continued the abridgment of those from 1732 to 1744 in two volumes: and of those from 1743 to 1750 in two volumes.

TRANSCENDENT, or TRANSCENDENTAL, something raised or elevated beyond other things; or which passes or *transcends* the nature and circumstances of other inferior beings, so as not to be intimately and essentially included under them.

The term is particularly applied to the object of metaphysics, which considers being in general, or *transcendental* beings, as God and angels, and truths consisting in pure speculation.

Logicians and metaphysicians give the name *transcendental terms* to those which are so general, and of a signification so extensive and universal, that they pass through all the categories, and agree to all kinds of things. Such are the terms *ens*, *unum*, *verum*, *bonum*, *res*. See ENS, &c.

TRANSCENDENTAL *art*. See ART.

TRANSCENDENTAL *perfection*. See PERFECTION.

TRANSCENDENTAL *quantities*, among *Schoolmen*. See QUANTITY.

TRANSCENDENTAL *quantities*, among *Geometricians*, are indeterminate ones; or such as cannot be expressed or fixed to any constant equation. Such is a *transcendental* curve, or the like.

M. Leibnitz has a dissertation in the Acta Erud. Lips. wherein he endeavours to shew the origin of such quantities; viz. why some problems are neither plain, solid, nor sur-solid, nor of any certain degree, but do *transcend* all algebraical equations.

He also shews how it may be demonstrated without calculus, that an algebraic quadratrix for the circle or hyperbola is impossible: for if such a quadratrix could be found, it would follow, that, by means thereof, any angle, ratio, or logarithm, might be divided in a given proportion of one right line to another, and this by one universal construction; and consequently the problem of the section of an angle, or the invention of any number of mean proportionals, would be of a certain finite degree.

Whereas the different degrees of algebraical equations, and therefore the problem, understood in general of any number of parts of an angle, or mean proportionals, is of an indefinite degree, and *transcends* all algebraical equations.

TRANSCENDENTAL *curve*, in the *Higher Geometry*, is such a one as cannot be defined by any algebraic equation; or of which, when it is expressed by an equation, one of the terms is a variable quantity. See CURVE.

These curves are the same with what Descartes, and, after his example, several others, call *mechanical curves*, and which they would have excluded out of geometry; but sir Isaac Newton and M. Leibnitz are of another sentiment. For, in effect, in the construction of geometrical problems, one curve is not to be preferred to another, as it is defined by a more simple equation, but as it is more easily described than that other. See GEOMETRICAL *line*.

And some of these *transcendental*, or mechanical curves, are found of greater use than all the algebraical ones together, except the circle.

Add, that M. Leibnitz, in the Acta Eruditor. Lips. gives us a kind of *transcendental* equations, whereby these *transcendental* curves are actually defined, and which are of an indefinite degree; that is, are not always the same in all the points of the curve.

Whereas algebraists use to assume some general letters or numbers for the quantities sought, in these *transcendental* problems M. Leibnitz assumes general or indefinite equations for the lines sought; e. gr. putting x and y for the abscis and ordinate, the equation he uses for a line sought, is $a+bx+cy+exy, +fxx+gyy$, &c. $=0$. By the help of which indefinite equation, which in reality is finite, for it may always be determined how far soever it is necessary to raise it, he seeks the tangent; and comparing that which results, with the given property of tangents, he finds the value of the assumed letters a, b, c, and thus defines the equation of the line sought.

If the comparison above mentioned do not proceed, he pronounces the line sought not to be an algebraical, but a *transcendental* one.

This supposed, he goes on to find the species of transcendency; for some *transcendentals* depend on the general division or section of a ratio, or upon the logarithms, others upon the arcs of a circle, and others on more indefinite and compound inquiries.

Here, therefore, beside the symbols x and y, he assumes a third, as v, which denotes the *transcendental* quantity; and of these three forms a general equation of the line sought, from which he finds the tangent according to the differential method, which succeeds even in *transcendental* quantities. What he finds he compares with the given properties of the tangent, and so discovers not only the values of a, b, c, &c. but also the particular nature of the *transcendental* quantity.

And though it may sometimes happen, that the several *transcendentals* are so to be made use of, and these of different natures too one from another; also though there be *transcendents* or *transcendentals*, and a progression of these *in infinitum*, yet we may be satisfied with the most easy and useful one, and for the most part may have recourse to some peculiar artifices for shortening the calculus, and reducing the problem to as simple terms as may be.

This method being applied to the business of quadratures, or to the invention of quadratrices, in which the property of the tangent is always given, it is manifest not only how it may be discovered, whether the indefinite quadrature may be algebraically impossible, but also how, when this impossibility is discovered, a *transcendental* quadratrix may be found; which is a thing which had not before been shewn. So that it seems that geometry is by this method carried infinitely beyond the bounds to which Vieta and Descartes brought it; since, by this means, a certain and general analysis is established, which extends to all the problems which are of no certain degree, and consequently not comprehended within algebraical equations.

Again, in order to manage *transcendental* problems (wherever the business of tangents or quadratures occurs) by a calculus. there is hardly any that can be imagined shorter, more advantageous or universal, than the differential calculus, or analysis of indivisibles and infinites.

By this method we may explain the nature of *transcendental* lines by an equation; e. gr. Let a be the arc of a circle, and x the versed sine: then will $a = \frac{\int dx}{\sqrt{2x-xx}}$, and if the ordinate of the clycoid be y, then will $y = \sqrt{2x-xx} + \frac{\int dx}{\sqrt{2x-xx}}$, which equation perfectly expresses the relation between the ordinate y and the abscis x; and from it all the properties of the cycloid may be demonstrated.

Thus is the analytical calculus extended to those lines which have hitherto been excluded, for no other cause but that they were thought incapable of it.

TRANCHEFILE, in the *Manege*, the cross chain of a bridle, that runs along the bit-mouth, from one branch to the other.

TRANSCOLATION, in *Pharmacy*, the same with FILTRATION, or PERCOLATION.

TRANSCRIPT, a copy of any original writing, particularly that of an act, or instrument, inserted in the body of another.

In this sense we say, *transcript of a fine*, &c. See FINE and DUPLICATE.

TRANSCRIPTO *recognitionis factæ coram justitiariis itinerantibus*, &c. is a writ for certifying a RECOGNIZANCE into chancery, taken before the justice in eyre.

TRANSCRIPTO *pedis finis levati mittendo in cancellariam*, is a writ

a writ for certifying the foot of a FINE levied before justices in eyre, &c. into chancery.

TRANSEAT, in the *Schools*, &c. a term purely Latin, signifying, *let it pass*, or suppose a proposition to be true, without granting it.

Hence the proverb, *transeat, Græcum est, non legitur*: the phrase is said to have taken its rise from some ancient commentators, or glossographers of the civil law, who, not understanding Greek, passed over all the words that occurred in that language without explaining them.

In the Roman chancery, a *nil transeat* is a kind of opposition made to the sealing of a bull, or to the delivery of some other instrument, till the parties, against whose interest it is directed, have been heard against it.

TRANSELEMENTATION, in the *Schools*, a change of the elements or principles of one body into those of another.

Such is that which Roman catholics contend for in the eucharist, where the elements of bread and wine, they say, are changed into those of flesh and blood. See TRANSUBSTANTIATION.

Transelementation, wherever it happens, is always allowed miraculous, or an effect beyond the ordinary powers of nature.

TRANSFER, in *Commerce*, &c. an act whereby a person surrenders his right, interest, or property, in any thing moveable or immoveable, to another.

The sale or donation of an inheritance, &c. *transfers* the property, rights, &c. thereof.

The term is principally used in the commerce of stocks; for the assigning and making over of subscriptions or shares therein to such as purchase them of the proprietors. In the South Sea company, the bank, East India, &c. *transfers* are made by entering the stock under the name of the purchaser, under his proper letter of the alphabet.

A counterfeit in this case is by act of parliament made a capital crime.

TRANSFIGURATION, among *Divines*, that miraculous change wrought by Jesus Christ, in presence of St. Peter, St. James, and St. John, on mount Thabor, where he appeared in his glory, in company with Moses and Elias. See the description thereof in St. Matthew, chap. xvii.

The term is also applied to a feast held in the Romish church on the 6th of August, in commemoration of that miracle.

TRANSFORMATION, a metamorphosis, or change of form.

The chemists have been a long time seeking the *transformation* of metals, that is, their *transmutation*, or the manner of changing them into gold.

Among the mystics, by *transformation* is understood a change of the contemplative soul, whereby it is in some measure deified, or converted into the substance of God, and wherein it is, as it were, lost and swallowed up in the divinity, so as not to perceive its own distinction from God.

The word *transformation* is very liable to be abused: but many of the mystics use it innocently enough; meaning no other by it than what St. Paul did, *Vivo ego, jam non ego, vivit vero in me Christus*.

TRANSFORMATION is also sometimes used for what we more properly call TRANSUBSTANTIATION.

TRANSFORMATION *of equations*, in *Algebra*, is a method of changing equations into others of a different form, but of equal value. This operation is necessary in order to prepare equations for a more easy solution. We shall subjoin some examples of the most common and useful kind under this head. The affirmative roots of an equation are changed into negative roots of the same value, and *vice versâ*, by only changing the signs of the terms alternately, beginning with the second.

Thus, the roots of the equation $x^4-x^3-19x^2+49x-30=0$ are $+1$, $+2$, $+3$, -5; whereas the roots of the same equation having only the signs of the second and fourth terms changed, viz. $x^4+x^3-19x^2-49x-30=0$, are -1, -2, -3, $+5$.

If it be required to transform an equation into another that shall have its roots greater or less than the roots of the proposed equation by some given difference, the method is as follows. Let the proposed equation be the cubic $x^3-px^2+qx-r=0$; and let it be required to transform it into another, whose roots shall be less than the roots of this equation by some given difference (e), i. e. suppose $y=x-e$, and consequently $x=y+e$; then, instead of x and its powers, substitute $y+e$ and its powers, there will arise this new equation.

$$\text{(A)}\quad \left.\begin{array}{r} y^3+3ey^2+3e^2y+e^3 \\ -py^2-2pey-pe^2 \\ +qy+qe \\ -r \end{array}\right\}=0$$

whose roots are less than the roots of the preceding equation by the difference (e).

To find an equation whose roots shall be greater than those of the proposed equation by the quantity (e), suppose $y=x+e$, and $x=y-e$, and the equation will have this form.

$$\text{(B)}\quad \left.\begin{array}{r} y^3-3ey^2+3e^2y-e^3 \\ -py^2+2pey-pe^2 \\ +qy-qe \\ -r \end{array}\right\}=0.$$

If the proposed equation be in this form $x^3+px^2+qx+r=0$, then by supposing $x+e=y$, there will arise an equation agreeing in all respects with the equation (A), but that the second and fourth terms will have contrary signs.

$$\text{(C)}\quad \left.\begin{array}{r} y^3-3ey^2+3e^2y-e^3 \\ +py^2-2pey+pe^2 \\ +qy-qe \\ +r \end{array}\right\}=0.$$

By supposing $x-e=y$, there will arise an equation agreeing with (B) in all respects, but that the second and fourth terms will have contrary signs to what they have in (B): as

$$\text{(D)}\quad \left.\begin{array}{r} y^3+3ey^2+3e^2y+e^3 \\ +py^2+2epy+pe^2 \\ +qy+qe \\ +r \end{array}\right\}=0.$$

Hence we see how the second, or other intermediate term may be taken away out of an equation; for, in the equation (A), whose second term is $\overline{3e-p}\times y^2$, if we suppose $e=\frac{1}{3}p$, and consequently $3e-p=0$, the second term will vanish. In the equation (C), whose second term is $-\overline{3e+p}\times y^2$, supposing $e=\frac{1}{3}p$, the second term also vanishes. But the equation (A) was deduced from $x^3-px^2+qx-r=0$, by supposing $y=x-e$, and the equation (C) was deduced from $x^3+px^2+qx+r=0$, by supposing $y=x+e$; whence may be deduced the following rule for exterminating the second term out of any cubic equation; viz. add to the unknown quantity of the given equation the third part of the co-efficient of the second term with its proper sign, viz. $\mp\frac{1}{3}p$, and suppose this aggregate equal to a new unknown quantity y. From this value of y find a value of x by transposition, and substitute the value of x and its powers in the given equation, and there will arise a new equation wanting the second term. E. g. let the equation be $x^3-9x^2+26x-34=0$; suppose $x-3=y$, or $y+3=x$, and substituting according to the rule, we shall have,

$$\left.\begin{array}{r} y^3+9y^2+27y+27 \\ -9y^2-54y-81 \\ +26y+78 \\ -34 \end{array}\right\}=0$$

$$y^3 \ast \quad -y \quad -10=0,$$ an equation wanting the second term.

If the equation proposed be of any number of dimensions (n), and the co-efficient of the second term with its sign prefixed be $-p$, then supposing $x-\frac{p}{n}=y$, and $x=y+\frac{p}{n}$, and substituting this value for x in the given equation, there will arise a new equation that shall want the second term; whence the second term may be exterminated out of any given equation by the following rule. Divide the co-efficient of the second term of the proposed equation by the number of dimensions of the equation; and assuming a new unknown quantity y, add to it the quotient having its sign changed: then, suppose this aggregate equal to x, the unknown quantity in the proposed equation; and for x and its powers, substitute the aggregate and its powers, and the new equation will want its second term.

Let the proposed equation be a quadratic, as $x^2-px+q=0$, then suppose $y+\frac{1}{2}p=x$ according to the rule, and substituting this value for x, we shall have,

$$\left.\begin{array}{r} y^2+py+\frac{1}{4}p^2 \\ -py-\frac{1}{2}p^2 \\ +q \end{array}\right\}=0$$

$$y^2 \ast \quad -\tfrac{1}{4}p^2+q=0.$$ Having found the value of y, that of x may be had by means of $y+\frac{1}{2}p=x$: e. gr. since $y+{}^2q-\frac{1}{4}p^2=0$, $y^2=\frac{1}{4}p^2-q$, and $y=\pm\sqrt{\frac{1}{4}p^2-q}$, and therefore $x=y+\frac{1}{2}p=\frac{1}{2}p\pm\sqrt{\frac{1}{4}p^2-q}$.

If the proposed equation is a biquadratic, as x^4-px^3+q

$x^4 - rx + s = 0$, then by suppoſing $x - \frac{1}{4}p = y$, or $x = y + \frac{1}{4}p$, an equation ſhall ariſe having no ſecond term. And if the propoſed equation is of five dimenſions, we muſt ſuppoſe $x = y \pm \frac{1}{5}p$, &c. It is plain, that in a quadratic equation wanting the ſecond term, there muſt be one root affirmative and one negative, and theſe muſt be equal to one another. In a cubic equation wanting the ſecond term, there muſt be either two affirmative roots equal, taken together, to a third root that muſt be negative; or two negative equal to a third that muſt be poſitive.

Let an equation $x^3 - px^2 + qx - r = 0$ be propoſed, and let it be required to exterminate the third term. By ſuppoſing $y = x - e$, the co-efficient of the third term in the equation of y is found (ſee equation A ſupra) to be $3e^2 - 2pe + q$. Suppoſe that co-efficient equal to nothing, and by reſolving the quadratic equation $3e^2 - 2pe + q = 0$, you will find the value of e, which ſubſtituted for it in the equation $y = x - e$, will ſhew how to transform the propoſed equation into one that ſhall want the third term.

The quadratic $3e^2 - 2pe + q = 0$, gives $e = \frac{p \pm \sqrt{p^2 - 3q}}{3}$; ſo that the propoſed cubic will be transformed into an equation wanting the third term by ſuppoſing $y = x - \frac{p - \sqrt{p^2 - 3q}}{3}$, or $y = x - \frac{p + \sqrt{p^2 - 3q}}{3}$.

If the propoſed equation is of n dimenſions, the value of e, by which the third term may be taken away, is had by reſolving the quadratic equation $e^2 + \frac{2p}{n} \times e + \frac{2q}{n \times n - 1} = 0$, ſuppoſing $-p$ and $+q$ to be the co-efficients of the ſecond and third terms of the propoſed equation. The fourth term of any equation may be taken away by ſolving a cubic equation, which is the co-efficient of the fourth term in the equation when transformed. The fifth term may be taken away by ſolving a biquadratic, &c.

There are other tranſmutations of equations that on ſome occaſions are uſeful. An equation, as $x^3 - px^2 + qx - r = 0$, may be transformed into another that ſhall have its roots equal to the roots of this equation multiplied by a given quantity, as f, by ſuppoſing $y = fx$, and $x = \frac{y}{f}$; and ſubſtituting this value for x in the propoſed equation, there will ariſe $\frac{y^3}{f^3} - \frac{py^2}{f^2} + \frac{qy}{f} - r = 0$, and multiplying all by f^3, $y^3 - fpy^2 + f^2qy - f^3r = 0$, where the co-efficient of the ſecond term of the propoſed equation, multiplied into f, makes the co-efficient of the ſecond term of the transformed equation, and the following co-efficients are produced by the following co-efficients of the propoſed equation (as q, r, &c.) multiplied into the powers of f (f^2, f^3, &c.) Therefore, to transform any equation into another whoſe roots ſhall be equal to the roots of the propoſed equation multiplied by a given quantity f, you need only multiply the terms of the propoſed equation, beginning at the ſecond term, by f, f^2, f^3, &c. and putting y inſtead of x, there will ariſe an equation having its roots equal to the roots of the propoſed equation multiplied by f as required.

Let it be required to transform an equation, the higheſt term of which has a co-efficient different from unity, into one that ſhall have the co-efficient of the higheſt term unit. If the equation propoſed is $ax^3 - px^2 + qx - r = 0$, then transform it into one whoſe roots are equal to the roots of the propoſed equation multiplied by a: i. e. ſuppoſe $y = ax$, or $x = \frac{y}{a}$, and there will ariſe $\frac{ay^3}{a^3} - \frac{py^2}{a^2} + \frac{qy}{a} - r = 0$; ſo that $y^3 - py^2 + qay - ra^2 = 0$: whence we deduce the following rule; change the unknown quantity x into another y, prefix no co-efficient to the higheſt term, paſs the ſecond, multiply the following terms, beginning with the third, by a, a^2, a^3, &c. the powers of the co-efficient of the higheſt term of the propoſed equation, reſpectively. Thus, the equation $3x^3 - 13x^2 + 14x + 16 = 0$ is transformed into the equation $y^3 - 13y^2 + 14 \times 3 \times x + 16 \times 9 = 0$, or $y^3 - 13y^2 + 42x + 144 = 0$. Then finding the roots of this equation, it will eaſily be diſcovered what are the roots of the propoſed equation; ſince $3x = y$, or $x = \frac{1}{3}y$: and therefore, ſince one of the values of y is -2, it follows that one of the values of x is $-\frac{2}{3}$. By this rule an equation is eaſily cleared of fractions.

Suppoſe the equation propoſed is $x^3 - \frac{p}{m}x^2 + \frac{q}{m}x - \frac{r}{e} = 0$. Multiply all the terms by the product of the denominator, you find $mne \times x^3 - nep \times x^2 + meq \times x - mnr = 0$. Then, *transforming* the equation into one that ſhall have unit for the co-efficient of the higheſt term, you find $y^3 - nep \times y^2 + m^2e^2nq \times y - m^3n^3e^2r = 0$. Or, neglecting the denominator of the laſt term $\frac{r}{e}$, you need only multiply all the equation by mn, which will give $mn \times x^3 - np \times x^2 + mq \times x - \frac{mnr}{e} = 0$: and then, $y^3 - np \times y^2 + m^2nq \times y - \frac{m^3n^3r}{e} = 0$. After the values of y are found, it will be eaſy to diſcover the values of x; ſince, in the firſt caſe, $x = \frac{y}{mne}$; in the ſecond, $x = \frac{y}{mn}$. E. g. the equation $x^3 * - \frac{4}{3}x - \frac{146}{27} = 0$ is firſt reduced to this form $3x^3 * - 4x - \frac{146}{9} = 0$, and then transformed into $y^3 * - 12y - 146 = 0$.

Sometimes, by theſe *transformations*, ſurds are taken away. E. g. the equation $x^3 - p\sqrt{a} \times x^2 + qx - r\sqrt{a} = 0$, by putting $y = \sqrt{a} \times x$, or $x = \frac{y}{\sqrt{a}}$, is transformed into this equation $\frac{y^3}{a\sqrt{a}} - p\sqrt{a} \times \frac{y^2}{a} + q \times \frac{y}{\sqrt{a}} - r\sqrt{a} = 0$; which, by multiplying all the terms by $a\sqrt{a}$, becomes $y^3 - pay^2 + qay - ra^2 = 0$, an equation free of ſurds. But in order to make this ſucceed, the ſurd $\sqrt{a}$ muſt enter the alternate terms beginning with the ſecond.

An equation, as $x^3 - px^2 + qx - r = 0$, may be transformed into one whoſe roots ſhall be the quantities reciprocal of x, by ſuppoſing $y = \frac{1}{x}$, and $y = \frac{z}{r}$, or by one ſuppoſition $x = \frac{r}{z}$, becomes $z^3 - qz^2 + prz - r^2 = 0$.

By this *transformation*, the greateſt root in the one is transformed into the leaſt root in the other: for ſince $x = \frac{1}{y}$, and $y = \frac{1}{x}$, it is plain that when the value of x is greateſt, the value of y is leaſt, and converſely. See on this ſubject Maclaurin's Algeb. part ii. chap. iii. iv. Saunderſon's Algeb. vol. ii. p. 687, &c. See REDUCTION of *Equations*.

TRANSFUGA, in *Antiquity*, a deſerter. Among the Romans, deſerters were commonly puniſhed by cutting off their hands, it being thought, that living in ſuch a miſerable truncated condition would ſtrike more terror than death itſelf.

We find, however, that deſerters were likewiſe crucified, burnt alive, thrown from the Tarpeian rock, or expoſed to wild beaſts at public ſhews.

TRANSFUSION, TRANSFUSIO, compounded of the prepoſition *trans, beyond, farther*, and *fundo, I pour*, the act of pouring a liquor out of one veſſel into another.

In the preparations of chemiſtry and pharmacy there are frequent *transfuſions* of liquors, ſyrups, &c.

TRANSFUSION *of the blood*, is particularly uſed for the letting out of the blood of one animal, ſo as to be immediately received into the body of another.

Dr. Lower is uſually accounted the inventor of this *transfuſion*; and the experiment is ſaid to have been firſt publicly made by him at Oxford in 1665, and the deſcription thereof publiſhed in his excellent book De Corde.

Yet we are informed from good authority, that it had been propoſed at Paris in 1658; that another of our countrymen had had the idea before; and that it had been known in Germany ſeveral years. It is certain there is a paſſage in Libavius, wherein the *transfuſion* is exactly deſcribed as ſinee practiſed: it is true he diſapproves it, and only mentions it to ridicule it.

Inſtances of this practice occur even among the ancients, for which Martiniere (Opuſcules Lettr. a M. de Colbert) refers to the hiſtory of the ancient Egyptians; to the book of the wiſdom of Tanaquila, wife of Tarquin the Elder; to Herophilus's Treatiſe of Anatomy; to the works of Pliny, Celſus, and many others, who condemn it; to the Metamorphoſes of Ovid, &c.

This writer alſo aſſures us, that Marſil Ficinus, the abbé Trithemius, Aquapendente, Harvey, and Fra. Paolo, had tried this practice.

The French ſeem to have been the firſt who ventured to make trial of this operation on human ſubjects; in which

which they were followed by Meffrs. Riva and Manfredi, in Italy, in 1668.

The ufe moft naturally expected from the operation is, that one animal may live by the blood of another; fo that thofe which want blood, or have corrupt morbid blood, may be fupplied from others with a fufficient quantity, and of fuch as is good and laudable.

However, it is certain, the operation has no place in the prefent practice of phyfic; but whether that be the fault of the operation itfelf, or only owing to the indolence and averfenefs of people to run into new methods, we will not undertake to fay.

The principal advocate for the fafety and advantage of this operation was M. Denis, whofe arguments were examined and refuted in a differtation written by M. Pierre Petit, under the title of Eutyphron.

The method of *transfufing* Dr. Lower gives us to the following effect: take up the carotid artery of the dog, or other animal, whofe blood is to be *transfufed* into another of the fame, or a different kind; feparate it from the nerve of the eighth pair, and lay it bare above an inch. Make a ftrong ligature on the upper part of the artery; and an inch nearer the heart another ligature with a running knot, to be loofened and faftened as occafion requires. Draw two threads between the two ligatures, open the artery, put in a quill, and tie up the artery again upon the quill by the two threads, and ftop the quill by a ftick.

Then make bare the jugular vein of the other animal for about an inch and half in length, and at each end make a ligature with a running knot; and in the fpace between the two knots, draw under the veins two threads, as in the other. Open the vein, and put into it two quills, one into the defcending part of the vein, to receive the blood from the other dog, and carry it to the heart: the other quill put into the other part of the jugular, towards the head, through which the fecond animal's own blood is to run into difhes. The quills thus tied faft, ftop them up with fticks till there be occafion to open them.

Things thus difpofed, faften the dogs on their fides towards one another, in fuch manner, as that the quills may go into each other; then unftop the quill that goes down into the fecond dog's jugular vein, as alfo that coming out of the other dog's artery; and by the help of two or three other quills put into each other, as there fhall be occafion, infert them into one another.

Then flip the running knots, and immediately the blood runs through the quills as through an artery, very impetuoufly.

As the blood runs into the dog, unftop the quill in the upper part of his jugular, for his own blood to run out at, though not conftantly, but as you perceive him able to bear it, till the other dog begins to cry and faint, and at laft die.

Laftly, take both quills out of the jugular, tie the running knot faft, and cut the vein afunder, and few up the fkin: the dog, thus difmiffed, will run away as if nothing ailed him.

In the Philofophical Tranfactions we have accounts of the fuccefs of various *transfufions* practifed at London, Paris, in Italy, &c. Sir Edmund King *transfufed* forty-nine ounces of blood out of a calf into a fheep; the fheep, after the operation, appearing as well and as ftrong as before.

Mr. Coxe *transfufed* fourteen or fixteen ounces out of a mangey into a found dog: the effect was, that no alteration was obferved in the found dog, but the mangy one was cured.

M. Gayant *transfufed* the blood of a young dog into the veins of an old one, almoft blind with age, and fcarce able to ftir, which yet, two hours afterwards, leaped and frifked about.

Mr. Denis *transfufed* the blood of three calves into three dogs, which all continued brifk, and eat as well as before. The fame perfon *transfufed* the blood of four wethers into a horfe twenty-fix years old, which thence received much ftrength, and a more than ordinary appetite.

Soon after this operation was introduced at Paris, viz. in 1667 and 1668, M. Denis performed it on five human fubjects, two of whom recovered of diforders under which they laboured, one being in perfect health fuffered no inconvenience from it; and two perfons who were ill, and fubmitted to the operation, died: in confequence of which the magiftrates iffued a fentence, prohibiting the *transfufion* on human bodies under pain of imprifonment.

At St. Griffomi's, at Udine, the blood of a lamb was *transfufed* into the veins of a fpaniel thirteen years old, which had been quite deaf for three years, and fo feeble as fcarce to be able to walk at all. After the operation he leaped from the table, and went about the houfe to feek his mafter. Two days afterwards he ran up and down the ftreets with other dogs; and his ftomach grew ftrong, and he recovered his hearing.

TRANSGRESSION, Transgressio, compounded of *trans, beyond,* and *gradire, to go,* an offence againft fome law, or a breach or violation thereof.

The term is chiefly ufed in refpect of the laws of God. In the doctrine of original fin, all mankind are fuppofed to fhare with Adam in the guilt of his firft *tranfgreffion.* Mofes threatens the *transgreffors* of his law with abundance of temporal punifhments.

Transgressione, in our *Law,* a writ, ufually called a *writ,* or *action of trefpafs.*

Of this Fitzherbert has two forts; one *vicountiel,* thus called becaufe directed to the fheriff, and not returnable, but to be determined in the country. Its form differs from that of the other, as wanting the words *quare vi & armis,* &c. See Vicountiel.

The other is termed a *writ of trefpafs,* and to be fued in the Common Pleas and King's-Bench. See Trespass.

TRANSIENT *action.* See Action.

Transient *air.* See Air.

TRANSIRE, in ftat. anno 14 Car II. cap. 11. is ufed for a cuftom-houfe warrant, or let pafs; from the verb *tranfeo, I pafs forth.*

TRANSIT, Transitus, from *tranfire,* to *pafs over,* formed of *trans* and *eo, I go beyond,* in *Aftronomy,* fignifies the paffage of any planet, juft by, or over a fixed ftar, or the fun; and of the moon, in particular, covering or moving over any other planet.

Mercury and Venus, &c. in their *tranfits* over the fun, appear like dark fpecks. See Meridian and Parallax.

Transit *Inftrument,* in *Aftronomy,* is a telefcope (fee *Meridian* Telescope) about 2½ feet long, fixed at right angles to an horizontal axis about 15 inches long; which axis muft be fo fupported, that the line of collimation may move in the plane of the meridian.

The axis, to the middle of which the telefcope is fixed, fhould gradually taper toward its ends, and terminate in cylinders well turned and fmoothed; and a proper balance is to be put on the tube, fo that it may ftand at any elevation when its axis refts on the fupporters. Two upright pofts of wood or ftone, firmly fixed at a proper diftance, are to fuftain the fupporters to this inftrument; thefe fupporters are two thick brafs plates, having well fmoothed angular notches in their upper ends to receive the cylindrical arms of the axis; each of the notched plates is contrived to be moveable by a fcrew, which flides them upon the furfaces of two other plates immoveably fixed to the two upright pofts; one plate moving in a vertical, and the other in an horizontal direction, adjuft the telefcope to the planes of the horizon and meridian; to the plane of the horizon, by a fpirit level hung in a parallel pofition to the axis, and to the plane of the meridian in the following manner. Obferve the times by the clock when a circumpolar ftar, feen through this inftrument, *tranfits* both above and below the pole; and if the times of defcribing the eaftern and weftern parts of its circuit are equal, the telefcope is then in the plane of the meridian; otherwife the notched plates muft be gently moved till the time of the ftar's revolution is bifected by both the upper and lower *tranfits,* taking care at the fame time of the horizontality of the axis.

When the telefcope is thus adjufted, a mark muft be fet at a confiderable diftance (the greater the better) in the horizontal direction of the interfection of the crofs-wires, and in a place where it can be illuminated in the night-time by a lanthorn hanging near it, which mark, being on a fixed object, will ferve at all times afterwards to examine the pofition of the telefcope, by firft adjufting the tranfverfe axis by the level.

In order to adjuft the clock by the fun's *tranfit* over the meridian, note the times by the clock, when the preceding and following edges of the fun's limb touch the crofs-wires: the difference between the middle time and twelve hours, fhews how much the mean, or clock-time, is fafter or flower than the apparent, or folar, time for that day; to which the equation of time being applied, and it will fhew the time of mean noon for that day, whereby the clock may be adjufted.

TRANSITION, in *Mufic,* is when a greater note is broken into lefs, to foften the roughnefs of a leap, by a gradual paffing to the note next following.

This is commonly called the *breaking of a note.*

Transition, in *Rhetoric,* a kind of connection in difcourfe, whereby the feveral different parts and members thereof are joined, fo as to conftitute one regular whole:

or

or, as Voſſius defines it, it is a form of ſpeech by which the ſpeaker, in a few words, tells his hearers both what he has ſaid already, and what he next deſigns to ſay. Sometimes, however, in paſſing from one thing to another, a general hint of it is thought ſufficient to prepare the hearers, without particularly ſpecifying what has been ſaid, or is next to follow.

Some place *tranſition* in the number of figures; others, with Quintilian, exclude it from that rank.

F. de Colonia makes two kinds of *tranſitions*, the one *perfect*, and the other *imperfect*.

TRANSITION, *Perfect*, is that wherein we briefly intimate what is ſaid, and what remains to be ſaid. As, *now that we have ſpoken of war, there remains ſomething to be ſaid of peace. Satis multa de turpitudine: dicam deinceps, quod propoſui, de periculo. Uni epiſtolæ reſpondi: venio ad alteram. Sed hæc vetera; illud recens: Cæſarem meo conſilio interfectum.*

TRANSITION, *Imperfect*, is that wherein only one of theſe is expreſſed. As, *let us now conſider the conſequences of, &c. Poſtularet hic locus, ut dicerem de—ſed finis ſit; neque enim præ lacrymis jam loqui poſſum; & hic ſe lacrymis defendi negat.*

TRANSITIVE, in *Grammar*, an epithet given to ſuch verbs as ſignify an action which paſſes from the ſubject that does it, to, or upon, another ſubject which receives it. Under the head of verbs *tranſitive*, come what we uſually call verbs active and paſſive: other verbs, whoſe action does not paſs out of themſelves, are called *neuters*, and by ſome grammarians *intranſitives*.

In the Hebrew, the verb היה, *hajah*, in the Greek, ειμι, and in the Latin *ſum*, are verbs purely neuter, or intranſitive; or, as the Latin and Greek grammarians more uſually expreſs it, verbs ſubſtantive, ſignifying the mere exiſtence of the thing, without the active or *tranſitive* conjugations.

TRANSITORY, in *Common Law*, ſtands oppoſite to local. See ACTION.

TRANSITORY *choſe*. See CHOSE.

TRANSITORY *treſpaſs*. See TRESPASS.

TRANSLATION, formed of *trans, beyond*, and *latio*, of *ferre, to carry*; the act of transferring or removing a thing from one place to another.

We ſay, the *tranſlation* of a biſhop's ſee, a council, a ſeat of juſtice, a parliament; the *tranſlation* of the relics of a ſaint, the *tranſlation* of the empire, &c.

The *tranſlations* of biſhops from one ſee to another are prohibited by the council of Nice, which declares them null, and appoints the *tranſlated* biſhop to return to his former church. The council of Sardica excludes *tranſlated* biſhops from communion. It has been obſerved, that no biſhop was ever removed from a greater church to a leſſer; and that thoſe who thus quitted their churches, only did it out of ambition, or avarice.

This diſcipline was generally obſerved for nine hundred years; and the firſt inſtance of any *tranſlation* of note, was that of pope Formoſus, who was biſhop of Porto. One of his ſucceſſors took hold of this pretence to have him dug out of his grave; and a council, held ſoon after, forbad this *tranſlation* to be made a precedent.

However, the ſame church allowed of ſome legitimate cauſes of *tranſlations*; as, the apparent advantage of the church; under which pretence, *tranſlations* ſoon became ſo frequent, that for five or ſix hundred years laſt paſt, they have been eſteemed a kind of common law.

The *tranſlation* of a religious from one order to another cannot be effected without the conſent of the pope; it is added, that it is not allowed to *tranſlate* from a ſeverer rule to a laxer one.

TRANSLATION is alſo uſed for the verſion of a book or writing, out of one language into another.

TRANSMARINE, TRANSMARINUS, ſomething that comes from, or belongs to, the parts beyond ſea.

TRANSMIGRATION, the removal or tranſlation of a whole people into another country, by the power of a conqueror. See MIGRATION.

TRANSMIGRATION is particularly uſed for the paſſage of a ſoul out of one body into another; the ſame with what we otherwiſe call METEMPSYCHOSIS.

The Siameſe, F. Tachard informs us, from a belief of the *tranſmigration* of ſouls into other bodies, forbear killing any beaſts; leſt, by that means, they ſhould diſpoſſeſs the ſouls of their deceaſed relations.

TRANSMIGRATION, *Ionic*. See IONIC.

TRANSMISSION, in *Optics*, &c. denotes the property of a tranſparent body, by which it ſuffers the rays of light to paſs through its ſubſtance; in which ſenſe, the word ſtands oppoſed to reflection.

Tranſmiſſion is alſo frequently uſed in the ſame ſenſe with refraction; becauſe moſt bodies, in *tranſmitting* the rays, do alſo refract them.

For the cauſe of *tranſmiſſion*, or the reaſon why ſome bodies *tranſmit*, and others reflect, the rays, ſee TRANSPARENCY and OPACITY.

The rays of light, Sir Iſaac Newton obſerves, are ſubject to fits of eaſy *tranſmiſſion* and reflection. See LIGHT and REFLECTION.

TRANSMUTATION, the act of transforming or changing one nature into another.

The term is chiefly uſed in chemiſtry and medicine. It has been greatly queſtioned, whether the *tranſmutation* of ſilver into gold, and of tin into ſilver, ſo much ſought by the chemiſts, be poſſible or not.

The pureſt and ſubtileſt parts of the food are *tranſmuted* or aſſimilated into the proper ſubſtance of the body. See NUTRITION.

Nature, Sir Iſaac Newton obſerves, ſeems delighted with *tranſmutations*: he goes on to enumerate ſeveral kinds of *natural tranſmutations*; groſs bodies and light, he ſuſpects, may be mutually *tranſmuted* into each other; and adds, that all bodies receive their active force from the particles of light which enter their compoſition.

For all fixed bodies, when well heated, emit light as long as they continue ſo; and, again, light intermingles itſelf and inheres in bodies as often as its rays fall on the ſolid particles of thoſe bodies.

Again, water, which is a fluid, volatile, taſteleſs, ſalt, is, by heat, *tranſmuted* into vapour, which is a kind of air; and, by cold, into ice, which is a cold, tranſparent, brittle ſtone, eaſily diſſolvable; and this ſtone is convertible again into water by heat, as vapour is by cold.

Earth, by heat, becomes fire, and, by cold, is turned into earth again: denſe bodies, by fermentation, are rarefied into various kinds of air; and that air, by fermentation alſo, and ſometimes without it, reverts into groſs bodies.

Quickſilver ſometimes puts on the form of a fluid metal; ſometimes it appears in ſhape of a pellucid, fragile ſalt, called *ſublimate*; ſometimes of a pellucid, volatile, white, taſteleſs earth, called *mercurius dulcis*; by diſtillation it becomes vapour; and by agitation *in vacuo* it ſhines like fire, &c.

All bodies, beaſts, fiſhes, inſects, plants, &c. with all their various parts, grow and increaſe out of water, and aqueous and ſaline tinctures; and, by putrefaction, all of them revert into water, or an aqueous liquor again.

Farther, water, expoſed a while to the open air, puts on a tincture which, in proceſs of time, has a ſediment and a ſpirit; and, before putrefaction, yields nouriſhment both for animals and vegetables.

TRANSMUTATION, in *Alchemy*, denotes the act of changing or exalting imperfect metals into gold or ſilver.

This is alſo called the *grand operation*; and, they ſay, it is to be effected with the PHILOSOPHER'S *ſtone*.

The trick of *tranſmuting* cinnabar into ſilver, is thus: the cinnabar, being bruiſed groſly, is ſtratified in a crucible with granulated ſilver, and the crucible placed in a great fire; and, after due time for calcination, taken off; then the matter, being poured out, is found to be cinnabar turned into real ſilver, though the ſilver grains appear in the ſame number and form as when they were put into the crucible; but the miſchief is, coming to handle the grains of ſilver, you find them nothing but light friable bladders, which will crumble to pieces between the fingers.

Mr. Boyle, in his Sceptical Chymiſt, tells us, that two friends of his did, by urging mercury in a ſkilfully managed fire, turn it, almoſt weight for weight, into water; but he does not ſay what was the ſpecific gravity of the produced water, nor of the remaining *untranſmuted* maſs of mercury. He likewiſe aſſures us, that rain-water, being diſtilled and re-diſtilled, by a friend of his, near two hundred times, did, after diſtillation, leave at the bottom of the glaſs body, a conſiderable quantity of a white earth; and that more plentifully in the latter diſtillations, than the former.

This he believed to be a certain quantity of water actually *tranſmuted* into earth, adding, that it was above twice as heavy ſpecifically as common water, and of ſo fixed a nature, that it lay a conſiderable time, in a red-hot crucible, without loſing any thing of its weight, or even emitting any ſmoke.

For the *tranſmutation* of iron into copper, ſee COPPER and VITRIOL.

TRANSMUTATION, in *Geometry*, denotes the reduction or change of one figure or body into another of the ſame area or ſolidity, but of a different form; as a triangle into a ſquare, a pyramid into a parallelepiped, &c.

TRANSMUTATION, in the *higher Geometry*, is uſed for the converting of a figure into another of the ſame kind and order,

der, whoſe reſpective parts riſe to the ſame dimenſions in an equation, admit the ſame tangents, &c.

If a rectilinear figure be to be *tranſmuted* into another, it is ſufficient that the interſections of the lines which compoſe it be transferred, and lines drawn through the ſame in the new figure.

If the figure to be *tranſmuted* be curvilinear, the points, tangents, and other right lines, by means whereof the curve line is to be defined, muſt be transferred.

TRANSMUTATION *of colours*. The change of colour of a decoction of the nephritic wood, according to the different lights it was viewed in, long perplexed thoſe who attempted to account for it; but Wolfius has carried the experiments on this decoction much farther, and found a way of giving it its colours again, after taking them wholly away. If this decoction be held between the eye and the light, it appears of a blue colour; but if the eye be placed between it and the light, it appears then of a yellowiſh or a reddiſh colour. If a few drops of oil of vitriol be dropped into it, it will appear of a gold yellow in whatever light it is viewed; but if too much of this oil be added, the whole becomes foul and obſcure; and if a few drops do not produce the effect, it is a ſign that the decoction is too ſtrong, and that it muſt be diluted with water. See COLOURS.

Oil of vitriol has the ſame effect upon many other decoctions of the woods, particularly on that of Braſil wood, which is of a fine red, but immediately becomes yellow on dropping a ſmall quantity of this acid into it. And, as in the other inſtance, ſo in this, it is neceſſary to the ſucceſs of the experiment, that the tincture be not over ſtrong. A few drops of oil of tartar added to this yellow liquor turn it red again as at firſt; and if more oil of tartar be added, the colour becomes bluiſh, with a tinge of red, much ſtronger than the colour of the nephritic wood at firſt, when held between the eye and the light. In all experiments of this kind, the weakneſs of the tincture produces the greateſt beauty; and therefore it is beſt, inſtead of making a decoction, to make only a cold infuſion, by putting a ſmall quantity of the chips of the wood into water, and letting this ſtand cold for ſame time.

A tincture of red roſes, made with common water and oil of vitriol, is well known to be of a very beautiful red colour, yet when the water has ſtood ever ſo long on the roſes alone, it has ſcarce any colour; if it be ſtrained off in this colourleſs ſtate, and the oil of vitriol then added, the red colour is produced as ſtrongly as if this acid had been dropped into the water while the roſes were yet in it. When the liquor is of this fine red colour, a ſmall quantity of oil of tartar makes it immediately green; and if more oil of vitriol be added to this green liquor, it becomes red again, but is muddy, and not ſo well coloured as before. If a few drops of a ſolution of corroſive ſublimate be added to this, it does not at all change colour; and on adding more water, with ſalt of tartar diſſolved in it, the liquor became red again, but of a very different red from what it was before in its muddy ſtate, being now clear and deeper. When the tincture of roſes has ſcarce any colour, a ſmall quantity of ſalt of tartar makes it green, but a large quantity makes it yellow. A few drops of oil of vitriol added to this yellow liquor, turned it to a pale red, and this could never be made green again by oil of tartar. Alum-water, added to a ſolution of ſalt of tartar, makes a white and opake fluid, though they are both ſeparately pellucid.

What is moſt obſervable in theſe experiments on the infuſion of woods is, that oil of tartar, and a ſolution of ſalt of tartar in water, have a very different effect. Thus an infuſion of Braſil-wood is red, and on dropping to it a few drops of oil of vitriol, it becomes yellow. If oil of tartar be added to this liquor, it only makes it yet more yellow; but if a ſolution of ſalt of tartar in water be added to this, it makes it red again. Act. Erudit. ann. 1718. p. 322.

The ſolution of verdigriſe, which is green, becomes colourleſs by the affuſion of ſpirit of nitre or ſpirit of vitriol, and by the affuſion of the oil of tartar it becomes green again. The ſpirit of ſal ammoniac gives it a purple colour, and oil of vitriol makes it pellucid. The ſolution of galls with vitriol gives black, the affuſion of oil of vitriol deſtroys the blackneſs, and it becomes pellucid as before.

M. Muſchenbroeck thought it to be univerſally true, that yellow vegetables, diſſolved in ſpirit of wine, gave yellow tinctures, which are either not at all, or very little changed by acid, alkaline, or any other ſalts; but he thought there were ſome exceptions, and ſays, that when oil of vitriol is put to a yellow paint, called *orlean*, it becomes of a beautiful blue, which is deſtroyed by water or any ſalt. A ſmall quantity of an aſtringent ſubſtance, with iron, gives a black colour; a greater quantity of the aſtringent produces blue, more of it makes a violet, and more ſtill produces purple.

There are ſome tinctures, the colours of which depend upon the external air: ſuch is the red tincture made of Canarian lichen, called *orſeille*, and water, a diluted ſpirit of wine, with lime and an urinous ſalt. For, if this tincture be put into a glaſs tube, hermetically ſealed, in a few days it becomes colourleſs; and when the tube is opened, the colour returns. The abbé Nollet made a variety of experiments with this tincture. To the ſame claſs may be referred the *ſympathetic* INKS.

Colours may be produced in liquors which originally have no colour; thus, ſpirit of wine with red roſes, upon which, whilſt it is yet white, any ſaline acid ſpirit is poured, in ſo ſmall a quantity that the acid can hardly be perceived, produces a florid red. Many other red flowers hardly give any colour to ſpirit of wine in a ſhort time, yet give a red colour by the addition of any of the acids. A ſolution of mercury and oil of tartar gives orange; a ſolution of ſublimate and lime-water produces yellow. The tincture of red roſes with oil of tartar per deliquium, or with ſpirit of ſal ammoniac gives green. In like manner, the tincture of many red flowers is changed into green by an alkali. The tincture of red roſes and ſpirit of wine gives blue. The ſolution of copper and ſpirit of ſal ammoniac gives purple. The ſolution of ſublimate and ſpirit of ſal ammoniac gives white. The ſolution of ſaccharum Saturni and that of vitriol, alſo the tincture of red roſes, or many other red flowers, and the ſolution of copperas in water, and likewiſe the ſolution of galls and copperas, produce black. The following table exhibits the colours ariſing from different mixtures.

1.	Yellow Red	Tincture of red roſes Tincture of crocus	produces	green.
2.	Green Brown	Tincture of violets Spirit of ſulphur		carmine.
3.	Red Brown	Tincture of red roſes Spirit of hartſhorn		blue.
4.	Blue Blue	Tincture of violets Solution of copper		violet
5.	Blue Blue	Tincture of violets Solution of Hungarian vitriol		purple.
6.	Blue White	Tincture of cyanus Spirit of ſal ammoniac		green.
7.	Blue Brown	Solution of Hungarian vitriol Lixivium		yellow.
8.	Blue Red	Solution of Hungarian vitriol Tincture of red roſes		black.
9.	Blue Green	Tincture of cyanus Solution of copper		red.
10	Violet Tranſparent	Tincture of dipſacum, or iris, or any other flowers that give a violet colour in water Alum diſſolved in water.		blue.

Muſchenbroeck's Introd. ad Phil. Nat. tom. ii. p. 738, &c.

The reſult of a variety of mixtures to produce colours, was recited before the Royal Society by Dr. Goddard in 1661, and may be ſeen in Birch's Hiſtory, vol. i. p. 11.

Mr. Melville has made many obſervations on the *tranſmutation* of colours by means of the light of different burning bodies. Bodies of all the principal colours, viz. red, yellow, green, and blue, are very little altered, he obſerves, when they are ſeen by the light of burning ſpirits; but if ſalts be continually mixed with them, during the burning, different changes enſue. When ſal ammoniac, pot aſh, or alum are infuſed, the colour of red bodies appears ſomewhat faded and dirty. Green and blue appear much the ſame as in candle light, both being faint, and hardly diſtinguiſhable. White and yellow are hardly at all affected.

When nitre, or ſea-ſalt, is plentifully mixed with the burning ſpirits, and the whole is ſtirred about briſkly, the brighteſt red bodies, ſeen by the light then emitted, are reduced to a dirty tawny brown, which ſeems to have nothing of redneſs in it. Green is transformed into another ſort of brown, only diſtinguiſhable from the former by a certain inclination to a livid olive colour. When nitre is mixed with the ſpirits, one may ſtill ſee ſome remains of a greeniſh colour, unleſs it be poured in very plentifully. Dark blue is hardly to be known from black, except that it appears the deeper black of the two. Light blue is changed into a very light brown, of a peculiar kind. White aſſumes a livid yellowiſh caſt; and yellow alone appears unaltered, and extremely luminous.

Theſe experiments he made with different ſorts of richly coloured bodies, as ſilks, cloths, and paints. Poliſhed copper,

per, which had contracted from the air a high flaming colour, was reduced, by the ſame light, to the appearance of yellow braſs. The faces and hands of the ſpectators appeared like thoſe of a dead corpſe; and other mixed colours, which had red or green in their compoſition, underwent the like changes.

Having placed a paſteboard, with a circular hole in it, between his eye and the flame of the ſpirits, in order to diminiſh and circumſcribe this object, he examined the conſtitution of thoſe different lights with a priſm, holding the refracting angle upwards; and found that, in the firſt caſe, viz. when ſal ammoniac, alum, or pot-aſh fell into the ſpirits, rays of all kinds were emitted, but not in equal quantities, the yellow being much more copious than all the reſt put together, and the red being more faint than the green and blue.

In the light of ſpirits mixed with nitre, or ſea-ſalt, he could obſerve ſome blue, though exceedingly weak and diluted. With the latter the green was equally faint, but with the former pretty copious. But when either of theſe ſalts were uſed, he could hardly perceive any trace of red, eſpecially when they were mixed in great plenty, and the ſpirits conſtantly agitated. At every little intermiſſion, indeed, the red rays would ſhew themſelves very manifeſtly below the hole, and red bodies ſeen by that light reſumed ſomewhat of their ordinary colour; and it was entertaining to obſerve how both would vaniſh again at once, when the ſalting and ſtirring were renewed.

The proportion in which the bright yellow exceeded the other colours in this light, was ſtill more extraordinary than in the former; in ſo much that the hole, ſeen through the priſm, appeared uniformly of that yellow, and as diſtinctly terminated as through a plane glaſs; except that there was adjoining to it, on the upper ſide, a very faint ſtreak of green and blue. White bodies illuminated with it, appeared alſo through the priſm perfectly well defined, both which, he ſays, are very ſurpriſing phenomena to thoſe who have been accuſtomed to the uſe of the priſm in heterogeneous lights, where it never fails to throw confuſion on the extremities of all viſible objects.

Upon examining bubbles of ſoap and water, in the ſame light, he could only obſerve luminous ſtreaks, ſeparated by dark ones, the green and blue being too weak to affect his eye. Edinb. Eſſays, vol. ii. p. 32.

Transmutation *of plants.* See Seed and Degeneration.

TRANSOM, among *Builders*, the piece that is framed acroſs a double-light window.

Transom, among *Mathematicians*, denotes the vane of a cross-*ſtaff*; or a wooden member fixed acroſs it, with a ſquare whereon it ſlides, &c.

Transoms, in a *Ship*, are beams or timbers extended acroſs the ſtern-poſt of a ſhip, to fortify her after-part, and give it the figure moſt ſuitable to the ſervice for which ſhe is calculated. See *Tab. Ship, fig.* ii. *n.* 109.

The general figure or curve, given to the ſhip by the diſpoſition of the arms of the *tranſoms*, which are gradually cloſer in proportion to their diſtance from the wing-*tranſom* downwards, in conſequence of which it becomes extremely narrow from the counter towards the keel, is called the *flight* of the *tranſoms*. Although theſe pieces are extremely different in their figures according to the extent of the angles formed by their branches or horns, each of them has nevertheleſs a double curve, which is partly vertical, and partly horizontal, with regard to its ſituation in the ſhip. The former of theſe is called, by the artificers, the *round-up*, and the latter the *round-aft*.

As the *tranſoms* fill up the whole ſpace comprehended between the head of the ſtern-poſt above, and the aftmoſt floor-timbers below, it is neceſſary to diſtinguiſh them by particular names. Thus the higheſt is called the *wing-tranſom*; the next, the *deck-tranſom*; and afterwards follow the firſt, ſecond, and third *tranſoms*, together with the intermediate ones. See Ship.

The higheſt *tranſoms* are connected to the ſhip's quarter by knees, which are bolted to thoſe pieces, and to the after-timbers. See Sleepers. Falconer.

TRANSPARENCY, *diaphaneity*, in *Phyſics*, a quality in certain bodies, whereby they give paſſage to the rays of light.

The *tranſparency* of natural bodies, as glaſs, water, air, &c. ſome have imputed to the great number and ſize of the pores or interſtices between the particles of thoſe bodies; but this account is exceedingly defective; for the moſt ſolid and opake body in nature, we know, contains a great deal more pores than it does matter; a great deal more, ſure, than is neceſſary for the paſſage of ſo infinitely fine and ſubtle a body as light.

Ariſtotle, Deſcartes, &c. place *tranſparency* in the rectitude or ſtraightneſs of the pores; by means of which, ſay they, the rays are enabled to make their way through, without ſtriking againſt the ſolid parts, and being reflected back again: but this account, Sir Iſaac Newton ſhews, is imperfect; the quantity of pores, in all bodies, being ſufficient to tranſmit all the rays that fall on them, howſoever thoſe pores be ſituated with reſpect to each other. The cauſe, then, why all bodies are not *tranſparent*, muſt not be aſcribed to their wanting rectilinear pores; but either to the unequal denſity of the parts, or to the pores being filled with ſome foreign matters, or to their being quite empty, by means of which the rays, in paſſing through, undergoing a great variety of reflections and refractions, are perpetually diverted this way and that, till, at length, falling on ſome of the ſolid parts of the body, they are extinguiſhed and abſorbed.

Thus cork, paper, wood, &c. are opake; whereas glaſs, diamonds, &c. are *tranſparent*; the reaſon is, that in the neighbourhood of parts equal in denſity, ſuch as thoſe of glaſs, water, diamond, &c. are, with reſpect to each other; the attraction being equal on every ſide, no reflection or refraction enſues: but the rays, which entered the firſt ſurface of the bodies, proceed, without interruption, quite through the body, thoſe few only excepted which chance to meet with the ſolid parts: but in the neighbourhood of parts that differ much in denſity, ſuch as the parts of wood and paper are, both in reſpect of themſelves, and of the air, or the empty ſpace in their pores; as the attraction will be very unequal, the reflections and refractions muſt be very great; and therefore the rays will not be able to make their way through ſuch bodies, but will be properly deflected, and at laſt quite ſtopped. See Opacity.

TRANSPARENT *column*. See Column.

TRANSPIRATION, the inſenſible, or almoſt inſenſible, paſſage of an excrementitious matter through the pores of the ſkin, called alſo perspiration.

Transpiration is alſo uſed, by ſome authors, for the ingreſs or entrance of the air, vapours, &c. through the pores of the ſkin into the body.

Cardan, by this kind of *tranſpiration*, accounts for the prodigy of a woman, whoſe daily urine weighed twenty-ſeven pounds, though all the food ſhe took, both dry and liquid, did not exceed four pounds. Dr. Baynard alſo ſuſpects ſome ſuch *tranſpiration* to be the caſe in hydropical perſons.

Transpiration *of plants*. See *Perſpiration of* Plants.

TRANSPLANTATION, in *Agriculture* and *Gardening*, the act of removing trees or plants from the places where they were ſowed or raiſed, and planting them in others. See Planting.

In the transplanting of foreſt trees, care is to be taken to preſerve the roots, and even the fine hairs or filaments thereof, with the earth that ſticks thereto; theſe filaments being the mouths that ſuck the nouriſhment, and tranſfuſe it to the tree.

The pits, or foſſes, into which trees are *tranſplanted*, ſhould be left open for ſome time before hand, that the rain, froſt, and ſun, may diſſolve the compacted ſalt, render the earth friable, and qualify it for nouriſhing the tree. The ſame may be effected, in ſome meaſure, by burning ſtraw in the new pits, and drenching the mould with water in dry ſeaſons, and by enriching the ground with manure.

Pliny was of opinion, no tree ſhould be removed under two, or above three years old; Cato would have none *tranſplanted* when leſs than five fingers in diameter: but we are now able to *tranſplant* trees of all ages, and ſizes, without danger.

To *tranſplant* old trees, was reckoned ſo difficult, that *Veterem arborem tranſplantare* was become a proverb for a difficult enterprize; and yet we are informed of a grove of ſix hundred cocoa-trees, of eighty years growth, and ſixty feet high to the loweſt bough, *tranſplanted*, by count Maurice, to his paradiſe of Friburg; and a great perſon in Devonſhire, Mr. Evelyn tells us, *tranſplanted* oaks, as big as twelve oxen could draw, to ſupply a defect in an avenue; and the thing is now, indeed, become quite common.

For the *tranſplantation* of grown trees, Mr. Evelyn gives the following method, as practiſed, with good ſucceſs, by the lord Fitzharding: chooſe trees about the thickneſs of a man's thigh; remove the earth from about them; cut through all the ſide-roots, till the tree may be, by force, brought down on one ſide, ſo that the tap-roots may be conveniently come at to be cut off with the ax: then redreſs the tree, and let it ſtand covered with the mould, from which it was looſened, till the next year, or longer; and by that time, it will have

that

ſhot new tender roots fit for *tranſplanting*, and may be taken up at a fit ſeaſon.

Otherwiſe, for very large trees, before the hard froſts come on, make a trench about the tree, at ſuch diſtance from the ſtem, as you judge ſufficient for the root; dig ſo deep, as almoſt to undermine it; place blocks, and quarters of wood, to ſuſtain the earth, and caſt in as much water as may fill the trench, or ſufficiently wet it, unleſs the ground were very moiſt before: thus let it ſtand till ſome hard froſt bind it firmly to the roots, and then convey it to its new ſtation, which may be preſerved from freezing by placing ſtore of warm litter in it: ſo cloſe the mould the better to the ſtraggling fibres, and place the earth taken out of the pit, about the root of the new-planted tree.

The common rules for *tranſplanting* are, 1°. The lighter the ſoil is, the deeper are the trees to be planted. 2°. If the ſoil be gravel, or ſand, mix clay with it, and *vice verſa*. 3°. The beſt ſeaſon is either October, or February; in warm, moiſt, clear weather. 4°. The large roots are to be abated, to prevent the neceſſity of digging too deep; but the ſmall fibrous ones to be ſpread. 5°. In taking up the trees, to obſerve how the roots grow; and, in *tranſplanting*, to diſpoſe them in the ſame order, and place the tree to the ſame aſpect. 6°. To defend young trees, after *tranſplantation*, both from the wind and ſun, till the roots be fixed, and they begin to ſhoot. 7°. If the ſoil you *tranſplant* into be good, do not top the trees, but lop all the boughs to a ſingle one, the moſt upright and promiſing among them; but if the ſoil be poor, top them, and when they are ſhot out again, lop off all the branches, to one.

Transplanting *of fruit trees*. After a ſummer's growth of fruit-ſeedlings in the ſeminary, ſuch are pulled up as are about a foot high, and *tranſplanted* into a nurſery; the reſt are to be left in the ſeed-plot till another year.

When drawn up, the ſprigs are to be cut off from about the top, the ſtrings from the roots, and the extremities, both of the top, that it may not run too faſt upwards; and of the tap or heart-root, that it may not paſs directly downwards; leſt it go beyond the good ſoil. The holes, or pits, are to be ſo deep, as that the plants may ſtand ſomewhat deeper in the ground than when in the ſeed-plot; cloſe the mould about them, and, if it be a dry time, water them the firſt day, and cover the ſoil with old fern.

Mr. Bradley gives us a new method of *tranſplanting* trees, of all kinds and ages, with ſafety, either while they are in bloſſom, or with fruit upon them, thus: the holes to receive the trees are to be prepared before the trees are taken up, and the earth which comes out of the holes is to be made very fine, and put into large tubs, and mixed with water, till it be about the conſiſtence of thin batter; then the holes, wherein the trees are to be planted, are to be filled with this thus tempered earth, before the earthy parts have time to ſettle.

The advantage hereof is, that the trees, thus planted, have their roots immediately cloſed, and guarded from the air; and the warm ſeaſon of the year diſpoſing every part of the tree for growth and ſhooting, it will loſe very little of its vigour. In winter this method does not ſucceed.

The ſame author adds, that in conſideration of the circulation of the ſap, it is as neceſſary to preſerve the veſſels of trees entire, as thoſe in animal bodies; and therefore, in *tranſplanting* trees in the ſummer ſeaſons, it is not proper to cut off any of the branches, or wound any of the veſſels, till they have renewed their roots, which it is of abſolute neceſſity to wound in *tranſplanting* them. For the wounded roots, he has provided a plaſter of a mixture of gums, to prevent the canker and rot, and promote their healing.

Transplantation, in *Natural Magic*, is uſed for a ridiculous ſuppoſed method of curing diſeaſes by transferring them from one ſubject to another; which was much in vogue among certain chemical, or rather ſympathetical phyſicians, ſome ages ago.

This *tranſplantation* was effected, either by the uſe of a certain medium, called, on that account, a *magnet*; or, without that, only by ſimple contact.

Tranſplantation, by means of the magnet, was of five kinds, viz. *inſemination*, *implantation*, *impoſition*, *irroration*, and *ineſcation*; but the whole practice is now deſervedly laughed out of the world.

TRANSPORT-*ſhip* is a veſſel uſed to convey proviſions, warlike ſtores, ſoldiers, &c. from one place to another.

TRANSPORTATION, the act of conveying or carrying a thing from one place or country to another.

In matters of commerce, *tranſportation* is of equal import with re-exportation, viz. the taking up of commodities in one foreign ſtate or kingdom, bringing them hither, and paying duties for them; and then conveying them into ſome other foreign ſtate: by which it is diſtinguiſhed from importation, and exportation; where the commodities are either carried originally out of, or brought finally into our own kingdom.

Transportation, in *Law*, is alſo a kind of puniſhment, or, more properly, an alleviation or commutation of puniſhment, for criminals convicted of felony; who, for the firſt offence, unleſs it be an extraordinary one, are ordinarily *tranſported* to ſome foreign country for a term of years or for life; within which if they return, they are executed without farther trial than aſcertaining their identity.

This is made felony without benefit of clergy by ſtatutes 4 Geo. I. cap. 11. 6 Geo. I. cap. 23. 16 Geo. II. cap. 15. and 8 Geo. III. cap. 15. as is alſo the aſſiſting tranſports to eſcape from ſuch as are conveying them to the port of *tranſportation*.

Exile and *tranſportation* are puniſhments at preſent unknown to the common law; and whenever the latter is now inflicted, it is either by the choice of the criminal himſelf, to eſcape a capital puniſhment, or elſe by the expreſs direction of ſome modern act of parliament. Accordingly, it was enacted by the ſtatutes 4 Geo. I. cap. 11. and 6 Geo. I. cap. 23. that when any perſons ſhall be convicted of any larceny or felony, who by the law ſhall be intitled to the *benefit of* clergy, and liable only to the penalties of burning in the hand or whipping, the court in their diſcretion, inſtead of ſuch burning in the hand or whipping, may direct ſuch offenders to be tranſported to America (or, by ſtatute 19 Geo. III. cap. 74. to any other parts beyond the ſeas) for ſeven years. And by the ſubſequent ſtatutes 16 Geo. II. cap. 15. and 8 Geo. III. cap. 15. many wiſe proviſions are made for the more ſpeedy and effectual execution of the laws relating to *tranſportation*, and the conviction of ſuch as tranſgreſs them. But now, by the ſtatute 19 Geo. III. cap. 74. all offenders liable to *tranſportation* may, in lieu thereof, at the diſcretion of the judges, be employed, if males (except in the caſe of petty larceny) in hard labour for the benefit of ſome public navigation; or, whether males or females, may, in all caſes, be confined to hard labour in certain penitentiary houſes, to be erected by virtue of the ſaid act, for the ſeveral terms therein ſpecified, but in no caſe exceeding ſeven years; with a power of ſubſequent mitigation, and even of reward, in caſe of their good behaviour; but if they eſcape and are retaken, for the firſt time an addition of three years is made to the term of their confinement; and a ſecond eſcape is felony without benefit of clergy.

Tranſportation is ſaid to have been firſt inflicted as a puniſhment by 39 Eliz. cap. 4. Blackſt. Com. vol. iv. p. 370, &c. Burn's ed.

Transportation *of plants*, is the removal of them from one country to another: with reſpect to which great caution is neceſſary. The plants ſent from a hotter country to a colder ſhould be tranſported in the ſpring of the year, that the heat of the ſeaſon may be advancing as they approach the colder climates; and, on the contrary, thoſe which are ſent from a colder country to a hotter ſhould be ſent in the beginning of winter.

The beſt way of packing up plants for a voyage, if they be ſuch as will not bear keeping out of the earth, is to have boxes with handles, and holes bored in their bottoms to let out the moiſture, filling them with earth, and planting the roots as cloſe together as may be; the plants ſhould be ſet in theſe boxes a fortnight or three weeks before they are to be put on board, and in good weather they ſhould be ſet upon the deck, and in bad removed or covered with a tarpaulin.

If they are going from a hotter country to a colder one, they muſt have very little moiſture; if, on the contrary, they are going from a colder to a warmer, they may be allowed water more largely, and being ſhaded from the heat of the ſun, they will come ſafe.

Very many plants, however, will live out of the earth a great while; as the ſedums, euphorbiums, ficoides, and other ſucculent ones. Theſe need no other care than the packing them up with moſs in a cloſe box; and there ſhould be a little hay put between them, to prevent them from wounding or bruiſing one another, and holes bored in the boxes to keep them from heating and putrefying. In this manner they will come ſafe from a voyage of two, or three, or even four or five months.

Several trees alſo will come ſafely in the ſame manner, taking them up at a ſeaſon when they have done growing, and packing them up with moſs. Of this ſort are oranges, olives, capers, jaſmines, and pomegranate-trees. Theſe, and many others, are annually brought over thus from Italy; and though they are three or four months in the paſſage, ſeldom miſcarry. And the beſt way of ſending

over

over feeds, is in their natural hufks, in a bag, or packed up in a gourd-fhell, keeping them dry, and out of the way of vermin. Miller. See SEED.

Thofe who are defirous of particular inftructions with regard to the beft means of collecting both feeds and plants in diftant countries, and of preferving them during a voyage hither in a vegetating ftate, may confult Mr. Ellis's Directions for bringing over Seeds and Plants from the Eaft Indies, and other diftant Countries, in a State of Vegetation, &c. 4to. 1770.

TRANSPORTING, in *Sea Language*, the act of removing a fhip from one place to another, by the help of anchors and ropes. See WARP.

TRANSPOSITION, in *Algebra*, the bringing any term of an equation over to the other fide.

Thus, if $a + b = c$, and you may make $a = c - b$; b is faid to be *tranfpofed*. See REDUCTION *of Equations*.

TRANSPOSITION, in *Grammar*, a difturbing or diflocating of the words in a difcourfe; or a changing of their natural order of conftruction, to pleafe the ear, by rendering the contexture more eafy, fmooth, and harmonious.

A *tranfpofition*, which renders the fenfe perplexed, is vicious. The conftruction of the ancient languages, being much more artful than that of the modern ones, allowed of much greater, and more frequent *tranfpofitions*. The Englifh, French, &c. fcarce ever allow of them but in oratory and poetry; in which cafes, they ferve to give a force and energy to the difcourfe, or the verfe, and to prevent their languifhing.

TRANSPOSITION, in *Mufic*, is a changing of the notes of a piece of mufic, or the fhifting a fong from its former fituation, to fet it higher or lower, or in another octave. Of this there are two kinds; the firft with refpect to the CLEF, the fecond with refpect to the KEY.

TRANSPOSITION *with refpect to the clef*, confifts in changing the places or feats of the notes or letters among the lines and fpaces; but fo, as that every note is fet at the fame letter.

This is done either by removing the fame clef to another line, or by ufing another clef, but with the fame fignature; becaufe the piece is ftill in the fame key.

The practice is eafy in either cafe. In the firft, you take the firft note at the fame diftance above or below the clef note, in its new pofition, as before, and all the reft of the notes in the fame relations or diftances from one another; fo that the notes are all fet on lines and fpaces of the fame name.

In the fecond, or fetting the mufic to a different clef, it is to be obferved, that the places of the three clef-notes are invariable in the fcale, and are to one another in thefe relations, viz. the mean a fifth above the bafs, and the treble a fifth above the mean. Now to *tranfpofe* to a new clef, *e. gr.* from the treble to the mean, wherever that new clef is fet, we fuppofe it the fame individual note, in the fame place of the fcale, as if the piece were that part in a compofition to which this new clef is generally appropriated; that fo it may direct to the fame notes we had before *tranfpofition*: now, from the fixed relations of the three clefs in the fcale, it will be eafy to find the feat of the firft *tranfpofed* note; and then all the reft are to be fet at the fame mutual diftances they were at before. See SCALE.

Suppofe, *e. gr.* the firft note of a fong be *d*, a fixth above the bafs clef, the piece being fet with that clef; if it is tranfpofed and fet with the mean clef, then, wherever that clef is placed, the firft note muft be the greater 2d above it; becaufe a greater 2d above the mean is a greater 6th above the bafs clef, the relation of thofe two being a 5th. So that the firft note will ftill be the fame individual *d*. Let a piece be fet with the treble-clef, and the firft note be *e*, a leffer 3d below the clef; if we tranfpofe this to the mean clef, the firft note muft be a greater 3d above it, which is the fame individual note *e* in that fcale, for a leffer 3d, and greater third make a 5th, the diftance of the treble and mean clefs.

The ufe of this *tranfpofition* is, that if a fong being fet with a certain clef, in a certain pofition, the notes go far above or below the fyftem of five lines; they may, by the change of the place of the fame clef in the particular fyftem, or by taking a new clef, be brought more within the compafs of the lines.

TRANSPOSITION *from one key to another*, is a changing of the KEY, or fetting all the notes of the fong at different letters, and performing it, confequently, in different notes upon an inftrument.

The defign hereof is, that a fong which, being begun in one note, is too high or low, or otherwife inconvenient, for a certain inftrument, may be begun in another note, and from that carried on in all its juft degrees and intervals.

The clef, and its pofition, here remain the fame; and the change is of the notes themfelves, from one letter, and its line or fpace to another.

In the former *tranfpofition* the notes were expreffed by the fame letters, but both removed to different lines, and fpaces: in this, the letters are unmoved, and the notes of the fong transferred to, or expreffed by other letters, and, confequently, fet upon different lines and fpaces, which, therefore, requires a different fignature of the clef. See Malcolm's Mufic, ch. xi. fect. 4.

TRANSTRUM, in the *Naval Architecture of the Ancients*, a term ufed to exprefs a fort of crofs or tranfverfe feats that were placed in the polycrote gallies of thofe times, and ferved for the places of feveral of the rows of men, who could move and work their oars under the feats of the other or lateral rowers of the next tire.

Meibomius, who has written exprefsly on the naval architecture of the ancients, has better underftood the places and ufe of thefe *tranftra*, than any other author of late times; by a proper arrangement of thefe feats, and the lateral ones above and below each, he has taken off greatly from the height allowed by Scaliger, and others, to the polycrote veffels.

TRANSUBSTANTIATION, TRANSUBSTANTIATIO, in the *Roman Theology*, the fuppofed converfion or change of the fubftance of the bread and wine, in the eucharift, into the body and blood of Jefus Chrift.

Tranfubftantiation, taken in its general and literal fenfe, implies any change of one fubftance into another. Thus the change of Mofes's rod into a ferpent; of the waters of the Nile into blood; of Lot's wife into a pillar of falt; were preternatural *tranfubftantiations*: and the change of the food we eat, into the fubftance of our bodies, is a natural *tranfubftantiation*.

But the word, in its proper and technical fenfe, is reftrained to the miraculous change which the Romifh church holds is wrought in the facrament, by the confecration of the prieft.

One of the great articles of that church, rejected by the reformed, is that of *tranfubftantiation*; the latter maintaining the *tranfubftantion* to be only figurative, and the former affirming it to be real.

This doctrine was eftablifhed in the fourth general Lateran council, under pope Innocent III. in 1215, who is faid to have introduced and eftablifhed the ufe of the term *tranfubftantiation*, which was hitherto abfolutely unknown: though fome fay that Stephen, bifhop of Autun, firft ufed this term. Burnet on the Articles, p. 312.

The reformed interpret *eft*, *is*, in the text *Hoc eft corpus meum*, *This is my body*, by *fignificat*; *q. d. This fignifies my body*: but the council of Trent ftand up ftrenuoufly for the literal fenfe of the verb. Thus, in can. 1. feff. 13. of that council, it is exprefsly decreed, that, in *tranfubftantiation*, the body and blood of our Lord Jefus Chrift are truly, really, and fubftantially, under the fpecies of bread and wine.

It is added, that, by *truly*, we mean *properly*; and not only by fignification, as if the eucharift were no more than a fign of the body and blood of Jefus Chrift: that by *really*, we mean *in fact*, and not only in figure, as if the eucharift were only a figure and reprefentation of the body and blood of the Saviour of the world; and that by *fubftantially*, we mean *in fubftance*, and not only in virtue and energy. Thus is *truly* oppofed to a fimple fign, *really* to a figure, and *fubftantially* to energy or virtue.

TRANSUBSTANTIATION, *declaration againft*. See DECLARATION.

TRANSUMPTION, TRANSUMPTIO, in the *Schools*, a fyllogifm by conceffion or agreement, ufed where a queftion propofed is transferred to another, with this condition, that the proof of this latter fhall be admitted for a proof of the former.

Thus Ariftotle, in his book De Cœlo, undertaking to fhew, that all the ftars are round, transfers the queftion to the moon, and proves her rotundity from her increafing and waining; fuppofing it a thing admitted by his opponents, that the ftars are all alike.

TRANSVERSALIS, in *Anatomy*, a name given to feveral mufcles, &c. in refpect of their fituation, progrefs, &c. as the

TRANSVERSALIS *abdominis*, a mufcle which lies under the obliqui, fo called from the direction of its fibres; fixed to the ribs above; below, to the os ilium and ligamentum Fallopii; before, to the linea alba; and behind to the vertebræ. Its upper part is fixed to the lower part of the cartilaginous furface of the two loweft true ribs, and of all the five falfe ribs, by flefhy digitations; the fibres of which become tendinous, as they approach the linea alba; the middle part is fixed to the three firft vertebræ of the loins, by a double aponeurofis or two tendinous planes; the internal and external planes having enclofed in their duplicature the mufculus facrolumbaris, and quadratus,

dratus lumborum, unite in one ſtrong aponeuroſis at the edges of thoſe muſcles; the inferior part of this muſcle is fixed by an inſertion wholly fleſhy to the internal labium of the criſta of the os ilium, and a great part of the ligamentum Fallopii. Winſlow.

The *tranſverſales* ſeem to have no other uſe than that of bracing or girding the abdomen in different degrees, either by their whole plane, or by different portions thereof. See *Tab. Anat. Myol. fig.* 2. *n.* 29. *fig.* 7. *n.* 39.

This, with the obliqui, unites its tendons, as it approaches the linea alba, and is the only muſcle that is cut in the operation of the bubonocele. It has a fine and thin membrane that cloſes exactly its ring, or hole, through which the veſſels paſs. See Obliquus.

Tranversalis *anticus primus capitis*, a ſmall, pretty thick, and wholly fleſhy muſcle, about the breadth of a finger, ſituated between the baſis of the *os occipitis* and the tranſverſe apophyſis of the firſt vertebra.

It is fixed by one end in the anterior part of that apophyſis, and from thence running up a little obliquely, it is inſerted by the other end in a particular impreſſion between the condyle of the *os occipitis* and the maſtoide apophyſis of the ſame ſide, behind the apophyſis ſtyloides, and under the edge of the jugular foſſula. Winſlow.

Transversalis *anticus capitis ſecundus*, a ſmall muſcle, ſituated between the tranſverſe apophyſes of the two firſt vertebræ of the neck. It is fixed by one extremity very near the middle of the ſecond apophyſis, and by the other near the root or baſis of the firſt.

Transversalis *colli major*, is a long thin muſcle, placed along all the tranſverſe apophyſes of the neck, and the fourth, fifth, or ſixth upper apophyſes of the back, between the complexus major and minor, lying, as it were, on the inſertions of the firſt of theſe muſcles. It is compoſed of ſeveral ſmall muſcular faſciculi, which run directly from one or more tranverſe apophyſes, and are inſerted ſometimes in others more remote, the ſeveral faſciculi croſſing each other between the inſertions of the two complexi, which are likewiſe croſſed by them.

They have ſometimes a communication with the *longiſſimus* dorsi, but this is not uniform. Winſlow.

Transversales *colli minores*, very ſmall and ſhort muſcles, found in the interſtices of ſeveral tranſverſe apophyſes in which they are inſerted, and called by ſome alſo inter-transversales.

Transversalis *gracilis*, or *collateralis colli*, a long thin muſcle, reſembling the *tranſverſalis* major in every thing but ſize, and ſituated on the ſide of that muſcle.

It is commonly taken for a portion or continuation of the ſacrolumbaris. Diemerbroek diſtinguiſhed it by the name of *cervicalis deſcendens*; and Stone, and others after him, have called it *acceſſorius muſculi ſacrolumbaris*.

The *tranſverſalis major*, *tranſverſalis gracilis*, and *tranſverſales minores*, acting on one ſide, can have no other uſe but to bend the neck laterally, and to hinder its inflexions when they act on both ſides. The ſmall *tranſverſales* may likewiſe preſerve the capſular membranes of the joints from being compreſſed, or otherwiſe hurt by the motions of the apophyſes. Winſlow.

Transversalis *dorſi major*, a name given to certain faſciculi fixed in the tranſverſe apophyſes of the back from the firſt to the ninth incluſively, and ſituated between the extremities of the *tranſverſalis major colli*, and of the *longiſſimus dorſi*, with which they communicate at or about the third vertebra.

Transversales *dorſi minores*. Some particular muſcles of this kind are found fixed to the extremities of the three loweſt tranſverſe apophyſes of the back; the reſt are all in ſome meaſure continuations of the *tranſverſalis major*; but theſe few which are diſtinct, and lie in the interſtices between two apophyſes may juſtly enough be called *inter-tranſverſales*.

Transversalis *digitorum pedis*, a ſmall muſcle which lies tranſverſely under the baſis of the firſt phalanges, and which at firſt ſight appears to be a ſimple muſcular body, fixed by one end to the great toe, and by the other end to the little toe. When carefully examined, it is found to be fixed by a very ſhort common tendon to the outſide of the baſis of the firſt phalanx of the great toe, conjointly with the antithenar, and by three digitations to the interoſſeous ligaments which connect the heads of the four metatarſal bones next the great toe. The three digitations are very ſlender, and gradually cover each other. This muſcle might be reckoned a ſecond antithenar. It may ſerve to aſſiſt the metatarsus in contracting the ſole of the foot, and increaſing the convexity of the upper ſide. Winſlow.

Transversalis *penis*, in *Anatomy*, a name given by ſome writers, particularly Cowper, to a muſcle called by others *virgæ lateralis parvus*, and by Albinus the *tranſverſus perinæi*. Winſlow calls it *tranſverſus urethræ*.

The *muſculi tranſverſi*, called alſo *triangulares*, are two long, narrow, fleſhy faſciculi, inſerted each by one extremity in the root or beginning of the ramus of the os iſchium; from whence they run tranſverſely along the edge of the interoſſeous ligament of the oſſa pubis, as far as the apex of the proſtates, where their other extremities meet, and form commonly a kind of digaſtric muſcle, the middle of which gives inſertion to the muſcles of the urethra, and to the cutaneous ſphincters of the anus. Winſlow.

They help to preſs the veins, upon the back of the penis, againſt the os pubis; which is the cauſe of erection.

Transversalis *lumborum*. See Sacer and Transverso-*ſpinalis lumborum*, and Spinales.

Transversalis *femoris*. See Quadratus.

Transversalis is alſo a name given to a ſuture of the cranium, becauſe of its traverſing or croſſing the face from one ſide to the other.

It ariſes at one of the leſſer angles of the eye, and, paſſing along the bottom of its orbit, and the root of the noſe, terminates in the other leſſer angle.

TRANSVERSE, ſomething that goes acroſs another from corner to corner.

Thus bends and bars, in heraldry, are *tranſverſe* pieces, or bearings: the diagonals of a parallelogram, or a ſquare, are *tranſverſe* lines.

Lines which make interſections with perpendiculars, are alſo called oblique or *tranſverſe* lines.

Transverse *axis*, or *diameter*, called alſo the *firſt* or *principal axis*. See Axis, Diameter, and Latus *tranſverſum*.

The *tranſverſe* axis of an ellipsis is the longer axis, or that which *tranſverſes* it lengthwiſe, in contradiſtinction from the conjugate one.

The *tranſverſe* axis of the hyperbola is the line DK, *Tab. Conics, fig.* 17. cutting the curve in the points D and K.

Tranverse *muſcles*, in *Anatomy*, are certain muſcles ariſing from the *tranſverſe* proceſſes of the vertebræ of the loins.

TRANSVERSO-SPINALIS *colli*. See Semi-spinalis *colli*.

Transverso-spinalis *dorſi*. See Semi-spinalis.

Transverso-spinalis *lumborum*, called by ſome sacer, a muſcle compoſed of ſeveral oblique converging or tranſverſo-ſpinal muſcles, in the ſame manner as in the back and neck.

It lies between the ſpinal and oblique apophyſes of the loins, reaching to the os ſacrum. The loweſt of theſe muſcles are fixed to the ſuperior lateral parts of the os ſacrum, to the ligamentum ſacro iliacum, and to the poſterior ſuperior ſpine of the os ilium. The reſt are fixed to the three loweſt tranſverſe apophyſes, and to the four loweſt oblique apophyſes of the loins, and to their lateral tuberoſities; from thence they run up to all the ſpinal apophyſes of theſe vertebræ: the external, or thoſe that appear firſt, being longer than the internal, eſpecially toward the lower part. The *tranverſo-ſpinales*, being oblique, converging, vertebral muſcles, are aſſiſtants to the ſacro-lumbaris and longiſſimus dorſi, which they croſs on each ſide. Winſlow.

TRANSVERSUM *latus*. See Latus.

Tranversum, *ſeptum*. See Septum.

TRANSVERSUS *auriculæ*, in *Anatomy*, a name given by Albinus to a muſcle of the ear, not allowed to be ſuch by other authors; but deſcribed by Santorini, and others, under the name of *fibræ tranſverſæ in gibbo auriculæ*, and *fibræ in convexa conchæ parte*.

Transversus *naſi*, in *Anatomy*, a name given by Santorini, and others, to the muſcle of the noſe, called by Winſlow *tranſverſalis ſive inferior*; and by Albinus, the compressor *naris*.

TRANSUM, in *Gunnery*, is a piece of wood which goes acroſs the cheeks of a gun-carriage, or of a gun to keep them fixed together; each *tranſum* in a carriage is ſtrengthened by a bolt of iron. See Carriage.

TRANTERY, in ſome *Cuſtoms*, denotes the money ariſing by amerciaments of ale-ſellers and victuallers for breaking the aſſize of bread and ale; particularly at Luſton, and other manors in Herefordſhire.

TRAPA, *water caltrops*, in the *Linnæan ſyſtem of Botany*, a genus of the *tetrandria monogynia* claſs, the characters of which are theſe: the cup is a perianthium compoſed of one leaf, divided into four at the edges, and remaining when the flower is fallen; the flower is compoſed of four petals larger than the ſegments of the cup, and placed vertically; the ſtamina are four filaments of the length of the cup; the antheræ are ſimple; the germen of the piſtillum is of an oval figure; the ſtyle is ſimple, and of the length of the cup, and the ſtigma is headed, and has a ridge round it; the fruit is an oval oblong ſtony

capsule, containing only one cell, and armed with four thorns placed oppositely on the sides; these are thick and pointed, and are what were originally the leaves or segments of the cup; the seed is a nut of an oval figure. There is one species.

TRAPEZIUM, in *Geometry*, a plain figure contained under four unequal right lines.

TRAPEZIUM *os*, in *Anatomy*, is one of the bones of the CARPUS or WRIST: it is the first bone of the second row, and has its name from its figure, which is a sort of unequal square; its outer surface is rough, and makes a part of the outer or convex side of the carpus; on its inner surface is an oblong eminence, which makes one of the four eminences on the concave side of the carpus; and on the same side it has a groove or channel; there is likewise a small tubercle on its outer surface.

This bone has several articular cartilaginous sides, viz. one brachial, one digital, and two cubital; the brachial side, which is hollow, is articulated with the os scaphoides; the digital, with the first phalanx of the thumb; one of the cubital with os trapezoides, and the other with the bone of the metacarpus; the side which is articulated with the first phalanx of the thumb, appears to be made up of two superficial sigmoide or semilunar half-sides, distinguished by an eminence of the same figure, being each more hollow towards the sides than at the middle, which makes a portion of a sort of superficial pulley, with the edges much worn. One of the cubital sides, which is articulated with the os trapezoides, is large; and the other, which joins the first metacarpal bone, is small. Winslow's Anat. p. 83.

TRAPEZIUS, in *Anatomy*, is a muscle, called also CUCULARIS, which is a large, broad, thin, fleshy plane, situated between the occiput and lower part of the back, and thence extending to the shoulder, in figure of a large irregular square, and, together with the *trapezius* of the other side, it forms a kind of lozenge. Above, it is fixed in the superior transverse line of the os occipitis, by a thin series of fleshy fibres reaching to the musculus occipitalis, and seeming to cover that muscle by a kind of aponeurosis. Behind, it is fixed to the five superior spinal apophyses of the neck, by means of the posterior cervical ligament, and immediately to the extremities of the two lowest spinal apophyses of the neck, and of all those of the back. From all these insertions the fibres run in different directions, and terminate by one continued insertion in about one third part of the clavicula, in the posterior edge of the acromium, and through the whole superior labium of the spine of the scapula, all the way to the small triangular surface in that spine, over which surface the fibres slide and pass freely, without being fixed therein. This muscle covers immediately the splenius or mastoidæus superior, part of the complexus major, the angularis, rhomboides, and part of the latissimus dorsi. The common insertion of the two trapezii in the cervical ligament, is the reason that in pulling either of them toward one side of the neck, the other will follow it a little beyond the spinal apophyses.

The use of the *trapezius*, regard being had to the direction and insertion of its fibres, is to raise the shoulders, or rather to turn the top of the scapula upward, and to hinder it from sinking. But it is too thin, and consists of too few fibres to be able to overcome or bear up against some resistances, without the co-operation of the SERRATUS *major*. Winslow.

TRAPEZOID, in *Geometry*, a plane irregular figure, having four sides, no two of which are parallel to each other.

TRAPEZOIDES *os*, in *Anatomy*, is the second bone of the second row in the CARPUS, or WRIST. It has its name from its figure, supposed to approach that of an unequal square; but it might much more properly have been called os pyramidale, being in figure rather a kind of a pyramid, with its point broken off. Its basis makes a portion of the outer or convex side of the carpus, and its truncated point a part of the concave side.

It has several articular sides, one brachial, which is the least of all, and is articulated with the os scaphoides; one digital, of a considerable length, notched on each side, and divided into two halves by a sort of middle line or angle, which gives it the appearance of a pulley, articulated with the basis of the first metacarpal bone; one radial, irregularly triangular, and articulated with the os trapezium; and one cubical, a little hollow, and articulated with the os magnum. Winslow, Anat. p. 84.

TRAPEZUNTINA *laurus*, a name used by some botanical authors, for the *laurocerasus*, or common laurel.

TRAPPE, *monks of La*, in *Ecclesiastical History*, monks of the CISTERCIAN order, belonging to an abbey beautifully situated in a large valley in the province of Le Perche, on the confines of Normandy, in France. The abbey was founded in 1140 by Rotrou, count of Perche, and dedicated under the name of the Blessed Virgin, in 1214, by Robert, archbishop of Rouen. This abbey was subjected to a very rigorous discipline by the abbed Rance in 1664. Encyclop.

TRAPPINGS. Among the ancients some will have the horse-*trappings* to have been placed on their breasts; others, on their forehead; and others again, on their cheeks; that on the breast was a small kind of shield, finely polished.

TRAQUENADE, in the *Manege*. See ENTREPAS.

TRASCINA, in *Ichthyology*, a name by which some authors have called the fish more usually known by the name of the DRACO *marinus*, and araneus.

TRAVAIL, in the *Manege*. See TRAVICE.

TRAVE, among *Farriers*, the same with TRAVICE.

TRAVELLER, in a *Ship*, a sort of thimble, whose diameter is much longer, in proportion to the breadth of its surface, than the common ones. It is furnished with a tail formed of a piece of rope, about three feet in length, one end of which incircles the ring, to which it is spliced. These machines are principally intended to facilitate the hoisting or lowering of the top-gallant-yards at sea: for which purpose two of them are fixed on each back-stay, whereon they slide upwards and downwards like the ring of a curtain upon its rod; being thus attached to the extremities of the top-gallant-yard, they prevent it from swinging backwards and forwards, by the agitation of the ship, whilst the yard is hoisting or lowering at sea. Falconer.

TRAVELLER'S *joy*, in *Botany*. See VIRGIN'S-*bower*.

TRAVERSE, or TRANSVERSE, something that goes athwart another, i. e. that crosses and cuts it obliquely.

TRAVERSE is particularly used for a piece of wood or iron, placed transversely, to strengthen and fortify another; such are those used in gates, windows, &c.

To plane a board against the grain, is also called, among joiners, &c. to *traverse* it.

TRAVERSE, in *Gunnery*, signifies to turn or point a piece of ordnance, which way one pleases, upon her platform.

The laying or removing of a piece of ordnance, or a great gun, in order to bring it to bear, or lie level with the mark, is also called *traversing the piece*. See GUNNERY.

TRAVERSE, in *Fortification*, denotes a trench with a little parapet, sometimes two, one on each side, to serve as a cover from the enemy that might come in flank. See GLACIS and *Tab.* VII. *Fortification*, *fig.* 41, in which *v*, *v* represent *traverses*, constructed at the extremities of the places of arms, which serve to enclose them: these *traverses* are three toises thick, and as long as the COVERT-*way* is broad, and a passage is cut in the glacis round them of about six or eight feet, in order to have a free communication with the rest of the covert-way.—There are also *traverses* of the same dimensions before every saliant angle of the bastion and out-works, and they are in the same direction of the faces of those works produced; and the thickness lies at the same side as the parapets. The passages round these last *traverses* are likewise from six to eight feet wide. The second covert-way has also *traverses* every where, in the same manner as the first.

Traverses are sometimes covered over-head with planks, and loaded with earth. Each *traverse* is furnished with a foot-bank, and a row of palisades planted on the foot-bank; and the passage round its end should be furnished with klinkets or doors, to shut them up when necessary. They are very commodious for stopping an enemy's way, and to prevent being enfiladed: they likewise make a good defence, in a dry foss, in making the parapet on the side next the opposite flank.

TRAVERSE, in a *wet foss*, is a sort of *gallery*, made by throwing saucissons, joists, fascines, stones, earth, and other things, into the foss, over-against the place where the miner is to be put to the foot, or the wall, in order to fill up the ditch, and make a passage over it.

TRAVERSE also denotes a wall of earth, or stone raised across a work which is commanded, in order to cover the men.

TRAVERSE also signifies any retrenchment, or line fortified with fascines, barrels or bags of earth, or gabions.

TRAVERSE, in *Navigation*, is the variation or alteration of a ship's course, occasioned by the shifting of the winds, currents, &c. or, a *traverse* is a compound course, wherein several different courses and distances are known.

Traverse sailing is used when a ship, having set sail from one port towards another, whose course and distance from the port sailed from is given or known, is, by reason of contrary winds, or other accidents, forced to shift and sail on several courses, which are to be brought into one course,

courſe, to learn, after ſo many turnings and windings, the true courſe and diſtance made from the place ſailed from, and the true point or place where the ſhip is; that ſo, the wind coming fair, it may be known how, afterwards, to ſhape a courſe for the place intended.

This may be performed geometrically two ways: the firſt, by drawing new meridians, through the extremity of every courſe, parallel to the firſt meridian, or north and ſouth line at firſt made, and ſetting off every courſe with a ſweep of ſixty, as if it were a queſtion in plain ſailing: you may alſo let fall perpendiculars to every new meridian, from the point that the ſhip ſailed to upon that courſe; by which you have the courſe, diſtance, difference of latitude, and departure, to every courſe.

To illuſtrate this by an example: a ſhip, being bound for a port diſtant 120 miles N. E. ½ E. ſails S. S. E. 30 miles, then N. E. by N. 40, then E. by N. 25, then N. N. E. 44: it is required to find the courſe and diſtance made good, and alſo the courſe and diſtance to the port bound for?

Draw the line HK (*Tab.* II. *Navigation, fig.* 56,) at pleaſure, for a meridian, or north and ſouth line, and therein aſſume a point, as A, for the port ſailed from; then, with 60 of the chords, and one foot in A, draw the arch L *m*, upon which ſet off two points (becauſe the courſe is S. S. E.) from L to *m*, and draw the line A *m*, upon which ſet off the diſtance 30 from A to B; then is the ſhip at B: thus letting fall the perpendicular BK, AK, 27° 7′ is the difference of latitude, and BK 11° 5′, the departure of the firſt courſe.

For the ſecond courſe, with the diſtance KB draw the parallel BN, and thereby with the chord of 60, as before, ſet off the ſecond courſe and diſtance, N. E. by N. 40, from B to C, and let fall the perpendicular CL; then is the ſhip at C, the difference of latitude upon the courſe is BL 33: 3, and departure CL 22: 2.

Proceed in the ſame manner for the third courſe, with the parallel CO, ſet off E. by N. 25, from C to D, and draw the line DP, from which ſet off the laſt courſe, N. N. E. 44; then is your ſhip at E.

Since, then, the ſhip came from A, and is now at E, the line AE, meaſured on the ſame equal parts upon which all the other diſtances were taken, will be found 91 miles; and the arch RQ, meaſured on the rhumbs, five points; viz. N. E. by E. ſo that the ſhip is now 91 miles N. E. by E. from the port ſailed from.

To find her courſe and diſtance to the port bound for, ſet off 4 half-points upon the arch RQ, from R to S, and from A through S draw the line ASF; upon which ſet off 120, the diſtance from the port ſailed from, to the port bound for, from A to F; then is F the port bound for: now the port bound for being at F, and the ſhip being but at E, the line EF, meaſured on the ſame equal parts that the reſt was taken from, will be found to be 31; and the arch TV meaſured on the chords, is 35°, 12′, or N. E. by N. ſomewhat eaſterly, &c. This method is uſeful, where the courſes tend generally one way, without interſecting one another; but if they often croſs, it is beſt to have recourſe to the ſecond method, which is without new meridians.

In order to this, obſerve how many points are between the point next to be laid down, and the point oppoſite to the courſe laſt laid down; for that is the point for laying down: then, with the chord of 60, and one foot in the point the ſhip is laſt come to, deſcribe an arch; upon which ſet off the points found by the abovesaid rule, and through that draw the line for the next courſe, &c. For an example:

Draw a north and ſouth line, as in the former, as the line RM, *fig.* 57, in which aſſume a point, as at A, for the port ſailed from; then from A ſet off the firſt courſe and diſtance; viz. N. N. W. 68, from A to B; and for the ſecond courſe, with the chord of 60, and one foot in B, draw the arch TW, upon which to ſet off the next courſe S. S. W. 70, obſerve the rule above delivered; viz. to take the number of points between the point oppoſite to the laſt courſe ſailed, and the point you are next to ſail on. The reaſon of which rule is this; if from A to B your courſe be N. N. W. then back from B to A, muſt needs be S. S. E. the oppoſite point; and then if you were to ſail S. by E. it muſt be one point to the ſouthward of that S. S. E. line; if ſouth, it is two points; and conſequently the next courſe being S. S. W. you are to ſet off 4 points, upon which ſet off 70 miles, from B to C, and then is your ſhip at C: for the third courſe, if from B to C be S. S. W. then from C to B is N. N. E. but the next courſe being E. half N. the points between N. N. E. and E. half N. are five points and an half; and therefore, with the chord of 60, and one foot in C, draw the arch XY, upon which ſet off five points and a half from X to Y; and through Y draw the line CD, upon which ſet off 90 miles from C to D: then is your ſhip at D.

After the ſame manner lay down all the reſt, as DE, which is W. N. W. half N. 70, then EF ſouth 25, then FG, E. half S. 45; then laſtly GH, ſouth 30, which is the laſt courſe.

Thus your ſhip being at H, and the port ſailed from at A, the line AH, 28 miles, is the diſtance made good; and the angle at A is four points; viz. S. E. but the port intended for, being S. W. 55, ſet it from A to K; and the ſhip being at H, the line HK, 62 miles, is the diſtance from the ſhip to the port bound for; and the courſe is found by meaſuring the angle at H 71° 48′, or W. S. W. more than a quarter weſterly, &c.

To work a Traverse *by the tables of difference of latitude and departure.* This is the principal uſe thoſe tables are intended for; and the way of working a *traverſe* hereby is equal to the beſt for exactneſs, and ſuperior in point of expedition.

Make a little table with ſix columns, the firſt for the courſe, the ſecond for the diſtance, the third for the northing, the fourth for the ſouthing, the fifth for the eaſting, the ſixth for the weſting. Then find the difference of the latitude and the departure to every courſe, and ſet them in their proper columns; as, where the courſe is northerly, ſet the difference of the latitude under northing, or in the north column; and where the courſe is ſoutherly, ſet the difference of latitude in the ſouth column.

Again, where the courſe is eaſterly, ſet the departure in the eaſt column, and when weſterly, ſet it in the weſt column: then, adding up each column by itſelf, ſubtract the north and ſouth columns, the leſs from the greater, the remainder is the northing or ſouthing made good. Alſo ſubtract the eaſt and weſt columns, the leſs from the greater, the remainder is the eaſting or weſting made good; then have you the difference of latitude and departure given to find the courſe and diſtance.

In the firſt example above ſpecified, the firſt courſe is S. S. E. 30 miles, or two points 30 miles; for which I find the difference of latitude 27: 7. Now the courſe being between ſouth and eaſt, I place my difference of latitude in the ſouth column, and my departure 11: 5 in the eaſt column, leaving the north and weſt columns blank.

Then for the ſecond courſe N. E. by N. or three points 40 miles, my difference of latitude, 33: 3 is to be placed in the north column, and the departure 22: 2 in the eaſt column, becauſe the courſe is between the north and eaſt.

Then the third courſe being E. by N. or ſeven points, 25 miles, I place my difference of latitude 4: 9, in the north column; and departure 24: 5, in the eaſt column.

And ſo for the fourth courſe N. N. E. or two points 44 miles, I place my difference of latitude 40: 6, in the north column; and my departure 16: 8, in the eaſt column; then adding up each column, the ſum of the northing column is 78: 8, and the ſum of the ſouthing column is 27: 7; which, ſubtracted from the northing 78: 8, the remainder 51: 1, is the difference of latitude made good, which is northing, becauſe the northing was the greater number.

Again the ſum of the eaſting column is 75: 0, which, becauſe there is no weſting to ſubtract from it, is the eaſting made good. Thus you have the northing 51: 1, and the eaſting 75: 0 given, to find courſe and diſtance; and though you cannot find in the table the exact number of 51: 1, and 75: 0 together, yet find the neareſt you can, which is 75: 4, and 50: 9, over which, at the top, you find 34 degrees for the courſe, which is N. E. by N. 0° 15′ eaſterly, and the diſtance is 91 miles.

To reſolve a *traverſe* by the ſcales on Gunter's *Scale*, improved by Mr. Robertſon: e. g. A ſhip in 40 north latitude, and 5° 14′ weſt longitude, ſails firſt S. E. by S. 68 min. then S. W. by W. 55 min. and then W. N. W. 75 min. What is her difference of latitude and departure in this general run?

The proportions are, for

First courſe.

As rad. : Diſt. : : S. Co. cour : Diff. lat. : : S. co. : Depart.
S. 8 pts. : 68′ : : S. 5 pts. : 57′ S. : : S. 3 pts. : 38′ E.

Second courſe.

S. 8 pts. : 55′ : : S. 3 pts. : 30′.6 S. : : S. 5 pts. : 46′ W.

Third courſe.

S. 8 pts. : 75′ : : S. 2 pts. : 28′.8 N. : : S 6 pts. : 69.5 W.

Traverse Table.

	Courses.	Dist.	Diff. Lat. N.	Diff. Lat. S.	Departure. E.	Departure. W.
1	S. E. by S.	68		57.0	38.9	
2	S. W. by W.	55		30.6		46.0
3	W. N. W.	75	28.8			69.5
			28.8	87.6 28.8		115.5 38.0
	General diff. Lat.			58.8		77.5

viz. departure made good in this day's run.

To work the above on the sliding Gunter. Set sine of 8 points on the fixed piece, by the help of the brass index, against 68 num. on the slide; then draw the said index to S. 5 points, you will find 57 num. on the slide, for the difference of latitude, and (without any alteration) against S. 3 points, on the fixed piece, you will have 38 num. on the slide, for the departure.

With the compasses. Take the extent from 8 points on the sine rhumbs to 68 on the numbers; the said extent laid the same way from sine 5 points will reach to 57 on the num. and the same extent laid the same way will reach to 38 on the num. as before: and in like manner may the rest, and all others of the like kind, be wrought with ease and dispatch. See Mountaine's Description of the Lines drawn on Gunter's Scale, as improved by Mr. J. Robertson, and executed by Messrs. Nairne and Blunt, p. 32, &c.

Traverse, in *Law*, denotes the denial of some matter of fact, alleged to be done in a declaration, or pleadings; upon which the other side coming, and maintaining that it was done, issue is joined for the cause to proceed to trial.

The formal words of a *traverse* are in the law-French *sans ceo*; in Latin, *absque hoc*; in English, *without that*, &c.

An answer, says West (speaking of bills in chancery), is that which the defendant pleadeth or saith in bar to avoid the plaintiff's bill or action, either by confession and avoiding, or by denying and *traversing* the material parts thereof. A replication is the plaintiff's reply to the defendant's answer, which must affirm and pursue his bill, and confess and avoid, deny or *traverse*, the defendant's answer.

A plea is naught, which neither *traverses* nor confesseth the plaintiff's title, &c. Every matter of fact alleged by the plaintiff, may be *traversed* by the defendant, but not matter of law, or what is part matter of law, and part matter of fact; nor may a record be *traversed*, as this is not to be tried by a jury.

If a matter be expressly pleaded in the affirmative, which is expressly answered in the negative, no *traverse* is necessary, there being a sufficient issue joined: also where the defendant hath given a particular answer in his plea, to all the material points contained in the declaration, he need not take a *traverse*; because when the thing is answered, three needs no farther denial.

Traverse *of an indictment or presentment* is the contradicting or denying some chief point of it, and taking issue thereon. See Indictment, and Presentment.

Thus, in a presentment against a person for a highway overflowed with water, for default of scouring a ditch, &c. he may either *traverse the matter*, by alleging, that there is no highway, or that the ditch is sufficiently scoured: or he may *traverse the cause*; viz. by alleging, that he hath not the land, or that he and they whose estate, &c. have not used to cleanse the ditch.

It is not customary, nor agreeable to the general course of proceedings, unless by consent of parties, to try persons indicted of smaller misdemeanors at the same court in which they have pleaded *not guilty*, or *traversed* the indictment. But they usually give security to the court, to appear at the next assizes or sessions, and then and there to try the *traverse*, giving notice to the prosecutor of the same.

Traverse *of an office* is the proving that an inquisition made of lands or goods is defective, and untruly made. See Office.

No person shall *traverse* an office, unless he can make to himself a good right and title: and if one be admitted to *traverse* an office, this admission of the party to the *traverse* supposes the title to be in him, or else he could have no cause to *traverse*.

Traverse is sometimes used, in *Heraldry*, for a partition of an escutcheon, of the figure represented in *Tab.* II. *Herald. fig.* 85, which they blazon parti per pale, *traverse*, argent and gules.

Traverse, in the *Manege*. A horse is said to *traverse*, when he cuts his tread cross-wise; throwing his croupe to one side, and his head to another.

TRA

Traverse-*board*, in *a ship*, a little round board hanging up in the steerage, and bored full of holes upon lines shewing the points of the compass: upon it by moving of a little peg from hole to hole, the steersman keeps an account how many glasses, that is, half hours, the ship steers upon any point.

This implement is particularly useful in light and variable winds. Thus, if the wind is northerly at the beginning of the watch, the ship, being close-hauled on the larboard-tack, will steer W. N. W. If, after the first half hour, the wind changes to N. by W. the ship will fall off to W. by N. both these courses are marked by the helmsman upon the *traverse-board*, by putting in one peg for every half hour in which she steers the same course; as one peg into W. N. W. and two pegs into W. by N. if she sails an hour on the latter course; and so on. The lee-way and variation of the compass are afterwards allowed by the pilot, on summing up the whole.

Traverse-*table*, in *Navigation*, is the same with a table of difference of latitude and departure; being only the difference of latitude and departure ready calculated to every degree, point, half-point, and quarter-point of the quadrant; and for any distance under one hundred miles, though it may conveniently serve for greater distances, by taking their halves, thirds, fourths, &c. and doubling, tripling, quadrupling, &c. the difference of latitude and departure found to those parts of the distance.

This table is one of the most necessary things a navigator has occasion for; for by it he can readily reduce all his courses and distances, run in the space of twenty-four hours, into one course and distance; whence the latitude he is in, and his departure from the meridian may be found.

See a table of this kind, in which the distances are continued to one hundred and twenty, for the sake of more easy subdivisions, and which is divided into two parts; the first containing the whole points and quarter-points in a quadrant, and the second part fitted to every degree and quarter of a degree in the quadrant; in Robertson's Navigation, at the close of b. 7.

Traverse *the yard*, on board a ship, is to brace it aft.

Traverse *tyles*. See Tyle.

TRAVESTY, or Travesti, a term which some late authors have introduced into poetry: it is originally French, being a participle of the word *travestir*, to disguise one's self, or to appear in masquerade. Hence *travesty* comes to be applied to the disguising of an author, or the translating him into a style and manner different from his own; and is generally applied to pieces of humour.

G. Battista Lalli has *travestied* Virgil, or turned him into Italian burlesque verse. Scarron has done the same in French; and Cotton and Phillips in English verse.

Castalio is, by some, charged with having *travestied* the sacred text, by reason of the difference of air and style between his version and the original.

TRAVICE, in the *Manege*, is a small enclosure or oblong quadrangle placed before a farrier's shop, and consisting of four pillars or posts, kept close together by cross poles. This enclosure is designed for holding and keeping in a horse that is apt to be unruly or disorderly in the time of shoeing, or of any operation.

This in some of the remoter parts of England goes by the name of a *break*; and is called, in French, *travail*.

TRAUMATICS, Τραυματικα, *Vulneraries*, or medicines good for the healing of wounds. See Vulnerary and Agglutinant, Healing and Consolidation.

TRAUMATICUM, *balsamum*. See Balsamum *Traumaticum*.

TRAYL-BASTON, or Trail-Baston. Edward I. in his 32d year, sent out a new writ of inquisition, under this denomination, against the intruders on other men's lands, who, to oppress the right owner, would make over their lands to great men; against batterers hired to beat men, breakers of peace, ravishers, incendiaries, fighters, false assisors, and other malefactors: which inquisition was so strictly executed, and such fines taken, that it brought in much treasure to the king.

Hence, also, *justices of trayl-baston*, a denomination given to the justices appointed to execute this commission, either by reason of their severe and summary way of proceeding, or because a staff was delivered them as the badge of their office, and the offenders were dragged before this jurisdiction.

TRAYTOR, Traitor, Traditor, a betrayer of his king and country, or one guilty of high-treason. See Treason.

TRAYTOROUS, or TRAITEROUS *Poſition*, is particularly underſtood of a tenet, which ſome formerly held, of the legality of taking arms, by the king's authority, againſt his perſon, and thoſe commiſſioned by him: which is condemned by ſtatute 14 Car. II. c. 3.

TREACLE, in *Pharmacy*, &c. See THERIACA.

The word *treacle* is alſo popularly uſed for melaſſes; and in this ſenſe it is that Dr. Shaw, in his Eſſay on Diſtillery, has endeavoured to bring into uſe ſeveral ſorts of *treacles*, which might be made at home, and would ſerve very conveniently for the diſtillation of ſpirits, or the making of potable liquors. Theſe are the inſpiſſated juices or decoctions of vegetables: ſuch as the ſweet juice of the birch, or ſycamore, procured by tapping or piercing the trees in ſpring, and the common wort made from malt, or from other vegetable ſubſtances treated in the ſame manner. Theſe liquors are ſeverally to be boiled down in a copper till they begin to inſpiſſate, and then to be poured into a balneum Mariæ, when the remainder of the evaporation may be finiſhed without burning the inſpiſſated juices: thus prepared it may be at any time reduced to the ſtate of wort, only by adding a ſufficient quantity of warm water.

TREACLE-*muſtard, thlaſpi*, or *mithridate*, in *Botany*, a genus of the *tetradynamia ſiliculoſa* claſs; its characters are theſe: the empalement of the flower is compoſed of four oval concave leaves, which fall off; the flower has four oval petals, double the ſize of the empalement, placed in form of a croſs: it has ſix ſtamina, half the length of the petals, two of which are ſhorter than the others, terminated by acute ſummits. It has a roundiſh compreſſed germen, ſupporting a ſingle ſtyle, the length of the ſtamina, crowned by an obtuſe ſtigma; the germen becomes an oval, heart-ſhaped, compreſſed, little pod, with an acute border, divided into two cells, by an intermediate partition containing two or three ſeeds in each. Linnæus enumerates ten, and Miller eight ſpecies.

The ſeed enters into the compoſition of the theriaca, and externally uſed cleanſes all ſorts of ulcers; and is alſo a ptarmic, but not very common. It is reckoned an enemy to pregnant women, becauſe it kills the fœtus. James. See THLASPEOS *ſemen*.

TREACLE *muſtard*, is alſo a name given to the CLYPEOLA.

TREACLE-*water, Aqua Theriacalis*, a compound cordial, or ſpirituous water, diſtilled with a ſpirituous menſtruum, from many cordial and ſudorific drugs and herbs, with a mixture of ſome of the theriaca Andromachi, or Venice *treacle*; whence its name.

TREAD, in the *Manege*. See PISTE.

TREASON, TREACHERY, the act or crime of infidelity to one's lawful ſovereign.

Treaſon is a general appellation, made uſe of by the law, to denote not only offences againſt the king and government, but alſo that accumulation of guilt which ariſes whenever a ſuperior repoſes a confidence in a ſubject or inferior, between whom and himſelf there ſubſiſts a natural, civil or even a ſpiritual relation; and the inferior ſo abuſes that confidence and ſo forgets the obligation of duty, ſubjection and allegiance, as to deſtroy the life of any ſuch ſuperior or lord. Whence,

Treaſon, in our laws, is of two ſorts, *high* and *petty*.

TREASON, *high*, or TREASON-*paramount*, (which is equivalent to the *crimen læſæ majeſtatis* of the Romans, as Glanvil denominates it alſo in our Engliſh law) is an offence committed againſt the ſecurity of the king or kingdom, whether by imagination, word, or deed.

In order to prevent the inconveniences which aroſe in England from a multitude of conſtructive *treaſons*, the ſtatute 25 Edw. III. c. 2. was made; which defines what offences only for the future ſhould be held to be *treaſon*: and this ſtatute comprehends all kinds of *high-treaſon* under ſeven diſtinct branches.

1. "When a man doth compaſs or imagine the death of our lord the king, of our lady his queen, or of their eldeſt ſon and heir." A queen regnant is alſo within the words of the act, though it does not extend to the huſband of ſuch a queen. And the king here intended is the king in poſſeſſion, without any reſpect to his title: conſequently a king, who has reſigned his crown, ſuch reſignation being admitted and ratified in parliament, is no longer the object of *high-treaſon*: and the ſame reaſon holds, in caſe a king abdicates the government; or by actions ſubverſive of the conſtitution, virtually renounces the authority which he claims by that very conſtitution. As the compaſſing or imagination, expreſſed by this ſtatute, is an act of the mind, it cannot poſſibly fall under any judicial cognizance, unleſs it be demonſtrated by ſome open, or *overt* act. The ſtatute expreſsly requires, that the accuſed "be thereof upon ſufficient "proof attainted of ſome open act by men of his own "condition." Thus to provide weapons or ammunition for the purpoſe of killing the king, is held to be a palpable overt act of *treaſon* in imagining his death: to conſpire to impriſon the king by force, and move towards it by aſſembling company, is an overt act of compaſſing the king's death: and taking any meaſures to render treaſonable purpoſes effectual, as aſſembling and conſulting on the means to kill the king, is a ſufficient overt act of *high-treaſon*. It now ſeems clearly to be agreed that, by the common law and the ſtatute of Edward III. words ſpoken amount only to a high miſdemeanor, and no *treaſon*. If the words be ſet down in writing, it argues more deliberate intention; and it has been held that writing is an overt act of *treaſon*; for *ſcribere eſt agere*. But even in this caſe, the bare words are not the *treaſon*, but the deliberate act of writing them. It was formerly held, that the publication of a treaſonable writing was a ſufficient overt act of *treaſon* at the common law; though of late even that has been queſtioned.

2. The ſecond ſpecies of *treaſon* is, "if a man do violate "the king's companion, or the king's eldeſt daughter "unmarried, or the wife of the king's eldeſt ſon and "heir." By the king's companion is meant his wife, and by violation is underſtood carnal knowledge, as well without force, as with it; and this is *high-treaſon* in both parties, if both be conſenting.

3. The third ſpecies of *treaſon* is, "if a man do levy "war againſt our lord the king in his realm." And this may be done by taking arms, not only to dethrone the king, but under pretence to reform religion, or the laws, or to remove evil counſellors, or other grievances whether real or pretended.

4. "If a man be adherent to the king's enemies in his "realm, giving to them aid and comfort in the realm, "or elſewhere," he is alſo declared guilty of *high-treaſon*. This muſt likewiſe be proved by ſome overt act, as by giving them intelligence, by ſending them proviſions, by ſelling them arms, by treacherouſly ſurrendering a fortreſs, or the like.

5. "If a man counterfeit the king's great or privy ſeal," this is alſo *high-treaſon*.

6. The ſixth ſpecies of *treaſon* under this ſtatute is, "if "a man counterfeit the king's money; and if a man "bring falſe money into the realm counterfeit to the "money of England, knowing the money to be falſe, "to merchandize and make payment withal." Counterfeiting the king's money is *treaſon*, whether the falſe money be uttered in payment, or not. Alſo if the king's own minters alter the ſtandard or alloy eſtabliſhed by law, it is *treaſon*. But gold and ſilver money only are held to be within this ſtatute. With regard likewiſe to importing foreign counterfeit money, in order to utter it here; it is held that uttering it, without importing it, is not within the ſtatute.

7. The laſt ſpecies of *treaſon* aſcertained by this ſtatute is, "if a man ſlay the chancellor, treaſurer, or the king's "juſtices of the one bench or the other, juſtices in eyre, "or juſtices of aſſize, and all other juſtices aſſigned to "hear and determine, being in their places doing their "offices." This ſtatute extends only to the actual killing of them, and not to wounding, or a bare attempt to kill them. The barons of the exchequer are not within the protection of this act; but the lord keeper or commiſſioners of the great ſeal now ſeem to be within it, by virtue of the ſtatutes 5 Eliz. c. 18. and 1 W. and M. c. 21.

The new *treaſons*, created ſince the ſtatute 1 M. c. 1. and not comprehended under the deſcription of ſtatute 25 Edw. III. may be compriſed under three heads. The firſt ſpecies relates to PAPISTS: the ſecond to falſifying the coin (ſee *Britiſh* COINS) or other royal ſignatures, as falſely forging the SIGN *manual*, privy SIGNET or PRIVY SEAL, which ſhall be deemed *high-treaſon*. 1 M. ſt. ii. c. 6. The third new ſpecies of *high-treaſon* is ſuch as was created for the ſecurity of the Proteſtant ſucceſſion in the houſe of Hanover. For this purpoſe, after the *act* of SETTLEMENT was made, it was enacted by ſtatute 13 and 14 W. III. c. 3. that the pretended prince of Wales, aſſuming the title of king James III. ſhould be attainted of *high-treaſon*; and it was made *high-treaſon* for any of the king's ſubjects to hold correſpondence with him or any perſon employed by him, or to remit money for his uſe. And by 17 Geo. II. c. 39. it is enacted, that if any of the ſons of the pretender ſhall land or attempt to land in this kingdom, or be found in the kingdom or any of its dominions, he ſhall be adjudged attainted of *high-treaſon*; and correſponding with them or remitting money to their uſe is made *high-treaſon*. By 1 Ann. ſtat. 2. c. 17. The offence of hindering the next in ſucceſſion from ſucceeding to the crown is *high-treaſon*:

treaſon: and by 6 Ann. c. 7. if any perſon ſhall maliciouſly, adviſedly, and directly, by writing or printing, maintain, that any other perſon hath any right to the crown of this realm, otherwiſe than according to the act of ſettlement, or that the kings of this realm with the authority of parliament are not able to make laws to bind the crown and its deſcent; ſuch perſon ſhall be guilty of *high-treaſon.*

The puniſhment of *high-treaſon* in general is very ſolemn and terrible. 1. That the offender be drawn to the gallows, and not be carried or walk; though uſually (by connivance, at length ripened by humanity into law) a ſledge or hurdle is allowed, to preſerve the offender from the extreme torment of being dragged on the ground or pavement. 2. That he be hanged by the neck, and then cut down alive. 3. That his entrails be taken out, and burned, while he is yet alive. 4. That his head be cut off. 5. That his body be divided into four parts. 6. That his head and quarters be at the king's diſpoſal.

The king may, and often doth, diſcharge all the puniſhment, except beheading, eſpecially where any of noble blood are attainted. For beheading being part of the judgment, that may be executed, though all the reſt be omitted by the king's command. But where beheading is no part of the judgment, as in murder or other felonies, it hath been ſaid that the king cannot change the judgment, although at the requeſt of the party, from one ſpecies of death to another. See Execution.

In the caſe of coining, the puniſhment is milder for male offenders; being only to be drawn, and hanged by the neck till dead. But in *treaſons* of every kind the puniſhment of women is the ſame, and different from that of men: for, as the decency due to the ſex forbids the expoſing and publicly mangling of their bodies, their ſentence is to be drawn to the gallows, and there to be burned alive.

The conſequences of the judgment pronounced upon a traitor are attainder, forfeiture and corruption *of blood.*

It is a maxim, that, *in majori proditione, omnes ſunt principales,* there are no accessories in *high-treaſon,* all are accounted principals.

Alſo, that *voluntas non reputabitur pro facto, niſi in cauſa proditionis,* the will is never taken for the deed in any caſe, but in that of *high-treaſon.* See Indictment.

Treason, *petty* or *petit,* according to the ſtatute 25 Edw. III. c. 2. may happen three ways: by a ſervant killing his maſter, a wife her huſband, or an eccleſiaſtical perſon (either ſecular or regular) his ſuperior, to whom he owes faith and obedience. A ſervant, who kills his maſter whom he has left, upon a grudge conceived againſt him during his ſervice, is guilty of *petit treaſon:* ſo if a wife be divorced *a menſa & thoro,* ſtill the *vinculum matrimonii* ſubſiſts; and if ſhe kills ſuch divorced huſband, ſhe is a traitreſs: and a clergyman is underſtood to owe canonical obedience to the biſhop who ordained him, to him in whoſe dioceſe he is beneficed, and alſo to the metropolitan of ſuch ſuffragan or dioceſan biſhop; and therefore to kill any of theſe is *petit treaſon.*

A perſon indicted of *petit treaſon* may be acquitted thereof, and found guilty of manſlaughter or murder; and in ſuch caſe it ſhould ſeem that two witneſſes are not neceſſary, as in caſe of *petit treaſon* they are. See Indictment.

The puniſhment of *petit treaſon,* in a man, is to be drawn and hanged, and in a woman to be drawn and burned: the idea of which latter puniſhment, ſays judge Blackſtone, ſeems to have been handed down to us by the laws of the ancient Druids, which condemned a woman to be burned for murdering her huſband; and it is now the uſual puniſhment for all ſorts of *treaſons* committed by thoſe of the female ſex. Perſons guilty of *petit treaſon* were firſt debarred the benefit of clergy by ſtat. 12 Henry VIII. c. 7. which has been ſince extended to their aiders, abettors, and counſellors, by ſtat. 23 Hen. VIII. c. 1. and 4. and 5 P. and M. c. 4.

This kind gives forfeiture of lands by escheat to the lord of the fee.

Treason, *Accumulative.* See Accumulation. Blackſt. Com. vol. iv. p. 75, &c. p. 203, &c.

Treason, *appeal of high.* It was anciently permitted, that any ſubject might appeal another ſubject of *high treaſon,* either in the courts of common law, or in parliament, or (for *treaſons* committed beyond the ſeas) in the court of the high conſtable and marſhal. The cognizance of appeals in the latter ſtill continues in force; and ſo late as 1631, there was a trial by battle awarded in the court of chivalry, on ſuch an appeal of *treaſon;* but that in the firſt was *virtually* aboliſhed by the ſtat. 5 Edw. III. c. 9, and 25 Edw. III. c. 24. and in the ſecond *expreſly* by ſtat. 1 Hen. IV. c. 14. So that the only appeals now in force, for things done within the realm, are appeals of felony and mayhem. Blackſt. Com. vol. iv. p. 314. Burn's ed.

Treason, *conſtructive,* an offence raiſed, by forced and arbitrary conſtruction, into the crime and puniſhment of *treaſon,* which never was ſuſpected to be ſuch: a multitude of theſe exiſted before the inconvenience was remedied by 25 Edw. III. c. 2. Conſtructive *treaſons* were alſo numerous in the reign of Richard II. and afterwards between the reign of Henry IV. and queen Mary, and particularly in the bloody reign of Henry VIII. all which were abrogated by the ſtat. 1 Mary, c. 1 which once more reduced all *treaſons* to the ſtandard of the ſtat. 25 Edw. III.

Treason, *Miſpriſion of.* See Misprision.

TREASURE, *Theſaurus,* θησαυρος, a ſtore, or ſtock of money, in reſerve.

Treasure-*trove,* q. d. *treaſure found, theſaurus inventus,* in *Law,* is when money, gold, ſilver, plate, or bullion, is found in the ground, in any place, and none knows to whom it belongs.

This ſhould naturally fall to the finder, to whom it formerly belonged, as was the rule of the civil law: but particular nations have made particular proviſions for it. The Jews gave it to the proprietor of the place where it was found: the Roman juriſprudence was various with regard hereto; ſometimes it was given to the maſter of the grounds, ſometimes to the finder, and ſometimes it was adjudged to the public treaſury.

In England, and alſo in Germany, France, Spain, and Denmark, the general uſage is, to have ſuch *treaſure* ſequeſtered to the king, unleſs where the benefit thereof is expreſsly granted or made over by the king to ſome other, as the lord of the manor: and that the prince ſhall be intitled to this hidden treaſure is now become, according to Grotius, *jus commune & gentium.* If, indeed, he that hid it be known, or afterwards found out, the owner, and not the king, is intitled to it. Alſo, if it be found in the ſea, or upon the earth, it doth not belong to the king, but the finder, if no owner appears. So that it ſeems it is the hiding, not the abandoning of it, that gives the king a property.

In ſome places in France it is divided into three parts, one for the king, one for the proprietor of the land, and one for the finder.

Briton ſays, it is every ſubject's part, as ſoon as he hath found any *treaſure* in the earth, to make it known to the coroner of the county, &c.

The puniſhment for concealing *treaſure* found in England, was formerly no leſs than death; but now it is only impriſonment and fine; but if any mine of metal be found in any ground, it always appertains to the lord of the ſoil, except it be a mine of gold or ſilver, which anciently always belonged to the king, in whoſe ground ſoever it were found; but, by an act of parliament, the king hath now only the pre-emption.

TREASURER, an officer to whom the treaſure of a prince, or corporation, is committed to be kept, and duly diſpoſed of, in payment of officers, and other expences. See Treasury.

Of theſe there is a great variety. His majeſty of Great Britain, in quality of elector of Brunſwick, is *archtreaſurer* of the Roman empire. In the ſtates of Poland are two *grand-treaſurers,* that of the kingdom of Poland, and that of the duchy of Lithuania.

In England, the principal officers under this denomination are, the *lord high-treaſurer,* the *treaſurer of the houſhold, treaſurer of the navy,* of *the king's chamber,* &c. Anciently, we had likewiſe a *treaſurer of the exchequer, treaſurer of war,* &c. In the Romiſh countries, the title *treaſurer* is alſo given, ſomewhat abuſively, to an eccleſiaſtic, who has the keeping of the relics, and of the charters and archives of a church or monaſtery. This dignity ſucceeds, in ſome meaſure, to that of the ancient deacons, who had the like charge in the primitive church.

Treasurer *of England, Lord high,* is the principal officer of the crown; under whoſe charge and government is all the king's revenue kept in the exchequer.

He receives the office by delivery of a white ſtaff to him from the king, and holds it during the king's pleaſure: anciently he received it by delivery of the golden keys of the *treaſury.*

He has the cheque of all the officers any way employed in collecting impoſts, cuſtoms, tributes, or other revenues of the crown. He has the gift of all the cuſtomers, comptrollers, and ſearchers places, in all the ports of London; and the nomination of the eſcheators in every county.

He alone (or others in commiſſion with him) lets leaſes of

of all the crown-lands, gives warrants to certain perſons of quality to have their wine cuſtom-free, &c.

Killing the lord-*treaſurer* in the execution of his office, is *high*-TREASON.

The office of lord-*treaſurer* is now in commiſſion.

The number of lords-commiſſioners is five; one of whom is the firſt lord, whoſe annual ſalary was formerly 383 *l.* but is now 4000 *l.* and who, unleſs he be a peer, is alſo chancellor of the exchequer, and prime miniſter in the government of this country; the other lords commiſſioners have an annual ſalary of 1600 *l.* each.

TREASURER *of England, under.* See UNDER-*treaſurer.*

TREASURER *of the houſhold*, is an officer who, in the abſence of the lord-ſteward, has power, with the comptroller, and other officers of the green-cloth, and the ſteward of the Marſhalſea, to hear and determine treaſons, felonies, and other crimes committed within the king's palace. See HOUSHOLD.

There is alſo a *treaſurer* belonging to the eſtabliſhment of her majeſty's houſhold, &c.

TREASURER *of the navy* is an officer who receives money out of the exchequer, by warrant from the lord high-*treaſurer*, or the lords commiſſioners executing that place; and pays all charges of the navy, by warrant from the principal officers of the navy. See NAVY.

TREASURER *of the county*, he that keeps the county ſtock.

There are two of them in each county, choſen by the major part of the juſtices of the peace, &c. at their general quarter-ſeſſion; under previous ſecurity given for the money entruſted with them, and the faithful execution of the truſts repoſed in them.

The juſtices may continue or remove theſe *treaſurers* at pleaſure, and allow each of them a ſalary of 20 *l.* a year.

The county ſtock, of which this officer hath the keeping, is raiſed by rating every pariſh yearly; and is diſpoſed of to charitable uſes, for the relief of maimed ſoldiers and mariners, priſoners in the county gaols, paying the ſalaries of governors of houſes of correction, and relieving poor alms-houſes, &c. And the duty of theſe *treaſurers*, with the manner of raiſing the ſtock, and how it ſhall be diſpoſed of, is ſet forth particularly in the ſtatutes of 43 Eliz. cap. 2. Jac. I. cap. 4. 11 & 12 W. III. cap. 18. 5 Ann. cap. 32. 6 Geo. I. cap. 23. See particularly 11 Geo. II. cap. 20, and 12 Geo. II. cap. 29.

TREASURER, in *Cathedral Churches*, an officer whoſe charge was to take charge of the veſtments, plate, jewels, relics, and other treaſure belonging to the ſaid churches. At the time of the Reformation, the office was extinguiſhed as needleſs in moſt cathedral churches; but it is ſtill remaining in thoſe of Saliſbury, London, &c.

TREASURY, the place wherein the revenues of a prince are received, preſerved, and diſburſed.

In England the *treaſury* is a part of the exchequer; by ſome called the *lower exchequer.*

The officers of his majeſty's *treaſury*, or the lower exchequer, are the lords commiſſioners, one of whom is chancellor, two joint ſecretaries, private ſecretary to the firſt lord, two chamberlains, an auditor, four tellers, a clerk of the pells, uſhers of the receipt, a tally-cutter, &c. See each officer under his proper article, CHANCELLOR, TELLER, TALLY, &c.

At Rome, under the emperors, there were two kinds of *treaſuries*, the one called *ærarium*, wherein the monies deſtined to ſupport the charges of the government were kept; the other *fiſcus*, wherein were preſerved thoſe intended for the particular ſubſiſtence of the emperor and his court. In effect, the ærarium belonged to the people, and the fiſcus to the prince. See ÆRARIUM and FISCUS.

We have ſtill a reſemblance of this difference among us; but it is confounded in France, &c. where the king diſpoſes abſolutely of the public treaſure, &c.

The Athenian *treaſury* was ſacred to Jupiter Σωτηρ, or the *Saviour*, and to Plutus the god of riches. Beſides the public monies, there were always a thouſand talents kept in it, which it was capital to touch, unleſs on the moſt preſſing occaſions. See OPISTHODOMUS.

The funds among the Athenians which ſupplied their *treaſury* were four, viz. the *tele*, τελη; the *phori*, φοροι; the *eiſphoræ*, εισφοραι; and the *timemata*, τιμηματα.

The public *treaſury* was divided into three parts, according to the uſe it was applied to; as 1. The χρηματα τῆς διοικήσεως, or that expended in civil uſes. 2. The στρατιοτικα χρηματα, or money deſigned to defray the charges of war. 3. The θεορικα, or money intended for pious uſes, in which they included the expences at plays, public ſhews, and feſtivals, &c. Potter, Archæol. Græc. tom. i. p. 82.

To each of theſe branches of the public revenue there was a *treaſurer* appointed, as ταμιας τῆς διοικησεως, των στρατιωτικων, and θεωρικων.

TREASURY, *Lords of the.* In lieu of one ſingle director and adminiſtrator of his majeſty's revenues, under the title of lord-high-treaſurer, it is frequently thought proper to put that office in commiſſion, i. e. to appoint ſeveral perſons to diſcharge it, with equal authority, under the title of lords commiſſioners of the *treaſury.* See *Lord-high-*TREASURER.

TREAT, in our *Old Law Books*, ſignifies as much as *taken out*, or *withdrawn.* Thus a juror was challenged, becauſe he could not diſpend 40 *l.* and therefore was *treat* by the ſtatute, or diſcharged.

TREATISE, TRACTATUS, a ſet diſcourſe in writing, on any ſubject.

A *treatiſe* is ſuppoſed more expreſs, formal, and methodical, than an eſſay; but leſs ſo than a ſyſtem.

TREATY, a covenant between ſeveral nations; or the ſeveral articles or conditions ſtipulated and agreed upon between ſovereign powers.

For the ſolemn manner in which the Romans uſed to conclude *treaties*, ſee Liv. lib. i. cap. 24. The ceremonies obſerved by the Greeks in making *treaties* may be ſeen in Potter, Archæol. Græc. lib. ii. cap. 6. tom. i. p. 252, ſeq.

In general, it appears that the ancients were very religious, grave and ſolemn in making *treaties*; which were always confirmed by ſacrifices and mutual oaths, with horrid imprecations on the party that ſhould break the terms of agreement.

There are *treaties* of peace, of marriage, of confederacy, of neutrality, of capitulation, and of commerce and navigation.

The celebrated *treaties* are thoſe of Nimeguen, of Munſter, of the Pyrenees, of Weſtphalia, of Ryſwick, of Utrecht, of Hanover, Vienna, &c.

Treaties of commerce are uſually followed by various tariſs, to adjuſt the duties of exportation and importation of merchandizes into the reſpective dominions of the contracting powers.

The great *treaty* of peace, commerce, navigation, &c between England and France, was ſigned at Utrecht, the 1ſt of April, 1713, and conſiſts of 39 articles.

It is the king's prerogative to make *treaties*, leagues, and alliances, with foreign princes and ſtates; and yet, leſt this plenitude of authority ſhould be abuſed to the detriment of the public, the conſtitution has interpoſed a check, by the means of parliamentary impeachment, for the puniſhment of ſuch miniſters as from criminal motives adviſe or conclude any treaty, which ſhall afterwards be judged to derogate from the honour and intereſt of the nation.

TREATY, *Guarantee of a.* See GUARANTY.

TREBELLIANICA, or TREBELLIAN *fourth*, in the *Roman Juriſprudence*, a right belonging to an heir inſtituted by teſtament. If the teſtator, after appointing a full and general heir, ſpent and diſpoſed of all his effects in legacies; or if he went *ultra dodrantem*, beyond three fourths thereof; in that caſe, the heir was allowed to retrench and detain one fourth part of the legacies to his own uſe. This was called the *trebellianica.*

In like manner, if the teſtator charged his heir with a feoffment of truſt, and to reſtore the inheritance to another; in that caſe the heir might likewiſe retain a fourth of the whole ſucceſſion, that the quality of heir might not be rendered wholly vain and fruitleſs.

TREBIUS, in *Ichthyology*, a name given by Joannes Cuba and ſome other writers, to the fiſh called PHYCIS by Ariſtotle, Ælian, and Pliny.

TREBLE, in *Muſic*, the higheſt or acuteſt of the four parts in ſymphony, or that which is heard the cleareſt and ſhrilleſt in a concert.

In the like ſenſe we ſay, a *treble* violin, *treble* hautboy, &c.

In vocal muſic, the *treble* is uſually committed to boys and girls. Their part is the *treble.*

The *treble* is divided into firſt or higheſt *treble*, and ſecond or baſs *treble.* The half *treble* is the ſame with the counter-tenor.

TREBUCHET, *Trebucket*, or *Trebuchetum*, a tumbler, ducking, or cucking-ſtool. See CUCKING-STOOL and SCOLDS.

TRECHEDIPNA, τρεχεδειπνα, formed of τρεχω, *I run*, and δειπνον, *a ſupper*, in *Antiquity*, a kind of livery, or diſtinguiſhing habit worn by paraſites; the wearing of which was a ſufficient paſſport to the tables of their patrons whoſe livery it was.

TRECHON, one of the many names by which the chemical writers have called quickſilver.

TREDECILE. See ASPECT.

TREDDLE, or TREADLE, *chalaza*, in *Natural Hiſtory*, a part of an egg. See CHALAZA.

TREE, *arbor*, the firſt and largeſt of the vegetable kind, conſiſting of a ſingle trunk, out of which ſpring forth branches and leaves. See PLANT.

Trees *in full air*, or *Standards*, are such as naturally rise a great height, and are not topped. For the choice of trees of this kind, to be transplanted out of a nursery, Quintiney recommends us to such as are straight, six feet high at least, and five or six inches thick at bottom, and three or four at top; the bark pretty smooth and shining, as a token of their youth, and of the good soil they grew in.

Trees, *dwarf*, are such as are kept low, and never suffered to have above half a foot of stem. These are used to be kept vacant, or hollow in the middle, that the branches, spreading round about the sides, may form a kind of round bowl, or bush. See Dwarf-*trees*.

Trees, *wall*, are those whose branches are stretched out, and nailed against walls.

For dwarf and wall-*trees*, such are to be chosen out of the nursery for transplantation as are straight, and consist of a single stem, and a single graft, rather than two or three grafts in several branches: their thickness at bottom, when removed, should be two or three inches.

Trees, *fruit*, are such as bear *fruit*. See Fruit-*trees*.

Trees, *timber*, are those whose trunks are tall and straight, whereof beams, masts, &c. are used to be made.

Trees that are nine inches girt about a yard from the ground, are commonly reckoned timber-*trees*, but none under this size. See Timber.

Mr. Ray, and other authors, speak of several *trees* of prodigious bulk.

The Jesuit, D'Acosta, in his history of the Indies, lib. iv. cap. 3, mentions a hollow *tree* at Tlacocharaya, three leagues from Gauxa, in New Spain, nine fathom withinside near the ground, and sixteen withoutside. He adds, that it is under this *tree* the barbarians assembled to perform their religious ceremonies, dance round their idols, &c. Herrera mentions another, which sixteen men, joining hands, could not fathom. And F. Kircher, in his Latium, p. 50, affirms, he has seen a *tree*, near Gonzano, which would lodge a whole family of twenty-five persons in its cavity. The common people had a tradition, that this was planted by Augustus.

There are forests of very large chesnut-*trees*, growing out of the lava of Mount Ætna, in Sicily. One of these, called the Castagno di Cento Cavalli, is much the most celebrated. It measures 204 feet round, and though said to be united below in one stem, it is a bush of five large trees growing together. The hollow of one of these chesnut-*trees* is said to contain a hundred sheep, and it is also related, that thirty people have been in it on horseback. Brydone's Letters, vol. i. p. 109, &c.

In the Indies there are very large forests formed from a single *tree*, whose branches, bending to the ground, take root, and put forth new *trees*: the Indian fig-*tree* and paretuvier are of this kind.

M. Lonvillers mentions *trees* in Peru, one part of whose branches produce fruit one half the year, and the other part the other half. In China there is a *tree* which bears tallow, whereof that nation make their candles.

There are two or three very remarkable phenomena in the growth of *trees*, which have escaped the observation of the naturalists of all ages, except those of our own: these are the perpendicularity of their trunks or stems to the horizon, and the parallelism of their tufts to the spot of earth they grow on.

For the planting, transplanting, semination, pruning, felling, grafting, shrowding, barking, &c. of *trees*, see Planting, &c.

Mr. Ray distinguishes the *trees* and shrubs of our native growth of England, into, I. Such as *have their flower disjoined and remote from the fruit*: which are,

1. *The nuciferous* Trees, or such as bear nuts; as the walnut-*tree*, the hazle-nut-*tree*, the beech, the chesnut, and the common oak.

2. *Coniferous* Trees, or such as bear a squammous or scaly fruit, of a conical figure, and a woody or hard substance, in which are many seeds, which, when they are ripe, the cone opens or gapes in all its several cells or partitions, and lets drop out: of this kind are the Scotch firs, male and female; the pine, which, in our gardens, is called the Scotch fir; the common alder *tree*, and the birch-*tree*.

These *trees* are also called resiniferous, by reason that *coniferous trees* are generally covered with a bark that abounds in resin.

3. *Bacciferous* Trees, are such as bear berries, as the juniper and yew-*tree*.

4. *Lanigerous* Trees, or such as bear a woolly, downy, sustance; as the black, white, and trembling poplar, and willows and osiers of all kinds.

5. Trees *which bear their seeds* (having an imperfect flower) *in leafy membranes and cases*; as the horn-beam, or hard-beam, called, in some places, the horn-beech.

II. Such *as have their fruits and flowers contiguous*; which are either with the flower placed on the top of the fruit, or adhering to the base or bottom of the fruit. Of the former kind, some are *pomiferous*, as apples and pears; and some *bacciferous*, as the sorb, or service-*tree*, the whitethorn, or hawthorn, the wild rose, sweet-briar, currants, the great bilberry-bush, honey-suckle, ivy, &c.

The latter kind are either such as *have their fruit moist and soft when ripe*; as 1. *Pruniferous* ones, whose fruit is pretty large and soft, with a stone in the middle; as the black-thorn, or sloe-*tree*, the black and white bullace-*tree*, the common wild cherry, the black cherry, &c.

2. *Bacciferous* Trees, as the strawberry-*tree*, common in the west of Ireland, misletoe, water-elder, the dwarf or spurge-laurel, the viburnum, or wayfaring-*tree*, the dogberry-*tree*, the sea black-thorn, the berry-bearing elder, the privet, barberry, common elder, the holly, the buckthorn, the berry-bearing heath, the bramble, and the spindle-*tree* or prickwood.

Or such as *have their fruit dry when ripe*; as the bladder-nut-*tree*, the box-*tree*, the common elm and ash, the maple, the gaule or sweet willow, common heath-broom, dyers weed, furze or gorse, and the lime-*tree*.

Heat is so essential to the growth of *trees*, that we see them grow larger and smaller in a sort of gradation as the climates in which they stand are more or less hot. The hottest countries yield, in general, the largest and tallest *trees*, and those also in much greater beauty and variety than the colder do; and even those plants which are common to both arrive at a much greater bulk in the southern than in the northern climates; nay, there are some regions so bleak and chill, that they raise no vegetables at all to any considerable height. Greenland, Iceland, and the like places, afford no *trees* at all; and what shrubs grow in them are always little and low.

In the warmer climates, where *trees* grow to a moderate size, any accidental diminution of the common heat is found very greatly to impede vegetation; and even in England, the cold summers we sometimes have, give us an evident proof of this; for though the corn and low plants have succeeded well enough, and gooseberries, currants, rasberries, and other low shrubs, have brought forth fruit in sufficient plenty, yet the production of taller *trees* have been found very much hurt; and walnuts, apples, and pears, have been very scarce among us.

Heat, whatever be the producing cause, acts as well upon vegetation one way as another. Thus the heat of dung, and the artificial heat of coal-fires in stoves, is found to supply the place of the sun.

Great numbers of the Indian *trees*, in their native soil, flower twice in a year, and some flower and bear ripe fruit all the year round; and it is observed of these last, that they are at once the most frequent and the most useful to the inhabitants; their fruits, which always hang on them in readiness, containing cool juices, which are good in fevers, and other of the common diseases of hot countries.

Plantations of useful *trees* might be made to very great advantage in many places in every country, and the country greatly enriched by it, while the public would be also benefited by it, since it would raise a continual supply of timber used in ship-building, and on other public as well as private occasions.

We have in many places heaths, and other barren and uncultivated lands, of very great extent; and how great an advantage would it be to the public to bring these to be truly valuable. Many, if not all of these heaths, would be found on trial capable of producing *trees*; and some of them are truly the remains of destroyed forests; and though the profit to be reaped from the planting of them would come late, yet the expence of doing it would be very trifling in comparison of that profit, and the means easy.

The authors who have given rules for planting, having employed themselves only about small spots of ground, the establishing of orchards or parks, are by no means to be supposed proper guides in attempts of this kind; and Monf. de Buffon, who had a great opinion of the knowledge of our Evelyn and Miller, who seem to speak of every thing from their own experience, found, when he set about large plantations, that their opinions and rules were erroneous; and was obliged to have recourse to experiments only, which he varied a thousand ways; and though many of them proved unsuccessful, yet they all gave hints toward others, by which the attempt might afterwards be brought to succeed.

This

This sagacious enquirer into the operations of nature in the growth of vegetables, having set apart a considerable quantity of land for the trial, and procured a number of young *trees*, first divided the whole quantity into a number of small squares, and having made a plan of it, examined the nature, depth, and other circumstances of the soil in each, and minuted the whole down on a proper part of the plan; that himself, or whoever succeeded him, might judge from the different growths of a number of trees planted in the same state in these different soils, the different advantages and disadvantages of every circumstance in the depth and nature of the ground, in regard to the growth of useful *trees*. Different numbers of labourers were employed upon different spots of this ground, and the acorns for the young growth planted at different seasons; but the result in general was, that what should seem the best methods succeeded the worst; and those pieces where many labourers had been employed, and the acorns planted before winter, were much thinner of young oaks than those where the least labour had been bestowed upon the ground, and where the acorns had been planted in the spring: but those places which succeeded best from the sowing, were those which had the acorns planted in holes made by a pick-ax, without any preceding culture of the ground. And those where the acorns had only been laid upon the earth, under the grass, afforded a great number of vigorous young *trees*, though the greater part had beeen carried away by birds and other devouring animals. Those spots of ground where the acorns were set at six inches depth were much worse furnished with young shoots, than those where they had been buried but at an inch deep; and in some places where they were buried at a foot deep not one shoot appeared, though in others, where they had been buried at nine inches, there were many.

Those acorns which had been steeped for eight or nine days in wine lees, and in the water of the common sewers, appeared out of the ground much earlier than those which were put in without this previous management.

But the most successful of all the trials, was that of planting in the spring such acorns as had been sown together in another place, and had time to shoot there; of these scarce any one failed, and the plantation was perfectly flourishing, though the growth of these young shoots was not so quick or vigorous as those of the acorns which had remained when first sown; which was probably owing to the injury the tender radicles received in transplanting.

Thus succeeded the experiments by sowing, while of those made by planting young *trees*, such as had been brought out of woods and places under covert, succeeded much worse than those which had grown in more exposed places.

The young *trees* of the several parts of the plantation kept on their growth in the manner they had begun to shoot, those of the more laboured parts continuing more weak, and lower than those of the less laboured.

Thus were a number of necessary experiments carefully tried, and the result of the whole was, that to make a plantation of oaks, on a soil of the common clayey or loamy kind, the most successful method is this: the acorns must be preserved during the winter in the earth in this manner; let there be made a bed of earth of six inches deep; on this place a layer of acorns, two inches deep, over these lay a bed of another half foot of earth, over that another layer of acorns, and so on successively, till as many are employed as there will be occasion for; the whole is then to be covered with a foot depth of earth to preserve all from the frost. In the beginning of March these beds are to be opened, and the acorns, which will by that time have shot out, and are then in reality so many young oaks, are to be planted out at a foot distance each, and the success of a plantation of this kind need not be feared. This is a manner of planting that is done at a small expence, and even that might be in a great measure spared, where it not for the birds and other devouring animals; since, could the acorns be defended from these, they might be only laid on the surface of the ground under the grass in autumn, and they would infallibly shew themselves in so many young oaks the succeeding spring.

It is easy to continue the carrying of the acorns, when taken out of their winter's bed, to the place where they are to be planted, without doing them much injury; and the small stop the transplanting puts to their growth is in reality rather an advantage than an injury, since it only retards the young shoots for about three weeks, or less than that; and by that means secures them from the few cold mornings that may be expected about the time of their natural appearance. Mem. Acad. Scienc. Paris, 1739. See Timber.

Trees in corn-fields are a worse enemy than any weeds, as they suck up the nourishment from the corn about them, even to a great distance; nor is it peculiar to corn to suffer by them. Mr. Tull gives an instance of a single *tree* standing in a field of turneps, which spoiled no less than half an acre of the crop. It has been supposed, that *trees* injured these lower herbs by their shadow; and some thought that the mischief they saw from them was owing to their droppings; but by this instance, it is plain both these conjectures are erroneous; the south side of the tree, where no shadow comes, is found to suffer as much as any other; and the droppings reaching only as far as the boughs, and the mischief so much farther, it is plain that the mischief is owing to neither of these causes, but to the *tree's* drawing all the nourishment, by extending its roots so far, and in such numbers, on every side the extent of ground through which the turneps were thus injured, probably shewing the extent of the roots of the *tree*, which are found by this to run farther than is usually supposed.

On felling of *trees*, letters have sometimes been found in the midst of them. We have instances of this kind mentioned in the Philos. Trans. N° 454, sect. 16. where the trunk of a beech being sawed, discovered several letters in the wood, about one inch and a half from the bark, and near the same distance from the centre of the trunk. It seems these letters had been formerly cut into the bark, and in process of time these might be covered.

In the same Transaction, we have an account of the horn of a deer found in the heart of an oak. Crucifixes have also been found in *trees*, and were to be sure shewn as miraculous to the ignorant. See p. 236 of the said Transaction in the Remarks.

For the punishment of stealing *trees*, see Larceny.

By stat. 1 Geo. I. cap. 48. maliciously to set on fire any underwood, wood, or coppice is made single felony. By the black-act, to cut down or destroy any *trees* planted in an avenue, or growing in a garden, orchard, or plantation, for ornament, shelter, or profit, is felony without benefit of clergy; and the hundred shall be chargeable for the damages, unless the offender be convicted. By 6 Geo. III. cap. 36. and cap. 48. wilfully to spoil or destroy any timber or other *trees*, roots, shrubs, or plants, is, for the two first offences, liable to pecuniary penalties; and for the third, if in the day-time, and even for the first, if at night, the offender shall be guilty of felony, and liable to transportation for seven years.

Trees are often found buried in the earth. See Morass, *Fossil*-wood, and *Bog*-wood.

How Trees may be injured by frost. See Frost.

Fruit-Trees. See Fruit-*trees*.

Distemperature of Trees. See Diseases *of Plants*.

Hollowness of Trees. See Hollowness.

Juices of Trees. See Juice and Sap.

Felling of Trees. See Felling and Timber.

Trees in a *Ship* are of several sorts, as *chess-trees*, *cross-trees*, *roof-trees*, *waste-trees*, *tressel-trees*. See Chess-*trees*, &c.

Cork-Tree. See Cork and Oak.

Chaste-Tree. See Agnus *Castus*.

Diana's Tree, in *Chemistry*. See Arbor.

Tree-*frog*. See Ranunculus *viridis*.

Germander-Tree. See Germander.

Dormant-Tree. See Dormant.

Tree *of Life*, *arbor vitæ*, *thuya*, in *Botany*, a genus of the *monoecia adelphia* class: its characters are these; it has male and female flowers in the same plant; the male flowers are produced in an oval katkin, placed opposite upon the common foot-stalk, each flower embracing it with its base; these come out of an oval concave scale; they have no petals, but have four stamina, which are scarce discernible; their summits adhere to the base of the scale of the empalement; the female flowers are collected in a common almost oval cone, two flowers standing opposite in each scale; they have no petals, but have a small germen supporting a slender style, crowned by a single stigma; these are succeeded by an oblong oval cone, opening longitudinally, whose scales are almost equal, convex on the outside, and obtuse, each containing an oblong seed with a membranaceous wing. Linnæus enumerates four, and Miller two species, viz. the occidental and oriental. The occidental, which grows naturally in Canada and other northern countries, is used, according to professor Kalm, for many medicinal purposes. It is much extolled for rheumatic pains; with this intention the fresh leaves are pounded in a mortar, and mixed with hog's grease or

or any other grease; this is boiled together, till it becomes a salve, which is spread on linen, and applied to the part where the pain is. This salve gives certain relief in a short time.

Against violent pains which move up and down in the thighs, and sometimes spread all over the body, they recommend ⅔ of the leaves of polypody *(polypodium fronde pinnata*, &c.) and ⅓ of the cones of the *thuya*, reduced separately to a coarse powder, and afterwards mixed. With this powder, and milk-warm water, they make a poultice, which they spread on linen, and wrap round the body; but they commonly lay a cloth between it and the body, otherwise it would burn and scorch the skin.

The decoction of thuya leaves is used as a remedy for the cough; and they use this at Saratoga for the intermitting fever.

TREE-*louse*. See APHIS.

TREE *of Mars*, in *Chemistry*. See ARBOR *Martis*.

Mealy-TREE, or WHITE *leaf*. See WAYFARING-*tree*.

TREE-*moss*, a species of *lichen*. See LIVER-*wort*.

Parallelism of rows of TREES. See PARALLELISM.

TREET, *triticum*, in *our Statutes*, is used for fine wheat. See stat. 51 Hen. III. Hence *treet*-bread. See BREAD.

To TRE-FALLOW, in *Husbandry*, is to plough land the third time before sowing.

TREE-*nails*, or TREENELS, in a *Ship*, are long cylindrical wooden pins, employed to connect the planks of a ship's side and bottom to the corresponding timbers.

The *tree-nails* are justly esteemed superior to spike-nails or bolts, which are liable to rust and loosen, as well as to rot the timber: but it is necessary that the oak of which they are formed should be solid, close, and replete with gum, to prevent them from breaking and rotting in the ship's frame. They ought also to be well dried, so as to fill their holes when swelled with moisture. They have usually one inch in thickness to 100 feet in the vessel's length; so that the *tree-nails* of a ship that is 100 feet long, are one inch in diameter, and one inch and a half for a ship of 150 feet.

TREFOIL, *trifolium*, in *Botany*, a genus of the *diadelphia decandria* class: its characters are these; the flower has a tubulous permanent empalement of one leaf; it is of the butterfly kind, and is frequently permanent, drying in the empalement; the standard is reflexed, the wings shorter than the standard, and the keel shorter than the wings; it has ten stamina, nine joined, and one separate, terminated by single summits, and an almost oval germen, supporting an awl-shaped style, crowned by a single stigma; the germen becomes a short pod, with one valve, containing a few roundish seeds. Miller enumerates twelve, and Linnæus forty species.

The species commonly cultivated in the open fields for the food of cattle are the red Dutch clover, the white Dutch clover, and the hop-clover.

The *common red clover* is well known, though it has been sometimes confounded with the red meadow *trefoil*, which is a distinct species. The seeds of the common clover have, in consequence of the extensive cultivation of it for many years, been spread over most of the English pastures, so that there are few of them which have not clover mixed with the other grasses; and hence some botanists have been led to suppose, that the meadow *trefoil* has been improved to this by dressing of the land.

Since the red clover has been cultivated in England, our clay-lands, which before produced little but rye-grass and other coarse bents, have been greatly improved; for by being sown with red clover, they have produced more than six times the quantity of fodder they used to do, whereby farmers have been enabled to feed a much greater stock of cattle, and the ground has been enriched and prepared for corn. Where the land is kept in tillage, it is the usual method among farmers, to lay down their ground with clover, after having had two crops of corn, whereby there is a constant rotation of wheat, barley, clover, or turneps, on the same land. The clover-seed is commonly sown with barley in the spring, and when the barley is taken off, the clover spreads and covers the ground, and this remains two years, after which the land is ploughed again for corn. If the land be very dry, some recommend sowing it with black oats, as early in the spring as possible, that it may get up while the spring rains last, and acquire strength before the dry weather sets in. Some sow it with wheat or rye at Michaelmas; this gives it an opportunity of shedding its seed on the ground, and thus the crop of the next year is rendered much stronger than it would have been made by any other means; but in this case it is best to sow it upon dry lands, which will bear the sowing both of wheat and rye upon broad ridges, which is usually very successful, if a mild winter follows; but if there are long and severe frosts, or deep snows, it is very hazardous.

Some farmers sow rye-grass with the corn at Michaelmas, and, early in the spring, they sow clover, which they only cover by rolling it. The best management seems to be the feeding of it bare before winter comes on, and then it is safe; for the frosts, though they often destroy the leaves of the clover, yet never hurt its roots, unless they happen to lie bare.

Clover is a biennial plant, whose roots decay after they have produced seeds; but by eating it down, or mowing it when it begins to flower, the roots are made to send out new shoots, and the plant is continued longer than it would naturally. The common allowance of seed for an acre of ground is ten pounds. In the choice of the seed, that which is of a bright yellow colour inclining to brown, should be preferred, and the pale-coloured thin seed rejected. The goodness of the seed may be easily determined by throwing it into a glass of water; that which sinks is good, but that which swims is bad, and will never vegetate. Clover delights most in a rich warm soil, and always thrives best in those lands which have been well dunged or manured; but the clay-lands, which are long in swarding, or acquiring a coat of grass, and are little subject to weeds, are the best land for clover; because in those light lands, where the common grass grows speedily, it soon eats out the clover. Besides, the soil in these light lands is easily washed away from the roots of the clover after showers of rain, and then the roots, thus left bare, are killed by the first frost that happens. In good ground clover will bear crops for three or four years, but not longer even in the most proper soil, and with all the necessary cautions.

The clover-seed, when sown with barley, should be sown after the barley is harrowed in, otherwise it will be buried too deep; and the ground should be afterwards rolled, in order to press the seeds into the ground; but this should be done in dry weather, lest the seeds should burst, or adhere to the roller.

Such is the method generally practised in the sowing of this seed with corn; but Mr. Miller and others recommend sowing it alone; for the corn prevents the growth of the plants until it is reaped and removed, so that one whole season is lost, and a great crop of corn spoils the clover; whereas, when it is sown without any other seed, the plants will come up more uniformly and much quicker than that which was sown the spring before under corn. Mr. Miller, therefore, advises to sow the seeds in August, when there is a prospect of rain, which will cause the plants to spring, and thus they will get strength before winter. In October, when the ground is dry, the clover should be well rolled, which will press the soil close to the roots, and cause the plants to send out more shoots: the same operation should be repeated in March. Mr. Miller prefers this season for sowing the seeds rather than the spring, because in the spring the ground is cold and wet, and if much rain fall after the seeds are sown, they will rot, and when they are sown late, they often will not grow.

About the middle of May the clover will be fit for mowing, when great care should be observed in making it, as it will require more labour and time to dry than common grass, and will shrink into less compass; but if it be not too rank, it will be found exceeding rich food for cattle. The time for cutting it is when it begins to flower; for if it stands much longer, the lower part of the stems, and the under leaves, will begin to dry, and yield a less quantity of hay, and that not so well flavoured. Some persons cut three crops in one year of this grass; but the best way is to cut but one in the spring, and feed it the remaining part of the year, whereby the land will be enriched, and the plants grow much stronger.

One acre of clover will feed as many cattle as four or five acres of common grass; but care should be taken to let them feed upon it gradually at first, lest it burst them. For this purpose they should be allowed to eat it only for half an hour or an hour in the middle of the day, when there is no dew upon the grass; and so every day they may remain a longer time, till they are fully seasoned to it. But they should never be fed on clover in wet weather; when they have been accustomed to it, they should be turned out at night, and be supplied with hay or straw, which will prevent the pernicious consequences of the clover. Some sow rye-grass among the clover, in order to check the richness of the crop; but this is not adviseable, as the rye-grass will obstruct the growth of the clover, and the seeds scatter and fill the ground with bents. See HOVEN.

When cattle are fed with the hay of clover, the best way is to put it in racks, otherwise they will tread a great

quantity of it down with their feet. Clover is much better for moſt other cattle than for milch-cows, which ſhould rarely have any of it; though when it is dry, it is much leſs injurious to all cattle than when it is green.

When clover is preſerved for ſeed, the firſt crop in the ſpring ſhould ſtand till the ſeeds are ripe, which may be known by the ſtalks and heads changing to a brown colour; then it ſhould be cut in dry weather, and houſed till winter, when it may be threſhed; or if the ſeeds are wanted for immediate ſowing, it may be threſhed out before it be houſed or ſtacked. In either caſe it ſhould be well dried, otherwiſe the ſeeds will not quit their huſks. By proper precaution two buſhels of ſeed may be procured out of an acre of good land where the clover has thriven.

The *white Dutch clover* grows naturally in moſt of the paſtures in England, and is generally known by the name of white honeyſuckle graſs. It is an abiding plant, and ſends out roots from every joint, ſo that it makes the cloſeſt ſward of any of the ſown graſſes, and it is the ſweeteſt feed for all ſorts of cattle yet known. In land deſigned for continued paſture, a quantity of ſeeds of this plant ſhould be ſown with the graſs-ſeeds. See PASTURE.

It ſhould never be ſown with corn; but if it be ſown in the ſpring without corn, it will afford a crop of hay fit for being mowed by the middle or latter end of July, and a much better after-feed for cattle the following autumn and winter, than the graſs which is ſown with corn will produce the ſecond year. The ſeed may alſo be ſown with graſs-ſeeds in autumn, as before directed for the common red clover; and this autumnal ſowing will afford a good early crop of hay the following ſpring; and if, after the hay is taken off, the ground is well rolled, it will cauſe the clover to form a thick ſward.

The ſeeds of this ſort of clover are annually imported from Flanders, by the way of Holland, whence it is called Dutch clover.

In this country the ſeeds have not been long collected for ſowing; but this ought to be done by the farmer, who ſhould ſow an acre or two of this white clover by itſelf for ſeeds.

The *hop-clover*, or yellow meadow *trefoil*, grows naturally among the graſs in moſt of the upland paſtures in this country; but the ſeeds are frequently ſold in the ſhops, and are mixed with the other ſorts of clover and graſs-ſeeds, for laying down ground to paſture. There are two ſorts which grow naturally in England, one called the *hop-clover*, becauſe the flowers are collected into oval imbricated heads, with naked empalements, lying over each other like ſcales, in a manner reſembling the flowers of hops; the other ſort is the *leaſt yellow hop-trefoil*, called none-ſuch, or black-ſeed, and as the plants of this ſort are not abiding, they are not proper to be ſown where the ground is deſigned to continue in paſture; but in ſuch places where one or two crops only are taken, and the land is ploughed again for corn, it may do well enough when mixed with other ſeeds, though the cattle are not very fond of it when green, unleſs it be very young. The large ſort is the moſt profitable, though it is often mixed with the ſmaller kind, and alſo with the ſmaller melilot, which is commonly called none-ſuch, and ſometimes black-ſeeds. But theſe ſeeds deſtroy the beauty of the verdure as they form unſightly yellow patches.

The *hop-clover* is greatly recommended by the following circumſtances. 1. It not only grows, but flouriſhes in the moſt barren lands, and therefore muſt be a very proper graſs to cultivate on ſuch unfertile ſoils where any other graſs that is worth notice will not grow at all. 2. It is not apt to ſwell cattle as the red clover does. 3. In good ground it will continue long, and bear a very good feed or crop, as Mr. Tull, though prejudiced againſt clovers, allows; and by its flouriſhing both on ſands and clay, which have not been ploughed for many years, it ſeems likely to continue long in any ſoil. They commonly allow twelve pounds of ſeed to an acre.

The fifth ſort, or *greater hairy meadow trefoil*, with a whitiſh ſulphur, or copper-coloured flower, grows naturally in chalky lands in many parts of England, and in ſome counties the ſeed is ſown after the ſame manner as the common red clover, eſpecially on chalky ground, where it will thrive, and produce a better crop than clover. It flowers and ripens its ſeeds about the ſame time as the common clover. This is known by the name of *trefoil* in the places where it is cultivated, but the ſeedſmen ſell the hop-clover by that name. This ſort of *trefoil* is much cultivated in that part of Eſſex which borders on Cambridgeſhire.

The ſixth ſort, or *trefoil* with an oblong red ſpike, grows naturally in Spain and Italy; but being an annual plant it is not proper for ſowing with graſs, though it makes good fodder.

The ſeventh ſort, or *trefoil* of the mountains, with very long red ſpikes of flowers, is an annual plant, which grows naturally in the ſouth of France and Italy.

The eighth ſort, or ſpiked mountain *trefoil*, with the narroweſt leaves, grows naturally in Spain and Italy.

The ninth ſort, or common hare's-foot *trefoil*, grows naturally upon dry gravelly land in moſt parts of England, and is a ſure indication of the ſterility of the ſoil.

The tenth ſort, or ſtrawberry *trefoil*, grows naturally on arable land in many parts of England. Theſe ſorts are frequently preſerved in gardens for the ſake of variety, and are eaſily propagated by ſeeds, which may be ſown on an open bed of ground, either in autumn or ſpring.

The eleventh ſort is the common MELILOT: and the twelfth, or ſweet *trefoil*, grows naturally in Bohemia and Auſtria, and has been long cultivated in England as a medicinal plant, though now rarely uſed. The whole plant has a ſtrong ſcent like fenugreek; and if the ſeeds of theſe two laſt ſorts are permitted to ſcatter, the plants will riſe without care. Miller's Gard. Dict. Mortimer's Huſb. p. 32, &c.

Bean TREFOIL, a ſpecies of *cytiſus*. See *Baſe* TREFOIL.

Stinking bean TREFOIL. See ANAGYRIS.

TREFOIL, *bird's-foot*, *lotus*, in *Botany*, a genus of the *diadelphia decandria* claſs. Its characters are theſe: the empalement of the flower is of one leaf, permanent, and cut at the top into five parts; the flower is of the butterfly kind; the ſtandard roundiſh, and reflexed backward; the wings are broad, roundiſh, and ſhorter than the ſtandard, cloſing together at the top; the keel is cloſed on the upper ſide, and convex on the under; it has ten ſtamina, nine joined, and one ſeparate, terminated by ſmall ſummits, with an oblong taper germen, ſupporting a ſingle ſtyle, crowned by an inflexed ſtigma; the germen becomes a cloſe cylindrical pod, with one cell opening with two valves, having many tranſverſe partitions, in each of which is lodged one roundiſh ſeed. Linnæus enumerates nineteen, and Miller ſeventeen ſpecies.

The fruit of the *lotus* was, by the ancients, imagined to be endowed with the virtue of making ſtrangers forget their native country.

TREFOIL, *marſh*. See *Bog*-BEAN.

TREFOIL, *moon*. See *Snail*-TREFOIL.

TREFOIL, *ſhrub*, *ptelea*, in *Botany*, a genus of the *tetrandria monogynia* claſs. Its characters are theſe: the empalement of the flower is ſmall, and cut into four acute parts; the flower has four oval ſpear-ſhaped petals, which ſpread open flat; it hath four awl-ſhaped ſtamina, terminated by roundiſh ſummits, and an orbicular compreſſed germen, ſupporting a ſhort ſtyle, crowned by two obtuſe ſtigmas; the germen afterward becomes a roundiſh membranaceous capſule with two cells, each containing one obtuſe ſeed. There are two ſpecies.

The ſecond ſpecies of this genus, or the *ptelea* with ſingle leaves, was formerly ſhewn for the tea-tree in many of the European gardens, where it many years paſſed for among thoſe who knew no better.

TREFOIL, *ſnail*, *medicago*, in *Botany*, a genus of the *diadelphia decandria* claſs. Its characters are theſe: the flower hath a cylindrical erect empalement of one leaf, cut at the brim into five equal acute ſegments; the flower is of the butterfly kind, having an oval erect ſtandard, whoſe borders are reflexed; the wings are oblong, oval, reflexed, and fixed to the keel by an appendix; the keel is oblong, bifid, obtuſe, and reflexed; it has ten ſtamina, nine of which are joined, the other ſingle, terminated by ſmall ſummits; and an oblong germen, which ſits on a ſhort ſtyle, and is involved with the ſtamina, by the keel, crowned by a very ſmall ſtigma; it afterward turns to a long compreſſed pod, twiſted into the form of a ſnail, incloſing many kidney-ſhaped ſeeds. There are many ſpecies which grow naturally in the warm parts of Europe. Miller. See LUCERNE.

TREFOIL *of Candia, thorny*. See FAGONIA.

TREFOIL, *baſe tree*, *cytiſus*, in *Botany*, a genus of the *diadelphia decandria* claſs. Its characters are theſe: it has a butterfly flower, with a ſhort bell-ſhaped empalement of one leaf, divided in two lips, the upper being bifid and acute, the under indented in three parts; the ſtandard of the flower is riſing, oval, and reflexed on the ſides; the wings are obtuſe, erect, and the length of the ſtandard; the keel is bellied and acute; it has ten ſtamina, nine joined, and one ſtanding ſeparate, terminated by riſing ſummits; and an oblong germen ſupporting a ſingle ſtyle, crowned by an obtuſe ſtigma; the germen becomes an oblong blunt pod, narrow at the baſe,

base, filled with kidney shaped flat seeds. Linnæus enumerates eleven, and Miller sixteen species.

The common broad leaved laburnum, is a species of this genus; it grows to be a large tree, the wood of it is very hard, of a fine colour, and polishes very well; it approaches nearly to green ebony. They grow very fast, are very hardy, and therefore may be well worth planting on poor shallow soils, and exposed situations. If their seeds are permitted to scatter in winter, the plants will rise in great plenty the following spring; so that a few trees will soon supply a sufficient quantity. Miller.

It has been much disputed among botanists, to what genus the *cytisus* of Virgil, Columella, and the old writers in husbandry, ought to be referred; they mention it as an extraordinary plant, and worthy of cultivation for fodder. Although it is hard to determine, which, among the several species of *cytisus*, is the legitimate *cytisus* of the ancients, yet the most skilful, says Miller, take it to be that which Maranthus has described, which is our *medica*, ranged under the genus of *cytisus* by most writers before Tournefort, who established the genus of *medicago*, on account of the seed-vessel being like that of medica, or snail-*trefoil*. Miller's Gard. Dict. art. *Medica*.

The ancient botanists seem to have been acquainted with two very different shrubs, under the name *cytisus*; and there have been no small errors about the true meaning of several passages in Dioscorides and Theophrastus, on occasion of the mistaking one of these things for another. Dioscorides describes the *cytisus*, as being a shrub with leaves white and hoary, both on the upper and under side, and of no use, or value, to mankind: as to its wood, Pliny translates this account, and adds to it from Hyginus, that it was a very hardy, and strong shrub, not being affected by heat, or cold, snow, or hail, or any other injuries of the weather, nor of its enemies, as Pliny expresses it, (*hostium*). It is not very easy to conceive what enemies these should be; but the most probable conjecture, as to this odd passage is, that Pliny had transcribed it in his usual careless way, and that what is called *hostium* should be the word *nostram*.

The sense then is clear enough; the author had just before said that the wood was good for no use to mankind; and therefore, when he was speaking of the trees standing a long time, and fearing the injuries of no weather, he might very well add, nor of us; for the wood being good for nothing, men would not be at the trouble of cutting it up. It is plain, however, that Theophrastus means quite a different shrub by this name *cytisus*; for, as Dioscorides says that the wood of his was white throughout, and very light, Theophrastus observes, that it was black at the heart, and as heavy and solid as ebony; and, in many places, where he speaks of the hard and elegant woods used for inlaying, he mentions the *cytisus* wood, coupling it with the ebony, heart of oak, and other the hardest, and most elegant woods known in his time.

Pliny mentions no other *cytisus* than that of Dioscorides, which was the common kind cultivated by the Greeks and Romans, as a food for cattle: he says, it was raised by seed, and came to its perfection in three years, and that it was gathered in the spring just after the time of its flowering; he adds, that this was usually the office of children, or old women, unfit for other work, and was the cheapest of all the offices of husbandry. It is easy to conceive, that such a shrub as the *cytisus* of Theophrastus, with a wood as firm as the heart of oak, and hard as ebony, did not come to perfection in three years from the sowing; nor could any more be cut up by boys and old women, than eaten by cattle when taken up. There were, therefore, two kinds of *cytisus* among the ancients, the one sown and cultivated as food for cattle, the other a wild tree, or shrub, growing in woods, and being larger than the sown kind. Dioscorides and Pliny describe the first, and Theophrastus alone the latter, except that Pliny has now and then taken a sentence from Theophrastus, when he mentions the *cytisus* occasionally among other hard woods, and placed it to the account of his manured *cytisus*.

Ovid, indeed, where he mentions the cytisus as a wild wood shrub, certainly means this kind mentioned by Theophrastus:

Nec tenuis cytisus curtave tinus abest.

And Columella acknowledges both kinds. It may seem a natural objection that culture could never make such a difference in this plant, as that it should be hard and black in the wood, in its wild state, and soft and white in the cultivated kind. But we are not to suppose that the cultivated and wild cytisus were the same species of shrub, only altered by these two states. The ancients were not so accurate in their names as later botanical writers have been; and if a wood-shrub, in some respects, resembled their manured cytisus, they would call it by that name, though it had not all the generical characters to make it the same. Columella, de R. R. lib. ix. cap. 4.

TRELLIS, an assemblage of wooden bars, crossing one another, either in a straight line, or slopewise, designed to support wall-trees.

There is another kind of *trellis*, made of iron-wire.

TRELOOBING, in *Mining*, denotes a stirring and working the loobs or slimy earth of tin, &c. in a slime pit, that the mud may be partly washed off with the water, and the ore settle at bottom.

TREMBLANT *of an organ*. See ORGAN.

TREMELLA, in *Botany*, the name of a genus of the *cryptogamia algæ* class: the characters of which are these; they are a kind of plants seemingly of a sort of a middle nature between the *alga* and *conferva*, which produce flowers scarce perceptible, in a jelly-like substance, but are throughout of one uniform and tender texture, pellucid and membranaceous, and jelly-like or leafy. Linnæus enumerates nine, but Dillenius recounts seventeen species of this plant, among which he reckons the LAVER. See ULVA. See *Tab.* XIII. *of Botany*, Nº 3.

The star-fall, tar-slough, or *tremella nostoc* of Linnæus, is found in pastures after rainy seasons, in gravelly soils, on the tops of hills, and on gravel walks, in spring and autumn. Micheli describes the seeds as lying in the form of little strings of beads coiled up within the folds of the plant, and discoverable only by the microscope. This is supposed by the country people to be the remains of a meteor or falling star. There are other species found in the bark of trees, on walls and hedges in the shade, in woods, on moss, on heaths, on stones, in brooks and rivers, on sea-river weeds, on the decayed bark and branches of trees and rotten wood, on savine, and in wine-vaults. See Withering's Bot. Arrangement, vol. ii. p. 731, &c.

TREMOLANTE, in the *Glass Trade*, a name for the preparation of calcined brass, otherwise called *orpello*, used either for a sky-blue, or a sea-green.

TREMOR, TREMBLING, in *Medicine*, a disease near akin to a convulsion, wherein there is something of a convulsive motion or shaking, accompanying a voluntary or natural motion.

A *tremor* is frequently found to arise upon the more violent passions, particularly anger, gluttony, venery, &c. but this is accidental and transitory.

A *tremor* is sometimes apt to degenerate into other worse diseases, viz. palsy, apoplexy, lethargy, spasmus, &c.

Medical writers distinguish this *tremor* into the active and passive; the active is that which happens in violent passions of terror, anger, joy, &c. or in intermittent fevers, and is to be referred to the semi-convulsive motions; the passive are owing to a privative cause, and are allied to the semi-paralytic affections.

The passive *tremors* of the limbs, when considered as a disease, are to be distinguished from those which are caused by external accidents, such as the being plunged into cold water, the drinking tea, coffee, or other warm liquors, in many constitutions, and other such accidental causes. The persons subject to *tremors* of the limbs are principally old people, in whom the vital principle is weak and languid.

Causes. The internal causes are a flaccidity of the nerves and remission of the tone of the parts; the external and accidental ones are the omission of accustomed evacuations, a diaphoretic regimen, and an abuse of spirituous liquors.

Prognostics and method of cure. This is usually in old people a very obstinate complaint, and the more it is confirmed by being grown habitual, the more difficult is the cure; but if a case of this kind be taken in hand, as soon as it seizes the patient, and be treated in a rational manner, it is often perfectly cured. In order to this, the first step must be the perfectly cleansing of the *primæ viæ*, by repeated doses of rhubarb, or of an extract of black hellebore; if any habitual evacuation have been omitted, as bleeding or the like, this must be restored in the accustomed manner; and if any natural flux of blood by the hæmorrhoids or otherwise have stopped, this also must be recalled by proper medicines, or by the application of leeches: after this the due tone of the parts is to be restored by nervine medicines, as by wine impregnated with serpyllum, lavender, sassafras, guaiacum, and the like ingredients; and externally by rubbing the parts with spirit of castor and serpyllum, and bathing them in decoctions of tanzy, savin, feverfew, and the like herbs. One great rule in the cure of this disease is, that the patient is to abstain from all hot things, otherwise an atrophy is easily brought on, and proves a much worse

worse thing than the original disorder. Junker's Consp. Med. p. 681.

The medicine commonly made use of in *tremors*, and other nervous distempers, by the name of *palsy-drops*, is no other than the compound spirit of LAVENDER. The most successful way of using it is, by taking thirty or forty drops twice or thrice a day, dropt on loaf sugar or a little bread. It is supposed, that, by this way, the most spirituous and efficacious parts make their way directly by the nerves of the palate, &c. without undergoing the course of the circulation, as it must do when taken in a liquid vehicle.

TREMOR *of the heart*. See PALPITATION.

TRENCH, a ditch cut or dug in the ground, to drain off the waters in a meadow, a morass, or the like; or to divert the course of a river.

Many of the bogs in Ireland have been drained, and made good ground, by only digging *trenches* around them.

TRENCHES, in *Fortification*, are ditches which the besiegers cut to approach more securely to the place attacked; whence they are also called *lines of* APPROACH. See *Tab. Fortif. fig.* 21. *n.* 11. &c. and PARALLELS.

They say, *mount the trenches*, that is, go upon duty in them. To *relieve the trenches*, is to relieve such as have been upon duty there.

The enemy is said to have *cleared the trenches*, when they have driven away, or killed, the soldiers who guarded them.

TRENCH, *tail of the*, is the place where it was begun. And the *head*, that to which it was carried.

Trenches are of several sorts, according to the nature of the soil: if the adjacent territory be rocky, the *trench* is only an elevation of bavins, gabions, woolpacks, or epaulements of earth, cast round about the place—but where the ground may be easily opened, the *trench* is dug therein, and bordered with a parapet on the side of the besieged.

The breadth of the *trenches* is from eight to ten feet, and the depth from six to seven; they are cut in talus, or aslope.

The *trenches* are to be carried on with winding-lines, in some manner parallel to the works of the fortress, so as not to be in view of the enemy, nor to expose their length to the enemy's shot: for then they will be in danger of being enfiladed, or scoured by the enemy's cannon: this carrying of the *trenches* obliquely, they call carrying them by *coudees*, or returns. See PARALLELS.

TRENCHES, *opening of the*, is when the besiegers begin to work upon the line of approaches; which is usually done in the night; sometimes within musquet-shot, and sometimes within half, or only whole cannon-shot of the place, if there be no rising ground about it, the garrison strong, and their cannon well served.

The workmen, that open the *trenches*, are always supported by bodies of men against the sallies of the besieged; and sometimes those bodies lie between them and the place, as also on their right and left.

The pioneers sometimes work on their knees: and the men, that are to support them, lie flat on their faces, in order to avoid the enemy's shot; and the pioneers are likewise usually covered with mantelets, or saucissons.

TRENCH-*guard*. See GUARD.

To TRENCH *the ballast* is a sea-phrase, signifying to divide the ballast into several *trenches* in a ship's hold.

TRENCHE', in *Heraldry*. See TRANCHE'.

TRENCHING-*plough*, in *Agriculture*, is an instrument for cutting out the sides of *trenches* and drains, or the sides of turf, &c. See PLOUGH.

TRENCHMORE, the name of an old English dance; of which nothing certain is now known, but that it was a lively movement.

TRENT, *council of*, in *Ecclesiastical History*, denotes the council assembled by Paul III. in 1545, and continued by 25 sessions till the year 1563, under Julius III. and Pius IV. in order to correct, illustrate, and fix with perspicuity, the doctrine of the church, to restore the vigour of its discipline, and to reform the lives of its ministers.

But it has been a matter of complaint by many, both in and out of the communion of the church of Rome, that this assembly, instead of reforming ancient abuses, rather gave rise to new enormities. It is alleged, that opinions of the scholastic doctors on intricate points, which had been left undecided, were by this council absurdly adopted as articles of faith, and imposed with violence upon the consciences of the people, under pain of excommunication: that there is an ambiguity in the decrees and declarations of this council, which renders the disputes and dissensions, that had rent the church, more intricate and perplexed, and which really multiplies and propagates, instead of lessening and suppressing them: that matters were decided in this assembly, according to the despotic will of the Roman pontiff, without regard to the dictates of truth or the authority of scripture: and that the few wise and pious regulations, that were made in this council, were never supported by the authority of the church, but suffered to degenerate into a mere lifeless form or shadow of law, which was treated with indifference and transgressed with impunity. It will not, therefore, appear surprising, that there are certain doctors in the Romish church, who, instead of submitting to the decisions of the council of *Trent*, as an ultimate rule of faith, maintain that these decisions are to be explained by the dictates of scripture and the language of tradition: nor can we wonder that this council has not every where the same degree of credit and authority, even in those countries that profess the Roman catholic religion. Some countries, indeed, such as Germany, Poland and Italy, have adopted implicitly and absolutely the decrees of this council, without the least restriction. But in other places it has been received and acknowledged on certain conditions, which modify, not a little, its pretended authority. Among these latter we may reckon the Spanish dominions, which, during many years, disputed the authority of this council, and at length acknowledged it only so far as it could be adopted without any prejudice to the rights and prerogatives of the king of Spain. In other countries, such as France and Hungary, it has never been solemnly received or publicly acknowledged. Indeed in the former of these kingdoms, those decrees of *Trent*, that relate to points of religious doctrine, tacitly and imperceptibly through the power of custom, acquired the force and authority of a rule of faith; but those, which regard external discipline, spiritual power, and ecclesiastical government, have been constantly rejected, both in a public and private manner, as inconsistent with the authority and prerogatives of the throne, and prejudicial to the rights and liberties of the Gallican church.

Notwithstanding the preceding remarks, the decrees of the council of *Trent* together with the creed of Pope Pius IV. contain a summary of the principal heads of the Roman catholic religion. See POPERY.

However in these decrees and confession of faith, many things are expressed in a vague and ambiguous manner, with a view to the intestine divisions then prevalent in the church: and several tenets are omitted in both, which no Roman catholic is allowed to deny, or even to question. But it must be acknowledged, that in these decrees, and in this confession, several doctrines and rules of worship particularly pertaining to the doctrine of purgatory, the invocation of saints, and the worship of images and relics are inculcated in a much more rational and decent manner, than that in which they appear in the daily service of the church, and in the public practice of its members: and it is to be observed, that in deducing a just notion of the doctrine of Rome from the decrees of the *council of Trent*, regard ought to be had, not so much to the terms made use of in these decrees as to the real signification of these terms, which must be drawn from the customs, institutions and observances, that are, every where, in use in the Romish church.— Mosh. Eccl. Hist. vol. iii. p. 451. Eng. ed. 8vo.

TRENT, *council of*, *congregation for interpreting the decrees of the*, is a CONGREGATION, the plan of which was formed by Pius IV. and afterwards instituted and confirmed by Sixtus V. It was authorized to examine and decide, in the name of the pope, all matters of small moment relating to ecclesiastical discipline; while every debate of any consequence, and particularly all disquisitions concerning points of faith and doctrine, were left to the decision of the pontiff alone, as the great oracle of the church. Hence it was, that the approbation of Innocent XI. was refused to the artful and insidious work of Bossuet, bishop of Meaux, entitled, an Exposition of the Doctrine of the Catholic Church, until the author had suppressed entirely the first edition of that work; and made corrections and alterations in the second. See POPERY.

But though the court of Rome, and all those who favour the despotic pretensions of its pontiff, maintain that he alone, who governs the church as Christ's vicegerent, is entitled to explain and determine the sense of scripture and tradition in matters pertaining to salvation, and that a devout and unlimited obedience is due to his decisions; yet it has been impossible to persuade the wiser part of the Roman catholic body to acknowledge this exclusive authority in their head. And accordingly, the greater part of the Gallican church, and a considerable number of learned men of the popish religion in other countries, think very differently from the court of Rome on this subject. They maintain, that all bishops and doctors

doctors have a right to consult the sacred fountains of scripture and tradition, and to draw from thence the rules of faith and manners for themselves and their flock; and that all difficult points and debates of consequence are to be referred to the cognizance and decision of general councils. Mosh. Eccl. Hist. vol. iii. p. 450. See INFALLIBLE.

TRENTAL, TRIGINTAL, or TRICENNAL, a Romish office for the dead, consisting of thirty masses, rehearsed for thirty days successively after the party's death.

The *trental* is thus called from the Italian, *trenta, triginta, thirty*.—It is mentioned anno primo Edw. VI.

TREPAN, *Trephine*, TREPANUM, a surgeon's instrument, serving to perforate a bone, especially that of the cranium, and used in the operation of *trepanning*.

It is also called *abaptiston, anabaptiston, modiolus, terebra, terebellum. Abaptiston*, from *α* privative, and *βαπτίζω, to dip*; as having a broad circle over its point, to prevent it, in the operation of trepanning, from penetrating through the membranes that invest the brain. *Modiolus*, from *modus*, a *measure*; being contrived to enter only to a certain depth. *Terebra*, &c. from *τερεω, to bore*.

It is in form of a terebellum, or small wimble, only that it is indented, and made somewhat in manner of a round saw.

It serves for the cure of wounds, contusions, and fractures, of the cranium, when they do not go beyond the second table; for by means hereof, an amputation or exfoliation is made of what part, or quantity, of a bone one pleases; and a way is opened for the raising of depressions.

It has usually a sharp point in the middle of its circumference, serving to keep it firm and steady during the operation, in which case it is called the *male trepan*, but when the said point is removed it is termed *female*.

The *trepan* should also have a kind of cope to rise and fall as occasion requires, that it may not go deeper than is necessary.

See the *trepan* represented in *Tab.* III. *Surgery, fig* 39; its pin in *fig.* 40; and the key for taking away the pin when the saw hath made an impression deep enough to be worked without the help of it, in *fig.* 41.

We have the description and figure of a *trepan*, differing from and turning more equally than the common, by Mr. Monro, in the Med. Ess. Edinb. vol. v. art. 41.

There are also two-pointed *trepans*, others triangular, quadrangular, and hexagonal, made for the cure of a caries of the bones, perforative *trepans*, and exfoliative ones. See EXFOLIATION.

TREPANNING, in *Surgery*, the operation of relieving cuts, contusions, caries, and fractures in the skull, by means of an instrument called the *trepan*.

The other instruments used in this operation, beside the TREPAN, are the SCALPEL (*Tab.* III. *Surgery, fig.* 38), ELEVATORS, *fig.* 35, 36, 37; the RASPATORY, which Mr. Sharpe recommends for scraping bones in order to promote granulations of flesh, *fig.* 42; a FORCEPS for taking out the circular piece of bone, when it does not stick to the saw of the trephine, *fig.* 43; and the LENTICULAR, to scrape the lower edge of the orifice of the cranium, in case any splinters should remain after the operation, and the button at its extremity receives the dust that it may not fall on the brain, *fig.* 44.

This operation was performed by the ancients, not only in fractures and depressions of the cranium, but also in other obstinate disorders of the head and brain, which could not be relieved by internal medicines and the use of issues upon the coronal suture: but the modern surgeons never use the trepan for internal disorders of the head, though they seldom neglect it in fractures and depressions of the cranium. The operation is useful in such cases for elevating the depressed parts of a fractured bone, and also in pressures of the cranium for discharging the extravasated blood through an aperture made by this instrument. The sooner this instrument be applied the better: nevertheless the operation should be performed slowly and carefully; as it is extremely difficult, if not impossible, to take out a piece of the cranium with the trepan without injuring the subjacent dura mater, to which it is closely attached. Accordingly Heister advises, with Celsus and most of the moderns, to try first the use of other remedies, both external and internal, as phlebotomy, purging, clysters, discutient bags, &c. rather than subject the patient to the danger of the trepan, before it appears to be absolutely necessary. In some cases, however, the danger is so urgent, that immediate recourse should be had to this instrument, for the prevention of fatal consequences.

The part of the cranium in which it will be proper to apply the *trepan* will, in general, be that where the fissure appears, if nothing indicates the contrary; but, in fractures, it will be adviseable to trepan a little below the injured part, that the extravasated humours may be more easily discharged. Heister adds, that there are several places in the cranium, which ought not to be, in any case, trepanned; as 1. Upon the sutures, especially the sagittal suture; because, in these parts, the dura mater is more strongly attached to the cranium, and under the sagittal suture runs the longitudinal sinus of the dura mater, which, by *trepanning*, in this place, might easily be injured to the hazard of the patient's life: however in cases of absolute necessity the *trepan* may be used upon the coronal suture, and sometimes upon others. 2. It is equally dangerous to *trepan* the cranium in the middle of the os frontis, especially in that part which forms the fontanel; because under these is seated the forementioned sinus of the dura mater, which might easily be wounded by the instrument. 3. The *trepan* must not be applied upon any of the sinuses of the os frontis: to this purpose Mr. Cheselden observes, that the sinuses and spine of the os frontis make it very dangerous, if not impracticable, to apply a *trepan* to the middle and lower part of the forehead. 4. The *trepan* ought not to be used where any large vein or artery spreads itself. 5. If the fractured part of the bone, upon which the *trepan* is fixed, is loose or carious, it might injure the brain. 6. It has been judged improper to *trepan* in the lower parts or basis of the cranium, which are invested with muscles, as upon the occiput and temples; unless the muscles have been previously forced from them. 7. Lastly, it will be improper to *trepan* upon the cruciform eminence of the os occipitale.—Notwithstanding these cautions, if a violent fracture should happen in or near the forementioned places, the *trepan* should be applied as near them as possible; and if the fracture has passed across the sutures, you must *trepan* within a finger's breadth of the suture on each side.—Sometimes it is impossible to discover the particular part of the cranium which is injured; the patient in the mean time being affected with the most urgent and dangerous symptoms. In these cases it will be necessary to *trepan* first on the right side, then on the left, afterwards upon the forehead, and lastly upon the occiput, and so round till you meet with the seat of the disorder. After having pitched upon the part to be *trepanned*, and the instruments, dressings, &c. being provided, your next business is to shave the scalp; and the head being held steady in a convenient posture, make an incision through the integuments to lay bare the cranium. The wound may be enlarged, and the hæmorrhage stopped, after the integuments and periosteum are separated and elevated from the cranium with the scalpel, by inserting a large quantity of scraped lint: and a compress dipped in camphorated spirit of wine must be applied and retained by the kerchief bandage. Thus the patient is to be left, if the disorder will permit, for a few hours, that the blood may be stopped before the *trepan* is applied. The operator proceeds, after having placed the patient in a proper posture, having removed the dressings and cleansed the wound, to fix the point of the *male trepan* in the skull; and holding the instrument fast with the left hand, he turns it round with the right, till the saw has made a circular cut of sufficient depth in the cranium: he then takes a *female trepan*, which has no point in the middle, or takes out the point or central pin of the other, and turns it round as before; in the mean time, brushing off the dust or small portions of the bone that proceed from the perforation. The *trepan* is used in this state till the bony dust becomes bloody, which denotes that the diploe is penetrated; in some skulls, however, the diploe is wanting; but when the dust becomes bloody the instrument is to be laid aside and the blood washed away with a spunge dipped in spirits of wine. As soon as the piece of bone is loose, it is taken out with the forceps, and if the lower edge of the perforation is rough, it is smoothed with the lenticular: the depressed piece of skull is then raised with the elevator, which is now made with fulcra to rest on the sound bone: and if extravasated matter seems to be lodged under the dura mater, it is discharged by an opening made with a lancet. After the operation is finished, and the fragments of bone and extravasated matter removed, the membranes may be dressed with the ointment of gum elemi softened with the balsam capivi, applying it warm with a feather, and soft lint lightly over it, dressing the other parts as in wounds of the head; after which the whole head may be embrocated with a mixture of oil and vinegar, and a plaster of the white cerate applied to it, with a gentle compress and bandage. Heister says, that the dressings are to be made with a round pledgit of dry lint laid next to the dura mater, with a thread fastened to it, and hanging

hanging out of the aperture, that it may be placed under and drawn out from beneath the cranium; upon which pledgit is afterwards poured some honey of roses diluted with a little spirit of wine: over this is laid another pledgit of lint, furnished with a string, with other dossils, till the cavity is replete. The cranium and wound itself must also be dressed with lint, spread with some mild digestive ointment or honey of roses, upon which is laid a square compress dipt in warm spirit of wine, and the whole secured without a plaster, by the head bandage. In the subsequent dressings, which must be repeated once or twice every day, all fat and oily applications must be avoided. The wound being constantly dressed with balsamic and healing topics, you will have an exfoliation of a thin plate from the trepanned margin of the bones, usually within forty or fifty days, which ought not to be pulled away by force. The exfoliation being obtained, there will appear new flesh and callus, shooting up from the clean bone and dura mater, so as at length to fill up the whole cavity. When the cavity is about half filled, the sprouting flesh and callus must be moderately compressed by scraped lint and bandage, to prevent it from being too soft and lax; and when it is arrived even with the surface of the bones of the cranium, attempts must be made to conjoin and extend the integuments over it, by the assistance of sticking plasters; that the new-formed substance may intimately unite with the superior dried skin. This substance becomes gradually more and more indurated, especially in young subjects; however the weaker resistance of these cartilaginous parts subjects persons that have been *trepanned* to disorders in their heads, which may be partly remedied by constantly keeping the place armed with a plate of silver. Sometimes a fungus proves troublesome; but it is prevented by applying a plate of lead, invented and described by Belloste. Heister's Surg. vol. i. p. 379, &c.

Where it is ambiguous whether there be an extravasation of liquors, or a depression of the skull, the operation of the *trepan* is said to be the safest method. Mr. Quesnay gives us some histories of the *trepan* being performed several times with success, for the same disease; and of large parts of the skull being taken away, without loss of the patient's life. See Mem. de l'Acad. de Chirurg.

Not only the head, but the STERNUM, is sometimes necessarily the subject of this operation, as abscesses are sometimes formed under the sternum between the membranes of the mediastinum, by fall or blow, an inflammation, or other causes; in which cases, there is hardly a possibility of discharging the matter by any other method.

The great difficulty is to determine when, and when not, this is necessary; that is, when there really is an abscess formed there. When this is known to be the case, the operation is to be performed in the following manner: the patient is to be inclined backward, and a crucial incision made in the integuments upon the lower part of the sternum, where the abscess sometimes makes a point; then the integuments being freed from the sternum, the *trepan* is to be applied, and worked in the same manner as in *trepanning* the cranium; and when the perforation is made, the patient is to be stooped forward, and ordered to cough or breathe hard, in order to promote the discharge of the matter; and the abscess is afterwards to be cleansed with detergent injections, and healed in the usual way. Heister's Surgery, vol. ii. p. 68.

TREPIDATION, in *Medicine*. See TREMOR.

The first symptom of madness, in dogs, is a *trepidation* of the limbs.

TREPIDATION, in the *Ancient Astronomy*, denotes what they called a libration of the eighth sphere; or a motion which the Ptolemaic system attributed to the firmament, to account for certain almost insensible changes and motions observed in the axis of the world; by means whereof the latitudes of the fixed stars come to be gradually changed, and the ecliptic seems to approach reciprocally, first towards one pole, then towards the other.

This motion is also called the motion of the first LIBRATION.

TREPIGNER, in the *Manege*, the action of a horse who beats the dust with his fore-feet in managing, without embracing the volt; and who makes his motions and times short, and near the ground, without being put upon his haunches. This is generally the fault of such horses as have not their shoulders supple, and at liberty, and withal have scarce any motion with them. A horse may *trepigner*, in going upon a straight line.

TRESAYLE, in *Law*, the name of a writ (now obsolete) to be sued, on ouster, by abatement, on the death of the grandfather's grandfather.

TRESPASS, in *Law*, signifies any transgression of the law, under treason, felony, or misprision of either.

TRESPASS, however, is most commonly used either for that wrong or damage which is done to the king in his forest, or by one private man to another.

In this sense, it is of two sorts: *trespass general*, otherwise called *trespass vi & armis*, where force or violence is used, to which belong THREATS, ASSAULT, BATTERY, MAYHEM, &c. and *trespass special*, otherwise called *trespass upon the case*; which should be that done without force, or where the injury is only consequential. See ACTION *on the case*.

But the two species are sometimes confounded.

Trespass on lands denotes an entry on another man's ground without lawful authority, and doing some damage, however inconsiderable, to his real property. Every such unwarrantable entry on another's soil the law entitles a *trespass* by breaking his CLOSE. But in order to be able to maintain an action of *trespass*, a man must have a property in the soil, and actual possession by entry: or at least it is requisite that the party have a lease and possession of the vesture and herbage of the land. But before entry and actual possession one cannot maintain an action of *trespass*, though he hath the freehold in law. However, by 4 Geo. II. c. 28, and 11 Geo. II. c. 19. in case after the determination of any term of life, lives, or years, any person shall wilfully hold over the same, the lessor is entitled to recover by action of debt, either a rent of double the annual value of the premises, in case he himself hath demanded and given notice in writing to deliver the possession; or else double the usual rent, in case the notice of quitting proceeds from any tenant having power to determine his lease, and he afterwards neglects to carry it into due execution.

A man is answerable not only for his own *trespass*, but that of his cattle also. See DAMAGE *feasant*.

In some cases *trespass* is justifiable; or, rather, entry on another's land and house shall not in those cases be accounted *trespass*; as if a man comes there to demand or pay money, there payable; or to execute, in a legal manner, the process of the law. A man may also justify entering into an inn or public house, without the leave of the owner: a landlord may justify entering to distrain for rent: a commoner to attend his cattle, commoning on another's land; and a reversioner to see if any waste be committed on the estate. It hath also been said, that by the common law and custom of England the poor are allowed to enter and glean upon another's ground after the harvest, without being guilty of *trespass*; which humane provision seems borrowed from the Mosaical law. Lev. chap. xix. ver. 9. chap. xxiii. ver. 22. Deut. chap. xxiv. ver. 19. In like manner the common law warrants the hunting of ravenous beasts of prey as badgers and foxes in another man's land. But in cases where a man makes an ill use of the authority with which the law entrusts him, he shall be accounted a trespasser *ab initio*; as if one comes into a tavern and will not go out in reasonable time; so if a landlord distrained for rent, and wilfully killed the distress, this made him a trespasser *ab initio*: and so would any other irregularity have done, till the statute 11 Geo. II. c. 19. which enacts that no subsequent irregularity of the landlord shall make his first entry a *trespass*; but the party injured shall have a special action on the case for the real specific injury sustained, unless tender of amends hath been made. But still, if a reversioner, who enters on pretence of seeing waste, breaks the house or stays there all night; or if the commoner, who tends his cattle, cuts down a tree; in these and similar cases the law judges that he entered for this unlawful purpose; and therefore, as the act which demonstrates such his purpose is a *trespass*, he shall be deemed a trespasser *ab initio*. So also in the case of hunting the fox or the badger, a man cannot justify breaking the soil, and digging him out of his earth.

A man may justify an action of *trespass*, on account of the freehold and right of entry being in himself; and this defence brings the title of the estate in question.—And this is one of the ways devised, since the disuse of real actions, to try the property of estates: though not so usual as that by ejectment, which being a mixed action, gives damages for the ejection, and possession of the land: whereas in *trespass*, which is a personal suit, the right can be only ascertained, but no possession delivered; nothing being recovered but damages for the wrong committed.

In an action of *trespass* the plaintiff always sues for damages, or the value of the hurt done him by the defendant.

In

In order to prevent trifling and vexatious actions of *trespass*, as well as other personal actions, it is *(inter alia)* enacted by statutes 43 Eliz. c. 6. and 21 Jac. I. c. 16. and 22 and 23 Car. II. c. 9. that where the jury who try an action of *trespass* give less damages than 40*s*. the plaintiff shall be allowed no more costs than damages; unless the judge shall certify under his hand, that the freehold or title of the land came chiefly in question, or that an actual battery, and not an assault only, was proved. And by statute 4 and 5 W. and M. c. 23, and 8 and 9 W. III. c. 11. if the *trespass* were committed in hunting or sporting by an inferior tradesman, or if it appear to be wilfully and maliciously committed, the plaintiff shall have full costs, though his damages as assessed by the jury amount to less than 40*s*. Blackst. Com. vol. iii. p. 120, &c. p. 208, &c.

Trespass is also divided into *local* and *transitory*.

TRESPASS *local* is that which is so annexed to the place certain, that if the defendant join issue upon a place, and traverse the place mentioned in the declaration, and aver it, it is enough to defeat the action.

TRESPASS *transitory* is that which cannot be defeated by the defendant's traverse of the place, because the place is not material.

The action of *trespass, quare clausum fregit*, ought to be local.

TRESSEL, or TRESTLE-*trees*, in a *Ship*, two strong bars of timber fixed horizontally on the opposite sides of the lower mast-head, to support the frame of the top and the weight of the top-mast.

TRESSURE, in *Heraldry*, a diminutive of an orle, usually supposed to be half the breadth thereof.

It is usually borne flory, and counterflory; and sometimes double, as in *Tab*. II. *Herald*. *fig*. 86, and sometimes triple.

TRESTLE, TRESSEL, or TRUSSEL, is explained, by Minshieu, to be a three-footed stool; or, more particularly, a wooden frame or stand to bear up tables, scaffolds, or the like.

TRET, in *Commerce*, an allowance made for the waste, or the dust, that may be mixed with any commodity; which is always four pounds in every 104 pounds weight. See TARE.

TREWIA, in *Botany*, a genus of the *polyandria monogynia* class; the characters of which are these: the perianthium is permanent, and is composed of three oval reflex and coloured leaves; there are no petals; the stamina are numerous capillary filaments, of the length of the cup; the antheræ are simple; the germen of the pistil is placed under the cup; the style is simple, and of the length of the stamina, and the stigma is simple; the fruit is a three-square, turbinated, coronated capsule, formed of three valves, and containing three cells; the seeds are single, and are in figure convex on the one side, and angular on the other. There is one species.

TRIA *prima*, among *Chemists*, the three hypostatical principles, viz. salt, sulphur, and mercury; of which they hold all bodies to be primarily made, and into which they are all held resolvable by fire.

TRIAD, TRIAS, τριὰς, see TERNARY, TRIAS, and TRINITY.

TRIAL, in *Law*, the examination of any cause, civil or criminal, according to the laws of the realm, before a proper judge.

Of this there are divers kinds: both in civil and in criminal cases. In civil cases there are seven species of *trial*, viz. by RECORD: by *inspection* or *examination*, when for the greater expedition of a cause, in some point or issue being either the principal question, or arising collaterally out of it, but being evidently the object of sense, the judges of the court, upon the testimony of their own senses, shall decide the point in dispute; as in case of a suit to reverse a fine for non-age of the cognizor, or to set aside a statute or recognizance entered into by an infant, the king's justices determine by view of the age of the party; also if a defendant pleads in abatement of the suit that the plaintiff is dead, and a person, calling himself the plaintiff, appears, the judges shall determine by inspection whether he be the plaintiff or not; likewise in the case of an idiot; in the appeal of mayhem; and in determining circumstances relative to a day past by inspection of an almanac: by CERTIFICATE, as for matters without the realm, and also within the realm; the customs of the city of London are tried by the certificate of the mayor and aldermen, certified by the mouth of their recorder; marriage, bastardy, excommunication and orders and other such matters are tried by the bishop's certificate; ability of a clerk presented, admission, institution and deprivation of a clerk shall be tried by certificate from the ordinary or metropolitan; and the customs of courts by certificate from the proper officers, &c. by WITNESSES: by *wager* of BATTLE: by WAGER of law: and by JURY. In criminal matters, there was formerly the *trial* by ORDEAL and by CORSNED; these two methods of *trial* were chiefly in use among our Saxon ancestors and are now antiquated: the next, which still remains in force, though very rarely in use, was introduced among us by the princes of the Norman line, and is the *trial* by BATTLE, DUEL, or *single* COMBAT: the fourth method of *trial* used in criminal cases is that by the peers of Great Britain, in the court of parliament, or the court of the *lord high* STEWARD, when a peer is capitally indicted: but that which most commonly occurs is the *trial* by JURY, or the country, secured to every Englishman, as the great bulwark of his liberties, by the great Charter. Backst. Com. vol. iii. p. 330, &c. vol. iv. p. 336, &c.

Before *trial*, in a criminal case, it is usual to ask the criminal how he will be tried? which was anciently a very pertinent question, though not so now; in regard there were formerly several ways of *trial*; viz. by *battle*, *ordeals*, and *jury*.

When the criminal answered, by God and his country, it shewed he made choice to be *tried* by a JURY. But there is now no other way of *trial*. This is also called *trying per pais*, or *per patriam*.

TRIAL, *New*, in *Law*, is a re-hearing of the cause before another jury, with as little prejudice to either party, as if it had never been heard before. The causes of granting a new *trial* are such as these: want of notice of *trial*; or any flagrant misbehaviour of the party prevailing towards the jury, which may have influenced their verdict; or any gross misbehaviour of the jury among themselves: also if it appears by the judge's report, certified to the court, that the jury have brought in a verdict without or contrary to evidence, so that he is reasonably dissatisfied therewith; or if they have given exorbitant damages; and if the judge himself has misdirected the jury, so that they found an unjustifiable verdict: for these, and other reasons of the like kind, it is the practice of the court to award a new, or second, *trial*. But if two juries agree in the same or a similar verdict, a third *trial* is seldom awarded; for the law will not readily suppose, that the verdict of any one subsequent jury can countervail the oaths of two preceding ones. There are instances of new *trials* in the year-books of the reign of Edward III. Henry IV. and Henry VII. &c. Blackst. Com. vol. iii. p. 387, &c.

TRIANDRIA, in *Botany*, the third class of plants which have hermaphrodite flowers, with three stamina or male parts in each. See FRUCTIFICATION, and *Tab*. I. and III. of *Botany*, Class 3. Of this class there are three orders; viz. *monogynia*, comprehending such plants as have but one style, which contain twenty-nine genera, distinguished into such whose flowers have no spatha or amentum, of which there are thirteen; such as have spathaceous flowers and a trilocular capsule, of which there are ten; and such as have an imbricated amentum, and are gymnomonospermous, of which there are six: *digynia*, comprehending such plants as have two styles, which contain twenty-nine genera: and *trygynia*, comprehending such plants as have three styles, which contain eleven genera. See ORDER.

TRIANDRIA, is also the title of several orders of plants, which have three stamina. See ORDER.

TRIANGLE, in *Geometry*, a figure comprehended under three lines, or sides, and which of consequence has three angles.

If the three lines or sides of the *triangle* be all right, it is said to be a *plain* or *rectilinear triangle*.

If all the three sides of the *triangle* be equal (as ABC, *Tab*. III. *Geometry*, *fig*. 68,) it is said to be *equilateral*.

If only two of the sides of the *triangle* be equal (as in DEF, (*fig* 57,) it is called an ISOSCELES, or *equicrural triangle*.

If all the sides of the *triangle* be unequal to each other as in ACB, (*Tab*. V. *Geometry*, *fig*. 127,) the *triangle* is said to be SCALENOUS.

If one of the angles, as K (*fig*. 128,) of a *triangle* KML be a right angle, the *triangle* is said to be RECTANGULAR.

If one of the angles, as N (*fig*. 129,) be obtuse, the *triangle* is said to be OBTUSANGULAR, or *amblygonous*.

If all the angles be acute, as in ACB (*Tab*. III. *Geometry*, *fig*. 68,) the *triangle* is said to be ACUTANGULAR, or *oxygonous*.

If the three lines of the *triangle* be all curves, the *triangle* is said to be CURVILINEAR.

If

If ſome of the ſides be right, and others curve, the triangle is ſaid to be *mixtilinear*.

If the ſides be all arches of great circles of the ſphere, the *triangle* is ſaid to be SPHERICAL.

TRIANGLES, *ſimilar*, ſee SIMILAR.

TRIANGLE, *characteriſtic*, of a *curve*, ſee CURVE.

TRIANGLE, *baſe, canon, hypothenuſe, legs, and reſiſtance of a*. See the ſeveral articles.

TRIANGLES, *conſtruction of*. 1. Two ſides, as A B and A C, (*Tab.* V. *Geometry*, *fig.* 130.) being given in numbers, or otherwiſe, together with the quantity of the angle intercepted between them, A; to conſtruct a *triangle*:—aſſume A B as a baſe; and in A make the given angle: on the other leg ſet off the other given line A C; laſtly, draw B C: then will A B C be the *triangle* required.

Hence, two ſides with the intercepted angle being determined, the whole *triangle* is determined. Wherefore, if in two *triangles* A C B and acb; $a = A$; and $ab : ac$ :: A B : A C, the *triangles* are determined in the ſame manner, and are therefore ſimilar; conſequently $c =$ C, and $b =$ B. $ab : bc$ :: A B : B C, &c.

2. Three ſides, A B, B C, and C A, (*Tab.* III. *Geometry*, *fig.* 68,) being given, any two whereof, as A C, A B, taken together, are greater than the third; to conſtruct a *triangle*. Aſſume A B for a baſe; and from A, with the interval A C, deſcribe an arch y; and from B, with the interval B C, deſcribe another arch x: draw the right lines A C and B C. Thus is the *triangle* conſtructed.— Hence, as of any three given right lines, only one *triangle* can be conſtructed; by determining the three ſides, the whole *triangle* is determined.

Wherefore, if in two *triangles* A C B and acb (*Tab.* V. *Geometry*, *fig.* 130.) A C : A B :: $ac : ab$; A C : C B :: $ac : bc$; the *triangles* are determined in the ſame manner, and conſequently are ſimilar, and therefore mutually equiangular.

3. A right line, as A B, and two adjacent angles A and B, which, taken together, are leſs than two right ones, being given; to deſcribe the *triangle* A B C. On the given line A B make the two given angles A and B: continue the ſides A C and B C till they meet in C.— Then will A B C be the *triangle* required.

Hence, one ſide and two angles being given, the whole *triangle* is determined. Wherefore, if in two *triangles* A $= a$ and B $= b$, the *triangles* are determined after the ſame manner, and therefore are ſimilar.

TRIANGLES, *menſuration of*. To find the area of a *triangle*, multiply the baſe A B, (*fig.* 131.) by the altitude C d; half the product is the area of the *triangle* A B C.

Or thus, multiply half the baſe A B by the altitude C d; or the whole baſe by half the altitude; the product is the area of the *triangle*.

E. gr.	A B = 342	A B = 342	½ A B = 171
	C d = 234	½ C d = 117	C d = 234
	1368	2394	684
	1026	342	513
	684	342	342
	2)80028(	40014	40014 area
area	40014	See QUADRATURE.	

Or, the area of any *triangle* is had by adding all the three ſides together, and taking half the ſum; and from that half ſum, ſubtracting each ſide ſeverally, and multiplying that half ſum and the remainder continually into one another, and extracting the ſquare root of the product.

Hence, 1. If between the baſe, and half the altitude, or between the altitude, and half the baſe, be found a mean proportional; it will be the ſide of a ſquare equal to the *triangle*. 2. If the area of a *triangle* be divided by half the baſe, the quotient is the altitude.

TRIANGLES, *properties of plain*. 1. If in two *triangles* ABC and abc (*fig.* 130.) the angle A be $= a$; and the ſides AB $= ab$, and A C $= ac$; then will the ſide B C $= bc$, and the angles C $= c$, and B $= b$; and therefore the whole *triangles* will be equal and ſimilar.

2. If one ſide of a *triangle* A B C, (*fig.* 132.) be continued to D, the external angle D A B will be greater than either of the internal oppoſite ones B or C.

3. In every *triangle*, the greateſt ſide is oppoſed to the greateſt angle, and the leaſt to the leaſt.

4. In every *triangle*, any two ſides taken together are greater than the third.

5. In two *triangles*, if the ſeveral ſides of the one be reſpectively equal to the ſides of the other, the angles will likewiſe be reſpectively equal; and conſequently the whole *triangles* will be equal and ſimilar.

6. If any ſide, as B C (*fig.* 133.) of a *triangle* A C B be continued to D, the external angle D O A will be equal to the two internal oppoſite ones y and z taken together.

7. In every *triangle*, as A B C, the three angles A, B, C, taken together, are equal to two right ones, or 180°.

Hence, 1. If the *triangle* be rectangular, as M K L (*fig.* 128.) the two oblique angles M and L, taken together, make a right angle, or 90°; and therefore are half right, if the *triangle* be iſoſceles. 2. If one angle of a *triangle* be oblique, the other two taken together are oblique likewiſe. 3. In an equilateral *triangle*, each angle is 60°. 4. If one angle of a *triangle* be ſubtracted from 180°, the remainder is the ſum of the other two; and if the ſum of two be ſubtracted from 180°, the remainder is the third. 5. If two angles of one *triangle* be equal to two of another, either together or ſeparately, the third of the one muſt be likewiſe equal to the third of the other. 6. Since in an iſoſceles *triangle*, D F E, (*Tab.* III. *fig.* 57.) the angles at the baſe y and u are equal; if the angle at the vertex be ſubtracted from 180°, and the remainder be divided by 2, the quotient is the quantity of each of the equal angles: in like manner, if the double of one of the angles at the baſe y be ſubtracted from 180, the remainder is the quantity of the angle at the vertex. See ISOSCELES *triangle*.

8. If in two *triangles*, A B C, and abc (*Tab.* V. *Geometry*, *fig.* 130.) A B $= ab$, A $= a$, and B $= b$; then will A C $= ac$, B C $= bc$, C $= c$, and the *triangle* A C B equal and ſimilar to the *triangle* abc.—Hence, if in two *triangles*, A C B and acb, A $= a$, B $= b$, and B C $= bc$; then will C $= c$; conſequently, A C $= ac$, A B $= ab$; and the *triangle* A C B $= acb$.

9. If in a *triangle* D F E the angles at the baſe y and u, (*Tab.* III. *Geometry*, *fig.* 57.) be equal, the *triangle* is iſoſceles: conſequently, if the three angles be equal, it is equilateral.

10. If in a *triangle* A B C, (*Tab.* V. *Geometry*, *fig.* 130.) a right line D E be drawn parallel to the baſe A C, then will B A : B C :: B D : B E :: A D : E C. And B A : A C :: B D : D E. Conſequently the *triangle* B D E ſimilar to B A C. And, *vice verſâ*, a right line, which divides two ſides of a *triangle* proportionally, is parallel to the remaining ſide. Moreover, if another right line F G be alſo drawn parallel to the baſe A C, the intercepted parts D F, E G are in the ſame ratio with the whole ſides A B, C B : *i. e.* D F : E G :: A B : B C : and if any number of lines be drawn parallel to the baſe, cutting the ſides of a *triangle*, every two correſponding ſegments will have the ſame ratio.

11. Every *triangle* may be inſcribed in a CIRCLE.

12. The ſide of an equilateral *triangle*, inſcribed in a circle, is in power triple of the radius.

13. *Triangles* on the ſame baſe, and having the ſame height, that is, being between the ſame parallel lines, are always equal. See PARALLELOGRAM.

14. Every *triangle*, as C A D, (*Tab.* III. *Geometry*, *fig.* 66.) is one half of a parallelogram A C D B on the ſame, or an equal baſe C D, and of the ſame altitude, or between the ſame parallels: or a *triangle* is equal to a parallelogram upon the ſame baſe, but half the altitude; or half the baſe, and the ſame altitude. See PARALLELOGRAM.

15. In every *triangle*, as well plain as ſpherical, the ſides or ſines of the ſides are proportional to the ſines of the oppoſite angles. See SINE.

16. In every plain *triangle*, as the ſum of two ſides is to their difference, ſo is the tangent of half the ſum of the oppoſite angles, to the tangent of half their difference. See TANGENT.

17. If a perpendicular be let fall upon the baſe of an oblique-angled *triangle*, the difference of the ſquares or the rectangle under the ſum and difference of the ſides is equal to double the rectangle under the baſe, and the diſtance of the perpendicular from the middle of the baſe.

18. The double of the ſquare of a line drawn from the vertex biſecting the baſe of any *triangle*, together with double of the ſquare of the ſemi-baſe, is equal to the ſquares of both the ſides taken together.

19. A whole *triangle* is to a *triangle* cut off by a right line, as the rectangle under the cut ſides is to the rectangle of the other two ſides.

20. In a right lined *triangle*, A D E, (*Tab.* III. *Geometry*, *fig.* 74.) a line D B drawn from the right angle of the vertex, perpendicular to the hypothenuſe, divides the *triangle* into two other right-lined *triangles*, A D B, D B E, which are ſimilar to the firſt *triangle*, and alſo to one another.

Hence it follows: 1. That E B : B D :: B D : B A; and A E : E D :: E D : E B; and A E : A D :: A D : A B. See PROPORTIONAL. Whence, 2. As the angle in a semicircle is a right angle, it follows that, if from any point D in the periphery of a semicircle A D E, a perpendicular D B be let fall upon the diameter A E, and from the same point D, to the extremities of that diameter, two chords D A, D E, be drawn; the square of that perpendicular will be equal to a rectangle under the two segments of the diameter; and the square of each chord equal to a rectangle under the whole diameter and its adjacent segment: i. e. $BD^2 = EB \times BA$; $ED^2 = EB \times EA$; and $AD^2 = AB \times EA$.

21. In every right-angled *triangle*, the square of the hypothenuse is equal to the sum of the squares of the other two sides. See HYPOTHENUSE and SUBTENSE.

22. If any angle of a *triangle* be bisected, the bisecting line will divide the opposite side, in the same proportion as the legs of the angle are to one another.

23. If the vertical angle of any *triangle* be bisected, the difference of the rectangles, made by the sides and the segments of the base, is equal to the square of the line that bisects the angle. Thus, if a right line B E (*Tab.* V. *Geom. fig.* 134.) bisect an angle A B C of a *triangle*, the square of the said line $BE = AB \times BC - AE \times EC$.

24. To divide a *triangle* into any given number of equal parts; divide the base C D, (*fig.* 135.) into as many equal parts as the figure is to be divided into; and draw the lines A 1, A 2, &c.

25. If in similar *triangles* from any two equal angles to the opposite *sides* two right lines be drawn, making equal angles with the homologous sides; those right lines will have the same ratio as the sides on which they fall, and also divide those sides proportionally.

26. If in two *triangles* having one side common to both, from any point in that side, two lines respectively parallel to two contiguous sides be drawn, terminating in the two remaining sides, those lines will have the same ratio as the sides to which they are parallel. Hence, if these sides are equal, those lines will be also equal.

27. If through any point within a *triangle* three right lines be drawn, from the angular points to cut the opposite sides, the segments of any one side will be to each other, as the rectangles under the segments of the other sides taken alternately. Hence if the former segments be equal, the forementioned rectangles will be equal, and therefore the sides of the triangle cut proportionally, and a line connecting the points of division will be parallel to the base.

28. *Triangles* having one angle in the one equal to one angle in the other, are in the ratio of the rectangles contained under the sides, including the equal angles. Hence, if the rectangles be equal, or the sides reciprocally proportional, the *triangles* will be equal.

TRIANGLES, *properties of spherical.* See SPHERICAL *Triangle.*

TRIANGLE, in *Trigonometry.* The solution, or analysis of *triangles*, is the business of TRIGONOMETRY.

The several cases thereof are reducible to the following problems:

TRIANGLES, *solution of plane.* 1. Two angles A and C (*Tab. Trigonometry, fig.* 28.) being given, together with a side A B opposite to one of them, C; to find the side B C opposite to the other, A. The rule or canon is this: as the sine of the angle C is to the given side A B, opposite to the same; so is the sine of the other angle A, to the side required. The side B C, therefore, is commodiously found by the logarithms, from the rule given for finding a fourth proportional to 3 numbers given. See LOGARITHM.

For an example: suppose $C = 48^\circ\ 35'$, $A = 57^\circ\ 28'$, $AB = 74$. The operation will stand thus:

Log. of sine of C	9.8750142
Log. of A B	1.8692317
Log. of sine of A	9.9258681
Sum of log. of A B and of sine of A	11.7950998
Log. of B C	1.9200856.

The nearest number corresponding to which, in the table of logarithms, is 83, the quantity of the side sought.

If the hypothenuse B C of a right-angled *triangle* A B C (*fig.* 29.) were given, together with the angles, either of the sides might be had by the following proportion: as the log. of the whole sine, or radius, is to the hyp. B C, so is the sine of B to A C, or the sine of C to A B.

If the angles were given, and one side e. gr. A B, the hypothenuse B C may be had by the following proportion: as the log. of sine of C to A B, so is the log. of the whole sine or radius to the hypothenuse B C.

2. Two sides A B and B C, together with the angle C, opposite to one of them given; to find the other angles A and B. The rule is this: as one side A B is to the sine of the given angle opposite thereto C; so is the other side B C, to the sine of the angle required opposite thereto.

E. gr. Suppose $AB = 94$, $BC = 69$, $C = 72^\circ\ 15'$.

Log. of A B	1.9731279
Log. of sine of C	9.9788175
Log. of B C	1.8388491
Sum of log. of sine of C and of B C	11.8176666
Log. of sine of A	9.8445387.

The nearest number to which in the table of logarithmic SINES, is $44^\circ\ 21'$. Now, the given angle C being $72^\circ\ 15'$, the sum of the two $116^\circ\ 36'$ subtracted from 180, the sum of the three, gives $63^\circ\ 24'$, for the other angle sought, B. The side A C may be found by the first case.

In like manner, suppose, in a right-angled *triangle* (*fig.* 29.), that beside the right angle A, is given the hypothenuse B C, 49, and the cathetus A C, 36, to find the angle B; then will the operation stand thus:

Log. of B C	1.6901961
Log. of whole sine	10.0000000
Log. of A C	1.5563025
Log. of sine of B	9.8661064.

The corresponding number to which, in the table of logarithmic SINES, is $47^\circ\ 16'$; consequently, $C = 42^\circ\ 44'$. The other side A B may be easily found by the first case.

3. Two sides B A and A C, together with the included angle A, being given; to find the two remaining angles.

1. If the *triangle* A B C be rectangular; take one of the sides including the right angle, as A B, for radius; then will C A be the tangent of the opposite angle B: the rule then is—As one leg AB, is to the other A C; so is the whole sine, or radius, to the tangent of the angle B.

E. gr. Suppose B A, 79, and A C, 54;

Log. of B A	1.8976271
Log. of A C	1.7323938
Log. of whole sine	10.0000000
Log. of tang. of B	9.8347667.

The nearest corresponding number to which, in the table of logarithmic SINES, &c. is $34^\circ\ 21'$; consequently, the 2 legs, the angle C is $55^\circ\ 39'$. Having the angles and 2 legs, the hypothenuse may be easily found by the first case.

2. If the angle A be oblique (*fig.* 28.) the rule is, as the sum of the given sides A B and A C is to their difference; so is the tangent of half the sum of the sought angles C and B, to the tangent of half the difference. Adding, therefore, the half difference, to the half sum; the aggregate will be the greater angle C; and subtracting the half difference from the half sum, the remainder is the less angle B.

E. gr. Suppose $AB = 75$, $AC = 58$, $A = 108^\circ\ 24'$; then

will	$AB = 75$	$AB = 75$	$A + B + C = 180^\circ\ 00'$
	$AC = 58$	$AC = 58$	$A = 108\ \ 24$
Sum.	133	differ. 17	$BC = 71\ \ 36$
			$\frac{1}{2}(B + C) = 35\ \ 48$

Log. of A B + A C,	2.1238516
Log. of A B—A C,	1.2304489
Log. of tan. $\frac{1}{2}(B + C)$	9.8580694
Sum of log.	11.0885183
Log. of tang. $\frac{1}{2}(C - B)$	8.9646667.

The nearest corresponding number to which is $5^\circ\ 16'$.

$\frac{1}{2}(B + C) = 35^\circ\ 48'$	$\frac{1}{2}(B + C) = 35^\circ\ 48'$
$\frac{1}{2}(C - B) = 5^\circ\ 16'$	$\frac{1}{2}(C - B = 5^\circ\ 16'$
$C = 41^\circ\ 4'$	$B = 30^\circ\ 32'$

If the other side C B were required, having found the angles that may be easily had by the first case.

4. The three sides, A B, B C, and C A (*fig.* 30.) being given, to find the angles, A, B, and C. From the vertex of the angle A, with the extent of the least side A B, describe a circle: then will C D be = the sum of the legs A C and A B; and C F their difference. The rule then is,

As the base B C is to the sum of the legs C D, so is the difference of the legs C F, to the segment of the base C G. This segment, thus found, being subtracted from the base C B, the remainder is the chord G B. Then, from A to the chord G B let fall the perpendicular A E; thus will $BE = EG = \frac{1}{2}GB$.

Thus in a rectangled *triangle*, A E B, the sides A B and

and B E being given; or, in a rect-angled *triangle*, A C E, the sides A C and C E being given: the angles B and A are found.

E. gr. Suppose A B = 36, A C = 45, B C = 40.

A C = 45	A C = 45
A B = 36	A B = 36
A C + A B = 81	F C = 9

Log. of B C = 1.6020600
Log. of A C + A B = 1.9084850
Log. of F C = 0.9542425

Sum of log. = 2.8627275

Log of C G = 1.2606675. The nearest corresponding number to which, in the table, is 18.22.

B C = 40.00	E G = 10.89
C G = 18.22	C G = 18.22
B G = 21.78	C E = 29.11

B E = 10 89
Log. of A B = 1.5563025
Log. of whole sine = 10.000000
Log. of E B = 1.0370279

Log. of sine of E A B = 9.4807254. The corresponding number to which, in the tables, is 17° 36'; consequently, the angle A B E 72° 24'.

Log. of A C = 1.6532125
Log. of whole sine 10.0000000
Log. of C E = 1.4640422

Log. of sine of E A C = 9.8108297. To which the nearest correspondent number, in the tables, is 40° 18'; therefore A C E 49° 42'; and C A B 57° 54'.

Solution of right-angled spherical TRIANGLES, *by the common rules.* 1. In a right-angled spherical *triangle*, any two parts, beside the right angle, being given, to find any of the rest.

1. Consider whether the parts, which come to the question, be conjunct or disjunct (see PART). If the disjunct be opposite to each other; as, if the hypothenuse B C, and the angle C (*fig.* 31.), be given, to find the opposite leg A B; then the rule is—As the whole sine is to the sine of the hypothenuse B C, so is the sine of the angle C, to the sine of the opposite leg A B. 2. If the disjunct parts be not opposite to each other; as, if A B, and the adjacent angle B, be given for the opposite angle C; the sides of the *triangle* are to be continued one way, till they become quadrants, that you may thus have a new *triangle*; wherein the parts that come into the question are mutually opposite to each other; as, in our case, the *triangle* E B F wherein we have given B F, the complement of the leg A B, and the angle B for E F, the complement of the angle C. The rule then is, as the whole sine is to the sine of B F; so is the sine of the angle B to the sine E F, or co-sine of C. 3. If the hypothenuse be not among the conjunct parts, as if the legs A B and A C be given for an angle opposite to one of them; the rule is—as the sine of A C is to the whole sine; so is the tangent of A B to the tangent of C.

4. But if the hypothenuse be found among the conjunct parts, as if the hypothenuse B C, and the angle C, be given, to find the adjacent side A C; the sides of the *triangle* are to be continued one way till they become quadrants, as they may have a new *triangle*, wherein the hypothenuse is not among the parts that come into the question; *e. gr.* in our case, the *triangle* E B F, wherein are given the complement E B of the hypothenuse B C, and the complement of the angle C, and the angle F the complement of the leg A C. Since then, in the *triangle* E F B, the hypothenuse does not come in the question, the rule is as before:

As the sine of E F, or co-sine of C, is to the whole sine; so is the tangent of E B, or co-tangent of B C, to the tangent of F, or co-tangent of A C.

5. When the sides of a *triangle* are to be continued, it is the same thing which way soever they be produced, provided no acute angle come into the question, otherwise the sides are to be continued through the other oblique one. And if both be in the connection, the sides are to be continued through that adjacent to the side in question.

By this means a *triangle* is always obtained wherein the thing required is found, either by the rule of sines or tangents.

Solution of right-angled spherical TRIANGLES, *by one catholic rule.* Consider, as before, whether the parts that come in question be conjunct or disjunct. See PART.

If either one, or both the sides, including the right angle, come into the question; for it, among the data, write its complement to a quadrant. Since then by the catholic rule, delivered under the article TRIGONOMETRY, the whole sine, with the sine complement of the middle part, must be equal to the sines of the disjunct parts, and the co-tangents of the conjunct parts; from the sum of those data subtract the third datum; the remainder will be some sine or tangent, the side or angle corresponding to which, in the artificial canon of *triangles*, is the side or angle sought.

This universal rule being of great service in trigonometry, we shall apply it to the various cases thereof, and illustrate it with examples; which examples, in the case of disjunct or separate parts, will at the same time illustrate the common method; but in the case of contiguous parts they admit of other solutions. 1. Given the hypothenuse B C, 60°, and the angle C, 23° 30'; to find the opposite leg A B (*fig.* 22). Since A B is the middle part, C and B C are disjunct (see PART); the product of the whole sine, into the co-sine of the complement A B, i. e. the sine itself of A B, is equal to the product of the sines of C and B C.

Therefore from the log. sine of C 9.6006997
+ Sine of B C 9.9375306

Sum 19.5382303
Subtract whole sine 10.0000000
Remains sine of A B 9.5382303. The nearest corresponding number to which, in the canon, is 20° 12'.

2. Given the hypothenuse B C, 60°, and the leg A B, 20° 12'; to find the opposite angle C. It is evident from the preceding problem, that from the sum of the whole sine, and the sine of the leg A B, the sine of the hypothenuse B C is to be subtracted, the remainder is the sine of the angle C. The example therefore of the former case is easily converted into an example of this.

3. Given the leg A B, 20° 12', and the opposite angle C 23° 30'; to find the hypothenuse B C. It is evident from the first case, that from the sum of the whole sine, and the sine of A B, is to be subtracted the sine of the angle C, and the remainder is the sine of the hypothenuse B C.

4. Given the hypothenuse B C, 60°, and one leg A B, 20° 12'; to find the other leg. Since B C is a mean part, and A B and A C are disjunct parts, the product of the whole sine, into the co-sine of the hypothenuse B C, is equal to the product of the sines of the complements, i. e. the co-sines of the legs A B and A C.

Therefore from the whole sine 10.0000000
Co-sine of B C 9.6989700

Sum 19.6989700
Subtract co-sine of A B 9.9724310

Remains co-sine of A C 9.7265390. The corresponding number to which, in the canon, is 32° 11'; therefore A C = 57° 49'.

5. Given the legs A C, 57° 49', and A B, 20° 12'; to find the hypothenuse B C. It is evident from the preceding case, that the whole sine is to be subtracted from the sum of the co-sines of the legs A B and A C; the remainder is the co-sine of the hypothenuse B C. The example, therefore, of the preceding case is easily applied to this.

6. Given the legs, A C, 57° 49', and the adjacent angle C, 23° 30'; to find the opposite angle B. Since B is a middle part, and A and C are disjunct parts; the product of the whole sine, by the co-sine of B, is equal to the product of the sine of C, and the sine of the complement, i. e. the co-sine of A C.

Therefore from the sine of C 9.6006997
Co-sine A C 9.7265310

Sum 19.3272307
Subtract whole sine 10.0000000

Remains co-sine of B 9.3272307. The nearest number corresponding to which, in the canon, is 12° 15'; therefore B = 77° 45'.

7. Given the leg A C, 57° 49', and the opposite angle B, 77° 45', to find the adjacent angle C. It is evident from the preceding case, that the co-sine of A C is to be subtracted from the sum of the whole sine, and the co-sine of B; the remainder is the sine of C. The former example, therefore, is easily accommodated to the present case.

8. Given the oblique angles B, 77° 45', and C, 23° 30'; to find the leg adjacent to the other, A C. From problem the sixth, it is evident, that the sine of C is to be subtracted from the sum of the whole sine, and the cosine of B; and that the remainder is the co-sine of A C.

The

The example of the sixth problem may be easily applied to this.

9. Given the leg AC, 57° 49′, and the adjacent angle C, 23° 30′; to find the opposite leg AB. Since AC is a mean part, and C and AB conjunct parts, the product of the whole sine, by the sine of AC, is equal to the product of the co-tangent of C, and the tangent of AB.

Therefore from the whole sine 10.0000000
Sine of AC 9.9275490

Sum 19.9275490
Subtract co-tangent of C 10.3616981
Remains tangent of AB 9.5658519. To which the nearest corresponding number, in the canon, is 20° 12′.

10. Given the leg AB, 20° 12′, and the opposite angle C, 23° 30′, to find the adjacent leg AC. From the sum of the co-tangent of C, and the tangent of AB, subtract the whole sine; the remainder is the sine of AC.

11. Given the legs AB, 20° 12′, and AC, 57° 49′; to find the angle C, opposite to one of them. From the sum of the whole sine, and sine of AC, subtract the tangent of BA; the remainder is the co-tangent of C.

12. Given the hypothenuse BC, 60°, and the oblique angle C, 23° 30′, to find the adjacent leg AC. Since C is a middle part, and BC and AC conjoint parts; the product of the whole sine, into the co-sine of C, will be equal to the product of the co-tangents of AC and BC.

Therefore from the whole sine 10.0000000
Co-sine of C 9.9623978

Sum 19.9623978
Subtract co-tangent of BC 9.7614394
Remains tangent of AC 10.2009584. The nearest number corresponding to which, in the tables, is 57° 49′.

13. Given the leg AC, 57° 49′, and the adjacent angle C, 23° 30′; to find the hypothenuse BC.
From the sum of the whole sine, and the co-sine of C, subtract the tangent of AC, the remainder is the co-tangent of BC.

14. Given the hypothenuse BC 608, and the leg AC 57° 49, to find the adjacent angle C.
From the sum of the co-tangent of BC, and tangent of AC, subtract the whole sine; and the remainder is the cosine of C.

15. Given the hypothenuse BC, 60°, and one angle C, 23° 30′; to find the other, B.
Since BC is the middle part, and B and C disjunct parts, the product of the whole sine, into the co-sine of BC, will be equal to the product of the co-tangents of B and C; and

Therefore from the whole sine 10.0000000
Co-sine of BC 9.6989700

Sum 19.6989700
Subtract co-tangent of C 10.3616981
Remains co-tangent of B 9.3372719. The nearest corresponding number to which, in the canon, is 12° 16′; therefore B is 77° 44′.

16. Given the oblique angles B, 77° 44′, and C, 23° 30′, to find the hypothenuse BC. From the sum of the co-tangents of C and B, subtract the whole sine; the remainder is the co-sine of BC.

Solution of oblique-angled spherical TRIANGLES. 1. In an oblique-angled spherical *triangle* ABC (*Tab. Trigonometry, fig.* 32.) two sides AB and BC being given, together with an angle A, opposite to one of them, to find the other C: the rule is,
As the sine of the side BC is to the sine of the opposite angle A; so is the sine of the side BA to the sine of the opposite angle C.
Suppose, for example, BC, 39° 29′; A, 43° 20′; BA, 66° 45; then will

Sine of BC 9.8033572
Sine of A 9.8364771
Sine of BA 9.9632168

19.7996939
Sine of C 9.9963367. The nearest corresponding number to which, in the tables, is 82° 34′.

2. Given two angles C, 82° 34′, and A, 43° 20′, together with the side AB, 66° 45′, opposite to one of them C; to find the side BC opposite to the other of them A; say, as the sine of the angle C is to sine of the opposite side AB, so is the sine of the angle A to the sine of the opposite side BC. The former example may suffice for the present case.

3. Given two sides AB, 66° 45′, and BC, 39° 29′, together with an angle opposite to one of them A, 43° 20′, to find the angle included by them B. Suppose the angle C to be acute, since the other, A, is also acute, the perpendicular BE falls in with the *triangle*. In the rectangled *triangle* ABE, therefore, from the given angle A, and side AB, find the angle ABE. Since BE is assumed as a lateral part in the *triangle* AEB, the angle EBC is a middle part, and the side BC must be a conjoint part: the co-sine of the angle EBC will be found by subtracting the co-tangent of AB from the sum of the co-sine of the angle ABE, and the co-tangent of BC. If then the angles ABE and EBC be added together, or in case the perpendicular fall without the *triangle*, be subtracted from each other, you will have the angle required B.

E. gr. whole sine 10.0000000
Co-sine of AB 9.5963154

Sum 19.5963154
Co-tang. of A 10.0252805

Co-tang. of ABE 9.5710349. The nearest number corresponding to which, in the tables, is 20° 26′. ABE, therefore, is 69° 34′.

Co-sine of ABE 9.5429713
Co-tang. of BC 10.0841529

Sum 19.6271242
Co-tang. of AB 9.6330985

Co-sine of EBC 9.9940257. The nearest number corresponding to which, in the tables, is 9° 29′; therefore ABC is 79° 3′.

4. Given two angles A, 43° 20′, and B, 79° 3′, together with the adjacent side AB, 66° 45′; to find the side BC opposite to one of them.
From one of the given angles B, let fall a perpendicular EB to the unknown side of AC; and in the rectangled *triangle* ABE from the given angle A, and hypothenuse AB, find the angle ABE; which, subtracted from the angle ABC, leaves the angle EBC. But if the perpendicular shall fall without the *triangle*, the angle ABC should have been subtracted from ABE. Since as the perpendicular BE is taken for one of the lateral parts, the middle part in the *triangle* ABE is the angle B, and the conjoint part AB; in the *triangle* EBC the middle part is the angle B, and the conjunct part BC; the co-tangent of the side BC is found by subtracting the co-sine of EBA from the sum of the co-tangent of AB, and the co-sine of EBC. The example of the preceding case is easily applied to this.

5. Given two sides AB, 66° 45′, and BC, 39° 29′, with the angle A opposite to one of them, 43° 20′; to find the third side AC.
Letting fall, as before, the perpendicular BE; in the rectangled *triangle* ABE, from the given angle and hypothenuse AB, find the side AE. Since assuming BE for a lateral part in the *triangle* AEB, AB is the middle part, and AE is the separate part; and in the *triangle* BEC, BC is the mean part, and EC a disjunct part; the co-sine of EC is found by subtracting the co-sine of AB from the sum of the co-sines of AE and CB. If then the segments AE and EC be added together, or in case the perpendicular fall without the *triangle*, be subtracted from each other, the side AC will be had.

6. Given two sides AC, 65° 31′, and AB 66° 45′, together with the included angle A, 43° 20′; to find the third side BC opposite thereto.
Letting fall the perpendicular BE, find, in the rectangled *triangle*, the segment AE; which, subtracted from AC, leaves EC. If the perpendicular fall without the *triangle*, AC is to be subtracted from AE. Since by assuming the perpendicular BE for a lateral part in the *triangle* AEB, AB becomes a middle part, and AE a separate part: in the *triangle* EBC, CB is the middle part, EC a separate part: the co-sine of BC is found by subtracting the co-sine of AE from the sum of the co-sines of AB and EC.

7. Given two angles A, 43° 20′, and B, 79° 3′, together with the side CB, 39° 29′, opposite to one of them; to find the side AB adjacent to both.
Letting fall the perpendicular CD from the unknown angle C, to the opposite side AB; and that falling within the *triangle*; from the given angle B, and the hypothenuse BC, seek in the rectangled *triangle* BCD for the segment BD. Since, assuming the perpendicular CD for a lateral part in the *triangle* CDB, DB is the mean part, and the angle B a conjunct part; and in the *triangle* CDA, AD is the middle part, and the angle A a conjunct part: the sine of the segment AD is found by subtracting the co-tangent of the angle B from the sum of the sine of DB, and the co-tangent of the angle A. If then the segments AD and DB be added, or in case the perpendicular fall without the *triangle*, be subtracted from each other, the result will be the side AB required.

8. Given

8. Given two ſides A B, 66° 45′, and B C, 39° 29′, with the included angle 79° 3′; to find the angle A oppoſite to one of them.

Letting fall the perpendicular CD, find the ſegment BD, as in the preceding problem. This, ſubtracted from A B, leaves A D. If the perpendicular fall without the *triangle*, A B is to be added to DB. And ſince, by aſſuming the perpendicular C D for a lateral part in the *triangle* C D B, B D is the middle part, and the angle B a conjoint part; and in the *triangle* C D A, A D is the middle part, and the angle A a conjoint part, the co-tangent of the angle A is found by ſubtracting the ſine of D B from the ſum of the co-tangent of the angle B, and of the ſine of A D.

9. Given two angles A, 43° 20′, and B, 79° 3′, together with the adjacent ſide A B, 66° 45′; to find the angle C oppoſite to the ſame.

From one of the given angles B, letting fall the perpendicular B E, to the oppoſite ſide A C; in the rectangled *triangle* A B E, from the given angle A, and hypothenuſe A B, we find the angle A B E; which, ſubtracted from A B C, leaves the angle E B C. In caſe the perpendicular fall without the *triangle*, A B C is to be ſubtracted from A B E. Since, by aſſuming B E for a lateral part in the *triangle* C E B, the angle C is a middle part, and the angle C B E a disjunct part, and in the *triangle* A B E, the angle A is the middle part, and the angle A B E the disjoint part: the co-ſine of the angle C is found by ſubtracting the ſine of the angle A B E, from the ſum of the co-ſine of the angle A, and the ſine of E B C.

10. Given two angles A, 43° 20′, and C, 82° 34′, together with a ſide B A, 66° 45′, oppoſite to one of them; to find the other angle.

From the ſought angle B, let fall a perpendicular B E; and in the right-angled *triangle* A E B, from the given angle A, and hypothenuſe B A, find the angle A B E. Since, aſſuming the perpendicular E B for a lateral part in the *triangle* ECB, the angle C is the middle part, and the angle C B E a disjunct part; and in the *triangle* A B E, the angle A is the middle part, and the angle A B E is a disjunct part: the ſine of the angle E B C is found by ſubtracting the co-ſine of A from the ſum of the co-ſine of C, and of the ſine of A B E. If then ABE and EBC be added, or in caſe the perpendicular fall without the *triangle*, be ſubtracted from each other, the reſult will be the angle required A B C.

11. Given the three ſides, to find an angle oppoſite to one of them. 1. If one ſide A C (*fig.* 19.) be a quadrant, and the leg AB be leſs than a quadrant, find the angle A. Continue A B to F, till A F become equal to a quadrant; and from the pole A draw the arch CF, to cut the arch B F at right angles in F. Since in the rectangled *triangle* C B F, we have given the hypothenuſe B C, and the ſide F B, or its complement A B to a quadrant; we ſhall find the perpendicular C F, which being the meaſure of the angle C A B, that angle is found of courſe,

2. If one ſide A C be a quadrant, and the other A B greater than a quadrant, ſeek again the angle A: from A B ſubtract the quadrant, A D, and from the pole A deſcribe the arch C D, cutting the arch A B at right angles in D. Since in the rectangled *triangle* C D B, the hypothenuſe B C, and ſide D B, or exceſs of the ſide A B beyond a quadrant, is given, the perpendicular C D will be found as before, which is the meaſure of the angle A required.

3. If the *triangle* be iſoſceles, and A C = C F; and the angle A C F be required; biſect A F in D, and through D and C draw the arch D C. Since D C is perpendicular to A F, the angles A and F, and A C D, and D C F, are equal; from the hypothenuſe A C, and leg A D, given, in the rectangled *triangle* A C D, we find the angle A C D; the double whereof is the angle required A C F: and from the ſame data may the angle A or F be found.

4. If the *triangle* be ſcalenous, and the angle A (*fig.* 32.) be required; from C let fall the perpendicular C D, and ſeek the ſemi-difference of the ſegments A D and D B, by ſaying, as the tangent of half the baſe A B is to the tangent of half the ſum of the legs A C and C B; ſo is the tangent of their ſemi-difference to the tangent of the ſemi-difference of the ſegments A D and D B: add then the ſemi-difference of the ſegments to the half baſe, to find the greater ſegment; and ſubtract the ſame from the ſame for the leſs. Thus having in the rectangled *triangle* C A D, the hypothenuſe A C, and the ſide AD, the angle A is found thence. After the ſame manner is B found in the other C D B, from C B and D B given.

12. Given the three angles A, B, and C, to find any of the ſides. Since in lieu of the given *triangle*, another may be aſſumed, whoſe ſides are equal to the given angles, and the angles to the given ſides; this problem is reſolved after the ſame manner as the preceding one.

Triangle, Triangulum, in *Aſtronomy*, a name which is common to two conſtellations; the one in the northern hemiſphere, called ſimply *triangulum*, or *triangulum cœleſte*; the other in the ſouthern hemiſphere, called *triangulum auſtrale*.

The ſtars in the northern *Triangle* in Ptolemy's Catalogue are 4; in Tycho's as many; in Hevelius's 12; in the Britannic 16; the longitudes, latitudes, magnitudes, &c. whereof, are as follow:

Names and ſituations of the ſtars.	Bayer's char.	Signs.	Longitud.	Latitude.	Magnitude.
			° ′ ″	° ′ ″	
That preceding the vertex	d	♉	0 05 17	17 39 08	6
Vertex of the triangle	α		2 30 51	16 48 23	4
That following the vertex	ι		6 00 25	19 28 00	6
Firſt of three in the baſe	β		7 59 44	20 34 17	4
			7 18 45	17 06 18	7
5.					
Firſt of 3 inform. under triangle	ι		6 52 35	15 59 02	6
Contig. to the laſt of the baſe	η		8 42 40	18 34 12	6
Middle one of the baſe	δ		9 09 43	19 21 32	5
Laſt of the baſe	γ		9 10 21	18 56 07	4
S. of inform. under the triangle	a		7 38 31	13 55 26	6
10.					
	d		10 32 52	16 16 32	7
Laſt of theſe informes	c		9 59 34	14 14 03	6
A former contiguous to it			10 12 15	14 24 24	7
			13 08 28	20 00 37	6
			13 15 01	18 26 18	7
15.					
			12 56 17	8 12 12	7

The ſtars in the ſouthern *Triangle*, in Mr. Sharp's catalogue are five, the longitudes, latitudes, magnitudes, &c. of which are as follow.

Names and ſituations of the ſtars.	Signs.	Longitud.	Latitude.	Magnitude.
		° ′ ″	° ′ ″	
In the vertex	♐	17 01 49	46 04 51	2.3
North of the baſe		8 04 26	41 50 10	3
Following this		11 01 33	41 32 41	5
South of the baſe		5 35 03	48 01 32	3
In the middle of the baſe		6 40 17	45 12 48	5.
5.				

Triangle, *arithmetical*, a kind of numerical *triangle* invented by M. Paſcal, and formed in the following manner:

1	1			
1	2	1		
1	3	3	1	
1	4	6	4	1
1	5	10	10	5
1	6	15	20	&c.
1	7	21	&c.	
1	8	&c.		
1	9			

The firſt vertical column contains unit; the ſecond a ſeries of the natural numbers 1, 2, 3, 4, 5, &c. the third a ſeries of triangular *numbers*, 1, 3, 6, 10, &c. the fourth a ſeries of pyramidal *numbers*, &c. The numbers taken horizontally are the co-efficients of the different powers of a binomial.

M. Paſcal wrote a treatiſe on the *arithmetical triangle*, which is contained in the fifth volume of his works, publiſhed at Paris and the Hague in 1779, in five volumes, 8vo. In this publication we have alſo a deſcription, taken from the firſt volume of the French Encyclopedie, art. Arithmetique *machine*, of that admirable machine invented by Paſcal at the age of nineteen, which furniſhes an eaſy and expeditious method of making all ſorts of arithmetical calculations, without any other aſſiſtance than the eye and the hand.

Triangular *battalion*, in the *Military Art*. See Battalion.

Triangular *canon*. See Canon and Sine.

Triangular *compaſſes*, are ſuch as have three legs or feet, whereby to take off any triangle at once: theſe are much uſed in the conſtruction of maps, globes, &c. See Compasses *of three legs*.

Triangular *fort*. See Fort.

Triangular *leaf*, in *Botany*. See Leaf.

Triangular *numbers*, are a kind of polygonal numbers; being the ſums of arithmetical progreſſions, the difference of whoſe terms is 1.

Thus, Of arithmetical progreſs	1	2	3	4	5	6
are formed *triang. numb.*	1	3	6	10	15	21.

For the rationale and management of theſe numbers, ſee Malcolm's Arith. book v. ch. 2.

TRIANGULAR *quadrant*, is a SECTOR furniſhed with a looſe piece, whereby to make it an equilateral triangle. The calendar is graduated thereon, with the ſun's place, declination, and other uſeful lines; and by the help of a ſtring and a plumbet, and the diviſions graduated on the looſe piece, it may be made to ſerve for a QUADRANT.

TRIANGULAR *winding-ſtairs*. See STAIR.

TRIANGULARIS, in *Anatomy*, a name given to two muſcles, in reſpect of their figure.

The *triangularis pectoris*, which has ſometimes the appearance of three or four diſtinct muſcles, ariſes from the inſide of the ſternum, and is implanted into the cartilages which join the four loweſt true ribs to the ſternum.

The action of this muſcle is very obſcure, ſince both the origination and inſertion are at parts, not moveable, but together. Dr. Drake conjectures it may conduce towards forming the neceſſary incurvation of the ſternum, and by its over-tenſion in children, while the cartilages are ſoft, may occaſion that morbid acumination of the ſternum ſeen in rickety children. Others ſuppoſe it may contract the cavity of the thorax in expiration. See PECTORALIS and STERNOCOSTALES.

TRIANGULARIS *coccygis*, in *Anatomy*, a name given by Santorini, and others, to the muſcle now generally called ſimply COCCYGÆUS.

TRIANGULARIS *labii*. See DEPRESSOR *labii ſuperioris*.

TRIANGULARIS *penis*, in *Anatomy*, a name given by Morgagni, and others, to a ſuppoſed muſcle, called alſo by ſome *dilatator penis*, and *dilatator poſticus urethræ*; and by others *levator ani*.

It is truly no diſtinct muſcle, but a proceſs of the SPHINCTER *ani* running into the perinæum. See TRANSVERSALIS *penis*.

TRIANGULARIS *piſcis*, in *Ichthyology*, the name of a ſea-fiſh of a very remarkable figure, called in Engliſh the *coney-fiſh*, of which there are two ſpecies, the one having two horns, the other wanting that character.

The horned kind is uſually ſix or ſeven fingers breadth long, and about three fingers broad; the tail ends in a longiſh fin; the mouth is ſmall, having twelve ſtrong ſerrated teeth in the upper jaw, and eight larger ones in the lower; the head riſes gibbouſly from the mouth to the horns, and the back is humped in the middle; it has only one ſmall fin near the tail; its eyes are large and placed near the horns; beſide the fin near the tail, it has four others; the tail being one, and one more being ſituated on the back, and two on the belly; it has two horns like cocks ſpurs, growing ſtraight out of its forehead, and two others in a contrary direction, out of its belly near the tail; it has no ſcales, but has a hard ſkin, white on the belly, and brown every where elſe, and wonderfully marked with trigonal, tetragonal, and pentagonal and hexagonal figures.

The ſpecies which has no horns, has a broader belly, a longer tail, and is marked all over its body only with hexangular figures, and innumerable ſmall tubercles; its belly is yellowiſh, and the reſt of its body of a greyiſh or browniſh yellow; the mouth is narrow, and the teeth ſmall, five in the lower and eleven in the upper jaw; the eyes are large and round; it is hollow, and has very little fleſh. See *Tab.* V. *of Fiſh*, Nº 60.

Both theſe ſpecies, which belong to the genus OSTRACION in the Linnæan ſyſtem, are caught among the rocks, on the ſhores of the iſland of Java, and are ſometimes eaten by the inhabitants, being firſt ſkinned. Cluſ. Exot. lib. ii. cap. 27. Willughby's Hiſt. Piſc. p. 150.

TRIANGULARIS *ſplenii*, in *Anatomy*, a name given by Spigelius and others, to a muſcle of the head called by Winſlow, the upper portion of the SPLENIUS, or *ſuperior maſtoidæus*, and by Albinus, the *ſplenius capitis*. The old authors have deſcribed it under the name of the *primus caput moventium*.

TRIANTHEMA, *horſe-purſlane*, in *Botany*, a genus of the *decandria monogynia* claſs. Its characters are theſe: the calyx is ſharp-pointed at the apex; it has no corolla; the germen is blunted, and the capſule is cut tranſverſely. There are three genera.

TRIARII, in the *Roman Militia*, a kind of infantry, armed with a pike, ſhield, a helmet, and a cuiraſs; they were thus called, becauſe they made the third line of battle.

The *triarii* were alſo called *poſtſignani*, becauſe ranged behind the principes who bore the ſtandard in a legion. Polybius diſtinguiſhes four kinds of forces in the Roman army: the firſt, called *pilati*, or *velites*, he ſays were a raw ſoldiery, lightly armed. The *haſtati*, or ſpear-men, were a degree older, and more experienced. The third, called *principes*, princes, were ſtill older, and better ſoldiers than the ſecond. The fourth were the oldeſt, the moſt experienced, and the braveſt; theſe were always diſpoſed in the third line, as a corps de reſerve, to ſuſtain the other two, and to reſtore the battle, when the others were broken or defeated.

Hence their name of *triarii*: and hence the proverb, *Ad triarios ventum eſt*, to ſhew that one is at the laſt and hardeſt ſtruggle.

TRIAS *harmonica*, or the *harmonical* TRIAD, in *Muſic*, a compound of three radical ſounds, heard all together; two whereof are a fifth and a third above the other, which is the fundamental.

The *triad* is properly a conſonance formed of a third and fifth; which, with the baſe, or fundamental ſound, makes three different terms, whence the name *trias*.

That of *harmonical* is doubtleſs given it from that wonderful property of the FIFTH, which divides itſelf naturally into two thirds, both excellent, and perfectly harmonical; ſo that this one ſound, diſpoſed between two others, makes two thirds at once, and of conſequence a double harmony.

Hence it is, that in *trios*, particularly, this concord is preferred to that which divides the octave into a fifth and a fourth; in regard here, if there be a concord on one ſide, there is a diſcord on the other; whereas in the former caſe the harmony is complete on both ſides.

Of the three ſounds which compoſe the harmonical *triad*, the graveſt is called the *fundamental*, or *baſs*; the acuteſt, i. e. that which makes the fifth, and which terminates the concord upwards, is called the *excluded* or *higheſt* ſound; and that which divides the fifth ſo agreeably into two thirds, is called the *harmonical mean*.

The diviſion of the fifth into two thirds may be performed two ways, viz. 1. Harmonically, when the greater third is loweſt, and the leſs above; in which caſe the *triad* is perfect and natural.

2. Arithmetically, when the leſs third is loweſt, and the greater above, in which caſe the *triad* is imperfect and flat. Both are good; but the latter is not to be often uſed.

TRIBE, TRIBUS, in *Antiquity*, a certain quantity or number of perſons; when a diviſion is made of a city or people into quarters, or diſtricts.

The city of Athens was divided into ten *tribes*. The Jewiſh nation into thirteen *tribes*, the deſcendants of the twelve ſons of Jacob, viz. the *tribes* of Judah, of Reuben, Gad, Aſher, Dan, Naphthali, Ephraim, Manaſſeh, Simeon, Levi, Iſſachar, Zebulun, and Benjamin; the poſterity of Joſeph being divided into two *tribes*, that of Manaſſeh, and that of Ephraim.

There were ten of theſe *tribes* that revolted, and followed Jeroboam. The other two, viz. thoſe of Judah and Benjamin adhered to the houſe of David, and to the worſhip of the true God, whilſt the other *tribes* declared for idolatry.

The Roman people were at firſt only divided into three *tribes*; and from this number *three*, *tres*, it was that the word *tribe*, *tribus*, took its riſe. This diviſion was accommodated by Romulus to the ſeveral nations he had united; the firſt conſiſted of the Albans, the ſecond of the Sabines, and the third of a mixture of fugitives, who came to ſeek an aſylum at Rome.

Servius Tullus, fearing this partition might occaſion ſeditions, divided the inhabitants of Rome by cantons, not by nations: accordingly, he diſtributed the city into four quarters, or *tribes*; and by reaſon a great number of citizens had retired into the country about, of thoſe he compoſed twenty-ſix other *tribes*; ſo that from this time the Roman people conſiſted of thirty *tribes*.

In after times, the number of *tribes* was increaſed to thirty-five; but they then ceaſed to be ranged according to the quarters of the city. The diſtribution depended on the cenſors, who formed their liſt at diſcretion, frequently confounding the country *tribes* with thoſe of the city.

A man was never abſolutely a Roman citizen, unleſs he had the *jus tribus*, *i. e.* till he were intitled to the honours of the magiſtrature, as alſo a right of voting in aſſemblies of the people; and this is what they called *jus quiritium*. Hence, the inhabitants of the municipal cities were only imperfect citizens, as being of no *tribe*.

The freed-men were obliged to purchaſe this *right of tribe*, which did not otherwiſe belong to them, though they were citizens of Rome.

The names of the thirty-five *tribes* were, 1. the Palatina; 2. the Suburrana; 3. the Collina; 4. the Eſquilina; 5. the Romilia; 6. the Æmilia; 7. the Cruſtumina; 8. the Cornelia; 9. the Fabia; 10. the Galeria; 11. the Lemonia; 12. the Mentian, or Menenia; 13. the Ocriculana; 14. the Papiria; 15. the Pollia; 16. the Popilia; 17. the Pupinia; 18. the Sergia; 19. the Veientina;

tina; 20. the Voltinia; 21. the Claudia; 22. the Stellatina; 23. the Tromentina; 24. the Arnensis; 25. the Sabatina; 26. the Pomptina; 27. the Publilia; 28. the Mæcia; 29. the Scaptia; 30. the Ousentina; 31. the Falerina; 32. the Aniensis; 33. the Terentina; 34. the Velina; 35. the Quirina. In ancient authors, and inscriptions, we meet with the names of others, viz. the Pinaria, Sappinia, Camilla, Cestia, Cluentia, &c.

TRIBOMETER, formed of τριβω, *I rub*, and μετρω, *I measure*, in *Mechanics*, a term applied by Muschenbroeck to an instrument invented by him for estimating the friction of metals. It consists of an axis formed of hard steel, passing through a cylindric piece of wood; the ends of the axis, which are highly polished, are made to rest on the polished semicircular cheeks of various metals, and the degree of friction is estimated by means of a weight suspended by a fine silken string or ribband over the wooden cylinder. For a farther description and figure of this instrument, and the results of various experiments performed with it: see Muschenb. Int. ad Phil. Nat. vol. i. p. 151, &c.

TRIBRACHYS, formed from τρεις, *three*, and βραχυς, *short*, in the *Ancient Prosody*, a foot of verse, consisting of three syllables, and those all short—as, *Mĕlĭŭs*.

Some of the ancients call this foot *trochæus*.

TRIBUCH, and TREBUCHET, a tumbrel, ducking or CUCKING-*stool*. See SCOLDS.

TRIBULASTRUM, in *Botany*, a name given by Jussieu to a genus of plants, since called by Linnæus NEURADA.

TRIBULOIDES, in *Botany*, the name of a genus of plants, the same with the TRAPA of Linnæus.

TRIBULUS, *caltrop*, in *Botany*. See CALTROPS.

TRIBULUS *marinus*, the *caltrop-shell*, in *Natural History*, the name of a peculiar species of the PURPURA. It is of a whitish colour, and has three rows of spines.

TRIBUNAL, *judgment-seat*, the seat of a JUDGE.

The *tribunal*, in a court of justice, is properly the seat or BENCH whereon the judge, and his associates, are placed, for the administration of justice, &c.

The word is Latin, and takes its origin from a seat raised from the ground, wherein the *tribune* of the Roman people was placed to administer justice.

TRIBUNAL, among the *Ancients*, was also a place from whence the people were harangued.

Among the Romans, it was an eminence in a temple, or the forum, as that called *pro rostris*, where the people were harangued in *tribes*.

The French architects likewise use the word *tribune* for a gallery or eminence in a church, or any other place, wherein the music is placed for a symphony or concert. *Tribune*, or *tribunal*, is also used for a room or hall, in which justice is administered; such, e. g. as the courts at Westminster. See *Tab. Architecture*, *fig.* 40.

TRIBUNE *of the people*, TRIBUNUS *plebis*, in *Antiquity*, a Roman magistrate, chosen out of the commons, to protect them against the oppressions of the great, and to defend the liberty of the people against the attempts of the senate and consuls.

The tribunes of the people were first established in the year of Rome 260. The first design of the creation was to shelter the people from the cruelties of usurers, and to engage them to quit the Aventine mount, whither they had retired in displeasure.

Their number, at first, was but two; and the next year, under the consulate of A. Posthumus Aruncius and Cassius Viscellinus, there were three more added; and this number of five was afterwards increased by L. Trebonius to ten.

The appellation *tribune* was given them, because they were at first chosen out of the *tribunes* of the army. See the article following.

The *tribunes* were, as it were, the heads and guardians of the people. They called assemblies of the people when they pleased; and in those assemblies they frequently annulled the decrees of the senate. Nothing could be concluded without their consent, which they expressed by subscribing the letter T at the bottom of the decree. They had it also in their power to prevent the execution of any decree, without giving any reason for it, and merely by subscribing *Veto*. This interposition was called *intercessio*. They sometimes even called the consuls and dictator to account for their conduct, before the people.

The *tribunes of the people*, by virtue of their office, claimed and exercised a power of summoning the senate at any time, whenever the affairs of the people required it, though the consuls themselves were in the city. It has been taken for granted, on the authority of Valerius Maximus, that the *tribunes* of the people, on their first creation, were not admitted into the senate, but had seats placed for them before the door in the vestibule. But we may reasonably conclude, that a magistrate so ambitious and powerful, who could controul by his single negative, whatever passed within doors, would not long be content to sit without. Dionys. Halic. x. 31. Middlet. of Rom. Senat. p. 129. Val. Max. lib. ii. cap. 27.

A. Gellius says, that they were not made senators before the law of Atinius, who is supposed to be C. Atinius Labeo, *tribune* of the people, A. U. 623; but that cannot possibly be true, since it is evident from the authority of Dionysius, that near four centuries before, the *tribunes*, by the mere weight and great power of their office, had gained an actual admission into the senate, within two years after their first creation; in which we find them debating and enforcing, with great warmth, the demands of the commons, for a liberty of intermarriages with the nobles, and the choice of a plebeian consul. So that the intent of this Atinian law could not be, as it is commonly understood, that the *tribunes* should be senators in virtue of their office, for that they had been from the beginning; but that for the future they should always be chosen out of the body of the senate, or, which is the same thing, out of those who had already borne the office of quæstor. A. Gell. xiv. 8. Vide Pighil. Annales, A. U. 623. Dionys. lib. x. 11. Dionys. xi. 57. Middleton of Rom. Sen. p. 45.

Sylla, the dictator, was the first who presumed to put a stop to the encroachments of the *tribunes*, A. U. 672; but under Cotta, the consul, they recovered part of their power, A. U. 679, and in 683, Pompey the Great re-established them in the possession of their ancient privileges. Their power subsisted till the time of Julius Cæsar. And in the year of Rome 731, the senate by a decree transferred the whole authority of *tribunes* of the people to Augustus and his successors, so that they had little more than the name and form of magistrates; whence the emperors were said to be *tribunitia potestate donati*. Accordingly, Augustus himself was *tribune* for thirty-seven years; Tiberius assumed the same quality; as likewise did his successor, signifying the year of their *tribunate* on their medals and coins: but their design herein was only to possess themselves of all the authority, that there might be nobody to oppose them.

In the time of the emperors Nerva and Trajan, the dignity of *tribune of the people* was a mere title without office and honour: and thus it continued till the reign of Constantine the Great, after which there occurs no mention of this magistrate.

TRIBUNE *of the soldiers*, TRIBUNUS *militum*, or *militaris*, an officer in the Roman army, who commanded in chief over a body of forces, particularly a division of a legion; and was much the same with our colonel, or the French mestre de camp.

There is a distinction of the *tribunes* into *laticlavii* and *angusticlavii*: those born of noble families were allowed, after they were made *tribunes* of a legion, to take the *latusclavus*. The rest were only to wear the *angustusclavus*; Whence Suetonius takes care to inform us, that his father was *tribunus laticlavius* of the thirteenth legion.

Over these *tribunes* of legions and cohorts, there were other *tribunes* who commanded in the absence of the consuls, and who were invested with a consular authority. Budæus will have these to be much the same as the marshals of France, or, at least, as our lieutenants-general.

Romulus likewise established a *tribune* of the cavalry, *tribunus equitum*, who was the same with the *magister equitum* under the dictators, the first officer after the kings.

The *tribunes* of the soldiery were of an elder standing than those of the people; those latter being elected out the former. Varro will have it they were called *tribunes*, because, at first, they were only three in number in each legion, when the legion consisted of three thousand men, taken out of the three tribes then on foot. In proportion as the legion was increased, the number of *tribunes* was likewise increased to the number of six.

At first, the nomination lay in the general of the army; but in the year of Rome 391, it was appointed, that the people should nominate one part, and the general another: the latter were called *Rufuli*, from Rutilius Rufus, who passed that law.

Those chosen by the people in the comitia, were called *comitiati*; they were indifferently either patricians or plebeians; and they had the same marks of honour as the consuls themselves. The *tribune of the pretorian cohorts* was the captain of the guards.

TRIBUNE was also an appellation given to various other officers; as the *tribuni ærarii*, *tribunes of the treasury*. *Tribune of the celeres*, or Roman light-horse, the officer who commanded them. *Tribuni fabricarum*, those who had the direction of the making of arms. *Tribuni marinorum*, *tribuni nolanorum*, and *tribuni voluptatum*, mentioned

tioned in the Theodosian Code, as intendants of the public shews, and other diversions.

The title of TRIBUNE, TRIBUNUS, was also given to the chief of each tribe.

TRIBUNITIAN, TRIBUNITIUS, a term among antiquaries and medallists. The *tribunitian power* was the dignity, office, or authority of a tribune of the people.

This power was assumed by the emperors, and makes one of the chief titles they bear on their medals: the quality was first introduced by Augustus, to keep the sovereign authority over the other magistrates, without either taking that of dictator or king. Indeed, it was offered to Julius Cæsar, but he despised it. Augustus is the first who used it, and his successors followed his example. They reckon the years of their empire on their medals by those of their *tribunitian power*.

This power was sometimes given them for a certain number of years, and sometimes for ever. Sometimes the emperors would communicate the power to such as they associated, or as they intended to succeed them: and Tiberius held it fifteen years with Augustus. But this practice only obtained till the time of Valerian and Gallienus. After them we only find TR. P. II. in Claudius; TR. P. V. in Aurelian; and TR. P. in Probus. This, however, is only to be understood of medals; for in inscriptions we find it after that time.

Cardinal Noris and F. Pagi have disputed about this *tribunitian* power, wherein it consisted. The first maintains, that it did not at all differ from that of the ordinary tribunes, which consisted in three things: 1. In the right of opposing all the acts and resolutions of the other magistrates. 2. In that it rendered their persons sacred and inviolable. 3. In a power of making edicts and laws.

F. Pagi asserts, that it made an addition to the power of the tribunes; that the privilege it conferred of making edicts, was more ample than that of the ordinary tribunes; besides, that it carried with it a power of convening the senate at pleasure.

M. Spanheim is of F. Pagi's opinion; he believes, that the *tribunitian power* had much the advantage of the tribunate: 1. In that it was peculiar to the patricians, and did not reduce the person who held it to the degree of a plebeian. 2. In that it was not confined to the city of Rome alone, like the other; but that it extended throughout the empire, as well as the proconsular power, which was usually annexed to it. 3. That the dignity of the tribunes was inferior to that of the pretors; whereas the *tribunitian power* of the Cæsars conferred, according to Tacitus, a sovereign authority over all magistrates, and rendered such as it was communicated to, equal to the emperors, and even made them their colleagues in the empire; besides the power of opposing the enterprizes of all the other magistrates; and that it rendered their persons sacred, and gave them a right to assemble and dismiss the senate; which were privileges the *tribunitian power* had in common with the tribunes.

F. Hardouin thinks we should distinguish two *tribunitian powers*; the one civil, the other military; but the proof he brings thereof is very weak. M. Spanheim says, his distinction is only founded on vain conjectures, none of which deserve notice.

The learned are greatly divided as to the month and day whereon the *tribunitian power* commenced: Sigonius and Petavius will have it begin on the 1st of January; others, as Perizonius, on the fifth of the calends of July: M. Toinard on the fourth of the ides of December: Onuphrius, cardinal Noris, F. Pagi, &c. on the day of the emperor's accession to the empire; with this difference, that F. Pagi takes it to be on the fifth of the calends of the month wherein the emperor was proclaimed; and that this day was, for this reason, held sacred among the Romans.

F. Hardouin thinks, that on medals the *tribunitian power* commences on the anniversary of the building of Rome, viz. the eleventh of the calends of May, excepting on the Greek medals, where it begins in September, in regard this month, which began the Greek year, was near the time when the *tribunitian power* was first conferred.

Of all these sentiments the most probable is that of Onuphrius, &c. setting aside the restriction of F. Pagi. See M. Spanheim, Dissert. xii. tom. ii. p. 429.

TRIBUTA *comitia*. See COMITIA.

TRIBUTARY, TRIBUTARIUS, one who pays TRIBUTE to another, in order to live in peace with him, or to share in his protection.

The republic of Ragusa is *tributary* to the grand Turk; so also is the cham of Little Tartary, &c.

TRIBUTE, TRIBUTUM, a tax, or impost, which one prince or state is obliged to pay to another, as a token of dependence; or in virtue of a treaty, and as a purchase of peace.

The Romans made all the nations they subdued, pay them *tribute*. Mahomet laid it down as a fundamental of his law, that all the world should pay him *tribute*.

In the states of the grand signor, Christian children are taken, in way of *tribute*, to make AGEMOGLANS, JANIZARIES, &c.

TRIBUTE is sometimes also used for a personal contribution, which princes levy on their subjects by way of capitation, or poll-money.

In this it differs from an impost, which is properly what is laid on merchandizes.

TRICENNAL. See TRENTAL.

TRICEPS, in *Anatomy*, a muscle of the thigh, having three originations, and as many insertions; and which may therefore be conveniently divided into three muscles, all arising from the os pubis, and inserted into the linea aspera of the thigh-bone, whereof they possess the greatest part. See *Tab. Anat.* (*Myol.*) *fig.* 1. *n.* 53. *fig.* 2. *n.* 36. *fig.* 6. *n.* 36. *fig.* 7. *n.* 26. They also serve as adductores, and draw the thighs together, and move them inward; as when in riding we press the thighs close against the saddle; when in sitting, we hold any thing close between the knees; when we cross the thighs; or when in standing we bring the legs close together, in order to jump.

TRICEPS *primus*, a fleshy and flat muscle situated between the os pubis and the whole length of the os femoris; the first and second cross each other in such a manner, as that the muscle which is the first on the os pubis, becomes the second on the os femoris, and *vice versa*; but the third keeps its rank.

The *triceps primus* is fixed above by a short tendon to the tuberosity or spine of the os pubis, and to the neighbouring part of the symphysis, its fibres mixing a little with those of the pectineus. From thence it runs down, increasing in breadth, and is inserted by fleshy fibres interiorly in the middle portion of the linea femoris aspera. At the lower part of this insertion a portion of the muscle separates from the rest, and sends off a long tendon, which, together with a like tendon of the *triceps tertius*, is inserted in the inner condyle of the extremity of the os femoris. Winslow.

TRICEPS *secundus*, a fleshy and flat muscle, fixed above by fleshy fibres below the superior insertion of the *triceps primus* in all the outside of the inferior ramus of the os pubis, as low as the foramen ovale; but seldom so low as the ramus of the os ischium. This insertion is broader than that of the former muscle. From thence it runs down, and is inserted in the upper part of the linea aspera, between the pectineus and *triceps primus*, mixing a little with each of those muscles. This insertion appears sometimes divided. Winslow.

TRICEPS *tertius*, a fleshy and flat muscle, fixed above by fleshy fibres to the anterior part of all the short ramus of the ischium, and to a small part of the tuberosity of that bone; this insertion covers some part of the tendon of the semi-membranosus, and is covered by that of the semi-nervosus; q. d. *tria capita*; from thence it runs down and is inserted by fleshy fibres in the linea aspera, almost from the little trochanter down to the middle of the os femoris.

It goes down lower than the first *triceps*, sending off a separate portion, like that of the secundus. These two portions join together and form a common tendon, which running down to the lower extremity of the os femoris is inserted in the back part of the tuberosity of the inner condyle; this separate portion is sometimes large enough to be mistaken for a distinct muscle, making a quadriceps instead of a *triceps*. In all this progress this muscle is joined to the vastus internus by a perforated aponeurosis, through which the blood-vessels pass. Winslow.

TRICEPS, in *Mythology*, a surname given to Mercury, because he exercises his functions in heaven, on earth, and in the infernal regions, and is exhibited under three different forms, according to the three different places in which he is employed.

TRICHECUS, in *Zoology*, a genus of the order of *bruta*, and class of *mammalia*, in the Linnæan system: the characters of which are; that it has no cutting teeth; that it has tusks only in the upper jaw; that the grinders on both sides are formed of a rugged bony substance, that the lips are geminated, and the hinder feet formed into fins. There are two species, viz. the manati, or SEA-*cow*, and the MORSE OR WALRUS.

TRICHERIÆ, in *Natural History*, the name of a genus of fossils, of the class of the fibrariæ; the characters of which are, that they are not elastic, and are composed of straight and continuous filaments. See *Tab. of Fossils*, *class* 1.

The

The word is derived from the Greek τριχες, capillaments or fibres. The bodies of this genus are divided into those which have narrower filaments; and there are six known species of it; all which burn very readily to a fine plaster, like the gypsums; and some of them are found in particular places in such great abundance, that it would be very advantageous to collect and burn them. Hill's Hist. of Foss. p. 90.

TRICHESTRUM, in *Natural History*, the name of a genus of fossils, of the class of the selenitæ, but differing extremely in figure and structure from the common kinds.

The word is derived from the Greek τριχες, *hairs* or *filaments*, and αστηρ, *a star*, and expresses a set of bodies composed of filaments arranged into the form of a star. The selenitæ of this genus are composed of filaments scarce any where visibly arranged into plates or scales, but disposed in form of a radiated star, made of a number of disjunct striæ. See *Tab. of Fossils*, Class 2.

Of this genus there is only one known species, which is of a pale brown, and is composed of extremely fine and slender filaments. It is formed like the lepastrum in the accidentally open cracks in the septaria, or ludus Helmontii, and is no other way different from the bodies of that genus, than as in all the selenitæ the plates they are composed of are made up of filaments nicely arranged: in this as in some other of those bodies, the filaments have never arranged themselves into plates at all, but are disposed into the form of a star composed of single threads. This body very readily and regularly splits according to the arrangements of the fibres; and is in some pieces tolerably pellucid.

It is found only in one place, so far as is yet known, which is under the cliffs of Sheppy-island, in Kent; where it is considerably plentiful, and makes a very elegant figure on the broken masses of septaria, which are in immense numbers strewed upon the shore. Hill's Hist. of Foss. p. 150.

TRICHIASIS, in *Surgery*, the name of a distemperature of the eyes, in which the eye-lids are inverted, and in which the eye-lashes hurt and irritate the eyes.

The cilia or margins of the eye-lids are sometimes inverted so as greatly to irritate the sensible coats of the eye, and bring on intense pains and inflammation, which, without timely assistance, may greatly injure, if not totally destroy the sight. This disorder is generally owing to accident, as the irregular cicatrix left on the part from a burn, the small-pox, an ulceration or wound, or some other external injury. But sometimes a relaxation of the skin, and a paralytic disorder of the eye-lids, are the chief causes of it.

Whatever cause it is from, it is always difficult enough to be remedied; for it is hardly possible for the surgeon to remove it, so as to prevent its returning, without extirpating the offending hairs; and if these be cut off close, it will be to no purpose, because the rigid stumps of the hairs will irritate the eye even worse than the whole hairs did before. It is a very nice operation alone that can make a cure; here the hair must be pulled up singly by the roots, and the places of their insertion singly cauterized with a hot broad-pointed needle; but this the patient will seldom submit to, and the only remaining method then, is to fill up the sinuses out of which they were extracted with the lapis infernalis. But in this the greatest care must be taken, that no part of that application get into the eye. The easiest method is the touching of the cavities, out of which the hairs have been pulled up, with a pencil-brush dipped in a mixture of spirit of sal ammoniac and highly rectified spirit of wine, by which means they will close up, and no more hairs will grow from them. Heister's Surgery, p. 369.

TRICHIDES, in *Ichthyology*, a name used by the ancients, for a fish of the harengi-form kind, probably the PILCHARD, which they called also *sardinia* and *sardella*.

TRICHILIA, in *Botany*, a genus of the *decandria monogynia* class. Its characters are, that the calyx is quindentated; it has five petals, a cylindric nectarium, bearing antheræ at its opening, a three-celled and three-valved capsule, and berried seeds. There are four species.

TRICHIURUS, in *Ichthyology*, a genus of the order of *apodes*, the characters of which are; that the head is extended, with lateral opercula; that the teeth are ensiform, and semi-sagittated at the apex; that it has seven branchiostegous rays; that the body is compressed and ensiform, and the tail subulated, without any fin: whence it is called LEPTURUS, and in English *needle-tail*. There is one species, viz. the *Indian* EEL of Willughby, or KUCU of Brasil.

TRICHOMANES, in the Linnæan system of *Botany*, the name of a genus of capillary plants, belonging to the order of *filices*, and class of *cryptogamia*, described by Plumier; the characters of which are these: on the margin of the leaves stands a single erect turbinated cup, and a stylus in the manner of a bristle terminates at the capsule; the plants of this genus are very different from what other authors call the *trichomanes*; which, according to Linnæus, is not a distinct genus of plants, but is a species of asplenium. Linnæus enumerates eleven species.

The fruit of the *trichomanes* is a roundish capsule, of a membranaceous texture, and covered with a sort of scales; these are surrounded with an elastic ring, by the contraction of which they are burst, and the seeds thrown out. Tourn. Inst. p. 539.

The *trichomanes*, or *English maiden-hair*, which is the ASPLENIUM *trichomanes* of Linnæus, serves with us as a succedaneum for the true adiantum, or maiden-hair, which is not a native of England, and by the carelessness of our druggists is seldom brought over to us; the whole plant, stalks and leaves together, are used, and the virtues are in their greatest perfection if it be gathered in the month of September.

This plant is perennial, and grows wild in shady grounds and old walls; it has a mucilaginous, somewhat sweetish, and roughish taste, and little or no particular flavour. It is accounted serviceable in disorders of the breast, particularly in tickling coughs and hoarseness from thin acrid defluxions; and in these intentions it is very little, if at all, different in quality from the adiantum. It is usually directed in infusion or decoction, with the addition of a little liquorice; a pectoral syrup is prepared in the shops from an infusion of five ounces of the dry leaves, and four of liquorice root in five pints of boiling water. Lewis.

TRICHOSANTHES, *serpent-cucumber*, in *Botany*, a genus of the *monoecia syngenesia* class. Its characters are these: it has male and female flowers at separate distances on the same plant; the male flowers have a long smooth empalement of one leaf, cut into five small segments, which are reflexed; the petal is plain, spreading and cut into five parts, ending in long branching hairs; they have three short stamina arising from the point of the empalement, terminated by cylindrical erect summits joined in a bed, and three small styles fastened to the empalement; the female flowers sit upon the germen, and have empalements and petals like the male flowers, but have no stamina; they have a long slender germen situated under the flower, supporting a style the length of the empalement, crowned by three oblong stigmas; the germen afterward turns to a long succulent fruit having three cells, enclosing many compressed seeds. Linnæus enumerates four species. We have but one species of this genus in the English gardens, which grows naturally in China; it is an annual, and of the cucumber tribe.

TRICHOSTEMA, in *Botany*, a genus of the *didynamia gymnospermia* class. Its characters are these: the flower has a lipped empalement; the upper lip twice as large as the under, and cut into three equal acute segments, the under lip in two; the flower is of the lip-kind, and has a very short tube, the upper lip is compressed and hooked, the under is cut into three parts, the middle one being the least; it has four hair-like stamina which are long and incurved, two of them being a little shorter than the other, terminated by single summits, and a four-pointed germen, supporting a slender style, crowned by a bifid stigma; the germen afterward turns to four roundish seeds enclosed in the swoln empalement of the flower. There are two species.

TRICHOURI, in *Natural History*, a term used by some authors to express such flies, as have one or more hairs growing out at their tails; these are called also SETICAUDÆ.

TRICHRUS, in *Natural History*, the name of a stone described by the ancients, and said to yield three colours; in their common way of preparing bodies of this kind for medicinal use (which was by rubbing them down on a porphyry, or other hard stone with water) this first coloured the water black, then red, and lastly white. It seems to have been a kind of hæmatites, or blood-stone.

TRICIPITIS *caput primum*, in *Anatomy*, a name given by many authors to a muscle of the thigh, called by Albinus *abductor femoris*; Douglas calls it *abductor primus femoris*, and Winslow the *musculus primus tricipitis*. It is the *pars octavi femoris* of Vesalius; that author, and indeed many others of the earlier anatomists, not esteeming it a distinct muscle. See TRICEPS.

TRICLARIA, formed of τρεις, *three*, and κληρος, *heritage*, in *Mythology*, a surname of Diana, ascribed to her because she was honoured by three cities of Achaia, viz. Aroe, Anthia, and Messatis, with an annual feast; the preceding night being spent in devotion. Encycl.

TRICLINIUM, in *Antiquity*, the name given by the Romans to the room in which they eat; and also to the beds upon which they reclined at meat, so called, because it was contrived to accommodate three persons.

TRICOR, a name by which some of the chemical writers have called gold.

TRICUSPIDES, in *Anatomy*, an epithet given to three valves situated at the entrance of the vena cava into the heart.

They open from without inwards, so as to let the blood of the cava pass into the heart, but prevent its reflux into the cava.

They are thus called from their figure, which is triangular; for which reason they are also called by the Greeks τριγλωχινες.

TRIDACNÆ, in *Natural History*, a genus of bivalve SHELLS.

TRIDAX, in *Botany*. See *American* STAR-WORT.

TRIDE, in the *Manege*, signifies short and swift; thus a *tride pace*, is a going of short and quick motions, though united and easy. A *tride career*, is a very fast gallop, with the times or motions short and nimble; and so of other motions. Some apply the word only to the motion of the haunches.

TRIDENT, TRIDENS, an attribute of NEPTUNE; being a kind of SCEPTRE which the painters and poets put in the hands of that god. It is in form of a spear or fork with three prongs, whence the word.

The poets tell us, that Neptune makes the earth open whenever he strikes it with his *trident*.

TRIDENT, among *Mathematicians*, is used for a kind of PARABOLA, by which Des Cartes constructed equations of six dimensions.

TRIEDROSTYLA, derived from τρις, *thrice*, εδρα, *a side*, and ςυλος, *a column*, in *Natural History*, the name of a genus of spars.

The bodies of this genus are spars, in form of trigonal columns, adhering by one end to some solid body, and terminated at the other by a trigonal pyramid. Of this genus there are four known species. Hill.

TRIEMERUS, the *three-day fly*, in *Natural History*, a fly somewhat like the butterfly; it has four large yellowish wings, and a long body, with a head furnished with long antennæ, large eyes, and a spiral trunk. It is found among the nettles and mallows.

TRIEMIMERIS, τριημιμερις, *semiternaria*, a kind of cæsura in Latin verse, wherein, after the first foot of the verse, there remains an odd syllable, which helps to make up the next foot.

As in, *Ille latus niveum molli fultus hyacintho.*

TRIENNIAL, an epithet applied chiefly to offices or employments which last for three years.

Thus we say, a *triennial* government; most regular monasteries have *triennial* superiors; that is, they elect new ones at the end of each three years.

In 1695, an act was made for *triennial* parliaments, i. e. for parliaments which should be dissolved, and the members be elected anew, every three years. Till that time, the king had it in his power to prorogue and continue his parliaments as long as he pleased. This opened a door to corruption, which the *triennial* bill was intended to prevent.

The *triennial* act has, from some other views, been since repealed; for the great struggles usual at elections, the great ferment it usually put the nation into, the great expences upon that occasion, with other considerations, determined the legislature, in 1717, to change *triennial* parliaments for septennial ones. See *Dissolution of* PARLIAMENT.

TRIENS, in *Antiquity*, a copper-money, of the value of one third of an as, which on one side bore a Janus's head, and on the other a water-rat.

This was the piece of money used to be put in the mouths of the deceased, to pay Charon his fare for their passage into another world.

TRIENS, or TRIENTAL, was also used for a drinking cup; and that which was ordinarily used. It contained four cyathi.

TRIENTALIS, in *Botany*, the name of a genus of plants of the *heptandria monogynia* class: the characters of which are these: the perianthium is composed of seven leaves, and is permanent; the leaves are narrow, pointed, and wide expanded; the flower is of the stellated kind, and is composed of seven petals, which stand flat and open, and adhere together very slightly at the top, these are a little longer than the leaves of the cup; the stamina are seven capillary filaments of the length of the cup, but inserted into the flower; the antheræ are simple; the germen of the pistil is globular; the style is capillary, and of the length of the stamina; and the stigma is headed; the fruit is a dry berry of a globular form, formed of an extremely thin crust, and having only one cell; the seeds are few in number, and are of an angular figure; the receptacle is large enough to hold a great number of them; the number of the leaves of the cup sometimes varies. There is one species.

TRIERARCHI, τριηραρχοι, among the *Athenians*, commissioners chosen annually out of the richest citizens, who are obliged to provide all sorts of necessaries for the fleet, and to build ships at their own charge. See Potter, Archæol. Græc. lib. i. cap. 15. tom. i. p. 86.

TRIERS, in *Law*. See TRIORS.

TRIETERIS, τριετηρις, in the *Ancient Chronology*, a cycle of three years.

Thales, it is said, observing that the lunar revolution never exceeded thirty days, appointed twelve months of thirty days each; so that the year consisted of three hundred and sixty days; and in order to reduce these months to an agreement with the revolution of the sun, he intercalated thirty days at the end of every two years, whence that space of time was called a *period of three*, because the intercalation was not made till after the expiration of full two years, though really it was only a period of two years; as we are informed by Censorinus, De Die Natali, cap. 18.

TRIETERIA, in *Antiquity*, feasts which the Bœotians and Thracians held every three years in honour of Bacchus, and in remembrance of his expedition into India, which lasted three years.

TRIEXAHEDRIA, formed of τρις, *thrice*, εξ, *six*, and εδρα, a *side*, in *Natural History*, the name of a genus of spars.

The bodies of this genus are perfect and pellucid crystalliform spars, consisting of thrice six planes, being composed of an hexangular column, terminated at each end by an hexangular pyramid; of this genus there are three known species. Hill.

TRIFAX, among the *Romans*, a javelin three cubits long, which was thrown by the catapulta.

TRIFOLIUM, TREFOIL, denotes several three-leafed plants. See TREFOIL.

That most used in medicine is the *trifolium palustre*, MENYANTHES *trifoliata* of Linnæus, or BUCK-BEAN.

This plant is perennial, grows wild in marshy places, and flowers in May. The leaves have a bitter penetrating taste, which they impart both to watery and spirituous menstrua; without any remarkable smell or flavour. They have of late years come into common use, as an alterative and aperient, in impurities of the humours, and some hydropic or rheumatic cases. They are usually taken in the form of infusion, with the addition of some of the acrid antiscorbutic herbs, which in most cases improve their virtue, and of orange-peel, or some other grateful aromatic to alleviate their ill-taste: they are sometimes, among the common people, fermented with malt liquors, for an antiscorbutic diet drink. Their sensible operation is by promoting urine, and somewhat loosening the belly. Lewis.

TRIFOLIUM *acidum*, in *Botany*, a name given by many authors to the oxys, or *wood*-SORREL, from its having its leaves always three on a stalk, and being of an acid taste.

TRIGA, in *Antiquity*, a kind of car, or chariot, with three horses.

The *triga*, in reality, was only drawn by two horses; so that it was properly a BIGA; but it had, besides, a third horse tied to the others, like a led horse, for change. Statius calls the third horse, *equus funalis*; Hesychius, παρηορος; and Dionysius Halicarnasseus, σειραιος.

We do not find the *triga* on any ancient monument; but it was a long time in use among the Romans, at their ludi Circenses. The Greeks, who first introduced it, soon abandoned it.

TRIGAMY, a third marriage; or the state of a person who hath been married three times.

In the ancient church, *trigamy* was only allowed to such as had no children by their former marriages.

If, having children by one or both the former, they married again, after forty years of age, they were excluded from communion for five years. If they were only forty years old, the penance was but four years. See BIGAMY.

TRIGEMINI *tertius*, in *Anatomy*, a name given by Spigelius and others, to a muscle called by Winslow the COMPLEXUS *minor* or *mastoidæus lateralis*, and by Cowper and Albinus *trachelo-mastoidæus*.

TRIGINTAL. See TRENTAL.

TRIGLA, in *Ichthyology*, the name of a genus of fish, of the order of the *thoracici*; for the distinguishing characters of which, see GURNARD. Linnæus enumerates nine species, as the LYRA, GURNARD, &c.

The characters of this genus, according to Artedi, are these: the branchiostege membrane contains several bones; the head is very declivious, from the eyes to the end of the snout, and is large, aculeated, and as it were square; the head is the broadest part of the fish, it thence grows gradually narrower, till it ends in a very small tail: in many of the species of this fish, there are two or three

articulated appendices growing under the pectoral fins; the eyes ſtand on the top of the head, and are covered with a ſkin; there are two back-fins, the firſt of which is prickly; the pectoral fins in ſome of the ſpecies are very large.

Many of theſe fiſh are capable of making a noiſe; and ſome of them by the help of their pectoral fins, can ſuſtain themſelves for a time out of the water, and fly to ſome diſtance. The appendices of the pylorus are from five to twenty.

Of thoſe *triglæ*, which have continuous, obtuſe, and undivided ſnouts, there are ſeven ſpecies, among which is the red *trigla*, with the ſnout divided into two little horns, and with the opercula of the gills ſtriated: this is the *cuculus*, and *lyra* of ſome authors. This fiſh grunts when taken out of the water, and the noiſe has been ſuppoſed to be like that of a cuckow, whence the name.

Of thoſe *triglæ*, which have the ſnout very deeply divided, and opened into two very broad parts, there are three ſpecies. Artedi Gen. Piſc. p. 32.

TRIGLOCHIN, *arrow-headed graſs*, in *Botany*, a genus of the *hexandria trigynia* claſs: the characters are theſe; it has a three-leaved calyx, three cup-ſhaped petals, no ſtyle, and a capſule opening at the baſe. There are two ſpecies, the ſea and the marſh *triglochin*.

TRIGLYPHS, formed from τριγλυφος, q. d. *three engravings*, from γλυφω, *ſculpo*, in *Architecture*, a ſort of ornaments repeated at equal intervals in the Doric FREEZE.

Each *triglyph* conſiſts of two entire gutters, or channels, cut to a right angle, called *glyphes*, and ſeparated by three interſtices, called by Vitruvius *femora*, from each other, as well as from two other half-channels which are at the ſides. See *Tab. Archit. fig.* 28, N° 8.

The ordinary proportion of *triglyphs*, is to be a module broad, and one and a half high. But this proportion, M. le Clerc obſerves, ſometimes occaſions ill-proportioned intercolumnations in the porticoes; for which reaſon he chuſes to accommodate the proportion of his *triglyphs* to that of the INTERCOLUMNATION.

The intervals between the *triglyphs* are called *metopes*.—Under the channels, or glyphes, are placed guttæ, or drops.

The *triglyphs* make the moſt diſtinguiſhing character of the Doric order. Some imagine them originally intended for the conveyance of the guttæ that are underneath them: others fancy they bear ſome reſemblance to a lyre, and thence conjecture the ornament to have been originally invented for ſome temple ſacred to Apollo. See DORIC.

TRIGLYPH, *capital of a.* See CAPITAL.

TRIGON, TRIGONUS, formed from τριγωνος, *triangle*, in *Geometry*, a triangle.

TRIGON, in *Aſtrology*. See TRIPLICITY.

TRIGON, in *Aſtronomy*, denotes an aſpect of two planets, wherein they are 120 degrees diſtant from each other; this is called alſo *trine*.

The *trigons* of Mars and Saturn are by aſtrologers held malific aſpects.

TRIGON, TRIGONON, was alſo a muſical inſtrument, uſed among the ancients.

The *trigon* was a kind of triangular lyre, or harp, and was invented by Ibycus.

It was uſed at feaſts, and played on by women, who ſtruck it either with a quill, or beat it with ſmall rods of different lengths and weights, to occaſion a diverſity in the ſounds. See Hawkin's Hiſt. Muſ. vol. i. p. 247.

TRIGON, or TRIANGLE of *ſigns*, is the name of an inſtrument uſed for drawing the arcs of the ſigns upon dials: it may be made of braſs or any other ſolid matter, and of any ſize at pleaſure. This inſtrument is conſtructed after the following manner: firſt draw the line *ab* (*Tab.* IV. *Aſtronomy*, *fig.* 95.) repreſenting the axis of the world, and *ac* perpendicular to it, repreſenting the radius of the equinoctial; and about the point *a* deſcribe the circular arc *dce* at pleaſure. Then reckon $23^{\circ}\frac{1}{2}$ both ways from the point *c* upon the ſaid arc for the ſun's greateſt declination, and draw the two lines *ad*, *ae* for the ſummer and winter tropics: likewiſe draw the line *de*, which will be biſected by the radius of the equinoctial in *o*; about which point, as a centre, draw a circle, whoſe circumference paſſes through the points *d* and *e* of the tropics, and divide the circumference into 12 equal parts, beginning from *d*: through each point of diviſion equally diſtant from *d* and *e*, draw occult lines parallel to the radius of the equinoctial circle: theſe lines will interſect the arc *dc* in the points, through which and the centre *a*, lines being drawn, will repreſent the beginnings of the ſigns of the zodiac at 30° diſtance from each other. But to divide the ſigns into every 10th or 5th degree, the circumference muſt be divided into 36 or 72 equal parts. The characters of the ſigns are annexed as in the figure; and when the *trigon* is divided into every 10th or 5th degree, the letter of the month is placed to the firſt 10° of each ſign agreeing with it. However this inſtrument may more readily be made by means of a table of the ſun's DECLINATION; for having drawn the two lines *ab* and *ac* at right angles, lay the centre of a protractor on the point *a*, with its limb towards the point *c*; and keeping it fixed, count $23^{\circ}\frac{1}{2}$ on both ſides of the radius *ac* for the tropics of ♋ and ♑, 20° 12′ for the beginnings of the ſigns ♌, ♊, ♐, and ♒, and 11° 30′ for ♉, ♍, ♏, and ♓. And thus the ſpaces for each ſign may be graduated in every 10th and 5th degree by means of a table. The equinoctial points of ♈ and ♎ are placed at the end of the radius of the equinoctial *ac*.

TRIGON *of diurnal and nocturnal arcs*. Theſe are drawn upon ſun-dials by curve-lines, like the arcs of the ſigns, and by means of them the ſhadow of the ſtyle ſhews how many hours the ſun is above the horizon, in any given day, &c.

The *trigon* of ſigns is the ſame for all latitudes, the ſun's declination being the ſame for the whole earth; but the diurnal arcs are different for every particular latitude, and as many of theſe arcs are drawn upon a dial, as there are hours of difference between the longeſt and ſhorteſt days of the year. For the conſtruction of this ſort of *trigon*, draw the right line R Z (*fig.* 96.) for the radius of the hour-line of 12, or of the equinoctial; and about the point R, with any opening of the compaſſes at pleaſure, deſcribe the circular arc T S V, and lay off both ways on it from the point S 2 arcs, S V, S T, each equal to the complement of the latitude.—Then draw the right line T X V, and about the point X, as a centre, deſcribe the circumference of a circle T Z V Y, which divide into 48 equal parts by dotted lines, drawn parallel to the radius of the equinoctial R Z: then theſe lines will interſect the diameter T X V in points, through which and the point R you may draw the radii of the hours. The angles which all the radii make at the point R may be found trigonometrically by the following proportion: as radius is to the co-tangent of the latitude ſo is the tangent of the difference between the ſemidiurnal arc at the time of the equinox and the arc propoſed to the tangent of the ſun's required declination.

The *trigon of ſigns* may be annexed to a rule or index A (*fig.* 97.) in order to draw the arcs of the ſigns upon great dials. The diurnal arcs may be drawn likewiſe upon this *trigon*; but the arcs of the ſigns and diurnal arcs too muſt not be drawn upon one and the ſame dial, for avoiding confuſion. In the centre of the index there is a ſmall hole, through which is put a pin, that the inſtrument may turn about the centre of a dial. The *trigon* ſlides along the index, and may be fixed in any part of it by means of the ſcrew B. The arcs of the ſigns with their characters are round about the circumference, and there is a fine thread fixed in the centre, in order to extend over the radii quite to the hour-lines of a dial.—For a farther account of theſe inſtruments and their uſe, ſee Bion's Conſtr. and Uſe of Math. Inſtr. by Stone, p. 231, &c.

TRIGONAL-*leaf*, among *Botaniſts*. See LEAF.

TRIGONAL *numbers*. See TRIANGULAR *numbers*.

TRIGONELLA, in *Botany*. See FENUGREEK.

TRIGONELLA *foſſilis*, in *Natural Hiſtory*, the name of a foſſil ſhell, of the cockle kind, but approaching to a triangular figure, having a broad bottom to which it deſcends, almoſt in ſtraight lines: on each ſide from the head or cardo, theſe are uſually found ſmall, but there are ſome met with of four or five inches round: they are found at different depths, in ſtone quarries, bedded in the matter of the ſtrata; and that often in the hardeſt ſtone. In ſome inſtances, the ſhells are found remaining in their native ſtate; but moſt frequently the ſhell itſelf is periſhed and gone, and there is a ſtony or ſparry matter depoſited in its place. Hill's Hiſt. of Foſſ. p. 646.

TRIGONOMETER *armillary*. See ARMILLARY *Trigonometer*.

TRIGONOMETRY, the art of finding the dimenſions of the parts of a triangle unknown, from the other parts known: or the art whereby, from any three parts of a triangle given, all the reſt are found. See TRIANGLE.

Thus, e. gr. from two ſides A B and A C, and an angle B, we find, by *trigonometry*, the two other angles A and C, with the third ſide B C, *Tab. Trigonometry*, *fig.* 5.

The word literally ſignifies the *meaſuring of triangles*, formed from the Greek, τριγωνος, *triangle*; and μετρον, *meaſure*. Yet does not the art extend to the meaſuring of the area or ſurface of triangles, which comes under

geometry: *trigonometry* only confiders the lines and angles thereof.

Trigonometry is of the utmoft ufe in various mathematical arts: it is by means hereof that moft of the operations of geometry and aftronomy are performed; without it the magnitude of the earth and the ftars, their diftances, motions, eclipfes, &c. would be utterly unknown.—*Trigonometry*, therefore, muft be owned an art, whereby the moft hidden things, and thofe remoteft from the knowledge of men, are brought to light. A perfon ignorant of this part of the mathematical fciences can make no great progrefs in mixed mathematics; but will often be puzzled, even in natural philofophy, particularly in accounting for the phenomena of the rainbow, and other meteors.

Trigonometry, or the folution of triangles, is founded on that mutual proportion which fubfifts between the fides and angles of a triangle; which proportion is known by finding the proportion which the radius of a circle has to certain other lines, called *chords*, *fines*, *tangents*, and *fecants*.

This proportion of the fines and tangents to their radius, is fometimes expreffed in common or natural numbers, which conftitute what we call the *tables of natural fines, tangents*, &c. Sometimes it is expreffed in logarithms, and in that cafe conftitutes the table of *artificial fines*, &c. See a table under SINE.

Laftly, fometimes the proportion is not expreffed in numbers; but the feveral fines, tangents, &c. are actually laid down upon lines of fcales; whence the *line of fines, tangents*, &c. See SCALE.

Trigonometry is divided into *plain* and *fpherical*: the firft confidering rectilinear triangles; and the fecond fpherical ones. The firft is of obvious and continual ufe in navigation, meafuring, furveying, and other operations of geometry. See MEASURING, SURVEYING, SAILING, &c.

The fecond is only learned, with a view to aftronomy and its kindred arts, geography and dialling. It is generally efteemed exceeding difficult, by reafon of the vaft number of cafes wherewith it is perplexed; but the excellent Wolfius has removed moft of the difficulties.—That author has not only fhewn how all the cafes of rectangled triangles may be folved the common way, by the rules of fines and tangents; but has likewife laid down an univerfal rule, whereby all problems, both in plain and fpherical rectangled triangles, are folved; and even oblique-angular triangles he teaches to folve with equal eafe. His doctrine fee under TRIANGLE. See alfo PART and CIRCULAR PARTS.

TRIGONOMETRY, *plain*, is an art whereby, from three given parts of a plain triangle, we find all the reft.

The great principle of *plain trigonometry* is, that in every plain triangle, the fides are, as the fines of the oppofite angles. See this principle applied to the folution of the feveral cafes of plain triangles, under TRIANGLE.

TRIGONOMETRY, *fpherical*, is the art whereby from three given parts of a fpherical triangle, we find the reft. E. gr. whereby from two fides, and one angle, we find the two other angles, and the third fide.

The principles of *fpherical trigonometry*, according to the doctrine of Wolfius, are as follow: 1. In every rectangled fpherical triangle A B C, rectangular at A, the whole fine is to the fine of the hypothenufe, B C, (*Tab. Trigonom. fig.* 33.) as the fine of either of the acute angles, C, is to the fine of the leg oppofite thereto A B; or as the fine of the angle B, to the fine of its oppofite leg A C: whence we deduce, that the rectangle of the whole fine into the fine of one leg, is equal to the rectangle of the fine of the angle oppofite thereto, into the fine of the hypothenufe.

2. In every right-angled fpherical triangle A B C (*fig.* 31.) neither of whofe fides is a quadrant; if the complements of the legs A B and A C to a quadrant, be confidered as the legs themfelves; the rectangle of the whole fine into the co-fine of the middle part, is equal to the rectangle of the fines of the disjunct parts, or extremes.

Hence, 1. If the fines be artificial, that is the logarithms of the natural ones; the whole fine, with the co-fine of the middle part, will be equal to the fum of the fines of the disjunct parts. 2. Since, in the rectilinear triangle A B C (*fig.* 34.) the whole fine is to the hypothenufe BC, as the fine of the angle B or C to the fine of the oppofite leg A C or A B; if, inftead of the fines of the fides, we take the fides themfelves; here, too, the whole fine, with the co-fine of the middle part AC or AB, will be equal to the fum of the fines of the disjunct parts B or C and B C; i. e. to the fine of B or C, and B C itfelf.

This Wolfius calls *regula finuum catholica*, or the firft part of the catholic rule of *trigonometry*; by means whereof all the problems of, either *trigonometry* are folved, when the thing is effected by fines alone. My lord Napier had the firft thought of fuch a rule; but he ufed the complements of the hypothenufe B C (*fig.* 22.) and of the angles B and C for the hypothenufe, and angles themfelves: fo that the tenor of his catholic rule of fines is this:

The whole fine, with the fine of the middle part, is equal to the co-fines of the disjunct, or, as he calls them, oppofite parts. But, in this, that harmony between plain and fpherical *trigonometry*, vifible in Wolfius's rule, does not appear.

3. In the rectangled fpherical triangle A B C (*fig.* 31.) neither of whofe fides is a quadrant; as the whole fine is to the fine of the adjacent leg A C; fo is the tangent of the adjacent angle C to the tangent of the leg A B.

Whence, 1. As the co-tangent of the angle C is to the whole fine, as the whole fine is to the tangent of the angle C, fo is the fine of A C to the tangent of A B; therefore the co tangent of the angle C will be to the whole fine, as the fine of the leg adjacent thereto, A C, is to the tangent of the oppofite one A B. 2 The rectangle, therefore, of the whole fine, into the fine of one leg A C, is equal to the rectangle of the tangent of the other leg A B, into the co-tangent of the angle C, oppofite to the fame. And, in like manner, the rectangle of the whole fine, into the fine of the leg A B, is equal to the rectangle of the tangent of the leg A C into the co-tangent of the angle B.

4. In every right-angled fpherical triangle, ABC, neither of whofe fides is a quadrant; if the complements of the legs A B and A C to a quadrant, or their exceffes beyond a quadrant, be confidered as the legs themfelves; the rectangle of the whole fine, into the co-fine of the middle part, will be equal to the rectangle of the co-tangents, of the conjunct parts. Hence, 1. If the fines and tangents be artificial; the whole fine with the co-fine of the middle part, is equal to the fum of the co-tangents of the contiguous parts. 2. Since in the rectilinear, right-angled triangle, we ufe the tangents, when from the legs A B and A C (*fig.* 34.) given, the angle C is to be found; and in that cafe the whole fine is to the co-tangent of C, i. e. to the tangent of B, as A B to A C; therefore, alfo in the rectilinear triangle, if for the fines and tangents of the fides be taken the fides themfelves; the whole fine, with the co-fine of the middle part, i. e with AC, is equal to the fum of the co-tangents of the conjunct parts, i. e. to the co-tangent of C, or the tangent of B and the fide AB.

This Wolfius calls *regula tangentium catholica*, and conftitutes the other part of the catholic rule of *trigonometry*; whereby all problems in each *trigonometry*, where tangents are required, are folved.

My lord Napier's rule to the like effect, is thus: that the whole fine, with the fine of the middle part, is equal to the fum of the tangents of the contiguous parts.

It is, therefore, a catholic rule, which holds in all *trigonometry*, that in a right-angled triangle (*notatis notandis*, i. e. the complements of the legs A B and A C being confidered as legs themfelves, and, in rectilinear triangles, the fides themfelves being taken for the fines and tangents of the fides) the whole fine, with the co-fine of the mean or middle part, is equal to the fum of the fines of the disjunct or feparate parts, or the fum of the co-tangents of the conjunct or contiguous parts.

For an illuftration and application of this rule, in the folution of the various cafes of fpherical triangles: fee TRIANGLE.

TRIGONOMETRY, *characters in*. See CHARACTER.

TRIHING, THRIHING, or TRITHING, from the Saxon, *drihinge*, an extent containing three or four hundreds, or the third part of a fhire, or province. See TITHING. Mr. Thorefby thinks the word ought to be written *Thrithing*. See Thorefb. Ducatus Leodenf. p. 85.

Thefe *trithings* ftill fubfift in the county of York, where by an eafy corruption they are denominated RIDINGS.

The word is alfo ufed for a court held within that circuit, which was the fame with what we now call a *court-leet*, which is above a court-baron, and inferior to the county-court.

TRILATERAL, a term applied to all three-fided figures. See TRIANGLE.

TRILL, in *Mufic*, a plain fhake upon a fingle note, formed by a beating in the throat on the vowel o, or by the fhaking of the palate on the throat in one found upon a note: this grace is ufually made in clofes or cadences, and when on a long note exclamation or paffion is expreffed, the *trill* is made in the latter part of fuch note; but moft commonly on binding notes and fuch as precede the clofing note. Playford. See TRILLO.

TRILL-*hooks*, thoſe uſed to hold the ſides of a cart up to the horſe.

TRILLETTO, in the *Italian Muſic*, a little ſhort ſhake or quaver; it differs from *trillo* only in point of continuance, being its diminutive.

TRILLION, in *Arithmetic*, the number of a billion of billions.

After billions, we reckon by *trillions*, which makes a claſs of numeration, and is divided, like the other claſſes, into three places: thus we ſay, *trillions*, *tens of trillions*; *hundreds of trillions*, &c.

TRILLIUM, in *Botany*. See *Herb* PARIS of *Canada*.

TRILLO, in the *Italian Muſic*, is often found marked with a ſingle T; or *tr*, and often alſo by a ſmall *t*, as well in vocal as inſtrumental parts. It is deſigned to intimate, that you beat quick upon two notes in conjoint degrees, as *e f*, or *d e*, alternately; beginning with the higheſt, and ending with the loweſt. This makes what the French improperly call *cadence*, and properly *tremblement*. But it is alſo very often found in the Italian muſic to give notice, that the ſame ſound be ſtruck many times over, beginning a little ſlow, and ending with all the quickneſs, that the throat or finger can form them. Thus, ſuppoſing the firſt two or three quavers, then as many ſemi-quavers, and then ending with demi-ſemi-quavers, all in the ſame pitch or tune.

The manner wherein we have deſcribed this, comes far ſhort of what able maſters can ſhew in practice: this *trillo* is more particularly uſed, after a note has been long held out, to eaſe the voice; which ſo long a tenſion had weakened. Broſſard.

TRILOBOUS *leaf*, among *Botaniſts*. See LEAF.

TRILOCULAR *capſule*, among *Botaniſts*. See CAPSULE.

TRIM, in *Carpentry*, is to fit one piece into another.

TRIM *of a ſhip*, is her beſt poſture, proportion of ballaſt, arrangement of her ſails, and poſition of her maſts for ſailing.

Thus, the *trim* of the HOLD denotes the moſt convenient arrangement of the various materials contained in it, with relation to the ſhip's motion or ſtability at ſea.

Trim, when applied to the ſails, denotes the general arrangement which is beſt calculated to accelerate the ſhip's courſe, according to the direction of the wind.

Trim, when expreſſed of the maſts, denotes their poſition with regard to the ſhip and to each other, ſo that they ſhould not be too far forward or aft, nor too near nor too far a-part: and, according to the ſituation or quality which communicates a greater velocity to the veſſel, they ſhould either be upright, or inclining aft or forward.

Hence, to find the beſt way of making a ſhip ſail ſwiftly, is to find her *trim*.

To TRIM *a boat*, is to ſet the paſſengers ſo as to keep the boat even on both ſides. See BOAT.

To TRIM *the ſails*. See TACK.

TRIMACRUS, or TRIMACER, in the *Ancient Proſody*, a foot in verſe, conſiſting of three long ſyllables.

TRIMILCHI, a name by which the Engliſh Saxons called the month of May; becauſe they always milked their cattle three times a day in that month.

TRIMMED, *ſharp*, in *Sea-language*, denotes the ſituation of a ſhip's ſails in a ſcant wind.

TRIMMERS, in *Architecture*, pieces of timber framed at right angles to the joints, againſt the ways for chimneys, and well-holes for ſtairs.

TRIMODIA, among the Romans, a bag like an inverted cone, in which ſowers carried their ſeed. It was ſuſpended from their necks, and was ſo called from its containing three buſhels.

TRIMONEER, a corruption of TIMONEER.

TRINE, *dimenſion*, or *threefold dimenſion*, includes length, breadth, and thickneſs.

The *trine* dimenſion is peculiar to bodies or ſolids.

TRINE, in *Aſtrology*, is the ASPECT or ſituation of one ſtar with regard to another, when they are diſtant 120 degrees.

It is alſo called TRIGON, and is uſually ſignified by the character △.

TRINGA, SAND-PIPER, in *Ornithology*, the name of a diſtinct genus of birds, of the order of the *grallæ*: the diſtinguiſhing characters of which are, that the beak is roundiſh, and of the length of the head, the noſtrils linear, and that the feet have each four toes, the outmoſt being generally connected at bottom by a ſmall membrane. Linnæus enumerates twenty-three ſpecies; among which are the *pugnax* RUFFE, the VANELLUS, or LAPWING, the GAMBETTA, the TURN-*ſtone*, the PHALAROPE, the STINT, the KNOT, &c.

TRINGLE, in *Architecture*, a name common to ſeveral little ſquare members, or ornaments; as reglets, liſtels, and platbands.

The word is French, where it ſignifies the ſame.

TRINGLE is more particularly uſed for a little member fixed exactly over every triglyph, under the platband of the architrave; from whence hang down the guttæ, or pendent drops.

TRINITARIANS, a term uſed very variouſly, and arbitrarily: frequently it ſtands, as a common name for all perſons who have ſentiments on the myſtery of the Trinity, different from thoſe of the catholic church.

Sometimes it is more immediately reſtrained to ſome one or other particular claſs of ſuch perſons.

It is now applied to the orthodox themſelves, in contradiſtinction to the others who are then called *Antitrinitarians*, who deny or impugn the doctrine of the Trinity.

Thus the Socinians and others call the Athanaſians, *Trinitarians*.

The *Trinitarians* of the preſent age, and eſpecially thoſe, who, in England, have written on the ſubject of the TRINITY, are far from being agreed in their opinions, and therefore ought to be claſſed very differently from one another.

A late writer (Prieſtley's Hiſt. Corrupt. of Chriſtianity, vol. i. p. 147.) thinks that they are all reducible to two claſſes, viz. that of thoſe who believe, that there is no proper divinity in Chriſt, beſides that of the Father; and the claſs of TRITHEISTS, who maintain that there are three equal and diſtinct Gods. Dr. Waterland and the reſt of the Athanaſians aſſert three proper diſtinct perſons, entirely equal to and independent upon each other, yet making up one and the ſame being. Mr. Howe (Works, vol. ii. p. 560—568) ſeems to ſuppoſe that there are three diſtinct eternal ſpirits, or diſtinct intelligent hypoſtaſes; each having his own diſtinct, ſingular, intelligent nature, united in ſuch an inexplicable manner, as that upon account of their perfect harmony, conſent and affection, to which he adds their mutual ſelf-conſciouſneſs, they may be called the one God, as properly as the different corporeal, ſenſitive, and intellectual natures united may be called one man. Biſhop Pearſon (on the Creed, p. 134, &c. 322, &c.) Biſhop Bull (Serm. vol. iv. p. 829) and Dr. Owen (on the Heb. i. 3. p. 53, &c.) are of opinion, that though God the Father is the fountain of the Deity, the whole divine nature is communicated from the Father to the Son, and from both to the Spirit; yet ſo as that the Father and Son are not ſeparate, nor ſeparable from the divinity, but do ſtill exiſt in it, and are moſt intimately united to it. Dr. Thomas Burnet (Script. Doctr. p. 173.) maintains one ſelf-exiſtent and two dependent beings; but aſſerts, that the two latter are ſo united to and inhabited by the former, that by virtue of that union divine perfections may be aſcribed and divine worſhip paid to them. In this opinion Dr. Doddridge is ſaid to have concurred. Dr. Wallis (Lett. on the Trin.) thought, that the diſtinction between the three perſons was only modal; which ſeems, ſays Dr. Doddridge, to have been the opinion of archbiſhop Tillotſon. Tillotſ. Serm. vol. i. p. 492—494. Dr. Watts (Diſſ. N° 7.) maintained one ſupreme God dwelling in the human nature of Chriſt, which he ſuppoſes to have exiſted the firſt of all creatures; and ſpeaks of the divine Logos, as the wiſdom of God, and the Holy Spirit, as the divine power, or the influence and effect of it; which, he ſays, is a ſcriptural perſon, i.e. ſpoken of figuratively in ſcripture under perſonal characters. Doddridge's Lectures, p. 402, &c.

TRINITARIANS alſo denote an order of religious, inſtituted in honour of the Trinity, for the redeeming of Chriſtian captives from the infidels; vulgarly called MATHURINS, and brothers of the *Redemption*.

They are clothed in white, and bear on the ſtomach a croſs, partly red, and partly blue; by which three colours, white, red, and blue, is ſuppoſed to be repreſented the myſtery of the Trinity, but the habit of this order is different in different provinces.

The *Trinitarians* made it their buſineſs to go and ranſom Chriſtians held in ſlavery in the republics of Algiers, Tunis and Tripoly, and the ſtates of Morocco. They have a rule peculiar to themſelves; though ſeveral hiſtorians rank them among the obſervers of the rule of St. Auguſtine.

The order had its riſe in 1198, under the pontificate of Innocent III. The founders were John de Matha and Felix de Valois; the firſt of Faucon in Provence; the ſecond, not of the royal family of Valois, as ſome have imagined, but thus called, in all probability, as being a native of the country Valois.

Gauthier of Chatillon was the firſt who gave them a place in his lands to build a convent; which afterwards became the chief of the whole order: Honorius III. confirmed their rule. And Urban IV. appointed the biſhop of Paris and

and others to reform them: they did it; and the reform was approved in 1267, by Clement IV.

This order possesses about 250 convents, divided into thirteen provinces; whereof six are in France, three in Spain, one in Italy, and one in Portugal. And formerly there was one in England, another in Scotland, and a third in Ireland.

Broughton, and some other writers, make a distinction between the order of the redemption of captives, and the *fraternity of the holy* TRINITY.

TRINITARIANS, *barefooted*, are a reform of this order, made in Spain, in a general chapter, held in 1594, where it was resolved, that each province should establish two or three houses, where the primitive rule should be observed, and where the religious should live up to a greater austerity, use coarser cloaths, &c. and yet should have the liberty of returning to their ancient convent when they thought fit.

Don Alvares Basan, intending to found a monastery at Valdepegnas, and desiring to have it occupied by barefooted religious, it was agreed to add nudity of feet to the reform, that the *Trinitarians* might have the benefit of that establishment. The reform afterwards grew into three provinces, and was at length introduced into Poland and Russia, and thence into Germany and Italy.

There are also *barefooted Trinitarians* in France, established by F. Jerom Hallies, who, being sent to Rome to solicit the first reform mentioned above, not content therewith, carried it farther, and obtained a permission of pope Gregory, to add a coarse habit, and nudity of feet, thereto. He began with the convent of St. Dionysius at Rome, and those of Aix in Provence.

In 1670, there were houses enough of this reform to make a province; and, accordingly, they held their first general chapter the same year.

There are also nuns of the TRINITARIAN order, established in Spain by St. John de Matha himself, who built them a convent in 1201. Those who first took the habit were only oblatæ, and made no vows; but in 1201, the monastery was filled with real religious, under the direction of the infanta Constantia, daughter of Peter II. king of Arragon, who was the first religious, and the first superior of the order.

There are also barefooted nuns of this order, established at Madrid about the year 1612, by Frances de Romero, daughter of Julian de Romero, a lieutenant-general in the Spanish army.

Lastly, there is a THIRD *order* of *Trinitarians*.

TRINITY, TRINITAS, TRIAS, TRIAD, in *Theology*, the ineffable mystery of three persons in one God, Father, Son, and Holy Spirit.

It is an article in some systems of theology, that there is one God, an unity in nature and essence, and a *Trinity* of persons. The term *Trinity* implies the unity of three, the unity of three divine persons really different, and the identity of an indivisible nature: the *Trinity* is a ternary of divine persons of the same essence, nature, and substance.

Person is defined an individual, reasonable, or intellectual substance; or an intellectual and incommunicable substance.

The HYPOSTASIS, or substance, is what constitutes the person. There are then in the Holy *Trinity* three persons, Father, Son, and Holy Spirit, which have all things in common, except their relations; whence that axiom in theology comes to have place, in the divine persons there is no distinction where there is no opposition of relation.

The Father is the first person in the Holy *Trinity*, by reason the Father alone produces the Word, by the way of *understanding*; and with the Word produces the Holy Spirit, by way of *will*.

Here is to be observed, that the Holy Spirit is not thus called from his spirituality, that being common and essential to all the three persons; but from the passive spiration (as some popish schoolmen express the manner in which the personality of the Holy Spirit is derived from the Father and Son), which is peculiar to him alone.

Add, that when one person in the Holy *Trinity* is called *first*, another *second*, and another *third*, it must not be understood of a priority of time, or of nature, which would imply some dependence; but of a priority of origin and emanation, which consists in this, that one person produces the other, in such manner, as that the person which produces cannot be, or be conceived, without that produced.

Those who maintain the doctrine of the *Trinity* allege, that the same titles, attributes, works, and worship are ascribed by the sacred writers to the Father, Son, and Holy Spirit: nevertheless they contend, in different ways, for the proper unity of the divine nature. For the sentiments of some of the chief modern *Trinitarians*, see TRINITARIANS: and for the sentiments of others, who have rejected what has been usually denominated the orthodox doctrine of the *Trinity*, see ARIANS, MACEDONIANS, NOETIANS, SABELLIANS, SEMI-ARIANS, SOCINIANS, and UNITARIANS. See also TRITHEISM.

It is observed by Dr. Waterland, and many other writers, that the term *Trinity* first occurs in the works of Theophilus, bishop of Antioch, about the year 180. Theoph. ad Autolyc. lib. ii. cap. 14. p. 148. 150, ed. Wolfii.

But at this time the words, persons and substance, were not in use; however, they were introduced on occasion of the disputes with Praxeas, Noetus, and Sabellius, either by Clemens of Alexandria, or by Tertullian.

For the punishment inflicted by the English law on those who deny the *Trinity*, see HERESY.

Many of the heathens seem to have had a notion of a *Trinity*. Steuch. Eugub. de Peren. Philos. lib. i. cap. 3. observes, that there is nothing in all theology more deeply grounded, or more generally allowed by them, than the *mystery* of the *Trinity*. The Chaldæans, Phœnicians, Greeks, and Romans, both in their writings, and their oracles, acknowledged that the Supreme Being had begot another Being from all eternity, which they sometimes called the *Son of God*, sometimes the *Word*, sometimes the *Mind*, and sometimes the *Wisdom of God*, and asserted it to be the creator of all things.

Among the sayings of the Magi, the descendents of Zoroaster, this is one, Παντα εξετελεσε πατηρ καινῳ παρεδωκε δευτερῳ: *the Father finished all things, and delivered them to the second Mind.* The Egyptians called their *Trinity*, *hemptha*, and represented it by a globe, a serpent, and a wing, disposed into one hieroglyphic symbol. Kircher, Gale, &c. suppose the Egyptians learned their doctrine of the *Trinity* from Joseph and the Hebrews.

The philosophers, says St. Cyril, owned three hypostases, or persons; they have extended their divinity to three persons, and even sometimes used the word *Trias*, *Trinity*: they wanted nothing but to admit the consubstantiality of the three hypostases, to signify the unity of the divine nature, in exclusion of all triplicity with regard to difference of nature; and not to hold it necessary to conceive any inferiority of hypostases.

We learn from Dr. Cudworth, that, besides the inferior Gods, generally received by all the Pagans (viz. animated stars, dæmons, and heroes), the more refined of them, who accounted not the world the supreme deity, acknowledged a *Trinity* of divine hypostases superior to them all. This doctrine, according to Plotinus, is very ancient, and obscurely asserted even by Parmenides. Some have referred its origin to the Pythagoreans, and others to Orpheus, who adopted three principles, called Phanes, Uranus, and Cronus. Dr. Cudworth apprehends, that Pythagoras and Orpheus derived this doctrine from the theology of the Egyptian Hermes; and, as it is not probable that it should have been first discovered by human reason, he concurs with Proclus in affirming, that it was at first a theology of divine tradition or revelation, imparted first to the Hebrews, and from them communicated to the Egyptians and other nations; among whom it was depraved and adulterated. Cudw. Intell. System, book i. chap. 4.

Plato, and some of his followers, speak of a *Trinity* in such terms, that the primitive fathers have been accused of borrowing the very doctrine from the Platonic school; but F. Mourgues, who has examined the point, asserts, that nothing can be more stupid than to suppose the Platonic *Trinity* brought into the church; and to have recourse to the Platonism of the fathers to discredit their authority with regard to this dogma.

Friery, or fraternity of the Holy TRINITY, is a society instituted at Rome, by St. Philip Neri, in 1548, to take care of pilgrims coming from all parts of the world to that capital, to visit the tombs of St. Peter and St. Paul.

In 1558, pope Paul IV. gave the fraternity the church of St. Benedict, to which they gave the title of the *Holy Trinity*. Since that time, they have built close by it a very ample hospital for pilgrims, and persons on the recovery.

The fraternity is now very considerable, and most of the noblesse of Rome, of either sex, have done it the honour to be members of it.

Congregation of the Holy TRINITY, is a congregation of twelve priests established in the hospital of the fraternity just mentioned, to take care of pilgrims, and others entertained therein.

Order of the Holy TRINITY. See TRINITARIAN.

TRINITY-*Sunday*, is the next Sunday after Whitsunday.

thus called, becauſe, on that day, was anciently held a feſtival (as it ſtill continues to be in the Romiſh church), in honour of the Holy *Trinity*. The obſervation of this feſtival was firſt enjoined by the ſixth canon of the council of Arles, in 1260; and John XXII. who diſtinguiſhed himſelf ſo much by his opinion concerning the beatific viſion, is ſaid to have fixed the office for this feſtival in 1334.

TRINITY-*herb*, in *Botany*. See VIOLET.

TRINITY-*houſe*, is a kind of college at Deptford, belonging to a ſociety of ſeafaring perſons, founded for the regulation of ſeamen, and ſecurity and convenience of ſhips and mariners on our coaſts.

This ſociety was incorporated by Henry VIII. in 1515, who confirmed to them not only all the ancient rights and privileges of the mariners of England, but alſo their ſeveral poſſeſſions: which, together with various grants of queen Elizabeth and king Charles II. were confirmed by letters patent of the 1ſt of James II. in 1685; under the name of the maſter, wardens, and aſſiſtants of the guild or fraternity of the moſt glorious and undivided *Trinity*, and of St. Clement, in the pariſh of Deptford Strand, in the county of Kent.

This corporation is governed by a maſter, four wardens, eight aſſiſtants, and eighteen elder brethren; the inferior members of the fraternity, denominated younger brethren, and choſen among the maſters and mates expert in navigation, are of an unlimited number, and ſerve for ſupplying vacancies among the thirty-one elder brethren. The maſter, &c. of this corporation, are inveſted by charter with a power to examine the mathematical children of Chriſt's Hoſpital, to examine the maſters of his majeſty's ſhips, to appoint pilots for conducting ſhips in and out of the river Thames, and to amerce ſuch as ſhall act as maſters or pilots without their approbation, in a fine of 20*l.* to ſettle the ſeveral rates of pilotage, and erect light-houſes, and other ſea-marks, on the ſeveral coaſts of the kingdom, for the ſecurity of navigation; to prevent aliens from ſerving on board Engliſh ſhips, without their licence, under penalty of 5*l.* for each offence; to puniſh ſeamen for deſertion or mutiny in the merchants ſervice; to hear and determine the complaints of officers and ſeamen in this ſervice, under an appeal to the court of admiralty; and to grant licences to poor ſeamen (non-freemen) to row on the river Thames.

To this company belongs the ballaſt-office, for cleaning and deepening the river Thames, by taking from it a ſufficient quantity of ballaſt for the ſupply of all ſhips that ſail out of the river; in which ſervice ſixty barges, of the burden of thirty tons, and two men each, are conſtantly employed: all ſhips taking in ballaſt pay to them 12*d.* a ton.

This corporation is impowered by charter to purchaſe lands, &c. to the amount of 500*l. per annum*, and alſo to receive charitable benefactions to the like amount. They have alſo light-houſes, to which all ſhips pay one halfpenny a ton.

Out of the income of this corporation about three thouſand poor ſeamen, their widows and orphans, are annually relieved, at the expence of about 6000*l.*

The houſe, in which the brethren of this corporation uſually meet for the diſpatch of buſineſs, is in Water-lane; and for the choice of maſter they meet at their houſe at Deptford. They have three hoſpitals, two at Deptford, and one at Mile-end, which laſt is deſigned for decayed ſea-officers, maſters of veſſels, pilots, and their widows.

TRINITY-*term*. See TERM.

TRINIUMGELD, or THRINIUMGILD, a compenſation uſed among our Saxon anceſtors for great crimes, which were not abſolved but by paying a fine thrice nine times. See GELD.

TRINK, in our *Statutes*, is uſed for a fiſhing-net. 2 Hen. VI. cap. 15. Blount.

TRINODA *neceſſitas*, in our *Ancient Cuſtoms*, a threefold neceſſary tax, to which all lands are liable; viz. *expeditio, & reparatio pontis, & arcis*; going to the wars, and repairing of bridges and of caſtles.

Theſe were the three exceptions anciently inſerted in the king's grants of lands to the church, after the words that freed them from all ſecular ſervice.

TRINODA, or TRINODIA *terræ*, in ſome *Ancient Writers*, denotes a quantity of land containing three perches.

TRINOMIAL, or TRINOMINAL *root*, in *Mathematics*, is a root conſiſting of three parts, or monomes, connected together by the ſigns +, or −.

Such is $x+y+z$, or $a+b-c$. See INVOLUTION.

TRIO, in *Muſic*, a part of a concert wherein three perſons ſing; or, more properly, a muſical compoſition, conſiſting of three parts.

Trios are the fineſt kind of compoſition, and theſe are what pleaſe moſt in concerts.

TRIOCTILE, in *Aſtrology*, an aſpect, or ſituation, of two planets, with regard to the earth, when they are three octants, or eight parts of a circle, i. e. 135 degrees diſtant from each other.

This aſpect, which ſome call the *ſeſquiquadrans*, is one of the new aſpects ſuperadded to the old ones by Kepler.

TRIONES, in *Aſtronomy*, a ſort of conſtellation, or aſſemblage of ſeven ſtars in the Urſa Major, popularly called *Charles's Wain*.

From the *Septem Triones* the north pole takes the denomination *Septentrio*.

TRIONUM, in *Botany*, was formerly ranked by Linnæus as a diſtinct genus; but is now referred to *hibiſcus*. See *Syrian* MALLOW.

TRIOPTHALMUS, formed of τρεις, *three*, and οφθαλμος, *eye*, a name given by authors to ſuch pieces of agate, or other ſemi-pellucid ſtones, as happen to have three ſmall circular ſpots, reſembling eyes upon them; theſe are of the nature of the common agate, &c. The ſpots are mere accidental varieties in the diſpoſitions of the veins, and do not make a diſtinct ſpecies of ſtone.

TRIOPTERIS, in *Botany*, a genus of the *decandria trigynia* claſs, the characters of which are theſe: the perianthium is very ſmall and permanent, and is compoſed of one leaf divided into five ſegments; the flower is compoſed of ſix equal petals of an oval figure, and theſe are ſurrounded by three other ſmaller petals, which are alſo of an equal ſize one with another; the ſtamina are two filaments, beyond the petals of the flower, and are fixed to the cup; the external ones are ſomewhat ſhorter than the interior, and the antheræ are ſimple; the germen of the piſtil is divided into three parts; there are three erect and ſimple ſtyles; and the ſtigmata are obtuſe; there is no fruit to encloſe the ſeeds, but they ſtand naked, and are three in number, and are hollowed at the back, and edged with alæ, which, when newly produced, have the appearance of petals. Indeed, what are called petals in this deſcription, are not ſo, but are the alæ of the germen, for the ſtamina are placed without them; but as they very much reſemble petals, a young botaniſt will more eaſily diſtinguiſh the genus by their being taken for ſuch, than by any other means. There is one ſpecies.

TRIORCHIS, a word uſed by ſome, to expreſs a man who has three teſticles.

It is alſo uſed as the name of a buzzard, and of a plant, called ladies-traces.

TRIORS, or TRIERS, in *Law*, ſuch as are choſen by the court to examine whether a CHALLENGE made to the panel of jurors, or any of them, be juſt or no.

The *triors*, in caſe the firſt man called be challenged, are two indifferent perſons named by the court; and if they try one man and find him indifferent, he ſhall be ſworn; and then he and the two *triors* ſhall try the next; and when another is found indifferent and ſworn, the two *triors* ſhall be ſuperſeded, and the two firſt ſworn on the jury ſhall try the reſt.

TRIOSTEOSPERMUM, in *Botany*. See *Falſe* IPECACUANHA.

TRIOSTEUM, in *Botany*. See *Falſe* IPECACUANHA.

TRIP, a ſea-term; a ſhip is ſaid to bear her topſails *a-trip*, when ſhe carries them twiſted up to the higheſt.

TRIP is alſo a cant-term, denoting an outward-bound voyage, particularly in the coaſting navigation. It alſo denotes a ſingle board in plying to windward.

TRIPARTITE, TRIPARTITUS, ſomething divided into three parts, or made by three parties; as an INDENTURE *tripartite*, &c.

TRIPARTITION is a diviſion by three, or the taking of the third part of any number or quantity.

TRIPELA. See TRIPOLI.

TRIPENTAHEDRIA, derived from τρὶς, *thrice*, πέντε, *five*, and ἕδρα, *a ſide*, in *Natural Hiſtory*, the name of a genus of ſpars.

The bodies of this genus are ſpars, compoſed of thrice five planes; being made of a pentangular column, terminated at each end by a pentangular pyramid. Of this genus we only know one ſpecies; this has a moderately long column, and very ſhort and broad pyramids; it is found in Derbyſhire, Yorkſhire, and Cornwall, and is very frequent about Goſſelaer in Saxony. Hill's Hiſt. of Foſſ. p. 205.

TRIPETALOUS *flowers*, ſuch which conſiſt of three leaves, which are called petals, to diſtinguiſh them from the leaves of plants.

TRIPHARMACUM, an ointment in the late London Diſpenſatory, ſo called from its being compoſed of three ingredients: the preſcription is this: take common plaſter four ounces; oil olive two ounces; vinegar one ounce;

ounce; ſet them over a gentle fire, and ſtir them continually till they become an ointment.

TRIPHTHONGUE, in *Grammar*, an aſſemblage, or concourſe, of three vowels in the ſame ſyllable; as in *quae*.

Quintilian, lib. i. cap. 6. denies the exiſtence of *triphthongues*; and aſſerts, that there never was any ſyllable of three vowels, but that one of them was always turned into a conſonant: Scioppius aſſerts the contrary. However this may be in the Latin and Greek, which were the only languages Quintilian underſtood, it is certain there are ſeveral languages in Europe where *triphthongues* are in uſe.

TRIPLARIS, in *Botany*, a genus of the *triandria trigynia* claſs: its characters are; that the calyx is very large and tripartite; it has no corolla; the antheræ are linear; the fruit is a three-cornered nut, included within the ovated baſe of the calyx. There is one ſpecies.

TRIPLE, threefold. See Ratio and Sub-triple.

Triple, in *Muſic*, is one of the ſpecies of meaſure, or time.

Triple time conſiſts of many different ſpecies, whereof there are in general four, each of which has its varieties. The common name of *triple* is taken hence, that the whole, or half-meaſure, is diviſible into three equal parts, and is beaten accordingly.

The firſt ſpecies is called the *ſimple triple*, wherein the meaſure is equal to three ſemibreves, three minims, three crotchets, three quavers, or three ſemi-quavers, which are marked thus, $\frac{3}{1}$, or $\frac{3}{2}$, $\frac{3}{4}$, $\frac{3}{8}$, $\frac{3}{16}$; but the laſt is not much uſed, except in church muſic.

In all theſe the meaſure is divided into three equal parts, or times, called thence *triple time*, or the meaſure of *three times*; whereof two are beat down, and the third up.

The ſecond ſpecies is the *mixt triple*; its meaſure is equal to ſix crotchets, or ſix quavers, or ſix ſemi-quavers, and accordingly it is marked $\frac{6}{4}$, or $\frac{6}{8}$, or $\frac{6}{16}$; but the laſt is ſeldom uſed.

Some authors add other two; viz. ſix ſemibreves and ſix minims, marked $\frac{6}{1}$, or $\frac{6}{2}$; but theſe are not in uſe.

The meaſure here is uſually divided into two equal parts, or times, whereof one is beat down and one up; but it may alſo be divided into ſix times; whereof the firſt two are beat down, and the third up; then the next two down, and the laſt up; i. e. each half of the meaſure is beat like the *ſimple triple* (on which account it may be called the *compound triple*); and becauſe it may be thus divided either into two or ſix times (i. e. two *triples*), it is called *mixed*; and, by ſome, the *meaſure of ſix times*.

The third ſpecies is the *compound triple*, conſiſting of nine crotchets, or quavers, or ſemi-quavers, marked $\frac{9}{4}$, $\frac{9}{8}$, $\frac{9}{16}$: the firſt and laſt are little uſed; and alſo add $\frac{9}{1}$, $\frac{9}{2}$, which are never uſed.

This meaſure is divided into three equal parts, or times, whereof two are beat down, and one up; or each third part may be divided into three times, and beat like the *ſimple triple*; on which account it is called the *meaſure of nine times*.

The fourth ſpecies is a compound of the ſecond ſpecies, containing twelve crotchets, or quavers, or ſemi-quavers, marked $\frac{12}{4}$, $\frac{12}{8}$, $\frac{12}{16}$; to which ſome add $\frac{12}{1}$, and $\frac{12}{2}$, which are never uſed; nor are the firſt and third much uſed, eſpecially the latter.

The meaſure here may be divided into two times, and beat one down, and one up; or each half may be divided, and beat as the ſecond ſpecies, either by two or three; in which caſe it will make in all twelve times, and hence is called *the meaſure of twelve times*.

The French and Italian authors make a great many more ſpecies and diviſions of *triple* time, unknown, or at leaſt unregarded by our Engliſh muſicians, and therefore not ſo neceſſary to be dwelt upon here.

Triple *quartan fever*. See Fever.

Triple *inciſion*. See Engraving.

TRIPLICATE *Ratio*, is the ratio which cubes bear to each other.

This ratio is to be diſtinguiſhed from *triple* ratio, and may be thus conceived. In the geometrical proportionals 2, 4, 8, 16, 32. as the ratio of the firſt term (2) is to the third (8) duplicate of that of the firſt to the ſecond, or of the ſecond to the third: ſo the ratio of the firſt to the fourth is ſaid to be *triplicate* of the ratio of the firſt to the ſecond, or of that of the ſecond to the third, or that of the third to the fourth, as being compounded of three equal ratios.

TRIPLICATIO, Triplication, in *Civil Law*, is the ſame with sur-rejoinder, in common law.

TRIPLICITY, or Trigon, among *Aſtrologers*, is a diviſion of the ſigns, according to the number of the elements; each diviſion conſiſting of three ſigns.

Triplicity is frequently confounded with *trine aſpect*; though, ſtrictly ſpeaking, the two are very different things: as *triplicity* is only uſed with regard to the ſigns, and *trine*, on the contrary, with regard to the planets. The ſigns of *triplicity* are thoſe which are of the ſame nature, and not thoſe which are in trine aſpect. Thus Leo, Sagittary, and Aries, are ſigns of *triplicity*, becauſe thoſe ſigns are, by theſe writers, all ſuppoſed fiery.

TRIPLOIDES, a ſurgeon's inſtrument, with a threefold baſis, uſed in the reſtoring of great depreſſions of the ſkull. Blanc.

TRIPOD, Tripos, in *Antiquity*, a famed ſacred ſeat or ſtool, ſupported by three feet, whereon the prieſts and ſibyls were placed to render oracles.

It was on the *tripos* that the gods inſpired the Pythians with that divine fury and enthuſiaſm wherewith they were ſeized at the delivering of their predictions.

M. Spanheim obſerves, that, on Roman medals, the *tripod* expreſſes ſome prieſthood, or ſacerdotal dignity. A *tripod*, with a raven and a dolphin, is alſo the ſymbol of the duumviri, deputed for keeping of the ſibylline oracles, and for conſulting them on occaſion.

TRIPODIUM. In the laws of Hen. I. occurs this paſſage —*In quibus vero cauſis triplicem ladam haberet, ferat judicium* tripodii, i. e. 60 ſolid. The meaning whereof, according to ſome, is, that, as for a ſmall offence, the compoſition was twenty ſhillings; ſo for a great offence, which was to be purged *triplici lada*, the compoſition was three times twenty ſhillings, and this was called *tripodium*.

TRIPOLI, in *Natural Hiſtory*, the name of an earthy ſubſtance, uſed by the lapidaries to poliſh ſtones, and by the braſiers, and other the like artiſts to clean metalline veſſels. It is of ſeveral kinds, diſtinguiſhed by its various colours.

The *tripoli* of a white colour is of a looſe friable texture, light, moderately hard, and of a harſh, rough, duſty ſurface; it ſlightly colours the hands, adheres to the tongue, breaks immediately in the mouth into a coarſe and very hard powder; thrown into water it makes a ſlight ebullition, and, after ſome time, falls into powder.

It is not acted upon by acids, and in the fire acquires ſome hardneſs without any change of colour.

It is dug in Saxony, in the duchy of Schwartzburg, and on the Blockeſberg, in the duchy of Brunſwick; and a variety of it is dug near Cork, in Ireland, where it is much uſed.

Hill has erroneouſly affirmed this ſpecies of *tripoli* to be the argentaria *creta* of the ancients, but Da Coſta has evinced this to be the common chalk.

The yellowiſh-white kind is called by authors *alana gleba*, *tripolis*, and *terra tripolitana*; this is the produce of Germany, Saxony, Poland, and France; there is alſo of it in the neighbourhood of Venice, but it is found in greateſt plenty in many parts of Africa. It is light chalk, of a very pale yellowiſh white, of a firm texture, and moderately hard. It is of a harſh dry ſurface, and colours the hands; it does not adhere to the tongue; it breaks pretty freely in the mouth, makes no effervеſcence with aqua fortis, and is ſlowly diffuſible in water. In the fire it acquires ſome hardneſs, and a pale roſy colour.

The reddiſh *tripoli* is of our own production, though not peculiar to ourſelves; it is found in great abundance on Mendip-hills in Somerſetſhire, nor leſs plentifully in many parts of Germany. This is well known in the ſhops as a ſubſtance of great uſe in poliſhing braſs, but is not applied to any of the other uſes of the yellowiſh kind: this, like the former, is moſt frequently found in detached maſſes, and while in the earth is tolerably ſoft, and eaſily falls into flakes. When dry it becomes of a conſiderable hardneſs, and is of a fine pale reddiſh white, of a looſe open texture, compoſed of a multitude of extremely thin plates or flakes laid evenly on one another, and conſiderably heavy; it is of a ſmooth and ſomewhat gloſſy ſurface; it adheres very firmly to the tongue, is dry and harſh to the touch, too hard to be broken between the fingers, and does not ſtain the hands; it makes no effervеſcence with acids, and burns to a paler colour, with ſome additional hardneſs.

There are likewiſe browniſh *tripolis*, particularly the *terra carioſa*, or *tripela fuſca levis*, vulgarly called *rotten-ſtone*; this is of an aſhen-brown colour, moderately hard, of a looſe but regular texture, of a harſh, dry, duſty ſurface, and colours the hands. It does not adhere to the tongue, breaks freely in the mouth, makes no effervеſcence with aqua fortis, and in water is eaſily pulveriſed. It is chiefly procured from Derbyſhire, and much uſed by braſiers and lapidaries. See Hill's Hiſt. Foſſ. p. 67, 68. Da Coſta's Hiſt. Foſſ. p. 76. 85. 87.

M. Hubner infers, from ſome obſervations relating to the

the production of the *terra tripolitana*, or *tripoli*, made in Upper Brittany, where this ſubſtance abounds, that it is a wood wholly petrified, and afterwards calcined by the ſubterraneous fire; the mountain of Poligné, in the interior of which it is found, has been, and is perhaps yet, he ſays, a volcano. He obſerves, however, that there are *tripolis* of various kinds, as well as of ſeveral degrees of goodneſs; among which there may be ſuch as are not otherwiſe than a real or native foſſil, deprived by fire of its primitive hardneſs and weight; but he thinks that the *tripoli*, which has its origin from petrified wood, muſt be the beſt, becauſe it naturally ought to be the fineſt, ſofteſt, and the beſt calcined.

Mr. Da Coſta, however, is of opinion, that the operation ſuppoſed by Mr. Hubner, is only a partial and local origin of this ſubſtance, by the concurring circumſtances of wood and *tripoli* being buried together in the bowels of a volcano: the layers of foſſil wood in the mountain having been ſaturated with the *tripoline* particles; which alſo abound in it, compoſed a ſtone, or third body; and theſe *tripoline* particles were again reduced, by ſubterraneous-fire, to their priſtine ſtate. Phil. Tranſ. vol. li. p. 186, &c.

Some have apprehended, that *tripoli* is a powder formed by the decompoſition or mouldering of jaſper; others have conſidered it as an argillaceous earth. Neumann ſays, that by diſtilling two ounces of it, he obtained two ſcruples of a weak marine acid, and a ſmall portion of ſal ammoniac; that by diſtilling a mixture of this earth and nitre, he obtained aqua regia; and that of ſixty grains of *tripoli*, one grain was ſoluble in concentrated vitriolic acid, two in diluted vitriolic acid, three in ſpirit of ſalt, five in ſpirit of nitre, eleven in aqua regia, and ſeven grains in cauſtic fixed alkali.

According to M. d'Arcet, *tripoli* is vitrifiable *per ſe*, in a porcelain heat long continued; and, according to Mr. Bergman, it yields to borax and microcoſmicic ſalt, but ſcarcely to fixed alkali. Mr. Haaſe, who has lately analyſed it, found 100 parts of it to contain 90 of ſiliceous earth, 7 of argil, and 3 of iron. According to Mr. Gerhard, magneſia has been ſometimes extracted from it. Mr. Kirwan ſays, that it is evidently a volcanic product. Elem. of Mineral. p. 82, 1784.

The rotten-ſtone of Derbyſhire is, according to Mr. Ferber, a *tripoli* united with calcareous earth.

Stahl has found that *tripoli* is aſtringent and deſiccative, like all martial ſubſtances.

For the method of imitating gems by means of *tripoli*, ſee GEMS.

TRIPOLIUM, in *Botany*, a ſpecies of *aſter*. See STAR-*wort*.

TRIPPING, in *Heraldry*, denotes the quick motion of all ſorts of deer, and of ſome other creatures, repreſented with one foot up, as it were, on a trot.

In ſpeaking of lions, they ſay *paſſant*, inſtead of *tripping*.

TRIPPING, in *Sea Language*, denotes the movement by which an anchor is looſened from the bottom by its cable or buoy-ropes. See ATRIP.

TRIPSACUM, in *Botany*, a genus of the *monoecia triandria* claſs: its characters are; that it has male and female flowers; the calyx of the male is a four-flowered glume, and the corolla a membranaceous glume; the calyx of the female is a glume with perforated hollows; the corolla a bivalve glume; the ſtyles two, and the ſeed ſingle. There are two ſpecies.

TRIPTHONGUE. See TRIPHTHONGUE.

TRIPTOTES, compounded of τρεις, *three*, and πτωσις, *caſe*, in *Grammar*, defective nouns, which have only three caſes; ſuch is *fors, fortis, forte*; or *dica, dicam, dicas*.

TRIPUDIUM, in *Antiquity*, a ſpecies of divination, in which omens were drawn from the rebounding of corn thrown to chickens.

TRIPYRAMIDES, derived from τρὶς, *thrice*, and πυραμὶς, a *pyramid*, in *Natural Hiſtory*, the name of a genus of ſpars.

The bodies of this genus are ſpars compoſed of ſingle pyramids, each of three ſides, ſtanding on no column, but affixed by their baſes to ſome ſolid body.

Of this genus there are only two known ſpecies: 1. A ſhort and thick one, found on the ſides of the ſtacks of ſtone in Northamptonſhire, and elſewhere; but this is not common, and is uſually ſmall. 2. A long one with a narrow baſe: this is not found in England, but is common in the German mines. Hill's Hiſt. of Foſſ. p. 226.

TRIQUETRA *oſſa*, triangular bones found in ſome craniums.

TRIQUETRUM *folium*, among *Botaniſts*. See LEAF.

TRIREME, or TRIREMIS, in *Antiquity*, a GALLEY with three ranks of oars on a ſide. See ENNERIS.

TRISACRAMENTARIANS, or TRISSACRAMENTARIANS, an appellation given to a ſect in religion, who admit of three ſacraments, and no more.

There have been ſeveral *Triſacramentarians* who allowed of baptiſm, the euchariſt, and abſolution for ſacraments. The Engliſh are often miſrepreſented by foreigners as *triſacramentarians*, from an opinion, that they allow ordination to be a ſacrament.

TRISACTIS, in *Natural Hiſtory*, the name of a genus of STAR-*fiſh*, compoſed of a body and three rays, the more uſual number being five.

TRISAGION, or TRISAGIUM, τρισαγιον, compounded of τρεις, *three*, and ἁγιος, *ſanctus*, *holy*, in *Church Hiſtory*, a hymn, wherein the word *holy* is repeated three times.

The proper *Triſagion* is thoſe words, *holy, holy, holy, Lord God of Sabaoth*, which we read in Iſaiah vi. 3. and in the Apocalypſe. From theſe words the church formed another *Triſagion*, which is rehearſed in Latin and Greek, in the reſpective churches, to this effect, *Holy God, Holy Mighty, Holy Immortal! have mercy upon us.* Petrus Fullenſis to this *Triſagion* added, ὁ σταυρωθεις δι' ἡμας, *Thou who waſt crucified for us—have mercy*, &c. thus attributing the paſſion, not to the Son alone, but to all the three perſons of the Trinity; and he pronounced anathema to all ſuch as would not ſay the ſame. See THEOPASCHITE.

The uſe of the ſecond *Triſagion* (excluſive of the addition of Fullenſis) began in the church of Conſtantinople, from whence it paſſed into the other churches of the Eaſt, and afterwards into thoſe of the Weſt. And ſtill ſubſiſts in its primitive purity, both in Latin, Greek, Ethiopic, and Mozarabic offices.

TRISCÆDECACTIS, in *Natural Hiſtory*, a name given by Linkius, and ſome other authors, to a kind of branched ſtar-fiſh, or aſtrophyte, whoſe rays are thirteen in number, where they firſt leave the body, and each divides into many more.

TRIS-DIAPASON, *triple-diapaſon*, in *Muſic*, what is otherwiſe called a *triple eighth*.

TRISE, at *Sea*, the ſeamen's word for haling up of any thing with a dead rope, or one that doth not run in a block, but is pulled by hand or by main ſtrength: thus if any caſk, cheſt, or other goods, hath only a rope faſtened to it, and ſo without a tackle be pulled up into a ſhip by hand, they ſay it is *triſed up*.

TRISECTION, or TRISSECTION, the dividing of a thing into three.

The term is chiefly uſed in *Geometry*, for the diviſion of an angle into three equal parts.

The *triſection of an angle* geometrically, is one of thoſe great problems whoſe ſolution has been ſo much ſought by mathematicians for two thouſand years; being, in this reſpect, on a footing with the quadrature of the circle, and the duplicature of the cube angle.

Several late authors have written of the *triſection* of the angle, and pretend to have found out the demonſtration thereof; but they have all committed paralogiſms.

TRISETÆ, the *three-haired flies*, a term uſed by the writers in *Natural Hiſtory*, to expreſs a certain genus of the SETICAUDÆ, or briſtle-tailed flies, which are diſtinguiſhed from the reſt, by having three hairs or briſtles growing from the tail; there are ſeveral kinds of theſe flies, found frequently among our hedges.

TRISEUS, in *Ichthyology*, a name given by Salvian, Benedictus Jovius, and others, to that ſpecies of the gadi which we call the EELPOUT, and authors in general the *muſtela fluviatilis*.

TRISMEGISTUS, formed from τρις, *thrice*, and μεγιστος, *greateſt*, an epithet, or ſurname, given to one of the two Hermes's, or Mercuries, kings of Thebes, in Egypt, who was contemporary with Moſes.

Mercury, or Hermes *Triſmegiſtus*, is the latter of the two Hermes's; the former having reigned about the time of the deluge. They are both of them repreſented as authors of many of the arts and inſtitutions of the Egyptians.

TRISMOS, τρισμος, or τριγμος, a convulſion of the muſcles of the temples, cauſing the teeth to gnaſh.

TRISOLYMPIONICA, τρισολυμπιονικης, compounded of τρεις, *three*, Ολυμπια, *Olympic games*, and νικη, *victory*, among the *Ancients*, a perſon who had thrice borne away the prize at the Olympic games.

The *triſolympionicæ*, or *triſolympionics*, had great privileges and honours allowed them. Statues were erected to them, of the kind called *iconicæ*, which were modelled to the ſize and form of their perſons.

They were alſo exempted from all taxes and incumbrances, and could never be marked with infamy.

TRISPAST, TRISPASTON, compounded of τρεις, *three*, and σπαω, *I draw*, in *Mechanics*, a machine with three pullies,

lies, or an assemblage of three pullies, for raising great weights.

The *trispaston* is a species of POLYSPASTON.

TRISPERMUM, in *Pharmacy*, the name of a cataplasm, or pultice, consisting of three ingredients; these are cummin and opium seed, and bay-berries.

TRISSA, in *Ichthyology*, a name used by some authors for the fish more commonly known by the name of alausa, and called in English, SHAD, or the mother of herring.

TRISSACRAMENTARIANS. See TRISACRAMENTARIANS.

TRISTO, a word used by Paracelsus, to express what he calls the material fire, lodged in the matter of all the four elements, and exerting upon occasion its influence, under the form of the proper effects of each element.

TRISTRA, TRUSTRA, or TRISTA, in our *old Law Books*, an immunity, whereby a man is excused from attending on the lord of the forest, when he is disposed to chace within the forest; so that he cannot be compelled to hold a dog, follow the chace, nor stand at the place appointed, which otherwise he might be, under pain of amercement.

Sint quieti, &c. de chevagio, hondepenny, buckstol, & tristis, *& de omnibus misericordiis, &c.* Privileg. de Sempling-ham.

TRISYLLABLE, TRISSYLLABLE, in *Grammar*, a word consisting of three syllables.

TRITÆOPHYES, a word used by the medical writers of the ancients, to express a kind of fever, much of the nature of the tertian, and taking its rise from it.

TRITE, τριτη, in *Music*, the third musical chord in the system of the ancients.

There are three strings under this denomination in the ancient diagramma, viz. the *trite hyperbolæon*, *trite diazeugmenon*, and *trite synemmenon*.

This chord of the ancient tetrachord, was so named from its being the third from the NETE; and hence we might call it the anti-penultimate. It was otherwise, in some tetrachords, called PARYPATE. See DIAGRAM and INTERVAL.

TRITE *diezeugmenon*, in the *Greek Music*, was the anti-penultimate note of the diezeugmenon tetrachord, and answers to Guido's c, sol, fa, ut.

TRITE *hyperbolæon*, in the *Greek Music*, was the anti-penultimate note of the hyperbolæon tetrachord, and answers to Guido's f, fa, ut.

TRITE *synemmenon*, in the *Greek Music*, was the anti-penultimate note of the synemmenon tetrachord, and answers to Guido's b, fa. Wallis's Append. Ptolem. Harm. p. 257. See DIAGRAM.

TRITHEISM, the opinion of the *Tritheists*, or the heresy of believing three Gods.

Tritheism consists in admitting not only of three persons in the Godhead; but of three substances, three essences, or hypostases, and indeed three Gods.

Several people, out of fear of giving into *Tritheism*, have become Sabellians; and several others, to avoid Sabellianism, have commenced *Tritheists*; so delicate and subtile is the distinction.

In the famous controversy between Dr. South and Dr. Sherlock, the first is judged to have run into Sabellianism, by a too rigorous asserting the unity of a Godhead, and the latter into *Tritheism*, by a too absolute maintaining the Trinity.

John the Grammarian, surnamed Philoponus, lover of labour, is held the author of the sect of the *Tritheists*, under the emperor Phocas; at least it appears, that he was a zealous advocate thereof.

The chief of this sect, according to Mosheim, Eccl. Hist. vol. i. p. 473, was John Ascusnage, a Syrian philosopher, and a Monophysite. He imagined in the Deity three natures or substances, absolutely equal in all respects, and joined together by no common essence.

TRITHEITÆ, TRITHEISTS, in *Church History*, a name given to such heretics, as admit not only of three persons, but of three distinct substances and natures, in the Holy Trinity. See TRINITY and TRITHEISM.

TRITHING. See TRIHING.

TRITICUM, in *Botany*. See WHEAT.

TRITON, in *Poetry*, a sea demigod, held by the ancients to be an officer, or trumpeter, of Neptune, attending on him, and carrying his orders and commands from sea to sea.

The poets and painters represent him as half-man, half-fish, terminating in a dolphin's tail, and bearing in one hand a sea-shell, which served him as a trumpet.

Some of the ancients make him the son of Neptune, and the nymph Salacia; Hesiod, of Neptune and Amphitrite; Numenius, in his book De Piscationibus, makes him the son of Oceanus and Tethys; and Lycophron, the son of Nereus.

But though Hesiod and the mythologists only speak of one *Triton*, the poets have imagined several; giving some of them for trumpeters to all the sea-gods, particularly to Neptune and Venus; accordingly they were frequently introduced on the ancient theatre, and in the naumachia.

In effect, the *Tritons* not only officiated as trumpeters in Neptune's retinue, but were also supposed to draw his chariot, i. e. the sea-shell wherein he rode over the waters; as we find in Virgil, Æneid x. 209. Ovid. Metam. i. 333, and on a medal of Claudius.

The fable of the *Tritons*, no doubt, took its rise from what are called the sea-men, or mermen; for that there are such things as sea-men has been believed in many ages. See MERMAID and SEA-*cow*.

The poets ordinarily attribute to *Triton* the office of calming the waves, and of making tempests cease. Thus, in the 1st of the Metamorphoses, we read, that Neptune, desiring to recall the waters of the deluge, commanded *Triton* to sound his trumpet, at the noise whereof the waters all retired.

TRITON, in the Linnæan system of *Natural History*, a genus of the *mollusca* order of worms: the characters of which are, that the body is oblong, the tongue spiral, the tentacula twelve in number, and bipartite, six on each side, and the three hinder ones cheliferous. There is one species, which is found in the clefts of submarine rocks.

TRITON *avis*, in *Ornithology*, a name under which Nieremberg has described a bird of the West Indies, famous for its fine singing, and found in Hispaniola; it is said to have three different notes, and to be able to give breath to sounds of all three kinds at the same time; it is also said to be a very beautiful bird. Ray.

TRITONE, TRITONO, in *Music*, a false concord, consisting of three tones, or a greater third, and a greater tone.

Its ratio, or proportion in numbers is, of 45 to 32. In dividing the octave we find, on one side, the false fifth, and the *tritone* on the other.

The *tritone* is a kind of redundant fourth, consisting of three tones, whence its name; or, more properly, of two tones with a greater semitone, and a lesser, as of *ut* to *fa*, sharp; of *fa* to *si*, flat, &c. But it is not, as many imagine, a greater fourth; for the fourth is a perfect interval, which does not admit of any majority or minority; nor must the *tritone* be confounded with the false fifth; for the *tritone* only comprehends four degrees, viz. *ut*, *re*, *mi*, *fa*, sharp; whereas the false fifth comprehends five, viz. *fa*, sharp; *sol*, *la*, *si*, *ut*; besides that, among the six semitones which compose the *tritone* chromatically, there are three greater and three less; whereas, among the six semitones, which compose the false fifth, there are only two less and four greater. See FOURTH, FIFTH, &c.

TRITOPATORIA, τριτοπατορια, in *Antiquity*, a solemnity in which it was usual to pray for children, to the θεοι γενεθλιοι, or *gods of generation*, who were sometimes called τριτοπατορες.

TRITORIUM, in *Chemistry*, a vessel generally made of glass, used for the separation of liquors of different densities, as oil and water. Its largest diameter is in the middle, and it terminates with an aperture at each of the two extremities. The lower extremity, the aperture of which is very narrow, is dipped into the mixed liquor, and when it is sufficiently filled, the upper orifice is to be stopped close, by pressing the thumb upon it, by which means the liquor contained will not run out at the lower aperture, when the vessel is raised from the mixed liquor. When the fluids, of which this liquor consists, have perfectly separated according to their respective densities, by removing the thumb, the heavier fluid will run out at the lower extremity, and the separation will be thus effected. Dict. Chem.

TRITTYARCHI, τριττυαρχοι, among the *Athenians*, were magistrates who had the command or government of the third part of a tribe. See PHYLARCHUS.

TRITURATION, TRITURA, or TRITUS, formed from *triturare*, to *thrash*, of *tero*, *I wear*, *rub*, or *grind*, in *Pharmacy*, *grinding*; the act of reducing a solid body into a subtile powder, called also *levigation*, *pulverization*, &c.

The *trituration* of woods, barks, minerals, and other hard and dry bodies, is performed in metalline mortars and in mills.

The same term is also applied to the comminuting, bruising, and dividing, of humid matters into little parts. The *trituration* of moist bodies is performed in marble or

or ſtone mortars, with peſtles of wood, glaſs, ivory, &c. The word *trituration* is generally applied to denote the diviſion that is made of ſeveral bodies together, to unite them with each other; as, e. g. the extinction of mercury in the operation of Æthiops mineral, and others ſimilar.

Trituration, Boerhaave obſerves, has a wonderful force to diſſolve ſome bodies, and will render them as fluid as if they were fuſed by the fire. Thus if you grind the powder of myrrh and ſalt of tartar together, they will diſſolve each other. By rubbing new and bright filings of iron in a mortar, with double their weight of clean ſulphur, the iron will be diſſolved, ſo as by diluting it with water to afford the vitriolum Martis.

Gold long ground in a mortar, with ſalt of tartar, will yield a kind of tincture; and rubbed with mercury, in a mortar of glaſs, it entirely diſſolves into a purple liquor, and becomes a moſt powerful medicine.

Dr. Langelotte has written a curious treatiſe of the great effects of *trituration* in chemiſtry, and deſcribes a peculiar way he employed to grind gold, whereby he ſays, he could render it as fluid as the fire does, and make an aurum potabile, by the bare motion of a mill.

This author, in the Philoſophical Tranſactions, mentions his way of grinding gold, and deſcribes two engines, or philoſophical mills, for the purpoſe; with one of which, in the ſpace of fourteen natural days, he reduced a leaf of gold to a duſky powder, and, putting it into a ſhallow retort, placed in a ſand-heat, he thence obtained, by gradually increaſing the fire, and giving a ſtrong one at laſt, a very few red drops, which, digeſted *per ſe*, or with tartarized ſpirit of wine, afforded a pure and genuine aurum potabile.

The ſucceſs of this operation the doctor attributes, in a great meaſure, to the ſalt of the air, which, in grinding, plentifully mixes and unites itſelf with the gold.

TRITURATION is alſo uſed, in *Medicine*, for the action of the ſtomach on the food, whereby it is fitted for nutriment. See DIGESTION, where the doctrine is laid down at large.

TRIVERBIAL *days*, in the *Roman Calendar*, denoted judicial days, or ſuch as were allowed to the prætor for hearing cauſes.

They were otherwiſe called *dies* FASTI, *in quibus licebat prætori fari tria verba, do, dico, addico*.

Of theſe court-days the Romans had only twenty-eight in the whole year; whereas, with us, one fourth of the year is TERM time, in which three courts conſtantly ſit for the diſpatch of buſineſs; beſides the cloſe attendance of the court of chancery for determining ſuits in equity, and the numerous courts of aſſize and niſi prius that ſit in vacation for the trial of matters of fact.

TRIVIUM, a term invented in the times of barbariſm to expreſs the three ſciences that were firſt learned in the ſchools, viz. grammar, rhetoric, and logic; and the ſchools in which theſe ſciences were taught were called *triviales*.

The *quadrivium*, to which the ſcholar next proceeded in his way to the ſummit of literary fame, comprehended the four mathematical ſciences, viz. arithmetic, muſic, geometry, and aſtronomy.

TRIUMFETTA, in *Botany*, a genus of the *dodecandria monogynia* claſs: its characters are theſe; the flower has no empalement, but has five linear, erect, obtuſe petals, which turn inward; it has ten awl-ſhaped riſing ſtamina, the length of the petals, terminated by ſingle ſummits; and a roundiſh germen, ſupporting a ſtyle the length of the ſtamina, crowned by an acute bifid ſtigma; the germen becomes a globular capſule, ſet with long prickles on every ſide, having four cells, each containing one ſeed, which is convex on one ſide and angular on the other. Linnæus enumerates four ſpecies, but Miller mentions only one, which is a native of the Weſt India iſlands.

TRIUMPH, TRIUMPHUS, a ceremony, or ſolemnity, practiſed among the ancient Romans, to do honour to a victorious general, by affording him a magnificent entry into their city.

The *triumph* was the moſt pompous ſpectacle known among the ancients: authors uſually attribute its invention to Bacchus, and derive the term from θριαμβος, one of his titles; and tell us, that he firſt triumphed upon the conqueſt of the Indians; and yet this ceremony was only in uſe among the Romans.

As long as the ancient diſcipline of the republic continued, no general could pretend to a *triumph* who had not extended the limits of the empire, and ſlain at leaſt five thouſand of his enemies in battle, without any conſiderable loſs on his own part; to this purpoſe an expreſs law was eſtabliſhed, and he was obliged to make oath before the quæſtors, that the account delivered to the ſenate was true. But this law became obſolete, and intrigue and faction procured a *triumph* in favour of generals whoſe merit was not very conſiderable.

The general who vanquiſhed his enemies in a naval engagement, had alſo the honour of a naval triumph. Theſe were firſt granted to C. Duillius, in the year 449, after his defeat of the Carthaginians.

The *triumph* was of two kinds, the *leſs* and the *greater*. The *leſs triumph* was granted upon a victory over ſome unequal and unworthy enemy, as over pirates, ſlaves, &c. This they called OVATIO, becauſe the only ſacrifices offered herein were ſheep.

The *greater triumph*, called alſo *curulis*, and ſimply the *triumph*, was decreed by the ſenate to a general upon the conquering of a province, or gaining a ſignal battle.

The order and œconomy of the *triumph* were thus: the general having diſpatched couriers with tidings of his ſucceſs, the ſenate met in Bellona's temple to read the letters: this done they ſend him the title *imperator*, with orders for him to return, and bring his victorious troops along with him.

When he was arrived near the city, the general and principal officers took oath of the truth of the victory; and the day of *triumph* was appointed.

The day being arrived, the ſenate went to meet the conqueror without the gate called Capena, or Triumphalis, and marched in order before him to the Capitol. He was richly clad in a purple robe, embroidered with figures of gold, ſetting forth his glorious atchievements; his buſkins were beſet with pearl, and he wore a crown, which at firſt was only laurel, but afterward was gold; in one hand he bore a laurel branch, and in the other a truncheon. He was drawn in a car or chariot, adorned with ivory and plates of gold, drawn uſually by two white horſes; though ſometimes by other animals, as that of Pompey, when he triumphed over Africa, by elephants; that of Mark Antony, by lions; that of Heliogabalus, by tygers; that of Aurelian, by deer; and that of Nero, by hermaphrodite mares, &c.

At his feet were his children, or ſometimes on the chariot-horſes. It is added, that the public executioner was behind him, to remind him, from time to time, that theſe honours were tranſitory, and would not ſcreen him from the ſeverity of the laws, if he ſhould ever be found delinquent.

The cavalcade was led up by the muſicians, who had crowns on their heads; after them came ſeveral chariots, wherein were plans of the cities and countries ſubdued, done in relievo: they were followed by the ſpoils taken from the enemy, their horſes, arms, gold, ſilver, machines, tents, &c. After theſe came the kings, princes, or generals, ſubdued, loaden with chains, and followed by mimics and buffoons, who inſulted over their misfortunes. Next came the officers of the conquering troops, with crowns on their heads.

After theſe appeared the *triumphal* chariot, before which, as it paſſed, they all along ſtrewed flowers, and the muſic played in praiſe of the conqueror amidſt the loud acclamations of the people, crying, *Io triumphe!*

The chariot was followed by the ſenate, clad in white robes; and the ſenate by ſuch citizens as had been ſet at liberty or ranſomed.

The proceſſion was cloſed by the prieſts, and their officers and utenſils, with a white ox led along for the chief victim.

In this order they proceeded through the Triumphal gate, along the Via Sacra, to the Capitol, where the victims were ſlain.

In the mean time all the temples were open, and all the altars loaden with offerings and incenſe; games and combats were celebrated in the public places, and rejoicings appeared every where.

What was horrible amidſt all this mirth was, that the captives, when arrived at the forum, were led back to priſon and ſtrangled; it being a point of religion with them, not to touch the victims till they had taken full revenge of their enemies. The rites and ſacrifices over, the *triumpher* treated the people in the Capitol, under the porticoes, and ſometimes in Hercules's temple.

The moſt conſiderable *triumphs* were thoſe of Cæſar after the taking of Utica, and of Auguſtus after the victory of Actium. Cæſar had four *triumphs*, which laſted four days, and were conducted with the moſt extraordinary ſplendor and magnificence. The firſt was the *triumph* of the Gauls, on which occaſion there were preſented to the view of the Romans the names of three hundred nations and eight hundred cities ſubdued by the death of a million of enemies, which Cæſar had defeated in ſeveral battles. The ſecond *triumph* was that of Egypt: the third repreſented the defeat of Pharnaces; and the fourth exhibited pictures of Scipio, Petreius, and Cato.

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The *triumph* of Auguſtus laſted three ſucceſſive days, and was not leſs magnificent than the former.

After Auguſtus the honour of a *triumph* became an appendage of ſovereignty. Encycl.

TRIUMPHAL *arch*, *car*, and *column*. See the articles.

TRIUMPHAL *crown*, or *garland*. See CROWN.

This is ſaid to have been taken from Apollo's crowning his head with a laurel after killing the Delphian ſerpent.

TRIUMPHAL *gown*, *toga triumphalis*. See TOGA.

TRIUMPHANT *church*. See CHURCH.

TRIUMVIR, one of three perſons who govern abſolutely, and with equal authority, in a ſtate.

The word is little uſed but in the Roman Hiſtory. Cæſar, Craſſus, and Pompey were the firſt *triumvirs*, i. e. the firſt who divided the government of the republic among them.

There were alſo other officers, called *triumvirs*, *triumviri*; as the *triumviri*, or *treſviri capitales*, created in the year of Rome 463, to take care of priſoners, and ſuperintend the execution of criminals.

Triumviri monetales, who were magiſtrates created at the ſame time to ſuperintend the coinage of the money; whence that mark, ſtill extant on many ancient coins, IIIVIRI. Theſe officers were very conſiderable, and were choſen out of the knights. They made a part of the *centumviri*. The title they bear on medals is IIIVIR AAÆFF, *triumvir*, *auro*, *argento*, *ære*, *flando*, *feriendo*, which ſignifies, that they had the direction of caſting and ſtriking of gold, ſilver, and braſs.

There were alſo *triumviri ædibus reficiendis*, officers appointed to look to the reparation of temples; *triumviri colonis deducendis*, for the conducting and ſettling of colonies; *triumviri* for the raiſing of troops; *nocturnal triumviri*, to prevent or extinguiſh fires; *triumviri* to review the forces, &c.

In the Acilian family we read of one M. Acilius IIIVIR VALETU; that is, *triumvir of health*, or a magiſtrate of health. M. Spanheim takes him to have been a magiſtrate eſtabliſhed to perform ſacrifices to the gods of health, to dedicate their temples, &c.

Oruphrius and Vaillant read *triumvir valetudinis*; Patin, *trivmvir valetudinarius*; but M. Spanheim, with much more reaſon, reads *triumvir valetudo*; in like manner, as on a medal of the Aquilian family, we read IIIVIR VIRTUS; ſignifying that one M. Aquilius had been made *triumvir* to repair the temple of Virtue, and Acilius that of Health.

TRIUMVIRATE, TRIUMVIRATUS, an abſolute government adminiſtered by three perſons, with an equal authority.

There were two famous *triumvirates* at Rome; Pompey, Cæſar, and Craſſus eſtabliſhed the firſt; and Auguſtus, Mark Antony, and Lepidus, the ſecond.

This latter *triumvirate* gave the laſt blow to the liberty of the republic. Auguſtus having vanquiſhed Lepidus and Antony, the *triumvirate* ſunk into a MONARCHY.

TRIUNE, *tres in uno*, three in one; a term ſometimes applied to God, to expreſs the unity of the Godhead, in a TRINITY of perſons.

TROADENSE *marmor*, a name given by the ancients to a ſpecies of white marble, dug in Mount Ida, and greatly uſed in building.

TROAT, among *Sportſmen*, the cry of a buck in rutting time.

TROCHAIC, TROCHAICUS, in the *Latin Poetry*, a kind of verſe, conſiſting of trochees, or wherein that foot predominates; as the iambus does in the iambic.

The 18th ode of the 2d book of Horace's Odes conſiſts of ſtrophes of two verſes, the firſt whereof is *trochaic* dimeter catalectic, i. e. *trochaic*, compoſed of three trochees, and a ſyllable at the end, or wanting a ſyllable in the firſt foot; which ſome call the *Euripidean trochaic*.

——*Nōn | ĕbūr | nĕque āu | rĕum*
Largiora | flagito.

Long verſes of fifteen half feet, which are more particularly diſtinguiſhed by the name of *trochaics*, are nothing more than tetrameter iambics or of eight feet, the firſt of which wants a ſyllable; as there are others where it is wanting at the end. Thus,

—*Prō | pĕccā | tō māg | nō, pāu | lūm ſūp | plĭcĭī | ſătĭs | ēſt pătrĭ.* Ter.

TROCHANTER, τροχαντηρ, in *Anatomy*, a name given to two apophyſes ſituate in the upper part of the thigh-bone. See APOPHYSIS.

The largeſt, which is above, is called the *great trochanter*; and the ſmaller, beneath, the *leſs trochanter*. See *Tab. Anat.* (*Oſteol.*) *fig.* 7. *n.* 23. *fig.* 3. *lit. t.* and *lit u. fig.* 7. *n.* 24. See alſo FEMUR.

The word literally ſignifies *rotator*, or *roller*, formed from the Greek τροχαω, *roto*, *I run*, *I turn round*. That appellation was given them becauſe they receive the tendons of moſt of the muſcles of the thigh, among which are the obturators, which move it round. See OBTURATOR.

TROCHAR, or TROCAR, in *Surgery*, an inſtrument conſiſting of a triangular-pointed ſteel bodkin, included in a ſilver cannula, ſerving for TAPPING, or perforating the abdomen and ſcrotum of dropſical patients. See *Tab.* II. *fig.* 24. and *Tab.* III. *fig.* 45 and 46.

Mr. Petit has contrived a cannula with a long ſlit in its upper part, for the more ready diſcharge of the water, together with a plate made hollow, like a gutter, by which the water is conveyed away to ſome proper receptacle.

Mr. Andrée has lately propoſed a new conſtruction of the *trochar*, for TAPPING both the HYDROCELE and the abdomen.

The elaſtic *trochar* for tapping the hydrocele conſiſts of two parts, viz. the ſtilet or perforator, and the cannula. The whole of the ſtilet, except its point, is contained within the cannula, which is flat, but ſomewhat convex on each ſurface, and has two ſharp edges. The cannula is formed of two pieces of well tempered elaſtic ſteel, ſo accurately fitted together at their edges as to form a complete cannula, and cloſely embrace the body of the ſtilet. When the inſtrument has been paſſed into the part affected, on withdrawing the ſtilet with the ſmalleſt degree of force, the cannula opens juſt wide enough to allow of its exit, and afterwards, by its own elaſticity, cloſes immediately; being then a complete canula, open at each end. The inſtrument is repreſented in *Tab.* III. *Surgery*, *fig.* 47. No. 1, 2, 3. A (No. 1.) repreſents the end of the ſtilet, *a a a* its point and edges, which are made to cut no farther than the lower *a a*: the cannula encloſing the ſtilet is ſeen at B; and C is that end in which its halves are joined by ſcrews: D is the upper junction of the cannula and ſtilet, the latter being wider than the former: E is the handle of the inſtrument; and *e e e* are marks, ſhewing that this ſide anſwers to the ſcrew ſide of the cannula. In No. 2. the ſtilet is repreſented complete, without the cannula; and No. 3. ſhews the inſide of one half of the cannula; the inſide from B to C is repreſented grooved, ſo as to form the half of a tube. The principal advantage propoſed by this new conſtruction is performing the operation at any period of the diſeaſe, and with leſs pain than with the common *trochar*.

A ſimilar *trochar* of a larger ſize may alſo be uſed for the aſcites, or water-dropſy of the belly, and will be found to have the ſame advantages.

Mr. Sharpe, in his Operations of Surgery, deſcribing the *trochar* for the belly, obſerves, that the perforator ſhould exactly fill up the cavity of the cannula; for unleſs the extremity of this lies quite cloſe and ſmooth on the other, the introduction of it into the abdomen will be very painful: that it may ſlip in the more eaſily, the edge of the extremity ſhould be thin and ſharp; and he recommends a cannula of ſteel, ſilver being too ſoft a metal, and liable to become jagged or bruiſed at its extremity, with very little uſe. See Andrée's Account of an Elaſtic *Trochar*, &c. 8vo. 1781.

M. le Cat has contrived a new *trochar* for the puncture of the HYDROCEPHALUS, and for other evacuations which are neceſſary to be made at different times. For a deſcription, illuſtrated with figures, ſee Phil. Tranſ. vol. xlvii. p. 267, &c.

TROCHE, TROCHISCUS, in *Pharmacy*, a form of medicine, made to be held in the mouth to diſſolve gradually.

The *troche* is properly a dry compoſition, the chief ingredients whereof, after having been brought into a very fine powder, and mixed with ſugar, are incorporated with ſome proper liquor, as diſtilled waters, wine, vinegar, or mucilages, and reduced into a maſs, which is moulded into little cakes, or balls of any form, at pleaſure, and dried in the air, far from the fire.

There are *troches* of various kinds, and for various intentions: as *purgative*, *alterative*, *aperitive*, *corroborative*, &c. *troches*.

Latin authors call them *paſtilli*, *rotulæ*, *placentulæ*, *orbes*, and *orbiculi*; and the Engliſh, frequently, *lozenges*.

The chief *troches*, now in uſe, are thoſe of myrrh and liquorice, and thoſe of the teſtaceous powders for the heart-burn. Thoſe of coloquintida are called *troches of alhandal*, from the Arabs, who called colaquintida *handal*.

TROCHES of *japan earth*, of *nitre*, of *ſcammony*, of *ſquills*, and of *ſulphur*, ſee the ſeveral articles.

TROCHEE,

TROCHEE, Trochæus, formed of τρεχω, *I run*, because it moves quickly, in Greek and Latin *Poetry*, a kind of foot, consisting of two syllables, the first long, the latter short: such as the words *vādĕ* and *mūsă*.

The *trochee* is the reverse of the iambus, and has just a contrary effect; the latter being light and sprightly, and the former weak and languid, as all those measures are which move from a long to a short syllable.

Some call the *trochee*, *choreus*, because it is proper for songs and dances. These give the denomination *trochæus* to the TRIBACHYS. Quint. lib. x. cap. 4.

TROCHILUS, in *Architecture*, a hollow member, more usually called, by modern architects, the SCOTIA; and, by our English workmen, the *casement*. See *Tab. Archit. fig.* 4.

Trochilus, *Honey-sucker*, or *Humming-bird*, in the Linnæan system of *Ornithology*, is a genus of the picæ; for the characters, &c. of which, see Humming-*bird*.

This genus comprehends the *polytmus* and *mellisuga* of Brisson, the former including sixteen, and the latter twenty species.

Trochilus, is also a name used by Aristotle, Pliny, and others of the ancient naturalists, for the *regulus cristatus*, or, as we call it, the golden-crowned WREN.

Trochilus is also the name of a remarkable water-bird, being very long-legged, yet web-footed.

It is a very swift runner on the ground, and is thence called by the Spaniards *corriza*. Its beak is straight and black at the end, and the opening of its mouth very wide; it has black eyes, surrounded by a white naked membrane, and that by a brown one. On its under part it is white; its back, shoulders, and wings, are of a ferruginous colour; its running is so very swift as to equal the flight of most birds. Aldrovand. de Avib. lib. xix. cap. 35.

TROCHING, the small branches on the top of a deer's head.

TROCHITÆ, or Trochites, in *Natural History*, a kind of figured fossil stones, resembling parts of plants; vulgarly called *St. Cuthbert's beads*.

They are usually of an opake, brownish colour: they break like spar, glossy and shining, and are easily dissolved in vinegar. Their figure is generally cylindrical, sometimes a little tapering, the circumference smooth, and both the flat sides covered with fine radii drawn from a certain hole in the middle to the circumference.

Two or three, or more, of the simple *trochitæ*, joined together, constitute what the naturalists call an ENTROCHUS.

In these the *trochitæ*, or single joints, are so set together, that the rays of the one enter into furrows in the other, as in the sutures of the skull. They are found in great plenty in the bodies of the rocks at Braughton and Stock, two villages in Craven, at all depths under ground; also in Mendip-hills, &c. sometimes only sprinkled here and there, and sometimes in large strata, or beds, of all magnitudes, from the size of the smallest pin, to two inches about.

They are often found ramous or branchy, several rudiments of large branches arising from the stem, or cylinder, and sometimes still smaller from these. The branches being deeply inserted into the stem, the tearing them off leaves great holes therein. See Entrochus *ramosus*.

Dr. Lister has discovered a sort of little fragments among them, which he takes to have been the apices of them; and another sort, which he supposes to have been the roots: for he supposes them to be a sort of rock plants.

Mr. Beaumont, in the Philosophical Transactions, assures us, that he has found, that all the cliffs in some mines are made up of these *entrochi*, some whereof have been converted into a reddish matter; while others, becoming white spar, compose bodies of that substance: and considering that all the cliffs, for a very large circumference in some places, consist almost wholly of these stones, it has been thought by some, who suppose them plants, that there have been, and still are, whole fields or forests of these under-ground, as there are of coral in the Red-sea. In the courses between the cliffs are found of these fossils, at all stages and degrees of maturity, growing up in the gritty clay, and rooted in the rake-mold stones, many of them of the form and dimensions of a tobacco-pipe, with the evident beginnings of circles and sutures; and others full grown, formed of perfect spar, and at their point of maturity.

The central matter, in many, continues still white and soft, as the whole substance is, by some, thought to have been at first; and is continually refreshed by the mineral streams and moisture, which have free access to it through five hollow slits, or feet, in the figured roots, or through the mass of clay usually lying under the plain roots. From the curiosity of their make, and from this accidental resemblance of plants, many have thought them to be such; and affirm, that they may vie with most of the vegetable kingdom, and are shaped and formed like them; having stem, branches, roots, an inward pith, as likewise joints and runnings in their grit, and sometimes cells to supply the place of veins and fibres.

Others have thought it highly probable, these rock-plants are lapides sui generis, and not parts of animals or plants petrified, as many authors have imagined. If the figured roots, whereon they sometimes grow, give any suspicion they might have belonged to an animal, particularly a species of the stella arborescens, the trunks seem to them to evince the contrary; nor are they reducible to any known species of vegetables. Mr. Beaumont tells us, that he had by him above twenty different species of *trochites*, all of them wonderfully regular, and not to be paralleled by any vegetable he knows of in nature: and it is inconceivable how so many species, diffused through many parts of the earth, should come to be lost. They are certainly, indeed, not vegetable remains, but are truly parts of the stella aboresceus petrified. See farther Keppellus Essai de Entroch. and the articles Entrochus, Star-*fish*, and Star-*stone*. See *Tab.* III. *Fossils, Class* 10.

TROCHITIFER *glans*, see Glans *trochitifera*.

TROCHLEA, τροχηλια, one of the mechanical powers, usually called a PULLEY.

Hence the cavity in the bone of the arm or shoulder, whereinto, when the arm is stretched forth, the process of the undermost and lesser of the long bones of the cubitus enters, is also called *trochlea*.

TROCHLEARES, in *Anatomy*, a name given to the oblique muscles of the eye; because they serve to pull the eye obliquely upwards and downwards, as it is turned like a pulley.

The OBLIQUUS *major* is particularly called *trochlearis*, because it passes through a small cartilaginous ring, as over a *trochlea* or pulley.

TROCHOID, Trochois, or Trochoides, formed from τροχος, *wheel*, and ειδος, *form*, in *Geometry*, a curve, whose genesis may be thus conceived: if a wheel or circle be moved with a two-fold motion, at the same time, the one in the right line, and the other circularly about its centre, and these two motions be equal, i. e. describe two equal lines in the same time; and if in the radius, which at the beginning of the motion reaches from the centre of the wheel, or the first point of the line which describes the circumference: if, I say, in this radius, a point be taken any-where, except in the centre; this point will describe a curve, one part whereof will be below the line described by the centre, and the other above it. This line, thus described by the point taken in the radius, is called the *trochoid*.

The right line which joins the two extremities of the *trochoid*, and which is either the path the wheel makes, or a line parallel to that path, is called the *basis of the trochoid*.

The *axis of the trochoid* is the diameter of the wheel, perpendicular to the base in the middle of the motion; or that part of the radius between the *trochoid* and its base.

The point wherein the axis is cut into two parts by the line described by the centre of the wheel, is called the *centre of the trochoid*; the uppermost point of the axis the *vertex of the trochoid*; and the plane, comprehended between the *trochoid* and its base, the *trochoidal space*.

The *trochoid* is the same with what we otherwise call the *cycloid*; for the properties, &c. of which, see CYCLOID.

TROCHUS, in *Antiquity*, denotes the exercise or game of the hoop. The hoop was of iron, five or six feet in diameter, set on the inside with a number of iron rings. The boys and young men used to whirl this along, as our children do their hoops, directing it with a rod of iron, having a wooden handle: which rod the Grecians called ελατηρ, and the Romans *radius*. The clattering of the ring served partly to the diversion and partly as a notice for persons to keep out of the way. Horace de Art. Poet. ranks this exercise among other manly sports:

> *Ludere qui nescit, campestribus abstinet armis,*
> *Indoctusve, pilæ, discive, trochive quiescit.*

Trochus, in *Natural History*, the name given by authors, to a genus of shells; some of the species of which resemble the figure of the *trochus*, or top, which boys play with. As there are many species of this shell, however, which are flatted and have nothing of this form, the whole series of them are much better named, by a denomination taken from the shape of the mouth, which is of an oval figure, and is alike in all these species, and different from all other shells. They are therefore aptly charactered by a late French writer under the name of COCHLEA *ore depresso*. See *Tab.* III. *Fossils. Class* 9

The characters of this genus according to Linnæus are, that the animal is a slug; the shell univalve, spiral, and conical; the aperture subtetragonous, angular or roundish, and the columella or axis oblique. He enumerates twenty-six species. The *trochi* or tops form the fifteenth family of SHELLS in Da Costa's arrangement; and he defines them to be shells of a conic or pyramidal shape, the top being broad and flattish, and gradually tapering thence to a very sharp point; the aperture or mouth is most generally angular, low, and narrow. This is a numerous family, and abounds with curious and fine shells. There is a fossil species of *trochus*, not yet discovered recent. It is a large kind, flattish, and like a cochlea-helix, generally about two inches in diameter, much wrinkled, with sharp prominent edges like plates, which are spiked at regular distances, running across the spires; and the whole shell is likewise striated. This *trochus* is found in the lime-stone of Coalbrook-dale, in Shropshire, and Dudley, in Staffordshire.

TROCTUS, in *Ichthyology*, a name given by Aristotle, Ælian, Athenæus, and others of the Greek writers, to the fish called *amia* by Pliny, and most other of the later as well as ancient Latin writers; but by some, *lechia* and *glaucus*. It is properly a species of the scomber, and is distinguished from the others by the name of the scomber with two fins on the back, and with the last ray of the hinder fin very long.

TROGLODYTES, TROGLODYTÆ, formed of τρωγλη, *caverna*, and δυω, *I enter*, in the *Ancient Geography*, a people of Ethiopia, said to have lived in caves under ground.

Pomp. Mela gives a strange account of the *Troglodytes*.—He says, they did not so properly speak as shriek; and that they lived on serpents, &c. Tzetzes calls them *Ichthyophagi*. Montanus takes them to be the same with those called, in Scripture, *Ghanamim*. Pintianus in Strabo will have the name written without the *l*, *Trogoditæ*.

TROGLODYTES is also an appellation given to a sect of Jewish idolaters.

The prophet Ezekiel relates, chap. viii. ver. 8, 9, 10, &c that God, among other abominations of the Israelites which he set before him, shewed him seventy old men, who, with their censers in their hands, adored secretly all kinds of animals and reptiles painted on the wall.

Philastrius, on this vision of the prophet, erects these idolaters into a sect of Israelites, who, hiding themselves under-ground, and in caves, adored all kinds of idols. And yet the prophet plainly shews, that it was in secret parts of their houses, and not in subterraneous caverns, that these seventy Israelites idolatrized. The name *Troglodytes*, then, is feigned; and so, probably, is the sect.

TROGLODYTES, in *Ornithology*. See WREN.

TROGON, *curucui*, in *Ornithology*, a genus of the *picæ*; the characters of which are, that the bill is shorter than the head, cultrated, hooked, and serrated at the margin of the mandibles; and the feet are formed for climbing, having two toes forward, and two backward; of this genus there are three species; one of which is the CURUCUI of Brasil.

TROIA, or TROJAN *games*, *ludi* TROJANI, were games instituted by Ascanius, son of Æneas; and which afterwards passed to the Romans, and were celebrated in the Circus by the youth of Rome.

One of the number, who presided over the solemnity, was called *princeps juventutis*; and was always of one of the first families in Rome.

At first, it is supposed, they only engaged on foot, and on horseback; because Virgil, who describes these games in the *Æneid*, lib. v. only speaks of horses and cavaliers, without any mention of bigæ and quadrigæ, which were not in use at Rome till long after Ascanius. And yet Dion, speaking of Cæsar's games, says, the youth there combated in chariots: but it is thought by some, that these were not the *Trojan* games, but races and combats, of a different kind, proper for young people, of a more advanced age.

The *Trojan games* were renewed by Augustus, after the victory at Actium, A. U. 726; began to decline under Tiberius, and terminated under Claudius.

TROIL, among *Tinners*, denotes a feast, or occasion of merriment, by eating and drinking; called also a *duggle*.

TROIS *cinque*, in the *French Distillery*, a term used to express their brandy when of a peculiar strength, consisting of five parts alcohol, and three parts phlegm.

The method of distilling the wines into brandy in France, is exactly the same with that used with us to draw the spirit from our wash or fermented liquor of malt, treacle, sugar, or whatever other kind. They only observe more particularly to throw a little of the natural lee into the still, along with the wine; and the poorest wines are found to succeed best on the trial, making by much the finest brandies. We are apt to wonder that we cannot from the wines of particular countries distil their particular brandies; but the whole mystery consists in this, that they do not send us over the same wines which they use in distilling, because these latter would not be liked as wines, nor would keep in the bringing over. Sometimes in Scotland they meet with the poor and pricked wines, the same that the French distill their brandies from; and from these they distil a spirit, not to be known from the brandy distilled in France.

The lee, which the French add in the distillation, gives the brandy that high flavour, for which we so much esteem it: but they themselves like it much the worse for it. The French notion of a proof strength, determined by the chaplet or crown of bubbles, is the same with ours; and all their fine spirits are found of this strength.

But they have one particular expedient for those brandies, which prove foul and feedy, or retain the taste of certain weeds which grow among the wines; they draw them over again, with a design to free them from that adventitious flavour. In this operation they always leave out the faints, or rather they change the receiver as soon as ever the stream comes proof; then mixing together all that run off before, they make a brandy stronger than the ordinary kind, and this is what they call *trois-cinque*.

The distillers in France scarce ever bring their brandies higher than this; for they have the art to persuade the foreign merchant, that the phlegm of French brandy is natural and essential to it: but the truth is, that the spirit alone contains the flavour and excellence of the brandy, and it might as well be reduced to half its bulk for exportation, and sent over in the state of alcohol, and then lowered with common water, to the proof strength.

The French use no art in colouring their *trois-cinque*, any more than their common proof-brandy, nor do they add any thing to give them an additional flavour. The thing which they principally value themselves upon, both in regard to brandies and wines, being to make them perfectly natural: so that all the colour we find in their brandies, is acquired from the cask, and the time they are left in it. This is often twelve or eighteen months, sometimes two or three years; in this time they acquire a brown colour, and lose their acrid taste.

The greatest adulteration of brandies is in England; the French have no temptation to do it, they having no cheaper spirit, since the prohibition of molasses in their country. The Dutch are in the same condition, having no molasses spirit; and only a very coarse and nauseous sugar spirit, and a yet worse malt spirit of their own manufacture; a single gallon of which would spoil a whole piece of brandy. The French brandy also paying no duty in Holland, is as cheap, or nearly so there as in France itself. The duties being high upon brandy in England, it is greatly adulterated, and that with all sorts of spirits; as malt, molasses, cyder, and sugar spirits; and when this is done in a dexterous and sparing manner, the cheat is not easily found out. Shaw's Essay on Distillery.

TROLLING, among *Anglers*. To *troll*, is to fish for pikes with a rod whose line runs on a reel. See *Pike*-FISHING.

TROLLIUS, *globe Ranunculus*, in *Botany*; a name sometimes given to HELLEBORE *with a globose flower*.

TROMBA, in the *Italian Music*, either denotes the common TRUMPET, the BUCCINA of the ancients, or the modern SACKBUT, but more properly our trumpet.

TROMBETTA, in *Ichthyology*, a name given by the Italians to the fish commonly called *scolopax* by authors. See TRUMPET FISH.

TROMBETTA, in the *Italian Music*, a small trumpet, being the diminutive of TROMBA.

TROMBONE, in the *Italian Music*, a SACKBUT.

TROMBONE *picciolo*, *grosso*, *primo*, *secundo*, &c. See SACKBUT.

TROMPE, in the *Manege*. See DECEIVED.

TRONAGE, TRONAGIUM, an ancient custom, or *toll*, paid for the weighing of wool.

The word comes from *trona*, an old name for a beam used in weighing.

TRONATOR, an officer of the city of London, whose business it was to weigh the wool brought into that city.

TRONCO *per grazia*, in the *Italian Music*, by the French called *coup de grace*; is used to intimate to the voices, as well as instruments, that they are not to draw out the sound to its natural length, but cut it short; that is, only continue it long enough to be heard, by which means there is a small silence between each sound; which

which has a very good effect in expressions of grief, to make signs; and also in expressions of wonder and surprize, &c.

TRONCONNEE, or TRONCONNE', in *Heraldry*, denotes a cross, or other thing, cut in pieces, and dismembered; yet so as that all the pieces keep up the form of a cross, though set at a small distance from one another.

TRONE *weight* was the same with what we now call *Troy* WEIGHT.

TRONE-*pound*, in Scotland, contains twenty Scotch ounces. But because it is usual to allow one to the score, the *trone-pound* is commonly twenty-one ounces.

TRONE-*stone*, in Scotland, according to sir John Skene, contains 19½ pounds.

TROOP, a small body of horse, or dragoons, usually about fifty or sixty; commanded by a captain, captain lieutenant, corner, quarter-master, and three or four corporals, who are the lowest officers in a *troop*; answering to a company of foot.

TROOP, *independent*, is a *troop* that is not imbodied in, or joined with, any regiment.

TROOP, *to beat the*, is the same with beating the ASSEMBLY.

TROOPS *of the houshold*. See HOUSHOLD.

TROOPER, in the *Military Art*, a private man in a troop of horse.

TROPÆA, in *Mythology*, a name given to JUNO, because she was thought to preside over triumphs; and in these ceremonies sacrifices were offered to her.

TROPÆOLUM, in *Botany*. See *Indian* CRESSES.

TROPE, TROPUS, in *Rhetoric*, a word or expression used in a different sense from what it properly signifies.— Or, a word changed from its proper and natural signification to another, with some advantage.

As when we say an *ass*, for a *stupid person*; *thunderbolt of war*, for a *great captain*; to *wash the blackamoor white*, for a *fruitless undertaking*.

This change of sense is never to be used, but where it gives a force and dignity, or renders the discourse more significant, weighty, and graceful.

It is called *trope*, τροπος, from the Greek, τρεπω, *verto, I change*; because the words are here transferred from the things they properly import, to others which they only import indirectly: and that *tropes* only signify the things they are applied to, by reason of the connexion and relation those things have with those others, whose proper names they are.

This change, or inversion, is performed various ways; but chiefly four: whence arise four principal *tropes*; viz. the METAPHOR, METONYMY, SYNECDOCHE, and IRONY, &c.

Some authors confound *trope* with figure; but they are very different things. Most authors, as F. De Colonia, &c. make figure the genus, and *trope* a species; defining figure to be, an ornament in discourse, whereby it is raised above the common language; and *trope* to be that peculiar kind of ornament which consists in the change of the sense, &c.

But Vossius makes *trope* and figure to be two collateral and independent things: defining *trope* to be, the change of the sense, &c. and figure to be any ornament, except what becomes so by such change, &c. See FIGURE.

With regard to the difference between *tropes* and figures we may observe, that *tropes* mostly affect single words, but figures whole sentences: a *trope* conveys two ideas to the mind by means of one word; but a figure throws the sentence into a different form from the common and usual manner of expression: and besides, *tropes* are chiefly designed to represent our thoughts, but figures our passions. The reasons which have occasioned the introduction of *tropes* are, according to Quintilian, three: viz. necessity, emphasis, and beauty. *Tropes* were first introduced from necessity, because no language contains a sufficient number of proper words to express all the different conceptions of our minds. *Tropes* do also on many occasions express things with greater force and evidence than can be done by proper words; thus when Virgil, (Æn. lib. vi. v. 842.) calls the Scipios, two thunderbolts of war, he gives us a more lively image of the rapid force, and speedy success of their arms than could have been conveyed by a long description in plain words. And moreover, beauty and ornament have been another cause of the use of *tropes*: and it is the business of an orator to entertain his hearers, at the same time that he instructs them. Accordingly some subjects require a more florid and elegant address than others, and variety of expression is also pleasing in a discourse.

The following directions, however, are proper to be observed in the choice of *tropes*. As every *trope* gives us two ideas, one of the word expressed, and another which by means of that the mind connects with it; it is necessary, that the relation between these two should appear very plain and evident; for an obscure *trope* is always faulty, unless where some particular reason makes it necessary; and therefore *tropes* ought not to be too far fetched, lest they should thus be rendered obscure.— Again, as a *trope* ought to be very plain and evident, so likewise should it bear a due proportion to the thing it is designed to represent, so as neither to heighten nor diminish the just idea of it. Poets, however, are allowed a greater liberty in this respect than orators. Farther, as a moderate use of *tropes*, justly applied, beautifies and enlivens a discourse; so an excess of them causes obscurity, by running it into abstruse allegories and riddles. Moreover, as one use of *tropes* is pleasure and entertainment, we should endeavour to make use of such as are smooth and easy; and if it should be necessary to use a harsh *trope*, it is proper to soften it by some precaution.— Finally, care should be taken how we transfer *tropes* from one language into another. It was customary for the Roman soldiers to carry their money in their girdles; hence it was the same thing with them to say, *a person had lost his girdle* (Hor. Ep. lib. 2. ep. 2) as that *he had lost his money*. And because the Romans wore the TOGA in time of peace, and a different garb, when engaged in war, their writers sometimes use the word *toga* to signify peace. But as neither of these customs is in use among us, so neither would the *tropes* suit our language, or be generally understood by us. There is also a beautiful *trope* in the account of St. Paul's ship-wreck, in the use of the word ἀντοφθαλμεῖν (Acts ch. xxvii. v. 15.) which we translate to *bear up* into the wind, but which properly signifies to *look* or *keep its eyes against* it: to this purpose Plutarch says of Demosthenes, that he could not ἀντοφθαλμεῖν τῷ ἀργυρίῳ, *look against*, or *resist the power of money*. Ward's Orat. vol. i. Lect. 25. See also on this subject Blair's Lect. vol. i. Lect. 14.

Besides the four capital *tropes* above mentioned, there are several inferior ones. When the *trope* is too bold, it is called an *hyperbole*; when continued, it is an *allegory*; when too obscure, an *ænigma*; when it shocks us, or is too remote, a *catachresis*.

Add to these, other *tropes*; as the metalepsis, antonomasia, and litotes, or extenuation. See METALEPSIS, &c.

Some also refer the six kinds of scoffing, or derision, to the *tropes*; viz. the sarcasm, diasyrm, charientism, asteism, mycterism, and mimesis; but this without sufficient reason. See SARCASM, IRONY, &c.

TROPÆUS, in *Mythology*, a name given to JUPITER for the same reason that TROPÆA was given to Juno.

TROPER, in our *Old Writers*, is used for a book of alternate turns and responses in singing mass. Lindewode calls it *liber sequentiarum*.

TROPHIS, in *Botany*, a genus of the *diœcia tetrandria* class: its characters are, that it has male and female flowers; the male have no calyx, and a corolla with four petals; the female flowers have neither calyx nor corolla; but a bipartite style, and a single-seeded berry.— There is one species.

TROPHONIUS, *oracle of*, in *Ancient Mythology*, a famous ORACLE in Bœotia, which was consulted with greater ceremony than those of any deity, and subsisted long after all those of Greece ceased. *Trophonius*, from whom the oracle took its name, was the son of Erginus, king of the Orchomenians, who, as well as his brother, were famous architects, and built the temple of Apollo at Delphi. The tomb of *Trophonius* had been altogether disregarded and forgotten, when the Bœotians, on occasion of a great drought, consulting the oracle of Apollo, were directed to have recourse to *Trophonius* at Lebadea.— They pursued the direction of the oracle and obtained an answer, that suggested the means of removing their calamity. In consequence of this event, they consecrated to *Trophonius* the wood in which he was interred, and in this wood erected a temple to him, with his statue executed by Praxiteles. The oracle of *Trophonius* was upon a mountain, within an enclosure of white stones, on which are elevated obelisks of brass. In this enclosure there was a cavern, in the form of an oven, cut out of the mountain by human art and labour. Within this was another small cavern, with a very strait entrance, into which those who consulted the oracle were to pass with a variety of ceremonies.

TROPHY, TROPÆUM, among the *Ancients*, a pile or heap of arms of a vanquished enemy, raised by the conqueror in the most eminent part of the field of battle.

The word is formed from the Latin *trophæum*, or *tropæum*, which Vossius deduces from the Greek τροπη, the flight of an enemy.

The word is also used for an artificial representation of such a pile, in marble, stone, or other matter. Such were the *trophies* of Marius and Sylla, in the Capitol, &c.

The ancient *trophies* consist of Greek and Roman arms; and the modern ones of arms of the various nations now in use: as in those insulated ones near Blenheim, in the Fauxbourg S. Antoine, and in the castle of Versailles. Some are done in basso-relievo; as those of the Trajan column, and the Attic of the court of the Louvre.

Trophies are likewise frequently exhibited on medals of the emperors, struck on occasion of victories; wherein, besides arms and spoils, are frequently seen one or two captives by the sides of the *trophy*.

Trophies, M. Vaillant observes, were, originally, nothing but trunks of trees, which the victor planted on the most eminent part of the conquered province, and hung them with the spoils of the enemy, to perpetuate the memory of the defeat.

TROPHY, in *Architecture*, an ornament which represents the trunk of a tree, charged or incompassed all round about with arms or military weapons, both offensive and defensive.

TROPHY-*money*, a duty paid annually by the housekeepers, in the several counties of England, towards providing harness, drums, colours, &c. for the militia.

TROPICS, TROPICI, in *Astronomy*, two immoveable circles of the sphere, drawn through the solstitial points, parallel to the equator.

Such are the circles ME and NL, *Tab. Astronomy, fig.* 5.

The *tropics* may be defined, two circles parallel to the equator, at such distance from it, as is equal to the sun's greatest recess from the equator towards the poles; or to the sun's greatest declination; or the obliquity of the ecliptic.

Of the two *tropics*, that drawn through the beginning of Cancer E, is called the *tropic of Cancer*.

And that through the beginning of Capricorn, the *tropic of Capricorn*.

They have their name from the Greek *τροπη, turn, conversion*; as being the limits of the sun's way, or declination towards north and south: so that, when the sun is arrived at either of them, he turns the other way.

Hence, 1. Since the declination of the ecliptic is the arch EA, or LD; EN will be the distance of the *tropics*; which is double the greatest declination.

2. Wherefore, if the sun's meridian altitude be observed, both in the winter and summer solstice, and the latter be subtracted from the former; the remainder will be the distance of the *tropics*; half whereof is the greatest declination of the ecliptic.

TROPICS, in *Geography*, are two lesser circles of the globe, drawn parallel to the equator, through the beginnings of Cancer and Capricorn.

These *tropics* are the planes of the celestial *tropics*, and at the distance of 23° 29′ from the equator, which is the sun's greatest declination.

TROPIC-*bird*, in *Ornithology*, a species of the PHAETON, called *lepturus* by Brisson, on account of the slenderness of its tail.

It is found within the *tropics*, and thence has its name. This bird is of the size of a common duck; its beak is red, about two fingers-breadth long, somewhat crooked and sharp at the point; it has on each side of the head a long white line, extended from the angles of the beak; its belly is white, as is also its back, but this is beautifully variegated with oblong black streaks; its wings are very long, and their feathers partly black and partly white; its legs are white, its feet black, the toes connected together by a membrane, and its tail seems extremely singular, appearing to consist of only two long feathers. Ray. See *Tab.* V. *Birds*, N° 58.

TROPICAL-*winds*. See TRADE-*winds* and WIND.

TROPICAL *year*. See YEAR.

TROPISTS, or TROPICI, the name of a sect. St. Athanasius, in his letter to Serapion, gives this appellation to the MACEDONIANS, who were also called *Pneumatomachi* in the East, and *Patripassians* in the West.

The reason of the name *Tropist* was, that they explained the Scripture altogether by tropes and figures of speech.

The Romanists also gave the appellation *Tropists* to those of the reformed religion; in regard to their construing the words of the eucharist figuratively.

TROPITES, TROPITÆ, a sect who, according to Philastrius, maintained, that the Word was turned or converted into flesh, or into man.

This opinion they founded on that passage of St. John, misunderstood; *The Word was made flesh*; as if it imported, that the Word was converted into flesh; and not that he was clothed with our flesh and our nature.

TROSSULI, among the Romans, a name given by some to the guards that attended the kings of Rome, otherwise called CELERES.

TROT, in the *Manege*, one of the natural paces of a horse, performed with two legs in the air, and two on the ground, at the same time, cross-wise, and continuing so alternately, to raise the hind-leg of one side, and the fore-leg of the other side at once; leaving the other hind and fore-leg upon the ground till the former come down.

This action of his legs is the same as when he walks, except that in the *trot* his motions are more quick.

In this motion, the nearer the horse takes his limbs from the ground, the opener, the evener, and the shorter his *trot* will be. If he takes up his feet slovenly, it is a sign of stumbling and lameness; if he tread narrow, or cross, it betokens interfering or falling; if he tread long, it shews over-reaching; if he steps uneven, he indicates toil and weariness.

Three qualities are essentially necessary to make the *trot* useful. It ought to be extended, supple, and even or equal; these three qualities mutually depend upon each other; so that you cannot pass to the supple *trot* without having first worked upon the extended *trot*; and you can never arrive at the even and equal *trot* without having practised the supple. The *extended trot* is that in which the horse *trots* out without retaining himself, being quite straight, and going directly forwards; and this, consequently, is the kind of *trot* with which you must begin. The *supple trot* is that in which the horse, at every motion he makes, bends and plays all his joints, viz. those of his shoulders, his knees, and feet, which no colts, or raw horses, can execute, who have not had their limbs suppled by exercise, and who always *trot* with a surprising stiffness and aukwardness, without the least spring or play in their joints. The *even* or *equal trot* is that in which the horse makes all his limbs and joints move so equally and exactly, that his legs never cover more ground one than the other, nor at one time more than another. To do this, the horse must necessarily unite and collect all his strength, and, if the expression may be allowed, distribute it equally through all his joints. To go from the extended *trot* to the supple, you must gently and by degrees hold in your horse; and when by exercise he has attained sufficient ease and suppleness to manage his limbs readily, you must insensibly hold him in still more and more, and by degrees you will lead him to the equal *trot*. All horses that are inclined to be RAMINGUE should be kept to the extended *trot*. A horse of a sluggish and cold disposition, which has, nevertheless, strength and bottom, should likewise be put to this *trot*; as he grows animated, and begins to go free, keep him together by little and little, in order to lead him insensibly to the supple *trot*; but if, while you keep him together, you perceive that he slackens his action and retains himself, give him the aids briskly, and push him forward, keeping him, nevertheless, gently in hand; by this means he will be taught to *trot* freely and equally at the same time.

The only proof, or rather the most certain sign of your horse's trotting well is, that when he is in his *trot*, and you begin to push him a little, he offers to gallop. The principal effects of a *trot* are to make a horse light and active, and to give him a just appuy.

The manner of trotting a colt who has never been backed is as follows: put a plain snaffle in his mouth; fit a caveson to his nose, to the ring of which tie a longe of a reasonable length. Let a groom hold this longe, who, having got at some distance from the colt, must stand still in the middle of the circle which the horse will make. Let another follow him with a long whip or chambriere, in his hand. The colt, being alarmed, will be forced to go forward, and to turn within the length of the cord; the groom must hold it tight in his hand; by this means he will draw *in*, or towards the centre, the head of the colt, and his croupe will of consequence be without the circle. See FOAL and *backing of a* HORSE.

In working a young horse after this manner, do not press or hurry him. Let him walk first, and afterwards put him to the *trot*. If you neglect this method, his legs will be embarassed; he will lean on one side, and be more upon one haunch than the other; the inner forefoot will strike against the outer one, and the pain which this will occasion will drive him to seek some means of defence, and make him disobedient. If he refuses to *trot*, the person who holds the chambriere will animate him, by trotting him, or striking the ground with it. If he offers to gallop instead of trotting, the groom must shake or jerk the cord that is tied to the caveson, and he will fall into his *trot*. Berenger's Art of Horsemanship, vol. i. ch. 4.

TROUBADOURS, a name given to the ancient poets of Provence, who wrote, set, and sung their own verses. See PROVENÇAL *Poets*.

Some will have the word borrowed from *trouver*, *to find*, by reason of their inventions, whence they are called *trou-*

trouverres; though others take them to have been called *trombadours*; by reaſon they ſung their poems to an inſtrument called a *trompe* or *trumpe*.

The poetry of the *troubadours* conſiſted in ſonnets, paſtorals, ſongs, ſyrventes, or ſatires, which were much to their taſte; and in tenſons, which were love-diſputes.

Jean De Notre Dame, commonly called Noſtradamus, a procureur in the parliament of Provence, wrote an ample diſcourſe of theſe poets. He makes their number ſeventy-ſix.

Paſquier tells us, he had an extract of an ancient book, belonging to cardinal Bembo, entitled, Los Noms daquels qui firent Tenſons & Syrventes, which made their number ninety-ſix; among which was an emperor, viz. Frederic I. and two kings, viz. Richard I. of England, and a king of Arragon; with a dauphin, ſeveral counts, &c. not that all theſe had compoſed entire works in Provençal; ſome of them had not brought forth any thing beyond epigrams.

Petrarch ſpeaks, with applauſe, of ſeveral *troubadours*, in the fourth chapter of the Triumph of Love. The Italian poets are ſaid to have borrowed their beſt pieces from the *troubadours*. Paſquier declares expreſsly, that Dante and Petrarch are, indeed, the fountains of Italian poetry; but fountains which have their ſources in the Provençal poetry.

Bouche, in his Hiſtory of Provence, relates that, about the middle of the twelfth century, the *troubadours* began to be eſteemed throughout Europe; and that their credit and poetry were at the higheſt about the middle of the fourteenth. So that they flouriſhed in Europe about two hundred and fifty years, viz. from 1120 or 1130 till the year 1382. He adds, that it was in Provence that Petrarch learned the art of rhyming, which he afterwards practiſed, and taught in Italy.

Strolling muſicians, under the appellation of *jongleurs*, abounded in France ſo early as the time of Charlemagne, who forbids their admiſſion into convents; and in the firſt capitulary of Aix la Chapelle, this prince ſpeaks of them as perſons branded with infamy. They continued, however, to amuſe the great in private, as well as the people in public, as a diſtinct body of men, till the *troubadours* introduced poetry into France, in the dialect of that country. Their licentiouſneſs was frequently repreſſed, and their conduct regulated by the police; and during the reign of Philip Auguſtus, the *troubadours* and minſtrels, or jongleurs, were involved in the ſame diſgrace, and for ſome time baniſhed the kingdom; which left ſuch a ſtigma upon their order, as no efforts of genius, or auſterity of manners, could entirely efface, though they were afterwards recalled, and in ſome degree reſtored to public favour.

It is obſerved by a late elegant French writer, that though the proſcription of muſic and poetry, and the kind of inquiſition which Philip eſtabliſhed againſt the jongleurs in France, may have originated from the laudable intention of repreſſing thoſe diſorders, which the abuſe of their profeſſion had occaſioned; yet, if he had reflected that the fate of letters was at that time in the hands of the *troubadours*, and that among every people approaching towards civilization, the progreſs of virtue is generally proportioned to the cultivation of arts and literature, he would have inflicted a leſs ignominious puniſhment on the objects of his diſpleaſure; for ſuch is the empire of prejudice, that the anathema it pronounces againſt the abuſe of a profeſſion remains in full force, even after the reformation of thoſe who exerciſe it. This author ventures to pronounce the jongleurs, or *troubadours* and minſtrels, notwithſtanding the contempt with which they are named at preſent, to have been the fathers of literature in France; they, ſays he, baniſhed ſcholaſtic quarrels and ill-breeding, and poliſhed the manners, eſtabliſhed the rules of politeneſs, enlivened the converſation, and purified the gallantry of its inhabitants. That urbanity, continues he, which diſtinguiſhes us from other people, was the fruit of their ſongs; and if it is not from them we derive our virtues, they at leaſt taught us how to render them amiable. Fableau Hiſtorique de Gens des Lettres, par l'Abbé de Longchamps, tom. v. cited by Dr. Burney in his Hiſt. of Muſic, vol. ii. p. 267.

TROVE, in *Law*. See TREASURE-*trove*.

TROVER, in *Law*, an action which a man hath againſt one that, having found any of his goods, refuſeth to deliver them upon demand, but converts them to his own uſe; from which finding and converting, it is called an action of *trover* and *converſion*.

Actions and detinue are frequently turned into actions upon the caſe, *ſur trover* and converſion.

The injury in this caſe, lies in the converſion: and, therefore, the fact of the finding, or *trover*, is now totally immaterial; for the plaintiff needs only ſuggeſt (as words of form) that he loſt ſuch goods, and that the defendant found them; and if he proves, that the goods are his property, and that the defendant had them in his poſſeſſion, it is ſufficient. But a converſion muſt be fully proved; and then in this action the plaintiff ſhall recover damages, equal to the value of the thing converted, but not the thing itſelf; which nothing will recover but an action of DETINUE or REPLEVIN. See RESTITUTION *of ſtolen Goods*.

TROUGH, a hollow wooden veſſel for kneading bread in; or to beat apples in for cyder; alſo a piece of the trunk of a tree made hollow, to feed ſwine in, or an open pipe or channel, made of boards, for the conveyance of water.

TROUGH *of the ſea*, is the hollow cavity made between two waves, or billows, in a rolling ſea.

When a ſhip lies down there, they ſay, ſhe lies in the *trough of the ſea*; in which caſe ſhe rolls heavieſt, becauſe the ſetting of the ſea is always produced by the wind, and, conſequently, the waves, and the *trough* between them, will be at right angles with the direction of the wind.

TROUSSEQUIN, in the *Manege*, a piece of wood, cut archwiſe, raiſed above the hinder-bow of a great ſaddle, and ſerving to keep the bolſters firm.

TROUS-*de loup*, in *Field Fortification*, are round holes, about ſix feet deep, and pointed at the bottom, with a ſtake placed in the middle. They are frequently dug round a redoubt, to obſtruct the enemy's approach. At top they are circular, and about four feet and a half in diameter.

TROUSSEQUEUE, in the *Manege*. See DOCK.

TROUT, *ſalmo fario* of Linnæus, in *Ichthyology*, a very valuable river-fiſh, the diſtinguiſhing characters of which are theſe. Its body is long; its head ſhort and roundiſh; the end of its noſe or ſnout obtuſe and blunt; its tail is very broad; its mouth large; and each jaw furniſhed with one row of ſharp teeth; and in its palate there are three parcels of teeth, each of an oblong figure in the congeries, and all meeting in an angle near the end of the noſe; and the tongue has ſix, eight, or ten teeth alſo on it; and its ſides are beautifully variegated with red ſpots. See *Trout*-FISHING.

The colours of the *trout*, and its ſpots, vary greatly in different waters, and in different ſeaſons; yet each may be reduced to one ſpecies. In Llyndivi, a lake in South-Wales, are *trouts* called *coch y dail*, marked with red and black ſpots, each of the ſize of ſixpence; others unſpotted, and of a reddiſh hue, that ſometimes weigh near ten pounds, but are bad taſted. In Lough Neagh, in Ireland, are *trouts* called *buddaghs*, ſome of which weigh thirty pounds; and others of a much ſuperior ſize are taken in Hulſe-water, a lake in Cumberland, ſuppoſed to be the ſame with the *trouts* of the lake of Geneva. In the river Eynion, not far from Machynlleth in North-Wales, and in one of the Snowdon lakes, is found a variety of *trout*, naturally deformed, having a ſtrange crookedneſs near the tail.

The ſtomachs of the *common trouts* are uncommonly thick and muſcular; as they feed on the ſhell-fiſh of lakes and rivers, as well as on ſmall fiſh; and take into their ſtomachs gravel or ſmall ſtones, to aſſiſt in comminuting the teſtaceous parts of their food. The *trouts* of certain lakes in Ireland, ſuch as thoſe of the province of Galway, and ſome others, are remarkable for the great thickneſs of their ſtomachs, which, from ſome ſlight reſemblance to the organs of digeſtion in birds, are called *gizzards*; and the ſpecies that have them are called *gillaroo*, or *gizzard trouts*. The hon. Mr. Daines Barrington ſuggeſts, that *gillaroo* may be either a corruption of Killaloe, the name of a town near which theſe *trouts* are caught, or formed of the Welſh, *cylla*, q. d. *ſtomach*, and the Iriſh *ruadh*, *q. d. ſtrong*; ſo that *gillaroo* may be the ſame as ſtrong ſtomach. From the obſervations both of Dr. Watſon and Mr. J. Hunter, there is no reaſon for conſidering the ſtomach of theſe *trouts* as gizzards, but as true ſtomachs. That of the Engliſh *trout* is of the ſame kind with the ſtomach of the gillaroo *trout*, but its coat is not ſo thick by two-thirds: and, therefore, the difference in the thickneſs of the ſtomach, which may be occaſioned by the nature of the waters, or adapted to the purpoſes of comminuting a greater quantity of ſhell-fiſh than the ſtomachs of our *trouts*, does not warrant its being claſſed as a diſtinct ſpecies. The ſtomach even of the gillaroo *trout* can poſſeſs ſcarcely any power of grinding, as the whole cavity is lined with a fine villous coat, the internal ſurface of which appears every where to be digeſtive, and by no means fitted for maſtication. Theſe ſtomachs are ſometimes ſerved up to table in Ireland, under the name of gizzards. See

on this subject, Phil. Transf. vol. lxiv. par. i. p. 116. 121. 310.

Trouts are a very voracious fish, and afford excellent diversion to the angler: they shift their quarters to spawn, and, like salmon, make up towards the heads of rivers to deposit their roes. The under jaw of the *trout* is subject, at certain times, to the same curvature as that of the salmon.

Mr. Pennant has described a species that migrates out of the sea into the river Esk, in Cumberland, from July to September, and called from its colour the *whiting*. When dressed its flesh is red, and most delicious eating. On their first appearance from the salt water, they have the salmon-louse adhering to them. They have both melt and spawn, but no fry has as yet been observed. The Scots call this fish *phinocs*; they never exceed a foot in length; the upper jaw is a little longer than the lower; in the first are two rows of teeth, in the last one; and on the tongue are six teeth; the back is straight; the whole body of an elegant form; the lateral line straight; the colour between that and the top of the back, dusky and silvery intermixed, beneath the line of an exquisite silvery whiteness; first dorsal fin spotted with black; the tail black and much forked; the first dorsal fin has eleven rays; the pectoral thirteen; the ventral nine, and anal nine. Pennant's Brit. Zool. vol iii. p. 302.

TROUT-*coloured*. A horse is said to be of this colour, when he is white, and speckled with spots of black, bay, or sorrel; especially about the head and neck.

TROUT-*fishing*. See *Trout*-FISHING.

TROUT, *salmon*. See SALMON-*trout*.

TROWEL. See BRICKLAYER.

TROWLE, or *trole* the *bowl*, in *English Antiquity*, was a common phrase in drinking for passing the vessel about, as appears from several of our old catches.

TROWSERS, among *Sailors*, a sort of loose breeches of canvas worn by seamen, &c.

TROY, *epocha of the destruction of*. See EPOCHA.

TROY *white*, *white of Orleans*, or *Spanish white*, is a name given to a preparation of chalk, which is finely powdered, formed into cakes, and used in the arts. This chalk is found in great abundance at a village called Villeloup, about four leagues from Troyes in France. It is dug out of the earth in small lumps, and after having been exposed to the air, is bruised and reduced into a gross powder, which is passed through a sieve: when it is perfectly dry, it is diluted with soft water, and formed into a kind of paste, which, being well-tempered, is ground very fine in a mill; and used by painters, gilders, &c. and the qualities that peculiarly recommend this substance are, its being very white, friable, and free from all mixture of adventitious earth and stone. The white of Orleans is prepared at Cavereau, a small village about nine leagues from Orleans, and is reckoned inferior in value to the former. Mem. Acad. Sc. An. 1754. Ephemerid. Troyennes, an. 1759.

The artificial *Troy white*, called also *Spanish white*, is chalk neutralized by the addition of water in which alum is dissolved, and afterwards washed over. It is used by some in water-colours as a white, and may be thus prepared: take a pound of chalk, and soak it well in water; then wash over all the fine part; and having poured off the first water, add another quantity, in which two ounces of alum are dissolved. Let them stand for a day or two, stirring the chalk once in six or eight hours: wash the chalk again over, till it be rendered perfectly fine, and pour off as much of the water as can be separated from the chalk by that means, taking off the remainder of the dissolved alum, by several renewed quantities of fresh water. After the last water is poured off, put the chalk into a cullender-filtre, with a linen cloth over the paper; and, when the moisture has been sufficiently drained off from it, lay it out in lumps to dry on a proper board. Handm. to the Arts, vol. i. p. 137.

TROY *weight*, anciently called *trone weight*. See WEIGHT.

TROY *pound*. See WEIGHT.

TRUCE, TREUGA, a suspension of arms; or a cessation of hostilities between two parties at war.

The word, according to Menage, &c. comes from the Latin *treuga*, which signifies the same; and which Caseneuge derives further, from the German *traue*, or *treue*, which signifies trust.

Truces are frequently concluded, between princes, in order to come to a peace. *Truces* of many years serve in lieu of treaties of peace between princes, whose differences cannot be finally adjusted.

TRUCE *of God*, *treuga Dei*, is a phrase famous in the histories of the eleventh century, when the disorders and licences of private wars between particular lords and families obliged the bishops of France to forbid such violences within certain times, under canonical pains.

Those intervals they called *treuga Dei*, *treve de Dieu*, *q. d. truce of God*, a phrase frequent in the councils since that time. The first regulation, of this kind, was in a synod held in the diocese of Elno in Roussillon, anno 1027, where it was enacted, that, throughout that county, no person should attack his enemy from the hour of nones on Saturday, to that of prime on Monday, that Sunday might have its proper honour; that nobody should attack, at any time, a religious priest walking unarmed, nor any person going to church, or returning from the same, or walking with women; that nobody should attack a church, or any house within thirty paces around it. The whole under penalty of excommunication, which, at the end of three months, was converted into an anathema.

These quarrels had prevailed even in the time of Charlemagne, and much more after his death; so that the church found it necessary to interpose. The most early of these interpositions, now extant, is towards the end of the tenth century.

In 990, several bishops assembled in the south of France, and published regulations to restrain the violence and frequency of private wars, ordaining that the transgressor should be excluded from all Christian privileges during his life, and be denied Christian burial after his death. To the same purpose a council was held at Limoges, A. D. 994; and several other councils issued their decrees for restraining the evil. But the authority of councils was insufficient; and, therefore, a bishop of Aquitaine, A. D. 1032, pretended that an angel from heaven had appeared to him with a writing, enjoining men to cease from their hostilities, and be reconciled to each other. Accordingly, a general cessation took place, and lasted for seven years; and a resolution was formed, that no man should attack or molest his adversaries from the evening of Thursday in each week, to the morning of Monday in the week ensuing, the intervening days being peculiarly holy; our Saviour's passion having happened on one of them, and his resurrection on another. This sudden change was considered as miraculous, and the respite from hostilities subsequent to it was called the *truce of God*.

This from being a regulation in one kingdom became a general law in Christendom, and was confirmed by the authority of the pope, and the violators were subjected to the penalty of excommunication. The council of Toulujes in Roussillon, A. D. 1041, issued an act, containing all the stipulations required by the *truce of God*. The nobles, however, disregarding the *truce*, pursued their quarrels without interruption. Toward the end of the twelfth century, a new revelation was pretended, and in consequence of it, an association formed under the title of the *Brotherhood of God*. At length Philip Augustus, or St. Louis, published an ordonnance, A. D. 1245, prohibiting any person to commence hostilities until forty days after the offence which caused the quarrel, and the transgressor was to be tried and punished by the judge as a traitor. This was called the *royal truce*, and the regulation was productive of good effects. This was farther enforced by an ordonnance of Philip the Fair, A. D. 1296. See Robertson's Hist. of Charles V. vol. i. p. 335, &c. 8vo.

TRUCE, *breaking of*. See PASSPORT.

TRUCE, *conservator of*. See CONSERVATOR.

TRUCHMAN, *dragoman*, or *drogman*, in the countries of the Levant, an interpreter.

TRUCK, in a *Ship*, a piece of wood, at the top of a mast, to put the flag-staff in. See *Tab. Ship. fig.* 1. *n.* 34. 79. 96. 121. 145.

Trucks are conical, cylindrical, spherical, or spheroidical. Thus, the *trucks* fixed on the spindle of a mast-head, called ACORNS, are in the form of a cone; those which are employed as wheels to the gun-carriages are cylinders; the *trucks* of the PARRELS assume the figure of a globe, and those of the FLAG-*staves* resemble an oblate spheroid. *Trucks* of the shrouds are nearly similar to those of the parrels: they are fastened to the SHROUDS about twelve or fourteen feet above the deck; the hole in the middle being placed perpendicularly to contain some rope which passes through it. The intention of these, is to guide the sailors to the particular rope, which might otherwise be easily mistaken for some other of the same size, especially in the night. Falconer.

TRUCKING, in *Commerce*. See PERMUTATION, EXCHANGE, and COMMERCE.

TRUCKS, among *Gunners*, round pieces of wood, in form of wheels, fixed on the axletrees of carriages, to move the ordnance at sea, and sometimes also at land. See CARRIAGE.

TRUE,

TRUE, ſomething agreeable to the reality of things, or to truth.

In this ſenſe we ſay, the *true* God, the *true* religion, *true* gold, &c. in oppoſition to falſe or pretended ones.

TRUE *love*, in *Botany*. See *Herb* PARIS.

TRUE *love of Canada*. See *Herb* PARIS *of Canada*.

TRUE *place of a planet*, or *ſtar*, in *Aſtronomy*. See PLACE.

TRUE *altitude*, *anomaly*, *aſthma*, *horizon*, *propoſition*, *recovery*, *ribs*, and *ſuture*. See the ſeveral articles.

TRUFFLES, formed from *truffe*, or *truffle*, of the Latin *tuber*, or *tuberculum*, *tubera terræ*, in *Natural Hiſtory*, a ſort of ſubterraneous vegetable production, or a kind of MUSHROOM, the characters of which are theſe: they are of a fungous fleſhy ſtructure, and are of a roundiſh figure, growing ſometimes ſingle, ſometimes many together, and always remaining under ground.

In the Linnæan ſyſtem, this is a ſpecies of the *lycoperdon*, or PUFF-*ball*.

The ſpecies of *truffles* are only two: 1. The common *truffle*; and, 2. The teſticulated *truffle*. Tourn. Inſt. p. 565.

Bradley calls them *under-ground edible muſhrooms*, or *Spaniſh ſtubbes*, and *under-ground deer's-balls*, or *muſhrooms*.

The ancients, it is evident from their writings, were not acquainted with the ſort of *truffles* which we have in uſe at preſent; they deſcribe theirs to have been of a reddiſh colour, and ſmooth on the ſurface; we at preſent know this kind very well; it is common in Italy, and is called the wild *truffle*, and diſregarded. They had indeed the white African *truffle*, ſometimes brought to them, and held it in great eſteem for its flavour. The Romans called it the Lybian *tuber*, and the Greeks the Cyrenian *miſy*.

Avicenna recommends thoſe *truffles* as the beſt, which were of a whitiſh colour within; and this not being a clear white, he expreſſes himſelf by a word which ſignifies ſand-coloured, alluding to duſky white ſand, in common uſe at that time.

It is certain that the fineſt *truffles* were called by ſome authors by this epithet *arenoſa*, with a very different meaning, only expreſſing that they were produced in ſandy countries: the European *truffles* both then were, and now are, moſtly produced in dry ground on the ſides of hills; but the Lybian were produced only in the burning ſands of that country, and theſe were therefore called *ſand-truffles*. Serapio tells us, that the beſt of all *truffles* were thoſe produced in ſand; and Martial alludes to theſe, where he deſcribes the fineſt *truffles* as breaking the ſurface of the earth into cracks, and by that means directing people where to ſearch for them. To which purpoſe Leo Africanus ſays of the Lybian *truffle*, that the places where they are may be known by the earth's being raiſed into hillocks, and breaking into numerous cracks.

The *truffle* is moſt abundantly produced in dry fields of a reddiſh loamy earth, not too poor; according to Pliny chiefly after rains and thunders in autumn; and they are found to flouriſh moſt near the roots of elms, the ilex, and ſome other trees. They do not well bear the ſeverity of hard winters, but are uſually ſcarce all the ſeaſon after ſuch. The ſmalleſt are found about the bigneſs of a pea, reddiſh without and whitiſh within, and they grow from this ſize ſometimes to a pound weight, but ſuch are not common; what are taken up in the ſpring are diſtinguiſhed by their white colour, and inſipidity to the taſte, and are commonly called white *truffles*: thoſe taken up in autumn are of a variegated colour within, and are called marbled *truffles*; the inner ſubſtance having ſwelled extremely and changed colour, and the white part now remaining only in form of a number of pipes or tubules, which ſeem in many places to run to the extremity, and terminate in the chaps and wrinkles of the back. The greyiſh ſubſtance, which is wrapped up among theſe tubules, when examined by the microſcope, appears to be a tranſparent parenchyma, compoſed of little bladders or hollow veſſels, in the midſt of which may be ſeen ſmall round bodies, which are unqueſtionably the ſeeds of the *truffle*.

What confirms the opinion of their coming from ſeed is, that there have been *truffles* diſcovered in England, and this, at firſt, only in Northamptonſhire, and even only in one place thereof, viz. near Ruſhton, a place ſtocked with trees formerly brought from Languedoc; and it is only ſince then, that any *truffles* have been there obſerved; whence it is concluded, that the ſeed of theſe *truffles* was brought from France among the roots of the trees brought thence.

Theſe Engliſh *truffles* were firſt diſcovered by Dr. Hatton. Dr. Tancred Robinſon aſſures us, they are the true French *truffles*, the Italian *tartuffi* or *tartuffole*, and the Spaniſh *turmos de tierra*, being not before noted by Mr. Ray as ever known on Engliſh ground: indeed he adds, that he has ſeen them thrice as large at Florence, Rome, &c.

Thoſe obſerved in England are all included in a ſtudded bark or coat, and the inner ſubſtance is of the conſiſtence of the fleſhy part of a young cheſnut, of a paſte-colour, a rank or hircine ſmell, and unſavoury.

When the *truffles* are arrived at ſuch a degree of maturity as to yield ſeeds, which is generally in Auguſt, they are of a fine high flavour and agreeable ſmell; and the heat and rains at this ſeaſon greatly promoting their growth, has been the occaſion of the old error, that thunder produced them; after this they continue good till the middle of winter, and ſometimes even till March; but thoſe gathered from this time till the end of July are ſmall and only white, never marbled nor of their high taſte.

If the *truffles* are not taken up when fully ripe, they always rot and burſt; whence it is plain, that they are an annual plant, which lives no longer than till they have perfected their ſeeds. And if the place where the old ones have rotted and burſt be examined, the ſeeds will be found after ſome time to have vegetated, and a great number of young *truffles* to be produced in the place: theſe, if not deſtroyed by the froſts, are what in the enſuing ſpring furniſh the younger white *truffles*.

The *truffle* is very apt to be pierced and eaten within by a worm, and this, though a damage to the particular *truffle*, is of ſome ſervice to the people, who make it their buſineſs to ſeek for them: for this worm, after a proper time paſſed in that ſtate, changes into its chryſalis ſtate in the body of the *truffle*; whence he ſoon after comes out, in the ſhape of a beautiful violet-coloured fly; and wherever theſe flies are found, they are an indication that there are beds of *truffles* near, as they are never bred in any other root.

Theſe communicate a bitterneſs to the whole *truffle*, and make it unfit for the table; though if the whole be carefully ſearched into, the part eaten by the worm, and the hole by which it made its way in, will be found to be in reality the only bitter parts, and the reſt of the *truffle*, when theſe are cut out, as good as ever: but, beſide theſe deſtroyers, the microſcope uſually diſcovers on the ſurface of the *truffle* a multitude of other devourers, which are ſmall animalcules, continually eating, and ſearching the cracks of the bark, as the places where the pulp is moſt eaſily come at; theſe ſomewhat reſemble mites.

The earth that produces *truffles* rarely affords any other plants, theſe taking up all the nouriſhment it can afford: the earth all about them ſmells ſo very ſtrongly of them, that they are eaſily found out by it, by the animals which carry their noſes near the ground: and thoſe who ſought after them ſoon found the way of uſing hogs to ſearch them out; but theſe being a ſort of unmanageable animals, dogs were found which would ſupply their place with more certainty, and much leſs trouble. Mem. Acad. Scienc. Paris, An. 1711.

By a chemical analyſis, *truffles* are found to abound in a volatile alkali ſalt mixed with oil, upon which their ſmell, &c. depend. They never riſe out of the ground, but are found, uſually, half a foot beneath the ſurface thereof.

Dr. Hatton has obſerved ſeveral little fibres iſſuing out of ſome *truffles*, and inſinuating themſelves within the ſoil, which, in all probability, do the office of roots. The *truffles* grow tolerably globular, as receiving their nouriſhment all around them; which they ſuck in through the pores of their bark or rind.

They are tendereſt and beſt in the ſpring, though eaſieſt found in autumn; the wet ſwelling them, and the thunder and lightning diſpoſing them to ſend forth their ſcent, ſo alluring to the ſwine: hence ſome of the ancients called them *ceraunia*, *q. d. thunder-roots*.

The ancients were exceedingly divided as to the uſe of *truffles*; ſome affirming them to be wholeſome food, and others pernicious: Avicenna, particularly, will have them to cauſe apoplexies. For my own part, ſays M. Lemery, I am of opinion, they have both good and evil effects: they reſtore and ſtrengthen the ſtomach, promote the ſemen, &c. but, when uſed too freely, they attenuate and divide the juices immoderately, and, by ſome volatile and exalted principles, occaſion great fermentations, &c. though the pepper and ſalt, with which they are ordinarily eaten, do doubtleſs contribute greatly to thoſe effects: their rich taſte is owing to their not putting forth any ſtalk; in effect, their principles being united, and, as it were, concentred in a little bulb, muſt yield a richer and more delicious flavour than if the juices were diſperſed by vegetation through the ſeveral parts of a com-

mon plant. Some roaſt *truffles* under the aſhes; and others mix them in ſauces.

In Italy, France, England, &c. they eat them as a great dainty, either in fried ſlices with oil, ſalt, and pepper, or boiled thoroughly in their own broth. The hogs are exceedingly fond of them, and are frequently the means of diſcovering the places where they are; whence the common people call them *ſwine-bread*. See MISY and UDNON.

TRUFFLE-*worms*, in *Natural Hiſtory*, a ſpecies of fly-worm which is found in *truffles*, and lives in and feeds on them, till the time it undergoes the common metamorphoſis of theſe creatures, for the production of a fly, like that from the egg of which it was hatched.

They are very ſmall, and have two brown ſpots, eaſily diſtinguiſhable near their hinder end, which are the two poſterior ſtigmata. They are all over white and very tranſparent; and one may very eaſily diſtinguiſh the two black ſtalks of their two hooks, with which they tear the ſubſtance of the *truffle*, as the other ſpecies do their food; when they have arrived at their full growth, which is uſually in a few days, they then leave the *truffle*, and go to ſeek ſome proper place, where they may reſt during the time of their transformation; they enter the earth for this purpoſe, and twelve hours after they have gone into it they are transformed into an egg-ſhaped ſhell, of a cheſnut-brown, of the ſame ſort with that of the blue fleſh-fly.

Theſe are the worms in a manner peculiar to the *truffles*; but, beſide theſe, they often furniſh nouriſhment to another ſpecies, very common in muſhrooms of the ordinary eatable kind, and which has a yellow body and a black cruſtaceous head. Reaumur's Hiſt. Inſ. vol. iv. p. 374.

TRUG, or TRUG-*corn*, TRUGA *frumenti*, in our *Ancient Cuſtoms*, denotes a meaſure of wheat. *Tres* trug *frumenti vel avenæ faciunt two buſhels, inter prœbendam de Hunderton eccleſia Heref.* MS. de temp. E. III.

At Lempſter, the vicar has *trug-corn* allowed him for officiating at ſome chapels of eaſe; as Stoke and Dockly, within that pariſh.

TRUG, is alſo a country word for a milk tray, or hod to carry mortar in.

TRULLIZATION, in the *Ancient Architecture*, the art of laying on ſtrata or layers of mortar, gypſum, or the like, with the trowel, in the inſide of vaults, ceilings, &c.

TRULLUM, a barbarous word, formed from *trulla*, *cap*, and ſignifying *dome*; chiefly uſed in the phraſe, *Council in trullo*.

This was a council aſſembled, in the year 692, againſt the Monothelites, in the dome of the palace of Conſtantinople, called *trullum*; the name whereof it has retained. It was alſo called the QUINISEXTUM.

The *trullum* was properly a hall in the palace of the emperors of Conſtantinople, where they uſually conſulted of matters of ſtate. This council, held in *trullo*, was the ſixth œcumenical or general council.

TRUMPE, in *Ichthyology*, a name given by ſome of the Engliſh writers to that ſpecies of whale, called by the generality of authors *cete*, and *balæna major*. This is the PHYSETER *microps* of Linnæus, or blunt-headed CACHALOT. The Dutch call it the pot-whale-fiſh.

TRUMPET, a muſical inſtrument, the moſt noble of all portable ones of the wind kind; uſed chiefly in war, among the cavalry, to direct them in the ſervice. Each troop of cavalry has one. The cords of the *trumpets* are of crimſon, mixed with the colours of the facings of the regiments.

The word is formed from the French *trompette*. Menage derives it from the Greek *στρομβος*, *turbo*, a ſhell anciently uſed for a trumpet. Du-Cange derives it from the corrupt Latin *trumpa*, or the Italian *tromba*, or *trombetta*; others from the Celtic *trompill*, which ſignifies the ſame. It is uſually made of braſs, ſometimes of ſilver, iron, tin, and even wood. Moſes, we read, made two of ſilver, to be uſed by the prieſts, Numb. x. and Solomon made two hundred like thoſe of Moſes, as we are informed by Joſephus, lib. viii. which ſhews abundantly the antiquity of that inſtrument.

As to the invention of the *trumpet*, ſome Greek hiſtorians aſcribe it to the Tyrrhenians; but others with greater probability to the Egyptians, from whom it might have been tranſmitted to the Iſraelites. The *trumpet* was not in uſe among the Greeks at the time of the Trojan war; though it was in common uſe in the time of Homer. According to Potter (Arch. Græc. vol. ii. cap. 9.) before the invention of *trumpets*, the firſt ſignals of battle in primitive wars were lighted torches; to theſe ſucceeded ſhells of fiſhes, which were ſounded like *trumpets*. And when the *trumpet* became common in military uſe, it may well be imagined to have ſerved at firſt only as a rough and noiſy ſignal of battle, like that at preſent in Abyſſinia and New Zealand, and perhaps with only one ſound. But even when more notes were produced from it, ſo noiſy an inſtrument muſt have been an unfit accompaniment for the voice and poetry; ſo that it is probable the *trumpet* was the firſt ſolo inſtrument in uſe among the ancients.

In the ninety-ſixth Olympiad, before Chriſt 396, a prize was inſtituted at the Olympic games for the beſt performer on the *trumpet*; and the firſt perſon who gained the prize was Timæus of Elis; and Herodotus of Megara, a famous trumpeter, who lived about the 120th Olympiad, or three hundred years before Chriſt, was victor at the different games of Greece no leſs than ten, or, as ſome ſay, fifteen ſeveral times. Theſe performers on the *trumpet* appear to have been heralds and public cryers; who not only gave the ſignals at the games for the combatants to engage, and announced their ſucceſs, but proclaimed peace and war, and founded ſignals of ſacrifice and ſilence, at religious ceremonies. Burney's Hiſt. of Muſ. vol. i. p. 376.

Among the Romans, there were various inſtruments of the *trumpet*-kind; as the *tuba*, *cornua*, *buccina*, and *lituus*. The *tuba* is ſuppoſed to have been exactly like our *trumpet*, widening gradually in a direct line to the orifice; the *cornua* were bended almoſt round; and the BUCCINA was ſomewhat leſs; the *lituus*, which was almoſt ſtraight, but crooked at the extremity, in the form of the augural ſtaff, whence its name, was a ſpecies of CLARION, or octave *trumpet*, made of metal, and extremely loud and ſhrill, uſed for horſe, as the ſtraight *trumpet* was for foot. Horace diſtinguiſhes it from the *tuba* or *trumpet*. Od. i. l. 23.

> *Multos caſtra juvant, et lituo tubæ*
> *Permiſtus ſonitus,*—

As Claudian does from the flute:

> Tibia *pro* lituis, *et pro clangore tubarum*
> *Molle lyræ, fauſtumque canant.*

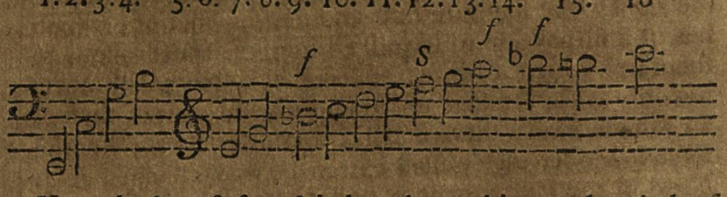
The *tuba*, or long *trumpet*, called by the Hebrews *the trumpet of the jubilee*, may be ſeen in ſeveral pieces of ancient ſculpture at Rome, particularly on the arch of Titus, on Trajan's pillar, and in a baſſo relievo at the Capitol, repreſenting the triumph of Marcus Aurelius.

The modern *trumpet* conſiſts of a mouth-piece, near an inch broad, though the bottom be only one-third ſo much. The pieces which convey the wind are called the *branches*; the two places where it is bent, *potences*; and the canal between the ſecond bend and the extremity, the *pavilion*: the places where the branches take aſunder, or are ſoldered, the *knots*; which are five in number, and cover the joints.

When the ſound of the *trumpet* is well managed, it is of a great compaſs. Indeed its extent is not ſtrictly determinable; ſince it reaches as high as the ſtrength of the breath can force it. A good breath will carry it beyond four octaves, which is the limit of the uſual keys of ſpinets and organs.

The uſual ſounds of the *trumpet* are repreſented by the following muſical notes.

1.2.3.4. 5.6.7.8.9.10.11.12.13.14. 15. 16



Here the loweſt ſound being denoted by 1, the pitch of the reſt, or the number of their reſpective vibrations, during the time that C vibrates once, will be expreſſed by the numbers denoting the order of the ſounds, 2, 3, 4, 5, &c. The ſounds expreſſed by the muſical numbers, that is, by 2, 3, 5, and their compoſites, which are 4, 6, 8, 9, 10, 12, 15, 16, are all perfectly in tune; but the ſounds expreſſed by numbers not muſical, as 7, 11, 13, 14, are falſe. Three of theſe, viz. B♭, its octave, and A, diſtinguiſhed by *f* placed over them, are too flat; and the remaining note F, marked with an S, is too ſharp. See MUSICAL *Numbers*.

The reaſon of which is, that B♭ ought to be a tone major below C; that is, its pitch to that of C will be as 8 to 9; but the proportion given by the *trumpet* is as 7 to 8; which being a leſs proportion than that of 8 to 9, it follows, that B♭ will be too flat. The ſame holds true of its octave. And A being a tone minor above G, it ought to be to G as 10 to 9: but in the *trumpet*, it is to G as 13 to 12; which being leſs than the proportion of

10 to 9, it follows that A will be too flat. On the other hand, F ought to be a semitone major above E; that is, F ought to be to E, as 16 to 15: but in the *trumpet*, F is to E, as 11 to 10; which being a greater proportion than that of 16 to 15, it follows that F is too high or too sharp.

This system of *trumpet*-notes is an effectual confutation of those who are for introducing 7, 11, 13, and other primes into music.

In war there are eight principal manners of sounding the *trumpet*: the first, called the *cavalquet*, used when an army approaches a city, or passes through it in a march. The second the *bout-selle*, used when the army is to decamp, or march; at which time the drums beat a *general*, when the troopers boot, saddle, and get ready. The third is when they sound to horse, when the *assembly* begins to beat, on which the troopers mount; and then to the standard. The fourth is the *charge*, in the day of battle. The fifth the *watch*. The sixth is called the *double cavalquet*. The seventh the *chamade*: and the eighth the *retreat*. Besides these, there are various flourishes, voluntaries, &c. used in rejoicings.

There are also people who blow the *trumpet* so softly, and draw so delicate a sound from it, that it is used not only in church-music, but even in chamber-music; and it is on this account, that, in the Italian and German music, we frequently find parts entitled *tromba prima*, or Ia, first *trumpet*; *tromba* IIa, *segonda*, IIIa, *terza*, second, third *trumpet*, &c. as being intended to be played with *trumpets*.

There are two very great defects in the *trumpet*, observed by Mr. Roberts, in the Philosophical Transactions for 1692, N° 195. The first is, that it will only perform certain notes within its compass, commonly called *trumpet-notes*; the second, that though its ordinary compass is from double C-*fa-ut* to C-*sol-fa* in alt, yet there are four notes, the 7th, 11th, 13th, and 14th, in this progression, viz. B*b*, *f*, *a a*, and *b b*, which are not exact in tune. The same defects are found in the TRUMPET-*marine*; and the reason is the same in both. Phil. Trans. Abr. vol. i. p. 607.

TRUMPET-MARINE, is a musical instrument consisting of three tables, which form its triangular body. It has a very long neck with one single string, very thick, mounted on a bridge, which is firm on one side, but tremulous on the other. It is struck by a bow with one hand, and with the other the string is pressed or stopped on the neck by the thumb.

It is the trembling of the bridge, when struck, that makes it imitate the sound of a *trumpet*, which it does to that perfection, that it is scarce possible to distinguish the one from the other. And this is what has given it the denomination of *trumpet-marine*, though, in propriety, it be a kind of monochord. Of the six divisions marked on the neck of the instrument; the first makes a fifth with the open chord, the second an octave, and so on for the rest, corresponding with the intervals of the military *trumpet*.

The *trumpet-marine* has the same defects with the *trumpet*, viz. that it performs none but *trumpet*-notes, and some of those either too flat or too sharp. This Mr. Fr. Roberts (*ubi supra*) accounts for, only premising the common observation of two unison strings; that if one be struck, the other will move: the impulses made on the air by one string setting another in motion, which lies in a disposition to have its vibrations synchronous to them; to which it may be added that a string will move, not only at the striking of an unison, but also of that of an 8th or 12th; there being no contrariety in the motions to hinder each other.

Now in the *trumpet-marine* you do not stop close, as in other instruments, but touch the string gently with your thumb, whereby there is a mutual concurrence of the upper and lower part of the string to produce the sound. Hence it is concluded, that the *trumpet-marine* yields no musical sound, but when the stop makes the upper part of the string an aliquot part of the remainder, and, consequently, of the whole; otherwise the vibrations of the parts will stop one another, and make a sound suitable to their motion, altogether confused. Now the aliquot parts, he shews, are the very stops which produce the *trumpet* notes.

TRUMPET, *Harmonical*, is an instrument which imitates the sound of a *trumpet*, and which resembles it in every thing, excepting that it is longer, and consists of more branches. It is usually called a SACKBUT.

TRUMPET, *Listening* or *hearing*, is an instrument invented by Joseph Landini, to assist the ear in hearing of persons who speak at a great distance, without the assistance of any speaking-*trumpet*.

Instruments of this kind, represented in *Tab. Music*, *fig.* 14, 15, are formed of tubes, with a wide mouth A A, and terminating in a small canal B, which is applied to the ear: the construction of these instruments evidently shews how they contribute to assist the hearing; for the weak and languid pulses of the air being received by the large end of the tube, and reflected several times from its sides in passing to B, the small end, are condensed, and entering the ear in this condensed state, strike the tympanum with a greater force than they could have done without the intervention of the tube. Hence it appears, that a *speaking* TRUMPET may be applied to the purpose of a hearing *trumpet*, by turning the wide end towards the sound, and putting the ear to the narrow end.

TRUMPET, *Speaking*, is a tube from six to fifteen feet long, made of tin, perfectly straight, and with a very large aperture; the mouth-piece being big enough to receive both lips.

The mouth being applied to it, carries the voice to a very great distance, so that it may be heard distinctly a mile, or more; hence its use at sea.

The invention of this *trumpet* is held to be modern, and is commonly ascribed to sir Samuel Moreland, who called it the *tuba stentorophonica*.

Of this instrument an account was published at London in 1671, in a work entitled Tuba Stentoro-phonica, wherein the author relates several experiments made by him with this instrument; the result of which was, that a *speaking-trumpet* constructed by him, 5 feet 6 inches long, 21 inches diameter at the greater end, and 2 inches at the smaller, being tried at Deal-castle, was heard at the distance of three miles, the wind blowing from the shore.

But Ath. Kircher seems to have a better title to the invention; for it is certain he had such an instrument before ever sir S. Moreland thought of his.

Kircher, in his Phonurgia Nova, published in 1673, says, that the tromba, published last year in England, he invented twenty-four years before, and published in his Musurgia: he adds, that Jac. Albanus Ghibbisius, and Fr. Eschinardus, ascribe it to him; and that G. Schottus testifies of him, that he had such an instrument in his chamber in the Roman college, with which he could call to, and receive answers from the porter.

Indeed, considering how famed Alexander the Great's tube was, wherewith he used to speak to his army, and which might be distinctly heard a hundred stadia or furlongs, it is somewhat strange the moderns should pretend to the invention; the stentorophonic horn, or tube of Alexander, whereof there is a figure preserved in the Vatican, being almost the same with that now in use. See STENTOROPHONIC.

The principle upon which this instrument is constructed is obvious; for as sound is stronger in proportion to the density of the air, it must follow, that the voice passing through a tube or *trumpet*, must be greatly augmented by the constant reflection and agitation of the air through the length of the tube, by which it is condensed, and its action on the external air greatly increased at its exit from the tube.

In order to estimate the effect of this instrument, let us suppose A B (*Tab. Music*, *fig.* 16) to be such a length of tube as admits one reflection of the sound, emitted by the speaker, from the side B B; let A F be another length, in which the sound or voice is reflected five times by the sides, viz. in B, C, D, E, and F: the sound striking the metal tube in B is the same as that at F; but the number of parts forming the periphery of the circle in B is to that in F, as the diameter B B is to the diameter F F; and therefore the intensities, with which the parts of the metal will be moved in these peripheries will be in the inverse ratio of the peripheries, or of the diameters B B, F F. But the parts of the metal move the air contained within the peripheries of the circle, or constituting their respective areas, which are as the squares of the diameters: i. e. the air agitated in B is to that agitated in F, as BB^2 to FF^2; and consequently, the intensity of the same sound in the tube of the length A B, is to that in the length A F, as BB^2 to FF^2, and the inverse ratio of the diameter B to F: or, the intensity in A B is to that in A F :: $FF \times BB^2 : BB \times FF^2$, i. e. dividing the last ratio by $BB \times FF$, :: BB : FF. But the intensity of the sound increases the more frequently it is reflected from the sides: let then the number of reflections of the sound in B be n, in F it will be $5n$, and therefore the whole intensity of the sound in B is to that in F as $n \times BB$ to $5n \times FF$. Consequently, the longer the tube the more numerous will be the reflections, and the greater will be the increase of the sound, and the farther may it be heard.

A man, speaking through a tube 4 feet in length, may be under-

understood at the distance of 500 geometrical paces; with a tube 16⅘ feet, at the distance of 1800 paces; and with a tube 24 feet long, at a greater distance than 2500 geometrical paces.

The sound will be also heightened by having the remoter aperture of the tube wide more than if it were narrow. However, the effect of the tube in magnifying sound, either for speaking or hearing, depends principally upon its length: nevertheless some advantage may be derived from its particular form and shape.

Some have proposed the figure which is made by the revolution of a parabola about its axis, as the best; where the mouth-piece is placed in the focus of the parabola, and consequently the sonorous rays will be reflected parallel to the axis of the tube. But Mr. Martin observes, that this parallel reflection is by no means essential to the magnifying of sound; on the contrary, it prevents the infinite number of reflections and reciprocations of sound, in which, according to sir I. Newton, its augmentation principally consists: the augmentation of the impetus of the pulses of air being proportional to the number of repercussions from the sides of the tube, and therefore to its length, and to such a figure as is most productive of them. Hence he infers, that the parabolic *trumpet* is the most unfit of any for this purpose.

He observes, that there is one thing more which contributes to the augmentation of the agitations of air in the tube; viz. the proportion which the several portions of air bear to each other when divided by transverse sections, at very small, but equal distances, from one end of the tube to the other.

Thus, let those several divisions be made at the points *a*, *b*, *c*, *d*, *e*, &c. (*fig.* 17.) in which let the right lines *n k*, *b l*, *c m*, *d n*, &c. be taken in geometrical proportion. Then will the portions of air contained between B and *a*, *a* and *b*, *b* and *c*, *c* and *d*, &c. be very nearly in the same proportion, as being in the same ratio with their bases, when the points of division are indefinitely near together. But it is known, that when any quantity of motion is communicated to a series of elastic bodies, it will receive the greatest augmentation when those bodies are in geometrical proportion. Therefore, since the force of the voice is impressed upon, and gradually propagated through a series of elastic portions of air in a geometrical ratio to each other, it easily receives the greatest augmentation possible.

And since by construction $Ba = ab = bc = cd$, &c. and $ak : bl :: bl : cm :: cm : dn$, &c. the points *k*, *l*, *m*, *n*, *o*, *p*, *q*, *r*, *s*, A will form the LOGARITHMIC or LOGISTIC curve: whence Mr. Martin concludes, that a *trumpet* formed by the revolution of this curve about its axis, will augment the sound in a greater degree than any other figured tube whatever.

Cassegrain also is of opinion, that an hyperbola, having the axis of the tube for an asymptote, is the best figure for this instrument. Musschenb. Int. ad. Phil. Nat. tom. ii. p. 926, 4to. Martin's Phil. Brit. vol. ii. p. 248, 3d edit.

For other constructions of speaking *trumpets* by Mr. Conyers, see Phil. Trans. N° 141. for 1678.

TRUMPETS, *Feast of*, in *Ecclesiastical History*, one of the menstrual feasts among the Jews, kept with greater solemnity than the rest, on the first day of the month Tisri. Num. xxix. 1—6. Levit. xxiii. 24, 25. The day of this feast was the new year's day with the Jews, in which the people were solemnly called to rejoice in a grateful remembrance of God's benefits to them through the last year, which might be intended by blowing the *trumpets*, as well as to implore his blessing upon them for the ensuing year, which was partly the intention of the sacrifices offered on this day.

The modern Jews have a notion, which they derive from the Mischna, that on this day God judges all mankind; and therefore, according to Basnage, their zealots spend, some a whole month, others four days, and especially the eve of this feast, in confessing their sins, beating their breasts, and some in lashing their bare backs, by way of penance, in order to procure a favourable judgment on this decisive day.

TRUMPET *fish*, *scolopax*, in *Ichthyology*, a fish called also the *bellows-fish*. In the Linnæan system it is a species of the CENTRISCUS; but in the Artedian, a species of BALISTES. Pliny calls it SERRA.

It is a very small fish, caught very frequently in the Mediterranean, and common in the markets of Rome, Venice, and elsewhere. Its common length is about three inches; its body is flat, and of about one finger's breadth, and covered with rough and harsh scales; the snout is extremely long, and is hard, straight, and made all of one bone, broad at the head, and narrow at the end, and opening there transversely with a membrane affixed to the under jaw, and serving to open and shut it at pleasure; the eyes are large, and their irises of a pale red; it has a thin fin at each of the gills; the anterior part of the belly is formed into a sharp edge, and has two bony substances instead of fins, and another lower on the belly, which is longer and notched; behind the anus there is a long fin reaching to the tail, and on the back two others, one near the tail, and the other a long and large bony spine, set in a joint, and moveable at pleasure; before this there is another fine prickle, and behind it three more, which make the whole a sort of fin. Gesner de Pisc. p. 1008.

TRUMPET-*flower*, or *scarlet jasmine*, *bignonia*, in *Botany*, a genus of the *didynamia angiospermia* class. Its characters are these: the empalement is cup-shaped, quinquefid, and of one leaf; the flower is of the ringent or grinning kind, tubulous, with long, swelling, bell-shaped chaps, divided into five parts at the top; and it has four awl-shaped stamina shorter than the petal, two longer than the other, having oblong reflexed summits; in the centre is an oblong germen, supporting a slender style, crowned by a roundish stigma; the germen becomes a bivalve pod, with two cells filled with compressed winged seeds, lying over each other imbricatim. Miller enumerates fifteen, and Linnæus seventeen species.

TRUMPET-*honeysuckle*. See HONEYSUCKLE.

TRUMPET-*shell*, or *whelk*, *buccinum*, in *Natural History*, the name of a large genus of shells, the characters of which are these: they are univalve shells of the form of a *trumpet*, according to old pictures, with a wide belly, and a large, broad, and elongated mouth; they have a distinct and regular tail, usually long, though sometimes short; they have a crooked beak, and the clavicle is often elevated, though sometimes depressed and contabulated.

In the Linnæan system, the characters of this genus are, that its animal is a slug, the shell univalve, spiral, and gibbous, the aperture oval, ending in a short canal or gutter. Linnæus enumerates fifty-one species.

For the arrangement of the *buccina* according to the system of Da Costa; see SHELLS.

The family of the *buccina*, when examined ever so strictly, is very large; but according to the general custom of authors, of confounding together several genera under the name, it is usually made to appear much larger than it really is. Lister has made it comprehend a vast number of shells, by confounding with it the families of the *murex* and *purpura*.

It is not indeed peculiar to this author, to have confounded these genera: those who went before him have done the same; and Pliny has comprised the *buccinum*, *murex*, and *purpura*, under the general name *ceryx*.

To avoid the general confusion, which arises from not distinguishing the families of the *buccinum*, *murex*, *purpura*, and *vis*, or screw-shell, it will be proper to observe, that there are regular characters, which distinguish them all, one from another: the characters are these; the *buccinum* differs from the *purpura*, in that it has a very long mouth of an oval figure, and has an elevated head; whereas the purpura has a round mouth, and a head somewhat flatted; the tail of the purpura is also usually furrowed, and is shorter than that of the buccinums.

The buccinum differs also from the murex in having a longer tail, by the smoothness and variety of colours of its coat, and by having a larger mouth less furnished with teeth; the *murex* having a smaller and longer shaped mouth, its surface covered with points or spires, and several teeth.

It is easier to distinguish the buccinum from the screw-shell, as this is always more long and slender than the buccinum; it has also a flat mouth, and has rarely any tail.

The most singular species of the buccinum class, is one that has its mouth turned the contrary way to all other shells: this has been thence called by authors, the *unique* and the *sans pareille*.

The buccina generate in the warm months, and some species of them are seen very frequently remaining in pairs together, upon the rocks deserted by the tide on that occasion. These have been thence supposed to be of a different genus, and have been called *buccina littoralia*; they are usually found in copulation early in the morning. Rumphius de Test. Aldrovand. de Test. lib. iii. cap. 231. Lister, Hist. Animal. Angl. p. 158.

The species of the *buccina* being very numerous, they are arranged under several distinct heads, according to certain obvious distinctions, and are as follow: of the *buccina*, with long distinct tails and oblong mouths, there are thirteen species; of those with a short tail and a wide mouth, we have twelve species; of those with long

long erect clavicles, there are eleven ſpecies; and of thoſe with leſs erect clavicles, and crooked roſtra, there are alſo eleven ſpecies.

It appears from the writings of the ancients, that the famous purple dye, which they obtained from a ſhell-fiſh was not peculiar to any one ſpecies; but was found in ſeveral of the ſmaller kinds of *buccina*; ſome of which they called *murices*, from the hollow ſpines, or long and ſlender proceſſes, which run in different directions from their ſhells. See PURPURA.

Mr. Reaumur, when on the coaſts of Poitou, found certain eggs of fiſhes arranged in regular order, and in great numbers, on the rocks and ſalted banks, which had the ſame property with the purple-dying liquor of the *buccinum*; it is not yet known to what particular fiſh they belong, or what uſes they may hereafter be brought to ſerve. Mem. Acad. Par. 1711.

Pliny ſeems to derive the name *buccinum* from *buccina*, a kind of muſical inſtrument; but it is more probable that inſtrument took its name from the ſhell to which it bore reſemblance, and of which it might probably have been anciently made. Plin. Hiſt. Nat. lib. ix. cap. 36. Phil. Tranſ. Nº 282. p. 1277.

Buccina are of ſome uſe in phyſic; when calcined they have a drying cauſtic quality. See *Tab. of Shells*, Nº 9, and *Tab.* III. *of Foſſils, claſs* 9.

Buccinum lapidoſum is a figured ſtone, ſhaped like the former, and probably only a petrifaction of the ſhell above mentioned.

Ray ſpeaks of a *buccinum* which was not only petrified, but after petrifaction was converted into a PYRITES.

TRUMPETER, in *Ornithology*, a name given in England, to a particular ſpecies of pigeon, called by Moore the *columba tibicen*.

This ſpecies is of the middle ſize of the common pigeon, and made conſiderably like it; but it is pearly-eyed; is of a mottled black, and is feathered down the legs and feet, and is turn-crowned like the nun, and ſome of the other ſpecies; ſometimes like the finnikin, but much larger: this ſeems to be the beſt ſort, as being the moſt melodious. The beſt character to know them by, is a tuft of feathers growing at the root of the beak; and the larger this tuft is, the more they are eſteemed; the reaſon of their name is, that they imitate in their cooing the ſound of the trumpet; but to be often entertained with their melody, it is neceſſary to feed them frequently with hemp-ſeed. Moore's Columbarium, p. 45.

Trumpeter is alſo a name given by Mr. Pennant to the PSOPHIA of Linnæus; becauſe it makes a ſtrong noiſe with its mouth, which it anſwers by a different noiſe from its belly, as if it came from the anus.

TRUMPETER, in a *Man of War*, one whoſe office is always to attend the captain's command, and be ready at the entertainment of ſtrangers. In the time of an engagement his proper ſtation is on the poop.

TRUMPETER, in *Anatomy*. See BUCCINATOR.

TRUNCATED *leaf*. See LEAF.

TRUNCATED *pyramid*, or *cone*, is one whoſe top or vertex is cut off by a plane parallel to its baſe. See PYRAMID and CONE.

The word is formed of the Latin *truncare*, to cut off a part from the whole; whence alſo *truncus*, *truncheon*, &c. In *Heraldry* they ſay TRUNKED.

A *truncated* cone, or the fruſtum of that body, is ſometimes alſo called a *curty-one*. See FRUSTUM. See alſo GAUGING.

TRUNCATED *roof*. See ROOF.

TRUNCHEON, of the French *troncon*, and the Latin *truncus*, a BATTOON; or a kind of ſhort ſtaff uſed by kings, generals, and great officers, as a mark of their command.

In our military language, it denotes a ſtaff of command borne by a general officer.

TRUNCHEONS, *columns in*. See COLUMN.

TRUNDLE, is a kind of carriage with low wheels, whereon to draw heavy cumberſome burdens.

TRUNDLE-*ſhot* is an iron-ſhot about ſeventeen inches long, ſharp-pointed at both ends, with a round bowl of lead caſt upon it, about an hand-breadth from each end.

TRUNGIBIN, in *Natural Hiſtory*, a name given by Rawwolf, Tournefort, and others, to a ſort of manna collected from the *alhagi maurorum*, as the common manna is from the aſh; and uſed in the eaſtern parts of the world as a purge. It is what we call the *manna Perſicum*, and though in itſelf a very fine and clean kind of manna, yet it is uſually ſo careleſly collected, and mixed with ſo much filth, that it requires to be given in three times the doſe of ours, in order to purge. The name ſeems very evidently to be a corruption of *tereniabin* or *terenjabin* of the Arabians, which was the word uſed by all their authors to expreſs the *manna Perſicum*.

TRUNK, a ſtrong cheſt or box of a roundiſh form, at leaſt on the upper ſide.

TRUNK, *Truncus*, in *Botany*, a ſtem or body of a tree, or that part between the ground and the place where it divides into branches.

In lopping of trees, nothing is left but the *trunk*.

TRUNK is alſo uſed for the ſtump, or that part left over the root in felling. Large trees, when felled, ſhoot out from the *trunk*, and make a copſe or underwood.

It is by means of the *trunks* left rotting in the ground, that the waſtes in foreſts are diſcovered.

TRUNK, in *Anatomy*, is uſed for the buſto of the human body, excluſive of the head and limbs.

The *trunk* is divided into three parts, viz. one common, called the SPINE, and two proper, viz. the THORAX or BREAST, and the PELVIS.

TRUNK, *truncus*, is alſo uſed for the main body of an artery, or vein, in contradiſtinction to the branches and ramifications thereof.

The word is particularly applied to certain parts of the aorta and cava. See *Tab. Anat.* (*Angeiol.*) *fig.* 5. *lit. a.*

TRUNK, in *Architecture*, is uſed for the fuſt or ſhaft of a column. Alſo, for that part of the pedeſtal between the baſe and the cornice, otherwiſe called the *dye*. See *Tab. Archit. fig.* 24. *lit. y.*

TRUNK, in *Mining*, is a ſtrek, or ſtrakes (q. d. ſtream) with a very ſmall ſtream or dribble of water, to waſh the ſlime of tin or copper ore, whereby the lighter earthy parts are carried off with the water. The operation is called *trunking the ſlimes*.

TRUNK is alſo popularly uſed for the ſnout of an elephant, by naturaliſts called the PROBOSCIS thereof.

TRUNK, in *Natural Hiſtory*, a pointed, hollow, ſlender, and oblong body; joined to the fore-part of the heads of many inſects, and ſerving them for ſucking the blood or juices of the animals, or vegetables, on which they feed.

The *trunks* of flies ſerve for diſtinguiſhing many genera of thoſe little animals, from their different form and other accidents. Some of theſe are a tube formed all of one ſimple piece, and others compoſed of ſeveral ſhorter pieces, nicely joined together: ſome are thin and as it were ſhelly, others thick and fleſhy; thoſe of ſome flies are terminated by a ſort of broad foot, or by a ſort of thick lips; and thoſe of others have no lips, or at leaſt no ſenſible ones; and others are made in form of a ſpindle hollowed at the end.

It is often neceſſary to have recourſe to the microſcope, to diſtinguiſh with nicety and exactneſs between theſe.

Without the aſſiſtance of glaſſes, however, it is eaſy to diſtinguiſh among the flies of different genera, three different manners of carrying this organ when in a ſtate of inaction. Many flies have *trunks* which they can ſhorten, when they are not uſing them; theſe are fixed in the fore part of the creature's head, where there is a cavity deſtined to receive them when they are not in uſe. In many ſpecies, this cavity is no more than a mere ſinus or hole, in the fore-part of the head; but in others it is more nicely contrived, the anterior part of the head lengthening itſelf, and forming a kind of arched vault for its reception. Other flies have *trunks*, which in the time of inaction are turned, or ſomewhat folded from above downwards; the *trunks* of bees are of this kind.

There are others alſo, which have their *trunks* contained entirely in a ſort of caſe, where they lie ſtraight at length, without being either turned or folded; but they are able to incline them in any direction, in regard to the poſition of their legs; of this kind are the *trunks* of the cicadæ, gnats, &c.

Among the butterfly claſs, a great number are furniſhed with a *trunk*; but there are alſo a great number that have it not: the fly of the ſilk-worm, and many, as well larger as ſmaller kinds, are without this organ. Thoſe ſpecies which have it, ſhew it to the firſt view; it is placed in the middle of the head directly between the two eyes. And though in ſeveral ſpecies it is very long, yet it takes up even in theſe but very little room; when it is not in uſe, it is always rolled up in a ſpiral form, in the manner of the ſpring of a watch; and even the ſhorteſt of them are thus turned as well as the longeſt.

There are among the butterflies, ſome which never ſettle upon any thing, but are eternally upon the wing in the manner of ſwallows: theſe feed on the wing as thoſe birds do. We often ſee them buzzing about a flower in the manner of a bee, and in that caſe they ſuſtain themſelves in the air with their wings, while they unrol their *trunk*, and thruſt its extremity into the flower, to ſuck from its bottom the honey-dew, which is the common food of them, of the bees, and of many other inſects.

It has been much diſputed, among the curious obſervers of nature, whether the *trunk* be originally compoſed of

two parts, or two *trunks* laid cloſe to one another; or whether it were owing to its tender ſtructure, that it was eaſily ſplit by breaking its parts.

Mr. Bonani was of the firſt opinion, and Mr. Riget agreed with him at firſt, but he afterwards became of the contrary ſentiment; and thought that they really broke in this ſplitting, being originally only one: but Reaumur has determined the queſtion in favour of Bonani; having, by repeated obſervations, found them compoſed of two parallel *trunks*, nicely and evenly laid ſidewiſe together.

The action of the *trunk* in ſucking is eaſily ſeen on giving a piece of ſugar to a butterfly, that has been kept without food for ſome days, after its being produced out of the chryſalis; many of the ſpecies will in this caſe feed on the ſugar in the ſame manner that they would on the juices of flowers, and will ſhew that the uſe of their rolling up their *trunk* at times, is the ſwallowing what they have received into it. The *trunks* of the ſeveral ſpecies of butterflies are as different in colour as in ſhape; ſome are black, others reddiſh, many of a cheſnut colour; ſome are alſo of a pale brown, and ſome of a beautiful yellow; many of them alſo are hairy on the under ſide, and many are ſmooth. The thicker *trunks* are always ſhorter than the flat ones, and have only one canal. Reaumur, Hiſt. Inſect. vol. i. p. 287, 293, 309.

TRUNK *of gnats*, the inſtrument by means of which the gnat ſtrikes the fleſh, and ſucks the blood from animal bodies.

This is a machine well worth an attentive obſervation. As fine and ſmall as this inſtrument appears, it is nevertheleſs of a very complex ſtructure. The piercer, or more properly the piercers of this inſtrument, are all entirely hid in the ſheath which makes what we call the *trunk*; and is the only part we naturally have offered to our view. This *trunk* appears to be cylindric in the greater part of its length, and is covered with ſcales reſembling ſmall leaves. Near its end it has an oblong button, furniſhed with an aperture, out of which is occaſionally thruſt a fine point, which is complex, being made up of a great number of pointed bodies.

The beſt way to get a regular ſight of the *trunk* of this creature, and of its manner of uſing it, is to ſuffer a gnat to ſettle upon the hand, and not diſturb him in the operation; but with a magnifying-glaſs in the other hand, to obſerve all his motions. In this caſe, we may firſt ſee a ſmall and ſlender point thruſt out at the end of the caſe, and the fly trying ſeveral different parts of the ſkin with this ſharp inſtrument; when it has done this, it chooſes that part which is moſt eaſily pierced; and where lies a veſſel underneath, capable of furniſhing as much blood as it will have occaſion to ſuck. As ſoon as he has made his choice, the wound is given; and ſince the point of the compound piercer cannot be protruded ſo far out of the caſe as is neceſſary for ſtriking to a proper depth, the uſe of the ſlit in this caſe is ſeen; for while the button at the end of this remains firmly applied to the orifice of the wound, where the piercer is introduced, and ſupports that delicate and feeble inſtrument from bending, the caſe opens at the ſlit, and its two ſides bend to give room for the piercer to penetrate, and at length, when the piercer is ſunk to its utmoſt depth, the two extremities of each piece touch, and the ſides are brought cloſe together.

The ſeveral ſpecies of gnats have great variety in their *trunks*; and in the obſerving of many kinds the true ſtructure of that organ in all will be moſt regularly and eaſily found. Some have the caſe of the piercers only one ſingle tube ſplit lengthwiſe along its upper part; others have this ſlit made by the junction of two caſes, which cover cloſely a great part of its circumference; and others have the two tubes ſo well adjuſted, and nicely fitted to one another, that a good glaſs cannot diſcover them from the reſt of the *trunk*, when in a ſtate of reſt; but in others this ſtructure is eaſily diſcoverable, as the extremity of one of them, when beſt fixed, is ſtill to be diſcovered ſomewhat ſeparated from the *trunk*, and adorned with a pencil of ſmall hairs, like thoſe of the antennæ. The male gnats, which have their antennæ feathered, are thoſe which have the plumes at the extremities of theſe additional pieces of the caſe of the *trunk*; and theſe have not the beards which are found ſituated over the *trunks* of the other ſpecies of gnats.

In ſome gnats four darts are thruſt out occaſionally from the opening ſide, one of which ſerves as a ſheath to the other three. The ſides of them are extremely ſharp, and they are barbed or indented towards the point.

Out of the immenſe number of gnats that one ſees in ſummer, in wet places, it is eaſy to determine that very few have any chance, even once in their lives, to ſuck the blood of larger animals. The reſt, however, are far from being doomed to perpetual famine; the herbs of the field afford them a ſufficient nouriſhment; for theſe, like many other of the inſect tribes, are partly carnivorous, partly otherwiſe, and feed equally on fleſh and vegetables. Reaumur, Hiſt. Inſect. vol. iv. p. 580, ſeq. Baker's Micr. 1743. p. 205.

TRUNK-*manna*. See MANNA.

Fire-TRUNK, in a *Fire-ſhip*. See FIRE-*ſhip*.

TRUNK-*roots* of a plant, are little roots which grow out of the *trunks* of plants.

Theſe are of two kinds: 1. Such as vegetate by a direct deſcent, the place of their eruption being ſometimes all along the *trunk*, as in mints, &c. and ſometimes only in the utmoſt point, as in ſome other plants and trees.

2. Such as neither aſcend nor deſcend, but ſhoot forth at right angles to the *trunk*, which, therefore, though, as to their office, they are true roots, yet, as to their nature, are a medium between a *trunk* and a root.

TRUNKED, among *Heralds*, is applied to trees cut off at each end, which are ſaid to be *trunked*, or *truncated*.

TRUNNIONS, or TRUNIONS, of a piece of ordnance, thoſe knobs or bunches of metal in a GUN, MORTAR, or HOWITZER, which project from the piece, and bear it up on the cheeks of the carriage.

TRUNNION-*ring*, is the ring about a cannon, next before the *trunnions*.

TRUNNION-*plates*, are two plates in travelling carriages, mortars, and howitzers, which cover the upper parts of the ſide-pieces, and go under the *trunnions*.

TRUSS, TRUSSA, a bundle, or a certain quantity of hay, ſtraw, &c.

A *truſs* of hay is to contain fifty-ſix pounds, or half a hundred weight; thirty-ſix *truſſes* make a load.

In June, July, and Auguſt, a *truſs* of new hay muſt weigh ſixty pounds.

A *truſs* of forage is as much as a trooper can carry on his horſe's crupper.

TRUSS *of flowers*, is uſed by floriſts to ſignify many flowers growing together on the head of a ſtalk; as in the cowſlip, auricula, &c.

TRUSS is alſo uſed for a ſort of bandage or ligature, made of ſteel, leather, linen, or other fit material, and of various forms, according to the nature of the caſe, or the contrivance of the maker, wherewith to keep up the parts in thoſe who have hernias or ruptures. See HERNIA, &c.

TRUSSED, in the *Manege*. A horſe is ſaid to be *well truſſed*, in French *bien gigote*, when his thighs are large and proportioned to the roundneſs of the croupe. On the contrary, a horſe with thin thighs, that bear no proportion to the breadth of the croupe, is ſaid to be *ill-truſſed*.

TRUSS, in a *Ship*, a machine employed to pull a yard home to its reſpective maſt, and retain it firmly in that poſition. As the *truſs* is generally uſed inſtead of a parrel, it is rarely employed except in flying top-gallant-ſails, which are never furniſhed with parrels. It is no other than a ring or TRAVELLER, which encircles the maſt, and has a rope faſtened to its after-part, leading downward to the top or decks; by means of which the *truſs* may be ſtraightened or ſlackened at pleaſure. The halliards of the top-gallant-ſail being paſſed through this ring, and the ſail being hoiſted up to its utmoſt extent; it is evident, that the yard will be drawn cloſe to the maſt, by pulling down the *truſs* cloſe to the upper part of the ſail. For, without the *truſs*, the ſail and its yard would be blown from the maſt, ſo as to ſwing about by the action of the wind, and the rocking of the veſſel; unleſs the yard were hoiſted cloſe up to the pulley wherein the halliards run; which ſeldom is the caſe in flying-top-gallant ſails, becauſe they are uſually much ſhallower than thoſe which are fixed or ſtanding. Falconer.

TRUSS-*parrel*. See PARREL.

TRUSSING, in *Falconry*, is a hawk's raiſing any fowl or prey aloft, ſoaring up, and then deſcending with it to the ground.

TRUST. See CESTUI *qui truſt*.

TRUSTEE, one who has an eſtate, or money, put, or truſted in his hands for the uſe of another. See FIDEI *commiſſum*.

TRUSTRA. See TRISTRA.

TRUTH, *veritas*, a term uſed in oppoſition to *falſhood*; and applied to propoſitions which anſwer or accord to the nature and reality of the thing whereof ſomething is affirmed or denied.

Thus, when we ſay that 4 is the fourth part of twice 8, that propoſition is true, becauſe agreeable to the nature of thoſe numbers.

Truth, according to Mr. Locke, conſiſts in the joining or

or separating of signs, as the things signified by them do agree or disagree one with another. Now the joining or separating of signs, is what we call making of propositions. *Truth*, properly, belongs only to propositions, whereof there are two sorts, mental and verbal; as there are two sorts of signs commonly made use, viz. ideas and words.

Mental propositions are those wherein the ideas in our understanding are put together, or separated, by the mind perceiving or judging of their agreement or disagreement.

Verbal propositions are words put together or separated, in affirmative or negative sentences. So that proposition consists in joining or separating of signs; and *truth* consists in putting together or separating those signs, according as the things they stand for agree or disagree.

Truth, therefore, as well as knowledge, may come under the distinction of *verbal* and *real*; that being only *verbal truth*, where terms are joined according to the agreement or disagreement of the ideas they stand for, without regarding whether our ideas are such as really have, or are capable of having, any existence in nature. But it is then they contain *real truth*, when these signs are joined as our ideas agree; and when our ideas are such, as we know are capable of having an existence in nature; which in substances we cannot know, but by knowing that such have existed.

Truth is the marking down in words the agreement or disagreement of ideas, as it is. Falshood is the marking down in words the agreement or disagreement of ideas, otherwise than it is; and so far as these ideas, thus marked by sounds, agree to their archetypes, so far only is the *truth* real.

The knowledge of this *truth* consists in knowing what ideas the words stand for, and the perception of the agreement or disagreement of those ideas, according as it is marked by those words.

Besides *truth*, taken in the strict sense before mentioned, which is also called *logical truth*, there are other sorts of *truths*: as

TRUTH, *Moral*, which consists in speaking things according to the persuasion of our own minds, called also *veracity*: and, in a more general sense, comprehending also *faithfulness*, which is a conformity of our actions to our words.

TRUTH, *Metaphysical* or *transcendental*, which is nothing but the real existence of things conformable to the ideas which we have annexed to their names.

In which sense a clock may be said to be *true*, when it answers the idea or intention of the person who made it. Others will have metaphysical *truth* to consist in the agreement of a thing with the idea thereof in the divine understanding.

TRUTINA *hermetis* is used, among *Astrologers*, for an artificial method of examining and rectifying a nativity, by means of the time of conception.

TRUTINATION, formed from *trutina*, *a pair of scales*, the act of weighing or balancing a thing.

TRUTTACEOUS, in *Ichthyology*, the name of a genus of fish, of the trout kind, which are distinguished from all other fish by a small fat fin, which they all have near the extremity of the back, and which has no rays or nerves. Of the fish of this genus, some live only in fresh waters, never entering the sea or salt rivers; others frequent both the fresh and salt waters, and are therefore called *anadromi*, or *catanadromi*. These leave the fresh waters while young, and go into the salt waters to feed and grow, and again return into the fresh rivers at the time of their full growth and spawning, that their offspring may have the same advantages themselves have had, of being hatched into life in fresh water.

The *truttaceous* fish are divided into two orders, those which have, and those which have not teeth. Of the edentulous kind, or such as have no teeth, are the lavaretus, ferra, thymallus, oxyrinchus, and albula; and of the toothed kind, are the salmo, umbra, trutta, carpio, &c. In dissection, the *truttaceous* fish have all apophyses to the pylorus, and are all a high-tasted and fine fish for the table. Ray's Ichthyology, p. 182.

TRYAL. See TRIAL.

To TRY, in the *Sea Language*. See TRYING.

TRYBLION, a word used by the old medical writers, to express the pot or dish in which the medicines used in fumigations were placed at the time of use.

TRYCHNUS, in *Botany*, the same as *strychnus*, the name of nightshade.

TRYGUM, in *Ichthyology*, the Greek name given by Ælian, Athenæus, and Appian, to the fish which we call the PASTINACA *marina*, or fire-flaire. Aristotle and some others write it *tragum*.

TRYING, in *Pharmacy*, the purifying of fat substances by means of melting, and separating them from their membranes, &c.

In the college dispensatory, the method laid down for the purifying of lard, suet, &c. is this: melt them at a gentle fire, with the addition of a little water intermixed, and, when melted, strain them from the membranes. The addition of water in this keeps the fat from burning and becoming black, which it would otherwise do; for the water not being capable of receiving any greater degree of heat than that of boiling, will keep the bottom of the vessel from growing too hot, much better than the nicest management of the fire could do.

TRYING, in *Sea Language*, denotes the situation in which a ship lies nearly in the TROUGH or hollow of the sea in a tempest, particularly when it blows contrary to her course. In *trying*, as well as in SCUDDING, the sails are always reduced in proportion to the increase of the storm. Thus, in the former state, the ship may lie by the wind under a whole main-sail, a whole fore-sail, or a whole mizen; or under any of those sails when diminished by the reef or balance. As the least possible quantity of sail used in scudding is the goose-wings of the fore-sail, so, in *trying*, the smallest portion is generally the mizen-stay-sail, or main-stay-sail; and in either state, if the storm is excessive, she may lie with all the sails furled, or, according to the sea-phrase, under bare poles.

The intent of spreading a sail at this time is to keep the ship more steady, and, by pressing her side down in the water, to prevent her from rolling violently; and also to turn her bow towards the direction of the wind, so that the shock of the waves may fall more obliquely on her flank than when she lies along the trough of the sea. While she remains in this situation, the helm is fastened close to the lee-side, or, in the sea language, hard-a-lee, to prevent her, as much as possible, from falling off. But as the ship is not then kept in equilibrio by the effort of her sails, which at other times counterbalance each other at the head and stern, she is moved by a slow but continual vibration, which turns her head alternately to windward and leeward, forming an angle of three or four points in the interval. That part where she stops, in approaching the direction of the wind, is called her coming-to, and the contrary excess of the angle to leeward is termed her falling off. Thus, suppose the wind northerly, and a ship *trying* with her starboard side to windward: if, in turning her head towards the source of the wind, she arrives at N. W. ½ N. or N. 39° W. and then declines to the leeward as far as W. ½ S. or S. 84° W. the former will be called her coming-to, and the latter her falling-off. In this position she advances very little according to the line of her length, but is driven considerably to leeward. Falconer.

TRYPHERA, τρυφερα, in *Pharmacy*, a denomination given to divers medicines, especially of the opiate kind. The great *tryphera* is composed of opium, cinnamon, cloves, and several other ingredients: it is used to fortify the stomach, to stop fluxes, and is good for some diseases of the womb.

The word is formed from the Greek τρυφερος, *delicate*, on account of their gentle and pleasant operation, or, according to others, because they make those who use them rest.

The Saracenic *tryphera*, and Persian *tryphera*, thus called, because first introduced, the one by the Saracens, and the other by the Persians, were both of them gentle purgatives.

TSAPHARI, in the *Materia Medica* of the ancients, a name given by some to the cadmia, called by Dioscorides, *placitis*, and by others of the Greek writers, *zonitis* and *onychitis*. It was a flat kind, forming a sort of coat or crust on the walls or sides of the furnace; hence it had the name *placitis*, or *crustaceous*; and it was called *onychitis* and *zonitis*, because, when broken transversely, it appeared made up of several successive plates, which had the appearance of so many belts or zones. Serapio tells us, that this and the bortryoide cadmia were dug out of the mines; that is, that they were natural productions; but this is erroneous, and contrary to all the accounts of the ancients.

TSCHIRNHAUSIANA *quadratrix*. See QUADRATRIX *Tschirnhausiana*.

TSHINKA, in the *Materia Medica*, a name by which some authors have called the clove-tree, the tree which produces the spice of that name.

TSIA, in *Botany*, a name taken from the Japonese, and used by some authors for the tea-tree.

TSJAKELA, H. M. *Ficus Malabarica, semel in anno fructifera, fructa minima*, a species of fig-tree growing in Malabar. Of the bark of this tree they make strings for their bows, and prepare a red colour for dying the Cambayan cloths.

TSIAM *pangam*, in *Botany*, a name used by some authors for the tree whose wood is the log-wood, used in dying and in medicine.

TSIANA *eua*, in the *Materia Medica*, a name given by some authors to the costus root.

TSI-CHU, in *Botany*, the name of a Chinese tree, which furnishes the liquor of which they make their celebrated varnish.

TSIN, in *Natural History*, the name given by the Chinese to a stone which they make great use of in their manufacture of porcelain ware. It is of a deep blue colour, much resembling Roman vitriol in appearance, and is found in lead-mines, and supposed to contain some particles of lead; its effects being the same in the porcelain manufacture as those of cerus, or white lead, in making the other colours penetrate into the substance of the vessels. The deep violet colour that we see so beautiful on the China ware, is usually made with this stone. They find it about Canton and Pekin; but the latter place affords the best, and it sells at greatly the best price.

The painters in enamel melt this stone in their way, and use it very much; they form many beautiful works, by laying it upon silver; but it is apt to come off in time. When the *tsin* is used in the porcelain manufacture, it is only used to the vases that pass a second baking, and are intended as the best kinds.

The *tsin* is prepared by only beating it to powder, not roasting it in the common way. They mix the powder with large quantities of water, and stirring it together, they let it subside a little to separate any earthy or extraneous matter that might be among it. They then let the powder subside. The water which is thrown away has no colour from this matter, and the powder itself is not of that fine blue it was in the lump, but of a pale ash-colour; but this recovers all its beauty when it is laid on the China and baked. The settlement taken from the water is dried and preserved in powder, and when it is to be used, they only mix it up with gum-water, or a solution of glue, and lay it on with a pencil. Observ. sur les Coutumes de l'Asie.

TUB, is used as a kind of measure, to denote the quantity of divers things. A *tub* of tea is a quantity of about 60 pounds. A *tub* of camphor is a quantity from 56 to 80 pounds.

TUB-*fish*, in *Ichthyology*, an English name given to a species of *trigla*, sometimes called the *flying-fish*. See *Sapphirine* GURNARD.

TUB-*man*, in the *Court of Exchequer*. See PRECEDENCE.

TUBA, in *Antiquity*. See TRUMPET.

TUBA, in *Natural History*, a name by which many old authors call the buccinum.

TUBBER, in *Mining*, a name given in Cornwall to that mining instrument, which is in other parts of England called a BEELE.

TUBBER-*men*, in *Cornwall*, the people who work with this tool, and who are, from its other name of *beele*, called in other places *beel-men*.

TUBE, TUBUS, pipe, conduit, or canal; a cylinder, hollow withinside, either of lead, iron, wood, glass, or other matter, for the air, or some other fluid, to have a free passage, or conveyance through.

The term is chiefly applied to those used in physics, astronomy, anatomy, &c. On other ordinary occasions, we more usually say *pipe*.

In the Memoirs of the French Academy of Sciences, M. Varignon gives us a treatise on the proportions necessary for the diameters of *tubes*, to give precisely any determinate quantities of water. The result of his piece turns upon these two analogies; that the diminutions of the velocity of water, occasioned by its friction against the sides of *tubes*, are as the diameters; the *tubes* being supposed equally long: and the quantities of water issuing out at the *tubes*, are as the square roots of their diameters, deducting out of them the quantity each is diminished.

For the *tubes* of barometers and thermometers, see BAROMETER and THERMOMETER. For the ascent of liquors in capillary *tubes*, see ASCENT and CAPILLARY.

TUBE, *alimentary*. See DUCT.

TUBE, *glass*. See GLASS *Tube*.

TUBE, *Fallopian*, *Stentorophonic*, and *Torricellian*, see the adjectives.

TUBE *of a flower*. See PETAL.

TUBES, in *Artillery*, are instruments used in quick firing, made with us of tin; their diameter is $\frac{2}{10}$ of an inch, so as just to enter into the vent of the piece; their length is about five or six inches, with a cap above, and cut slanting below in the form of a pen, and the point is strengthened with some solder, that it may pierce the cartridge.

Through each *tube* is drawn a QUICK-*match*, and the cap is furnished with mealed powder, moistened with spirits of wine. To prevent the mealed powder from falling out by carriage, a cap of paper is tied over it, which is taken off when used; but of late this cap is made of flannel, steeped in spirits of wine, and with saltpetre dissolved in it; and there is no occasion to take it off, because it takes fire as quick as loose powder.

The French use a small reed, to which is fixed a wooden cap, and they are about two inches long, filled with mealed powder, moistened with spirits of wine; and a small hole is made through them of the size of a needle, through which the fire darts with great violence, and gives fire to the cartridge, which must be pierced beforehand with the priming-iron.

These *tubes* may be kept a great while without being spoiled; but piercing of the cartridge retards the quickness of firing. Muller's Art. p. 293.

TUBE, in *Astronomy*, is sometimes used for TELESCOPE; but more properly for that part thereof into which the lenses are fitted, and by which they are directed and used.

The goodness of the *tube* being of great importance to that of the telescope, we shall here add its structure.

The construction of a draw-TUBE *for a telescope.* The chief points to be regarded here are, that the *tube* be not troublesome by its weight, nor liable to warp and disturb the position of the glasses: so that any kind of *tube* will not serve in every case: but

1. If the *tube* be small, it is best made of thin brass plates covered with tin, and formed into pipes or draws, to slide within one another.

2. For long *tubes*, brass or iron would be too heavy; for which reason some chuse to make them of paper, thus: a wooden cylinder is turned, of the length of the paper to be used; and of a diameter equal to that of the smallest draw. About this cylinder is rolled and pasted paper, till it be of a sufficient thickness: when one *tube* is dry, provide others after the same manner; still making the last serve for a mould for the next, till you have enough for the length of the *tube* desired. Lastly, to the extremes of the draws are to be glued wooden ferrils, that they may be drawn forth the better.

3. Since paper draws are apt to swell with moist weather, so as to spoil their sliding; and in dry weather to shrink, which renders them loose and tottering; in both which cases, the situation of the lenses is easily disturbed; the best method of making *tubes* is as follows: glue parchment round a wooden cylinder, and let the parchment be coloured black, to prevent the reflected rays making any confusion. Provide very thin slits of beech, and bending them into a cylinder, glue them carefully to the parchment: cover this wooden case with white parchment, and about its outer extreme make a little ring or ferril: after the same manner make another draw over the former; and then another, till you have enough for the length of the *tube*.

To the inner extremes of each draw, fit a wooden ferril, that the spurious rays, striking against the sides, may be intercepted and lost. In those places where the lenses are to be put, it will be proper to furnish the ferrils with female screws. Provide a wooden cover to defend the object-glass from the dust, and putting the eye-glass in its wooden ferril, fasten it by the screw to the *tube*. Lastly, provide a little wooden *tube* of a length equal to the distance the eye-glass is to be from the eye, and fit it to the other extreme of the *tube*.

TUBEL, a word used by some chemical writers to express scales of copper or brass.

TUBER, or TUBERCLE, in *Botany*, a kind of round turgid root, in form of a knob or turnep.

The plants which produce such roots are hence denominated *tuberose*, or *tuberous plants*.

TUBER, or TUBEROSITY, in *Surgery*, is used for a knob or tumor growing naturally on any part; in opposition to tumors which rise accidentally, or from a disease.

The same term is also used for a knot in a tree.

TUBERA *terræ*. See TRUFFLES.

TUBERCULES, TUBERCLES, little tumors, which suppurate and discharge pus, often found in the lungs. See PHTHISIS.

TUBEROSE, in *Botany*. See POLIANTHES.

TUBEROUS, or TUBEROSE, an epithet given to such roots as are round, and consist of an uniform fleshy substance, having neither skins nor shells, as bulbous roots have.

Such are the roots of the iris, piony, and the like. See ROOT.

TUBILUSTRIUM, compounded of *tubus*, *trumpet*, and *lustro*, *I purify*, in *Antiquity*, a feast or ceremony in use among the Romans. This denomination was given to the day whereon they purified their sacred trumpets, as also

also to the ceremony of purifying them. It was held on the fifth and last day of the feast of Minerva, called *quinquatrus*, or *quinquatria*, which was performed twice a year.

TUBIPORA, *red tubular coral*, in *Natural History*, a name given by Linnæus to a genus of *lithophyta*, in the class of worms: the characters of which are, that its animal is a NEREIS, and that it is a CORAL, consisting of cylindric, hollow, erect, and parallel tubes. He enumerates four species.

TUBOR *terræ*, a name used by some botanical authors for the cyclamen or sow-bread.

TUBULARIA, in *Natural History*, the name of a genus of *zoophytes*, in the class of worms, according to the Linnæan distinction; the characters of which are these: that it has the flowers of the HYDRA, placed singly at the extremities, and that the stem is radiated, filiform, and tubulous. Linnæus enumerates five species, some of which belong to the *tubular* CORALLINES of Ellis.

TUBULARIA *fossilis*, in *Natural History*, the name of a species of coral found very often fossil in Germany and Italy, and composed of a great number of tubes, or longitudinal pipes, often resembling so many worms ranged perpendicularly in the mass. See *Tab.* II. *of Fossils, class* 7.

They are usually found either in masses of a lax stone, or in single tubules in those of the harder and firmer texture. In these two states this fossil makes two very different appearances; and, according to the different directions in the mass, or the different views of them that the sections of it place them in, they make a number of very elegant figures. Hill's Hist. of Foss. p. 641.

TUBULATED *flower*, *tubulatus flosculus*, in *Botany*, a term used by authors to express those smaller flowers, a great number of which go to compose one large compound flower. These are called *tubulated* by way of distinction from another kind of them, which are, from their shape, called ligulated. The *tubulated* flosculés generally compose the disk, and the ligulated ones the radius of the compound flowers. The *tubulated* ones are formed into a hollow cylinder, which expands into a mouth at the top, and is divided into five equal segments, which stand expanded, and in some measure bent backward.

TUBULI *concamerati*, in *Natural History*, the name of a genus of the TUBULUS *marinus*, distinguished abundantly from all the others by its figure and inner structure.

They are long shelly bodies, usually either of a conic or cylindric form, or else resembling the dentales in shape; and sometimes, but that very rarely, they have their smaller end bent and twisted round. They are composed within a number of hollow compartments, each of which communicates with the next by means of a siphunculus, which runs through the whole length in the manner of the thick nautilus, or the cornu ammonis. We know not these in their recent state at this time, but frequently meet with them fossil in the stones brought from Sweden for pavements, and in some others.

Some authors have called these by the name *alveoli*, confounding them with the conic body found in the belemnitæ. See ALVEOLUS.

Others have called them *pyramidal entrochi*, others *obelisci marmorei alveolares*; and they are the bodies described by Gesner and Aldrovand, under the names of *lapides caudæ cancri*, or *cancrites*. Some late authors have called them also *polythalamii*, and other *cone-stones*. Klein. de Tubul. p. 7.

TUBULI *fossiles*, in *Natural History*, the name given by authors to the cases or *tubules* of sea-worms, found buried in the earth.

They are in their native state of very various kinds, but by different accidents attending them in their accidental one, they are subject to a multitude of other appearances. They are found of very various sizes, sometimes complete, and buried in the strata of earth or stone; sometimes they are more or less perfect, and are immersed in masses of the *ludus Helmontii*, or *septariæ*, and in this state they make one kind of *lapis syringoides*, or pipe-stone; but the most beautiful *syringoides*, or pipe-stones, are the parts of the bottoms of ships, or posts fixed in the sea which have been pierced, in their original state of wood, by these sea-worms, and afterwards petrified with the cases or *tubuli* of the worms remaining in them.

Of these there are many beautiful specimens on the shore of the island of Sheppey, and in our clay-pits about London and Richmond.

Those *tubuli*, called *dentalia & entalia*, are not less frequent, and found of various kinds in the clay-pits about London and the hills of Yorkshire; but they are more frequent in similar places in France and Italy.

TUBULI *lactiferi*, in *Anatomy*, is a name used by some writers for those small tubes through which the milk flows to the nipples of the mammæ or breasts.

TUBULI *seminiferi*. See TESTICLE.

TUBULI *vermiculares*, a name sometimes used by naturalists for certain small oblong and hollow sea-shells resembling worms.

TUBULUS *marinus*, or *canalis*, in *Natural History*, the name of a genus of univalve shell-fish; the characters of which are these: it is of an oblong figure, terminating in a point, and hollow within, so that it resembles a tube or horn. These are also called by the older writers *dentalia*, from their resembling the tooth of a dog. See DENTALIUM and SHELLS.

It has been a common error of authors to confound under the general name of *tubulus marinus*, these shells, and those very different ones of the *vermiculi marini*, which make a number of pipes or tubes joined together; these, by their number and joinings, have induced a late French author to place them among the multivalve shells, while the *canales* are usually single and separate, and can have no title to any class, but the tubular univalve one. Aldrovand observes, that the *tubuli* called *dentalia*, and those called *antalia*, differ only in size; and he thinks they have no title to the name *conchæ*, since they are neither of the nature of the common bivalve, nor univalve shells, such as the patella and *auris marina*; but this is very idle, since by this rule the snails, and many other families, might be excluded as well as these. This author says, in another place, that the *antale* is formed of many circumvolutions; whence he seems to have taken in the *buccina* under this name; but later writers have more nicely distinguished in these cases. The sea pencil is evidently of this genus, though extremely different from all the other species of it, in having its head pierced with a multitude of holes, in the manner of the head of a watering pot. Some authors, from the figure of the shell, call this *phallus marinus*, and the French call it *le priape*. Aldrovand. de Testac. lib. iii. p. 382.

Of this general class of the *tubuli* or *canales*, there are four subordinate distinctions, including several species. Hist. Nat. Eclairc. part ii. p. 245. See PENICILLI *marini*, DENTALIS, BELEMNITES, and TUBULI *concamerati*. See *Tab.* III. *Shells*, N° 25, and *Tab.* III. *Fossils*, *Class* 9.

TUBULOSE-*leaf*, among *Botanists*. See LEAF.

TUCANA, in *Ornithology*, a name given by some to the TOUCAN.

TUCK *of a ship*, a name given to that part of the ship where the ends of the bottom planks are collected together, immediately under the stern or counter. When this part, instead of being incurvated, and forming a convex surface, assumes the shape of a vertical or oblique plane, it is said to be square; and a square *tuck* is accordingly terminated above by the wing-transom, and below, and on each side, by the fashion-pieces. Falconer.

TUE-*iron*, in *Smithery*, the iron through which a smith's bellows blow.

TUEL, among *Sportsmen*, denotes the fundament of a horse, or wild beast.

TUESDAY. See HOKE *day*, TUISCO, TYR, and WEEK.

TUFA, in *Natural History*, a name given to a stone, formed of volcanic ashes, concreted with various other species of stone, in which argil predominates. It is harder than TERRAS, but still porous and spungy.

TUFECSI, a body of the spahis, or horse, in the service of the grand signor.

TUFFO, in *Botany*, a name given by the people of Guinea to a plant common in that country, and used in decoction to wash sore eyes with. It is of the sun-flower kind, and is called by Petiver, *flos solis Guineensis folio scabro flore minore*. It much resembles some of the American sun-flowers. Phil. Trans. N° 232.

TUFT, a term used by some authors for the bushy part of trees; or that part set with branches, leaves, &c.

TUFTS *of trees, parallelism of the*. All trees are observed naturally to affect to have their *tufts* parallel to the spot of ground they shadow; for an account of which phenomenon, see PARALLELISM.

TUFTED *duck*, in *Ornithology*, the English name for the CAPO *negro*. See *Tufted* DUCK.

TUGPINS, in *Artillery*, are the iron pins which pass through the fore-ends of the shafts of the army carts, to fasten the draught chains for the fore-horses.

TUGUS, in *Botany*, the name of a sweet aromatic plant, growing

growing up sometimes to eight or nine cubits, much esteemed in the eastern parts of the world, and supposed by father Camelli, who very strictly compared it with the accounts given by Dioscorides and the ancients of their amomum, to be that very plant. The clustered manner of growing of the fruit, together with its oblong shape, and the aromatic taste of the seeds, seem greatly to countenance this opinion.

Each fruit of the *tugus* contains five or seven seeds; these are of an oblong figure, of a reddish colour, and of an agreeable aromatic taste, but not too acrid. They are much sought after by birds, insects, and field-mice.

The natives seem as fond of these as the ancients were of the amomum; and the young women string them on threads, and wear them as bracelets; sometimes they make the bracelets of the seeds alone; but more usually they string them alternately with pearls, and pieces of red coral: these bracelets they call *caropi*, as well as the fruit itself.

They are supposed, when worn by way of a necklace, to keep off the effects of a bad air, and to preserve them from the bites of serpents or the centipes. If not a preservative, they are however found, upon experience, to be a very good remedy in the last case, the common application for the bite of this animal being some of the seeds of the *tugus* chewed in the mouth to a sort of paste.

The cluster of fruit of the *tugus*, or true amomum, when newly formed and unripe, somewhat resembles the pseudo-amomum of Garcias; but this likeness wears off as they ripen. For Camelli's accurate description of this plant, illustrated by a figure, see Phil. Trans. N° 248, p. 2.

TUI, in *Ornithology*, a name by which some call the *paroquette*.

The word is originally Brasilian; and the names of several of the Brasilian species of this bird, described by Maregrave, have the word *tui* as a part of them; as the *tuiete*, the *tuipara*, the *tuitirica*, and *tuiaputejuba*. See Tuiete, &c.

TUIAPUTEJUBA, in *Ornithology*, the name of a Brasilian species of paroquette, all over of a green colour, but in different shades, very deep on the wings, very pale, and somewhat yellowish on the belly, and of a faint colour all over the rest of the body; its tail is very long; it is about the size of a swallow; its eyes are large and black, and have a circle of yellowish green feathers round them, and over the beak, which is black and crooked; and on his head he has one spot of gold yellow feathers.

TUIETE, in *Ornithology*, the name of a Brasilian species of paroquette, of the size of a lark, and all over of a pale green colour, variegated with blue; the origin of its wings is blue, as are also the ends of the wing-feathers, so that when the bird sits still, there is, as it were, a blue line seen running down each side; on its rump there is also a blue spot; its tail is but short; its beak is small, crooked, and of a pale red; and its legs and feet grey.

TUILERIE, or Tylery, French, formed from *tuile, tile*, a *tile work*; a large building with a drying-place, covered atop, but furnished with apertures on all sides, through which the wind having admittance dries the tiles, bricks, &c. in the shade, which the sun would crack, before they be put in the kiln.

The garden of the Louvre is called the *Tuileries*, as being a place where tiles were anciently made, &c. But the term *Tuileries* does not only include the garden, but also a magnificent palace, whose front takes up the whole length of the garden.

The palace of the *Tuileries* is joined to the Louvre by a large gallery, which runs along the banks of the river Seine, and has its prospects thereon.

The *Tuileries* was begun in 1564, by Catharine de Medicis, wife of Henry II. in the time of her regency; it was finished by Henry IV. and magnificently adorned by Louis XIV. The garden of the *Tuileries* was much improved by Louis XIII.

TUISCO, or Tuisto, in *Mythology*, a name given by the ancient Germans to a celebrated person, whom they regarded as the founder of their nation, and whom they represented to be the son of the earth, because they were ignorant of his origin. He gave them laws, polished them, established religious ceremonies among them, and obtained such a high degree of reputation, that after his death they ranked him among the gods. One of the principal ceremonies of his worship consisted in singing songs in praise of him. Cæsar thought that Pluto was honoured under this appellation. Encycl.

Some have ascribed the origin of the name of Tuesday to this deity. See Week.

TUITIRICA, in *Ornithology*, the name of a Brasilian paroquette, which is a little larger than the common kind; all over of a fine beautiful green, but deeper on the back and wings than elsewhere; its beak is very hooked, and of a pale red; its eyes black, and its feet blue; its tail is but a little longer than the wings when closed. This is a species much esteemed in the Brasils, as it easily learns to talk, and becomes so tame, as to eat out of any one's mouth.

TULACUM, in *Natural History*, a name given by the people of the East Indies to a species of yellow orpiment, of the coarser kind, variegated with red. They prepare this by several calcinations, and then give it internally in fevers, and many other disorders, esteeming it a sort of panacea. They say that gold may be extracted from it, which is not improbable; for it is well known, that some of the Roman emperors did actually procure gold from one of the other kinds of orpiment, which is now found at Goffelaer in Saxony.

TULIP, *tulipa*, in *Botany*, a genus of the *hexandria monogynia* class. Its characters are these: the flower has no empalement; it is of the bell shape, composed of six oblong, oval, concave, erect petals; it has six awl-shaped stamina, which are shorter than the petals, terminated by oblong, four-cornered summits, and a large, oblong, taper, three-cornered germen, having no style, crowned by a triangular, three-lobed, permanent stigma; the germen afterward turns to a three-cornered capsule, having three cells, which are filled with compressed seeds, lying over each other in a double order. Miller reckons two, and Linnæus three species.

The characters of a good *tulip* are these: 1. It must have a tall and strong stem. 2. The flower should consist of six leaves, three within, and three without; and the former should be larger than the latter. 3. The bottom of the flower should be proportioned to the top, and the ends of the leaves should be rounded, not pointed. 4. The leaves, when opened, should neither turn inward, nor bend outward, but stand erect; and the whole flower should be of a middling size, neither too large nor too small. 5. The stripes must be small and regular, and should all arise from the bottom of the flower: the chives also should not be yellow, but of a brown colour.

Tulips are generally divided into three classes, according to their times of flowering, the early, the middling, and the late.

The early ones are not near so fair nor so high as the late, but they are valued for their earliness, as they flower in February. The roots of these are to be planted in the beginning of September, in a warm border, near a wall, pale, or hedge. The proper soil for them is pasture-land, with the turf rotted among it, and a mixture of one fourth part of sea-sand; this should be laid about ten inches deep, and should be renewed every year. The roots need not be planted more than four or five inches deep. If the weather is very severe when they first appear, they should be covered with mats; as also at nights, when they are in flower, if it be very frosty, and likewise in the heat of the day. When their flowering is over, they should not be permitted to seed; and when their leaves decay, the roots should be taken up and laid in a dry place, and afterwards cleaned and laid up in a safe place from vermin, till the September following.

The late blowers are propagated from what they call breeders, or flowers produced from seeds, which are brought over principally from Flanders, which is the great mart for flower-roots; and these, by culture, are changed into striped and variegated ones. They are also propagated by sowing the seeds; but this requires great care, as in the raising of all the other fine flowers from seeds.

The seeds must be saved from the choicest flowers, and sowed in shallow pans or boxes of earth, with holes at the bottom for draining off the moisture, in September. The spring following they appear like the leaves of grass, or young onions, and after standing two or three months these decay. The boxes are to be kept clear of weeds, and removed to different situations, where they may enjoy the morning sun, and be defended from sharp winds and frosts; at the Michaelmas of the following year they are to be removed out of the boxes into beds of fresh sandy earth, with tiles under them, to prevent the roots from shooting downward, where they should be planted two inches deep, and at two inches distance from one another. In October, an inch depth of new earth should be sifted on them, and they are to remain two years in these beds; after which the bulbs must be taken up, and planted in fresh beds, four inches asunder, and as many deep, and have the same culture for two years more; at the end of this time they will flower, and the best of them must be marked with sticks, that their roots may be distinguished when the leaves are decayed.

But

But there is no judgment to be paſſed either on *tulips*, or any other flowers, on their firſt flowering; becauſe the next year the good ones are often found to have degenerated, and the bad to have improved: after this, however, they may be concluded good or bad.

The breeders, as they are called, being thus raiſed, are to be ſhifted every year into freſh earth, and they will in time break out into very fine ſtripes. The earth they are planted in ſhould be every year of a different kind, and the beſt general ſoil is made of a third part of paſture-land, with the graſs rotted in it, a third part fine ſea-ſand, and a third part lime-rubbiſh; theſe ſhould be mixed half a year before they are uſed, and often turned. The beds muſt be laid eighteen inches deep with this earth; and on this the roots ſhould be placed in regular order, and at even diſtances, of ſix inches; and then ſix or eight inches of earth ſhould be laid over theſe, the top of the bed being a little rounded to throw off the wet. Thus they are to remain till the buds appear, and then if the nights are very ſevere they are to be ſheltered by covering them with mats. The flowers which break out into fine ſtripes here ſhould be ſeparated afterwards from the reſt, and if they hold on their beauty to the laſt, which the floriſts call dying well, they will never return to plain flowers again; and the off-ſets from the roots of theſe will always produce ſuch flowers, and often more beautiful than thoſe of the parent root.

When the *tulips* have flowered, their heads ſhould be broken off to prevent their ſeeding, which would make them flower much the worſe the next year. Miller's Gardener's Dict.

The Dutch have always been admirers of flowers, and before the preſent faſhion of cultivating the auriculas and carnations came up among them to the height it now is at, they took the ſame care of *tulips*. The prices they ſold theſe at among one another, are amazing. Munting tells us, that in the year 1634, and the four or five following, they not only purchaſed them at extravagant rates beyond credibility, but many of the burghers, ſhopkeepers, and tradeſmen, quitted their ſhops and trades, and addicted themſelves ſolely to the culture and care of their *tulips*. The fineſt of them were then valued above gold or gems; and there is an account of one bargain for the purchaſe of that *tulip* which they call the viceroy, preſerved: the perſon who purchaſed this, not having money, paid for it the following things; two laſts of wheat, four laſts of rye, four fat oxen, twelve fat ſheep, eight fat hogs, two hogſheads of wine, four tons of beer, two ton weight of butter, a thouſand pound weight of cheeſe, a bed, a ſuit of cloaths, and a large ſilver beaker; the whole valued at two thouſand five hundred gilders. We have another account, about the ſame time, of twelve acres of good land offered for one *tulip* root; and at a public ſale of a private perſon's collection there were produced ninety thouſand gilders. This madneſs would have run yet higher among them; but the States at length took it into conſideration, and finding it very detrimental to ſubſtantial and neceſſary trade, put a ſtop to it, and reduced the price. Munting. de Plant.

TULIP, *chequered*. See FRITILLARY.

TULIP-*flower*. See TRUMPET-*flower*.

TULIP, *African*. See BLOOD-*flower*.

TULIP-*tree*, *tulipifera*, or *liriodendron*, in *Botany*, a genus of the *polyandria polygynia* claſs. Its characters are theſe: the proper involucrum of the flower is compoſed of two angular leaves, which fall off; the empalement is compoſed of three oblong plain leaves, like petals, which fall away; the flower is nearly of the bell-ſhape, and has nine petals, which are obtuſe, and channelled at their baſe; the three outer fall off; it has a great number of narrow ſtamina, which are inſerted into the receptacle of the flower, having long narrow ſummits faſtened to their ſide, and many germina diſpoſed in a cone, having no ſtyle, crowned by a ſingle globular ſtigma; the germina afterward become ſcaly ſeeds, lying over each other like the ſcales of fiſh, and form the reſemblance of a cone. Linnæus mentions two ſpecies, and Miller one, which is a tree commonly found wild in all the northern parts of America, where its timber is of very great uſe. The flowers are not in reality much like thoſe of the *tulip*, though vulgarly ſaid to be ſo. The flowers are ſucceeded by canes, which are often ſent over from America; and the trees are frequently raiſed with us from the ſeeds contained in them. The ſeeds muſt be taken out of the canes in ſpring, and ſown in pots of light earth, which muſt be placed in a gentle hot-bed, and covered with mats, and frequently refreſhed with a little water. When the young plants appear, they ſhould be placed, during ſummer, in a ſhady ſituation; and in winter they ſhould be put into a frame, where they may have the benefit of the open air in mild weather, and be ſheltered from ſeverity of froſts. In the ſpring following, the plants ſhould be tranſplanted into nurſery beds, and taken the ſame care of for two or three years, as while they were in the ſeed-pots; after this they will be ſtrong enough to tranſplant finally into the places where they are to remain: they ſhould be planted on a light loamy ſoil, not too dry, nor indeed too moiſt, leſt their roots ſhould be rotted. Some raiſe them from layers, but they are two or three years before they take good root, and then never make ſuch ſtraight and regular trees. Miller.

TULIP-*tree*, *laurel-leaved*, *magnolia*, in *Botany*, a genus of the *polyandria polygynia* claſs. Its characters are theſe: the empalement is compoſed of three oval, concave leaves, which ſoon fall away; the flower is compoſed of nine oblong, concave, blunt petals; it hath a great number of ſhort ſtamina, which are inſerted into the germina, terminated by linear ſummits, and many oblong, oval germina, faſtened to the receptacle, ſupporting recurved, contorted, ſhort ſtyles, with hairy ſtigmas; the germina afterward become oval cones, with imbricated capſules, having one cell opening with two valves, encloſing one kidney-ſhaped ſeed, hanging by a ſlender thread from the ſcale of the cone. There are four ſpecies.

The firſt ſort, or ſmall *magnolia* tree, grows pretty common in Virginia and Carolina, and other parts of North America. In moſt places it grows to about fifteen or ſixteen feet high, with a ſlender ſtem. The wood is white and ſpongy, the bark is ſmooth and white, the branches are garniſhed with thick ſmooth leaves, reſembling thoſe of the bay, but are of an oval ſhape, ſmooth on their edges, and white underneath; the flowers are produced in May, and riſe in ſucceſſion for two months, at the extremity of the branches, which are white, and compoſed of ſix concave petals, and have an agreeable ſweet ſcent. After theſe are paſt, the fruit increaſes in ſize to be as large as a walnut with its cover, but of a conical ſhape, having many cells round the outſide; in each of which is lodged a flat ſeed, about the ſize of a ſmall kidney-bean; the fruit is at firſt green, afterward red, and when ripe of a brown colour: the ſeeds when ripe are diſcharged from their cells, and hang by a ſlender thread.

When theſe trees are tranſplanted from the places of their growth into dry ground, they make handſomer trees, and produce a great number of flowers. This is to be underſtood of America; for in Europe they do not thrive ſo well in a dry ſoil as in a moiſt loamy land.

The greater *magnolia* grows in Florida and Carolina to the height of eighty feet or more, with a ſtraight trunk two feet in diameter, and a regular head; the leaves reſemble thoſe of common laurel, but are larger, and continue all the year, ſo that this is one of the moſt beautiful evergreen trees yet known. The leaves of the third ſort, or umbrella tree, which riſes in Carolina to ſixteen or twenty feet, are large, and produced in horizontal circles, whence its name.

All theſe ſorts are beſt propagated by ſeeds, produced from the places of their natural growth, and brought over in ſand. Miller.

TULOS, a word uſed by ſome medical writers to expreſs a callus.

TUMBABA, a word uſed by chemiſts, to expreſs *ſulphur vivum*, or crude ſulphur.

TUMBALA, a word uſed by ſome authors, to expreſs the *ſquamæ*, or ſcales of any metal.

TUMBLER, a name given to a particular ſpecies of pigeon, called by Moore the *columba revolvens*.

It has its name from its peculiar property of *tumbling*, when it is in the air, which they are very fond of doing; and effect exactly in the ſame manner as our poſture-maſters do it; by throwing themſelves over backward. It is a very ſmall pigeon, and is always ſhort-bodied, full-breaſted, thin necked, narrow beaked, and has a ſmall ſhort head; the iris of the eye in this ſpecies is uſually of a bright pearl-colour.

The Engliſh *tumbler* is uſually of one plain colour; black, blue, or white: the Dutch is much of the ſame make, but has different colours, and is feathered on the legs ſometimes; it has alſo a larger head, and thin ſkin round the eye. Some of the fineſt pigeons of this ſort are bred from a mixture of the Dutch and Engliſh kinds. Theſe pigeons are remarkable for the height they fly to; they never ramble far from home, but will riſe almoſt perpendicularly, till they appear no larger than a ſparrow, or become quite out of ſight; they will often keep at this height five or ſix hours, and then come gradually down again: they never tumble when they are at any great height, but only as they aſcend or come down again. There are particular times alſo, at which theſe birds will take much higher flights than at others; but they

they ought to be kept by themſelves, and practiſed to it by the company of one of their own ſpecies; for if they mix while young with other pigeons, they will learn to fly as they do: a flight of a dozen of theſe birds ſent out together, will keep ſo cloſe, as to be all in a compaſs that might be covered with a handkerchief; but they ſhould never be turned out in foggy weather, or in high winds; in the firſt caſe, they loſe ſight of their home, and perhaps never find it again; and in the others, they are blown away; and if they return, it is not till another day; in the mean time lying out, they are in danger of cats, and other accidents.

Laſtly, the hen ſhould never be turned out with egg, for ſhe is then ſick, and not fit for flying; and beſide often drops her egg, and the breed is loſt by it. Moor's Columbarium, p. 39.

TUMBLER is alſo a ſort of DOG, called in Latin *vertagus*, from his quality of tumbling and winding his body about, before he attacks and faſtens on the prey.

This ſpecies took its prey by mere ſubtlety, depending neither on the ſagacity of its noſe, nor its ſwiftneſs; if it came into a warren, it neither backed nor ran on the rabbits; but by a ſeeming neglect of them, or attention to ſomething elſe, deceived the object till it got within reach, ſo as to take it by a ſudden ſpring.

Theſe dogs are often leſs than hounds; being lanker, leaner, and ſomewhat pricked-eared; and by the form of their bodies, they might be called mungrel greyhounds, if they were a little bigger. They ſeem to anſwer to our modern LURCHERS.

TUMBLING-*home*, with reſpect to a *Ship*, denotes that part of her ſide which falls inward above the extreme breadth, ſo as to make the ſhip gradually narrower from the lower deck upwards. In all our old ſea-books, this narrowing of a ſhip from the extreme breadth upwards, is called houſing-in. Falconer.

TUMBREL, *tumbrellum*, a ducking or CUCKING-*ſtool*, an engine of puniſhment, which ought to be in every liberty, that has a view of frank-pledge, for the correction and cooling of SCOLDS, and unquiet women.

TUMBREL, in *Artillery*, is a kind of carriage with two wheels, uſed to carry the tools of the pioneers and miners, and ſometimes likewiſe the money of the army.

TUMBREL is alſo a common name for a dung-cart.

TUMEFACTION, the act of ſwelling, or riſing into a TUMOR.

Inflammations and *tumefactions* of the teſtes frequently happen in the GONORRHOEA; either from the weakneſs of the veſſels, violent motion, unſeaſonable uſe of aſtringents, a neglect of purging, or the like.

TUMEX, in the *Materia Medica of the Ancients*, a name given by authors to a ſort of tutty, the ſame with the CADMIA *placitis* of Dioſcorides and the Greeks. This was a worſe kind than the BOTRYTIS. See TSAPHARI.

TUMOR, or TUMOUR, in *Medicine*, &c. a preternatural riſing or eminence on any part of the body.

Tumor is defined by the phyſicians, a ſolution of continuity, ariſing from ſome humour collected in a certain part of the body, which disjoins the continuous parts, inſinuates itſelf between them, and deſtroys their proper form.

This has given occaſion to the Arabs to define a *tumor* to be an indiſpoſition compoſed of three kinds of diſeaſes; viz. an intemperature, an ill conformation, and a ſolution of continuity; all which they compriſe under the name *apoſtem*, from the Greek ἀπόστημα.

Tumors may proceed from various cauſes. The maſs of blood throwing off or diſcharging itſelf of any particular humour, as ſometimes happens in the criſis of a fever, pleuriſy, empyema, bubo, &c. will give riſe to it. And according to the nature of the humour ſo diſcharged, whether ſanguineous, watery, bilious, &c. the *tumor* is different.

Other *tumors* there are, occaſioned by flatulency, as the tympany, after the ſame manner as hydropical *tumors* are occaſioned by a collection of the lympha, or ſerum, in a particular part. Ruptures of the inteſtines, or their ſtarting from their places, will likewiſe cauſe a *tumor*.

External injuries are another general cauſe of *tumors*.— Thus a contuſion, or a violent ſtricture of any part, a wound, fracture, diſlocation, &c. will make it ſwell or riſe above its natural level. And the ſame thing may likewiſe happen from the bites of venomous creatures, &c.

Tumors, properly ſo called, i. e. *humoral tumors*, or thoſe which contain a fluid matter, ariſe either from a ſtagnation, i. e. an obſtruction of the paſſage of ſome fluid, occaſioning a ſlow congeſtion, or from the tranſlation or fluxion of an humour from ſome other parts; or from the generation of ſome new humour.

Tumors of the *firſt* kind are very numerous, and are uſually divided, with regard to the particular humours they are filled with, into phlegmons, which come from the blood; eryſipelaſes, which come from the bile; œdemas, filled with pituita; and ſcirrhuſes. To which may be added, flatulencies, filled with wind. See FLATULENCY, &c.

Of the *ſecond* kind are *critical tumors*.

And of the *third* kind are cancers, ganglions, and all *tumors* contained in a cyſtis or bag.

Tumors alſo frequently acquire peculiar denominations from the part affected; as, ophthalmia, if in the eye; parotis, about the ears; paronychia, in the fingers, &c.

With reſpect to the cure, all *tumors* are diviſible into *ſimple* and *compound*, i. e. into ſuch as are of a kindly nature, and go off, or are cured, in a reaſonable time, by the uſe of common means, without the appearance of any violent or dangerous ſymptoms; and ſuch as are more malignant, or prove difficult of cure, and are attended with bad ſymptoms, and affect the adjacent parts, or the whole body. When a *tumor* is formed by fluxion, a ſudden pain, heat, tenſion, and pulſation, are felt in the part, and manifeſt ſigns of a fever appear.

In thoſe formed by congeſtion, the ſwelling riſes ſlowly, and the pain and other ſymptoms come on gradually, and prove leſs violent; unleſs it happen in the joints, and other of the more ſenſible parts.

All *tumors*, except thoſe from ruptures, terminate, or are removed, either by diſcuſſion, ſuppuration, putrefaction, induration, or tranſlation.

When a *tumor* is diſcuſſed, the part that was affected appears relaxed, or reduced to its natural ſize and figure, and is free from pain and hardneſs.

When a *tumor* haſtens to ſuppuration, a conſiderable degree of heat, pain, and pulſation, is felt in the part; and if the *tumor* be large, or lie deep, a fever generally comes on: when the matter is formed, theſe ſymptoms commonly decreaſe, and ſometimes totally vaniſh. And now, if the ſituation of the parts permit it, the *tumor* appears drawn to a point, or becomes conical in the middle, or moſt depending part, where the matter collected commonly proves white. At this time likewiſe the *tumor* appears to be more contracted, and the ſkin of the part more ſhrivelled or flaccid, than before; and now, upon preſſure, if the *tumor* be ſuperficial, or by vibrating it between the fingers, the matter may be felt to quaſh from ſide to ſide.

Tumors in the fleſhy parts of the body tend to their ſtate, or ſuppurate, faſter than *tumors* in the joints, glands, &c.

When a *tumor* is reſolved by induration, the ſwelling of the part, and the pain, decreaſe as the hardneſs comes on. When it terminates in putrefaction or mortification, the part grows ſenſeleſs, and turns black and fetid. See MORTIFICATION.

But when a *tumor* goes off by repulſion, or a return of the matter into the blood, it diſappears at once; upon which a fever, or ſome other acute diſeaſe, uſually enſues. See INFLAMMATION. See alſo the following articles.

TUMORS *of the bones*. See SPINA *ventoſa*.

TUMORS *of the breaſts*, *mammarum* TUMORES. *Tumors* and inflammations of the breaſts are a diſorder that very frequently afflicts child-bearing women, and almoſt conſtantly happens, in ſome degree, a few days after their delivery. See *Women's* MILK.

If the milk be impelled into the breaſts too plentifully and forcibly, which frequently happens at that time, and the mother be at the ſame time ſeized with a violent cold, or indeed be but affected by any violent paſſions, the veſſels become obſtructed, and the breaſts tumefied, with great heat, redneſs, reſiſtance, and violent pain. The ſame thing happens alſo very frequently to women who give ſuck after their lying-in, and often to ſuch whoſe milk is very ſmall in quantity. Women at other times are alſo ſubject to them, and even men have been known to have the ſame diſorder, from no other cauſe than a great fright. One breaſt of a man, opened on ſuch an occaſion, has afforded above two pounds of matter. This ſort of abſceſs is uſually attended with a fever, thirſt, head-ach, and difficult reſpiration, and is often preceded by ſhiverings.

Tumors of this kind are generally prevented in thoſe who do not intend to ſuckle their children, by applying, ſoon after their delivery, plaſters of ſpermaceti warm, all over the breaſts, but perforated with a hole for the nipples. A moderate tight bandage ſerves alſo as a help to keep away milk; and cooling plaſters are of ſervice to the ſame purpoſe, applied between the ſhoulders. But if the lying-in woman intends to ſuckle the child, there is no better way to prevent theſe *tumors*, than very carefully to avoid colds, and violent paſſions of the mind, and to let the child ſuck very frequently, to prevent the milk

milk from stagnating. Plenty of small broth, and thin fluids, must also be taken, which will prevent the milk, for the first two or three weeks, from being too abundant, or from stagnating in the breasts; the diet being so ordered, that the discharge by urine may be increased, and the bowels kept lax. But when the milk has once stagnated, and a *tumor* is begun, all endeavours are to be used to discuss what has stagnated in the small vessels, with all possible expedition, both by internal and external remedies, in order to prevent the *tumor* from running to a suppuration, or into a scirrhus.

The best external application, on these occasions, is the spermaceti plaster, covered with a warm bag, or cataplasm of salt and bran, or of chamomile, elder, and melilot flowers. The carminative seeds of fennel, anise, &c. are also very good external applications over a plaster, on these occasions. A calf's bladder, filled with a warm decoction of elder and chamomile flowers in milk, applied to the breast, and renewed as often as necessary, is also found of excellent service. These not proving sufficient, recourse must be had to Venice treacle, rob of elder, litharge-vinegar, cummin-vinegar, and lime-water, which must be all applied hot to the breasts by means of linen cloths dipped into them, and put to the breasts as warm as can be conveniently borne.

If the breasts are very full of milk, part of it must be discharged by sucking, or by a glass-pipe; and this, with the other means, often repeated, till the pain and *tumor* disappear.

When an inflammation has taken place, it may also be proper to bleed, to order a thin spare diet and laxatives, and to apply the following embrocation, by means of linen rags, moistened with it as often as they dry; viz. half an ounce of spirit of sal ammoniacum vol. and an ounce and a half of camphorated wine, well mixed. If this is too irritating, half an ounce of olive oil may be added to it.

If the *tumor*, however, proves large, and will not be dispersed in four or five days by these methods, or when, as it very frequently happens, the surgeon is called in too late to put this method in practice, the best method is to forward its maturation and suppuration as quick as possible, lest it turn to a scirrhus or cancer by delay. The plaster of diachylon, with the gums, or some other such ripening plaster, should be applied forthwith; and with all convenient speed the proper cataplasms are to be used, to digest the matter; these are to be applied hot to the breasts, and very frequently renewed, keeping them on with large compresses and bolsters, the better to retain the heat. The safest application is a poultice of bread and milk, softened with oil or fresh butter, which may be renewed twice a day, till the *tumor* be either discussed (if that be practicable), or brought to suppuration. The use of repellents in this case is very dangerous, as they occasion fevers, and sometimes cancers; whereas a suppuration is seldom attended with any danger, and has often the most salutary effects. The *tumor*, when the matter is ripe, will by this means either break of itself, or else it must be opened by the scalpel, the incision being always made in the lower part of the breast; and after the matter is all discharged, the wound is to be cleansed with the common digestives, incarned with the sarcotic, and healed with the balsam of Peru, or some other such vulnerary balsam. But where the suppuration has run very deep, the wound must be washed by means of a syringe, with vulnerary decoctions; and to prevent the opening from closing, before the bottom is healed, and filled up with new flesh, a sort of tent of scraped lint must be introduced, which may be shortened every dressing, as the wound fills up, and at length wholly laid aside. Heister's Surgery, vol. i. p. 206, &c. See INFLAMMATION.

TUMORS, *encysted*, *tumors* arising in different parts of the body, but contained in certain membranous coats: these are sometimes harder, sometimes softer, of a palish colour, and usually attended with little pain. These *tumors* arise from obstructions either in the glands, or in the adipose membrane, more especially about the face and neck, where they occasion great deformity.

The membranous coat, with which these *tumors* are invested, is often of a considerable thickness, and is usually the coat of the disordered gland, or some of the adipose cells. At their beginning they are usually very small and moveable; but increasing by slow degrees, they grow sometimes to an enormous bulk.

The consistence of some of these *tumors* is soft and fluctuating, and of others more hard and firm. They are of all shapes and sizes, and some of them become hard as a callus, and unmoveable, while others are, for the generality, soft and moveable.

They are distinguished according to the consistence of their contents; some are called *atheromata*, from their contents resembling paste; others, which have them of the consistence of honey, are called *meliceres*; but if they are of a fatty substance, like suet or lard, they are called *steatomata*. M. Littre, in Mem. de l'Acad. des Scienc. adds a fourth kind, which he calls *lipoma*, because it is formed of soft fat. If they happen in a gland which becomes indurated, they are called *scirrhous*; and lastly, when they are of a fleshy consistence, they are called *sarcomata*. Some of these *tumors* have been found also full of hair.

They are distinguished by others according to the places where they are situated. Those seated under the scalp are called *talpa*, *testudo*, or *lupia*. Those in the neck, *strumæ* or *scrophulæ*; and those in the hands and feet, especially if among the tendons, are called *ganglions*.

There is no general method for the cure of them; but the surgeon, according to their different circumstances, attempts this by discussion, suppuration, or extirpation. Heister's Surgery, p. 345. See WEN.

TUMORS, *fungous*, in *Surgery*, are a sort of swellings much approaching to the nature of the OEDEMA, and are often disorders of very bad consequence.

These are *tumors* of a limb, taking their rise at the joint; they look pale, are void of heat and pain, easily yield to the pressure of the fingers, but rise again instantly on removing the finger, leaving no pit or impression behind. Though no joint of the upper or lower limbs can be said to be secure from this disorder, yet the knees are ever most subject to it, and that because they abound in fat and glandular bodies, which are concealed among the ligaments and tendons. It is what we commonly know by the name of *white swellings* or scrophulous *tumors* in the joints, and is of several species; for some *tumors* of this kind are larger, some smaller, some softer, some harder; and with regard to the state of the inspissated fluid, some are more, some less glutinous. The noxious humours are usually situated without the joint, and are, in that case, properly what we are here treating of. But in some they are collected and retained in the joint itself, as the serum is contained in the testicle in an hydrocele. This last disorder is not improperly to be called a DROPSY *of the joint*; and this may be commonly distinguished from the external fungous *tumors* of the joints, by the enlargement which appears all round the joint; whereas the fungous *tumor* is usually situated more on one or the other side of it.

The proximate cause of these *tumors* is, doubtless, the viscidity of the serum about the ligaments of the joints, which is apt to stagnate after the ligaments have received any considerable violence from a fall or a blow. The *tumor* sometimes rises in the external parts, sometimes in the articulation itself, by which the ligaments being weakened, the part loses its natural motion; and when the nerves or blood-vessels are greatly pressed upon by the *tumor*, the parts below are usually deprived of nourishment; and while the joint, by degrees, becomes greatly enlarged, the parts below it diminish and waste.

In order to render the cure of recent and milder *tumors*, of this kind, the more easy, by dispersing remedies, it will be proper to rub the disordered part with warm cloths every day, fomenting it afterwards with tartarized spirit of wine; and this method is carefully to be pursued, till the natural strength and form of the limb are restored. Purmannus's fomentation is excellent for this purpose. It is made of six ounces of roch alum, an ounce and half of Roman vitriol, and two handfuls of sage leaves, boiled in a quart of herring-pickle, mixed with a pint of the sharpest vinegar; it is to boil together for about half an hour, and then to be used as the before mentioned.

When the *tumors* begin to disperse, and the parts to recover their strength, it will be a great forwarding of the cure to foment the limb well several times every day with tartarized spirit of wine, or with the fetid oil of tartar, laying the bandages carefully on every time afterwards, to defend it from the injuries of the external air, of which it is very susceptible; and lastly, the following is an application by which many of these *tumors* have been perfectly and happily cured. Take litharge, half a pound; bole armenic, an ounce; mastic and myrrh, of each half an ounce; white wine vinegar, a pint; mix these together, and let them boil for a quarter of an hour, and let coarse linen rags be dipped in this liquor, or fine ones often doubled, and applied morning and night in bed to the part; and at the same time the patient is not to omit the proper internal remedies, which are the attenuants and sudorifics.

But if the *tumor* be of long standing, and will not give way to any of these remedies, all the hope left is to make an incision into the dependent part of it, taking great

care

care to avoid wounding the ligaments or tendons of the joint; and by this means the stagnating serum, if contained in one cavity, is instantly evacuated, and if it be lodged in several different cells, it will yet make its escape through the same orifice in the space of a few days. Before the incision is made in this case, the *tumor* should be pulled down as low as may be with the fingers, and a tight bandage made above to retain it in that situation; by this means the most convenient part for the incision to be made in will lie fair, and when the opening is made, the serum will readily burst forth like blood on the opening of a vein; or lymph in the tapping for the hydrocele or ascites. When this is done, if any *tumor* still remains, the part is to be dressed with diachylon or oxycroceum plasters, and washed with lime-water or spirit of wine. By continuing the applications, what remains inspissated in the *tumor* will entirely disperse. When the limb is restored to its natural shape, the wound is to be healed with vulnerary balsams, diligently avoiding the use of fatty or oily medicines, as they are hurtful to the tendons and ligaments, with which those parts abound. If the serum, contained in the *tumor*, is so glutinous that it cannot discharge itself for want of fluidity, throw up attenuating injections at every dressing. The best for this purpose are those prepared from a decoction of agrimony, birthwort, or ladies mantle, mixed with honey, in which rosemary or celandine have been infused. Notwithstanding that such of these *tumors* as are opened by the knife are soonest discharged and healed, yet some surgeons prefer the application of caustic medicines to the knife, discharging the serum upon the falling off of the eschar. In either case it would be proper to warm and invigorate the ligaments and tendons, especially when the disorder falls upon the knee, by the use of some nervous ointment, or aromatic spirit.

It too frequently happens, however, that after the wound has been cauterized, the inspissated serum having been first ever so carefully evacuated, that there will be a fresh collection of a vitiated fluid in the part. In order to prevent therefore an accident of this kind, let the patient be kept in a strict course of purging, sudorific, and attenuating medicines, and the wound be kept open with tents, cleansing it thoroughly every day, by throwing up an injection, such as has been before directed. It may be proper also sometimes to inject lime-water, and afterwards to cover up the part with a warm plaster, or foment it with some liquor of the same intention. It is, however, finally to be observed, that it is not every fungous *tumor* of the joints that can be opened with safety; for if the *tumor* is of a very long standing, hard, or of a very large size, or the patient is of an infirm, weakly habit of body, the knife must not be thought of, as it would occasion disorders worse than the first; to wit, caries, fistulas, and gangrene. Heister's Surgery, p. 257.

We have an account of a very extraordinary *tumor* in the knee of a person, whose leg was taken off by Mr. Peirce at Bath. The leg and foot weighed sixty-nine pounds. Phil. Trans. N° 452. sect. 4.

See Remarks on the White Swelling of the Knee by Mr. Monro, and also by Dr. Simpson, in Med. Ess. Ed. vol. iv. p. 242. 246; by Dr. Reimarus, in his Thesis; or Diss. Inaug. De *Tumore* Ligamentorum circa Articulos, &c. Leidæ, 1757; and Mr. Cheston, in his Philosophical Inquiries and Observations in Surgery, &c. 4to.

Dr. Falconer observes, that white swellings, when beginning, and before the formation and collection of matter, are often discussed by pumping upon them the Bath waters, without coming to that crisis which is almost always productive of the loss of the motion of the joint, and often of the loss of the limb itself, where it is formed. Ess. on Bath Waters, vol. ii. p. 301. See SPINA *ventosa*.

TUMORS, *œdematous*. See OEDEMATOUS.

TUMORS *of the parotids*. See PAROTIDES.

TUMORS, *pestilential*. See BUBO and CARBUNCLE.

TUMORS *of the testicles*. See TESTICLES.

TUMORS, *windy*. These *tumors* are formed by the air enclosed under some membrane, which is dilated more or less by that air, according to its quantity, and from within which it cannot escape, at least not for a certain time. These *tumors* are usually round, circumscribed, or determinate, and if they are struck with a finger, they give a sound like that of a blown bladder. They have no particular seat in any part of the body, but almost every part is more or less liable to them.

The great difficulty in accounting for these *tumors*, is to say how the air comes to be collected there; but the most probable cause seems to be the collecting together of a quantity of a fluid in some adjoining part where there is some obstruction. The air, which is naturally mixed with all the fluids in the human body, always remains in them while they continue in their fluidity, and in their natural motions; but when they are amassed together in any particular part, and their fluidity and motion become impaired, the air that was in them becomes immediately in a state of disengaging itself from them; and it usually does so disengage itself. The membranes of the part where this collection of the fluids is made, are relaxed by it, and their pores consequently enlarged, and the air which has disengaged itself, escapes easily by these pores, while the fluids are much too thick to be able to follow it, so that it escapes alone.

The air, thus separated, runs under some other adjoining membrane, which it immediately elevates and distends. As the liquors amassed in the other place are not yet so far altered, but that part of them are continually received again into the road of circulation, and consequently more fresh fluids left in their place; these fresh fluids contain more air, which is, by degrees, separated from them, as from the others, and finds its way, in the same manner, to the place where the rest of the air is; and hence is the continual increase of the *tumors*; and it is very evident, that when a *tumor* is once formed in this manner, it cannot go down, even though the first extravasation, which occasioned it, should wholly disappear, and all the fluids be again received into their vessels; but, in fine, the air included in the *tumor* may dilate the membrane which encloses it, so far, that its pores may be sufficiently opened to let it escape; this, however, wholly depends on its quantity, and on the closer or laxer texture of the membrane.

Those acute pains which we call stitches in the side, and which are principally felt on the sides, and about the region of the breast, may possibly be sometimes occasioned by acrid humours, which prick the nervous fibres; and the pain, in this case, is sometimes very acute, and even attended with a sharp fever; but very often this pain is occasioned only by air included between the fibres, where it occasions a violent tension and pain; but often the relief from this is sudden, the natural elasticity of the parts restoring all to their pristine state, and the air being condensed again almost as soon as dilated. Very often the natural spring of the parts either entirely sends off the air, or else drives it to another place; and this is the reason why pains of this kind are often found to shift about and change place so suddenly.

But of all the effects of air in the body, none is so great as that found in the bodies of those who have died by loss of blood, whether that has been occasioned by wounds or natural hæmorrhages. There may, in this case, often be perceived, through the coats of some of the veins, little bubbles of air floating on the surface of the blood contained in them; and this is no way to be wondered at, since as a great part of the blood has been lost out of the body by the hæmorrhage, the remainder has been by this much injured in its power of motion, as well by loss of quantity to impel it, as of animal spirits to enliven it; and by the want of strength in the arteries to perform their pulsations, in order to the keeping it in motion; the consequences of these joint causes, according to the principles before laid down, must be, that the air must escape out of the blood, and appear freed as we see it.

If we perceive this only in the veins, the reason is plain, since there is no blood any where but in the veins of persons who have died in this manner, the arteries having been already drained; whereas in other bodies there always remains some blood, though but little, in the arteries. Another consequence of dying by an hæmorrhage is, that the ventricles of the heart are always found empty of blood; which is not the case in those who have died by other means. The cause of this is, that the force with which the veins drive up the blood from their extremities toward their larger trunks, and thence to the heart, is much weaker than that by which the arteries throw the blood they contain toward the extremities. This being allowed, a great loss of blood cannot but diminish the force of the arteries and veins both; but its effect will certainly be greater on the veins; so that they may wholly lose their force before the arteries have lost theirs; and these last making at length one general contraction, may throw off all their contents into the veins; while they, having already lost all their power, can no longer move it forwards; so that, in this case, it all remains there, and consequently what blood remains in the body, must, on opening it, be found lodged in the veins.

It is sometimes observed in bodies which have died of hæmorrhages, that the smaller vessels, at considerable distances from the heart, have been all full and distended with wind; in this state it is not impossible that they may have been sometimes mistaken for lymphatic vessels; but in tracing them up to their trunks, they soon discover

discover what they really are. After a large quantity of blood has been lost, it is plain that there can be but little in the lungs, while the quantity of air is always equal there; and as the air always easily disengages itself from the blood, when it is less fluid, and in smaller quantity than before, the air may, in this case, pass from the lungs to the heart with the blood, without being so intimately mixed with it as at other times; when the arteries have, after this, not power enough to impel the blood into the veins, their power may yet be sufficient to drive this wind into them, it being much lighter, and more susceptible of motion; and this alone seems a very natural and easy solution of this phenomenon. This supposes, indeed, that the motion of the blood being stopped, death comes on, as well by this means, as by the stoppage of respiration. Mem. Acad. Par. 1714.

TUMPING, the making of a kind of fence in the fields, by setting trees almost on the surface of the ground, and covering their roots with mould.

TUN, or TON, originally signifies a large vessel or cask, of an oblong form, biggest in the middle, and diminishing towards its two ends, girt about with hoops, and used to put up several kinds of merchandizes in, for their better carriage; as brandy, oil, sugar, skins, hats, &c.

Some derive the word from *autumnus*, in regard it is then *tuns* are most needed. Du-Cange deduces it from *tunna*, or *tonna*, words used in the base Latin for the same thing; whence also *tunnare, to tun.*

The term is also used for certain vessels of extraordinary bigness, serving to keep wine in for several years. In Germany there are many which are scarce ever emptied: the Heidelberg *tun* is famous.

The *tun* we frequently, though improperly, call a *hogshead*.

TUN, or TON, is also a certain MEASURE for liquids; as wine, oil, &c.

The English *tun* contains two pipes, or four hogsheads, or two hundred and fifty-two gallons.

The *tun* of Amsterdam contains six æms or awms; and the æm four ankers, the anker two stekans, the stekan sixteen mingles: twelve stekans are equal to an English barrel, or thirty-six gallons.

The *tun* of Bourdeaux and Bayonne contains four barrels, equal to three Paris muids. At Orleans and Berry it is about two Paris muids.

The *tun* of Malaga, Alicant, Seville, &c. is two bottas, equal to about thirty-six or thirty-seven stekans. The *tun* of Lisbon is two Portuguese bottas, and is equal to twenty-five stekans.

The great *tun* or Rhenish wine-vessel of Heidelberg, made in 1343, contained six hundred and seventy-two urnæ, of $4\frac{1}{2}$ English gallons each; being in all 2690 English gallons, or about forty-two hogsheads, or twenty-one pipes of wine.

TUN is also a certain weight, whereby the burden of ships, &c. is estimated.

The *sea tun* is computed to weigh two thousand pounds, or twenty quintals or hundred weight (amounting to 2440 pounds avoirdupois); so that when we say a vessel carries two hundred *tuns*, we mean it is able to carry two hundred times the weight of two thousand pounds, i. e. four hundred thousand pounds: it being found by a curious observation, that the sea-water, whose room the vessel fills when full loaden, weighs so much.

To find the burden and capacity of a ship, they measure the hold or place where she is loaden; allowing forty-two cubic feet to the *sea tun*. See BURDEN.

The price of freight, or carriage of merchandizes, is ordinarily settled on the foot of the *sea tun*: and yet, though the *tun* is regularly twenty hundred weight, there is some difference made therein either on account of the cumbersomeness, or bulk of the commodities, the space they take up, or the like. See FREIGHT.

Accordingly, at Bourdeaux four barrels of wine are held a *tun*, five barrels of brandy are estimated two *tuns*, three of syrup are one *tun*, four barrels of prunes one *tun*, two dozen of walnut-tree tables one *tun*, a dozen of planks one *tun*; twenty bushels of chesnuts are accounted one *tun*; and the like of wheat, or other grain; and ten bales of cork, five bales of feathers, and eight of paper, make each one *tun*.

A *tun* or load of TIMBER is forty solid feet, if the timber be round: if it be hewed or square, fifty-four.

TUNS, in *Natural History*, a family of univalves. See SHELLS.

TUN, TON, in the ends of words or names of places, signifies a town, village, or dwelling-place:—from the Saxon, *tun, sipes, vallum, villa, vicus, oppidum*; and this from *don*, or *dun*, *a hill*, where they formerly built towns.

TUNBRIDGE-*water*. See *Tunbridge*-WATER.

TUN-GREVE, a name anciently used for a reeve or bailiff, *qui in villis, & quæ dicimus maneriis, domini personam sustinet, ejusque vice omnia disponit & moderatur.*—Spelman.

TUN-HOOF, in *Botany*, see GROUND-*ivy*.

TUNA, in *Botany*, the name by which some authors have called the *opuntia*, the Indian fig, or *ficus Indica*, as it is usually called.

TUNALLUS, in *Ichthyology*, a name given by Albertus, and some others, to the GRAYLING, or *umber*.

TUNE, or TONE, in *Music*, is that property of SOUNDS, whereby they come under the relation of *acute* and *grave* to one another. See GRAVITY, &c. See also TONE.

Though gravity and acuteness be mere terms of relation, yet the ground of the relation, the *tune* of the sound, is something absolute; every sound having its own proper *tune*, which must be under some determinate measure in the nature of the thing.

The only difference then between one *tune* and another is in degrees, which are naturally infinite; i. e. we conceive there is something positive in the cause of sound, which is capable of less and more, and contains in it the measure of the degrees of *tune*; and because we do not suppose a least or greatest quantity of this, we conceive the degrees depending on those measures to be infinite.

If two or more sounds be compared together in this relation, they are either equal or unequal in the degree of *tune*. Such as are equal are called UNISONS.

The unequal constitute what we call INTERVALS, which are the differences of *tune* between sounds.

Cause and measure of TUNE, *or that whereon the* tune *of a sound depends*. Sonorous bodies, we find, differ in *tune*: 1. According to the different kinds of matter; thus the sound of a piece of gold is much graver, than that of a piece of silver of the same shape and dimensions; in which case, the *tones* are proportional to the specific gravities.

2. According to the different quantities of the same matter in bodies of the same figure; as a solid sphere of brass, one foot in diameter, sounds acuter than a sphere of brass, two feet in diameter; in which case the *tones* are proportional to the quantities of matter. See GRAVITY.

Here then are different *tunes* connected with different specific gravities, and different quantities of matter; yet cannot the different degrees of *tune* be referred to those quantities, &c. as the immediate cause. In effect, the measures of *tune* are only to be sought in the relations of the motions that are the cause of sound, which are nowhere so discernible as in the vibration of chords.

Sounds, we know, are produced in chords by their vibratory motions; not, indeed, by those sensible vibrations of the whole chord, but by the insensible ones, which are influenced by the sensible, and, in all probability, are proportional to them. So that sounds may be as justly measured in the latter, as they could be in the former, did they fall under our senses: but even the sensible vibrations are too small and quick to be immediately measured. The only resource we have, is to find what proportion they have with some other thing: which is effected by the different tensions, or thickness, or lengths of chords, which, in all other respects, excepting some one of those mentioned, are the same.

Now, in the general, we find that in two chords, all things being equal, excepting the tension, or the thickness, or the length, the *tones* are different; there must therefore be a difference in the vibrations owing to those different tensions, &c. which difference can only be in the velocity of the courses and recourses of the chords, through the spaces wherein they move to and again. Now, upon examining the proportion between that velocity, and the things just mentioned, whereon it depends, it is found to a demonstration, that all the vibrations of the same chord are performed in equal times.

Hence, as the *tone* of a sound depends on the nature of those vibrations, whose differences we can conceive no otherwise than as having different velocities; and as the small vibrations of the same chord are all performed in equal time; and as it is found true in fact, that the sound of any body arising from one individual stroke, though it grows gradually weaker, yet continues in the same *tone* from first to last; it follows, that the *tone* is necessarily connected with a certain quantity of time in making every single vibration; or that a certain number of vibrations, accomplished in a given time, constitutes a certain and determinate *tone*: for the frequenter those vibrations are, the more acute is the *tone*; and the slower and fewer they are in the same space of time, by so much the more grave is the *tone*; so that any given note of a *tune*

ture is made by one certain measure of velocity of vibrations; i. e. such a certain number of courses and recourses of a chord or string, in such a certain space of time, constitutes a determinate *tone*. See SOUND.

This theory is strongly supported by our best and latest writers on music, Dr. Holder, Mr. Malcolm, &c. both from reason and experience. Dr. Wallis, who owns it very reasonable, adds, that it is evident the degrees of acuteness are reciprocally as the lengths of the chords; though, he says, he will not positively affirm, that the degrees of acuteness answer the number of vibrations, as their only true cause: but his diffidence arises hence, that he doubts whether the thing has been sufficiently confirmed by experiment. Indeed, whether the different number of vibrations in a given time be the true cause, on the part of the object, of our perceiving a difference of *tone*, is a thing which we conceive does not come within the reach of experiment; it is sufficient the hypothesis is reasonable.

TUNG, in *Natural History*, the name given by the Indians to a little insect, called by the Spaniards *pique*, which is very common, and very troublesome, in some parts of the East and West Indies.

It is of the size of a small flea; its place of laying its eggs is within the skin of the human body, and it diligently searches opportunities of doing this, and often succeeds in the attempt, to the great pain and trouble of the person who suffers it.

The creature, knowing that it shall be soon crushed to death under the skin, generally makes its way either under the nails, or where there is some callus on the surface; there it eats its way along, and, in fine, lays its eggs, which hatch into so many young ones, and spread themselves between the flesh and skin all over the finger and hand, if not prevented by taking out the old one in time.

The person often does not perceive the creature's getting in, it enters so gradually and easily; but he is soon advertised of the place where it is by a violent gnawing pain, the creature really eating its way as it goes along. The only remedy in this case is, to enlarge the orifice at which it entered, and take it out whole; the wound soon heals up, and there is an end of the matter. This may often be done with the point of a needle; but if not, it is much better to submit to the opening it with a lancet than to the ill consequences which otherwise will attend it. Observ. sur les Coutumes de l'Asia, p. 184.

TUNGSTEN, *lapis ponderosus*, in *Natural History*, a calcareous stone combined with the *tungsten* acid. When pure it is of a grey colour and lamellar texture, gives fire with steel, and is very heavy; its specific gravity being from 4,99 to 5,8. It is insoluble in acids, except by peculiar management; when powdered and digested with the nitrous or marine, it assumes a yellow colour, as Mr. Woulfe first observed: (Phil. Trans. vol. lxix. pt. i. for 1779, p. 26.) when heated, it bursts, becomes reddish, melts very difficultly per se; and according to Mr. Bergman, it is unfusible with the blow-pipe, and not totally fusible even with the assistance of fixed alkali, but easily by borax and without effervescence. It also easily melts with its own weight of fluor. Its constituent parts were discovered by Mr. Bergman and Mr. Scheele, nearly at the same time, but first published by the latter in the Swedish Memoirs for 1781. It appears to contain about half its weight of calcareous earth, and the remainder a peculiar acid of an earthy appearance, and iron. This acid, which has hitherto been found only in this stone, is separated from its earthy basis, by digesting the powdered stone in three times its weight of nitrous acid, and after pouring off this acid, and edulcorating the residuum, digesting it again in caustic volatile alkali; after some time the alkali is poured off, and the residuum being edulcorated, is again digested in nitrous acid, and afterwards in volatile alkali; these successive digestions are continued till the greater part of the stone disappears, the nitrous acid constantly taking up the calcareous earth, and the volatile alkali uniting to the *tungsten* acid: at last this acid is precipitated from the volatile alkali in the form of a white powder, by saturating the alkali with any other acid. This powder is soluble in twenty times its weight of boiling water, and then reddens litmus, has an acid taste, and with lime-water produces a regenerated *tungsten*: its specific gravity is about 3,6.

TUNICA, a kind of waistcoat, or under garment, worn by the ancients, both at Rome, and in the East.

The common people ordinarily wore only a *tunica*; but those of better fashion wore a *toga* or gown over it. The philosophers wore a gown without a *tunica*, as professing to go half naked.

The *tunica* was peculiar to the men; the under-garment of the women not being called *tunica*, but *stola*.

The senators wore their *tunica* enriched with several little pieces of purple, cut in form of large nails; whence it was called LATICLAVIA: the knights had less nails on their *tunica*, which was hence called ANGUSTICLAVIA: the common people wore their *tunica* without any *clavi* at all. And it was by these three different sorts of *tunicas*, that the three different orders of the Roman people were distinguished in habit.

It has been a common opinion, that the *angusticlavia* distinguished the knights from the common people, in the same manner as the *laticlavia* did the senators from those of the equestrian rank. But Rubenius avers, that there was no manner of difference between the *tunics* of the knights and those of the commons. As to the persons who had the honour of wearing the *laticlavia* it may be maintained, says Kennet (Ant. of Rome, p. 308.) that the sons of those senators who were patricians had the privilege of using this vest in their childhood together with the prætexta. But the sons of such senators as were not patricians did not put on the *laticlavia*, till they applied themselves to the service of the common-wealth, and to bearing of offices. Yet Augustus changed this custom and gave the sons of any senators leave to assume the *laticlavia* presently after the time of their putting on the toga virilis, though they were not yet capable of honours. And by the particular favour of the emperors, the same privilege was allowed to the more splendid families of the knights.

In the declension of the empire, the *tunics* did not only reach down to the ancles, whence they were called *talares*, but had sleeves too coming down to the hands, whence they were called chirodotæ. And now it was counted as scandalous to appear without sleeves, as it had been hitherto to be seen in them: and, therefore, in the writers of that age, we commonly find the accused persons at a trial habited in the *tunic* without sleeves, as a mark of disgrace and infamy. Besides the different sorts of *tunica* above mentioned, there was also the *tunica palmata*, worn by generals in a triumph, and perhaps always under the toga picta. It had its name either from the great breadth of the clavi, equal to the palm of the hand, or else from the figures of palms, embroidered upon it.

Among religious, the woollen shifts, or under-garments, are styled *tunicas*, or *tuniques*.

TUNICA, or TUNIC, in *Anatomy*, is applied to the membranes which invest the vessels, and divers others of the less solid parts of the body. See *Tab. Anat. (Angeiol.) fig. 7. a a, b b, c, d.*

The eye consists principally of a number of humours contained in *tunics* ranged over one another: as the *tunica albuginea*, the *tunica cornea*, the *tunica retiformis*, &c. See EYE, ALBUGINEA, &c.

TUNICA *albuginea*, the name of the membrane that covers the body of the TESTICLES. See ALBUGINEA.

The *tunica albuginea*, so named from its complexion, is a compact, firm, white, strong, and smoothly polished membrane, having a tendinous appearance. It very closely adheres to, embraces, and immediately contains the body of the testis and epididymis: it likewise loosely connects the middle part of the epididymis with the body of the testicle, by means of a thin and fine membrane formed by a duplicature of the *tunica albuginea*, making a kind of ligament for this purpose. It serves also to confine the growth of the testis and epididymis within certain limits; and, by closely embracing these parts, it gives them a due degree of firmness, and enables them to perform their proper functions. Warner on the Testicles, p. 8. See also on this article Phil. Trans. Nº 53.

TUNICA *vaginalis*. See VAGINALIS.

TUNICATED *roots*, among *Botanists*, such as are formed of a multitude of coats surrounding one another. See ROOT.

TUNNAGE, or TONNAGE, a duty or custom due for merchandize brought or carried in *tons*, and such-like vessels, from or to other nations; thus called, because rated at so much *per tun*.

Tunnage is properly a duty imposed on liquids according to their measures; as poundage is that imposed on other commodities according to their weight. See POUNDAGE and CUSTOMS.

This duty at first was 4*l*. 10*s*. sterling *per tun*, for French wines brought into the port of London by the English, and only three for that brought into the other ports. For the same wine imported by strangers to London, this duty was 6*l*. and that brought into the other ports 4*l*. 10*s*. sterling.

Rhenish wine, in virtue of the same act, paid 7*l*. 10*s*. sterling; and Spanish, Portuguese, Malmsey, and Greek wines, the same as French wines.

But there have been divers additional duties imposed since.

As the *additional duty of the old ſubſidy, ſignorage, duty of ancient impoſt of* tunnage, *duty of additional impoſt, orphans money, new ſubſidy*, &c.

TUNNAGE is alſo uſed for a certain duty paid the mariners, by the merchants, for unloading their ſhips arrived in any haven, after the rate of ſo much *per tun*.

TUNNEL, or FUNNEL, an inſtrument through which any liquor is poured into a veſſel.

Part of the draught of a chimney, above the mantle piece, is alſo called by the ſame name.

TUNNEL-*Net* is a kind of net much uſed for the catching of partridges; thus called from its form, which is a cone fifteen or eighteen feet long.

This net muſt be made of three-twiſted thread, and muſt not be too thick: it ſhould be dyed green, that the colour may give no ſuſpicion to the birds, and the meſhes ſhould be about two inches and a half broad.

Into the hind meſhes, at the larger end, there muſt be put a ſmooth wooden rod, about the bigneſs of a gunrammer; of this muſt be made a ſort of hoop, both ends being tied together; and at different diſtances from one another, there muſt be placed many more ſuch, which are to be rounded in the ſame manner, and are to ſupport the net its whole length in the *tunnel* form. Two ſtakes, or ſtrong pegs, muſt be faſtened at the ſides of the entrances into the net, and one at the farther end, or narrower part; the two firſt are to keep the mouth of the net ſufficiently extended, and the laſt is to keep it pulled out lengthwiſe to its full dimenſions, the hoop preventing its falling in.

There muſt be uſed with this net two others of that kind, which they call *halliers*. Theſe are long and ſtraight nets, and are to be faſtened down to the mouth of the *tunnel-net* on each ſide, extending ſeven or eight fathoms on each ſide from it, ſo as to take in fourteen or ſixteen fathoms in front, beſide the breadth of the mouth of the *tunnel-net*, and to direct all that ſhall move forward within that compaſs into the net.

In order to uſe this net, a covey of partridges is to be found, and then the net is to be placed at a conſiderable diſtance behind them: when this is fixed, the ſportſman is to take a compaſs, and get before the birds with a ſtalking horſe or ſtalking ox, and then to move forward, driving them towards the net. This is to be done gently and carefully; they are not to be driven at once ſtraight forwards, but the ſportſman is to wind and turn about, and at times to ſtand ſtill, as if the horſe was grazing. If the partridges, in the time of driving, make a ſtand, and look at the machine, it is a ſign they ſuſpect it, and are ready to take wing: in this caſe the ſportſman muſt ſtand ſtill, or even go back a little; and when they are become compoſed again, he is again to advance upon them. If any ſingle bird lies remote from the reſt, the ſportſman muſt take a compaſs round him, and fetch him in; for if he takes wing the reſt will all follow; in this manner, with patience and caution, the whole covey may be driven like a flock of ſheep up to the nets. A real horſe, trained to the purpoſe, is, however, much better than a ſtalking machine. The halliers, or wings of the *tunnel*, muſt not be pitched ſtraight, but in a ſort of ſemicircle; and the birds, when they ſtop their march, will run along them to the middle, where the mouth of the *tunnel* is open.

When they come to the mouth of the *tunnel*, the old ones will make a ſtand, as if to conſider what was before them; but on preſſing gently on them with the horſe, the young ones will run in, and then all the reſt will follow.

The ſportſman muſt then make all the haſte he can to the mouth of the net, to ſecure them from coming back again.

TUNNING, or TONNING, a part of the proceſs of brewing, or rather an operation which is the ſequel thereof.

The *tunning* of beer, &c. is performed various ways; ſome being of opinion it is beſt *tunned* as it cools, or begins to come; while others let it ſtand longer to become riper.

The moſt regular method is, to cleanſe and *tun* juſt as it comes to a due ferment, and gets a good head; for then it has the moſt ſtrength to clear itſelf. What works out of the caſk is to be ſupplied with freſh beer of the ſame brewing.

TUNNY, in *Ichthyology*, a name given by us to the Spaniſh mackrel, a larger fiſh of the ſcomber kind, called by authors *thynnus* and *arcynus*, by Salvian *limoſa*, and *pelamys* by Ariſtotle, Ælian, and the other old writers.

It is properly a ſpecies of the SCOMBER, and the *ſcomber thunnus* of Linnæus, and is expreſſively named by Artedi, the ſcomber with eight or nine fins in the hinder part of the back, riſing out of a furrow; and a furrow at the place of the belly-fins. It is common in the Mediterranean, and other ſeas, and ſometimes, though not frequently, caught on the Engliſh coaſts.

The *tunny* was a fiſh well known to the ancients, and made a conſiderable branch of commerce: the time of its arrival in the Mediterranean from the ocean was obſerved, and ſtations for taking them eſtabliſhed in places that were moſt frequented by them. And at this time there are very conſiderable *tunny* fiſheries on the coaſt of Sicily, as well as ſeveral other parts of the Mediterranean, where they are cured, and ſupply a great article of proviſion in the adjacent kingdoms. They are caught in very large quantities along the ſhores in nets. In the lochs on the weſtern coaſts of Scotland they are alſo found in purſuit of herrings, and ſold to people, who either carry them freſh to the country markets, or ſalt and preſerve them in large caſks. The pieces, when freſh, look like raw beef, but when boiled turn pale, and have ſomewhat the flavour of ſalmon. One of them have been found to weigh four hundred and ſixty pounds. The *tunny* grows ſometimes to ſeven or eight feet in length; it has a rounded and thick body, growing gradually ſmaller toward the tail, till it is at length extremely ſlender; the irides are of a pale green, and the teeth very ſmall; the ſkin on the back is ſmooth, thick, and black, or, if held in ſome lights, is of a ſhining blue or greeniſh hue; its belly and half its ſides are of a ſilvery whiteneſs, tinged with cœrulean and pale purple; near the tail marbled with grey; its ſcales are very ſmall; the tail in form of a creſcent. See *Tab.* V. *Fiſh*, N° 61. Ray and Pennant.

TUNUPOLON, in *Zoology*, the name of an Eaſt Indian ſpecies of viper, found principally in the iſland of Ceylon; it is of a ſmall ſize, and of a fine ſattin-like gloſs, beautifully variegated with ſhades of brown. Ray.

TUPELO *tree*, *nyſſa*, in *Botany*, a genus of the *polygamia dioecia* claſs. Its characters are theſe: it has hermaphrodite and male flowers on the ſame plant; the male flowers have an open, ſpreading empalement, cut into five parts; no petal, but ten awl-ſhaped ſtamina, with twin ſummits as long as the ſtamina; the hermaphrodite flowers have empalements like the male, which ſit upon the germen; they have no petals, but five awl-ſhaped ſtamina, terminated by ſingle ſummits; the oval germen ſituated under the flower ſupports an awl-ſhaped, incurved ſtyle, crowned by an acute ſtigma; the germen becomes an oval berry of one cell, encloſing an oval, acute-pointed nut, with rough, angular, irregular furrows. Linnæus mentions one, and Miller two ſpecies, natives of North America.

TURBAN, TURBANT, the head-dreſs of moſt of the eaſtern and Mahometan nations; conſiſting of two parts, viz. a cap, and a ſaſh of fine linen, or taffaty, artfully wound in divers plaits about the cap.

The word is formed from the Arabic דאר *dar*, or דור *dur*, or דאל *dal*, or דול *dul*, which ſignifies *to encompaſs*; and בנר *band* or *bend*, which ſignifies *ſaſh*, or *ſcarf*, or *band*; ſo that *durbant*, or *turbant*, or *tulbant*, only ſignifies a *ſcarf*, or *ſaſh*, tied round; it being the ſaſh that gives the denomination to the whole *turban*.

The cap is red or green, without any brim, pretty flat, though roundiſh a-top, and quilted with cotton, but does not cover the ears. About this is wrapped a long piece of fine thin linen or cotton, in ſeveral wreaths variouſly diſpoſed.

There is a good deal of art in giving *turbans* the fine air; and the making of them up conſtitutes a particular trade, as the making of hats does among us.

The emirs, who pretend to be deſcended of the race of Mahomet, wear their *turbans* green: thoſe of the other Turks are ordinarily red, with a white ſaſh. The genteel people have frequent changes of *turbans*. M. de Tournefort obſerves, that the *turban*, all things conſidered, is a very commodious dreſs; and that he even found it more eaſy to him than his French habit.

The grand ſignor's *turban* is as big as a buſhel, and is ſo exceedingly reſpected by the Turks, that they dare ſcarce touch it. It is adorned with three plumes of feathers enriched with diamonds and precious ſtones: he has a miniſter on purpoſe to look to it, called *tulbentoglan*. See CROWN.

That of the grand vizir has two plumes; ſo have thoſe of divers other officers, only ſmaller one than another: others have only one, and others none at all. The *turban* of the officers of the divan is of a peculiar form, and called *mugenezek*.

The ſaſh of the Turks *turban*, we have obſerved, is white linen; that of the Perſians is red woollen. Theſe are the diſtinguiſhing marks of their different religions; Sophi, king of Perſia, who was of the ſect of Ali, being the firſt who aſſumed that colour, to diſtinguiſh himſelf from the Turks, who are of the ſect of Omar, and whom the Perſians eſteem heretics.

TURBAN, or *clavicle*, in *Conchology*, denotes the aggregate, or whole ſet of the whirls of a ſhell, and forms its lower part. The flat, or helix *turban*, is one ſo ſlightly pro-

minent,

minent, as to be nearly on a level. There are also the short *turban*, the produced *turban*, and the long *turban*.

TURBAN-*top*, *helvella*, in *Botany*, a genus of the *cryptogamia fungi*, the fungus of which is *turban*-shaped. Linnæus enumerates two species.

TURBAN-*shell*, *cidaris*, in *Natural History*, the name of a genus of the echinodermata, which are of a hemispheric or spheroidal figure, and have their name from the Latin *cidaris*, a Persian *turban*, as in some degree resembling that head-dress. See *Tab. of Testaceous and Crustaceous Animals*, N° 1, 2, 3, 4.

Of this there are several genera, and subordinate species. This class of the echinodermata is made out by the assistance of the fossil, as well as the recent animals; many of the kinds being now unknown on any shores. Klein's Echinod. p. 17. See ECHINODERMA.

TURBARY, *turbaria*, a right to dig turf in another man's ground; from *turba*, an old Latin word for a turf.

TURBARY, *common of*, is a liberty which some tenants have by prescription to dig on the lord's waste.

TURBARIA is sometimes also taken for the ground where turfs are digged.

TURBARIA *bruaria*, more particularly denotes flaw-turf; or heath-turf; mentioned in the charter of Hammon de Massy.

TURBINATA *ossa*. See NOSE.

TURBINATED, is a term applied by naturalists to shells which are spiral, or wreathed, conically, from a larger basis to a kind of apex.

TURBINATUM, a name given by some to the glandula pinealis.

TURBINES, in *Natural History*. See TURBO.

TURBINITÆ, fossil shells of the turbo kind, or stones found in those shells.

TURBIT, in *Ichthyology*, the same with TURBOT.

TURBIT *pigeon*, a particular species of pigeon, remarkable for its short beak, and called by the Dutch *cort bek*, that is, *short beak*. Moore calls it in Latin, *columba fimbricata*; and its English name seems no other than a bad pronunciation of its Dutch one. It is a small and short bodied pigeon, and has a beak no longer than that of a partridge; the shorter this is, the more the pigeon is esteemed. It has a short round head, and the feathers upon the breast open, and reflect both ways, standing out like the frill of the bosom of a shirt. This is called by many, the *purle*, and the more the bird has of it, the more it is esteemed; the tail and back are generally of one colour, as blue, black, red, yellow, or dun, and sometimes chequered; the flight feathers, and those of all the rest of the body, are white; they are a light nimble pigeon, and, if trained to it, will take very high flights, in the manner of the tumblers.

TURBITH, or TURPETH, TURPETHUM, a medicinal root, brought from the East-Indies, particularly from Cambaya, Surat, and Goa; though others will have it, that the true *turbith* comes chiefly from Ceylon.

It is the cortical part of the root of a species of CONVOLVULUS, viz. the *convolvulus turpethum* of Linnæus.

The *turbith* of the moderns bears so little resemblance to that of the ancients, that it is difficult to suppose them the same. That sold by our druggists is a longish root about the thickness of the finger, resinous, heavy, and of a brownish hue without, and whitish within. It is brought to us cloven in the middle, lengthwise, and the heart or woody matter taken out. The best is ponderous, not wrinkled, easy to break, and discovers to the eye a large quantity of resinous matter.

This root, on the organs of taste, makes at first an impression of sweetness; but when chewed for some time, betrays a nauseous acrimony. It is accounted a moderately strong cathartic, but does not appear to be of the safest or most certain kind; the resinous matter, in which its virtue resides, being very unequally distributed; insomuch, that, as it is said, some pieces, taken from a scruple to a dram, purge violently, whilst others in larger doses have very little effect. Lewis.

It is commonly supposed to take its name *turbith* from *turbare*, on account of the violence of its operation, as disturbing the whole œconomy; and has accordingly been used in the dropsy, palsy, and apoplexy.

It yields a deal of resinous matter in a spirituous menstruum, which Quincy observes does not affect the larger passages much; but is very active in the smaller vessels, and glandulous contorsions, which it wonderfully clears of all viscid adhesions.

Some apothecaries, either through ignorance or parsimony, substitute white THAPSIA, which they call *grey turbith*, or *turbith garganicum*, for the true *turbith*; though both as to taste, colour, and qualities, they are very different.

TURBITH *mineral*, TURPETHUM *minerale*, is a name which the chemists give to a yellow precipitate of mercury.

The method of preparing it is thus: on the dry powder gained by dissolving mercury in twice or equal its weight of oil of vitriol, pour a proper quantity of warm water, and the powder will immediately turn of a yellow colour. This dry saline powder, which is a combination of mercury with vitriolic acid, may be obtained by pouring upon mercury in a glass-retort an equal weight of concentrated vitriolic acid, or more, according to the degree of its concentration, and distilling these matters together in a sand-bath, till nothing but the powder remains in the retort. When by affusion of warm water, the yellow powder has been precipitated, continue to wash it by repeated affusions of water, till the liquor comes away as insipid and colourless as it was poured on, and there will be left a beautiful yellow calx at the bottom of the vessel, which is called by the name of *turbith mineral*.

Turbith mineral may also be made by precipitating mercury from its solution in nitrous acid by means of vitriolic acid, or of some vitriolic salt. For this purpose the nitrous acid must be well saturated with mercury.

We may observe that *turbith mineral* becomes yellow only by being deprived of the adhering vitriolic acid, and that it remains white till it has been washed with a large quantity of water; and, in general, the more perfectly it is deprived of acid, the deeper yellow colour it acquires. Some chemists have supposed, that a portion of vitriolic acid remains united with the *turbith*, though not enough to render it soluble in water: M. Beaumé affirms, that when sufficiently washed it contains no acid; but the later experiments of M. Bayen prove the contrary.

This powder is called *mineral turbith* from the resemblance it bears to the vegetable *turbith* of the Arabians, in strongly purging the most internal recesses of the body; for though it be insipid upon the tongue, yet it is possessed of very considerable virtues. Being boiled with water, it loses more of its salts, and thereby grows milder, and more safe; so it does also by being deflagrated twice or thrice, or distilled with spirit of wine.

The powder, prepared in the manner above described, proves, though not corrosive, strongly emetic; operating, in this intention, the most effectually of all the mercurials that can be given with safety. It is used chiefly in virulent gonorrhœas, and other venereal cases accompanied with a great flux of humours to the parts: it is said likewise to have been employed with success in robust constitutions, against leprous disorders, and obstinate glandular obstructions. The dose, as an emetic, is from two grains to six or eight; though some constitutions, habituated to mercurials, can bear larger quantities. It may be given in smaller doses, as half a grain or a grain, as an alterative, after the same manner as the red calx of MERCURY; and even when intended as an evacuant, it may perhaps, as Malouin observes, be most advisable to give only a small quantity at a time, as one grain, and repeat the dose every hour till the vomiting succeeds. Lewis's Mat. Med. and Dict. Chem. Art. *Turbith mineral*.

Turbith mineral appears to have been the grand secret of Paracelsus, which, in his scarce German book of hospital medicines, he praises so extravagantly for the venereal and all chronical diseases. Sydenham also commends it in venereal cases, given in the quantity of six or eight grains, in strong habits of body, so as to prove emetic; but when imprudently used, it is apt to bring on a dysentery.

Turbith-mineral has been used as a sternutatory, and is said to have made wonderful cures in distempers of the eyes. Mr. Boyle relates a cure of this sort, performed by the famous empiric Adrian Glass-maker on Mr. Vatteville, a Swiss officer of distinction in the French service, and totally blind. This gentleman was ordered to snuff about a grain of *turbith* up each nostril, which immediately operated in a violent manner by vomit, stool, sweat, salivation, and the lacrymal glands, for twelve hours together; and also caused his head to swell greatly; but within three or four days after this single dose had done working, he recovered his sight. Boyle's Works Abr. vol. i. p. 103.

We read of this preparation being given to the quantity of ten grains, with the same quantity of camphor, and fifteen grains of the *pilul. ex duob.* to remove the swelling of the testicles. This medicine, which in the beginning vomited and purged, at last operated chiefly as an alterative. It is said to be successful in obstinate venereal and scrophulous disorders. See Medic. Ess. Edinb. vol. iv. art. 4.

Turbith-mineral is an excessive bright true yellow, of a great body like vermilion; will stand equally well, and work with oil or water much in the same manner. These qualities (says the author of the Handmaid to the Arts, vol. i. p. 107.) render it very valuable for many purposes; as it is much brighter than any other yellow used in oil, except king's yellow, and is free from its nauseous smell, and cooler. Mixed with Prussian blue it yields a much finer green than from the king's yellow without ultramarine. As it is now procured, it requires levigation in water before it be used.

TURBO, the *screw-shell*, in *Natural History*, the name of a genus of shell-fish, the characters of which are these: they are univalve shells, with a long, wide, and depressed mouth, in some species approaching to a round shape, and in some having teeth, in others not. They all grow narrow toward the base, and are auriculated, and terminate in a very long and sharp point. See *Tab. of Shells*, N° 11.

Aldrovand, and many others of the old authors, make no difference between the *turbines* and screw-shells, though the distinction of the genera is very obvious; the screw-shells having a long, large, and dentated mouth, which terminates toward the base in a narrower aperture than elsewhere; and the shell itself always runs to a very sharp point at the end: whereas the *turbines* terminate in a less sharp point, and have thicker bodies, and always much wider mouths. The screw-shells are indeed very easily confounded with the buccina; and it requires more accuracy to distinguish them, than has fallen to the share of the generality of writers on these subjects an age or two ago. Aldrovand and Rondeletius have confounded these genera, and have brought in a third among them, by the epithet *muricatum*, which, when applied to the buccinum, is generally observed to bring into that family a shell of the murex class, and which might have been very properly called by that shorter name.

For the sake of distinguishing these, it may be observed, that the screw-shell is of a very long and slender shape, terminating in a very sharp point, with its spires running on imperceptibly, without any great cavity, and the base small and flat, as well as the mouth.

Turbo, in the Linnæan system, is a genus of the *testacea* order of worms. Its characters are: that its animal is a slug, the shell univalve, spiral, and solid, and the aperture straightened, orbiculated, and entire. Linnæus enumerates fifty species.

In Da Costa's system the *turbo* is a genus of snails with a lengthened clavicle or turban; which have generally a perfect round mouth; the columella, or inner lip, not much faced outwards, and the body spire very bellied, so that the turban is suddenly, and not insensibly produced from it. See SHELLS.

The most remarkable species of the *turbo*, or screw-shell, is that called *scalare* by Rumphius, from its spires running up hollow, or with a space between them. This is a very scarce and valuable shell when large, but is often found small in the Adriatic.

The species of the *turbo* are so numerous, that it is proper to arrange them under different heads.

1. The *turbines* which have a long and toothless mouth, and a wrinkled columella, of which there are seven species.
2. Those *turbines* which have dentated mouths and a wrinkled columella, including two species.
3. Those *turbines* which are of a pyramidal figure, and have depressed mouths; comprehending five species.
4. Those *turbines* which have long and erect mouths, containing four species.
5. Those *turbines* which have a flat mouth, and are of a longer shape, including two species.
6. Those *turbines* which have a large oval mouth, including three species.
7. The round-mouthed *turbines*, comprehending six species. See Hist. Nat. Eclairc. p. 271.

TURBO *cochlea*, in *Natural History*, a name by which some authors have called the Persian shell, a species of *concha globosa*, or DOLIUM.

Many have been puzzled with this shell, not knowing in what class to rank it; and Aldrovand has placed it at the end of his work, saying, that it would seem to belong to the turbinated kinds, but that it wants the *turbo*.

TURBOT, in *Ichthyology*, a name given to the fish, which in the systems of Artedi and Linnæus, is a species of PLEURONECTES, being the *pleuronectes* of the former, with the eyes on the left side, and a rough body, and the *pleuronectes maximus* of the latter, and the *rhombus maximus asper non squamosus* of Ray. This is a well known fish, of a remarkable square form; the colour of the upper part of the body is cinereous, marked with numbers of black spots of different sizes; the belly is white; the skin is without scales, but greatly wrinkled, and mixed with small short spines, dispersed without any order.

Turbots grow to a large size, some of them weighing from twenty-three to thirty pounds. They are taken chiefly off the north coast of England, and others off the Dutch coast. The large *turbots* (as well as several other kinds of flat fish) are taken by the hook and line, for they lie in deep water; the method of taking them in weirs, or staked nets being very precarious. When the fishermen go out to fish, each person is provided with three lines, which are coiled on a flat oblong piece of wicker-work; the hooks being baited, and placed regularly in the centre of the coil. Each line is furnished with fourteen score of hooks, at the distance of six feet two inches from each other. The hooks are fastened to the lines upon sneads of twisted horse-hair, twenty-seven inches in length. When fishing, there are always three men in each COBLE, and consequently nine of these lines are fastened together, and used as one line, extending in length near three miles, and furnished with 2520 hooks. An anchor and a buoy are fixed at the first end of the line, and one more of each at the end of each man's lines; in all four anchors, which are common perforated stones, and four buoys made of leather or cork. The line is always laid across the current. The tides of flood and ebb continue an equal time upon our coast, and, when undisturbed by winds, run each way about six hours; they are so rapid that the fishermen can only shoot and haul their lines at the turn of tide, and therefore the lines always remain upon the ground about six hours; during which time the MYXINE *glutinosa* of Linnæus will frequently penetrate the fish that are on the hooks, and entirely devour them, leaving only the and skin bones. The same rapidity of tides prevents their using hand-lines; and therefore two of the people commonly wrap themselves in the sail, and sleep while the other keeps a strict look-out, for fear of being run down by ships, and to observe the weather. For storms often rise so suddenly, that it is with extreme difficulty they can sometimes escape to the shore, leaving their lines behind. Besides the coble, the fishermen have also a five-men boat, which is forty feet long, and fifteen broad, and of twenty-five tons burthen; it is so called, though navigated by six men and a boy, because one of the men is commonly hired to cook, &c. and does not share in the profits with the other five.

This boat is decked at each end, but open in the middle, and has two large lug-sails.

All our able fishermen go in these boats to the herring-fishery at Yarmouth, in the latter end of September, and return about the middle of November. The boats are then laid up till the beginning of Lent, at which time they go off in them to the edge of the Dogger, and other places, to fish for *turbot*, cod, ling, skates, &c. They always take two cobles on board, and when they come upon their ground, anchor the boat, throw out the cobles, and fish in the same manner as those do who go from the shore in a coble; with this difference only, that here each man is provided with double the quantity of lines, and instead of waiting the return of the tide in the coble, return to their boat and bait their other lines; thus hawling one set, and shooting another every turn of tide. They commonly run into harbour twice a week to deliver their fish.

The best bait for all kinds of fish is fresh herring cut in pieces of a proper size; the five-men boats are always furnished with nets for taking them. Next to herrings are the lesser LAMPREYS. The next baits in esteem are small haddocks cut in pieces, sand-worms, and limpets, here called *flidders*, and when none of these can be had, they use bullock's liver. The hooks are two inches and a half long in the shank, and near an inch wide between the shank and the point. The line is made of small cording, and is always tanned before it is used.

Turbots, and all the rays, are extremely delicate in their choice of baits; for if a piece of herring or haddock has been twelve hours out of the sea, and then used as bait, they will not touch it. Pennant's Brit. Zool. vol. iii. p. 234, &c.

TURCICA *sella*. See SELLA.

TURCICA *terra*, *Turky earth*, in the *Materia Medica*, a very fine bole or medicinal earth, dug in great plenty in the neighbourhood of Adrianople, and used by the Turks as a sudorific and astringent, and famous among them in pestilential diseases. It is sometimes brought over to us also, made up into flattish orbicular masses, of two or three drams weight, and sealed with some Turkish characters. The earth is of a somewhat lax and friable texture,

texture, yet conſiderably heavy, of a greyiſh red colour, but always redder on the ſurface than within; extremely ſoft, and naturally of a ſmooth ſurface. It breaks eaſily between the fingers, and melts freely in the mouth, with a conſiderably ſtrong aſtringent taſte. It adheres but ſlightly to the tongue, raiſes no effervescence with acids, and burns to a duſty yellow colour. Hill's Hiſt. of Foſſ. p. 15.

Many authors who have written of the materia medica, and of foſſils in general, have indiſcriminately called the various kinds of Lemnian earth by this name; but the true *terra Turcica*, deſcribed by Schroder, Wormius, &c. is a different ſubſtance, though not ſufficiently characteriſed by thoſe authors to diſtinguiſh it from all the other earths.

TURCOIS, or TURQUOIS, in *Natural Hiſtory*, a precious ſtone of the opake kind, of a beautiful blue colour.

The Greeks and Latins ſeem to have known it under the name *callais*: and it appears to have had a place in the rationale of the high-prieſt of the Jews.

There are *turcoiſes* both oriental and occidental, of the new rock and of the old. The oriental partakes more of the blue tincture than the green; and the occidental more of the green than the blue. Thoſe of the old rock are of a finer blue, and thoſe of the new rock are often whitiſh, and do not keep their colour.

The oriental ones come from Perſia, the Indies, and ſome parts of Turky; and ſome even ſuppoſe, that it is hence they derive their modern name *turcois*. The occidental are found in various parts of Europe, particularly in Germany, Bohemia, Sileſia, Spain, and France.

Turcoiſes often grow of a round or oval figure; they cut eaſily, and beſides ſeals, which are frequently engraved on them, ſome are formed into crucifixes, or other figures, near two inches high; though De Boodt miſtakenly affirms, that none have been known to exceed the bigneſs of a walnut; for the ſpecimen exhibited by Mr. Mortimer to the Royal Society was twelve inches long, five inches broad, and in ſome places near two inches thick.

This gem has many virtues attributed to it; but all that we know of it at preſent is, that, like other bodies which contain copper, it is a violent emetic, and not at all fit to be received into practice.

The *turcois* is eaſily counterfeited; and that often is done ſo perfectly, that it is impoſſible to diſcover the deceit, without taking it out of the collet.

In the Memoirs of the Academy of Sciences for the year 1715, we have a very curious account of the formation of the *turcois*, and the manner of managing its naturally irregular colour, by M. Reaumur. The *turcois*, he obſerves, is one of the ſofteſt of precious ſtones, its hardneſs uſually not coming up to that of a cryſtal, or a tranſparent pebble; though ſome are much harder than others: and ſtill the harder, *cæteris paribus*, the more valuable, by reaſon of the vivacity of the poliſh, which is always proportionable to the hardneſs.

Roſnel, a jeweller, and the author of a ſcarce treatiſe, called Mercure Indien, eſtimating the ſeveral precious ſtones, ſets a hard *turcois*, whoſe blue is neither bright nor deep, on the foot of the moſt perfect emeralds, that is, nearly on a level with a diamond; but ſuch are ſcarce ever met with. Thoſe with any defect he only values at a French crown the carat.

Tavernier affirms, but erroneouſly, there are but two mines of *turcoiſes* known in all the earth, and thoſe are both in Perſia; the one called the *old rock*, near a town called Necabourg, three days journey to the north-eaſt of Meched; the other called the *new rock*, is five days journey from it. The ſtones from the latter, he adds, are but little valued; and the king of Perſia hath for many years prohibited the digging in the former for any but himſelf. M. Reaumur takes the old rock to be now exhauſted; in effect, the common diviſion of *turcoiſes* into the old rock, or oriental, and new rock, or occidental, is very arbitrary and precarious. All the beſt, and moſt perfect, grow where they will, in India or Europe, are reckoned among the former, and the reſt among the latter. Near Simore, in the Lower Languedoc, there are ſeveral conſiderable mines of *turcoiſes*; but that fine blue colour, admired in the *turcois*, is not natural to thoſe of theſe rocks; the prevailing colour being ſometimes white, and ſometimes much like that of tripoli of Venice. Other precious ſtones are dug out of the mine with all their colour, to the force whereof nothing can be added, though it may frequently be diminiſhed, as we ſee fire bring down the too deep colour of the ſapphire, and quite take away that of a pale ſapphire; theſe *turcoiſes*, on the contrary, are naturally whitiſh, or yellowiſh, of a colour as ordinary as that of a free-ſtone; and by oppoſing them for ſome time to the action of the fire they aſſume a blue colour.

It ſeems a paradox, and yet M. Reaumur has attempted to prove, that *turcoiſes* are originally the bones of animals. In the mines in France, pieces have ſeveral times been found in the figure of teeth, bones of the legs, &c. And *turcoiſes* which are yet imperfect, or half formed, are apparently compoſed of laminæ, or leaves like thoſe of bones, between which ſome petrifying juice, inſinuating itſelf, binds them cloſe together; and ſtill, the ſofter, and more imperfect the ſtones are, the more diſtinguiſhable are the different directions of the fibres and laminæ, with their interſections, and the greater reſemblance they bear to fractured bones, and the leſs to any kind of ſtones known.

To give them a blue colour, they dry them a-while in the air, then heat them gradually in a furnace made after a particular manner. If they be heated too haſtily, the humidity between the laminæ wanting time to evaporate, the whole will ſeparate into ſcales or flaws. Some of the ſtones require a greater degree of heat to bring them to their colour than others; and even in large pieces, the ſeveral parts ordinarily require ſeveral degrees of heat. On this account a great deal of care is to be taken in the heating of them; for the fire, which gives them their blue by degrees, if they be expoſed beyond a certain degree, takes it away again.

M. Reaumur accounts for their taking a blue colour by heat very well; when freſh cut out of the rock, it ſeems, their ſubſtance is found ſprinkled and ſtreaked all over with ſpots, veins, little circles, &c. of a dark blue colour; theſe he takes to be ſources of a deep bluiſh matter, which the fire rarefying, ſpreads and diffuſes throughout the whole ſubſtance of this ſtone. This matter, again, he concludes to have been either originally the juice contained in the bones, ſince mixed and coagulated with the petrifying juice, or ſome other mineral matter inſinuated into the pores of the ſtone.

Mr. Kirwan is alſo of opinion, that *turcois* is the tooth of an animal, penetrated with the blue calx of copper; its ſpecific gravity is from 2,5 to 2,908. The copper may be extracted from it by diſtilled vinegar. Elem. of Min. p. 262.

According to M. Reaumur's Mem. Par. 1715, nitrous acid will not diſſolve that of Perſia, though it will that of France, which ſhews a difference between them.

Dr. Woodward maintains, that the *turcois*, or *callais* of Pliny, is nothing elſe but foſſil ivory, tinged with copper; but Mr. Mortimer, who produced a ſpecimen of the *turcois* to the Royal Society, is of opinion, that thoſe, which authors call ſtones of the old rock, and in which the colour is permanent, are real mineral ſtones; the form and ſize of the ſample which he produced evince this; for its ſhape ſhews that it could not be part of any animal bone, but its botryoid form ſeems to prove, that it is the product of fire, which has once melted this ſubſtance, and that when it cooled, its ſurface was formed into bliſters and bubbles, in the ſame manner as the hæmatites botryoides, or blood-ſtone, whoſe ſurface conſiſts of knobs, reſembling a bunch of grapes. He apprehends the elephas ορυκτος, or ebur foſſile of Theophraſtus to be what Dr. Woodward calls the *turcois*, and ſuſpects that it is what De Boodt calls the new rock. He thinks that, for diſtinction ſake, all theſe ſtones of ivory origin ſhould be called *pſeudo-turcheſiæ*, or *baſtard turquois*. By a chemical analyſis he found, that his ſtone was a rich copper ore; ſome of it pounded and diſſolved in ſpirit of hartſhorn gave a deep blue; in aqua fortis a fine green; and an iron wire put into it was in an hour's time incruſted with copper; ſome of it, being calcined, without any flux in a crucible, ran to a ſlag, or half-vitrified ſubſtance; whereas the ſame heat, if it had been ivory or bone, would have reduced it to a white aſh like bone aſhes, for it was expoſed to a fire that vitrified the tile which covered it. Its hardneſs and conſiſtence to an engraver's tool ſeemed to be the ſame as that of common white marble; its colour was not improved by heat, and it became brittle when red hot.

Sir Hans Sloane had ſeveral ſpecimens of theſe oriental *turcoiſes*, which are all botryoid, and ſeem to be copper ores; and in his muſeum there are alſo ſamples of *turcoiſes* from Spain and the South of France, which are ſmall, and ſeem to be pieces of ivory tinged with copper. Phil. Tranſ. vol. xliv. art. 17.

The great defect of *turcoiſes* in general is, that in time they loſe their blue colour, and become green; and then ceaſe to be of any value.

The pale blue of the natural *turcois* gem, is a very favourite colour in the glaſs-trade, and is given to glaſs in the following manner. Firſt calcine common ſea-ſalt, and

and beat it to a fine powder; then make a pot of the sea-green glass, of a fair and full colour; to this, when in fusion, throw in at times the powder of salt, till the mass has lost all its transparence, and is become paler and opake; then add, by very small quantities at a time, more and more salt, till the colour is exactly that of the *turcois*-gem; and when it is so, work it immediately, for the salt is soon burnt off, and the glass becomes transparent, and of its green colour. If it become transparent while working, more salt must be thrown in, and that will reduce it to the same opacity again. Neri's Art. of Glass, p. 57. See GLASS.

For the method of making an enamel exactly of the colour of the *turcois* gem, and very much resembling it in many respects, see ENAMEL.

For making a paste resembling the *turcois*, see PASTE.

TURDUS, *thrush*, in the *Linnæan system of Ornithology*, the name of a genus of birds, of the order of the *passeres*. The distinguishing characters of this genus are, that the tongue is jagged, and has a rim or margin round it; the bill is of a conic pointed figure, the upper mandible bent at the apex, and emarginated; the nostrils naked, but half covered above with a small membrane, and the chaps ciliated. Linnæus enumerates twenty-eight species.

The distinguishing characters of this genus, according Mr. Ray, are these: they are of a middle size between the pigeon and the lark; their beak is moderately long and thick, and is a little bent downwards; their mouth yellow within; their tail long; and their food both vegetable substances, and insects in common. Most of these birds sing very melodiously, and may be taught to imitate the human voice in speaking. Ray's Ornithol. p. 137.

We have four species of thrush in England: 1. The *turdus viscivorus major*, or missel-bird. 2. The *viscivorus minor*, or song-thrush, or throstle. 3. The *turdus pilaris*, or field-fare. And, 4. The swine-pipe, or red-wing. See BLACK-*bird*, FIELD-*fare*, MISSEL-*bird*, *Ring*-OUZELL, *Rose-coloured* OUZELL, RED-*wing*, and THROSTLE.

TURDUS *chiappæ*, in *Ornithology*, the name of a bird of the West Indies, called also PASSER *faber*.

TURDUS, in *Ichthyography*, the name of a genus of fishes according to Mr. Ray, of the class of those which have only one back-fin, the anterior rays of which are prickly; the hinder ones soft and smooth.

Of these fish there are several species, which may properly be divided into two orders; the first, of those which are smaller and broad; the second, of those which are larger and oblong.

Of the first order are the *tinca marina*, or WRASSE; the MERULA, or *turdus niger*; the LEPRAS, and PIRA *pixanga*; and the *turdus viridis*, or VERDONE. Ray's Ichthyogr. p. 320.

Of the second order are the *pavo*, or PEACOCK-*fish*; and the *turdus viridis major*, and *turdus fuscus maculosus*.

The *turdus viridis major*, or great green *wrasse*, is of a fine green on its back and sides, even to the side-lines; and the lower part of the sides and belly are of a pale whitish yellow, variegated with greyish and pale blue spots; its body is long, and not much unlike that of the pike in figure; its back fin is long, and has thirty-two ribs, the anterior nineteen of which are rigid and prickly, the hinder twelve soft, flexile, and ramose; the scales are large, the eyes small, and the teeth very large and strong.

The *turdus fuscus maculosus*, or brown spotted *wrasse*, scarce at all differs from the others, except in colour. It is of a dusky hue on the back and sides, variegated with blue spots; and on the belly blue, with lines and spots of red. All the fins, except those of the gills, are of a red colour, spotted with blue; the tail also is of this colour, and the gill-fins are yellow. Ray's Ichthyogr. p. 322.

TURF, *peat*, a blackish, sulphureous earth, used in several parts of England, Holland, and Flanders, as fewel.

Turf, as distinguished from peat, consists of mould interwoven with the roots of vegetables; when those roots are of the bulbous kind, or in a large proportion, they form the looser and worse kind of *turf*; but when mixed with a considerable proportion of peat, they form what is called *stone-turf*; it at first hardens, but at last crumbles by long exposure to the air. Of *peat* or *geanthrax*, there are two sorts: the first and principal is of a brown, yellowish brown, or black colour, found in moory grounds, and, when fresh, of a viscid consistence, but hardens by exposure to the air; it consists of clay mixed with calcareous earth and pyrites, and sometimes contains common salt; when distilled, it affords water and oil and volatile alkali, and its ashes contain a small proportion of fixed alkali. They are either white or red, according as it contains more or less ochre or pyrites. This sort of peat is found in Scotland, Holland, and Germany. Another sort is found near Newbury, in Berkshire: it contains but little earth, and consists chiefly of wood-branches, twigs, roots of trees, with leaves, grass, straw, and weeds. Phil. Trans. for 1757, p. 110. Kirwan's Elem. of Miner. p. 219.

In Flanders their *turf* is dug or pared from off the surface of the earth, and cut in form of bricks. The sedge, or species of grass, growing very thick on the *turf* earth, contributes greatly, when dry, to the maintenance of the fire.

The Dutch take their *turf* from the bottom of the dikes or canals which run across most of their lands; by which means they not only supply the defect of wood, which is very great in most of the United Provinces, but also keep their dikes clear and navigable: this *turf*-earth is very black. As they take it up from the bottom of the dikes, they spread it about the edges, of such a thickness, as that it may be reduced to three inches when moderately dried. In this condition they cut it into pieces of *turf* seven or eight inches long, and three broad; and to complete the drying, lay them up in heaps, and at last in stacks.

In the north of England, Scotland, &c. *turf* or peat is dug out of soft, moist, rotten earth, called *peat-moss*; for the formation whereof see MORASS.

They dig horizontally from the surface, to the depth of about four feet, with a spade, which at once fashions and takes them out in parallelepipeds, nine or ten inches long, and three square, which are spread on the ground to drain as fast as dug, and then set up on end three or four against each other, for the wind to blow through them; and at last they are stacked or housed. The pits or dikes in a few years fill up again, and afford a fresh crop.

TURF *sweating*, an Indian method of curing diseases, which has been found to succeed very happily on many trials.

Paul Dudley, esq. gives an account of a man of seventy-four years old in New England, who drinking cold water when very hot, had a pain settled in one side and arm, which baffled all art to remove; till after nine weeks confinement to his bed, when he was given over by every body, it was proposed to try this method of cure upon him.

An oven full of *turf* was ordered to be cut; the *turfs* were of about eighteen inches square each, and were of the nature of the English *turf* used in gardens.

The Indian doctor, before the *turf* was put into the oven, rubbed over their grassy side with some sort of oil or spirit, and then putting the two grass sides together, placed them in the oven. When they had been two hours there, and were well baked, he took them out, and made a bed upon the floor, the place for the head being a little raised; the old man was then taken out of bed without his shirt, but wrapped in a sheet, and being laid on the *turf*-bed, such another parcel of the hot *turf* was laid over him. The *turf* was laid thickest on that side where the pain was, but none of it was put on his breast or head.

He was then covered with a blanket to keep in the heat, and while he was in this warm bath, he was continually supplied with warm cordials to keep him from fainting, of which he was in great danger. After he had lain in this bath about three quarters of an hour, which was as long as he could bear it, he was put into a bed very well warmed, without his shirt, where he soon fell asleep, and sweated to that degree, that it run through the pillow and bed on the floor. After about two hours' sweat they rubbed and dried him, and put on his cloaths, and the old gentleman found himself much eased and refreshed. The operation was performed in the morning, and before night he walked about the house comfortably, his pain being almost all gone. The cordials were, after this, repeated, and, on the fourth day, the sweating was performed again; the day after which the old gentleman was well enough to go about his business. He lived eleven years afterwards in perfect health, and free from pain.

Great care is to be taken in this operation that the patient do not lie too long in the *turf*: in many cases a quarter of an hour is found to be long enough; and the general rule is, that as soon as the patient begins to fetch his breath short or faint, he must be put to bed immediately, and the cordials must by no means be omitted, for the life of the patient is endangered without them. Phil. Trans. N° 384, p. 129.

TURFING-*spade*, among *Husbandmen*, is an instrument used to undercut the *turf*, after it is marked out with a trenching-plough.

TUR-

TURGESCENCE, Turgescency, a swelling, or growing bloated.

TURIONES, the first young tender shoots which plants annually put forth.

TURK's-*cap*, a name given to a species of Lily.

Turk's-*head*, a name sometimes given to the *Melon* Thistle.

Turk's *Turban*, a name given to a species of ranunculus.

TURKEY, *meleagris*, in *Ornithology*, a distinct genus of birds, of the order of the *gallinæ*; the distinguishing characters are, that its head and neck are covered with a naked tuberose flesh, with a long fleshy appendage hanging from the base of the upper mandible: to which we may add from Mr. Pennant's description of this genus, that the bill is convex, short, and strong; the nostrils open, pointed at one end, and lodged in a membrane; the tongue is sloped on both sides towards the end, and pointed; and the tail is broad, consisting of eighteen feathers, and extensible. Linnæus enumerates three species; the first of which is the *gallo-pavo*, or wild *turkey*, which has in the breast a long tuft of coarse black hairs; the plumage is dark, glossed with variable copper colour and green; the coverts of the wings and the quill-feathers are barred with black and white; the tail consists of two orders, the upper, or shorter, having the ground colour a bright bay, and the middle feather marked with numerous bars of shining black and green; the exterior feathers are mostly marked with three broad bands of mallard green, the two next coloured like those of the middle, with the end plain and crossed with a single bar like the exterior; the longer, or lower order of feathers, are of a rusty white colour, mottled with black, and crossed with numerous narrow-waved lines of the same colour, and near the end with a broad band.

Wild *turkies* preserve a sameness of colouring; the tame varying; but the black approaching nearest to the original stock. Of late a beautiful kind has been introduced into England of a snowy whiteness, finely contrasting with its red head. The usual weight of the wild *turkey* is about 30*lb*.

The passions of the males are strongly expressed by the change of colours in the fleshy substance of head and neck, which alters to red, white, blue, and yellowish, as they are differently affected. One cock serves many hens, who retire to an obscure place in order to sit, the cock being apt to break the eggs. The females are very affectionate to their young, and though the eggs addle, will almost perish with hunger, unless they are removed, before they will quit the nest.

Turkies delight much in the seeds of nettles, but those of the purple fox-glove are fatal to them. They are stupid, quarrelsome, and cowardly birds; they are swift runners, but indifferent flyers; they love to perch on trees, and, in a wild state, get so high as to be beyond the reach of the musquet.

In the state of nature they go in flocks, even of five hundred, and feed much on the small red acorns, frequenting the swamps of their native country, where they roost, but at sun-rising repair to the dry woods in search of acorns and berries. The flesh of the wild *turkey* is said to be preferable to that of the tame, but redder.

Wild *turkies* are now very rare in the inhabited parts of America, but are found in numbers in the distant and most unfrequented spots.

The Indians make a very elegant cloathing of the feathers, twisting the inner webs into a strong double thread of hemp, or inner bark of the mulberry-tree, and working it like matting: it a pears rich and glossy, and as fine as a silk shag. They also make fans of the tail, and the French of Louisiana were wont to make umbrellas by the junction of four of the tails.

Turkies are natives only of America, or the New World, and of course unknown to the ancients: this is a point which Mr. Pennant has established by an elaborate induction of various particulars in the history of these birds; evincing that they are natives neither of Europe, Asia, nor Africa. The first precise description of them is given by Oviedo, in 1525; they are also mentioned as natives of the main land of the warmer parts of America, by Fernandez, physician to Philip II. who wrote between the years 1555 and 1598: they were also frequently seen, both in their wild and tame state, by Dampier, in the province of Yucatan, now a part of Mexico.

In North America they were observed by the first discoverers. They were first introduced into Europe from Mexico or Yucatan, and imported into England, probably from Spain, as early as the year 1524. Since that period they have been successfully cultivated in this kingdom, so that in the year 1585 they made a dish even in our rural feasts. But in France they were so rare, that the first which was eaten in that kingdom appeared at the nuptial feast of Charles IX. in 1570. Phil. Trans. vol. lxxi. part i. p. 67, &c.

Turkey-*stone*. See Oil-*stone*.

Turkey *Wheat*. See Maize.

Turkey *Baum*. See Dragon's *head*.

Turkey *Company and Silk*. See Company and Silk.

TURKISH *coins*, *measures*, and *year*, see the substantives.

TURLUPINADE, a term used chiefly among the French for a low jest, or witticism. The occasion of the name is said to be derived from a famous comedian at Paris, called *Turlupin*; whose talent consisted chiefly in raising a laugh by miserable puns and quibbles.

TURLUPINS, Turlupini, a denomination given to the brethren *of the free spirit*; whose external aspect and manners carried a very shocking air of lunacy and distraction.

They called their sect the *fraternity of the poor*, and spread themselves over England and France. They are said by some to have had their name *turlupines*, *quod ea tantum habitarent loca, quæ lupis exposita erant.*

They attempted to settle themselves at Paris in 1372, but were a great part of them burnt, with their books; as is related by Gaguin and du Tillet in the life of Charles V.

TURMERIC, or *Indian saffron*, *curcuma*, in *Botany*, a genus of the *monandria monogynia* class. Its characters are these: the flower have each several spathæ which are single and drop off; the flower hath one petal with a narrow tube, cut at the brim into three segments: it hath an oval pointed nectarium of one leaf, inserted in the sinus of the largest segment of the petal; it hath five stamina, four of which are barren and one fruitful, situated within the nectarium, and having the appearance of a petal, with a bifid point, to which the summit adheres; it hath a roundish germen situated under the flower, supporting a style of the length of the stamina, crowned by a single stigma; the germen afterward becomes a roundish capsule having three cells, which are filled with roundish seeds. There are two species.

Turmeric, *curcuma*, in the *Materia Medica*, a medicinal root, being the root of the *curcuma longa* of Linnæus, used likewise by the dyers, to give a yellow colour.

It is externally greyish, and internally of a deep lively yellow or saffron colour, very hard, and not unlike, either in figure or size, to ginger.

It is brought chiefly from the East-Indies; though the island Madagascar does likewise afford it. You are to chuse that which is big, new, resinous, hard to break, and heavy.

Some people have mistakenly imagined, that there was a native red *turmeric*; their error was owing to this, that the yellow root as it grows old, turns brown; and when pulverized, is reddish. It is much used by the glovers, &c. to dye their gloves. The Indians use it to dye their rice, and other foods, of a yellow colour; whence some call it *Indian saffron*.

Our dyers do not find, that it gives so steady a yellow as the luteola or weld; but it is admirable to brighten and heighten the red colours dyed with cochineal or vermilion; as scarlets, &c.

Turmeric has a slight aromatic, and not very agreeable smell, and a bitterish somewhat warm taste. It readily gives out its active matter both to aqueous and spirituous menstrua; communicating to the former its own deep yellow, and to the latter a fine yellowish red tincture. Distilled with water, it yields a small quantity of a gold-coloured essential oil, of a moderately strong smell and pungent taste: the remaining decoction inspissated, leaves a bitterish, considerably saline mass. The inspissated extract from rectified spirit is moderately warm and bitter, and not a little nauseous. In the eastern countries, this root, besides its use in colouring and seasoning their food, is much recommended as a medicine; being accounted one of the most effectual remedies in obstructions of the viscera and mesentery, which are there frequent; in uterine disorders, difficulties of urine, and affections of the kidnies. Among us it has also been employed by way of decoction, infusion, and powder, as a deobstruent, in hypochondriac, leuco-phlegmatic and cachectical constitutions; and esteemed by some as a specific in the jaundice: the dose in substance is from a scruple to a dram; in decoction or infusion twice as much. It tinges the urine of a deep yellow colour. Lewis.

A plaster of *turmeric*, well bruised, top and roots, is thought

thought to be good against the bite of the rattle-snake. See Phil. Transf. N° 479. p. 144.

TURMERIC *Wash*, is the gum of the *turmeric*-root dissolved in water.

The qualities and uses of it are much the same as those of the *yellow*-BERRY wash for water-painting; but it is a brighter and cooler yellow: for which purpose it should be dissolved in spirit of wine instead of water, by putting two ounces of proof-spirit, and one ounce of water, in a phial, with two drams of powdered *turmeric*-root, shaking them well together, and letting them stand, with a repetition of the shaking, for three or four days.

TURN is used for a circular motion; in which sense it coincides with *revolution*.

TURN, in a *Clock* or *Watch-work*, particularly denotes the revolution of a wheel or pinion.

In calculation, the number of *turns* which the pinion hath in common arithmetic, thus 5)60(12, where the pinion 5, playing in a wheel of 60, moves round 12 times in one *turn* of the wheel. Now, by knowing the number of *turns*, which any pinion hath in one *turn* of the wheel it works in, you may also find how many *turns* a wheel or pinion has at a greater distance; as the contrat-wheel, crown-wheel, &c. by multiplying together the quotients, and the number produced is the number of *turns*, as in this example:

5) 55 (11
5) 45 (9
5) 40 (8

The first of these three numbers has 11 *turns*, the next 9, and the last 8. If you multiply 11 by 9, it produceth 99; that is, in one *turn* of the wheel 55, there are 99 *turns* of the second pinion 5, or the wheel 40, which runs concentrical or on the same arbor with the second pinion 5. If you multiply 99 by the last quotient 8, it produces 792, which is the number of *turns* the third pinion 5 hath. See CLOCK-*work* and PINION.

TURN, in *Mining*, is a pit sunk in some part of a drift. If the mine be deep, there are many of these *turns* one below another.

TURN-*house*. When a drift is driven across the country N. and S. to cut a lode, the miners make a right angle from their drift, and work on the lode itself; which, as it is in a contrary direction to their past drift, they call *turning-house*, in order to work on the course of the lode.

TURN, in the *Manege*, is a term commonly used in directing to change hands. See CHANGE and ENTIER.

TURN, in the *Sea Language*. See LAND-*turn*, TACK and TURNING.

TURN, or TOURN, is also used for the sheriff's COURT, kept twice a year in every hundred within his county, viz. a month after Easter, and within a month after Michaelmas.

From this court none are exempted but archbishops, bishops, earls, barons, religious men and women, and all such as have hundreds of their own to be kept.

It is a court of record in all things that pertain to it; and is also the king's leet through all the county, whereof the sheriff is judge; this court being incident to his office. The attendance on it is called *secta regalis*, or *suit-royal*.

It is called the *sheriff's turn*, because he takes a *turn* or circuit for this purpose through the shire, holding the same in several places.

TURNADO. See TORNADO.

TURNAMENT, or TOURNAMENT, a martial sport or exercise, which the ancient cavaliers used to perform, to shew their bravery and address.

The first *turnaments* were only courses on horseback, wherein the cavaliers tilted at each other with canes in manner of lances; and were distinguished from *justs*, which were courses or careers, accompanied with attacks and combats, with blunted lances and swords.

Others say, it was a *turnament* when there was only one quadril or troop; and that where there were several to encounter each other, it was a JUST. But it is certain the two became confounded together in process of time; at least we find them so in authors.

The prince who published the *turnament*, used to send a king at arms with a safe-conduct, and a sword, to all the princes, knights, &c. signifying, that he intended a *turnament* and a clashing of swords, in the presence of ladies and damsels; which was the usual formula of invitation.

The first engaged man against man, then troop against troop; and after the combat, the judges allotted the prize to the best cavalier, and the best striker of swords; who was, accordingly, conducted in pomp to the lady of the *turnament*; where, after thanking her very reverently, he saluted her and likewise her two attendants.

These *turnaments* made the principal diversion of the thirteenth and fourteenth centuries. Munster says, it was Henry the Fowler, duke of Saxony, and afterwards emperor, who died in 936, that first introduced them; but it appears from the chronicle of Tours, that the true inventor of this famous sport, at least in France, was one Geoffry, lord of Preuilli, about the year 1066.

It is difficult to fix the epocha of their institution, as many nations have laid claim to it. Nithard relates, that at the interview of Charles the Bald, king of France, who succeeded to the throne in the year 840, and his brother Lewis of Germany, at Strasburg, the gentlemen of the retinue of both princes fought on horseback, to display their courage and skill.

Du-Cange says, that these sports were so peculiar to the French, that they were called *conflictus Gallici*, or French combats. To this purpose Matthew Paris, under the year 1179, says, *Henricus rex Anglorum junior mare transiens in conflictibus Gallicis, et profusioribus expensis, triennium peregit, regiaque majestate deposita, totus est de rege translatus in militem.*

The Historia Byzantina tells us, that the Greeks and Latins borrowed the use thereof from the Franks; and we find mention made of them in Cantacuzenus, Gregorias, Bessarion, and others of the late Greek authors.

Instances of them occur among the English in the reign of king Stephen, about the year 1140; but they were not much in use till Richard's time, towards the year 1149. After which period these diversions were performed with extraordinary magnificence in the *Tilt-yard* near St. James's, Smithfield, and other places.

At last, however, they were found to be productive of bad effects, and the occasions of several fatal misfortunes, as in the instance of Henry II. of France, and of the *tilt* exhibited at Chalons, which from the numbers killed on both sides, was called the little war of Chalons. These and other inconveniences, resulting from these dangerous pastimes, gave the popes occasion to forbid them, and the princes of Europe gradually concurred in discouraging and suppressing them.

Budæus derives the word *turnament* from *Trojana agmina*; others from *Trajamentum, quasi ludus Trojæ*. Menage deduces it from the Latin *tornensis*, or the French *tourner*, because the combatants rode in rings and circles, and were obliged to make many turnings with their horses, as the laws of the game required.

M. Paris calls them in Latin, *hastiludia*; Neubrigensis, *meditationes militaris*; others *gladiaturæ*, others *decursiones ludicræ, &c.*

It is natural, however, to conclude *ex vi termini*, that although the sport itself may owe its rise to the Trojan game, yet that its name is of French extraction, and not only given with great propriety, but seems to be a tacit agreement of its superior antiquity among that people, whose historians assert that it was first known in France. Berenger's Art of Horsemanship, vol. i. p. 104, &c.

Pope Eugenius II. excommunicated those who went to *turnaments*, and forbad them burial in holy ground. K. Henry II. of France died of a wound received at a *turnament*. One Chiaoux, who had assisted at a *turnament* under Charles VIII. said very wisely, *If it be in earnest, it is too little; if in jest, too much.*

It is to the exercise of *turnaments* that we owe the first use of armories; of which the name blazonry, the form of the escutcheons, the colours, principal figures, the mantlings, labels, supporters, &c. are undeniable evidences.

In Germany, it was anciently a custom to hold a solemn *turnament* every three years, to serve as a proof of nobility. For the gentleman who had assisted at two, was sufficiently blazoned and published; i. e. he was acknowledged noble, and bore two trumpets by way of crest on his *turnament* casque. Those who had not been in any *turnaments* had no arms, though they were gentlemen.

TURNEP, or *turnip*, *rapa*, in *Botany*. Its characters are these: the empalement of the flower is three-leaved, coloured, and erect; the flower hath four plain spreading petals, which are narrow at their base, and entire; it has four oval honey glands, situated between the stamina and style, and six erect awl-shaped stamina, the two which are opposite, are of the length of the empalement, the other four are longer, terminated by erect acute-pointed summits; it hath a taper germen, supporting a short thick style, crowned by an entire headed stigma; the germen afterwards becomes a long taper pod, depressed on the sides, opening in two cells, which are filled with roundish seeds. There are three species, viz. the garden-*turnep* with a white root; the *turnep* with an oblong root, or female *turnep*, and the *turnep* with a spindle-shaped root or garden naphew with a white root, commonly called French *turnep*. The *turnep* is a species of BRASSICA in the Linnæan system.

The first species is the *turnep* commonly cultivated in the fields, of which there are the following varieties, viz. the round red or purple top, the green top, the yellow, the black-rooted, and the early Dutch *turneps*; the last sort is commonly sown early in the spring, to supply the markets

markets in May and June, and ſhould be drawn up young, otherwiſe it becomes ſtrong and rank, but is never cultivated for a general crop. The red-rooted *turnep* was formerly more cultivated in England than at preſent, inſtead of which the large green-top *turnep* has been introduced and preferred to it. It grows more above ground than any other, which renders it better for feeding cattle, and its roots are the ſofteſt and ſweeteſt, and continue good for the longeſt time, and therefore are moſt eſteemed for the table. The next to this is the red or purple-top *turnep*, though its roots are apt to become ſtringy. The long-rooted, the yellow, and the blackiſh-rooted *turneps* are now rarely cultivated in England, neither of them being ſo good either for the table, or for feed, as the red and green top *turneps*. The French *turnep* is not much cultivated in England, but in France and Holland is much eſteemed, eſpecially for ſoups.

Turneps delight in a light, ſandy, loamy ſoil, which muſt not be rich, otherwiſe they become rank and ſticky; but if it be moiſt they will thrive the better in ſummer, eſpecially in freſh land, where they are always ſweeter than upon an old worn-out, or a rich ſoil. The common ſeaſon for ſowing them is any time from the beginning of June to the middle of Auguſt: however, about London they are ſown ſucceſſively from March to Auguſt, for the conſtant ſupply of the markets; but thoſe that are ſown early in a dry ſeaſon, are in danger of being deſtroyed by the fly, and ſhould be watered; and they always ſucceed beſt in a moiſt ſoil. The ſeeds ſhould always be ſown upon an open ſpot of ground; for near hedges, walls, buildings, or trees, they will draw up, and be long topped, but have ſmall roots.

It is but of late years that the farmers have brought *turneps* into uſe, as an improvement of their fields. This is the more extraordinary as Columella, an ancient writer on huſbandry, recommends the plentiful cultivation of *rapa*; becauſe, ſays he, thoſe roots which are not wanted for the table will be eaten by the cattle.

All ſorts of land, when made fine either by dung and tillage, or by tillage alone, will produce *turneps*, but not all equally.

Chalky land is too dry for them, and they are ſo long on it before they get into the rough leaf, that the fly often takes them, and they are deſtroyed. Sometimes, however, they ſucceed well in this ſort of land, though rarely. Charlock is a weed very apt to infeſt *turnep* lands, and when the *turneps* and this are both young, they are ſo alike, that there have been inſtances of the people ſent to weed, miſtaking one for the other, and cutting up all the *turneps*, and leaving all the charlock.

Sandy and gravelly land are found to be the beſt for *turneps*, becauſe theſe ſoils are moſt eaſily pulverized, and have a warmth that makes the *turneps* grow much faſter than they would in a colder ground. By this means they are preſerved from the danger of the fly, which only infeſts them while not yet grown into the rough leaf; and this ſort of ſoil, when well tilled and hoed, never wants moiſture even in the hotteſt weather. The dews reach as deep as the plough or hoe penetrates, which is ſix or eight inches; and the ſun's heat with us is never ſo great as to exhale it wholly from that depth.

The land upon which *turnep*-ſeed is ſown, ſhould be ploughed in April, and twy-fallowed in May; the ſeed ſhould be ſown thin, two pounds being fully ſufficient for an acre, though one pound is the common allowance; as ſoon as it is ſown, it muſt be harrowed in with a ſhort-tined harrow, and the ground rolled with a wooden roll, in order to break the clods and make the ſurface even. However, Mr. Reynolds, an ingenious practical farmer, obſerves (Mem. Agriculture, vol. i. p. 437.) that the common practice of rolling down *turnep*-ground, when finiſhed, is injurious to theſe young ſeed-plants; becauſe the clods of earth are uſeful in ſcreening the plants from the ſun, and in quickening their growth. If rolling ſhould become neceſſary, as ſoon as the flies appear, the unrolled ground will have much the advantage of the rolled in deſtroying them; becauſe, being rough, the roller will, by breaking the clods, bury and cruſh, as well as lick up the greater part of thoſe inſects.

When the plants begin to come up, in about ten days or a fortnight after ſowing, they will be in danger of being deſtroyed by the fly; in which caſe the ground, being firſt harrowed, muſt be re-ſown. When the plants have four or five leaves, they ſhould be hoed both for deſtroying the weeds and thinning them, the remaining plants being left about ſix or eight inches aſunder each way; but in the ſecond hoeing, about three weeks or a month after the firſt, they ſhould be left at the diſtance of fourteen or ſixteen inches; for thus the roots will be proportionably large, and anſwer better the purpoſe of feeding cattle; but for kitchen uſe the diſtance of ten inches or a foot will be ſufficient.

When *turneps* are ſowed by hand, and hoed by hand-hoers, the plants grow too cloſe, and the operation is never half performed, the workers uſually leaving one half of the land unhoed, and covering it with the earth they cut up from the other parts; ſo that the weeds there being only buried an inch or two deep, grow more vigorouſly than before. The beſt method, which has been lately much practiſed, is to ſow the ſeed in rows with the drill-plough, and horſe-hoe, or hand-hoe them afterwards. By this means the plants are kept at a proper diſtance, and the earth opened between them. The effect of this, upon a fair trial, has been proved to be (ſays Mr. Tull) that the drilled *turneps*, when gathered, have been twice the quantity of the ſown ones, upon an equal quantity of ground, though the hand-hoeing of the latter had coſt at the rate of ten ſhillings an acre.

The late lord viſcount Townſhend made an accurate trial of theſe two methods of huſbandry, by equally dividing the ſame fields into different lands, which were alternately ſown in drills, and the intermediate lands in broad-caſt: the latter were hoed by hand, in the common method, and the other cultivated by the hoeing plough; and when the roots were grown, his lordſhip had an equal quantity of land, which had been ſown in different methods meaſured, and the roots drawn up and weighed, and theſe roots, which had been cultivated by the plough, were ſo much larger than the other, that the crop of one acre weighed a ton and a half more than that of one acre in the other huſbandry.

From the experiments of ſir Digby Legard, in 1762, an account of which was communicated to the Society of Arts, &c. (ſee Mem. Agr. vol. i. p. 350.) it appears, that one pound of *turnep*-ſeed, ſown on four acres, and cultivated by the drill-huſbandry, produced ſixty tons of *turneps*, and ten pounds of ſeed ſown on ſeven acres, and cultivated by the common huſbandry, produced one hundred and forty tons of *turneps*. *Turneps*, he ſays, are particularly ſuited to the ſyſtem of Mr. Tull; but, if introduced as an intermediate crop, ſhould be ſown early, viz. in the beginning of June, that they may attain their full growth, and be removed or fed off in time, to give the ground a due preparation for wheat; he generally drilled a ſingle row of *turneps* on five feet ridges, and the produce was from fifteen to thirty-two tons, according to the goodneſs of the ſoil and the ſeaſon. And twenty tons, he thinks, may be reckoned the mean produce on land worth 15*s*. an acre. From a compariſon of both methods, as ſtated by another writer, it appears, that the drilled crop, with intervals of five feet, was greater than the broad-caſt crop upon an acre, by three tons, ſixteen hundred, three quarters, and fourteen pounds weight.

In the method of drilling, the plants are ſure to come up quickly, becauſe in every row half the ſeed is planted at four inches deep, from which, or even a greater depth, this ſeed will come up well; and the other half is planted exactly over that at half an inch depth, falling in upon the earth that has covered the firſt half. Thus planted, if the ſucceeding weather be ever ſo dry, the deep half of the ſeed will certainly come up; and if it chance to rain much ſoon after the ſowing, then the ſhallow half will be up firſt. The plants may alſo be made to come up at four ſucceſſive times, by mixing the ſeed half new and half old, for the new will be ſure to come up two days, or thereabouts, before the old.

Turnep-ſeed ſhould always be ſown in this manner, in order to its eſcaping the danger of the fly, which otherwiſe often deſtroys whole fields of the young plants; but theſe four chances ſecure it; for though one coming-up ſuffers, another eſcapes it, it being often found, that the ſeed ſown over night had been ruined by the fly, while that ſown the next morning has wholly eſcaped.

When the fly is found likely to devour them, they may be horſe-hoed; this will bury the greateſt part of thoſe animals; or they may be drilled in another row, without new ploughing the land. This fly feeds only on the two firſt or ſeed-leaves of the *turnep*, which are very ſweet; the following leaves are rough, and do not ſuit its taſte; ſo that if the plants eſcape being eaten up while in the ſeed-leaves, they eſcape entirely.

The moſt infallible of all methods of preventing the miſchief from this fly, is to make the ground very fine, and then roll it with a heavy roller acroſs the ridges, after it is drilled; this method cloſes up the cavities in the earth, and prevents the fly's entrance or exit to lay the eggs, hatch, or bring forth the young ones, to prey upon the *turneps*. This rolling always diſappoints the fly, but it ſometimes alſo diſappoints the owner, if he has ſown the crop by hand in a ſcattering manner. Theſe ſeeds, lying near the ſurface, are injured, and the ground, hardened by the rolling, will not let them grow well,

but they become yellow, dwindle, and come to no perfection, unless they have a thorough hoeing, as soon as the rough leaves appear. The drilled *turneps*, being in single rows, with six-foot intervals, may be rolled without danger; for, be the ground ever so hard, the hand-hoe will easily single them out to a proper distance, at the expence of six pence an acre, or less, if not in harvest; and the horse-hoe will plough in those wide intervals to great advantage, whether the season be wet or dry. Three or four ounces of seed in the drill way, answer for as much land as three or four pounds in the hand-sowing; and there is this other advantage, that the plants, all standing in rows, will be easily distinguished, and properly singled out to their due distances, while very young; which is a thing of great advantage, as they thrive much the better for being early separated from their useless neighbours. The six-foot ridges, whereon *turneps* are drilled in single rows, may be left higher than for double-rowed crops; because there will be more earth in the intervals, as the single rows take up less.

Mr. Tull for some time drilled his *turnep*-seed upon six feet ridges, a single row on the middle of each, and found that, in this way, his crops were better than on three feet ridges; but upon farther trial, he found four feet ridges were more proper than six; and at the end of his table of the contents of the Horse-hoeing Husbandry he advises those who have the engine for drilling *turnep*-seed to sow in single rows, on high four feet ridges; but where they are designed for seed, in six feet ridges.

There is no prefixed time for planting *turneps*, because the nature of the soil must be consulted; some land will bring them as forward when planted in August, as other land will when planted in May; but the usual time is the middle between these, that is, about Midsummer. It is a practicable scheme, when *turneps* are planted in rows, with these large intervals, to sow wheat between. In the latter end of September, when the *turneps* are full grown, a ridge is to be ploughed in the middle of each of the intervals, taking the earth to the ridge in such quantity, as only to leave enough with the *turneps* to keep them alive; wheat is to be drilled on this ridge. Toward spring the *turneps* are, in this case, to be pulled up, and carried off the ground. The wheat being now left alone, the land is to be well horse-hoed in the intervals. In spring the wheat may be sown in treble rows, and will afford a good crop. If the *turneps* stand so thick in these single rows as to touch one another, when half grown, provided the intervals between the rows be well horse-hoed, they will yet attain to their full bigness; and they are often found to have thrust one another out of shape, and become oval instead of round.

Sir Digby Legard informs us, that he has generally sown *turneps* in the intervals of his drilled barley, immediately after the last horse-hoeing, about the beginning of July. The land is then reduced to excellent tilth; and nothing more is necessary than to sow the seed pretty thick. The first shower of rain washes it into the ground, and covers it, without the aid of the harrow. The young plants enjoy the benefit of the fresh tilled earth, and, the corn being reaped soon afterwards, the whole field is left for the *turneps* to extend their roots in it. He adds, that he has had nearly as good crops of *turneps* in this way as when the land was occupied by that plant alone.

Mr. Philpot Chambers, a correspondent of the Society of Arts, having in the beginning of March sown a piece of land with long-podded beans, which were both horse-hoed and hand-hoed, as usual, in the summer-time, sowed *turneps* among them towards the end of the July following, and hoed the beans, which served both to clear them of weeds, and to cover the *turnep*-seed. When the *turneps* were up, and sufficiently secured from the fly by the shade of the beans, these were pulled up, and the *turneps* hoed out. The time, he says, of sowing the *turneps* must be left to the discretion of the farmer. About three weeks before the beans are fit to pull is a good time for it; for thus the *turneps* will be strong, and out of danger of the fly: though he never knew any *turneps* eaten by the fly, which were sown among beans. Mem. Agr. vol. i. p. 328. vol. ii. p. 355.

It is best to give the first hoeing alternately; that is, to hoe only every other interval; this keeps them from being stinted, and it proves better thus to give them their food at twice, than to do it all at once.

In horse-hoeing it is not well to come nearer than within three inches of the sides of the rows; but where the *turneps* are planted in double rows, as soon as their roots are grown as large as a finger, the prong-hoe is to be used between the plants; and even in that little space of three inches, left by the horse-hoe, when they are in single rows. Four of the alternate hoeings in the intervals are found, on trial, to be equal in use to four whole hoeings, though they are done at half the expence; for this half-hoeing furnishes the *turneps* with as much nourishment as they require, and it is in vain to give more.

Dry weather is very injurious to *turneps*, when sown in the common way, and only hand-hoed; because the hoe, in this case, does not penetrate deep enough to keep the ground moist; but in horse-hoeing the earth is cut so deep, that it is always kept moist, and a dry season does the crop no hurt. Dung and tillage will, in all cases, do their business quicker than tillage alone. On this principle, *turneps* have more occasion for dung than any other plants, because they have less time to grow.

Twelve pound weight may be esteemed the middle size for the great *turneps*, and they sometimes grow to sixteen or nineteen pound weight. The farmers great interest in them is their size; and it seems evident that every *turnep* in a field may be made to grow to its full standard, or the largest size that nature has allotted it, provided it be properly managed, and nourishment supplied in a due manner. The greatest inconvenience that attends *turnep* husbandry, is, that when they are to be eaten off in the spring, which is their chief use, they do not leave time for bringing the land in tilth for barley; and the loss of a crop of this is more than the gain by the *turneps*; but this is wholly remedied by the horse-hoeing husbandry, in which the land may be almost as well tilled before the *turneps* are eaten off, as afterwards. When the ground has been thus stirred in every part, one ploughing will be sufficient, after the *turneps* are eaten, for the sowing of barley, or any other crop.

If the *turneps* be sown in June, the most experienced farmers will have only thirty plants left to a square perch in the hand-hoeing, finding that if more are left, they starve one another, and the crop will be worse; but in drilling the rows at six foot intervals, there will be at least sixty left to the perch, and these will thrive well, if the soil be rich, and well broken.

Sixty *turneps* to a square perch, at five pound each, which is but a third part of the size of sheep-*turneps* at their full growth, will make a crop of above eighty quarters to an acre.

When *turneps* are planted late upon poor ground, they may be left more numerous; because they will not have the advantage of heat for the hoeing, that would make them grow larger, when set out at greater distances.

The greatest *turnep* improvement of the farmer is for his cattle in winter; one acre of *turneps*, at this season, will maintain more than fifty of meadow or pasture land. Most cattle will eat *turneps*, and they breed milk better than any other food whatever. Sheep always refuse them at first, and, unless they have eaten them while lambs, they will be ready to starve before they will touch them; but as soon as hunger compels them to fall to, they are soon fattened by them. Lambs of three weeks old will scoop and eat them; while those of a year old, which are called *tegs*, will not touch them for three or four days, till almost famished.

In some places, the greatest use of *turneps*, except for fattening oxen and sheep, is for ewes and lambs in the spring, when natural grass is not grown up on poor grounds. Sometimes the farmers are obliged to keep their ewes and lambs upon them till April, though they were run up to seed in the mean time.

There are three manners of spending *turneps* with sheep. See Sheep.

It is a common mistake, says Mr. Miller, that the mutton of sheep fatted with *turneps* is rank and ill-tasted; whereas the best mutton which this country affords is thus fatted, and the rank mutton, the fat of which is yellow, is produced by the low marshy lands of Lincolnshire, and other rank pastures. *Turneps* are always carried off the field, when they are intended to fatten the larger sorts of cattle, and they should be cut in pieces, lest they choke themselves with the whole ones. Instruments of a peculiar structure have been contrived, with this view, for slicing *turneps*. These roots serve for feeding and fattening, not only sheep, oxen, and cows, but likewise hogs, which will eat them greedily, and thrive apace: they will eat them raw, but it is better to boil them when the hogs are to be fattened.

In order to save good *turnep*-seeds, some of the fairest roots should be transplanted in February, at the distance of two feet, and the ground cleared from weeds: as the seed ripens, it should be well guarded from birds, and when ripe, the plants may be cut and dried in the sun; after which it may be threshed out, and preserved for use.

There have been many receipts for preserving *turneps* from the fly: the following have been tried by Mr. Miller with success; viz. steeping the seeds in water, mixed with flour of brimstone, so as to make it strong of the brimstone; or steeping it in water mixed with a

quantity of the juice of horse-aloes. The sowing of soot or tobacco-dust over the young plants, as soon as they appear above the ground, has been found serviceable; and, indeed, whatever will add vigour to the young plants will prevent their being destroyed by the fly, which never attacks them till they are stinted in their growth. Some have scattered slacked lime over them every morning before the dew was off. Mr. Reynolds recommends mixing the *turnep*-seed with long-top radish seed, which the flies much admire; the radish leaves will supply these insects till the *turnep* plants are sufficiently grown to escape them. But if they are numerous, he advises to run a light roller over them night and morning, whilst the dew remains, which will either lick them up or destroy them. Crops of *turneps* are sometimes destroyed by caterpillars, when they are grown so large as to have six or eight leaves on a plant. The surest method of destroying these is to turn a flock of hungry poultry early in the morning into the field, which will devour the insects, and clear the *turneps*. Those *turneps* that are sown in drills are less in danger than others, because the ground between the rows being well stored, the plants will be kept growing, and be in no danger of suffering from these insects, which attack only such as are stinted. Tull's Horse-hoeing Husbandry, p. 44, &c. Miller's Gard. Dict.

Turneps are accounted a salubrious food; demulcent, detergent, somewhat laxative and diuretic, but liable in weak stomachs to produce flatulencies, and prove difficult of digestion; the liquor, pressed out from them after boiling, is sometimes used medicinally, in coughs and disorders of the breast. The seeds have been accounted alexipharmic or diaphoretic; they have no smell, but discover to the taste a mild acrimony, seemingly of the same nature with that of mustard-seed, though far weaker. Lewis.

Stealing or otherwise destroying *turneps*, when growing, is by statute punishable criminally, by whipping, small fines, imprisonment, and satisfaction to the party wronged, according to the nature of the offence. By 13 Geo. III. c. 32. the offender shall, on conviction before one justice, by confession on oath of one witness, forfeit such sum, not exceeding 10*s*. over and above the value of the goods stolen, as to the justice shall seem meet; and in default of payment, be committed to hard labour, for a time not exceeding one month.

TURNEP, *French*, the name by which some call the *napus* of botanical writers. See NAPUS, and TURNEP.

TURNEP-*cabbage*, in *Botany*. See CABBAGE.

TURNEP-*rooted cabbage*. See CABBAGE.

TURNER's *cerate*. See CERATUM *epuloticum*.

TURNERA, in *Botany*, a genus of the *pentandria trigynia* class. Its characters are these: the empalement of the flower is funnel-shaped, of one leaf, having an oblong, cylindrical, angular tube, and is cut into five segments; the flower has five heart-shaped, pointed, plain petals, inserted in the tube of the empalement, terminated by acute-pointed, erect summits, and a conical germen, supporting three slender styles, crowned by hairy, many-pointed stigmas; the germen afterward turns to an oval capsule with one cell, which opens at the top with three valves, and contains several oblong, obtuse seeds. Miller enumerates two, and Linnæus four species.

TURNESOLE, or TURNSOLE, *heliotropium*, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the empalement of the flower is of one leaf, tubulous at the bottom, and cut into five segments at the brim; the flower hath one petal, with a tube of the length of the empalement, spreading flat above, where it is cut into five parts, which are alternately larger than the other; the chaps of the tube are closed, and have five prominent scales, joined in form of a star; it hath five short stamina, terminated by small summits, and four germina at the bottom of the tube, with one slender style of the length of the stamina, crowned by an indented stigma; the germina afterward become so many seeds sitting in the empalement. Linnæus enumerates eight, and Miller eleven species.

Some have translated *turnesole* by the English word *sun-flower*; which has led many to suppose that the great yellow sun-flower, which we keep in gardens, was the plant that afforded the *turnesole* colour: but this is a mistake; and it is to be observed, that the true *turnesole* plant, or *heliotropium tricoccum*, is very common in the fields of France, especially about Montpelier, and in Germany, but does not grow wild with us in England.

The juice of the berries of the *turnesole*, rubbed upon paper or cloth, at the first appears of a fresh lovely green, but presently changes into a kind of bluish purple. It is said that the common blue paper receives its colour from this juice. The same cloth, afterwards wet in water, and wrung out, will turn the water into a claret-colour; and it is to be observed, that the rags of cloth tinctured by this juice, and turned red by acids, are usually called *turnesole* in the druggists shops, and employed for colouring wines and other liquors. M. Nissole, of the French Academy of Sciences, says, that the colouring juice is obtained, not from the berries, but from the tops of the plant, gathered in August, ground in mills, and then committed to the press. The juice is exposed to the sun about an hour; the rags dipt in it, dried in the sun, moistened by the vapour which arises during the slacking of quicklime with urine, then dried again in the sun, and dipt again in the juice. The Dutch, and others, are said to prepare these rags and *turnesole* in the mass from other ingredients, of which ARCHIL is a principal one. Boyle's Works abr. vol. ii. p. 19. Neumann's Chem. by Lewis, p. 433.

The principal use of this plant is in dyeing: in order to which, the juice is inspissated and prepared with calx and urine, into blue cakes; which are used also with starch, instead of smalt.

The lixivium of this plant in lime-water and urine, or in the volatile spirit of wine, turns marble blue. See *Colouring of* MARBLE.

TURNETUM, in our *Old Law-Books*, a duty paid to the sheriff for holding his TURN, or county-court.

TURNING, a branch of sculpture; being the art of fashioning hard bodies, as brass, ivory, wood, &c. into a round, or oval form, in a lathe.

Turning is performed by putting the substance to be *turned* upon two points, as an axis, and moving it about on that axis; while an edge-tool, set steady to the outside of the substance, in a circumvolution thereof, cuts off all the parts that lie farther off the axis, and makes the outside of that substance concentric to the axis.

The invention of *turning* appears to be very ancient.— Some indeed, to do honour to late times, will have it brought to perfection by the moderns; but if what Pliny, and some other ancient authors relate, be true, that the ancients *turned* those precious vases, enriched with figures and ornaments in relievo, which we still see in the cabinets of the curious; it must be owned, that all that has been added in these ages, makes but a poor amends for what we lost of the manner of *turning* of those times.

The principal instruments used in *turning*, beside the lathe, are chissels and mandrels of various forms; the description whereof see under their proper articles.

TURNING-*evil*, in *Cattle*, a disease that causes them frequently to turn round in the same place. It is also called the *sturdy*.

The common remedy, recommended by Mr. Markham, is to throw the beast down, and bind him; then to open his skull, and take out a little bladder, filled with water and blood, which usually lies near the membrane of the brain, and then gradually heal the wound. Boyle's Works abr. vol. i. p. 87.

TURNING *palisades*. See PALISADE.

TURNING *to windward*, in *Sea Language*, denotes that operation in sailing wherein a ship endeavours to make a progress against the direction of the wind, by a compound course, inclined to the place of her destination. This method of navigation is otherwise called *plying*. See TACKING.

TURN-*up compasses*. See COMPASSES.

TURNO *vicecomitum*, a writ that lies for those that are called to the *sheriff's turn*, out of their own hundred.

TURNPIKE, a gate set up across a road, watched by an officer for the purpose, in order to stop travellers, waggons, coaches, &c. to take toll of them, or money towards repairing, or keeping the roads in repair.

There are several statutes, which have established regulations relating to *turnpike* roads, the principal of which, beside those recited under HIGHWAY, are as follow. No person shall be capable of acting as a trustee in superintending *turnpike*-roads, who is not possessed of lands, &c. of the clear yearly value of 40*l*. or personal estate to the value of 800*l*. to which purpose he makes oath before two trustees, or heir apparent of a person possessed of an estate in land of the clear yearly value of 80*l*. No alehouse keeper, nor persons retailing liquors of any kind, are capable of acting as trustees, or holding any place under them, or collecting the toll; but they are not precluded from farming the tolls, provided some other person collects them. No gate-keeper, or person renting the tolls, and residing in the toll-house, shall gain a parish settlement, nor shall the tolls, or toll-house, be assessed to the poor rate, or any other public or parochial levy. Any gate-keeper, permitting a violation of the orders pertaining to carriages and horses, and not proceeding within one week for the recovery of forfeitures, shall forfeit 40*s*.; and both he, and the surveyor, shall render upon oath, when required by written notice from the trustees, an account of all money received, on pain of 5*l*.; and all officers shall deliver up

their books, &c. relating to the execution of their offices, within ten days after written notice, on pain of 20*l.*; and all perfons concerned in the execution of acts relating to *turnpike*-roads, neglecting their duty, fhall forfeit 10*l.* The truftees, whofe meetings are affembled by ten days notice affixed on the toll-gates, or other confpicuous places, and adjourned for no longer time than three calendar months, or any five of them, may caufe weighing engines to be erected at the toll-gates, order the weighing of carriages and their loads, and take an additional toll for every hundred weight, over and above the following weights; viz. for every four-wheel carriage, having the fellies of the wheels fixteen inches broad, eight tons in fummer, and feven in winter; for every waggon and wain, with axles of different lengths, having the diftance of the nearer pair of wheels on the ground not more than four feet two inches, and the diftance of the other pair fuch, that the fore and hind wheels fhall roll only a fingle furface fixteen inches wide at the leaft on each fide of the carriage, and the fellies nine inches from fide to fide, fix tons ten hundred in fummer, and fix tons in winter; for every four-wheeled carriage, having the bottom of the fellies of the wheels nine inches broad, fix tons in fummer, and five tons ten hundred in winter; for every cart, having fellies of nine inches, three tons in fummer, and two tons fifteen hundred in winter; for every waggon, having the fellies of the wheels fix inches broad, four tons five hundred in fummer, and three tons fifteen hundred in winter; for every waggon, rolling a furface of eleven inches, five tons ten hundred in fummer, and five tons in winter; for every cart of the fame dimenfions, two tons twelve hundred in fummer, and two tons feven hundred in winter; for every waggon, having the bottom of the fellies of the wheels of lefs breadth than fix inches, three tons ten hundred in fummer, and three tons in winter; and for every cart of the fame dimenfions, one ton ten hundred in fummer, and one ton feven hundred in winter: fummer, in all thefe cafes, being determined from May 1 to October 31, and winter from November 1, to April 30. The additional toll fhall be as follows; viz. for the firft and fecond hundred of over-weight, the fum of 3*d.* for each hundred; for every hundred above two, and not exceeding five hundred, 6*d.*; for every hundred above five, and not exceeding ten hundred, 2*s.* 6*d.*; for every hundred above ten, and not exceeding fifteen hundred, 5*s.*; and for every hundred above fifteen hundred, 20*s.* The truftees, however, of the feveral *turnpike*-roads within ten miles of London, Weftminfter, and Southwark, are allowed to lower thefe additional tolls at pleafure. The toll-taker offending againft thefe regulations, incurs a forfeiture of 5*l.*; but the preceding regulations of weight do not extend to any carriage employed in hufbandry, and carrying manure for land, hay, ftraw, fodder, or corn unthrafhed; except hay or ftraw carried for fale; nor fhall any toll be taken for horfes belonging to officers or foldiers upon their march, or upon duty, or for any horfes, cattle, or carriages, employed in carrying their arms or baggage, &c. It is required, that a table of the feveral tolls be put up at every toll-gate. For the encouragement of broad wheels, the truftees are empowered to reduce the toll of carriages, having wheels fix inches broad, fo that it may not be greater than that which is taken for four-wheeled carriages drawn by four horfes; and for carts, having the fellies of their wheels fix inches broad, no more than for carts drawn by three horfes; but for every carriage, having the fellies of the wheels of lefs breadth than fix inches at the bottom, and for the horfes, &c. one half more than the tolls payable for the fame refpectively, except carriages carrying corn in the ftraw, hay, ftraw, fodder, dung, lime for the improvement of land, or other manure, and implements of hufbandry. The fellies of the wheels of carriages, entitled to the above exemptions, and the tire upon them, are required to be fo flat, as not to deviate more than one inch from a flat furface And all carriages, moving upon rollers fixteen inches broad on each fide, with flat furfaces, fhall pay only fo much toll as fhall not exceed half of the full toll payable for carriages having the fellies of the wheels fix inches broad, and not rolling a furface of fixteen inches on each fide; and half toll fhall be paid for waggons having the fellies of the wheels nine inches broad, and rolling a furface of fixteen inches on each fide. Thefe regulations do not extend to any chaife marine, coach, landau, berlin, chariot, chaife, chair, calafh, or hearfe; nor to the carriage of ammunition or artillery for his majefty's fervice; nor to any carriage drawn by one horfe or two oxen; nor to any carriage having the fellies of the wheels nine inches broad, and laden with one block of ftone or marble, one cable rope, and one piece of metal or timber; and no toll fhall be paid at any *turnpike*-gate for carriages employed in carrying materials for the repair of any *turnpike*-road, or public highway. No four-wheeled carriage, having the fellies of the wheels of lefs breadth than fix inches, fhall pafs on any *turnpike*-road with more than four horfes. For other regulations, relating to the number of horfes, fee HIGHWAY.

Any carriage may be drawn with any number of horfes upon a *turnpike*-road, where a weighing engine fhall be erected, provided the carriage be weighed at fuch engine; and the truftees may allow for hills, the rife of which fhall be more than four inches in a yard, fuch number of horfes as they fhall think neceffary, not exceeding ten for waggons with nine-inch wheels, nor fix for carts with nine-inch wheels; and not exceeding feven for waggons with fix-inch wheels, nor five for carts with fix-inch wheels; and not exceeding five for waggons with wheels of lefs breadth than fix inches, nor four for carts of fuch dimenfions. There is alfo an exception in favour of carriages that are drawn in deep fnow or ice. No carriages, with the fellies of the wheels of lefs breadth than nine inches, fhall be allowed to pafs upon any *turnpike*-road, if the fame fhall be drawn by horfes in pairs; except fuch, having the breadth of the fellies fix inches, authorized by feven or more truftees, and carriages drawn by two horfes only. The penalty on conviction, by confeffion or oath of one witnefs, is a forfeiture not exceeding 5*l.* nor lefs than 10*s.* The penalty of evading the tolls, by unloading goods, is 5*l.*; by turning out of the road, for the owner, any fum not exceeding 5*l.* nor lefs than 20*s.*; but for the driver, if he be not the owner, any fum not exceeding 50*s.* nor lefs than 10*s.*; by taking out horfes, 5*l.*; or by taking the benefit of any exemptions fraudulently, a fum not exceeding 5*l.* nor lefs than 40*s.* Exemptions in favour of cattle going to or from water, or pafture, fhall extend only to fuch as fhall be driven from one parifh to the next adjoining, or that fhall not pafs upon the *turnpike* road more than the fpace of two miles. *Turnpike*-roads are kept in repair by the ftatute-duty, required by the feveral acts, or if this be infufficient, by contracting for labour, &c. The furveyor of any *turnpike*-road, who fhall fuffer to remain in any part, within ten feet on either fide of the middle of it, for four days, any heap of ftones, rubbifh, &c. obftructing the paffage of it, fhall forfeit 40*s.*; and any perfon encroaching on it by a ditch, fence, &c. fhall forfeit 40*s.*; and the truftees may direct profecution by indictment for any nuifance, at the expence of the tolls. See HIGHWAY.

If any perfon fhall wilfully or malicioufly deftroy any *turnpike*-gate, poft, rail, wall, chain, bar, or other fence, fet up to prevent paffengers from paffing without paying toll, or any houfe erected for the ufe of fuch gate, or any weighing engine, or refcue any perfon in cuftody for fuch offences, he fhall be found guilty of felony, and tranfported for feven years, or committed to prifon for any time not exceeding three years. The indictment for fuch offences may be inquired of, heard, and determined in any adjacent county; and the hundred fhall anfwer damages, as in cafes of robbery. If the truftees erect a gate where they have no power, the juftices upon complaint may order the fheriff to remove it. As for direction ftones, &c. fee HIGHWAY.

The truftees are empowered to let the tolls to farm, in confequence of public notice, to the beft bidder; and if the farmer of the tolls fhall take a greater or lefs toll than he ought to do, he fhall forfeit 5*l.* and the contract; and every other gate-keeper, offending in the fame way, fhall forfeit 40*s.* The truftees may alfo leffen the tolls during fuch time as they fhall think proper, provided that the perfons entitled to five-fixths of the money remaining due upon fuch tolls confent. The penalty for obftructing the execution of any *turnpike* act is a forfeiture of a fum not exceeding 10*l.* nor lefs than 40*s.* to be paid to the furveyor for the ufe of the road, or commitment to the common gaol, or houfe of correction, for any time not exceeding three months, unlefs the money be fooner paid. Perfons aggrieved by proceedings in the execution of *turnpike* acts may appeal, with previous notice, to the general quarter feffions, when the juftices fhall determine the appeal, and award cofts, &c. But all actions are limited to thirty-three calendar months after the fact committed, and to the county where the defendant refides, or the fact was done; and the defendant may plead the general iffue, and if he prevails in the action, have treble cofts. 13 Geo. III. cap. 84. 14 Geo. III. cap. 82. 16 Geo. III. cap. 39. 17 Geo. III. cap. 16. 18 Geo. III. cap. 28. cap. 63. Burn's Juftice, art. *Highways.*

The firft *turnpike* road erected by law was A. D. 1663. 16 Car. II. cap. 1.

TURNPIKE is alfo ufed, in the *Military Art*, for a beam ftuck full of fpikes, to be placed in a gap, a breach, or at the entrance of a camp, to keep off an enemy. See CHEVAL *de frife*.

TURNSOLE. See TURNESOLE.

TURNSPIT, *versator*, in *Zoology*, a variety of the DOG, which belonged, in the arrangement of Dr. Caius, to the class of degeneres, curs, or mongrels.

TURNSTONE, in *Ornithology*, the English name of a bird, the TRINGA *morinellus* of Linnæus, called by authors *morinellus marinus*, or sea-dotterel.

It is a little larger than the blackbird; its head moderately thick, and its body of a longish shape; its beak a finger's breadth long, thick and whitish at the base, and sharp and black at the point; and its head, neck, shoulders, wings, and the upper part of its breast, are of a brownish colour; its throat and forehead are ash-coloured; the back and rump are white; the middle of its back is marked with a very large triangular black spot; the tail consists of twelve feathers, the lower half white, the upper black, and the tips white; the quill-feathers are dusky, but from the third or fourth the bottoms are white, increasing to about the nineteenth, when the feathers are entirely of that colour; its legs are short, and of a reddish yellow or orange colour.

These birds take their name from their method of searching for food, by turning up small stones with their strong bills, to get at the insects that lurk under them. Ray and Pennant.

Mr. Pennant mentions another species, which is the *turnstone* from Hudson's Bay, and the TRINGA *interpres* of Linnæus; often shot in the north of Scotland and its islands, and also in North America. This bird is of the size of a thrush; the forehead, throat, and belly, are white; the breast black; the neck surrounded with a black collar, whence another bounds the sides of the neck, and passes over the forehead; the head and lower part of the neck behind white; the first streaked with dusky lines; the back ferruginous, mixed with black; the coverts of the tail white, crossed with a black bar; the tail black, tipt with white; and legs rather short, and of a full orange.

TURONILLA, in *Ichthyology*, a name given by some authors to the common little prickly fish called the STICKLEBACK, or *barnstickle*.

TURPENTINE, *terebinthina*, a transparent sort of resinous juice, flowing either naturally, or by incision, from several unctuous and resinous trees: as the terebinthus, larch, pine, fir, &c.

Medical writers distinguish four kinds of *turpentines*; as that of Chio, or Cyprus, that of Venice, that of Strasburg, and the common *turpentine*.

The *turpentine* of Chio, or Cyprus, which is the finest genuine kind, and that which gives the denomination to all the rest, is generally about the consistence of thick honey, very tenacious, clear, and almost transparent, of a white colour, with a cast of yellow, and frequently of blue, of a warm, pungent, bitterish taste, and a fragrant smell, more agreeable than that of any of the other *turpentines*.

This is the produce of the common terebinth, or *pistachia terebinthus* of Linnæus (see MASTICH-*tree*), an evergreen bacciferous tree or shrub, growing spontaneously in the eastern countries, and in some of the southern parts of Europe. The *turpentine* brought to us is extracted in the islands whose name it bears, by wounding the trunk and branches a little after the buds have come forth: the juice issues thin and clear as water, and by degrees thickens into the consistence in which we meet with it. A like juice, exuding from this tree in the East, inspissated by a slow fire, is said by Kæmpfer to be used as a masticatory by the Turkish women, for preserving the teeth, sweetening the breath, and promoting appetite.

The *turpentine* of Venice is usually thinner than any of the other sorts, of a clear whitish or pale yellowish colour, a hot, pungent, bitterish, disagreeable taste, and a strong smell, without the aromatic flavour of the Chian kind. The true Venice *turpentine* is said to be obtained from the LARCH-*tree*, or *pinus larix* of Linnæus, growing in great abundance on the Alps and Pyrenees, and not uncommon in the English gardens. For this purpose incisions are made at about two or three feet from the ground into the trunk of the trees, and into these they fix narrow troughs, about twenty inches long. The end of these troughs is hollowed like a ladle; and in the middle is a small hole bored, through which the *turpentine* runs into a receiver placed below it. The people who gather it visit the trees morning and evening, from the end of May to September, to collect the *turpentine* out of the receivers. When it flows out of the tree, it is clear, like water, and of a yellowish white; but as it grows older, it thickens, and becomes of a citron colour. Though this kind of *turpentine* bears the name of Venice, it is not the produce of the Venetian territories: it is brought from some parts of Germany, and one greatly resembling it, as it is said, from New England. It is also procured in great abundance in the neighbourhood of Lyons, and in the valley of St. Martin, near Lucern, in Switzerland.

The *turpentine* flowing naturally, and called by the peasants *bijon*, is a kind of balsam, not inferior in virtue to that of Peru. That drawn by incision, after the tree has ceased to yield spontaneously, is also of considerable use in several arts, and it is even of this that varnish is chiefly made. It must be chosen white and transparent; and care should be taken it have not been counterfeited with some other *turpentine*.

In the shops *turpentine* of Venice is often supplied by a composition of rosin, and the distilled oil of common *turpentine*.

Turpentine of Strasburg is generally of a middle consistence between the two former, more transparent, and less tenacious than either, in colour yellowish brown, in smell more agreeable than any of the other *turpentines*, except the Chian; in taste the most bitter, yet least acrid. This juice is extracted, in different parts of Germany, from the silver and red fir, by cutting out, successively, narrow strips of the bark, from the height which a man can reach, to within two feet of the ground. In some places, a resinous juice is collected from certain knots under the bark; this, called *lacryma abiegna*, and *oleum abietinum*, is accounted superior to the *turpentine*. Neither this *turpentine*, nor any thing under its name, is at present common in the shops.

Common turpentine is about the consistence of honey, of an opake, brownish, white colour, the coarsest, heaviest, and in smell and taste the most disagreeable, of all the kinds of *turpentine*. It is obtained from the wild PINE, which is extremely resinous; insomuch that, if not evacuated of its juice, it often swells and bursts. The juice, as it issues from the tree, is received in trenches made in the earth, and afterwards freed of its grosser impurities by colature through wicker baskets. The cones of the tree appear to contain a resinous matter, of a more grateful kind than that of the trunk; distilled while fresh, they are said to yield a fine essential oil, called by the Germans *carpathicum oleum*, much superior to that of the *turpentines*.

All these juices dissolve totally in rectified spirit, but give out little to watery menstrua: they become miscible with water into a milky liquor, by the mediation of the yolk or white of an egg, and more elegantly by mucilages. Distilled with water, they yield a considerable quantity of a subtile, penetrating, essential oil, vulgarly called spirit. Neumann says, that sixteen ounces of Venice *turpentine*, being distilled with water, yielded four ounces and three drams of essential oil; and the same quantity, distilled without water, yielded with the heat of a water bath, two ounces only. The essential oil cannot without great difficulty be dissolved in spirit of wine: one part of the oil may be dissolved in seven parts of rectified spirit of wine; but on standing a while, the greatest part of the oil separates, and falls to the bottom. After distillation of *turpentine* with water, a yellow or blackish resin remains in the still, which is the common ROSIN of the shops. See *Burgundy* PITCH.

The essential oil, redistilled by itself in a retort, with a very gentle heat, becomes more subtile, and in this state is called ethereal; a thick matter remaining behind, called balsam of turpentine. A like balsam is also obtained by distilling, with a stronger fire, the common resin; from which there arises, first, a thin yellow oil, and afterwards the thicker dark-reddish balsam, a blackish resin, called COLOPHONY, remaining in the retort.

All the *turpentines* are hot stimulating corroborants and detergents. They are given, where inflammatory symptoms do not forbid the use of them, from half a scruple to half a dram and upwards, for cleansing the urinary passages, and internal ulcerations in general, and in laxities of the seminal and uterine vessels. They seem to act in a peculiar manner on the urinary organs, impregnating the water with a violet smell, even when applied externally, particularly the Venice sort. This last is accounted the most powerful as a diuretic and detergent, and the Chio and Strasburg as corroborants. They all loosen the belly, but the Venice most; and on this account they are supposed by Riverius and others to be less hurtful than such irritating diuretics, as are not accompanied with that advantage. Dr. Cullen remarks, that terebinthinate glysters, in obstinate costiveness, are much preferable to saline, as being more certain and durable.

The common *turpentine*, as being the most offensive, is rarely given internally; its principal use is in some external applications, among the farriers, and for the distillation of the oil.

The oil is a most potent, stimulating, detergent diuretic. It is sometimes given, in doses of a few drops, in rheumatisms

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matiſms and fixed pains of the joints; and ſome have ventured on much larger quantities. Cheyne recommends (Eſſ. on the Gout, p. 119, ed. 10.), as a perfect cure for SCIATICAS, though of many years ſtanding, from one to four drams of the ethereal oil, to be taken with thrice its quantity of honey, in a morning faſting, with large draughts of ſack-whey after it, and an opiate at bed-time: this medicine is to be repeated, with the occaſional intermiſſion of a day, if daily repetitions cannot be borne, for four or five days, or eight at fartheſt. It appears, however, ſays Dr. Lewis, highly imprudent to venture on ſuch large doſes at once of a medicine ſo very hot and ſtimulating. Boerhaave, after recounting, not without ſome exaggeration, its ſtyptic, anodyne, healing, antiſeptic, and diſcutient virtues, when applied hot externally, and its aperient, warming, ſudorific, and diuretic qualities, when taken internally, adds, that it muſt be uſed with great caution; that when taken too freely, it affects the head, excites heat and pain therein, and, violently urging a diabetes, brings on a flux of the ſemen and of the liquor of the proſtates; and that in venereal runnings, in which it has by ſome been commended, it tends to inflame the parts, and increaſe the diſorder.

The *oil of turpentine*, taken in too large a doſe, hath often very bad conſequences; ſuch as a ſtrangury, bloody urine, and its total ſuppreſſion, with a fever, violent thirſt, and vomiting.

In the Medic. Eſſ. Edinb. vol. ii. art. 5. we have an account of ſuch symptoms produced by the taking of two drams of this oil in warm ale. The patient was cured by a warm bath, and drinking plentifully of Fuller's *emulſio Arabica*.

This oil is generally uſed as a drier, to mix with the other oils; for which purpoſe it has greatly the advantage of *drying* OIL, with regard to colour, as it is perfectly tranſparent and white. It is uſed without any other preparation than mixing it, either alone or together with drying oil, with the other oils and colours.

Turpentine is ſometimes uſed with other bodies, to render ſpirit of wine a fit vehicle for colours.

The balſam and the inſpiſſated reſins are uſed chiefly externally: the balſam is leſs pungent than the oil, and the reſins much leſs ſo than the *turpentines* in ſubſtance. The common yellow reſin, in taſte conſiderably bitter, is ſometimes given as an internal corroborant, in preference to the *turpentines* themſelves, as being diveſted of the ſtimulating oil. Lewis's Mat. Med.

Turpentine may be of uſe to preſerve the bodies of inſects. Mr. Boyle took clear Venice *turpentine*, and evaporating to two thirds, obtained a reddiſh tranſparent gum, clear of bubbles, eaſily ſoluble by heat, and as eaſily rendered brittle by cold. Having firſt pulverized it, he melted it for uſe, with a gentle heat, and dipped the body to be preſerved ſeveral times therein, till it acquired a caſe of due thickneſs.

TURPENTINE, *balſam, oil, and ſpirit of*. See TURPENTINE *ſupra*.

TURPENTINE-*tree*. See MASTICH-*tree*.

This tree, beſides its proper fruit which ſucceeds the flowers in the uſual way, is remarkable for producing what authors of little curioſity have named another fruit, called its *horn*. This horn is a membranous production, of the length and thickneſs of a man's finger; and what ſurpriſed thoſe authors who eſteemed it a ſort of pod, was to find that it produced not ſeeds, but living animals, which they called flies.

The true hiſtory of this horn is, that it grows from the ſurface of the leaves, not from the ſtalks in the manner of fruit, and is no natural production of the tree, but a mere accidental thing, occaſioned by the wound of an inſect on the leaf.

A certain ſpecies of animals called pucerons, is peculiarly fond of the juices of the *turpentine*-tree, and always takes its abode upon its leaves: and theſe horns are produced in the ſame manner with the galls of other plants. See PUCERON.

TURPETH. See TURBITH.

TURQUOIS. See TURCOIS.

TURREBA, the *earth-apple*, in *Natural Hiſtory*, a name given by the people of Guinea, and ſome other parts of Africa, to a very fine kind of truffle, which they find in great plenty in their barren deſarts, four or five inches under the ſand.

TURRETS, *moveable*, in the *Roman Art of War*, were of two ſorts, the leſs and the greater: thoſe of the leſſer ſort were about 60 cubits high, with ſquare ſides, 17 cubits broad; they had five or ſix, and ſometimes ten ſtories or diviſions, each of which were open on all ſides. The greater *turrets* were 120 cubits high and 23 cubits ſquare, containing ſometimes 15, ſometimes 20 diviſions. They were of great uſe in making approaches to the walls, the diviſions being able to carry ſoldiers with engines, ladders, caſting bridges, and other neceſſaries. The wheels on which they moved were contrived to be within the planks, to defend them from the enemy, and the men who were to drive them forwards ſtood behind, where they were moſt ſecure; the ſoldiers within were protected by raw hides thrown over the *turrets*, and guarding thoſe parts that were moſt expoſed.

TURRITIS, *tower-muſtard*, in *Botany*. See *Tower*-MUSTARD.

TURSIO, in *Ichthyology*, a name by which Bellonius, Scaliger, and ſeveral others, have called the *phocæna* or PORPESSE, diſtinctively from the dolphin, with which it is confounded by the vulgar.

TURTLE, in *Ornithology*. See DOVE.

TURTLE, in *Ichthyology*, the name by which we commonly call the great ſea-TORTOISE.

TURTLE-*ſhell*. See TORTOISE and TORTOISE-*ſhell*.

TURTUR, in *Ornithology*. See DOVE.

TURTUR, in *Ichthyology*, a name given by Paulus Jovius, and ſome other writers, to the fiſh called the PASTINACHA *marina*.

TURTUR, the *turtle-ſhell*, in *Natural Hiſtory*, the name given by the collectors of ſhells to a very beautiful ſpecies of MUREX, common in the cabinets, but not found any where on the ſhores. This is owing to its having greatly altered its appearance in poliſhing; for it is no other than the white and brown-mouthed murex, which is common in its rough ſtate, with its outer coat taken off.

TURUNDA, in *Medicine* and *Surgery*, *tent*, *pellet*, or *pencil*; a piece of lint thruſt into a wound, ulcer, or other cavity. See TENT.

TUSCAN, in *Architecture*, the firſt, ſimpleſt, and moſt maſſive of the five ORDERS. See *Tab. Archit. fig.* 24.

The *Tuſcan order* takes its name from an ancient people of Lydia, who, coming out of Aſia to people Tuſcany, firſt executed it in ſome temples, which they built in their new plantations.

Vitruvius calls the *Tuſcan* the *ruſtic order*; with whom agrees M. de Cambray, who, in his Parallel, ſays, it ought never to be uſed but in country-houſes and palaces. M. le Clerc adds, that in the manner Vitruvius, Palladio, and ſome others have ordered it, it does not deſerve to be uſed at all. But in Vignola's manner of compoſition, he allows it a beauty, even in its ſimplicity; and ſuch as makes it proper not only for private houſes, but even for public buildings, as in the piazzas of ſquares and markets, in the magazines and granaries of cities, and even in the offices and lower apartments of palaces.

The *Tuſcan* has its character and proportions, as well as the other orders; but we have no ancient monuments to give us any regular *Tuſcan* pillar for a ſtandard.

M. Perrault obſerves, that the characters of the *Tuſcan* are nearly the ſame with thoſe of the Doric; and adds, that the *Tuſcan* is, in effect, no other than the Doric, made ſomewhat ſtronger, by ſhortening the ſhaft of the column; and ſimpler, by the ſmall number, and largeneſs of the mouldings.

Vitruvius makes the whole height of the order 14 modules, wherein he is followed by Vignola, M. le Clerc, &c. Serlio only makes it 12. Palladio gives us one *Tuſcan* profile, much the ſame as that of Vitruvius; and another too rich; on which ſide Scamozzi is likewiſe faulty. Hence it is, that that of Vignola, who has made the order very regular, is moſt followed by the modern architects. See COLUMN.

Of all the orders, the *Tuſcan* is the moſt eaſily executed, as having neither triglyphs nor dentils, nor modillions to cramp its intercolumns. On this account the columns of this order may be ranged in any of the five manners of Vitruvius, viz. the pycnoſtile, ſyſtile, euſtile, diaſtile, or aræoſtile. For the parts and members of the *Tuſcan* order, their proportions, &c. ſee CAPITAL, BASE, PEDESTAL, FREEZE, &c.

TUSCULAN, in *Matters of Literature*, is a term which frequently occurs in the phraſe *Tuſculan queſtions*. Cicero's *Tuſculan Queſtions* are diſputations on ſeveral topics in moral philoſophy, which that great author took occaſion to denominate from *Tuſculum*, the name of a country ſeat, or villa, where they were compoſed, and where he lays the ſcene of the diſpute.

They are compriſed in five books; the firſt on the contempt of death; the ſecond of enduring pain; the third on aſſuaging grief; the fourth on the other perturbations of the mind; and the laſt, to ſhew, that virtue is ſufficient to a happy life.

TUSHES, in the *Manege*, are the fore-teeth of a horſe, ſeated beyond the corner teeth, upon the bars, where they ſhoot forth on each ſide of the jaws, two above, and two below, about the age of three, three and half,

and sometimes four; and no milk or foal-teeth ever come up in the place where they grow. See TEETH.

TUSK, in *Carpentry*, a bevel-shoulder, made to strengthen the iron of the joist, which is let into the girder.

TUSK, in *Zoology*, is used to denote the long tooth of a fighting animal; and in the same sense with TUSHES, as applied to other animals besides horses.

TUSSILAGO, *Coltsfoot*, in *Botany*. See COLTSFOOT.

TUSSIS. See COUGH.

TUT, in *Armory*, &c. an imperial ensign of a golden globe, with a cross on it.

TUT-*bargain*, among the *Miners*, denotes a bargain by the lump; as when they undertake to perform a piece of work at a fixed price, however it may prove.

TUTELARY, TUTELARIS, one who has taken something into his patronage and protection.

It is an ancient opinion, that there are *tutelary* angels of kingdoms and cities, and even of particular persons, called *guardian angels*.

The ancient Romans, it is certain, had their *tutelary* gods, whom they called PENATES. And the Romish church to this day, hold an opinion not much unlike it: they believe that every person, at least every one of the faithful, has, from the time of his birth, one of those *tutelary* angels attached to his person to defend him from all temptations; and it is on this, principally, that their practice of invoking angels is founded.

F. Antony Macedo, a Portuguese Jesuit of Coimbra, has published a large work in folio on the *tutelary* saints of all the kingdoms, provinces and great cities of the Christian world; Divi Tutelares orbis Christiani, at Lisbon, 1678.

TUTENAG, a name given in India to the semi-metal ZINC. It is also sometimes applied to denote a white metallic compound, brought from China, called also *Chinese*, or *white* COPPER, the art of making which is not known in Europe. It is the best imitation of silver which has been made: it is very tough, strong, malleable, may be easily cast, hammered, and polished; and the better kinds of it, when well manufactured, are very white, and not more disposed to tarnish than silver is.

Three ingredients of this composition may be discovered by analysis, viz. copper, zinc, and iron.

TUTOR, in the *Civil Law*, is one chosen to look to the person and estate of children left by their fathers and mothers in their minority. See GUARDIAN.

By the custom of Normandy, the father is the natural *tutor* of his children. A person nominated *tutor*, either by testament, or by the relations of the minor, is to decline that office, if he have five children alive; if he have any other considerable *tutorage*; if he be under twenty-five years of age; if he be a priest, or a regent in an university; or if he have any law-suit with the minors, &c.

The marriage of a pupil, without the consent of his *tutor*, is invalid. *Tutors* may do any thing for their pupils, but nothing against them; and the same laws which put them under a necessity of preserving the interest of the minors, put them under an incapacity of hurting them. See PARENT.

TUTOR, *honorary*. See HONOURARY.

TUTOR is also used in our universities, for a member of some college or hall, who takes on him the instructing of young students in the arts and faculties.

TUTORAGE, TUTELA, in the *Civil Law*, a term equivalent to guardianship in common law, signifying an office imposed on any one, to take care of the person and effects of one or more minors. See GUARDIAN.

By the Roman law there are three kinds of *tutorage*. *Testamentary*, which is appointed by the father's testament. *Legal*, which is given by the law to the nearest relation. And *dative*, which is appointed by the magistrate.

But in all customary provinces, as France, &c. all *tutorages* are dative and elective; and though the father have by testament, nominated the next relation to his pupil, yet is not that nomination of any force unless the choice be confirmed by that of the magistrate, &c.

By the Roman law, *tutorage* expires at fourteen years of age; but in France not till twenty-five years. A minor quits his *tutorage*, and becomes free by marriage; in which case a curator is given him.

TUTSAN, in *Botany*, &c. See St. JOHN's *wort*.

TUTTI, in the *Italian Music*, is used to signify that all the parts are to play together, or to make a full concert.

In this sense *tutti* stands opposed to *soli* or SOLO.

It is often found expressed by *omnes*, *ripieno*, *da capello*, *choro*, &c.

TUTTY, TUTIA *Alexandrina*, or *Lapis* TUTIÆ, an argillaceous ore of zinc, found in Persia, formed on cylindrical moulds into tubulous pieces, like the bark of a tree, and baked to a moderate hardness. This account of its origin is supported by the authority of Teixeira and Douglas; and by its chemical properties. That the common opinion of its being a sublimate produced in the European founderies where zinc is melted with other metals, is erroneous, appears from hence, that *tutty* is not found, upon strict enquiry, to be known at those founderies; and by its consisting in great part of an earth not capable of rising in sublimation. This, however, is probable, that sublimates, or the common ores of zinc are often mixed with argillaceous earths, and baked hard, in imitation of the genuine oriental *tutty*.

Bontius, in his animadversions upon Garcias ab Orta, informs us, that it is made of a glutinous or argillaceous earth, like clay, found in great quantities in the province of Persia, called Kirmon, which the Indians, who gather it, put into earthen pots made on purpose, and, adding water to it, stir it with a stick; these pots are then placed in furnaces till the water is evaporated; afterwards removing the dregs which remain at the bottom, they pick off from the sides of the pots the calcined earth or *tutty*, which they carefully preserve for sale. He adds, that it is used in India as a cosmetic for destroying hair, more especially by the women, when they bathe.

Tutty is generally of a brownish colour, and full of small protuberances on theout side, smooth and yellowish within, sometimes whitish, and sometimes with a bluish cast. Like other argillaceous bodies, it becomes harder in a strong fire; and after the zinc has been revived and dissipated by inflammable additions, or extracted by acids, the remaining earthy matter affords, with oil of vitriol, an aluminous salt.

Tutty, levigated into an impalpable powder, is, like the lapis calaminaris and calces of zinc, an useful ophthalmic, and frequently used as such in ointments and collyria.

Ointments for this intention are prepared in the shops, by mixing the levigated *tutty* with so much viper's fat as is sufficient to reduce it to a due consistence, or, by adding one part to five parts of a simple liniment made of oil and wax. Lewis.

TUTULUS, among the *Romans*, a manner of dressing the hair, by gathering it up on the forehead into the form of a tower.

TUTULUS likewise signified a woollen cap with a high top.

TWA-NIGHTS *Geste*, in our *Ancient Customs*. See THIRD-*night awn Hynde*.

If the *twa-nights geste* did any harm to any, his host was not answerable for it, but himself.

TWAITE, in *Ichthyology*. See SHAD.

TWAITE, in our *Old Writers*, a wood grubbed up and converted into arable land.

TWELFTH-HIND, in our *Ancient Customs*, imports much the same with *thane*.

Among the English Saxons, those who were worth 1200*s*. were called *twelve-hindi*, and if an injury was done to them, satisfaction was to be made accordingly. See HINDENI.

TWELFTH-DAY, or TWELFTH-*tide*, the festival of the Epiphany, or the manifestation of Christ to the Gentiles, so called, as being the *twelfth-day*, exclusive, from the Nativity, or Christmas-day.

TWELVE MEN, *duodecim homines legales*, otherwise called *jury*, or *inquest*, is a number of *twelve* persons, or upwards, as far as twenty-four; by whose oath, as to matters of fact, all trials pass, both in civil and criminal cases, through all courts of the common law in this realm. See JURY.

TWELVE *Tables*, *laws of the*. See TABLE.

TWELVE-MONTH, the space of a year, according to the calendar months.

TWENTY-*four men*; men chosen every half year to redress the grievances of the mines and miners; but every man generally serves his year when chosen.

TWI-FALLOWING, or *Twy-fallowing of ground*, in *Husbandry*, is the tilling or laying of it fallow a second time.

TWI-HINDI, or TWYHINDI, among our Saxon ancestors, were men valued at 200*s*. See HINDENI.

These men were of the lowest degree; and if such were killed, the mulct was 30*s*. Thus in Leg. H. I. cap. 9. *de* twihindi *homines interfecti, vera debet reddi secundum legem*. Where note, that this was not an introduction of a new law, but a confirmation of the old, made in the reign of king Alfred.

TWILIGHT, in *Astronomy*, denotes the dubious or faint light which is reflected to us by means of the atmosphere, for some time before the sun rises, and after he sets. See CREPUSCULUM and ATMOSPHERE.

The following table shews the duration of *twilight* in different

different latitudes: it is calculated on a suppofition that the *twilight* begins and ends when the fun is 18° below the horizon: the letters c. d. fignify that it is then continual day; c. n. continual night; w. n. that the *twilight* lafts the whole night.

Alt. Pole.		0	10	20	30	40	45	50	52½	55	60	65	70	75	80	85	90
☉ enters		H. ′	H. ′	H. ′	H. ′	H. ′	H. ′	H. ′	H. ′	H. ′	H. ′	H. ′	H. ′	H. ′	H. ′	H. ′	H. ′
	♋	1 18	1 21	1 28	1 41	2 8	2 39	w. n.	w. n.	w. n.	w. n.	w. n.	c. d.	c. d.	c. d.	c. d.	c. d.
♊	♌	1 16	1 19	1 25	1 36	1 58	2 19	3 3	w. n.	w. n.	w. n.	w. n.	c. d.	c. d.	c. d.	c. d.	c. d.
♉	♍	1 13	1 15	1 20	1 28	1 43	1 55	2 12	2 25	2 41	3 55	w. n.	w. n.	w. n.	c. d.	c. d.	c. d.
♈	♎	1 12	1 13	1 17	1 24	1 35	1 44	1 55	2 2	2 10	2 33	3 8	4 18	w. n.	w. n.	w. n.	w. n.
♓	♏	1 13	1 14	1 18	1 24	1 35	1 43	1 54	2 0	2 8	2 27	2 56	3 41	5 2	17 32	w. n.	w. n.
♒	♐	1 16	1 17	1 21	1 28	1 40	1 49	2 1	2 8	2 18	2 43	3 26	11 38	11 14	10 32	8 38	c. n.
♑		1 18	1 19	1 23	1 30	1 43	1 53	2 6	2 15	2 26	2 57	4 4	10 24	9 30	7 46	c. n.	c. n.

Long's Aftron. vol. i. p. 258.

TWINKLING *of the ftars*, denotes that tremulous, vibratory, intermitting motion, which is obferved in the light proceeding from the fixed ftars: Alhazen, an Arabian philofopher of the twelfth century, confiders refraction as the caufe of this phenomenon.

Vitellio, in his Optica, publifhed in 1270, p. 449, afcribes the *twinkling* of the ftars to the motion of the air, in which the light is refracted; and he obferves, in confirmation of this hypothefis, that they twinkle ftill more when they are viewed in water put into motion.

Dr. Hooke (Microgr. p. 231, &c.) very reafonably attributes this phenomenon to the inconftant and unequal refraction of the rays of light occafioned by the trembling motion of the air and interfperfed vapours, in confequence of variable degrees of heat and cold in the air, producing correfponding variations in its rarity or denfity, and alfo of the action of the wind, which muft caufe the fucceffive rays to fall upon the eye in different directions, and confequently upon different parts of the retina at different times, and alfo to hit and mifs the pupil alternately; and this is alfo the reafon, he fays, why the limbs of the fun, moon, and planets appear to wave or dance.

Thefe tremors of the air are manifeft to the eye by the tremulous motion of fhadows caft from high towers; and by looking at objects through the fmoke of a chimney, or through fteams of hot water, or at objects fituated beyond hot fands, efpecially if the air be moved tranfverfely over them. But when ftars are feen through telefcopes that have large apertures, they twinkle but little, and fometimes not at all. For, as fir Ifaac Newton has obferved (Opt. p. 98.) the rays of light which pafs through different parts of the aperture, tremble each of them apart, and by means of their various, and fometimes contrary tremors, fall at one and the fame time upon different points in the bottom of the eye, and their trembling motions are too quick and confufed to be feparately perceived. And all thefe illuminated points conftitute one broad lucid point, compofed of thofe many trembling points confufedly and infenfibly mixed with one another by very fhort and fwift tremors, and thereby caufe the ftar to appear broader than it is, and without any trembling of the whole.

Dr. Jurin, in his Effay upon Diftinct and Indiftinct Vifion, has recourfe to fir Ifaac Newton's hypothefis of fits of eafy refraction and REFLECTION for explaining the *twinkling* of the ftars; thus, he fays, if the middle part of the image of a ftar be changed from light to dark, and the adjacent ring be at the fame time changed from dark to light, as muft happen from the leaft motion of the eye towards or from the ftar, this will occafion fuch an appearance as *twinkling*.

Mr. Michell (Phil. Tranf. vol. lvii. p. 262.) fuppofes, that the arrival of fewer or more rays at one time, efpecially from the fmaller or more remote fixed ftars, may make fuch an unequal impreffion on the eye, as may, at leaft, have fome fhare in producing this effect: fince it may be fuppofed, that even a fingle particle of light is fufficient to make a fenfible impreffion upon the organs of fight; fo that very few particles arriving at the eye in a fecond of time, perhaps not more than three or four, may be fufficient to make an object conftantly vifible. See LIGHT.

Hence he fays, it is not improbable, that the number of the particles of light which enter the eye in a fecond of time, even from Sirius himfelf, may not exceed three or four thoufand, and from ftars of the fecond magnitude they may, therefore, probably not exceed a hundred. Now the apparent increafe and diminution of the light, which we obferve in the *twinkling* of the ftars, feem to be repeated at not very unequal intervals, perhaps about four or five times in a fecond. He, therefore, thought it reafonable to fuppofe, that the inequalities which will naturally arife from the chance of the rays coming fometimes a little denfer, and fometimes a little rarer, in fo fmall a number of them, as muft fall upon the eye in the fourth or fifth part of a fecond, may be fufficient to account for this appearance. An addition of two or three particles of light, or perhaps a fingle one, upon twenty, efpecially if there fhould be an equal deficiency out of the next twenty, would, he fuppofed, be very fenfible, as he thought was probable from the very great difference in the appearance of ftars, the light of which does not differ fo much as is commonly imagined. The light of the middlemoft ftar in the tail of the Great Bear does not, he thinks, exceed the light of the very fmall ftar that is next to it, in a greater proportion than that of about 16 or 20 to 1; and M. Bouguer found, that a difference in the light of objects, of one part in fixty-fix, was fufficiently diftinguifhable.

Since thefe obfervations were publifhed, Mr. Michell (as we are informed by Dr. Prieftley, Hift. of Light, p. 495.) has entertained fome fufpicion, that the unequal denfity of light does not contribute to this effect in fo great a degree as he had imagined; efpecially in confequence of obferving that even Venus does fometimes twinkle. This he once obferved her to do remarkably when fhe was about 6 degrees high, though Jupiter which was then about 16 degrees high, and was fenfibly lefs luminous, did not twinkle at all. If, notwithftanding the great number of rays, which, without doubt, come to the eye from fuch a furface as this planet prefents, its appearance be liable to be affected in this manner, it muft be owing to fuch undulations in the atmofphere, as will probably render the effect of every other caufe altogether infenfible.

M. Mufchenbroeck (Introd. ad Phil. Nat. vol. ii. fect. 1741, p. 707.) fufpects, that the *twinkling* of the ftars arifes from fome affection of the eye, as well as the ftate of the atmofphere. For, he fays, that in Holland, when the weather is frofty, and the fky very clear, the ftars twinkle moft manifeftly to the naked eye, though not in telefcopes; and fince he does not fuppofe there is any great exhalation, or dancing of the vapour at that time, he queftions whether the vivacity of the light, affecting the eye, may not be concerned in the phenomenon.

But this philofopher might have fatisfied himfelf with refpect to this hypothefis, by looking at the ftars near the zenith, when the light traverfes but a fmall part of the atmofphere, and therefore might be expected to affect the eye moft fenfibly. For he would not have perceived them to twinkle near fo much as they do near the horizon, when much more of their light is intercepted by the atmofphere.

Some aftronomers have lately endeavoured to explain the *twinkling* of the fixed ftars, by the extreme minutenefs of their apparent diameter; fo that they fuppofe the fight of them is intercepted by every mote that floats in the air. To this purpofe Dr. Long obferves (Aftron. vol. i. p. 170.) that our air near the earth is fo full of various kinds of particles, which are in continual motion, that fome one or other of them is perpetually paffing between us and any ftar which we look at, and this makes us every moment alternately fee it and lofe fight of it: and this *twinkling* of the ftars, he fays, is greateft in thofe which are neareft the horizon, becaufe they are viewed through a great quantity of thick air, where the intercepting particles are moft numerous; whereas ftars that are near the zenith do not twinkle fo much, becaufe we do not look at them through fo much thick air, and therefore the intercepting particles, being fewer, come lefs frequently before them.

With refpect to the planets, it is obferved, that they, becaufe they are much nearer to us than the ftars, have a fenfible apparent magnitude, fo that they are not covered by the fmall particles floating in the atmofphere, and therefore do not twinkle, but fhine with a fteady light. The fallacy of this hypothefis appears from the obfervation of Mr. Michell, that no object can hide a ftar from us that is not large enough to exceed the apparent diameter of the ftar, by the diameter of the pupil of

of the eye; so that if a star was a mathematical point, the interposing object must still be equal in size to the pupil of the eye: and, indeed, it must be large enough to hide the star from both eyes at the same time.

The principal cause, therefore, of the *twinkling* of the stars is now acknowledged to be the unequal refraction of light, in consequence of inequalities and undulations in the atmosphere

Besides a variation in the quantity of light, it may here be added, that a momentary change of colour has likewise been observed in some of the fixed stars. Mr. Melville (Edinb. Ess. vol. ii. p. 81.) says, that when one looks stedfastly at Sirius, or any bright star, not much elevated above the horizon, its colour seems not to be constantly white, but appears tinctured, at every *twinkling*, with red and blue. Mr. Melville could not entirely satisfy himself as to the cause of this phenomenon; observing that the separation of the colours by the refractive power of the atmosphere is, probably, too small to be perceived. Mr. Michell's hypothesis above mentioned, though inadequate to the explication of the *twinkling* of the stars, may pretty well account for this circumstance. For the red and blue rays being much fewer than those of the intermediate colours, and therefore much more liable to inequalities from the common effect of chance, a small excess or defect in either of them will make a very sensible difference in the colour of the stars.

TWINS, two young ones delivered at a birth by an animal which ordinarily brings forth but one.

It has been greatly disputed, which of two *twins* is to be esteemed the elder? The faculty of Montpelier have given it, that the later born is to be reputed the elder, because first conceived: but by all the laws which now obtain, the first-born enjoys the privileges of seniority; and the custom is confirmed by the Scripture instance of Esau and Jacob.

But if two *twins* be born so intermixed, that one cannot distinguish which of the two appeared first, it should seem that neither the one nor the other can pretend to the right of primogeniture, which ought to remain in suspence by reason of their mutual concourse. In such case some would have the decision left to the father, and others to the chance of a lot.

TWINS, in *Astronomy*. See GEMINI.

TWIST *of a rope, cord*, &c. See ROPE.

TWIST, again, is used for the inside, or flat part of a man's thigh, upon which a true horseman rests when on horseback.

To TWIST *a horse*, is violently to wring or twist his testicles twice about, which causes them to dry up, and deprives them of nourishment, and reduces the horse to the same state of impotency with a gelding.

TWISTED *column*. See COLUMN.

TWISTED *silks*. See SILK.

TWITE. See LINNET.

TWOPENCE, *Herb*, a species of *lysimachia*. See LOOSE-*strife*.

TWO *thirds subsidy*. See DUTY and SUBSIDY.

TWYBLADE, *ophrys*, in *Botany*, a genus of the *gynandria diandria* class. Its characters are these: it has a single stalk with a vague spatha; the flower hath no empalement; it consists of five oblong petals, which join so as to form a helmet, and the under one is bifid; the nectarium is dependent, and keel-shaped, behind; it hath two short stamina, sitting on the pointal, with erect summits fastened to the interior border of the nectarium; it hath an oblong contorted germen situated under the flower, with a style adhering to the inner border of the nectarium, crowned by an obsolete stigma; the germen afterwards turns to an oval, three-cornered, obtuse capsule, with one cell opening with three valves, filled with small seeds like dust. Linnæus enumerates nineteen, and Miller nine species.

The common *twyblade*, or *ophrys bifolia*, grows in woods and moist pastures in several parts of England, and flowers in May.

It has been reckoned astringent and agglutinating, good to consolidate ruptures, and heal wounds, though it is but seldom used.

TYCHONIC *system*, or *hypothesis*, is an order or arrangement of the heavenly bodies, of an intermediate nature between the Copernican and Ptolemaic, or participating alike of them both. See SYSTEM.

TYE, in *Mining*. See STREAMING.

TYE, in *Sea Language*, denotes a sort of runner, or thick rope, used to transmit the effort of a tackle to any yard or gaff, which extends the upper part of a sail.

The *tye* is either passed through a block fixed to the mast-head, and afterwards through another block moveable upon the yard or gaff intended to be hoisted; or the end of it is simply fastened to the sail, yard, or gaff, after communicating with the block at the mast-head. Falconer. See JEERS.

TYGER. See TIGER.

TYING, in *Music*. See LEGATE-*note* and SYNCOPE.

TYLE, or TILE, in *Building*, a sort of thin, factitious, laminated brick, used on the roofs of houses, or, more properly, a kind of fat clayey earth, kneaded and moulded of a just thickness, dried and burnt in a kiln, like a brick, and used in the covering and paving of houses.

It is thus called from the French *tuille*, of the Latin *tegula*, which signifies the same.

Tyles are made, says Mr. Leybourn, of better earth than brick-earth, and something nearer a-kin to the potter's earth.

According to stat. 17 Ed. IV. cap. 4. the earth for *tyles* should be cast up before the 1st of November, stirred and turned before the 1st of February, and not made into *tyles* before the 1st of March; and should likewise be tried and severed from stones, marle, and chalk.

Any person setting to sale *tyles* made otherwise than this act directs, shall forfeit to the buyer double value of the *tyles*, and make fine and ransom at the king's will. Justices may assess upon the offender no less fine than for every 1000 plain *tyles* 5*s.* for every 100 roof *tyles*, 6*s.* 8*d.* and for every 100 corner, or gutter-*tyles*, 2*s.*

Searchers shall be appointed to present defaulters, who shall have for their labour of the *tyle*-makers, for every 1000 plain *tyles* searched, 1*d.* for every 100 of roof *tyles*, ½*d.* and for every 100 of corner and gutter-*tyles*, ½*d.* and searchers neglecting their duty forfeit 10*s.*

By 17 Geo. III. cap. 42. all combinations for enhancing the price of *tyles* and bricks shall be void; and every *tyle*-maker, or brick-maker, offending, shall forfeit 20*l.* and every clerk, agent, or servant, 10*l.* half to the poor, and half to him who sues within six calendar months. By 24 Geo. III. cap. 24. the following duties shall be raised on all BRICKS and *tyles*, made in Great Britain, from September 1, 1784, to be paid by the maker, viz. for all bricks, 2*s.* 6*d.* *per* 1000, and in proportion for a greater or less quantity; for plain *tyles*, 3*s.* *per* 1000; for pan or ridge-*tyles*, 8*s.* *per* 1000; for small paving-*tyles*, not exceeding 10 inches square, 1*s.* 6*d.* *per* 100; and for large paving-*tyles*, exceeding 10 inches square, 3*s.* *per* 100; and for all other *tyles* 3*s.* *per* 1000, and in proportion for a greater or less quantity.

Brick or *tyle*-makers are required to give notice at the next office of excise, of their names and places of abode, &c. before they begin making, on forfeiture of 100*l.* The bricks and *tyles* are to be charged with the duty while they are drying, and before they are removed to the kiln; and the penalty of obstructing officers is 50*l.*

Ten bricks or *tyles* are allowed in every 100 for waste, &c. And the penalty of removing bricks or *tyles* to the kiln before the officer has charged the duties, is a forfeiture of the same, and also 50*l.* Those that are not surveyed are to be kept separate from others; and the penalty of concealing bricks or *tyles*, while making, is 20*l.* and forfeiture of the same.

The makers are required to enter, every six weeks, at the proper office, all bricks and *tyles* made by them, and to pay the duties within six weeks after entry, under a penalty of forfeiting double the sum of the duties; and removal of any for which the duties have not been paid, incurs a forfeiture of 50*l.*

Bricks and *tyles*, for which the duties have been paid, may be exported, with a drawback of the duties; but the penalty of re-landing such as are shipped for exportation in any part of Great Britain, is a forfeiture of the same, or their value, together with the penalty of the bond.

From September 1, 1784, the following additional duties are to be paid on the importation of bricks and *tyles*, viz. for bricks, 2*s.* 6*d.* *per* 1000; for plain *tyles*, 3*s.* *per* 1000; for pan-*tyles*, 8*s.* *per* 1000; for paving-*tyles*, small, 1*s.* 6*d.* *per* 100, and large, 3*s.* *per* 100; and for all other *tyles*, 3*s.* *per* 1000. The said duties shall also be liable to the additional 5 *per cent.* imposed by 19 Geo. III. cap. 25; and 5 *per cent.* thereon by 22 Geo. III. cap. 66.

For the method of burning them, see BRICK.

As to the applying of *tyles*, some lay them dry, as they come from the kiln, without mortar, or any thing else; others lay them in a kind of mortar made of loam and horse-dung. In some parts, as in Kent, they lay them in moss.

There are various kinds of *tyles* for the various occasions of building; as *plain, thack, ridge, roof, crease, gutter, pan, crooked, Flemish, corner, hip, dorman* or *dormar, scallop, astragal, traverse, paving*, and *Dutch tyles*.

TYLES, *plain* or *thack*, are those in ordinary use for the covering of houses. They are squeezed flat, while yet soft, in a mould. They are of an oblong figure, and by

stat.

ſtat. 17 Edw. IV. cap. 4. are to be $10\frac{1}{2}$ inches long, $6\frac{1}{4}$ broad, and half an inch and half a quarter thick. But theſe dimenſions are not ſtrictly obſerved.

Plain *tyles* are not laid in mortar, but only pointed in the inſide.

TYLES, *ridge*, *roof*, or *creaſe*, are thoſe uſed to cover the ridges of houſes, being made circular, breadth-wiſe, like a half cylinder. Theſe are what Pliny calls *laterculi*, and are by ſtatute to be 13 inches long, and of the ſame thickneſs with the *plain tyles*.

TYLES, *hip* or *corner*, are thoſe which lie on the hips or corners of roofs. As to form, they are firſt made flat, like *plain tyles*, but of a quadrangular figure, whoſe two ſides are right lines, and two ends, arches of circles; one end being a little concave, and the other convex: the convex end is to be about ſeven times as broad as the concave end; ſo that they would be triangular, but that one corner is taken off; then, before they are burnt, they are bent on a mould, breadth-wiſe, like *ridge tyles*. They have a hole at their narrow end to nail them on by, and are laid with their narrow end upwards. By ſtatute they are to be $10\frac{1}{2}$ inches long, and of a convenient breadth and thickneſs.

Theſe, as well as the ridge *tyles*, are to be laid in mortar, becauſe they ſeldom lie ſo cloſe as not to admit any water to paſs between them.

TYLES, *gutter*, are thoſe which lie in gutters or vallies in croſs-buildings. They are made like *corner-tyles*, only the corners of the broad end are turned back again with two wings. They have no holes in them, but are laid with the broad end upwards, without any nailing. They are made in the ſame mould as *corner-tyles*, and have the ſame dimenſions on the convex ſides. Their wings are each 4 inches broad, and 8 long.

Theſe *tyles* are ſeldom uſed where lead is to be had.

TYLES, *pan*, *crooked*, or *Flemiſh*, are uſed in covering of ſheds, ſtables, out-houſes, and all kinds of flat-roofed buildings. They are in form of an oblong parallelogram, as *plain tyles*, but are bent breadth-wiſe forwards and backwards in the form of an S, only one of the arches is at leaſt three times as big as the other, which biggeſt arch is always laid uppermoſt, and the leſs arch of another *tyle* lies over the edge of the great arch of the former. They have no holes for pins, but hang on the laths by a knot of their own earth. By 17 Geo. III. cap. 42, they are to be, when burnt, not leſs than $13\frac{1}{2}$ inches long, $9\frac{1}{2}$ inches wide, and $\frac{1}{2}$ an inch thick, on pain that the maker ſhall forfeit 10*s*. for every 1000.

Pan-*tyles* are laid in mortar, becauſe the roof being flat, and many *tyles* being warped in the burning, they will not cover the roof ſo well as that no water paſs between them.

TYLES, *dormar*, or *dorman*, conſiſt of a plain *tyle* and a triangular piece of a plain one, ſtanding up at right angles to one ſide of the plain *tyle*, and ſwept with an arch of a circle from the other end, which end terminates in a point. Of theſe *tyles* there are two kinds, the triangular piece, in ſome, ſtanding on the right, in others on the left ſide of the plain *tyle*. And of each of theſe, again, there are two kinds, ſome having a whole plain *tyle*, others but half a plain *tyle*. But in them all, the plain *tyle* has two holes for the pins, at that end where the broad end of the triangular piece ſtands.

Their uſe is to be laid in the gutters, betwixt the roof and the cheeks or ſides of the dormars, the plain part lying on the roof, and the triangular part ſtanding perpendicularly by the cheek of the dormar. They are excellent to keep out the wet in thoſe places, and yet they are hardly known any where but in Suſſex. The dimenſions of the plain *tyle* part are the ſame as thoſe of a plain *tyle*, and the triangular part is of the ſame length, and its breadth at one end 7 inches, and at the other nothing.

TYLES, *ſcallop* or *aſtragal*, are, in all reſpects, like plain *tyles*, only their lower ends are in form of an aſtragal, viz. a ſemi-circle, with a ſquare on each ſide. They are uſed in ſome places for weather *tyling*.

TYLES, *traverſe*, are a kind of irregular plain *tyles*, having the pin-holes broken out, or one of the lower corners broken off. Theſe are laid with the broken end upwards, upon rafters, where pinned *tyles* cannot hang.

TYLES, *Flemiſh* or *Dutch*, are of two kinds, *ancient* and *modern*. The *ancient* were uſed for chimney foot-paces; they were painted with antic figures, and frequently with poſtures of ſoldiers, ſome with compartments, and ſome with moreſque devices; but they came greatly ſhort, both as to the deſign and colours, of the modern ones.

The *modern Flemiſh tyles* are commonly uſed plaſtered up in the jaumbs of chimneys, inſtead of chimney-corner-ſtones. Theſe are better glazed, and ſuch as are painted (for ſome are only white) are much better performed than the ancient ones.

But both kinds ſeem to be made of the ſame whitiſh clay as our white-glazed earthen-ware. The ancient ones are five inches and a quarter ſquare, and about three quarters of an inch thick; the modern ones ſix inches and a half ſquare, and three quarters of an inch thick.

When theſe tyles are ſet with good mortar, they look beautiful, and caſt a greater heat than ſtone; for, being very ſmooth and glazed, the rays of heat ſtriking upon them are all reflected into the work, eſpecially when the ſides of the chimnies are oblique, or in the form of circular arches. But they are little uſed.

Tyling is meaſured by a ſquare of a 100 ſquare feet; and the number of *tyles* required for ſuch a ſquare depends on the diſtance of the laths, which, when 6 inches, requires 800; when $6\frac{1}{2}$ inches, 740; when 7 inches, 690; when $7\frac{1}{2}$ inches, 640; and when 8 inches, 600 *tyles*.

TYLE, in *Aſſaying*. See TILE.

TYLER, one that covers or paves with tyles.

Tylers and *bricklayers* were *incorporated* 10 Eliz. under the name of maſter and wardens of the ſociety of freemen of the myſtery and art of *tylers* and *bricklayers*. See COMPANY.

TYLERY. See TUILERIE.

TYLOS, in *Ornithology*, a name by which many authors have called the *turdus iliacus*, or REDWING.

TYLWITH, in matters of *Heraldry and Deſcent*, is ſometimes uſed for a tribe or family branching out of another, which the modern heralds more uſually call the *ſecond* or *third houſe*.

TYMBER *of ſkins*. See TIMBER.

TYMPAN, or TYMPANUM, in *Architecture*, the area of a pediment, being that part which is in a level with the naked of the freeze. Or it is the ſpace included between the three cornices of a triangular pediment, or the two cornices of a circular one. See *Tab. Archit. fig.* 40. E.

Sometimes the *tympan* is cut out, and the part filled with an iron lattice to give light; and ſometimes it is enriched with ſculpture, in baſſo-relievo, as in the weſt front of St. Paul's, in the temple of Caſtor and Pollux, at Naples, &c.

Tympan is alſo uſed for that part of a pedeſtal called the *trunk* or *dye*.

TYMPAN, among *Joiners*, is alſo applied to the pannels of doors.

TYMPAN *of an arch* is a triangular ſpace or table in the corners or ſides of an arch, uſually hollowed and enriched, ſometimes with branches of laurel, olive-tree, or oak; or with trophies, &c. ſometimes with flying figures, as fame, &c. or ſitting figures, as the cardinal virtues.

TYMPAN, in *Anatomy*, *Mechanics*, &c. See TYMPANUM.

TYMPAN, among *Printers*, is a double frame belonging to the preſs, covered with parchment, on which the blank ſheets are laid in order to be printed off. See PRINTING *preſs*.

TYMPANA, τυμπανα, among the *Athenians*, a capital puniſhment, wherein the criminal, being affixed to a pole, was beaten to death with cudgels. Potter, Archæol. Græc. lib. cap. 25. tom. i. p. 134.

TYMPANITES, in *Medicine*. See TYMPANY.

TYMPANOTRIBA, among the *Ancients*, a deſignation given to an effeminate perſon, who could do nothing but play on the tympanum.

TYMPANUM, τυμπανον, *drum*; a muſical inſtrument, which, among the ancients, conſiſted of a thin piece of leather or ſkin, ſtretched upon a circle of wood or iron, and beaten with the hand, or with a rod of iron or braſs.

TYMPANUM, TYMPAN, in *Mechanics*, is a kind of wheel placed round an axis, or cylindrical beam, on the top of which are two levers, or fixed ſtaves, for the more eaſy turning the axis about, in order to raiſe a weight required.

The *tympanum* is much the ſame with the peritrochium; but that the cylinder of the axis of the peritrochium is much ſhorter and leſs than the cylinder of the *tympanum*. See AXIS *in Peritrochio*.

TYMPANUM of a machine is alſo uſed for a hollow wheel, wherein one or more people, or other animals, walk to turn it; ſuch as that of ſome cranes, calenders, &c.

TYMPANUM, in *Anatomy*. *Membrana* TYMPANI, is a thin tender ſkin or membrane, ſtretched upon a bone or circle, in the meatus auditorius of the ear, which it ſhuts, and ſuppoſed to be the immediate organ of hearing. See *Tab. Anat.* (*Oſteol.*) *fig.* 13. *lit. c.*

The *tympanum*, or barrel of the ear, is a cavity irregularly ſemicircular, the bottom of it being turned inward, and the mouth joined to the circular groove of the external auditory paſſage. It has both eminences and cavities obſervable in it. The remarkable eminences are three in number, a large tuberoſity lying in the very bottom of the barrel, a little toward the back part, and

 a ſmall

a small irregular pyramid, situated a little above the tuberosity, and a little more backward; the apex of it is perforated by a small hole, and on one side of the basis, two small bony filaments are often found in a parallel situation. They are seldom found to be wanting, on a careful investigation, though their tender structure exposes them to be very often broken. In the third eminence is a cavity shaped like the mouth of a spoon, situated at the upper, and a little toward the anterior part of the bottom of the *tympanum*. This cavity is part of a half canal, and, at a very small distance from its point, is a little bony ridge, which goes from one edge of it to the other, but is sometimes not entire. The principal cavities are the opening of the cells of the mastoide sinuosities, the opening of the Eustachian tube, the bony half canal, the fenestra ovalis and rotunda; and to these may be added the small hole in the pyramid. The opening of the mastoide cells is at the posterior and upper part of the edge of the barrel; the cells themselves which end there are dug in the substance of the mastoide process, being very irregular and full of windings and turnings. The opening of the Eustachian tube is at the anterior, and a little toward the upper part of the edge of the barrel. This tube, which in France, is usually termed the aqueduct, runs from the *tympanum* toward the posterior openings of the nasal fossæ and arch of the palate. The bony part of it, the only part spoken of here, is dug in the apophysis petrosa along the duct of the carotide apophysis; and when it leaves that, it is lengthened out by the spinal apophysis of the os sphenoides. These two cavities, the mastoide cells, and the Eustachian tube, are, in some measure, prolongations of the *tympanum*, one anterior, the other posterior. The bony half canal, of which the cavity, like the mouth of a spoon, is the extremity, lies immediately above the Eustachian tube, towards the upper side of that apophysis petrosa, or rather in the very substance of the upper side, and in a natural state a small muscle is lodged in it. Winslow's Anat. p. 47. See Ear.

Within the *cavitas tympani*, Vieussens has discovered a very fine thin membrane, serving to shut the door of the labyrinth, and prevent the internal air from having any communication with the external. The *membrana tympani* has a remarkable branch of a nerve passing on its internal surface between the incus and malleolus, called the *chorda tympani*.

The *tympanum* Dr. Willis takes to be a kind of preparatory instrument to Hearing, and its office to be, to receive the first impressions of sounds, or the sensible species, and to convey them duly modified and proportioned to the sensorium. See Drum.

Its office, in effect, with respect to the sense of hearing, seems to be the same as that of the pupil of the eye with regard to seeing; each of them prevents the ingress of too many rays, temper and soften them, and deliver them, as it were, commensurate to the sensory; upon which, if they should fall immediately, they might be apt to spoil its delicate constitution.

The *tympanum*, it is true, does not hear; but it contributes to the better and safer hearing. That it may do the office of a porter the better, it is necessary its expanse should, like the pupil, be contracted and relaxed on occasion; and to this purpose serve the four little bones, called *malleolus*, *incus*, *stapes*, and *os orbiculari*, which have the same use in straining and relaxing, as the braces of the war-drum have in that instrument. By means of this extension and retraction, the *tympanum* is made to correspond to all sounds loud or languid, just as the pupil does to all the degrees of light. The ingenious Dr. Holder has improved on this theory. He conceives that the action of the muscle, whereby the *tympanum* is stretched and relaxed, does ordinarily and constantly draw it to a moderate tension; but when we have occasion to listen, and give a particular attention to any sound, the action of that muscle is then more intense, and the drum is drawn to more than ordinary tension, to facilitate the passage of the sound. See Attention.

Upon these considerations, that author having a young gentleman, who was born deaf, put into his hands, and perceiving the great defect to lie in the want of a due tension of the *tympanum*, he advised his mother to consult with physicians, whether by some astringent fumes, or otherwise, it might not be restored to a due tension.

In the mean time he thought of a temporary way by the means of any vehement sound, as of a drum beaten near him; which sound, during its continuance, must needs give the *tympanum* a tension, by driving and swelling it outwards, as a fresh gale of wind fills the sails of a ship: and the experiment succeeded according to expectation; for so long as he beat a drum fast and loud by him, he could hear those that stood by him call him gently by his name. But when the drum ceased, he could no longer hear the same persons calling him very loudly.

But what makes the use of the *tympanum* appear the less considerable is, that there are instances where the hearing has been perfect, without any use of a *tympanum*. Mr. Chefelden relates, that he broke the *tympanum* in both ears of a dog, yet did not destroy his hearing; though for some time afterwards, he received strong sounds with great horror: he adds, that Mr. St. André assured him, that a patient of his had the *tympanum* destroyed by an ulcer, and the auditory bones cast out, yet without destroying his hearing.

Tympanum, in *Architecture*. See Tympan.

Tympani, *chorda*. See Chord.

TYMPANY, Tympanias, or Tympanites, in *Medicine*, a flatulent tumor, or swelling of the abdomen or belly, very hard, equable, and permanent; whereby the skin is stretched so tight, that, when struck, it gives a sound like that of a drum. See Flatulency and *Windy* Tumors.

The *tympanites* is a species of dropsy, by some called a *dry dropsy*; but what the cause and seat of the disease are, or what the morbific matter is that occasions the tumor, physicians are not at all agreed.

Wind certainly makes a principal part of the morbid matter; but this is scarce ever found without water, excepting at the beginning, so that some will not allow of any difference between the *tympany* and the *ascites*; but though it is often productive of, or complicated with an ascites, yet it is in itself a perfectly distinct disease, and accompanied with no extravasation of water in the abdomen: persons who have died of it having been found, on opening the body, with the abdomen as dry as in a state of health; but the stomach has been found, in some, greatly distended with flatulencies, and containing a viscid humour, though in no great quantity. The intestines are also usually found distended, and, as it were, pellucid, and, on being pricked, they collapse, without the appearance of any water. And, in some cases, on opening the abdomen, the whole swelling has subsided, on the exclusion of a gross flatulence which had distended it. The intestines have, in some subjects, been found distended to the bigness of a man's thigh, in some parts, and in others lower down, so contorted and twisted together, that there could be no passage either for the wind or the excrements. It is not uncommon, also, on dissection, to find great numbers of worms, of the common long kind, in the intestines.

A *tympany*, without a dropsy, is most incident to women after labour, when the lochia have been suppressed by colds or otherwise, or discharged in too small quantities; a bad regimen during the lying-in, and the omitting to swathe the belly properly down, has also often a bad effect this way. In cases of this kind, women find soon afterwards the abdomen inflated, with a considerable uneasiness, a difficulty of breathing, costiveness, and an unaccountable anxiety. These are the breeding symptoms of the approaching *tympany*; and the same often happens after unskilful treatment in abortions, and after the leaving of a part of the lochia behind, or the injuring of the uterus in delivery.

Children are also subject to *tympanies* when violently afflicted with worms, and sometimes after the measles and small-pox; and if due care is not taken of these cases at their beginning, the superior parts soon become extenuated, and the patients die. Extreme voracity of children also, and their eating great quantities of food at a time when the stomach is weak, sometimes bring on this disorder.

Some suppose it to arise from a watery humour extravasated, and rarefied into vapour; and, by a property common to it with common air, corrupting the parts. But this Boerhaave makes a particular kind of *tympanites*, or wind-dropsy; and adds, that it is cured like the ascites, or water-dropsy, by tapping, &c.

Others will have the *tympanites* to arise from the air's insinuating itself through perforations in the distempered intestines. A *tympanites* from this cause, Boerhaave, who makes it a peculiar class, observes, is almost always incurable.

Willis sets aside this latter cause, and accounts for the disease from an irregularity in the animal spirits belonging to the viscera, which, rushing tumultuarily into the nervous fibres, bloat them up: thus the peritonæum is inflated, the intestines are distended, and the mesentery and other viscera, rendered turgid; and while this is doing, that the vacuities left in the tumefied viscera may be filled up, a quantity of the humour contained in them is rarefied into vapour, which presently spreads in blasts through the vacant places. Others account for the

the *tympanites* from a convulsion of the muscles of the abdomen, &c.

M. Littre has proposed a new system of the *tympanites*, built on a great number of observations. According to him, it does not proceed from any convulsion of the abdominal muscles, nor from any air contained in the cavity thereof, or in the thorax, the mesentery, or epiploon; but from the air enclosed in the stomach and intestines, which swells them excessively.

This air, always carried into those parts with the food, maintains a kind of equilibrium therein; opposing, on the one hand, the too great pressure on that long canal, when empty of food; and naturally finding, on the other side, in the spring of the coats of the stomach and intestines, an obstacle capable of preventing its too great dilatation.

If this equilibrium chance to be destroyed by the irritation of the fibres, whose spring in that case prevails over that of the air, this latter is expelled either upwards or downwards, or both ways (whence belching, &c.) But if the equilibrium come to be broken by the force of the air, rendered superior to that of the fibres, by those latter being left destitute of spirits, as from the blood's being impoverished after a long sickness; in that case, the air rarefying itself beyond measure, swells the cavities it is contained in.

If it be demanded, why, when the stomach and intestines are so full of wind, none of the wind escapes either through the anus or by the mouth, which uses to be expelled by those passages?

Mr. Mery solves the paradox thus: according to this theory the fibres, both of the stomach and intestines, have lost their spring, at least in part, and are in an imperfect palsy; but the winds, evacuated either by the anus or mouth, are winds which those viscera expel out of their cavities, by putting them in a state of contraction capable of surmounting the forces which oppose the egress of the matters contained in those cavities. These forces are two sphincters, one whereof shuts the upper orifice of the stomach, and the other the anus; but paralytic viscera, i. e. viscera destitute of spirits, in which alone consists the strength of the muscles, cannot overcome the resistance of those two muscles; whence the wind, therefore, cannot escape through its usual outlets.

The *tympany* is justly accounted one of the more dangerous kinds of diseases, since the persons afflicted with it much oftener die than recover. When it is accompanied with a dropsy, it is scarce ever cured; and a simple *tympany* in women and children, if neglected at first, degenerates into a chronic disorder, and hardly admits of a cure. Some, indeed, have gone so far as to say, they never knew a patient, afflicted with a *tympany*, recover; but this seems too rash a judgment. That distention of the abdomen, which is properly called a flatulent colic, is by some accounted a species of *tympany*; but this is not naturally dangerous, and is easily cured, except when it is attended with spasms of the viscera, in which case the medicines given to restore the due tone of the intestines, are by no means proper in regard to the spasms.

In curing flatulencies of the stomach and intestines, the proper method is to promote the discharge of the vapours by the anus, and to attenuate and carry off by stool the viscid matter which is the occasion of them. To this purpose discutient and evacuating glysters are very serviceable: these should be prepared of chamomile, hyssop, juniper-berries, and the carminative seeds, a little quantity of sal gem, crude sal ammoniac, or Epsom salt, in veal broth. After these, laxative medicines are to be given, with balsamic and carminative ingredients; and then the powders of zedoary, orange-peel, tartarum vitriolatum, are to be given; and, when necessary, the pilula de styrace, at proper intervals. In the mean time much service may also be done by external applications; such as the oils of mint, rue, nutmeg, and the like, with balsam of Peru; and the rubbing of the belly with Hungary-water is often of immediate relief: by these means the slighter inflations of the stomach and intestines are usually cured with ease, and often beginning *tympanies* yield to continuance of them. Hoffman. Opera, tom. iv.

The *tympanites* rarely kills of itself; but it frequently degenerates into an ascites. Cathartics rather aggravate than alleviate it; antihysterics, antiscorbutics, chalybeats, and strengtheners are of use, before it be commenced an ascites. Equal quantities of leek and elder-leaves mixed, are a famed empirical medicine in this disease, which has often proved effectual when every thing else had failed.

It is usual to apply carminatives to the belly, as the emplaster of cummin-seeds, &c. and also to use carminatives mixed with cathartics, diuretics, &c. internally; but if the disease proceed from a paralytic cause, destroying the tone of the fibres of the first passages, what is of use in rectifying paralytic disorders, where the tension of the fibres is insufficient, will doubtless for the same reason be of use here.

In the case of a *tympany* mentioned by Mr. Monro, the patient took several doses of purgatives, which operated sufficiently, but brought little or no wind away with the fæces, and altered the state of her belly very little. On account of her being irregular in her menstrua, and a suspicion of pituita in the primæ viæ, she was next ordered some doses of calomel, which produced little change; and for two months she was constantly taking large doses of the antihysteric medicines, either by themselves or mixed with purgatives; the antihysteric plaster was kepr always applied to her whole belly, and once or twice the semicupium was used, but without any prospect of cure. Some time before the eruption of the menses, purgatives were again given more sparingly, and doses of the strongest antihysterics, such as assa fœtid. ol. c. c. &c. mixed with soap, were enlarged and given more frequently, and accompanied with the hotter antiscorbutics, e. g. rad. raphan rustic. recent. zinziber, &c. infused in strong ale with steel. The patient was also ordered to use frequent and strong frictions to the trunk and extremities of her body, and to exercise moderately. Immediately before the menses began to flow, clysters of the same kind of medicines were injected. When her courses, which were in sufficient quantity, ceased, her saponaceous, antihysteric, and antiscorbutic medicines being continued for two days, she had very violent explosions of wind upward and downward; her belly became less and softer than it had been from the first attack of the disease: her medicines, with a dose of syrup. de rhamno, at proper intervals, were still continued, and the proportion of steel increased, and her flatulent discharge went successfully on, till at length, after using her medicines several months, she was discharged cured, and continued in good health. Edinb. Ess. Med. vol. i. art. 31.

TYNDARIDÆ, in *Mythology*, a name given by the poets to Castor and Pollux, the sons of Jupiter and Leda.

Though, according to the fable, Pollux and Helena proceeded from the egg which Leda had conceived by Jupiter, and were therefore immortal; whereas, out of another egg, which she conceived by Tyndarus, her husband, came Castor, and Clytemnestra, who were mortal. See CASTOR and *Pollux*.

TYPE, TYPUS, formed from τυπος, *form, figure*, a copy, image, or resemblance, of some model.

The term *type* is less in use than its compounds PROTOTYPE and ARCHETYPE, which are the originals that are made without models.

TYPE is also a scholastic term, much used among divines, signifying a symbol, sign, or figure, of something to come.

In this sense the word is commonly used with relation to ANTITYPE, αντιτυπος, which is the thing itself, whereof the other is a *type* or figure.

Thus Abraham's sacrifice, the paschal lamb, &c. were *types* or figures of our redemption; and the brazen serpent was a *type* of the cross, &c.

Types are not mere conformities, or analogies, which the nature of things holds forth between them; nor arbitrary images arising merely from the casual resemblance of things; but there is farther required a particular institution of God to make a *type*, and a particular declaration of his that it is so.

Gale divides *types* into *historical* and *prophetical*. The first are those used by the ancient prophets in their agitations and visions: the second, those wherein things done, or ceremonies instituted, in the Old Testament, prefigure Christ, or things relating to him in the New Testament.

The ancient fathers, as well as the modern critics, have been greatly divided about the nature and use of *types* and *typical* representations in the Old Testament; and it is this makes one of the great difficulties in understanding the ancient prophecies, and in reconciling the New and Old Testament together.

There is no denying but that there were some *types* which the divine wisdom instituted to be the shadows and figures of things to come; and yet people run into an excess that way; some looking for *types* in every thing, like Origen, who discovered mysteries in the very caldrons of the tabernacle. A prudent man should be contented with the more sensible and obvious ones, nor propose any without proving them as much as possible, and

and shewing that they were really intended for *types*, in order to justify the solidity of the reasoning of the apostles, who argued from them.

An author, in reference to this subject, maintains, that not the fathers only, but St. Paul himself, was of the opinion, that "Christianity was all contained in the Old Testament, and was implied in the Jewish history and law; "both which are to be reputed *types* and shadows of Christianity." In order to which, he quotes Hebrews, viii. 5. x. 1. and Colos. ii. 16, 17. He adds, "That the ritual "laws of Moses, being in their own nature no other "than *types* and shadows of future good things, are to "be considered as having the effect of prophecies." This is likewise the sense of Mr. Whiston, and others; but the same author even quotes our Saviour speaking in behalf of this *typical* reasoning in that passage, Matth. xi. 13. where he affirms that, "The law prophesies; "and that he came to fufil the law as well as the gos"pel." Matth. v. 17. Disc. of the Grounds, &c.

An ingenious divine takes this occasion to observe, that had the ancients, with the modern retainers to the *typical* way, expresly designed to have exposed Christianity, they could not have done it more effectually than by thus making every thing *types* and prophecies.

Not that he denies the reality of such things as *types*. It is manifest there were many under the Old Testament, such were Zechariah's staves, beauty, and bands, chap. xi. 7, 10, 14; such was Hosea's adulterous wife, ch. i. 2. and such were his children, ver. 4, 6. The prophets designed by these to presigure future events; but in these instances the reader is at once, by the declaration of the prophet, made to understand as much, and not left to his own conjectures about them after the events are over.

In effect, all that is urged from Scripture for the *typical* or allegorical interpretations of the Jewish law, history, ceremonies, &c. it is asserted, may be set aside, without any violence to the Sacred Text, which may be explained on more natural and intelligible principles, and more consistently with grammar.

The word τυπος, we have observed, literally denotes no more than a copy or impression of any thing; and accordingly, in our translation, we find it sometimes rendered by *print*, sometimes by *figure*, sometimes by *fashion*, and sometimes by *form*.

Hence also the word is figuratively applied to denote a moral pattern; in which sense it signifies no more than *example* and *similitude*.

Again, the word αντιτυπος, *antitype*, in Scripture, signifies any thing formed according to a model or pattern; and thus, in the Epistle to the Hebrews, the tabernacle, and holy of holies, being made according to the pattern shewn to Moses, are said to be *antitypes*, or figures of the true holy places. In the like sense, St. Peter, speaking of the flood and the ark, whereby eight persons were saved, calls baptism an *antitype* thereto; by which he expresses no more than a similitude of circumstances.

The other words used in Scripture to imply a future event, prefigured by some foregoing act, are—υποδειγμα, rendered by *imitation* and *example*; and σκια, *shadow*.

Such being the import of all the terms used in the New Testament writers, seeming to imply any prefiguration of future events under the Gospel, it is observed,

1. That to argue from *types*, is only to argue from examples or similitudes; and, consequently, that all inferences drawn from such reasonings are no farther conclusive than reasonings from similitudes are. The intent of similitudes is only to help to convey some ideas more clearly or strongly; so that to deduce consequences from a simile, or infer any thing from other parts of the simile, than what are plainly similar, is absurd.

The same author also alledges, 2. That it cannot be proved, that the ceremonies of the Mosaic law were ever designed to prefigure any future events in the state of the Messiah's kingdom. No such declared prefigurations are mentioned in the writings of the Old Testament, whatever notions prevailed among the writers who immediately followed. It is granted, that the apostles argued from the rites in the Mosaic institution; but this (he says) appears to have only been by way of illustration and analogy.

There is certainly a general likeness in all the dispensations of Providence; an analogy of things in the natural as well as the moral world, from which it is easy arguing by way of parity, and it is very just and usual so to do; but that one of these dispensations was therefore given to presignify another that was future, can never be proved, unless it be expresly declared.

It is in the same way of similitude (he maintains) we are to understand St. Paul, where he says, "That Christ our passover is sacrificed for us." And thus we are to understand John the Baptist, when he calls our Saviour the "Lamb of God." There was this similitude of circumstance, that Christ was slain on the same day with the paschal lamb; that he died about the same time of the day when the priests began their hillel; that not a bone of the one or the other was broken. Add, that as the paschal lamb was without blemish, so was Christ without sin. From these, and other circumstances, the apostle applied the term *passover* to Christ.

Thus, also, we are to account for what St. Paul calls the baptism of the children of Israel in the cloud, and in the sea; and for the comparison betwixt the high-priest entering the holy place every year, and Christ entering into heaven. Sykes's Essay on the Truth of the Christian Religion, 1725.

Type, τυπος, is also a name given to an edict of the emperor Constans II. published in 648, to impose a general silence both on the orthodox and the Monothelites.

It had the name *type*, as being a kind of formulary of faith; or rather a form whereon men were to regulate their conduct.

The *type* owed its original to Paul, patriarch of Constantinople, who persuaded that emperor to take away the ecthesis, compiled and hung up in all the public places by Heraclius (as occasioning great complaints from the orthodox, by its favouring the Monothelites); and to publish an edict to impose silence on both parties.

But such kinds of pacifications are held inexcusable in matters of religion; accordingly pope Theodore soon procured the patriarch Paul to be deposed; the *type* was examined in the council of Rome, consisting of a hundred and five bishops, in 649, and condemned; and an anathema was pronounced against all such as admitted either the impious ecthesis or *typus*.

Type, Typus, is also used to denote the order observed in the intension and remission of fevers, pulses, &c.

Type, among *Letter-founders* and *Printers*, denotes the same with letter.

TYPHA, *Reed Mace*, in *Botany*, a genus of the *monoecia triandria* class. Its characters are, that it has male and female flowers; the male flowers form a cylindric catkin; the calyx is obsolete and consists of three leaves; the female flowers have the same kind of catkin with the male, and neither have any corolla; the calyx is soft and hairy; the seed is single, insident upon hairy down. There are two species, one of which, called the great cat's tail, grows on the banks of rivers and fish-ponds; the other, or narrow-leaved cat's-tail, grows in ditches and ponds, is eat by cows, but refused by swine.

TYPHIUM, in *Botany*, a name used by some authors for coltsfoot.

TYPHLE, or Typhline, a name by which some authors have called the fish more usually known by the name of the acus.

TYPHLINUS, in *Zoology*, the name by which the Greeks, and from them some others, have called the *cæcilia*, or slow-worm.

TYPHODES, τυφωδης, or τυφος, in *Medicine*, a kind of ardent, or burning fever, usually attendant on erysipelases of any of the viscera.

This disease is described by Hippocrates and the old writers, and by them distinguished into five kinds.

The first kind is a legitimate and continual fever, impairing the person's strength, and accompanied with pains in the abdomen, and a preternatural heat and weakness of the eyes, and a failure of speech.

The second kind begins with a tertian or quartan fever, and is attended with a pain in the head, and a large discharge of saliva, and sometimes worms. The feet, and other parts of the body, are afflicted with soft swellings, the eyes are painful, and the voice tremulous and faint, from the sticking of the saliva in the throat. The belly and back are also often in pain.

The third kind is distinguished by the intense pains it occasions in the joints, and sometimes over the whole body, and often attended with a lameness.

The fourth is known by the violent tension and pain of the abdomen which attends it; this is usually followed by a diarrhœa, and sometimes by a dropsy.

The fifth kind is distinguished by an unnatural paleness all over the body, and a sort of transparence, as if the whole skin was only a bladder, containing a watery juice, though not inflated; the eyes are hollow in this case, and the patient is continually feeling about the bedcloaths, as if picking out threads. There is always an uneasiness after eating, and frequent nocturnal pollutions.

The word *typhos* is also used in a more general sense for *typos*,

types, to import the remiſſions and exacerbations of diſeaſes.

TYPHOMANIA, τυφομανια, formed from τυφος, *ſmoke*, and μανια, *madneſs*, in *Medicine*, a diſeaſe of the brain, wherein the patient not being able to ſleep, though greatly inclined thereto, lies with his eyes ſhut, talks abſurdly, and flings himſelf this way and that.

If he be pulled, or the like, he juſt opens his eyes, looks about, and ſinks again into a kind of dozing, which is interrupted by a train of diſagreeable imaginations.

The *typhomania* is a kind of combination of a phrenſy with a lethargy. It is alſo called a COMA *vigil*.

TYPHON, or TYPHOEUS, in *Mythology*, the name of one of the *rebel* GIANTS.

TYPHON, or TYPHO, in *Phyſics*. See WHIRLWIND.

TYPIC *fevers*, an appellation given by medical writers to thoſe fevers which are regular in their attacks, and in their general period: they are thus called by way of diſtinction from the erratic, which obſerve no regular type, or determinate appearance.

TYPOGRAPHY, formed from τυπος and γραφη, *writing*, the art of PRINTING.

TYPOLITES, or TYPOLITHUS, formed of τυπος, *type*, and λιθος, *ſtone*, in *Natural Hiſtory*, names given to ſtones or foſſils, on which are impreſſed the figures of various animals and vegetables. See STONES, *Adventitious* FOSSILS, &c.

TYR, in the *Ethiopian Calendar*, the name of the fifth month of the Ethiopian year. It commences on the 25th of December of the Julian year.

TYR, in *Mythology*, a name given to a warrior deity, the protector of champions and brave men, invoked by the ancient northern nations.

The third day of the week was conſecrated to *Tyr*, from whom, it is ſaid, the name given to it in moſt of the northern languages is derived: it is called in Dan. *Tyrſdag*, or *Tiiſdag*; in Sued. *Tiſdag*; in Engliſh, *Tueſday*; in Low Dutch, *Dings-tag*; and in Latin, *Dies Martis*: whence it is inferred, that *Tyr* anſwered to Mars.

The Germans, in High Dutch, call this day *Erichs-tag*, from the word *heric* or *harec*, *a warrior*, which comes to the ſame thing.

Tyr muſt be diſtinguiſhed from another deity called THOR. Mallet's North Ant. vol. i. p. 99.

TYRANNICIDE, formed of *tyrannus* and *cædo*, *I kill*, denotes the act of killing a tyrant.

TYRANNUS, in *Ornithology*, a name given by ſome to the lanius, or BUTCHER-*bird*, a ſpecies of hawk, not larger than a thruſh, but a very fierce and fatal enemy to the ſmall birds.

TYRANNY, in *Political Government*, is the exerciſe of power beyond right, which nobody can have a right to; and thus it is diſtinguiſhed from USURPATION, or the exerciſe of power which another hath a right to: and it is the uſe of power which any one poſſeſſes, not for the good of thoſe who are ſubject to it, but for his own private ſeparate advantage; when the governor, however intitled, makes not the law, but his will the rule; and his command and actions are not directed to the preſervation of the property of his people, but the ſatisfaction of his own ambition, revenge, covetouſneſs, or any other irregular paſſion.

It is a miſtake to think this fault peculiar to monarchies; other forms of government are liable to it as well as that. For, wherever the power that is put in any hands for the government of the people, and the preſervation of their property, is applied to other ends, and made uſe of to impoveriſh, harraſs, or ſeduce them to the arbitrary irregular commands of thoſe that have it, there it becomes *tyranny*, whether thoſe who thus uſe it are one or many.

Accordingly we read of the thirty tyrants at Athens, as well as one at Syracuſe; and the intolerable dominion of the decemviri at Rome was nothing better. Every wanton and cauſeleſs reſtraint of the will of the ſubject, whether practiſed by a monarch, a nobility, or popular aſſembly, is a degree of *tyranny*.

Whenever the conſtitution of a ſtate veſts in any man, or body of men, a power of deſtroying at pleaſure, without the direction of laws, the lives or members of the ſubject, or of alienating their property, or of depriving them of their liberty at pleaſure, ſuch conſtitution is tyrannical. In a word, wherever law ends, *tyranny* begins, if the law be tranſgreſſed to another's harm. And whoſoever in authority exceeds the power given him by the law, and makes uſe of the force he has under his command, to compaſs that upon the ſubject which the law allows not, ceaſes in that to be a magiſtrate, and, acting without authority, may be oppoſed as any other man, who by force invades the right of another. The end of government, whatever be its name or nature, is the good of mankind: and upon this principle, whoſoever uſes force without right, as every one does in ſociety who does it without law, puts himſelf into a ſtate of war with thoſe againſt whom he uſes it; and in that ſtate all former ties are cancelled, all other rights ceaſe, and every one has a right to defend himſelf, and to reſiſt the aggreſſor.

If it be aſked, who ſhall be judge; whether the prince or legiſlative act contrary to their truſt? The anſwer is obvious, the people ſhall be judge; for who ſhall be judge whether the truſtee or deputy acts well, and according to the truſt repoſed in him, but he who deputes him, and muſt, by having deputed him, have ſtill a power to diſcard him when he fails in his truſt? If this be reaſonable in particular caſes of private men, why ſhould it be otherwiſe in that of the greateſt moment, where the welfare of millions is concerned; and alſo, where the evil, if not prevented, is greater, and the redreſs very difficult, dear, and dangerous? Locke, of Civil Government, ch. xviii. and xix. in his Works, vol. ii. p. 214, &c.

TYRANT, TYRANNUS, among the *Ancients*, denoted ſimply a king or monarch.

But the ill uſe ſeveral perſons inveſted with that character made of it, has altered the import of the word, and *tyrant* now carries with it the idea of an unjuſt and cruel prince, who invades the people's liberty, and rules in a more deſpotic manner than the laws of nature, or the country, do allow of.

The term *tyrant*, we are told, became odious among the Greeks, thoſe zealous lovers of liberty, almoſt as ſoon as introduced; but Donatus aſſures us, it was never taken ſo among the Romans till the latter ages of that empire.

The motto of a *tyrant* is, *Oderint dum metuant*. Rowland contends, that this word, as well as the correſpondent Greek and Latin, is derived from *tir*, Welch and Erſe, *land*, and *rhanner*, Welch, *to ſhare*; q. d. *tirhanner*, a ſharer or divider of land among his vaſſals. Johnſon.

TYRANTS, *thirty*, an appellation under which the thirty perſons, eſtabliſhed by the Lacedæmonians in Athens, in order to enſlave and keep it in ſlavery, are denominated. Thraſybulus formed the generous deſign of driving them from Athens, and ſucceeded; upon which event Cornelius Nepos has remarked, that many have deſired, and few had the happineſs to reſcue their country from a ſingle *tyrant!* but Thraſybulus delivered his from thirty.

One of the means which theſe *tyrants* uſed for carrying on their ſcheme of enſlaving the Athenians, was the ordering of the ſuffrages of the Areopagites to be public, that they might manage them as they pleaſed. See Monteſquieu's Spirit of Laws, vol. i. p. 17.

TYRBE, τυρβη, in *Antiquity*, a feſtival celebrated by the ancients in honour of Bacchus.

TYRIUM *marmor*, a name given by the ancients to a ſpecies of marble of a beautiful white, ſometimes free from veins, and ſometimes variegated with duſky blackiſh grey ones. When pure, it was little inferior to the Parian, and often was uſed inſtead of it by the ſtatuaries. See MARBLE.

TYRO. See TYROCINIUM.

TYROCINIUM, TYROCINY, formed of *tyro*, a *raw beginner*, a noviciate or apprenticeſhip in any art or ſcience.

We have ſeveral writings under the title of *tyrociniums*; *tyrocinium chymicum*, *tyrocinium chirurgicum*, &c. containing the rudiments of thoſe arts, accommodated to the apprehenſions of beginners.

TYROSIS, τυρωσις, formed of τυρος, *cheeſe*, in *Medicine*, a coagulating or curdling of milk in the ſtomach, after the manner of cheeſe.

TYRUS, a word uſed by ſome of the barbarous writers for a ſerpent or viper.

TYSHAS, among the *Ethiopians*, the name of the fourth month of their year, commencing the 27th of November in the Julian year.

TYTH, or rather TITHE. See TITHE.

TYTHING, and TYTHING-*man*. See TITHING, DECINERS, TENMENTALE, HUNDRED, WAPENTAKE, &c.

TZANATL, in *Ornithology*, the name of an American bird deſcribed by Nieremberg, which, he ſays, has all over very long and beautiful feathers, of a fine green, and of the ſhining gloſs of the feathers of the peacock. The upper ſide of the wings is black, but their under part is of a very fine and ſhaded green; it has a very beautiful creſt on its head; its throat and breaſt are of fine ſcarlet; the wing-feathers are very long, and very beautifully variegated with ſeveral colours. The Indians

esteem the feathers of this bird more valuable than gold; they dress up the images of their gods with them. Ray's Ornithol. p. 303.

TZANGÆ, among the *Ancients*, a kind of Parthian garments, according to some; but others will have them to have been shoes set with precious stones, formed into the figure of eagles, and designed for the emperor's use.

TZANPAU, in *Ornithology*, the name of an American bird, described by Nieremberg, and famous for the modulations of its voice, and is by many esteemed the female of the POLYGLOTTA *avis*, or cencontlatolli of the Indians.

TZICATLINA, in *Zoology*, a species of serpent, said to be found in America, and reckoned among the most beautiful of that kind of animals. It is nine inches long, about the thickness of a man's little finger, and variegated with alternate swaths of white and red crossing its body. It is likewise one of the harmless kinds of serpents.

The name signifies the *serpent of ants*, because it lives always in their nests, and comes out along with them.

TZINITZIAN, in *Ornithology*, the name of a very beautiful American bird, described by Nieremberg, of the size of a small pigeon, and ornamented with variously-coloured feathers. The beak is short, crooked, and of a pale colour; the head and neck are like those of the pigeon; the breast and part of the belly are red; but that part which is next the tail is of a fine elegant blue, and a bright white, beautifully intermixed with one another; the tail is green on the upper part and black underneath; the wings are variegated with white and black; the feet and legs are grey, and the shoulders of a very beautiful green. It is most frequent near the South Sea, and feeds on vegetables. It is kept in cages for its beauty, but never sings. The Indians make several beautiful works of its feathers. Ray's Ornithol. p. 303.

TZTACTZON, in *Ornithology*, an American name under which Nieremberg has described a species of duck, remarkable for the variable and beautiful colours of its head, which are purple, blue, white, and green, and shine like sattin; its body is variegated with black, grey, and white; its legs are red, and is eaten as the other water-fowl. It is common in the lakes of Mexico, and has feet much more adapted to swimming than to walking. Ray's Ornithol. p. 299.

U.

U, The twentieth letter in the alphabet, and the fifth vowel.

Besides the vowel *u*, there is a consonant of the same denomination, wrote *v* or V.

V consonant and U vowel ought to be considered as two letters; but as they were long confounded while the two uses were annexed to one form, the old custom still continues to be followed.

U, the vowel, has two sounds; one clear, expressed at other times by *eu*, as *obtuse*; the other close, and approaching to the Italian *u*, or English *oo*, as *obtund*.

V, the consonant, has a sound nearly approaching to those of *b* and *f*. With *b* it is by the Spaniards and Gascons always confounded, and in the Runic alphabet is expressed by the same character with *f*, distinguished only by a diacritical point. The sound in English is uniform: it is never mute.

V is also a numeral letter, and signifies *five*; according to the verse.

V vero quinque dabit tibi, si recte numerabis.

When a dash was added at top, $\bar{V}$, it signified 5000.

V. R. among the Romans, stood for *uti rogas*, as you desire: which was the mark of a vote, or suffrage for the passing of a law.

The following abbreviations sometimes occur, viz. V. A. for veterani assignati; V. B. vero bono; V. B. A. viri boni arbitratu; V. B. F. vir bonæ fidei; V. C. vir consularis; V. C. C. F. vale, conjux charissime, feliciter; V. D. D. voto dedicatur; V. G. verbi gratia; V. L. videlicet; V. N. quinto nonarum.

V, on the French coins, denotes those that were struck at Troyes.

V, in *Music*, is often used to shew that a piece is designed for the violin; and VV, for two violins, or more.

V. S. is an abbreviation for VOLTI *subito*.

VACANCY, in *Philosophy*. See VACUUM.

VACANCY, in *Law*, &c. a post or benefice wanting a regular officer, or incumbent.

The canonists hold, that the kind of *vacancy* is to be expressed in the impetration of a benefice.

A future *vacancy*, or voidance of a spiritual living, some writers call *vacatura*. *Devolution* is a species of canonical *vacancy*.

VACANCY of the *throne*. See *Right* of CROWN and REVOLUTION.

VACANT *effects*, *prædia* VACATA, or VACUA, are such as are abandoned for want of an heir, after the death or flight of their former owner.

In our law-books, *vagantes terræ*, for *vacantes*, expresses forsaken, or uncultivated lands.

A Romish benefice is said to be *vacant in curia Romana*, when the incumbent dies in Rome, or within twenty leagues thereof; though it be only by accident that he was there. The pope nominates to all benefices *vacant in curia Romana*, excepting those of the neighbouring bishopricks.

VACANT *cylinder*, in *Gunnery*. See CYLINDER.

VACATING *records*, in *Law*. See IMBEZZLE.

VACATION, *non-term*, in *Law*, all the time included between the end of one term, and the beginning of the next succeeding one. See TERMS.

This intermission was called by our ancestors *pax Dei*, and *ecclesiæ*; and sometimes, the *time* or *days of the king's peace*. Among the Romans, it was called *justitium* or *feriæ*, or *dies nefasti*.

The time from the death of a bishop, or other spiritual person, till the bishoprick, or other dignity, be supplied by another, is also called *vacation*.

During the *vacation* of a bishoprick, the dean and chapter are GUARDIANS of the *spiritualities*, by the canon law; and of common right they are so at this day in England, and the archbishop hath this privilege only by prescription or composition, to whom with us, during the vacancy of any see within his province, all episcopal rights of the diocese belong; and all ecclesiastical jurisdiction is exercised by him and his commissioners. But when an archiepiscopal see is vacant, the dean and chapter of his diocese are guardians of the spiritualities, and exercise the spiritual jurisdiction of his province. And the perquisites that happen by the execution of such power belong to the guardian, but the new-elected bishop may by law, after election and confirmation, execute the same. See CUSTOS *spiritualium*.

The custody of the temporalities of every archbishoprick and bishoprick within the realm, in the time of *vacation*, belong to the KING by his prerogative; and upon the filling of a void bishoprick, the king, and not the new bishop, hath the temporalities thereof, from the time that the same became void to the time that the new bishop shall receive them from the king: which the king *ex gratia* may grant him by his letters patent after his confirmation, and before his consecration: but after he is consecrated, invested, and installed, he may sue for his temporalities out of the king's hands by a writ directed to the estreator; the metropolitan testifying the time of consecration. See CUSTOS *temporalium*.

During the *vacation* of a benefice, the profits, by the common law of the church, were to be laid out for the benefit of the church, or reserved for the successor; and by special privilege or custom the bishop or archdeacon might have the same, wholly or in part: and it is said, the king might take the profits of a free chapel, and the patron those of a donative. But by statute 28 Hen. VIII. c. 11. it is enacted, that the tithes and profits of spiritual promotions, offices, benefices and dignities, during the time of their *vacation*, shall belong to the person next presented, promoted, instituted, inducted, or admitted, towards the payment of his first fruits. Anciently, upon the death of an incumbent, the rural dean, without any formal sequestration, took the vacant benefice into his custody; but in process of time, the chancellors of bishops, or their archdeacons, laid claim to this jurisdiction, and by forms of sequestration assigned vacant churches to the œconomi or lay guardians of the church: and now the ordinary way of managing the profits of *vacation* is by sequestration granted to the church-wardens, who are to manage all the profits and expences of the benefice for the successor; whose right to the profits commences from the avoidance of the benefice, and to whom the sequestrators are to account for such as they have received, deducting their reasonable expences, and those of supplying the cure, during the *vacation*. By 28 Hen. VIII. c. 11. an incumbent before his death may make his testament of all the profits of the corn growing upon glebe lands which he has manured and sown: but if his successor is inducted before the severance of it from the ground, the successor shall have the tithe of it; otherwise, if the parson dies after the severance of it, and before it is carried off, the successor shall have no tithe. Where there is no proper lease of tithes, the person who receives them shall be accountable to the executor for those received by him, and which became due before the incumbent's death, and to the successor for tithes which he received, and which became due after the incumbent's death: but glebe lands, and tithes demised or leased are comprehended under statute 11 Geo. II. c. 19. which enacts, that the executors or administrators of a tenant for life may, in an action upon the case, recover of the under tenant, if such tenant for life die on the day on which the rent was made payable, the whole, or if before such day, a proportion of such rent, according to the time such tenant for life lived, of the last year, or quarter of year, or other time in which the said rent was growing due. As to modus in lieu of tithes, which, if taken in kind, would have been due before the death of the incumbent, whereas the modus for the same is not due till after his death, it seems that the executors are not

not intitled to the said modus, nor any part thereof, but that the whole shall go to the successor.

Cicero, in his *orations*, mentions a law, whereby the priests were exempted from service in all wars, except only in uproars, and civil tumults; which exemptions he calls *vacationes*.

VACCA, in *Zoology*, the female of the ox-kind. See Cow.

Vacca *marina*. See Sea *cow*.

VACCARY, *vaccaria*, in our *Old Writers*, a house or place to keep cows in; a dairy-house, or cow-pasture.

VACCINIUM, in *Botany*, a name by which some authors have called the great bilberry, or *vitis idæa magna* of other writers. See Whortle-*berry*.

VACERRI. See Druids.

VACUNALIA, among the *Romans*, a festival kept in honour of the goddess Vacuna, who presided over those that were unemployed or at rest.

It was celebrated in December by the country labourers, after the fruits were gathered in, and the land tilled. Ovid speaks of it in his Fasti, lib. vi.

Nam quoque cum fiunt antiquæ sacra vacunæ,
Ante vacunales stantque, sedentque focos.

The worship of *Vacuna* was very ancient in Italy, and established among the Sabines long before Rome was founded. Some take her for Diana, Venus, or Ceres, and others for Bellona or Victory. Varro thinks she was Minerva.

VACUUM, Vacuity, in *Physics*, a space empty or devoid of all matter, or body.

Whether there be any such thing in nature as an absolute *vacuum*; or whether the universe be completely full, and there be an absolute plenum; is a thing that has been controverted by the philosophers of all ages.

The ancients, in their controversies, distinguished two kinds; a *vacuum coacervatum*, and a *vacuum interspersum*, or *disseminatum*.

Vacuum *coacervatum*, is conceived as a place destitute of matter: such, e. gr. as there would be, should God annihilate all the air, and other bodies within the walls of a chamber.

The existence of such a *vacuum* is maintained by the Pythagoreans, Epicureans, and the Atomists, or Corpuscularians; most of whom assert such a *vacuum* actually to exist without the limits of the sensible world. But the modern Corpuscularians, who hold a *vacuum coacervatum*, deny that appellation; as conceiving, that such a *vacuum* must be infinite, eternal, and uncreated.

According, then, to the later philosophers, there is no *vacuum coacervatum* without the bounds of the sensible world; nor would there be any other *vacuum*, provided God should annihilate divers contiguous bodies, than what amounts to a mere privation, or nothing; the dimensions of such a space, which the ancients held to be real, being by these held to be mere negations; that is, in such a place, there is so much length, breadth, and depth wanting, as a body must have to fill it. To suppose, that when all the matter in a chamber is annihilated, there should yet be real dimensions, is to suppose corporeal dimensions without body; which is absurd.

The Cartesians, however, deny any *vacuum coacervatum* at all; and assert, that if God should immediately annihilate all the matter, v. gr. in a chamber, and prevent the ingress of any other matter, the consequence would be, that the walls would become contiguous, and include no space at all. They add, that if there be no matter in a chamber, the walls can be conceived no otherwise than as contiguous; those things being said to be contiguous, between which there is not any thing intermediate: but if there be no body between, there is no extension between; extension and body being the same thing: and if there be no extension between, then the walls are contiguous; and where is the *vacuum*?

But this reasoning is founded on a mistake, viz. that body and extension are the same thing. See Matter.

Vacuum *disseminatum*, or *interspersum*, is that supposed to be naturally interspersed in and among bodies, in the pores of the same body, and in the interstices between different bodies.

It is this kind of *vacuum* which is chiefly disputed among the modern philosophers; the Corpuscularians strenuously asserting it; and the Peripatetics, and Cartesians, as tenaciously impugning it. See Cartesian and Leibnitzian.

The great argument the Peripatetics urge against a *vacuum interspersum*, is, that there are divers bodies frequently seen to move contrary to their own nature and inclination; and that for no other apparent reason, but to avoid a *vacuum*: whence they conclude, that nature abhors a *vacuum*; and give us a new class of motions ascribed to the fuga *vacui*, or nature's flying a *vacuum*. Such, they say, is the rise of water in a syringe, upon the drawing up of the piston; such also is the ascent of water in pumps, and the swelling of the flesh in a cupping-glass, &c. But since the weight, elasticity, &c. of the air have been ascertained by sure experiments, those motions and effects are universally ascribed to the gravity and pressure of the atmosphere.

The Cartesians deny not only the actual existence, but even the possibility, of a *vacuum*: and that on this principle, that extension being the essence of matter, or body, wherever extension is, there is matter; but mere space, or vacuity, is supposed to be extended; therefore it is material. Whoever asserts an empty space, they say, conceives dimensions in that space, i. e. he conceives an extended substance in it; and therefore he denies a *vacuum*, at the same time that he admits it.

Des Cartes, if we may believe some accounts, rejected a *vacuum* from a complaisance to the taste which prevailed in his time, against his own first sentiments; and amongst his familiar friends used to call his system his philosophical romance.

On the other hand, the corpuscular authors prove, not only the possibility, but the actual existence, of a *vacuum*, from divers considerations; particularly from the consideration of motion in general; and that of the planets, comets, &c. in particular; from the fall of bodies; from the vibration of pendulums; from rarefaction and condensation; from the different specific gravities of bodies; and from the divisibility of matter into parts.

1°, It is argued, that motion could not be effected without a *vacuum*. This is what Lucretius urged long ago. *Principium quoniam cedendi nulla daret res—undique materies quoniam stipata fuisset.*

The force of this argument will be increased from the two following considerations, viz. first that all motion is either in a straight line, or in a curve, which returns into itself, as the circle, and ellipsis; or in a curve that does not return into itself, as the parabola, &c. And, secondly, that the moving force must always be greater than the resistance.

For, hence it follows, that no force, even though infinite, can produce motion where the resistance is infinite; consequently, there can be no motion either in a straight line, or a non-returning curve; because, in either of those cases, the protrusion, and consequently the resistance, would be infinite. There remains, therefore, only the motion of a revolving curve practicable; this must either be a revolution upon an axis, or an annular motion round a quiescent body; both which are, again, impossible in an elliptic curve: and consequently, all motion must be in circles geometrically true; and the revolving bodies must either be spheres, spheroids, cylinders, or portions of them, exactly geometrical; otherwise, the revolutions in a plenum would be impossible: but such motions, or such figured bodies, we do not know in nature. Therefore there is a *vacuum*.

2°, The motions of the planets and comets demonstrate a *vacuum*: thus Sir Isaac Newton—"That there is no "such fluid medium as æther," (to fill up the porous parts of all sensible bodies, as the air and interstellar parts, and so make a plenum), "seems probable; because the planets and comets proceed with so regular "and lasting a motion, through the celestial spaces, both "from and to all parts; for hence it appears, that those "celestial spaces are void of all sensible resistance, and "consequently of all sensible matter. For the resisting "force of fluid mediums arises partly from the attrition "of the parts of the medium, and partly from the inactivity of matter. Now, that part of the resistance of "any medium, which arises from the tenacity or attrition of its parts, may be lessened by dividing the matter into smaller parts, and by rendering those parts "more smooth and slippery: but that part of the resistance which arises from the inactivity of matter, is always in proportion to the density of the matter; nor "can it be diminished by dividing the matter, nor by "any other means, except by diminishing the density "thereof.

"Consequently, if the celestial regions were as dense as "water, or as quicksilver, they would resist almost as "much as water or quicksilver; but if they were perfectly dense, without any interspersed vacuity, though "the matter were ever so fluid and subtle, they would "resist more than quicksilver does; a perfectly solid "globe, in such a medium, would lose above half its "motion, in moving three lengths of its diameter; and "a globe not perfectly solid, such as the bodies of the "planets and comets are, would be stopped still sooner. "Therefore, that the motion of the planets and comets "may be regular, and lasting, it is necessary the celestial

" leſtial ſpaces be void of all matter, except perhaps " ſome few, and much rarefied effluvia of the planets " and comets, and the paſſing rays of light."

3°, The ſame great author deduces a *vacuum* alſo from the conſideration of the weights of bodies; thus: " All " bodies about the earth gravitate towards the earth; " and the weights of all bodies, equally diſtant from " the earth's centre, are as the quantities of matter in " thoſe bodies. If the æther, therefore, or any other " ſubtile matter, were altogether deſtitute of gravity, or " did gravitate leſs than in proportion to the quantity of " its matter; becauſe (as Ariſtotle, Deſcartes, and others, " argue) it differs from other bodies only in the form of " matter; the ſame body might, by the change of its " form, gradually be converted into a body of the ſame " conſtitution with thoſe which gravitate moſt in propor- " tion to the quantity of matter: and, on the other " hand, the moſt heavy bodies might gradually loſe their " gravity, by gradually changing their form; and there- " fore the weights would depend upon the forms of bo- " dies, and might be changed with them; which is con- " trary to all experiment."

4°, The deſcent of bodies proves, that all ſpace is not equally full; for the ſame author goes on, " If all ſpaces " were equally full, the ſpecific gravity of that fluid, " with which the region of the air would, in that caſe, " be filled, would not be leſs than the ſpecific gravity " of quickſilver or gold, or any other the moſt denſe " body; and therefore neither gold, nor any other bo- " dy, could deſcend therein. For bodies do not deſcend " in a fluid, unleſs that fluid be ſpecifically lighter than " the body. But, by the air-pump, we can exhauſt a " veſſel, till even a feather ſhall fall with a velocity equal " to that of gold in the open air: the medium, there- " fore, through which this feather falls, muſt be much " rarer than that through which the gold falls in the " other caſe.

" The quantity of matter, therefore, in a given ſpace, " may be diminiſhed by rarefaction: and why may not " it be diminiſhed in infinitum? Add, that we conceive " the ſolid particles of all bodies to be of the ſame den- " ſity; and that they are only rarefiable by means of their " pores: and hence a *vacuum* evidently follows."

5°, " That there is a *vacuum*, is evident from the vi- " brations of pendulums: for ſince thoſe bodies, in places " out of which the air is exhauſted, meet with no re- " ſiſtance to retard their motion, or ſhorten their vibra- " tions; it is evident there is no ſenſible matter in thoſe " ſpaces, or in the occult pores of thoſe bodies."

As to what Des Cartes urges of his materia ſubtilis, that its tenuity prevents its reſiſtance from being ſenſible; and that a ſmall body, ſtriking againſt a greater, cannot in the leaſt move, or reſiſt the motion of that other; but is reflected back again with all its momentum; it is contrary to all experience. For ſir Iſaac proves, that the denſity of fluid mediums is proportionable to their reſiſtances, very nearly; and that they are exceedingly miſtaken, who ſuppoſe the reſiſtance of projectiles to be infinitely diminiſhed, by dividing the parts of the fluid, even in infinitum (Princip. lib. II. prop. 38.): When, on the contrary, it is clear the reſiſtance is but little diminiſhed by the ſubdiviſion of the parts (ibid. Prop. 40.) and that the reſiſting forces of all fluids are nearly as their denſities—For why ſhould not the ſame quantity of matter, whether divided into a great number of ſubtle parts, or into a few larger ones, have the ſame reſiſting force? If then there were no *vacuum*, it would follow, that a projectile moving in the air, or even in a ſpace whence the air is exhauſted, ſhould move with as much difficulty as it would in quickſilver; which is contrary to experience.

Nor will it avail to ſuppoſe the particles of the ſubtile fluid, conſtituting a plenum, to move conſtantly and equally in all directions; and by favour of this hypotheſis, to imagine that they act but do not reſiſt. Becauſe the motion of a fluid favours the motion of a body in it, only as far as it is in the ſame direction; and an inteſtine motion of the parts of the fluid, equal in all directions, cannot make the reſiſtance leſs than if there was no motion of the parts. It is ſuppoſed by many that the particles of common fluids, e. g. water or air, are in a conſtant inteſtine motion; but this does not hinder thoſe fluids from reſiſting in proportion to their denſity.

If it ſhould be alledged, that by ſuppoſing this denſe fluid which repleniſhes ſpace to penetrate the pores of bodies with the utmoſt freedom, (as light paſſes through tranſparent bodies, and the magnetic and electric effluvia through moſt kinds of bodies), its reſiſtance will then be incomparably leſs than in proportion to its denſity; the reſiſtance in this caſe not being meaſured by the denſity of the fluid, *becauſe the greater part paſſes through the* pores of the body in motion freely, without reſiſtance: yet even on this hypotheſis, the reſiſtance of a golden ball in a plenum would be ſtill very great. For this ſubtle fluid, how penetrating ſoever it be, muſt reſiſt the ſolid parts of the ball; which cannot move in the fluid without diſplacing its parts, and loſing as much motion as muſt be communicated to thoſe parts; and this reſiſtance depends on the quantity of ſolid parts in the ball; whereas the reſiſtance which the ſame ball meets with in quickſilver (which we ſuppoſe to have no paſſage through the ball), depends on the quantity of the ſolid parts in an equal bulk of the quickſilver, which muſt be moved to make way for the ball. And this being leſs than the quantity of ſolid parts in an equal bulk of the golden ball, in proportion as the ſpecific gravity of quickſilver is leſs than that of gold, it follows that the reſiſtance of a golden ball, moving in ſuch a ſubtile penetrating plenum, would be greater than its reſiſtance in quickſilver. The reſiſtance of a golden ball in a plenum (how freely ſo ever the matter conſtituting it paſs through the pores of the ball, and how large or numerous ſo ever theſe pores may be) muſt correſpond to the ſolid matter in the ball; which is greater than the ſolid matter in any equal bulk of any of our fluids, upon which their reſiſtance depends.

6°, That there are interſperſed vacuities, appears from matter's being actually divided into parts, and from the figures of thoſe parts: for, on ſuppoſition of an abſolute plenitude, we do not conceive how any part of matter could be actually divided from that next adjoining, any more than it is poſſible to divide actually the parts of abſolute ſpace from one another: for by the actual diviſion of the parts of a continuum from one another, we conceive nothing elſe underſtood, but the placing of thoſe parts at a diſtance from one another, which, in the continuum, were at no diſtance from one another: but ſuch diviſions between the parts of matter muſt imply vacuities between them.

7°, As for the figures of the parts of bodies, upon the ſuppoſition of a plenum, they muſt either be all rectilinear, or all concavo-convex; otherwiſe, they would not adequately fill ſpace; which we do not find to be true in fact.

8°, The denying a *vacuum* ſuppoſes what it is impoſſible for any one to prove to be true; viz. that the material world has no limits.

However we are told by ſome, that it is impoſſible to conceive a *vacuum*. But this ſurely muſt proceed from their having imbibed Des Cartes's doctrine, that the eſſence of body is conſtituted by extenſion; as it would be contradictory to ſuppoſe ſpace without extenſion. To ſuppoſe that there are fluids penetrating all bodies and repleniſhing ſpace, which neither reſiſt nor act upon bodies, merely in order to avoid admitting a *vacuum*, is feigning two ſorts of matter, without any neceſſity or foundation; or is tacitly giving up the queſtion.

Since then the eſſence of matter does not conſiſt in extenſion, but in ſolidity, or impenetrability, the univerſe may be ſaid to conſiſt of ſolid bodies moving in a *vacuum*: nor need we at all fear, leſt the phenomena of nature, moſt of which are plauſibly accounted for from a plenitude, ſhould become inexplicable when the plenum is ſet aſide. The principal ones, ſuch as the tides; the ſuſpenſion of the mercury in the barometer; the motion of the heavenly bodies, and of light, &c. are more eaſily and ſatisfactorily accounted for from other principles. See TIDES, &c.

VACUUM, or *vacuum Boyleanum*, is alſo uſed, ſomewhat abuſively, to expreſs that approach to a real *vacuum*, which we arrive at by means of the air-pump.

Thus, any thing put in a receiver ſo exhauſted, is ſaid to be put *in vacuo*: and thus, moſt of the experiments with the air-pump are ſaid to be performed *in vacuo*, or *in vacuo Boyleano*. Some of the principal phenomena, obſerved of bodies *in vacuo*, are; that the heavieſt and lighteſt bodies, as a guinea and a feather, fall here with equal velocity:—that fruits, as grapes, cherries, peaches, apples, &c. kept for any time *in vacuo*, retain their nature, freſhneſs, colour, &c. and thoſe withered in the open air recover their plumpneſs *in vacuo*:—all light and fire become immediately extinct *in vacuo*:—the colliſion of flint and ſteel *in vacuo*, produces no ſparks:—no ſound is heard, even from a bell rung *in vacuo*:—a ſquare phial, full of common air, well cloſed, breaks *in vacuo*; a round one does not:—a bladder half full of air will heave up forty pound weight *in vacuo*:—cats, and moſt other animals, ſoon expire *in vacuo*.

By experiments made in 1704, Dr. Derham found, that animals which have two ventricles, and no foramen ovale, as birds, dogs, cats, mice, &c. die in leſs than half a minute; counting from the firſt exſuction; a mole died,

died in one minute, a bat lived seven or eight. Insects, as wasps, bees, grasshoppers, &c. seemed dead in two minutes; but, after being left *in vacuo* twenty-four hours, they came to life again in the open air: snails continued twenty-four hours *in vacuo*, without appearing much incommoded.

Seeds planted *in vacuo* do not grow:—Small beer dies, and loses all its taste, *in vacuo*:—Lukewarm water boils very vehemently *in vacuo*:—And air, rushing through mercury into a *vacuum*, throws the mercury in a kind of shower upon the receiver, and produces a great light in a dark room.

The AIR-PUMP can never produce a perfect *vacuum*; as is evident from its structure, and the manner of its working: in effect, every exsuction only takes away a part of the air: so that there will still be some left after any finite number of exsuctions. Add, that the air-pump has no longer any effect than while the spring of the air remaining in the receiver is able to lift up the valves: when the rarefaction is come to that degree, you can come no nearer to a *vacuum*. Sir Isaac Newton, observing that a thermometer suspended *in vacuo*, and in that state removed to a warm or a cold room, receives the heat or cold, and rises, or falls, almost as soon as another in open air; takes thence occasion to suspect, that the heat of the warm room is conveyed through the *vacuum*, by the vibrations of a much subtiler medium than air, which remained in the *vacuum* after the air was drawn out. (Opt. p. 323.)

VACUUM, *Torricellian*. See TORRICELLIAN.

VADARI, in the *Civil Law*, denotes a person to pledge, undertake, or give security, in behalf of another, that he shall, on a certain day, appear in court, to prosecute, or answer.

If he fails, his surety has an action *vadimonii deserti* against him; that is, an action for deserting his bail. See WAGER.

Properly speaking, *vadari reum*, among the Romans, was the act of the plaintiff himself, who here demanded surety, or bail from the defendant, that he would appear before the prætor on a certain day.

VADELECT. See VALET.

VADE-MECUM, or a VENI-MECUM, a Latin phrase, used in English, to express a thing that is very familiar; and which any one usually carries about with him: it is chiefly applied to some favourite book.

Some make Virgil, others Horace, their *vade-mecum*; others an Epictetus, &c.

This is what the Greeks call εγχειριδιον, or *manual*. The Arabs have a phrase of equal import; viz. *Habib al feir*, *comes itineris*, companion of the journey. In Latin it is best expressed by *comes*; as *comes theologicus*, *comes rusticus*, &c.

VADIATION. See VADARI.

VADIMONIUM, in the *Civil Law*, a promise, or bond, given for appearance before the judge upon a day appointed.

VADIUM. See GAGE and PONE *per Vadium*.

VA-EMBU, in the *Materia Medica*, a name given by some authors to the *acorus Asiaticus*, or Asiatic sweet flag.

VAGABOND, a person that wanders about, having no certain dwelling; or a sturdy beggar, &c. mentioned in divers statutes.

De vagabundis, *& aliis hominibus mendicantibus, qui se nominant*—Travelling men, *&c.* Charta 22. Hen. VI.—*Item utemur, quod nullus* vagabundus *vagetur seu deambulet de nocte in villa seu suburbio post pulsationem campanæ nostræ communis, vocatæ Coverfeu: & si aliquis ibidem capiatur post pulsationem dictæ campanæ, ducatur ad gaulam domini regis, & ibi morabitur usque in crastinum, ut notitia personæ suæ habeatur*, &c. M.S. Cod. de Leg. & Stat. Burgi villæ Mountgomer. temp. Hen. II.

All itinerant beggars, fortune-tellers, collectors for gaols, fencers, bearwards, players of interludes, minstrels, jugglers, gypsies, &c. shall be reputed *vagabonds*, rogues, and sturdy beggars, 39 Eliz. c. 4.

The court of Areopagus at Athens punished idleness, and exercised a right of examining every citizen in what manner he spent his time. The civil law expelled all sturdy beggars from the city: and, in our own law, all idle persons or *vagabonds*, (whom our ancient statutes describe to be "such as wake in the night, and sleep in the day, and haunt customable taverns, or alehouses, and routs about; and no man wot from whence they come ne whither they go;" or such as are more particularly described by statute 17 Geo. II. c. 5. called the *vagrant act*, and divided into three classes, (*idle and disorderly* persons, *rogues* and *vagabonds*, and *incorrigible rogues*;) are offenders against the good order, and blemishes in the government of any kingdom. They are therefore all punished by the statute last-mentioned: i. e. idle and disorderly persons with one month's imprisonment in the house of correction; rogues and *vagabonds* with whipping and imprisonment not exceeding six months; and incorrigible rogues with the like discipline and confinement, not exceeding two years; the breach and escape from which confinement in one of an inferior class, ranks him among incorrigible rogues; and in a rogue (before incorrigible) makes him a felon, and liable to be transported for seven years. Persons harbouring vagrants, are liable to a fine of 40*s.* and to pay all expences brought on the parish thereby; in the same manner as, by our ancient laws, whoever harboured any stranger, for more than two nights, was answerable to the public for any offence which his inmate might commit. Black. Com. vol. iv. p. 170.

VAGINA, a Latin term, literally signifying a *sheath*, or *scabbard*; used on divers occasions. As

VAGINA, in *Architecture*, is used for the lower part of a TERMINUS; because resembling a sheath, out of which the statue seems to issue. See TERMS.

The *vagina* is that long part between the base, and the capital; and is formed in divers manners, and with divers ornaments.

VAGINA, in *Anatomy*, denotes a canal, or cavity, leading from the pudendum to the uterus of women.

The *vagina*, called also CERVIX *uteri*, is a membranous passage, extended from the rima, or aperture of the labia, to the neck of the womb. See *Tab. Anat.* (*Splanch.*) *fig.* 9. *lit. h. fig* 11. *lit. a.*

It is situated below the urethra, and above the extremity of the intestinum rectum, a little obliquely, being more raised in the inner and back part than in the outer and fore-part: its inner or posterior extremity joins the extremity of the body of the uterus, and surrounds its orifice much as the duodenum surrounds the pylorus, or as the ilium is surrounded by the cæcum and colon: the anterior extremity forms the great orifice, which lies under that of the urethra, and above the fossula of the inferior commissure of the alæ; and is commonly bordered by a circular membranous fold, called HYMEN; and each side of this anterior portion is covered externally by a thin, broad, cavernous, and vascular plexus, called the plexus retiformis of this canal, being composed of vessels which come chiefly from the hypogastricæ; and this plexus is strictly united to the muscular portions commonly taken for accelerators or constrictors, and may be inflated by air like the spongy substance of the clitoris, with which it seems to have some communication: the length of the *vagina* is ordinarily seven or eight inches. The body of the canal is chiefly made up of a spongy nervous substance, interwoven with numerous blood-vessels, exquisitely sensible, and it is commonly longer and narrower in virgins, than in married women.

Through the whole course of its inner surface, it is covered by a particular membrane, and is full of rugæ, or wrinkles; formed by oblong narrow eminences, incurvated like portions of arches; which arches the use of venery renders less apparent, and frequent parturition obliterates: this shews, that they were intended to render the part more easily distendible for parturition.

Along the whole tract of the *vagina* there are pores, or ostia, or little ducts seen, which are the extremities of glands, that, in the act of venery, emit a liquor by many mistaken for seed. See LACUNÆ.

The *vagina* has a constrictory muscle, inserted under the clitoris; which, with a broad series of fibres, embraces and constringes the lower part of the *vagina*, and puts the dimension of the part, in some measure, in the power of the mind.

The use of the *vagina* is to receive the penis in coition, and to emit from the womb the menstrual discharges, the fœtus, secundines, and lochia.

The *vagina* is liable to an *inflammation* after delivery, occasioned by the head of the child being long retained in the pelvis. If the swelling and inflammation are not very great, they are generally removed by the discharge of the lochia; but if the internal membrane of the *vagina* be inflamed, emollient injections must be occasionally used, and a piece of prepared sponge should be introduced to prevent its coalescing. The sponge may be thus prepared: take a piece of a proper size for keeping the *vagina* open, when it is expanded; soak it in warm water; then roll it tight from end to end with a string; cut off any hard lumps, and lay it to dry; then take off the string; anoint it with lard, and introduce it into the *vagina*, the moisture of which will expand it. If the pressure on this part was so long continued, as to obstruct the circulation in it, a mortification will ensue, which may be either total or partial: if it be total, the patient will die; if partial only, the mortified parts will slough off. This may be known by great pain after delivery; a fetid smell, and a discharge of sharp ichor at first from the *vagina*, then pus and matter. When this is the case, emollient fomentations may be thrown up from time to time; dossils of lint may be dipped in some proper bal-

fum, and applied to the parts in order to deterge and heal them; and when the sloughs are all cast off, great care should be taken to prevent the *vagina* from growing together, either by introducing dossils of lint, or pieces of sponge into it. Motherby.

VAGINÆ *procidentia*. See PROCIDENTIA.

VAGINÆ *femoris tensor*, in *Anatomy*, a name given by Albinus to a muscle of the thigh, called by others the MEMBRANOSUS, and the *musculus fasciæ latæ*; and by some *musculus* APONEUROTICUS.

VAGINÆ *uteri sphincter*. See SPHINCTER *vaginæ*, &c.

VAGINALIS *gulæ*, in *Anatomy*, a name some anatomists give to the musculous coat of the gula; as supposing it a proper muscle, conspiring with the œsophagus in thrusting the aliment down, when entered.

VAGINALIS *tunica*, the same with what we otherwise call ELYTROIDES.

The *tunica vaginalis* is common to the spermatic chord, and the testicle; the *tunica* of the latter being a continuation of that of the former, which is a process of the peritonæum. The *tunica vaginalis* of the spermatic chord is composed of two distinct membranous laminæ, situated upon one another; the upper being extended downwards, and dilated in its progress towards the testicle and epididymis, so as to form a bag or sheath for the reception of these and the tunica albuginea. On the posterior part the epididymis is connected to the internal surface of the *tunica vaginalis*. Its internal lamina is attached to the spermatic rope, a little above the testicle, by a thin, fine membrane, with which it is lined; and thus a transverse partition is formed betwixt the superior and inferior parts: the *tunica vaginalis* of one testicle has no connection with that of the other; such connection being prevented by the septum scroti. The outer surface of this tunica is rough; the inner smooth, and lubricated by a small quantity of extravasated lymph, furnished by the extremities of exhaling, lymphatic, or secretory vessels, which fluid, in a proportional quantity, is occasionally returned into the course of circulation by inhaling or absorbent vessels. See HYDROCELE.

VAGINANS *folium*, among *Botanists*. See LEAF.

VAGRANTS, in *Law*. See VAGABOND.

VAGUM, in *Anatomy*, a name given to the eighth pair of nerves of the medulla oblongata, called the *par vagum*, because dispersed to divers parts of the body. See *Tab. Anat. (Osteol.) fig.* 5. *lit. q. q.* See NERVE.

VAI-*hio*, in the *Materia Medica*, a name used by some authors for a kind of lignum aloes, which is brought from China, and is very black, and scented.

VAIR, in *Heraldry*, a kind of fur, or doubling, consisting of divers little pieces, argent and azure, resembling a Dutch U, or a bell-glass. See *Tab.* II. *Heraldry, fig.* 87.

Vairs have their point azure opposite to their point argent, and the base argent to the azure.

When there are only two or three *vairs*, the ancient heralds call it *great vair*; and when there are more, *small vair*.

Vair is intended to represent a kind of skin, used anciently by the kings of France, in lieu of a fur, and wherewith the gowns of the presidents à mortier, the counsellors of the court, the heralds coats, *&c.* were lined, till the fifteenth century.

It was properly the skin of a kind of squirrel, called also, in French, *vair*, and in Latin *sciriceus*; which was white underneath, and of a dove-colour at top. It is described by Aldrovandus, under the name of *sciriceo vario*, and is the same, according to Gesner, with the *mus Ponticus* of Aristotle and Pliny; which the Latins call *varus*, or *varius*, from the variety of its colour. Its two skins, joined together, make the figure of the *vairs* in armories; being naturally white and azure.

Vair, Colombiere observes, is the second sort of fur anciently used as a lining of the garments of great men; consisting of little pieces, sewed by the furriers on white skins: and because these pieces were usually blue, those who first settled the rules of heraldry, decreed, that this fur, in its natural blazon, should always be argent and azure. So, if it be absolutely said, such a family bears *vair*; it is supposed to be argent and azure.

Regularly there must be but four rows or ranks of *vair* in the shield; if there be either more or less, the number must be specified. The smallest number, being three rows, is called *beffroy de vair*; and the most, being five or six, is called *menu*, or *small vair*.

The *beffroy* is also known by the first figure on the dexter-side of the escutcheon, being always of metal, and in form of a belt; whereas that of mere *vair* is in shape of a glass.

VAIR, *counter*. See COUNTER-*vair*.

VAIRY, VAIRE, VERRY, or VARRY, is applied to a coat, or the bearings of a coat, when charged, or chequered with *vair*.

When the colours are argent and azure, or white and blue, it is *vairy proper*: if it be otherwise, the colours are to be expresly named; *vairy* of such a colour or metal. He bears *vairy*, or, and vert; this is particularly called *vair composed*. The bearings are likewise said to be *vairy*, when they are charged with *vairs*.—When chiefs, crosses, pales, fesses, &c. happen to be *vairy*, the number of ranks are to be specified.

Vairy gowns are observed, by Julius Pollux, to have been the habit of the ancient Gauls, as ermines were of the Armenians.

VAIRY *cuppy*, or VAIRY *tassy*, or *potent* COUNTER, COUNTER-*potent*, is a bearing in heraldry, composed of pieces representing the tops of crutches, or potents counter-placed. See *Tab.* II. *Herald. fig.* 88.

In blazon, the colours must be expressed; as, azure, argent, &c.

VAISSEAUX *enfilez*, a term used by the French writers in *Chemistry*, for the vessels used in distilling in an open fire, or in sand, which do not consist in the common way of a retort, joined immediately to a receiver, but have a receiver with a double opening, and a neck at each end, placed between the retort and the ordinary receiver. The neck of the retort is let into one of the necks of this middle vessel, and its other neck is thrust into that of the receiver; by this means the receiver, into which the liquor is to fall, stands at a greater distance than it otherwise would from the fire, and the vapours are more easily condensed in it by its coolness, while they have also a double or treble space to expand in, and by that means are not so likely to burst the vessel.

VALANTIA, in *Botany*. See CROSS-*wort*.

VALDENSES. See VAUDOIS.

VALDIA, in *Botany*, a name given by Plumier to a genus of plants, since called by Linnæus, OVIEDA.

VALE *of a pump*, at *Sea*, a term for the trough by which the water runs from the pump along the ship-sides, to the scupper-holes.

VALENTIAM. See CAPE *ad Valentiam*.

VALENTINIANS, in *Ecclesiastical History*, an ancient and famous sect of GNOSTICS; thus called from their leader *Valentinus*, an Egyptian by birth, who was eminently distinguished by the extent of his fame, and the multitude of his followers. His sect, which took rise at Rome towards the close of the second century, grew up to maturity in the isle of Cyprus, and spread itself through Asia, Africa, and Europe, with amazing rapidity. His principles were much the same with those of the Gnostics, though in many respects he entertained opinions peculiar to himself. He placed in the pleroma, as the Gnostics called the habitation of the Deity, thirty ÆONS, half male and half female: to these he added four others, which were of neither sex, viz. Horus, Christ, the Holy Ghost, and Jesus. The youngest æon, called Sophia or Wisdom, conceived an ardent desire of comprehending the nature of the Supreme Being, and by the force of this propensity, brought forth a daughter, named Achamoth; who, being exiled from the pleroma, fell down into the undigested mass of matter and arranged it; and, by the assistance of Jesus, produced the DEMIURGE, the lord and creator of all things. This demiurge separated the animal from the terrestrial matter; and out of the former created the superior world, or visible heavens; and out of the latter the inferior world, or the terraqueous globe. He also made man, uniting in his composition the animal and terrestrial matter, to which Achamoth added a spiritual and celestial substance. The demiurge, according to Valentine, arrogating the honours of God alone, sent prophets to the Jewish nation to urge his claims; and his ambition was imitated by the other angels that preside over the different parts of the universe. In order to chastise this lawless arrogance, and to illuminate the minds of rational beings with the knowledge of the true and supreme Deity, Christ appeared on earth, composed of an animal and spiritual substance, and clothed, moreover, with an aerial body. The Redeemer, in descending upon earth, passed through the womb of Mary; and Jesus, one of the supreme æons, was united to him when he was baptised by John in Jordan. The creator of this world, perceiving that the foundations of his empire were shaken, caused him to be apprehended and nailed to the cross: but before Christ submitted to this punishment, not only Jesus the Son of God, but the rational soul of Christ, ascended up on high; so that only the animal soul and the ethereal body suffered crucifixion. Those, who abandoning the service of false deities and the worship of the God of the Jews, live according to the precepts of Christ, and submit the ani-

mal and sensual soul to the discipline of reason, shall be truly happy; and when all the parts of the divine nature, or all souls, are purified thoroughly and separately from matter, then a raging fire shall spread its flames through the universe, and dissolve the frame of the corporeal world. Such is the doctrine of Valentine and the Gnostics: and such, in general, are the tenets of the ORIENTAL *philosophy*. The sect of the *Valentinians* was divided into many branches. See PTOLEMAITES, SECUNDIANS, HERACLEONITES, and MARCOSIANS. Mosheim's Ecc. Hist. vol. i. p. 186. &c. 8vo. edit.

VALERE. See PERINDE *Valere*.

VALERIAN, VALERIANA, in *Botany*, a genus of the *triandria monogynia* class. Its characters are these: the flower has either no or a small empalement, and one tubulous petal, cut into five obtuse segments at the brim, with a gibbous honey-gland on the inside; it has three small erect awl-shaped stamina the length of the petals, terminated by roundish summits; the germen is situated under the flower, supporting a slender style crowned by a thick stigma; it turns to a crowned capsule which falls off, and in it is lodged a single seed. There are several species of it, which grow naturally in England, and other parts of Europe. Miller enumerates twelve, and Linnæus nineteen species.

The *valerians* may be known, when not in flower, by their roots being scented, and their leaves always standing two at a stalk.

There are various kinds of *Valerian*; but those chiefly in use, are the large garden *valerian*, *valeriana hortensis*; called by Dioscorides, *phu*, *folio olusatri*; and the *valeriana sylvestris*, or great wild *valerian*.

The former is an ingredient in Venice treacle; its chief use is in disorders of the nerves: in which respect, however, it is held inferior to the latter.

The *wild valerian*, *valeriana officinalis* of Linnæus, or *valeriana sylvestris major montana* of Bauhine, is perennial, and grows wild in dry mountainous places. The root consists of tough strings with numerous smaller threads, matted together, issuing from one head, of a dusky brownish colour approaching to olive. Cows eat the leaves, and cats are very fond of the roots. Another species, or variety, of *wild valerian* is met with in moist watery grounds, distinguishable by the leaves being broader, and of a deep, glossy green colour. Both sorts have been used indiscriminately; but the mountain sort is much the most efficacious, and is, therefore, expresly ordered for the officinal species by the London college.

The *mountain valerian* root has a strong, not agreeable, smell, and an unpleasant, warm, bitterish, subacrid taste: the strength of the smell and taste is the only certain test of its genuineness and goodness. It is a medicine of great esteem in the present practice against obstinate hemicraniæ, hysterical, and the different kinds of nervous disorders, and is commonly considered as one of the principal antispasmodics. Columna reports, that he was cured by it of an inveterate epilepsy after many other medicines had been used in vain.

M. Marchant, in the Memoirs of the Academy of Sciences, has confirmed this virtue, by many instances within his own knowledge: and what is very remarkable, is, that in the two observations he enlarges most upon, the patients, on taking it, voided great quantities of worms. His custom was, always to purge before he administered it.

On more extensive trials it has been found, in some epileptic cases, to effect a cure, in several to abate the violence or frequency of the fits, and in many to prove altogether ineffectual; oftentimes, it either purges, or operates by sweat or by urine, or brings away worms, before it prevents a fit. The dose of the root in powder is from a scruple to a dram or two, which may be repeated, if the stomach will bear it, two or three times a day. Dr. Withering says, that in habitual costiveness it is an excellent medicine; and frequently loosens the bowels when other stronger purgatives have been tried in vain. A remarkable instance of its efficacy in a catalepsy is given by Mr. Mudge (on the *vis vitæ*, &c.); doses of half an ounce of the powder were exhibited twice a day, and a less quantity was found ineffectual.

The powdered root, infused in water or digested in rectified spirit, impregnates both menstrua strongly with its smell and taste, and tinges the former of a dark brown, and the latter of a brownish red colour. Water distilled from it smells considerably of the root, but no essential oil separates: the extract obtained by inspissating the watery infusion, which is about one fourth the weight of the root, has a pretty strong taste, disagreeably sweetish, and somewhat bitterish: the spirituous extract, which is about one-eighth the weight of the root, is less disagreeable, and more perfectly resembles the root itself. Tinctures of it are prepared in the shops, by digesting four ounces of the powdered *valerian* in a quart of proof spirit, in the same quantity of the volatile aromatic spirit, or of the dulcified spirit of sal ammoniac. The root in substance, however, is generally found to be more effectual than any preparation of it: and its flavour may best be covered with mace. Lewis.

VALERIAN, *Greek*, or JACOB's *Ladder*, *polemonium*, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the flower has a permanent empalement which is cut into five segments, and it has one wheel-shaped petal; the tube is very short, and the upper part is divided and spreads open; it has five slender stamina inserted in the valves of the tube, which are shorter than the petal, and are terminated by roundish summits; in the bottom of the tube is situated an acute oval germen, supporting a slender style equal with the petal, crowned by a revolving trifid stigma; the germen becomes a three-cornered oval capsule, having three cells filled with irregular acute-pointed seeds. Linnæus enumerates four, and Miller two species.

VALERANELLA, a species of VALERIAN, called lamb's lettuce or corn-sallad; it is common in corn-fields; and the young leaves in spring and autumn are eaten as sallad, and are very little inferior to young lettuce.

VALESIANS, VALESIANI, in *Ecclesiastical History*, ancient sectaries, so called from one *Valesius*, a person unknown to Epiphanius, who however makes mention of this sect, Hær. 58. though he owns he knew but very little of them; only this, that they admitted none into their society but eunuchs; at last, if any were admitted before castration, they obliged them not to eat any meat till the operation was performed. For then, being no longer subject to the motions of the flesh, they allowed them to eat any kind of meats. Whiston says of them, that they sprung up about the year 240, and that they rejected the law and the prophets.

VALET, or VALECT, a French term, anciently written *varlet*.

In France, *valet* is a common name for all domestic servants, employed in the lower, and more servile offices; including what we call *grooms*, *footmen*, *coachmen*, *bailiffs*, &c. But the word is not used among us in this sense, nor any otherwise than in the phrase *valet de chambre*; which is a servant, whose office is to dress and undress his master, to look to his bed-chamber, wait on him at table, &c. the same with what we otherwise call his *gentleman*.

In the history of Lewis XII. by Seisel, we always find *varlet de chambre du roi*, *varlet de la gardrobe*, &c. But *varlet*, like *knave*, and divers other words, is now degenerated into a term of reproach.

Valet, *valect*, *vadelect*, *vadlet*, and *vallet*, Camden observes, were anciently used at our court, for a gentleman of the privy-chamber.

Selden, in his Titles, relates, that *valets* anciently signified young gentlemen, and heirs of great estate and quality; especially such as were to be knighted.

In the accounts of the Inner Temple, *valet* is used for a bencher's clerk, or servant. The butlers of the house still call them *varlets*.

VALET, in the *Manege*, a stick armed at one end with a blunted point of iron, to prick and aid a leaping horse. Formerly a *valet* was called *aiguillon*, i. e. goad, and some of them had spur-rowels upon them, only the points beaten down: and when a horse was first begun round a pillar, without a rider, they used to prick his flanks with the *valet*, to make him know the spur, and obey it, without resisting. At present the *valet* is not used for that purpose, and the name of *goad* is suppressed, as being only proper for oxen.

VALETUDINARY, VALETUDINARIUS, a term sometimes used by the writers of medicine, for a person of a weak, sickly constitution, who is very frequently out of order, &c.

Dr. Cheyne, by all means, directs the weakly, the studious, the sedentary, and the *valetudinary*, to a low, spare regimen.

VALID, a term applied to acts, transactions, expeditions, &c. which are clothed in all the formalities requisite to their being put into execution, and to their being admitted in a court of justice.

A contract by a minor is not *valid*, or is *invalid*: a marriage is not *valid*, unless performed with the solemnities injoined.

VALIGA, a name given by some medical writers to an infusion or tincture of jalap in spirit of wine, or spirit of citron, with the addition of a little saffron.

VALLAR, VALLARIS, formed from *vallum*, a stake with branches, whereof they made the palisade of a camp, called *lorica*, in *Antiquity*, an epithet given to a kind of crown,

crown, which the Roman generals bestowed on him, who, in attacking the enemies camp, first broke in upon the lines, or palisades.

The *corona vallaris* was the same with what was otherwise called *corona castrensis*, from *castra*, a camp. Aulus Gellius assures us, that it was of gold, as the mural and naval crowns also were: yet though they were made of that precious metal, they were not the most valued; for Pliny, lib. xxii. cap. 3. gives the preference to the corona obsidionalis, which yet was only of gramen, or grass. See CROWN, and *Tab.* III. *Heraldry*, *fig.* 98.

VALLEY, VALE, in *Geography*. See MOUNTAIN.

VALLEYS, in *Building*, denote the gutters over the sleepers in the roof of a building.

VALLISPERIA, in *Botany*, a genus of the *dioecia diandria* class. Its characters are these: it has male and female flowers; the spatha of the male is bipartite, the spadix is covered with floscules, and the corolla is tripartite; the spatha of the female is bifid and uniflorous; the calyx tripartite; the corolla has three petals, and three styles; the capsule is unilocular and polyspermous. There is one species.

VALLOR, VALLOW, or VALE, among country people, a hollow mould, in which a new made cheese is pressed.

VALLUM, in *Roman Antiquity*, denotes a kind of parapet with which they fortified their camps. In the *vallum* some distinguish two parts, the *agger*, which was no more than the earth cast up to form the *vallum*; and the *sudes*, which were a sort of wooden stakes to secure and strengthen it.

VAL-*ombroso* gives its name to a congregation of Benedictine monks, founded in the Apennines by Gualbert of Florence, in the 11th century; who in a short space of time propagated their discipline in several parts of Italy.

VALOR *beneficiorum*, in *Law*. See FIRST-FRUITS.

VALORE *maritagii*, VALUE *of marriage*, a writ which anciently lay for the lord, after having proffered suitable marriage to an infant who refused the same; to recover the value of the marriage. See GUARDIAN.

VALVASOR, or VALVASOUR. See VAVASOR.

VALUE, VALOR, in *Commerce*, the price or worth of any thing.

VALUE, *intrinsic*, denotes the proper, real, and effective worth of any thing: and is used chiefly with regard to money; the popular *value* whereof may be raised and lowered at the pleasure of the prince; but its real or *intrinsic value*, depending wholly on its weight and fineness, is not at all affected by the stamp, or impression thereon.

It is generally on the foot of this *intrinsic value*, that species are received in foreign countries; though in the places where they are coined, and where the sovereign power makes them current, they sometimes pass for much more.

It is, in good measure, on the difference of those two *values*, one whereof is, as it were, arbitrary, and the other, in some sort, natural, that the difference of exchanges depends; and those still rising and falling, as the rate at which a species is current, comes nearer or farther off the just price of the metal whereof it consists.

VALUE, in *Bills of Exchange*, is used to signify the nature of the thing (as ready money, merchandizes, bills, debts, &c.) which is given, as it were, in exchange for the sum specified in the bill.

From four different manners of expressing this *value*, some distinguished four kinds of bills of exchange.—The first bears *value received*, simply and purely, which comprehends all kinds of *value*; the second, *value received in money*, or *merchandize*; the third, *value of myself*; and the fourth, *value* understood.

The first is dangerous, and the fourth but little used: accordingly, to have the *value* well expressed, and to prevent the ill consequences of oversights therein, it is well provided by the French ordonnance of 1673, that bills of exchange shall contain the name of the person to whom the contained sum is to be paid; the time of payment; the name of him who has given the *value*; and whether it was received in money, merchandize, or other effects.

VALUE, VALOR, or VALENTIA, in *Law*. West gives us a nice difference between *value*, and *price*; the *value* (says he) of things in which offences are committed, is usually comprised in indictments; which seems necessary in theft, to make a difference from petty larceny; and in trespass, to aggravate the fault, and increase the fine.

But no price of things *feræ naturæ* may be expressed, as of deers, hares, &c. if they be not in parks and warrens. And where the number of things taken is to be expressed in the indictment, as of young doves in a dove-house, there must be said *pretii*, or *ad valentiam*: but of divers dead things, *ad valentiam*, and not *pretii*: of coin not current it shall be said *pretii*; but of coin current, neither *pretii*, nor *ad valentiam*; the price and *value* being certain.

VALVE, VALVULA, formed from *valvæ*, *folding doors*, in *Hydraulics*, *Pneumatics*, &c. is a kind of lid, or cover of a tube, or vessel, so contrived, as to open one way; but which, the more forcibly it is pressed the other way, the closer it shuts the aperture: so that it either admits the entrance of a fluid into the tube, or vessel, and prevents its return; or admits it to escape, and prevents its re-entrance.

Valves are of great use in the air-pump, and other wind-engines; in which they are ordinarily made of pieces of bladder.

In hydraulic engines, as the emboli of pumps, they are frequently of leather; their figure round, and they are fitted to shut the apertures of the barrels or pipes.

Sometimes they are made of two round pieces of leather enclosed between two others of brass; having divers perforations, which are covered with another piece of brass, moveable upwards and downwards, on a kind of axis, which goes through the middle of them all.

Sometimes they are made of brass, covered over with leather, and furnished with a fine spring, which gives way upon a force applied against it: but, upon the ceasing of that, returns the *valve* over the aperture. See PUMP. See also for the construction of different sorts of *valves* for the buckets of pumps; Desaguliers, Exp. Phil. vol. ii. p. 156. &c. and for the description of a new *valve*, by M. Belidor, ibid. p. 180.

VALVE, VALVULA, in *Anatomy*, a thin membrance, applied, like a door or shutter, on divers cavities and vessels of the body; to afford a passage to some humour, or other matter, going one way, and prevent its reflux towards the part whence it came.

The veins and lymphatics have *valves*, situate from space to space, which open towards the heart, but keep close on that side towards the extremities; i. e. they let the blood and lymph pass towards the heart, but prevent their returning to the extreme parts, whence they came.

The heart has also its *valves*, placed at the entrance of the vessels arising out of it. Those at the entrance of the vena cava, and pulmonary vein, let the blood pass on to the heart, and prevent its return: on the contrary, those at the entrance of the aorta, and pulmonary artery, let the blood pass out of the heart, and prevent its flowing back again.—See *Tab. Anat.* (*Angeiol.*) *fig.* 1. *lit. A.* See HEART, MITRALES, SEMILUNAR, and TRICUSPIDES.

"In the jejunum, and ileum, the inner tunic, being "larger than the outer, is much corrugated: the loose "folds of this have been thought, in some measure, to "do the office of *valves*; and have therefore been called "*valvulæ conniventes*." Drake, Anat. p. 49.

"The lacteals, opening into the intestines, receive the "prepared fluid part of the chyle; and appear at inter-"vals, as it were, girt and streightened; and when "pressed, do not admit of a reflux towards the intes-"tines; though the liquor be easily propelled towards "the glands: which argues, that there are *valves* "in them, though they be too minute to be sensible to "the eye." Id. ibid. p. 56.

The COLON has a thick *valve*, to prevent the excrements from passing into the ileon; and several other *valves*, to retard the descent of the excrements.

Constantine Varolius, a Bolognese, and physician of Gregory XIII. who died in 1570, was the first that observed the *valve* in the colon. Bart. Eustachio, a native of San Severino in Italy, discovered, about the same time, the *valve* at the orifice of the coronary vein; and that remarkable one at the orifice of the lower trunk of the vena cava, near the right auricle of the heart: though he did not take it for a *valve*, but merely for a membrane.

Sig. Lancisi, physician to pope Clement XI. who first published Eustachio's works, takes the use of this *valve* to be to prevent the blood of the upper vena cava from striking with too much violence against that of the lower: and M. Winslow, who has considered it very diligently in the Memoirs of the Royal Academy of Sciences, is much of the same opinion.

But as it gradually dwindles in children, and at length becomes quite lost in adults, still diminishing as the foramen ovale does, it should seem to have some other office; and that, chiefly, regarding the circulation of the blood in the fœtus.

In effect, by means hereof, M. Winslow reconciles the two opposite systems of the circulation of the blood in the fœtus. See *Circulation of the* BLOOD, and FOETUS.

VALVE, *great*, *valvula major*, is the upper part, and as it were, the lid of the isthmus between the testes, and the first vermicular process of the cerebellum: its substance

is medullary. Its uſe is to prevent the lymph from falling on the nerves at the baſe of the cranium.

VALVULÆ *conniventes.* Mr. du Vernoi is of opinion, that the *valvulæ conniventes* of the inteſtines are formed by the arched veſſels and fat in the internal cellular coat, and covered by the villous or nervous coat. See Comment. Acad. Petrop. tom. iv. p. 192.

VAMPYRE, a name given to an imaginary demon, which, it is pretended, ſucks the blood of perſons during the night, and thereby deſtroys them. Theſe *vampyres* were ſuppoſed to animate the bodies of dead perſons, which when dug up were found freſh, florid, and full of blood. Thoſe who were killed by *vampyres* were ſaid to become *vampyres* themſelves: the way to deſtroy them, was to drive a ſtake through them, at which time they would give a horrid groan; and to burn the body to aſhes. This ſpecies of ſuperſtition occaſioned, ſome years ago, great diſturbances in Hungary and other places.

VAMPYRE, in *Zoology*, the *veſpertilio vampyrus* of Linnæus, called alſo *ternate*, and by Buffon *la rouſſette* and *la rougette*, is a ſpecies of BAT, with large canine teeth, four cutting teeth above, and the ſame below; ſharp black noſe; large naked ears; tongue pointed, and terminated by ſharp aculeated papillæ; exterior toe detached from the membrane; the claw ſtrong, and hooked; five toes on the hind feet; talons very crooked, ſtrong, and compreſſed ſideways; no tail; the membrane divided behind quite to the rump; varying in colour, ſome being entirely of a reddiſh brown and others duſky, and alſo in ſize, ſome having the extent from tip to tip of the wings four feet, others five feet four inches; and others extending farther than a man can reach with his extended arms. This animal inhabits Guinea, Madagaſcar, and all the iſlands from thence to the remoteſt in the Indian ocean. They are alſo found in New Holland, the Friendly Iſlands, the New Hebrides, and New Caledonia. They fly in flocks, obſcuring the air with their numbers; beginning their flight from one neighbouring iſland to another immediately on ſun-ſet, and returning in clouds from the time it is light till ſun-riſe, and during the day lodging in hollow trees: they live on fruit, and are ſo fond of the juice of the palm-tree, that they will intoxicate themſelves with it till they drop on the ground. In New Caledonia, the natives uſe their hair in ropes, and in the taſſels of their clubs. The Indians eat them, and declare the fleſh to be very good. The French, who live in the Iſle de Bourbon, boil them in their bouillon, to give it a reliſh. While they are eating they make a great noiſe; their ſmell is rank; and their bite, reſiſtance, and fierceneſs very great when taken. The ancients had ſome knowledge of theſe animals, and M. de Buffon apprehends, that from the account of them the poets formed their fictions of harpies. Linnæus calls this ſpecies *vampyre*, conjecturing it to be the kind which draws blood from people in their ſleep. The bat is ſo dexterous a bleeder, as to inſinuate its aculeated tongue into a vein without being perceived, and then ſuck the blood till it is ſatiated; all the while fanning with its wings, or agitating the air ſo as to caſt the ſufferer into a ſtill ſounder ſleep. In certain parts of America, they have deſtroyed all the great cattle introduced there by the miſſionaries. Pennant's Hiſt. Quadrupeds, vol. ii. p. 548, &c.

VAMPYRE is alſo a name given by M. de Buffon to the *veſpertilio ſpectrum* of Linnæus, or BAT, with a long noſe, large teeth, long, broad, and upright ears; with a long, conic, erect membrane at the end of the noſe, bending at the end, and flexible; hair on the body cinereous, and pretty long; wings full of ramified fibres; a membrane extending from one hind leg to the other; no tail, but three tendons extending from the rump, and terminating at the edge of the membrane. This animal inhabits South America, lives in the palm-trees, and grows very fat. Buffon ſuppoſes it to be the ſpecies that ſucks human blood. Pennant. See ANDIRA.

VAN, VANT, or VAUNT (of the French *avant*, or *avaunt*, *before*) is a term uſed in compoſition with ſeveral words in our language. As,

VAN-COURIERS, are light-armed ſoldiers, ſent before armies to beat the road, upon the approach of an enemy.

VAN-FOSSE, a ditch dug without the counterſcarp, and running all along the glacis; uſually full of water.

VAN, or VANT, or VAUNT-*corps*. See CORPS.

VAN, or VAN-GUARD. See GUARD.

VAN-*lay*. See VAUNT.

VAN, in *Sea-Language*, denotes the foremoſt diviſion of any naval armament, or that part which uſually leads the way to battle, or advances firſt in the order of failing. See ENGAGEMENT and FLEET.

VAN, in *Mining*. To *make a van* is to take a handful of the ore or tin-ſtuff, and bruiſe, waſh, and cleanſe it on a ſhovel; then by a peculiar motion of the ſhovel, to ſhake and throw forth upon the point of it almoſt all the ore that is freed from waſte. This operation being repeated, the ore is collected and reſerved, and from thence they form an eſtimate how many tons of copper ore, or how many hundred weight of block tin, may be produced out of one hundred ſacks of that ſtuff, of which the *van* is made. Pryce's Mineral. Com. p. 330. See TIN and VANNING-*ſhovel*.

VANDELLIA, in *Botany*, a genus of the *didynamia angioſpermia* claſs. Its characters are theſe: the calyx is divided into four ſegments; the corolla is ringent; there are two filaments proceeding from the diſc of the lip of the corolla; the antheræ are joined; and the capſule is unilocular and polyſpermous. There is one ſpecies.

VANDOSIA, in *Ichthyology*, a name by which ſome authors have called the *leuciſcus*, the common DACE.

VANEERING. See VENEERING.

VANE, in a *Ship*, is a thin ſlip of bunting hung to the maſt-head, or ſome other conſpicuous place, to ſhew the direction of the wind. It is commonly ſewed upon a wooden frame, called the ſtock, which contains two holes, whereby to ſlip over the ſpindle, upon which it turns about as the wind changes.

VANE, *Dog*, in *Sea-Language*, is a ſmall light *vane*, formed of a piece of pack-thread about two feet in length, upon which are fixed five or ſix thin ſlices of cork ſtuck full of light feathers. It is uſually faſtened to the top of a ſtaff two yards high, which is placed on the top of the ſhip's ſide on the quarter-deck, in order to ſhew the direction of the wind to the helmſman, particularly in a dark night, or when the wind is extremely feeble. Falconer.

VANES, on *Mathematical Inſtruments*, are ſights made to move and ſlide upon croſs-ſtaves, fore-ſtaves, quadrants, &c.

VANES, or FANES *of Feathers*. See FEATHER.

VANES, *Weather*. See WEATHER.

VANES *of Windmills*. See WINDMILL.

VANELLUS, in *Ornithology*, a name given by many to the LAPWING, more commonly known by the name *capella*.

VANGS, in *Sea-Language*, are a ſort of braces to ſupport the mizen-gaff, and keep it ſteady. They are fixed on the outer end or peek, and reach downwards to the aftmoſt part of the ſhip's ſide, where they are hooked and drawn tight, ſo as to be ſlackened when the wind is fair; and drawn in to windward when it becomes unfavourable to the ſhip's courſe. Falconer.

VANILLA, *Epidendrum*, in *Botany*, a genus of the *gynandria diandria* claſs. Its characters are theſe: it has a ſingle ſtalk; the flowers are included in ſheaths ſitting upon the germen, and have no empalement; they have five oblong petals which ſpread open very wide, with turbinated nectariums, whoſe baſes are tubulous, ſituated on the back ſide of the petals, their brims are oblique and bifid; the upper lip is ſhort and trifid; the under one runs out in a long point; they have two very ſhort ſtamina ſitting upon the pointal, and the ſummits are faſtened to the upper lip of the nectarium; they have a long, ſlender, contorted germen, ſituated under the flower, ſupporting a ſhort ſtyle faſtened to the upper lip of the nectarium, crowned by an obſolete ſtigma; the germen afterwards becomes a long, taper, fleſhy pod, including many ſmall ſeeds. Miller enumerates two ſpecies, but Linnæus reckons thirty ſpecies of *epidendrum*.

The plant which produces the fruit called *vanilia* or *banilla* by the Spaniards, or the *epidendrum vanilla* of Linnæus, has a trailing ſtem ſomewhat like the common ivy, but not ſo woody, which faſtens itſelf to any tree that grows near it by ſmall fibres or roots produced at every joint; theſe attach themſelves to the bark of the tree; and by them the plants are often nouriſhed, when they are cut or broken off from the root, at a conſiderable height from the ground; as is the caſe with the ivy in England. The leaves are as large as thoſe of the common laurel, and are produced alternately at every joint. It riſes to the height of eighteen or twenty feet, and the flowers are of a greeniſh yellow mixed with white, which, when fallen, are ſucceeded by the fruit, which is ſix or ſeven inches long.

The ſort, which is manufactured, grows not only in the bay of Campeachy, but alſo at Carthagena, at the Caraccas, Honduras, Darien, and Cayan, at all which places the fruit is gathered and preſerved; but it is rarely found in any of the Engliſh ſettlements, though it might be eaſily propagated in them: for the ſhoots are ſo full of juice that they will continue freſh, out of the ground, for ſeveral months.

When theſe plants are intended for propagation in the warm parts of America, nothing more is required than to make cuttings of three or four joints in length, which ſhould be planted cloſe to the ſtems of trees in low marſhy places, and the ground about them kept clear of weeds.

The method used to preserve the fruit is, when it turns of a yellow colour and begins to open, to gather it, and lay it in small heaps to ferment two or three days, in the same manner as is practised for the cocoa pods; then they spread them in the sun to dry, and when they are about half dried, they flat them with their hands, and afterwards rub them over with the oil of palma Christi, or of the cocoa; then they expose them to the sun again to dry, and afterward they rub them over with oil a second time; then they put them in small bundles, covering them with the leaves of the Indian reed to preserve them.

These plants produce but one crop of fruit in a year, which is commonly ripe in May, fit for gathering, for they do not let them remain on the plants to be perfectly mature. When they are about half changed yellow, they esteem them better for keeping, than when thoroughly ripe; at which time the fruit splits. While the fruit is green it affords no remarkable scent, but as it ripens it diffuses a most grateful aromatic smell; and when it begins to open, the birds attack them, and devour the seeds greedily.

The fruit which is brought to Europe is of a dark brown colour, about six inches long, and scarcely an inch broad; wrinkled on the outside, and full of a vast number of black seeds, like grains of sand, of a pleasant smell, like balsam of Peru.

This fruit is only used in England as an ingredient in chocolate, to which it gives an agreeable flavour to some palates, though it is disagreeable to others; but the Spanish physicians use it in medicine, and esteem it grateful to the stomach and brain, good for expelling wind, for provoking urine, resisting poison, and curing the bite of venomous animals. Miller's Gard. Dict.

The *vanillas*, or *vanilloes*, have an unctuous aromatic taste, and a fragrant smell like that of some of the finer balsams heightened with musk. They are used chiefly in perfumes: scarcely ever among us in any medical intention; though they should seem to deserve a place among the principal medicines of the nervous class. By distillation, they impregnate water strongly with their fragrance, but give over little or nothing with pure spirit. By digestion, spirit totally extracts their smell and taste; and in great measure covers or suppresses the smell. Lewis.

VANNING-*shovel*, among *Miners*, an instrument used for washing the ores of any metal, after being reduced to powder, thereby to discover the richness and other qualities of the ore. See SHOAD, TIN, and VAN.

VANSIRE, in *Zoology*, a species of *weasel*, with short ears; the hair brown at the roots, barred above with black, and ferruginous; the tail of the same colour; the length from nine to about fourteen inches, and the tail near ten. This animal inhabits Madagascar.

VANT, or VAUNT. See VAN.

VAPORARIUM, or VAPOROSUM *Balneum*, *Vapour-Bath*, in *Chemistry*, a term applied to a chemist's bath, or heat, wherein a body is placed, so as to receive the fumes of boiling water.

The *balneum vaporosum* consists of two vessels disposed over one another in such manner, as that the vapour raised from the water contained in the lower, heats the matter enclosed in the upper.

The *vapour-bath* is very commodious for the distilling of odoriferous waters, and the drawing of spirit of wine. On this subject, see BATH *in Chemistry*.

We also use the term *vapour-bath*, when a sick person is made to receive the vapours arising from some liquid matter placed over a fire.

Many contrivances have been proposed for this purpose; and their expediency and utility are best known to those who are conversant in this business. A late writer has suggested a new construction of *vapour baths*; and the whole apparatus is reduced to a tin boiler, tin pipes wrapped in flannel, and a deal box with a cotton cover, for the reception of the body and circulation of the vapour. See Playfair's Method of constructing *Vapour-Baths*, at a small Expence, for the Use of private Families, 8vo. 1783.

VAPORATION, VAPORATIO, in *Chemistry*, a term applied to the action of a fume, or vapour.

VAPORATION is a kind of bathing, or rather of fomentation, whereby the warmth, or humidity, of a vapour, is made to act on some other body, that is to be warmed, or moistened.

VAPOROSUM *balneum*. See VAPORARIUM.

VAPOUR, VAPOR, in *Meteorology*, a thin vesicle of water, or other humid matter, filled or inflated with air; which, being rarefied to a certain degree by the action of heat, ascends to a certain height in the atmosphere, where it is suspended, till it returns in form of rain, snow, or the like. An assemblage of a number of particles, or vesicles of *vapour*, constitutes what we call a CLOUD.

Some use the term *vapour* indifferently, for all fumes emitted, either from moist bodies, as fluids of any kind; or from dry bodies, as sulphur, &c. But sir Isaac Newton, and other authors, better distinguished between humid and dry fumes, calling the latter *exhalations*.

For the manner wherein VAPOURS *are raised, and again precipitated*, see CLOUD, DEW, RAIN, BAROMETER, and particularly EVAPORATION.

We shall here add, with respect to the principles of solution adopted to account for evaporation, and largely illustrated under that article, that Dr. Halley, about the beginning of the present century, seems to have been acquainted with the solvent power of air on water; for he says, that, supposing the earth to be covered with water, and the sun to move diurnally round it, the air would of itself imbibe a certain quantity of aqueous *vapours*, and retain them like salts dissolved in water; and that the air, warmed by the sun, would sustain a greater proportion of *vapours*, as warm water will hold more dissolved salts; which would be discharged in dews, analogous to the precipitation of salts on the cooling of liquors. Phil. Trans. Abr. vol. ii. p. 127.

Mr. Eeles, in 1755, endeavoured to account for the ascent of *vapour* and exhalation, and their suspension in the atmosphere, by means of the electric fire. The sun, he acknowledges, is the great agent in detaching *vapour* and exhalations from their masses, whether he acts immediately by himself, or by his rendering the electric fire more active in its vibrations: but their subsequent ascent he attributes entirely to their being rendered specifically lighter than the lower air, by their conjunction with electrical fire: each particle of *vapour*, with the electrical fluid that surrounds it, occupying a greater space than the same weight of air. Mr. Eeles also endeavours to shew, that the ascent and descent of *vapour*, attended by this fire, are the cause of all our winds, and that they furnish a satisfactory solution of the general phenomena of the weather and barometer. Phil. Trans. vol. xlix. p. 124, &c.

Dr. Darwin, in 1757, published remarks on the theory of Mr. Eeles, with a view of confuting it; and attempted to account for the ascent of *vapours*, by considering the power of expansion which the constituent parts of some bodies acquire by heat, and also that some bodies have a greater affinity to heat, i. e. acquire it sooner, and retain it longer than others. On these principles, he thinks, it is very intelligible how water, whose parts appear from the æolipile to be capable of immeasurable expansion, should by heat alone become specifically lighter than the common atmosphere. A small degree of heat is sufficient to detach or raise the *vapour* of water from the mass to which it belongs; and the rays of the sun communicate heat only to those bodies by which they are refracted, reflected, or obstructed, whence, by their impulse, a motion or vibration is caused in the parts of such bodies. Hence he infers, that the sphericles of *vapour* will, by refracting the solar rays, acquire a constant heat, though the surrounding atmosphere remain cold. If it be asked, how clouds are supported in the absence of the sun? it must be remembered, that large masses of *vapour* must for a considerable time retain much of the heat they have acquired in the day; at the same time reflecting, how small a quantity of heat was necessary to raise them, and that doubtless even a less will be sufficient to support them; as from the diminished pressure of the atmosphere at a given height, a less power may be able to continue them in their present state of rarefaction; and lastly, that clouds of particular shapes will be sustained or elevated by the motion they acquire from winds. Phil. Trans. vol. l. p. 246.

For the effect of VAPOUR *in the formation of springs*, &c. see SPRING, and RIVER.

The quantity of *vapour*, raised from the sea by the warmth of the sun, is far greater than one would imagine. Dr. Halley has attempted to estimate it. For the result of his estimate, see EVAPORATION.

VAPOURS, *Fiery*, *halitus ignei*, a term used by some to express those exhalations from the earth, which either take fire of themselves on their bursting forth into the air, or are readily inflammable on the bringing of a candle to them. See DAMPS, and AIR *inflammable*.

Many of the supposed burning lakes are owing to these fumes bursting up through the water, and not to any quality of the water itself. Our famous burning-well at Wigan, in Lancashire, is of this kind. The common people affirm, that the water of this spring burns like oil; but there is nothing of truth in this. There bursts up a *vapour* through the earth in this place, which keeps the water bubbling, as if boiling over in the fire, though it is not warm; and the stream of this breath may be felt issuing up in these places like a strong wind. This breath alone is inflammable, and takes fire at the approach of a candle, burning with considerable violence for some time.

There are coal-pits in the neighbourhood, and the air is certainly of the same kind with that inflammable *vapour*, often

often met with in thoſe places, and which may alſo be prepared from iron diſſolved in a proper menſtruum. The water itſelf, taken from the place, does not burn; and if the bottom be made dry, the *vapour* which aſcends from it will burn as ſtrongly as if the water were there. The flame is not diſcoloured like that of ſulphureous bodies, nor has it any bad ſcent; and the fumes, as they are felt burſting out of the earth, by the hand held over the place, are hot. Phil. Tranſ. Nº 20.

VAPOUR-*bath*. See VAPORARIUM, and BATH.

VAPOURS, in *Medicine*, a diſeaſe popularly called the *hypo*, or the HYPOCHONDRIAC diſeaſe; and in men particularly, the *ſpleen*.

Vapours, ſuppoſed to be emitted from the womb, in women, are what we otherwiſe call HYSTERIC *affections*, or *ſuffocations*, or *fits of the mother*.

VAPPA, a word uſed by the ancients to expreſs dead wine, or wine deprived of all its ſpirituous part.

The word is alſo metaphorically applied to a peculiar ſtate of the blood, when it is in a low, diſpirited condition, as is the caſe even in healthy perſons, when worn out with exceſſive labour, and in cachectic and ſcorbutic perſons.

VARA, in *Commerce*. See *Spaniſh* MEASURE.

VARANGI. See ACOLUTHI.

VARI, in *Medicine*, little, hard, ruddy tumors, whitiſh about the tips, and of the ſize of a hemp-ſeed; frequently found on the face and neck of young people; chiefly of ſuch as are much addicted to venery.

If the red be very lively, the cure is ſomewhat difficult; and though the puſtules be taken away, the redneſs remains. To this if an inflammation and hoarſeneſs be added, it is a ſymptom of a leproſy.

VARI, in *Zoology*, a name given to the MAUCUACO, or LEMUR *catta* of Linnæus, with his tail marked with rings of black and white; it is about the ſize of a cat, and inhabits Madagaſcar and the neighbouring iſles.

The *vari* of Buffon is the ruffed maucuaco of Pennant, the black maucuaco of Edwards, and LEMUR *caudatus niger, collari barbato*, of Linnæus. It has orange-coloured irides; long hair round the ſides of the head, ſtanding out like a ruff; long tail; the colour wholly black, but ſometimes white, ſpotted with black; the feet black. It inhabits Madagaſcar; is very fierce in a wild ſtate; and makes ſo violent a noiſe in the woods, that the noiſe of two may be eaſily miſtaken for that of a hundred: when tamed, gentle and good natured. Pennant. See *Tab.* V. *Quadrupeds*, Nº 64.

VARIA, in *Zoology*, a name by which ſome authors have called the LEOPARD, or *pardalis*, from the beautiful variegations it is marked with.

VARIABLE, in *Geometry* and *Analytics*, is a term applied by mathematicians, to ſuch quantities as either increaſe or diminiſh, according as ſome other quantity either increaſes or diminiſhes.

Thus, the ſemiordinates and abſciſſes of an ellipſis, &c. are *variable quantities*; becauſe, if the one increaſe, the others increaſe likewiſe.

They are thus called, in contradiſtinction to *conſtant*, or *given*, or *ſtable quantities*; which are always the ſame, though others change: as the ſemidiameter of a circle, which remains the ſame, though the abſciſſes and ſemiordinates increaſe.

Variable quantities are uſually denoted by the laſt letters of the alphabet, x, y, z.

Some authors, inſtead of *variable* and conſtant quantities, uſe the terms *fluent*, and *ſtable* quantities.

The infinitely ſmall quantity whereby a *variable* quantity is continually increaſing, or diminiſhing, is called the increment or decrement, or *difference*; and the velocity with which its increaſes or decreaſes at any given point is called its *fluxion*; the calculation whereof is the ſubject of the new *methodus differentialis*, or *doctrine of* FLUXIONS.

VARIABLE *Winds*. See WIND.

VARIANCE, VARIANTIA, in *Law*, an alteration or change of condition in a perſon, or thing, after ſome former concern or tranſaction, therewith.

Thus, if the commonalty of a town make a compoſition with a lord, and afterwards bailiffs be granted by the king to the ſame town, there, if the lord commence any ſuit for breach of the compoſition, he muſt *vary* from the word *commonalty*, uſed in the compoſition, and uſe *bailiffs* and *commonalty*.

VARIANCE is alſo uſed for an alteration of ſomething formerly laid in a plea: or where the declaration in a cauſe differs from the writ, or from the deed upon which it is grounded.

VARIATION *of quantities*, in *Algebra*. See CHANGES, and COMBINATION.

VARIATION, in *Aſtronomy*—The *variation of the moon*, called, by Bullialdus, the *reflexion of her light*, is the third inequality obſerved in the moon's motion; whereby when out of the quadratures, her true place differs from her place twice equated. See PLACE, EQUATION, &c.

Sir Iſaac Newton takes the moon's *variation* to ariſe partly from the form of her orbit, which is an ellipſis; and partly from the inequality of the parts of ſpace, which the moon deſcribes in equal times, by a radius drawn to the earth.

To find the greateſt variation, obſerve the moon's longitude in the octants; and, for the time of obſervation, compute the moon's place twice equated: the difference between the computed, and the obſerved place, is the greateſt *variation*.

Tycho makes the greateſt *variation* 40′ 30″: Kepler makes it 51′ 49″: ſir Iſaac Newton makes the greateſt *variation*, at a mean diſtance, between the ſun and the earth, to be 35′ 10″: at the other diſtances, the greateſt *variation* is in a ratio compounded of the duplicate ratio of the times of the moon's ſynodical revolution directly, and the triplicate ratio of the diſtance of the ſun from the earth inverſly. And, therefore, in the ſun's apogee, the greateſt *variation* is 33′ 14″, and in his perigee, 37′ 11″; provided that the eccentricity of the ſun be to the tranſverſe ſemi-diameter of the orbis magnus, as $16\frac{1}{8}$ to 1000. Or, taking the mean motions of the moon from the ſun, as they are ſtated in Dr. Halley's tables, and the greateſt *variation* at the mean diſtance of the earth from the ſun will be 35′ 7″, in the apogee of the ſun 33′ 27″, and in his perigee 36′ 51″. Phil. Nat. Princ. Math. prop. XXIX. lib. iii. apud Horſley's Newtoni Opera, vol. iii. p. 71.

VARIATION, in *Geography*, *Navigation*, &c. a term applied to the deviation of the magnetic needle, or compaſs, from the true north point, towards either eaſt or weſt; called alſo the *declination*.

The *variation*, or declination, of the needle, is properly defined, the angle which a magnetic needle, ſuſpended at liberty, makes with the meridian line on an horizontal plane; or an arch of the horizon, comprehended between the true, and the magnetical meridian.

In the ſea-language, the *variation* is uſually called *north-eaſting* or *north-weſting*.

All magnetic bodies, we find, range themſelves, in ſome ſort, to the meridian; but it is rare, that they fall in preciſely with it: in one place, they decline from the north to the eaſt, and from the ſouth to the weſt; and in another place, on the contrary, from the north to the weſt, and from the ſouth to the eaſt; and that too, differently, at different times.

The *variation* of the compaſs could not be long a ſecret, after the invention of the compaſs itſelf: accordingly, Ferdinand, the ſon of Columbus, in his life written in Spaniſh, and printed in Italian at Venice in 1571, aſſerts, that his father obſerved it on the 14th of September, 1492: though others ſeem to attribute the diſcovery of it to Sebaſtian Cabot, a Venetian, employed in the ſervice of our king Henry VII. about the year 1500.

And as this *variation* differs in different places, Gonzales d'Oviedi found there was none at the Azores; whence ſome geographers have thought fit in their maps to make their firſt meridian paſs through one of theſe iſlands; it not being then known, that the *variation* altered in time. See Gilbert de Magnete, Lond. 1600. p. 4 and 5: or Purchas's Pilgrims, Lond. 1625. book ii. ſect. 1. See *Variation of the* MAGNET.

Various are the hypotheſes framed to account for this extraordinary phenomenon: we ſhall only mention, ſome of the later, and more probable: only premiſing, that Mr. Robert Norman, the inventor of the DIPPING-*needle*, diſputes againſt Cortes's notion, that the *variation* was cauſed by a point in the heavens, contending that it ſhould be ſought for in the earth, and propoſes how to diſcover its place.

The firſt is that of Gilbert (de Magnete, lib. iv. p. 151, &c.), which is followed by Cabeus, &c.

This notion is, that it is the earth, or land, that draws the needle out of its meridian direction; and hence they argue, that the needle varied more, or leſs, as it was more or leſs diſtant from any great continent; conſequently, that if it were placed in the middle of an ocean, equally diſtant from equal tracts of land on each ſide, eaſtward and weſtward, it would not decline either to the one, or the other; but point juſtly north and ſouth. Thus they ſay, in the Azores iſlands, which are equally diſtant from Africa on the eaſt, and America on the weſt, there is, in effect, found no *variation*: but as from the Azores you ſail towards Africa, the needle begins to decline from the north to the eaſt; and that ſtill more and more, till you reach the ſhore.

If you ſtill proceed eaſtward, the declination gradually diminiſhes again, by reaſon of the land left behind on the weſt, which continues to draw the needle.

The ſame holds till you arrive at a place where there are equal tracts of lands on each ſide; and there again there is no *variation*.

The obſervation of our mariners, in their Eaſt India voy-

ages, ſeem to confirm this ſyſtem; as they proceed towards the cape of Good Hope the *variation* is ſtill eaſtward; at length arriving at the cape De las Aguillas, q. d. of the Needles, the meridian line, then dividing Africa into two equal parts, there is no *variation* at all; but as they proceed farther, and leave the African coaſt on the weſt, the *variation* becomes weſtward.

But the misfortune is, the law does not hold univerſally; in effect, a great number of obſervations of the *variations*, in various parts, made and collected by Dr. Halley, overturn the whole theory.

Others, therefore, have recourſe to the frame and compages of the earth, conſidered as interwoven with rocks and ſhelves, which being generally found to run towards the poles, the needle comes to have a general tendency that way; but which ſeldom going perfectly in the direction of the meridian, the needle, of conſequence, has commonly a *variation*.

Others hold various parts of the earth to have various degrees of the magnetic virtue, as ſome are more intermixed with heterogeneous matters, which prevent the free action or effect thereof, than others.

Others aſcribe all to magnetic rocks and iron mines, which, affording more of the magnetic matter than other parts, draw the needle more.

Laſtly, others imagine earthquakes, or high tides, to have diſturbed and diſlocated ſeveral conſiderable parts of the earth, and ſo changed the magnetic axis of the globe, which originally was the ſame with the axis of the globe itſelf.

But ſtill, that great phenomenon, the *variation of the variation*, i. e. the continual change of the declination, in one and the ſame place, which the modern obſervations do abundantly evince, is not accountable for, on any of theſe foundations, nor even is it conſiſtent with them.

Dr. Hooke communicated to the Royal Society, in 1674, a theory of the *variation*, the ſubſtance of which is, that the magnet has its peculiar pole, diſtant 10 degrees from the pole of the earth about which it moves, ſo as to make a revolution in 370 years; whence the *variation* (he adds) hath altered of late about 10 or 11 minutes every year, and will probably ſo continue to do for ſome time, till it begins to become ſlower and ſlower, and will at length be ſtationary and retrograde, and in probability may return. Birch's Hiſt. of the Royal Society, vol. iii. p. 131.

Dr. Halley has given us a new ſyſtem, the reſult of a great number of obſervations; and even of a great number of voyages made at the public charge on this account; the light that excellent author has let into this obſcure part of natural hiſtory, is very great, and the conſequences thereof in navigation, &c. are very conſiderable. Add, that he has reduced the divers *variations* of divers places to a preciſe rule, or order, which before appeared all precarious and arbitrary.

His theory, therefore, will deſerve a more ample detail. The obſervations it is built on, as laid down in the Philoſophical Tranſactions, Nº 148. or Abr. vol. ii. p. 610, &c. are as follow:

Obſervations on the *variations* of the needle in divers places, and at divers times.

Names of Places.	Longitude from London.	Latitude.	Year of Obſervat.	Variation obſerved.
	° ′	° ′		° ′
London	0 0	51 32 N	1580	11 15 E
			1622	6 0 E
			1634	4 5 E
			1672	2 30 W
			1683	4 30 W
Paris	2 25 E	48 51 N	1640	3 0 E
			1666	0 0
			1681	2 30 W
Uraniburg	13 0 E	55 54 N	1672	2 35 W
Copenhagen	12 53 E	55 41 N	1649	1 53 E
			1672	3 45 W
Dantzick	19 0 E	54 23 N	1679	7 0 W
Montpelier	4 0 E	43 37 N	1674	1 10 W
Breſt	4 25 W	48 23 N	1680	1 45 W
Rome	13 0 E	41 50 N	1681	5 0 W
Bayonne	1 20 W	43 30 N	1680	1 20 W
Hudſon's Bay	79 40 W	51 0 N	1668	19 15 W
In Hudſon's Streights	57 0 W	61 0 N	1668	29 30 W
In Baffin's Bay, at ſir Th. Smith's [Sound	80 0 W	78 0 N	1616	57 0 W
At ſea	57 0 W	38 40 N	1682	7 30 W
At ſea	31 30 W	43 50 N	1682	5 30 W
At ſea	42 0 W	21 0 N	1678	0 40 E
Cape St. Auguſtine	35 30 W	28 0 S	1670	5 30 E
At ſea off the mouth of R. Plata	53 0 W	39 30 S	1670	20 30 E
Cape Frio	41 10 W	22 40 S	1670	12 10 E
Eaſt entrance of Magellan Straits.	68 0 W	52 30 S	1670	17 0 E
Weſt entrance	75 0 W	53 0 S	1670	14 10 E
Baldivia	73 0 W	40 0 S	1670	8 10 E

Names of Places.	Longitude from London.	Latitude.	Year of Obſervat	Variation obſerved.
	° ′	° ′		° ′
Cape Aguillas	16 30 E	34 50 S	1622	2 0 W
			1675	8 0 W
At ſea	1 0 E	34 30 S	1675	0 0
At ſea	20 0 W	34 0 S	1675	10 30 E
At ſea	32 0 W	24 0 S	1675	10 30 E
St. Helena	6 30 W	16 0 S	1677	0 40 E
I. Aſcenſion	14 30 W	7 50 S	1678	1 0 E
Johanna	44 0 E	12 15 S	1675	19 30 W
Mombaſa	40 0 E	4 0 S	1675	16 0 W
Zocatra	56 0 E	12 30 N	1674	17 0 W
Aden, in the mouth of the Red S	47 30 E	13 0 N	1674	15 0 W
Diego Roiz	61 0 E	20 0 S	1676	20 30 W
At ſea	64 30 E	0 0	1676	15 30 W
At ſea	55 0 E	27 0 S	1676	24 0 W
Bombay	72 30 E	19 0 N	1676	12 0 W
C. Comorin	76 0 E	8 15 N	1680	8 48 W
Ballaſore	87 0 E	21 30 N	1680	8 10 W
Fort St. George	80 0 E	13 15 N	1680	8 10 W
Weſt point of Java	104 0 E	6 40 S	1676	3 10 W
At ſea	58 0 E	39 0 S	1677	27 30 W
I. S. Paul	72 0 E	38 0 S	1677	23 30 W
At Van Diemen's	142 0 E	42 25 S	1642	0 0
At New Zealand	170 0 E	40 50 S	1642	9 0 E
At Three King Iſle in New Zeal.	169 30 E	34 35 S	1642	8 40 E
I. Rotterdam in the South Sea	184 0 E	20 15 S	1642	6 20 E
On the coaſt of New Guinea	149 0 E	4 30 S	1643	8 45 E
At the weſt point of New Guinea	126 0 E	0 26 S	1643	5 30 E

From theſe obſervations, the learned author infers, 1. That, throughout all Europe, the *variation*, at this time is weſt, and is more in the eaſtern parts thereof than the weſtern, increaſing that way.

2. That, on the coaſt of America, the *variation* is weſterly, increaſing all the way as you go northerly along the coaſt, ſo as to be above 20° at Newfoundland, nearly 30° in Hudſon's Streights, and not leſs than 57° in Baffin's Bay: and that, as you ſail eaſtward from this coaſt, the *variation* conſtantly diminiſhes. Hence he argues, that ſomewhere, between Europe and the north part of America, there muſt be an eaſterly *variation*, or at leaſt, no *variation*.

3. That on the coaſt of Braſil, there is an eaſt *variation*, increaſing as you go to the ſouthward, ſo as to be 12° at cape Frio, and 20° and half over againſt Rio Plata; and thence ſailing ſouth-weſterly, to the Streights of Magellan, it decreaſes to 17°; and, at the weſt entrance, it is about 14°.

4. That eaſtward of Braſil, this eaſterly *variation* decreaſes, ſo as to be very little at St. Helena and Aſcenſion, and to be quite gone, and the compaſs point true, about 18° longitude weſt from the cape of Good Hope.

5. That, to the eaſtward of the aforeſaid places, a weſtward *variation* begins and governs in all the Indian ſea, riſing to 18° under the equator, about the meridian of the northern part of Madagaſcar; and 27° ½, in 39° ſouth latitude, near the ſame meridian: eaſterly from thence, the weſt *variation* decreaſes, ſo as to be not much above 8° at cape Comorin, and about 3° upon the coaſt of Java; and about the Molucca iſlands to be quite gone, as alſo a little to the weſtward of Van Diemen's land.

6. That, to the eaſtward of the Moluccas and Van Diemen's land, in ſouth latitude, there ariſes another eaſterly *variation*, which ſeems not ſo great as the former, nor of ſo large extent; becauſe, at the iſle of Rotterdam, it is ſenſibly leſs than upon the eaſt coaſt of New Guinea; and at the rate it decreaſes, it may well be ſuppoſed, that about 20° farther eaſtward, or 205° eaſt longitude from London, in the latitude of 20° ſouth, a weſterly *variation* begins.

7. That the *variation*, taken at Baldivia, and at the weſt entrance of the ſtreights of Magellan, ſhews, that the eaſt *variation*, noted in the third obſervation, is decreaſing apace; and that it cannot well extend many degrees into the South Sea, from the coaſt of Peru and Chili; leaving room for a ſmall weſterly *variation*, in that tract of the unknown world that lies in the midway between Chili and New Zealand, and between Hound's Iſland and Peru.

8. That in ſailing north-weſt from St. Helena, by Aſcenſion, as far as the equator, the *variation* continues very ſmall eaſt, and, as it were, conſtantly the ſame; ſo that, in this part of the world, the courſe, wherein there is no *variation*, is evidently no meridian, but rather north-weſt.

9. That the entrance of Hudſon's Streights, and the mouth of Rio Plata, being nearly under the ſame meridian, at the one place the needle varies 29½° weſt; at the other 20½° eaſt.

This, he ſays, demonſtrates the impoſſibility of reconciling theſe *variations* by the theory of Bond (for which ſee Phil. Tranſ. vol. viii. Nº 95. p. 6065, for June, 1673.) which is by two magnetical poles and an axis, inclined to the axis of the earth; whence it would follow,

fow, that under the fame meridian, the *variation* fhould be in all places the fame way.

VARIATION *of the needle, theory of the.* From the circumftances above rehearfed, the learned author takes occafion to affert, "That the whole globe of the earth "is one great magnet, having four magnetical poles, "or points of attraction; near each pole of the equator "two; and that in thofe parts of the world which lie "nearly adjacent to any one of thefe magnetical poles, "the needle is governed thereby; the neareft pole be-"ing always predominant over the more remote."

The pole which at prefent is neareft to us, he conjectures to lie in or near the meridian of the Land's-end of England, and not above 7° from the Arctic pole: by this pole the *variations* in all Europe and Tartary, and the North Sea, are principally governed; though ftill with fome regard to the other northern pole, whofe fituation is in the meridian paffing about the middle of California, and about 15° from the north pole of the world, to which the needle has chiefly refpect in all North America, and in the two oceans on either fide thereof, from the Azores, weftwards, to Japan, and farther.

The two fouthern poles, he imagines, are rather farther diftant from the fouth pole of the world; the one about 16° therefrom, in a meridian 20° to the weftward of Magellan Streights, or 95° weft from London: this commands the needle in all South America, in the Pacific Sea, and the greateft part of the Ethiopic Ocean. The other feems to have the greateft power, and the largeft dominion of all, as it is the moft remote from the pole of the world, being little lefs than 20° diftant therefrom, in the meridian which paffes through New Holland, and the ifland Celebes, about 120° eaft from London; this pole is predominant in the fouth part of Africa, in Arabia, and the Red Sea, in Perfia, India, and its iflands, and all over the Indian Sea, from the Cape of Good Hope eaftwards, to the middle of the Great South Sea that divides Afia from America.

Such feems to be the prefent difpofition of the magnetical virtue throughout the whole globe of the earth. It remains to fhew how this hypothefis accounts for all the *variations* that have been obferved of late, and how it anfwers to the feveral remarks drawn from the table.

1. Then, it is plain that, as our European north pole is in the meridian of the Land's End of England, all places more eafterly than that will have it on the weft fide of the meridian; and, confequently, the needle, refpecting it with its northern point, will have a wefterly *variation*, which will ftill be greater as you go to the eaftwards, till you come to fome meridian of Ruffia, where it will be the greateft, and from thence will decreafe again. Accordingly, in fact, we find, that at Breft the *variation* is but $1\frac{1}{2}$°; at London $4\frac{1}{2}$° (in 1683.); and at Dantzick 7° weft. Again, to the weftward of the meridian of the Land's End, the needle ought to have an eafterly *variation*, were it not that, by approaching the American northern pole (which lies on the weft fide of the meridian, and feems to be of greater force than this other), the needle is drawn thereby weftward, fo as to counterbalance the direction given by the European pole, and to make a fmall weft *variation* in the meridian of the Land's End itfelf. Yet, about the ifle of Tercera, it is fuppofed our neareft pole may fo far prevail, as to give the needle a little turn to the eaft, though but for a very little fpace; the counterbalance of thofe two poles admitting no confiderable *variation* in all the eaftern parts of the Atlantic Ocean, nor upon the weft coafts of England, and Ireland, France, Spain, and Barbary. But to the weftward of the Azores, the power of the American pole overcoming that of the European, the needle has chiefly refpect thereto, and turns ftill more and more towards it as we approach it. Whence it comes to pafs, that on the coaft of Virginia, New England, Newfoundland, and in Hudfon's Streights, the *variation* is weftward, that is, it decreafes as you go from thence towards Europe; and that it is lefs in Virginia and New England than in Newfoundland and Hudfon's Streights.

2. This wefterly *variation*, again, decreafes as you pafs over North America; and about the meridian of the middle of California, the needle, again, points due north; and from thence weftward to Yedzo and Japan, it is fuppofed the *variation* is eafterly, and half-fea over, not lefs than 15°; and that this eaft *variation* extends over Japan, Yedzo, Tartary, and part of China, till it meets with the wefterly, which is governed by the European north pole, and which is the greateft fomewhere in Ruffia.

3. Towards the fouth pole the effect is much the fame, only that here the fouth point of the needle is attracted. Whence it will follow, that the *variation* on the coaft of Brafil, at the river of Plata, and fo on to the Streights of Magellan, fhould be eafterly, if we fuppofe a magnetical pole, fituate about 20° more wefterly than the Streights of Magellan. And this eafterly *variation* extends eaftward over the greateft part of the Ethiopic Sea, till it be counterpoifed by the virtue of the other fouthern pole, as it is about mid-way between the Cape of Good Hope and the ifles of Triftan d'Alcunha.

4. From thence eaftwards, the Afiatic fouth pole becoming prevalent, and the fouth point of the needle being attracted thereby, there arifes a weft *variation*, very great in quantity and extent, becaufe of the great diftance of this magnetical pole from the pole of the world. Hence it is, that in all the Indian Sea, as far as Hollandia Nova, and farther, there is conftantly a weft *variation*; and that, under the equator itfelf, it rifes to no lefs than 11°, where it is moft. And that, about the meridian of the ifland of Celebes, being likewife that of this pole, this wefterly *variation* ceafes, and an eafterly one begins, which reaches to the middle of the South Sea, between Zelandia Nova and Chili, leaving room for a fmall weft *variation*, governed by the American fouth pole.

5. From the whole it appears, that the direction of the needle, in the temperate and frigid zones, depends chiefly upon the counterpoife of the forces of two magnetical poles of the fame nature; as alfo why, under the fame meridian, the variation fhould be in one place $29\frac{1}{2}$° weft, and in another $20\frac{1}{2}$° eaft.

6. In the torrid zone, and particularly under the equinoctial, refpect muft be had to all four poles, and their pofitions muft be well confidered, otherwife it will not be eafy to determine what the *variation* fhall be, the neareft pole being always ftrongeft; yet not fo as not to be counterbalanced, fometimes, by the united forces of two more remote. Thus, in failing from St. Helena, by the ifle of Afcenfion, to the equator, on the north-weft courfe, the *variation* is very little eafterly, and in that whole tract is unalterable; becaufe the South American pole (which is confiderably the neareft in the aforefaid places), requiring a great eafterly *variation*, is counterpoifed by the contrary attraction of the North American and the Afiatic fouth poles; each, whereof, fingly, is, in thefe parts, weaker than the American fouth pole: and, upon the north-weft courfe, the diftance from this latter is very little varied; and, as you recede from the Afiatic fouth pole, the balance is ftill preferved by an accefs towards the North American pole. In this cafe no notice is taken of the European north pole; its meridian being a little removed from thofe of thefe places, and of itfelf requiring the fame *variations* which we here find.

After the fame manner may the *variations* in other places under and near the equator, be accounted for, upon Dr. Halley's hypothefis.

VARIATION, *or declination of the needle, to obferve the.* Draw a meridian line, as directed under MERIDIAN, then, a ftyle being erected in the middle thereof, place a needle thereon, and draw the right line which it hangs over. Thus will the quantity of the *variation* appear.

Or thus: as the former method of finding the declination cannot be applied at fea, others have been thought of, the principal whereof follow: fufpend a thread and plumbet over the compafs, till the fhadow pafs through the centre of the card; obferve the rhumb, or point of the compafs, which the fhadow touches when it is the fhorteft. For the fhadow is then a meridian line; confequently the *variation* is fhewn.

Or thus: obferve the rhumb wherein the fun, or fome ftar, rifes and fets; bifect the arch intercepted between the rifing and fetting; the line of bifection will be the meridian line; confequently the declination is had as before. The fame may be had from two equal altitudes of the fame ftar, obferved either by day or night.

Or thus: obferve the rhumb wherein the fun, or a ftar, rifes and fets; and from the latitude of the place find the eaftern or weftern amplitude; for the difference between the amplitude, and the diftance of the rhumb obferved, from the eaftern rhumb of the card, is the *variation* fought.

Or thus: obferve the altitude of the fun, or fome ftar, SI (*Tab.* II. *Navigation, fig.* 58.) whofe declination is known; and note the rhumb in the compafs, to which it then correfponds. Since, then, in the triangle ZPS we have three fides; viz. PZ, the complement of the elevation of the pole PR; SP, the complement of the declination DS; and ZS, the complement of the altitude SI; the angle PZS is found by fpherical trigonometry; the contiguous one to which, viz. AZS, meafures the azimuth HI. The difference, then, between the azimuth, and the diftance of the rhumb obferved

from

from the south, is the *variation* sought. See *Azimuth* COMPASS.

Note, to have the eastern or western amplitude accurately, regard must be had to the refraction; the laws whereof are delivered under REFRACTION.

For the more commodious observing in what rhumb of the compass the sun, or a star, is seen, it will be proper to have two little apertures, or glass windows, opposite to each other, under the limb thereof, with a telescope-sight fitted to one of them, and to the other a fine thread.

The use of the *variation* is to correct the courses a ship has steered by the compass: e. g. given the course set, and the *variation* of the compass, and let it be required to find the true course the ship steers: if the *variation* is west, call the N. W. quarter the 1st. the S. W. the 2d. the S. E. the 3d. and the N. E. the 4th; but if the *variation* be east, call the N. E. quarter the 1st. the S. E. the 2d. the S. W. the 3d. and the N. W. the 4th. Then, if the course be set in the 1st or 3d quarters, add the *variation* to the points or degrees in the given course; but if in the 2d or 4th quarters, subtract, and the sum in the former, or the difference in the latter case, will be the course corrected by the *variation*.

VARIATION *of the* VARIATION, is the change in the declination of the needle, observed, at different times, in the same place.

This *variation* was first discovered by Mr. Henry Gellibrand (see *Variation of the* MAGNET) by comparing the observations made at different times near the same place by Mr. Burrough, Mr. Gunter and himself: and the discovery was soon known abroad; for Kircher, in his treatise intitled Magnes, first printed at Rome in 1641, says, that our countryman Mr. John Greaves had informed him of it, and then gives a letter of the famous Mersennus, containing a very distinct account of it.—Indeed, in the History of the Royal Academy of Sciences at Paris, for 1712, p. 19. it is said by M. de Fontenelle, that the learned Gassendi was the principal discoverer of this property: but Gassendi himself acknowledged that he had before received information of Gellibrand's discoveries. Gassendi Oper. vol. ii. sect. 3. l. 3. c. 5. p. 132. Lugdun. 1658.

That this change is gradual and universal, will appear by the following examples.

At Paris, Orontius Finæus, about the year 1550, reckoned it about 8° or 9° E.; in 1640, it was 3° E. in 1666, the needle had no *variation*; and in 1681, it was 2° 3′ W. M. de la Lande (Exposition du Calcul Astronomique) observes, that the *variation* at Paris, in 1759, was 18° 10′ W. and in 1760, 18° 20′; and that the *variation* has changed 26° 20′ in the space of 150 years, allowing that in 1610, the *variation* was 8° E.: and since 1740, the needle, which was always used by M. Maraldi, is more than 3° advanced toward the west, beyond what it was at that period; and this makes a change of 9′ in one year.

At Cape d'Agulhas, in 1600, it had no *variation*; whence the Portuguese gave it its name; in 1622, it was 2° W. in 1675, 8° W. and in 1692, 11° W.

At St. Helena, in 1600, the *variation* was 8° E. in 1623, 6° E. in 1677, 40′ E; and in 1692, 1° W. At Cape Comorin, in 1620, the *variation* was 14° 20′ W. in 1680, 8° 48′ W. and in 1688, 7° 30′ W.

At London, in 1580, the *variation* was 11° 15′ E.: in 1622, 6° E. in 1634, 4° 5′ E. in 1657, 0°; in 1672, 2° 30′ W. in 1692, 6°. W. in 1723, 14° 17′ W. in 1747, 17° 40′ W. so that during the course of 167 years elapsed since the year 1580 to the end of the year 1747, the magnetic needle at London has moved to the Westward, 28° 55′. See Phil. Trans. N° 148, and N° 383, or Abr. vol. ii. p. 615. and vol. vii. p. 290. and Phil. Trans. vol. xlv. p. 280.

The *variation*, as it appears in the Meteorological journals of the Royal Society published annually in their Transactions, in 1774, was 21° 16′ W. in 1775, 21° 43′; in 1776, 21° 47′; in 1777, 22° 12′; in 1778, 22° 20′ $\frac{1}{2}$, or by certain corrections mentioned in vol. lxix. pt. i. p. 322, and vol. lxvi. p. 385, &c. 21° 55′ $\frac{1}{2}$; in 1779, 22° 28′, or allowing 15′$\frac{1}{2}$ for the magnetism of the building, 22° 4$\frac{1}{2}$′; in 1780, 22° 41′. The hon. Mr. Cavendish observes, that on comparing the observations of the years 1774 and 1775 together, the *variation* appears, after allowing for the error of the instrument, to have been 27′ greater in 1775 than in 1774; though Dr. Heberden, who has made observations of this kind for several years past, informed him, that the annual alteration of the *variation* has, in general, been not more than 10′. See Phil. Trans. vol. lxvi. pt. ii. p. 393.

According to Dr. Halley's theory the *variation* of the *variation* of the compass is supposed owing to the difference of velocity of the motions of the internal and external parts of the globe.

Theory of the VARIATION *of the* VARIATION. From the observations above recited, under the head VARIATION, it seems to follow, that all the magnetical poles have a motion westward: but if it be so, it is evident, that it is not a rotation about the axis of the earth; for then the *variations* would continue the same in the same parallel of latitude (the longitude only changed) as much as the motion of the magnetical poles: but the contrary is found by experience; for there is no-where, in the latitude of 51 and an half north, between England and America, a *variation* of 11 degrees east, at this time; as it was once here at London. Wherefore it seems, that our European pole is become nearer the arctic pole than it was heretofore; or else, that it has lost part of its virtue.

But whether these magnetic poles move altogether with one motion, or with several; whether equally, or unequally; whether circular or libratory; if circular, about what centre; if libratory, after what manner; are things yet unknown.

This theory seems yet somewhat obscure and defective: to suppose four poles in one magnetical globe, in order to account for the *variation*, is a little unnatural; but to conceive those poles to move, and that by such laws as to solve the *variation* of the *variation*, is still more extraordinary. In effect, the solution appears not much less implicit and arbitrary than the problem.

The learned author of the theory, therefore, found himself under a necessity to solve the phenomena of his solution; and with this view, he presented the following hypothesis. The external parts of the globe he considers as the shell, and the internal as a nucleus, or inner globe; and between the two, he conceives a fluid medium. That inner earth, having the same common centre and axis of diurnal rotation, may turn about with our earth each twenty-four hours. Only the outer sphere having its turbinating motion some small matter either swifter or slower than the internal ball; and a very minute difference in length of time, by many repetitions, becoming sensible; the internal parts will, by degrees, recede from the external; and not keeping pace with one another, they will appear gradually to move, either eastward, or westward, by the difference of their motions.

Now, suppose such an internal sphere, having such a motion, the two great difficulties in the former hypothesis are easily solved; for if this exterior shell of earth be a magnet, having its poles at a distance from the poles of diurnal rotation; and if the internal nucleus be likewise a magnet, having its poles in two other places, distant also from the axis; and these latter, by a gradual and slow motion, change their place in respect of the external, we may then give a reasonable account of the four magnetical poles afore mentioned, as likewise of the changes of the needle's *variation*.

The period of its motion being wonderfully great, and there being hardly a hundred years since these *variations* have been duly observed, it will be very hard to bring this hypothesis to a calculus; especially since, though the *variations* do increase and decrease regularly in the same place, yet in different places at no great distance, there are found such casual changes thereof, as can no ways be accounted for by a regular hypothesis; but seem to depend upon the unequal and irregular distribution of the magnetical matter, within the substance of the external shell, or coat of the earth, which deflect the needle from the position it would acquire from the effect of the general magnetism of the whole. Of which the *variations* at London and Paris give a notable instance; for the needle has been constantly about 1$\frac{1}{2}$° more easterly at Paris than at London: though it be certain that, according to the general effect, the difference ought to be the contrary way; notwithstanding which, the *variations*, in both places, do change alike.

Hence, and from some other things of like nature, it seems plain, that the two poles of the external globe are fixed in the earth; and that if the needle were wholly governed by them, the *variations* thereof would be always the same, with some irregularities, upon the account just now mentioned. But the internal sphere having such a gradual translation of its poles, does influence the needle, and direct it variously, according to the result of the attractive or directive power of each pole, and, consequently, there must be a period of the revolution of this internal ball; after which the *variations* will return again as before. But if it shall in future ages be observed otherwise, we must then conclude, that there are more of these internal spheres, and more magnetical poles, than four; which, at present, we have not a sufficient number of observations to determine, and particularly

cularly in that vast Mar del Zur, or South Sea, which occupies so great a part of the whole surface of the earth.

If, then, two of the poles be fixed, and two moveable, it remains to ascertain, which they are that keep their place.

The author thinks it may be safely determined, that our European north pole is the moveable one of the two northern poles, and that which has chiefly influenced the *variations* in these parts of the world; for, in Hudson's Bay, which is under the direction of the American pole, the change is not observed to be near so fast as in these parts of Europe, though the pole be much farther removed from the axis. As to the south poles, he takes the Asiatic pole to be fixed, and, consequently, the American pole to move.

This granted, it is plain, that the fixed poles are the poles of this external shell, or cortex, of the earth; and the other the poles of the magnetical nucleus, included and moveable within the other. It likewise follows, that this motion is westwards, and, by consequence, that the aforesaid nucleus has not precisely attained the same degree of velocity with the exterior parts in their diurnal revolution; but so very nearly equals it, that, in 365 revolutions, the difference is scarce sensible. That there is any difference of this kind arises hence, that the impulse whereby the diurnal motion was impressed on the earth, was given to the external parts; and from thence, in time, communicated to the internal; but not so as yet perfectly to equal the velocity of the first motion impressed on, and still conserved by, the superficial parts of the globe.

As to the precise period we want observations to determine it, though the author thinks we may, with some reason, conjecture, that the American pole has moved westward 46° in 90 years, and that the whole period thereof is performed in about 700 years.

Mr. Whiston, in his New Laws of Magnetism, raises several objections against this theory. See MAGNETISM.

M. Euler, the son of the celebrated geometrician of that name, has also controverted and censured the above theory: he thinks that two magnetic poles, placed on the surface of the earth, will sufficiently account for the *variation*; and he then endeavours to shew, how we may determine the declination of the needle, at any time, and on every part of the globe, from this hypothesis. But we must refer for the particulars of this reasoning to the Histoire de l'Academie Royal des Sciences & Belles Lettres of Berlin, for 1757.

Dr. Halley having collected, as we have already mentioned under the article VARIATION, a great multitude of observations made on the *variation* of the needle in many parts of the world, was enabled, by knowing the latitude and longitude of the places where the observations were made, to draw on a Mercator's chart certain lines, shewing the *variation* of the compass in all those places over which they passed, in the year 1700, which was the time when he published the first chart of this kind, called the *variation chart*.

From the construction of this chart it appears, that the longitude of any of those places may be found by it, provided that its latitude and the *variation* in that place be given. For, having found the *variation* of the compass, draw a parallel of latitude on the chart through the latitude found by observation; and the point where it cuts the curved line, whose *variation* is the same with that observed, will be the ship's place. E. g. a ship finds, by a good observation, that she is in the latitude of $18^{\circ}\ 20'$ N. and that the *variation* of the compass is 4° W. let it be required to determine the ship's place. For this purpose take from the graduated meridian the distance between the equator and the latitude of $18^{\circ}\ 20'$ N.: lay a ruler along the equator, and slide one point of the compasses along its edge till the other point cuts the curve of 4° W. *variation*, and the intersection gives the ship's place, whose longitude will be found to be about $27^{\circ}\ 10'$ W. from London.

This method, however, is attended with two inconveniences: 1st. That wherever the *variation* lines run east or west, or nearly so, this way of finding the longitude becomes imperfect: but among all the trading parts of the world, this imperfection is at present found chiefly on the west coasts of Europe, between the latitudes of 45° and 53°; on the eastern shores of North America, and in some parts of the Western Ocean and Hudson's Bay, lying between the said shores: therefore, for the other parts of the world, a *variation* chart may be esteemed as of the greatest use. But the *variation* curves, even when they run east and west, may be sometimes applied to good use in correcting the latitude, when meridian observations cannot be had, as it frequently happens on the northern coasts of America, in the Western Ocean, and about Newfoundland; for if the *variation* can be obtained exactly, then the east and west curve, answering to that *variation* on the chart, will shew the latitude.

2dly. As the deflection of the magnetical meridian from the true one is subject to continual alteration, therefore, a chart to which the *variation* lines are fitted for any year must in time become useless, unless new lines, shewing the state of the *variation* at that time, be drawn on that chart: but as the change in the *variation* is very slow, therefore new *variation* charts published every seven or eight years, will answer the purpose required.

Hence it has happened, that Dr. Halley's *variation* chart, so well adapted, notwithstanding its defects, to the service of most mariners, has become useless, for want of encouragement to renew it from time to time.

However, in the year 1744, Mr. William Mountaine and Mr. James Dodson published a new *variation* chart, fitted for that year, which was well received; and several instances of its great utility having been communicated to them, they fitted the *variation* lines anew for the year 1756, and, in the following year, published the third *variation* chart, and also presented to the Royal Society a curious paper concerning the *variation* of the magnetic needle, with a set of tables annexed, containing the result of upwards of fifty thousand observations, in six periodical reviews, from the year 1700 to 1756, inclusive, and adapted to every five degrees of latitude and longitude in the more frequented oceans; which paper and tables were printed in the Transactions for the year 1757.

It is much to be wished, that charts of this kind should be occasionally printed, like the Nautical Almanack, at the expence of the public.

In the account that accompanies the tables above mentioned, there occur the following facts and observations that are particularly worth reciting.

According to the observations of captain Snow, the *variation* at Barbadoes seems nearly at a stand; for in the road, in 1752, it was 5° E. and by Halley's draught $5\frac{1}{2}^{\circ}$: in 1747, at Port Royal keys, in Jamaica, the *variation* was $7^{\circ}\ 20'$ E. and on the coast of Carthagena, off the high land of Sancta Martha, $7^{\circ}\ 45'$ E. nearly south of Port Royal: therefore these curves are not much altered; and the curve at Jamaica nearly at a stand; and the south part of them, with the rest, dropping to the westward.

Under the equator, in longitude 40° E. from London, the highest *variation*, during the whole 56 years, appears to be $17\frac{1}{4}^{\circ}$ W. and the least $16\frac{1}{2}^{\circ}$ W. and in latitude 15° N. longitude 60° W. from London, the *variation* has been constantly 5° E. but in other places the case has been widely different; for in the latitude 10° S. longitude 60° E. from London, the *variation* has decreased from 17° W. to $7\frac{1}{4}^{\circ}$ W.: and in latitude 10° S. longitude 5° W. from London, it has increased from $2\frac{1}{4}^{\circ}$ W. to $12\frac{3}{4}^{\circ}$ W.; and in latitude 15° N. longitude 20° W. it has increased from 1° W. to 9° W.

But there is still a more extraordinary appearance in the Indian Seas: for instance, under the equator.

Longitude from London.	*Variation* in 1700.	*Variation* in 1756.	Longitude from London.	*Variation* in 1700.	*Variation* in 1756.
Degrees.	Degrees.	Degrees.	Degrees.	Degrees.	Degrees
40 E	$16\frac{3}{4}$ W	$16\frac{3}{4}$ W	75 E	$9\frac{3}{4}$ W	1 W
45 E	$1\frac{3}{4}$ W	$14\frac{1}{2}$ W	80 E	$7\frac{1}{4}$ W	$0\frac{1}{4}$ E
50 E	$17\frac{1}{2}$ W	$11\frac{3}{4}$ W	85 E	$5\frac{1}{2}$ W	$1\frac{1}{4}$ E
55 E	$16\frac{1}{2}$ W	$8\frac{3}{4}$ W	90 E	$4\frac{1}{4}$ W	1 E
60 E	$15\frac{1}{4}$ W	6 W	95 E	$3\frac{1}{4}$ W	$0\frac{1}{2}$ W
65 E	$13\frac{1}{2}$ W	$4\frac{1}{2}$ W	100 E	$2\frac{1}{2}$ W	1 W
70 E	$11\frac{1}{2}$ W	$3\frac{1}{4}$ W			

Where the west *variation* in the longitude 40° E. is the same in both the above years; and, in 1700, the west *variation* seemed to be regularly decreasing from longitude 50° E. to the longitude 100° E.; but, in 1756, we find the west *variation* decreasing so fast, that we have east *variation* in the longitude 80°, 85°, and 90° E.; and yet, in the longitude 95° and 100° E. we have west *variation* again.

Such are the irregularities that experience hath shewn us in the *variation* of the magnetic needle, which appear so considerable, that we cannot think it wholly under the direction of one general and uniform law; but rather conclude, with the learned and judicious Dr. Gowen Knight, Fellow of the Royal Society, in the 87th prop. of his Treatise upon Attraction and Repulsion, that it is influenced

influenced by various and different magnetic attractions, in all probability occasioned by the heterogeneous compositions in the great magnet, the *earth*. Phil. Transf. vol. xlviii. p. 875. Vol. l. p. 329, &c.

We have many observations on the *variation* of the magnetic needle in the Phil. Trans. See particularly vol. lvi. p. 220. Vol. lxi. part ii. p. 422, where we have lieutenant Cook's observations in his voyage round the world.

There is a small *variation* of the *variation* of the magnetic needle, amounting only to a few minutes of a degree in the same place, at different hours of the same day, which is discoverable by accurate observations. Mr. George Graham made several observations of this kind in the years 1722 and 1723, professing himself altogether ignorant of the cause of the *variation* which he observed. Phil. Transf. N° 383, or Abr. vol. vii. p. 290, &c.

About the year 1750, Mr. Wargentin, secretary of the Royal Academy of Sciences in Sweden, took notice both of the regular diurnal *variation* of the needle, and also of its being disturbed at the time of the aurora borealis, as recorded in the Phil. Transf. vol. xlvii. p. 126, &c.

About the year 1756, Mr. Canton commenced a series of observations amounting to near 4000, with an excellent *variation*-compass, of about 9 inches diameter. The number of days on which these observations were made was 603, and the diurnal *variation* on 574 of them was regular, i. e. the absolute *variation* of the needle westward was increasing from about 8 or 9 o'clock in the morning, till about 1 or 2 in the afternoon, when the needle became stationary for some time; after that, the absolute *variation* westward was decreasing, and the needle came back again to its former situation, or near it, in the night, or by the next morning. The diurnal *variation* is irregular when the needle moves slowly eastward in the latter part of the morning, or westward in the latter part of the afternoon; also when it moves much either way after night, or suddenly both ways in a short time. These irregularities seldom happen more than once or twice in a month, and are always accompanied, as far as Mr. Canton observed, with an aurora borealis.

Mr. Canton lays down and evinces, by experiment, the following principle, viz. that the attractive power of the magnet (whether natural or artificial) will decrease while the magnet is heating, and increase while it is cooling. He then proceeds to account for both the regular and irregular *variation*. It is evident, he says, that the magnetic parts of the earth in the north on the east side, and the magnetic parts of the earth in the north on the west side of the magnetic meridian, equally attract the north end of the needle. If then the eastern magnetic parts are heated faster by the sun in the morning than the western, the needle will move westward, and the absolute *variation* will increase: when the attracting parts of the earth on each side of the magnetic meridian have their heat increasing equally, the needle will be stationary, and the absolute *variation* will then be greatest; but when the western magnetic parts are either heating faster, or cooling slower than the eastern, the needle will move eastward, or the absolute *variation* will decrease; and when the eastern and western magnetic parts are cooling equally fast, the needle will again be stationary, and the absolute *variation* will then be least.

By this theory, the diurnal *variation* in the summer ought to exceed that in winter; and accordingly it is found by observation; that the diurnal *variation* in the months of June and July is almost double that of December and January.

The irregular diurnal *variation* must arise from some other cause than that of heat communicated by the sun; and here Mr. Canton has recourse to subterranean heat, which is generated without any regularity as to time, and which will, when it happens in the north, affect the attractive power of the magnetic parts of the earth on the north end of the needle. That the air nearest the earth will be most warmed by the heat of it, is obvious; and this has been frequently taken notice of in the morning, before day, by means of thermometers at different distances from the ground. Phil. Transf. vol. xlviii. p. 526.

Mr. Canton has annexed to his paper on this subject a complete year's observations; from which it appears, that the diurnal *variation* increases from January to June, and decreases from June to December. Phil. Transf. vol. li. p. 398, &c.

It has also been observed, that different needles, especially if touched with different load-stones, will differ a few minutes in their *variation*. See Poleni Epist. Phil. Transf. N° 421.

We shall here subjoin a method practised by M. du Hamel, who was one of those who attempted, and succeeded in the preparation of artificial magnets, for enlarging the scale of the *variation*. At each extremity of the needle, composed of two magnetic bars, and which is 14 inches long, a slender pointed piece of steel is erected perpendicularly; and at the distance of 52 feet, in the direction of the needle, he has placed on two pillars, and in a line perpendicular to that direction, a graduated limb 6 feet long; being a segment of a supposed circle, described from the centre on which the needle turns. The observer, placing himself so as to bring the two pieces of steel at the extremities of the bar, into a line with the eye, observes where that line prolonged, or the visual ray, points to the graduated arch. As, at this distance, each of these degrees measures a foot, the true direction of the needle is ascertained with the greatest precision; and lest the observer's eyes may not be good enough to enable him to see distinctly the particular division at that distance, an assistant occasionally moves a certain index conformably to his direction. Hist. de l'Acad. Roy. des Scienc. Paris, for 1772, part ii. Mem. 2.

Variation *of curvature*, in *Geometry*, is used for that inequability, or change, which happens in the curvature of all curves, except the circle. And this *variation* or inequability constitutes the quality of the curvature of any line.

Sir Isaac Newton makes the index of the inequability, or *variation* of curvature, to be the ratio of the fluxion of the radius of curvature to the fluxion of the curve; and Mr. Maclaurin, to avoid the perplexity that different notions, connected with the same terms, occasion to learners, has adopted the same definition; but he suggests, that this ratio gives rather the *variation* of the ray of curvature, and that it might have been proper to have measured the *variation* of curvature rather by the ratio of the fluxion of the curvature itself to the fluxion of the curve; so that the curvature being inversely as the radius of curvature, and, consequently, its fluxion as the fluxion of the radius itself directly, and the square of the radius inversely, its *variation* would have been directly as the measure of it, according to sir Isaac Newton's definition, and inversely as the square of the radius of curvature.

According to this notion, it would have been measured by the angle of contact contained by the curve and circle of curvature, in the same manner as the curvature itself is measured by the angle of contact contained by the curve and tangent. The reason of this remark may appear from this example. The *variation* of curvature, according to sir Isaac Newton's explication, is uniform in the logarithmic spiral, the fluxion of the radius of curvature in this figure being always in the same *ratio* to the fluxion of the curve; and yet, while the spiral is produced, though its curvature decreases, it never vanishes, which must appear a strange paradox to those who do not attend to the import of sir Isaac's definition. Newton's Meth. of Flux. and Inf. Series, p. 76. Maclaurin's Fluxions, art. 386. Phil. Transf. N° 468. sect. 6. p. 342.

The *variation* of curvature at any point of a conic section, is always as the tangent of the angle contained by the diameter that passes through the point of contact, and the perpendicular to the curve at the same point, or to the angle formed by the diameter of the section, and of the circle of curvature. Hence the *variation* of curvature vanishes at the extremities of either axis, and is greatest when the acute angle, contained by the diameter, passing through the point of contact and the tangent, is least.

When the conic section is a parabola, the *variation* is as the tangent of the angle, contained by the right line drawn from the point of contact to the focus, and the perpendicular to the curve. See Curvature.

Variation, in the *Italian Music*, is understood of the different manners of playing or singing, a tune or song; whether by subdividing the notes into several others of less value, or by adding graces, &c. This is to be done in such manner, however, as that one may still discern the ground of the tune through all these enrichments, which some call *embroideries*.

Thus, e. gr. the divers couples of chacons, Spanish folies, gavots, French passecaillies, &c. are so many *variations*: so also many diminutions of courants, gavots, and other pieces for the lute, harpsichord, &c. are real *variations*.

VARICES, of *varix*, formed from *variare*, because of the turns of the veins which the tumor in this disease sometimes takes, in *Surgery*, a name given to those unequal or knotty and livid protuberances of the veins, which

which are formed in all parts of the body, but most frequently in the legs, near the ankles, and often near the knees, or in the thighs, scrotum, abdomen, and sometimes the head.

Varices are sometimes confined to one single branch of a vein, and sometimes they extend to several; and sometimes run crooked, and bent in various knots and circumvolutions.

They happen oftenest to the crural and hæmorrhoidal veins; sometimes also to those in the testes, and frequently to those in the abdomen and breasts of pregnant women, and such as give suck. They are supposed owing to the great abundance or thickness of the blood, or to the relaxation of the membranes of the veins, immoderate labour, sprains, cramps, too great pressure or stricture by bandages. Stagnations of the blood, from a plethora, cacochymia, &c. may also give occasion to them. Women with child are the most liable to this disorder in the thighs and legs, on account of the fœtus compressing the iliac veins, and preventing the reflux of the blood to the heart; but it also frequently happens to plethoric men, or to those who are hypochondriacal, and who have an inspissated or viscid blood, and an obstruction, or scirrhosity of their liver.

Varices happening spontaneously, and proving of a moderate size, are rarely dangerous; they are even allowed serviceable in the case of hæmorrhoids. When immoderate, they sometimes occasion a cachexy, dropsy, or consumption.

The larger these protuberances are, so much the more painful and troublesome they prove, by the greater distension of the coats or membranes of the vessel, which are sometimes quite ruptured, and occasion a profuse hæmorrhage or an ulcer.

In order to prevent this disorder from increasing, it may be proper to bleed the patient, prescribe a proper regimen, and apply an expulsive bandage close to the disordered legs.

Dr. Harris thinks, that tincture of myrrh is a very powerful remedy for *varices*, if it be often applied with a feather, and the part covered with emplast. diasulp. Rulandi, which will still succeed better with a bandage or strait stocking. When they are much enlarged, and attended with bad symptoms, it will be necessary to lay open the worst of them by a longitudinal incision with the scalpel, or a lancet, and take away eight or ten ounces of the grumous and viscid blood, dressing the wound with bole armenic and vinegar, applied on scraped lint, and retained with a plate of lead, compress, and bandage; and thus the vein will unite and form a cicatrix strong enough to resist any farther dilatation.

The ancients cured *varices* by incision or cauterization, as Celsus observes, lib. vii. cap. 36.

For preventing their return, the patient should carefully avoid gross and plentiful feeding, and use frequent exercise, with frictions of the legs and occasional bleeding. Heister's Surgery, part ii. p. 343.

VARICIFORMES *parastatæ*, in *Anatomy*, a name which some authors give to two vessels near the bladder; by reason of their many turnings, serving to work and prepare the seed the better. See PARASTATÆ and DEFERENTIA *Vasa*.

VARICOCELE, in *Surgery*, a name given to one of the spurious HERNIÆ, which consists in a dilatation of the blood-vessels of the scrotum. These are of different sizes, in different people, and like the vessels in other parts of the body, are liable to become varicose; but are seldom so much enlarged as to be troublesome, unless such enlargement is the consequence of a disease, either of the testicle, or of the spermatic chord. When this is the case, the original disease should engage the attention of the surgeon, and not this simple effect of it; and therefore, considered abstractedly, the *varicocele* is a disease of no importance. Pott's Chirurgical Works, vol. ii. p. 423, 1779.

VARICOMPHALUS, in *Surgery*, a kind of umbilical rupture, or EXOMPHALUS, so denominated from the nature of the particular humour of which it is formed.

VARICOSA *Hernia*. See HERNIA *Varicosa* and CIRSOCELE.

VARICOSUM *Corpus*, in *Anatomy*, the same as *corpus* PYRAMIDALE.

VARICOUS *ulcers*. See ULCER.

VARICULA, a diminutive of the word *varix*, a term applied by some authors to the intumescence of the veins of the tunica adnata in the eye, arising from thick blood.

VARIEGATION, among *Botanists* and *Florists*, the act of streaking or diversifying the leaves, &c. of plants and flowers, with several colours.

Variegation is either *natural* or *artificial*. Of *natural variegation* there are four kinds; the first shewing itself in yellow spots here and there in the leaves of plants; called by gardeners the *yellow blotch*.

The second, called the *white blotch*, marks the leaves with a great number of white spots, or stripes; the whitest lie next the surface of the leaves, usually accompanied with other marks of a greenish white, that lie deeper in the body of the leaves.

The third, and most beautiful, is, where the leaves are edged with white, being owing to some disorder, or infection, in the juices, which stains the natural complexion, or verdure of the plant.

The fourth kind is that called the *yellow edge*.

All *variegation* is, in itself, a disease; and these are only so many species, or rather degrees thereof. In the yellow, the disease is the slightest; but the white is a sure sign of a deep infection, and weakness in the plant: which is farther evinced by this, that no two leaves are ever marked exactly alike. The former sometimes degenerate into the third, or edge kind; which is a total and immoveable disease, that lays hold not only of the leaves, but of the wood, and even the fruit, seed, &c.

In the two first kinds, when accidental, there is a possibility of recovering the plants to their native verdure, by inarching them into an healthful stock of the same species, and letting the stock stand a year or two joined together; by which means the juices of the strong stock, overpowering the distemper, throw off the morbid humours by perspiration; but the third kind is incurable: no art can recover the edged plant to produce plain green leaves again.

Artificial variegation is performed by inarching, or inoculating, a striped or *variegated* plant into a plain one of the same sort; as a *variegated* common jessamin, into a plain, common, Spanish, Brazil, or Indian jessamin.

A single bud, or eye, Mr. Bradley observes, being placed in the escutcheon of a distempered tree, wherein it can only receive nourishment from the vitiated juices, will become *variegated*, proportionably to the nourishment it draws; and will partake more of the white or yellow juice, than if a branch should be inarched; the bud having nothing to nourish it, but the juices of the plant it is inoculated on; whereas a cyon inarched is fed both by the striped plant, and the healthful one.

As to the natural stripes, or *variegations*, there are some particular circumstances to be observed: 1. That some plants only appear *variegated*, or blotched in the spring and autumn; the stains disappearing as they gather strength in summer; instances of this kind are seen in rue, thyme, and pot-marjoram.

2. Some plants are commonly blotched in the spongy part of their leaves; the sap-vessels, all the time, remaining of a healthful green: such are the alaternus, orange-mint, &c. which, being strengthened by rich manure, or being inarched into healthful plants, always throw off the distemper.

3. In other plants the disease is so rooted and inveterate, that it is propagated with the seed: such are the archangel, water-betony, bank-cress, borrage, striped celery, and sycamore; the seeds of all which produce striped plants.

VARIETIES, in *Natural History*, a word used to express an accidental change in some body which is not essential to it, and therefore does not constitute a different species.

The naturalists of former ages have run into great errors, in mistaking the accidental *varieties* of plants, animals, and minerals, for distinct species. Many of them have called a plant a new species, because its flower, which should have been blue or red, is white, on account of the poorness of the soil, or some other such reason. Mr. Ray has established a very good test for *varieties* in botany; he allows every thing to be a distinct plant which will propagate itself in its own form by its seeds; but such, as when sown, lose their difference, and run back to the old standard, he accounts *varieties*, however great their distinctions may appear. In the history of fish as much confusion has been introduced, by mistaking *varieties* for distinct species, as in botany. Artedi is the only author who has rationally attempted to bring this part of natural history into order in this respect, and to settle regularly the rules by which to distinguish real and essential, from accidental differences.

The principal grounds of the error of supposing *varieties* distinct species of fish, have been these: the variable and inconstant colour of fish hath been mistaken for a specific difference; in this manner Rondeletius has described many *varieties* of the turdi, labri, and other fish, under the names of distinct genera.

Others have paid the same too great regard to the more constant *varieties* of colour, which are found only to differ in degree, in the several individuals of the same species, and their differences to be only in the degrees of the same colour, which is much more intense in some, and more remiss in others. These differences can only make *varieties* of the same fish, the species remaining always

always the same. Of the same kind are the mistakes of those who esteem size or magnitude a specific character; and thus, out of the *varieties* of the same fish, occasioned by scarcity or plenty of food, or other such occasions, make larger or smaller species. The place, where fish are caught, is also another cause of making new species with these authors: thus, though the *perca fluviatilis* of Bellonius, and the *perca marina* of other authors be the same fish, yet they are pretended to be different species. The time of spawning is also with some made a distinction of species; and thus we find the common pike divided into three species, according to its spawning, in spring, summer, and autumn, which it does according to the heat or coldness of the climate. See SPECIFIC *names*.

All these differences are false and frivolous, and the utmost they can do, is to make what are properly called *varieties*, though few of them are sufficient even for that. A salmon caught at sea, is not different from one of the same brood caught in a river; and if the *perca marina*, falsly so called, be a little different from the *perca fluviatilis*, yet if its spawn will produce regular *percæ fluviatiles*, its difference can only amount to a *variety*, not a distinct species.

The time of spawning is no essential difference; for we daily see the change of climate make changes of that kind in all creatures; and even in the same climate, and under the same circumstances, the same species of birds will afford some individuals much earlier or later in laying their eggs than others. Artedi Ichthyol.

VARIOLÆ, or VARIOLI, a contagious disease, popularly called the *small*-POX.

It is called *variolæ*, as shewing itself in pustules, or little tumors, like VARICES; or as variegating the skin.

VARIORUM, in *Matters of Literature*, a term or phrase of abbreviation, used for an edition of a classic author, printed in Holland, with the notes of divers authors thereupon: *Cum notis variorum*, or *cum selectis variorum observationibus*.

In this sense, we say, *Plautus variorum*; a set of Dutch *variorums*, &c. Many of the *variorum* are valuable editions.

The word is the genitive plural of the Latin *varius*; *different*, *divers*.

VARIUS, in *Ichthyology*, a name used by most authors for a small fresh-water fish, common in brooks and running waters, and well known in England by the name of the MINOW.

VARIUS *mus*, in the old authors of *Zoography*, a name used for the same creature they otherwise called *mus ponticus*; which seems to have been no other than the *European flying* SQUIRREL.

VARIX, in *Surgery*. See VARICES.

VARLET. See VALET.

VARNISH, or VERNISH, *vernix*, a thick, viscid, glossy liquor, used by painters, gilders, and various other artificers, to give a gloss and lustre to their works, as also to defend them from the weather, dust, &c.

There are divers kinds of *varnishes*; some of the principal of which are as follow.

VARNISH, *amber*, is prepared in the following manner: put four ounces of amber into a crucible, and melt it with a small degree of heat, and pour it out upon an iron plate; when cold, reduce it to powder, and add to it two ounces of drying oil, that is, linseed oil thickened by boiling it up with litharge, and one pint of oil of turpentine, and dissolve the whole together into a liquid *varnish*.

This simple *amber varnish* is of great use for many purposes, and is said to be the basis of the fine *varnishes* which we see on coaches, and may be prepared without drying oil, by boiling the powder of amber in linseed oil, or in a mixture of linseed oil and oil of turpentine. Drying oil is commonly used by the workmen; but Dr. Lewis thinks it more eligible to take the oil unprepared, that the boiling, requisite for giving it the drying quality, may be employed at the same time in making it act upon the amber. It has generally been thought, that amber will not at all dissolve in oils, till it has suffered a degree of decomposition by fire; but Hoffman relates an experiment, in his Observationes Physico-Chemicæ, which discovers the solubility of this concrete in its natural state. Powdered amber, with twice its quantity of oil olive, was put in a wide-mouthed glass; and a digestor, or strong copper vessel, being filled about one third with water, the glass was placed in it, the cover of the digestor screwed down tight, and a moderate fire continued an hour or more: when cold, the amber was found dissolved into a gelatinous, transparent mass. In Dr. Stockar's Specimen Inaugurale de Succino, printed at Leyden, in 1760, we have an account of other experiments made by himself, in conjunction with Mr. Ziegler of Winterthur; from which we learn, that by continuing a simmering heat twelve hours, and confining the vapour as much as stone-ware vessels would bear, without bursting (the danger of which was avoided by making a small notch in the cork-stoppers), powdered amber dissolved perfectly in expressed oils, in turpentine, and in balsam of copaiba: a strong copper vessel, with a cover screwed on it, seems most eligible; and for the greater security, a valve may be made in the cover, kept down by a spring, that shall give way before the confined vapour is of sufficient force to endanger bursting the vessel. Moreover, by digestion for a week in close-stopped glass vessels, in which the compressure could not be very great, solutions equally perfect were obtained. The solution in rape-seed oil, and in oil of almonds, was of a fine yellowish colour; in linseed oil, gold-coloured; in oil of poppy-seeds, yellowish red; in oil olive, of a beautiful red; in oil of nuts, deeper coloured; and in oil of bays, of a purple red. The solutions made with turpentine, and with balsam of copaiba, were of a deep red colour, and on cooling, hardened into a brittle mass of the same colour. All the solutions mingled perfectly well with spirit of turpentine. Those made with the oils of linseed, bays, poppy-seeds, and nuts, and with balsam of copaiba and turpentine, being diluted with four times their quantity of spirit of turpentine, formed hard, tenacious, glossy *varnishes*, which dried sufficiently quick, and appeared greatly preferable to those made in the common manner from melted amber.

An amber *varnish* may also be made by boiling down some colophony, or turpentine, till it becomes black and friable, and melting this in a glazed earthen vessel, sprinkling in by degrees thrice as much amber in fine powder, with the addition of a little spirit or oil of turpentine now and then. When the amber is melted, sprinkle in the same quantity of sarcocolla; continuing to mix them, and to add more spirit of turpentine, till the whole becomes fluid; then strain out the clear through a coarse hair bag, pressing it gently between hot boards. This *varnish*, mixed with ivory black in fine powder, is applied, in a hot room, on the dried paper paste, of which the PAPIER MACHE' is made; which is then set in a gently-heated oven, next day in a hotter oven, and the third day in a very hot one, and let stand each time till the oven is grown cold. The paste thus varnished is hard, durable, glossy, and bears liquors hot or cold. Lewis's Com. Phil. Techn. p. 367.

An amber *varnish* may be otherwise made, by melting eight ounces of Chio turpentine, and when fluid, pouring into it by degrees a pound of fine powdered amber, and stirring it; and when it is properly mixed, setting it on a fire for half an hour, taking it off, and stirring it well, and adding to it two ounces of the white colophony. It is again to be put on a brisk fire, and covered close; when the mass is perfectly fluid, and taken off to cool, a pound of linseed or poppy oil, made drying, is to be poured in boiling hot, and stirred till it be incorporated with the mass; and then a quart of hot turpentine is to be added, and the whole well stirred. Let it then cool, and strain it off for use; when, if it has been properly made, it will be quite clear. See GILDING *on enamel and glass*.

VARNISH, *black*, for JAPANNING on wood or leather, is prepared by mixing lamp-black or ivory-black with a proper quantity of a strong solution of gum lac in spirit of wine. The lamp-black is commonly preferred to the ivory-black, on account of its uniting better with the fluid, and working smoother. The thicker part of the *varnish*, which settles at the bottom, is used with the lamp-black for the first coatings, and the mixture applied at different times, in a hot room, one layer after another is dry, till a full body of colour is obtained; after which, the piece is washed over in the same manner several times, with the finer part of the *varnish*, just tinged with the black, so as to make a coating of sufficient thickness to bear polishing with tripoli. Iron snuff-boxes, mourning buckles, &c. are coloured black, by making them considerably hot, and applying on them in this state a thick mixture of lamp-black, with a certain *varnish* called gold-size, consisting of drying oil, turpentine, and the pigment called Naples yellow; but the yellow might be omitted, and the *varnish* formed at once by mixing lamp-black with a proper quantity of turpentine and drying oil. The workmen, as Dr. Lewis says, frequently employ, as *varnish* for metals, a mixture of lamp-black, with the scummings, &c. of different oil paints: the mixture is applied with a pencil, and the piece afterwards baked in an oven with a heat somewhat greater than is used for the papier maché. Naples yellow, a superfluous ingredient in the black *varnish*, is the basis

baſis of the dark brown which we ſee on ſome iron ſnuff-boxes; this pigment changing to a brown in baking with the *varniſh*. Lewis. See Lacquer.

The excellent black *varniſh* of China and Japan, which has been hitherto but imperfectly imitated in Europe, and which was formerly thought to be an artificial compoſition of reſinous bodies coloured with black pigments, has been diſcovered by the later travellers into thoſe countries, to be a native juice, exuding from inciſions made in the trunks of certain trees. Mr. Miller, in conſequence of a letter from the abbé Mazeas to Dr. Hales, containing a communication of the diſcovery of a plant by the abbé de Sauvages, which he calls *toxicodendron Carolinianum foliis pinnatis, floribus minimis herbaceis*, and the black juice of which adheres, without the leaſt acrimony, to cloth, with more force than any other known preparation, takes occaſion to ſhew, that this American toxicodendron is the ſame ſpecies of plant from which the inhabitants of Japan procure the *varniſh* with which they ſtain all their utenſils; adding, that the calicuts are alſo painted with the juice of this ſhrub. This American toxicodendron (ſee Poison-*tree*) is the ſame plant, as he affirms, which is mentioned by Kæmpfer, in his Amœnitates Exoticæ, by the title of *arbor vernacifera legitima, folio pinnato juglandis, fructu racemoſo ciceris facie*, i. e. the true *varniſh* tree, with a walnut-tree leaf, and a branching fruit like cicers. It is called by the inhabitants of Japan *ſitz*, or *faſitz-dſju*, and alſo *urus*, or *urus noki*. Kæmpfer has alſo deſcribed the wild or ſpurious *varniſh* tree, called *faſi-no-ki* by the natives, which he ſays agrees with the other in every part, except that the lobes of the leaves are narrower; but Mr. Miller is of opinion, that this is a diſtinct ſpecies, if not a different genus from the true ſort, and ſays, that the *varniſh* yielded by it is of little eſteem. The account which the Jeſuits at China have given of the manner in which the *varniſh* is procured, is as follows: they firſt ſlit the back of the branches of the ſhrub, in different places, with a knife; and thus there flows out a white clammy juice, which is received into wooden veſſels; and when theſe become dry, they tap the ſtems of the ſhrubs near their roots, ſo that all the juice is drawn out of them. The ſhrubs are then cut down to the ground, and from their roots new ſtems ariſe, which in three years will be fit for tapping. The juice turns black when expoſed to the air; it heats without turning ſour; but being of a poiſonous nature, it is dangerous to handle it. This native *varniſh* wants hardly any preparation; but if any dirt ſhould happen to mix with it, it is cleanſed by being ſtrained through coarſe gauze, put into wooden veſſels, and covered with an oil called *toi*, and a ſkin, in order to prevent its evaporating. In this ſtate it is carried over to China and Japan for ſale. The ſhrub is chiefly cultivated in the provinces of Tſi-Kocko, and Figo; and the beſt *varniſh*, according to Kæmpfer's account, is produced about the city Jaſſino; but there is an ordinary ſort of *varniſh*, called *nam rak*, brought from Siam, which is collected in the province of Corſama, and in the kingdom of Cambodia, from the tree anacardus, called by the inhabitants *tong* or *tue-rak*, the fruit of which is called in our ſhops anacardium. To collect this liquor, they bore a hole in the trunk, and inſert a tube. By this method they procure as much of it as is ſufficient not only to varniſh all the utenſils of China, Tonquin, and Japan, but it is even exported in cloſe wooden veſſels to Batavia, and other parts of India. This *varniſh*, ſays Kæmpfer, is not only ſold quite pure, but likewiſe coloured, with Chineſe native cinnabar, and a kind of red earth, which the Dutch formerly, but now the Chineſe bring them, and alſo with the materials of which they make their common or Japan ink. Mr. Ellis has controverted the opinion of Mr. Miller, and endeavoured to ſhew that the American toxicodendron is not the ſame with Kæmpfer's arbor vernicifera legitima; alledging, that Kæmpfer's deſcription of the true *varniſh*-tree does not agree with this toxicodendron; and he inclines to the opinion, that the Carolina pinnated toxicodendron, or poiſon-aſh, is the ſame with the *faſi-no-ki*, or ſpurious *varniſh*-tree of Kæmpfer. Mr. Ellis alſo thinks it not improbable, that the *varniſh* mentioned by Kæmpfer, as obtained from the oriental anacardium, is the ſame with that mentioned by father d'Incarville, in the Phil. Tranſ. vol. xlviii. p. 254, called *toeng-yeou*; which is ſo univerſally uſed in China for preſerving and ornamenting their furniture. See this controverſy between Mr. Miller and Mr. Ellis at large, in Phil. Tranſ. vol. xlix. part i. p. 157—166. part ii. p. 806—876. vol. l. p. 430—456. See Poison-*tree*, Linen, and Japanning.

Varnish, *brown, for metals*. See *Black* Varnish, ſupra.

Varnish, *copal oil*, called in France *vernis martin*, is made by pouring into a well-glazed ſtrong earthen pot, in ſhape reſembling a chocolate pot, and in ſize large enough to hold about a gallon, and made warm, four ounces of Chio or Cyprus turpentine, and when this is diſſolved, eight ounces of finely powdered amber; mingling them well, and ſetting them on the fire for a quarter of an hour; take off the pot, and pour gently into it a pound of copal, finely bruiſed, but not powdered; ſtir the maſs and add four ounces of Chio turpentine, and a gill of warm turpentine oil; then ſet it on a briſk fire for about half an hour, and taking it off, ſtir the contents well, and add two ounces of the fineſt and whiteſt colophony. Let the pot be put on a very briſk fire, and remain till the whole is diſſolved, and become as fluid as water; let it be removed from the fire, and remain for a few minutes, and then gradually pour in twenty-four ounces of poppy, nut or linſeed-oil, made drying, and boiling hot, and ſtir the maſs with a deal ſtick. When the gums and oil are thoroughly incorporated, ſet them over the fire for a few minutes, ſtill ſtirring them about, and let them boil once up; and having taken off the pot, pour into it a quart of hot turpentine; ſtir them together, and give them one boil up; take off the pot, and pour into it a pint more of hot turpentine, ſtill ſtirring it well. If the gums are thoroughly melted, and well incorporated, the *varniſh* is made; which, being cool, is ſtrained through a cloſe cloth into another veſſel, and if it be too thick, thinned with oil of turpentine, till it becomes of the conſiſtence of linſeed-oil; ſtrain it a ſecond time, bottle it for uſe, and let it ſtand a month at leaſt, before it is uſed. This *varniſh* is uſed for coaches, cabinets, &c. and the piece, whatever it be, after having been varniſhed ſmoothly, and dried in the intervals, half a dozen times, and ſuffered thoroughly to dry, muſt be rubbed with a wet coarſe rag, dipped in pumice-ſtone powdered and ſifted, till the ſtreaks of the bruſh and all blemiſhes are removed. When it is perfectly ſmoothed, waſhed, and dried, the coats of *varniſh* are to be repeated, for ten or twelve times, till there be a ſufficient body. After having again uſed the powdered pumice-ſtone, and waſhed it off as before, let it be rubbed with fine emery, till the ſurface becomes even and ſmooth as glaſs; then with powder of fine rotten ſtone, till by paſſing the palm of the hand two or three times over the ſame place, you diſcover a gloſs equal to that of glaſs; having dried it clean, dip a rag, or piece of flannel, in ſweet oil, and rub the ſurface a few times over, and clear it off with fine dry powder, flour, or the hand; and a piece of fine flannel, dipped in flour, and rubbed over it, when cleared of the oil, will give it an excellent luſtre. Between every coat of *varniſh* it will be adviſeable, if the ſubject admits of it, to ſet it in a warm oven; or to heat the varniſhed pieces by ſtoves. See Copal.

Varnish, *gold-coloured*. See Lacquer.

The compoſition of a gold-coloured *varniſh*, uſed by the Engliſh artiſts for braſs and ſilver, was communicated to ſome of the French academicians in 1720, by Mr. Scarlet, and in 1738 by Mr. Graham, and publiſhed in the volume of the French Memoirs for 1761. It is as follows: take two ounces of gum lac, two ounces of yellow amber, forty grains of dragon's blood in tears, half a dram of ſaffron, and forty ounces of good ſpirit of wine; infuſe and digeſt in the uſual manner, and then ſtrain through a linen cloth. The piece to be varniſhed muſt be heated before the liquid is applied: it receives from the *varniſh* a gold colour, and may be cleaned, when ſullied, with warm water.

Varnish *for preſerving poliſhed iron from ruſt*. See Iron.

Varnish, *lacca*, is made of gum lacca, and ſpirit of wine, frequently ſhaken till the gum be diſſolved, then ſtrained, and the clear liquor decanted off.

The lacca ought to be of the kind called ſeed lacca. Three ounces of this, well purified by repeated ablution with water, dried and powdered groſsly, ſhould be put into a bottle with a pint of rectified ſpirit of wine, ſo as to fill about two-thirds of it, and the bottle placed in a gentle heat; proceeding as above: though for varniſhing ordinary woods, ſhell lacca is often uſed. For this purpoſe, five ounces of the beſt ſhell-lacca ſhould be groſsly powdered, and put into a bottle, holding about three pints or two quarts, with one quart of rectified ſpirit of wine; and placed in a gentle heat: the mixture muſt be filtered through a flannel bag. To this *varniſh*, the colours uſed in *varniſh* painting may be added, and properly diluted with rectified ſpirit, and kept in phials, or tin veſſels, cloſely ſtopped for uſe. But this will not ſtand againſt the weather.

For various preparations of this kind, ſee Japanning and Lacquer.

Varnish, *maſtich*, is made by putting five ounces of pow-

dered maſtich into a proper bottle, with a pound of ſpirit of turpentine, and ſetting them to boil in balneo Mariæ, till the maſtich be diſſolved, and ſtraining the ſolution through flannel. This *varniſh* may be converted into a proper *varniſh* for painting, by grinding one ounce of gum anime on a ſtone with water, till it becomes an impalpable powder; then drying it, and grinding it again with half an ounce of turpentine, and afterwards with the proper colours, and moiſtening it with the maſtich *varniſh*, till the mixture be of a due conſiſtence for working with the pencil. It muſt then be kept in phials or tin veſſels, and diluted, as there may be occaſion, with ſpirit of turpentine.

VARNISH *for preſerving paintings*. See PICTURE.

For this purpoſe ſome have recommended the following compoſition; viz. half a pound of gum ſandarac; an ounce and a half of Venice turpentine; three quarters of an ounce of each of the gums anime and copal; half an ounce of maſtich; benzoin, gum elemi, and white reſin, each two drams, and one pound of rectified ſpirit. The benzoin and gum anime powdered, are put with the Venice turpentine into a phial, with eight ounces of the ſpirit of wine; the copal and reſin powdered are alſo put in a phial with ſix ounces, and the powdered gum elemi, with two ounces of ſpirit of wine. The ſeveral phials are frequently ſhaken, till the gum, &c. are diſſolved; then the ſolutions are ſtrained through a fine linen into one bottle, and when the mixture has ſtood ſome days, it is decanted off clear, and kept in a ſeparate bottle for uſe. Some have ſubſtituted the ſarcocolla for the copal. Another compoſition is formed, by diſſolving maſtich and ſandarac, groſsly powdered, of each ſix ounces, and Venice turpentine, half an ounce, in a quart of highly rectified ſpirit of wine, and ſtraining off the ſolution. If it be required harder, an equal weight of the gums anime and copal may be added, and the quantity of ſpirit of wine doubled. In the uſe of this *varniſh*, the painting ſhould be thoroughly dry, and it ſhould be ſpread very gently with the pencil. The *varniſh* ſhould be laid on in a very warm place, or the picture itſelf warmed to a moderate degree, in order to prevent the *chilling* of the *varniſh*; in which caſe another coat ſhould be added. And, indeed, two or three coats are neceſſary to preſerve the painting, and to bring out a due effect of its colours, if they are in that ſtate called *ſunk in*, occaſioned by the attraction of the cloth on the oils mixed with them. An oil of turpentine *varniſh* may be made by groſsly powdering maſtich and ſandarac, of each four ounces; two ounces of white reſin, and ſarcocolla, anime, copal, and olibanum, of each one ounce, and putting them into a phial with two pounds of oil of turpentine, ſtopping the phial gently, and placing it in any heat, ſo that the maſs may not boil, and ſtraining off the ſolution for uſe. Or, a *varniſh* more ſimple, and equally good, may be made by powdering two ounces of ſandarac, maſtich and olibanum, of each an ounce and half; or three ounces of maſtich, and Venice turpentine, half an ounce; and diſſolving them in half a pound of oil of turpentine, and proceeding as before. Handmaid to the Arts, vol. ii. p. 227, &c.

VARNISH *for paper-hangings*. See PAPER-*hangings*.

VARNISH *for printers ink*. See PRINTING-*ink*.

VARNISH, *white*, is uſually made of gum ſandarac, and gum maſtich, diſſolved in ſpirits, left to ſettle two days, then ſtrained through a linen cloth, and, after ſtanding ſome time, the clear poured off, and bottled for uſe.

The more curious artiſts diſſolve the two gums ſeparately; and having made a ſeparate *varniſh* of each, mix them occaſionally, as their work requires a ſtiffer or a ſofter *varniſh*.

But for the *beſt white varniſh* more gums are required; viz. Venice turpentine, gum copal, elemi, benzoin, anime, and white reſin.

Beſides theſe, there are *hard* and *ſoft varniſhes*, or grounds, uſed by the etchers and engravers. See ETCHING.

VARNISH is alſo uſed for a kind of gloſſy coat, wherewith potter's ware, DELF-*ware*, China ware, &c. are covered, to give them a ſmoothneſs and luſtre. Some preparation of lead is the *varniſh* ordinarily uſed for the firſt; and earths for the ſecond. See GLAZING and POTTERY.

The true *varniſh* uſed by the Chineſe and Japaneſe, to give that inimitable luſtre to their porcelain, is one of the grand ſecrets in that manufacture; and is one of the great things wanting, to make Delf and French ware vie with the Chineſe. Several have deſcribed the preparation thereof; particularly Kircher: but none ever ſucceeded in the trial. See PORCELAIN and VARNISH, *ſupra*.

VARNISH is alſo a term applied to the colours which antique medals acquire in the earth.

The value of a medal is heightened by a beauty, which nature alone is able to give, and art has never yet attained to counterfeit: we mean, the colour or *varniſh* with which certain ſoils tinge the medal; ſome with a blue, almoſt as beautiful as that of a turquoiſe; others with an inimitable vermilion colour; and others with a gloſſy ſhining brown, infinitely beyond any of our figures in bronze.

The moſt uſual *varniſh*, however, is a fine green, which hangs to the moſt delicate ſtrokes without effacing them; much more accurately than the fineſt enamel does on metals. Braſs alone is ſuſceptible of it; for as to ſilver, the green ruſt that gathers on it, always ſpoils it; and it muſt be ſcoured off with vinegar, or lemon juice.

There is alſo a *falſe*, or *modern varniſh*; which the falſifiers of medals give to their counterfeits, to give them the air of antiquity: it is diſcovered by its being ſofter than the natural *varniſh*, which is hard as the metal itſelf.

Some lay their ſpurious medals under-ground, where they contract a degree of *varniſh*, that may impoſe on the leſs knowing: others uſe ſal ammoniac, mixed with vinegar; others the acid ſpirits of nitre, &c.

VAROLI *pons*. See PONS.

VARRONIA, in *Botany*, a genus of the *pentandria monogynia* claſs. Its characters are, that the corolla is divided into five ſegments, and that the fruit is a drupe, containing a nut with four cells. There are ſix ſpecies.

VARRONIAN *ſatire*. See SATIRE.

VARVELS, in *Falconry*, ſmall ſilver rings about a hawk's leg, with the owner's name on them.

VAS, *veſſel*. See VESSEL, VESICULA, and ANGEIOLOGY.

Hence, in the ſtyle of anatomiſts, the *vaſa adipoſa, præparantia*, &c.

VAS *breve*, *ſhort veſſel*, in *Anatomy*, a veſſel at the bottom of the STOMACH: thus called from its ſhortneſs.

It ſends divers little branches from the bottom of the ſtomach to the ſpleen; or, according to the uſe the ancients imagined it to be of, from the ſpleen to the ſtomach: for their notion was, that, by means of this veſſel, the ſpleen ſupplied the ſtomach with an acid juice; which, acting on the inner nervous membranes of the ſtomach, cauſed the ſenſation of hunger; and at the ſame time mixing with the foods contained therein, aſſiſted, by its acid quality, in the diſſolution thereof.

But upon examining the little branches of this veſſel more accurately, it is found, that they do not pierce into the ſtomach, and that they are no more than branches of veins, ſerving to return the blood into the ſplenic vein; whence it paſſes into the vena porta.

VASA *concordiæ*, among *Hydraulic Authors*, are two veſſels, ſo conſtructed, as that one of them, though full of wine, will not run a drop; unleſs the other, being full of water, do run alſo. Their ſtructure and apparatus may be ſeen in Wolfius, Element. Matheſ. tom. ii. Hydraul.

VASA *deferentia*, in *Anatomy*. See *Vaſa* DEFERENTIA.

VASCULAR, *vaſcularis*, in *Anatomy*, is applied to any thing conſiſting of divers veſſels, veins, arteries, &c.

We ſay, the *vaſcular* and valvular texture of the lungs. All the fleſh, in an animal body, is found to be *vaſcular*, none of it parenchymous, as the ancients imagined.

VASCULAR *glands*. See GLAND.

VASCULAR, *vaſcularius*, in *Antiquity*, was the denomination of a kind of artificers among the ancient Romans; who made ſilver and gold veſſels without relievos, or figures imboſſed thereon.

Hence, according to Salmaſius, it is, that Cicero, in his ſixth oration againſt Verres, diſtinguiſhed *vaſcularius* from *cælator*, *engraver*.

In the art called by the Greeks ἐμπαιστικὴν, which was the art of ſuperadding ornaments of precious ſtones, or rich metals, to vaſes of other metals; the *vaſcularii* and cælatores were different; the firſt being the goldſmiths who made the vaſe; the ſecond, the ſculptors who added the ornaments. But in the art called τορευτικὴν, or the art of cutting bas reliefs, or ſtamping figures on metal; the *vaſcularii* were alſo cælatores, or engravers; that is, they who made the vaſe, made alſo the relievos, or figures, wherewith it was enriched.

VASCULIFEROUS *plants*, among *Botaniſts*, ſuch as have a peculiar veſſel or caſe to contain the ſeed; which is ſometimes divided into cells. See *Syſtems of* PLANTS.

VASE, a term of equal import with the Latin *vas*, whence it is formed; and with the Engliſh VESSEL.

It is applied to the ancient veſſels dug from under ground, or otherwiſe found, and preſerved in cabinets, &c. as veſſels of ſacrifice, urns, &c. and to other more modern veſſels, which are rather of curioſity and ſhew, than uſe; as thoſe of cryſtal, porcelain, &c.

In the curious collection of ornamental works, made by Meſſrs. Wedgwood and Bentley, after the antique, there are

are *vaſes* of various kinds; ſome formed of a compoſition of *terra cotta*, reſembling agate, jaſper, porphyry, and other variegated ſtones, of the vitreſcent or cryſtalline kind; others of black porcelain, or artificial baſaltes, highly finiſhed, with bas-relief ornaments; others of the painted Etruſcan kind; and others again ornamented with ENCAUSTIC paintings. The art of painting *vaſes* in the manner of the Etruſcans has been loſt for ages: however, theſe ingenious manufacturers ſet themſelves to revive it; and, having carefully examined the original Etruſcan *vaſes*, and having peruſed with attention the writings of the late count Caylus upon Etruſcan antiquities, they were convinced that the colours of the figures could not be ſucceſsfully imitated with enamel; and that their ſucceſs muſt chiefly depend upon the diſcovery of a new kind of enamel colours, to be made upon other principles, and to have effects eſſentially different from thoſe that were then in uſe, and are of the nature of glaſs: the Etruſcan colours being burnt in, ſmooth and durable, but without any glaſſy luſtre. In conſequence of this obſervation, and by a great variety of experiments, they invented a ſet of encauſtic colours, not only ſufficient to imitate the paintings upon the Etruſcan *vaſes*, but to give the beauty of deſign the advantages of light and ſhade in various colours; and to render paintings durable, without the defect of a varniſhed or glaſſy ſurface. Theſe encauſtic colours may be applied with great eaſe and certainty; they change very little in the fire, are not liable to run out of drawing, are perfectly durable, and not glaſſy, and poſſeſs the advantages of enamel, without its eſſential defects. Catalogue of Cameos, &c. by Wedgwood and Bentley. 1773.

VASES, in *Architecture*, are ornaments of ſculpture, placed on ſocles, or pedeſtals, repreſenting the veſſels of the ancients; particularly thoſe uſed in ſacrifice, as the præfericulum, ſimpulum, incenſe-pots, flower-pots, &c. and occaſionally enriched with baſſo-relievos.

They are commonly placed there to crown or finiſh façades, or frontiſpieces. They are frequently alſo called *acroteria*; and are uſually inſulate.

In forming and decorating *vaſes*, fancy has great ſcope. Many excellent inventions of theſe ornaments are tranſmitted to us from the ancients; among which, that repreſented in *Tab. Architecture, fig.* 40. M. is much eſteemed. A *vaſe* differs from an URN, as it is in general of a more elegant contour, and is lofty; whereas an urn ſhould be low and wide, and always covered.

Vitruvius mentions a kind of *theatrical vaſes*, made of braſs, or earthen-ware, called *echea*, ηχεια; which they diſpoſed in private places, under the ſteps and ſeats of the theatres, to aid and increaſe the reflexion and reſonance of the actors voices, &c. It is ſaid, there are alſo *vaſes* of this kind in the cathedral church of Milan.

VASE is particularly uſed, in *Architecture*, to ſignify the body of the Corinthian and Compoſite capital; called alſo the *tambour*, or *drum*; and ſometimes the *campana*, or *bell*. See *Tab. Archit. fig.* 21.

VASE is alſo ſometimes uſed, among *Floriſts*, for that they otherwiſe call the CALYX.

The *vaſe*, or rather calyx of a tulip, is the top or head of a tulip; the leaves whereof form a kind of *vaſe*, or cup.

Goldſmiths, braſiers, &c. alſo uſe *vaſe* for the middle of a church candleſtick; which is uſually of a roundiſh figure, bordering ſomewhat on that of a *vaſe*.

VASSAL, *vaſſallus*, in our *Ancient Cuſtoms*, a perſon who vowed fidelity and homage to a lord, on account of ſome land, &c. which he held of him, in fee.

Du-Cange will have the word to come from *vaſſus*, which anciently ſignified a *ſervant*, or *domeſtic* of a prince, and ſometimes alſo the *comites*, or *aſſeſſores*, in public trials. Menage, after Cujas, takes *vaſſal* to have been formed of *geſſel*, an ancient German word, ſignifying *companion*. Caſeneuve derives it from the Gauliſh *geſſus*, a *brave man*, from *geſſo*, or *geſſum*, or *jaſum*, a kind of javelin uſed among them. Voſſius derives *vaſſal* from *vas, vadis, pledge*; whence alſo he will have it to be, that they are ſometimes called *fideles*.

The *vaſſal* was alſo called *piratus, lord's-man*, and *fee-man*; but now the denomination is changed into that of *tenant in fee*.

Accordingly the *vaſſal*, or FEUDATORY, was only another name for the tenant or holder of the lands; though, on account of the prejudices we have juſtly conceived againſt the doctrines that were afterwards grafted on this ſyſtem, we now uſe the word *vaſſal* opprobriouſly, as ſynonymous to ſlave or bondman. The manner of the grant, on the part of the proprietor or lord, who retained the dominion or ultimate property of the FEUD or FEE, was by words of gratuitous and pure donation, *dedi et conceſſi*; which are ſtill the operative words in our modern infeodations, or deeds of feoffment. This was perfected by the ceremony of corporal inveſtiture, or open and notorious delivery of poſſeſſion, in the preſence of the other *vaſſals*, which perpetuated among them the æra of the new acquiſition, at a time when the art of writing was very little known; and, therefore, the evidence of property was repoſed in the memory of the neighbourhood; who, in caſe of a diſputed title, were afterwards called upon to decide the difference, not only according to external proofs, adduced by the parties litigant, but alſo by the internal teſtimony of their own private knowledge.

They ſometimes alſo uſed the term *vaſſour* for *vaſſal*; whence *vavaſour*.

If a *vaſſal* offended his lord grievouſly, either in perſon, or in honour, he committed the crime of felony; which carried with it a confiſcation of his fee.

VASSAL, *a rear*, is he who holds of a lord, who himſelf is *vaſſal* of another lord.

VASSAL was anciently uſed for ſoldier; by reaſon fees, at firſt, were given to none but military men.

VASSALAGE, the ſtate of a vaſſal; or a ſervitude and dependency on a ſuperior lord.

Anciently, they diſtinguiſhed between *liege vaſſalage*, and *ſimple vaſſalage*.

Liege vaſſalage only belonged to the king; as carrying with it an obligation on the ſide of the vaſſal, to ſerve his lord in war, againſt all perſons whatever. See LIEGE.

In all *ſimple vaſſalage*, the fealty, or *liege vaſſalage*, was ſtill reſerved to the king.

Some alſo diſtinguiſh *active vaſſalage*, and *paſſive*: the firſt is the right of fealty reſiding in the lord; the ſecond, the ſervice and duties incumbent on the tenant.

VASTO, in *Law*, a writ that lies againſt the tenant for life, or years, for making waſte.

VASTUS, in *Anatomy*, a name common to two muſcles of the leg, diſtinguiſhed into *internal* and *external*: thus called from their largeneſs; both of them ſerving to extend the leg.

VASTUS *externus* is a large fleſhy muſcle, almoſt as long as the os femoris, broad at the extremities, and thick in the middle, lying on the outſide of the thigh. Its upper inſertion being ſomething tendinous, is in the poſterior or convex rough ſurface of the great trochanter. It is likewiſe fixed by a fleſhy inſertion along the outſide of the os femoris, for above two-thirds of its length downward, in the correſponding part of the linea aſpera, and in the neighbouring portion of the faſcia lata. From all this extent, the fleſhy fibres running downward, and a little obliquely forward, towards the rectus anterior, terminate inſenſibly in a kind of ſhort aponeuroſis, which is fixed in all the neareſt edge of the tendon of the rectus, in the ſide of the patella, in the edge of the ligament of that bone, and the neighbouring lateral part of the head of the tibia. The body of this muſcle is bigger than its extremities, and its loweſt fibres run a little behind the rectus. Winſlow. See *Tab. Anat. (Myol.) fig.* 1. *n.* 60. *fig.* 2. *n.* 41. *fig.* 6. *n.* 35.

VASTUS *internus* is very like the former, and ſituated in the ſame manner on the inſide of the os femoris. It is fixed above by a ſhort flat tendon in the anterior rough ſurface of the great trochanter, and by fleſhy fibres in that oblique line, which terminates the baſis of the collum femoris anteriorly, on the foreſide of the inſertions of the pſoas and iliacus; in the whole inſide of the os femoris, and in the linea aſpera on one ſide of the inſertions of the three tricipites, almoſt down to the internal condyle. From all this extent, the fibres run downward, and a little obliquely forward, and the body of the muſcle increaſes in bulk like the former; it terminates below in an aponeuroſis, which is fixed in the edge of the tendon of the rectus anterior, in the ſide of the patella, and of its tendinous ligament, and in the ſide of the head of the upper extremity of the tibia. Winſlow. See *Tab. Anat. (Myol.) fig.* 1. *n.* 35. *fig.* 2. *n.* 39. *fig.* 7. *n.* 42.

VAT. See FAT.

VAT, or VATE, in *Mineralogy*, denotes a ſquare hollow place on the back of a calcining furnace, wherein they lay the next ſerving of tin-ore to dry, before it is let down into the furnace, into which it paſſes through a plug-hole in the bottom of this *vat*, or *dry*.

VATERIA, in *Botany*, a genus of the *polyandria monogynia* claſs; the characters of which are theſe: the perianthium is ſmall, acute, and permanent, and is compoſed of one leaf, divided into five ſegments; the flower conſiſts of five oval expanded petals; the ſtamina are numerous filaments, ſhorter than the flower; the antheræ are ſimple; the germen of the piſtil is roundiſh; the ſtyle is ſimple and ſhort, and the ſtigma is headed; the

the fruit is a trivalved, single-celled capsule, containing three seeds. There is one species.

VATES, in *Mythology*, the name of a class of DRUIDS.

VATICAN, *Vaticanus*, is properly the name of one of the seven hills whereon Rome stands: on the foot hereof is the famous church of St. Peter, hence called the *Vatican*; and a magnificent palace of the pope, which has the same denomination. Hence arise divers figurative expressions; as *the thunderbolt of the Vatican*, q. d. the pope's anathema, &c.

The word, according to Aulus Gellius, is derived from *vaticinium, prophecy*; by reason of the oracles and predictions which were used to be delivered there by the inspiration of an ancient deity, called *Vaticanus*; who was supposed to unbind the organs of speech in new-born children; and whom others will have to be no other than Jupiter, considered in that capacity.

VATICAN, *the library of the*, is one of the most celebrated in the world: it is particularly remarkable for its manuscripts. It was first erected, according to Petavius (Rat. Temp. lib. ix. cap. 9.) by pope Nicholas V. who succeeded to the papal chair in 1447. It was re-established, after the books had been dispersed, under the pontificate of Calixtus III. by Sixtus IV. and after having been almost entirely destroyed by the army of Charles V. it was not only restored to its former state by Sixtus V. but greatly enriched with books and manuscripts. It was finally fixed in the *Vatican*, under the pontificate of Martin V.

Towards the beginning of the last century, it was greatly augmented by the addition of that of the elector Palatine. It is open to all the world, three or four times a week. In it are shewn a Virgil, Terence, &c. above a thousand years old; as also the manuscript whereon the edition of the Septuagint was made; and abundance of rabbinical manuscripts.

VATICAN *Manuscript* is one of the most celebrated manuscripts of the Greek version of the Bible now extant in the world. It was published at Rome by cardinal Carafa, at the command of Sixtus Quintus, in 1587; and in the preface, it is said to have been written *ante millesimum ducentesimum annum*, i. e. before 387; but Blanchini supposes it a few years later. A Latin edition from this manuscript, with notes, was printed at Rome in 1588, by Flam. Nobilius; and an edition, with the Greek and Latin, with the division of the verses, according to the Vulgate, and Nobilius's Latin notes, and the Greek scholia of Carafa, by J. Morinus, at Paris, in 1628. This manuscript is written in large or text letters, and has no distinguishing chapters, verses, words, nor any marks of accents. It is mutilated both at the beginning and end; and wants the first forty-six chapters of Genesis, thirty-two Psalms, viz. from the 105th to the 137th, and the latter part of the Epistle to the Hebrews, from chap. ix. ver. 14. with the other Epistles of Paul to Timothy, Titus, and Philemon, and the whole book of Revelation. It appears also, that the whole manuscript has been repaired, with fresh ink laid over the letters, which were disappearing through age. In the edition of Carafa the mutilated passages have been supplied from other copies.

It has been asserted, by two eye-witnesses, that this manuscript has undergone some alterations by a later hand. See Le Long's Biblioth. Sacra, cap. 3. sect. 4. and Wetstein's Prolegomena, Nov. Test. p. 24.

It is difficult to estimate the comparative value of this and the Alexandrian manuscript, in which thirty Psalms, a few chapters, and a few verses, are now lost, as well as parts of verses in different places; and in which there have been some rasures and insertions, as Grabe allows. If, as Grabe states it, that manuscript be the most respectable, which comes the nearest to the Hexaplar copy, the Alexandrian manuscript seems to claim that merit in preference to its rival. But if it be thought a matter of superior honour, to come nearer the old Greek version, unaltered by Origen, that merit seems to belong to the *Vatican*. For farther particulars, see the Prolegomena of Walton, Grabe, Wetstein, Mills, and Le Long, ubi supra.

VATICANÆ *pilulæ*, the name of an old form of medicine, intended as a purge. The recipe is in the old London Pharmacopœia; but the late ones have discarded it.

VATICINATION, *vaticinatio*, the act of prophesying, or divining. See DIVINATION, and PROPHECY.

VAVASOR, VALVASOR, VAVASOUR, or VALVASOUR, in our *Ancient Customs*, a diminutive of *vassal*, or *vassour*; signifying a *vassal of a vassal*, or one who held a fee of another vassal.

Yet Camden, and others, hold *vavasor* to be a dignity, next below that of a baron: he adds, that the word is formed of *vas fortium ad valetudinem*, a vessel chosen for safety and health. Others derive it *à valvis, quasi obligatus sit adstare ad valvas domini, vel indignus sit eas intrare*; as being a person obliged to wait at his lord's door, or as unworthy to enter thereat; but this etymology is ridiculous enough.

Du-Cange distinguishes two sorts of vassals under this denomination: the great, called *valvasores*, who held of a king: such were counts and barons.—And the *lesser*, called *valvasini*, who held of the former.

The *valvasors* are mentioned by our ancient lawyers as *viri magnæ dignitatis*; and sir Edward Coke speaks highly of them. But they are now quite out of use; and our legal antiquarians are not agreed upon even their original or ancient office.

VAVASORY, *vavasoria*, the quality of the land, or fee held by a VAVASOR.

Quod dicitur de baronia non est observandum in vavasoria, *vel aliis minoribus feodis quam baronia, quia caput non habent sicut baronia.* Bract. lib. ii. cap. 39.

There are *base vavasories*, and *frank*, or *noble vavasories*; according as it has pleased the lord to make his *vavasor*. *Base vavasories* are those for which the lord of the fee owes summage, light-horse, rents, or other services.—*Free vavasories* are such as are exempt from these services.

VAUDOIS, VALDENSES, or WALDENSES, in *Ecclesiastical History*, a name given to a sect of reformers, who made their first appearance about the year 1160.

Of all the sects that arose in this century, none was more distinguished by the reputation it acquired, by the multitude of its votaries, and the testimony which its bitterest enemies bore to the probity and innocence of its members, than that of the *Waldenses*, so called, says Mosheim, from their parent and founder *Peter Waldus*. They were also called *Leonists*, from Leona, the ancient name of Lyons, where their sect took its rise. The more eminent persons of that sect manifested their progress towards perfection by the simplicity and meanness of their external appearance: hence, among other things, they wore wooden shoes, which in the French language are termed *sabots*, and had imprinted upon these shoes the sign of the cross, to distinguish themselves from other Christians; and on these accounts they acquired the denominations of *Sabbatati* and *Insabbatati*.

The origin of this famous sect, according to Mosheim, was as follows: Peter, an opulent merchant of Lyons, surnamed Valdensis, or Validisius, from Vaux, or Waldum, a town in the marquisate of Lyons, being extremely zealous for the advancement of true piety and Christian knowledge, employed a certain priest, called Stephanus de Evisa, about the year 1160, in translating from Latin into French the four Gospels, with other books of holy Scripture, and the most remarkable sentences of the ancient doctors, which were so highly esteemed in this century. But no sooner had he perused these sacred books with a proper degree of attention, than he perceived that the religion, which was now taught in the Roman church, differed totally from that which was originally inculcated by Christ and his apostles. Struck with this glaring contradiction between the doctrines of the pontiffs, and the truths of the Gospel, and animated with zeal, he abandoned his mercantile vocation, distributed his riches among the poor (whence the *Waldenses* were called *poor men of Lyons*), and forming an association with other pious men, who had adopted his sentiments and his turn of devotion, he began, in the year 1180, to assume the quality of a public teacher, and to instruct the multitude in the doctrines and precepts of Christianity.

Beza, and other writers of note, who are followed by Dr. Macleane, the learned translator of Mosheim's History, give different accounts of the origin of the *Waldenses*; alledging, that it seems evident from the best records, that *Valdus* derived his name from the true *Valdenses* of Piedmont, whose doctrine he adopted, and who were known by the names of *Vaudois* and *Valdenses*, before he or his immediate followers existed. If the *Valdenses* or *Waldenses* had derived their name from an eminent teacher, it would probably have been from *Valdo*, who was remarkable for the purity of his doctrine in the eleventh century, and was the cotemporary and chief counsellor of Berengarius. But the truth is, that they derive their name from their *vallies* in Piedmont, which in their language were called *vaux*, and hence *Vaudois*, their true name: hence also Peter, or, as others call him, John of Lyons, was called in Latin *Valdus*, because he had adopted their doctrine; and hence the term *Valdenses* or *Waldenses* used, by those who write in English or Latin, in the place of *Vaudois*. The bloody inquisitor, Reinerus Sacco, who exerted such a furious zeal for the destruction of the *Waldenses*, lived but eighty years after Valdus of Lyons, and must, therefore, be supposed to know whether or not he was the real

founder of the *Valdenſes* or *Leoniſts*; and yet it is remarkable, that he ſpeaks of the *Leoniſts* as a ſect that had flouriſhed above five hundred years; and mentions authors of note who make their antiquity aſcend to the apoſtolic age. See the account given of Sacco's book by the Jeſuit Gretſer, in the Bibliotheca Patrum. See alſo Leger's Hiſtoire Gen. des Egliſes *Vaudoiſes*, cap. 2. 25, 26, 27.

But to return to the hiſtory of *Peter Valdus*. Soon after Peter had aſſumed the exerciſe of his miniſtry, the archbiſhop of Lyons, and the other rulers of the church in that province, vigorouſly oppoſed him. However, their oppoſition was unſucceſsful; for the purity and ſimplicity of that religion which theſe good men taught, the ſpotleſs innocence that ſhone forth in their lives and actions, and the noble contempt of riches and honours, which was conſpicuous in the whole of their conduct and converſation, appeared ſo engaging to all ſuch as had any ſenſe of true piety, that the number of their followers daily increaſed. They accordingly formed religious aſſemblies firſt in France, and afterwards in Lombardy, from whence they propagated their ſect throughout the other provinces of Europe with incredible rapidity, and with ſuch invincible fortitude, that neither fire, nor ſword, nor the moſt cruel inventions of mercileſs perſecution, could damp their zeal, or entirely ruin their cauſe.

The attempts of *Peter Waldus* and his followers were neither employed nor deſigned to introduce new doctrines into the church, nor to propoſe new articles of faith to Chriſtians. All they aimed at was, to reduce the form of eccleſiaſtical government, and the manners both of the clergy and people, to that amiable ſimplicity, and primitive ſanctity, that characterized the apoſtolic ages, and which appear ſo ſtrongly recommended in the precepts and injunctions of the divine Author of our holy religion. In conſequence of this deſign, they complained that the Roman church had degenerated, under Conſtantine the Great, from its primitive purity and ſanctity. They denied the ſupremacy of the Roman pontiff, and maintained, that the rulers and miniſters of the church were obliged, by their vocation, to imitate the poverty of the apoſtles, and to procure for themſelves a ſubſiſtence by the work of their hands. They conſidered every Chriſtian as, in a certain meaſure, qualified and authorized to inſtruct, exhort, and confirm the brethren in their Chriſtian courſe, and demanded the reſtoration of the ancient penitential diſcipline of the church, i. e. the expiation of tranſgreſſions by prayer, faſting, and alms, which the new-invented doctrine of indulgences had almoſt totally aboliſhed. They, at the ſame time, affirmed, that every pious Chriſtian was qualified and entitled to preſcribe to the penitent the kind or degree of ſatisfaction or expiation that their tranſgreſſions required; that confeſſion made to prieſts was by no means neceſſary, ſince the humble offender might acknowledge his ſins, and teſtify his repentance to any true believer, and might expect from ſuch the counſel and admonition which his caſe demanded. They maintained, that the power of delivering ſinners from the guilt and puniſhment of their offences belonged to God alone; and that indulgences, of conſequence, were the criminal inventions of ſordid avarice. They looked upon the prayers, and other ceremonies that were inſtituted in behalf of the dead, as vain, uſeleſs, and abſurd, and denied the exiſtence of departed ſouls in an intermediate ſtate of purification; affirming, that they were immediately, upon their ſeparation from the body, received into heaven, or thruſt down to hell. Theſe, and other tenets of a like nature, compoſed the ſyſtem of doctrine propagated by the *Waldenſes*. It is alſo ſaid, that ſeveral of the *Waldenſes* denied the obligation of infant-baptiſm, and that others rejected water-baptiſm entirely; but Wall has laboured to prove, that infant-baptiſm was generally practiſed among them. Hiſt. of Infant-Baptiſm, p. 387, &c.

Their rules of practice were extremely auſtere; for they adopted, as the model of their moral diſcipline, the ſermon of Chriſt in the mount, which they interpreted and explained in the moſt rigorous and literal manner, and, conſequently, prohibited and condemned in their ſociety all wars, and ſuits of law, and all attempts towards the acquiſition of wealth, the inflicting of capital puniſhments, ſelf-defence againſt unjuſt violence, and oaths of all kinds.

The government of the church was committed by the *Waldenſes* to biſhops, called alſo majorales or elders, preſbyters, and deacons; for they acknowledged, that theſe three eccleſiaſtical orders were inſtituted by Chriſt himſelf. But they thought it abſolutely neceſſary that theſe orders ſhould reſemble the apoſtles of Chriſt, and be like them, unlearned, poor, and furniſhed with ſome laborious trade or vocation, in order to gain by conſtant induſtry their daily ſubſiſtence; and indeed moſt of the *Waldenſes* gained their livelihood by weaving; whence in ſome places the whole ſect was called the *ſect of the weavers*. The laity were divided into two claſſes, viz. the perfect and the imperfect Chriſtians: the former diveſted themſelves of all worldly poſſeſſions, manifeſted, in the wretchedneſs of their apparel, their extreme poverty, and emaciated their bodies by frequent faſting: the latter were leſs auſtere, and approached nearer to the method of living generally received, though they abſtained from all appearance of pomp and luxury.

The *Waldenſes* were not without inteſtine diviſions; for ſuch of them as lived in Italy differed conſiderably in opinion from thoſe who dwelt in France, and the other European nations. The former conſidered the church of Rome as the church of Chriſt, though much corrupted; they acknowledged, moreover, the validity of its ſeven ſacraments, and ſolemnly declared they would continue always in communion with it, provided that they might be allowed to live as they thought proper, without moleſtation or reſtraint. The latter affirmed, on the contrary, that the church of Rome had apoſtatized from Chriſt, was deprived of the holy ſpirit, and was, in reality, that whore of Babylon mentioned in the Revelations of St. John. They were alſo divided in their ſentiments concerning the poſſeſſion of worldly goods. In the fourteenth century the *Waldenſes*, though they were every where expoſed to the fury of the inquiſitors and monks, baffled all the attempts that were made to extirpate them. Many of them fled out of Italy, France, and Germany, into Bohemia, and other adjacent countries, where they afterwards aſſociated with the HUSSITES, and other ſeparatiſts, from the church of Rome. In the fifteenth century they ſubſiſted in ſeveral European provinces, more eſpecially in Pomerania, Brandenburg, the diſtrict of Magdeburg and Thuringia, where they had a conſiderable number of friends and followers; though, it is ſaid, that many adherents of this ſect, in the countries now mentioned, were diſcovered by the inquiſitors, and delivered over by them to the civil magiſtrates, who committed them to the flames. After the Reformation, in the ſixteenth century, the deſcendants of the *Waldenſes*, who lived ſhut up in the vallies of Piedmont, were naturally led, by their ſituation in the neighbourhood of the French, and of the republic of Geneva, to embrace the doctrines and rites of the reformed church. So far down, however, as the year 1630, they retained a conſiderable part of their ancient diſcipline and tenets; but being much reduced by the plague in that year, and deprived of many of their clergy, they applied to the French churches for ſpiritual ſuccour; and the new teachers, ſent from thence, introduced ſeveral changes into the diſcipline and doctrine of the *Waldenſes*, and rendered them conformable, in every reſpect, to thoſe of the proteſtant churches in France. In this century they ſuffered much from the perſecution of Philibert Emanuel, duke of Savoy, who at the ſolicitation of the pope reſolved to force his ſubjects to return to the communion of the church of Rome; and in 1561 ſent a Dominican friar, as an inquiſitor, with forces to effect his purpoſe. After ineffectual ſupplications they took up arms, and ſo far prevailed, after enduring very ſevere diſtreſs, as to obtain ſome degree of liberty and peace.

During the greateſt part of the ſeventeenth century, thoſe of them who lived in the vallies of Piedmont, and who had embraced the doctrine, diſcipline, and worſhip of the church of Geneva, were oppreſſed and perſecuted, in the moſt barbarous and inhuman manner, by the miniſters of Rome. This perſecution was carried on with peculiar marks of rage and enormity in the years 1655, 1656, and 1696, and ſeemed to portend nothing leſs than the total extinction of that unhappy nation. The moſt horrid ſcenes of violence and bloodſhed were exhibited in this theatre of papal tyranny; and the few *Waldenſes* that ſurvived were indebted for their exiſtence and ſupport to the interceſſion made for them by the Engliſh and Dutch governments, and alſo by the Swiſs cantons, who ſolicited the clemency of the duke of Savoy in their behalf. Moſheim's Eccl. Hiſt. vol. ii. p. 450, &c. vol. iii. p. 190. 272. vol. iv. p. 104. p. 488. Eng. ed. 8vo. Dupin's Eccl. Hiſt. of the Sixteenth Century, vol. ii. p. 414.

VAULT, *fornix*, in *Architecture*, an arched roof, ſo contrived, as that the ſeveral ſtones whereof it conſiſts, do, by their diſpoſition, ſuſtain each other.

Vaults are to be preferred, on many occaſions, to ſoffits, or flat cielings, as they give a greater riſe and elevation; and, beſides, are more firm and durable.

The ancients, Salmaſius obſerves, had only three kinds of *vaults*: the firſt, the *fornix*, made cradle-wiſe; the ſecond,

ſecond, the *teſtudo*, tortoiſe-wiſe, called by the French *cul de four*, or oven-wiſe; the third, the *concha*, made ſhell-wiſe.

But the moderns ſubdivide theſe three ſorts into a great many more, to which they give different names, according to their figures and uſe: ſome are *circular*, others *elliptical*, &c.

The ſweeps of ſome, again, are larger, and others leſs portions of a ſphere: all above hemiſpheres are called *high*, or *ſurmounted vaults*; all that are leſs than hemiſpheres, are *low*, or *ſurbaſed vaults*, &c.

In ſome, the height is greater than the diameter; in others, it is leſs: there are others, again, quite flat, only made with haunſes; others oven-like, or in form of a cul de four, &c. and others growing wider, as they lengthen, like a trumpet.

Of *vaults*, ſome are *ſingle*, others *double*, *croſs*, *diagonal*, *horizontal*, *aſcending*, *deſcending*, *angular*, *oblique*, *pendent*, &c. There are likewiſe *Gothic vaults*, with *pendentives*, &c.

VAULTS, *maſter*, are thoſe which cover the principal parts of buildings; in contradiſtinction to the *leſs*, or ſubordinate *vaults*, which only cover ſome little part; as a paſſage, a gate, &c.

VAULT, *double*, is ſuch a one as, being built over another, to make the exterior decoration range with the interior, leaves a ſpace between the convexity of the one, and the concavity of the other: as in the dome of St. Paul's at London, and that of St. Peter's at Rome.

VAULTS *with compartiments*, are ſuch whoſe ſweep, or inner face, is enriched with pannels of ſculpture, ſeparated by platbands: theſe compartiments, which are of different figures, according to the *vaults*, and are uſually gilt on a white ground, are made with ſtucco, on brick *vaults*; as in the church of St. Peter's at Rome; and with plaſter, on timber *vaults*.

VAULTS, *theory of*. A ſemicircular arch, or *vault*, ſtanding on two piedroits, or impoſts, and all the ſtones that compoſe it, being cut and placed in ſuch manner, as that their joints, or beds, being prolonged, do all meet in the centre of the *vault*; it is evident, all the ſtones muſt be in form of wedges, i. e. they muſt be wider and bigger at top than at bottom; by virtue of which they ſuſtain each other, and mutually oppoſe the effort of their weight, which determines them to fall.

The ſtone in the middle of the *vault*, which is perpendicular to the horizon, and is called the *key of the vault*, is ſuſtained on each ſide by the two contiguous ſtones, juſt as by two inclined planes; and of conſequence, the effort it makes to fall, is not equal to its weight.

But ſtill, that effort is greater, as the inclined planes are leſs inclined; ſo that, if they were infinitely little inclined, i. e. if they were perpendicular to the horizon, as well as the key, it would tend to fall with its whole weight, and would actually fall, but for the mortar.

The ſecond ſtone, which is on the right or left of the key-ſtone, is ſuſtained by a third; which, by virtue of the figure of the *vault*, is neceſſarily more inclined to the ſecond, than the ſecond is to the firſt; and, of conſequence, the ſecond, in the effort it makes to fall, employs a leſs part of its weight than the firſt.

For the ſame reaſon, all the ſtones, reckoning from the key-ſtone, employ ſtill a leſs and leſs part of their weight to the laſt; which, reſting on an horizontal plane, employs no part of its weight; or, which is the ſame thing, makes no effort to fall; as being entirely ſupported by the impoſt.

Now, in *vaults*, a great point to be aimed at is, that all the ſeveral ſtones make an equal effort in order to fall: to effect this, it is viſible, that as each (reckoning from the key to the impoſt) employs a ſtill leſs and leſs part of its whole weight; the firſt, for inſtance, only employing one half; the ſecond, one third; the third, one fourth, &c. there is no other way to make thoſe different parts equal, but by a proportionable augmentation of the whole; i. e. the ſecond ſtone muſt be heavier than the firſt; the third, than the ſecond, &c. to the laſt; which ſhould be vaſtly heavier.

M. de la Hire demonſtrates what that proportion is, in which the weights of the ſtones of a ſemicircular arch muſt be increaſed, to be in equilibrio, or to tend with equal forces to fall; which gives the firmeſt diſpoſition a *vault* can have.

Before him, the architects had no certain rule to conduct themſelves by; but did all at random. Reckoning the degrees of the quadrant of the circle from the key-ſtone to the impoſt; the extremity of each ſtone will take up ſo much the greater arch, as it is farther from the key.

M. de la Hire's rule is, to augment the weight of each ſtone above that of the key-ſtone, as much as the tangent of the arch of the ſtone exceeds the tangent of the arch of half the key. Now, the tangent of the laſt ſtone, of neceſſity, becomes infinite, and of conſequence its weight ſhould be ſo too; but as infinity has no place in practice, the rule amounts to this, that the laſt ſtones be loaded as much as poſſible, that they may the better reſiſt the effort which the vault makes to ſeparate them; which is called the *ſhoot*, or *drift of the vault*.

M. Parent has ſince determined the curve, or figure, which the extrados, or outſide of a *vault*, whoſe intrados, or inſide, is ſpherical, ought to have, that all the ſtones may be in equilibrio. See ARCH.

VAULT, *key of a*. See KEY and VOUSSOIR.

VAULT, *reins*, or *fillings up of a*, are the ſides which ſuſtain it.

VAULT, *pendentive of a*. See PENDENTIVE.

VAULT, *impoſt of a*, is the ſtone whereon the firſt vouſſoir, or arch-ſtone of the *vault*, is laid. See IMPOSTS.

VAULT, in the *Manege*. To *vault* a horſe-ſhoe, is to forge it hollow, for horſes that have high and round ſoles; to the end that the ſhoe, thus hollow or *vaulted*, may not bear upon the ſole that is higher than the hoof; but after all, this ſort of ſhoe ſpoils the feet; for the ſole being tenderer than the ſhoe, aſſumes the form of the ſhoe, and becomes every day rounder and rounder. In Mr. Solleyſel's Complete Horſeman, may be ſeen the true method of ſhoeing for high and round ſoles.

VAULT, or VOLTE, in the *Manege*. See VOLTE.

VAULT, *going to the*, a term uſed by ſportſmen for a hare's taking the ground like a coney, which ſhe ſometimes does.

VAUNING, in *Mineralogy*. See VAN, VANNING-*ſhovel*, and TIN.

VAUNT, or VANT. See VAN.

VAUNT-*Lay*, among *Hunters*, a ſetting of hounds, or beagles, in a readineſs where the chaſe is to paſs; and caſting them off before the reſt of the kennel come in.

VAYVODE, or VAIVODE. See WAYWODE.

VAZABU, in the *Materia Medica*, a name by which ſome authors have called the *acorus Aſiaticus*, or Aſiatic ſweet flag.

UBIQUISTS, UBIQUITARIES, or UBIQUITARIANS, formed from *ubique, every where*, in *Eccleſiaſtical Hiſtory*, a ſect of Lutherans, which roſe and ſpread itſelf in Germany; and whoſe diſtinguiſhing doctrine was, that the body of Jeſus Chriſt is every where, or in every place.

Brentius, one of the earlieſt reformers, is ſaid to have firſt broached this error, in 1560. Luther himſelf, in his controverſy with Zuinglius, had thrown out ſome unguarded expreſſions, that ſeemed to imply a belief of the omnipreſence of the body of Chriſt; but he became ſenſible afterwards, that this opinion was attended with great difficulties, and particularly that it ought not to be made uſe of as a proof of Chriſt's corporal preſence in the euchariſt. Luther. Oper. tom. viii. p. 375. ed. Jenenſ. However, after the death of Luther, this abſurd hypotheſis was renewed, and dreſſed up, in a ſpecious and plauſible form, by Brentius, Chemnitius, and Andræas, who maintained the communication of the properties of Chriſt's divinity to his human nature.

Melancthon declared againſt it; maintaining that it introduced, with the Eutychians, a kind of confuſion into the two natures of Jeſus Chriſt; and proteſted, that he would oppoſe it as long as he lived.

On the other hand, Andræas, Flacius Illyrius, Schmidelin, Oſiander, &c. eſpouſed Brentius's party; and aſſerted the body of Jeſus Chriſt to be every where.

The univerſities of Leipſic and Wirtemberg, and the generality of Proteſtants, ſet themſelves againſt this new hereſy, but in vain: the *Ubiquitarians* grew ſtronger and ſtronger. Six of their leaders, Andræas, Selneccer, Muſculus, Chemnitius, Chytræus, and Cornerus, having a meeting in 1576, in the monaſtery of Berg, they there compoſed a kind of credo, or formula of faith, called the *Form of* CONCORD; wherein the *ubiquity* was eſtabliſhed as an article.

Muſculus, one of theſe leaders, and the moſt zealous advocate of the *ubiquity*, expreſly maintains, that the aſcenſion of Chriſt into heaven was nothing more than a ceaſing to be viſible, and that it is not performed by any phyſical motion, or change of place: and in 1575 he publiſhed a book to prove that it is by no means neceſſary, that the glorious body of Chriſt ſhould phyſically fill up any ſpace. And he declares in a ſermon in 1564, that they who teach that Jeſus Chriſt died only as to his human nature, belong to the devil both body and ſoul; and that the true doctrine is, that he died both as to his human and divine nature. Hoſpin. Hiſtor. Sacram. part ii. p. 492. ad ann. 1561. Idem ibid. p. 553. ad ann. 1564. Idem ibid. p. 600. Bayle. art. *Muſculus*.

All the *Ubiquiſts*, however, are not agreed: ſome of them, and among the reſt the Swedes, hold that Jeſus Chriſt, even during his mortal life, was every where; others maintain, that it is only ſince his aſcenſion that his body is every where.

G. Hornius only allows Brentius the honour of being the firſt propagator of *ubiquitiſm*; its firſt inventor, according to him, was John of Weſtphalia, or Weſtphalus, a miniſter of Hamburg, in 1552.

But according to Hoſpinian, Weſtphalus oppoſed the opinion concerning the *ubiquity* advanced by Brentius and Schmidelin. Bayle, art. *Weſtphalus.*

UBIQUIST, in the *Univerſity of Paris*, is a term applied to ſuch doctors in theology, as are not reſtrained to any particular houſe; either to that of Navarre, or Sorbonne.

The *Ubiquiſts* are called, ſimply, *doctors in theology*; whereas the others add, *of the houſe of Sorbonne*, or *Navarre*, &c. See SORBONNE.

UBIQUITY, *omnipreſence*; an attribute of the Godhead, whereby he is always intimately preſent to all things; gives the eſſe to all things; and knows, preſerves, and does all in all things.

For ſince God cannot be ſaid to exiſt in all places, as placed therein (becauſe, then, he would need ſomething to his exiſtence, viz. place; and would have extenſion, parts, &c.) he muſt be conceived to be every where, or in all things, as a firſt, univerſal, efficient cauſe, in all his effects.

He is preſent, therefore, to all his creatures, as a pure act, or an exerciſe of an active virtue, which knows, preſerves, governs, &c. every thing. Nor are even finite minds preſent otherwiſe than by operation. See GOD.

UBIQUITY *of the king*. See KING.

UBIRRE, in *Ichthyology*, a name given by ſome to the anguilla marina, or ſmall *ſea*-EEL.

UCKEWALLISTS, in *Eccleſiaſtical Hiſtory*, a ſect of rigid Anabaptiſts, ſo called after its founder *Uke Walles*, a native of Frieſland. This ſectary not only exhorted his followers to maintain the primitive and auſtere doctrine of Menno, but took it into his head to propagate, in connection with one John Leus, in 1637, a ſingular opinion concerning the ſalvation of Judas, and the reſt of Chriſt's murderers: alledging, that the period of time, which extended from the birth of Chriſt to the deſcent of the Holy Ghoſt, and was, as it were, the diſtinctive term that ſeparated the Jewiſh from the Chriſtian diſpenſation, was a time of profound ignorance, during which the Jews were deſtitute both of light and divine ſuccour; and that, conſequently, the ſins and enormities, that were committed during this interval, were in a great meaſure excuſable, and could not merit the ſevereſt diſplays of the divine juſtice. This idle fiction met with no indulgence either from the Mennonites, who excluded its inventor from their communion, or from the magiſtrates of Groningen, who baniſhed him from the city. In Eaſt Frieſland he drew after him a conſiderable number of diſciples, whoſe deſcendants ſtill ſubſiſt in the neighbourhood of Groningen, Frieſland, and alſo in Lithuania and Pruſſia, and have their own religious aſſemblies, ſeparate from thoſe of the other MENNONITES. They re-baptize all who leave other Chriſtian churches to embrace their communion: they ſtudiouſly avoid every appearance of elegance or ornament; ſuffering their beards to grow to an uncommon length, and their hair to lie uncombed over their ſhoulders: their countenances are marked with melancholy; and their houſes only adapted to anſwer the demands of neceſſity. Their inſpectors or biſhops, whom they diſtinguiſh from the miniſters whoſe office is to teach, are choſen by an aſſembly compoſed of all the congregations of the ſect. The ceremony of waſhing the feet of ſtrangers is conſidered by them as a rite of divine inſtitution. They carefully avoid even the aſpect of learning and ſcience, and thus prevent all attempts to alter or modify their religious diſcipline. Moſheim. Ecc. Hiſt. vol. v. p. 48. 8vo.

UDDER, UBER, in *Comparative Anatomy*, that part of brutes wherein the milk is prepared; anſwering to the mammæ, or breaſts, in the human kind.

UDAL. See ODHAL.

UDNON, in *Botany*, the name by which Theophraſtus and Dioſcorides have called the truffle commonly uſed at table in their times: but we find that they were not acquainted with the better kind of truffle, which we cultivate at preſent.

This ſmooth reddiſh-coated truffle is common in Italy at this time, and is eſteemed of no value, and called the wild truffle: the ſort that is eaten there, and in all other parts of Europe, is the blackiſh and rough-coated kind. In Africa they have a yet finer kind than ours; it has a white coat, and is of the moſt delicious flavour. The Greeks were alſo acquainted with this, and denominated it Cyrenean, as they did almoſt all the things they had from Africa: they alſo gave it the name MISY.

UDO, in the *Materia Medica*, a name given by the Portugueſe to the lignum ALOES.

It ſeems only a corruption of the monoſyllable *ud*, by which the Arabian phyſicians have called that drug; and even this *ud* poſſibly was only a contraction of the orthography of the word *heud*; which ſeems to have been the original name of this drug among the Arabs.

VEADAR, in *Chronology*, the 13th month of the Jewiſh eccleſiaſtical year, anſwering commonly to our March; this month was intercalated, to prevent the beginning of *Niſan* from being removed to the end of February.

VECTIS, in *Mechanics*, one of the powers, more uſually called the LEVER.

VECTIS, *Heterodromus*. See HETERODROMUS.

VECTOR, in *Aſtronomy*, a line ſuppoſed to be drawn from any planet moving round a centre, or the focus of an ellipſis, to that centre, or focus.

This, by ſome writers of the new aſtronomy, is called *vector*, or RADIUS *vector*, becauſe it is that line by which the planet ſeems to be carried round its centre; and with which it deſcribes areas proportional to the times.

VEDAM. See VIEDAM.

VEDETTE, in the *Military Art*, a ſentinel on horſeback, detached from the main body of the army, to diſcover and give notice of the enemy's deſigns.

VEER, a *Sea-Term*, variouſly uſed.—*Veering out the rope*, denotes the letting it go by hand, or letting it run out of itſelf: thus, they ſay, *Veer more cable*; that is, let more run out.

VEER is alſo uſed in reference to the wind: for when it changes often, and ſuddenly, they ſay, *the wind veers*.—Or, the wind is ſaid to *veer* and *haul*, when it alters its direction, and becomes more or leſs *fair*: thus it is ſaid to *veer* aft, and to haul forward.

To VEER and *haul*, in *Sea-language*, is to pull a rope tight, by drawing it in and ſlackening it alternately, till the body to which it is applied acquires an additional motion, like the increaſed vibration of a pendulum, ſo that the rope is ſtraitened to a greater tenſion with more facility and diſpatch. This method is particularly uſed in hauling the bow-lines. Falconer.

VEERING, in *Sea-Language*, denotes the operation by which a ſhip, in changing her courſe from one board to the other, turns her ſtern to windward. Hence it is uſed in oppoſition to TACKING, wherein the head is turned to the wind, and the ſtern to leeward. A ſhip, having made the neceſſary diſpoſitions to *veer*, bears away gradually before the wind, till it blows obliquely upon the oppoſite ſide, which was before to leeward; and as the ſtern neceſſarily yields to this impreſſion of the wind, aſſiſted by the force of the helm, and the action of the waves upon the ſame quarter, the ſide which was before to leeward ſoon becomes to windward. Since, by this movement, a ſhip loſes ground conſiderably more than by tacking, it is rarely practiſed except in caſes of neceſſity or delay; as, when the violence of the wind and ſea renders tacking impracticable; or when her courſe is ſlackened to wait for a pilot, or ſome other ſhip in company, &c.

When it becomes neceſſary to *veer* the ſhip, the ſails towards the ſtern are either furled or brailed up, and made to ſhiver in the wind; whilſt thoſe near the head are ſpread abroad, ſo as to collect the whole current of air which their ſurfaces can contain. Hence, while the whole force of the wind is exerted in the fore-part of the ſhip to turn her about, its effect is conſiderably diminiſhed, or altogether deſtroyed, on the ſurfaces of the after-ſails. The fore-part, accordingly, yields to the above impulſe, and is put in motion; and this movement, conſpiring with that of the wind, puſhes the ſhip about as much as is neceſſary to produce the effect required. When ſhe is turned ſo that the wind will act upon that quarter which was formerly to leeward, her circular motion will be accelerated by extending ſome of the ſails near the ſtern, as the mizen, and by placing thoſe at the prow more obliquely, which will wheel the veſſel round with her bow to the windward; in the ſame ſituation, with regard to the wind, as when cloſe-hauled or tacking. When the tempeſt is ſo violent as to prevent the uſe of ſails, the effort of the wind operates almoſt equally on the oppoſite ends of the ſhip, ſo that the maſts and yards ſituated at the head and ſtern counterbalance each other. The effect of the helm is alſo conſiderably diminiſhed, becauſe the head-way, which gives vigour to its operations, is at this time feeble and ineffectual. Hence it is neceſſary to deſtroy this equilibrium which ſubſiſts between the maſts and yards afore and abaft, and to throw the balance forward, in order for *veering*. This is accordingly performed by bracing the foremoſt yards acroſs the direction of the wind, and arranging thoſe on the main-maſt and mizen-maſt directly in the line of the wind. If this expedient proves unſucceſsful, and it is abſolutely neceſſary to *veer*, in order to ſave the ſhip from deſtruction, by overſetting or running aſhore, the mizen-

mast must be instantly cut away, and even the main-mast, if she yet remains incapable of answering the helm by bearing away before the wind. Falconer.

VEERING, in *Husbandry*, a term borrowed of the sailors, and used for the turning of two furrows toward each other, as they must do to begin a ridge; they therefore call the top of a ridge a *veering*; and they call the two furrows that are turned from each other at the bottom between two ridges, a *henting*, that is, an ending, because it makes an end of plowing ridges.

VEGETABLE, VEGETABILE, in *Physiology*, a term applied to all plants, considered as capable of growth, i. e. to all natural bodies which have parts organical, formed for generation and accretion, but not sensation. See PLANT.

In *vegetables*, there is supposed to be a principle of life, commonly called the *vegetative* SOUL. See also VEGETATIVE.

The vascular structure of *vegetables* is rendered very apparent by an experiment of Mr. Willughby. Cutting off some pretty big branches of birch, and making a sort of bason, or reservoir, on the end thereof, with soft wax; upon filling this with water, and holding the branch upright, the water, in a few minutes, sunk into the vessels of the wood, and, running quite through the length, dropped out considerably fast at the other end; continuing so to do, as long as the water was poured on. The same succeeds in the sycamore, walnut-tree, &c. though the flux here is not so copious. Phil. Transf. N° 70.

In a dietetical view, it is to be observed, that *greens* as well as fruit are but a flatulent diet, and therefore ought to be eaten with moderation in bilious disorders. However, on account of their antiseptic quality, they are esteemed good for preventing putrid and contagious diseases. Pringle, Observ. on the Diseases of the Army, p. 210. 294.

Vegetables, says Mr. Henry Cavendish, seem to consist almost entirely of fixed and phlogisticated air, united to a large proportion of phlogiston and some water; since by burning in the open air, in which their phlogiston unites to the dephlogisticated part of the atmosphere and forms water, they seem to be reduced almost entirely to water, and those two kinds of air. As plants, that grow in water without earth, can receive nourishment only from the water and air, they must, therefore, in all probability absorb their phlogiston from the water. It is known also that plants growing in the dark do not thrive well, and grow in a very different manner from what they do when exposed to the light. Mr. Cavendish apprehends, that plants, when assisted by the light, deprive part of the water sucked up by their roots of its phlogiston, and turn it into dephlogisticated air, while the phlogiston, which light enables them to absorb from the water, unites to, and forms part of the substance of the plants. Phil. Transf. vol. lxxiv. part i. p. 147, &c.

Vegetables, according to the analyses made of them by chemistry, are distinguishable into two grand tribes, the acid and the alkaline; the first affording a volatile acid, and the second a volatile alkali, upon a dry distillation: thus guaiacum, cedar, box, cinnamon, cloves, sorrel, mint, baum, &c. afford an acid; but garlick, leeks, onions, horse-radish, scurvy-grass, mustard, &c. afford an alkali, which, when rectified, is hardly distinguishable from that of animal substances, so as nearly to resemble the spirit and salt of hartshorn.

For the analogy between the animal and *vegetable* world, see PLANTS, and VEGETATION *infra*.

There are secrets whereby the growth of *vegetables* is surprisingly promoted. Mr. Boyle mentions a virtuoso, who entertained his friends at the end of their meal with a sallad of lettuces, which he sowed in their presence, immediately before they sat down to table. For the preservation of *vegetables*, see PRESERVATION of *Vegetables* and FLOWERS.

The chemists also furnish us with an extraordinary sort of what they call *vegetables*. See *Artificial* VEGETATION. The water used by many in this process, the chemists call *flint water*; the secret whereof has been communicated by Rhodocanasses, a Greek chemist.

VEGETABLE *acid*. See ACID, and VINEGAR.

VEGETABLE *ashes*. See ASHES, *Ashes* of PLANTS, and POT-*ashes*.

VEGETABLE *earths*. See EARTH.

VEGETABLE *fly*, in *Natural History*, an insect found in the island Dominica, and (excepting that it has no wings) resembling the drone in size and colour. In the month of May this insect buries itself in the earth, and begins to vegetate. By the latter end of July the tree is arrived, at its full growth, and resembles a coral branch; being about three inches high, and bearing several little pods, which dropping off become worms, and afterwards flies, like the English caterpillar. Dr. Hill, in his account of this production, to whose examination it was submitted, observes, that the CICADA is common in Martinique, and in its nympha state, in which the old authors called it TETTIGOMETRA, it buries itself under dead leaves to wait its change; but when the season is unfavourable, many perish: and that the seeds of the CLAVARIA *sobolifera*, which is a fungus producing soboles or shoots from its sides, and growing in putrid animal bodies, find a proper bed on this dead insect and grow. This, he says, is the fact; though the untaught inhabitants suppose a fly to vegetate, and though there exists a Spanish drawing of the plant's growing into a trifoliate-tree; and it has been figured with the creature flying with this tree upon its back. Phil. Transf. vol. liii. p. 270, &c.

VEGETABLE *oil*. See OIL.

VEGETABLE *salt*. In the Philosophical Transactions we have some very curious processes and observations, by Redi, on the subject of the salt of *vegetables*. Burn any wood, herb, fruit, or flower to ashes; make a ley with these ashes with common water, not heated; filtre this through paper till it is clear as rock-water; then evaporate this ley to a proper degree in a balneum Mariæ, in a glass vessel. This degree of evaporation must be carefully observed, according as the congelation of the salt is intended to be hastened or retarded. In the common way of evaporating lixiviums of this kind in earthen vessels over a naked fire, a great quantity of the salt is always lost; part of this is carried off with the vapours raised too hastily in this manner, and part penetrates the sides and bottom of the vessel, though it be ever so well glazed. The quantity of water necessary, is, in most cases, about five pints to two pounds weight of the ashes. After all the salt that can be got is extracted by this operation, the ashes, being calcined again in a kiln, will afford more salt of the same kind, but in a much smaller quantity.

Though the lixivial salt of every plant thus treated hath its own peculiar figure, when dissolved, and regularly shot again; yet, as in the sea-salt, and some other natural salts, there appear, on crystallization, masses of different figures, so in some of these the same salt will have two or three different figures, all peculiar however to itself.

Besides the diversity of figures in many of the kinds of salts, there is one kind of crystals which run through the salts of almost all the kinds, in a greater or lesser proportion: these are certain cubic grains or crystals. It is probable, that these are crystals of sea-salt, which is a salt found mixed among many others, and is naturally of this cubic figure in its first or simple concretions. It seems also a general rule, that the different parts of the same plant form crystals of a different figure; for the leaves of laurel form crystals very differently shaped from those procured from the wood of the same tree; and the figures of the crystals in the salt of the pulp of a gourd are very different from those of the salts made from the rind of the same fruit. See *Tab. of Microscopical Objects*, *Class* 3.

Many salts, made from different substances, have either absolutely the same or very similar figures in their crystals.

In order to obtain these several crystals of the lixivial salts, determinate and exact in their figures, and not mixing one with another, it is necessary to use great caution in the evaporating of the ley.

Nothing but practice and experience can dictate when to stop the evaporation; but when this has been learned, the vessel is to be taken out of the balneum Mariæ, and the clear liquor is to be poured out of it into several small vials. These are to be stopped to keep out dust and moisture; and, after a time, the salts will congeal into crystals, which will be fixed to the sides and bottoms of the vials, in their true and proper shapes, and in the likeness of rock-crystal, as to brightness and transparency.

Different plants and trees yield ashes, which are impregnated in a different degree with salts. The same plants, at different seasons of the year, contain also different quantities; and all these varieties make it necessary to attend carefully to the time of stopping the evaporation.

It was observed, that all these salts, thus crystallized, had a purging virtue, from whatever plant they were made; and the salt drawn from pomgranate peels, or other astringents, is as strongly purgative, as that from the most purgative drugs. The dose, in which these salts are to be taken, is from half an ounce to an ounce, dissolved in warm water; and it is all the same thing what *vegetable* they are made from; the sharp-pointed crystals and the blunt ones having the same degree of virtue. Garlick, and the like shop *vegetables*, yield no salt at all of this kind.

kind. Phil. Transf. N° 245. p. 296. See *Fixed* SALTS, *Lixivious* SALTS, and *Soluble* TARTAR.

VEGETABLES, *muscles of.* See MUSCLE.

VEGETATION, VEGETATIO, the act whereby plants, and other living bodies, receive nourishment, and grow.

Plants, we learn from the microscope, consist of different parts, vessels, &c. analogous to those of animals: and each kind of vessel is supposed to be the vehicle of a different humour, or juice, secreted from the mass of sap; which is considered as the blood, or common fund of them all.

Dr. Grew assigns the offices of the several vessels: those placed on the inner verge of the bark, he calls *lymphe-ducts*, and supposes them destined for the conveyance of the most aqueous, or watery liquor; these Mr. Bradley calls the *new forming vessels*, which are annually produced, and help to increase the bulk of the tree.

Those in the middle of the bark, Dr. Grew calls *lactiferous*, or *resiniferous* vessels; their use, according to Bradley, is to return the superfluous sap: these vessels, Grew observes, are the principal viscera of plants; and adds, that as the viscera of animals are but such vessels conglomerated; so the vessels of a plant are viscera drawn out at length.

The process of nature in the *vegetation* of plants is very accurately delivered by the excellent Malpighi, and others, to the effect following.

The seed of the plant, after it has dropt from the ovarium, called the pod or husk, may be considered as an impregnated ovum, within which the embryo plant is securely lodged. In a few days after it has been committed to the earth, we may discern the rudiments of the future plant. Every part appears to exist in miniature. The nutritive juices of the soil insinuate themselves between the original particles of the plant, and bring about an extension of its parts; and this is called the growth of the vegetable body; with regard to this increase by addition and extension, there seems to be a great analogy between the animal and vegetable kingdoms. Every one knows that animals, instead of being strengthened, are enfeebled by a supply of improper nourishment. This case is the same with regard to vegetables; but with this difference, that animals refuse whatever is improper. While vegetables, from their passive nature, must be content with what we give them. The impregnated ovum of every animal, after it has passed down the Fallopian tube, and fixed itself to the bottom of the uterus, is found to contain the tender embryo within two membranes called chorion and amnion. In this situation the embryo could not long subsist without a supply of nourishment. Nature has, therefore, bestowed upon it a placenta and umbilical chord, through which the blood and juices of the mother are transmitted, for its preservation and increase. Seeds are disposed by Providence nearly in the same manner: they have two coverings, answering to the chorion and amnion, and two lobes, which perform the office of the placenta. These lobes constitute the body of the seed, and, in the farinaceous kinds, they are the flower of the grain. Innumerable small vessels run through the substance of the lobes, which, uniting as they approach the seminal plant, form a small chord to be inserted into the body of the grain. Through this the nutriment supplied by the placenta or lobes is conveyed for the preservation and increase of the embryo plant. Here it may be observed, that the lobes of farinaceous grains are fixed in the earth; they are, therefore, improperly termed SEMINAL *leaves*, being rather the placenta or cotyledons of the plant. On the contrary, vegetables that have an oily seed, as rape, hemp, line, and turnip, carry their lobes upward, and spread them upon the surface in the form of broad leaves. These, though they perform the office of a placenta, are properly seminal leaves. See SEED.

To illustrate the subject of *vegetation*, let us take a view of what happens to a bean, after it has been committed to the earth. In a few days, sooner or later, according to the temperature of the weather and disposition of the soil, the external coverings open at one end, and disclose to the naked eye part of the placenta or body of the grain. This substance consists of two lobes, between which the seminal plant is securely lodged. Soon after the opening of the membranes, a sharp-pointed body appears, which is the root. By a kind of principle, which seems to bear some appearance of instinct, it seeks a passage downward, and fixes itself into the soil. At this period the root is a smooth and polished body, and has, perhaps, but little power to absorb any thing from the earth, for the nutriment of the germ. The two lobes now begin to separate, and the germ, with its leaves, may be plainly discovered. As the germ increases in size, the lobes are farther separated, and the tender leaves, being closely joined, push themselves forward in the form of a wedge. These leaves take a contrary direction to the root. They seek a passage upward, which having obtained, they lay aside their wedge-like form, and spread themselves in an horizontal direction, as being the best adapted for receiving the rains and dew. The radicle, every hour increasing in size and vigour, pushes itself deeper into the earth, from which it now draws some nutritive particles. At the same time the leaves of the germ, being of a succulent nature, assist the plant, by attracting from the atmosphere such particles as the tender vessels are fit to convey. These particles, however, are of a watery kind, and have not in their own nature a sufficiency of nutriment for the increasing plant. Vegetables, as well as animals, during their tender state, require a large share of balmy nourishment. As soon as an animal is brought into life, the milk of its mother is supplied in a liberal stream, while the tender germ seems only to have the crude and watery juices of the earth for its support. This, however, is not the case: for the vegetable lives upon a similar fluid, though differently supplied. For its use the farinaceous lobes are melted down into a milky juice, which, as long as it lasts, is conveyed to the tender plant by means of innumerable small vessels, which are spread through the substance of the lobes. These vessels uniting into one common trunk, enter the body of the germ, and perform the office of an umbilical chord. Without this supply of balmy liquor, the plant must inevitably have perished, its root being then too small to absorb a sufficiency of food, and its body too weak to assimilate it into nourishment.

Turnips, and all the tribe of brassicas, in opposition to the leguminous and farinaceous plants, spread their seminal leaves upon the surface: these leaves contain all the oil of the seed, which, when diluted by the moisture of the atmosphere, forms an emulsion of the most nourishing quality; and on account of its sweetness, the seminal leaves are greedily devoured by the fly. A grain of wheat, as soon as the germ has made its appearance, shews the milky liquor to the naked eye; but the umbilical chord, with its ramifications, can only be discovered by the assistance of the nicest glasses. As the plant increases in size, the balmy juice diminishes, till at last it is quite exhausted. The umbilical chord then dries up, and the external covering of the grain appears connected with the root in the form of a shrivelled bag. In the process of *vegetation*, there is no mortality; from the moment that the seed is lodged in its parent earth, the vegetative soul begins its operations, and in the whole successive gradation of them illustrates the wisdom, power, and bounty of Providence. It is worthy of observation, that farinaceous vegetables and oviparous animals are nourished in their tender state, nearly in the same manner. The embryo plant is supported by the farina melted down into a milky liquor, and conveyed into its body by means of an umbilical chord, at a time when the radicle was unable to supply a sufficiency of nutriment. An oviparous animal, from the time that it is brought into light, seems to receive all its nourishment from without: but this is only in appearance. The yolk of the egg, remaining entire during incubation, is received into the body of the animal, and in a manner similar to the passage of the milky juice of the vegetable, is slowly conveyed into the vessels of the tender chick: and thus a sweet nourishment is prepared at a time when neither the industry of the animal, nor the attention of its mother, could have procured a sufficient supply. Evelyn's Silva, by Dr. Hunter, p. 33, &c. note. Hales's Statics, vol. i. and Miller's Gard. Dict. art. *Vegetation.*

For other circumstances of *vegetation*, see PLANTS; under which article their nature, anatomy, œconomy, generation, nutrition, perspiration, &c. are particularly illustrated. See also PARALLELISM, PERPENDICULARITY, PLUME, RADICLE, SEED, &c.

VEGETATION, *artificial.* Many of the processes and operations in chemistry afford productions, whether of salts or metals, or of whatever other substance, which very much resemble plants of one kind or other, whence they have been called *metallic vegetations*. But though many have been hence induced to believe, that these productions were formed in the manner of vegetables, there is not the least ground for such an opinion from reason or experiment.

Mr. Homberg, who has treated very accurately of the several kinds of these *chemical vegetations*, divides them into three different classes.

Those of the first class are such as consist of a pure massy metal, without the mixture of any foreign matter whatever.

whatever. Thoſe of the ſecond claſs are compoſed of a diſſolved metal, which, though it has concreted afterwards, yet retains a part of the menſtruum in it: and the third claſs contains thoſe which have no metal in them, but are merely compoſed of ſalts, oils, or earths, or of combinations of theſe.

All the productions of the firſt kind are made without the admixture of any liquor, and are merely owing to the force of fire. Theſe are of a firm and ſolid texture, and may be taken out of the veſſels in which they were made, without danger of breaking them. On the other hand, the *vegetations* of the ſecond kind are all formed in a fluid, and are all ſo brittle, that they are not to be touched without breaking. Of the third kind, ſome are formed, or will ſubſiſt at leaſt, in the dry air; others are very tender, and are formed only in fluids, the very ſtirring about of which deſtroys them. See ARBOR.

VEGETATION *of ſalts*, a name given by Mr. Petit, of the academy of Paris, to the concretions which ſalts form, after ſolution in water, when ſet in the air to evaporate.

Theſe concretions always appear round the ſurface of the liquor, affixed to the ſides of the veſſel, or ariſing above its top, and are very different in the different ſalts, and in moſt of them very beautiful.

One of the moſt ready and moſt beautiful of all the ſaline *vegetations* is that formed by a ſolution of the ſalts in the caput mortuum of aqua-fortis, with common water. If a pint of water be put to half a pound of this caput mortuum, and the whole boiled together, that the ſalts may be diſſolved, and the liquor afterwards filtrated, and expoſed in an earthen veſſel, there will be formed, in about eight-and-forty hours, *vegetations* wholly like thoſe from the mixture of ſpirit of nitre and oil of tar, except that theſe from the caput mortuum are more ramified and more beautiful. When the ſolution is expoſed in a glaſs veſſel, they form themſelves on the ſurface into very beautiful figures of trees, ſhrubs, and buſhes; and this not only on the ſurface, but on both the inſide and outſide of the glaſs. Theſe can be compared to no known concretions, except to the *vegetations* of iron, deſcribed by Mr. Lemery; they differ indeed in nothing from theſe, but that the *vegetations* of the metal are of a browniſh colour, whereas thoſe of the ſalt are white.

This impregnation ſucceeds beſt in dry weather, for in a moiſt ſeaſon the *vegetations* form themſelves more ſlowly, and are much leſs beautiful. Glaſs veſſels are alſo eſſential to the *vegetations* being formed in their greateſt beauty; they are never nearly ſo beautiful in earthen ones; and even in the former the *vegetations* ſucceed much better in ſome ſort of glaſs, than in others. The caput mortuum of aqua-fortis alſo is very different, from the different diſtillations; and all of it does not ſucceed alike in this *vegetation* of the ſalt. That which looks lighteſt, and of the reddeſt colour, ſeems the beſt for this purpoſe. An impregnation of this caput mortuum in red wine produces no *vegetations*, but only forms a cruſt with ſmall eminences on the ſides of the veſſel; and ſalt-petre, diſſolved in the impregnation of this caput mortuum in water, produces a much more beautiful *vegetation* than than that of ſalt-petre alone; but at the ſame time much leſs beautiful than that of the impregnation alone. Salt-water, diſſolved in the ſame impregnation, ſometimes will produce beautiful *vegetations*, but ſometimes only a rough cruſt. Common rough ſalt-petre forms no *vegetations*, but only cruſts over the veſſel, as is the caſe with the ſolutions of many of the metals in different acid menſtruums. And the ſame is the caſe in regard to many ſalts from which it might be natural to expect concretions of this kind. Memoirs Acad. Par. 1722.

VEGETATIVE, VEGETATIVUS, a term applied to that principle, or part, in plants, by virtue whereof they receive nouriſhment, and grow, or vegetate.

The philoſophers ſpeak of three kinds of ſouls, the *vegetative*, *ſenſible*, and *rational*. See SOUL.

The *vegetative* ſoul is that principle whereby trees and plants live, grow, and produce their kinds.

This *vegetative* principle is differently ſeated in different plants: an ingenious author obſerves, that, generally ſpeaking, its place is exactly between the trunk and root; at leaſt, this appears to be the place in moſt of the annual tribe; which, if cut down near this place, rarely ſhoot again.

In other vegetables, as the elm, and many edible plants, it ſeems to reſide wholly in the roots; which, if cut into ever ſo many parts, yet thoſe being planted in the ground, ſoon grow.

In others, as the willow-kinds, it ſeems to be diffuſed all over root, trunk, and branches; inſomuch that, if cut into a thouſand pieces, there is no deſtroying them without ſplitting them in the middle; and ſcarcely then.

Laſtly, in others, as the cereuſes, ficuſ.s, &c. it is ſeated in the body, branches, and leaves; any of which, being put into the ground, ſtrike root immediately, and grow.

The office of this *vegetative* principle is to concoct the nutritive matter which is imbibed by the roots and flowers; and to aſſimilate it to the nature of the plant. See *Food of* PLANTS.

VEGETO-*mineral water* of Goulard, in *Medicine*. See *Water of* LEAD.

VEGI, or UGI, the names given by the Arabian phyſicians to the acorus. Theſe writers ſeem not to have been acquainted with the plant itſelf in its growing ſtate, but only to have known that part of it which was uſed in medicine, in their time; but the Greeks deſcribe the plant in ſome ſort.

VEHICLE, VEHICULUM, in *its literal ſenſe*, ſignifies ſomewhat that carries, or bears a thing along. See CARRIAGE, WAGGON, WHEEL, &c.

Thus, in *Anatomy*, the ſerum is ſaid to be the *vehicle* that conveys the globules of the blood.

In *Pharmacy*, any liquid ſerving to dilute another with, or to adminiſter it in, more agreeable to a patient, is called a *vehicle*.

In *Painting*, *vehicles* denote certain fluids, which are added to colours, in order to give them an unctuous conſiſtence while uſed, that they may be laid on and ſpread properly, adhere to the grounds on which they are laid, acquire a proper degree of tenacity when dry, and defend them from being injured by accidents. The principal *vehicles* hitherto uſed are oils, water, ſpirit of wine, and turpentine. But as water and ſpirit of wine want the unctuous conſiſtence neceſſary for ſpreading the colours, and dry away totally without leaving any glutinous ſubſtance to bind and fix ſuch of the pigments as are of an earthy or incohering texture; gums, ſize, ſugar, and other ſuch viſcid ſubſtances have been ſuperadded to ſupply their defects, and render them of a due conſiſtence and body.

VEIENTANA *gemma*, in *Natural Hiſtory*, the name of a gem deſcribed by Pliny, and ſaid to be found in Italy; he ſays it was black, but ſurrounded with a circle of white; it was probably a ſtone of the camea kind.

VEIL, VELUM, a piece of ſtuff, ſerving to hide, or prevent the ſight of any thing.

In this ſenſe, we read of a large *veil*, or curtain, in the temple of Jeruſalem, miraculouſly rent at the paſſion of our Saviour. In the Romiſh churches, in time of Lent, they have *veils*, or curtains, over the altar, crucifix, images of the ſaints, &c.

VEIL is alſo uſed for a large piece of crape, worn on the head by nuns; as the badge of their profeſſion. Whence, to *take the veil*, ſignifies to commence religious.

The novices wear white *veils*; and thoſe who have made the vows, black ones.

The prelate, before whom the vows are made, bleſſes the *veil*, and gives it to the religious.

VEIN, VENA, in *Anatomy*, a name given to ſeveral veſſels, or canals, which receive the blood from the divers parts of the body, to which the arteries had conveyed it from the heart; and carry it back to the heart again. See *Tab. Anat. (Angeiol.) fig.* 6, 7.

The *veins* are only a continuation of the extreme capillary arteries, reflected back again towards the heart.

In their progreſs, uniting their channels as they approach the heart, they, at laſt, all form three large *veins*, or trunks, called by anatomiſts *vena cava*, *vena portæ*, and *vena pulmonaris*. The *vena cava* carries back to the right auricle of the heart the blood conveyed by the aorta to all the parts of the body, except what goes by the arteriæ coronariæ cordis. See CORONARY.

The *vena cava* goes out from the right auricle of the heart by two large ſeparate trunks, in a direction almoſt perpendicularly oppoſite to each other, one running upward, called *vena cava ſuperior* or *deſcendens*, which is diſtributed chiefly to the thorax, head, and upper extremities, and but very little to the parts below the diaphragm, and which bring the blood back from all the parts above the heart: the other running downward called the *vena cava inferior*, or *aſcendens*, which is diſtributed chiefly to the abdomen and lower extremities, and but very little to the parts above the diaphragm, and which brings the bood from all the parts below the heart. See CAVA.

The trunks of each of theſe two veins ſends off a certain number of principal branches, which are afterwards ramified in different manners. Each trunk terminates by a bifurcation, or a diviſion into two ſubordinate trunks, each of which gives off other principal branches, ending in

in a great number of small trunks, rami, and ramifications. The superior *vena cava* runs up from the right auricle of the heart, almost in a direct course, for about two fingers breadth, lying within the pericardium, in the right side of the trunk of the aorta, but a little more anteriorly. As it goes out of the pericardium it is inclined a little to the left hand, and then runs up as high as the cartilage of the first true rib, and a little higher than the curvature of the aorta. Here it terminates by a bifurcation or division into two large subordinate trunks, one of which runs toward the left hand, the other toward the right; and these branches are called *subclaviæ*. See SUBCLAVIAN.

The trunk of the *superior cava*, from the pericardium to the bifurcation, sends out anteriorly several small branches, called the *vena mediastina, pericardia, diaphragmatica superior, thymica, mammaria interna*, and *trachealis*, which sometimes arise separately, and sometimes by small common trunks. Posteriorly, a little above the pericardium, the trunk of the *superior cava* sends out a capital branch, called *vena* AZYGOS, which runs down on the right side of the bodies of the vertebræ dorsi, almost to the diaphragm; giving off the greatest part of the *venæ intercostales* and *lumbares superiores*.

The portion of the *vena cava inferior*, or *ascendens*, contained in the pericardium, is very small, being scarcely the twelfth part of an inch on the fore part, and not above a quarter of an inch on the back part. From thence it immediately perforates the diaphragm, to which it gives the *venæ diaphragmaticæ inferiores* or *phrenicæ*. It passes next behind the liver, through the great sinus of that viscus, to which it furnishes several branches, termed *venæ hepaticæ*. In this course it inclines a little toward the spina dorsi and aorta inferior, the trunk and ramifications of which it afterwards accompanies in the abdomen, all the way to the os sacrum; the arteria cœliaca, and the two mesentericæ only excepted. Thus the inferior *cava* sends out on each side, in the same manner with the aorta, the *venæ adiposæ, renales, spermaticæ, lumbares* and *sacræ*. Having reached the os sacrum, it loses the name of *cava*, and terminating by a bifurcation, like that of the descending aorta, it forms the two *venæ iliacæ*. See ILIAC *Vessels*.

The *vena portæ* receives the blood carried to the floating viscera of the abdomen by the arteria cœliaca, and the two mesentericæ, and conveys it to the *vena hepatica*, and from thence to the *vena cava*. See PORTA.

The *vena pulmonaris* conveys to the pulmonary sinus, or left auricle of the heart, the blood carried to the lungs by the arteria pulmonaris. See PULMONARY. See also HEART.

To these three *veins* two others might be added, viz. those which belong particularly to the heart and to its auricles, and the sinuses of the dura mater. Winslow's Anat. vol. ii. sect. v.

The anastomosis, or inosculation of the *veins* and arteries, was first seen by the microscope, in the feet, &c. of frogs, and other amphibious animals, by Leewenhoeck; but has since been observed in other animals, particularly the omentum of a cat, by Mr. Cowper, &c.

The coats of the *veins* are four, the same with those of the arteries; only the muscular coat is thin in all the *veins*, as it is in the capillary arteries; the pressure of the blood against the sides of the *veins* being less than that against the sides of the arteries, because the force of the heart is much broken in the capillaries. See *Tab. Anat.* (*Angeiol.*) *fig.* 7. *a. a. b. b. c. d.*

In the *veins* there is no natural pulse, because the blood is thrown into them with a continual stream, and because it moves from a narrow channel to a wider. But they have a peristaltic motion, which depends on their muscular coat.

The *capillary veins* unite with one another, as has been said of the capillary arteries; only their course is directly opposite to that of those: for instead of a trunk distributed into branches and capillaries, a *vein* is a trunk, formed out of a concourse of capillaries.

In all the *veins*, which are perpendicular to the horizon, excepting those of the uterus, and the porta, there are small membranes, or valves; sometimes there is only one, sometimes there are two, and sometimes three, placed together, like so many half-thimbles stuck to the sides of the *veins*, with their mouths towards the heart. These, in the motion of the blood towards the heart, are pressed close to the sides of the *vein*; but shut the *veins*, against any reflux of the blood that way from the heart; and thereby they sustain the weight thereof in the great trunks.

The *veins* are distinguished, with respect to their situation, into *superior*, and *inferior*; *ascending*, and *descending*; *right*, as the mesenteric; and *left*, as the splenic branch; *internal*, as the basilica; and *external*, as the humeral. Many of them, likewise, acquire denominations from the parts wherein they are found; as, the *jugulars, phrenitic, renal, iliac, hypogastric, epigastric, axillary, crural, umbilical, sciatica, saphena, mediana, cephalic, thoracic, subclavian, intercostal, coronal, diaphragmatic, hæmorrhoidal, cervical, thymal, mammillary, gastric, stomachic, epiploic, splenic*, &c.

They are also distinguished, from their particular offices, into *spermatic, emulgent*, &c. all which see exhibited in *Tab. Anat.* (*Angeiol.*)—and their particular descriptions under their proper articles.

VEINS, *pulsations of the*. The pulsations of the arteries are well known; but though no such motion be natural to the *veins*, yet there have not been wanting instances in which a morbid state has been able to produce them. The pulsations of the arteries answer to the motion of the heart, that throws the blood into them; but when this fluid has once got into the *veins*, it usually returns through them to the heart again in an uniform and equable motion; and this is not only the case in the human body, but also in other animals, whether they be in health or in sickness. One of the instances in which the contrary has been observed, and where the *veins* have had a pulsation, is a case related by Mr. Homberg to the Paris academy. The patient was a lady of about thirty-five years old, afflicted with a grievous asthma, a pain in the head, a continual want of rest, and terrible palpitations of the heart.

On opening her body after death, the heart was found of twice its natural dimensions, its cavities very large, and its sides very thin; and in each trunk of the arteries there was a fleshy polypus fixed to their internal surface. That in the trunk of the aorta was found to be two feet long, and plainly of a fibrous fleshy substance, for six or seven inches of its length; but from that downwards, it became only like clotted blood.

At the time that this lady was most violently afflicted with her asthma, the veins of her arms and neck were plainly perceived to have a pulsation wholly like that of the arteries, and plainly followed the motion of the heart: she had, in the latter time of her life, usually two of these fits in four-and-twenty hours; and when they were over, the pulsations in the *veins* ceased. Mem. Acad. Par. 1704.

VEINS *of plants*, a term used by Dr. Lister, to express certain vessels in plants, which are analagous to the *veins* of animals, and have been observed in some degree, by the naturalists of almost all ages, though differently described by authors. Pliny has described these parts of a plant under the names of *venæ* and *pulpæ*; and Dr. Grew calls them *fibres* and insertments on the ligneous body, interwoven with that substance which he takes to be the cortical body, that is, the several distinctions of the grain. This author also calls them the pores of the ligneous body; but that they are not merely such, may be plainly seen in cutting off a transverse piece of the stalk of some large wild plant, as the great wild angelica, or the like. In the cut stalk of this plant, the *veins* every where shew themselves to be distinct from fibres, observable in the parenchyma of the same cortical body with themselves, the milky juice always rising beside the fibres, not in any fibre: also in a transverse cut of the root of the common burdock; the like juice springs on both sides of the several radii of the woody circle, that is, in the cortical body, and the pith only.

Again, where there is no pith, there is none of this juice to be observed, and consequently none of these *veins*, as in the roots of plants, and trunks of trees, but even in the bark of either. The sphondylium, the cicutaria, and many of the thistle kind, are instances of this. Dr. Grew describes pores in the cortical body, and pith; but these vessels are not of the number of the things designed by those pores; these pores are extended by the breadth of the plant; but the pores of this juice are extended lengthwise. The pith of a dried fennel-stalk will shew these very beautifully, and with due care, they may be traced all along the whole length of that pith.

The primary use of these *veins* is certainly to carry the nutritious juice of plants; and this appears plainly in that where they are not, there is no vegetation, as is seen if an engrafted branch or arm is bared, or the clay stripped off; in this case, all the course of the vegetation will appear to have been made only by the bark, the wood having had no share in it. The bark is the place where these *veins* lie, not the wood; and therefore, it is no wonder that the vegetation, if dependent on these *veins*, is carried on only where these *veins* are. The vegetable drugs of our shops are all of this nature, the juices contained in these *veins* being evidently what give them their virtue. Phil. Transf. N° 79.

VEIN is also applied to the streaks, or waves, of divers colours, appearing on several sorts of woods, stones, &c.

as if they were really painted; and which the painters frequently imitate in painting wainſcots, &c.

Marble is generally full of ſuch *veins*.

Lapis lazuli has *veins* like gold. Ovid, ſpeaking of the metamorphoſis of men into ſtones, ſays—*Quæ modo vena fuit, ſub eodem nomine manſit.*

Veins, in ſtones, are often a defect, proceeding uſually from an inequality in their conſiſtence, as to hard and ſoft: which makes the ſtone crack, and ſhiver in thoſe parts.

VEIN is alſo applied, in the ſame ſenſe with *ſtratum*, to the various diſpoſitions and kinds of earth met with in digging. Thus, we ſay, a *vein* of ſand, another of rock, &c. A *vein* of ochre, vitriol, alum, calamine, coal, &c. Mineral waters acquire their different qualities, by paſſing through *veins* of vitriol, ſulphur, &c.

In the ſame ſenſe, we ſay, a *vein* of gold, ſilver, quick-ſilver, &c. meaning certain parts of the earth, wherein the ore or glebe of theſe metals is found; and which is diſtributed into divers branches, like the *veins* of the body. Tavernier gives a deſcription of the *veins* in the diamond-mines in Golconda, with the manner of digging them.

In digging of coal-pits, they meet with a variety of *veins*, the order, &c. of which is different, in different places: in the Philoſophical Tranſactions, N° 360, the *veins* in thoſe famous coal-mines at Mendip, in Somerſetſhire, are obſerved to be (below the turf, or loam, or malm) a rediſh fire-ſtone; the coal clives, which is blackiſh rock; the *ſtinking vein*, a hard coal for mechanic uſes; five feet below which is the *catſhead vein*, twenty-two feet thick, intermixed with lumps of ſtone; at a like diſtance below which is the *three-coal vein*, divided into three kinds of coal, and about three feet thick. The *veins* hitherto mentioned are frequently worked in the ſame pit. The next is the *peaw vein*, which is intermixed with cockle-ſhells, and fern-branches, uſually wrought in a ſeparate pit; though its depth below the *three-coal vein* be only about five feet, yet the cliff between is very hard, and liable to water: this *vein* is about a yard thick; and at the like diſtance below it is the *ſmith's coal vein*: beneath which is the *ſhelly vein*; and under that, a *vein* of ten inches, which is little worth, and ſeldom wrought. The ſame *veins* are found in a place ſeven or eight miles diſtant. All the *veins* lie obliquely, or ſhelving: the obliquity, or *pitch*, as they term it, is about twenty-two inches in a fathom; which, when it riſes to the land, is called *crop*, and in ſome places *baſſeting*.

In digging to the ſouth-weſt, they oft meet with ridges, which cauſe the *vein* to *trap up*; i. e. being cut off by the ridges, they find it over their heads, when they are through the ridge: on the contrary, working through a ridge to the north-eaſt, they ſay, it *traps down*, i. e. they find it under their feet.

VEIN, among *Miners*, is that ſpace which is bounded with woughs, and contains ore, ſpar, canck, clay, chirt, croil, brown-hen, pitcher-chirt, cur, which the philoſophers call the mother of metals, and ſome times ſoil of all colours. When it bears ore, it is called a *quick vein*; when no ore, a *dead vein*. Houghton's Comp. Miner, in the Explan. of the terms. See MINERALOGY, and TRAINING.

VEJOURS, or VIEWERS, VISORES, in *Law*, are perſons ſent, by the court, to take a view of any place in queſtion, for the better deciſion of the right.

It is alſo uſed for thoſe ſent to view ſuch as eſſoign themſelves *de malo lecti*, whether, in truth, they be ſuch as that they cannot appear, or whether they counterfeit.

VELAMEN is uſed, by ſome *Surgeons*, for the bag, ſkin, or bladder, of an impoſthume, or ſwelling.

VELAMENTUM *bombycinum*, a name which ſome anatomiſts give to the velvet membrane, or inner ſkin of the inteſtines.

VELARIUS, in *Antiquity*, an officer in the court of the Roman emperors, being a kind of uſher, whoſe poſt was behind the curtain, *vela*, in the prince's apartment; as that of the chancellors, *cancelli*, was at the entry of the baluſtrade, and that of the *oſtiarii* at the door.

The *velarii* had a ſuperior, of the ſame denomination, who commanded them; as we find in two inſcriptions, quoted by Salmaſius in his notes on Vopiſcus, and, by a third, in Gruter.

VELEZIA, in *Botany*, a genus of the *pentandria digynia* claſs. Its characters are theſe; the corolla is ſmall, and has five petals; the calyx is filiform, and divided into five points; the capſule is ſingle-celled, and the ſeeds are very numerous. There is one ſpecies.

VELITES, in the *Roman Army*, one of the four kinds of ſoldiers that compoſed their legions, who were armed lightly with a javelin, a caſque, cuiraſs, and ſhield.

Theſe were commonly young men of mean condition, and took their name *à volando*, or *à velocitate*, from their ſwiftneſs and expedition.

They ſeem not to have been divided into any diſtinct bodies or companies, but to have hovered in looſe order before the army.

The other claſſes of the Roman infantry were the *haſtati*, *principes*, and TRIARII. See BATTLE.

VELITIS, in the *Natural Hiſtory of the Ancients*, the name of a peculiar ſort of ſand uſed in the manufacture of glaſs; for which purpoſe they always choſe ſuch as was found waſhed clean on the banks of rivers; and this they therefore called glaſs-ſand, or *velitis*, or *hyalitis*.

VELLA, in *Botany*. See *Spaniſh* CRESSES.

VELLEITY, VELLEITAS, in the *School Philoſophy*, is uſually defined a languid, cold, and remiſs will.

Others ſay, it implies an impotency of obtaining what we require. Others will have it, a ſlight deſire for ſomething, which a perſon does not eſteem much or is too indolent to ſeek; as *Catus amat piſcem, ſed non vult tangere lympham*.

VELLIA, in *Ornithology*, a name uſed by ſome authors for the *lanius minor*, or *lanius tertius* of Aldrovand, called in England the FLUSHER.

VELLICATION, among *Phyſicians*, the act of twitching or ſtimulating. The word is more particularly applied to a ſort of ſudden convulſions that happen to the fibres of the muſcles.

VELLICULA, or FORFICULA. See EAR-*wig*.

VELLING, a term uſed by huſbandmen in the Weſt of England, for ploughing up by the turf.

VELLUM. See VELOM.

VELOCE, in the *Italian Muſic*, is uſed for quick.

VELOCISSAMENTE, or VELOCISSIMO, in the *Italian Muſic*, is uſed for very quick, or with great rapidity. It is ſeldom met wit; *preſto*, or *preſtiſſimo*, being moſtly uſed in its ſtead.

VELOCITY, in *Mechanics*, *ſwiftneſs*; that affection of motion, whereby a moveable is diſpoſed to run over a certain ſpace in a certain time.

It is alſo called CELERITY, and is always proportional to the ſpace moved.

Huygens, Leibnitz, Bernoulli, Wolfius, and the foreign mathematicians, hold, that the momenta, or forces, of falling bodies, at the end of their falls, are as the ſquares of their *velocities* into the quantity of matter; the Engliſh mathematicians, on the contrary, maintain them to be as the *velocities* themſelves into the quantity of matter. See MOTION.

Velocity is conceived either as *abſolute* or *relative*: the *velocity* we have hitherto conſidered, is *ſimple* or *abſolute*, with reſpect to a certain ſpace, moved in a certain time.

Relative, or *reſpective velocity*, is that wherewith two diſtant bodies approach each other, and come to meet in a longer or leſs time; whether only one of them moves towards the other at reſt, or whether they both move; which may happen two ways, either by two bodies naturally approaching each other in the ſame right line, or by two bodies moving the ſame way in the ſame line, only the foremoſt ſlower than the other; for, by this means, this will overtake that; and, as they come to meet, in a greater or leſs time, the *relative velocity* will be greater or leſs.

Thus, if two bodies come nearer each other by two feet in one ſecond of time, their reſpective *velocity* is double that of two others, which only approach one foot in the ſame time.

Velocity is alſo *uniform* or *equal*, when a moving body paſſes through equal ſpaces in equal times; or *unequal*, when in equal times it paſſes through unequal ſpaces; in which caſe it is either *accelerated* or *retarded*; and this acceleration, or retardation, may alſo be equal or unequal. See ACCELERATION and MOTION.

In the doctrine of fluxions it is uſual to conſider the *velocity* with which magnitudes flow, or are generated. Thus the *velocity*, with which a line flows, is the ſame as that of the point, which is ſuppoſed to deſcribe or generate the line. The *velocity*, with which a ſurface flows, is the ſame as the *velocity* of a given right line, that, by moving parallel to itſelf, is ſuppoſed to generate a rectangle, always equal to the ſurface. The *velocity* with which a ſolid flows may be meaſured by the *velocity* of a given plain ſurface, that, by moving parallel to itſelf, is ſuppoſed to generate an erect priſm, or cylinder, always equal to the ſolid. The *velocity*, with which an angle flows, is meaſured by the *velocity* of a point, ſuppoſed to deſcribe the arc of a given circle, which ſubtends the angle, and meaſures it. See Macl. Fluxions, book i. chap. 1.

All theſe *velocities* are meaſured at any term of the time of the motion, by the ſpaces which would be deſcribed in a given point of time, by theſe points, lines, or ſurfaces, with their motions continued uniformly from that term.

The *velocity* with which a quantity flows at any term of the time, while it is ſuppoſed to be generated, is called its FLUXION.

VELOCITIES *of bodies moving in curves*. According to Galileo's ſyſtem of the fall of heavy bodies, which is now admitted by all philoſophers, the *velocities* of a body falling vertically are, each moment of its fall, as the roots of the heights from whence it has fallen; reckoning from the beginning thereof. Hence that author inferred, that if a body fall along an inclined plane, the *velocities* it has, at the different times, will be in the ſame ratio; for ſince its *velocity* is all owing to its fall, and it only falls as much as there is perpendicular height in the inclined plane, the *velocity* ſhould be meaſured by that height as if it were vertical. See *Inclined* PLANE.

The ſame principle, likewiſe, led him to conclude, that if a body fall through two contiguous inclined planes, making an angle between them, much like a ſtick when broken, the *velocity* would be regulated after the ſame manner, by the vertical height of the two planes taken together; for it is only this height that it falls; and from its fall it has all its *velocity*.

This concluſion was univerſally admitted till the year 1693, when M. Varignon demonſtrated it to be falſe. From his demonſtration it ſhould ſeem to follow, that the *velocities* of a body falling along the cavity of a curve, for inſtance, of a cycloid, ought not to be as the roots of the heights, ſince a curve is only a ſeries of an infinity of infinitely little contiguous planes, inclined towards one another; ſo that Galileo's propoſition would ſeem to fail in this caſe too; and yet it holds good, only with ſome reſtriction.

All this mixture of truth and error, ſo near akin to each other, ſhewed, that they had not got hold of the firſt principle; M. Varignon, therefore, undertook to clear what related to the *velocities* of falling bodies, and to ſet the whole matter in a new light. He ſtill ſuppoſes Galileo's firſt ſyſtem, that the *velocities*, at the different times of a vertical fall, are as the roots of the correſpondent heights. The great principle he makes uſe of to attain his end is, that of compound motion.

If a body fall along two contiguous inclined planes, making an obtuſe angle, or a kind of concavity between them; M. Varignon ſhews, from the compoſition of thoſe motions, that the body, as it meets the ſecond plane, loſes ſomewhat of its *velocity*, and of conſequence, that it is not the ſame at the end of the fall, as it would be, had it fell through the firſt plane prolonged; ſo that the proportion of the roots of the heights aſſerted by Galileo does not here obtain.

The reaſon of this loſs of *velocity* is, that the motion, which was parallel to the firſt plane, becomes oblique to the ſecond, ſince they make an angle: this motion, which is oblique to the ſecond plane, being conceived as compounded, that part perpendicular to the plane is loſt, by the oppoſition thereof, and part of the *velocity* along with it; conſequently, the leſs of the perpendicular there is in the oblique motion, or, which is the ſame thing, the leſs the two planes are from being one, i. e. the more obtuſe the angle is, the leſs *velocity* does the body loſe.

Now all the infinitely little, contiguous, inclined planes, whereof a curve conſiſts, making infinitely obtuſe angles among themſelves; a body falling along the concavity of a curve, the loſs of *velocity* it undergoes each inſtant is infinitely little; but a finite portion of any curve, how little ſoever, conſiſting of an infinity of infinitely little planes, a body moving through it loſes an infinite number of infinitely little parts of its *velocity*: and an infinity of infinitely little parts makes an infinity of a higher order, i. e. an infinity of infinitely little parts make a finite magnitude, if they be of the firſt order or kind, and an infinitely little quantity of the firſt order, if they be of the ſecond, and ſo in infinitum. Therefore if the loſſes of *velocity* of a body, falling along a curve, be of the firſt order; they will mount to a finite quantity in any finite part of the curve, &c.

The nature of every curve is abundantly determined by the ratio of the ordinates to the correſpondent portions of the axis; and the eſſence of curves in general may be conceived as conſiſting in this ratio, which is variable in a thouſand ways. Now this ſame ratio will be, likewiſe, that of two ſimple *velocities*, by whoſe concurrence a body will deſcribe any curve; and, of conſequence, the eſſence of all curves, in the general, is the ſame thing as the concourſe or combination of all the forces, which, taken two by two, may move the ſame body. Thus we have a moſt ſimple and general equation of all poſſible curves, and of all poſſible *velocities*.

By means of this equation, as ſoon as the two ſimple *velocities* of a body are known, the curve, reſulting from them, is immediately determined. It is obſervable that, according to this equation, an uniform *velocity*, and a *velocity* that always varies according to the roots of the heights, produce a parabola, independent of the angle made by the two projectile forces that give the *velocities*; and, conſequently, a cannon-ball, ſhot either horizontally or obliquely to the horizon, muſt always deſcribe a parabola. The beſt mathematicians, hitherto, had laboured much to prove, that oblique projections formed parabolas as well as horizontal ones.

To have ſome meaſure of *velocity*, the ſpace is to be divided into as many equal parts as the time is conceived to be divided into; for the quantity of ſpace, correſponding to that diviſion of time, is the meaſure of the *velocity*.

For an inſtance; ſuppoſe the moveable A paſſes through a ſpace of 80 feet in 40 ſeconds of time: dividing 80 by 40, the quotient 2 ſhews the *velocity* of the moveable to be ſuch, as that it paſſes over an interval of two feet in one ſecond; the *velocity*, therefore, is rightly expreſſed by $\frac{80}{40}$; that is, by 2.

Suppoſe, again, another moveable B, which, in 30 ſeconds of time, travels 90 feet; the index of the celerity will be 3. Wherefore, ſince in each caſe the meaſure of the ſpace is a foot, which is ſuppoſed every where of the ſame length, and the meaſure of time a ſecond, which is conceived every where of the ſame duration; the indices of the *velocities* 2 and 3 are homogeneal, and therefore the *velocity* of A is to the *velocity* of B, as 2 to 3.

Hence, if the ſpace be $= s$, and the time $= t$, the *velocity* may be expreſſed by $\frac{s}{t}$; the ſpace being in a ratio of the time and the *velocity*. See MOTION.

VELOCITY, *Circular*. See CIRCULAR.

VELOCITY, *Initial*, in *Gunnery*, denotes the *velocity* with which military projectiles iſſue from the piece by which they are diſcharged. This is now known to be much more conſiderable than was formerly apprehended. For the method of eſtimating it, and the reſult of a variety of experiments by Mr. Robins, Dr. Hutton, &c. ſee GUN, GUNNERY, PROJECTILE, and RESISTANCE.

We ſhall here add, that Mr. Thompſon has lately publiſhed the reſult of a variety of experiments upon gunpowder, and alſo an account of a new method of determining the *velocities* of all kinds of military projectiles. From the equality of action and re-action it appears, ſays Mr. Thompſon, that the momentum of a gun muſt be preciſely equal to the momentum of its charge; or that the weight of the gun, multiplied into the *velocity* of its recoil, is juſt equal to the weight of the bullet and of the powder (or the elaſtic fluid that is generated from it) multiplied into their reſpective *velocities*: for every particle of matter, whether ſolid or fluid, that iſſues out of the mouth of a piece, muſt be impelled by the action of ſome power, which power muſt re-act with equal force againſt the bottom of the bore.

It is eaſy to determine the *velocity of the recoil* in any given caſe, by ſuſpending the gun in an horizontal poſition by two pendulous rods, and meaſuring the arc of its aſcent by means of a ribbon, according to the method which Mr. Thompſon has deſcribed, and this will give the momentum of the gun, its weight being known, and conſequently the momentum of its charge.

But in order to determine the *velocity* of the bullet from the *recoil*, it will be neceſſary to find how much the weight and *velocity* of the elaſtic fluid contribute to it. That part of the recoil which ariſes from the expanſion of this fluid is always very nearly the ſame, whether the powder is fired alone, or whether the charge is made to impel one or more bullets, as Mr. Thompſon has determined by various experiments.

If, therefore, a gun, ſuſpended according to the method propoſed, is fired with any given charge of powder, but without any bullet or wad, and the recoil is obſerved, and if the ſame piece is afterwards fired with the ſame quantity of powder, and a bullet of a known weight, the exceſs of the *velocity* in the latter caſe above that in the former will be proportional to the *velocity* of the bullet; for the difference of theſe *velocities*, multiplied into the weight of the gun, will be equal to the weight of the bullet multiplied into its *velocity*.

Accordingly, if W is put for the weight of the gun, U for the *velocity* of its recoil, when it is fired with any given charge of powder, without any bullet; V, for the *velocity* of the recoil when the ſame charge is made to impel a bullet; B, for the weight of the bullet, and v for its *velocity*, we ſhall have $v = \frac{\overline{V-U} \times W}{B}$. Let B = 580 grains, W = 336000 grains; and therefore, B : W :: 580 : 336000, i. e. :: 1 : 579,31 nearly, and $\overline{V-U}$ is

is found by experiment to be equal to 1,8522; and consequently $v = 1,8522 \times 579,31 = 1073$ feet in a second; which is very near 1083 feet in a second, the mean of the *velocities* determined by the pendulum after the manner of Mr. Robins.

But the theorem will be rendered more simple by putting *c* for the chord of the recoil in English inches, when the piece is fired with powder only, and C for the chord when a bullet is discharged by the same charge; and then $C-c$ will be as $V-U$; and consequently, as $\frac{\overline{V-U} \times W}{B}$, which measures the *velocity* of the bullet, the ratio of W to B remaining the same.

Supposing, therefore, $C-c=1$ inch, and the *velocity* of the bullet to be computed from that chord; the *velocity* in any other case, wherein $C-c$ is greater or less than one inch, will be found by multiplying the difference of the chords C and *c* by the *velocity* that answers to a difference of one inch. Or the velocity of the bullet, expressed in feet *per* second, may in all cases be found by multiplying the difference of the chords C and *c* by 118,35; the weight of the barrel, the length of the suspending rods, and the weight of the bullet remaining the same, whatever be the charge of powder or its strength.

According to this rule Mr. Thompson has computed by several experiments the *velocities* of bullets from the recoil, and compared them with the *velocities* obtained by the pendulum. The result, making the necessary allowances for the difference in the conclusions arising from these two methods, leads Mr. Thompson to infer, that there is the greatest probability that the *velocities* of bullets may in all cases be determined by the recoil with great accuracy; and if this method succeeds with musquet-bullets, it may also be applied as well to cannon-balls and bomb-shells of the largest dimensions: he apprehends also, that it will be much preferable to any other method hitherto known, not only as it may be applied indifferently to all kinds of military projectiles, with little trouble or expence, but also because by this method the *velocities* with which bullets are actually projected are determined; whereas, by the pendulum, their *velocities* can only be ascertained at some distance from the gun, after they have lost a part of their *initial velocities* by the resistance of the air through which they are obliged to pass to arrive at the pendulum.

Those who advert to what has been delivered under the article GUNNERY, will find that, according to Mr. Robins's theory, farther confirmed by Dr. Hutton's experiments, when bullets of the same diameter, but different weights, are discharged from the same piece by the same quantity of powder, their velocities should be in the sub-duplicate ratio of their weights.

But this theory, says Mr. Thompson, is founded upon a supposition, that the action of the elastic fluid, generated from the GUN-*powder*, is always the same in every given part of the bore when the charge is the same, whatever may be the weight of the bullet; and as no allowance is made for the expenditure of force required to put the fluid itself in motion, or for the loss of it by the vent, he concludes that the theory is defective. And from a variety of experiments, made with a view of ascertaining this point, he infers, that the ratio of the *velocities* of bullets to their weights is different from that which Mr. Robins's theory supposes; and from other experiments he finds, that the *velocities* computed, according to the reciprocal sub-triplicate ratio of their weights, agree much better with the conclusions deduced from those experiments than those computed upon Mr. Robins's principles; though, in this mode of computation, the difference between the actual and computed *velocities* was in some of the experiments inconsiderable. But as the powder itself is heavy, it may be considered as a weight put in motion along with the bullet; and if the density of the generated fluid be supposed always uniform from the bullet to the breech, the *velocity* of the centre of gravity of the powder, or of the elastic fluid, and the gross matter generated from it, will be just half as great as the *velocity* of the bullet; putting, therefore, P to denote the weight of the powder, B the weight of the bullet, and v its *initial velocity*; then $Bv + \frac{1}{2}Pv = \overline{B + \frac{1}{2}P} \times v$ will express the momentum of the charge at the instant when the bullet quits the bore. Instead, therefore, of ascertaining the relation of the *velocities* to the weights of the bullets, he proposes to add half the weight of the powder to the weight of the bullet, and to compute the *velocities* from the reciprocal sub-triplicate ratio of the quantity $\overline{B + \frac{1}{2}P}$: and the result of several experiments shews an agreement between the actual and computed *velocities* that is very remarkable.

We shall only add, that Mr. Thompson disputes the justness of Mr. Robins's conclusion with respect to the force of GUN-*powder*, which makes it 1000 times greater than the mean pressure of the atmosphere; whereas, from the result of one of his experiments, its force appears to be at least 1308 times greater than the mean pressure of the atmosphere. Phil. Trans. vol. lxxi. part ii. p. 229—321.

VELOCITY, *Measure of*. See MEASURE.

VELOCITY of *Light*, *Sound*, *Wind*, &c. See LIGHT, SOUND, WIND, &c.

VELOM, or VELLUM, is a kind of PARCHMENT, that is finer, evener, and more white than the common parchment.

The word is formed from the French *velin*, of the Latin *vitulinus*, *belonging to a calf*. See ABORTIVE.

By 9 Ann. cap. 11. and 10 Ann. cap. 26, there is a duty for all *vellum* made in Great Britain of 3*s.* a dozen; and for all parchment made in Great Britain, 1*s.* 6*d.* a dozen. Also by the same statutes, and 4 W. cap. 5. additional duties are laid on *vellum* and parchment imported, over and above what they are charged with in the book of rates. See STAMP.

For regulations relating to makers of *vellum*. See TANNERS.

By 24 Geo. III. cap. 41. every maker of *vellum* or parchment shall take out a yearly licence at 1 *l.*

VELVET, a rich kind of stuff, all silk, covered on the outside with a close, short, fine, soft shag, the other side being very strong and close.

The word is formed of the French *velours*, which signifies the same, and which comes from *velu*, a thing covered with hair.

The knap or shag, called also the *velveting*, of this stuff, is formed of part of the threads of the warp, which the workman puts on a long narrow channelled ruler, or needle, or wire; and which he afterwards cuts, by drawing a sharp steel tool along the channel of the needle to the ends of the warp.

The principal and best manufactories of *velvet* are in France and Italy, particularly at Venice, Milan, Florence, Genoa, and Lucca; there are others in Holland, set up by the French refugees, whereof, that at Haerlem is the most considerable.

Velvets are now made to great perfection at Manchester and other parts of England.

There are some brought from China, but they are the worst of all.

There are *velvets* of various kinds, as *plain*, that is, uniform and smooth, without either figures or stripes.

VELVET, *figured*, that is, adorned and worked with divers figures, though the ground be the same with the figures; that is, the whole surface *velveted*.

VELVET, *ramage*, or *branched*, representing long stalks, branches, &c. on a sattin ground, which is sometimes of the same colour with the *velvet*, but more usually of a different one. Sometimes, instead of sattin, they make the ground of gold and silver, whence the denominations of *velvets with gold ground*, &c.

VELVET, *uncut*, is that wherein the threads, that make the *velveting*, have been ranged over the channelled ruler, or wire, but not cut there.

VELVET, *striped*, is that wherein there are stripes of divers colours, running along the warp; whether those stripes be partly *velvet* and partly sattin, or all *velveted*.

VELVET, *cut*, is that wherein the ground is a kind of taffety, or gros de Tours, and the figures *velvet*.

Velvets are likewise distinguished, with regard to their different degrees of strength and goodness, into *velvets* of four threads, three threads, two threads, and a thread and a half; the first are those where there are eight threads of shag, or *velveting*, to each tooth of the reed; the second have only six, and the rest four.

In general, all *velvets*, both worked and cut, shorn and flowered, are to have their warp and shag of organzine, spun and twisted, or thrown in the mill, and their woof of silk well boiled, &c. They are all of the same breadth.

VELUM, in *Ecclesiastical Writers*, the same with what is otherwise called BRANDEUM.

VELUM *quadragesimale*, a veil or piece of hangings, anciently drawn before the altar in Lent, as a token of mourning and sorrow.

VENA, VEIN, in *Anatomy*. See VEIN.

VENA *cava*. See CAVA and VEIN.

VENA *porta*, &c. See *Tab. Anat. (Splanch.) fig.* 5. *lit. i.* See also PORTA and VEIN.

VENA *pulmonis*. See PULMONARY and VEIN.

VENABULUM, in *Antiquity*, a long kind of spear used in hunting wild beasts.

VENÆ-SECTIO, the opening of a vein, called also *phlebotomy*, and popularly BLEEDING.

VENÆ *lacteæ*. See LACTEALS.

VENÆ *lymphaticæ*. See LYMPHATICS.

VENAL, or VENOUS, among *Anatomists*, something that bears relation to a VEIN.

The extremities of the cava and pulmonary veins, where they enter the auricles of the heart, are called *venous sinuses*.

VENAL, formed from *venalis*, *to be sold*, is also used for something bought with money, or procured by bribes.

Thus, we say, *venal* bards; courtezans and flatterers are *venal*; even justice, in Turkey, is *venal*, and must be bought of the bashaws.

In England, there are several offices in the revenue, policy, &c. *venal*; but this venality of offices is no where so considerable as in France, where all offices of judicature are bought of the king, and only municipal officers are elected. Offices in England are *venal* only by a kind of connivance; in France it is a thing solemn and authorized. The venality was first introduced by Louis XII. who, to clear those immense debts contracted by his predecessor Charles VIII. without burdening his people with new taxes, bethought himself to sell the offices of finance; and, in reality, he made a vast sum thereby; but he forbad, by an edict in 1508, the sale of offices of judicature. Francis I. made an advantage of the same expedient to get money, and sold his posts, not excepting the offices of judicature, openly; under this king, it was only accounted a kind of loan; but that loan was no more than a name to disguise a real sale. However, it is said, that the sale of offices of judicature was established by edicts of Charles IX. and that military offices were sold under the reign of Henry III.

The parliament, not being able to relish the venality of offices, always made the buyer take an oath, that he did not buy his post, either directly or indirectly; but there was a tacit exception made, of monies lent the king for being put into them. At length the parliament, finding its oppositions were in vain, and that the traffick of offices was publicly authorized, abolished the oath in 1597.

VENCU, in *Botany*, the Chinese name for an excellent fruit found in that country, which the Portuguese call *jamboa*, and the Dutch *pompebinoes*. It grows on prickly trees, like the limon-tree, only larger. Its flowers are white, exactly the same in shape with those of the limon, and have an exceeding sweet smell; a very fragrant water is distilled from them. The fruit itself far exceeds the citron in bulk, being in size equal to, and sometimes exceeding a man's head; the rind is like that of the golden rennet; the pulp is of a reddish colour, and its taste partakes of sweet and acid, resembling that of grapes not fully ripe. A liquor is pressed from it, as in Europe from apples, pears, &c. It will keep for a whole year.

VENDEE, in *Law*, the person to whom any thing is sold, in contradistinction to vendor, or the seller.

VENDITIONI *exponas*, is a judicial writ, directed to the sheriff, commanding him to sell goods, which he has formerly, by commandment, taken into his hands, for the satisfying of a judgment given in the king's court.

VENDITOR *regis*, the *king's salesman*, or person who exposed to sale goods or chattels seized or distrained to answer any debt to the king. This office was granted by king Edward I. to Philip de Lardimer, in the county of York, *Ita quod ipse, vel certus suus attornatus, ibit ad mandatum vicecomitis de loco in locum infra com. præd. sumptibus suis, ad venditiones faciendas, & capiat de unaquaque venditione pro feodo suo xxxii. den*; but the office was seized into the king's hands for the abuse thereof, anno 2 Ed. II.

VENEERING, VANEERING, or FINEERING, a kind of marquetry, or inlaying, whereby several thin slices, or leaves of fine wood, of different kinds, are applied and fastened on a ground of some common wood.

There are two kinds of inlaying: the one, which is the more ordinary, goes no farther than the making of compartiments of different woods; the other requires much more art, and represents flowers, birds, and the like figures.

The first kind is what we properly call *veneering*, the latter we have already described under MARQUETRY.

The wood intended for *veneering* is first sawed out into slices, or leaves, about a line thick: in order to saw them, the blocks or planks are placed upright, in a kind of sawing-press: the description whereof may be seen under the article PRESS.

These slices are afterwards cut into slips, and fashioned divers ways according to the design proposed; then the joints being carefully adjusted, and the pieces brought down to their proper thickness, with several planes for the purpose, they are glued down on a ground, or block of dry wood, with good strong English glue.

The pieces thus joined and glued, the work, if small, is put in a press; if large, it is laid on the bench, covered with a board, and pressed down with poles, or pieces of wood, one end whereof reaches to the cieling of the room, and the other bears on the boards.

When the glue is quite dry, they take it out of the press and finish it; first with little planes, then with divers scrapers, some whereof resemble rasps, which take off dents, &c. left by the planes.

When sufficiently scraped, the work is polished with the skin of a sea-dog, wax, and a brush and polisher of shave-grass: which is the last operation.

VENELLIS. See VICIS & *venellis mundandis*.

VENENUM *cocci*, a term used by many of the ancients for the purple tinge, which the kermes berry, as it is usually called (see KERMES), gave to linen, or other things.

The word *venenum* being generally understood to express poison, it has been supposed by many, that the kermes was esteemed poisonous, or that there were two sorts of this drug; the one a harmless medicine, the other poisonous. But there is no warrant for this in any of the old writers, and the whole seems indeed but a mistake about the sense of the word *venenum*, which we find by many passages of the best authors, signified a stain, as well as a poison.

The ancients called the vestments dyed scarlet with the kermes indifferently, by the names of *flammeæ* or *venenatæ*. Servius tells us, that in certain sacred ceremonies, it was necessary that the priest should be clothed in a scarlet robe; and he uses the word *venenato* to express it in some places, and *flammeo* in others.

VENER, one of the many names by which the chemists call Mercury.

VENEREA *concha*, in *Natural History*, the name of a very large and elegant genus of shells, more usually called *porcellanæ*. See PORCELAIN-*shell*.

VENEREAL, something belonging to VENUS.

A *venereal* person is one addicted to venery, or *venereal* pleasures. *Venereal medicines* are called *aphrodisiacs*, *provocatives*, &c.

VENEREAL *disease*, *lues* VENEREA, the *French disease*, *foul disease*, *French pox*, or *great pox*, is a contagious malady, contracted by some impure humour, generally received in coition; and discovering itself in ulcers and pains about the genital, and other parts.

It is usually said to have made its first appearance in Europe in the year 1494, though others will have it much older, and contend for its being known to the ancients, only under other names.

Mr. Becket particularly (Phil. Transf. N° 355. N° 365, 366, or Abr. vol. v. p. 381. and vol. viii. p. 652. 663, &c.) has attempted to shew, that it is the same with what, among our forefathers, was called the *leprosy*, and which, in many of our ancient English writings, charters, &c. is called *brenning*, or *burning*.

In order to prove this point he has searched the records relating to the stews anciently kept on the Bank-side, Southwark, under the jurisdiction of the bishop of Winchester.

Among other constitutions of these stews, dated 1162, it was appointed, "That no stew-holder should keep any "woman that hath the perilous infirmity of BURNING."

And in another vellum manuscript, now in the custody of the bishop of Winchester, dated 1430, it is again ordered, "That no stew-holder keep any woman within his "house that hath any sickness of BRENNING, but that "she be putte out upon the peyne of making a fine "unto the lord of a hundred shillings."

To confirm this account, Mr. Becket quotes a description of the disease from a manuscript of John Arden, esq. surgeon to king Richard II. and king Henry IV. Arden, who wrote about the year 1360, defines the disease called *brenning*, *incendium*, to be a certain inward heat and excoriation of the urethra; which definition, Mr. Becket observes, gives us a perfect idea of what we now call a *clap*, agreeable to the latest and most exact anatomical discoveries, and free of all the errors of Platerus, Rondeletius, Bartholin, Wharton, and other later writers on this disease.

As to the leprosy being the same with this *venereal disease*, it must be owned, there are a good many symptoms in the one disease, which quadrate well enough with those in the other; but then the symptoms in each are so precarious, that a great deal of stress cannot be laid hereon.

The common tradition is, that the *venereal disease* first broke out in the French army, when it lay encamped before Naples, and that it was owing to some unwholesome food; on which account the French call it the *Neapolitan disease*, and the Italians the *mal Francese*.

But others go much higher, and suppose this to be the

ulcers

ulcers Job complained of ſo grievouſly; and accordingly, in a Miſſal, printed at Venice in 1542, there is a maſs in honour of St. Job, to be ſaid by thoſe recovered of this diſeaſe, as being ſuppoſed to owe their deliverance to his interceſſion.

But the opinion which prevails moſt among the more knowing of our phyſicians is, that the diſeaſe is of Indian extraction, and that it was brought hither by the Spaniards from the American iſlands, where it was very common before ever the Spaniards ſet footing there; whence the Spaniards call it *ſerva des India*, or *las buvas*, notwithſtanding what Herrera ſays, that the Spaniards carried it to Mexico, inſtead of bringing it thence.

To this purpoſe ſir Hans Sloane obſerves (Nat. Hiſt. Jamaica, Introd. p. 2.) that Columbus brought into Europe, in his firſt voyage in 1493, the pox, which ſpread ſo quickly all over Europe, that Antonius Benivenius, a famous phyſician at that time at Florence, in the firſt chapter of his book De Abditis nonnullis ac mirandis Morborum, & ſanationum Cauſis, tells us, that the *lues venerea*, then beginning in Spain, had ſpread itſelf through Italy and France, and that in 1496 it had poſſeſſed many people in all the provinces of Europe. Dodonæus likewiſe tells us, that this diſeaſe raged very much in the war which Charles VIII. king of France had with Alphonſus, king of Naples, in 1494; and yet he is of opinion, that Gulielmus de Saliceto, who lived in 1270, Valeſcus de Taranta, who lived in 1418, and Bernardus de Gerdonio, who died in 1305, give us an account of ſome of its ſymptoms. Sir Hans Sloane apprehends, notwithſtanding what theſe writers have ſaid, and ſome other leſs material paſſages in ancient hiſtorians and writers, and what Arden has written, and likewiſe what Stow ſays of the public ſtews in Southwark, that this was a diſtemper altogether new in Europe, Africa, and Aſia, before it was brought from the Weſt Indies. The diſeaſes mentioned by the authors juſt cited are, in his opinion, very different from that diſtemper, both in ſymptoms and cure, although communicated perhaps ſomewhat after the ſame manner; and he adds, that he has ſeen ſome ſuch ſingular caſes, attended with conſiderable inconveniences and fears, which have not been at all of the venereal kind. By communicating this dreadful malady, the ſevereſt ſcourge with which, in this life, Heaven chaſtens the indulgence of criminal deſire, the Americans, ſays an excellent hiſtorian, have not only amply avenged their own wrongs, but by adding this calamity to thoſe which formerly embittered human life, they have, perhaps, more than counterbalanced all the benefits which Europe has derived from the diſcovery of the new world. Robertſon's Hiſt. Amer. vol. ii. p. 87. 8vo.

Liſter, and ſome others, take it to have had its firſt riſe from ſome of the ſerpentine kind, either from a bite thereof, or from ſome of their fleſh taken as food. This is pretty certain, that men, bitten or ſtung by ſcorpions, are greatly eaſed by coition; but the woman, Pliny aſſures us, receives a great deal of damage thereby; which they think no ſlender argument of the diſeaſe's ariſing from ſome perſon ſo poiſoned.

Liſter adds, there is no room to doubt, but that the lues aroſe from ſome ſuch cauſe; for, upon any venomous bite, the penis becomes vehemently extended; and the patient, being ſeized with a ſatyriaſis, breathes nothing but rage and luſt; nature, in effect, ſeeming to direct him to coition for a remedy.

But what proves a remedy to the wounded perſon, proves a diſeaſe to the woman; and from women, thus infected, other men, who have to do with them, they ſay, become infected in their turns; and thus has the diſeaſe been propagated.

Antonio Sanchez Riberio, a learned phyſician, publiſhed a diſſertation in the year 1765, in which he endeavours to prove, that this diſeaſe was not introduced from America, but took its riſe in Europe, and was brought on by an epidemical and malignant diſorder. A ſecond edition of this diſſertation has been ſince publiſhed, containing ſeveral additional facts in confirmation of Dr. Sanchez's opinion, which is ſupported with ſuch plauſible arguments, as render it a ſubject of inquiry well deſerving the attention of learned phyſicians. It muſt be acknowledged, that the rapid communication of this diſeaſe from Spain over Europe ſeems to reſemble the progreſs of an epidemic, rather than that of a diſeaſe tranſmitted by infection. Robertſon's Hiſt. Am. vol. ii. p. 482. 8vo.

The firſt ſymptoms generally ariſing after intercourſe with an infected perſon, are, a heat, ſwelling, and inflammation, about the penis, or vulva, with a hotneſs of urine. The infection, generally within eight or ten days after it has been received, ſometimes in two or three days, and at other times not before the end of four or five weeks, brings on a gonorrhœa, or dripping, which denominates it a CLAP; and which, in a few days more, is often followed by a CHORDEE, or PRIAPISM, and other diſtortions of the penis. See GONORRHOEA and GLEET.

Though ſometimes there is no gonorrhœa, or clap; but the poiſon rather makes its way through the cutis, to the groin; and there raiſes buboes, with various malignant puſtules, in all parts of the body. See *Venereal* BUBOES.

Sometimes, alſo, there happen callous ulcers, called CHANCRES, in the ſcrotum and perinæum; and ſometimes a cancerous and callous ulcer between the prepuce and glans; and, in ſome, the teſticles ſwell.

Chancres may happen either with or without a gonorrhœa; they are commonly ſeated about the glans; and firſt appear in form of ſmall red pimples, which ſoon become pointed at top, and are filled with a whitiſh matter, inclining to yellow. Theſe pimples are hot, and generally itch before they break; they afterwards degenerate into obſtinate ulcers, the bottom of which is uſually covered with a viſcid mucus, and whoſe edges become gradually hard and callous; ſometimes the firſt appearance reſembles a ſingle excoriation of the cuticle, which, however, ſoon becomes a true chancre. The chancre is ſometimes a primary affection, but much oftener ſymptomatic, and the mark of a confirmed lues. Primary chancres diſcover themſelves ſoon after impure coition, and are generally ſeated in parts covered with a thin cuticle, as the lips, the nipples of women, the glans penis of men, &c. and when venereal ulcers are ſeated in the lips, the infection may be communicated by kiſſing. When a chancre appears ſoon after impure coition, its treatment is in every reſpect ſimilar to that of the *virulent* GONORRHOEA. The patient muſt obſerve the cooling regimen, loſe a little blood, and take ſome gentle doſes of ſalts and manna. The parts affected ought to be often bathed, or ſoaked, in warm milk and water, and, if the inflammation be great, an emollient poultice, or cataplaſm, may be applied; and by this courſe the inflammation will commonly abate, and the patient be prepared for the uſe of mercury. Symptomatic chancres are commonly accompanied with ulcers in the throat, nocturnal pains, ſcurfy eruptions about the roots of the hair, and other ſymptoms of a confirmed lues. They uſually appear upon the private parts, or the inſide of the thigh, though occaſionally in any of the parts above mentioned; and are leſs painful, but frequently much larger and harder than primary chancres: their cure depends upon that of the pox. See *Venereal* ULCERS.

The ſwelled teſticle may either proceed from infection lately contracted, or from the venereal poiſon lurking in the blood: the latter is not very common; but the former frequently happens both in the firſt and ſecond ſtages of the GONORRHOEA, particularly when the running is unſeaſonably checked by cold, hard drinking, ſtrong draſtic purges, violent exerciſe, the too early uſe of aſtringent medicines, &c. In the inflammatory ſtage bleeding is neceſſary, which muſt be repeated according to the urgency of the ſymptoms. The food muſt be light, and the drink diluting. High-ſeaſoned food, fleſh, wine, and every thing of a heating nature, muſt be avoided. Fomentations are of ſingular ſervice. Poultices of bread and milk, ſoftened with freſh butter or oil, ought alſo to be applied when the patient is in bed; and when he is up, the teſticle ſhould be kept warm, and ſupported by a bag or truſs. If this courſe fails, mercurial ointment ſhould be rubbed on the part, if free from pain, or on the thighs, and the patient muſt be confined to bed, if neceſſary, for five or ſix weeks, ſuſpending the teſticle, and ſupplying him inwardly with ſtrong decoctions of ſarſaparilla. If theſe means do not ſucceed, and there ſhould be reaſon to ſuſpect a ſcrophulous or cancerous habit, either of which may ſupport a ſcirrhous induration, after the venereal poiſon is corrected, the parts ſhould be fomented daily with a decoction of hemlock, the bruiſed leaves of which may be added to the poultice, and the extract at the ſame time taken inwardly. Fordyce aſſures us, that by this method he has cured diſeaſed teſticles of two or three years ſtanding, even when ulcerated, and when the ſcirrhus had begun to be affected with pricking and lancing pains. See SARCOCELE, and *Tumors of the* TESTICLES.

Another occaſional attendant of the *venereal diſeaſe* is the STRANGURY; which may be owing either to a ſpaſmodic conſtriction, or an inflammation of the urethra and parts about the neck of the bladder. In the former caſe, known by the patient's beginning to void his urine with tolerable eaſe, but by a ſudden conſtriction, when it touches the galled or inflamed urethra, and its being

voided by ſpirts or drops, ſuch medicines as tend to dilute and blunt the ſalts of the urine, will be proper. For this purpoſe, beſides the common diluting liquors, ſoft and cooling emulſions, ſweetened with the ſyrup of poppies, may be uſed; and if theſe do not give relief, bleeding and emollient fomentations will be neceſſary. In the latter caſe, when there are a conſtant heat and uneaſineſs about the neck of the bladder, a perpetual deſire to make water, while the patient can only diſcharge a few drops, and a troubleſome teneſmus, or conſtant inclination to go to ſtool, bleeding muſt be more liberally performed, and repeated according to the urgency of the ſymptoms. After bleeding, if the ſtrangury continues, ſoft clyſters may be adminiſtered, and emollient fomentations applied to the region of the bladder. The patient may, at the ſame time, take every four hours a tea-cup of barley-water, to a pint of which, ſix ounces of the ſyrup of marſhmallows, four ounces of the oil of ſweet almonds, and half an ounce of nitre, may be added. If, notwithſtanding theſe means, a total ſuppreſſion of urine ſhould come on, bleeding muſt be repeated, and the patient ſet to his middle in a warm bath: the diuretics ſhould be diſcontinued, and the water drawn off with a catheter, or mild bougies may be uſed. See Phimosis and Paraphimosis.

When the *venereal* poiſon is actually received, by means of the lymphatics into the blood, and, circulating with it through every part of the body, mixes with the ſeveral ſecretions, and renders the whole habit tainted, rhe diſeaſe becomes a confirmed lues. According to Boerhaave, the ſeat of the *venereal lues* is the MEMBRANA *adipoſa*.

The ſymptoms of a confirmed lues are buboes in the groin, pains of the head and joints, which are peculiarly troubleſome to the patient at night and in bed; ſcabs and ſcurf in various parts of the body, eſpecially on the head, of a yellowiſh colour, reſembling honeycomb; corroding ulcers, generally commencing about the throat, and gradually aſcending by the palate toward the cartilage of the noſe, which they deſtroy; excreſcences or exoſtoſes in the middle of the bones, and brittleneſs at their ſpungy ends, and ſometimes ſoftneſs of the bones, ſo that they bend like wax; hardneſs and calloſity of the conglobate glands, forming in the neck, arm-pits, groin, and meſentery, hard moveable tumors, like the king's evil; tumors of different kinds in the lymphatic veſſels, tendons, ligaments, and nerves, as the gummata, ganglia, nodes, tophs, &c. itching, pain, and redneſs of the eyes, and ſometimes total blindneſs; ſinging noiſe, pain, and deafneſs of the ears, together with exulceration and caries of their internal ſubſtance: at length all the animal, vital, and natural functions, are depraved; the face becomes pale and livid; the body emaciated and unfit for motion; and the miſerable patient falls into an atrophy or waſting conſumption.

Women have ſometimes ſymptoms peculiar to the ſex; as cancers of the breaſt; a ſuppreſſion or overflow of the menſes; the whites; hyſteric affections; an inflammation, abſceſs, ſcirrhus, gangrene, cancer, or ulcer of the womb: they are alſo generally barren, or ſubject to abortion; or if they bring forth children, they have an univerſal eryſipelas, are half rotten, and covered with ulcers. All theſe ſymptoms, however, are rarely to be met with in the ſame perſon, or at the ſame time. It has been obſerved, that in perſons of a thin habit, the ſymptoms and cure are worſe and more difficult to manage than in the fat and plethoric; and in children this diſorder is worſe than in adults.

The *venereal diſeaſe*, Sydenham obſerves, is communicated by copulation, lactation, handling, ſaliva, ſweat, the genital mucus, and the breath; and in whatever part it is received, it there diſcovers itſelf firſt. Thus, when the infection is received along with the milk from the nurſe, it commonly ſhews itſelf in ſoreneſs and ulcers of the mouth.

The method of cure is various, according to the various ſymptoms and ſtages: for the firſt ſtage, viz. a gonorrhœa virulenta, or clap, Dr. Pitcairn's method is this: after two or three vomits, he directs mercurius dulcis, for ſome days, twice a day; when the mouth grows ſore, let alone the mercury for three or four days, and purge every other day; as the mouth grows well again, repeat the uſe of mercury; and thus alternately, till the ſymptoms ceaſe. See Gonorrhoea.

For a confirmed lues, mercurial ſalivation produced either by FUMIGATION, or friction, or taking mercury internally, was ſome time ago held the only effectual cure: though mercurial frictions, applied in ſuch quantity, and at ſuch intervals, as not to raiſe a ſalivation, are held, by ſome, to be not only eaſier and ſafer, but even more ſucceſsful, in this diſeaſe, than ſalivation itſelf. See Salivation.

Dr. Sydenham tells us, he uſed to ſalivate immediately, without any preliminary evacuation, or preparation of the body, at all. His method was this: he preſcribes an unguent of two ounces of axung. porcin. i. e. hogslard, and one ounce of mercury; with a third part of this he orders the patient to anoint his arms and legs, for three nights ſucceſſively, with his own hands, ſo as not to touch either the arm-pits, the groin, or the abdomen. After the third unction, the gums uſually ſwell, and a ptyaliſm comes on. If it does not come in this time, he directs turbith mineral, eight grains, in conſerve of red roſes; which, occaſioning a vomiting, ſoon raiſes the ptyaliſm. And if, afterwards, the ſalivation abate before the ſymptoms have quite diſappeared, he orders it to be promoted with a freſh doſe of mercurius dulcis. The diet, and other regimen, is to be the ſame as in a catharſis.

Dr. De Sault, in his treatiſe on this diſeaſe, recommends frequent frictions with large quantities of mercurial ointment made with one-third of quickſilver; to wit, from two or three drams to an ounce, or an ounce and a half every night, or every other night, taking care to keep the belly in a purging way, by clyſters, laxatives, or the ſtronger purgatives, if the mercury begins to affect the mouth. He ſays this method is ſure, and altogether ſafe, and he relates ſeveral hiſtories of cures performed by it, not only in the *lues venerea*, but in many other diſeaſes, particularly in obſtructed hardened glands, the liver, teſtes, &c.

Mr. Douglas greatly commends De Sault's method, and it is ſaid that it has been practiſed with ſucceſs in ſome of the hoſpitals of London. See a Letter on the Cure of the *Venereal Diſeaſe*. Dr. Werlhoff prefers frequently repeated ſmall doſes of mercury to a ſalivation, for the cure of the *lues venerea*. Commerc. Norimb. 1235. Hebd. 13. ſect. 4.

Indeed, it was formerly thought impoſſible to cure a confirmed lues without a ſalivation; but this method is now pretty generally laid aſide, and mercury is found to be as efficacious, or rather more ſo, in expelling the venereal poiſon, when adminiſtered in ſuch a manner as not to run off by the ſalival glands. Various preparations of mercury have been extolled at different times, by different authors, for the cure of the *venereal* diſeaſe. Mr. Plenck of Vienna, in a treatiſe tranſlated by Dr. W. Saunders, in 1767, recommends a mixture of quickſilver and gum arabic, in preference to every other mercurial preparation (ſee Mercury); but Dr. Lewis ſays, that he has known it given, without much benefit, in caſes which were afterwards cured in a ſhort time by ſolution of ſublimate; and that in ſome of our hoſpitals, ſmaller doſes than thoſe which Mr. Plenck has preſcribed, have on the third day brought on a ptyaliſm. After all it has been found, that the moſt ſimple forms, in which it can be introduced in the ſyſtem, generally ſucceed as well as the moſt elaborate chemical preparations. Thus, an ointment or pill, prepared by triturating common quickſilver with greaſe, reſin, or mucilage, will, if uſed for a ſufficient length of time, remove the moſt obſtinate *venereal* ſymptoms, unleſs the conſtitution be ſo far deſtroyed as to render a cure impoſſible. Theſe may be uſed in the ſame manner as for the *virulent* GONORRHOEA; and if any ſymptoms of a ſalivation ſhould appear, they muſt be diſcontinued for ſome days, and a purge or two taken. It is impoſſible to determine *à priori* either the exact quantity of medicine that muſt be taken, or the time required for a cure: this is beſt judged of by the abatement and ceaſing of the ſymptoms. Aſtruc obſerves, that commonly not leſs than two ounces of the ſtrong mercurial ointment is ſufficient, and not more than three or four ounces are neceſſary. The corroſive ſublimate of mercury was ſome years ago brought into uſe for the *venereal* diſeaſe in Germany, and it was ſoon after introduced into Britain by the late ſir John Pringle. For the method of preparing and adminiſtering it, ſee *Corroſive ſublimate of* Mercury. See Obſervations and Caſes relative to the efficacy of this medicine, in London Med. Obſ. and Inq. vol. i. p. 365. vol. ii. p. 70, p. 88. 256.

Dr. Smith recommends the following conciſe method of managing a confirmed *lues venerea*. Give mercury only by way of alterative, and adminiſter it as follows: ℞ merc. calcin. gr. i. ad iii. Sulph. ant. precip. gr. ii. ad iv. Extract. Theb. gr. ß. ad gr. i. Conſ. roſar. ℞ q. s. f. bol. omn. noct. hor. decubitus ſumend. During the uſe of the mercurial bolus, the patient ſhould take half a pint of the following decoction four times a day. ℞ rad. ſarſaparil. ℥ iii. laureolæ ʒ ii. coq. ex aq. font. ℔ iii. ad ℔ ii. & cola. During the cure, he directs that the patient be kept warm, uſe a light diet, drink plenty of broth and other thin liquors, and go frequently into a warm bath.

Several roots, woods, and barks, have been recommended for curing the *venereal* disease; but though none of these can be depended upon alone, yet when joined with mercury, some of them are found to be very beneficial in promoting a cure. One of the best is SARSAPARILLA, of which a decoction may be made by slicing and bruising two ounces of the fresh root, and boiling with it one ounce of shavings of guaiacum in three quarts of water, over a slow fire, to one; adding towards the end half an ounce of sassafras wood, and three drams of liquorice, and straining the decoction. This may be either employed as an assistant to a course of mercurial alteratives, or taken after the mercury has been used for some time; and the quantity may be from a pint and a half to two quarts in the day. The following decoction is said to be similar to that used by Kennedy, in the cure of the *venereal* disease: take of sarsaparilla, two ounces; liquorice and mezereon root, of each half an ounce; shavings of guaiacum and sassafras wood, of each one ounce; crude antimony, powdered, an ounce and a half: infuse these ingredients in eight pints of boiling water for twenty-four hours; then boil them, till one half of the water is consumed, and strain the decoction, which may be used in the same manner as the preceding. See an attempt to discover the virtues of the sarsaparilla root in the *venereal* disease, by Mr. W. Fordyce, in Lond. Med. Obs. and Inq. vol. i. p. 149, &c.

The mezereon root is likewise found to be a powerful assistant to the sublimate, or any other mercurial. It may be either used, as above directed, along with the sarsaparilla, or in the manner prescribed under SPURGE-*laurel*. The natives of America, it is said, cure the *venereal* disease in every stage by a decoction of the root of a plant called LOBELIA, which is used either fresh or dried; the patient takes a large draught of the decoction early in the morning, and continues to use it for his ordinary drink through the day: they wash the ulcers with the same decoction, and dry them with the pulverized root of the *geum floribus nutantibus*, or aquatic HERB *bennet*, with nodding flowers. Kalm informs us, that they sometimes use a decoction of the root of CEANOTHUS, to which they sometimes join that of the *rubus caule aculeato*.

Dr. Cheyne, in his English Malady, affirms the sufficiency of a total milk and seed diet, strictly adhered to, for the certain cure and eradication of this distemper in all its stages.

We may observe, that the Peruvian bark is a necessary addition in all cases where the patient's strength is diminished, where inflammation attends, and where there are œdematous swellings. Moreover, the condition of a patient should be considered previous to his entering upon a course of mercury. It would be rash and dangerous to administer mercury to a person labouring under any violent acute disease; as a putrid fever, pleurisy, peripneumony, or the like; and also in some chronic cases, as a slow hectic fever, or the last stage of a consumption; though if these diseases proceed from a confirmed lues, mercury will be necessary. Mercury ought not to be administered to women during the menstrual flux, or when the period is near at hand; neither should it be given in the last stage of pregnancy: however, if the woman be not near the time of her delivery, mercury may be given in smaller doses, and at greater intervals than usual. In the London Med. Obs. and Inq. vol. ii. p. 256, &c. we have two instances of pregnant women cured of the *lues venerea* by the solution of corrosive sublimate in French brandy, taken inwardly, and washing the *venereal* warts with the same solution; together with the subsequent use of the decoction of sarsaparilla. Mercury should be administered to infants, and also to aged persons, with great caution; and also to hysteric and hypochondriac persons, and such as are subject to an habitual diarrhœa or dysentery, or to frequent and violent attacks of the epilepsy, or who are afflicted with the scrophula or the scurvy.

The most proper seasons for entering upon a course of mercury are the spring and autumn; at other times, the warmth of the patient's chamber should be adapted to the season of the year. Bleeding, and repeated purges, should also be recommended, previous to the administration of mercury, and when convenient the patient should bathe once or twice a day, for a few days, in lukewarm water; his diet should be light, moist, and cooling; and he should carefully avoid wine, and all heating liquors, violent exercise, and great exertions of mind. During a course of mercury, a proper regimen is of great importance; for a much less quantity of mercury will be sufficient for the cure of a person who lives low, keeps himself warm, and avoids all manner of excess, than that of such as cannot restrain their appetites. Cleanliness is also of peculiar moment: to this purpose Dr. Gilchrist has given an account of a species of the *lues venerea* which prevails in the west of Scotland, called by the natives *sibbins* or *sivvins*, the spreading of which is chiefly owing to neglect of cleanliness; and he seems to think, that by due attention to this circumstance it might be extirpated. The treatment of this disease is similar to that of a confirmed lues or pox; and the YAWS, a disease which is now very common both in America and the West India islands, may also be cured in the same manner.

When the *venereal* disease has been neglected, or improperly treated, it often becomes a disorder of the habit: in which case, the cure must be attempted by restoratives, as a milk diet, the decoction of sarsaparilla, and such like, to which mercury may be occasionally added. In the cure of this disease, the patient should never leave off taking medicines immediately upon the disappearing of the symptoms, but continue them for some time after, gradually lessening the quantity, till it is entirely eradicated. It does not appear from observation, that the most robust constitution is able to overcome the virulence of the *venereal* contagion, after it has got into the habit: in this case, a proper course of medicine is always indispensably necessary.

Although it is impossible, says Dr. Buchan, to lay down fixed and certain rules for the cure of this disease, yet the following general plan will always be found safe, and often successful; viz. to bleed and administer gentle purges, with diuretics, during the inflammatory state, and as soon as the symptoms of inflammation are abated, to administer mercury, in any form that may be most agreeable to the patient. The same medicine, assisted by the decoction of sarsaparilla, and a proper regimen, will not only secure the constitution against the farther progress of a confirmed pox, but will generally perform a complete cure. Buchan's Dom. Med. chap. xlvii. See GRANDGOR.

VENERIS *æstrum, the stimulus or incentive of venery*, is an appellation given, by some anatomists, to the CLITORIS.

VENERIS *æstrum* is also used, by others, for the transport of love, or the utmost ecstasy of desire or enjoyment in coition.

Some are of opinion, that infectious women are the most apt to communicate the poison when they are thus excited with desire; whereas, with indifference, they may admit the same intercourse, without giving the infection.

VENERIS *ens*. See ENS.

VENERY is used for the act of copulation, or coition, of the two sexes.

It takes its name from *Venus*, the supposed deity of the passion of love.

VENERY also denotes the arts or exercise of hunting wild beasts; which are also called *beasts of venery*, and *beasts of the forest*.

Such are the hare, hart, hind, boar, and wolf. See BEAST, GAME, and HUNTING.

VENETA *bolus*, a fine red earth used in painting, and called in the colour-shops *Venetian red*. See RED.

It is improperly denominated a bole, being a genuine species of red ochre. It is of a fine bright, and not very deep red, approaching, in some degree, to the colour of minium, or red-lead, and is moderately heavy, and of an even and smooth texture, yet very friable, and of a dusty surface: it adheres firmly to the tongue, is very smooth, and soft to the touch, easily crumbles to pieces between the fingers, and very much stains the skin in handling. It has a slight astringent taste, effervesces considerably with aqua fortis, and in water immediately breaks into a fine powder.

It is dug in Carinthia, and sent from Venice into all parts of the world, being an excellent colour, and very cheap; our colour-men, however, find too many ways of adulterating it. Hill, and Da Costa.

VENEW. See VENUE.

VENGOLINA, in *Ornithology*, an African bird, which seems not to have been described by any of the ornithologists. According to the hon. Daines Barrington's account, it is of the *finch* tribe, and about the same size with our aberdavine, or siskin; the colours are grey and white, and the cock hath a bright yellow spot upon the rump; it is a very familiar bird, and sings better than any of those which are not European, except the American mocking-bird. Phil. Trans. vol. lxiii. part ii. p. 254.

VENIA, among our *Ancient Writers*, denotes a kneeling, or low prostration, to the ground; used by penitents. See GENUFLEXION.

Walsingham, p. 196. *Rege interim prostrato in longa venia. Per* venias, *centum verrunt barbis pavimentum.*

VENIAL, a term in the Romish *Theology*, applied to slight sins, and such as easily obtain pardon.

in confeſſing to the prieſt, people are not obliged to accuſe themſelves of all their *venial* ſins. The thing that gives the greateſt embarraſs to the Romiſh caſuiſts is, to diſtinguiſh between *venial* and mortal ſins. See Popery.

The reformed reject this diſtinction of *venial* and *mortal* ſins; and maintain, that all ſins, how grievous ſoever, are *venial*; and all ſins, how ſlight ſoever, may be mortal; and the reaſon they urge is, that all ſins, though of their own nature mortal, yet become *venial*, or pardonable, by virtue of our Saviour's paſſion, to all ſuch as fulfil the conditions on which it is offered in the Goſpel. To which the Romaniſts anſwer, that the chief of theſe conditions is confeſſion.

VENIRE *facias*, in *Law*, is a judicial writ, lying where two parties plead, and come to iſſue; directed to the ſheriff, to cauſe twelve men, of the ſame neighbourhood, to meet to try the ſame, and recognize the truth upon the iſſue taken.

Afterwards a compulſive proceſs is awarded againſt the jurors, called *habeas corpora juratorum*, or *diſtringas*, that they may appear upon the day appointed. See Jury.

Venire *facias* is alſo the name of a writ, which is the proper proceſs in an indictment for any petty miſdemeanor, or on a penal ſtatute, and which is in the nature of a ſummons, to cauſe the party to appear. And if by the return to ſuch *venire* it appears, that the party hath lands in the county whereby he may be diſtrained, then a *diſtreſs infinite* ſhall be iſſued from time to time till he appears. But if the ſheriff returns that he hath no lands in his bailiwick, then, upon his non-appearance, a writ of *capias* ſhall iſſue; and if he cannot be taken upon the firſt *capias*, a ſecond and a third ſhall iſſue, called an *alias*, and a *pluries capias*.

Venire *facias tot matronas*. See Ventre *inſpiciendo*.

VENISON, *venaiſon*, the fleſh of beaſts of game, or of animals to be caught in the way of game, i. e. by hunting, &c. as deer, hare, &c.

The word is French, *venaiſon*; formed of the Latin *venatio, hunting*.

The old huntſmen have determined, that every beaſt of the foreſt, that is food for man, is *veniſon*. In many parts of the world the bears are as regularly hunted as the hare and buck, &c. are with us, and there are called *veniſon*; but with us, at preſent, the word *veniſon* ſeems limited to the fleſh of the hart, the hind, the buck, the doe, and the other creatures of that kind.

Some have extended the ſignification of the word to the beaſts of the foreſt which were chaſed as game, and afforded the diverſion of hunting, whether their fleſh were eaten or not: thus, in ſome places, the wolf and the fox are reckoned among the *veniſon* beaſts.

VENOM, *venenum*. See Poison.

The terms *venom* and *poiſon* only differ from each other in this, that the latter is more frequently uſed where the noxious matter is taken inwardly, as in foods, drinks, &c. and the former, where it is applied outwardly, as in ſtings and bites of ſerpents, ſcorpions, vipers, ſpiders, &c.

The pike is ſaid to have a *venomous* tooth. All *venomous* beaſts, in the general, have that quality in a greater degree, when bred in mountainous and dry places, than when in wet and marſhy places; and the ſouthern more than the northern; thoſe hungry and enraged, more than others; and all of them in ſummer more than winter. See Viper.

VENOSA *arteria*. See Arteria *venoſa*.

VENOSE *leaf*, *venoſum folium*, among *Botaniſts*. See Leaf.

VENOUS, *venoſus*. See Venal.

VENT, formed from *ventus*, *wind*, *vent-hole*, or *ſpiracle*, a little aperture left in the tubes or pipes of fountains, to facilitate the air's eſcape; or, on occaſion, to give them air; as in froſty weather, &c. for want of which they are apt to burſt.

A *vent*, taken in this ſenſe, is properly the end of a pipe, placed erect, and reaching above the ground; uſually ſoldered to the turns, or elbows, of pipes. The *vents* of large pipes are to be as high as the ſuperficies of the reſervoir, unleſs there be a valve in them.

Vent is alſo uſed for a little hole, pierced in veſſels of wine, beer, &c. that are on tap; and which admits air enough to make the liquor run, but not ſo much as to corrupt and ſpoil it.

Vent, again, is applied to the covers in wind-furnaces, whereby the air enters, which ſerves them for bellows; and which are ſtopped with regiſters, or ſlices, according to the degree of heat required: as in the furnaces of glaſs-houſes, aſſayers, &c.

Vent is alſo uſed for a pipe of lead, or other matter; one end whereof opens into the cell of a neceſſary-houſe, and the other reaches to the roof of the houſe, to give room for the corrupt fetid air to exhale.

There are alſo *vents*, or apertures, made in the walls which ſuſtain terraſſes, to furniſh air, and give a paſſage for the waters.

This kind of *vent* the Italians, and we from them, call a *barbacane*.

Vent, in *Gunnery*. See Touch-*hole*.

The common method of placing the *vent* is within about a quarter of an inch from the bottom of the chamber or bore. Some, however, have thought, that if the *vent* was to come out at the middle of the charge, the powder would be inflamed in leſs time than in any other caſe; but Mr. Muller, by firing mortars with two vents, one at the bottom, and the other in the middle, and ſo contrived that one was ſhut whilſt the other ſerved to fire, found always the range of the ſhell greater when the lower *vent* was uſed, than when the powder was fired by the middle one. Artillery, p. 83.

Mr. Thompſon has lately made a number of experiments, in order to determine the beſt poſition of the *vent*; from the reſult of which it appears, that the effect of placing the *vent* in different poſitions with reſpect to the bottom of the chamber is different in different charges; but the difference in the force exerted by the powder, which aroſe from the particular poſition of the *vent*, was in all caſes ſo inconſiderable, as to afford occaſion for concluding, that any given charge of powder exerts nearly the ſame force, whatever is the poſition of the *vent*. He infers, upon the whole, that in the formation of fire-arms no regard need be had to any ſuppoſed advantages that gunſmiths and others have propoſed to derive from particular ſituations for the *vent*: ſuch as diminiſhing the recoil, increaſing the force of the charge, &c. but the *vent* may be indifferently in any part of the chamber where it will beſt anſwer upon other accounts; and he thinks there is little doubt but the ſame thing will hold good in great guns, and all kinds of heavy artillery. Workmen in general agree, that the *vent* in fire-arms ſhould be as low or far back as poſſible, in order, as they conceive, to leſſen the recoil: accordingly ſome make the bottom of the chamber flat, and bring the *vent* out even with the end of the breech-pin; others make the *vent* ſlanting through the breech-pin, in ſuch a manner as to enter the bore juſt in its axis; others again make the bottom of the chamber conical; and there are thoſe who make a little cylindric cavity in the breech-pin, of about two-tenths of an inch in diameter, and near half an inch in length, coinciding with the axis of the bore, and bring out the *vent* even with the bottom of this little cavity.

The objection to the firſt method is, that the *vent* is apt to be ſtopped up by the foul matter that adheres to the piece after firing, and which is apt to accumulate, eſpecially in damp weather. The ſame inconvenience in a greater degree attends the other methods, with the addition of another, ariſing from the increaſed length of the *vent*; for the *vent* being longer, is not only more liable to be obſtructed, but it takes a longer time for the flame to paſs through it into the chamber; in conſequence of which the piece is ſlower in going off, or, as ſportſmen term it, is apt to hang fire. Mr. Thompſon propoſes, that the bottom of the bore ſhould be in form of a hemiſphere; and that the *vent* ſhould be brought out directly through the ſide of the barrel, in a line perpendicular to its axis, and pointing to the centre of the hemiſpheric concavity of the chamber. In this caſe the *vent* would be the ſhorteſt poſſible; it would be the leaſt liable to be obſtructed, and the piece would be more eaſily cleaned. Similar advantages, he apprehends, would be gained by making the bottom of the bore and *vent* of great guns in the ſame manner. Phil. Tranſ. vol. lxxi. part ii. p. 272, &c.

From a variety of experiments made by order of the king of Pruſſia in 1765 and 1766, it appears, that the concave chamber produced the greateſt ranges, and that the bottom of the chamber is the beſt place for the *vent*.

Vent-*aſtragal*, is that part of a gun or howitz which determines the *vent-field*.

Vent-*field* is the part of a gun or howitz between the breech mouldings and the aſtragal.

Vent, *port*. See Port-*vent*.

VENTAROLI, a name given in Sicily, &c. to grottoes formed under their houſes, from which iſſues a conſtant extreme cold wind, and at times with impetuoſity, and a noiſe like water daſhing upon rocks. Theſe are ſhut up with doors like cellars, and made uſe of as ſuch, as alſo to keep proviſions freſh, and to cool liquors. At Ceſi, in the Roman ſtate, there are many ſuch *ventaroli*; and the inhabitants of that town, by means of leaden pipes, conduct the freſh air from theſe into the rooms of their houſes, ſo that by turning a cock they can cool them to any degree. Some who have refined ſtill more upon this luxury, by ſmaller pipes, bring cold air under the dining table, ſo as to cool the bottle of liquor upon it. On

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mount Ætna and Vesuvius, and in the island of Ischia, there are many caverns of this kind. Phil. Trans. vol. lxx. part i. p. 73.

VENTER, *belly*, in *Anatomy*, a cavity in the body of an animal, containing viscera, or other organs, necessary for the performance of divers functions.

Physicians divide the human body into three *venters*, regions, or cavities: the first, the HEAD, containing the brain, &c.

The second, the BREAST, or THORAX, as far as the diaphragm, containing the organs of respiration.

The third, which is what we more commonly call the *venter*, or *belly*, is that wherein the intestines and the organs of generation and digestion are contained; this is called, by anatomists, the ABDOMEN.

VENTER, or *belly*, is also popularly used for the exterior part of the lower *venter*. In which sense we say, the navel is in the middle of the *venter*, &c.

VENTER is also used for the ventricle, or STOMACH; because that part is enclosed in the cavity thereof. In this sense it is, that Jonah is said, in Scripture, to have been three days in the whale's *venter*, or belly.

VENTER is also used for the womb, or uterus, of women. And hence the writ *de* VENTRE *inspiciendo*.

Hence, also, in the civil law, we say, *partus sequitur ventrem*, the child follows the belly; meaning, that its condition is either free or servile, according to that of its mother.

They also say, to *appoint a curator for the belly*, with regard to posthumous children, yet in the mother's womb.

With regard to princes, the *venter*, or belly, has been sometimes crowned in form.

VENTER is also used, in speaking of a partition of the effects of a father and mother, among children born, or accruing, from different marriages.

This partition is so ordered, as that a single child of one marriage, or *venter*, takes as much as several of another marriage, or *venter*: in order to which, the estate is divided into so many parts as there have been *venters*, or marriages.

VENTER, or *belly*, of a muscle. See BELLY *of a muscle*.

VENTER *draconis*, *dragon's belly*, in *Astronomy*. See *Dragon's* BELLY. See also DRAGON, in *Astronomy*.

VENTER *equi*, *horse's belly*, among *Chemists*, denotes horse-dung, or a dunghill, whereon are enclosed certain vessels for particular operations, to be performed by means of the gentle heat thereof.

VENTIDUCTS, in *Building*, are spiracles, or subterraneous places, where fresh cool winds, being kept, are made to communicate, by means of tubes, funnels, or vaults, with the chambers, or other apartments of a house, to cool them in sultry weather.

These are much in use in Italy, where they are called *ventidotti*. Among the French they are denominated *prisons des vents*, and *palais d'Eole*. See VENTAROLI.

VENTILATOR, a machine by which the noxious air of any close place, as an hospital, gaol, ship, chamber, &c. may be discharged and changed for fresh.

The noxious qualities of bad air have been long known; and no one has taken greater pains to set the mischiefs arising from foul air in a just light than Dr. Hales; who has also proposed an easy and effectual remedy by the use of his *ventilators*; his account of which was read to the Royal Society in May 1741. In the November following M. Triewald, military architect to the king of Sweden, informed Dr. Mortimer, secretary to the Royal Society, that he had in the preceding spring invented a machine for the use of his majesty's men of war, in order to draw out the bad air from under their decks, the least of which exhausted 36172 cubic feet of air in an hour, or at the rate of 21732 tons in twenty-four hours. In 1742 he sent one of them, formed for a sixty-gun ship, to France; which was approved of by the Royal Academy of Sciences at Paris; and the king of France ordered all the men of war to be furnished with the like *ventilators*.

The *ventilators* invented by Dr. Hales consist of a square box ABCD (*Tab.* IV. *Pneumatics*, *fig.* 64.) of any size; in the middle of one side of this box a broad partition, or midriff, is fixed by hinges X, and it moves up and down, from A to C, by means of an iron rod ZR, fixed at a proper distance from the other end of the midriff, and passing through a small hole in the cover of the box up to R. Two boxes of this kind may be employed at once, and the two iron rods may be fixed to a lever FG (*fig.* 65.) moving on a fixed centre O; so that by the alternate raising and pressing down of the lever FG, the midriffs are also alternately raised and depressed, whereby these double bellows are at the same time both drawing in air, and pouring it out through apertures with valves made on the same side with, and placed both above and below the hinges of the midriffs. In order to render the midriffs light, they are made of four bar lengthwise, and as many across them breadthwise, the vacant spaces being filled up with thin pannels of fir-board; and that they may move to and fro with the greater ease, and without touching the sides of the boxes, there is an iron regulator fixed upright to the middle of the end of the box AC (*fig.* 64.) from N to L, with a notch cut into the middle of the end of the midriff at Z, so that the midriffs, in rising and falling, suffer no other friction than what is made between the regulator and the notch. Moreover, as the midriff ZX moves with its edges only one twentieth of an inch from the sides of the box ABCDFE, very little air will escape by the edges, and, therefore, there will be no need of leathern sides as in the common bellows. The end of the box at AC is made a little circular, that it may be better adapted between A and C to the rising and falling midriff; and at the other end X of the midriff a slip of leather may be nailed over the joints, if needful. The eight large valves, through which the air is to pass, are placed at the hinge-end of the boxes BK (*fig.* 65.) as at 1, 2, 3, &c. The valve 1 opens inward to admit the air to enter, when the midriff is depressed at the other end, by means of the lever FG. And at the same time the valve 3 in the lower *ventilator* is shut by the compressed air which passes out at the valve 4. But when that midriff is raised, the valve 1 shuts, and the air passes out at the valve 2. And it is the same with the valves 5, 6, &c. of the other box; so that the midriffs are alternately rising and falling, and two of the *ventilators* drawing in air, and two blowing it out; the air entering at the valves 1, 3, 6, 8, and passing out at the valves 2, 4, 5, 7. Before these last valves there is fixed to the *ventilators* a box QQNM (*fig.* 66.) as a common receptacle for all the air which comes out of these valves; which air passes off by the trunk P, through the wall of a building.

For a farther account of this machine we refer to the author himself, who gives a full detail of it, and of its manner of working. See Description of *Ventilators*, by Stephen Hales, D. D. Lond. 1743. 8vo.

The doctor has shewn the use of his *ventilators* very fully. As to ships, in particular, he observes, that the wind-sail, made use of at sea to introduce fresh air between decks, is far from being sufficient for that purpose; nor can it be used with equal safety to the sick, and those who are sleeping, by means of the strength of the wind which conveys the air with too much violence. But when the foul air is carried off by means of *ventilators*, notwithstanding the great velocity with which they throw out the air, which they may do at the rate of sixty tuns in a minute, yet the motion of it downwards into the hold, to supply what is carried off, is so very gentle, that it cannot be perceived; because the sum of all the open passages for it through the deck exceeds the opening of the trunk of the *ventilator*, in so great a proportion as 100 to 1, or more. Besides, in a calm the wind-sail can do little or no good; nor when the ship is under sail, at which time the wind-sail is not used. And it is to be observed, that it is not the *ventilating* of a ship now and then with a wind-sail, when wind and weather serve, that will suffice; it ought to be done daily, if due regard be had to the health of the ship's crew. The great quantity of rancid noxious vapours, which are incessantly exhaling from a number of living human bodies, the stench that incessantly arises from the bilge water, and from the hot, stagnant, putrid air in the hold, makes it very adviseable to refresh so bad an air continually, either with the wind-sail, when that can be properly used, or else with *ventilators*, which are intended to supply the defects of the wind-sail.

Ventilators must also be of particular service in new ships, which are observed to be more unhealthy, on account of a greater quantity of sappy wreak which arises from new timber, and makes the confined air the more unwholesome.

They will also be an effectual preservative of horses in transports, where they are sometimes suffocated, when in a storm there is a necessity to shut the hatches down.

These *ventilators* will also drive out of the hold of a ship that dangerous vapour which arises from corn, which is so noxious, that sometimes they dare not venture into the hold, till after the hatches have been opened for some time.

Ventilation will not only be of service to preserve several kinds of goods, but also the timbers and planks of the hold itself, when laid up in ordinary, as well as when in use, and will make the air in the hold less noxious, though it will still be offensive to the smell, by reason of the bilge water. But this may be made less offensive, by often letting in sweet water from the sea, and then pump-

ing it out; which good practice ought to be continued, notwithſtanding the uſe of the *ventilators*.

What is here ſaid of the foul air of ſhips may be applied to that of mines, gaols, workhouſes, barracks, and hoſpitals. In mines, *ventilators* may guard againſt the ſuffocations, and other terrible accidents ariſing from DAMPS. The air of gaols has been often known to be infectious; and we had a fatal proof of this, by the accident that happened ſome years ago at the ſeſſions at the Old Bailey. To guard againſt the like for the future, as well as to preſerve the health of the priſoners, a worthy magiſtrate, in 1752, had *ventilators* placed in Newgate, which were wrought by a windmill; and in the beginning of the year 1753, Dr. Hales gave an account of the good ſucceſs attending the uſe of theſe machines, by a remarkable decreaſe in the uſual mortality and ſickneſs of that place.

Although the old priſon at Newgate is now taken down, and a much more commodious one erected near the ſame ſpot, it may not be improper to give a brief account of the manner in which the *ventilators* of Dr. Hales were conſtructed, and how they were moved by the windmill annexed to them. The midriffs *hh* (*fig.* 67.) of theſe two *ventilators*, two pair of which were laid upon one another, were each nine feet long, and four and a half wide, and moved up and down by the flat iron rods *ef*, paſſing through the lower and upper *ventilators*, and through an iron plate at *z*, about three inches ſquare; over which is another broader iron plate, with a wide hole in its middle, to give room for the iron rod at *g* to move ſideways to and fro, with the under plate, the hole of which exactly fits the iron rod, ſo that no air can eſcape at *g*; and there are the like plates at *i*, the top of the *ventilator*; and at *f*, *g* are joints, where the iron rods are fixed to the midriffs, by which means both are moved up and down at the ſame time; and the iron rods of both ſides of the *ventilators* being fixed to one common lever at *ee*, all the four midriffs are thereby alternately worked up and down at the ſame time. The valve-holes *v v x x*, &c. are twenty-three inches long, and ſix and a half wide, covered with buckram glued on them, and move on liſts of tanned ſheep-ſkin, and fall on liſts of woollen cloth nailed round the valve-holes. A very large noſe (*fig.* 68.) is fixed with iron hooks *kk* to the *ventilators ll*; and this noſe is divided into three ſpaces, the middle and largeſt of which, *mm*, receives all the foul air blown into it from the eight middle valves *x x x x* (*fig.* 67.), whence it paſſed through a trunk *tt*, ſixteen inches wide, through the leads of the priſon, into the open air; the top of this trunk being covered with weather-boards to keep the rain out, and the middle valves hanging ſo as to open outwards. The two other outer ſpaces of the noſe *pp* receive the foul air, drawn into them, from the ſeveral wards, through the trunks *pp*, and paſſing off into the *ventilators*, through the eight outer valve-holes *vvvv*, whoſe valves open inwards. In theſe outer partitions of the noſe there are two holes at *zz* (*fig.* 68.) covered with boxes, in the bottom of each of which there is a large moveable valve, opening upwards, and towards the *ventilators*: theſe are made of ſuch a weight, as to open only when all the trunks to the ſeveral wards are ſhut; whereby the *ventilators* will always be ſupplied with air, ſo as not to endanger the breaking of the midriffs for want of it. Theſe *ventilators*, about eighteen inches deep in the clear, were fixed in an upper room of Newgate, in order to be near the windmill on the leads, which worked them. From each of the outer noſtrils there went a trunk, twelve inches in the clear withinſide, and from theſe trunks, which deſcended through all the floors as far as a little below the cieling of the ground rooms, leſſer trunks, ſix inches ſquare within, branched off, near the cieling of every room; and extended more or leſs into the ſeveral wards; ſo that when the foul air was drawn out of any ward, the freſh air might enter on the oppoſite ſide, and drive out all the foul air before it. By other contrivances with ſliding ſhutters and handles, the ſeveral wards might be ventilated at ſuch a time, or in ſuch a degree, as was found neceſſary. In the caſe of a priſon that is built with an open area in the middle, Dr. Hales obſerves, that the ſide of the priſon which is oppoſite to the ſide where the *ventilators* are, may be commodiouſly ventilated in its turn, by having a round brick air-gutter under ground; through which the foul air of theſe wards might eaſily be drawn.

The windmill for working the *ventilators* was contrived to move with a ſmall degree of wind, and to obtain a ſufficient power in a ſmall compaſs. In *fig.* 69. *c* is one of the croſs-trees which ſupport the mill-poſt *d* and the braces *ee*; the croſs-trees reſt on the blocks *a*, *a*, and are fixed to the floor by ſtrong iron bolts. The mill-poſt *d*, being hollow, admits the iron rod *b* to paſs through from the crank of the iron axle-tree *i*; the turning frame *gn* moves on the girdle *f*, on which lies a broad circular iron plate, where is the bearing of the braſs friction-wheels, whoſe iron axle-trees move in braſs collars: the turning frame *gn* carries the axle-tree *ii*, and the ſails *lk*, which are turned ſo as always to face the wind, by the vane *h*; the frame is kept from wracking by iron braces *qr*, repreſented by the double pricked lines. The crank *z* is ſix inches and a half long, and therefore gives a ſtroke of thirteen inches; but the lower end of the rod *x* is fixed to the lever of the *ventilator* (*fig.* 67.) at ſuch a diſtance from the centre of its motion, as to raiſe and fall the midriffs fifteen inches. The iron axle-tree extends forward, about two feet and a half beyond the face of the ſails; from the extremity of which, *s*, eight iron braces, *ll*, go to each arm, to which they are faſtened by iron ſcrew-bolts, which bind them and the iron circle of pricked lines *mm* (*fig.* 70.) faſt together; the diameter of this circle is ſix feet, and the ſweeps or arms of the mill *kk* are ſeven feet three inches long, and they are mortifed into the drum *yy*. A void ſpace of about ſix inches breadth is left between the ſails, as repreſented in the figure, that the direct current of the wind, as it paſſed through, might give a turn to the courſe of the wind; which otherwiſe, being driven obliquely from the face of the preceding ſail, would be forced to act on the back of the following ſail, and thereby abate the force, and retard the motion of the mill. The brake-pole (*fig.* 69.) is *n*; and the ſingle pricked line *t* at the end of it is the ſword which is to claſp round the nave to ſtop the mill, by pulling the rope *w*: *oo* is the bottom ſheer-tree of the turning frame; and *p* expreſſes the manner of ſcrewing the braſs collars of the axle-tree nearer and nearer, as they wear away. For a farther account of this machine, ſee Hales's Treatiſe of *Ventilators*, part ii. 1758, p. 32, &c.

Dr. Hales farther ſuggeſts, that *ventilators* might be of uſe in making ſalt, in order to which there ſhould be a ſtream of water to work them, or they might be worked by a windmill, and the brine ſhould be in long narrow canals, covered with boards or canvas, about a foot above the ſurface of the brine, in order to confine the ſtream of air, ſo as to make it act upon the ſurface of the brine, and carry off the water in vapours. Thus it might be reduced to a dry ſalt, with a ſaving of fuel, in winter and ſummer, or in a rainy or dry ſtate of the air. *Ventilators*, he apprehends, might alſo ſerve for drying linen hung in low, long, narrow galleries, eſpecially in damp, rainy weather, and alſo in drying woollen cloths, after they are fulled or dyed, and in this caſe they might be worked by the fulling water-mill. *Ventilators* might alſo be an uſeful appendage to malt and hop-kilns; in which caſe it would be beſt to have the air-trunk enter the kiln about eighteen or twenty-four inches from the ground, and juſt oppoſite to the fire; but in order to prevent the air's blowing too ſtrongly on the fire, a ſkreen of brick-work might be formed about a yard diſtant from the hole of the air-trunk, and a yard ſquare; for thus the air from the *ventilators* would be better diffuſed through the whole kiln.

Dr. Hales is alſo of opinion, that a ventilation of warm dry air from the adjoining ſtove, with a cautious hand, might be of ſervice to trees and plants in green-houſes; where it is well known that an air full of the rancid vapours, which perſpire from the plants, is very unkindly to them, as well as the vapours from human bodies are to men. For freſh air is as neceſſary to the healthy ſtate of vegetables, as of animals.

The larger kinds of *ventilators*, uſed by the doctor, are ten feet long, five feet broad, and two feet high, in the clear within. Thoſe he uſed by way of experiment on board the Captain, a ſeventy-gun ſhip, were ten feet long, four feet three inches wide in the clear within, and thirteen inches deep; one inch of which being occupied by the midriff, there remained a foot depth for it to riſe and fall in. A *ventilator* of theſe dimenſions will, through a trunk of a foot ſquare, drive the air at the rate of twenty-five miles in an hour, which is double of what Mariotte aſſigns for the velocity of a pretty ſtrong WIND.

But beſides theſe large *ventilators*, the doctor made a ſmaller ſort, four feet in length, ſixteen inches in breadth, and thirteen inches deep, all in the clear within. This ſmaller *ventilator* may be very uſeful in preſerving the bread, in the bread-room of a ſhip, ſweet and dry. Peaſe alſo, and oatmeal, which are apt to heat and ſpoil in caſks, may be preſerved, by putting them into a large bin, with a falſe bottom of hair-cloth laid on bars, whereby freſh air may be blown upwards through them with theſe ſmall *ventilators*.

Ventilators are alſo of excellent uſe for the drying of corn, hops, and malt. See GRANARY.

Gunpowder may be thoroughly dried, by blowing air up through it by means of *ventilators*.

What advantage dry gunpowder has over that which is damp, may be seen by the experiment mentioned in the article GUNPOWDER.

These small *ventilators* will also serve to purify most easily, and effectually, the bad air of a ship's well, when there is occasion for persons to go down into it, by blowing air through a trunk, reaching within a yard of the bottom of the well, both for some time before, and during their stay there. They may be also made use of at sea to sweeten stinking water, &c. See *Sea*-WATER. Dr. Hales made also several trials for curing ill-tasted milk by ventilation.

For these and other uses to which they might be applied, as well as for a particular account of the construction and disposition of *ventilators* in ships, hospitals, prisons, &c. and the benefits attending them, see Hales's Treatise on *Ventilators*, part 2. passim; and Phil. Trans. vol. xlix. p. 332, &c.

The *ventilators* in large ships, since the order for ventilating the fleet, issued by the lords of the admiralty in 1756, are fixed in the gunner's fore-store-room, and generally a-head of the sail-room. The foul air is carried up through the decks and fore-castle, near the fore-mast, sometimes afore it, and sometimes abaft it, but more frequently on its starboard side; the lever, by which the *ventilators* are worked, is under the fore-castle in two-deck ships, and between the upper and middle decks in three-deckers; sometimes the lever is hung athwart ships; in some ships afore and aft; and in others oblique. The iron rod, which communicates the motion from the lever, passes through the partners of the fore-mast, and is connected with another lever, suspended at or near the middle; in some ships over the *ventilators*; in others under them, when it is found necessary to fix them up to the deck. The best method to save room is to place the *ventilators* over one another, with their circular ends together; the air-trunk should be so high above deck, that the men on deck may not be incommoded by the foul air which blows out of it; and therefore the trunk comes through the upper deck, near and behind the fore-mast. Dr. Hales has calculated the following table for the sizes of *ventilators*, &c. adapted to ships of war.

	Guns.	Feet.	Inch.	Feet.	Inch.	Feet.	Inch.	Inches.
Three decks.	100	10	0 long	4	6 broad	2	0 deep	Trunk 12 square
	90	Ditto		Ditto		1	10	11½
	80	Ditto		Ditto		1	8	11
	70	Ditto		Ditto		Ditto		Ditto
	60	Ditto		Ditto		Ditto		Ditto
	50	9	0	4	3	1	6	10
	40	8	6	4	0	Ditto		9½
	20	8	0	Ditto		Ditto		9

The construction of twenty-gun ships being various, the sizes of *ventilators* for these must be left to the direction of the officers of the yard.

When the hold is to be ventilated from one end to the other, the three doors of the gang-way into the gunner's store-room must be opened, and all the gratings on the gun-deck be covered with tarpaulins, leaving all doors open whose rooms want ventilation, on the orlop and the steward-room hatch. But when it is thought proper to ventilate between decks, then the doors of the gang-way into the gunner's store-room must be shut, and the scuttle in the headmost trunk or pipe upon the gun-deck must be opened, and all the gratings of the middle deck, if the ship be a three-decker, or of the upper deck, if it be a two-deck ship, be laid with tarpaulins; and, if possible, one of the stern-posts opened, or the aftermost hatch-way, or a scuttle on purpose, through the deck, as near the stern as possible. Hales's Treat. part ii. p. 97, &c.

The method of drawing off air from ships by means of fire-pipes, which some have preferred to *ventilators*, was published by sir Robert Moray in the Phil. Trans. for 1665. These are metalline pipes, about two inches and a half in diameter, one of which reaches from the fire-place to the well of the ship; the other three branches go to other parts of the ship; the stoke-hole and ash-hole being closed up, the fire is supplied with air through these pipes. The defects of these, compared with *ventilators*, are particularly examined by Dr. Hales, ubi supra, p. 113. See *Air*-PIPE and SHIP.

Mr. Erasmus King proposed to have *ventilators* worked by the fire-engines, in mines; and Mr. Fitzgerald has suggested an improved method of doing this, which he has also illustrated by figures. See Phil. Trans. vol. l. p. 727, &c.

There are various ways of ventilating the air of rooms: Mr. Tidd contrived to admit fresh air into a room, by taking out the middle upper sash-pane of glass, and fixing in its place a frame box, with a round hole in its middle, about six or seven inches diameter; in which hole are fixed, behind each other, two or three small twirling windmills, with sails of very thin broad copper-plates, which spread over and cover the circular hole, so as to make the air which enters the room to spread round in thin sheets sideways; and thus not to incommode persons, by blowing directly upon them, as it would do if it were not hindered by the sails, which turn on the same axle-tree, each less than the other. See ÆOLUS. This method of refreshing rooms is much approved of, and used by many, not only in England, but also in other countries. For other methods of ventilating ships, buildings, rooms, &c. see AIR-*chamber*, BELLOWS, *Air*-PIPE, *Centrifugal* WHEEL, and WIND-*sail*.

VENTININA, a term used by Paracelsus and his followers, to express the art of divining, or knowing by the winds and their courses the good or ill effects of seasons.

VENTOSA *spina*. See SPINA *ventosa*.

VENTOSITY, in *Medicine*. See FLATULENCY, *Windy* TUMORS, and TYMPANY.

VENTRE *inspiciendo*, a writ for the search of a widow that says she is with child, and thereby holds land from him that is, otherwise, next heir at law. See *Jury of* MATRONS.

VENTRICLE, *ventriculus*, q. d. *little belly*, in *Anatomy*, a diminutive of VENTER; signifying a cavity, smaller than what we express by a venter; or, rather, a division of a venter; or some smaller cavity contained in a larger.

There are two cavities in the heart, adjoining to the auricles, and four in the brain, called *ventricles*; which see explained under the articles HEART, and BRAIN.

The right *ventricle* of the heart, in relaxing, admits the blood, by the right auricle, from the cava; and, in contracting, drives it out into the pulmonary arteries; the *left*, receiving the blood by the left auricle, from the lungs, drives it out into the aorta. See *Tab. Anat.* (*Angeiol.*) *fig.* 9. *lit. c.*

VENTRICLE, or VENTRICULUS, by way of eminence thus called, is the same with the STOMACH.

For the action of the VENTRICLE *in vomiting*, see VOMITING.

VENTRICULI *ardor*. See ARDOR.

VENTRICULUS *succenturiatus*, in *Medicine*, a name given by some to the duodenum, when very large. Med. Eff. Edinb. abr. vol. ii. p. 34.

VENTRILOQUOUS, VENTRILOQUUS, compounded of *venter*, *belly*, and *loquor*, *I speak*, *gastriloquus*, or *engastrimythus*, a term applied to persons who speak inwardly; having a peculiar art of forming speech, by drawing the air into the lungs; so that the voice, proceeding out of the thorax, to a by-stander seems to come from some distance, or in any direction. See ENGASTRIMYTHUS.

Such a person we had formerly in London, a smith by profession, who had the faculty in such perfection, that he could make his voice appear, now, as if it came out of the cellar; and the next minute, as if in an upper room; and nobody present could perceive that he spoke at all. Accordingly, he has frequently called a person first up, then down stairs; then out of doors, then this way, then that; and all this without stirring from his seat, or appearing to speak at all.

We cannot forbear making a few extracts on this curious subject from a work, published in 1772, entitled, Le Ventriloque, &c. or the Ventriloquist, by M. de la Chapelle, censor royal at Paris, member of the academies at Lyons and Rouen, and F. R. S. Some faint traces of the art or faculty of *ventriloquism* are to be found in the writings of the ancients; but many more are to be discovered there, if we adopt this author's opinion, that the responses of many of the ancient oracles were actually delivered by persons possessing this quality, so very capable of being applied to the purposes of priestcraft and delusion. The abbé de la Chapelle, having heard many surprising circumstances related concerning one M. St. Gille, a grocer at St. Germain-en-Laye, near Paris, whose powers as a *ventriloquist* had given occasion to many singular and diverting scenes, formed the resolution of seeing him. Being seated with him on the op-

posite side of a fire in a parlour on the ground-floor, and very attentively observing him, the abbé, after half an hour's conversation with M. St. Gille, heard himself called, on a sudden, by his name and title, in a voice that seemed to come from the roof of a house at a distance; and whilst he was pointing to the house from which the voice had appeared to him to proceed, he was yet more surprised by hearing the words "it was not "from that quarter," apparently in the same kind of voice as before, but which now seemed to issue from under the earth, at one of the corners of the room. In short, this factitious voice played, as it were, every where about him, and seemed to proceed from any quarter, or distance, from which the operator chose to transmit it to him. To the abbé, though conscious that the voice proceeded from the mouth of M. St. Gille, he appeared absolutely mute, while he was exercising this talent; nor could any change in his countenance be discovered. He observed, however, that M. St. Gille presented only the profile of his face to him, while he was speaking as a *ventriloquist*. On another occasion, M. St. Gille sought for shelter from a storm in a neighbouring convent; and finding the community in mourning, and enquiring the cause, he was told, that one of their body much esteemed by them had lately died. Some of the religious attended him to the church, and shewing him the tomb of their deceased brother, spoke very feelingly of the scanty honours that had been bestowed on his memory; when suddenly a voice was heard, apparently proceeding from the roof of the choir, lamenting the situation of the defunct in purgatory, and reproaching the brotherhood with their want of zeal on his account. The whole community being afterwards convened into the church, the voice from the roof renewed its lamentations and reproaches, and the whole convent fell on their faces, and vowed a solemn reparation. Accordingly they first chaunted a *de profundis* in full choir, during the intervals of which the ghost occasionally expressed the comfort he received from their pious exercises and ejaculations in his behalf. The prior, when this religious service was concluded, entered into a serious conversation with M. St. Gille, and inveighed against the absurd incredulity of our modern sceptics, and pretended philosophers, on the article of ghosts and apparitions; and M. St. Gille found it difficult to convince the fathers that the whole was a ludicrous deception.

Another instance of his extraordinary powers occurred in presence of a large party, consisting of commissaries from the Royal Academy of Sciences at Paris, and other persons of the highest quality, together with a certain lady, who was not in the secret, and who was only told, that an aerial spirit had lately established itself in the forest of St. Germain-en-Laye, and that they were assembled to enquire into the reality of the fact. When the party sat down to dinner, the aerial spirit began to address the lady with a voice that seemed to be in the air over their heads; sometimes he spoke to her from the trees around them, or from the surface of the ground at a great distance, and at other times from a considerable depth under her feet. The lady, being thus addressed for more than two hours, was firmly persuaded that this was the voice of an aerial spirit; and it was some time before she was undeceived.

Several other instances of M. St. Gille's talent are related; and the abbé, in the course of his inquiries, was informed, that the baron de Mengen, a German nobleman, possessed this art in a very high degree. He also relates, from Brodeau, a learned critic in the sixteenth century, one of the singular feats performed by a capital *ventriloquist* in his time, who was called Louis Brabant, and was valet de chambre to Francis I. Our countryman Dickenson speaks of him particularly, in his tract, entitled Delphi Phœnicizantes, printed in duodecimo at Oxford, in 1655. Louis had fallen in love with a beautiful and rich heiress, but was rejected by the parents as an unsuitable match, on account of his low circumstances. However, the father dying, he visits the widow; and on his first appearance in the house, she hears herself accosted in a voice resembling that of her dead husband, and which seemed to proceed from above, "Give my daughter in marriage to Louis Brabant, who "is a man of great fortune, and excellent character; I "now endure the inexpressible torments of purgatory, "for having refused her to him; obey this admonition, "and I shall be soon delivered; you will provide a wor- "thy husband for your daughter, and procure everlast- "ing repose to the soul of your poor husband." The dread summons, which had no appearance of proceeding from Louis, whose countenance exhibited no change, and whose lips were close and motionless, was instantly complied with; but the deceiver, in order to mend his finances for the accomplishment of the marriage contract, applies to one Cornu, an old and rich banker at Lyons, who had accumulated immense wealth by usury and extortion, and was haunted by remorse of conscience. After some conversation on demons and spectres, the pains of purgatory, &c. during an interval of silence, a voice is heard like that of the banker's deceased father, complaining of his dreadful situation in purgatory, and calling upon him to rescue him from thence, by putting into the hands of Louis Brabant, then with him, a large sum for the redemption of Christians in slavery with the Turks; threatening him at the same time with eternal damnation, if he did not thus expiate his own sins. Upon a second interview, in which his ears were saluted with the complaints and groans of his father, and of all his deceased relations, imploring him for the love of God, and in the name of every saint in the Calendar, to have mercy on his own soul and others, Cornu obeyed the heavenly voice, and gave Louis ten thousand crowns, with which he returned to Paris, and married his mistress. The miser, being afterwards undeceived, was so mortified, that he took to his bed and died.

The abbé de la Chapelle takes occasion to account for all the circumstances attending Saul's conference with the WITCH *of Endor*, and endeavours to shew that the speech, supposed to be addressed to Saul by the ghost of Samuel, actually proceeded from the mouth of the reputed sorceress, whom he supposes to have been a capital *ventriloquist*. On these grounds he explains that transaction, and reconciles all its circumstances to the relation given of it in Scripture; where, it is to be observed, that Saul is not said to have seen Samuel, but only to have heard a voice, which a *ventriloquist* can produce and transmit from any quarter, and with any degree of strength whatever. He afterwards brings many instances to prove, that the ancient oracles principally supported their credit, and derived their influence, from the exercise of this particular art. Many other learned men have given the same account of the witch of Endor. Though she is said to have a *familiar spirit*, yet the Hebrew word *ob*, and the plural *oboth*, is generally rendered by the LXX, ἐγγαστριμυθος, *ventriloquist*. Thus it is rendered Isaiah xix. 3. It appears from Plutarch (De Defect. Orac. tom. ii. p. 414.) Suidas (tom. i. ad voc. ἐγγαστριμυθος, p. 667.) and Josephus (Antiq. lib. xiv. p. 354.) that those who were anciently called *ventriloquists* had afterwards the name of *Pythonesses*, which implies a pretence to divination. Accordingly *Python* is the word used by the Vulgate version, 1 Sam. xxviii. 7, 8; though not, as Voltaire seems to intimate, in the Hebrew; and therefore there is no ground for the conclusion which he draws, viz. that the history was not written till the Jews traded with the Greeks, after the time of Alexander, i. e. for determining the date of a Hebrew book from the use of a word in a Latin translation, made many hundred years after it, and not to be found in the original.

From baron de Mengen's account of himself, and the observations made by M. de la Chapelle in his frequent examinations of M. St. Gille, it seems that the factitious voice produced by a *ventriloquist* does not (as the etymology of the word imports) proceed from the belly, but is formed in the inner parts of the mouth and throat. The art, according to this author, does not depend on a particular structure or organization of these parts, peculiar to a few individuals, and very rarely occurring, but may be acquired by almost any ardently desirous of attaining it, and determined to persevere in repeated trials. The judgments we form concerning the situation and distance of bodies, by means of the senses mutually assisting and correcting each other, seem to be entirely founded on experience (see Reid's Inquiry into the Human Mind, p. 70, edit. 2); and we pass from the sign to the thing signified by it immediately, or at least without any intermediate steps perceptible to ourselves. Hence it follows, that if a man, though in the same room with another, can by any peculiar modification of the organs of speech produce a sound, which in faintness, tone, body, and every other sensible quality, perfectly resembles a sound delivered from the roof of an opposite house, the ear will naturally, without examination, refer it to that situation and distance; the sound which the person hears being only a sign, which from infancy he has been accustomed, by experience, to associate with the idea of a person speaking from a house top. A deception of this kind is practised with success on the organ and other musical instruments, and there are many similar optical deceptions.

Rolandus, in his Aglossostomographia, mentions, that if the mediastinum, which is naturally a single membrane, be divided into two parts, the speech will seem to come out of the breast; so that the by-standers will fancy the person possessed.

VENTURINE, or Adventurine, is sometimes used for the finest and slenderest gold wire, used by embroiderers, &c.

When reduced into powder, as fine as it can be clipped, or filed, this powder may be strewed on the first layer of pure varnish, made use of in japanning, after the varnish is dry, in order to lay any colour over it.

VENUE, or Venew, in *Law*, a neighbouring or near place. *Locus quem vicini habitant.*

Thus we say, twelve of the assizes ought to be of the same *venue* where the demand is made.

In transitory actions the courts will very often change the *venue*, or county, wherein the cause is to be tried. The statute 6 Ric. II. cap. 2. having ordered all writs to be laid in their proper counties, this, as the judges conceived, impowered them to change the *venue*, if required, and not to insist rigidly on abating the writ, which practice began in the reign of James I. and this power is discretionally exercised, so as not to cause, but prevent a defect of justice. Therefore the court will not change the *venue* to any of the four northern counties, previous to the spring circuit; because there the assizes are holden only once a year, at the time of the summer circuit. And it will sometimes remove the *venue* from the proper jurisdiction (especially of the narrow and limited kind) upon a suggestion, duly supported, that a fair and impartial trial cannot be had therein. Blackst. Comm. book iii. p. 294.

VENUS, in *Astronomy*, one of the inferior planets; denoted by the character ♀.

Venus is easily distinguished by her brightness and whiteness, which exceeds that of all the other planets; and which is so considerable, that in a dusky place, she projects a sensible shadow. Her place is between the earth and Mercury.

She constantly attends the sun, and never departs from him above 47 or 48 degrees. See Elongation.

When she appears west of the sun, that is, from her inferior conjunction to her superior, she rises before him, and is called *Phosphorus*, or *Lucifer*, or the *Morning star*; and when the appears east of the sun, that is, from her superior conjunction to her inferior, she sets after him, or shines in the evening after he sets, and is called *Hesperus*, or *Vesper*, or the *Evening star*: being each in its turn for two hundred and ninety days. The diameter of *Venus* is to that of the earth as $11\frac{7}{10}$ to 10 nearly, her apparent diameter equal to 59″, and real diameter equal to 9330 miles: her horizontal parallax about 30″: her distance from the sun is to that of the earth from the sun as 72333 to 100000, and her real distance is 68,891,486 miles: her excentricity is $\frac{7}{1000}$ths of her mean distance from the sun: the inclination of her orbit to the plane of the ecliptic 3° 23′: the points of their intersection or nodes are 14° of Gemini and Sagittarius: her periodical course round the sun is performed in two hundred and twenty-four days seventeen hours; and her motion round her own axis in twenty-three hours, or, according to the observations of Bianchini, in twenty-four days eight hours. See Diameter, Distance, Excentricity, Parallax, and Period. See also Planets.

Venus, when viewed through a telescope, is rarely seen to shine with a full face, but has phases just like those of the moon; being now gibbous, now horned, &c. and her illumined part is constantly turned towards the sun, i. e. it looks towards the east, when *Phosphorus*; and towards the west, when *Hesperus*.

These different phases of *Venus* were first observed by Galileo; who thus fulfilled the prediction of Copernicus: for when this excellent astronomer revived the ancient Pythagorean system, asserting, that the earth and planets moved round the sun, it was objected that in such a case the phases of *Venus* should resemble those of the moon; to which Copernicus replied, that some time or other that resemblance would be found out. Galileo sent an account of the first discovery of these phases in in a letter, written from Florence in 1611, to William de Medici, the duke of Tuscany's ambassador at Prague; desiring him to communicate it to Kepler. The letter is extant in the preface to Kepler's Dioptrics, and a translation of it may be seen in Smith's Optics, p. 416.

Having recited he observations which he had made, he adds, "we have hence the most certain, sensible decision and demonstration of two grand questions, which to this day have been doubtful and disputed among the greatest masters of reason in the world. One is, that the planets in their own nature are opake bodies, attributing to Mercury what we have seen in *Venus*: and the other is, that *Venus* necessarily moves round the sun; as also Mercury and the other planets; a thing well believed indeed by Pythagoras, Copernicus, Kepler, and myself, but never yet proved, as now, by ocular inspection upon *Venus*." He closes with explaining the cypher that had been sent in the following words, *Hæc immatura à me frustra leguntur, o, y,* i. e. *Cynthiæ figuras æmulatur mater amorum*, or Venus *imitates the phases of the moon.*

De la Hire, in 1700, through a telescope of sixteen feet, discovered spots in *Venus*; which he found to be larger than those in the moon.

And Cassini, and Campani, in the years 1665 and 1666, discovered spots in her face: from the appearances of which he ascertained her motion round her axis: concluding, with diffidence, that *Venus* revolved about an axis in less than a day; or at least, that the bright spot which he observed, finished its period either by revolution or libration in that time, or in about twenty-three hours. The next observations of the same kind that occur are those of signior Bianchini at Rome, in 1726, 1727, 1728, who, with Campani's glasses, discovered several dark spots in the disk of *Venus*, of which he gave an account and representation in his book entitled Hesperi & Phosphori Nova Phenomena, published at Rome in 1728. From several successive observations, Bianchini concludes, that a revolution of *Venus* about her axis was not completed in twenty-three hours, as Cassini imagined, but in $24\frac{1}{3}$ days; that the north pole of this revolution faced the 20th degree of Aquarius, and was elevated 15° above the plane of the ecliptic, and that the axis kept parallel to itself, during its revolution about the sun. Cassini the son, though he admits the accuracy of Bianchini's observations, disputes the conclusion drawn from them, and ultimately observes, that if we suppose the period of the revolution of *Venus* to be 23 h. 20′, it agrees equally well with the observations both of his father and Bianchini; but if it revolves in 24 d. 8 h. then his father's observations must be rejected as of no consequence.

M. Maraldi made several observations on *Venus* in 1729, but could perceive no spot: and, therefore, those observed by Bianchini must either have disappeared, or the air at Paris was not so clear as at Rome.

Martin Folkes, esq. formerly president of the Royal Society, spoke of Bianchini with respect, as too accurate to make any mistakes in astronomical observations, and too honest to publish any thing that was not exactly agreeable to truth.

Sometimes *Venus* is seen in the disk of the sun, in form of a dark, round spot. This happens when the earth is about her nodes at the time of her inferior conjunction. These appearances, called transits, happen but seldom. We have had two in this century, viz. one in June, 1761, and another in June, 1769. The next will not occur before the year 1874. See Parallax.

Except such transits as these, *Venus* exhibits the same appearances to us regularly every eight years; her conjunctions, elongations, and times of rising and sitting, being very nearly the same, on the same days, as before.

In 1672, and 1686, Cassini, with a telescope of 34 feet, thought he saw a satellite moving round this planet, and distant from it about $\frac{3}{5}$ of *Venus*'s diameter. It had the same phases as *Venus*, but without any well defined form; and its diameter scarce exceeded $\frac{1}{4}$ of that of *Venus*. Dr. Gregory (Ast. lib. vi. prop. 3), thinks it more than probable, that this was a satellite; and supposes the reason why it is not usually seen, to be the unfitness of its surface to reflect the rays of the sun's light; as is the case of the spots in the moon: of which if the whole disk of the moon were composed, he thinks, that planet could not be seen as far as to *Venus*.

Mr. Short, in 1740, with a reflecting telescope of $16\frac{1}{2}$ inches focus, perceived a small star near *Venus*; with another telescope of the same focus, magnifying fifty or sixty times, and fitted with a micrometer, he found its distance from *Venus* about 10°: with a magnifying power of 240 he observed the star assume the same phases with *Venus*: its diameter seemed to be about $\frac{1}{3}$, or somewhat less, of the diameter of *Venus*; its light not so bright and vivid, but exceeding sharp and well defined. He viewed it for the space of an hour, but never had the good fortune to see it after the first morning. Phil. Trans. N° 459. p. 646, or Martyn's Abr. vol. viii. p. 208.

M. Montaigne, of Limoges in France, we are told in the Encyclopedie, art. *Venus*, preparing for observing the transit of 1761, discovered in the preceding May a small star about the distance of 20′ from *Venus*, and its diameter was about $\frac{1}{4}$ of the planet. He made other observations for several days, which were communicated to M. Baudouin, who read two memoirs on the subject to the Royal Academy of Sciences, in which he endeavoured to state the elements of the orbit of this satellite: but it is to be considered, that Montaigne's telescope had no micrometer, and that his distances must be very vague and uncertain. After all, it must be acknowledged, that *Venus* may

may have a satellite, though it is difficult for us to see it. Its enlightened side can never be fully turned towards us, but when *Venus* is beyond the sun; in which case *Venus* appears little bigger than an ordinary star, and therefore her satellite may be too small to be perceived at such a distance. When she is between us and the sun, her full moon has her dark side turned towards us; and when *Venus* is at her greatest elongation, we have but one half of the enlightened side of her full moon towards us, and even then it may be too far distant to be seen by us. But it was presumed, that the two transits of 1761, and 1769, would afford opportunity for determining this point; and yet we find that, although many observers directed their attention to this object, no satellite was seen in the sun's disk; and therefore, it is reasonable to conclude, that *Venus* has no satellite.

The phenomena of *Venus* evidently shew the falsity of the Ptolemaic system: for that system supposes, that *Venus*'s orb, or heaven, encloses the earth; passing between the sun and Mercury. And yet all our observations agree, that *Venus* is sometimes on this side of the sun, and sometimes on the other; nor did ever any body see the earth between *Venus* and the sun: which yet must frequently happen, if *Venus* revolved round the earth in an heaven below the sun.

Dr. Desaguliers contrived a planetarium to represent the phenomena of *Venus*, according to the discoveries of Bianchini; as did also Mr. Ferguson an orrery for the same purpose. The principal properties of these machines are the following: that the angle of the axis of the globe representing *Venus* makes, with the ecliptic, an angle of 15°; that the tropics are 75° from the equator; that the tropics are 15° from the equator; that the plane of a solar horizon for the longest day cuts the plane of the equator at an angle of 15°; that the sun's greatest declination is 75°; that there are but $9\frac{1}{4}$ days in every revolution round the sun; and that to bring the days to an even reckoning, every fourth year must be a leap year, which, taking in the four quarters of a revolution, will make the leap year in *Venus* consist of ten of her days, equal to $7\frac{1}{2}$ months of our time; and that the long day for the north pole will contain $4\frac{5}{8}$ apparent diurnal revolutions of the sun. For a detail and illustration of the phenomena resulting from these properties; see Desaguliers's Exp. Phil. vol. ii. p. 552, &c. Phil. Trans. vol. xliv. p. 127, &c. &c. Ferguson's Astron. p. 8, &c.

VENUS, in *Chemistry*, is used for the metal COPPER.

Its character is ♀; which, say the adepti, expresses it to be gold, only joined with some corrosive and arsenical menstruum; which removed, copper would be gold.

Venus is universally allowed, by the chemists, &c. to be one of the most powerful medicines in nature: of this, is said to have been composed the famous Butler's stone, which cured most diseases by only licking it. Of this is composed that noble remedy of Van Helmont, viz. the sulphur of vitriol, or ens vitrioli, fixed by calcination and cohobation. Of the ens vitrioli of *Venus* is likewise composed Mr. Boyle's arcanum, the colcothar vitrioli.

It is certain, copper is a powerful emetic, and an antidote against poisons; for it is no sooner taken than it exerts its force: whereas other vomitories lie a good while in the stomach: but one single grain of rust of *Venus* immediately vomits. Hence syrups, that have stood over night in copper vessels, create a vomiting.

However pure copper, in its metallic state, or calcined by fire, appears to be indissoluble, and of no considerable effect, in the bodies of animals: but dissolved in the nitrous or marine acids, and crystallized or exsiccated by heat, it proves a strong caustic. Preparations of this kind, though formerly used, are now laid aside. Copper, combined with the vitriolic acid, or with vegetable acids, or corroded by the air, acts outwardly, as an efficacious detergent and a gentle escharotic, and internally as a virulent emetic and cathartic. Some have ventured on small doses, as quick emetics for expelling poison; but the end may be obtained by less dangerous means.

It has been also reckoned an excellent medicine in chronical cases: hence a famous physician is recorded to have cured Charles V. of a dropsy by the use of copper.

A saturated solution of the metal in volatile spirits is recommended by Boerhaave in disorders proceeding from an acid, weak, cold, phlegmatic cause. He says, that if three drops be taken in the morning in a glass of mead, and the dose doubled every day to twenty-four drops, it proves attenuating, warming, and diuretic; that by this medicine he once cured a confirmed ascites; though in other similar cases it failed; that it is the only preparation of copper which does not prove emetic; and that it may be tried with safety. Dr. Lewis, however, is of opinion, that in considerable doses it would exert the same virulent operation with the other soluble preparations or solutions of copper. A solid preparation of this kind, made by rubbing together in a glass mortar two parts of blue vitriol, and three of the volatile salt procured from sal ammoniac, till all effervescence has ceased, and then gently drying the concrete, is ordered in the last Edinburgh Pharmacopœia, under the name of *cuprum ammoniacum*. It has frequently been given with success in epileptic and convulsive disorders. Lewis. See SAPPHIRINA *aqua*, and AQUA *vitriolica cærulea*.

Venus is dissoluble by all the salts known, both acid, alkaline, and nitrous; nay, even by water and air, considered as they contain salt.

It is from this common reception of all menstruums, that copper is called *Venus*, q. d. *meretrix publica*, a common prostitute: though others take the denomination to have been occasioned by its turning of a sea green colour, when dissolved by acid. It must be given internally, with great caution.

VENUS, *crystals of*. See CRYSTAL, and VERDEGREASE.

VENUS, *spirit of*. See SPIRIT of *Venus*.

VENUS, in *Mythology*, the goddess of love, thus invoked by Lucretius:

Tu dea, tu rerum naturam tota gubernas,
Nec sine te quicquam des in luminis oras
Exoritur, neque fit lætum, nec amabile quicquam.

She is represented by the poets, painters, and statuaries of antiquity, in a variety of alluring forms: with her hair sometimes waving over her naked shoulders, and sometimes negligently tied behind in golden tresses; with a mantle, exhibiting all the colours of the rainbow and glittering with diamonds, sometimes flowing loosely, and at other times bound with a girdle or belt, called CESTUS, of which it is said that, *in eo deliramenta omnia inclusa erant; ibi inerat amor, inerat desiderium, inerat et amantium colloquium, itinerat et blanda loquentia quæ furtim mentem prudentium subripit*: accompanied by the two Cupids, the three Graces, and followed by the beautiful Adonis, who held up her train; and riding in a chariot of ivory, finely carved, and beautifully painted and gilt, and drawn by swans, doves, or swallows. She is sometimes exhibited like a young virgin rising from the sea, and riding in a shell; at other times with a shell in her hand, and her head crowned with roses; sometimes with a mirror in her hand, and golden sandals and buckles on her feet; sometimes with poppy in one hand, and an apple in the other; and at Elis she was represented as treading on a tortoise; the tortoise being an emblem of reserve and modesty.

According to Cicero (de Nat. Deorum, lib. iii.) there were four principal deities under the denomination of *Venus*; one, the daughter of Cælum and Dies, called *Venus Urania*, who had a temple at Cythera, and also at Elis, with a statue of gold and ivory, executed by Phidias: the second, produced from the froth of the sea, called by the Greeks APHRODITE and ANADUOMENE, whose cradle was a shell in which she was driven by Zephyrus upon the island Cyprus, and received by the Hours or *Horæ*, who educated her and presented her to the gods, and who was at length, as some say, married to Vulcan: the third, born of Jupiter and Dione, and as Cicero says, married to Vulcan: and the fourth, born of Syria and Tyrus, called Astarte, and said to have been married to Adonis. *Venus* was known under several appellations and characters. Accordingly we read of the *Venus Amica, Armata, Apaturia* or *Desidiosa, Barbata, Cypria, Cytherea, Calva, Cluacina, Erycina, Ridens, Improba, Hortensis, Marina, Paphia, Verticordia, Victrix*, &c. Praxiteles executed two statues of *Venus*, one clothed, bought by the inhabitants of Cos, and another naked, which he sold to the Cnidians. See ANADUOMENE, and VENUS *de Medicis*.

The *Venus* of M. Maffei seems to have been formed in conformity to the well-known passage of Terence,

Sine Cerere & Baccho friget Venus.

We have on medals the *Venus Urania*, or *Cœlestis*, with a star or sun; and the *Venus Paphia* almost naked, leaning on a column, with a helmet and the arms of Mars in her hands, bearing an inscription *Veneri Victrici*, or *Veneri Genetrici*. There is also a picture of the *Venus Desidiosa* in the Barbarini palace at Rome, which is one of the finest-coloured pictures that is left us by the ancients; the air of whose head may be compared with Guido's, and the colouring of the flesh reminds us of Titian. Part of this picture is lost, and part restored by Carlo Marat. *Venus* is described by Statius (lib. i. sylv. v. 56), much in the same manner as she is represented in the Barbarini picture.

We shall only add, that *Venus* is sometimes described by the poets of the third age under the character of the goddess

goddeſs of jealouſy, rather than as the goddeſs of love; in which Valerius Flaccus (Argon. ii. v. 106) and Statius (Theb. v. v. 69) have drawn two very terrible pictures of her. Spence's Polymetis, p. 74.

VENUS *de Medicis*, in the hiſtory of *Ancient Sculpture*, a famous ſtatue of white marble, about five feet high, brought from the Medicis palace at Rome to Florence, by order of duke Coſmo III. and now ſtanding in the great duke's palace. The hips, legs, and arms, were broken off by the removal of this ſtatue; but they have been rejoined with an art, that renders their former ſeparation imperceptible. The inſcription on the baſe intimates that this was the work of Cleomenes, an Athenian, the ſon of Apollodorus; the pedeſtal is modern; the ſtatue ſeems to bear a little forward; the right knee advances a little, the left hand is placed before that part which diſtinguiſhes the ſexes, and the right acroſs her breaſts; yet without touching the body. The head inclines a little to the left ſhoulder; ſo that her face ſeems to be turned away a little from the obſerver: and from this circumſtance ſome have taken occaſion to remark, that the air of the head of this *Venus* expreſſes three different paſſions; as you firſt approach her, you perceive averſion or denial in her look; as you advance a ſtep or two nearer, ſhe ſhews compliance; and one ſtep more to the right, it is ſaid, turns into a little inſidious and inſulting ſmile: but Mr. Spence does not allow that this account is juſtified by the ſtatue itſelf.

The attitude of the *Venus* de Medici is peculiarly graceful: that attitude may be deſcribed in two verſes of Ovid, Art. Am. v. 614.

Ipſa Venus *pubem, quoties velamina ponit,*
Protegitur læva ſemireducta manu.

The bloom of youth, the pleaſing ſoftneſs of her look, and her beauty and modeſty ſeem to rival each other in the charms of her countenance. Her perſon is ſomewhat plump, and the fleſh is ſo admirably executed, that it ſeems ſo ſoft as if it would yield to the touch. Time has given to the white marble a yellowiſh hue, though ſtill in the ſun-ſhine it is almoſt tranſparent: her hair is brown, which may be no more than the faded gilding not unuſual among the ancients. The head, which is ſaid to be too ſmall in proportion to the other parts, is ſuſpected by ſome not to have been executed by the ſame artiſt who made the body: this will ever be the ſtandard of female beauty and ſoftneſs: the breaſts are alſo the fineſt that can be conceived, ſmall, diſtinct, and delicate, ſuggeſting an idea of ſoftneſs, which no copies can imitate, and alſo of firmneſs: from the breaſts, her ſhape begins to diminiſh gradually down to her waiſt; but with an exquiſite fineneſs of ſhape, the *Venus* of Medici has what the Romans call corpus ſolidum, and the French the embonpoint; and her waiſt in particular is not repreſented as ſtinted by art, but as exactly proportioned by nature to all the other parts of her body. There is alſo a tenderneſs and elegance in every other part of her form: her legs are neat and ſlender; the ſmall of them is finely rounded, and her feet are little, white, and pretty: ſo that ſhe poſſeſſes all thoſe leſſer beauties which the poets have marked out in the female make; the *teretes ſuræ* (Hor. lib. ii. od. iv. ver. 21) and the *pes candidus* (id. lib. iv. od. i. v. 27) and *exiguus* (Ovid. Am. lib. ii. el. iii. ver. 7.) And one may well ſay of this ſtatue, what one of the perſons in Plautus's Epidicus (act. v. ſc. 1) ſays of a complete beauty:

Ab unguiculo ad capillum ſummum, eſt feſtiviſſima.

Though the *Venus* of Medici has not eſcaped cenſure, with regard to the ſmallneſs of her head and hips, the largeneſs of the noſe, the depth of the partition along the vertebræ of the back, the length of the fingers, which, excepting the little finger on the right hand, are without joints; and though in comparing the parts ſeparate, as the head, noſe, &c. of this ſtatue, with thoſe of others, the ſimilar parts might be found, even of ſuperior workmanſhip; yet for ſuch a combination of beauties, the delicacy of ſhape and attitude, and ſymmetry of the whole, it is univerſally allowed that the world doth not afford its equal. This incomparable ſtatue ſtands between two others, which in any other place would be eſteemed admirable pieces: that on the right of the *Venus* de Medici is twice as big, with the golden apple in her hand, and is called *Venus Victrix*; the other by Hercules Ferrata is diſtinguiſhed by the name of *Venus Urania*. Spence's Polymetis, p. 6, &c. Keyſler's Travels, vol. i. p. 434.

VENUS's *comb*, in *Botany*, the Engliſh name of a genus of plants, called by botanical writers *ſcandix*. See SHEPHERD's *needle*.

VENUS's *looking-glaſs*, a name ſometimes uſed for the CAMPANULA, or bell-flower.

VENUS's *navel-wort*, the name by which ſome call the *omphalodes*, or *cynogloſſum*. See HOUND's *Tongue*.

VENUS, in *Heraldry*, is uſed for the colour VERT.

VENUS, in the Linnean ſyſtem of *Natural Hiſtory*, a genus of the *teſtacea* order of worms. Its characters are, that the animal is a *tethys*, the ſhell is bivalve, the legs are incumbent at the anterior margin, the hinge has three teeth, diverging at their apex; the anus and vulva diſtinct. Linnæus enumerates thirty-nine ſpecies.

VENUS, *mount of*, *Mons* VENERIS, among *Anatomiſts*, is a little hairy protuberance in the middle of the PUBES of women; occaſioned by the collection of fat under the ſkin in that place.

Among chiromancers, the *mount of Venus* is a little eminence in the palm of the hand, at the root of one of the fingers.

VER-*puceron*, in *Natural Hiſtory*, a name given to a kind of inſects which are fond of eating the PUCERON, and deſtroy them in vaſt numbers.

They are thus called, as the ant-eater is, *formica leo*, from their deſtroying great numbers of them.

Theſe *ver-pucerons* are a ſort of worms produced from the eggs of flies, and are of two principal kinds; the one having legs, the other none.

When we obſerve the vaſt number of young produced by every puceron, and the quick progreſs they make in their multiplication, we are apt to wonder, that every plant and tree in the world is not covered with them; but on the contrary, when we obſerve the devaſtation theſe devourers make among them, we are apt to wonder how any of them eſcape at all, to perpetuate the ſpecies. Theſe worms indeed ſeem created for no other purpoſe but to deſtroy them; and this they do in ſo violent a manner as is ſcarce to be conceived. As the flies of many kinds lay their eggs on meat and other ſubſtances, which they know will afford food for the young ones, when hatched from them: ſo the parents of theſe worms lay their eggs on the branches and leaves of trees loaded with pucerons, on which they know they will feed. The worms produced from them are devourers from the very inſtant they are hatched, and find themſelves placed in the midſt of prey, being every way ſurrounded by a nation of creatures which are their proper food, and which are furniſhed with no weapons, either offenſive or defenſive, and which never ſo much as attempt to fly from them, but ſeem wholly ignorant of their danger, till ſeized upon by the devourers. Reaumur's Hiſt. of Inſects, vol. vi. p. 111. See *Tab. Inſects*, N° 24.

The flies, which are produced from theſe worms, are all of the two-winged kind; but there are ſeveral different ſpecies of them; the generality of them reſemble waſps, and have a very flat body. Geodart, who has deſcribed ſome of theſe flies, was ſurpriſed to ſee them very ſmall, when firſt produced from the chryſalis, yet growing very large in a quarter of an hour's time, and that without taking any nouriſhment; but this was only owing to their ſeveral parts having been ſqueezed while in the chryſalis, and expanding themſelves when they were at liberty from the compreſſion. Theſe are the changes of this kind of *leo-puceron*; but the other devourer of theſe creatures, which has ſix legs, is of a different kind, and indeed is in itſelf reducible to ſeveral ſpecies, ſome of theſe ſix-legged worms becoming four-winged flies, and others a kind of beetles. Theſe, from their near reſemblance to the formica-leo, are by Reaumur diſtinctly called *puceron*-LIONS.

VER-*polype*, in *Natural Hiſtory*, a name given by Reaumur, and ſome other authors, to a ſpecies of water-worm, by no means to be confounded with the creature called ſimply the POLYPE, and which is ſo famous for its reproduction of parts cut off, and for many other ſingular properties.

This *ver-polype* is a ſpecies of water-worm, produced from the egg of a tipula, and had this name given it from ſome remarkable productions, placed at the anterior and poſterior parts of the body, which are ſuppoſed to have ſome analogy with the parts of the ſea-fiſh called the *polypus*. Theſe worms are found in muddy ditches, uſually either crawling upon, or buried in the mud. Reaumur's Hiſt. Inſects, vol. ix. p. 49.

VERA *billa*. See BILLA.

VERANO *ave*, or *ave de* VERANO, in *Ornithology*, the name by which the Portugueſe in the Braſils call a large bird of the thruſh kind, approaching to the ſize of a ſmall pigeon, remarkable for its loud noiſe; and more commonly known by its American name GUIRAPANGA.

VERATRUM, in *Botany*. See HELLEBORE.

VERB,

VERB, in *Grammar*, a word serving to express what we affirm of any subject, or attribute to it; or, it is that part of speech, by which one thing is attributed to another, as to its subject; as the words, *is*, *understands*, *hears*, *believes*, &c.

The *verb* is thus called of the Latin *verbum*, word, by way of eminence; as being the principal word of a SENTENCE.

The common definition given by grammarians, is, that a *verb* is a word which betokens *being*, *doing*, or *suffering*.

To conceive the origin and office of *verbs*, it may be observed, that the judgment we make of any thing, as when I say *the earth is round*, necessarily includes three terms. The first, called the *attribute*, is the thing we affirm of, e. g. earth. The second, called the *attribute*, is the thing affirmed, e. g. round. The third, *is*, connects those two terms together, and expresses the action of the mind, *affirming* the attribute of the subject.

This last is what we properly call the *verb*; and which some of our later grammarians, particularly the Port Royalists, choose to call by a more significant word, *affirmation*. The reason is, that its principal use is to signify *affirmation*; that is, to shew the discourse, wherein that word is used, is the discourse of a man who does not only conceive things, but judges and affirms somewhat of them.

By this circumstance, a *verb* is distinguished from nouns, which also signify an affirmation, as *affirmans affirmatio*; those only signify affirmation, as that, by a reflection of the mind, is rendered an object of thought: so that they do not shew, that the person who uses them *affirms*, but only that he conceives *an affirmation*.

Though the principal use of *verbs* be to signify affirmation, they also serve to express the other motions of the soul; as to desire, pray, command, &c. but this they only do, by changing the mood, or inflexion.

Here, we only consider the *verb* in its primary signification, which is that it has in the indicative mood. On this footing, the *verb* should have no other use, but to mark the connection which we make in the mind, between the two terms of a proposition; but the *verb esse*, *to be*, is the only one that has retained this simplicity: nor, in strictness, has this retained it, but in the third person, as *est*, *is*.

In effect, men being naturally inclined to shorten their expressions, to the affirmation they have almost always added other significations, in the same word: thus, e. g. they add that of some attribute, so as that two words make a proposition; as in *Petrus vivit*, Peter lives: where *vivit* includes both the attribute and affirmation; it being the same thing to say *Peter lives*, as that *Peter is living*. And hence the great variety of *verbs* in every language.

For, if people had been contented to give the *verb* its general signification, without any additional attribute, each language would only have needed one *verb*, viz. the *verb* substantive *est*, *is*.

Again, on some occasions, they also superadd the subject of the proposition, as *sum homo*, I am a man: or *vivo*, I live; and hence the diversity of persons in *verbs*.

Again, we also add to the *verb*, a relation to the time, with regard to which we affirm; so that one single word, as *cœnasti*, signifies that I attribute to the person I speak the action of supping, not for the present time, but for the past: and hence the great diversity of tenses in most *verbs*.

The diversity of these significations, or additions in the same word, has perplexed and deceived many of our best authors, in the nature of a *verb*; and has led them to consider it, not according to what is essential to it, which is to affirm; but according to some of these its accidental relations.

Thus, Aristotle, taking up with the third of those additional significations, defines *verb* to be *vox significans cum tempore*; a word signifying something with time.

Others, as Buxtorf, adding the second relation, define it, *vox flexilis cum tempore & persona*; a word admitting of divers inflexions, in respect of time and person.

Others, taking up with the first of the additional significations, which is that of the attribute, and considering that the attributes men ordinarily add to the affirmation, were actions and passions, have supposed the essence of a *verb* to consist in signifying *actions* or *passions*.

Lastly, Scaliger imagined he had made a great discovery in his book of the Principles of the Latin Tongue, in saying, that the distinction of things into *permanentes*, and *fluentes*, into what remain, and what pass away, is the proper source of the distinction between *nouns*, and *verbs*; the first being to signify what remains, and the second what passes.

But from what we have said, it is easy to perceive, that these definitions are all false; and that the only true definition is, *vox significans affirmationem*: this definition includes all that is essential to the *verb*: but if one would likewise include its principal accidents, one might define it, *vox significans affirmationem, cum designatione personæ, & temporis*; a word which signifies an affirmation, with a designation of person, number, and tense: which is what properly agrees to the *verb* substantive *est*.

For, as to other *verbs*, considered as becoming different by the union of certain attributes, one may define them thus; *vox significans affirmationem alicujus attributi, cum designatione personæ, numeri, & temporis*; a word which expresses the affirmation of some attribute, with a designation of person, number, and time.

Verbs, according to Mr. Harris, are those ATTRIBUTIVES, which have a complex power of denoting both an attribute and an assertion; those which take the attribute alone without the assertion are PARTICIPLES; and all other attributives are included under the general name of ADJECTIVES. And as some attributes have their essence in motion, e. g. to *walk*, to *live*, &c. others in the privation of motion, e. g. to *rest*, to *die*, &c. and others again in subjects, which have nothing to do with either motion or its privation, as *great* and *little*, *white* and *black*, &c. these last are adjectives, and those which denote motion or its privation are either *verbs* or participles. But motions and their privation, comprehended under the general term energy, imply time as their concomitant, and hence, he says, *verbs*, which denote them, come to denote time also. See TENSE. See also MOOD.

Every energy has a reference, says this ingenious writer, to some energizing substance, and is conversant about some subject; and hence he derives the distinction between *verbs* ACTIVE and PASSIVE: and as every energy respects an energizer or a passive subject; hence appears the reason why every *verb*, whether active or passive, has in language a reference to some noun for its nominative case. When among the infinite subjects, to which the energy refers, that happens to occur, which is the energizer also, as *Brutus* loved *himself*, slew *himself*, &c. in such case the energy hath to the same being a double relation, both active and passive: and this gave rise among the Greeks to that species of *verbs*, called *verbs middle*; but in other languages the *verb* still retains its active form, and the passive subject (*se* or *himself*) is expressed like other accusatives. Again, in some *verbs* it happens that the energy always keeps within the energizer, and never passes out to any foreign subject, because the energizer and the passive subject are united in the same person; and then we obtain that species of *verbs*, called by grammarians *verbs neuter*, as if they were void both of action and passion, though they may rather be said to imply both. Of the above species of *verbs*, the middle cannot be called necessary, because most languages have done without it: those remaining are, therefore, the *active*, the *passive*, and the *neuter*, which seem essential to all languages whatever. Mr. Harris observes, that though the greater part of *verbs* denote attributes of energy and motion; there are some which appear to denote nothing more than a mere simple adjective, joined to an assertion, as ισαζει in Greek, *equalleth* in English, *albeo* and *tumeo* in Latin; and there are also *verbs*, which are formed out of nouns, or in which the substantive is converted into an attributive. There are other supposed affections of *verbs*, besides moods and tenses, such as number and person. But these are, in fact, the properties not of attributes, but of substances. Hermes. chap. vi. viii. and ix.

Verbs are variously divided: with respect to the subject or signification, they are divided into *active*, *passive*, *neuter*, &c. with respect to their construction, into *transitive* and *intransitive*; with respect to their formation or inflexions, into *regular*, and *irregular*; *personal*, and *impersonal*; *auxiliary*, *substantive*, &c.

VERB *active*, is a *verb* which expresses an action that falls on another subject, or object. It is called also TRANSITIVE, because the action passeth over to the object, or hath an effect upon some other thing. See ACTIVE.

VERB *passive*, is that which expresses a passion; or which receives the action of some agent, and necessarily implies an object acted upon, and an agent by which it is acted upon: it is conjugated, in the modern tongues, with the auxiliary *verb*, *I am*, *je suis*, *je sono*, &c.

Some do not allow of any *verbs passive* in the modern language: the reason is, what we call *passive* is nothing but the participle of the *verb*, joined with the auxiliary *verb*, *to be*; whereas the *verbs passive* of the Latin, &c. have their particular terminations. See PASSIVE.

VERB *neuter*, is that which signifies an action that has no particular object whereon to fall; but which, of itself,

takes

takes up the whole idea of the action: or a *verb neuter* expresses being, or a state or condition of being; when the agent and the object acted upon coincide: as, *I sleep, thou yawnest, he snores, we walk, you run, they stand.*

The Latins call them *neuters*, because they are neither active nor passive; though they have the force and signification of both; as, *I languish*, signifies as much as, *I am languishing*; *I obey*, as much as, *I exercise obedience*, &c. only that they have no regimen to particularize this signification. The *verb neuter* is called INTRANSITIVE; because the effect is confined within the agent, and doth not pass over to any object.

The distinction between *verbs* absolutely neuter, as, *to sleep*, and *verbs* active intransitive, as, *to walk*, though founded in nature and truth, is of little use in grammar: the construction of both is the same. Lowth's Gram. p. 62.

Of these *verbs*, there are some which form their tenses by the auxiliary *verb*, *to have*; as, *as I have slept, you have run.* These, grammarians call *neuter active.*

Others there are, which form their compound parts by the auxiliary, *to be*; as, *to come, to arrive*, &c. for we say, *I am come*, not *I have come*, &c. These are called *neuters* PASSIVE.

The *neuter verb* is varied like the active; but, having somewhat of the nature of the passive, admits in many instances of the passive form, retaining still the neuter signification; chiefly in such *verbs* as signify some sort of motion, or change of place or condition; as, *I am come, I was gone*, &c.

In English, many *verbs* are used both in an *active* and *neuter* signification, the construction only determining of which kind they are.

VERB *substantive*, is that which expresses the being, or substance, which the mind forms to itself, or supposes in the object; whether it be there, or not: as, *I am, thou art.*

Existence, says Mr. Harris, may be considered as an universal genus, to which all things of all kinds are at all times to be referred. The *verbs*, therefore, which denote it, claim precedence of all others, as being essential to the very being of every proposition in which they may still be found, either exprest, or by implication; exprest, as, when we say, *the sun is bright*; by implication, as when we say, *the sun rises*, which means, when resolved, *the sun is rising*. The *verbs is, groweth, becometh, est, fit*, ὑπάρχει, ἐςὶ, πέλει, γίγνεται, are all used to express this general genus; and are called by the Latins *verbs substantive*, and by the Greeks ῥήματα ὑπαρκτικὰ, *verbs* of *existence*, a name more apt, as being of greater latitude, and comprehending equally as well attribute as substance. The principal of these *verbs* is the *verb*, ἐςὶ, *est, is.* All existence is either absolute, as when we say, *B is*; or qualified, as when we say, *B is an animal, B is black*, &c. And with respect to this difference, the *verb*, *is*, can by itself express absolute existence, but never the qualified, without subjoining the particular form; consequently when *is* only serves to subjoin some such form, it has little more force than that of a *mere assertion.* Under the same character, it becomes a latent part in every other *verb*, by expressing that assertion, which is one of their essentials: e. g. *riseth* means IS *rising*, &c. Moreover, as to existence in general, it is either mutable, as in the objects of sensation, or immutable, as in the objects of intellection and science. All mutable objects exist in time, and admit the several distinctions of present, past, and future: but immutable objects know no such distinctions, but rather stand opposed to all things temporary. And hence result two different significations of the *substantive verb* IS, as it denotes mutable, or immutable being: e. g. if we say, *this orange is ripe*, IS meaneth that it existeth so now at this present, in opposition to past time, when it was green, and to future time, when it will be rotten: but if we say, *the diameter of the square is incommensurable with its side*, we do not intend by IS that it is incommensurable *now*, having been *formerly* commensurable, or being to become so hereafter: on the contrary, we intend that perfection of existence, to which time and its distinctions are utterly unknown. Under the same meaning, we employ this *verb*, when we say, *truth is*, or, *God is*: the opposition is not of time present to other times, but of necessary existence to all temporary existence whatever. Hermes, p. 88. &c.

VERBS, *auxiliary*, or *helping*, are those which serve in conjugating active and passive *verbs*; such are, *I am, I have*, &c.

The abbot de Dangeau distinguishes all *verbs* into two general kinds; *auxiliary verbs*, and *verbs* which make use of auxiliaries.

This distinction some may tax as not very just: in regard

auxiliary verbs sometimes make use of auxiliaries themselves: but this does not destroy the division; it only shews, that the *auxiliary verb* has two formalities, or two different qualities, under which it is to be considered; in virtue whereof, it constitutes, as it were, two sorts of *verbs.*

The *verbs* which make use of auxiliaries, he divides into *active, neuter*, and *pronominal. Verbs neuter*, he farther distinguishes into *neuters active*, and *neuters passive. Pronominals* he distinguishes into *identic, reciprocal, neutrized*, and *passived.* But several of these are peculiar to the French language. See AUXILIARY *Verbs.*

When an auxiliary is joined to the *verb*, the auxiliary goes through all the variations of person and number; and the *verb* itself continues invariably the same. When there are two or more auxiliaries joined to the *verb*, the first of them only is varied according to person and number. The auxiliary *must* admits of no variation.

VERBS, *regular*, are those which are conjugated after some one manner, rule, or analogy.

VERBS, *irregular*, or *anomalous*, are those which have something singular in the terminations or formations of their tenses. See ANOMALOUS *Verbs.*

The formation of *verbs* in English, both regular and irregular, is derived from the Saxon. The *irregular verbs* in English are all monosyllables, unless compounded; and they are for the most part the same words which are *irregular verbs* in the Saxon. The first class of irregulars comprehends those that are become so from some kind of contraction: thus, some *verbs* ending in *d* or *t* have the present, the past time, and the participle perfect and passive, all alike without any variation, as *beat, burst, cast*, &c. which are contractions from *beated, bursted, casted*, &c. because of the disagreeable sound of the syllable *ed* after *d* or *t*. Others in the past time, and participle perfect and passive, vary a little from the present, by shortening the diphthong, or changing the *d* into *t*, as *lead, led, meet, met, bend, bent*, &c. Others not ending in *d* or *t* are formed by contraction: as *have, had*, for *haved*; *flee, fled*, for *flee-ed*, &c. The following, beside the contraction, change also the vowel: *sell, sold, tell, told, clothe, clad.* The second class of *irregulars* are those that end in *ght*, both in the past time and participle, and change the vowel or diphthong into *au* or *ou*: they are taken from the Saxon, in which the termination is *hte*: as, *bring, brought, buy, bought, seek, sought*, &c. The third class of *irregulars* form the past time by changing the vowel or diphthong of the present; and the participle perfect and passive, by adding the termination *en*: these also derive their formation from the Saxon: such are, *fall, fell, fallen, shake, shook, shaken, draw, drew, drawn, slay, slew, slain*, &c. &c. When *en* follows a vowel or liquid, the *e* is dropped. Some *verbs*, which change *i* short into *a* or *u*, and *i* long into *ou*, have dropped the termination *en* in the participle; as, *begin, began, begun, sing, sang* or *sung, sang*, &c. To this third class belong the defective *verbs, be, been, go, gone*, i. e. *goen.*

The whole number of *verbs* in the English language, regular and irregular, simple and compounded, taken together, is about four thousand three hundred. See in Dr. Ward's Essays on the English Language the catalogue of English *verbs.* The whole number of irregular *verbs*, including the defective, is about one hundred and seventy-seven. Lowth's Gram. p. 85. See CONJUGATION.

VERBS, *defective*, are those which are not only for the most part irregular, but are also wanting in some of their parts. Such are the *auxiliary* VERBS, most of which are of this number. They are in use only in some of their tenses and moods; and some of them are a composition of tenses of several defective *verbs* having the same signification.

VERBS *inchoative.* See INCHOATIVE.

VERBS *impersonal.* See IMPERSONAL.

There are also *reduplicative verbs*; as, *resound, recall*, &c. and *frequentative verbs*, &c.

VERBS, *transitive.* See TRANSITIVE, and VERB *active supra.*

VERBAL, something that belongs to *verbs*, or even to words spoken with the mouth.

Verbal nouns, are those formed from verbs.

A *verbal contract*, is that made merely by word of mouth, in opposition to that made in writing.

VERBAL *accident.* See ACCIDENT.

VERBASCULUM, in *Botany*, a name given by many authors to the primrose, and with the title of *odoratum* to the cowslip.

VERBASCUM, *mullein*, in *Botany.* See MULLEIN.

VERBENA, in *Botany.* See VERVAIN.

VERBERATION, formed from *verbero, I smite*, in *Physics*, a term used to express the cause of sound, which

arises from a *verberation* of the air, when struck, in divers manners, by the several parts of the sonorous body first put into a vibratory motion.

VERBESINA, *naked-headed hemp agrimony*, in *Botony*, a genus of the *syngenesia polygamia superflua* class. Its characters are these: the common empalement of the flower is concave, and composed of a double order of channelled leaves; the flower is made up of hermaphrodite florets in the disk, and female half-florets in the border or rays; the hermaphrodite florets are funnel-shaped, and cut into five parts at the brim; they have short hair-like stamina, terminated by cylindrical summits, and a germen of the same figure as the seed, supporting a slender style, crowned by two reflexed stigmas; the germen becomes a thick angular seed, crowned by three-pointed chaff; the female half-florets have no stamina, but a germen, style, and two stigmas, like the hermaphrodite florets, and succeeded by seeds like those. Miller enumerates six, and Linnæus ten species.

VERDEGREASE, Verdigrease, Verdegris, or Verdigrise, a kind of rust of copper, formed from the corrosion of copper by a fermented vegetable, and into a bluish green substance, of great use among painters for a green colour.

The word is formed from the Latin, *viride æris*: it is also called *ærugo*. Others call it the *flower*, and others the *vitriolic salt of copper*; though, in reality, it is rather the proper substance of the metal.

The greatest quantities of *verdigrise* have been manufactured at Montpellier, the wines of Languedoc being very proper for this preparation; and it has been exported thence in cakes, each weighing about twenty-five pounds. The following process for making it is described by M. Monet, of the Royal Society of Montpellier, and is published in the Memoirs of the Academy for the years 1750, and 1753. Vine-stalks, well dried in the sun, are steeped during eight days in strong wine, and afterwards drained. They are then put into earthen pots, and wine is poured upon them; the pots are carefully covered; the wine undergoes the acetous fermentation, which in summer is finished in seven or eight days, but requires longer time in winter, although the operation is always performed in cellars. When the fermentation is sufficiently advanced, which may be known by observing the inner surface of the lids of the pots, which during the process of the fermentation is continually wetted by the moisture of the rising vapours, the stalks are then to be taken out of the pots: these stalks are by this method impregnated with the acid of the wine, and the remaining liquor is but a very weak vinegar. The stalks are to be drained during some time in baskets, and layers of them are to be put into earthen pots with plates of Swedish copper, so disposed, that each plate shall rest upon, and be covered with layers of stalks. The pots are to be covered with lids, and the copper is thus exposed to the action of the vinegar, during three or four days or more, in which time the plates become covered with *verdigrise*. The plates are then to be taken out of the pots, and left in the cellar three or four days; at the end of which time they are to be moistened with water, or with the weak vinegar above mentioned, and left to dry. When this moistening and drying of the plates have been thrice repeated, the *verdigrise* will be found to have considerably increased in quantity, and it may be then scraped off for sale.

A solution or erosion of copper, and consequently a *verdigrise*, may be prepared by employing ordinary vinegar instead of wine, as directed in the above process. But it will not have the unctuosity of ordinary *verdigrise*, which is necessary in painting. Good *verdigrise* must be prepared by means of a vinous acid or solvent, half acid and half spirituous. Accordingly, the success of the operation depends chiefly on the degree of fermentation to which the wine employed has been carried; for this fermentation must not have been so far advanced that no sensibly vinous or spirituous part remained in the liquor. Dict. Chem. art. *Verdigrise*.

The Society of Arts, &c. offered a premium in 1756 for the making of *verdigirse* in England; and in 1760 intimated, that it might be made by moistening with the cheapest and worst sort of cyder, the marc or remains of apples, peas, gooseberries, currants, sloes, crabs, blackberries, or any fruits deprived of their juice by expression, proceeding afterwards by the process above described. The premiums offered by the society were several times claimed and allowed; and it was resolved in 1763, that *verdigrise* actually made of British materials, and submitted to various trials, was even superior to the foreign. Accordingly, a considerable manufactory was established, and successfully carried on for the purpose of making *verdigrise*.

The goodness of *verdigrise* is judged of from the deepness and brightness of its colour, its dryness, and its forming, when rubbed on the hand with a little water or saliva, a smooth paste free from grittiness. This concrete is partially dissoluble in water and in rectified spirit, and almost totally in vinegar; from the acetous solution, well saturated and left to exhale slowly in a warm air, the greatest part of the *verdigrise* may be recovered in a crystalline form; called *distilled verdigrise*. See Crystals *of Venus*.

The crystals, distilled with a suitable fire, in a retort or other like vessel, give over the acetous acid in a highly concentrated state, but somewhat altered by the process. See Spirit *of Venus*.

The matter which distilled vinegar leaves undissolved, on being mixed with some borax and linseed oil, and fluxed in a crucible, yields a brittle metallic substance, of a whitish colour, not unlike bell-metal. Neum. Chem. by Lewis, p. 64. n. *a*.

Verdigrise is employed externally for deterging foul ulcers, and as an escharotic. Hoffman recommends it particularly for destroying the callosities of old fistulæ: tents of powdered *verdigrise*, made up with saliva, or other liquids not fat or oily, consume, he says, the hardest callus in three or four days, so as to render it completely separable. A detergent ointment, called *mel* ægyptiacum, is prepared by boiling five parts of *verdigrise* in fine powder with sixteen of honey, and seven of vinegar, till reduced to a clear consistence. The thinner matter which floats on the top of this mixture, after standing for some time, is generally used; unless it be required more acid, in which case the thick part which has subsided is shook up among it.

In the Edinburgh dispensatory, an ointment called *unguentum ex ærugine*, is directed, composed of white wax and resin, each two ounces, olive-oil one pint, and *verdigrise* half an ounce. When these kinds of applications are employed for venereal or other ulcerations in the mouth or tonsils, great caution is necessary lest they should pass into the stomach, in which case dangerous and even fatal consequences may ensue.

Verdigrise is rarely or never given internally. Some recommend it, in the dose of a grain or two, as an emetic, which produces almost instantaneous effect, where poisonous substances have been taken, for the immediate rejection of them. But warm water, milk, and oils, are much less dangerous and more proper. Lewis's Mat. Med.

M. Navier has lately evinced the salutary effects of liver of sulphur, and particularly of liver of sulphur of Mars, as an antidote against the poison of *verdigrise*.

Verdigrise makes a blue-green colour in paint; but is generally used in yellow, which, by a proper mixture, renders it a true green. It is bright when good; but soon flies when used in oil. When dissolved in vinegar, it is used in water painting, and is more durable: it may be also dissolved in the juice of rue, and thus produces a fine full green colour, equally fit for washing with that dissolved in vinegar.

Verdigrise, with a decoction of logwood, strikes a deep black, which when diluted becomes a fine blue. See Dying.

VERDELLO, in *Natural History*, the name of a green marble, used in Italy as a touch-stone, for the trying of gold, &c.

VERDERER, or Verderor, formed from *viridarius*, which Ulpian used in the like signification, a judicial officer of the king's forest, whose business is to look to the vert, and see it well maintained.

He is sworn to keep the assizes of the forest; as also to view, receive, and enroll, the attachments and presentments of all manner of trespasses, relating to vert and venison therein.

VERDETER. See Verditer.

VERDETUM, the name of a green substance, used as a colour in painting. It is a very pure kind of verdigrise, being an ærugo of copper, produced by the vapour of vinegar.

VERDICT, from *vere dictum*, q. d. *dictum veritatis*, *the dictate of truth*, is the answer of the jury given to the court, concerning the matter of fact, in any cause, civil or criminal, committed by the court to their trial and examination.

A *verdict* is either *privy* or *public*: a privy *verdict* is when the judge hath left or adjourned the court; and the jury, being agreed, in order to be delivered from their confinement, obtain leave to give their *verdict* privily to the judge out of court; which is of no force, unless afterwards affirmed by a public *verdict* given openly in court, wherein the jury may, if they please, vary from their privy *verdict*. If indeed the judge hath adjourned the

the court to his own lodgings, and there receives the *verdict*, it is a public and not a privy *verdict*. In a criminal case, no privy *verdict* is allowed.

But the only effectual and legal *verdict* is the public *verdict*; in which they openly declare to have found the issue for the plaintiff or for the defendant; and if for the plaintiff, they assess the damages also sustained by the plaintiff, in consequence of the injury upon which the action is brought. This is either *general*, or *special*.

VERDICT, *general*, is that which is brought into the court in like general terms as the general issue: as in action of disseisin, the defendant pleads, no wrong, no disseisin. Then the issue is general, whether the fact be wrong, or not: which being committed to the jury, they, upon consideration of the evidence, come in and say, either for the plaintiff, *That it is a wrong disseisin*; or for the defendant, *That it is no wrong, no disseisin*: and in criminal cases, *guilty*, or *not guilty*.

VERDICT, *special*, is, when they say at large, that such and such a thing they found to be done by the defendant, or tenant; declaring the course of the fact, as in their opinion it is proved; and as to the law, upon the fact, praying the judgment of the court.

The *special verdict*, if it contains any ample declaration of the cause from the beginning to the end, is called a *verdict at large*. This is grounded on the stat. Westm. 2. 13 Edw. I. cap. 30. in order to avoid the danger of an ATTAINT. After stating the facts, they conclude conditionally, that if upon the whole matter the court shall be of opinion that the plaintiff had cause of action, they then find for the plaintiff; if otherwise, then for the defendant. This is entered at length on the record, and afterwards argued and determined in the court at Westminster, from whence the issue came to be tried. Another method of finding a special *verdict* is when the jury find a *verdict* generally for the plaintiff, but subject nevertheless to the opinion of the judge, or the court above, on a *special* CASE. This is attended with much less expence, and obtains a speedier decision than the other. But as nothing appears upon the record but the general *verdict*, the parties are precluded hereby from the benefit of a writ of error, if dissatisfied with the judgment of the court or judge upon the point of law. Blackst. Com. book iii. p. 377, &c. See JURY.

VERDICT, *attainder by*. See ATTAINDER.

VERDICT, *false*. See ATTAINT.

VERDITER, VERDETER, a kind of mineral substance sometimes used by the painters, &c. for a blue, but more usually mixed with yellow for a green colour. See TERRE *verte*.

Verditer, according to Savary, ought to be made of the lapis Armenus; or, at least, of an earthy substance much like it, brought from the mountains of Hungary, &c. only prepared by powdering it, and cleansing it by lotion.

But this stone and earth are very rare; and the *verditer* used is not a native, but a factitious substance, or blue pigment, obtained by adding chalk or whiting to the solution of copper in aqua fortis. It is prepared by refiners of silver, who employ for this purpose the solution of copper, which they obtain in the process of PARTING, by precipitating silver from aqua fortis with plates of copper. It is said, that a fine-coloured *verditer* cannot be obtained from a solution of copper prepared by dissolving directly that metal in aqua fortis; and that the silver is necessary. According to Dr. Merret's account of the method of preparing it, a quantity of whiting is put into a tub, the copper solution poured on it, and the mixture stirred every day for some hours together, till the liquor loses its colour. The liquor is then poured off, and more of the solution of copper added; and this is to be repeated till the matter appears of the proper colour; after which it is spread on large pieces of chalk, and laid in the sun to dry. Boyle observes, that the process often miscarried, and that heating the liquor, before it is poured on the whiting, has been found to contribute to its success. It is still however, Dr. Lewis says, very apt to fail in the hands of the most skilful workman; the preparation, instead of a fine blue, turning out of a dirty green.

From the liquor poured off in making *verditer*, Mr. Boyle says (Works Abr. vol. i. p. 169), that the refiners obtain, by boiling, a kind of saltpetre, fit, with the addition of vitriol, to yield them a new aqua fortis.

Some have said that a deeper and brighter kind of *verditer* may be made by using a filtered solution of pearl-ashes instead of the chalk, in the above process.

Verditer, when good, is a cool full blue, but without the least transparency either in oil or water. In oil it is subject to turn greenish, and sometimes black; and in water it is not always found to hold. It is chiefly used for paper hangings and coarse work, and in varnish.

VERDONE, in *Ichthyology*, the name of a fish of the turdus or wrasse kind, called by some authors *turdus viridis minor*.

It is of a fine green colour in all parts of its body; the back, sides, and belly, have all plainly the same colour; but in different degrees: the back being of the deepest dye; the belly has something of yellowness with the green, and the sides are variegated with lines of a fine blue. It has only one long fin on the back, which has thirty rays or ribs, the eighteen foremost of which are rigid and prickly, the others soft and flexile. It is caught in the Mediterranean, and sold in the markets in Italy. Salvian de Aquat. p. 88.

VERDOY, in *Heraldry*, is applied to a bordure of a coat of arms; charged with any kinds or parts of flowers, fruits, seeds, plants, &c. Of these there are eight in number.

VERDURE, the quality of greenness. The word is French, formed of *verd, green*.

VERGADELLE, in *Ichthyology*, the name of a fish of the mullet kind, called by others the CHELON, remarkable for the thickness of its lips.

VERGE, VIRGA, a rod, switch, or yard; particularly a stick or wand, which persons are admitted tenants by holding in their hand, and swearing fealty to the lord of the manor.

On this account, they are called *tenants by the verge*.

VERGE, among *Gardeners*, generally denotes the edge or outside of a border; but more particularly, is used for a slip of grass adjoining to gravel-walks, and dividing them from the borders in the parterre-garden.

VERGE, *dented*. See DENTED.

VERGE is also used for the compass or extent of the king's court; within which is bounded the jurisdiction of the lord steward of the king's houshold.

It is thus called, from the *verge* or staff which the marshal bears. It was anciently also denominated *pax regis*, or the king's peace.

The lord steward, by virtue of his office, without any commission, judges of all transgressions, as treasons, murders, felonies, bloodshed, &c. committed in the court, or within the *verge* thereof; which extends, every way, by 13 Ric. II. stat. 1. cap. 3. (in affirmance of the common law) for twelve miles round the king's place of residence; only London, by charter, being exempted.

VERGE, *court of*. See COURT.

VERGE *of land, virga terræ*. See YARD-*Land*.

VERGERS, VIRGATORES *servientes*, are officers who carry white wands before the justices of either bench; called also, *porters of the verge*.

VERGERS *of cathedral* or *collegiate churches*, are inferior officers, who go before the bishop, dean, &c. with a verge, or rod tipped with silver.

VERGILIÆ, a constellation, whose appearance denotes the approach of the spring.

According to the poets, the *Vergiliæ* were the daughters of Atlas; and by the Greeks, were called PLEIADES: but the Romans named them *Vergiliæ*.

VERIFICATION, the act of proving, or making a thing appear true.

In the French law, *verifying* is used for the recording of the king's edicts and decrees by the parliament.

VERIFICATIONE *relicta*. See RELICTA.

VERISIMILITUDE. See PROBABILITY.

VERITH, in *Ichthyology*, a name given by Isidore to the fish commonly called by authors, *thrissa*; by us, the SHAD, or the mother of the herrings.

VERJUICE, a juice or liquor drawn from sour grapes, or wild apples, unfit for wine, or cyder; or from sweet ones, while yet acid, or unripe.

Its chief use is in sauces, ragouts, &c. though it is also an ingredient in some medicinal compositions; and is used by the wax-chandlers to purify their wax.

It has its name from a large sort of grape, called *verjus*, or *bourdelas*; which is said never to grow perfectly ripe; or rather, which in its utmost maturity is too austere and sour to be used in wine; whence it is commonly turned into *verjuice*; though in France all unripe grapes are denominated *verjus*.

There is also a tolerable *verjuice* made of crabs, gathered, and laid in an heap to sweat, the stalks, &c. separated; they are then stamped, or ground, and the crab mash put in a hair bag; the juice squeezed in a press, then barrelled up close, and set in a warm place to work for ten or twelve days.

Verjuice made for sale shall pay the same duty as CYDER or perry.

VERKENS *visch*, in *Ichthyology*, the Dutch name of a fish caught in the East Indies. It is about seven inches long, of a blackish-green colour, with fins and tail wholly black, and with yellow irises to the eyes. It is caught in fresh waters in the East Indies, and is a very delicate fish.

fiſh. It is very nearly related to the capriſcus, or GOAT-*fiſh*, if not the ſame ſpecies.

VERMELHO, in *Ichthyology*, the name of an American fiſh, more uſually known by the name of the PUDIANO.

VERMES. See WORMS.

VERMICELLI, or VERMICHELLY, a kind of mixture, prepared of flour, cheeſe, yolks of eggs, ſugar and ſaffron; and reduced into little long pieces, or threads, like worms, by forcing it with a piſton through a number of little holes in the end of a pipe made for the purpoſe.

The word, in the original Italian, ſignifies *little worms*: they alſo call it *tagliarini*, and *millefanti*.

It was firſt brought to us from Italy, where it is in great vogue. In effect, it is the great regale of the Italians. Other nations are not eaſily brought to reliſh the taſte of it. It is chiefly uſed in ſoups and pottages, to warm, provoke venery, &c.

VERMICULAR, an epithet given to any thing that bears a relation or reſemblance to worms, *vermiculi*.

Anatomiſts particularly apply it to the motion of the inteſtines, and certain muſcles of the body.

The *vermicular*, or PERISTALTIC, motion of the inteſtines is performed by the contraction of the fibres thereof, from above downward; as the unnatural, or antiperiſtaltic motion is by their contraction from below upwards.

The contraction happening in the periſtaltic, which others call the *vermicular motion*, as reſembling the motion of worms, does not affect all the parts of the inteſtines at once; but one part after another.

VERMICULAR, or VERMICULATED *work*, *Opus vermiculatum*, in *Sculpture*, a ſort of ornament, conſiſting of frets, or knots, in Moſaic pavements, winding, and repreſenting, in ſome ſort, the tracks made by worms.

> *Quam lepide lexeis compoſitæ, ut teſſerulæ omnes*
> *Arte pavimento, atque emblemate vermiculato.*
>
> Cic. de Orat. lib. iii.

VERMICULARIS *cruſta*, a term uſed by ſome anatomical writers to expreſs the internal hairy and corrugated coat of the inteſtines.

VERMICULUM, a word uſed by ſome chemiſts to expreſs a tincture or elixir.

VERMICULUS *marinus*, the *ſea worm*, in *Natural Hiſtory*, the name of a genus of ſhell-fiſh.

Theſe ſhells are called *vermiculi*, or ſea-worms, from the fiſh contained in them, which is always a ſort of worm. They uſually are found in great cluſters together, interwoven oddly with one another.

Bonani calls them ſea-ſerpents, encloſed in ſhells, from the various twiſted forms in which they adhere to ſhips and rocks. The author eſtabliſhes them among the multivalves, becauſe they are never found ſingle, but always in theſe cluſters; in this ſenſe he looks upon the whole cluſter as the ſhell-fiſh under conſideration, not any one of the ſingle tubes: though he acknowledges that each of theſe tubes is a perfect ſhell, independent of the reſt, and has its proper inhabitant. Strictneſs in natural hiſtory therefore would not bear him out, in arranging them among multivalves, for they are certainly an univalve ſhell, though many of them happen always to be found together.

Care muſt be had not to confound theſe with the *dentalia* and *entalia*; for theſe laſt are always found ſingle; and the *vermiculi*, of the kind here treated of, are always found together in great numbers, forming cluſters of ten inches, and often much more in diameter.

Of the *vermiculi*, which are ſtraight, we have ſix ſpecies: of the crooked kind, we have four ſpecies; and of thoſe which are diſpoſed in a ſort of circles, we have nine ſpecies. Hiſt. Nat. Eclair. p. 354.

According to Da Coſta's arrangement, the *vermiculi* or worm-ſhells, conſtitute the third family of univalve SHELLS: and he defines them to be tubular cylindric ſhells, ſingle, in maſſes together, or adherent to other ſhells or bodies; variouſly ſinuous, by winding or twiſting to and fro in a very irregular manner. Of theſe *vermiculi* he reckons two genera, viz. thoſe which have no fixed or regular form, as the common *vermiculi*, of which, though they are found in great abundance, there are not many different ſpecies; and the penecilli or worm-ſhells, which, in the whole or any particular part, have a determinate regular ſhape or ſtructure. There are few ſpecies of this genus; the watering-pot from the Eaſt Indies is the chief kind, and when perfect, is much valued. There are alſo *vermiculi* which have concamerations, or are divided into chambers by a few or many tranſverſe plates; but they are ſeldom regular, or ſet at equi-diſtant intervals, and are not pierced by a pipe or ſiphunculus, communicating from chamber to chamber, ſo as to permit the fiſh to penetrate more than one chamber or encloſure at a time, in which reſpect they differ from the concamerated ſhells, as the nautili, &c. The *vermiculi* are frequently found in the foſſil ſtate; but there is no ſpecies, that is not known recent, or from the ſea. Da Coſta's Conchol. p. 148.

VERMIFORMIS, in *Anatomy*, a term applied to various parts in the human body; bearing ſome reſemblance to worms. Such are the

Proceſſus, or *Apophyſes* VERMIFORMES, two extremities of the CEREBELLUM, ſituate near the fourth ventricle of the brain.

VERMIFORMES *muſculi*, or the four muſcles in each hand and foot, which bring the fingers and toes towards the thumbs and great toes; called alſo LUMBRICALES.

VERMIFUGUS, the ſame with ANTHELMINTIC. See alſo WORM-*ſeed*, and *Worm*-POWDERS.

VERMILION, a bright, beautiful red colour; in great eſteem among the ancients, under the denomination of MINIUM.

There are two kinds of *vermilion*; the one *natural*, the other *factitious*.

The *natural* is found in ſome ſilver mines, in form of a ruddy ſand; which they prepare and purify by ſeveral lotions and coctions. When this is uſed as a colour, no other preparation is neceſſary than a careful levigation with water on a ſtone.

Factitious or common VERMILION is made of *artificial* CINNABAR, ground up (as ſome ſay) with white wine, and afterwards with the white of eggs: in this ſtate it is made into cakes, and left to dry. And to fit it for uſe, they grind it up a ſecond time with water, and whites of eggs. To purify and heighten its colour ſome grind it up with urine, or ſpirits of wine, to which a little ſaffron is added.

Some alſo pretend to make *vermilion* of lead, burnt and waſhed; or of ceruſs, rubified by fire. But theſe are not properly denominated *vermilion*, but *red lead*. See MINIUM.

It is this laſt, however, that ſeems to be the artificial minium, or *vermilion* of the ancients; and accordingly, apothecaries and painters ſtill give it the name.

The ancient Greek and Latin authors have given divers fabulous accounts of their minium; and ſeveral of the moderns have adopted their dreams: the moſt rational accounts are, that Theophraſtus attributes the firſt invention of making it to Callias the Athenian; who hit upon it in endeavouring to draw gold, by fire, out of a red ſand, found in the ſilver mines, in the year of Rome 249. But Vitruvius ſays, it was diſcovered in the Cilbian fields; where it was drawn from a red ſtone, called by the Greeks *anthrax*.

We have two kinds of *vermilion* from Holland; the one of a deep red, the other pale: but both are in reality the ſame matter; the difference of colour only proceeding from the cinnabar's being more or leſs ground: when fine ground, the *vermilion* is pale; and this is preferred to the coarſer and redder.

It is of conſiderable uſe among the painters in oil, and in miniature; and likewiſe among the ladies, as a fucus, or paint, to heighten the complexion of ſuch as are too pale.

VERMILION is ſometimes alſo, though improperly, uſed for what we otherwiſe call KERMES, or *ſcarlet grain*.

VERMINA. See VERMINE, and VERMINATION.

VERMINATION, VERMINATIO, the act of breeding worms, and other vermin; particularly bots in cattle, &c.

VERMINATION is ſometimes alſo uſed among phyſicians, for a ſort of tormina ventris, or wringing of the guts; wherein the patient is affected, as if worms were gnawing his inteſtines.

VERMINE, VERMINA, a collective name, including all kinds of little animals, or inſects, which are hurtful or troubleſome to men, beaſts, fruits, &c. as worms, lice, fleas, bugs, caterpillars, ants, flies, &c.

VERMIS, *worm*, in *Natural Hiſtory*. See WORMS.

VERMIS *aureus*. See APHRODITA.

VERMIS *cœruleus*. See CÆRULÆUS.

VERMS *cerebri*, the *worm* in the brain, a name given by ſome writers to an epidemical fever in Hungary, attended with terrible deliriums.

VERMIVOROUS *animals*, are ſuch as feed upon worms.

VERNACULAR is applied to any thing that is peculiar to ſome one country.

Whence, diſeaſes which reign moſt in any particular nation, province, or diſtrict, are ſometimes called *vernacular diſeaſes*; though more frequently ENDEMIC DISEASES.

Such are the *plica Polonica*, *ſcorbutus*, *tarantiſm*, &c.

VERNAL, ſomething belonging to the ſpring ſeaſon. See SPRING.

Spring. Hence, *vernal leaves* are thoſe leaves of plants which come up in the ſpring, &c.

Vernal *ſigns*, and *equinox*. See Sign and Equinox.

VERNIER *Scale*, a ſcale excellently adapted for the graduation of mathematical inſtruments, thus called from its inventor Peter Vernier, a perſon of diſtinction in the Franche Comté, who communicated the diſcovery to the world in a ſmall tract, entitled La Conſtruction, l'Uſage, & les Proprietez du Quadrant Nouveau de Mathematique, &c. printed at Bruſſels in 1631. This was an improvement on the method of diviſion propoſed by Jacobus Curtius, printed by Tycho in Clavius's Aſtrolabe, in 1593.

Vernier's method of diviſion, or dividing plate, has been very commonly, though very erroneouſly, called by the name of Nonius; the method of Nonius being very different from that of *Vernier*, and much leſs convenient. For the hiſtory of this, and other inventions of a ſimilar nature, ſee Robins's Math. Tracts, vol. ii. p. 265, &c.

Vernier's method is derived from the following principle. If two equal right lines, or circular arcs, A, B, are ſo divided, that the number of equal diviſions in B is one leſs than the number of equal diviſions of A, then will the exceſs of one diviſion of B above one diviſion of A be compounded of the ratios of one of A to A, and of one of B to B.

For let A contain 11 parts, then one of A to A is as 1 to 11, or $\frac{1}{11}$. Let B contain 10 parts, then one of B to B is as 1 to 10, or $\frac{1}{10}$. Now $\frac{1}{10} - \frac{1}{11} = \frac{11-10}{10 \times 11} = \frac{1}{10 \times 11} = \frac{1}{10} \times \frac{1}{11}$.

Or, if B contains n parts, and A contains $n+1$ parts; then $\frac{1}{n}$ is one part of B, and $\frac{1}{n+1}$ is one part of A.

And $\frac{1}{n} - \frac{1}{n+1} = \frac{\overline{n+1} - n}{n \times \overline{n+1}} = \frac{1}{n} \times \frac{1}{n+1}$.

Or thus: let A and B be unequal right lines, or circular arcs; and let any part of A, conſidered as the relative unit, be divided into n parts; and a part of B, equal to to $m+1$ parts of A, be divided into m parts; then will $\frac{1}{m}$th of B $= \frac{1}{n}$th of A $= \frac{1}{m}$th of B $\times \frac{1}{n}$th of A.

But n parts of A : 1 unit of A :: $m+1$ parts of A : $\frac{m+1}{n}$ units of A.

But m parts of B $=$ ($m+1$ parts of A $=$) $\frac{m+1}{n}$ units of A.

Then m parts of B : $\frac{m+1}{n}$ units of A :: 1 parts of B : $\frac{m+1}{m \times n}$ units of A.

Therefore $\frac{m+1}{m \times n} - \frac{1}{n} = \left(\frac{m+1}{m \times n} - \frac{1 \times m}{n \times m} = \frac{m+1-m}{m \times n} = \frac{1}{n \times m} =\right) \frac{1}{m} \times \frac{1}{n}$.

The moſt commodious diviſions, and their aliquot parts, into which the degrees on the circular limb of an inſtrument may be ſuppoſed to be divided, depend on the radius of that inſtrument.

Let R be the radius of a circle in inches; and a degree to be divided into n parts, each being $\frac{1}{p}$th part of an inch.

Now the circumference of a circle, in parts of its diameter 2 R inches, is $3,1415926 \times 2R$ inches.

Then $360^\circ : 3,1415926 \times 2R :: 1^\circ : \frac{3,1415926}{360} \times 2R$ inches.

Or, $0,01745329 \times R$ is the length of one degree in inches.

Or, $0,01745329 \times R \times p$ is the length of 1°, in pth parts of an inch.

But as every degree contains n times ſuch parts, therefore $n = 0,01745329 \times R \times p$.

The moſt commodious perceptible diviſion is $\frac{1}{8}$ or $\frac{1}{10}$ of of an inch.

Example. Suppoſe an inſtrument of 30 inches radius; into how many convenient parts may each degree be divided? how many of thoſe parts are to go to the breadth of the *Vernier*, and to what parts of a degree may an obſervation be made by that inſtrument?

Now $0,01745 \times R = 0,5236$ inches, the length of each degree: and if p be ſuppoſed about $\frac{1}{8}$ of an inch for one diviſion; then $0,5236 \times p = 4,188$, ſhews the number of ſuch parts in a degree. But as this number muſt be an integer, let it be 4, each being 15′: and let the breadth of the *Vernier* contain 31 of thoſe parts, or $7\frac{1}{4}$, and be divided into 30 parts.

Here $n = \frac{1}{4}$; $m = \frac{1}{30}$; then $\frac{1}{4} \times \frac{1}{30} = \frac{1}{120}$ of a degree, or 30′, which is the leaſt part of a degree that inſtrument can ſhew.

If $n = \frac{1}{5}$, and $m = \frac{1}{36}$; then $\frac{1}{5} \times \frac{1}{36} = \frac{60}{5 \times 36}$ of a minute, or 20″.

The following table, taken as examples in the inſtruments commonly made from 3 inches to 8 feet radius, ſhews the diviſions of the limb to neareſt tenths of inches, ſo as to be an aliquot of 60's, and what parts of a degree may be eſtimated by the *Vernier*, it being divided into ſuch equal parts, and containing ſuch degrees as their columns ſhew.

Rad. inches	Parts in a deg.	Parts in *Vern.*	Breadth of *Vernier.*	Parts obſerved.	Rad. inches	Parts in a deg.	Parts in *Vern.*	Breadth of *Vernier.*	Parts obſerved.
3	1	15	$15\frac{1}{4}$	4′ 0″	30	5	30	$7\frac{1}{2}$	0′ 20′
6	1	20	$20\frac{1}{4}$	3 0	36	6	30	$5\frac{1}{4}$	0 20
9	2	20	$10\frac{1}{4}$	1 30	42	8	30	$3\frac{7}{8}$	0 15
12	2	24	$12\frac{1}{4}$	1 15	48	9	40	$4\frac{5}{9}$	0 10
15	3	20	$6\frac{3}{4}$	1 0	60	10	36	$3\frac{7}{10}$	0 10
18	3	30	$10\frac{1}{4}$	0 40	72	12	30	$2\frac{7}{12}$	0 10
21	4	30	$7\frac{1}{4}$	0 30	84	15	40	$2\frac{2}{3}$	0 6
24	4	36	$9\frac{1}{4}$	0 25	96	15	60	4	0 4

By altering the number of diviſions, either in the degrees or in the *Vernier*, or in both, an angle can be obſerved to a different degree of accuracy. Thus, to a radius of 30 inches, if a degree be divided into 12 parts, each being five minutes, and the breadth of the *Vernier* be 21 ſuch parts, or $1\frac{3}{4}^\circ$, and divided into 20 parts, then $\frac{1}{12} \times \frac{1}{20} = \frac{1^\circ}{240} = 15''$: or taking the breadth of the *Vernier* $2\frac{7}{12}^\circ$, and divided into 30 parts; then $\frac{1}{12} \times \frac{1}{30} = \frac{1^\circ}{360}$, or 10″!

Or $\frac{1}{12} \times \frac{1}{50} = \frac{1^\circ}{600} = 6''$; where the breadth of the *Vernier* is $4\frac{1}{4}^\circ$. See Robertſon's Nav. book v. p. 279, &c.

For the method of applying the *Vernier* to a quadrant, ſee *Hadley's* Quadrant. And for the application of it to a teleſcope, and the principles of its conſtruction, ſee Smith's Optics, book iii. ſect. 861, &c.

VERNIS *Martin*. See *Copal* Varnish.

VERNISH. See Varnish.

VERONICA, a term abbreviated from *vericonica*, of *veraicon*, q. d. *true image*, and applied to portraits, or repreſentations, of the face of our Saviour on handkerchiefs.

Veronicas are imitations of that celebrated original one, preſerved with great veneration at St. Peter's in Rome; and imagined by ſome to be the handkerchief laid over our Saviour's face in the ſepulchre.

The firſt mention we find of this famous relic, is in a ceremonial, compiled in 1143, dedicated to pope Celeſtine, by Benedict, a canon of St. Peter's: but there is no mention made of the time when it was brought to Rome. A feaſt is kept in honour thereof in moſt churches, on the Tueſday in Quinquageſima week.

It is to be obſerved, that the name *veronica* is only given to ſuch handkerchiefs as repreſent no more of our Saviour than his face; for ſuch as repreſent his whole body, as that of Beſançon, which ſhews his fore-part at length; and that of Turin, which repreſents both his fore and hind-part, as having covered him all over, were never called by this name.

The painters ſometimes repreſent the *veronica* as held up by an angel, but moſt commonly by a woman, which woman the common people imagine to be a ſaint, called St. *Veronica*; a perſon of that name having been ſuppoſed, about the ninth century, to have preſented her handkerchief to our Saviour, as he went to Calvary, to wipe his face, when the picture was miraculouſly impreſſed upon it. This woman, it was added, was the perſon troubled with the flux of blood mentioned in the Goſpel; and accordingly, ſhe was ſoon joined with St. Fiacrius, and invoked together with him againſt the hæmorrhoids. And hence the eſtabliſhment of feaſts in honour of St. *Veronica*, in the churches dedicated to St. Fiacrius.

The milliners have taken St. *Veronica*, or as they call her St. *Veniſſe*, or St. *Venecia*, or *Veniſa*, for their tutelary ſaint.

VERONICA, in *Botany*. See SPEEDWELL.

VERONUS, in *Ichthyology*, a name given by many to a ſmall river-fiſh, well known in England by the name of the MINOW.

VERRUCA, in *Medicine*. See WART.

Hence, *verrucous* is applied to any excreſcences which have a reſemblance to warts. There are alſo *verrucous* ulcers, &c.

VERRY, in *Heraldry*. See VAIRY.

VERSA. See VICE *verſa*.

VERSCHORISTS, in *Eccleſiaſtical Hiſtory*, a religious ſect, deriving its denomination from Jacob Verſchoor, a native of Fluſhing, who, in the year 1680, out of the tenets of Cocceius and Spinoſa, produced a new form of religion; for the leading tenets of which ſee HATTEMISTS.

The diſciples of *Verſchoor* were alſo called Hebrews, on account of the zeal and diligence with which they applied themſelves to the ſtudy of the Hebrew language.

VERSE, VERSUS, in *Poetry*, a line or part of a diſcourſe conſiſting of a certain number of long and ſhort ſyllables, which run with an agreeable cadence; the like being alſo reiterated in the courſe of the piece.

This repetition, according to F. Boſſu, is neceſſary to diſtinguiſh the notion of *verſe* from that of proſe; for in proſe, as well as *verſe*, each period and member are parts of diſcourſe, conſiſting of a certain number of long and ſhort ſyllables; only, proſe is continually diverſifying its meaſures and cadences, and *verſe* regularly repeats them.

This repetition of the poets appears even in the manner of writing; for one *verſe* being finiſhed, they return to the beginning of another line to write the *verſe* following; and it is to this return that *verſe* owes its name; *verſus* coming from *vertere*, to *turn*, or *return*.

Accordingly, we find the ſame word uſed to ſignify any thing that is placed in a certain regular order; Cicero uſes *verſus* for a line in proſe; Virgil for a row of trees, and even of oars in a galley. But as the regularity of *verſe* carries with it more charms, and requires a greater degree of exactneſs, the word has, in time, become appropriated to poetry.

To make *verſe*, it is not enough that the meaſures and quantities of ſyllables be obſerved, and ſix juſt feet put, one after another, in the ſame line; there are farther required certain agreeable cadences, particular tenſes, moods, regimens, and even ſometimes words unknown in proſe.

But what is chiefly required, is an elevated, bold, figurative manner of diction: this manner is a thing ſo peculiar to this kind of writing, that, without it, the moſt exact arrangement of longs and ſhorts does not conſtitute *verſe* ſo much as a ſort of meaſured proſe.

The Greek and Latin *verſes* conſiſt of a certain number of feet diſpoſed in a certain order. And ſome have attempted to make French and Engliſh *verſes* on the ſame foundation, but without ſucceſs.

Voſſius is very ſevere on the modern *verſe*, and makes it altogether unfit for muſic: our *verſes*, ſays he, run all, as it were, on one foot, without diſtinction of members or parts, and without regard to the natural quantities of ſyllables. We have no rhythmus at all; and we mind nothing, but to have a certain number of ſyllables in a *verſe*, of whatever nature, and in whatever order.

Mr. Malcolm vindicates our *verſe* from this imputation. It is true, he ſays, we do not follow the metrical compoſition of the ancients; yet we have ſuch a mixture of ſtrong and ſoft, long and ſhort ſyllables, as makes our *verſe* flow, ſmooth or rumbling, ſlow or rapid, agreeable to the ſubject. Inſtances of all which we have in the following lines.

"Soft is the ſtrain when Zephyr gently blows.
"The hoarſe rough *verſe* ſhould, like the torrent, roar.
"The line too labours, and the words move ſlow.
"Flies o'er th' unbending corn, and ſkims along the
"main."

By making a ſmall change, or tranſpoſition of a word or ſyllable, in any of theſe *verſes*, any body who has an ear will find, that we make a great matter of the nature and order of the ſyllables.

Voſſius adds, that the ancient odes were ſung, as to the rhythmus, in the ſame manner as we ſcan them; every pes being a diſtinct bar, or meaſure, ſeparated by a diſtinct pauſe, though, in reading, that diſtinction was not accurately obſerved.

Laſtly, he obſerves, that their odes had a regular return of the ſame kind of *verſe*; and the ſame quantity of ſyllables in the ſame place of every *verſe*; whereas, in the modern odes, to follow the natural quantity of our ſyllables, every ſtanza would be a diſtinct ſong.

It is next to impoſſible to write proſe without ſometimes intermixing *verſe* with it; ſo that Vaugelas's rule, which enjoins us to avoid them, is next to impracticable. This may be farther ſaid, that for ſhort *verſes*, they are ſo little perceived, that it is ſcarce worth while to ſtrain one's ſelf to avoid them; and, as to long *verſes*, they are chiefly to be avoided in the ends of periods, for, in the middle, they are ſcarce felt. In the general, rules of this kind muſt be conſidered as principally regarding numerous *verſes*, and ſuch as are readily diſtinguiſhed by their cadence: thus, in Latin, it is ſcarce poſſible to avoid iambic *verſes*; but hexameters muſt, by all means, be avoided, their cadence being more ſenſible and more ſtudied.

VERSES are of various kinds; ſome denominated from the number of feet whereof they are compoſed, as the *monometer*, *dimeter*, *trimeter*, *tetrameter*, *pentameter*, *hexameter*, *hendecaſyllabum*, &c. Some from the kinds of feet uſed in them; as the pyrrhichian, proceleuſmatic, iambic, trochaic, dactylic, anapæſtic, ſpondaic, or molloſſean, choriambic, iambidactylic, or dactylotrochaic. Sometimes from the names of the inventors, or the authors who have uſed them with moſt ſucceſs; as the Anacreontic, Archilochian, Hipponactic, Pherecratian, Glyconian, Alcmanian, Aſclepiadean, Alcaic, Steſichorian, Phaliſcan, Ariſtophanian, Callimachian, Galliambic, Phalæcian, and Sapphic. Sometimes from the ſubject, or the circumſtances of the compoſition; as the heroic, elegiac, Adonic, &c. See HEXAMETER, PENTAMETER, IAMBIC, &c.

In reckoning the feet of iambics, trochaics, and anapæſtics, each meter is a dipody, or comprehends two feet. In other *verſes* a meter is put a ſingle foot. Hence it is that the iambic trimeter is alſo called *ſenarium*, becauſe compoſed of ſix feet. Serv. Centim. 1817.

The moderns have invented *heroic*, or *Alexandrine verſes*, which conſiſt of twelve or thirteen ſyllables.

The ancients, likewiſe, invented various kinds of poetical devices in *verſe*, as *centos*, *echos*, and *monorhymes*.

VERSES, *equivocal*, thoſe where the ſame words contained in two lines carry a different ſenſe.

VERSES, *reciprocal*, are thoſe which read the ſame backwards as forwards. See RETROGRADE.

VERSES, *concordant*, *dactylic*, *elegiac*, *feſcennine*, *heroic*, *metrical*, *rhopalic*, *ſerpentine*, and *technical*, ſee the adjectives.

VERSE is alſo uſed for a part of a chapter, ſection, or paragraph, ſubdivided into ſeveral little articles.

The whole Bible is divided into chapters; and the chapters are divided into *verſes*.

The five books of the law are divided into fifty-four ſections. See PARASCHE and PENTATEUCH.

Many of the Jews maintain, that this was one of the conſtitutions of Moſes from Mount Sinai; but others, with greater probability, aſcribe it to Ezra, and ſay, that it was made for the uſe of the ſynagogues, in which one ſection was read every Sabbath-day, and thus the whole law read over every year. When the Jews were forbid, in the time of the perſecution of Antiochus Epiphanes, to read the law, they ſubſtituted in its room fifty-four ſections out of the prophets, which were afterwards continued; and when the reading of the law was reſtored by the Maccabees, the ſection which was read every Sabbath out of the law ſerved for their firſt leſſon, and that out of the prophets for their ſecond leſſon; and ſo it was practiſed in the time of the apoſtles.

Theſe ſections were divided into *verſes*, which the Jews call *peſukim*. They are marked out in the Hebrew Bibles by two great points at the end of them, called *ſoph-paſuck*, i. e. *the end of the verſe*. If Ezra was not the author of this diviſion, it is certainly very ancient, and was probably invented for the ſake of the Targumiſts or Chaldee interpreters. Mention is made of theſe *verſes* in the Miſchna. Prideaux's Conn. vol. ii. p. 479. For the more modern diviſion, ſee CHAPTERS.

The diviſion of *verſes* in the New Teſtament was firſt made by Robert Stephens; and ſo negligently was it done, that his ſon, Henry Stephens, aſſures us, he worked at it as he travelled from Paris to Lyons. Many learned men find great fault with this diviſion, and yet it is every where followed.

M. Simon obſerves, that the Greeks and Latins meant by *verſe*, a line, containing a certain number of words. He adds, that the authors of thoſe days, to prevent any thing being added or taken away from their works, uſed to mark, at the end, the number of *verſes* they contained; but the books themſelves were written all running, without any diviſions, points, or the like.

VERSE, *neck*. See NECK *verſe*.

VERSED *ſine of an arch*. See *Verſed* SINE.

Co-VERSED *Sine*. See CO-VERSED *Sine*.

VERSIFICATION, the art or manner of making verſe; alſo the tune and cadence of verſe.

Verſification is properly applied to what the poet does more by labour, art, and rule, than by invention, and the genius, or furor poeticus. See POETRY.

The matter of *verſification* is long and ſhort ſyllables, and feet compoſed of them; and its form is the arrangement of them in correct, numerous, and harmonious verſes; but this is no more than a mere tranſlator may pretend to, and which the Catilinarian war, put in meaſure, might merit.

It is with reaſon, therefore, that theſe ſimple matters are diſtinguiſhed from the grand poetry, and called by the name *verſification.*

In effect, there is much the ſame difference between grammar and rhetoric, as there is between the art of making verſes, and that of inventing poems.

VERSIO *chemica*, a term uſed by chemical writers to expreſs a change, wrought by their art, of manifeſt forms into occult ones, which, they ſay, is done by a corruption of the ſpecific form, and the generation of a more general one; that is, by a converſion of decompounded elements into compound bodies, and of impure into ſuch as are perfectly pure.

VERSION, a tranſlation of ſome book, or writing out of one language into another.

For various verſions of the Scriptures, ſee BIBLE and SEPTUAGINT. See alſo HEXAPLA and POLYGLOTT.

VERSO. See FOLIO *verſo*.

VERT, in *Heraldry*, the term for a green colour.

It is alſo called *vert* in the blazon of the coats of all under the degree of nobles; but in coats of nobles it is called EMERALD; and in thoſe of kings, VENUS.

In engraving, it is expreſſed by diagonals, or lines drawn athwart, from right to left, from the dexter chief corner to the ſiniſter baſe. See *Tab.* II. *Herald. fig.* 89.

In lieu of *vert*, the French heralds uſe *ſinople*, or ſynople.

VERT, or *Green Hue*, in *Foreſt Law*, any thing that grows and bears a green leaf, within the foreſt, that may cover a deer.

This is divided into *over-vert* and *nether-vert.*

Over-VERT is the great woods, which, in law-books, are uſually called *hault-bois.*

Nether-VERT is the under-woods, otherwiſe called *ſubbois.*

We ſometimes alſo meet with *ſpecial* VERT, which denotes all trees growing in the king's woods within the foreſt, and thoſe which grow in other men's woods, if they be ſuch trees as bear fruit to feed the deer.

VERTEBRÆ, in *Anatomy*, a chain of little bones, reaching from the top of the neck, down the back, to the os ſacrum; and forming a third part of the human ſkeleton, called the *ſpina dorſi*. See SPINE.

They have their name *a vertendo*, becauſe it is on them the head and trunk turn; the Greeks call them σπονδυλοι, *ſpondyli*, for the ſame reaſon.

The *vertebræ* are twenty-four in number; ſeven of them belong to the neck, twelve to the back, and five to the loins.

The *falſe vertebræ* are the os ſacrum and the os coccygis.

They lie not in a ſtraight line; thoſe of the neck bend inwards, and thoſe of the back outwards, for enlarging the cavity of the thorax; and thoſe again of the loins bend inwards, and thoſe of the os ſacrum outwards, to enlarge the cavity of the baſon. See SPINE.

The body of each *vertebra* is ſpongy and cavernous, covered with an outer compact ſubſtance, which, in the body of the *vertebræ*, is very thin, but thicker in the proceſſes; having in the middle a large perforation, through which the medulla ſpinalis paſſes, and ſeven apophyſes, or proceſſes.

The fore-part of this body is round and convex; the hind-part ſomewhat concave; its upper and lower ſides are plain, each covered with a cartilage which is pretty thick forwards, but thin backwards; by means whereof it is that we bend the body forwards; the cartilages yielding to the preſſure of the bodies of the *vertebræ*, which, in that motion, come cloſer to one another, which could not be effected, if the hard bodies of the *vertebræ* were cloſe to one another.

The proceſſes of each *vertebra* are of three ſorts, two tranſverſe, or lateral, in each of which there is a tendon of the *vertebral* muſcles inſerted: four oblique, or articular ones, diſtinguiſhed into ſuperior, or aſcending and inferior, or deſcending, each of which has a cartilaginous ſide; by which the *vertebræ* are articulated into one another: and one acute on the hindermoſt part of the *vertebra*, called the ſpinal apophyſis, which ends in a ſmall epiphyſis, and has given the name to the whole ſyſtem of the *vertebræ*. See *Tab. Anat. (Oſteol.) fig*, 10. *lit, a. a. b. b. fig.* 7. *lit. a. a. a. a. fig.* 7. *lit. n. n. o. o. o. r. r. ſ. ſ.* &c. *fig.* 11. *lit. b. b. c. c. fig.* 8. *lit. b. b. a. a.*

The proceſſes, which are peculiarly called the *ſpines*, form, with the hinder or concave part of the body of the *vertebræ*, a large hole in each *vertebra* between the body and apophyſis, which is part of the *vertebral* or ſpinal canal; and all the holes, anſwering one another, make a channel for the deſcent of the ſpinal marrow, which ſends out its nerves to the ſeveral parts of the body by pairs, through two ſmall holes, formed by the jointing of four notches in the ſides of each ſuperior and inferior *vertebra*; and communicating with the canal.

The *vertebræ* are joined together by their bodies and by their ſmall apophyſes. The bodies, in a natural ſtate, are principally united by a cartilaginous ſymphyſis, that is, by the intervention of a pliable and elaſtic cartilage. This cartilaginous connexion makes the lateral holes of the ſpine larger in the body than in the ſkeleton, where theſe cartilages are wanting. Their connexion by the ſmall apophyſes is by arthrodia, and not by ginglymus. Theſe two articulations are ſecured by very ſtrong ligaments. See *Cartilages and Ligaments of the* SPINE.

In the *vertebræ* of the neck, the two firſt and the ſeventh excepted, the body is a little flatted anteriorly, and is thinner or ſhorter than that of all the other *vertebræ* of the ſpine; the upper ſide is a little concave, the lower convex: the breadth of the fore part gradually increaſes as they deſcend, ſo that taken together they repreſent a ſort of pyramid.

The ſpinal apophyſes of theſe *cervical vertebræ* are more or leſs ſtraightened, and forked at the extremity, the firſt excepted, which has no ſuch proceſs. The tranſverſe apophyſes are for the moſt part very ſhort, perforated perpendicularly, concave or grooved on the upper ſide, a little forked, and, as it were, double, except in the firſt and laſt *vertebræ*, in which theſe apophyſes are longer and more pointed.

The articular, or oblique apophyſes, except the firſt, are more oblique than in the other *vertebræ*, and their cartilaginous ſides are ſo inclined, that in each *vertebra* the ſuperior apophyſes are turned backward and upward, the inferior forward and downward. See *Tab. Anat. (Oſteol.) fig.* 3. *n.* 1. 1. *fig.* 7. *n.* 14. 14. *fig.* 8. and *fig.* 9.

The firſt *vertebra*, called ATLAS, has neither body nor ſpinal apophyſis; the hole in it is much larger than in the reſt, and may be divided into two arches, the anterior or largeſt, and poſterior or ſmalleſt; the firſt formed by two thick lateral portions, and a ſmall curve middle part; the lateral portions may be conſidered as a body in two parts, without which the firſt *vertebra* would have been too weak to ſuſtain the articulations; the latter arch having in the middle of its convex ſide a pointed tubercle, marked with muſcular impreſſions, and ſeeming to be in the place of a ſpinal apophyſis.

The tranſverſe apophyſes of the firſt *vertebra* ariſe from the middle of the breadth of the lateral portions, being perforated perpendicularly at their broad origins, and are much longer than thoſe of the five *vertebræ* below them; contracting gradually, they terminate in an obtuſe point.

The ſuperior articular apophyſes are larger than any other of the ſame kind in the whole ſpine; being oblong cartilaginous cavities in the upper ſide of the lateral portions, horizontal in their ſituation, and with their anterior extremities nearer to one another than the poſterior. The inferior articular apophyſes are leſs hollow, ſhorter, and broader; inclined laterally from within outwards, and from above downwards; directly under the ſuperior, ſo that the articular and tranſverſe apophyſes, the holes and lateral portions on each ſide, are all in the ſame line. Between each ſuperior articular apophyſis, and the poſterior arch of the bony ring, there is a long notch or groove, in which the *vertebral* blood-veſſels, in the natural ſtate, make a turn, before they enter the great occipital foramen. There is another more ſhallow notch, on each ſide, between this arch and the inferior apophyſes. In the internal circumference of the great hole of this *vertebra*, in the middle of the great notch, there is a cartilaginous impreſſion for the articulation of the axis of the ſecond *vertebra*; and on each ſide of that notch, there is another ſmall impreſſion for the inſertion of a tranſverſe ligament which ſecures the axis in its place.

The ſecond *vertebra* of the neck, called *epiſtrophæus*, *axis*, *cardo*, and *vertebra dentata*, is very different from the firſt; its body is narrower and longer than that of the following *vertebræ*, and its length increaſed on the upper part by an eminence like a pivot or axis, called by the Greeks ODONTOIDES, by the Latins DENTIFORMIS, or ſimply *dens*. In this axis four impreſſions are obſervable, viz. one anterior, which is cartilaginous, for its articulation by a like impreſſion with the great notch in the firſt *vertebra*; one poſterior, for the inſertion of the tranſverſe ligament above mentioned; two ſuperior, which unite at the point of the axis, and ſerve for the

inſertion

inſertion of the ligaments by which the axis is faſtened to the anterior edge of the occipital hole. The ſuperior portion of the axis is a true epiphyſis grafted upon a forked apophyſis. The ſpinal apophyſis is ſhort, broad, and very much forked, and diſtinguiſhed into two lateral parts by a kind of angular criſta. The tranſverſe apophyſes are very ſhort, a little inclined downward, and perforated obliquely; whereas, in all the other *vertebræ* theſe perforations are perpendicular; the apophyſes terminate in a point turned downward. The ſuperior articular apophyſes do not anſwer exactly to the inferior apophyſes of the firſt *vertebræ*, their cartilaginous ſides are inclined outward and downward. The ſuperior apophyſes of this *vertebra*, the tranſverſe proceſſes of the firſt, and their holes, are all in the ſame perpendicular line. The inferior apophyſes are leſs, and ſituated farther back; their cartilaginous ſides are turned backward, and very obliquely, ſo that their ſituation is more vertical than horizontal; they are likewiſe a little hollow. The ſuperior notches are ſuperficial, long, ſituated behind the ſuperior apophyſes, and inſenſibly diſappear toward the ſpinal apophyſes. The inferior notches are ſituated more forward, directly under the tranſverſe apophyſes and their holes. The body of this *vertebra* has a ſmall tubercle on the fore ſide.

The conformation of the third *vertebra* of the neck is not very different from that of thoſe already deſcribed.

The fourth, fifth, and ſixth *vertebra* are like the third, except that their bodies are gradually more extended, but ſtill hollow in the upper ſide, and convex on the lower; and that the ſpinal apophyſis of the ſixth *vertebra* is longer, thinner, and ſtraighter than in the three above it. The inferior apophyſes of the fourth and fifth *vertebræ*, and the ſuperior of the ſixth, are not ſo much inclined as thoſe above them.

The body of the laſt or ſeventh *vertebra* of the neck is largeſt of all: its lower ſide being almoſt flat. The ſpinal apophyſis is long, almoſt ſtraight, and very prominent, terminating in a ſmall flat head, ſometimes ſmooth and ſometimes a little depreſſed or forked. The tranſverſe apophyſes of this *vertebra* are longer, placed farther back, and leſs grooved than the former. Their holes are ſometimes double, and, in that caſe, leſs than when they are ſingle; and ſometimes there is a break or opening in them like a notch, as is alſo ſometimes obſervable in the 6th *vertebra*. The ſuperior apophyſes are like thoſe of the other *vertebræ*; but in the inferior the ſides are more inclined and broader, correſponding to the ſuperior apophyſes of the firſt *vertebra* of the back. In the ſix lower *vertebræ* of the neck, the middle holes are much larger than the *vertebræ* of the back: they are in ſome meaſure triangular, being broad on the fore ſide, and contracted on the back ſide.

The *vertebræ* of the back have their bodies longer than thoſe of the neck, and in all of them, except the firſt, the upper ſide of which is a little hollow, both upper and lower ſides are equally flat. From the firſt *vertebra* to the fourth or fifth, their bodies are contracted between the upper and lower ſides, gradually more in the lower *vertebræ*, and growing broader between the fore and back ſides; ſo that viewed on the fore ſide, they repreſent an inverted pyramid or cone, and viewed laterally, they repreſent a pyramid in its natural ſituation. From the fourth, or laſt *vertebra*, the ſize of the bodies gradually increaſes, but more between the upper and lower, than between the fore and back ſides. The ſpinal apophyſes are long, ſharp on the upper ſide, and a little hollow on the lower, terminating in a ſort of ſmall pointed head. They are much inclined downward, except the firſt three or four, which are ſtraighter and ſhorter in proportion to their nearneſs to the *vertebræ* of the neck. The three laſt become likewiſe ſtraighter as they deſcend, and are broader and ſhorter than thoſe above them. The articular apophyſes are ſituated almoſt directly above and below the tranſverſe, and their ſides are rather perpendicular than oblique; thoſe of the ſuperior apophyſes are a little convex, and turned backward, the inferior a little concave, and turned forward. The tranſverſe apophyſes are pretty long, diminiſhing in length gradually to the twelfth *vertebra*, in which they are very ſhort and ſmall; they end in a ſort of head ſet upon a narrow neck. In the anterior part of theſe heads are cartilaginous cavities correſponding to the tubercles in the ribs, which cavities diminiſh gradually as they deſcend, and in the two laſt *vertebræ* there are ſcarce any to be ſeen. In the upper *vertebræ* they are ſituated more forward than in the following, in which they remove gradually outward. The lateral notches are between the articular apophyſes and bodies of the *vertebræ*. and the inferior are the moſt hollow. Moſt of theſe *vertebræ* have four ſmall cartilaginous impreſſions, two on each ſide of their bodies, which are obliquely hollow, and ſo diſpoſed, that the inferior in the body of one *vertebra*, and the ſuperior in the next below, form a ſort of niche, in which the ends or heads of the ribs are articulated. In the firſt *vertebra* there is commonly an entire niche for the firſt rib, and half of another for the ſecond. The two laſt *vertebræ* have generally but one entire niche on each ſide. Theſe marks are peculiar to the *vertebræ* of the back, and eaſily diſtinguiſh them from the reſt. In the lower articular apophyſes of the laſt *vertebra*, the ſides are turned laterally from within outward, and are likewiſe a little convex; ſo that this *vertebra* is received both above and below, whereas the firſt *vertebra* of the neck receives both ways. Beſides the ſeven ordinary apophyſes, this laſt *vertebra* has often two ſmall ones between the tranſverſe and ſuperior articular apophyſes. The large middle holes in the *vertebræ* of the back become rounder and narrower as they deſcend, eſpecially from the firſt to the tenth, where they begin again to be more flat and extended. All theſe large holes, each of which ſhould be regarded as a portion of a canal, have a notch in the back ſide above the ſpinal proceſſes, and between the articular apophyſes; that in the laſt *vertebra* appears to be deeper than any of the reſt. See *Tab. Anat. (Oſteol.) fig.* 3. *n.* 13. 13. *fig.* 7. *n.* 15. 15. *fig.* 10.

The *vertebræ* of the loins are the largeſt in the whole ſpine, and, as they deſcend they increaſe, much more in breadth than in thickneſs: between the upper and lower ſides they are a little contracted in the middle, and their edges are conſequently prominent. The ſpinal apophyſes are ſhort, ſtraight, and broad on each ſide, but narrow on the upper and lower parts. The upper edge is ſharp; the lower divided, as it were, into two labia by a narrow ridge more or leſs prominent; the extremities ſwell a little, and the ſpinal apophyſis of the fifth *vertebra* is ſhorter and narrower than the reſt, and bent a little downward. The tranſverſe apophyſes are longer and more ſlender than in the *vertebræ* of the back, increaſing in length from the firſt to the third, and then diminiſhing to the fifth; they are flat on the back part, and more even on the fore part. The ſuperior articular apophyſes of all theſe *vertebræ* are hollowed lengthwiſe; the inferior are convex lengthwiſe, and placed nearer each other than the ſuperior; the cavities are turned inward, and the convexities outward, and this direction changes as the *vertebræ* deſcend; and thus in the fifth *vertebra* the ſides of the inferior apophyſes are turned a little more forward. Beſides theſe ſeven apophyſes, each *vertebra* has two additional ones near the ſuperior apophyſes. The lower ſide of the body of the laſt *vertebra* is obliquely inclined forward, ſo that it is much longer before than behind. The great foramina in theſe *vertebræ* are larger than in thoſe of the back; they are flatted on the fore ſide, and almoſt angular behind, much like thoſe in the *vertebræ* of the neck. See *Tab. Anat. (Oſteol.) fig.* 2. *n.* 14. 14. *fig.* 7. *n.* 16. 16. *fig.* 11.

The ſpine taken together is the ſupport of all the other bones, and the univerſal director of all the attitudes neceſſary for their different motions. To give a machine both theſe advantages, it muſt have two properties, which, at firſt ſight, appear incompatible, viz. ſtrength and flexibility; and it will be ſtill more perfect if it be alſo light in proportion to its bulk. The author of nature has framed the ſpine, with all theſe advantages, in a manner which is the more wonderful, becauſe it is moſt ſimple. He has made the ſpine flexible by the number of pieces of which it is compoſed; he has made it firm and ſtrong, by diſpoſing theſe pieces, ſo as naturally to ſupport and ſuſtain each other, and by framing them in the moſt convenient manner for that infinite number of cords by which they are bound together; and laſtly, their internal ſtructure renders them very light.

However, the contrivance of this excellent mechaniſm is not the ſame in all the three claſſes of the *vertebræ*. Thoſe of the back and loins ſuſtain each other eaſily enough by the extent and direction of their bodies; and in all of them this diſpoſition is proportioned to the weight they have to bear, the inferior *vertebræ* being larger than thoſe above them; nor does the contraction of this bony pillar, at the fourth or fifth *vertebra* of the back, in the leaſt impair this mechaniſm; for as it is there ſtrengthened by the connexion of the true ribs, large *vertebræ* would have been uſeleſs; whereas, by diminiſhing their ſize, the capacity of the thorax is increaſed for the more commodious reception of the viſcera.

In the *vertebræ* of the neck the caſe is different; their bodies are of ſmall extent, and their ſides narrow. The ſituation of the whole row of theſe *vertebræ* is oblique and inclined forward, except the two firſt, which are placed perpendicularly; ſo that this portion of the bony pillar is concave, the upper half being bent forward. In order to judge how far this obliquity extends in a living

body, we need only ſtand or ſit, holding the head in a ſtraight poſture, and obſerve the ſituation of the maſtoide apophyſes, becauſe the articulation of the firſt *vertebra* of the neck with the condyles of the os occipitis is exactly between the anterior edges of theſe apophyſes. When a man ſtands or ſits in an erect poſture, the oblique diſpoſition of theſe *vertebræ* puts the oblique ſides of their articular apophyſes almoſt in a horizontal ſituation; ſo that they ſupport each other, not only by their bodies, as in the other *vertebræ*, but alſo by their articular apophyſes; the bodies being thus eaſed of part of their burden.

The obliquity of theſe apophyſes facilitates the rotation of the neck; for the natural oblique ſituation of the neck would have made that motion very difficult, without the obliquity of the apophyſes. The diſpoſition of the ſecond and third *vertebra* being more vertical than oblique, the natural inflexions of the neck are thereby made more eaſy.

The holes in the tranſverſe apophyſes of the *vertebræ* of the neck form a ſort of canal for the paſſage of the blood-veſſels. The length of this apophyſis in the firſt *vertebra* enables it to turn more eaſily on the axis of the ſecond; and the ſhortneſs of theſe apophyſes in the other *vertebræ* prevents them from injuring the neighbouring parts in the lateral inflections of the neck.

The length of the ſpinal apophyſis of the ſecond *vertebra* facilitates the rotation of the firſt. The ſmallneſs of this apophyſis, in the three following *vertebræ*, prevents them from compreſſing the neighbouring parts, when the neck is bent backwards; and they are broad and forked ſo as to afford ſufficient room for the inſertion of the muſcles.

The *vertebræ* of the back ſerve principally for the formation of the cavity of the thorax, by ſuſtaining the arches of the ribs; and this cavity is alſo augmented, becauſe the whole row of theſe *vertebræ* is concave on the fore-ſide. The length of their ſpinal apophyſes is proportioned to the great number of muſcles inſerted in them; and their oblique ſituation, and their lying for the moſt part cloſe upon one another, not only prevent the inconveniences of ſo great a length, but hinder the *vertebræ* from being bent backward, and, conſequently, enable them to ſupport great weights without ſinking under them.

The curvature of the tranſverſe apophyſes backward enlarges the capacity of the thorax, and gives to the double articulation of the ribs a peculiar ſort of obliquity, without which it is impoſſible to conceive how, by ſimply raiſing the ribs, all the dimenſions of the thorax ſhould be increaſed, and diminiſhed by lowering them.

The articular apophyſes of the back being almoſt vertical, and nearly in the ſame plane, ſmall degrees of flexion and extenſion are thereby made practicable, as alſo lateral inflexions; but they cannot allow of any rotation. As theſe apophyſes are placed between the tranſverſe, and near the poſterior extremities of the ribs, they are very little expoſed to ſtrains or external injuries; and thereby their ſmall ſize, when compared with the bodies of the dorſal *vertebræ*, becomes ſufficient.

The gentle curvature of the row of lumbar *vertebræ* counterbalances the different directions of the other portions of the ſpine. The ſhortneſs and ſtraightneſs of their ſpinal apophyſes give room to bend the whole ſpine backward on the loins, and their largeneſs affords ſufficient ſpace for the inſertion of muſcles. The length of their tranſverſe apophyſes facilitates the action of the muſcles; but the ſhortneſs of the upper and lower apophyſes prevents their ſtriking againſt the ribs, or oſſa innominata, in lateral inflections.

The ſize of the articular apophyſes is proportioned to the great efforts which they often ſuffer in their motions. The particular direction of theſe apophyſes ſets bounds to the motions of rotation, by their meeting and ſtriking againſt each other; and it is principally on this occaſion that their large ſize becomes neceſſary, to enable them to ſuſtain ſuch ſtrokes without breaking.

The whole canal of the ſpine, from the firſt *vertebra* of the neck to the extremity of the os *ſacrum*, may be regarded as an articulated elongation of the CRANIUM, ſerving to contain a production of the brain called the SPINAL *marrow*, or MEDULLA *ſpinalis*. This canal is larger in the neck and loins than in the back. The lateral holes formed by the notches in each *vertebra* tranſmit the ſame number of nerves. Winſlow's Anat. vol. i. p. 54, &c.

Such are the ſtructure and motion of the *vertebræ*, when in their natural poſition; but we frequently find them variouſly diſtorted. If the *vertebræ* of the back ſtick out, it conſtitutes what we call a *bunched back*; and in ſuch caſes the cartilages between the *vertebræ* are very thin and hard forwards, but conſiderably thick backwards, where the oblique proceſſes of the ſuperior and inferior *vertebræ* are at a conſiderable diſtance from one another; which diſtance is filled up with a viſcous ſubſtance.

This inequality of the thickneſs of the cartilages happens, either by a relaxation, or a weakneſs, of the ligaments and muſcles, faſtened to the back ſide of the *vertebræ*; in which caſes, their antagoniſts, finding no oppoſition, remain in a continual contraction. See BUNCH and *Curvature of the* SPINE.

The cartilages between the *vertebræ* of the back yield conſiderably to the preſſure of the body, in an erect poſture, and expand themſelves in the night when perſons lie down. Hence ariſes a very ſingular phenomenon, but a very true one; which is, that a man is conſiderably taller at his riſing in a morning, after the expanſion of theſe cartilages, during the abſence of preſſure for ſeveral hours, than at night, when they have been preſſed down all the day.

The reverend Mr. Waſſe ſeems to have examined this difference more ſtrictly than any other perſon. He found that ſeveral perſons, enliſted as ſoldiers in a morning, had been diſcharged for want of height, on their being meaſured again before the officers in the evening; and on this occaſion meaſured ſeveral other people, and found the difference in many caſes to be not leſs than an inch. This gentleman obſerved in himſelf, that fixing a bar of iron where he juſt reached it with his head on getting firſt out of bed in the morning, he could loſe near half an inch in an hour, or leſs, if he employed that time in rolling his garden, or any other exerciſe of that laborious kind. He obſerved alſo, that riding often took off the height very ſuddenly; and what was more particular, that in ſitting cloſe to ſtudy for five or ſix hours without any motion, he loſt often a whole inch in height.

People who uſe hard labour ſink rather leſs in the whole than thoſe of ſedentary lives; and the height once loſt is never to be recovered that day, not even by the uſe of the cold bath; but a night's lying down alone can reſtore it. Philoſ. Tranſ. N° 383. p. 87.

This difference in height takes place only in the human ſpecies, as they are the only creatures who walk erect, and throw the preſſure of their whole weight upon the back-bone. This gentleman meaſured horſes before and after riding, and could find no difference even after the longeſt journies.

The alteration in height is much greater in young people than in thoſe who are more aged. It is evident from this change happening to perſons when they ſit, as well as when they ſtand, that it is brought about merely by the back-bone; and we muſt admire the ſtructure of that part of the body, which owes its giving way thus, to its being formed together in that manner which alone could ſuit it to the ſeveral purpoſes it was intended for. The thickneſs and ſhortneſs of the bones, with the intervening cartilages, aſſiſted by the bony proceſſes, diſpoſe it to a motion peculiar to itſelf; whereas, had the bones been of any conſiderable length, upon bending the body, the articulations muſt have made a large angle upon their inmoſt edges, and the ſpinal marrow would have been continually liable to be injured; and had the cartilages been entirely wanting, it would have been as uſeleſs as if it were but one bone, whereby the trunk of the body, being rendered incapable of bending, muſt have remained for ever in an erect poſture. Another particular, which beſpeaks the utmoſt wiſdom and deſign in the contrivance of this part is, the remarkable difference there is in the cartilages placed betwixt the ſeveral bones of the ſpine.

The *vertebræ* of the back require but little motion, and the cartilages there are for that reaſon ſmall and thin, in compariſon with thoſe of the loins, which being very thick, the loweſt more eſpecially, the motion is much greater there, and much better to be borne. This being the ſtate and diſpoſition of the parts during the whole ſpace of time in which we are uſually employed about our ſeveral buſineſſes, till the time that we diſpoſe ourſelves to reſt, the cartilages of the ſpine will, by their compreſſible and yielding properties, become more cloſe and compact from the preſſure they ſuſtain, and conſequently the ſpine, which is the only ſupport of the trunk of the body, will become ſhorter; but when this ſuperior weight ſhall be entirely removed, by placing the body in an horizontal poſture, as it always is when we are in bed, the compreſſed cartilages will, by their natural elaſtic power, begin gradually to enlarge themſelves, till they, by degrees, recover the expanded ſtate they had before they gave way.

The cartilages between the ſeveral *vertebræ* are twenty-four in number, and every one of theſe is preſſed ſomewhat in our daily employments, ſo that when they all come to expand, the aggregate of their ſeveral expanſions cannot be ſuppoſed leſs than about an inch. Now, if

if this be the difference occasioned by the pressure of the common weight of the body alone upon itself, it must necessarily be much greater in those persons whose constant employment it is to carry heavy burdens. The compression and expansion of the cartilages in older people being less than in younger, is a necessary consequence of the cartilages in time of age growing harder, and less capable of compression; for they often grow almost bony in length of time; and hence it is, that old people are observed to lose somewhat of their former height, the cartilages in them shrinking to a somewhat smaller compass as they grow bony; and this shortening is therefore not imaginary, as many have believed, but real, and owing to this plain cause. Phil. Trans. N° 383. p. 90. See *Cartilages of the* SPINE.

The os *sacrum* has also its false *vertebræ*; and as the use of this bone is to sustain the spine, with all that belongs to it, it is necessary that it should be strongly connected with, and enclosed by the ossa innominata, with which it likewise serves to form the PELVIS.

VERTEBRÆ, *Cartilages and Ligaments of the*. See SPINE.

VERTEBRÆ *fractured*. When any of the *vertebræ* are fractured without hurting the spinal marrow, we may reasonably suppose, that the fracture is confined to some of the oblique, or spinal processes, and therefore the patient will be in no great danger; but when the body of the *vertebra* is either broke or split, and the contiguous spinal marrow bruised or compressed; all parts of the limbs and viscera beneath that *vertebra* become immoveable and rigid, and death often follows. Lastly, if the transverse processes of the *vertebræ* are broken, which incline toward the cavity of the thorax, it is scarce possible that the heads of the ribs, which are connected there, should escape being fractured also, which makes the case very deplorable. When only the processes of the *vertebræ* are broken, it will be the best way to reduce the bones into their places with the fingers, placing narrow compresses, dipped in warm spirit of wine on each side of the *vertebræ*, and over them slips of thick pasteboard, to be kept on by the proper bandages; for by this means the bones of the *vertebræ*, which are very soft and spungy, will very quickly and easily grow together again. If in these fractures the spinal marrow be divided, death is generally an inevitable consequence; all that the surgeon can attempt in this case is to lay bare the fractured *vertebræ* with the scalpel, and replace, or else remove, such fragments as injured the spinal marrow; and the wound must be afterwards gently cleansed, and treated with the vulnerary balsams, to be kept on with the napkin and scapulary bandage, till either the wounds shall be terminated by a perfect cure, or by death. Heister's Surgery, vol. i. p. 140.

VERTEBRÆ *luxated*. The luxations, which happen to the spine and *vertebræ* of the back, are generally imperfect ones; for it appears from an accurate consideration of the structure, and articulations of these bones, that none of the *vertebræ* can be entirely displaced without being fractured, and also compressing and wounding the spinal marrow, which must produce danger of instant death. Even the imperfect luxations of these bones are very dangerous, which happen either between the two superior *vertebræ* of the head and neck, or between the rest of the *vertebræ*, when they are forced from each other.

Such as have a luxation between the head and upper *vertebra* seldom escape being carried off by a sudden death; for by this means the tender medulla, which joins immediately with the brain, and is lodged in the spine, the brain itself, and the nerves which arise from beneath the occiput, are too much distended, compressed, or lacerated. The two condyloide processes of the occiput usually slide out of their glenoide sinuses in the first *vertebra* of the neck, when a person falls headlong from a high place, or from on horseback, or when he receives a violent blow upon the neck. People die usually very suddenly by this accident, and are usually said to have broke their necks, when there is really no more than a bare luxation; though it does sometimes happen, that the *vertebræ* of the neck are broken. If life should remain after such an accident, which very rarely happens, the head must necessarily be distorted, commonly with the chin close down to the breast, so that the person can neither swallow, speak, nor move any part that is below the neck; therefore, if speedy assistance is not had, death ensues, from the compressure, or hurt of the medulla.

In order to reduce this luxation, the patient must be laid flat upon the ground; then the surgeon, kneeling down with his knees against the patient's shoulders, must bring them together so as just to contain the patient's neck between them; this done, he is quickly to lay hold of the patient's head with both his hands, and strongly pulling and extending it, he must gently move it from one side to another, till he finds, by a noise, the natural posture of the neck, and a remission of the symptoms, that the dislocation is properly reduced.

The imperfect luxations of the *vertebræ* of the back are no more than their two upper or lower processes being displaced, and that often but on one side; this happens sometimes to only one of the spinal *vertebræ*, sometimes to more. These luxations are generally very difficult to be reduced; the best method of doing it is thus: when the apophyses of the *vertebræ* are dislocated on both sides, the patient is to be laid leaning on his belly over a cask, drum, or some other gibbous body; and then two assistants are strongly to press down both ends of the luxated spine on each side; by this means the bones of the spine will be set free from each other, lifted, or pushed up in form of an arch, and so gradually extended; this done, the surgeon pushes down the luxated *vertebræ*, and at the same time nimbly pushes the superior part of the body upwards, and by this means the luxated bones are sometimes happily reduced into their places; if success does not attend the first attempt in this way, the operation is to be repeated. When the *vertebra* comes out on one side, the patient is to be placed inclining in the prone posture now mentioned; but so, that when the left apophysis is displaced, one assistant may press the lower *vertebræ* inward to the right, and another may depress the right humerus, and *vice versa*. After the *vertebræ* are reduced, the part is to be bathed with spirit of wine camphorated, or to have compresses dipped in the same spirit laid on it, and the napkin and scapulary bandage are to be applied. Heister's Surgery, vol. i. p. 171, &c.

VERTEBRÆ *of fish*. The *vertebræ* of fish are extremely different in shape in the several kinds, and even vary in number in the different species of the same genus. The anterior *vertebræ* in some have three apophyses, as in the cyprini, esoces, pleuronecti, &c. and in the clupeæ they have no less than seven of these apophyses, but they are slender and capillary. Artedi Ichthyol.

VERTEBRAL *Artery*, in *Anatomy*, is an artery that goes out from the posterior and upper side of the subclavian, and runs up through all the holes in the transverse apophyses of the vertebræ of the neck; sending off little twigs, through the lateral notches of these vertebræ, to the medulla spinalis and its coverings, and giving arteries to the *vertebral* muscles and others near them. After an incurvated passage it sends off, at its third curvature, a small branch, which is ramified on the outer and posterior part of the occiput, and communicates with the cervical and occipital arteries. Having afterward reached the great foramen of the os occipitis, it enters the cranium, and pierces the dura mater, sending several small ramifications to the back part of the medulla oblongata, and to the corpora olivaria and pyramidalia; it afterward advances on the apophysis basilaris of the os occipitis, inclining gradually toward the *vertebral* artery of the other side all the way to the extremity of that apophysis, where they both join in one common trunk, which may be named arteria basilaris.

VERTEBRAL *Muscles*, in *Anatomy*, are those which lie along the spine, the greatest part of which serve for the motions of the neck, back, and loins.

By *vertebral* muscles, Steno understands those which are fixed in the vertebræ alone; and he distinguishes them all into recti and obliqui. The recti, which are those that run up parallel to the medulla spinalis, or in a longitudinal direction, are middle and lateral: the middle recti being those which are fixed to the spinal apophyses, and the lateral those that are fixed to the transverse apophyses. He again subdivided all these into simple and compound; the simple being those which are fixed in two vertebræ only, and the compound those that are fixed in more than two.

The obliqui are those which run obliquely between the spinal and transverse apophyses; and they are of two kinds: some run up from the transverse to the spinal apophyses, approaching each other; and some run up from the spinal to the transverse apophyses, diverging from each other: the first Steno calls *ad medium vergentes*, or converging muscles, and the second, *a medio recedentes*, or diverging muscles.

He adds, that several muscles of the first kind go from one transverse to several spinal apophyses, and from several transverse to one spinal apophysis.

According to this account of the *vertebral* muscles, the ancient terms spinales, transversales, and semi-spinales, may still be applied to them; understanding by the first those which are wholly fixed in the spinal apophyses; by the second, those which are wholly fixed in the transverse apophyses; and by the last, those which are fixed in the spinal apophyses by one extremity only.

The two kinds of oblique *vertebral* muscles, says Winslow, are better expressed by the two compound terms

trans-

transverso-spinales and spino-transversales. *It is*, however, necessary to retain the general names of vertebrales recti, vertebrales obliqui, &c. because, though the terms already mentioned agree very well to the posterior obliqui, they cannot be applied to the anterior obliqui, one end of which is fixed, not in the spinal apophyses, but in the bodies of the vertebræ.

The small simple muscles that pass between two vertebræ may be named vertebrales minores, and the large compound muscles that reach several vertebræ, vertebrales majores; both being afterwards divided into spinales and transversales majores & minores. The small muscles are likewise called inter-spinales and inter-transversales; and as there are some small oblique muscles, which cannot be said to reach either the transverse or spinal apophyses, these may be termed simply inter-vertebrales.

Besides the *vertebral* muscles, properly so called, several other muscles, not inserted wholly in the vertebræ, serve to move them. Some of the ancients called these semi-spinales, to distinguish them from those they termed spinales, which included all the *vertebral* muscles: these, says Winslow, may be named semi-vertebrales.

The *vertebral* muscles vary much in their insertions and reciprocal communications, and they are, therefore, difficultly distinguished; but, in general, they are more easily distinguished in children than in adults, and in adults than in very aged persons.

The *vertebral* muscles of the neck, according to the distribution of Winslow, may be reduced to twelve, six on each side, viz. LONGUS *colli*, TRANSVERSALIS *colli major*, TRANSVERSALIS *gracilis sive collateralis colli*, SEMI-*spinalis sive transverso-spinalis colli*, SPINALES *colli parvi sive* INTER-SPINALES, and TRANSVERSALES *colli minores sive* INTER-TRANSVERSALES. To these may be added two, which are sometimes described among those of the head, viz. OBLIQUUS *major*, and RECTUS *minor*.

The muscles which move the vertebræ of the back and loins are reduced to twenty-four, twelve on each side, viz. SACRO-*lumbaris*, *longissimus* DORSI, SPINALIS *dorsi major*, SPINALES *dorsi minores*, TRANSVERSALIS *dorsi major*, TRANSVERSALES *dorsi minores*, SEMI-*spinalis sive transverso-spinalis dorsi*, *semi-spinalis sive* TRANSVERSO-*spinalis lumborum*, SPINALES & *transversales lumborum*, QUADRATUS *lumborum sive lumbaris externus*, and *coccygæi* or *musculi* COCCYGIS.

The vertebræ of the back, and especially those of the loins, may likewise be moved by the muscles of the abdomen; the inferior portion of the LONGUS *colli* may contribute something to the motion of the upper vertebræ of the back; the psoas, to that of the vertebræ of the loins; and the *glutæus maximus* to that of the os coccygis. Winslow.

VERTEBRAL *Vein*, in *Anatomy*, arises posteriorly from the SUBCLAVIAN or AXILLARY, sometimes by two stems, and sometimes by one, which soon afterwards divides into two. The first and principal stem gives out a branch, called vena cervicalis, which is distributed to the neighbouring muscles, and afterwards runs up through the holes of the transverse apophyses of the vertebræ colli; this cervical branch comes sometimes from the axillaris. The other stem of the *vertebral* vein runs up on the side of the vertebræ, and having reached the fourth, or sometimes higher, it runs in between the transverse apophyses of that vertebra and the fifth, to join the first, or principal stem.

The *vertebral* vein accompanies the VERTEBRAL *artery*, sometimes in one trunk, sometimes in several stems, through all the holes of the transverse apophyses of the vertebræ colli to the great foramen occipitale, communicating with the occipital veins, and small occipital sinuses of the dura mater; and sending branches to the anterior muscles of the neck, and to the small interior muscles of the head; and also other branches to the musculi transversales and vertebrales colli, and to the great canal of the spinal marrow, where sinuses are formed communicating with those on the other side. Winslow.

VERTEX, in *Anatomy*, the crown of the head, or that uppermost and middle part situate between the sinciput and occiput.

Hence, also, *vertex* is figuratively used for the top of other things. Thus, the *vertex* of a cone, pyramid, conic section, &c. is the point of the upper extremity of the axis, or the top of the figure.

VERTEX *of an Angle*, is the angular point, or the point A, (*Tab.* IV. *Geometry*, *fig.* 91.) wherein the legs meet.

VERTEX *of a Figure*, is the *vertex* of the angle opposite to the base.

Such is the point M (*Tab. Geometry*, *fig.* 19.) opposite to the base KL.

VERTEX *of a Curve*, is the point A (*Tab. Geometry*, *fig.* 12.) from which the diameter is drawn; or it is the intersection of the diameter and the curve.

VERTEX *of a Glass*, in *Optics*, the same with the pole thereof.

VERTEX is also used, in *Astronomy*, for the point of heaven perpendicularly over our heads, called the ZENITH.

VERTEX, *Path of the*. See PATH.

VERTIBULUM, a word used by some writers to express the round head of a bone, which, in its articulation, is inserted into the sinus, or cavity of another bone.

VERTICAL *Circle*, in *Astronomy*, is a great circle of the sphere, passing through the zenith Z, and the nadir N, (*Tab. Astronomy*, *fig.* 6.) and any other given point on the surface of the sphere, as B.

The *vertical*, *circles* are also called AZIMUTHS. The meridian of any place is a *vertical circle*. All the *vertical circles* intersect each other in the zenith and nadir.

The use of the *vertical circles* is to measure the height of the stars, and their distances from the zenith, which is reckoned on these circles; and to find their eastern and western amplitude, by observing how many degrees the *vertical*, wherein the star rises or sets, is distant from the meridian.

Prime VERTICAL, is that *vertical* circle, or azimuth, which passes through the poles of the meridian; or which is perpendicular to the meridian, and passes through the equinoctial points.

Prime VERTICALS, in *Dialling*. See PRIME *Verticals*.

VERTICAL *of the Sun*, is the *vertical* which passes through the centre of the sun at any moment of time.

Its use is, in dialling, to find the declination of the plane whereon the dial is to be drawn, which is done by observing how many degrees that *vertical* is distant from the meridian, after marking the point, or line of the shadow upon the plane at any times.

VERTICAL *Angles*. Two angles, as *o* and *x*, (*Tab. Geometry*, *fig.* 18.) are said to be *vertical*, if the legs of one of them, AE and EB, be only continuations of the legs of the other, CE and DE. See *Vertical* ANGLES.

VERTICAL *Plane*, in *Perspective*. See PLANE and PERSPECTIVE.

VERTICAL *Plane*, in *Conics*, is a plane passing through the vertex of a cone, and parallel to any conic section.

VERTICAL *Line*, in *Conics*, is a right line drawn on the *vertical plane*, and passing through the vertex of the cone.

VERTICAL *Line*, in *Perspective*. See *Vertical* LINE.

VERTICAL *Dial*. See *Vertical* DIAL.

VERTICAL *Point*, in *Astronomy*, the same with *vertex*, or *zenith*.

Hence, a star is said to be *vertical*, when it happens to be in that point which is perpendicularly over any place.

VERTICAL *Line*, in *Dialling*, is a line in any plane perpendicular to the horizon.

This is best found and drawn on an erect and reclining plane, by holding up a string and heavy plumbet steadily, and then marking two points of the shadow of the thread on the plane, a good distance from one another; and drawing a line through those marks.

VERTICILLATE *Plants*, in *Botany*. See PLANTS.

Mr. Ray makes two distinctions of the *verticillate plants*. 1. The *fruticosæ*, or such whose superficies is perennial; these, again, have either a plain flower, as the chamædrys vulgaris, teucrium, and the marum Syriacum; or a flower with a lip, which they call a *labiated flower*; or one something in the form of an helmet, which they call *galeated*; as the sclarea, stœchas, hyssopus, rosmarinus, satureia, marum vulgare, thymum vulgare, and the polium montanum.

2. The *herbaceæ*, or such whose stalks are not perennial; these are the menthæ, verbena, dictamnus Creticus, origanum, majorana, ocymum, horminum, galeopsis, nepeta, betonica, prunella, stachys, clinopodium vulgare, lamium, moluca, hedera terrestris, galericulata, calamintha, melissa, marrubium commune, nigrum & aquaticum; chamæpitys, scordonia, scordium, bugula, syderitis, and cardiaca.

VERTICILLATE *Flowers*. See FLOWERS.

VERTICITY, is that property of the load-stone whereby it turns or directs itself to some peculiar point.

The attraction of the magnet was known long before its *verticity*.

VERTIGO, formed *à vertendo*, from *turning round*, in *Medicine*, an indisposition of the brain, wherein the patient sees the objects about him as if they turned round, and fancies he turns round himself; though he is all the while at rest.

Physicians distinguish two kinds, or rather two degrees of *vertigoes*. The first, called a *simple vertigo*, is when the

body and external objects appear to turn round, without any great dimness of sight.

The other, called *scotomia*, or *vertigo tenebrosa*, is when the eyes are also darkened, and, as it were, covered with a mist.

Some make a third stage, viz. *vertigo caduca*, wherein the patient actually falls down. But this seems scarce to differ from an EPILEPSY.

Sometimes the *vertigo* is situated in the fore part of the head and sometimes in the hind part; the latter is much the more dangerous.

Bellini accounts for the *vertigo* very well, from a preternatural motion in the retina; for it is evident, an object will seem to move circularly, if the images thereof, painted on the retina, fall successively on different parts of the retina.

This they may do, either by the objects moving while the eye is at rest, or from the eye moving while the object rests; or lastly, the object and eye being both at rest, and the rays falling on the same place, by the optic nerves being alone in motion. For since a right and an oblique incident do not excite the same tremors in the nerves, and the same species of motion; if the optic nerve only be moved, and the object be at rest, it will will appear to shift its situation, by the change of the place in which it was represented.

External causes of *vertigoes* are a continued turning round of the body, drunkenness, too long fasting, immoderate exercise, surprize, voracity, much use of pulse, onions, leeks, radishes, cabbage, mustard, &c. and, in general, whatever may press, distend, or contract the arteries.

The first step in the cure is bleeding in the jugular, or cupping; then they proceed to an emetic; then a vesicatory on the neck, or a perpetual blister, or issues, with sternutatories, and the other medicines that obtain in the apoplexy.

VERTILLAGE, in *Agriculture*, the tilling, or preparing of ground to receive the seed, by turning, stirring, or tossing it.

VERTUE. See VIRTUE.

VERTUMNALIA, among the *Romans*, a festival celebrated in honour of the god Vertumnus in the month of October.

VERTUMNUS, in *Mythology*, a god who presided over gardens and orchards, honoured among the Etruscans, from whom the worship of this deity was transmitted to the Romans.

Ovid has described the various forms assumed by this deity, in order to obtain the love of Pomona. Some have supposed that *Vertumnus*, whose name they derive *a vertendo*, because he had power to change his form at pleasure, marked the year and its variations; and thus they say he pleased Pomona, by bringing the fruits to maturity. Accordingly, Ovid says, that he assumed the form of a labourer, reaper, vine-dresser, and old woman, to represent the four seasons, spring, summer, autumn, and winter.

Vertumnus had a temple near the market-place at Rome, being represented as one of the tutelary deities of the merchants.

Vertumnus, says an ancient scholiast, *deus est præses vertendarum rerum*, i. e. *vendendarum ac emendarum*.

At the feast instituted in honour of him, he was represented as a young man crowned with different sorts of herbs, dressed in a robe which reached to his middle; holding fruit in his left hand, and, in his right, a cornucopiæ.

The commentators on Ovid say, that he was an ancient king of Hetruria, who, by his diligent and successful cultivation of fruits and gardens, obtained the honour of being ranked among the gods. Encyclopedie.

VERTUOSO. See VIRTUOSO.

VERU, a comet, according to some writers, resembling a spit, being nearly the same as the lonchites, only its head is rounder, and its train longer and sharper pointed.

VERVA, a word used by some authors to express an ivory amulet to be worn for the epilepsy.

VERVAIN, *verbena*, in *Botany*, a genus of the *diandria monogynia* class. Its characters are these: the flower has an angular permanent empalement, indented in five parts at the brim; it has one petal with a cylindrical tube, the length of the empalement, which is incurved, and cut into five points at the brim, which spread open, and are nearly equal; it has sometimes two, at other times four, very short bristly stamina within the tube, two of which are shorter than the other, with as many incurved summits as stamina, with a four-cornered germen, supporting a slender style the length of the tube, crowned with an obtuse stigma; the germen afterward becomes two or four oblong seeds, closely shut up in the empalement. Miller enumerates eighteen, and Linnæus sixteen species.

The common *vervain*, or *verbena officinalis* of Linnæus, is very common on the sides of roads, foot-paths, and farm-yards near habitations; for although there is scarce any part of England in which this is not found in plenty, yet it is never found above a quarter of a mile from a house; which occasioned its being called *simpler's joy*, because, wherever this plant is found growing, it is a sure token of a house being near; this is a certain fact, says Miller, but not easy to be accounted for. It is rarely cultivated in gardens, but is directed by the College of Physicians for medicinal use, and is brought to the markets by those who gather it in the fields. It is annual, and flowers in July or August.

Vervain was used among the ancients at their sacrifices, and was thought to contain something divine. The Romans, in the beginning of the year, made a present of this herb to their friends.

It manifests a slight degree of astringency. The root, worn at the pit of the stomach, an infusion, and an ointment prepared from the leaves, are said to produce good effects in scrophulous cases. Morley's Ess. on Scrophula.

But this, says Dr. Withering, wants confirmation from the more rational, and less enthusiastic practitioner.

Its sensible qualities, says Dr. Lewis, afford little or no foundation for the abundance of virtues for which it has been celebrated.

VERVAIN *Mallow*. See MALLOW.

VERU-MONTANUM, in *Anatomy*, a kind of little valve in the place wherein the ejaculatory ducts enter the urethra.

Its use is to prevent the urine, in passing the urethra, from getting in at those ducts, and so mixing with the semen. See URETHRA.

VERY *Lord*, and VERY *Tenant*, are those that are immediate lord and tenant to one another. See LORD and TENANT.

VERZELLINO, in *Ornithology*, the name of a bird common in Italy, and kept in cages for its singing, called by authors CITRINELLA, and *thraupis*.

VESICA, in *Anatomy*, a bladder; a membranous or skinny part, in which any humour is contained.

VESICA *bilaria*. See GALL-*bladder*.

VESICA, among *Chemists*, is a large copper vessel, tinned on the inside, used in distilling ardent spirits; so called, as resembling the figure of a blown bladder.

VESICÆ *sphincter*. See SPHINCTER.

VESICATORY, *vesicatorium*. See BLISTER, CANTHARIDES, and EMPLASTRUM.

Vesicatories are a stronger sort of sinapisms, and a kind of potential cauteries.

VESICULA, *vesicle*, a diminutive of VESICA; signifying a *little* BLADDER.

The lungs consist of *vesiculæ*, or lobules of *vesiculæ*, admitting air from the bronchiæ; and not only air, but also dust, &c.

There are several parts in the body which bear this appellation; as,

VESICULA *fellis*, *cistula fellis*. See GALL-*bladder*.

VESICULÆ *seminales*, in *Anatomy*, are soft, whitish, knotted bodies, about three or four fingers breadth in length, one in breadth, and about three times as broad as thick, situated obliquely between the rectum and lower part of the bladder, in such a manner, as that their superior extremities are at a distance from each other, and their lower extremities united between those of the vasa deferentia. They are irregularly round on the upper part, and their breadth gradually decreases from thence. By the union of their lower extremities they form a kind of fork, the branches of which are broad, and bent like ram's horns. These extremities are very narrow, and form a small neck, which runs behind the bladder toward its orifice, and continues its course in the groove of the prostates, through the substance of the contiguous portion of the urethra, till its extremities pierce the caruncula. The inner substance of the *vesiculæ* is plaited, and distinguished into several capsulæ, by contorted folds. Their external surface is covered by a fine membrane, which serves for a border and frænum to the folds, and is a true continuation of the cellular substance of the peritonæum. The *vesiculæ* may be easily unfolded, and when their contortions are straightened, they become much longer than in their natural state. Their inner surface is villous and glandular, and furnishes a fluid, which exalts, refines, and perfects the semen, which they receive from the vasa deferentia, and of which they are the reservatories for a certain time. Besides the septum formed by the passage of the *vasa* DEFERENTIA into the *vesiculæ*, the lateral union of the extremities

extremities of the vas deferens, and *veſicula ſeminalis* on each ſide, forms likewiſe a kind of ſhort ſeptum, terminating in a creſcent, like a ſmall ſemilunar valve, and the extremity of the vas deferens is narrower than that of the *veſicula*. By this mechaniſm, the fluid contained in each vas deferens has liberty to enter the contiguous veſicula, but that contained in the *veſicula* cannot return into the other canals. Winſlow.

See *Tab. Anat.* (*Splanch.*) *fig.* 8. *lit. o. o. fig.* 15. *lit. b. b.* See alſo SEED, and TESTICLES.

VESICULÆ *ſeminales.* Theſe veſſels are very evident in fiſh; the females of moſt fiſh have double ovaria, though in ſome they are ſingle, as in the oſmerus, and perca fluviatilis of Bellonius; but the *veſiculæ ſeminales* in the males are two in number in all fiſh, not excepting the males of theſe here mentioned. They differ, however, very much in regard to their figure and ſituation. As to their ſituation, they in ſome fiſh occupy almoſt the whole length of the abdomen, as in the ſpinoſe kinds in general, and in the petromyzum, accipenſer, and many of the other cartilaginous kinds. In ſome fiſh, they are placed only in the lower part of the abdomen, as in the cetaceous kinds, &c. As to figure, in the generality of fiſh, they are oblong and compreſſed, but in ſome they are round, as in the cetaceous kinds. The other parts of generation are wanting in moſt fiſh. Artedi's Ichthyolog. See TESTES.

VESICULÆ *adipoſæ.* See ADEPS, and CELLULÆ *adipoſæ.*

VESICULAR *glands.* See GLANDS.

VESP, or WASP, *veſpa*, in the *Hiſtory of Inſects.* See WASP.

VESP-*ichneumon.* See ICHNEUMON-*waſp.*

Of this inſect, Mr. Ray mentions not leſs than thirty-two ſpecies; the greater part of which are common on the ſides of mud banks in the borders of fields. Theſe have all ſlender bodies, and are armed with ſtings.

The origin of this creature is very ſtrange; it is uſually found iſſuing from the body of the common cabbage caterpillar; the occaſion of which is this: the parent fly ſtrikes her tail through the ſkin of the back of this caterpillar, and depoſits her eggs in the creature's fleſh. The eggs hatch into ſmall maggots of the carnivorous kind; and theſe prey upon the fleſh of the caterpillar till they arrive at their full growth: the creature that ſupports them keeping itſelf alive all this time by the vaſt quantities of nouriſhment it is continually taking in. At length, when theſe worms are arrived at their full growth, they ſpin themſelves a web, under which they change into cryſales, and ſoon after come out in form of the fly that laid the egg. This is not peculiar to this ſingle ſpecies of fly; but many are formed thus in the bodies of caterpillars of ſeveral kinds: ſome of theſe ſpin their webs under the ſkin of the caterpillar, and eat their way through it, when arrived at their perfect ſtate; but others crawl out while yet in their worm ſtate, after having eaten their full time, and bury themſelves under ground in order to ſpin their webs.

VESPER, in *Aſtronomy*, called alſo *Heſperus*, and the *evening ſtar*, is the planet VENUS, when ſhe is eaſtward of the ſun, and conſequently ſets after him.

VESPERS, in the Romiſh *Church*, *evening ſong*; that part of the office which is rehearſed after noon; anſwering to our *evening prayers*; except that it differs more from the office of the morning, called *matins*.

VESPERS, *Sicilian*, denote a famous æra in the French hiſtory; or a general maſſacre of all the French in Sicily, in the year 1282, to which the firſt toll that called to *veſpers* was the ſignal.

Some will have it to have happened on Eaſter eve; others, on the day of the Annunciation; but moſt authors aſſign it to Eaſter day. It is aſcribed to one Prochites, a Cordelier, at the time when Charles of Anjou, count of Provence, was king of Naples and Sicily. The women with child by Frenchmen were not ſpared.

After the like manner, we ſay, the *matins of Moſcow*, ſpeaking of the Muſcovites aſſaſſinating their prince Demetrius, and all the Poles, his adherents, at Moſcow, the twenty-ſeventh of May 1600, under the conduct of their duke Choutſky, at ſix a clock in the morning: and *French matins* to the maſſacre of St. Bartholomew in 1572.

VESPERTILIO, in *Zoology.* See BAT.

VESPERTILIO, in *Conchyliology*, the name of an elegant ſpecies of VOLUTA, ſuppoſed to have ſome reſemblance to the colour of a bat.

VESPERTILIONUM *alæ, bat's wings*, among *Anatomiſts*, two broad membranous ligaments, with which the bottom of the womb is tied to the bones of the ilium; they are ſo called from their reſembling the wings of a bat. See *Tab. Anat.* (*Splanch.*) *fig.* 11. *lit. g. g.*

VESPERTINE, *veſpertinus*, in *Aſtronomy*, is when a planet is ſeen deſcending to the weſt after ſun-ſet.

VESPIVORUS *buteo*, in *Ornithology*, a name given by ſome authors to the bird, called in Engliſh the honey-buzzard, from its feeding its young with the maggot worms out of honey-combs. See APIVORUS *buteo.*

VESSEL, *vas, vaſe*, a thing proper to hold or contain liquor. See VAS.

Thus, a tun, or hogſhead, &c. are *veſſels* fit to contain ale, wine, &c.

The *chemiſts* uſe a great diverſity of *veſſels* in their operations; as copper alembics, with their refrigeratories, worms, and receivers, alembics of glaſs, ſtone, and earthen ware, adopters, or ſmall receivers with two necks, aludels, balloons, bottles, glaſs jars and baſons of various ſizes, capſules, or diſhes of glaſs, ſtone-ware, cryſtal glaſs, crucible earth, and plate iron, the cone, crucibles, glaſs funnels, ingot-moulds, matraſſes, mortars, muffles, pelicans, retorts, receivers, circulatory *veſſels*, ſubliming *veſſels*, &c. See each article. See alſo LABORATORY, and *Tables of Chemiſtry.*

VESSEL, *double.* See DOUBLE.

Among anatomiſts, &c. all the tubes or canals, wherein the blood, and other juices or humours, are ſecreted, conveyed, depoſited, &c. as the veins, arteries, lymphatics, ſpermatics, &c. are called *veſſels.* See *Tab. Anat. P.* 2. *Veſſels of human body.*

Some even extend the word *veſſel* to the nerves; as ſuppoſing them the conduits of the animal ſpirits.

Veſſels conſiſt of membranes, variouſly formed, and diſpoſed for the reception of the fluids; and theſe membranes, again, conſiſt of leſſer veſicles, or veſiculæ; and this, for what we know, without end.

In the new ſyſtem of many modern philoſophers and phyſicians, *veſſel* is a name common to all the ſolid parts of the body.

Theſe authors explain the whole animal œconomy, functions, &c. from the divers liquors diffuſed throughout the body, and the various tubes or *veſſels* which contain thoſe liquors. In effect, all we know in the human body, is either *veſſel*, or liquor.

The ancients, it is true, had a notion, that ſome parts of the body, as the heart, ſpleen, &c. are mere parenchymas, i. e. a kind of pulp, or pith, void of all *veſſels*; but the moderns, by the advantage of microſcopes, injections, &c. find that theſe, and all other parts of the body, are mere congeries, or maſſes of *veſſels*, interwoven. Some philoſophers even extend the modern ſyſtem to all material beings; owning only two elements, viz. a matter infinitely liquid, diffuſed through all nature; and hard, or ſolid parts; which are, as it were, the *veſſels* of that matter.

The number of *veſſels*, ſome of our lateſt and beſt anatomiſts obſerve, is greateſt in embryos, and continually decreaſes as age comes on.

For, in the actions whereby nutrition, &c. are effected, the greater *veſſels* being much diſtended by their humours, the ſmaller veſicles, whereof the membranes or coats of the larger are compoſed, become compreſſed and ſtreightened, and at length quite dry, and void of juices; ſo that, growing together, the fibres become the firmer and ſtronger, by the loſs of the veſicles. And hence the ſtrength, firmneſs, ſtiffneſs, &c. of the ſolid parts.

VESSELS, *extraordinary*, in *Anatomy.* It is not uncommon to find in the bodies of diſſected perſons remarkable variations from the common courſe of nature in the ſtructure of the body; and among theſe, ſometimes duplicates of parts naturally ſingle: thus Kerkring mentions a double *vena cava*, and a treble ductus thoracicus in different bodies, as alſo four ſpermatic arteries in one body, with no ſpermatic veins. There are accounts alſo of defects of parts uſually judged eſſential; but it is to be obſerved, that the ends of nature being much more eaſily anſwered by the exceſs than by the defect of parts, the accidents of exceſs are much more common than thoſe of defect. Kerkring's Spicil. Anat.

VESSEL, *axis of a, capillary, cervical, phrenic, pulmonary, ſpermatic*, and *umbilical.* See the ſeveral articles.

VESSEL, in *Navigation*, is a general name common to all ſorts of ſhips; i. e. all floating machines, or vehicles that move in water; whether they are navigated on the ocean, or in canals and rivers.

Veſſels, in this comprehenſive ſenſe, are frequently diſtinguiſhed into two general claſſes, viz. *high-bottomed*, or *decked veſſels*; which are thoſe that move wholly with wind and ſail, and live in all ſeas; as *pinks, galleons, ſhips*, &c. and *flat-bottomed veſſels*, which go both by oars and ſails: ſuch are *boats, galleys, praams, wherries*, &c.

Floating veſſels are uſually diſtinguiſhed into *boats, lighters, barges, barks, fiſhing veſſels, ſhips of trade*, and *veſſels*

vessels of war; of each whereof there are divers kinds and denominations. See SHIP.

However, the name *vessel* is more particularly applied to ships or floating machines of the smaller kind, furnished with one or two masts. In *Tab.* II. *Ship*, the reader will see the principal of those that are most frequently employed in European navigation. A SNOW under sail is exhibited in *fig.* 9. *fig.* 10. represents a KETCH at anchor; *fig.* 11. a brig or BRIGANTINE; *fig* 12. a BILANDER; *fig.* 13 a XEBEC; *fig.* 14. a SCHOONER; *fig.* 15. a GALLIOT; *fig.* 16. a DOGGER; all of which are under sail; *fig.* 17. and 18. two GALLEYS, one of which is under sail, and the other rowing; and *fig.* 19 a SLOOP. The ketch, whose sails are furled, is furnished with a try-sail, like the snow; and it has a fore-sail, fore-stay-sail, and jib, nearly similar to those of a sloop; but the sails on the main-mast and mizen-mast are like those of a ship. The main-sail and main-top-sail of the brig are like those of the schooner; and the fore-mast is rigged and equipped with sails in the same manner as the ship and snow. The sails, masts, and yards of the xebec, being extremely different, are described under XEBEC. In the schooner both the main-sail and fore-sail are extended by a boom and gaff, as likewise is the sloop's main-sail; the sails of the dogger and galliot are sufficiently expressed in the figures; and, finally, the galleys are navigated with lateen-sails, which are extremely different from those of the *vessels* above described. Falconer.

A *vessel* is said to be *of three or four hundred tons*; meaning, that it will carry three or four hundred times two thousand weight; or that, when immerged in water, it possesses the space of three or four hundred tons of water; which are equal to the weight of the *vessel*, and all the loading it can carry.

A *vessel* is said to *draw ten or fifteen feet of water*; meaning, that, when loaden, it sinks so deep under water.

The figure of *vessels* is an object of great importance, with regard to their motion, sailing, &c. and in the determining what form is most commodious, the new doctrine of infinites becomes of apparent service to navigation and commerce.

A body, moving in an immoveable fluid, is obliged to sever the parts thereof; and they resist such separation.—Now, setting aside a certain tenacity, whereby they are, as it were, glued together, and which is different in different fluids; the whole force of the resistance depends on that of the shock, or impulse: for a body that is struck, strikes at the same time; but a perpendicular stroke is that which a liquid resists the most, as being the greatest; and for a body to move freely therein, it must be of such figure, as to present itself as obliquely as possible. If it were triangular, and moved with the point foremost, it is certain all its parts would strike the fluid obliquely; but they would all strike it with the same obliquity; and it were more advantageous, that each should strike more obliquely than the next adjacent.

Now, such a perpetual augmentation of obliquity can no where be had in a curve line; each point whereof is considered as an infinitely small right line, always inclined to the other little right lines contiguous to it.

To find what curve it is, whose perpetual change of obliquity, or inclination in all its parts, renders it, of all others, the fittest to divide the fluid easily, is a problem much more difficult than it appears to be, and, in effect, is only to be solved by the new geometry: the solution was first given by sir Isaac Newton, in his investigation of the solid of the least resistance.

That author, however, did not publish his analysis; yet the marquis de l'Hopital hit upon it; and afterwards M. Fatio resolved the same problem, though by a much longer, and more perplexed way. See *Solid of the least* RESISTANCE.

VESSELS, *book of*. See BOOK.

VESSIGON, in the *Manege*, a WIND-*gall*, or soft swelling, on the in and outside of a horse's hough, that is, both on the right and left of it.

VEST, and VESTITURE. See INVESTITURE.

VESTA, in *Mythology*, one of the principal deities of the pagans.

Those who have diligently investigated the religion of the Pythagorean philosophers pretend, that by *Vesta* they meant the universe, to which they ascribed a soul, and which they worshipped as the sole divinity, sometimes under the name of *τὸ πᾶν, the whole*, and sometimes under the appellation of *μονάς, unity*. However, fabulous history records two goddesses under the name of *Vesta*; one the mother of Saturn, and wife of Cœlum, and the other, the daughter of Saturn by his wife Rhea. The first was *Terra*, or the Earth, called also CYBELE, and derived her name *Vesta*, according to some, from cloathing, because the earth is clothed, *vestitur*, with plants and fruits, or, according to Ovid, from the stability of the earth, because *stat vi terra sua*, or it supports itself. Hence the first oblations in all sacrifices were offered to her, because whatsoever is sacrificed springs from the earth; and the Greeks both began and concluded their sacrifices with *Vesta*, because they esteemed her the mother of all the gods. The second was fire, and *Vesta*, whose power was exercised about altars and houses, derives her name, according to Cicero, from *ἑστια*, *fire* or *hearth*. Accordingly the poets frequently use *Vesta* for fire or flame; as they do Jupiter for air, Ceres for corn, &c. An image of *Vesta*, to which they sacrificed every day, was placed before the doors of the houses at Rome; and the places where these statues were erected were called *vestibula*, from *Vesta*. This goddess was a virgin, and so great an admirer of virginity, that when Jupiter her brother gave her leave to ask what she would, she besought that she might always be a virgin, and have the first oblations in all sacrifices.

This goddess is called by Horace *æterna Vesta*, and it was in honour of her that Numa erected a temple at Rome, and dedicated virgins to keep a perpetual fire upon her altars, *ut ad simulacrum cœlestium siderum, custos imperii flamma vigilaret*, as Florus says. One way of representing this goddess, it is said, was in the habit of a matron, holding in her right hand a flambeau or lamp, and sometimes a Palladium, or small Victory. Mr. Spence, however, doubts, whether the figures, that are generally looked upon as *Vestas*, do really represent that goddess or not. There is nothing, he says, which he has seen, that would not be as proper for one of the vestal virgins, as for the goddess who presided over them. To this purpose Ovid expressly says (Fast. vi. ver. 298) they had no representations of this goddess: *effigiem nullam* Vesta *nec ignis habent*. And he explains away another passage in the third book of his Fasti, ver. 46. where he speaks of a figure of *Vesta*. Polymetis, p. 82. The titles that are given to *Vesta* upon medals and ancient monuments are, *Vesta* the Happy, the Mother, the Saint, the Eternal, &c. The worship of *Vesta* and of fire was brought from Phrygia into Italy by Æneas and the other Trojans who resorted thither. To this purpose Virgil observes (Æn. lib. ii.) that Æneas, before he left the palace of his father, had taken away the fire from the sacred hearth: *Æternumque adytis effert penetralibus ignem.*

The name *Vesta*, called by the Greeks *ἑστια*, was synonymous with the Chaldæan and Persian *Avesta*; and hence, according to the learned Hyde, Zoroaster gave to his famous book on the worship of fire, the name of *Avesta*, or ABESTA, i. e. the custody of fire.

VESTALIA, feasts held in honour of the goddess Vesta, on the fifth of the ides of June; i. e. on the ninth day of that month.

On that day, banquets were made before the houses; and meats were sent to the vestals, to be offered by them to the goddess. See VESTALS.

The asses, that turned the mills for grinding corn, were, on this occasion, led about the city, crowned with flowers, and chaplets formed of pieces of bread; and the mill-stones were likewise decked with garlands and crowns. The ladies went barefooted in procession to the temple of Vesta; and an altar was erected to Jupiter *the Baker*, *Jovi Pistori*, in the Capitol.

The *Vestalia* had their names from that of their goddess VESTA.

VESTALS, *Vestales*, in *Antiquity*, virgins in ancient Rome, consecrated to the service of the goddess Vesta; and particularly to watch the sacred fire in her temple.

Numa first instituted four *Vestals*; and Plutarch tells us, Servius Tullius added two more; but Dion. Halicarnass. and Valerius Maximus ascribe this augmentation to Tarquinius Priscus; which number, six, lasted as long as the worship of the goddess Vesta. The *Vestals* made a vow of perpetual virginity: their employment was, the sacrificing to Vesta, and keeping up the holy fire in her temple. If they violated the vows of chastity, they were punished with remarkable severity; being shut up, or buried, in a deep pit, or cavern, in a place called *agger & sceleratus campus*, with a lighted lamp, and a little water and milk, and there left to be devoured by hunger. If they let out the fire, they were whipped by the pontifex maximus; and the fire was rekindled by the sun-beams. It is said, that they always lighted it anew on the first of March in every year, whether it had gone out or not.

To be secure of their virginity, at their admission, it was provided, that they should not be under six, nor above ten years old. They were chosen by lot, out of twenty virgins, carried by the pontiff to the comitia, for that purpose.

They were only consecrated for thirty years; after which time

time they were at liberty to go out, and be married. If they continued in the houſe after that time, they were only to be aſſiſtant, in point of advice, to the other *Veſtals*.

The firſt ten years they were to employ in learning their functions; the ten following they were to exerciſe them; and the laſt ten, to teach them to others.

Their order was very rich; both on account of the endowments of the emperors, and of legacies of other perſons.

The *Veſtals* had a particular place allotted them at the amphitheatres, and games of the Circus. Their vehicle was the carpentum, or pilentum. The veil, wherein they ſacrificed, was called *ſuffibulum*.

At firſt, they were nominated by the kings; but after the extinction of monarchy, by the pontifex maximus, or high-prieſt. The eldeſt of them was called *maxima*, as the firſt pontiff was maximus.

They had divers privileges; diſpoſed of their effects by teſtament, in their fathers life-time; had the ſame gratification as a mother of three children; and whenever they met a criminal going to execution, they had a power to pardon him. Whenever they went abroad they had the faſces carried before them, a conſul, or the prætor, being obliged to give way to them.

The fire, which the *Veſtals* were to watch, was not on an altar, or an hearth, but in little earthen veſſels with two handles, called *capeduncula*.

This fire was held a pledge of the empire of the world. If it went out, it was judged a very unlucky prognoſtic, and was to be expiated with infinite ceremonies. Among the Romans, Feſtus tells us, it was only to be rekindled by the rubbing a kind of wood, proper for the purpoſe. But among the Greeks, Plutarch, in the life of Numa, obſerves, it was to be rekindled by expoſing ſome inflammable matter in the centre of a concave veſſel held to the ſun. For it is to be noted, the Romans were not the only people who kept the perpetual fire of Veſta, in imitation of the celeſtial fires; but the Greeks were poſſeſſed with the ſame ſuperſtition; particularly the Delphians, Athenians, Tenedians, Argives, Rhodians, Cyzicenians, Mileſians, Epheſians, &c.

This order of *Veſtals* is ſaid to have ſubſiſted about a thouſand years, i. e. from the time of Numa to that of the emperor Theodoſius.

VESTED *legacy*. See CONTINGENT *legacy*.

VESTED *remainder*. See REMAINDER.

VESTIARIUS, *veſtiary*, in *Antiquity*, maſter of the wardrobe; an officer under the Greek empire, who had the care and direction of the emperor's apparel, robes, &c.

The *protoveſtiarius*, or *firſt veſtiary*, was the grand maſter of the wardrobe. But, among the Romans, *veſtiarius* ſimply was only a ſaleſman, or taylor.

VESTIBULE, *veſtibulum*, in the *Ancient Architecture*, a large open ſpace before the door, or entrance of a houſe.

Martinius derives the word from *veſtæ ſtabulum*; becauſe the fore-part of the houſe was dedicated to Veſta. Daviler derives it from *veſtis*, and *ambulo*; becauſe people there begin to let their trains fall.

The Romans had places called *veſtibules*, at the entrance of their houſes, to ſhelter people obliged to ſtand at the door from the weather; and we have ſtill *veſtibules* of the like kind, in many old churches, houſes, &c. called *porches*.

Veſtibules, only intended for magnificence, are uſually between the court and the garden: theſe are ſometimes *ſimple*; that is, have their oppoſite ſides equally enriched with arches; and ſometimes their plan is not contained under four equal lines, or a circular one, but forms ſeveral van-corps, and rear-corps, furniſhed with pilaſters.

VESTIBULE is alſo uſed for a kind of little antichamber before the entrance of an ordinary apartment.

VESTIBULE is alſo an apartment in large buildings, which preſents itſelf at the entrance into a hall or ſuite of rooms, or offices. The area, in which a magnificent ſtair-caſe is carried up, is ſometimes called a *veſtibule*. And alſo when the ends of corridores, or paſſages, terminate in a room, without being ſeparated from them by doors, either to receive light or air, or for appearance; ſuch rooms are called *veſtibules*.

VESTIBULE, *veſtibulum*, in *Anatomy*, denotes the fore-part of the labyrinth of the ear.

The *veſtibule* is a ſmall cavity, of an irregular form, placed immediately above the baſis of the ſtapes; between the ſemicircular canals, and the cochlea.

In it appear divers foramina; as that of the feneſtra ovalis; the five foramina of the ſemicircular canals; that of the cochlea; and five other very ſmall ones, through which ſo many nerves paſs. See EAR.

VESTIGIA, a Latin term, frequently uſed by Engliſh writers, to ſignify the traces or footſteps any thing has left behind it.

The word is particularly applied to the marks remaining of ſomething antique, gone to ruin by time.

VESTIS *angelica*. See ANGELIC *garment*.

VESTMENT. See VESTURE.

VESTRY, *veſtiaria*, a room adjoining to a church, where the prieſts veſtments, and the ſacred utenſils, are kept, and parochial aſſemblies are held.

Hence the term *veſtry* is applied to the parochial aſſembly itſelf. On the Sunday before a *veſtry* is to meet, public notice ought to be given, either in the church, after divine ſervice is ended, or elſe at the church door, as the pariſhioners come out, both of the calling of the ſaid meeting, and alſo the time and place of aſſembling it, and ſometimes of the buſineſs for which it is convened. And it is uſual that for half an hour before it begins, to give notice, by tolling one of the church bells. Anciently, at the common law, every pariſhioner who paid to the church rates, or ſcot and lot, and no other perſon had a right to come to theſe meetings, the miniſter excepted, who is reſponſible to the biſhop, whether he be rector or vicar, for his attendance, and who preſides in every pariſh meeting. Out-dwellers alſo, occupying land in the pariſh, have a vote in the *veſtry*, as well as the inhabitants; and when they are met, the major part preſent will bind the whole pariſh. Burn's Eccl. Law, art. *Veſtry*.

VESTRY-*men*, a ſelect number of the principal perſons of every pariſh within the city of London, and elſewhere; who yearly chooſe pariſh-officers, and take care of its concernments.

They are thus called, becauſe they uſually meet in the *veſtry* of the church.

By theſe *ſelect veſtries*, the pariſhioners have in ſome places loſt not only their right to concur in the public management as often as they would attend, but alſo the right of electing the managers. And yet ſuch a cuſtom of the government of pariſhes hath been adjudged a good cuſtom, as the churchwardens accounting to them has been adjudged a good account. In ſome pariſhes, theſe ſelect veſtries have been thought oppreſſive and injurious, and great ſtruggles have been made to ſet them aſide. Preſcription and conſtant immemorial uſage ſeem to be the baſis and only ſupport of theſe *ſelect veſtries*. In the act of the 10 Ann. cap. 11. for building fifty new churches, the commiſſioners are empowered to appoint a convenient number of ſufficient inhabitants to be *veſtry-men*; and from time to time, upon the death or removal, or other voidance, of any ſuch *veſtry-man*, the reſt, or majority of them, may chuſe another. In the ſeveral private acts for building particular churches, ſometimes the miniſter, churchwardens, overſeers of the poor, and others, who have ſerved or paid fines for being excuſed from ſerving theſe offices; ſometimes the miniſter, churchwardens, overſeers of the poor, and all who pay to the poor rate; ſometimes only all who pay a certain ſum to the poor rate; ſometimes all who rent houſes of ſo much a year, are appointed to be *veſtry-men* within ſuch pariſhes, and no other perſons.

VESTRY-*clerk*, an officer who keeps the pariſh accounts.

VESTURE, *veſtiment*, a garment, or cloathing.

In our law books, it is alſo uſed metaphorically; as in *veſtura terræ*, i. e. *ſegetes quibus terra veſtitur*; the corn wherewith the earth is clothed, or covered.

VESTURE *of an acre of land*, is the produce on it; or the wood, corn, &c. growing on it. It ſhall be enquired how much the *veſture* of an acre of ground, and how much the land, &c. 4 Ed. I. 14 Ed. III. &c.

VESTURE, *veſtura*, alſo ſignifies a poſſeſſion, or ſeiſin.

In which ſenſe it is borrowed from the feudiſts; with whom *inveſtitura* ſignifies a delivery of poſſeſſion by a ſpear, or ſtaff; and *veſtura*, the poſſeſſion itſelf. See INVESTITURE.

VESUVIUS, *eruptions of*. See ERUPTION, and VOLCANO.

VETCH, or TARE, *vicia*, in *Botany*, a genus of the *diadelphia decandria* claſs. Its characters are theſe: the flower has an erect, tubulous empalement, of one leaf, cut into five equal parts at the brim; the petal is of the butterfly kind; the ſtandard oval, broad at the tail, indented at the point, and the borders are reflexed; the two wings are almoſt heart-ſhaped, and ſhorter than the ſtandard; the keel is ſhorter than the wings; the tail is oblong, and divided into two parts; it has ten ſtamina, nine joined, and one ſeparated, terminated by erect ſummits, with four furrows, and a linear, compreſſed, long germen, ſupporting a ſlender ſtyle, crowned by an obtuſe ſtigma, which is bearded on the under ſide; the germen afterward turns to a long pod, with one cell, opening with two valves, ending with an acute point,

and

and containing ſeveral roundiſh ſeeds. There are many ſpecies. Miller enumerates five, and Linnæus eighteen. The common *vetch* or *tare* is much cultivated in the fields for fodder; of this there are two varieties, if not diſtinct ſpecies. The firſt, which is the moſt common, has a black ſeed; the other has ſeeds as white, if not whiter, than the whiteſt peaſe; and this difference is permanent, for they are never found to vary. Theſe plants are annual, and periſh ſoon after they have perfected their ſeeds; the ſtalks are angular, ſtreaked, and hairy; they are weak and want ſupport, ſo generally decline where they have nothing near to faſten themſelves to; the leaves are compoſed of ſeveral pair of blunt lobes, and are terminated by tendrils; the flowers come out from the wings of the ſtalk, ſitting very cloſe to the baſe of the foot-ſtalks of the leaves; two of theſe generally ſpring from the ſame joint; they are pretty large, and of the butterfly-ſhape; thoſe of the black-ſeeded ſort are purple, and thoſe of the white-ſeeded white; they appear in June and July, which are ſucceeded by erect pods, containing three or four round ſeeds in each, which ripen in Auguſt or September. The ſort with white ſeed is rather the more ſucculent plant of the two, and therefore better for fodder; and if they are ſown in drills, may be ſo covered, that the rooks cannot find them.

Vetches are generally ſown at two ſeaſons; one is in autumn, and the other early in the ſpring; but the beſt time is in Auguſt; for the ſeeds which are ſown then will come up ſoon, and the plants will have time to get ſtrength before winter, ſo will be in leſs danger of ſuffering by froſt, than thoſe which are ſown later, and will be fit to cut for feed much earlier in the ſpring; for that is the time when green feed is moſt wanted, and if they are deſigned for ſeed, and not to be cut for fodder, thoſe early ſown *vetches* will come ſoon into flower, and the ſeeds will be ripe early, ſo they may be cut and ſtacked in good weather, which is a great advantage; for thoſe which ripen late are often ſtacked or houſed wet, and then the ſeeds frequently ſprout in the mow, and are ſpoiled.

The uſual method of ſowing *vetches* is in broad-caſt, ploughing them lightly in; in this way the common allowance of ſeed for one acre of land, is two buſhels; but there are ſome who ſow two buſhels and a half; this practice may do well enough for thoſe *vetches* which are deſigned to be cut for fodder in the ſpring; but thoſe which are ſown with an intent to ſtand for ſeed, will do much better if they are ſown in drills, in the ſame way as is practiſed for peaſe, and then leſs than half the quantity of ſeed will be ſufficient; for the drills ſhould not be nearer to each other than three feet, that the hoe-plough may have room to go between them, to deſtroy the weeds, and earth up the plants; for by this management they will produce a much greater crop, and ripen earlier in the ſeaſon. Theſe drills ſhould be about the ſame depth as thoſe uſually made for peaſe, and the ſeeds ſhould be ſcattered about the ſame diſtance in the drills. Theſe ſeeds ſhould be carefully covered as ſoon as they are ſown; for if they are left open, the rooks will diſcover them; and when they once find the rows, if they are not carefully watched, they will entirely devour them. Indeed, theſe being ſown early in autumn, will be in leſs danger than thoſe which are ſown late, or in the ſpring, becauſe there is more food for rooks and pigeons in the open fields at this ſeaſon, and the plants will appear much ſooner above ground. Toward the latter end of October the plants will have obtained conſiderable ſtrength, therefore they ſhould be earthed up with the hoeing-plough. This work ſhould be performed in dry weather, and in doing it care muſt be taken to lay the earth up as high to the ſtems of the plant as poſſible, ſo as not to cover the ſtalks, becauſe this will ſecure them againſt the froſt. The whole ſpace of ground between the rows ſhould alſo be ſtirred, in order to deſtroy the weeds, which, if carefully done in dry weather, will lay the land clean till March; at which time the crop ſhould be earthed a ſecond time, and the ground cleaned again between the rows, which will cauſe the plants to grow vigorous, and in a little time they will ſpread ſo as to meet, and cover the ſpaces; whereas thoſe ſown in the ſpring will not grow to half this ſize, and will be much later in flowering.

Some people ſow theſe *vetches*, and when they are fully grown, plough them into the ground to manure it. Where this is deſigned, there will be no occaſion to ſow them in drills at this diſtance, nor to huſband them in the manner before directed; but in this caſe it will be the beſt method to ſow them in autumn, becauſe they will be fit to plough in much ſooner the following year, ſo that the land may be better prepared to receive the crops for which it is intended.

When theſe plants are cultivated for their ſeeds, they ſhould be cut ſoon after the pods change brown; and when they are dry, they muſt be immediately ſtacked; for if they are ſuffered to lie out in the field to receive wet, and there come one hot day after it, the pods will moſt of them burſt, and caſt out the ſeeds. When the ſeeds are threſhed out, the haulm is eſteemed very good for cattle; and ſome have recommended the ſeeds for horſes, and affirm they are as proper for theſe animals as beans; which, if true, will render them more valuable, becauſe theſe will grow on the lighteſt ſandy land, where beans will not thrive.

There is another kind of *vetch*, with a ſmaller black ſeed, cultivated occaſionally, though very rarely, in the fields, becauſe it is more tender than the other, and muſt be always ſown in the ſpring, called in ſome counties rath-ripe *vetch*, and in others pebble or ſummer *vetch*. The *Siberian vetch*, which is a biennial plant, is recommended by Mr. Miller for fodder; becauſe its ſtalks grow to a great length, and are well furniſhed with leaves; they do not decay in autumn, but continue green through the winter, notwithſtanding the ſevereſt froſt, eſpecially if they are kept from trailing on the ground; ſo that in February and March, when there is a ſcarcity of green feed for ewes and lambs, this is of great ſervice. The flowers of this ſpecies are of a light blue colour, and appear in July. This may be ſown in ſpring or autumn; and when the plants come up, they require no other culture, but to be kept clean from weeds. While they are young, this ſhould be done with the Dutch hoe, and afterwards with the hoeing plough; and thus the plants may be earthed up like peaſe and beans, which will ſtrengthen their ſtalks, and make the leaves larger and more ſucculent. Miller's Gard. Dict.

In Glouceſterſhire the common *vetch* or tare is ſown as paſturage for horſes, and eat off early enough to allow of turneps being ſown the ſame year. The ſeeds are excellent food for pigeons.

Tares are rarely uſed in medicine, though the common people boil them in milk, and give the decoction to drive out the ſmall-pox and meaſles.

VETCH, *axe*, in *Botany*. See *Hatchet* VETCH.

VETCH, *bitter*, or *peaſeling*, *orobus*, in *Botany*, a genus of the *diadelphia decandria* claſs. Its characters are theſe: the empalement of the flower is tubulous, of one leaf; the brim oblique, and indented in five parts; the flower is of the butterfly kind; the ſtandard is heart-ſhaped; the two wings are almoſt as long as the ſtandard, and join together; the keel is bifid, acute-pointed, and riſing upwards; the borders are compreſſed, and the body ſwollen; it hath ten ſtamina, nine joined, and one ſeparate, terminated by roundiſh ſummits; it hath a cylindrical compreſſed germen, ſupporting a crooked riſing ſtyle, crowned by a narrow, downy ſtigma; the germen afterward becomes a long taper pod, ending in an acute point, having one cell, containing ſeveral roundiſh ſeeds. Linnæus enumerates ten, and Miller fourteen ſpecies.

The roots of the tuberous orobus, or wood and heath peaſe, when boiled, are ſavoury and nutritious; ground into powder they may be made into bread. They are much eſteemed by the Highlanders in Scotland, and chewed for preventing hunger. They imagine that they promote expectoration, and are efficacious in curing diſorders of the lungs. They alſo know how to prepare an intoxicating liquor from them. Withering's Bot. Arr. vol. ii. p. 446.

VETCH, *bitter*, and *Corn* VETCH. See ERVUM.

VETCH, *bindweed-leaved*. See VETCHLING.

VETCH, *chichling*, *lathyrus*, in *Botany*, a genus of the *diadelphia decandria* claſs. Its characters are theſe: the flower has a bell-ſhaped empalement of one leaf, cut into five parts at the top; it is of the butterfly kind; the ſtandard is heart-ſhaped, large, and reflexed at the point; the wings are oblong and blunt, the keel half round, and of the ſize of the wings; it hath ten ſtamina, nine of them joined, and one ſeparate, crowned by roundiſh ſummits; it has an oblong, narrow, compreſſed germen, ſupporting a riſing ſtyle with an acute point, crowned by a hairy ſtigma; the germen becomes a long compreſſed pod, ending in a point, having two valves, filled with roundiſh ſeeds. Linnæus reckons twenty-one, and Miller twenty ſpecies, one of which is known by the name of the ſweet-ſcented pea.

The ſweet pea grows naturally in Ceylon, but is hardy enough to thrive in the open air in England. It is an annual plant with a climbing ſtalk, which riſes from three to four feet high, garniſhed with leaves compoſed of two large oval lobes, whoſe mid-rib is terminated by long claſpers; the footſtalks, which come out at the joints, ſuſtain two large flowers, with dark purple ſtandards, but the keel and wings are of a light blue colour; the flowers have a ſtrong ſweet ſmell, and are ſucceeded by

long inflated pods, which are hairy, containing four or five roundish seeds in each. There are two other varieties of it, one with a pink-coloured standard, and a white keel, the wings of a pale bluish colour. This is commonly called the painted-lady pea. The flowers of the other are all white.

These plants require little culture; only where sown for ornament, they should have some sticks to prevent their trailing on the ground. Miller.

VETCH, *crimson grass*, a species of *lathyrus*. See *Chichling* VETCH.

VETCH, *hatchet*, *securidaca*, in *Botany*. Its characters are these: the empalement of the flower is short, compressed, and of one leaf, cut into two segments; the flower is of the butterfly kind; the standard heart-shaped, reflexed on both sides, and scarcely longer than the wings; these are oval, joining at the top, but open at the bottom, and the keel is compressed and pointed; it has ten stamina, nine joined, and one separate, terminated by small summits; and an oblong compressed germen, with a bristly style, crowned by an obtuse stigma; the germen turns to a long, compressed, sword-shaped pod, with a thick border on one side, plain on the other, opening in two cells filled with square seeds. We know but one species, which grows naturally in the corn-fields in Spain and Italy. Miller.

Linnæus has joined this to the CORONILLA.

VETCH, *Clusius's foreign hatchet*. See BISERRULA.

VETCH, *horseshoe*, *hippocreps*, in *Botany*, a genus of the *diadelphia decandria* class. Its characters are these: the empalement of the flower is permanent, divided into five parts, and the flower is of the butterfly kind; the standard hath a narrow base, of the length of the empalement, heart-shaped above; the wings are oval, oblong, and blunt; the keel is moon-shaped and compressed; it hath ten stamina, nine joined, and one separate, terminated by single summits; and an oblong, narrow germen, sitting on an awl-shaped style, crowned by a single stigma; the germen becomes a long, plain, compressed pod, cut into many parts from the under seam to the upper, each part forming a roundish sinus, with obtuse, three-cornered joints connected to the upper seam, each joint shaped like a horseshoe, enclosing a single seed. There are three species.

VETCH, *bastard milk*, *phaca*, in *Botany*, a genus of the *diadelphia decandria* class. Its characters are these: the flower has a tubulous empalement of one leaf, cut into fine small indentures at the brim; it is of the butterfly kind, having a large oval, erect standard, with two oblong wings, which are shorter, and a short, compressed, obtuse keel; it has ten stamina, nine of which are joined in one body, the other standing separate, terminated by roundish, rising summits; in the centre is situated an oblong germen, supporting an awl-shaped style, crowned by a single stigma; the germen becomes an oblong swelling pod, whose upper suture is depressed toward the under, having one cell, containing several kidney-shaped seeds. Linnæus enumerates five, and Miller two species.

VETCH, *Venetian*, a species of *orobus*. See *Bitter* VETCH.

VETCH *grass*. See GRASS.

VETCH, *kidney*, a species of *anthyllis*. See LADY'S *finger*.

VETCH, *liquorice*, or *wild liquorice*. See ASTRAGALUS.

VETCH, *knobbed-rooted liquorice*. See GLYCINE.

VETCH, *milk*. See ASTRAGALUS.

VETCHLING, a species of *hedysarum*. See *French* HONEY-*suckle*.

VETCHLING, *yellow*, *aphaca*, in *Botany*. Its characters are these: the empalement is of one leaf, slightly indented at the top in five parts; the flower is of the butterfly kind, the standard being large and heart-shaped, the wings shorter and obtuse; the keel is the length of the wings, and divided slightly in the middle; it hath ten stamina, nine joined, and one single, crowned by round summits; the oval germen, which is situated in the centre, supporting a single style, and crowned by a hairy stigma, becomes a short pod, containing two or three round seeds. We have but one species, which is found wild on arable land in divers parts of England. Linnæus has joined this species to his genus of *lathyrus*. See *Chichling* VETCH.

The seeds of this, and of all the other species of *vetchling*, are nutritious, either eaten in broth, or made into bread. Withering.

VETERAN, *veteranus*, in the *Roman Militia*, a soldier who was grown old in the service; or who had made a certain number of campaigns; and, on that account, was entitled to certain benefits and privileges.

These privileges consisted in being absolved from the military oath; in being exempted from all the functions of a soldier; and in enjoying a certain salary or appointment, &c. The time of service fixed by the Roman laws was from seventeen to forty-six years; and among the Athenians forty years. The use of the term *veteran* was not introduced till about the close of the republic; but its origin may be traced to the first distribution which Servius Tullius made of the Roman people into classes and centuries; under which the *centuriæ seniorum*, or old soldiers, were appointed to guard the city. They were afterwards employed to guard the camp, whilst the *centuriæ juniorum* fought in the field of battle. After they had served some years, they were called *veteres*, in contradistinction to the *novitii* or *tirones*. In process of time, those who had served a certain number of campaigns were called *veterans*, and were exempt from the obligation of military service, except on urgent occasions. See EVOCATI.

The rewards conferred on *veterans* were at first very inconsiderable, e. gr. a few acres of land in a foreign country, where they established colonies; but at length they became immense. Tiberius Gracchus distributed among them the treasures of Attalus, who had made the Roman people his heirs. Augustus also bestowed upon them pecuniary recompence, and almost all his successors augmented their privileges. Encyclop.

In France, the term *veteran* is still retained to such officers as have held their post twenty years, and who enjoy certain of the honours and privileges affixed thereto, even after they have laid them down.

A *veteran* counsellor has a voice and seat at audiences, though not at processes by writing. A *veteran* secretary of the king acquires the privilege, &c. of nobility, to himself, and his children.

VETERINARIA, *Mulo-medicina*, or medicine applied to the diseases of cattle. Whence,

VETERINARIUS, a farrier, or horse-leach.

VETERNUS is used, by some physicians, for a lethargy, or other drowsy disease.

VETITUM *Namium*, in *Law*, imports a forbidden DISTRESS. See NAMIUM.

VETO, in *Roman Antiquity*, was the solemn word used by the tribunes of the people, when they inhibited any decree of the senate, or law proposed to the people, or any act of other magistrates. See INTERCESSION.

VETOLA, in *Ornithology*, a name used by the Venetians, and from them by many others for a water-bird of the *scolopax* kind, called by Aldrovand the *totano*, and by Gesner, the *fedoa secunda*. In the Linnæan system it is the SCOLOPAX *limosa*.

It usually weighs about nine ounces; its beak is shaped like that of the woodcock, and is red all over, except at the end, where it is blackish; its neck is grey; its belly and breast white; its head of a brownish grey, and its back brown; but its rump has a white ring on it; its tail is composed of black and white feathers. Ray's Ornithology, p. 216.

VETTONICA, in *Botany*, the ancient way of spelling the word *betonica*, the name of a plant, called in English BETONY.

It is called *vettonica* by Pliny, who says it obtained that name from a people of Italy so called, among whose woods it grew.

If any thing certainly can be judged of the *betonica* of the ancients, it is, that it was our SERRATULA.

VEXES. See NE *injuste vexes*.

VEXILLARII, among the Romans, were veteran soldiers, the same with those the old Romans called TRIARII. There were six hundred of them in every legion.

VI ET ARMIS, q. d. *by force and arms*, a law-term used in an indictment; to denote the forcible and violent commission of any crime.

VI LAICA *removenda*, a writ lying where debate being between two parsons, or provisors for a church, one of them makes a forcible entry into it, with a number of laymen, and holds the other out.

VIA, *way*. See WAY, and ROAD.

VIA LACTEA, in *Astronomy*, the *milky way*, or GALAXY.

VIA MILITARIS, in our *Law Books*, is used for a *highway*. *Quæ publica dici poterit, & ducit ad mare, & ad portum, & quandoque ad mercata.* Bracton, lib. iv. cap. 16.

VIA MILITARIS, in *Roman History*. See MILITARY *Ways*, and WAY.

VIA REGIA, the *king's highway*, is defined in Leg. Hen. I. to be "that which is always open, and which nobody "may shut by any means, as leading to a city, port, or "town."

Its breadth the same laws prescribe to be such, as that two carts may pass each other, and sixteen horsemen armed may go abreast. See HIGHWAY.

VIA SOLIS, the *sun's way*, in *Astronomy*, is used, among some astronomers, for the ecliptic line; so called, because the sun never goes out of it.

VIÆ Primæ, *first passages*, among *Physicians*, are the œsophagus, stomach, and guts, including the whole length of the alimentary duct, or canal, from the mouth to the sphincter ani.

In this sense, we say, an obstruction in the *primæ viæ*. Purging and emetic medicines operate chiefly on the *primæ viæ*. And sudorifics, alteratives, cardiacs, &c. suspend their action till after they have passed the *primæ viæ*.

VIAL, or Phial, a small and thin glass bottle. See Phial.

VIALES, in *Mythology*, a name given, among the Romans, to the gods who had the care and guard of the roads and highways. Such were Mercury and Hercules.

The *Dii Viales*, according to Labeo, were of the number of those gods called *Dii Animales*; who were supposed to be the souls of men, changed into gods: these were of two kinds; viz. the *Viales*, and Penates.

The *Viales* were the same with those otherwise called Lares; at least, some of the *Lares* were denominated *Viales*; viz. such of them as had the more immediate intendency of the roads.

Hence the two names are sometimes joined, and those highway-deities are called *Lares Viales*; witness that inscription in Gruter:

FORTUNAE
REDUCI LARI
VIALI ROMAE
AETERNAE
Q. AXIUS AELIA
NUS—VE. PROC.
AUG.

IONI.

VIATICUM, among the ancient Romans, was the allowance or appointment which the republic gave to such of its officers as were sent into the provinces, to exercise any office, or to perform any service, or commission; as also to the officers of the army, and even the soldiers, &c.

Tacitus makes mention of it, lib. i. Annal. cap. 37. *Viaticum amicorum, ipsiusque Cæsaris*; meaning the appointments which the republic paid to Germanicus, and his officers.

This *viaticum*, however, did not consist altogether in money: the ring, given to the magistrates and officers sent into the provinces, was part of it; so were the cloaths, baggage, tents, and the rest of their equipage.

Some have also given the name of *viaticum* to the piece of gold, silver, or copper, which the ancients used to put into the mouths of the dead, to pay Charon for their passage.

In the Romish church, *viaticum* is still the allowance made a religious, to defray the expences of a journey, mission, &c.

Viaticum is also used for the communion, or eucharist, which is given to the people in the pangs of death, or who are about to make the voyage of the other world.

The *viaticum* is not to be given to persons executed in course of justice.

VIATOR, in *Antiquity*, an officer of justice among the Romans. The term, originally, had no other signification than that of a public messenger, or servant, sent to advertise the senators and magistrates when assemblies were to be held, where their presence was required.

Hence, because, in the first ages of that empire, the Roman magistrates lived mostly at their country houses; these officers being obliged to be frequently upon the road, were called *viatores, travellers*; from *via, highway*.

In process of time, the name *viator* became common to all officers of the magistrates, lictors, accensi, scribes, statores, and criers; either by reason these names and offices were confounded in one; or because *viator* was a general name, and the rest particular ones, specifying the particular functions they discharged, as A. Gellius seems to insinuate, when he says, that the member of the company of *viatores*, who binds a criminal condemned to be whipped, was called *lictor*.

Be this as it will, the names *lictor* and *viator* are often used indiscriminately for each other; and we as often meet with *Send to seek, or advertise him by a lictor*, as *by a* viator.

None but the consuls, prætors, tribunes, and ædiles, had a right to have *viatores*. They were not to be Roman citizens, and yet they were required to be free.

VIBEX is sometimes used, by *Physicians*, for a black and blue spot on the skin, occasioned by an afflux, or extravasation, of blood.

VIBRANT, or Vibrion, in *Natural History*, the name of a class of flies, commonly known by the name of the *ichneumons*.

The word is derived from the Latin *vibro, to shake* or *quiver*, and is applied to these flies, from the continual vibrating motion observed in their antennæ.

VIBRATION, in *Mechanics*, a regular, reciprocal motion of a body, e. g. a pendulum; which, being suspended at freedom, swings, or *vibrates*, first this way, then that. For the bob being raised, falls again by its gravity; and with the velocity thus acquired, rises to the same height on the other side; whence its gravity makes it fall again: and thus its *vibrations* are continued.

Mechanical authors, in lieu of *vibration*, frequently use the term Oscillation.

The *vibrations* of the same pendulum are all isochronal; that is, they are performed in equal time, at least in the same climate; for, towards the equator, they are found somewhat slower. See Pendulum.

A pendulum 3 feet 3 inches and two tenths of an inch, according to Huygens, or 39, 25 inches according to sir J. Moor, and lord Brouncker, *vibrates* seconds, or makes 3600 *vibrations* in an hour.

The *vibrations* of a longer pendulum take up more time than those of a shorter one, in a subduple ratio of the lengths. Thus, a pendulum 3 feet long will make 10 *vibrations*, while another 9 inches long makes 20. For 10 is the half of 20, and 3 feet, or 36 inches, are the square of 6 inches; which is double of 3, whose square is 9: so that 10 is to 20 in a subduple ratio of 36 to 9.

The same thing is meant when we say, that the number of *vibrations* of pendulums, in a given time, is in a reciprocal subduple ratio of their lengths.

M. Mouton, a priest of Lyons, wrote an express treatise, to shew, that, by means of the number of *vibrations* of a given pendulum, in a certain time, one might establish an *universal* Measure throughout the whole world; and fix the several measures in use among us, in such manner, as that they might be recovered again, if at any time they should chance to be lost, as is the case of most of the ancient measures; which we now only know by conjecture.

The Vibrations *of a stretched chord*, or *string*, arise from its elasticity; which power being of the same kind with that of gravity, the *vibrations* of a chord follow the same laws as those of pendulums: consequently, the *vibrations* of the same chord equally stretched, though they be unequal in length, are equidiurnal, or are performed in equal times; and the squares of the times of the *vibrations* are among themselves, inversely, as the powers whereby they are equally bent, and inflected. See Chord, and String.

The *vibrations* of a Spring, too, are proportionable to the powers whereby it is bent: these follow the same laws as those of the chord, or pendulum; and, consequently, are equidiurnal; which is the foundation of spring-watches.

Vibrations are also used in *Physics*, &c. and for divers other regular alternate motions. Sensation is supposed to be performed by means of the *vibratory* motion of the contents of the nerves, begun by external objects, and propagated to the brain.

This doctrine has been particularly illustrated by Dr. Hartley, and extended farther by him than by any other writer in establishing a new theory of our mental operations. The doctrine of *vibrations*, and its use in explaining our sensations, are comprized by this writer in the following propositions: that the white medullary substance of the brain, spinal marrow, and the nerves proceeding from them, is the immediate instrument of sensation and motion: that this white medullary substance of the brain is also the immediate instrument, by which ideas are presented to the mind; or, in other words, whatever changes are made in this substance, corresponding changes are made in our ideas, and *vice versâ*: that the sensations remain in the mind for a short time after the sensible objects are removed: that external objects impressed upon the senses occasion, first in the nerves on which they are impressed, and then in the brain, *vibrations* of the small, and, as one may say, infinitesimal, medullary particles: that these *vibrations* are excited, propagated, and kept up, partly by the æther, i. e. by a very subtle and elastic fluid, and partly by the uniformity, continuity, softness, and active powers of the medullary substance of the brain, spinal marrow, and nerves; which Dr. Hartley supposes are rather solid capillaments, according to sir Isaac Newton, than small tubuli, according to Boerhaave: and that the phenomena of sensible pleasure and pain, and also those of sleep, appear to be very suitable to the doctrine of *vibrations*. Hence he proceeds to establish the agreement of the doctrine of *vibrations* with the phenomena of ideas. Sensations, he says, by being often repeated, leave certain vestiges, types, or images of themselves, which may be called simple ideas of sensation; because the most vivid of these

ideas are those where the corresponding sensations are most vigorously impressed, or most frequently renewed; whereas, if the sensation be faint, or uncommon, the generated idea is also faint in proportion, and, in extreme cases, evanescent and imperceptible. The exact observance of the order of place in visible ideas, and of the order of time in audible ones, may likewise serve to shew, that these ideas are copies and offsprings of the impressions made on the eye and ear, in which the same orders were observed respectively: and though it happens, that trains of visible and audible ideas are presented in sallies of the fancy, and in dreams, in which the order of time and place is different from that of any former impressions; yet the small component parts of these trains are copies of former impressions; and reasons may be given of the varities of their compositions. Sensory *vibrations*, by being often repeated, beget, in the medullary substance of the brain, a disposition to diminutive *vibrations*, which may be also called *vibratiuncles* and miniatures corresponding to themselves respectively: so that, if it be allowed, that original impressed vibratory motions leave a tendency to miniature ones of the same kind, place, and line of direction, this author infers, that sensations must beget ideas, not only in the senses of sight and hearing, where the ideas are sufficiently vivid and distinct, but in the three others, since their sensations are also conveyed to the mind by means of vibratory motions.

Any sensations, says Dr. Hartley, by being associated with one another a sufficient number of times, get such a power over the corresponding ideas, that any one of the sensations, when impressed alone, shall be able to excite in the mind the ideas of the rest: and any *vibrations*, by being associated together a sufficient number of times, get such a power over the corresponding miniature *vibrations*, that any of those *vibrations*, when impressed alone, shall be able to excite the miniature of the rest. Hence he argues, that simple ideas will run into complex ones, by means of association, and that when this is the case, we are to suppose, that the miniature *vibrations* corresponding to those simple ideas run, in like manner, into a complex miniature *vibration*, corresponding to the resulting complex idea; some of which complex *vibrations*, attending upon complex ideas, may be as vivid as any of the sensory *vibrations* excited by the direct action of objects. See Association.

Dr. Hartley also applies the doctrine of *vibrations* to the explication of muscular motion, which he thinks, is performed in the same general manner as sensation, and the perception of ideas. For a particular account of his theory, and the manner in which it is largely illustrated, and the arguments by which it is supported, we must refer to his Observations on Man, vol i. passim.

The several sorts and rays of light sir Isaac Newton conceives to make *vibrations* of several bignesses; which, according to those magnitudes, excite sensations of several colours; much after the same manner as *vibrations* of air, according to their several magnitudes, excite sensations of several sounds. See Colour.

Heat, according to the same author, is only an accident of light, occasioned by the rays putting a fine, subtile, ethereal medium, which pervades all bodies, into a *vibrative* motion, which gives us that sensation. See Heat.

From the *vibrations*, or pulses, of the same medium, he accounts for the alternate fits of easy reflexion, and easy transmission of the rays.

In the Philosophical Transactions, it is observed, that the butterfly, into which the silk-worm is transformed, makes one hundred and thirty *vibrations*, or motions of its wings, in one coition.

VIBRATIUNCLES. See Vibrations *supra*.

VIBRISSÆ, a word used by medical writers to express the hairs in the nostrils.

VIBURNUM, in *Botany*. See Wayfaring *tree*.

Viburnum, *American*. See Lantana.

Viburnum-*galls*, in *Natural History*, the name of a species of galls, or small protuberances, frequently found on the leaves of the *viburnum*. These are of a very singular nature, and seem to be composed of a different substance from that of the leaf. They appear in form of brown circular spots, of which there are sometimes forty or more on one leaf: they are about a fifteenth of an inch in diameter, and they rise a little above the surface of the leaf, as well on the under as the upper side; each of them has also a small prominence in the centre, on each side of the leaf, looking like a nipple standing on the breast.

These are found in great plenty in the months of June, July, and August, and, when opened, each contains one insect, which is a small worm of a white colour, with six legs, and two hooks of a brown colour at the head.

Mr. Reaumur found that these worms became, in fine, a very small species of beetle. They were of a cinnamon colour, and had conic and granulated antennæ of a beautiful figure. Reaumur's Hist. Insects, vol. vi. p. 209.

VICAR, Vicarius, a person appointed as deputy of another; to perform his functions in his absence, and under his authority.

The word is formed from *vicarius, qui alterius vices gerit.*

The pope pretends to be *vicar* of Jesus Christ on earth. He has under him a *grand vicar*, who is a cardinal; and whose jurisdiction extends over all priests, both secular, and regular; and even, in many cases, over laymen.

Apostolical vicars are those who perform the functions of the pope in churches or provinces, which he has committed to their direction.

Among the ancient Romans, *vicarius*, *vicar*, was a legatus, or a lieutenant, sent into the provinces where there was no governor; so that the *vicarii* were properly the emperor's *vicars*, not those of governors. Cod. de Offic. Vicar.

Italy, in the time of the eastern empire, was governed by two *vicarii*: the one, *vicar of Italy*, who resided at Milan; the other, *vicar of the city*, who resided at Rome.

Cujas observed, that the word *vicar* was sometimes, though rarely, attributed to the lieutenant-generals of pro-consuls, or governors of Roman provinces.

Vicar, in the *Canon Law*, denotes a priest of a parish, the predial tithes whereof are impropriated, or appropriated; that is, belong either to a chapter, religious house, &c. or to a layman, who receives them, and only allows the *vicar* the small tithes, or a convenient salary, anciently called *portio congrua*.

He is thus called, *quasi vice fungens rectoris*, as serving for, or in lieu of, rector, who would be entitled to the great tithes.

Hence, the part or portion of the parsonage, allotted to the *vicar*, for his maintenance and support, or the promotion or living which he has under the parson, is called a *vicarage*.

The stipend of *vicars* was formerly at the discretion of the appropriators; but on account of their neglect, it was enacted by 15 Rich. II. c. 6. that in all appropriations of churches, the diocesan bishop should ordain (in proportion to the value of the church) a competent sum to be distributed among the poor parishioners annually, and that the *vicarage* should be sufficiently endowed. However the *vicar* was liable to be removed at the pleasure of the appropriator; and, therefore, by 4 Hen. IV. cap. 12. it is ordained, that the *vicar* shall be a secular person, not a member of any religious house; that he shall be *vicar* perpetual, not removeable at the caprice of the monastery; and that he shall be canonically instituted and inducted, and be sufficiently endowed, at the discretion of the ordinary, for these three express purposes, to do divine service, to inform the people, and to keep hospitality. The endowments in consequence of these statutes have usually been by a portion of the glebe, or land, belonging to the parsonage, and a particular share of the tithes, called small, or vicarial tithes. Some, however, were more liberally, and some more scantily, endowed; and hence many things, as wood in particular, is in some countries a rectorial, and in some a vicarial tithe. The distinction therefore of a parson and *vicar* is this: that the parson has generally the whole of all the ecclesiastical dues in his parish; but a *vicar* has generally an appropriator over him, entitled to the best part of the profits, to whom he is in effect a perpetual curate, with a standing salary. Though in some places the vicarage has been considerably augmented by a large share of the great tithes; which augmentations were greatly assisted by the statute 29 Car. II. cap. 8. enacted in favour of poor *vicars* and curates, which rendered such temporary augmentations (when made by the appropriators) perpetual. See Augmentation. Blackst. Com. book i. p. 387.

A *vicar* who has a part of the great tithes, and also of the glebe, is called a *vicar endowed*.

These *vicars* were anciently called *perpetui vicarii*; because not appointed by the impropriator, and licensed by the bishop to read service; but presented by the patron, and canonical institution given them by the hands of the ordinary; and so having constant succession, or corporations, and never dying.

The canonists mention four species of *vicars*: some *perpetual*; others, appointed for a certain time, and on some special occasion, called *mercenarii*: others, called *speciales*, appointed, not for the whole cure, but for some certain place, article, or act: others *generales*, neither perpetual, nor appointed for any certain act, but for all things in the general.

VICAR-*general* was a title given by king Henry VIII. to Thomas Cromwell, earl of Essex; with full power to oversee the clergy, and regulate all matters relating to church-affairs.

VICAR-*general* is now the title of an office, which, as well as that of OFFICIAL *principal*, are united in the CHANCELLOR of the diocese. The proper work of an OFFICIAL is to hear causes between party and party, concerning wills, legacies, marriages, and the like; which are matters of temporal cognizance, but have been granted to the ecclesiastical courts by the concessions of princes: whereas that of a *vicar-general* is the exercise and administration of jurisdiction purely spiritual, by the authority and under the direction of the bishop, as visitation, correction of manners, granting institutions, and the like, with a general inspection of men and things, in order to the preservation of discipline and good government in the church. These two offices have been ordinarily granted together; but Dr. Gibson wishes they might be still kept separate: the office of *vicar-general* to be vested in the hands of some grave and prudent clergyman, usually resident within the diocese; and that of official (as being conversant about temporal matters), in the hands of a layman, well skilled in the civil law.

VICARDI, the name of an office in the island of Candia. The word is probably a corruption of the Latin *vicarii*. The *vicardi* is the governor of a village, and is sometimes the parish priest; his office is to levy the public taxes, and to send offenders to the cadic. This office is always appointed yearly. Pococke's Egypt, vol. ii. part ii. p. 12.

VICARIO *deliberando occasione cujusdam recognitionis*, &c. An ancient writ that lies for a spiritual person imprisoned.

VICE, VITIUM, in *Ethics*, is ordinarily defined an elective habit, deviating, either in excess, or defect, from the just medium wherein virtue is placed.

It is called a *habit*, to distinguish it from *sin*, which is only an act: hence, a *sin* is looked upon as something transient; and a *vice*, as something permanent.

In the common use of the terms *vice* and SIN, there is no ground for this subtle distinction. *Vice*, as opposed to VIRTUE, is better defined the disagreement of the actions of any intelligent being with the nature, circumstances, and relation of things; hence called the moral unfitness of such actions.

Some authors distinguish three states of *vice*: the first *incontinentiæ*, of incontinence, wherein a person sees and approves the good, but is hurried to evil by the violence of his passions. The second *intemperantiæ*, of intemperance; wherein even the judgment is depraved and perverted; the third *feritatis*, of obduracy; wherein the person is totally immersed in *vice*, without any sense or feeling thereof.

The state of incontinency is considered as infirmity, wherein the person feels the sharpest stings of conscience: that of intemperance, as malice, wherein the remorse is not so lively. In that of obduracy there is none.

VICE, in *Smithery*, and other arts employed in metals, &c. is a machine, or instrument, serving to hold fast any thing they are at work upon, whether it be to be filed, bent, or riveted, &c.

The parts of the *vice* are, the *face*, or *plane*, which is its uppermost part; the *chaps*, which are cut with a bastard-cut, and well tempered; the *screw-pin*, cut with a square, strong worm; the *nut*, or *screw-box*, which has a square worm, and is brased into the round box; the *spring*, which throws the chaps open; and the *foot*, on which the whole is mounted.

VICE, *hand*, is a small kind of *vice*, serving to hold the less works in, that require often turning about.

Of this there are two kinds, the *broad-chapt hand-vice*, which is that commonly used; and the *square-nosed hand-vice*, seldom used but for filing small round work.

VICE is also a machine used by the glaziers, to turn, or draw lead into flat rods, with grooves on each side, proper to receive the edges of the glass.

This machine consists of two iron chaps, or cheeks, joined with two cross iron pieces. In the space between the chaps are two steel wheels, and their spindles, or axes passed through the middle, each of which has its nut, or pinion with teeth, that catch into each other; and to the lowest is fitted a handle, whereby the machine is turned.

There are some of these *vices* double, and that will draw two leads at once: these have three wheels. Some glaziers will turn lead of different sizes in the same *vice*; by changing their cheeks for each size.

With another pair of spindles, whose nuts almost meet, they turn lead for *tiers*; which, when it comes out of the *vice*, is almost cut asunder, in two thicknesses, easy to be parted. Before the invention of this *vice*, which is but a late thing, they used a plane: accordingly, in all the ancient windows, we find the lead planed and grooved that way.

VICE is also used in the composition of divers words, to denote the relation of something that comes instead, or in the place, of another.

In this sense the word is Latin, *vice*, stead, place, turn, &c.

VICE-ADMIRAL. See ADMIRAL.

VICE-CHAMBERLAIN, called also, in ancient statutes, *under-chamberlain*, is an officer in the court, next under the lord-chamberlain; and who, in his absence, has command and controul of all officers belonging to that part of the houshold called the *chamber* above stairs.

VICE-CHANCELLOR of an university is an eminent member, chosen annually to manage affairs in the absence of the CHANCELLOR.

VICE-CONSUL, an officer who discharges the duty of a CONSUL, under his orders or during his absence.

VICE-DOGE is a counsellor of Venice, who represents the doge when sick, or absent; that the signory may never be without a chief.

The *vice-doge* never takes the ducal chair, nor bears the horn, nor is addressed under the title of *serenissimo*: yet the foreign ambassadors, speaking to the college, use the common apostrophe of *serenissimo principe*: and he performs all the offices of doge, and gives answers to ambassadors, without moving his ca[p].

VICE-DOMINUS, a viscount, sheriff, or vidame.

VICE-DOMINUS *Abbatiæ*, or *Ecclesiæ*, in the civil and canon law, an advocate, or protector, of an abbey, or church. See ADVOCATE.

VICE-DOMINUS *Episcopi*, in the *Canon-Law*, is the COMMISSARY, or VICAR-*general*, of a bishop.

VICE-GERENT, *Vicegerens*, a vicar, deputy, or lieutenant.

VICE-COMES, in *Law*. See VICOUNT.

Accedas ad VICE-COMITEM. See ACCEDAS.

Respectu habendo computi VICE-COMITIS. See RESPECTU.

VICE-LEGATE, an officer whom the pope sends to Avignon, and some other cities, to perform the office of a spiritual and temporal governor, at a time when there is no legate, or cardinal, to command there.

All the Gaul Narbonnoise, as Dauphiné, Provence, &c. has recourse to the *vice-legate* of Avignon, for all ecclesiastical dispatches; in like manner as the other provinces address themselves to Rome. See LEGATE.

VICE-ROY, a governor of a kingdom, who commands therein in the name and stead of a king; with full and sovereign authority.

Thus, when Naples and Sicily were subject to Spain, *vice-roys* were sent thither; and the name is now given to those who govern in Mexico and Peru.

The lord-lieutenant of Ireland is also sometimes called the *viceroy*.

VICE *versa*, a Latin phrase, frequently retained in English writings; signifying as much as *on the contrary*.

Thus, as the sun mounts higher and higher above the horizon, insensible perspiration increases; and, *vice versa*, as he descends lower, it diminishes.

VICENNALIS, in *Antiquity*, something of twenty years, or that returns after twenty years.

Among the Romans, *vicennalia* was particularly used for the funeral feasts, held on the twentieth day after a person's decease.

VICENNALIA, or VICENNALES *Ludi*, were also games, feasts, and rejoicings, held every twentieth year of the reign of a prince.

On medals we frequently meet with *vicennalia vota*; the vows put up on that occasion, for the safety of the emperor and the enlargement of the empire.

These are expressed by VOT. X & XX, in the medals of Tacitus, Gallienus, and Probus; VOT. X. M. XX, in those of Valerius Maximianus, and Galerius Maximianus; VOT. X. MUL. XX, in those of Constantine, Valentinian, and Valens; VOT. X. MULT. XX. in those of Dioclesian, Constantine, Julian, Valentinian, Theodosius, Arcadius, Honorius; VOTIS X. MULT. XX. in those of Julian, Valentinian, Gratian; VOT. X. SIC. XX. in those of Valerius Constantius; VOT. XII. FEL. XX. in the younger Licinius; VOT. XV. FEL. XX. in Constantine.

VICES, a term used by the dealers in horses to express certain faulty habits or customs in that creature, which render him troublesome to the rider, and are never to be worn off, but by attention to the regular methods.

The following are the tricks generally understood as *vices* by dealers, and their methods of preventing, correcting, and curing them.

1. If a horse carry his head or neck awry, strike him twice or thrice with the spur on the contrary side; but if

if he be very stiff-necked on the right side, and very plying or bending on the left, the rider is to hold the right rein shorter than the other, and give him sudden checks every time he inclines that way, having a sharp wire fastened in the reins, that striking in his neck, he may be compelled to hold it straight; but in this care must be always taken to check him upwards, for otherwise he will get a habit of ducking his head, which will prove very troublesome.

2. If a horse is apt to shake his head and ears, upon the least occasion, or move his ears, when he is going to kick or bite, or cast his rider; the way of curing this, is to strike him on the head with a wand, as soon as he shews the first attempt to it; and, at the instant of striking him, he is to be checked with the bridle, and be struck with the spur on the contrary side; this will put him out of his pace, and he is then to be stopped, that he may have leisure to understand the rider's meaning. Every time that he starts or winches, which are signals that he is going to bite, or to strike with his heels, the same is to be done, and he will, by degrees, be broke of these habits.

3. If a horse is subject to ducking down his head frequently, the rider must, every time he is guilty of it, check him suddenly with his bridle, and at the same time strike him with the spurs, in order to make him sensible of his fault. If he be standing, he is thus to be made to bring his head in the right place as he stands; and when he does so, he is to be cherished, that he may understand the rider's meaning, which, in time, he will certainly do.

4. If a horse be skittish, and apt to start, so that the rider is never free from danger, while on his back, the cause of the malady is first to be carefully enquired into: if it be found to proceed from a weak sight, which represents objects to him other than they really are; the method of curing him is, every time he does it, to give him leisure to view the things, and see what they really are; he must have time to view them well, and then be rid gently up to them. If, on the contrary, his skittishness depends on his being naturally fearful, and alarmed at every noise, he is to be cured of it by the inuring of him to loud noises of many kinds, as firing of guns, drums, trumpets, and the like: and he will, in time, come to take delight in what he was before afraid of.

5. If a horse be restive, and refuse to go forward, the rider is to pull him backwards, and this will often occasion his going forward; this is using his own fault, as a means of reclaiming him. The rider is first cautiously to find whether this *vice* proceeds from real stubbornness, or from faintness; if from the latter, there is no remedy but rest; but if actual stubbornness be the fault, the whip and spur, well employed, and persisted in, will at length, be found a certain cure.

6. If a horse rear up an end; that is, if he rises so high before as to endanger his coming over the rider, the horseman must give him the bridle, and bear forwards with his whole weight. As he is going down, he should have the spur given him very roundly; but this must by no means be done as he is rising, for then it will make him rise higher, and, probably, come over.

7. If a horse be subject to lie down in the water, or upon the ground, there is no better remedy than a pair of sharp spurs resolutely applied. But there is some caution to be used in the applying of them, for bad horsemen generally are the occasion of the faults in horses, by correcting them out of due time.

The proper moment of spurring is just when he is going to lie down; but when this has diverted him from the thought of it, he is not immediately to be spurred again. For the doing this frightens the creature, and puts him into confusion to that degree, that he at length becomes restive, and thus one fault is only changed for another, and that perhaps a worse.

8. If a horse be apt to run away, very cautious means must used to break him of it. The rider must be gentle, both with a slack curb, and keeping an easy bridle-hand. He is first to be walked without stopping him; but only staying him, by degrees, with a steady, not a violent hand, and always cherishing him when he obeys: when he is thus made very manageable in his walk, he is to be put to his trot, and finally to his gallop; and from these he is to be brought into a walk again, always by degrees, and staying him with a steady hand. By using this method from time to time, with judgment and patience, it is probable he may at length be cured.

9. If a horse is apt to fly out violently, it is certain, that the more the bridle-rein is pulled, and the more he is hurt by tugging the curb, the faster he will run: the best method is therefore, if there be field-room enough, to let him go, as soon as he is going, by slackening the bridle, and giving him the spur continually and sharply, till he slacken of his own accord. Thus, by degrees, he will find that himself is the sufferer, by all his flights, and he will then leave them off, though he could be never broke of them any way else.

10. Some horses will not endure the spurs when they are given them, nor ever go forwards; but fastening themselves to them, they will strike out and go back; and if they are pressed more hard, they will fall to staling without ever going out of the place. If the horse who has this *vice* be a gelding, it will prove very difficult to cure him of it. A stone-horse, or a mare are much easier cured; but even these will be trying at it again afterwards; and if ever they get the better of their rider, they will not fail to keep it up in this particular.

Every horse, of whatever kind, that has this fault of cleaving to the spurs, as the jockies call it, and not going forwards with them, is to be rejected, in the buying for any gentleman's riding, for it is a sign of a restive nature, and is a fault generally accompanied with many others.

VICESIMATIO, in *Roman Antiquity.* See DECIMATION.

VICIA, in *Botany.* See VETCH.

VICINAGE, and VICINITUM, a neighbourhood. See VENUE.

VICINAGE, *common per cause de.* See COMMON.

VICIS & *Venellis mundandis*, a writ lying against a mayor, bailiff, &c. for not taking care that the streets be well cleansed.

VICISSITUDE, VICISSITUDO, the succeeding of one thing after another. As, the *vicissitude* of seasons, fortune, &c.

VICOMAGISTER, among the *Romans*, an officer whose business it was to take care of the streets, that nothing might obstruct, or render them any wise incommodious.

VICONTIEL. See VICOUNTIEL.

VICOUNT, VICE-COMES, in our *Law-Books*, signifies the same with SHERIFF; between which two words there seems to be no other difference, but that the one came from our conquerors, the Normans; and the other from our ancestors, the Saxons.

VICOUNT, or VISCOUNT, is also used for a degree of nobility, next below a count or earl, and above a baron.

Camden observes, that this is an ancient name of office, but a new one of dignity never heard of among us till Henry VIth's days, who, in his 18th year, created, in parliament, John lord Beaumont, *vicount Beaumont*: but it is much more ancient in other countries.

Du-Cange, indeed, will have the dignity to have had its first rise in England; but it is much more probable, it was first brought over hither by the Normans.

The privileges of a *vicount* are, that he may have a cover of assay held under his cup when he drinks, and may have a travers in his own house. And a *vicountess* may have her gown borne up by a man, out of the presence of her superiors; and, in their presence, by a woman.

VICOUNTIELS, VICONTIELS, VICECOMITALIA, in our *Law Books*, denote things belonging to the sheriff; particularly certain farms, for which the sheriff pays a rent to the king, and makes what profits he can of them.

Writs VICOUNTIEL are such as are triable in the county or sheriff's court, and which are not returned to any superior court, till finally executed by him. Of which kind are divers writs of nuisance, the writ of ADMEASUREMENT *of pasture*, &c.

VICOUNTIEL, or VICONTIEL *jurisdiction*, is that jurisdiction belonging to the officers of a county; as sheriffs, coroners, escheators, &c.

VICTIM, VICTIMA, so called either because *vincta percussa cadebat*, or because *vincta ad aras ducebatur*, a bloody sacrifice, offered to some deity, of a living thing; either a human person, or a beast, which is slain to appease his wrath, or to obtain some favour. See SACRIFICE.

The Greeks offered Iphigenia, at Aulis, for a *victim* to obtain a favourable wind. The gods of the heathens had each their proper *victims*: thus, the goat was Bacchus's *victim*; and the horse, Neptune's.

Artificial or *factitious* VICTIM, denotes a *victim* made of baked paste in the form of an animal, which was offered to the gods, when they had no natural *victims* or no opportunity of offering them. Thus, according to Porphyry, Pythagoras offered a sacrifice of an ox in paste; Empedocles is also said by Athenæus to have done the same. Pythagoras derived the practice from Egypt, where it was very ancient, and where it was used in the time of Herodotus. Encycl.

VICTIMARIUS, a minister, or servant of the priest, whose office was to bind the *victims*, and prepare the water, knife, cake, and other things, necessary for the sacrifice. See SACRIFICE.

To the *victimarii* it alſo belonged to knock down, and kill, the victims: in order to which, they ſtood cloſe by the altar, naked to the waiſt, but crowned with laurel; and holding a hatchet or a knife up, aſked the prieſt leave to ſtrike; ſaying, *Agone? Shall I ſtrike?* Whence they were called *agones*, and *cultellarii*, or *cultrarii*.

When the victim was killed, they opened it; and, after viewing the entrails, took them away, waſhed the carcaſe, and ſprinkled the flour on it, &c.

The ſame *victimarii* alſo lighted the fire, wherein books were condemned to be burnt. See Liv. lib. xl. cap. 29. and A. Gellius, lib. i. cap. i. extr. 12.

VICTORIAN *period*, in *Chronology*. See Period.

VICTORIATUS, among the *Romans*, a coin with victory repreſented on one ſide, equal in value to half the Denarius.

VICTORIOLA, in *Botany*, a name uſed by ſome authors for the hippogloſſum, called in Engliſh the *Alexandria-laurel*, *horſe-tongue*, or *double-tongue*.

VICTORY, Victoria, the overthrow, or defeat, of an enemy, in war, combat, duel, or the like. See War, Combat, Duel, Champion, &c.

Among the Romans, crowns, triumphs, &c. were decreed to their generals, for the *victories* they gained.

Actian victory, denotes the *victory* which Auguſtus, or rather his general, gained over Mark Antony after the capture of Actium; in commemoration of which he built the city of Nicopolis, and re-eſtabliſhed with peculiar magnificence the Actian *games*.

Games of victory, were public games celebrated on account of a *victory*; they were called by the Greeks ἐπινίκαλοι ἀγῶνες, and in Latin inſcriptions they are denominated *ludi victoriæ*. Of theſe the Roman hiſtory recites, thoſe in honour of Auguſtus, after the battle of Actium, thoſe of Septimius Severus after the defeat of Peſcenius Niger, thoſe in honour of Lucius Verus and Marcus Aurelius, on their return from the expedition againſt the Parthians, recorded on the marble of Cyzicus, &c.

Victory, in *Mythology*, was perſonified and made a deity both by the Greeks and Romans. According to Varro, ſhe was the daughter of Cœlum and Terra; but Heſiod makes her the daughter of Styx and Pallas. Temples, ſtatues, and altars, were conſecrated to this deity. At Athens there was a temple dedicated to *Victory*, in which was placed her ſtatue without wings. The firſt temple built in honour of her by the Romans was during the Samnite war, under the conſulate of L. Poſthumius and M. Attilius Regulus. With them ſhe was repreſented as a winged deity, ſometimes almoſt in the attitude of flying, and with her robe carried back by the wind; holding a laurel-crown in her hand, which was anciently the peculiar reward of ſucceſsful generals and great conquerors. The poets inform us, that her wings were white, and her robe of the ſame colour. They ſometimes deſcribe her hovering between two armies engaged in battle, as doubtful which ſide ſhe ſhall chooſe, and ſometimes ſtanding fixed by one ſhe is reſolved to favour, as ſhe is often ſeen on the medals of the Roman emperors. This goddeſs is often repreſented in a chariot, drawn rapidly along by two horſes. Pliny ſpeaks of a picture of *Victory* in Rome, in which ſhe was aſcending to heaven, in a chariot with four horſes, as ſhe appears on the Antonine pillar, carrying thither ſome hero, and with a palm-branch in her hand. This, and the crown of laurel, were her general attributes; and a third was a trophy, and ſometimes two, one on each ſide of her. Sometimes ſhe is ſeen mounted on a globe.

VICTUALLER, one that ſells victuals; and we now call all common alehouſe-keepers *victuallers*. See Alehouse.

Victuallers ſhall ſell their victuals at reaſonable prices, or forfeit double value; and *victuallers*, fiſhmongers, poulterers, &c. coming with their victuals to London, ſhall be under the regulation of the lord-mayor and aldermen; and ſell their victuals at prices appointed by juſtices, &c. 23 and 31 Edw. III. cap. 6. 7 Rich. II. 13 Rich. II. If any *victuallers*, butchers, brewers, poulterers, cooks, &c. conſpire and agree together not to ſell their victuals, but at certain prices, they ſhall forfeit for the firſt offence 10*l.* for the ſecond, 20*l.* and for the third offence 40*l.* ſtat. 2 and 3 Edw. VI. cap. 15. See Forestalling.

Victualler, *agent*. See Agent.

VICTUALLING-*office*, an office kept on Tower-hill, for furniſhing his majeſty's navy with *victuals*.

It is managed by ſeven commiſſioners, at a ſalary of 400*l.* a year each, who have their inferior officers; as ſecretaries, clerk, &c. beſides agents in divers parts of Great Britain, Ireland, &c.

VICTUS *ratio*, among *Phyſicians*, a particular manner of living, for the preſervation of health, and prevention of diſeaſes.

VICUNNA, in *Zoology*, a name given to the pacos.

VIDAME, *Vice-Dominus*, was anciently uſed for the biſhop's deputy in temporals; as, *comes*, or *vice-comes*, was the king's.

The word, according to Nicod, comes from *vicarius*; or according to Paſquier, from *vice-dominus*; *dam* ſignifying *dominus*, or *lord*. See Dom.

The original inſtitution of *vidames* was for the defence of the temporalities of biſhopricks, while the biſhops themſelves were taken up in prayer, and other ſpiritual functions. They alſo led the biſhops' forces, when they were obliged to go to war, either to defend their temporalities, or for the arrier-ban.

They alſo managed, and pleaded, their cauſe in courts of juſtice; diſtributed juſtice among their tenants; and prevented any body's pillaging, or damaging, the houſes of deceaſed biſhops, &c. In effect, they repreſented the biſhop, conſidered as a temporal lord.

In ſome ancient charters, the *vidames* are called *advocates*, or *advowees*.

Vidame is ſtill a title of ſignory, or lordſhip; attributed to ſeveral gentlemen in France: as the *vidame of* Chartres, of Amiens, &c.

The ancient *vidames*, Paſquier ſays, were the biſhops temporal judges; and they had the ſame privileges as the vicounts.

By degrees, the *vidames* converted their office into a fee; and the biſhops their *vidames*, or judges, into vaſſals, as kings did their counts, dukes, &c. Accordingly, the *vidame* of Chartres, &c. ſtill hold lands of the biſhops of thoſe places. See Valvasor.

VIDIMARUM, in *Botany*, the name of the tree which bears the ſebeſtens, a medicinal plum, of Aſia and Ægypt.

VIEDAM, or Vedam, the name of a ſacred book of law and religion, written, according to M. de Sainte Croix, by the Samaneans in the Samſcretan or Shanscrit language, and held in great veneration by the Brahmins of Hindoſtan, from a notion that Bramha their legiſlator received it from the Deity himſelf. This writer gives us an account of four *Viedams*, from Indian memoirs and relations: and other writers have ſaid, that the *Viedam* is divided into four parts, diſtinguiſhed by different names. The firſt is called *rogo*, *roukou*, or *orokou*, and treats of the firſt cauſe and the firſt matter; of angels; of the ſoul; of the rewards deſtined to the good, and the puniſhment of the wicked: of the production and deſtruction of beings; of ſin, and the method of obtaining pardon, &c. The ſecond part, called *jadara* or *iſſure-vedam*, is a treatiſe on government and the power of ſovereigns. The third part, called *ſama-vedam*, is a treatiſe of morality, deſigned to inſpire men with a love of virtue and hatred of vice. The fourth part, called *addera-vedam*, *brama-vedam*, or *latharvana-vedam*, treats of external worſhip, ſacrifices, the ceremonies which are to be practiſed in the temples, the feaſts that are to be celebrated, &c. The reſpect entertained by the Brahmins for the *Viedam* is the reaſon why they are averſe from communicating copies of it; and M. St. Croix ſays, that there are few even of them, who underſtand the language in which it is written. However, the miſſionary Jeſuits obtained a copy of it from a converted Brahmin, which was lodged by Calmet in the king's library at Paris in 1733. M. de Sainte Croix ſpeaks alſo of the *Pouranams*, which were religious books of an inferior order, and which ſome of the Brahmins reject, as others do the *Viedam*. The *Baga Viedam*, which contains the doctrine of the Indians concerning the Deity, happineſs, a contemplative life, the hiſtory of the creation, preſervation, and deſtruction of the univerſe, the origin of the inferior gods, men, giants, &c. is one of the *Pouranams*. After theſe, he ſays, come the *Shaſters* or *Shaſtah*, which he repreſents as an explication of the *Viedams*.

The *Viedams*, according to this writer, were publiſhed in the tenth century of the Chriſtian æra, and the *Pouranams* in the fifteenth. All theſe books contain the moſt ſublime and elevated ideas of the Supreme Being, mingled with the moſt abſurd fables, the greateſt materialiſm, and the moſt monſtrous fancies.

The *Ezour-Vedam* is a commentary on the *Viedam*, which, as M. Voltaire pretends, is more ancient than the age of Alexander the Great: but M. de Sainte Croix refutes this opinion, by an argument to which there is no reply, viz. that mention is made in this book of the Mahometans and Moors. Mod. Univ. Hiſt. vol. vi. 8vo. St. Croix's Ezour-Vedam, &c. in two vols. 12mo. Paris, 1779. For an account of different opinions with regard to the *Viedam*, ſee Shastah.

VIDIMUS, in *Law*, the same with *innotescimus*; being letters patent of a charter of feoffment, or some other instrument, not of record.

VIDUITATIS *professio*, the making a solemn profession of living a chaste widow; a custom heretofore observed in England, and attended with divers ceremonies.

VIE. See CESTUI *qui vie*.

VIELLE, in *Music*. See VIOL.

VIELLE *ridée*, the *wrinkled old woman's shell*, a name given by the French authors to a species of *chama* of the mutilated kind, very much resembling the famous *concha Veneris*, but longer, and without that peculiarly-shaped oval aperture to which that shell owes its name.

It has several spines about the lips, as the *concha Veneris* has, but they are shorter and more obtuse than in that shell. The whole surface of this species is deeply and irregularly wrinkled. It is of a whitish colour, variegated with brown.

VIELLEUR, in *Natural History*, the name of a species of fly, common in Surinam, and some other places. It is moderately large, though less so than the lanthorn-fly, so common in that place, and has a long head, and some other particulars, in which it resembles that creature. Mrs. Merian has given a figure of it, and reports it as the opinion of the natives, that it changes at length into a LANTERN-*fly*.

VIEW, VISUS, in *Law*, the act of *veiors*, or *viewers*.

This is called by Bracton, *Res quasi sacra, quia solam personam regis respicit, & introducta pro pace, & communi utilitate*.

When a real action is brought, and the tenant knows not well what the land is that the demandant asks; he may pray the *view*: which is, that the jury may *see* the land which is claimed.

This course of proceeding we received from the Normans, as appears by the *Grand Customary*. It is used in various cases; as in assize of rent-services, rent-charge, rent-sec; in a writ of nuisance; in a writ quo jure; in the writ de rationabilibus divisis, &c. See JURY.

VIEW *of Frank-pledge*, VISUS *franci plegii*, is the office which the sheriff in his county-court, or the bailiff in his hundred, performs; in looking to the king's peace, and seeing that every man be in some pledge. See COURT-*leet*, and FRANK-*pledge*.

VIEW, in matters of *Optics*, *Perspective*, &c. See VISION.

VIEW, *point of*. See POINT.

VIEW, among *Hunters*, the track, or print of the feet, of a fallow deer on the ground.

To VIEW *a place*, in the *Military Art*, is to ride about it, before the laying of a siege, in order to observe the strength or weakness of its situation and fortification.

VIEWERS, or VEIORS, in *Law*. See VEIOURS.

VIGESIMA, among the *Romans*, a tax of the twentieth part of the yearly incomes of all inheritances. It was first established by Augustus.

VIGESIMA was likewise a custom paid for slaves sold, as also for one made free.

VIGESIMARIUS, among the *Romans*, an officer who had the management of collecting the VIGESIMA.

VIGIL, or EVE, in *Church-Chronology*, the day before any feast, &c.

Though the civil day begins at midnight, yet the ecclesiastical, or scriptural, day, begins at six o'clock in the evening, and holds till six in the evening the ensuing day.

Hence, the collect for every Sunday and holiday, by order of the church, is to be read, at the preceding evening service, that is, at six o'clock the day before; from which time the religious day was supposed to begin.

And this first part of the holiday, from six o'clock the day before, was, by the primitive Christians, spent in hymns, and other devotions; and, being often continued till late in the night, was called *vigil*.

These *vigils* came by degrees to be so enlarged, that, at last, all the day preceding the holiday was called by the name.

The origin of *vigils* is deduced by Forbes from a custom in the ancient church, for the people, both men and women, to meet together in the evening before Easter-day, and watch and pray, as expecting the coming of our Lord, who was to rise early in the morning. This practice, Tertullian observes, *ad uxorem*, afterwards got to other feasts, and saints days. But abuses creeping in, they were forbid by a council, in 1322, and, in lieu thereof, fastings were instituted on the day before, though still called by the ancient name of *vigils*. See WAKES.

VIGIL, *coma*. See COMA.

VIGILIA, in *Ancient Chronology*. See WATCH.

VIGILIA, *that state of an animal which is opposite to sleep*, and is popularly called *waking* or *watching*. See SLEEP, and WATCHING.

VIGILIÆ, in *Antiquity*, denote the watches and guards among the Roman soldiers, who performed duty by night, in contradistinction to the *excubiæ*, who kept guard by day, either in the camp, or at the gates and intrenchments: of these last there seem to have been assigned one company of foot and one troop of horse to each of the four gates every day; and it was a most unpardonable crime to desert their post, and to abandon their corps of guards. In the camp, there was allowed a whole manipulus to attend before the prætorium, and four soldiers to the tent of every tribune. The night-guards assigned to the general and tribunes were of the same nature as those in the day. But the proper *vigiles* were four in every manipulus, keeping guard three hours, and then relieved by four others; so that there were four sets in a night, according to the four watches, which took their name from this custom. The night guard was set by a tally or tessera, with a particular inscription given from one centurion to another through the army, till it came again to the tribune who first delivered it. Upon the receipt of this, the guard was immediately set. But because this regulation was not sufficient, they had the *circuitio vigilium*, or a visiting of the watch, commonly performed about four times in the night by some of the horse. Upon extraordinary occasions the tribunes and lieutenant-generals, and sometimes the general himself, made these circuits in person, and took a strict view of the watch in every part of the camp. Kennett's Ant. Rom. p. 206.

VIGILIÆ *florum*, in *Botany*, a term used by Linnæus to express a peculiar faculty, belonging to the flowers of several plants, of opening and closing their petals at certain hours of the day. Previous to the explanation of this phenomenon, it is necessary to observe, that the flowers of most plants, after they are once opened, continue so night and day, until they drop off, or die away. Several others, which shut in the night-time, open in the morning sooner or later, according to their respective situation in the sun or shade, or as they are influenced by the manifest changes of the atmosphere. But the class of flowers, to which this article refers, open and shut regularly at certain hours, exclusive of any manifest changes in the atmosphere. This property is so evident in one of our common English plants, the *tragopogon luteum*, that our country people have called it *John-go-to-bed-at-noon*. Linnæus's observations in the Philosophia Botanica, p. 273, extend to near fifty species, which are subject to this law: such are the male pimpernel, the blue-flowered pimpernel with narrow leaves, the little blue convolvulus or bindweed, the day-lily, the proliferous pink, the common purslain, the white water-lily, the garden lettuce, the dandelion, the rough dandelion, several species of hawkweeds, wild succory, wild marygold, &c. See an account of this phenomenon by Dr. Pulteney, in Phil. Transf. vol. l. p. 506, &c.

VIGILIUM *præfectus*. See PREFECT.

VIGINTIVIRATE, a dignity among the ancient Romans, established by Cæsar.

This dignity comprehended four others; for of the *vigintiviri*, or twenty men which composed the company, there were three who sat and judged all criminal affairs; three others had the inspection of the coins and coinage; four took care of the streets of Rome; and the rest were judges of civil affairs.

VIGNETTE, in the art of *Printing*, is a French word, now often used among English artists and writers, to denote the flourish or ornament, placed at the beginning of a book, preface, or dedication. These *vignettes* or head-pieces are very various in their form and size. See the description of PRINTING-*press*.

VIGOROSO, or VIGOROSAMENTE, in the *Italian Music*, is used to direct a performer to sing or play with vigour, strength, and firmness.

VILL, VILLA. See VILLAGE.

VILLA *Regis*, or *Regia*, a title anciently given to those *villages* where the kings of England had a royal seat, and held the manor in their own demesne; having there commonly a free chapel exempt from the bishop's jurisdiction.

VILLÆ *prepositus*. See PREPOSITUS.

VILLAGE, VILLA, or VILL, an assemblage of houses, inhabited chiefly by peasants and farmers, having usually a church but no market.

The word is French, formed of *vil*, or *vilis*, *low*, *mean*, *contemptible*: or rather, from the Latin, *villa*, a *country-house*, or *farm*.

The want of a market distinguishes a *village* from a *town*, as the church does from a *green*, *street*, &c. Among our Saxon ancestors, *vill*, or *village*, was used in the sense of the Roman *villa*; viz. for a country farm, or seat, furnished with convenient outhouses, &c. for repositing the fruits

fruits thereof. Afterwards it came to be taken for a manor: and then for part of a pariſh, or the pariſh itſelf. Hence, in ſeveral ancient law-books, *vill* and *pariſh* are the ſame thing: accordingly, Forteſcue de Laudibus Leg. Ang. writes, "That the boundaries of *villages* are "not by houſes, ſtreets, or walls; but by a large circuit "of ground, within which may be divers hamlets, wa- "ters, woods, &c."

Fleta makes this difference between a *manſion*, a *village*, and a *manor*; that a manſion may conſiſt of one, or more houſes; though there is only to be one dwelling-place, without any other very near it: for if other houſes be contiguous, it is then a *village*. A manor may conſiſt of one or more *villages*.

For the better government of *villages*, the lord of the ſoil has uſually a power to hold a court-baron every three weeks.

The ſtatute of Exeter 14 Edw. I. makes frequent mention of entire-*vills*, demi-*vills*, and hamlets.

Entire-*vills* ſir H. Spelman conjectures to have conſiſted of ten freemen, or frank-pledges, demi-*vills* of five, and hamlets of leſs than five. See TOWN.

VILLAIN, or VILLEIN, VILLANUS, in *our Ancient Cuſtoms*, the ſame with BONDMAN: called alſo, in Domeſday-book, *ſervus*, *ſlave*.

A *villain* was one who held lands in *villenage*, or on condition of rendering baſe ſervices to his lord.

Under the Saxon government, there was, as ſir William Temple ſpeaks, a ſort of people in a condition of down-right ſervitude, employed in the moſt ſervile works, and belonging, they, their children and effects, to the lord of the ſoil, like the reſt of the cattle or ſtock upon it. Theſe ſeem to have been thoſe who held what was called the FOLK-*land*, from which they were removeable at the lord's pleaſure. On the arrival of the Normans here, it ſeems not improbable, that they, who were ſtrangers to any other than a feodal ſtate, might give ſome ſparks of enfranchiſement to ſuch wretched perſons as fell to their ſhare, by admitting them, as well as others, to the oath of FEALTY, which conferred a right of protection, and raiſed the tenant to a kind of ſtate ſuperior to down-right ſlavery, but inferior to every other condition. This they called VILLENAGE, and the tenants *villains*, either from the word *vilis*, or elſe, as ſir Edward Coke tells us, *a villa*, becauſe they lived chiefly in villages, and were employed in ruſtic works of the moſt ſordid kind: hence they were alſo denominated *pagenſes* and *ruſtici*. Theſe *villains*, belonging principally to lords of manors, were either *villains* REGARDANT, by the civilians called GLEBÆ *addicti* or ASCRIPTITII, that is, annexed to the manor or land; or elſe they were *in* GROSS, or at large, that is, annexed to the perſon of the lord, and transferrable from one owner to another. They could not leave their lord without his permiſſion; but if they ran away, or were purloined from him, might be claimed and recovered by action, like beaſts or other chattels. They held indeed ſmall portions of land by way of ſuſtaining themſelves and families; but it was at the mere will of the lord, who might diſpoſſeſs them whenever he pleaſed; and it was upon *villain* ſervices, that is, to carry out dung, to hedge and ditch the lord's demeſnes, and any other the meaneſt offices; and their ſervices were not only baſe, but uncertain both as to time and quantity. A *villain* could acquire no property either in lands or goods: but if he purchaſed either, the lord might enter upon them, ouſt the *villain*, and ſeize them to his own uſe, unleſs he contrived to diſpoſe of them again before the lord had ſeized them; for the lord had then loſt his opportunity. In many places alſo, a fine was payable to the lord, if the *villain* preſumed to marry his daughter to any one without leave from the lord; and by the common law, the lord alſo might bring an action againſt the huſband for damages in thus purloining his property. For the children of *villains* were alſo in the ſame ſtate of bondage with their parents; whence they were called in Latin NATIVI, whence the female appellation of a *villain*, who was called a NEIFE. In caſe of a marriage between a freeman and a neiſe, or a *villain* and a free-woman, the iſſue followed the condition of the father, being free if he was free, and *villain* if he was *villain*; but no baſtard could be born a *villain*. The law, however, protected the perſons of *villains*, as the king's ſubjects, againſt atrocious injuries of the lord; for he might not kill, or maim his *villain*; though he might beat him with impunity, ſince the *villain* had no action or remedy at law againſt his lord, but in caſe of the murder of his anceſtor, or the maiming of his own perſon. Neiſes indeed had alſo an appeal of rape, in caſe the lord violated them by force.

Villains might be enfranchiſed by MANUMISSION.— Hence, and by other means, they gained in proceſs of time conſiderable ground on their lords; and in particular ſtrengthened the tenure of their eſtates to that degree, that they came to have in them an intereſt in many places full as good, in others better than their lords. For the good nature and benevolence of many lords of manors having, time out of mind, permitted their *villains*, and their children, to enjoy their poſſeſſions without interruption, in a regular courſe of deſcent, the common law gave them title to preſcribe againſt their lords; and, on performance of the ſame ſervices, to hold their lands, in ſpite of any determination of the lord's will. For though, in general, they are ſaid to hold their eſtates at the will of the lord; yet it is ſuch a will as is agreeable to the cuſtoms of the manor; which cuſtoms are preſerved and evidenced by the rolls of the ſeveral courts-baron in which they are entered, or kept on foot by the conſtant immemorial uſage of the ſeveral manors in which the lands lie. And, as ſuch tenants had nothing to ſhew for their eſtates but theſe cuſtoms, and admiſſions in purſuance of them, entered on thoſe rolls, or the copies of ſuch entries witneſſed by the ſteward, they now began to be called *tenants by copy of court-roll*, and their tenure itſelf a COPY-HOLD. Copy-holders are, therefore, in truth no other but *villains*, who, by a long ſeries of immemorial incroachments on the lord, have at laſt eſtabliſhed a cuſtomary right to thoſe eſtates, which were before held abſolutely at the lord's will. Theſe incroachments at length became ſo univerſal, that when tenure in villenage was virtually aboliſhed (though copy-holds were reſerved) by the ſtatute of Charles II. there was hardly a *pure villain* left in the nation. To this purpoſe ſir Thomas Smith teſtifies, that in all his time (and he was ſecretary to Edward VI.) he never knew any *villain in groſs* throughout the realm; and the few *villains regardant* that were then remaining were ſuch only as had belonged to biſhops, monaſteries, and other eccleſiaſtical corporations, in the preceding times of popery. By ſeveral means the generality of *villains* in the kingdom have long ago ſprouted up into COPY-HOLDERS; their perſons being enfranchiſed by manumiſſion or long acquieſcence; but their eſtates in ſtrictneſs, remaining ſubject to the ſame ſervile conditions and forfeitures as before; though, in general, the *villain* ſervices are uſually commuted for a ſmall pecuniary QUIT-RENT.— Blackſt. Com. book ii. p. 92, &c. See VILLENAGE.

VILLAIN *eſtate*, or *condition*, is contradiſtinguiſhed to *free eſtate*. See BASE *Tenure*, and VILLENAGE.

VILLAINAGE. See VILLENAGE.

VILLAINOUS *judgment* is that which caſts the reproach and ſtain of villany and ſhame on him againſt whom it is given. As that againſt a conſpirator, &c. See CONSPIRACY.

Lambard calls it *villainous puniſhment*; and ſays, it may well be called *villainous*, in regard the judgment, in ſuch caſe, ſhall be like the ancient judgment in attaint, viz. that the criminals ſhall not be of any credit afterwards; nor ſhall it be lawful for them, in perſon, to approach the king's court: that their lands and goods ſhall be ſeized into the king's hands, their trees rooted up, their bodies impriſoned, &c.

This *villainous* judgment is now become obſolete; it not having been pronounced for ſome ages: but inſtead thereof the delinquents are uſually ſentenced to impriſonment, fine, and pillory.

VILLANELLA, in the *Italian Muſic*, a ſort of air or tune to which the peaſants of that country dance. There are ſome of theſe *villanellas* very agreeable, having ſomething gay and enlivening in them, well adapted to their deſign. The firſt couplet is uſually played plain and ſimple, afterwards come an infinity of variations, diminutious, &c.

VILLARUM *nomina*. See NOMINA.

VILLEIN *fleeces*, in *our Statutes*, are bad fleeces of wool, ſhorn from ſcabby ſheep. 31 Edw. 3. cap. 8.

VILLENAGE, or VILLAINAGE, VILLANIA, the quality or condition of a VILLAIN.

Villenage is more particularly uſed for a ſervile kind of tenure of lands, or tenements; whereby the tenant was bound to do all ſuch ſervices as the lord commanded, or were fit for a villain to perform; which Bracton expreſſes by *Sciri non poterit veſpere, quale ſervitium fieri debet mane.*

Villenage is divided into that *by blood*, and that *by tenure*. Tenure, in *villenage*, could make no freeman a villain, unleſs it were continued time out of mind; nor could free land make a villain free.

Villenage is alſo divided, by Bracton, into *pure villenage*, where the ſervices to be performed were baſe in their nature, and indeterminate and arbitrary as to time and quantity, as above expreſſed, from which ancient tenures have ſprung our preſent COPY-HOLD tenures: and

ſocage

focage or *privileged villenage*, where the fervice was bafe in its nature, but reduced to a certainty: which was to carry the lord's dung into his fields, to plough his ground on certain days, to fow and reap his corn, &c. and even to empty his jakes: as the inhabitants of Bicton were bound to do to the lord of Cluncaftle in Shropfhire; which was afterwards turned into a rent, now called *Bicton-filver*; and the villainous fervice excufed.

This laft fpecies of *villenage*, fays Bracton, is fuch as has been held of the kings of England from the Conqueft downwards; that the tenant herein *villana faciunt fervitia, fed certa & determinata*; that they cannot alien or transfer their tenements by grant or feoffment any more than pure *villains* can; but muft furrender them to the lord or his fteward, to be again granted out and held in *villenage*. From thefe circumftances, fays judge Blackftone, we may collect, that what he thus defcribes is no other than an exalted fpecies of copyhold fubfifting at this day, viz. the tenure in *ancient demefne*: to which, as partaking of the bafenefs of *villenage* in the nature of its fervices, and the freedom of focage in their certainty, he has given the compound name of *villanum focagium*. This ancient demefne or DEMAIN confifts of lands or manors, which, though now perhaps granted out to private fubjects, were actually in the hands of the crown in the time of Edward the Confeffor, or William the Conqueror; and fo appear to have been by the great furvey called Domefday Book. Some of the tenants of thefe lands continued for a long time pure and abfolute *villains*, dependent on the will of the lord; and thofe who fucceeded them in their tenures now differ from common copyholders in a few points. Others were in a great meafure enfranchifed by royal favour; being only bound in refpect of their lands to perform fome of the better fort of villain fervices, and thofe determinate and certain; as, to plough the king's land, to fupply his court with provifions, and the like; all of which are now changed into pecuniary rents; and in confideration hereof they had many privileges and immunities granted to them; as, to try the right of their property in a peculiar court of their own, called a court of ancient demefne, by a peculiar procefs denominated a writ of *right clofe*; not to pay toll or taxes; not to contribute to the expences of knights of the fhire; not to be put on juries, and the like. Thefe tenants, though their tenure be abfolutely copyhold, have an intereft equivalent to a freehold; for their fervices were fixed, and they could not be compelled (like pure villains) to relinquifh thefe tenements at the lord's will, or to hold them againft their own; and *ideo*, fays Bracton, *dicuntur liberi*. Briton alfo, from this their freedom, calls them abfolutely *fokemans*, and their tenure *fokemanries*. The fame name is alfo given them in Fleta. Lands holden by this tenure are a fpecies of copyhold, and as fuch preferved and exempted from the operation of the ftatute of Cha. II. yet they differ from common copyholds, principally in the privileges before mentioned: as alfo they differ from freeholds by one fpecial mark and tincture of *villenage*, noted by Bracton, and remaining to this day, viz. that they cannot be conveyed from man to man by the general common law conveyances of feoffment, and the reft; but muft pafs by furrender to the lord or his fteward, in the manner of common copyholds: yet with this difference, that, in the furrenders of thefe lands in ancient demefne, it is not ufed to fay "*to hold at the will of the lord*" in their copies; but only "*to hold according to the cuftom of the manor*." Blackft. Com. book ii. p. 99, &c.

VILLI, *coarfe-hair*, in *Anatomy*, is fometimes ufed in the fame fenfe, as *fibres*, or *fibrillæ*. See FIBRE.

VILLI, in *Botany*, denote a fort of tomentum, or down, like the grain or fhag of plufh; with which, as a kind of excrefcence, fome trees and plants do abound.

VILLOUS, VILLOSA, is particularly applied to one of the coats or membranes of the ftomach, called CRUSTA *villofa*. See *Tab. Anat.* (*Splanch.*) *fig.* 2. *lit. h.*

It takes its name from innumerable *villi*, or fine fibrillæ, wherewith its inner furface is covered.

VILTRUM, a word ufed fometimes alone to exprefs a FILTRE, inftead of the word *filtrum*. But *viltrum* is more commonly joined with the word *philofophorum*, and then expreffes the common alembic for diftillation.

VIMMALA, in *Natural Hiftory*, a name given by the people of the Eaft Indies to a kind of pyrites, of a braffy appearance, and of a cubic figure.

They alfo give it in the fame places to the *pyritæ* in general, when fmall and of a fimple internal ftructure.

VINAGO, in *Ornithology*, a name given by fome authors to the wood-pigeon, from the colour of its breaft, fhoulders, and wings, refembling that of red wine. Its more ufual name among authors is OENOS.

VINALIA, in *Antiquity*, a name common to two feafts among the ancient Romans; the one in honour of Jupiter, and the other of Venus.

The firft was held on the nineteenth of Auguft; and the fecond, on the firft of May. The *Vinalia* of the nineteenth of Auguft were called *Vinalia ruftica*; and were inftituted on occafion of the war of the Latins againft Mezentius; in the courfe of which war, that people vowed a libation to Jupiter, of all the wine of the fucceeding vintage.

On the fame day likewife fell the dedication of a temple of Venus; whence fome authors have fallen into a miftake, that thefe *Vinalia* were facred to Venus. But Varro, LLL. V. and Feftus, in *verbo Ruftica*, diftinguifh between the two ceremonies; and exprefly affert the *Vinalia* to be a feaft of Jupiter.

VINCA, in *Botany*. See PERIWINKLE.

VINCETOXICUM, in the *Materia Medica*. See SWALLOW-*wort*.

VINCULO *matrimonii*, *divorce a*. See DIVORCE.

VINCULUM, in *Algebra*, a character in form of a line, or ftroke drawn over a factor, divifor, or dividend, when compounded of feveral letters, or quantities; to connect them, and fhew, that they are to be multiplied, or divided, &c. together, by the other term.

Thus, $d \times \overline{a+b-c}$, fhews that d is to be multiplied into $a+b-c$.

VINDEMIATING, formed of *vindemia*, *vintage*, the gathering of grapes, or other ripe fruits; as apples, pears, cherries, &c.

VINDEMIATRIX, or VINDEMIATOR, a fixed ftar of the third magnitude, in the northern wing of the conftellation Virgo; whofe longitude, latitude, &c. fee among the reft of thofe of VIRGO.

VINDICATION, *claiming*, in the *Civil Law*, an action arifing from the property a perfon has in any thing: or a permiffion to take or feize a thing, as one's own, out of the hands of a perfon, whom the law has doomed not to be the true proprietor.

VINDICATORY *part of a Law*. See LAW.

VINDICTA, among the *Romans*, the prætor's rod or fwitch, with which he touched a flave's head, when he was enfranchifed.

VINE, VITIS, in *Botany*, a genus of the *pentandria monogynia* clafs. Its characters are thefe: the flower has a fmall empalement indented in five parts; it has five fmall petals which drop off, and five awl-fhaped ftamina, which fpread and fall away, terminated by fingle fummits; it has an oval germen having no ftyle, crowned by a headed obtufe ftigma; which turns to an oval or roundifh berry with one cell, including five hard feeds or ftones. Linnæus reckons feven fpecies.

Vines have been denominated, either from the foil and place, where they grow, as the *Bourguignon*, *Bourdelas*, *Italian*, *Mantua*, &c. *vines*; or from the form, colour, tafte, &c. of their grapes, as the *acorn*, *apricot*, *damafk*, *bird-bill*, *mufcadine*, &c. *vines*. We fhall here fubjoin from Mr. Miller's Dictionary thofe forts of grapes which ripen pretty well in this country, or that merit a little affiftance to bring them to perfection by artificial heat.

The *July* grape, called by the French, *Morillon noir hatif*, is a fmall, round, black berry, growing loofe on the bunches: the juice is fugary, but has little flavour: it ripens in the beginning of Auguft.

The *black fweet water* is a fmall roundifh berry, growing clofe in the bunches, which are fhort: the fkin is thin, the juice very fweet; and the birds and flies are apt to devour them, if they are not guarded: this ripens foon after the other.

The *white fweet water* is a large round berry, in perfection, but very different in fize on the fame bunch, and therefore not much efteemed: the juice is fugary, but not vinous: this ripens about the fame time as the other.

The *chaffelas blanc*, or *royal mufcadine*, is an excellent grape; the bunches are generally large, and at the upper part divide with two fmaller fide-bunches; the berries are round, and when perfectly ripe turn of an amber colour; the juice is rich and vinous; it ripens in September, but if carefully preferved will hang very late, and become excellent.

The *chaffelas mufque*, or *le cour* grape, by fome called the *Frankindal*, is an excellent grape, and generally ripens well in England on a wall with a good afpect; the berries are very like thofe of the former in fhape, fize, and colour, but are flefhy, and have a flight mufky flavour: this ripens at the fame time with the former.

The *black clufter*, or *Munier* GRAPE, is a good fruit, and ripens well here; the bunches are fhort, the berries oval, and very clofe to each other; it ripens in September, and is by fome called the *Burgundy* grape.

The *Auverna*, or true *Burgundy* grape, fometimes called *black*

black Morillon, is an indifferent fruit for the table, but is eſteemed one of the beſt ſorts for making wine; the berries are oval, and hang more looſely on the bunches than thoſe of the *cluſter* grape, and as they ripen more equally, are preferred.

The *Corinth*, or as it is vulgarly called the *currant* grape, is a ſmall roundiſh berry generally without ſtone, of a deep black colour, and much cluſtered on the branches, which are ſhort; it has a ſugary juice, and ripens in September, but will not laſt long.

The *red chaſſelas* is very like the *white* in ſize and ſhape, but of a dark red colour; it is a very good grape, but ripens later than the white, and is pretty rare in England.

The *white muſcadine* is ſomewhat like the *chaſſelas*, but the berries are ſmaller, and hang more looſely on the bunches, which are longer, but not ſo thick as thoſe of the *chaſſelas*; the juice is ſweet, but not ſo rich as that of the *chaſſelas*.

The *black Frontinac*, or *muſcat noir*, is a round berry of good ſize; growing looſely on the bunches, but not ripening equally; the bunches are ſhort, the berries when fully ripe are very black, and covered with a meal or flue, like the black plums; the juice is very rich and vinous; it ripens in the end of September or beginning of October.

The *red Frontinac*, or *muſcat rouge*, is an excellent grape when fully ripe, but unleſs the ſeaſon is very warm, rarely ripens without artificial heat in England; the bunches of this ſort are longer than thoſe of the former; the berries are large and round; when fully ripe, of a brick colour, but before, they are grey with a few dark ſtripes, and frequently taken for a different kind, and commonly called *griſley Frontinac*; but Mr. Miller ſays, it is the ſame grape: the juice of this has the moſt vinous flavour of all the ſorts, and is greatly eſteemed in France.

The *white Frontinac* has larger bunches than either of the former; the berries are round, and ſo cloſely cluſtered on the bunches, that they require to be carefully thinned early in the ſeaſon, when the berries are very ſmall, or elſe the ſun and air will be excluded and they will not ripen, and the moiſture detained in them in autumn will cauſe them to rot; the juice is excellent, and if the fruit is perfectly ripe, inferior to none; this is called by the French *muſcat blanc*.

The *Alexandrian Frontinac* or *muſcat d'Alexandrie*, is called by ſome *muſcat of Jeruſalem*; the berries of this are oval, and hang looſely on the bunches; they are long and not ſhouldered; there are two ſorts, one with white and the other with red berries; their juice is very vinous and rich; but they ſeldom ripen in England without artificial heat.

The *red and black Hamburgh*, is called by ſome the *Warner* grape, from the name of the perſon who brought them to England: theſe have middle-ſized berries, inclining to an oval ſhape; the bunches are large, and their juice, when ripe, is ſugary, with a vinous flavour; this ripens in October.

The *St. Peter's* grape has a large oval berry of a deep black colour, when ripe: the bunches are very large, and make a fine appearance at the table, but the juice is not rich, and it ripens late in the year; the leaves of this ſort are much more divided than thoſe of the other ſorts, approaching to thoſe of the *parſley-leaved* grape, and therefore may be diſtinguiſhed before the fruit is ripe.

The *claret* grape, *Bourdelais* or *verjuice* grape, the *raiſin* grape, the *ſtriped* grape, and many other ſorts which never come to perfection here, are not worthy a place in gardens, unleſs for the ſake of variety; for when they have the aſſiſtance of heat to bring them to maturity, their juice is harſh, and without flavour, and therefore they ſhould not occupy the room of better fruit.

Mr. Mortimer ſays, that the grapes, beſt adapted to the Engliſh climate, are the ſmall black grape, the white muſcadine, parſley grape, muſcadilla, and white and red Frontinac.

Mr. Bradley recommends the July grape, the early ſweet water grape, brought from the Canaries, the Arbois or French ſweet water grape; all which, he ſays, if well managed, are ripe by the middle of Auguſt. He alſo recommends the claret and Burgundy grapes.

All the ſorts of *vines* are propagated either from layers or cuttings. The former is the method uſually practiſed with us, but the latter ſeems much the better.

In order to propagate them by cuttings: theſe muſt be choſen ſuch as are ſtrong and well-ripened ſhoots, of the laſt year's growth, and ſhould be cut from the old *vine*, juſt below the place where they were produced, taking a knot of the two years wood, which ſhould be pruned ſmooth. The upper part of the ſhoot ſhould then be cut off, ſo as to leave the cutting about ſixteen inches long. Theſe cuttings are to be placed with their lower part in the ground, in a dry ſoil, laying ſome litter upon their upper parts, to prevent them from drying. In this place they ſhould remain till the beginning of April, which is the beſt time to plant them. They are then to be taken up and wiped clean, and if they are very dry, they ſhould ſtand with their lower parts in water ſix or eight hours.

In preparing the ground for *vines*, the nature of the ſoil ſhould be conſidered, which, if ſtrong and inclinable to wet, is by no means proper: in this caſe, a trench ſhould be opened where the cuttings are to be planted, which ſhould be filled with lime rubbiſh, in order to drain off the moiſture; and then the border ſhould be raiſed with freſh light earth about two feet thick, ſo as to be at leaſt a foot above the level of the ground.

Having prepared the beds for the cuttings, they are to be ſet in holes at about ſix feet diſtance from each other, and making their heads ſlant a little toward the wall. The cutting is to be ſo buried in the ground, that only the uppermoſt bud be upon a level with the ſurface; the earth is then to be well cloſed about the plant, and a little mould heaped up over the eye of the bud, to keep it from drying. After this, there is no more trouble neceſſary, but to keep the ground clear from weeds, and to nail up the ſhoot, as it grows, to the wall, rubbing off all the ſide-ſhoots.

The Michaelmas following, if the cuttings have produced ſtrong ſhoots, they ſhould be pruned down to two eyes. In the ſpring following the ground is carefully to be dug up about the ſhoots, and the ſtalks to be earthed up ſo as to cover the old wood, but not ſo deep as to cover either of the eyes of the laſt year's wood. During the ſummer all the lateral ſhoots muſt be rubbed off as they appear, and only the two from the two eyes which were left, muſt be encouraged; theſe, as they grow, are to be nailed up againſt the wall; and in the middle or latter end of July, theſe ſhould be ſhortened, by nipping off their tops, and this will greatly ſtrengthen the ſhoot.

At the Michaelmas following, or as ſoon as the leaves begin to drop, theſe ſhould be pruned, leaving them each three eyes, if they are ſtrong; but if they are weakly, only two. They ſhould then be faſtened to the wall, ſpreading them out horizontally each way, that there may be room to train the new ſhoots the following ſummer, and in the ſpring, the borders ſhould be dug as before. The third ſeaſon there will be two ſhoots from each ſhoot of the laſt year's wood; but if there ſhould be two from one eye, which is ſometimes the caſe, then the weaker is to be rubbed off. At Midſummer the ends of the ſhoots are to be pinched off as before; all the weak lateral ſhoots are to be diſplaced, as in the preceding ſummer, and the whole management is to be the ſame. This is all the culture neceſſary to young *vines*.

As to the management of grown *vines*, it is to be obſerved, that theſe rarely produce any bearing ſhoots, from wood that is more than one year old; the great care muſt therefore be always to have plenty of this wood in every part of the tree; for the fruit is always produced upon the ſhoots of the ſame year, which come out from buds of the laſt year's wood.

The bearing ſhoots for the following year ſhould be left at the pruning with four eyes each. The under one of theſe does not bear, and conſequently there are only three which do. Many leave more eyes on the ſhoots, that they may have more fruit, which is the conſequence; but then the fruit is much poorer; and this is ſo well known in the wine countries, that there are laws to direct that no more than ſuch a number of eyes are to be left on each ſhoot, for the grapes would elſe be of a poor juice, and deſtroy the reputation of their wine. Each of the three eyes left will produce two or three bunches; ſo that each ſhoot will give ſix or eight bunches, which is as much as it can bring to any perfection. Theſe ſhoots muſt be laid at about eighteen inches aſunder on the wall; for if they are cloſer, when the ſide-ſhoots are produced, there will be no room to train them upon the wall; and the largeneſs of the leaves of the *vine* requires alſo that the ſhoots ſhould be at a proportionable diſtance, that they may not croud or ſhade the fruit.

The beſt ſeaſon for pruning *vines* is about the middle or end of October. The cut is always to be made juſt above the eye, and ſloped backward from it, that if it bleed, the juice may not run upon the bud; and where there is an opportunity of cutting down ſome young ſhoots to two eyes, in order to produce vigorous ſhoots for the next year's bearing, it ſhould always be done. In the latter end of April, or beginning of May, when the *vines* are ſhooting, they ſhould be looked over, and all the

the ſhoots from the old wood ſhould be rubbed off, as alſo the weaker, whenever there are two produced from one eye. In the middle of May the dangling ſhoots ſhould be rubbed off as before, and the branches muſt be nailed up againſt the wall as they ſhoot; and toward the middle of June, the ends of the bearing branches ſhould be nipped off, which will greatly ſtrengthen the fruit. Thoſe, however, which are to bear the next year, ſhould not be ſtopped before the middle of July.

During the ſummer ſeaſon, the dangling branches ſhould be rubbed off, and the ſhoots trained up regularly to the wall as before; for thus the growth of the fruit will be accelerated, and its flavour improved: but the branches ſhould never be diveſted of their leaves, becauſe the ſkins of the grapes, too much expoſed to the ſun, will be rough, and the fruit will be ſtarved and ſeldom come to any ſize.

When the fruit is all gathered, the *vines* ſhould be pruned, whereby the litter of their leaves is all removed at once, and the fruit will thus be forwarder the ſucceeding year. Miller's Gard. Dict.

For the method of building hot walls, and of forming eſpaliers, of preparing the ground adjoining to them, and planting and pruning, &c. the *vines*, we muſt refer to Mr. Miller's directions, ubi ſupra.

The moſt valuable grapes raiſed againſt hot walls are the red and white muſcat of Alexandria, the red, white, and black Frontinac. Thoſe proper to be planted againſt eſpaliers are the Miller grape, the chaſſelas white, the white muſcadine, the ſweet water, and le cour grapes.

Thoſe kinds of grapes, which are thin ſkinned, grow ſooner ripe than others, and will thrive in a temperate climate where the others will not. If it happen that grapes are ſtruck with hail at the time that they are large and near ripening, they never become ripe at all, but harden, and ſo remain. Fortzius de Vin. Rhen.

We have in the Philoſophical Tranſactions a remarkable account of the change of colour in grapes of the ſame tree. A muſcadine grape-tree was raiſed from a cutting of a parent-*vine* of this kind, whoſe fruit was white; it was planted againſt an eaſtern wall, where it had the benefit of the ſun from its riſing, to half an hour after twelve: the ſoil a ſtiff clay, but rendered fitter for the growth of this ſort of tree, by a mixture of rubbiſh of an old wall.

At about five years ſtanding it was ſo pruned, as to make it ſhoot two principal branches, one to the right, the other to the left hand; from hence it ſhot twenty-two inches on each ſide, before it came to a joint. That on the right was a very luxuriant branch, as thick as the body of the tree, the other about half that bigneſs. The leaves on the right hand were alſo of twice the bigneſs of thoſe on the left, and indeed larger than the leaves of the parent-tree; but what is moſt ſingular is, that the luxuriant branch produced annually fine black grapes in large bunches, and the left-hand branch white ones. But the white were often in the greateſt quantity, though the black grew on the much ſtronger branch. It is obſervable, that in all thoſe *vines* which bear black and blue grapes, that the leaves die red; but in this tree, whoſe origin was from a white grape, the leaves on that branch which bore black grapes died white, as well as thoſe on the other. The ſucceeding year, the number of the branches on the right-hand ſhoot were greatly increaſed in number, and the ſucceeding year all bore fine deep black grapes in very large numbers. Phil. Tranſ. Nº 366. p. 102. See RAISIN.

The *vine* is one of the trees moſt liable to be injured by froſts with us; its trunk is often ſplit in froſty weather, and that moſt frequently when it ſtands in the warmeſt aſpects. In the year 1683, the great froſt ſplit almoſt all our timber-trees; but this was owing to defects in them, by which the ſap was detained in very large quantities in particular places, from their being windſhaken, coltie, or otherwiſe diſtempered; but the *vines* ſuffered the ſame accident, ſeemingly from another cauſe.

Thoſe *vines* were moſt ſplit this year, which were expoſed to a ſouth aſpect, and planted againſt the warmeſt walls. The ſun, their uſual friend, now proved their enemy, and daily thawing the ſap in the trunk, it was again frozen every night. This often bending and unbending, ſoftening and hardening the vivid ſpirituous juice of this plant, deſtroyed it; and the ſap, being the ſame year diſordered, and not gradually ſeaſoned, but even ſtopped before Michaelmas-day, and the freſh ſap wholly detained by the ſucceeding froſts from ariſing, the frozen and hard earth alſo denying its juices, even though the veſſels of the plant had been in a condition to receive them; the trunks and branches of the *vines* were filled only with a thin, watery, and mortified ſap, and this moſt of it extravaſated by the burſting of the veſſels it was frozen in, many of them ſuffered as much as if cut off from the root. Thus periſhed the greater part of the *vines* expoſed to the ſun's action; while the others, which ſtood in more ſhady places, not having their juices thawed and frozen daily, ſuffered but one change, and often eſcaped. It was alſo obſerved this year, that the red grape-trees eſcaped much better than the white, being hardier than they.

Other wall-trees, containing viſcous juices, eſcaped very well, while the *vines* thus ſuffered, even though expoſed in the ſame manner. Among others, the plums, apricots, peaches, and wall-cherries, had very little damage. It is eaſy to conceive why plants with viſcous juices ſhould ſuffer leſs by froſt, than thoſe with more thin ones; and we ſee that this is the caſe between theſe two ſorts of trees, the plums, &c. often exſudating their juices in form of gum-arabic; but the *vines*, when they throw out any, ſhew that theirs is as thin as common water. The different kinds of trees have, doubtleſs, all their different conſiſtences in their juices; and it may have principally been owing to that diverſity in others, as well as in the plum and *vine*, that ſome eſcape, while others periſh by froſts. Phil. Tranſ. Nº 165. See FROST.

It is ſaid that *vines* were firſt planted about the rivers Rhine, Maine, and Moſelle, and alſo in Hungary and the northern part of Gaul, about the year 276. But with reſpect to the provinces of Gaul and Spain, which border on the Mediterranean ſea, as well as to Italy, many are of opinion, that *vines* grew ſpontaneouſly there. Julius Cæſar found *vines* growing in Gallia Narbonenſis, i. e. Languedoc and Provence; and Strabo remarks that the ſaid province produced all the kinds of fruit which Italy afforded. The Phœnicians are ſaid in early times to have planted *vines* in the iſles of the Mediterranean ſea, as well as in ſeveral parts of the continent both of Europe and Africa. It appears that there were real vineyards in England in 1140 and 1230. And. Com. vol. i. p. 16, and p. 81.

VINE, *black*. See *Black* BRYONY.

VINE, *climbing five-leaved*, of *Canada*, a ſpecies of *hedera*. See IVY.

VINE, *Spaniſh arbor*, a ſpecies of *ipomoea*. See QUAMOCLIT.

VINE, *wild*, or *White* VINE. See *White* BRYONY.

VINE *gall-inſect*, an inſect of the GALL-*inſect* claſs, principally found on the *vine*, though capable of living on ſome other trees, and ſometimes found on them. It is much of the ſame ſhape, figure, and manner of life, with the other animals of this claſs; but differs from them in this; that as they lay their eggs all under their body, and continue abſolutely to cover them, till they are hatched; theſe protrude them from their body, and they are found in prodigious abundance, lodged in a ſort of cottony or ſilky bags all over the ſtalks and branches of the *vines*; the dead animal is ſometimes found covering them in part; but more frequently they are abſolutely naked, and often are ſo numerous as to appear like thin cobwebs hung one over another all over the *vine*. See *Tab. of Inſects*, Nº 32.

Theſe eggs might be eaſily miſtaken for thoſe of ſmall ſpiders; they always hatch well, and come to maturity on the *vines* they are found on; but if removed to others, they ſeldom come to any thing, which is very ſingular, ſince the *gall-inſects* of almoſt all other trees may be removed and propagated either on the ſame or on different trees.

Theſe *vine* inſects are of the boat-faſhioned kind; but, beſide theſe, there are ſome other ſpecies which lodge their eggs in a cottony neſt of the ſame kind. The common thorn affords a ſhorter and more convex kind than this does; theſe are a very ſmall ſpecies; others are ſomething larger; but the oak affords a ſort equal in ſize, if not exceeding thoſe of the *vine*; ſome of theſe are brown, others bluiſh, and others reddiſh; and there are ſome minute differences in their ſhape. Reaumur, Hiſt. Inſ. tom. iv. p. 61.

VINE-*grubs*, in *Natural Hiſtory*, a name given by ſome authors to the pucerons, or little inſects, which are uſually of a green colour, and are found often in prodigious numbers, ſticking to the leaves of trees and plants, and to their young ſtalks.

Mr. Reaumur has been very curious in his inveſtigation of the nature of this inſect; but its manner of propagating its ſpecies was never clearly obſerved, till Mr. Bonet diſcovered it.

Reaumur obſerves, that in every family of pucerons, there are ſome that have wings, and ſome that have not; and that, according to the uſual courſe of nature, the winged ones ſhould be males, and the others females; but

but, on the contrary, that both the winged and the unwinged *vine-grubs* are females, all being viviparous, and each kind producing a number of living young; so that the males of these pucerons were never discovered, even by that careful observer; nor could he ever find out what it was that impregnated the one and the other kind. He leaves us queries on this subject, whether there is no copulation among them? and whether they are all hermaphrodites, each having in itself the organs of both sexes, as is the case in the river muscles?

Mr. Bonet, in order to inform himself of the process of nature in these creatures, brought up one of them in perfect solitude from its birth; he had an opportunity of observing it in the place where it was kept, and watched it very strictly for many months together. At the end of twelve days this creature, without having had any copulation with a male, began to breed. She produced in the whole ninety-five young ones, all alive, and constantly under the eye of the observer. This experiment was repeated several times with the same success; and, at length, repeated upon the young ones produced in this manner, and they were found to breed at the same period, and in the same manner with their parent, without having had any copulation with a male, as far as to the fourth generation.

A hasty observer would immediately conclude from this, that there was no copulation among the pucerons; but farther enquiry proves, that this is not the case; for the same observer has found a species of them in which there is copulation; so that both the winged and the unwinged kinds are truly females, and the male is a small fly, of a very different shape, as is the case in regard to many other insects. This male is the most salacious creature imaginable, copulating a vast many times successively, with the same, and with different females. As this is the case in regard to one species of this creature, it doubtless is so also in regard to the rest, though that has not yet been observed: and the singularity seems to be this, that after the male has copulated with the female, she not only becomes prolific, but her young ones are born ready impregnated, as far as the fourth generation; after which, probably, there is a necessity for the copulation with the male again.

There is another very singular observation also in the production of the young pucerons; the females are properly viviparous, and usually bring forth live young; but they sometimes produce only a sort of foetuses, which are laid in long series one beside the other, as the caterpillar-eggs are laid by the butterfly; and they are left to hatch, as it were afterwards, by the heat of the sun. Phil. Transf. N° 469.

VINEÆ, in the Roman *Art of War*, were defensive engines, composed of wicker hurdles, laid for a roof on the tops of posts, which the soldiers who went under it for shelter, bore up with their hands. Some say that they had two roofs; the first and lower of planks, and the upper roof of hurdles, to break the force of any blows, without disordering the machines. See MANTELETS.

VINEGAR, *acetum*, an agreeable, acid, penetrating liquor, prepared from wine, cyder, beer, and other liquors; and of considerable use, both as a medicine, and a sauce: or, *vinegar* is a vegetable acid liquor, produced by the second degree of fermentation, or that which succeeds the spirituous, and is called the acid or acetous FERMENTATION. Every liquor, which has completely undergone the spirituous fermentation, is spontaneously and necessarily disposed to the acid fermentation. Accordingly, every vinous liquor does continually tend to become *vinegar*, and is actually changed into it, sooner, or later, according to circumstances; unless this change be prevented by some obstacle to fermentation in general.

The word is French, *vinaigre*; formed from *vin*, *wine*, and *aigre*, *sour*.

The method of making *vinegar* has long been kept a secret among the people of that profession; who, it is said, oblige themselves to each other by oath not to reveal it; but, notwithstanding this, the Philosophical Transactions, and some other late writings, furnish us with approved accounts thereof.

VINEGAR, *method of making cyder*. The cyder (the meanest of which will serve the purpose) is first to be drawn off fine into another vessel, and a quantity of the must, or pouz of apples, to be added; the whole is then to be set in the sun, if there be a conveniency for the purpose; and, at a week or nine days end, it may be drawn off.

VINEGAR, *method of making beer*. Take a middling sort of beer, indifferently well hopped; into which, when it has worked well, and is grown fine, put some rape, or husks of grapes, usually brought home for that purpose; mash them together in a tub; then, letting the rape settle, draw off the liquid part, put it into a cask, and set it in the sun as hot as may be; the bung-hole being only covered with a tile, or slate stone; and in about thirty or forty days it will become a good *vinegar*, and may pass in use as well as that made of wine, if it be refined, and kept from turning musty.

Or *vinegar* may be made thus. To every gallon of spring-water, add three pounds of Malaga raisins; which put into an earthen jar, and place them where they may have the hottest sun from May till Michaelmas; then pressing all well, tun the liquor up in a very strong iron-hooped vessel, to prevent its bursting; it will appear very thick and muddy, when newly pressed; but it will refine in the vessel, and be as clear as wine. Thus let it remain untouched for three months, before it be drawn off, and it will prove excellent *vinegar*.

VINEGAR, *to make wine*. Any sort of vinous liquor, being mixed with its own fæces, flowers, or ferment, and its tartar first reduced to powder; or else with the acid and austere stalks of the vegetable from whence the wine was obtained, which hold a large proportion of tartar; and the whole being kept frequently stirring in a vessel which has formerly held *vinegar*, or set in a warm place full of the steams of the same, will begin to ferment anew, and conceive heat, and will grow sour by degrees, and soon after turn into *vinegar*.

The remote subjects of acetous fermentation are the same with those of vinous; but the immediate subjects of it are all kinds of vegetable juices, after they have once undergone that fermentation which reduces them to wine; for it is absolutely impossible to make *vinegar* of must, the crude juice of grapes, or other ripe fruits, without the previous assistance of vinous fermentation.

The proper ferments for this operation, whereby *vinegar* is prepared, are, 1. The fæces of all acid wines. 2. The lees of *vinegar*. 3. Pulverized tartar; especially that of Rhenish wine, or the cream or crystals thereof. 4. *Vinegar* itself. 5. A wooden vessel well drenched with *vinegar*, or one that has long been employed to contain it. 6. Wine that has often been mixed with its own fæces. 7. The twigs of vines, and the stalks of grapes, currants, cherries, or other vegetables of an acid austere taste. 8. Bakers leaven, after it is turned acid. 9. All manner of ferments, compounded of those already mentioned.

Vinegar is no production of nature, but a mere creature of art: for verjuice, the juices of citrons, lemons, and the like native acids, are improperly said to be *natural vinegars*; because, when distilled, they afford nothing but vapid water; whereas it is the property of *vinegar* to yield an acid spirit by distillation.

The wine which is generally converted into *vinegar*, and which, for its cheapness is commonly employed for this purpose, is such as has already become sour; although the better and the more spirituous the wine, and also the more of the vinous spirit that can be retained in the *vinegar*, the better and stronger it will be. Beccher says, in his Physica Subterranea, that having digested wine in order to convert it into *vinegar* in a bottle hermetically sealed, he found, that although a longer than the ordinary time was required, the *vinegar* produced was much stronger than when free air is admitted. Mr. Cartheuser also affirms, that the strength of *vinegar* may be much increased by adding some aqua vitæ to the wine, before it is exposed to the acetous fermentation. Nothing more seems requisite in the preparation of good *vinegar*, than to employ good wine, and to conduct the fermentation in the most advantageous method; the principal part of the operation being performed by nature.

VINEGAR *in France*, *method of making*. The French use a method of making *vinegar* different from that above described. They take two very large oaken vessels, the larger the better, open at the top; in each whereof they place a wooden grate, within a foot of the bottom: upon these grates they first lay twigs, or cuttings of vines, and afterwards the stalks of the clusters of grapes, without the grapes themselves, or their stones, called the rape, till the whole pile reaches within a foot of the brim of the vessels; then they fill one of these vessels with wine to the very top, and half fill the other; and with liquor drawn out of the full vessel, they fill up that which was only half full before; daily repeating the same operation, and pouring the liquor back from one vessel to the other; so that each of them is full and half full by turns.

When this process has been continued for two or three days, a degree of heat will arise in the vessel which is then but half full, and will increase for several days successively, without any appearance of the like in the vessel which happens to be full during those days; the liquor whereof will still remain cool; and as soon as the heat

heat ceaſes in the veſſel that is half full, the *vinegar* is prepared; which, in the ſummer, happens on the fourteenth or fifteenth day from the beginning; but, in the winter, the fermentation proceeds much ſlower; ſo that they are often obliged to forward it by artificial warmth, or the uſe of ſtoves.

When the weather is exceeding hot, the liquor ought to be poured off from the full veſſel into the other twice a day; otherwiſe, the liquor would be over-heated, and the fermentation would prove too ſtrong; whence the ſpirituous parts would fly away, and leave a vapid wine, inſtead of *vinegar*, behind.

The full veſſel is always to be left open at top; but the mouth of the other muſt be cloſed with a cover of wood, in order the better to keep down and fix the ſpirit in the body of the liquor; for otherwiſe, it might eaſily fly off in the heat of fermentation. The veſſel that is only half full ſeems to grow hot, rather than the other, becauſe it contains a much greater quantity of the vine-twigs and ſtalks than that, in proportion to the liquor; above which the pile riſing to a conſiderable height, conceives heat the more, and ſo conveys it to the wine below. Boerhaave's Elem. of Chemiſtry, part iii. p. 143, &c. Phil. Tranſ. vol. ii. p. 657.

There is another method, by which a very good *vinegar* is commonly made at Paris from the lees of wine. For this purpoſe all the wine contained in the lees is preſſed out, and put into large caſks, the bung-holes of which are left open. Theſe caſks are put into a hot place; and if the fermentation proceeds too faſt, it muſt be checked by adding more freſh wine.

In both the vinous and acetous fermentations, an inteſtine motion, a ſwelling, a hiſſing noiſe, and an ebullition, may be perceived; but the heat produced by the former is ſcarcely ſenſible, whereas that produced by the latter is very conſiderable. Moreover, the vapour which exhales from *vinegar*, during fermentation, is not noxious, like that of fermenting wine: on the contrary, as the acid of *vinegar* diſengages itſelf, it ſeems to acquire more power to bind and retain the inflammable principle, which is the truly dangerous part of theſe vapours. Beſides, *vinegar* does not depoſit tartar as wine does, even though it has been made with wine that had not depoſited its tartar; but the ſediment of *vinegar* is a viſcid, oily, and very putreſcent matter; which is uſed to cover the grape-ſtalks that are employed in the making of *vinegar*, in order to promote the fermentation. The acid of the grape-ſtalks, which are waſhed clean and preſerved to promote the fermentation of more *vinegar*, acts powerfully as a leaven or ferment. The caſks, which have been uſed, are alſo to be cleanſed from the viſcid matter juſt mentioned, and kept for the ſame uſe, as they are fitter for the purpoſe than new caſks. When the acetous fermentation is finiſhed, the nature and character of the liquor that has undergone it are totally changed. The taſte and ſmell of wine are partly ſpirituous and partly acid; though in good wine the latter is ſcarcely perceptible: the taſte and ſmell of *vinegar* are alſo acid and ſpirituous; but the former quality prevails ſo much as almoſt totally to conceal the latter. The properties of wine and *vinegar* prove, that the acetous fermentation unfolds in a very ſingular manner the acid parts of wine, and intimately combines them with the inflammable ſpirit; ſo that by changing wine into *vinegar*, the ardent ſpirit is no longer perceptible, ſo that it cannot affect the head and intoxicate; and if it be diſtilled, the firſt liquor that riſes with a heat leſs than that of boiling water is not an ardent ſpirit, as when wine is diſtilled, unleſs the *vinegar* be too new, and the acetous fermentation has not been completely finiſhed; but when old *vinegar* is diſtilled, the liquor that firſt riſes is a ſlightly acid phlegm, which contains the moſt volatile, the moſt odoriferous, and the moſt ſpirituous part of the *vinegar*.

When *vinegar* has run a little beyond the acetous ſtate, and begun to enter on the putrefactive, the putrefaction may be ſtopped by quenching a red-hot iron in the liquor; and the acid, which has been loſt, may in ſome meaſure be reſtored, by the addition of a little ſpirit of wine, rye-bread, muſtard-ſeed, &c. The putrefaction of *vinegar* may alſo be prevented, by racking it off from the feculencies, and keeping it in a cloſe-ſtopped veſſel in a cool place. However, ſuch as has once ſuffered a conſiderable heat, cannot long be preſerved from corruption.

In England the duty on *vinegar* is as follows; viz. for every ton of *vinegar* imported, 13*l.* and if imported by ſtrangers, 30*s.* more; and by 18 Geo. II. cap. 9. and 3 Geo. III. cap. 12. 16*l.* more for French *vinegar*, and other *vinegar* 8*l.* and by 18 Geo. III. cap. 27. an additional duty of 8*l.* 8*s.* for French *vinegar*, and other *vinegar* 4*l.* 4*s.* and again by 20 Geo. III. cap. 30. an additional duty of 8*l.* on French *vinegar*, and other *vinegar* 4*l.* The duty on home *vinegar* is, for every barrel (at 34 gallons to the barrel) of *vinegar*, *vinegar*-beer, or liquors preparing for *vinegar*, made for ſale, that for making white lead excepted, 8*s.* 9*d.* 10 & 11 W. cap. 21. and 8 Ann. cap. 7. *Vinegar* is alſo ſubject to an additional duty of three *five per cents.* by 19 Geo. III. cap. 25. 21 Geo. III. cap. 17. and 22 Geo. III. cap. 66. By 24 Geo. III. cap. 41. every maker of *vinegar* for ſale is required to take out a licence at the annual expence of 10*l.*

VINEGAR, *chemical properties of.* *Vinegar* is not a pure or ſimple acid, like thoſe of the mineral kingdom: in open veſſels it becomes vapid, ropy, and putrid, while the mineral acids remain unchanged. Diſtilled by a moderate heat, it yields firſt a phlegmatic liquor, afterwards a ſlightly acid one, which is ſucceeded by ſtronger and ſtronger acids, till the matter in the diſtilling veſſel becomes thick and unctuous like honey: the *vinegar* prepared from malt liquors contains more of this viſcous ſubſtance than that of wine, and is, therefore, more diſpoſed to become ropy and ſlimy in keeping. This reſiduum, urged with a ſtronger fire, gives over an empyreumatic oil, and a penetrating acid ſpirit, tainted with the ill ſmell and yellow colour of the oil. Then there remains a black coal, which, burnt into white aſhes, yields a conſiderable proportion of fixt alkaline ſalt. Pure fixt alkaline ſalt, ſaturated with the colourleſs diſtilled liquors, and afterwards exſiccated, contracts a yellowiſh or brown tinge, and thus diſcovers that the acid ſtill retains a portion of the oil. On gently melting the dry ſalt, the oily matter burns to a black coal, which ſeparates on diſſolution in water: the ſolution, exhaled to dryneſs, leaves a perfectly white neutral ſalt, containing the pure acetous acid combined with the alkali. On adding to this compound a little oil of vitriol, the acetous acid is diſengaged, and may be collected by diſtillation, in a highly concentrated ſtate, and of a very pungent volatile ſmell. The quantity of fixed alkaline ſalt, which *vinegar* is capable of ſaturating, is one of the ſureſt criterions of its ſtrength. The beſt of the German *vinegars*, according to Stahl, ſaturate little more than one fortieth of their own weight; the French *vinegars*, examined by Geoffroy, above one thirty-fifth; and ſome of them no leſs than one twelfth; the common diſtilled *vinegar* of our ſhops about one twentieth. By congelation, and diſtillation from alkalis, and from ſome metallic bodies, particularly copper, the acid may be ſo far concentrated as to ſaturate nearly equal its own weight. The beſt way of judging of the ſaturation, according to Dr. Lewis, is by trying the liquor from time to time with certain coloured vegetable juices, or on paper ſtained with them. For this purpoſe a thick writing paper may be ſtained pale blue on one ſide with the blue preparation of archil, commonly called lacmus; and pale red on the other ſide by a mixture of the ſame infuſion with ſo much dilute ſpirit of ſalt as is juſt ſufficient to redden it. If a ſmall ſlip of this paper be dipped occaſionally into the liquor to be tried, or a drop of the liquor be applied on both ſides of the paper, the red ſide turns blue as long as any of the alkali remains unſaturated; the blue ſide turns red, when the acid begins to prevail; and no change at all is produced when the ſaturation is complete. Where lacmus cannot be procured, the paper may be coloured with the juices of violets, iris, cyanus, &c. or with the blue juice preſſed out from ſcrapings of the cortical part of common radiſh roots; with which it is ſufficient to ſtain the paper on one ſide; this one colour diſcovering both acidity and alkaleſcence, the former changing it red, and the latter green.

The acetous acid differs eſſentially from all the others: from the native vegetable acids, in ſubtility and volatility; not being obtainable in the form of a concrete ſalt, which moſt, perhaps all, of the native ones are, and riſing in diſtillation with a moderate heat, which very few of the native ones have been found to do: from the mineral acids, in its habitude to different bodies, and the nature of the compounds which it forms with them, being much weaker than the mineral acids: thus, whatever alkaline, earthy, or metallic ſubſtance, the acetous acid be combined with, the addition of any mineral acid will disjoin them, the mineral taking the place of the acetous; neutral ſalts, compoſed of the acetous acid and fixed alkalis, diſſolve totally and plentifully in rectified ſpirit of wine, whilſt thoſe, compoſed of the ſame alkalis and mineral acids, are not at all ſoluble in that menſtruum: in this property, the acetous acid differs alſo from moſt, perhaps from all, of the acids of its own kingdom; and from all acids in general, in its peculiar odour.

The acid of *vinegar* diſſolves all ſubſtances upon which other acids can act, and forms with them neutral ſalts, all which may be called *acetous* SALTS. With calcareous earth it forms ſalts, which in cryſtallizing ſhoot into

silky ramifications and vegetations: these salts are named, from their earthy bases, salt of chalk, salt of crabs eyes, &c. The solubility of calcareous earth in this acid, and its precipitability by that of vitriol, afford a ready method of discovering the sophistication of *vinegar*, said to be sometimes practised, with vitriolic acid. If a saturated solution of any calcareous earth, as chalk, made in strong *vinegar*, be added to such as is suspected of containing vitriolic acid, no change will ensue if the *vinegar* was pure; but if it contained even a minute portion of that acid, the mixture will immediately become milky, and on standing for a little while deposit a milky sediment: if the calcareous solution be gradually dropt in, so long as it produces any milkiness or cloudiness, all the vitriolic acid will be absorbed by the chalk; and as this new compound is very sparingly dissoluble, nearly the whole of it will precipitate, so as to leave the *vinegar* almost pure. With fixed vegetable alkali the acid of *vinegar* forms a very pungent and very deliquescent salt, called *regenerated* TARTAR, or TERRA *foliata tartari*. With fixed mineral alkali it forms a neutral crystallizable salt. With volatile alkali it forms an acetous ammoniacal salt, called *spirit of Mindererus*.

Vinegar dissolves, among metallic bodies, zinc, iron, copper, tin, lead, bismuth, and regulus of antimony; the two last, however, in small quantity, but sufficient to give a strong impregnation to the *vinegar*; and united with copper it forms VERDIGRISE, and CRYSTALS *of Venus*. With lead it forms CERUSSE, and *salt* or *sugar of* LEAD; dissolving it more easily when reduced to a calx, than in its metallic state; boiled even with the glass of lead, or in the common glazed earthen vessels, in the GLAZING of which this metal is a principal ingredient, it extracts so much as to become strongly tainted with the pernicious qualities of the lead. Gold, platina, silver, and quicksilver, are not affected by *vinegar* in their metallic state; the two first have not been observed in any state to be affected by it. Silver precipitated from the nitrous acid, and thoroughly edulcorated with water, and mercury treated in the same manner, or changed by fire into a red powder, slowly and sparingly dissolve in it. Of the affinities of this acid to different metals, or its forsaking one to unite with another, few experiments have been made. Dr. Lewis observes, that it deposits lead and copper upon adding iron. (See *Tables of* AFFINITY.) It dissolves the vegetable inspissated juices, and several of the gummy resins, and extracts the virtues of sundry plants in tolerable perfection, superadding at the same time a virtue of a different kind. However, it excellently assists and coincides with some drugs, as garlic, squills, and ammoniacum; and in many cases, where this acid is principally to be depended upon, it may be advantageously impregnated with the flavour of certain vegetables. *Vinegar* very much concentrated, as the rectified SPIRIT *of Venus*, or *radical* VINEGAR, being distilled with equal parts of highly rectified spirit of wine, furnishes a liquor which has all the essential characters of ÆTHER, and is called *acetous æther*. It was discovered by the count de Lauraguais. (See Hist. Acad. Scienc. Par. 1759.) It mingles equally with blood and its serum, and with most of the fluids of animals; not thickening or coagulating them, like the acids of the mineral kingdom, but tending rather, as Boerhaave justly observes, to attenuate and resolve coagulations. It is likewise, when taken internally, less stimulating than the mineral acids, and less disposed to affect the kidneys. Professor Cullen observes, that it is less liable to undergo changes in the first passages than the native vegetable acids, which have yet to go through the process of fermentation.

VINEGAR, *medicinal properties of*. This mild, unctuous acid, is a medicine of great use in the different kinds of inflammatory and putrid distempers, both internal and external. Nothing is more extolled in many cases of putrefaction, and as an antidote against venomous bites, by Dioscorides and Hippocrates, than OXYCRATE; and *vinegar*, when applied to sores in animal bodies, is known to stimulate and resist putrefaction. When weak, it possesses the virtues of water; when strong, its effects approach to those of salts and acid spirit. Med. Ess. Edingb. vol. v. art. 24.

It is one of the most certain antiphlogistics and sudorifics in high fevers, and one of the best preservatives against pestilential and other putredinous contagions. Accordingly Boerhaave informs us, that Franciscus de la Boe Sylvius visited his patients in the plague with safety, by drinking first an ounce or two of *vinegar*. And it is now a common practice to wash and sprinkle the rooms of hospitals, the decks of ships, &c. with *vinegar*, in order to purify the air. Dr. Hales (Ventilators, part i. p. 46.) recommends dipping many cloths in *vinegar*, and hanging them up in all proper vacancies between the decks of ships, and in the chambers of sick persons, whereby great quantities of *vinegar* would intermix and float in the air; and he found by an experiment, mentioned in his Statical Essays, vol. i. p. 266. that an air, which passes through such cloths, could be breathed to and fro as long again, as the like quantity of air, which was not impregnated with *vinegar*. Fainting, vomiting, lethargic, and hysteric paroxysms, are likewise frequently relieved by *vinegar*, applied to the mouth and nose, or received into the stomach. Lethargic persons are often found to be excited more effectually by *vinegar* blown into the nose, than by the far more pungent volatile spirits. Boerhaave observes, that this acid counteracts, in a peculiar manner, the effects of spirituous liquors. The daily use of *vinegar* with food is salutary in hot, bilious dispositions, and where there is a tendency to inflammation or putrefaction. It is prejudicial to children, to aged, hysterical, and hypochondriacal persons; in cold, pale, phlegmatic habits, where the vessels are lax, the circulation languid, and the power of digestion weak. It tends in all cases, if used freely, to prevent corpulence: Hoffman suspects that it produces this effect by impeding the formation of chyle, or destroying the union of the unctuous and serous fluids of which chyle is composed; an effect common to all acids, as appears from their coagulating milk and artificial emulsions. Dr. Lewis observes, that he has known great corpulence reduced by the liberal use of *vinegar*, but not with impunity; diseases succeeding, which eluded the power of medicines, and proved at length fatal.

Combinations of *vinegar* with different earthy bodies differ in virtue according to the nature of the earth. A solution of the aluminous earth in this acid is strongly styptic; of vegetable earths, or magnesia alba, bitterish, and gently purgative: both these solutions are milder, and less ungrateful, than those of the same earths made in the mineral acids; and though as yet unknown in practice, certainly deserve (as Dr. Lewis says) to be introduced. Solutions of different animal and the calcareous mineral earths, are bitterish and subaustere, in various degrees, and supposed to act as mild resolvents, subastringents, or diaphoretics. Combinations of *vinegar* with fixed alkaline salts are useful aperients, diuretics, and cathartics. Dr. Lewis has known two drams of the alkali, dissolved in as much *vinegar* as was sufficient to saturate it, occasion ten or twelve copious watery stools, and a plentiful discharge of urine, without griping or fatiguing the patient. Mixtures of alkali and distilled *vinegar*, evaporated to a dry salt, are kept in the shops; either in a brownish oily state, as obtained by simple evaporation, or purified to perfect whiteness, by gentle fusion and solution in water. These preparations are given in doses of ten or twenty grains as mild aperients, and to a dram or two as purgatives and diuretics. See TARTAR *regeneratus*, SAL *diureticus*, TERRA *foliata*, and ARCANUM *tartari*.

Combinations of *vinegar* with volatile alkaline salts, commonly made with distilled *vinegar*, added gradually to the salt, till the effervescence ceases, scarcely yield any solid salt; the saline matter evaporating with the watery fluid, or even before it: on distilling the mixture in a retort, a salt sometimes concretes about the sides of the receiver, but liquefies again as the vessels grow cold. These mixtures, called *spiritus Mindereri*, have little purgative virtue, but operate powerfully as aperients; by urine, if the patient walks about in the cool air; by perspiration or sweat, if kept warm in bed. They are principally made use of in this last intention, in doses of half an ounce; and as they act without irritation, they have place in inflammatory cases, where the warm sudorifics, if they fail of exciting a sweat, aggravate the distemper. *Vinegar* and honey, or OXYMEL, of the consistence of a syrup, swallowed warm, is very good in many cases of sore throats arising from colds. A very important medicinal virtue has been attributed to *vinegar*, namely, that of curing the canine madness. See HYDROPHOBIA, and MADNESS *from the bite of enraged animals*.

Mr. Buchoz, in a work, entitled, an Historical Treatise of Plants growing in Lorraine, &c. affirms, that several successful trials have ascertained the efficacy of *vinegar* against the ill effects arising from the bite of mad dogs, when it is given in the quantity of a pound each day, divided into three doses; one to be taken in the morning, another at noon, and a third in the evening. See on the subject of this article, Boerhaave's Elem. Chem. by Dallowe, part iii. p. 146, &c. Neumann's Chem. by Lewis, p. 458, &c. Dict. Chem. and Lewis's Mat. Med.

VINEGAR *of antimony*, is an acid spirit, best made by distillation from the ore of antimony.

Its use is commended in continued and malignant fevers.

VINEGAR, *distilled*, is the spirituous acid of *vinegar* obtained by distillation. The process of distilling *vinegar*

is very simple. A quantity of good ordinary *vinegar* is put into a large cucurbit or still, which ought to be made of stone-ware, and not of metal, as the acid of *vinegar* is capable of acting upon most metals. This cucurbit is sunk in a deep furnace, so that five or six fingers' breadth only near its neck appears. The neck is to be carefully luted with clay all round the furnace, that the capital may not be heated too much. A capital and a glass receiver are then to be fitted, and the distillation is to be begun with a very gentle heat. The acid spirituous liquor passes by drops into the receiver. This liquor is white, transparent, penetrating, somewhat empyreumatic, and disengaged from an acid, but not spirituous substance, and also from an extractive saponaceous matter, both which are contained in ordinary *vinegar*. These latter substances remain in the still with the colouring matter, and form together an extremely acid extract of *vinegar*. This residuum contains also some tartar, and by incineration yields much fixed alkali, as all matters belonging to vines, grapes, and wine, do. See *Chemical Properties of* VINEGAR, supra.

The thicker *vinegar* is, the less fit it proves for distillation, as there is always the greater danger of an empyreuma, or burnt smell, which would spoil the whole process, and as it usually in this case comes over oleaginous. And the purest white salt of tartar, saturated with this distilled *vinegar*, being afterwards ignited, turns black, and yields a smell extremely like that of crude tartar in the calcination. Shaw's Chemical Essays.

On the other hand, the more the *vinegar* is diluted immediately before distillation, the less danger there is of burning; and if the thick remaining mass, when the thinner part is distilled from it, be again diluted with water, it may, by a second distillation, be brought to afford an acetous substance; though this latter be by no means comparable to this former volatile part. This Vigani justly suspects to be a thing known but to very few. And even when the *vinegar* is distilled with the utmost labour and care, it still has this effect in a higher degree, and contains an immense quantity of phlegm, in proportion to its acid salt.

In this case, the method of condensation by freezing is of the utmost service; first of all separating the more aqueous part, and in the next place, that which is somewhat acetous, though not comparable to what remains behind; so that, by this means, a most concentrated and subtle spirituous distilled *vinegar* may be produced, viz. by freezing the whole parcel of distilled phlegm and distilled *vinegar* together, a thing of great moment to the curious in the *chemia sublimior*, and particularly to those who understand Hollandus. And when the *vinegar* is froze without distillation, by this means you have a noble rob, or a rich concentrated *vinegar*, freed from its distillating aqueous and useless part. Vigani, Medull. Chem.

VINEGAR, *concentrated*. See CONCENTRATION.

VINEGAR *of lead* is a liquor formed by digesting CERUSSE or LITHARGE, with a sufficient quantity to dissolve it perfectly. This is called the *acetum lithargyrites*, and is prepared by digesting four ounces of litharge about three days in a sand heat, with a pint of strong vinegar, now and then shaking the vessel. The liquor, filtered, will receive a strong impregnation from the litharge, and will be found to have dissolved about one tenth of it. When a saturated solution is required, the cerusse is preferred to the litharge. This *vinegar* is of the same nature with solutions of SACCHARUM *saturni*, and when diluted with a large quantity of water, it abates external inflammations, the itching and other uneasinesses in cancerous ulcers; and before Mr. Goulard's practice, it was used for bathing inflammations in scirrhous tumors, to prevent their becoming cancerous. Inflammations and inflammatory tumors, in general, are dispersed by it. Dr. William Saunders has observed, that the *acetum lithargyrites*, or Goulard's extract, is not the same in its operation and powers as the *saccharum saturni*, as medical practitioners have generally supposed. In the preparation of the former, the acid is fully saturated with lead; but in that of the latter, the acid is in a much greater proportion to the lead. The former, when diluted by the purest distilled water, gives out a copious precipitation, which he finds, by experiment, to be cerusse. The latter remains dissolved in distilled water, and is, therefore, applied topically in a state more immediately active, both on account of its greater proportion of acid, and its preserving its solubility under high degrees of dilution. He has also found by experiment, that, by adding a very small proportion of distilled *vinegar* to the *aqua saturnina* of Goulard, the white precipitate is redissolved, and that the solution procured in this manner is more active, but less adapted to remove inflammation, and abate irritation, as a sedative, than the *aqua saturnina* itself. Dr. Saunders, however, is perfectly convinced, that no degree of dilution of *saccharum saturni* will answer the many valuable purposes obtained from the use of the *acetum lithargyrites*. Water alone, in the case of the *aqua saturnina*, proves a precipitant of lead, by attracting the acid, and reducing the preparation to a state of cerusse, an intermediate state between lead and the *saccharum saturni*; so that cerusse diffused in water more nearly resembles the *aqua saturnina* of Goulard, than a solution of the *saccharum saturni* does. The *saccharum saturni* may be considered as an union of cerusse with *vinegar*; whereas Goulard's *acetum lithargyrites* is an union of lead with *vinegar*. See Percival's Phil. Med. and Exp. Ess. 1776. Append. p. 323, &c.

VINEGAR, *portable*, a name given by the chemists to a sort of *vinegar* powder, or *vinegar* in a dry form. It is a preparation of tartar with *vinegar*, and is made in this manner: take white tartar, half a pound; let it be carefully washed, then dried and powdered; infuse this powder in the strongest wine-*vinegar*; then dry it, and infuse it again, repeating this operation ten times. After this the dry powder is to be kept for use: at any time a sort of extemporaneous *vinegar* may be made by dissolving a small quantity of this powder in any proper liquor.

VINEGAR, *radical*, is a name given to the acid of *vinegar* highly concentrated, by distilling verdigrise, or crystals of verdigrise, &c. See SPIRIT *of Venus*.

M. de Lassone has lately found, that in the process of distilling verdigrise for this purpose, a fluid escapes of the nature of those called by the ancient chemists *gas*, and by the moderns *fixed air*; and he also observed, that if the distillation be suspended the moment before the acid concentrated vapours appear under a white form, copperish flowers are obtained: before this period the radical *vinegar* contains no copper: it only begins to contain some, when the copperish flowers, carried along by the acid vapours, mix themselves with this *vinegar*: if it is then rectified by a new distillation, these flowers are no more sublimed, and, therefore, a radical *vinegar*, exempt from copper, may be extracted from verdigrise. The copperish flowers are in a high degree caustic, and may be considered as a violent poison. Hist. Acad. Sc. Par. 1777.

VINEGAR *of roses*. See ACETUM *rosatum*.

VINEGAR, *eels in*. The common opinion, from the discovery of eels in *vinegar*, that its sharpness to the taste was occasioned by these animals, occasioned the accurate Leewenhoek to attempt a careful examination of it by the microscope.

Some of the strongest and sharpest *vinegar*, after having been exposed for some hours to the air, and afterwards examined by the microscope, entertains the sight with a number of corpuscles, called the salts of *vinegar*, which are acute at both extremities, and have many of them in the middle an oblong figure of a brownish colour, and others were altogether clear, pellucid, and bright as crystal. Others of these particles appeared of an oval figure, and some of the half of such a figure, hollowed like a small boat, or the half of a nut-shell. The more perfect figures, pointed at both ends, and pellucid, are so very minute, that some thousands of them are comprehended in a small drop.

These seem to be what affect the tongue with the acid sharpness, when we taste *vinegar*; and it is very probable, that beside these, minute as they are, there are multitudes of others equally pointed, and infinitely smaller than these.

If *vinegar* be placed in an open glass, and suffered to remain some weeks, the surface of it will be found, on examination with good glasses, to be full of the same figures, double-pointed, and very pellucid; and in these, very often, there may be cavities plainly discovered; but examining the liquor a little deeper down, there are found numbers of minute eels; yet these, though minute, are prodigiously larger than the salt particles, and can never be supposed to be the occasion of the sharpness of *vinegar* to the taste, by any who rightly consider, since it is not all *vinegar* that contains them; nay, the much greater part of *vinegar* is wholly without them, and in winter they all die; yet *vinegar* is not less sharp at that season, than in the summer.

Mr. Mentzelius was so lucky as to see these undergo their last metamorphosis, and change into small flies; and though this is a single instance, in regard to the microscopical world of animalcules, yet it is highly probable that the whole race of those, whose appearance in medicated fluids we have been so long puzzled to account for, may, like these, be the worm-state of some winged aerial insect, and have owed their origin, where we see them, to the eggs of parent flies, too small for our sight. Reaum. Hist. Inf. vol. iv. p. 404.

If *vinegar* be impregnated with crabs-eyes, or any other alka-

alkaline ſubſtance, which blunts, and in a great meaſure deſtroys its acidity, theſe double-pointed figures are no longer found in it, on a microſcopical inſpection; but in their places we find others with an oblong quadrangular baſe, from which they ſhoot up into pyramids, and appear like poliſhed diamonds. Theſe are alſo ſo very minute, that ſix thouſand of them are computed to be contained in a drop of the liquor, no larger than two corns of barley; and theſe will be uſually found all of the ſame ſize, or very nearly ſo, which is by no means the caſe with the other ſalts of *vinegar* in its natural ſtate. See *Microſcopic* EELS.

VINEYARD, *vinetum*, a plantation of vines. See VINE. *Vineyards* were formerly common in England, but for a conſiderable time the cultivation of them has been altogether neglected. There was a famous *vineyard* at Bath, planted with white Muſcadine and black cluſter grapes, which, at one time, yielded ſixty hogſheads of wine at a vintage, though, in 1721, it only yielded three hogſheads.

Bradley alſo mentions a ſmall *vineyard* of a private perſon at Rotherhithe, conſiſting only of a hundred vines, which yielded at a vintage ninety-five gallons of wine, that had the true Burgundy flavour, as being made of that ſort of grape, and exceeded any made on this ſide of Paris.

Mr. Miller apprehends, that renewed trials, conducted with judgment, might be attended with a ſucceſs beyond the expectations that are now generally entertained. With this view particular attention ſhould be given to the ſoil, ſituation, &c. The beſt ſoil, he ſays, for a *vineyard* in England is ſuch, whoſe ſurface is a light ſandy loam, and not above a foot and a half or two feet deep above the gravel or chalk: the moſt deſirable ſituation is that on the north ſide of a river, upon an elevation inclining to the ſouth, with a ſmall gradual deſcent for draining the moiſture; always open to the eaſt, defended from the north and north-weſt wind by hills with a chalky ſurface, and ſurrounded by an open hilly country.

In order to prepare the ground for planting, it ſhould be ploughed in the ſpring as deep as the ſurface will admit, turning the ſward to the bottom, then well harrowed, and afterwards conſtantly ploughed and harrowed for at leaſt one year: in March the ground ſhould be again ploughed, and when the ſurface is made even, marked with rows from ſouth-eaſt to north-weſt, at the diſtance of ten feet from each other, which rows ſhould be again croſſed at five or ſix feet diſtance; and thus the places in which each plant ſhould be ſet will be marked, ſo that the vines will be ten feet row from row, and about five or ſix feet aſunder in the rows.

The next object is the choice of the proper grapes, which ſhould not be thoſe which are the moſt palatable for eating. The moſt likely to ſucceed in England is the Auvernat, or true Burgundy grape, cuttings of which ſhould be provided and planted about the beginning of April. See VINE.

The ground between the rows may be planted with any kind of eſculent plants, which do not grow tall, and this huſbandry continued three or four years, till the vines come to bearing; after which no crop ſhould be put between them in ſummer; but when the grapes are gathered, there may be a crop of coleworts, for ſpring uſe, planted between the rows, which, by occaſioning the ſoil to be ſtirred, will be ſerviceable to the vines: in England they will require no watering, as there is no danger of their miſcarrying by drought.

When the cuttings begin to ſhoot, each of them ſhould be faſtened to a ſtick about three feet long; the lateral ſhoots being diſplaced, and the ground between the vines always kept clean.

At Michaelmas, when the vines have done ſhooting, they ſhould be pruned, and the earth drawn up in a hill about each plant to guard them from the froſt. At the beginning of the following March, the ground between the vines ſhould be well dug, in order to looſen and clean it, and the earth laid up again in a hill about each plant, without burying the two young eyes of the former year's ſhoot. At the beginning of May, when the vines are ſhooting, there ſhould be two ſtakes fixed down to the ſide of each plant, taller and ſtronger than thoſe of the former year, to which the two ſhoots, if ſo many are produced, ſhould be faſtened, and the lateral ſhoots diſplaced. In the autumn following they ſhould be pruned, cutting down thoſe that have two ſhoots of equal vigour to three eyes each; and thoſe with one ſtrong ſhoot to two eyes. In the next ſpring, about the beginning of March, the ground between the vines ſhould be dug, and two ſtakes placed by thoſe that have two ſhoots, ſo that the ſhoots may be drawn out on each ſide to the ſtakes at an angle of about 45° with the ſtem. In May, when the vines ſhoot, all the weak dangling ſhoots ſhould be rubbed off, and thoſe which are produced from ſtrong eyes faſtened to the ſtakes. This management ſhould be repeated at leaſt every three weeks, from the beginning of May to the end of July, and the ſoil conſtantly kept clean.

In the autumn of the third year from planting, the vines ſhould be pruned in the following manner: if the two ſhoots of the former year, which were ſhortened to three eyes, have each of them produced two ſtrong branches in the laſt ſummer, then the uppermoſt ſhoot on each branch ſhould be ſhortened down to three good eyes, without including the lower, which is ſituated juſt above the former year's wood, and the lower ſhoots ſhould be ſhortened down to two good eyes each; theſe being deſigned to produce vigorous ſhoots for the ſucceeding year, and the former for bearing fruit; but when the vines are weak, and have not produced more than two or three ſhoots the laſt ſeaſon, there ſhould be but one of them left with three eyes for bearing; the other muſt be ſhortened down to two, or if weak, to one good eye. In the ſucceeding March the ground between the vines ſhould be well dug, and the horizontal roots produced on or near the ſurface of the ground pruned off cloſe to the places where they were produced; and on each ſide of every vine a ſtake ſhould be put in at about ſixteen inches diſtance from the root, to which the two branches, which were pruned to three eyes for bearing, ſhould be faſtened obliquely; and another taller ſtake ſhould be placed down near the foot of the vine, to which the two ſhoots pruned down to two eyes ſhould be faſtened, provided they are long enough; but if not, when their eyes begin to ſhoot, theſe muſt be trained upright to the ſtakes, in order to prevent their trailing on the ground, hanging over the fruit branches, or being broken by the wind. In May all weak lateral branches ſhould be rubbed off as they are produced; and thoſe ſhoots, which ſhew fruit, muſt be faſtened with baſs to the ſtakes to prevent their being broken, till they are extended to three joints beyond the fruit, when they ſhould be ſtopped; but the ſhoots, which are deſigned for bearing the following ſeaſon, ſhould be trained upright to the middle ſtake, by which method the fruit branches will not ſhade theſe middle ſhoots, nor will theſe middle ſhoots ſhade the fruit. This proceſs ſhould be repeated every fortnight or three weeks, from the beginning of May to the middle of July; the dangling ſhoots being conſtantly diſplaced, and the leaves ſuffered to remain, in order to ſcreen the fruit.

When the fruit is ripe, if the ſtalks of the bunches are cut half through a fortnight before they are gathered, it will cauſe the juice to be much better, becauſe ſo great a quantity of nouriſhment will not enter the fruit, and the watery particles will have time to evaporate, and the juice be better digeſted. And when the fruit is cut, if it be hung up in a dry room upon ſtrings, ſo as not to touch one the other, for a month before it is preſſed, the watery juices will evaporate, and the wine will thus acquire additional ſtrength. The wine produced by *vineyards* that are young will not be ſo good as it will be after they have been planted ten or twelve years, and it will be conſtantly improving till they are fifty years old.

When a *vineyard* is in a bearing ſtate, there ſhould not be too many branches left upon a root, nor ſhould theſe be too long: the number of branches generally left by the Italians upon a ſtrong vine is four; two of the ſtrongeſt having four eyes, and the two weaker being ſhortened to two eyes each. The ground between the vines ſhould be kept clean, carefully dug every ſpring, and manured every third year with ſuch manure as beſt ſuits the nature of the ſoil. The digging and manuring ſhould be performed about the beginning of March, when the ſuperficial or day roots, as they are called, ſhould be cut off: the ſtakes ſhould be placed down, one on each ſide of the vines, and about ſixteen inches from their ſtems, to which the longeſt bearing branches ſhould be faſtened, and one ſtake cloſe to the ſtem, to which the two ſhorter branches ſhould be trained, to furniſh wood for the ſucceeding year. In the ſummer, all weak dangling ſhoots ſhould be rubbed off, and the good ones trained regularly to the ſtakes; thoſe of them that have fruit ſtopped in June, about three joints beyond the bunches, and the upright ſhoots, which are deſigned for bearing the following year, muſt not be ſtopped till the middle of July, when they may be left about five feet long. All the ſummer dreſſing ſhould be performed with the thumb and finger, and not with knives; becauſe the wounds made by inſtruments in ſummer do not heal ſo ſoon as when they are ſtopped by gently nipping the leading bud; which if it be done before the ſhoot is become woody, may be effected with great eaſe. Miller's Gard. Dict.

VINNET, in our *Statutes*, is used for a flower or border which printers use to ornament printed leaves of books. See VIGNETTE.

VINOUS, *vinosus*, something that relates to WINE; or that has the taste and smell thereof.

All vegetables, by a due treatment, afford a *vinous* liquor; as corn, pulse, nuts, apples, grapes, &c.

A second fermentation, duly managed, turns any *vinous* liquor into an acetous one.

The proper character and effect of fermentation are, to produce either a *vinous*, or an acetous quality in the body fermented.

Some of our countrymen, bound on a voyage to the East Indies, having filled several casks with Thames water, to carry along with them, observed an intestine motion in it, when they came to the equator; and found it afterwards turned into a kind of *vinous* liquor, capable of affording an inflammable spirit by distillation. See PUTREFACTION *of water*.

VINTAGE, the crop of wine, or what is got from the vines each season.

The word is also used for the time or season of gathering, or pressing the grapes.

In France, a decree or ordinance of the proper judge, and a solemn publication thereof, are required, before the *vintage* can be begun.

VINUM, a liquor, or drink, popularly called WINE.

VINUM, in *Medicine*, *vinum medicatum*, is particularly applied to several medicated wines, i. e. medicinal preparations, whereof wine is the basis. Some of these are denominated from the ingredients used in them; some from the intentions with which they are prescribed; and some from their qualities, &c. Such are the

VINUM *absynthites*, or *wormwood wine*; made of the great or little *absynthium*, by taking the apices, or tops, with the flowers, putting them in a sacculus, or bag, and suspending it in the middle of a vessel of wine; which, fermenting, extracts the taste, smell, and virtues, of the wormwood. See ABSINTHITES.

VINUM *aloeticum alkalinum*, a form of medicine in the late London Dispensatory, intended to stand in the place of Helmont's elixir proprietatis. It is prepared in this manner: take of bay fixed alkaline salt, eight ounces; aloes, myrrh, and saffron, of each an ounce; purified sal ammoniac, six drams; white wine, a quart; infuse them together without heat for a week, or longer, and then filtre the wine through paper for use.

VINUM *amarum*, *bitter wine*, is an infusion of certain bitter stomachic herbs, as gentian-root, juniper-berries, tops of centaury, orange and lemon-peel, in wine. This wine may be made by infusing for a week, without heat, gentian-root, and yellow rind of lemon-peel, of each one ounce, and two drams of long-pepper, in two pints of mountain wine, and straining out the wine for use. For other preparations, see GENTIAN-*root*.

In complaints arising from weakness of the stomach, or indigestion, a glass of this wine may be taken an hour before dinner and supper.

VINUM *anthelminticum*, *anthelminthic wine*, may be made by infusing, without heat, half an ounce of rhubarb, and an ounce of worm-seed, bruised, in two pints of red Port wine, for a few days, and straining off the wine. As the stomachs of persons afflicted with worms are always debilitated, red wine alone will often prove serviceable: it must, however, have still better effects when joined with bitter and purgative ingredients, as in the above form. A glass of this wine may be taken twice or thrice a day.

VINUM *antimoniale*, *antimonial wine*, is made by digesting, without heat, half an ounce of glass of antimony, reduced to a fine powder, in eight ounces of Lisbon wine, for three or four days, occasionally shaking the bottle, and afterwards filtering the wine through paper. The dose of this wine varies according to the intention. As an alterative and diaphoretic, it may be taken from ten to fifty or sixty drops. In a larger dose it generally proves cathartic, or excites vomiting.

VINUM *aromaticum*, made by infusing aromatics, or spices, in new wine, or must.

VINUM *benedictum*, the *blessed wine*, is made of crocus metallorum and mars, infused in wine. This was formerly a celebrated emetic, but is now almost out of use, on account of its roughness.

VINUM *chalybeatum*, *chalybeate wine*, is thus prepared: take filings of iron, four ounces; cinnamon and mace, of each half an ounce; of Rhenish wine, two quarts; infuse a month without heat, often shaking the vessel; then filtre it off for use. Some superadd a reddish colour, by using a small quantity of cochineal. This is the prescription of the New London Dispensatory, and is vastly preferable to that of the former, where only saffron was ordered.

Fine iron wire, cut in pieces, is more eligible than the filings, as we may always depend on the wire being pure iron; and as it exposes a larger surface to the fluid, it is more easily acted upon.

This wine is an excellent stomachic and aperient; it may be drank in the quantity of a common spoonful, or even of a moderate glass, once or twice a day, or mixed in apozems of the aperient vegetables.

In obstructions of the menses, this preparation of iron may be taken in the dose of half a wine-glass twice or thrice a day. Dr. Buchan says, that the medicine would probably be as good if made with Lisbon wine, sharpened with half an ounce of the cream of tartar, or a small quantity of the spirit of vitriol.

VINUM *cydonites*, *quince-wine*; made of slices of that fruit, steeped in must, or new wine.

VINUM *emeticum*, *emetic wine*, is wine wherein the glass or regulus of antimony, or crocus metallorum, have been steeped. See EMETIC.

This only takes a certain degree of efficacy from the matters; nor is it found any stronger at three months end, than at the end of eight days. It purges both upwards and downwards.

VINUM *enulatum*, *elecampane wine*, is an infusion of the root of that plant, with sugar and currants, in white port. It cleanses the viscera, prevents disorders and obstructions of the lungs, and is good in asthmatic cases, cachexies, &c. See ELECAMPANE.

VINUM *Hippocraticum*. See HIPPOCRAS.

VINUM *ipecacuanhæ*. See IPECACUANHA.

VINUM *marinum*, *sea-wine*, is made by casting sea-water on the grapes in the vat.

VINUM *millepedum*. See MILLEPEDES.

VINUM *pectorale*, *pectoral wine*, is prepared of liquorice, saffron, coriander seeds, caraway, anise, salt of tartar, penny-royal, and hyssop leaves, digested with Canary wine, and strained. It is a good expectorant, helping to deterge and cleanse the lungs, &c.

VINUM *picatum*, *pitched wine*, is made of pitch infused in must.

VINUM *rosatum*, *rose-wine*, is made by steeping roses for three months in wine.

VINUM *scilliticum*. See SQUILLS.

VINUM *stomachicum*, *stomachic wine*, is prepared by infusing an ounce of Peruvian bark, grossly powdered, cardamom-seeds, and orange-peel, bruised, of each two drams, in a bottle of white port or Lisbon wine for five or six days, and straining off the wine. This wine is not only of service in laxity and debility of the stomach and intestines, but may also be taken as a preventive, by persons liable to the intermittent fever, or who reside in places where this disease prevails. It will be of use to those who recover slowly after fevers of any kind, as it assists digestion, and helps to restore the tone and vigour of the system. A glass of it may be taken two or three times a day.

VINUM *strobilites* denotes pine-apple wine.

VINUM *e tartaro antimoniali*, is made by dissolving tartar emetic in white wine, in the proportion of twenty-four grains to a pound.

VINUM *viperinum*. See VIPER-*wine*.

VINUM *essatum*, in *Chemistry*. See ESSENCE *of wine*.

VINUM *extemporaneum*, a name given by Dr. Shaw and others, to a sort of extemporaneous vinous liquor, made without fermentation, from the melasses spirit, lemons, water, and sugar, in the following manner. Some good sound lemons are to be cut into slices, rind and all, and put into a quantity of pure and fine melasses spirit; when they have stood in infusion three or four days, the liquor is to be strained clear off, and filtered; and having before prepared a very thin syrup of the finest sugar dissolved in spring-water, the two liquors are to be mixed together. The proportions of this mixture can only be hit by repeated trials, but when once found, it will be easy to continue them; and a vinous liquor will thus be prepared not inferior to many foreign wines.

VIOL, *viola*, a musical instrument, of the same form with the *violin*, but larger, and having six strings; and struck, like that, with a bow.

The *viol* played with a bow was very early in favour with the inhabitants of France, and is very different from the *vielle*, whose tones are produced by the friction of a wheel, which performs the part of a bow.

There are *viols* of divers kinds. The first, and principal, among us, is the BASS-*viol*, called by the Italians *viola di gamba*, or the *leg-viol*; because held between the legs. It is the largest of all, and is mounted with six strings. Its neck is divided in half-notes, by seven frets fixed thereon. Its sound is very deep, soft, and agreeable. The tablature, or music for the *bass-viol*, is laid down on six lines, or rules.

What the Italians call *alto viola*, is the counter-tenor of this;

this; and their *tenore viola*, the tenor. They sometimes call it, simply, the *viol*: some authors will have it the *lyra*, others the *cithara*, others the *chelys*, and others the *testudo*, of the ancients.

2. The *love viol*, *viola d'amore*, which is a kind of triple viol, or violin; having six brass or steel strings, like those of the harpsichord. This yields a kind of silver sound, which has something in it very agreeable.

3. A *large viol*, with forty-four strings, called, by the Italians, *viola di bardone*; but little known among us.

4. *Viola bastarda*, or *bastard viol*, of the Italians; not used among us. Brossard takes it to be a kind of *bass-viol*, mounted with six or seven strings, and tuned as the common one.

5. What the Italians call *viola di braccio*, arm-*viol*; or, simply, *braccio*, *arm*; is an instrument answering to our counter-tenor, treble, and fifth violin.

6. Their *viola prima*, or *first viol*, is really the counter-tenor violin; at least, they commonly use the cliff *c sol ut* on the first line, to denote the piece intended for this instrument.

7. *Viola secunda*, is much the same with our tenor violin; having the cliff of *c sol ut* on the second line.

8. *Viola terza*, is nearly our fifth violin; the cliff *c sol ut* on the third line.

9. *Viola quarta*, or *fourth viol*, is not known in England, or France; though we frequently find it mentioned in the Italian compositions; the cliff on the fourth line.

Lastly, their *violetta*, or little *viol*, is, in reality, our triple *viol*; though strangers frequently confound the term with what we have said of the *viola prima*, *secunda*, *terza*, &c.

VIOL is also a term used among mariners, when a hawser, or strand-rope, is bound fast with nippers to the cable, and brought to the jeer-capstan, for the better weighing of the anchor, where the main-capstan proves insufficient.

VIOLA, in *Botany*. See VIOLET.

VIOLA, in *Ichthyography*, a name by which some authors have called the SMELT.

VIOLA *serotina*, the *late violet*, a name given by the ancients to a garden-flower, not properly of the *violet* kind, but to which we, as well as they, have connected the name *violet*, though with a distinctive epithet, we call it *viola matronalis*, or *dame's* VIOLET.

Pliny is very express in this distinction, but is not sufficiently attended to in it; and by this means is misunderstood in some other parts of his works, where he alludes to this flower in his description of the colour called by the Romans *conchylius*, or *conchyliaceus color*; he says, that the deepest degree of it was that of the flower of the *viola serotina*. The commentators on his works have generally explained this into his saying, that the deepest colour of this name was a blue purple, like that of the *violet*; but he only means that it is of a deeper red than the colour of the mallow flower, and with a proportionate mixture of purple, as there is in that flower.

VIOLARIS *lapis*, in *Natural History*, a fossile body, called by the Germans *violstein*, and by many authors *lapis odore violarum*, from its having a sweet smell when fresh broken, which has been supposed to resemble that of the *violet*.

The Germans have many stones, which have more or less of a sweet smell when fresh broken, as they have many which stink very strangely; the latter of these they call all by the common name of *swine-stone*, and the former, all by that of *violet-stone*. The substance, however, which possesses this quality in the highest degree of all others, and is therefore most proper to be called distinctly by this name, is a species of talc, of the genus of the bractearia, called by Dr. Hill *bractearium niveum lucidissimum bracteis undulatis*, or the snow-white shining bractearium, with undulated scales. This is found in masses of an extremely rude and irregular structure, but very compact and firm, usually of a roundish, or oblong figure: these are of various sizes, from an inch or two, to a foot in diameter, and are composed of almost an infinite number of thin, extremely beautiful, and snow-white plates, which are all broad, thin, and flaky, and of various sizes, and perfectly irregular in shape and figure, and are naturally waved, bent, and curled: its smell, when broken, is not like that of any of the known perfumes, but is a sort of mixed one, resembling that of roses and *violets* together: it is very heavy, and will neither give fire with steel, nor ferment with acid menstruums. It is common on the shores of rivers in Italy, and in the mountains in Germany. Hill's Hist. of Foss. p. 83.

VIOLATION, the act of *violating*, i. e. forcing a woman, or committing a rape upon her.

Amnon, David's son, *violated* his sister, who was avenged by Absalom: Tereus *violated* his sister-in-law Philomela. To *violate* the queen, the king's eldest daughter, or the princess of Wales, is high treason.

VIOLATION is also used, in a moral sense, for a breach or infringement of a law, ordinance, or the like.

Thus, we say, a *violation* of the law of nature, of the law of nations, of a treaty of peace, of one's oath, &c.

VIOLATION is also used for a profanation. In which sense we say, to *violate* a church, &c.

VIOLENT, in the *Schools*, a thing done by force. In which sense it stands opposed to SPONTANEOUS.

A thing is said to be *violent*, when affected by some external principle; the body that undergoes it contributing nothing thereto, but struggling against it.

The body, in such case, is said to *struggle*, because whatever is *violent*, discomposes and distracts a thing from its natural constitution, and tends to destroy it.

The schoolmen all allow, that man, as being endued with reason, is capable of suffering such *violence*; but brute and inanimate bodies are not: *in brutum*, &c. violentum *non cadet*.

VIOLENT *motion*. See MOTION.

VIOLET, *viola*, in *Botany*, a genus of the *syngenesia monogamia* class. Its characters are these: the flower has a short, permanent empalement of five leaves, which are differently ranged in the different species; the flower is of the ringent kind, and is composed of five unequal petals; the upper is broad, obtuse, and indented at the point, having a horned nectarium at the base; the two side petals are opposite; the two lower are larger and reflexed; it has five small stamina, which are annexed as appendages to the entrance of the nectarium, terminated by obtuse summits, which are sometimes connected, and a roundish germen, supporting a slender style, which stands out beyond the summits, and is crowned by an oblique stigma; the germen afterward turns to an oval three-cornered capsule with one cell, opening with three valves, including many oval seeds. Miller reckons eleven, and Linnæus twenty-five species.

The common *violets* are easily propagated, by parting of their roots: this may be done at two seasons. The first or most common season for the removing and parting of these roots, is at Michaelmas, that the young plants may be well rooted before winter: this is generally practised where the plants are put on the borders of wood-walks in large plantations; but in the gardens where they are cultivated for their flowers, the gardeners transplant and part their plants, soon after their flowering season is over. These will have all the remaining summer to grow and get strength, so will produce a greater quantity of flowers the following spring than those which are removed in autumn; but this is not to be practised where they cannot be supplied with water till they have taken new root, unless in moist seasons.

Violets may also be propagated by seeds, which should be sown soon after they are ripe, or about the end of August; and, in spring, transplanted to shady borders to grow till autumn, and then they may be planted where they are to remain; but the double-flowering *violets* do not produce seeds. Miller.

The common *violet*, or *viola odorata* of Linnæus, is perennial, grows wild in hedges and shady places, and flowers in March. The flowers of the hairy, scentless March *violets*, are often substituted for the other in our markets; but this sort may be easily distinguished; the herb, by its having stalks, which trail on the ground, and bear both leaves and flowers, and by the young leaves being hairy; the flower, by the three lower petals being spotted with white, and by their want of smell. The officinal *violet* flowers have a very agreeable smell, and a weak, mucilaginous, bitterish taste. Taken to the quantity of a dram or two, they are said to be gently laxative or purgative; and the seeds, which have more taste than the flowers, to be more purgative, and sometimes emetic. The flowers give out to water both their virtue and their fine colour, but scarcely impart any tincture to rectified spirit, though they impregnate the spirit with their fine flavour, and probably also with their purgative quality. An infusion of two pounds of the fresh flowers in five or eight pints of boiling water, passed through a fine linen cloth without pressure, is made in the shops into a syrup, which proves an agreeable laxative for children. Both the flowers and the syrup lose their colour in being long kept; acids change them instantly into a red; alkalis, and sundry combinations of acids with earthy and metallic bodies, to a green; perfect neutral salts, or those compounded of an acid and alkali, make no alteration.

That species of *violet*, called pansies, or HEART'S *ease*, or *viola tricolor* of Linnæus, has lately been recommended by Dr. Strack, a German physician, as a specific in the crusta lactea of children. He directs a handful of the fresh, or half a dram of the dried leaves, to be boiled in half a pint of milk, which is to be strained for use. This dose is repeated morning and evening. He observes, that when it has been administered eight days, the eruption

tion usually increases considerably, and the patient's urine acquires a smell like that of cats. When the medicine has been taken a fortnight, the scurf begins to fall off in large scales, leaving the skin clean. The use of the remedy is to be persisted in, till the skin has resumed the natural appearance, and the urine ceases to have any particular smell. Lewis.

VIOLET, *bulbous*, a name sometimes given to the SNOW-*drop*, a plant which Linnæus makes a distinct genus under the name *galanthus*; but which Tournefort comprehends among the *narcisso-leucoiums*.

VIOLET, *calathian*, the name of a species of GENTIAN.

VIOLET, *corn*, a name sometimes given to the CAMPANULA, or bell-flower.

VIOLET, *dame's*, ROCKET, or *queen's* GILLIFLOWER, *hesperis*, in *Botany*, a genus of the *tetradynamia siliquosa* class. Its characters are these: the flower is composed of four oblong petals, in form of a cross, whose base or tails are narrow, and situated in a four-leaved empalement, which falls away; it has six awl-shaped stamina as long as the tube of the flower, two of which are much shorter than the other, terminated by narrow, erect summits, reflexed at their points; it has a honey gland situated between the two short stamina, and a four-cornered germen of the length of the stamina, but no style, with a stigma, sitting on the germen, divided into two parts, which join at their points; the germen becomes a plain, long, compressed pod with two cells, enclosing many oval compressed seeds. Linnæus enumerates seven, and Miller ten species.

This plant is antiscorbutic and diaphoretic, and is very serviceable in the asthma, coughs, and convulsions. The outward use of it is recommended in inflammations, cancers, gangrenes, sphacelus, and contagious diseases. Bruised, it very potently resists putrefactions; and applied to pestilential buboes in the arm-pits, it ripens and softens them. James from Boerhaave.

VIOLET, *dog's tooth*, the name by which some call the *dens canis* of botanical writers. See DOG's *tooth*.

VIOLET, *water*, *hottonia*, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the flower has one petal, with a tube of the length of the one-leaved empalement, cut above into five oblong, oval segments, spreading open, and indented at their extremity; it has five short awl-shaped stamina, standing on the tube of the petal, terminated by oblong summits; in the centre is situated a globular germen, ending in a point, supporting a short slender style, crowned by a globular stigma; the germen becomes a capsule of the same form, with one cell, filled with globular seeds, sitting upon the empalement. We know but one species, which grows naturally in standing waters in many parts of England. Linnæus enumerates two species.

VIOLIN, *violino*, *fiddle*, a musical instrument, mounted with four strings, or guts; and struck, or played, with a bow.

It has long been a dispute among the learned, whether the *violin*, or any instrument of that kind, as now played with a bow, was known to the ancients. The little figure of Apollo, playing on a kind of *violin*, with something like a bow, in the grand duke's tribuna at Florence, which Mr. Addison and others supposed to be antique, has been proved to be modern by the abbé Winckelmann and Mr. Mings. So that as this was the only piece of sculpture reputed ancient, in which any thing like a bow could be found, nothing more remains to be discussed relative to that point. With respect to an instrument with a double neck, besides that on the broken obelisk at Rome, and one from a sepulchral grotto in the ancient city of Tarquinia, there is an antique painting in the collection of William Locke, esq. which consists of a single figure, supposed to be a muse, with an instrument nearly in the form of a modern *violin*, but the neck is much longer, and neither bow nor plectrum are discoverable near it. This, as Dr. Burney apprehends, may have been a CHELYS, which was a species of GUITAR, either thrummed by the fingers, or twanged with a quill. The ancients had, indeed, instead of a BOW, the PLECTRUM; but in all the representations which painting and sculpture have preserved of this implement, it appears too clumsy to produce from the strings tones that had either the sweetness or brilliancy of such as are drawn from them by means of the bow or quill. Dr. Burney supposes, though it is represented so massive, that it was a quill, or piece of ivory in imitation of one, rather than a stick or blunt piece of wood or ivory; and, indeed, Virgil tells us, Æn. vi. 647. that it was made of ivory. Burney's Hist. Mus. vol. i. p. 515.

The *violin* consists, like most other instruments, of three parts; the *neck*, the *table*, and the *soundboard*.

At the side are two apertures, and sometimes a third towards the top, shaped like a heart.

Its bridge, which is below the apertures, bears up the strings, which are fastened to the two extremes of the instrument; at one of them by a screw, which stretches or loosens them at pleasure.

The style and sound of the *violin* are the gayest and most sprightly of all other instruments; and hence it is, of all instruments, the fittest for dancing. Yet there are ways of touching it, which render it grave, soft, languishing, and fit for church or chamber music.

It generally makes the treble, or highest parts in concerts. Its harmony is from fifth to fifth. Its play is composed of bass, counter-tenor, tenor, and treble; to which may be added, a fifth part: each part has four fifths, which rise to a greater seventeenth.

In compositions of music, *violin* is expressed by V: two V V denote two *violins*.

The word *violin*, alone, stands for *treble violin*: when the Italians prefix *alto*, *tenore*, or *basso*, it then expresses the counter-tenor, tenor, or bass-*violin*.

In compositions, where there are two, three, or more different *violins*, they make use of *primo*, *secondo*, *terzo*, or of the characters I° II° III°, or 1° 2° 3°, &c. to denote the difference.

The *violin* has only four strings, each of a different thickness, the smallest whereof makes the *e si mi* of the highest octave of the organ; the second, a fifth below the first, makes the *a mi la*; the third, a fifth below the second, is *d la re*; lastly, the fourth, a fifth below the third, is *ge re sol*. Most nations, ordinarily, use the cliff *ge re sol* on the second line, to denote the music for the *violin*; only, in France, they use the same cliff as the first line at bottom: the first of these methods is best, where the song goes very low; the second where it goes very high.

Mersennus speaks of the tenor and contratenor *violin*, which, he says, differ only in magnitude from the treble *violin*. But we have at present no such instrument in use as the contratenor *violin*; the part proper to it being with ease performed on the *violin*; and accordingly in concertos, overtures, and other instrumental compositions of many parts, the second *violin* is in reality the counter-tenor part. It is much to be doubted, says sir John Hawkins (Hist. Mus. vol. iv. p. 115.) whether the counter-tenor *violin* ever came into England. Anth. Wood, speaking of the band of Charles II. makes no mention of the contratenor *violin*. Before the restoration of Charles II. says he, and especially after, viols begun to be out of fashion, and only *violins* used, as treble *violin*, tenor and bass *violin*; and the king, according to the French mode, would have twenty-four *violins* playing before him while he was at meals, as being more airy and brisk than viols.

A small pocket *violin* is called a KIT.

The VIOLONCELLO of the Italians is properly our fifth *violin*, which is a little bass *violin*, half the size of the common bass *violin*, and its strings just half as thick, and half as long; which renders the sound just an octave higher than the same.

The VIOLONE is a double bass, almost twice as big as the common bass *violin*, and the strings bigger and longer, in proportion; and consequently, its sound an octave lower than that of our bass *violin*; which has a noble effect in great concertos: but this depends upon the number of strings, and the manner of tuning them; some performers using four strings, and others three; and in the tuning of these there is a considerable difference. The true use of the *violone* is to sustain the harmony, and in this respect it has a noble effect: divided basses are improper for it, the strings not answering immediately to the percussion of the bow: these can only be executed with a good effect on the VIOLONCELLO, the sounds of which are more articulate and distinct.

VIPER, *vipera*, in *Natural History*, a kind of SERPENT, the COLUBER *berus* of Linnæus, famed not only for the exceeding venomousness of its bite, which is one of the most dangerous poisons in the animal kingdom, but also for the great usefulness of its flesh in medicine; whence *vipers* come to make a considerable article in the materia medica.

Its size is usually two feet in length; though Mr. Pennant says he once saw a female (which is nearly a third larger than the male) which was almost three feet long; the ground colour of the *viper* is a dirty yellow; that of the female deeper; its back is marked through the whole length with a series of rhomboidal black spots, touching each other at the points; the sides with triangular ones; the belly entirely black, and covered with long black scales, placed transversely; the tail does not run to more than a fifth part of the length of the body beyond the anus, and is terminated in a very sharp point. There is a variety; viz. the *coluber prester* of Linnæus, and called by Petiver the *vipera Anglica nigricans*, which is wholly

wholly black; but even in this the rhomboidal marks are very conspicuous, being of a deeper and more glossy hue than the rest. The head of the *viper* is inflated, which distinguishes it from the common snake; the snout not unlike that of a hog; the tongue is forked; the teeth, which are sixteen in each jaw, small and immoveable; besides the four canine teeth, which are placed two on each side the upper jaw, and are the instruments of poison; these are long, crooked, and moveable, and can be raised and depressed at pleasure; these are hollow from near the point to the base, near which is a gland that secretes, prepares, and lodges the poison; and the same action that gives the wound, forces from this gland, through the tooth, the fatal juice into it. The *viper* has only one row of teeth; whereas many others of the serpent kind have two; its body is not at all fetid; whereas the inner parts of the bodies of other serpents are intolerably so; it creeps but slowly, and never leaps like other serpents; though it is nimble enough to bite when provoked.

Vipers are found in many parts of this island; but the dry, stony, and, in particular, the chalky countries, abound with them. They are said to swarm in many of the Hebrides.

Wormius says, the *viper* feeds on herbs; but this assuredly is not its only diet, since there are frequently found in its stomach, frogs, toads, lizards, mice, beetles, moles, small birds, and the like; many of which are often found whole; and it is surprising to conceive how they were swallowed, since they are often three times as thick as the whole neck of the serpent, which must, therefore, be capable of a very extraordinary distension. The *viper* is capable of supporting very long abstinence; some of them having been kept in a box six months without food, and yet with unabated vivacity. They feed only for a small part of the year, but never during their confinement, except, as it is said, females with young; for if mice, their favourite diet, should at that time be thrown into their box, though they will kill, they will not eat them. The poison decreases in proportion to the duration of their confinement; and the virtues of its flesh are at the same time considerably lessened. These animals, when at liberty, remain torpid through the winter; but when confined have never been observed to take their annual repose.

The male and female have the organs of generation very perfect: the female *viper* brings forth her young living; whereas all other serpents lay eggs, and hatch them; on which account, the *viper* is ranked among the viviparous animals. See Philos. Trans. N° 84. p. 138.

Though *vipers* are viviparous, they are of that class of animals of whose generation Aristotle (De Gen. Anim. lib. iii. cap. 2.) says, that they conceive a perfect egg within, but bring forth their young alive.

The species is far from being prolific, more than eleven eggs not being found in one *viper*, which are, as it were, chained together, and each about the size of a blackbird's egg. They copulate in May, and are supposed to be about three months before they bring forth. It is said, that the young of the *viper*, when terrified, will run down the throat of the parent, and seek shelter in its belly, in the same manner as the young of the OPOSSUM retire into the ventral pouch of the old one; whence some have erroneously imagined, that the *viper* devours its own young.

The method of catching *vipers* is by putting a cleft-stick on or near their head, after which they are seized by the tail, and put into a bag. Ray and Pennant.

Dr. Mead observes, that the ancients esteemed the *viper* sacred; and that the kings of the East Indies caused cottages to be built for their entertainment, and their killers to be punished with death. On medals, the *viper* is frequently represented as a symbol of divine power; and, as such, given by way of attribute to the ancient physicians.

The story of the *rattle*-SNAKE's charming its prey has been laughed at by many, and by others the effects of the animal's fear have been supposed the result of a previous bite; but we have a great deal of reason to believe, that this sort of fascination is just what it is related to be, from an experiment mentioned in the Philosophical Transactions, of a like thing in regard to a *viper*. It is well known that no *viper* will feed while in confinement, except a female which is with young, but that such a one will. A *viper*-catcher, who had more than sixty living *vipers* in a chest, put a living mouse in among them; there happened to be one female big with young among these, none of the others at all regarded the mouse, but she raised up her head a little, and looked furiously at it. The mouse was terrified, and stood still for a considerable time, though the *viper* continued rolled up in a spiral, only raising up its head and looking at it, and vibrating its tongue; the mouse at length recovered of its fright, and began to move, but without running away, only walking in a terrified manner round and round the *viper*, and often squeaking; at length she came before the head of the creature, which was still raised, and the mouth open. The mouse, after some time, went up to the creature, and crept into its mouth, where she was gradually swallowed without the *viper*'s altering its posture.

By Mr. Boyle's experiments made upon *vipers in vacuo*, it appeared, that on the withdrawing of the air from the vessel where the *viper* was put, she began to swell, and, after some time, she opened her mouth very wide, and frequently; but, on continuing two hours and a half in the receiver, she did not appear to be quite dead. The gaping of the jaws was attended with a loss of the swelling, observed at first in her whole body; but after every time closing them she swelled again, and thus became lank and plump reciprocally many times in an hour. During the first moments this creature crawled about, as if in search of air, and afterwards foamed at the mouth.

The neck and body continued swelled longer in a second experiment with another *viper*, and a blister appeared on the back. This creature lived an hour and a half. The mouth remained vastly distended after death, and the internal parts of it were much distorted, and thrust forwards. After the admitting of the air the mouth closed, and opened again after a time; and, in fine, on pinching the tail there was some motion perceived in the body that seemed to argue life. The common snake bears the exhausted receiver better than the *viper*, and, after many hours remaining in it, and seeming dead, will give signs of life on being warmed by bringing the glass to the fire; but a longer continuance in the rarefied air absolutely kills it, as it does all other creatures. Phil. Trans. N° 62.

As to the manner wherein the *viper* conveys its poison, authors are a little disagreed. Francisco Redi, and Moise Charras, have each of them written very curious pieces on the subject; but their result is very different. See BITE.

Redi maintains, that all the venom of the *viper* is contained in the two vesiculæ, or bags, which cover the base of the two canine teeth; whence, upon biting, a yellowish liquor is squeezed out into the wound; where, mixing with the blood, and other juices, it produces those dreadful symptoms. This hypothesis he maintains by a good number of experiments; as of animals, viz. cocks, &c. being bit with *vipers*, after these vesiculæ and their juice had been taken out, without any signs of poison, or any ill consequence at all.

Charras, on the other hand, maintains, that this yellow liquor is not poisonous; that he has given it to pigeons as food, without their being at all disordered thereby; that the *viper*'s bite he has always found mortal to animals, even after the bag has been taken clear out, as well as before; and lastly, that the poison must lie in the irritated spirits of the *viper*, which it exhales in the ardor of its biting, and which are so cold, that they curdle the blood, and stop the circulation.

The controversy between these two ingenious authors is very extraordinary; their systems are opposite, yet both are maintained by a great number of well attested experiments.

Dr. Mead supposes the sentiment of sig. Redi to be the true one, in his essay on the poison of the *viper*, and adds to Redi's account, that the poison in the *viper*'s bag is separated from the blood by a conglomerate gland, lying in the lateral interior part of the os sincipitis, behind the orbit of the eye; from which gland there is a duct that conveys the poison to the bags at the teeth. The teeth, he adds, are tubulated for the conveyance and emission of the poison into the wound; but their hollowness does not reach to the apex, or tip of the tooth, but ends in a long slit below the point, out of which slit the poison is emitted.

These slits, or perforations of the teeth, Galen tells us, the mountebanks of his days used to stop with some kind of paste; after which they would publicly expose themselves to be bitten without danger.

The abbé Fontana, in a treatise on the poison of the *viper*, first published in Italian, in 1765, and, in 1776, translated into French by M. Darcet, who has made several additions to it, has given the result of no less than six thousand experiments, in which upwards of four thousand animals were bitten, and most them killed by the *vipers*.

The *viper*, he says, has sometimes four, seldom three, but generally two canine teeth in each jaw, falcated and inserted and fixed in a socket; at their bases, and behind

hind them, are six or seven smaller teeth, adhering by a membrane, which, it is thought, are intended to supply the place of the larger teeth, sometimes lost in the act of biting. A similar conjecture, with respect to the use of the same kind of teeth in the rattlesnake, was made by Dr. Bartram. Phil. Trans. N° 456. p. 358. or Abr. vol. ix. p. 60.

Each of these has two cavities; one tubular, beginning near the base, and proceeding along the convex side nearly to the end, and open at each end; the aperture near the base being almost elliptical, and the other longitudinal; the other cavity, situated behind the former, and never before observed, is broad at the base, and diminishes as it approaches toward the point. It has only one aperture at the insertion in the gum, through which the nerves and blood-vessels of the tooth are admitted.

The fibrous sheath, that covers all these teeth, seems to be a continuation of the external membrane of the palate, being always open near the points of the teeth.

The receptacle of the venom is a small bladder, a spongy gland, situated under the muscles of the side of the upper jaw, and seldom containing more than three or four drops of a yellow fluid, which is conveyed thence by an excretory duct to the socket of the canine teeth, whence it enters the lower aperture of the tube, and finds it way out again at the longitudinal orifice, near the point, into the internal part of the wound occasioned by the bite: this fluid receives its impulse from a constrictor muscle, which, however, never propels at once the whole of the contents of the gland.

Effects of the bite of the VIPER. The symptoms following the bite of a *viper* are, an acute pain in the place wounded; swelling, first red, afterwards livid, spreading by degrees; great faintness; a quick, low, and sometimes interrupted pulse; sickness at the stomach; bilious convulsive vomiting; cold sweats; sometimes pains about the navel; and death itself, if the strength of the patient, or slightness of the bite, do not prevent it.

If he overcomes it, the swelling continues inflamed for some time; and the symptoms abating, from the wound runs a sanious liquor, little pustules are raised about it, and the colour of the skin is as if the patient were icterical.

But the violence of the symptoms depends much on the season of the year, the difference of the climate, the size or rage of the animal, or the depth and situation of the wound.

By the microscope, the virus, according to Dr. Mead, was found to consist of minute salts in continual motion; after which a number of spicula or darts appeared, resembling, but much finer, a spider's web. This, when mixed with syr. violar. inclined it to red, no ways to green; so that the juice is not alkalious: but Mr. Boyle, and Dr. Pitcairn, prove the blood to be only an alkali.

Such a small quantity of the virus seems to have so great an effect, partly by wounding the fibres, and partly by altering the cohesion of the globules of blood, which, by the elastic matter thereof, proves a nimble vehicle to carry the viperine spicula almost every where suddenly. These will stimulate and fret the sensible membranes; whereupon a more than usual afflux of the animal juices may be carried to the parts.

The venomous quality of this yellow fluid does not depend, according to the abbé Fontana, *ubi supra*, on the irritation of the *viper*, but is rather its peculiar and specific character. It is neither acid nor alkaline, nor of the nature of any salt: it has no determinate taste nor smell, excites no inflammation on the tongue, nor does it exhibit any acrid or caustic appearance. When dried upon a glass, it contracts into a number of molecules, with interstices between them, which Mead took for crystals, and hence ascribed to the virus a saline nature. The fluid subsides in water; is not inflammable; when fresh rather viscous, and when dry of a consistency similar to that of pitch; in which state it is partly soluble in water, but not in spirit of wine: by various tests it was found to be of a gummy nature, and so far as it has been examined, it may be called an animal gum.

Among two hundred *vipers* which the abbé dissected, he found two whose vesicles contained none of the yellow poison, and five in which, instead of the poison, he found a white, opake, viscous matter, which, in two of them, was perfectly innocent, and, in the other three, retained some venomous quality.

Dr. Mead asserts, that the bite of the *viper* is fatal to its own species; but this, says the abbé, is a mistake; nor, says he, is there an instance of an animal furnished with an excretion deleterious to its own kind.

The virus of *vipers* is not a poison for all kinds of animals, it having been found harmless when applied to leeches, snails, and some other animals of cold blood: there is reason to apprehend, if applied in a sufficient quantity in proportion to the size of the animal, it always proves fatal to the hot-blooded animals. The one thousandth part of a grain was found sufficient to kill a sparrow; five or six times that quantity was necessary to kill a pigeon; and thus, comparing the weight of these animals, the abbé inferred from calculation, that three grains will be required to kill a man, and twelve to destroy an ox: and therefore, as a *viper* of a moderate size contains seldom more than two grains of virus, and *vipers* are known to emit but a small proportion of their venom at every bite, he concludes, that a man cannot be killed by less than five or six *vipers* wounding him nearly at the same time, and in parts the most susceptible of the infection, and that an ox will require twenty to produce that effect.

The abbé Fontana found, after a series of experiments, for ascertaining which are the parts of an animal mostly affected by this poison, that it was never noxious unless it had penetrated the cellular membrane; that it had no effect upon the nerves, bones, the marrow, the brain, the tongue, or palate; and, in general, the operation of this poison was found to be the most rapid and fatal when it affected those parts of the animal that abound with blood, e. g. the more sanguineous muscles, the liver, and all the viscera and intestines; and its effect is never more rapid than when injected immediately into the blood.

On dissecting an animal killed by the venom of two *vipers* injected into its jugular vein, the whole mass of the blood in the heart and larger vessels was found coagulated and black; and yet blood out of the circulation, even whilst warm, and at the instant when it leaves the vein, is no ways affected by it. The abbé also mentions experiments, which prove, that, contrary to the opinion of Redi, Celsus, and several others, this poison is mortal when taken in a proportionate quantity into the stomach.

There have been various opinions with respect to the cause of the death of animals bitten by *vipers*. Some have thought that it is occasioned by the immediate coagulation of the blood; and others, by a sudden inflammation of the whole frame.

Hoffman, and his disciples, attribute this death to an universal spasm. Dr. Mead, as we have seen above, to the effects of the caustic saline property of the virus: Buffon, who discerns organic molecules in all animated nature, asserts, that they exist in this venom, and constitute its deleterious property. Baker maintains, that this poison affects the figure and solidity of the red globules of the blood, and that a single atom of it is sufficient to corrupt the whole mass of that fluid. But the abbé Fontana, apprehending that the life of an animal is wholly dependent on the irritibility of its muscular fibres, ascribes the deleterious property of the poison of *vipers*, to its effect upon that irritibility which it destroys, disposing the parts to a very rapid putrefaction; or rather, this loss of irritability is the consequence of the change produced in the blood by the venom.

This tendency of the poison to promote putrefaction seems to indicate, as the abbé imagines, that its use in the animal œconomy of the *viper* is its operating as a menstruum to promote digestion.

The cure of the venomous bites of *vipers* seems very unsettled: Mr. Boyle found a hot iron held near the place very successful; but it proved otherwise with M. Charras. Again, the snake-root from the East Indies, immediately applied to the place, is much commended; but signor Redi, and M. Charras, found it of no use; yet Baglivi, and Dr. Havers, give instances of its good success.

Dr. Mead adds, that the snake-stone directly applied to a pigeon, when bitten, saved its life four hours; whereas most of the other pigeons bitten died in half an hour. This stone is not natural, but factitious; its virtue lies in its porosity, which is supposed to imbibe the virus.

The *viper*-catchers, Dr. Mead adds, have a specific, in which they can so far confide as not to be afraid of being bitten.

That specific is, the axungia of the *viper* presently rubbed into the wound; which, consisting of clammy, viscid, penetrating, and active parts, sheathes the salts of the virus.

The same author, applying it to the nostrils of a dog bitten, found the creature well the next day: when this is not timely applied, and the virus has insinuated into the blood, the sal. *viper.* is excellent, given and repeated till sweats be produced. This succeeded well with M. Charras; and Dr. Mead relates, that it recovered one after the virus had induced an universal icterus.

The bite of the *viper* having been supposed certainly curable

VIP

able by oil of olives, vulgarly called ſallad-oil, alone, and a *viper*-catcher in England having ſuffered himſelf to be bitten by one of theſe creatures, and having recovered after many dangerous ſymptoms, and the cure being attributed to the oil alone, though other medicines were given him internally; in conſequence of which Dr. Vater tried the ſame remedy with ſucceſs at Dreſden; Meſſ. Geoffroy and Hunauld, of the Royal Academy of Sciences at Paris, made a number of experiments, in which this oil proved ineffectual; and added to their accounts, ſome others of perſons bitten, in which all the dreadful conſequences of that poiſon are ſhewn, and the remedies by which they were cured are mentioned. Philoſ. Tranſ. N° 443, 444, 445. or Abr. vol. ix. p. 60.

Their firſt inſtance is in the caſe of Mr. Piron, who was bitten at the end of the fore-finger by an enraged *viper*, there immediately iſſued a drop of blood from the wound, and the firſt application made to it was the covering up of the whole finger with a quantity of Venice treacle; the finger, however, ſwelled violently, and was ſcarified in ſeveral places, and the patient was made to eat the body of the *viper* boiled, and drank after it a glaſs of wine with ſome Venice treacle, and with a few drops of the volatile ſpirit of *vipers*; and the finger was wrapped round with compreſſes and bandages wetted in aqua vitæ. Soon after this the patient began to have inclinations to vomit, he vomited very plentifully, the ſwelling increaſed, and his arm, which was now very much diſtended, was ſcarified in twenty places, and compreſſes of linen, dipped in aqua vitæ, laid on the wounds; he afterwards took volatile ſalt of *vipers* in repeated doſes, had more ſcarifications made on his arm, and he drank in the ſpace of an afternoon and evening a quart of ſtrong wine. He ſlept very ſound after this, and the ſymptoms all diſappeared; he was almoſt recovered by ſix o'clock the next morning, only the ſcarifications took two months to heal, and, after that time, he enjoyed a perfect ſtate of health.

A ſecond inſtance is that of a young lad, of a robuſt conſtitution bitten by a *viper*, enraged, and kept for ſome time in a very hot place near the fire; he felt a pain like that of oil of vitriol dropped on a wound, but without delay he cut off the head of the *viper*, bruiſed it, and applied it to the wound, and tied the finger, on which he was bitten, very tight round with a binder: he, after this, had ſome ſcarifications made, and rubbed into them a quantity of the fat of the *viper*; he killed four *vipers*, and uſed all their fat, and took three drams of Venice treacle in ſome wine. His whole arm ſwelled, he perceived a violent heat over his whole body, and the other hand was ſo ſwelled at length that he could ſcarce ſhut it: on this he took a large doſe of Venice treacle, camphor, volatile ſalt of *vipers*, of amber, and of ſal ammoniac, and a dram of volatile ſpirit of ſal ammoniac, and ſal volatile oleoſum; this he repeated at ſome diſtance of time; he was blooded in the oppoſite arm; the patient vomited violently; and, an inciſion being made all along the finger, there followed no blood. The hand, arm, and breaſt were embrocated with a mixture of ſpirit of lavender, camphor, Venice treacle, and the fat of *vipers*. After having vomited plentifully, and been embrocated with this warm mixture, he found himſelf much eaſier, at eight o'clock at night he took another doſe of his volatile medicines, and ſlept till four in the morning, he then took a large glaſs of wine, and ſlept till ſix, and at ſeven eat a part of a chicken with a good appetite. The ſurgeons would have made more ſcarifications on the arm, but he would not ſuffer it; and three days afterwards an eriſipelas appeared, to which he applied a mixture of aqua vitæ and ointment of marſhmallows, and finally was perfectly recovered.

Theſe are two inſtances in which the ſymptoms of the bite appeared much in the ſame manner with thoſe of the man who ſuffered himſelf to be bitten in England, in order to be cured by the oil. The ſleep came on in all the ſame circumſtances, and they were all cured, as well he who uſed no unctuous application at all, as he who uſed the fat of the *vipers*, or the Engliſhman who depended upon oil. The internal medicines given to them all were of much the ſame kind; and all that can be concluded from the whole is, that either theſe bites would not have proved mortal in themſelves, or that the cordial medicines, which they took internally, were the remedies that prevented the miſchief that would have enſued; and theſe ſeem to have acted not as ſpecifics againſt the bite of this animal, but merely as medicines that would ſtop the ſpreading of a gangrene; the unprevented increaſe of which is the thing that proves fatal from this creature's bite.

The diſſections of the animals which had died by the bite of the *viper*, whether they had or had not been rubbed with oil, afforded all the ſame appearances. The limb which had received the wound was in all ſwelled and livid, and theſe ſymptoms uſually were carried along the thigh to the belly, and ſometimes up to the breaſt. Inciſions made along theſe parts always diſcovered the cellules of the membrana adipoſa full of a bloody-coloured water, and the membrane itſelf was ſwelled, blackiſh, and gangrened. And this appeared always more plainly in the belly than in any other part; the membrana adipoſa in all other parts of the body was in its natural ſtate. The injured parts often had a cadaverous ſmell; the muſcles of the wounded limb were alſo found of a browniſh colour, and their fibres had loſt their conſiſtence, and ſeemed ready to give way to the approaching gangrene. Nor is this effect confined to the external parts alone: a gooſe that had been bitten had three gangrenous ſpots on its heart, and all the indications of a beginning gangrene in other parts of it; the concave ſide of the liver was alſo gangrened, and had wholly loſt its conſiſtence; and the lungs of a fowl, that had been bitten on the wing, were found in part gangrened. The effects, however, were different in degree, from the bites of the ſeveral *vipers*; and there ſeems no reaſon to doubt, but that the bites of different animals, though of the ſame ſpecies, under different circumſtances, either in regard to the creature wounding, or the creature wounded, may be followed with very different conſequences; ſo that remedies are not to be depended on from their ſucceſs in one or two trials. Mem. Acad. Scienc. Par. 1737.

The poiſon of the *viper* is only noxious when immediately conveyed into the blood. Nor is it mortal to eat the fleſh of creatures killed by *vipers*, or to drink the wine in which they have been drowned, or to ſuck the parts they have wounded. On the contrary, ſignior Redi ſays, ſucking the wound is a ſovereign remedy againſt the bite of *vipers*. This author denies what had been affirmed by Ariſtotle and Galen, that the ſpittle of a faſting perſon kills *vipers*. Phil. Tranſ. N° 9. p. 160.

The practice of ſucking out poiſons is very ancient, and indeed nothing can be more rational. Where the bite cannot be cut out, this is the moſt likely way for extracting the poiſon. There can be no danger in performing this office, as the poiſon does no harm, unleſs it is taken into the body by a wound. The perſon who ſucks the wound, ought, however, to waſh his mouth frequently with ſallad oil, which will ſecure him from the leaſt inconvenience.

The Pſylli in Africa, and the Merſi in Italy, were famed for curing the bites of poiſonous animals, by ſucking the wound; and we are told that the Indians in North America practiſe the ſame at this day.

When the wound is well ſucked, it ſhould be afterwards rubbed with warm ſallad oil. A poultice of bread and milk, ſoftened with ſallad oil, ſhould likewiſe be applied to it, and the patient ſhould drink freely of vinegar-whey, or water-gruel with vinegar in it, to make him ſweat. Vinegar is, indeed, one of the beſt medicines which can be uſed in any kind of poiſon, and ought to be taken very liberally. If the patient be ſick, he may take a vomit. This courſe, ſays Dr. Buchan, will be ſufficient to cure the bite of any of the poiſonous animals of this country.

Dr. Brookes ſays, that the following remedy, which was the invention of a negro, who, for the diſcovery, obtained his freedom and a penſion for life of 100 *l. per annum*, from the general aſſembly of Carolina, has been found effectual for the bite of the *rattle*-snake. The preſcription is as follows: take of the roots of plantain and horehound in ſummer, roots and branches together, a ſufficient quantity; bruiſe them in a mortar, and ſqueeze out the juice, of which give, as ſoon as poſſible, one large ſpoonful; if the patient be ſwelled, force it down his throat. This generally will cure: but if he finds no relief an hour after, give him another ſpoonful, which is ſaid never to fail. If the roots are dried, they muſt be moiſtened with a little water. To the wound may be applied a leaf of good tobacco moiſtened with rum.

Meſſrs Juſſieu and Le Sage ſtrongly recommend the uſe of the volatile fluor alkali as an antidote againſt the venom of *vipers*; but if the proofs alledged by the abbé Fontana, that the poiſon of *vipers* is not of an acid nature be admitted, the utility of the alkali muſt be precluded. The abbé adds, that cantharides, applied outwardly, always did miſchief by increaſing the inflammation; when given inwardly, they operated as an emetic, which is ſometimes beneficial. Scarification produced the ſame effect with the external application of cantharides: Peruvian bark, theriaca, oils, the ſuction of leeches, and of the mouth, were all found ineffectual. He alſo explodes, in this caſe, the boaſted virtue of the Piedra de Cobras, as an alexipharmic. Quicklime alſo, when applied to the wound in pigeons, has ſometimes

been

been of use, but not so as to justify any confidence in the remedy.

Upon the whole this writer infers, that the greatest security we have against the bite of *vipers* in one species, is the little probability of its being poisonous to the degree that has been always imagined, and that has caused such dreadful alarms, which alone are sufficient to irritate a tainted habit. He also doubts whether the bite of the rattle-snake is actually so venomous as is generally imagined. See Fontana sur les Poisons et sur le Corps Animal, &c. in two volumes, 4to. Florence.

Vipers make a considerable article in medicine. Most authors agree, that there is no part, humour, or excrement, not even the gall itself of a *viper*, but may be swallowed without harm. Accordingly the ancients, and, as several authors assure us, the Indians, as well as many other people at this day, both of the East and West, eat them as we do eels.

Caro viperina, *viper's* flesh, either roasted or boiled, the physicians have unanimously prescribed as an excellent restorative; and it has been particularly recommended in the elephantiasis, incurable consumptions, leprosy, &c. and Dr. Mead thinks, they might be less sparing in the quantity than they are; instead of a little *viper's* flesh, he recommends the broth or jelly of *vipers*; or, as the ancients did, to boil and eat them as fish, or at least to drink vinum viperinum, i. e. wine wherein they have been long infused.

Viper's flesh, indeed, appears to be very nutritious, and therefore an useful restorative in some kinds of weaknesses and emaciated habits; but in scrophulous, leprous, and other like distempers, the good effects which have been ascribed to it are more uncertain. Dr. Lewis says, that he has known a *viper* taken every day for above a month, in disorders of the leprous kind, without any apparent benefit.

The form in which they are used to the best advantage, is that of broth, or jus viperinum, of which an elegant preparation is directed by the London College.

Viper's flesh is an ingredient in several of our best antidotes, as the theriaca Andromach. &c.

The apothecaries also formerly sold the pulvis viperinus, which is only dried *vipers* pulverized, heart, liver, and all, and passed through a sieve. This, to heighten the price, we suppose, they call *animal* BEZOARD.

The *salts of vipers*, whether volatile or fixed, also their fat, or axungia, and their oil, chemically drawn, are drugs that have been in considerable repute.

The fat of the *viper* is accounted particularly useful in disorders of the eyes; but what advantages it has above other soft fats, is by no means clear. It was formerly supposed to have some specific power of resisting the poison of the *viper's* bite, by being rubbed immediately on the wounded part; but experience has now shewn, that common oil is, in this intention, of equal efficacy. Lewis.

VIPER *Wine*, *vinum viperinum*, is a preparation of *vipers* infused in wine. It is commonly made by macerating for a week, with a gentle heat, two ounces of the dried flesh in three pints of mountain. This has been deemed a great restorative, and provocative to venery, and also good against cutaneous eruptions, &c.

But Dr. Lewis observes, that it cannot perhaps be affirmed from fair experience, that this wine has any great virtue.

VIPER'S *Bugloss*, *echium*, in *Botany*, a genus of the *pentandria monogynia* class. Its characters are these: the flower hath a permanent empalement, divided into five parts; it has one petal, with a short tube, and an erect broad brim, cut into five irregular parts, with naked chaps; and it has five awl-shaped stamina, terminated by oblong prostrate summits; in the bottom are situated four germina with one slender style, crowned by an obtuse bifid stigma, which become so many roundish pointed seeds, enclosed in the rough empalement. Linnæus enumerates nine, and Miller seven species.

Pliny has made a strange mistake in his account of this plant: he says, the ancients were acquainted with two species of it, the descriptions of which he gives correctly enough from Dioscorides; but then he adds, that there is a third kind, called by some personata, a plant with extremely large leaves, and with burs, or prickly nodules, by way of fruit.

It is clear from this, that the author confounded the words *arctium* and *echium* together, though sufficiently unlike both in sound and orthography, to have been distinguished; and his third *echium* is no other than the great arctium, or burdock.

The flowers of the *viper's bugloss* are supposed to possess the virtue of cordials, in the same degree with the borrage and bugloss. Some authors greatly recommend a decoction of the dried plant in epilepsies. It is said that very singular cures have been done by it.

VIPER'S *Grass*, *scorzonera*, in *Botany*, a genus of the *syngenesia polygamia æqualis* class. Its characters are these: the common empalement is scaly, cylindrical, and imbricated; the flower is composed of several hermaphrodite florets, which are narrow, tongue-shaped, and indented in five parts; they have five short hair-like stamina, terminated by cylindrical summits; the germen is situated under the floret, supporting a slender style, crowned by two reflexed stigmas; it turns to a single, oblong, channelled seed, crowned with a feathery down. Linnæus enumerates ten, and Miller eight species.

The roots of the common *viper's* grass, or *scorzonera Hispanica* of Linnæus, have been employed indifferently as alexipharmacs, and in hypochondriacal disorders, and obstructions of the viscera; but at present are more properly considered as alimentary articles, in general salubrious, and moderately nutritious. They abound with a milky juice, of a soft sweetish taste, but which, in drying, contract a slight bitterness. Extracts made from them by water are considerably sweet and mucilaginous: extracts made by rectified spirit have a less degree of sweetishness, accompanied with a slight grateful warmth.

In Cartheuser's experiments, the spirituous extract amounted to one third the weight of the root, and the watery to above one half. Lewis.

VIPERA *pileata*, or *vittata*, in *Zoology*, a name by which some authors have called a remarkable species of Indian serpent, more usually known by the name of COBRA *de capella*.

VIPERARIA, in *Botany*, a name given by some authors to the *scorzonera*, or VIPER'S *grass*.

VIRAGO, a woman of extraordinary stature and courage, and who, with the female sex, has the mien and air of a man, and performs the actions and exercises of men.

The word is pure Latin, formed from *vir*, *man*, and is seldom used but in the way of diversion.

Such were Semiramis, and Penthesilea, among the ancients; and Jeanne la Pucelle, commonly called *the Maid of Orleans*, among the moderns.

In the Vulgate version of the Bible, Eve is called *virago*, because made of the rib of the man. The Latin translator by this, aimed to preserve the etymology as it is in the Hebrew, and of *vir*, formed *virago*; as Adam, in the Hebrew text, called Eve *Ischa*, of *isch*, *man*.

VIRGA. See YARD.

VIRGA is particularly used in law for VERGE, or *rod*, such as sheriffs and bailiffs carry, as a badge of their office.

Ranf. ap Howell, præpositus de Lantissin amerciatus pro eo quod habuit in manu sua coram justiciariis hic virgam *nigram & inhonestam, ubi habere debuisset* virgum *album & honestum certæ longitudinis, prout decet*. In sess. Itin. de Cardiff. 7 Hen. VI.

VIRGA *aurea*, in *Botany*, see GOLDEN *Rod*.

VIRGA *pastoris*, in *Botany*, a name given by some authors to dipsacus.

Where the name *virga pastoris* occurs in the translation of the Arabian writers, it is not to be supposed to mean the plant we call *virga pastoris*.

It is, indeed, the literal translation of the hassalelrheir of Serapion and Avicenna; but they called the common horsetail by this name, when they applied the adjective female to it; and when they added the male, they meant by it the common knot-grass.

VIRGA *sanguinea*, in *Botany*, a name given by Mathiolus, and some other authors, to the cornus fœmina, or dogberry bush, common in our hedges.

VIRGÆ *lateralis minimus*, in *Anatomy*, a name given by some writers to a muscle, called by others *levator ani parvus*, and by some *transversus ani*. It is called by Albinus the *transversus perinæi*, and by some *transversalis penis*.

VIRGÆ, in *Physiology*, a meteor, called also *columellæ*, and *funes tentorii*; being an assemblage of several streams of light, representing a bundle of rods or ropes.

It is supposed owing to the streaming of the sun-beams through certain rimulæ, or chinks; at least through the more lax and open parts of a watery cloud, happening chiefly in the morning and evening.

There is also another kind, consisting not of streams of mere white light, but, as it were, painted of various colours, like those of the rainbow.

VIRGATA *sutura*, a term used by some anatomists for the sagittal suture of the cranium.

VIRGATA *Terræ*, or VIRGA *terræ*, a YARD-*land*.

VIRGATORES *Servientes*, in Fleta, are vergers, or tipstaves, who attend the judges. See VERGER, and SERJEANT *at Arms*.

VIRGILIANÆ *Sortes*. See SORTES.

VIRGIN, VIRGO, a female who has had no carnal commerce with man; or, more properly, who has ſtill the *flos virginis*, or maidenhood.

By the Moſaic law, the prieſts are enjoined to take none to wife but thoſe that are *virgins*; the widow, the divorced, and the harlot, are to be refrained from.

In the Roman breviary there is a particular office for *virgins* departed, anſwering to thoſe of ſaints, martyrs, and confeſſors.

VIRGIN is alſo applied, by way of eminence, to Mary the mother of our Saviour.

Many of the fathers, with the modern churches, hold, that the *Virgin* not only conceived, but brought forth, or was delivered, without breach of her virginity; otherwiſe, ſays St. Auguſtine, it would be falſe which is ſaid in the creed, that he was born of a *virgin*. It is even alledged, that ſhe ſtill remained a *virgin* to the end of her life; whence the Greeks always called her ἀειπαρθενος, *ever virgin Mary*; and after them the Latins, *ſemper virgo*. Though, as this is not recorded in Holy Writ, many have denied it, and held, that ſhe had afterwards to do with Joſeph, and bore other children; and this as early as the time of Origen. Tertullian himſelf is produced as one that denied the perpetual *virginity*; and the like may be ſaid of Apollinaris and Eunomius, with their followers. See ANTIDICOMARIANITES and HELVIDIANS.

VIRGIN, *Charity of the Holy*. See CHARITY.

VIRGIN, *Nativity of the*. See NATIVITY.

VIRGIN, *Preſentation of the*. See PRESENTATION.

VIRGINS *of Love*. See MISSION.

VIRGIN is alſo applied, figuratively, to ſeveral things that retain their abſolute purity, and have never been made uſe of. Thus,

VIRGIN *Wax*. See *Virgin* WAX.

VIRGIN *Oil*. See *Virgin* OIL.

VIRGIN *Gold*. See GOLD.

VIRGIN *Copper*. See COPPER.

VIRGIN *Quickſilver*, is that found perfectly formed, and fluid, in the veins of mines; or, at leaſt, ſuch as is got from the mineral earth, by mere lotion, without fire.

VIRGIN *Parchment*. See PARCHMENT.

VIRGIN *Sulphur*. See SULPHUR.

VIRGIN's *Bower*, *clematis*, in *Botany*, a genus of the *polyandria polygynia* claſs. Its characters are theſe: the flowers have no empalements; they have each four looſe oblong petals, with a great number of ſtamina, and the ſummits adhere to their ſide; they have many roundiſh compreſſed germina, with an awl-ſhaped ſtyle, crowned by a ſingle ſtigma; the germina become ſo many roundiſh compreſſed ſeeds, with the ſtyle ſitting on their top, and are collected into a head; the ſtyles of the ſeveral ſpecies being of different forms. Linnæus enumerates twelve, and Miller ſixteen ſpecies.

The four varieties of that ſpecies of *clematis*, called *virgin's bower*, make a very fine ornament in the quarters of gardens allotted to flowering ſhrubs.

They grow naturally in the woods in Spain and Portugal; they flower in June and July, but their ſeeds ſeldom ripen in England.

They are propagated by laying down their branches; for though the ſingle flowers do ſometimes produce ſeeds in England, yet as theſe ſeeds, when ſown, remain a whole year in the ground before they vegetate, the other is the moſt expeditious method of increaſing theſe plants, and is commonly practiſed.

The beſt time for laying down the branches is July, ſoon after they have made their firſt ſhoots: the branches ſhould be faſtened to the ground, and the young ſhoots laid in the earth, with their tops raiſed upright three or four inches above ground; and after the layers are placed down, if the ſurface of the ground be covered with moſs, rotten tanner's bark, or decayed mulch, the ground will be preſerved from drying, ſo that the layers will not require watering above three or four times at five or ſix days interval. They ſhould be always planted where their climbing branches may be ſupported, as againſt the trellis work of ſeats and arbours, or for concealing any wall or fence; their branches require room to extend, and are, therefore, improper for open borders, nor do they anſwer expectation when intermixed with ſhrubs.

The ſort with double flowers is the moſt beautiful, and ſhould be preferred to thoſe with ſingle flowers. Miller.

The leaves and flowers of the upright *virgin's bower*, or *clematis erecta* of Linnæus, called alſo *flammula Jovis*, and diſtinguiſhed by its pinnated oval leaves and erect ſtalk, are extremely acrid; the former, when freſh, raiſing bliſters on the part to which they are applied.

This is one of the new medicines introduced by Dr. Stoerck. He has publiſhed ſeveral caſes of its efficacy in cancerous, venereal, and other malignant ulcers, obſtinate pains of the head and bones, inveterate itch, and other diſeaſes proceeding from peculiar acrimony. It was uſed internally, in infuſion of the flowers or leaves, and extract of the plants; and the powder was ſprinkled on the ulcers externally, where it was found to act as a moſt excellent eſcharotic and detergent.

The medicine is ſaid to have proved diuretic to ſome patients, and ſudorific to others, but rarely to have moved the belly. Small doſes, of only half a grain of the extract, and half a dram of the dried leaves in infuſion, were at firſt exhibited, which were gradually increaſed. Lewis.

VIRGIN's *Milk*, in the *Materia Medica*, is a name given to a ſolution of BENZOIN in ſpirits, mixed with twenty times its quantity, or more, of water, which renders it milky.

It is ſaid to be of great ſervice in diſorders of the breaſt, for reſolving obſtructions of the pulmonary veſſels, and promoting expectoration. It is alſo uſed as a coſmetic.

VIRGIN's *Milk*. See *Virgin's* MILK.

VIRGIN's *Thread*, a ſort of meteor that flies in the air, like ſmall untwiſted ſilk, and which falling upon the ground, or upon plants, changes itſelf into a ſubſtance like a ſpider's web.

In theſe northern climates it is moſt frequent in ſummer; the days being then temperately warm, the earth not exceeding dry, nor yet overcharged with moiſture.

This has formerly paſſed for a ſort of dew of an earthy ſlimy nature; but naturaliſts are now agreed, that the *virgin's threads* are no other than ſo many ſpiders webs.

VIRGINALE *Clauſtrum*, in *Anatomy*, the ſame as HYMEN.

VIRGINEUS *Morbus*, the *virgin's diſeaſe*; the green-ſickneſs, or CHLOROSIS.

VIRGINIANA *Bolus*, is a pure earth, of a compact texture, hard and heavy, of a pale red or roſe colour, variegated with veins of deep red, and often with large ſpots and veins of bright yellow: it is of a gloſſy ſurface, does not colour the hands, adheres firmly to the tongue, melts with difficulty in the mouth, is of a rough aſtringent taſte, leaves no grittineſs in the teeth, and is diffuſible with difficulty in water. It burns in the fire to an almoſt ſtony hardneſs without any change of colour. It is the product of Penſylvania, and moſt parts of America. This kind of bole has not yet been uſed in medicine.

VIRGINIS, *Spica*. See SPICA.

VIRGINITY, VIRGINITAS, the teſt or criterion of a *virgin*; or that which intitles her to the denomination.

In the firſt ages of the Chriſtian church, *virginity* grew into great honour and eſteem, inſomuch that the women were admitted to make ſolemn vows thereof in public. Yet was it held infamous among the Jews for a woman to die a maid.

The Veſtals, among the ancients, and the nuns or religious among the moderns, found guilty of a breach of the vow of *virginity*, are allotted a ſevere puniſhment; the firſt to be buried alive, the latter to be immured.

The phyſicians, both ancient and modern, are exceedingly divided upon the ſubject of *virginity*, ſome holding that there are no certain marks or teſtimonies thereof; and others, that there are. Solomon ſays expreſsly, there are four things too wonderful for him to know; "The "way of an eagle in the air; of a ſerpent on the rock; "of a ſhip in the midſt of the ſea; and the way of a "man in a maid;" which our tranſlators have rendered, leſs juſtly, *the way of a man with a maid*.

Yet Moſes eſtabliſhed a teſt, which was to be concluſive among the Jews. The nuptial ſheets, it ſeems, were to be viewed by the relations on both ſides; and the maid's parents were to preſerve them as a token of her *virginity*, to be produced, in caſe her huſband ſhould ever reproach her on that ſcore.

In caſe the token of *virginity* was not found thereon, ſhe was to be ſtoned to death at her father's door.

This teſt of *virginity* has occaſioned abundance of ſpeculation about the parts concerned; but the niceſt inquiries cannot ſettle any thing certain about them. Dr. Drake ſays expreſsly, that, whatever might be expected among the Jews, there is not the ſame reaſon to expect thoſe tokens of *virginity* in theſe countries; for, beſides that the Hebrews married extremely young, as is the cuſtom in all the Eaſtern countries, there are ſeveral circumſtances which may here fruſtrate ſuch expectations, even in virgins not vitiated either by any male contact, or any wantonneſs of their own.

In effect, in theſe northern climates, the inclemency of the air expoſes the ſex to ſuch checks of perſpiration, as gives a great turn to the courſe of the humours, and drives ſo much humidity through the parts, as may extraordinarily

traordinarily supple and relax those membranes from which the resistance is expected; and from which, in hotter countries, it might more reasonably be depended on.

What most commonly passes among us for a test of *virginity* is the HYMEN; and yet the most curious among the anatomists are greatly divided, not only about the figure, substance, place, and perforations of this famous membrane, but even about the existence thereof, some positively affirming, and others as flatly denying it.

As nice a point as that of *virginity* is among anatomists, the midwives and matrons treat it with less diffidence. In the statutes of the sworn matrons, or midwives of Paris, containing likewise divers formulas of reports and depositions made in court, upon their being called to visit girls that made their complaint of being deflowered, they lay down fourteen marks whereon to form a judgment.

Laur. Joubart, a famous physician of Montpelier, has transcribed three of these reports; one made to the provost of Paris, another in Languedoc, and a third in Bearn. These reports are very consistent with each other, and contain fourteen marks of *virginity*, expressed in their proper terms, such as were received among the women of that profession, and authorized in court.

M. Joubart does not explain those terms, nor do we find any explanation of them any where, but in another report, of the 23d of October, 1672, inserted in the Picture of Love of Vennette, a physician of Rochel.

In Peru, and several other provinces in South America, we are assured by Pedro de Cieca, in the history of the Yncas, &c. that the men never marry but on condition that the next relation or friend of the maid's shall undertake to enjoy her before him, and take away her *virginity*. And our countryman, Lawson, relates the like of some of the Indian nations of Carolina. So little is the *flos virginis* valued in some places.

VIRGO, in *Astronomy*, one of the signs or constellations of the zodiac, into which the sun enters in the middle of August.

The stars in the constellation *Virgo*, in Ptolemy's catalogue, are 32; in Tycho's, 33; in Hevelius's, 50; and in the Britannic, 110. The longitudes, latitudes, magnitudes, &c. whereof, are as follow:

Names and Situations of the Stars.	Bayer's Char.	Sign.	Longitud. ° ′ ″	Latitude. ° ′ ″	Magnitude.
That preced. *Virgo*'s head	ω	♍	17 30 05	5 19 13 N	6
North. on the top of the head	ξ		19 00 29	6 6 21 N	5
South.	ν		19 49 35	4 35 39 N	5
Subseq. and less in the top of the head	ξ		19 37 15	6 21 33 N	6
In the bend of the south. wing.	β		22 46 14	0 40 47 N	3
5.					
	A		21 9 47	7 14 53 N	6
	b		24 12 31	3 20 31 N	5.6
South. in the face	π		23 13 29	6 8 52 N	5
North.	ο		23 23 06	8 31 29 N	5
	r		27 8 22	2 42 52 N	5
10.					
	s		25 39 56	6 19 31 N	6
	t		24 38 13	10 44 24 N	6.7
	n	♎	0 16 44	1 8 8 N	6
			3 38 52	6 14 52 S	6
Preced. in the south. wing.	η		0 30 52	1 22 1 N	3
15.					
That in the neck	c	♍	29 2 17	5 4 22 N	4.3
			28 44 18	7 7 9 N	6
			26 42 10	15 26 6 N	6
			28 6 34	12 44 47 N	6
			29 7 51	12 43 22 N	6
20.					
	q	♎	7 9 52	5 19 47 S	6
			0 49 45	11 9 52 N	6
			1 3 33	11 1 10 N	5
			2 4 00	8 49 30 N	6
	f		6 42 20	1 35 32 S	6
25.					
First of three under south. arm	χ		7 50 38	3 27 23 S	5
			1 3 5	13 41 37 N	6
			8 15 49	2 44 25 S	6
Second of the south. wing	γ		5 52 11	2 48 53 N	3
Preced. of 3 in the north. wing	δ		1 10 33	13 32 49 N	5
30.					
1 at	d		2 36 14	10 24 45 N	6
South. of the north wing	d		3 6 18	11 34 15 N	6
			2 28 51	13 22 45 N	6.7
			1 42 11	15 39 11 N	6
			5 16 0	8 1 40 N	6
35.					
			1 10 28	17 47 57 N	6
			6 20 30	7 55 50 N	6

Names and Situations of the Stars.	Bayer's Char.	Sign.	Longitud. ° ′ ″	Latitude. ° ′ ″	Magnitude.
			9 19 24	2 0 24 N	5
			11 31 30	3 3 16 S	5
Middle under the south. arm	ψ		11 52 25	3 25 22 S	5
40.					
			3 3 5	16 43 35 N	5
			5 12 10	12 37 27 N	5
In the n. side against the girdle	δ		7 9 54	8 38 27 N	3
Third of the south. wing	k		10 52 55	2 21 50 N	5
			0 56 32	2 52 55 N	6
45.					
			10 54 1	2 23 4 N	7
Upper of n. wing vindemiatrix	ε		5 37 40	16 12 54 N	3
			1 48 45	2 56 15 N	5
Third under the south. arm	g		15 25 9	3 15 3 S	5
			15 41 28	2 42 31 S	6
50.					
Fourth and last of the south. wing	θ		13 54 23	1 45 29 N	4
			16 4 27	2 21 25 S	6
First of the three under spica			18 25 56	7 53 20 S	4.5
			19 46 20	10 12 6 S	6
			20 30 30	11 6 24 S	6
55.					
			16 51 7	2 15 25 S	6
			20 43 20	11 0 50 S	6
			17 27 52	1 58 38 S	6
The following vindemiatrix	e		9 41 3	16 13 7 N	6.7
The following north. wing	σ		11 27 17	12 39 30 N	5
6 .					
Middle under spica			20 43 10	9 9 50 S	4.5
			18 28 19	2 35 26 S	6
			21 28 22	8 19 41 S	5.6
			12 39 6	12 48 11 N	6
			16 46 0	3 35 51 N	6
65.					
			17 8 20	3 27 34 N	6.7
In south hand, called spica	α		19 31 21	2 1 59 S	1
Underneath spica	ι		20 26 48	3 18 24 S	4
Last and north. of 3 under spica			21 40 15	6 17 54 S	5.6
			10 38 7	21 24 35 N	6
70.					
			12 4 17	18 42 49 N	6
N. of preced. in square of thigh 1 at	l		18 59 18	2 47 25 N	6
			23 52 14	8 26 42 S	6
Second 2 at	l		19 16 27	3 8 55 N	6
			22 48 30	5 14 34 S	6
57.					
South of preced. in squ. of thigh	h		20 55 51	0 24 7 S	6
			20 6 23	2 0 27 N	7
Another following north wing			16 3 48	12 33 1 N	6
Under the girdle as in the hip	ζ		17 49 50	8 39 9 N	6
Third in square of thigh 3 at	l		19 46 12	4 15 21 N	6
80.					
			21 10 24	2 9 20 N	6
North of those following in square of girdle	m		22 23 31	1 43 45 N	6
			25 26 5	5 6 32 S	6
That over the girdle	o		18 15 4	13 16 45 N	6
			25 50 3	4 30 38 S	6
85.					
In south. knee			24 43 6	1 21 46 S	6
			26 59 34	6 18 29 S	6
			23 10 7	4 4 4 N	6
			27 39 36	6 21 27 S	5.6
In north. thigh	p		22 52 22	9 37 22 N	6
90.					
			21 55 9	11 59 34 N	6
			22 21 32	12 9 41 N	6
That over the north. thigh	τ		23 24 56	13 4 50 N	5
			28 10 30	3 41 48 S	6
			28 25 25	3 19 59 N	6
95.					
			29 16 54	2 32 20 N	5
			29 57 42	3 15 23 N	6
South. of three in the border of garment	κ	♏	0 10 40	2 55 40 N	4
Middle in the border		♎	29 27 36	7 15 40 N	4
In extrem. of south. foot		♏	2 38 13	6 31 4 N	4
100.					
			21 35 23	8 12 20 N	6
North. of 3 in the garment 1 at	υ	♎	29 4 40	11 2 57 N	5
1 at	υ		29 33 5	11 30 3 N	5
			2 14 42	8 4 23 N	6
A bright one follow. these	φ	♏	1 8 14	11 47 25 N	4
105.					
			2 48 1	7 25 56 N	6
In extrem. of the north foot	μ		5 47 23	9 43 8 N	4
			4 22 44	15 56 52 N	6
			4 10 50	17 7 1 N	4
			8 17 42	18 34 15 N	6
110.					

VIRGULA *divina*, or *Baculus divinatorius*, a forked branch in form of a Y, cut off an hazle-tree, by means whereof

whereof people have pretended to discover mines, springs, &c. under-ground.

The method of using it is this: the person, who bears it, walking very slowly over the places where he suspects mines or springs may be, the effluvia exhaling from the metals, or vapour from the water, impregnating the wood, makes it dip or incline, which is a sign of a discovery.

We find no mention made of this *virgula* in any author before the 11th century; but from that time it has been in frequent use. Divers fine names have been invented for it, some calling it *caduceus*; others, *Aaron's rod*, &c.

Some dispute the matter of fact, and deny it to be possible; others, convinced by the great number of experiments alledged in its behalf, look out for the natural causes thereof. The corpuscles, say these authors, rising from the springs, or minerals, entering the rod, determine it to bow down, in order to render it parallel to the vertical lines which the effluvia describe in their rise.

In effect, the mineral or watery particles are supposed to be emitted by means of the subterraneous heat, or of the fermentations in the entrails of the earth: now the *virgula*, being of a light porous wood, gives an easy passage to those particles, which, withal, are very fine and subtile; the effluvia then driven forwards by those that follow them, and oppressed, at the same time, by the atmosphere incumbent on them, are forced to enter the little interstices between the fibres of the wood; and, by that effort, they oblige it to incline or dip down perpendicularly, to become parallel with the little columns which those vapours form in their rise.

A late writer has recited no less than six hundred experiments, made with all possible attention and circumspection, and several of which are very curious and extraordinary, in order to ascertain the facts attributed to the divining rod; and he has also undertaken to unfold their resemblance to the admirable and uniform phenomena of electricity and magnetism. See M. Thouvenel's Memoire Physique & Medicinale Montrant des Raports evidens entre les Phenomenes de la Baguette Divinatoire, &c. 12mo. Paris, 1781.

Mr. Pryce has collected several observations on the nature and use of the *virgula divinatoria*, in his Mineralog. Cornub. lib. iii. cap. 1.

VIRGULA, in *Grammar*, a term which Latin, French, and some other authors use for a point in writing, usually called by us, *comma*.

Virgulas, F. Simon observes, are an invention of the modern grammarians, to give the greater clearness to discourse. The use thereof was unknown to the ancient Greeks and Romans, who wrote all without taking off the pen, so that their books lie all together without any distinction of points and *virgulas*.

VIRGULTUM, in our *Ancient Law Books*, is used for an holt, or plantation of twigs, or osiers.

Sometimes, also, for a coppice of young wood. *Et præterea concedo* virgultum *meum, & totam communiam dominii mei.* Mon. Angl.

In another place of the same work, *virgultum*, or rather *virgulta*, may be taken for *virgata, viz. Dedit prædictæ ecclesiæ unam* virgultum *terræ in manerio de Crumptone.* See YARD *Land*.

VIRIDARIO *eligendo*, a writ that lies for the choice of a VERDEROR in the forest.

VIRIDE *æris*, the same as ÆRUGO, or VERDIGRISE.

VIRIDELLUS, a word used by some medical writers to express the epilepsy, and, by some of the chemical ones, as a name for the common green vitriol.

VIRILE, something that belongs, or is peculiar to man, or the male sex.

Thus *virile* member, *membrum virile*, is frequently used for the PENIS.

VIRILE *Age*, *ætas virilis*, is the strength and vigour of a man's age, viz. from thirty to forty-five years, which is an age wherein we are equally removed from the extremes of youth and old age. See AGE.

The civil lawyers only make one age of youth and *virility*, and yet their different temperatures seem to require a distinction, for which reason some compare youth to summer, and *virility* to autumn.

At Rome, the youth quitted the prætexa at fourteen or fifteen years of age, and took the *virile* gown, *toga virilis*, to shew, it seems, that they then entered on a serious age.

M. Dacier will have it, that children do not take the prætexta till thirteen years of age, nor quit it for the *toga virilis* till seventeen.

VIRILIA, a man's genitals, or privy members, including the penis and testes.

The cutting off the *virilia*, according to Bracton, was felony by common law; and that whether the party were consenting or not.

Henricus Hall & A. uxor ejus capti & detenti in prisona de Evilchester, eo quod rectati fuerunt, quod ipsi absciderunt virilia *Johannes Monachi, quem idem Henricus deprehendit cum prædicta A. uxore ejus.* Rot. Claus. 13 Hen. III.

VIRILIS *testis musculus*, in *Anatomy*, a name given by Vesalius, and others, to the muscle generally known by the name of the *cremaster*.

VIRITES, a name by which the writers of the middle ages have called the pyrites.

VIRTSUNGIANUS *Ductus*, or *Ductus* VIRTSUNGII, so called from the inventor, *Virtsungius*, a professor at Padua, in *Anatomy*, a canal, more usually called DUCTUS *pancreaticus*. See PANCREAS and PANCREATIC *Juice*.

VIRTUAL, *Potential*, something that has a power, or virtue, of acting or doing.

The term is chiefly understood of something that acts by a secret invisible cause, in opposition to *actual* and *sensible*.

VIRTUAL *Focus*, in *Optics*. See FOCUS.

VIRTUALITY, VIRTUALITAS, in the *Schools*, denotes some mode or analogy in an object, which, in reality, is the same with some other mode, but out of regard to contradictory predicates, is considered as if distinct therefrom.

And hence arise what we call *virtual distinctions*, whereby one *virtuality* is distinguished from another, not one thing from another.

Thus it is, the divine nature is distinguished from the divine person; and the divine understanding from the divine will.

VIRTUALLY, VIRTUALITER, in the *Schools*, is applied to a mode of existence. A thing is said to be *virtually* any where, when it is deemed to be there by some *virtue*, influence, or other effect, produced by it. Thus the sun is *virtually* on earth, i. e. by his light, heat, &c.

A thing is also said to be *virtually* present, when the virtues, or properties, belonging to it, and issuing from it, remain. In which sense, the forms of the elements are held to be *virtually* in mixed bodies.

A thing is also said to be a cause *virtually*, or a *virtual cause*, and that two ways; the first, when there is no real distinction between it and the effect attributed to it; and yet it is conceived by us as if it were really the cause thereof. Thus, immutability in God is the cause of eternity.

Secondly, when any effect is not of the same kind with the cause, and yet the cause has the power or virtue of producing the effect; thus the sun is not formally, but *virtually* hot; and fire is not contained formally, but *virtually*, in heat.

VIRTUE, VIRTUS, a term used in various significations. In the general, it denotes *power*, or *perfection*, of any thing, whether natural or supernatural, animate or inanimate, essential or accessary. Hence the *virtues*, that is, the powers of God, angels, men, plants, elements, &c.

VIRTUE, in its more proper and restrained sense, signifies an habit, which improves and perfects the possessor, and his actions.

In this sense, *virtue* is a principle of acting, or doing well and readily; and that, either infused from above, such as are *theological virtues*, or acquired by our own application, as the *intellectual* and *moral virtues*.

For, as there are two things in man from which all his actions proceed, viz. the understanding and the will, so the *virtue*, by which he is perfected, or whereby he is disposed to do all things rightly, and to live happily, must be two-fold; the one of the understanding, the other of the will. That which improves the understanding is called *intellectual*, or *dianoetic*; and that, the will, *moral*, or *ethic*. For, since there are two things required in order to live aright, viz. to know what should be done, and, when known, readily to perform it; and, since man is apt to err various ways in each respect, unless regulated by discipline, &c. he alone can deport himself rightly in his whole course of life, whose understanding and will have attained their utmost perfection.

Intellectual VIRTUE, then, according to Aristotle, is an habit of the reasonable soul, whereby it conceives, or speaks the truth, either in affirming or denying.

The *virtues*, which come under this class, are divided into *speculative*, which are those conversant about necessary things, that can only be known or contemplated; and *practical*, which are conversant about contingent things that may likewise be practised.

Aristotle has another division of *intellectual virtue*, fetched

from

from the subject; as some of them are seated in the επιστημονικη, or *contemplative part*, viz. those conversant about necessary things, as *science*, *wisdom*, *intelligence*: and others in the λογιστικη, or *practical part*, such as those conversant about contingent things, as *prudence*, *art*, &c.

Moral VIRTUE is defined by Aristotle to be an elective habit, placed in a mediocrity, determined by reason, and as a prudent man would determine.

The Scotists maintain every moral habit to be indifferent, as to good or evil, and capable of becoming, successively, either *virtue* or vice; *virtue*, if it have a relation of conformity with right reason, and vice, if it have not.

According to them, therefore, *virtue* is an habit subjectively, but not entitatively good, as it is only a relation of conformity, &c. which is separable from the entity of the habit.

The Thomists, on the contrary, assert *virtue* to be a habit essentially good, nor capable of ministring any thing to any act positively bad. And they philosophize thus: every habit, essentially good, inclines to act like those whereby it was acquired: thus, by doing justly, we become just, and, by abstaining from forbidden pleasures, we become temperate.

But *moral virtue* is produced, or acquired, by acts essentially good; good, we mean, both in respect of our duty, and of the motive and end; therefore *moral virtue* inclines only to good acts.

Others disallow the Peripatetic notion of *virtue*, as placed in a habit: for a habit, or hability, say they, includes two things; a custom, and facility; the first as a cause, and the second as an effect: so that a habit is nothing but a facility acquired by custom. They, therefore, who make *virtue* a habit of doing well, must, of necessity, ascribe it to a frequent exercise of good actions. But this cannot be; for the *virtue* must be before the good actions; and the habit, after them. Indeed, whence should the actions proceed, but from *virtue*? *Virtue*, therefore, is before the good actions, and, certainly, before a habit, resulting from a frequency of good actions. Hence, they define *virtue* to be a firm purpose, or resolution, of doing whatever right reason demands to be done. For, though a custom of doing well be required, to make a person esteemed good among men; yet it does not follow, that that custom, or habit, is the formal cause of that denomination, or the goodness itself.

Besides, from the definition of Aristotle none can know what *virtue* is; for what mediocrity is, or what an extreme, in which he supposes VICE to consist, can never be determined, till we know what is agreeable to the nature of things; and, moreover, the definition is faulty, because there are some branches of *virtue* which cannot be carried to an extreme.

We shall here subjoin as concise an account as possible of the principal systems of MORALITY, that have been proposed by different writers, both ancient and modern, who have treated of this subject; from which the reader will be able to discover the opinions that have chiefly prevailed with regard to the nature, foundation, and obligation of *virtue*.

It may be proper to premise, that *virtue* has been distinguished into abstract or absolute, and relative or practical *virtue*. *Abstract virtue* is, most properly, a quality of the external action or event; and denotes what an action is, considered independently of the sense of the agent; or what, in itself and absolutely, it is right such an agent, in such circumstances, should do, and what, if he judged truly, he would judge he ought to do. *Practical virtue*, on the contrary, has a necessary relation to, and dependence upon, the sense and opinion of the agent concerning his actions: or it signifies what he ought to do, upon supposition of his having such and such sentiments of things. Agreeably to this distinction, good actions have been by some divided into such as are *materially* good, and such as are *formally* so. The enquiry concerning the foundation of *virtue* refers to *absolute virtue*: and if it be asked what the foundation of *virtue* is, we may mean either, what is the true account or reason that such and such actions are right, or apprehended as such by us; or, what are the primary principles and heads of *virtue*, i. e. the considerations inferring obligation in particular cases, and rendering particular actions right and fit to be done; or, moreover, what are the motives, causes, and reasons, which engage or attach us to it, and support the practice of it in the world. In this last sense the term must be used by those who represent the will of God, self-interest, the reasons of things, and the moral sense, as all distinct and coincident foundations of *virtue*.

An ingenious writer, in forming his arrangement of the different systems of moral philosophy, of which we shall here avail ourselves, observes, that in treating of the principles of morals, there are two questions to be considered: first, wherein does *virtue* consist, or what, in temper and conduct, constitutes the excellent and laudable character? and secondly, by what power of the mind is this character, whatever it be, recommended to us? The first question is examined when we consider whether *virtue* consists in benevolence, as Dr. Hutcheson imagines; or in acting suitably to the different relations of persons and things, as Dr. Clarke supposes; or in the prudent pursuit of our own true happiness, as others have maintained. In reference to the second question we consider, whether the virtuous character, whatever it consists in, be recommended to us by self-love, which makes us perceive that this character, both in ourselves and others, tends most to promote our own private interest; or by reason, which points out to us the difference between one character and another, in the same manner as it does that between truth and falshood; or by a peculiar power of perception, called a moral sense, which this virtuous character gratifies and pleases, as the contrary disgusts and displeases it; or lastly, by some other principle in human nature, such as a modification of sympathy, or the like.

The different accounts which have been given of the nature of *virtue*, may be reduced to three different classes. According to some, *virtue*, or the virtuous temper of mind, does not consist in any one species of affections, but in the proper government and direction of all our affections, which may be either virtuous or vicious, according to the objects which they pursue, and the degree of vehemence with which they pursue them. According to these authors, therefore, *virtue* consists in propriety.

According to others, *virtue* consists in the judicious pursuit of our own private interest and happiness, or in the proper government and direction of those selfish affections which aim solely at this end. In the opinion of these authors, *virtue* consists in prudence.

Others again make *virtue* consist in those affections only which aim at the happiness of others, not in those which aim at our own. According to them, therefore, disinterested benevolence is the only motive which can stamp upon any action the character of *virtue*.

According to Plato, Aristotle, and Zeno, *virtue* consists in propriety of conduct, or in the suitableness of the affection from which we act to the object which excites it. In the system of Plato, reason is the judging and ruling faculty; and *virtue*, according to him, consists in that state of mind in which every faculty confines itself within its proper sphere without encroaching on that of any other, and performs its proper office with that precise degree of vigour which belongs to it: or, in other words, *virtue* consists in propriety of conduct.

Virtue, according to Aristotle, consists in the habit of mediocrity, according to right reason; every particular *virtue* lying in a kind of medium between two opposite vices; and thus, by making *virtue* to consist in practical habits, he probably had in view to oppose the doctrine of Plato, who seems to have thought that just sentiments concerning what was fit to be done or avoided were of themselves sufficient to constitute the most perfect *virtue*: Aristotle, on the contrary, was of opinion, that no conviction of the understanding was capable of getting the better of inveterate habits, and that good morals arose not from knowledge but from action.

According to Zeno and the Stoics, *virtue* consisted in choosing and rejecting all different objects and circumstances according as they were by nature rendered more or less the objects of choice or rejection; in selecting those which were most to be chosen, when all could not be obtained; and in selecting those which were least to be avoided, when all could not be avoided. This constituted the essence of *virtue*, and was what the Stoics called to live consistently, to live according to nature, and to obey those laws which nature, or the Author of nature, prescribed for our conduct; and in this course, they required the most perfect apathy, and considered every emotion which might in the smallest degree disturb the tranquillity of the mind, as the effect of levity and folly.

Besides these ancient, there are some modern systems, according to which *virtue* consists in propriety; or in the suitableness of the affection from which we act, to the cause or object which excites it. The system of Dr. Clarke, Mr. Balguy, and other writers, which places *virtue* in acting according to the relations of persons and things, in regulating our conduct according to the fitness or incongruity which there may be in the application of certain actions to certain things, or to certain relations: that of Mr. Grove and others, who explain *virtue* by

saying,

ſaying, that it is the conformity of our actions to reaſon: that of Mr. Wollaſton, which places it in acting according to the truth of things, actions as well as words having a language, ſo that when this language is agreeable to the nature of things, the action is virtuous, and when it implies a falſe aſſertion, vicious: that of lord Shaftſbury, which places it in maintaining a proper balance of the affections, and allowing no paſſion to go beyond its proper ſphere, or in a certain juſt diſpoſition of a rational creature towards the moral objects of right and wrong: are all of them reducible to the ſame fundamental idea of propriety, as it has been explained.

The moſt ancient of thoſe ſyſtems, which make *virtue* conſiſt in prudence, is that of Epicurus, who maintained that bodily pleaſure and pain were the ſole ultimate objects of natural deſire and averſion, and were the ſources of thoſe of the mind; and who placed the moſt perfect happineſs which man was capable of enjoying in eaſe of body, and in tranquillity of mind. According to him, *virtue* did not deſerve to be purſued for its own ſake, nor was itſelf one of the ultimate objects of natural appetite, but was eligible on account of its tendency to prevent pain, and to procure eaſe and pleaſure. Among our modern writers on the ſubject of morality, there have been ſome who have placed all *virtue* in a wiſe regard to our own intereſt: this ſeems to have been the opinion of Dr. Waterland, Dr. Rutherford, &c.

The ſyſtem which makes *virtue* conſiſt in benevolence, ſeems to have been the doctrine of moſt of thoſe philoſophers who, about and after the age of Auguſtus, called themſelves ECLECTICS, who pretended to follow chiefly the opinions of Plato and Pythagoras, and who are commonly known by the name of the later Platoniſts. In the divine nature, according to them, benevolence was the ſole principle of action, and directed the exertion of all the other attributes. The wiſdom of the Deity was employed in finding out the means for bringing about thoſe ends which his goodneſs ſuggeſted, as his infinite power was exerted to execute them. Benevolence, however, was a ſupreme and governing attribute, to which the others were ſubſervient, and from which the whole excellency of the divine operations was ultimately derived. The whole perfection and *virtue* of the human mind conſiſted in ſome reſemblance or participation of the divine perfections, and, conſequently, in being filled with the ſame principle of benevolence, which influenced all the actions of the Deity. This ſyſtem, as it was much eſteemed by many ancient fathers of the church, was, after the Reformation, adopted by ſeveral divines of the moſt eminent piety and learning, and of the moſt amiable manners: particularly by Dr. Ralph Cudworth, Dr. Henry More, and Mr. John Smith, of Cambridge. Mr. Bays has alſo more lately conſidered benevolence as the ſpring of the divine actions; whilſt Mr. Balguy referred them all to rectitude, and Mr. Grove to wiſdom. The ſubject was ably canvaſſed by theſe writers, and ſeveral excellent pamphlets publiſhed on the occaſion. But of all the patrons of the ſyſtem of benevolence, the late Dr. Hutcheſon purſued it to the greateſt extent, and with diſtinguiſhed acuteneſs and accuracy. Accordingly, he defines moral goodneſs to be a quality apprehended in ſome actions, which produces approbation and love towards the actor, from thoſe who receive no benefit from the action; and he obſerves, that the mixture of any ſelfiſh motive diminiſhes or altogether deſtroys the merit which would otherwiſe have belonged to any action, and, therefore, that *virtue* muſt conſiſt in pure and diſintereſted benevolence alone. Others, and particularly Dr. Cumberland, in his Law of Nature, have placed the whole of *virtue* in the love of God and our fellow-creatures: to this purpoſe he obſerves, de Leg. Nat. cap. i. ſect. 4.) the foundation of all natural law is this, that the greateſt benevolence of every rational agent towards all forms the happieſt ſtate of every and of all the benevolent, as far as is in their power, and is neceſſarily requiſite to the happieſt ſtate which they can attain; and, therefore, the common good is the ſupreme law.

The three ſyſtems above recited comprehend the principal accounts which have been given of the nature of *virtue*. To one or other of theſe, all the other definitions or deſcriptions of *virtue*, how different ſoever they may appear, are eaſily reducible. That ſyſtem which places *virtue* in obedience to the will of the Deity, may be counted among thoſe which makes it conſiſt in prudence, or among thoſe which make it conſiſt in propriety. When it is aſked, why we ought to obey the will of the Deity, the queſtion can admit but of two different anſwers. It muſt either be ſaid, that we ought to obey the will of the Deity becauſe he is a being of infinite power, who will recompence or puniſh; or it muſt be ſaid, that independent of any regard to our own happineſs, or to rewards and puniſhments of any kind, there is a congruity and fitneſs that a creature ſhould obey its Creator, and a limited imperfect being ſubmit to one of infinite perfection. In the firſt caſe, *virtue* conſiſts in prudence, or in the proper purſuit of our own final and ſupreme intereſt; ſince it is upon this account that we are obliged to obey the will of the Deity; and in the latter caſe, *virtue* muſt conſiſt in propriety, ſince the ground of our obligation to obedience is the ſuitableneſs or congruity of the ſentiments of humility and ſubmiſſion to the ſuperiority of the object which excites them. That ſyſtem which places *virtue* in utility, coincides too with that which makes it conſiſt in propriety.

All the ſyſtems above recited ſuppoſe, that there is a real and eſſential diſtinction between *virtue* and vice, whatever theſe qualities may conſiſt in. There is a real and eſſential difference between the propriety and impropriety of any affection; between benevolence and any other principle of action; between real prudence and ſhort-ſighted folly or precipitate raſhneſs. And the general tendency of all theſe ſyſtems is to encourage the beſt and moſt laudable diſpoſitions and habits.

There are, however, ſome other ſyſtems, which ſeem altogether to annihilate the diſtinction between vice and *virtue*, and the tendency of which is, therefore, wholly pernicious: ſuch are the ſyſtems of Rochefoucault, and Mandeville, who aſcribes actions commonly accounted virtuous to the frivolous motive of vanity: treating every thing as vanity that has any reference to what are, or ought to be, the ſentiments of others; and by means of ſuch ſophiſtry he eſtabliſhes his favourite concluſion, that private vices are public benefits.

After the enquiry concerning the nature of *virtue*, the next queſtion of importance in moral philoſophy concerns the principle of APPROBATION, or that faculty of the mind which renders certain characters agreeable or diſagreeable to us, makes us prefer one tenor of conduct to another, denominate the one right and the other wrong, and conſider the one as the object of approbation, honour, and reverence, and the other as that of blame, cenſure, and puniſhment. Three different accounts have been given of this principle of approbation. According to ſome, we approve and diſapprove both of our own actions and of thoſe of others, from ſelf-love only, or from ſome view of their tendency to our own happineſs or diſadvantage. According to others, reaſon, the ſame faculty by which we diſtinguiſh between truth and falſhood, enables us to diſtinguiſh between what is fit and unfit both in actions and affections; according to others, this diſtinction is altogether the effect of immediate ſentiment and feeling, and ariſes from the ſatisfaction or diſguſt with which the view of certain actions or affections inſpires us.

Thoſe who account for the principle of approbation from ſelf-love, differ in their repreſentation of its influence. According to Mr. Hobbes, and many of his followers, man is driven to take refuge in ſociety, not by any natural love which he bears to his own kind, but becauſe without the aſſiſtance of others he is incapable of ſubſiſting with eaſe or ſafety: *virtue* being the great ſupport, and vice the great diſturber of human ſociety, whence the former neceſſarily pleaſes, and the latter is as neceſſarily offenſive. Moreover, a ſtate of nature, according to Mr. Hobbes, being a ſtate of war, ſo that antecedent to the conſtitution of civil government there could be no ſafe and peaceable ſociety among men; to preſerve ſociety was to ſupport civil government, and the ſupport of civil government depends upon the obedience that is paid to the ſupreme magiſtrate; hence it was inferred, that the laws of the civil magiſtrate ought to be regarded as the ſole ultimate ſtandards of what was juſt and unjuſt, right and wrong. See HOBBISM.

In order to confute ſo odious a doctrine, it was neceſſary to prove that, antecedent to all law or poſitive inſtitution, the mind was naturally endowed with a faculty, by which it diſtinguiſhed in certain actions and affections the qualities of right, laudable, and virtuous, and in others, thoſe of wrong, blameable, and vicious. This faculty was reaſon, which pointed out the difference between right and wrong, in the ſame manner in which it did between truth and falſhood. Right and wrong, it is argued, denote ſimple ideas, and are, therefore, to be aſcribed to ſome immediate power of perception in the human mind, which power is the underſtanding. Beſides, all actions have a nature; ſome character belongs to them, and there is ſomething that may be affirmed of them, i. e. ſome are right and others wrong. But if our actions are, in themſelves, either right or wrong, or any thing of a moral and obligatory nature, which can be an object to the underſtanding, it muſt follow that in themſelves,

themſelves, they are all indifferent. From ſuch reaſoning it follows, that morality is eternal and immutable: becauſe right and wrong denote what actions are; and whatever any thing is, that it is not by will, or decree or power, but by nature and neceſſity. No will can render any thing good and obligatory, which was not ſo antecedently and from eternity, or any action right, that is not ſo in itſelf. In this view of it, morality appears not to be, in any ſenſe, factitious, or the arbitrary production of any power, human or divine; but equally everlaſting and neceſſary with all truth and reaſon. Some have ſuppoſed, however, that, in men, the rational principle, or the intellectual diſcernment of right and wrong, ſhould be aided by ſomewhat inſtinctive. Of this number is Dr. Price, who, in his reaſoning concerning the original of our ideas of the BEAUTY and DEFORMITY of actions, obſerves, that in contemplating the actions and affections of moral agents, we have both a perception of the underſtanding, and a feeling of the heart; and that the latter, or the effects in us accompanying our moral perceptions are deducible from two ſprings; they partly depend on the poſitive conſtitution of our natures, but the moſt ſteady and univerſal ground of them is the eſſential congruity or incongruity between the object and faculty; in other words, *placet ſuapte natura*—virtus: Sen. or, *Etiamſi à nullo laudetur, natura eſt laudabile*. Tully. See COMMON SENSE.

This leads us to mention thoſe ſyſtems which make ſentiment the principle of approbation; theſe may be diſtributed into two different claſſes.

According to ſome, the principle of approbation is founded upon a ſentiment of a peculiar nature, upon a particular power of perception exerted by the mind at the view of certain actions and affections; ſome of which affecting this faculty in an agreeable, and others in a diſagreeable manner, the former are ſtamped with the characters of right, laudable, and virtuous; the latter with thoſe of wrong, blameable, and vitious.

This ſentiment being of a peculiar nature, diſtinct from every other, and the effect of a particular power of perception, they give it a particular name, and call it a *moral* SENSE.

Dr. Hutcheſon, having taken great pains to prove that the principle of approbation was not founded on ſelf-love, and that it could not ariſe from any operation of reaſon, ſuppoſed it to be a faculty of a peculiar kind, with which nature had endowed the human mind, in order to produce this particular and important effect. This power, which he called a moral ſenſe, he ſuppoſed to be ſomewhat analogous to the external ſenſes.

According to his ſyſtem, the various ſenſes or powers of perception, from which the human mind derives all its ſimple ideas, were of two different kinds, of which one were called the direct or antecedent, the other the reflex or conſequent ſenſes. The direct ſenſes were thoſe faculties from which the mind derived the perception of ſuch ſpecies of things, e. g. ſounds and colours, as did not pre-ſuppoſe the antecedent perception of any other quality or object. The reflex, or conſequent ſenſes, were thoſe faculties from which the mind derived the perception of ſuch ſpecies of things as pre-ſuppoſed the antecedent perception of ſome other; ſuch as harmony and beauty.

The moral ſenſe was conſidered as a faculty of this kind. That faculty, which Mr. Locke calls reflection, and from which he derived the ſimple ideas of the different paſſions and emotions of the human mind, was, according to Dr. Hutcheſon, a direct internal ſenſe. That faculty again, by which we perceived the beauty or deformity, the virtue or vice of thoſe different paſſions and emotions, was a reflex internal ſenſe.

Dr. Hutcheſon endeavoured ſtill farther to ſupport this doctrine, by ſhewing that it was agreeable to the analogy of nature, and that the mind was endowed with a variety of other reflex ſenſes exactly ſimilar to the moral ſenſe; ſuch as a ſenſe of beauty and deformity in external objects; a *public* SENSE, by which we ſympathiſe with the happineſs or miſery of our fellow-creatures; a ſenſe of ſhame and honeſty, and a ſenſe of ridicule.

To this ſyſtem it has been objected, that it makes *virtue* an arbitrary thing, depending on the poſitive conſtitution of our minds; that right and wrong are only qualities of our minds and ſenſations, depending on the particular frame and ſtructure of our natures, which have no other meaſure or ſtandard beſides every one's private ſtructure of mind and ſenſations; that it implies, that a creature with intelligence, reaſon, and liberty, could not have performed one good action, without that inſtinctive affection to which Dr. Hutcheſon aſcribes every good action; that it makes brutes capable of *virtue*, becauſe they are capable of affections; that it eſtimates the excellency of characters by the ſtrength of paſſions, by no means in our power; and that, upon the whole, it gives us a much leſs honourable idea of *virtue* than other ſyſtems, which make it to conſiſt in the agreement of the actions of an intelligent being with the nature, circumſtances, and relations of things, and of which reaſon is the judge.

We ſhall only add, that the opinion of thoſe, who maintain our ideas of morality to be derived from ſenſe, is far from being entirely modern. There were, among the ancients, philoſophers, particularly Protagoras and his followers, who entertained a like opinion, but extended it much farther, that is, to all ſcience, denying all abſolute and immutable truth, and aſſerting every thing to be relative to perception.

According to others, who aſcribe the principle of approbation to ſentiment, there is no occaſion for ſuppoſing any new power of perception; nature acting in this, as in all other caſes, with the ſtricteſt œconomy, and producing a multitude of effects from one and the ſame cauſe; and therefore, ſympathy, they ſay, a power which has always been taken notice of, and with which the mind is manifeſtly endowed, is ſufficient to account for all the effects aſcribed to this peculiar faculty. Of this number is Dr. Adam Smith. See SYMPATHY. See alſo Smith's Theory of Moral Sentiments, paſſim; and particularly part i. ſect. 1, 2, 3.

The term, obligation of *virtue*, or moral obligation, frequently occurs among moral writers; and it is very differently defined and explained. Mr. Balguy defines obligation to be a ſtate of the mind into which it is brought by perceiving a reaſon for action; but an excellent writer obſerves, that this is the effect of obligation perceived, rather than obligation itſelf.

Other writers, with Dr. Cumberland, have defined obligation the neceſſity of doing a thing in order to be happy: but if this be the only ſenſe of obligation, what is meant when we ſay, a man is obliged to ſtudy his own happineſs? In this caſe we can only mean, that it is right to ſtudy our own happineſs, and wrong to neglect it.

Dr. Warburton maintains, that moral obligation always denotes ſome object of will or law, or implies ſome obliger; and accordingly, the word obligation ſignifies only the particular fitneſs of obeying the divine will, and cannot properly be applied to any other fitneſs, which is reſtraining the ſenſe of the word in a manner unwarranted by the common uſe of it.

Dr. Hutcheſon ſays, a perſon is obliged to an action, when every ſpectator, or he himſelf, upon reflexion, muſt approve his action, and diſapprove omitting it. Obligation to act, however, and reflex approbation or diſapprobation, do, in one ſenſe, always accompany and imply one another; yet they ſeem as different as an act and an object of the mind, or as perception and the truth perceived. After all, it may be obſerved that, however variouſly and looſely this word may be uſed, its primary and original ſignification coincides with rectitude: right implies duty in its idea, ſo that to perceive an action to be right, is to ſee a reaſon for the doing it in the action itſelf, abſtracted from all other conſiderations whatever; and this perception, this acknowledged rectitude in the action, is the very eſſence of obligation, or that which commands the approbation and choice, or binds the conſcience of every rational being. See Price's Review of the Principal Queſtions, &c. in Morals, chap. vi. and Adams's Sermon on the Nature and Obligation of *Virtue*.

Moraliſts uſually diſtinguiſh four *principal*, or, as they are vulgarly called, *cardinal virtues*, viz. *prudence*, *juſtice*, *fortitude*, and *temperance*: the reaſon of which diviſion is founded in this; that, for a man to live *virtuouſly* and honeſtly, it is neceſſary he know what is fit to be done; which is the buſineſs of *prudence*.

That he have a conſtant and firm will to do what he judges beſt; which will perfect the man, either as it reſtrains too violent perturbations, the office of *temperance*: or, as it ſpurs and urges on thoſe that are too ſlow and languid, which is the buſineſs of *fortitude*: or, laſtly, comparatively, and with regard to human ſociety; which is the object of *juſtice*.

To theſe four all the other *virtues* are referred, either as parts, or as concomitants.

VIRTUES, in the *Celeſtial Hierarchy*, the third rank, or choir, of angels, being that in order between *dominations* and *powers*.

To theſe is attributed the power of working miracles, and of ſtrengthening and reinforcing the inferior angels in the exerciſe of their functions.

VIRTUOSO, an Italian term, lately introduced into Engliſh, ſignifying a man of curioſity and learning; or one who loves and promotes the arts and ſciences.

In Italy, *virtuoſi* are properly ſuch as apply themſelves to the

the polite arts of painting, sculpture, mathematics, music, &c. A person who makes profession thereof is called *virtuoso, questo è un virtuoso.*

Among us, the term seems appropriated to those who apply themselves to some curious and quaint, rather than immediately useful art or study; as antiquaries, collectors of rarities of any kind, microscopical observers, &c.

VIRULENT, a term applied to any thing that yields a *virus*, that is, a contagious, or malignant pus.

The GONORRHOEA *virulenta* is what we popularly call a CLAP.

VIS, a Latin word, signifying FORCE or *power*; adopted by physical writers, to express divers kinds of natural powers, or faculties.

This is active and passive; the *vis activa* is the power of producing motion; the *vis passiva*, that of receiving or losing it. The *vis activa* is again subdivided into *vis viva* and *vis mortua*.

VIS *absoluta*, or *absolute force*, is that kind of centripetal force which is measured by the motion that would be generated by it in a given body, at a given distance, and depends on the efficacy of the cause producing it.

VIS *acceleratrix*, or *accelerating force*, is that centripetal force which produces an accelerated motion, and is proportional to the velocity which it generates in a given time.

This is different at different distances from the same central body; and depends not on the quantity of matter that gravitates, being equal in all sorts of bodies at equal distances from the centre. See ACCELERATION.

VIS *impressa* is defined by sir Isaac Newton to be the action exercised on any body to change its state, either of rest or moving uniformly in a right line.

This force consists altogether in the action; and has no place in the body after the action is ceased. For the body perseveres in every new state, by the *vis inertiæ* alone.

The *vis impressa* may arise from divers causes; as from percussion, pression, and centripetal force.

VIS *inertiæ*, or *power of inactivity*, is defined by sir Isaac Newton to be a power implanted in all matter, whereby it resists any change endeavoured to be made in its state, i. e. whereby it becomes difficult to alter its state, either of rest or motion.

This power, then, coincides with the *vis resistendi*, power of resisting, whereby every body endeavours, as much as it can, to persevere in its own state, whether of rest or uniform rectilinear motion; which power is still proportional to the body, and only differs from the *vis inertiæ* of the mass, in the manner of conceiving it.

Bodies only exert this power in changes brought on their state by some *vis impressa*, force impressed on them. And the exercise of this power is, in different respects, both resistance and impetus; resistance, as the body opposes a force impressed on it to change its state; and impetus, as the same body endeavours to change the state of the resisting obstacle. Phil. Nat. Princ. Math. lib. i.

The *vis inertiæ*, the same great author elsewhere observes, is a passive principle, by which bodies persist in their motion, or rest, receive motion, in proportion to the force impressing it, and resist as much as they are resisted.

For the effect of the VIS Inertiæ, *in resisting and retarding the motion of bodies*, &c. see RESISTANCE.

VIS *insita*, or *innate force* of matter, is a power of resisting, by which every body, as much as in it lies, endeavours to persevere in its present state, whether of rest or of moving uniformly forward in a right line.

This force is ever proportional to that body whose force it is, and differs nothing from the *vis inertiæ* but in our manner of conceiving it.

VIS *Centripeta*. See CENTRIPETAL *Force*.

VIS *Centrifuga*. CENTRIFUGAL *Force*.

VIS *motrix*, or *moving force* of a centripetal body is the tendency of the whole body towards the centre, resulting from the tendency of all the parts, and is proportional to the motion, which it generates in a given time; so that the *vis motrix* is to the *vis acceleratrix* as the motion to the celerity: and as the quantity of motion in a body is estimated by the product of the celerity into the quantity of matter, the *vis motrix* arises from the *vis acceleratrix*, multiplied by the quantity of matter.

The followers of Leibnitz use the term *vis motrix* for the force of a body in motion, in the same sense as the Newtonians use the terms *vis inertiæ*; this latter they allow to be inherent in a body at rest; but the former, or *vis motrix*, is a force inherent in the same body whilst in motion, which actually carries it from place to place, by acting upon it always with the same intensity in every physical part of the line which it describes. See FORCE and MOTION.

VIS *viva*, in *Mechanics*, a term used by Leibnitz and his disciples for FORCE, which they distinguish into two kinds, *vis mortua*, and *vis viva*; understanding by the former any kind of pressure, or an endeavour to move, insufficient to produce actual motion, unless its action on a body be continued for some time, and by the latter, that force or power of acting which resides in a body in motion.

VISCAGO, in *Botany*, the name of a genus of plants, described by Dillenius, and since called by Linnæus *silene*. See *Viscous* CAMPION.

VISCAGO is also used by some pharmaceutic writers, to express a mucilage.

VISCERA, in *Anatomy*, a term of equal import with *entrails*, including the heart, liver, lungs, spleen, intestines, and other inward parts of the body. See *Tab. Anat. (Splanch.) P.* 3.

The term is formed of *vesci*, *to feed*; by reason eatables, called in Latin *vesca*, undergo divers preparations in the *viscera*.

The word is also frequently used singularly, *viscus*, to express some particular part of the entrails, because the word *entrails* has no singular.

VISCERA, *Wounds of the*. If any of the *viscera* situated in the abdomen, as the liver, spleen, or kidney, has received a wound from a sharp instrument, at the first dressing the wound must be filled, as tenderly as possible, with lint well saturated with highly rectified spirit of wine, or spirit of turpentine, securing the dressings with compresses and a bandage; by this means the hæmorrhage will be stopped, if no large vessel is divided. When this part is gained, the wound must be treated in the common manner, and the patient kept very low; bleeding him, if of a plethoric habit, and giving daily two or three doses of Lucatellus's balsam; for balsams of this kind are of great service in healing internal wounds. This is the method to be taken with wounds of the *viscera*, which may be discovered by the eye or touch. But in such of them as are hidden, and not to be thus discovered, all that can be done is to inject vulnerary decoctions, and keep a passage open for the evacuation of sordes, or grumous blood. Heister.

VISCERALIA, a term used by physicians, to denote such medicines as impart strength and firmness to the sanguineous *viscera*, such as the liver, spleen, &c.

VISCERATIONES, among the *Romans*, a feast consisting of the entrails of animals, given to the people at the burial of great men in Rome.

VISCIDITY, or VISCOSITY, the quality of something that is *viscid*, or *viscous*, i. e. glutinous and sticky, like bird-lime; which the Latins call by the name *viscus*.

Viscid bodies are those which consist of parts so implicated within each other, that they resist, a long time, a complete separation, and rather give way to the violence done them by stretching, or extending each way.

The too great *viscidity* of foods has very ill effects; thus meals, or farinæ not fermented, jellies, &c. of animals, tough cheese, or curd too much pressed, produce a weight, or oppression in the stomach; wind, yawnings, crudities, obstructions of the minuter vessels in the intestines, &c. Hence an inactivity of the intestines themselves, a swelling of the abdomen; and hence a *viscidity* of the blood, from the re-union of the *viscid* particles; obstructions of the glands, paleness, coldness, tremors, &c.

VISCOUNT. See VICOUNT.

VISCUS, and VISCOSITY. See VISCERA and VISCIDITY.

VISCUM, in *Natural History*, &c. See MISSELTOE.

VISCUM is also used for *birdlime*. This was esteemed a poison among the ancient Greeks, and is seldom omitted under the class of deleterious things enumerated in their writings.

It is called by these authors *ixias*; but this word has occasioned great errors in late writers, the word *ixias* having been applied for the white chamæleon thistle, not because of any poisonous quality it had, for they all declare it to be innocent, but because of its yielding a viscous, or clammy juice. The black CHAMÆLEON thistle was always esteemed poisonous among them; and hence some have supposed the word *ixias* to be applied to that, and the poison *ixias*, mentioned by the Greeks, to be the root of that plant. Paulus Ægineta, indeed, seems to have understood it so, the poison *ixias* being by him placed among the roots; but Galen, who calls it a slow poison, and says, that it kills by stopping up and gluing together the intestines, plainly enough means *birdlime*, not the root of any plant.

VISCUM *caryophylloides*, a name given by sir Hans Sloane, and many other authors, to a genus of plants of a very peculiar kind.

They are called *viscum* from their growing upon other trees,

trees, in the manner that the misletoe does with us; and *caryophylloides*, from their leaves, in some degree resembling those of our pinks or carnations; but the plant itself, in all its species, is wholly different, both from the misletoe and pink, in all other respects.

The several species of these plants differ greatly also from one another; the most fragrant species in Jamaica is a very large one, called by the common people the wild pine. See the description of it in Phil. Trans. Nº 252. p. 114.

VISIBLE, VISIBILE, something that is an object of SIGHT, or VISION; or something whereby the eye is affected, so as to produce a sensation.

The school philosophers make two kinds of *visibles*, or *visible* objects; the one *proper*, or *adequate*, which are such as are no other way perceivable, but by sight alone; the other *common*, which are subject to divers senses, as the sight, hearing, feeling, &c.

Again, the first, or *proper object of vision*, is of two kinds, viz. *light* and *colour*; for these two are only sensible by sight. The first, and primary, viz. *light*, they make the formal, and *colour*, the material object.

The Cartesians think they philosophize better, when they say, that light alone is the proper object of vision; whether it flow from a luminous body through a transparent medium, and retains its first name, *light*, or whether it be reflected from opake bodies, under a certain new modification or habitude, and exhibit their images; or, lastly, whether in being reflected, it is likewise refracted, after this or that manner, and affects the eye with the appearance of *colour*.

But, agreeable to sir Isaac Newton's sentiments, colour alone is the proper object of sight; colour being that property of light whereby the light itself is *visible*, and whereby the images of opake bodies are painted on the retina.

Aristotle, De Anima, lib. ii. enumerates five kinds of common *visibles*, which are usually received for such in the schools, viz. *motion*, *rest*, *number*, *figure*, and *magnitude*.

Others maintain nine, as in the verses:

> *Sunt objecta novem* visus *communia*: quantum,
> *Inde* figura, locus, *sequitur* distantia, situs,
> Continuumque & discretum, motusque, quiesque.

Authors reason very variously as to these common objects of vision; there are two principal opinions among the schoolmen.

The adherents to the first hold, that the common *visibles* produce proper representations of themselves, by some peculiar species, or image, whereby they are formally perceived, independently of the proper *visibles*.

But the second opinion prevails most, which imports, that the common *visibles* have not any such formal peculiar species to become *visible* by; but that the proper objects are sufficient to shew themselves in this or that place or situation, and in this or that distance, figure, magnitude, &c. by the circumstances of their conveyance to the sensory.

In effect, since these common *visibles* cannot be represented alone (for who ever saw place, distance, figure, situation, &c. of itself?) but are always conveyed along with the images of light and colour to the organ; what necessity is there to conceive any such proper images whereby the common *visibles* should be formally perceived by the soul? It is much more probable, that from the peculiar manner wherein the sensitive faculty perceives a proper object, it is apprised of its being in this or that situation or place; in this or that figure, magnitude, &c. How this is effected may be conceived from what follows:

I. The situation and place of *visible* objects are perceived without any intentional species thereof, merely by the impulse being made from a certain place and situation, either above or below, on the right or left, before or behind, whereby the rays of the proper *visibles* are thrown upon the retina, and their impression is conveyed to the sensory.

For, since an object is seen by those rays which carry its image to the retina, and in that place to which the visive power is directed by the rays it receives, as it perceives the impulse of the rays to come from any place, &c. it is abundantly admonished of the object's being in that place and situation. See *Apparent* PLACE.

Philosophers, in general, had formerly taken for granted, that the place to which the eye refers any *visible* object, seen by reflection or refraction, is that in which the visual ray meets a perpendicular from the object upon the reflecting or the refracting plane. That this is the case with respect to plane mirrors is universally acknowledged; and some experiments with mirrors of other forms seem to favour the same conclusion, and thereby afford reason for extending the analogy to all cases of vision. If a right line be held perpendicularly over a convex or concave mirror, its image seems to make one line with it. The same is the case with a right line held perpendicularly within water; for the part which is within the water seems to be a continuation of that which is without, at least when it is viewed with no more than common attention, and in some positions. But Dr. Barrow called in question this method of judging of the place of an object, and thereby opened a new field of inquiry and debate in this branch of science. This, with other optical investigations, he published in his Optical Lectures, first printed in 1674. Having, as he imagined, refuted the common hypothesis concerning the place of *visible* objects, he substitutes another rule, by which, he says, our judgments are actually directed in this case. According to him, we refer every point of an object to the place from which the pencils of light, that give us the image of it, issue, or from which they would have issued, if no reflecting or refracting substance intervened. Pursuing this principle, Dr. Barrow proceeded to investigate the place, in which the rays, issuing from each of the points of an object, and which reach the eye after one reflection or refraction, meet; and he found, that if the refracting surface was plane, and the refraction was made from a denser medium into a rarer, those rays would always meet in a place between the eye and a perpendicular to the point of incidence.

If a convex mirror be used, the case will be the same; but if the mirror be plane, the rays will meet in the perpendicular, and beyond it if it be concave. He also determined, according to these principles, what form the image of a right line will take when it is presented in different manners to a spherical mirror, or when it is seen through a refracting medium.

Dr. Barrow, however, mentions an objection against the maxim which he endeavoured to establish, concerning the supposed place of *visible* objects, and candidly owns that he was not able to give a satisfactory solution of it. The objection is this; let an object be placed beyond the focus of a convex lens, and if the eye be close to the lens, it will appear confused, but very near to its true place. If the eye be a little withdrawn, the confusion will increase, and the object will seem to come nearer; and when the eye is very near the focus, the confusion will be exceedingly great, and the object will seem to be close to the eye. But in this experiment the eye receives no rays but those that are converging; and the point from which they issue is so far from being nearer than the object, that it is beyond it; notwithstanding which, the object is conceived to be much nearer than it is, though no very distinct idea can be formed of its precise distance.

The first person who took much notice of Dr. Barrow's hypothesis, and the difficulty attending it, was Dr. Berkeley, who, in his Essay on a New Theory of Vision, p. 30. observes, that the circle formed upon the retina, by the rays which do not come to a focus, produce the same confusion in the eye, whether they cross one another before they reach the retina, or tend to it afterwards; and therefore, that the judgment concerning distance will be the same in both the cases, without any regard to the place from which the rays originally issued; so that in this case, as, by receding from the lens, the confusion, which always accompanies the nearness of an object, increases, the mind will judge that the object comes nearer. See *Apparent* DISTANCE.

M. Bouguer, a late ingenious writer on optics, in his Traité D'Optique, p. 104. adopts the general maxim of Dr. Barrow, in supposing that we refer objects to the place from which the pencils of rays seemingly converge at their entrance into the pupil. But when rays issue from below the surface of a vessel of water, or any other refracting medium, he finds that there are always two different places of this seeming convergence: one of them of the rays that issue from it in the same vertical circle, and, therefore, fall with different degrees of obliquity upon the surface of the refracting medium, and another of those that fall upon the surface with the same degree of obliquity, entering the eye laterally with respect to one another. Sometimes, he says, one of these images is attended to by the mind, and sometimes the other; and different images may be observed by different persons. An object, plunged in water, affords an example, he says, of this duplicity of images.

G. W. Krafft has ably supported the opinion of Dr. Barrow, that the place of any point seen by reflection from the surface of any medium, is that in which rays issuing from it, infinitely near to one another, would meet; and considering the case of a distant object, viewed in a concave mirror by an eye very near to it, when the image, according to Euclid and other writers, would be between

tween the eye and the object, and the rule of Dr. Barrow cannot be applied, he says that, in this case, the speculum may be considered as a plane, the effect being the same, only that the image is more obscure. Com. Petropol. vol. xii. p. 252. 256. See Priestley's Hist. of Light, &c. p. 89. 688, &c.

From the principle above illustrated, several remarkable phenomena of vision are accountable for, as:

1. That if the distance between two *visible* objects be an angle that is insensible, the distant bodies will appear as if contiguous: whence a continuous body being the result of several contiguous ones; if the distances between several *visibles* subtend insensible angles, they will appear one continuous body; which gives a pretty illustration of the notion of a continuum.

Hence parallel lines, and long vistas, consisting of parallel rows of trees, seem to converge more and more, the farther they are extended from the eye; because the apparent magnitudes of their perpendicular intervals are perpetually diminishing, while, at the same time, we mistake their distance. When two parallel rows of trees stand upon an ascent, the more remote parts appear farther off than they really are, because the line that measures the length of the vistas now appears under a greater angle than when it was horizontal; the trees, in such a case, seeming to converge less, and sometimes, instead of converging, seeming to diverge.

The proper method of drawing the appearance of two rows of trees that shall appear parallel to the eye, is a problem that has exercised the ingenuity of several philosophers and mathematicians. That the apparent magnitude of objects decreases with the angle under which they are seen, has always been acknowledged: and it is also acknowledged, that we learn to form a judgment both of magnitudes and distances only by custom and experience; but in the application of these maxims to the above mentioned problem, all persons, before M. Bouguer, made use of the real distance instead of the apparent one, by which only the mind can form its judgment. And it is manifest, that if any circumstances contribute to make the distance appear otherwise than it is in reality, the apparent magnitude of the object will be affected by it, for the same reason, that if the magnitude be misapprehended, the idea of the distance will vary. For want of attending to this distinction, Tacquet pretended to demonstrate, that nothing can give the idea of two parallel lines to an eye situated at one of their extremities, but two hyperbolical curves, turned the contrary way; and M. Varignon maintained, that, in order to make a vista appear of the same width, it must be made narrower, instead of wider, as it recedes from the eye. M. Bouguer observes, that very great distances, and those that are considerably less, make nearly the same impression upon the eye. We, therefore, imagine great distances to be less than they are, and on this account the ground plan of a vista always appears to rise. The visual rays come in a determinate direction, but as we imagine they terminate sooner than they do, we necessarily conceive that the place from which they issue is elevated.

Every large plane, therefore, as AB (*Tab.* VI. *Optics, fig.* 137.) viewed by an eye at O, will seem to lie in such direction as A *b*, and consequently lines, in order to appear truly parallel, on the plane A B, must be drawn so as that they would appear parallel on the plane A *b*, and be from thence projected to the plane AB. To determine the inclination of the apparent ground plane A *b* to the true ground plane A B, M. Bouguer directs us to draw upon a piece of level ground two straight lines of a sufficient length, making an angle of three or four degrees with one another. Then a person placing himself within the angle, with his back towards the angular point, must walk backwards and forwards till he can fancy the lines to be parallel. In this situation, a line drawn from the point of the angle through the place of his eye, will contain the same angle with the true ground plane which this does with the apparent one.

M. Bouguer also shews other more geometrical methods of determining this inclination, and says that, by these means, he has often found it to be four or five degrees, though sometimes only two or two and a half degrees; the determination of this angle being variable, and depending upon the manner in which the ground is illuminated, and the intensity of the light, the colour of the soil, the conformation of the eye, and the part of the eye on which the object is painted.

In looking towards a rising ground, the difference between the apparent ground plane, and the true one, he says, will be much more considerable, so that they will sometimes make an angle of 25 or 30 degrees. An. Par. 1755. M. 156.

2. If the eye be placed above an horizontal plane, objects, the more remote they are, the higher will they appear, till the last be seen in a level with the eye. Whence it is that the sea, to persons standing ashore, seems to rise higher and higher the farther they look.

3. If any number of objects be placed below the eye, the most remote will appear the highest; if they be above the eye the most remote will appear the lowest.

Thus, the remoter parts of an horizontal walk, or long floor, will appear to ascend gradually; whereas, the cieling of a long gallery appears to descend.

M. Bouguer observes, that when a man stands upon a level plane, it does not seem to rise sensibly, but at some distance from him: the apparent plane, therefore, has a curvature in it, the form of which is not very easy to determine; so that a man standing upon a level plane of infinite extent, will imagine that he stands in the centre of a bason. The case is the same with a person standing upon the level of the sea.

4. The upper parts of high objects appear to stoop, or incline forwards; as the front of churches, towers, &c. And statues at the tops of buildings, to appear upright, must incline, or bend backwards. See farther under the articles of REFRACTION and HORIZON.

II. The mind perceives the distance of *visible* objects, from the different configurations of the eye, and the manner wherein the rays strike the eye, and in which the image is impressed thereon. For the eye disposes itself differently, according to the different distances it is to see; viz. for remote objects the pupil is dilated, and the crystalline brought nearer the retina, and the whole eye is made more globous; on the contrary, for near objects, the pupil is contracted, the crystalline thrust forwards, and the eye lengthened.

Philosophers are agreed, that we have a power of altering the form of our eyes, so as to make the rays of any pencil to converge at different distances from the pupil: and hence we are capable of viewing objects with almost equal distinctness, though they are placed at considerably different distances; but with regard to the alteration that takes place in the eye, and the mechanism by which it is produced, different accounts have been given.

It was the opinion of Kepler, that the contraction of the processus ciliares changes the form of the eye, and by the elongation of it places the crystalline at a greater distance from the retina; whereas, Des Cartes imagined, that the curvature of the crystalline itself suffers an alteration by the contraction of those ligaments.

M. de la Hire maintained that, in order to view objects at different distances, there is no alteration but in the size of the pupil, or the aperture of the eye; and he made a curious experiment, which, he thought, proved his assertion.

M. Le Roi, a member of the Royal Academy at Montpelier, has lately attempted to defend the opinion of M. de la Hire, which had long been exploded by all philosophers; and he says, that the accommodation of the eye to the view of objects, placed at different distances, by the contraction or dilatation of the pupil only, does not consist in the change of the place of the crystalline, by means of the ligamenta ciliaria, the strength of which is inadequate to the purpose. Besides, he observes, that they are not attached to the edges of the capsula, as has been supposed, but that they extend a considerable way along the anterior surface of it, without any close adherence to it. He is also of opinion, that these fibres are not muscular, but are only ramified vessels, which, according to all appearance, he says, answer no other purpose than than that of secreting an aqueous humour, to lubricate the surface of the crystalline.

That nothing is requisite but the contraction of the pupil in order to view the nearest objects with distinctness is evident, he says, from experiment. For when an object is placed so near, that the eye cannot bear as great a degree of contraction as is necessary for viewing it distinctly, the same end is obtained by an artificial pupil. For if a small hole be made in a card, the nearest object may be viewed through it with the greatest ease and distinctness.

That the variation of the pupil is sufficient for the purpose of viewing objects at all distances, he also thought he could demonstrate by experiment with an artificial eye; for when, with a large aperture, the images of near objects were confused, and ill defined upon the retina of this instrument, they became very distinct, and well defined, by contracting the aperture. Ac. Paris, 1755, M. p. 920.

But the most satisfactory discussion of this subject we owe to Dr. Porterfield, who proved, by a series of experiments, in which an object was viewed through small slits in a thin plate of iron, at a less distance than the diameter of the pupil (which, therefore, was of no use in this case), that we are possessed of a power of changing the conformation of our eyes, and of adapting them to various

various diſtances; and that this change always follows a ſimilar motion in the axes of viſion, with which it has been connected by uſe and cuſtom. Porterfield on the Eye, vol. i. p. 411. 415. 421.

However, among thoſe who ſuppoſe a conformation of the eye for this purpoſe, independent of a variation in the aperture, it is by no means agreed in what it conſiſts. Some have ſaid, that the cryſtalline becomes more or leſs convex for this purpoſe, by the action of certain muſcular fibres which enter into its compoſition. But Dr. Porterfield (ubi ſupra, p. 442.) obſerves that, though the cryſtalline, when dry, appears to conſiſt of many thin concentric laminæ, or ſcales, their diſpoſition is but ill qualified for changing the figure of the cryſtalline; or if they were ſo, it is not eaſy, he ſays, to prove that theſe fibres are muſcular, and capable of contraction.

His own opinion is, that the cryſtalline has a motion by means of the ligamentum ciliare, by which the diſtance between it and the retina is increaſed or diminiſhed, according to the different diſtances of objects. The ſtructure and diſpoſition of the ligamentum ciliare, he ſays, excellently qualify it for changing the ſituation of the cryſtalline, and removing it to a greater diſtance from the retina, when objects are too near for us; becauſe, when it contracts, it will not only draw the cryſtalline forward, but alſo compreſs the vitreous humour lying behind it, ſo that it muſt preſs upon the cryſtalline, and puſh it towards the retina.

He adds, that the cryſtalline, being moved forwards, muſt, at the ſame time, preſs the aqueous humour againſt the cornea; by which means that membrane, which is flexible, will be rendered more convex, and enable us ſtill better to ſee near objects diſtinctly.

That the ſituation of the cryſtalline is made uſe of in conforming the eye to the diſtinct view of objects placed at different diſtances, Dr. Porterfield thinks, is very evident from what is obſerved concerning perſons who have cataracts couched; for the ſame lens is not uſeful to them for ſeeing all objects diſtinctly, but they are obliged to make uſe of glaſſes of different degrees of convexity, in proportion to the nearneſs of the object.

To the objection of M. De la Hire, and others, among whom are the celebrated anatomiſts Haller and Zinn, that the ciliary ligament is not muſcular, and conſequently has no power of contraction, he obſerves, that they have been led into this miſtake by apprehending that the colour of muſcles is always red; whereas this is not the caſe univerſally, for the muſcular fibres of the inteſtines and ſtomach have hardly any redneſs in their colour. It is alſo certain, he ſays, that the PUPIL contracts and dilates itſelf according as objects are more or leſs luminous, and yet none of the fibres which perform that action are in the leaſt red. Ubi ſupra, vol. ii. p. 434. 447. 450.

Dr. Jurin (Eſſ. on diſtinct, &c. Viſion, p. 143.) ſuppoſes, that when the eye is to be ſuited to greater diſtances than fifteen or ſixteen inches, the ligamentum ciliare contracts, ſo as to draw part of the anterior ſurface of the capſula of the cryſtalline, into which the fibres of it are inſerted, a little forwards and outwards, on which the water within the capſula muſt flow from under the middle towards the elevated part of it; and the aqueous humour muſt flow from above the elevated part of the capſula to the middle. In conſequence of this, the whole anterior ſurface, within the inſertion of the ciliary ligament, will be reduced to a leſs convexity. When this contraction ceaſes, the capſula will return to its former ſituation, by its own elaſticity. To this hypotheſis it has been objected, that unleſs the water within the capſula has a greater refractive power than the aqueous humour, the retiring of it from one place to another to make room for that humour, will have no effect upon the pencils of rays.

Dr. Jurin, however, not attending to this circumſtance, and ſeeming to conſider the water within the capſula as having the ſame refractive power with the cryſtalline itſelf, attempts to ſhew by calculation, that this change in the convexity of it is quite ſufficient to extend the natural diſtance of diſtinct viſion from fifteen inches to fourteen feet five inches, without the leaſt motion of the cryſtalline itſelf, and a very ſmall one of the anterior ſurface of the capſula.

M. Muſchenbroeck, or rather Albinus (whoſe Anatomical Obſervations on the Eye he has publiſhed in his Introd. ad Phil. Nat. vol. ii. p. 759.) ſuppoſes, that the change of conformation in the eye is performed by means of the zona ciliaris, in the following manner. In viewing a very near object, in conſequence of which the pencils of rays tend to a focus beyond the retina, the zona ciliaris, and the anterior membrane of the capſula, as alſo the vitreous humour, being driven forward by the compreſſion of the coats of the eye, puſh the cryſtalline, and make it recede from the retina. At the ſame time the cryſtalline, puſhing the aqueous humour into the cornea, makes it more prominent. Perhaps, alſo, he ſays, the cryſtalline may be made rounder, ſo that, on theſe accounts, the pencils will come to their foci ſooner than otherwiſe. On the other hand, when the object is too remote for diſtinct viſion, ſo that the pencils come to their foci too ſoon, the zona ciliaris becomes tenſe, and, with the anterior membrane of the capſula, puſhes the cryſtalline farther within the vitreous humour. By this preſſure the cryſtalline becomes flatter, ſo that, on theſe ſeveral accounts, the foci of the pencils are carried farther. The zona ciliaris, and the anterior membrane of the capſula, can only puſh the cryſtalline into the vitreous humour one half of its own thickneſs, which, he ſhews, is not ſufficient to make viſion diſtinct at a competent diſtance, and therefore concludes, that ſome change muſt take place in the form of the cryſtalline, as, he ſays, Dr. Pemberton has well demonſtrated. He ſuppoſes, that the proviſion for ſuiting the eye to different diſtances is the ſame in all animals, and does not depend on the change of the ſclerotica in any of them, which is hard, and incapable of being compreſſed. Prieſtley's Hiſt. of Light, &c. p. 638—652. See *Apparent* DISTANCE.

The diſtance of *viſible* objects again, is adjudged of by the angle the object makes, from the diſtinct or confuſed repreſentation of the objects; and the briſkneſs or feebleneſs, or the rarity or ſpiſſitude of the rays.

To this it is owing, 1. That objects which appear obſcure, or confuſed, are judged to be more remote; a principle which the painters uſe to make ſome of their figures appear farther diſtant than others on the ſame plane.

2. To this it is likewiſe owing, that rooms, whoſe walls are whitened, appear the ſmaller; that fields covered with ſnow, or white flowers, ſhew leſs than when clothed with graſs; that mountains covered with ſnow, in the night time, appear the nearer, and that opake bodies appear the more remote in the twilight.

III. The magnitude or quantity of *viſible* objects is known chiefly by the angle comprehended between two rays drawn from the two extremes of the object to the centre of the eye. An object appears ſo big as is the angle it ſubtends; or bodies ſeen under a greater angle appear greater; and thoſe under a leſs, leſs, &c. Hence the ſame thing appears now bigger, and now leſs, as it is leſs or more diſtant from the eye. This we call the *apparent* MAGNITUDE.

Now, to judge of the real magnitude of an object, we conſider the diſtance; for, ſince a near and remote object may appear under equal angles, the diſtance muſt neceſſarily be eſtimated; that if it be great, and the optic angle ſmall, the remote object may be judged great; and *vice verſa*.

The magnitude of *viſible* objects is brought under certain laws, demonſtrated by the mathematicians: as,

1. That the apparent magnitudes of a remote object are as the diſtances reciprocally.

2. That the co-tangents of half the apparent magnitudes of the ſame objects, are as the diſtances; hence the apparent magnitude and diſtance being given, we have a method of determining the true magnitude; the canon is this, As the whole ſine is to the tangent of half the apparent magnitude, ſo is the given diſtance to half the real magnitude. The ſame canon, inverted, will, from the diſtance and magnitude given, determine the apparent one.

3. Objects, ſeen under the ſame angle, have their magnitudes proportional to their diſtances.

4. The ſubtenſe A B (*Tab.* VI. *Optics, fig.* 135.) of any arch of a circle appears of equal magnitude in all the points D C E G, though one point be vaſtly nearer than another; and the diameter D G appears of the ſame magnitude in all the points of the periphery of the circle. Hence ſome have derived a hint for the moſt commodious form of theatres.

5. If the eye be fixed in A (*fig.* 136.) and the right line B C be moved in ſuch manner, as that the extremes thereof always fall on the periphery, it will always appear of the ſame magnitude. Hence the eye, being placed in any angle of a regular polygon, the ſides will appear equal.

6. If the magnitude of an object directly oppoſite to the eye be equal to its diſtance from the eye, the whole object will be taken in by the eye, but nothing more. Whence the nearer you approach an object, the leſs part you ſee of it.

IV. The figure of *viſible* objects is eſtimated, chiefly, from our opinion of the ſituation of the ſeveral parts thereof.

This opinion of the ſituation, &c. enables the mind to apprehend an external object under this or that figure,

more justly than any similitude of the images in the retina, with the object, can; the images being frequently elliptical, oblong, &c. when the objects they exhibit to the mind are circles, squares, &c.

The laws of vision, with regard to the figures of *visible* objects, are,

1. That if the centre of the pupil be exactly against, or in the direction of a right line, the line will appear as one point.

2. If the eye be placed in a direction of a surface, so that only one line of the perimeter can radiate on it, it will appear as a line.

3. If a body be opposed directly towards the eye, so as only one plane of the surface can radiate on it, it will appear as a surface.

4. A remote arch, viewed by an eye in the same plane, will appear as a right line.

5. A sphere, viewed at a distance, appears a circle.

6. Angular figures, at a distance, appear round.

7. If the eye look obliquely on the centre of a regular figure, or a circle, the true figure will not be seen; but the circle will appear oval, &c. See *Apparent* FIGURE.

V. The number of *visible* objects is perceived, not only by one or more images formed in the fund of the eye; but also by such a position of those parts of the brain whence the optic nerves spring, as the mind has been used to, in attending to a certain place; and that either single or manifold.

Accordingly, when either of the eyes, with the contiguous part of the brain, are forced out of their just parallelism with the other, v. gr. by pressing it with the finger, &c. all things appear double; but when they are in the requisite parallelism, though there be two images in the fund of the two eyes, yet the object will appear single. Again, one thing may appear double, or even manifold, not only with both eyes, but even with only one of them open; by reason the common concourse of the cones of rays reflected from the object to the eye, either falls short of the retina, or goes much beyond it.

VI. Motion and rest are seen when the images of objects represented in the eye, and propagated to the brain, are either moved, or at rest; and the mind perceives these images either moving or at rest, by comparing the moved image to another, with respect to which it changes place; or by the situation of the eye to the object being continually changed. So that motion is only perceived, by perceiving the images to be in different places and situations; nor are these changes perceived unless affected in time. So that to perceive motion, a sensible time is required. But rest is perceived by the visual faculty, from the reception of the image in the same place of the retina, and the same situation for some sensible time.

Hence the reason, why bodies moving exceeding fast appear at rest; thus, a live coal, swung briskly round, appears a continual circle of fire; the motion not being commensurate with *visible* time, but much swifter than the same; so that, in the time the soul requires to judge of any change of situation of the image on the retina, or that it is moved from this place to that, the thing itself performs its whole circuit, and is in its own place again.

Laws of vision, with regard to the motion of *visibles*, are,

1. That if two objects unequally distant from the eye, move from it with equal velocity, the more remote one will appear the slower; or, if their celerities be proportionable to their distances, they will appear to move equally swift.

2. If two objects, unequally distant from the eye, move with unequal velocities in the same direction, their apparent velocities are in a ratio compounded of the direct ratio of their true velocities, and the reciprocal one of their distances from the eye.

3. A *visible* object, moving with any velocity, appears to be at rest, if the space described in the interval of one second be imperceptible at the distance of the eye. Hence it is, that a near object, moving very slowly, as the index of a clock; or a remote one very swiftly, as a planet, seem at rest.

4. An object, moving with any degree of velocity, will appear to rest, if the space it runs over in a second of time be to its distance from the eye, as 1 to 1400: nay, in fact, if it be as 1 to 1300.

5. The eye proceeding straight from one place to another, a lateral object, not too far off, either on the right or left, will seem to move the contrary way: the eye, in this case, being sensible of its motion, distant objects will seem to move the same way, and with the same velocity.

6. If the eye and the object move both the same way, only the eye much swifter than the object, that last will appear to go backwards.

7. If two or more objects move with the same velocity, and a third remain at rest, the moveables will appear fixed, and the quiescent in motion the contrary way. Thus, clouds moving very swiftly, their parts seem to preserve their situation, and the moon to move the contrary way.

8. If the eye be moved with a great velocity, lateral objects at rest appear to move the contrary way. Thus, to a person sitting in a coach, and riding briskly through a wood, the trees seem to retire the contrary way; and to people in a ship, &c. the shores seem to recede.

9. An object moving very swiftly is not seen, unless it be very luminous. Thus, a cannon ball is not seen if it is viewed transversely; but if it be viewed according to the line it describes, it may be seen, because its picture continues long on the same place of the retina, which, therefore, receives a more sensible impression from the object.

10. A live coal swung briskly round in a circle, appears a continued circle of fire, because the impressions made on the retina of light being of a vibratory, and consequently of a lasting nature, do not presently perish, but continue till the coal performs its whole circuit, and returns again to its former place.

11. If a person turns swiftly round, without changing his place, all objects about him will seem to move round in a circle the contrary way; and this deception continues not only while the person himself moves round, but, which is more surprising, it also continues for some time after he ceases to move, when the eye as well as the object is at absolute rest.

The reason why objects appear to move round the contrary way, when the eye turns round, is not so difficult to explain; for though, properly speaking, motion is not seen, as not being itself the immediate object of sight, yet by the sight we easily know when the image changes its place on the retina, and thence conclude that either the object, or the eye, or both, are moved. But by the sight alone we can never determine how far this motion belongs to the object, how far to the eye, or how far to both.

If we imagine the eye at rest, we ascribe the whole motion to the object, though it be truly at rest. If we imagine the object at rest, we ascribe the whole motion to the eye, though it belongs entirely to the object: and when the eye is in motion, though we are sensible of its motion, yet, if we do not imagine that it moves so swiftly as it really does, we ascribe only a part of the motion to the eye, and the rest of it we ascribe to the object, though it be truly at rest.

This last, says Dr. Porterfield, is what happens in the present case, when the eye turns round; for though we are sensible of the motion of the eye, yet we do not apprehend that it moves so fast as it really does; and, therefore, the bodies about appear to move the contrary way, as is agreeable to experience.

But the great difficulty still remains, viz. why, after the eye ceases to move, objects should, for some time, still appear to continue in motion, though their pictures on the retina be truly at rest, and do not at all change their place.

This, Dr. Porterfield imagined, proceeds from a mistake with respect to the eye, which, though it be absolutely at rest, we nevertheless conceive it as moving the contrary way to that in which it moved before; from which mistake, with respect to the motion of the eye, the objects at rest will appear to move the same way which the eye is imagined to move; and consequently will seem to continue their motion for some time after the eye is at rest. Porterfield on the Eye, vol. ii. p. 422. 424.

VISIBLE *horizon*, *place*, and *species*, see the substantives.

VISIER, or VIZIER, an officer, or dignitary in the Ottoman empire, whereof there are two kinds; the first, called by the Turks *visier azim*, that is, *grand visier*, first created in 1370, by Amurath I. in order to ease himself of the chief and weightier affairs of the government.

The *grand*, or *prime visier*, is the prime minister of state of the whole empire. He commands the army in chief, and presides at the divan, or great council. Renegado Christians have been sometimes raised to the *visierate*; such were Khairedain, surnamed Barbarossa; Ulug Ali, Cuproli, &c.

Next to the *grand visier*, there are six other subordinate *visiers*, called *visiers of the bench*, who officiate as his counsellors or assessors in the divan.

VISION, VISIO, the act of seeing, or of perceiving external objects by the organ of sight.

Vision is well defined to be a sensation, whereby, from a certain motion of the optic nerve, made in the bottom of the eye by the rays of light emitted or reflected from objects, and hence conveyed to the common sensory in the

the brain, the mind perceives the luminous object, its quantity, quality, figure, &c.

The phenomena of *viſion*, the cauſes thereof, and the manner wherein it is effected, make one of the greateſt and moſt important articles in the whole ſyſtem of natural knowledge. Indeed, a great part of the phyſical, mathematical, and anatomical diſcoveries and improvements of the moderns, terminate here, and only tend to ſet the buſineſs of *viſion* in a clearer light.

Hitherto refer what ſir Iſaac Newton and others have diſcovered of the nature of light and colours; the laws of inflexion, reflexion, and refraction of the rays; the ſtructure of the eye, particularly the retina and optic nerves, &c.

It is not neceſſary we ſhould here give a minute detail of the proceſs of *viſion* from its firſt principles; the greateſt part is already delivered under the reſpective articles. The eye, the organ of *viſion*, we have deſcribed under the article EYE; and its ſeveral parts, tunics, humours, &c. under their proper heads, CORNEA, CRYSTALLINE, &c.

The immediate and principal organ of *viſion*, viz. the retina, according to ſome, and the choroides, according to others, are alſo diſtinctly conſidered; as alſo the ſtructure of the optic nerve, which conveys the impreſſion to the brain; and the texture and diſpoſition of the brain itſelf, which receives them, and repreſents them to the ſoul. See RETINA, CHOROIDES, OPTIC *nerves*, BRAIN, SENSORY, &c.

Again, the nature of light, which is the medium or vehicle whereby objects are carried to the eye, is laid down at large, under the articles LIGHT and COLOURS; and the chief properties thereof concerned in *viſion*, under REFLECTION, REFRACTION, &c. and alſo many of its circumſtances under RAY, MEDIUM, &c. What remains for this article, therefore, is only to give a general idea of the whole proceſs, in which all the ſeveral parts are concerned.

Different opinions or ſyſtems of VISION. The Platoniſts and Stoics held *viſion* to be effected by the emiſſion of rays out of the eyes; conceiving that there was a ſort of light thus darted out; which, with the light of the external air, taking, as it were, hold of the objects, rendered them viſible; and thus returning back again to the eye, altered and new modified by the contact of the object, made an impreſſion on the pupil, which gave the ſenſation of the object.

The reaſons whereby they maintain their opinions are fetched, 1. From the brightneſs and luſtre of the eye. 2. From our ſeeing a remote cloud, without ſeeing one with which we are encompaſſed (the rays being ſuppoſed too briſk and penetrating to be ſtopped by the near cloud, but growing languid at a greater diſtance, are returned to the eye.) 3. From our not ſeeing an object laid on the pupil. 4. From the eye's being weary with ſeeing; i. e. by emitting great quantities of rays. And laſtly, from animals which ſee in the night, as cats, lions, moles, owls, and ſome men.

Our own countryman, Roger Bacon, diſtinguiſhed as he was in a variety of reſpects, does not heſitate to aſſent to the opinion that viſual rays proceed from the eye; giving this reaſon for it, that every thing in nature is qualified to diſcharge its proper functions by its own powers, in the ſame manner as the ſun, and other celeſtial bodies. Opus Majus, p. 289.

The Epicureans held *viſion* to be performed by the emanation of corporeal ſpecies, or images from objects; or a ſort of atomical effluvia continually flying off from the intimate parts of objects to the eye.

Their chief reaſons are, 1. That the object muſt neceſſarily be united to the viſive faculty; and ſince it is not united by itſelf, it muſt be ſo by ſome ſpecies that repreſents it, and that is continually flowing from bodies. 2. That it frequently happens, that old men ſee remote objects better than near ones; the diſtance making the ſpecies thinner, and more commenſurate to the debility of their organ.

The Peripatetics hold, with Epicurus, that *viſion* is performed by the reception of ſpecies; but they differ from him in the circumſtances; for they will have the ſpecies (which they call *intentionales*) to be incorporeal.

It is true, Ariſtotle's doctrine of *viſion*, delivered in his chapter De Aſpectu, amounts to no more than this; that objects muſt move ſome intermediate body, that by this they may move the organ of ſight. To which he adds, in another place, that when we perceive bodies, it is their ſpecies, not their matter, that we receive; as a ſeal makes an impreſſion on wax, without the wax's retaining any thing of the ſeal.

But this vague and obſcure account the Peripatetics have thought fit to improve. Accordingly, what their maſter called *ſpecies*, the diſciples underſtanding of real proper ſpecies, aſſert, that every viſible object expreſſes a perfect image of itſelf, in the air contiguous to it; and this image another, ſomewhat leſs in the next air; and the third another, &c. till the laſt image arrives at the cryſtalline, which they hold for the chief organ of ſight, or that which immediately moves the ſoul. Theſe images they call *intentional* SPECIES.

The modern philoſophers, as the Carteſians and Newtonians, give a better account of *viſion*. They all agree, that it is performed by rays of light reflected from the ſeveral points of objects received in at the pupil, refracted and collected in their paſſage, through the coats and humours, to the retina; and thus ſtriking, or making an impreſſion, on ſo many points thereof; which impreſſion is conveyed, by the correſpondent capillaments of the optic nerve, to the brain, &c.

Baptiſta Porta's experiments, with the camera obſcura, about the middle of the 16th century, convinced him, that *viſion* is performed by the intermiſſion of ſomething into the eye, and not by viſual rays, proceeding from the eye, as had been the general opinion before his time; and he was the firſt who fully ſatisfied himſelf and others upon this ſubject; though ſeveral philoſophers ſtill adhered to the old opinion.

As for the Peripatetic ſeries or chain of images, it is a mere chimæra; and Ariſtotle's meaning is better underſtood without than with them. In effect, ſetting theſe aſide, the Ariſtotelian, Carteſian, and Newtonian doctrines of *viſion* are very conſiſtent; for ſir Iſaac Newton imagines, that *viſion* is performed chiefly by the vibrations of a fine medium, which penetrates all bodies excited in the bottom of the eye by the rays of light, and propagated through the capillaments of the optic nerves, to the ſenſorium. And Deſcartes maintains, that the ſun preſſing the materia ſubtilis, wherewith the world is filled every way, the vibrations and pulſes of that matter reflected from objects are communicated to the eye, and thence to the ſenſory; ſo that the action or vibration of a medium is equally ſuppoſed in all.

Modern theory of VISION. In order to *viſion*, we are certain, it is required, that the rays of light be thrown from the viſible objects to the eye. What befalls them in the eye will be conceived from what follows.

Suppoſe, e. gr. Z the eye, and A B C the object (*Tab.* VI. *Optics, fig.* 138.); now, though every point of an object be a radiant point, that is, though there be rays reflected from every point of the object to every point of the circumambient ſpace, each carrying with it its reſpective colour (which we falſely imagine to be thoſe of the object), yet, as only thoſe rays which paſs through the pupil of the eye affect the ſenſe, we ſhall here conſider none elſe but theſe.

And again, though there be a great number of rays paſſing from one radiant point, as B, through the pupil; yet we ſhall only conſider the action of a few of them; as B D, B E, B F.

Now, then, the ray B D, falling perpendicularly on the ſurface E D F, will paſs out of the air into the aqueous humour, without any refraction, and proceed right to H, where, falling perpendicularly on the ſurface of the cryſtalline humour, it will go on, without any refraction, to M; where, again falling perpendicularly on the ſurface of the vitreous humour, it will proceed ſtraight to the point O, in the fund or bottom of the eye.

Again, the ray B E, paſſing obliquely out of the air upon the ſurface of the watery humour E D F, will be refracted, and approach towards the perpendicular E P; and thus, proceeding to the point G, in the ſurface of the cryſtalline, it will be there refracted ſtill nearer to the perpendicular. So alſo E G, falling obliquely out of air into an harder body, will be refracted towards the perpendicular G R, and, falling on the point L of the ſurface of the vitreous humour, it will ſtill be brought nearer to M.

Laſtly, G L, falling obliquely out of a denſer, upon the ſurface of a rarer body L M N, will be refracted, and recede from the perpendicular L T; in receding from which, it is evident, it approaches towards the ray BDO, and may be ſo refracted, as to meet the other in O. In like manner, the ray B F, being refracted in B, will turn to I, and thence to N, and thence to the others in O. But the rays between B E and B F, being ſomewhat leſs refracted, will not meet preciſely in the ſame point O.

Thus will the radiant point B affect the fund of the eye, in the ſame manner as if the pupil had no breadth, or as if the radiant itſelf had only emitted one ſingle ray, ſuch as were equal in power to all thoſe between B E and B F.

In like manner, the rays proceeding from the point A, will be ſo refracted in paſſing through the humours of the eye, as to meet near the point X; and the rays from

any intermediate point between A and B, will nearly meet in ſome other point in the fund of the eye between X and O.

Upon the whole, it may be aſſerted univerſally, that every point of an object affects one point in the fund of the eye; and, on the contrary, that every point in the fund of the eye only receives rays from one point of the object. Though this is not to be underſtood with the utmoſt rigour.

Now, if the object recede from the eye, in ſuch manner as that the radiant point B does not decline from the line B D; the rays which would proceed from B, not enough divaricated, would be ſo refracted in paſſing the three ſurfaces, as that they would meet before they reached the point O; on the contrary, if the object ſhould be brought nearer the eye, the rays paſſing from the point to the pupil, being too much divaricated, would be refracted ſo, as not to meet till beyond the point O: nay, the object may be ſo near, that the rays proceeding from any point, may be ſo divaricated, as that they ſhall never meet at all. In all which caſes, there would be no point of the object but would move a pretty large portion of the fund of the eye; and thus the action of each point would be confounded with that of the contiguous one.

And this would commonly be the caſe, but that nature has provided againſt it; either by contriving the eye, ſo that its bulb may be lengthened, or ſhortened, as objects may be more or leſs diſtant; or, as others will have it, ſo as that the cryſtalline may be made more convex, or more flat; or, according to others, ſo as that the diſtance between the cryſtalline and the retina may be lengthened or ſhortened.

The firſt expedient is the moſt probable; on the footing of which, when we direct our eyes to an object ſo remote, as that it cannot be diſtinctly viewed by the eye in its accuſtomed figure, the eye is drawn back into a flatter figure, by the contraction of four muſcles; by which means the retina, becoming nearer the cryſtalline humour, receives the rays ſooner; and, on the other hand, when we view an object too near, the eye, being compreſſed by the two oblique muſcles, is rendered more globular; by which means the retina, being ſet farther off from the cryſtalline, does not receive the rays of any point before they meet. See VISIBLE.

It may be here added, that this acceſs and receſs of the cryſtalline is ſo neceſſary to *viſion*, that whereas, in ſome birds, the coats of the eye are of ſuch a bony conſiſtence, that muſcles would not have been able to contract and diſtend them; nature has taken other means, by binding the cryſtalline down to the retina, with a kind of blackiſh threads not found in the eyes of other animals. Nor muſt it be omitted, that of the three refractions above mentioned, the firſt is wanting in fiſhes; and that, to remedy this, their cryſtalline is not lenticular, as in other animals, but globular. Laſtly, ſince the eyes of old people are generally worn flatter than thoſe of young ones, ſo that the rays from any point fall on the retina before they become collected into one, they muſt exhibit the object ſomewhat confuſedly; nor can ſuch eyes ſee any but remote objects diſtinctly. In others, whoſe eyes are too globular, the caſe is juſt the reverſe. See PRESBYTA and MYOPS.

From what has been ſhewn, that every point of an object moves only one point of the bottom of the eye; and, on the contrary, that every point in the fund of the eye, only receives rays from one point of the object, it is eaſy to conceive, that the whole object moves a certain part of the retina; that in this part there is a diſtinct and vivid collection of all the rays received in at the pupil; and that as each ray carries its proper colour along with it, there are as many points painted in the fund of the eye, as there were points viſible in the object. Thus is there a ſpecies, or picture, on the retina, exactly like the object: all the difference between them is, that a body is here repreſented by a ſurface; a ſurface frequently by a line, and a line by a point: that the image is inverted, the right-hand anſwering to the left of the object, &c. and that it is exceedingly ſmall; and ſtill the more ſo, as the object is more remote.

What we have ſhewn, under other articles, of the nature of light and colours, readily accounts for this painting of the object on the retina. The matter of fact is proved by an eaſy experiment, long ſince tried by Deſcartes, thus: the windows of a chamber being ſhut, and light only admitted at one little aperture; to that aperture apply the eye of ſome animal newly killed, having firſt dextrouſly pulled off the membranes that cover the bottom of the vitreous humour, viz. the hind-part of the ſclerotica, choroides, and even part of the retina: then will the images of all the objects, without doors, be ſeen diſtinctly painted on any white body, as on an egg-ſhell, that the eye is laid upon. And the ſame thing is better ſhewn by an *artificial* EYE, or a CAMERA *obſcura*.

The images of objects, then, are repreſented on the RETINA; which is only an expanſion of the fine capillaments of the optic nerve, and from which the optic nerve is continued into the brain. Now, any motion or vibration, impreſſed on one extreme of the nerve, will be propagated to the other: hence the impulſe of the ſeveral rays, ſent from the ſeveral points of the object, will be propagated as they are on the retina (i. e. in their proper colours, &c. or in particular vibrations, or manners of preſſure, correſponding thereto), to the place where thoſe capillaments are interwoven into the ſubſtance of the brain. And thus is *viſion* brought to the common caſe of ſenſation.

For ſuch, we know, is the law of the union between the ſoul and body, that certain perceptions of the firſt do neceſſarily follow certain motions of the laſt; but the different parts of the object do ſeparately move different parts of the fund of the eye; and thoſe motions are propagated to the ſenſory: it follows, therefore, that there muſt ariſe ſo many diſtinct ſenſations at the ſame time. See SENSATION.

Hence, 1. We eaſily conceive, that the perception, or image, in the mind, muſt be the clearer, and more vivid, the more rays the eye receives from the object; and conſequently, the largeneſs of the pupil will have ſome ſhare in the clearneſs of *viſion*.

2. Conſidering only one radiant point of an object, we may ſay, that that point would move the ſenſe more weakly, or be ſeen more obſcurely, as it is more remote; becauſe the rays coming from any point, like all qualities propagated in orbem, are always diverging; and therefore the more remote, the fewer of them will be received in at the pupil. But the pupil dilating itſelf more, as the object is more remote, takes in more rays than it would otherwiſe do.

3. The diſtinctneſs of *viſion* is ſomewhat concerned in the ſize of the image, exhibited in the fund of the eye. For there ſhould be, at leaſt, as many extremes of capillaments, or fibres of the optic nerve, in the ſpace that image poſſeſſes, as there are particles in the object, that ſend rays into the pupil; otherwiſe, every particle will not move its ſeparate capillament; and if the rays from two points fall on the ſame capillament, it will be the ſame as if only one point had fell there; ſince the ſame capillament cannot be differently moved at the ſame time. And hence it is, that the images of very remote objects being very ſmall, they appear confuſed, ſeveral points of the image affecting each capillament; and hence, alſo, if the object be of different colours, ſeveral particles affecting the ſame capillament at the ſame time, only the brighteſt and moſt lucid will be perceived. Thus, a field, furniſhed with a good number of white flowers, among a much greater quantity of green graſs, &c. at a diſtance, appears all white. See *Diſtinct* VISION, infra.

Our ſeeing of objects *ſingle*, though with two eyes, in each of which is a ſeparate image, or picture; and our ſeeing of them *erect*, whereas the picture is really inverted, are two great phenomena in *viſion*; which we have conſidered under the article SEEING.

For the manner of ſeeing, and judging of the diſtance and magnitude of objects, ſee VISIBLE, MAGNITUDE, &c.

VISION, in *Optics*. The laws of *viſion*, brought under mathematical demonſtrations, make the ſubject of OPTICS, taken in the greateſt latitude of that word: for, among the writers of mathematics, optics is generally taken, in a more reſtrained ſignification, for the doctrine of *direct viſion*; catoptrics, for the doctrine of *reflected viſion*; and dioptrics, for that of *refracted viſion*.

VISION, *direct*, or *ſimple*, is that performed by means of direct rays; that is, of rays paſſing directly, or in right lines, from the radiant point of the eye. Such is that explained in the preceding article, VISION.

VISION, *reflected*, is that performed by rays reflected from ſpecula, or mirrors. The laws hereof, ſee under REFLECTION, and MIRROR.

VISION, *refracted*, is that performed by means of rays *refracted*, or turned out of their way, by paſſing through mediums of different denſity; chiefly through glaſſes and lenſes. The laws of this, ſee under the article REFRACTION.

VISION, *arch of*. See ARCH.

VISION, *diſtinct*, denotes that by which an object is ſeen diſtinctly. An object is ſaid to be ſeen diſtinctly, when its outlines appear clear and well defined, and the ſeveral parts of it, if not too ſmall, are plainly diſtinguiſhable, ſo that we can eaſily compare them one with another, in reſpect to their figure, ſize, and colour.

In order to ſuch *diſtinct viſion*, it has hitherto been commonly

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monly thought, that all the rays of a pencil, flowing from a physical point of an object, must be exactly united in a physical, or, at least, in a sensible point of the retina. But it seems certain, from the experiments mentioned by Dr. Jurin, that such an exact union of rays is not always necessary to *distinct vision*.

Hence the doctor divides *distinct vision* into two species, viz. into *vision perfectly distinct*, or *perfect vision*, and *vision imperfectly distinct*; which he calls simply by the name of *distinct vision*. The former is that in which the rays of each pencil are collected into a single physical, or sensible point of the retina; the other species is that in which those rays occupy some larger space upon the retina, yet so as that the object is distinctly perceived.

Perfect *vision* in a given eye, and a given disposition of that eye, depends only upon the distance of the object; it has no dependance upon the magnitude of the object; but distinct *vision*, in a given eye, and a given disposition of the eye, depends upon the distance and magnitude of the object jointly. There appearing therefore a real difference between perfect *vision*, and what we call *distinct vision*, the learned doctor has enquired very particularly into the reason why an object may be seen distinctly without perfect *vision*.

He shews, that objects may be seen with sufficient distinctness, though the pencils of rays issuing from the points of them do not unite precisely in the same point on the retina; but that since, in this case, pencils from every point either meet before they reach the retina, or tend to meet beyond it, the light that comes from them must cover a circular spot upon it, and will, therefore, paint the image larger than perfect vision would represent it. Whence it follows, that every object, placed either too near or too remote for perfect *vision*, will appear larger than it is by a penumbra of light, caused by the circular spaces, which are illuminated by pencils of rays proceeding from the extremities of the object. All the varieties occasioned by this circumstance he traces with great accuracy, and he applies his observations upon it to the explanation of many phenomena in *vision*. See *Circle of* DISSIPATION.

Dr. Jurin observes, that when objects are large, they will appear tolerably distinct at a much less distance than small objects, because the penumbræ will not interfere so much; and on this account a large print may be read much nearer to the eye than a small one. In this case the former will appear only ill defined, but sufficiently distinct, when the latter is quite indistinct, the penumbra of one letter interfering with that of another, and thereby making marks altogether unlike any that are in the book. The dispersed light of these penumbræ, he says, is of different densities; and Mr. Robins, in his Remarks on Dr. Jurin, p. 279, observes, that the whole circle made by the confused image of any print will be proportioned to the diameter of the pupil of the eye, which limits the whole pencil.

The smallest distance of *perfect vision*, or that in which the rays of a single pencil are collected into a physical point on the retina in the generality of eyes, Dr. Jurin, from a number of observations, states at five, six, or seven inches. The greatest distance of distinct and perfect *vision* he found to be more difficult to determine; but by considering the proportion of all the parts of the eye, and the refractive power of each, together with the interval that may be discerned between two stars, the distance of which is known, he fixes it, in some cases, at fourteen feet five inches, though Dr. Porterfield had confined it to twenty-seven inches only, with respect to his own eye.

When *vision* is indistinct, Dr. Jurin thinks that there are two methods of rendering it distinct. One is for the eye to apply the same power, whereby it conforms itself to the view of objects placed at different distances, so as to obtain *perfect vision*; and the other is the contraction of the pupil by the lesser muscular ring of the uvea, which is chiefly made use of in a strong light, and which will sometimes render the other means altogether unnecessary. In a weak light, he says, the pupil is so far from contracting, that there is rather a necessity for dilating it, to take in more light. But upon this Dr. Whytt (Ess. on vital and involuntary Motions, p. 133.) observes, that in the same, or a less degree of light, the pupil will be contracted, in order to view a nearer or a smaller object. For other observations on this subject, see Jurin's Ess. on distinct and indistinct *Vision*, at the end of Dr. Smith's Optics; and Robins's Remarks on Dr. Jurin, in his Math. Tracts, vol. ii. p. 278, &c.

VISION, *field of*. See FIELD.

VISION, among *Divines*, is used for an appearance, which God occasionally sent to his prophets and saints; either by way of dream, or in reality.

Such were the *visions* of Ezekiel, Amos, &c. the *vision* of St. Paul, lifted up to the third heaven, &c. of Joseph, by which he was assured of the purity of the Virgin, &c.

Some have represented our blessed Lord's temptation in the wilderness, Matt. v. 1, &c. as a *vision*. Mr. Farmer, in particular, considers it as a divine *vision*, representing the trials he was to endure, and designed to prepare him for encountering and vanquishing them.

Many, among the Romish saints, have pretended to *visions*: as St. Theresa, St. Bridget, St. Catharine de Sienna, &c.

Hence the word has come into disrepute, and become a common name for all chimeras, or spectres, which either our folly or fear possesses us with: and hence, a person that frames to himself wild romantic notions, is called a *visionary*. Quevedo's *Visions* are descriptions of what passed in the imagination of that author.

VISION, *beatific*, denotes the act whereby the angels and blessed spirits see God in Paradise.

VISIR, VISIER, or VIZIER. See VISIER.

VISITATION, *visitatio*, an act of jurisdiction, whereby a superior, or proper officer, *visits* some corporation, college, church, or other public or private house, to see that the laws and regulations thereof be duly observed.

Among us, the bishop of each diocese is obliged to hold a *visitation* every third year, and the archdeacon the other two years; to see that the discipline be well observed, the people well instructed, and to take care, that neither the church, nor the pastors thereof, receive any detriment.

The business of parochial *visitation*, in order to inspect and take account of the fabrics and mansions, ornaments and utensils, vestments and books of the church, peculiarly belongs to the archdeacon. In all *visitations* of parochial churches made by bishops and archdeacons, the law hath provided, that the charge thereof shall be defrayed by the procurations then due, and payable by the inferior clergy; wherein custom, as to the quantum, shall prevail. These procurations are due to the person visiting of common right; and although originally due by reason of *visitation* only, yet the same may be due without actual *visitation*. They are sueable only in the spiritual court, and are merely an ecclesiastical duty; and they may be levied by sequestration, or other ecclesiastical process. Free chapels and donatives (unless such donative hath received the augmentation of queen Anne's bounty) are exempt from the *visitation* of the ordinary: the first being visitable only by commission from the king, and the second by commission from the donor. And there are also other churches and chapels exempted, which belonged to the monasteries; which by 25 Hen. VIII. cap. 21. were made visitable by the king, or by commission under the great seal.

Anciently the regarder's office was expressed to be the *visitation of manners*. See REGARDER.

The lawyers hold it a branch of the king's prerogative, to *visit* the universities; to inquire into the statutes, and the observation of them; to expel delinquents, &c. But some of the colleges disallow this privilege, and plead themselves, by royal charters, exempt from all civil and royal *visitations*.

With regard to all ecclesiastical corporations, the ordinary is their visitor, so constituted by the canon law, and thence derived to us. The pope formerly, and now the king, as supreme ordinary, is the visitor of the archbishop or metropolitan: the metropolitan has the charge and coercion of all his suffragan bishops; and the bishops in their several dioceses are in ecclesiastical matters the visitors of all deans and chapters, of all parsons and vicars, and of all other spiritual corporations. With respect to all lay corporations, the founder, his heirs or assigns, are the visitors, whether the foundation be civil or eleemosynary; for in a lay corporation the ordinary neither can nor ought to visit. In general, the king being the sole founder of all civil corporations, and the endower, the perficient founder of all eleemosynary ones, the right of *visitation* of the former results to the king, and of the latter to the patron or endower. The king being constituted by law the visitor of all civil corporations, the law has also appointed the place wherein he shall exercise this jurisdiction; which is the court of king's bench, where, and where only, all misbehaviours of this kind of corporations are enquired into and redressed, and all their controversies decided. Accordingly this is the meaning of lawyers, when they say that these civil corporations are liable to no *visitation*; viz. that the law having by immemorial usage appointed them to be visited and inspected by the king their founder, in his majesty's court of king's bench; according to the rules of common law they ought not to be visited elsewhere, or by any other authority.

As to eleemosynary corporations, by the dotation the

founder and his heirs are of common right the legal visitors, to see that property is rightly employed, which might otherwise have descended to the visitor himself: but if the founder has appointed and assigned any other person to be visitor, then his assignee so appointed is invested with all the founder's power, in exclusion of his heir. Eleemosynary corporations are chiefly hospitals, or colleges in the university. With regard to hospitals, it has long been held, that if the hospital be spiritual, the bishop shall visit; but if lay, the patron. This right of lay patrons was indeed abridged by 2 Hen. V. cap. 1. which ordained, that the ordinary should visit *all* hospitals founded by subjects; though the king's right was reserved, to visit by his commissioners such as were of royal foundation. But the subject's right was in part restored by stat. 14 Eliz. cap. 5. which directs the bishop to visit such hospitals only, when no visitor is appointed by the founders thereof; and all the hospitals founded by virtue of the stat. 39 Eliz. cap. 5. are to be visited by such persons as shall be nominated by the respective founders. But still, if the founder appoints nobody, the bishop of the diocese must visit. Colleges in the universities were formerly considered by the popish clergy, under whose direction they were, as ecclesiastical, or at least as clerical, corporations; and therefore the right of *visitation* was claimed by the ordinary of the diocese. In some of our colleges, where no special visitor is appointed, the bishop of that diocese, in which Oxford was formerly comprized, has immemorially exercised visitorial authority; which can be ascribed to nothing else but his supposed title as ordinary to visit this, among other ecclesiastical foundations. And it is not impossible, that the number of colleges in Cambridge, which are visited by the bishop of Ely, may in part be derived from the same original. But, whatever might be formerly the opinion of the clergy, it is now held as established common law, that colleges are lay corporations, though sometimes totally composed of ecclesiastical persons; and that the right of *visitation* does not arise from any principles of the canon law, but of necessity was created by the common law. In a disputed case it was held by lord chief justice Holt, that by the common law the office of visitor is to judge according to the statutes of the college, and to expel and deprive upon just occasions, and to hear all appeals of course; and that from him, and him only, the party grieved ought to have redress; the founder having reposed in him so entire a confidence, that he will administer justice impartially, that his determinations are fixed, and examinable in no other court whatsoever.

To this leading case all subsequent determinations have been conformable. But where the visitor is under a temporary disability, then the court of king's bench will interpose, to prevent a defect of justice. Also it is said, that if a founder of an eleemosynary foundation appoints a visitor, and limits his jurisdiction by rules and statutes, if the visitor in his sentence exceeds those rules, an action lies against him; but otherwise, where he mistakes in a thing within his power. Blackst. Comm. book i. p. 480, &c.

Among the Romanists, the general of each religious order is obliged to visit the several monasteries of his order.

In abbeys, that are chiefs of their orders, there are particular officers, called *visitors*; who are dispatched into all the houses and congregations depending on them, to see that the regular discipline is observed.

In Spain there is a *visitor*, and *inquisitor-general*. The *visitation* of the cloister belongs to the ordinary. At Paris, the parliament *visits* the several prisons and prisoners four times a year.

VISITATION, in a moral and religious sense, is also applied to the afflictions that befal mankind; as coming from the hand of God, to try or prove them. In which sense, the plague, among us, is frequently called the *visitation*.

VISITATION *of the Virgin Mary*, is a feast instituted in memory of the visit paid by the Virgin to Elizabeth, first established by Bonaventure, general of the order of St. Francis, by a decree of a general chapter, comprehending the churches of his own order, held at Pisa in 1263; and afterwards extended to the whole church, by pope Urban IV. in the year 1379, and ordained to be kept on the second of July.

VISITATION is likewise an order of monks founded by Francis de Sales and his mother Chantalia.

VISITORS. See VISITATION, supra.

VISITORS *of the Inquisition*. See INQUISITION.

VISIVE, *visivus*, in the *School Philosophy*, a term applied to the power of *seeing*. See VISION.

Authors are exceedingly divided about the place where the *visive faculty* resides: some will have it in the retina; others, in the choroides; others, in the optic nerve; others, as sir Isaac Newton, in the place where the optic nerves meet, before they come to the brain; and others, in the brain itself.

VISNAGA, in *Botany*. See CARROT and FENNEL.

VISNE, *visnetum*, in *Law*, a neighbouring place, or a place near at hand. See VENUE.

VISPELLIONES, among the Romans, were slaves who could not be manumitted.

VISTAMENTE, in the *Italian Music*, is used to give notice to play or sing quick, briskly, &c.

VISTE, in *Botany*, a name given by some authors to the common white mountain coralloides: it is the Lapland name for the same plant; the rein-deer and many other creatures feeding on it, when all other vegetables are destroyed.

VISTNOU, or VISTNUM, in the *Modern History of Mythology*, a name given in the theology of the Bramins, to one of the three great gods of the first class, which are the objects of worship to the inhabitants of Hindostan: the other two are *Brama* and *Ruddiren*.

According to the VIEDAM, these three gods were created by the Supreme Being, to be his ministers in nature. Brama is represented as the creator, *Vistnou* as the preserver, and Ruddiren as the destroyer of beings. However, there are some sects which maintain, that *Vistnou* is superior to Brama, and that he gave him existence. *Vistnou*, it is said, distributed mankind into three classes, the rich, the poor, and those of middle state; and created many worlds, inhabited by spirits destined for the preservation of other beings. *Vistnou* is most respected in the kingdom of Carnata, Brama in the Mogul empire, and Ruddiren in Malabar. Un. Hist. vol. vi. 8vo.

VISUAL, something belonging to the SIGHT, or SEEING.

VISUAL *rays* are lines of light, imagined to come from the object to the eye. See RAY.

All the observations of astronomers and geometers are performed by means of the *visual* rays, received in at the sights, or pinnulæ, of alhidades.

VISUAL *point*, in *Perspective*, is a point, in the horizontal line, wherein all the ocular rays unite. See POINT.

Thus, a person standing in a straight long gallery, and looking forwards; the sides, floor, and cieling, seem to meet, and touch one another in a point, or common centre.

VISUAL *angle*. See ANGLE.

VISUAL *line*. See LINE.

VISUM. See HABERE *facias visum*.

VITA, *life*. See LIFE.

VITA, *cui in*. See CUI.

VITÆ, *aqua*. See AQUA.

VITÆ, *arbor*. See TREE *of life*.

VITÆ, *lignum*. See GUAIACUM.

VITA *longa*, a name given by some botanical authors to the *piper Æthiopicum*, or Æthiopian pepper.

VITAL, *vitalis*, in *Anatomy*, something that ministers principally to the constituting or maintaining of life in the bodies of animals.

Thus, the heart, lungs, and brain, are called *vital* parts.

VITAL *functions*, or *actions*, are those operations of the *vital* parts whereby life is affected; so as that it cannot subsist without them.

Such are the musculous action of the heart; the secretory action in the cerebellum, the respiratory action of the lungs; and the circulation of the blood and spirits through the arteries, veins, and nerves. See FUNCTION and ACTION.

VITAL *principle*, or *substance*, denotes a kind of agent or instrument, supposed by Dr. Grew to be employed under the direction and in subordination to the will of the Creator, in the production of plants, animals, &c.

This principle corresponds to the PLASTIC nature of Dr. Cudworth. The supposed existence of these principles produced a dispute between M. Bayle and M. Le Clerc, which the former conceived to favour atheism, though he allows that neither Dr. Cudworth, nor Dr. Grew, were aware of the consequence; but the latter maintains, that the plastic or *vital* natures, admitted by these writers, cannot in the least favour the atheists, because they are only instruments in the hand of God, and have no efficacy but what they receive from him, who directs and rules all their actions. Of this dispute Dr. Warburton observes, that Cudworth's plastic life of nature is fully overthrown by Bayle, whose superiority in the controversy with Le Clerc is clear and indisputable. See Grew's Cosmologia Sacra, fol. 1701. p. 31, &c. and Cudworth's Life, prefixed to Birch's edition of the Intellectual System, vol. i. p. 15, &c.

VITAL *spirits* are the finest and most volatile parts of the blood. See SPIRITS.

VITALBA, in *Botany*, a name given by some authors to the viorna, or TRAVELLER's *joy*.

VITALIA, a name given by some authors to the cardiac medicines.

VITALIS, in *Botany*, a name given by some authors to the common telephium, called in English *orpine*, and live-long, from its quality of living and flourishing a long time after it is taken from the root.

VITELLIANI, in *Antiquity*, a kind of tablet, or pocket-book, wherein people anciently used to write down their ingenious, humorous, and even wanton fancies and impertinencies: the same with what, in English, we may call a *trifle-book*. See Martial, lib. xiv. epig. 8.

Some will have them to take their name from *vitellus*, a yolk of an egg; because the leaves were rubbed therewith. Others derive the name from one *Vitellius*, their inventor.

VITEX, in *Botany*, a genus of the *didynamia angiospermia* class. For the characters, &c. see AGNUS *castus*.

VITI *chorea*. See VITUS's *dance*.

VITIFERA, in *Ornithology*, a name by which many have called the common œnanthe, a bird well known in England by the name of the WHEAT-*ear*.

VITILIGO, a disease frequent among the Arabians: it is the same with what is otherwise called ALPHOS.

VITIS, in *Botany*. See VINE.

VITIS *idæa*. See WHORTLE *berry*.

VITISALTUS, a word used by some medical writers for the VITUS's *dance*.

VITRAGO, in *Botany*, a species of plants, resembling that of which the glass is made. It is otherwise called HELXINE.

VITREA *tabula*, a name given by some authors to the internal table of the cranium.

VITRESCIBLE, or VITRIFIABLE, formed of *vitrum*, *glass*, is a denomination applied to all stones which, joined to alkaline salts, can form glass. In the present century those stones, which had before been called *vitrescible*, were called siliceous by Mr. Pott, and after him by Mr. Cronstedt. See STONE.

VITREUS *humor*, or *vitreous humour*, in *Anatomy*, denotes the third or glassy humour of the eye; thus called from its resemblance to melted glass. It lies under the crystalline; by the impression of which, its fore-part is rendered concave. It greatly exceeds in quantity both the aqueous and crystalline humours taken together, and consequently occupies much the greatest part of the cavity of the globe of the eye. It is solid, gelatinous, very pellucid, and without colour, except in the fœtus; consisting principally of a congeries of lymphatic vessels, which are derived from the numerous vessels of the internal lamina of the choroides. Scheiner says, that the refractive power of this humour is a medium between those of the aqueous, which does not differ much from water, and of the crystalline, which is nearly the same with glass. Hawksbee makes its refractive power the same with that of water, and, according to Robertson, its specific gravity agrees nearly with that of water.

The *vitreous* humour is contained in a very fine membrane or coat, denominated, from its situation, *tunica vitrea*, and from the delicacy of its texture ARACHNOIDES; the internal lamina of which not only invests the surface of this humour, as its external lamina does the crystalline; but it dips down, insinuates itself into the substance of the *vitreous* humour, and is separated into a variety of distinct cells or bags, in which are deposited different portions of this humour. This tunic is rendered visible, by putting the whole of the humour into a glass of clear water; but its distinct cells cannot be made visible without the assistance of an acid liquor to coagulate it. It is grooved on its surface, in a variety of places, for the reception of the processus ciliares.

For the office of the *vitreous* humour, see VISION.

VITRIFICATION, or VITRIFACTION, the act of converting a body into glass, by means of fire.

Of all bodies, sand, flints, and pebbles, with alkaline salts, *vitrify* the most easily: accordingly, it is of these that GLASS is principally made.

Vitrification is performed by fusing pure and elementary earth, which makes the principal basis of all *vitrifications*, and is, therefore, called vitrifiable earth, with certain very fusible substances, that are capable of uniting intimately with this earth, and of communicating to it some of their fusibility: these substances are the inflammable principle or phlogiston, and several saline matters.

And as all compound bodies partake of the properties of their component parts, factitious crystals ought to partake so much more of the properties of inflammable and saline matters, and ought to be removed so much more from those of pure vitrifiable stones, as they contain a larger quantity of those matters. Accordingly glass is so much more perfect, as it possesses more of the properties of vitrifiable earth. If we could, therefore, produce a fire sufficiently intense, and had furnaces and vessels capable of sustaining it, we should make glass equal to the precious stones: whence it is evident, that the most important object in *vitrification* is to have furnaces capable of producing the greatest heat, and pots or crucibles capable of resisting, during a long time, this heat, and also the action of the vitrescent matter they contain. See *Glass-house* FURNACE, and *Glass*-POTS.

The FLUXES proper for the process of *vitrification* are, as we have observed, the inflammable and the saline. In order to obtain the inflammable principle, choice must be made of such substances with which it is found naturally combined; and these are particularly metallic earths, which are best adapted for conveying phlogiston into vitreous compositions; and of all metallic earths, that of lead is fittest for the purpose. This metal, which contains a large portion of phlogiston, is quickly deprived of so much of it, that it loses its metallic state, and is easily melted into a transparent vitreous mass; but it has, at the same time, this remarkable property, that when once it has lost as much phlogiston as is necessary to dispose it to *vitrification*, its calx strongly retains as much of it as is necessary to give to it its greatest degree of vitrescibility; and that it may be sooner dissipated into vapours by the continued action of a very intense fire, that it can be changed into an earth totally dephlogisticated, and consequently refractory, like the calxes of tin, and of regulus of antimony. Besides, the fusible earth of lead is one of those that retain the least colour. All these qualities render it preferable to any other metallic earth for the purposes of *vitrification*.

In whatever manner the calx of lead has been prepared, provided it be ready in a calcined, and not in a metallic state, it may be used in *vitrification*. Accordingly, the grey calx, or ashes of lead, massicot, red lead, litharge, ceruse, and all the precipitates of lead, separated from acids by unmetallic intermediate substances, being mixed with sand, or any other vitrifiable stone, and exposed to a sufficient degree of fire, do always promote the fusion of these matters, and form with them glasses more or less hard and transparent, according to the strength of the fire, and the proportion of the ingredients. See GLASS *of lead*.

The saline matters, fit for *vitrification*, are fixed alkalis, vegetable and mineral; nitres, with basis of fixed alkali; sedative salt and borax; fusible salt of urine, or rather phosphoric acid. The fixed alkalis, vegetable and mineral, are most frequently used: these are fusible with a moderate heat; they are so fixed, that they can resist, during a sufficient time, the heat of ordinary *vitrification*; and they act powerfully upon flints, sands, and other vitrifiable stones.

The proportion of alkali to sand, in order to make good glass, is, from one to two parts of the former ingredient, and two parts of the latter. Borax, sedative salt, and the fusible salt of urine, which may be melted, without any earthy addition, into transparent vitreous masses, and, therefore, contain a larger portion of the earthy principle than nitre or fixed alkali, do nevertheless very powerfully promote the *vitrification* of other substances. They are not employed in the manufacture of large quantities of glass, because they are too dear. Borax, however, is sometimes used for making small quantities of some particular kinds of fine glass. Arsenic may also be enumerated among vitrifying fluxes, as it is fusible and vitrescible singly, and is also capable of promoting the fusion of vitrifiable earths; for which purpose it is frequently employed as an ingredient in vitreous compositions. As arsenic partakes both of the metallic and saline properties, it probably acts in *vitrification* both as a salt and a metallic earth; and the quantity necessary to promote *vitrification* is, therefore, intermediate betwixt the quantities of calx of lead, and of saline substances, that are necessary for the same purpose.

Arsenic cannot well be employed as the sole flux for vitrifiable earth: nitre should be added to the ingredients of the glass, and thus the arsenic uniting with the alkaline basis of the nitre, forms the neutral arsenical salt, in which the arsenic is considerably fixed. But as this neutral arsenical salt is easily decomposed by contact of phlogiston, therefore no calx of lead, or other substance containing the inflammable principle, ought to be mixed with arsenic in the composition of glass. Arsenic is also very difficultly manageable in *vitrification*, on account of its property of powerfully corroding and pervading crucibles and pots.

From Mr. Pott's experiments it is known, that vitrifiable, calcareous, and argillaceous earths, each of which are singly unfusible, do reciprocally promote the fusion of each other, when mixed together nearly in equal proportions, and exposed to a very violent heat; and that from

from these mixtures matters perfectly vitrified are formed. But the cause of this singular fusibility not being known, it is not determined whether it is produced by a phlogistic or by a saline substance, or by both. Dict. Chem. art. *Vitrification*. See Glass.

Gold held, by M. Homberg, near the focus of the duke of Orleans's large burning concave mirror, at first smoaked, then changed, all of it that did not go off in fumes, into glass, of a deep violet colour. This glass of gold weighs less than gold. Memoirs of the Royal Academy, 1702.

All metals, and even almost all natural bodies, sufficiently heated, vitrify; and this *vitrification* is the last effect of the fire: after which, the most intense heat of the largest burning-glass will make no farther alteration.

VITRIOL, *vitriolum*, in *Chemistry*, a saline, crystalline concrete, composed of metal, united with a certain acid, called the *vitriolic* Acid.

Some take the word *vitriolum* to be used *quasi vitri oleum*, because of its shining colour; but Menage rather derives it *à vitreo colore*: the Latins call it *atramentum sutorium*; and the Greeks, *chalcanthus*.

Vitriol is defined, by Boerhaave, a saline, metallic, transparent glebe; dissoluble in water, and fusible and calcinable by fire.

It acquires different names, according to the different places where it is dug; and the *vitriols* of those, also, differ from each other in denomination and colour; some being *white*, others *blue*, and others *green*.

Roman and Cyprus *vitriol*, for instance, is blue; and that of Sweden and Germany, commonly called English *vitriol*, is green; besides which there is also a white kind, called Goslar *vitriol*.

M. Geoffroy the elder, observes, that they all consist of an acid salt, like that found in alum and sulphur; excepting that in alum the acid is mixed with an absorbent earth, or calx: in sulphur, it is united with certain fatty, bituminous parts; and in *vitriols*, with metallic parts.

According to Boerhaave, *vitriol* consists of a metallic part, with a sulphur adhering, a menstruous acid, and water. In *blue vitriol*, the metal wherewith the acid, &c. is joined, is copper. In *white vitriol*, it is combined with zinc. In *green vitriol*, the acid is joined with iron.

In five ounces of *green vitriol* M. Geoffroy the younger has found two of water, two of iron, and one of acid. Vide Hist. Acad. Roy. Scienc. an. 1728. p. 45.

According to the analysis of sir Torbern Bergman, (Essays, by Cullen, vol. i. p. 180.) 100 parts of blue *vitriol*, or vitriolated copper, crystallized, contain 26 of copper, 46 of vitriolic acid, and 28 of water. According to Kirwan, 100 parts contain 30 of real acid, 27 of copper, and 43 of water. The taste is acescent, æruginous, and caustic; it calcines in heat; one part, in a moderate heat, requires nearly 4 parts of water, but much less of boiling water. Of white *vitriol*, or vitriolated zinc, 100 parts contain 20 of zinc, 40 of vitriolic acid, and 40 of water. According to Kirwan, 100 parts contain 22 of acid, 20 of zinc, and 58 of water. In a moderate heat, one part requires more than two of water, but much less of boiling water. Its taste is acescent, astringent, and caustic. Of green *vitriol*, or vitriolated iron, 100 parts contain 23 of iron, 39 of vitriolic acid, and 38 of water. According to Mr. Kirwan, 100 parts of it recently crystallized, contain 20 of real acid, 25 of iron, and 55 of water: in moderate heat one part requires six of water, but three-fourths of boiling water. In heat it splits into a yellow powder; in the fire into a ferruginous powder: the taste is acescent, styptic, and caustic.

In order to conceive the formation of *vitriol*, e. g. the *green vitriol*, the reader will consider, that sulphur is composed of an acid and phlogiston; and that iron is also composed of an earth and phlogiston. During the fermentation of a mass of sulphur and iron, the phlogiston, or inflammable part of them both, is dispersed, and leaves the acid of the sulphur and the earth of the iron; and the union of these constitutes the salt in question. That this is a true explanation of the origin of this salt, will appear evident from the following consideration. If into a quantity of the acid procured from the burning of sulphur, you put a piece of iron, the iron will be wholly dissolved in the acid; and if you saturate the acid with iron, and then evaporate and crystallize the solution, you will obtain a *green vitriol*, similar, in every respect, to that obtained from the residue abovementioned.

The decomposition, or analysis of *green vitriol*, will farther prove, that it consists of the acid of sulphur united to iron, or more properly to the earth of iron. If you put sixteen ounces of fresh *green vitriol* into a retort, and distil them till nothing more can be forced into the receiver, by the utmost violence of a long continued fire, you will find in the receiver about eleven ounces of an acid liquor, smelling very strongly of sulphur; and in the retort you will find about five ounces of an earth, of a deep red or purplish colour. The acid liquor, by combining it again with iron, may be made into *vitriol*; and the earth, by being properly melted in conjunction with any matter, which will restore to it its inflammable principle, may be made into iron. The proportionable quantities of acid and earth, procurable from *green vitriol* by distillation, are expressed in terms rather indefinite, because that proportion is somewhat variable in different *vitriols*.

It is well known, that natural combinations of iron and sulphur are subject to the same spontaneous changes observable in the artificial mixtures of these substances; and hence we may clearly apprehend the manner in which those substances that are called *native vitriols* are formed in mines and other subterraneous cavities. The pyrites existing in these places being naturally decomposed by the sulphur's parting with its phlogiston, the water, which is always dripping in mines, dissolves the *vitriol* generated in the decomposed pyrites; and being afterwards evaporated, either by the heat, or the current of air subsisting in the mine, the *vitriol* is found in its crystalline form, either projecting like circles from the top and sides of the mine, or lying in cavities at its bottom. The crystals of *native vitriol* are more or less regular, according to the circumstances attending the evaporation of the water, and they are of different colours, according to the quality of the pyrites; for, together with the sulphur and iron, the chief constituent parts of the pyrites, there is sometimes combined copper, and other metallic matters, which being dissolved by the acid of the sulphur at the same time that the iron is dissolved, a mixed *vitriol* is produced, the colour of which is sometimes whitish; but more generally it consists of different shades of green and blue.

Native vitriol is often met with in our coal-mines. From an old cannel coal-pit, near Wigan in Lancashire, Dr. Watson procured a considerable quantity of it, very well crystallized; and Dr. Rutty has observed, that the vitriolic water at Haigh in Lancashire, is the strongest in Britain, yielding 1920 grains of *vitriol* from a gallon of water. See Vitriolic *waters*.

Vitriol is very commonly called by the manufacturers copperas; accordingly, we constantly hear of green, blue, and white copperas. The constituent parts of the different kinds of *vitriols* were not understood by the ancients so well as they are at present: they seem to have had an idea, that copper was the basis of them all: hence the Greek term for *vitriol*, *chalcanthos*, the efflorescence of copper, and the Latin one, *cuperosa*, or *cupri rosa*, the flower or efflorescence of copper; from which, says Dr. Watson, the French *couperose*, and our copperas, are evidently derived. See Cabrusi.

Some moderns take the chalcitis, or *chalcanthum* of the ancients, which they supposed to be a *native vitriol*, that had acquired, according to their opinion, its full perfection in the entrails of the earth, and which is a kind of mineral stone, of a reddish colour, to be the same with that *chalcanthum* brought from Sweden and Germany; the best whereof is of a brownish red colour, and a vitriolic taste, and dissolves easily in water; and when broken, is of the colour of shining copper. See Vitriolic *minerals*.

The *vitriols* which nature prepares are never to be met with in commerce; they serve to adorn the cabinets of the curious, but they are neither sufficiently pure for the purposes to which common *vitriols* are applied, nor are they found in sufficient quantities to answer the demand which is made for them.

Vitriol, *the white*, or *vitriol* of zinc, is found native in the mines of Goslar, sometimes in transparent pieces, more commonly in white efflorescences; which are dissolved in water, and crystallized into large irregular masses, somewhat resembling fine sugar; it is also found dissolved in mineral waters, and generally with some proportion of the *vitriol* of iron and copper: it is in taste sweetish, nauseous, and styptic.

It has been disputed, whether *white vitriol* is any thing else than *green vitriol* calcined. But it seems that *white vitriol* is of a quite different species from either the green or the blue *vitriols*. See Geoffroy, Mat. Med. tom. i. p. 124.

In the condition in which *white vitriol* is usually bought, it contains somewhat both of copper and iron; but being purified by solution, filtration, and crystallization, it is freed from both these metals, and appears to be a native *vitriol sui generis*. See Cramer, Elem. Art. Docim. vol. i. p. 302. ed. 2. Med. Ess. Edinb. Abr. vol. ii. p. 472.

If four ounces of alum be put in concoction with two parts of *cadmia fossilis* pulverized, the earth of the alum precipitates, and its acid takes hold of the earth of zinc, so that a true *white vitriol* is the result.

This *vitriol* being precipitated by an alkaline ley, and dried, after its salts are separated in water, and then mixed with charcoal-dust, it will give ZINC.

The same thing happens in mixing *vitriol* of iron with two or three parts of lapis calaminaris; but the operation is easier with alum and *vitriol* of copper. Marggraaf, in Mem. de l'Acad. de Berlin, 1746.

The *white vitriol* requires little more than twice its weight of water to dissolve it in the temperature of 60°; its specific gravity is about 2,000. It mixes uniformly with vitriolic neutral salts, but precipitates nitrous or marine selenites from their solutions, which ascertains its acid principle: it is itself precipitated whitish by alkalis and earths, but not by iron, copper, or zinc, which sufficiently indicates its basis: if it contains any other metallic principle, this may be precipitated by adding more zinc, except iron, which will of itself precipitate by exposure to the air, or boiling in open air. That in common use is mostly prepared at Goslar, from an ore, which contains zinc, copper, and lead, mineralized by sulphur and a little iron: the copper ore is first separated as much as possible, and the residuum, after torrefaction and distillation, is thrown red-hot into water, and lixiviated: it is never free from iron.

The common *white vitriol* of the shops contains a quantity of ferruginous matter; of which, in keeping, a part is extricated from the acid, in an ochery form, so as to tinge the mass of a yellow hue. On dissolving the whitest pieces in water, a considerable portion of ochre immediately separates: the filtered solution, transparent and colourless, becomes again turbid, and yellow, on being made to boil, and deposits a fresh ochery sediment; and a like separation happens, though much more slowly, on standing without heat. Hence, when the solution is evaporated to the usual pitch, and set to crystallize, the crystals generally prove foul; unless some fresh acid be added (as an ounce of the strong spirit or oil of *vitriol* to a pound of the salt) to keep the ferruginous matter dissolved: this addition secures the whiteness of the crystals, and prevents their becoming soon yellow in the air. *White vitriol* generally contains also a small portion of copper, distinguishable by the cupreous stain which it communicates to polished iron immersed in solutions of it, or rubbed with it in a moist state. The quantity of copper is, indeed, very small, and may, if it be thought necessary, be separated by boiling the solution for some time, along with bright pieces of iron, which will extricate all the copper: by continued or repeated coction, the greatest part of the ferruginous matter may also be separated. For the use of *white vitriol* in medicine and surgery, see VITRIOL, in *Medicine*, infra.

VITRIOL, *blue*, or *vitriol* of copper, is commonly called Roman or Cyprian *vitriol*, or blue-stone. After being long exposed to the air, it degenerates into a mixture of blue and rusty yellow. It requires about four times its weight of water to dissolve it in the temperature of 60°. Its specific gravity is about 2,23. This salt rarely occurs crystallized, but is often found naturally dissolved in water, in Hungary, Sweden, and Ireland; from which water *blue vitriol* is generally prepared, by evaporating the water to a proper standard; after which it is let out into coolers, where it shoots into regular and beautiful crystals of a rhomboidal form. See ZIMENT *water*.

It is also occasionally extracted from sulphurated copper ores after torrefaction, by the application of water, or washed out by rain or subterraneous waters. Mr. Cronstedt says, it is seldom free from iron and zinc. If a piece of clean polished iron be dipped into the solution of this salt, it will almost immediately be covered with a cupreous coat: this, together with the deep blue colour arising from mixing it with a volatile alkali, discovers its basis; as its uniform mixture with other vitriolic salts does its acid. Hence it also appears, that the acid of *vitriol* has a greater affinity with iron than with copper, because it quits copper to unite itself with iron. This fact explains, in a very satisfactory manner, the nature of that transmutation of iron into copper, which was formerly considered as a perplexing phenomenon. Agricola speaks of waters in the neighbourhood of Newsol, in Hungary, which had the property of transmuting the iron which was put into them into copper. In the year 1673, our countryman, Dr. Brown, visited a famous copper-mine at Herrn-Grundt, near Newsol; and he informs us, that he there saw two springs, called the old and new ZIMENT, which turned iron into copper. The iron in this case is taken up by the water, and remains suspended in it, in the place of the copper; so that this transmutation is nothing but a change of place; and as the copper is precipitated by the iron, so the iron might be precipitated by pot-ash, or any other substance which has a greater affinity with the acid of *vitriol* than iron has.

The cause of the impregnation of these copper waters in Germany is not difficult to be explained. Most copper-ores contain sulphur, and when the sulphur is in any degree decomposed, its acid unites itself to the copper, and forms *blue vitriol*, which is the substance with which the waters issuing from the copper-mines are impregnated. The copper contained in these waters has been for some centuries collected in Germany, by putting old iron into pits filled with the coppery water; and thus the iron is dissolved, and the copper is precipitated, and being raked out in the form of mud, it is afterwards melted into very fine copper. The quantity of copper procured by an hundred tons of iron amounts sometimes to ninety tons, and seldom to less than eighty-four. Of late years some successful attempts of this kind have been made in Engladd and Ireland. See COPPER.

In the isle of Anglesey, near Paris mountain, which abounds in copper ore, the water in which the roasted ore is washed is so strongly impregnated with copper, that they have found it useful to adopt the German method of precipitating it by means of old iron, and they have obtained in one year near a hundred tons of copper, precipitated from this water. The water, after the copper has been precipitated by means of iron, is at present thrown away; whereas, by evaporation, it would yield *green vitriol*; and as above a hundred tons of iron must be employed in obtaining the forementioned quantity of copper, Dr. Watson suggests, whether a manufactory of *green vitriol* might not be established at this and at all other places where copper is obtained by precipitation. One hundred tons of iron would yield, at the least, two hundred tons of *vitriol*, which, at the low price of three pounds per ton, would defray the expence of extracting it; more especially as the watery solution might be evaporated by a proper application of part of that heat, which is now lost in all the great smelting houses.

The greatest part of the *blue vitriol*, now met with in the shops, is prepared in England, by artificially combining copper with its sulphur or its acid. The method of making the preparation by the glass-makers is this: take little thin pieces of brass, and lay them *stratum super stratum* in a crucible, with powder of brimstone. When the vessel is full, set it luted and covered in an open wind furnace, with burning coals over it, and let it stand two hours; then let the furnace cool of itself, and take out the crucible, the mass within will be of an obscure blackish purple; powder it and sift it fine, and then mixing with every pound of it six ounces of powdered brimstone, take a round vessel of earth, that will bear the fire, place it upon iron bars set across in an open wind-furnace, fill it with coals, and then put in the powder; keep it burning and stirring about till all the brimstone is burnt up; then take out the pan, and powder the calcined mass again; sift it fine, and proceed with it thrice as before; the last time let it stand on the fire till it become red. Put a pound of this calcined copper into a glass body, with six pints of water; evaporate two pints or thereabout in a sand heat; the water is then of a fine blue, and must be poured off clear; then filtrate it. Evaporate the water from the remaining sediment of copper left in the glass, and with new sulphur calcine it again and again; repeat this five or six times, and extract the blue tincture with water as before; filtrate all the waters, and put them together. Evaporate all to a fifth part, or thereabouts, and set it in a cool place, and fine pointed crystals will be formed, resembling emeralds; separate these crystals, and evaporate the water again, till all the crystals be procured. Then put a pound of them into a glass retort, well luted, and fitted to a capacious receiver; let the joints be well closed, and make a moderate fire for four hours; then make it violent for twenty hours, or till no more white fumes arise. The next day open the receiver, and separate the liquor into a glass, where it must be kept carefully sealed up. Neri's Art of Glass, p. 50.

Very great things are to be done in the glass art by means of this liquor; the remainder in the retort, exposed to the air for a few days, will acquire a blue colour, and this, mixed with zaffer, will give glass a fine sea-green.

The *vitriol* of copper is of an elegant sapphire blue colour; hard, compact, and semitransparent; when perfectly crystallized, of a flattish, rhomboidal, decahedral figure; in taste extremely nauseous, styptic, and acrid. Exposed to a gentle heat, it first turns white, and then of a yellowish red, or orange colour; on increasing the fire, it parts, difficultly, with its acid, and changes at length to a very dark red calx, reducible, by fusion with inflammable fluxes, into copper.

Some writers hold *vitriol* to be the root or matrix of cop-per;

per; becauſe, in the copper-mines, they never dig deeper than the glebe, out of which the *vitriol* is drawn. For the uſe of *blue vitriol* in medicine, &c. ſee Vitriol, in *Medicine*.

Vitriol, *green*, or *vitriol* of iron, is commonly called Engliſh *vitriol*, or copperas; and it is the Roman *vitriol* of the Italian writers. This *vitriol* is of a greeniſh colour, when perfectly and recently cryſtallized, but effloreſces by expoſure to the air, and becomes yellowiſh; it requires ſix times its weight of water to diſſolve it in the temperature of 60°. Its acid is known by this, that the ſolution of this ſalt mixes without turbidity with the ſolutions of other ſalts that contain the vitriolic acid, as Epſom, ſelenite, tartar vitriolate, &c. but renders the ſolutions of nitrous or marine ſelenite turbid; and its baſis is known by the black colour which the ſolution of galls, or vegetable aſtringents, immediately produce in its ſolution. It is frequently found native, either in coal mines, or in the cavities of pyritaceous mines, or adhering to the ſcaffolds in a ſtalactitical form; and alſo in ſmall round ſtones, called ink-ſtones, of a white, red, grey, yellow, or black colour, which are almoſt entirely ſoluble in water, and contain a portion of copper and zinc; but the greateſt part of that in uſe is prepared from the martial pyrites or mundic. *Vitriol* is formed in theſe ſtones by expoſing them a long time to the action of the air and moiſture, or by torrefaction in open air, and ſubſequent expoſure to its action, which operation in ſome caſes muſt be often repeated, according to the proportion of ſulphur, and nature of the earth: the calcareous pyritæ are thoſe in which it is moſt eaſily formed, and they effloreſce the ſooneſt; good pyritæ, properly treated, yield about two-thirds of their weight of *vitriol*.

The common *green vitriol* is made at Deptford, near London, and other places, from a ſpecies of the pyrites found on Sheppey iſle, the iſle of Wight, and various other parts of the Eſſex, Kentiſh, Suſſex, and Dortſetſhire coaſts. Large quantities of the pyrites are laid in heaps in the open air, on beds properly prepared; in half a year, a year, or two years, ſooner or later, according to its quality, the pyrites acquires a ſpontaneous heat; that heat, without being increaſed to ſuch a degree as to fire the pyrites, inſenſibly diſperſes the inflammable principle of the ſulphur, one of the conſtituent parts of the pyrites: the acid of the ſulphur, thus diſengaged from the inflammable principle, unites itſelf to the other principal conſtituent part of the pyrites, the iron, and forms *green vitriol*. The *vitriol*, thus formed, is waſhed from the bed of pyrites by the rain: the rain-water, which has diſſolved the *vitriol* of the pyrites, cannot ſink into the earth, becauſe the bed on which the pyrites is ſpread is formed of clay; and being made, moreover, in a ſloping poſition, the diſſolved *vitriol* runs into receptacles properly placed to receive it, and being boiled with old iron, till it is of a proper conſiſtence, it is run off into coolers, and left to cryſtallize. After the formation of the cryſtals, there remains a thick, reddiſh, unctuous, ſtyptic, and aſtringent liquor, which M. Geoffroy calls *eau mere de vitriol*, and which we call *mother of vitriol*, as containing all the principles of *vitriol*, though diſunited: this liquor is ſometimes boiled, and evaporated again. In the original liquor, of which *vitriol* is made from the pyrites, there is contained a white, acid, pungent ſalt. This is ſeparated from the mother liquor or brine, when no more *vitriol* will ſhoot, and is called by the chemiſts the saline *principle of vitriol*.

Vitriol may be made without the uſe of old iron; but the liquor which drains from the pyrites being often not ſaturated with iron, the iron is added to ſaturate the acid, and at the ſame time to purify it from any particles of copper which it may happen to contain: by this means a pure iron *vitriol* is obtained, which is known in commerce under the name of Engliſh *vitriol*. The quantity of old iron, in ſome works, amounts to two hundred weight in making a ton of *vitriol*.

Much after the ſame manner *vitriol* is made from the pyrites found among coal: there are manufactories of it near Wigan, at Whitehaven, at Newcaſtle upon Tyne, and in ſeveral other parts of the kingdom. But all the *vitriol* works have ſunk in value of late years; the home conſumption of *vitriol* being much diminiſhed, ſince the acid, which uſed to be procured from the diſtillation of *vitriol*, has been obtained from the burning of ſulphur.

It is not eaſy to determine when this method of making *vitriol* was introduced into England. In the beginning of the reign of queen Elizabeth, a patent was granted to Cornelius Devoz for making alum and copperas; but it was not till towards the end of the laſt century, that this art of making *vitriol* was brought to ſo great a perfection as to enable us to export any of it; and indeed Dr. Campbell (Surv. of Brit. vol. ii. p. 21.) aſſures us, that at the latter end of the laſt century we imported annually about five hundred tons of *vitriol*, and that we now export upwards of two thouſand tons. It appears from ſir Charles Whitworth's Regiſter of Trade, N° 1. that there were exported, from the port of London alone, near four hundred tons of copperas in three months, in 1776. A ſmall quantity of *vitriol*, perhaps to the annual amount of fifty or ſixty tons, is ſtill imported into England; ſome particular dyers, and other artiſts, being of opinion, that the foreign *vitriol*, as containing a little copper, is more uſeful to them than the Engliſh *vitriol*. It may be eaſily known whether *green vitriol* contains any copper, by only rubbing the *vitriol* to be examined upon a moiſtened piece of poliſhed iron; for if there is any copper in its compoſition, the iron will be changed into a copper colour.

Vitriol is alſo prepared from mineral waters that hold copper in ſolution, which is precipitated by iron; this ſolution of iron is afterwards cryſtallized, and always retains ſome copper. In Hungary it is prepared from pyritaceous ſhiſtus, and in many places from a ſpecies of calamine: the *vitriol* of Goſlar commonly contains a portion of zinc, as that of Hungary and Saxony does of copper: the Engliſh and French *vitriols* are purer, and yet ſometimes contain a ſmall proportion of alum. Turf and peat are ſometimes impregnated with *vitriol*; other earths alſo often contain *vitriol* and alum. This *vitriol* is ſometimes found of a white colour on the borders of the mineral lakes of Tuſcany.

Pure *vitriol* of iron is conſiderably tranſparent, of a fine bright, though not very deep, graſs-green colour; of a nauſeous, aſtringent taſte, accompanied with a kind of ſweetiſhneſs. Diſſolved, and ſet to cryſtallize, it ſhoots into thick rhomboidal maſſes, a part generally riſing at the ſame time in effloreſcences about the ſides of the veſſel. The ſolution depoſits, in ſtanding, a conſiderable quantity, and in boiling a much larger one, of the metallic baſis of the *vitriol*, in form of a ruſty calx or ochre: iron ſeems to be the only metallic body that thus ſeparates ſpontaneouſly, in any conſiderable quantity, from the vitriolic acid. On expoſing the *vitriol* itſelf to a moiſt air, a ſimilar reſolution happens on its ſurface; which, ſooner or later, according as the acid is more or leſs ſaturated with the metal, changes its green to a ruſty hue. In a warm dry air, it loſes a part of the phlegm, or water, neceſſary to its cryſtalline form, and falls by degrees into a white powder. Expoſed to a gentle fire, it liquefies and boils up; but ſoon changes, on the exhalation of the watery part that rendered it fluid, to a ſolid, opake, whitiſh, or grey maſs: this pulverized, and urged with a ſtronger fire, continues to emit fumes, becomes yellow, being the *vitriolum calcinatum* of the London and Edinburgh Diſpenſatories; afterwards red, and, at length, having parted with moſt of its acid as well as phlogiſton, turns to a deep purpliſh-red calx, called colcothar *of vitriol*, and the *chalcitis factitia* of the Paris Pharmacopœia, revivable by inflammable ſubſtances into iron. This *colcothar* is ſold at Paris for ten-pence a pound, and uſed for giving the laſt poliſh to plate-glaſs, at the great manufactory in the ſtreet St. Antoine. The plate of glaſs when firſt caſt is an inch thick; its aſperities are ground away with a coarſe kind of grit-ſtone, with ſand and emery, of different degrees of fineneſs, and it is at laſt poliſhed by colcothar. Dr. Watſon ſuggeſts to the proprietors of the plate-glaſs manufactory, near Preſcot, in Lancaſhire, and to the patentees for poliſhing marble, at Aſhford, in Derbyſhire, that colcothar, which is very cheap, might perhaps render the uſe of putty, or calcined tin, leſs neceſſary. From the colcothar of *vitriol*, is prepared the ens *veneris*.

From the *green vitriol* the *vitriolic* acid has been generally extracted; by diſtilling the calcined *vitriol* in earthen long necks, with a ſtrong fire continued for two days or longer; though it is now moſtly obtained by collecting the vapour of burning ſulphur. See *Spirit* of Sulphur, and Concentration.

The diſtilled ſpirit appears of a dark blackiſh colour, and contains a quantity of phlegm, greater or leſs, according as the *vitriol* has been leſs or more calcined. On committing it a ſecond time to diſtillation, in a glaſs retort placed in a ſand-heat, the phlegmatic parts riſe firſt, together with a portion of the acid, and are kept apart under the name of *ſpirit*, or *weak ſpirit of vitriol*, *ſpiritus vitrioli tenuis* of the London Diſpenſatory: at the ſame time the remaining *ſtrong ſpirit*, or *oil*, as it is called, loſes its black colour, and becomes clear; in which ſtate it is the *acidum vitriolicum* of the Edinburgh Diſpenſatory, and the *ſpiritus vitrioli fortis* of that of London; and this is the uſual mark for diſcontinuing the rectification.

The college of Edinburgh now directs a weak vitriolic acid of more certain ſtrength, made by mixing one part of the ſtrong acid with ſeven parts of water: this is called

called *acidum vitriolicum tenue*, vulgo *ſpiritus vitrioli tenuis*. Mr. Boyle (Works abr. vol. i. p. 142.) informs us, that if the caput mortuum, after the diſtillation of the *oil of vitriol*, be ſuffered to lie for a conſiderable time in the air, it will be ſo impregnated with new ſaline particles, as to be worth a ſecond diſtillation. The ſtrong acid, or *oil of vitriol*, is the moſt ponderous of unmetallic fluids, and the moſt fixed of ſaline ones, yielding no ſmell in the greateſt heat of the atmoſphere, and requiring, to make it boil or diſtil, a heat conſiderably greater than that in which lead melts. Expoſed to the air, it imbibes its humidity, ſo as to gain by degrees an increaſe of more than twice its weight. The quantity of water it attracts from the air, in any given time, is not, however, in proportion to its own quantity, but to its ſurface; and Mr. Boyle has found by experiment, that if the ſame quantities be expoſed to the ſame air in glaſſes, in the one of which the ſurface is nine times greater than the other, that with the larger ſurface will gain eighteen grains addition in weight, while the other gains only two grains, and ſo in proportion for any longer time.

When the *oil of vitriol* is fully ſatiated in the moiſteſt air, or wetteſt weather, it afterwards retains or loſes its acquired weight, as the air proves more or leſs moiſt. It may therefore be very practicable to make it a means to eſtimate the moiſture and dryneſs of the air. A very eaſy machine may be contrived to anſwer this purpoſe; for even a common pair of ſcales will do very well; and by a ſcale, on which the tongue of the balance ſhould move, would mark out the ſmalleſt changes in the moſt nice and accurate manner.

If a quantity of *oil of vitriol* be expoſed in a wide-mouthed glaſs, till thoroughly ſated with the moiſture of the air, and then put into a ſcale, and in the moiſteſt weather exactly poiſed with a weight in the oppoſite ſcale, it will only continue exactly poiſed ſo long as the weather continues in that moiſt ſtate; but as the air becomes gradually more and more dry, it will weigh leſs and leſs, and mount, while the ſcale with the weights preponderates and ſinks.

The tongue of a balance of but an inch and half long, thus deſcribes an arch of the third of an inch, by the different riſing and falling of the ſcale in which the *oil of vitriol* is; and conſequently if the tongue were a foot long, it would deſcribe an arch of near three inches, which would be a ſufficient ſpace to mark a ſcale of degrees very nicely upon; and, as the tongue is pointed to theſe, it would be an excellent hygrometer.

This balance may be contrived two ways, either ſuch whoſe pin ſhould be in the middle of the beam, with a very ſlender tapering tongue, of a foot or a foot and a half long, pointed to the diviſions on a broad arched place fixed above; or elſe the ſcale with the liquor may be hung to a point of the beam, very near the pin, and the other extreme made ſo long as to mark a large arch on a board, placed conveniently for that purpoſe; and the ſcale, in either caſe, may very conveniently be a concave glaſs of four or five inches in diameter. On the diviſion of the arches ſhould be inſcribed the different temperature of the air ſhewn by the liquor. Phil. Tranſ. Nº 157.

Oil of vitriol, mixed directly with water, produces a heat ſo great as to render the veſſel intolerable to the hand: glaſs veſſels are apt to crack from the ſuddenneſs of the heat, unleſs the commixture is very ſlowly performed. The moſt ready method of diſtinguiſhing it, in a dilute ſtate, or when mixed with other acids, is by adding a ſolution of ſome calcareous earth, as chalk, made in any kind of acid liquor: this ſolution is, by a minute portion of the vitriolic acid, rendered milky, but ſuffers no change from any other ſpecies of acid. See SELENITES.

This *oil of vitriol* is not always fluid: ſometimes, when it is exceedingly ſtrong, it has been obſerved to become ſolid; and in this ſtate it is denominated *glacial*, or *icy oil of vitriol*. If the long neck, in the extrication of the acid from *vitriol*, happens to crack in the fire, the acid that riſes after this period, called by Stahl *ſpiritus vitrioli volatilis*, is found remarkably changed. It emits in the air ſuffocating vapours like the fumes of burning brimſtone, and riſes in diſtillation with a heat not much greater than that which the hand can bear; to the taſte it diſcovers little corroſiveneſs or acidity. Combined with alkaline ſalts, it loſes its pungent odour; but on the addition of any other acid, it is diſengaged from the alkali, ſo as to riſe again in diſtillation as volatile and ſuffocating as before. It deſtroys or whitens the blue and red colours of the flowers of plants; whereas, in its fixed ſtate, like the other acids, it changes the blue to red, and heightens thoſe which are naturally red. This volatile ſpirit loſes its ſuffocating odour, and reſumes its corroſiveneſs, fixedneſs, and other qualities, by expoſure to the air, which ſeems to carry off the inflammable principle on which its volatility depended. For other preparations of *green vitriol*, and their uſe in medicine, &c. ſee VITRIOL, in *Medicine*.

VITRIOL, in *Medicine* and the *Arts*, has various applications and uſes. *White vitriol* is ſometimes given, from five or ſix grains to half a dram and more, as an emetic, and appears to be one of the quickeſt in operation of thoſe that can be employed with ſafety. Its chief uſe is for external purpoſes, as a cooling reſtringent and deſiccative: a dilute ſolution of it, as ſixteen grains in eight ounces of water, with the addition of ſixteen drops of weak vitriolic acid, or the *aqua vitriolica* of the Edinburgh Diſpenſatory, is an excellent collyrium in defluxions and ſlight inflammations of the eyes; and, after bleeding and purging, in the more violent ones. A ſolution of it with alum, in the proportion of two drams of each to a pint of water, called the AQUA *aluminoſa Bateana*, is uſed as a repellent fomentation for ſome cutaneous eruptions, for cleanſing foul ulcers, and as an injection in the fluor albus and gonorrhœa, when not accompanied with virulence. This *vitriol* is ſometimes likewiſe employed as an errhine, and ſaid to be a very effectual diſſolvent of mucous matters; in which intention it is recommended, in the German Ephemerides, againſt obſtructions of the noſtrils in new-born infants.

Blue vitriol, like the other preparations of copper, acts, in doſes of a few grains, as a moſt virulent emetic. Its uſe is chiefly external, as a detergent, eſcharotic, and for reſtraining hæmorrhages; for which laſt intention a ſtrong ſtyptic liquor is prepared in the ſhops, called AQUA *vitriolica cærulea*. *Blue vitriol* has of late been conſiderably employed as an emetic by ſome practitioners; and is ſaid to be by no means an unſafe one, as it operates the inſtant it reaches the ſtomach, before it has time to injure by its corroſive quality. The peculiar advantage in uſing it is repreſented to be, that it has no tendency to become alſo purgative, and that its aſtringent power prevents the tone of the ſtomach from being impaired after vomiting with it. It is much recommended in the early ſtate of tubercles in the lungs; and the following method of exhibition is directed. (See Simmons on the Treatment of Conſumptions, p. 70.) Let the patient firſt ſwallow about half a pint of water, and immediately afterwards, the *vitriol* diſſolved in a cupfull of water. The doſe may be varied according to age, conſtitution, &c. from two grains to ten, or even twenty; always taking care to begin with ſmall ones. After the emetic is rejected, another half pint of water is to be drunk, which is likewiſe ſpeedily thrown up, and this is commonly ſufficient to remove the nauſea. In ſtill ſmaller doſes, the *blue vitriol* has been much uſed by ſome as a tonic in intermittents, and other diſeaſes.

Pure *green vitriol* is in no reſpect different from the artificial SAL *martis*. It is one of the moſt certain of the chalybeate medicines, ſcarcely ever failing to take effect where the calces, and other indiſſoluble preparations, paſs inactive through the inteſtinal tube. It may be conveniently given in a liquid form, largely diluted with aqueous fluids: two or three grains or more, diſſolved in a pint or quart of water, may be taken in a day, divided into different doſes. This *vitriol* is uſed alſo, eſpecially when calcined, as an external ſtyptic: the STYPTIC of Helvetius, and, as is ſaid, that of Eaton is no other than French brandy impregnated with the calcined *vitriol*; a dram of the *vitriol* is commonly directed to a quart of the ſpirit, but only a minute portion of the dram diſſolves in it. As French brandy has generally an aſtringent impregnation from the oaken caſks in which it has been kept, the *vitriol* changes it, as it does the watery infuſions of vegetable aſtringents, to a black colour; but makes no ſuch change in ſpirituous liquors that have not received ſome aſtringent tincture.

The *acid of vitriol*, or ſulphur, largely diluted, is the moſt ſalubrious of all the mineral acids. It is mixed with watery infuſions, ſpirituous tinctures, and other liquids, as an antiphlogiſtic; as a reſtringent in hæmorrhages; and as a ſtomachic and corroborant in weakneſſes, loſs of appetite, and decays of conſtitution, accompanied with ſlow febrile ſymptoms, brought on by irregularities, or ſucceeding the ſuppreſſion of intermittents by Peruvian bark. In ſeveral caſes of this kind, after bitters and aromatics of themſelves had availed nothing, a mixture of them with the vitriolic acid has taken effect: the form commonly made uſe of is that of a ſpirituous tincture; ſix ounces of *oil of vitriol* are dropt by degrees into a quart of rectified ſpirit of wine; the mixture digeſted for three days in a very gentle heat, and afterwards digeſted for three days longer with an ounce and a half of cinnamon, and an ounce of ginger; this is the *elixir vitrioli* of the Edinburgh Diſpenſatory. Or,

a pint

a pint of an aromatic tincture, drawn with proof ſpirit, is mixed with four ounces of the ſtrong acid, ſo as to form the *acid* ELIXIR *of vitriol* of the London Diſpenſatory: theſe liquors are given from ten to thirty or forty drops, in any convenient vehicle, when the ſtomach is moſt empty. A mixture of *oil of vitriol* with ſpirits of wine alone, in the proportion of one part of the former to three of the latter, digeſted together for ſome time, is uſed in France as a reſtringent in gonorrhœas, female fluors, and ſpittings of blood, under the denomination of *Aqua Rabelliana*, and *eau de Rabel*. The *acid of vitriol*, diluted with water, has been given internally with great ſucceſs in the itch. It was firſt uſed for this purpoſe in the Pruſſian army in 1756, and has ſince been much employed in ſeveral parts of Germany. The doſe recommended is from an eighth to a fourth of a dram of the pure acid twice or thrice a day. It is ſaid to ſucceed equally in the dry and moiſt itch; and when given to nurſes, to cure both themſelves and their children.

When *oil of vitriol*, and rectified ſpirit of wine, are long digeſted together, or diſtilled, a part of the acid unites with the vinous ſpirit into a new compound, very volatile and inflammable, of no perceptible acidity, of a ſtrong and very fragrant ſmell, and an aromatic kind of taſte: this dulcified part, more volatile than the reſt, ſeparates and riſes firſt in diſtillation, and may thus be collected by itſelf. The college of London directs this *ſpiritus vitrioli dulcis* to be made by cautiouſly and gradually mixing a pound of *oil of vitriol*, and a pint of rectified ſpirit of wine, and ſetting them to diſtil with a very gentle heat: that of Edinburgh orders the ſame quantity of the *oil of vitriol* to be dropt into four times as much of the vinous ſpirit, and the mixture to be digeſted in a cloſe veſſel, for eight days, previouſly to the diſtillation, with a view of promoting the coalition of the two ingredients. The different proportions of the acid ſpirit to the vinous, in theſe preſcriptions, make no material variation in the qualities of the product, provided the diſtillation be duly conducted; for the ſmalleſt of the above proportions of acid is much more than the vinous ſpirit can dulcify, and all the redundant acid remains in either caſe behind. The true dulcified ſpirit riſes in thin ſubtile vapours, which condenſe upon the ſides of the recipient in ſtraight ſtriæ; theſe are ſucceeded by white fumes, which form either irregular ſtriæ, or large round drops like oil; at the firſt appearance of which, the proceſs is either to be ſtopped, or the receiver changed. The ſpirit which theſe fumes afford, very different from the dulcified one, has a pungent acid ſmell, like the fumes of burning ſulphur: on its ſurface is found a ſmall quantity of oil, called the *ſweet oil of vitriol* of Hoffman, of a ſtrong, penetrating, and very agreeable ſmell, readily diſſoluble in ſpirit of wine, to a large proportion of which it communicates the ſmell and taſte of the aromatic or dulcified ſpirit. The college of Edinburgh, in order to ſecure againſt any acidity in the dulcified ſpirit, order it to be rectified, by mixing it with an equal meaſure of water, in every pint of which a dram of ſalt of tartar has been diſſolved, and drawing off the ſpirit again by a gentle heat. This college, in their laſt Pharmacopœia, have manifeſtly ſhewn how little they conceive the acid to enter as a conſtituent part of this preparation, and at the ſame time have directed an effectual method of preventing its preſence in it. They order the *acidum vitriolicum vinoſum*, vulgo *ſpiritus vitrioli dulcis*, to be made by ſimply mixing one part of vitriolic ether with two of rectified ſpirit.

This ſpirit, taken from ten to eighty or ninety drops, ſtrengthens the ſtomach and digeſtive powers, relieves flatulencies, promotes urine, and, in many caſes, abates ſpaſmodic ſtrictures, and procures reſt. It is not eſſentially different from the celebrated mineral anodyne liquor of Hoffman; to which it is frequently, by the author himſelf, directed as a ſubſtitute. See LIQUOR *mineralis anodynus*.

The dulcified ſpirit is ſometimes uſed as a menſtruum for certain reſinous and bituminous bodies, which are more difficultly and languidly acted upon by pure vinous ſpirits. It is often mixed with aromatic and ſtomachic tinctures, in caſes where the ſtomach is too weak to bear the acid elixirs above mentioned: eight ounces are commonly added to a pint of the officinal aromatic tincture; or the ingredients of the aromatic tincture are infuſed in the dulcified acid, inſtead of common rectified ſpirit, in order to form the *ſweet elixir of vitriol*. A medicine of this kind was formerly in great eſteem, under the name of *Vigani's volatile elixir of vitriol*, prepared by macerating, in ſome dulcified ſpirit of *vitriol*, free from acidity, a ſmall quantity of mint-leaves curiouſly dried, till the ſpirit has acquired a fine green colour; and to prevent the neceſſity of filtration, during which the more volatile parts would exhale, the mint may be ſuſpended in the ſpirit in a fine cloth. If the dulcified ſpirit, rectified from a ſolution of fixed alkaline ſalt, be ſhaken with equal its quantity of a like ſolution, and the mixture ſuffered to reſt, an ethereal fluid riſes to the ſurface, and great part of the dulcified ſpirit may be recovered again from the remainder by diſtillation. Dr. Hadley obtained the largeſt portion of ether, by uſing the ſtrongeſt vitriolic acid of the ſhops with equal its quantity, by meaſure, of ſpirit of wine, and diſtilling immediately by a heat ſufficient to make the mixture boil. By this management, from three pints of *oil of vitriol*, and ſix pints of rectified ſpirit of wine, he obtained two pints and a half of the ether. For other proceſſes, ſee ÆTHER, and *Ætherial* SPIRITS.

The vitriolic acid ſaturates a larger quantity of fixed alkaline ſalts than any of the other acids, and diſlodges from them ſuch other acids as have been previouſly combined with them. Of the ſtrong ſpirit, or *oil of vitriol*, about five parts are ſufficient for eight of the common vegetable fixed alkalis. The neutral ſalt thus obtained is of a bitteriſh taſte, very difficultly ſoluble in water, and ſcarcely fuſible in the fire: in ſmall doſes, as a ſcruple, or half a dram, it is an uſeful aperient: in larger ones, as four or five drams, a mild cathartic. This ſalt has been commonly prepared with the alkali obtained from tartar, and hence called *vitriolated* TARTAR, and ſometimes *ſal* ENIXUM, and ARCANUM *duplicatum*. Some dilute the *oil of vitriol* with ſix times the quantity of warm water, and drop into it a ſolution of the alkaline ſalt till no efferveſcence enſues: others uſe *vitriol* in ſubſtance, which being diſſolved in boiling water, any alkaline ſalt, gradually ſuperadded, till the efferveſcence ceaſes, abſorbs the pure acid, and throws down the metallic baſis of the *vitriol*: one part of the alkali is nearly ſufficient for two of the *vitriol*.

With the mineral fixed alkali, this acid forms compound ſalts of a bitterer taſte, ſomewhat leſs purgative, and much eaſier of ſolution, than that with vegetable alkalis: with volatile alkalis, a very pungent ammoniacal ſalt, whoſe medicinal effects are not well known. The ſtrong acid, boiled on argillaceous earths to dryneſs, corrodes a portion of them, and concretes therewith into an auſtere ſtyptic ſalt. Calcareous earths it does not diſſolve into a liquid ſtate, but may be combined with them, by precipitation from other acids, into an indiſſoluble concrete, ſeemingly of no medicinal activity. Among metallic bodies, it diſſolves zinc and iron readily; copper, ſilver, quickſilver, lead, and tin, very difficultly: it is fitted for acting on the two firſt by dilution with three or four times its quantity of water: the others require the undiluted acid, and a heat ſufficient to make it boil; when, the more phlegmatic parts exhaling, ſo much of the pure acid matter remains combined with the metals as to render them, in part at leaſt, diſſoluble in water.

The principal uſe of *green vitriol* is in DYING, and in the making of INK. When the *vitriol* is diſſolved in water, the iron contained in it becomes black by the addition of an infuſion of GALL-*nuts*. Mr. Lemery the younger, in order to account for this blackneſs, imagines, that as the *vitriol*, of which ink is made, is iron diſſolved by an acid, and intimately mixed with it, and as galls are an alkali or abſorbent, this alkali, meeting the acids which hold the iron diſſolved, unites with them, and makes them let the iron looſe; which thereupon revivifies, and reſumes its natural blackneſs; ſo that in ſtrictneſs we write with the iron.

In the Swediſh Tranſactions, *vitriol* is recommended as a yellow for houſe-painting: quicklime, made into a paſte with water, is to be diluted with a ſolution of *vitriol*, more or leſs, according as the colour is required deeper or lighter: the mixture appears of a bluiſh green colour, and does not become yellow till it is dry. One part of *vitriol* is ſaid to go as far as two of the dearer yellow ochre. This ſalt is alſo recommended for preſerving wood, as particularly the wheels of carriages, from decay: when all the pieces are fit to be joined together, they are directed to be boiled in a ſolution of *vitriol* for three or four hours, and then kept for ſome days in a warm place to dry. It is ſaid that wood by this preparation becomes ſo hard and compact, that moiſture cannot penetrate it. See on the ſubject of the preceding articles, Neumann's Chem. Works, by Lewis, p. 173, &c. Watſon's Chem. Eſſ. vol. i. eſſ. 6. Lewis's Mat. Med. art. *Vitriolum*. Bergman's Eſſ. vol. i. p. 180, &c. Kirwan's Elem. of Mineral. p. 189, &c.

VITRIOLS, *metallic*. All metals, it is to be obſerved, may be converted into *vitriols*, by diſſolving them with acid ſpirits, and letting them ſtand to cryſtallize.

Factitious vitriols, being only metals diſſolved and cryſtallized in ſaline menſtruums, are frequently called, by way of diſtinction, *metallic vitriols*, and *metallic ſalts*.

VITRIOL *of cobalt* is found native in ſmall pieces, mixed with

with a greenish efflorescence in cobalt mines: it is difficultly soluble in water; and both it and its solution are red, which sufficiently distinguishes its basis. Its acid is known by the same taste as that of the other *vitriols*.

VITRIOL *of iron*, *vitriolum Martis*, is a preparation made by dissolving iron, or steel, in oil or spirit of *vitriol*; then evaporating or drawing off the moisture, and bringing the matter to crystallize, by setting it in a cool place. This is also called SAL *Martis*, or *salt of steel.*

VITRIOL *of lead*. See LEAD.

VITRIOL *of Luna*, or *the Moon*, is the name given to a salt with a metallic basis, called also *vitriol* of SILVER.

VITRIOL *of nickel* is found native, efflorescing on kupfernickel, and generally mixed with *vitriol* of iron. This is difficultly soluble in water: both it and its solution are of a green colour.

VITRIOL *of quicksilver*, the name of a chemical preparation of quicksilver, with acid spirits, the process of which is this: let so much a solution of quicksilver be made in spirit of nitre, or aqua fortis, that no more can be contained; let this solution be made by the assistance of heat, and the liquor immediately afterwards poured off into a clean and cold glass. There will, on this, spontaneously shoot on the bottom of the glass a saline, white, transparent matter, from which the liquor being poured, it is found to be a sharp, moist, saline substance, or true *vitriol* of mercury, soluble in water, and not safe to be touched. If the liquor, poured off from this, be evaporated half way, and the remainder set in a cool place, more crystals of the same nature with the first will shoot.

Another method of making the *vitriol* of mercury, is this: reduce to powder some decrepitated sea-salt, and with two parts of this mix one part of crude mercury; distil the whole in a glass body, with a strong fire, continued five or six hours; when the vessels are cold, break them, and there will be found a solid dry mercury, sublimed to the top and sides of the body, in form of *vitriol*. Nay, Boerhaave affirms, that the common mercury sublimate is a true *vitriol* of mercury, though semivolatile. Boerh. Chem. part ii. p. 301.

Vitriol of quicksilver is also a name given to a salt of mercury, mineralized by vitriolic acid, first discovered by Mr. Woulfe, together with the marine salt of mercury, at Obermoschel, in the duchy of Deux-Ponts: they have a spar-like appearance, and are either bright and white, or yellow or black, mixed with cinnabar in a stony matrix: these well mixed with one-third of their weight of vegetable alkali, afforded him cubic and octagonal crystals, that is, salt of Sylvius, and tartar *vitriol*. Phil. Trans. vol. lxvi. part ii. p. 618.

VITRIOL *of Venus* is a solution of copper in spirit of nitre, evaporated and crystallized, to gain the salt; called also *vitriol of copper*.

VITRIOL, *liquamen*, or *wash of*, is a name given to the ochry matter remaining after successive evaporations of the mother of *vitriol*, which yields no more *vitriol*. Its taste is acrid and fiery, and the quantity left from a gallon of the well impregnated liquor from the bed, is about a pound. From this may be procured a white pungent salt, by subsequent evaporations. This is the saline principle of *vitriol*, according to the chemists, and is contained in so large a quantity, that near thirteen ounces of it may be separated from a pound of the liquor; the remaining liquor, after this, is what is called *liquamen vitrioli* by some chemists, but not properly. It will never coagulate into salt, but is very fiery and acrid to the taste, and extremely ponderous, not less so than oil of *vitriol*, nor less pungent; and is the strongest liquor any way obtained from a natural substance without distillation. This liquor, being exposed to the air in a vessel not closed, will in a little time attract double its weight of water from it. All corrosive and saline liquors have somewhat of this property of imbibing moisture from the air, and weakening themselves by it; but this liquor attracts it faster and in greater quantity than any other. This liquor receives most moisture, and increases most quickly in wet weather, less so in dry; and this may have given occasion to that error so common among the chemists, that several preparations of *vitriol* derive moisture from the moon, and have more or less of it, according to her different phases. The changes of the constitution of the air have effected what, in this case, they supposed to be done by the different phases of the moon. Phil. Trans. N° 103.

VITRIOL, *mother of*. See VITRIOL, in *Chemistry*, supra.

VITRIOLI, *ros*. See ROS.

VITRIOL, *saline principle of*. See SALINE *principle*.

VITRIOL, *emetic salt of*. See GILLA.

VITRIOLATED, among *Chemists*, turned into *vitriol*, or having *vitriol* infused in it.

VITRIOLATED *tartar*. See TARTAR *vitriolated*.

VITRIOLIC, something that has the quality of *vitriol*, or that partakes of the nature of *vitriol*.

VITRIOLIC *minerals* are compound fossile substances, formed of various stony and earthy particles, mixed with others of iron and copper, and that either separately or conjunctly; so that, in effect, they are ores of *vitriols*.

The different kinds of these minerals are, 1. The chalcites. 2. The misy. 3. Sory or rusma. 4. Melanteria. 5. Pyrites, or fire-stone. 6. Marcasites. See CHALCITIS, MISY, &c.

In Europe the only use made of chalcitis is as an ingredient of Venice-treacle; and even here its place is generally supplied with common green *vitriol* calcined to a redness. The ancient Greeks used it externally in hæmorrhages, and collyriums for the eyes; also for the herpes and erysipelas; but never ventured to give it internally. The ancients used *misy* for the same purposes as *chalcitis*, being esteemed milder than this last.

At present it is no where put to any use, nor indeed does it merit it, as containing no other virtues than those of green *vitriol*, though we are not sure what pernicious substance it may be mixed with.

VITRIOLIC *waters*. The countries which abound with mines of copper and iron usually afford a great many *vitriolic* waters. See *Blue* VITRIOL.

One of the most remarkable springs of this kind, of which we have an account, is that near Paderborn in Germany: this is a sort of treble spring, having three openings, and all three yielding very different waters. Two of these openings are not more than a foot and a half distant from one another, and yet of so different qualities, that the one is limpid, bluish, milk-warm, and bubbling, and contains sal ammoniac, ochre, iron, vitriol, alum, sulphur, nitre, and orpiment; all these substances having been separated in its analysis. The other is cold as ice, and is turbid, whitish, and much heavier, and stronger to the taste than the other. This holds much orpiment, with some salt, alum, nitre, sal ammoniac, and vitriol. The first of these waters is taken by the people in the neighbourhood, against worms, and disorders of the spleen, as also against epilepsies; the other is poisonous to birds, all that drink of it dying in a very little time. The experiment has been tried on common hens, with the water brought from the springs into other places, and given them to drink.

Those to which salt is given, after the swallowing of this poisonous water, struggle longer before they die by it; and vinegar is found to save them very often from death, after drinking largely of it; but in this case they are sickly for seven or eight days after it, and have the pip, as the good women express it.

In the dissecting of those birds which have died by drinking this water, the lungs are always found quite shrivelled up.

The people of the country have not been deterred by this bad effect of the water, from using it in medicine; they take small quantities of it diluted in water, to destroy the worms, and it performs this very well, but gives them a grievous sickness while it operates.

The third stream, or opening, of this remarkable spring, is about twenty paces distant from the others; the water is here very clear, of a greenish colour, and of a sour, but not very disagreeable taste. It is of a middle weight, and of middle qualities between the other two, and is evidently formed of the joining of those two springs with some other fresh water in the way; for a liquor exactly resembling this third kind may be prepared, by mixing equal quantities of the other two with a sufficient quantity of common well-water.

There is a spring in Basil discharging its water through the Tanners-street, or Gerber-gasse, which is of a bluish colour, and somewhat turbid. This holds blue vitriol, that is, copper, in the form of a salt, and with it bitumen and antimony; but a much larger proportion of the first ingredient than of either of the others. The analysis of it shews, that it contains three parts copper to one of bitumen, and two of antimony. It serves the tanners of the place to good purposes, their skins receiving one of their preparations from this native water.

The same town affords several other springs of peculiar qualities, all owing to the veins of metalline ores, with which the earth of the place abounds. The one of these is called *Bandulph's well*, and affords a water of great use in medicine, several being regularly and perfectly cured of hydropical distempers by it. And another very remarkable one contains, as is found by its analysis, sulphur, nitre, and some gold. These, however, are in such small quantity in it, as not to prevent its being fit for the common uses of life. It is very agreeable to the taste, and is much esteemed for drinking, and sent for all over the town.

Another *vitriolic* water runs out of a cavern, near Gelsbach,

bach, in Alsace. It is a fattish and oily liquor, and is used by the country-people for greasing their wheels; but it is fit for much better purposes. If it be boiled to the evaporation of a third part, there will remain very little water, but a fatty bituminous substance, like tar, will subside to the bottom, and there will swim at the top a yellow, thin, and limpid liquor, very much resembling linseed-oil; and this, distilled in a sand-heat, yields an oily and watery liquor; the first very good for external uses, for burns and scalds; and the other a good internal medicine, in consumptions, and other diseases of the lungs. Phil. Transf. N° 8.

Some time ago there was a water discovered in England, that gave, on many experiments, an appearance of containing natural and perfect vitriol. This water was found near Eglingham, in Cumberland; and being examined, by adding galls to it, it became absolute ink, much deeper than any of the atramentous waters ever do: when one half the quantity was slowly evaporated, the remainder retained this quality to a higher degree than before; and on evaporating it yet farther, there concreted in it fair crystals of pure and genuine vitriol.

This was an appearance wholly new in England, and not easily accounted for, as we have no mineral, except the common pyrites, which contains vitriol; and it is very well known, that there requires a fermentation in the air, before the vitriol, contained in that stone, will be disentangled from its other principles, so as to be capable of appearing in its own form; and as this stone, lying under water, can never impregnate that water with its vitriol, it did not seem easy to conceive in what manner a genuine vitriol should be communicated to water, where there was no other substance which could give it. The suspicions that these thoughts gave the gentleman who examined this water, occasioned his making a visit to the place where it was produced, when he found that the supposed *vitriolic* spring was no other than an old drift made for the draining of the water from some old wrought coal-pits: the people who had worked in these, remembered to have seen great quantities of pyrites there. This drift was sometimes dry for a considerable time together, and sometimes run in a plentiful stream; and there is no doubt but that, in these dry seasons, the air acted upon the pyritæ, and caused it to shoot its vitriol, which the next tide of water washed away, and it came off dissolved in it, and highly impregnating it.

This proved therefore no better a medicinal spring than some of a like kind, described by Mr. Leigh in his Natural History of Lancashire; and all these are very little better than the discovery of a medicated water in Old-street, from the remains of an old colour-shop, or Kircher's reckoning the common shores of Rome among the medicated springs of Italy.

The *vitriolic* spring, which has been so much talked of near Haigh, in Lancashire, is no other than an accidental impregnation of common water, in the same manner: it being only the runnings of an old drift, or drain, made to carry off the water from some pits of cannel-coal; and this like the other, as it sometimes has water, and at other times is dry, gives time for the pyrites to let go its vitriol while dry, and then imparts it to the waters that pass that way afterwards. These are not to be accounted medicated springs, since neither natural nor continual, and such may be any day made at home, by laying the common pyritæ of our clay, or coal-pits, out to moulder in the air, and then pouring water upon it, and after a short time standing, taking it off again. Phil. Transf. N° 245, p. 380. See Ziment, and Vitriol, in *Chemistry*.

Vitrum. See Glass.

Vitrum, in *Botany*, a name given by some of the old writers to the plant we now call *glastum* or woad.

This plant has always been a native of England, and was in use among the savage inhabitants of this island, for painting their bodies. Those who have not understood this to be the name of that plant, have been strangely perplexed to account for these people's painting their bodies with *vitrum*, *glass*, as they understood it: but the whole meaning of this plant obtaining the name of *vitrum*, seems to have been its staining the skin to a pale blue colour, or, as it was called by many, a glass-colour.

Vitrum *antimonii ceratum*, in *Pharmacy*, is thus prepared: take glass of antimony, in powder, one ounce; bees-wax, one dram; melt the wax in an iron ladle, then add the powder; set them on a slow fire without flame, for the space of half an hour, continually stirring them with a spatula; then take it from the fire; pour it upon a piece of clean white paper, powder it, and keep it for use.

The glass melts in the wax with a very slow fire. After the materials have been about twenty minutes on the fire, they begin to change colour, and in ten more acquire nearly the colour of snuff; which is a mark of the medicine's being sufficiently prepared.

The ordinary dose for adults is ten or twelve grains; but it is sufficient to begin with six, or even with three or four grains. The quantity of a scruple has been given to a strong man, which wrought gently. The dose for a child of three or four years is two or three grains; and for one of ten, three or four grains.

This medicine has for some time been held a specific in dysenteries; but the preparation and manner of giving it had been kept a secret, till Dr. Young generously made it public. Dr. afterwards sir John Pringle, says, he tried it in a dysentery of four years standing, with surprising success; and, indeed, to him we are principally indebted for the general introduction and use of this medicine; as he collected and published several cases of its efficacy.

It has been given in dysenteries, with or without a fever, whether epidemic or otherwise, and whether bleeding and vomits have been premised, or not. In its operation, it sometimes makes the patient sick, and vomits him; it purges almost every person; but it has been known to cure without any evacuation or sickness. It is to be given with an empty stomach, for then it operates most mildly. Nothing is to be drank after it for three hours, unless the patient is very sick, and disposed to vomit; in which case warm water may be given, as in other vomits.

This medicine should not be given for diarrhœas in the end of consumptions. Other diarrhœas have been cured with large doses of it; but in such cases it fails oftener than in dysenteries. During the use of this powder, fermented liquors should be abstained from, and a milk diet is proper. It may be given safely to women with child, and to children on the breast may be given half a grain. This preparation has also been found successful in uterine hæmorrhages, both in young and old.

It has also been tried in colic pains, from viscidities in the intestines, and found a safe and easy purgative, and sometimes a gentle emetic.

The method of giving it is in a bolus, with conserve of roses, diascordium, or theriaca Edinensis. An opiate, after the operation, is proper. Med. Ess. Edinb. vol. v. art. 15, p. 162, &c. See an account of its efficacy in bloody fluxes, diarrhœas, simple loosenesses, quartan agues, even the most obstinate, and in certain cases of the fluor albus, and observations on the mode of administring it, by M. Geoffroy, in Phil. Transf. vol. xlvii. p. 273, &c.

Vitrum *Archimedeum*, *Archimedes's glass*, a name given by Swedenborg to an instrument which he invented for the examination of mixt metals, and by means of which he could discover the quantities, without the trouble of the apparatus and calculation commonly used for this purpose.

Vitrum *morrhinum*, *morrhine*, or *myrrhine glass*, a name given by Pliny, and some of the ancients, to a sort of manufacture made in Egypt, which though truly no other than a kind of glass divested of its transparency, yet was made so nicely to imitate the *myrra* or *morra* of the Indies, so famous among the Romans, under the form of cups and vessels, called *murrhina vasa*, that it was called by some *murrha altera*, another sort of *murrha*, and the cups made of it honoured with the name of *murrhine vessels*. This serves to shew, that the *myrrhina vasa*, properly so called, were not of any precious stone, as vulgarly supposed, but a sort of porcelain. See Murrhine.

Vitrum *Saturni*. See Glass *of lead*.

VITTA, among the Romans, a fillet with which the women in Rome bound their hair. The matrons wore a double one, to distinguish them from the virgins, whose *vittæ* were single.

Vittæ were also worn by priests and poets, in which case they were made of branches of olive or laurel; the statues of the gods were likewise adorned with *vittæ*, as were altars, the doors of temples, victims, and suppliants.

Vitta, among *Anatomists*, *fillet* or *head-band*, is used for that part of the amnios which sticks to the infant's head when it is just born.

Vitta *cærulea*, in *Conchyliology*, a species of dolium.

Vitta, in *Ichthyology*, a name given by Gaza, and some others, to the fish called by others tænia, and by the Italians cepole.

VITULUS *marinus*, the *sea-calf*, in *Zoology*. See Sea-*calf*.

Vitulus, *calf*, in *Zoology*. See Calf.

Vituli *aquatici*, in the *History of Insects*, a name given by the German writers to the worms resembling animated horse-*hairs*. See Amphisbæna *aquatica*.

VITUS's *dance*, or St. Vitus's *dance*, in *Medicine*, the name of a peculiar ſort of convulſion, to which young women are principally ſubject, toward the time of the firſt eruption of the menſes.

It ſeems to have had its name from the account which Horſtius gives of ſome women who once every year paid a viſit to the chapel of *St. Vitus*, near Ulm, and there exerciſed themſelves day and night in dancing, being diſordered in mind, till they fell down like people in an extacy. By this means they were always reſtored to health for a whole year, till the return of May, at which time they were again ſeized with a reſtleſsneſs, and diſorderly motion of their limbs, ſo as to be obliged, at the anniverſary of *St. Vitus*, to repair again to the ſaid chapel, for the ſake of dancing. Horſtius, Ep. Med. ſect. vii.

It is the moſt frequent with girls, yet not peculiar to them, attacking boys alſo, from the age of ten to fourteen. It firſt ſhews itſelf by a ſort of lameneſs, or rather unſteadineſs of one of the legs, which the patient draws after him like an idiot, and afterwards affects the hand on the ſame ſide; which being brought to the breaſt, or any other part, can by no means be held in the ſame poſture for a moment, but is diſtorted or ſtretched by a ſort of convulſion to a different poſture and place, notwithſtanding all poſſible efforts to the contrary.

If a glaſs of liquor be put into the patient's hand to drink, before he can get it to his mouth he makes a hundred odd grimaces and geſtures, for not being able to carry it ſtraight, becauſe his hand is drawn different ways by the convulſion, as ſoon as it has reached his lips, he throws it ſuddenly into his mouth, and drinks it very haſtily, as if he meant only to divert the ſpectators. It differs from other convulſions, in that the motions are not painful, nor are any of the extremities or parts forcibly contracted, or extended for any time. Boys and girls are moſt ſubject to this diſeaſe, and that from ten years of age to puberty; though the latter oftener than the former.

It ſometimes precedes the firſt eruption of the menſes; in which caſe, proper cathartics, with calomel and deobſtruents, are generally uſed; otherwiſe evacuations and anti-epileptics, as in other nervous diſtempers.

As this diſorder appears to proceed from ſome ſharp humours thrown upon the nerves, which, by their irritation, excite preternatural motions, it ſeems that the curative indications are to be directed firſt to leſſen thoſe humours by bleeding and purging, and, ſecondly, to ſtrengthen the nervous ſyſtem. Dr. Sydenham therefore propoſes the following method: firſt to take from the arm ſeven or eight ounces of blood, more or leſs, according to the ſtrength of the patient. The next day let him take a gentle purge of rhubarb, ſena, manna, &c. In the evening of this day, let him take a draught, with a ſcruple of Venice treacle, and eight drops of liquid laudanum, mixed in honey and milk-water. This purging and opiate draught is to be repeated at ſome days diſtance, and the bleeding is alſo to be repeated to the fourth time; and in the intermediate days, a cordial and nervous electary is to be given, compoſed of the conſerves of roſemary, orange-peel, and Roman wormwood, with Venice treacle, candied nutmeg, and candied ginger; of this the bigneſs of a nutmeg may be given every morning and afternoon, drinking after it a decoction of piony, maſter-wort, and elecampane, and angelica-roots, the leaves of rue, ſage, betony, and other cephalic plants, with orange-peel, and juniper-berries.

Spirit of hartſhorn may alſo be given every night in ſmall doſes, in a nervous julep, and plaſters of gum caranna may be applied to the ſoles of the feet. According as the cure advances, the patient recovers the uſe of his hand and foot, and his amendment may always be diſcovered by letting him attempt to bring a glaſs of any liquor to his mouth in a ſtraight line; though the bleeding ſhould not be repeated beyond the fourth time, yet the alterative and purging medicines ſhould be continued till the patient is quite well; and as people are ſubject to relapſes in this diſorder, it is proper to give the ſame medicines, and to bleed at the return of that ſeaſon of the year.

Dr. Anthony Fothergill recites the particulars of the caſe of a girl, of ten years of age, who had for ſix weeks laboured under violent convulſive motions, which affected the whole frame, and from which ſhe had very ſhort intermiſſions, except during ſleep. At the beginning of the diſeaſe ſhe had ſlight twitchings, attended with running, ſtaggering, and a variety of involuntary geſticulations, diſtinguiſhing the *St. Vitus's dance*; theſe ſymptoms were afterwards ſucceeded by convulſions, which rendered it difficult for two perſons to keep her in bed, which impaired her memory and intellectual faculties, and ſoon deprived her of ſpeech, and the uſe of her limbs. Volatile and fetid medicines were firſt recommended, and the warm bath every other night; but with no other ſucceſs, except that her reſtleſs nights became ſomewhat more compoſed. Bliſters and antiſpaſmodics were directed, and particularly the flowers of zinc, which were continued for almoſt a month, without the leaſt abatement of the ſymptoms. As a dernier reſort, Dr. Fothergill recommended a trial of electricity, under the management of the reverend Mr. Underwood, an ingenious electrician, which in about the courſe of a month effected her perfect cure. The proceſs was as follows: on the fifth of July, ſhe was placed on the glaſs-legged ſtool for thirty minutes; ſparks were drawn from the arms, neck, and head, which cauſed a conſiderable perſpiration, and a raſh appeared in her forehead. She then received ſtrokes through her hands, arms, breaſt, and back; and from this time the ſymptoms abated, her arms beginning to recover their uſes. The coated bottle uſed on this occaſion held near a quart. On the fifteenth of July ſhe ſtood on the ſtool forty-five minutes; and received ſtrong ſhocks through her legs and feet, which from that time began to recover their wonted uſes; alſo four ſtrong ſhocks through the jaws, ſoon after which her ſpeech returned. On the twenty-third of July ſhe ſtood on the ſtool for an hour: ſparks were drawn from her arms, legs, head, and breaſt, which for the firſt time ſhe very ſenſibly felt; and alſo two ſhocks through the ſpine. She could now walk alone; her countenance became more florid, and all her faculties ſeemed wonderfully ſtrengthened, and from this time ſhe continued recovering to a ſtate of perfect health. Every time ſhe was electrified poſitively, her pulſe quickened to a great degree, and an eruption, reſembling the itch, appeared in all her joints. The eruptions, which appeared on the parts electrified, ſoon receded, without producing any return of the ſymptoms, and, therefore, Dr. Fothergill obſerves, could not be called critical, but were merely the effect of the electrical ſtimulus.

Dr. Fothergill mentions another caſe of a boy, who had long had the *St. Vitus's dance*, though in a much leſs degree, that was cured by electricity; and from theſe facts infers, that electricity is entitled to a diſtinguiſhed place in the claſs of antiſpaſmodics. Phil. Tranſ. vol. lxix. part i. p. 1, &c.

The firſt ſymptoms in this diſeaſe are often perceived to come on at the hips and os ſacrum, or extremity of the back-bone; from thence a pain extends itſelf acroſs the navel, and thence the pain runs up to the top of the head: as ſoon as this happens the convulſions uſually begin; theſe often firſt appear in the belly, and are ſo violent, that two or three perſons can ſcarce hold the patient, and are forced to lie upon the bed to prevent him from raiſing up his belly in a ſtrange manner.

After this, in ſome caſes, the nerves of the lungs become affected, and the patient will imitate the barking of a dog, or the ſnarling and howling of that animal when hurt: after this, the nerves of the jaws generally ſuffer, and the teeth are ſnapped violently together, and the mouth foams; perſons have ſometimes beaten out their teeth with the violence of ſnapping them together in theſe agonies.

There is, in the Philoſophical Tranſactions, an account of a caſe of this kind following a fever, in which the patient attempted to bite every body about him, and would have even gnawed his own fleſh, if he had not been prevented; but, though the people about him thought, from all theſe ſymptoms, that he had been bitten by a mad dog, and that this was madneſs, yet, on offering him water, he drank, or rather lapped it greedily; which proved it could be no effect of that bite, becauſe the great ſymptom of ſuch diſorders, the dread of liquids, did not ſhew itſelf in him. Theſe were merely the effect of this *chorea ſancti Viti*, and were attended with twitchings of the arms and legs, which conſtitute that diſtemper; his noiſes alſo were not confined to thoſe of a dog, but in different fits he repreſented the ſounds of different animals, as the roaring of a bull, the grunting of a hog, and the noiſe of a gooſe.

Theſe were not premeditated, or meant by the patient as imitable of ſuch ſounds, but merely proceeded from the forcing out of the air from the lungs in different manners, according to the different power of the convulſion, which affected their nerves. The patient in this caſe was ſpeechleſs, not only in the time of the fits, but for a week together; and the country people fell into the common error of ſuppoſing that he was bewitched, but the phyſician cured them of that belief, by curing the patient of his diſtemper by the common means; as they were convinced, that a diabolical ſpirit could not be caſt out by a regular courſe of phyſic. Phil. Tranſ. N° 287. p. 1480.

VIVA *pecunia* was anciently uſed for live cattle.

VIVA *voce*, q. d. by word of mouth. See Oral.

VIVACE, Vivacemente, or Vivamente, in the *Italian*

ian Music, signifies to play with life and spirit. It requires a degree of movement between LARGO and ALLEGRO, but nearest *allegro*.

VIVACISSIMO, in the *Italian Music*, denotes a degree or two quicker than *vivace*, and is much the same with ALLEGRO.

VIVACITY *of style*, in *Oratory*, a character of STYLE, depending on the choice of words, their number, and their arrangement. See Campbell's Philosophy of Rhetoric, vol. ii. p. 158, &c.

VIVARY, *vivarium*, in our *Law Books*, is sometimes used for a park, warren, or fish-pond, wherein living creatures are kept.

VIVERRA, in *Zoology*. See FERRET.

VIVERRA, in the Linnæan *System*, is a distinct genus of the order of *feræ*, whose characters are, that it has six cutting teeth, the intermediate being shorter; the grinders are more than three; the tongue bends backward, and is often aculeated, and the nails are extended. This genus includes six species; viz. the ICHNEUMON, or Indian QUIRPELE; the *nasua*, or coati mundi of Brasil, of a reddish colour, with the tail annulated with white; the *narica*, of a dusky colour, and the tail sometimes annulated with black and white, and sometimes of an uniform dusky colour, which some writers make a variety of the former; the *putorius*, or *American* POLE-CAT; the *zibetha*, or CIVET, and the GINETTA.

VIVES, a name given by our farriers to a disease of horses, which consists in the growth of certain flattish kernels in clusters, like bunches of grapes, beginning from the ears, and creeping downwards, between the chap and the neck of the horse toward the throat.

When they are inflamed they swell, and become not only painful to the creature, but are even mortal, stopping his wind, unless a speedy course be taken for their cure. The difficulty of breathing, which they occasion in their progress towards this highest degree, occasions many symptoms, which being misunderstood by the farriers not being well acquainted with the nature of this disease, are often treated as peculiar distempers themselves, and the creature perishes by the treatment of them in an improper manner.

The horse will often lie down, and start up again, and tumble about in a strange manner, and be supposed to have convulsions, when he has really no other complaint but the difficulty of taking his breath.

The common cause of this distemper is the drinking of cold water after any violent heat: it is also sometimes said to arise from the eating of too much bad corn. The method of cure is to be varied according to the progress and state of the disease, and the immediate danger.

If the tumors be not grown so large as to put the horse in absolute danger of suffocation, the farrier usually attempts to rot them away, by taking hold of each with a pair of pincers, and beating them gently with the handle of a shoeing-hammer, or bruising them with the hand alone, till they grow soft; this will often make them disappear; but this method is only to be used when they are nearly ripe; for otherwise they will return after a time; their being in a proper state for this, is known by the separation of the hair, which easily comes off on the taking hold of it between the fingers. If the case be more desperate, and the horse likely to be immediately suffocated, it is best to open them with an instrument. Whether this, or the other method be taken, the horse should immediately after be blooded under the tongue, and afterwards in the flanks, and his mouth washed with salt and vinegar, and some of the same mixture should be put into his ears, rubbing and squeezing them hard to make it penetrate: this will wonderfully assuage the pain. After this, the horse is to take a quart of white wine, with two handfuls of hemp-seed bruised, two nutmegs scraped, and the yolks of six eggs, all thoroughly mixed in it. About an hour after this draught he is to have the following clyster: boil an ounce and half of sal polychrestum, finely powdered, in five pints of beer; when this is taken off the fire, two ounces of oil of bays are to be put to it; and the whole is to be thrown up blood-warm. This is a regular method, and seldom fails of a cure; but some, who are not willing to have so much trouble and expence, only cut holes where the kernels are, and pick them out at these with a wire; they then fill the hole with salt, and at the end of three days it will run; after this they wash the wound some days with the juice of sage, and heal it with the common green ointment, or with a mixture of honey, butter, and tar.

VIVIFICATION, in *Medicine*, the art of *vivifying*, that is, of contributing to the action that gives life, or maintains life.

The chemists also use the word in speaking of the new force, vigour, and lustre, which, by their art, they give to natural bodies, particularly to mercury; which, after having been fixed, or amalgamated, they restore to its first state. See REVIVIFICATION.

VIVIPAROUS, *viviparus*, in *Natural History*, an epithet applied to such animals as bring forth their young alive and perfect; in contradistinction to such as lay eggs, which are called *oviparous animals*.

The females of all the quadruped class are *viviparous*, and those of the bird class are all *oviparous*.

The laws of nature in the larger animals are, therefore, in a great measure, fixed and certain; but it is not so in the insect tribes, nor in the fishes; for of these some are *viviparous*, and others *oviparous*; and those of genera nearly allied to one another.

Among insects, the much greater number are *oviparous*; but there are many which are not so, as the pucerons, progall insects, cochineal, &c. The millepedes and scorpions are also well known to be so; all the females of the butterfly, and of some other classes, lay only eggs; but the most singular and remarkable inconstancy in nature, if we may be allowed the expression, is that in the fly kingdom; the same class of insects, and even the same genus, will furnish us with some which are *viviparous*, and others which are *oviparous*: the two-winged flies give us instances of this; but these are not single in that respect; for among the reptile world, there are other creatures which are subject to the same varieties; and Swammerdam has observed a *viviparous* snail.

The species of *viviparous* two-winged flies are much more rare than the oviparous; and among the four-winged class they are yet more uncommon. It is not certain, that any of the latter, beside the winged pucerons, are of this kind; but among the former there are six or seven species which are known always to produce living worms, and probably many more will be discovered, by a more close attention than has hitherto been given them.

It is easy to find about our houses one of these species of *viviparous* flies; the creature is always buzzing about the places where meat is kept, and loves to deposit her young as the common blue flesh-fly does its eggs, on meat. Its way of carrying its wings is the same with that of the blue fly, and its antennæ are of the same form. It at least equals the blue fly in length, but its body is less thick, and is a little bent at the hinder part; its colour is grey; its legs are black; its petty wings whitish, and its reticular eyes reddish.

There are, beside this species, two other of the *viviparous* flies, which are not uncommon. Both these, in a great measure, resemble the former, but their bodies are shorter, and, in the whole, they much more than the other approach to the form of the blue flesh-fly. They are also smaller than the former species; the one of them, however, on the whole, is not much so, and, though shorter, yet is much thicker both in the corcelet and body. They are both, though smaller than that kind, yet tolerably large flies, and are bigger than the common horse-fly.

On the leaves of ivy also there are often seen, about autumn, two other species of *viviparous* flies, which are easily distinguished from all the others. Those of one of these species are larger than the great blue flesh-fly, and have a shorter and thicker body than that kind. The manner of carrying the wings is also the same in both; but though both have antennæ of the battledore kind, yet they are evidently distinguished by this, that the extremities of the one are lenticular, and those of the other prismatic. Near the origin of each wing these have a brownish spot, as have those oviparous flies which usually have in their body only two large eggs at a time, and which are produced of the yellow worms, so common in cow-dung. But these *viviparous* ones differ from those flies, in that they are larger, and of a deep, but dead brown; whereas the others are black, or nearly so.

The other species is not much unlike this in form, but is smaller, being not more than of the bigness of the blue flesh-fly, and of a bluish black; so that it might easily be mistaken for one of the common flesh-flies, were it not for the two brown spots at the insertion of the wings; and both this and the former species are plainly distinguished from the cow-dung-fly before described, by their wanting the gold-coloured down which that has on the fore-part of its head. Reaumur, Hist. Insect. vol. iv. p. 405, seq.

Vipers are distinguished from snakes, in that the latter lay eggs in dunghills, to be hatched by the warmth thereof; but the former are *viviparous*, that is, they keep their eggs within their bellies, and bring forth live vipers.

In the Philosophical Transactions we have an account of a *viviparous fly*, of the œstrum or gad-kind. Dr. Lister tells us, he opened several females of this class, and found,

found, in each, two bags of live white worms. The like is hinted by Aldrovandus. Liſter even ſuſpects, that all of this tribe are, in ſome meaſure, *viviparous*.

VIVO, in *Architecture*, the ſhaft or fuſt of a column. See *Tab. Architect. fig.* 24.

The term is alſo uſed, in a more particular ſenſe, for the naked of a column, or other part.

VIVUM *linum*. See LINUM.

VIVUM *ſulphur*. See SULPHUR.

VIXEN, or FIXEN, among *Sportſmen*, denotes a fox's cub.

VIZARD, or VIZOR. See MASQUE.

VIZIER. See VISIER.

ULCER, ULCUS, in *Surgery*, a ſolution or diſcontinuity of texture, or loſs of ſubſtance, in the ſoft parts of the body and ſkin, proceeding from an internal cauſe.

Galen defines *ulcer*, an inveterate eroſion of the ſoft parts of the body; by which, inſtead of blood, they are brought to yield a kind of pus, or ſanies; which prevents the conſolidation.

Etmuller defines an *ulcer*, a ſolution of continuity, from ſome corroſive ſharpneſs or acidity, that takes away from the parts, and turns the proper nouriſhment of the body into a ſanious matter. A like ſolution of continuity, happening in a bony part, is called a CARIES.

Galen commonly uſes the word *ulcer* and *wound* indifferently; but the Arabs, and the moderns after them, diſtinguiſh between the two.

Spontaneous *ulcers* are generally ſuppoſed to proceed from acrimony, or a corroſive diſpoſition of the humours of the body; whether brought on by poiſons, by the venereal taint, or by other cauſes.

Ulcers are divided into *ſimple*, and *complicated*. They are again divided, with regard to their circumſtances, into *putrid*, or *ſordid*, wherein the fleſh all around is corrupted, and fetid; *verminous*, where the matter, being thick, does not flow away, but generates worms, &c. *virulent*, which, inſtead of pus, or ſanies, yield a malignant virus, &c.

They are again diſtinguiſhed, with regard to their form, into *ſinuous*, *fiſtulous*, *varicous*, *carious*, &c.

They are diſtinguiſhed alſo, with regard to their cauſes, into *ſcorbutical*, *venereal*, *cancerous*, &c. with regard to the part of the body which they infeſt, being ſometimes found in the ſkin, fat, and glands, and ſometimes in the muſcular parts; with regard to their ſituation in the body, as *ulcers* of the noſe, fauces, breaſt, anus, &c. with regard to their ſize, ſome ſpreading wide; others occupying but a ſmall ſpace; ſome being deep, and others ſhallow; and alſo with regard to their duration, they are called *recent* or *inveterate*.

When an *ulcer* happens in a good conſtitution, and proves eaſy of cure, it is ſaid to be *ſimple*.

When attended with other concurring ſymptoms, as a cacochymic habit, which greatly retards or obſtructs the cure, it is called a *compound ulcer*.

A *ſimple ulcer* is attended with no other ſign than that of eroſion; but *compound ulcers*, happening in a ſcorbutic, dropſical, or ſcrophulous conſtitution, may be attended with pain, a fever, convulſions, a large and emaciating diſcharge of matter, inflammation and ſwelling of the part, calloſity of the lips, a caries of the bones, &c.

Ulcers may be the conſequence of wounds, bruiſes, or impoſthumes improperly treated; and they may likewiſe proceed from an ill ſtate of the humours, or what may be called a bad habit of the body. In the latter caſe, they ought not to be haſtily dried up; leſt it ſhould prove fatal to the patient.

Ulcers happen moſt commonly in the decline of life, and perſons who neglect exerciſe, and live groſly, are moſt liable to them. They might often be prevented by retrenching ſome part of the ſolid food, or by opening artificial drains, as iſſues, ſetons, or the like.

An *ulcer* may be diſtinguiſhed from a wound by its diſcharging a thin watery humour, which is often ſo acrid as to inflame and corrode the ſkin; by the hardneſs and peculiar ſituation of its ſides or edges, by the time of its duration, &c. The *ulcerative proceſs*, according to the idea of Mr. Hunter, is an action of the abſorbent ſyſtem, whereby, in conſequence of a ſtimulus, it takes up the ſoft parts, and carries them into the circulation.

With regard to the proper treatment and cure of *ulcers* in general, it requires ſkill to determine whether it is expedient and ſafe to dry up an *ulcer* or not. All *ulcers*, which proceed from a bad habit of body, ſhould be ſuffered to continue open, at leaſt till the conſtitution be ſo far changed by proper regimen, or the uſe of medicine, that they ſeem diſpoſed to heal of their own accord. *Ulcers*, which are the effect of malignant fevers, or other acute diſeaſes, may generally be healed with ſafety after the health has been reſtored for ſome time. The cure ought not, however, to be attempted too ſoon, nor at any time without the uſe of purging medicines and a proper regimen.

When wounds or bruiſes have, by wrong management, degenerated into *ulcers*, if the conſtitution be good, they may generally be healed with ſafety.

When *ulcers* either accompany chronical diſeaſes, or come in their ſtead, they muſt be cautiouſly healed.

If an *ulcer* conduces to the patient's health, from whatever cauſe it proceeds, it ought not to be healed; but if, on the contrary, it waſtes the ſtrength, and conſumes the patient by a ſlow fever, it ſhould be healed as ſoon as poſſible.

Mr. Sharp obſerves, that except the callous and the ſinuous *ulcer*, and the *ulcer* with a caries in the bone, the cure of all the other kinds depends chiefly on that of the morbid habit of the body in general. If the body is free from any degree of cacochymy, the healing of an *ulcer* is the work of nature, and the effect of topical applications is merely to maintain the fibres in ſuch a mean ſtate between laxity and rigidity, as will render them moſt capable of carrying on this natural operation. While an inflammatory hardneſs exiſts, an emollient poultice laid over the dreſſings will relieve, after which dry lint generally ſuffices, or at the moſt it may be moiſtened in ſome mild aſtringent, to give a tone to the new fleſh. When a too great laxity, or ſpongineſs is obſerved in *ulcers*, gently ſtimulating and bracing applications take place.

The moſt proper regimen for the cure of *ulcers*, is to avoid all ſpices, ſalted and high-ſeaſoned food, and all ſtrong liquors, and to leſſen the uſual quantity of fleſh-meat. The body ought to be kept gently open by a diet conſiſting chiefly of cooling laxative vegetables, and by drinking butter-milk, whey ſweetened with honey, or the like. The patient ought to be kept chearful, and ſhould take as much exerciſe as he can eaſily bear.

ULCERS, *callous*, are thoſe whoſe internal parts are lined with a hard and almoſt cartilaginous ſubſtance. The cure of callous *ulcers* is attended with very great difficulties, and indeed no cure is to be expected, till the callus is perfectly extirpated. This is to be done three ways; the mildeſt of theſe, which is ſuited to recent calluſes, and ſuch as are not yet become very hard, is by means of corroſive medicines, and of theſe the milder kinds are often ſufficient; burnt alum, or red precipitate, either rubbed on the parts alone, or applied with an equal part either of the common digeſtive or baſilicon, will ſometimes anſwer this purpoſe in theſe caſes, as will alſo the Ægyptian ointment, to which a ſmall quantity of red precipitate may be added occaſionally. If the callus will not yield to theſe remedies, it muſt be attacked with the common cauſtic, or with butter of antimony, or with a ſolution of quickſilver in ſpirit of nitre.

Another mild method of extirpating calloſities we are alſo taught by Le Dran. This author adviſes to apply, for four or five days, a plaſter made of the diachylon with the gums, and the mercurial plaſter, with a quadruple proportion of mercury, mixed in equal quantities; this is to be renewed morning and night, in order to ſoften the callous lips as much as poſſible; after this he makes numerous inciſions, ſo deep as to paſs quite through the ſubſtance of the callus, and ſtops the blood which flows from theſe with dry lint; then the ſame plaſter is again applied, and ſo laid on, that it may touch the naked inciſed lips. After about four days of this treatment, the ſcarifications are again repeated, and this to a third or fourth time, if the calloſity be not before deſtroyed.

If callous *ulcers* are attended with fiſtulous ſinuſes, theſe muſt always be laid open, before we can attempt to deſtroy the callus, with any probability of ſucceſs; after this they may be cured as before directed; or, if the uſe of the knife be not ſafe, or the patient dreads it too much, it will be proper to form tents, and thruſt them up the ſinus, firſt anointing them with the Ægyptian or with Wurtz's brown ointment. By theſe methods a callus, that is not of long ſtanding, may be extirpated; if the ends of the tents laſt mentioned be touched with butter of antimony, red precipitate, or the infernal ſtone, the buſineſs in that method will be the more eaſily effected; and, in caſes of this kind, where the callus cannot be reached by the corroſive end of the tent, it is a very good method to inject into the ſinus either the PHAGEDÆNIC-*water*, or a ſolution of the Ægyptian or brown ointment in ſpirit of wine. The opening of the ſinus ſhould be then cloſed, to keep in the injection as long as may be, and the operation frequently repeated.

Sometimes, however, it is found abſolutely neceſſary to uſe the knife, as in callous *ulcers*, or fiſtulæ, that are of very long ſtanding, and that have formed variety of ſinuſes,

finuses, and when either nothing can be done by corrosive medicines, or else that they tear and corrode the nerves, and bring on convulsions, and other bad symptoms, before they affect the callus. In these cases the best and safest way is to lay open the sinus, taking care not to wound the nerves, tendons, and arteries; and, after that, all the calluses may be easily destroyed by the common methods. Finally, if even this method should not have the desired effect; and if the patient has a considerable share both of strength and courage, and the situation of the nerves and arteries is favourable, the callous parts must be all either entirely cut out with the knife, or burned away by the actual cautery. This operation, though a very painful one, is attended with this good consequence, that it will reduce the most inveterate callous *ulcers* to the state of a fresh wound; and unless a caries, or bad habit of body, or the pox, scurvy, or dropsy, or some other constitutional complaint, be in the way, it may be cured as easily as a fresh wound. Heister's Surgery, vol. i. p. 271.

ULCERS, *cancerous*. See *Ulcerated* CANCERS.

ULCERS, *carious*, are those in which any neighbouring bone is deprived of its periosteum, or affected with a caries: in this case, the flesh over the caries is soft, flaccid, fungous, and inflated; the lips of the *ulcer* are inverted; the sanies clear, scarce at all glutinous, fetid, and full of small black holes: if the *ulcer* heals, it is only on the surface, and soon breaks out again; never healing firmly before the cure of the faulty bone, and when that is effected, the *ulcer* soon fills up with solid flesh, and is healed. See CARIES.

ULCERS, *cutaneous*. Such of these as attack the skin of the face, both in infants and adults, approach very much to the nature of the truly phagedænic *ulcers*; for they, like those, arise from an acrimony of the blood, and are very apt to spread abroad.

In both these cases, therefore, purging medicines, with such as sweeten the blood, will always prove of service. Decoctions of the woods, or of the sharp-pointed dock root, or the herb fumitory, should be drank on these occasions, half a pint at a draught, as hot as can well be borne, three or four times a day. And some of these draughts should be taken in bed, and a gentle sweating be promoted for some time afterwards. And absorbent and sweetening powders, as those prepared from antimony and flower of brimstone, should be taken at the same time. When this case happens to infants at the breast, they can only take some slight doses of medicines to open the bowels; but the mothers or nurses ought to be enjoined proper regimen.

In regard to the external applications, oil of tartar per deliquium will be found of great service; a pencil or feather is to be dipped in this, and rubbed over the parts three or four times a day. This may either be thus used alone, or else mixed with oil of eggs and wax, and a plaster laid over it, of the de minio, or any other of the lead plasters, or one of sperma ceti and camphor.

If the whole face be affected, which in infants is not unfrequently the case, a plaster would prove highly troublesome; but, in this case, the proper ingredients may be spread in a softer form over a linen mask. Lime-water is a medicine of great power and value also in these cases, as is likewise the water used in the washing of diaphoretic antimony. The *ulcers* may very properly be washed with either of these, and the litharge or pompholyx ointment afterwards applied; to which, in very stubborn cases, a little crude mercury may be added; and sometimes a small admixture of red precipitate is found necessary; and finally, if these *ulcers* are attended with a large and foul discharge, it will be proper to sprinkle them with some of the absorbent powders, as tutty, lapis calaminaris, cerus, chalk, or the like, mixed up occasionally with a little native cinnabar, or red precipitate; or, if it be found more convenient, these powders may conveniently enough be made into an ointment with cream. Heister's Surgery, p. 267.

ULCERS, *fistulous*, are such as are sinuous, or winding, and are attended with great callosity; and discharge a thin, serous, and fetid matter. See FISTULA.

When it is discovered, either by the eye or probe, that *ulcers* are become fistulous, though the fistulæ, or sinuses are not yet become callous, the readiest way of curing them is by laying them open, if that can be conveniently done, down to the bottom with a knife, and, after this, they may be cleansed and healed. As patients, however, are always averse to the knife, the cure of these may be attempted by injecting them with the decoctions of vulnerary herbs, such as agrimony, birth-wort, or ladies mantle, and dressing them with digestive ointments or lint. Many surgeons are, in these cases, fond of thrusting their dressings to the bottom of the sinus with tents; but they are very apt to do mischief by their hardness and too great length, often bringing on a callus, inflammation, or too great flux of humours on the part. They ought, therefore, either wholly be laid aside, in these cases, or else to be made as soft and as short as the nature of the case will admit. The next particular, in the cure of these fistulous sinuses, is to press the fundus as near to the mouth or opening as possible; and when the wound is cleansed, and the proper dressings applied, a small compress, or a slip of plaster, doubled up in the form of a small compress, must be laid on the part where the fundus, or bottom of the fistula, is judged to be seated, securing all on by a larger compress, and the proper bandages. In rolling up, in these cases, the proper method is always to place the beginning of the roller upon the fundus of the fistula, or at least to make the pressure tight upon that part; the continuation of this will urge the contained matter up toward the opening, and the fundus, or bottom of the sinus, will naturally be the first part that heals. When these sinuses penetrate so deep, that there is no coming at their bottoms with the dressings, vulnerary injections must be frequently used; and, of these, none are more serviceable in these cases than the following: take the common digestive, prepared with turpentine, dissolved in the yolk of an egg, an ounce and half; honey, either simple, or the honey of roses, or of celandine, an ounce; common proof-spirit, nine ounces: mix these together for an injection. Or take of a decoction of scordium, or else of southern-wood or agrimony, nine ounces; common proof-spirit, four ounces; elixir proprietatis, or essence of myrrh and aloes, one ounce; honey of roses, two ounces; mix all together. These are to be injected at every dressing, and the opening of the fistula must afterwards be kept closed, to keep them in its cavity for some time, which will much hasten the agglutination of the part. If this method of cure does not succeed, recourse must at last be had to the knife; and, indeed, in very many of these cases, there is no great probability of relief from any other means, particularly where the fundus lies directly downward, or where the fistula takes such an irregular course, that the fundus of it cannot, with any success, be pressed toward the opening. In this case there is no relief to be had, but by laying it open to the bottom. To do this a grooved probe, or director, should be gently passed down the fistula, and then directing the knife along the groove, the flesh, and common integuments, are to be laid open as far as is safe and necessary; a free passage is, by this means, given to the corrupted matter, and the part may be come at with the proper dressings. If the opening is attended with a large discharge of blood, as is frequently the case, the wound must be, at the first dressing, filled with dry lint, and afterwards it is to be dressed with the common digestive, with a small mixture of the Egyptian ointment, or with a little red precipitate, till the wound is perfectly cleansed, and it may then be easily healed in the common way. Heister's Surg. p. 264.

Ulcers about the anus are most apt to become fistulous, and are very difficult to cure. Some, indeed, pretend to have found Ward's fistula paste very successful in this complaint. It is not a dangerous medicine, and being easily procured, it may deserve a trial: but as the *ulcers* generally proceed from an ill habit of body, they will seldom yield to any thing except a long course of regimen, assisted by medicines, which are calculated to correct that particular habit, and to induce an almost total change in the constitution. Buchan's Dom. Med. p. 637.

ULCER, *phagedænic*, is an ulcer of a corrosive nature, eating away the adjacent parts all around; the lips thereof remaining tumefied. When this kind of *ulcer* eats deep, and spreads wide, without being attended with a tumor, but putrefies, and grows foul and fetid, it is called *noma*; and both, on account of the difficulty wherewith they heal, are also termed *dysepulota*.

In this kind of *ulcers*, the acrimony of the blood is to be moderated by lenient medicines; such as decoctions of the China-root, sarsaparilla, scorzonera, sharp-pointed dock, marsh-mallow, sanicle, agrimony, white horehound, &c. The same directions with regard to diet are to be observed as in the case of *running* ULCERS. A purging medicine, with the addition of mercurius dulcis, occasionally taken, will not only lessen the foul discharge of the *ulcer*, but also destroy the acrimony of the blood, and forward the cure. The external remedies are the same as in the *running* ULCERS.

In the Lond. Med. Obs. and Inq. vol. ii. p. 365, &c. we have an account of a *phagedænic ulcer* cured by the sublimate and sarsaparilla. The patient took a quart every day, at four doses, of a strong decoction of sarsaparilla, with half a grain of corrosive sublimate dissolved in it: the sore began to mend after the patient had taken the decoction for a fortnight,

fortnight, and, in about ſix weeks, was entirely healed. Mr. Underwood, in his Treatiſe on *Ulcers* of the Legs, much extols an aſtringent ſolution of green vitriol, calcined to whiteneſs, in water, in *phagedænic ulcers*. See PHAGEDÆNIC *Water* and WORT.

ULCER, *a putrid or ſordid*, is that whoſe ſides are lined with a tough viſcous humour, and which is alſo attended with heat, pain, inflammation, and a large flux of humours to the part; with time the ſordes increaſe, and change colour, the *ulcer* corrupts, its matter grows fetid, and ſometimes the part gangrenes. Putrid fevers often give riſe to this kind of *ulcer*.

When *ulcers* become putrid or fetid, this accident ariſes either from a very bad habit of body in the patient, or elſe from the negligence or unſkilfulneſs of the ſurgeon.

The acrimony of the blood is by all poſſible means to be taken off in theſe caſes, and the *ulcer* to be frequently dreſſed, and every time thoroughly cleanſed. When wounds are dreſſed but ſeldom, as will be the caſe after the ſharp engagements in an army, where great numbers have been wounded, it cannot happen, but that the injured parts, in many patients, will be annoyed with heat, putrefaction, or worms.

To prevent and remedy theſe, the wounds muſt be dreſſed with the Egyptian ointment, mixed with Wurtz's brown ointment, or the phagedænic water may be uſed with great ſucceſs, as alſo red precipitate, either alone, or mixed with burnt alum, or with the common digeſtive. Theſe applications are to be continued till the putrid fleſh ſeparates from the bottom of the *ulcer*; and while this is doing, it will be very proper to cover the part with lint dipped in ſpirits of wine, which is a very powerful remedy againſt putrefaction.

When the putrid parts are caſt off, the cure will be perfected by the common means uſed in *ulcers*, adding myrrh to the healing medicines; and where there are worms bred in the *ulcer*, no particular caution need be given againſt them, ſince the ſame applications anſwer the purpoſe, as, whatever reſiſts putrefaction, will alſo be found to deſtroy worms.

Ulcers ſometimes prove, however, ſo very malign and obſtinate, that they will give way to none of theſe remedies; and, in theſe caſes, though there be nothing venereal at the bottom, yet the only relief ſeems from a ſalivation. Heiſter's Surgery, p. 269.

Dr. Percival and Dr. Withering having found, that mephitic, or fixed air, was capable of correcting purulent matter in the lungs in the caſe of a PHTHISIS *pulmonalis*, it was reaſonably inferred, that it would be equally uſeful when applied externally to foul *ulcers*; and experience is ſaid to have confirmed this concluſion. See CANCERS.

ULCERS, *recent and benign*, are thoſe that are attended with no violent ſymptoms; in which the pus is of a moderate conſiſtence, whitiſh, without acrimony, and of no bad ſmell, and the patient otherwiſe healthy, and of a good conſtitution. Theſe, like recent abſceſſes, are not generally difficult to be cured; they may be treated like recent abſceſſes or wounds, being firſt cleanſed, after diſcharging the matter, if deep, by means of an injection, or otherwiſe with lint; and then applying a digeſtive ointment, ſpread upon lint, and ſecuring it on the part with diachylon, or any other ſimilar plaſter, and covering the whole with compreſſes and bandages. When the *ulcer* appears to be thoroughly cleanſed, ſo that the bottom of it appears florid, and acquiring new fleſh, the next object is to fill it with new fleſh, by the medicines, vulgarly called ſarcotics, the beſt of which is the common digeſtive ointment; though ſome uſe different balſamic remedies, as balſam of Arcæus, of Peru, of ſulphur, eſſence of myrrh and aloes, oil of myrrh per deliquium, or other vulnerary balſams of this kind. When the *ulcer* is filled up with new fleſh, it remains to induce a proper cicatrix, by dreſſing the part daily with dry lint till it is formed; and if the fleſh becomes luxuriant, and the *ulcer* moiſt, it muſt be ſprinkled with drying powders, as thoſe of maſtich, frankincenſe, ſarcocolla, colophony, calaminaris, or tutty; but if the luxuriant fleſh has grown above the ſkin, it ſhould be eat down with blue vitriol, or powder of red precipitate mixed with burnt alum; and then the above proceſs ſhould be continued. A proper regimen ſhould accompany every ſtage of the cure. Heiſter's Surg. vol. i. p. 262.

ULCERS, *running*. When *ſtubborn* ULCERS are attended with a large diſcharge, there is reaſon to apprehend that the blood abounds with too large a quantity of a thin acrimonious ſerum, which are hence called *rheumatic ulcers*.

This cannot be drawn off any way more properly than by cathartic medicines; theſe and diuretics are to be repeated as often as the ſtrength of the patient will conveniently permit, and he muſt be particularly cautioned againſt drinking too freely.

Millepedes, in any form, are very properly preſcribed to be taken internally in theſe caſes, as are alſo the eſſence of amber, myrrh, balſam of Peru, tincture of ſalt of tartar, tartarized tincture of antimony, and the like; large and frequent draughts of ſmall liquors are frequently the cauſe of theſe diſorders, and are therefore moſt carefully to be avoided; ſtrong ale, or old wine, ſhould be drank ſparingly at meals, and nothing between them.

Such meats are beſt, on theſe occaſions, as have feweſt juices in them, and are very well roaſted; and the external medicines muſt be thoſe which have the greateſt reputation for dryers. The principal of theſe are lime-water, lapis calaminaris, tutty, chalk, maſtich, frankincenſe, colophony, and native cinnabar; when any of theſe have been ſprinkled in fine powder upon the *ulcer*, a plaſter of lead, diapompholygos, or calaminaris, is to be laid over it. Heiſter's Surgery, p. 267.

ULCERS, *ſinuous*, are ſuch as run aſlant, or ſideways from their orifice, and may be known either by ſearching with the probe, wax-candle, &c. or by the quantity of matter they diſcharge, in proportion to their apparent magnitude. Theſe ſometimes lie deep, and have ſeveral turnings: they are diſtinguiſhed from fiſtulas only by their want of calloſity, except in the very orifice.

ULCERS, *ſtubborn, inveterate, and malign*, called in the medical ſchools, *ulcera dyſepulotica*, *chironia*, *cacoethica*, *rebellia*, and *contumacia*, are thoſe which uſually appear in ſubjects of a bad, ſcorbutical, cachectical, and hydropical habit of body, or where the pox, a caries, a callus, a cancer, or very great acrimony of the blood, are the radical cauſes; in which the pus is too fluid, acrimonious, fetid, yellow, brown, green, or blackiſh, or of the conſiſtence of lard. In theſe caſes the cauſes of the diſorder ſhould be explored and extirpated. In *ulcers* of this kind, ariſing merely from a vitiated habit of body, without a fiſtula, callus, caries, putrid fleſh, or worms, the habit ſhould be corrected by internal remedies and a ſtrict regularity of diet; the *ulcers* ſhould be alſo cleanſed daily with proper medicines, and dreſſed with any common ointment, oil, or balſam, covering the dreſſings with any plaſters in uſe, as that of lead or diapompholyx. After they are well cleanſed, they ſhould be dreſſed with digeſtive ointment, to which may be added myrrh, maſtich, or colophony, or a decoction of the æs viride with wine, or a decoction of walnut-tree leaves in water, with a little ſugar; in which laſt a linen cloth being dipped, is to be laid in the *ulcer*, and repeated every ſecond or third day. This ſimple and vulgar medicine, ſays M. Belloſte, ſuppurates, deterges, incarnates, reſiſts putrefaction, &c. more than any other medicine known. In ſome caſes, *ſpirit* of wine, or lime-water, has had great efficacy in healing and drying up *ulcers*. If any ſinuſes or fiſtulæ are diſcovered, they muſt be laid open and cleanſed, and healed with the balſam of Peru, of Copaiba, or terebinthine balſam of ſulphur, or with any other agglutinating medicine; by ſuch means, with the conſtant uſe of internal remedies, the worſt *ulcers* may be generally cured. Heiſter. Surg. vol. i. p. 266.

Dr. Whytt ſtrongly recommends the uſe of the ſolution of corroſive ſublimate of mercury in brandy, for the cure of obſtinate ill-conditioned *ulcers*. Dr. Buchan has alſo found this medicine ſucceſsful. The doſe is a table-ſpoonful night and morning, at the ſame time waſhing the ſore twice or thrice a day with it. Dr. Whytt obſerved, that waſhing the ſore thrice a day with the ſolution of a triple ſtrength was very beneficial.

When *ulcers* obſtinately reſiſt ſuch treatment, ſome have had recourſe to ſalivation, which ſeldom fails to effect a cure, when all other remedies have been tried in vain. If the patient be too weak to undergo the fatigue of a thorough ſalivation, it may be moderated, and kept up the longer, in proportion to his ſtrength.

ULCERS, *varicous*, are ſuch as, being ſeated in the veins, and becoming painful and inflammatory, ſwell up the part they poſſeſs. Theſe, when recent, being occaſioned by the uſe of corroſives, or proceeding from a ruptured varix, are often attended with an hæmorrhage. The veins adjacent to the *ulcers* are, in this caſe, preternaturally diſtended, and may ſometimes be felt interwoven together, like net-work, about the part.

ULCERS, *venereal*. Theſe are almoſt always ſituated either in the groins, after the ſuppuration of venereal buboes, or elſe in the prepuce, frænum, or glans penis, which is uſually termed a CHANCRE. In females they are frequently ſituated in the vagina, or labia pudendi, and in either ſex ſometimes in the noſe, palate, lips, fauces, tongue, and uvula; and ſometimes the os frontis, and

other bones both of the head and other parts of the body, are subject to them.

The great intention, in these cases, is to expel the venereal poison by proper remedies; for one *ulcer* of this kind, if neglected or ill-treated, will produce an universal pox. The internal medicines are principally calomel, mixed with purging medicines; and, in the intermediate times, decoctions of the woods, with tincture of antimony, and the like; these last are to be taken before rising in the morning, to bring on a gentle sweat, and may be repeated afterwards many times in the day. A strict regimen of diet ought also to be observed; wine, and all vinous or spirituous liquors, are to be forbidden, and all aromatics, spices, salt, and acrimonious or acid things, are poison to persons in these cases. If such a regimen, and a course of these medicines, will not effect a cure, such quantities of mercury must be conveyed into the blood, as will raise a salivation, by which both the *ulcers*, and the pox, which was the cause of them, will be cured at the same time. When the *ulcers* are situated in the mouth, uvula, fauces, or tongue, the patient should frequently use a gargle, made of decoctions of the woods, and sweetened with honey of roses; and the *ulcerated* part should be frequently touched with honey of roses, acidulated with spirit of vitriol, and, after this, they may be healed with essence of myrrh, amber, or with oil of myrrh made per deliquium.

When the *ulcers* are on the external parts, they must be dressed either with the common digestive, or with basilicon, with red precipitate mixed in them; and these dressings are to be covered, and kept on by a mercurial plaster; and when they are thoroughly cleansed, they may be healed in the ordinary way.

Another excellent medicine for cleansing these *ulcers*, is the PHAGEDÆNIC-*water*, or, in its place, lime-water, impregnated with calomel; either of these may be applied every day many times, and the parts may be, when necessary, touched with the caustic, or red precipitate; and when they are thoroughly cleansed, they may very successfully be healed, either with an ointment made only of crude mercury mixed with turpentine, or with the following: take of the diapompholygos ointment, and crude mercury, killed with a small quantity of Venice turpentine, of each equal quantities, mix them in a glass mortar into an ointment, or take of the amalgama of lead and tin an ounce, of bole armenic two ounces; mix these, and make them into an ointment, by mixing them with a sufficient quantity of ointment of roses, or any other simple ointment, in a glass mortar. If there be, at the same time, a caries of the bone, which is, indeed, too frequently the case, that is to be dressed with euphorbium, oil of cloves, phagedænic water, or spirit of nitre with quicksilver dissolved in it; or, if it can conveniently and safely be done, the actual cautery is of signal service.

Sometimes, when these *ulcers* fall on a soft part of the body, as the groin, they throw out continually so large a quantity of lymph, that all the medicines that can be invented or applied, are of no consequence to stop it. This accident is occasioned either by the rupture or erosion of some of the lymphatic vessels. In this case the surgeon ought to try what can be done by proper compresses, and a tight bandage; but when these, and the other milder applications are of no service, the actual cautery must be employed, but with great care and caution, to the vitiated parts.

If venereal *ulcers* of the penis and glans are negligently or unskilfully treated, an universal pox is very frequently the consequence; the urethra will, in these cases, be often perforated in various places, and the urine will be discharged through it, as through a sieve; and sometimes the whole glans, or penis itself, will be either totally eaten off, or so miserably affected with scirrhuses and cancers, that the surgeon is obliged to extirpate them with a knife. When the nose is affected by these *ulcers*, it is very frequently entirely demolished by them; sometimes the palate, with its bones, are so eroded and perforated, that an open communication is made between the mouth and nostrils, and the fluid part of the aliment, in eating, is thrown out by the nostrils. These passages can scarce ever be perfectly covered again by flesh; but when the extremities and edges of them are healed, they may be closed with a small plate of silver or gold. The tonsils also, the external coat of the uvula, and frequently the whole uvula itself, are also destroyed by the virulence of these ulcers: and lastly, the cranium itself, particularly the frontal bone, is frequently so eroded and perforated by a caries, that the brain lies bare, and the motion of the pulsation of the arteries may plainly be seen. It is no wonder if the worst of symptoms, and even death itself, follow this, if neglected or improperly treated. Heister's Surgery, p. 270. See VENEREAL *Disease*.

ULCER *of the bladder* is known by a discharge of fetid matter, or blood, and sometimes a sort of scales, or membranous pellicle, observed in the urine. There is also a continual dysury, and a pain in the urinary passages. The means of relief are similar to those for an *ulcer in the kidnies*.

Cheselden observes, that an ulcerated bladder very rarely occurs in the bodies that are are obtained for dissection.

ULCERS *of the head*. See HEAD.

ULCER *of the kidnies*. Oribasius observes, that an *ulcer* in the kidnies may be distinguished from the same disorder in the bladder, by the following circumstances; when the bladder is affected, the pain is felt in the pubes and bottom of the belly; but when the kidnies suffer, the pain is in the back part of the loins: in the first case there is a difficulty, if not a suppression of urine; but, in the latter, the urine passes freely; from the bladder there are voided membranous scales, but from the kidnies fibrous pieces of flesh: and moreover, a violent pain is felt in the bladder when it is ulcerated; but when the *ulcer* is in the kidnies, the pain is of a dull kind. The urine looks like milk, when first discharged from an ulcerated kidney, but it is not fetid; however, on standing for some time, the white matter falls: when the pain is considerable in the kidnies, it occasions a nausea, and sometimes a vomiting.

Dr. Hunter observes, that though the kidnies are often found wasted, they are hardly ever seen ulcerated. For the regimen, &c. to be observed in the case of ulcerated kidnies, see NEPHRITIS.

ULCERS *in the legs*. See LEGS.

Some have recommended in the cure of these *ulcers* absolute confinement and rest; but is now found, that moderate exercise promotes the circulation, and increases that vigour of action, on which the healing of the *ulcer* depends.

In old *ulcers* of the legs, Messrs. Else and Martin, surgeons of St. Thomas's Hospital, in consequence of information relating to the method used by Mr. Battiscomb in the cure of such *ulcers*, determined to try what bandage would do, without administring any internal medicine, and found it so efficacious, as to lead them to conclude it will seldom fail where there is no carious bone. If the *ulcer* is foul, they begin by making it clean by the application of bread and milk, or some other emollient poultice. They then apply a linen cloth, moistened with tincture of myrrh, or Goulard's eau vegetau-minerale, as they find one or other best to agree. If these should give pain, they then first apply dry lint, and upon that a piece of cloth spread with the ceratum epuloticum, or ceratum album. Over this they lay a very thin plate of lead, cut to the figure of the sore, and just large enough to cover its edges. This is secured upon the part with a bandage drawn as tight as the patient can bear it, even so as to make the leg feel numb, which is rolled from the toes to above the knee. In proportion as the sore contracts, the size of the plate is lessened. When the patients are well, it is recommended to them to keep the leg constantly rolled tight in the day-time. When, from the long continuance of the drain furnished by a sore leg, or from bad habit of body, they apprehend ill consequences from healing the *ulcer*, they content themselves with bringing it to a better condition, and with keeping it so, by a judicious application of the bandage; and even when there is no fear as to the consequence of healing the *ulcer*, it may be prudent to advise an issue in the other leg, to order an occasional dose of some laxative medicines, and to confine the patient to a spare diet for some time after the sore is well. But if, notwithstanding these precautions, any disorder should supervene, which may be imputed to the healing of the *ulcer*, such as pulmonic complaints, which are the most frequent, they immediately endeavour to open the sore again.

The intention of curing *ulcers* of the legs by bandage is not new. Wiseman, in his second book of surgery, recommends a laced stocking, not only to promote the cure of this disease, but also to prevent a relapse. Med. Obs. and Inq. vol. iv. art. 29. See also Underwood's Treatise upon *Ulcers* of the Legs, &c. 1783.

ULCER *in the lungs* occasions the disease which we call PHTHISIS *pulmonalis*; for the cure of which Dr. Percival and Dr. Withering have in several cases successfully administered fixed air. Dr. Percival directed his patients to inspire the steams of an effervescing mixture of chalk and vinegar, or of vinegar and pot-ash; and observed that the hectic fever, in several instances, considerably abated, and the matter expectorated became less offensive and better digested; though in no instance he was happy enough to effect an absolute cure. Dr. Withering,

thering, however, by a ſimilar courſe, was more ſucceſsful.

It is obſerved, that fixed air can only be employed, with any proſpect of ſucceſs, in the latter ſtages of the phthiſis pulmonalis, when a purulent expectoration takes place. Percival's Eſſ. vol. ii. Prieſtley on Air, vol. i. p. 301.

Ulcers *of the palate* proceed moſtly from a ſcorbutic acrimony, or a venereal infection in the blood. See *Venereal* Ulcers.

In the cure of theſe *ulcers*, principal regard ſhould be had to the morbid ſtate of the blood, the venereal or ſcorbutic acrimony of which ſhould be corrected by proper internal medicines. If the palate is not perforated by the *ulcer*, it will be proper firſt to cleanſe the parts by often injecting a deterging gargle made of vulnerary herbs, and mixed either with honey of roſes, Egyptian ointment, or Wurtz's brown ointment, as it is required more or leſs deterging. After ſuch detergents have cleanſed the *ulcer*, it may be dreſſed with honey of roſes, tincture of myrrh, elixir proprietatis, or balſam of Peru, applied with lint. When the bones of the palate are alſo carious, the foul parts will very often ſeparate from the ſound by the uſe of the aforeſaid medicines, eſpecially if the dreſſing be ſometimes performed with honey of roſes acidulated with ſpirit of vitriol. But when theſe prove inſufficient, an actual cautery ſhould be gently applied to the foul bone, after it has been firſt cleanſed and dried with lint, and the tongue is ſecured by the ſpeculum oris, or a ſpatula. After a cauterization, the parts muſt be dreſſed with balſams till the naked bone is again covered with fleſh. Heiſter's Surg. vol. ii. p. 40.

Ulcers *of the tonſils* are much leſs frequent than perſons commonly ſuppoſe. Dr. Hunter obſerves, that the tonſils have, over their whole ſurface, ſmall orifices, which emit a ſlimy mucus; and that, when they are inflamed, the mucus being purulent and white, and the ſurface irregular, there is the appearance of ulceration, when there is really none. When *ulcers* are actually formed, they may be touched with mixtures of honey, alum, borax, ſpirit of ſalt, &c. as their cauſe, or attending circumſtances require.

Ulcers *in the womb.* Whilſt a viſcid, yellow, or bloody humour is evacuated, the *ulcer* is in a mild ſtate, but when it becomes ſanious, fetid, and attended with pain, a cancer may be ſuſpected, and then palliatives only can be propoſed. In the milder kind the belly ſhould be kept lax with manna, tamarinds, and ſuch cooling purgatives, and an infuſion of elder-flowers in milk and water injected. When the caſe is cancerous, demulcent and lenitive medicines, with anodynes to moderate the pain, are all that can be propoſed. Motherby.

ULCERATED *cancers.* See Cancer.

ULCERATION, Exulceratio, a little aperture, or hole in the ſkin, cauſed by an *ulcer*.

Cauſtic medicines occaſion *ulcerations* in the ſkin. Arſenic always *ulcerates* the part it ſticks to. A ſalivation *ulcerates* the tongue and palate.

ULCEROUS *ſore throat.* See Quinzy.

ULEX, in *Botany*, the name by which Linnæus calls the plant named by Tournefort and other botaniſts, *geniſta ſpartium*. See Furze.

ULIGINOUS, Uliginosus, implies as much as moiſt, mooriſh, fenny.

ULLAGE *of a caſk* is ſo much as a veſſel wants of being full.

ULMARIA, in *Botany*. See Spiræa.

ULMUS, in *Botany*. See Elm.

ULNA, in *Anatomy*, a long hard bone in the arm, with a cavity in the middle; called alſo *focile majus*, and *cubitus*. See *Tab. Anat.* (*Oſteol.*) *fig.* 3. *n.* 8. *fig.* 7. *n.* 10.

The *ulna* lies on the inſide of the fore-arm, reaching from the elbow to the wriſt, is big at its upper end, and grows ſmaller to its lower end.

At its upper it has two proceſſes, which are received into the fore and hind ſinuſes of the extremity of the humerus. The foremoſt proceſs is ſmall and ſhort, and called *corone*, or the coronoide apophyſis; the hindmoſt, called *ὀλεκρανον*, is bigger and longer; it ſtays the fore-arm, when it comes to a right line with the arm. See Olecranum.

Betwixt theſe proceſſes it has a ſemicircular ſinus, or large ſigmoide cavity, covered with a ſmooth cartilage, which receives the inner protuberance of the lower end of the humerus, upon which we bend and extend our fore-arm; and along the middle of that there runs a ſmall ridge, by which this bone is articulated to the humerus by ginglymus. Had the articulation here been an arthrodia, the joint muſt have been much weaker; but the hand could have received no more motion from it than it has now from the ſhoulder.

The inſide of this upper end has a ſmall ſinus, or ſigmoide cavity, covered with a cartilage, which receives the circumference of the round head of the radius. The lower extremity of the *ulna*, which is round and ſmall, is received into a ſinus, in the lower end of the radius; and, upon this extremity, it has a ſhort and ſmall proceſs, from which the ligaments which tie it to the bone of the wriſt ariſe; this proceſs ſerves to keep the bones of the wriſt in their place.

The middle portion, or body, of the *ulna* is divided into three ſides, and three angles. One of the ſides is narrow and rounded, one broad and hollow, and the third flat, and marked with an oblique line on its upper part. The narrow ſide anſwers to the tuberoſity of the olecranum, and is covered only by the common integuments. The other two ſides are diſtinguiſhed from the former by two blunt angles, and they unite in a ſharp angle, which lies oppoſite to the rounded ſide, and anſwers to the point of the coronoide apophyſis. The hollow ſide is even with the ſmall ſigmoide cavity, and the flat ſide oppoſite to it. Theſe two ſides give inſertion to many muſcles, and the ſharp angle to what is called the interosseous *ligament*. At the top of this angle there is a narrow oblong muſcular impreſſion. The angle common to the rounded and flat ſides, ends below in an oblong uneven muſcular eminence.

The ſubſtance of the *ulna* is much the ſame with that of the os humeri. The tuberoſity of the olecranum, and the ſmall inferior head, with its ſtyloide apophyſis, remain for a long time epiphyſes in ſome ſubjects. It is connected with the pulley of the os humeri by an angular ginglymus, with the two extremities of the radius by a compound lateral ginglymus, and with the hand by ligament, and not by articulation. Winſlow.

Ulna, *cartilages of the.* The two ſigmoide cavities, in the upper extremity of the *ulna*, are covered by a cartilage common to both, which is a little interrupted about the middle of the edges of the cavities, by the tranſverſe notches in this part of this bone. The inferior extremity, or ſmaller head of the *ulna*, is cruſted over by a cartilage round its cylindric border, in the notch near the ſtyloide apophyſis, and for ſome ſpace on the apophyſis itſelf. The cartilage, which covers the head of the radius, is alſo ſtretched over the cylindric border thereof, and a lateral portion of the muſcular tuberoſity, immediately below the neck, is alſo covered by a thin ſhining cartilage. The lateral half grooves, or channels of the baſis of this bone, appear likewiſe to be cruſted over with a cartilaginous matter; but this may poſſibly be only ſome portions of the annular ligaments. Winſlow.

Ulna, *fracture of the.* See Cubitus.

Ulna, *wounds of the.* See *Diſeaſes and injuries of the* Bones.

Ulna, an ell in meaſure. See Ell and Measure.

Ulna *ferrea*, denotes the ſtandard iron ell, kept in the exchequer.

ULNAGE. See Alnage.

ULNARIS *extenſor*, in *Anatomy*, a muſcle called alſo extensor *carpi*. See *Tab. Anat.* (*Myol.*) *fig.* 1. *n.* 38.

This is a long muſcle, lying on the outſide of the fore-arm, fleſhy toward the os humeri, and tendinous toward the carpus.

It is fixed above to the external condyle of the os humeri, being there united to the anconæus minor, to the annular ligament of the head of the radius, and to the upper half of the external angle of the *ulna*; from thence it advances and forms a tendon, which paſſes through the external notch, at the lower extremity of this bone, on one ſide of the ſtyloide apophyſis. The tendon, after having paſſed under a particular ligament, ſituated near the os cuneiforme, of the carpus, is inſerted in the outſide of the baſis of the fourth metacarpal bone, ſending ſome tendinous filaments to the baſis of the third metacarpal bone. Winſlow.

This muſcle is alſo called *cubitalis externus*, and it is named by Cowper, *extenſor carpi ulnaris*.

When this muſcle acts with the *ulnaris internus*, it turns the outer edge of the hand toward the olecranum. With the radiales externi, it turns the back of the hand toward the outer condyle. When it acts alone, it brings the outer edge of the hand obliquely toward the olecranum and the external condyle at the ſame time; but this is performed with difficulty.

Ulnaris *gracilis*, a muſcle, called by ſome palmaris *longus*. It is a ſmall muſcle, lying between the os humeri and the carpus, on the inſide of the fore-arm.

Its body is ſmall and ſlender, and its tendon very long and flat. It is fixed by its fleſhy portion in the ſmall criſta of the inner condyle of the os humeri, ſometimes cloſely united to the *ulnaris internus*; from thence it runs down fleſhy for ſome ſpace, turning a little obliquely toward the middle of the fore-arm, and ends in a long narrow thin tendon. This tendon paſſes down the middle of

of the fore-arm, over all the other muſcles, to which it ſlightly adheres, and, advancing over the large internal annular or tranſverſe ligament of the carpus, is inſerted in the ſurface thereof, ſending off ſome radiated filaments to the aponeuroſis palmaris. This muſcle is ſometimes fixed to the condyle of the os humeri, by a tendon about a finger's breadth in length, to which the fleſhy body joins toward the middle of the fore-arm. The inferior tendon is alſo ſometimes inſerted in the os ſcaphoides of the carpus, without communicating with the large annular ligament; and ſometimes the aponeuroſis palmaris ariſes from this ligament. From all which variations it may reaſonably be concluded, that that aponeuroſis has no eſſential dependence on this muſcle; and ſometimes this muſcle appears to be only a production from the *ulnaris internus*.

The *ulnaris gracilis* ſeems to be an aſſiſtant to the *ulnaris* and *radialis interni* in bending the wriſt, and it ſeems likewiſe particularly to aſſiſt the radialis internus in the motion of pronation. Winſlow.

ULNARIS *internus*, a long muſcle, fleſhy at its upper extremity, and tendinous at the other, ſituated on the outer part of the *ulna*. It is fixed in its upper part, in the backſide of the long or internal condyle of the os humeri, in that part of the olecranum which is next the condyle, along the upper half of the *ulna* very nearly, and to the middle common tendon of the neighbouring muſcle, commonly termed *profundus*. It runs in the direction of the external angle of the *ulna*, and ends by a long tendon in the os piſiforme, or orbiculare of the carpus, reaching likewiſe to the os unciforme, being united to the ligament common to theſe two bones. *Tab. Anat.* (*Myol.*) *fig.* 2. *n.* 24.

When this muſcle acts alone, or as the principal mover, it brings the hand obliquely toward the internal condyle and toward the olecranum, though with difficulty. When it acts together with the radialis internus, it turns the hand equally toward the two extremities of the bones of the fore-arm, and thereby moves not only the carpus in general on the fore-arm, but alſo the ſecond row of the carpus on the firſt, and the metacarpal bones on the ſecond. When it acts with the *ulnaris externus*, it turns the outer edge of the hand toward the olecranum. Winſlow.

This muſcle is alſo called *cubitalis internus*, and is named FLEXOR *cubiti ulnaris* by Cowper.

ULOPHONUS, in *Botany*, a name given by the ancients to a poiſonous plant, ſince called the CHAMÆLEON *thiſtle*, and even at that time known to Dioſcorides, Galen, and others, under the name of the *black chamæleon thiſtle*. See IXIAS.

ULPHA, a term uſed by ſome authors to expreſs the muddy ſubſtance which falls off from whetſtones, grindſtones, and the like, which is ſometimes ordered in medicines among the chemical writers, and is only the communicated particles of the ſtone, with a very ſmall portion of iron abraded from the things ground on them.

ULPICUM, in *Botany*, a name by which Columella, and ſome other authors have called the *allium*, or *garlic*.

ULRACH, a name given by ſome writers to the *ſanguis draconis*, or *dragon's blood*.

ULTERIOR, in *Geography*, is applied to ſome part of a country or province, which, with regard to the reſt of that country, is ſituate on the farther ſide of a river, mountain, or other boundary, which divides the country into two parts.

Thus Africa, with regard to Europe, is divided by Mount Atlas, into citerior and *ulterior*, i. e. into two portions, the one on this ſide Mount Atlas, and the other on that.

ULTIMA *baſia*, *laſt kiſſes*, is a phraſe uſed among ſome painters, for the laſt finiſhing touches with the pencil.

ULTRAMARINE, ULTRAMARINUM. See BLUE and *Lapis* LAZULI.

ULTRAMARINE *aſhes* is the name of a pigment which is the reſiduum of the *lapis* LAZULI, after the *ultramarine* has been extracted from it. But as the coloured particles which remain are mixed with thoſe of another kind contained in the lapis lazuli, theſe aſhes muſt of courſe be much leſs valuable than even the worſt *ultramarine*.

Their appearance is that of the *ultramarine*, a little tinged with red, and diluted with white. The adulteration to which they are ſubject, and which gives them a better appearance than that of their genuine ſtate, may be detected by the methods propoſed for diſcovering the ſophiſtication of the *ultramarine*. See *Ultramarine* BLUE.

ULTRAMONTANE, ſomething beyond the mountains. The term is principally uſed in relation to Italy and France, which are ſeparated by the mountains of the Alps.

In France, the opinions of the *ultramontane* canoniſts, i. e. of thoſe of Italy, are not received.

The painters, particularly thoſe of Italy, call all thoſe that are not of that country *ultramontanes*, or ſimply, *tramontanes*. Pouſſin is the only *tramontane* painter that the Italians ſeems to envy.

ULTRAMUNDANE, ULTRAMUNDANUS, *beyond the world*, is that part of the univerſe ſuppoſed to be without, or beyond the limits of our world, or ſyſtem.

ULVA, a name given by ſome botanical authors to a genus of imperfect plants, conſiſting of the common oyſter-green, the ſea-chitterling, and the like, which have been ſince called by Dillenius, TREMELLÆ.

Bauhine makes the *ulva* a purple ſea-moſs allied to the alga.

Ulva, or *laver*, in the Linnæan ſyſtem, is a genus of the *cryptogamia algæ* claſs. Its characters are, that the flowers are contained in a ſemi-tranſparent bladder-like membrane, with no appearance of a regular leaf. Linnæus enumerates ten ſpecies, moſt of which grow on rocks and ſtones in the ſea, or on the ſea-ſhore, and ſome in freſh-water ditches. The ſpecies, called the green LAVER, or oyſter-green, is eſteemed by the inhabitants of the ſea-coaſt as a wholſome and pleaſant food, being gently opening, and antiſcorbutic. It is frequently ſent to London in earthen pots.

ULULA, in *Ornithology*. See *Grey* OWL.

UMBELLA, or UMBRELLA. See PARASOL.

UMBELLÆ, UMBELS, among *Botaniſts*, the round tufts or heads of certain plants, or the extremities of ſtalks or branches, divided into ſeveral pedicles or rays, beginning from the ſame point, and opened in ſuch a manner as to form an inverted cone. When the pedicles, into which the ſtalk is divided, are ſubdivided into others of the ſame form, upon which the flowers or fruits are diſpoſed; the firſt order is called rays, the ſecond pedicles. That *umbel*, which conſiſts of pedicles only, is called a *ſimple umbel*; that which is compoſed both of rays and pedicles is called a *compound umbel*.

Sparſed, or thin *umbellæ*, are thoſe whoſe parts ſtand at a diſtance from one another, and yet are all of an equal height.

UMBELLIFEROUS *plants*, are ſuch as have their flowery tops produced in an *umbel* on the top of the ſtalks, or branch, and ſpread out, like an umbrella, on each little ſubdiviſion of which there is growing a ſmall flower; ſuch as fennel, dill, &c.

This flower is always pentapetalous, and is ſucceeded by two naked ſeeds adjoining to each other, which are the true characteriſtics that diſtinguiſh theſe plants from others.

The *umbelliferous* are a very large claſs of plants, and are diſtinguiſhed by Mr. Ray into,

1. Such as have a compounded leaf, of a triangular and pinnate form. The ſeeds of theſe are either broad, flat, and plain, and edged with membranes, or the ſeeds are more tumid, and leſs compreſſed and flat than the former.

2. Such as have a ſimple or undivided leaf, or at leaſt one only a little jagged. See *Umbelliferous* PLANTS and *Umbelliform* FLOWERS.

UMBER, or UMBRE, in *Natural Hiſtory*, a foſſil brown or blackiſh ſubſtance, uſed in painting, ſo called from *Ombria*, the ancient name of the duchy of Spoleto in Italy, whence it was firſt obtained; diluted with water, it ſerves to make a dark brown colour, uſually called with us an hair-colour.

Dr. Hill and Mr. Da Coſta conſider it as an earth of the ochre kind. It is found in Egypt, Italy, Spain, and Germany; in Cyprus alſo it is found in large quantities: but what we have brought into England is principally from different parts of the Turkiſh dominions. But it might be found in conſiderable plenty alſo in England and Ireland, if properly looked after, ſeveral large maſſes of it having been thrown up in digging on Mendip hills in Somerſetſhire, and in the county of Wexford in Ireland: it is alſo ſometimes found in the veins of lead-ore, both in Derbyſhire and Flintſhire.

The characters by which, they ſay, it is known from other earths, are theſe: it never conſtitutes a ſtratum of itſelf, as the generality of other earths do, but is found ſometimes in ſmall lumps among gravel, and other looſe matter, and ſometimes in the perpendicular fiſſures of the ſolid ſtrata. It is of a cloſe compact texture, yet very light, of a ſmooth ſurface, and of an elegant pale brown, in different degrees; it is ſmooth and ſoft to the touch, and adheres firmly to the tongue, melts ſlowly in the mouth, breaks eaſily between the fingers, and ſtains the hands a little, makes no fermentation with acids, and ſlowly moulders in water. Burnt, it becomes of a

deep reddish-brown colour, but acquires no hardness.

Wallerius ranks the *umber* as a humus or mould, apprehending, by its immediately flaming in the fire, and by the smell which it emits, that it owes its colour to an admixture of bituminous parts. But M. le Baron de Hupfel (Berlin, Mem. 1771) has discovered it to be a fossil wood, filled with a bituminous juice. It is found in two different states, first, as retaining the form of wood, which it has preserved by means of a bituminous matter that has prevented the rotting of the wood; and secondly, as a powder, like that into which the first kind, that still retains the form of the wood, easily crumbles.

It is certain, however, says Mr. Kirwan, that the name hame hath been also given to a sort of brown ochre, which becomes red when slightly heated, but in a stronger heat is again brown and magnetic, and in a still stronger, melts into a black glass. It does not effervesce with acids before roasting, but after that the martial part is soluble. Elem. Mineral. p. 78.

This substance, when burnt, makes a good shade for gold. It need only be put into the naked fire in large lumps, which should not be taken out till they be thoroughly red-hot.

UMBER, or OMBRE, in *Ichthyology*, an English name for a fish of the truttaceous kind, more commonly called the GRAYLING, and by the authors in ichthyography, *thymallus*, a fresh-water fish of a very fine taste.

UMBILICAL, UMBILICALIS, in *Anatomy*, something that relates to the *umbilicus*, or navel.

UMBILICAL *region*, is that part of the abdomen lying round the *umbilicus*, or navel.

UMBILICAL *vessels*, are a set or assemblage of vessels belonging to a foetus; constituting what we call the *funiculus umbilicalis*, or navel-string.

These vessels are two arteries, a vein, and the urachus.

The UMBILICAL *arteries* arise from the hypogastricæ, run up by the sides of the bladder, and remain hollow and filled with blood, even in adults, as high as the middle of the bladder, through all which space they likewise send off ramifications. Afterwards they lose their cavity, and become ligamentary as they ascend. At the upper part of the bladder they approach each other, and joining the urachus, form that rope which may be termed the superior ligament of the bladder. See *Tab. Anat.* (*Angeiol.*) *fig.* 1. *n.* 56. 56. *fig.* 3 *lit. e. e. fig.* 16. *lit. g. g.*

The UMBILICAL *vein*, from innumerable capillaries united into one trunk, descends from the placenta to the liver of the fœus, where it is partly distributed into the porta, and partly into the cava. See *Tab. Anat.* (*Angeiol.*) *fig.* 4. *lit. c.* (*Splanch.*) *fig.* 3. *lit. i. fig.* 16. *lit. f.*

The urachus is most plainly found in brutes; though there is no doubt but it has place likewise in the human species.

The use of these vessels is to maintain a continuity and communication between the mother and the fœtus. Some authors will have it, that the fœtus receives its food and increase this way, and that it grows, like a vegetable, from the mother as the root, of which the *umbilical vessels* are the stem, and the child the head or fruit of this plant-animal. See FOETUS and NAVEL-*string*.

Dr. Trew asserts, contrary to Casserius, that the *umbilical* vein enters the liver towards the left part of it; and that there is but one *umbilical* vein, which empties itself into the left extremity of the *sinus vena portarum*, and sends no branches to the liver. See Phil. Transf. N° 457. sect. 7.

Dr. Trew endeavours to shew how, after birth, the *umbilical* veins and arteries, separating from the navel, gradually retract within their sheaths, which they have from the peritonæum, and leave the sides of the sheath to grow together, as the sides of the remains of the vessels also do. Hence he infers, that the hæmorrhages, which sometimes happen at the navels of adults, must not be from the *umbilical* vessels, but from some other. Commerc. Norimb. 1737. Hebd. 12. sect. 1.

UMBILICALIS *funiculus*, popularly called the *navel-string*, is a kind of string formed of the *umbilical vessels*, which being tied up in a common coat, or membrane, traverse the secundines, and are inserted, at one end, into the placenta of the mother, and, at the other, into the abdomen of the fœtus. See *Tab. Anat.* (*Splanch.*) *fig.* 16.

The navel-string is membranous, wreathed, and unequal, arising out of the middle of the abdomen, and reaching to the placenta uterina: it is usually half an ell in length, and as thick as one's finger. It was necessary it should be so long and lax, that when the fœtus in the womb grows strong, it might not break it by its sprawling and tumbling about; and that, after it is born, the secundine, or after-birth, might be drawn out the better by it.

The way that it passes from the navel to the placenta is very inconstant; for sometimes it goes upon the right hand to the neck, which being encompassed, it descends to the placenta; and sometimes it goes on the left hand up to the neck, &c. Sometimes it comes not to the neck at all, but goes first a little up towards the breast, and then turns round the back, and from thence passes to the placenta.

This part, at the birth, is either broken, or cut away, to the navel; so that its vessels, viz. two arteries, a vein, and urachus, become perfectly useless as vessels, and, drying up, become impervious, and serve only as ligaments to suspend the liver. See NAVEL-*string*.

UMBILICAL *points*, in *Mathematics*, the same with *foci*. See FOCUS.

UMBILICUS, *navel*, in *Anatomy*, the centre, or midde part of the lower venter, or belly, being the place through which the *umbilical* vessels pass, out of the fœtus, to the placenta of the mother. See *Tab. Anat.* (*Splanch.*) *fig.* 3. *lit. c. fig.* 16. *lit. e.*

The word is formed of *umbo*, the little bunch in the middle of a buckler, by reason of its resemblance to the navel.

UMBILICUS, in *Mathematics*, the same with *focus*.

UMBILICUS *marinus*, a name given to a small oval body of a shelly matter, from its resemblance to the human navel. It is properly the operculum of a shell-fish, serving to close up the aperture of the shell in the buccinum, and other turbinated shells; and to that purpose it is fixed to the anterior extremity of the body of the animal; so that when it retracts its body into the shell, this naturally fills up the mouth of it: it is convex on one side, and flat on the other; the convex side is plain and white, the flat side is yellowish or reddish, and marked with a spiral line.

It is said by authors to have great virtues as an absorbent and astringent; but it is not used at present in the shops, though it holds a place in the catalogues of the materia medica, as well of our own as other nations.

UMBINUS, among the *Ancients*, a kind of coin current in Gallia Narbonensis.

UMBLA, or, as some write it, UMBRA, in *Ichthyology*, the name of a fish of the truttaceous kind, and nearly allied to the salmon.

It is the *salmo umbla* of Linnæus, with the lateral lines bent upward, and a bifurcated tail.

There are four species of this fish mentioned among naturalists; but the *umbla prior*, and *umbla altera* of Rondeletius, which are two of them, seem only to be the different sexes of the same fish. These are considerably large, very like the common salmon, but have blue backs and yellow bellies. The third is the fish commonly called the *salvelin*, or *salmo salvelinus* of Linnæus, with the upper jaw longer than the other: and the fourth is the red CHARR. Willughby's Hist. Pisc. p. 198.

UMBO, in *Antiquity*, the round protuberant part of a SHIELD.

UMBONE, or *horn*, among *Florists*, signifies any pointed style, or pistil, in the middle of a flower.

There is also an *umbone*, called *double-pointed*, or *biparted*, as in the peony; and sometimes the *umbone* has four sharp points, in which case it is termed, an *umbone* divided into so many heads, or cut into three or four parts.

UMBRA, *shadow*. See LIGHT, SHADOW, PENUMBRA, &c.

UMBRA, in *Ichthyology*, the name of a sea-fish caught in the Mediterranean, and brought to the markets in Italy and other places; called by some *chromis*, and by the Venetians *corvo*.

Its usual size at market is about twelve or fourteen inches in length; but it grows to sixty pounds weight, and to the length of five or six feet. It is of a somewhat flatted figure, and its back is ridged and rises up from the head. It something resembles the carp in its general figure, but is broader. It is very elegantly coloured, for there are a number of long oblique lines covering its whole sides, which are alternately of a fine pale blue, and a beautiful yellow. Its scales are moderately large, and its coverings of the gills, and great part of its very head, as well as its body, are covered with these; its head is moderately large, but its mouth small, and it has a single beard hanging down from its chin. Rondelet. de Pisc. p. 182.

UMBRATILIS *pugna*, the fighting with one's own shadow.

This was one of the kinds of exercise much recommended by the ancient physicians; they ordered the persons who used it, not only to box, but to wrestle, with his shadow; that is, not only to use his arms, but his legs also, and often to put themselves into a leaping posture, and and throw their bodies violently forward, and often to retreat

retreat hastily backwards. The custom seems to have been of ancient date; Plato expressly mentions it, and St. Paul seems to allude to it in the passage where, glorying in the reality of his conflicts, he says, he does not fight as one who beats the air. The physicians greatly recommended this exercise to people of sedentary lives, and to those who had weak nerves, and were afflicted with tremors. They esteemed it useful also in diseases of the kidneys, and of the thorax.

UMBRE. See Umber.

UMBRELLA. See Umbella.

UMBRINO, in *Ichthyology*, a name used by some authors for the *coracinus*, or *umbra*, as some call it. The *umbrino* has by some been esteemed a distinct species of fish from the coracinus; but they seem to differ no other way than as the one is the older, the other the younger fish. Wilughby's Hist. Pisc. p. 330.

UMBUNCULUS, in *Natural History*, a name given by ancient authors to the small prominences in the surface of certain stones. It was originally derived from the word *umbo*, which expresses the prominent knob, or round lump in the centre of a shield; and its first use that we find in the naturalists, is, in expressing a very similar thing; that is, the prominent part of the zmilampis. This was a stone of the nature of what we call *oculus beli*, or *bellochio*, and was of a white ground, and roundish figure, somewhat resembling an eye. It was found in the Euphrates, and other rivers, and had always an *umbunculus* of a glaucous or bluish colour. This *umbunculus* was a prominent round spot, such as we see in our *oculi beli*, and call the *pupil*. It was afterwards used to express the inequalities on the surfaces of flints and agates, which frequently are roundish and obtuse, and represent a kind of umbones.

UMPIRE, a third person, chosen to decide a controversy left to an arbitration, in case the arbitrators cannot agree. See Arbitrator.

Minshew supposes the word formed of the French *un pere, a father*. Some call him a *fur-arbitrator*.

UMPLE, in our *Statutes*, signifies fine linen. 3 Ed. IV. cap. 5. Blount.

UNANIMITY *of juries*. See Jury.

UNANNEALED *bottles*, or Bologna *bottles*, a kind of *unannealed* glass bottles made at Bologna, and many other places, in the year 1742, which, though appearing very strong, yet are to be broken by a fragment of flint, scarce larger than a grain of sand, thrown into them. See *Annealing of* Glass.

UNAROTA, among the *Ancients*, a carriage with only one wheel.

UNBALLAST, *to*, in the *Sea Language*, is to discharge the ballast of a ship.

UNBENDING, in *Sea Language*, generally implies the act of taking off the sails from their yards and stays; or casting loose the anchors from their cables, or of untying one rope from another.

UNBITTING, in *Sea Language*, denotes the operation of removing the turns of a cable from off the bits.

UNCASING, among *Hunters*, the cutting up or flaying of a fox.

UNCATA, in *Botany*, a name given by some authors to the stramonium, or thorn-apple.

UNCEASESATH, in our *Old Writers*, an obsolete word, used where one killed a thief, and made oath that he did it as he was flying for the fact, and thereupon *parentibus ipsius occisi juret* unceasesath, viz. that his kindred would not revenge his death; or they swore, that there should be no contention about it.

Du-Cange derives the word from the negative particle *un* and the Saxon *ceath*; which last signifies the same with assithment in the law of Scotland.

UNCERTAIN, in the *Manege*. We call a horse *uncertain* that is naturally restless and turbulent, and is confounded in the manege he is put to, so that he works with trouble and uncertainty.

UNCIA, a term generally used for the twelfth part of a thing. In which sense it occurs in Latin writers, both for a weight, called by us an *ounce*, and a measure called an *inch*.

Uncia *terræ*, or *agri*, is a phrase frequently met with in the ancient charters of the British kings; but what the quantity of ground was is a little obscure. All that we know for certain is, that it signified a large quantity, as much as twelve modii, which modius some conjecture to have been an hundred feet square.

UNCIÆ, in *Algebra*, are the numbers prefixed to the letter of the members of any power produced from a binomial, residual, or multinomial root; now usually called coefficients.

Thus, in the fourth power of $a+b$, that is, $aaaa+4aaab+6aabb+4abbb+bbbb$, the *unciæ* are 4, 6, 4.

Sir Isaac Newton gives a rule for finding the *unciæ* of any power arising from a binomial root. Thus: let the index of the power be called *m*, then will the *unciæ* arise from such a continual multiplication as this, viz. $1\times\frac{m-0}{1}\times\frac{m-1}{2}\times\frac{m-2}{3}\times\frac{m-3}{4}\times\frac{m-4}{5}$, &c. Thus, if the *unciæ* of the biquadrate, or fourth power, were required; the rule is, $1\times\frac{4-0}{1}(=4)\times\frac{4-1}{2}(=6)\times\frac{4-2}{3}(=4)\times\frac{4-3}{4}(=1)$; which shews, that the *unciæ* are 1, 4, 6, 4, 1.

Or thus: The terms of any powers are compounded of certain little factums, with numbers, called *unciæ*, prefixed; and the factums are found by making two geometrical progressions; the first of them beginning from the required power of the first part of the root, and ending in unity; and the second beginning with unity, and ending in the required power of the second part; thus, for a sixth power of $a+b$;

$a^6\ a^5\ a^4\ a^3\ a^2\ a^1$ first series.

$1\ b\ b^2\ b^3\ b^4\ b^5\ b^6$ second series.

And multiplying the terms of the same order in either series into one another; as $a^6+a^5b+a^4b^2+a^3b^3+a^2b^4+ab^5+b^6$, out of which the sixth power of $a+b$ is compounded.

The *unciæ*, then, are found by writing the exponents of the powers of the second series, i. e. of *b*, under the exponents of the powers of the first series, i. e. of *a*; and taking the first figure of the upper series for the numerator, and the first of the lower for the denominator of a fraction, which is equal to the *uncia* of the second term, and so for the rest. Thus, for the sixth power, we have,

6 5 4 3 2 1
1 2 3 4 5 6

Accordingly, $\frac{6}{1}=6$ is the *uncia* of the second term of the sixth power; $\frac{6.5}{1.2}=\frac{30}{2}=15$, the *uncia* of the third term; $\frac{6.5.4}{1.2.3}=\frac{120}{6}=20$, the *uncia* of the fourth term; $\frac{6.5.4.3}{1.2.3.4}=\frac{6.5}{1.2}=\frac{30}{2}=15$, the *uncia* of the fifth term; $\frac{6.5.4.3.2}{1.2.3.4.5}=\frac{6}{1}=6$, the *uncia* of the sixth term; $\frac{6.5.4.3.2.1}{1.2.3.4.5.6}=1$, the *uncia* of the last power. See Binomial *Theorem*.

UNCIAL, Uncialis, an epithet which antiquaries give to certain large-sized letters, or characters, anciently used in inscriptions and epitaphs.

The word is formed from the Latin *uncia*, the twelfth part of any thing, and which, in geometrical measure, signified the twelfth part of a foot, viz. an inch; which was supposed to be the thickness of the stem of one of these letters.

UNCIFORME *os*, in the carpus, is the fourth bone in the second row; it has its name from the Latin *uncus*, a *hook*, and is composed of a body, and a hooked, or unciform apophysis. This apophysis, which is one of the four eminences on the concave, or inner surface of the carpus, is flat, and the hollow side of its curvature is turned toward the os magnum. The outer surface of its body is rough, and in some measure triangular; it completes the convex side of the carpus, and, toward the ulna, terminates in a small tuberosity, which is all the cubital side of this bone.

It has three articular or cartilaginous sides, one radial, one brachial, and one digital. The radial side is double, answering to the cubital side of the os magnum. The brachial side is very oblique, some part of it being gently concave, the rest gently convex, answering to the digital side of the os cuneiforme. The digital side is double, or distinguished into two halves, by a sigmoide angular line, for its articulation with the two last bones of the metacarpus. Winslow.

UNCINUS, in *Surgery*, the name of a small hooked instrument serving to many purposes.

UNCORE, or Unques *prist, still ready*, in *Law*, a plea for the defendant, being sued for a debt due on a bond at a day past, to save the forfeiture of his bond, &c. by affirming that he tendered the debt at the time and place, and that there was none to receive it; and that he is yet also ready to pay the same.

UNCTION, Unctio, the act of anointing, or rubbing with oil, or other fatty matter.

Mercurial *unction*, properly applied, brings on a salivation. The surgeons cure divers wounds, ulcers, &c. by repeated *unctions*, with oils, unguents, cerates, &c.

Unction, in *Matters of Religion*, is used for the character conferred on sacred things, by anointing them with oil.

Anciently in the eastern countries, which abounded so much in oil, and odoriferous spices, it was the custom to separate persons and things designed for extraordinary offices or uses, by anointing them with ointments composed of such ingredients; symbolizing thereby, both an effusion of the necessary gifts to qualify them for their office, and a diffusion of the good and grateful effects expected from them.

There were three sorts of persons to whom this *unction*, or consecration, especially belonged, kings, priests, and prophets; who, therefore, are all of them (says Barrow) styled in Scripture the *Lord's anointed*.

The *unction* of kings is supposed to be a ceremony introduced very late among Christian princes: Onuphrius says, none of the emperors were ever anointed before Justinian, or Justin. The emperors of Germany took up the practice from those of the eastern empire. King Pepin of France was the first king who received the *unction*.

In the Romish church, besides an *unction* at baptism, on the forehead, and at confirmation, on the head (see Chrism), they have an *extreme unction*, given to people in the pangs of death, on the parts where the five senses reside, being the parts by which the person is supposed to have sinned.

The first mention that is made of this ceremony is by pope Innocent I. Sacred oil, indeed, was held in great veneration so early as the fourth century, and esteemed as an universal remedy; for which purpose it was either prepared and dispensed by priests and monks, or was taken from the lamps which were kept burning before the relics of the martyrs. But in none of the lives of the saints before the ninth century is there any mention made of their receiving extreme *unction*, though their deaths are sometimes particularly related, and their receiving the eucharist is often mentioned. But from the seventh century to the twelfth, they began to use this anointing of the sick, and a peculiar office was made for it; but the prayer that was used in it plainly shews that it was with a view to their recovery, for which purpose it is still used in the Greek church. But because it failed so often, that the credit of this rite was in danger of suffering much in the esteem of the world, they began, in the tenth century, to say that it did good to the soul, even when the body was no better for it; and then they applied it to the several parts of the body, after having originally applied it to the diseased parts only. In this manner was the rite performed in the eleventh century. In the twelfth, the prayers that had been made before for the soul of the sick person, though only as a part of the office (the pardon of sin being supposed to be preparatory to their recovery) came to be considered as the most essential part of it. After this the schoolmen brought it into shape, and then it was decreed to be a sacrament by pope Eugenius; and it was finally established at the council of Trent. Burnet on the Articles, p. 268. See Extream *unction*.

UNCTUARIUM, a room in the ancient baths, where people were anointed before they went away.

UNCTORES, among the Romans, servants whose employment it was to anoint their master when he bathed.

UNCUS, among the Romans, an instrument used in torturing criminals. It was a kind of club bent and inclined to one side.

UNCUTH, *unknown*, is used in the ancient Saxon laws, for him that comes to an inn, guest-wise, and lies there but one night. In which case, his host was not bound to answer for any offence he committed, whereof he was guiltless himself.

Prima nocte potest dici uncuth; *secunda vero*, guest; *tertia nocte* hogenhine. *Bracton*, lib. iii. See Third *night awn hynd*.

UNDE *nihil habet*, a writ of dower. See Dote *unde nihil habet*.

UNDECAGON, is a regular polygon of eleven sides.

UNDECIMVIR, a magistrate among the ancient Athenians, who had ten other collegues, or associates, joined with him in the same commission.

The functions of the *undecimviri* at Athens were much the same as those of the prevots de marechaussé in France. They took care of the apprehending of criminals; secured them in the hands of justice; and when they were condemned, took them again into custody, that the sentence might be executed on them.

They were chosen by the tribes, each tribe naming its own; and as the number of tribes, after Callisthenes, was but ten, which made ten members, a scribe or notary was added, which made the number eleven.—Whence their name, οι ενδεκα, or *undecimviri*, as Cornelius Nepos calls them in the life of Phocion. In Julius Pollux they are denominated επαρχοι, and νομοφυλακες. See Nomophylaces.

UNDE, Undee, or Undy, in *Heraldry*. See Waved.

UNDER *the sea*, in the *Sea Language*. A ship is said to be so, when she lies still, or waits for some other ships, with her helm lashed, or tied up a-lee. See Lying *under the sea*.

Under-*currents*. See *Under*-Currents.

Under-*chamberlains*, or *deputy-chamberlains of the exchequer*, officers there, who cleave the tallies, and read the same; so that the clerk of the pell, and the comptrollers thereof, may see that the entries are true.

They also make searches for all records in the treasury, and have the custody of Domesday-book.

UNDERMINING. See Sap.

UNDER-RUN, *to*, in *Sea Language*, is to pass under, or examine any part of a cable or other rope, in order to discover whether it is damaged or entangled. It is usual to *under-run* the cables in particular harbours, as well to cleanse them with brooms and brushes from any filth, ooze, shells, &c. collected in the stream, as to examine whether they have sustained any injury under the surface of the water; as, from rocky ground, or by the friction against other cables or anchors.

To Under-run *a tackle*, is to separate the several parts of which it is composed, and range them in order, from one block to the other; so that the general effort may not be interrupted, when it is put in motion. Falconer.

UNDER-SAIL, in *Sea Language*, denotes the state of a ship when she is loosened from her moorings, and under the government of her sails and rudder.

UNDER-SHERIFF, *sub-vice-comes*. See Sheriff.

UNDERSHRUB. See Suffrutex.

UNDER-SITTER, an inmate. See Inmates.

UNDERSTANDING, *intellectus*, is defined, by the Peripatetics, to be a faculty of the reasonable soul, conversant about intelligible things, considered as intelligible. They also make it twofold; viz. *active* and *passive*.

Understanding, *active*, *intellectus agens*, they hold that faculty of the soul, by which the species and images of intelligible things are framed, on occasion of the presence of phantasms or appearances thereof. For, maintaining the intellect to be immaterial, they hold it impossible it should be disposed to think by any disproportionate phantasms of mere body; and therefore that it is obliged to frame other proportionate species of itself; and hence its denomination *active*.

Understanding, *passive*, *intellectus patiens*, is that which, receiving the species framed by the *active understanding*, breaks forth into actual knowledge.

The moderns set aside the Peripatetic notion of an *active understanding*. The Cartesians define the *understanding* to be that faculty, whereby the mind, conversing with, and, as it were, intent on itself, evidently knows what is true in any thing not exceeding its capacity.

The Corpuscular philosophers define the *understanding* to be a faculty, expressive of things which strike on the external senses, either by their images, or their effects, and so enter the mind. Their great doctrine is, *Nihil esse in intellectu, quod non prius fuerit in sensu*; and to this doctrine our famous Mr. Locke, and most of the latest English philosophers, subscribe.

The Cartesians exclaim much against it; and between these and the Corpuscularians there is this farther difference, that the latter make the judgment to belong to the *understanding*; but the former to the will.

Hence, according to the most approved opinion of the Corpuscularians, the *understanding* has two offices, viz. *perception*, and *judgment*; according to the Cartesians, it has only one, viz. *perception*.

Understanding is also used for the act, exercise, or exertion, of this faculty; or the action whereby the mind knows things, or represents them in idea to itself.

UNDERTAKERS were anciently such persons as were employed by the king's purveyors, and acted as their deputies.

At present, the name is chiefly used for *upholders*, or persons who furnish out funerals. And also for such as *undertake* any great work, as the draining of fens, &c. Stat. 43 Eliz.

UNDER-TREASURER *of England*, *vice-thesaurarius Angliæ*, an officer mentioned in stat. 39 Eliz. cap. 7. and whom several other statutes confound with treasurer of the exchequer.

He chested up the king's treasure at the end of every term, and noted the content of money in each chest, and saw it carried to the king's treasury in the Tower, for the ease of the lord treasurer, &c.

In the vacancy of the lord treaſurer's office, he alſo did every thing in the receipt, that the lord treaſurer himſelf does. See TREASURER.

UNDERWOOD, *ſub-boſcus*, is coppice, or any wood that is not accounted timber.

In the cutting of the *underwood* of coppices, when the ſtubs are great, they ſhould be ſtubbed up, for they only take up a great deal of room, and ſend up few ſhoots, their cracks and holes letting in water, and uſually half killing them. The taking up of theſe ſhould be performed in winter, and the ſpaces they leave will be ſoon occupied by young trees; if not, a long branch of ſome neighbouring tree may be laid down, and will ſoon ſend up a ſufficient ſupply of ſuckers for the place.

In the felling of the *underwood*, it is always proper to leave young trees enough. The worſt of theſe may be taken down the next fall, eſpecially if any of them grow near a great tree that will be fit to fell the next ſeaſon, becauſe they may be ſpoiled by its fall. When trees are at their full growth, there are ſeveral ſigns of their decay, as the withering or drying of their top branches; their taking in water at ſome of their knots, their being hollow or diſcoloured, and their making but ſmall ſhoots. If wood-peckers make holes in the body, it is but a bad ſign, and according to the appearance of one or more of theſe ſymptoms, it is very proper to cut down the tree before it decays farther. Large and ſpreading trees in coppices are often of more miſchief than advantage, as they ſpoil a great deal of the *underwood* by their droppings.

The owner of a coppice muſt be very careful when he fells the wood, ſtanding, by the acre, to mark beforehand what ſtandards are to be left, elſe the purchaſer ſeldom fails to cheat him, by ſelling ſome of them. Mortimer's Huſbandry, vol. ii. p. 69. See WOOD-*coppices*.

UNDERWOOD, *ſtealing of*. See LARCENY.

UNDERWRITERS are perſons who ſubſcribe their names to polies of inſurance, and become anſwerable for the ſums annexed, in caſe of loſs or damage of the ſhip, goods, &c. thus inſured by them to the owner.

UNDETERMINED, in *Mathematics*, is ſometimes uſed for INDETERMINATE.

UNDIMIA, in *Surgery*, the name of a kind of an œdematous tumor, the matter contained in which is glutinous and ropy, like the white of an egg.

UNDULAGO, in *Natural Hiſtory*, a name given by Mr. Lhuyd to a ſpecies of fungites found foſſile, and uſually of a ſort of undulated figure. See FUNGITÆ.

UNDULATED *leaf*, among *Botaniſts*. See LEAF.

UNDULATION, in *Phyſics*, a kind of tremulous motion, or vibration, obſervable in a liquid; whereby it alternately riſes and falls, like the waves of the ſea; and hence it is that the term takes its riſe, from *unda*, *wave*. See WAVE.

This *undulatory* motion, if the liquid be ſmooth, and at reſt, is propagated in concentric circles, as moſt people have obſerved upon throwing a ſtone, or other matter, upon the ſurface of a ſtagnant water, or even upon touching the ſurface of the water lightly with the finger, or the like.

The cauſe of theſe circular *undulations* is, that, by touching the ſurface with the finger, there is produced a depreſſion of the water in the place of contact. By this depreſſion the ſubjacent parts are moved ſucceſſively out of their place, and the other adjacent parts thruſt upwards, which, lying ſucceſſively on the deſcending liquid, follow it; and thus the parts of the liquid are alternately raiſed and depreſſed, and that circularly.

When a ſtone is thrown into the liquid, the reciprocal vibrations are more conſpicuous: here the water in the place of immerſion riſing higher, by means of the impulſe or rebound, till it comes to fall again, gives an impulſe to the adjoining liquid, by which means that is likewiſe raiſed about the place of the ſtone, as about a centre, and forms the firſt *undulous* circle; this falling again, gives another impulſe to the fluid next to it farther from the centre, which riſes likewiſe in a circle; and thus, ſucceſſively, greater and greater circles are produced.

UNDULATION, in *Medicine*, the term uſed by ſome to expreſs an uneaſy ſenſation in the heart, of an undulatory motion, which may ſometimes be perceived externally.

UNDULATION, or BEAT, in *Muſic*, is uſed for that rattling, or jarring of ſounds, which is obſerved, chiefly, when diſcordant notes are founded together.

The phenomenon is more fully deſcribed thus, by Dr. Smith. In tuning muſical inſtruments, eſpecially organs, it is a known thing, that while a conſonance is imperfect, it is not ſmooth and uniform, as when perfect, but interrupted with very ſenſible *undulations* or *beats*; which, while the two ſounds continue at the ſame pitch, ſucceed one another in equal times, and in longer and longer times, while either of the ſounds approach gradually to a perfect conſonance with the other, till at laſt the *undulations* vaniſh, and leave ſmooth, uniform conſonance. Smith's Harmonics, p. 107.

This learned author obſerves farther, that quicker *undulations* are *beats*, and are remarkably diſagreeable in a concert of ſtrong, treble voices, when ſome of them are out of tune; or in a ring of bells ill tuned, the hearer being near the ſteeple; or in a full organ badly tuned. Nor can the beſt tuning wholly prevent that diſagreeable battering of the ears with a conſtant rattling noiſe of *beats*, quite different from all muſical ſounds, and deſtructive of them, and chiefly cauſed by the compound ſtops called the cornet and ſeſquialter, and by all other loud ſtops of a high pitch, when mixed with the reſt. But if we be content with compoſitions of uniſons and octaves to the diapaſon, whatever be the quality of their ſounds, the beſt manner of tuning will render the noiſe of their *beats* inoffenſive, if not imperceptible.

The doctor has with great ingenuity deduced the theory of theſe *undulations* from his principles, and has applied his doctrine to the tuning of inſtruments; by which he has ſhewn, that a perſon of no ear at all for muſic, may ſoon learn to tune an organ, according to any propoſed temperament of the ſcale, and to any deſired degree of exactneſs, far beyond what the fineſt ear, unaſſiſted by theory, can poſſibly attain to. This may be done by counting the number of *undulations* in a certain time, ſuch as fifteen ſeconds. See the treatiſe before cited, prop. xv. p. 215. and the Table, p. 244. plate 20.

From this ingenious theory the learned author has demonſtrated ſeveral errors in what monſieur Sauveur has delivered concerning theſe *undulations* or *beats*. See Harmonics, Scholium 2. p. 115.

In the ſame treatiſe we find ſome curious obſervations relating to the analogy of audible and viſible *undulations*. See p. 128, 273.

UNDULATION is alſo uſed, in *Surgery*, for a motion enſuing in the matter contained in an abſceſs, upon ſqueezing it. A tumor is ſaid to be in a condition for opening, when one perceives the *undulation*.

UNDULATORY *motion* is applied to a motion in the air, whereby its parts are agitated after the like manner as waves in the ſea; as is ſuppoſed to be the caſe when the ſtring of a muſical inſtrument is ſtruck.

This *undulatory* motion of the air is ſuppoſed the matter or cauſe of SOUND.

Inſtead of the *undulatory*, ſome authors chooſe to call this a *vibratory motion*.

UNDY, in *Heraldry*. See WAVED.

UNEDO, in *Natural Hiſtory*, a name uſed by the ancients for a fruit which they recommended as cooling and ſubaſtringent.

The generality of the world are led into a common error of believing this to be the fruit of the arbutus or ſtrawberry-tree. Pliny has given occaſion to this error, by ſaying expreſly that the *unedo* is the fruit of the arbutus; but we find this to be contrary to the practice of all the ancient Latin writers, who have always called the fruit by the ſame name with the tree, not by a different one. Varro, De Re Ruſtica, ſpeaking of gathering the autumn fruits, calls them all by the name of the trees; and among them, mentioning the fruit of the arbutus, he expreſſes in the ſame manner, not by the word *unedo*, *decerpendo arbutum mora pomaque*. And both Galen and Paulus Ægineta deny the *unedo* to be the name of the fruit of the arbutus or ſtrawberry-tree, and make it the fruit of the EPIMELIS. Servius explains the word *unedo* by the fruit of the ſtrawberry-tree; but in this he too raſhly follows Pliny's opinion, and plainly errs from the truth.

UNEQUAL *courſes*. See MASONRY.

UNEQUAL *hours*. See HOUR.

UNEVEN *number*. See NUMBER.

UNGELD, compounded of the negative *un*, and *gildan*, *to pay*, in our *Ancient Cuſtoms*, a perſon out of the protection of the law; ſo that if he were murdered, no *geld*, or fine, was to be paid in the way of compenſation by him that killed him. See GELD, and ÆSTIMATIO *capitis*.

Si Frithman, i. e. *homo pacis*, *fugiat & repugnet*, *& ſe nolit indicare*; *ſi occidatur*, *jaceat* ungeld, i. e. no pecuniary compenſation ſhall be made for his death. Skinner. *Ungilda akere*, mentioned in Brompton, has much the ſame ſignification; viz. where any man was killed, attempting any felony, he was to lie in the field unburied, and no pecuniary compenſation was to be made for his death.

UNGUENT, *unguentum*, *ointment*, in *Surgery*, a topical remedy, or compoſition, chiefly uſed in the dreſſing of wounds and ulcers.

Unguents, liniments, and cerates, are external forms, applied on divers parts of the body, both to cure, and to eaſe and relieve them. They only differ from each other

in their consistence; with regard to which, *unguents* hold the medium; being stiffer than liniments, but softer than cerates.

Oils are ordinarily the bases of all three; to which are added wax, axungia, and several parts of plants, animals, and minerals; both on account of the virtues they furnish, and to give a consistence to the oils, and to keep them longer on the part, that they may have more time to act.

Many extravagant encomiums have been bestowed on the efficacy of different preparations of this kind in the cure of wounds, sores, &c. and yet it is unquestionable, that the most proper application to a green wound is dry lint. But though ointments do not heal wounds and sores, they serve, however, to defend them from the external air, and to retain such substances as may be necessary for drying, deterging, destroying proud flesh, and such purposes.

The principal *unguents*, or ointments, are, *unguentum album*, or *white unguent* of cerusse; *populneum*, made of the buds of the poplar tree, &c. *Unguentum basilicum*, a suppurative; *unguentum Ægyptiacum*, a mild caustic; *unguentum aureum*, incarnative, and cicatrizing. Pomatums are also ranked in the number of *unguents*. See POMATUM.

UNGUENTUM *ex ærugine*. See VERDEGRISE.

UNGUENTUM *album*, the *white ointment*, a medicinal preparation, well known by name, and much used in families.

The late London Dispensatory has made very great alterations in it, and indeed given a new ointment under this name; it is there ordered to be made thus: take olive-oil, a pint; white wax, four ounces; spermaceti, three ounces; melt all together with a gentle heat, and stir them very briskly without ceasing, till they are fully cold.

The ointment formerly known by this name had cerusse or white lead for its principal ingredient; but as this is principally intended for frettings of the skin, that ingredient was judged dangerous. See UNGUENTUM *Saturninum*.

If a dram and a half of camphor, first ground with a few drops of oil, are mixed with a pound and a half of the white ointment, we shall have the *unguentum album camphoratum*, used for burns, itchings, and serpiginous eruptions on the skin.

UNGUENTUM *arcæi*. See ELEMI.

UNGUENTUM *basilicum viride*, a form of medicine prescribed in the late London Pharmacopœia. It is ordered to be made thus: take of yellow basilicon, eight ounces; oil of olives, three ounces; verdigrise, in fine powder, one ounce; mix the whole into an ointment.

UNGUENTUM *basilicum flavum*, or yellow basilicon ointment, may be made by melting yellow wax, white resin, and frankincense, of each a quarter of a pound, over a gentle fire; and then adding of hog's lard prepared, one pound; strain the ointment while warm. This is employed for cleansing and healing wounds and ulcers.

UNGUENTUM *calaminare*, or *epuloticum*, commonly called *Turner's cerate*. See CERATUM *epuloticum*.

In this preparation the college of Edinburgh uses one part of the calamine to five parts of a cerate, composed of oil, wax, and spermaceti. This is a very good application in burns, and excoriations from whatever cause.

UNGUENTUM *citrinum* is a mercurial ointment, prepared by dissolving an ounce of quicksilver in two ounces of spirit of nitre; the solution is poured hot into a pound of lard melted, and just beginning to grow stiff, and the whole briskly stirred up till an uniform yellow mixture is procured. This *unguent* is used for venereal ulcers, &c.

UNGUENTUM *dialthϾ*. See DIALTHÆA, and *Marsh*-MALLOW.

UNGUENTUM *digitale*. See FOX-GLOVE.

UNGUENTUM *emolliens*, or *emollient ointment*, may be made by taking of palm-oil, two pounds; of olive-oil, a pint and a half; of yellow wax, half a pound; and of Venice turpentine, a quarter of a pound; melting the wax in the oils over a gentle fire, then mixing in the turpentine, and straining the ointment. This supplies the place of althæa ointment, and may be used for anointing inflamed parts, &c.

UNGUENTUM *epispasticum*. See UNGUENTUM *vesicatorium*.

UNGUENTUM e *Japanica terra*. See JAPAN *earth*.

UNGUENTUM *linariæ*. See *Toad*-FLAX.

UNGUENTUM *mercuriale*, or *mercurial ointment*, is commonly prepared by rubbing the mercury with lard, or other fat matters, of a due consistence: three parts of hog's lard, and one of mutton suet, make a commodious basis, with which may be mixed one part or more of mercury, for the mercurial ointment of the London Dispensatory.

The *unguentum cæruleum mitius* is made by previously extinguishing the mercury with a little turpentine, and afterwards mixing it with four times its weight of lard.

The *unguentum cæruleum fortius* is prepared by extinguishing the mercury with balsam of sulphur, and mixing it with twice its weight of lard. The principal intention of these ointments is to convey mercury into the blood by being rubbed upon the skin. Dr. Lewis observes, that the turpentines, in this form, are apt by frequent rubbing to fret the skin. The mercury in mercurial ointments must not be considered merely as distributed and intermixed with the parts of the fat: on the contrary, there is an adhesion and even intimate combination between the integrant parts of these two substances; for this fat very quickly becomes rancid, as all oily matters do when combined; and besides, when mercurial ointment has been made a considerable time, all the mercury cannot be separated from it even by fusion. This fact has been verified by M. Beaume.

An *unguent*, or pomatum, is directed to be made in the Paris Dispensatory, by dissolving two ounces of mercury in a sufficient quantity of nitrous acid, and mixing it perfectly in a mortar with two pounds of hog's lard. This pomatum, it is said, by being lightly rubbed on the parts attacked by the itch, soon cures this disorder.

The white precipitates of mercury are also used in *unguents* for cutaneous eruptions: one part of the mercurial precipitate, three of precipitated sulphur, and eighteen of the simple ointment or pomatum, moistened with a little strong alkaline ley, make the common mercurial application for these complaints.

UNGUENTUM *nardinum*. See NARDINUM *unguentum*.

UNGUENTUM *nutritum* is the name of an ointment of lead, made by grinding two ounces of litharge, and adding alternately, and by little and little, two ounces of vinegar, and six of oil. This *unguent*, though now expunged from our dispensatories, is an excellent application in many cases. It should not be long kept, but made fresh as wanted. Lewis. See UNGUENTUM *Saturninum*.

UNGUENTUM *oculi*, or *eye-ointment*, may be made of hog's lard prepared, four ounces; of white wax, two drams; and of TUTTY prepared, one ounce: melt the wax with the lard over a gentle fire, and then sprinkle in the tutty, continually stirring them till the ointment is cold. This ointment will be more efficacious, and of a better consistence, if two or three drams of camphor be rubbed up with a little oil, and mixed with it. Another eye-ointment may be made, by taking of camphor and calamine stone levigated, of each six drams; of verdigrise well prepared, two drams; of hog's lard and mutton suet prepared, of each two ounces; rub the camphor well with the powder; afterwards mix in the lard and suet, continuing the triture till they be perfectly united. This ointment has been long in esteem for diseases of the eyes. It ought, however, to be used with caution when the eyes are much inflamed, or very tender.

UNGUENTUM *e pice*, *tar-ointment*, a form of medicine prescribed in the late London Pharmacopœia, and ordered to be made in the following manner: take of tar, and of tried mutton-suet, each equal quantities; melt them together, and strain the whole while it is hot.

In the Edinburgh Dispensatory it is directed to be made by melting together five parts of tar, and two of yellow wax. This ointment is sometimes used as a digestive, and said to be particularly serviceable against scorbutic and other cutaneous eruptions.

UNGUENTUM *populeum*. See POPULEUM.

UNGUENTUM *sambucinum*, or *ointment of elder*, is prepared by taking four ounces of the leaves, and the same quantity of the inner bark, fresh, thoroughly bruising, and boiling them in a quart of linseed oil till the watery moisture is consumed, and the oil tinged of a green colour; the oil is then pressed out, and brought to the consistence of an ointment by melting it in six ounces of white wax. This ointment is celebrated against burns and inflammations. An *unguent* is also prepared of the flowers, probably of equal efficacy with the other, and preferred by some as being more elegant, by melting three pounds of mutton suet with a pint of oil olive, and boiling in this mixture four pounds of the full blown flowers till they are almost crisp.

UNGUENTUM *Saturninum*, a form of medicine prescribed in the late London Pharmacopœia, and ordered to be made in this manner: take of oil olive, half a pint; of white wax, an ounce and a half; of sugar of lead, a quarter of an ounce, first brought to a very subtle powder, with some part of the oil; then add this to the rest of the oil, with the wax melted in it, and stir the whole till it is cold.

The Edinburgh Dispensatory directs one part of the sugar to twenty parts of the simple oil and wax ointment. The *unguentum e cerussa*, vulgo *album* of the same Dispensatory,

tory, is made by mixing one part of ceruffe with five of the fimple ointment made with oil and wax. See UNGUENTUM *nutritum*, and UNGUENTUM *tripharmacum*.

Unguents and liniments of this kind are recommended againft cutaneous heats and excoriations, flight ferpiginous eruptions, and for anointing the lips or wounds of ulcers that itch much, or tend to inflammation.

Dr. Lewis obferves, that thefe are by no means fo efficacious as they have been reprefented. The oil and wax fo cover the metallic falt, that its action is prevented; or, if it acts at all, it proves highly ftimulating, from the undiffolved ftate in which it is applied.

UNGUENTUM *fimplex*, a name given in the London Difpenfatory to the compofition commonly called POMATUM.

UNGUENTUM *e fulphure*, *fulphur-ointment*. Take of fimple ointment, half a pound; of flower of fulphur unwafhed, two ounces; effence of lemons, a fcruple. This is the preparation ordered in the late London Difpenfatory, and expected to be kept ready mixed in the fhops.

This fulphureous ointment for the itch, called alfo *unguentum antipforicum*, is directed by the Edinburgh Pharmacopœia to be prepared by mixing two ounces of the unwafhed flowers of fulphur with eight ounces of hog's lard, and a fcruple of effence of lemons. Some recommend an ointment of fulphur, made of four ounces of hog's lard prepared, an ounce and a half of flowers of fulphur, two drams of crude fal ammoniac, and ten or twelve drops of effence of lemon.

UNGUENTUM *tripharmacum* is prepared by boiling and ftirring over a gentle fire four ounces of the common plafter, with one of vinegar, and two of oil, where a thick *unguent* is required; or four of oil, for a fofter liniment. See UNGUENTUM *Saturninum*.

UNGUENTUM *tutiæ*. See UNGUENTUM *oculi*, and TUTTY.

UNGUENTUM *veficatorium*, *bliftering ointment*, a form of medicine prefcribed in the late London Pharmacopœia, and no other than a bliftering plafter in a fofter form. It is made by melting equal quantities of hog's lard and blifter-plafter, with a very gentle heat, ftirring them till they are cold.

The *unguentum epifpafticum* e pulvere cantharidum of the Edinburgh Difpenfatory, is prepared by melting feven parts of yellow bafilicon, and then adding one part of powdered cantharides. This ointment is chiefly intended for dreffing blifters, in order to keep them open during pleafure. However, a foft extract of cantharides is in many cafes preferable, for external purpofes, to the ointments and plafters made with the powdered fly, particularly for the dreffing of perpetual blifters; as it acts more uniformly than the compofitions containing the fly in fubftance, and occafions lefs pain in the dreffing. Hoffman's mild blifter, which gives little pain, mentioned occafionally in his works, feems to have been, or to have had for its bafis, a preparation of this kind; and probably the empirical perpetual blifter is no other. The college of Edinburgh have now received a compofition on the fame principle: they direct an ounce of cantharides to be infufed for a night in four ounces of boiling water, the liquor to be ftrongly preffed and ftrained out, and boiled with two ounces of hog's lard, till the humidity is wafted; after which, an ounce of white refin, an ounce of yellow wax, and two ounces of Venice turpentine, are to be added, and the whole well mixed, fo as to form a fmooth ointment. Lewis's Mat. Med.

UNGUENTUM *viride*, the *green ointment*, a form of medicine prefcribed in the late London Pharmacopœia, and ordered to be made by melting ten ounces of yellow wax in three pounds of the *oleum viride*, or green oil, of the fame Pharmacopœia.

UNGUENTUM e *calce zinci*, is directed by the Edinburgh Difpenfatory to be made by mixing one part of flowers of zinc with fix of the fimple liniment of wax and oil. See ZINC.

UNGUICULI, in *Botany*, is ufed for the ends of the petals of rofes, or other flowers, where they adhere to the plant.

UNGUIN, in *Botany*, a name given by the people of Guinea to a plant, of which they are very fond, on account of its medicinal virtues: they boil it in water, and give the decoction in large draughts for pains in the back. The leaves of this plant grow alternately on pedicles of an inch long, and have the exact fhape and fize of thofe of the common bay-tree; but they have neither its tafte nor fmell, nor any thing approaching to either. Phil. Tranf. Nº 232.

UNGUIS, a Latin term, fignifying a NAIL of the hand or foot.

UNGUIS, in *Anatomy*, is applied to two bones of the nofe, which help to complete the internal fides of the orbit of the eye, to cover the fore-part of the labyrinth of the nofe, and form the lachrymal duct.

They have their name from the Latin *unguis*, a *nail of the hand*, and are alfo, by fome authors, from their office in forming the lachrymal duct, called *offa lachrymalia*. Others call them *orbitaria offa*.

They are each fituated in the orbit of the lower part of the internal angle; they are the leaft bones of the face, and are very thin and tranfparent. They are in fhape fomewhat longer than broad, and not unaptly refemble the figure of the finger nails, efpecially while in their natural places; for, being taken out of the fkull, their figure becomes fomewhat more irregular. Each of them is divided, by anatomifts, into two fides, the one external, the greateft part of which appears in the orbit in an entire fkull; the other internal, which is hid; two extremities, the one upper, the other lower; and two edges, one anterior, the other pofterior. The outfide is fmooth, and a little concave; toward the anterior edge is a groove full of fmall holes like a fieve, called the lachrymal groove. It begins at the upper extremity, and runs down lower than any other part of this fide of the bone, the lower extremity of it being hid by the os maxillare. It is diftinguifhed from the reft of the outfide by a very fharp prominent edge. The infide is rough, and unequally convex, with a perpendicular depreffion, anfwering to the fharp prominence of the outfide. On the upper part of this infide, fmall portions of cellulous laminæ are fometimes obfervable, which communicate with the entry of the frontal finus; and there are likewife fome about the middle, which complete the anterior ethmoidal cells; and others toward the lower end, which communicate with the rugged portions of the upper border of the finus maxillaris: thefe, however, often vary, and are fometimes wanting. Thefe bones are altogether without diploe; they are connected with the os frontis, and with the os ethmoides, covering a part of the cells in that bone, with the nafal apophyfis of the os maxillare, and with the groove of that bone in fuch a manner, that the two grooves, joined together, form an entire tube, called the lachrymal duct; they alfo cover a little the opening of the maxillary finufes, and join the inferior conchæ of the nares, of which they appear to be only a continuation in advanced age. Winflow's Anatomy, p. 36.

UNGUIS, or UNGUICULUS, among *Botanifts* and *Florifts*, denotes a little fpeck, of a different colour from the reft of the petala, or leaves of flowers.

It has the figure of a nail of the hand: its place is at the origin, or root of thofe petals; as we fee in the rofe, poppy-flowers, and divers other petals. See PETAL.

In preparing of medicines, the *ungues*, or *unguiculi*, are pulled off the flowers that enter the fame.

UNGUIS, in *Natural Hiftory*, a name given by authors to a genus of fhells, more ufually called SOLEN.

UNGUIS, in *Surgery*, a difeafe of the eye; being a whitifh fpeck on the adnata, formed of a nervous excrefcence growing on that coat; beginning at the great canthus, fomewhat of the fhape and fize of a nail of the hand, and fpreading infenfibly till it reach the pupil, and at laft quite cover it.

The *unguis* is much of the fame nature with the PTERYGIUM and PANNUS.

The ordinary caufe of the *unguis* is an exceffive acrimony in the tears, which corrode the tunica conjunctiva; as is often the cafe in an ophthalmia, or after the fmall-pox.

UNGUIS *odoratus*, in the *Materia Medica*, a thin, flat, teftaceous fubftance, of an oval or oblong figure, rounded at both ends, and marked on the furface with three or four concentric circles, or oval lines. Its colour is a dufky brown, with fome admixture of the orange, fometimes of a purplifh tinge. Its ufual fize is that of a full grown nail of a man's thumb; and its thicknefs rather lefs than that of the nail. It is tough, flexile, and elaftic; and has no peculiar fmell or tafte.

The want of fmell might feem to argue this to be a different fubftance from the *unguis odoratus* of the ancients; but the truth is, that theirs owed all its fweet flavour to its being brought over among aromatic drugs.

There were two kinds of it, the largeft of which they had from the Red Sea, and the other from Babylon; and both were the opercula of two fpecies of MUREX-*fhells*.

Diofcorides tells us, that this *unguis* was the operculum or poma of the fhell, which ftopped the mouth at pleafure, and from under which the creature thruft out its tongue to feed; and he adds, that the fhell-fifh to which it belonged was taken in the marfhes of India, when the waters were dried away; and that the Indian fpikenard growing in great abundance in thefe marfhes, the creature became fweet-fcented in every part, by feeding on it. However, he concludes with telling us, that there

 were

were only two kinds brought into Greece in his time, the one from the Red Sea, the other from Babylon.

The truth is, that ſpikenard grows neither in the Red Sea, nor any where about Babylon, but only in India, beyond the Ganges, or about its banks. The ſpikenard alſo does not grow in the water, but only in marſhy places, and therefore can never be in the way of feeding ſhell-fiſh. Avicenna, perceiving the abſurdity and contradiction of Dioſcorides's account, ſays, that the ſhell-fiſh was found in an iſland in the Indies, on which iſland the ſpikenard alſo grew in great abundance. But this account ſuppoſes that the ſhell-fiſh, to which the *unguis odoratus* belongs, may be found on dry land; whereas it is certain, that no ſhell-fiſh, living in the water, can ſubſiſt, without ſome means of cloſing up its cavity, ſo as to keep out the water at pleaſure; this is done in the bivalve kinds, by cloſing the two valves; but in the ſtromboide ones, by drawing down this operculum, which is the *unguis odoratus*, to the mouth of the ſhell. A land-ſhell therefore can have no occaſion for ſuch a part as the poma or operculum, and no ſuch drug as the *unguis odoratus* can be found about it. But it is to be obſerved, that Avicenna did not know that the *unguis odoratus* was a covering or operculum of the mouth of a ſhell, but thought that it was only a fragment cut or broken indeterminately from any part of the ſhell. This therefore might appear no abſurdity to him; and the thin and flat *ungues* he ſaw might appear fragments artificially cut from ſome of the thin-ſhelled kind of land-ſnails. See Blatta *Byzantina*.

UNGULA, in *Geometry*, is the ſection of a cylinder, cut off by a plane paſſing obliquely through the plane of the baſe, and part of the cylindric ſurface.

Ungula, in *Natural Hiſtory*, the claw, or hoof, of a quadruped.

Ungula *alcis*, the elk's claw. See Elk.

Ungula, or Hamus, among *Surgeons*, a ſort of hooked inſtrument, wherewithal to extract a dead fœtus out of the womb.

Ungula *oculi*, the name given by ſome to a diſeaſe of the eye, called by others pterygium.

UNGULUS, in *Antiquity*, a remarkable kind of bracelet.

UNHALTER, in the *Manege*. A horſe is ſaid to *unhalter* himſelf, that turns off his halter.

UNICORN, in *Aſtronomy*. See Monoceros.

Unicorn, in *Natural Hiſtory*, an animal famous among the Greek authors, under the name of μονοκερως; and among the Latins, under that of *unicorn*.

Both theſe names it takes from its diſtinguiſhing characteriſtic, the having one horn only. See Rhinoceros.

The firſt author, who wrote of the *unicorn*, was one Cteſius, whom Ariſtotle mentions as a very ſuſpicious author. Ælian ſpeaks of it in very doubtful terms. The other writers on the ſubject are Philoſtratus and Solinus; Æneas Sylvius, who is pope Pius II.; Marcus Paulus, Aleoſius, Geſner, Garcias ab Orta, And. Marinus, &c. Of theſe, ſome ſay it reſembles a horſe, others an aſs, others a goat, by its beard; others an elephant, others a rhinoceros, others a greyhound, &c.

Munſter and Thevet will have it an amphibious animal, and its horn to be moveable at pleaſure. Others make all its ſtrength to conſiſt in its horn; and add, that when purſued by the hunters, it precipitates itſelf from the tops of the higheſt rocks, and pitches upon its horn; which ſuſtains the whole effort of its fall, ſo that it receives no damage thereby. In reality, the ſeveral authors do all give different accounts of the figure and colour, both of the animal, and of its horn, and all its parts. And hence many among the moderns have ſuppoſed it to be a merely fabulous animal.

The legend adds, that it is wonderfully fond of chaſte perſons; and therefore, in order to take it, a virgin is placed in its way; whom when the *unicorn* ſpies, he lies down by her, and lays his head on her lap, and ſo falls aſleep; upon which the virgin making a ſignal, the hunters come in, and take the beaſt; which could never be caught any other way, becauſe it would either caſt itſelf headlong from the rock, or die. For an account of the animal to which the appellation of the *unicorn* has been applied, ſee Rhinoceros.

What ordinarily paſſes among us for *unicorn's horn*, and is ſhewn for ſuch in the collection of curioſities, and uſed for ſuch by ſeveral phyſicians, we are aſſured by Pereyra, in his account of Greenland, &c. is the tooth of a large fiſh of the whale kind, called by the iſlanders *narwal*; frequent enough in the icy ſea. The tooth or horn, turned, channelled, and terminating in a point, as it is, ſprings out of the middle of the fore-part of the upper jaw, where it has a root a foot long, as thick as the horn itſelf: it is the only tooth the animal has in the upper jaw, and ſerves it as a weapon of defence, wherewith it dares to attack the largeſt whale.

There is a fine horn of this kind preſerved in the repoſitory of St. Denis at Paris, given by And. Thevet, and pretended to have been a preſent to him from the king of Monomotapa, who carried him to hunt the *unicorn*; which is frequent in that country: this horn ſome have ſuſpected to be an elephant's tooth, carved in that manner. At Straſburgh there is another between ſeven and eight feet long. In the repoſitory at Venice there is a good number; all different from each other.

The ancients held the *unicorn's horn* to be a counter-poiſon; and that the animal uſed to dip it in the water, to purify and ſweeten it ere it would drink: it is added, that for the ſame reaſon other beaſts wait to ſee this creature drink before them. Thence, as alſo from the rarity of the thing, people have taken occaſion to attribute divers medicinal virtues thereto.

But Amb. Paré has proved it a mere piece of charletanery, and all the virtues attributed to it to be falſe; and yet the price it has borne is almoſt incredible. Andrea Racci, a phyſician of Florence, affirms the pound of ſixteen ounces to have been at one time ſold, in the apothecaries ſhops, for fifteen hundred and thirty-ſix crowns, when the ſame weight of gold was only worth one hundred forty-eight crowns. See Rhinoceros.

The *unicorn* is one of the ſupporters of the arms of England. This beaſt is repreſented, by heralds, paſſant, and ſometimes rampant. When in this laſt action, as in the Engliſh arms, it is properly ſaid to be *ſaillant*. Argent, an *unicorn* ſejant ſable, armed and unguled, or, borne by the name of *Harding*.

Unicorn, *ſea*, in *Natural Hiſtory*, the name of a fiſh of the whale kind, called alſo *narhual* or *narwal*, remarkable for having a horn growing out at its noſe, in the manner of the ſuppoſed *unicorn's* horn, as deſcribed by many too credulous authors. It is the only ſpecies of monodon in the Linnæan ſyſtem.

This fiſh feeds on fleſh, or other fiſh, and is not only found in the main ſea, but ſometimes gets up into large rivers. In the year 1736 there was a large one caught in the river Oſte, near its diſcharging itſelf into the Elbe, in the duchy of Bremen; this place is four German miles from the ſea. The ſkin of this fiſh was ſpotted with dark brown ſpots upon a white ground; the epidermis was tranſparent; and under it was another ſkin very thin and ſpotted; but the true ſkin was brown, and near an inch in thickneſs. On the top of the head there is only a ſemilunar hole, as in the porpoiſes; this hole opens into the two channels, which run through the ſkull to the palate, and are called the ductus hydragogi. The people who examined this creature, were not able to find any aperture in the body for the diſcharge of the excrements; whence it has been generally believed, that the creature voids them through this paſſage in the head.

Authors have differed in the name of the proceſs iſſuing from the head; ſome calling it a horn, others a tooth; ſome are of opinion that it ſerves to break the ice for air; but others pretend that it is an offenſive weapon, with which it wounds the common whale, and other large fiſh; and that when it has plunged it up to the head in the whale's body, it ſucks the juices of that animal.

The fiſh was near twenty feet long, and about four feet in diameter. The horn ſtood on the fore-part of the head, juſt above the mouth, and was ſix feet long, white like ivory, and curiouſly wreathed or twiſted. The body was ſmooth and ſlippery, like that of an eel; the head in proportion to the body was ſmall, not exceeding ſixteen inches in length, and the ſame in diameter; the eyes not larger than a ſix-pence. It had, on each ſide of the neck, two black fins, one above another at a ſmall diſtance; theſe were two feet long, of the breadth of a hand, and about half an inch in thickneſs. See the account of this fiſh by Dr. Steigertahl, and Dr. Hampe, in Phil. Tranſ. N° 447. p. 147, and p. 149. or Abr. vol. ix. p. 71, &c. See *Tab.* V. *Fiſh*, N° 62.

This *unicorn's horn* has been ſo common in the Daniſh and neighbouring ſeas, that there was a magnificent throne built only of them in that kingdom; the horns are from ten to fifteen feet in length, and are all white, and furrowed with a ſpiral line.

Unicorn's horn has the ſame medicinal virtues with hart's horn and ivory; but at preſent is only kept as an ornament in druggiſts ſhops.

Unicorn, *ſea*, is alſo a name given to two ſorts of ſmall fiſh caught in the American ſeas, and known among authors under the name of monoceros *piſcis*.

Unicornu *foſſile*, *foſſile unicorn's horn*, the name of a ſubſtance much uſed in medicine in ſome parts of the world, but which ſeems to have been very little underſtood by many who have written of it. Dr. Hill, from the examination of the ſeveral varieties of ſhapes it is found in, and trying it by the ſeveral teſts which fix the criterions of

of foffils, has determined it to be no other than a terrene cruftaceous fpar, not very different from the ofteocolla, and other bodies of that genus, which he has called the *cibdeloplacia*; and has diftinguifhed this peculiar fpecies by the name *cibdeloplacium albido-fubcinereum, friabile, fuperficie lævi*, or the whitifh-grey friable cruftaceous fpar, with a fmooth furface.

It differs principally from the ofteocolla in its foftnefs and the fmoothnefs of its furface; but from its having, like many other of the cruftaceous terrene fpars, the property of encrufting, and fometimes even permeating the pores of bodies, and in a manner petrifying them, it has obtained the names of the things it thus lodges itfelf in and about, which being ufually bone, and fome of them bones of an extraordinary fize and figure, have been taken for the bones and horns of *unicorns*; and the name and nature of the body itfelf wholly loft and neglected, and that of the horn, with that of its imaginary animal, only preferved.

They are, however, now fenfible in Germany, that it is not the horn, but this fubftance which is lodged about it, which is the medicine; for they never ufe the foffile bones, which are petrified in the common way, but only fuch as are impregnated with this fparry fubftance; and even ufe all fubftances whatever, which are impregnated with this, whether bones or wood, under the fame name, calling the natural tubular pieces of it, which are very common, and alfo the pieces of branches of trees impregnated with it, by the common name of *unicorn's horn*, while they allow plain bones, petrified in the common way, no fuch name. So that the word is now become a mere technical term, and fignifies either this fpar in its pure ftate, or any fubftance whatever which is impregnated with it.

It is a lax and fpongy terrene fpar, and is naturally of a regular form, in fome degree like that of the ofteocolla, being always found, where it has concreted pure, and not been in the way of any extraneous fubftance, an oblong and moderately thick, cylindric, tubular body, frequently narrower at one end than the other, and approaching to a conic form. Ufually its hollow is empty, but fometimes it is found filled up with a fubftance of the fame nature with itfelf, only compofed of a larger proportion of earth with lefs fpar, and therefore more crumbly and foft. Thefe are found of various fizes, from an inch to three feet long. The larger fpecimens are moft frequent; and it is very probable, that the ignorance of the firft ages, which brought it into ufe in medicine, might take thefe natural concretions for *unicorns horns*.

It is found in other parts of the world befide Germany, and is in great efteem in many places as a fudorific and aftringent; and is given in fevers, attended with diarrhœas, with great fuccefs. Hill's Hift. of Foff. p. 361.

Dr. Ebrens, in his Natural Hiftory of Hartz Foreft, in Germany, gives a particular account of this foffile. He fays, that it is dug up of different fhapes; fometimes like a ftraight horn, fkull, jaw-bone, fhoulder-blade, backbone, rib, tooth, thigh-bones, or other bones of men and beafts; and fometimes like an unfhaped lump or mafs of ftone, having no refemblance to bone. Conrigius, and Otto Guerick, have maintained that this foffile is petrified bone; others, as Sennertus, Schræder, Baufchius, &c. not being able to comprehend how bones of fuch fize and in fuch quantities fhould be collected together, and diffatisfied with the account given by naturalifts of the manner of their petrifaction, reckon it among the minerals. Some think, with Libavius, that it is a bituminous earth; others fay that it is a kind of agate; but Dr. Ebrens apprehends, that it is formed of a clay or fattifh earth, called *marga* or marl, common in that country, hardened by petrifying water, and affuming different fhapes and fizes, according to the fituation in which this earth lies under ground. It is commonly of a light grey, black, or yellowifh colour, and feldom perfectly white; fometimes it is as hard as a ftone, and fometimes foft as clay, and hardens by being expofed to the air. It has commonly neither fmell nor tafte; though in fome cafes it has been found with a fcent like that of quinces, which Dr. Ebrens afcribes to a bituminous fubftance mixed with the petrifying water. The whiteft and melloweft is reckoned the beft for medical purpofes. It operates, he fays, like the terra figillata, abforbing, aftringing, and promoting perfpiration; and is one of the ingredients of the bezoardic powder, defcribed by Ludovici in his Pharmacopœia Moderno fæculo applicanda, and produces a very good effect, unlefs a fymptomatic coftivenefs forbids the ufe of it. Externally it ferves in puftulary eruptions and erofions about the pudendum and fundament in children, and in eyewaters. Hoffman advifes people to try the *foffile unicorn* firft upon a dog, before it is ufed in medicine; becaufe he thinks it is fometimes of a poifonous nature, but this is never obferved in any foffile of this kind found in or near Hartz foreft.

UNIFORM, *uniformis*, denotes a thing to be fimilar, or confiftent either with another thing, or with itfelf, in refpect of figure, ftructure, proportion, and the like. In which fenfe it ftands oppofed to *difform*.

UNIFORM, in a *Military Senfe*, fignifies the ornamental parts of a foldier's drefs, by which one regiment is diftinguifhed from another. See REGIMENTALS.

UNIFORM, or *equable motion*. See MOTION.

UNIFORM *flowers of plants*. See *Polypetalous* FLOWERS.

UNIFORM *matter*, in *Natural Philofophy*, that which is all of the fame kind and texture.

UNIFORM *temperament*. See TEMPERAMENT.

UNIFORMITY, *regularity*, a fimilitude or refemblance between the parts of a whole. Such is that we meet with in figures of many fides, and angles refpectively equal, and anfwerable to each other.

A late ingenious author makes BEAUTY to confift in *uniformity*, joined or combined with variety.

Where the *uniformity* is equal in two objects, the beauty, he contends, is as the variety; and where the variety is equal, the beauty is as the *uniformity*.

UNIFORMITY is particularly ufed for one and the fame form of public prayers, and adminiftration of facraments, and other rites, &c. of the church of England, prefcribed by the famous ftat. 1 Eliz. and 13 & 14 Car. II. cap. 4. called the *Act of Uniformity*. See LITURGY.

UNIGENITUS, called alfo *the Conftitution*, in *Ecclefiaftical Hiftory*, a famous bull, deriving its denomination from the firft word of it, which was iffued in 1713 by pope Clement XI. and in which Quenel's book, entitled Moral Reflexions on the New Teftament, was condemned, and a hundred and one propofitions contained in it were pronounced heretical. This bull gave a favourable turn to the affairs of the Jefuits; but it was highly detrimental to the interefts of the Romifh church, as many of the wifer members of that community candidly acknowledge. For it not only confirmed the proteftants in their feparation, by convincing them that the church of Rome was refolved to adhere to its ancient fuperftitions and corruptions, but alfo offended many of the Roman catholics, who had no peculiar attachment to the doctrines of Janfenius, againft which this bull was levelled, and were only bent on the purfuit of truth, and the advancement of piety. See JANSENISM.

The diffenfions and tumults excited in France by this edict were in the higheft degree violent. A confiderable number of bifhops, among whom was the cardinal de Noailles, archbifhop of Paris, and a large body, compofed of perfons eminently diftinguifhed for their piety and erudition, both among the clergy and laity, appealed from the bull to a general council; and hence thofe who reject the authority of the bull, are called APPELLANTS. However, the iffue of this famous conteft was favourable to the bull, which was at length rendered valid by the authority of the parliament, and was regiftered among the laws of the ftate. Mofheim's Eccl. Hift. vol. v. p. 78, &c. 8vo.

UNILOCULAR *capfule*, among *Botanifts*. See CAPSULE.

UNIOLA, *fea-fide oats of Carolina*, in *Botany*, a genus of the *triandria digynia* clafs. Its characters are, that the calyx is multivalve, and the fmall fpikes ovated and carinated. There are four fpecies.

UNION, a junction, coalition, or affemblage of two or more different things in one. Philofophers are exceedingly to feek about the manner of the *union* of foul and body, or by what medium it is that two fuch heterogeneous beings are kept clofely together.

It is one of the great laws of this *union*, that fuch and fuch an impreffion on the brain be followed by fuch and fuch a fenfation, or perception in the foul.

UNION, in a philofophical fenfe, is ufed, by Dr. Grew, for one of the three ways of mixture; being the joining together of atoms, or infenfible particles, fo as to touch in a plane: as is fuppofed to be the cafe in the cryftallizations of falts and the like bodies.

UNION, among *Painters*, expreffes a fymmetry and agreement between the feveral parts of a painting; when, e. gr. there is a confiderable degree of relation and connexion between them, both as to the figuring and the colouring; fo that they apparently confpire to form one thing.

UNION, in *Architecture*, may denote a harmony between the colours in the materials of a building.

UNION, in an ecclefiaftical fenfe, denotes a combining or confolidating of two churches into one.

This is not to be done without the confent both of the bifhop, the patron, and the incumbent.

The canonifts diftinguifh three kinds of *union*: that of *acceffion*, that of *confufion*, and that of *equality*.

UNION *of accession* is the most usual: by this the united benefice becomes a member, and accessory of the principal.

UNION *by confusion*, is that where the two titles are suppressed, and a new one created, including both.

UNION *of equality*, is that where the two titles subsist, but are equal, and independent.

By stat. 37 Hen. VIII. cap. 21. it is enacted, that an *union* or consolidation of two churches may be admitted, provided the annual value of one of them, in the king's books, doth not exceed 6*l.* and the distance between them be not above one mile.

And by another stat. 17 Car. II. cap. 3. it is enacted, that the *union* of two churches, or chapels, in any city or town, by the bishop, patron, and chief magistrate of the town, shall be valid, unless the value of the churches so united exceed 100*l.*

By the *union* the two churches are become so much one, that a second benefice may be taken by dispensation within the statute of pluralities. If any question arise concerning the *union*, after it is established, this may not be tried in the temporal, but only in the spiritual court; unless it be such *union* as is restrained by the aforesaid statutes.

UNION, *hypostatical*. See HYPOSTATICAL.

UNION, in the *Manege*, denotes the action by which a horse draws together and assembles the parts of his body, and his strength, in distributing it equally upon his fore-legs, and in reuniting or drawing them together; as we ourselves do when we are going to jump, or perform any other action which demands strength and agility. This posture alone is sufficient to settle and place the head of the animal, to lighten and render his shoulders and legs active, which, from the structure of his body, support and govern the greatest part of his weight. Being then, by these means, made steady, and his head well placed, you will perceive in every motion which he makes a surprising correspondence of the parts with the whole. The legs and shoulders of a horse support, as we have said, the greatest part of his weight; and, therefore, his fore-part, either when he is in motion, or in a state of rest, is always employed, and consequently needs the assistance of art to ease it; and in this consists the *union* or putting together, which, by setting the horse upon his haunches, counterbalances and relieves his fore-part. Besides, the *union* not only helps and relieves the part of the horse that is the weakest, but it is so necessary to every horse, that no horse that is disunited can go freely: he can neither leap nor gallop with agility and lightness, nor run without being in manifest danger of falling, and pitching himself headlong; because his motions have no harmony nor agreement with one another. The TROT is very efficacious in bringing a horse to this *union*; i. e. the trot, in which he is supported and kept together, and yet suppled at the same time: this compels the horse to put himself together, and to collect and unite his strength. In order to support the horse in this trot, the horseman should hold his hand near his body, keeping his horse together a little, and having his legs near his sides. The effect of the hand is to confine and raise the fore-parts of the horse; the effect of the legs is to push and drive forward the hinder parts. Now, if the fore-parts are kept back or confined, and the hinder parts are driven forward, the horse, in a quick motion, such as the trot, must necessarily sit down upon his haunches, and unite and put himself together. For the same reason, the making of your horse to launch out vigorously in his trot, and the quickening of his cadence from time to time, the putting of him to make passades, the stopping of him, and making him to go backward, will all contribute towards his acquiring the *union*. If your horse trots, press him a little; in the instant when he redoubles and quickens his action, moderate and shorten the hurry of his pace; and the more he presses to go forward, the more will his being checked and confined tend to unite his limbs, and the *union* will be owing to opposite causes; viz. on the one hand, to the ardour of the horse who presses to go forward, and to the diligence and attention of the horseman on the other, who, by holding him in, slackens the pace, and raises the fore-parts of the creature, and at the same time distributes his strength equally to all his limbs. The action of a horse, when going backward, is directly opposite to his abandoning himself upon his shoulders; by this he is compelled to put himself upon his haunches; and this lesson is so much the more effectual, as the cause of a horse's being disunited is often owing to the pain he feels in bending his haunches.

The PESADES have not less effect, especially upon horses that are clumsy and heavy shouldered; because they are thus taught to use them and to raise them up; and when they raise them up, it necessarily follows, that their whole weight must be thrown upon their haunches. A light and gentle hand, then, and the aids of the legs, judiciously managed, are capable of giving a horse the *union*; but before a horse is put upon his haunches, his fore-part must be lightened, and he must acquire that suppleness, which is the source of light and free action. Nothing can supple the shoulder more than the working of a horse upon large circles; walk him first round the circle, in order to make him know his ground; afterwards try to draw his head in, or towards the centre, by means of your inner rein and inner leg: e. gr. I work my horse upon a circle; and I go to the right; I draw his head to the right, by pulling the right rein; I bring *in* his outward shoulder by means of the left rein; and I support him at the same time with my inner leg. Thus the horse has his head in the centre, although the croupe is at liberty. The right leg crosses over the left leg; and the right shoulder is suppled, while the left leg supports the whole weight of the horse in the action. In working him to the left hand, and following the same method, the left shoulder is suppled, and the right is pressed and confined. When this lesson, which tends not only to supple the shoulders, but likewise to give an appuy, is well comprehended by the horse, let him be led along the side of the wall. Having placed his head, the horseman is to make use of the inner rein, which draws in his head, and to bring in his outward shoulder by means of the other rein. In this posture the horseman supports him with his inner leg, and he goes along the wall; his croupe being *out*, and at liberty, and his inner leg passing over and crossing his outward leg at every step he makes. By this his neck and shoulders are suppled, his haunches worked, and he is taught to know the heels. The haunches are thus worked, though the croupe of the horse is at liberty; because it is from the fore-parts only that a horse can be upon his haunches. In effect, after having placed his head, draw it *in*, and you will lengthen his croupe; if you raise him higher before than behind, his legs come under his belly, and consequently he bends his haunches. It is the same when he comes down hill, his croupe, being higher than his fore-parts, is pushed under him, and the horse is upon his haunches; since it is evident, that the hinder support all the fore-parts; therefore, in going along the side of the wall, by means of the inner rein, the horse is put together and united. When a horse has acquired *union*, he becomes able to undertake and execute, with justness and grace, whatever the horseman demands of him, conformably to his strength and disposition. Berenger's Art of Horsemanship, vol. ii. chap. 7.

UNION, or *the* UNION, by way of eminence, is more particularly used, among us, to express the act whereby the two separate kingdoms of England and Scotland were incorporated into one, under the title of *the kingdom of Great Britain*.

The kingdom of Scotland, notwithstanding the *union* of the crowns on the accession of their king James VI. to that of England in 1603, continued an entirely separate and distinct kingdom for above a century more, though an *union* had been long projected; which was judged to be the more easy to be done, as both kingdoms were anciently under the same government, and still retained a very great resemblance, though far from an identity, in their laws. By an act of parliament, 1 Jac. I. cap. 1. it is declared, that these two mighty, famous, and ancient kingdoms, were formerly one. And sir Edward Coke observes, how marvellous a conformity there was, not only in the religion and language of the two nations, but also in their ancient laws, the descent of the crown, their parliaments, their titles of nobility, their officers of state and of justice, their writs, their customs, and even the language of their laws: upon which account he supposes the common law of each to have been originally the same. However, sir Edward Coke, and the politicians of that time, conceived great difficulties in carrying on the projected *union*; but these were at length overcome, and the great work was happily effected in the year 1707, by the general consent of the queen, and the estates of each realm.

The act, or treaty of *union*, consists of twenty-five articles; which eleven English commissioners, and eleven Scotch ones, examined, approved, and signed on the third of August 1706. The parliament of Scotland approved it on the fourth of February 1707, and the parliament of England on the tenth of March in the same year. On the seventeenth following the queen went to parliament, where she approved the same treaty, with the act of ratification.

The purport of the most considerable articles is as follows: 1. That on the first of May, 1707, and for ever after, the kingdoms of England and Scotland shall be united into one kingdom, by the name of Great Britain. 2. The

The succession to the monarchy of Great Britain shall be the same as was before settled with regard to that of England. 3. The united kingdom shall be represented by one parliament. 4. There shall be a communication of all rights and privileges between the subjects of both kingdoms, except where it is otherwise agreed. 9. When England raises 2,000,000*l.* by a land-tax, Scotland shall raise 48,000*l.* 16, 17. The standards of the coin, of weights, and of measures, shall be reduced to those of England, throughout the united kingdoms. 18. The laws relating to trade, customs, and the excise, shall be the same in Scotland as in England. But all the other laws of Scotland shall remain in force, but alterable by the parliament of Great Britain; yet with this caution, that laws relating to public policy are alterable at the discretion of the parliament; laws relating to private right are not to be altered, but for the evident utility of the people of Scotland. 22. Sixteen peers are to be chosen to represent the peerage of Scotland in parliament, and forty-five members to sit in the house of commons. 23. The sixteen peers of Scotland shall have all privileges of parliament; and all peers of Scotland shall be peers of Great Britain, and rank next after those of the same degree at the time of the *union*, and shall have all privileges of peers, except sitting in the house of lords, and voting on the trial of a peer.

These are the principal of the twenty-five articles of *union*, which are ratified and confirmed by statute 5 Anne, cap. 8. in which statute there are also two acts of parliament recited; the one of Scotland, whereby the church of Scotland, and also the four universities of that kingdom, are established for ever, and all succeeding sovereigns are to take an oath inviolably to maintain the same; the other of England, 5 Anne, cap. 6. whereby the acts of uniformity of 13 Eliz. and 13 Car. II. (except as the same had been altered by parliament at that time) and all other acts then in force for the preservation of the church of England, be declared perpetual; and it is stipulated, that every subsequent king and queen shall take an oath inviolably to maintain the same within England, Ireland, Wales, and the town of Berwick upon Tweed; and it is enacted, that these two acts shall for ever be observed as fundamental and essential conditions of the *union*.

The great officers of the crown of Scotland, before the *union*, were, the lord high chancellor, lord high treasurer, or treasurer, lord privy-seal, and lord register, or secretary. Their less officers of state were, the lord register, lord advocate, lord treasurer depute, and lord justice-clerk.

Since the *union* the officers of state in Scotland are the keeper of the great seal, lord privy-seal, lord register, lord vice-admiral, lord justice general, lord president, lord chief baron of the exchequer, lord advocate, lord justice clerk, lord high constable, heretable royal standard bearer, knight mareschal, heretable keeper of the king's houshold, heretable carver, and heretable usher of the white rod. The privy-council of Scotland is sunk in the parliament and privy-council of Great Britain, and the civil and criminal causes are chiefly cognizable by two courts of judicature, viz. the college of justice, or the *court of* SESSION, and the JUSTICIARY *court*, under the direction of the lord justice general, with an annual salary of 2000*l.* the lord justice clerk, with 500*l.* per annum, five commissioners at 200*l.* each, his majesty's ADVOCATE, with 1000*l.* per annum, three deputy advocates, a solicitor general, &c. Besides these two great courts of law, the Scots, by the articles of *union*, have a COURT *of exchequer*, under the direction of a lord chief baron, with a salary of 2000*l.* per annum, and four barons. The court of admiralty in Scotland is a supreme court in all cases competent to its jurisdiction, and under the direction of the lord vice admiral, whose salary is 1000*l.* per annum, a judge, procurator fiscal, &c. The courts of commissaries in Scotland answer to those of the English diocesan chancellors; the highest of which is kept at Edinburgh, wherein, before four judges, actions are pleaded concerning wills, the right of patronage to ecclesiastical benefices, tithes, divorces, and such causes. The office of privy seal is under the direction of the lord privy seal, with a salary of 3000*l.* per annum, a deputy, writer to the privy seal, and his deputy. The great seal office is under the direction of the lord keeper, with 3000*l.* per annum, and deputy and king's writer. The lord register's office is under the superintendance of the lord register, with 2000*l.* per annum, and six deputies. The chancery is under the administration of a director, deputy, and principal clerk. See COLLEGE *of heralds*, and UNIVERSITY.

Under this article of *union* we may observe, with respect to Wales, that very early in our history we find its princes doing homage to the crown of England; till at length, in the reign of Edward the First, the line of its ancient princes was abolished; and the king of England's eldest son became, as a matter of course, their titular prince; the territory of Wales being then entirely annexed (by a kind of feudal resumption) to the dominion of the crown of England. 10 Edw. I. By 12 Edw. I. and other subsequent statutes, their provincial immunities were farther abridged; but the finishing stroke to their independency was given by the statute 27 Hen. VIII. cap. 26. which at the same time admitted them to a thorough communication of laws with the subjects of England. By this statute it is enacted, 1. That the dominion of Wales shall be for ever united to the kingdom of England. 2. That all Welchmen born shall have the same liberties as the other king's subjects. 3. That lands in Wales shall be inheritable according to the English tenures and rules of descent. 4. That the laws of England, and no other, shall be used in Wales; besides many other regulations of the police of the principality. And the statute 34 & 35 Hen. VIII. cap. 26. confirms the same, adds farther regulations, divides it into twelve shires, and, in short, reduces it into the same order in which it stands at this day; differing from the kingdom of England in only a few particulars, and those too of the nature of privileges (such as having courts within itself, independent of the process of Westminster-hall), and some other immaterial peculiarities, hardly more than are to be found in many counties of England itself.

The town of Berwick upon Tweed was originally part of the kingdom of Scotland; and as such was for a time reduced by king Edward I. into the possession of the crown of England; and during its subjection, it received from that prince a charter, which (after its subsequent cession by Edward Baliol, to be for ever united to the crown and realm of England) was confirmed by king Edward III. with some additions, particularly that it should be governed by the laws and usages which it enjoyed before its reduction by Edward I. Its constitution was new modelled, and put on an English footing by a charter of king James I. and all its liberties, franchises, and customs, were confirmed in parliament by the statutes 22 Edw. IV. cap. 8. and 2 Jac. I. cap. 28. Though, therefore, it has some local peculiarities, derived from the ancient laws of Scotland, yet it is clearly part of the realm of England, being represented by burgesses in the house of commons, and bound by all acts of the British parliament, whether specially named, or otherwise. Accordingly it was declared by statute 20 Geo. II. cap. 24. that, where England only is mentioned in any act of parliament, the same notwithstanding hath and shall be deemed to comprehend the dominion of Wales, and town of Berwick upon Tweed. And, though certain of the king's writs or processes of the courts of Westminster do not usually run into Berwick, any more than the principality of Wales, yet it hath been solemnly adjudged, that all prerogative writs (as those of mandamus, prohibition, habeas corpus, certiorari, &c.) may issue to Berwick, as well as to every other of the dominions of the crown of England; and that indictments, and other local matters arising in the town of Berwick, may be tried by a jury in the county of Northumberland.

As to Ireland, that is still a distinct, though a dependent, subordinate kingdom. It was entitled the dominion, or lordship of Ireland, stat. Hiberniæ, 14 Hen. III. and the king's style was no other than *dominus Hiberniæ*, lord of Ireland, till the thirty-third year of king Henry VIII. when he assumed the title of king, which is recognized by act of parliament 35 Hen. VIII. cap. 3. See Blackst. Comm. vol. i. Int. sect. 4.

UNION *fire-office*. See INSURANCE.

UNIONS, *uniones*, in *Physiology*, the same with *margaritæ*, or *pearls*. See PEARL.

UNIQUE is sometimes anglified, and used to denote a thing which is the only one of its kind.

UNISETA, in *Natural History*, the name of a species of fly, found frequently sitting on the ammi or bishops weed, and distinguished by having one long hair or bristle growing out at its tail. See HENOTHRIX.

UNISON, in *Music*, is the effect of two sounds, which are equal, in degree of tune, or in point of gravity and acuteness.

Unison may be defined a consonance of two sounds, produced by two strings, or other bodies of the same matter, length, thickness, and tension, equally struck, and at the same time; so that they yield the same tone, or note.

Or, it is the union of two sounds, so like each other, that the ear, perceiving no difference, receives them as one and the same sound. See SOUND.

What constitutes *unisonance*, is the equality of the number of vibrations of the two sonorous bodies in equal times; where

where there is an inequality in that reſpect, and, of conſequence, an inequality in degree of tune, the unequal ſounds conſtitute an *interval*.

Since iſochronous vibrations produce ſounds that are muſical, and that are ſaid to continue at the ſame pitch, and ſlower vibrations produce graver, flatter or lower ſounds, and quicker vibrations produce ſounds that are acuter, ſharper, or higher; it follows, that if ſeveral ſtrings, however different in length, thickneſs, denſity, and tenſion, or other ſounding bodies, vibrate all together in equal times, their ſounds will have one and the ſame pitch, however they may differ in loudneſs, or other qualities, and are, therefore, called *uniſons*; and, on the contrary, the vibrations of *uniſons* are iſochronous. This obſervation reduces the theory of all ſorts of muſical ſounds to that of the ſounds of a ſingle ſtring, with reſpect to gravity or acuteneſs. Conſequently the wider and narrower vibrations of a muſical ſtring, or of any other body ſounding muſically, are all iſochronous very nearly; otherwiſe, while the vibrations decreaſe in breadth till they ceaſe, the pitch of the ſound could not continue the ſame as we perceive it does, if the firſt vibrations be not too large; in which caſe the ſound is a little acuter at the beginning than afterwards. In like manner, ſince the pitch of the ſound of a ſtring or bell, or other vibrating body, does not ſenſibly alter, while the hearer varies his diſtance from it; it follows, that the larger and leſſer vibrations of the particles of air, at ſmaller and greater diſtances from the ſounding body, are all iſochronous; and conſequently, that the little ſpaces deſcribed by the vibrating particles are every where proportional to the celerity and force of their motions, as in a pendulum; and this difference of force, at different diſtances from the ſounding body, cauſes a difference in the loudneſs of the ſound, but not in its pitch. It follows alſo, that the harmony of two or more ſounds, according as it is perfect or imperfect at any one diſtance, will alſo be perfect or imperfect at any other diſtance; and this is a known fact, e. gr. in a ring of bells. If two muſical ſtrings (ſee STRING), have the ſame thickneſs, denſity, and tenſion, and differ in length only, mathematicians have demonſtrated, that the times of their ſingle vibrations are proportional to their lengths. Hence, if a ſtring of a muſical inſtrument be ſtopped in the middle, and the ſound of the half be compared with that of the whole, we may acquire the idea of the interval of two ſounds, whoſe ſingle vibrations (i. e. the times) are in the ratio of 1 to 2; and by comparing the ſounds of $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{5}{6}$, $\frac{8}{9}$, $\frac{9}{10}$, &c. of the ſtring with the ſound of the whole, we may acquire the ideas of the intervals of two ſounds, whoſe ſingle vibrations are in the ratio of 2 to 3, 3 to 4, 3 to 5, 4 to 5, 5 to 6, 8 to 9, and 9 to 10, &c. See CHORD. Smith's Harmonics, p. 2, &c.

Uniſon is the firſt and greateſt of concords; and the foundation, or, as ſome call it, the *mother* of all the reſt: yet others deny it to be any concord at all, maintaining it to be only that in ſounds, which unity is in numbers.

Theſe reſtrain the word *concord* to intervals, and make it include a difference of tune; but this is precarious; for as the word *concord* ſignifies an agreement of ſounds, it is certainly applicable to *uniſons* in the firſt degree.

But though *uniſonance*, or an equality of tune, makes the moſt perfect agreement of ſound, it is not true that the nearer any two ſounds come to an equality of tune, they are the more agreeable. The mind is delighted with variety; and the reaſon of the agreeableneſs or diſagreeableneſs of two ſounds muſt be aſcribed to ſome other cauſe than the equality or inequality of the number of their vibrations.

It is a famed phenomenon in muſic, that an intenſe ſound being raiſed, either with the voice, or a ſonorous body, another ſonorous body near it, whoſe tune is either *uniſon*, or octave to that ſound, will ſound its proper note *uniſon*, or octave, to the given note.

The experiment is eaſily tried by the ſtrings of two inſtruments; or by a voice and an harpſichord; or a bell, or even a drinking-glaſs.

This our philoſophers account for thus; one ſtring being ſtruck, and the air put in motion thereby; every other ſtring, within the reach of that motion, will receive ſome impreſſion therefrom: but each ſtring can only move with a determinate velocity of recourſes or vibrations; and all *uniſons* proceed from equal, or equidiurnal vibrations; and other concords from other proportions. The *uniſon* ſtring, then, keeping equal pace with the ſounded ſtring, as having the ſame meaſure of vibrations, muſt have its motion continued, and ſtill improved, till its motion become ſenſible, and it give a diſtinct ſound. Other concording ſtrings have their motions propagated in different degrees, according to the frequency of the coincidence of their vibrations with thoſe of the ſounded ſtring: the octave, therefore, moſt ſenſibly; then the fifth: after which, the croſſing of the motions prevents any effect.

This they illuſtrate (as Galileo firſt ſuggeſted) by the pendulum, which being ſet a moving, the motion may be continued and augmented, by making frequent, light, coincident impulſes; as blowing on it when the vibration is juſt finiſhed: but if it be touched by any croſs or oppoſite motion, and this, too, frequently, the motion will be interrupted, and ceaſe altogether. So, of two *uniſon* ſtrings, if the one be forcibly ſtruck, it communicates motion, by the air, to the other; and both being equidiurnal in their vibrations, that is, finiſhing them preciſely together, the motion of that other will be improved and heightened, by the frequent impulſes received from the vibrations of the firſt, becauſe given preciſely when that other has finiſhed its vibration, and is ready to return: but if the vibrations of the chords be unequal in duration, there will be a croſſing of motions, leſs or more, according to the proportion of the inequality; by which the motion of the untouched ſtring will be ſo checked, as never to be ſenſible. And this we find to be the caſe in all conſonances, except *uniſon*, octave, and the fifth. See CHORD.

UNIT, UNITE, or UNITY, in *Arithmetic*, the number *one*, or one ſingle individual part of diſcrete quantity. See NUMBER.

If a number conſiſts of four or five places, that which is outermoſt towards the right hand, is called the place of *units*.

Number, in general, is by Euclid defined to be μοναδων ϖοσοτης, a multitude, or aggregate of *units*; but, in this ſenſe, *unity* is not a number.

UNITARIANS, in *Eccleſiaſtical Hiſtory*, a name given to thoſe who confine the glory and attribute of divinity to the *One*, only great and ſupreme God, and Father of our Lord Jeſus Chriſt.

This denomination is ſometimes applied to thoſe that are otherwiſe called ARIANS; but it is now more commonly appropriated to the SOCINIANS, who maintain that the Father alone is the God of the univerſe, the only true God; that our Lord Jeſus Chriſt was a mere man, with a reaſonable ſoul and human body, who had no exiſtence before he was born, by the immediate operation and miraculous power of God at Bethlehem, and who, in the courſe of his life and miniſtry, death, reſurrection, and exaltation, was honoured with peculiar and extraordinary tokens of the divine influence and favour; and that the Holy Spirit was not a perſon, or diſtinct intelligent agent, but only the power, influence, and energy of God. Some, in imitation of Socinus, allow that Chriſt is an object of worſhip; but moſt of the modern *Unitarians* reſtrict prayer and divine worſhip to God alone.

For an account of the progreſs of *Unitarianiſm* in our own country, ſee an Hiſtorical View of the State of the *Unitarian* Doctrine and Worſhip from the Reformation to our own Times, by Mr. Lindſey, 8vo. 1783.

UNITAS *Fratrum*, or *United Brethren*, in *Eccleſiaſtical Hiſtory*, a name diſtinguiſhing thoſe Chriſtians who are frequently called abroad HERRNHUTERS and with us MORAVIANS.

Under thoſe articles ſome account has been introduced of this ſect; the account was formed from the authorities particularly cited at the cloſe of the article HERRNHUTERS; but the editor having been favoured, ſince the publication of that article, with ſeveral teſtimonies relating to this denomination of Chriſtians by the Rev. B. la Trobe, a very reputable miniſter among the Moravians in London, and having no object in view but truth, takes this opportunity of declaring his own opinion, that they do not allow, either in principle or practice, of thoſe irregularities which have been charged upon them; and that the charge ſeems to have been principally owing to ſome unguarded expreſſions introduced into their diſcourſes and forms of devotion, which, as Mr. Cranz, their hiſtorian, candidly acknowledges, "being not clear "and determinate enough, and in part overſtrained, "proved offenſive to many divines both in and out of "their congregations." The reader's candour will therefore lead him to diſtinguiſh between the uniform and avowed ſentiments and conduct of thoſe called Moravians, and certain ſallies and extravagancies which they themſelves diſallow and condemn.

To thoſe who are acquainted with the hiſtory of this ſect, it is well known, that their moſt approved writers have taken great pains to derive their origin from thoſe formerly diſtinguiſhed by the appellation of MORAVIAN or *Bohemian brethren*, and who were afterwards denominated HUSSITES.

Moſheim, however, obſerves, that they may be ſaid with more propriety to imitate the example of that famous community, than to deſcend from thoſe who compoſed it: for, he adds, it is well known, that there are very few Bohemians and Moravians in the fraternity of the Herrnhuters; and it is extremely doubtful, whether even this ſmall number are to be conſidered as the poſterity of the ancient Bohemian brethren that diſtinguiſhed themſelves ſo early by their zeal for the Reformation. But from the Moravian writers, and from Cranz in particular, *ubi infra*, we are furniſhed with a circumſtantial account of the riſe and progreſs of this ſect from the ninth century, when the Bohemians and Moravians, and the whole Sclavonian nation, were firſt proſelyted to the faith of Chriſtianity, to the revival of it by count Zinzendorff. To this purpoſe they alledge, that when by the inſtrumentality of Methodius and Cyrillus, two Greek monks, Bogaris, king of Bulgaria, and king Suatopluck, in Moravia, were converted, they and their reſpective countries united with the Greek church; Methodius being the firſt biſhop, and Cyrillus having tranſlated the Bible into the Sclavonian language. After various ſtruggles the Greek Chriſtians were conſtrained to ſubmit to the ſee of Rome. Some few, however, ſtill adhered to the rites of the Greek church, who, in 1176, being joined by the Waldenſes and inſtructed by them, aſſociated in acts of worſhip, and ſent miſſionaries into many countries. In this ſtate they continued for more than two hundred years, till a ſevere perſecution was commenced againſt them in 1391. In the beginning of the next century they acquired the denomination of Hussites, and were alſo called at different periods *Fratres Legis Chriſti*, or Brethren of the Law of Chriſt; *Unitas Fratrum*, or the Unity of the Brethren; or *Fratres Unitatis*, United Brethren. Notwithſtanding very ſevere treatment, they maintained ſtrict church diſcipline among themſelves; and, at the ſynod of Lhota in 1467, choſe twenty, and out of theſe nine perſons, of whom they appointed three by lot for elders.

Having, at this time, no biſhops of the Bohemian church who had not ſubmitted to the ſee of Rome, they obtained conſecration for three of their prieſts of Stephen, biſhop of the Waldenſes in Auſtria, and theſe, on their return, ordained ten co-biſhops, or conſeniors, from among the reſt of the preſbyters. After many intervals of perſecution and of peace, towards the beginning of the ſixteenth century, there were two hundred congregations in Bohemia and Moravia, which had the Bible tranſlated into the Bohemian tongue, firſt from the Vulgate, and afterwards another from the original text.

In 1523, after the dawn of the Reformation, a friendly correſpondence commenced between the *Brethren* and Luther, and afterwards with Calvin, and others of the reformers. This correſpondence involved them in a ſevere perſecution, which greatly oppreſſed and diſpirited them. The diſſenſions alſo that prevailed amongſt themſelves threatened their ruin, which were, at length, happily terminated at the ſynod of Sendomir, in 1570, when the three *Tropuſſes* (i. e. thoſe who held different tenets and rites with regard to non-eſſentials) viz. the epiſcopal brethren, the Lutheran, and reformed, or followers of Calvin, agreed that they would perform divine ſervice and communicate together. In 1575 they obtained an edict for the public exerciſe of their religion, which was confirmed in 1609, when they obtained leave to erect new churches. But, in 1612, a civil war broke out in Bohemia, and, in 1721, a violent perſecution occaſioned the diſperſion of their miniſters, and great diſtreſs to the *Brethren* in general. Among the miniſters was one John Amos Comenius, biſhop of the church of the Brethren. Cranz has given the ſucceſſion of the Bohemian, Moravian, and Poliſh biſhops from Stephen, in 1467, to the renewal of the church of the *United Brethren* in this century. In 1662, Comenius conſecrated Peter Figulus, commonly called Jablonſky, and, in 1699, his ſon, Daniel Erneſt Jablonſky, was conſecrated biſhop; and by him, it is ſaid, the epiſcopal ordination has been committed to the preſent *Unity of the Brethren*, adhering to the Augſburg confeſſion, renewed by the emigration of many out of Bohemia and Moravia. This emigration was ſo conſiderable, and ſuch numbers of others conformed to the rites of the church of Rome, that, at the cloſe of the ſeventeenth century, it was apprehended, that this ancient church was become utterly extinct.

Several, however, it is ſaid, continued in Bohemia and Moravia, and retained their principles in ſecret; and from theſe the Moravian writers derive the preſent church, known by the name of *Unitas Fratrum*, or United Brethren, which, they ſay, is a renewal and continuation of the ancient church. About the year 1720, the revival commenced among the poſterity of the *Brethren* about Fulneck in Moravia, and Leutomiſchel in Bohemia. In Moravia, one Chriſtian David had been the chief inſtrument of the edification of his brethren, and the inſtructions which he received from miniſters whoſe names were Schoefer and Schwedler, he communicated, in 1717, to the deſcendants of the ancient Brethren. But being perſecuted in their native country, ſome of them migrated under the conduct of Chriſtian David, and, in 1722, put themſelves under the protection of Nicholas Lewis, count of Zinzendorff, in Upper Luſatia; where they built houſes upon the hill called the *Hutberg*, i. e. the Watch Hill, and hence the new ſettlement was called *Herrnhut*, i. e. the Watch of the Lord, and the Brethren were denominated *Herrnhuters*. The count ſoon after removed to Bertholſdorff, and ſuperintended their riſing ſettlement. In 1724 more emigrants arrived at Herrnhut from Moravia, juſt as the Brethren were beginning to lay the foundation of an edifice intended for the education of the children of the nobleſſe, for printing cheap Bibles, and preparing medicines for their neighbours, in which building was alſo to be a chapel.

It would far exceed our limits to recount the ſucceſſive emigrations to Herrnhut, and the additions that were made by the means of the preaching of the Rev. Mr. Rothe, miniſter at Bertholſdorff, and the zeal of Chriſtian David. Among theſe ſettlers there were perſons of different opinions, which engaged the attention of count Zinzendorff, who endeavoured to eſtabliſh an union among them in the fundamental truths of the Proteſtant religion, and, in 1727, formed ſtatutes for their government in conformity to theſe truths.

From this period in particular, when elders and wardens were choſen, and an union eſtabliſhed between the Brethren from Moravia, both among themſelves, and with their Lutheran and reformed Brethren, the Moravian writers date the renewal of the *Unity of the Brethren*. The whole congregation was divided into claſſes, called choirs, and one of their own ſex and ſtation in life appointed to have the ſpecial care of each choir under the inſpection of the elders. The officers were appointed by lot, which has continued to be the caſe to the preſent day.

From the year 1727 to 1731, deputations were ſent from Herrnhut to Denmark, Sweden, England, Livonia, Switzerland, and other places in Germany, and thus the renewed unity of the Brethren became more known.

In 1729 a deed was ſigned by ſeveral, and ratified by the count and Mr. Rothe, in which they declare that they are neither Separatiſts, nor a new ſect, but deſcendants of the Moravian Brethren, &c.

We acknowledge, ſay they, no viſible congregation of Chriſt, but where the word of God is taught in ſimplicity and purity, and the members lead a holy life; yet we will not ſeparate from any one of any other Chriſtian denomination who truly believes in Chriſt, though he gives a different expoſition to this or the other text of Scripture, &c.

They guard againſt latitudinarianiſm in religion; they determine to maintain their ancient church diſcipline, without forſaking divine ſervice in the Proteſtant pariſh church at Bertholſdorff; they agree to the confeſſion of Augſburg: they will not be called Huſſites or Lutherans, but retain their ancient name, *The Brethren*; thus hoping for the protection of their ſovereign, and that their whole caſe might be examined by government.

The count's journey to Copenhagen to the coronation of Chriſtian VI. in 1731, where he heard of the miſerable condition of the Negroes in the iſland of St. Thomas, was the occaſion of the firſt miſſion of the Brethren among the heathen, ſo that two Brethren went thither in the year 1732, and the miſſion to Greenland commenced in 1733. In 1732 the count determined to devote himſelf to the miniſtry of the Goſpel, and accepted the office of warden, which he had held before, in 1733. In 1734 the firſt Brethren went to America. The count having been examined and received into the clerical order, by the theological faculty of Tubingen, correſponded with Jablonſky, eldeſt biſhop of the Brethren's unity, about the renewal of epiſcopal ordination; and he conſecrated a biſhop for the church of the Brethren at Berlin, with the concurrence of his colleague, the ſenior, or biſhop of Liſſa, in Poland, in 1735. And, in 1737, the count himſelf was conſecrated a biſhop of the *Unitas Fratrum* by theſe three biſhops; having previouſly obtained the opinion of Dr. Potter, archbiſhop of Canterbury, that the Moravian Brethren were an apoſtolical and epiſcopal church, not maintaining any doctrines repugnant to the thirty-nine articles of the church of England: and he afterwards received a congratulatory letter from the archbiſhop on his conſecration. From this time the

the count is called the ordinary of the Brethren. The count appears to have been zealous and indefatigable in his labours; and it appears that, in 1739, the Brethren were dispersed in about forty places, most of which were missionaries among the heathen. New settlements were made in Europe and America; institutions for the education of children were established in many places; and many regulations were adopted for mutual edification, in conformity to the constitution of the ancient church of the Brethren. In 1748 a formal and very respectable commission, consisting of three counts, two doctors of law, and three divines, was appointed to examine the charges that had been urged against the principles and practice of the Brethren, the result of which was very favourable to them. In consequence of the report of the commissioners, the bailiwick and palace of Barby, where the college and seminary of the Brethren are now established, were ceded in lease to count Henry, twenty-eighth Reuss, and his consorts, and the chapel of the palace given to the Brethren.

In 1749 a royal mandate was published, importing, that the congregations of the Protestant Moravian Brethren, avowing the unaltered Augustan confession, should be received in all Saxony, in the same manner as in Upper Lusatia and the county of Barby.

An eminent divine of Saxony, dean of the king's chapel, became this year, with the approbation of the sovereign, honorary president of the Lutheran Tropus in the unity of the Brethren; Dr. Cochius, dean of the king of Prussia's chapel was, with the approbation of the king, introduced as honorary president of the reformed Tropus in the Unity, to which he had been appointed in 1746, and after his death, in 1749, was succeeded in that office by Dr. Thomas Wilson, bishop of Sodor and Man.

After the state of the Brethren's church had been deliberately examined by the British parliament, an act passed on the 6th of June, 1749, in behalf of the ancient episcopal church known by the name of *Unitas Fratrum*.

In the mean time, as their number increased, and their local congregations became more numerous, men of different connections and principles were introduced among them; some of whom had imbibed extravagant notions, which they zealously propagated. This occasioned what they called a time of sifting in doctrine and in conduct. Their phraseology in expounding divine truths, often bordered upon error, and the passions being warmed, a kind of joy took place which produced extravagant actions. Cranz, however, observes, that this sifting did not arise from irreligious principles, nor did it end in immoral practices. Many among the Brethren were offended, and their adversaries took occasion to reproach them. The count, it is said, interposed with such success, that in the years 1750 and 1751, almost all that had been chargeable with these excesses, in doctrine and practice, acknowledged their error with shame; those who did not retract deserted them, and those, whose relapse was dreaded, were dismissed from their offices. The consequence of these excesses was, indeed, in another respect, more serious and alarming; for the count of Buedingen was so prejudiced against them, that an edict was published requiring the inhabitants of Herrnhaag, who would not renounce the count and the ministers of the Brethren's church, to leave the country; whereas those who complied were allowed to remain in their habitations, under the protection of the reigning count. On this occasion more than a thousand persons, from 1750 to 1753, left a beautiful village, which they had erected at a great expence, and were dispersed in other congregations in Germany, Holland, England, and America; and the French reformed Brethren and sisters, who lived at Herrnhaag, formed a settlement at Neuwied, which is now in a flourishing condition.

The increase of the Brethren, their new settlements, and numerous journies and missions, involved the society in a great expence, and threatened ruin. Their debts were many and great, discouraged their friends, and gave their enemies occasion for censure. The count, however, became security for their whole debt, which, at a stipulated time, was discharged. As soon as they were extricated from these difficulties, new regulations were adopted to prevent future distress of a similar kind.

We can only add, that the count lived to see congregations and missions settled in the four quarters of the globe, and these, it has been urged, were the most effectual apologies and defences of the principles and practice of the Brethren.

In 1760 the count died, with a memorial among the Brethren of having been their patron, and the instrument by whom God restored and built up the church of the Brethren.

But though they counted him a distinguished servant of God, yet they did not regard him as their head; for they acknowledged, from the beginning, no other head and elder but the Lord Jesus Christ, and no other father but the Father in heaven.

At the first synod of the Unity, after his decease, in 1764, a number of Brethren were chosen to have collectively the superintendency of the whole *Unity*, and, in the following synods, the arrangement then made was continued with some amendments. This company is called the Elders Conference of the *Unity*, and consists of thirteen Brethren, who are chosen at every synod of the whole Unity.

The Brethren appeal to their lives for a refutation of the calumnies that have been circulated against them, professing themselves to be a people who walk in honesty and godliness as followers of the Lord Jesus Christ: and, as to doctrine, they avowedly adhere to the Augsburg, or AUGUSTAN *confession*; and, with respect to this, the public, we are informed, may soon read an exposition of Christian doctrine as taught in the church known by the name of *Unitas Fratrum*, now preparing for the press.

In England, the congregations belonging to the *Unitas Fratrum* are the following, viz. two in London, one at Bedford, where are houses belonging to the single Brethren and single Sisters, to which belong their chapels and societies at Northampton, Risely, &c. one at Ockbrook, near Derby; one at Fulneck, near Pudsey, in Yorkshire, where are houses for the single Brethren, and Sisters, and widows, and schools for children; to this the members of the societies near Leeds and Bradford belong; one at Wyke, near Halifax, another at Merfield, and another at Little Gummersal; one at Duckenfield, in Cheshire, where they have two choir-houses, one for the single Brethren, and one for the single Sisters; one at Leominster, in Herefordshire; one at Bristol, where are houses for the single Brethren and Sisters, to which belongs that at Kingswood; one at Bath; one at Tetherton, in Wiltshire, to which the chapel at Malmesbury belongs: a congregation was also collected in 1759, at Haverfordwest, in Pembrokeshire. Besides these congregations, the Brethren have chapels in several parts of England; viz. at Apperly, in Gloucestershire; Frome, in Somersetshire; Plymouth, in Devonshire; Eden and Culworth, in Northamptonshire.

For other particulars relating to the sentiments, discipline, mode of worship, &c. of the *Unitas Fratrum*, we must refer to Cranz's Ancient and Modern History of the Brethren, 8vo. published in 1780, by the Rev. B. la Trobe; and to a Concise Historical Account of the Present Constitution of the *Unitas Fratrum*, translated from a work intitled Neueste Religions Geschichte, by Dr. Walch, of Goettingen, and published in 1775, by Mr. La Trobe. See also Cranz's History of Greenland, &c. published in 2 vols. 8vo. in 1767. A Succinct View of the Missions established among the Heathen by the Church of the Brethren, in a Letter to a Friend, by M. La Trobe, in 1771: and a Brief Account of the Mission established among the Esquimaux Indians, on the Coast of Labrador, in 1774.

UNITE, in the *Manege*. See UNION.

UNITED *affection*. See AFFECTION.

UNITY, UNITAS, the abstract, or quality, which constitutes, or denominates a thing *unum*, or one.

The school philosophers generally define *unity*, by a thing's being undivided in itself, and divided from every thing else. Others, more accurately, define it, a mode of being, whereby it agrees to any particular being, once: these make two kinds of *unity*, viz. *unity of simplicity*, which is both undivided and indivisible; such as that of God, angels, and human souls: the other, *union of composition*, which, though undivided, is divisible in the being, as consisting of divers parts: such is that of man, &c.

Hence, *unity* is also divided into that *per se*, which agrees to any being whose parts are collected into one substratum: and *unity per accidens*, whose parts are not united into one substratum, as that of a flock of sheep, &c.

Some also make a *singular*, or *numerical unity*, and an *universal unity*; a *real*, and an *imaginary unity*, &c.

It is disputed among mathematicians, whether or no *unity* be a number? The generality of authors hold the negative, and make *unity* to be only inceptive of number, or the principle thereof; as a point is of magnitude, and an *unison* of concord.

Stevinus is very angry with the maintainers of this opinion: and yet, if number be defined a multitude of units joined together, as many authors define it, it is evident that *unity* is not itself a number.

It is to be observed in algebra, that *unity* itself has three different expressions of its cube root, one real, and the other two impossible or imaginary. Thus the three cube roots of 1, are $1, \frac{-1+\sqrt{-3}}{2}$, and $\frac{-1-\sqrt{-3}}{2}$.

This

This is sometimes of use in finding the cube roots of quantities, appearing under impossible expressions.

The two impossible expressions of $\sqrt[3]{1}$ may be thus found: let $x=1$ then $x^3=1$, or $x^3-1=0$, and $x-1=0$. Divide x^3-1 by $x-1$ the quotient is $xx+x+1=0$, or $xx+x=-1$. Resolve this quadratic equation, by adding $\frac{1}{4}$ to both sides. Then $xx+x+\frac{1}{4}=-\frac{3}{4}$, and extracting the square root, $x+\frac{1}{2}=\sqrt{-\frac{3}{4}}=\frac{\sqrt{-3}}{2}$. Therefore $x=-\frac{1}{2}\pm\sqrt{-\frac{3}{4}}=\frac{-1\pm\sqrt{-3}}{2}$. That is, $x=\frac{-1+\sqrt{-3}}{2}$, and $x=\frac{-1-\sqrt{-3}}{2}$. See Maclaurin's Algebra, p. 128. 226.

UNITY, among *Divines*. The Romanists, and the reformed, dispute, whether or no the church be one single body, all the members whereof are joined together, either really, or in inclination; so that whatever does not appertain to that body, is no part of the church: which is what they call *the unity of the church*; and which the Romanists maintain to be restrained to one single society, or one communion, under one visible head; and out of which the Protestants are excluded. These last, on the contrary, hold, that the *unity* of the church may still subsist, without the members being united under any one visible head; it being sufficient, that all Christians be united by the bonds of mutual love and charity; and that they be agreed in the fundamental points of religion.

All the difficulty is, to fix what those fundamentals are; some inclining to make the door of the church wider than others.

UNITY, in *Poetry*. In the drama there are three *unities* to be observed; the *unity of action*, that of *time*, and that of *place*.

In the epic poem, the great and almost only *unity* is that of the action. Some regard, indeed, ought to be had to that of time: but that of place there is no room for. The *unity* of character is not reckoned among the *unities*.

The *unity* of the dramatic action consists in the *unity* of the intrigue in comedy, and that of the danger in tragedy; and this not only in the plan of the fable, but also in the fable extended and filled with episodes.

The episodes are to be worked in, without corrupting the *unity*, or forming a double action; and the several members are to be so connected together, as to be consistent with that continuity of action so necessary to the body; and which Horace prescribes, when he says, *Sit quodvis simplex duntaxat & unum.*

The *unity* of the epic action, M. Dacier observes, does not consist in the *unity* of the hero, or in the *unity* of his CHARACTER, and manners; though those be circumstances necessary thereto. The *unity of action* requires, that there be but one principal action, of which all the rest are to be incidents, or dependencies.

F. Bossu assigns three things requisite thereto: the first, that no episode be used, but what is fetched from the plan, and ground of the action, and which is a natural member of that body: the second, that these episodes and members be well connected with each other: the third is, not to finish any episode, so as it may appear a whole action; but to let each be always seen in its quality of member of the body, and an unfinished part.

The same excellent critic examines the *Æneid*, *Iliad*, and *Odyssey*, with respect to these rules, and finds them strictly observed. Indeed, it was from the conduct of those divine poems, that he took the hint of the rules themselves. Instances wherein these rules are all neglected, he gives us in Statius's *Thebaid*.

To the *unity of time*, it is required, in the drama, that the action be included in the space of a day. Aristotle says expresly, it must not exceed the time the sun employs in making one revolution, which is a natural day, under pain of irregularity: some critics will even have it included in the space of twelve hours, or an artificial day.

Indeed, the ancient tragic poets sometimes dispensed with this rule; and many of the modern English ones disallow it: and very few of them practise it.

In the epic poem, the *unity of time* is still less established. In effect, there is no fixing the time of its duration; in regard, the warmer and more violent the action is, the less must be its continuance; whence it is, that the *Iliad*, representing the anger of Achilles, only contains forty-seven days at most; whereas the action of the *Odyssey* holds eight years and a half, and that of the *Æneid* almost seven years.

But the length of the poem Aristotle gives us a rule for; which is, that it be such as that it may be read over in one day: pretending, that if it exceeds that compass, the imagination will be bewildered in it, and that one cannot see the end, without having lost the idea of the beginning.

As to the *unity of place* and *scene*, neither Horace nor Aristotle give us any rules relating thereto. It were to be wished, indeed, that what is presented to the audience on the same stage, which is never shifted, might be supposed to have passed in the same house, and the same apartment. But as such a constraint would cramp the poet too much; and as such an uniformity would suit very ill with abundance of subjects; it has been agreed, that what passes any where in the same town or city, shall be allowed for *unity of place*. At least, if two different places be unavoidable; yet the place is never to be changed in the same act.

Shakspeare, it is well known, paid no regard to the *unities* of *time* and *place*. On this subject Dr. Johnson observes, in the preface to his edition of Shakspeare's plays, that perhaps a nearer view of the principles on which they stand will diminish their value, and withdraw from them the veneration which, from the time of Corneille, they have very generally received, by discovering that they have given more trouble to the poet, than pleasure to the auditor.

As nothing is essential to the fable but *unity of action*, and as the *unities of time and place* arise evidently from false assumptions, and by circumscribing the extent of the drama, lessen its variety, Dr. Johnson does not think we need much lament their not being known or not observed by Shakspeare.

He adds, as the result of his inquiries, that the *unities of time and place* are not essential to a just drama; that though they may sometimes conduce to pleasure, they are always to be sacrificed to the nobler beauties of variety and instruction; and that a play written with nice observations of critical rules, is to be contemplated as an elaborate curiosity, as the product of superfluous and ostentatious art, by which is shewn rather what is possible than what is necessary.

He that, without diminution of any other excellence, shall preserve all the *unities* unbroken, deserves the like applause with the architect, who shall display all the orders of architecture in a citadel, without any deduction from its strength; but the principal beauty of a citadel is to exclude the enemy; and the greatest graces of a play are to copy nature and instruct life.

UNITY *of possession*, in *Law*, signifies a joint possession of two rights, by several titles.

Thus, if I take a lease of land upon a certain rent, and afterwards buy the fee-simple; this is an *unity of possession*, whereby the lease is extinguished: by reason I, who before had only the occupation for my rent, am now become lord of the same, and am to pay rent to none but myself.

Unity of possession amounts to the same with what civilians called CONSOLIDATION.

The *unity* of a joint estate is fourfold, viz. the *unity* of interest, the *unity* of title, the *unity* of time, and the *unity* of possession; or, in other words, JOINT-*tenants* have one and the same interest, accruing by one and the same conveyance, commencing at one and the same time, and held by one and the same undivided possession. See Blackst. Com. book ii. p. 180, &c.

UNITY *of a sentence*, in *Grammar* and *Rhetoric*. See STYLE.

UNIVALVE, in *Natural History*, a denomination given to a genus of SHELLS.

UNIVERSAL, something that is common to many things: or it is one thing belonging to many, or all things.

The word, according to some, is compounded of *unum versus alia*.

There are *universal instruments*, for measuring all kinds of distances, as heights, lengths, &c. called also *pantometers*, and *holometers*.

An *universal* DIAL, is that whereby the hour may be found by the sun all over the earth; or under any elevation of the pole.

Several learned authors have had it in view, to establish an *universal* CHARACTER; by which the different nations might understand each other's writings, without learning their language.

The Romanists are divided among themselves, about the title of *universal bishop*, which some of the popes have arrogated to themselves; though others of them have declined it. Baronius holds the appellation to belong to the pope jure divino; and yet St. Gregory, opposing the same quality given by a council in 586 to John, patriarch of Constantinople, asserted expresly, that it did not belong to any bishop; and that the bishops of Rome neither could, nor ought to take it. Accordingly, St. Leo refused

refused to accept it, when offered him by the council of Chalcedon; for fear, lest, giving something particular to one bishop, they should take from all the rest; since there could not be an *universal bishop*, but the authority of the rest must be diminished.

UNIVERSAL, UNIVERSALE, in *Logic*, is either *complex*, or *incomplex*. A *complex universal*, is either an *universal* proposition, as, "Every whole is greater than its parts;" or whatever raises a manifold conception in the mind; as the definition of a reasonable animal.

An *incomplex universal*, is what produces one only conception in the mind, and is a simple thing, respecting many; as human nature, which relates to every individual wherein it is found.

Now in an *universal*, two things are distinguished, the *matter*, called the *material universal*, *universale materiale*, which is the one nature multipliable into many; as humanity in Peter, Paul, &c. and the *form*, called the *formal universal*, which is the unity of that nature.

Wherefore, to constitute an *universal*, it is requisite the nature be one, yet multipliable; but what such a nature is has proved matter of great controversy, both among the ancient and modern philosophers.

The Platonists will have *universals* to be nothing but divine ideas. Now by *idea* they mean the pattern or form which the artificer has in view when he makes any thing: but as this is twofold; *internal*, which is a sort of image of the thing to be done, which the artificer frames in himself; and *external*, which is something out of himself, which the artificer imitates; the philosophers have been infinitely perplexed to find which of the two Plato meant. The Peripatetics insist he meant the *external*; but the Platonists, and most of the Christian divines, hold for the *internal*.

The STOICS and NOMINALISTS maintain this in common with the PLATONISTS, that *universals* are not in the things themselves, but out of them. The Stoics particularly, for *universals*, put a kind of formal conceptions, or acts of knowing; by reason they represent many things at the same time: e. gr. knowledge, representing all men, is, according to the Stoics, an *universal*.

The Nominalists make words *universals*; by reason the same word represents many things, as the word *man* represents all men; but both Stoics and Nominalists make *universals* to be something extrinsic to things themselves; by reason whatever exists, or is produced, is singular; so there is no *universal* really in things.

The PERIPATETICS, however, contend, that there are *universal* and common natures in things themselves; or that things and natures like each other form a material *universal*. But as to the manner wherein they are *universal*, or whence they derive their *universality*, that is, their unity and aptitude of being in many, whether from nature, or from our understanding, is great matter of dispute among them. If they derive that unity, wherein their *universal* form is placed, from nature, then there is an *universal à parte rei*; which is the opinion of the SCOTISTS.

If they do not derive it from nature, but only from our minds or understandings, then the doctrine of the THOMISTS is allowed, who contend, that a formal *universal* has no other existence, but by an act of the intellect.

UNIVERSAL *cause*, *characters*, *consumptions*, *geography*, *gravity*, *joint*, *maps*, *palsy*, *proposition*, *rheumatism*, *ring-dial*, *system*, and *theorem*, see the substantives.

UNIVERSALISTS, in *Polemical Divinity*, an appellation given to such as hold an *universal* grace; in like manner as the denomination PARTICULARISTS, is given to those who hold a *particular* and *efficacious* grace.

The ARMINIANS are particularly denominated *universalists*.

UNIVERSALISTS, *hypothetical*, in *Ecclesiastical History*, an appellation given to those doctors of Saumur who attempted to reconcile the doctrine of predestination, as it had been taught at Geneva, and confirmed at Dort, with the sentiments of those who represent the Deity as offering the displays of his goodness and mercy to all mankind. The first person who made this attempt was John Cameron (see CAMERONIANS) whose sentiments were supported, and farther illustrated by Moses Amyraut, a man of uncommon sagacity and erudition. The latter applied himself, from 1634, with such zeal to this work, that he produced no small changes in the doctrine commonly received among the reformed in France. The form of doctrine which he proposed with this view may be summed up in the following propositions; viz. that God desires the happiness of all men, and that no mortal is excluded, by any divine decree, from the benefits that are procured by the death, sufferings, and gospel of Christ; that, however, no one can be made a partaker of the blessings of the Gospel, and of eternal salvation, unless he believe in Jesus Christ; that such is the immense and universal goodness of the Supreme Being, that he refuses to none the power of believing; though he does not grant unto all his assistance and succour, that they may wisely improve this power to the attainment of everlasting salvation; and that, in consequence of this, multitudes perish through their own fault, and not from any want of goodness in God. Those who embraced this doctrine were called *Universalists*, because they represented God as willing to shew mercy to all mankind; and *hypothetical universalists*, because the condition of faith in Christ was necessary to render them the objects of this mercy. Mosh. Eccl. Hist. vol. iv. p 503. 8vo.

UNIVERSALITY, the quality that denominates a thing *universal*.

The Catholics assert the *universality* of their church, both as to time and persons; and maintain this to be a note or mark of the true church, which distinguishes it from all other societies that pretend to the name.

UNIVERSALITY, in the *Schools*. Logicians make two kinds of *universality*, the one *metaphysical*, the other *moral*.

UNIVERSALITY, *metaphysical*, is that which excepts nothing; as this proposition, "Every man is mortal."

UNIVERSALITY, *moral*, is that which admits of some exception; as, "All old men praise the times past." In such like propositions, it is enough that the thing be ordinarily so; it not being strictly required, that every old man should be of that disposition. See PREDICABLE.

UNIVERSE, a collective name, signifying the assemblage of heaven and earth, with all things therein, called by the Greeks το παν, and by the Latins, *mundus*.

The ancients, and after them the Cartesians, imagine the *universe* to be infinite. The reason they give is, that it implies a contradiction to suppose it finite or bounded; since it is impossible not to conceive space beyond any limits that can be assigned it; which space, according to the Cartesians, is body, and consequently part of the *universe*. But that the *universe* is finite, appears from the two following considerations: 1. That whatever consists of parts cannot be infinite, since the parts that compose it must be finite, either in number or magnitude; which, if they be, what they compose must be so too: or, 2dly, they must be infinite either in number or magnitude; but an infinite number is a contradiction, and to suppose the parts infinitely big is to suppose several infinities, one bigger than another; which, though it may pass among mathematicians, who only argue about infinites, *in posse*, or in imagination, will not be allowed in philosophy.

UNIVERSITY, UNIVERSITAS, a collective term, applied to an assemblage of several colleges established in a city, or town, wherein are professors in the several sciences, appointed to teach them to students; and where degrees, or certificates of study in the divers faculties are taken up.

In each *university* four faculties are usually taught; theology, medicine, law, and the arts and sciences.

They are called *universities*, or *universal schools*, because the four faculties are supposed to make the grand world, or whole compass of study; or rather, because they form one whole out of many individuals.

In the eye of the law, an *university* is held a mere lay body, or community; though, in reality, it be a mixed body, composed partly of laymen, and partly of ecclesiastics. See CORPORATION.

The definition of the term *universitas*, by foreign civilians, answers nearly to our common law term of body politic or corporate; and such towns as had this appellation in Germany, &c. might hold lands and rents in common, and do all other acts as one aggregate body. And in this sense the word *universitas* came to be applied to such academies for learning as were incorporated, which archbishop Usher thinks began about the year 1250.

Universities had their first rise in the twelfth and thirteenth centuries. Those of Paris and Bologna pretend to be the first that were set on foot; but then they were on a very different footing from the *universities* among us.

The *university* of Paris is said to have commenced under Charlemagne, and to owe its rise to four Englishmen, disciples of Venerable Bede, who, going to that city, made a proposal to set up and sell learning; and accordingly held their first lectures in places assigned them by that prince: such is the account given by Gaguin, Gilles, De Bauvais, &c. Though the authors who wrote in those days, as Eginhard, Aimon, Reginon, Sigebert, &c. make not the least mention of this memorable fact.

Add, that Pasquier, Du Tillet, &c. declare openly against the opinion; and assert, that the first foundations were

were not laid till the time of Lewis the Young, and Philip Auguste, in the twelfth century. The earliest mention we find made of the *university* of Paris, is in Regordus, who lived in that age, and who was contemporary with Peter Lombard, the master of the sentences, the great glory of that *university*; in memory of whom an anniversary is to this day observed by that body in the church of St. Marcel, where he lies buried.

But it is certain it was not established all at once; it appears to have been at first no other than a public school in the cathedral church; from which it grew, by little and little, under the favour and protection of the kings, into a regular body.

Our own *universities*, Oxford and Cambridge, seem intitled to the greatest antiquity of any in the world; and University, Baliol, and Merton colleges in Oxford, and Peter's in Cambridge, all made colleges in the thirteenth century, may be said to be the first regular endowments of this kind in Europe.

For though University college in Oxford had been a place for students ever since the year 872, yet this, like many of the other ancient colleges beyond sea, and Leyden to this day, was no proper college; but the students, without any distinction of habit, lived in citizens houses, having only meeting-places to hear lectures, and to dispute.

In after-times, there were houses built for the students to live in society; only each to be at his own charge, as in the inns of court. These, at first, were called *inns*, but now *halls*.

At last plentiful revenues were settled on several of these halls, to maintain the students in diet, apparel, &c. and these were then called *colleges*.

The *universities* of Oxford and Cambridge are governed, next under the king, by a *chancellor*, who is to take care of the government of the whole *university*, to maintain the liberties thereof, &c.

The chancellor's courts in the two *universities* enjoy the sole jurisdiction, in exclusion of the king's courts, over all civil actions and suits whatsoever, where a scholar or privileged person is one of the parties, excepting in such cases where the right of freehold is concerned. And these, by the *university* charters, they are at liberty to try and determine, either according to the common law of the land, or according to their own local customs, at discretion. See *University* Courts.

Privileges of this kind are of very high antiquity, being enjoyed by all foreign *universities* as well as our own, in consequence (as judge Blackstone apprehends) of a constitution of the emperor Frederick, A. D. 1158. The oldest charter containing this grant to the *university* of Oxford, which the same learned judge had seen, was 28 Hen. III. A. D. 1244. And the same privileges were confirmed and enlarged by almost every succeeding prince, down to king Henry the VIIIth. in the fourteenth year of whose reign the largest and most extensive charter of all was granted. One similar to which was afterwards granted to Cambridge, in the third year of queen Elizabeth. All the charters of the two *universities* were confirmed by the statute 13 Eliz. cap. 29. This privilege, so far as it relates to civil causes, is exercised at Oxford in the chancellor's court; the judge of which is the vice-chancellor, his deputy, or assessor. From his sentence an appeal lies to delegates appointed by the congregation; from thence to other delegates of the house of convocation; and if they all three concur in the same sentence, it is final, at least by the statutes of the *university*, according to the rule of the civil law. But if there be any discordance or variation in any of three sentences, an appeal lies in the last resort to judges delegates, appointed by the crown under the great seal in Chancery.

This chancellor's court hath also authority over all criminal offences, under the degree of treason, felony, or mayhem.

Under the chancellor is the *high-steward*, whose office is to assist the chancellor, and other officers, when required, in the execution of their offices, and to hear and determine capital causes, according to the laws of the land, and the privileges of the *university*.

By the charter of 7 Jun. 2 Hen. IV. confirmed by the stat. of 13 Eliz. cap. 29. cognizance is granted to the *university* of Oxford of all indictments of treasons, insurrections, felony, and mayhem, which shall be found in any of the king's courts against a scholar or privileged person; and they are to be tried before the high-steward of the *university*, or his deputy, who is to be nominated by the chancellor for the time being. But when his office is called forth into action, such high-steward must be approved by the lord high-chancellor of England; and a special commission under the great seal is given to him, and others, to try the indictment then depending. The process of the trial is this: the high-steward issues one precept to the sheriff of the county, who thereupon returns a panel of eighteen freeholders; and another precept to the beadles of the *university*, who thereupon return a panel of eighteen matriculated laymen, "*laicos privilegio universitatis gaudentes*;" and by a jury formed *de medietate*, half of freeholders, and half of matriculated persons, the indictment is to be tried in the guildhall of the city of Oxford. And if execution be necessary to be awarded, in consequence of finding the party guilty, the sheriff of the county must execute the *university* process; to which he is annually bound by an oath. Blackston. Com. book iv. p. 274.

The next officer is the *vice-chancellor*, who officiates for the chancellor in his absence.

In the *university* of Oxford there are four *pro-vice-chancellors*: in the *university* of Cambridge the *vice-chancellor*, and five others, constitute the *caput*, which every *university* grace must pass before it can be introduced into the senate.

There are also two *proctors*, who assist in the government of the *university*, particularly in the business of school-exercise, taking up degrees, punishing violators of the statutes, &c.

In the *university* of Cambridge there are also two moderators, two scrutators, and two taxors. In this *university* there are nineteen professors, beside lady Margaret's preacher: in that of Oxford there are twenty-one professors, including the readers in anatomy and chemistry. Add to these a *public orator*, *keeper of records*, *librarians*, *register*, *esquire* and *yeoman*, *beadles*, *clerk*, and *verger*. See College.

For the degrees taken up in each faculty, with the exercises, &c. requisite thereto, see Degree.

The *universities* of Scotland are four, viz. that of St. Andrew's, founded in 1411, under the direction of a chancellor, two principals, and eleven professors: that of Glasgow, founded in 1454, under the direction of a chancellor, rector, principal, and fifteen professors: that of Aberdeen, founded in 1477, which has two colleges, the King's College and Marischal College; the King's College has a principal, sub-principal, and eight professors; the Marischal College has a chancellor, principal, and seven professors: and that of Edinburgh, founded in 1582, under the direction of patrons, a principal, and twenty-five professors.

University *courts*. See *University* Courts, and University, *supra*.

UNIVOCAL, in the *Schools*, is applied to two or more names, or terms, that have but one signification: in opposition to *equivocal*, which is, where one term has two or more significations.

Or, *univocal terms* are such whose name, as well as nature, is the same; in opposition to *equivocals*, whose names are the same, but their natures very different.

For a thing to be predicated *univocally* of any others, it is to be attributed to all of them alike, and in the same proper sense. See Predicate and Predicable.

Univocal *generation*. The doctrine of the ancients, with respect to propagation, was, that all perfect animals were produced by *univocal generation*, that is, by the sole union, or copulation, of a male and female of the same species, or denomination; and that insects were produced by equivocal generation, without any seed, and merely of the corruption of the earth exalted, and, as it were, impregnated by the sun's rays; but this is wholly erroneous.

Some philosophers make a kind of intermediate generation, between equivocal and *univocal*, which they call *analogous* generation.

Univocal *action*. See Action.

Univocal *cause*. See Cause.

UNIVOCALS, called by the Greeks *synonyma*, are defined by Aristotle to be those things whose name is common, and also the reason corresponding to the name; that is, the definition of the idea affixed to it, the same.

Thus, under the name and definition of *animal*, man and brute are equally included; and circle and square, in the reason or definition of a *figure*.

Here, the word, as *figure*, they use to call *univocum univocans*, or *univocating univocal*; and the things included under the *univocal* name, as *circle* and *square*, *univoca univocata*, *univocated univocals*.

UNIVOCATION, in *Logics and Metaphysics*. The schoolmen have long disputed about the *univocation* of being, i. e. whether the general idea of *being* agree in the same manner, and in the same sense, to the substance, and the accident, to God, and the creature?

UNLACING, in *Sea Language*, the act of loosening and taking off the bonnet of a sail from its principal part.

UNLAWFUL, *illegal*, something prohibited by, or contrary to the terms of a law, either divine or human.

UNLAWFUL *assembly*, the meeting of three or more persons together, by force to commit some unlawful act; as, to assault any person, to enter his house, or land, &c. and thus abiding together, whether they attempt the execution or not. See REBELLIOUS *assembly*, RIOT, and ROUT.

By the stat. 16 Car II. if five persons, or more, shall be assembled together, above those of the family, at any conventicle or meeting, under colour of any exercise of religion, it is *unlawful*, and punishable by fines, and otherwise, as in that statute is provided. See CONVENTICLE.

UNLIKE *quantities* and *signs*, in *Algebra*. See LIKE *Signs and Quantities*.

UNLIMITED, or *indeterminate problem*, is such a one as is capable of infinite solutions. As, to divide a triangle given into two equal parts; to make a circle pass through two points assigned, &c. See DIOPHANTINE and INDETERMINATE.

UNLUTING, in *Chemistry*, the taking away of the LUTE, loam, or clay, wherewith a vessel was before closed, joined to another, or covered.

To UNMOOR, in *Sea Language*, is to reduce a ship to the state of riding by a single anchor and cable, after she has been moored or fastened by two or more cables.

UN POCO, in the *Italian Music*, is often put before the terms *allegro*, *adagio*, *presto*, *piano*, &c. where it shews that the movement, with their direction, is something less than it would otherwise have been, had this word been omitted. See POCO.

But if *piu* is put between *un poco*, and the above mentioned terms, then their usual signification is a little increased, as *un poco piu allegro* signifies a little more briskly than *allegro* alone requires. The contrary of this happens if, instead of *piu*, the word *men*, or *meno*, be used, as *un poco meno allegro*, i. e. a little less gaily than if *allegro* were alone.

UNQUES *prist*, *always ready*. See UNCORE *Prist*.

UNRECLAIMED *hawk*, one that is untamed.

UNREEVING *a rope*. See REEVING.

UNRIGGING *of a ship*, is the taking away of the standing and running rigging.

UNSEELING, in *Falconry*, a taking away of the thread that runs through the hawk's eye-lids, and hinders her sight. See HAWK.

Drawing the strings of the hood, to be in readiness to pull off, is called *unstriking the hood*.

UNSUMMED, a term used by falconers for a hawk's feathers before they have arrived at their full length.

VOARCHADUMIA, a kind of cabala, or ænigmatic art, relative to metals, which proposes the exaltation of gold by cementations, and other methods; among which, charms made of the Hebrew letters have their place.

VOCA, in *Ichthyology*, a name given by Gaza, and some other writers, to the fish called BOOPS by the generality of writers. It is a species of the spari, and is distinguished fom the rest by having four longitudinal parallel lines, of a bright yellow and white colour, resembling gold and silver on its sides.

VOCABULARY, VOCABULARIUM, formed of *vocabulum*, *word*, in *Grammar*, denotes the collection of the words of a language, with their significations; otherwise called a *dictionary*, *lexicon*, or *nomenclature*.

The *vocabulary* is, properly, a less kind of dictionary, which does not enter so minutely into the origins, and different acceptations of words. Though the Italian *vocabulary* of the academy de la Crusca seems to be an exception from this distinction, as being a copious and exact work, in three volumes folio, said to have been forty years in compiling. And the like holds of the *Vocabulario* Portuguez of F. Bluteau, in ten volumes folio; in the titles of both these books the word is used in a larger sense.

VOCAL, something that relates to the VOICE or SPEECH. Thus, *vocal prayer* is that spoken out, or delivered in words, in contradistinction to *mental prayer*.

In our ancient customs, VOCALIS is frequently used for *so called: post hæc Merganus de tribu Walensium, &c. alter nomine Madocus* vocalis *princeps eorum*. Matt. Paris.

VOCAL is sometimes also used substantively, in speaking of matters of election, to signify a person who has a right to vote. Thus the Romanists say, a man must have been a religious a certain number of years to be *vocal*.

VOCAL *music*, is music set to words, especially verses, and to be performed with the voice: in contradistinction to *instrumental music*, composed only for instruments, without singing.

Poetry then makes a necessary part of *vocal music*; and this appears to have been the chief, if not the only practice of the ancients, from the definitions which they give us of music.

Their *vocal music* seems to have had some advantage over ours, in that the Greek and Latin languages were better contrived to please the ear than the modern ones. In effect, Vossius taxes all the latter languages as unfit for music; and says, "We shall never have any good *vocal* "*music* till our poets learn to make verses on the model "of the ancients;" i. e. till the ancient metrical feet and quantities are restored.

But it is to be observed, that the rhythmus of their *vocal music* was only that of their poetry, and had no other forms and mutations than what the metrical art afforded.

Their changes were no other than from one kind of metrum or verse to another, as from iambic to choraic. See MEASURE and RHYTHMUS.

Their *vocal music*, then, consisted of verses set to musical tunes, and sung by one or more voices, in chorus, or alternately; sometimes with, and sometimes without the accompaniments of instruments.

As for instrumental music, in the manner we have defined it, it is not very clear that they ever had any. See SYNAULIA, &c.

VOCATION, *calling*, among *Divines*, the grace or favour which God does any one in calling him out of the way of death, and putting him into the way of salvation.

In this sense we say, the *vocation of the Jews*, the *vocation of the Gentiles*, &c. There are two kinds of *vocation*, the one *external*, the other *internal*. The first consists in a simple and naked proposing of objects to the will. The second is that which renders the first effectual, by disposing our faculties to receive those objects.

VOCATION is also used for a destination to any state, or profession. It is a rule that none are to enter the ecclesiastic or monastic state, without a particular *vocation* or call.

The Romanists hold the *vocation* of the reformed divines null and invalid. Among ourselves, some hold an uninterrupted succession necessary to the validity of the *vocation* of a priest.

VOCATIVE, in *Grammar*, the fifth case, or state of nouns.

When we name the person we are speaking to, or address ourselves to the thing we are speaking of, as if it were a person, the noun or name acquires a new relation, which the Latins and Greeks express by a new termination, called the *vocative*.

Thus, of *Dominus*, *Lord*, in the nominative, the Latins have made *Domine*, *O Lord*, in the *vocative*; of *Antonius*, *Antoni*, &c. But as this was a thing not absolutely necessary, and as the nominative case might very well serve on such occasions, this new case, or termination, was not universal: in the plural, for instance, it was the same with the nominative; and even in the singular, it was only practised in the second declension among the Latins; and in Greek, where it is the most common, it is frequently neglected, and the nominative used instead of it; as in that passage in the Greek Psalms, quoted by St. Paul, θρονος σου Θεος, thy throne, O God!

In English, and most of the modern tongues, this case is ordinarily expressed in nouns that have an article in the nominative, by suppressing that article; as, *the Lord is my hope.—Lord, thou art my hope!* though, on many occasions, we use an interjection.

VOCATORES, among the *Romans*, were servants whose business it was to call the guests, receive them, and assign every one a place according to his dignity.

VOCE *sola*, in the *Italian Music*, denotes a piece composed for a single voice, generally accompanied with a thorough bass on the harpsichord or organ, without other instruments. But if besides that it is to be accompanied by other instruments, they add, *con violini*, with violins; *due violini*, *e violoncello*, *e basso per l'organo*, i. e. with two violins, a bass violin, and a thorough bass on the organ; *con violini o stromenti*, i. e. with violins or instruments; *parti con*, *parti senza violini*, i. e. part with, part without violins, &c.

VOCIFERATIO, in our *Old Law Books*, the same with HUE *and cry*.

——*Qui furem plegi tum dimiserit, qui ei obviaverit, & gratis sine* vociferatione *dimiserit, &c*. Leg. Hen. I.

VOCONIAN *law*, in *Roman Antiquity*, a testamentary law prepared by Q. Voconius, tribune of the people, which prohibited every citizen from making any woman universal legatee, not excepting an only daughter, and enjoined a daughter's fortune, after her father's death, to be proportioned to his estate, according to the estimation of prudent men; and this proportion was usually one fourth of her father's estate; and, moreover, that

all the legacies of the testator should not exceed one half of his estate. This was intended as a supplement to the FURIAN law; the time of its passing is fixed by Cicero, de Senect. to the year of Rome 584, when Q. Marcius Philippus, and Cn. Servilius Cæpio, were consuls. It was revoked by Augustus in favour of Livia, to whom he was resolved to devise by will a great part of his estate. However though, by the abrogation of this law, married women were not restrained from receiving any legacies above a certain sum, yet Augustus bestowed on such women as had vowed perpetual virginity the same rewards and privileges as upon mothers.

VOICE, *vox*, a sound produced in the throat and mouth of an animal, by an apparatus of instruments for that purpose.

Voices are either *articulate*, or *inarticulate*.

VOICES, *articulate*, are those whereof several conspire together to form some assemblage, or little system of sounds. Such are the *voices* expressing the letters of an alphabet, numbers of which, joined together, form words.

VOICES, *inarticulate*, are such as are not organized, or assembled into words: such is the barking of dogs, the braying of asses, the hissing of serpents, the singing of birds, &c.

The formation of the *human voice*, with all the varieties thereof observed in speech, music, &c. makes a very curious article of enquiry; and the apparatus and organism of the parts ministering thereto, are something exceedingly surprising.

Those parts are, the TRACHEA, or wind-pipe, through which the air passes and repasses into the lungs; the LARYNX, which is a short cylindric canal, at the head of the trachea; and the GLOTTIS, which is a little oval cleft, or chink, left between two semicircular membranes, stretched horizontally withinside the larynx; which membranes, though capable of joining close together, do generally leave an interval, either greater or less, between them, called the *glottis*.

The long canal of the trachea, terminated at the top with the glottis, appears so like a flute, that the ancients made no doubt but the trachea contributed the same to the *voice*, as the body of the flute does to the sound of that instrument. Galen himself fell, in some measure, into the mistake: he perceived, indeed, that the principal organ of *voice* was the glottis; but he still allowed the trachea a considerable share in the production of sound.

Galen's opinion was followed by all the ancients after him, and even by all the moderns, before M. Dodart. But that author observes, that we do not either speak or sing, when we inspire, or take in the air, but only when we expire, or expel it; and that the air, coming out of the lungs, passes always out of the minuter vesicles of that part into larger; and at last into the trachea itself, which is the largest of all: that thus its passage becoming still more free and easy, and this more than ever in the trachea, it can never undergo such a violence, and acquire such a velocity in that canal, as is required to the production of sound; but that, as the aperture of the glottis is very small, in comparison with the width of the trachea, the air can never get out of the trachea by the glottis, without a vast compression, and augmentation of its velocity; and that, by this means, in passing, it communicates a brisk agitation to the minute parts of the two lips of the glottis, and gives them a kind of spring, and occasions them to make vibrations; which, communicated to the passing air, are what really occasion the sound.

This sound, thus formed, proceeds into the cavity of the mouth and nostrils, where it is reflected, and resounds; and on this resonance, M. Dodart shews, it is, that the agreeableness of the voice entirely depends. The different consistences, forms, &c. of the divers parts of the mouth, contribute to the resonance, each in their way; and from this mixture of so many different resonances in their due proportion, there results a harmony in the human *voice*, inimitable by any musician. Hence it is, that when any of these parts are disordered, e. gr. when the nose is stopped, the *voice* becomes displeasing.

This resonance in the cavity of the mouth does not seem to consist in a simple reflexion, such as that of a vault, &c. but in a resonance proportionate to the tones of the sound sent into the mouth from the glottis; and, accordingly, we find this cavity to lengthen and shorten itself, according to the depth, or acuteness, of the tone.

Now, for the trachea to effect this resonance, as it was the common opinion it did, it would be required, that the air, after its being modified, and turned into sound, by the glottis, instead of continuing its course from within outwards, should return from without inwards, and thus strike on the sides of the trachea; which can never happen, except in those who have a violent cough, and in ventriloquous persons. Indeed, in most river-fowl, which have a very strong *voice*, the trachea does resound; but the reason is, that in them the glottis is placed at the bottom of the trachea, and not at the top, as in men.

The canal, then, which at first passed for the principal organ of *voice*, is now found not to be so much as the secondary one, i. e. not that which occasions the resonance. It does not serve the glottis, as the body of the flute does its plug; but, instead of that, the mouth serves the glottis, as the body of some other wind-instrument not yet known in music. In effect, the office of the trachea is no other than that of the port-vent in an organ; viz. to furnish wind.

VOICE, *for the cause of the different tones of.* As the organs that form the *voice* make a kind of wind-instrument, one might expect to find some provision therein, answerable to that which produces the differences of tones in some other wind-instruments. The tone, therefore, must be attributed either to the mouth and nostrils, which occasion the resonance, or to the glottis, which produces the sound; and as all the different tones are produced in man by the same instrument, it follows, that the part which produces them must be capable of changes answerable thereto.

Now, for a grave tone, we know there is more air required than for an acute one. The trachea, therefore, to let this greater quantity pass, must dilate and shorten itself; by which shortening, the external canal, that is, the canal of the mouth and nose, reckoned from the glottis to the lips, or nostrils, is lengthened. For, the shortening of the internal canal, i. e. of the trachea, brings the larynx and glottis lower down; and, of consequence, makes its distance from the mouth, &c. greater; and there is a change in the length of each canal, for every change of tone and semitone. Accordingly, it is easy to observe, that the knot of the larynx alternately rises and falls in all quaverings, or shakings of the *voice*, how small soever the difference of tone may be.

Hence, as the depth of the tone of an hautboy is answerable to the length of the instrument; the longest fibres of the wood, whose vibrations make the resonance, making always the slowest vibrations, and consequently the deepest tone, it may appear probable, that the concavity of the mouth, by its lengthening for grave tones, and shortening for acute ones, might serve very well for the production of the divers tones; but M. Dodart observes, that in that stop of the organ called the *human voice*, the longest pipe is six inches; and yet, with all that length, it does not make any difference of tone; but the tone of the pipe is precisely that of the plug; whereas the concavity of the mouth of a man of the gravest *voice*, not being above six inches deep, it is evident that cannot modify, vary, and give the tone.

It is the glottis, then, that forms the tone, as well as the sound; and the manner of forming the various tones is by varying its aperture. A piece of mechanism too admirable not to be here particularly inquired into.

The human glottis, then, represented in *Tab. Nat. History*, *fig.* 18. is only capable of one proper motion; viz. that of an approach of its lips ADB, and ADB. Accordingly, the dotted lines AEB, AFB, AGB, exhibit three different degrees of approach. These different apertures of the glottis anatomists usually attribute to the action of the muscles of the larynx; but M. Dodart shews, from their position, direction, &c. that they have other uses; and that the opening and shutting of the glottis is effected by other means; viz. by two tendinous cords, or strings, inclosed in the two lips of that aperture.

In effect, each of the two semicircular membranes, whose interstice forms the glottis, is doubled back upon itself; and within each duplicature there is a cord, or string, which is fastened at one end to the fore-part of the larynx, and to the hind-part at the other. It is true, they appear more like ligaments than muscles, as consisting of white and membranous fibres, not of red and fleshy ones; but the vast number of minute changes in this aperture necessary to form the vast variety of tones, make an extraordinary kind of muscle, by whose contraction they should be effected, absolutely necessary. Common fleshy fibres, wherein the blood is received in large quantity, had been infinitely too coarse for such delicate motions.

These strings, which, in their state of relaxation, make each a little arch of an ellipsis, as they contract more and more, become longer, but less and less curve; and at last, with the greatest contraction they are capable of, they degenerate into two right lines, applied close to each other; so close, and so firm, that an atom of air cannot escape out of the lungs, how full soever they may be, and how great an effort soever all the muscles of the

lower

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lower venter may make against the diaphragm, and, by the diaphragm, against these two little muscles.

The different apertures of the lips of the glottis, then, produce all the different tones in the several parts of music; viz. *bass*, *tenor*, *counter-tenor*, *treble-bass*, and *treble*; and the manner is thus:

The *voice*, we have shewn, can only be formed by the glottis; but the tones of the *voice* are modifications of the *voice*; and these can only be produced by the modifications of the glottis. Now the glottis is only capable of one modification, which is the mutual approach, or recess, of its lips: it is this, therefore, that produces the different tones. Now that modification includes two circumstances; the first, and principal, is, that the lips are stretched more and more, from the lowest tone to the highest; the second is, that the more they are stretched, the nearer they approach.

From the first it follows, that their vibrations will be so much the quicker, as they come nearer their highest tone; and that the *voice* will be just, when the two lips are equally stretched; and false, when they are unequally; which agrees perfectly well with the nature of string-instruments.

From the second it follows, that the higher the tones are, the nearer will they approach to each other; which agrees perfectly well with wind-instruments governed by reeds or plugs.

The degrees of tension of the lips are the first and principal cause of tones; but their differences are insensible. The degrees of approach are only consequences of that tension; but their differences are more easily assigned.

To give a precise idea of the thing, therefore, we had best keep to that, and say, that this modification consists in a tension, from whence results a very numerous subdivision of a very small interval; which yet, small as it is, is capable, physically speaking, of being subdivided infinitely.

The doctrine is confirmed from the different apertures found in dissecting persons of different ages, of both sexes. The aperture is less, and the exterior canal always shallower, in the sex and ages fittest to sing treble. Add, that the reed of an hautboy, separated from the body of the instrument, being a little pressed between the lips, will yield a tone somewhat higher than its natural one; and if pressed still more, will yield another still higher; and thus an able musician may run successively through all the tones and semitones of an octave. They are different apertures, then, that produce, or, at least, that accompany, different tones, both in natural wind-instruments, and artificial ones; and the diminution of the aperture raises the tones both of the glottis, and the reed.

The reason why lessening the aperture heightens the tone, is, that the wind passes through it with the greater velocity; and from the same cause it is, that if any reed, or plug, of an instrument, be too weakly blown, its tone will be lower than ordinary.

Indeed, the contractions and dilatations of the glottis must be infinitely delicate: by an exact calculation of the ingenious author above mentioned, it appears, that, to perform all the tones and semitones of a common *voice*, which is computed to reach twelve tones; to perform all the particles and subdivisions of those tones into commas, and other minuter, though still sensible parts; to perform all the shakes, or the differences in a tone, when sounded more or less strong, without changing the tone; the little diameter of the glottis, which does not exceed one-tenth of an inch, but which varies within that extent at every change, must be actually divided into 9632 parts; which parts are yet very unequal, and therefore many of them much less than the $\frac{1}{963200}$th part of an inch. A delicacy scarce to be matched by any thing but a good ear, which has so just a sense of sound, as, naked, to perceive differences in all these tones; even those whose origin is much less than the 963200th part of an inch.

Voice, in *Grammar*, is a circumstance in verbs, whereby they come to be considered as either active, or passive, i. e. either as expressing an action impressed on another subject; as, *I beat*; or receiving it from another; as, *I am beaten*.

The Greeks have a third *voice*, called medial, because it has sometimes an active, and sometimes a passive signification.

Voice, in matters of election, denotes a *vote*, or *suffrage*. In this sense a man is said to have a *deliberative voice*, when he has a right to give his advice and opinion in a matter of debate, and his suffrage is taken: an *active voice*, when he gives his vote for the election of any one; and a *passive voice*, when the suffrages may fall on himself to be elected: an *excitative voice*, when he may act to procure another to be elected: a *consultative voice*, when he can only offer reasons and remonstrances, whereon the chief, or head, determines at his own discretion: such the cardinals have, with regard to the pope; and the masters in chancery, with regard to the lord chancellor, &c.

Voice, in *Oratory*, is one of the parts of PRONUNCIATION, upon the proper regulation of which much of the orator's success depends. For this purpose it will be right to observe, in general, what nature does, when free and unconstrained. As persons are differently affected when they speak, so they naturally alter the tone of their *voice*: it rises, sinks, and has various inflexions given it, according to the present state and disposition of the mind. When the mind is calm and sedate, the *voice* is moderate and even; when the former is dejected with sorrow, the latter is languid; and when that is inflamed by passion, this is raised and elevated. It is the orator's business, therefore, to follow nature, and to endeavour, that the tone of his *voice* appear natural and unaffected; and for this end, he must take care to suit it to the nature of the subject; but still so as to be always grave and decent.

The principal affections or properties of the *voice* may be referred either to *quantity* or *quality*. The quantity of the *voice* consists in its highness or lowness, swiftness or slowness, and the intermediate degrees between them. Every person who speaks in public should endeavour, if he can, to fill the place where he speaks; without exceeding the natural key of his *voice*; in which case it will be either harsh and rough, or too shrill and squeaking; nor will he be able to give every syllable its full and distinct sound, and to inflect it properly. He should also take care, that it does not sink too low, which will give him pain to raise it again to its proper pitch, and be no less offensive to the hearers. The last word of a sentence ought, in a particular manner, to be expressed distinctly, because the meaning of the whole sentence often depends upon it. The medium between these two is a moderate and even *voice*, which every person must regulate by the natural key of his own *voice*. But this equality of *voice* must be accompanied with a variety of inflexions and changes within the same pitch; and the gradations, whether higher or lower, must be gentle and regular; the *voice* moving from one key to another, so as rather to glide like a gentle stream, than pour down like a rapid torrent; and the degree of these inflexions and various tones of *voice* should differ according to the nature of the subject, and design of the speaker.

The next property of the *voice* is swiftness; and with regard to this care should be taken to avoid the two extremes of hurrying precipitately without pausing, which destroys not only the necessary distinction between sentence and sentence, but likewise between the several words of the same sentence; and of speaking so slowly, as to argue a heaviness in the speaker, and to render the discourse flat and lifeless.

In order to avoid both these extremes, the *voice* ought to be sedate and distinct; for which purpose it is necessary, not only that each word and syllable should have its full and just sound, both as to time and accent, but likewise that every sentence, and part of a sentence, should be separated by its proper pause and interval. See PAUSE.

Those properties of the *voice*, that respect its *qualities*, are chiefly strength or weakness, clearness or obscureness, fullness or smallness, smoothness or roughness. Temperance is a great preservation of the *voice* in all these respects, and all excess is highly prejudicial to it. A strong *voice* is very serviceable to the orator, because, if it wants some other advantages, he is however able to make himself heard; and if he is forced to strain it, he is less in danger of its failing him, before he has finished his discourse. But he who has a weak *voice* should be careful not to strain it, especially at first: he ought to begin low, and rise gradually to such a pitch, as the key of his *voice* will carry him, without being obliged to sink again afterwards. Frequent inflexions of the *voice* will likewise relieve him; and he should speak deliberately, and ease his *voice*, by allowing due time for respiration at all the proper pauses.

A *voice* is said to be clear, when the organs of speech are suited to give every single letter, and all the combinations of them in syllables and words, their proper and distinct sound. Such a *voice* is agreeable to the hearers, and advantageous to the speaker; as by speaking moderately, he may be distinctly heard, and thus be able to modulate his *voice* at pleasure.

An obscure and confused *voice* is sometimes owing to a deficiency in the organ, but often it is the effect of bad habit, acquired either by misplacing the accent, confounding the sound of the letters, or huddling the syllables one upon another, so as to render what is said unintelligible. When this confused *voice* arises from a natu-

ral defect, it may be remedied, as well as weakneſs of *voice*, in the manner purſued by Demoſthenes. See PRONUNCIATION.

But the moſt likely way of mending faults proceeding from bad habit, is to ſpeak deliberately.

A full *voice* is not the ſame as a ſtrong or a loud *voice*; it fills the ear, but it is often not pleaſant; and, therefore, to render it ſo, as well as audible, it ſhould be frequently varied. Thoſe who have the misfortune of a very ſmall *voice* ſhould be cautious of raiſing it to too high a pitch, eſpecially at once; becauſe the ſudden compreſſure of the organ is apt to occaſion a ſqueaking and very diſagreeable ſound. A ſoft and ſmooth *voice* is of all the moſt muſical, eſpecially if it be flexible; and, on the contrary, nothing is leſs harmonious than a *voice* that is harſh and rough.

Upon the whole, we may conclude, that *voice* to be the beſt or fitteſt for an orator, which is moderate, diſtinct, firm, clear, and ſmooth, and alſo eaſily flexible to the ſeveral degrees and variations of ſound, which every part of the diſcourſe may require. The different parts of a diſcourſe require correſponding modulations of the *voice*. The orator ſhould ſpeak low at firſt, becauſe this has the appearance of modeſty, engages attention, and is beſt for the *voice*. In the narration, the *voice* ought to be raiſed to ſomewhat a higher pitch. The propoſition, or ſubject of the diſcourſe, ſhould be delivered with a very clear and audible *voice*. The confirmation admits of great variety, both of the *voice* and geſtures: in reaſoning, the *voice* is quick and pungent, and ſhould be enforced with ſuitable actions; and in deſcriptions, whilſt the orator is pointing out the images of things, he ſhould ſo endeavour to adapt both his *voice*, and the motions of his body, particularly the turn of his eyes, and action of his hands, as may beſt help the imagination of his hearers. Where he introduces another perſon ſpeaking, or addreſſes an abſent perſon, it ſhould be with ſome degree of imitation; and in dialogue, the *voice* ſhould alter with the parts. When he diverts from his ſubject by any digreſſion, his *voice* ſhould be lively and cheerful; ſince that is rather deſigned for entertainment than inſtruction. In confutation, the arguments of the adverſe party ought firſt to be repeated in a plain and diſtinct manner, unleſs they appear unworthy of a ſerious anſwer; and then a facetious manner, both of expreſſion and geſture, may be the moſt proper way to confute them. In the concluſion, both the *voice* and geſture ſhould be briſk and ſprightly.

There are ſometimes certain words, which require an EMPHASIS and diſtinction of the *voice*: ſuch are often pronouns, as *this is the man*; and many words that denote the circumſtances and qualities of a thing, ſome of which heightening or magnifying the idea of the thing to which they are joined, elevate the *voice*, and others debaſing or leſſening it, depreſs the *voice*, or at leaſt protract the tone. Some tropes likewiſe, as metaphors, and verbal figures, which conſiſt in the repetition of a ſingle word, ſhould have a particular emphaſis.

In ſentences, regard ſhould be had to their length, and the number of their parts, in order to diſtinguiſh them by proper pauſes. The frame and ſtructure of the period ought likewiſe to be conſidered, that the *voice* may be ſo managed, as to give it the moſt muſical accent. Unleſs there be ſome ſpecial reaſon for the contrary, it ſhould end louder than it begins. In an antitheſis, one contrary muſt be louder than the other; in a climax, or gradation, the voice ſhould riſe with it.

As to the paſſions, it is evident that each of them requires a different *voice* and action. Love and eſteem are expreſſed in a ſmooth and cheerful tone; but anger and reſentment with a rough, harſh, and interrupted *voice*. Joy raiſes and dilates the *voice*; as ſorrow ſinks and contracts it. Fear occaſions a tremor and heſitation of the *voice*; and aſſurance gives it ſtrength and firmneſs. Admiration elevates the *voice*, and ſhould be expreſſed with pomp and magnificence; the expreſſion of it being often accompanied with an elevation both of the eyes and hands: on the contrary, contempt ſinks and protracts the *voice*.

All exclamations ſhould be violent. When we addreſs inanimate things, the *voice* ſhould be higher than when we addreſs animated beings; and appeals to heaven muſt be made in a loftier tone than thoſe to men.

After all, it is impoſſible to gain a juſt and decent pronunciation of *voice* and geſture merely from rules, without practice, and an imitation of the beſt examples. Ward's Orat. vol. ii. lect. 48. and lect. 50.

VOICE, *part of the*, in *Muſic*. See PART.

VOID *ſpace*, in *Phyſics*. See VACUUM, &c.

VOID, in *Common Law*. See ANNULLING.

VOID *baſtion*. See BASTION.

VOIDANCE, *vacancy*, in the *Canon Law*, a want of an incumbent upon a benefice. See VACANCY, &c.

This is twofold; either in law, *de jure*; as when one holds ſeveral benefices that are incompatible: or *de facto*, in deed; as when the incumbent is dead, or reſigns, or is actually deprived.

VOIDED, *vuidé*, in *Heraldry*, is underſtood of an ordinary whoſe inner or middle part is cut out, leaving nothing but its edges to ſhew its form; ſo that the field appears through it. Hence, it is needleſs to expreſs the colour, or metal, of the *voided* part; becauſe it muſt, of courſe, be that of the field.

The Croſs VOIDED differs from the croſs *fimbriated*, in that this latter does not ſhew the field through it, as the other does. And the ſame obtains in other ordinaries.

VOIDER, in *Heraldry*, one of the ordinaries, whoſe figure is much like that of the flaſque, or FLANCH; only that it doth not bend ſo much. See *Tab.* II. *Heraldry*, *fig.* 90.

This armoury, they ſay, is properly the reward of a gentlewoman that has well ſerved her prince. It is always borne by pairs.

VOIDING, *evacuating*, in *Medicine*. See EVACUATION.

In the Philoſophical Tranſactions we have an account of one Matt. Milford, who *voided* a worm by urine, ſuppoſed to have come from the kidneys.

Dr. Liſter mentions true caterpillars *voided* by a boy of nine years old. Mr. Jeſſop ſaw hexapods vomited up by a girl. Catharina Geilaria, who died in 1662, in the hoſpital of Altenburg, for twenty years *voided*, they ſay, by vomit and ſtool, toads and lizards. Ephem. German. tom. i. obſ. 103.

In the ſame Ephem. is alſo a ſtory of a kitten, bred in the ſtomach, and vomited up; and others of whelps, frogs, lacertæ aquaticæ, and other animals, bred and *voided* the like way. Bartholine gives us an inſtance of a worm bred in the brain, and *voided* by the noſe of O. W. See WORMS.

VOIR *dire*, in *Law*. When, upon a trial at law, it is prayed, that a witneſs may be ſworn upon a *voir dire*; the meaning is, that he ſhall, upon his oath, ſpeak or declare the truth, whether he ſhall get or loſe by the matter in controverſy. If he be unconcerned, his teſtimony is allowed, otherwiſe not.

VOL, among *Heralds*, ſignifies the two wings of a fowl joined together, borne in armoury; as being the whole that makes the flight. Accordingly, a *demi-vol* is a ſingle wing.

VOLA, the palm, or inſide of the hand, comprehended between the fingers and the wriſt.

VOLANS. See DRACO, and PISCIS.

VOLANT, in *Heraldry*, is when a bird, in a coat of arms, is drawn flying, or having its wings ſpread out.

VOLANT, *paſs*. See PASS-VOLANT.

VOLANT, *pont*. See PONT-VOLANT.

VOLATICA, in *Medicine*, a name given by authors to a ſort of wandering pain, attended with a tumor, and affecting, at different times, different parts of the body. It is by ſome accounted a ſpecies of the ſcurvy; by others, of the leproſy.

VOLATILE, in *Phyſics*, is commonly uſed to denote a mixt body, whoſe integral parts are eaſily diſſipated by fire, or heat; but it is more properly uſed for bodies whoſe elements, or firſt component parts, are eaſily ſeparated from each other, and diſperſed in air.

For, as any mixt body is ſaid to be *fixed*, in a double ſenſe; ſo may it be ſaid to be *volatile* two ways; whence the ſame body, e. gr. mercury, is both *volatile* and fixt at the ſame time.

Since, as its integral parts, or thoſe which ſtill retain the nature of mercury, are eaſily ſeparable by fire, and readily fly away, it is ſaid to be *volatile*; and yet, as it is very difficult to deſtroy its contexture, and reſolve it by fire, or any other menſtruum, into its firſt elements, it is ſaid to be *fixt*. The ſame may be ſaid of ſulphur, antimony, &c.

As thoſe bodies which by heat ſuffer no diminution of their weight are ſaid to be FIXED, ſo thoſe which do loſe of their weight are ſaid to be *volatile*; and they are ſaid to be more or leſs *volatile*, according as a greater or leſs degree of heat is requiſite for producing a ſeparation of their parts. Perhaps, indeed, every body is, rigorouſly ſpeaking, *volatile*; but as there are ſome, the volatility of which can be only rendered ſenſible by the action of a fire much more violent than any which we can produce, we conſider theſe bodies as being fixed, or not *volatile*.

Minerals, for the generality, are leſs *volatile* than vegetables; and vegetables are leſs ſo than animals.

The chemiſts diſtinguiſh between *volatile* ſalts and fixt ſalts. The capitals of aludels ſtop and collect the *volatile* parts of ſubſtances in ſublimation, and make what we call *flowers*.

"The particles of fluids which do not cohere very "ſtrongly together, and are of ſuch ſmallneſs as renders "them

"them most susceptible of those agitations which keep "liquors in a fluor, are easily rarefied into vapour; and, "in the language of the chemists, are *volatile*. Those "which are grosser, and by that means less susceptible "of alterations, or which cohere by a stronger heat, or, "perhaps, not without fermentation; these are what "the chemists call *fixt bodies*." Newton's Optics, p. 371.

VOLATILE, in *Chemistry*. When the fire decompounds any mixt body, the parts most disposed to receive a great motion are soonest loosened, and rise up in the order which the differences of that disposition give them; the rest remaining immoveable at the bottom of the vessel.

Those that rise first are called *volatile parts*: such are *phlegm*, *oil*, *spirits*, and *salts*, both urinous, and alkalious.

The parts remaining, viz. *earth*, and *lixivial salts*, are called *fixt*. For the making of fixt salts *volatile*, see *Fixed* SALTS.

VOLATILE *alkaly*. See ALKALY.

VOLATILE *salt of amber*. See AMBER.

Sal VOLATILE *oleosum*. See SAL.

VOLATILE *salts*. See SALTS.

It is the opinion of many of the greatest chemists, that our distinction of salts into fixed and *volatile* is far from just, because there are in nature no such things as fixed salts. Tartar is generally allowed to contain as much fixed salt as any thing, yet this substance, treated by fermentation, in Langelot's method, yields all in *volatile* salt that it would otherwise have yielded in fixed, and leaves scarce any fixed at all. The same process will have the same effect on the supposed fixed salts of most other substances; and upon this, and many other considerations, it appears highly probable, that our division of salts into fixed and *volatile* is unknown to nature; there not being to be formally found in any body, before calcination, any fixed salt; but salts are in themselves all *volatile*, though by the action of the fire they are apt to be colliquated among themselves, and blended with the earthy parts, and by that means rendered fixed.

The division of salts into acids and alkalies has much more reason for its foundation: these are differences which really exist in them, and by means of these all fermentations, and all motions in natural things, begin. Both these salts appear to be in their own nature *volatile*, and therefore easily resoluble by the supervening salt of the air.

It appears that all vegetables, especially the aromatic class, if they are any considerable time exposed to the air, lose their salts. The soundest wood, losing its salts in process of time, in the same manner moulders away.

These are proofs that the salts of these bodies are in themselves *volatile*, though they are all liable to be rendered fixed by the action of fire, by which means the acid and the alkali are blended together, and the mixture becomes fixed.

We are indebted to the pains of Dr. Cox for a method of procuring a *volatile* salt from plants, a thing of considerable use in medicine, though so much out of the common road of the chemical analyses, that it was not discovered till about a century ago, and soon after reduced to practice, in a regular manner, by that physician.

The method is this: a quantity of the leaves of any plant are to be carefully stripped from the stalks in summer, in dry weather; lay them in a heap, pressed hard together, and they will soon ferment and heat, and will be reduced to a pulpy substance. This is to be rolled into little balls, and put into a retort, and distilled; it will yield a thick liquor, of a strong smell, and a large quantity of a black oil, of a balsamic consistence. The liquor is to be separated from the oil, and distilled over again in a tall glass cucurbit; a *volatile* spirit arises; this is to be rectified two or three times more, and then is not to be distinguished from the spirit of hartshorn, urine, or other animal substances, by any trials. Phil. Trans. N° 101. p. 4.

All plants that have ever been tried in this manner, yield this *volatile* salt dissolved into the form of a spirit; and the very lowest class of plants, the mosses, and common grass, yield it as well as any other. And it is remarkable, that the vessels, in which these operations are performed, have afterwards a smell like musk, which all the cleansing in the world, and even the exposing of them to the air, does not well clean them of. The caput mortuum left in the vessels is much less in quantity than in the common distillations of a like quantity of the same plant; and if the plants have not been sufficiently fermented before the distillation, there remains, after the first rectification of the spirituous liquor, a sour water.

The *volatile* salt, thus obtained, is considerably more in quantity than the essential or the incinerated salt would have been in the common ways of preparing them; but those plants which yield most fixed salt always yield most *volatile* salt this way. And these volatile salts, when well rectified, do not differ from one another, though made from ever so different plants; but this is not wonderful, since the fixed salts also, and the vinous spirits of all plants, are alike, when reduced to the same degree of perfection and purity. The herb, as it ferments, affords its natural smell at first, very strongly; after that it yields a mixed smell, between its own natural scent and an urinous one; and at the end, when it is nearly ready for distillation, the smell becomes urinous. In this operation, the urinous spirit and salt come over chiefly toward the end of the distillation, and are seen in form of white clouds, issuing very fast out of the neck of the retort, and condensing on the sides of the receiver into little rivulets, or winding streams of water.

Sage, winter-savory, and some other of the aromatic plants, yield thin *volatile* salt, on the first distillation, in a dry form, coating over the inside of the receiver on the upper part, and clogging the neck of the retort; and saffron, in digestion with spirit of wine, has been found to yield its salt in the same dry form.

It is remarkable, that the very greatest heat of the fermentation of these plants does not prevent their being stored with a sort of maggots, which swarm in great numbers in those parts of the fermented mass, where the heat is so great, that a person cannot bear his hand in it.

It is to be considered, whether these animals may not afford the *volatile* salt attributed to the plants. The doctor does not seem to have considered this; but as they are said to be very numerous in the mass, it will be very necessary to try the effect of a distillation of some of this fermented matter, without these insects; which might be done by covering the whole from the access of flies; for though the doctor seems to think they are equivocally generated there, it is certain that they owe their origin entirely and only to the eggs of flies. The doctor seems to think that they will of themselves yield no *volatile* salt or spirit; but this is so different from the nature of animal bodies in general, that it may be this opinion was founded on too slight a trial. If the external air be excluded from plants, they will not ferment; and if they are put into a long-necked glass, and left open, they will, in a few weeks, become of a mucilaginous nature; and after standing a year in this manner, they will yield a large quantity of urinous salt or spirit, but not a drop of oil.

Some mosses, and other of the plants usually called imperfect, yield a *volatile* salt on distillation, without previous putrefaction; and some seeds, though in themselves insipid to the taste, have the same quality.

All these spirits and salts have the same properties and effects with the spirits of hartshorn and urine. They change syrup of violets, and many other vegetable tinctures, green. They are diaphoretic, diuretic, and deobstruent, and contrary in their nature to acids. They precipitate all metals dissolved in acids, by breaking the force of those acids; and when highly rectified, and mixed with spirit of wine as highly rectified, they make the offa alba of Helmont; like all other *volatile* alkali spirits, they unite with acids, and thereby become ammoniac or neutral salts. Phil. Trans. N° 101. p. 4, &c.

Chemical experiments abundantly prove that *volatile* salts are obtainable from all kinds of land animals, the amphibious and subterraneous tribes, birds, fish, and reptiles; from alkaline vegetables also without putrefaction, and from all other vegetables, after putrefaction; as also from soot, horns, hoofs, and all refuse animal and vegetable matters, such as the pith of horns, urine, the blood of slaughter-houses, &c. and these as pure and perfect as from hartshorn; and this affords a hint for the making of *volatile* alkalies and sal ammoniac cheap in England. Shaw's Lectures, p. 168.

The shootings of *volatile* salts are not limited, like those of the fixed and common salts, to any determinate figures, but, by various accidents, are thrown into a great variety of pleasing forms. Fanciful people have supposed the shootings of salt of hartshorn, in the tops of the vessels used in subliming it, to resemble the horns of the deers; and that of vipers, to assume the figure of little crawling serpents; but all this is imaginary, and the things from which the salts are obtained have no power to determine their forms, which are governed by more vague principles; such as the peculiar degree of heat, the temperature of the external air, and many other the like uncertain principles.

We have, in the Philosophical Transactions, an account of a whole forest of most elegant trees painted in perspective, in the head of a vessel, by these bodies. The substances

substances employed were sal ammoniac and pot-ashes; these were mixed in equal quantities, and put into a tall glass body, which being placed in sand, immediately on the approach of the heat, a large quantity of the salt was sublimed in flowers in the common way: this was a process from which nothing particular could be expected; but after some time the sublimed salt began to assume a regular form, and the head of the cucurbit, which was very large, was filled with the representations of trees so perfect and elegant, that a forest, delineated by the ablest hand, could scarce come up to it.

The figures, though externally numerous, yet were very regular, and all reducible to three kinds; the pine, the fir, and one other tree. These, though very exact and beautiful, could have no analogy with the substances out of which the salts were formed, the fir and pine kind yielding so little fixed salt, that they are never employed for this purpose, and the sal ammoniac belonging to no vegetable production at all. The same process repeated several times afterward, both with the same salts, and with others of the same nature, never arrived at this perfection; and the whole beauty of this was lost while the spectators were gazing on it, by the sublimation of more of the salt, which filled up all the interstices, and destroyed the figure. Phil. Trans. N° 105.

VOLATILISATION, or VOLATILIZATION, the act of rendering fixt bodies volatile, or resolving them, by fire, into a fine, subtile vapour, or spirit, which easily dissipates, and flies away.

All bodies, even the most fixt, as gold, may be *volatilized*, either of themselves, or with the admixture of some volatile substance, or spirit; by distillation, or sublimation.

In the Memoirs of the Royal Academy we have a discourse on the *volatilisation* of the fixt salts of plants, by M. Homberg. See *Fixed* SALTS.

VOLATILITY, in *Chemistry*, is a property that many bodies have of being reduced into light vapours, which exhale when they are exposed to the action of fire. This quality is opposed to FIXITY, and is owing to the greater or less dilatability which bodies have, when exposed to fire. See VOLATILE, SUBLIMATION, &c.

VOLCANO, in *Natural History*, a name given to burning mountains, or to vents for subterranean fires, that belch or vomit flame, ashes, cinders, stones, liquid sulphur, and other substances.

Europe affords five principal openings of this kind. Of these, the chief is Ætna, now Gibel, in the island of Sicily, a *volcano* famous in all histories. The eruptions of flame and smoke from this *volcano* are seen, by those that sail on the Mediterranean, at the distance of forty German miles from the shore of Sicily. Though fire and smoke are continually discharged from it, yet it rages at some times with peculiar violence. In 1536 it shook all Sicily; the noise proceeding from it resembled that of the firing of great guns, and many houses were overthrown throughout the whole island. After this storm had continued for eleven days, the ground opened in several places, and discharged fire and flame; which in four days consumed all that were within five leagues of Ætna. Then the funnel, on the top of the mountain, disgorged a great quantity of ashes, which were not only dispersed over the whole island, but also carried beyond sea to Italy, so that several ships that were sailing to Venice, at two hundred leagues distance, suffered damage. Mr. Oldenburg has given an historical account of the eruptions of mount Ætna, in Phil. Trans. N° xlviii. p. 967. See ERUPTION.

The last very great eruption from this mountain happened in 1669; of which the earl of Winchelsea, who was a spectator, says, that the inundation of fire, cinders, and burning stones, advanced into the sea six hundred yards, and a mile in breadth: it destroyed in forty days the habitations of twenty-seven thousand persons; and of twenty thousand persons, who inhabited Catania, three thousand only remained. He adds, that the fiery deluge in its progress met with a lake four miles in compass, and not only filled it up, though it was four fathoms deep, but raised it into a mountain.

Borelli has calculated, that the matter discharged at this eruption was sufficient to fill a space of 93,838,750 cubic paces. Sir William Hamilton, who visited this mountain in 1769, informs us, that the lava which ran from it, and on which there are as yet no signs of vegetation, is fourteen miles in length, and in many parts six in breadth, and that it reached Catania, and destroyed part of its walls, buried an amphitheatre, an aqueduct, and many other monuments of its ancient grandeur, and ran far into the sea, so as to form a safe harbour, which was soon after filled up by a fresh torrent of the same inflamed matter. There has been no such eruption since, though there are signs of many, more terrible, that preceded it.

From the highest point of Ætna, sir William counted forty-four mountains in the middle region on the Catanian side, and many others on the other side of the mountain, all of a conical form, and each having a crater, which, he says, have been evidently raised by explosion. He estimated the great crater of Ætna to be about two miles and a half in circumference. The last eruption of Ætna was in 1766.

The next to this is Vesuvius, near Naples. The first ERUPTION of this mountain recorded in history, is that which happened in the time of Vespasian, A. D. 79; on which occasion, says Dion Cassius, great quantities of ashes and sulphureous smoke were carried not only to Rome, but also beyond the Mediterranean, into Africa, and even to Egypt. Birds were suffocated in the air, and fell down dead upon the ground, and fishes perished in the neighbouring waters, which were made hot, and infected by it. Sir William Hamilton reckons, that the eruption in 1767 was the twenty-seventh from that in the time of Titus, since which there have been nine others; that of 1779 being peculiarly violent and alarming.

Bishop Berkeley has given a particular account of the eruption in 1717; for which, see Phil. Trans. N° 354. p. 708. or the Life of Berkeley, in the Biographia Britannica, by Dr. Kippis.

We have an account of mount Vesuvius, and of the eruption from it in 1737, by the prince of Cassano, in the Philosophical Transactions, N° 435. sect. 1, 2. The matter thrown out flowed like melted lead, and moved about half a mile in an hour, which was an unusual velocity. The trees, touched by this matter, immediately took fire, and fell. Glass in houses was melted into a paste.

The academy of sciences of Naples made an analysis of the matter thrown out in this eruption. From which it appears, that this matter contains iron; that it is spongy at top, and dense towards the bottom; and after growing hard, it retained part of its heat above a month. Damps were afterwards seen to arise in divers parts of the mountains. An ammoniacal salt, which gave an extraordinary coldness to water in dissolving, was also found here.

Sir William Hamilton has given an accurate and circumstantial description of the eruptions in 1766, 1767, and 1779. See Phil. Trans. vol. lvii. p. 192. vol. lviii. p. 1, &c. vol. lix. p. 18, &c. vol. lxx. part i. p. 42, &c. The usual symptoms of an approaching eruption are rumbling noises and explosions within the bowels of the *volcano*, a quantity of smoke forcibly issuing from its crater, accompanied at times with an emission of red-hot scoriæ and ashes, which gradually increase so as to exhibit in the night-time the most beautiful fire-works that can be imagined. When the eruption of 1779 began, the *volcano* was violently agitated; a white and sulphureous smoke issued continually and impetuously from its crater, forming clouds resembling bales of the whitest cotton. Such a mass of these was soon piled over the top of the *volcano* as exceeded the height and size of the mountain itself at least four times. In the midst of this white smoke, an immense quantity of stones, scoriæ, and ashes, were shot up to a height not less than two thousand feet; and a quantity of liquid lava was discharged, which ran with violence near four miles from the spot whence it issued. Minute ashes, of a reddish hue, were dispersed to a great distance, and darkened the air; these ashes were mixed with long filaments of a vitrified matter, like spun-glass; several birds in cages were suffocated by the sulphureous smoke; and the leaves of trees were covered with white salts very corrosive. In the progress of the eruption, after loud explosions, a fountain of liquid transparent fire began to rise, and gradually increasing, arrived at a height not less than three times that of Vesuvius itself, which rises perpendicularly near three thousand seven hundred feet above the level of the sea. Puffs of black smoke succeeded one another hastily, and accompanied the red-hot, transparent, and liquid lava, within which smoke sir William Hamilton perceived a bright, but pale, electrical fire, briskly playing about, in zig-zag lines. The liquid lava, mixed with stones and scoriæ, after having mounted at least ten thousand feet, in part perpendicularly, and joining that which issued from the crater, formed one complete body of fire, not less than two miles and a half in breadth, and of the extraordinary height above mentioned, casting a heat to the distance of at least six miles around it. The black cloud of smoke was charged in its course with electrical matter, which darted about it in strong and bright zig-zags, just like those described by Pliny the younger in his letter to Tacitus, and which accompanied the great eruption of Vesuvius that proved fatal to his uncle. This volcanic lightning, however, very rarely quitted the cloud, but usually returned to the

great

great column of fire, toward the centre of the *volcano*, from whence it originally came. The air, for some time after the eruption had ceased, continued in a considerable degree electrical. Whilst the eruption lasted, a mixed smell, like that of sulphur, with the vapours of an iron foundery, was sensible. The air, after one day's eruption, was filled at night for many hours with meteors, such as are vulgarly called falling stars, which shot generally in a horizontal direction, leaving behind them a luminous trace, which quickly disappeared. Many small volcanic stones and cinders were afterwards found to have fallen more than thirty miles from Vesuvius, and minute ashes fell in great abundance at the distance of a hundred miles. The number and size of the stones, or fragments of lava, which were thrown out of the *volcano* in this eruption, were incredible: the largest was in circumference no less than a hundred and eight feet, and seventeen feet high. It was a solid block, much vitrified. This was thrown at least a quarter of a mile clear of the *volcano*. For an account of these, and many other curious circumstances attending the eruption of 1779, illustrated by a figure, see Phil. Trans. vol. lxx. part i. art. 4.

The known qualities and effects of the noxious vapours, called in Italy *mofete*, that are usually set in motion by an eruption of the *volcano*, and that are then manifest in the wells and subterraneous parts of its neighbourhood, correspond with those attributed to fixed air. Id. vol. lxi. part i. p. 41.

Water has been also observed to be mixed with the ashes that are thrown up by the eruptions of *volcanos*.

Stromboli is another *volcano*, which exists in all its force, and it is in its form the most pyramidal of all the Lipari islands, which have been all formed by explosion. This *volcano* differs from Ætna and Vesuvius, by its continually emitting fire, and seldom any lava.

Hecla also, in Iceland, rages sometimes with as great violence as Ætna, and casts out great stones. The chimæra in Greece is likewise a *volcano*.

The *volcanos* of Asia are not less numerous than those in Europe; there are several in the mountains of Persia, and in the island of Ormuz. The pic of Adam, in the island of Ceylon, also burns at certain times; but the principal *volcanos* of that part of the world are in the Philippine and Molucca islands. Java and Sumatra also furnish some in the centre of their largest mountains. The island of Ternate affords also a *volcano* on the top of a mountain very difficult of access, but opening with a vast mouth, and very terrible when it burns.

The several violent eruptions of this mountain have given it, within the mouth or crater, the appearance of an amphitheatre, formed for holding people at the time of some public shew, several circles appearing in it one above another, found with a sort of regularity that is surprising.

In Japan there are very numerous instances of the use that mountains serve to on this occasion, many of the higher mountains of that island burning almost continually; and the little islands which lie scattered about in the same sea have also many of them spiracles of the same kind in the tops of the mountains, seen principally in the night, when the absence of the sun's rays gives their faint fire leave to appear.

Whatever may be the number of these *volcanos* in Asia, there is no part of the world that yields so many as America. In the kingdom of Chili alone there are fourteen very considerable *volcanos*, all placed in a regular order one by the other; and not a less number in Peru; these all burst forth from the summits of those vast mountains the Andes. In New Spain there are three very formidable for the fierceness of their burning.

Near Guatimala, in South America, are two mountains; the one called *volcano of fire*, the other of water. Out of the first, huge pieces of rocks are frequently hurled, with as much vehemence as balls out of a cannon; and a written letter may be read by the light of its flames at the distance of three miles. Out of the other vast quantities of water are continually thrown up.

The most extreme parts of the northern world are not free from these store-houses of fire. Authors tell us of no less than four of them in the most northern parts of Tartary; and we know that Greenland, and all the neighbouring country, have them. The *volcanos* of the Terra del Fuego are very well known, and it is indeed the general opinion, that farther north than we have yet penetrated, there may be very many undiscovered ones; and some authors have gone so far as to declare, that, were the cold no prevention, we should not be able to come much nearer than we do to the southern pole, for the number and fierceness of the burning mountains.

Africa also has its *volcanos*, in the kingdom of Fez, and other places.

There are also some *volcanos* which have left off burning, as that on the island of Queimoda, upon the coast of Brasil, near the mouth of Rio de la Plata; the mountains in Congo or Angola; those in the Azores, especially in Tercera and St. Michael, which formerly used to burn, but now only emit occasionally smoke and vapours. The islands of St. Helena and Ascension, Ischia, and the Lipari islands, in the Mediterranean sea; several of the Molucca islands in the Indian sea; several of the Azores and Antilles, &c. in the Atlantic ocean; Otaheite and Huaheine, &c. in the Southern ocean; all these, and many others, furnish a variety of volcanic appearances and remains.

Sir William Hamilton has lately given an account of certain traces of *volcanos* on the banks of the Rhine. Phil. Trans. vol. lxviii. part i. art. 1.

Ancient extinguished *volcanos* have, indeed, lately been discovered in the inland parts of most countries; and as *volcanos* now existing are generally placed in the neighbourhood of the sea, some have inferred from hence, that the sea at some remote period covered those countries. Submarine *volcanos* have often been observed even in our own times. The volcanic mountains, which are of different heights, generally form lofty spires, internally shaped like an inverted cone, placed on a broader basis. This cone is called the crater of the *volcano*, as the lava commonly passes through it, though it sometimes bursts from the sides, and even from the bottom of the mountain; sometimes the crater itself falls in, and is defaced; and sometimes in extinguished *volcanos* it is filled with water, and forms those lakes that are observed on the summit of some mountains.

The effects of *volcanos* in the course of many ages must be allowed to be very considerable; and hence some have taken occasion to account for the formation of mountains, islands, and even the immense continents in our present globe.

That many mountains owe their origin to *volcanos* is an unquestionable fact, confirmed by several observations recited by sir William Hamilton. The mountain called Montagno Novo, near Puzzoli, which is a hundred and fifty feet high, and three miles round, rose in one night out of the Lucrine lake, in 1538; and he says it is not more extraordinary, that Vesuvius itself should in many ages rise above two thousand feet. All the high grounds near Naples are formed in the same manner, as sir William could not discover, in any place, what could be called virgin earth; and if he were to establish a system, he says, it would be, that mountains are produced by *volcanos*, and not *volcanos* by mountains.

Dr. Hooke formerly had maintained, that all land was raised out of the sea by earthquakes; and modern philosophers seem to admit his hypothesis, though not, perhaps, in its utmost latitude. Von Troil (Letters on Iceland, p. 222.) is of opinion, that this island has been produced by *volcanos* in the course of several centuries. Dr. Forster, in his Observations made during a Voyage round the World, p. 151. after giving an ingenious conjecture concerning the origin of all the tropical low isles in the South Sea, assures us, that of the higher isles there is hardly one of them which has not strong vestiges of its having undergone some violent alteration by a *volcano*. Some of them have *volcanos* still subsisting; others, among which are Otaheite and Huaheine, seem to have been elevated, in remote ages, from the bottom of the sea by subterraneous fires. Sir William Hamilton is confident, that the island of Ischia, the whole basis of which is lava, rose out of the sea in the same manner as some of the Azores.

Mr. Whitehurst, in his Inquiry into the original State and Formation of the Earth, 4to. 1778, apprehends, that subterraneous fire must at different times have existed universally in the bowels of the earth, and that in union with water, or by the expansive power of steam, it has produced the immense continents, as well as the mountains of our globe, and also the universal deluge. When these fires were first kindled, by what sort of fuel they are still maintained, at what depths below the surface of the earth they are placed; whether they have a mutual communication; of what dimensions they consist, and how long they may continue, are questions which do not admit an easy decision. Some, with M. Buffon, have placed the seat of the fire of *volcanos* towards the centre, or near the summit of the mountains, which they suppose to furnish the matter emitted. But if this were the case, that part of the mountain which is situated above the supposed seat of the fire, must be destroyed or dissipated in a short time; whereas an eruption usually adds to the height and bulk of a *volcano*; and the matter discharged by it for many ages would be sufficient to form three such mountains as the simple cone or mountain of the existing *volcano*.

Mr. Gerhard computes, that Vesuvius has ejected from the year 79 to 1783, 309,658,161 cubic feet. Besides,

if the seat of the fire of the *volcano* did not lie far below the basis of the mountain, or general level of the country whence the mountain springs, the quantity of matter thrown up would soon leave so great a hollow under it, that the mountain itself must sink and disappear after a few eruptions. Others have, therefore, with greater probability supposed, that the earth, at a considerable distance below its surface, is surrounded with a stratum of ignited matter of a definite thickness; or that the whole central part of it is nothing but a mass of melted minerals, which every where struggling for vent, bursts forth where there is the least resistance, shivering into rude fragments the superincumbent crust of earth, and deluging with mountainous torrents of liquid fire the adjoining countries. And as iron makes from one-fifth to one-fourth of all these discharges, some have inferred, that the interior parts of the earth consist chiefly of this metal, its ores, or stones that contain it; conjecturing also, that their greater or less dephlogistication in different parts may be the cause of the variation of magnetic direction.

As for the cause of those subterraneous fires, that produce *volcanos*, Dr. Lister is of opinion, that they are owing to that inflammable mineral called PYRITES, a substance consisting of sulphur and iron, and found in great plenty in all those mountains where the *volcanos* are found to break out.

The quantities of sulphur continually sublimed in these mountains, in the same manner as the common sulphur is separated by artificial fire from the pyrites in Germany, seem to prove this; and what farther evinces it is, that the black or purple cinders thrown out of these *volcanos* in their most violent eruptions, and wholly differing from the calcined stones or pumice, will be attracted by the magnet, and shew that the whole is very much the same with that caput mortuum of the common pyrites, out of which we have extracted or burnt away the sulphur.

No subject in the whole mineral kingdom is so proper for the keeping up a fire for the many ages these mountains have been burning, as the pyrites. Nothing is so lasting a fuel, and, in general, other fuels become more or less lasting, as they partake more or less of its nature. Scotch coals have more of the bitumen in them, and less of the pyrites than others, and therefore they burn away quickly, and leave only white ashes, without any remains of the pyrites; and yet it is said, there are some coalieries on fire now in Scotland, which were on fire in the time of Agricola. The common Newcastle coal burns more slowly away, because it contains a far larger portion of the pyrites mixed with its bitumen, as is found by the sulphureous smell it yields in burning; and the Sunderland coal, which contains most of all of this mineral, burns with a more sulphureous smell indeed, but so slowly, that it is said proverbially to make three fires. This burns to a heavy reddish cinder, much resembling the caput mortuum of the pyrites, or the flags cast out of the burning mountains, and contains so much iron, that it is freely attracted by the magnet.

There is, in Ireland, a sort of coal more rich in the pyrites than all these, and seeming indeed to consist in great part of it. This, consequently, keeps up a much more durable fire than any of the others, and will remain twenty-four hours red-hot in the fire, without changing its shape. The rise of the breath or effluvia of these pyrites into the air, and their taking fire there, may, Dr. Lister apprehends, very naturally cause lightning and thunder there; and it is remarkable, that even the seemingly miraculous accounts of storms of throwing down iron-dust or iron-stones, instead of hail or rain, do not wholly discredit this system; for iron being one part of the constituent matter of the pyrites, it is possible it may have been raised in a vapour with it, and when the sulphureous part was fired and burnt away, it may have again concreted into a solid form, and in that form have fallen to the earth again. Phil. Trans. N° 157.

Mr. Lemery seems to have been the first person who illustrated, by actual experiment, the origin of subterraneous fires. He mixed twenty-five pounds of powdered sulphur with an equal weight of iron filings; and having made with water, a paste of the mixture, he put it into an iron pot, covered it with a cloth, and buried it a foot under ground. In about eight or nine hours time the earth swelled, became warm, and cracked; hot sulphureous vapours were perceived; a flame which dilated the cracks was observed; the superincumbent earth was covered with a yellow and black powder; and, in short, a subterraneous fire, producing a *volcano* in miniature, was spontaneously lighted up from the reciprocal actions of sulphur, iron, and water. See *Artificial* EARTHQUAKES.

The above experiment has been often repeated; and it has been observed, that large quantities of the materials are not requisite to make the experiment succeed, provided there be a due proportion of water: half a pound of steel filings, half a pound of flowers of brimstone, and fourteen ounces of water, will, when well mixed, acquire heat enough to make the mass take fire. But it was known long before the time of Lemery, that natural mixtures of sulphur and iron would spontaneously take fire. These substances, it is well known, are supplied by the pyrites; a small quantity of which is sufficient to kindle a fire; a proper portion of water (for too great a quantity would extinguish the subterraneous fire) may be derived either from fissures and channels communicating with the sea, or from sources in the earth, wherein it is known to abound; and air, if it should be thought absolutely necessary to the spontaneous firing of the pyrites, may be conceived either to accompany the water, or to descend into the innermost parts of the earth through the fissures which are found on its surface. Or, if we suppose the heated pyrites to have been in contact with black wad and petrol, the flame may arise, as it is produced by art, from the desiccation of that substance, and its mixture with the mineral oil. That ore when heated affords dephlogisticated air, of which a very small quantity is sufficient to produce flame; and the flame, when once produced, may be supported by dephlogisticated air from other ores, as Dr. Priestley has shewn (Obs. on Air, vol. iv. p. 210, &c.), and the phlogiston may be supplied by pyrites, bituminous shistus, bitumen, and coal. After the eruption in any place, the *volcanos* themselves serve for spiracles or air-holes, by which the subterranean fire may receive necessary supplies; so that these serve to keep the magazines of internal fire in a due state, as well as to discharge the smoke and other matters with which it would otherwise be choaked up and extinguished.

It was the opinion of bishop Berkeley, that a vacuum was made within the body of the earth by a vast body of inflammable matter taking fire, and that the water, by communication with the sea, rushed in, and was converted into steam. However this be, it is certain, that by the process above explained, a vapour would be produced, whose elastic force is known to be several times greater than that of gunpowder; and, therefore, if the superincumbent weight were not too great, it might cause earthquakes; and it would propel the matter melted by the subterraneous fire laterally toward the mouth of the *volcano*, where meeting with least resistance, it would expel it, together with all the unmelted stony masses which it found in its passage. It is easy to conceive, that before the dense matter is ejected, the dilated air of the *volcano* will be first forced out, and carry with it the ashes and loose stones adhering to the sides and crater of the *volcano*, in the manner observed and described by sir William Hamilton.

It is observed, that *volcanos* and ignivomous mountains, though some of the most terrible phenomena in nature, have their uses; being a kind of spiracles, or tunnels, whereby to vent the fire and vapour that would otherwise make a more dreadful havock, by convulsions and earthquakes. Accordingly, Dr. Woodward observes, there is scarce any country much annoyed with earthquakes, but has one of these fiery vents; which is constantly observed to be all in flames, whenever an earthquake happens; by which means it soon disgorges that fire, which, while it was underneath, was the cause of the disaster; and there are not wanting instances of countries that have been wholly freed from earthquakes, by the eruption of a new *volcano*.

Dr. Priestley (Obs. on Air, vol. i. p. 263.) thinks it not improbable, that the *volcanos*, with which there are evident traces of almost the whole surface of the earth having been overspread, may have been the origin of our atmosphere, as well as (according to the opinion of some) of all the solid land. The superfluous phlogiston of the air, in the state in which it issues from *volcanos*, may have been imbibed by the waters of the sea, which it is probable covered the surface of the earth, though part of it might have united with the acid vapour exhaled from the sea, and by this union have made a considerable and valuable addition to the common mass of air; and the remainder of this overcharge of phlogiston may have been imbibed by plants as soon as the earth was furnished with them.

The substances ejected by *volcanos* are phlogisticated, fixed, and inflammable air, water, ashes, pumice-stones, stones that have undergone no fusion, and lava. The water proceeds partly from that contained in the *volcano*, partly from the condensed vapours, and partly, perhaps, from the intimate union of the phlogiston and dephlogisticated air; an union which some late experiments shew to be productive of water in certain circumstances. From the stones, projected to great distances, may probably

bably be derived those solitary masses of granite, which are sometimes met with in lime-stone countries. Some have supposed that basaltes, and in many instances shoal, owe their origin both to fire and water; having been at first a lava; but this lava, while in a liquid state, being immersed in water, was so diffused or dissolved in it by the assistance of heat, as to crystallize when cold, or coalesce into regular forms. Basaltic mountains, common in Sweden, seem to owe their origin to submarine *volcanos*.

The immense masses of lava ejected by *volcanos* are many years in cooling, and many hundred years are required for their decomposition, which is quicker or slower, as they have been more or less perfectly melted. According to the observations of sir William Hamilton (Phil. Trans. vol. lxi. part i. p. 5, &c.) the lava of Vesuvius forms one or two feet of mould in a thousand years; this bed of mould being afterwards covered with fresh lava, and this, after mouldering by means of that of still later eruptions, affords some ground for calculating the age of the *volcano*, at least within certain limits.

The beds of lava are deepest and narrowest in the proximity of the crater, and broader and shallower as they are more distant, unless some valley intervenes; pumice-stone and ashes lie still more distant. From these observations extinguished *volcanos* are traced. Many excellent investigations of this sort may be seen in M. Soulavie's History of the South of France. See Watson's Chem. Eff. vol. i. eff. 5. Kirwan's Elem. of Mineral. p. 388, &c. Varenius's Geog. vol. i. p. 145, &c.

VOLCANOS *in the moon*. Mr. Herschel, now so well known and universally celebrated, on account of his various astronomical observations, has lately (viz. on the fourth of May, 1783) discovered a burning *volcano* in the moon. This discovery confirms the conjectures formed by M. Æpinus in 1778, and published in a memoir printed at Berlin in 1781, concerning the volcanic origin of the inequalities in the moon's surface. Similar ideas occurred to professor Beccaria of Turin, nearly at the same time, and also to professor Lichtenberg, of Gottingen. The nephew of professor Beccaria discovered, Oct. 11, 1772, a luminous spot on the moon, during its total eclipse of that night, in or near the place marked Copernicus; and from this time the professor mentioned this observation in his public lectures, as an evidence that the round cavities on the surface of the moon were so many craters of distinct *volcanos*; adding, that he considered those straight radiations, or bright paths, which are observed particularly on the place of the moon marked Tycho, as so many torrents of the lava, which spouted off in some former conflagration of a *volcano*.

The reader may see this account, given by the professor himself, in a letter concerning the luminous appearance observed by don Ulloa on the moon, during the total eclipse of the sun, June 24, 1778; in which he maintains, that such a luminous spot was an actual burning *volcano*, and not a real hole through the mass of the moon, as don Ulloa asserted it to be. This letter is inserted in the Journal de Physique for the month of June, 1781. M. Æpinus observes, that the opinion of *volcanos* in the moon was first suggested by Dr. Hooke, in his Micrographia, printed at London in 1665; in the twentieth chapter of which work he speaks at large concerning this opinion.

Mr. Herschel, on the thirteenth of May, 1783, discovered two small conical mountains in the very same spot where he had observed the *volcano*: these are situated in the Mons Porphyrites of Hevelius, just by a third mountain, much larger, which Mr. Herschel had often observed before. See Gent. Mag. for August, 1784, p. 563, &c.

VOLERY, a great bird-cage, so large that the birds have room to fly up and down in it.

VOLITION, the act of willing. See WILL.

VOLITIVE *thinking*. See THINKING.

VOLKAMERIA, in *Botany*, a genus of the *didynamia angiospermia* class. Its characters are these: it has an empalement of one leaf, indented at the brim in five parts; it has one ringent petal, whose cylindrical tube is twice the length of the empalement, spread open at the brim, which is cut into five equal segments; it has four long, slender stamina, terminated by single summits, and a four-cornered germen, supporting a slender style, crowned by a bifid stigma; the germen turns to a roundish capsule, with two cells, including one seed in each. Miller mentions only one, but Linnæus enumerates three species.

VOLLEY, a military salute, made by discharging a great number of fire-arms at the same time.

VOLO, in *Antiquity*, a name which the Romans gave the slaves, who, in the second Punic war, offered themselves to serve in the army, upon a want of a sufficient number of citizens.

The name *volo*, *volones*, they are said to have had from their offering themselves voluntarily. Festus says, it was after the battle of Cannæ that this happened. Macrobius, Sat. lib. i. cap. 2. places it before that battle. Capitolinus tells us, that Marcus Aurelius formed troops, or legions, of slaves, which he called *voluntarii*; and that the like forces, in the second Punic war, had been called *volones*. But, before M. Aurelius, Augustus had given the name *voluntarii* to forces which he had raised out of *liberti*, or freedmen; as we are assured by Macrobius, Sat. lib. i. cap. 2.

The *volones* were afterwards called EVOCATI.

VOLTA, in the *Italian Music*, shews that the part is to be repeated one, two, or more times, according to the numeral adjective joined with it: thus, *si replica una volta*, intimates to play that part once over again.

VOLTA is also a sort of dance of Italian origin, in which the man turns the woman several times, and then assists her to make a leap or jump. It is a species of GALLIARD.

VOLTE, in the *Manege*, signifies a round or circular motion, consisting of a gait of two treads, made by a horse going sideways round a centre; the two treads making parallel tracks, one by the fore-feet, larger; and the other by the hind-feet, smaller; the shoulder bearing outwards, and the croup approaching towards the centre.

VOLTE, *demi*, is a half-round of one tread, or two, made by the horse at one of the angles, or corners, of the *volte*, or at the end of the line of the passade; so as when he is near the end of this line, or near one of the corners of the *volte*, he changes hands, to return by a semicircle.

VOLTE, *renversed*, or *inverted*, is a track of two treads, which the horse makes with his head to the centre, and his croup out; going sideways upon a walk, trot, or gallop; and tracing out a larger circumference with his shoulders, and a smaller with his croup. See on this subject Berenger's Art of Horsemanship, vol. ii. p. 83, &c.

VOLTURNALIA, among the Romans, a festival kept in honour of the god Volturnus, on the sixth of the calends of September, or twenty-sixth of August.

VOLVA, among *Botanists*, a membranous matter surrounding the bases of many of the fungi; and in many of them, of very singular figure and structure.

VOLVA is also a word used by Scribonius Largus, and some other authors, to express the central part, or, as we call it, the core of the apple, in which the seeds are placed. He prescribes this in weaknesses of the stomach, and reachings to vomit.

VOLUBILIS, in *Botany*. See BINDWEED.

VOLUBLE *stalk*. See STALK.

VOLVENS *oculi*, in *Anatomy*, a name given by Spigelius, and some others, to one of the muscles of the eye, called by Cowper and Albinus, *obliquus inferior*.

VOLUME, *volumen*, a book, or writing, of a fit bulk to be bound by itself.

The word has its rise *à volvendo*, *rolling*, or *winding*; the ancient way of making up books being in rolls of bark, or parchment.

This manner lasted till Cicero's time, and long after paper was invented, and books written thereon. The several sheets were glewed, or pasted, end to end, written only on one side; and at the bottom a stick was fastened, called *umbilicus*; and at the other end a piece of parchment, whereon was the title of the book in letters of gold.

And yet, we are assured, king Attalus, or rather Eumenes, had, long before, done up some of his books in the square form; as having found the secret of parchment, which would bear writing on both sides.

The library of Ptolemy king of Egypt contained, according to Aulus Gellius, three hundred thousand *volumes*; and, according to Sabellicus, seven hundred thousand.

Raymund Lully wrote above four thousand *volumes*; whereof we have divers catalogues extant. It is held, that Trismegistus wrote six thousand five hundred twenty-five *volumes*; others say, thirty-six thousand five hundred twenty-nine: but it is much more rational to suppose, with La Croix, that it was the custom with the Egyptians to put all the books they composed under the name of *Trismegistus*.

At present, *volume* is chiefly used in the same sense with *tome*, for a part, or division, of a work, bound separately. In this sense we say, "The Councils are printed "at the Louvre, in thirty-seven *volumes*." See TOME.

VOLUME *of a body* is also used, among foreign philosophers, for its bulk, or the space inclosed within its superficies.

VOLUMUS, in *Law*, the first word of a clause in one species of the king's writs of protection, and letters patent.

VOLUNT, *voluntas*, in *Law*, is when a tenant holds lands, &c. at the will of the lessor, or lord of the manor.

VOLUNTARY, in the *Schools*. The generality of philosophers use *voluntary* in the same sense with SPONTANEOUS; and apply it to any thing arising from an internal principle, attended with a due knowledge thereof.

Aristotle, and his followers, restrain the term *voluntary* to those actions that proceed from an inward principle, which knows all the circumstances of the action.

There are two things, therefore, required to the *voluntariness* of an action: the first, that it proceeds from an inward principle; thus, walking for pleasure-sake, is a *voluntary* action; as arising from the will commanding, and the moving faculty obeying, which are both internal. On the contrary, the motion of a man dragged to prison is not *voluntary*.

The second, that the action be performed with a perfect intelligence of the end, and circumstances thereof: in which sense the actions of brutes, children, sleeping people, &c. are not properly *voluntary*.

Anatomists distinguish between the *voluntary* and natural or *involuntary* motions in the body. Of the latter kind are those of the heart, lungs, pulse, &c.

VOLUNTARY, in *Music*, a piece played by a musician extempore, according to his fancy. This is often used before he begins to set himself to play any particular composition, to try the instrument, and to lead him into the key of the piece he intends to perform. See RESEARCH.

In the Philosophical Transactions, N° 483. sect. 2. we have a method of writing down extempore *voluntaries*, or other pieces of music, as fast as any master can play them on the organ, or harpsichord; and that in a manner expressive of all the varieties those instruments are capable of. This is performed by a cylinder, turning equally upon its axis, under the keys of an organ, and by having points under the heads of the keys. Hence, when they are pressed down, they will make a scratch or mark on the cylinder, which may shew the duration of the note; and the situation of this mark on the cylinder will shew what note was touched. For farther particulars we refer the curious to the Transaction itself.

VOLUNTARY *agent*, *escape*, *homicide*, *novation*; see the substantives.

VOLUNTEERS, in the *Military Art*, persons who enter of their own accord to serve in the army. See LISTING.

VOLVOX, in the Linnæan system of *Natural History*, a genus of the order of *zoophytes*, in the class of *vermes*. Its characters are, that the body is smooth, gelatinous, roundish, without joints, and formed for a whirling or vertiginous motion. Its young are roundish, and lodged in small holes in different parts of the body. Of this genus, Linnæus enumerates four species. See BEROE, and GLOBE *animalcule*.

VOLUSPA, q. d. *the oracle of the prophetess*, in *Mythology*, a poem of about four hundred verses, forming part of the ancient EDDA.

VOLUTA, the *volute*, in *Natural History*, the name of a genus of shells, the characters of which are these: they are univalve shells, and have an oblong mouth, with a clavicle sometimes erect, sometimes depressed; and they are sometimes coronated at the top. See *Tab. of Shells*, N° 10.

In the Linnæan system, the *voluta* is a genus of the *testacea* order, in the class of *vermes*; the characters of which are, that its animal is a slug; that the shell is univalve and spiral, the aperture narrow, without a beak, and the columella, or pillar, plaited. Linnæus enumerates forty-six species, among which are the mitres, Persian crowns, cylinders, and other univalves, that have their pillar plaited or wrinkled; but he calls the *voluta* of other authors, *conus*.

In the arrangement of Mr. Da Costa, it is the twelfth family of *univalve* SHELLS.

This genus of shells is generally confounded by authors with that of the cylindri. There is indeed a general external resemblance between these two kinds of shells at first sight; but when they are a little examined, they will be found very different. The *volutæ* are of a conic figure. One of their extremities is of a pyramidal figure, and the other formed into high ribs, which constitute a depressed clavicle, or a dentated crown; on the contrary, the cylinder is nearly of an equal size at both ends; and it is not necessary to have recourse to the form of the mouth of this shell, in order to fix its generical character. Its figure, which is lengthened out into a point in the lower end, sufficiently characterizes this genus; and to this may be added another very remarkable character, which is, that the head is separated from the body of the shell by a high rib.

The most remarkable specific character in this genus is in the shape of the clavicle, some species having it very much elevated, and others very flat or depressed. The corona imperialis, which is a shell of this genus, is singular in the dentated crown, which terminates its head.

The *volutæ* make the most rich and beautiful shells of the whole body of sea productions. Rumphius calls them *eximiæ*; and the admiral and vice-admiral shells, so famous among the curious, and held at so great a price, are both of this genus. The brightness of the colours, the perfect white of the enamel, and the elegant shape of these shells, would make them the first in esteem among this class of bodies, even were they common; but it happens that their scarcity adds immensely to their value. There is one of these shells now in Holland, which cost the possessor five hundred florins. It is from the bands and fasciæ of these shells, which resemble the colours of ships, that they have obtained the names of admiral and vice-admiral.

Some of the Hollanders give to another shell of this kind the name of extra-admiral; this resembles the admiral, but has its colours arranged without divisions of the white enamel. It is a very scarce shell, but less beautiful than either of the two others.

The *cedo nulli* is so extremely rare and beautiful, that it is valued at the prodigious sum of a hundred guineas.

The family of the *volutæ* being numerous, the species may be aptly ranged under three general heads. 1. Those with an exerted clavicle. 2. Those with a depressed clavicle. And, 3. Those with a coronated clavicle. Hist. Nat. Eclair. p. 279.

VOLUTE, VOLUTA, in *Architecture*, a kind of spiral scroll, used in the Ionic and Composite capitals; whereof it makes the principal characteristic and ornament. See *Tab. Archit. fig.* 29. *fig.* 26. *fig.* 27.

Some call it the *ram's horn*, from its figure, which bears a near resemblance thereto.

Most architects suppose, that the ancients intended the *volute* to represent the bark or rind of a tree, laid under the abacus, and twisted thus at each extreme, where it is at liberty: others will have it a sort of pillow, or bolster, laid between the abacus and echinus, to prevent the latter being broken by the weight of the former, and the entablature over it; and, accordingly, they call it *pulvinus*. Others, after Vitruvius, will have it to represent the curls, or tresses, of a woman's hair.

The number of *volutes* in the Ionic order is four; in the Composite, eight.

There are also eight angular *volutes* in the Corinthian capital, accompanied with eight other smaller ones, called *helices*.

There are several diversities practised in the *volute*. In some, the list or edge, throughout all the circumvolutions, is in the same line or plane: such are the antique Ionic *volutes*, and those of Vignola. In others, the spires or circumvolutions fall back; in others, they project, or stand out. Again, in some, the circumvolutions are oval; in others, the canal of one circumvolution is detached from the list of another, by a vacuity or aperture. In others, the rind is parallel to the abacus, and springs out from behind the flower thereof. In others, it seems to spring out of the vase, from behind the ovum, and rises to the abacus, as in most of the fine Composite capitals.

The *volute* is a part of great importance to the beauty of the column. Hence, architects have invented divers ways of delineating it. The principal are that of Vitruvius, which was long lost, and at last restored by Goldman; and that of Palladio. Davi'ler prefers the former as the easier. The manner thereof is as follows:

Draw the cathetus F C (*Tab. Architecture, fig.* 29) whose length must be half a module, and from the point C describe the eye of the *volute* A E B D, of which the diameter is to be $3\frac{1}{4}$ minutes; divide it into four equal sectors by the diameters A B, D E: bisect the radii C A, C B, in 1 and 4; construct a square 1, 3, 3, 4, from the centre C to the angles 2, 3; draw the diagonals C 2, C 3, and divide the side of the square 1, 4, into six equal parts, at 5, 9, C, 12, 8; then through the points 5, 9, 12, 8, draw the lines 5, 6, 9, 10, 12, 11, 8, 7, parallel to the diameter E D, which will cut the diagonals in 6, 7, 10, 11; and the points 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, will be the centres of the *volute*. From the first centre 1, with the interval I F, describe the quadrant F G, from the second centre 2, with the interval 2 G, describe the quadrant G H, and, continuing the same operation from all the twelve centres, the contour of the *volute* will be completed.

The centres for deſcribing the fillet are found in this manner: conſtruct a triangle, of which the ſide A F (*fig.* 30), is equal to the part of the cathetus contained between A F, and the ſide F V equal to C 1; on the ſide A F, place the diſtance F S from F towards A, equal to F S, the breadth of the fillet, and through the point S draw the line S T, which will be to C 1 in the ſame proportion as A S is to A F; place this line on each ſide of the centre C, on the diameter of the eye A B; divide it into three equal parts; and through the points of diviſion, draw lines parallel to the diameter E D, which will cut the diagonals C 2, C 3, and you will have twelve new centres, from whence the interior contour of the fillet may be deſcribed, in the ſame manner as the exterior one was from the firſt centres.

Conſoles, modillions, and other ſorts of ornaments, have likewiſe their *volutes*, or ſcrolls.

Volute, *canal of the.* See Canal.

Volute, *eye of the.* See Eye.

VOLVULA, in *Natural Hiſtory*, the name of an extraneous foſſile body, nearly allied to the entrochus, being compoſed of the ſame ſubſtance, and being like that of a cylindric column, made up of ſeveral joints; the commiſſures of the joints are, however, much leſs viſible in the *volvulæ* than in the entrochi, and they are not ſtriated, as in the entrochus, from the centre to the circumference.

The *volvulæ* are of various figures; ſome reſemble in ſhape a little bottle, and are called *volvulæ utriculatæ*, and of theſe ſome have, and others have not, a ſtar marked on their bottom; others of them ſwell out in the middle, and taper a little toward each end; and theſe, from their reſemblance in ſhape to a little barrel, are called *dolioli*, or *volvulæ doliatæ*. There is great reaſon, from the analogy theſe bear to the entrochi, and other foſſils which owe their form to animal remains, to ſuppoſe theſe of the ſame origin; but we yet know not to what animal it is that they have belonged. Hill's Hiſt. Foſſ. p. 653.

VOLVULUS, in *Botany*, a name given by Daleſchamp, and ſome others, to the upright narrow-leaved or toad-flax-leaved bind-weed. See Convolvulus.

Volvulus, in *Medicine*, a name which ſome authors give to the iliac *paſſion*, by others called *chordapſus*; and by others, *miſerere mei.*

VOMER, in *Anatomy*, a Latin name, ſignifying, literally, a *ploughſhare*; uſed, by authors, to denote the eleventh, or, according to the numeration of others, the thirteenth bone of the upper jaw; by reaſon of the reſemblance it bears to that utenſil.

The *vomer*, or *vomer aratri*, is a thin bone, placed in the middle of the noſe, over the palate, and ſerving to part the two noſtrils from each other.

It is in figure nearly of an oblique ſquare. Anatomiſts divide it into the right and left ſide, both of which are unequally flat; and four edges, the ſuperior, inferior, anterior, and poſterior; the upper edge is an horizontal groove, which receives the ſharp proceſs or roſtrum of the os ſphenoides: this groove is broad, narrower in the fore-part, and ending in a ſtraight line, which divides the bone into two laminæ. The anterior edge is oblique, and very unequal; its poſterior part is ſmall and thin, and ſupports the perpendicular lamina of the os ethmoides; the anterior is larger, with a pretty deep groove, continued from the canal in the upper edge, which ſuſtains the cartilaginous ſeptum of the nares. The lower edge is likewiſe unequal; and near its anterior extremity is an angle, which divides it into two parts; one anterior, very ſhort, which is ſet in the criſta narium; the other poſterior, and much longer, ſet in the common groove of the oſſa maxillaria and palate. The angle by which this edge is divided lies in the notch formed by the criſta narium, and the groove of the maxillary bones. The poſterior edge is oblique and ſharp, becoming inſenſibly more obtuſe as it approaches to the larger groove in the edge. This bone has but very little diploe; it is connected with the os ſphenoides, os ethmoides, oſſa maxillaria, and oſſa palati; its uſe is to form the poſterior part of the ſeptum narium. Winſlow.

Vomer, in *Ichthyology*, a ſpecies of zeus, with a forked tail, and ſpine occumbent before the anal and dorſal fin. This is an American fiſh.

VOMICA, in *Natural Hiſtory*, a word uſed by the ancients to expreſs one of the blemiſhes to which cryſtals and the precious ſtones are ſubject. This is a duſky foulneſs lying deep in the ſtone, and giving a duſky colour and tinge to the whole. Both the luſtre and tranſparence of the ſtone are much hurt by this accident. When the *vomica* was of a bluiſh or blackiſh colour, the Romans expreſſed it by the word plumbago.

Vomica, in *Medicine*, a collection of pus in any part of the body. When this maſs, or collection, is in the lungs, it is called *vomica pulmonum.* When in the kidneys, *vomica renum*, &c.

Vomica *pulmonum*, in *Medicine*, the name of a diſeaſe which is a ſanious collection of matter, or an apoſtem formed in the lungs, and included in its own proper membrane; this ſometimes ſeizes one lobe, ſometimes the other; and ſometimes lies deep in the ſubſtance, ſometimes near the ſurface. It finally breaks, and then diſcovers itſelf by a diſcharge of purulent matter from the lungs. This differs from an empyema, which is a collection of pus in the cavity of the thorax.

The ſigns of this diſeaſe are at firſt very diſtinct; it generally begins from a hard node, which, by ſlow degrees, ripens into a collection of matter. A hectic fever is a conſtant attendant on it, and there is always a dry cough attending it; but this is not very violent. Toward the ripening of the matter, there is a difficulty of breathing, and often the patient complains of a dull heavy pain, ſometimes of a very acute one, in ſome particular part of the breaſt. The face is irregularly red, and a languor grows upon the whole body. The appetite is irregular, and finally a fever comes on; and during this the ſwelling breaks, and the matter is thrown up in ſuch large quantities as to endanger ſuffocation.

The moſt fatal diſeaſes are uſually the moſt rare, and this is of that number, ſeldom being met with, and when it is, too often fatal. The cauſes of it are, ſtagnations of the blood in plethoric habits, in the veſicles of the lungs; and theſe are uſually owing to the ſuppreſſion of natural habitual evacuations, or the omiſſion of artificial ones, as habitual bleedings and the like; to theſe are to be added, external injuries from falls, blows, or wounds of the breaſt; violent running till out of breath, and a ſudden cooling of the breaſt while the body is hot.

If the *vomica* be ſituated at the bottom of the affected lobe of the lungs, and in its internal part, i. e. nearly in the middle of the breaſt, ſome puffineſs or ſwelling may be perceived in ſome bodies, by gently preſſing the pit of their ſtomach; eſpecially when the patient coughs.

The uſual cauſes of the breaking of a *vomica*, when formed, are violent ſucceſſions of the body, loud ſpeaking or calling, violent coughing or ſneezing, and the falling of any ſubſtance in eating into the windpipe.

The breaking of it may be alſo promoted by making the patient receive continually, by his mouth, the vapour of warm water; and by ſwallowing a large quantity of the moſt emollient liquid, ſuch as barley-water, almond milk, light veal broth, or milk and water. Shaking and jolting in a carriage have alſo ſometimes effected a rupture.

Prognoſtics in it. The more ſlowly this diſeaſe advances to its height, the more difficultly it is diſcovered; and the deeper it lies in the ſubſtance of the lungs, the greater is the danger of it; though, when moſt ſuperficial, it is of no ſmall danger; for, breaking externally on the lungs, it diſcharges its matter into the cavity of the thorax, and thus makes an empyema, a diſtemper little leſs fatal than the other, unleſs the matter be immediately let out by the paracenteſis. When the matter has lain deep, there is great danger of the perſon's being ſuffocated either at the firſt diſcharge of it, or at the ſucceeding ones, if they are large, and he be already worn down by a hectic, as is uſually the caſe; and even if he eſcapes this, the apoſtem degenerates into an ulcer, and ſo brings on a phthiſis.

In general, the ſmaller the quantity of matter thrown up, the leſs is the danger. If the matter diſcharged be thick, and the cough and breathing become eaſier, there may be ſome hopes of a cure; the diet at this time ought to be light, but reſtorative, as chicken broths, ſago gruel, rice milk, &c. the drink, butter-milk, or whey ſweetened with honey. This is likewiſe a proper time for the Peruvian bark, as directed under the article phthiſis.

Many perſons afflicted with a *vomica* faint away at the inſtant when it breaks. In this caſe ſharp vinegar ſhould be applied to the noſe; and this ſmall aſſiſtance is generally ſufficient, when the burſting of it is not attended with ſuch appearances, as ſhew it to be mortal, in which caſe every application is inſignificant.

Method of cure. The ſame general medicines are to be uſed as in a phthiſis. The apoſtem is to be cleanſed and abſterged, which is done by pectorals mixed with diſcutients; ſuch are liquorice, hyſſop, and the ſeeds of carduus Mariæ. Then the ſolution of continuity is, if poſſible, to be repaired. This is to be attempted by balſamics, ſuch as comfrey, plantain, ground-ivy, and the like. The febrile heat is to be allayed by mixtures of nitre and diaphoretic antimony; and the violence of the

cough abated by the use of gentle opiates, such as storax pill, and the like, in small doses.

The bowels are to be kept open by clysters and gentle purges; revulsion is to be made by bleeding in the foot, and after this, the pectorals, &c. are to be relied on. And during the whole course a light diet, tranquillity of body and mind, and moderate exercise on horseback, are to be prescribed. Junker's Consp. Med. p. 173, seq. Buchan's Dom. Med. p. 199, &c. Tissot's Adv. p. 94, &c. See Consumption and Phthisis.

After the rupture and discharge of a *vomica*, Dr. Percival observes, that fixed air promises to be a powerful palliative. Antiseptic fumigations and vapours have been long employed and much extolled in cases of this kind. Percival's Eff. vol. ii. Priestley's Obs. on Air, vol. i. p. 301. See Ulcers.

Vomica, *nux*, *Vomic Nut*. See Nux *Vomica*.

VOMIT, *black*, a distemper frequent in the West Indies, particularly at Carthagena. The following account of this distemper was communicated by a friend.

The city of Carthagena is situated in 10° 25′ 48½″ of north latitude. The weather there is always sultry hot. A thermometer, constructed by Monsieur de Reaumur, gave, on the 19th of November, 1735, one of their winter months, the degree of the warmth of the air 1025 divisions and a half; and this, with little variation, both night and day. The greatest height to which the spirit ascended at Paris, the same year, by a thermometer, graduated in the same manner, was 1025½ divisions; so that the heat of the cool nights at Carthagena was nearly equal to that of the hottest days at Paris.

As the heats in this climate are so great without receiving any mitigation from the night, it is no wonder that the perspiration of the inhabitants is very great. From this it comes about, that all those who make their abode there any time appear pale and weakly, as though newly recovering from a fit of illness. You remark in all their actions, even so far as in their speaking, a certain idleness, and, as our author expresses himself, a disjointedness: notwithstanding this they are in good health, though their aspect indicates the contrary. The people who arrive there from Europe, hold their appearance of strength and colour in their countenances during three or four months; but after that time they lose both one and the other from the quantity of sweat, until they become like the former inhabitants. These effects are most observable in younger people: on the contrary, those who are farther advanced in life when they go thither, preserve their former appearance better, and enjoy so good a state of health, that they live commonly to more than eighty years of age.

As the temperament of this country is particular, so are some of its distempers. These may be considered of two kinds, viz. those distempers to which the Europeans newly arrived there are liable; and they only; and those which are common to all persons there, as well Criollos as Chapetones.

The distempers of the first class are many, as the resort of the Europeans there is very great. They are very dangerous, and often mortal. They frequently destroy a great part of the people, both sailors and others, who arrive there from Europe. The continuance of these distempers is very short: they last but three or four days, in which time the sick either die, or are out of danger. The particular distemper, to which they are most liable, is very little known, though it takes its rise in some from taking cold, in others from indigestion; but from whichsoever of these, or what other cause it takes its rise, it becomes in the short time before mentioned the *vomito prieto*, or *black vomit*, which is what kills them; it being very rare that those who have it escape. It is observed that in some their delirium is so violent, that they are obliged to be tied down in their beds, that they may not tear themselves to pieces, and they often die raving with the greatest degree of agony.

It is to be remarked, that those only are subject to this distemper who are lately arrived from Europe; the inhabitants of the country, as well as those who have lived there any time, are by no means liable to it, and enjoy perfect health during its greatest violence. As the crews of ships are very liable to this distemper, and more so than the officers and passengers, who have greater variety of food and liquor; it has been conceived that the great exercise and labour of these people, and their feeding upon salt provisions, prepare their constitutions to be liable in this climate to corruption of the blood and humours, from whence is supposed to proceed the *vomito prieto*. What must be observed is, that although the crews of ships suffer the greatest mortality, neverthelefs passengers and others, who go the voyage under the greatest advantages with regard to the conveniences of life, are not free from being exposed to it. It must be remarked also, that those persons, who after having been used to this climate, go from thence, and are absent even three or four years, are not liable to it at their return, but retain their health like the other inhabitants, although in their way of living they have not observed the most exact regimen.

The desire of knowing the cause of this terrible calamity has occupied from time to time the minds of the surgeons who make this voyage in the galleons, as well as those of the physicians of the country; and their opinion has been, that it chiefly takes it rise from the labour, to which the ships crews are constantly exposed, and their manner of living. There is no doubt but these may greatly contribute thereto; but then it will be difficult to conceive why persons, who are better circumstanced, are likewise liable to it: and it is somewhat extraordinary, that notwithstanding many endeavours have been made towards finding out remedies equal to this disease, none have been discovered either as specifics or preservatives; for the inconstancy of the symptoms is so great, that they are not in the beginning to be distinguished from those, which are in common to this with slighter distempers; but the principal complaints at first are a weariness and great disorder in the head.

This distemper does not always attack the ships of Europe at their arrival in the bay of Carthagena, nor is it very ancient in that country; for what they heretofore called *chapetonada*, so denominated, as those from Europe were only liable to it, were indigestions; and though they were in that climate always attended with danger, the women of the country, as they do now, cured them with ease, especially when they were taken in time. The ships afterwards going from Carthagena to Porto Bello, it was there succeeded by the great mortality, which was always attributed to the unseasonableness of the climate, and to the fatigue of the ship's crew in unloading their ships, and in the business of the fair there.

The *black vomit* was not known at Carthagena, nor in its neighbouthood, until the years 1729 and 30; when first it carried off a great part of the crews of the ships of war, which Don Domingo Justiniani then commanded, and were then there as guarda costas. These ships were first attacked at Santa Martha, where the severity of this distemper, and its great slaughter, had cast a great terror upon their crews. The second attack of this distemper was on board the galleons commanded by Don Manuel Lopez Pintado, when its mortality was highly formidable; and death followed the attack so quick, that persons who were one day seen walking at large, were next day met carrying to their graves.

Our author is of opinion that this, as well as some other distempers, to which Europeans are liable at, or soon after, their arrival at Carthagena, and other places under the same circumstances, should be considered as arising from the great alteration that happens in their constitutions there: and this change, which from the climate is soon brought about, makes them suffer this and other distempers, which either destroy them, or generate in them a disposition to bear the heats; after which, being as it were naturalised, they enjoy the same share of health with the natives.

Our author remarks, that at Carthagena, when the ships from Spain fail in their arrival, the European productions, which at all times are dear and much valued there, are sometimes quite expended. These more particularly are wine, oil, and raisins. When this is the case with regard to wine, the people there suffer much in their health; as all, except the negroes and those who use brandy, accustom themselves to drink it with their food. From the want of this their stomachs fail, they grow sick, and this sickness becomes general. This want of wine happened when our author arrived at Carthagena, and the sickness in consequence was so general in that city, that mass was celebrated only in one of their churches.

VOMITING, Vomitus, as a disease, a violent casting up, or evacuating by the mouth, what is contained in the stomach. See Evacuation.

This action has been generally allowed to be owing, principally, to the contraction of the fibres of the stomach, when irritated by the acrimonious quality, or oppressed with the quantity of its contents.

But M. Chirac, and after him M. du Verney, and others, set aside the fibres of the stomach, and advance, that *vomiting* is produced wholly by the extraordinary motions of the diaphragm, and muscles of the lower venter. So that the stomach is here supposed destitute of all action, and casts back its contents only by its being compressed and flatted, from some foreign and accidental causes.

However Boerhaave, and most of our latest writers, allow the stomach, the diaphragm, and the muscles of the abdomen

domen, all to have their ſhare in the action of *vomiting*; accordingly, that diligent author makes *vomiting* to conſiſt in a convulſive and retrograde motion of the muſcular fibres of the gullet, ſtomach, and inteſtines, as well as thoſe of the abdomen, and the ſeptum tranſverſum; which, when in a leſs degree, produce a nauſea, and, in a greater, a *vomiting*.

By the contraction of ſo many parts, the ſtomach comes to be ſqueezed, as in a preſs, whence it is obliged to give up what is contained in its cavity, and the neighbouring parts, juſt as water is forced out from a bladder, or ſponge, when ſqueezed between the hands.

The evacuation, too, muſt be upwards, rather than downwards, by reaſon the paſſage is more open and eaſy that way; and that the inteſtines are preſſed by the diaphragm and the muſcles of the lower venter.

The primary cauſes of *vomiting* are commonly the too great quantity, or too much acrimony, of the contents, foulneſs of the ſtomach, a tranſlation of the morbific matter of ulcers, the gout, the eryſipelas, or other diſeaſes to the ſtomach; a looſeneſs ſuddenly ſtopped; the ſtoppage of any cuſtomary evacuation, as the bleeding piles, menſes, &c. a weakneſs of the ſtomach, the colic, the iliac paſſion, a rupture, a fit of the gravel, worms, &c. It ariſes alſo from poiſons, contuſions, compreſſions, inflammations, and wounds in the brain; inflammations of the diaphragm, ſtomach, inteſtines, ſpleen, liver, kidneys, pancreas, and meſentery; unuſual agitations in coaches, at ſea, &c.

It may be likewiſe excited by violent paſſions: ſometimes it proceeds from a regurgitation of the bile into the ſtomach, in which caſe the matter diſcharged is generally of a yellow or greeniſh colour, and has a bitter taſte.

Perſons who are ſubject to nervous affections are often ſuddenly ſeized with violent fits of *vomiting*; and, moreover, *vomiting* is a common ſymptom of pregnancy, in which caſe it generally comes on about two weeks after the ſtoppage of the menſes, and continues during the firſt three or four months.

The treatment of *vomiting*, as a diſeaſe, muſt therefore be alſo various, according to the different cauſes producing it.

Critical *vomitings*, by which humours of various kinds are diſcharged by the operation of nature alone, are ſalutary, and ſcarce require any care as to their cure; but are, in many caſes, to be promoted; whereas, ſymptomatical *vomitings*, which are leſs ſufficient, or leſs accommodated to the removing of the cauſe, are more carefully to be treated, in order to their cure.

The two principal curative indications to be obſerved are, firſt, to quiet and compoſe the convulſive and unruly motion of the ſtomach, and ſecondly, to oppoſe and ſubdue the material cauſes of the diſorder.

The firſt intention is anſwered by corroborating and antiſpaſmodic medicines, ſuch as ſaffron and caſtor, with the teſtaceous powders, as coral, crab's-claws, and oyſter-ſhells; powders compoſed of cinnamon, the leaves of mint, nutmeg, orange-peel, calamus aromaticus, and other ſuch ſimples, are alſo of great ſervice. And if anodynes are found neceſſary, the ſtorax pill, or Sydenham's laudanum, are to be given.

While theſe medicines are taken internally, there may alſo be applied outwardly, to the region of the ſtomach, ſuch things as have power to repreſs its diſorderly motions; of this kind are the oil of mint, nutmeg, and the like, with balſam of Peru: theſe oils may be reduced to a proper conſiſtence with this balſam, for ſpreading on leather, and lying on for ſome time. Hungary-water, and other the like ſpirits, are of great uſe alſo, rubbed on with the hand; and to theſe may be added yeaſt, and the ſtrongeſt wine-vinegar applied hot to the part. Finally, an excellent application is balſam of Peru alone, reduced to the conſiſtence of a cataplaſm, with crumb of bread.

The methods to be uſed to remove the material cauſes of the *vomiting*, are next to be conſidered: if it be of the pituitous kind, and owing to crudities in the primæ viæ, and a viſcid mucus ſticking to them, it is beſt cured by an emetic: if the *vomiting* of itſelf be found not ſufficient to carry off the ſordes which occaſioned it, and the patient continues, after the fits of *vomiting*, afflicted with a nauſea and heart-burn; in this caſe a large quantity of warm water, or thin gruel, with a little butter, may ſerve the purpoſe; or if this be found inſufficient, a doſe of ipecacuanha is to be given, and worked off with weak chamomile tea.

When infants are afflicted with *vomiting*, from milk coagulated upon their tender ſtomachs, which is a very frequent caſe, the beſt medicine is a mixture of oxymel of ſquills, and ſyrup of rhubarb. See Infant.

In caſes of bilious *vomitings*, which ariſe from a weakened digeſtion, and have their fomes in the duodenum, the cure is to be begun with the abſorbent and teſtaceous powders; after theſe gentle purges of rhubarb and manna are to be given; and finally, the cure is to be perfected by reſtoring the ſtrength of the ſtomach and inteſtines.

In *vomitings* which ariſe from an acrid matter adhering to the nerves of the ſtomach, from the retropulſion of the gout, an eryſipelas, or other ſuch diſorder, the mild ſedatives are to be given, and with them ſuch medicines as promote the expulſion of the matter; and all means are to be uſed to remove it to the ſurface of the ſkin, or to the extremities again. All ſweating medicines are good in this intention, as they carry the matter to the ſurface. Camphor taken internally, in moderate doſes, is alſo of great ſervice; and warm baths for the feet often prove highly uſeful. Bleeding, purging, opening iſſues, ſetons, perpetual bliſters, &c. are of ſervice.

In *vomitings* excited by poiſonous ſubſtances, nothing gives ſuch immediate relief as the taking of large quantities of warm milk, and pinguious liquors; for, by means of theſe, the ſpicula of the poiſon are blunted, and afterwards *vomited* up with the liquors. And hence, in contagious and peſtilential caſes, where there is no inflammation of the ſtomach, many phyſicians have very ſucceſsfully given *vomits* of ipecacuanha, and after theſe acid liquors with diaphoretics.

Acrid, acid, and bilious ſordes, falling upon the inteſtines, often occaſion a *vomiting*, attended with colic pains; in this caſe ſmall doſes of oil of ſweet almonds and manna, with large draughts of barley-water between the doſes, are found of great ſervice; and ſmall doſes of laudanum, at proper times, ſerve to complete the cure. In perſons of hot habits, ſpirit of vitriol, and mild laxatives, are found of moſt certain relief.

A *vomiting* which proceeds from acidities in the ſtomach is relieved by alkaline purges; the beſt medicine of the kind is magneſia alba, a tea-ſpoonful of which may be taken in a diſh of tea, or a little milk, three or four times a day, or oftener, if neceſſary, to keep the body open.

If *vomiting* proceeds from weakneſs of the ſtomach, bitters will be of ſervice. Peruvian bark, infuſed in wine or brandy, with as much rhubarb as will keep the body gently open, is an excellent medicine in this caſe. The elixir of vitriol alſo is a good medicine, and may be taken in the doſe of fifteen or twenty drops, twice or thrice a day, in a glaſs of wine or water.

If *vomiting* ariſes from violent paſſions, or affections of the mind, all evacuants, and eſpecially vomits, muſt be carefully avoided. The patient ſhould be kept eaſy and quiet, have his mind ſoothed, and take ſome gentle cordial, as negus, or a little brandy and water, to which a few drops of laudanum may be occaſionally added.

When *vomiting* proceeds from ſpaſmodic affections of the ſtomach, muſk, caſtor, and other antiſpaſmodic medicines are of uſe. Aromatic plaſters have likewiſe a good effect. The ſtomach plaſter of the London or Edinburgh Diſpenſatory may be applied to the pit of the ſtomach, or a plaſter of theriaca, which will anſwer better. Aromatic medicines may likewiſe be taken inwardly, as cinnamon or mint tea, wine with ſpices boiled in it, &c. The region of the ſtomach may be rubbed with æther, or ſtrong brandy, or other ſpirits. The belly ſhould be fomented with warm water, or the patient immerſed to the breaſt in a warm bath.

The too frequent method of attempting to ſtop a *vomiting* by aſtringents and anodynes, before the peccant matter is removed, is highly blameable; for when the ſpaſmodic motions are allayed, which nature uſed to free herſelf from this matter, and that yet remains behind, there muſt follow worſe ſymptoms. Theſe remedies, which affect the motion only, and not the matter, are only to be uſed when the motion ſubſiſts after the matter is diſcharged, or when the motion is very violent, and the matter to be thrown off but very ſmall in quantity.

Hence, in *vomitings* excited by the chin-cough in children, ſedatives and anodynes are very proper, ſuch as the ſyrup of red poppies, or diacodium, and a little oil of ſweet almonds.

The *vomitings* of pregnant women, ariſing from a regurgitation of the blood to the ſtomach, which is alſo obſerved in women afflicted with a retention of the menſes, and in men who have a ſtoppage of habitual hæmorrhoidal diſcharges, are beſt removed by temperating medicines, mild laxatives, emollient clyſters; and beſt of all by bleeding, or recalling the natural ſecretions of blood, in the two latter caſes. On ſuch occaſions it is highly improper to give emetics, for they ſometimes bring on a *vomiting* of blood, and ſometimes an inflammation of the ſtomach.

The immoderate and long continued *vomitings* of pregnant women, which principally happen in the firſt

months of the time, especially in those who indulge themselves too much in venery, and are plethoric, are by no means to be cured by astringents, opiates, or spirituous medicines; but are to be removed by repeated bleedings, in small quantities, sometimes in the ankle, keeping the body gently open by mild purgatives, as stewed prunes, manna, or sena, rest of the body, and tranquillity of the mind. They should neither allow their stomachs to be quite empty, nor eat much at once. And when *vomiting* of this kind is so violent as to threaten abortion, it is often stopped more effectually by the drinking of cold water than by any medicine whatsoever. If the stomach is weak, a little brandy may be added to it. When an analeptic is necessary, one spoonful of cinnamon-water, with a little marmalade of quinces or oranges, taken after meals, is sufficient.

In cases of efforts to *vomit*, or actual *vomitings*, in the morning, which frequently happen to those who use too much strong liquors over night, the testaceous powders are to be given, and all other things which will absorb acidities, and, after these, the grateful stomachics, such as candied orange-peel, and the like.

Chronical *vomitings* sometimes affect persons who have been in a long continued state of grief; in this case the best relief is found in analeptics, and the use of cinnamon-water, impregnated with quinces, and the generous wines.

In *vomitings*, which are a symptom of fevers coming on, the use of a gentle emetic, such as the ipecacuanha, is very proper. In the small-pox, the *vomiting* usually ceases spontaneously after the eruption of the pustules, and in these and many other cases, great relief is to be obtained in *vomitings*, by a mixture of salt of wormwood and juice of lemons.

In *vomitings* arising from fits of the stone, the spiritus nitri dulcis often proves of great service; and oily clysters, and oil of sweet almonds, taken internally, are also of great service.

The *vomiting* of persons in hernias, or the iliaca passio, rarely remits till the cause ceases. Rest, and lying in bed, contribute greatly to the stopping of immoderate *vomitings*, for all motion of the body excites, in these cases, a fresh tendency to *vomiting*. In the beginning of erysipelases, and the like disorders, *vomitings* often happen, and these are by no means to be checked; but the appearance of the disease externally is to be forwarded by diaphoretics; for, as soon as the eruptions appear, the *vomiting* stops of itself.

The obstinate *vomitings* of hysterical patients are not to be stopped by opiates or astringents; for the consequence of this is usually violent convulsions in the limbs, and anxieties and pain in the præcordia; all which symptoms disappear again as soon as the *vomiting* returns.

Dr. Buchan observes, that the saline draughts, taken in the act of effervescence, are of singular use in stopping a *vomiting*, whatever be the cause from which it proceeds. These may be prepared by dissolving a dram of the salt of tartar in an ounce and a half of fresh lemon-juice, and adding to it an ounce of pepper-mint water, the same quantity of simple cinnamon-water, and a little white sugar. This draught must be swallowed before the effervescence be quite over, and may be repeated every two hours, or oftener, if the *vomiting* be violent. After the *vomiting* has stopped, the patient must avoid all manner of action; the diet must be such as will sit easy on the stomach. Hoffman, Op. tom. iii. Buchan's Dom. Med. p. 343, &c.

Dr. Percival relieved a patient who had very severe convulsive reachings, after various remedies had been administered without effect, by means of fixed air. Being indulged, at her earnest desire, with half a pint of Burton beer in brisk effervescence, the *vomitings* ceased immediately, and returned no more. To the fixed air, with which fermenting liquors are known to abound, and to the cordial quality of the beer, the favourable effect produced by it may be justly ascribed. Percival's Ess. vol. ii. Priestley's Obs. on Air. vol. i. p. 314.

VOMITINGS *in infants*. See INFANT.

VOMITING *of blood*, *vomitus cruentus*, a very dangerous kind of hæmorrhage, consisting in bringing up, by *vomit*, of pure and unmixed blood from the stomach, and being a method used by nature to throw off a portion of the blood, which molests the whole in the vena porta, and, by that means, facilitate the circulation of the rest of the mass.

This distemper sometimes arises from internal causes, and is regularly periodical, observing the stated times of the eruptions of the menses, or other natural discharges; sometimes it arises from accidents, such as the giving of violent purging or emetic medicines, or corrosive ones.

Preceding signs of it. Among these are to be reckoned a sensation of straitness and anxiety in the præcordia, with tension, and involuntary sighs, with a nausea or sickness of the stomach, and a straining to vomit, which is more violent than in vomiting on any other occasion; after this the blood is thrown up pure, and the *vomiting* then ceases, till after a sensation of more blood being collected in the stomach, the efforts to discharge it in the same manner are again renewed. The quicker the blood is thrown up, after its being discharged into the stomach, the more fluid and more florid it appears; the longer it is detained there, the blacker and thicker it appears.

Persons most subject to it. A *vomiting* of blood is but an uncommon disorder: it more frequently attacks women than men; among the female sex it is principally seen in those whom the menses have left too early in life, or who have had violent suppressions of them for a long time. In men, this distemper seldom seizes any but those who had been used to periodical discharges from the hæmorrhoidal vessels, and who have had them suddenly stopped; and they are then usually first attacked with violent pains in the left hypochondrium. It is often the effect of obstructions in the liver, the spleen, or some of the other viscera. People of scorbutic habits, and such as have had quartan agues of long standing, have been sometimes thus affected. And, beside these natural causes, people of all ages and sexes may vomit blood, from external injuries.

Prognostics from it. A *vomiting* of blood is ever a dangerous disorder, for though the quantity of blood thrown up is seldom so great as to occasion immediate death, yet it generally degenerates into a tabes in men, and into a cachectic habit in women. The extravasated blood lodges in the bowels, and, becoming putrid, occasions a dysentery, or putrid fever. It is less dangerous to young women than to any other persons; and when it is periodical, especially when it observes the times of the menstrual discharges, is much less dangerous than under any other circumstances.

Method of cure. During the paroxysm the proper medicines are powders of nitre, cinnabar, and the absorbent substances, such as crabs-eyes, or the like; drinking cold water has sometimes proved a remedy, but it will succeed better when sharpened with the spirits of vitriol; and afterwards bleeding, when there are signs of inflammation; cupping, emollient clysters, and gentle purges, and diaphoretics, are to be given for some time. Opiates may be of use, provided they are given in small doses, as four or five drops of liquid laudanum twice or thrice a day. The food and drink must be of a mild cooling nature, and taken in small quantities. Junker's Consp. Med. 35. Buchan's Dom. Med. p. 371.

VOMITING *excited by medicines.* The effects of *vomits*, on the motion of the blood, appear by the following experiments: by observing the pulse of several men after taking a *vomit*, it has been found, that so soon as a man begins to grow sick, his pulse becomes low, quick, and irregular, and, in the action of *vomiting*, is often so low as not to be felt; that in the intervals, between the *vomits*, the pulse is still low and quick, but not near so low and quick as in the action of *vomiting*; and that, after the operation is over, the pulse rises gradually, and, in the space of half an hour or an hour, becomes fuller than it was before the *vomit* was taken. Hence we see the effects of *vomits* on the motion of the blood, they lessen that motion during the whole time of their operation, and almost quite stop it in the very act of *vomiting*; and after the whole operation is over, they increase the motion of the blood, so as to make it greater than it was before.

From these effects of *vomits* on the motion of the blood, we discover their great usefulness in the cure of many diseases.

For instance, *vomits* stop hæmorrhages from small vessels. For when a blood-vessel is opened, the blood flows faster through that vessel, and slower through all the rest of the vessels, than it did before. And therefore, all that is necessary to stop an hæmorrhage from a small vessel, is to stop the motion of the blood in that vessel, and increase its motion in all the other vessels; and both these are done by *vomits*, as appears by the foregoing experiments.

The increasing of the motion of the blood in all the other vessels, will lessen the motion in the vessel supplying the hæmorrhage, and thereby effectually prevent a return of the discharge. For the same reason, *vomits* lessen immoderate discharges of the glands and ulcers, for they lessen the motion of the blood and humours in the parts affected, by increasing the motion in all the other parts. By increasing the blood's motion, repeated *vomits*, with a proper diet, have been found to be of great service in dispersing schrophulous tumors; which may be allowed, when it is considered that these tumors are

are more incident to children and young bodies; the motion of whose blood is slow; and that they often disappear of themselves, when bodies are grown up, and their blood has acquired a stronger motion.

When obstructions arise from too languid a motion of the blood, *vomits* are generally of use in removing them. And, when the motion of the blood is too great, and the obstructions are formed by cold, *vomits*, after large bleeding, will be of great service in removing them. In short, *vomits*, repeated according to the nature and obstinacy of the disorder, are generally of service in all irregularities, and disproportions of the motions of the blood, and other fluids, in different parts of the body. The safety, as well as usefulness of frequently repeated *vomits*, is evidently seen in persons at sea, and in women with child. Persons at sea, who are sick, and *vomit* much, are commonly the better for it; and frequent *vomiting* in women with child, is of service, and prevents abortion. As all muscles grow stronger by exercise, so the muscular coat of the stomach grows stronger by *vomiting*. Dr. Br. Robinson of the Food and Discharge of Human Bodies. See EMETIC.

Some have pretended to give rules for ascertaining the doses of *vomits*. See PURGATIVE.

VOMITING *julep*. See JULEP.

VOMITIVES, or VOMITIVE *medicines*. See EMETICS.

VOPISCUS, a Latin term, used in respect to twins in the womb, for that which comes to the perfect birth; the other being before excluded abortive.

VORTEX, *whirlwind*, in *Meteorology*, a sudden, rapid, violent motion of the air, in gyres, or circles. See WHIRL-*wind*.

VORTEX, VORAGO, is also used for an *eddy*, or *whirlpool*, or a body of water, in certain seas and rivers, which runs rapidly around, forming a sort of cavity in the middle.

The ordinary course of these *vortices* is a gulf or outlet, whereby the water of the sea, &c. is absorbed, or precipitates itself into some other receptacle; sometimes to some other communicant sea; and sometimes, perhaps, into the vast abyss of central water.

An artificial VORTEX, expressive of the phenomena of the natural ones, may be made with a cylindric vessel placed, immoveable, on an horizontal plane, and filled to a certain height with water. In this water a stick being plunged, and turned round as briskly as may be, the water is necessarily put into a pretty rapid circular motion, and rises to the very edge of the vessel, and, when there arrived, ceases to be farther agitated.

The water, thus raised, forms a cavity in the middle, whose figure is that of a truncated one; its base is the same with the upper cavity of the vessel; and its vertex in the axis of the cylinder.

What raises the water at the side of the vessel, which occasions the cavity in the middle, is its centrifugal force. For the motion of the water being circular, it respects a centre taken in the axis of the vessel; or, which is the same, in the axis of the *vortex* formed by the water; the same velocity, then, being impressed on all the water, the circumference of a smaller circle of water, or a circle less remote from the axis, has a greater centrifugal force than another that is greater, or more remote from the axis. The smaller circle, therefore, drives the greater towards the side of the vessel, and, from this pression, or impulsion, which all the circles receive from the smaller ones that precede them, and convey to the greater which follows them, arises that elevation of the water along the edge of the vessel to the very top, where we suppose the motion to cease.

With a *vortex* thus formed, Mr. Saulmon, of the Royal Academy of Sciences, made divers experiments, by putting several solid bodies therein, to acquire the same circular motion, with intent to discover which of them, in making their revolution round the axis of the *vortex*, approach toward, or recede from it, and with what velocity. The result was, that the heavier the body, still the greater was its recess from the axis.

M. Saulmon's view, in this attempt, was to shew how the laws of mechanics produce the celestial motions, and that it is probably to those motions that the gravity or weight of bodies is owing. But, unhappily, the experiments shew just the contrary of what they should do, to confirm the Cartesian doctrine of gravity. See WHIRLING *Table*.

VORTEX, in the *Cartesian Philosophy*, is a system or collection of particles of matter moving the same way, and round the same axis.

Such *vortices* are the grand machines whereby these philosophers solve most of the motions, and other phenomena of the heavenly bodies. Accordingly, the doctrine of these *vortices* makes a great part of the Cartesian philosophy.

The matter of the world they hold to have been divided at the beginning into innumerable little equal particles, each endowed with an equal degree of motion, both about its own centre, and separately, so as to constitute a fluid.

Several systems, or collections of this matter, they farther hold to have been endowed with a common motion about certain points, as common centres, placed at equal distances, and that the matters, moving round these, composed so many *vortices*.

Then, the primitive particles of the matter they suppose, by these intestine motions, to become, as it were, ground into spherical figures, and so to compose globules of divers magnitudes; which they call *the matter of the second element*: and the particles rubbed, or ground off them, to bring them to that form, they call *the matter of the first element*.

And since there would be more of this first element than would suffice to fill all the vacuities between the globules of the second, they suppose the remaining part to be driven towards the centre of the *vortex*, by the circular motion of the globules; and that being there amassed into a sphere, it would produce a body like the sun.

This sun being thus formed, and moving about its own axis with the common matter of the *vortex*, would necessarily throw out some parts of its matter, through the vacuities of the globules of the second element constituting the *vortex*; and this especially at such places as are farthest from its poles; receiving, at the same time, in, by these poles, as much as it loses in its equatorial parts. And, by this means, it would be able to carry round with it those globules that are nearest, with the greater velocity; and the remoter, with less. And, by this means, those globules, which are nearest the centre of the sun, must be smallest; because, were they greater, or equal, they would, by reason of their velocity, have a greater centrifugal force, and recede from the centre.

If it should happen, that any of these sun-like bodies, in the centres of the several *vortices*, should be so incrustated, and weakened, as to be carried about in the *vortex* of the true sun; if it were of less solidity, or had less motion, than the globules towards the extremity of the *solar vortex*, it would descend towards the sun, till it met with globules of the same solidity, and susceptible of the same degree of motions with itself; and thus, being fixed there, it would be for ever after carried about by the motion of the *vortex*, without either approaching any nearer to, or receding from, the sun; and so would become a planet.

Supposing then all this, we are next to imagine, that our system was at first divided into several *vortices*, in the centre of each of which was a lucid spherical body; and that some of these, being gradually incrustated, were swallowed up by others which were larger, and more powerful, till at last they were all destroyed, and swallowed up, by the biggest *solar vortex*; except some few which were thrown off in right lines from one *vortex* to another, and so become comets.

But this doctrine of *vortices* is, at best, merely hypothetical. It does not pretend to shew by what laws and means the celestial motions are really effected, so much as by what means they possibly might, in case it should have so pleased the Creator. But we have another principle which accounts for the same phenomena as well, nay, better than that of *vortices*; and which we plainly find has an actual existence in the nature of things: and this is *gravity*, or the weight of bodies.

The *vortices*, then, should be cast out of philosophy, were it only that two different adequate causes of the same phenomena are inconsistent.

But we have other objections against them. For, 1°, If the bodies of the planets and comets be carried round the sun in *vortices*, the bodies of the parts of the *vortex* immediately investing them, must move with the same velocity, and in the same direction; and besides, they must have the same density, or the same vis inertiæ. But it is evident, that the planets and comets move in the very same parts of the heavens with different velocity, and in different directions. It follows, therefore, that those parts of the *vortex* must revolve at the same time, in different directions, and with different velocities; since one velocity, and direction, will be required for the passage of the planets, and another for that of the comets.

2°, If it were granted, that several *vortices* are contained in the same space, and do penetrate each other, and revolve with divers motions; since those motions must be conformable to those of the bodies, which are perfectly regular, and performed in conic sections; it may be asked, How they should have been preserved entire so many ages, and not disturbed and confounded by the

adverse actions and shocks of so much matter as they must meet withal?

3°, The number of comets is very great, and their motions are perfectly regular, observing the same laws with the planets, and moving in orbits, that are exceedingly eccentric. Accordingly, they move every way, and to all parts of the heavens, freely pervading the planetary regions, and going frequently contrary to the order of the signs; which would be impossible, unless these *vortices* were away.

4°, If the planets move round the sun in *vortices*, those parts of the *vortices* next the planets, we have already observed, would be equally dense with the planets themselves: consequently the *vortical* matter, contiguous to the perimeter of the earth's orbit, would be as dense as the earth itself: and that between the orbits of the earth and Saturn, must be as dense, or denser. For a *vortex* cannot maintain itself, unless the more dense parts be in the centre, and the less dense towards the circumference: and since the periodical times of the planets are in a sesquialterate ratio of their distances from the sun, the parts of the *vortex* must be in the same ratio. Whence it follows, that the centrifugal forces of the parts will be reciprocally as the squares of the distances. Such, therefore, as are at a greater distance from the centre, will endeavour to recede therefrom with the less force. Accordingly, if they be less dense, they must give way to the greater force, whereby the parts nearer the centre endeavour to rise. Thus, the more dense will rise, and the less dense descend; and thus there will be a change of places, till the whole fluid matter of the *vortex* be so adjusted, as that it may rest in æquilibrio.

Thus will the greatest part of the *vortex* without the earth's orbit, have a degree of density and inactivity, not less than that of the earth itself. Whence the comets must meet with a very great resistance, which is contrary to all appearances. Cotes. Præf. ad Newt. Princ.

The doctrine of *vortices*, sir Isaac Newton observes, labours under many difficulties: for a planet to describe areas proportional to the times, the periodical times of the *vortex* should be in a duplicate ratio of their distances from the sun; and for the periodical time of the planets to be in a sesquiplicate proportion of their distances from the sun, the periodical times of the parts of the *vortex* should be in the same proportion of their distances: and, lastly, for the less *vortices* about Jupiter, Saturn, and the other planets, to be preserved, and swim securely in the sun's *vortex*, the periodical times of the parts of the sun's *vortex* should be equal. None of which proportions are found to obtain in the revolutions of the sun and planets around their axes. Phil. Nat. Princ. Math. apud Schol. Gen. in Calce.

Besides, the planets, according to this hypothesis, being carried about the sun in ellipses, and having the sun in the umbilicus of each figure, by lines drawn from themselves to the sun, do always describe areas proportionable to the times of their revolutions; which that author shews the parts of no *vortex* can do. Schol. prop. ult. lib. ii. Princip.

Again, Dr. Keill proves, in his Examination of Burnet's Theory, that if the earth were carried in a *vortex*, it would move faster in the proportion of three to two, when it is in Virgo, than when it is in Pisces; which all experience proves to be false.

We have, in the Philosophical Transactions, a physico-mathematical demonstration of the impossibility and insufficiency of *vortices* to account for the celestial phenomena. By Monf. de Sigorne. See N° 457. sect. vi. p. 409. seq.

This author endeavours to shew, that the mechanical generation of a *vortex* is impossible; that it has only an axifugal, and not a centrifugal and centripetal force; that it is not sufficient for explaining gravity and its properties; that it destroys Kepler's astronomical laws; and therefore concludes with sir Isaac Newton, that the hypothesis of *vortices* is fitter to disturb than explain the cœlestial motions. We must refer to the dissertation itself for the proof of these assertions. See CARTESIAN PHILOSOPHY.

VORTICELLA, in the Linnæan system of *Zoology*, a genus of *zoophytes*, the characters of which are, that the flower has a vasculous calyx, that the mouth is contractile and ciliated, and the stem fixed, giving a kind of whirling motion to the flower. Linnæus enumerates fourteen species.

VOTE, or VOICE. See SUFFRAGE, and VOICE.

In the house of peers, they give their *votes*, or suffrages, beginning at the puisne, or lowest baron, and so to the rest, seriatim, every one answering, apart, *content*, or *not content*.

In the house of commons, they *vote* by *yeas* and *nos*, promiscuously. See PARLIAMENT.

Votes of the house of commons first began to be printed by a resolution of the last parliament of Charles II. at Oxford, in 1681.

VOTIVE *medals*, are those whereon the vows of the people for the emperors, or empresses, are expressed.

The public vows, made every five, ten, or twenty years, are more often found round the edges of medals, than on the faces thereof, at least under the western empire; for in the eastern the case is different: witness the medal of M. Aurelius the younger, where the reverse represents the vows made at the time of his marriage, VOTA PUBLICA. And on Greek medals, ΔΗΜΟΥ ΕΥΧΑΙ, which they sometimes express by the two initial letters, Δ. Ε. according to F. Hardouin's conjecture, which may be admitted in certain medals, where the ΔΗΜ. ΕΞ. that is, ΔΗΜΑΡΧΙΚΗΣ ΕΞΟΥΣΙΑΣ, does not well agree. Witness also the medal of Antonine, VOTA SUSCEPTA DECENNALIA.

The origin of *vows*, and *votive medals*, is given by M. Du-Cange, thus: Augustus feigning himself willing to quit the empire, and having twice, at the prayers of the senate, condescended to hold it for ten years longer, it grew into a custom, to make fresh public prayers, sacrifices, and games, for his continuing it, at the ten years end; and these they called *decennalia*, or *vota decennalia*.

Under the eastern emperors, these vows were repeated every five years: hence it is, that, after Dioclesian's time, we find on medals VOTIS V. XV. &c. which practice continued till the time of Theodosius, when Christianity being well established, a ceremony that had some remains of heathenism in it was set aside. So that the VOTIS MULTIS, on a medal of Marjorianus, must be a very different thing; and no other, doubtless, than a kind of acclamation, like that PLURA NATALIA FELICITER.

VOTIVE *mass*. See MASS.

VOTUM, VOW. See VOW.

VOTUM, in our *Ancient Law-Books*, is used for *nuptiæ*, or marriage: so, *dies votorum*, is the wedding-day, Fleta, lib. iv. cap. 2. part 16. *Si donatarius ad alia* vota *convolaverit*, &c. See MARRIAGE.

VOUCH. A person is said to *vouch for another*, when he undertakes to maintain, or warrant him in any thing, or passes his word in his behalf.

In law, to *vouch*, is to call such person, or *vouchee*, into court, to make good his warrant.

VOUCHEE, a person who is to warranty, or *vouch* for another, who, in respect hereof, is called *voucher*. See VOUCHER, and WARRANTY.

VOUCHER, in *Law*, the tenant in a writ of right, who calls another person into court, bound to warranty him, and either to defend his right against the demandant, or to yield him other lands, &c to the value.

This seems in some measure to agree to the contract in the civil law, whereby the vendee binds the vendor, sometimes in the simple value of the things bought, sometimes in the double; to warrant the secure enjoying of the thing bought. Yet there is this difference between the civil and common law, in this point, that the civil law binds every man to warrant the security of that which he selleth; which the common law doth not, unless it be specially covenanted.

The process, whereby the vouchee is called, is a *summoneas ad warrantisandum*; and if the sheriff return upon that writ, that the party hath nothing whereby he may be summoned, then goes out another writ, called *sequatur sub suo periculo*.

A recovery with a *single voucher*, is when there is but one *voucher*; and with a *double voucher*, is when the vouchee voucheth over; and so a *treble voucher*.

There is also a *foreign voucher*, when the tenant, impleaded in a particular jurisdiction, voucheth one to warranty in some other county, out of the jurisdiction of that court; and prays he may be summoned, &c. This were more pertinently called a *voucher of a foreigner*.

VOUCHER also signifies a ledger-book, or book of accompts, wherein are entered the warrants for the accomptant's discharge.

VOUSSOIR, *Vault-stone*, or *Key-stone*, in *Architecture*, a stone proper to form the sweep of an arch, being cut somewhat in the manner of a truncated cone, whose sides, were they prolonged, would terminate in a centre, to which all the stones of the vault are directed. See KEY, and VAULT.

VOW, VOTUM, a solemn promise, or offering of a man's self, or other thing, to God.

A person is constituted a religious, by taking three *vows*, that of poverty, that of chastity, and that of obedience.

Authors are divided as to the antiquity of these *vows*. It is agreed, the ancient anchorets, and hermits of the Thebaid, made none; they did not consecrate themselves to God by any indissoluble obligation, but were at liberty

liberty to quit their retirement, and return into the world, whenever the fervor, that drove them out of it, came to abate.

Vows were not introduced till long after; and that to fix the too frequent inconſtancy of ſuch as, after retiring from the world, repented themſelves too ſoon, or too ſlightly; and by that means ſcandalized the church, and diſturbed the quiet of families by their return.

Eraſmus will have it, that ſolemn *vows* were not introduced till the thirteenth century, under the pontificate of Boniface VIII. Others hold them to be as ancient as the council of Chalcedon: but the truth is, before Boniface VIII. there were none but ſimple *vows*, and ſuch as might be diſpenſed withal. Their *vows*, till that time, were not deemed eternal chains; they were not indiſſoluble. It is true, they were obligatory promiſes, as to conſcience; and the inconſtancy of ſuch as violated them was held an odious deſertion: but, as to law, the perſons were not held to be civilly dead, ſo as, upon their return, to render them incapable of all acts of civil ſociety.

The moſt common *vow* was that of poverty, but this only regarded the convent; on account of which, every perſon diveſted himſelf of all property: but the making of *vows* did not at all exclude them from the rights of blood, or render them incapable of inheriting.

No religious, it is true, acquired the property of the effects that fell to him; they all belonged to the monaſtery, in favour of which he had diveſted himſelf of every thing; and the monaſtery only left him the uſufruit and direction of them. The popes have frequently confirmed this privilege to divers orders, and permitted the monks to inherit, as much as if they were ſeculars, and had made no *vows*.

At preſent, the civil death of a religious is dated from the day he makes the *vows*; and from that time he is utterly incapable of inheriting. A religious may reclaim, or proteſt againſt his *vows*, within five years; but, after that, it is no longer admitted. The failures in the profeſſion are eſteemed to be purged, by his ſilence and perſeverance for five years. Indeed, to be relieved from his *vows*, it is not enough the party reclaim within the five years; but he muſt likewiſe prove that he was forced to take the habit.

Vows, Vota, among the *Romans*, ſignify ſacrifices, offerings, preſents, and prayers, made for the emperors and Cæſars, particularly for their proſperity, and the duration of their empire.

Theſe were, at firſt, made every five years, then every fifteen, and then every twenty, called *quinquennalia*, *decennalia*, and *vicennalia*.

In divers antique medals and inſcriptions, we read, *Vot.* X. *Vot.* XX. *Vot. mult.* ſignifying *votis decennalibus, vicennalibus, multis*, &c. See Decennalia.

VOWEL, Vocalis, in *Grammar*, a letter which affords a complete ſound of itſelf; or a letter ſo ſimple, as only to need a bare opening of the mouth to make it heard, and to form a diſtinct voice.

Such are *a, e, i, o, u*; which are called *vocales*, *vowels*, in contradiſtinction to certain other letters, which, depending on a particular application of ſome part of the mouth, as the teeth, lips, or palate, can make no perfect ſound without an opening of the mouth, that is, without the addition of a *vowel*; and are therefore called *conſonants*.

Though we ordinarily only reckon five *vowels*, yet, beſides that each of theſe may be either long or ſhort, which occaſions a conſiderable variety in the ſound; to conſider only their differences reſulting from the different apertures of the mouth, one might add four or five more *vowels* to the number. For the *e* open, and the *e* cloſe, are different enough to make two *vowels*, as in *ſea*, and *depth*; ſo alſo the *o* open, and *o* cloſe, in *boſt*, and *organ*. Add, that the *u* pronounced *ou*, as the Latins did, and as the Italians and Spaniards ſtill do, has a very different ſound from the *u*, as pronounced by the Greeks, and, as at this day, by the Engliſh and French. Again, *eo*, in *people*, make but one ſimple ſound, though we write it with two *vowels*.

Laſtly, the *e* mute is, originally, no more than a ſurd joined to a conſonant, when that is to be pronounced without a *vowel*, as when it is immediately followed by other conſonants. This is what the Hebrews call *ſcheva*, eſpecially when it begins the ſyllable: and this *ſcheva* is found in all languages, though overlooked in many of them, particularly in the Engliſh, Latin, &c. by reaſon it has no proper character to denote it; though, in ſome of the vulgar tongues, particularly French and High Dutch, it is expreſſed by the *vowel e* adding its ſound to the reſt.

Thus, without regarding the differences of the ſame ſound or *vowel*, as to length or ſhortneſs, one may diſtinguiſh ten ſeveral *vowels*, expreſſed by the following characters, *a, è, é, i, o, ô, eu, ou, u, e* mute.

To theſe we may add *y*, which, as the learned Dr. Lowth obſerves, is formed by the opening of the mouth, without any motion or contact of the parts, and has every property of a *vowel*, and not one of a conſonant. Lowth's Gram. p. 20. *n.* 1.

Mr. Sheridan, who makes the number of ſimple ſounds in our language to be twenty-eight, reckons nine vow-
a a a e o o e i u
els, viz. hall hat hate beer note nooſe bet fit but. Rhet. Gram. p. 9.

Vowel-*points*, in the *Hebrew Language*. See Vowel-Points.

VOX, in *Law*. Vocem *non habere*, is a phraſe uſed by Bracton and Fleta, for an infamous perſon; one who is not admitted to be a witneſs.

VOYAGE, denotes a journey by ſea.

VOYAL, in a *Ship*, a large rope uſed to unmoor, or heave up the anchors of a ſhip, by tranſmitting the effort of the capſtern to the cables. This is performed by faſtening one part of the *voyal* to the cable in ſeveral places, and by winding another part thereof three or four times about the capſtern, which anſwers the ſame purpoſe as if the cable itſelf were in that manner wound about the capſtern; and the *voyal*, being much lighter and more pliant, is much more convenient in this exerciſe. If the cable is drawn into the ſhip by the main capſtern, the *voyal* is uſed without any block; but if the capſtern in the fore-part of the ſhip be employed for this purpoſe, the *voyal* uſually paſſes through a large block attached to the main-maſt, and thence communicates with the jear-capſtern. Falconer.

Voyal, *ſhifting the*. See Shifting.

UPHOLDER is uſed in the ſame ſenſe with under-taker, as the denomination of a tradeſman who provides for funerals.

Upholder, or Upholsterer, denotes alſo a perſon who furniſhes houſes, fitting up apartments with beds, and other furniture. See Appraiser, and Bed.

UP-LAND denotes high ground, or, as ſome call it *terra firma*: by which it ſtands oppoſed to ſuch as is mooriſh, marſhy, or low.

Or, it is pasture-land, which lies ſo high, as not to be over-flowed with rivers, or land floods.

Thoſe lands, which lie flat upon the tops of hills, are uſually the drieſt, and thoſe which form the ſlopes or ſides are uſually the moiſteſt, becauſe of the wet that is continually ouzing through them. The chalky, and eſpecially the clayey ſoils in theſe places, are moſt of all ſubject to be wet, eſpecially in winter, becauſe they retain the moiſture a long time; though they have alſo the inconveniences of the ſandy and rocky lands in the ſame ſituations, chapping in ſummer. The black mould, and the hazely loams in theſe places, are the beſt for corn, as well as for paſture, eſpecially if the latter eſcapes the common misfortune of being full of worms. Theſe lands neither are waſhy in winter, nor parched up in ſummer. The *upland* meadows have ſome diſadvantages, as they often need mending or feeding, which thoſe that lie lower do not; but then they make amends for this in their hay, which is always much finer and ſweeter than that of the low-lands.

Mr. Miller has ſuggeſted ſeveral hints for the improvement of *up-land* paſture. He recommends to fence and divide it into ſmall fields of four, five, ſix, eight, or ten acres each, planting timber in the hedge-rows, which will ſhelter the graſs from the drying pinching winds of March. The next object is to make the turf good, by paring off the ſurface and burning it, if it is clayey and cold; or by laying upon it, in conſiderable quantities, proper manures, as chalk, lime, marle, or clay, if it is a hot ſandy ſoil. If the ground is over-run with buſhes or ruſhes, theſe ſhould be grubbed up toward the latter part of the ſummer, dried, and burnt; and the aſhes ſpread over the ground juſt before the autumnal rains: the ſurface of the land ſhould then be levelled, and ſown with graſs ſeed. Mole-hills and ant-hills ſhould be alſo deſtroyed, by ſcattering them over the ground. In the months of February and March, the turf ſhould be rolled with a heavy wood roller, in moiſt weather, which will level the ſurface and thicken the graſs. Another improvement of *up-land* paſtures is the feeding of them every other year, otherwiſe the land muſt be manured at leaſt every third year. The manure ſhould be always adapted to the nature of the ſoil: e. g. all hot ſandy lands ſhould have a cool manure; neat's dung and ſwine's dung are very proper for ſuch lands, as are alſo marle and clay; but for cold lands, horſe dung, aſhes, or ſand, and other warm manure, are proper: and theſe ſhould be laid on in autumn, and carefully ſpread, and early in the ſpring harrowed with buſhes. The weeds ſhould

ſhould be carefully deſtroyed every ſpring and autumn. By proper attention to *up-land* paſtures, they will yield a fine ſweet graſs for many years without renewing. Miller's Gard. Dict.

UPLOPER, a name given to one particular ſpecies of pigeon, called by Moore, *columba gutturoſa ſaliens*.

It was firſt brought to England from Holland, and much reſembles that kind of pigeon called the Engliſh powter, but that it is ſmaller. Its crop is very round, and in this it buries its bill. Its legs are very ſmall and ſlender, and its toes are ſhort, and cloſe together, on which it treads ſo nicely, that when moving, any ſmall thing might be put under the ball of its foot. The pigeons of this ſpecies are generally all blue, all black, or all white; ſeldom or never pyed. They are very ſcarce in England, and in Holland have been valued at five and twenty guineas a pair.

They have their name from the Dutch word *oplopen*, which ſignifies to leap up, and it was thus named from its manner of approaching the hen, which is always by leaping upon her. Moore's Columbarium, p. 67.

UPPER-*Deck*, in a *Ship*, the higheſt of thoſe decks which are continued throughout the whole of a ſhip of war, or merchantman, without any interruption of ſteps or irregular aſcents.

Upper *hemiſphere, ocean, polar dial*, and *region*. See the ſubſtantives.

Upper *work*, in *Naval Architecture*, a general name given to all that part of a ſhip which is above the ſurface of the water when ſhe is properly balanced for a ſea-voyage: or it is that part which is ſeparated from the bottom by the main wale.

UPRIGHT, in *Architecture*, a repreſentation or draught of the front of a building; called alſo, an *elevation*, or *orthography*.

Upright, in *Heraldry*, is uſed in reſpect of ſhell-fiſhes, as crevices, &c. when ſtanding erect in a coat. Inaſmuch as they want fins, they cannot, according to Guillim, be properly ſaid to be *hauriant*; that being a term appropriated to ſcaly fiſhes.

Upright, in *Sea-Language*, denotes the ſituation wherein the oppoſite ſides of a ſhip are equally elevated above the ſurface of the water; or when ſhe inclines neither to the right nor left, with regard to the vertical poſition of her ſtem and ſtern-poſt.

UPULUS, in *Botany*, the old Latin name for the *lupulus*, or hop. This word *lupulus* is not old Latin, but a more modern name, formed on the word *upulus*.

UPUPA, in *Ornithology*. See Hoopoe.

URACHUS, ουραχος, in *Anatomy*, a membranous canal in a fœtus, proceeding from the bottom of the urinary bladder through the navel to the placenta, along with the umbilical veſſels, whereof it is eſteemed one. See *Tab. Anat.* (*Splanch.*) *fig.* 1. *lit. ſ. ſ. fig.* 3. *lit. e. d. fig.* 8. *lit. n. fig.* 16. *lit. n.*

The termination of the *urachus* in the placenta forms a little oval veſica, or bladder, which ſerves to receive the urine ſecreted in the kidneys of the fœtus, and that could not make its way through the urethra, by reaſon of the reſiſtance of the ſphincter of the bladder, which is not to be overcome, but by inſpiration.

The humour found in the veſica of the *urachus* is ſtill in the greater quantity, the higher coloured, and the more like urine, as the fœtus is nearer the time of the birth.

The *urachus* is moſt plainly found in brutes; but there is no diſpute but that it exiſts in an human fœtus.

M. Drelincourt, a celebrated profeſſor of anatomy at Leyden, and ſome others after him, deny the *urachus* to be hollow: on which ſuppoſition it would not be eaſy to aſſign its uſe, unleſs to keep the bladder ſuſpended to the navel. See Urine.

The uſe of the *urachus* is not yet diſcovered, according to Dr. Trew. Phil. Tranſ. Nº 457. ſect. 7. See Allantois, and Foetus.

URAN. See Ouran.

URANIA, in *Mythology*, one of the nine Muses, that preſided over aſtronomy; ſhe is repreſented as clothed with an azure-coloured robe, crowned with ſtars, holding a globe in her hand, or ſometimes with the globe at her feet, and ſurrounded with ſeveral mathematical inſtruments.

URANIBURGH, q. d. *the city of the heavens*, a term often heard among aſtronomers, being the name of a celebrated obſervatory, in a caſtle in the little iſland Weenen, in the Sound; built by that noble Dane, Tycho Brahe; and furniſhed with inſtruments for obſerving the courſe and motions of the heavenly bodies.

This famed obſervatory, finiſhed about the year 1580, did not ſubſiſt above ſeventeen years; when Tycho, who little thought to have erected an edifice of ſo ſhort a duration, and who had even publiſhed the figure and poſition of the heavens, which he had choſen for the moment to lay the firſt ſtone in, was obliged to abandon his country.

Soon after this, thoſe to whom the property of the iſland was given, made it their buſineſs to demoliſh *Uraniburgh*: part of the ruins was diſperſed into divers places: the reſt ſerved to build Tycho a handſome ſeat upon his ancient eſtate, which to this day, bears the name of *Uraniburgh*. For as to the ancient *Uraniburgh*, there is now no footſtep of it remaining. It was here Tycho compoſed his catalogue of the ſtars.

M. Picart, making a voyage to *Uraniburgh*, found Tycho's meridian line, drawn thereon, to deviate from the meridian of the world; which confirms the conjecture of ſome, that the poſition of the meridian line may vary.

URANOSCOPUS, in *Ichthyology*, the name of a fiſh called in Engliſh the *ſtar-gazer*; and by ſome authors, *callionymus*.

The *uranoſcopus*, in the Linnæan ſyſtem, is a genus of the order of *jugulares*: its characters are, that the head is flat, rough, and large; the mouth has the upper jaw ſhorter than the lower; the branchioſtege membrane has five rays, and is covered with ſmall eminences like teeth; the opercula are membranaceous and ciliated; the anus is in the middle of the body. There is one ſpecies, which is the *trachinus* of Artedi, with many beards on the lower jaw.

It is uſually caught of about ſeven or eight inches in length, but ſometimes it grows to a foot; its head is very large, bony, and rough, and of a ſort of ſquare figure; its body is long and rounded; its upper part is all of an aſh-colour; its belly white; its ſcales are very ſmall and thin, inſomuch that many have ſuppoſed it had none. Theſe are diſpoſed in oblique ranges acroſs the body of the fiſh, running toward the tail. The ſide lines are arched, and riſe to the back fin. Its face is flat, and ſeems turned upward; and its eyes are ſmall and prominent, and are ſo placed in the upper part of its head, as naturally to look up to the heavens, whence it has its name.

Many of the flat fiſh have their eyes placed as thoſe of this fiſh; but the pupils in all theſe look ſideways; in this only they are turned ſtraight upward. Its mouth is very large, and opens perpendicularly downward, being placed in the ſame direction with the eyes in the upper part of the head. It has a beard under its chin, like that of a man, and its jaws are furniſhed with very ſharp teeth, as are alſo the inner parts of its mouth. Its whole head is covered with rough tubercles, and it has two fins on the back, and two on its breaſt. It is frequently caught in the Mediterranean, and is by ſome ſaid to be a well-taſted fiſh. Geſner, de Aquat. p. 159. See *Tab.* V. *Fiſh*, Nº 63.

The reaſon of the ſituation of the eyes of the *uranoſcopus*, is the providence of nature for a fiſh which, always keeping at the bottom, has no where to look for prey but in the water above it. But if other fiſh had been well examined, this peculiar name would never have been given to this. The eyes of the *rana piſcatrix* are placed in the ſame manner, and thoſe of a great number of other fiſh, whoſe cuſtom it is to keep at the bottom, are more or leſs alſo thus ſituated.

URBICARY *Provinces*. See Suburbicary.

URCEOLUS, in *Eccleſiaſtical Writers*. See Aquæ-manilis.

URCEUS, in *Antiquity*, the name of a meaſure of liquids, which in different places was of different capacity; its moſt uſual ſtandard ſeems to have been between twelve and ſixteen ounces.

URCHIN, a common name given to the *hedge*-hog.

Urchin, *ſea*, in *Ichthyology*. The *echinus marinus* of authors, is, in ſome parts of England, called the *ſea-egg*, and in others the *ſea-urchin*, or *hedge-hog*. It is a genus of fiſh, of which there are a great number of ſpecies. See Echino-derma, and Centronia.

The manner of theſe creatures moving at the bottom of the ſea has been diſputed among naturaliſts; the general opinion of the world has been, that they did it by means of their ſpines or prickles, which ſerved them by way of legs; but ſome of late, particularly Mr. Gandolphe, pretend that the ſpines of the *urchins* are of no uſe to them on this occaſion, but that they move by means of certain legs, like the legs of the ſtar-fiſh, which they occaſionally put out when they walk, and at other times retract them into their body. The world was readily falling into this ſyſtem, particularly as Mr. Gandolphe affirmed, that he had been often an eye-witneſs to it; but the indefatigable Mr. Reaumur tried the experiment himſelf, and often made himſelf an eye witneſs of the contrary fact, having frequently ſeen them walk at the bottom of a ſhallow baſon of ſea-water, with no other aſſiſtance than that of their ſpines, and even having

having made them perform the ſame motion, by the ſame means, upon his hand.

This curious enquirer into nature did not, however, ſtop here; but took occaſion from hence to enquire accurately into every circumſtance of their progreſſion, which is performed by ſo uncommon means.

It is certain that the *ſea-urchin* does throw out at the lower aperture of its ſhell, when it pleaſes, certain bodies which reſemble not a little the legs of ſtar-fiſh; but theſe ſerve not at all to its motion; but, on the contrary, their real uſe is to keep the creature ſtill, and fixed in the ſame poſition; and, to deſcribe them more exactly, they very aptly reſemble the horns of ſnails; whence M. Reaumur has choſen rather to call them horns than legs. The uſe the *urchin* makes of theſe horns, while it is in motion, is to feel about, and try the ground on which it marches; and they ſerve the creature as a ſtaff does a blind man in his walking, to touch and try every thing that lies in the way; and to make them ſerve to this purpoſe, it is continually extending or retracting them during the time it is moving. Theſe horns are not only placed about the orifice of the ſhell, but they are every where diſperſed among the ſpines, all over the ſurface of the ſhell.

In order to underſtand the poſition of theſe horns, we muſt conſider that the *ſea-urchin* ſhell is a hard body, approaching in form to that of a ſegment of a ſphere, with two apertures, one commonly at the ſummit of the ſhell and another oppoſite to it at the baſe: the former hole ſerves, as it is ſuppoſed, for diſcharging the excrement, and the latter for the mouth of the animal. The whole external ſurface is divided by protuberances of different ſizes into ten ſpherical iſoſceles triangles, which have their vertex at the upper aperture, and their baſe at the lower: five of theſe are large and five ſmall; the larger are ſeparated from the ſmaller by triangular bands pierced with ſmall holes, arranged in a beautiful and regular order. The triangular ſpaces are divided by ſeveral lines, commencing at the upper aperture of the ſhell and terminating at the lower; theſe lines are marked by ſundry eminences of different ſizes, each of which reſembles a ſort of nipple: on theſe parts the baſe of every ſpine is fixed, and as the baſe is hollow, it is able to turn round each eminence. Of theſe ſpecies Mr. Reaumur found more than two thouſand on every fiſh; and the number of perforations in each ſhell is not leſs than thirteen hundred. From each of theſe perforations, there proceeds a horn, which horns are only viſible when the fiſh is in the water, and even then it puts forth only ſome of them at once: theſe ſerve as anchors to the fiſh, becauſe it glues them faſt to the ſtones, &c.

The ſpines are all capable of aſſiſting the creature in its motions, but thoſe it principally employs are ſuch as are placed near its mouth; as theſe can turn upon their balls every way with equal facility, the creature finds it equally eaſy to move on any ſide; and when it has determined which way it will move, thoſe ſpines which ſtand directly toward that point, and thoſe which are directly oppoſite, are of equal ſervice to it; it draws itſelf forward by means of the firſt, and puſhes itſelf on with the others; to do this, it firſt thruſts out the foremoſt ones as far as poſſible, and preſſing them againſt the bottom, it draws on its body by them; and this is ſucceeded by drawing up the hinder ones cloſe to its ſhell, and then fixing them againſt the bottom, it puſhes itſelf forward by them. This is the manner of this little creature's marching in the common way with its mouth downward; but it has this ſtrange ſingularity, that it is not confined to this poſture alone in marching, but can, with equal eaſe, walk with its mouth upwards, or run along ſideways in the manner of a wheel; or in any direction between theſe. The legs and the horns cover all parts of it, and are in every part of it equally able to move ſeparately thirteen hundred horns, and more than two thouſand ſpines, which ſerve for legs. Mem. Acad. Par. 1712.

URDE', or Urde'e, in *Heraldry*. A *croſs urdé* ſeems to be the ſame with what we otherwiſe call CLECHE'E.

UREDO, a word uſed by ſome of the chemical writers to expreſs the virtues of metals communicated to them from the ſun. Pliny uſes the ſame word to expreſs the ſmut affecting fruits; and ſome medical writers have expreſſed by it a very violent and excruciating pain in the head: and others an extreme itching or burning in the ſkin. See Smut, Blast, and Blight.

URENA, in *Botany*. See *Indian* Mallow.

URENTIA, are ſometimes uſed for medicines of a hot or burning quality. See Caustic.

URETERS, *οὐρητῆρες*, formed from *οὐρεῖν*, *meiere, to make water*, in *Anatomy*, two long and ſlender canals, which come from the pelvis or baſon of the kidneys; one on each ſide runs down obliquely to the lateral parts of the inner or anterior ſide of the os ſacrum, and paſſing between the rectum and bladder, terminates in the bladder; ſerving to convey the urine, ſecreted in the glands of the kidneys, into the bladder. See *Tab. Anat. (Splanch.) fig.* 1. *lit. g. g. fig.* 4. *lit. f. fig.* 8. *lit. m. m. fig.* 9. *lit. II.*

The *ureters* are inveſted by the cellular ſubſtance of the muſcular and nervous peritonæum; and, deſcending in the form of an S, they run behind the ſpermatic veſſels, and then behind the lower part of the bladder, approaching each other: each *ureter* lies between the umbilical artery, and vas deferens of the ſame ſide; the artery lying on the outſide of the *ureter*, and the vas deferens on the inſide: afterwards they get between the vaſa deferentia and the bladder, croſſing theſe canals; and then at about a finger's breadth from each other, they begin to pierce the coats of the bladder. They run a little way between its muſcular and nervous coats, and open into the bladder obliquely, ſomewhat nearer each other, than when they firſt entered its coats. Their orifices in the bladder are ſomewhat oval and narrower than the cavity of the *ureters* immediately above them: the edge of the orifices is thin, and ſeems to be formed merely by the union of the internal coat of the bladder with that of the *ureters*.

They are compoſed of three proper coats: the firſt of which, that ſurrounds the reſt, is of a whitiſh colour, and of a very compact filamentary texture: the next coat is of a reddiſh colour, ſtronger than the firſt, and made up of different ſtrata of fibres, which interſect each other; but it is not eaſy to determine, whether they are muſcular or ſimply membranous: the third or innermoſt coat is in ſome meaſure ligamentary, and lined by a very fine membrane, which covers a very delicate texture of veſſels. It is ſlightly granulated like ſhorn velvet, and has ſeveral ſmall glands, which ſeparate a ſlimy liquor, to defend it againſt the acrimony of the urine.

The neighbouring parts furniſh them with blood-veſſels; and they have nerves from the intercoſtal, and the vertebræ of the loins. Their cavity is ſometimes contracted in three or four places, eſpecially towards the bladder.

Such as are ſubject to the gravel, and given to exceſſive drinking, have them ſometimes ſo much dilated, that one may put the end of one's little finger into them. Their obſtruction cauſes a ſuppreſſion of the urine.

URETHRA, *οὐρήθρα*, in *Anatomy*, a tube or canal ariſing from the neck of the bladder, and continued to the pudendum; ſerving to diſcharge, or carry off the urine out of the bladder. See *Tab. Anat. (Splanch.) fig.* 8. *lit. u. u. fig.* 15. *lit. d. f. m. m.*

Some will have it to be only a production of the neck of the bladder itſelf. Its length is very different in the two ſexes. In man it terminates in the extremity of the glans, and is ordinarily about a foot long.

The ſubſtance is ſpongy or cavernous, except a ſmall portion next the bladder, and its inner and outer ſurfaces are membranous. It is at firſt no more than a membranous canal continued from the neck of the bladder; but about a finger's breadth and a half from its origin, it joins a cavernous ſubſtance, which ſurrounds it through the whole extent of the inferior groove of the *corpora* CAVERNOSA. This ſpongy ſubſtance, before it begins to ſurround the *urethra*, forms a diſtinct oblong body called the *bulb of the urethra*, which is divided anteriorly by a very fine membranous ſeptum into lateral parts.

The firſt portion of the *urethra*, from the bladder to the bulb, is ſuſtained by a large ſolid whitiſh maſs, called the PROSTATÆ. The ſpongy ſubſtance of the *urethra*, having reached the extremity of the corpora cavernoſa, forms a large head called the GLANS, which next to the *urethra* is perforated by that canal; and this canal continues its direct courſe through the lower flat ſide of it, all the way to the extremity, where it terminates by an oblong orifice.

The whole convex ſurface of the glans is covered by a fine villous ſubſtance, and that again by a fine membrane, reſembling the red part of the lips. The circumference of the baſis of the glans has a double row of ſmall papillæ, which may be reckoned ſebaceous glands, from which a thick matter is diſcharged. At the bottom of the cavity of the firſt portion of the *urethra*, which lies within the proſtatæ, there is a ſmall oblong oval eminence, called caruncula or VERU-MONTANUM.

The inſide of the canal of the *urethra* is lined by a fine membrane, full of capillary blood-veſſels; and its ſurface is perforated by a great number of oblong holes or ſmall lacunæ of different ſizes, which are orifices of the excretory ducts of the ſame number of ſmall glands, diſperſed through the ſubſtance of the *urethra*. From theſe may be expreſſed a mucilaginous liquor, which ſerves to lubricate the *urethra*, and preſerve it from being galled by the urine. A little way from the beginning of the cellular ſubſtance of the *urethra*, we meet with two lacunæ more conſiderable than the reſt, and their ducts are very long: they lead to two glandular bodies,

bodies, covered entirely by the two muscles called ACCELERATORES, and commonly called PROSTATÆ *inferiores.*

The cavity of the *urethra* resembles nearly that of a small writing pen: it is not every where round, and toward the glans becomes broader and flatter, on each side, especially in the glans itself, where there is a kind of oval or navicular fossula.

The *urethra* in females has its orifice between the nymphæ, below the glans of the clitoris: the sides of this orifice are a little prominent and wrinkled, and perforated by small lacunæ, from which a mucilaginous liquor may be squeezed. This orifice is sometimes drawn a little inward in time of pregnancy. Its body is a spongy duct of the same structure as in males, but much shorter, being about two fingers' breadth long; it is situated directly under the trunk of the clitoris, and above the great canal of the uterus, adhering to each of these canals between which it lies by membranous filaments. It passes under the cartilaginous arch of the ossa pubis, and terminates by an oblique opening at the neck of the bladder. The internal membrane of the *urethra* is a little plaited, and perforated by small holes, which communicate with folliculi, lying hid in its substance, as in males. If we blow into one of these holes, we observe a small canal to be inflated, which runs from without inwards, and terminates in some places by a kind of sacculus, by compressing which a viscid liquor is discharged. The *urethra* in women is usually called MEATUS *urinarius.* Winslow.

It is much wider, and more easily dilated here, than in the other sex.

Mr. Cowper gives us an instance of a woman, wherein the HYMEN was so firm and impervious, that her husband, finding no passage through it, had opened himself another through the orifice of the *urethra.*

The hard knots which are sometimes formed in the corpus cavernosum *urethræ*, after venereal virulency, are very difficult to cure. Till the pocky matter is all extirpated, it is in vain to attempt the cure of these knots, and even then they do not yield to mercury in any shape, but are resolved by embrocations of the waters of Bareges. See Mem. de l'Acad. de Chirurg. tom. i.

Mr. le Cat has given us the figure of the canal of the *urethra*, determined by solid injections. See Phil. Trans. N° 460. sect. 5. p. 684.

URETHRÆ *depressor*, in *Anatomy*, a name given by Santorini to a muscle of the pudenda in women, the same with that which he calls in men the *elevator urethræ* and *ejaculator.* Winslow, and the generality of the French anatomists, call it the *prostatique inferieur.* And Albinus, who has given to the *transversalis penis* the name of the *transversus perinæi*, calls this also the *transversus alter perinæi.*

URETHRÆ *elevator*, in *Anatomy*, a name given by Santorini to a muscle of the penis, which he calls also the *ejaculator*; it is called by Albinus the *transversalis alter perinæi*, to distinguish it from the muscle commonly called the *transversus penis*; but which he calls the *transversus perinæi.* The same muscle in women is called the *depressor urethræ* by the same Santorini.

URETHRAM *dilatans*, in *Anatomy*, a name given by De Graef to a muscle of the penis called the *urethram trahens* by Spigelius, and by the later writers, the *accelerator penis.* See ACCELERATORES.

URETHRAM *trahens*, in *Anatomy*, a name given by Spigelius and others to a muscle now generally called the *accelerator.* See ACCELERATORES.

URETHRÆ *triangularis*, in *Anatomy*, the name of a supposed muscle of the penis, called also *dilatator penis*, and *dilatator urethræ*; it is properly only a process of the sphincter and continued into the perinæum.

URIBACO, in *Ichthyology*, the name of a Brasilian sea-fish, esteemed a very well tasted and wholesome one. It is somewhat of the figure of the pearch; its back is ridged, and its belly is somewhat protuberant. It grows to ten or twelve inches long. Its teeth are small and sharp, and the ends of its gills and gill-fins terminate in a triangular point: its belly-fins are sustained by a very rigid and strong spine: its long fin, behind the anus, is supported by flexile and short spines: it has only one fin on the back, equally broad, and reaching nearly to the tail, supported by prickly rays; its tail is deeply forked; its scales are of a fine silvery white, with a faint cast of pale but bright red; its belly-fins are white, and its back-fin and tail reddish: its side-lines are broad, and of a fine red; over these and under them, near the tail, there is on each side a large black spot. Margraave. Ray's Ichthyol. p. 338.

URIGO, a burning with a caustic, or cautery.

URIM *and Thummim*, אורים תמים, q. d. *light and perfection*, the name of a kind of ornament belonging to the habit of the Jewish high-priest; in virtue whereof he gave oracular answers to the people.

The high-priests of the Jews, we are told, consulted God in the most important affairs of their commonwealth, and received answers by the *urim and thummim.* What these were, is disputed among the critics: some take them to be the twelve precious stones in the breast-plate of the high-priest, on which were engraven the names of the twelve tribes of Israel; and they maintain that the oracle gave its answer to any question proposed, by causing such letters in them to shine with a superior lustre, or to appear prominent above the rest, as formed the words of the answer; or by an audible divine voice pronouncing the words, the high-priest was prevented from mistaking the answer. Josephus, and some others, imagine, the answer was returned by the stones of the breast-plate appearing with an unusual lustre, when it was favourable, or in the contrary case, dim. Others suppose, that the *urim and thummim* were something enclosed between the folding of the breast-plate; this some will have to be the tetragrammaton, or the word יהוה, *Jehovah.* Christophorus de Castro, and after him Dr. Spencer, maintain them to be two little images shut up in the doubling of the breast-plate, which gave the oracular answer from thence by an articulate voice. Accordingly they derive them from the Ægyptians, who consulted their lares, and had an oracle, or teraphim, which they called truth. This opinion however has been sufficiently confuted by the learned Dr. Pococke, Comment. on Hosea, chap. iii. 4. and by Witsius in his Ægyptiaca, lib. ii. cap. 3. 10. 11, 12. The more common opinion among Christians concerning the oracle by *urim and thummim*, and which Dr. Prideaux espouses, is, that when the high-priest appeared before the veil, clothed with his ephod and breast-plate, to ask counsel of God, the answer was given with an audible voice from the mercy-seat, within the veil: but, it has been observed, that this account will by no means agree with the history of David's consulting the oracle by Abiathar; 1 Sam. xxiii. 9. 11. chap. xxx. 7. 8. because the ark on which was the mercy-seat was then at Kirjathjearim; whereas David was in the one case at Ziklag, and in the other in the forest of Hareth. Braunius and Hottinger have adopted another opinion: they suppose, that when Moses is commanded to put in the breast-plate the *urim and thummim*, signifying *lights* and *perfections* in the plural number, it was meant that he should make choice of the most perfect set of stones, and have them so polished as to give the brightest lustre: and on this hypothesis, the use of the *urim and thummim*, or of these exquisitely polished jewels, was only to be a symbol of the divine presence, and of the light and perfection of the prophetic inspiration: and as such, constantly to be worn by the high-priest in the exercise of his sacred function, especially in consulting the oracle. See Prideaux's Connection, vol. i. p. 123, &c. Jennings's Jewish Ant. vol. i. p. 233, &c.

Diodorus Siculus relates, that there was also a ceremony in use among the Egyptians, whose principal minister of justice wore a collar of precious stones about his neck, which was called αληθεια, or truth.

URINAL, in *Medicine*, a vessel fit to receive and hold urine; and used accordingly, for the conveniency of sick persons. It is usually of glass, and crooked; and sometimes it is filled with milk, to assuage the pain of the gravel.

URINAL, in *Chemistry*, is an oblong glass vessel, used for making solutions, and so called from its resemblance to the glasses in which urine is set to settle, for the inspection of the physician.

URINARIA, in *Botany.* See DANDELION.

URINARIA *fistula* is the same as URETHRA; so called from its office, to convey the urine.

URINARIA, *vesica.* See BLADDER.

URINARIUS, *meatus.* See MEATUS.

URINARY *bladder.* See BLADDER.

URINARY *passage.* See URETHRA.

URINE, URINA, formed from ουρον, which signifies the same, a liquid excrement, or humour, separated from the blood in the kidneys, conveyed thence into the bladder, and discharged by the urethra.

The *urine* is secreted from the arterial blood, in the glands of the kidneys, from which arise numerous little pellucid pipes, and veins; which, receiving the secreted *urine*, at length join into twelve papillæ; out of which the *urine* ouses into a cavity called the *pelvis*, from whence it runs into the ureters of either side, and through them into the bladder; and from that, at length, through the urethra, out of the body.

The secretion of the *urine*, then, is not performed by any attraction, as some will have it; or by any fermentation, as others; or any precipitation, as others: but by the force of the heart, and arteries, whereby the blood is driven through innumerable turnings and windings of the

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the veſſels; attenuated by reſiſtances, oppoſite motions, violent concuſſions, and various mixtures, till the more liquid and ſerous part thereof is forced through canals ſmaller than the blood-veſſels, and ſo collected and diſcharged.

The ſecretion of *urine*, as alſo that of PERSPIRATION, is conſiderably influenced by the paſſions.

It is more than probable, that the blood of the emulgent artery, conveyed through all the little branches that ſpread through the exterior membranes of the veſiculæ, whereof the kidneys are compoſed, being by this means exceedingly divided, and, as it were, attenuated, enters the veſiculæ themſelves, and gives them their red colour; that it is there filtrated, and the ſerous or *urinous* part ſecreted; that this filtration is promoted by the alternate contraction and dilatation of the fleſhy fibres that encloſe the little veſicles; and that, after filtration, the parts that remain blood are reſumed by the capillary branches of the veins; the reſt entering the excretory ducts of the veſiculæ, which are the firſt receptacle of the *urine*. Hiſt. Acad. des Sciences, an. 1705.

M. Morin, in the Memoirs of the Academy of Sciences, marks out a new route or courſe of the *urine*. The ordinary one, which is the paſſage of any liquor we drink through the ſtomach into the inteſtines, thence into the lacteals, thence into the receptacle of the chyle, thence into the ſubclavian vein, thence into the cava, thence into the right ventricle of the heart, thence into the lungs, and thence into the left ventricle of the heart, thence into the aorta, thence into the emulgent artery, thence into the kidneys, thence into the ureters, and at laſt into the bladder, ſeems to him too long and circuitous; conſidering how readily mineral waters paſs, and what a ſpeedy effect aſparagus is found to have on our *urine*. Beſides that, on this principle, the liquors we drink mixing with ſo many other liquors in their way, ſhould be greatly altered thereby; whereas we frequently find a tincture of caſſia rendered by *urine* almoſt as black as when firſt taken; and the like is obſerved of divers other liquors.

M. Morin, therefore, maintains, that a conſiderable part of the liquor we drink, ouſes through the membranes of the ſtomach, and falls into the abdomen; where it enters the bladder through the pores thereof, without getting into the inteſtines, which are lined with too thick and viſcid an humour to allow it ingreſs.

This ſyſtem is confirmed hence, that both the ſtomach and bladder, even of a dead animal, are found eaſily permeable to water.

Accordingly, Dr. Morgan aſſures us, that if the contents of the abdomen be taken out of an animal body, after it is juſt opened, and the ſtomach be filled with warm water, while the parts are yet reeking, the liquor will paſs into the bladder; which will viſibly receive it, and be filled in proportion as the ſtomach empties.

The ſame author adds, that if a ligature be made upon the ureters, while the animal is yet living, and the blood continues to circulate; though this muſt cut off all communication from the kidneys to the bladder; yet any liquor, with which the ſtomach is filled, will paſs into the bladder.

From the whole, he ſays, though ſome of our beſt anatomiſts hold, that a circulation of the whole maſs of blood is effected in five minutes, and others in two, which might account for the quick paſſage of the *urine*, it is hard to conceive, but that part of it muſt go immediately from the ſtomach into the bladder.

The general deſign of nature, in this new *urinary* drain, is ſuppoſed to be, to prevent any ſudden plethora, or immoderate diſtention of the veſſels upon drinking.

As a neceſſary conſequence of this ſyſtem, the author eſtabliſhes two kinds of *urine*; the one filtrated immediately out of the ſtomach into the bladder, the other paſſing the long courſe of circulation.

But Dr. Rega endeavours to prove, by an eaſy calculation of the quantity of *urine* ſecreted in the kidneys, that they are capable of furniſhing all the quantity obſerved at any time. And laſtly, he mentions the fullneſs and great frequency of the pulſe, after drinking theſe liquors, as a proof of their being mixed with the blood. Med. Eſſ. Edinb.

The ſpecific gravity of the human *urine*, made in the night-time, has been found greater than that made in the day. Hence Dr. Bryan Robinſon infers, that *urine* draws off more contents from the blood in ſleep, than when bodies are awake; and conſequently that natural ſleep is a very good ſign in fevers, in which the blood abounds more with contents than it does in health. Of the Food and Diſcharge of Human Bodies, p. 85.

In the Philoſophical Tranſactions we have an inſtance given us, by Mr. Young, of a boy ſix years old, that diſcharged almoſt all his *urine* by his navel.

In the ſame Tranſactions, Dr. Richardſon gives an account of a boy at North Bierly, in Yorkſhire, who lived to ſeventeen years of age without ever making water; yet was in perfect health. He had conſtantly a diarrhœa on him, but without much uneaſineſs. The obſtruction, that author obſerves, muſt have been in his kidneys; for he had never any inclination to make water.

Urines are of various kinds and properties. After drinking plentifully of any aqueous fluid, the *urine* is crude, inſipid, void of ſmell, and eaſily retained. That yielded by chyle well concocted, is ſharper, more ſaline, leſs copious, ſomewhat fetid, and more ſtimulating. That from chyle already converted into ſerum, is redder, ſharper, ſalter, and more fetid and ſtimulating. And that ſecerned, after long abſtinence, from humours well concocted, and worn off the ſolid parts, is the leaſt copious, ſharpeſt, ſalteſt, reddeſt, moſt fetid, almoſt putrefied, and of all others the hardeſt to retain. The *urine*, therefore, contains the watery part of the blood, its ſharpeſt, ſubtileſt, and moſt volatile ſalt, and that neareſt to the alkaline kind; its ſharpeſt, ſmalleſt, and moſt volatile oil, and that neareſt to putrefaction; and its ſmalleſt, moſt volatile earth.

The phoſphorus, in uſe among us, is made from human *urine*. Saltpetre is likewiſe prepared from the *urine*, and other excrements, of animals.

The Indians ſcarce uſe any other medicine but cows *urine*.

The Spaniards make great uſe of *urine* to clean their teeth; and ſo did the Celtiberians of old.

Urine is alſo uſed in dying, to ferment and warm the woad. Old *urine* tinges ſilver with a fine gold colour.

The diſorders in the *urine* are various. See STRANGURY, RETENTION, DIABETES, STONE, NUBECULA, &c. and the ſubſequent articles.

URINE, in *Medicine*. The *urine* affords one of the principal criterions, or ſigns, whereby phyſicians judge of the ſtate of the patient, and the courſe of the diſeaſe.

In caſting or examining *urine*, the things to be conſidered are, its *quantity*, *colour*, *ſmell*, *taſte*, *fluidity*, and the matters ſwimming therein.

An *abundance of urine* indicates a looſeneſs of the renal pipes, a diminution of perſpiration, ſweat, ſaliva, an imperfect mixture of the blood, whereby the watery parts ſeparate eaſily from the reſt; a nervous indiſpoſition, a copious drinking of ſome aqueous liquid, or ſome diuretic taken. Such *urine* preſages a thickneſs of what is left behind; and its acrimony denotes thirſt, anxiety, obſtructions, and their effects, a dry and hot conſtitution.

A contrary ſtate of the *urine* indicates the contraries, and preſages future repletions, heavineſs, drowſineſs, convulſive tremors, &c.

A *thin, limpid, inſipid, colourleſs, taſteleſs urine*, denotes a great conſtriction of the renal veſſels, and, at the ſame time, a briſk agitation of the humours; a ſtrong coheſion of the oil, ſalt, and earth, in the blood itſelf, and an imperfect mixture of the aqueous parts therewith; ſome grievous indiſpoſition of the mind, an hyſteric or hypochondriac fit; a debility of the viſcera; crudity, pituita, obſtructions of the veſſels, and, in acute diſeaſes, a want of a coction and criſis. Such *urine* portends much the ſame as a too copious *urine*; and in acute, inflammatory diſeaſes, a bad condition of the viſcera, deliria, phrenſies, convulſions, and death.

Ruddy urine, without any ſediment, in acute diſeaſes, indicates a violent motion and attrition among the parts that conſtitute the humours, and between the veſſels and the humours; a cloſe intimate mixture of the oil, ſalt, earth, and water, in the humours; and hence a great crudity of the diſeaſe, and its long duration, and great danger. Such *urine* preſages gangrenous obſtructions of the fineſt veſſels, chiefly thoſe of the brain and cerebellum, and thence death; a difficult coction; a ſlow, doubtful criſis; and all theſe the worſe, as the *urine* is redder, and freer of ſediment. If there be a heavy, copious ſediment, it ſhews a ſtrong antecedent attrition, looſe veſſels, ſharp, ſaline, colliquated blood, unfit for nutrition, intermitting fevers, and ſcurvy.

The preſages are, the durableneſs of the diſeaſe, wearing of the veſſels, weakneſs, colliquative ſweats, ſaliva, atrophy, and dropſy. If the ſediment in ſuch *urine* be branny, ſcaly, filmy, &c. it preſages the like, only worſe.

A *yellow urine*, with a ſediment as before, denotes a jaundice, and the ſymptoms thereof in the cutis, ſtools, &c.

A *green urine*, with a thick ſediment, denotes an atrabilary temperature; and that the matter thereof is reſolved, and now excreted; conſequently anxieties about the præcordia, perturbations of ſtool, and iliac and colic pains.

Black urine denotes the ſame with green, only in a greater and worſe degree.

Blood, pus, caruncles, filaments, hairs, anguillæ, grumæ, ſandy parts of ſtone, and a mucus at the bottom of the

urine,

urine, denote ſome diſorder in the kidneys, ureters, bladder, and urethra.

Fatty urine generally breeds ſmall ſands, adhering to ſome viſcid matter; and thus produces a ſort of oily membrane, or pellicle, which denotes an abundance of earth, and a heavy ſalt in the blood; and preſages the ſcurvy, ſtone, &c.

A *fetid urine* denotes the ſalts and oils to be attenuated, diſſolved, and almoſt putrefied; whence very great danger, both in chronic and acute diſeaſes.

Urine which, when ſhaken, retains its froth long, denotes a tenacity of the mixture, and thence a difficulty of criſis; and pulmonic diſeaſes, or catarrhs in the head.

But the *urine* is chiefly conſulted in acute fevers, where it is a very ſure ſign: for, 1. *Urine* with a white, light, equable, turbinated, inodorous ſediment, through the whole of the diſeaſe to the criſis, is a very good preſage. 2. Copious, white, ſtrangurious *urine*, with much white ſediment, emitted at the time of the criſis, cures and takes away abſceſſes. 3. A thin, ruddy *urine*, that does not ſubſide; a white, thin, watery *urine*; a thin, equable, yellow *urine*; and a turbid *urine*, that does not ſubſide, denote, in very acute diſeaſes, a great crudity, a difficult criſis, and a durable dangerous diſeaſe. See Ourology.

The *urine* of phthiſical people is ſaid to be always ſpecifically heavier than that of people in health, or in any other diſeaſe.

Urine is ſometimes applied externally, boiled with bran, as a reſolvent and diſcutient; in which intentions it is ſaid to be very efficacious.

We have frequent inſtances of people's voiding by *urine* much greater quantities of liquids than they take into the ſtomach in the time; but this, though a ſeeming paradox, is eaſily explained, by conſidering how very ſmall a part only of what we call ſolids, is really ſolid. Chemiſtry ſhews us that the far greater part of our food may be procured in a fluid form by diſtillation; and on this principle alone, ſo long as the quantity of *urine* voided is not more than that of the meat and drink together, the miracle ceaſes. There are, however, inſtances of the quantity of *urine* greatly exceeding that of both. Dr. Wittie, in this caſe, ſuppoſes the converting of air into water to make up the over proportion; but it is more rationally accounted for by the decreaſe of the patient's fleſh all the time. Our own bodies, as well as the foods we take in for their ſupport, are compoſed of a greater proportion of fluids; and the real ſolid matter is ſo very little, that when, by the courſe of a diſeaſe, thoſe fluids, which ſhould remain locked up in the texture of the ſolids, and increaſe their bulk, are drained and ſeparated from them, it is no wonder that the diſcharge be vaſtly diſproportioned to the ſupplies, when the body itſelf goes off with them. We have indeed accounts not eaſily ſoluble on theſe principles, nor any way but by the ſcheme of converting air into water before mentioned; but till we are certain that the quantities and proportions are accurately noted in them, it will be raſh to conclude any thing from them. See Phil. Tranſ. N° 52.

When *urine* has been reduced to a rob by condenſation by freezing, it is found to vary very remarkably, according as it was taken, either freſh, or half putrefied, to make the operation. That which was made freſh remains in this ſtate tolerably clear, and of a dull yellow colour, and almoſt without ſmell; but that which was taken half putrefied, remains of a colour between brown and red, or ſomewhat deeper, like the brown ſtrong beer, and becomes intolerably fetid, if ſet for any time in a warm place; but that which was condenſed freſh, is not liable to this accident, but may be kept two or three years in the ſtate of rob, and will never grow fetid, nor ſmell much like *urine*. Stahl, De Concentration. See Phosphorus *of urine*.

Urine is ſtrongly diſpoſed to putrefaction. In ten or twelve hours, when the weather is warm, it acquires a ſtrong ſmell; and in great heats, this ſmell may be perceived in five or ſix hours. The beginning of its putrefaction may be perceived by a putrid, diſagreeable, but not pungent ſmell. The ſmell afterwards becomes pungent, and diſcovers a volatile alkali, which is very copiouſly diſengaged in the putrefaction of this liquor. Although the diſagreeable ſmell that is perceived at firſt in *urine* beginning to putrefy has not the pungency of volatile alkali, it nevertheleſs ſeems to be produced by this ſalt; for by mixing any acid with *urine* in this ſtate, its fetid ſmell is immediately deſtroyed. By the ſame means alſo the ſmell of veſſels in which *urine* has been contained may be deſtroyed. On the contrary, by mixing ſome fixed alkali or quick-lime with freſh *urine*, a pungent ſmell of volatile alkali and of putrid *urine* is inſtantly produced. As in ſo ſhort a time no real putrefaction can happen, the diſcharge of volatile alkali muſt be attributed to a decompoſition of a ſal ammoniac, which is contained in the freſheſt *urine*.

From an analyſis of *urine*, recited in the Chemical Dictionary, we may infer, that it is compoſed of a large portion of pure water, in which is diſſolved a conſiderable quantity of earthy matter, that forms the ſediment of *urine*; of two phoſphoric ſalts, one of which is ammoniacal, and the other has a baſis of fixed alkali; of common ſalt; and, laſtly, of a ſaline ſaponaceous matter, which contains a combined oil. In *urine* no gelatinous matter nor uncombined oil are found. However, the compoſition and proportions of the ſeveral conſtituent parts of *urine* are very variable, according to the ſtate of health or of ſickneſs, to the differences of conſtitutions, aliments, exerciſes, diſeaſes, medicines, and perhaps even to the variations of the atmoſphere. A knowledge of the differences of the *urine* in all theſe ſeveral circumſtances is very important, but can only be acquired by a long and zealous obſervation of thoſe phyſicians who are inſtructed in the ſeveral ſciences relative to their profeſſion.

Urine, *bloody*, *mictus cruentus*, in *Medicine*, the name of a very troubleſome and often dangerous diſeaſe: it is a voiding of pure blood by the urinary paſſages, and takes its origin from a congeſtion of blood in the emulgents, and is the method (though an unhappy one) taken by nature to diſcharge the load of a plethora, and give the maſs of blood freer room to circulate. This is the natural or ſimple *mictus cruentus*; but, beſide this, there is another accidental one, ariſing from an injury of the veſſels of the kidneys or bladder, occaſioned by their being either enlarged, broken, or eroded.

Signs of it. When a *mictus cruentus* is natural, it uſually comes on without any previous ſymptoms; or if there be any, they are only ſome ſenſations of a weight and preſſure upon the loins; but when this is brought on by accidents, as by the rubbing of a ſtone, or the like, it is always preceded by violent pains. When pure blood is voided ſuddenly without interruption, and without pain, it proceeds from the kidneys; but if the blood be in ſmall quantity, of a dark colour, and emitted with heat and pain about the bottom of the belly, it proceeds from the bladder. When bloody *urine* is occaſioned by a rough ſtone deſcending from the kidneys to the bladder, which wounds the ureters, it is attended with a ſharp pain in the back, and difficulty of making water. If the coats of the bladder are hurt by a ſtone, and bloody *urine* follows, it is attended with the moſt acute pain, and a previous ſtoppage of *urine*. The blood voided with the *urine* is florid, and, after a time, ſubſides perfectly from among it; but when there is an exulceration of the kidneys, the blood is altered in its texture and appearance, and ſhews itſelf like worms.

Perſons moſt ſubject to it. Theſe are old men of plethoric habits; but even with theſe it is a rare diſtemper. When young men, or even middle-aged ones, are affected with it, we are to ſeek for its origin in violent and preternatural cauſes. Men are alſo, in general, more ſubject to it than women; but theſe are not wholly free from it.

Cauſes of it. Theſe are uſually a plethora, and an unnatural derivation of the hæmorrhoidal blood to the kidneys, where the veſſels burſt; for it is very rarely, and never but from ſome preternatural cauſes, that they burſt in the bladder. It may alſo proceed from ulcers or eroſions of the bladder, or from a ſtone lodged in the kidneys. The common violent and preternatural cauſes of this diſeaſe are the uſe of violent purges, and of the hot diuretics, of balſam of ſulphur, of oil of amber, and, above all, of cantharides; long and hard riding on horſeback, or any violent motion, falls, the lifting or carrying of heavy burdens, or blows on the region of the loins. In old men, an exceſſive uſe of venery may alſo bring it on, as alſo violent paſſions of the mind, a ſpirituous diet, an exulceration of, or a ſtone in, the kidneys; and finally, an omiſſion of habitual diſcharges of blood, whether they have been artificial by bleeding, or natural by the hæmorrhoids, or the like.

Prognoſtics from it. It is a diſtemperature that never can prove of benefit in any caſe, but is often very dangerous; except, indeed, when the diſcharge proceeds from exceſs of blood, in which caſe it is rather to be conſidered as a ſalutary evacuation than a diſeaſe; but if the diſcharge be very great, it may waſte the patient's ſtrength, and occaſion an ill habit of body, a dropſy, a conſumption, &c. Old men who are afflicted with it, rarely live long after it, eſpecially if the diſcharges are not regularly made; and if it be raſhly ſuppreſſed by the uſe of aſtringents, in any caſe, it brings on inflammations, fevers, and often dropſies. Ulcers in the kidneys are another very frequent effect of this; and under theſe, blood

and purulent matter are voided together, and appear like clouds in the *urine*.

Method of cure. In the time of the fit, the violent emotion of the blood is to be restrained by nitre, cinnabar, and some of the absorbent powders; and if these are found insufficient, the milder astringents are to be joined with them, coral, crocus martis, and vitriol of iron; and if these fail, the astringent tinctures of steel, and the terra Japonica, are to be given. Some also recommend as specifics, the juice of nettles, a decoction of the equisetum, or horse-tail, and a tea made of asparagus-roots. The bowels must be kept gently open by clysters, or the milder purgatives; and after the fit the same methods are to be continued, to prevent a return. After this, bleeding in the foot is of great service, and old persons are not to be excused from it on account of their age. It is finally to be considered, whether an obstruction of the menses, or of the hæmorrhoidal discharges, has occasioned the disease; and if so, they are to be regulated with all due care for the future; and for the first the proper medicines are to be given; for the latter, leeches are to be applied to the hæmorrhoidal vessels. Junker's Consp. Med. p. 39. 44.

In cases of *bloody urine*, spirit of vitriol, mixed with the patient's drink, has been found serviceable. See Med. Ess. Edinb. abr. vol. i. p. 68.

When bloody *urine* is owing to a stone in the bladder, the cure depends upon an operation. If it be attended with a plethora, and symptoms of inflammation, bleeding will be necessary. The body must likewise be kept open by emollient clysters, or cooling purgative medicines, as cream of tartar, rhubarb, manna, and small doses of lenitive electary. When it proceeds from a dissolved state of the blood, it is commonly the symptom of some malignant disease, as the small-pox, a putrid fever, or the like. In this case the patient's life depends on the liberal use of the Peruvian bark and acids. When there is reason to suspect an ulcer in the kidneys or bladder, the patient's diet must be cool, and his drink of a soft, healing, balsamic quality, as decoctions of marshmallow-roots with liquorice, solutions of gum-arabic, &c. Three ounces of marshmallow-roots, and half an ounce of liquorice, may be boiled in two quarts of water to one; two ounces of gum-arabic, and half an ounce of purified nitre, may be dissolved in the strained liquor, and a tea-cup-full of it taken four or five times a day.

The early use of astringents in this disease has often produced bad consequences. When the flux is stopped too soon, the grumous blood, by being confined in the vessels, may occasion inflammations, abscess, and ulcers. If, however, the case be urgent, or the patient seems to suffer from the loss of blood, gentle astringents may be necessary. In this case the patient may take three or four ounces of lime-water, with half an ounce of the tincture of Peruvian bark, three times a day. Buchan's Dom. Med. p. 374.

Urine, *incontinence of*. This is a term used by medical writers to express an involuntary excretion of this liquor, whether it be incessantly, or in larger quantities at different intervals.

This is of two kinds; in the one it is only in the night, in the time of sleep: and this arises merely from carelessness, and a bad habit; in the other, it depends on a paralytic affection of the sphincter of the bladder; and in this case it drops away continually from the patient; and this is therefore called by some a *stillicidium*.

Authors also divide an *incontinence of urine* into the idiopathic and symptomatic: the idiopathic is a disease in itself, and depends upon the preceding causes; the symptomatic happens to different persons on different occasions, as a symptom of other complaints. It is common to dying persons; it is also very frequent to women who are very big with child, and sometimes happens from violent sneezing, coughing, or laughing.

Persons subject to it. The voiding of the *urine* involuntarily, and in the sleep, in infants, is not to be accounted a disease; but when this custom continues with them as they grow up, from idleness, or ill habit, it is at length to be considered as a disease, as they are by no means able to help it. Women who have suffered much in child-birth are often subject to an *incontinence of urine* afterwards, especially persons who have had their first child at an advanced age. People in years, who are subject to paralytic complaints, are also often afflicted with this troublesome complaint; and many who have been cut for the stone by persons not sufficiently skilled in the operation. Persons subject to the piles also sometimes fall into it, from the suppressions of their usual discharges, and sometimes from the tumors becoming fistulous, and reaching to the neck of the bladder. Imposthumes of the bladder will also occasion it, and violent external injuries.

Prognostics in it. An *incontinence of urine*, which happens only in the night, and is merely caused by a bad habit, and not of long standing, usually admits of a cure; but the stillicidiums of *urine*, from paralytic disorders of the sphincter of the bladder, are very rarely cured, especially when they have been fixed some time upon the person.

Method of cure. The involuntary voiding of the *urine* in the night, in children, is to be cured, in a great measure, with punishment for the neglect, and by denying them much liquids after dinner-time; by a proper diet; the avoiding all diuretics, and the making water immediately before going to bed; and when it has gone so far, that the tone of the parts is injured, the usual strengthening medicines are to be given, as in the following cases.

When the *incontinence of urine* is occasioned by a paralytic weakness of the sphincter, nervous and strengthening medicines are the proper method of curing; in this case, mastic, amber, nutmeg, and cinnabar, are found to be of great service, and pills or powders compounded of them, are an excellent general remedy to be given in small doses, two or three times a day. Externally, it is very proper to use by way of fomentation, decoctions of rosemary, sage, serpyllum, marjoram, and the like warm herbs in red wine.

When the disease is occasioned by an imposthume or ulcer in the neck of the bladder, balsamics are to be given, as mastic, gum-juniper, and boiled turpentine; but when it is owing to injuries received in child-birth, the manual operation of the surgeon is usually to be preferred to all internal medicines. Junker's Consp. Med. p. 538 See Incontinence.

Dr. Dickson recites several instances, in which large blisters, applied to the region of the os sacrum, have been of use in the cure of *incontinence of urine*, as well as of palsies of the lower extremities, in London Med. Obs. vol. ii. art. 27. and vol. iii. art. 11.

Urine, *suppression of*. See Suppression *of urine*, and Strangury.

Urine *of a cow*. This disagreeable potion having been much recommended as a medicine both in England and France, Mr. Lemery was at the pains of enquiring how far it might reasonably be supposed to possess the virtues ascribed to it.

He observes, that *urine* in general is a serous liquor, impregnated with a volatile salt and oil, both which it has taken up from the blood, in the course of its circulation with it. It is easy to conceive, that principles so active as these may give it virtues, and those very great ones. We find that recent human *urine* purges, when taken in a proper quantity; but for all medicinal purposes, it must be much more proper to take the *urine* of some animal which feeds only on vegetables, that being a sort of extract of the more subtle saline parts of the herbs on which the creature feeds.

Though the *urine* of any of these animals seems equally to be recommended, yet that of the cow has, in all times, been preferred to others, from the quantities of it easily obtained, and the tame and pacific nature of the animal, which has been supposed so far to influence it, as to occasion its *urine* to be less acrid than in other beasts.

The spring season is the properest for the use of this remedy, and the method of taking it is to drink two or three large glasses in a morning fasting, a quarter of an hour after one another: thus taken, it purges both by stool and *urine*, and sometimes vomits; the person is to walk about, after taking it; and it has been found, in this manner, to do great service, as an attenuant and deobstruent, in jaundices, dropsies, rheumatisms, and asthmas, as also in sciaticas and vapours.

Mr. Lemery gives several instances of cures performed by it, under his own direction, and afterwards proceeds to give its analysis.

This *urine* is usually somewhat turbid; and when it has been suffered to stand by a little, deposits a sediment; it is of a pale yellow colour, and of a faint smell, greatly different from the *urine* of the generality of other animals, and resembling the smell of the dung of the same creature, only less strong, and with some mixture of the smell of new milk.

The taste is saline, acrid, and bitter; cows kept in cities often have their *urine* very acrid; but those in the fields frequently have it with only a slight bitterness at first, and not shewing its saline or acrid properties till after it has been made some hours. It always readily ferments with acids.

Mr. Lemery put into a cucurbit sixteen pounds of *urine of a cow*, kept in the country, and which had been made two

two days; this, being distilled in a cucurbit, purged with less violence than before. The purging virtue plainly consists in a volatile salt, which the *urine* carries up with it in vapour; for it tastes somewhat acrid and saline after distillation.

The distillation being continued in the ordinary way, there arises a large quantity of volatile salt and oil, in nothing differing from those of the human *urine*; and the remainder, in the bottom of the vessel, is a black, light, and spongy coal, weighing four ounces: this, being calcined in an unglazed earthen vessel, over an open fire, and treated in the common way of elixiviation, affords three ounces two drams and a half of a fixed, acrid, and highly alkaline salt, white, and without smell. Mem. Acad. Par. 1707.

URINE, in *Agriculture*, is of excellent use as a manure.

The knowing in agriculture and gardening prefer *urine* for land, trees, &c. before dung; as penetrating better to the roots, and removing divers infirmities of plants.

The decay of the ancient Kentish pippins is a thing much complained of; and Mr. Mortimer observes, they will be quite lost, unless some persons set themselves to the ancient way of culture; which, as all ancient graziers and gardeners know, was by washing the mossy, worm-eaten, cankered, and unsound trees, two or three times in the month of March, with the *urine* of oxen, &c. gathered in earthen vessels, placed under the planks or the stalls wherein they were fatted.

In Holland, and in divers other parts, they preserve the *urine* of their beasts, &c. with as much care as their dung. Mr. Hartlib, sir Hugh Plat, Mr. Mortimer, &c. make a common complaint, that so great an improver of land, and so remarkable a strengthener of manure, should be so much disregarded among us.

Glauber, indeed, has taught the world to believe, that there is nothing so destructive to vegetables of all kinds as *urine*, which, he says, by means of the sal ammoniac that it contains, burns up all the roots. This is certainly true of *urine*, and of dung too, when laid on in too great quantities; but it is certain that *urine* is as safe as dung, and as profitable, when laid on in a sparing and proper manner. Dung is of no use to land, but by its fermentation; but the best of all things to hasten and perfect that fermentation, is *urine*.

URINE, *salt of*. See *Fusible* SALT.

URINOUS *salts* are the same with what we otherwise call *alkali salts*, or *alkalies*.

There are two kinds of *urinous salts*, the one *fixt*, the other *volatile*. The fixt prevail in plants, and the volatile in animals.

They are called *urinous*, in respect of their taste and smell, which bear some resemblance to those of urine.

URN, *urna*, a kind of VASE, of a roundish form, but biggest in the middle, like the common pitchers; now seldom used, but in the way of ornament over chimney-pieces, in buffets, &c. or, by way of acroters, at the tops of buildings, funeral monuments, &c.

The great use of *urns*, among the ancients, was to preserve the ashes of the dead, after they were burnt; for which reason they were called *cineraria*, and *urnæ cinerariæ*; and were placed sometimes under the tomb-stone, whereon the epitaph was cut, and sometimes preserved in vaults in their own houses.

Urns were also used, at their sacrifices, to put liquid things in. They were also of use in the *sortes Prænestinæ*, or casting of lots. At Rome, also, the custom was, to absolve or condemn the accused, by the suffrages, or calculi, which the judges cast into the *judicatory urn*. Virgil represents Minos, the judge of hell, shaking the *urn*, to decide the lots of mankind.—*Quæstor Minos* urnam *movet*.

The *urn* is still the attribute of rivers, which are painted leaning on *urns*, representing their sources by the waters flowing therefrom. We find them represented, in the same manner, on antique medals, and relievos.

These vessels are frequent in many parts of this kingdom, where there have been Roman stations, and are of very various kinds and manner of workmanship.

Dr. Lister, who was very fortunate in his researches into the structure and differences of these remains of antiquity, observed, that in Yorkshire, where there are great numbers found, there were met with three very different kinds, as to their matter and tempers.

1. A bluish-grey sort, which had a great quantity of coarse sand wrought in among the clay. 2. A sort of the same bluish colour, but containing a sand of a much finer kind, and full of mica, and probably made of a clay naturally sandy, or a fine smooth and stiff loam. And, 3. A red sort, made of a fine pure clay, with little or no mixture of sand. These are throughout of a fine red colour like bole, and many of them are elegantly adorned with figures in basso relievo; and usually these have on the bottom, or else on the cover, the name of the workman, which some have mistaken for the name of the person whose ashes they enclose; but this must be an error, since great numbers of pots and *urns* are found with the same name. Those are varnished all over, both inside and out, with a varnish of a bright red colour.

The several matters of these *urns* informed this ingenious enquirer of the place where they were made; which he found to be in the same county on sand-hills, now never used as potteries; but, as he well observes, the difference is very great between the potteries of those days and of ours, since we, who use great quantities of clay, and but little sand, erect these works where there is much clay, and bring the small quantity of sand we use to it; whereas the Romans, on the other hand, who used much sand, and but little clay, naturally established their works where there was plenty of sand, and brought their clay to it.

The Roman *urns* differ from the earthen-ware made at this time in several particulars. 1. They have no lead-glazing, which seems a modern invention, and is, in many respects, a very bad one. See GLAZING. 2. They are composed of a far larger quantity of sand than clay. And, 3. They are baked not in an open fire, as our common earthen-ware, but have been enclosed in large earthen vessels, to defend them from the immediate contact of the flames; and hence it is, that the natural colour of the clay they are made of is not altered in them.

The red *urns* seem to have been the master-piece of the workmen, and to have employed their greatest art; the embossed work upon them is often very beautiful, and their coral-like glazing is more beautiful than any thing of the modern times, and seems to have been done by dipping them all over in some appropriated liquor, and afterwards baking them in the close manner before described. This has certainly been the method they used, since the fragments of these large coffins, or cases, are found near all the Roman potteries. Hooke's Philosophical Collections, p. 87.

The Romans, and most other nations, contented themselves to make their funeral *urns* of potters ware, or baked earth; but we find there have been some people who have made them of gold, on particular occasions. In the year 1685, as a peasant of the island of Funen was ploughing a piece of land, which had before lain barren, he turned up no less than six golden sepulchral *urns*. They were all full of a greyish substance, which some took to be a grey earth; but it was much more probably ashes.

These are all preserved at this time in the musæum of the king of Denmark at Copenhagen; the largest of them weighs two ounces and a half, and the others about two ounces and one dram each. Wormius, and some others, give accounts, that it was an ancient custom among the northern nations to burn their dead, and when they were great persons, to collect their ashes, and bury them in golden *urns*; and the finding of these seems an evident proof of the truth of that account.

These *urns* were very thin, and each had three rings of gold about their necks, and several circles, one within another, with one common centre carved on the outside round the body of the *urn*. They held about five ounces of liquids a-piece, or a little more than that; one near six ounces.

Sepulchral *urns* of crystal were also not uncommon; the same musæum has some of these: they are of a conic figure, and have usually a gold wire wound round them. *Urns* of this kind have been found buried in some parts of Norway. Another kind of *urns* were those which they called *lachrymales*, or the *tear-urns*: these were contrived to receive the tears of the friends of the deceased, which were afterwards mingled with the ashes of the burnt corpse. These were made of various materials, and of various shapes and sizes, according to the fancy of particular people. Phil. Trans. Nº 285.

URN, *urna*, was also a Roman measure for liquid things; containing about three gallons and a half of English wine measure.

The *urn* was half the amphora, and four times the congius.

UROCRITERIUM, or UROCRISIA, compounded of *ερον*, *urine*, and *κριτηριον*, *criterion*, *mark*, *sign*, or *casting of water*, or giving judgment on diseases by the sight of water. See URINE.

Hence, also, *uromancy*, *uroscopy*, &c.

UROGALLUS *major*. See COCK *of the mountain*, and GROUSE.

UROGALLUS *minor*. See GROUSE.

UROMASTIX, in *Zoology*, a name used by some authors for that sort of lizard called CORDYLUS.

UROPIGIUM, in *Ornithology*, or rump, is that part of

birds

birds which is furnished with two glands, secreting a fattish liquor from an orifice in each, and which the birds express with their bills, in order to oil the discomposed parts of their FEATHERS.

URVOW-*fish*, in *Ichthyology*, the name of a fresh-water fish of the malacostomous, or, as we call it, the leather-mouthed kind, caught in the lakes and rivers of Germany, and esteemed a very delicate fish.

It is something like the English rudd or finscale, but its body is somewhat longer, in proportion to its breadth; its back is brown, and its belly yellow; the belly-fins near the anus are a little reddish, but all the rest are brown; the scales are large and silvery, and the irises of the eyes have each, in their lower part, a blood-coloured spot; the tail is forked; and its usual size is about seven or eight inches, though it is sometimes caught considerably larger. Willughby's Hist. Pisc. p. 253.

URRY, in *Natural History*, a name given by the people of Cheshire, and some other counties of England, to a black fat earth found in coal-pits, lying immediately over the stratum of coal. It is found to be an excellent manure for land, particularly in cold clayey soils.

URSA, in *Zoology*. See BEAR, and POLAR *Bear*.

URSA, in *Astronomy*, *the Bear*, a name common to two constellations of the northern hemisphere, near the pole; distinguished by *Major*, and *Minor*.

URSA *Major*, or *the Great Bear*, according to Ptolemy's Catalogue, consists of 35 stars; according to Tycho's, of 56; according to Hevelius's, of 73; but, in the Britannic Catalogue, we have 87; the longitudes, latitudes, &c. whereof, are as follow:

Names and Situations of the Stars.	Bayer's Char.	Signs.	Longitud. ° ′ ″	Latitude. ° ′ ″	Magnitude.
In the tip of the nose	o	♋	18 40 32	40 12 34	4.5
Preceding between the two eyes	A		17 19 15	44 33 0	5
1 at	π		18 1 16	44 35 45	5
2 at	π		18 29 45	43 59 35	6
			21 33 52	42 19 35	5
5.					
			20 38 49	44 55 3	5
	b		22 34 8	41 26 0	6
Preceding of 2 in forehead	s		19 39 10	47 54 45	5
Northern in left foot	ι		28 30 49	29 34 32	4
	n	♌	0 58 22	23 41 47	4
10.					
Second of 2 in forehead 1 at	σ	♋	20 53 6	47 28 50	5
South. in left foot	κ		29 36 58	28 57 10	4
2 at	σ		20 58 26	47 48 10	5
Preceding of 2 in the neck	τ		23 14 30	44 32 5	5
Under the right knee	f		28 47 50	33 25 56	5
15.					
	c		24 56 18	42 48 0	5
			27 37 40	38 35 8	5
Right under the knee	e		28 58 3	36 4 25	5
		♌	6 14 28	17 47 41	6
		♋	26 47 30	41 36 16	7
20.					
		♌	0 35 38	36 36 25	6
		♋	20 3 0	53 16 0	7
Second of 2 in the neck	h		26 28 10	45 7 4	4
In the end of the foremost ear	d		22 1 52	51 13 40	4.5
In the left knee	θ	♌	3 0 22	34 56 22	3.4
25.					
			3 6 16	35 20 18	5.6
		♋	20 52 45	53 38 3	6
			28 8 0	46 25 17	5
Northern of two in the breast	υ	♌	1 56 49	42 39 6	4
Southern	φ		5 0 17	38 14 10	5
30.					
			7 50 58	34 36 40	6
			1 27 56	49 27 18	5
First of the two in the left hind foot	λ		15 13 42	29 52 22	3.4
Second	μ		16 54 47	28 58 10	3
			2 35 24	50 35 5	6
35.					
			10 15 6	42 30 0	5
			10 12 42	43 45 36	5
			4 6 21	51 24 32	5
			11 30 54	44 28 18	6
			12 5 36	44 23 27	6
40.					
			11 49 28	44 48 58	6.7
			11 5 52	46 48 30	5.6
			13 11 10	44 28 46	6
			15 2 12	42 58 10	6
	ω		22 10 40	33 2 36	4.5
45.					
			27 17 27	24 27 23	6
In the belly, first in the quadrilateral	β		24 43 55	31 2 12	6
			15 4 13	45 6 15	2
			25 38 16	30 4 26	6
Upon the ribs, 2d in the quadrilateral	α		10 50 0	49 40 5	1.2
50.					
			26 51 46	29 20 51	7
In the left ham	ψ		24 28 58	5 31 30	3.4
Southern in the right hind foot	ξ	♍	3 0 36	24 46 0	4
Northern	ν		2 18 40	26 8 12	4
		♌	29 51 5	30 45 50	5
55.					
			27 37 44	35 46 22	6
		♍	1 15 28	32 41 32	6
		♌	29 21 20	36 11 48	6
		♍	0 35 46	37 16 47	6
		♌	28 33 20	40 3 51	6
60.					
		♍	6 25 42	29 14 51	6
			7 52 57	27 5 24	6
	χ	♌	29 20 16	41 31 58	4
In the left thigh, 3d in the quadrilateral	γ		26 6 38	47 7 20	2
		♍	1 58 17	41 14 25	7
65.					
		♌	23 52 57	49 38 40	6
		♏	5 43 30	38 58 14	6
		♌	26 3 45	51 21 0	7
In the root of the tail, 4th in the quadrilateral	δ		26 40 55	51 39 40	2.3
			26 42 52	52 45 22	6
70.					
			28 36 6	52 18 16	7
		♍	0 21 33	51 6 10	7
			0 8 50	51 43 6	6
		♌	27 38 39	53 57 20	6
			Unknown	Unknown	6
75.					
			23 50 40	57 55 36	6
First of 3 in the tail from the root	ε	♍	4 33 5	54 19 35	3
			Unknown	Unknown	6
Middle of 3 in the tail	ζ		11 18 23	56 22 47	3
	g		11 28 50	56 33 30	5
80.					
			12 46 50	57 40 40	5.6
1st in the triangle above the last of the tail			16 53 5	56 25 50	6
			14 55 24	57 50 24	6
			16 24 23	58 13 34	6
Third in the extremity of the tail	η		22 33 40	54 24 30	3
85.					
			18 51 34	58 25 10	6
Second in the triangle above the last of the tail		♍	0 31 5	65 21 38	5

URSA *minor*, the *Little Bear*, called also *Charles's Wain*; and, by the Greeks, *Cynosura*; by its neighbourhood to the north pole, gives the denomination *αρκτος*, *bear*, thereto. Ptolemy makes it consist of 8 stars; Tycho, of 7; Hevelius, of 12; but Mr. Flamsteed of 24; the longitudes, latitudes, magnitudes, &c. whereof, as laid down in the Britannic Catalogue, follow.

Names and Situations of the Stars.	Bayer's Cha.	Signs.	Longitud. ° ′ ″	Latitude. ° ′ ″	Magnitude.
Last of the tail, or *Pole-star*	α	♊	24 14 43	66 4 10	3
			21 43 37	65 42 54	6
		♌	7 9 4	70 4 54	6
	b	♋	28 23 24	70 29 38	5
	a	♌	4 1 9	71 25 20	4
5.					
North of the preceding square			16 17 33	72 31 44	7
	β		8 55 8	72 58 26	3
			3 26 50	73 6 34	6
			17 19 48	73 40 40	7
			9 39 20	73 59 44	7
10.					
			17 14 17	74 56 0	5
			Unknown	Unknown	7
Southern of the preced. square	γ		17 10 28	75 13 1	3
			Unknown	Unknown	7
		♋	26 22 26	74 45 48	5
15.					
North. of the second square	ζ		23 2 25	75 6 50	4
			29 47 50	76 42 40	7
			Unknown	Unknown	6
			26 29 28	77 24 15	5
			28 51 45	77 50 55	6
20.					
South. of the second square	η		26 18 22	77 44 15	5
Before the root of the tail	ε		4 55 25	73 53 8	4
Next to the first of the tail	δ	♊	26 49 30	69 54 10	3
			27 6 23	69 34 25	6.7

URSULINES, an order of nuns, who obſerve the rule of St. Auguſtine; and are chiefly noted for taking on them the education and inſtruction of young maids.

They take their name from their inſtitutreſs St. Urſula, and are clothed in white, or black.

This inſtitute was firſt eſtabliſhed in Italy by Angelus de Breſcia, in 1537; it was afterwards approved in 1544 by pope Paul III. and united in one nunnery by ſolemn vows, by Gregory XIII. The *Urſulines* of France were founded in 1611 by Magdalen Lhuillier, lady of St. Beuve. Their chief houſe is at Paris, whence they have ſpread through other parts of the kingdom.

URTICA, in *Botany*. See NETTLE. *Dead* NETTLE, in *Botany*. See ARCHANGEL.

URTICA *errans*, in *Zoology*, the name of a ſea-animal, of the nature of the common URTICA *marina* in many particulars; but as that is always fixed down to the rocks, this ſpecies is always found looſe.

It has been ſuppoſed that theſe creatures affected the ſkin with a pain like that of the ſtinging of nettles on touching them, and even the eyes of thoſe who only look attentively on them; but Mr. Reaumur, who ſaw prodigious numbers of them on the coaſts of Poictou, declares that he found no ſuch property in any of them, any more than in thoſe fixed to the rocks.

Theſe in ſubſtance ſo much reſemble a ſtiff jelly, that if they were called ſea-jellies, there would want but a ſhort additional deſcription to make them underſtood. Their fleſh, if it may be ſo called, appears of the colour as well as the conſiſtence of a common jelly; and if a piece of one of them be taken up, the mere heat of the hand is ſufficient to make it melt away into plain water. Theſe are notwithſtanding true and perfect animals; and thoſe who have been of a contrary opinion, have not examined them with ſufficient attention. There are very different figures among them; but this is owing to their being of different ſpecies; for all thoſe of the ſame ſpecies are ever exactly of the ſame figure. One great reaſon of people's ſuppoſing them unorganized bodies, is, that what is ſeen of them about the ſhores is very often a fragment of a dead animal, not the whole of a living one; and no wonder if all the neceſſary parts of an animal could not be found in ſuch a piece of one.

Though the generality of theſe animals are of the ſimple colour of a jelly, there are ſome of a greeniſh caſt, and others which have a broad band of a beautiful purple round their extremity; and ſome are beautifully ſpotted with brown. Their figure is very well expreſſed by that of the head of a large muſhroom; their upper ſurface is convex in the ſame manner, and this convexity is greater or leſs in the different kinds, as it is in the different ſpecies of muſhrooms.

If one of theſe animals be dried in the ſun in hot weather, there remains nothing of it but a ſubſtance like a thin parchment; but if one of them be boiled in water, it does not diſſolve away as might have been expected, but only regularly decreaſes in ſize; and when it has become of about one fourth of its natural bigneſs, it there ſtops the decreaſe, and continues nearly of that ſize, and after that will not melt away upon the hand.

All the creatures of this ſpecies, which we ſee thrown upon the ſhores, are found lifeleſs and without motion; but there is nothing wonderful in that, becauſe the violent ſhocks and blows which they muſt have received, in being daſhed againſt the rocks or ſands by the waves, are enough to kill ſo tender an animal. One proof that theſe animals once lived, is, that all thoſe which we find about the ſhores are heavier than the water, and ſink to the bottom; whereas all thoſe, ſeen out at ſea, ſwim upon the ſurface; and this could not be the caſe in regard to any ſubſtance heavier than water, unleſs kept up by ſome voluntary motion. This motion Mr. Reaumur has obſerved to be a reciprocal contraction and dilatation of the whole body, in the manner of a ſyſtole and diaſtole. In the contraction it elevates the convexity of the body, and in the dilatation it makes it more flat; and by continually repeating theſe motions, it keeps above water as a man does by ſwimming. Mem. Acad. Par. 1710.

URTICA *marina*, in *Zoology*, the name of a remarkable genus of aquatic animals, ſo called from a ſuppoſition of their affecting the ſkin on touching them, with a painful ſenſation like that of the ſtinging of nettles. Theſe are animals of the loweſt claſs, and have by many been reckoned among thoſe creatures called *zoophytes*, or plant-animals, as ſuppoſed to partake of the nature of vegetables and of animals. Some of the ſpecies of this fiſh are found looſe upon the ſmooth ſhores, and ſome fixed to the rocks which are always covered with water. This has given birth to a diſtinction of them into two claſſes, which is as old as Ariſtotle; thoſe of the one being ſuch as move in the open ſea, called by later writers *urticæ ſolutæ*, and referred by Linnæus to the genus of MEDUSA, and denominated by the common people ſea-jellies and ſea-blubbers (ſee URTICA *errans*); and thoſe of the others ſuch as are fixed to rocks, and were ſuppoſed always to remain immoveably in the ſame place, which belong to the ACTINIA of Linnæus. The accurate Mr. Reaumur has obſerved, however, that even theſe laſt have a power of a progreſſive motion, and are not doomed to an eternal reſidence on the ſame ſpot. The motion of theſe creatures is ſo ſlow, that it might eaſily paſs unobſerved by leſs accurate obſervers; this gentleman comparing it to that of the hour-hand of a clock, and adding, that a journey of an inch takes them up commonly between one and two hours. He obſerves alſo, that many of the ſpecies have no property of ſtinging, or cauſing any painful ſenſation on the fleſh.

Dr. Gaertner obſerves, that there is not a ſingle ſpecies of the *urtica marina* poſſeſſed of that ſtinging quality which the ancients aſcribed to them; their tentacula indeed feel rough and clammy, when touched with the finger; but this roughneſs is not perceptible, except when the animal attempts to lay hold of the finger; in which caſe it throws out of the whole ſurface of the feeler a number of extremely minute ſuckers, which, ſticking faſt to the ſmall protuberances of the ſkin, produce the ſenſation of a roughneſs, which is ſo far from being painful, that it even cannot be called diſagreeable.

Theſe creatures occaſionally change their bodies into ſo many different forms, that there is no giving any deſcription of their figure. The moſt natural and general ſhape ſeems that of a truncated cone, the baſe of which is applied to the rock; but this baſe is often round, often elliptic, and often of a perfectly irregular figure. The ſurface of the top of the cone is not flat, but convex, and has in its centre an aperture, which the creature makes larger or ſmaller at pleaſure. In ſome poſitions the whole fiſh not unaptly reſembles a purſe, only with this difference, that the body is not drawn up into any folds or wrinkles by the cloſing of the aperture or mouth. In the middle of this purſe, as we call it, is placed the body of the fiſh, touching this outer covering at the bottom on every ſide, and of a conic figure, as that is. At its top, however, it is looſe, and ſtands every way free from its covering; the ſides are more or leſs diſtant from this free or looſe part of the body, as the aperture at the top of the cone is more or leſs open; when it is nearly ſhut up, very little of the body of the animal can be ſeen; but when it opens it to different widths, more or leſs of the body becomes viſible, and when it is at the wideſt, every part of it, and all the horns, are ſeen perfectly diſtinct. Theſe horns reſemble in appearance thoſe of the common ſnail; but in their uſe they ſeem much more allied to the pipes or proboſcides of the chamæ kind, the fiſh generally throwing out water at them on being touched. They are placed in three ranges on the internal ſurface of the covering, and are very numerous, their whole number not being leſs than a hundred and fifty.

The creature very often not only opens the outer covering or purſe to the utmoſt width it is capable of, but at the ſame time turns back its extremities: in this caſe the internal part, or body of the fiſh, becomes viſible on the ſurface, and at the ſame time all the horns being, by this bending back of the ſkin on which they grow, thrown into the poſture of ſo many rays, the whole makes a very remarkable figure, and not unaptly reſembles an anemony, or ſome other ſuch flower, when fully open. Very often alſo there is a great addition to the beauty of this appearance, by ſeveral round veſicles of water, which appear blue, or of ſome other lively colour. The general colour of the different ſpecies of this fiſh, or indeed of the ſame ſpecies in different circumſtances, is as variable as the ſhape; ſometimes they are ſeen pellucid and colourleſs, ſometimes white, often yellowiſh, ſometimes of a roſe-colour; at other times they are of a beautiful green, and often of various ſhades of brown. In ſome theſe colours are equally diffuſed through every part; in others they are only ſeen in form of ſpots and clouds, or variegations; ſometimes theſe are irregularly diſpoſed, ſometimes more regularly, but always with great beauty. The green ones have uſually a broad line of blue all round their baſe. Neither the colours nor ſhapes of theſe animals can be any marks of different ſpecies; but the firmneſs of their fleſh may: in this they remarkably differ one from another, and this is a difference the more obvious, as their fleſh is always open to the touch, there being no ſhell, nor any other hard ſubſtance to cover it. However ſlow the progreſſive motion of this fiſh is, when examined it is found to depend on a very remarkable mechaniſm, to underſtand which we muſt attentively conſider what is obvious to the eye in the ſtructure of the creature, and remember the compariſon of the whole fiſh to a purſe. We find that what reſembles the bottom of that purſe is flat, and is fixed to the rock, while the body of

of the fish is contained in the rest of the purse, but never fills it, unless when the mouth of the purse or covering is close drawn together. The whole covering is a collection of muscles, which are all tubular. The base of the fish never appears to us, because always fixed down to the rock; but when the creature is raised from that position, and the base examined, it appears composed of a vast number of tubes placed one behind another, and running from the centre to the circumference. These tubes are often filled with an aqueous liquor, which may be forced out on pressing them. Besides these tubes, there are also many circular ones surrounding one another.

The progressive motion seems thus performed: when the creature has determined which way it will march, it distends all those longitudinal tubes which are on that side of its body which is placed toward the point it would move to; this, from its round shape at the base, gives it an oblong one; that is, it throws the fore-part somewhat forward upon the rock; and, at the same time, if the longitudinal tubes on the opposite side of the body be all left empty, and the circular ones distended, these naturally draw the whole body toward the fore-part, and thus a small advance is made and preserved, and this, often repeated, is the slow progression of this animal. All this is, however, performed so very slowly, that though there is a continual change going on in the creature, both as to shape and place, yet if the eye is kept continually on the object, neither is perceived; but, if taken off for some time, and the place and figure both kept in mind, both will be found to be altered on viewing again.

There is a species of this fish also which moves by means of its horns; this is known from the rest by the length of the horns, and their being covered with a glutinous moisture. This species lives in the cavities and holes of rocks; and when it has a mind to move, it turns itself bottom upwards, and crawls slowly on by means of its horns, which then touch the rock.

The food of the *urtica marina* is not less wonderful than its structure and motions. It should seem very strange that an animal, soft like this creature, with no feet nor instrument of that kind to help itself with, should be able to feed on the flesh of muscles, sea-snails, and other shell-fish; yet these are its constant food. They find means to take in the shell-fish whole into the body, and then close the aperture fast upon it, so that it is not to be seen that they have any such thing within them; they keep them here as long as they please, and afterwards throw out the empty shells by the same aperture, which they can, as before observed, widen and contract at pleasure. By what means the *urtica* is able to get out the body of these fish, is not known, as it all passes in the body; but it very often fails, and the creature is obliged to throw out the shell-fish alive again; and sometimes when it has greedily gorged too large a morsel, and it is got into a wrong position to be thrown out the same way, it is obliged to let it through the base, where there is no natural aperture, and where its passage must be attended with a terrible wound. The manner in which the larger shells are thrown out by the mouth, is by opening it extremely wide, and turning it back, so that the inside appears outward for a little way down; and this motion is also used on another very necessary occasion, the excluding of the young ones, for these animals are viviparous. Mem. Acad. Par. 1710.

It has been found that this creature has the remarkable property of the POLYPE, in reproducing such parts as it had lost. Mr. Reaumur tried many experiments on the various species of this, and of the star-fish kind, and found that whatever parts were cut off, the wound soon healed; and Mr. de Villars had opportunities of watching the whole progress of the growth of the animals afterwards, and found that they not only seemed alive and well after cutting, their wounds soon cicatrizing, but that they, in a very little time, regained what had been cut off, and became as perfect as before. See *Sea*-ANEMONIES.

Dr. Gaertner refers the *urticæ marinæ*, or sea-nettles, to the HYDRA of Linnæus, commonly called the POLYPE; for he says, that they agree with that genus in the following general characters, besides many of its less essential or accidental qualities; they are of a gelatinous substance; they have only one opening in their bodies, which gives a passage to the food, as well as to the excrements, of the animal; and they have also a set of feelers, which surround this opening, and serve these creatures for claws, to catch their prey with, and convey it to their mouths. Phil. Trans. vol. lii. art. 13. p. 73, &c.

These animals were known to the Greeks and Romans by the names of πνευμα θαλασσιος, and pulmo marinus, or sea-lungs. They attributed medicinal virtues to them. Accordingly Dioscorides informs us, that if rubbed fresh on the diseased part, they cured the gout in the feet, and kibed heels. Ælian says, that they were depilatory, and if macerated in vinegar, would take away the beard. Their phosphoric quality was noticed by Pliny, who says that a stick rubbed with them will appear to burn, and the wood to shine all over: he also adds, that when they sink to the bottom of the sea, they portend a continuance of bad weather. Pennant's Brit. Zool. vol. iv. p. 59.

URUBU, in *Ornithology*. See VULTUR.

URUS, in *Natural History*, the name of a species of wild bull, of a very remarkable size and strength. Cæsar, in his Commentaries, has described them as little inferior to elephants in size, and resembling the bull in shape, figure, and colour. He adds, that they were very swift and fierce, and had horns very much larger, and very different from those of the common bull. And Mentzelius tells us, that it is a vast and terrible species of wild bull, common in Livonia, &c. and that when killed, its brain is found scented like musk. Mr. Ray wishes very much, that some one, who has an opportunity of seeing this creature, would give a more accurate and perfect account than those we already have of it. Ray's Syn. Quad. p. 70.

USAGE, in *Law*. See PRESCRIPTION, and CUSTOM.

USAGE, in *Language*. See LANGUAGE.

USANCE, *uso*, in *Commerce*, is a determinate time fixed for the payment of bills of exchange, reckoned either from the day of the bills being accepted, or from the day of their date; and thus called, because regulated by the usage and custom of the places whereon they are drawn. See BILL *of exchange*.

Bills of exchange are drawn at one or more *usances*, either from sight, or from date. The Italians say, *uso doppio*, for *double usance*, or *two usances*.

This term is longer or shorter, according to the different countries. In France, *usance* is fixed at thirty days. At London, *usance* is a calendar month; and *double usance*, two months. In Spain, *usance* is two months, or sixty days. At Venice, Genoa, and Leghorn, three months.

At Hamburgh, *usance* of bills drawn from England, France, and Venice, is two months after date. From Antwerp, and Nuremberg, fifteen days after sight.

At Venice, *usance* of bills drawn at Ferrara, Bologna, Florence, Lucca, and Leghorn, is five days after sight. From Naples, Ausbourg, Genoa, and Vienna, fifteen days after sight. From Mantua, Modena, and Milan, twenty days after date. From Amsterdam, Antwerp, and Hamburgh, two months after date; and from London, three months after date.

At Milan, *usance* of bills drawn from Genoa, is eight days after sight. From Rome, ten days after sight. And from Venice, twenty days after date.

At Florence, *usance* of bills drawn from Bologna, is three days after sight. From Rome, ten days after sight. From Venice and Naples, twenty days after date.

At Rome, *usance* of bills of exchange drawn in Italy, was, originally, ten days after sight; but, by an abuse, this term has been extended to fifteen.

At Leghorn, *usance* of bills drawn from Genoa, is eight days after sight; from Rome, it is ten days; from Naples, three weeks; from Venice, twenty days after date; from London, three weeks; and from Amsterdam, forty days.

At Amsterdam, *usance* of bills drawn from England and France, is a month after date; from Venice and Madrid, Cadiz and Sevil, two months.

At Genoa, *usance* of bills from Milan, Florence, Leghorn, and Lucca, is eight days after sight; from Venice, Rome, and Bologna, fifteen days; from Naples, twenty-two days; from Sicily, a month after sight, or two months after date; from Sardinia, a month after sight; from Antwerp, Amsterdam, and other places in the Low Countries, three months after date.

USE, *usus*, in *Law*, denotes the benefit or profit of lands and tenements.

Use imports a trust and confidence reposed in a man for the holding of lands; that he to whose *use* or benefit the trust is intended, shall reap the benefits thereof.

A deed consists of two principal parts: the *premisses*, which include all that comes before the habendum, or limitation of the estate; and the *consequent*, which is the habendum itself; wherein are two limitations; the one of the *estate*, or property the party shall receive by the deed; the other of the *use*, expressing to or for what *use* and benefit he shall have the same.

Uses, some say, were invented upon the stat. of Westminster, *Quia emptores terrarum*; before which time, no such *uses* were known. And because, in course of time, many deceits got footing, by settling the possession in one man, and the *use* in another, it was enacted, anno 27 Hen. VIII. cap. 10. that the *use* and possession of lands should

ſhould ſtand united, or that the poſſeſſion ſhould be given to him who had the *uſe*.

Hence this ſtatute is called the *ſtatute of uſes*, or, in conveyances and pleadings, the ſtatute *for transferring* uſes *into poſſeſſion*.

USE *and cuſtom*, in *Ancient Law Books*, denotes the ordinary method of acting or proceeding in any caſe, which, by length of time, has obtained the force of a law.

USE, *ceſtui que*. See CESTUI.

USE, *contingent*. See CONTINGENT.

USE, *reſulting*, is an *uſe* which being limited by the deed, expires, or cannot veſt, and returns back to him who raiſed it, after ſuch expiration, or during ſuch impoſſibility: as if a man makes a feoffment to the *uſe* of his intended wife for life, with remainder to the *uſe* of her firſt born ſon in tail; here, till he marries, the *uſe* reſults back to himſelf; after marriage, it is executed in the wife for life; and if ſhe dies without iſſue, the whole reſults back to him in fee.

USE, *ſecondary*, or *ſhifting*, is that which, though executed, may change from one to another by circumſtances *ex poſt facto*: as, if A makes a feoffment to the *uſe* of his intended wife and her eldeſt ſon for their lives, upon the marriage the wife takes the whole *uſe* in ſeveralty; and upon the birth of a ſon, the *uſe* is executed jointly in them both. Blackſt. Comm. book ii. p. 335.

USER *de action*, in *Law*, is the purſuing or bringing an action in the proper county, &c. See ACTION.

USES, *covenant to ſtand ſeiſed to*. See COVENANT.

USES *and cuſtoms of the ſea* are certain maxims, rules, or uſages, which make the baſe or ground-work of the maritime juriſprudence; by which the policy of navigation, and commerce of the ſea, are regulated.

Theſe *uſes* and cuſtoms conſiſt in three kinds of regulations. The firſt, called *laws*, or *judgments of* OLERON, were made by order of queen Eleanor, ducheſs of Guienne, at her return from the holy war; and that chiefly from memoirs which ſhe had gathered in the Levant, where commerce was at that time in a very flouriſhing condition. She called them *rolls of Oleron*, becauſe ſhe then reſided in an iſland of that name, in the bay of Aquitaine. Theſe were much augmented, about the year 1266, by her ſon Richard, king of England, on his return from the Holy Land.

The ſecond regulations were made by the merchants of Wiſby, a city in the iſland of Gothland, in the Baltic, anciently much famed for commerce; moſt of the nations of Europe having their particular quarters, magazines, and ſhops, therein. Theſe were compiled in the Teutonic language, and are ſtill the rule in the northern countries. Their date does not appear; but it is probable they were made ſince the year 1288, when the city of Wiſby was deſtroyed the firſt time, and afterwards reſtored by Magnus, king of Sweden.

The third ſet of regulations was made at Lubec, about the year 1597, by the deputies of the HANSE-*towns*.

USHER, *huiſſier*, ſignifies an officer, or ſervant, who has the care and direction of the door of a court, hall, chamber, or the like.

In the king's houſhold there are four *gentlemen-uſhers* of the privy-chamber, with an annual ſalary of 200*l.* each, appointed to attend the door, to give entrance, &c. to perſons that have admittance thither: four *gentlemen-uſhers*, waiters, whoſe ſalary is 150*l.* per annum; and an aſſiſtant *gentleman-uſher*, at 66*l.* 13*s.* 4*d.* per annum: and eight *gentlemen-uſhers*, quarter-waiters in ordinary.

There are alſo in the queen's houſhold three *gentlemen-uſhers* of the private chamber, three *gentlemen-uſhers*, daily waiters; each of whom has the ſame annual appointment with thoſe of the king's houſhold; and three *gentlemen-uſhers*, quarterly waiters, at 100*l.* per annum.

In the French court there are two *uſhers* of the antechamber, or hall, where the king dines in public. They wait ſword by ſide, all the year, and open the door to ſuch as are to come in. There are above ſixteen *uſhers* of the chamber, two of the cabinet, and one of the order of the Holy Ghoſt.

The *uſhers* of the Inquiſition in Spain and Portugal, are perſons of the firſt quality, who think themſelves highly honoured, by only looking to the doors of that ſacred tribunal.

USHER is alſo uſed for an officer in the exchequer; of which ſort, three or four attend the chief officers and barons, at the court at Weſtminſter, as alſo juries, ſheriffs, and other accomptants, at the pleaſure of the court. See EXCHEQUER.

USHER *of the black-rod*. See BLACK-*rod*.

In a chapter held at Whitehall, 13 Car. II. it was ordained, that this office ſhould be fixed to one of the *gentlemen-uſhers*, daily waiters at court; the eldeſt of which always holds the place, and is called *gentleman-uſher*, and *black-rod*.

In relation to the order of the Garter, he is appointed to carry the rod at the feaſt of St. George, and other ſolemnities, which he alſo makes uſe of as an authority to attach delinquents, who have offended againſt the ſtatutes of the order, which he frequently doth by touching them therewith. He wears a gold badge, embelliſhed with the enſigns of the order. He has a houſe in Windſor caſtle, and other privileges.

USNEA, in *Natural Hiſtory*, *muſcus arboreus*, *cupthong*; a ſort of plant of the paraſite or moſs kind, growing like a great beard on the oak, cedar, and divers other trees; the characters of which are theſe: they are wholly deſtitute of leaves, and are compoſed only of long ſlender filaments or ſtalks, which are uſually ſolid, rigid, and of a cylindric figure; the extremities, or other parts of theſe, are at times furniſhed with a ſort of orbicular bodies, dry and deſtitute of uſe, but ſeeming to ſupply the place of flowers; theſe are hollow, in form of cups, but have no rim; the whole plants are fixed in the manner of miſletoe to the barks of trees. Micheli has given accounts of flowers and ſeeds in theſe plants; but Dillenius ſuſpects the accuracy of the obſervation, and adds, that if there are ſuch, they are too minute to be of any ſervice in the general diſtinctions of the plants. Dillen. Hiſt. Muſc. p. 68.

Of this genus of plants Dillenius enumerates nineteen known ſpecies. *Tab.* XIII. *Botany*, N° 4.

Linnæus has referred the *uſnea* to the genus of LICHEN, in the order of *algæ*, and claſs of *cryptogamia*.

USNEA *humana* is a ſmall greeniſh moſs, growing on human ſkulls that have lain a long time expoſed to the air. It is ſuppoſed to be very aſtringent, and held proper to ſtop hæmorrhages. It is alſo an ingredient in the weapon-ſalve of Paracelſus and Crollius. It has not a whit the more virtue for the place of its growth; nor is there, indeed, any peculiar moſs of this name; but whatever ſpecies chances to grow on the ſkull, is taken for uſe.

USNEN, in *Botany*, a name given by Avicenna and Serapion to the plant kali, of which the alkali ſalt called *pot-aſhes*, and uſed in the compounding of our ſoap, is made. There are alſo ſeveral other things called by this name, and, in general, all that were uſed in the ſcouring or cleaning of cloaths. The dung of ſparrows was uſed by ſome people for this purpoſe, as the dung of hogs is at this time, and this was therefore called by ſome *uſnen*. Hyſſop, a plant famous for its cleanſing virtue, was alſo called by the ſame name; and ſome have alſo applied it to the ſoldanella, or ſea bind-weed.

Wherever, in the Arabian writers, the word *uſnen* is uſed in any of theſe latter ſenſes, there is ſomething added to diſtinguiſh which of the things before expreſſed is meant by it; but whenever it ſtands alone and unexplained, it is to be underſtood as meaning the kali.

USQUEBAUGH, a ſtrong, rich, compound liquor, chiefly taken by way of dram; its baſis being brandy, or a more ordinary ſpirit.

The manner of making it is ſomewhat various, and the ingredients numerous. We ſhall give a receipt, much commended formerly, as a ſpecimen.

To two gallons of brandy, or ſpirits, put a pound of Spaniſh liquorice, half a pound of raiſins of the ſun, four ounces of currants, three of dates, ſliced; tops of thyme, baum, ſavory, and mint, and tops or flowers of roſemary, of each two ounces; cinnamon and mace bruiſed, nutmegs, aniſeeds, and coriander-ſeeds, bruiſed likewiſe, of each four ounces; citron, or lemon and orange-peel, ſcraped, of each an ounce: all theſe are to be left to infuſe forty-eight hours in a warm place, often ſhaking them together; then ſet them in a cool place, for a week; after which, the clear liquor is to be decanted off, and to it is to be put an equal quantity of net white port-wine, and a gallon of canary. The whole is finally to be ſweetened with a proper quantity of double refined ſugar.

USSAC, in the *Materia Medica* of the Arabians, a name given by Serapio to the gum ammoniacum of the Greek writers. It ſeems no other than a falſe ſpelling of the word *aſſac*, which is the common name of the gum in Avicenna, and other of the writers of that nation; but this does not ſeem to be the ſame drug which we call gum ammoniacum at this time.

USTION, *uſtio*, formed from *urere*, *to burn*, in *Pharmacy*, the preparing of certain ſubſtances, by burning them.

The ancients made uſe of burnt horns, nails, feathers, and other parts of animals, for divers remedies; and the moderns ſtill uſe æs uſtum, which is burnt copper, or copper that has undergone the *uſtion*, with ſulphur.

The *uſtion* of minerals is a more imperfect kind of calcination. It is a degree beyond torrefaction.

USTRINA, among the Romans, the place where they burnt the bodies of the dead. It was commonly in the Campus Martius, or ſome other place in the ſuburbs, and ſome-

ſometimes in the city for perſons of quality; and for the common people on the Eſquiline mount. See Bustum.

USTULATION, *uſtulatio*, a word uſed by pharmaceutic writers to expreſs the roaſting or torrefying of humid or moiſt ſubſtances over a gentle fire, ſo as to render them fit for powdering. The ſame word is alſo uſed by ſome for what we call burning of wine.

USTUM *æs*. See Æs *uſtum*.

USUCAPTION, *uſucaptio*, in the *Civil Law*, is an acquiſition of the property of a thing, by a poſſeſſion and enjoyment thereof for a certain term of years preſcribed by law.

Some make a difference between prescription and *uſucaption*; maintaining, that the latter is only uſed with regard to moveables, and the former with regard to immoveables. But there is no eſſential difference between them; and, accordingly, *preſcription* and *uſucaption* are generally held ſynonyma.

USUFRUIT, *uſus fructus*, in the *Civil Law*, the temporary uſe or enjoyment of any lands or tenements; or the right of receiving the fruits and profits of an inheritance, or other thing, without a power of alienating or changing the property thereof.

When the *uſufructuary* dies, the *uſufruit* returns to the proprietor. The dower or the jointure of a widow is only an *uſufructuary* due; that is, ſhe only enjoys the *uſufruit* thereof, and cannot diſpoſe of the principal.

All mutual preſents between man and wife, only import the *uſufruit* of the goods of the firſt that dies, to the profit of the ſurvivor. The incumbents of benefices are only *uſufructuary*. An *uſufructuary* has full right over the coppice; but he cannot fell timber-trees.

USURA *maritima*, terms applied to contracts for the repayment of money borrowed, not on the ſhip and goods only, but on the mere hazard of the voyage itſelf; as when a man lends a merchant 1000*l.* to be employed in a beneficial trade, with condition to be repaid with extraordinary intereſt, in caſe ſuch a voyage be ſafely performed. This kind of agreement is ſometimes called *fœnus nauticum*. See Bottomry, and Respondentia.

USURER, a perſon charged with a habit or act of *uſury*.

The laws of our ancient Saxon and Norman kings are very ſevere upon *uſurers*, or letters-out of money upon intereſt. *Uſurarios quoque defendit rex Edvardus* (Confeſſor), *ne remaneret aliquis in toto regno ſuo; & ſi quis inde convictus eſſet, quod fœnus exegerat, omni ſubſtantia propria careret, & poſtea pro ex lege habeatur: quoniam* uſura *radix omnium malorum.* Leg. Edv. Confeſſ. cap. 37.

They were, indeed, allowed to diſpoſe of their goods before conviction, and whilſt they were living; but after their death they were confiſcate, if it could be proved they lent money to *uſe* within a year before their death. If a clergyman were an *uſurer*, his goods were not to be confiſcated, but to be diſtributed to pious uſes. In thoſe days *uſury* was thus defined:

> *Eſt* uſura *ſuos quiſquis tradit mihi nummos*
> *Spe lucri, fœnus duplex* uſura *vocatur.*

USURIOUS *contract* is any bargain, or contract, whereby a man is obliged to pay more intereſt for money than the ſtatute allows.

It is enacted by ſtatute 13 Eliz. cap. 8. that all brokers ſhall be guilty of a *præmunire*, who tranſact any *uſurious* contract where more than ten per cent. intereſt is taken.

USURPATION, in *Law*, an injurious uſing or enjoyment of a thing, for continuance of time, that belongs of right to another. See Tyranny.

Usurpation, in a more peculiar ſenſe, denotes an abſolute ouſter or diſpoſſeſſion of the patron of a church; and happens when a ſtranger, that hath no right, preſenteth a clerk, and he is thereupon admitted and inſtituted. In which caſe of *uſurpation*, the patron loſt by the common law not only his turn of preſenting *pro hac vice*, but alſo the abſolute and perpetual inheritance of the advowſon, ſo that he could not preſent again upon the next avoidance, unleſs in the mean time he recovered his right by a real action, viz. a writ of right of advowſon. However, becauſe biſhops, in ancient times, either by careleſſneſs or colluſion, frequently inſtituted clerks upon the preſentation of uſurpers, and thereby defrauded the real patrons of their right of poſſeſſion, it was in ſubſtance enacted by the ſtatute Weſtm. 2. 13 Edw. I. cap. 5. ſect. 2. that if a poſſeſſory action be brought within ſix months after the avoidance, the patron ſhall (notwithſtanding ſuch *uſurpation* and inſtitution) recover that very preſentation; which gives back to him the ſeiſin of the advowſon. Yet ſtill, if the true patron omitted to bring his action within ſix months, the ſeiſin was gained by the uſurper, and the patron to recover it was driven to the long and hazardous proceſs of a writ of right. To remedy which, it was farther enacted by ſtatute 7 Ann. cap. 18. that no *uſurpation* ſhall diſplace the eſtate or intereſt of the patron, or turn it to a mere right; but that the true patron may preſent upon the next avoidance, as if no ſuch *uſurpation* had happened. So that the title of *uſurpation* is now much narrowed, and the law ſtands upon this reaſonable foundation, that if a ſtranger uſurps my preſentation, and I do not purſue my right within ſix months, I ſhall loſe that turn without remedy, for the peace of the church, and as a puniſhment for my own negligence; but that turn is the only one I ſhall loſe thereby. *Uſurpation* now gains no right to the uſurper, with regard to any future avoidance, but only to the preſent vacancy: it cannot indeed be remedied after ſix months are paſt; but, during thoſe ſix months, it is only a ſpecies of diſturbance. Blackſt. Comm. book iii. p. 243, &c.

Usurpation *of franchiſes and liberties*, is when a ſubject unjuſtly uſes any royal franchiſes, &c. And this is ſaid to be an *uſurpation* upon the king, who ſhall have the writ of quo *warranto* againſt the uſurpers.

USURY, Usura, in the general, denotes a gain or profit which a perſon makes of his money, by lending the ſame; or it is an increaſe of the principal exacted for the loan thereof; or the price a borrower gives for the *uſe* of a ſum credited to him by the lender: called alſo *intereſt*, and, in ſome ancient ſtatutes, *dry exchange*. For lawful intereſt, ſee Interest.

The word *uſury* is uſually taken in an evil ſenſe; viz. for an unlawful profit which a perſon makes of his money; in which ſenſe it is, that *uſury* is forbidden by the civil and eccleſiaſtical law, and even by the law of nature. In this ſenſe it alſo is, that it is held *uſury* to lend money on pawns, to exact intereſt for money, without ſurrendering the principal, and to ſtipulate intereſt for money which is not employed in trade, nor brings any profit to the perſon who receives it: but, as the Latin word *uſura*, at leaſt the plural thereof, *uſuræ*, may be underſtood of a lawful intereſt, *uſury*, in Engliſh, might alſo be uſed in the ſame harmleſs ſenſe.

However, cuſtom has now diſtinguiſhed betwixt *uſury* and legal intereſt; and appropriated the term *uſury* to that which exceeds the intereſt determined by ſtatute. The legal intereſt is five *per cent.* by 12 Anne, ſtat. 2. cap. 16. commonly called the ſtatute againſt *uſury*, which ordains not only that all contracts for taking more than 5*l. per cent.* and proportionably for a greater or leſs ſum, are in themſelves totally void, but alſo that the lender ſhall forfeit treble the value of the money borrowed. And farther if any ſcrivener or broker takes more than 5*s. per cent.* procuration money, or more than 12*d.* above the ſtamp duties for making a bond, he ſhall forfeit 20*l.* with coſts, and ſhall ſuffer impriſonment for half a year.

The enemies to intereſt in general make no diſtinction between that and *uſury*, holding any increaſe of money to be indefenſibly uſurious. And this they ground as well on the prohibition of it by the law of Moſes among the Jews, as alſo upon what is laid down by Ariſtotle, that money is naturally barren, and to make it breed money is prepoſterous, and a perverſion of the end of its inſtitution, which was only to ſerve the purpoſes of exchange, and not of increaſe. Hence the ſchool divines have condemned the practice of taking intereſt, as being contrary to the divine law both natural and revealed; and the canon law has proſcribed the taking of any, the leaſt, increaſe for the loan of money as a mortal ſin.

But, in anſwer to this, it may be obſerved, that the Moſaical precept was clearly a political, and not a moral precept. It only prohibited the Jews from taking *uſury* of their brethren; but in expreſs words allowed them to take it of a ſtranger: Deut. xxiii. 20. which proves that the taking of moderate *uſury*, or a reward for the uſe, as the word ſignifies, is not *malum in ſe*, ſince it was permitted where any but an Iſraelite was concerned. And as to Ariſtotle's reaſon, deduced from the natural barrenneſs of money, the ſame may be alledged of houſes, which never breed houſes, &c. &c. And though money was originally uſed only for the purpoſes of exchange, yet the laws of any ſtate may be well juſtified in permitting it to be turned to the purpoſes of profit, if the convenience of ſociety ſhall require it. And that the allowance of moderate intereſt tends greatly to the benefit of the public, eſpecially in a trading country, will appear, from the generally acknowledged principle, that commerce cannot ſubſiſt without mutual and extenſive credit. Unleſs money, therefore, can be borrowed, trade cannot be carried on; and if no premium were allowed for the hire of money, few perſons would care to lend it; or at leaſt, the caſe of borrowing at a ſhort warning would be entirely at an end. Thus, in the

dark

dark ages of monkish superstition and civil tyranny, when interest was laid under a total interdict, commerce was also at the lowest ebb, and fell entirely into the hands of the Jews and Lombards; but when men's minds began to be more enlarged, when true religion and real liberty revived, commerce grew again into credit; and again introduced with itself its inseparable companion, the doctrine of loans upon interest.

Indeed, while all degrees of profit from loans were discountenanced, we find more complaints of *usury*, and more flagrant instances of oppression, than in modern times, when money may be easily had at a low interest. Moderate interest is necessary in every civil state, if it were but to exclude that exorbitant interest to which the truly odious appellation of *usury* is applied, and which ought never to be tolerated in any well-regulated society. For, as the whole of this matter is well summed up by Grotius (De Jur. Bell. & Pac. lib. ii. cap. 12. sect. 22.) if the compensation allowed by law does not exceed the proportion of the hazard run, or the want felt, by the loan, its allowance is repugnant neither to the revealed nor the natural law: but if it exceeds those bounds, it is then oppressive *usury*; and though the municipal laws may give it impunity, they never can make it just.

The exorbitance or moderation of interest, for money lent, depends upon two circumstances, viz. the general inconvenience of parting with it for the present, which results from the quantity of specie or current money in the kingdom, and the hazard of losing it entirely, so that the better the security, the lower will be the interest: and therefore, the rate of interest is generally in a compound ratio, formed of the inconvenience and the hazard.

Upon these two principles, compared together, different nations have at different times established different rates of interest. The Romans at one time allowed *usuræ centesimæ*, i. e. *one per cent.* monthly, or *twelve per cent.* yearly, to be taken for common loans: but Justinian reduced it to *trientes*, or one third of the *as*, or *centesimæ*, i. e. *four per cent.* but allowed higher interest to be taken of merchants, because there the hazard was greater. In like manner Grotius informs us, that in Holland the rate of interest used to be eight *per cent.* in common loans, but twelve to merchants. Our law established one standard for all alike, where the pledge or security is not put in jeopardy, in order to prevent fraud and *usury*. Blackst. Com. book ii. p. 455.

UT, a Latin term, signifying, literally, *as*; much used in the stating of ratios and proportions.

Sir Isaac Newton assigns its use thus: if indeterminate quantities of divers kinds be compared together, and one of them be said to be *ut*, *as*, any other, directly, or inversly; the meaning is, that the first is increased, or diminished, in the same ratio as the latter. And if one of them be said to be, *ut*, *as*, two or more others, directly, or inversly; the meaning is, that the first is increased, or diminished, in a ratio compounded of the ratios in which the others are increased or diminished.

Thus, if A be said to be *as* B directly, and *as* C directly, and *as* D inversly; the meaning is, it is increased, or diminished, in the same ratio with $B \times C \times \frac{1}{D}$; that is, A and $\frac{BC}{D}$ are to each other in a given ratio.

UT, in *Music*, the first of the musical notes. See NOTE.

Ut, re, mi, fa; the clef of *G, re, sol, ut*; of *C, sol, ut*, &c.

This note, with the rest, were taken out of the hymn of St. John Baptist, composed about the year 770, in the time of Charlemagne, according to Possevin, by Paulus Diaconus of Aquileia. *Ut queant laxis*, &c. See MUSIC.

UTAMANIA, in *Ornithology*, the name of a bird of the web-footed kind, wanting the hinder toe. It is common about the island of Crete, and is very expert at diving. It is of the size of a teal, and has its head and back black, and its belly white. Its feathers resemble down rather than plumage; but though they are soft and slender, they are very firmly affixed to the skin. Its beak is sharp at the edges, and covered in a great part with down. From the description of Bellonius, as well as his figure, this bird approaches to the common razor-bill, if it is indeed essentially different from it.

UTAS, *octava*, in *our Statutes*, the eighth day following any feast or term; as the *utas of St. Michael*, &c. And any day between the feast and the octave is said to be within the *utas*. The use of this is in the return of writs, as appears by stat. 51 Hen. III.

UTENSIL, UTENSILE, a little domestic moveable, particularly such as belong to the kitchen. Such as pots, pans, plates, &c.

UTENSILS are more particularly used in *war*, for the moveables which the host is obliged to furnish the soldiers quartered with him; which are, a bed with bed-cloaths, a pot, and a spoon. They are likewise to have a place at their host's fire, and candle. *Utensils* are sometimes furnished in money, and sometimes in kind.

UTERINE, UTERINUS, something belonging to the uterus or womb of women.

Uterine brothers or sisters are those born of the same mother, but by different fathers.

UTERINUS, *furor*, in *Medicine*. See FUROR.

Men are subject to the like disease, as well as women; so that it might with more propriety be called, the *furor venereus*, or *venereal fury*. It had its name, *furor uterinus*, from an opinion, that it proceeded from vapours, rising from the womb to the brain.

It has been frequently found, that maids, supposed to be possessed, were only seized with the *uterine fury*.

UTERINE *hæmorrhages*. In this dangerous disorder the STYPTIC *powder* of Helvetius is much recommended: and the stibium ceratum has also been tried with great success. See VITRUM *antimonii ceratum*.

In the Stockholm Acts, 1770, there are several cases of *uterine* hæmorrhages cured by $\frac{1}{4}$ or $\frac{1}{2}$ grain of IPECACUANHA, rubbed with sugar, given every four hours or oftener. In one case, the hæmorrhage returned on discontinuing the medicine, and ceased on repeating it. These small doses had good effects in catarrhal coughs, even in those which attend consumptions; and if not beneficial, are at least not hurtful, in bloody coughs, in which vomiting has several times been observed to come on, without any increase of the hæmorrhage. They may be useful in peripneumony and pleurisy, in which cough is often the most troublesome symptom, and in which seneka root (which in increased doses proves also emetic) has been so much recommended.

UTERINUS *lapis*, in *Natural History*, a name given by some authors to a stone found in New Spain, and in some other parts of America; it is very hard and heavy, of a beautiful black, and capable of a very elegant polish. The natives cut it into various shapes, and apply it to the navel in diseases of the womb, and pretend that it possesses very great virtues.

UTERINUM *jecur*. See JECUR.

UTERUS, in *Anatomy*, the *matrix*, or *womb*; that organ of generation, in women, wherein the business of conception is performed, and wherein the embryo or fœtus is lodged, fed, and grows, during the time of gestation, or till its delivery. Its description see under WOMB; its office, &c. under GENERATION, CONCEPTION, GESTATION, and FOETUS.

UTERUS *of fish*. Among the fish kinds, all those which are oviparous have no *uterus*; but on the contrary, all the viviparous fishes have this part. The whales, and all the cetaceous kinds, as also many of the cartilaginous ones, have the *uterus* very fair. It is probable that the eel kind also have it; but this is less certain, the generation of those fishes being yet somewhat obscure. The *uterus* in the cetaceous fishes is always divided into two processes or horns; but in the cartilaginous ones it is divided into two glandulous bodies, which are pervious, and, according to the opinion of Needham, discharge a whitish liquor into the womb, and are of great use in gravidation.

UTERI, *cornua*, are also called HORNS of the WOMB.

UTERI, *fundus*. See FUNDUS.

UTERI, *hydrops*. See DROPSY.

UTERI, *procidentia* and *retroversio*. See the articles.

UTERI, *vagina* or *cervix*. See those articles.

UTFANGTHEF, in our old *Law-Books*. See OUTFANTHEFE.

UTILE, a Latin term, signifying profitable, or useful; sometimes used, by English authors, in the same sense.

The *utile* and the *dulce*, profit and delight, are both to be aimed at in poetry; but it is disputed, which of them is to be aimed at in the first place. Corneille says, expresly, *Dans la tragedie l'utile n'entre que sous la forme du delectable.*

In the language of the philosophers, there is nothing *utile*, but what is just and honest: *nihil bonum, nisi honestum: nihil malum, nisi turpe.* Cic. de Fin. lib. ii.

UTILE *dominium*. See DOMINIUM.

UTLAGARIÆ *perdonatio*. See PERDONATIO.

UTLAGATIO, in *Law-Terms*, an OUTLAWRY.

UTLAGATO *capiendo, quando utlagatur in una comitatu, & postea fugit in alium*, a writ for apprehending a man who is outlawed in one county, and flies into another. See OUTLAWRY.

UTLAGATUM *capias*. See CAPIAS.

UTLAGH, UTHLAGHUS. See OUTLAW.

UTLAND, *Outland*, is opposed to INLAND.

UTLARY, or UTLAWRY, UTLAGARIA. See OUTLAWRY.

UTRAQUISTÆ, in *Church History*, an appellation given by way of reproach, to those in Bohemia who communicate under both species, bread and wine.

UTRICULARIA, in *Botany*, the name of a plant used by Linnæus for what other authors have called *lentibularia*, or hooded water-milfoil. This, in his system of botany, is also a distinct genus of plants, of the *diandria monogynia* class; the characters of which are, that the cup is a two-leaved perianthium; its leaves being very small, of an oval figure, hollow, and falling with the flower; the flower is labiated, and consists of one petal; the upper lip is plain, obtuse and erect; the lower is large, plain, and undivided: between the two there is a heart-fashioned palate, standing a little out; the nectarium is corniculated, is shorter than the petal, and is produced from its base. The stamina are two short and crooked filaments; the antheræ are small, and cohere together; the pistillum has a round germen, a thread-like style of the length of the cup, and a conic stigma. The fruit is a large conic capsule, containing only one cavity: the seeds are very numerous. There are eight species.

UTRICULI *foliorum*, a name given by the writers on the anatomy of plants to a number of small and fine vessels, which fill up the interstices between the several ramifications of the surculi, or minutest divisions of the branches of the middle rib.

These are to be examined by good microscopes, in order to obtain any idea of their structure. This is found to be composed of a reticular plexus of fine white and flat filaments, whose interstices are again filled up with other smaller *utriculi*; so that nature seems but forming new bodies, by making congeries of the same, but in a more minute state. When the largest of these are opened by a fine instrument, they are found to consist only of a white skin, containing a greenish matter, composed of particles so fine, that the best glasses are used in vain to distinguish their figure.

Accident sometimes offers what all the art in the world would attempt in vain; and the leaves of trees, whose cuticle has been eat off on one side by small insects, sometimes afford views of these *utriculi*, which no art could have laid open in so nice a manner, or in such various views. Act. Erudit. Ann. 1722. p. 28.

UTRUM, *Juris* UTRUM. See JURIS, ASSISE, &c.

UTTER *barrister*. See BARRISTER.

UVA, *grape*. See GRAPE.

UVA *gruina*, in the *Materia Medica*, the name of the fruit of the great American *vitis idæa*, or crane-berries.

UVA *lupina*, *wolf-berries*, in *Botany*, a name given by some authors to the common water-elder, and by others to the *herba Paris*, or herb true-love.

UVA *marina*, in *Botany*, the name given by many authors to the *ephedra*, the sea-grape, or shrub sea-horse-tail.

UVA *quercus*, in *Natural History*, a name given to certain accidental productions of the oak, a tree famous for producing many such, besides its common fruit: the best account we have of this in particular, is from Mr. Marchant. He observed a vast quantity of this production upon an oak of about twelve feet high; this tree had no acorns, but there hung from almost all the branches a great number of greyish threads, of two inches or more in length, and of a silky flexible matter; to several parts of these there were fixed certain round berries, sometimes two or three, sometimes ten or twelve on a thread; these were of the size of a half-ripe red gooseberry, but they had no umbilicus, nor any appearance of fibres; they were hard and not hollow, but filled with a cottony matter, very closely compacted. The threads on which these berries were produced all grew out of the alæ of the leaves, in the very places where the buds of the rudiments of young branches should have come; and over these filaments there were often a few small leaves, of the regular shape of the oak-leaf.

It is generally asserted, that there are eggs of insects lodged in all these extraordinary productions of the oak, which are supposed to be produced by a wrong derivation of the juices, occasioned by the puncture of the fly which leaves those eggs; but the most accurate search could not discover the least appearance of any animal remains in any part of these productions, neither in the berries, nor in the threads that support them.

There is another species of this remarkable production, differing from the former, by not having the long threads on which the berries of that are supported; this, however, has been confounded by the generality of naturalists under the same name, and of this Mr. Marchant has given an equally accurate description. In the month of October he observed a young oak of about six feet high, in a coppice-wood, in a very flourishing condition, very full of branches and leaves, but without fruit. The young branches of this oak were loaded with clusters of red berries, of the shape and size of common red gooseberries; they stood principally at or near the extremities of the branches, and were of a very polished and shining surface, and of a spongy and tender substance. They stood in clusters of three, four, and five together, and each grew immediately to the branch, without any pedicle; they had some appearance of fibres, but not the least mark of an umbilicus, as in the regular fruits. On opening these berries, they were found full of a mucilaginous and viscous juice, of a red colour, tolerably fluid, and having some fibres intermingled with it; the taste of this juice was acrid, and its smell disagreeable, and like that of rotten wood; but there appeared not in these, any more than in the other species, any the least appearance of any thing belonging to an animal, no egg, no worm, no fly, nor indeed any foreign body of any sort whatever.

These berries, though so large and succulent, are but of a very short duration, for Mr. Marchant going three days after he had seen them in the greatest perfection, to gather some of them, with intent to try their juice on different liquors, found they were all become flaccid and withered; and returning again three days after this, they were so entirely perished and gone, that there remained only a few vestiges of thin skins on the places where they had been fixed to the tree, and some few fallen ones among the bushes, that grew under the tree; and upon inquiring of the people who lived thereabout, to know whether these berries were a regular annual production of the tree, they told him that they never remembered to have seen any thing of the kind before.

It may not be easy perhaps to account regularly for these fortuitous productions, for they seem merely of the nature of monsters among animals, and it may be allowed no improbable conjecture in regard to them, that the root of these small trees having taken in more nourishment than they should circulate, when it came to lead the tender extremities of the young branches, may have made its way through their laxer texture, and being retained yet in some of their membranes, may have swelled out more and more, by the addition of fresh matter, and finally have been matured by the sun's heat into these seemingly regular productions. Mem. Acad. Par. 1692.

UVA *ursi*, in *Botany*, the name of a species of ARBUTUS, with trailing stalks and entire leaves, called in English *bear's whortleberry*. This plant is found on the snowy hills of Austria and Styria, but more plentifully on the Swedish hills: it is also a native of the highlands of Scotland, and is now cultivated in some of our gardens. The leaves of this plant have a bitterish astringent taste, without any remarkable smell. Infusions of them in water strike a deep black colour with solution of chalybeate vitriol, but soon deposit the black matter, and become clear. For their use in dying, see DYING *of Cloths*, &c.

The leaves of *uva ursi* have of late been greatly celebrated in calculous and nephritic complaints, and other disorders of the urinary organs; the dose is half a dram of the powder of the leaves every morning, or two or three times a day. See STONE.

De Haen relates, after large experience of this medicine in the hospital of Vienna, that suppurations, though obstinate and of long continuance, in the kidneys, ureters, bladder, urethra, scrotum, and perinæum, without any venereal taint or evident marks of a calculus, were in general completely cured by it; that of those who had a manifest calculus, several found permanent relief, so that, long after the medicine had been left off, they continued free from pain or inconvenience in making water, though the catheter shewed that the calculus still remained; that others, who seemed to be cured, relapsed on leaving off the medicine, and were again successively relieved on repeating the use of it; while others obtained only temporary and precarious relief. In several cases, paregorics were joined to the *uva ursi*, and other mild astringents have been recommended for the same intentions.

Dr. Lewis observes, that the trials of the *uva ursi*, made in this country, have by no means answered expectation: in all cases within his knowledge, it produced great sickness and uneasiness, without any apparent benefit, though continued for a month. Mat. Med.

UVA *vulpis*, a name given by some authors to the common nightshade.

UVARIA, in *Botany*, a genus of the *polyandria polygynia* class. Its characters are these: the calyx has three leaves, the flower has six petals, and the berries are numerous, pendulous, and contain four seeds. There are two species.

VUBARANA, in *Ichthyology*, the name of an harengiform fish, caught in the American seas.

It resembles in figure our river trout. Its body is very nearly

nearly of the ſame thickneſs all the way, but is elevated a little on the back, and ſomewhat ſlender juſt near the tail. It grows to a foot in length, and to ſix inches in thickneſs. It is a very well taſted fiſh, and is generally dreſſed with the ſcales on, they being not offenſive in eating. Marggrave's Hiſtory of Braſil.

UVEA, in *Anatomy*, *aciniformis tunica*, the third tunic, or membrane, of the eye.

It is called *uvea*, on account of its reſembling the figure and colour of a grape, called, by the Latins, *uva*. For which reaſon, alſo, ſome have given it the name of *aciniformis*, from *acinus*.

The hind-part of this coat, or that next the orbit of the eye, on each ſide, is called the *choroides*; and is derived from the *pia mater*.

The anterior or fore-part is, like the former, tranſparent, but thinner; and is, by authors, reckoned as a different tunic, and called *uvea*.

Of the duplicature of this part, is formed that ſtriped, variegated circle, called the *iris* of the eye.

And in its middle is a perforation, through which appears a little black ſpeck, which is the ſight, or PUPIL, of the eye; and about which the iris forms a ring.

From the inſide of this membrane ſpring certain fibres, which ſpread themſelves round the cryſtalline humour; ſerving to contract or dilate the ſight, at pleaſure.

Mr. Ferren demonſtrated to the Academy of Sciences at Paris, the lymphatic veſſels of the *uvea* of the human eye. Hiſt. de l'Acad. de Sciences, 1738.

The production of the *uvea* forms the *membrana pupillaris*, which cloſes the pupil in the fœtus. This membrane was diſcovered by the perſon whom Dr. Hunter (Med. Com. part i. p. 63) calls Dr. F——s S——s, and alſo by M. Wachendorf, Haller, and Albinus, in 1731. Haller (Opuſcula, p. 342) ſays, that the time when this membrane diſappears is uncertain, but he is confident that it is never found in a full-grown fœtus.

VULCAN, in *Mythology*, the ſon of Jupiter and Juno, who, on account of his deformity, was caſt down from heaven into the iſland Lemnos, and breaking his leg with the fall, is always repreſented as lame. At Lemnos, he ſet up the trade of a ſmith, and taught the Lemnians, in recompence of the ſuccours they afforded him, the manifold uſes of fire and iron: he is alſo repreſented as the manufacturer of Jupiter's thunder, and the arms of the other gods. The poets deſcribe him as blackened and hardened from the forge; with a face red and fiery, whilſt at his work; and tired and heated after it.

This poor God is almoſt always the ſubject, either of pity or of ridicule. He is the great cuckold of heaven; and his lameneſs ſerves to divert the gods. The great celeſtial deities ſeem to have admitted *Vulcan* among them merely to make them laugh, and to be the butt of the whole company. Spence's Polymetis, p. 81.

Cicero mentions three other *Vulcans*; one the ſon of Cœlum, the ſecond the ſon of the Nile, and the other the ſon of Menalius, who inhabited the Vulcanian iſles.

VULCANALIA, among the *Romans*, a feſtival in honour of Vulcan, which was kept from the twenty-third to the twenty-ninth of Auguſt. On this occaſion the people uſed to throw animals into the fire.

VULGAGO, a name given by ſome botanical authors to the aſarum or aſarabacca, whoſe leaves and root are uſed in medicine.

VULGAR *arithmetic*, *fractions*, and *purgation*. See the ſubſtantives.

VULGATE, a very ancient Latin tranſlation of the Bible; and the only one the church of Rome acknowledges to be authentic.

The ancient *Vulgate* of the Old Teſtament was tranſlated, almoſt word for word, from the Greek of the Septuagint. The author of the verſion is not known, nor ſo much as gueſſed at.

It was a long time known by the name of the *Italic*, or old verſion; as being of very great antiquity in the Latin church. It was the common, or vulgar verſion, before St. Jerom made a new one; whence it has its name *Vulgate*.

Nobilius, in 1588, and F. Morin, in 1628, gave new editions of it; pretending to have reſtored, and re-collated it, from the ancients who had cited it. The *Vulgate* was held, by St. Auguſtine, to be preferable to all the other Latin verſions then extant; as rendering the words and ſenſe of the ſacred text more cloſely and juſtly than any of the reſt. It has ſince been retouched from the correction of St. Jerom; and it is this mixture of the ancient Italic verſion, and ſome corrections of St. Jerom, that is now called the *Vulgate*, and which the council of Trent has declared to be authentic.

It is this *Vulgate* alone that is uſed in the Romiſh church, excepting for ſome paſſages of the ancient *Vulgate* left in the miſſal, and the pſalms; which are ſtill ſung according to the old Italic verſion.

The two principal popiſh editions of the *Vulgate* are theſe of popes Sixtus the Vth, and Clement the VIIIth. The former was printed in 1590, after pope Sixtus had collected the moſt ancient MSS. and beſt printed copies, ſummoned the moſt learned men out of all the nations of the Chriſtian world, aſſembled a congregation of cardinals for their aſſiſtance and counſel, and preſided over the whole himſelf. This edition was declared to be corrected in the very beſt manner poſſible, and publiſhed with a tremendous excommunication of every perſon, who ſhould preſume ever afterwards to alter the leaſt particle of the edition thus authentically promulged by his holineſs, ſitting in that chair, *in qua Petri vivit poteſtas, et excellit auctoritas*. The other edition was publiſhed in 1592, by pope Clement the VIIIth; which was ſo different from that of Sixtus, as to contain two thouſand variations, ſome of whole verſes, and many others clearly and deſignedly contradictory in ſenſe: and yet this edition is alſo pronounced authentic, and enforced by the ſame ſentence of excommunication with the former. See Kennicott's State of the printed Hebrew Text, &c. vol. ii. p. 198, &c.

VULGATE *of the New Teſtament*. This the Romaniſts generally hold preferable to the common Greek text, becauſe it is this alone, and not the Greek text, that the council of Trent has declared authentic: accordingly that church has, as it were, adopted this edition, and the prieſts read no other at the altar, the preachers quote no other in the pulpit, nor the divines in the ſchools.

Yet ſome of their beſt authors, F. Bouhours, for inſtance, own, that among the differences that are found between the common Greek, and the *Vulgate*, there are ſome wherein the Greek reading appears more clear and natural than that of the Latin; ſo that the ſecond might be corrected from the firſt, if the holy ſee ſhould think fit. But thoſe differences, for the generality, only conſiſt in a few ſyllables, or words: they rarely touch the ſenſe. Beſides, in ſome of the moſt conſiderable, the *Vulgate* is authorized by ſeveral ancient manuſcripts. Bouhours ſpent the laſt years of his life, in giving a French tranſlation of the New Teſtament, according to the *Vulgate*. In 1675, a new edition of the Greek Teſtament was publiſhed by the univerſity of Oxford; and great care taken therein, to compare the common Greek text with all the moſt ancient manuſcripts in England, France, Spain, and Italy; and to note the differences obſerved therein.

In the preface of this work, the editors, ſpeaking of the divers verſions of the Bible in the vulgar tongues, obſerve of the *Vulgate*, that there is no verſion of any language to be compared with it. And this they juſtify, by comparing paſſages that occur in the moſt celebrated Greek manuſcripts, with the ſame paſſages in the *Vulgate*, where there is any difference between that, and the common printed Greek copy. In effect, it is probable, that at the time the ancient Italic, or *Vulgate* verſion of the New Teſtament was made, and at the time it was afterwards compared with the Greek manuſcripts, by St. Jerom; as they were then nearer the times of the apoſtles, they had juſter Greek copies, and thoſe better kept, than any of thoſe uſed when printing was firſt ſet on foot.

M. Simon calls the Greek verſion of the Septuagint, before it was reviſed and reformed by Origen, *The ancient* Vulgate *Greek*. Origen's correction was preferred to the ancient Greek, which was conſequently diſuſed; ſo that we have now ſcarce any copies thereof. See SEPTUAGINT.

VULNERARIA, in *Botany*. See LADY's *finger*.

VULNERARY, formed from *vulnus*, *wound*, in *Medicine*, an epithet given to remedies, proper for the cure of wounds and ulcers.

There are divers *vulnerary* herbs; as ariſtolochia, or birth-wort; ſanicle, or ſelf-heal; plaintain, mouſe-ear, veronica, or fluellin; agrimony, vervain, or the holy herb, &c.

There are alſo *vulnerary* potions, compoſed of various ſimples. *Vulnerary* balſams, unguents, plaſters, &c. See BALSAM, &c.

VULNERARY *water*. See WATER.

VULPANSER, in *Ornithology*, a name given by ſome authors to the ſhell drake, or borrow-duck, a very beautiful ſpecies of duck, common on ſome of our coaſts, and called by the generality of authors TADORNA.

VULPECULA, in *Ichthyology*, a name given by Bellonius and Geſner to the fiſh called by the generality of authors CENTRINE.

VULPECULA *et* ANSER, *Fox and Gooſe*, in *Aſtronomy*, a conſtellation made out of unformed ſtars by Hevelius, in which he reckons twenty-ſeven ſtars; but Flamſteed enumerates thirty-five; the longitude, latitude, &c. of which are as follow:

Names and Situation of the Stars.	Bayer's Char.	Signs.	Longitud. °	′	″	Latitude. N. °	′	″	Magnitude.
In the right wing of the goose		♑	20	20	24	43	15	10	5
			21	47	10	44	49	26	6
In the corner of the southern wing			23	47	36	47	46	35	6
In the head of the goose			22	47	43	41	16	27	6
Under the right wing of the goose			23	7	12	41	32	43	6
5.									
In the nose of the fox, before the beak of the swan			25	12	34	45	54	20	4
			24	7	59	41	34	28	5
			25	25	49	46	28	37	6
			25	35	50	40	49	26	6
In the head, at the eye of the fox		♒	0	18	38	46	10	32	6
10.									
			2	41	40	47	28	3	
In the right fore foot of the fox			1	28	49	42	41	50	5
First in the neck			2	43	29	43	58	26	6
			4	7	19	42	40	56	5
Over the back			6	31	37	47	1	43	4.5
15.									
At the left fore foot			5	39	1	44	15	50	5
First at the left shoulder			6	36	40	42	41	12	4.5
			9	3	51	45	34	54	6.5
			9	24	14	45	24	28	6
			9	19	24	45	4	48	5.6
20.									
			10	59	28	47	2	8	5.6
Second at the left shoulder			9	7	46	42	0	27	5
Second of the informes over the back			11	3	12	46	5	20	4.5
First in the side			9	58	47	43	1	53	5
Second in the side			11	26	23	42	26	36	6
25.									
In the hip-bone			16	10	44	2	45	11	6
			16	42	41	43	13	32	5
			16	4	26	40	54	10	6
In the left hind foot			14	56	59	38	7	7	5
In the thigh			18	22	34	41	30	54	6
30.									
South at the root of the tail	r		21	18	12	42	37	9	6
First of the tail, or north at the root	q		22	28	29	43	18	42	5
In the right hind foot			20	45	4	37	39	42	6
			24	51	36	37	59	50	6
Last of the tail		♓	1	14	9	40	0	20	6
35.									

VULPES, in *Zoology*. See Fox.

Vulpes *marina*, in *Ichthyology*. See *Sea*-Fox.

VULPINALIA, among the *Romans*, a feast celebrated on the nineteeth of April, in which they burnt foxes.

VULTUR, Vulture, in *Ornithology*, the name of a genus of birds of the hawk kind: the characters of which are, that the bill is straight, and hooked only at the end; the head has no feathers, and at the base of the bill is covered with a naked skin, and the tongue is bifid. Of this genus Linnæus enumerates eight species, viz. the *gryphus* or condore, the *harpyia* or *crested* eagle, the *papa king of vultures*, or *cozcaquauhtli*, the *monachus*, black crested or Arabic *vulture*, the *aura* or *urubu* of Brasil, the bearded, golden or Bætic *vulture* of Egypt, the *percnopterus*, or sacred *vulture* of Egypt, and *albiulla* or pygargus.

There are no *vultures* in Great Britain, nor any north of the Baltic: but the various species are found in the southern parts of Europe, Asia, Africa, and America, as low as Terra del Fuego. They are a sluggish ungenerous race, preying oftener on dead animals, and even on putrid carcases, than on living creatures: their sense of smelling is most exquisite: they collect in flocks from great distances; and are directed to their prey by the sagacity of their nostrils: they fly slowly and heavily; are very greedy and voracious to a proverb; and they are bold and fearless, preying in the midst of cities, undaunted by mankind. Pennant's Genera of Birds, p. 2. See *Tab.* V. *Birds*, N° 59.

VULTURIUS, among the *Romans*, a throw of the *tali*, otherwise called *canis*. See Talarius *ludus*.

Vulturius *lapis*, a name given by many to the stone called quandros.

VULTURNALIA. See Volturnalia.

VULTUS *de Luca*, the same with veronica.

VULVA, *quasi valvæ*, *doors*, a name which some physicians give to the vagina, and others to the uterus, or womb.

Vulva is sometimes also used for the cunnus, or whole pudendum muliebre.

VUNENA, a name given by the people of Guinea to a kind of catch-fly, or lychnis, common in that part of the world, and much used by them in a decoction to cure swellings of the legs. Petiver has called it *lychnis Guineensis fructu caryophylloide foliis roris marini, hirsutis, angustioribus*. Phil. Trans. N° 232.

UVULA, in *Anatomy*, a round, soft spongeous body, like the end of a child's finger; suspended from the palate, near the foramina of the nostrils, perpendicularly over the glottis.

Its use is, to break the force of the cold air, and prevent its entering too precipitately into the lungs.

It is formed of a duplicature of the membrane of the palate; and it is called by some authors, *columella*, and, by others, *gurgulio*. It is moved by two pair of muscles, and suspended by as many ligaments. The muscles are, the *external*, called the sphenostaphylinus, which draws the *uvula* upwards and backwards; and hinders the masticated aliment from passing into the foramina of the nostrils in deglutition: and the *internal*, called the pterygostaphylinus: which draws the *uvula* upwards and forwards.

Both these muscles move the *uvulu* upwards, to give room for swallowing; and serve to raise it, when relaxed, and fallen down. In which case, it is usual to promote its rising, by applying a little beaten pepper on the end of a spoon, or some other warm aromatic powder to it.

Bartholin says, that such as have no *uvula* are subject to the phthisic, and usually die thereof; because the cold air, entering the lungs too hastily, soon injures them. See Phthisis.

The cutting out of the *uvula*, when swelled and hanging down, is commonly practised in Scotland, and no other remedy applied than a piece of bread and cheese. The surgeon, who is some neighbouring peasant, uses also no other instrument than his knife; and yet all succeeds very well.

Uvulæ *prolapsus, vel procidentia*. See Prolapsus.

UVULARIA, in *Botany*, a genus of the *hexandria monogynia* class. Its characters are these: the flower has no empalement; it has oblong, erect, spear-shaped petals, and six awl-shaped stamina terminated by oblong, erect, four-cornered summits; it has an oblong, obtuse, three-cornered germen, supporting a style longer than the stamina, crowned by a triple, obtuse, spreading stigma: the germen afterwards turns to an oblong obtuse capsule, with three lobes, and as many cells, filled with flat orbicular seeds ranged in a double order. Miller reckons two, and Linnæus three species.

Uvularia, in the *Materia Medica*, the name given by authors to the plant called *hypoglossum*, or double-tongue.

UXOR, in the *Language of the Chemists*, the mercury of metals. This is the wife they say, and sulphur is the husband. See Maritus.

UXORIUM, in *Antiquity*, a fine, or forfeit, paid by the Romans for not marrying.

UZIFIR, Uzufar, or Uzifur, in *Chemistry*, a name which some authors give to cinnabar.

W.

W, A letter peculiar to the northern languages and people; as the Engliſh, Dutch, Poliſh, and others of Teutonic and Sclavonic original.

The form and the ſound of *w* are excluded from all the languages derived from the Latin; though it is not improbable, ſays Dr. Johnſon, that by our *w* is expreſſed the ſound of the Roman *v*, and Eolic *f*. However, the *w* is ſometimes admitted into the French, Italian, &c. in proper names, and other terms borrowed from the languages in which it is originally uſed.

In Engliſh, the *w* is uſually a conſonant; and as ſuch, may go before all the vowels, except *u*; as in *want*, *weapon*, *winter*, *world*, &c.

It is ſometimes alſo a vowel; and, as ſuch, follows any of the vowels *a*, *e*, *o*; and unites with them into a kind of double vowel, or diphthong; as in *law*, *ewe*, *ſow*, &c. The Engliſh *w* is ſounded as in Latin *u*, in *quantum*, *ſuadeo*, *lingua*. Its ſound is alſo commonly like the groſs, or full *u*, rapidly pronounced. In French, the ſound of the *w* does not differ from that of the ſingle *u*, or rather *ou*. See U.

WACHENDORFIA, in *Botany*, a genus of the *triandria monogynia* claſs. Its characters are theſe: the flowers have oblong, acute-pointed ſheaths, which are ranged alternately upon the ſtalks at a diſtance from each other; they are permanent and wither, encloſing the capſule; the flower has ſix oblong petals; three of the upper ſpread open, and are erect, and joined at their tails; the two ſide petals ſpread each way, and the lower is the keel, which is ſometimes wanting; it has a protuberant nectarium, placed outward on each ſide of the upper petal, and three awl-ſhaped declining ſtamina, which are ſhorter than the petals, and reſt upon the under one, and are terminated by oblong, horizontal ſummits, which join; it has an oval, blunt, three-cornered germen, ſituated within the petals, ſupporting a ſingle awl-ſhaped ſtyle, which always bends to the right, crowned by a ſingle ſtigma; the germen turns to an almoſt oval, three-cornered, hairy capſule, having three cells, containing three oval ſeeds, faſtened to the placenta, which is in the centre. There are two ſpecies.

WADD, or WADDING, in *Gunnery*, a ſtopple of paper, hay, ſtraw, old rope-yarns, or tow, rolled firmly into the form of a ball, and forced into a gun upon the powder, to keep it cloſe in the chamber; or put up cloſe to the ſhot, to keep it from rolling out, as well as to prevent the powder, when fired, from dilating round the ſides of the ball, by its windage, as it paſſes through the chace, which would conſiderably diminiſh the effort of the powder. From ſome experiments recited in the Military Dictionary, it is inferred, that the judicious ramming of a little *wadding* over the powder, adds about one-fourth part of the whole effect.

WADD-*hook*. See WORM.

WADD-*mill* is a hollow form of wood, to make the *wadds* of a proper ſize.

WADD, *black*, in *Natural Hiſtory*, a name given by the miners of Derbyſhire to the *ochra friabilis negro-fuſca* of Da Coſta, which he deſcribes as a very light, friable, and exceeding fine ochre, which conſiſts of parts extremely ſmall, ſubtile, and even impalpable; of a looſe regular texture, and of a very deep blackiſh, or dark brown colour; it is often variouſly blended with veins of a yellow ochre, and thick ſet with glittering, ſparry particles; its ſurface is even, though very duſty, and it much colours the hands; it adheres firmly to the tongue, melts pretty freely in the mouth, and raiſes a moderately ſtrong ebullition in water, but does not readily break into powder; in the fire it acquires a great hardneſs, and a deep bluiſh black colour. It is found in ſeveral lead-mines, and both with water and oil it makes a very fine colour; and is now employed in conſiderable quantities, and to great advantage, as an oil colour, in ſhip and houſe-painting. In 1751 and 1752 this ſubſtance was found, by ſeveral repeated experiments, to take fire, upon being ſlightly mixed with linſeed-oil; its inflammable property, when mixed with oil, was re-examined in 1782; and Mr. Wedgwood has lately made ſeveral experiments, with a view of analyſing this ſubſtance; from which it appears, that twenty-two parts of this mineral contain nearly two of indiſſoluble earth, chiefly micaceous, one of lead, about nine and a half of iron, and the ſame quantity of mangañeſe; that it ſhould not be claſſed among the ochres not acted upon by acids; and may, with as great propriety, be called mangañeſe as ochre. When this mineral was previouſly calcined with a ſlight red heat about half an hour, the mixture of it with linſeed-oil dried much ſooner and harder; and this is a circumſtance which may render it particularly valuable to the painter. Da Coſta's Hiſt. Foſſ. p. 102. Phil. Tranſ. vol. lxxiii. part ii. p. 284, &c.

If half a pound of this ſubſtance, or ore of mangañeſe, be dried before a fire, and afterwards ſuffered to cool for about an hour, and then two ounces of linſeed-oil be gradually poured in it, mixing them looſely like yeaſt with flour, little clots will be formed, and in ſomewhat more than half an hour the whole will gradually become hot, and at laſt burſt into a flame: the heat of the room, in the houſe of ſir Joſeph Banks, where this experiment was repeatedly made, was about 50; and the heat to which the ore was expoſed while drying, might be about 130. Kirwan's Elem. of Min. p. 352.

WAFE. See WAIF.

WAFERS for ſealing letters are made by mixing fine flour with glair of eggs, iſinglaſs, and a little yeaſt, and beating the maſs into a paſte; then ſpreading it, when thinned with gum-water, on even tin-plates, and drying it in a ſtove, and cutting it for uſe. The different colours may be given by tinging the paſte with brazil or vermilion for red; indigo, or verditer, &c. for blue; ſaffron, turmeric, or gamboge, &c. for yellow, &c.

WAFT, in *Sea Language*, a ſignal diſplayed from the ſtern of a ſhip for ſome particular purpoſe, by hoiſting the enſign, furled up together into a long roll, to the head of its ſtaff. It is particularly uſed to ſummon the boats off from the ſhore to the ſhip whereto they belong; or as a ſignal for a pilot to repair aboard. Falconer.

To waft a ſhip, is to convoy her ſafe, as men of war do by merchants ſhips.

WAFTERS, *waftores*, conductors of veſſels at ſea.

King Edward IV. conſtituted a triumvirate of officers with naval power, whom the patent ſtyles *cuſtodes*, *conductores*, and *waftores*; their buſineſs chiefly was to guard our fiſhermen on the coaſts of Norfolk and Suffolk.

WAGA, or VAGA. See WEIGH.

WAGA, in *Botany*, H. M. a ſiliquous Indian tree, with a tetrapetalous ſtellated flower, and flat pods, three inches in length. It is very like the intſia, but without ſpines, and climbs about high trees. The pods are two inches in breadth, thin, and very flat; when dried, of a reddiſh colour, and have a cortex of a ſnow-white colour on the inſide. The beans are aſtringent, bitter, round, and ſmooth, a little flattiſh, lying in a tranſverſe poſition with reſpect to the pod, and of a green, inclining to a cheſnut colour. It is evergreen, and grows in Malabar.

The juice of this tree, together with lemons and green turmeric, boiled for a conſiderable time in cocoa-nut oil, is a good ointment for the leproſy, and of great uſe in inveterate ulcers. Raii Hiſt. Plant. 1766.

WAGER, *waging*, in *Law*, *vadari*, ſignifies the giving of ſecurity for the performance of any thing.

Thus, to *wage* law, is to put in ſecurity, that you will make law at the day aſſigned, i. e. take the benefit which the law has allowed you.

Our anceſtors conſidered, that there were many caſes in which an innocent man, of good credit, might be overborne by a multitude of falſe witneſſes; and, therefore,

eſtabliſhed

established this species of trial, by the oath of the defendant himself. This method of trial is not only to be found in the codes of almost all the northern nations that broke in upon the Roman empire, and established petty kingdoms upon its ruins, but its original may be traced back as far as the Mosaical law. Exod. xxii. 10. A manifest resemblance may also be discerned between this species of trial, and the *canonical* PURGATION of the popish clergy, when accused of any capital crime. Similar to this is also the SACRAMENTUM *decisionis* of the civil law. But, though a custom somewhat like this prevailed formerly in the city of London, yet in general the English law does not thus, like the civil, reduce the defendant, in case he is in the wrong, to the dilemma of either confession or perjury.

The manner of *waging* and making law is this. He that has waged, or given security, to make his law, brings with him into court eleven of his neighbours; a custom which is particularly described so early as the league between Alfred and Guthrun the Dane. The defendant then, standing at the end of the bar, is admonished by the judges of the nature and danger of a false oath; and if he still persists, he is to repeat this or the like oath: "Hear this, ye justices, that I do not owe unto Richard "Jones the sum of ten pounds, nor any penny thereof, "in manner and form as the said R. hath declared "against me. So help me God." And thereupon his eleven neighbours, or COMPURGATORS, shall avow upon their oaths, that they believe in their consciences that he says the truth; so that himself must be sworn *de fidelitate*, and the eleven *de credulitate*. Some have maintained, that fewer than eleven compurgators will suffice; but sir Edward Coke is positive, that there must be this number; and his opinion is approved and supported by judge Blackstone, who observes, that as *wager* of law is equivalent to a verdict in the defendant's favour, it ought to be established by the same or equal testimony, namely, by the oath of twelve men.

In the old Swedish or Gothic constitution, *wager* of law was not only permitted, as it still is in criminal cases, unless the fact be extremely clear against the prisoner, but was also absolutely required, in many civil cases. But with us in England *wager* of law is never required; and is then only admitted, where an action is brought upon such matters as may be supposed to be privately transacted between the parties, and wherein the defendant may be presumed to have made satisfaction without being able to prove it; as in actions of debt upon simple contract, or for an amercement in actions of detinue and of account, where the debt may have been paid, the goods restored, or the account balanced, without any evidence of either; and not, when there is any specialty, as a bond or deed, to charge the defendant, but when the debt groweth by word only. Nor doth it lie in an action of debt, for arrears of an account, settled by auditors in a former action. By such *wager* of law, when admitted, the plaintiff is perpetually barred; for the law, in the simplicity of ancient times, presumed, that no one would forswear himself, for any worldly consideration. *Wager* of law, however, lieth in a real action, where the tenant alleges he was not legally summoned to appear, as well as in mere personal contracts. A man outlawed, attainted for false verdict, or for conspiracy or perjury, or otherwise become infamous, shall not be permitted to *wage* his law. Neither shall an infant under the age of twenty-one, for he cannot be admitted to his oath; nor shall the defendant, where the plaintiff is an infant, *wage* his law. But a feme-covert, when joined with her husband, may be allowed to *wage* her law; and an alien shall do it in his own language. It is, moreover, a rule, that where a man is compellable by law to do any thing, whereby he becomes creditor to another, the defendant in that case shall not be admitted to *wage* his law; for then it would be in the power of any bad man to run in debt first, against the inclinations of his creditor, and afterwards to swear it away. But where the plaintiff hath given voluntary credit to the defendant, there he may *wage* his law. In no case where a contempt, trespass, deceit, or any injury with force is alleged against the defendant, is he permitted to *wage* his law. Executors and administrators, when charged for the debt of the deceased, shall not be admitted to *wage* their law. The king also has his prerogative; for, as all *wagers* of law import a reflection on the plaintiff for dishonesty, therefore there shall be no such *wager* on actions brought by him; and this prerogative extends and is communicated to his debtor and accomptant; for, on a writ of *quo minus* in the exchequer for a debt on simple contract, the defendant is not allowed to *wage* his law.

Notwithstanding all the restrictions to which *wagers* of law were subject, it was at length considered, that it threw too great a temptation in the way of indigent or profligate men; and therefore by degrees new remedies were devised, and new forms of action were introduced, wherein no defendant is at liberty to *wage* his law; so that *wager* of law is quite out of use, being avoided by the mode of bringing the action; but still it is not out of force. And, therefore, when a new statute inflicts a penalty, *and gives an action of debt for recovering it*, it is usual to add, in which no *wager* of law shall be allowed: otherwise a hardy delinquent might escape any penalty of the law, by swearing he had never incurred, or else had discharged it. Blackst. Comm. book iii. p. 341, &c.

WAGER *of battle*. See BATTLE and DUEL, &c.

WAGGEL, in *Ornithology*, a name given by the people of Cornwall to the species of *larus*, or sea-gull, known among authors by the name of MARTINAZZO.

WAGGON, a kind of vehicle, or carriage, in common use. There are divers forms of *waggons*, accommodated to the divers uses they are intended for. The common *waggon* consists of the *shafts*, or *rods*, which are the two pieces the hind horse bears up; the *welds*; the *slotes*, which are the cross pieces that hold the shafts together; the *bolster*, being that part on which the fore-wheels and axle-tree turn, in wheeling the *waggon* across the road; the *chest*, or body of the *waggon*, having the staves or rails fixed thereon; the *bales*, or hoops, which compose the top; the *tilt*, the cloth thrown over the hoops; besides the *wheels*, *axle-tree*, &c. See WHEELS *of coaches*, &c.

By 23 Geo. III. cap. 66. there is a yearly duty on *waggons*, wains, and carts, with three or four wheels, of 4*s*. each, and upon those with two wheels, of 2*s*. each. But no person is obliged to pay the yearly sum of 4*s*. for more than one carriage employed in agriculture, nor for more than three, otherwise employed, and not used to hire; nor 2*s*. for any cart, employed in agriculture only, and not let out for hire. Entry and payment of the duty are enjoined under a penalty of 5*l*. for every default.

WAGGON, *ammunition*, in *Military Language*, is a *waggon* used in carrying all kinds of stores, and also bread; for which purpose it is lined on the inside with basket-work.

WAGGON-*master-general*, in the *Military Art*, is he who has the ordering and marching of the baggage of the army. On a day of march he meets the baggage at the place appointed in the orders, and marshals it according to the rank of the brigade or regiment each *waggon* belongs to, which is sometimes in one column, sometimes in two; sometimes after the artillery; and sometimes the baggage of each column follows their respective column.

WAGGONER, in *Astronomy*, a kind of constellation, called also CHARLES'S *Wain*.

WAGGONER is also used for a routier, or book of charts, describing the seas, their coasts, &c.

WAGTAIL, *motacilla*, in *Ornithology*, a genus of *passeres*; the characters of which are, that the bill is straight and awl-shaped, the mandibles are almost equal, the tongue lacerated, and has a rim or margin round it, and the nostrils ovated. Of this genus Linnæus enumerates forty-nine species: among which are the NIGHTINGALE, BLACK-*cap*, PETTY-*chaps*, RED-*breast*, RED-*start*, *hedge*-SPARROW, *lesser reed* SPARROW, STONE-*chatter*, WHEAT-*ear*, WHINCHAT, WHITE-*throat*, WREN, *golden crested* WREN, &c.

The *white wagtail*, or *motacilla alba* of Linnæus, is black on the head, back, and upper and lower side of the neck; in some the chin is white, and the throat marked with a black crescent; the breast and belly are white; the quill-feathers are dusky; the coverts black, tipt and edged with white; the tail is very long, and always in motion; the bill, inside of the mouth, and the legs, are black; the hind-claw is very long. This bird frequents the sides of ponds and small streams, and feeds on insects and worms. It shifts its quarters in the winter, moving from the north to the south of England: in spring and autumn it is a constant attendant of the plough, for the sake of the worms thrown up by it.

Yellow wagtail is the *motacilla flava* of Linnæus: the male is a bird of great beauty; the breast, belly, thighs, and vent feathers, being of a very lively yellow; the throat is marked with some large black spots; above the eye is a bright yellow line; beneath that from the bill across the eye is another of a dusky hue; and beneath the eye a third of the same colour; the colour of the head, and whole upper part of the body, is an olive green, which brightens in the coverts of the tail; the quill-feathers are dusky; the coverts of the wings olive-coloured, but the lower rows are dusky, tipt with yellowish white; the two outmost feathers of the tail half white; the others black. The colours of the female are much more obscure than those of the male; and it wants the black spots on the throat. This bird makes its nest on the ground

ground in corn-fields, and lays five eggs; it migrates in the north of England; but in Hampſhire continues the whole year.

Grey wagtail, a ſpecies deſcribed by Mr. Pennant; the top of the head, upper part of the neck and back, are aſh-coloured, ſlightly edged with yellowiſh green; the ſpace round each eye is aſh-coloured, beneath and above which is a line of white: in the male, the chin and throat are black; the feathers incumbent on the tail are yellow, and the tail is longer, in proportion to its ſize, than that of the other kinds; the two exterior feathers are white, the reſt black; the breaſt and whole underſide of the body are yellow; the quill-feathers are duſky, and thoſe next the back edged with yellow. The colours of the female are uſually more obſcure, and the black ſpot on the throat is wanting. The *wagtails* are much in motion, ſeldom perch, perpetually flirt their tails, ſcream when they fly, frequent waters, feed on inſects, and make their neſts on the ground. Pennant's Brit. Zool. vol. i. p. 361, &c.

WAIF, or WAFE, a term primarily applied to ſtolen goods, which a thief, being either purſued, or overburdened, flies, and waives or throws away in his flight.

The king's officer, or the bailiff of the lord within whoſe juriſdiction ſuch *waifs* or *waif* goods were left (having by grant, or preſcription, the franchiſe of *waif*), may ſeize the goods to his lord's uſe; except the owner come with freſh ſuit after the felon, and ſue an appeal of robbery within a year and a day, or give in evidence againſt him, and he be attainted. In which caſes, the owner ſhall have his goods again.

Waived goods do alſo not belong to the king, till ſeized by ſomebody for his uſe; for if the party robbed can ſeize them firſt, though at the diſtance of twenty years, the king ſhall never have them. If the goods are hid by the thief, or left any where by him, ſo that he had them not about him when he fled, and therefore did not throw them away in his flight; theſe alſo are not *bona waviata*, but the owner may have them again when he pleaſes. The goods of a foreign merchant, though ſtolen and thrown away in flight, ſhall never be *waifs*.

Waifs, things loſt, and eſtrays, are ſaid to be *pecus vagrans*, and are *nullius in bonis ubi non apparet dominus*. And therefore they belong to the lord of the franchiſe where they are found; who muſt cauſe them to be cried, and publiſhed in the markets and churches near about: elſe the year and day does not run to the prejudice of him that loſt them. See ESTRAY.

Though *waif* be properly ſpoken of things ſtolen, yet it may alſo be underſtood of goods not ſtolen. As, if a man be purſued with hue and cry, as a felon, and he flies, and leaves his own goods, theſe ſhall be forfeited as goods ſtolen; and they are properly called FUGITIVE *goods*.

WAIN. See CART.

WAIN. See CHARLES's *Wain*.

WAINSCOT, in *Building*, the timber-work ſerving to line the walls of a room; being uſually made in panels, and painted, to ſerve in lieu of hangings.

Even in halls, it is common to have *wainſcot* breaſt-high, by reaſon of the natural humidity of walls.

It was formerly the cuſtom to *wainſcot* rooms up to the cieling, and to terminate it by a cornice; but it is now commonly raiſed only chair high, or from two to three feet; the reſt of the wall is either covered with paper, which is often paſted on thin cloth, and fixed in frames, to prevent its being ſpoiled by the dampneſs of the wall, or elſe it is finiſhed with ſtucco. Walls ſhould be thoroughly dry before they are *wainſcoted*, and the ſtuff of which the *wainſcot* is made ſhould be dry and well ſeaſoned.

Some joiners put charcoal behind the panels of the *wainſcot*, to prevent the ſweat of ſtone and brick-walls from ungluing the joints of the panels. Others uſe wool for the ſame purpoſe. But neither the one nor the other is ſufficient for ſome houſes: the only ſure way, is by priming over the backſides of the joints with white lead, or Spaniſh brown and linſeed oil.

Wainſcoting is meaſured by the ſquare yard of nine feet; and in taking dimenſions, they uſe a ſtring, which they preſs into all the mouldings; it being a rule, that they are to be paid for all where the plain goes.

The cornice is meaſured and paid by the foot in length.

WAIST *of a ſhip* is that part which is contained between the quarter-deck and fore-caſtle, being uſually a hollow ſpace, with an aſcent of ſeveral ſteps to either of thoſe places. When the *waiſt* of a merchant-ſhip has only one or two ſteps of deſcent from the quarter-deck and fore-caſtle, ſhe is ſaid to be galley-built; but when it is conſiderably deeper, as with ſix or ſeven ſteps, ſhe is called frigate-built. Falconer.

WAIVE, in *Law*, a woman that is put out of the protection of the law. She is called *waive*, as being forſaken of the law; and not *outlaw*, as a man is; by reaſon women cannot be of the decenna, and are not ſworn in leets to the king, nor to the law, as men are; who are therefore within the law; whereas women are not, and ſo cannot be outlawed, ſince they never were within it.

In this ſenſe we meet with *waviaria mulieris*, as of the ſame import with *utlegatio viri*.

WAKE *of a ſhip*, denotes the print or track impreſſed by the courſe of a ſhip on the ſurface of the water. It is formed by the reunion of the body of water, which was ſeparated by the ſhip's bottom whilſt moving through it, and may be ſeen to a conſiderable diſtance behind the ſtern, as ſmoother than the reſt of the ſea. Hence it is uſually obſerved by the compaſs, to diſcover the angle of LEE-*way*.

By this, a gueſs alſo may be made of the ſpeed ſhe makes.

When, in a ſhip's ſtaying, ſhe is ſo quick, that ſhe does not fall to leeward upon a tack, but that, when tacked, her *wake* is to the leeward, they ſay, *ſhe ſtays to the weather of her wake*; which is a ſign ſhe feels her helm well, and is nimble of ſteerage.

Alſo, when one ſhip, purſuing another, is got as far into the wind as ſhe, and ſails directly after her, on the ſame track, or on a line ſuppoſed to be formed on the continuation of her keel, they ſay, *ſhe is got into her wake*.

Two diſtinct objects obſerved at ſea are ſaid to be in the *wake* of each other, when the view of the fartheſt is intercepted by the neareſt; ſo that the obſerver's eye, and the two objects, are all placed upon the ſame right line.

WAKE-*robin*, or CUCKOW-*pint*, *arum*, in *Botany*, a genus of the *gynandria polyandria* claſs. Its characters are theſe: the flower hath a long, oblong ſpatha, cloſed at the bottom, compreſſed in the middle, and coloured within; the ſpadix is ſingle, ſhaped like a club at the top, and ſhorter than the ſpatha, upon which the germina are ſituated; it hath no petals nor ſtamina, but many four-cornered ſummits, ſituated cloſe to the germina, with a double row of hairs between them, which adhere to the ſpadix; there are many germina, which ſurround the upper part of the ſpadix, which are oval, having no ſtyles, but have bearded ſtigma; the germina afterward become globular berries, with one cell, having round ſeeds. Linnæus enumerates twenty-two, and Miller nineteen ſpecies, ſome of which were known by the name of *ariſarum*, or *friar's cowl*.

This plant is called *wake-robin* from the acrid taſte, which, if eaten, will occaſion a violent pain in every part of the mouth and throat, attended commonly with a great defluxion of water.

All the exotic ſorts of this plant are preſerved in the gardens of thoſe perſons who are curious in collecting foreign plants, for the variety of their leaves; for their flowers have very little beauty, nor do they often appear in this country. The plants are propagated eaſily, by offſets from their roots, which they put forth plentifully; theſe muſt be planted in pots filled with rich earth, and plunged in a hot-bed. If they are afterwards continued in the bark-ſtove, they will make great progreſs, and their leaves will be very large. Miller.

The common *arum*, or *wake-robin*, with ſpotted and plain leaves, or *arum maculatum* of Linnæus, is a low, perennial plant, growing wild under hedges, and by the ſides of banks; it flowers in April, and the ſeeds ripen in July; in ſome plants the leaves are ſpotted with black, in others with white ſpots, and in others not ſpotted at all; the black ſpotted ſort is ſuppoſed to be the moſt efficacious, and is, therefore, directed to be uſed by the London college. All the ſorts are ſaid to be ſtronger, when produced in moiſt ſhady ſoils, than in dry, open expoſures. The freſh roots of *arum* have an extremely pungent, acrimonious taſte; ſlightly chewed, they vellicate and burn the tongue, producing a conſiderable thirſt; theſe uneaſy ſenſations are ſometimes alleviated by milk, butter, or oily liquors: the other parts of the plant are likewiſe highly acrid, though leſs ſo than the roots, which, however, loſe the greateſt part of their acrimony on being dried ſo as to become pulverable. Parkinſon obſerves, that the white farinaceous ſtarch-like powder has been uſed in waſhing, and that it has ſometimes bliſtered the hands. The root may be preſerved freſh in ſand for ſeveral months; and if the ſand is ſomewhat moiſt, ſo as to ſuffer it to vegetate, it will be the better ſecured both from rotting, and from loſing its virtue. It appears to be of equal vigour, or at leaſt of ſufficient vigour for medicinal uſe, at all periods of its growth, and in all ſeaſons of the year.

Arum root, newly dried and powdered, is given in doſes of a ſcruple and upwards, for ſtimulating the ſolids, attenuating viſcid juices, and promoting the natural ſecretions; in cold, languid, phlegmatic habits; againſt weak-

ness and relaxations of the stomach, and catarrhous and rheumatic disorders. In the officinal powders of *arum*, sixteen grains of the dry root are accompanied with eight grains of the pungent roots of pimpinella, the same quantity of those of the yellow water-flag, four grains of cinnamon, and two grains of salt of wormwood, with four grains of crabs-eyes. In the medicine recommended by Sydenham against rheumatisms, the acrid antiscorbutic herbs are largely joined to it. Juncker observes, that a dram of the powder of *arum*, taken with a spoonful of brandy, procures a very copious sweat, even in persons little disposed to it, whilst the powder itself has no such effect.

The intolerable pungency on the tongue, which has prevented the root from being used in a fresh state, so as to exert its full virtues, Dr. Lewis has found to be effectually covered by unctuous and gummy materials. The fresh root beaten into a mass, with the addition of a little testaceous powder, which promotes the division of it, may either be mixed with about an equal quantity of powdered gum arabic, and three or four times as much conserve, so as to make them into an electary; or rubbed with a thick mixture of mucilage of gum arabic and spermaceti, gradually adding any suitable watery liquors, and a little syrup, so as to form an emulsion; two parts of the root, two of gum, and one of spermaceti, make an emulsion, which scarcely impresses any degree of pungency, though kept long in the mouth. In these forms Dr. Lewis has given the fresh root from ten grains to upwards of a scruple, three or four times a day: it generally occasioned a sensation of slight warmth, first about the stomach, and afterwards in the remoter parts, manifestly promoted perspiration, and frequently produced a plentiful sweat. Several obstinate rheumatic pains were removed by this medicine, which Dr. Lewis recommends to farther trial. Mat. Med.

The root of *arum*, dried and powdered, is used by the French for washing their skin, and is sold at a high price under the name of Cypress powder; it is both a good and an innocent cosmetic.

The leaves and flowers of *arisarum æqualis*, broad-leaved friar's cowl, are detersive and vulnerary; and applied either in the form of ointment or decoction to malignant ulcers. Its root taken in powder is esteemed against the plague, the dose being from a scruple to a dram. Of the root also are made collyria, which are used in curing fistulas of the eyes. Vide Lemery, des Drog, in voc.

WAKEFULNESS, or WATCHING, *insomnia*. See WATCHING.

WAKES, formed from the Saxon *wæcce, vigilia, excubiæ, watch, vigils*, or *Country*-WAKES, are certain ancient anniversary feasts, in several parishes; wherein the people were to be awake at the several vigils, or hours to go to prayer. See VIGIL.

They are usually observed, in the country, on the Sunday next before the saint's day to whom the parish-church is dedicated.

The learned Mr. Whitaker, in his History of Manchester, hath given a particular account of the origin of *wakes* and fairs. He observes, that every church at its consecration received the name of some particular saint: this custom was practised among the Roman Britons, and continued among the Saxons; and in the council of Cealchythe, in 816, the name of the denominating saint was expressly required to be inscribed on the altars, and also on the walls of the church, or a tablet within it. The feast of this saint became of course the festival of the church. Thus Christian festivals were substituted in the room of the idolatrous anniversaries of heathenism: accordingly at the first introduction of Christianity among the Jutes of Kent, pope Gregory the Great advised what had been previously done among the Britons, viz. Christian festivals to be instituted in the room of the idolatrous, and the suffering-day of the martyr whose relics were reposited in the church, or the day on which the building was actually dedicated, to be the established feast of the parish. Both were appointed and observed; and they were clearly distinguished at first among the Saxons, as appears from the laws of the Confessor, where the *dies dedicationis*, or *dedicatio*, is repeatedly discriminated from the *propria festivitas sancti*, or *celebratio sancti*. They remained equally distinct to the Reformation; the dedication-day in 1536 being ordered for the future to be kept on the first Sunday in October, and the festival of the patron saint to be celebrated no longer. The latter was, by way of pre-eminence, denominated the church's holiday, or its peculiar festival; and while this remains in many parishes at present, the other is so utterly annihilated in all, that bishop Kenner, says Mr. Whitaker, knew nothing of its distinct existence, and has attributed to the day of dedication what is true only concerning the saint's day. Thus instituted at first, the day of the tutelar saint was observed, most probably by the Britons, and certainly by the Saxons, with great devotion. And the evening before every saint's day, in the Saxon-Jewish method of reckoning the hours, being an actual part of the day, and therefore like that appropriated to the duties of public religion, as they reckoned Sunday from the first to commence at the sun-set of Saturday; the evening preceding the church's holiday would be observed with all the devotion of the festival. The people actually repaired to the church, and joined in the services of it; and they thus spent the evening of their greater festivities in the monasteries of the North, as early as the conclusion of the seventh century.

These services were naturally denominated from their late hours *wæccan* or *wakes*, and vigils or eves. That of the anniversary at Rippon, as early as the commencement of the eighth century, is expressly denominated the vigil. But that of the church's holiday was named *cyric wæccan*, or church-*wake*, the church-vigil, or church-eve. And it was this commencement of both with a *wake*, which has now caused the days to be generally preceded with vigils, and the church-holiday particularly to be denominated the church-*wake*. So religiously was the eve and festival of the patron saint observed for many ages by the Saxons, even as late as the reign of Edgar, the former being spent in the church, and employed in prayer. And the *wakes*, and all the other holidays in the year, were put upon the same footing with the octaves of Christmas, Easter, and of Pentecost. When Gregory recommended the festival of the patron saint, he advised the people to erect booths of branches about the church on the day of the festival, and to feast and be merry in them with innocence. Accordingly, in every parish, on the returning anniversary of the saint, little pavilions were constructed of boughs, and the people indulged in them to hospitality and mirth. The feasting of the saint's day, however, was soon abused; and even in the body of the church, when the people were assembled for devotion, they began to mind diversions, and to introduce drinking. The growing intemperance gradually stained the service of the VIGIL, till the festivity of it was converted, as it now is, into the rigour of a fast. At length they too justly scandalized the puritans of the last century, and numbers of the *wakes* were disused entirely, especially in the east and some western parts of England; but they are commonly observed in the north, and in the midland counties.

This custom of celebrity in the neighbourhood of the church, on the days of particular saints, was introduced into England from the continent, and must have been familiar equally to the Britons and Saxons; being observed among the churches of Asia in the sixth century, and by those of the west of Europe in the seventh. And equally in Asia and Europe, on the continent, and in the islands, these celebrities were the causes of those commercial marts which we denominate FAIRS. The people resorted in crouds to the festival, and a considerable provision would be wanted for their entertainment. The prospect of interest invited the little traders of the country to come and offer their wares; and thus, among the many pavilions for hospitality in the neighbourhood of the church, various booths were erected for the sale of different commodities. In larger towns, surrounded with populous districts, the resort of the people to the *wakes* would be great, and the attendance of traders numerous; and this resort and attendance constitute a fair. Basil expressly mentions the numerous appearance of traders at these festivals in Asia, and Gregory notes the same custom to be common in Europe. And as the festival was observed on a feria or holiday, it naturally assumed to itself, and as naturally communicated to the mart, the appellation of feria or fair. Indeed, several of our most ancient fairs appear to have been usually held, and have been continued to our time, on the original church-holidays of the places: besides, it is observable, that fairs were generally kept in church-yards, and even in the churches, and also on Sundays, till the indecency and scandal were so great, as to need reformation. See Burn's Eccl. Law, art. *Churches*.

WALDENSES. See VAUDOIS.

WALDRAPP, in *Ornithology*, a name given by some to the wood-raven, or CORVUS *sylvaticus* of Gesner, a bird of the size of a hen, of a glossy black, and adorned with a crest on its head.

WALE-*knot*, or WALL-*knot*, in *Sea Language*, is a particular sort of large KNOT raised upon the end of a rope, by untwisting the strands, and interweaving them amongst each other.

WALE-*reared*, an obsolete phrase, implying WALL-*sided*.

WALES, in a *Ship*, an assemblage of strong planks extending along a ship's side, throughout her whole length, at different heights, and serving to reinforce the decks, and

and form the curves, by which the vessel appears light and graceful on the water. As the *wales* are framed of planks broader and thicker than the rest, they resemble ranges of hoops encircling the sides and bows. They are usually distinguished into the main-*wale*, and the channel-*wale*. The situation of the *wales*, being ascertained by no invariable rule, is generally submitted to the fancy and judgment of the builder. The position of the gun-ports and scuppers ought, however, to be particularly considered on this occasion, that the *wales* may not be wounded by too many breaches. Falconer.

WALE, or WALE-*sided*, denotes the figure of a ship's side, when, instead of being incurvated so as to become gradually narrower towards the upper part, it is nearly perpendicular to the surface of the water, like a *wall*; whence the phrase.

WALINGHURU, in *Botany*, a name by which some authors have called the plant, of which the medicinal zerumbeth is the root.

WALK, in the *Manege*, is the slowest and least raised of all a horse's goings. The duke of Newcastle says, that this motion is performed with two legs, diametrically opposite in the air, and two upon the ground at the same time, in form of a St. Andrew's cross; but this, in reality, is the motion of a TROT; and accordingly all the later writers agree, that this author is mistaken, and that the *walk* is performed, as any one may observe, by the horse's lifting up its two legs on a side, the one after the other, beginning with the hind-leg first. Thus, if he leads with the legs of the right side, then the first foot he lifts is the far hind-foot, and in the time he is setting it down (which in a step is always short of the tread of his fore-foot on the same side) he lifts his far fore-foot, and sets it down before his near fore-foot. Again, just as he is setting down his far fore-foot, he lifts up his near hind-foot, and sets it down again just short of his near fore-foot, and just as he is setting it down, he lifts his near fore-foot, and sets it down beyond his far fore-foot.

This is the true motion of a horse's legs in a *walk*; and this is the pace in which many things are best taught. For instance, when the horse is to be taught to turn to the right and left, or from one hand to another, he is first to be taught it on the *walk*, then on the trot, and finally on the gallop.

WALKÆPETHIGA, in *Botany*, a name by which some authors have called the tree, on which the gum lacca of the shops is usually found.

WALKERS, a sort of forest officers, appointed by the king to walk about a certain space of ground, committed to their care and inspection.

Walkers are the same with what we otherwise call FORESTERS.

WALKS, in *Gardening*. See ALLEYS. See also GRASS and GRAVEL-*walks*.

Grass *walks* in gardens were formerly in great esteem; but of late years they have justly been banished by every person of true taste; for those narrow slips were very unsightly, and for the most part useless; being generally too damp for persons of tender constitutions to walk upon; and whenever they were constantly used they became bare and ugly.

Sand *walks* are now very frequently made in gardens, as being less expensive than others, which in large irregular gardens is a very great article. For as the greatest part of *walks* in gardens are carried about in an irregular manner, it would be very difficult to keep gravel *walks* handsome, especially under the dripping of trees, which in rainy weather is apt to wash the gravel into holes; and when wood *walks* are of grass, they are not proper for walking on after rain. Sand walks, on the contrary, are always dry and wholesome, and if of that kind that will bind, it will neither fly in windy weather, nor stick to the feet after rain; and whenever they appear mossy, or weeds grow on them, if a hoe is drawn over them, and they are often raked smooth, they will appear as fresh and handsome as if new laid.

The breadth of these *walks* must be proportioned to the size of the ground, which in a large extent may be twelve or fourteen feet wide; but in small gardens five or six feet will be sufficient: the sides may be lined with honey-suckles, sweet-briars, roses, and many other sweet-flowering shrubs; and all tall trees should be planted at least five or six feet from the *walk*, to allow room for these. These sand *walks* are made, after they are designed, and the ground traced out, by digging the earth out of them, and laying it in the quarters. When the ground is dry, the *walks* need not be much elevated above the quarters; and therefore a depth of four or five inches will be sufficient: but when the ground is wet, the bottom of the *walks* need not be more than two inches below the surface, that they may be raised high enough to throw off the wet into the quarters. The bottom should be laid with rubbish or coarse gravel, four, five, or six inches thick, and well beaten down; then the sand should be laid upon this about three inches thick; and after treading it down, it should be raked, in order to level the surface; the whole being a little rounded, to throw off the wet. The sand should be of a binding nature; and when the *walks* are laid, they should be well rolled two or three times, in order to settle them. If sand cannot be procured, *walks* of this kind may be laid with sea-shells well powdered, or sea-coal ashes, &c. Miller's Gard. Dict.

WALK, *ring*, among *Hunters*. See RING-*walk*.

WALK, *terrace*. See TERRACE.

WALKING-*fire*. See IGNIS *fatuus*.

WALL, in *Architecture*, &c. a work of stone, brick, or the like, making the principal part of a BUILDING; as serving both to enclose it, and to support the roof, floors, &c.

Walls, though built very thick and strong, and their foundations laid deep, yet, if carried on straight in a line, are apt to lean, or fall; and such as are built crooked, though thin and weak, are much more lasting. A *wall* raised over a river, on arches of pillars, stands as firm as others, whose foundation is entire.

Hence it appears, that a *wall* built much thinner than usual, by only having at every twenty feet distance an angle set out about two feet, or more, in proportion to the height of the *wall*; or by having at the like distance, a column, or pilaster, erected along with it, six or eight inches on each side, over and above the thickness of the rest of the *wall*, will be much stronger than if five times the quantity of materials were used in a straight *wall*.

Walls are distinguished into divers kinds, from the matter whereof they consist; as *plastered* or *mud-walls*, *brick-walls*, *stone-walls*, *flint* or *boulder-walls*, and *boarder-walls*. In all which these general rules are to be regarded:

1. That they be built exactly perpendicular to the ground-work.

2. That the massiest and heaviest materials be the lowest; as being fitter to bear, than be borne.

3. That the *walls*, as they rise, diminish proportionally in thickness, for ease both of weight and expence.

4. That certain courses, or ledges, of more strength than the rest, be interlaid, like bones, to strengthen the whole fabric.

WALLS, *mud* and *plastered*, are chiefly used in ordinary timber-buildings. These *walls*, being quartered and lathed between the timber, or sometimes lathed over all, are plastered over again with white mortar.

WALLS, *brick*, are the most usual among us. In these, particular care is to be taken about the laying of the bricks, viz. that in summer they be laid as wet, and in winter as dry, as possible, to make them bind the better with the mortar; that in summer, as fast as they are laid, they be covered up, to prevent the mortar, &c. from drying too fast; and that in winter they be covered well, to protect them from rain, snow, and frost, which are all enemies to the mortar; that they be laid joint on joint in the middle of *walls*, as seldom as may be; but good bond made there, as well as on the outsides. Care is likewise to be taken, that the angles be firmly bound: in order to which, in working up the *walls* of a building, it is not adviseable to raise any *wall* above three feet high, before the next adjoining *wall* be wrought up to it; that good bond may be made in the progress of the work.

Brick-walls are sometimes wrought part of the way two inches thicker than the rest of the work, to serve for a water-table to the wall.

Lastly, in building a house in the city of London, the *walls* are to be of such thicknesses as are enjoined by act of parliament. See BUILDING, and PARTY-*walls*.

WALLS, *flint*, or *boulder*, are frequently used in divers parts for fence-*walls*, around courts, gardens, &c. and even for *walls* of outhouses. Sir Henry Wotton observes, that the building of *walls* of flint was a thing utterly unknown to the ancients; who observing in that material a kind of metallic nature, at least a fusibility, reserved it for nobler uses.

These *walls* are usually raised by a right and left-handed man, who have a hod of mortar poured down on the work, which they part betwixt them; each spreading it towards himself, and so they lay in the flints. The mortar for this work is to be very stiff.

WALL, *angle of a*. See ANGLE.

WALL, *coping of a*. See COPING.

WALL, *plinth of a*. See PLINTH.

WALL,

WALL, *scenography of a*. See SCENOGRAPHY.
WALLS, *painting on*. See PAINTING.
WALLS, *party*. See PARTY.
WALL, *Picts*. See PICTS.
WALLS, *fence*. See FENCE, and *Inclosing of* LAND.
WALL, in *Fortification*, &c. See RAMPART.

WALLS, in *Gardening*, &c. The position, matter, and form of *walls*, for fruit-trees, are found to have a great influence on the fruit; though authors differ as to the preference.

The reverend Mr. Lawrence directs, that the *walls* of a garden be not built directly to face the four cardinal points, but rather between them, viz. south-east, south-west, north-east, and north-west: in which the two former will be good enough for the best fruit, and the two latter for plums, cherries, and baking pears. See EXPOSURE.

Mr. Langford, and some others, propose garden-*walls* to consist chiefly of semicircles, each about six or eight yards in front, and including two trees; and between every two semicircles, a space of two feet of plain *wall*. By such a provision every part of a *wall* will enjoy an equal share of the sun, one time with another; beside, that the warmth will be increased, by the collecting and reflecting of the rays in the semicircles; and the trees within will be screened from injurious winds. But Mr. Miller says, there has not been any method yet contrived, which has succeeded nearly so well, as that by making the *walls* straight, and building them upright.

Of all the materials for building *walls* for ripening fruit, brick is generally the best, as it reflects a great deal of heat, retains its warmth a great while, and affords, by the smallness of the joints, the convenience of fastening up the trees with small nails. If these *walls* are coped with free-stone, and have stone pilasters at proper distances, to break the force of the winds, and shelter the fruit-trees, they make the most advantageous, as well as the most beautiful of all *walls*.

Mr. Lawrence, however, affirms, on his own experience, that *mud-walls*, made of earth and straw tempered together, are better for the ripening of fruit, than either brick or stone *walls*: he adds, that the coping of straw laid on such *walls* is of great advantage to the fruits, in sheltering them from perpendicular blights, rains, &c. This answers all the purposes of the late invention of placing tiles horizontally to hang over from the tops of the walls.

In some parts of England there are *walls* built both of brick and stone; some having the outside of stone, and the inside of brick, and others stone lined with brick. When the *walls* are built entirely of stone, there should be trellises fixed up against them, for the more convenient fastening of the branches of the trees.

It is sometimes an advantageous thing to build these *walls* upon arches, that the roots of the trees may have room to spread under, and to the other side of them. This is necessary when the soil is a hard gravel; for without this, when the roots of peaches, &c. have reached the gravel, they find not sufficient nourishment, and the trees canker and die. But though Mr. Fairchild had found great advantages from this way of building *walls*, Mr. Miller disapproves it.

M. Fatio, in a particular treatise on the subject, instead of the common perpendicular *walls*, proposes to have the *walls* built sloping, or reclining from the sun; that what is planted against them, may be more exposed to his perpendicular rays; which must contribute greatly to the ripening of fruit in our cold climate.

The angle of reclination is to be that of the latitude of the place; that, when the sun is in the meridian at the equinoxes, his rays may strike just perpendicularly.

Yet some others prefer perpendicular *walls*, and even inclining ones, or such as hang forwards to the sun; as such receive the sun's rays perpendicularly when he is low; as in spring and autumn, or in the evening and morning; which they imagine of more service than the greatest heat of the sun at midsummer, upon reclining *walls*.

Add, that in autumn the sun is most wanted to ripen winter pears; in order to which, they should be kept dry, which against sloping *walls* cannot be; the dews, &c. lying much longer thereon, than on those that are perpendicular.

One great advantage, however, of M. Fatio's sloping *walls*, is, that fruit-trees, as vines, &c. being planted against them, melon-glasses may be set on the fruit; which will much forward their ripening.

There are some persons who also recommend the painting of *walls* black, or of a dark colour; as they suppose the dark colour will imbibe more of the sun's rays, and retain the warmth longer; yet as the fruit is generally situated at a small distance from the *wall*, it receives no benefit from the warmth of the *wall*; and it is the reflected heat that accelerates the ripening of the fruit. Mr. Miller advises to build the *walls* substantial, both for duration and warmth; and he says, that a *wall* two bricks thick will be found to answer better than one that is a brick and a half; and if in the building of garden *walls* they are grouted with soft mortar, to fill and close all the joints, the *walls* will be much stronger, and the air will not so easily penetrate through them, as it does through others. As for the height of *walls*, it need not be more than nine or ten feet, unless for pears; in which case a *wall* with a south aspect should be raised fourteen feet high or more.

When persons are curious in their fruit, they erect a trellis against the *walls*, which projects about two inches from them, to which they fasten their trees; and by this contrivance the fruit will be at a proper distance from the *walls*, and the *walls* themselves will be preserved from the damage attending the driving of nails into their joints. These trellises may be adapted to the different sorts of fruit which are planted against them: those designed for peaches, nectarines, and apricots, should have their rails three, or at most four, inches asunder every way; but for the other sorts of fruit, which continue bearing on the old wood, they may be five or six inches apart; and those for vines may be at the distance of eight or nine inches. Miller.

WALLS, *hot*, in *Gardening*, are *walls* built for the purpose of accelerating the ripening of fruit. The ordinary height of these *walls* is about ten feet; and as the length of a wall sufficient to produce early fruit for a middling family cannot be less than eighty or a hundred feet, there should be three times this quantity of walling built; so that by dividing it into three parts, there will be two years for the trees to recover their vigour between the times of their being forced. These *walls* at their foundation should be four bricks and a half thick, in order to support the flues; but this thickness need not be continued more than six inches above the ground, where should be the bottom of the first flue; then the *walls* may be set off four inches on each side, which will reduce it to the thickness of three bricks and a half, so that the back *wall* may be two bricks thick, which is necessary to throw the heat out more in front; the wall in front next to the fruit should be only four inches thick, whereby there will be an allowance of nine inches for the flues, which may be covered with twelve-inch tiles. The ovens in which the fires are made must be contrived on the backside of the *walls*, and their number should be proportioned to the length of the *walls*. The length usually allowed for each fire to warm is forty feet, though it will serve for fifty feet. The ovens should be shedded over with bricks and tyles, to keep out the wind and rain; and the sheds should not be narrower than eight feet in the clear. If the length of walling requires two ovens, both may be included in one shed, which should be ten feet long, and six broad, having the steps into it at one end; and when the ovens are joined together, there should be a partition *wall* at least three bricks thick between them. The lower flue, through which the smoke first passes from the fire, may be two feet and a half deep; therefore the back-*wall* should be at least two bricks thick, as high as to the top of this flue, and then it may be set off to a brick and a half, and continued to the top of the *wall*. The second flue, which should return over the first, may be made two feet, the third a foot and a half, and the fourth one foot deep; which four flues, with their coverings, will rise near eight feet in height; so that there will be about two feet left for the fixing of the frames at the top to support the glasses, and for coping the walls; and these four returns will suffice to warm the air in the frames. In the carrying up of these *walls*, there should be strong hooks at convenient distances, projecting about two inches from the *wall*, to which the trellis for supporting the trees must be fastened.

The borders, in front of these hot *walls*, should be about four feet wide, which will make a sufficient declivity for the sloping glasses; and in these borders there may be a row of dwarf peas planted to come early, or a row of dwarf kidney-beans; on the outside of these borders should be low *walls* erected, which should rise about an inch or two above the level of the borders, upon which the plate of timber should be laid, on which the sloping glasses are to rest; and this *wall* will keep up the earth of the border, and also preserve the wood from rotting. The glasses, designed to cover these *walls*, should be divided into two ranges: the frames in which they are placed should be so contrived as that the upper row may slide down; and by making on one side three small holes in the wood-work which supports the frames, at about a foot

foot diſtance, and having a ſmall iron pin to fix into them, the top glaſſes may be let down one, two, or three feet, as there may be occaſion to admit air. The lower row of glaſſes may be contrived ſo as to take eaſily out, but as they muſt lie ſloping, and the upper row muſt bear on them, they cannot be contrived to ſlide upwards. The ſloping timbers, which are to ſupport the glaſs frames, muſt be faſtened at bottom into the ground plate in the front of the border, and at the top into ſtrong iron cramps fixed in the upper part of the *wall* for that purpoſe. On the top of theſe ſhould be fixed a ſtrong board, under which the upper row of glaſſes ſhould ſlide. The uſe of this board is to ſecure the upper part of the glaſſes from being raiſed by the winds, and alſo to keep the wet from getting to the trees; and therefore it ſhould be joined as cloſe as poſſible to the wall, and ſhould project about two inches over the glaſs frames. At the end of the range of glaſſes there will be an angular ſpace between the glaſſes and the wall, which muſt be cloſely ſtopped, to prevent the air from getting in, which might greatly injure the fruit. If they are cloſed with glaſſes, which may be occaſionally opened to let in air, it would be of great advantage. The ſorts of fruit which are uſually planted for forcing are cherries, plums, peaches, apricots, and nectarines; the two laſt, however, rarely ſucceed well.

In the preparing of the borders for planting theſe fruit-trees, there ſhould be the ſame care as for thoſe in open borders; and the trees muſt be trained up in the ſame manner, when they ſhoot. The time for beginning to make the fires is about the middle or latter end of January, as the ſeaſon is more or leſs favourable; and thoſe trees which are forced into flower by the middle of February will ripen their fruit as early as moſt people will deſire to eat them; for the cherries will ripen early in April, and the apricots in the beginning of May; and ſoon after, the plums, peaches, and nectarines, will be ripe. After the middle of May there will be no want of fires, if the glaſſes are cloſe ſhut every night, or in bad weather; for half an hour's ſun on the glaſſes at this ſeaſon will ſufficiently warm the air incloſed in the glaſſes, for the growth of any of our European fruits.

In ſome parts of England, where moſt of our good kinds of fruit ſeldom ripen, it might be worth while to build ſome of theſe *hot walls*, in order to obtain good fruit from the beſt kinds of peaches, plums, &c. where the fuel is cheap. Inſtead of glaſs coverings, there may be frames of canvas, or oiled paper may be uſed, the expence of which is not great. For other particulars, relating to the conſtruction and uſe of *hot walls*, ſee Miller's Gard. Dict. See Forcing.

Walls, *ſea*. See Dike.

Wall-*creeper*, in *Ornithology*. See Picus *murarius*.

Wall-*flower*. See Stock-*gilly-flower*.

Wall *moſs*. See Moss.

Wall-*ſided*, in *Sea Language*. See Wale-*ſided*.

Wall-*trees*. See Tree.

Wall-*wort*, in *Botany*, the dwarf elder. See Elder.

Wall-*fruit-trees, planting of*. See Planting.

WALLA, the name of an officer in the eaſtern nations. The Arabs have the care of the country round about the city of Cairo in Egypt, and a *walla* is obliged to patrole continually about there, eſpecially in the night.

His buſineſs is to take up all perſons who are committing any diſorders, or who cannot give an account of themſelves, or are found abroad at irregular hours; and he often has their heads cut off upon the ſpot. As this officer is naturally the terror of rogues, ſo for preſents made to him he often becomes their protector. Without this they are ſure, one time or other, to fall a ſacrifice to his reſentment; and to him the great people ſend for any villains who have rendered themſelves obnoxious to them, and are ſure to have them delivered up. See Pocock's Egypt, p. 165.

WALLING *of brick*. See Brick.

Walling, *lead*. See Lead-*walling*.

WALNUT-*tree*, *juglans*, in *Botany*, a genus of the *monoecia polyandria* claſs. Its characters are theſe: it hath male and female flowers at diſtances on the ſame tree; the male flowers are diſpoſed in an oblong, cylindrical, imbricated catkin; each ſcale has one flower, with one petal, divided into ſix equal parts; in the centre are ſituated many ſhort ſtamina, terminated by erect, acute ſummits; the female flowers grow in ſmall cluſters, ſitting cloſe to the branches; theſe have a ſhort, erect, four-pointed empalement, ſitting on the germen, and an acute erect petal, divided into four parts; under the empalement ſits a large oval germen, ſupporting two ſhort ſtyles, crowned by large reflexed ſtigmas; the germen afterward becomes a large oval, dry berry, with one cell, incloſing a large oval nut, with netted furrows, whoſe kernel has four lobes, variouſly furrowed. Linnæus enumerates five, and Miller ſix ſpecies.

There are ſeveral varieties of the common *walnut*, which are diſtinguiſhed by the following titles: the large *walnut*, the thin-ſhelled *walnut*, the French *walnut*, the late ripe *walnut*, and the double *walnut*; but theſe do all of them vary when raiſed by ſeeds, ſo that the nuts from the ſame tree will produce plants, whoſe fruit will differ; therefore there can be no dependence upon the trees which are raiſed from nuts, till they have produced fruit; ſo that thoſe perſons who plant the trees for the fruit, ſhould make choice of them in the nurſeries when they have the fruit upon them, to prevent their being deceived.

The common *walnut* is propagated in many parts of England for the fruit, and the trees were formerly cultivated for their wood, which was in very great eſteem, till the quantity of mahogany, and other uſeful woods, which have of late years been imported into England, have almoſt baniſhed the uſe of it.

Walnuts, which are propagated for timber, ſhould be ſown where they are to remain; for the roots of theſe trees always incline downward; which being ſtopped or broken, prevent their aſpiring upward; ſo that they afterward divaricate into branches, and become low ſpreading trees; but ſuch as are propagated for fruit, are greatly mended by tranſplanting; for hereby they are rendered more fruitful, and their fruit is generally larger and fairer; it being a common obſervation, that downright roots greatly encourage the luxuriant growth of timber in all ſorts of trees; but ſuch trees as have their roots ſpreading near the ſurface of the ground, are always the moſt fruitful.

In tranſplanting theſe trees, you ſhould always obſerve never to prune either their roots or large branches, both which are very injurious to them; nor ſhould you be too buſy in lopping or pruning the branches of theſe trees while growing, for it often cauſes them to decay; but when there is a neceſſity of cutting any of their branches off, it ſhould be done very early in September, that the wound may heal before the cold increaſes. And the branches ſhould be cut off cloſe to the trunk, otherwiſe the ſtump will decay, and rot the body of the tree.

The beſt ſeaſon for tranſplanting theſe trees, is as ſoon as the leaves begin to decay; at which time, if they are carefully taken up, and their branches preſerved entire, there will be little danger of ſucceeding, even if they are eight or ten years old; though the younger they are removed, the larger the trees will be.

This tree delights in a firm, rich, loamy ſoil, and ſuch as is inclinable to chalk or marle; and will thrive very well in ſtony ground, and on chalky hills.

The diſtance at which theſe trees ſhould be placed, ought not to be leſs than forty feet, eſpecially if regard be had to their fruit; but if intended for timber, their ſtanding nearer promotes their upright growth.

The general opinion, that the beating down of this fruit improves the trees, is wrong; ſince in the doing of this, the younger branches are generally broken and deſtroyed; but as it would be exceedingly troubleſome to gather it by hand, ſo in beating it off, great care ſhould be taken that it be not done with violence, for the reaſon before aſſigned. In order to preſerve the fruit, it ſhould remain upon the trees till it is thoroughly ripe, and drops from the trees; then laid in heaps for two or three days, when the huſks will eaſily part from the ſhells; they ſhould then be dried well in the ſun, and laid up in a dry place, where vermin cannot come to them; by which means they will remain good four or five months. But there are ſome perſons who put their *walnuts* into a gentle oven, where they let them remain four or five hours to dry; and then put them up in oil-jars, or any other cloſe veſſels, mixed with dry ſand; by which means they will keep good ſix months. The heat of the oven dries the germ, and prevents their ſprouting; but if the oven be too hot, it will occaſion them to ſhrink. Miller.

The bark of the *walnut*-tree is a ſtrong emetic, either green, or dried and powdered; the green nuts are cordial, alexipharmic, and ſaid to be of great uſe in all contagious, malignant diſtempers, and the plague itſelf; and they are one of the principal ingredients in treacle water. The nuts preſerved are ſtomachic, and good to be eaten in a morning in time of peſtilential diſtempers, to prevent infection. Two or three ounces of the oil expreſſed from the ripe kernels, is a very good medicine for the ſtone and gravel. The ſhells powdered and burnt are accounted reſtringent, though but ſeldom uſed. Miller's Bot. Off.

Walnuts have a ſingular quality of promoting the menſes when ſuppreſſed, and all other medicines fail. James.

The effluvia of *walnut*-trees are ſaid to be hurtful to the

head-

head. Mr. Boyle assures us, they caused the head-ach in himself. Works abr. vol. i. p. 436.

WALOON, or WALLOON, a kind of old French; being the language spoken by the Walloons, or the inhabitants of a considerable part of the French and Austrian Low Countries; viz. those of Artois, Hainault, Namur, Luxemburg, and part of Flanders and Brabant.

The *Waloon* is held to be the language of the ancient Gauls, or Celts.

The Romans, having subdued several provinces in Gaul, established prætors, or proconsuls, &c. to administer justice in the Latin tongue. On this occasion, the natives were brought to apply themselves to learn the language of their conquerors; and thus they introduced abundance of the Roman words and phrases into their own tongue.

Of this mixture of Gaulish and Latin, was formed a new language, called ROMANS; in contradistinction to the ancient unadulterated Gaulish, which is called *Walon*, or *Walloon*. This distinction is kept up to this day; for the inhabitants of several of the Low-Country provinces say, that in France they speak Romans; whereas they speak the *Walloon*, which comes much nearer the simplicity of the ancient Gaulish.

WALRUS, in *Zoology*, the name by which some authors call the morse, or sea-horse, called also by others *rosmarus*, a creature very different from the *hippopotamus*, or river-horse. See MORSE.

WALT, in *Sea Language*, an obsolete or spurious term, signifying CRANK.

WALTHERIA, in *Botany*, the name of a genus of plants of the *monadelphia pentandria* class; the characters of which are these: the flower has a cup-shaped, permanent empalement of one leaf, cut into five points at the rim; it has five heart-shaped petals, which spread, and five stamina joined in a cylinder, terminated by loose summits, and an oval germen, supporting a single style, crowned by a bifid stigma; the germen turns to an oval capsule, with two valves, and one cell, inclosing one obtuse seed. There are three species.

WAMPUM, a sort of shells, several of which, being strung upon threads, are used as money among the Indians.

It is made of a shell, formed into small cylinders, of about one quarter of an inch long, and a fifth of an inch over, and being bored as beads, is strung in great numbers upon long strings. In this state it passes among the Indians in their usual commerce, as silver and gold among us; but being loose, it is not so current.

It is both white and black; and the meanest is in single strings, of which the white goes at five shillings a fathom, and the black at ten; or by number, the white at six a penny, the black at three. The next in value to the single strings, is that which is wove into bracelets of about three quarters of a yard long, black and white, in stripes, and six pieces in a row, the warp consisting of leather thongs, and the woof of thread; these the gentlewomen among them wear, wound twice or oftener about their wrists.

The most valuable of all is that woven into girdles. These are composed of many rows, and the black and white pieces woven into squares or other figures. These girdles are sometimes worn as their richest ornaments; but they are oftener used in their great payments, and make their noblest presents, and are laid up as their treasure. Grew's Musæum, p. 370.

WANDASS. See WINDASS.

WANDERING *stars*. See PLANET.

WANDSU, in *Zoology*, the name of a species of monkey found in the island of Ceylon. It is all over of a fine deep black; but has a long white beard hanging from its chin.

WANHOM, in the *Materia Medica*, a name by which Kæmpfer has called the plant, of which the great GALANGAL of the shops is the root.

WANLASS, in *Hunting*. See WINDASS.

WANT, in *Zoology*, a name given by many to the MOLE.

WANTI. See GLOVE.

WAPENTAKE, or WEAPENTAKE, a division of certain northern counties, particularly those beyond the Trent, answering to what in other places is called a *hundred*, or a *cantred*.

Authors differ as to the origin of the word. Brompton brings it from the Saxon *waepen*, and *taecan*, *to deliver*, by reason the tenants anciently delivered their arms to every new lord as a token of their homage.

Sir Thomas Smith gives a different account. Musters, he observes, were anciently taken of the armour and weapons of the several inhabitants of every hundred; and from such as could not find sufficient pledges for their good abearing, their *weapons* were taken *away*, and delivered to others.

Others give a different account of its rise; viz. that when first the kingdom was divided into *wapentakes*, he who was the chief of the division, and whom we now call *high-constable*, as soon as he entered upon his office, appeared in the field, on a certain day, on horseback, with a pike in his hand; and all the chief men of the hundred met him with their lances; who, alighting, touched his pike with their lances, as a signal they were firmly united to each other, by the touching of their weapons. Whence the denomination *wapentake*, from the Saxon *waepen*, and *tac*, *touching*.

WAPP, in a *Ship*, that rope wherewith the shrowds are set taught with wale-knots; one end is made fast to the shrowds, and to the other are brought the laniards.

WAPPE, a species of *cur*. The name is derived from its note; its only use was to alarm the family by barking, if any person approached the house. See DOG.

WAPPER, in *Ichthyology*, a name given by some to the smaller species of the river GUDGEON.

WAR, *bellum*, a contest or difference between princes, states, or large bodies of people; which, not being determinable by the ordinary measures of justice and equity, is referred to the decision of the sword.

Hobbes's great principle is, that the natural state of man is a state of *warfare*; but most other politicians hold *war* to be a preternatural and extraordinary state.

The sole prerogative of making *war* and peace belongs, by the English constitution, to the KING. Levying *war* against the king in his realm is a species of TREASON.

WAR, *civil*, or *intestine*, is that between subjects of the same realm; or between parties in the same state.

In this sense we say, the *civil wars* of the Romans destroyed the republic; the *civil wars* of Granada ruined the power of the Moors in Spain; the *civil wars* in England began in 1641, and ended in the king's death, 1648.

WAR, *gladiators*. See GLADIATORS.

WAR, *holy*, is that anciently maintained by leagues and croisades, for the recovery of the Holy Land.

WAR, *king's*, *bellum regis*. At the time when particular lords were allowed to make *war* with one another, to revenge injuries, instead of prosecuting them in the ordinary courts of justice, the appellation *king's war* was given to such *war* as the king declared against any other prince, or state: on which occasion, the lords were not allowed to make private *war* against each other; as being obliged to serve the king, with all their vassals.

WAR, *religious*, is a *war* maintained in a state, on account of religion; one of the parties refusing to tolerate the other.

WAR, *social*. See SOCIAL *war*.

WAR, *art of*. See MILITARY *art*

WAR, *council of*. See COUNCIL.

WAR, *habiliments of*. See HABILIMENTS.

WAR-*horse*. See HORSE.

WAR, *man of*. See SHIP, RATE, &c.

WAR, *officers of*. See OFFICERS.

WAR, *place of*, is a place fortified, on purpose to cover and defend a country, and stop the incursion of an enemy's army: or, it is a place wherein are disposed the provisions of *war*, for an army encamped in the neighbourhood; or whither an army retires into winter-quarters. See PLACE.

WAR-*cry* was formerly customary in the armies of most nations, when just going to engage. Sometimes they were only tumultuous shouts, or horrid yells, uttered with an intent to strike terror into their adversaries; such as is now used by the Indians in America, called the *war-whoop*.

WARASDINS, a kind of Sclavonian soldiers, clothed like the Turks, with a sugar-loaf bonnet instead of a hat. Their arms are a fuzee and pistols; the butt-end of their fuzee serves for a spade, when they have occasion to throw up earth.

WARBLERS, in *Ornithology*, a name by which Mr. Pennant distinguishes an order of birds, comprehending the nightingale, red-start, red-breast, black-cap, petty-chaps, hedge-sparrow, yellow, gold-crested, and common wren, the sedge-bird, or lesser reed-sparrow, the tit lark, or grashopper-lark, the wheat-ear, whinchat, stone-chatter, and white-throat: their general characters are, that the bill is slender and weak, the nostril small and sunk, and the exterior toe joined at the under part of the last joint to the middle toe. Some of these birds have tails of one colour, and others have party-coloured tails. Brit. Zool. vol. i. p. 363.

WARBLING *of the wings*, in *Falconry*, is when a hawk, after having mantled herself, crosses her wings over her back.

WARD, *warda*, *custody*, or *keeping*. See GUARD.

WARD is a word used, in our *Law Books*, in divers significations. Thus, a *ward*, in London, is a part of the city, committed to the special charge of one of the al-

dermen

dermen of the city. There are twenty-six *wards* in London, which are as hundreds, and the parishes thereof as towns.

A forest is also divided into *wards*; so also are most of our HOSPITALS.

A prison is sometimes also called a *ward*.

The heir of the king's tenant, who held by knights-service, or in capite, was also called a *ward*, during his nonage. But this sort of wardship is taken away by the statute 12 Car. II. cap. 24. See GUARDIAN, in *Chivalry*.

WARD, *watch and*. See WATCH.

WARD, *castle*. See CASTLE.

WARD, *warda*, *wardagium*, is also used, in our *Ancient Writers*, for the custody of a town or castle, which the tenants and inhabitants were bound to keep at their own charge. See WARDSHIP.

WARDA *ecclesiarum* denotes the guardianship of churches; which is in the king during vacancies, by reason of the regalia, or temporalities. See VACATION.

WARDAGE, *wardagium*, is sometimes used, in our ancient law-writers, in the same sense with WARDPENNY. Sometimes it also seems to denote a being free from wardship.

WARDECORNE, among our *Ancient Writers*, a duty incumbent on the tenants, to guard the castle, by sounding a horn upon the approach of an enemy; called also CORNAGE.

WARDEN, *guardian*, one who has the charge or keeping of any person, or thing, by office. See GUARDIAN.

Such is the *warden of the Fleet*, who is the keeper of the Fleet prison, and has the charge of the prisoners there; especially such as are committed from the court of chancery for contempt.

Such also are, the *warden* of the fellowships, *warden* of the marshes, *wardens* of peace, *warden* of the west marches, *warden* of the forest, *warden* of the alnage, *warden* of the king's wardrobe, &c.

WARDEN, in an university, is the head of a college; answering to what in other colleges we call the *master* thereof.

WARDEN, or *Lord* WARDEN, *of the Cinque Ports*, is the governor of those noted havens; who has the authority of an admiral, and sends out writs in his own name. See CINQUE-*ports*, and GUARDIAN.

WARDEN *of the mint*, is an officer, whose business is to receive the gold and silver bullion brought in by the merchants; to pay them for it, and oversee the other officers. He is also called *keeper of the exchange*, and MINT.

WARDENS, *church*. See CHURCH.

WARDEN, *renter*. See RENTER.

WARDER. *Yeomen warders of the Tower*, are officers, forty in number, who are accounted the king's domestic servants, and are sworn by the lord chamberlain: their duty is, to attend prisoners of state, and to wait at the gates.

Ten of them are usually upon the day's wait, to take an account of all persons who come into the Tower; to enter their names, and the names of the persons they go to, in a book, to be perused by the constable or lieutenant.

WARDFEOH, or WARDFEGH, the value of a ward, or heir under age; or the money paid to the lord of the fee for his redemption.

WARD-HOOK, in *Gunnery*, the same with *wad-hook*, or WORM.

WARDMOTE, in London, is a court so called, which is kept in every ward of the city; answering to the *curiata comitia*, in ancient Rome.

WARDPENNY, *wardpeni*, was formerly a customary due, paid to the sheriff, or other officer, for maintaining WATCH *and ward*.

It was payable at the feast of St. Martin; and is still paid within the manor of Sutton-Colfield, in Warwickshire; and that with some very singular ceremonies.

WARDROBE, a closet, or little room adjoining to a bedchamber; serving to dispose and keep a person's apparel in; or for a servant to lodge in, to be at hand to wait, &c.

WARDROBE, in a prince's court, is an apartment wherein his robes, wearing apparel, and other necessaries, are preserved; under the care and direction of proper officers.

His majesty has a *great wardrobe*, a *removing wardrobe*, and divers *standing wardrobes*, belonging to his bed-chamber, in each of his palaces; viz. at Whitehall, Kensington, Windsor, Hampton-Court, and the Tower; each under its respective keeper.

The *removing wardrobe* always attends on the king's person; as also on ambassadors, at christenings, masques, plays, &c. It is under the command of the lord chamberlain: the under-officers are, a yeoman, two grooms, and three pages.

The *great wardrobe* is of great antiquity. Anciently it was kept near Puddle-wharf, in a house purchased for that purpose by king Edward III. but, after the fire of London, it was kept in York-buildings.

The master or keeper thereof is an officer of great dignity: high privileges were conferred on him by Henry VI. and king James I. enlarged the same, and erected the office into a corporation.

The officers are, the *master* or keeper, his *deputy*, and his *clerk*; besides several under-officers; and above sixty tradesmen, all sworn servants to the king.

This office is to provide for coronations, marriages, and funerals, of the royal family; to furnish the court with beds, hangings, carpets, &c. to furnish houses for ambassadors, at their first arrival here; presents for foreign princes, and ambassadors; furniture for the lord lieutenant of Ireland, and our ambassadors abroad; robes for the knights and officers of the Garter, heralds, pursuivants, ministers of state; liveries for the officers of the bed-chamber, and other servants; liveries for the lord chief justices, and barons of the exchequer, and other officers in those courts; as also yeomen, warders, trumpets, kettle-drums, messengers, coachmen, grooms, &c. with coaches, harnesses, saddles, &c. the watermen, game-keepers; linen and lace for the king's person; tilts, &c. for his barges, &c.

WARDS. See COURT *of Wards*.

WARDS *of hospitals*. See HOSPITAL.

WARD'S *medicines*, a denomination given to certain medical nostrums, originally prepared and dispersed by Mr. Ward, and which were some years ago much celebrated for their efficacy in a variety of disorders.

The method of compounding the principal of these medicines was communicated to the public about thirty years ago by I. Page, esq. to whom Mr. Ward left his book of receipts; and in order to their being procured at a cheap rate, his late majesty settled a pension on Messrs. White and Osterman, the two chemists who had been employed by Mr. Ward in preparing them, on condition that the profits arising from the sale of them should be applied to the support of the Asylum and Magdalen charities.

These medicines are the red pill and emetic sack drop, the white drop, sweating powders, liquid sweat, paste for piles and fistulas, dropsy purging powders, and essence for the head-ach.

The method of preparing the antimony for the pill and drop, is as follows: the finest and purest crude antimony is powdered, and ten or twelve ounces of it put into an earthen unglazed pan that holds three or four quarts, and set on a fire; the mass is stirred with an iron spatula, and the fire raised till it sends forth fumes, and a flame like burning brimstone; and the same degree of fire is continued, and the mass stirred, till no fumes escape from it, and it becomes a grey or ash-coloured powder. If it should melt and run into lumps, it must be taken out of the pan, and pounded again, and then put in and stirred as before, till it be thoroughly calcined. Then four ounces of the crude matter must be added; and the process repeated, till a sufficient quantity has been thus prepared. The process must be performed in a chimney, lest the fumes should injure the operator. Into a clean crucible, holding about a quart, put about two pounds of the calcined antimony; set it in a melting furnace, and make a gradual fire under it; put coals round the crucible nearly to the top; keep the mass in a state of moderate fusion, occasionally stirring it with an iron rod. When the matter that adheres to the rod appears bright and transparent, which with a proper degree of fire will be in about half an hour after it is in fusion, pour the vitrified matter on a smooth marble, well dried, and heated as hot as the hand can bear; repeat the process, in order to obtain more of the matter, if necessary; and thus will be had a fair and pure glass of antimony, of a light red colour.

In order to prepare the *pill*, take a quantity of this glass of antimony; pound it in a clean iron mortar, and sift it through a fine lawn sieve; then grind, or levigate it, on a smooth marble, to an impalpable powder: take also dragon's blood dried and powdered; and put one ounce of this to four ounces of the levigated glass; grind them well together; and with good sack, or rich mountain wine, make them into a mass for pills, of about one grain and a half each, which is a full dose for a man or woman.

The *drop* is made by putting about half an ounce of the levigated glass of antimony into a quart of the richest Malaga mountain or sack; shake them well together, and let them stand two or three days to settle, and grow clear; then pour it off gently, to be quite fine. The full dose for a man or woman is half an ounce; but it is adviseable

adviſeable to begin with the half or two thirds, according to the age or ſtrength of conſtitution. Theſe medicines, it is ſaid, cannot be ſafely adminiſtered, if the viſcera are unſound. They have been uſually given in diſorders occaſioned by foul ſtomachs and indigeſtion; and the *pill* has been very ſucceſsful in inveterate rheumatiſms: both the *pill* and the *drop* frequently operate upward and downward, but with leſs ſtraining than the emetics uſually given. The *pill* muſt be bruiſed, and taken in a ſpoonful of any ſmall liquid, on an empty ſtomach: if it works upwards or downwards, it will be proper to drink a ſmall quantity of balm or ſage-tea, between each motion; and if it ſweats, as it ſometimes does, let the patient keep himſelf warm, and encourage it by drinking the above ſmall liquors: when it is taken, milk, greens, and fruit, muſt be avoided. The potion, called the *drop*, requires no vehicle: when the ſickneſs comes on, let the patient drink about half a pint of warm water, or thin water-gruel, and continue to do ſo every time it works.

The *white drop* is prepared by bruiſing fourteen pounds of the cleaneſt copperas into a rough powder; then drying it with a gentle heat, and ſpreading it thin, till it becomes a dry and ſubtile powder, reſembling quick-lime, but much whiter. When this operation is finiſhed, which requires about ſix or ſeven days, take an equal quantity of good and clean rough nitre, or ſalt-petre, tolerably dry; pound the nitre and copperas together; ſift the powder through a fine hair-ſieve, put it into a large glaſs retort, coated at bottom, and ſet it in a ſand-furnace about an inch from the bottom and ſides of the ſand-pan; fix on with lute a large receiver, leaving a ſmall vent-hole in the joint to prevent the burſting of the retort or receiver; make a gentle fire for the firſt three hours; and gradually increaſe it for three or four hours longer, till the iron pan be red at bottom; continue the fire about thirty hours; and then let it out, and when it is cool, you obtain a very powerful aqua-fortis; put this into a bottle, ſtop it cloſe, and let it ſtand ſix or eight days to digeſt itſelf. Put this aqua-fortis into a glaſs retort about half or two-thirds full; ſet it in the ſand-heat, and fix on a receiver; make a moderate fire, till the aqua-fortis is come over into the receiver, leaving behind only a brown, reddiſh earth: by this proceſs is obtained a very ſtrong and pure aqua-fortis. Put a quantity of this rectified aqua-fortis into a large bolt-head, with a long neck, ſo as to make it about a quarter full; then take of the pureſt and fineſt volatile ſal ammoniac, in which there is not the leaſt acid ſalt, or lime. To ſixteen ounces of the aqua-fortis in the bolt-head, add, by half an ounce at a time, ſeven ounces of the volatile ſal ammoniac, ſtopping the mouth of the bolt-head (a vent-hole excepted) till the fermentation ends; let it ſtand two or three hours, till the fumes are ſettled. Next put it into a ſmaller bolt-head, half full, and ſet it in a moderate ſand-heat; when it is warm, put four ounces of the fineſt quickſilver to each pound of ſixteen ounces of the ſolution, and let it ſtand in the heat till the quickſilver is diſſolved; increaſe the fire, and add quickſilver; and when it will diſſolve no more, take it out of the bolt-head, and put it into an open glaſs veſſel, or a white, large ſtone bowl; ſet it in a moderate ſand-heat, and let it evaporate till a pellicle or ſkin comes over the top of it; then put it in a cool place to congeal. The heavy liquor, or oil, which remains congealed, muſt be poured off, and thoroughly drained, and the remaining ſalt muſt be put into a glaſs body; to each pound adding three pounds of the fineſt roſe-water, and ſtopping the mouth of the glaſs with a piece of double brown paper. Set it again in a ſand-heat with a moderate fire, till the ſalt is wholly diſſolved, which is uſually effected in twenty-four hours; and thus is the *white drop* prepared.

This medicine, it is ſaid, cannot be accounted dangerous; as there is not in two drops, uſually taken in twenty-four hours, half a grain of mercury. It has been adminiſtered with ſucceſs as an antiſcorbutic in all ſtages of the ſcurvy, and even when the diſeaſe has been hereditary. The doſe of two drops is to be taken in a ſmall glaſs of water in the morning, faſting, or at night, going to reſt, for two or three days together; then after an interval of as many days, proceeding as before. It generally produces its effect without any ſenſible operation; except that in ſome conſtitutions it produces one or two motions.

Mr. Ward adminiſtered two ſorts of *ſweating powders*: one ſort is directed to be made by rubbing together in a mortar four ounces of refined nitre, and as much vitriolated tartar, into a powder; and putting into a red-hot crucible half of this maſs, and ſtirring it with an iron rod: when the red fumes that ariſe from it ceaſe, put in the remainder of the matter, and ſtir it, till no more fumes ariſe: then pour it into an iron mortar; and when cool, add opium, ipecacuanha, and liquorice powder, of each an ounce: pound and ſift them through a lawn ſieve, and mix all together. When the powders are thus prepared, they ſhould be ſpread thin on white ſtone diſhes, and ſet in a cool place for about two days, mixing them well, and ſpreading them twice a day; then dry them before the fire, or with any other gentle heat. The other ſort of *ſweating powder* is prepared by fulminating together common tartar, and refined nitre, of each one pound, in a crucible or iron pot, which will reduce them to about fifteen ounces: to theſe add white hellebore, and liquorice powder, of each ſix ounces; powder them together, and ſift them through a fine lawn ſieve. The doſe is from twenty-five to fifty grains.

Theſe *ſweating powders* are ſaid to remove rheumatic and other pains, occaſioned by obſtructions: though it is ſaid that the *red pill* has been found to anſwer better in ſtubborn rheumatic caſes, and other ſettled pains in the limbs. They may be taken in any liquid, going to bed between the blankets, and now and then drinking ſome warm diluting liquor, as white wine whey, baum tea, &c. They may be repeated every other night at diſcretion.

The *liquid ſweat* is prepared by putting a gallon of good ſpirits of wine, and half a gallon of good white wine, into a ſtrong bottle, and adding half a pound of ſaffron, four ounces of cinnamon, two ounces of ſalt of tartar, and one ounce of opium, cut into ſmall pieces. Stop the bottle cloſe, and ſet it near the fire for eight days, ſhaking it three or four times a day; then filter the contents through a filtring paper. The doſe is from thirty to ſixty drops, in a glaſs of good white wine.

The *paſte* for the piles and fiſtulas is prepared by pounding ſeparately a pound of elecampane root, three pounds of fennel-ſeeds, and one pound of black pepper, and ſifting the powders through a fine ſieve; then melt two pounds of honey, and two pounds of powder ſugar, over a gentle fire, ſcumming them, till they become bright as amber: when they are cool, mix and knead your powder into them in the form of a ſoft paſte. This paſte is ſaid to be a ſpecific remedy for the fiſtula, piles, &c. The doſe is the quantity of a nutmeg, morning, night, and noon, drinking after it a glaſs of water, or white wine.

The *dropſy purging powder*, as made by Mr. Ward, was formed by powdering ſeparately jalap, cream of tartar, and florentine iris, of each four ounces, and mixing them well: as prepared by Mr. d'Oſterman for Mr. Ward; it conſiſts of a pound of jalap in powder, a pound of cream of tartar, and an ounce of bole armoniac, in fine powder, mixed well together. The doſe is from thirty to forty grains, in broth, or warm water, to be repeated two or three days ſucceſſively, and longer, at proper intervals, if neceſſary.

The *eſſence for the head-ach* was formed by Mr. Ward of four ounces of ſpirits of wine, two ounces of camphor, and two ounces of volatile ſpirit of camphor, well mixed, and applied with the hand. Mr. d'Oſterman prepared it for Mr. Ward, by putting two pounds of true French ſpirit of wine into a large ſtrong bottle, and adding two ounces of roch allum in fine powder, four ounces of camphor cut ſmall, half an ounce of eſſence of lemon, and four ounces of the ſtrongeſt volatile ſpirit of ſal ammoniac. Stop the bottle cloſe, and ſhake it three or four times a day for five or ſix days. The method of applying it is to rub a little of it gently upon the palm of the hand, and then holding it to the part affected, till it is dry. If the pain is not relieved, it ſhould be repeated two or three times.

For ſome remarks on Mr. Ward's *pill* and *drop*, by Mr. Clutton, ſee True and candid Relation of their good and bad Effects, and Med. Eſſ. Edinb. abr. vol. ii. p. 434. 470, &c. and Ed. Med. Eſſ. and Obſ. vol. vi. p. 423.

WARDSHIP, in *Chivalry*. See GUARDIAN, in *Chivalry*, and WARD, *ſupra*.

WARDSHIP *in copy-holds*, is incident only to thoſe of inheritance. It partakes both of that in chivalry, and that in ſocage; like that in chivalry, the lord is the legal guardian, who uſually aſſigns ſome relation of the infant tenant to act in his ſtead; and he, like guardian in ſocage, is accountable to his ward for the profits. See GUARDIAN.

WARDSHIP *in ſocage*. See GUARDIAN, and SOCAGE.

WARD-STAFF, the conſtable or watchman's ſtaff.

The manor of Lambourn, in Eſſex, is held by ſervice of the *ward-ſtaff*; viz. by the carrying of a load of ſtraw in a cart with ſix horſes, two ropes, and two men in harneſs, to watch the ſaid *ward-ſtaff*, when it is brought to the town of Abridge, &c.

WARD-WITE, compounded of the Saxon *ward*, *watch*, and *wite*, *mulct*, is defined by Fleta, as ſignifying a being exempted

exempted from the duty of watching. Others rather take it for a duty paid towards the charge thereof.

WARE, *earthen*, *queen's*, and *ſtone*. See POTTERY.

WARECTUM, in *Ancient Writings*, ſignifies land that has lain long neglected, and untilled.

In ancient records, we meet with *tempus warecti*, for the time wherein land lies fallow, or elſe the ſeaſon of fallowing.

WAREN. See WARREN.

WARMTH. See HEAT.

WARMTH, in *Painting*, denotes that fiery effect which a ſmall addition of yellow gives to a true red; and that glowing appearance which red imparts to either yellow or blue. By *warmth*, in red, is to be underſtood a ſmall inclination towards orange; by the ſame term, applied to yellow, a like tendency by the admixture of red; and by the ſame again, in the caſe of blue, muſt be underſtood its ſlightly verging on the purple.

WARN, in *Law*, to ſummon a perſon to appear in a court of juſtice.

WARNAS, a name by which ſome of the chemical writers expreſs what others of them call the ACETUM *philoſophorum*, or vinegar of the philoſophers.

WARNING-*piece*, in the *Military Art*. See *Evening* GUN.

WARNING-*wheel*, in a clock, is the third or fourth, according to its diſtance from the firſt wheel. See CLOCK.

WARNOTH, in our *Old Writers*, an ancient cuſtom, by which if a tenant, holding of the caſtle of Dover, failed in paying his rent at the day, he was to forfeit double; and for the ſecond failure, treble; and the lands ſo held were called *terris cultis*, and *terris de warnoth*.

WARP, in the *Manufactures*, is the threads, whether of ſilk, wool, linen, hemp, cotton, or the like, that are extended lengthwiſe on the weaver's loom, and acroſs which the workman, by means of his ſhuttle, paſſes the threads of the woof, to form a cloth, ribband, fuſtian, or other matter.

For a woollen ſtuff, &c. to have the neceſſary qualities, it is required, that the thread of the *warp* be of the ſame kind of wool, and of the ſame fineneſs, throughout; that they be ſized with Flanders or parchment-ſize, well prepared; and that they be in ſufficient number, with regard to the breadth of the ſtuff to be wrought. See WOOF, CLOTH, &c.

WARP, in a *Ship*, is a ſmall rope employed occaſionally to remove a ſhip from one place to another, in a port, road, or river. Hence,

To WARP, in *Sea Language*, is to change the ſituation of a ſhip, by pulling her from one part of a harbour, &c. to ſome other, by means of *warps*, which are attached to buoys, to anchors ſunk in the bottom, or to certain ſtations upon the ſhore, as poſts, rings, trees, &c. The ſhip is accordingly drawn forwards to thoſe ſtations, either by pulling on the *warps* by hand, or by the application of ſome purchaſe, as a tackle, windlaſs, or capſtern, upon her deck. When this operation is performed by the ſhip's leſſer anchors, theſe machines, together with their *warps*, are carried out in the boats alternately towards the place where the ſhip is endeavouring to arrive; ſo that when ſhe is drawn up cloſe to one anchor, the other is carried out to a competent diſtance before her, and being ſunk, ſerves to fix the other *warp*, by which ſhe is farther advanced.

Warping is generally uſed when the ſails are unbent, or when they cannot be ſucceſsfully employed, which may ariſe from the unfavourable ſtate of the wind, the oppoſition of the tide, or the narrow limits of the channel. Falconer.

WARPENI. See WARDPENNY.

WARRANT, an act, inſtrument, or obligation, whereby a perſon authorizes another to do ſomething, which he had not otherwiſe a right to do.

WARRANT, in *Law*, is a precept under the hand and ſeal of ſome officer to bring any offender before the perſon granting it.

A *warrant* may be granted in extraordinary caſes by the privy-council, or ſecretaries of ſtate; but ordinarily by juſtices of the peace. This they may do in any caſes where they have a juriſdiction over the offence, in order to compel the perſon accuſed to appear before them. And this undoubtedly extends to all treaſons, felonies, and breaches of the peace; and alſo to all ſuch offences as they have power to puniſh by ſtatute.

Sir Edward Coke lays it down, that a juſtice of the peace cannot iſſue a *warrant* to apprehend a felon upon mere ſuſpicion, nor even till an indictment be actually found; but this opinion has been combated by ſir Matthew Hale, who maintains, that a juſtice of peace hath power to iſſue a *warrant* to apprehend a perſon accuſed of felony, though not yet indicted; and that he may alſo iſſue a *warrant* to apprehend a perſon ſuſpected of felony, though the original ſuſpicion be not in himſelf, but in the party that prays his *warrant*. But in both caſes it is proper to examine upon oath the party requiring a *warrant*, as well to aſcertain that there is a felony or other crime actually committed, without which no *warrant* ſhould be granted; as alſo to prove the cauſe and probability of ſuſpecting the party, againſt whom the *warrant* is prayed. This *warrant* ought to be under the hand and ſeal of the juſtice, ſhould ſet forth the time and place of making, and the cauſe for which it is made, and ſhould be directed to the conſtable, or other peace officer, or it may be to any private perſon by name, requiring him to bring the party either generally before any juſtice of the peace for the county, or only before the juſtice who granted it: the *warrant* in the latter caſe being called a *ſpecial warrant*.

A *general warrant* to apprehend all perſons ſuſpected, without naming particularly, or deſcribing any perſon in ſpecial, is illegal and void for its uncertainty; for it is the duty of the magiſtrate, and ought not to be left to the officer, to judge of the ground of ſuſpicion; and a *warrant* to apprehend all perſons, guilty of a crime therein ſpecified, is no legal *warrant*; becauſe the point, upon which its authority reſts, is a fact to be decided upon in a ſubſequent trial; namely, whether the perſon apprehended thereupon be really guilty or not. It is, therefore, in fact, no *warrant* at all; for it will not juſtify the officer who acts under it; whereas a *warrant*, properly penned (even though the magiſtrate who iſſues it ſhould exceed his juriſdiction) will, by ſtatute 24 Geo. II. cap. 44. at all events indemnify the officer, who executes the ſame miniſterially. A practice, indeed, had obtained in the ſecretaries office, ever ſince the Reſtoration, grounded on ſome clauſes in the acts for regulating the preſs, of iſſuing *general warrants* to take up (without naming any perſon in particular) the authors, printers, and publiſhers, of ſuch obſcene or ſeditious libels as were particularly ſpecified in the *warrant*. When thoſe acts expired in 1694, the ſame practice was inadvertently continued, in every reign, and under every adminiſtration, except the four laſt years of queen Anne, down to the year 1763; when ſuch a *warrant* being iſſued, its validity was diſputed; and the *warrant* was adjudged by the whole court of king's bench to be void. After which the iſſuing of ſuch *general warrants* was declared illegal by a vote of the houſe of commons. Com. Journ. 22 April, 1766.

When a *warrant* is received by the officer, he is bound to execute it, ſo far as the juriſdiction of the magiſtrate and of himſelf extends. A *warrant* from the chief or other juſtice of the court of king's bench, extends all over the kingdom; and is teſted or dated England, and not any particular county. But the *warrant* of a juſtice of peace in one county muſt be backed, that is, ſigned by a juſtice of the peace in another, before it can be executed there. Formerly, regularly ſpeaking, there ought to have been a freſh *warrant* in every freſh county; but the practice of BACKING *warrants* had long prevailed without law, and was at laſt authorized by ſtatutes 23 Geo. II. cap. 26. and 24 Geo. II. cap. 55. And now, by ſtatute 13 Geo. III. cap. 31. any *warrant* for apprehending an Engliſh offender, who may have eſcaped into Scotland, and *vice verſa*, may be endorſed and executed by the local magiſtrates, and the offender be conveyed back to that part of the united kingdoms, in which ſuch offence was committed. Blackſt. Comm. book iv. p. 287, &c.

WARRANT *of attorney*, is that whereby a man appoints another to do ſomething in his name, and *warrants* his action.

It ſeems to differ from a *letter of attorney*, which paſſes under hand and ſeal of him that makes it, before credible witneſſes; whereas *warrant of attorney*, in perſonal, mixed, and ſome real actions, is put in courſe by the attorneys for the plaintiffs, or defendants. Though a *warrant of attorney*, to ſuffer a common recovery by the tenant, or vouchee, is to be acknowledged before ſuch perſons as the commiſſion for the doing thereof directs.

It is uſual, in order to ſtrengthen a bond creditor's ſecurity, for the debtor to execute a *warrant* of attorney to any one, empowering him to confeſs a judgment by *nihil dicit*, *cognovit actionem*, or *non ſum informatus*, in an action of debt to be brought by the creditor for the ſpecific ſum due; which judgment, when confeſſed, is abſolutely complete and binding.

In the court of common pleas, there is a *clerk of the warrants*, who enters all *warrants of attorney* for plaintiff, and defendant.

WARRANT, *ſearch*. See SEARCH.

WARRANT *officers*. See OFFICERS.

WARRANT, in the *Manege*. A jockey that ſells a horſe is, by

by custom, in some countries, obliged to *warrant* him, that is, to refund the money that was given for him, and re-deliver the horse in nine days after the first delivery, in case he sold him when under such infirmities as may escape the view of the buyer, and as are not obviously discovered. These infirmities are pursivenefs, the glanders, and unsoundness, hot and cold: but he does not *warrant* him clear of such infirmities as may be discerned. Not only jockeys or horse-merchants, but also persons of what quality or condition soever, are obliged to take back the horse, and repay the money, if he is affected with the said disorders. But the rule of the law of England is, *caveat emptor*, unless the seller expresly *warrants*. See WARRANTY.

WARRANTS, *dividend*. See DIVIDEND.

WARRANTIZANDUM. See SUMMONS *ad Warrantizandum*.

WARRANTO. See QUO *Warranto*.

WARRANTY, WARRANTIA, in *Law*, a promise, or covenant, by deed, made by the bargainer for himself, and his heirs, to *warrant* and secure the bargainee, and his heirs, against all men, for enjoying the thing agreed on or granted between them.

Such *warranty* passes from the seller to the buyer; from the feoffer to the feoffee; from him that releases, to him that is released from an action real. The form of it is thus: *Et ego vero præfatus A. & hæredes mei, prædictas quinque acras terræ cum pertinentiis suis præfato B. hæredibus & assignatis suis, contra omnes gentes* warrantizabimus *in perpetuum, per præsentes*.

Note, under *hæredes*, heirs, are comprised all such as the first *warranter*'s lands come to, whether by descent, purchase, or the like.

Warranty is either *real*, or *personal*. *Real*, when it is annexed to lands and tenements granted in fee, or for life, &c. which, again, is either *in deed*, or *in law*.

Personal either respects the property of the thing sold, or the quality of it.

By the civil law an implied *warranty* was annexed to every sale, in respect to the title of the vendor: and so too, in our law, a purchaser of goods and chattels may have a satisfaction from the seller, if he sells them as his own, and the title proves deficient, without any express *warranty* for that purpose. But, with regard to the goodness of the wares so purchased, the vendor is not bound to answer; unless he expresly warrants them to be sound and good, or unless he knew them to be otherwise, and hath used any art to disguise them, or unless they turn out to be different from what he represented to the buyer. And if he, who selleth any thing, doth upon the sale warrant it to be good, the law annexes a tacit contract to this *warranty*, that if it be not so, he shall make compensation to the buyer: also, it is an injury to good faith, for which an action on the case will lie to recover damages. The *warranty* must be upon the sale; for if it be made after, and not at the time of the sale, it is a void *warranty*. Also the *warranty* can only reach to things in being at the time of the *warranty* made, and not to things *in futuro*: as, that a horse is found at the time of buying him, not that he will be found two years hence. Any artifice to disguise goods shall be equivalent to an express *warranty*, and the vendor is answerable for their goodness.

A general *warranty* will not extend to guard against defects that are plainly and obviously the object of one's senses, as if a horse be warranted perfect, and wants either a tail or an ear, unless the buyer in this case be blind. Also, if a horse is warranted sound, and he wants the sight of an eye, though this seems to be the object of one's senses, yet as the discernment of such defects is frequently matter of skill, it hath been held that an action on the case lieth, to recover damages for this imposition. Blackst. book iii. Com. p. 165.

Real warranty, again, in respect of the estate, is either *lineal*, *collateral*, or *commencing by disseisin*.

Lineal warranty was where the heir derived, or might by possibility have derived, his title to the land warranted, either from or through the ancestor who made the *warranty*; as, where a father, or an elder son in the life of the father, released to the disseisor of either themselves or the grandfather, with *warranty*, this was *lineal* to the younger son.

Collateral warranty was where the heir's title to the land neither was, nor could have been, derived from the warranting ancestor; as, where a younger brother released to his father's disseisor, with *warranty*, this was collateral to the elder brother.

But where the very conveyance, to which the *warranty* was annexed, immediately followed a disseisin, or operated itself as such (as, where a father tenant for years, with remainder to his son in fee, aliened in fee-simple with *warranty*), this, being in its original manifestly founded on the tort or wrong of the warrantor himself, was called a *warranty commencing by disseisin*; and, being too palpably injurious to be supported, was not binding upon any heir of such tortious warrantor. Blackst. Com. book ii. p. 301, &c.

WARRANTIA *Chartæ*, a writ that lies for a person who is infeoffed in lands and tenements, with clause of *warranty*; and is impleaded in an assize, or writ of entry, wherein he cannot vouch, or to call to *warranty*. See VOUCHER.

WARRANTIA *Diei*, a writ which lies in a case where a man, having a day assigned personally to appear in court to an action wherein he is sued, is, in the mean time, by commandment, employed in the king's service; so that he cannot come at the day assigned. It is directed to the justices, ordering them not to find or record him in default.

WARREN, WARENNA, a franchise, or place privileged, either by prescription, or grant from the king, to keep BEASTS and *fowl of warren* in; as rabbits, hares, partridges, pheasants, &c.

A man that has the franchise of *warren* is in reality no more than a royal game-keeper: but no man, not even a lord of a manor, could by common law justify sporting on another's soil, or even in his own, unless he had the liberty of *free-warren*. This franchise is almost fallen into disregard, since the new statutes for preserving the game. There are, indeed, many instances of eager sportsmen in ancient times, who have sold their estates, and reserved the *free-warren*, or right of killing game, to themselves; by which means it comes to pass that a man and his heirs have sometimes *free-warren* over another's ground.

By a statute 21 Edw. III. a warren may lie open, and there is no need of closing it in; as there is of a park.

If any person be found an offender in any such *free-warren*, he is punishable for the same at common law. See BLACK *Act*, and GAME.

The word *warren* is now generally applied to a piece of ground set apart for the breeding and preserving of rabbits.

In the setting up of a *warren*, great caution is to be used for the fixing upon a proper place, and a right situation. It should always be upon a small ascent, and exposed to the east or the south. The soil that is most suitable, is that which is sandy; for when the soil is clayey or tough, the rabbits find much more difficulty in making their burrows, and never do it so well; and if the soil be boggy or moorish, there would be very little advantage from the *warren*, for wet is very destructive of these animals.

All due precautions must be taken, that the *warren* be so contrived, that the rabbits may habituate themselves to it with ease. Many would have it that *warrens* should be enclosed with walls; but this is a very expensive method, and seems not necessary nor adviseable; for we find but very few that are so, and those do not succeed at all the better for it.

Mr. Chomel's opinion is, that it ought to be surrounded with a ditch. This indeed is no fence to prevent the rabbits from going out, unless there be water in it; but it marks the intended bounds of the *warren*, and the rabbits generally confine themselves within its circumference, though not necessarily compelled to do so. The space proper for a *warren* has no limits but the owner's pleasure; but, in general, the larger it is, the more profitable it also proves; and the rabbits, when once accustomed to the place, will keep within their bounds, though they are hemmed in neither with walls nor ditches, nor any other fence whatever.

Some have prescribed the making of deep ditches, and constantly keeping them supplied with water in the summer as well as winter season, that they may serve as fences to the rabbits, but as it is not found necessary to fence them in at all, it is extremely injudicious to do it, by means of a thing known to be so very prejudicial to these creatures, as water is. If the person who has set up a *warren* has but few rabbits to stock it with, the more patience he must have as to the profit of it; but the best method of getting quickly into the scheme of profit in it, is the buying at first a large number of doe-rabbits, all big with young. These being unwieldy and heavy, will naturally stay in the place, and the young ones will be habituated to it, as their native place, and will never run from it. These young ones will soon breed again, and the *warren* will begin quickly to be stocked with inhabitants, almost all natives of the place. They should not be hunted at all the two first years, and but very moderately the third. After this they will increase so fast, that scarce any body can conceive the numbers that may be taken, and the profit that may be annually made without hurting it.

The

The *warren* is the next franchiſe in degree to the PARK, and when ſpoken of in law, the terms uſed are, the liberty and franchiſe of a free *warren*.

A foreſt, which is in dignity the higheſt and greateſt franchiſe, comprehends in it a chaſe, a park, and a free *warren*; for which reaſon the beaſts of the park, and the beaſts and fowls of the free *warren*, are as much privileged within the foreſt, as the beaſts of the foreſt itſelf are.

WARREN is alſo applied to a contrivance for preſerving fiſh in the midſt of a river, to be taken at pleaſure.

WART, *verruca*, a little round hard excreſcence, ariſing on the fleſh like a pea.

Warts are more frequent on the hands than any other part. There are divers ſorts: the moſt uſual are called *porraceæ*; as having heads like leeks, and conſiſting of little threads, reſembling the roots thereof.

Another ſort is called *myrmecia*: this is a little round, callous eminence on the hands of young children: riſing ſuddenly, and diſappearing again.

A third ſort is the ACROCHORDON.

Some phyſicians alſo rank the corns growing on the toes under the claſs of *warts*: theſe the Latins call *clavi*; becauſe they occaſion ſhooting pains, as if one were pricked with the point of a nail.

Warts, if only rooted in the cutis, are eaſily taken away; but if they ariſe from the tendons underneath, there is ſcarce any extirpating them without great danger. The juices of chelidon majus, or eſula, or dens leonis, or tithymal, frequently applied, are ſaid to take off *warts*.

Strong vinegar, charged with as much common ſalt as it will diſſolve, is a very proper application to them. A plaſter may alſo be compoſed of ſal ammoniac and galbanum, which being kneaded up together and applied, ſeldom fails of deſtroying them.

Borelli commends water wherein ſal ammoniac has been diſſolved: which Dr. Mapletoft, formerly profeſſor of phyſic at Greſham College, makes no ſcruple to ſay, is the only ſure remedy he knows of in all medicine.

There are a thouſand ſuperſtitious remedies for *warts*, but none of them are of the leaſt conſequence. The ſurgeon's aſſiſtance is the only true method of getting rid of them. There are ſeveral ways of deſtroying them practiſed by him, as by ligature, extirpation, evulſion, the cauſtic, and the actual cautery. The cure by ligature, is by means of a looſe hair, or a piece of fine and ſtrong ſilk, tied very tight about the root of the *wart*; and by this means the nutritious veſſels being compreſſed, the excreſcence withers and decays.

The method by extirpation, is to take them up with a pair of plyers, and cut them cloſe off with ſciſſars, dreſſing the wound with common cauſtic, or applying a plaſter of diachylon with the gums, to remove the roots, if there be any, which would give riſe to a new tubercle.

The cure by cauſtics is beſt performed by cutting off the hard upper part of the *wart* with a razor or ſciſſars, and then ſurrounding its bottom with a circle of wax, to prevent the ſpreading of the remedies, to touch it daily with oil of tartar, ſpirit of ſalt, ſpirit or oil of vitriol, aqua-fortis, or butter of antimony.

The cure by cautery is performed by chooſing a cautery of a proper ſize, and with that burning down to the root of the *wart*. This is the moſt painful of all the methods of extirpating theſe excreſcences; but the pain is but for a moment, and the *warts* extirpated this way never return again.

The cure by evulſion is performed by anointing them with ſoftening ointment, and then ſeizing them artfully between the thumb and the fore-finger, and forcibly wrenching them out. This is a mountebank method, and a bad one; for it is not only very painful, but the *warts* commonly grow up again.

WARTS, *cancerous*. It is no uncommon thing to find on the face, lips, and about the eyes, *warts* which look blue and livid; theſe are always to be let alone entirely; for when irritated, they frequently degenerate into a cancer, and miſerably torment the parts where they are ſituated. Heiſter.

WART, in the *Manege*, is an excreſcence, or ſuperfluity of ſpongy fleſh, that riſes in the hinder paſterns of coach-horſes, almoſt as big as a walnut. It ſuppurates, and voids red ſtinking matter, and does not heal but for a time, for it returns again.

WART-*wort*, in *Botany*, a name ſometimes given to two very different plants. See NIPPLE-*wort*, and SPURGE.

WARTH, in our *Old Writers*, ſeems to be the ſame with WARD-*penny*, being a cuſtomary payment for ſome caſtle-guard.

WARWICK's, *earl of*, *powder*. See *Scammony* POWDER.

WASH, the diſtillers name for the fermentable liquor, made by diſſolving the proper ſubject for fermentation and diſtillation in common water.

The *waſh* of the malt-diſtiller is made by mixing the water hot with the malt ground into meal. If the water be too hot, the mixture will become gluey; and if too cool, a part of the virtue of the malt will be loſt. Under the right application of the water is to be conſidered the proper manner of agitating the maſs, ſo that all the parts of the aqueous fluid may come fully and freely in contact with the ſoluble particles of the ſubject. When once the water is well ſaturated by ſtanding on the malt a proper time, it may be drawn off, and freſh poured on, till at length the whole virtue, or all the ſugary ſweetneſs of the malt is extracted, and nothing but a fixed huſky matter remains behind, incapable of being farther diſſolved by the action of hot or boiling water, or of being advantageouſly waſhed or rinſed out by the bare affuſion of cold. This artificial and external agitation, or ſtirring about of the maſs, is neceſſary not only in the common way of brewing for the malt-diſtillery, but alſo in that more expeditious way, now in uſe with ſome, of reducing the operations of brewing and fermenting to one, and grinding the malt to a fine meal, which is to be kept in the *waſh* during the whole time, and even put into the ſtill with it, and worked together. The ſtirring may be repeated to great advantage more than once in each operation, as at the affuſion of every parcel of freſh water, in the common way, and at any ſhortly diſtant times in the ſhort way, in which it is of greater ſervice.

The difference of ſeaſons is found to require ſome alteration in the direction and management of the buſineſs of brewing for the malt-diſtillery. The water muſt always be uſed colder in ſummer than in winter, and the tincture muſt be cooled ſuddenly in cloſe ſultry weather, to prevent it from becoming eager or ſour. The ſummer ſeaſon alſo gives malt an over-forward diſpoſition to ferment, and this impairs the quantity of ſpirit, and is to be checked by the addition of a quantity of unmalted meal, which being leſs diſpoſed to ferment than the malted meal, will reſtrain and moderate its impetuoſity.

The action of fermentation works ſuch a change in the body of the tincture or ſolution, called the *waſh*, as to render it ſeparable by the action of fire, into parcels of matter that are ſpecifically different, and of a nature entirely foreign to what the ſame liquor would have yielded without the fermentation. With reſpect to the proper workings of this liquor, great regard is to be had to the containing veſſel. Its purity, and the proviſion for its occaſional cloſeneſs, are the things to be principally conſidered. Though it is neceſſary that the veſſel be perfectly clean, yet in the cleanſing of it great care muſt be taken that no ſoap, or other unctuous body, be uſed, for this would check the fermentation in it; and for the ſame reaſon all ſtrong alkaline lixiviums are to be avoided. Lime-water, or even the turbid ſolution of quick-lime, however, may be ſafely uſed for this purpoſe; and this is indeed particularly proper to deſtroy a prevailing acid, which is very apt to be generated about the ſides and bottoms of thoſe veſſels, if the warm air has acceſs to them, and thus prevents the order of the fermentation.

It is a very prejudicial miſtake, in the buſineſs of fermenting the *waſh*, to ſuppoſe that the free concourſe or admiſſion of the external air is neceſſary to the operation. The contrary is the truth, and a great advantage will be found in practiſing upon this ſuppoſition. A conſtant influx of the open air, if it does not carry off ſome part of the already formed ſpirit; yet it certainly catches up and diſſipates the fine ſubtle oleaginous and ſaline particles, of which the ſpirit is formed, and thus conſiderably leſſens the quantity to be procured. This inconvenience is wholly avoided by the way of cloſe fermentation, by which all air, except that which is contained in the veſſel, is kept out.

This method of cloſe fermentation is practicable to good advantage in the ſmall way of buſineſs; but it requires ſuch a conſiderable time, that it will never be liked by the large dealers, who are in a manner forced to admit the free air, and thus ſuſtain a very conſiderable loſs in the ſpirit, only to get the operation over in a proper time. Excepting for the neceſſity of expedition of this kind among the large dealers, it is certain that this ſlow and imperceptible vinous fermentation is greatly preferable, on all accounts, to the other.

The operation is known to be over in this cloſe way of fermentation, as ſoon as the hiſſing noiſe ceaſes, and can no longer be heard on applying the ear to the veſſel; and when, on opening it, the liquor is found to be clear, and of a vinous pungent taſte; when it is arrived at this ſtate, it ſhould be ſet by for a time in a cooler place than that in which it was fermented; in this manner it will thoroughly purge itſelf of its lees, and will become perfectly clear, vinous, and pungent; in this ſtate it ſhould be

be drawn clear off from the lees, and immediately committed to the still; and by this method a perfectly pure vinous spirit will be procured, much better than that which can be obtained by the common way, which those who work large quantities fall into, for the sake of expedition.

The particular intention of the operator may render various other additions necessary; thus some, to dispose the *wash* to yield more spirit, or to give the spirit a greater degree of pungency, and a better flavour, add to it the strong and pungent aromatics: the cheapest chosen for this purpose, and the most used, are the cortex Winteranus, ginger, and grains of paradise.

In the common way, these additions, however, do very little, though by a proper artifice in the management they may be made of considerable use. Upon this foundation, stands a very instructive method, used abroad, of making geneva *ab origine*, by mixing the bruised juniper-berries among the malt, and brewing the whole together; by this means a compound tincture, or *wash*, is prepared, which, by fermentation and distillation, affords a spirit much more intimately and homogeneously impregnated with the essence of the berry, than that prepared by our distillers, in the common way of adding the berry to the malt-spirit, and distilling it from them again.

Wash being of a mucilaginous, or somewhat glutinous nature, requires management to prevent its scorching, and make it work kindly in the still: if it should happen to be burnt in the operation, the spirit will have a most disagreeable flavour, and such as can never be got off again, without very great labour, and a particular treatment, not known to every body. To prevent this ill effect, there must be three things observed; the liquor, or *wash*, must be made dilute, the fire must be well regulated, and the whole kept in a constant agitation. The manner of making the *wash* dilute, has been long known among the more judicious distillers in this branch, and they have always found their spirit the purer for it. The fire is easily kept regular, by a constant attendance, and avoiding hasty stirring it, or throwing on new fuel; and the stirring of the liquor in the still is to be effected by means of a paddle, or bar kept in the liquor, till it just begins to boil, which is the time for luting on the head; and after which there is no great danger, but from the improper management of the fire: this is the common way, but it is hard to hit the exact time, when to lute down the head; and the doing it either too soon, or too late, is attended with great inconvenience, so that many have found out the other methods, of either putting some moveable solid bodies into the still with the *wash*, or placing some proper matter at the bottom and sides of the still, which are the places where the fire acts strongest.

There is another inconvenience attending the distilling of malt-spirit, which is, when all the bottoms, or gross mealy feculence is put into the still along with the liquor, the thinner part of the *wash* going off in form of spirit, the mealy mass grows by degrees more and more stiff, so as to scorch toward the latter part of the operation. The method used to remedy this, is to have a pipe with a stop-cock, leading from the upper part of the worm-tub into the still; so that, upon a half, or quarter turn, it may continually supply a little stream of hot water, in the same proportion as the spirit runs off, by which means the fear of scorching is taken away, and the operation at the same time not at all retarded. In Holland, the malt-distillers work all their *wash* thick, with the whole body of the meal among it; yet they are so careful in the keeping of their stills clean, and so regular and nice in the management of their fires, that, though they use no artifice at all on this head, only to charge the still while it is hot and moist, they very rarely have the misfortune to scorch, except now and then in the depth of winter. When such an accident has once happened in a still, they are extremely solicitous and careful to scrape, scrub, and scour off the remains of the burnt matter, otherwise they find the same accident very liable to happen again in the same place. But beyond all the other methods in use on this occasion, would be the working the stills not by a dry heat, but in a balneum Mariæ, which might possibly be so contrived by the bason being large, and capable of working a great many stills at once, as to be extremely worth the proprietor's while in all respects. Shaw's Essay on Distillery. See FERMENTATION, and MALT-*distillery*.

WASH is also used for the shallow part of a river, or arm of the sea, as the *washes* in Lincolnshire.

WASH *of an oar*. See OAR.

WASH-*board*, in a *Ship*, a broad thin plank fixed occasionally on the top of a boat's side, so as to extend the height thereof, and be removed at pleasure. It is used to prevent the sea from breaking into a vessel, particularly when the surface is rough, as in tempestuous weather. Falconer.

WASHERS, in *Wheel-carriages*, a name given to a flat circular ring which is put on the axle-tree, between the linch-pin and small end of the nave, to prevent the nave rubbing against the linch-pin and wearing it, as likewise to diminish the friction of the nave.

WASHING. See ABLUTION, LOTION, &c.

Washing the feet was a common piece of civility among the Jews, practised in regard to strangers, visitors, &c. at their arrival.

Washing the feet of twelve poor people, is an anniversary ceremony to be performed both by the kings of England and France; in commemoration of our Saviour's *washing* the feet of his apostles. See MAUNDY.

Arnobius, Adv. Gentes, lib. vii. mentions a feast in use among the ancients, called *lavatio matris Deûm*. See LAVATION.

WASHING *of ores*. See *Dressing of* ORES.

WASHING *of a ship*, in *Sea-Language*, is when all the guns are brought to one side; and the men, getting upon the yards, *wash* her other side, and scrape her as far as they can reach.

WASHING, in *Painting*, is when a design drawn with a pen, or crayon, has some one colour laid over it with a pencil; as Indian ink, bistre, or the like; to make it appear the more natural, by adding the shadows of prominences, apertures, &c. and by imitating the particular matters, whereof the thing is supposed to consist.

Thus, they *wash* with a pale red, to imitate brick and tile; with a pale Indian blue, to imitate water and slate; with green, for trees and meadows; with saffron or French berries, for gold and brass; and with several colours, for marbles.

These *washes* are usually given in equal teints, or degrees, throughout; which are afterwards brought down, and softened over the lights with fair water, and strengthened with deeper colours for the shadows.

The colours, which require only to be dissolved in water, are, for red, red ink; for blue, litmus; for green, sap-green and verdigrise in vinegar; for yellow, gamboge, the yellow berry wash and turmeric wash; for purple, the logwood wash and archil; for brown, Spanish liquorice; and for black, Indian ink.

Mr. Cochin, in order to produce *washed* prints much more beautiful than the common, proposes to print upon the colours instead of applying the colours upon the impression, in the following manner.

Having a plate already engraved, with a figure, in which it is required to introduce two or three colours, as the hat grey, the hair brownish, the cloak red, the coat and the stockings of different colours; let another plate of well polished copper be procured, and fitted to the size of the first: when this ungraved plate is varnished with white varnish, let a proof fresh drawn from the engraved plate be laid upon it exactly in the place where the engraved plate has made the impression, and then spread two blankets upon the table of the press, and lay the varnished plate upon them, with the proof lying upon it; and having covered them with two or three other blankets, pass them under the roller of the press. When the blankets and proof are taken off the plate, the white varnish will have the same impression with that of the proof, in the manner of a counter-proof; and the outlines of the hat, hair, cloak, &c. must be traced with a very fine needle, and the plate then gently corroded. After this the varnish should be taken off the plate; and some proofs should be taken from it on strong paper allumed, or upon cartoon very thin and well beaten; which should be previously moistened by lying in a damp cellar for a night, or two, or by putting it among the paper moistened in order to be printed. The proofs being made, and the cartoons or paper on which they were printed being dry, the part inclosed in the outline of the cloak should be coloured with a red ground; that within those of the head with a brown ground of bistre, and the same of the rest. The sheet thus coloured must then be put into the cellar, in order to moisten it; and having spread some of the blankets on the table of the press, the coloured sheet must be laid upon them, with the blank side downwards. After having inked all the first plate, that has the entire engraving upon it, in the manner for printing at other times, it must be put upon this leaf with the engraved side downwards, so that the parts of which the outline is marked on the sheet, may exactly coincide with those corresponding to them in the plate; and then two or three blankets being laid over them, the whole must be passed through the rollers. After which, the sheet being uncovered, will be found printed upon the colours, in a manner that renders the effect much more beautiful than that of those printed and

and coloured upon the printing, as in the common way. Handmaid to the Arts, vol. ii. p. 212, &c.

Washing *colours*, in *Painting*, a denomination given to ſuch colours as are tranſparent in water; in contradiſtinction from thoſe called *glazing colours*, which are pigments poſſeſſing the property of becoming tranſparent in oil.

Washing *over of colours*. The *waſhing* or cleanſing of ſome colours may be thus performed: take the colours to be *waſhed*, and put them, after having been well levigated or pounded, into a veſſel of fair water; ſtir it about till the water be all coloured therewith, and if any filth ſwim on the top of the water, ſcum it clean off, and when you think the groſſeſt part of the colour is ſettled at the bottom, then pour off that water into another earthen veſſel, that may contain the firſt veſſel full of water four or five times; then pour more water into the firſt veſſel, and ſtir the remaining colour till the water be thick; and after it is a little ſettled, pour that water alſo into the ſecond veſſel. Let this be repeated till all the fineſt of the colour is drawn off, and nothing but coarſe gritty ſtuff remains behind. Then letting the water in the ſecond veſſel ſtand to ſettle, till it is perfectly clear, pour it off, and reſerve the *waſhed* colour in the bottom of the veſſel for uſe.

The colours to be thus *waſhed* are red-lead, blue and green bice, verditer, blue and green ſmalt, Spaniſh brown, yellow ochre, &c.

Washings, or Washes, among *Goldſmiths*, *Coiners*, &c. are the lotions whereby they recover the particles of gold and ſilver out of the ſweep, i. e. aſhes, earths, ſweepings, &c.

This is either performed by ſimply *waſhing* them again and again, or by putting them in the *waſhing* mill.

To make one of theſe *waſhes*, they not only gather together the aſhes of the furnaces, and ſweepings of the workhouſes; but they alſo break and pound the old earthen crucibles, and the very bricks whereof the furnaces are built; little particles of gold, &c. being found to ſtick to them, by the flying off natural to thoſe metals, when in their laſt degree of heat.

Theſe matters, being well ground, and mixed together, are put in large wooden baſons, where they are *waſhed* ſeveral times, and in ſeveral waters, which run off, by inclination, into troughs underneath; carrying with them the earth, and the inſenſible particles of the metals, and only leaving behind them the larger and more conſiderable ones, which are viſible to the eye, and are finally taken out with the hand without more trouble.

To get out the finer parts, gone off with the earth, they uſe quickſilver, and a *waſhing* mill. This mill conſiſts of a large wooden trough, at bottom of which are two metalline parts, ſerving as mill-ſtones; the lower being convex, and the upper, which is in form of a croſs, concave.

At the top is a winch, placed horizontally, which turns the upper piece round; and at bottom is a bung, to let out the water and earth, when ſufficiently ground.

To have a *waſh*, then, the trough is filled with common water; into which they caſt thirty or forty pounds of quickſilver, and two or three gallons of the matter remaining from the firſt lotion. Then turning the winch, they give motion to the upper mill-ſtone; which grinding the matter and the quickſilver violently together, the particles of gold and ſilver become the more eaſily amalgated therewith; this work they continue for two hours; when opening the bung, the water and earths run out, and a freſh quantity is put in.

The earths are uſually paſſed thus through the mill three times; and the ſame quantity of mercury uſually ſerves all the three times. When there is nothing left in the mill but the mercury, united with the gold and ſilver which it has amalgated, they take it out, and *waſhing* it in divers waters, they put it in a ticken bag, and lay it in a preſs, to ſqueeze out the water, and the looſe quickſilver: the remaining quickſilver they evaporate by fire, in a retort, or an alembic. And the metal which remains, they refine with lead, or part it with aqua fortis.

WASP, Vespa, in *Zoology*, a genus of the *hymenoptera* order of inſects; the characters of which are theſe: the mouth has maxillæ without any proboſcis; the upper wings are plicated; the ſting is pointed and concealed; the eyes are lunar; and the body naked and ſmooth. Linnæus enumerates twenty-eight ſpecies.

M. Reaumur (Hiſt. Acad. Sci. Paris, 1719), and Dr. Derham (Phil. Tranſ. Nº 382. p. 53. or Abr. vol. viii. p. 404), agree in diſtinguiſhing three ſorts of *waſps*; viz. the queens or females, the males, and the common labouring *waſps*, called mules, which, according to Reaumur, are neither males nor females, and conſequently barren. The queens, of which there is a great number, are much longer in the body, and larger than any other *waſp*: they have a large heavy belly, correſponding in ſize to the prodigious quantity of eggs with which they are charged. The males are leſs than the queens, but longer and larger than the common *waſps*, which are the ſmalleſt of the ſpecies: they have no ſtings, with which both the queens and common *waſps* are furniſhed. There are in one neſt two or three hundred males, and as many females: but their number depends on the ſize of the neſt; and Dr. Derham obſerved, that the males were bred, or at leaſt moſtly reſided, in the two cells or partings, between the combs, next to the uppermoſt cell. The antennæ or horns of the male *waſps* are longer and larger than thoſe of either of the other ſorts: but the chief difference, ſays Dr. Derham, conſiſts in their parts of generation, which are altogether different from thoſe of other *waſps*.

The mules are the labourers belonging to a neſt, and are employed in procuring materials for the neſts and in conſtructing them, and alſo in furniſhing the other *waſps*, and the young, with proviſions.

M. Reaumur has obſerved, that when the females that have ſurvived the winter begin, at the return of ſpring, to lay their eggs, they firſt lay thoſe which hatch mules, and at this time they build cells of a ſmaller ſize to lodge the eggs from which they are produced: they afterwards build larger cells, and fill them with the largeſt eggs, which are thoſe of the males and females. This writer ſays, that the copulation of the males and females is viſible, and he has given a particular account of it; obſerving that it is performed in October, like that of all other flies.

At the beginning of winter, the *waſps* deſtroy all the eggs, and all the young ones without exception: all the mules and males, which have been employed in this work, being unfurniſhed with proviſions, periſh; and none ſurvive except ſome few females, which, according to Reaumur, were fecundated in October, and raiſe a new colony in the beginning of ſpring.

The *waſps* conſtruct regular combs, and rear their young in the cells of theſe combs in the manner of bees: wherever there is a young worm in a cell, the old *waſps* frequently thruſt their heads into it, and caſt up the food for the young one out of their mouths: their cells are hexagonal; and when they have a mind to enlarge their habitation, and make more or bigger combs in them, they are ſeen very buſily coming out of the mouth of the hole, every one loaded with a parcel of earth, till they have carried out as much as is neceſſary for the intended enlargement.

They ſupport their combs one over another by croſs pieces of about an inch long, ſo that there is ample room for the *waſps* to paſs in their ſeveral buſineſſes. Thoſe cells which ſtand in the centre of a comb, are always perpendicular; the others all ſtand more or leſs obliquely; and in the centre, the comb is ſomewhat hollowed and depreſſed on the face, and convex on the back; and in this part is inſerted the principal croſs piece that ſerves for a ſupport.

A *waſp*'s neſt is commonly round, and made of materials reſembling fine paper. The common covering of it, which is formed of ſeveral leaves or layers, with intermediate ſpaces, is pierced by two holes at a diſtance from one another, one of which is uſed for the entrance of the *waſps*, and the other only for their exit. The ſpace within this covering is cut by a number of horizontal planes, with intervals between them of the ſize of about half an inch; they are ſuſpended from one another by ligaments, and attached to the covering by their edges: they all have hexagonal cells in their lower ſurface.

The eggs of the *waſp* are of an oblong form, and reſemble thoſe of a common fly, but they are larger; they are always faſtened to the angles of a cell, never to the ſides of it. They are uſually placed ſingle; it is very rare to find two in one cell; and, if they are laid ſo, it ſeems that only one ſucceeds; for there is never found more than one worm in a cell.

The heads of all the nymphs are turned toward the centre of the comb, and their tails go obliquely downward toward the baſe of the cell. They are continually ſeen opening their mouths, and moving their forcipes, ſeeming ever hungry, and impatiently waiting for food from their parents. The cells are left open, till the nymph is at its full growth; then the *waſps* cover it over with a thin lid, under which the worm undergoes its tranſformation; and as ſoon as it is arrived at the *waſp*-ſtate, it eats its way through this thin cover, and comes to work with the reſt.

Mr. Ray mentions a peculiar ſpecies of *waſp*, which builds a much ſmaller neſt. This is uſually fixed to a beam of ſome old building, and has only one aperture, which is about half an inch wide, and ſerves for the *waſps*

waſps to go in and out at. This aperture is always exactly oppoſite to that part of the hive, where it adheres to the beam. The hive or neſt is covered with a thin membranaceous ſubſtance reſembling paper, of a brown colour, with ſtreaks of white, diſpoſed in regular circles. The whole neſt is about three inches in diameter, and is uſually compoſed of about nine cruſts; when theſe are cut away, there appears a round comb in the centre, and a ſmaller above it, fixed up by a pedicle ariſing from the centre of each. In every one of theſe cells, which are hexagonal as thoſe of the common *waſp*, is reared one worm, which, in fine, becomes a *waſp*.

The ſpecies of *waſp*, which builds in this manner, differs from the common *waſp*, in that it is ſomewhat larger; it is ſmoother alſo, and has rings of a deeper yellow on the back: the black ſpots are not ſo regular in this, as in the common *waſp*; and the forehead in this is of a perfect yellow, without any ſpots. Theſe marks, with the difference of hanging a ſmall neſt againſt a beam, and building a large one in the ground, are ſufficient to diſtinguiſh this as an abſolutely different ſpecies. Beſide theſe two, Mr. Ray mentions four other ſpecies of *waſps*.

We have an account in the Philoſophical Tranſactions, Nº 476, of ſome *waſp*-neſts made of clay in Penſylvania.

Mr. Reaumur, in his Hiſtory of Inſects, vol. vi. mentions clay-neſts from St. Domingo, ſomewhat different from theſe.

The common *waſp* has four wings and ſix feet; his body is yellow, with black triangular ſpots: the common *waſp* breeds in the ground.

There is another kind much more fierce, but very rare: theſe breed in woods and mountains; they are larger, and have broader bodies, and much more black about them; their ſting is ſo large, that it ſeems diſproportioned to the ſize of their bodies. The application of vinegar is ſaid to be good againſt their ſtinging.

To theſe are to be added the *ichneumon-waſps*, which are ſmaller than the others, and have very ſlender bodies, but of the ſame colours with the common kind: theſe uſually live in the holes of mud-walls, and make a ſort of porch of mud before the doors of their habitations.

There is alſo another *waſp* common about Vienna; this is three times as large as the common kind, and ſeems of two different ſpecies, the one having rough antennæ, and the other ſmooth: they are both variegated with black and a bright yellow. Mouffet's Hiſt. Inſects, p. 6.

WASP, *ichneumon*. See ICHNEUMON, and VESP-*ichneumon*.

WASP-*fly*, in *Natural Hiſtory*, a ſpecies of fly having very much the external figure of a *waſp*, but harmleſs, without a ſting, and with only two wings.

It is black and yellow on the body, and marked exactly as the *waſp*, and is produced from a ſpecies of the rat-tailed fly-worms. See DRONE-*fly*.

But beſide theſe there is another ſmall fly produced of the puceron-eaters, which has extremely the appearance of a ſmall *waſp*; but is perfectly harmleſs, and has only two wings. Reaumur, Hiſt. Inſ. vol. iv. p. 486.

WASP-*tipula*, in *Natural Hiſtory*, the name of an inſect deſcribed by Mr. Reaumur, and being properly a tipula, or long-legs, through greatly reſembling a *waſp*.

This is produced of a worm found in the earth, lodged in the cavities of old trees; the worm has no legs, but has a regularly figured ſcaly head. The fly produced from it has the long legs and the mouth of the tipula, with the remarkable double beard which covers it, and which makes the great character of this claſs of inſects; but then the body is ſhort and thick, whereas the bodies of the common kinds are very bony and thin. This, as alſo the breaſt, is variegated with ſtreaks of black and yellow, in the manner of the *waſp*; and its antennæ are very beautifully feathered, and bearded like thoſe of the males of many of the gnat-kind. The head is black, and the legs are yellowiſh. The wings have a yellowiſh caſt, and near their end have each a large ſpot of brown. The body of the female of this ſpecies is always much thicker than that of the male; and the ſexes are eaſily diſtinguiſhed by this. Reaumur, Hiſt. of Inſ. vol. ix. p. 19.

WASSAILE, or WASSEL, a feſtival ſong, ſung heretofore from door to door, about the time of Epiphany. See WASSEL-*bowl*.

WASSEL-*bowl*, or WESTEL-*bowl*, was a large cup or bowl of ſilver or wood, wherein the Saxons, at their public entertainments, drank a health to one another, in the phraſe *was-heal*; that is, *health be to you*.

This *waſſel-bowl* ſeems plainly to be meant by the word *vaſſellum*, in the Lives of the Abbots of St. Albans, by Matt. Paris; where he ſaith, *Abbas ſolus prandebat ſupremus in refectorio habens* vaſtellum: "He had ſet by him "the *waſſel-bowl* to drink a health to the fraternity; or "the poculum charitatis."

And hence the cuſtom of going a *waſſeling*, ſtill uſed in Suſſex, and ſome other places, ſeems to have taken its name.

WAST, or WASTE, *Vaſtum*, in *Law*, has divers ſignifications.

1. It is uſed for a ſpoil, made either in houſes, woods, lands, &c. by the tenants for life, or for years, to the prejudice of the heir, or of him in reverſion, or remainder.

Waſte is either voluntary, as by pulling down a houſe; or permiſſive, as by ſuffering it to fall for want of neceſſary reparations. Whatever does a laſting damage to the freehold or inheritance is *waſte*: therefore the removing of wainſcot, floors, or other things once fixed to the freehold of a houſe, is *waſte*.

Waſte may alſo be committed in ponds, dove-houſes, warrens, and the like; by ſo reducing the number of erections therein, that there will not be ſufficient for the reverſioner when he comes to the inheritance. To cut down trees, that are deemed timber, as oak, aſh, and elm, and other trees generally uſed in building, or to lop them, or do any other act whereby the timber may decay, is *waſte*. The converſion of land from one ſpecies to another is *waſte*; and alſo to convert one ſpecies of edifice into another, even though it is improved in its value. To open the land to ſearch for mines of metal, coal, &c. is *waſte*: and, in general, whatever tends to the deſtruction, or depreciating the value, of the inheritance, is conſtituted by the law as *waſte*.

In conſequence of the ſtatute of Marlbridge, 52 Hen. III. cap. 23. and that of Glouceſter, 6 Edw. I. cap. 5. all tenants for life, or for any leſs eſtate, are puniſhable or liable to be impeached for *waſte*, both voluntary and permiſſive; unleſs their leaſes be made, as ſometimes they are, without impeachment of *waſte*, *abſque impetitione vaſti*; that is, with a proviſion or protection that no man ſhall *impetere* or ſue them, for *waſte* committed.

The puniſhment for *waſte* committed was, by common law and the ſtatute of Marlbridge, only ſingle damages, except in the caſe of a guardian in chivalry, who alſo forfeited his wardſhip by the proviſions of the great charter, 9 Hen. III. cap. 4. But the ſtatute of Glouceſter directs that tenants in dower, by courteſy, for life, and for years, ſhall loſe and forfeit the place wherein the *waſte* is committed, and alſo treble damages, to him that *hath* the inheritance. For this purpoſe a writ of *waſte* is brought by him, who hath the immediate eſtate of inheritance in reverſion or remainder, calling upon the tenant to appear and ſhew cauſe, why he hath committed *waſte*; and if the defendant makes default, or doth not appear at the day aſſigned him, then the ſheriff, with a jury of twelve men, is to go to the place alledged to be waſted, and there enquire of the *waſte* done, and the damages; and make a return or report to the court, upon which report the judgment is founded. But if the defendant appears, and afterwards ſuffers judgment to go againſt him by default, or upon a *nihil dicit*, this amounts to a confeſſion of the *waſte*; and the ſheriff ſhall then only make enquiry of the quantum of damages. When the *waſte* and damages are thus aſcertained, by confeſſion, verdict, or enquiry of the ſheriff, judgment is given, in purſuance of the ſtatute of Glouceſter, cap. 5. that the plaintiff ſhall recover the place waſted, for which he has immediately a writ of ſeiſin, and alſo that he ſhall recover treble the damages aſſeſſed by the jury.

The redreſs of this injury of *waſte* is alſo preventive, by writ of ESTREPEMENT; and, beſides, the courts of equity, upon bill exhibited therein, complaining of *waſte* and deſtruction, will grant an injunction to ſtay *waſte*, until the defendant ſhall have put in his anſwer, and the court ſhall thereupon make farther order: which is now become the moſt uſual way of preventing *waſte*. Blackſt. Com. book ii. p. 281. book iii. p. 223, &c.

WASTE *of the foreſt*, is, properly, where a man cuts down his own woods within the foreſt, without licence of the king, or lord chief-juſtice in eyre.

WASTE is alſo taken for thoſe lands which are not in any man's occupation; but lie common.

They ſeem to be ſo called, becauſe the lord cannot make ſuch profit of them as of his other lands; by reaſon of the uſe others have thereof, for paſſing to and fro. Upon this none may build, cut down trees, dig, &c. without the lord's licence.

Year, Day and WASTE. See YEAR, *Day and Waſte*.

WASTE *of a ſhip*. See WAIST.

WASTE-*board*. See WASH-*board*.

WASTE-*cloths*, in a *Ship of War*. See FIGHTS.

WASTE-*trees*, in a *Ship*, are thoſe timbers which lie in her *waſte*, or WAIST.

WASTEL *bread*. See BREAD.

WASTORS, in *our Statutes*, a kind of thieves ſo called, and mentioned among robbers, draw-latches, &c.

WATCH, *Guet*, a perſon poſted as a ſpy in any place, to have an eye thereto, and to give notice of what paſſes.

WATCH is alſo uſed for a *corps de guarde* poſted at any paſſage; or for a company of guards who go on the patrole. Some officers are exempted from *watch* and guard.

In the ſame ſenſe they ſay, *night-watch*, *guet de nuit*: *watch-word*, *mot de guet*: *royal watch*, and *city-watch*.

Chevalier de guet is a name given by the French, to the officer who commands the *royal watch*, &c.

WATCH, *vigilia*, in *Roman Antiquities*, a diviſion of their night; being the fourth part of the ſpace of time between ſun-ſet and ſun-riſing, and conſequently varying according to the ſeaſon of the year.

In the Roman army, there were night-guards or vigiles, viz. four in every manipulus, who kept guard three hours, and were then relieved by four others: ſo that there were four ſets in a night, according to the four *watches*. The way of ſetting this nightly guard was by a tally or TESSERA, with a particular inſcription, given from one centurion to another quite through the army, till it came again to the tribune who firſt delivered it: upon the receipt of this the guard was immediately ſet. Beſides they had the *circuitio vigilium*, or a viſiting of the *watch*, performed commonly about four times in the night by ſome of the horſe. Upon extraordinary occaſions the tribunes and lieutenant-generals, and ſometimes the general himſelf, made theſe circuits in perſon, and took a ſtrict view of the *watch* in every part of the camp.

WATCH, at *Sea*, ſignifies the ſpace of time, wherein one diviſion of a ſhip's crew remains upon deck, to perform the neceſſary ſervices, whilſt the reſt are relieved from duty, either when the veſſel is under ſail, or at anchor. The length of the ſea-*watch* is not the ſame in the ſhipping of different nations. It is always kept four hours by our Britiſh ſeamen, if we except the *dog-watch* between four and eight in the evening, that contains two reliefs, each of which is only two hours on deck. The intent of this is to change the period of the night-*watch* every twenty-four hours; ſo that the party watching from eight till twelve in one night ſhall *watch* from midnight till four in the morning on the ſucceeding one. In France the duration of the watch is extremely different, being in ſome places ſix hours, and in others ſeven or eight; and in Turky and Barbary it is uſually five or ſix hours.

A ſhip's company is uſually claſſed into two parties: one of which is called the ſtarboard and the other the larboard *watch*. It is, however, occaſionally ſeparated into three diviſions, as in a road or in particular voyages.

In a ſhip of war, the *watch* is generally commanded by a lieutenant, and in merchant ſhips by one of the mates: ſo that if there are four mates in the latter, there are two in each watch; the firſt and third being in the larboard, and the ſecond and fourth in the ſtarboard *watch*: but in the navy the officers who command the *watch* uſually divide themſelves into three parts, in order to lighten their duty. Falconer.

WATCH-*glaſſes*, in a *Ship*, are glaſſes employed to meaſure the period of the *watch*, or to divide it into any number of equal parts, as hours, half-hours, &c. ſo that the ſeveral ſtations therein may be regularly kept and relieved, as at the helm, pump, look-out, &c.

To ſet the WATCH, in *Sea-Language*, is to appoint one diviſion of the crew to enter upon the duty of the *watch*; as at eight o'clock in the evening.

WATCH, *death*. See DEATH.

WATCH is alſo uſed for a ſmall portable movement, or machine, for the meaſuring of time; having its motion regulated by a ſpiral ſpring.

Watches, ſtrictly taken, are all ſuch movements as ſhew the parts of time; as clocks are ſuch as publiſh it, by ſtriking on a bell, &c. But commonly, the name *watch* is appropriated to ſuch as are carried in the pocket; and *clock* to the large movements, whether they ſtrike the hour, or not.

Spring, or *Pendulum* WATCHES, ſtand pretty much on the ſame principle with pendulum clocks; whence their denomination. If a pendulum, deſcribing little arches of a circle, makes vibrations of unequal lengths, in equal times; it is becauſe it deſcribes the greater with a greater velocity. For the ſame reaſon, a ſpring put in motion, and making greater or leſs vibrations, as it is more or leſs ſtiff, and as it has a greater or leſs degree of motion given it, performs them nearly in equal times. Hence, as the vibrations of the pendulum had been applied to large clocks, to rectify the inequality of their motions; ſo, to correct the unequal motions of the balance of *watches*, a ſpring is added; by the iſochroniſm of whoſe vibrations, the correction is to be effected.

The ſpring is uſually wound into a ſpiral; that, in the little compaſs allotted it, it may be as long as poſſible; and may have ſtrength enough not to be maſtered, and dragged about, by the inequalities of the balance it is to regulate.

The vibrations of the two parts, viz. the ſpring and balance, ſhould be of the ſame length; only ſo adjuſted, as that the ſpring, being more regular in the length of its vibrations than the balance, may, on occaſion, communicate its regularity thereto.

The invention of ſpring, or *pocket-watches*, is owing to the laſt age. It is true, we find mention made of a *watch* preſented to Charles V. in the hiſtory of that prince: but this, in all probability, was no more than a kind of clock to be ſet on a table; ſome reſemblance whereof we have ſtill remaining in the ancient pieces made before the year 1670. In effect, it is between Dr. Hooke, and M. Huygens, that the glory of this excellent invention lies: but to which of them it properly belongs, is greatly diſputed; the Engliſh aſcribing it to the former; and the French, Dutch, &c. to the latter.

Dr. Derham, in his Artificial Clock-maker, ſays expreſly, that Dr. Hooke was the inventor; and adds, that he contrived various ways of regulation. One way was with a load-ſtone. Another with a tender ſtraight ſpring, one end whereof played backwards and forwards with the balance: ſo that the balance was to the ſpring, as a bob to a pendulum; and the ſpring as the rod thereof. A third method was with two balances, of which there were divers ſorts; ſome having a ſpiral ſpring to the balance for a regulator, and others without.

But the way that prevailed, and which continues in mode, was with one balance, and one ſpring running round the upper part of the verge thereof. Though this has a diſadvantage, which thoſe with two ſprings, &c. were free from; in that a ſudden jerk, or confuſed ſhake, will alter its vibrations, and put it in an unuſual hurry.

The time of theſe inventions was about the year 1658, as appears, among other evidences, from an inſcription on one of the double balance *watches*, preſented to king Charles II. viz. Rob. Hook inven. 1658. T. Tompion fecit, 1675. The invention preſently got into reputation, both at home and abroad; and two of them were ſent for by the dauphin of France.

Soon after this, M. Huygens's *watch* with a ſpiral ſpring got abroad, and made a great noiſe in England, as if the longitude could be found by it. It is certain, however, that this invention was later than the year 1673, when his book de Horol. Oſcillat. was publiſhed; wherein he has not one word of this, though he has of ſeveral other contrivances in the ſame way.

One of theſe the lord Brouncker ſent for out of France, where M. Huygens had got a patent for them. This *watch* agreed with Dr. Hooke's in the application of the ſpring to the balance; only M. Huygens's had a longer ſpiral ſpring, and the pulſes or beats were much ſlower. The balance, inſtead of turning regularly round, as Dr. Hooke's, turns ſeveral rounds every vibration.

Dr. Derham ſuggeſts, that he has reaſon to doubt, whether M. Huygens's fancy was not firſt ſet to work, by ſome intelligence he might have of Dr. Hooke's invention, from Mr. Oldenburg, or ſome other of his correſpondents in England: though Mr. Oldenburg vindicates himſelf againſt that charge, in Philoſophical Tranſactions, Nº 118. and 129. See a farther account of the ſtate of this controverſy in Mr. Waller's Life of Dr. Hooke, p. 4. and Birch's Hiſt. of the R. S. vol. iii. p. 320.

Huygens invented divers other kinds of *watches*, ſome of them without any ſtring or chain at all; which he called, particularly, *pendulum watches*.

As it was in England that *watches* had their firſt riſe; ſo it is there, too, they have arrived at their greateſt perfection. Witneſs that exceeding value put on an Engliſh *watch* in all foreign countries, and that vaſt demand made for them.

M. Savary, in his Diction. de Commerce, pretends to match the French *watchmakers* againſt the Engliſh. He aſſerts, "That if the Engliſh be in any condition to "diſpute it with them, they owe it entirely to the great "number of French workmen, who took ſhelter here "upon the revocation of the edict of Nantes." He adds, "That three fourths of the *watches* made in England, "are the work of Frenchmen." From what authorities "he ſays this, at the time when he wrote, we know "not."

It is certain the French have preferred our *watches* to their own; inſomuch that, to have them with the more eaſe, a number of Engliſh workmen were invited over in 1719, and eſtabliſhed with great countenance at Verſailles, under the direction of the famous Mr. Law. But the eſtabliſhment, though every thing promiſed well for

it, and the French *watch* and clockmakers seemed undone by it, fell to the ground in less than a year's time. M. Savary imputes its fall, entirely, to the strong prejudice of the French people, in behalf of the English workmen, and to their knowing that the *watches* did not come from England. But the truth is, the workmen sent over, being most of them men of loose characters, grew dissolute, quarrelled with the priests, insulted the magistrates, and were dismissed, of necessity.

One of the English artists, who established a manufactory at Versailles, was Mr. Henry Sully; and though he returned to England within two years after his first settlement, he soon after went back and established another manufactory at St. Germain's. He published an account of a longitude clock he had invented, in 1726; from which, however, his expectations were disappointed; and died in 1728.

M. Le Roy, a celebrated artist of Paris, has not long since pointed out some inconveniences attending the usual disposition of the wheels and pinions of *watches*, and proposed a method of remedying them. Every wheel of a *watch* is fixed in an arbor, which terminates in two pivots, and these turn in holes drilled in the plates of the *watch*. Each arbor is charged both with a wheel and a pinion: and it is the pinion which receives the action of the immediately preceding wheel, and transmits it to the wheel fixed on its own arbor. M. Le Roy observes, that a *watch*-wheel placed near the middle of its arbor is in the most advantageous position, especially if its pinion be nearly in the same position; because then, the effort it receives is distributed equally between the two pivots; the pivot-holes in the plates wear equally and on the same side, and their enlargement will always let the wheel continue parallel to the plates; and, therefore, the position of the planes of the wheels suffering no alteration by such wearing, with respect to one another, they drive one another on without any alteration as to the pitching or the friction. But it will be otherwise, when the wheel or the pinion are near one of the extremities of the arbor, because the friction arising from the action of the wheel is no longer equal on both the pivots; that which is nearest the pinion receiving almost the whole effort of the preceding wheel, whilst the other is very slightly affected by it. Hence it will follow, that the hole of such pivot must wear much more, and in a shorter time, than the other; the position of the arbor will be altered, and consequently that of the parallelism of the planes of the wheels. This is the great defect of common *watches*; the pinion of the small middle wheel or third wheel, and that of the contrate wheel are so near one of their pivots, that it is often necessary to stop or bush up their holes, and drill them anew in a year or two. M. Le Roy set himself about remedying this inconvenience; in order to which he was under a necessity of inverting the fusee, so that the wide base should be at top, and little end at bottom, near the great wheel: and thus the little middle wheel might be made to act upon the pinion of the contrate wheel, near the middle of its arbor. M. Le Roy makes the lower pivots to turn not in the plate of the frame, but in another little plate or cap placed on the outside of the frame-plate; by which contrivance he renders the effort of the pivots nearly equal, and keeps the oil from quitting the pivots, as it is too apt to do in the common construction. By the inversion of the fusee, its base being on the same side as the square of the great pivot, the diameters of the pivots are proportioned to the friction they suffer; whereas in English *watches*, the great pivot is on the side where the chain draws nearest the centre, or on the wrong side.

We shall add in this place, that the true principles upon which all TIME-*keepers* must be constructed are clearly laid down, and the means of improvement fully pointed out in an excellent short tract, intitled, Thoughts on the Means of improving *Watches*, by Thomas Mudge.

Watches made by artificers with us are to have the maker's name, &c. under penalty of 20*l.* 9 and 10 W. III. cap. 28.

WATCHES, *striking*, are such as, besides the proper *watch*-part, for measuring of time, have a clock-part, for striking the hours, &c.

These are real clocks; only moved by a spring instead of a weight. Properly speaking, they are called *pocket-clocks*.

WATCHES, *repeating*, are such as, by pulling a string, &c. repeat the hour, quarter, or minute, at any time of the day or night.

This repetition was the invention of Mr. Barlow, and was first put in practice by him in larger movements, or clocks, about the year 1676. The contrivance immediately set the other artists to work, who soon contrived divers ways of effecting the same. But its application to pocket-*watches* was not known before king James the Second's reign; when the ingenious inventor above mentioned, having directed Mr. Tompion to make a *repeating-watch*, was soliciting a patent for the same.

The talk of a patent engaged Mr. Quare to resume the thoughts of a like contrivance, which he had in view some years before: he now effected it; and being pressed to endeavour to prevent Mr. Barlow's patent, a *watch* of each kind was produced before the king and council; upon trial of which, the preference was given to Mr. Quare's.

The difference between them was, that Barlow's was made to repeat, by pushing in two pieces on each side the *watch*-box; one of which repeated the hour, and the other the quarter: whereas Quare's was made to repeat by a pin that stuck out near the pendant: which, being thrust in (as now it is done by thrusting in the pendant itself), repeated both the hour and quarter with the same thrust.

The movement of these machines will be stopped with great cold; and therefore in very cold climates, it is proper to keep them in one's fob by day, and in the bed by night. See Phil. Transf. N° 465. sect. 2. See TIME-*keeper*.

WATCH-*glass*. Mr. Boyle informs us, that to fashion glasses for *watches*, or the like purpose, into a convex or concave figure, there is no necessity for grinding: for, a smooth and flat piece of glass, of a competent thickness, being carefully laid upon a shallow concave cylinder of iron, so that the edges of both touch, the heat of a fire, warily applied, will soften the glass, and suffer it to sink into the form required. See Works Abr. vol. i. p. 135.

WATCH *and ward*, in *Law*, constitute one of the principal duties of CONSTABLES, who, by the statute of Winchester, 13 Edw. I. cap. 4. are appointed to keep *watch* and ward in their respective jurisdictions. Ward, guard or *custodia*, is chiefly intended of the day-time, in order to apprehend rioters, and robbers on the highways; the manner of doing which is left to the discretion of the justices of the peace and the constable; the HUNDRED being, however, answerable for all robberies committed therein, by day-light, for having kept negligent guard. *Watch* is properly applicable to the night only (being called among our Teutonic ancestors *wacht* or *wacta*), and it begins at the time, when ward ends, and ends when that begins; for, by the statute of Winchester, in walled towns the gates shall be closed from sun-setting to sun-rising, and *watch* shall be kept in every borough and town, especially in the summer season, to apprehend all rogues, vagabonds, and night-walkers, and make them give an account of themselves. The constable may appoint watchmen at his discretion, regulated by the custom of the place; and these, being his deputies, have for the time being the authority of their principal. Blackst. Com. book i. p. 356.

WATCHING, WAKEFULNESS, *insomnia*, among *Physicians*, denotes a disorder whereby a person is disabled from going to sleep.

It is occasioned by a continual and excessive motion of the animal spirits in the organs of the body, whereby those organs are prepared to receive, readily, any impressions from external objects, which they propagate to the brain; and furnish the soul with divers occasions of thinking.

This extraordinary flux of spirits may have two causes: for, 1. The sensible objects may strike the organ with too much force. In which case, the animal spirits being violently agitated, and those agitations continued by the nerves to the brain, they give a like motion to the brain itself; the necessary consequence of which is, that the animal must wake. Thus, a loud shriek, pains, head-ach, gripes, coughing, &c. cause *waking*. Add, that the mind's being oppressed with cares, or deeply engaged in thinking, contributes to the same; since, as it acts by the ministry of the spirits, any cares or meditations, that keep those in motion, must produce *watchfulness*. Of this kind are the inveterate *wakings* of melancholic persons; some of whom have been known to pass three or four weeks without a wink of sleep.

2. The other cause is in the spirits themselves; which have some extraordinary disposition to receive motion, or to persist in it: as, from their too great heat, or that of the brain in fevers, &c. Hence it is, that the disorder is most frequent in summer, in the heat of youth, &c. Long fasting has the same effect; the want of food subtilizing the spirits, and drying the brain. The same is likewise an ordinary symptom in old age, by reason the pores of the brain, and the nerves, having been much widened by the continual passage of spirits, for a great number of years, the spirits now pass and repass through them with too much ease; and need not any extraordinary motion to keep the mind awake.

There are instances of peoples *waking* for forty-five nights successively: and we even read of a melancholy person, who never slept once in fourteen months. Such *watchings* usually degenerate into madness.

WATCH-WORK is that part of the movement of a clock or watch, which is designed to measure and exhibit the time on a dial-plate; in contradistinction to that part which contributes to the striking of the hour, &c. which is called CLOCK-*work*. See *Tab. Horology, fig.* 1.

The several members of the *watch*-part are, 1. the *balance*, consisting of the *rim*, which is its circular part; and the *verge*, which is its spindle; to which belong the two *pallets* or *leaves*, that play in the teeth of the crown-wheel.

2. The *potence*, or *pottance*, which is the strong stud in pocket-watches, whereon the lower pivot of the verge plays, and in the middle of which one pivot of the balance-wheel plays; the bottom of the pottance is called the *foot*, the middle part the *nose*, and the upper part the *shoulder*.

3. The *cock*, which is the piece covering the balance.

4. The *regulator*, or *pendulum spring*, which is the small spring, in the new pocket-*watches*, underneath the balance. See REGULATOR.

5. The *pendulum*; whose parts are, the *verge x*, *pallets* 5,5, *cocks y y y*, the *rod*, the *fork z*, the *flatt* 2, the bob or great *ball* 3, and the *corrector* or regulator 4, being a contrivance of Dr. Derham, for bringing the pendulum to its nice vibrations.

6. The *wheels*, which are the *crown-wheel* F, in pocket-pieces, and *swing-wheel* in pendulums; serving to drive the balance or pendulum.

7. The *contrate-wheel* E, which is that next the crown-wheel, &c. and whose teeth and hoop lie contrary to those of other wheels; whence the name.

8. The *great*, or *first wheel* C; which is that the fusee B, &c. immediately drives, by means of the chain or string of the spring box or barrel A; after which are the *second wheel* D, *third wheel*, &c.

Lastly, between the frame and dial-plate, is the *pinion of report*, which is that fixed on the arbor of the great wheel; and serves to drive the *dial-wheel*, as that serves to carry the *hand*.

For the illustration of this part of the work, which lies concealed, let ABC (*Tab. Horology, fig.* 2.) represent the uppermost side of the frame plate, as it appears when detached from the dial-plate: the middle of this plate is perforated with a hole, receiving that end of the arbor of the centre wheel, which carries the minute hand; near the plate is fixed the pinion of report *a b* of 10 teeth; this drives a wheel *c d* of 40 teeth; this wheel carries a pinion *e f* of 12 teeth; and this again drives a wheel *g h* with 36 teeth.

As in the body of the watch, the wheels every where divide the pinions, here, on the contrary, the pinions divide the wheels, and by that means diminish the motion, which is here necessary; for the hour-hand, which is carried on a socket fixed on the wheel *g h* is required to move but once round, while the pinion *a b* moves twelve times round. For this purpose the motion of the wheel *c d* is $\frac{1}{4}$ of the pinion *a b*. Again, while the wheel *cd*, or the pinion *ef*, goes once round, it turns the wheel *g h* but $\frac{1}{3}$ part round; consequently the motion of *g h* is but $\frac{1}{3}$ of $\frac{1}{4}$ of the motion of *a b*; but $\frac{1}{3}$ of $\frac{1}{4}$ is $\frac{1}{12}$; i. e. the hour-wheel *gh* moves once round in the time that the pinion of report, on the arbor of the centre or minute wheel, makes 12 revolutions, as required. Hence the structure of that part of a clock, which shews the time, may be easily understood.

The cylinder A (*fig.* 1.) put into motion by a weight or inclosed spring moves the fusee B, and the great wheel C to which it is fixed by the line or cord that goes round each, and answers to the chain of a watch.

The method of calculation is easily understood by the sequel of this article: for, suppose the great wheel C goes round once in 12 hours, then if it be a royal pendulum clock, swinging seconds, we have $60 \times 60 \times 12 = 43200$ seconds or beats in one turn of the great wheel. But because there are 60 swings or seconds in one minute, and the seconds are shewn by an index on the end of the arbor of the swing wheel, which in those clocks is in an horizontal position; therefore, it is necessary that the swing wheel F should have 30 teeth; whence $\frac{43200}{60} = 720$ the number to be broken into quotients for finding the number of teeth for the other wheels and pinions.

In spring-clocks, the disposition of the wheels in the watch part is such as is here represented in the figure, where the spring-wheel F is in an horizontal position; the seconds not being shewn there by an index, as is done in the large pendulum clocks. Whence in these clocks, the wheels are disposed in a different manner, as represented in fig. 3. where C is the great wheel, D the centre or minute wheel, as before: but the contrate wheel E is placed on one side, and F the swing-wheel is placed with its centre in the same perpendicular line G H, with the minute wheel, and with its plane perpendicular to the horizon, as are all the others. Thus the minute and hour hands turn on the end of the arbor of the minute wheel at *a*, and the second hand on the arbor of the swing wheel at *b*.

Theory and Calculation of WATCH-WORK. Preliminaries necessary to the calculation of the *watch*-part of a movement, are laid down under BEATS, MOVEMENT, CLOCK-WORK, and TURN.

Preliminary rules, common to the calculation of all movements, the *clock* as well as the *watch*-parts; see under the article MOVEMENT. Particular rules for the *striking part*; see under the article CLOCK-WORK. Those for the *watch*-part we have from the Rev. Dr. Derham, as follow:

1. The same motion, it is evident, may be performed either by one wheel, and one pinion, or many wheels, and many pinions; provided the number of turns of all the wheels bear the proportion to all the pinions, which that one wheel bears to its pinion: or, which is the same thing, if the number, produced by multiplying all the wheels together, be to the number produced by multiplying all the pinions together, as that one wheel to that one pinion. Thus, suppose you had occasion for a wheel of 1440 teeth, with a pinion of 28 leaves; you make it into three wheels of 36, 8, and 5, and three pinions of 4, 7, and 1. For the three wheels, 36, 8, and 5, multiplied together, give 1440 for the wheels, and the three pinions 4, 7, and 1, multiplied together, give 28 for the pinions. Add, that it matters not in what order the wheels and pinions are set, or which pinion runs in which wheel; only, for convenience sake, the biggest numbers are commonly put to drive the rest.

2. Two wheels, and pinions of different numbers, may perform the same motion. Thus, a wheel of 36 drives a pinion of 4; the same as a wheel of 45, a pinion of 5; or a wheel of 90, a pinion of 10. The turns of each being 9.

3. If, in breaking the train into parcels, any of the quotients should not be liked; or if any other two numbers, to be multiplied together, are desired to be varied; it may be done by this rule. Divide the two numbers by any other two numbers which will measure them; multiply the quotients by the alternate divisors; the product of these two last numbers found, will be equal to the product of the two numbers first given. Thus, if you would vary 36 times 8, divide these by any two numbers which will evenly measure them: so, 36 by 4, gives 9; and 8 by 1, gives 8: now, by the rule, 9 times 1 is 9, and 8 times 4, 32; so that for 36×8, you have 32×9; each equal to 288. If you divide 36 by 6, and 8 by 2, and multiply as before, you have $24 \times 12 = 36 \times 8 = 288$.

4. If a wheel and pinion fall out with cross numbers, too big to be cut in wheels, and yet not to be altered by these rules; in seeking for the pinion of report, find two numbers of the same, or a near proportion, by this rule: as either of the two given numbers is to the other, so is 360 to a fourth. Divide that fourth number, as also 360, by 4, 5, 6, 8, 9, 10, 12, 15 (each of which numbers exactly measures 360), or by any of those numbers that bring a quotient nearest to an integer. As suppose you had 147 for the wheel, and 170 for the pinion; which are too great to be cut into small wheels, and yet cannot be reduced into less, as having no other common measure but unity: say, as 170 : 147 : : 360 : 311. Or, as 147 : 170 : : 360 : 416. Divide the fourth number, and 360, by one of the foregoing numbers; as 311, and 360, by 6, it gives 52 and 60; divide them by 8, you have 39, and 45: and, if you divide 360 and 416, by 8, you have 45 and 52 exactly. Wherefore, instead of the two numbers 147 and 170, you may take 52 and 60, or 39 and 45, or 45 and 52, &c.

5. To come to practice in calculating a piece of *watch-work*, first pitch on the train or beats of the balance in an hour; as, whether a swift one, of about 20000 beats (the usual train of a common 30 hour *pocket-watch*), or a slower of about 16000 (the train of the new pendulum *pocket-watches*), or any other train. Next, resolve on the number of turns the fusee is intended to have, and the number of hours the piece is to go: suppose, e. g. 12 turns, and to go 30 hours, or 192 hours (i. e. 8 days), &c. Proceed now to find the beats of the balance or pendulum in one turn of the fusee, by the direction given under the word BEATS. Thus in numbers; 12 : 16 : : 20000 : 26666. Wherefore, 26666 are the beats in one turn of the fusee, or great wheel, and are equal to the quotients of all the wheels unto the balance multiplied together. Now this number is to be broken into a convenient

venient parcel of quotients; which is to be done thus: first, halve the number of beats; viz. 26666, and you have 13333; then pitch on the number of the crown-wheel, suppose 17: divide 13333 by 17, and you have 784 for the quotient (or turns) of the rest of the wheels and pinions; which, being too big for one or two quotients, may be best broken into three. Choose therefore three numbers; which, when multiplied all together continually, will come nearest 784: as suppose 10, 9, and 9, multiplied continually, give 810, which is somewhat too much; therefore try again other numbers, 11, 9, 8: these, drawn one into another continually, produce 792; which is as near as can be, and is a convenient quotient. Having thus contrived the piece from the great wheel to the balance; but the numbers not falling out exactly, as you first proposed, correct the work thus: first (by the direction given under the word BEATS), multiply 792, the product of all the quotients pitched upon, by 17 (the notches of the crown-wheel); the product is 13464, which is half the number of beats in one turn of the fusee; then (by a rule given under the word BEATS) find the true number of beats in an hour. Thus, 16 : 12 : : 13464 : 10098, which is half the beats in an hour. Then find what quotient is to be laid upon the pinion of report (by the rule given under that word). Thus, 16 : 12 : : 12 : 9, the quotient of the pinion of report. Having thus found your quotients, it is easy to determine what numbers the wheels shall have; for, choosing what numbers the pinions shall have, and multiplying the pinions by their quotients, the product is the number for the wheels. Thus, the number of the pinion of report is 4, and its quotient is 9; therefore the number for the dial-wheel must be 4×9, or 36: so the next pinion being 5, its quotient 11, therefore the great wheel must be $5 \times 11 = 55$; and so of the rest.

4) 36 (9
5) 55 (11
5) 45 (9
5) 40 (8
17

Such is the method of calculating the numbers of a 16 hour *watch*. Which *watch* may be made to go longer, by lessening the train, and altering the pinion of report. Suppose you could conveniently slacken the train to 16000; then, by the rule given under the word BEATS, say, as $\frac{1}{2}$ 16000, or 8000 : 13464 : : 12 : 20; so that this *watch* will go 20 hours. Then for the pinion of report, say (by the rule given under that word), as 20 : 12 : : 12 : 7. So that 7 is the quotient of the pinion of report. And as to the numbers, the operation is the same as before; only the dial wheel is but 28; for its quotient is altered to 7. If you would give numbers to a *watch* of about 10000 beats in an hour, to have 12 turns of the fusee, to go 170 hours, and 17 notches in the crown-wheel; the work is the same, in a manner, as in the last example: and consequently thus: as 12 : 170 : : 10000 : 141666, which fourth number is the beats in one turn of the fusee; its half, 70833, being divided by 17, gives 4167 for the quotient: and because this number is too big for three quotients, therefore choose four, as 10, 8, 8, 6 $\frac{3}{4}$; whose product into 17 makes 71808, nearly equal to half the true beats in one turn of the fusee. Then say, as 170 : 12 : : 71808 : 5069, which is the true train of your *watch*. And again, 170 : 12 : : 12 : $\frac{144}{170}$, the denominator of which expresses the opinion of report, and the numerator is the number of the dial-wheel. But these numbers being too big to be cut in small wheels, they must be varied by the fourth rule, above, thus:

4) 28 (7
5) 55 (11
5) 45 (9
5) 40 (8
17

As 144 : 170 : : 360 : 425;
Or 170 : 144 : : 360 : 305.

Then dividing 360, and either of these two fourth proportionals (as directed by the rule); suppose by 15; you will have $\frac{24}{28}$ or $\frac{20}{24}$; then the numbers of the whole movement will stand as in the margin.

24) 20 ($\frac{20}{24}$
6) 60 (10
6) 48 (8
5) 40 (8
5) 33 (6$\frac{3}{4}$
17

Such is the calculation of ordinary *watches*, to shew the hour of the day: in such as shew minutes, and seconds, the process is thus:

1. Having resolved on the beats in an hour; by dividing the designed train by 60, find the beats in a minute; and accordingly, find proper numbers for the crown-wheel, and quotients, so as that the minute-wheel shall go round once in an hour, and the second wheel once in a minute.

Suppose, e. g. you shall choose a pendulum of seven inches, which vibrates 142 strokes in a minute, and 8520 in an hour. Half these sums are 71, and 4260. Now, the first work is to break this 71 into a good proportion, which will fall into one quotient, and the crown-wheel. Let the crown-wheel have 15 notches; then 71, divided by 15, gives nearly 5; so a crown-wheel of 15, and a wheel and pinion, whose quotient is 5, will go round in a minute to carry a hand to shew seconds. For a hand to go round in an hour to shew minutes; because there are 60 minutes in an hour, it is but breaking 60 into good quotients (suppose 10 and 6, or 8 and $7\frac{1}{2}$, &c.), and it is done. Thus, 4260 is broken, as near as can be, into proper numbers. But since it does not fall out exactly into the above-mentioned numbers, you must correct (as before directed), and find the true number of beats in an hour, by multiplying 15 by 5, which makes 75; and 75 by 60 makes 4500, which is half the true train. Then find the beats in one turn of the fusee; thus, 16: 192 : : 4500 : 54000; which last is half the beats in one turn of the fusee. This 54000 being divided by 4500 (the true numbers already pitched on), the quotient will be 12; which, not being too big for a single quotient, needs not be divided into more; and the work will stand as in the margin. As to the hour-hand, the great wheel, which performs only one revolution in 12 turns of the minute-wheel, will shew the hour; or it may be done by the minute-wheel.

8) 40 (5
15

8) 64 (8
8) 60 ($7\frac{1}{2}$
8) 40 (5
15

9) 108 (12
8) 64 (8
8) 60 ($7\frac{1}{2}$
8) 40 (5
15

It is requisite for those who make nice astronomical observations, to have watches that make some exact number of beats *per* second, without any fraction; which we seldom find a watch that does. As four beats *per* second would be a very convenient number, we shall here give the train for such a watch, which would (like most others) go 30 hours, but is to be wound up once in 24 hours.

The fusee and first wheel to go round in four hours. This wheel has 48 teeth, and it turns a pinion of 12 leaves, on whose axis is the second wheel, which goes round in one hour, and carries the minute-hand. This wheel has 60 teeth, and turns a pinion of 10 leaves, on whose axis is the third wheel, of 60 teeth, turning a pinion of 6 leaves, on whose axis is the fourth (or contrate) wheel, turning round in a minute, and carrying the small hand that shews the seconds, on a small circle on the dial-plate, divided into 60 parts: this contrate wheel has 48 teeth, and turns a pinion of 6 leaves, on whose axis is the crown or balance-wheel of 15 teeth, which makes 30 beats in each revolution.

The crown-wheel goes 480 times round in an hour, and 30 times 480 make 14400, the number of beats in an hour. But one hour contains 3600 seconds, and 14400 divided by 3600 quotes 4, the required number of beats in a second.

The fusee must have $7\frac{1}{2}$ turns, to let the chain go so many times round it. Then, as 1 turn is to 4 hours, so is $7\frac{1}{2}$ turns to 30 hours, the time the watch would go after it is wound up.

WATER, *aqua*, in *Physics*, a simple, fluid, and liquid body; reputed the third of the four vulgar elements.

Sir Isaac Newton defines *water* to be a fluid salt, volatile, and void of taste: but this definition Boerhaave sets aside; inasmuch as *water* is a menstruum, or dissolvent of salts and saline bodies, which does not agree with the notion of its being a salt itself; for we do not know of any salt that dissolves another.

By some late experiments of Messrs. Lavoisier, Watt, Cavendish, Priestley, and Kirwan, it appears, that *water* consists of dephlogisticated air, and inflammable air or phlogiston intimately united: or as Mr. Watt conceives, of dephlogisticated air and phlogiston, deprived of part of their latent heat.

Whether WATER *be originally fluid?* Though water be defined a *fluid*, it is a point controverted among philosophers, whether fluidity be its natural state, or the effect of violence: we sometimes find it appear in a fluid, and sometimes in a solid form; and as the former in our warmer climate is the more usual, we conclude it the proper one, and ascribe the other to the extraneous action of cold. Boerhaave, however, asserts the contrary, and maintains *water* to be naturally of the crystalline kind; since, where ever a certain degree of fire is wanting to keep it in fusion, it readily grows into a hard glebe, under the denomination of *ice*.

Mr. Boyle is much of the same opinion. Ice, he observes, is commonly reputed to be *water* brought into a preternatural state by cold: but with regard to the nature of things, and setting aside our arbitrary ideas, it might as justly be said, that *water* is ice preternaturally thawed by heat. If it be urged, that ice left to itself, will, upon the removal of the freezing agents, return to *water*; it may be answered, that, not to mention the snow and ice which lie during the whole summer on the Alps, and other high mountains, even in the torrid zone, we have been assured, that, in some parts of Siberia, the surface of the ground continues more months of the year frozen by the natural temperature of the climate, than

than thawed by the heat of the sun; and a little below the surface of the ground, the *water* which chances to be lodged in the cavities there, continues in a state of ice all the year round: so that when, in the heat of summer, the fields are covered with corn, if you dig a foot or two deep, you shall find ice, and a frozen soil.

Water, however, is very volatile, so that it is constantly liquid with a less degree of heat than is requisite for vegetation; and hence it is generally considered as liquid.

WATER, *no pure, in all nature. Water*, if it could be had alone, and pure, Boerhaave argues, would have all the requisites of an element, and be as simple as fire; but there is no expedient hitherto discovered for procuring it so pure. *Rain-water*, which seems the purest of all those we know of, is replete with infinite exhalations of all kinds, which it imbibes from the air: so that if filtred and distilled a thousand times, there still remain fæces. Farther, the *rain-water*, gathered from the roofs of houses, is a lixivium of the salt of tyles, slate, or the like; impregnated with the dungs and fæces of the animals, birds, &c. deposited thereon; and the exhalations of numerous other things. Add, that all the *rain-water*, gathered in cities, must at least be saturated with the smoke of a thousand chimneys, and the various effluvia of numbers of persons, &c. Besides this, there is fire contained in all *water*; as appears from its fluidity, which is owing to fire alone.

As what is in the air necessarily mixes itself with *water*, it hence appears impossible to have such a thing as pure *water*. If you percolate it through sand, or squeeze it through pumice, or pass it through any other body of the like kind, you will always have salt remaining. Nor can distillation render it pure; since it leaves air therein, which necessarily abounds in corpuscles of all sorts.

The *waters* that flow within, or upon the surface of the earth, contain various earthy, saline, metallic, vegetable, or animal particles, according to the substances over or through which they pass.

The purest of all *waters* we can any way arrive at, is, that distilled from snow, gathered in a clear, still, pinching night, in some very high place; taking none but just the outer or superficial part thereof. By a number of repeated distillations, the greatest part of the earth, and other fæces, may be separated from this: and this is what we must be contented to call *pure water*.

Mr. Boyle, indeed, relates, that one ounce of *water*, distilled carefully in glass vessels two hundred times, yielded six drams of a white, light, insipid earth, fixed in the fire, and indissoluble in *water*: whence he concludes, that the whole *water*, by farther prosecuting the operation, might be converted into earth.

Borrichius, Wallerius, Godfrey, Woulfe, &c. concur in this opinion. But Boerhaave, Macquer, and other chemists, maintain, that *pure water* is unalterable, and incapable of being decomposed; so that whatever be the substances with which it is combined, when separated from these and sufficiently purified; and also when distilled singly, or mixed with other substances, its nature and essential properties still remain unchanged.

Boerhaave attributes the earth obtained by distillation of *water*, in the experiment of Mr. Boyle, to the dust floating in the air, and the instruments employed in operation; and apprehends, that the *water* might lose, in proportion, by getting out at the junctures of the vessels.

That author assures us, that after distilling some very pure *water*, by a gentle fire, during the space of four months, it appeared perfectly pure; and yet, leaving it to rest in vessels exactly closed, it would conceive a slender kind of weedy matter, somewhat like the stamina of plants, or the little tufts of a mucilage: yet Schottus saw *water* in Kircher's museum, that had been kept in a vessel, hermetically sealed, upwards of fifty years; yet still remained clear and pure, and stood to the same height in the vessel, as at first, without the least sign of sediment.

Other chemists have made experiments to ascertain the truth of that of Mr. Boyle.

Leidenfrost found, that when pure distilled *water* is dissipated or evaporated by throwing it into a red-hot iron spoon, he always obtained a quantity of earth.

Wallerius obtained a scruple and a half of fine white earth by triturating during two hours a dram of distilled *water*; and he found that a larger quantity of earth is deposited from boiling *water* with a strong, than with a gentle fire. Swed. Mem. 1760.

M. Margraaf, by distillation and also by evaporation with the heat of the sun, of rain *water*, the purity of which had been previously ascertained by thirteen distillations, obtained a white, light, shining earth; part of which was soluble in nitrous acid, and when precipitated by vitriolic acid formed a selenites, whence he infers that it is a true calcareous earth; and the other part unfusible by fire, but convertible by addition of half of its quantity of salt of tartar, into a transparent glass. He observes, that earth is more copiously deposited from *water* boiling with a strong than with a gentle heat. The quantity of earth which he obtained in one experiment, from seventy-two ounces of distilled water, by twelve distillations, was nine or ten grains. M. Lavoisier, however, maintains, that the earth thus obtained by distilling *water* proceeds from the vessels employed.

M. Margraaf proved the existence of the earth in *water* by another experiment. He put two ounces of distilled *water* into a glass vessel ten inches high, and from one to two inches in diameter, and closed the mouth with a smooth glass stopper. After the *water* had been agitated in this tube eight days, it was observed to be turbid, and upon continuing the agitation eight days longer, he observed distinctly, especially upon exposing the tube to the rays of the sun, particles of earth floating in the *water*.

Dr. Priestley made many experiments on *water* put into glass tubes hermetically sealed, and exposed to a long continued heat, with a view of ascertaining the conversion of *water* into earth; but failed of success. He thinks, however, his disappointment might have been owing to his using a greater degree of heat than others had used, in order to save time; whereas Mr. Woulfe is of opinion that the heat must be very moderate, and long continued. After a trial of six months, the wished-for effect was not produced; nevertheless he candidly adds, that it was ten months before Mr. Godfrey perceived any change in the consistence of his *water*, and fifteen months before its conversion into earth was completed. Obs. on Air, vol. iv. p. 406, &c.

Boerhaave says, that he is convinced nobody ever saw a drop of pure *water*; that the utmost of its purity known, only amounts to its being free from this or that sort of matter; and that it can never, for instance, be quite deprived of salt; since air will always accompany it, and air always contains salts.

WATER *in all places and bodies. Water* seems to be diffused every where, and to be present in all space where there is matter. There are few bodies in nature that will not yield *water*: it is even asserted, that fire itself is not without *water*. A single grain of the most fiery salt, which, in a moment's time, will penetrate through a man's hand, readily imbibes half its weight of *water*, and melts, even in the driest air imaginable. Thus, salt of tartar, placed near the hottest fire, will attract or imbibe *water*; and, by that means, increase considerably its weight, in a small time: so, in the driest summer's day, a pewter vessel, with ice in it, brought up from some cold subterraneous place, into the hottest room, will immediately be covered over with little drops of *water*, gathered from the contiguous air, and condensed by the coldness of the ice.

It is surprising to consider the plenteous stock of *water* which even dry bodies afford. Oil of vitriol, being exposed a long time to a violent fire, to separate all the *water*, as much as possible, from the same, will afterwards, by only standing a few minutes in the air, contract fresh *water* so fast, as soon to afford it as plenteously as at first. Hartshorn, kept forty years, and turned as hard and dry as any metal, so that, if struck against a flint, it will yield sparks of fire, yet, being put into a glass vessel, and distilled, will afford one-eighth part of its quantity of *water*. Bones dead and dried twenty-five years, and thus become almost as hard as iron, yet, by distillation, have afforded half their weight of *water*. And the hardest stones, ground and distilled, do always discover a portion thereof. But hitherto no experiment shews, that *water* enters as a principle into the combination of metallic matters, or even into that of vitrescible stones.

Eels, by distillation, yielded Mr. Boyle some oil, spirit, and volatile salt, besides the caput mortuum; yet all these were so disproportionate to the *water*, that they seemed to have been nothing but that coagulated: the same strangely abounds in vipers, though they are esteemed very hot in operation; and will, in a convenient air, survive, for some days, the loss of their heads and hearts. Human blood itself, as spirituous and elaborate a liquor as it is reputed, so abounds in *water*, that out of seven ounces and a half, the same author, by distillation, drew near six ounces of phlegm; before ever any of the other principles began to rise.

Whether WATER *be the common matter of all bodies?* From considerations somewhat of this kind, Thales, and some other philosophers, have been led to hold, that all things were made of *water*: which opinion, probably, had its rise from the writings of Moses; where he speaks of the Spirit of God moving upon the face of the *waters*. But Mr. Boyle does not conceive the *water* here mentioned by Moses as the universal matter to be our elementary *water*: we need only suppose it an agitated

congeries of a great variety of seminal principles, and of other corpuscles fit to be subdued and fashioned by them; and it may yet be a body fluid like *water*, in case the corpuscles it was made up of were, by their Creator, made small enough, and put into such an actual motion, as might make them roll and glide easily over one another. However, Basil Valentine, Paracelsus, Van Helmont, Sendivogius, and others, have maintained the same principle; viz. that *water* is the elemental matter, or stamen, of all things, and suffices alone for the production of all the visible creation. Thus sir Isaac Newton: "All birds, beasts, and fishes, insects, trees, and vegetables, with their several parts, do grow out of *water*, and *watery* tinctures, and salts; and, by putrefaction, they all return again to *watery* substances."

Helmont endeavours to prove this doctrine from an experiment recited under *Food of* PLANTS.

The same thing is inferred by Mr. Boyle, from a parallel experiment; and the whole is countenanced by sir Isaac Newton; who observes, that *water*, standing a few days in the open air, yields a tincture; which, like that of malt, by standing longer, yields a sediment, and a spirit; but, before putrefaction, is fit nourishment for animals and vegetables.

But Dr. Woodward endeavours to shew the whole to be a mistake: *water* containing extraneous corpuscles, some of which, according to him, are the proper matter of nutrition; the *water* being still found to afford so much the less nourishment, the more it is purified by distillation. So that *water*, as such, does not seem the proper nutriment of vegetables; but only the vehicle thereof, which contains the nutritious particles, and carries them along with it, through all the parts of the plant. See *Food of* PLANTS.

Helmont, however, carries his system still farther; and imagines, that all bodies may be re-converted into *water*. His alkahest, he affirms, adequately resolves plants, animals, and minerals, into one liquor, or more, according to their several internal differences of parts; and the alkahest, being abstracted from these liquors, in the same weight, and with the same virtues, as when it dissolved them, the liquors may, by frequent cohobations from chalk, or some other proper matter, be totally deprived of their seminal endowments, and return, at last, to their first matter; which is insipid *water*.

Spirit of wine, of all other spirits, seems freest from *water*: yet Helmont affirms, it may be so united with *water*, as to become *water* itself. He adds, that it is materially *water*, only under a sulphureous disguise.

And as to salts, salt of tartar, well calcined, being laid to liquefy in the air, will deposit an earth; and if it be then committed to distillation, will yield a considerable quantity of insipid *water*; insomuch that, if it be urged with a vehement fire, the salt will almost all vanish, and nothing saline remain, either in the *water*, or the earth. Whence Helmont concludes, that all salts might be converted into *water*. Add, that sea-salt, recovered from its own acid spirit, and oil of tartar, resolve into *water*, as much as oil of tartar.

Lastly, oils run, in great measure, into *water*; and, it is probable, might be converted wholly into the same.

WATER, *no standard for the weight and purity of*. *Water* scarce ever continues two moments exactly of the same weight; by reason of the air and fire contained therein. Thus a piece of pure limpid ice, laid in a nice balance, never continues in equilibrio. In effect, the expansion of *water* in boiling shews what effect the different degree of fire has on the gravity of *water*. This makes it difficult to fix the specific gravity of *water*, in order to settle its degree of purity; but this we may say in the general, that the purest *water* we can procure is that which, according to the experiments of Mr. Hawksbee, whose determination has been usually followed, is 850 times as heavy as air: or according to the experiments of the hon. Mr. Cavendish, the thermometer being at 50° and the barometer at 29½, about 800 times as heavy as air. However, neither have we any tolerable standard in air; for *water* being so much heavier than air, the more *water* there is contained in the air, the heavier, of course, must the air be: as, in effect, the principal part of the weight of the atmosphere seems to arise from the *water* in it.

WATER, *properties and effects of*. 1. *Water* is a very volatile body. It is entirely reduced into vapours and dissipated, when exposed to the fire and unconfined.

Water heated, in an open vessel, has been observed to acquire no more than a certain determinate degree of heat, whatever be the intensity of the fire to which it is exposed; which greatest degree of heat is that which it has when it boils quickly. See *Fixed Points of* THERMOMETERS.

It has been often observed, that the degree of heat necessary to make *water* boil is variable, according to the purity of the *water* and the weight of the atmosphere. Within the usual limits of 28 and 31 inches in the barometer, Boerhaave (Chem. vol. i. p. 171), was of opinion, that there would be a variation in the heat of boiling *water*, amounting to 8 or 9 degrees. This subject has lately been examined with great accuracy by M. de Luc, and sir George Shuckburg; and Mr. Cavallo (on Air, p. 215) has given us the result of their experiments in the annexed table, which is formed according to the scale of Fahrenheit's thermometer.

Height of the barometer.	Heat of boiling *Water* according to M. de Luc.	Sir G. Shuckburg.
	Deg. Pts. of a deg.	Deg. Pts. of a deg.
26	205,17	204,91
26½	206,07	205,82
27	206,96	206,73
27½	207,84	207,63
28	208,69	208,25
28½	209,55	209,41
29	210,38	210,28
29½	210, 2	211,15
30	212	212
30½	212,79	212,85
31	213,57	213,69

When *water*, or other volatile bodies, are exposed to a greater degree of heat than is suited to their volatility, they are in a violent state; and are, therefore, apt to break any vessels that confine them, with an explosion so much more violent, as they are more strongly compressed, and are exposed to a more violent and more suddenly applied heat.

2. *Water* is found the most penetrative of all bodies, after fire, and the most difficult to confine; so that a vessel, through which *water* cannot pass, may retain any thing. Nor is it any objection, that syrups and oils will sometimes pass through bodies which will hold *water*; this not being owing to the greater subtilty and penetration of their particles, but to the resin wherewith the wood of such vessels abounds, to which oils and syrups are as menstruums; so that, dissolving the resin, they make their way through the spaces left thereby: whereas *water*, not acting on resins, is retained in them.

And yet *water* gradually makes its way, even through all woods, and is only retainable in glass and metals; nay, it was found by experiment at Florence, that when shut up in a spherical vessel of gold, and then pressed with a great force, it made its way through the pores even of the gold: so that the most solid body in nature is permeable to *water* under certain circumstances.

Water is even found more fluid than air; a body being reputed more fluid than another, when its parts will find way through smaller pores: now air, it is known, will not pass through leather, as is evident in the case of an exhausted receiver covered therewith; whereas *water* passes with ease. Again, air may be retained in a bladder, but *water* ouses through. In effect, it is found, that *water* will pass through pores ten times smaller than air will.

It must not be omitted, however, that M. Homberg accounts for this passage of *water* through the narrow pores of animal substances, which will not admit the air, on another principle; viz. its moistening and dissolving the glutinous matter of the fine fibres of the membranes, and rendering them more pliable and distractile; which are things that the air, for want of a wetting property, cannot do. As a proof of this doctrine, he filled a bladder, and compressed it with a stone, and found no air to come out; but placing the bladder thus compressed in *water*, the air easily escaped. Hist. de l'Acad. an. 1700, p. 45.

3. *Water*, then, may even hence, viz. from its penetrative power, be argued to enter the composition of all bodies, both vegetable, animal, and fossil; with this particular circumstance, that it is easily, and with a gentle heat, separable again from bodies it had united with: which cannot be said of any other body. Fire, indeed, will penetrate more than *water*; but it is difficult to procure it again from the bodies it is once fixed in; as is evident in red-lead, &c.

This property of *water*, joined with its smoothness and lubricity, fits it to serve as a vehicle for the commodious and easy conveyance of the nutritious matter of all bodies: being so fluid, and passing and repassing so readily, it never stops up the pores, and leaves room for the following *water* to bring on a new supply of nutritious matter.

4. And yet the same *water*, as little cohesive as it is, and as easily separated from most bodies, will cohere firmly with some others, and bind them together in the most solid

solid masses; though it appears wonderful, that *water*, which will be shewn an almost universal dissolvent, should, nevertheless, be a great coagulator.

Water, we see, mixed up with earth or ashes, gives them the utmost firmness and fixity. The ashes, e. g. of an animal, incorporated with pure *water* into a paste, and baked with a vehement fire, become a coppel; which is a body remarkable for this, that it will bear the utmost effort of a refiner's furnace. It is, in effect, upon the glutinous nature of *water* alone, that our houses stand; for take but this out of wood, and it becomes ashes; or out of tiles, and they become dust.

Thus, a little clay, dried in the sun, becomes a powder; which, mixed with *water*, sticks together again, and may be fashioned at pleasure; and this dried again by a gentle fire, or in the sun, and then baked in a potter's oven by an intense fire, becomes little other than a stone. So the Chinese earth, whereof our porcelain vessels are made, which hold all liquors, and even melted lead itself, is diluted and wrought up with *water*.

To say no more, all the stability and firmness seen in the universe have been ascribed by some writers to *water* alone. Thus, they say, stone would be an incoherent sand, did not *water* bind it together; and thus, again, of a fat gravelly earth, wrought up with *water*, and baked, or burnt, we make bricks, tiles, and earthen vessels, of such exceeding hardness and closeness, that *water* itself cannot pass through them. And these bodies, though to appearance perfectly dry, and destitute of *water*, yet, being pulverized, and put in a retort, and distilled, yield an incredible quantity of *water*.

The same, it is said, holds of metals; for the parings or filings of lead, tin, antimony, &c. by distillation, yield *water* plentifully; and the hardest stones, sea salt, nitre, vitriol, sulphur, &c. are found to consist chiefly of *water*, into which they resolve by force of fire.

The *lapis calcarius*, or lime-stone, being exposed to the fire, affords a prodigious quantity of pure *water*; and the more of this *water* is extracted, the more friable does it become, till, at length, it commences a dry calx, or lime, wherein, in lieu of the water so expelled, the fire, in the course of calcination, enters; and this is expelled again, in its turn, by pouring on cold *water*. Yet the same *water* and calx tempered together, produce a mass scarce inferior, in point of solidity, to the primitive lime-stone.

Many, if not most, of the effects here ascribed to *water* in uniting and consolidating the parts of various bodies, have been attributed by modern chemists and philosophers to the gas, or *fixable* AIR, which enters into their composition; which escapes when they are dissolved, and which is capable in certain circumstances, of being again restored to them. See LIME, and MORTAR.

5. Some have imagined, that *water* is incompressible; and, therefore, non-elastic; founding their opinion on that famous experiment above mentioned, made by order of the great-duke of Tuscany: on which the *water*, being, as they say, incapable of condensation, rather than yield, transuded through the pores of the metal, so that the ball was found wet all over the outside; till, at length, making a cleft in the gold, it spun out with great vehemence.

But the validity of the inferences drawn from this Florentine experiment have been very justly questioned; Mr. Canton having proved by very accurate experiments, that *water* is actually compressed by the weight of the atmosphere. See COMPRESSION.

Besides, the diminution of size which *water* suffers when it passes from a greater to a less degree of heat, till it begins to freeze, sufficiently shews, that the integrant parts of this fluid are, like those of all other known substances, capable of approximation.

However, as *water* is compressed to any considerable degree with difficulty, we see the reason why blocks of marble sometimes burst in cold weather; and why, if a vessel be filled with *water*, and afterwards, by any means, reduced to a less compass, the *water* bursts the vessel, though ever so strong. This is observable in a piece of brass cannon, which, being filled with *water*, and the mouth exactly stopped, so as to prevent all egress of *water*, if a cold night happens, sufficient to contract and constipate bodies; the metallic matter undergoing the common fate, and the *water* refusing to give way, or giving way very reluctantly, is burst asunder with incredible violence.

It may be added, that a degree of cold, sufficient to congeal *water*, or turn it into ice, does expand it. There are many ways to manifest this expansion of *water* by freezing. Mr. Boyle, having poured a proper quantity of *water* into a strong cylindrical earthen vessel, exposed it, uncovered, both to the open air in frosty nights, and the operation of snow and salt; and found, that the ice produced in both cases, reached higher than the *water* did before it was frozen. Add, that it has been found, that the rain soaking into marble, and violent frosts coming on, have burst the stones: and even implements made of bell-metal, carelesly exposed to the wet, have been broken and spoiled by the *water*; which, entering at little cavities of the metal, was there afterwards frozen, and expanded into ice. See FREEZING, and ICE.

From the whole we may be enabled to settle something as to the nature of the component particles of *water*; and, 1. That they are, as to our senses, infinitely small; whence their penetrative power.

2. Exceedingly smooth and slippery, or void of any sensible asperities; witness their fluidity, and their being so easily separable from other bodies which they adhere to.

3. Extremely solid.

4. Perfectly transparent, and as such invisible; which we gather hence, that pure *water*, inclosed in a vessel hermetically sealed, projects no shadow; so that the eye shall not be able to discover whether the vessel have *water* in it or not; and in that the crystals of salts, when the *water* is separated from them, lose their transparency.

5. If *water* be considered as consisting of spherical, or cubical particles, hollow within-side, and of a firm texture; here will be enough to account for the difficulty of compressing it, and also for its being light, fluid, and volatile; its firmness and similarity will make it resist sufficiently; and its vacuity renders it light enough, &c. And the little contact between spherules (if indeed they touch at all) will account for the weakness of its cohesion, &c.

Salt melted into *water*, does not fill the vessel in proportion to its bulk: whence it follows, that there are little spaces between the particles of *water*, to admit those of the salt.

6. *Water* is the most insipid of all bodies; the taste we sometimes observe therein arising not from the mere *water*, but from salt, vitriol, or other bodies mixed therewith; and accordingly, all the sapid *waters* recommended for medicinal uses, are found to deposit a quantity of some of those fossils.

7. *Water* is perfectly inodorous, or void of the least smell. *Water*, then, neither affects sight, taste, nor smell, provided it be pure; and, consequently, it might remain for ever imperceptible to us, but for the sense of feeling.

Among the common tests of the purity of *water*, the least fallacious are, its being lighter and more fluid than impure *water*; its being colourless, transparent, and void of smell and taste; its wetting more easily than the *water* containing metallic and earthy salts, called *hard* WATER, and feeling softer when touched; its dissolving soap into a smooth lather, and mixing easily and perfectly with a solution of soap in spirit of wine; its boiling pulse tender; its not changing the colour of syrup of violets or the juices of other blue flowers; and its mingling with alkaline and with acid liquors, with solution of sulphur in alkalies, solution of gold in aqua regia, solution of silver, or of lead or of mercury in nitrous acid, and a solution of sugar of lead in *water*, without precipitation or change of transparency.

We may add, that the purest *waters* soonest freeze; hence ice is purer than the *water* that remains unfrozen: on this principle, vinous and some saline liquors may be freed from a part of their sulphureous *water* by gentle congelation.

Ice, exposed to the open air, loses of its weight, its superficial parts being dissolved or abraded by the motion of the atmosphere. This property of ice was known to Hippocrates; who, imagining not the ice in its whole substance, but some of its finer and lighter parts to be dissipated, was hence led unjustly to condemn both melted ice and snow as the most impure of all *waters*. Lewis. Mat. Med.

The purest natural *water* may, however, be rendered still more pure by distillation; for which purpose let it be put into a well-tinned copper alembic, and the distillation promoted by a gentle fire. The first portion of *water* that passes into the receiver should be thrown away, because it washes the alembic and receiver, and is of course the most impure. When about two-thirds of *water* have nearly passed, the distillation is to be discontinued, because the remainder is impure. The distilled *water* thus obtained, should be put into very clear bottles, and stopped with glass stopples.

Whether WATER *be convertible into air?* It has been disputed, whether or no *water* be convertible into air; there being numerous instances of, at least, an apparent transmutation. In the vapours daily raised, we find *water* rarefied to such a degree, as to take place in the atmosphere, and help to compose a considerable part of what we call *air*; and even to contribute to many of the effects ascribed to the air. But such a vapour-air has not the

the characters of true permanent air, being easily reducible into *water* again. So, in digestions, and distillations, though *water* may be rarefied into vapours, yet it is not really changed into air, but only divided by heat, and diffused into very minute parts; which, meeting together, presently return to such *water* as they constituted before.

Yet *water* rarefied into vapour in an æolipile, will, for a while, have an elastic power, the great and last characteristic of true air, and will stream out perfectly like a blast of air: the elastic power of this stream is manifestly owing to nothing else but the heat, that expands and agitates the aqueous particles thereof; and, when the heat is gone, the elasticity, and other aerial properties, disappear likewise.

Rapid winds, thus made, seem to be no more than mere *water*, broken into little parts, and put into motion; since, by holding a solid, smooth, and cold body, against it, the vapours condensing thereon will presently cover the body with *water*. Indeed, though no heat intervenes, motion alone, if vehement, may, perhaps, suffice to break *water* into minute parts, and make them ascend upwards in form of air. Mr. Boyle observes, that between Lyons and Geneva, where the Rhone is suddenly streightened by two rocks very near each other, that rapid stream, dashing with great impetuosity against them, breaks part of its water into minute corpuscles, and gives it such a motion, that a mist may be observed at a considerable distance, arising from the place, and ascending high into the air.

Mr. Cavendish (Phil. Transf. vol. lxxiv. part i. p. 128, &c.) recites several experiments, in which he converted common air into pure water, by decomposing it, in conjunction with inflammable air. Dr. Priestley likewise, having decomposed dephlogisticated and inflammable air, by firing them together by the electric explosion, found a manifest deposition of *water*, which, as nearly as he could judge, was equal in weight to that of the decomposed air. He also made a number of other curious experiments, which seemed to favour the idea of a conversion of *water* into air, without absolutely proving it. The difficulty which M. De Luc, and others, have found in expelling all air from *water*, is best accounted for on the supposition of the generation of air from *water*; and admitting that the conversion of *water* into air is effected by the intimate union of what is called the principle of heat with the *water*, it appears sufficiently analogous to other changes, or rather combinations of substances. Is not, says Dr. Priestley, the acid of nitre, and also that of vitriol, a thing as unlike to air as *water* is, their properties being as remarkably different? And yet it is demonstrable, that the acid of nitre is convertible into the purest respirable air, and probably by the union of the same principle of heat. Phil. Transf. vol. lxxiii. part ii. p. 414, &c.

Water is distinguished, with regard to the places where it is found, into *marina*, *sea-water*; *pluvialis*, *rain-water*; *fluviatilis*, *river-water*; *fontana*, *spring-water*; *putealis*, *well-water*; *cisternina*, that of *cisterns*; and *palustris*, that of *lakes*, *morasses*, &c. which are each more impure and heterogeneous than the other; and with regard to its qualities, it is farther distinguished into saline, salt-water, and dulcis, or FRESH-*water*.

WATER, *sea*, is an assemblage of bodies, wherein *water* can scarce be said to have the principal part: it is an universal colluvies of all the bodies in nature, sustained and kept swimming in *water* as a vehicle.

Dr. Lister considers it as the fund, or source, out of which all bodies arise. He gives, in some measure, into the opinion of Thales and Van Helmont; and imagines the *sea-water* to have been the only element created at the beginning, before any animal, or vegetable, or even before the sun himself. *Fresh-water* he supposes to have risen accidentally after the creation of these, and to owe its origin to the vapours of plants, the breath of animals, and the exhalations raised from the sun. De Font. Med. Ang.

Dr. Halley is of another opinion. He takes it for granted, that the saltness of the sea arises from the saline matter dissolved and imbibed by the rivers in their progress, and discharged with their *waters* into the ocean; and, consequently, that the degree of saltness is continually and gradually increasing. On this hypothesis he even proposes a method for determining the age of the world; for two experiments of the degree of saltness, made at a large interval of time, will, by the rule of proportion, give the time wherein it has been acquiring its present degree. Phil. Transf. N° 344. See SALTNESS *of the sea*.

Authors, who write with accuracy of *sea-water*, distinguish it as to its degrees of saltness and virtues, according to the nature of the seas where it is taken, and the depths from which it is drawn up. Count Marsigli always divides the *waters* of a deep sea into three portions; the upper, the middle, and the deep: each of these, according to him, reach to one third of the depth of the bed of *water* from the superficies to the bottom. The upper *water* he finds greatly to differ from the lower or deep *water* in its qualities and strength, but the middle portion to be always more nearly allied to one of the others; he therefore never takes any notice of the middle portion, but makes all his observations of the differences of *sea-water* from the upper and lower portions.

The *sea-water* is brighter and clearer than that of any river or pond, but this is not seen, as the whole body of it is viewed together, because then many various colours are reflected from its surface; but on taking up a large glass of it, and setting it in a still place, it is seen to have none; the whole series of its colours when viewed at sea, being entirely owing to its motion, and the different reflections its waves have in different angles and directions.

The *sea-water* appears indeed coloured in its superficial part in some places, particularly about the mouths of large rivers; which is merely owing to the foul *water* of these rivers mixing itself with it; and they also extend themselves a great way, and give a foulness to the upper part of a vast quantity of *sea-water*, whose bottom part is all the while perfectly clear.

The *water* of the sea, taken up at great depths, is generally clear and bright, as has been observed; but this is not always the case; for in some places a quantity of it taken up in very deep *water*, and that near the bottom, is found fouled in the same manner as the superficial part is near the mouths of large rivers; and this, when strictly enquired into, is found to proceed from the same cause, the mixing of a foul river *water* loaded with particles of earth, which it has washed off from the substances it passed through, and containing large quantities of blue, black, or yellow earth, all which it would suffer to subside, if set by for a time in a still place. Count Marsigli has proved, that as rivers burst up in many places out of the surface of the dry ground, so they do also in several parts of the bottom of the sea: in these places they pour in their whole body of fresh *water*, which is fouler than that of our common rivers, because, in its subterranean passage, it has been surrounded on all parts with earth, and confined to a much fouler channel. The foul *waters* these mouths of rivers discharge from the bottom upwards into the *sea-water*, cannot but act upon that clear liquor, in the same manner as the superficial *waters* do on the surface, and both must be fouled alike. This author has particularly described one of these subterranean rivers opening into the sea from his own observations. The clouds also give a sort of coloured appearance to the surface of the *sea-water*, in regard to our eye, though the *water* itself be really colourless as that of the purest spring.

As the clouds in many cases thus evidently give colour to the *sea-water*, in regard to our eye, so the sun does the same thing in many others; but in all these cases it is to be observed, that the colours are so far from being real, that the *water* is all the time clear, pellucid, and colourless; only its different reflections, from these different causes, present our eyes with colours, as the colourless glass prism, or the outside or edge of a common looking-glass does.

Beside the clouds, the sun, the foulness of rivers, and the different bottoms, it is certain that the winds also contribute greatly to give the colours we observe in *sea-water*. A tempest in the winter season, an hour or two before sun-set, will shew all the colours that *sea-water* is capable of giving, and that without any other accident whatever to assist in it.

These are all the various colours and appearances that the *sea-water* puts on in different places, and on various occasions; and we see, in the whole, that these differences are in general owing not to the alteration in its nature, but only to its change of parts in their directions to the eye, and in their breaking one against another, or receiving more or less light, or that from a clear or from a cloudy sky.

Count Marsigli has gone through a long course of experiments upon *sea-water*, and after a thousand tedious processes has observed, that three liquors alone are of power to shew the different nature of the *sea-water* in various places, and that very readily: these only need, therefore, be carried abroad by those who intend to make experiments of this kind. These are an infusion of mallow-flowers in *water*, made so strong as to be of a violet-colour, spirit of sal ammoniac, and oil of tartar. The two last of these will always keep as long as there is occasion; the other may be preserved from decay by sugar dissolved in it in different quantities, according to the time it is to be kept, and the climate it is to be carried

to;

lo; for this ingredient, if added in ſo large a quantity as twice the weight of the liquor, ſo as to make it a true ſyrup, does not prevent it from performing its office in theſe experiments; and in this ſtate it will keep every where, and ever ſo long. When intended for leſs ſevere trials, it may have a ſmaller proportion of the ſugar, and its effects will be then more ſudden and more manifeſt. This infuſion of mallow-flowers, mixed with *ſea-water*, turns it to a greeniſh yellow colour, like that of the chryſolite. The ſpirit of ſal ammoniac, mixed with *ſea-water*, renders it turbid and muddy, and after a time a white ſediment is formed, and ſubſides by ſmall pieces at a time to the bottom of the glaſs. Oil of tartar occaſions the ſame change, but it does it with much more violence.

By mixing theſe liquors with *ſea-water*, taken up in different places, and at various depths, we ſee the different quantity of ſalt it contains manifeſted, by the more or leſs ſudden productions of theſe changes, and by the deepneſs or paleneſs of the colour, and the quantity of matter precipitated. The common attempts of ſweetening *ſea-water* are alſo eaſily proved by this means; for the more ſalt it contains, after theſe pretended ſweetenings, the more colour or precipitation it will occaſion in theſe mixtures; and the mixing of them with it, perfectly freed from its ſalt, will produce no change at all, as is evident by mixing them ſeverally with *ſea water* carefully diſtilled; for as this proceſs entirely robs it of its ſalt, there is no ſort of alteration made in it by the mixing of theſe liquids. Marſigli, Hiſt. Phyſ. de la Mer.

With reſpect to the temperature of *ſea-water* at different depths, it ſeems reaſonable enough to ſuppoſe, that in ſummer time it will be hotter at the ſurface than at any conſiderable depth below it, and that in winter it will be colder. It has been frequently obſerved, that the ſurface of a pool of *water*, of two feet in depth, has in a ſunny day, even in winter, been five degrees hotter than the *water* at its bottom. There have been various inſtruments contrived for eſtimating the temperature of the ſea, at different terms. Dr. Hales invented a ſea *bucket*-GAGE. The apparatus made uſe of by Mr. Wales, for trying the heat of the *ſea-water* at different depths, conſiſted of a ſquare wooden tube, about eighteen inches long, and three inches ſquare, externally. It was fitted with a valve at the bottom, and another at the top, and had a contrivance for ſuſpending the thermometer exactly in the middle of it. When it was uſed it was faſtened to the deep ſea-line, juſt above the head, ſo that all the way as it deſcended the water had a free paſſage through it, by means of the valves, which were then both open; but the inſtant it began to be drawn up, both the valves cloſed by the preſſure of the water, and of courſe the thermometer was brought up in a body of water of the ſame temperature with that it was let down to. With this inſtrument, which is much the ſame with one formerly deſcribed by Mr. Boyle, in his obſervations about the ſaltneſs of the ſea, *water* was fetched up from different depths, and its temperature accurately noticed, in different ſeaſons and latitudes. Aug. 27, 1772, lat. 24° 40′ S. the heat of the air was 72$\frac{1}{2}$, of the *water* at the ſurface 70, and of *water* from the depth of 80 fathoms, 68. Dec. 27, 1772, lat. 58° 21′ S. the heat of the air was 31$\frac{1}{2}$; of the *water* at the ſurface 32; and of *water* from the depth of 160 fathoms, 33$\frac{1}{2}$. See Aſtronomical Obſervations made in a Voyage towards the South Pole, in 1772, 1773, &c. by W. Wales.

In a voyage to high northern latitudes in 1773, ſimilar experiments were made both with lord Charles Cavendiſh's thermometer, and with a bottle fitted properly by Dr. Irving. The bottle had a coating of wool, three inches thick, which was wrapped up in an oiled ſkin, and let into a leather purſe, and the whole encloſed in a well-pitched canvas bag, firmly tied to the mouth of the bottle, ſo that not a drop of water could penetrate to its ſurface. A bit of lead, ſhaped like a cone, with its baſe downwards, and a cord fixed to its ſmall end, was put into the bottle; and a piece of valve leather, with half a dozen ſlips of thin bladder, were ſtrung on the cord, which, when pulled, effectually corked the bottle in the inſide.

The reſult of two of the experiments with this bottle is as follows: Aug. 4, 1773, lat. 80° 30′ N. the heat of the air was 32; of the *water* at the ſurfaces 36; and of *water* fetched up from the depth of ſixty fathoms under the ice, 39. Sep. 4, 1773, lat. 75° N. the heat of the air was 66$\frac{1}{2}$; of the *water* at the ſurface, 55; and of *water* at the depth of 683 fathoms, 40. See Voyage towards the North Pole, p. 142, 143. For an account of the reſult of other experiments for aſcertaining the temperature of the ſea in great depths, near the coaſts of Lapland and Norway, and of the inſtrument uſed for this purpoſe by Charles Douglas, eſq. in 1769, ſee Phil. Tranſ. vol. lx. p. 39, &c.

It appears from all theſe experiments, that, when the atmoſphere was hotter than the ſurface of the ſea, the ſuperficial *water* was hotter than that at a great depth; and when the atmoſphere was colder than the ſurface of the ſea, it is evident that the ſuperficial *water* was ſomewhat colder than at a conſiderable diſtance below it.

In the year 1779, ſeveral experiments were made, with great accuracy, in order to inveſtigate the temperature of the lake of Geneva, and of other lakes in Switzerland, at different depths; from which we learn, that in winter there is very little difference between the heat of the *water* at the ſurface, and at a great depth below it; but that in ſummer the ſuperficial *water* is conſiderably warmer than that which is at a great diſtance from the ſurface. The reſult of ſome of theſe experiments, reduced to Fahrenheit's ſcale, is as follows: heat of the open air variable from 37° to 40°; in the beginning of February, 1779, *water* at the ſurface of the lake of Geneva, 42$\frac{1}{8}$; at a depth of 100 feet, 42$\frac{1}{8}$; of 250 feet, 42$\frac{1}{8}$; of 950 feet, or bottom, 41$\frac{27}{40}$; in another part of the lake, open air, the ſame as before; ſurface, 42$\frac{1}{8}$; depth of 350 feet, 42$\frac{1}{8}$; depth of 620 feet, bottom, 41$\frac{27}{80}$. The temperature of the lake of Neufchatel, July 17, 1779: air, 75$\frac{1}{5}$; ſurface, 73$\frac{5}{8}$; depth, 225 feet, bottom, 41. See Voyages dans les Alpes, per Horace Benedict de Sauſſure, profeſſor of philoſophy at Geneva, vol. i.

Beſide common alimentary ſalt, the *ſea-water* contains other ſalts, which are found in the bittern, or bitter brine remaining after the ſea-ſalt is extracted. Firſt, it contains a bitter purging ſalt, known in the ſhops under the name of *Epſom-ſalt*. This was firſt extracted from the Epſom, Dulwich, and other purging *waters*, but is now made only from the bittern at Newcaſtle, and other places; and it is chiefly to this bitter ſalt that the *ſea-water* owes its bitter taſte, though that has been ſuppoſed to proceed from bituminous matter contained in it, and often found on its ſurface, or lodged upon the rocks by its motion.

Another ſalt is alſo found in bittern, which is called a muriatic calcareous ſalt, its acid principle being ſpirit of ſea-ſalt, and its baſis an earth nearly allied to quickſilver. This ſalt remains in the bittern after the purging ſalt has been extracted from it, and though it is a neutral ſalt, it cannot be made to ſhoot in cryſtals, but may be procured in a dry form by fire; but it is very difficultly kept in this form, being, of all other ſalts, the moſt ready to imbibe the watery particles of the air, and run per deliquium.

Beſide theſe ſalts, the bittern contains a conſiderable portion of a fixed mineral alkali. Theſe principles are all found in boiling the *ſea-water* into ſalt. But beſide theſe there muſt be many other ſubſtances, which eſcape our ſearch in this manner, ſuch as the ſeeds and excrements of innumerable plants and animals, and the tinctures which thoſe plants and animals impart to it in their decay. Theſe, together with divers ſaline and ſulphureous particles, will naturally fall under the obſervation of thoſe who ſhall attempt a perfect analyſis of *ſea-water* by the nicer methods of chemiſtry; a thing yet much wanted in the learned world.

Theſe ſubſtances are found in different quantities and proportions, according to the nature of the waters; but the quantity of common ſalt is always greater than that of any other. Of this the quantity in different ſeas varies, according to the greater or leſs evaporation, and acceſſion of freſh *water*, from about one-fiftieth to near one-twentieth of the weight of the *water*. The Baltic ſea is very weakly impregnated with ſalt; the Engliſh and German ſeas more ſtrongly, and the Mediterranean ſtill more; and the *water* on the coaſt of Moſambique is ſuppoſed to be much ſalter even than this. Mem. Acad. Par. 1711.

The author of the Chemical Dictionary ſtates the quantity of common ſalt contained in *ſea-water* to be to the quantity of *water*, as 3 or 4 to 100; ſo that the *water* is far from being ſaturated with the ſalt; for *water* is capable of diſſolving nearly a fourth part of its weight of common ſalt. *Sea-water* has generally been obſerved to contain more ſalt in hot than in cold climates.

All theſe *waters* have a ſaline, and more or leſs of an acrid, bitteriſh taſte; their colour is greeniſh, and they become fetid by keeping. The acrimony and bitterneſs of theſe waters are generally attributed to the bituminous matters ſuppoſed to be contained in them; but the author of the Chemical Dictionary affirms, that he has made many experiments on large quantities of theſe ſeveral *waters*, and never could find any ſenſible quantity of bitumen. The bitterneſs, therefore, of theſe *waters*, he ſays, ought to be attributed to the Glauber's ſalt, which is bitter, and eſpecially to the marine ſalt with earthy baſis, which is very bitter and acrid.

Sea-

Sea-water occaſions a very ſingular nauſea, which is frequently attended with vomiting. This nauſeous ingredient (ſays Bergman, Phyſ. and Chem. Eſſ. vol. i. p. 191.) is not to be found at all, or but very little, in *ſea-water* taken up at the depth of ſixty fathoms; the reaſon of which probably is, that the immenſe quantity of fiſh, worms, and other animals, which inhabit the ocean, dying, are gradually carried up to the ſurface, and there, by the aſſiſtance of the air, are deſtroyed by putrefaction; and the putrefactive proceſs is much aſſiſted by the ſalt, which, at the ſurface, is preſent preciſely in the quantity neceſſary to promote that operation.

Many attempts have been made for rendering *ſea-water* freſh and potable: they have, in general, been little elſe than different modes of diſtillation; though many of the authors of them, either from an ignorance of the real nature of *ſea-water*, or from a deſign of rendering their proceſs myſterious, have mixed different ingredients with the *water* either before or after its diſtillation. The method of obtaining freſh water, from the diſtillation of *ſea-water*, was practiſed by ſir R. Hawkins, in the reign of queen Elizabeth, who thus obtained *water* that was wholeſome and nouriſhing. See Purchas's Collect. of Voyages, book vii. chap. 5.

Dr. Hales informs us, that lime was one of the ingredients which ſir Theophilus Oglethorpe, and the reſt of the patentees, in the time of Charles II. called the cement, with which they made diſtilled *ſea-water* wholeſome.

Dr. Liſter propoſes the freſhening of *ſea-water* by means of ſea-plants; theſe vegetables, like other plants, continually exhaling a large quantity of *water* in form of vapour, and that being all freſh, he propoſes on this baſis a diſtillation, without fire, in this manner. The body of a large ſtill, or alembic, is to be filled three parts with *ſea-water*, ſeveral freſh and growing ſea-plants are to be put into this in their growing poſture, and the head being then fitted on, and a receiver adapted to the noſe, there will be a continual aſcent of vapours from the plant, which will condenſe into *water* in the head, and this will be thence conveyed into the receiver ſweet, clear, and every way fit for drinking. The quantity thus procured, however, though conſiderable in regard to the manner of its being obtained, can be but ſmall in proportion to the wants of a ſhip's company.

Mr. Hauton therefore attempted a more general method of doing it in quantities; to this purpoſe a large quantity of *ſea-water* is to be taken up in a proper veſſel, and as much oil of tartar per deliquium is to be added to this, as will render it turbid, and cauſe a large precipitation. After this the *water* is to be diſtilled, the furnace of the ſtill being ſo contrived as to take up very little room, and conſume but a ſmall quantity of fuel; the ſea itſelf may ſerve for a worm-tub, the worm paſſing out of the ſhip, and in again at another place. When the *water* is thus diſtilled, it is to be mixed with an alkaline earth, and after ſtirring thoroughly about, the earth is to be ſuffered to ſubſide to the bottom, and the *water* poured off clear; it is then ſaid by the inventor of this ſcheme to be perfectly ſweet, and no way diſtinguiſhable from the very pureſt river *water*. Phil. Tranſ. N° 67. or Abridg. vol. ii. p. 297.

Another method of ſeparating ſalt from *ſea-water*, without fire, is propoſed in the Philoſophical Tranſactions: take a veſſel of wax, hollow within, and every where tight; plunge it into the ſea, or other ſalt *water*, and there will be made ſuch a ſeparation, that the veſſel ſhall be full of ſweet *water*, the ſalt ſtaying behind. But though this *water* hath no ſaltiſh taſte, yet a ſalt will be found in the eſſay. Phil. Tranſ. N° 7. p. 128.

The proceſs of Mr. Appleby, publiſhed by order of the lords of the admiralty in 1734, conſiſted in mixing with twenty gallons of *ſea-water* ſix ounces of a fixed alkali, prepared with quicklime, as ſtrong as lapis infernalis, and ſix ounces of bones, calcined to whiteneſs, and finely powdered, and drawing off in a common ſtill, with a ſlow fire, fifteen gallons. Phil. Tranſ. vol. xlviii. p. 69.

Dr. Butler, inſtead of the lapis infernalis, and calcined bones, propoſed the uſe of ſoap-leys. Dr. Hales, in his Philoſophical Experiments, ſuggeſted a method of keeping the *ſea-water* cloſe ſhut up, till it has putrefied, and has again become ſweet, and then diſtilling the *water*; upon which he found that three-fourths of the *ſea-water* were freed both of the bittern and acid. He ſubjoins a particular detail of the circumſtances which may make this operation eaſy. In another place he directs for this purpoſe the uſe of powdered chalk, and ventilation, by blowing ſhowers of air up through the diſtilling *water*, by means of a double pair of bellows. See Phil. Tranſ. vol. xlix. p. 312, &c. and Treatiſe of Ventilators, part ii. p. 318, &c.

Captain Chapman, in 1757, ſucceeded in obtaining a ſupply of freſh *water*, by diſtilling *ſea-water* with wood-aſhes, inſtead of the ſoap-leys of Dr. Butler.

In 1761 Dr. Lind diſcovered, that *ſea-water* diſtilled, without the addition of any ingredients, afforded a *water* as pure and wholeſome as that obtained from the beſt ſprings; and in 1762 an account of this diſcovery was read to the Royal Society, and ſoon after publiſhed by authority of the lords of the admiralty. The practicability of this operation was alſo evinced by the author of the Chemical Dictionary. In 1765 Mr. Hoffman introduced a ſtill of a new conſtruction, with a ſecret ingredient. About the ſame time experiments were made with a ſtill of the common conſtruction, and Mr. Dove's ingredient.

The manner of procuring freſh water, by the ſimple diſtillation of *ſea-water*, ſeems at preſent to have attained a great degree of perfection, both in France and England. M. de Bougainville, in his Voyage round the World, has borne ample teſtimony to the utility of the machine for diſtilling *ſea-water*, which was made public in 1763 by M. Poiſſonnier, its inventor; and lord Mulgrave, in his Voyage towards the North Pole, in 1773, has done equal juſtice to the method of obtaining freſh *water* from the ſea by diſtillation, which was introduced into the Engliſh navy in 1770, by Dr. Irving; for which he obtained a parliamentary reward of 5000*l.*

In order that the reader may have a clear notion of Dr. Irving's method, let us ſuppoſe a tea-kettle to be made without a ſpout, and with a hole in the lid, in the place of the knob; then the kettle being filled with *ſea-water*, the freſh vapour which ariſes from the *ſea-water* as it boils, will iſſue out through the hole in the lid; into that hole fit the mouth of a tobacco-pipe, letting the ſtem have a little inclination downwards; then will the vapour of freſh *water* take its courſe through the ſtem of the tube, and may be collected by fitting a proper veſſel to its end. This would be an apt repreſentation of Dr. Irving's contrivance; in which he has adapted a tin, or iron, or copper tube, of ſuitable dimenſions, to the lid of the common kettle uſed for boiling the proviſions on board a ſhip; the freſh vapour, which ariſes from boiling *ſea-water* in the kettle, paſſes through this tube into a hogſhead, which ſerves as a receiver; and in order that the vapour may be readily condenſed, the tube is kept cool by being conſtantly wetted with a mop dipped in a tub of cold *ſea-water*. For a particular account of the advantages attending this method of diſtillation, contraſted againſt the defects and inconveniences of the other methods that have been propoſed, ſee Voyage towards the North Pole, Append. p. 205, &c.

It appeared from the teſtimony which was delivered to the lords of the admiralty by many reſpectable officers, who were eye-witneſſes to an experiment made on board the Arrogant at Spithead, in January 1771, that eighty gallons of *ſea-water* did, in twenty-five minutes, after being put into the copper, and a fire made, diſtil in the proportion of twenty-five gallons per hour into freſh *water*, perfectly well taſted, and of leſs ſpecific gravity than the beſt ſpring-*water* in that neighbourhood; and the ſaid officers gave it as their opinion, that five hundred gallons of freſh *water* might be diſtilled in the ſpace of twenty-four hours, with the ſame quantity of fuel, in proportion to the time, as is required in the ordinary buſineſs of the ſhip. Every ſhip's kettle is divided into two parts, by a partition in the middle; one of theſe parts is only in uſe when peas or oatmeal are dreſſed, but *water* is at the ſame time kept in the other, to preſerve its bottom. Dr. Irving has availed himſelf of this circumſtance; and by filling the ſpare part of the copper with *ſea-water*, and fitting on the lid and tube, he has ſhewn, that fixty gallons of freſh *water* may be drawn off, during the boiling of either of the above mentioned proviſions, without the uſe of any additional fuel. He recommends alſo the preſerving of the *water* which may be diſtilled from the coppers in which peas, oatmeal, or pudding, are dreſſed, as both a ſalutary beverage for the ſcorbutic, and the moſt proper kind of *water* for the boiling of ſalt proviſions. Dr. Irving particularly remarks, that only three-fourths of the *ſea-water* ſhould be diſtilled, as the *water* diſtilled from the remaining concentrated brine is found to have a diſagreeable taſte; and as the farther continuation of the diſtillation is apt to be injurious to the veſſels. For an account of ſeveral experiments made on ſome of the beſt diſtilled *waters*, prepared by Dr. Irving from *ſea-water*, by Dr. Watſon, ſee his Chem. Eſſ. vol. ii. p. 168, &c.

Dr. Prieſtley has ſuggeſted a propoſal to give to this diſtilled *water* the briſkneſs and ſpirit of freſh ſpring *water*, and at the ſame time of rendering it, perhaps, a remedy or preventative againſt the ſcurvy, by impregnating it with the gas or fluid called fixed air, obtained by mixing

mixing chalk with oil of *vitriol*. See PYRMONT *water*.

We have many accounts of the methods of obtaining fresh *water* by dissolving frozen *sea-water*. Bartholine, in his book De Nivis Usu, says, that if the ice of *sea-water* be thawed, it loses its saltness, as, he adds, has been lately tried by a professor in our university: accordingly the thawed ice of *sea-water* is often used in Amsterdam for brewing. Captain Cook, in his Voyage round the World, was furnished with fresh *water*, from the melting of the ice which was found floating in the sea; and this *water*, he says, was not only fresh, but soft and wholesome. See SCURVY.

Mr. Barker also obtained from *salt-water*, which was left to freeze, ice that, being drained, was quite fresh. Phil. Trans. vol. lxvi. part ii. p. 373.

Sea-water has been found of excellent use against strumous swellings and obstructions of the glands, and different cutaneous foulnesses. It has been given also in the true marine scurvy, and found to promote the cure, when assisted by proper vegetables. The dose of *sea-water* is from half a pint to a pint, which may be repeated every morning for some months. In these doses it gently purges the belly, promotes also the other excretions, and somewhat warms and strengthens the habit; in large ones, it excites vomiting. In scrophulous complaints, and for removing glandular swellings, the bark is sometimes advantageously joined with it. It is also serviceable in purging off gross humours, that have been the consequence of intemperance, or an inactive life; and in cleansing the intestines of viscid mucus, and worms.

This *water*, at first, is apt to occasion great thirst, which abates with the continued use of it, and may be palliated by sleeping immediately after it is drank. In some constitutions it produces immoderate heat, and when used externally, an itching of the skin; and therefore in all inflammatory cases, and habits prone to phlogoses, it is hurtful. These symptoms should be removed, previous to the use of it, by bleeding, purging, and a proper cooling treatment. In many cases bathing in *sea-water* may be joined to the internal use of it; both as a general corroborant, and as a topical discutient and antiseptic. Accordingly it is excellent in the scrophula or king's evil, in hard swellings, in the bite of a mad dog, in the rickets, in the dry leprosy and itch, in paralytic and scorbutic complaints, and many other cases. Lewis's Mat. Med. Elliot on Min. Wat. p. 190.

Drinking *sea-water* with wine is said to prevent people from being sick at sea. It is said, that thirst may be allayed by bathing in warm *sea-water*, the pores imbibing the *water*, and carrying it to the intestines, but not suffering the dissolved salt to accompany the *water*.

WATER, *fresh*. See FRESH *water*.

WATER, *hard*, or *crude*, is that in which soap does not dissolve uniformly, but is curdled. The dissolving power of *hard water* is less than that of soft; and hence its unfitness for bleaching, dying, boiling leguminous vegetables, and for many other purposes of œconomy and arts. One cause of the hardness of *water* is, that it contains some salt that may be decomposed by soap, the alkali of which uniting with the acid of the salt, the oil of the soap separates, and the soap is said to be curdled. Hardness of *water* proceeding from this cause may be discovered and remedied by adding some drops of a solution of fixed alkali. The salts capable of rendering *water* hard are not only selenites, which is a very frequent cause of the hardness of *water*, but any other earthy or metallic salt that may be contained in the *water*, as all these are capable of being decomposed by fixed alkali. Such are the marine salt with basis of magnesia, or of calcareous earth, vitriolic salt with basis of magnesia, called Epsom salt, green vitriol, and a nitrous salt with earthy basis, to which Dr. Home attributes the hardness of several *waters* examined by him. The hardness of *water* has been attributed by some persons to common salt. But Dr. Home, in his Essay on Bleaching, has shewn, that neither pure common salt, nor any other salt with basis of fixed alkali, give any hardness to *water*, but that this quality may be given to *water* by the common salt which is generally sold, because this contains some part of the earthy salts of *sea-water*, or of the *water* of salt springs. The gas, which *waters* frequently contain, is another cause of the hardness of *water*. This gas unites with the alkali of soap, renders it mild, and thus weakens its union with the oil. By exposure of the *water* some time in open vessels, this gas exhales; by which means, *water* is rendered soft, and any calcareous earth or iron which may be dissolved in the *water* merely by means of the gas, as Mr. Cavendish and Mr. Lane have shewn (Phil. Trans. 1767 and 1769) is precipitated. See *Fixed* AIR.

By boiling, the hardness of *water* proceeding from gas may be cured, but that from earthy or metallic salts cannot be remedied in this way.

Spring *waters* are frequently hard; river *water* is generally soft. The small quantity of earthy salts contained in rain and snow *waters*, according to M. Margraaf's analysis, does not sensibly render them hard. Chem. Dict. Eng. ed.

Hard waters are remarkably indisposed to corrupt, and even preserve putrescible substances for a considerable length of time: hence, as Dr. Home observes, they seem to be best fitted for keeping at sea, especially as they are so easily softened by a little alkaline salt.

WATER, *rain*, is the *water* of the sea, purified by a sort of distillation; or rather, it is the *watery* vehicle, separated from the saline, and other matters residing therein, by evaporation.

Rain-water is next in purity to *snow*-WATER, especially when collected with the same precautions, after the rain has continued for some time, so as to clear the air from insects, or other light bodies, that float in it. Neither this water nor *snow-water* discover any heterogeneity in the common trials with acids, alkalies, soap, blue vegetable juices, or metallic solutions, till great part of the aqueous fluid has been separated by evaporation. Evaporated to dryness, it leaves four or five grains of solid matter in the gallon. Its salt is often nitrous, and its earth in great part calcareous.

The *rain-water*, in summer, or when the atmosphere is in commotion, it is certain, must contain infinite kinds of heterogeneous matter: thus, gathering the *water* that falls after a thunder-clap, in a sultry summer's day, and letting it settle, a real salt is found sticking at the bottom. But in winter, especially when it freezes, the exhalations are but few, so that the rain falls without much adulteration; and hence, what is thus gathered in the morning, is found of good use for taking away spots in the face; and that gathered from snow, against inflammation of the eyes.

Yet this *rain-water*, with all its purity, may be filtred and distilled a thousand times, and it will still leave some fæces behind it.

WATER, *river*, on some occasions, is to be esteemed purer than that of springs, and next in purity to *rain-water*; and it is sufficiently soft, and fit for all the purposes of life. Indeed, if the stream, in descending from its spring, chance to flow over strata, or beds, wherein there is salt, sulphur, vitriol, iron, or the like, it dissolves and imbibes part thereof. Otherwise, *spring-water* becomes purer and better as it runs; for, while the river drives on its *waters* in an uninterrupted stream, all its salts, with the vegetable and animal matters drained into it, either from exhalations, or from the ground it washes, gradually either sink to the bottom, or are driven to the shore; and hence, the ancient poets and painters represent the deities of springs and rivers, as combing and carding their *waters*.

River-waters generally putrefy sooner than those of springs. During the putrefaction, they throw off a part of their heterogeneous matter, and at length become sweet again, and purer than at first. See PUTREFACTION *of water*.

WATER, *salt*. See SALT, SALTNESS, and *Sea*-WATER.

WATER, *snow*, is the purest of all the common *waters*; when produced by snow that has been carefully collected on the tops of mountains, or on an open plain. A gallon, slowly evaporated, or distilled, leaves only two or three grains of solid matter. Distilled water itself leaves nearly as much upon a second, and upon repeated distillations; but with this difference, that the residuum of *snow-water*, like that of all the other natural ones, is brownish and saline; whereas that of the distilled is a fine white earth, void of saline matter, partly calcareous, and partly indissoluble. *Snow-water*, kept in a warm place, in clean glass vessels, not closely stopped, but covered from dust, &c. becomes in time putrid; though in well-stopped bottles it remains unaltered for several years. Distilled *water* suffers no alteration in either circumstance. The saline matter of *snow-water* is commonly of the nitrous kind, composed of the acid of nitre, united with calcareous earth. Lewis.

WATER, *spring*, is in general of all *waters* the hardest and most impure; though some *spring-waters* approach in purity to that of rain. Some, even of those which the eye and palate judge to be good *waters*, contain above a hundred grains of solid matter in the gallon. The saline matter of these *waters* is most commonly nitrous or muriatic, that is, composed of the nitrous or marine acids, united with earths: on adding to them, by little and little, a solution of any alkaline salt, the liquor becomes turbid and milky, more and more, till the acid, completely neutralized by the alkali, parts with all the earth,

earth, which on ftanding fettles to the bottom. The *water* thus corrected, though really no purer than at firft, is found perfectly foft for œconomical ufes, and much lefs, if at all, detrimental to health; its pungent, auftere, earthy falt, being now converted into a mild neutral one.

Spring-water, according to Dr. Halley, is collected from the air itfelf; which, being faturated with *water*, and coming to be condenfed by the evening's cold, is driven againft the cold tops of the mountains; where being farther condenfed and collected, it gleets down, or diftils, much as in an alembic.

This *water*, which before floated in the atmofphere, in form of a vapour, being thus brought together, at firft forms little ftreams; feveral of which, meeting together, form rivulets, and thefe, at length, rivers.

The Italian phyficians have talked much of cures performed by means of cold *water*, which they efteem almoft an univerfal remedy; giving in a day fifteen, twenty, or twenty-five pounds of *water* made cold by ice, and applying at the fame time cold water, or fnow, to feveral parts of the body. By this method they treat fevers, the fmall-pox, dropfy, &c. See Commerc. Norimb. 1736. hebd. 8. fect. 2.

Water, when applied to animal bodies, and when nearly of the fame heat with thefe, relaxes their folids, and dilutes their fluids.

With regard to the medicinal powers of *pure water*, Dr. Lewis obferves, that fimple fluidity, the abfence of every quality that can offend the tendereft organ, mifcibility with all the animal juices in a ftate of perfect health, except fat, unfitnefs to dilute and mingle with them when greatly thickened, as in fome difeafes, and a difpofition to pafs off by the cutaneous pores more fpeedily and more plentifully than by the kidneys, in confequence perhaps of its total want of irritation, conftitute the principal part of its medical character. To which may be added, that it is the moft commodious medium for applying to the human body the powerful agents, heat and cold; of which the one expands and relaxes, the other contracts and conftringes, all the fluid and foft parts of the animal machine.

Water putrefying by ftagnation is extremely dangerous to health. Thus in the holds of fhips, the bilge-*water*, if the fhip is tight, and the *water* not pumped out often, foon becomes fo extremely poifonous, as frequently to fuffocate thofe feamen, who, as the pumps are fubject to be clogged with filth, venture down to cleanfe them; and alfo to affect perfons at a diftance with violent headachs, cold fweats, and frequent vomitings, which continue more or lefs, in proportion to the diftance from the well of the fhip when the injury was received, and the degree of putrefaction in the *water* and air. Phil. Trans. N° 463. p. 63.

To prevent the above mentioned inconveniences many fchemes have been thought of, particularly the machines of Dr. Hales, and Dr. Defaguliers; the firft by an inftrument, which he calls the VENTILATOR, and may not improperly be called the fhip's lungs; and the latter by a machine, which is an improvement of the Heffian bellows.

Putrefied *water* being thus noxious, a method of preventing its putrefaction would be very defirable, and this feems now to be found in the ufe of lime. See LIME-*water*, MAGNESIA, and PUTREFACTION *of water*.

WATER, *ditch*, is often ufed as an object for the microfcope, and feldom fails to afford a great variety of animalcules.

This *water* very often appears of a greenifh, reddifh, or yellowifh colour; and this is wholly owing to the multitudes of animals of thefe colours which inhabit it. Thefe animals are ufually of the fhrimp-kind; and Swammerdam, who very accurately examined them, has called them, from the branched figures of their horns, *pulex aquaticus arborefcens*. They copulate in May and June; and are often fo numerous at that feafon, that the whole body of the *water* they are found in, is feen to be of a red, green, or yellow colour, according to the colours of their bodies. The green thin fcum alfo, fo frequently feen on the furface of ftanding *waters* in fummer, is no other than a multitude of fmall animalcules of this or fome of the other kinds. Dunghill-*water* is not lefs full of animals than that of ditches; but is often found fo thronged with animalcules, that it feems altogether alive; this is fo very much crowded with thefe creatures, that it is proper to dilute it before they can be diftinctly viewed, by adding clear *water* to it. There are ufually in this fluid a fort of eels, which are extremely active; and befide thefe, and many other of the common inhabitants of fluids, there is one fpecies found in this which feems peculiar to it; the middle part of thefe is dark, and befet with hairs, but both ends are tranfparent; their tails are tapering, with a long fprig at the extremity, and their motion is flow and wadling. Baker's Microfcope, p. 87. See PEPPER-*water*.

WATER, *hay*. See HAY.

WATER, *ufes of*. The ufes of *water* are infinite; in food, in medicine, in agriculture, in navigation, in divers of the arts, &c.

As a *food* it is one of the moft univerfal drinks in the world; and, if we may credit many of our lateft and moft judicious phyficians, one of the beft too. For this ufe, that which is pureft, lighteft, moft tranfparent, fimple, colourlefs, void of tafte and fmell, and which warms and cools fafteft, and wherein herbs and pulfe boil and yield their virtues fooneft, is beft.

Hippocrates, in his treatife De Aere, Aquis, & Locis, fpeaks much in behalf of light *water*. Herodotus relates, that, among the ancients, fome nations drank a *water* fo very light, that all woods readily funk therein. And Mr. Boyle mentions fome *water* brought out of Africa into England, which was fpecifically lighter than ours, by four ounces in a pint, i. e. by one third.

It is efteemed a good quality in *water*, to bear foap, and make a lather therewith. This our river *waters* readily do; but the pump and *fpring-waters* are found too hard for it; yet may this be remedied in them, by barely letting them ftand for four or five days.

It has been proved by many inftances, that *water* alone is capable of fuftaining human life a long time. Phyfical writers give us many accounts of people's living four or five days on it; but the Philofophical Tranfactions furnifh us with a much more memorable inftance.

Some people at work in a deep coal-pit, near Liege, had the misfortune to pierce into a fubterranean current of *water*, of fuch force that it inftantly filled a great part of the works. The perfon who ftruck the blow into it was drowned, and fome that were near the mouth of the pit efcaped very narrowly by being drawn up; but twenty-four days after, when the mine was cleared of the *water*, and people came down to work in it again, four of the perfons, who had been fuppofed drowned, were found alive: they had faved themfelves by climbing into a place above the reach of the *water*; they had not the leaft morfel of bread with them, but had lived all this time on the *water* of a little fpring which broke out by them. This *water* was examined, and found to have no peculiar matter contained in it, but only the common fparry fubftance found in all *water*, and that not in any abundance. Phil. Tranf. N° 159.

We have alfo an account in the Philofophical Tranfactions of a man who lived for eighteen years on no other aliment than *water*, and now and then, though feldom, clarified whey. The man was pretty healthy. See N° 466. fect. 7.

As a *medicine*, it is found, internally, a powerful febrifuge; and excellent againft colds, coughs, the ftone, fcurvy, &c. Externally, its effects are no lefs confiderable.

In agriculture, and gardening, *water* is allowed abfolutely neceffary to vegetation: whence Varro places it in the number of the divinities he invokes in his firft book De Re Ruftica. *Etiam*, fays he, *precor*, *Lympha*, *quoniam fine aqua omnis mifera eft agricultura*.

The changes *water* is liable to, and the different forms it appears under, are very numerous: fometimes as ice, then as a vapour, then as a cloud, fhower, fnow, hail, fog, &c.

Many naturalifts have even maintained *water* to be the vegetable matter, or the only proper food of plants; but Dr. Woodward has overturned that opinion, and endeavoured to fhew, that the office of *water* in vegetation is only to be a vehicle to a terreftrial matter, whereof vegetables are formed; and that it does not itfelf make any addition to them. All *water*, he allows, contains more or lefs of this terreftrial matter; fpring and *rain-water* near an equal quantity; and *river-water* more than either of them. See *Food of* PLANTS.

Water is of the utmoft ufe in chemiftry; being one of the great inftruments by means whereof its operations are all performed.

It acts in various manners and capacities; as a menftruum, a ferment, a putrefacient, a vehicle, a medium, &c.

1. As a *menftruum*, it feems to be capable of diffolving a certain quantity of air; for all natural *water*, being placed under an exhaufted receiver, emits many air-bubbles; and it is well known, that large quantities of *water* are raifed from the earth; and yet the *water*, which is thus elevated, is no more vifible in the air, than a piece of fugar is vifible in the *water* wherein it happens to be diffolved; nor is the tranfparency of the air injured by the *water* it has received from the earth; fo that

that the *water* is not only mixed with the air, but really dissolved in it; a perfect transparency of the fluid, in which any body is dissolved, being esteemed the most unequivocal mark of its solution.

There are various ways by which the existence of *water* in air is made apparent. If a bottle of wine be fetched out of a cool cellar, in the hottest and driest day in summer, its surface will presently be covered with a thick vapour, which, when tasted, appears to be pure *water*; and the same appearance is observable on the outside of a silver or other vessel, in which iced *water* is put in summer-time. *Water* which is cooled by the solution of any salt, or even spring-*water*, which happens to be a few degrees colder than the air, produces a similar condensation of vapour on the outside of the vessel in which it is contained. These and other phenomena of the same kind, are explicable on the same principle. Warm air is able to retain more *water* in solution than cold air can; when, therefore, warm air becomes contiguous to the outward surface of a vessel, containing cold liquor, it is cooled, and in cooling is forced to part with some of the *water* which it had dissolved; and this *water*, ceasing to be suspended by the air, attaches itself to the surface of the cold vessel. See EVAPORATION.

Besides, certain bodies acquire an increase of weight by exposure to the open air: thus, salt of tartar, and strong acid of vitriol, attract humidity from the air, and derive from hence a very sensible increase of weight. The human body also acquires an increase of weight from the *water* which the pores of the body imbibe from the air. Keil has proved, that a young man, weakened from want of nourishment, but in other respects healthy, added eighteen ounces to his weight, in the space of one night, by the absorption through his pores. Another person has been seen to gain forty pounds weight, in the same manner, in the space of a day. M. de Haen is of opinion, that dropsical patients absorb more than a hundred pounds weight every day. And it is supposed, that, in general, the body absorbs more than one pound every day by the pores. The imbibition of *water* through the pores of the skin is an acknowledged fact: it is well known, that persons, who go into a warm bath, come out several ounces heavier than they went in; their bodies having imbibed a correspondent quantity of *water*. The utility of medicated and vapour baths depends partly on this principle of imbibition by the pores. Moreover, it has been shewn, that *water* which has lost a portion of its air, either by being frozen, or heated, or by long continued agitation, or by other means, has the property of re-absorbing as much air from the atmosphere as it had lost; and it has also been shewn, that this absorption is the strongest at first, and becomes less and less powerful, as the *water* becomes more and more impregnated with air. Such observations render it probable, that *water* is as capable of dissolving a certain portion of air, as it is of dissolving a certain portion of any particular kind of s lt. The quantity of air, which *water* is capable of dissolving and retaining in solution, depends partly upon the temperature of the *water*, partly upon the weight of the atmosphere, and partly, perhaps, on the *water's* purity. Hence authors have given different accounts of the quantity of air contained in *water*. Boerhaave infers from an experiment which he made, that there may be separated from *water* a quantity of air equal in bulk to the *water*. The abbé Nollet says, that *water*, which has been previously purged of its air, absorbs in six days one-thirtieth of its bulk. Dr. Hales obtained by distillation one cubic inch of air from fifty-four cubic inches of *water*. Mr Eller is of opinion, that the portion of air contained in *water* does not exceed the hundred and fiftieth part of its bulk. Dr. Priestley found, that a pint of his pump-*water* contained about one-fourth of an ounce measure of air; i. e. the bulk of the *water* was to that of the air it contained, as 64 to 1. M. Fontana says, that the *water* of the Seine at Paris, after being long boiled, absorbs in forty days one twenty-eighth of its bulk of common air. And Mr. Cavallo observes, that in a temperate degree of heat, and when the barometer is about 29½ inches, *water* absorbs about one-fortieth of its bulk of common air. Boerh. Chem. vol. i. p. 521. Hist. de l'Acad. 1743. Hales's Veget. Stat. chap. vi. Berl. Mem. 1750. Phil. Trans. for 1772, p. 248. Id. for 1779, p. 439. Cavallo on Air, p. 213. See Watson's Chem. Ess. vol. iii. essay 3 and 5.

The solution of air in *water* is more sensible with many kinds of gas, which were till of late confounded with air. The gas which is expelled by the effervescence of acids and alkalies, is one of those with which *water* charges itself in greatest quantity. See *Fixed* AIR.

Farther, *water* dissolves all kinds of salts. Air also seems to dissolve salts; but it is only in virtue of the *water* it contains. Nor has any other body the power of dissolving salts, farther than as it shares in this fluid.

The particles of salts, we have observed, insinuate themselves into the interstices between the particles of *water*; but when those interstices are once filled, the same *water* will not any longer dissolve the same salt; but it will then still dissolve a salt of another kind, by reason of the different figure of the particles, which enter and occupy the vacancies left by the former; and thus it will dissolve a third or fourth salt, &c.

Thus, according to Neumann, four ounces of *water*, that have been saturated with a dram and a few grains of alum, will still dissolve five drams of nitre, then half an ounce of green vitriol, six drams of common salt, three drams of soluble tartar, and five drams of sugar. In the same manner also, four ounces of *water* saturated with half an ounce of nitre, will dissolve half an ounce of white vitriol, six drams of common salt, six drams of sal ammoniac, half an ounce of soluble tartar, and after all these, an entire ounce of sugar.

Mr. Eller has published an account of the following experiments, containing the solutions of different salts in the same *water*. Mem. Acad. Berlin, for 1750.

In each experiment he employed eight ounces of distilled *water*; and found, that this quantity of *water*, when saturated with four ounces of nitre, dissolved one ounce five drams of fixed alkali, and half an ounce of common salt; with three ounces, one dram, and one scruple of common salt dissolved three drams of nitre, and five drams of fixed alkali; with three ounces and a half of fossile salt, dissolved half an ounce of nitre; with half an ounce of cream of tartar, dissolved half an ounce of Sedlitz salt, and half an ounce of fixed alkali; with an ounce and a half of vitriolated tartar, dissolved half an ounce of fixed alkali; with three ounces and a half of Glauber's salt, dissolved two drams of nitre, and as much sugar; with four ounces of soluble tartar, dissolved half an ounce of pure nitre; with four ounces of Epsom salt, dissolved half an ounce of fine sugar; with two ounces and a half of sal ammoniac, dissolved five drams of fossile salt; with an ounce and a half of volatile salt of hartshorn, dissolved an ounce of nitre, and half an ounce of sugar; with four drams and two scruples of borax, dissolved half an ounce of fixed alkali; with two ounces and a half of alum, dissolved six drams of common salt, and one dram of Epsom salt; with nine ounces and a half of green vitriol, dissolved an ounce and a half of Sedlitz salt, two drams of nitre, and three ounces of refined sugar; with nine ounces of blue vitriol, dissolved an ounce of nitre, three drams of common salt, and an ounce of sugar; with four ounces and a half of white vitriol, dissolved one ounce of refined sugar.

Water dissolves all saline bodies, it being the constituent character of this class of bodies, that they are uninflammable, and dissoluble in *water*. And it may be said, in general, that every body truly soluble in *water* is of a saline nature; and that no other body can be dissolved in *water* but by means of a saline substance. The quantities of the saline substances that could be dissolved in an ounce of *water*, with the heat of 50° of Fahrenheit's scale, according to experiments made by Mr. Spielman, (Instit. Chem. p. 48.) are as follow: terra foliata tartari, 470 grains; salt of Sedlitz, 384; Epsom salt, 324; salt of tartar, 240; vegetable salt, 212; white vitriol, 210; sal gem, 200; salt of soda, 200; sal ammoniac, 176; common salt, 170; salt of Glauber, 168; salt of Lorrain, 168; salt of Sylvius, 160; salt of Seignette, 137; blue vitriol, 124; green vitriol, 80; purified nitre, 60; sal polychrest of Glaser, 40; vitriolated tartar, 30; sublimate mercury, 30; borax, 20; alum, 14; volatile salt of amber, 5; arsenic, 5; crude tartar, 4; cream of tartar, 3.

Metallic matters, except the perfect metals, are acted upon by *water*; but especially by the vapour of *water*, together with the concurrence of air: it converts their surfaces into rust. *Water* seems also capable of dissolving a small quantity of calcareous earth; for the most limpid, clear *water*, being distilled, always deposits some part of this earth. Spirit of wine, and all ardent spirits of the same kind, may be dissolved in *water* in all proportions. The spiritus rector of vegetable and animal substances, and most of the volatile fluids, called gas, are soluble in *water*. Ethereal liquors, as vitriolic, nitrous, marine, and acetous æthers, are soluble in *water*, in certain proportions.

Water dissolves all saponaceous bodies, i. e. all alkalious salts and oils blended together: though oil itself be not dissoluble in *water*, the admixture of salt herewith, rendering it saline, brings it under the power of *water*.

M. Beaumé has observed, that *water* dissolves the most subtle and volatile part of any oils.

Now, all the humours in the human body are apparently saline,

ſaline, though none of them are ſalt itſelf; and the ſame may be ſaid of the juices of all vegetables, excepting their oils; and, accordingly, they all diſſolve in *water*.

Water diſſolves glaſs itſelf. This, being melted with ſalt of tartar, becomes ſoluble in *water*.

It diſſolves all gums, and gummous bodies; it being a characteriſtic of a gum, that it diſſolves in *water*, in contradiſtinction from a reſin.

Farther, *water*, mixed with alkali ſalts, diſſolves oil, and oily bodies. Thus, though mere *water* poured on greaſy wool be repelled thereby, yet a ſtrong lixivium, or alkali ſalt, being mixed with the *water*, it readily diſſolves and abſorbs all that was greaſy and oleaginous; and thus it is that woollen cloths are uſually ſcoured.

But *water* does not diſſolve reſins; as we conceive a reſin to be no other than an inſpiſſated, or concentrated oil.

Oils and ſulphurs, *water* leaves untouched; and, what is more extraordinary, it repels them; and, by repelling, it drives the oily particles into eddies. Add, that it ſeems to repel all oleaginous, ſulphureous, fatty, and adipoſe bodies, wherein oil predominates; and hence alſo it is, that the fatty parts in our bodies eſcape being diſſolved by *water*. And it is, in all probability, by this means that fat is collected in the adipoſe cells of all animals.

Nor does it diſſolve terrene or earthy bodies, but rather unites and conſolidates them; as we ſee in tyles, &c.

After diſſolving a body, the *water* unites and hardens together with it; and, if the body be of the ſaline kind, forms cryſtals, and retains the ſalts in that form.

Salts, while thus joined with *water*, aſſume various figures: the cryſtals of ſea-ſalt, e. gr. are pyramidal; thoſe of nitre, priſmatical; thoſe of ſal gemmæ, cubical, &c.

But that *water* is the cauſe of theſe ſalts being in cryſtals, is evident hence, that, upon ſeparating the *water*, the cryſtals are no more; their form is loſt, and their tranſparency ceaſes.

2. Without *water* there can no fermentation be raiſed. Thus, if you grind a plant into a duſt, or farina, it will never ferment, even though you add yeſt, or ſpirit of wine, thereto; but *water* being poured on it, the fermentation readily ariſes.

3. All putrefactions, both of animal and vegetable bodies, are likewiſe performed by means of *water* and air; and, without it, there could be no ſuch effect in all nature.

4. *Water* is indiſpenſibly required to efferveſcence, which is an inteſtine motion ariſing between contrary ſalts; for no ſuch motion can ariſe from a mixture of contrary ſalts, unleſs there be *water* to diſſolve and keep them in ſolution.

5. A farther uſe is in making ſeparations of oily from ſaline parts, which is a thing of the laſt ſervice: thus, any oleaginous ſubſtance, incorporated with ſalt, being ſhaken ſome time in a proper quantity of *water*, the ſalts, diſſolving, will be extracted from the oil, and imbibed by the *water*; and thus is the body dulcified. So butter, by a continued lotion in fair *water*, becomes inſipid; and aromatic oils, agitated a long while in warm *water*, lay aſide their ſaline ſpirituous parts, and become inert and inodorous.

Spirit of wine, mixed with oil, makes one body therewith; but if you pour *water* thereon, it will repel the oil, and draw all the ſpirit to itſelf: nay, frequently, what the ſpirit had diſſolved in other bodies, *water* will ſeparate from them, by diluting the ſpirit, and letting the other matters precipitate.

6. *Water* is of great ſervice in directing and determining the degree of fire or heat. This was firſt diſcovered by M. Amontons, from an obſervation, that *water* over the fire grows gradually more and more hot, till it comes to boil; but then ceaſes to increaſe, and only maintains its preſent degree of heat, even though the fire were ever ſo much enlarged, or were continued ever ſo long. This, therefore, affords a ſtandard, or fixed degree of heat, all over the world; boiling *water*, provided it be equally pure, being of the ſame heat in Greenland, as under the equator. See WATER, ſupra, and *Fixed Points of* THERMOMETERS.

By means hereof they make baths of divers degrees of heat, accommodated to the various occaſions.

Water is of the utmoſt uſe in divers of the mechanical arts and occaſions of life; as, in the motion of mills, and other machines. *Water*, by its fall, may be made to afford wind enough to blow a fire. This is practiſed in the braſs-works of Tivoli, near Rome. And the laws, properties, &c. of this fluid, with reſpect thereto, as its motion, gravitation, preſſion, elevation, action, &c. and the conſtruction of divers engines ſubſervient thereto, or founded thereon, as ſiphons, pumps, &c. make the ſubject of *hydraulics* and *hydroſtatics*.

Water may be uſed with good ſucceſs in taking the height of any acceſſible object, as it naturally becomes parallel to the horizon. The manner of performing this operation is exactly the ſame as with a MIRROR.

The quantity of *water* on this ſide our globe, Dr. Cheyne ſuſpects to be daily decreaſing; "ſome part thereof being continually turned into animal, vegetable, metalline, or mineral ſubſtances; which are not eaſily diſſolved again into their component parts." Philoſoph. Princip. of Relig.

WATER, in *Geography* and *Hydrography*, is a common, or general name, applied to all liquid tranſparent bodies, gliding or flowing on the earth.

In this ſenſe, *water* and earth are ſaid to conſtitute our terraqueous globe.

Some authors have raſhly and injuriouſly taxed the diſtribution of *water* and earth in our globe as unartful, and not well proportioned; ſuppoſing that the *water* takes up too much room.

An inundation, or overflowing of the *waters*, makes a DELUGE.

WATER, in *Natural Hiſtory*, &c. is diſtinguiſhed into *pure*, called alſo *elemental*, *mineral*, and *artificial* or *factitious*.

As to the *pure*, we have already obſerved, that there is, perhaps, none abſolutely ſo.

WATERS, *mineral*, are thoſe which contain ſuch, and ſo many, particles of different natures from *water*, as thence to derive ſome notable property beyond what common *water* has: or *mineral waters* are thoſe which have contracted ſome peculiar virtue, by paſſing through beds of minerals, as alum, vitriol, ſulphur, &c. or by receiving the fumes thereof.

Or, they are ſuch, in which gas, or ſulphureous, ſaline, or metallic ſubſtances, are diſcovered by chemical trials; and as many of them are employed ſucceſsfully in medicine, they are alſo called *medicinal waters*.

The ſubſtances generally found in *mineral waters* are almoſt always combinations of vitriolic acid, and thoſe of marine acid, together with the ſeveral matters that theſe acids are capable of diſſolving.

The following combinations of vitriolic acid are found in *mineral waters*; viz. volatile ſulphureous acid, which ſeldom occurs; ſulphur, found ſometimes ſingly, but generally formed into a liver of ſulphur by means of calcareous earth, or of mineral alkali; vitriolic ſalts with earthy baſis, which ſalts are frequently ſelenitic; i. e. their acid is combined with a calcareous earth; or they are of the nature of Epſom ſalt, the baſis of which is magneſia; ſometimes, but not ſo often, they are aluminous, when their acid happens to be united with an argillaceous earth; vitriols, as martial vitriol, which is frequently contained in *mineral waters*; vitriol of copper, ſometimes but ſeldom, and vitriol of zinc ſtill more rarely, found in theſe *waters*; the vitriols of other metallic ſubſtances are ſcarcely ever, except in ſingular caſes, found in *water*. Laſtly, vitriolic ſalts with baſis of fixed alkali; this is always Glauber's ſalt; for neither vitriolated tartar, nor vitriolic ammoniacal ſalt, are ever found, unleſs by ſome ſingular accident, in *mineral waters*. The combinations of marine acid that are contained in *mineral waters* are common ſalt, and marine ſalt with earthy baſis.

As to the manner by which *mineral waters* become impregnated with their ſeveral principles, we may obſerve, that the ſelenitic parts of *water* are received by this fluid while it flows through gypſeous earth and ſtones; theſe being compoſed of ſelenites, which is ſoluble in *water*; the mines of ſal gem furniſh the *waters* that flow through them with the common ſalt that they contain; and when *water* once contains common ſalt, it may become impregnated with Glauber's ſalt by paſſing through clay; the vitriolic acid, that is always contained in argillaceous earths, decompoſing a part of the common ſalt of the *water*, with the baſis of which it forms the Glauber's ſalt; while the marine acid, now diſengaged, will unite with the firſt calcareous principles that occur, and form a marine ſalt with earthy baſis, which is accordingly always found in ſea-*water*, and ſalt ſprings. When *water* impregnated, or not, with ſaline principles, flows through parts of the earth containing pyrites in a decompoſed ſtate, it becomes impregnated with ſulphur, with martial vitriol, vitriol of copper, alum, and other ſalts, and frequently with ſeveral of theſe ſubſtances at the ſame time, according to the nature of the PYRITES. The heat of hot *mineral waters* can be only acquired by waſhing large maſſes of pyrites, and other ſimilar minerals, in a ſtate of ſpontaneous decompoſition, during which they always acquire conſiderable heat. Finally, the aerial gas, or fixed air, of ſome *mineral waters*, may have been diſcharged from ſome of the principles with which the *water* is impregnated, which were in the act of combination with each other at the time they were diſſolved by the *water*, or which were combined after this ſolution.

WAT

tion. For it is known, that in almoſt all ſolutions much air is extricated; and this air, being diffuſed among the particles of *water*, adheres to them, and in ſome meaſure combines with them ſuperabundantly. This gas, which gives the ſparkling and inebriating qualities to many *mineral waters*, does not differ from the vapour extricated from effervefcing and fermenting ſubſtances. The honourable Mr. Cavendiſh has diſcovered that, by means of gas, and without the intervention of any acid, calcareous earth is diſſolved in ſome *mineral waters*. He found, that the quantity of this gas contained in Rathbone-place *water*, relatively to the quantity of calcareous earth contained in that *water*, was about twice as much as is uſually combined with an equal quantity of calcareous earth; and that the earth might be precipitated from this *water* by driving off the gas by heat, or by abſorbing it by the addition of lime-*water*.

Mr. Lane alſo diſcovered another inſtance of the diſſolving power of gas upon iron, and has ſhewn the probability that this metal is diſſolved in many *mineral waters* by means only of that gas. He found, that pure diſtilled *water*, having been impregnated with the gas ariſing from effervefcing or fermenting ſubſtances, was rendered capable of diſſolving a ſenſible portion of iron; and that this artificial chalybeate *water*, by expoſure to air, loſt entirely its property of tinging an infuſion of galls. As ſeveral chalybeate *mineral waters* do alſo by expoſure to air entirely loſe their property of tinging an infuſion of galls; and as *waters* containing iron diſſolved by means of vitriolic acid, though a conſiderable ſediment is depoſited from them, do never entirely loſe this property; he infers, that the former kind of *waters* receive their chalybeate impregnation by means, not of an acid, but of this gas. He farther ſhews, from experiments, that iron cannot be ſo entirely precipitated from its ſolution in any of the mineral acids by means of mild alkalies, or mild calcareous earth, that this ſolution ſhall loſe its power of tinging an infuſion of galls; but that the iron may be ſo perfectly precipitated from the above mentioned ſolutions, by means of cauſtic alkali, or of lime-*water*; and hence he infers, that, in the former caſe, the portion of iron that is not precipitated, is kept ſuſpended or diſſolved by means of the gas extricated by the acid of the ſolution from the mild alkali or earth. See *Fixed* Air.

The analyſis of *mineral water* is an operation of great importance, in order to a diſcovery of the nature and properties of the ſubſtances which they contain. No traces of the art of accurately examining *waters*, with regard to their contents, that are worthy of obſervation, occur till the ſeventeenth century. Tabernæmontanus, or Jacob Theodore, about the end of the ſixteenth century, enumerates a variety of the *waters* of Germany, but gives no analyſis of them; and Andrea Bacci, an Italian phyſician, in 1596, makes no mention of analyſes of this kind, though he wrote more accurately than any of his predeceſſors on the ſubject of *waters*. It appears, that Mr. Boyle, in 1663, had diſcovered the uſe of ſeveral precipitants, which he enumerates in his experiments on colours, printed in 1663. In 1667, M. Dom. du Clos attempted to examine all the *waters* of France, for which purpoſe he made uſe of various precipitants; and he alſo examined the reſiduum after diſtillation, inveſtigated its figure by the microſcope, its flavour, and its ſolubility in *water*, and put its properties to the teſt of hot iron. See his Examin. des Eaux Min. In 1680, ſome remarkable experiments on this ſubject, made by Urbanus Hierne, were publiſhed in Sweden. In 1685, Mr. Boyle propoſed a number of ſubſtances for the more accurate examination of *waters*; and the ſubject was proſecuted by Nic. Valerius, a Swede, in 1697. About the beginning of the preſent century other ſubſtances were introduced by D. Regis, Didier, Boulduc, and Burlet; and Geoffroy made ſome improvements in the apparatus for diſtillation, ſubſtituting broad open glaſs veſſels for the cloſe retorts that had been uſed before the year 1707.

Upon the whole, it appears, that the principal precipitants at preſent known were in uſe at leaſt from the middle of the ſeventeenth century; but the concluſions drawn from an obſervation of their effects were generally unſatisfactory, and often falſe. Alum was long ſuppoſed to be preſent in *waters*; but this was contradicted by du Clos, who mentions a certain ſalt, ſimilar to gypſum. Allen was perhaps the firſt who obſerved in *waters* a ſalt conſiſting of vitriolic acid and lime, which he calls ſelenite. Hierne firſt obſerved natron, or mineral alkali, in the acidulous *waters* of Egra; and Hoffman afterwards diſcovered it in ſeveral medicated ſprings. The nature of this ſubſtance was accurately explained by Boulduc in 1729. The ſal catharticus amarus, or vitriolated magneſia, was in high eſteem at Epſom, from the year 1610, and found in ſeveral *waters*; but its real compoſition was unknown, till Dr. Black, in 1755, accurately examined the nature of magneſia, the preſence of which, in union with fixed air, was afterwards diſcovered in ſeveral *waters*. In 1682, Liſter diſcovered lime in *waters*; and he affirms, that the two ſalts from which *mineral waters* derive their virtues, are common ſea-ſalt, and nitrum calcarium. Le Roy, in 1752, found ſalited lime in the laſt lixivium; Margraaf diſcovered ſalited magneſia in 1759; and Home nitrated lime in 1756.

In the beginning of this century, Hoffman attempted to eſtabliſh a new theory of *mineral waters*, denying that there is in the acidulous *waters* any true acid; and inſiſting, that they are alkaline; the alkali originating from a ſpirit of ſulphur, which, according to the degree of its ſubtlety, would form with lime an alkali, either fixed or volatile; but Henckel thinks the alkali is derived from common ſalt. Dr. Seip ſuppoſes, that the genuine mineral ſpirit is the volatile vitriolic acid. In 1748, Dr. Springsfield affirmed, that air was the cauſe by which the contents of the ſubtile *waters* were kept in a ſtate of perfect clear ſolution, which was confirmed by M. Venel in 1755; and by later experiments it has been ſufficiently proved, that the genuine mineral ſpirit of *mineral waters* is *fixed* AIR; and that different ſalts, in different proportions, determine the different ſpecies of theſe *waters*. See on the hiſtory of the analyſis of *waters*, Bergman's Phyſ. and Chem. Eſſ. vol. i. p. 91, &c.

Previous to the operation of analyſing *mineral water*, it will be proper to examine the ſituation of the ſpring, and the nature of the ſoil; to obſerve the ſenſible qualities of the *water*, as its ſmell, taſte, and colour; to aſcertain its ſpecific gravity and heat by a hydrometer, or hydroſtatical balance, and by the thermometer; and to notice the changes that are ſpontaneouſly produced upon the *water* in cloſe and open veſſels, and with different degrees of heat; and if by theſe means any matter be cryſtallized or depoſited, it muſt be ſet apart for farther examination. Experiments of this kind are beſt made near the ſpring, if poſſible.

The operation of analyſing, or decompoſing the *water*, may be performed either without addition, and merely by evaporation and diſtillation, or with the addition of other ſubſtances, by means of which the matters contained in the *water* may be precipitated and diſcovered. It is not material which of theſe two methods be firſt practiſed; but an accurate analyſis requires that both of them ſhould be employed. If we begin by evaporation and diſtilling, theſe operations muſt ſometimes be interrupted, that the ſeveral principles which ariſe at different periods of the diſtillation may be obtained and examined ſeparately; and alſo to allow the ſeveral ſalts that may be contained to cryſtallize by evaporation, and by cold. The dry matter left in the retort after diſtillation is to be boiled in ſix times its own weight of pure diſtilled *water*: this being afterwards filtered and ſet to cryſtallize, will give, after a proper evaporation, its own peculiar ſalt in cryſtals; and if more ſorts of ſalt than one ſhould be contained in the *water*, they will be all thus ſeparated by repeated evaporations and cryſtallizations.

Whether theſe ſalts be acids or alkalies, is eaſily found by the common experiments, the acid turning ſyrup of violets red, and the alkali turning a ſolution of corroſive ſublimate yellow. The neutral ſalts, waſhed out of the earth by *waters*, are chiefly ſea-ſalt, and ſuch as conſiſt of a vitriolic ſalt, and a ſalt or earth of an alkaline nature. Sea-ſalt is diſcovered by its taſte, by the white fume it yields on being mixed with oil of vitriol, and by its figure in cryſtallization; and the other neutral ſalts are diſcovered by their property of producing, or regenerating ſulphur, upon being mixed and melted with ſalt of tartar, and powdered charcoal. Thus, if two ounces of ſuch ſalt be mixed with one ounce of ſalt of tartar, and an ounce of powdered charcoal, and the whole put into a crucible, there will be produced a reddiſh-coloured maſs of a ſulphureous alkaline taſte, and giving a high yellow colour to ſpirit of wine, which will turn ſilver black; and being precipitated by an acid, affords a true lac ſulphuris, which may be ſublimed, and melted into brimſtone like the common.

What remains of the reſiduum, after *water* has ſeparated the ſalt, is properly earth: this is often of more kinds than one, and may be ſeparated by repeated waſhings into bole, ochre, ſand, and whatever elſe it conſiſts of; and theſe may afterwards be tried, as to their nature, by fire in the common ways, the firſt and readieſt of which is the ſeeing whether they will calcine or vitrify; and the next, with proper additions, to try whether they contain any metalline or mineral particles, which may be ſeparable by the ſeveral fluxes; and if the quantity of metalline matter be too ſmall to be collected into a regulus, or ſhew itſelf in the common way, it may be melted with cryſtalline glaſs, and from the colour it gives that glaſs,

the

the metal it contains may be known. See *Concrete* JUICES.

In order to form a right judgment of *mineral waters*, the analyſis of them muſt be confirmed by ſyntheſis. For this purpoſe the pureſt ſnow-*water*, gently diſtilled, and freed from empyreuma, by ſtanding in the open air, ſhould be employed; and when the heterogeneous matters which have been diſcovered are added in due proportion, the artificial *water* ſhould be preciſely like the natural in every circumſtance.

We ſhall here ſubjoin ſome of the moſt obvious and familiar methods of analyſing, or diſcovering the nature of *mineral waters*, without decompoſing the *waters* by evaporation or diſtillation.

Mineral waters are known to contain iron, by their exhibiting a purple or black colour with the infuſion of galls; the quantity of iron being determined by the deepneſs of the colour. The iron is alſo diſcovered in theſe *waters* by their ſtriking a blue colour with a ſolution of fixed alkaline ſalts that have been calcined with animal coals, or with a tincture made by digeſting Pruſſian blue in volatile alkaline ſpirits. This phlogiſticated alkali, ſays Bergman, is beſt prepared from four parts of Pruſſian blue, boiled with one part of alkali, in a ſufficient quantity of *water*; the clear liquor, ſaturated with an acid, muſt then be freed by filtration from the ſmall portion of Pruſſian blue which is ſeparated. The method by vegetable aſtringents, as galls, ſerves to diſtinguiſh minute portions of iron, provided the liquor contains no more acid than is ſufficient to keep the metal diſſolved; but if the quantity of acid is very large, aſtringents give no notice of the iron; whereas the tincture of Pruſſian blue diſcovers it univerſally. If the iron be held in ſolution by fixed air, the latter will fly off on expoſing the *water* in an open veſſel, and then the iron will fall to the bottom in the form of a yellowiſh or reddiſh brown powder, or ochre; but if the iron be held in ſolution by the vitriolic acid, in the form of green vitriol, or copperas, this precipitation of ochre does not happen. Some chalybeate *waters* reſemble a ſolution of vitriol of iron in common ſpring-*water*; ſtriking a blue or black colour with galls, depoſiting ſome of their iron in form of an ochre, and retaining part of it for a length of time, and yielding, in evaporation, a ſaline matter, which communicates a ferruginous impregnation to freſh *water*, and which appears to be a true vitriol of iron. Other *waters* reſemble a ſolution of the ſame vitriol, with an admixture of the mineral fixt alkaline ſalt; and like ſuch a mixture, according to the diſcovery of Mr. Reynolds, they ſtrike, when freſh, a purple colour with galls, ſoon depoſit the whole of their iron, and yield, on evaporation, not a vitriol or chalybeate ſalt, but a ſalt compoſed of the acid of vitriol and alkali, and ſometimes a little pure alkali, beſides that which is ſatiated with acid. In general, a blue or black colour, produced with galls, may be regarded as a mark of the abſence of alkaline ſalt; and a purple, as a mark that either the *water* originally contained an alkali, or has become alkaleſcent, or verging to putrefaction, by ſtanding. Chalybeate *water* may be known to be vitriolic by its auſtere, ſtyptic taſte.

The vitriol of copper, or copper diſſolved by any acid, may be diſcovered by adding ſome of the volatile ſpirit of ſal ammoniac, which produces a fine blue colour, or by the addition of clean iron, upon the ſurface of which the copper is precipitated in its metallic ſtate. If any portion of diſengaged acid or alkali be contained in *water*, it may be known by the taſte, by changing the colour of ſyrup of violets, or tincture of turnſole, and by adding the preciſe quantity of acid or alkali that is neceſſary for the ſaturation of the contained diſengaged ſaline matter. When the *water* contains an acid, the addition of ſyrup of violets, or tincture of turnſole, produces a red colour, and changes the colour of paper tinged by ſaturated tincture of turnſole, with a little ſtarch boiled in it, into red. A ſingle grain, ſays Bergman, of highly concentrated vitriolic acid, communicates a viſible red tinge to 172,300 grains, or 408 cubic inches, of the blue tincture of turnſole. The vitriolic acid may be diſcovered in any combination, by mixing with the matter to be examined any inflammable ſubſtance, and expoſing it to a red heat, in which caſe the leaſt particle of the acid will be rendered ſenſible by the ſulphur, or by the volatile ſulphureous acid thence produced.

The ingenious Dr. Percival, in his Eſſay on *Water*, has demonſtrated, that the vitriolic acid, when the ſalt containing it is in a ſtate of ſolution in *water*, is ſeparable by a boiling heat, and that thus the hardeſt *waters*, owing this quality to that ſubſtance, might be rendered ſoft.

If the addition of ſyrup of violets to *water* changes it to a bright green, it ſhews that an alkaline ſalt is contained in the *water*. However, when the *water* is firſt taken up from the well, the alkaline ſalt is uſually ſaturated with fixed air, and therefore does not change the ſyrup green. It is, indeed, often ſuper-ſaturated with fixed air, and therefore turns the ſyrup red. But the air ſoon flies off on expoſure, and the above effect is produced; the *water* is alſo found ſofter than the common *water*, and lathers better with ſoap. But earthy and metallic ſubſtances alſo change ſyrup of violets green. In order to aſcertain the foſſile alkali, add a little fixed alkaline ſalt, and if no powder falls to the bottom, and the *water* does not become turbid, it may be concluded that the *water* is impregnated with the foſſile alkali. The paper tinged with tincture of turnſole, already mentioned, after being made red by diſtilled vinegar, ſerves to diſcover alkalies, by recovering its blue colour more or leſs completely; or the blue colour of the paper is heightened by the alkali. Thus, alſo, the watery tincture of Braſil wood is red, but readily takes a blue colour from alkalies; paper ſteeped in this tincture, with a little ſtarch boiled in it, is alſo red, and equally fit for this purpoſe. Acids induce a yellow colour upon paper, tinged by Braſil wood, and reſtore immediately the original red colour to the paper which has been made blue by alkalies. Watery tincture of turmeric is more or leſs changed to a brown by alkalies; and paper tinged by this tincture, and ſtarch, poſſeſs the ſame property with the foregoing.

When *waters*, ſtrongly impregnated with fixed air, are firſt taken up from the fountain, they change ſyrup of violets red. As the air flies off, this redneſs diſappears; and if the *water* contained an alkali, it will, on the farther eſcape of the fixed air, turn green. If *water* contains ſea-ſalt, oil of vitriol dropped into it will cauſe white noxious fumes to ariſe: if a ſufficient quantity of the oil of vitriol be added, and the *water* evaporated, a true Glauber's ſalt will remain inſtead of the ſea-ſalt; the reſiduum of theſe *waters* crackles and flies when placed on a red-hot iron. Common ſalt contained in *waters*, forms, with a ſolution of ſilver in nitrous acid, a white precipitate, or luna cornea; and may alſo be known by its cryſtallization. Marine ſalt with earthy baſis produces the ſame effect upon ſolution of ſilver, and alſo forms a precipitate, when fixed alkali is added; the acrimony, bitterneſs, and deliqueſcency of this ſalt, ſerve to diſtinguiſh it. Glauber's ſalt is diſcovered in *waters* by adding a ſolution of mercury in nitrous acid, and forming with it a turbith mineral; or by cryſtallization; or by adding a ſolution of fixed alkali, which will make the *water* turbid, and the earthy baſis of the ſalt will fall to the bottom in the form of a white powder. Vitriolic ſalts with earthy baſis may be diſcovered in *water*, by either of the methods juſt recited.

Any metallic ſubſtance, diſſolved in *water* by any acid, may be diſcovered in *mineral waters*, by adding ſome of the liquor ſaturated by the colouring matter of Pruſſian blue, which produces no effects upon any neutral ſalts with earthy or alkaline baſes, but decompoſes all metallic ſalts; ſo that if no precipitate be formed upon adding ſome of this liquor, the *water* contains no metallic ſalt; but if a precipitate is formed, the *water* does contain ſome metallic ſalt.

Sulphur, and liver of ſulphur, may be diſcovered in *waters* by their ſingular ſmell, and by the black colour which theſe ſubſtances give to white metals, or to their precipitates, but eſpecially to ſilver. Bergman obſerves, that the preſence of ſulphur in certain *waters* of the fetid kind may be detected, by adding a ſmall quantity of concentrated nitrous acid, which corrects and finally deſtroys the fetid ſmell, and precipitates the ſulphur.

If *water* contains an earth deprived of fixed air, it may be diſcovered by adding fixed air to it; for then the *water* will become turbid, and the earth fall to the bottom. But if it contains an earth ſuperſaturated with fixed air, drawing part of it away by the air-pump, or expoſing the *water* to the air, or to warmth, it will alſo precipitate the earth. Bergman informs us, that if the ſmalleſt portion of calcareous earth, or lime, combined in any manner whatever, be contained, even in a large quantity of *water*, a ſmall cryſtal of the *acid of* SUGAR, no larger than the head of a pin, being dropped into it, will produce ſky and clouds, cauſed by a precipitate formed of the calcareous earth, combined with the acid, and which is inſoluble in *water*. Scarce any *water*, he ſays, is perfectly free from calcareous earth; and even with reſpect to that which is the pureſt, this teſt is ſo ſenſible, that when the *water* has ſtood twenty-four hours after it has been dropped into it, it will preſent ſome appearance of this peculiar precipitate. A combination of the ſaccharine acid, with an alkaline ſalt, produces the ſame effect ſtill more ſenſibly, in conſequence of a double affinity. No acid, alkaline, or earthy body whatever, is

capable

capable of decompounding the compound thus formed of the faccharine acid, and calcareous earth. Finally, *water* may be known to contain fixed air by its fparkling, on being poured from one veffel to another, by the explofion which follows its being fhook in a phial half filled with it, and by the bubbles which arife when placed over the fire, long before it is hot enough to boil.

Waters of this kind alfo precipitate lime from lime-*water*, on admixture with the latter, and corrode, and even diffolve iron, when frefh taken up. See WATER, fupra. See alfo, for various tefts of *waters*, ACIDULÆ.

As to the ufe of *mineral waters*, the learned Heifter obferves, that in general they are found to agree much better with perfons in the middle ftages of life than with the very old or very young. If any general rule can be given in this cafe, it is, that people fhould not take them when younger than eighteen, or when older than fixty. Young people, efpecially fuch as are under ten years old, fhould by no means be allowed to drink the chalybeate *waters*, becaufe of the tender ftate of their vifcera; and older people than thofe of fixty are never found to receive any benefit from them, unlefs they are of very robuft conftitutions, or have been long accuftomed to the drinking of them. In fome cafes, however, particularly in hectics, young people may be allowed to drink the milder kinds mixed with an equal quantity of milk, and often find great benefit from them.

In confirmed confumptions, and ulcers of the lungs, the ftronger chalybeate *waters* are found to do no fort of fervice, but rather hurt; but in cafes where the ulcers are but beginning, the drinking of the weaker ones with milk has been known to do great good. In fpittings of blood arifing from ulcerations of the lungs, the ftronger cold chalybeate *waters* do nothing but harm; but in the fame cafes, where the milder kinds are taken warm, and mixed with an equal quantity of milk, they are found to be very beneficial. They muft never be taken in cafes of dyfenteries, in confirmed dropfies, nor where there is a ftone in the bladder or kidneys; but in œdematous fwellings of the legs and feet, they are often found highly ufeful. In venereal cafes, whether recent, or of long ftanding, they do not cure, but they difpofe the body the more readily to be cured; but in a fimple gonorrhœa, where there is no venereal taint, they have been often known to cure, when all other methods have failed.

Method of taking them. All people who are of a plethoric habit ought to be blooded before they begin to take them; for by this means there is a freer accefs given them into the veffels, and they become much more able to correct the whole mafs. Perfons who are not of a plethoric habit have no occafion to bleed before they take them, but all ought to take a gentle purge to clear the primæ viæ; and to this purpofe nothing is more proper than the common purging falts of Epfom, or Glauber's; but all the draftic purges are carefully to be avoided on this occafion, fuch as fcammony, refin of jalap, and the like. If there be indications for vomiting in the patient, fuch as pains, and a fenfation of weight at the ftomach, with bitternefs in the mouth, naufeas, and reachings to vomit, then it is extremely proper to give, a day or two before the beginning of the courfes of the *waters*, a gentle dofe of ipecacuanha.

Time moft proper. The beft hour of drinking them is early in the morning; fix or feven o'clock is very proper, becaufe they then have time to finifh their operation before dinner, but earlier than this is not fo proper; and thofe who go to the wells or fprings at three or four in a morning, are expofed to all the injuries of a cold and damp air, which prevents perfpiration, and often brings on coughs and other diforders of the breaft and head. It was formerly a cuftom to drink them in an afternoon, but this is at prefent left off, as found to produce many diforders of the ftomach; and fuch as are defirous of having the utmoft effects of the *waters*, content themfelves at this time of the day with drinking them at home in fmall quantities, and mixed with wine.

Seafon moft proper. The fummer is the feafon in which the *mineral waters* are to be drank with the greateft advantage. The months of June, July, and Auguft, are more proper for the taking of them than any other time of the year; but upon urgent occafions, the courfe of them may be begun in May, and continued till September; and in fome extraordinary cafes, the ufe of them may be allowed even in winter.

Method of drinking them. It is always proper to begin the ufe of them by fmall quantities, and gradually increafe them to larger. Thus the firft day it may be proper to drink about a pint and a half at four draughts; the fecond day a quart may be drank; and on the third or fourth, three pints; after this the quantity may be increafed to two quarts a day, and more than this it is not proper to take, unlefs the perfon be of a very robuft habit; for many people have injured themfelves by taking too large quantities. The quantity that is taken as the moft the ftrength will bear, whether it be two, three, or four pints, is to be continued every day for a fortnight or three weeks, or longer, if the nature of the difeafe requires it; and when the courfe is to be finifhed, it muft be done in the fame manner in which it was began, by taking lefs and lefs every day, till the ufe is gradually worn off, and no purge or other medicine is neceffary afterwards.

The *mineral waters* in general operate in fome conftitutions by ftool, and in others by urine fingly; but in moft they operate both ways together. Thefe are both very proper ways of excretion, and which ever nature choofes the *waters* fhould pafs off by, it is to be judged proper and falutary, and by no means to be checked. If the difcharge by urine be plentiful, and the bowels are moved but once a day, it is very well in many conftitutions; but where, as in fome conftitutions, it happens that the *waters* actually act as aftringents in the bowels, this is to be prevented, and a fmall dofe of the common purging falts is to be taken in the firft draught of the *waters* every morning.

In the taking of them it is to be obferved, that they are not to be poured down as it were all at once; for the ftomach is often loaded and injured by this; but the firft glafs fhould be fuffered to pafs off, and then, after walking about for ten minutes or longer, a fecond is to be taken, and fo on; and no draught fhould exceed half a pint in quantity; fo that the taking of the whole quantity in this manner fhould be the bufinefs of an hour and a half, or two hours. After this it is proper to ufe moderate exercife by walking, or otherwife, till dinner time; and in the mean time, if the *waters* would pafs off by urine or ftool, this muft be by no means repreffed. People who have very weak and tender ftomachs, or who have diforders of the breaft, and drink the *waters* in a rainy feafon, fhould have them gently warmed before they take them: this is beft done by fetting a glafs of them in a veffel of hot *water*, and they are only to be fuffered to ftand thus till moderately hot, and then immediately drank off; for if heated to too high a degree, they eafily lofe their virtues by evaporation.

All perfons are to regulate the quantity of the *waters* they drink by the ftrength of their own conftitution; however fmall a quantity they perceive to be enough, and to operate in the manner they expect, they are to be contented with that, and never to teize nature to make her bear more.

It is a certain rule in regard to all *mineral waters*, that they are much the beft when drank at the place, though fome of them bear carriage much better than others. It is a neceffary caution, that the motion of the body be never violent in the time of taking the *waters*; for if it produce fweat it always obftructs, in fome degree, their operation by urine or ftool; and if flatulences are troublefome at the time, it will be proper to take candied orange-peel, or fome other carminative, at the time. In order to have all the good effects of the *waters*, a regulation of diet is extremely neceffary; it is proper to dine and fup early, and the dinner fhould not be too heavy. It is a good rule, indeed, under fuch a courfe as this, never to eat or drink fo much as one can, but always to rife with an appetite. The foods principally to be avoided, during fuch a courfe, are fuch as are dried in the fmoke, or have been long kept in falt; and the flefh of young animals is in general to be greatly preferred to that of old ones; and in general, a too great quantity of vegetables, efpecially of the flatulent ones, is to be avoided. Lamb, chickens, veal, and the like, are moft proper for the diet at this time; and to thefe are to be added the tender river-fifh, as trout and pike. Broths alfo of all kinds are good; and peas, kidney-beans, fpinach, and afparagus, are all very proper. The bread that is eaten under the courfe fhould never be ftale; the moft proper drink at the time is good wine, and if the perfon is not over thirfty, it is beft to drink this pure, not mixed with *water*: but in this cafe it is only to be allowed within the bounds of moderation; half a pint, at the utmoft, at a meal, to thofe who have not been habituated to it; and to thofe who have, fomewhat lefs than their cuftomary quantity. The liquor next proper after wine, is found and well-bodied ale; but fuch as is either new and fermenting, or fo old as to be ftale, is by no means to be ufed. Acids, tea, and other things, which decompofe thefe *waters*, fhould not be taken for fome time before or after drinking them.

Violent exercife is wrong; but different conftitutions will bear different degrees of it; and thofe of cold and pituitous habits fhould ufe confiderably more than others. The feafon of the year is alfo to be regarded; for the fame degree of exercife that is good in a cooler, is too much

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much in a hotter air. The greatest caution, in the course of taking these *waters*, is to avoid too much sitting still, either after the taking of them, or after meals; for the *waters* remaining in the body, or the food remaining undigested, from these causes the consequence is, that the patient is subject to flatulences, colics, diarrhœas, and pains of the stomach. Sleeping immediately after meals is also improper, as it occasions at this time disorders of the head, and many other complaints.

There are some cases, however, in which the *mineral waters* may be drank with great advantages by persons confined to their bed: thus, gouty, paralytic, and other extremely emaciated or weak persons, have often found great benefit by this method. Slare even goes so far as to advise this as the best method of taking them in all cases; but the more judicious writers all judge him in an error in this, because there are very many reasons why motion and bodily exercise, after the drinking of them, must be beneficial. It is proper to abstain, as much as possible, from all sorts of passions, during the course of taking these *waters*. Violent anger, grief, or terrors and frights, have been known to occasion more mischief at such a time than they would otherwise have done; and all people are to abstain as much as may be from venery during the time, lest it too much debilitate the body, already weakened by the discharges occasioned by the *waters* by stool and urine. Suppers should be moderate during the course, and the wine drank at that meal should be diluted with *water*: it is always very adviseable in this case also to walk for some time after supper, that the sleep may be more quiet, sound, and refreshing. And the cold air of the night, especially if it be a damp season, is cautiously to be avoided, lest it occasion catarrhs, and other disorders; for this reason, it is proper to sup early all the while.

Symptoms attending the taking of these waters. These are of many kinds, and differ greatly from the same *waters* drank at the same season, in persons of different habits and constitutions. One of the most common is a binding of the bowels; and from this there often arise pains in the bowels, colics, and vomitings, with other the like disorders. People of melancholy, hypochondriac, and hysteric habits, are more subject than any others to this complaint from them: this is a symptom easily removed by any of the mild cathartics, and nothing in particular is more proper for that purpose than a decoction of sena, tamarinds, and rhubarb, to be taken a few spoonfuls at a time, as occasion shall require. A small dose of the cooling salts may also be taken, but all the hot and resinous purges are apt to occasion hypercatharses. On the other hand, some are thrown into a diarrhœa by them, and this is often a salutary symptom; and while the patient's strength is unhurt, and he is not found to suffer any great inconvenience from it, this is by no means to be checked; for very often the patient is greatly relieved by a copious discharge of the noxious humours this way, and by a continuance in the same course, becomes absolutely cured by this means: but when the person is perceived to be greatly weakened by this symptom, and it is attended with nauseas, vomitings, and pains in the bowels, it must be carefully checked or restrained. This is often done by drinking the same *waters* in a smaller quantity, and warm instead of cold; but if this do not prove sufficient, small draughts of cinnamon-*water* are to be allowed, and, if necessary, small doses of diascordium every night. In cases where the *waters* take this turn violently, it is proper to abstain from them for some days, and then to take to them again with great caution, and in small quantities.

Some persons, at their first entering on a course of the *mineral waters*, are thrown into vomitings by them; and these are sometimes salutary, sometimes merely symptomatic. If it be salutary, the person is always the better for it, and the noxious humours are very happily attenuated and discharged this way by the *waters*: in this case, all the caution necessary is not to drink too much of them at a time, and sometimes, between whiles, to take a little of some bitter tincture. But if, on the contrary, the patient is greatly weakened by this vomiting, the method is to drink smaller quantities, and to eat and drink more sparingly at meals. Sometimes this symptom arises from a redundance of bile, or of pituitous humours from the stomach and bowels, not having been emptied by a purge before the entering on the course: in this case a gentle purge is to be given, and after that the common strengthening and bitter stomachics, and the *waters* are afterwards to be cautiously taken in small quantities.

When the patient is attacked with violent colic pains, and the common method of eating candied orange-peel, and the carminative seeds, does not take effect, a gentle purge is to be given to evacuate the humours which occasion them, and after this, tincture of cardamom seeds, or some other such carminative, usually takes effect. In cases where the pains are more violent and obstinate, a glyster of camomile flowers boiled in milk, with a little sugar, may be given at times, and the *waters* afterwards must be drank in small quantities, and always warmed.

If an immoderate flux of the menses or hæmorrhoids should happen during the time of taking the *waters*, it will be proper to abstain from the use of them on that occasion for a few days; but if these evacuations are in a moderate degree, the *waters* may be continued, only taking them in smaller quantity, and not quite cold. Sometimes intermittent fevers come on while persons are drinking the *waters*; but these are not to be regarded as any very bad case; for if the use of the *waters* be continued, and the carminatives and bitters of the common kind taken at times with them, they are usually soon cured. Pains of the gout, rheumatism, sciatica, and teeth, also sometimes return upon people accustomed to them, while they are in a course of the *waters*; but these are not to be greatly regarded; for they usually go off again very easily, only by continuing the use of the *waters*, and require no peculiar care: only, during the time the pains last, some comforting cordial may be taken at times; and if they are violent, a few drops of laudanum may be taken every night going to rest, or a few grains of the storax pill. See Heister's Compend. Medic. Pract. cap. 20. See the following articles.

The kinds of *mineral waters* are various, as are the kinds of compositions of the minerals with which they are impregnated.

Some are *simple*, as only containing mineral particles of one sort; others *mixed*, of two, three, four, or more sorts.

Hence we have, 1. *Metallic waters*, in different parts; as *golden*, *silver*, *copper*, *tin*, *leaden*, and *iron waters*.

2. *Saline waters*, viz. *nitrous*, *aluminous*, *vitriolate*, and those of common salt.

3. *Bituminous*, *sulphureous*, *antimonial*, *carbonaceous*, and *amber waters*.

4. *Earthy* and *stony waters*; viz. *lime*, *chalk*, *oker*, *cinnabar*, *marble*, and *alabaster waters*.

To which some add *mercurial waters*.

This division of *mineral waters* is taken from their essences; that is, from the mineral particles they contain.

Dr. Falconer, from a review of the impregnation of *mineral waters*, divides them, as in the following table, into those impregnated with

Saline Bodies.	Simple,	Acid.		1. Vitriolic acid per se.
		Alkali.		2. Fossile alkali per se.
				3. Volatile alkali per se.—Very dubious.
	Compound,			4. Glauber's salt.
				5. Vitr. ammon. very dubious
				6. Common salt.
				7. Sal ammon. very dubious
Inflammable Bodies.	Oil.	Simple,		8. Oil fossile per se.
		Comp.		9. Oil in form of soap.
	Sulphur.	Simple,		10. Sulphur per se.
		Compound,		11. Hep. sulph. with an alkali
				12. Hep. sulph. c. calce vivâ.
Metallic Bodies.	Base Metals.	Copper,		13. Vitriolic acid in form of blue vitriol.
		Iron.	in a state of solution by	14. Fixt vitriolic acid in form of green vitriol.
				15. Vol. vitriolic acid, as in many chalybeates.
				16. Hep. sulph. with an alkali
				17. Hep. sulp. with quicklime
				18. Fixable air.
	Semi-metals.	Zinc.		19. Vitriolic acid in form of white vitriol.
Earthy bodies.	Simple,			20. Calcareous earth in solution, by being deprived of fixable air.
				21. ———— ——, by being united with it in over-proportion.
	Compound—with vitriolic acid,			22. Calcareous, in form of selenites.
				23. Magnesia. — Spurious Glauber's salt.
				24. Earth of alum—in form of alum.
Aërial Bodies.	Common Air.			25. In solution, or mixture?
				26. In diffusion.
	Fixable Air.			27. Q. In solution, diffusion, or mixture?
	Inflammable Air			28. Probably only in diffusion.

The most usual and celebrated division is borrowed from the manner wherein they affect our senses; with regard to which there are ten kinds; viz. *acid*, *bitter*, *hot*, *cold*, *oily*

oily and *fat*, *poiſonous*, *coloured*, *boiling*, *petrifying*, *incruſtating* and *ſaline*.

Some conſiderable naturaliſts and phyſicians, among whom is the learned Dr. Donald Monro, have made a diviſion of *mineral waters* from their difference of temperature into hot and cold, or *thermæ* and *acidulæ*.

WATERS, *acid*, called alſo *acidulæ*, ariſe from the admixture of vitriol, nitre, alum, ſalt, &c. in them. Theſe are *cold*, and are very frequent, there being not reckoned leſs than a thouſand in Germany alone: ſome of which are ſaid to be ſour as vinegar, and to be uſed inſtead thereof; others vinous, and ſerving for wine; others aſtringent, &c.

There is alſo a conſiderable number of *cold* mineral *waters* in England; but the number of hot ones is very ſmall. See ACIDULÆ.

WATERS, *hot*, called THERMÆ, ariſe from the admixture of ſulphureous particles and fumes, &c. Of theſe, the hotteſt is that in Japan, which, it is ſaid, no fire can bring *water* to equal; and which keeps hot thrice as long as common *water* boiled.

The cauſe of the heat of theſe *waters* may be, in ſome inſtances, ſubterraneous fire: in other caſes the heat ariſes from the mineral ingredients with which they are impregnated in their paſſage: and the ſame may be ſaid of thoſe *waters* that are cooler than the common temperature of the atmoſphere. Thus it is known, that quicklime, the pyrites ſtone, and other ſubſtances, thrown into *water*, will make it warm: and on the contrary, ſalts of various kinds make it colder than before.

The *warm waters* poſſeſs many of the virtues and properties of *cold waters*, which are impregnated in the ſame manner; but they are in many caſes preferable, as by their warmth they are more agreeable to the ſtomachs of weak perſons, and promote perſpiration. The *warm waters* are alſo uſed as warm baths; which, by reſtoring the fibres, are uſeful in many diſorders ariſing from rigidity, ſpaſm, &c. Hence is derived their great uſe in rheumatiſms, inflammations, coſtiveneſs, &c. The cure is commonly aſſiſted by the internal uſe of thoſe *waters* at the ſame time. For complaints of a particular part of the body, the part is either fomented with the *warm water*, or the *water* is pumped upon the diſeaſed part.

There are alſo contrivances for converting theſe *waters* into ſteam or vapour; hence called *vapour* BATHS.

Baths are likewiſe made of the mud formed at the bottom of theſe *waters*, and they have been ſerviceable in removing pains and aches, and paralytic and other complaints: the mud being either rubbed on the part, or the part immerſed in it. When the mud is collected in quantity in a reſervoir for theſe purpoſes, it is called the *mud-bath*.

WATERS, *oily* and *fat*, owe their virtues to a bituminous and ſulphureous matter; as ambers, petroleum, pitch, naphtha, &c.

WATERS, *bitter*, are produced from an impure ſulphur, bitumen, nitre, and ſometimes copper. Such are the lacus Aſphaltites.

WATERS, *very cold*, have their riſe from a mixture of nitre and alum; or of mercury, iron, &c. The depth of the ſource or ſpring too may have ſome effect.

WATERS *which change the nature of bodies*. Of theſe there is great variety.

1. Near Armagh in Ireland is a lake, wherein a ſtaff being fixed ſome months, it is affirmed, that the part which ſtuck in the mud will be turned into iron; and that part encompaſſed with the *water* into hone-ſtone; the reſt remaining as before. Thus Gyraldus and Miginus; but Brietius very rightly denies it.

2. In the northern part of Ulſter is ſaid to be a ſpring, which, in the ſpace of ſeven years, petrifies wood, or converts it into ſtone. The like *waters* are alſo ſaid to be found in divers other parts, as in Hungary, Burgundy, &c. And Vitruvius mentions a lake in Cappadocia, which converts wood into ſtone in one day: but theſe accounts are not ſufficiently atteſted. See PETRIFACTION, and PETRIFYING *Waters*.

3. There are alſo *waters* ſuppoſed to tranſmute or turn iron into COPPER. See ZIMENT.

4. Others are ſaid to change the colour of the hair. Gyraldus mentions a ſpring in Ireland, wherein if a perſon were waſhed, he inſtantly became grey; but this is incredible.

WATERS, *poiſonous*, are occaſioned by their creeping through arſenical, antimonial, and mercurial earths; or being impregnated by their fumes. Such are the lacus Aſphaltites, and divers *waters* about the Alps, &c. which immediately kill thoſe who drink of them: but theſe are moſt of them filled up with ſtones; which is one reaſon why ſo few are known.

WATERS, *ſaline*, are generated two ways; either they are derived from the ſea, by ſome ſubterraneous paſſage; or they are generated from mineral ſalts, which they meet with in their paſſage, before they arrive at their ſprings.

WATERS, *boiling*, or *bubbling*, are produced either by a current of air, or elſe by a ſulphureous, or a nitrous ſpirit, mixed with the *water* in the earth: if it be ſulphureous, the *water* is hot; if nitrous, cold. For all the *waters* that boil, as if hot, are not ſo; but ſome few are cold: we read both of thermæ and acidulæ that boil. See *Boiling* SPRINGS.

There are divers other *waters*, which have very ſingular properties, not reducible to any of theſe claſſes: ſuch, 1. is that ſpring in Portugal, which abſorbs all bodies caſt into it, though the lighteſt: and not far from it, there is ſaid to have been anciently another, in which no bodies, not the heavieſt, could ſink.

2. In Andaluſia, we are aſſured by Euſeb. Nierembergenſis, there is a lake which foretels approaching ſtorms, by making a terrible roaring, that may be heard eighteen or twenty miles diſtance.

3. In Granada is ſaid to be a well, whoſe *water* diſſolves ſtones.

4. We read of a ſpring in Arcadia, which rendered thoſe who drank of it abſtemious.

5. In the iſland of Chio is ſaid to be a ſpring, which converts thoſe who drink of it into fools.

6. There are ſprings in divers parts of England, Wales, Spain, &c. which ebb and flow daily with the flux and reflux of the ſea; and ſome are even ſaid to ebb and flow againſt the tide. See SPRINGS.

Add, 7. *Stalactical waters*, which form ſtony icicles from the tops of caverns.

Mineral Waters may, again, be diſtributed, according to their medical properties and effects, under the following denominations.

WATERS, *chalybeate*, are thoſe which, beſide iron held in ſolution by means of fixed air, &c. uſually contain ſea-ſalt, the foſſile alkali, a purging ſalt, or other ſubſtances. See *Mineral* WATERS *ſupra*.

The learned Mr. Monro has an enquiry into *chalybeate waters*, in which he conſiders them with regard to their medical uſe, in order to diſcover what their real or comparative ſtrength is, how they bear carriage, and how long they retain their virtues; that phyſicians may judge which of them is moſt proper in the various diſeaſes and circumſtances of patients; which muſt be drank at the fountain-head, and which may be conveniently drank at a diſtance from it. For the reſult of his enquiry, ſee Med. Eſſ. Edinb. vol. iii. art. 7. Abridg. vol. i. p. 126, &c.

Chalybeate waters have a briſk, acidulous, or vinous taſte when freſh, and tinge the ſtools with black. Some of them are rarely obſerved, and ſome ſcarcely ever, to give any black tinge to the fæces, though drank in large quantity; a phenomenon, ſays Dr. Lewis, which, perhaps may be aſcribed to their depoſiting of their iron in the firſt paſſages in an indiſſoluble and inactive ſtate, rather than to the cauſe which ſome have aſſigned, their carrying it entire into the blood.

Theſe *waters* taken inwardly ſtrengthen the conſtitution in general, increaſe the tone of the fibres, quicken the circulation, and reſtore a proper conſiſtence to the blood when in a too thin and watery ſtate. And hence they are found to invigorate the whole frame. They are good in diſeaſes ariſing from weakneſs; in ſpaſmodic diſeaſes, ariſing from too great irritability and relaxation of the nervous ſyſtem, in the fluor albus, and gleets; in female obſtructions; in hyſteric and hypochondriacal diſorders; in loſs of appetite and digeſtion; and in a variety of other complaints.

Theſe *waters* are taken to the quantity of two or three pints or more in a day, divided into different doſes; and require the ſame caution in their uſe, as the artificial chalybeates. Of theſe *waters* there are thoſe of Iſlington, Malvern, Harrowgate, Llandrindod, Tunbridge, Buxton, Spa, &c.

Theſe *waters* may be imitated by impregnating *water*, in which iron-filings, or wire have been infuſed with fixed air; or they may be made according to the directions under PYRMONT, and SPA *Waters*.

WATERS, *chalybeate purging*, contain a greater proportion of purging ſalt than any other ſolid matter, and, therefore, when taken in ſufficient quantity, e. g. ſeveral pints, they operate by ſtool: and they have this advantage of other purges, that they do not exhauſt the ſtrength. If taken in leſs quantity, as alteratives, they operate chiefly by urine. Of theſe there are the *waters* of Scarborough, Cheltenham, Bagnigge, Pyrmont, Nevil Holt, Jeſſop, &c.

Theſe *waters* may be imitated by adding to a gallon of *water* impregnated with fixed air, two or three ounces of Epſom or other purging ſalt, and a little ſea-ſalt.

WATERS, *ſulphureous*, are thoſe which are impregnated

either

either with actual fulphur, or with a phlogifton and an acid, which are the principles of fulphur, whence they derive their fulphureous fmell. They ufually contain, befides, either the foffile alkali, fea-falt, a purging falt, iron, an earth, or other matter, and commonly feveral of thefe in different proportions.

It has been a fubject of controverfy, whether thefe *waters* contain *fulphur*. Dr. Hoffman feems much to doubt of its exiftence in the greater number of them; and Dr. Lucas has affirmed, that it is not to be found in the form of fulphur in any *water* whatever; not even in that of Aix la Chapelle, where a true and perfect fulphur is found on the upper parts of the conduits through which the *water* paffes; for he fays that, ftrictly fpeaking, thefe *waters* do not contain fulphur fubftantially diffolved in them, but are impregnated with a phlogifton and an acid, the principles of fulphur, which, being in a volatile ftate, are fublimed, meet on the furface of the conduits, and there unite into a true and perfect fulphur, which did not naturally exift in the *water*.

However, Dr. Rutty maintains the exiftence of fulphur in mineral *waters*; and Dr. Shaw and Dr. Short are faid to have found fulphur in Harrowgate *water*.

Notwithftanding the teftimony of fuch eminent perfons, the more recent opinion of a phyfician, whom Dr. Monro confulted in 1768, is againft the exiftence of fulphur in fuch *waters*: to this purpofe, he fays, that he has never obferved any appearance of fulphur in the Harrowgate *waters*, nor any fcum at the top of the well; and that he could not find any perfon in the neighbourhood, who remembered the appearance of real fulphur fublimed, upon taking up the ftones at the bottom of the well, as mentioned by Dr. Neale.

Dr. Watfon, in 1780, examined thefe *waters*, and found a cruft adhering to the circular ftone, contiguous to the furface of the *water*, a portion of which, being fcraped off, and put on a hot iron, burned with the flame and fmell of fulphur: whence, it may be inferred, that fomething is fublimed from the *water*, which either of itfelf is fulphur, or which in conjunction with the air, or fome other principle, conftitutes fulphur. This ingenious writer mentions the following experiment, which throws no inconfiderable light on the impregnation of *fulphureous waters* in general. The acid of vitriol does not act upon the common Derbyfhire lead ore, except when it is affifted by heat; it then diffolves it, and a great efcape of air is obferved: he made this air, difcharged from the ore, pafs through a high bended tube into a bottle full of pump *water*: the *water* in a little time acquired the fetid fmell of Harrowgate *water*; its tafte was the fame as that of fuch *fulphureous waters* as contain no falt; it was perfectly tranfparent, but in the courfe of twenty-four hours became cloudy, and loft moft of its fmell; it did not fuffer any precipitation by the addition of the acid of vitriol; filver was blackened by being put into this *water*, and by being expofed to the vapours which arofe from it: from all thefe circumftances it may properly enough, he thinks, be called an *artificial fulphureous water*.

The fame phenomena were obferved by ufing black jack inftead of lead ore; and air of the fame kind may be feparated from other fubftances, and by other means, as well as by the acid of vitriol; and it feems very probable, that the *waters* ufually called *fulphureous* are impregnated with this kind of air, which has been feparated in the bowels of the earth, from particular minerals, efpecially fulphureous ones: and it has been remarked of Harrowgate *water*, that as it fprings up it is clear and fparkling, and throws up a quantity of air-bubbles.

Dr. Watfon fuggefts the following fimple method of impregnating common *water* with the fulphureous properties of Harrowgate *water*: put into a phial holding four or five ounces, fome pounded lead ore, and pour upon it fome acid of vitriol; wrap a few folds of wet linen round one end of a bended tube; infert this end into the neck of the phial fo clofely, that no air may pafs out of the phial except through the tube; the end of the tube being at fome diftance from the furface of the acid. Put the other end of the tube into a bottle full of *water*; and by fetting the phial on the hot bar of a grate, or by fome other means, heat the acid, which, as foon as it is heated, will begin to act on the lead ore, and a great quantity of air will be difcharged, which will pafs through the tube into the *water* in the bottle, and in a few minutes the *water* will be impregnated with the fulphureous properties of Harrowgate *water*. In order to make the refemblance complete, the falt which *fulphureous waters* feverally hold fhould be added in due proportion to the *water* impregnated with the air.

There is another way in which the impregnation of *waters* with fulphur may be fuppofed to arife, which will account for the faline tafte, as well as the fmell of the *water*. *Water* extracts from the afhes of fea-wrack burned to a black coal not only a great quantity of common falt, but fomething elfe alfo, by which, without lofing its tranfparency, it acquires both the fmell and fulphureous tafte of Harrowgate *water*, and by which it is enabled, like that *water*, to blacken filver and white paint. This fomething Dr. Watfon is fenfible may be what chemifts call liver of fulphur, or an union of fulphur with fixed alkali: no fulphur, however, can be precipitated from the *water* by the acid of vitriol, though that acid turns it, as is the cafe with Harrowgate *water*, a little cloudy.

The air extracted from iron by the acid of fea-falt impregnates *water* with a fmell refembling that of Harrowgate *water*, but its difference both from the natural and the artificial *fulphureous waters* may be eafily diftinguifhed, efpecially after the water has ftood a few hours expofed to the air. See Watfon's Chem. Eff. vol. iii. eff. 6. See alfo Falconer's Effay on Bath *Wat.* vol. i. p. 103, &c.

It appears from the experiments and obfervations of Bergman, that a real fulphur is contained in *fulphureous waters*, in a ftate of perfect folution; and that it may be precipitated from them by the nitrous and dephlogifticated marine acids, and likewife, but more flowly, by the atmofpherical air.

Hence as air, as well as the nitrous acid, has the property of decompounding thefe *waters*; when the natural *fulphureous waters* come in contact with the external air, the latter, according to Bergman, feifes the phlogiftic principle which kept the fulphur diffolved in *water*; and thus in time are formed thofe fulphureous crufts, which, as well as even the prefence of actual fulphur in thefe *waters*, have been the fubjects of fo much controverfy among the chemifts.

Dr. Macbride has fuggefted a method of impregnating a fpring with fulphur, in its pure ftate, in the way of folution. He made a folution of fulphur in *water* by means of quick-lime, and by injecting currents of fixed air upon the furface of it, found the calcareous earth to precipitate, leaving the fulphur diffolved in the *water*.

Bergman (Phil. and Chem. Eff. vol. i.) informs us, that the procefs of imitating the warm *fulphureous waters* confifts fimply in adding the vitriolic acid to hepar fulphuris, and impregnating *water* with the peculiar species of air that arifes from this mixture. This hepatic air (part of which is fixed air, proceeding from the falt of tartar) is very readily abforbed by water; to which it gives the fmell, tafte, and other fenfible qualities of the *fulphureous waters*. A Swedifh cantharus of diftilled *water* will abforb about fixty inches of this hepatic air; and on dropping into it the nitrous acid, it will appear, that a real fulphur is contained in a ftate of perfect folution in this *water*, to the quantity of eight grains.

The faline or other contents peculiar to the *fulphureous water* to be imitated, muft be added to the artificial hepatic *water*.

Inftead of the liver of fulphur the operator may ufe a mixture of three parts of filings of iron, and two parts of fulphur, melted together.

The liver of fulphur, for impregnating *water* with fulphureous air, and thus imitating the *fulphureous mineral waters*, may be prepared, by mixing together equal parts of brimftone and of clean pot-afhes, or quick-lime well burnt, and placing them in a crucible, or unglazed difh, over a gentle fire: ftir them with a ftick till they are incorporated into a blood-red mafs; and put it, while warm, into a bottle which is to be kept well clofed. Then to make the *fulphureous water*, put a fufficient quantity of this fubftance, with oil of vitriol and *water* into the part A of the apparatus defcribed under PYRMONT *Water* (fee *Tab.* III. *Pneumatics*, *fig.* 51.), and proceed as in impregnating *water* with fixed air: the fulphureous air will arife; the *water* in the middle veffel B will be impregnated with it, will fmell ftrongly fulphureous, and refemble the celebrated *waters* of Aix la Chapelle, &c. The water thus impregnated may be heated, by putting it into a clofe veffel, placed in one that contains boiling *water*; and it is then a *warm fulphureous water*.

If it be not immediately ufed, it fhould be preferved in ftone or glafs bottles, well corked and cemented, and placed with the corks downward in a cellar.

As the cold *fulphureous waters* contain both fixed and fulphureous air, a mixture of liver of fulphur and chalk may be put into the veffel A with the oil of vitriol, by which means both thefe airs will be produced, and the *water* of courfe impregnated with them.

Sulphureous waters are diuretic and ftrongly diaphoretic, and are, therefore, good in cutaneous difeafes, ufed both internally and externally. They are alfo good in chronic obftructions; and in diforders proceeding from acidity, from worms, &c. Of thefe are thofe of Harrowgate, Llandrindod, Moffat, Aix la Chapelle, Bath, Matlock, &c.

The *ſulphureous purging waters* differ from the former, as they contain a purging ſalt as the principal ſolid ingredient, and therefore operate by ſtool. They are good in the ſame diſorders as the alterative *ſulphureous waters*, and alſo for foulneſſes of the bowels, &c.

Some of the chalybeate purging *waters* are alſo *ſulphureous*.

Waters, *acidulous* or *ſaline*, contain the foſſile alkaline ſalt. This ſalt, as the *waters* are taken up from the fountain, is ſaturated or rather ſuper-ſaturated with fixed air. Hence the *waters* do not then manifeſt any alkaline quality; on the contrary, they curdle with ſoap, and are termed Acidulæ. This fixed air, however, being very volatile, ſoon exhales when the *water* is heated, or ſtands for ſome time expoſed, and then the alkali manifeſts itſelf. For the general virtues of this *water*, ſee Seltzer *Water*.

Of theſe *waters* there are thoſe of Seltzer, Tilbury, &c. Theſe *waters* may be imitated, or even excelled, by ſimply impregnating *water* with fixed air; and the ſolid ingredients may be added in the proportions directed under Seltzer *Water*.

Waters, *ſaline purging*, are impregnated with ſea-ſalt, and alſo with a purging ſalt; either the calcareous Glauber's, or the Epſom. They differ in ſtrength; ſome of them purge ſufficiently in the quantity of a pint, while 2, 3, 4, 5, or 6 pints of others are neceſſary to produce that effect. Some again are ſo weak as to require the addition of Glauber's ſalt, or other purgative. In ſmall quantities they act as diuretics and alteratives. They are good in ſcrophulous and ſcorbutic complaints, ulcers, and other diſeaſes which make their appearance on the ſkin, and are likewiſe uſed as baths and fomentations in theſe and other diſorders. The virtues of the preceding claſs of *waters* depend in a great meaſure on the preſence of their fixed air. The *waters* of this claſs ſeem to derive their virtues principally from the ſaline matters which they contain.

Of theſe *waters* there are thoſe of Lymington, Dulwich, Holt, Stretham, Kilburn, Bagnigge, Acton, Epſom, Llandrindod, Seidlitz, ſea-*water*, Dog and Duck, Sydenham, &c.

A purging *water*, anſwering perhaps all the intentions of theſe, may be made by impregnating three ounces of Epſom, Rochelle, or Glauber's ſalt, in a gallon of *water* with fixed air.

Waters, *vitriolic*, are impregnated with green vitriol or copperas, and ſtrike a black colour with galls. They are chiefly uſed outwardly for waſhing old ſores, and frequently with good effect. In ſome caſes they are taken inwardly in ſmall doſes, and then they prove emetic and purgative. But this, ſays Dr. Lewis, is a practice too hazardous to be followed. See Vitriolic *Waters*.

Waters *which contain an earth* are thoſe of Briſtol, Buxton, &c.

The cold *waters* of this claſs have a petrifying quality. See the ſubſequent articles.

Waters, *Aix la Chapelle*, ariſe from ſeveral ſources, which ſupply eight baths conſtructed in different parts of the town. In ſmell, they reſemble the waſhings of a foul gun; their taſte is ſaline, bitter, and urinous; their heat is upwards of 100° of Fahrenheit's thermometer; their general operation is by ſtool and *urine*, and they alſo promote perſpiration. As an alterative, it is, in general, beſt to begin with a quarter or half a pint in the morning, and afterwards to increaſe the doſe to pints, as may be found convenient. When it is required to purge, it ſhould be drank in large and repeated draughts. With regard to bathing, it is beſt to begin with the temperate baths, and to increaſe the heat gradually. Theſe *waters* are efficacious in diſeaſes proceeding from indigeſtion, and foulneſs of the ſtomach and bowels, in rheumatiſms, in the ſcurvy, ſcrophula, and diſeaſes of the ſkin, in hyſteric and hypochondriacal diſorders, in nervous complaints and melancholy, in the ſtone and gravel, in paralytic complaints, &c. They ought not to be uſed in hectic caſes with heat and fever, in putrid diſorders, or where the blood is diſſolved, or the conſtitution much impaired. See Aix la Chapelle and *Sulphureous* Waters.

An artificial *water* of this kind may be made by impregnating half a dram of ſea-ſalt, a dram of foſſile alkali, a ſcruple of clean chalk, and a gallon of *water*, with ſulphureous air.

Waters, *Bagnigge*, are thoſe of Bagnigge Wells, ſituated on the north-eaſt ſide of London.

The ſalt purging *water* is uſually quickened with Glauber's, or other ſalts; and the doſe is from a pint to a quart. The chalybeate *water* has a ſlight irony taſte; and when firſt taken to the quantity of three or four glaſſes, is uſually purgative. Its virtues reſemble thoſe of ſimilar chalybeates.

Waters, *Bath*, are the warm chalybeate *waters* of Bath in Somerſetſhire, which have been long uſed both internally and externally, and extolled for their medical efficacy in a great variety of diſorders.

Of the ſix baths, which are ſupplied from different ſprings with *waters* of the ſame nature, the principal are the king's bath, the queen's bath, the hot bath, and the croſs bath. The temperature of theſe *waters* has been variouſly eſtimated: Dr. Falconer ſtates the heat, as they are commonly drank, of the king's bath at 116°, of the hot bath at 116°, of the croſs bath at 112°, and that of the queen's bath about the ſame with the croſs bath. See Baths.

The *water*, when viewed in the baths, has a greeniſh colour; but in a phial it appears tranſparent and colourleſs, and it ſparkles in the glaſs. It has a ſlight ſaline, agreeably pungent, and light chalybeate taſte. Dr. Falconer thinks that the king's bath poſſeſſes the two laſt qualities in the greateſt degree, though others aſcribe their prevalence to the hot bath; and the chalybeate impregnation is moſt obſervable in the *water* of the king's bath. Both the chalybeate taſte and pungency go off entirely on the cooling of the *water*, but are retained for the longeſt time by the *water* of the hot bath; and in this caſe the ſaline taſte becomes more manifeſt. Some have aſcribed a ſulphureous ſmell to theſe *waters*, eſpecially when the baths are filling; but Dr. Falconer could not diſcover any particular ſmell either in the *waters* themſelves, or in the vapours ariſing from them.

As the *water* riſes from the pump, it contains fixed air, or other volatile acid, in a ſufficient quantity to curdle milk, and diſſolve iron: it is alſo ſlightly impregnated with ſea-ſalt.

Dr. Falconer infers from a variety of experiments, that Bath *water* contains the following ingredients, viz. ſaline bodies, ſome of which are ſimple, as vitriolic acid per ſe, the exiſtence of which, however, is very dubious, and others compound, as common ſalt in a ſmall quantity: inflammable bodies, as hepar ſulphuris cum calce viva, in large quantity; metallic bodies, as iron, in the proportion of one thirty-ſeventh and a half of a grain in a pint of the *water*, and lead, which he ſuſpects to be an accidental impregnation; earthy bodies, as ſelenites, in large quantity; and aerial bodies, as common air, probably both in ſolution or mixture and diffuſion, and mephitic air in large quantity.

The primary qualities of the *Bath waters* enumerated by Dr. Falconer are the following: they are ſtimulant, aſtringent, diuretic, diaphoretic, antiſpaſmodic, and antiſeptic. This ſtimulant quality is manifeſt in their heat, briſk and poignant taſte, and, if largely taken, inebriating effects, as well as by their effect in accelerating and raiſing the pulſe, increaſing the heat of the body, and exciting the ſecretions: and beſides they poſſeſs, as he apprehends, a ſtimulus of a peculiar nature, principally affecting the nervous ſyſtem, and not to be meaſured altogether by the pulſe, heat, or increaſe of ſecretions. This ſtimulus is indicated by the glowing ſenſation in the ſtomach perceived on drinking them, the ſudden increaſe of ſtrength often procured by their means, and the pain of the head conſequent on taking too large a quantity. This ſtimulant quality is leaſt obſervable in the croſs Bath *water*, and moſt conſiderable in that of the king's bath; and it is aſcribed by Dr. Falconer principally to their impregnation with fixed air. The aſtringent quality of *Bath waters* is evinced by the coſtiveneſs commonly attendant on them; and their effects in reſtoring the tone of the ſtomach and bowels may be probably owing to this quality. The king's bath is moſt remarkable for this quality, and the hot bath is generally thought to have the leaſt of it.

The diuretic quality of theſe *waters*, which Dr. Falconer attributes principally to their fixed air, is well known; and they poſſeſs this quality, that of the croſs bath being thought to be the moſt conſiderable, with no peculiar ſtimulus in either the ſecretory or excretory organs of urine.

The diaphoretic quality of *Bath waters* ſeems to be owing to the ſame cauſe with the former; and Dr. Falconer apprehends it is more prevalent in the king's and hot baths than in the croſs bath.

Their antiſpaſmodic quality, poſſeſſed in the greateſt degree by the hot bath, is obvious in their efficacy in ſeveral ſpaſmodic and nervous caſes: and Dr. Falconer thinks it is chiefly owing to the aerial part of their impregnation, which ſeems to poſſeſs qualities at once ſtimulant and ſedative, which is the foundation of moſt antiſpaſmodics.

The antiſeptic quality of theſe *waters* has been demonſtrated by experiment, and this is alſo aſcribed to fixed air, which is known to be a powerful preventer and corrector of putrefaction; both which qualities ſeem to be poſſeſſed, in ſome degree, by the *Bath waters*: the king's and hot baths, being more largely impregnated with fixed air than the croſs bath, poſſeſs this antiſeptic quality in a much greater degree than the other.

Bath waters possess also several secondary qualities: in this respect they are attenuant, antacid, cathartic, expectorant, sialagogue, and emmenagogue.

As stimulants, these *waters* are indicated in cachectic disorders; as the chlorosis incident to women, obstructions of the viscera, œdematous swellings succeeding fevers, or fits of the gout: in paralytic disorders, arising from the bilious colic, fumes of metallic substances, or fits of the gout and rheumatism; and also in such paralytic complaints as occur in weak habits, and in consequence of low diet, damp situations, &c. These *waters* are also of special service in the apoplexy, lethargy, and other similar disorders. Their efficacy, as stimulants, is also very considerable in all disorders that depend on the inertia of the organs of digestion, and in restoring the stomach to such a degree of tone as enables it to send the gout from the noble parts into the extremities.

The *Bath waters*, as astringents, are indicated in debility and laxity of the moving fibres, as the rickets; in weakness succeeding large evacuations either of blood, stool, or perspiration; in restraining evacuations by stool and by the urinary passages, as in the diarrhœa and diabetes, and also that disposition to perspiration which sometimes attends people of a lax and irritable habit, and likewise the fluor albus, and involuntary seminal evacuations.

The diuretic power of these *waters* renders them peculiarly serviceable in dropsical disorders, many of which have been cured by them in their last stage; also in leprous, scrophulous, and scorbutic complaints; and in discharging gravelly concretions from the kidneys and bladder.

By their diaphoretic quality, they stop or moderate habitual laxities of the bowels; and relieve violent retchings: they are serviceable in the diabetes, partly by changing the tendency of the fluids from the urinary to the perspiratory secretions; and have been found an efficacious remedy in that kind of dropsy, which arises from the check given to perspiration by sudden changes of climate: they are also of great service in cutaneous eruptions, occasioned by obstructed perspiration, and generally affecting the face; in that kind or stage of the rheumatism, which is not attended with any considerable degree of fever or inflammation; and in allaying the pain and carrying off the paroxysms of the gout.

Bath waters, by their antispasmodic quality, are of the greatest service in hysteric and hypochondriac complaints, arising from a weak stomach and digestion; in the hysteric colic and bilious vomitings; in the colic of Poictiers, commonly called the dry belly-ach; in icterical complaints, by relaxing the spasmodic constriction of the biliary ducts and opening a passage for the bile, and promoting the discharge of gall-stones; and in removing those menstrual obstructions which occur at an early period of life, and in hysteric constitutions: they are also, by their antispasmodic property, often peculiarly serviceable in the gout, when it attacks the stomach.

The efficacy of these *waters* in cutaneous eruptions, attendant on a scorbutic habit of body, may probably be owing, in some degree, to their antiseptic quality, correcting the putrid tendency of the humours of the body; and also in cachectic complaints, and many other cases of debility, which these *waters* relieve.

In some cases, however, *Bath waters* are hurtful; as in hectic fevers; in suppurations of the lungs; in all cases of inflammation; in hæmorrhages; in plethoric habits; in confirmed obstructions of the abdominal viscera; and in cases, where the solids are very tender and friable; and the fluids very thin and acrid, which sometimes take place in a high degree of the scurvy.

It may be observed, in general, and with allowances for different constitutions and other circumstances, with regard to the choice of these *waters*, that in disorders to which the stimulant, astringent, and antiseptic qualities of the *waters* are adapted, it will be most proper to make trial of the king's bath *water*: those for which their diaphoretic and antispasmodic qualities are recommended, will be most likely to find relief from hot bath *water*: and where large dilution is required, as in some glandular cases, and the urinary secretion is to be promoted, the use of the cross bath will be most adviseable.

As the fixed air and chalybeate impregnation of these *waters* are liable to be soon dissipated and destroyed, it will be most adviseable, in cases where their stimulant and astringent effects are desired in their full extent, to drink them at the fountain-head.

In leprous and cutaneous disorders, where the effects of the *waters* depend not so much on the stimulant, as on the diaphoretic and diuretic qualities, which are more permanent, they may be drank more at leisure and at a distance from the pump, when their heat is abated: but the *water* should never be suffered to stand so long as to cause any precipitation, which would alter its nature.

In all cases, where the *Bath waters* are meant to act as restoratives, they are best drank fresh at the spring; and their effects may be moderated by lessening the quantity. Dr. Falconer is of opinion, that these *waters* can serve very few useful purposes in medicine, when used at a distance from the spring; their impregnation with fixed air being thus destroyed, and the chalybeate and sulphureous ones nearly so.

These *waters* being of a heating nature, it is usual, previous to a course of them, to cool the body by gentle purges, by a low diet, and if necessary, by bleeding.

As to the quantity to be taken of these *waters*, it was formerly much greater than in the present practice. Guidott mentions three pints a day as the smallest quantity commonly taken, and recommends, in some cases, even ten pints a day. But the quantity which he advised as the smallest is now scarce ever exceeded. Dr. Falconer thinks that, in general, these *waters*, when exhibited with a view to their stimulant or astringent qualities, might be properly taken by adults from two thirds of a pint to two pints in a day: but with reference to their diuretic, diaphoretic, or antispasmodic qualities, and when the patient is advanced in life, and of an inert habit, and they are used at a moderate season of the year, he would not advise to exceed from 1 pint to $2\frac{1}{2}$ or 3 pints in 24 hours.

In cases where the *waters* are used as diluents, and for washing out the lymphatic system, as in many glandular and cutaneous disorders, when there is no danger of an inflammatory complaint, the season moderate, and the less stimulant *water* used, as that of the cross bath or even hot bath, and some of its stimulant qualities allowed to evaporate; the *water* may be safely drank from 1 to 3 quarts, or even more in a day. However, it is always best to begin with small quantities, as half a pint, or $\frac{2}{3}$ of a pint in a day, and increasing to any quantity that may be thought proper. And the quantity taken should be divided into small doses, and taken at proper intervals. It has been the general custom to drink the whole quantity prescribed before dinner; viz. $\frac{2}{3}$ of it before breakfast, between eight and ten, and $\frac{1}{3}$ at noon. Some have repeated them again in the interval between dinner and supper; and a glass of the *water* has been beneficially taken at going to bed.

As to the season of the year best adapted to the use of *Bath waters*, this was formerly confined to the summer months; and since that time the colder seasons have been preferred. Dr. Falconer thinks, they are more likely, in general, to produce good effects in a warm, than a cool season; especially in cases where their stimulant and diaphoretic qualities are likely to be serviceable. In cases where they are meant to act as restoratives in debilitated habits, in which their astringent and antispasmodic effects, joined to a moderate degree of stimulus, would be desirable, a more moderate season would be adviseable.

Dr. Falconer is of opinion, that the *Bath waters*, when required to act as stimulant, as in weak low cases, especially of the paralytic kind, are in greatest perfection in the warmest seasons, as in the latter part of June, July, and the beginning of August; when a moderate degree of stimulus is required, and their diaphoretic effects desired to be promoted, the latter part of May and beginning of June, and from the latter part of August to the end of September, are more proper: and when they are used with an intent to promote the urinary evacuations, as mild diuretics, in gravelly complaints and urinary obstructions, the months of March, April, and beginning of May, and the month of September and beginning of October would be preferable.

The usual season is in April, May, and June; and in August, September, and October.

The course of drinking these *waters*, as stimulants, should be, in general, from three weeks to two months: when given with a diaphoretic, antispasmodic, or antiseptic intention, they may be continued, with occasional intermission, from six weeks to three months: as diluents in glandular disorders, and as gentle diuretics, they may be drank, with occasional intermission, from two to six months.

The course of drinking these *waters* is usually continued for a month or six weeks; and the quantity toward the close should every day be diminished, as it was increased at first.

The patient, in the use of these *waters*, should live upon a light diet, easy of digestion; use proper exercise; go early to bed, and rise betimes in the morning.

These *waters* are also used externally in a variety of disorders, with good effect; either by bathing or pumping, as occasion may require, especially if used inwardly at

the fame time. The efficacy of bathing in paralytic cafes has been long and generally acknowledged: it has alfo been of great fervice by its ftimulant quality in the chlorofis, in cachectic diforders, in the jaundice, in the hypochondriac difeafe, and in cafes of barrennefs; as antifpafmodic, it has been very efficacious in the colica Pictonum, hyfteric colic, afthma, jaundice, menftrual obftructions, preventing abortion, nervous difeafes, as the epilepfy, St. Vitus's dance, the hyfteric and the hypochondriac difeafe, the nervous head-ach, particularly the hemicrania, fpafmodic vomiting, nervous atrophy, mufcular contractions, and paralytic contractions of the extremities: as diaphoretic, the *Bath waters* have been much celebrated in the common rheumatifm, where the inflammatory difpofition is very flight, and yet the pain and other fymptoms grievous and of long duration; efpecially towards the decline of the paroxyfm; and in thofe rheumatic pains which fometimes accompany the colica Pictonum; in every variety of the gout, and the complications of it with many other diforders; in the fcurvy, provided that bathing be not ufed if the putrid difpofition fhould be fo ftrong as to form external ulcers; in the venereal difeafe; in the colic; in habitual diarrhœas; in the diabetes; and in the leprofy: as diuretics, *Bath waters* are ufeful in liver complaints; in cutaneous diforders; in the calculus: as expectorants, they have been alfo of fervice in gouty coughs, by promoting a beneficial difcharge. The external ufe of thefe *waters* is improper in continued fevers, local inflammations, both internal and external, in hæmorrhages, in immoderate menftrual difcharges, in plethoric habits, in diarrhœas attended with fever or an extreme degree of irritability, in obftructions of the vifcera, and in cafes of extreme weaknefs.

As to the choice of the feveral baths, Dr. Falconer obferves, that as a ftimulant, in paralytic cafes, the hotteft part of the king's bath or the hot bath is preferable; as an antifpafmodic, in the tetanus, hypochondriac complaints, and other nervous difeafes, the cooler parts of the king's bath or the queen's are more proper; when a mild diaphorefis is defired, the queen's or crofs baths are moft effectual.

The time of ftay in the bath is at prefent from ten or even five minutes to an hour. As a ftimulus, e. g. in the palfy, the common time is from fifteen minutes to half an hour; as an antifpafmodic, a longer ftay is in general adviseable: when the baths are ufed with a diaphoretic intention, a pretty long ftay is generally thought neceffary, in order to procure a copious evacuation by fweat. After bathing, the patient goes to bed for a fhort time to compofe himfelf and cool gradually, rather than for the fake of promoting any evacuation by the fkin.

The time of day for bathing has, in the public baths, been by immemorial cuftom fixed between the hours of five and nine in the morning: however, the abbey baths may be had at any hour in the day, filled with frefh *water* for every perfon who ufes them, of nearly the fame heat and quality with the king's bath *water*.

Formerly, the ufe of the *Bath waters*, as well externally as internally, was confined to the fummer months; but for many years paft, the colder, or rather more moderate feafons, as the fpring and autumn, have been preferred.

It is the common practice to bathe from one to three or four times a week; but the time of its being continued, and the frequency of its being repeated, muft depend on the nature of the cafe.

During a courfe of bathing, attention fhould be had to the regimen, to the tranquillity of the mind, to exercife, and to a moderate laxity of the bowels.

When the complaint is local, pumping is generally preferred to bathing: in this cafe, the *water* is hotter than that of the bath; the ftream of *water* is generally directed to the limb or part affected, and fometimes to that part of the fpine, where the nerves that fupply the place affected iffue forth. In this way the *Bath waters* are ufed with great fuccefs in the palfy, in reducing diflocations of the vertebræ, in relieving contractions of the limbs, in difcuffing incipient white fwellings, in nervous cafes, in fits of the gout, and rheumatic complaints, and in the tinea capitis or fcald-head. Pumping and bathing are often ufed at the fame time; the mud and fcum of thefe *waters* have been alfo applied with good effect, by way of poultice, in hard fwellings, weak joints, contractions of the limbs, fcald heads, running ulcers, &c. and herbs are fometimes boiled with them in the *Bath water* to a proper confiftence for fuch purpofe. See Falconer's Eff. on the Bath *Waters*, vol. i. and vol. ii. paffim.

Waters, *Briftol*, are obtained from fprings, known by the name of the hot wells.

Thefe *waters* at their origin are warm, clear, pellucid, and fparkling; and if left to ftand in a glafs, cover its infide with fmall air-bubbles. They have no fmell, and are foft and agreeable to the tafte. They raife the thermometer from about 79 to 80°. They contain an earthy matter, fufpended by means of fixed air, together with fea-falt, and a fpecies of Glauber's falt, in fmall quantities.

Dr. Guidott pretends that the *Bath* and *Briftol waters* are of the fame virtues, but in a different degree; that both are impregnated with the fame principles, but the *Bath waters* containing a much greater fhare of them, and therefore capable of doing that in a little time which thofe of *Briftol* could only do in a much longer. But this feems to be far from a true ftate of the cafe.

The *Briftol waters* are fuppofed by many a modern difcovery, and their ufe but of late date, but this is a very erroneous opinion. Dr. Venner, more than a century ago, has written profeffedly of them, and given them their true character, and proper commendations in all the difeafes in which they are at this time found effectual, the diabetes only excepted, in which their ufe has not been known fo long. They were not indeed much frequented at that time, nor for fome years afterwards; but that was merely from the want of the neceffary accommodations at the place. Dr. Mapletoft, in the year 1639, writes largely of their virtues, particularly in diforders of the urinary bladder and kidneys, and adds great praifes of their external efficacy in curing cancerous ulcers; but with all this praife, they never came into an univerfal repute, till their character was eftablifhed by Dr. Mead and Dr. Lane.

Thefe *waters* have been recommended in a variety of diforders: in confumptions and weaknefs of the lungs; in cafes attended with hectic fever and heat, (in which, befide other properties, they differ from the *Bath waters*;) in uterine and other internal hæmorrhages, and in immoderate difcharge of the menfes; in old diarrhœas and dyfenteries; in the fluor albus; in gleets; in the diabetes, for which fome have extolled them as a fpecific; and in other cafes, where the fecretions are too much increafed, and the humours too thin; in the ftone and gravel; in the ftrangury; in colliquative fweats; in fcorbutic and fimilar cafes; in colics; in the gout and rheumatifm; in lofs of appetite and indigeftion; and in many other difeafes.

The ufual method of drinking thefe *waters* is a glafs or two before breakfaft, and about five in the afternoon: on the next day, three glaffes before breakfaft, and as many in the afternoon, which quantity is to be continued during the patient's ftay at the wells. A quarter or half an hour is allowed between each glafs.

A courfe of thefe *waters* requires no other preparation than to empty the bowels by fome gentle purge; and if heat or fever requires, to take away a few ounces of blood. Coftivenefs fhould be avoided. Externally they are ufeful in fore and inflamed eyes; in fcrophulous and cancerous ulcers, and in other fimilar cafes.

They are cooling, and quench the thirft; they are beft drank at the fpring head; but will bear carriage tolerably well.

The time of drinking the *Briftol waters* medicinally is from April to September. Elliot on Min. Wat. p. 114.

Waters, *Buxton*, the *waters* of medicinal fprings near Buxton in the Peak of Derbyfhire, refembling thofe of Briftol.

Thefe *waters* are the hotteft of any in England, except thofe of Bath. See Baths.

The *Buxton waters* break out in feveral places thereabouts; what is called Buxton bath takes in feveral warm fprings. Thirty-two yards north-eaft of this is St. Anne's well, which is chiefly fupplied from a fpring on its north fide. Twenty yards fouth-eaft of St. Anne's, in another clofe, is a place where a hot fpring and a cold one rife in the fame receptacle. About fixty-three yards fouth-eaft of this is that called Bingham's well, called alfo Leigh's *water*, from the great benefit a neighbouring gentleman of that name received from it. A little way eaft of this is another; and in the ftreams of the level that carries the *water* from the bath, there rifes another very plentiful one; and about four yards farther eaft there arife three or four other fmall ones. From this account, it may eafily be conceived that there can be no great difference between the *waters* of thefe feveral fprings, though on trials they feem to yield different portions of falts and fediments; at the utmoft, their difference can be only in degree. They contain calcareous earth, together with a fmall quantity of fea-falt, and an inconfiderable portion of a purging falt: but no iron can be difcovered in them.

Thefe *waters* taken inwardly are efteemed good in the diabetes; in bloody urine; in the bilious colic; in lofs of appetite, and coldnefs of the ftomach; in inward bleedings; in atrophy; in contraction of the veffels and limbs, efpecially from age; in cramps and convulfions

in

in the dry aſthma without a fever; and alſo in barrenneſs. Inwardly and outwardly they are ſaid to be good in rheumatic and ſcorbutic complaints; in the gout; in inflammation of the liver and kidneys, and in conſumptions of the lungs; alſo in old ſtrains; in hard callous tumors; in withered and contracted limbs; in the itch, ſcabs, nodes, chalky ſwellings, ring-worms, and other ſimilar complaints.

As to the difference of age and ſex in patients, there is little caution required in the drinking of them, except that they ſhould be taken more ſparingly by young people, between the ages of twenty-three and thirty, if very full of blood and juices, and by women with child in their firſt and laſt months.

As to the method of uſing them, except the body be coſtive, and the firſt paſſages furred up with groſs humours, it is not only unneceſſary, but hurtful, to prepare the body for them, as it is called, by purging; or at leaſt by any ſtronger purges than manna, cream of tartar, and the like.

The heat of *Buxton waters*, in froſty weather, is equal to that of common river-*water* with which two-fifths of boiling *water* have been immediately mixed.

Beſide the hot *water*, there is alſo a cold chalybeate *water* with a rough irony taſte. See Short's Hiſt. of Mineral *Waters*. Elliot on Min. *Waters*, p. 118.

Waters, *Carlſbad*, called *Caroline baths*, are *waters* of Carlſbad in Bohemia, which are hot, and impregnated with the foſſile alkali; they are recommended, externally and internally, in female obſtructions; relaxed habits; glandulous obſtructions; diſorders ariſing from viſcid fluids, &c.

Waters, *Cheltenham*, are ſome of the beſt and moſt noted purging chalybeate *waters* in England; the ſprings of which are at Cheltenham near Glouceſter.

The doſe is from one pint to three or four: they operate with great eaſe, and are never attended with gripings, teneſmus, or ſtraining at ſtool. They are beſt taken a little warm: they create an appetite; are excellent in ſcorbutic complaints; and have been uſed with ſucceſs in the gravel.

Waters, *Dog and Duck*, are the *waters* of a houſe of that name in St. George's fields near London; which are clear, with little taſte. They are mildly purgative, and may be drank to the quantity of ſeveral pints; they are commonly quickened by the addition of Glauber's or other purging ſalts.

They are uſeful in ſcrophulous complaints, leproſies, and diſeaſes of the ſkin; and are alſo ſaid to prevent the return of cancerous diſeaſes: for theſe complaints they may be uſed both internally and externally. They are cooling and diuretic; and may be given freely to young people of robuſt conſtitutions; but too cool and relaxing for people in years, and of weak habit.

Waters, *Dulwich*, contain a purging ſalt, together with ſea-ſalt. They are purging and diuretic; uſeful in complaints ariſing from obſtructions, as thoſe of the liver, ſpleen, and other viſcera; recommended in the green-ſickneſs, jaundice, ſcurvy, difficulty of urine, and gravelly complaints: they are ſaid to ſtrengthen the ſtomach, and create a good digeſtion: they are alſo ſaid to ſtrengthen the nervous ſyſtem, and to be ſerviceable in palſies, apoplexies, and other nervous diſorders, in which caſes it is beſt to take them warm.

The courſe of drinking theſe *waters* is uſually twenty days; three pints a day are to be drank at firſt, and the quantity increaſed to eight pints by the tenth day, and afterwards diminiſhed in the ſame manner.

Water, *Egra*. See Egra *water*.

Waters, *Epſom*, have a ſlight ſaline taſte; they are purgative, when drank to the quantity of two or three pints: they alſo operate by urine: in leſs quantity, or about the third part of a pint taken three times a day, they are a mild alterative. They are eſteemed good for waſhing old ſores. See Epsom *Salt*, and Epsom *Water*.

Waters, *Harrowgate*, are the *waters* iſſuing from four ſprings at Harrowgate in Yorkſhire: as they ſpring up, they are clear and ſparkling, and throw up a quantity of air-bubbles: they have a ſtrong ſmell of ſulphur (ſee *Mineral* Waters), and a ſalt taſte, as they contain a conſiderable quantity of ſea-ſalt, together with a little purging ſalt: they are purgative, the doſe being about three or four pints; when drank in ſmaller quantities, they are a good alterative, and ſerviceable in the ſcurvy, king's evil, and diſeaſes of the ſkin. They may alſo be uſed outwardly at the ſame time, by way of bath or fomentation. They have been found efficacious in deſtroying worms; and recommended in the gout, jaundice, ſpleen, green-ſickneſs, and other diſorders ariſing from obſtructions. They are uſed externally for removing old aches, ſtrains, paralytic weakneſs, &c. and for the cure of ulcers, ſcabs, the itch, &c.

Waters, *Holt*, are mineral *waters* at Holt, near Bradford, in Wiltſhire; which contain a purging ſalt, together with a large quantity of earth: they are a very mild purge, the doſe uſually required being two quarts: in leſs quantity they are alterative and diuretic: they are good as a diluent, cooler, and ſtrengthener; and create an appetite. Rags or ſpunge dipped in them, and applied externally, are ſaid to cure ſcrophulous ulcers, attended with carious bones; an internal courſe being obſerved at the ſame time. They are alſo of ſervice in old running ulcers of the legs, and other parts; in cutaneous foulneſſes, though attended with hot corroſive humours; in the piles, in cancerous ulcers, and in foreneſſes of the eyes: but in theſe caſes they muſt be uſed both internally and externally. See Holt.

Water, *Jeſſop*, is a ſtrong purging *water* at Jeſſop's well, near Cobham in Surry, with a nauſeous taſte, and ſlightly chalybeate. This, ſays Dr. Lewis, is one of the ſtrongeſt purging *waters* in the kingdom: a pint left in evaporation ſeventy-two grains of ſalt: whereas Kilburn and Cheltenham *waters* yielded only ſixty-four grains; that of Acton not fifty, and that of Epſom, leſs than forty. About a quart of this *water* purges briſkly without griping, and operates likewiſe by urine. It enlivens the ſpirits; but loſes its virtues by being kept. In leſs doſes it acts as an alterative; and is a good antiſcorbutic.

Water, *Iſlington*, is a light chalybeate water, reckoned one of the beſt of the kind about London. The iron in this *water* is held in ſolution by means of fixed air; and when the air has eſcaped, and the air precipitates, if the *water* be left to putrefy, the fixed iron diſengaged by the putrefaction again diſſolves the iron, and cauſes it to be ſuſpended in the *water*: it then recovers its chalybeate taſte, and property of tinging with galls, both which it had loſt before.

This *water* is recommended in indigeſtion and loſs of appetite, in lowneſs of ſpirits, nervous, hyſteric, and hypochondriacal complaints, and relaxed conſtitutions, and raiſes the ſpirits. It is good in the fluor albus, in weakneſs from miſcarriage, in obſtructions of the liver, the kidneys, &c. It is alſo ſerviceable in diſeaſes of the ſkin, in ſcorbutic complaints, in the gravel, and in paralytic diſorders. It operates chiefly by urine, and may be drank to the quantity of ſeveral half pints, or even pints, according to the conſtitution of the patient. This *water* deſerves to be eſteemed and frequented.

Water, *Lancarim*. See Lancarim *Water*.

Waters, *Llandrindod*, are *waters* iſſuing from three mineral ſprings near Llandrindod, in the county of Radnor, South Wales. Theſe ſprings are the ſaline purging *water*, the ſulphureous *water*, and the chalybeate rock *water*.

The *ſaline purging*, or *pump-water*, may be uſed as a purge twice in a week: it is directed to be drank at the fountain-head by half pints, till it begins to operate; the patient riding or walking about between each draught: it operates alſo by urine. As an alterative, about three pints are directed to be drank in a day: a pint and a half before breakfaſt, at three draughts, with the interval of a quarter of an hour: the other pint and a half at three draughts, one an hour before dinner, another about ſix in the evening, and the third going to bed. This courſe ſhould be continued ſeveral weeks; and the moſt proper ſeaſon is the ſummer. It is alſo uſed as a bath and fomentation. It is recommended both internally and externally in the ſcurvy, leproſy, tetters, king's evil, and all cutaneous foulneſſes. It is alſo preſcribed in the gravel, the hypochondriacal diſeaſe, indigeſtion, and in other complaints.

The *ſulphureous water*, called alſo the black ſtinking *water*, is to be drank in ſmall doſes at firſt, from a pint to a quart in the morning, at repeated draughts: the quantity may be increaſed as the ſtomach will bear. This *water* is alſo uſed outwardly as a bath or fomentation. It is recommended in the king's evil, ſcurvy, leproſy, and all cutaneous diſeaſes; in the jaundice, hypochondriacal and other diſorders ariſing from obſtruction; in the gravel, rheumatiſm, gout, bloody flux, hectic fever, weakneſſes of the limbs, want of digeſtion, &c.

The *chalybeate* or *rock water* is limpid and tranſparent, when taken from the fountain, but on ſtanding ſoon loſes theſe qualities, together with its chalybeate taſte. Mixed with ſugar and rough cyder as it is taken up from the ſpring, it excites a briſk fermentation. It is recommended in ſuch chronic diſorders as proceed from laxity of the fibres, and weakneſs of the muſcular ſyſtem; in weakneſs of the nerves, paralytic complaints, and the like; in ſcorbutic caſes, moiſt and convulſive aſthmas; obſtinate agues, obſtructions of the lower belly, wandering, ſlow, nervous fevers, and diſorders ariſing from obſtruction.

Waters, *Malvern*, iſſue from two noted ſprings at *Malvern*,

vern, in Gloucestershire: they are light and pleasant chalybeates, and almost entirely free from any earthy matter; three quarts of the holy well *water* being evaporated left behind scarce the fourth part of a grain of sediment.

These *waters* are recommended as excellent in diseases of the skin; in leprosies, scorbutic complaints, the king's evil, glandular obstructions, scaid heads, old sores, cancers, &c.: they are also of use in inflammations and other disorders of the eyes; in the gout and stone; in cachectic, bilious, and paralytic cases; in old head-achs and female obstructions.

These *waters* are used externally by washing the part several times in a day, and afterwards covering it with cloths dipped in the *water*, and kept constantly moist. Those who bathe are said to go usually into the *water* with their linen on, and to dress upon it wet, without any inconvenience.

These *waters*, when first drank, are apt to occasion a nausea in some; they purge others briskly for several days; but they operate by urine in all. They should be drank freely for some days before they are used externally.

WATERS, *Matlock*, are warm *waters* supplied by several springs at *Matlock*, in Derbyshire, in their nature resembling Bristol *water*, except that they are very slightly impregnated with iron, and in their virtues similar to those of Bristol and Buxton.

The baths are recommended in rheumatic complaints, cutaneous disorders, and other cases where warm bathing is serviceable.

WATERS, *Moffat*, are mineral *waters* of considerable efficacy at *Moffat*, in the county of Annandale in Scotland. They arise from two springs on the declivity of a hill, which yield about 1360 gallons of *water* daily.

These *waters* have a sulphureous taste, and smell of the washings of a gun-barrel; their colour is milky or bluish. The season for using them is between the middle of April and the end of September; but they may be drank all winter, and if the rains be moderate, the strength of the *water* is not found to be impaired. The *water* of the upper spring being too foul for drinking, is made use of for bathing, and is, for this purpose, made somewhat warmer than tepid. The quantities of *water* usually drank are pretty large, exceeding sometimes a gallon. It is usual to join purgatives, and that in great doses, frequently repeated with the use of the *waters*; but this is thought unjustifiable by some.

The *water* is alterant and diuretic: its purging is owing to the large quantities drank, or to some singularity in the constitution, as a weak state of the stomach and intestines. Few medicines are said to be superior to these *waters* in disorders of the stomach and bowels. It has also proved useful in nephritic, nervous, and hysteric colics, melancholy, barrenness, female weaknesses and disorders, as also in old gleets, either natural, or caused by venereal disorders. In rheumatic and scorbutic complaints it is advantageous, and in cutaneous eruptions. It is said seldom to fail in scrophulous disorders. It is warmed and used by way of bath to particular parts, and even to the whole body: the hot steam has been successfully used for relaxing hard swelled parts, and stiff joints. In such complaints it is used both internally and externally. This *water* gives no marks of a chalybeate nature with galls, nor of acidity with tincture of roses, or syrup of violets, neither does it produce any effervescence with oil of tartar *per deliquium*, or spirit of sal ammoniac. It seems to contain a subtile volatile sulphur, but in small quantity, since it soon loses its remarkable smell and taste, when exposed to the air, and that acid liquors can neither separate nor precipitate it. Upon evaporation there is found a dirty salt mixed with earth. This salt seems not to be nitre, nor sal ammoniac, but common salt; and by a slow evaporation of a solution of sea-salt, crystals not unlike those of the salt of *Moffat water* have been obtained. Med. Ess. Abr. vol. i. p. 99. Ibid. p. 101. Ibid. p. 103, seq. where other experiments on these *waters* may be seen.

WATERS, *Montrose*. Steel spas are very numerous in the country about *Montrose* in Scotland: the principal of these are at Aberbrothoc, Kincardin, and Peterhead. That of Aberbrothoc is in greatest esteem. Medic. Ess. Abr. vol. i. p. 106, 107. Ibid. p. 111.

Beside these, there is a well near *Montrose*, the *water* of which is of a whitish colour, soft taste, and faintly discovering the mineral quality. This *water* is of a different nature from the steel-springs. The alkali prevails in its salt; it resembles the Scarborough *water*, and no salts come up to any analogy with those of the *Montrose water*, and those of Scarborough, but nitre and sea-salt. See Med. Ess. vol. iii. art. 8. Abr. vol. i. p. 112, seq. where various experiments with those *waters* are enumerated, and a comparison instituted between them and the Scarborough *waters*.

The *water* of this *Montrose* well is universally diuretic; being drank from two to three pints, it purges; and half the quantity succeeds with some. It has been found very useful in stranguries and stoppage of urine, scorbutic disorders, flatulencies, spasmodic colic, and spitting of blood. In rheums and strains it has been of good use by way of cold pump, where persons could not bear such use of ordinary cold *water*. Med. Ess. vol. iii. art. 9. Abr. vol. i. p. 122, seq.

WATER, *Nevil-Holt*, is a mineral *water* at *Nevil-Holt*, in Leicestershire, which is very clear as it falls from the spout, and void of smell: it has a brisk austere bitter, but not disagreeable taste, and abounds in fixed air: exposed to the air, it soon becomes turbid and spoils. Drank to the quantity of several pints, it proves purgative, and operates without griping; it operates also by urine and sweat. In putrid disorders, it is a powerful antiseptic. As an alterative, it must be taken in small doses, from a few spoonfuls to a quarter or half a pint several times in a day; and a little brandy may be added to it, if it is cold on the stomach.

This *water* is esteemed an excellent remedy in old dysenteries and diarrhœas, internal hæmorrhages, the fluor albus, gleets, the gravel, rheumatisms, and for the *worms*: it is good in atrophies, bloated constitutions, dropsical complaints, scorbutic disorders, want of appetite, and other cases; but in inflammatory complaints, and with an acidity of the humours, it is injurious. Externally, it is a speedy cure for fresh wounds, inflamed eyes, and hectic ulcers, &c. especially, if taken inwardly at the same time.

WATERS, *Pyrmont*, *Scarborough*, *Seltzer*, and *Spa*. See the several articles.

WATER, *Sydenham*, is a purgative *water* at *Sydenham*, near London, of the same nature with *Epsom* WATER, but weaker.

WATERS, *Tiberiades*, and *Tilbury*. See the articles.

WATER, *Tunbridge*, is one of the most famous chalybeate *waters* in England. The wells are situated about five miles from the town of *Tunbridge* in Kent. This is a brisk, light *water*, has a ferruginous taste, and contains also a little sea-salt: exposed to the air, it soon loses its virtues; as it does also in a few days in bottles. It is sometimes usual to mix with the first glass of the *water*, taken in the morning, either a little common salt, or some other purging salt, in order to make it operate by stool: with a foul stomach it is apt to cause a vomiting.

The *Tunbridge water* is chiefly resorted to in June, July, and August; and is recommended in all the disorders in which the celebrated spa *waters* of Germany are serviceable: as it possesses the same virtues, in a weaker degree.

WATER, *Witham*, in Essex, is a chalybeate *water* of considerable strength, and is also impregnated with sea-salt; but must be drank at the fountain, as it will not bear carriage. It is very diuretic, and has been successfully prescribed in hectic fevers, in weakness occasioned by long disease, in lowness of spirits, nervous complaints, want of appetite, indigestion, habitual colic and vomiting; in agues, the jaundice, and incipient dropsy; in the gravel, and in asthmatic and scorbutic disorders.

For a more particular account of the nature, qualities, and various kinds of *mineral waters*, we must refer to the treatises of Dr. D. Monro, Dr. Rutty, Dr. Short, Dr. Falconer, and Dr. Elliot, on this subject. See also Chem. Dict. art. *Water*, Lewis's Mat. Med. art. *Aqua*, and Bergman's Chem. Ess. vol. i.

WATER, in *Chemistry*, by the chemists called more usually PHLEGM, is the fourth of the five chemical principles, and one of the passive ones.

WATER *of crystallization* is a denomination given to the *water* attracted by the particles of a salt during its crystallization. This is contained in different quantities in different salts, and adheres to them with different degrees of force; though it is easily separated from most of them, the moderate heat of the atmosphere being sufficient to evaporate it from many. When this *water* of crystallization is evaporated from any sa[illegible] of the crystals is destroyed; the salt from be[illegible] transparent substance becomes an opake powder. [illegible] a salt, in losing its *water* of cystallization, [illegible] stalline form, it does not thereby lose part of its saline quality: for the *water* which is separated from it is pure *water*; and the salt, by being re-dissolved in *water* and re-crystallized, will not only regain its former figure, but the whole of its weight.

WATER, *lime*. See LIME-*water*.

WATER, *mercurial*, a name given to a solution of merc[illegible] in nitrous acid, diluted with a greater or less quanti[illegible] common *water*. This liquor produces good effects, [illegible] escharotic;

eſcharotic, and even as a cauſtic in ſome diſeaſes of the ſkin that are external, local, and eſpecially venereal.

There is alſo a *mercurial water* made with four ounces of quickſilver to two quarts of ſpring *water* boiled to one quart. This is reckoned an efficacious medicine in ſeveral caſes, as the worms and the itch in children, by Dr. Cheyne and others. See AQUA *mercurialis*.

WATER, *mercurial*, for forming pearls. See PEARL.

WATERS, *mother*, a name given to the liquor that remains after as much of the ſaline ſubſtances contained in a *water* has been ſeparated as can be by the uſual methods, evaporation and cooling, and from which, therefore, no more cryſtals can be obtained, without much difficulty, though it ſtill remains impregnated with ſalts.

Theſe *mother waters* are very different according to the kinds of ſalts with which the *waters* are originally impregnated. They are generally very heavy, acrid, and red.

WATER *of Rabel*, a vitriolic acid dulcified by mixture with rectified ſpirit of wine, ſo called from its inventor Rabel. It may be prepared by mixing one part of oil of vitriol with three parts of rectified ſpirit of wine, and digeſting the mixture in a well-cloſed veſſel.

This *water* is employed in medicine as an aſtringent; but it requires to be diluted in ſome proper vehicle, as in potions or juleps.

WATERS, in *Medicine, Pharmacy, Chemiſtry*, &c. called alſo *artificial*, and *medicated waters*, are a kind of liquors procured or prepared by art from divers bodies, principally of the vegetable tribe; having various properties, and ſerving various purpoſes.

Theſe *waters* are either *ſimple* or *compound*.

WATERS, *ſimple*, are thoſe procured from ſome one vegetable body, by means of common *water*.

A *ſimple water* is not ſuppoſed to be the mere *water*, or phlegm of the body it is drawn from, as is evident both from the taſte and ſmell thereof. The intention of making ſuch *water* is, to draw out the virtues of the herb, ſeed, flower, root, or the like; ſo as it may be more conveniently given in that form than any other. But the phlegm, or *watery* part of any medicinal ſimple, is no better than common *water* undiſtilled: ſo that all thoſe ingredients, which in diſtillation raiſe nothing but phlegm, as may be diſcovered from the ſcent and taſte of what comes over, are not fit for the ſtill. On this principle, a great part of the *waters* retained in the diſpenſatories will appear good for nothing, at leaſt not worth diſtilling.

The means whereby this ſeparation is effected, are either *evaporation, infuſion, decoction*, or *diſtillation*. The firſt is performed by expoſing the vegetable in a cold ſtill, to a gentle heat, like that of a ſummer's ſun; and catching the effluvia which exhale from it.

The effect of this operation is a *water*, or fluid matter, which is the moſt volatile, fragrant, and aromatic part of the plant; and that wherein its ſpecific virtue reſides. And thus it is, that the fineſt aromatic or odoriferous *waters* of vegetables are to be procured.

The ſecond means, viz. *infuſion*, is performed by putting the vegetable in hot *rain-water*, below the degree of boiling; keeping it to this degree by an equable heat, for the ſpace of half an hour; and then drawing it off. The only *waters* procured this way, in much uſe in the modern practice, are thoſe of frog-ſpawn, and oak-buds.

The third means, viz. *decoction*, only differs from the ſecond in this, that the *water* is kept to the degree of boiling.

The fourth means, viz. *diſtillation*, is performed by infuſing the ſubject in an alembic, with a gentle warmth, for ſome time; and then increaſing the heat, ſo as to make it boil; and laſtly, catching and condenſing the ſteam or vapour ariſing therefrom.

This proceſs furniſhes what we call the *diſtilled waters*, of ſo much uſe in medicine, &c. See DISTILLED *Waters*.

The vegetable ſubjects beſt fitted for it, are the ſapid and odorous, or thoſe of the aromatic tribe; as angelica, aniſeed, baum, carraway, coriander, cumin, dittany, fennel, hyſſop, marjoram, mint, roſes, roſemary, ſaffron, ſage, ſcurvy-graſs, thyme, cinnamon, citron, juniper, lime, myrtle, orange, peach, &c.

The medicinal virtues of *waters* prepared after this manner are the ſame as thoſe of the reſpective plants, &c. they are drawn from. Thus, the diſtilled *water* of mint is ſtomachic; that of wormwood, vermifugous, &c.

The materia medica, it may be obſerved, affords no remedies in this way, but for the intentions either of cordials, emmenagogues, diuretics, or diaphoretics. Were it practicable to raiſe a balſamic, cathartic, or opiate, in this manner, yet would thoſe properties be much more conveniently brought forth by other proceſſes; ſo that nothing is to be looked for in a diſtilled *water*, but ſuch ſubtle and light parts of a medicinal ſimple, as may fall in with the fore-mentioned intentions: indeed, very little comes over under that diviſion, weighty enough to effect even the urinary ſecretions.

The *ſimple waters*, of chief virtue, are the following ones; viz. *dill-water, aqua anethi*; *angelica-water, aqua angelicæ*; *mint-water, aqua menthæ*; *roſemary-water, aqua anthos*; *orange-flower-water, aqua naphæ*; *black-cherry-water, aqua ceraſor. nig.*; *parſley-water, aqua petroſellini*; *camomile, chamæm.*; *pennyroyal, pulegii*; *fennel-water, aqua fœniculi*; *damaſk-roſe-water, aqua roſarum dam.*; *hyſſop-water, aqua hyſſopi*; *rue-water, aqua rutæ*; *juniper-water, aqua juniperi bacc.*; *elder water, aqua ſambuci flor.*; *lovage-water, aqua leviſtici*; *carminative water, aqua carminativa*, &c.

It may be here proper to note, that whatever properties any ſimple has from the groſſneſs or ſolidity of its parts, which make it act as an emetic, cathartic, or aſtringent, the reſidue left after diſtillation, will remain in full poſſeſſion thereof. Thus the purging ſyrup of roſes is as well made after the damaſk-roſe-*water* is drawn off, as if the flowers were put into infuſion; becauſe nothing of a cathartic quality riſes with the *water*.

In the diſtillation of *ſimple waters*, a good general rule is this: take as much of the dried herb, as when cut ſmall will fill two-thirds of the ſtill to be uſed; pour upon this as much rain *water* as will make the plant float commodiouſly, leaving, however, a fourth of the ſtill empty; digeſt this a while in a gentle heat, and then give fire enough to work the ſtill, and draw off ſo long as the *water* appears thick or milky, and taſtes of the herb. It is a principal caution in this operation to remove the receiver before the more pellucid, acid, faint, and dead *water* comes over, as it will at length do, and by mixing with the reſt will ſpoil the whole, by giving it a vapid or faint taſte, and ſometimes a degree of acidity or vitriolic ſtypticity, or emetic quality; for part of the eſſential ſalt of the plant now riſing, corrodes the head of the ſtill, and carries over with it ſome particles of the metal: for which reaſon, ſuch *waters* ſhould be either diſtilled with a glaſs head, or a pewter one, or elſe the laſt running carefully watched, and not ſuffered to come over and mix with the firſt; for want of this caution, children, and perſons of tender habits, have been often vomited, purged, &c. contrary to the intention of the preſcriber, by a *ſimple-water*.

The *ſimple-waters* diſtilled by this method may often be too ſtrong to give alone, but then it is eaſy to let them down to a proper ſtrength with common *water*; which is beyond all compariſon better than to mix them with their own faints, or the liquor of their ſecond running.

Some recommend putting the freſh herbs, cut and bruiſed, into an alembic placed in a *water*-bath, without adding *water* to them, and diſtilling to dryneſs with a very gentle heat and well-luted veſſels.

There are yet, however, two methods of improving the common *ſimple waters*, which might eaſily be put in practice: the firſt is the cohobating, and carefully digeſting of the plant; the ſecond, the fermenting of it. With regard to the firſt, if the liquor remaining in the ſtill be expreſſed from the herb, and returned, along with all the *water* that came over, upon a freſh quantity of the ſame ſubject, and then diſtilled as before, the *water* thus obtained will be much richer, and more efficacious than before; and if the ſame operation be repeated two or three times, thoſe who have not tried it cannot eaſily conceive how very rich a *ſimple water* may by that means be made: and this is moſt neceſſary in diſtilling the *ſimple waters* of roſes, elder-flowers, baum, and the like ſubjects, which afford but little oil, and otherwiſe make but weak *waters*.

The other method recommended, viz. by fermentation, is performed by adding to the plant and *water*, put together as for diſtillation, a tenth or twelfth part of ſugar or honey, or elſe a fortieth part of yeaſt; then ſetting the whole in a warm place to ferment for three or four days only, ſo that the herb may not fall to the bottom, nor the fermentation be above half finiſhed; then the whole being committed to the ſtill, a *water* may be procured at one operation, extremely rich, or impregnated with the whole virtue of the plant; and thus may *ſimple waters* be made fit for long keeping without ſpoiling, the ſmall quantity of inflammable ſpirit generated in the fermentation ſerving excellently to preſerve them. Shaw's Lectures, p. 199.

The *waters* procured in this manner contain the oil of the plant in great perfection; which makes them of conſiderable uſe in medicine, farther than thoſe raiſed without fermentation; beſide that they keep better and longer; the ſpirit in them preventing their corrupting, or growing mothery.

To procure the *diſtilled waters* of vegetables, or other ſubjects,

ſubjects, pure and free from all mixture of the other principles of the body it was extracted from, let the *water*, as diſtilled, be put into a funnel lined with paper to be filtred, and the funnel being kept continually filled up, that the lighter oil may not come in contact with the paper, the *water* will be tranſmitted through, in a great meaſure, without the oil; but there ſtill remains ſome proportion of oily, and commonly of ſaline matter alſo in it. If the ſaline matter be acid, the way to deſtroy it is by mixing chalk, or any alkaline ſalt, with the *water*, which being afterwards diſtilled again, will then riſe pure. If the plant were alkaline, and an alkaline ſalt be ſuſpended in the *water*, let it be made a neutral one, by mixing ſome acid, and then the *water* filtred and diſtilled again. By theſe methods the *water* of vegetables is procured pure; and this is the way of proving, that the chemical principle *water* is lodged in, and may be ſeparated from all ſuch ſubſtances. Shaw's Lectures, p. 150.

Waters, *compound*, or thoſe wherein ſeveral ingredients are uſed, are very numerous, and make a large article in commerce; ſome prepared by the apothecaries, according to the Diſpenſatory preſcripts, for medicinal uſes; others by the diſtillers, to be drank by way of dram, &c. and others by the perfumers, &c.

They are diſtinguiſhed by different epithets, taken from the Latin, Greek, Arabic, Engliſh, &c. in reſpect either of the ſpecific virtues of the *waters*, or the parts of the body, for the cure whereof they are intended; or the ingredients they are compounded of; or their different uſes, &c.

The moſt conſiderable among the claſs of *compound waters*, we ſhall here enumerate. The manner of making them, it is true, is not always the ſame; eſpecially thoſe intended for drinking; for which every one gives his own method as the beſt. Thoſe we here deliver, are taken from ſuch as have the greateſt reputation in preparing theſe things; or from thoſe who have written beſt of them.

We have only three general remarks to add, with regard to thoſe intended for drinking; 1. That ſuch wherein any thing is infuſed, as bruiſed fruits, pounded herbs, or ground ſpices, muſt be always paſſed through a filtre, to make them finer and purer.

2. That thoſe made with brandy, or ſpirit of wine, are uſually diſtilled after mixing their ingredients; which renders thoſe liquors exceeding ſtrong and dangerous, and confirms the proverb; *Plures occidit gula quam gladius.* In effect, ſome of them are ſo penetrating, that they burn the tongue when taken.

3. That the *waters* which take their name from any particular things, as *cinnamon*, &c. have often ſome other ingredients joined with them, according to the taſte or ſmell required.

In the making of compound ſpirituous liquors, or, as they are called by the apothecaries, *cordial waters*, the great care is to uſe a pure and well-rectified ſpirit, as nearly inſipid as poſſible, that the flavour of it may not mix among the flavours of the other ingredients. It is the general cuſtom to uſe the proof-ſpirit, but it would be infinitely better to uſe the alcohol, or totally inflammable; partly, as the ſtrength of the *water* would be much better aſcertained that way, the proof ſtrength determined by the crown of bubbles being very vague and uncertain, and that of the alcohol or totally inflammable ſpirit perfectly fixed and certain; and becauſe this ſpirit is always more free from the oil of the ingredient it is made from, and on that account not only approaches more to that ſo much deſired thing, a pure and taſteleſs ſpirit, but being free from oil of its own is the more hungry, the more ready to imbibe that of the ingredients added to it, and has no overpowering taſte to give of its own.

If the method of uſing alcohol be not choſen, let a fine, clear, and pure melaſſes ſpirit of the proof ſtrength be uſed, without any farther addition of *water* in the ſtill, an additional quantity of *water* only taking up room to very bad purpoſe, and prolonging and prejudicing the operation; and when alcohol is employed, it ſhould only be mixed with an equal quantity of pure *water*, to reduce it to the proof ſtrength. When the choice of a ſpirit is thus ſettled, the next thing to be had regard to is the matter of digeſtion, for without this many ingredients will not part with their flavour and virtues at all, and many others but very imperfectly. Cinnamon in particular, if not macerated in the ſpirit a long while before diſtillation, will not part with its heavy oil, which will therefore be left in the ſtill, and thrown away, while the ſlightly impregnated ſpirit is ſaved.

When the ingredients have ſtood a due time in digeſtion, according to their ſeveral natures, the ſpirit is to be drawn from them in the manner that beſt tends to bring over their virtues, whereon the character and expectation of the *water* is founded; ſo if the ingredients naturally abound in a heavy viſcous oil, the operation ſhould be performed with a briſker fire, than when the oil is thin, light, and etherial. Thus ſtrong cinnamon-*water*, after a ſufficient digeſtion to looſen the oil, may be drawn over ſmarter, or with a briſker fire, than citron-*water*, the ſpirit of mint, or the like, in which the oil of the ingredient is thin, and will eaſier aſcend with the ſpirit. The capital thing in this compound diſtilling reſts here, that a ſufficient quantity of the fine eſſential oil of the ingredients be received into, and mixed with the ſpirit, while the groſſer, leſs ſubtile, and leſs agreeable oil is thrown out. To effect this to any degree of perfection, requires that the operation be well conducted from the beginning, that the receiver be changed in due time, and that the ſpirit be prudently made up.

When no regard is had to theſe three particulars, as is uſually the caſe among the apothecaries, the conſequence is, that the *cordial-water* becomes a thick, turbid, and milky liquor, and taſtes more like what the diſtillers call faints, than like a *cordial-water*, and is fitter to give ſickneſs rather than to cure it. At leaſt, before it can be uſed, it muſt either ſtand a long time to fine itſelf, if ever it will fine, or have its groſs and terreſtrial parts precipitated by art. On the contrary, when theſe rules are prudently obſerved, the *water* proves, without farther trouble, clean-taſted, clear, briſk, pleaſant, and refreſhing.

The diſtillers in general make their compound *waters* in a much neater manner than the apothecaries; and what has led them into the way of doing ſo, is their ſtrict obſervance of the bubble-proof, a thing which the apothecaries ſeem either not to underſtand, or to pay very little regard to.

The diſtillers, in the making of their compound *waters*, find that if they let the faints run in among the clear ſpirit, it kills the proof, as they call it, before the time; hence they are inſtructed to leave the faints out, and to make up the ſpirit with pure *water*, reſerving the faints to other uſes, to which they are better adapted, as containing a copious oil; or they let the ſtill work longer than the proceſs for making the *water* would require, and by this means obtain a larger quantity of oil than is commonly imagined: this they preſerve ſeparate, if the oil of only ſome one ingredient; and they ſell large quantities of the oils of juniper, aniſe, and carraway, and the like, to the druggiſts, chemiſts, and apothecaries. But this is a very ſcandalous cheat on the buyer, for there is a very great difference between a pure and clear eſſential oil, that is perfect and entire, and ſuch a one as has, in this manner, been robbed of its lighter and finer parts by diſtillation with a ſpirituous menſtruum.

It is a general rule in this buſineſs to change the receiver as ſoon as the ſpirit runs proof, and make up the quantity with *water*: in this caſe, the whole is certain to be clean and fine; but there are ſome caſes, as in particular in the diſtilling of cinnamon-*water*, where a ſmall quantity of the faints ought to be ſuffered to come into the ſpirit: but this is to be obſerved by way of ſtint, that ſo much is never to be allowed of the faints as will make the *water* milky; for the *water* ſhould always be kept in the ſtate of full proof, as it mellows and ripens, as they expreſs it, much ſooner in this than in any other ſtate. But if the cuſtom could be univerſally introduced, it would be better that all the *waters*, kept by the apothecaries, ſhould be juſt in the ſtate in which they came over, that is, three-fifths of the quantity of the proof ſpirit put into the ſtill: if this were generally brought about, it would be eaſy for the phyſicians to regulate the doſes in their preſcriptions accordingly; every draught and julep that they entered into would be the better for it. Shaw's Eſſay on Diſtillery.

Dr. Shaw in another treatiſe, after obſerving that the apothecaries uſually ſucceed but ill in diſtilling *cordial-waters*, lays down the four following rules, by the obſervance of which the art of making theſe *waters* might be brought to great perfection.

The firſt is, to uſe a well cleanſed ſpirit that is free from its own eſſential oil; for as the deſign of compound diſtillation is to impregnate a ſpirit with the eſſential oil of the ingredients, it ought firſt to be deprived of its own.

The ſecond rule is, to ſuit the time of the digeſtion of the ingredients to their tenacity, or the ponderoſity of their oil: thus rhodium-wood and cinnamon require to be longer digeſted, before they are diſtilled, than calamus aromaticus, or lemon-peel. Sometimes alſo cohobation, or the pouring of the ſpirit, already diſtilled, back upon the ingredients, proves neceſſary, as particularly in making the ſtrong cinnamon-*water*, where the eſſential oil is extremely ponderous, and difficultly riſes along with the ſpirit without this cohobation.

The

The third rule is, to suit the degree of fire, or strength of the distillation, to the ponderosity of the oil intended to be raised with the spirit: thus strong cinnamon-*water* should be distilled off brisker, than the spirit of mint or baum.

The fourth rule is, that a due proportion of only the finer essential oil of the ingredients be thoroughly united, or incorporated with the spirit, so as to keep out the grosser and less fragrant oil. This may chiefly be effected by leaving out the faints, and making up to strong proof with fine soft *water* in their stead.

The addition of sugar to *cordial-waters* is a thing of little moment, and may therefore be omitted. If the four rules before laid down be duly observed, there is no occasion for distilling in balneo Mariæ, nor for fining down *waters* with alum, whites of eggs, isinglass, or the like, for they will be presently bright, sweet, and pleasant tasted, without any farther trouble. Shaw's Lectures, p. 127.

WATERS, *alexipharmic*, or *alexiterial*, are *waters* that resist poisons, and the plague. Such are those of angelica, scorzonera, citron, orange, scordium, rue, &c. Such also are *treacle-water*, *plague-water*, *milk-water*, *poppy-water*, &c. See AQUA *Alexiteria*.

WATER, *alum*, is a vulnerary *water*, thus called, because the basis, or principal ingredient thereof, is alum. See AQUA *Aluminosa*.

WATER, *angelica*, is usually prepared of brandy, angelica-roots and seeds, carduus, baum, fennel-seed, &c. the whole beat together in a mortar; infused for a night in French brandy, and then distilled. It is reputed a good carminative, and cordial, as also a cephalic, &c. See ANGELICA, and *Alexiteria* AQUA.

WATER, *aniseed*. To six ounces of bruised aniseeds, add a gallon of melasses spirit, and two quarts of *water*; distil a gallon, and, if you require it sugared, add half a pound of clarified sugar; but many prefer it without: and strain the whole.

The compound *aniseed water*, commonly kept in the shops, is prepared from a mixture of equal parts of the seeds of aniseed and angelica, by drawing off a gallon of proof spirit from half a pound of each of the seeds. Lewis.

WATER, *apricot*. See APRICOT.

WATERS, *aromatic*, we have already spoken of among the simple *waters*.

They are such as are impregnated by distillation with the spiritus rector, or odoriferous principle of aromatic matters. If spirit of wine be impregnated in the same manner, the *waters*, as they have been called, ought to be distinguished by the name of *aromatic spirituous waters*. Those that are impregnated with the smell of one substance are called simple, and those impregnated by means of several substances compound.

WATERS, *arthritic*, are *waters* good against the gout, palsy, tremors, pains in the joints, &c. Such are those of piony, chamæpitys, betony, rosemary, &c.

WATER, *bryony*, is one of the compound *waters* prescribed in the College Dispensatory; prepared from bryony-roots, rue, mugwort, savin, feverfew, dittany, &c. It is a good hysteric, opens menstrual obstructions, &c.

WATER, *carduus*, is made from carduus benedictus pounded in a mortar, and put in an alembic: then a sufficient quantity of the juice of the same plant, drawn by expression, is poured into the alembic, that the herbs swimming in the juice may be in no danger of sticking to the bottom of the cucurbit in distillation. Lastly, fitting on the head, and luting the joints, distil half as much as you put in. This *water* is said to be sudorific; and good against the plague, malignant fevers, &c.

WATER *of separation* or *depart*, is only AQUA *fortis*; thus called, because serving to separate gold from silver. See DEPART. It is also called

WATER, *caustic*, and is prepared of a mixture of spirit of nitre and vitriol, drawn by force of fire; to which are sometimes added alum, &c.

It dissolves all metals, gold only excepted. The invention of aqua fortis is usually referred to the thirteenth century: though some hold it to have been known in the time of Moses.

WATERS, *cephalic*, are *waters* proper to strengthen and comfort the brain. Such are those of rosemary, marjoram, sage, piony, betony, baum, &c.

WATER, *chalybeate*, is a *water* wherein red-hot steel has been quenched. It is astringent, and good, like ferruginous, or iron *waters*, for diarrhœas, &c.

WATER, *cherry*. In a quart of *water* crush half a pound of cherries, with four or five ounces of sugar. Strain the whole through a cloth till it be very clear.

WATER, *cinnamon*. In a gallon of spirit, distil a pound of cinnamon: add four ounces of sugar. Or thus: take a pound of cinnamon, three pounds of *rose-water*, and as much white-wine: bruise the cinnamon, infuse it fourteen days, then distil it. The first quart that rises is the best; then the second; then the third. Or, steep one pound of cinnamon-bark, bruised, in a gallon and a half of *water*, and one pint of brandy, for two days; and then distil off one gallon. For a spirituous *cinnamon-water*, take of cinnamon, one pound; proof spirit and common *water*, of each one gallon: steep the cinnamon in the liquor for two days; then distil off one gallon.

WATER, *citron*. See CITRON.

WATER, *clary*. See CLARY.

WATER, *clove*. See CLOVE.

WATER, *copper*. See ZIMENT.

WATERS, *cordial*, or *cardiac*, are *waters* proper to strengthen and comfort the heart. Such are those of endive, chicory, bugloss, borrage, marigolds, &c. See CORDIAL.

WATERS, *cosmetic*, are *waters* proper to cleanse, smoothen, and beautify the skin.

WATERS, *distilled*, of *laurel-leaves*, poisonous. See LAUREL.

WATER, *fennel*. Distil a pound of dried fennel, with a gallon of *water*. See FENNEL.

WATER, *gentian*. Take four pounds of gentian-roots, either green or dried; mince them small, infuse them in white-wine, or only sprinkle them therewith; then distil them, with the addition of a little centaury the less. This is frequently used as a stomachic, and is also commended for a deterger; serving in dropsies, jaundice, obstructions of the viscera, &c. but it is really of very little virtue.

WATER, *gum*, is that made by letting gum Arabic, inclosed in a linen rag, infuse in common *water*. The ladies also make a thick *water* for their hair, of quince-kernels steeped in *water*.

WATERS, *hepatic*, are those used to cleanse, strengthen, and refresh the liver. Such are those of chicory, the capillaries, purslain, agrimony, fumitory, &c.

WATER, *honey*, is a *water* prepared of honey and ambergrise, distilled with spirit of wine. The poor people also have a drink, which they call by this name; they procure it in places where much honey is made, by washing out the honey-combs, and the vessels they have been in, in common *water*. This gives it a honey taste, and it afterwards becomes very clear, and the people use it as common drink.

WATER, *horse-raddish*, *aqua raphani*, is prepared of the juice of scurvy-grass, brook-lime, water-cresses, white-wine, lemon-juice, bryony-root, horse-raddish, Winter's-bark, and nutmeg, digested in spirits, and distilled. It is a good diuretic; cleansing and removing obstructions of the viscera, promoting perspiration, &c.

WATER, *Hungary*. See HUNGARY *Water*.

WATERS, *hysteric*, are those proper to strengthen the matrix, or womb, and remedy the disorders that befal it. Such are those of bryony, matricary or motherwort, hyssop, fennel, baum, mugwort, smallage, &c.

WATERS, *iced*, or *frozen*, are certain agreeable and wholesome *waters*, as *orange-water*, or the like, artificially frozen in summer-time, particularly in hot countries, to be used in collations, &c. as coolers. The way of making them is thus: the vessels containing the liquors designed to be frozen, are first set in a pail, in such manner as not to touch each other; then they are covered up, and the void space in the pail filled with common ice, beaten, and mixed with salt. Every half-hour they clear out what *water* the thawing ice sends to the bottom of the pail, by means of a hole at bottom; and at the same time stir up the liquors with a spoon, that they may freeze into snow: for were they to shoot in form of ice, or icicles, they would have no taste. Then, covering the vessels again, they fill up the pail with more beaten ice and salt, in lieu of that dissolved and evacuated. The more expeditious the freezing is required to be, the more salt is to be mixed with the ice. See ICE.

WATER, *imperial*, *aqua imperialis*, is a *water* distilled from cinnamon, nutmeg, citron-peel, cloves, calamus aromaticus, santal, and divers other simples, infused in white-wine and *baum-water*. It is a pleasant cordial dram, and is good against diseases of the brain, stomach, and womb.

WATER, *juniper*, is a compound *water*, made of brandy, and juniper-berries beaten therein, and distilled. This is commonly called GENEVA.

WATER, *lime*, is common *water*, wherein quick-lime has been slaked; afterwards filtred. See LIME-*water*.

WATER, *milk*, *aqua lactis*, is prepared of mint, wormwood, carduus benedictus, goat's-rue, and meadow-sweet, bruised, infused in milk, and drawn off by distillation. It is held alexipharmic, and cephalic.

WATER, *aqua mirabilis*, or *the wonderful*, is prepared of cloves, galangals, cubebs, mace, cardamoms, nutmeg ginger,

ginger, and spirit of wine, digested twenty-four hours, then distilled. It is a good and agreeable cordial, carminative, &c.

WATERS, *nephritic*, are such as strengthen the reins, and help them to discharge, by urine, any impurities therein. Such are those of the honeysuckle, pellitory, raddish, beans, mallows, &c. See NEPHRITIC.

The *nephritic water* of Dr. Radcliff, popularly called Dr. *Radcliff's water*, was taken into one of the editions of the College Dispensatory. It is prepared from the kernels of black cherries, peaches, and bitter almonds, beaten in a mortar into a paste, with Rhenish wine; and seeds of smallage, treacle, mustard, gromwell, and parsley, beaten likewise, and added thereto: to the mixture are put juniper-berries, garlick, onions, leeks, pimpernel, horse-radish, calamus aromaticus, cinnamon, wall-rue, mace, and nutmegs: the whole macerated in Rhenish, spirit of black cherries, &c. and thus distilled. It is said to be one of the most powerful detergers and cleansers known; and good in the dropsy, jaundice, asthma, pleurisy, &c.

WATERS, *opthalmic*, or *eye*, are such as are good in disorders of the eyes. Such are those of eye-bright, fennel, vervain, plantain, celandine, cyanus, &c.

WATER, *blue eye*. See SAPPHIRINA *aqua*.

WATERS, *orange-flower*, is made of common *water* and orange-flowers infused, and then distilled. After the like manner, one may make *waters* of divers other flowers; as violets, jonquils, jessamines, tuberoses, &c.

WATER, *peach*, is made after the same manner as *apricot-water*; only with peaches.

WATER, *penny royal*. See PENNY-*royal*.

WATER, *pepper*. See PEPPER-*water*, and PIMENTO.

WATER, *pepper-mint*. See MINT.

WATER, *phagædenic*. See PHAGÆDENIC *Water*.

WATER, *plague*, *aqua epidemica*, is prepared from the roots of masterwort, angelica, pyony, and butter-bur; vipergrass, Virginia snake-root, rue, rosemary, baum, carduus, water-germander, marigold, dragon, goat's-rue, and mint; the whole infused in spirit of wine, and distilled. It is of frequent use, as an alexipharmic: it revives the spirits, and promotes a diaphoresis. It is the basis of many juleps prescribed, especially in feverish cases.

WATER, *poppy*, is prepared from the flowers of wild poppies, infused in white wine, or brandy, and drawn off in a cold still. It is a cordial, and is good against the colic, and by some called *red plague-water*.

WATER, *pyony*, is made of pyony and lime-flowers, and lily of the valley steeped in canary, and distilled: to these ingredients are added the root of male pyony, white dittany, birth-wort, rue, castor, cubebs, cinnamon, betony, &c. It is a good cordial, and is much used in nervous cases.

WATER, *rose*, is made of damask roses fresh-gathered, six pounds being distilled with two gallons of common *water*, and drawing off one gallon.

WATER, *scordium*, is prepared from the juices of goat's-rue, sorrel, scordium, citrons, and Venice treacle, digested and distilled. It is an alexipharmic.

WATER, *second*. See *Secunda* AQUA.

WATER, *sorrance*. See SORRANCE.

WATERS, *specific*, are such as have some peculiar virtue, appropriate to certain diseases. Thus *purslain-water*, wherein mercury has been infused, is said to be a specific against worms in young children.

WATER, *spear-mint*. See MINT.

WATERS, *splenetic*, are those proper against diseases of the spleen. Such are those of the tamarisk, cuscuta, harts-tongue, hops, &c. See SPLEEN.

WATERS, *Stephens's*, *aqua Stephani*, is made from cinnamon, ginger, galangals, cloves, nutmegs, paradise-grains, aniseeds, sweet-fennel, carraway, thyme, mint, sage, penny-royal, pellitory, rosemary, red roses, camomile, origany, and lavender, steeped in French brandy, or spirit of wine, and distilled. It is a good cephalic and cardiac, and is also reputed an hysteric.

WATERS, *stomachic*, are such as have the virtue to cleanse, strengthen, and confirm the stomach. As red *rose-water*, *mint-water*, *aniseed-water*, &c.

WATER, *Stygian*. See AQUA *Regalis*.

WATER *styptic*, is made by boiling blue vitriol and alum, of each an ounce and a half, in one pint of *water*, till the salts are dissolved; then filtering the liquor, and adding to it a dram of the oil of vitriol. This *water* is used for stopping bleeding at the nose, and other hæmorrhages; for which purpose cloths or dossils dipt in it must be applied to the part. See STYPTIC.

WATER, *sublimate*, is made by dissolving eight grains of the corrosive sublimate in a pint of common *water*. If a stronger solution be wanted, a double or triple quantity may be used. This is principally intended for cleansing foul ulcers, and consuming proud flesh.

WATER, *sulphur*. See AQUA *sulphurata*.

WATER, *surfeit*. See SURFEIT.

WATER, *tar*. See TAR-*water*.

WATER, *treacle*, *aqua theriacalis*. See TREACLE-*water*.

WATER, *vulnerary*, is a *water* proper for the healing of wounds, prepared from the juice of vulnerary plants; as sanicle, and the like.

WATER-*calamint*, in *Botany*, the name used by some for a species of MINT.

WATER-*cress*. See CRESSES.

WATER-*drop-wort*. See DROP-*wort*.

WATER, *elephant*, in *Zoology*. See HIPPOPOTAMUS.

WATER-*germander*. See GERMANDER.

WATER-*hemp-agrimony*. See *Water-Hemp*-AGRIMONY.

WATER-*hen*, in *Ornithology*. See MOOR-*hen*.

WATER-*hog*, in *Zoology*. See CAPYBARA.

WATER-*leaf*. See *Water*-LEAF.

WATER-*lily*. See LILY.

WATER *ouzell*, in *Ornithology*. See OUZELL.

WATER-*parsnep*. See PARSNEP.

WATER-*pepper*. See PEPPER.

WATER-*rail*. See RAIL.

WATER-*rat*. See MUS.

WATER-*soldier*, a species of STRATIOTES.

WATER-*worm*, *reproduction of*, in *Natural History*. See REPRODUCTION, and *Water*-WORM.

WATER, in *Anatomy*, &c. is applied to divers liquors, or humours, in the human body.

Such is the aqua phlegmatica, *phlegmatic water*; which is a soft serous humour contained in the pericardium, and wherein the heart swims.

Anatomists are divided about it: some will not have it natural, but suppose it separated forcibly during the pangs of death: their reason is, the difficulty they meet with in tracing its passage, or how it is carried off. The latest anatomists, however, seem to agree to its being a natural and necessary humour: and one reason is, that it is found even in the pericardiums of fœtuses.

It has likewise been disputed whence it should be separated. The most probable opinion is, that it is secreted by some glands about the basis of the heart; and that it distils thence, drop by drop, into the cavity of the pericardium, in such quantity, as just to supply what is expended daily by the motion and warmth of the heart; and so needs no evacuation. Its use is to moisten, lubricate, and cool the heart, and prevent the inflammation that might arise from the dry friction of the heart and pericardium. So that it does the same office to the heart, that the *water* does wherein the fœtus swims; which, without it, would not have liberty to move at all.

WATER is also used in divers ceremonies, both civil and religious. Such are the *baptismal water*, *holy water*, &c.

WATER, *holy*, is a *water* prepared every Sunday in the Romish church, with divers prayers, exorcisms, &c. used by the people to cross themselves with at their entrance, and going out of church; and pretended to have the virtue of washing away venial sins, driving away devils, preserving from thunder, dissolving charms, securing from, or curing diseases, &c.

The use of *holy water* appears to be of a pretty ancient standing in the church: witness St. Jerom, in his life of St. Hilarion, and Gretser, de Benedict. cap. x. &c.—M. Godeau attributes its original to Alexander, a martyr under the emperor Adrian.

Many of the reformed take the use of *holy water* to have been borrowed from the LUSTRAL *water* of the ancient Romans: though it might as well be taken from the sprinkling in use among the Jews. See Numbers xix. 17.

Urban Godfrey Siber, a German, has a dissertation printed at Leipsic, to shew, by proofs brought from church-history, that one may give *holy water* to drink to brutes.

Bitter WATERS *of jealousy*. In the Levitical law, we find mention made of a *water*, which served to prove whether or no a woman were an adultress. The formula was this: the priest, offering her the *holy water*, denounced, "If thou hast gone aside to another, instead of thy husband, and if thou be defiled, &c. the Lord make thee a curse and an oath among thy people, by making thy thigh to rot, and thy belly to swell; and this *water* shall go into thy bowels, to make thy belly to swell, and thy thigh to rot." And the woman shall say, *Amen*. "These curses the priest shall write in a book, and blot them out with the *bitter water*." When he hath made her drink the *bitter water*, it shall come to pass, that, if she be defiled, the *water* shall enter into her, and become bitter, and her belly shall swell," &c. "If she be not defiled, she shall be free, and conceive seed." Numbers, chap. v.

WATER

WATER *ordeal*, or *trial*, was of two kinds; by hot, and by cold *water*. See ORDEAL.

WATER, *interdiction of fire and*. See INTERDICTION.

WATER, among *Jewellers*, is properly the colour or luſtre of diamonds and pearls; thus called, by reaſon theſe were anciently ſuppoſed to be formed, or concreted of *water*.

The term is ſometimes alſo uſed, though leſs properly, for the colour or hue of other precious ſtones.

WATER, *aſcent of*, in *Hydraulics*. See ASCENT, and CAPILLARY *tubes*.

WATER-*bailiff*. See BAILIFF.

WATER-*bearer*, in *Aſtronomy*. See AQUARIUS.

WATER-*bellows*, in *Mechanics*. See BELLOWS.

WATER-*bomb*, a name given by our chemiſt Godfrey to a machine he invented on the plan of Greyl's diſcovery, for the extinguiſhing of accidental fires in houſes. He conſidered firſt, that the unmanageable ſize of Greyl's engine was a very great objection; and on this plan contrived a medicated liquor, which was ſuch an enemy to fire, that a very ſmall quantity would extinguiſh as much as a much larger of common *water*; and this liquor had the farther advantage, that it might be kept ever ſo long without corrupting, and by that means the veſſels containing it would remain always fit for uſe; whereas in Greyl's method they muſt have been rotted by the corrupting and fermenting of the *water*, after a few years. The author of this invention tried it twice in public with us, and both times with all the ſucceſs that could be wiſhed; but the ſtructure of the veſſel was ſo much the ſame with that of Greyl's, that Godfrey cannot be allowed any farther merit as an inventor, than that of contriving the medicated liquor inſtead of common *water*. The machine is a wooden veſſel, made very firm and ſtrong, that the liquor, when once put in, cannot leak out any where; in the centre of this is an oblong, cylindric veſſel, which is filled with gunpowder; a tube is brought from this to the head of the barrel; and this being filled with combuſtible matter, and the inner caſe with powder, and both made of plate-iron, that no *water* may get in, the veſſel is then filled with the medicated, or antiphlogiſtic liquor. The top of the tube is then covered, and the thing ſet by for uſe.

When there is occaſion for it, it is only neceſſary to uncover the tube, and ſetting fire to the matter in it, it is conveyed to the veſſel containing the powder, and the whole machine being thrown into the place where the fire is, is torn to pieces by the exploſion, and the extinguiſhing liquor ſcattered every way about, on which the fire is quenched in an inſtant.

The contriver of theſe things propoſed the making of three kinds of them, the one containing five gallons of the liquor: this was the largeſt ſize, and contrived for the largeſt rooms, and moſt urgent neceſſities. The ſecond kind contained three gallons; and the ſmalleſt, which was meant for a cloſet, or other little room, contained only two gallons. The ſmaller kind alſo had ſometimes a peculiar difference in their ſtructure, the powder-veſſel being placed not in the centre, but at the bottom: the intent of this was to fit them for chimneys, when on fire, as by this means the liquor, not being wanted to be ſcattered on all ſides, was carried moſtly upwards. Theſe were fixed on the end of a long pole, and by this means thruſt to a proper height up the chimney; and the tube that communicated the fire was placed downwards.

The manner of uſing the machines for rooms on fire, is this: the perſon who has the care of them is to throw them as nearly as may be into the middle of the room, and then to retire to a little diſtance: as ſoon as he hears the exploſion, he may ſafely enter the room, and with a cloth, or any thing of that kind, put out any remaining ſparks of fire that there may be in particular places. If the room be ſo large, that one of the machines cannot diſperſe the liquor to every part of it, two are to be uſed, one being laid at each end; and if ſeveral rooms are on fire at once, as many of the machines are to be uſed, one being thrown into each room. If a whole houſe is on fire, the lower rooms are firſt to be taken care of, and after theſe the upper, as they aſcend.

Our Godfrey had ſcarce better ſucceſs than his predeceſſor Greyl; for while he was making his public experiments, one Povey, collecting ſome of the fragments of his broken veſſels, found out the ingredient uſed in the medicated liquor, and made and ſold the things in the ſame place where he had proved his right to them. It is probable that the medicated liquor was no other than common *water*, with a large quantity of ſal ammoniac, that ſalt having this virtue of extinguiſhing fire in a very remarkable degree. But it is greatly to be wondered at, that while all the world were convinced by experiments of the uſe of the machine, the author made but little advantage of it, and it is now diſuſed. Act. Erudit. Ann. 1724, p. 183.

The ſociety of arts and manufactures, &c. made trials of balls, prepared in Mr. Godfrey's method, by his grandſon, in a proper edifice erected for this purpoſe; and they found, that, after the fire had prevailed for a conſiderable time, and the flame forced its way through the chimney and windows, it diſappeared, and was entirely extinguiſhed by the exploſion of two of theſe balls. See FIRE, *extinguiſhing of*.

WATER-*borne*, in the *Sea-Language*, denotes the ſtate of a ſhip, with regard to the *water* ſurrounding her bottom, when there is barely a ſufficient depth of it to float her off from the ground; particularly when ſhe had for ſome time reſted thereon.

WATER *camblets*. See CAMBLET.

WATER, *cataract of*. See CATARACT.

WATER-*clock*. See CLEPSYDRA.

WATER-*colours*, in *Painting*, are ſuch colours as are only diluted and mixed up with *gum-water*: thus called, in contradiſtinction to *oil-colours*. See WASHING.

The uſe of *water-colours* makes what we call LIMNING; as that of oil-colours does PAINTING, properly ſo called.

Painters in *water-colours* have been often afflicted with the diſeaſe called COLICA *Pictonum*, occaſioned by the poiſonous quality of ſeveral of the pigments which they uſe; and which, by putting the point of their pencils between their lips, whilſt they are ſtudying their ſubject, they inſenſibly ſwallow. Dr. Fothergill ſays, that, when the vomitings are abated, copious diſcharges by ſtool are procured, and the functions of the bowels in a degree reſtored to their uſual ſtate by the method purſued in the cure of the colica Pictonum; nothing contributes ſo effectually to reſtore the uſe of the limbs, when impaired by theſe cauſes, as the liberal and conſtant uſe of the tinctura guaiacina volatilis; which may be given in ſuch quantity, as to keep the body gently open; mixed with a little common ſugar or honey, and then diluted with any weaker mucilaginous liquor, as thin gruel, or barley-water, or marſhmallow-tea. Med. Obſ. vol. v. p. 394.

WATER-*column*. See COLUMN.

WATER, *cut*. See CUT-*water*.

WATER, *dead*, in the *Sea-Language*. See DEAD-*water*.

WATER-*dog*. See DOG.

WATER-*farcin*. See FARCIN.

WATER, *foul*, in *Sea-Language*. See FOUL.

WATER-*fowl*. See FOWL.

WATER-*engine*, in *Mechanics*, denotes either an engine to raiſe *water*, or any engine that moves by the force of *water*.

WATER-*gage*, an inſtrument to meaſure the depth or quantity of any *water*. See GAGE.

WATER-*gang*, a channel cut to drain a place, by carrying off a ſtream of *water*.

WATER-*gavel*, in our *Old Writers*, a rent paid for fiſhing in, or other benefits received from, ſome river.

WATER-*gilding*. See GILDING.

WATER, *high*. See FLUX, HIGH, and TIDE.

WATER-*level*. See LEVEL.

WATER-*lines*, in a *Ship*, are certain horizontal lines, ſuppoſed to be drawn about the outſide of her bottom, cloſe to the ſurface of the *water* in which ſhe floats. They are accordingly higher or lower upon the bottom, in proportion to the depth of the column of *water* required to float her. See SHIP.

WATER-*logged*, in *Sea-Language*, denotes the ſtate of a ſhip when, by receiving a great quantity of *water* into her hold, by leaking, &c. ſhe has become heavy and inactive upon the ſea, ſo as to yield without reſiſtance to the effort of every wave ruſhing over her deck. In this dangerous ſituation of a ſhip, the crew have no reſource, except to free her by the pumps, or to abandon her by the boats as ſoon as poſſible. Falconer.

WATER, *low*. See FLUX, and TIDE.

WATER-*machine*. See MACHINE.

WATER, *to make*, in *Sea-Language*. See MAKE.

WATER-*meaſure*. Salt, ſea-coal, &c. while aboard veſſels in the pool, or river, are meaſured with the corn-buſhel heaped up; or elſe five ſtriked pecks are allowed to the buſhel. This is called *water-meaſure*; and this exceeds Wincheſter-meaſure by about three gallons in the buſhel.

WATER *microſcope*. See MICROSCOPE.

WATER *mill*. See MILL.

WATER, *motion of*, in *Hydraulics*. The theory of the motion of running *water* is one of the principal objects of hydraulics, and many eminent mathematicians have applied themſelves to this ſubject. But it were to be wiſhed that their theories were more conſiſtent with each other, and with experience. The curious may conſult ſir Iſaac Newton's Principles, lib. ii. prop. 36. with the comment.

comment. Dan. Bernouilli's Hydrodynamica. Jo. Bernouilli, Hydraulica, Oper. tom. iv. p. 389, seq. Dr. Jurin, in the Phil. Trans. Nº 452, and in Dr. Martyn's Abridg. vol. viii. p. 282, seq. s'Gravesande, Physic. Elem. Mathemat. lib. iii. par. 2. Polenus, de Castellis, and others.

Mr. Maclaurin, in his Fluxions, art. 537, seq. has illustrated sir Isaac Newton's doctrine on this intricate subject, which still, notwithstanding the labours of all these eminent authors, remains in a great measure obscure and uncertain. Even the simple case of the motion of running *water*, which is when it issues from a hole in the bottom of a vessel kept constantly full, has never yet been determined, so as to give universal satisfaction to the learned. We shall here mention some of the phenomena of this motion, as stated by Dr. Jurin from Poleni; referring for other observations on this subject to Fluids, and *Hydraulic Laws of* Fluids.

1. The depth of the *water* in the vessel, and the time of flowing out being given, the measure of the effluent *water* is nearly in proportion to the hole.

2. The depth of the *water*, and the hole being given, the measure of the effluent *water* is in proportion to the time.

3. The time of flowing out, and the hole being given, the measure of the effluent *water* is nearly in a subduplicate proportion to the height of the *water*.

4. The measure of the effluent *water* is nearly in a ratio compounded of the proportion of the hole, the proportion of the time, and a subduplicate proportion of the depth of the *water*.

5. The measure of the *water* flowing out in a given time, is much less than that which is commonly assigned by mathematical theorems. For the velocity of effluent *water* is commonly supposed to be that which a heavy body would acquire in vacuo in falling from the whole height of the *water* above the hole; and this being supposed, if we call the area of the hole F, the height of the *water* above the hole A, the velocity which a heavy body acquires in falling in vacuo from that height V, and the time of falling T; and if the *water* flows out with this constant velocity V, in the time T, then the length of the column of *water*, which flows out in that time will be 2 A, and the measure of it will be 2 A F. But if we calculate from Poleni's accurate experiments, we shall find the quantity of *water* which flows out in that time to be no more than about $\frac{571}{1000}$ of this measure 2 A F. Polen. de Castellis, art. 35, 38, 39, 42, 43.

Poleni also found, that the quantity of *water* flowing out of a vessel through a cylindrical tube far exceeded that which flowed through a circular hole made in a thin lamina, the tube and hole being of equal diameter, and the height of the *water* above both being also equal; and he found it to be so when the tube was inserted, not into the bottom, which others had observed before, but into the side of the vessel.

6. Since the measure of the *water* running out in the time T, is $2\,A\,F \times \frac{571}{1000}$, the length of the column of *water*, which runs out in that time, is $2\,A \times \frac{571}{1000}$. Therefore if each of the particles of *water*, which are in the hole in the same space of time, passes with equal velocity, it is plain that the common velocity of them all is that with which the space $2\,A \times \frac{571}{1000}$ would be gone over in the time T, or the velocity $V \times \frac{571}{1000}$. But this is the velocity with which *water* could spring in vacuo to near $\frac{1}{3}$ of the height of the *water* above the hole.

7. But when the motion of *water* is turned upwards, as in fountains, these are seen to rise almost to the entire height of the *water* in the cistern. Therefore the *water*, or at least some portion of the *water*, spouts from the hole with almost the whole velocity V, and certainly with a much greater velocity than $V \times \frac{571}{1000}$.

8. Hence it is evident, that the particles of *water*, which are in the hole in the same point of time, do not all burst out with the same velocity, or have no common velocity; though some mathematicians have hitherto taken the contrary to be certain.

9. At a small distance from the hole, the diameter of the vein of *water* is much less than that of the hole. For instance, if the diameter of the hole be 1, the diameter of the vein of *water* will be $\frac{21}{25}$, or 0.84, according to sir Isaac Newton's measure, who first observed this phenomenon; and according to Poleni's measure $\frac{20}{26}$, or $\frac{20\frac{1}{2}}{26}$, that is, taking the mean diameter 0 78, nearly.

As to the manner of accounting for these phenomena, we have already observed, that authors are not agreed; and it would be far beyond our design to state their different theories, we must therefore refer to the originals above quoted.

Neither are authors agreed as to the force with which a vein of *water*, spouting from a round hole in the side of a vessel, presses upon a plane directly opposed to the motion of the vein. Most authors agree, that the pressure of this vein, flowing uniformly, is equal to the weight of a cylinder of *water*, the basis of which is the hole through which the *water* flows, and the height of which is equal to the height of the *water* in the vessel above the hole. The experiments made by Mariotte, and others, seem to countenance this opinion. But Mr. Daniel Bernouilli rejects it, and estimates this pressure by the weight of a cylinder, the diameter of which is equal to the contracted vein (according to sir Isaac Newton's observation above mentioned), and the height of which is equal to twice the height of the *water* above the hole, or, more accurately, to twice the altitude corresponding to the real velocity of the spouting *water*; and this pressure is also equal to the force of repulsion, arising from the reaction of the spouting *water* upon the vessel. For he says that he can demonstrate, that this force of repulsion is equal to a pressure exerted by a vein of spouting *water* upon a plane directly opposed to its motion, if the whole vein of *water* strikes perpendicularly against the plane. From whence it would follow, that the pressure or force of the vein will be greater in proportion, as its contraction is less; and this contraction vanishing, as it does when the *water* spouts through a short tube, and the vein being at the same time supposed to have the whole velocity it can acquire by theory, the spouting *water* will then exert a pressure double to what is commonly supposed. But the actual velocity of the *water* being always something less than it ought to be by theory, and the vein of *water* being not uncommonly contracted to almost one half, experiments have led authors to think, that the pressure, exerted by spouting *water*, was equal to the weight of a cylinder of the same diameter with the vein, and of the height of the *water* above the hole. The ingenious author remarks, that he speaks only of single veins of *water*, the whole of which are received by the planes upon which they press; for as to the pressures exerted by fluids surrounding the bodies they press upon, as the wind, or a river, the case is different, though confounded with the former by writers on this subject. Hydrodynamica, sect. 13. p. 289.

M. Bernouilli endeavours to confirm his theory by a dissertation in the eighth volume of the Acta Petropolitana; where he observes, that the experiments formerly made before the Academy of Sciences at Paris, to establish the quantity of the pressure exerted by a vein of spouting *water*, are very far from proving the truth of the rule they are brought to establish. For instance, in one of those experiments, the height of the *water* in the vessel above the hole from whence the vein spouted, was two feet Paris measure; the diameter of the circular hole, which was cut in the horizontal bottom of the vessel, was four lines; and the force of the vein of *water* was observed to be one ounce and three quarters. But the weight of a cylinder of *water* of the diameter of the hole, and of the height of the *water* in the vessel, is scarce equal to one ounce and three eighths. The difference therefore is at least three eighths of an ounce, which is about three elevenths of the whole weight of the before mentioned cylinder of *water*. So that it is surprising, that this difference should have been ascribed to the removal of the plane, receiving the impulse, to some distance from the hole; for this cause, supposing the plane removed to the distance of two inches, could not produce an increase of one sixteenth of an ounce. It appears, therefore, that the common opinion is rather overturned, than confirmed by experience. Du-Hamel, Hist. Acad. Paris, ann. 1679. sect. 3. cap. 5.

Mr. Bernouilli, on the other hand, thinks his own theory sufficiently established by the experiments he relates; for the particulars of which, we refer to the Acta Petropolitana, vol. cit. p. 122, seq.

This ingenious author thinks, that his theory of the quantity of the force of repulsion, exerted by a vein of spouting *water*, might be usefully applied to move ships by pumping; and he thinks the motion produced by this repulsive force would fall little, if at all, short of that produced by rowing. He has given his reasons and computations at length in his Hydrodynamica, p. 203 to 302.

The science of the pressures exerted by *water*, or other fluids in motion, is what Mr. Bernouilli calls *hydraulico-statica*. This science differs from hydrostatics, which considers only the pressure of *water* and other fluids at rest; but hydraulico-statics considers the pressure of *water* in motion. Thus the pressure exerted by *water*, moving through pipes, upon the sides of those pipes, is an hydraulico-statical consideration, and has been erroneously determined by many, who have given no other rules in these cases, but such as are applicable only to the

pressure

preſſure of fluids at reſt. See Hydrodynam. ſect. 12. p. 256, ſeq.

WATER-*organ*. See ORGAN.

WATER, *petrifying*. See PETRIFYING.

WATER-*poiſe*. See HYDROMETER, and ARÆOMETER.

Dr. Hooke has contrived a *water-poiſe*, which may be of good ſervice in examining the purity, &c. of *water*. It conſiſts of a round glaſs ball, like a bolt-head, about three inches in diameter, with a narrow ſtem or neck, one twenty-fourth of an inch in diameter; which being poiſed with red lead, ſo as to make it but little heavier than pure ſweet *water*, and thus fitted to one end of a fine balance, with a counterpoiſe at the other; upon the leaſt addition of even $\frac{1}{2000}$th part of ſalt to a quantity of *water*, half an inch of the neck will emerge above the *water*, more than it did before. Phil. Tranſ. Nº 197.

WATER, *raiſing of*, in *Hydraulics*. The great uſe of raiſing *water* by engines for the various purpoſes of life, is well known. Machines have in all ages been contrived with this view; a detail of the beſt of which, with the theory of their conſtruction, would be very curious and inſtructive. Monſieur Belidor has executed this part in his Architecture Hydraulique. Dr. Deſaguliers has alſo given us a deſcription of ſeveral engines to raiſe *water*, in his Courſe of Experimental Philoſophy, vol. ii. not to mention the compilers of treatiſes under the title of Theatres of Machines, &c.

Dr. Deſaguliers has ſettled the maximum of engines for raiſing *water*, thus: a man with the beſt *water-engine* cannot raiſe above one hogſhead of *water* in a minute, ten feet high, to hold it all day; but he can do almoſt twice as much for a minute or two.

Dr. Deſaguliers obſerves, that when we come to examine the beſt engines, and thoſe that are moſt extolled, if we look narrowly into them, and meaſure the *water* they deliver, and at what height they deliver it; or bring to calculation the beſt atteſted relations concerning them, we ſhall find that they do not exceed this maximum, though they may far out-do ſome very bad engine with which they are compared.

Mr. Daniel Bernouilli thinks that a man may, with the moſt perfect machine, raiſe one cubic foot of *water*, in one ſecond of time, to the height of one foot. But by an experiment he made at Geneva with a good pump, he found that a man could not raiſe above four fifths of that quantity. Hydrodyn. p. 199.

Yet the greateſt quantity, mentioned by Mr. Bernouilli, falls ſhort of Dr. Deſaguliers's maximum; for according to the doctor's rule, one hogſhead being equivalent to eight cubic feet, and the raiſing one hogſhead of *water* to the height of ten feet being equivalent to the raiſing of ten hogſheads of *water*, or eighty cubic feet to the height of one foot, it follows, that a man may raiſe eighty cubic feet of *water* in one minute, to the height of a foot. But by Mr. Bernouilli's rule, he can only raiſe ſixty cubic feet of *water* to that height in the ſame time.

Engines for raiſing *water* are either ſuch as throw it up with a great velocity, as in jets; or ſuch as raiſe it from one place to another by a gentle motion. For the general theory of theſe engines, ſee Daniel Bernouilli's Hydrodynamica.

We ſhall here ſubjoin, for the information and amuſement of the reader, an account of the method of raiſing *water* by applying a running ſtream to two curious engines, admirably conſtructed for this purpoſe. The firſt engine is that erected by Mr. Alderſea, at Blenheim, for the duke of Marlborough. Let A A (*Tab.* VII. *Hydraulics*, *fig.* 79.) be a wheel, turned by the fall of *water* B B; and have any number of cranks (e. gr. ſix), as C, D, E, F, G, H, on its axis, according to the force of the fall of *water*, and the height to which the *water* is intended to be raiſed by the engine. As the wheel turns round, theſe cranks move the levers *c*, *d*, *e*, *f*, *g*, *h*, up and down, by the iron rods *i*, *k*, *l*, *m*, *n*, *o*; which alternately raiſe and depreſs the piſtons by the other iron rods *p*, *q*, *r*, *s*, *t*, *u*, *w*, *x*, *y*, in twelve pumps; nine of which, as L, M, N, O, P, Q, R, S, T, appear in the figure; the other three being hid behind the work at V. And as pipes may go from all theſe pumps, to convey the *water* (drawn up by them to a ſmall height) into a cloſe ciſtern, from which the main pipe proceeds, the *water* will be forced into this ciſtern by the deſcent of the piſtons. And as each pipe, going from its reſpective pump into the ciſtern, has a valve at its end in the ciſtern, theſe valves will hinder the return of the *water* by the pipes; and, therefore, when the ciſtern is once full, each piſton upon its deſcent will force the *water* (conveyed into the ciſtern by a former ſtroke) up the main pipe, to the height to which the engine was intended to raiſe it; which height depends upon the quantity raiſed, and the power that turns the wheel. When the power upon the wheel is leſſened by any defect of the quantity of *water* turning it, a proportionable number of the pumps may be laid aſide, by diſengaging their rods from the vibrating levers.

When ſuch a machine is placed in a ſtream that runs upon a ſmall declivity, the motion of the levers, and action of the pumps, will be but ſlow; ſince the wheel muſt go once round for each ſtroke of the pumps. But when there is a large body of ſlow running *water*, a cog or ſpur-wheel may be placed upon each ſide of the *water*-wheel A A, upon its axis, to turn a trundle upon each ſide; the cranks being upon the axis of the trundle. And by proportioning the cog-wheels to the trundles, the motion of the pumps may be made quicker, according to the quantity and ſtrength of the *water* upon the firſt wheel; which may be as great as the workman pleaſes, according to the length and breadth of the float-boards, or wings of the wheel. In this manner the engine for raiſing *water* at London-bridge is conſtructed; which we ſhall now proceed to deſcribe. Ferguſon's Lect. p. 77. 4to.

The wheels of the London-bridge *water-works* are placed under the arches of the bridge, and moved by the common ſtream of the tide-*water* of the river. A B (*fig.* 80.) the axle-tree of the *water*-wheel is nineteen feet long, and three feet in diameter; in which C, D, E, F, are four ſets of arms, eight in each place, on which are fixed G G G G, four ſets or rings of felloes, twenty feet in diameter, and the floats H H H, fourteen feet long, and eighteen inches deep, being about twenty-ſix in number. The wheel lies with its two gudgeons, or centre-pins, A, B, upon two braſſes in the pieces M N, which are two great levers, whoſe fulcrum, or prop, is an arched piece of timber L; the levers being made circular on their lower ſides to an arch of the radius M O, and kept in their places by two arching ſtuds fixed in the ſtock L, through two mortiſes in the lever M N. The wheel is, by theſe levers, made to riſe and fall with the tide in the following manner. The levers M N are ſixteen feet long; from M, the fulcrum of the lever, to O, the gudgeon of the *water*-wheel, ſix feet; and from O to the arch at N, ten feet. To the bottom of the arch N is fixed a ſtrong triple chain P, made after the faſhion of a watch-chain, but the links arched to a circle of one foot diameter, having notches, or teeth, to take hold of the leaves of a pinion of caſt iron Q, ten inches diameter, with eight teeth in it moving on an axis. The other looſe end of this chain has a large weight hanging at it, to help to counterpoiſe the wheel, and preſerve the chain from ſliding on the pinion. On the ſame axis is fixed a cog-wheel R, ſix feet diameter, with forty-eight cogs. To this is applied a trundle, or pinion S, of ſix rounds, or teeth; and upon the ſame axis is fixed T, a cog-wheel of fifty-one cogs, into which the trundle V, of ſix rounds, works; on whoſe axis is a winch or windlaſs W, by which one man, with the two windlaſſes, raiſes or lets down the wheel as there is occaſion.

And becauſe the fulcrums of theſe levers M N, are in the axis of the trundle K, viz. at M or X, in what ſituation ſoever the wheel is raiſed or let down, the cog-wheel I I, is always equidiſtant from M, and works or geers truly.

By means of this machine, the ſtrength of an ordinary man will raiſe about fifty ton weight.

I, I, is a cog-wheel fixed near the end of the great axis, eight feet diameter, and forty-four cogs working into a trundle K, of four feet and a half diameter, and twenty rounds, whoſe axis or ſpindle is of caſt iron four inches in diameter, lying in braſſes at each end, as at X.

Z Z is a quadruple crank of caſt iron, the metal being ſix inches ſquare, each of the necks being turned one foot from the centre, which is fixed in braſſes at each end in two headſtocks faſtened down by caps. One end of this crank at Y is placed cloſe abutting to the end of the axle-tree X, where they are at thoſe ends ſix inches diameter, each having a ſlit in the ends, where an iron wedge is put, one half into the end X, the other half into Y, by means of which the axis X turns about the crank Z Z.

The four necks of the crank have each an iron ſpear, or rod, fixed at their upper ends to the reſpective libra, or lever, *a* 1, 2, 3, 4, within three feet at the end. Theſe levers are twenty-four feet long, moving on centres in the frame *b b b b*; at the end of which, at *c* 1, 2, 3, 4, are jointed four rods with their forcing plugs working into *d* 1, 2, 3, 4, four caſt iron cylinders four feet three quarters long, ſeven inches bore above, and nine below where the valves lie, faſtened by ſcrewed flanches over the four holes of a hollow trunk of caſt iron, having four valves in it juſt over *e e e e*, at the joining on of the bottom of the barrels, or cylinders, and at one end a ſucking pipe and grate *f*, going into the *water*, which ſupplies all the four cylinders alternately.

From the lower part of the cylinders *d* 1, *d* 2, *d* 3, *d* 4, come out necks turning upward arch-wiſe, as *g g g g*, whoſe upper parts are caſt with flanches to ſcrew up to the trunk *h h h h*; which necks have bores of ſeven inches diameter, and holes in the trunk above communicating with them, at which joining are placed four valves. The trunk is caſt with four boſſes, or protuberances, ſtanding out againſt the valves, to give room for their opening and ſhutting; and on the upper ſide are four holes ſtopped with plugs, to take out on occaſion, to cleanſe the valves. One end of this trunk is ſtopped by a plug *i*. To the other, iron pipes are joined, as *i* 2, by flanches, through which the *water* is forced up to any height or place required.

Beſides theſe four forcers, there are four more placed at the other ends of the libræ, or levers (not ſhewn here, to avoid confuſion, but to be ſeen on the left hand) the rods being fixed at *a* 1, 2, 3, 4, working in four ſuch cylinders, with their parts *d d*, &c. *e e*, *f*, *g g*, and *i*, as before deſcribed, ſtanding near *k k*.

At the other end of the wheel (at B) is placed all the ſame ſort of work as at the end A is deſcribed, viz.

The cog-wheel I.	The four levers *a c*, *a c*, &c.
The trundle K.	8 forcing rods *a d*, *a d*, &c.
The ſpindle X.	8 Cylinders *d e*, *d e*, &c.
The crank Y, Z.	4 Trunks, ſuch as *e e*, *h h*.
The ſucking pipes *f*.	2 Forcing pipes, as *i*.

So that one ſingle wheel works ſixteen pumps.

All which work could not be drawn in one perſpective view, without making it very much confuſed.

Mr. Beighton, who has deſcribed the ſtructure and operation of this engine (ſee Phil. Tranſ. abr. vol. vi. p. 358.) has calculated the quantity of *water* raiſed by it in a given time. In the firſt arch next the city there is one wheel with double work of ſixteen forcers; and in the third arch, one wheel with double work at one end, and ſingle at the other, having twelve forcers; a ſecond wheel in the middle having eight forcers, and a third wheel with ſixteen; ſo that there are in all fifty-two forcers: one revolution of a wheel produces in every forcer $2\frac{1}{5}$ ſtrokes; ſo that one turn of the four wheels makes 114 ſtrokes. When the river acts with moſt advantage, the wheels go ſix times round in a minute, and but $4\frac{1}{2}$ at middle *water*; hence the number of ſtrokes in a minute is 684; and as the ſtroke is $2\frac{1}{2}$ feet in a ſeven-inch bore, it raiſes three ale gallons; and all raiſe per minute 2052 ale gallons; i. e. 123120 gallons = 1954 hogſheads per hour, and at the rate of 46896 hogſheads in a day, to the height of 120 feet. Such is the utmoſt quantity they can raiſe, ſuppoſing that there were no imperfections or loſs at all; but Mr. Beighton infers, from experiments performed on engines whoſe parts were large and excellently conſtructed, that they will loſe one fifth and ſometimes one fourth of the calculated quantity. For an eſtimate of the power by which the wheels are moved, ſee Phil. Tranſ. ubi ſupra.

Mr. Beighton obſerves, that, though theſe *water-works* may juſtly be eſteemed as good as any in Europe, yet ſome things might be altered much for the better. If, he ſays, inſtead of ſixteen forcers, they worked only eight, the ſtroke might be five feet in each forcer, which would draw much more *water* with the ſame power in the wheel; becauſe much *water* is loſt by the too frequent opening and ſhutting of the valves; and that the bores that carry off the *water* from the forcers are too ſmall; and that they ſhould be near nine inches in diameter. This objection Dr. Deſaguliers ſays is of no force, unleſs the velocity of the piſtons was very great; but here the velocity of the *water* paſſing through the bores is much leſs than two feet in a ſecond. This laſt writer obſerves, that a triple crank diſtributes the power better than a quadruple one. He adds, that forcers made with thin leather tanned, of about the thickneſs of the upper leather of a countryman's ſhoe, would be much better than thoſe of the ſtiff leather commonly uſed. Dr. Deſaguliers has formed a compariſon of the powers of this engine with thoſe of the famous machine at Marly. Eſtimating the quantity of *water* merely raiſed by theſe machines, the former raiſes almoſt twice and a quarter as much as the latter; but conſidering that the London-bridge *water-works* raiſe this *water* but 120 feet high, and that the Marly engine raiſes its *water* 533 feet high, he deduces from a calculation formed on theſe different heights, and on the difference of the fall of *water* on both engines, this concluſion, viz. that the effect of the four wheels at London-bridge is three times greater than that of four of the wheels at Marly.

The engine at London-bridge was put up by Mr. Sorocold towards the beginning of this century: the contrivance for raiſing and falling the *water*-wheel was the invention of Mr. Hadley, who put up the firſt of that kind at Worceſter, for which he obtained a patent. Deſaguliers's Experimental Philoſophy, vol. ii. lect. 12. and annot. 3 and 4.

Water-*rocket*. See Rocket.

Water-*ſail*, in a *Ship*, denotes a ſmall ſail, ſpread occaſionally under the lower ſtudding-ſail, or driver-boom, in a fair wind, and ſmooth ſea.

Water-*ſcape*, of the Saxon *waterſchap*, denotes an aqueduct, drain, or paſſage for *water*.

Water-*ſhield*. See Hydraspis.

Water-*ſhoot*, a young ſprig, which ſprings out of the root or ſtock of a tree.

Water-*ſhot*, in the *Sea-Language*. See Mooring.

Water-*ſpout*. See *Water*-Spout.

Water-*table*, in *Architecture*, is a ſort of ledge, left in ſtone or brick walls, about eighteen or twenty inches from the ground; from which place, the thickneſs of the wall begins to abate. See Wall.

Water-*wagtail*, in *Ornithology*. See Wagtail.

Water-*way*, in a *Ship*, is a long piece of timber, ſerving to connect the ſides of a ſhip to her decks, and form a ſort of channel to carry off the *water* from the latter by means of scuppers.

Water-*wheel*, an engine for raiſing *water* in great quantity out of a deep well. See Persian-*wheel*.

Water-*works*. See *Raiſing of* Water.

WATERING, in *Gardening*, &c. the application of *water* to the ſoil of plants, &c. when not ſufficiently moiſtened with rain, dew, &c.

After ſowing ſeed of any kind, though the ground be ever ſo dry, they ſhould never be *watered* till they have been forty-eight hours in the ground, and the ground is a little ſettled about them; otherwiſe, a too great glut of nouriſhment at firſt will be apt to burſt them.

Care is to be taken, that the leaves of young and tender plants be not *watered* at all while the weather is cold; only the ground to be wet about them. For hardy plants and ſeeds, if the nights be cold, *water* in the forenoon; otherwiſe, in the evening.

Water that comes out of pits, or deep wells, ſhould ſtand a day in an open veſſel, before it be applied to tender plants in the ſpring. Dung of ſheep, pigeons, or hens, or aſhes, lime, &c. infuſed in the *water*, will forward the growth of plants.

Watering, in the *Manufactures*. *To* Water *a ſtuff*, is to give it a luſtre, by wetting it lightly, and then paſſing it through the preſs, or the calender, whether hot or cold. See Tabbying.

WATERLANDIANS, in *Eccleſiaſtical Hiſtory*, a ſect of thoſe that were called the groſs or moderate Anabaptiſts, conſiſting at firſt of the inhabitants of a diſtrict in North Holland, called *Waterland*; whence their name. They were alſo called Johannites from John de Ries, who, aſſiſted by Lubert Gerard, compoſed their confeſſion of faith in 1580. This confeſſion far ſurpaſſes in reſpect both of ſimplicity and wiſdom all the other confeſſions of the Mennonites; though it has been alledged, that it is not the general confeſſion of the *Waterlandians*, but that merely of the congregation, of which its author was the paſtor.

This community, ſays Moſheim, has abandoned the ſevere diſcipline and ſingular opinions of Menno, whom, nevertheleſs, they generally reſpect as their primitive parent and founder. They are, however, divided into two diſtinct ſects, which bear the reſpective denominations of Frieslanders and *Waterlandians*; and are both without biſhops, employing no other eccleſiaſtical miniſters than preſbyters and deacons. Each congregation of this ſect is independent on all foreign juriſdiction, having its own eccleſiaſtical council or conſiſtory, which is compoſed of preſbyters and deacons. The ſupreme ſpiritual power is, nevertheleſs, in the hands of the people, without whoſe conſent nothing of importance can be carried into execution. Their preſbyters are, generally ſpeaking, men of learning, and apply themſelves with ſucceſs to the ſtudy of phyſic and philoſophy; and there is a public profeſſor, ſupported by the ſect at Amſterdam, for the inſtruction of their youth in the various branches of philoſophy, and ſacred erudition. One of theſe *Waterlandian* ſects was divided, in 1664, into two factions, of which the one were called Galenists, and the other Apostoolians, from their reſpective leaders. Moſheim's Eccl. Hiſt. vol. iv. p. 149, &c. vol. v. p. 49, &c.

WATERMEN are ſuch as row in boats, or ply on the river Thames, ultimately ſubject to the direction and government of the lord-mayor of London, and court of aldermen, who ſettle their fares; and as well as other juſtices of peace, have authority to hear and determine offences, &c.

The names of *watermen* are to be regiſtered; and their boats muſt be twelve feet and a half long, and four and a half broad, or be liable to forfeiture; and *watermen*, taking

taking more than the fares assessed, shall forfeit 40*s.* and suffer half a year's imprisonment; and refusing to carry persons for their fare, shall be imprisoned for twelve months. None shall ply on the river, but such as have been apprentices to *watermen* for seven years. 2 & 3 P. & M. cap. 16. 29 Car. II. cap. 7.

The lightermen and *watermen* constitute a COMPANY; and the lord-mayor and aldermen yearly elect eight of the latter, and three of the former, to be rulers, and the *watermen* chuse assistants; the rulers and assistants being empowered to make rules, which are required to be observed, under penalties. The rulers on their court-days shall appoint forty *watermen* to ply on Sundays, for carrying passengers across the river, who pay them for their labour, and apply the overplus to the poor decayed *watermen*; and no persons are allowed to travel on a Sunday with boats, unless they are licensed and allowed by a justice, on pain of forfeiting 5*s.* 11 & 12 W. III. cap. 21.

No apprentice shall take upon him the care of a boat, till he is sixteen years of age, if a *waterman's* son, and seventeen, if a landman's; unless he hath worked with some able *waterman* for two years, under the penalty of 10*s.*; and if any person, not having served seven years to a *waterman*, &c. row any boat in the river Thames for hire, he shall forfeit 10*l.* gardener's boats, dung-boats, fishermen's, wood-lighters, western barges, &c. excepted. No apprentice is to be taken under fourteen years, who shall be bound for seven years, and inrolled in the book of the *watermen's* company, on pain of 10*l.* No tilt-boat, row-barge, &c. shall take more than thirty-seven passengers, and three more by the way; nor any other boat above eight, and two by the way, on forfeiture of 5*l.* for the first offence, and 10*l.* for the second, &c. And in case any person be drowned, where a greater number is taken in, the *waterman* shall be deemed guilty of felony, and transported. 10 Geo. II. cap. 31.

Tilt-boats used between London-bridge and Gravesend shall be fifteen tons, and the other boats three tons. Rulers of the *watermen's* company are required to appoint two officers, one at Billingsgate at high-water, and another at Gravesend, to ring a bell for the tilt-boats, &c. to put off; and those which do not immediately proceed with two sufficient men, shall forfeit 5*l.* The fares of *watermen*, assessed by the court of aldermen, are, from London-bridge to Limehouse, Ratcliffe-cross, &c. for oars, 1*s.* and scullers, 6*d.*; Wapping-dock, Rotherhithe-church stairs, &c. for oars 6*d.* and for scullers 3*d.*; from either side of the water above the bridge to Lambeth and Vauxhall, for oars 1*s.* and scullers 6*d.* For all the stairs between London-bridge and Westminster, oars 6*d.* and scullers 3*d.*

WATERS, among *Farriers*, the name given to a distemperature of horses. The hinder legs of these creatures are very subject to a defluxion of certain white, sharp, and corrupt humours, or *waters*, as they call them, which happen very rarely to the fore-legs.

This disease is discovered by searching the pasterns, where, if a moistness is felt beneath the hair, and is extremely stinking, there is danger of its growing to the utmost height of the disease, in which it will grow all round the pastern and pastern joint, and sometimes almost up to the very ham. These *waters* frequently cause the pasterns to swell, keeping the legs stiff, and making the horse lean; finally, they often separate the flesh from the coronet near the heel. This disease is very obstinate and stubborn when once rooted in the horse. It may easily be stopt in the beginning, but when of any continuance, it is an error to attempt to stop it, for if dried up ever so often, it will always return again. It is in vain to attempt a cure of this disease in the winter, unless it be but just begun; but in the summer season all attempts succeed better; and what the farriers call the white honey charge has surprising effects, often performing a cure alone.

Some farriers distinguish between the *waters*, and what they call *watery sores*, though others call them only degrees of the same distemper. Those who distinguish them, describe the *watery sore* as a white, corrosive, and malignant matter, issuing out of the pores of a horse's leg, usually on the lower part only, but sometimes all over it, and beginning from a stinking matter, deadening the skin of the pastern and fetlock, and by degrees loosening the hoof from the coronet at the heel. The breaking out of this matter is always ushered by a swelling of the lower part of the leg, and attended with pain; and the humour at length acquiring a sharp and venomous quality, it is attended with warts, clefts, and nodes, which in process of time over-run the whole part, and render the cure very difficult.

This disease generally appears first on the outside of the pastern, and by degrees rises up to the middle of the leg, peeling off some part of the hair all the way. The method of cure should be this: as soon as a horse is seized with the distemper, he should be blooded sparingly, at the utmost not exceeding two pounds; after this he should take large doses of a decoction of guaiacum, rof box-wood, twice every day for eight days; after this he is to take three or four brisk purges, and then to have recourse to the decoction again. In the interim, the hair must be clean shaved off from the distempered part of the leg, and it must be rubbed with a wisp of hay very often, and the *watery sores* in it anointed with the following ointment. Take a pound of black soap, three ounces of spirit of wine, two ounces of common salt, and three ounces of burnt alum; there is to be as much meal or flour added to these, as will make the whole into a proper consistence: this is to be laid on all the sores without any covering or bandage, and the next morning it is to be washed off with a ley of ashes fresh made. This anointing and washing are to be repeated every day, and with the effects of this, and of the internal remedies, the disease seldom fails of a cure, if it be not very obstinate, or of very long standing.

WATERY *humour*. See AQUEOUS, and HUMOUR.

WATERY *head*. See HYDROCEPHALUS.

WATERY *sores*. See WATERS.

WATLING-*street*, in *Roman Antiquity*. See WAY.

WATSONIA, in *Botany*, a genus of plants belonging to the *triandria monogynia* class of Linnæus, so called by Mr. Miller, who raised the plant from seeds, in honour of Dr. William Watson. Its characters are these: the flower has a permanent spatha, or sheath, which divides into two parts almost to the bottom; it has one petal; the tube is long, a little curved, and swells at the upper part; the rim is cut into six obtuse segments, which spread open; it has three long, slender stamina, which are terminated by prostrate, oblong summits, and a roundish three-cornered germen, supporting a slender style, somewhat longer than the stamina, crowned by three bifid stigmas; the germen afterwards turns to a roundish three-cornered capsule, having three cells, opening with three valves, each containing three or four roundish seeds. There is one species, a native of Æthiopia.

WATTLES, among *Husbandmen*, grates or hurdles, for folds for sheep.

The word is also used for the gills of a cock, and for the naked red flesh that hangs under a turkey's neck.

WAVE, *unda*, in *Physics*, a cavity in the surface of the water, or other fluid, with an elevation aside thereof. Or, it is a volume of water elevated by the action of the wind upon its surface, into a state of fluctuation.

The origin of *waves* may be thus conceived. The surface of a standing water being naturally plain, and parallel to the horizon, if by any means it be rendered hollow, as at A (*Tab.* VII. *Hydraulics*, *fig.* 81.) its cavity will be surrounded with an elevation BB; this raised water will descend by its gravity, and, with the celerity acquired in descending, will form a new cavity; by which motions, the water will ascend at the sides of this cavity, and fill the cavity A, while there is a new elevation towards C; and, when this last is depressed, the water rises anew towards the same part. Thus arises a successive motion in the surface of the water; and a cavity, which carries an elevation before it, is moved along from A, towards C. This cavity, with the elevation next it, is called a *wave*; and the space taken up by the *wave* on the surface of the water, and measured according to the direction of the *wave's* motion, is called the *breadth of the wave*.

WAVES, *the motion of*, makes an article in the new philosophy; and the laws thereof being now pretty well determined, we shall give the reader the substance of what is taught thereon.

1. Then, the cavity, as A, is encompassed every way with an elevation; and the motion above mentioned expands itself every way: therefore the *waves* are moved circularly.

2. Suppose, now, AB (*fig.* 82.) an obstacle, against which the *wave*, whose beginning is at C, strikes; and we are to examine what change the *wave* suffers in any point, as E, when it is come to the obstacle in that point. In all places through which the *wave* passes in its whole breadth, the *wave* is raised; then a cavity is formed, which is again filled up; which change while the surface of the water undergoes, its particles go and return through a small space: the direction of this motion is along CE, and the celerity may be represented by that line. Let this motion be contrived to be resolved into two other motions, along GE and DE, whose celerities are respectively represented by those lines. By the motion along DE, the particles do not act against the obstacle; but, after the stroke, continue their motion in that direction with the same celerity; and this motion is here

here represented by EF, supposing EF and ED to be equal to one another; but by the motion along GE, the particles strike directly against the obstacle, and this motion is destroyed; for though the particles are elastic, yet, as in the motion of the *waves* they run through but a small space, going backward and forward, they proceed so slowly, that the figure of the particles cannot be changed by the blow; and so are subject to the laws of PERCUSSION of bodies perfectly hard.

But there is a reflexion of the particles from another cause: the water which cannot go forward beyond the obstacle, and is pushed on by that which follows it, gives way where there is the least resistance; that is, it ascends; and this elevation, which is greater in some than other places, is caused by the motion along GE; because it is by that motion alone that the particles impinge against the obstacle. The water, by its descent, acquires the same velocity with which it was raised; and the particles of water are repelled from the obstacle with the same force in the direction EG, as that with which they struck against the obstacle. From this motion, and the motion above mentioned along EF, arises a motion above EH, whose celerity is expressed by the line EH, which is equal to the line CE; and by the reflexion, the celerity of the *wave* is not changed, but it returns along EH, in the same manner as if, taking away the obstacle, it had moved along E*h*.

If from the point C, CD be drawn perpendicular to the obstacle, and then produced, so that D*c* shall be equal to CD, the line HE continued will go through *c*; and as this demonstration holds good in all points of the obstacle, it follows, that the reflected *wave* has the same figure on that side of the obstacle, as it would have had beyond the line AB, if it had not struck against the obstacle. If the obstacle be inclined to the horizon, the water rises and descends upon it, and suffers a friction, whereby the reflexion of the *wave* is disturbed, and often wholly destroyed; and this is the reason why very often the banks of rivers do not reflect the *waves*.

If there be a hole, as I, in the obstacle BL, the part of the *wave* which goes through the hole, continues its motion directly, and expands itself towards QQ; and there is a new *wave* formed, which moves in a semicircle, whose centre is the hole. For the raised part of the *wave*, which first goes through the hole, immediately flows down a little at the sides; and by descending, makes a cavity, which is surrounded with an elevation on every part beyond the hole, which moves every way in the same manner as was laid down in the generation of the first *wave*.

In the same manner, a *wave* to which an obstacle, as AO, is opposed, continues to move between O and N, but expands itself towards R, in a part of a circle, whose centre is not very far from O. Hence, we may easily deduce what must be the motion of a *wave* behind an obstacle, as MN.

Waves are often produced by the motion of a tremulous body, which also expand themselves circularly, though the body goes and returns in a right line; for the water which is raised by the agitation, descending, forms a cavity, which is every where surrounded with a rising.

Different *waves* do not disturb one another, when they move according to different directions. The reason is, that whatever figure the surface of the water has acquired by the motion of the *waves*, there may in that be an elevation and depression; as also such a motion as is required in the motion of a *wave*.

To determine the celerity of the *waves*, another motion, analogous to theirs, must be examined. Suppose a fluid in the bent cylindric tube EH (*fig.* 83.); and let the fluid in the leg EF be higher than in the other leg by the distance *l*E; which difference is to be divided into two equal parts at *i*. The fluid, by its gravity, descends in the leg EF, while it ascends equally in the leg GH; so that when the surface of the fluid is arrived at *i*, it is at the same height in both legs; which is the only position wherein the liquid can be at rest; but by the celerity acquired in descending, it continues its motion, and ascends higher in the tube GH; and in EF is depressed quite to *l*, except so much as it is hindered by the friction against the sides of the tube. The fluid in the tube GH, which is higher, also descends by its gravity, and so the fluid in the tube rises and falls, till it has lost all its motion by the friction.

The quantity of matter to be moved, is the whole fluid in the tube; the moving force is the weight of the column *l*E, whose height is always double the distance E*i*; which distance, therefore, increases and diminishes in the same ratio with the moving force. But the distance E*i* is the space to be run through by the fluid, in order to its moving from the position EH, to the position of rest; which space, therefore, is always as the force continually acting upon the fluid: but it is demonstrated, that it is on this account that all the vibrations of a pendulum, oscillating in a cycloid, are isochronal; and, therefore, here also, whatever be the inequality of the agitations, the fluid always goes and returns in the same time. The time in which a fluid thus agitated ascends, or descends, is the time in which a pendulum vibrates, whose length is equal to half the length of the fluid in the tube, or to half the sum of the lines EF, FG, GH. This length is to be measured in the axis of the tube. See PENDULUM.

From these principles, to determine the celerity of the *waves*, we must consider several equal *waves* following one another immediately; as A, B, C, D, E, F (*fig.* 84.), which move from A towards F: the *wave* A has run its breadth, when the cavity A is come to C; which cannot be, unless the water at C ascends to the height of the top of the *wave*, and again descends to the depth C; in which motion, the water is not agitated sensibly below the line *hi*: therefore, this motion agrees with the motion in the tube above mentioned; and the water ascends and descends, that is, the *wave* goes through its breadth, while a pendulum of the length of half BC performs two oscillations, or while a pendulum of the length BCD, that is, four times as long as the first, performs one vibration. Therefore, the celerity of the *wave* depends upon the length of the line BCD; which is greater, as the breadth of the *wave* is greater, and as the water descends deeper in the motion of the *waves*. In the broadest *waves*, which do not rise high, such a line as BCD does not much differ from the breadth of the *wave*; and in that case, a *wave* moves its breadth, while a pendulum, equal to that *wave*, oscillates once.

In every equable motion, the space gone through increases with the time and the celerity; wherefore, multiplying the time by the celerity, you have the space gone through; whence it follows, that the celerities of the *waves* are as the square roots of their breadths: for as the times in which they go through their breadths are in that ratio, the same ratio is required in their celerities, that the products of the times, by their celerities, may be as the breadths of the *waves*, which are the spaces gone through.

This motion of the sea-water depends greatly on the winds, and on the situation of mountains, in regard to the sea; for the winds are driven back from these with great impetuosity; and in some places this occasions a great and very irregular undulation, beside that which is produced by the immediate action of the winds on the surface of the water, in their own direct course.

Waves are to be considered as of two kinds, and these may be distinguished from one another by the names of natural and accidental *waves*.

The natural *waves* are those which are regularly proportioned in size to the strength of the wind, whose blowing gives origin to them. The accidental *waves* are those occasioned by the wind's reacting upon itself by repercussion from hills and mountains, or high shores, and by the washing of the *waves* themselves, otherwise of the natural kind, against rocks and shoals; all these cases give the *waves* an elevation, which they can never have in their natural state.

The great Mr. Boyle has proved by numerous experiments, that the most violent wind never penetrates deeper than six feet into the water; and it should seem a natural consequence of this, that the water moved by it can only be elevated to the same height of six feet from the level of the surface in a calm; and these six feet of elevation being added to the six of excavation, in the part whence that water so elevated was raised, should give twelve feet for the utmost elevation of a *wave*. This is a calculation that does great honour to its author; for count Marsigli measured carefully the elevations of the *waves* near Provence, and found that, in a very violent tempest, they arose only to seven feet above the natural level of the sea, and this additional foot in height he easily resolved into the accidental shocks of the water against the bottom, which was, in the place he measured them in, not so deep as to be out of the way of affecting the *waves*; and he allows that the addition of one sixth of the height of a *wave*, from such a disturbance from the bottom, is a very moderate alteration from what would have been its height in a deep sea; and concludes, that Mr. Boyle's calculation holds perfectly right in deep seas, where the *waves* are purely natural, and have no accidental causes to render them larger than their just proportion.

In deep water, under the high shores of the same part of France, this author found the natural elevation of the *waves* to be only five feet; but he found also that their breaking against rocks, and other accidents to which they were liable in this place, often raised them to eight feet high.

We are not to ſuppoſe, from this calculation, that no *wave* of the ſea can riſe more than ſix feet above its natural level in open and deep water; for *waves* immenſely higher than theſe are formed in violent tempeſts in the great ſeas. Theſe, however, are not to be accounted *waves* in their natural ſtate, but they are ſingle *waves* formed of many others; for in theſe wide plains of water, when one *wave* is raiſed by the wind, and would elevate itſelf up to the exact height of ſix feet, and no more, the motion of the water is ſo great, and the ſucceſſion of *waves* ſo quick, that, during the time this is riſing, it receives into it ſeveral other *waves*, each of which would have been at the ſame height with itſelf; theſe run into the firſt *wave* one after another, as it is riſing; and by this means its riſe is continued much longer than it naturally would have been, and it becomes accumulated to an enormous ſize. A number of theſe complicated *waves* ariſing together, and being continued in a long ſucceſſion by the continuation of the ſtorm, make the *waves* ſo dangerous to ſhips, which the ſailors in their phraſe call mountains high. Marſigli, Hiſt. Phyſ. de la Mer.

WAVE-*offering*, among the *Jews*, a ſacrifice offered by agitation or *waving* towards the four cardinal points.

WAVED, or WAVY, a term in *Heraldry*, when a bordure, or any ordinary or charge in a coat of arms, has its outlines indented, in manner of the riſing and falling of *waves*. This is alſo called *undy*, *undé*, or *ondé*, and denotes that the firſt of the family in whoſe arms it ſtands, acquired his honours for ſea-ſervices, and has this peculiar commemoration of it ordered in his arms.

To WAVE, is uſed, in the *Sea-Language*, for the making ſigns for a veſſel to come near, or keep off.

WAVESON, in the *Admiralty-Law*, a term uſed for ſuch goods, as, after ſhipwreck, appear ſwimming on the waves.

WAVY. See WAVED.

WAX, *cera*, a ſoft, yellowiſh, concrete matter, collected from vegetables by the bee, and extracted from the combs, after the honey is got out, by heating and preſſing them.

Wax is not the excrement of this laborious inſect, as the ancients, and after them many of the moderns, have imagined.

According to Mr. Reaumur, the farina fœcundans of the flowers of plants, contained in their apices, is the matter of which the bees form their *wax*; they either diſlodge this from its cells with their teeth, or elſe merely by rubbing their bodies among the ſtamina and apices, load themſelves with the globules of it, which their hairs keep ſticking upon their body, and which they afterward bruſh off with their legs, and, by degrees, collect into balls or lumps, which they depoſit upon the flat and triangular piece, which makes the third joint of the hinder pair of their legs.

The lumps of *wax* with which we ſee them loaded in this part, and carrying to their hives, he adds, are only the farina of flowers worked up and compreſſed into a maſs or ſort of cake. The ſtamina of the flowers therefore ſuſtain certain caſes, containing a powder, which is the matter of bees-*wax*. This powder, thus collected into lumps on the legs of the bees, is called rough *wax*, and is probably *wax* to all intents and purpoſes, only wanting a little beating together. *Wax*, therefore, ſo long eſteemed an animal ſubſtance, will appear to be a native vegetable production.

If the bees are obſerved when returning to the hive loaded with their lumps of *wax* on their thighs, theſe lumps on ſome will be found to be white, on others yellow, on others red, and on ſome greeniſh: this is owing to the different colours of the farina, yielded by the different plants they have been at work upon. The manufacture of the bee, in moulding this into a lump, has not yet been able to alter the colour of the farina, nor even its figure; for if the lumps be examined by the microſcope, they will all be found to conſiſt of globules of a rounded or oval figure, or of whatever other ſhape they had when on the plant. The bees returning to their hives, after their morning excurſions in the ſpring, are always found to contain in the cells of their palettes large lumps of *wax*; but thoſe, which go out in the heat of the day, return with little or none; the reaſon of this is, that the humidity of the farina, by means of the dew, makes it eaſily formed into a lump or maſs, its particles naturally ſticking together; whereas in the heat of the day this powder is too dry to be formed thus into a compact maſs, and therefore cannot be carried home by the bee. However, it is evident, that the bee does ſomething to the matter of which *wax* is made, in order to the reducing of it into perfect *wax*.

The opinion of Swammerdam and Maraldi was, that the bee added ſome other matter to the rough *wax*, in order to reduce it to this proper ſtate. And as there is no ſubſtance ſo ready for the bee as honey, they ſuppoſed that ſhe mixed honey with this matter, and ſo made *wax* of the compound; but experiment is wholly againſt this; ſince if honey, and this matter collected from the bees, be mixed in any proportion, the compound has no more the properties of *wax* than it had before, but ſtill remains a quite different ſubſtance. Swammerdam afterwards fell into another opinion, in regard to the matter mixed with the rough *wax*, in order to render it perfect; this was, that the bee mixed with it the venomous liquor, of which ſhe has a bag full near the tail, in order to poiſon the wounds made by her ſting. He made ſome experiments on this plan, which he thought favoured his ſyſtem, and endeavours to ſtrengthen the probability, by obſerving, that as the ſting of the bee comes but very little into uſe, it would not have been neceſſary that the creature ſhould have been thus conſtantly ſupplied with a large bag of this matter, if nature had not allotted to it ſome other uſe beſide that regarding the ſting. This opinion prevailed among the learned, till Mr. Reaumur of late proved by experiments, that this liquor had no effect on the matter found on the thighs of the bee, as to the turning it into *wax*; and alſo, that ſeveral creatures which make no true genuine *wax*, ſuch as the humble bee, the waſp, and the hornet, whoſe combs are made of a ſort of paper, yet have all this bag of liquor near their ſting.

It is moſt probable, ſays this writer, that the method in which the bees turn the farina of flowers into *wax*, is a very ſimple one; and moſt likely it conſiſts only in a ſort of beating the quantities of them, which they collect, till they are very thoroughly united. We have never been able yet to diſcover their manner of doing it; but this appears, he thinks, moſt like the courſe of nature, in the operations of other inſects. If this be the caſe, it would be poſſible, perhaps, for us to imitate their method, and procure for ourſelves *wax* out of the ſtamina of flowers. This would be a diſcovery of the utmoſt importance; for though at preſent the bees which work it for us coſt us nothing in keeping, yet it is to be obſerved, that they are too few in number to collect ſo much as we might wiſh.

The difficulty in the way of the making *wax* from the ſubſtance from which the bees make it, is the poſſibility of its being converted into *wax* within the body of the animal. If this is the caſe, notwithſtanding that we perfectly know the matter of which *wax* is made, we are not to wonder that we are not able to make it, any more than that we are not able to make chyle or blood out of the ſeveral ſubſtances uſed by us as food, and out of which we well know that it is made within our bodies. Reaumur's Hiſt. Inſ. vol. ix. p. 382. vol. x. p. 39, &c. For the opinions of other writers, and bee-maſters, on this ſubject, ſee HONEY, PAIN *d'abeilles*, and PROPOLIS.

Wax makes a very conſiderable article in commerce; the conſumption thereof throughout the ſeveral parts of Europe being incredible. There are two kinds, *white* and *yellow*; the yellow is the native *wax*, juſt as it comes out of the hive, after expreſſing the honey, &c. This colour, ſays Thorley, is owing to the age of the combs, and breath of the bees; *wax*, he ſays, both as it is gathered, and wrought into combs, being always white: the white is the ſame *wax*, only purified, waſhed, and expoſed to the air. The preparation of each follows.

WAX, *yellow*. To procure the *wax* from the combs for uſe; after ſeparating the honey from them, they put all the matter remaining in a large kettle, with a ſufficient quantity of water; where, with a moderate fire, they melt it, and then ſtrain it through a linen cloth, by a preſs: before it is cold, they ſcum it with a tile, or a piece of wet wood, and caſt it, while yet warm, in wooden, earthen, or metalline moulds; having firſt anointed them with honey, oil, or water, to prevent the *wax* from ſticking. Some, to purify it, make uſe of Roman vitriol, or copperas; but the true ſecret is to melt, ſcum it, &c. properly, without any ingredients at all.

The beſt is that of a high colour, an agreeable ſmell, ſomewhat reſembling that of honey, brittle, and that does not ſtick to the teeth when chewed. When new, it is of a lively yellow colour; it is ſomewhat tough, yet eaſy to break; by age, it loſes its fine colour, and becomes harder and more brittle. The ſmell alſo, by long keeping, and in the proceſs by which it is whitened, is in good meaſure diſſipated. However, *wax* is often ſophiſticated with reſin, or pitch, coloured with rocou, or turmeric.

Wax is lighter than water, but heavier than proof ſpirit. It has ſome properties in common with reſins, on account of which it has been long conſidered as a reſin. It has the

the ſame conſiſtence, and, like reſins, furniſhes an oil and an acid by diſtillation, and is ſoluble in all oils; but in ſeveral reſpects it differs ſenſibly from reſins. Like theſe, *wax* has not a ſtrong aromatic taſte and ſmell, but a very weak ſmell, and, when pure, no taſte. With the heat of boiling water no principles are diſtilled from it; whereas with that heat, ſome eſſential oil, or, at leaſt, a ſpiritus rector is obtained from every reſin. Farther, *wax* is unſoluble in ſpirit of wine. If *wax* be diſtilled with a heat greater than that of boiling water, it may be decompoſed, but not ſo eaſily as reſins can. By this diſtillation, a ſmall quantity of water is firſt ſeparated from the *wax*, and then ſome very volatile and penetrating acid, accompanied with a ſmall quantity of a very fluid and very odoriferous oil. As the diſtillation advances, the acid becomes more and more ſtrong, and the oil more and more thick, till its conſiſtence be ſuch that it becomes ſolid in the receiver, and is then called *butter of wax*. When the diſtillation is finiſhed, nothing remains but a ſmall quantity of coal, which is almoſt incombuſtible, from the want of ſome ſaline matter. *Wax* cannot be kindled, unleſs it be previouſly heated, and reduced into vapours; in which reſpect it reſembles fat oils. The oil and butter of *wax* may, by repeated diſtillations, be attenuated, and rendered more and more fluid, becauſe ſome portion of acid is thereby ſeparated from theſe ſubſtances; which effect is ſimilar to what happens in the diſtillation of other oils and oily concretes; but this remarkable effect attends the repeated diſtillation of oil and butter of *wax*, that they become more and more ſoluble in ſpirit of wine; and that they never acquire greater conſiſtence by evaporation of their more fluid parts. Boerhaave kept butter of *wax* in a glaſs veſſel open, or careleſsly cloſed, during twenty years, without acquiring a more ſolid conſiſtence. *Wax*, its butter, and its oil, differ entirely from eſſential oils and reſins, in all the above mentioned properties; and in all theſe perfectly reſemble ſweet oils. Hence Macquer concludes, that *wax* only reſembles reſins in being an oil rendered concrete by an acid; but that it differs eſſentially from theſe in the kind of oil, which in reſins is of the nature of eſſential oils; while in *wax*, and other analogous oily concretions, it is of the nature of ſweet, unctuous oils, that are not aromatic, and not volatile, and are not obtained from vegetables by expreſſion.

Although *wax* is not diſſoluble at all in watery liquors, yet the gelatinous ſolution obtained by boiling it in ſpirit of wine, by mixture with a thick mucilage of gum arabic, becomes ſoluble in water, ſo as to form therewith an emulſion or milky liquor: the *wax* itſelf is made in like manner ſoluble, without the intervention of ſpirit, by thoroughly mixing it with the gum in fine powder; but when thus diſſolved, it proves ſtill inſipid, and perfectly void of acrimony.

WAX, *white*. The whitening, blanching, or bleaching of *wax*, is performed by reducing the yellow ſort, firſt, into little bits or grains, by melting it, and throwing it, while hot, into cold water, or elſe by ſpreading it into very thin leaves, or cakes. For this purpoſe, ſome diſpoſe the cauldron in which the *wax* is melted, ſo that it may flow gradually through a pipe at the bottom into a large tub filled with water, in which is fitted a large wooden cylinder, that turns continually round its axis, and upon which the melted *wax* falls. As the ſurface of this cylinder is always moiſtened with cold water, the *wax* falling upon it does not adhere to it, but quickly becomes ſolid and flat, and acquires the form of ribbands. The continual rotation of the cylinder carries off theſe ribbands as faſt as they are formed, and diſtributes them through the tub. This *wax*, thus granulated, or flatted, is expoſed to the air on linen cloths, where it remains night and day, having equally need of ſun and dew. Then they melt and granulate it over again ſeveral times; ſtill laying it out to the air, in the intervals, between the meltings.

When the ſun and dew have at length perfectly blanched it, they melt it for the laſt time, in a large kettle; out of which they caſt it, with a ladle, upon a table, covered over with little round dents or cavities, of the form of the cakes of *white wax*, as ſold by the apothecaries, &c. having firſt wetted thoſe moulds with cold water, that the *wax* may be the more eaſily got out. Laſtly, they lay out theſe cakes to the air for two days, and two nights, to render it more tranſparent and drier.

The yellow colour of the *wax* is evidently deſtroyed by the combined action of the air, of the water, and of the ſun. As the volatile, ſulphureous acid, has the property of deſtroying more quickly almoſt all the colours of vegetables, it is ſuggeſted by the author of the Chemical Dictionary, that this bleaching might perhaps be ſhortened, by expoſing ribbands of yellow *wax* to the vapour of ſulphur, as is practiſed for wool and ſilk. However, the operation of bleaching *wax* above deſcribed, can be performed well only in fine weather, as it depends chiefly on the action of the ſun. This circumſtance being attended with much inconvenience to the manufacturers, the diſcovery of a method of whitening *wax*, independently of the ſeaſons, would be very uſeful, and has been recommended to the attention of chemiſts by ſome œconomical ſocieties.

With a view to diſcover ſuch a method, Mr. Beckman has made experiments, an account of which is publiſhed in the fifth volume of the Novi Commentarii Societatis Regiæ Scientiarum Gottingenſis. According to theſe experiments, thin pieces of yellow *wax* were whitened and hardened, by being digeſted and boiled in diluted and undiluted nitrous acid, in a few hours. But the *wax* thus whitened, being melted by means of boiling water, was obſerved to acquire a yellow colour, leſs intenſe, however, than it was before it had been treated with the mineral acids. The marine and vitriolic acids were leſs effectual than the nitrous. He expoſed *wax* to the flames of burning ſulphur, but without ſucceſs. Yellow *wax*, being melted in vinegar, was rendered of a grey colour. The oil of tartar whitened *wax*, but leſs effectually than acids had done; and this *wax*, being waſhed in water, and afterwards digeſted in nitrous acid, was rendered ſtill more white; but upon melting it in water, a yellowiſh tinge returned. He liquefied *wax* in ſolutions of nitre and alum, but without any good effect. Spirit of wine, which is recommended by Mr. Boyle for this purpoſe, did indeed whiten the *wax*, but changed it to a butyraceous ſubſtance, ſo frothy, that its bulk was increaſed thirty times. Reflecting that tartar is purified from its oily particles by means of a calcareous earth, he tried the effects of a kind of fuller's earth, which he threw upon *wax* liquefied in water, and he agitated the mixture. This method rendered *wax* of a greyiſh colour, and is, therefore, recommended by him as preparatory to bleaching; the time neceſſary for which, he thinks, may be thus greatly ſhortened.

This white *wax* is uſed in the making of candles, torches, tapers, flambeaux, figures, and other *wax*-works. See CANDLES, TAPER, FLAMBEAUX, &c.

It is alſo an ingredient, partly for giving the requiſite conſiſtence to other ingredients, and partly on account of its own emollient quality, in plaſters, cerates, and divers pomatums and unguents for the complexion.

The yellow ſort, diſſolved into an emulſion, or mixed with ſpermaceti, oil of almonds, conſerve of roſes, &c. into the form of an electary; or divided, by ſtirring into it, when melted over a gentle fire, as much as it will take up of powdery matters, as the compound crabs-claw powder, is given alſo internally, and often with great ſucceſs, in diarrhœas and dyſenteries, for obtunding the acrimony of the humours, ſupplying the natural mucus of the inteſtines, and healing their excoriations or eroſions.

The empyreumatic oil, into which *wax* is reſolved by diſtillation with a ſtrong heat, is greatly recommended by Boerhaave, and others, for healing chaps and roughneſs of the ſkin, for diſcuſſing chilblains, and with proper fomentations and exerciſe, againſt ſtiffneſs of the joints, and contractions of the tendons. It is, without doubt, ſays Dr. Lewis, highly emollient; but does not appear to have any other quality by which it can act in external applications; it has nothing of the acrimony or pungency, which prevail in all the other known diſtilled vegetable oils; though in ſmell it is not a little diſagreeable and empyreumatic; a circumſtance which occaſions it to be at preſent more rarely uſed than formerly. As the *wax* ſwells up greatly in the diſtillation, it is convenient to divide it, by melting it with twice its weight of ſand, or putting the ſand above it in the retort, that it may mingle with the *wax* when brought into fuſion. The oil, which is preceded by a ſmall quantity of acid liquor, congeals in the neck of the retort, from whence it may be melted down, by applying a live coal, and made fluid by rediſtilling it two or three times without addition. The fæces remaining, after expreſſing the *wax*, have been uſed both by ſurgeons and farriers, with ſucceſs, againſt ſtrains. Dict. Chem. art. *Wax*. Eng. ed. and Lewis's Mat. Med.

Yellow *wax* is made ſoft with turpentine, yet retains its natural colour. Red *wax* is only the white melted with turpentine, and reddened with vermilion or alkanet. Verdigriſe makes it green; and burnt paper, or lamp-black, black. Some travellers tell us of a natural black *wax*; aſſuring us there are bees, both in the Eaſt and Weſt Indies, that make an excellent honey, included in black cells. Of this *wax*, they ſay, it is, that the Indians make thoſe little vaſes, wherein they gather their balſam of Tolu.

WAX, *chafe*. See CHAFE.

WAX, *crude or rough*, called by the French *cire brute*, in

Natural

Natural Hiſtory, a name given to a ſubſtance called by the ancients *erithace, ſandarac*, and *ambroſia*.

We ſeem to have no name for it in Engliſh, but may call it after the name of the French, *rough wax*.

The Dutch call it the food of the bees, and that, perhaps, very properly, there appearing many reaſons to think that the bees eat it.

This is the yellow ſubſtance found on the hinder legs of bees in ſmall lumps, and is the ſubſtance of which, according to Reaumur, *wax* is made by this inſect. See PAIN *d'abeiles*.

WAX, *myrtle*. See CANDLE-BERRY-*tree*.

WAX, *virgin, propolis*, is a ſort of reddiſh *wax*, uſed by the bees to ſtop up the clefts or holes of the hive. It is applied juſt as taken out of the hive, without any art, or preparation of boiling, &c. It is the moſt tenacious of any, and is held good for the nerves. See PROPOLIS.

WAX, *ſealing*, or *Spaniſh* WAX, is a compoſition of gum LACCA, melted and prepared with reſins, and coloured with ſome ſuitable pigment.

There are two kinds of *ſealing-wax* in uſe; the one hard, intended for ſealing letters, and other ſuch purpoſes, where only a thin body can be allowed: the other ſoft, deſigned for receiving the impreſſions of ſeals of office to charters, patents, and ſuch written inſtruments.

The beſt hard red *ſealing-wax*, is made by mixing two parts of ſhell-lac, well powdered, and reſin and vermilion, powdered, of each one part, and melting this combined powder over a gentle fire; and when the ingredients ſeem thoroughly incorporated, working the *wax* into ſticks. Seed-lac may be ſubſtituted for the ſhell-lac; and inſtead of reſin, boiled Venice turpentine may be uſed. A coarſer, hard, red *ſealing-wax*, may be made, by mixing two parts of reſin, and of ſhell-lac, or vermilion and red-lead, mixed in the proportion of one part of the vermilion to two of the red-lead, of each one part; and proceeding, as in the former preparation. For a cheaper kind, the vermilion may be omitted, and the ſhell-lac alſo, for very coarſe uſes. The hard black *ſealing-wax* may be prepared in the ſame manner; uſing for the beſt ſort, inſtead of the vermilion, the beſt ivory black; and for the coarſer ſort, inſtead of the vermilion and red-lead, the common ivory black. For hard, green *ſealing wax*, inſtead of vermilion, uſe powdered verdegriſe; and for a bright colour, diſtilled, or cryſtals of verdigriſe. For hard, blue *ſealing-wax*, inſtead of the vermilion, ſubſtitute well powdered ſmalt, or for a light blue, verditer; or a mixture of both. For yellow, hard *ſealing-wax*, ſubſtitute maſticot, or for a bright colour, turbith mineral, inſtead of the vermilion. The hard, purple *wax*, is made like the red; changing half the quantity of the vermilion for an equal, or greater proportion of ſmalt, as the purple is deſired to be more blue or more red.

For uncoloured, ſoft *ſealing-wax*, take of bees-*wax*, one pound; of turpentine, three ounces; and of olive-oil, one ounce; place them in a proper veſſel over the fire, and let them boil for ſome time; and the *wax* will be then fit to be formed into rolls or cakes for uſe. For red, black, green, blue, yellow, and purple ſoft *ſealing-wax*, add to the preceding compoſition an ounce or more of any ingredients directed above for colouring the hard *ſealing-wax*, and ſtir the maſs, till the colouring ingredient be incorporated with the *wax*. The hard *ſealing-wax* is formed into ſticks, by rolling the maſs on a copper-plate, or ſtone, with a rolling-board, lined with copper, or block-tin, into rolls of any required ſize. In order to give them the fire-poliſh, or gloſs, a furnace or ſtove, like a pail, with bars at the bottom for ſupporting the charcoal, and notches at the top of the ſides for putting the ſticks of *wax* over the fire, is uſually provided. By means of this ſtove the ſticks of *wax* may be conveniently expoſed to the fire, and turned about, till the *wax* is ſo melted on the ſurface as to become ſmooth and ſhining. Hard *ſealing-wax* may be formed into balls, by putting a proper quantity on the plate or ſtone, and having faſhioned it into a round form, rolling it with the board till it be ſmooth.

The ſoft *wax* is eaſily formed into rolls or cakes, by pouring the melted maſs of the ingredients, as ſoon as they are duly prepared, into cold water, and working it with the hands into any deſired figure. Some perfume both theſe kinds of *wax*, by uſing, for a pound of the *wax*, half an ounce of benjamin, one ſcruple of oil of Rhodium, ten grains of muſk, and of civet and ambergriſe, each five grains; rubbing the oil with the other ingredients powdered; and when the *wax* is ready to be wrought into ſticks, ſprinkling in and well ſtirring the mixture; or by uſing one ounce of benjamin, one ſcruple and a half of oil of Rhodium, and five grains of ambergriſe, in the ſame manner. Lewis's Com. of Arts, p. 370. Handmaid to the Arts, vol. ii. p. 34, &c.

WAX-*candles*. See CANDLE.

By 24 Geo. III. cap. 36. inſtead of the former duty of 8*d*. a pound on *wax*-candles imported, ſhall be paid a duty of 2*d*. a pound on all *wax* imported; which ſhall be ſubject to the additional 5 per cents. impoſed by the acts of 19 Geo. III. cap. 25. and 22 Geo. III. cap. 66. And for every pound of *wax* or ſpermaceti candles made in Great Britain (notwithſtanding the mixture of any ingredients therewith), ſhall be paid a duty of 3*d*. a pound. Moreover, an annual licence duty of 5*l*. ſhall be paid by every perſon making *wax* or ſpermaceti candles, and of 5*s*. for trading in or ſelling the ſame; ſubject alſo to the additional 5 per cents. of the 19th, 21ſt, and 22d Geo. III. Making or trading in ſuch candles without licence, incurs a forfeiture of 20*l*.

WAX, *to imitate fruit*, &c. *in*. Take the fruit, and bury it half-way in clay; oil its edges, and the extant half of the fruit; then nimbly throw on it tempered alabaſter, or plaſter of Paris, to a conſiderable thickneſs. When this is concreted, it makes the half mould, the ſecond half of which may be obtained in the ſame way. The two parts of the mould being joined together, a little coloured *wax*, melted, and brought to a due heat, being poured through a hole made in any convenient part of the mould, and preſently ſhook every way therein, will repreſent the original fruit. Boyle's Works abr. vol. i. p. 136.

Here we muſt not forget that pretty invention of M. Benoiſt, a man famous at Paris for his figures of *wax*. Being, by profeſſion, a painter, he found the ſecret of forming moulds on the faces of living perſons, even the faireſt and moſt delicate, without any danger either to their health or complexion: in which moulds he caſt maſks of *wax*; to which, by his colours, and glaſs eyes imitated from nature, he gave a ſort of life: inſomuch as, when clothed in proper habits, they bore ſuch a reſemblance, that it was difficult diſtinguiſhing between the copy and the original.

WAX, *gilding*. See GILDING.

WAX, *grafting*, is a compoſition ſerving to bind or fix the bud, or graft, in the cleft of the ſtock.

Inſtead of *grafting wax*, the country gardeners, &c. only uſe clay, over which they lay a piece of linen cloth, and ſo keep it moiſt; and to prevent its cracking with the heat of the ſun, they tie moſs over it. But the *wax* ordinarily uſed, is a compoſt of one pound and a half of pitch, a quarter of a pound of *wax*, and an ounce of oil of almonds, melted and mixed together; with the addition, in ſpring or autumn, of a moderate quantity of turpentine.

For cleft-grafting, whip-grafting, and grafting by approach, Mr. Mortimer recommends tempered clay, or ſoft *wax*; but for rind-grafting, clay and horſe-dung.

WAX, *green*. See GREEN *wax*.

WAX, *thorough*, in *Botany*. See HARE'S *ears*.

WAX, *painting in*. See ENCAUSTIC *painting*.

WAXING, *ceratio*, in *Chemiſtry*, the preparation of any matter to render it fit and diſpoſed to liquefy, or melt, which of itſelf it was not.

This is frequently done, to enable things to penetrate into metals, or other ſolid bodies.

WAX-SCOT, or WAX-SHOT, *ceragium*, in our *Ancient Cuſtoms*, money paid twice a year towards the charge of maintaining lights, or candles, in the church.

WAY, *via*. See HIGHWAY, ROAD, TURNPIKE, and VIA.

Roman *ways* are divided into *conſular, prætorian, military*, and *public*.

We have four notable ones of theſe in England; anciently called *chimini quatuor*, and intitled to the privileges of pax regis. The firſt is *Watling-ſtreet*, or *Wathe-ling-ſtreet*, leading from Dover to London, Dunſtable, Towceſter, Atterſton, and the Severn, near the Wrekin in Shropſhire, extending as far as Angleſea in Wales. The ſecond, called *Hekineld*, or *Ikenild-ſtreet*, reaches from Southampton, over the river Iſis at Newbridge, thence by Camden and Litchfield, then paſſes the Derwent near Derby, ſo to Bolſover-Caſtle, and ends at Tinmouth. The third, called *Foſſe-way*, becauſe in ſome places it was never perfected, but lies as a large ditch, leads from Cornwall through Devonſhire, by Tetbury near Stow in the Wolds; and beſide Coventry to Leiceſter, Newark, and ſo to Lincoln. The fourth, called *Erming*, or *Erminage-ſtreet*, ſtretches from St. David's in Weſt Wales, to Southampton.

WAY. See WEIGH.

WAY, *milky*. See GALAXY.

The opinion, long maintained among aſtronomers, but lately controverted, that the *milky way* contains a great number of ſtars, has been confirmed by the obſervations of the ingenious and indefatigable Mr. Herſchel. On applying his teleſcope of the Newtonian form, with an object-ſpeculum of twenty-feet focal length and an aperture of 18 $\frac{7}{10}$ inches, to a part of this ſpace, he found

found that it completely reſolved the whole whitiſh appearance into ſmall ſtars; which his former teleſcopes had not light enough to effect. In the tract immediately about the hand and club of Orion, to which his obſervations were particularly directed, the multitude of ſtars of all poſſible ſizes that preſented themſelves to view was aſtoniſhing: and in order to form ſome juſt idea of their number, Mr. Herſchel counted many fields, and computed from a mean of them, what a given portion of the *milky way* might contain. Among many trials of this ſort he found, that ſix fields, promiſcuouſly taken, contained 110, 60, 70, 90, 70, and 74 ſtars each. A mean of theſe gives 79 ſtars for each field. Hence, by allowing 15 minutes of a great circle for the diameter of the field of view, it is inferred, that a belt of 15 degrees in length and 2 in breadth, which is the quantity often obſerved by this excellent aſtronomer to paſs through the field of his teleſcope in one hour's time, could not well contain leſs than fifty thouſand ſtars, that were large enough to be diſtinctly numbered. But, beſides theſe, Mr. Herſchel ſuſpected at leaſt twice as many more, which, for want of light, he could only ſee now and then by faint glittering and interrupted glimpſes.

This author, obſerving that the nebulæ and cluſters of ſtars, of which he has already found 466 not before ſeen by any other perſon, are arranged into ſtrata, which ſeem to run into a great length, conjectures that the *milky way* is nothing but a ſtratum of fixed ſtars; and that the ſun is placed in this ſtratum, though perhaps not in the very centre of its thickneſs. This he infers from the appearance of the galaxy, which ſeems to encompaſs the whole heavens, as it certainly muſt do if the ſun is within the ſame. For, ſuppoſing a number of ſtars arranged between two parallel planes, indefinitely extended every way, but at a given conſiderable diſtance from each other; and calling this a ſidereal ſtratum, an eye placed ſomewhere within it will ſee all the ſtars in the direction of the planes of the ſtratum projected into a great circle, which will appear lucid on account of the accumulation of the ſtars; while the reſt of the heavens, at the ſides, will only ſeem to be ſcattered over with conſtellations, more or leſs crouded, according to the diſtance of the planes or number of ſtars contained in the thickneſs or ſides of the ſtratum.

If this ſituation of the ſun ſhould be admitted, and it be not far from the branching out of a ſecondary ſtratum, it will naturally lead us to gueſs at the cauſe of the probable motion of the ſolar ſyſtem; for the very bright, great node of the *via lactis*, or union of the two ſtrata about Cepheus and Caſſiopeia, and the Scorpion and Sagittarius, points out a conflux of ſtars manifeſtly quite ſufficient to occaſion a tendency towards that node in any ſtar ſituated at no very great diſtance; and the ſecondary branch of the galaxy not being much leſs than a ſemi-circle ſeems to indicate ſuch a ſituation of our ſolar ſyſtem in the great undivided ſtratum as the moſt probable. Phil. Tranſ. vol. lxxiv. part ii. p. 439, &c.

Way *of a ſhip* is ſometimes uſed for the ſame with the rake. But the term is more commonly underſtood of the courſe or progreſs which ſhe makes on the water under ſail: thus, when ſhe begins her motion, ſhe is ſaid to be *under way*; when that motion increaſes, ſhe is ſaid to have *freſh way* through the water; when ſhe goes apace, they ſay, *ſhe has a good way*; and they call the account how faſt ſhe ſails by the log, *keeping an account of her way*.

And becauſe moſt ſhips are apt to ſail a little to the leeward of their true courſe; they always, in caſting up the log-board, allow ſomething for her leeward-*way*. Hence alſo a ſhip is ſaid to have head-*way* and stern-*way*.

Way *of the rounds, chemin des rondes*, in *Fortification*, is a ſpace left for the paſſage of the rounds, between the rampart, and the wall of a fortified town.

This is not now much in uſe; becauſe the parapet not being above a foot thick, it is ſoon overthrown by the enemy's cannon.

Way, *covert, foſs, gang, hatch, ſpur*, and *water*. See the ſeveral articles.

Ways *and means, committee of*. See Supplies.

WAYED *horſe*, in the *Manege*, is one that is already backed, ſuppled and broken, and ſhews a diſpoſition to the manege.

WAYFARING-*tree, viburnum*, in *Botany*, a genus of the *pentandria trigynia* claſs. Its characters are theſe: the flower has a ſmall permanent empalement, which is cut into five parts; it has one bell-ſhaped petal, cut at the brim into five obtuſe ſegments which are reflexed; it has five awl-ſhaped ſtamina the length of the petal, terminated by roundiſh ſummits; and a roundiſh germen ſituated under the flower, having no ſtyle, but the place occupied by a roundiſh gland, crowned by three obtuſe ſtigmas: the germen turns to a roundiſh fruit with one cell encloſing one hard ſeed. Linnæus enumerates eight and Miller nine ſpecies. See Gelder-*roſe*.

WAY-WISER, an inſtrument for meaſuring the road, or diſtance gone; called alſo perambulator, and *podometer*, or pedometer.

Mr. Lovell Edgworth communicated to the Society of Arts, &c. an account of a *way-wiſer* of his invention; for which he obtained a ſilver medal. This machine conſiſts of a nave, formed of two round flat pieces of wood, one inch thick and eight inches in diameter. In each of the pieces there are cut eleven grooves, five-eighths of an inch wide and three-eighths deep; and when the two pieces are ſcrewed together, they encloſe eleven ſpokes, forming a wheel of ſpokes, without a rim; the circumference of the wheel is exactly one pole; and the inſtrument may be eaſily taken to pieces, and put up in a ſmall compaſs. On each of the ſpokes there is driven a ferril, to prevent them from wearing out; and in the centre of the nave, there is a ſquare hole to receive an axle. Into this hole there is inſerted an iron or braſs rod, which has the thread of a very fine ſcrew worked upon it from one end to the other: upon this ſcrew hangs a nut which, as the rod turns round with the wheel, advances or recedes towards or from the nave of the wheel. The nut does this becauſe it is prevented from turning round with the axle, by having its centre of gravity placed at ſome diſtance below the rod, ſo as always to hang perpendicularly like a plummet. Two ſides of this ſcrew are filed away flat, and have figures engraved upon them to ſhew by the progreſſive motion of the nut, how many circumvolutions the wheel and its axle have made: on one ſide the diviſions of miles, furlongs, and poles are in a direct, and on the other ſide the ſame diviſions are placed in a retrograde order.

If the perſon who uſes this machine places it at his right ſide, holding the axle looſely in his hands, and walks forward, the wheel will revolve, and the nut advance from the extremity of the rod towards the nave of the wheel. When two miles have been meaſured, the nut will have come cloſe to the wheel. But to continue this meaſurement, nothing more is neceſſary than to place the wheel at the left hand of the operator; and the nut will, as he continues his courſe, recede from the axletree, till another ſpace of two miles is meaſured.

It appears from the conſtruction of this machine, that it operates like circular compaſſes; and does not, like the common wheel *way-wiſer*, meaſure the ſurface of every ſtone and mole-hill, &c. but paſſes over moſt of the obſtacles it meets with, and meaſures the chords only, inſtead of the arcs of any curved ſurfaces upon which it rolls.

WAYWODE, is properly a title given the governors of the chief places in the dominions of the czar of Muſcovy. The palatines, or governors of provinces in Poland, alſo bear the quality of *waywodes*, or *waiwodes*. See Palatine.

The Poles likewiſe call the princes of Walachia and Moldavia *waywodes*; as eſteeming them no other, than on the foot of governors; pretending that Walachia and Moldavia are provinces of Poland, which have withdrawn themſelves from the obedience of the republic. Every where elſe theſe are called *hoſpodars*.

Du-Cange ſays, that the name *waywode* is uſed in Dalmatia, Croatia, and Hungary, for a *general of an army*: and Leunclavius, in his Pandects of Turkey, tells us, it uſually ſignifies *captain*, or *commander*.

WEACHIN, in *Botany*, the name given by the Indians of America to the maiz, or Indian corn, which they cultivated for bread before we knew them.

WEAK, or *eaſy branch*, in the *Manege*. See Banquet, and Banquet-*line*.

Weak *pulſe*. See Pulse.

WEALD, or Weld, the woody part of a country; as the *weald of Kent*, the word *weald* in Saxon ſignifying a wood. It is miſrepreſented in ſome books and maps, and called the *wilds* of Kent, Suſſex, and Surry.

WEALREAF, in *our Old Writers*, ſignifies the robbing of a dead man in his grave.

The word comes from the Saxon *weal, ſtrages*, and *reaf, ſpoliatio*.

WEANEL, a country term for a young beaſt newly weaned, or taken from ſucking its dam.

WEANING, *ablactation*. See Ablactation.

WEAPONS. See Arms, and Armour.

Weapon-*ſalve*, a kind of unguent, ſuppoſed to cure wounds ſympathetically, by being applied, not to the wound, but to the *weapon* that made it. See Sympathetic *Powder*, and Transplantation.

WEAR, or Weer, a great ſtank, or dam in a river: fitted for the taking of fiſh, or for conveying the ſtream to the mill. See Fishing.

WEARING, in *Sea-Language*. See VEERING.

WEASEL, WEESEL, in *Zoology*, a species of the MUSTELA.

The *weasel*, in some parts of England, is called the *foumart*, or *fitchet*. It is a little creature, smaller than the *pole-cat*, and the least of the *weasel*-kind: its back and sides are reddish, and its throat and belly white, the whiteness reaching perfectly from the angle of the chin to the insertion of the tail; but beneath the corners of the mouth on each jaw is a spot of brown: its head is something like a dog's, the upper jaw reaches beyond the lower, and is ornamented with some bristles by way of whiskers. Its fore-teeth are six in number in each jaw, and are small and set very close together, like the teeth of a comb; those of the under-jaw are much smaller than the others; the dog-teeth are long, large, and strong; the eyes are small and black, the ears short and broad, and covered with very thick-set hairs; and, which is a very remarkable circumstance, they are doubled in their lower part. The inner cavity of the ear is very large, and full of tubercles. The feet are small, but broad, and each divided into five toes; the legs are short. The heart and liver are, in dissecting this creature, found remarkably large. (See *Tab.* III. *Quadrupeds*, N° 39.)

This animal, like the rest of the kind, is very destructive to young birds, poultry, and rabbits, and also to eggs: it also preys upon moles. It frequents houses, barns, and granaries, clearing its haunts, more effectually than the cat, of rats and mice. It brings five or six young at a time: its skin and excrements are most intolerably fetid.

This animal is confounded by Linnæus with the STOAT or ERMINE. He seems unacquainted with our *weasel* in its brown colour; but describes it in the white state under the title of *fnomus*, or *mustela nivalis*.

In Norway, Sweden, Russia, and Siberia, the *weasel* always changes to white at the approach of winter. In Siberia it is called *lasmitska*; and the skins are sold to the Chinese for three or four rubles per hundred. Ray and Pennant.

WEASEL-*coot*, in *Ornithology*, the red-headed *smew*, or MERGUS *minutus* of Linnæus.

WEATHER, the state or disposition of the atmosphere, with regard to moisture or drought, heat or cold, wind or calm, rain, hail, frost, snow, fog, &c. See ATMOSPHERE, RAIN, HEAT, WIND, HAIL, FROST, &c.

As it is in the atmosphere that all plants and animals live and breathe, and as that appears to be the great principle of most animal and vegetable productions, alterations, &c. there does not seem any thing in all philosophy, of more immediate concernment to us, than the state of the *weather*. In effect, all living things are only assemblages, or bundles of vessels, whose juices are kept moving by the pressure of the atmosphere; and which by that motion maintain life. So that any alterations in the rarity or density, the heat, purity, &c. of that, must necessarily be attended with proportionable ones in these.

What great, yet regular alterations, a little change of *weather* makes, in a tube filled with mercury, or spirit of wine, or in a piece of string, &c. every body knows, in the common instance of barometers, thermometers, hygrometers, &c. and it is owing partly to our inattention, and partly to our unequal, intemperate course of living, that we do not feel as great and as regular ones in the tubes, chords, and fibres, of our own bodies.

It is certain, a great part of the brute creation have a sensibility, and sagacity, this way, beyond mankind; and yet, without any means or disposition thereto, more than we; except that their vessels, fibres, &c. being, in other respects, in one equable habitude; the same or a proportionable cause from without, has always a like, or proportionable effect on them; that is, their vessels are regular barometers, &c. affected only from one external principle; viz. the disposition of the atmosphere; whereas ours are acted on by divers from within, as well as without: some of which check, impede, and prevent, the action of others.

We know of nothing more wanting than a just theory of the *weather*, on mechanical principles. But, in order to that, a complete history of the *weather* will be required.

If registers were carefully kept in divers parts of the globe, for a good series of years, we should be enabled to determine the directions, breadth, and bounds, of the winds, and of the *weather* they bring with them; the correspondence between the *weather* of divers places, and the dependence between one sort and another at the same place. In time, no doubt, we might learn to foretel divers great emergencies; as, extraordinary heats, rains, frosts, droughts, dearths, plagues, and other epidemical diseases, &c.

The members of our Royal Society, the French Academy of Sciences, and many authors of note, have made considerable essays this way; and the practice of keeping meteorological journals has, of late years, become very general. For instructions and examples pertaining to this subject, see Phil. Trans. vol. lxv. part ii. art. 16. Eras. Bartholin has observations of the *weather* for every day throughout the year 1671. Mr. W. Merle made the like at Oxford, for seven years, with a very remarkable care and accuracy. Dr. Plott did the same at the same place, for the year 1684. Mr. Hillier, at Cape Corse, for the years 1686, 1687. Mr. Hunt, &c. at Gresham College, for the years 1695, 1696. Dr. Derham, at Upminster in Essex, for the years 1691, 1692, 1697, 1698, 1699, 1703, 1704, 1705. Mr. Townley, in Lancashire, in 1697, 1698. Mr. Cunningham, at Emin in China, for the years 1698, 1699, 1700, 1701. Mr. Locke, at Oats in Essex, 1692. Dr. Scheuchzer, at Zurich, in 1708; and Dr. Tilly, at Pisa, the same year. See the Phil. Transactions.

The form of Dr. Derham's observations we give as a specimen of a journal of this kind; observing that he notes the strength of the winds, by 0, 1, 2, 3, &c. and the quantity of rain, as it fell through a funnel, in pounds and centesimals.

Phenomena of the WEATHER, October 1697.

Day.	Hour.	Weather.	Wind.		Barometer.		Rain.	
27	7	Fair.	S. W.	2	29	37	1	52
	12	Rain.	S. W. by W.	5	29	34		
	9	Stormy.		0	29	88	0	29

We have several schemes for keeping METEOROLOGICAL *journals* or diaries of the *weather*, extant in the Philosophical Transactions, the Medical Essays of Edinburgh, and in other books. The Ephemerides Ultrajectinæ may also be consulted. The instruments requisite for such journal, are a barometer, thermometer, anemoscope, and ombrometer, which see in their proper places.

As a specimen of the use of such histories, we shall add some general remarks, drawn from them by Dr. Derham; and, 1. That foggy *weather* makes the mercury rise in the barometer, as well as the north wind. The cause, he suggests, probably enough, to be the accession of the load of vapour to the former weight of the atmosphere. *Misling weather* he likewise observes to have the like effect.

2. The colds and heats in England and Switzerland begin and end nearly about the same time: nay, and any remarkable *weather*, especially if it continue any while, affects one place as well as the other.

3. That the remarkably cold days in June, anno 1708, were found, in Switzerland, to precede ours, commonly by about five days, or more; and that the remarkable heats in the following months began to abate in both places about the same time; only somewhat sooner here than there.

4. That though the winds in both places frequently agree, yet they oftener differ.

5. That the barometer is always lower at Zurich than at Upminster, by sometimes one, and sometimes above two English inches; but the common difference is about half an inch. Which may be solved either by supposing Zurich situate one-fourth of a mile higher above the level of the sea than Upminster; or else, by supposing that part of the terraqueous globe, as lying nearer the line, to be higher, and more distant from the centre than ours is, which lies nearer the pole.

6. That the barometers generally rise and fall together at far distant places: though this agreement of the barometer is not so constant between Zurich and Upminster, as in places nearer home; viz. at London and Paris; where, again, the agreement is not so great as between Upminster and Lancashire.

7. That the variations of the barometer are greatest, as the places are nearest the pole. Thus, e. gr. the mercury at London has a greater range by two or three lines than at Paris; and at Paris, a greater than at Zurich. In some places near the equinoctial, there is scarce any variation at all. See BAROMETER.

8. That the rain in Switzerland and Italy is much greater in quantity, throughout the year, than that in Essex, yet the rains are more frequent, i. e. there are more rainy days, in Essex, than at either of those places. For the proportion of the annual rains that fall in several places and seasons, see RAIN.

9. That cold contributes greatly to rain; and that, apparently, by condensing the suspending vapours, and making them descend. Thus, very cold months, or seasons,

ſons, are generally followed immediately by very rainy ones; and cold ſummers are always wet ones.

10. That high ridges of mountains, as the Alps, and the ſnows with which they are covered, not only affect the neighbouring places by the colds, rains, vapours, &c. they produce; but even diſtant countries, as England, often partake of their effects. Thus, the extraordinary colds, December 1708, and the relaxations thereof, were felt in Italy and Switzerland, ſeveral days before they reached us; an indication, Dr. Derham thinks, that they were derived from them to us. See a collection of ingenious and meteorological obſervations conjectures by Dr. Franklin, in his Experiments, &c. p. 182, &c. See Evaporation, Rain, and Wind.

Weather, *prognoſtics of the*. We do not here mean to obtrude the idle, arbitrary obſervations of fanciful people upon our readers. That cloud of popular predictions from the brute world, which partly the ſagacity, and partly the credulity, of our countrymen have eſtabliſhed, we ſet aſide; as not flowing from any natural, neceſſary relations, that we know of, in the things themſelves. Such is the foretelling of rain and wind from water-fowls flocking to land, or land-fowls to the water; from birds pruning their feathers, geeſe cackling, crows cawing loud, and flying in companies, ſwallows chattering, and flying low, peacocks crying much, aſſes braying, deer fighting, foxes and wolves howling, fiſhes playing, ants and bees keeping within-doors, moles caſting up earth, earthworms creeping out, &c. We ſhall offer nothing on this head, but what has ſome viſible foundation in the nature of things; and which lets ſome light into the cauſe and reaſon of the *weather* itſelf, or diſcovers ſome notable effects thereof.

1. Then, *a thick, dark ſky, laſting for ſome time, without either ſun or rain, always becomes firſt fair, then foul*, i.e. it changes to a fair clear ſky, before it turns to rain. This, the rev. Mr. Clarke obſerved, who kept a regiſter of the *weather* for thirty years, ſince put into Dr. Derham's hands by his grandſon the learned Dr. Samuel Clarke: he ſays, he ſcarce ever knew it to fail; at leaſt, when the wind was in any of the eaſterly points; but Dr. Derham has obſerved the rule to hold good, be the wind where it will. And the cauſe is obvious. The atmoſphere is replete with vapours, which, though ſufficient to reflect and intercept the ſun's rays from us, yet want denſity to deſcend; and while the vapours continue in the ſame ſtate, the *weather* will do ſo too. Accordingly, ſuch *weather* is generally attended with moderate warmth, and with little or no wind to diſturb the vapours, and a heavy atmoſphere to ſuſtain them; the barometer being commonly high. But when the cold approaches, and by condenſing, drives the vapours into clouds or drops, then way is made for the ſun beams; till the ſame vapours, being by farther condenſation formed into rain, fall down in drops.

2. *A change in the warmth of the* weather *is generally followed by a change in the wind*. Thus, the northerly and ſoutherly winds, commonly eſteemed the cauſes of cold and warm *weather*, are really the effects of the cold or warmth of the atmoſphere; of which Dr. Derham aſſures us he has had ſo many confirmations, that he makes no doubt of it. Thus, it is common to ſee a warm ſoutherly wind ſuddenly changed to the north, by the fall of ſnow or hail; or to ſee the wind, in a cold froſty morning, north, when the ſun has well warmed the earth and air, wheel towards the ſouth; and again turn northerly or eaſterly in the cold evening.

3. *Moſt vegetables expand their flowers and down in ſunſhiny* weather; *and towards the evening, and againſt rain, cloſe them again; eſpecially at the beginning of their flowering, when their ſeeds are tender and ſenſible.* This is viſible enough in the down of dandelion, and other downs; and eminently in the flowers of pimpernel; the opening and ſhutting of which, Gerard (Herb. lib. ii.) obſerves, are the countryman's *weatherwiſer*, whereby he foretels the *weather* of the following day. The rule is, if the flowers be cloſe ſhut up, it betokens rain, and foul *weather*: if they be ſpread abroad, fair *weather*.

Eſt & alia (arbor in Tylis) *ſimilis, folioſior tamen, roſeique floris; quem noctu comprimens, aperire incipit ſolis exortu, meridie expandit. Incolæ dormire eum dicunt.* Plin. Nat. Hiſt. lib. xii. cap. 11.

The ſtalk of trefoil, lord Bacon obſerves, ſwells againſt rain, and grows more upright: and the like may be obſerved, though not ſo ſenſibly, in the ſtalks of moſt other plants. He adds, that in the ſtubble-fields there is found a ſmall red flower, called by the country people *pimpernel*; which, opening in a morning, is a ſure indication of a fine day. See *Sleep of* Plants, and Vigiliæ *florum*.

That vegetables ſhould be affected by the ſame cauſes that affect the *weather*, is very conceivable; if we conſider them as ſo many hygrometers, and thermometers; conſiſting of an infinite number of tracheæ, or air-veſſels; by which they have an immediate communication with the air, and partake of its moiſture, heat, &c. Theſe tracheæ are very viſible in the leaf of the ſcabioſe, vine, &c.

Hence it is, that all wood, even the hardeſt and moſt ſolid, ſwells in moiſt *weather*; the vapours eaſily inſinuating into the pores thereof; eſpecially of that which is lighteſt and drieſt. And hence we derive a very extraordinary uſe of wood, viz. for breaking rocks for mill-ſtones.

The method at the quarries is this. Having cut a rock into a cylinder, they divide that into ſeveral leſs cylinders, by making holes at proper diſtances round the great one; the holes they fill with ſo many pieces of ſallow wood, dried in an oven, which, in moiſt *weather*, becoming impregnated with the humid corpuſcles of the air, ſwell; and, like wedges, break or cleave the rock into ſeveral ſtones.

Predictions of the Weather *from the barometer*. See Barometer.

As to the ſuppoſed influence of the moon upon the *weather*, ſee *Influence of the* Moon.

Weather, in *Sea-Language*, is uſed as an adjective, and applied by mariners to every thing lying to windward of a particular ſituation: thus, a ſhip is ſaid to have the *weather*-gage of another, when ſhe is farther to windward. Thus alſo, when a ſhip under ſail preſents either of her ſides to the wind, it is then called the *weather*-ſide or *weather*-board; and all the rigging and furniture ſituated thereon are diſtinguiſhed by the ſame epithet; as the *weather*-ſhrouds, the *weather*-lifts, the *weather*-braces, &c.

To Weather, in *Sea-Language*, is to ſail to windward of ſome ſhip, bank, or head-land.

Weather-*bit*, in *Sea-Language*, denotes a turn of the cable of a ſhip about the end of the windlaſs, without the knight-heads. It is uſed to check the cable, in order to ſlacken it gradually out of the ſhip, in tempeſtuous weather, or when the ſhip rides in a ſtrong current. See Ring-*ropes*.

Weather-*boarding*, among *Carpenters*, &c. denotes the nailing up of boards againſt a wall, and ſome times the boards themſelves when thus nailed up.

Weather-*cock*, or Weather-*vane*, a moveable vane, in form of a cock, or of other ſhape, placed on high, to be turned round according to the direction of the wind, and point out what quarter the wind blows from. See Vane.

Weather-*cord*. See Hygrometer.

Weather, *hard-a*. See Hard.

Weather-*houſe*. See Hygrometer.

Weather-*glaſſes* are inſtruments contrived to indicate the ſtate or diſpoſition of the atmoſphere, as to heat, cold, gravity, moiſture, &c. to meaſure the changes befalling it in thoſe reſpects; and, by thoſe means, to predict the alteration of *weather*, as rains, winds, ſnow, &c.

Under the claſs of *weather-glaſſes*, are comprehended *barometers, thermometers, hygrometers, manometers*, and *anemometers*, of each whereof there are divers kinds: ſee their theories, conſtructions, uſes, kinds, &c. under Barometer, Thermometer, Hygrometer, &c.

Weather-*quoil*, or *coile*, in the *Sea-Language*, is the turning of the ſhip's head about, ſo as to lie that way which her ſtern did before, without looſing any ſail, but only by bearing up the helm.

Weather-*ſhore*, in *Sea-Language*, a name given to the ſhore lying to windward.

Weather-*tiling*, in *Building*, the covering of the upright ſides of a houſe with tiles.

WEATHERING, a doubling, or ſailing by a point, or place.

Weathering, among *Mill-wrights*. See Wind-*mill*.

The Weathering *of a hawk*, among *Falconers*, is the ſetting of her abroad to take the air.

WEAVER, in *Manufactures*, one who practiſes the art of weaving.

Perſons uſing the trade of a *weaver*, ſhall not keep a tucking or fulling-mill, or uſe dying, &c. or have above two looms in a houſe in any corporation or market-town, on pain of forfeiting 20*s*. a week; and ſhall ſerve an apprenticeſhip for ſeven years to a *weaver* or clothier, or ſhall forfeit 20*l*. &c. ſtat. 2 and 3 Ph. and M.

Weaver's *alarm*. This contrivance is only a weight faſtened to a packthread, which is placed horizontally, ſo that in a certain time a candle may burn down to it. Then the flame of the candle ſetting fire to the thread, the weight falls, and awakens the ſleeping perſon. See Phil. Tranſ. Nº 477. ſect. 14. where we have a figure to explain the invention, which got its name from being in frequent uſe among the *weavers*.

WEAVING,

WEAVING, the art, or act, of working a web of cloth, silk, linen, or other stuff, on a loom, with a shuttle.

It is difficult to say, with any assurance, to whom we owe this admirable invention, unless we choose to ascribe it to the spider, that poisonous, but ingenious little insect, which draws certain infinitely fine threads from its own substance through papillæ near its *anus*. See SILK.

WEAVING *of cloth*. See CLOTH.

WEAVING *of tapestry*, &c. See TAPESTRY, &c.

WEAVING, *stocking*. See STOCKINGS.

WEB, a sort of plexus, or texture, formed of threads interwoven with each other; some whereof are extended in length, and called the *warp*; and others drawn across them, called the *woof*.

Spider's WEB, or *Cob*-WEB, is a very delicate and wonderful plexus, which that insect spins out of its own bowels; serving it as a sort of toil, or net, to catch flies, &c. See SPIDER.

For the manner wherein the spider spins his *web*, the admirable mechanism of the parts subservient thereto, and the uses thereof, see SILK, and *Ductility of Spider*-WEBS *infra*.

This substance dried and powdered is esteemed by some, as a good astringent and absorbent.

Dr. Lister tells us, that, attending nearly to a spider weaving a net, he observed it suddenly to desist in the mid-work; and turning its tail to the wind, it darted out a thread, with the violence and stream we see water spout out of a jet: this thread, taken up by the wind, was immediately carried to some fathoms long; still issuing out of the belly of the animal. By-and-by the spider leaped into the air, and the thread mounted her up swiftly. After this discovery, he made the like observation in near thirty different sorts of spiders; and found the air filled with young and old, sailing on their threads, and doubtless seizing gnats and other insects in their passage: there being often manifest signs of slaughter, legs and wings of flies, &c. on these threads, as well as in their *webs* below.

Dr. Hulse discovered the same thing about the same time. In a letter of Dr. Lister to Mr. Ray, he thinks there is a fair hint of the darting of spiders in Aristotle, Hist. An. lib. ix. cap. 39. and in Pliny, lib. x. cap. 74. But with regard to their sailing, the ancients are silent, and he thinks it was first seen by him. In another letter to Mr. Ray, dated January, 1670, speaking of the height spiders are able to fly to, he says, "Last October, &c. I "took notice, that the air was very full of *webs*; I forth-"with mounted to the top of the highest steeple on the "Minster (in York) and could there discern them yet "exceeding high above me."

Ductility of Spider-WEBS. M. Reaumur observes, that the matter whereof spiders and silk-worms form their threads, is brittle when in the mass, like dry gums. As it is drawn out of their bodies, it assumes a consistence, much as glass-threads become hard, as they recede from the lamp; though from a different cause. The ductility of this matter, and the apparatus thereto, being much more extraordinary in spiders than in silk-worms, we shall here only consider the former. Something also has already been said of each under SILK.

Near the anus of the spider are six papillæ, or teats, represented in *Tab. Nat. Hist. fig.* 19. The extremities of the several papillæ are furnished with holes, that do the business of wire-drawers, in forming the threads. Of these holes, M. Reaumur observes, there are enough in compass of the smallest pin's-head, to yield a prodigious quantity of distinct threads. The holes are perceived by their effects: take a large garden-spider ready to lay its eggs, and applying the finger on a part of its papillæ, as you withdraw that finger, it will take with it an amazing number of different threads. M. Reaumur has often counted seventy or eighty with a microscope, but has perceived, that there were infinitely more than he could tell. In effect, if he should say, that each tip of a papilla furnished a thousand, he is persuaded, he should say much too little. The part is divided into an infinity of little prominences, like the eyes of a butterfly, &c. each prominence, no doubt, makes its several thread; or rather, between the several protuberances, there are holes that give vent to threads; the use of the protuberances, in all probability, being to keep the threads at their first exit, before they are yet hardened by the air, asunder. In some spiders those protuberances are not so sensible; but in lieu thereof there are tufts of hair, which may serve the same office, viz. to keep the threads a-part. Be this as it will, there may threads come out at above a thousand different places in every papilla; consequently, the spider having six papillæ, has holes for above six thousand threads. It is not enough that these apertures are immensely small: but the threads are already formed before they arrive at the papilla, each of them having its little sheath, or duct, in which it is brought to the papilla from a considerable distance.

M. Reaumur traces them up to their source, and shews the mechanism by which they are made. Near the origin of the belly, he finds two little soft bodies, which are the first source of the silk. Their form and transparency resemble those of glass-beads (see *fig* 20.) by which name we shall hereafter denote them. The tip of each bead, as R, goes winding, and makes an infinity of turns, and returns towards the papilla. From the base, or root of the bead, proceeds another branch much thicker; which winding variously, forms several knots, and takes its course like the other, towards the hind part of the spider. In these beads and their branches, is contained a matter proper to form the silk, only that it is too soft. The body of the bead is a kind of reservoir, and the two branches two canals proceeding from it. A little farther backwards, there are two other lesser beads, which only send forth one branch a-piece, and that from the tip. Beside these, there are three other larger vessels on each side of the spider, which M. Reaumur takes for the last reservoirs, where the liquor is collected. They are represented (*fig.* 21.) The biggest is near the head of the insect, and the least near the anus. They all terminate in a point; and from the three points of these three reservoirs it is, that the threads, at least the greatest part of the threads drawn out at the three papillæ, proceed. Each reservoir supplies one papilla. Lastly, at the roots of the papillæ, there are discerned several fleshy tubes: probably, as many as there are papillæ. Upon lifting up the membrane, or pellicle, that seems to cover these tubes, they appear full of threads, all distinct from each other, and which, of consequence, under a common cover, have each their particular one; being kept like knives in sheaths. The immense quantity of threads contained here, M. Reaumur concludes upon tracing their course, does not wholly come from the points of the reservoirs; but some from all the turns, and angles; nay probably, from every part thereof. But by what conveyances the liquor comes into the beads, and out of the beads into the reservoirs, remains yet to be discovered.

We have already observed, that the tip of each papilla may give passage to above a thousand threads; yet the diameter of that papilla does not exceed a small pin's-head: but we were there only considering the largest spiders.

If we examine the young, growing spiders produced by those, we shall find, that they no sooner quit their egg, than they begin to spin. Indeed their threads can scarce be perceived; but the *webs* may: they are frequently as thick, and close, as those of house-spiders; and no wonder: there being often four or five hundred little spiders concurring to the same work. How minute must their holes be? the imagination can scarce conceive that of their papillæ! The whole spider is, perhaps, less than a papilla of the parent which produced it.

This is easily seen: each big spider lays four or five hundred eggs; these eggs are all wrapped up in a bag; and as soon as the young ones have broke through the bag, they begin to spin. How fine must their threads at this time be!

Yet is not this the utmost nature does: there are some kinds of spiders so small at their birth, that they are not visible without a microscope. There are usually found an infinity of these in a cluster, and they only appear like a number of red points. And yet there are webs found under them, though well nigh imperceptible. What must be the tenuity of one of these threads; the smallest hair must be to one of these what the most massive bar is to the finest gold-wire.

The matter whereof the threads are formed, we have observed, is a viscid juice. The beads are the first receptacles where it is gathered, and the place where it has the least consistence. It is much harder when got into the six great reservoirs, whither it is carried by canals from the former: this consistence it acquires in good measure in its passage; part of the humidity being dissipated in the way, or secreted by parts destined for that purpose.

Lastly, the liquor is dried still farther, and becomes thread, in its progress through the respective canals to the papillæ. When these first appear out at the holes, they are still glutinous; so that such as spring out of neighbouring holes, stick together. The air completes the drying.

By boiling the spider, more, or less, the liquor is brought to a greater or less consistence, fit to draw out into threads; for it is too fluid for that purpose while yet inclosed in its reservoirs.

The matter contained in these reservoirs, when well dried,

dried, appears a tranſparent gum, or glue, which breaks when much bent: like glaſs, it only becomes flexible by being divided into the fineſt threads. And probably it was on this account nature made the number of holes ſo immenſe. The matter of ſilk formed in the bodies of ſpiders being much more brittle than that formed in ſilk-worms, needed to be wound ſmaller. Otherwiſe we do not conceive, why ſhould they form a great number of threads, which were afterwards to be re-united: a ſingle canal might elſe have done.

WEB-*caſe.* See CHRYSALIS.

WEB, *pin and.* See PANNUS.

WEDGE, *cuneus*, in *Mechanics*, the laſt of the five powers, or ſimple machines.

The *wedge* is a triangular priſm, whoſe baſes are iſoſceles acute-angled triangles.

Authors are divided about the principle whence the *wedge* derives its power.

Ariſtotle conſiders it as two levers of the firſt kind, inclined toward each other, and acting oppoſite ways. Guido Ubaldus, Merſennus, &c. will have them levers of the ſecond kind. But Fr. de Lanis ſhews, that the *wedge* cannot be reduced to any lever at all.

Others refer the *wedge* to the inclined plane. Others, again, with De Stair, deny the *wedge* to have ſcarce any force at all; and aſcribe much the greateſt part to the mallet that drives it.

Its doctrine (according to ſome writers) is contained in this propoſition. "If a power be applied to a *wedge*, in "ſuch manner, as that the line of direction C D (*Tab.* "VII. *Mechanics, fig.* 116.) perpendicular to A B, is to "the reſiſtance to be overcome, as A B to C D; the "power will be equal to the reſiſtance."

Or thus: "If the power directly applied to the head of "the *wedge*, be to the reſiſtance to be overcome by the "*wedge*, as the thickneſs of the *wedge* is to its height; "then the power will be equivalent to its reſiſtance; "and, if increaſed, will overcome it."

In proof of this propoſition, they alledge, that the firmneſs whereby the parts of the obſtacle, ſuppoſe wood, adhere to one another, is the reſiſtance to be overcome by the *wedge*: and that while the *wedge* is driven into the wood, the way or length it has gone is B H (*fig.* 117.); and D C is the way or length gone in the ſame time, by the impediment; that is, the parts C and D of the wood are ſo far divided aſunder: and according as the *wedge* is driven down farther and farther along its height; ſo the parts C and D of the wood are divided more and more, along the thickneſs of the *wedge*.

But Dr. Deſaguliers has proved, that, when the reſiſtance acts perpendicularly againſt the ſides of the *wedge*, the power is to the whole reſiſtance as the length of both ſides of the *wedge*, taken together, is to the thickneſs of its back.

According to the preceding theory, if the thickneſs of the *wedge* (that is, the way of the impediment, and conſequently its velocity) be to the height of the *wedge* (that is, the way, and conſequently the velocity of the power) as the power to the impediment, or reſiſtance; then the momentum of the power, and the impediment, will be equal the one to the other: and conſequently the power, being increaſed, will overcome the reſiſtance.

Hence, 1. The power equivalent to half the reſiſtance, is to it as A C to D C, (*fig.* 116.) that is, as the whole ſine to the co-tangent of half the angle of the *wedge* A D C. And 2. As the tangent of a leſs angle is leſs than that of a greater, the power muſt have a greater proportion to half the reſiſtance, if the angle be greater than if leſs: conſequently, the acuter the *wedge* is, the more does it increaſe the power.

The above proportion is adopted by Wallis (Op. Math. vol. i. p. 1016) Keil (Int. ad Ver. Phyſ.) and s'Graveſande (El. Math. lib. i. cap. 14.); but s'Graveſande, in his Scholium de ligno findendo (ubi ſupra) obſerves, that when the parts of the wood are ſeparated before the *wedge*, the force by which it is thruſt in is to the reſiſtance of the wood as a line, drawn from a point in the middle of the baſe to the ſide of the *wedge*, and at right angles with the ſide of the ſeparated wood continued, to the height of the *wedge*; but when the parts of the wood are ſeparated no farther than the *wedge* is driven in, the equilibrium will be, when the power is to the reſiſtance as the half baſe of the *wedge* to its ſide.

To this method of eſtimating the power of the *wedge* it has been objected that, by allowing each part of the weight to have moved through a ſpace equal to half the back of the *wedge*, whilſt the power has moved through its height, and the whole weight to have moved through a ſpace equal to the whole back, the whole is made to move farther than its parts.

Mr. Muſchenbroeck ſtates the proportion of the power to the weight in a ſimple *wedge*, or half the *wedge* (*fig.* 116.) biſecting it by a plane paſſing through C D, as its back is to its length, or in that caſe as A C to C D: and in a double *wedge* or the *wedge* A B D, as A B to 2 C D. Int. ad Phil. vol. i. p. 132.

Mr. Ferguſon eſtimates the power of the *wedge*, in the two caſes mentioned by s'Graveſande, in the following manner. When the wood does not cleave at any diſtance before the *wedge*, there will be an equilibrium (he ſays) between the power impelling the *wedge* downward, and the reſiſtance of the wood acting againſt the two ſides of the *wedge*, if the power be to the reſiſtance as half the thickneſs of the *wedge* at its back is to the length of either of its ſides: and if the power be increaſed ſo as to overcome the friction of the *wedge*, and the reſiſtance ariſing from the coheſion or ſtickage of the wood, the *wedge* will be drove in, and the wood ſplit aſunder.

But when the wood cleaves at any diſtance before the *wedge* (as it generally does) the power impelling the *wedge* will be to the reſiſtance of the wood as half its thickneſs is to the length of either ſide of the cleft, eſtimated from the top or acting part of the *wedge*: for, ſuppoſing the *wedge* to be lengthened down to the bottom of the cleft, the power will be to the reſiſtance as half the thickneſs of the *wedge* is to the length of either of its ſides; or, which amounts to the ſame thing, as the whole thickneſs of the *wedge* is to the length of both its ſides.

In proof of this proportion we may ſuppoſe the *wedge* divided lengthways into two equal parts, and then it will become two equally inclined planes; one of which, as *a b c* (*fig.* 118.) may be made uſe of as a half-*wedge* for ſeparating the moulding *c d* from the wainſcot A B. When this has been driven its whole length *a c* between the wainſcot and moulding, its ſide *a c* will be at *e d*, and the moulding will be ſeparated to *f g* from the wainſcot.

From the property of the *inclined* PLANE it appears, that to have an equilibrium between the power impelling the half-*wedge* and the reſiſtance of the moulding, the former muſt be to the latter, as *a b* to *a c*; that is, as the thickneſs of the back which receives the ſtroke is to the length of the ſide againſt which the moulding acts. Conſequently, ſince the power upon the half-*wedge* is to the reſiſtance againſt its ſide, as the half back *a b* is to the whole ſide *a c*, it is plain, that the power upon the whole *wedge* (where the whole back is double the half back) muſt be to the reſiſtance againſt both its ſides, as the thickneſs of the whole back is to the length of both the ſides, ſuppoſing the *wedge* at the bottom of the cleft; or as the thickneſs of the whole back to the length of both ſides of the cleft, when the wood ſplits at any diſtance before the wedge. For, when the *wedge* is driven quite into the wood, and the wood ſplits at ever ſo ſmall a diſtance before its edge, the top of the *wedge* then becomes the acting part, becauſe the wood does not touch it any where elſe. And ſince the bottom of the cleft muſt be conſidered as that part where the whole ſtickage or reſiſtance is accumulated, it is plain, from the nature of the lever, that the farther the power acts from the reſiſtance, the greater is the advantage.

Some writers have indeed, advanced, that the power of the *wedge* is to the reſiſtance to be overcome, as the thickneſs of the back of the *wedge* is to the length only of one of its ſides; but this, ſays Mr. Ferguſon, ſeems very ſtrange; for, if we ſuppoſe A B (*fig.* 119.) to be a ſtrong inflexible bar of wood or iron fixed into the ground at C B, and D and E to be two blocks of marble lying on the ground on oppoſite ſides of the bar; it is evident that the block D may be ſeparated from the bar to the diſtance *d* equal to *a b*, by driving the inclined plane or half-*wedge* *a b o* down between them; and the block E may be ſeparated to an equal diſtance on the other ſide, in like manner, by the half-*wedge* *c d o*. But the power impelling each half *wedge* will be to the reſiſtance of the block againſt its ſide, as the thickneſs of that half-*wedge* is to the length of its acting ſide. Therefore the power to drive both the half-*wedges* is to the reſiſtances, as both the half backs are to the length of both the acting ſides, or as half the thickneſs of the whole back is to the length of either ſide. And, if the bar be taken away, the blocks put cloſe together, and the two half-*wedges* joined to make one; it will require as much force to drive it down between the blocks, as is equal to the ſum of the ſeparate powers acting upon the half-*wedges* when the bar was between them. Ferguſon's Lect. p. 40, &c. 4to. See alſo Deſag. Exp. Phil. vol. i. p. 107, &c.

Mr. Ludlam, in an Eſſay on the Power of the *Wedge*, printed in 1770, propoſes, with a particular view to the machines deſcribed by s'Graveſande, Deſaguliers, and Ferguſon, for eſtimating the power of the *wedge*, to determine this power, when two equal forces act on the ſides of an iſoſceles triangle in directions parallel to the back but oppoſite to each other, and are ſuſtained by a third

third force acting perpendicularly on the back of the *wedge*. For this purpose, let ABC (*fig.* 120) be an isosceles *wedge*, whose angular point is C, sides AC and BC, back AB, and perpendicular height HC: let FE represent the quantity and direction of the force applied to one of the sides; this may be resolved into two other forces FD and DE, the former parallel and the latter perpendicular to the side AC; and the oblique force FE will have just the same effect upon the *wedge* as a less perpendicular force DE; the former being to the latter as AC is to HC. But this last perpendicular force on the side AC is to that on the back which balances it, as AC is to AH; whence, compounding these ratios, the oblique force against one side of the *wedge* is to the perpendicular force on the back which balances it, as AC^2 is to $AH \times HC$. The oblique force *fe* on the other side of the *wedge*, being equal to FE, will require another perpendicular force on the back to balance it equal to the former perpendicular force; whence the whole force on both sides of the *wedge* is to the whole force on the back as AC^2 is to $AH \times HC$, or as the square of the side of the *wedge* to the rectangle under half the back and the perpendicular height.

For other methods of estimating the effect of the *wedge* in various cases, see MECHANICAL *Powers*.

The *wedge* is a very great mechanical power, since not only wood but even rocks can be split by it; which it would be impossible to effect by the lever, wheel and axle, or pulley; for the force of the blow, or stroke, shakes the cohering parts, and thereby makes them separate the more easily.

To the *wedge* may be referred all edge-tools, and instruments which have a sharp point, in order to cut, cleave, slit, chop, pierce, bore, or the like; as knives, hatchets, swords, bodkins, &c.

WEDLOCK. See MARRIAGE, WIFE, HUSBAND, &c.

WEDNESDAY, the fourth day of the WEEK, formerly consecrated by the inhabitants of the northern nations to *Woden* or ODIN, who, being reputed the author of magic and inventor of all the arts, was thought to answer to the Mercury of the Greeks and Romans, in honour of whom they called the same day *dies Mercurii*.

WEDNESDAY, *Ash*. See ASH-*Wednesday*.

WEED, a common name of all rank and wild herbs, that grow of themselves without particular culture, to the detriment of other useful herbs, among which they appear.

No plants are useless in themselves; but in respect to the farmer they are both useless and hurtful, when they come in this manner, and devour the nourishment destined for the crop of what was sown.

All *weeds* are pernicious; but some much more so than others: some are very mischievous, but easily killed; some less hurtful, but more difficultly rooted out; and some have both qualities together. The hardest to kill are those which grow readily from seed, and have roots, every part of which is qualified for becoming a stout plant in a small time; the worst are couch-grass, colts-foot, melilot, fern, and some others of the like kind.

Some of these pernicious plants only affect the crop by imbibing its nourishment, and thus starving, and lessening its increase; but there are others which add to this mischief, that of spoiling what they leave; these infect the crop with their own nauseous smell, such as melilot, garlic, and some others.

The farmer finds it impossible ever wholly to destroy the *weeds* in his lands; and the reason seems to be, that in many kinds the seeds will lie many years in the ground, and successively grow, some one year, some another; so that the destroying of the crop entirely for one year does not kill them for succeeding ones. The seed of red poppy will lie twenty years in the ground, in a land all that time occupied by saintfoin: and if it be, after that, ploughed for corn, they will all grow, and fill the field.

The seeds of these plants will never all come up in one year, because they must have their exact degrees of depth, moisture and covering; the seeds, which want any of these one year, lie to grow up another. The best defence the farmer has hitherto found against these enemies, is to endeavour their destruction by a summer fallow. This, if the weather be propitious, does make some havock among them, but it never destroys them entirely. If the seeds lie so high that the summer's heat parches them up, or so deep that it cannot reach them, they do not germinate, and are by that means preserved for another year. And another thing, which preserves a very great number of them, is their being able to bear the moisture of a whole year without growing. Wild oats, and many other seeds of *weeds* are of this kind. If you gather these when ripe, and sow them in the most careful manner, watering them at times, and taking all the care of them that is necessary for the most tender plants, they will not grow till the second spring after they were sowed, and sometimes not till the spring after that; that is, two years and a half after the time of putting them into the ground. It is plain from this, that no art can destroy these by fallowing, or other means, in one year.

The common way of *weeding* among the young corn, turns out to very little good; if this is done while the *weeds* are young, most of them are only cut or broken off near the ground: this, instead of destroying them, gives them new vigour, and they shoot up with many heads in the place of one, and draw more nourishment than at first: if, on the other hand, it is done when they are grown up, the relief comes after the disease; for by that time they have robbed the corn of all the nourishment, or nearly all, they could.

Hand-*weeders* also frequently do more harm in the corn, by treading it down, than they do good by taking out the *weeds*. This operation sometimes costs the farmer twelve shillings an acre, beside the mischief done, and yet there remain *weeds* enough for a crop the next year from seeds.

The method of horse-hoeing is a very excellent way of curing lands of this evil, so long as it is carefully practised; one of the greatest advantages it will bring the farmer, is, that no *weeds* will grow up but those whose seeds are brought in the air, and these are but very few in comparison of the other kinds.

WEED, *dyer's*. See DYER's *Weed*, *Bastard* ROCKET, and WELD.

WEED, *Fuller's*. See TEAZEL.

WEED, *sea*. See FUCUS.

WEED, *silver*, in *Botany*. See CINQUEFOIL.

WEEDS, in *Mining*, a term used by our English diggers to express any sort of unprofitable substance found among the ores of metals. They seem to have borrowed the phrase from the gardeners; and as every thing with them is a *weed*, except what they have planted, and expect to gather, so every thing is a *weed* with the miners, except the thing they are sinking for. See DIGGING.

The principal substances known in our mines under the name of *weeds*, are mundic or marcasite; this is of three sorts, white, yellow, and green; daze, a kind of glittering talcky stone, of the telaugium kind, which endures the fire, and is of various colours and hardnesses; iron-moulds, or pyritæ; caul, which is brownish and spongy; and glister, which is a sort of talc. Phil. Trans. N° 69.

WEEDS, also, denote a peculiar habit, worn by the relicts of persons deceased, by way of mourning. See MOURNING.

WEEK, *septimona*, *hebdomada*, in *Chronology*, a division of time, comprising seven days.

The origin of this division of *weeks*, or of computing time by sevenths, is greatly controverted. Some will have it to take its rise from the four quarters or intervals of the moon, between her changes of phases, which being about seven days distant, gave occasion to the division. Be this as it will, the division is certainly very ancient.

The Syrians, Egyptians, and most of the oriental nations, appear to have used it from all antiquity: though it did not get footing in the West till Christianity brought it in: the Romans reckoned their days not by sevenths, but by ninths; and the ancient Greeks by decads, or tenths.

Indeed, the Jews divided their time by *weeks*, but it was upon a different principle from the other eastern nations. God himself having appointed them to work six days, and to rest the seventh, in order to keep up the sense and remembrance of the creation; which being effected in six days, he rested the seventh.

Some authors will even have the use of *weeks*, among the other eastern nations, to have proceeded from the Jews; but with little appearance of probability. It is with better reason that others suppose the use of *weeks*, among the heathens of the East, to be a remain of the tradition of the creation, which they had still retained with divers others.

This is the opinion of Grotius, de Veritat. Relig. Christ. lib. i. who likewise proves, that not only throughout the East, but even among the Greeks, Italians, Celtæ, Sclavi, and even the Romans themselves, the days were divided into *weeks*; and that the seventh day was in extraordinary veneration. This appears from Joseph. adv. Apion. II. Philo. de Creatione. Clem. Alexand. Strom. lib. v. Though Helmoldus, lib. i. cap. 84. Philostratus, lib. iii. cap. 13. Dion. lib. xxxviii. Tibullus, Lucian, Homer, Callimachus, Suetonius, Herodotus, &c. who mention the septenary division of days as very ancient, suppose it to have been derived from the Egyptians.

The *days of the week* were denominated by the Jews, from the order of their ſucceſſion from the ſabbath. Thus, the day next after the ſabbath, they called the *firſt* of the ſabbath; the next, the *ſecond* of the ſabbath; and ſo of the reſt; except the ſixth, which they call *paraſceve*, or preparation of the ſabbath.

The like method is ſtill kept up by the Chriſtian Arabs, Perſians, Ethiopians, &c. The ancient heathens denominated the days of the *week* from the ſeven planets; which names are ſtill generally retained among the Chriſtians of the Weſt. Thus the firſt day was called *Sun-day, dies ſolis*; the ſecond *Moon-day, dies lunæ*, &c. a practice the more natural on Dion's principle, who ſays, the Egyptians took the diviſion of the *week* itſelf from the ſeven planets.

In effect, the true reaſon of theſe denominations ſeems to be founded in aſtrology. For the aſtrologers diſtributing the government and direction of all the hours in the *week* among the ſeven planets, ♄ ♃ ♂ ☉ ♀ ☿ ☽, ſo as that the government of the firſt hour of the firſt day fell to Saturn, that of the ſecond day to Jupiter, &c. they gave each day the name of the planet, which, according to their doctrine, preſided over the firſt hour thereof; and that, according to the order ſpecified above; and which is included in the following technical verſe.

Poſt SIM SUM *ſequitur, pallida Luna ſubeſt.*

Wherein, the capital letters SIM SUM, and L, are the initial letters of the planets. So that the order of the planets in the *week*, bears little relation to that in which they follow in the heavens: the former being founded on an imaginary power each planet has, in its turn, on the firſt hour of each day.

Dion Caſſius gives another reaſon of the denomination, fetched from the celeſtial harmony. For it being obſerved, that the harmony of the diateſſaron, which conſiſts in the ratio of 4 to 3, is of great force and effect in muſic; it was judged meet to proceed directly from Saturn to the Sun; becauſe, according to the old ſyſtem, there are three planets between Saturn and the Sun, and four from the Sun to the Moon.

Our anceſtors the Saxons, before their converſion to the Chriſtian faith, named the ſeven days of the *week* from the Sun and Moon and ſome of their deified heroes, to whom they were peculiarly conſecrated, which names we received and ſtill retain: thus Sunday was devoted to the Sun; Monday to the Moon; Tueſday, according to ſome, to Tuiſto or Tuisco, mentioned by Tacitus, but, according to others, to Thyſa or Dyſa, the wife of Thor, and the goddeſs of juſtice; or, according to others, to Tyr; Wedneſday to Woden, the god of war; Thurſday to Thor, who preſided over the air, and was ſuppoſed to govern the winds and clouds; this is the ſame with Lucan's Taranis, ſimilar to the Welch word for thunder; Friday to Friga or Fræa, the wife of Thor, and the goddeſs of peace and plenty; and Saturday to Seater, called alſo Orodo, to whom they prayed for protection, freedom, and concord, and for the fruits of the earth. The origin of the laſt appellation, however, is doubtful; as ſome have obſerved, that the name *Seater* is not mentioned by any writer before Verſtegan. See Verſtegan's Reſtitution of decayed Intelligence, p. 68. Junii Etym. Angl. and Mallet's North. Ant. vol. i. p. 91, &c.

To find the accompliſhment of Daniel's prophecy of the Meſſiah, the deſtruction, rebuilding, &c. of the temple, chap. ix. ver. 24, &c. the critics generally agree to underſtand *weeks of years*, inſtead of *weeks of days*.

Accordingly, Dr. Prideaux, fixing the end of theſe *weeks* at the death of Chriſt, in the year of the Julian period 4746, and in the Jewiſh month Niſan, dates their commencement in the month Niſan, in the year of the Julian period 4256, which was the very year and month in which Ezra had his commiſſion from Artaxerxes Longimanus, king of Perſia, for his return to Jeruſalem, there to reſtore the church and ſtate of the Jews. And thus he finds, that from the one period to the other, there were exactly 70 *weeks* of years, or 490 years. Connect. vol. ii. p. 381, &c.

Weeks, *Ember*. See Ember.

Weeks, *Feaſt of*. See Pentecost.

Week, *Paſſion*, or *the Holy* Week, is the laſt *week* in Lent, wherein the church celebrates the myſtery of our Saviour's death and paſſion.

This is alſo ſometimes called *the great week*. Its inſtitution is generally referred, both by Proteſtants and Papiſts, to the times of the apoſtles. All the days of that *week* were held as faſts: no work was done on them; no juſtice was diſtributed; but the priſoners were ordinarily ſet at liberty, &c. even pleaſures, otherwiſe allowed, were at this time prohibited. The oſculum charitatis was now forborn: and divers mortifications practiſed by all ſorts of people, and even the emperors themſelves.

Week, *Rogation*. See Rogation.

Week, or Wick *of a candle*, &c. the cotton match in a candle or lamp. See Candle, Lamp, &c.

Week-*fiſh*, in *Ichthyology*, a name given by ſome to a very delicate fiſh, caught on the Eaſt Indian ſhores, and called by the Dutch there the *wit viſch*. See Wit-*Fiſh*.

WEEPING. See Tears.

WEER. See Wear.

WEEVER, in *Ichthyology*, the Engliſh name for the fiſh called by Willughby and other authors, the draco-*marinus*, or ſea-dragon.

Belon ſays, that this name is a corruption of the French *la vive*, becauſe this fiſh is capable of living long out of the water.

Mr. Pennant deſcribes another ſpecies, under the name of the *great weever*, the *draco* major or *araneus* of Salvian, which inhabits the ſea near Scarborough. Brit. Zool. vol. iii. p. 171.

WEEVIL, in *Natural Hiſtory*, the name of a ſmall inſect which does great damage in magazines of corn, by eating into the ſeveral grains, and deſtroying their whole ſubſtance.

This creature is ſomewhat bigger than a large louſe, and is of the ſcarab or beetle kind, having two pretty, jointed, tufted horns, and a trunk or piercer, projecting from the fore part of its head: at the end of this trunk, which is very long in proportion to its body, there is a ſort of forceps or ſharp teeth, with which it gnaws its way into the heart of the grain, either to ſeek its food, or to depoſit its eggs there.

By keeping theſe creatures alive in glaſs tubes, with a few grains of wheat, their copulation and manner of generation have been diſcovered. The female perforates a grain of wheat, and therein depoſits a ſingle egg, or, at the utmoſt, two eggs; and this ſhe does to five or ſix grains every day for ſeveral days together. Theſe eggs, which are not larger than a grain of ſand, in about a week produce as odd a ſort of white maggot, which wriggles its body very much about, but is very little able to move from place to place: this, in about a fortnight, turns to an aurelia, from which is produced the perfect *weevil*. This deſtructive creature is itſelf very ſubject to be deſtroyed, and when in the egg or aurelia ſtate, is very ſubject to be eaten by mites. Baker's Microſ. p. 221. Leewenhoeck. tom 4. ep. 76.

WEFT, a kind of web, or thing woven: as, a *weft* or treſs of hair. See Web, Hair, Tissue, &c.

WEIF. See Waif.

WEIGH, Way, or Wey, *Waga*, a weight of cheeſe, wool, &c. containing two hundred and fifty-ſix pounds avoirdupois. Of corn, the *weigh* contains forty buſhels; of barley or malt, ſix quarters.

In ſome places, as Eſſex, the *weigh* of cheeſe is three hundred pounds. See Measure.

Et decimam caſei ſui de Herting, præter unam peiſam, quæ pertinet ad eccleſiam de A. Mon. Angl. where *peiſa* ſeems to be uſed for a *weigh*.

Coke alſo ſpeaks of *weighs* of bay ſalt.

WEIGHER, an officer in divers cities, appointed to *weigh* the commodities bought or ſold, in a public balance, &c. Theſe *weighers* are generally obliged by oath to do juſtice to both parties; and to keep a regiſter of the things they weigh.

In Amſterdam there are twelve *weighers*, eſtabliſhed into a kind of office. As it was formerly allowed them to touch the ſtrings of the balance in *weighing*, it was eaſy for them to favour either the buyer or ſeller, according as the one gave them more money than the other. To prevent which abuſe, it was charged on them, by an ordinance of the burgomaſters, in 1719, not to touch the balance in any manner whatever.

WEIGHING, the act of examining a body in the balance, to find its *weight*.

The diſtillers in London *weigh* their veſſels when full; and for half a hogſhead, which is thirty-one gallons and a half, allow two hundred one quarter and eleven pounds for the caſk and liquor. For a puncheon, they allow ſix hundred one quarter and two pounds; for a Canary pipe, eight hundred a half and ſeventeen pounds.

Weighing-*chair*, a machine contrived by Sanctorius, to determine the quantity of matter carried off from the body, and that of food taken at a meal; and to warn the feeder when he had eat his quantum.

That ingenious author, having obſerved, with many others, that a great part of our diſorders ariſes from the exceſs in the quantity of our foods, more than in the quality thereof; as alſo how much a fixed portion, once well adjuſted, would, if kept to regularly, contribute to health;

health; bethought himſelf of an expedient to that purpoſe. The reſult was the *weighing-chair*: which was a chair fixed at one arm of a ſort of balance, wherein a perſon being ſeated at meat, as ſoon as he had eat his allowance, the increaſe of *weight* made his ſeat preponderate: ſo that, deſcending to the ground, he left his table, victuals, and all, out of reach.

WEIGHING *of the air*. See WEIGHT *of Air*.

WEIGHING *anchor*, in the *Sea Language*. See ANCHOR.

WEIGHT, *Gravity*, *Pondus*, in *Phyſics*, a quality in natural bodies, whereby they tend downwards, toward the centre of the earth. See GRAVITY.

Or, *weight* may be defined, in a leſs limited manner, to be a power inherent in all bodies, whereby they tend to ſome common point, called the *centre of gravity*; and that with a greater or leſs velocity, as they are more or leſs denſe, or as the medium they paſs through is more or leſs rare.

In the common uſe of language, *weight* and *gravity* are conſidered as one and the ſame thing. Some authors, however, make a difference between them; and hold *gravity* only to expreſs a *niſus*, or endeavour, to deſcend; but *weight* an actual deſcent.

But there is room for a better diſtinction. In effect, one may conceive gravity to be the quality, as inherent in the body; and *weight*, the ſame quality, exerting itſelf, either againſt an obſtacle, or otherwiſe.

Hence, *weight* may be diſtinguiſhed, like gravity, into *abſolute* and *ſpecific*.

Sir Iſaac Newton demonſtrates, that the *weights* of all bodies, at equal diſtances from the centre of the earth, are proportionable to the quantities of matter each contains. Whence it follows, that the *weights* of bodies have not any dependence on their forms or textures; and that all ſpaces are not equally full of matter.

Hence alſo it follows, that the *weight* of the ſame body is different, on the ſurface of different parts of the earth; becauſe its figure is not a ſphere, but a ſpheroid.

The law of this difference the ſame author gives in the following theorem. "The increaſe of *weight*, as "you proceed from the equator to the poles, is, nearly, "as the verſed ſine of double the latitude; or, which "amounts to the ſame, as the ſquare of the right ſine "of the latitude."

Therefore, ſince the latitude of Paris is 48° 50′; that of a place under the equator 00° 00′; and that of a place under the pole 90° 00′; and the verſed ſines of the double latitudes are 11334,00000 and 20000, the radius being 10000; and the *weight* at the pole is to the *weight* at the equator, as 230 to 229; and the exceſs of *weight* at the pole, to that at the equator, as 1 to 229; the exceſs of gravity in the latitude of Paris, to that under the equator, will be as $1 \times \frac{11334}{20000}$ to 229, or as 5667 to 2290000; and therefore, the whole *weights*, in thoſe places, will be to each other as 2295667 to 2290000.

Hence, alſo, as the lengths of pendulums that perform their vibrations in equal times, are as their *weights*; and the length of a pendulum, which in the latitude of Paris vibrates ſeconds, is three Paris feet and eight lines $\frac{5}{9}$; the length of a pendulum, that vibrates ſeconds under the equator, will be ſhort of a ſynchronous pendulum at Paris, by one line, and an 87000th part of a line. Phil. Nat. Princ. Math. lib. iii. prop. 20. apud Opera Ed. Horſl. tom. iii. p. 43, &c.

A body immerged in a fluid ſpecifically lighter than itſelf, loſes ſo much of its *weight*, as is equal to the *weight* of a quantity of the fluid of the ſame bulk with itſelf.

Hence, a body loſes more of its *weight* in a heavier than in a lighter fluid; and therefore weighs more in a lighter, than a heavier fluid. See *Specific* GRAVITY.

To find the weight *of any quantity of a fluid*, e. g. of the wine contained in a hogſhead. Find the bulk or quantity of the liquor by the rules of GAUGING.

Suſpend a cubic inch of lead therein by a horſe-hair; and by a balance note the *weight* loſt. This will be the *weight* of a cubic inch of the fluid.

Wherefore, ſince in a homogeneous fluid, the *weight* is proportionable to the bulk; the *weight* of the fluid will be found by the rule of three. Thus, if the wine gallon contains 224 cubic inches, and conſequently the capacity of the hogſhead be 14112 cubic inches, or 8,1 cubic feet, and the cubic inch of red wine be 10 pennyweights 11,42 grains, and therefore the cubic foot of wine contains 75,42 pounds; the whole *weight* of the wine will be 610,902 or nearly 611 pounds. See *Cubic* MEASURES, and *Specific* GRAVITY.

The *weight* of a cubic foot of water has been determined by ſeveral: but as in different ſprings, &c. the *weight* of the water is different, and there is even a difference in the ſame water at different times; it is no wonder the obſervations of the ſeveral authors ſhould be found very different. Dr. Wiberd, by repeated experiments, found a cubic foot of water to weigh 76 pounds troy.

In the Philoſophical Tranſactions (N° 458. p. 457, &c.) we have an account of the analogy betwixt Engliſh *weights* and meaſures by Mr. Barlow. He advances, that anciently a cubic foot of water was aſſumed as a general ſtandard for liquids, and weighed 62 pounds and a half. This cubic foot multiplied by 32, gives two thouſand, the *weight* of a ton. And hence 8 cubic feet of water made a hogſhead, and four hogſheads a ton, in capacity and denomination, as well as *weight*.

Dry meaſures were raiſed on the ſame model. A BUSHEL of wheat, aſſumed as a general ſtandard for all ſorts of grain, alſo weighed 62 pounds and a half. Eight of theſe buſhels made a quarter, and 4 quarters a ton *weight*. Coals were ſold by the CHALDRON, ſuppoſed to weigh a ton, or 2000 pounds.

Hence a ton in *weight* is the common ſtandard for liquids, wheat, and coals. If this analogy had been kept up, it would have prevented the confuſion now complained of.

It may be reaſonably ſuppoſed that corn and other commodities, both dry and liquid, were firſt ſold by *weight*, and that meaſures, for convenience, were afterwards introduced, bearing ſome analogy to the weights before uſed.

Mr. Barlow's ſcheme ſhews the reaſon why the word *ton* is applied both to *weight* and liquid meaſure, viz. becauſe the ſame quantity of liquor is a ton both in *weight* and meaſure. Hence the word *quarter* may alſo be explained. Biſhop Fleetwood (Chron. Pret. p. 72.) gueſſed that it ſignified the fourth part of ſome *weight*, and not of any meaſure. And it ſeems plainly to ſignify the fourth part of a ton, or 2000 pounds. Phil. Tranſ. Abr. vol. ix. p. 489.

WEIGHT, *pondus*, in *Mechanics*, is any thing to be raiſed, ſuſtained, or moved by a machine; or any thing that in any manner reſiſts the motion to be produced. See MOTION, &c.

In all machines, there is a natural ratio between the *weight* and the moving power. If the *weight* be increaſed, the power muſt be ſo too; that is, the wheels, &c. are to be multiplied, and ſo the time increaſed, or the velocity diminiſhed.

"The centre of gravity F. (*Tab.* VII. *Mechanics*, *fig.* "121.) of a body I H, together with the *weight* of the "body, being given; to determine the point M, in "which, lying on a horizontal plane, a given *weight* G, "hung in L, cannot remove the body I H out of its horizontal ſituation."

Conceive a *weight* hung in the centre of gravity F, equal to the *weight* of the whole body I H, and find the common centre of gravity M, of that and the given *weight* G. If the point M be laid on the horizontal plane; the *weight* G will not be able to move the body H I out of its place.

"The centre of gravity C (*fig.* 122.) of a body A B, "together with its *weight* G, being given; to determine "the points L and M, wherein props M N and L O are "to be placed, that each may bear any given proportion "of the *weight*."

In the horizontal line AB, paſſing through the centre of gravity C, aſſume the right lines M C and C L in the given ratio. Props, then, M N, L O, placed in theſe points, will be preſſed in the given ratio.

Hence, if in the points M, L, in lieu of props, you place the ſhoulders or arms of porters, &c. they will be able to bear the burden alike; if their ſhares be proportioned to their ſtrengths. Thus we have a way of diſtributing a burden in any given ratio.

WEIGHT *of the atmoſphere*. See ATMOSPHERE.

WEIGHT, in *Commerce*, denotes a body of a known *weight*, appointed to be put in the balance againſt other bodies, whoſe *weight* is required.

Theſe *weights* are uſually of lead, iron, or braſs; though in divers parts of the Eaſt Indies they are common flints, and, in ſome places, a ſort of little beans.

The ſecurity of commerce depending, in good meaſure, on the juſtneſs of theſe *weights*, there is ſcarce any nation that has not taken proper meaſures to prevent the falſification thereof. The ſureſt means are the ſtamping, or marking of them by proper officers, from ſome original or ſtandard, depoſited where recourſe may be had to them.

This expedient is very ancient; and many authors are of opinion, that what among the Jews was called SHEKEL *of the* SANCTUARY, was not any particular kind of *weight* different from the common one; but a ſtandard or original *weight*, preſerved by the prieſts in the ſanctuary.

Thus, alſo, in England, the ſtandard of *weights* is kept in the exchequer, by a particular officer, called the CLERK, or *comptroller of the* MARKET. In France, the ſtandard

ſtandard *weight* is kept under ſeveral keys, in the cabinet of the cour de monnoyes. See STANDARD, and MEASURE.

Moſt nations wherein there is any thing of commerce flouriſhing, have their particular *weights*; and even ſometimes different *weights* in the different provinces, and for the different kinds of commodities.

This diverſity of *weights* makes one of the moſt perplexing articles in commerce; but it is irremediable. The reducing of the *weights* of different nations to one, is not only impracticable, but even the reduction of thoſe of the ſame nation: witneſs thoſe vain attempts made for reducing the *weights* in France, by ſo many of their kings, Charlemagne, Philip the Long, Louis XI. Francis I. Henry II. Charles IX. Henry III. Louis XIV.

Weights may be diſtinguiſhed into *ancient* and *modern*, *foreign* and *domeſtic*.

Modern WEIGHTS, *uſed in the ſeveral parts of Europe, and the Levant.*

WEIGHTS, *Engliſh*. By the twenty-ſeventh chapter of *Magna Charta*, the *weights* are to be the ſame all over England; (ſee MEASURE) but for different commodities there are two different ſorts, viz. *troy weight*, and *avoirdupois weight*.

The origin from which they are both raiſed, is the grain of wheat, gathered in the middle of the ear: 32 of theſe well dried made one penny-weight, 20 penny-weights 1 oz. and 12 oz. 1 lb. troy, ſtat. 51 Hen. III. 31 Edw. I. 12 Hen. VII.

A learned writer has ſhewn that, by the laws of aſſiſe, from William the Conqueror to the reign of Henry VII. the legal pound *weight* continued a pound of 12 ounces, raiſed from 32 grains of wheat; and the legal gallon meaſure invariably contained 8 of thoſe pounds of wheat, 8 gallons made a buſhel, and 8 buſhels a quarter.

Henry VII. altered the old Engliſh *weight*, and introduced a pound, under the name of troy, which exceeded the old Saxon pound by $\frac{3}{4}$ of an ounce: in proof of this it is alledged that Henry VIII. when he aboliſhed the old pound, in the eighteenth of his reign, and eſtabliſhed the troy, declares that the troy pound exceeded the old pound by $\frac{3}{4}$ of an ounce.

This troy pound, now in uſe, conſiſting of 12 ounces, contains 5760 troy grains, and the ounce therefore contains 480 grains; conſequently 360 grains, equal to $\frac{3}{4}$ of the ounce, deducted from 5760, leave 5400 troy grains, equal to the *weight* of the old Saxon pound which he aboliſhed. It appears, therefore, that the old Saxon pound was $\frac{540}{576}$ of the preſent troy pound, and, as the avoirdupois pound of 16 ounces contains 7000 troy grains, the old Saxon pound was $\frac{54}{70}$ of the preſent avoirdupois pound.

Moreover, it appears, that the braſs buſhel of Henry VII. found in the exchequer in 1688, contained 2145 cubic inches; and it is known by experiment, that 1728 cubic inches of wheat will weigh $58\frac{17}{576}$ pounds troy; and, therefore, 1728 cubic inches : 2145 cubic inches : : $58\frac{17}{576}$ pounds troy : 72 pounds troy, the *weight* of wheat contained in Henry VII.'s buſhel. And dividing 72 by 8, the number of pounds limited by the ſtatute to a gallon, his buſhel appears to have been a meaſure of 9 gallons inſtead of 8; and as 8 buſhels made a quarter, the quarter contained 72 gallons. Now if we divide 2145 by 9, the gallon will appear to contain $238\frac{1}{3}$ cubic inches, i. e. $\frac{1}{16}$th part more than the old Saxon gallon of 224 cubic inches; juſt as the troy pound is $\frac{1}{16}$th part heavier than the old Saxon pound.

Although formerly 32 grains made a penny weight, it has in later times been thought ſufficient to divide the penny-weights into 24 equal parts called grains, being the leaſt *weights* now in common uſe.

The firſt ſtatute that directs the uſe of the avoirdupois *weight* is that of 24 Henry VIII. which plainly implies it was no legal *weight*, till that ſtatute gave it a legal ſanction; and the particular uſe to which the ſaid *weight* is thus directed, is ſimply for weighing butchers meat in the market. How or when it came into private uſe is not clearly known. Phil. Tranſ. vol. lxv. part i. art. 3. See the following tables.

Table of *Troy Weight*, as uſed by the

Goldſmiths, &c.

Grains.			
24	Penny-weight.		
480	20	Ounce.	
5760	240	12	Pound.

Apothecaries.

Grains.				
20	Scruple. ℈			
60	3	Dram. ʒ		
480	24	8	Ounce. ℥	
5760	288	96	12	Pound.

By troy *weight* are weighed jewels, gold, ſilver, ſilk, and all liquors.

We may here obſerve, that a troy pound of gold is worth 46*l*. 14*s*. 6*d*.; for $44\frac{1}{2}$ guineas are coined from each pound at the mint: a troy ounce is worth 3*l*. 17*s*. 10*d*$\frac{1}{2}$. and a grain is worth 1 penny $3\frac{7875}{10000}$ farthings, in coinage ſtandard.

A troy pound of ſilver (coinage ſtandard) is worth 3*l*. 2*s*. an ounce is worth 5*s*. 2*d*. a penny-weight is worth 3*d*. and $\frac{4}{10}$th parts of a farthing; and a grain is worth about half a farthing. See tables under MONEY and STANDARD.

The troy pound in Scotland, which by ſtatute is to be the ſame as the French pound, is commonly ſuppoſed equal to 15 ounces and three quarters troy Engliſh *weight*, or 7560 grains. But by a mean of the ſtandards kept by the dean of gild of Edinburgh, it weighs $7599\frac{2}{32}$ or 7600 grains.

Table of *Avoirdupois Weight.*

Drams.					
16	An ounce.				
256	16	A pound.			
7168	448	28	A quarter.		
28672	1792	112	4	A hundred.	
573440	35840	2240	80	20	A ton.

By this *weight* are weighed all coarſe and heavy goods, as pitch, tar, roſin, tallow, &c. copper, tin, &c. fleſh, butter, &c. and alſo bread by 31 Geo. II. cap. 29. and all grocery wares: and Dr. Ward ſuppoſes that from this uſe of it it was firſt introduced; as it was cuſtomary to allow larger weight of ſuch goods than the law had expreſly enjoined, and this, he ſays, happened to be about a ſixth part more.

Mr. Ferguſon (Lect. on Mech. p. 100 4to.) has given the following compariſon between troy *weight* and avoirdupois *weight*, with the two tables for ſhewing how much of either of theſe *weights* is contained in any quantity of the other.

175 troy pounds are equal to 144 avoirdupois pounds.
175 troy ounces are equal to 192 avoirdupois ounces.
1 troy pound contains 5760 grains.
1 avoirdupois pound contains 7000 grains.
1 avoirdupois ounce contains $437\frac{1}{2}$ grains.
1 avoirdupois dram contains 27.34375 grains.
1 troy pound contains 13 oz. 2.651428576 drams avoirdupois.
1 avoirdupois pound contains 1 lb. 2 oz. 11 penny-weights 16 gr. troy.

A Table for reducing Troy Weight *into Avoirdupois* Weight.

Troy weight.		Avoirdupois. lb.	oz.	dr.	Troy weight.		Avoirdupois. Drams.
Pounds	4000	3291	6	13.68	Penny-wts.	19	16.67
	3000	2528	9	2.26		18	15.79
	2000	1645	11	6.84		17	14.92
	1000	822	13	11.42		16	14.04
	900	740	9	2.28		15	13.16
	800	658	4	9.14		14	12.28
	700	576	0	0.00		13	11.41
	600	493	11	6.85		12	10.53
	500	411	6	13.71		11	9.65
	400	329	2	4.57		10	8.78
	300	246	13	11.42		9	7.90
	200	164	9	2.28		8	7.02
	100	82	4	9.15		7	6.14
	90	74	0	13.62		6	5.26
	80	65	13	4.11		5	4.39
	70	57	9	9.60		4	3.51
	60	49	5	15.08		3	2.63
	50	41	2	4.57		2	1.75
	40	32	14	10.05		1	0.88
	30	24	10	15.54	Grains	23	.84
	20	16	7	5.02		22	.80
	10	8	3	10.51		21	.77
	9	7	6	7.86		20	.73
	8	6	9	5.21		19	.69
	7	5	12	2.56		18	.66
	6	4	14	15.90		17	.62
	5	4	1	13.25		16	.58
	4	3	4	10.60		15	.55
	3	2	7	7.95		14	.51
	2	1	10	5.30		13	.47
	1	0	13	2.65		12	.44
Ounces	11		12	1.09		11	.40
	10		10	15.54		10	.36
	9		9	13.98		9	.33
	8		8	12.43		8	.29
	7		7	10.88		7	.26
	6		6	9.32		6	.22
	5		5	7.77		5	.18
	4		4	6.21		4	.14
	3		3	4.66		3	.11
	2		2	13.10		2	.07
	1		1	1.55		1	.04

EXAMPLE.

EXAMPLE.

In 2756 *pounds* 10 *ounces* 15 *penny-weights* 20 *grains troy*, Qu. *How much Avoirdupois* Weight.

	Troy weight.	*Avoirdupois* Weight. Pounds.	oz.	drams.
Pounds	2000	1645	11	6.84
	700	576	0	0.00
	50	41	2	4.57
	6	4	14	15.90
Ounces	10	—	10	15.54
Penny-weights	15	—	—	13.16
Grains	20	—	—	.73
	Anſwer	2268	8	8.74

A Table for reducing Avoirdupois Weight *into Troy* Weight.

Avoirdupois weights.	Troy Weight. lb.	oz.	pwt.	gr.	Avoirdupois weight.	Troy Weight. lb.	oz.	pwt.	gr.
Pounds 6000	7291	8	0	0	Ounces 15	1	1	13	10.5
5000	6076	4	13	8	14	1	0	15	5
4000	4861	1	6	16	13		11	16	23.5
3000	3645	10	0	0	12		10	18	18
2000	2430	6	13	8	11		10	0	12.5
1000	1215	3	6	16	10		9	2	7
900	1093	9	0	0	9		8	4	1.5
800	972	2	13	8	8		7	5	20
700	850	8	6	16	7		6	7	14.5
600	729	2	0	0	6		5	9	9
500	607	7	13	8	5		4	11	3.5
400	486	1	6	16	4		3	12	22
300	364	7	0	0	3		2	14	16.5
200	243	0	13	8	2		1	16	11
100	121	6	6	16	1			18	5.5
90	109	4	10	0	Drams 15			17	2.1
80	79	2	13	8	14			15	22.8
70	85	0	16	16	13			14	19.4
60	72	11	0	0	12			13	15.1
50	60	9	3	8	11			12	12.7
40	48	7	6	16	10			11	9.4
30	36	5	10	0	9			10	6.1
20	24	3	13	8	8			9	2.7
10	12	1	16	16	7			7	23.4
9	10	11	5	0	6			6	20.0
8	9	8	13	8	5			5	16.7
7	8	6	1	16	4			4	13.4
6	7	3	10	0	3			3	10.1
5	6	0	18	8	2			2	6.7
4	4	10	6	16	1			1	3.3
3	3	7	15	0	$\frac{3}{4}$				20.5
2	2	5	3	8	$\frac{1}{2}$				13.7
1	1	2	11	16	$\frac{1}{4}$				6.8

EXAMPLE.

In 2268 *pounds* 8 *ounces* 9 *drams Avoirdupois*, Qu. *How much Troy* Weight.

	Avoirdupois weight.	*Troy* weight. lb.	oz.	pwts.	gr.
Pounds	2000	2430	6	13	8
	200	243	0	13	8
	60	72	11	0	0
	8	9	8	13	8
Ounces	8	—	7	5	20
Drams	9	—	—	10	6.1
	Anſwer	2756	10	16	2.1

From accurate ſtandards of *weights* and meaſures, deduced from experiments made in England and France, and laid up in the archives of the Royal Society in London and Royal Academy of Sciences at Paris, it appears that the Engliſh avoirdupois pound weighs 7004 troy grains, whence the avoirdupois ounce, whereof 16 make a pound, is found equal to 437,75 troy grains: and conſequently, the troy pound is to the avoirdupois pound as 88 to 107 nearly, for as 88 to 107, ſo is 5760 to 7003,636; and the troy ounce is to the avoirdupois ounce as 80 to 73 nearly, for as 80 to 73, ſo is 480 to 438; and the avoirdupois pound and ounce are to the Paris two marc *weight* and ounce as 63 to 68 nearly, for as 63 to 68, ſo is 7004 to 7559,873.

Moreover it appears, that the Paris half toiſe, as ſet off on the ſtandard in the Royal Society, contains 38,355 Engliſh inches by the ſame ſtandard: whence the Engliſh yard and foot are to the Paris half-toiſe and foot nearly as 107 to 114; for as 107 to 114, ſo is 36 to 38,35514. Hence the Paris FOOT, expreſſed in decimals, is equal to 1,0654 of the Engliſh foot, or contains 12,785 Engliſh inches. Phil. Tranſ. N° 465, p. 185. or Abr. vol. ix. p. 490.

The moneyers, jewellers, &c. have a particular claſs of *weights*, for gold, and precious ſtones, viz. *carat*, and *grain*; and for ſilver, the *penny-weight*, and *grain*.

The moneyers have alſo a peculiar ſubdiviſion of the *grain* troy: thus,

The	*Grain*	into	20 *Mites.*
	Mite		24 *Droits.*
	Droit		20 *Periots.*
	Periot		24 *Blanks.*

The dealers in wool have likewiſe a particular ſet of *weights*; viz. the *ſack*, *weigh*, *tod*, *ſtone* and *clove*, the proportion of which ſee under WOOL.

The beſt way, ſays Dr. Lewis, of procuring equal ſmall *weights* is by cutting off equal lengths of the fineſt ſilver wire; the ſilver thread, being kept equally ſtretched by a heavy body at the end, may be coiled cloſe round a thicker piece of large wire, and all the coils cut through at once by a ſharp inſtrument applied lengthwiſe.

Silver wire is drawn to ſuch fineneſs, and of ſuch uniform thickneſs, that *weights*, thus made by menſuration, are of greater nicety than it is poſſible for any balance to weigh. Lewis's Com. of Arts, p. 544.

WEIGHTS, *French*. The common or *Paris pound*, which is to the Engliſh troy pound as 21 to 16, and therefore contains 7560 troy grains, is 16 ounces; which they divide two ways: the firſt diviſion is into two *marcs*, the marc into 8 *ounces*; the ounce into 8 *gros*, or drams; the gros, or dram, into 3 deniers, Paris ſcruples or *penny-weights*; the penny-weight into 24 *grains*; the grain equivalent to a grain of wheat. So that the Paris ounce contains 472$\frac{1}{2}$ troy grains, and, therefore, is to the Engliſh troy ounce as 63 to 64; the Paris dram, or gros, is equal to 72 Paris grains or 59$\frac{1}{16}$ troy grains; the Paris ſcruple or denier, or penny-weight, contains 19$\frac{11}{16}$ troy grains; and the Paris grain is the $\frac{1}{9216}$th part of a Paris pound, and is to the troy grain as 7560 to 9216.

The ſecond diviſion of the pound, is into 2 *half-pounds*; the half-pound into 2 *quarters*; the quarter into two *half-quarters*; the half-quarter into 2 *ounces*; and the ounce into two *half-ounces*.

The *weights* of the firſt diviſion are uſed to weigh gold, ſilver, and the richer commodities: and the *weights* of the ſecond diviſion, for commodities of leſs value.

Grains.					
24	Penny-weight.				
72	3	Gros.			
576	24	8	Ounce.		
4608	192	64	8	Marc.	
9216	384	128	16	2	Pound.

Half-ounce.						
2	Ounce.					
4	2	Half-quarter-pound.				
8	4	2	Quarter-pound.			
16	8	4	2	Half-pound.		
32	16	8	4	2	Pound.	
3200	1600	800	400	200	100	Quintal.

But the pound is not the ſame throughout France. At Lyons, e. gr. the city pound is only 14 ounces: ſo that 100 Lyons pounds make only 88 Paris pounds. But, beſide the city pound, they have another at Lyons for ſilk, containing 16 ounces. At Tholouſe, and throughout the Upper Languedoc, the pound is 13 ounces and $\frac{1}{2}$ of Paris *weight*. At Marſeilles, and throughout Provence, the pound is 13 ounces of Paris *weight*. At Rouen, beſide the common Paris pound and marc, they have the *weight* of the *vicomte*; which is 16 ounces and $\frac{1}{2}$ and $\frac{1}{8}$, of the Paris *weight*.

The *weights* enumerated under the two articles of Engliſh and French *weights* are the ſame that are uſed throughout the greateſt part of Europe; only under ſomewhat different names, diviſions, and proportions.

Particular nations have alſo certain *weights* peculiar to themſelves: thus, Spain has its *arrobas*, containing 25 Spaniſh pounds, or $\frac{1}{4}$ of the common quintal: its *quintal macho*, containing 150 pounds, or 1$\frac{1}{2}$ common quintal, or 6 *arrobas*: its *adarme*, containing $\frac{1}{16}$ of its ounce. And for gold, it has its *caſtillan*, or $\frac{1}{100}$ of a pound; its *tomin*, containing 12 grains, or $\frac{1}{8}$ of a caſtillan. The ſame are in uſe alſo in the Spaniſh Weſt Indies.

Portugal has its *arroba*, containing 32 Liſbon *arratels*, or pounds: Savary alſo mentions its *faratelle*, containing two Liſbon pounds: and its *rottoli*, containing about 12 pounds. And for gold, its *chego*, containing four *carats*. The ſame are uſed in the Portugueſe Eaſt Indies.

Italy, and particularly Venice, have their *migliaro*, containing four mirres; the *mirre* containing 30 Venice pounds: the *ſaggio*, containing a ſixth part of an ounce. Genoa has five kinds of *weights*; viz. *large weights*, whereby

whereby all merchandizes are weighed at the custom-house; *cash-weights*, for piastres, and other species; the *cantara*, or *quintal*, for the coarsest commodities; the *large balance*, for raw silks; and the *small balance* for the finer commodities. Sicily has its *rottolo*, 32 and an half pounds of Messina. Savar.

Germany, Flanders, Holland, the Hanse-towns, Sweden, Denmark, Poland, &c. have their *schippondt*, which at Antwerp and Hamburgh is 300 pounds; at Lubeck, 320; and at Koningsberg, 400 pounds. In Sweden, the *schippondt* for copper is 320 pounds; and the *schippondt* for provisions 400 pounds. At Riga, and Revel, the *schippondt* is 400 pounds; and at Dantzick, 340 pounds; in Norway, 300 pounds; at Amsterdam, 300; containing 20 *lyspondts*, each weighing 15 pounds. Idem.

In Muscovy, they weigh their large commodities by the *bercheroct*, or *berkewits*, containing 400 of their pounds. They have also the *poet*, or *poede*, containing 40 pounds, or $\frac{1}{10}$ of the *bercheroct*. Idem.

In Turky, at Smyrna, &c. they use, what they call the *batman*, or *battemant*, containing 6 *occos*; the occo weighing 3 pounds $\frac{3}{4}$ English. They have another *batman* much less, consisting, as the former, of six occos; but the occo only containing 15 ounces English: 44 occos of the first kind make the Turkish *quintal*. At Cairo, Alexandretta, Aleppo, and Alexandria, they use the *rotto*, *rotton*, or *rottoli*. The *rottoli* at Cairo, and other parts of Egypt, is 144 drams; being somewhat more than an English pound. At Aleppo there are three sorts of *rottos*; the first 720 drams making about 7 pounds English, and serving to weigh cottons, galls, and other large commodities: the second is 624 drams, used for all silks but white ones, which are weighed by the third *rotto* of 700 drams. At Seyda the *rotto* is 600 drams.

The other ports of the Levant, though not named here, use some of these *weights*; particularly the *occo* or *ocqua*, the *rottoli*, and *rotto*.

To shew the proportion of these several *weights* to one another, we shall add a reduction of the divers *pounds* used throughout Europe, by which the other *weights* are estimated, to one standard pound; viz. the pound of Amsterdam, Paris, and Bourdeaux; as calculated with great accuracy by M. Ricard, and published in the new edition of his excellent Traité de Commerce, in 1722.

Proportion of the WEIGHTS *of the chief Cities in Europe, to those of Amsterdam.*

A hundred pounds of Amsterdam are equal to

108 Pounds of Alicant.
105 *lb.* of Antwerp.
120 *lb.* of Archangel, or three poedes.
105 *lb.* of Arschot.
120 *lb.* of Avignon.
98 *lb.* of Basil in Switzerland.
100 *lb.* of Bayonne in France.
166 *lb.* of Bergamo.
97 *lb.* of Berg ap Zoom.
95 *lb.* $\frac{1}{4}$ of Bergen in Norway.
111 *lb.* of Bern.
100 *lb.* of Besançon.
100 *lb.* of Bilboa.
105 *lb.* of Bois le duc.
151 *lb.* of Bologna.
100 *lb.* of Bourdeaux.
104 *lb.* of Bourg en Bresse.
103 *lb.* of Bremen.
125 *lb.* of Breslaw.
105 *lb.* of Bruges.
105 *lb* of Brussels.
105 *lb.* of Cadiz.
105 *lb.* of Cologne.
125 *lb.* of Koningsberg.
107 *lb.* and $\frac{1}{2}$ of Copenhagen.
87 Rottos of Constantinople.
113 *lb.* and $\frac{1}{2}$ of Dantzick.
100 *lb.* of Dort.
97 *lb.* of Dublin.
97 *lb.* of Edinburgh.
143 *lb.* of Florence.
98 *lb.* of Franckfort on the Maine.
105 *lb.* of Gaunt.
89 *lb.* of Geneva.
163 *lb.* of Genoa, *cash-weight*.
102 *lb.* of Hamburgh.
106 *lb.* of Leyden.
105 *lb.* of Leipsic.
105 *lb.* and $\frac{1}{2}$ of Liege.
114 *lb.* of Lisle.
143 *lb.* of Leghorn.
106 *lb.* and $\frac{1}{2}$ of Lisbon.
109 *lb.* of London, *avoirdupois weight*.
105 *lb.* of Louvain.
105 *lb.* of Lubeck.
141 *lb.* and $\frac{1}{2}$ of Lucca, *light-weight*.
116 *lb.* of Lyons, *city-weight*.
114 *lb.* of Madrid.
105 *lb.* of Malines.
123 *lb.* and $\frac{1}{2}$ of Marseilles.
154 *lb.* of Messina, *light-weight*.
168 *lb.* of Milan.
120 *lb.* of Montpelier.
125 Bercherocts of Muscovy.
100 *lb.* of Nantes.
106 *lb.* of Nancy.
169 *lb.* of Naples.
98 *lb.* of Nuremberg.
100 *lb.* of Paris.
112 *lb.* and $\frac{1}{2}$ of Revel.
109 *lb.* of Riga.
100 *lb.* of Rochel.
146 *lb.* of Rome.
100 *lb.* of Rotterdam.
96 *lb.* of Rouen, *vicounty-weight*.
100 *lb.* of S. Malo.
100 *lb.* of S. Sebastian.
158 *lb.* and $\frac{1}{2}$ of Saragosa.
106 *lb.* of Seville.
114 *lb.* of Smyrna.
110 *lb.* of Stetin.
81 *lb.* of Stockholm.
118 *lb.* of Tholouse, and Upper Languedoc.
151 *lb.* of Turin.
158 *lb.* and $\frac{1}{2}$ of Valencia.
182 *lb.* of Venice, *small-weight*.

Mr. Ferguson has calculated the following table for comparing the English avoirdupois pound with the foreign pound *weight*:

London Pound	1.0000	Hamburgh	1.0865
Antwerp	1.04	Lisbon	1.135
Amsterdam	1.1111	Leghorn	0.75
Abbeville	1.0989	Norimberg	1.1363
Ancona	0.78	Naples	0.71
Avignon	0.8928	Paris	1.1235
Bourdeaux	1.0989	Prague	1.2048
Bologna	0.8	Placentia	0.72
Bruges	1.0204	Rochelle	0.8928
Calabria	0.73	Rome	0.7874
Calais	0.9345	Rouen	1.1089
Dieppe	1.0989	Seville	0.9259
Dantzic	0.862	Tholouse	0.8928
Ferrara	0.75	Turin	0.82
Flanders	0.9433	Venice	1.06
Geneva	1.07	Vienna	1.23
Genoa, gross	0.7		

Ferguson's Tab. and Tracts, p. 274.

WEIGHTS *used in the several parts of the East.* The *Chinese weights* are, the *pice*, for large commodities: this is divided into 100 *catis*, or *cattis*, though some say into 125: the cati into 16 *taels*, or *tales*; each tael equivalent to 1$\frac{1}{3}$ of an ounce English, or the weight of one rial and $\frac{1}{12}$, and containing 10 *mas*, or *masses*; and each mas 10 *condrins*. So that the Chinese *pice* amounts to 137 pounds English avoirdupois, and the cati to 1 pound 8 ounces: the *picol*, for silk, containing 66 *catis* and $\frac{3}{4}$: the *bahar*, *bakaire*, or *barr*, containing 300 catis.

Tonquin has all the same *weights*, measures, &c. as China. Japan has only one *weight*, viz. the *catti*; which, however, is different from that of China, as containing 20 *taels*. At Surat, Agra, and throughout the states of the great mogul, they use the *man*, or *maund*, whereof they have two kinds; the *king's man*, or *king's weight*; and the *man*, simply so called: the first used for the weighing of common provisions, containing 40 *seers*, or *serres*; and each near a just Paris pound. Though Tavernier will have the seer near a seventh less than the Paris pound.

The common *man*, used in the weighing of merchandize, consists likewise of 40 *seers*; but each seer is only estimated at 12 Paris ounces, or $\frac{3}{4}$ of the other seer.

The *man* may be looked on as the common *weight* of the East Indies, though under some difference of name, or rather of pronunciation; it being called *mao* at Cambaya, and in other places *mein*, and *maun*. The *seer* is properly the Indian pound, and is of universal use: the like may be said of the *bahar*, *tael*, and *catti* above mentioned.

The *weights* of Siam are the *pice*, containing two *schans*, or *cattis*; but the Siamese *catti* is only half the Japonese, the latter containing 20 *taels*, and the former only 10: though some make the Chinese catti only 16 taels, and the Siamese 8. The *tael* contains 4 *baats*, or *ticals*; each about a Paris ounce: the *baat* 4 *selings*, or *mayons*: the mayon 2 *fouangs*: the fouang 4 *payes*: the paye 2 *clams*: the *sompaye*, half a *fouang*. Savar.

It is to be observed, that these are the names of their coins, as well as *weights*; silver and gold being, there, commodities sold, as other things, by their *weights*. See COIN, &c.

In the isle of Java, and particularly at Bantam, they use the *gantan*, which amounts to near three Dutch pounds.

In Golconda, at Visapour and Goa, they have the *furatelle*, containing 1 pound 14 ounces English: as also the *mangalis*, or *mangelin*, for weighing diamonds and precious stones; weighing at Goa 5 grains, at Golconda, &c. 5$\frac{1}{4}$ grains. They have also the *rotolo*, containing 14$\frac{1}{2}$ ounces English: the *metricol*, containing the sixth part of an ounce: the *vall*, for piastres and ducats: containing the 73d part of a rial.

In Persia, they use two kinds of *batmans*, or *mans*; the one, called *cabi*, or *cheray*, which is the king's *weight*; and the other *batman of Tauris*, from the name of one of the chief cities of Persia. The first weight, according to Tavernier, 13 pounds 10 ounces English; the second, 6 pounds $\frac{3}{4}$. According to Sir J. Chardin, the *king's batman* is 13 pounds 14 ounces, and the *batman of Tauris* 6 pounds $\frac{1}{2}$. Its divisions are the *ratel*, or a 16th; the *derhem*, or dram, which is the 50th; the *meskal*, which is half the derhem; the *dung*, which is the 6th part of the meschal; being equivalent to 6 *carat-grains*; and lastly, the *grain*, which is the 4th part of the dung. They have also the *vakie*, which exceeds, a little, our ounce: the *sah-cheray*, equal to the 1170th part of the derhem: and the TOMAN, used to weigh out large payments of money, without telling: its *weight* is that of 50 *abassis*. Savar.

WEIGHTS, *African and American.* We have little to say as

as to the *weights* of America; the several European colonies there, making use of the *weights* of the states or kingdoms of Europe which they belong to. For as to the *aroue* of Peru, which weighs 27 pounds, it is evidently no other than the Spanish *arroba*, with a little difference in the name.

As to the *weights* of Africa, there are few places that have any, except Egypt, and the coasts of Africa, whose *weights* are enumerated among those of the ports of the Levant, &c.

As to the coasts beyond Cape Verde, viz. Guinea, Congo, to Soffola, Mozambica, &c. they have no *weights*; only the English, French, Dutch, Portuguese, and Danes, have introduced their own *weights* in their respective settlements.

The isle of Madagascar, indeed, has its particular *weights*, but it has none that exceed the dram, nor are they used for any thing but gold and silver. Other commodities they never weigh.

Ancient WEIGHTS.

Jewish *Weights* reduced to English *Troy Weight*.

			lb.	*oz.*	*pwt.*	*gr.*
Shekel.			00	00	09	02 $\frac{4}{7}$
60	Maneh.		02	03	06	10 $\frac{2}{7}$
3000	50	Talent.	113	10	01	10 $\frac{2}{7}$

Note, in reckoning money, 50 *shekels* made a *maneth*, but in *weight*, 60 *shekels*.

Grecian and Roman WEIGHTS reduced to English *Troy Weight*.

										lb.	*oz.*	*pwt.*	*gr.*
Lentes.										0	00	00	00 $\frac{85}{112}$
4	Siliquæ.									0	00	00	03 $\frac{1}{28}$
12	3	Obolus.								0	00	00	09 $\frac{3}{28}$
24	6	2	Scriptulum.							0	00	00	18 $\frac{3}{14}$
72	18	6	3	Drachma.						0	00	02	06 $\frac{9}{14}$
96	24	8	4	1 $\frac{1}{3}$	Sextula.					0	00	03	00 $\frac{6}{7}$
144	36	12	6	2	1 $\frac{1}{2}$	Sicilicus.				0	00	04	13 $\frac{2}{7}$
192	48	16	8	2 $\frac{2}{3}$	2	1 $\frac{1}{3}$	Duella.			0	00	06	01 $\frac{5}{7}$
576	144	48	24	8	6	4	3	Uncia.		0	00	18	05 $\frac{1}{7}$
6912	1728	576	288	96	72	48	36	12	Libra.	0	10	18	13 $\frac{5}{7}$

For the subdivisions of the Roman as, libra, or pound, see AS.

The Roman ounce is the English avoirdupois ounce, which they divided into seven *denarii*, as well as eight *drams*: and since they reckoned their denarius equal to the Attic dram, this will make the Attic *weights* one-eighth heavier than the correspondent Roman *weights*. Arbuth.

Note, the Grecians divided their *obolus* into *chalci* and λεπτα. Some, as Diodorus and Suidas, divided the *obolus* into six *chalci*, and every *chalcus* into seven λεπτα. Others divided the *obolus* into eight *chalci*, and every *chalcus* into eight λεπτα, or *minuta*. Arbuthnot's Tables, &c.

WEIGHT *of the air*, is equal to the elasticity thereof.

To find the weight *of a cubic inch of air.* Weigh a round glass vessel full of common air, very accurately; then exhaust the air out of it; weigh the exhausted vessel, and subtract the latter *weight* from the former, the remainder is the *weight* of the air exhausted.

Find, then, the content of the vessel by the laws of measuring; and the ratio of the remaining air to the primitive air. This done, the bulk of the remaining air is found by the rule of three; which being subtracted from the capacity of the vessel, the remainder will be the bulk of air extracted. Or, if the air-pump be very tight, and the exhaustion continued as long as any air is got out, the remaining air will be so small, that it may be very safely neglected, and the content of the vessel taken for the bulk of the exhausted air.

Having, therefore, the *weight* and bulk of the whole exhausted air, the *weight* of one cubic inch is easily had by the rule of three.

This method was first used by Otto Guericke, and afterwards by Burcher de Volder; who gives us the following particulars in his experiment. 1. That the *weight* of the glass spherical vessel he made use of, full of common air, was 7 pounds, 1 ounce, 2 drams, 48 grains; when exhausted of air, 7 lb. 1 oz. 1 dr. 31 gr. and when full of water, 16 lb. 12 oz. 7 dr. 14 gr. The *weight* of the air, therefore, was 1 dr. 17 gr. or 77 gr. the *weight* of the water 9 lb. 11 oz. 5 dr. 43 gr. or 74743 gr. Consequently, the ratio of the specific gravity between water and air is 74743 : 77 :: 970$\frac{53}{77}$: 1. Now, De Volder having found a cubic foot of water to weigh 64 pounds, by inferring, as 970 is to 1, so is 64 pounds to a fourth proportional, deduced, by the rule of three, the *weight* of a cubic foot of air, viz. 1 ounce, 27 grains, or 507 grains nearly. Wolfii Elem. tom. ii. p. 291.

From other later experiments accurately made with the hydrostatical balance, a cubic inch of air appears to be equal to $\frac{2}{7}$ of a grain, and therefore a cubic foot equal to 493$\frac{5}{7}$ troy grains. There are various ways of estimating the *weight* of the air, for which see AIR, ATMOSPHERE, BAROMETER, *Specific* GRAVITY, &c.

It may be easily determined by fitting a brass cap, with a valve tied over it, to the mouth of a thin bottle or Florence flask, whose contents are exactly known, and screwing the neck of this cap into the hole of the plate of the air-pump; then, having exhausted the flask of its air and taken it off from the pump, suspend it at one end of a balance, and nicely counterpoise it by *weights* in the scales at the other end: when this is done, raise up the valve with a pin, and the air will rush into the flask, and cause it to descend. When it is full of air, put grains into the scale at the other end to restore the equilibrium; and if the flask holds exactly a quart, it will be found, that 17 grains will be sufficient for this purpose, when the quicksilver stands at 29$\frac{1}{2}$ inches in the barometer; and this shews, that when the air is at a mean ratio of density, a quart of it weighs 17 grains; and consequently a gallon weighs 68 grains: i. e. 231 cubic inches of air are equal in *weight* to 68 grains, and 1728 cubic inches, or a cubic foot of air, weighs 509$\frac{156}{231}$ grains; and as a cubic foot of water weighs about 437702 troy grains, the specific gravity of water will appear to be more than 850 times that of AIR.

The *weight* of *sea*-WATER is different in different climates. Mr. Boyle having furnished a learned physician, going on a voyage to America, with an hydrostatical balance, and recommended him to observe, from time to time, the difference of *weight* he might meet withal; this account was returned him: that the sea-water increased in *weight*, the nearer he came to the line, till he arrived at a certain degree of latitude, as he remembers, about the 30th; beyond which, it retained the same specific *weight*, till he came to Barbadoes. Philos. Trans. N° 18.

The *weight* of a cubical inch of good brandy, rum, or other *proof* SPIRITS, is 235,7 grains; therefore, if a true inch cube of any metal weighs 235,7 grains less in spirits than in air, it shews the spirits are proof: if it loses less of its aerial *weight* in spirits, they are above proof; if it loses more, they are under: for the better the spirits are, they are the lighter; and the worse, the heavier.

As all bodies expand with heat and contract with cold, in different degrees, the ſpecific gravities of bodies are not preciſely the ſame in ſummer as in winter. It has been found, that a cubic inch of good brandy is 10 grains heavier in winter than in ſummer; as much ſpirit of nitre, 20 grains; vinegar, 6 grains; and ſpring water 3. Hence it is moſt profitable to buy ſpirits in winter, and ſell them in ſummer, ſince they are always bought and ſold by *meaſure*. It has been found, that 32 gallons of ſpirits in winter will make 33 in ſummer. Ferguſon's Lect. p. 98, 4to. See *Specific* Gravity, and Hydrometer.

Weights, *groſs*, *neat*, *penny*, *aſſay of*, *ancel*, ſee the ſeveral articles.

Weight *of the human body*. It is to be obſerved, that the heat and dryneſs of the air both leſſen the *weight* of the body, and the cold and moiſture of the air both increaſe this *weight*. See Moisture.

Much ſleep, much food, and little exerciſe, are the principal things which increaſe the *weight* of the body, and make animals grow fat. Conſequently, if the *weight* of the body be too great for good and uninterrupted health, it may be leſſened by diminiſhing ſleep and food, and by increaſing exerciſe. On the contrary, if the *weight* of the body be too little for good health, it may be increaſed by adding to food and ſleep, and by leſſening exerciſe; and the food muſt be increaſed chiefly by increaſing drink and liquid nouriſhment. For the diſcharges are commonly leſs from drink and liquid nouriſhment, than from dry and ſolid food.

There is but one *weight* under which a body can enjoy the beſt and uninterrupted health, and that *weight* muſt be ſuch, that perſpiration and urine may be nearly equal at all ſeaſons of the year; for by this means the body will be uniformly drained of its moiſture: the inward parts by urine, and the more ſuperficial parts by perſpiration, without any irregular and unnatural diſcharges, and its moving *weight* will continue nearly the ſame at all ſeaſons of the year. Dr. Bryan Robinſon thinks this *weight* may be ſettled by his obſervations in his Treatiſe on the Food and Diſcharges of Human Bodies.

A quick increaſe of *weight* in human bodies often produces diſtempers; the beſt way to prevent this increaſe is either by faſting or exerciſe. But amidſt a variety of diſturbing cauſes, nothing ſo effectually prevents ſuch an increaſe of *weight* as a very exact and regular diet, which may prevent the diſcharges from running into irregularities and diſproportions to one another. See Dr. Bryan Robinſon of the Food and Diſcharges of Human Bodies, p. 82. ſeq.

Men, and other animals of extraordinary *weight*, are often recorded in the writings of the learned. See Phil. Tranſ. Nº 479, p. 102.

Weight, *athletic*, in the *Animal Oeconomy*, that *weight* of the body under which an animal has the greateſt ſtrength and activity. Dr. Robinſon thinks this happens when the *weight* of the heart, and the proportion of the *weight* of the heart to the *weight* of the body, are greateſt. For the ſtrength of an animal is meaſured by the ſtrength of its muſcles, and the ſtrength of the muſcles is meaſured by the ſtrength of the heart. Alſo the activity of an animal is meaſured by the *weight* of the heart, in proportion to the *weight* of the body.

If the *weight* of the body of an animal be greater than its athletic *weight*, it may be reduced to that *weight* by evacuations, dry food, and exerciſe. Theſe leſſen the *weight* of the body by waſting its fat, and leſſening its liver, and they increaſe the *weight* of the heart, by increaſing the quantity and motion of the blood; ſo that by leſſening the *weight* of the body, and by increaſing that of the heart, they will ſoon reduce the animal to its *athletic weight*. Thus a game cock, in ten days, is reduced to its *athletic weight*, and prepared for fighting. If the food which, with the evacuations and exerciſe, reduced the cock to its *athletic weight* in ten days, be continued any longer, the cock will loſe his ſtrength and activity.

It is known by experience, that a cock cannot ſtand above twenty-four hours at his *athletic weight*, and that he has even changed for the worſe in twelve hours. When he is in the beſt condition, his head is of a glowing red colour, his neck thick, and his thigh thick and firm; the day after, his complexion is leſs glowing, his neck thinner, and his thigh ſofter; and the third day his thigh will be very ſoft and flaccid. Four game cocks, reduced to their *athletic weight*, were killed, and found to be very full of blood, with large hearts, large muſcles, and no fat.

It is to be obſerved, that the *athletic weight* of an animal is a very dangerous *weight*. Fevers and apoplexies are the diſorders which commonly happen to animals under or near the *athletic weights*. Hence, horſes fed upon dry food are much more ſubject to fevers and apoplexies than horſes fed upon graſs. Robinſon's Diſſertation, p. 117, &c.

Weights, *ſeſſions for*. See Sessions.

WEINMANNIA, in *Botany*, a genus of the *octandria digynia* claſs. Its characters are theſe: the calyx is compoſed of four leaves, the corolla has four petals, and the fruit is a double-celled capſule, with a double ſtem. There is one ſpecies.

WELD, or Wold, *reſeda luteola* of Linnæus, a plant uſed by the dyers, to give a yellow colour; and for this reaſon called, in Latin, *luteola*, of *luteus*, *yellow*. For the characters ſee Reseda; ſee alſo Dyer's *Weed*.

This plant grows wild on dry grounds; but it is alſo cultivated for uſe.

This is a very rich commodity among the dyers, and is the more advantageous to the farmer, as it may be raiſed on very poor land, and at a very ſmall expence. Moderately fertile land does beſt for it; but it will grow upon the moſt barren; and if this be but dry and warm, it will require no tillage. The ſeed may be ſown with barley or oats, and only harrowed in with bruſh or furze, or rolled down with a wooden roller. It is a very ſmall ſeed, and the greateſt difficulty about it is the ſowing of it even. It is a ſlow grower; a gallon of ſeed is ſufficient for an acre; and though it makes but little progreſs the firſt ſummer, it begins to grow after the corn is cut, and the next year yields a good crop. However, though *weld* will grow upon very poor ſoil, the crop will be in proportion to the goodneſs of the ſoil.

The beſt way to cultivate it is to ſow it without any other crop. In the beginning or middle of Auguſt, the ground which, unleſs it be poor, wants no dung, being ploughed and harrowed fine, the ſeeds ſhould be ſown in the proportion of a gallon to an acre. In about two months, the plants will come up, ſo as to be diſtinguiſhed from weeds; and ſhould be hoed like turnips, leaving them at about 6 inches diſtance. If this hoeing be performed in dry weather, the plants will be clean from weeds till the ſpring: in March they ſhould be hoed again; and if weeds appear, a third time about the beginning of May. The beſt time to pull the *weld* for uſe is when it begins to flower, though moſt people ſtay till the ſeeds are ripe, being unwilling to loſe the ſeeds: but Mr. Miller adviſes to ſow a ſmall piece of land to remain for a produce of new ſeeds. By drawing off the crop early, as towards the latter end of June, the ground may be ſown with wheat the ſame ſeaſon; and the plants at this time will be in the greateſt vigour, and afford a greater quantity of the dye.

When the plants are pulled, they may be ſet up in ſmall handfuls to dry in the field, and when dry enough, tied up in bundles and houſed dry; care being taken to houſe them looſely, that the air may paſs between them to prevent their fermenting. That which is left for ſeeds ſhould be pulled as ſoon as the ſeeds are ripe, and ſet up to dry; and then beat out for uſe; for if the plants are left too long, the ſeeds will ſcatter. Mortimer and Miller.

Weld is much cultivated in Kent, for the uſe of the London dyers.

With the help of pot-aſhes, it yields a deep lemon colour; but either by the largeneſs of the proportion put into the liquor, or by taking from it a ſtronger or ſlighter tincture, it ſerves to dye all colours between white and a deep yellow. Its dye will hold well, except againſt urine, and tartarous liquors.

Mr. Hellot obſerves, in his Art de Teindre, that for dying with *weld*, the beſt proportions of alum and tartar for the preparatory liquor are four parts of alum, and one of tartar, to ſixteen of the wool; and that the wool, prepared with theſe, is to be boiled again with five or ſix times its quantity of *weld*: that for light ſhades, it is cuſtomary to diminiſh the alum, and omit the tartar; and that, in this caſe, the colour is more ſlowly imbibed, and proves leſs durable.

Weld, or Weald, in a *Chorographical Senſe*. See Weald.

WELDING *heat*, a degree of heat which ſmiths give their iron in the forge, when there is occaſion to double up the iron, and to *weld* a work in the doublings; ſo that the iron ſhould grow into a lump thick enough for the purpoſe. It is alſo uſed when two bars of iron are to be joined together at the ends, to make a length. See Iron.

WELL, a hole dug under ground, below the level or ſurface of the water collected in the ſtrata.

It is uſually of a cylindrical figure, and commonly walled with ſtone, and lined with mortar.

M. Blondel informs the Royal Academy of Sciences of a device they uſe, in the Lower Auſtria, which is encompaſſed with the mountains of Stiria, to fill their *wells* with

with water; viz. that they dig in the earth, to the depth of twenty or twenty-five feet, till they come to a clammy earth, which they bore into, continuing the operation till the water breaks forcibly out; which water, in all probability, comes from the neighbouring mountains, in subterraneous channels. Cassini observes, that in many places of Modena and Bologna, they make themselves *wells* by the same artifice. Dr. Derham adds, that the like has been sometimes found in England, particularly in Essex.

In the Philosophical Transactions we are informed, by Mr. Norwood, that, in Bermudas, *wells* of fresh water are dug within twenty yards of the sea, and even less, which rise and fall with the tides, as the sea itself does. He adds, that, in digging *wells* in that island, they dig till they come almost to a level with the surface of the sea; and then they certainly find either fresh water, or salt: if it prove fresh, yet, by digging two or three feet deeper, they always come at salt water. If it be sandy ground, they usually find fresh water; but if hard lime-stone rock, the water is commonly salt, or brackish.

Lay well, near Torbay, ebbs and flows very often every hour; though somewhat oftener in winter, than in summer. Dr. Oliver observes, its flux and reflux sometimes return every minute; though, at other times, not above twenty-six or twenty-eight times in an hour. Philos. Trans. N° 1.4.

In Scotland they have a *well*, which Sibbald has mentioned as foretelling storms. It is a deep and large *well* near Edinburgh, and from the noises heard in it at certain times, is called by the people the *routing well*. They go to this to listen after the presages of weather, and it is said that storms are particularly foretold by it; and that noises are not only heard in it before storms happen, but that they are always heard determinately and distinctly on that side whence the storm will come.

In the Philosophical Transactions we have an account of a boiling *well*, &c. See SPRING.

WELL-*water*. See WATER.

WELL, in the *Military Art*, denotes a depth which the miner sinks into the ground, from which he runs out branches or galleries, either to prepare a mine, or find out, and disappoint, the enemy's mine.

WELL, in a *Ship*, an apartment formed in the middle of a ship's hold to enclose the pumps, from the bottom to the lower deck. It is used as a barrier to preserve those machines from being damaged by the friction or compression of the materials contained in the hold, and particularly to prevent the entrance of ballast, &c. by which the tubes would presently be choaked, and the pumps rendered incapable of service. By means of this enclosure, the artificers may likewise more readily descend into the hold, in order to examine the state of the pumps, and repair them, as occasion requires. Falconer.

WELL *of a fishing vessel*, an apartment in the middle of the hold, which is entirely detached from the rest, being lined with lead on every side, and having its bottom pierced with a sufficient number of small holes, passing also through the ship's floor, so that the salt water running into the *well* is always kept as fresh as that in the sea, and yet prevented from communicating itself to the other parts of the hold. Falconer.

WELL-*room of a boat*, denotes the place in the bottom where the water lies, between the cieling and the platform of the stern-sheets, from whence it is thrown out into the sea with a scoop. Falconer.

WELL-*hole*, in *Building*, is the hole left in a floor, for the stairs to come up through. See STAIRS.

WELLE *coronde, sandy cinnamon*, a name given by the Ceylonese to a species of cinnamon which feels hard and gritty between the teeth, as if it were full of particles of sand, though in reality there is no sand among it.

The bark of this tree comes off very easily; but it is not so fit to roll up into quills as the right cinnamon, for it is more rigid and stubborn, and apt to burst open. It is of a sharp but bitterish taste. The roots of all the cinnamon trees yield more or less camphor, but this as small a quantity as any of them. Phil. Trans. N° 409.

WELLIA *tagera*, H. M. in *Botany*, a siliquous plant of Malabar, with a pentapetalous flower, and long flat pods, with transverse partitions between the contained seeds. It grows to the ordinary height of a man, with a stem as big as a man's arm, and is transplanted into gardens only on account of its beauty. It is an evergreen.

All the parts of this plant, the root excepted, are exhibited, with an addition of cummin, white sugar, and milk, against a virulent gonorrhœa. The leaves boiled in cow's milk, or used in baths, expel the gout. The bark, triturated with sugar and water, is proper for the diabetes. The bark of the root, and green saffron mixed with milk, give relief under the nodous gout, called by the Malabarians *sonida badda*. Raii Hist. Plant.

WEN, in *Surgery*, a tumor, or excrescence, growing on divers parts of the body; consisting of a cystis, or bag; filled with some peculiar matter. See *Encysted* TUMORS.

Wens are all, usually, of the like colour with the rest of the body: they begin from very little, and grow gradually. They are not dangerous, but frequently last a long while. Sometimes they degenerate into abscesses. The cure is, to cut off the cystis by the root, which is always narrow.

In the Philosophical Transactions we have an account of a very extraordinary *wen*, on the lower jaw of one Alexander Palmar, of Keith, in Scotland. It was twenty-seven years in growing: at length its enormous bulk, and the pain it gave him, together with its emaciating him exceedingly, determined him to have it cut off. Dr. Bowers assures us, its basis was five inches over, which should seem too large for the whole face; and that, with blood and all, it weighed one or two and twenty pounds. Its form was spheroidal; and, when measured, it was thirty-four inches about one way, and twenty-eight another. It seemed to be an atheroma, being a glandulous substance, with several large blood-vessels in it, and hair growing on it: it was as sensible as any other part. The hæmorrhage, after cutting it off, was stopped by the vitriolic powder; and, the ordinary dressing being used, a cure was completed in six weeks time.

WENS *of pearl*. See PEARL.

WENDING, at *Sea*, a term for bringing a ship's head about, and seems only to be a corruption from *winding*. They say, *How wends the ship?*

WEPOLON, in *Zoology*, the Ceylonese name of an East-Indian serpent, of a very long and slender body, and in some degree resembling a piece of cane.

WERE, *wera*, in our old *Law-Books*, signifies as much as *æstimatio capitis*, or *pretium hominis*; that is, so much as was anciently paid for killing a man.

When such crimes were punished with pecuniary mulcts, not death, the price was set on every man's head, according to his condition and quality. *Were suum*, id est, *pretium suæ redemptionis*, his RANSOM.

WERELADA, among our Saxon ancestors, the denying of a homicide on oath, in order to be quit of the fine, or forfeiture, called *were*.

Where a man was slain, the price at which he was valued was to be paid to the king, and his relations: for, in the time of the Saxons, the killing of a man was not punished by death, but by a pecuniary mulct, called *were*.

If the party denied the fact, he was to purge himself, by the oaths of several persons, according to his degree and quality. If the guilt amounted to four pounds, he was to have eighteen jurors on his father's side, and four on his mother's: if to twenty-four pounds, he was to have sixty jurors; and this was called *werelada*. *Homicidium* wera *solvatur, aut* werelada *negetur*.

WEREGILD, *weregeld*, in our *Ancient Customs*, the price of a man's head: *pretium seu valor hominis occisi, homicidii pretium*; which was paid partly to the king for the loss of his subject, partly to the lord whose vassal he was, and partly to the next of kin.

This was a custom derived to us, in common with other northern nations, from our ancestors, the ancient Germans; among whom, according to Tacitus (De Mor. Germ. cap. 21.) *luitur homicidium certo armentorum ac pecorum numero; recipitque satisfactionem universa domus*. In the same manner, by the Irish BREHON law, in case of murder, the brehon, or judge, compounded between the murderer and the friends of the deceased, who prosecuted him, by causing the malefactor to give unto them, or to the child or wife of him that was slain, a recompence, which they called ERIACH. And thus we find in our Saxon laws, particularly those of king Athelstan, the several *weregilds* for HOMICIDE, established in progressive order, from the death of the ceorl, or peasant, up to that of the king himself. And in the laws of king Henry I. we have an account what other offences were then redeemable by *weregild*, and what were not so. The process called APPEAL had probably its rise in the times when *weregild* was in use. Blackst. Comm. vol. iv. p. 308.

The *weregild* of an archbishop, and of an earl, was 15000 thrimsas. That of a bishop, or alderman, 8000; that of a general, or governor, 4000; that of a priest, or thane, 2000; that of a king, 30000; half was to be paid to his kindred, and the other half to the public. The *weregild* of a ceorl was 266 thrimsas.

WERST, or WURST, a Russian measure equal to 3500 English feet. A degree of a great circle of the earth contains about 104 *wersts* and a half. Phil. Trans. N° 445. § 7.

WEST, *occidens, occasus*, in *Cosmography*, one of the cardinal points of the horizon; diametrically opposite to the east.

Weſt is ſtrictly defined, the interſection of the prime vertical with the horizon, on that ſide in which the ſun ſets.

To draw a true weſt *line.* See MERIDIAN.

WEST, in *Aſtronomy*, is chiefly uſed for the place, in or towards which the ſun or ſtars ſink under the horizon. Thus, we ſay, the Sun, Mars, &c. are in the *weſt.*

The point in which the ſun ſets when in the equator, is particularly called the *equinoctial weſt*, or *point of true weſt.*

WEST, and WESTERN, in *Geography*, are applied to certain countries, &c. ſituate towards the point of ſun-ſetting with reſpect to certain others.

Thus, the empire of Rome, anciently, and of Germany, at preſent, is called the *empire of the Weſt*, or *weſtern empire*, in oppoſition to that of Conſtantinople, which is called the *empire of the Eaſt.*

The Latin or Roman church is called the *weſtern church*; in oppoſition to the Greek church.

The French, Spaniards, Italians, &c. are called *weſtern nations*, in reſpect to the Aſiatics; and America, the *Weſt Indies*, in reſpect of the Eaſt Indies.

WEST-*Aſhton water*, is a chalybeate water, reſembling that of Holt. See Phil. Tranſ. Nº 461. ſect. 20.

WEST *wind* is alſo called *Zephyrus*, and *Favonius*. See WIND.

WEST *Saxonlage*, or the law of the Weſt Saxons. See LAW.

WEST *India companies.* See COMPANY, &c.

WEST *dial.* See DIAL.

WEST, *mooring for.* See MOORING.

WESTERN *amplitude*, *church*, *horizon*, and *ocean.* See the ſeveral articles.

WESTERWALD *earth*, a kind of earth mentioned by Agricola, of a whitiſh yellow colour, of a like nature to the terra Sileſiaca, but preferable to it, as yielding more ſalt. He tells us, that it diſſolves ſilver ſo much better than other menſtrua, as to render it potable, and capable of being prepared into a uſeful medicine in cephalic caſes. Boyle's Works, vol. i. p. 501.

WESTING, in *Navigation*, the ſame with DEPARTURE.

WESTPHALIA-*ham.* See HAM.

WET-GLOVER, a dreſſer of the ſkins of ſheep, lambs, goats, &c. which are ſlender, thin, and gentle.

WET *air.* See MOISTURE.

WET *couch*, a term uſed by the malſters for one of the principal articles of malt-making.

In the making of malt, the uſual way is to ſoak the grain in water two or three days, till it becomes plump and ſwelled, and the water is brown; the water is then drained away, and the barley is removed to a floor, where it is thrown into a *wet couch*, that is, an even heap of about two feet thick.

In this heap the barley ſpontaneouſly heats, and begins to grow, ſhooting out firſt the radicle, and, if ſuffered to continue growing, ſoon after the blade; but at the eruption of the radicle, the proceſs is to be ſtopped ſhort, by ſpreading the *wet couch* thin over the floor, and turning it once every four or five hours for two days, laying it thicker each time; after this it is thrown into a large heap, and there ſuffered to grow hot of itſelf, and afterwards ſpread abroad again and cooled, and then thrown upon the kiln to be dried criſp, without ſcorching. Shaw's Lectures, p. 186.

WET *dock.* See DOCK.

WEY. See WEIGH.

WHALE, in *Aſtronomy*, one of the conſtellations. See CETUS.

WHALE, *cete*, in the Linnæan ſyſtem of *Zoology*, the ſeventh order in the claſs of *mammalia*; the characters of which are, that the animals of this order have breathing apertures on the head, pectoral fins, the tail placed horizontally, and no claws. The order includes four genera, viz. *monodon*, or *ſea*-UNICORN, *balæna* or *whale*, PHYSETER, and *delphinus*, comprehending the DOLPHIN, PORPESSE, and GRAMPUS. See FISH.

The genus of *balæna*, or *whale*, is diſtinguiſhed by having horny laminæ in the upper jaw, inſtead of teeth, and a double fiſtula or pipe in the head; it includes four ſpecies.

The common WHALE, or *balæna myſticetus* of Linnæus, called alſo *muſculus*, is the largeſt of all animals; it is ſometimes, even at preſent, found in the northern ſeas ninety feet in length; but formerly, when the captures were leſs frequent, and the fiſh had time to grow, it was taken of a much greater ſize. The *whales* of the torrid zone, where they are unmoleſted, are ſo large as a hundred and ſixty feet in length; the head is in ſize about one third that of the fiſh; the under lip is much broader than the upper, which is narrow and oblong; the tongue is compoſed of a ſoft, ſpongy fat, capable of yielding five or ſix barrels of oil; the gullet is very ſmall, in proportion to the large bulk of the fiſh, not exceeding four inches in width; in the middle of the head are two orifices, through which it ſpouts water to a great height, and with a great noiſe, eſpecially when diſturbed or wounded; the eyes are ſmall in proportion to the bulk of the head, being no larger than thoſe of an ox, and placed at a great diſtance from each other; on the back there is no fin, but on the ſides, beneath each eye, are two large ones, which ſerve it for rowing; the penis is eight feet in length, encloſed in a ſtrong ſheath, and the *whales* copulate like land animals; the teats in the female are placed in the lower part of the belly; the body is thick and ſomewhat rounded, but toward the extremity of the back there is a ſubacute angle, extending itſelf longitudinally to the tail, which is broad and ſemilunar, placed horizontally, ſo as to enable the animal to riſe ſuddenly to the ſurface of the water, in order to breathe, and ſo ſtrong as even, it is ſaid, to daſh the ſtrongeſt boat in pieces. This *whale* varies in colour; the back of ſome being red, the belly generally white; others are black, ſome mottled, others quite white, according to the obſervation of Marten, who ſays, that their colours in the water are extremely beautiful, and that their ſkin is very ſmooth and ſlippery. The ſubſtance, called WHALE-*bone*, adheres to the upper jaw, and is formed of thin parallel laminæ, called whiſkers, ſome of the longeſt being four yards in length; of theſe there are commonly three hundred and fifty on each ſide, but in very old fiſh more; and of theſe only about five hundred are of a length fit for uſe, the others being too ſhort; they are ſurrounded with long, ſtrong hair, not only that they may not hurt the tongue, but as ſtrainers, to prevent the return of their food, when they diſcharge the water out of their mouths. From theſe hairs, Ariſtotle gave the name of *μυςικητος*, or *bearded whale*, to this ſpecies, which, he ſays, had in its mouth hairs inſtead of teeth; and Pliny deſcribes the ſame under the name of *muſculus*. Under the ſkin the *whale* is covered with fat or BLUBBER from ſix to twelve inches thick, and about the under lip it is two feet thick; which has yielded from a hundred to two hundred barrels, ſome ſay three hundred, according to the ſize of the fiſh. See *Whale* FISHERY, and TRAIN-*oil*.

Under this blubber the fleſh is of a reddiſh colour, which is coarſe, and ſaid to taſte like beef. The Greenlanders eat it, eſpecially that about the tail; and the Icelanders ſoak it in four whey.

The *whale*, though an animal of ſuch immenſe bulk, ſwims very ſwiftly, and generally againſt the wind. The female brings forth only one, or at moſt two young ones, at a time, which are nine or ten feet long, and ſuck the dam's teats; when purſued, they wrap them up in their fins, cloſe to their bodies. The food of the *whale* is a certain ſort of ſmall ſnail, and, as Linnæus ſays, the meduſa, or ſea-blubber.

The great reſort of this ſpecies is within the arctic circle, but they ſometimes viſit our coaſts. The food of the *whale* is found in greateſt quantity between Spitzberg, Nova Zembla, John May's iſland, and Greenland; and therefore this fiſh rarely emigrates far from theſe parts; but here they are found in ſuch numbers, that there have been often ſeen three hundred or three hundred and fifty ſhips of different nations, each ſhip having from five to ſeven long boats, in the compaſs of two degrees from the ſeventy-ſeventh to the ſeventy-ninth; and in two months time they catch from eighteen hundred to two thouſand fiſh, without reckoning the wounded ones that eſcape. See *Whale* FISHERY.

In old time the *whale* ſeems never to have been taken on our coaſts, but when it was accidentally flung on ſhore; it was then deemed a ROYAL *fiſh*; and the king and queen divided the ſpoil; the king aſſerting his right to the head, and the queen to the tail. The reaſon of this whimſical diviſion, as aſſigned by our ancient records, was, to furniſh the queen's wardrobe with *whale-bone*.

The anatomy of the bones of the *whale* has been ſo little underſtood, that there have been many very great errors in regard to ſuch of them as have been at times found foſſile, or buried in the earth among the teeth of elephants, and the remains of teſtaceous and other animals. The moſt frequent and moſt ridiculous of all the wrong opinions about theſe, is their having originally belonged to creatures of the human ſpecies; yet many, even among the more intelligent part of the world, have taken them for the remains of giants. The vertebræ of a *whale* have been miſtaken for thoſe of a giant, and a part of its fins for a hand, and ſo of the reſt. While the world, more ready to ſpread the marvel, than to enquire into the truth, have made computations of the height of the man to whom bones of that ſize muſt have belonged, and from their proportion in regard to thoſe of the common human ſize, have found the giant who poſſeſſed them muſt have been ninety or a hundred feet high; much leſs pains in comparative anatomy would have taught them, that

that they never could have belonged to any human body at all. Mem. Acad. Par. 1727.

WHALE, *beaked*, *bottle-head*, or *nebbe-haul*, is a ſpecies fourteen feet long, and ſeven and a half round; the body very thick, the forehead high, the noſe depreſſed, and equally thick through its whole length, not unlike the beak of a bird; the mouth without teeth; the eyes large; the eye-lids ſmall; the ſpout-hole on the top of the head ſemicircular, with the corners pointed towards the tail; the pectoral fins ſeventeen inches long; the back fin placed nearer the tail than the head, and a foot long; the breadth of the tail three feet two inches. Theſe fiſh ſometimes grow to the length of twenty feet; they make little noiſe in blowing, are very tame, come very near the ſhips, and will accompany them a great way.

WHALE, *fin-back*, *balæna-phyſalus* of Linnæus, called alſo FIN-*fiſh*, is diſtinguiſhed from the common *whale* by a fin on the back, placed very low, and near the tail; its length is equal to that of the common kind, but much more ſlender; it is furniſhed with *whale*-bone in the upper jaw, mixed with hairs, but ſhort and knotty, and of little value; the blubber on the body is very inconſiderable; it is alſo extremely fierce and active, ſo that the capture of it is dangerous, and the fiſhermen have neglected it: however, the Greenlanders eſteem it on account of its fleſh; the lips of this ſpecies are brown, and like a twiſted rope; the ſpout-hole is, as it were, ſplit in the top of its head, through which it blows water with greater violence, and to a greater height, than the common *whale*. The fiſhermen are not fond of ſeeing it; for on its appearance the others retire out of thoſe ſeas.

WHALE, *pike-headed*, *balæna boops* of Linnæus, is a ſpecies which takes its name from the ſhape of its noſe, which is narrower and ſharper pointed than that of other *whales*. The length of one taken on the coaſt of Scotland, obſerved by ſir Robert Sibbald, was forty-ſix feet, and its greateſt circumference twenty; the head of an oblong form, ſloping down, and becoming narrower toward the noſe, having two ſpout-holes at ſix feet eight inches from the end of the noſe, ſeparated by a thin diviſion; the eyes ſmall; the pectoral fins five feet long, and one and a half broad; on the back, about eight feet and a half from the tail, inſtead of a back-fin, was a hard horny protuberance; the tail was nine feet and a half broad; the belly uneven, and formed into folds running lengthways; the ſkin extremely ſmooth and bright; that on the back black, and on the belly white.

WHALE, *round-lipped*, *balæna muſculus* of Linnæus, is characterized by having the lower lip broader than the upper, and of a ſemicircular form. That taken in 1692 near Abercorn-caſtle, and deſcribed by Mr. Pennant, was ſeventy-eight feet long, the circumference thirty-five; the rictus, or gape, very wide; the tongue fifteen feet and a half long; the mouth furniſhed with ſhort *whale*-bone, about three feet in length; on the forehead were two ſpouts of a pyramidal form; the eyes were placed thirteen feet from the end of the noſe; the pectoral fins ten feet long; the back-fin about three feet high, placed near the tail, which was eighteen feet broad, and the belly full of folds. This ſpecies is ſaid to feed on herrings.

WHALE, *ſpermaceti*. See CACHALOT, PHYSETER, and SPERMACETI.

See on the ſubjects of the preceding articles, Pontoppidan's Nat. Hiſt. of Norway, vol. ii. p. 118, &c. Crantz's Hiſt. of Greenland, vol. i. p. 106, &c. Pennant's Brit. Zool. vol. iii. p. 50, &c. Phil. Tranſ. abr. vol. viii. p. 424, &c.

WHALE-*bone*, a commodity procured from the whiſkers of the *common whale*, uſed as a ſtiffening in ſtays, fans, buſks, ſcreens, &c.

WHALE-*fins*, a name improperly given to *whalebone*.

WHALE-*fiſhery*. See FISHERY.

WHAME, in *Natural Hiſtory*, the name given by the people of ſome parts of England to the burrel-fly or WRINGLE-*tail*, a ſpecies of bee-fly very troubleſome to horſes.

WHARF, a perpendicular building of wood or ſtone, raiſed on the ſhore of a road or harbour, for the convenience of lading or diſcharging a veſſel, by means of cranes, tackles, capſterns, &c. See *Artificial* PORTS.

The fee paid for the landing of goods on a *wharf*, or for ſhipping them off, is called *wharfage*. And the perſon who has the overſight and direction of the *wharf*, receives *wharfage*, &c. is called the *wharfinger*.

WHEAT, *triticum*, in *Botany*, a genus of the *triandria digynia* claſs. Its characters are theſe: it has an oval, chaffy empalement, with two valves, which encloſe two or three flowers; the petals have a double valve, as large as the empalement; the outer valve is bellied and acute-pointed, the inner is plain; the flowers have three hair-like ſtamina, terminated by oblong forked ſummits, and a top-ſhaped germen, ſupporting two hairy reflexed ſtyles, crowned by feathered ſtigmas; the germen afterward becomes an oblong oval ſeed, obtuſe at both ends, convex on one ſide, and channelled on the other, wrapped up in the petal of the flower. Miller enumerates four, and Linnæus eleven ſpecies.

The firſt ſort, mentioned by Mr. Miller, is the winter *wheat* without awns, or common *wheat*, which is ſown in moſt parts of England; the ſpikes or ears of this are long; the grains are ranged in four rows, and lie over each other like the ſcales of fiſh; the chaff is ſmooth, and is not terminated by awns or beards. The ſecond ſort is called ſummer or ſpring *wheat*, which ripens much earlier than the other, and therefore has often been ſown in the ſpring of the year; but in a wet ſeaſon, it grows tall, and has very thin grains; ſo that, unleſs the winter corn is injured, the practice of ſowing *wheat* in the ſpring is rarely uſed. The third ſort is called in ſome places grey *wheat*, in others duck-bill *wheat*, and grey pollard; and in Suſſex is generally known by the title of Fuller's *wheat*: this ſort grows very tall, and if it is ſown too thick, is apt to lodge with rain and wind, as the ears are large and heavy; the awns are long, and the chaff hairy, which detains the moiſture; and for this reaſon many people do not chuſe to cultivate it; but where the roots are at a proper diſtance, they will put out many ſtalks, and the ſtalks will be ſtronger; and the grain of this ſort produces more flour in proportion than any of the other ſorts. The fourth ſort is more cultivated in Oxfordſhire and Berkſhire, than in any other part of England; the ears are formed like a cone, whence it has had the title of cone *wheat*. Of this ſort there are the white and red. The awns are long and rough; and hence the farmers ſay it guards the grain from birds, and have therefore been induced to ſow it near encloſures, where there are ſhelters for birds. Mr. Tull prefers this ſort for ſowing in drills; but Mr. Miller obſerves, that he has ſeen the third ſort anſwer much better in the horſe-hoeing huſbandry.

It is not eaſy to determine where *wheat* grows naturally; but it has been generally ſuppoſed that Africa is the country; becauſe in the earlieſt accounts of *wheat*, mention is made of its being tranſported from thence to other countries; and Sicily was the firſt country in Europe where this grain was cultivated. However, it has been very juſtly obſerved by the ancients, as well as moderns, that *wheat* will grow in almoſt any part of the world, and that, as it is the plant moſt neceſſary to mankind, ſo it is the moſt general and the moſt uſeful. It grows well not only in the temperate climates, but in the very hot and very cold ones; and when ſown in places where it never grew ſpontaneouſly, ſucceeds as well as where it has been always common.

The ſucceſs of our crops of *wheat* in America plainly prove this; and in Peru and Chili in particular, where, though thoſe countries were very well inhabited, it never was known till the Europeans brought it in, it produces as large crops as in any part of Europe.

Wheat ſhould be ſown in autumn, and always when the ground is moiſt. In the downs of Hampſhire, Wiltſhire, and Dorſetſhire, farmers begin to ſow their *wheat* in Auguſt, if any rain has fallen; in low ſtrong lands, ſome think it ſufficient to get the *wheat* into the ground by the middle of November; nay, it is ſometimes Chriſtmas, or even later, before all their *wheat* is ſown. But this late *wheat*, beſides being apt to run too much to ſtraw, eſpecially if the ſpring be moiſt, is liable to be thrown out of the ground by froſts. In general, all *wheat* ſucceeds beſt upon ſtrong ſoils, eſpecially if they have been well drained, ſo that the corn lies dry; but as ſome ſorts of this grain thrive better in ſome ſoils than in others, particular attention ſhould be had to the nature of the ſoil in the choice of the grain. Some perſons have been curious enough to procure their ſeed *wheat* from Sicily, and it has ſucceeded very well; but the grain of this ſpecies has been too hard for our Engliſh mills to grind.

The beſt time for ſowing *wheat* is about the beginning of September, eſpecially if any rain has fallen; a circumſtance ſo eſſential, that, if the earth be very dry, the farmer had better ſtay till ſhowers have moiſtened his ſoil, than put his corn into ground where it will not grow before it has been wet, whatever be the length of time. Mr. Mortimer ſays, he has known *wheat* to be ſo muſtied and ſpoiled by lying in the ground, before rain came, that it has never grown at all; adding, that he has alſo ſeen very good crops of *wheat* from ſeed ſown in July. At all events, the huſbandman ſhould finiſh the ſowing of his *wheat* by the middle of October. The land which is uſually allotted for *wheat*, is laid fallow the ſummer before the corn is ſown, during which time it is ploughed two or three times, to bring it into a tilth; and

and the oftener and better the ground is ploughed, and the more it is laboured with harrows between each ploughing, to break and divide the clods, the better will be the crop, and the fewer weeds will be produced. The dung likewiſe ſhould never be laid on the land faſter than it can be ploughed in; for one load of dung ſo managed is better than three in the uſual method of ſpreading it on the ground, and letting it lie expoſed to the ſun for a conſiderable time, before it is ploughed into the ground. Early ſowings require leſs ſeed than late ones; becauſe the plants then riſe better, and acquire ſtrength to reſiſt the winter's cold. More ſeeds ſhould always be allowed for poor lands than for thoſe that are rich; becauſe a greater number of plants will periſh in the former. Rich lands, ſown early, require the leaſt ſeed of any. Another circumſtance which the farmer ſhould carefully attend to in ſowing, is, that his eſtimate of ſeed be formed, not from the capacity of any particular meaſure, but from the number of grains which that meaſure will contain; becauſe the grains of ſome crops of *wheat* are much larger than thoſe of others, though of the ſame ſpecies, and perhaps equally good. It is very natural to ſuppoſe, that a large grained *wheat* will produce larger and finer plants, and larger grain, than a ſmall grained one; but experiments have proved, that the ſmalleſt grained *wheat* produces as large plants as the largeſt, and thoſe with as great ears and as big ſeeds; but the young plants appear ſmaller and poorer. In the choice of the ſeeds for ſowing, particular attention ſhould be paid to the land upon which they grew; for if it is light land, the *wheat* which grew upon ſtrong land is the beſt, and *vice verſâ*. See *Change of* SEED, and *Steeping of* SEED.

Inſtead of the uſual allowance of three buſhels of ſeed-*wheat* to an acre of land, repeated trials have ſhewn, that half that quantity is generally more than ſufficient: for the future plants, being crouded together by being ſown too thick, and not having ſpace enough allowed them for their ſuſtenance, cannot yield ſo plentiful a crop as they would otherwiſe produce. A fair trial, ſays Mr. Miller, made with proper care, would ſoon convince farmers of their error in this reſpect; for if they examine a field of corn ſown in the common way, they will find few plants with more than two or three ſtalks, unleſs by chance, where ſome of them ſtand ſo as to have room to ſpread: theſe, indeed, will have ſix, eight, or ten ſtalks, and frequently many more. But a field of *wheat* ſown with only a buſhel of good corn, has been known to be well covered with healthy, vigorous plants, each of which has had from ſix to fourteen, or more, ſtalks, crowned with long, well-nouriſhed ears, full of fine plump grain, of which it has yielded a much greater quantity than any of the neighbouring grounds ſown with the common allowance. If the land is good, and the roots ſtand at a proper diſtance from each other, few of them will produce leſs than the above mentioned number of ſtalks and ears. But farmers think they ſhall have no crop, if the ground is not covered with the blades of corn by the ſpring; whereas if they would have patience to wait till the roots put out their ſtems, they would be convinced of the contrary; eſpecially if they would draw a weighty roller over the *wheat* in March, which would make it ſpread, and cloſe the earth to the roots, ſo that they would produce the more ſtalks. More ſeed is commonly ſown upon ground newly broken up, than upon that which has been longer in tillage.

As *wheat* remains a longer time upon the ground than moſt other ſorts of corn, it requires a greater ſtock of nouriſhment to lengthen and fill the ears; and, therefore, if the dreſſing is exhauſted in winter, the corn will have but ſhort lean ears, nor will the grain afford much flour; ſo that it often happens that a light dreſſing of ſoot in the ſpring, at the time the *wheat* is beginning to ſtalk, is more ſerviceable to the crop than a dreſſing of dung laid on the land before it is ploughed. Beſides, deep ploughing, where the ground admits of it, will alſo be of great benefit to the corn; for the ſmall fibres of the roots, which are the mouths that ſupply the nouriſhment, extend themſelves very deep (more than three feet) into the ground; and, therefore, it is of great advantage to the crop to have the ground ſtirred and looſened to a proper depth; as the roots will thus find a ſupply of paſture for the nouriſhment and augmentation of the ears, at the time when they are forming, and when it is moſt required.

The general practice is to ſow *wheat* under furrows, which is moſt adviſeable, if the ſoil is ſhallow, to prevent the plants being thrown out by the winter froſts, or their roots being left bare by the drying winds of ſpring. Some ſow in broad caſt, either with a ſingle caſt, or double bout, harrowing once between; after which the ground is again harrowed ſeveral times, till the ſeed is well covered. However, in this manner of ſowing, much of it will become the prey of birds; and on the other hand, in planting the corn deep, there is the greateſt danger of its being eaten off by worms between the grain and the blade. It is very neceſſary to guard againſt the rooks, juſt at the time when the *wheat* is ſhooting up. Theſe miſchievous birds perceive it beginning to ſprout much ſooner than the farmer can, and are led by the ſhoot to pick it up. They muſt, therefore, be carefully kept off the ground for a week or ten days at this time, till the blade grows up, and the grain is ſo exhauſted of its flour, as to be of no value to them, and they will give themſelves no trouble in picking it up. The rooks never moleſt the *wheat* which is ſown about Michaelmas; for at this ſeaſon there is ſo much grain of the late harveſt ſcattered about the fields, where it has grown, that they find it more eaſy to gather up that, than to ſearch under ground for it in the new-ſown lands.

No part of huſbandry requires the farmer's attention more than the keeping of his land free from weeds. For this purpoſe Mr. Miller recommends the method now practiſed by good kitchen gardeners; that is, the making uſe of ſmall kind of hoes for cleaning the *wheat* early in the ſpring, before the ground is covered with the blades of corn. With theſe inſtruments, all the low as well as the tall weeds will be cut up; and if it is performed in dry weather, the weeds, being then ſmall, will ſoon die. Where the ground happens to be very full of weeds, it may be neceſſary to go over it a ſecond time, about a fortnight after the firſt hoeing, to cut up any remaining weeds. By laying the ground clean at this time, the corn will not be robbed of its nouriſhment; and there will not be time for the weeds to grow, ſo as to prejudice it much afterwards; for the ground will be ſo mu[illegible] ſhaded by the corn, as to keep down the weeds; ſo [illegible] they cannot have time to ripen their ſeeds before h[illegible]. If the roots of corn are cut up where they are too [illegible] at the ſame time, this will be found of great ſervic[illegible] thoſe that remain. Both the advantages of having th[illegible] plants of corn at proper diſtances from each other, and of keeping them quite free from weeds, which cannot be completely obtained in the common method of ſowing, are nevertheleſs fully attainable in the new huſbandry.

We ſhall here add, that Mr. Duhamel and Mr. Miller concur in condemning the practice of turning ſheep into the fields of *wheat*, to eat it down, when it is thought to be too rank; becauſe, they ſay, the leaves or blades of corn are neceſſary to draw in nouriſhment from the air and dews, for the increaſe of the ſtalk and ear. To ſatiſfy himſelf of this, Mr. Miller cut off the leaves of ſome plants of *wheat*, alternately, early in the ſpring, and always found the ſtalks of theſe plants much ſmaller, the ears ſhorter, and the grain poorer, than thoſe of the intermediate plants, whoſe blades were not cut. Several experiments made by Mr. Duhamel have proved, not only that all plants are impeded in their growth, and rendered leſs perfect in their productions, but often even killed, by ſtripping them of their leaves; and this is confirmed by Mr. Miller, who adds, that he has frequently obſerved in gardens, that plants, diveſted only of their lower leaves, plucked off by ignorant perſons, upon a ſuppoſition of their drawing the nouriſhment from the head, have been greatly weakened thereby. The ſame will undoubtedly hold good with reſpect to corn; beſides which, cattle, and particularly ſheep, will often bite ſo cloſe, as to deſtroy the crown of the plant, from which its future growth ſhould proceed. However, in many places, and particularly in the iſle of Thanet, where there are excellent farmers, this practice is continued; for when the *wheat* is rank, and the weather dry, they feed it down with their ſheep, which they think makes the *wheat* branch more, and ſettles the earth about the roots of the plant. An experienced farmer obſerves, that ſheep ſhould never be turned into *wheat* after the middle of February: the beſt time, in general, is the latter end or middle of January. Muſ. Ruſtic. vol. iii. p. 151.

Many experiments have been tried to the great purpoſe of multiplying grain, ſome of which are commemorated, with an account of their different ſucceſs, in the Philoſophical Tranſactions. Digby mentions a plant of barley, all riſing from one corn, which, by ſteeping in water in which was a ſmall quantity of ſalt-petre, and afterwards being watered every day with the ſame water, brought forth two hundred and forty-ſix ſtalks, and above eighteen thouſand grains; and the laſt edition of Camden mentions a thing very obſervable of this kind, though from another cauſe; which is, that the corn ſown in a field in Cornwall, where a battle had a little time before been fought in the civil wars, brought forth four or five ears upon every ſtalk.

Mr. de la Pryme has fairly tried the common and many other methods, which though they have not had ſuch immenſe products for their ſucceſs as theſe related above, yet may ſet the world right as to what they have to expect from the different ingredients generally uſed, and which of them promiſe moſt fairly for ſucceſs. His trials were made with alum-water, brimſtone-water, ſolution of ſalt of tartar, ſolution of the caput mortuum of ſal ammoniac, common urine, a ſolution of the common nitrum murale, or ſalt of old walls, a ſolution of ſaltpetre in water, and noſtoch, or ſtar-jelly; from which it appeared, that all theſe ſteepings did no viſible ſervice to the grain, but that many of them were injurious.

It ſeems very plain, from ſuch experiments, that the multiplying of *wheat* and other grain is rather to be expected from the ſowing of it on a good ſoil, and at a proper diſtance, than from any of theſe liquors contrived to ſteep the ſeed-grain in. As moſt of the liquors contrived for this purpoſe are, however, harmleſs, it will be worth the farmers while to try them at times, and in a regular manner, ſowing the different parts of the ſame field with ſteeped and unſteeped grain, in the ſame proportion.

The experiment of the ſteeping of the grain in the offals of animal ſubſtances, carries with it evident ſucceſs; but we are to remember, that only a third part of the quantity of ſeed is to be uſed to the ſame quantity of ground in that method, as is in the common way; and it is more than poſſible that the increaſe which attends this method, may be owing to this diſtance of the plants, rather than to the good done by the water. Phil. Tranſ. Nº 281. p. 1212. See *Steeping of* SEED.

It is evident from experience, that the multiplication of *wheat*, that is, the quantity of *wheat* produced from every grain, is very different in different places, and according to various accidents. It has been often attempted to arrive at the art of cauſing every grain of *wheat* to yield its utmoſt poſſible increaſe; and if this could be brought about on eaſy terms in the large way, ſo as to affect whole fields, it is evident that the advantage would be very conſiderable. This has been attempted by Vallemont in ſeveral different ways, but with moſt ſucceſs in the following: let there be collected together as large a quantity as may be of the bones, ſkins, feathers, and other parts of animals, which are thrown away as refuſe, together with the refuſe of foods and wearing apparel, ſuch as old ſhoes, gloves, or whatever elſe of this kind comes in the way, though horns and hoofs of all animals are excellent; and, in ſhort, let every thing be collected that abounds with ſalts: when a large parcel of theſe things is got together, let them be ſeparated into two or three heaps, according to their different natures; the hardeſt kinds into one heap, the ſofteſt into another, and ſo on. Let each of theſe parcels be put into a large wooden veſſel, and a ſufficient quantity of rain or river-water be poured on them, that they may ſwim at liberty in it. When the water has ſtood ſo long, that it ſtinks very much, ſtrain it off, and keep it in veſſels for uſe. The ſofteſt bodies will give the water this ſtink in five days; the moderately hard ones in ſeven days; and the hardeſt of all in nine days. Theſe laſt are to be broken to pieces before they are put into the water. The liquor prepared from theſe is called the *prepared water*.

Let a quantity of plants of any kind, no matter what, be burnt with their flowers and ſeeds, and let a lixivial ſalt be made from the aſhes in the common way. Then take as many pounds of ſalt-petre as there are acres of land to be employed, and let each pound be diſſolved in twelve quarts of water, and to this ſolution add a ſmall quantity of the lixivial ſalt of the plant. This liquor the author calls the *univerſal matter of vegetation*. When both the liquors are thus made, mix together an equal quantity of each of them; that is, of the prepared water, and of the univerſal matter; and let the whole quantity be ſo much as will ſerve thoroughly to wet and ſoak the quantity of corn that is to be ſown; this is to be ſo much, that it ſtands two fingers breadth above the grain. When the grain and the liquor are thus mixed, the light grains, which will not grow, will ſwim at the top, and may be ſkimmed off, and ſeparated from the reſt. The grain at the bottom of the veſſel is to be ſtirred up and turned every two hours: in this manner, the grain is to be ſoaked twelve hours, and after this the water is to be poured off, and the grain dried, by lying on a ſieve, or being thin ſpread on the floor; and after two or three hours it is to be ſown in the common way.

The quantity of ſeed neceſſary for an acre of ground, when thus ſteeped, is only one third of the quantity commonly uſed, and this will produce infinitely more grain, and is as much as the land can bear. The liquor, poured off from the ſoaking of this quantity of grain, is not to be thrown away, but muſt be ſaved, for it will ſerve as well for ſeveral more parcels as it did for this.

This was tried in the year 1706, which was the year after the book came out, in ſeveral parts of France, and that with ſo much ſucceſs, that the author got great reputation, and his book was tranſlated into the German, and ſome other languages. Whether the method was found afterwards not to ſucceed ſo well, or whether it was dropped through mere inadvertence, the thing has not been regarded ſince that time; but the proceſs is at once ſo cheap and ſo eaſy, that it ſhould ſeem extremely worth while to bring it into trial again. Vallemont. Curioſ. de Vegetat.

In the Philoſophical Tranſactions, vol. lviii. for 1768, we have an account of ſome experiments made by Mr. Charles Miller, of Cambridge, on the multiplication of *wheat*, by diviſion and tranſplantation. In the firſt inſtance near two thouſand ears were produced from a ſingle grain. In another inſtance, a ſingle plant was ſeparated into eighteen parts, each of which was planted ſeparately: theſe were again taken up and divided; and the ſecond diviſion produced ſixty-ſeven plants, which remained through the winter; another diviſion of them was made in the ſpring, which produced five hundred plants. Theſe were, in general, ſtronger than any of the *wheat* in the fields. Some of them produced upwards of a hundred ears from the ſingle root; and many of the ears meaſured ſeven inches in length, and contained between ſixty and ſeventy grains. The whole number of ears produced from one grain of *wheat* was 21,109, which yielded three pecks and three quarters of clear corn; the weight of which was forty-ſeven pounds ſeven ounces, and the number of grains about 576,840. If a ſecond diviſion had been made in the ſpring, Mr. Miller thinks the number of plants would have amounted, at leaſt, to 2000, inſtead of 500; and the produce much enlarged.

There are four ways of augmenting the crops of *wheat*, not in the number of the plants, but in the ſtalks, ears, and grains.

The firſt is by increaſing the number of ſtalks from one, two, or three, to thirty or forty in each plant, in ordinary field land; and the crop is augmented by bringing up all theſe ſtalks into ear, which is the ſecond way; for if it be diligently obſerved, it will be found that not one half of the ſtalks of *wheat*, ſown in the common way, ever come to ear at all; nay, if a ſquare yard of ſown *wheat* be marked out, and the ſtalks thereon numbered in the ſpring, it will be found that no leſs than nine parts in ten of them are wanting at the harveſt-time.

An experiment of the advantage of this augmentation was made by Mr. Tull in rows of *wheat* that were equally poor; one of theſe rows was increaſed ſo much, as to produce more grains than ten of the other, by bringing up more of its ſtalks into ears, and alſo by augmenting the ears to a much greater bigneſs, which is the third way; for it is very certain that the ears will be much larger or much ſmaller, according to the quantity of nouriſhment that is given them.

The fourth and laſt way of increaſing the crops of *wheat*, is by cauſing the grain to be much larger in the ears. This can no way be done ſo effectually as by late hoeing, eſpecially if it be done juſt after the *wheat* is gone out of the bloſſom. Others, however, have recommended hoeing, juſt before the *wheat* blows. By this means the grains will weigh twice as much as thoſe produced in the ſame ſort of *wheat*, when this late hoeing has been omitted; their number, at the ſame time, is the ſame in the ear; and as the *wheat* is ſold not by tale, but by meaſure, the farmer's gain is double in this caſe, the *wheat* meaſuring juſt twice as much as it would otherwiſe have done.

Thus by increaſing the number of the ſtalks, bringing more of them up into the ear, making the ears larger, and the grains larger, plumper, and fuller in every ear; the method of horſe-hoeing, by which alone this can be effected, makes a larger crop out of the tenth part of the number of plants, than in the common way: but all theſe advantages will be loſt by thoſe who, though they give into the horſe-hoeing way, yet will not allow the ſix feet intervals between the rows; for it is owing to this great ſpace of ground alone, that as much nouriſhment may be given to the *wheat* as the farmer pleaſes.

In the method by theſe wide intervals, we can raiſe a larger crop of *wheat* with leſs labour, leſs feed, no dung, and no fallowing; but not without a competent quantity of earth, which is the cheapeſt thing given to corn. The earth of a whole good acre being but about the tenth part of the expence, and of indifferent land but about a twentieth.

The crop enjoys all the earth; for between the laſt hoeing and the harveſt, there remains nothing but a ſpace of empty

empty mould in the middle of the intervals. Farmers do not grudge the price of three or four pounds in the buying and carriage of dung for an acre; but they think themſelves undone if they afford an extraordinary eighteen-pennyworth of earth to the wide intervals of an acre, not conſidering that earth is at once the beſt and the cheapeſt entertainment that can be given to plants; for at five and ſix pence rent, which is common to ſome land in many parts of the kingdom, the whole earth belonging to each of the rows coſts only ſix pence; that is, a penny for a foot broad and ſix hundred and ſixty feet long, that being the ſixty-ſixth part of an acre. But the vulgar count this expence of a foot breadth of ground not as they ought, only as part of the rent, but as an eleventh part of their own uſual charges added to the rent.

If the intervals are narrower in deep land, there might be earth enough in them; but there would not be room enough to pulverize it.

The horſe-hoe, well applied, ſupplies the uſe of dung and fallow; but it cannot ſupply the uſe of the earth, though it can infinitely increaſe the virtue of it, where there is any reaſonable quantity.

The mean price of *wheat*, between dear and cheap, is reckoned by Mr. Tull at five ſhillings a buſhel; and therefore an acre of land that ſhould produce every year eight buſhels, without any expence, would be accounted a very profitable one. Now an acre of land drilled with *wheat*, and horſe-hoed, will produce ſixteen buſhels of *wheat* eaſily, with the expence only of ten or fifteen ſhillings, and this is a third part more profitable.

It is commonly computed that the farmer cannot live, if *wheat* be ſold was under five ſhillings a buſhel; he muſt therefore keep his *wheat* when it is ſold cheaper than that in the markets; and the common method is to keep it in the ſtraw, taking care to keep away the mice. The ſecureſt method of all is to dry the *wheat* in the grain; but this many are afraid to practiſe.

Some people, who have known this ſecret, have made great profit by buying up the *wheat*, when under three ſhillings a buſhel in the markets, and then preſerving it in this manner till a dearer time. The method is to dry it in a malt-kiln, but with no other fuel than *wheat*-ſtraw, never ſuffering it to have any ſtronger heat than that of the ſun. The longeſt time the *wheat* need lie in this heat, is twelve hours, but ſometimes four hours are ſufficient; according to its dampneſs when bought, and the time it is intended to be kept, it requires a longer or ſhorter drying. The only thing that cauſes the decay of *wheat*, and gives way to that devouring animal the weevil in it, is its too great dampneſs; this is carried off in this manner, by a heat no greater than that which the ſun might have given to the grain. The vegetating power therefore is not deſtroyed by this; and the bakers have acknowledged that the flour of this *wheat* does rather better for the working into bread, than that of freſh *wheat*.

Though all ſorts of vegetables may have great benefit from the hoe, becauſe it ſupplies them with plenty of food at the time of their greateſt need; yet they do not all equally require hoeing; but the plant that lives longeſt ſhould always have the greateſt ſtock of nouriſhment provided for it, and ſhould therefore be moſt frequently hoed of any plant. *Wheat* generally lives, or ought to live, longer than any other corn; for if it be not ſown before ſpring, its grain will be thin, and will have but little flour in it; and when it is ſown late in the winter, it is in great danger of being killed by the froſts, while weak and tender.

To prevent theſe inconveniences, *wheat* is generally ſown in autumn; and by this means, having thrice the time to be maintained that ſpring-corn hath, it requires a larger ſupply of nouriſhment, in proportion to that longer time; not that the *wheat* in its infancy conſumes the ſtock of food that it afterwards does, but becauſe, during that long interval between winter and the ſpring feed-times, moſt of the artificial paſture, or benefit from former tillage, is loſt both in light and ſtrong lands.

This is the reaſon why all that extraordinary pains in fallowing and dunging of the ſoil is neceſſary for *wheat*; and yet all this trouble and expence are ſo far loſt, that if a part of the ſame field unfallowed and undunged be ſown in April, after good ploughing, it will raiſe as fair a crop in all reſpects as the other, only that the flour will be in leſs quantity, by wanting time in the ground for filling the grains.

Poor light land, in the common way of huſbandry, muſt be extremely well manured, in order to the maintaining of *wheat* a year, which is the uſual time that it is in it; and if it be ſown late, the greater part of it uſually periſhes, not being able to ſurvive the winter while ſo poor, and on ſuch land; and if it be ſown very early on ſtrong land, though rich, well tilled, and dunged, the crop will be worſe than on poor light land ſown early. The new method of horſe-hoeing gives both to ſtrong and to light land all the advantages neceſſary, and takes off all the diſadvantages of both. By this method the ſtrong land may be planted with *wheat* as early as the light, if ploughed dry; and the hoe-plough, if rightly applied, will be able to give it nouriſhment equal to that of dung in both ſorts of land.

The tops of the ridges for the drilling of *wheat* muſt not be left quite ſo narrow and ſharp as they are for drilling of turneps; *wheat* being generally to be ſowed in treble rows, and the turnep only in ſingle ones. In reaping the *wheat* thus ſown, it is to be cut as near to the ground as poſſible, and this is eaſier done in this than in *wheat* ſown in the common way, becauſe in this drilled method the ſtalks all ſtand cloſe together. When the *wheat* is cut thus low in the reaping, the ſtubble is no great impediment to the preparing of the land for the ſucceeding crops.

As ſoon as conveniently may be, after the carrying off a crop of *wheat*, if the trench in the middle of each wide interval be left deep enough by the laſt hoeing, the farmer is to go as near as he can to the ſtubble, with a common plough, and turn two large furrows into the middle of the intervals, which will make a ridge over the place where the trench was; but if the trench be not deep enough, it is beſt to go firſt in the middle of it with one furrow: this, with two more taken from the ridges, will be three furrows in each interval; and this ploughing is to be continued as long as the dry weather laſts, and then the whole is to be finiſhed by turning the partitions on which the laſt *wheat* grew up to new ridges, which is uſually done at two great furrows; theſe laſt furrows, which complete the ridges, may be ploughed in wet weather. By this ſort of management, the *wheat*, being planted in rows, at ſix feet intervals, the ſame piece of ground will produce every year a new crop of *wheat* in the intervals, without any fallowing or manure, only by means of ſufficiently breaking the ſurface with ploughing and horſe-hoeing.

It is a general rule, that all ſorts of grain proſper beſt where they are ſown at a time when the ground is ſo dry that it is broken to a ſort of powder by the plough. *Wheat alone* is an exception to this rule; and the reaſon of this is, that as *wheat* is to endure the ſeverities of a whole winter, after it is ſown, it therefore ſucceeds beſt by being ſown in wetter weather, when the ground is not to be broken to ſo very ſmall, and is preſſed down cloſe upon the ſeeds, and covers them better. If *wheat* were as hardy as rye, and its roots were as hardy and patient of the cold, it might be ſown in as dry a ſeaſon as the rye, and would profit as much by it; but, on the contrary, it requires ſo much covering, that it is a very good practice of ſome farmers to turn their ſheep over very light land, as ſoon as it is ſown with *wheat*, in order to tread the ſurface of it hard, and then the cold of winter cannot ſo eaſily kill or penetrate the roots. And as *wheat* requires to have the earth lie harder on and about it in the winter, ſo it alſo requires more dung, or ſomewhat elſe, to diſſolve the earth about its roots, after the cold weather is paſt, than the rye does, whoſe roots were not ſo confined by the preſſing of the earth about them.

It is another general rule, that all vegetables thrive beſt when ſown on freſh tilled ground, immediately after it is ploughed; but *wheat* is alſo an exception to this rule; for the beſt way for it is to plough the ground when very dry, and then to let it lie, even though it be many weeks, till ſome rain come to moiſten it, and then drill the *wheat*. The harrows and the drill, in this caſe, will move a ſufficient part of the ground, which will ſtick together for the defence of the ſmall roots during the winter, the reſt of the mould lying open, and divided underneath until ſpring, to moiſten and nouriſh them.

There is a ſort of binding ſand, which requires not only to be ploughed dry, but to be ſowed dry alſo, or elſe the *wheat* will dwindle in the ſpring, and fail of being a good crop. What is meant here by dry ploughing, is not, however, that the ground ſhould be ſo dry that the duſt ſhould fly; but it muſt not be ſo wet as to ſtick together in lumps; neither ſhould the ground be drilled when it is as wet as pap: it ſuffices that it is moiſt; only the lighter lands ought to be more moiſt than the ſtrong.

Strong land ploughed wet in November, will be harder in the ſpring than if ploughed dry in Auguſt, though it would then have three months longer to lie. See HOEING, and HUSBANDRY.

The horſe-hoeing huſbandry practiſed and recommended by Mr. Tull has been generally rejected by our farmers; who ſtill adhere to the BROAD-*caſt* huſbandry. Innova-

tions,

tions, however advantageous, are introduced ſlowly, and require many repeated experiments to evince their uſe, and eſtabliſh their credit. It is much to be wiſhed that his new method of huſbandry were univerſally practiſed; for thoſe, who have made ſufficient trial of it, have found their crops anſwer much better than in the common, or old method of huſbandry; and the French, deriving their information concerning it from Mr. Tull's book, have ſet a laudable example of ardour in the proſecution of it. Nor have there been wanting many in our own country who have borne ample teſtimony to its utility; notwithſtanding the prejudice at firſt conceived againſt it; a prejudice partly owing to Mr. Tull's poſitive aſſertion, that the ſame land would nouriſh the ſame ſpecies of plants without changing the crops, for ever, and this without the aid of manure.

Mr. Miller recites the following experiments, which evince the utility of Mr. Tull's method of huſbandry in the culture of *wheat*. The firſt experiment was in a field of *wheat*, which was ſown partly in broad-caſt in the common method, and partly according to Tull's method. Thoſe parts of the field that were ſown in Mr. Tull's method, were in rows at two feet diſtance, and ſtood thin in the rows; the roots of the *wheat* in theſe ſpots had from ten to thirty ſtalks upon a root, which continued upright till the corn was reaped; whereas few of the roots in the common method had more than two or three ſtalks, and moſt of theſe were lodged before harveſt; ſo that upon trial of the grain when threſhed, there was near a third part more in weight and meaſure, than from the ſame extent of ground, taken in the beſt part of the field ſown in the common way.

Another trial was made in ſowing of the corn at different diſtances, with ſome ſown in two parts of the ground broad-caſt. The event was, that all which was ſown broad-caſt in the uſual way was lodged, as was alſo moſt of that where the rows were ſix or nine inches aſunder: thoſe which ſtood at a foot diſtance eſcaped better; but the rows two feet aſunder were the beſt, and the produce much greater than any of the other; which plainly ſhews the abſurdity of that practice, in ſowing a great quantity of ſeeds to have a better produce, which is the opinion of moſt of the old farmers.

It may be proper to add, that Mr. Tull began his ſcheme of ſucceſſive *wheat* crops with four rows; afterwards he found that three rows were better, and was in that practice of drilling three rows upon a ridge, when he publiſhed his Eſſay in 1733. Upon farther experience he found, that two rows produced as good crops as three or four, and were more eaſily managed. This he recommends as his laſt and beſt method; and he altered his drill-plough to his practice of planting only two rows upon a ridge, of which he gives a figure and deſcription in his Addenda, publiſhed in 1738, and Concluſion, publiſhed in 1739. By this alteration, his drill is much leſs complicated, and leſs difficult to manage, than that for planting three rows, deſcribed in his Eſſay. However thoſe, who are promoting the new huſbandry abroad, have adopted the practice of planting three rows upon every ridge; and the drill-ploughs invented by M. Duhamel and M. de Chateauvieux, are conſtructed for ſowing three rows.

In the additions made by Mr. Tull to his Eſſay, there occur ſeveral material improvements in the manner of hoeing and cultivating *wheat*, and other crops; and we may here ſee, that the reports of his bad ſucceſs, in repeated *wheat* crops, are without ſufficient foundation. In his Addenda he informs us, that the real produce of an acre of horſe-hoed *wheat* was thirty-two buſhels; whereas from a computation of the crop on his other hundred and ſix acres, the amount appears, upon an average, to have been about twenty buſhels of *wheat* per acre. He adds an account of other experiments, which prove, that pulverization by inſtruments very much exceeds the benefit of common manure; and concludes upon the whole, from a practice of thirteen years, that he has never had the leaſt reaſon to ſuſpect the truth of his principles.

In his Eſſay he directs, that the hoe-plough ſhould be brought as near as poſſible to the rows at firſt, and when the plants are young; but that the ſubſequent hoeings ſhould be at ſome diſtance from the rows, leſt the plough ſhould tear off too many of the roots, and deſtroy the plants; and alſo that the laſt hoeing ſhould throw the earth of the intervals up to the plants, which he thought neceſſary for their better nouriſhment, when they were grown large. But his laſt practice was different in both theſe reſpects. For in the Concluſion to his Eſſay, p. 272, he ſays, "at the ſecond hoeing the plough goes in the furrow of the firſt, making it deeper and nearer to the *wheat*; the third hoeing fills up this furrow; and then, at the fourth hoeing, the plough goes in the ſame place as the ſecond, turning the mould into the intervals. He

adds, it is remarkable, that though the furrows of the ſecond and fourth hoeings be deep and near to the rows, ſeeming to deprive the *wheat* of the mould which ſhould nouriſh it; whence one would imagine, that theſe furrows, lying long open, ſhould weaken or ſtarve it; but, on the contrary, it grows more vigorous; and it is the obſervation of my ploughmen, that they cannot at theſe hoeings go too near to the rows, unleſs the plough ſhould tear out the plants."

The produce of an acre of *wheat* is various, according to the goodneſs of the ſoil. In ſome of the ſhallow, chalky, down lands, where there have been near four buſhels of corn ſown, Mr. Miller ſays that he has known the produce not more than double of the ſeed, which is not ſufficient to defray the expence. But upon good land, where the corn has ſtood thin upon the ground, he has known eight or ten quarters reaped from an acre, over the whole field, and ſometimes much more. Mr. Miller has been informed by perſons of credit, that on good land, which was drilled and managed with the horſe-hoe, they have had twelve quarters from an acre of land, which is a great produce; and this is with greater certainty, if the ſeaſons prove bad, than can be expected by the common huſbandry. See Husbandry.

Wheat is known to be ripe, when its ſtraw has turned yellow, its ears hang, no greenneſs appears in the middle of them, and the grain is hard when bitten. It was formerly a cuſtom among farmers to delay reaping their *wheat* till it was very ripe; but they now find their account in cutting it greener; for ſuch *wheat* has a better colour than that which is thoroughly ripe, and ſells for more money at market: it is alſo ſaid, that *wheat* reaped early is heavier by the buſhel than the ſame *wheat* when it ſtands to be thoroughly ripe.

It is a well known maxim, that *wheat* ſhould be left for ſome days in the field, after it is cut, before it is houſed; this the farmers think, and not without reaſon, improves its quality; the dews plumping the kernels, and the ſun bringing it to a proper and perfect ſtate of maturity.

An ingenious farmer ſuggeſts, that when *wheat* is wet, and by reaſon of an unfavourable ſeaſon in danger of growing, it is moſt adviſeable to carry it home, and to provide cutting boxes, in which the ears ſhould be cut off from the wet ſheaves; theſe ſhould be put up looſely in ſacks, and gradually dried in a malt-kiln. By this management, he ſays, the farmer will find great advantages; and his *wheat* will, with a very inconſiderable additional expence, be nearly, and ſometimes quite as good in a wet harveſt, as if it had been houſed in ever ſuch good weather. Miller's Gard. Dict. Tull's Horſe-hoeing Huſbandry. Farmer's Dictionary.

By 10 Geo. III. cap. 39. in force for ſeven years, and 17 Geo. III. cap. 44. in force for ſeven years more, the juſtices at Michaelmas ſeſſions, yearly, ſhall order returns to be made weekly of the prices of *wheat*, rye, barley, oats, and beans (and in Scotland of bear or big), from ſuch market-towns as they ſhall think proper, and appoint a proper perſon to make ſuch returns. In London, the meal-weighers ſhall take an account of the prices of *wheat*, &c. at the markets within the city, and return the average prices weekly to the perſon appointed to receive the ſame; and a ſtandard Wincheſter buſhel of eight gallons ſhall be kept at each market-town from whence the return ſhall be made. The commiſſioners of the treaſury ſhall appoint a fit perſon to receive the returns at the treaſury, who ſhall enter them in a book, and once in every week cauſe them to be publiſhed in the London Gazette; and four times in every year tranſmit a certificate to the clerk of the peace for each county or diviſion, and to the court of the mayor and aldermen of London, of the returns which have been ſeverally made.

The laws relating to the importation and exportation of *wheat*, and other corn, are as follow. When corn doth not exceed the following prices, the cuſtom and poundage for corn imported, ſhall be as follows: *wheat* not above 53*s.* 4*d.* a quarter, ſhall pay 16*s.* if above 53*s.* 4*d.* and not above 4*l.* it ſhall pay 8*s.* Rye, not above 40*s.* a quarter, ſhall pay 16*s.* Barley and malt, not above 32*s.* a quarter, ſhall pay 16*s.* Buck-*wheat*, not above 32*s.* a quarter, ſhall pay 16*s.* Oats, not above 16*s.* a quarter, ſhall pay 5*s.* 4*d.* Peaſe or beans, not above 40*s.* a quarter, ſhall pay 16*s.* 22 Car. II. cap. 13. But when the prices exceed theſe rates, then the duties, payable before this act, ſhall only be paid, viz. for every quarter of *wheat* imported 5*s.* 4*d.* of rye, 4*s.* barley or malt, 2*s.* 8*d.* buck-*wheat*, 2*s.* oats, 1*s.* 4*d.* peaſe or beans, 4*s.* 15 Car. II. cap. 7.

Whenever the price of middling Britiſh *wheat*, at the ports and places where *wheat* ſhall be imported, ſhall be at or above 48*s.* a quarter; rye, peaſe, or beans, 32*s.* barley, bear, or bigg, 24*s.* oats, 16*s.* all cuſtoms and duties payable on importation ſhall ceaſe; and in lieu

thereof

thereof ſhall be paid on importation a duty of only 6*d.* a quarter for *wheat*; 2*d.* a hundred weight for *wheat* flour; 3*d.* a quarter for rye, peaſe, and beans; and 2*d.* a quarter for barley, bear, bigg, and oats; and the ſame may be carried coaſtwiſe, under the ſame regulations as corn, flour, or grain, of the growth of this kingdom. 13 Geo. III. cap. 43. Whenever the price of middling Britiſh *wheat*, at any port or place from whence the ſame ſhall be intended to be exported, ſhall be at or above 44*s.* a quarter, no perſon ſhall export, or cauſe to be laid on board for exportation, any *wheat*, *wheat*-meal, or flour, malt, bread, biſcuit, or ſtarch made of *wheat*. When the price of rye, peaſe, or beans, ſhall be at or above 28*s.* a quarter, no perſon ſhall export, &c. any rye, peaſe, or beans, ground or unground, or any bread or biſcuit made of rye, peaſe, or beans. When the price of barley, bear, or bigg, ſhall be at or above 22*s.* a quarter, no perſon ſhall export, &c. any barley, &c. or malt, bread, or biſcuit, made of barley, &c. And when the price of oats ſhall be at or above 14*s.* a quarter, no perſon ſhall export, &c. any oats or oatmeal, or malt, bread, or biſcuit, made of oats; under penalty of forfeiture of the commodities and veſſel, &c. and alſo 20*s.* for every buſhel of *wheat*, &c. the maſter or mariners aſſiſting ſhall on conviction be impriſoned for three months. 13 Geo. III. cap. 43. By the ſame ſtatute the former bounties on exportation ſhall ceaſe; and inſtead thereof there ſhall be allowed, on the exportation of corn or grain, either ground or unground, being the growth of this kingdom, and put on board in Britiſh ſhipping, the maſter, and at leaſt two thirds of the mariners, being his majeſty's ſubjects, the ſeveral bounties following; viz. when the price of middling Britiſh *wheat* ſhall be under 44*s.* a quarter, there ſhall be allowed a bounty of 5*s.* for every quarter of *wheat*, and 5*s.* for every quarter of malt, made of *wheat*. When rye ſhall be under 28*s.* a quarter, there ſhall be allowed a bounty of 3*s.* for every quarter of rye. When barley, bear, or bigg, ſhall be under 22*s.* a quarter, there ſhall be allowed a bounty of 2*s.* 6*d.* for every quarter of barley, bear, or bigg; and 2*s.* 6*d.* for every quarter of malt made of barley, &c. And when oats ſhall be under 14*s.* a quarter, there ſhall be allowed a bounty of 2*s.* for every quarter of oats, and 2*s.* 6*d.* for every quarter of oatmeal, computed at the rate of two hundred and ſeventy-ſix pounds avoirdupois to a quarter.

WHEAT, *brining of.* See BRINING.

WHEAT, *ſetting of.* See SETTING.

WHEAT, *buck*, *fagopyrum*, in *Botany*, a ſpecies of POLYGONUM in the Linnæan ſyſtem.

Buck-wheat is cultivated in many parts of England, and is a very great improvement of dry barren lands. The beſt ſeaſon for the ſowing of it is in May, and one buſhel of the ſeed is enough for an acre; the ground is to be dreſſed for it exactly as for barley; and if the ſoil is not very clean, it will yield a very large increaſe, as fifty buſhels an acre, and is excellent food for hogs and poultry. The flour of it is alſo very white, and mixed with wheat flour is eaten in ſome countries, and when broken in a mill, makes a fine addition to corn for horſes, making them ſoon grow fat. It is commonly late in the ſeaſon before it is ripe, but it is in no danger from ſtanding; when it is cut, it is uſually laid many days to dry before it is houſed. Beſides theſe uſes, ſome people ſow it very thick, and ſuffer it to grow up till it is near flowering, they then plough it in, and it makes a very good land for wheat or rye. But the beſt way is, juſt before it bloſſoms, to feed it with cattle, eſpecially with milch-cows, which it cauſes to yield a great deal of milk, and that ſuch as affords very good cheeſe and butter. It is food for the cattle in the very drieſt time, when all the common graſs in paſtures is burnt up; and proves a very great improvement for the land. For this purpoſe they ſow it thicker than for others, ſometimes three or four buſhels on an acre. Mortimer's Huſbandry, p. 137.

WHEAT, *cow*, *melampyrum*, in *Botany*, a genus of the *didynamia angioſpermia* claſs. Its characters are theſe: the flower has a permanent empalement of one leaf, which is tubulous, and cut into four ſegments at the brim; the flower is of the lip-kind, having an oblong recurved tube, compreſſed at the brim; the upper lip is formed like a helmet, and compreſſed and indented at the top; the under lip is plain, erect, and cut into three ſegments, which are unequal and obtuſe; it hath four awl-ſhaped ſtamina, which are curved under the upper lip, two of which are ſhorter than the other, terminated by oblong ſummits; in the centre is ſituated an acute-pointed germen, with a ſingle ſtyle, crowned by an obtuſe ſtigma; the empalement afterward turns to an oblong, acute-pointed capſule, with two cells, encloſing two pretty large oval ſeeds. Miller reckons four, and Linnæus five ſpecies.

The *cow-wheat*, with purpliſh tops, is a delicious food for cattle, particularly for fattening oxen and cows; for which purpoſe it may be cultivated. The ſeed ſhould be ſown in the autumn, ſoon after they are ripe, otherwiſe they ſeldom grow the firſt year; they ſhould be weeded while young, and the cattle may be turned in upon it, as ſoon as the flowers begin to appear; but they ſhould be confined to a certain ſpace, and not permitted to run at large, and trample it about. In Weſt Frieſland and Flanders it grows plentifully among the corn. Miller.

WHEAT, *white cone*, a term uſed by our huſbandmen, to expreſs a peculiar kind of WHEAT, which is very ſtrong, and has a large ear.

It is the beſt kind for ſowing in fields ſubject to the blight; for the ſtalks of it being, for the moſt part, ſolid or full of pith, like a ruſh, not hollow, like thoſe of common *wheat*; the inſects that cauſe the blight, ſeizing on the ſtalks of other *wheat*, do this no injury, even though they ſhould attack it; the ſtalks of this kind being often found full of the black ſpecks, which are always the marks of that inſect having been there, and yet the ear full, and the grain good.

This *wheat* makes very good bread, if the miller does not grind it too ſmall, or the baker make his dough too hard, it requiring to be ſomewhat larger than other *wheat*-flour, and ſomewhat ſofter in the dough. A buſhel of *white-cone-wheat* will make conſiderably more bread than a buſhel of Lammas *wheat*; but it gives it a ſomewhat yellowiſh caſt.

WHEAT, *Indian.* See MAIZE.

WHEAT, *Smyrna*, a peculiar kind of *wheat* that has an extremely large ear, with many leſſer or collateral ears coming all round the bottom of the great one.

As this is the largeſt of all ſorts of *wheat*, ſo it will diſpenſe with the nouriſhment of a garden, without being overfed, and requires more nouriſhment than common huſbandry in the large way can give it. In the common way its ears grow not much larger than thoſe of our common *wheat*.

This ſort of *wheat* ſeems, of all others, the moſt proper for the new method of horſe-hoeing huſbandry, as that method ſeems capable of giving as much nouriſhment as the farmer pleaſes, by often repeating the hoeing. Next to this, the *white-cone-wheat* is beſt for this ſort of huſbandry; then the grey-cone-*wheat*.

WHEAT-*bird*, a name given by the people of Virginia to a ſpecies of bird, which, after the time of the ſowing of the *wheat* in that country, made its appearance annually at the ſeaſon of its beginning to ripen, and was never ſeen there before. See *Birds of* PASSAGE.

WHEAT-*ear*, in *Ornithology*, the Engliſh name of the common œnanthe, or *motacilla œnanthe* of Linnæus, called alſo the *white-tail*, and the *fallow-finch*. See *Tab.* V. *of Birds*, N° 60.

It is ſomething larger than the common ſparrow; its head and back are of a greyiſh colour, with ſome admixture of redneſs; the rump is white, whence the bird has its name of the *white-tail*; though this is ſometimes not the caſe, the rump being of the ſame colour with the reſt of the back; over each eye is a white line, and beneath it a broad black ſtroke, paſſing acroſs each eye to the hind part of the head; the under ſide of the body is white, tinged with yellow; on the neck it inclines to red; the quill-feathers are black, edged with reddiſh brown. The colours of the female are more dull; it wants the black ſtroke acroſs the eye; and the bar of white on the tail is narrower. Theſe birds feed on beetles, and other inſects, and build in the deſerted burrows of rabbits, &c. They are extremely plentiful in Suſſex, and ſome other counties of England, after harveſt-time, when they are extremely fat, and very much eſteemed at table. They are much fatter in a rainy ſeaſon than a dry one, becauſe they feed on earth-worms, which then come out of the ground, as well as inſects. About Eaſtbourn, in Suſſex, they abound, becauſe of a certain fly which frequents the adjacent hills for the ſake of the wild thyme with which they are covered; and they are taken in great numbers in ſnares made of horſe-hair, placed under a long turf, into which, being very timid, they are eaſily driven. The number annually caught there is ſaid to amount to eighteen hundred and forty dozen; and yet the numbers that return the following year do not appear to be leſſened. They lay from ſix to eight eggs, of a light blue colour. Theſe birds begin to viſit us about the middle of March, and continue coming till the beginning of May; the females arriving about a fortnight before the males. They diſappear in September, at leaſt from the northern parts of the kingdom; but in Hampſhire many of them continue the whole winter. Ray and Pennant.

WHEE, or WHEY, a word uſed in the northern counties for a heifer or young cow.

WHEEL, *rota*, in *Mechanics*, a ſimple machine, conſiſting of a round piece of wood, metal, or other matter, which revolves on an axis.

For an account of the *wheel* and *axle*, as a mechanical power, ſee AXIS *in peritrochio*, and MECHANICAL *powers*.

The *wheel* is one of the principal mechanic powers. It has place in moſt engines: in effect, it is of an aſſemblage of *wheels* that moſt of our chief engines are compoſed. Witneſs clocks, mills, &c.

Its form is various, according to the motion it is to have, and the uſe it is to anſwer. By this it is diſtinguiſhed into *ſimple*, and *dented*.

WHEELS, *ſimple*, are thoſe whoſe circumference and axis are uniform, and which are uſed ſingly, and not combined. Such are the *wheels* of carriages, which are to have a double motion; the one circular, about their axis; the other rectilinear, by which they advance along the road, &c. which two motions they appear to have; though, in effect, they have but one: it being impoſſible the ſame thing ſhould move, or be agitated, two different ways at the ſame time.

This one is a ſpiral motion; as is eaſily ſeen, by fixing a piece of chalk on the face of a *wheel*, ſo as that it may draw a line on a wall, as the *wheel* moves. The line it here traces is a juſt ſpiral, and ſtill the more curve, as the chalk is fixed nearer the axis.

This fact, however, has been diſputed; and it has been alledged, that nothing is more eaſy than for any one, who will take the trouble to make the experiment, to prove its falſhood. Place the chalk on the face of the *wheel*, as directed, and you will find that, ſo far from its deſcribing a juſt ſpiral, and that ſtill the more curve as the chalk is fixed nearer the axis, the chalk, if placed on the periphery of the *wheel*, will deſcribe a cycloid, and the nearer it is placed to the axis, the nearer will the line it deſcribes approach to the ſtraight line which is deſcribed by the axis itſelf. Moreover, it is not true, nor pretended to be ſo, that the ſame thing moves two ways at once in the rectilinear and circular motion of *wheels*. The local motion, or motion of the *whole wheel*, is rectilinear only; that of the *parts* of the *wheel* circular. Nor can this latter motion with any propriety be called that of the *wheel*, unleſs the ſame thing could alſo move quick and flow at the ſame time, which the different parts of the *wheel*, in revolving round its axis, evidently do. Jacob's Obſ. on the Structure and Draught of *Wheel*-Carriages, 1773, p. 28, &c.

For a very nice phenomenon, in the motion of theſe *wheels*, ſee ROTA *Ariſtotelica*.

We ſhall add, that, in *wheels* of this kind, the height ſhould always be proportioned to the ſtature of the animal that draws or moves them. The rule is, that the load and the axis of the *wheels* be of the ſame height with the power that moves them; otherwiſe, the axis being higher than the beaſt, part of the load will lie upon him; or, if it be lower, he pulls to diſadvantage, and muſt exert a greater force. Though Stevinus, Dr. Wallis, &c. ſhew, that, to draw a vehicle, &c. over waſte, uneven places, it were beſt to fix the traces to the *wheels* ſomewhat lower than the horſe's breaſt. See WHEELS *of coaches*, &c.

The power of theſe *wheels* reſults from the difference of the radii of the axis, and circumference. The canon is this: "As the radius of the axis is to that of the circumference, ſo is any power to the weight it can ſuſtain hereby."

This is alſo the rule in the AXIS *in peritrochio*; and, in effect, the *wheel*, and the axis in peritrochio, are the ſame thing; only, in theory, it is uſually called by the latter name, and, in practice, by the former.

WHEELS, *dented*, are thoſe either whoſe circumference, or axis, is cut into teeth, by which they are capable of moving and acting on one another, and of being combined together.

The uſe of theſe is very conſpicuous in clocks, jacks, &c.

The power of the *dented wheel* depends on the ſame principle as that of the ſimple one. It is only that to the ſimple axis in peritrochio, which a compound lever is to a ſimple lever.

Its doctrine is compriſed in the following canon; viz. "The ratio of the power to the weight," in order for that to be equivalent to this, "muſt be compounded of the ratios of the diameter of the axis of the laſt *wheel* to the diameter of the firſt; and of the ratio of the number of revolutions of the laſt *wheel*, to thoſe of the firſt, in the ſame time." But this doctrine will deſerve a more particular explication.

1. Then, if the weight be multiplied into the product of the radii of the axes, and that product be divided by the product of the radii of the *wheels*, the power required to ſuſtain the weight will be found. Suppoſe, e. gr. the weight A (*Tab.* VII. *Mechanics*, *fig.* 123.) = 6000 pounds, BC = 6 inches, CD = 34 inches, EF = 5 inches, EG = 35 inches, HI = 4 inches, HK = 27 inches: then will BC × EF × HI = 120; and CD × EG × HK = 32130. Hence the power required to ſuſtain the weight, will be 6000 × 120 ÷ 32130 = $22\frac{1}{3}$ very nearly; a ſmall addition to which will raiſe it.

2. If the power be multiplied into the product of the radii of the *wheels*, and the factum be divided by the product of the radii of the axes; the quotient will be the weight which the power is able to ſuſtain. Thus, if the power be $22\frac{1}{3}$ pounds; the weight will be 6000 pounds.

3. A power and weight being given, to find the number of *wheels*, and in each *wheel* the ratio of the radius of the axis, to the radius of the *wheel*; ſo as that the power, being applied perpendicularly to the periphery of the laſt *wheel*, may ſuſtain the given weight.

Divide the weight by the power; reſolve the quotient into the factors which produce it. Then will the number of factors be the number of *wheels*; and the radii of the axes will be to the radii of the *wheels*, as unity to the ſeveral *wheels*. Suppoſe, e. gr. a weight of 3000 pounds, and a power of 60, the quotient of the former by the latter, is 500, which reſolves into theſe factors, 4.5.5.5. Four *wheels* are, therefore, to be made; in one of which, the radius of the axis is to the radius of the *wheel*, as 1 to 4; in the reſt, as 1 to 5.

4. If a power move a weight by means of two *wheels*, the revolutions of the flower *wheel* are to thoſe of the ſwifter, as the periphery of the ſwifter axis is to the periphery of the *wheel* that catches on it.

Hence, 1. The revolutions are as the radius of the axis FE to the radius of the *wheel* DC. 2. Since the number of teeth in the axis FD, is to the number of teeth in the circumference of the *wheel* M as the circumference of that to the circumference of this; the revolutions of the flower *wheel* M are to the revolutions of the ſwifter N, as the number of teeth in the axis, to the number of teeth in the *wheel* M, which it catches.

5. If the factum of the radii of the *wheels* GE, DC, be multiplied into the number of revolutions of the floweſt *wheel* M, and the product be divided by the factum of the radii of the axes which catch into them, GH, DE, &c. the quotient will be the number of revolutions of the ſwifteſt *wheel* O. E. gr. If GE = 8, DC = 12, GH = 4, DE = 3, and the revolution of the *wheel* M be one; the number of revolutions of the *wheel* O will be 8.

6. If a power move a weight by means of divers *wheels*, the ſpace paſſed over by the weight, is to the ſpace of the power, as the power to the weight. Hence, the greater the power, the quicker is the weight moved; and *vice verſa*.

7. The ſpaces, paſſed over by the weight and the power, are in a ratio compounded of the revolutions of the floweſt *wheel*, to the revolutions of the ſwifteſt; and of the periphery of the axis of that, to the periphery of this. Hence, ſince the ſpaces of the weight and the power are reciprocally as the ſuſtaining power is to the weight; the power that ſuſtains a weight, will be to the weight, in a ratio compounded of the revolutions of the floweſt *wheel*, to thoſe of the ſwifteſt, and of the periphery of the axis of that, to the periphery of this.

8. The periphery of the axis of the floweſt *wheel*, with the periphery of the ſwifteſt *wheel*, being given; as alſo the ratio of the revolutions of the one, to thoſe of the other; to find the ſpace which the power is to paſs over, while the weight goes any given length.

Multiply the periphery of the axis of the floweſt *wheel* into the antecedent term of the ratio, and the periphery of the ſwifteſt *wheel*, into the conſequent term; and to theſe two products, and the given ſpace of the weight, find a fourth proportional: this will be the ſpace of the power. Suppoſe, e. gr. the ratio of the revolutions of the floweſt *wheel*, to thoſe of the ſwifteſt, to be as 2 to 7, and the ſpace of the weight 30 feet; and let the periphery of the axis of the floweſt *wheel* be to that of the ſwifteſt, as 3 to 8: the ſpace of the power will be found 280. For 2 × 3 : 7 × 8 : : 30 : 280.

9. The ratio of the peripheries of the ſwifteſt *wheel*, and of the axis of the floweſt; together with the ratio of their revolutions, and the weight, being given: to find the power able to ſuſtain it.

Multiply both the antecedents and the conſequents of the given ratios into each other, and to the product of the antecedents, the product of the conſequents, and the given weight, find a fourth proportional: that will be the power required. Suppoſe, e. gr. the ratio of the peripheries 8 : 3; that of the revolutions 7 : 2, and the weight

weight 2000: the power will be found $214\frac{2}{7}$. For $7 \times 8 : 2 \times 3 :: 2000 : 214\frac{2}{7}$. After the same manner may the weight be found; the power, and the ratio of the peripheries, &c. being given.

10. The revolutions the swiftest *wheel* is to perform while the slowest makes one revolution, being given; together with the space the weight is to be raised, and the periphery of the slowest *wheel*; to find the time that will be spent in raising it.

Say, As the periphery of the axis of the slowest *wheel* is to the given space of the weight; so is the given number of revolutions of the swiftest *wheel* to a fourth proportional: which will be the number of revolutions performed while the weight reaches the given height. Then, by experiment, determine the number of revolutions the swiftest *wheel* performs in an hour; and, by this, divide the fourth proportional found before. The quotient will be the time spent in raising the weight. Wolf. Elem. Math. tom. ii. p. 214, &c.

WHEELS *of a clock*, &c. are, the CROWN *wheel*, contrat *wheel*, great *wheel*, second *wheel*, third *wheel*, STRIKING *wheel*, DETENT *wheel*, &c. See CLOCK and WATCH.

WHEELS *of coaches, waggons*, &c. With respect to these the following particulars are collected from the experiments and reasonings of Camus, Desaguliers, Beighton, Ferguson, &c.

1. The use of *wheels*, in the draught of carriages, is twofold; viz. that of diminishing, or of more easily overcoming the resistance arising from the friction of the carriage, and that of more readily surmounting obstacles, which form angular prominences on the plane over which they are drawn, and which must be either depressed by the weight of the carriage, or render it necessary for the carriage, with its load, to be lifted over them. They serve in their first use to transfer the friction from the under surface of the carriage, and the plane supporting it, to the surfaces of the axle, and nave of the *wheel*. The common method of accounting for this advantage is by saying, that the resistance, arising from friction in planes of equal asperity, increases with the velocity of the motion; so that this velocity must be compared with that of the power necessary to move the machine, and overcome the friction; and it is obvious, at the same time, that the velocity of a circular motion diminishes gradually from the circumference to the centre. See FRICTION.

But to this position it has been objected, that the illustration is not applicable to the case: for, granting that, in the friction of sledges or flat surfaces, the resistance increases in proportion to the velocity of their motion, this is not a parallel case with that of a circular surface rolling over a flat plane. On the contrary, the velocity of motion, in the outer surface of a *wheel*, is greater than that of its nave, moving under the axle; while at such outer surface there is little or no friction at all; whereas at the nave, moving much slower, there is much more. Indeed, the friction, which the *wheel* would have against its supporting plane, if it did not turn round its axis, is by its turning round transferred almost wholly to the axis and nave; whose circular motion is notwithstanding so much slower. It is, indeed, notorious, that the great friction of the *wheels* of carriages lies between the axle and nave; and how then can it be properly asserted, that such friction is diminished at the axle, as the velocity of the circular motion is there diminished? Accordingly it has been alledged by a late writer, that friction is not diminished by the use of *wheels*, but merely transferred from the outer surface of the *wheel* to its nave and axle; and that in the case of a *wheel* rolling along the ground, the spokes act only as single levers, to overcome the friction of the periphery against the plane of its support, the prominences, constituting the roughness of the plane over which it moves, being the fulcra upon which they turn, and not the common centre of these spokes, as others have maintained, who say that the *wheel* acts, in overcoming friction, as an axis in peritrochio. However, in obviating the friction of the *wheels* in loaded carriages, their spokes act as double levers, resting on a fulcrum at each end. See the author's method of illustrating and evincing these principles, in Jacob's Obs. on *Wheel*-Carriages, p. 23, &c.

If carriages were to move along smooth horizontal planes, *wheels* would be useful only in overcoming friction; but as they are drawn along roads covered with loose stones, indented with cavities, they are farther useful in serving to depress, or raise the carriage over the one, and in raising it out of the other.

2. The *wheels* of all carriages ought to be exactly round; and the fellies should be at right angles to the naves, according to the inclination of the spokes, i. e. the plane of the curvature of the *wheel* should cut the nave at right angles, though it need not pass through the place where the spokes are inserted into the nave.

3. The spokes should be inclined to the naves, so that the *wheels* may be dishing or concave. If, indeed, the *wheels* were always to go upon smooth and level ground, it would be best to make the spokes perpendicular to the naves, or at right angles with the axles; because they would then bear the weight of the load perpendicularly, which is the strongest way for the wood. But because the ground is generally uneven, one *wheel* often falls into a cavity or rut, when the other does not, and then it bears much more of the weight than the other does; in which case dishing *wheels* are best, because the spokes become perpendicular in the rut, and therefore have the greatest strength when the obliquity of the road throws most of its weight upon them; whilst those on the high ground have less weight to bear, and therefore need not be at their full strength.

4. The axles of the *wheels* ought to be perfectly straight, and at right angles to the shafts, or to the pole. When the axles are straight, the rims of the *wheels* will be parallel to each other, and then they will move the easiest, because they will be at liberty to go on straight forwards. But in the usual way of practice, the axles are bent downwards at their ends; which brings the sides of the *wheels* next the ground nearer to one another than their higher sides are; and this not only makes the *wheels* to drag sidewise as they go along, and gives the load a much greater power of crushing them than when they are parallel to each other, but also endangers the overturning of the carriage when any *wheel* falls into a hole or rut, or when the carriage goes on a road which has one side lower than the other, as along the side of a hill. Thus, in the hind view of a waggon or cart, let AE and BF (*Tab.* VII. *Mechanics, fig.* 124.) be the great *wheels* parallel to each other, on their straight axle K, and HCI the carriage loaded with heavy goods from C to G. Then as the carriage goes on in the oblique road A*a*B, the centre of gravity of the whole machine and load will be at C; and the line of direction C*d*D falling within the *wheel* BF, the carriage will not overset. But if the *wheels* be inclined to each other at the ground, as AE and BF are (*fig.* 125.), and the machine be loaded as before from C to G, the line of direction C*d*D falls without the *wheel* BF, and the whole machine tumbles over. When it is loaded with heavy goods which lie low, it may travel safely upon an oblique road, so long as the centre of gravity is at C (*fig.* 124.), and the line of direction C*d*D falls within the *wheels*; but if it be loaded high with lighter goods from C to L (*fig.* 126.), the centre of gravity is raised from C to K, which shews the line of direction K*k* without the lowest edge of the *wheel* BF, and then the load oversets the waggon. Mr. Beighton has offered several reasons to prove, that the axles of *wheels* ought not to be straight; for which we must refer to Desaguliers's Exp. Phil. vol. ii. Appendix, p. 540, &c. Moreover, if the axle were not at right angles to the pole or shaft, but this was on one side, then the coach or carriage would be drawn on one side, and almost all the weight would bear upon one horse.

5. Large *wheels* are always more advantageous for rolling than small ones, in any case, or upon any ground whatever. If we consider *wheels* with regard to their friction upon the axles, it is evident that small *wheels* must turn as much oftener round than the large ones, as their circumferences are less; and, therefore, a *wheel* which is twice as large as another will have twice the advantage in respect of the friction, the holes of the naves and axles, and the weights upon them, being equal. Again, if we consider the *wheels* as they sink into the earth, or fall into holes, the bearing of the great *wheel* being double that of the small one, it will sink but half so deep; and if the small *wheel* should meet with a hole of the same diameter with itself, it would wholly sink in, whilst only a segment less than half of the great *wheel* would fall in: the same thing would also happen in marshy ground, where the small *wheel* would sink wholly in the same hole which the great one would sink into but in part. The large *wheel* would also have the advantage of a small one in rising over eminences or rubs that occurred; so that the former would go over rubs much higher than the latter; and indeed over any eminences, provided their height be not equal to its semidiameter. Desaguliers has reduced this matter to a mathematical calculation, in his Exp. Phil. vol. i. p. 171, &c.

A late writer has also proved, that a *wheel* of eight feet diameter has somewhat more than twice the advantage in overcoming obstacles of a *wheel* of two feet; and he found, in practice, that if it requires a certain power to draw a carriage of a certain weight over a certain obstacle, with *wheels* of any determinate diameter, it will require *wheels* of four times that diameter to draw the same carriage over the same obstacle with half that power. This writer also observes, that, in the draught of carriages ascending inclined planes, the moving power acts

not only against the vis inertiæ, which is always equal to the absolute gravity of the load, but *also* against its relative gravity, which increases with the inclination of the plane; and with respect to carriages raised on *wheels*, it is to be observed, that the higher the axle is removed from the plane, the farther is the centre of gravity removed out of the perpendicular line of support; so that the lower the *wheel*, the less is the relative gravity of the carriage. Hence he infers, that supposing the friction of two carriages of equal weight, but of different sized *wheels*, to be equal, the low-wheeled one would be drawn up hill, on a smooth plane, much more easily than the high-wheeled one; though on a smooth, horizontal plane, the latter would be drawn more easily than the former. On the contrary, in going down hill, the high-wheeled carriage will be urged forward, by its relative gravity, more than the low-wheeled one. Jacob, ubi supra, p. 63, &c.

It appears, therefore, that the larger *wheels* are, the more advantageous they are in proportion, provided that they are not more than five or six feet in diameter; for when they exceed these dimensions, they become heavy; or if they are made light, their strength is proportionably diminished, and the spokes, being long, are more liable to break: besides, horses, applied to such *wheels*, would be incapable of exerting their utmost strength, by having the axles higher than their breasts, so that they would draw downwards; as in small *wheels* the draught is made more difficult, by the horses drawing upwards.

6. Carriages with four *wheels*, as waggons or coaches, are much more advantageous than carriages with two *wheels*, as carts and chaises; for in applying horses to a carriage with two *wheels*, it is plain that the tiller carries part of the weight, in whatsoever manner it be kept in equilibrio upon the axle. In going down a hill, the weight bears upon the horse; and in going up hill, the weight falls the other way, and lifts the horse, by which means part of his force is lost. Besides, as the *wheels* sink into the holes in the road, sometimes on one side, sometimes on the other, the shafts strike against the tiller's flanks, which is the destruction of many horses. Add to this, that when one of the *wheels* sinks into a hole or rut, half the weight will fall that way, whereby the carriage will be in danger of being overturned.

7. It would be much more advantageous to make the four *wheels* of a coach or waggon large, and nearly of a height, than to make the fore-*wheels* of only half the diameter of the hind-*wheels*, as is usual in many places. The fore-*wheels* of carriages have commonly been made of a less size than the hind ones, both on account of turning short, and to avoid cutting the braces. Crane-necks have also been invented for turning yet shorter, and the fore-*wheels* have been lowered, so as to go quite under the bend of the crane-neck. See an account of an ingenious contrivance for this purpose, under PERCH.

Some carriers and coachmen have, indeed, absurdly alledged, that when the fore-*wheels* are much lower than the hind ones, they serve to push them on. However, many disadvantages attend this construction. A considerable force is lost that would be effectual, if they were large: the carriage would go much more easily, if the fore-*wheels* were as high as the hind ones; and the higher the better, because their motion would be so much the slower on their axles, and consequently the friction proportionably diminished. The jolting and uneasy motion, occasioned by low *wheels*, has induced persons to contrive springs, in order to prevent it. But nothing can be more inconsistent even with this end, than the common method of fixing the braces to the bottom of the body of a carriage. In consequence of this practice, the centre of gravity of the suspended body is so high above the centre of its motion, that it is liable to be continually agitated by the jolting of the carriage, and its danger of overturning increased: whereas if, instead of practising this method, the body were suspended as near as possible to its centre of gravity, the agitation of the carriage, as well as its danger of overturning, would be in a great measure avoided.

There is also an inconvenience which attends the usual method of loading carriages; for when a carriage is loaded equally heavy on both axles, the fore-axle must endure as much more friction, and consequently wear out as much sooner, than the hind-axle, as the fore-*wheels* are less than the hind ones. However, the carriers commonly put the heavier part of the load upon the fore-axle of the waggons; which not only makes the friction greatest where it ought to be least, but also presseth the fore-*wheels* deeper into the ground than the hind-*wheels*, although the fore-*wheels*, being less than the hind ones, are with so much the greater difficulty drawn out of a hole, or over an obstacle, even supposing the weights on their axles were equal; for the difficulty, with equal weights, will be as the depth of the hole, or height of the obstacle, is to the semidiameter of the *wheel*. Moreover, since a small *wheel* will often sink to the bottom of a hole, in which a great *wheel* will go but a very little way, the small *wheels* ought to be loaded with less weight than the great ones; and then the heavier part of the load would be less jolted upward and downward, and the horses tired so much the less, as their draught raised the load to less heights. When the waggon-road, indeed, is much up-hill, there may be danger in loading the hind-part much heavier than the fore-part; for then the weight would overhang the hind-axle, especially if the load be high, and endanger tilting up the fore-*wheels* from the ground. In this case, the safest way would be to load it equally heavy on both axles; and then as much more of the weight would be thrown upon the hind-axle than upon the fore-one, as the ground rises from a level below the carriage. But as this seldom happens, a small temporary weight might be laid upon the pole between the horses, which would overbalance the danger.

There is another great disadvantage attending small fore-*wheels*, viz. that as their axle is below the level of the horses breasts, the horses not only have the loaded carriage to draw along, but also part of its weight to bear, which tires them sooner, and makes them grow much stiffer in their hams, than they would be if they drew on a level with the fore-axle; and for this reason, coach-horses soon become unfit for riding. So that on all accounts it is plain, that the fore-*wheels* of all carriages ought to be so high, as to have their axles even with the breasts of the horses; which would not only give them a fair draught, but likewise cause the machine to be drawn by a less degree of power.

Mr. Beighton disputes the propriety of fixing the line of traction on a level with the breast of a horse, and says it is contrary to reason and experience. Horses, he says, have little or no power to draw, but what they have from their weight; otherwise they could take no hold of the ground, and then they must slip, and draw nothing. Common experience also teaches, that if a horse is to convey a certain weight, he ought, that he may draw the better, to have a proportionable weight on his back or shoulders. Besides, when a horse draws hard he bends forward, and brings his breast near the ground; and then if the *wheels* are high, he is pulling the carriage against the ground. A horse tackled in a waggon will draw two or three ton, because the point or line of traction is below his breast, by reason of the *wheels* being low. And it is very common to see, when one horse is drawing a heavy load, his fore-feet will rise from the ground, and he will nearly stand on end; in which case it is usual to add a weight on his back, to keep his fore-part down, by a person mounting on him, which will enable him to draw that load, without which he before could not move. The greatest stress, or main business of drawing, says this ingenious writer, is to overcome obstacles; for on level plains the drawing is but little, and then the horse's back need be pressed but with a small weight. Most or all of these obstacles may be considered as inclined planes. In order to draw the *wheel* AB (*Tab.* VII. *Mechanics*, *fig.* 127.) over the obstacle D, M. de Camus, agreeably to the principles above laid down, would have the horse draw in the line HC; whereas Mr. Beighton says, since the obstacle is D, and the tangent of the earth, or line of the floor, is at B, and the line to be moved in is BD, an inclined plane; the easiest position of drawing, to get the *wheel* over D, is to draw in the position of that inclined plane B T, or its parallel C *b*. As all the radii of a *wheel* are equal, the pulling at the centre is the same as a balance in equilibrio; viz. there is the same force at A as at B. But in the case of drawing in the horizontal line HC, when the obstacle is at D, the whole force which the horse has for drawing is by the short end of the brachium = *e* D, against the force or weight of the long end of the brachium *f* D = *e* C, which must be very disadvantageous: therefore, he says, the line of traction should be *b* C. Desag. Exp. Phil. vol. ii. app. p. 542, &c.

8. The utility of broad *wheels*, in amending and preserving the roads, has been so long and generally acknowledged, as to have occasioned several acts of the legislature to enforce their use. (See TURNPIKE.) At the same time, the proprietors and drivers of carriages seem to be convinced by experience, that a narrow-wheeled carriage is more easily and speedily drawn by the same number of horses than a broad-wheeled one of the same burthen. And though government allowed them to draw with more horses, and carry greater loads than usual, they were persuaded with difficulty to comply with the requisition of legislature; and methods have been used to evade it. Their principal objection has been, that as a broad

broad *wheel* must touch the ground in many more points than a narrow *wheel*, the friction must of course be so much the greater; not considering, that if the whole weight of the waggon, and load in it, bears upon many points, each sustains a proportionably less degree of weight and friction, than when it bears only upon a few points; so that what is wanting in one is made up in the other, and, therefore, will be just equal under equal degrees of weight, as appears by the following plain and easy experiment proposed by Mr. Ferguson.

Let one end of a piece of packthread be fastened to a brick, and the other end to a common scale for holding weights; then, having laid the brick edge-wise on a table, and letting the scale hang under the edge of the table, put as much weight into the scale as will just draw the brick along the table. Then taking the brick to its former place, lay it flat on the table, and leave it to be acted upon by the same weight in the scale as before, which will draw it along with the same ease as when it lay upon its edge. In the former case, the brick may be considered as a narrow *wheel* on the ground; and in the latter, as a broad *wheel*. And since the brick is drawn along with equal ease, whether its broad side or narrow edge touches the table, it shews that a broad *wheel* might be drawn along the ground with the same ease as a narrow one, supposing them equally heavy, even though they should drag, and not roll as they go along. Besides, as narrow *wheels* are always sinking into the ground, especially when the heaviest part of the load lies upon them, they must be considered as constantly going up hill, even on level ground; and their edges must sustain much friction, by rubbing against the sides of the ruts made by them. But both these inconveniences are avoided by broad *wheels*; which, instead of cutting and ploughing up the roads, roll them smooth, and harden them: though after all it must be confessed, that they will not do in stiff, clayey, cross roads; because they would soon gather up as much clay as would be almost equal to the weight of an ordinary load; and also in passing along roads abounding with loose stones and other obstacles, which a narrow *wheel* may avoid passing over, and a broad one must surmount, the broad-*wheel* carriage will certainly be drawn less easily and less speedily than a narrow-wheeled one, though not on account of any additional friction arising from the pressure of the weight on a greater quantity of surface. Broad *wheels* are likewise more liable to an inequality of pressure between the axle and box than narrow ones, and consequently to a greater wear and tear.

9. According to the usual method of constructing *wheels*, their peripheries are composed of a number of pieces or felloes joined together; but these are weak, and subject to several inconveniences. As the joints are the weakest parts of the *wheel*, they are most liable to yield inward; for which reason the wheelwrights leave them higher than the other parts of the rim, in consequence of which the *wheel* is not at first exactly round, nor of course its motion uniform. Besides, the felloes, being segments of a circle, sawed or hewn out of straight wood, they are on this account rendered so brittle, from the cross direction of the grain near the joints, that they are with difficulty kept together, even though almost twice the quantity of timber be employed that would otherwise be necessary. The strength of such a *wheel* depends on the thickness of the iron tier or rim that surrounds it, and hence the carriage is loaded with an useless weight both of wood and iron. To obviate these inconveniences, Mr. Viny invented a process for bending timber into a circular form, practised for some time by Messrs. Jacob and Viny, and now continued by Mr. Viny. In *wheels* made of timber thus bent, the rim consists either of a single piece of wood, or two felloes only, and is cased with a single hoop of iron. By this mode of construction, the grain of the wood is kept parallel throughout, so that the periphery of the *wheel* is every where equally strong; its thickness is considerably lessened, insomuch that though little more than half the usual quantity of timber is employed, the *wheel* is of itself strong enough to sustain the common burthen laid on such *wheels*, without the assistance of iron tiers, which are only applied to them as a safe-guard, to preserve the wood from the injuries to which it would otherwise be necessarily exposed from the roads; and hence a less quantity of iron is sufficient, and even that will be fairly worn out before it becomes useless. Besides, the *wheel* is rendered much lighter, and at the same time much stronger and more durable than *wheels* constructed of detached pieces of wood and iron in the usual manner. Jacob's Obs. on the Structure and Draught of *Wheel*-Carriages, 1773, p. 81, &c. See on the subject of the preceding article, Desag. Exp. Phil. vol. i. p. 201, &c. Ferguson's Lect. p. 56, &c. 4to. Martin's Phil. Brit. vol. i. p. 229, &c.

There is a yearly duty on COACHES, &c. with four *wheels*, kept by any persons for their own use, or let out to hire (licensed hackney-coaches and post-chaises excepted) of 6*l*. each; and on every chaise, &c. with two *wheels*, under the same circumstances, of 40*s*. and 20*s*. more, if kept by any person for his own use. And for every coach, &c. kept as public stage-coaches, 5*l*.; entry and payment to be made under a penalty of 20*l*. 20 Geo. II. cap. 10. 16 Geo. III. cap. 34. 22 Geo. III. cap. 63. See WAGGON.

By 24 Geo. III. cap. 27. an additional duty of 5*s*. per week is laid on hackney-coaches.

WHEEL, *blowing*, a machine contrived by Dr. Desaguliers for drawing out the foul air of any place, or for forcing in fresh, or doing both successively, without opening doors or windows. See Phil. Transf. N° 437.

The intention of this machine is the same as that of Dr. Hales's ventilator, but not so effectual, nor so convenient. See Desagul. Course of Exper. Philos. vol. ii. p. 563. 568.

This *wheel* is also called a *centrifugal wheel*, because it drives the air with a centrifugal force.

WHEEL, *water*, *of a mill*, that which receives the impulse of the stream by means of ladle-boards or FLOAT-*boards*. M. Parent, of the Academy of Sciences, has determined the greatest effect of an under-shot *wheel* to be, when its velocity is equal to the third part of the velocity of the water that drives it.

In fixing an under-shot *wheel*, the workmen ought to consider whether the water can run clear off, so as to occasion no back-water to stop its motion. For a farther account of *water-wheels*, see Desaguliers, Experim. Phil. vol. ii. p. 422, seq. See also a variety of experiments and observations relating to undershot and overshot *wheels*, by Mr. Smeaton, in Phil. Transf. vol. li. p. 100, &c. See MILL.

WHEEL, *Aristotle's*. See ROTA *Aristotelica*.

WHEEL, *measuring*. See PERAMBULATOR.

WHEEL, *Orffyreus's*. See ORFFYREUS.

WHEEL, *Persian*. See PERSIAN.

WHEEL, *potter's*. See POTTERY.

WHEEL is also the name of a kind of punishment, which great criminals are put to in divers countries.

In France, their assassins, parricides, and robbers on the highway, are condemned to the *wheel*; i. e. to have their bones first broken with an iron bar on a scaffold, and then to be exposed, and left to expire on the circumference of a *wheel*. In Germany, they break their bones on the *wheel* itself.

This cruel punishment was unknown to the ancients; as is observed by Cujas. It is not certain who was the inventor. Its first introduction was in Germany. It was, indeed, but rarely practised any where else, till the time of Francis I. of France; who, by an edict of the year 1534, appointed it to be inflicted on robbers on the highway. Richelet dates the edict in the year 1538, and quotes Brodæus, Miscell. lib. ii. cap. 10.

WHEEL, in the *Military Art*, is the word of command, when a battalion or squadron is to alter its front, either one way, or the other.

To wheel to the right, the man in the right angle is to turn very slowly, and every one to *wheel* from the left to the right, regarding him as their centre; and *vice versa*, when they are to *wheel to the left*.

When a division of men are on the march, if the word be, *wheel to the right*, or *to the left*; then the right or left-hand man keeps his ground, turning only on his heel, and the rest of the rank move about quick, till they make an even line with the said right or left-hand man.

Squadrons of horse *wheel* after much the same manner.

In *wheeling*, the circle is conceived to be divided into four parts; whence *wheeling* to the right or left respects only a quarter of the circle; and *wheeling* to the right or left about, refers to half of the circle. In performing this motion, each man moves more quickly or slowly, according to his distance from the right or the left.

WHEEL-*animals*, *brachionus*, in *Zoology*, a genus of animalcules, which have an apparatus of arms for taking their prey. This apparatus has been supposed, by microscopical writers, to be a kind of *wheels*. This is one of the smaller animalcules; and is described by Dr. Hill to be, when at rest, of a plain smooth body, conic figure, obtuse at the posterior extremity, and open at the anterior, of a dusky olive colour, and semitransparent. When in motion, it protrudes from the open extremity a part of its naked body, to the whole of which this outer conic body seems to be but a case or sheath; from the end of this exerted part of the body, it thrusts out two protuberances, which give it the appearance of a double head; and in each of these is discovered an apparatus in continual motion, appearing to be a rotatory one, though really a vibratory one very quickly repeated. Each of these

theſe protruded bodies has ſix arms inſerted into it, which it continually ſhuts and opens over one another. Each of the arms is furniſhed with a double ſeries of fibres at its edge, which being expanded cauſe it to ſpread to a conſiderable breadth. There are ſeveral ſpecies of this genus.

The *wheel-animal*, deſcribed by Mr. Baker, has two ſeeming *wheels*, with a great many teeth or notches, coming from its head, and turning round, as it were, on an axis. On the leaſt touch, this animalcule draws its *wheel* into its body into the ſheath; but when every thing is quiet, throws them out, and works them again. See *Tab. of Microſcopical Objects*, *Claſs* 1.

In order to find theſe animalcules, chooſe ſuch roots of duck-weed as are long, and proceed from ſtrong old plants, for the young roots ſeldom afford any; they ſhould not be covered with that rough matter which is frequently found about them, nor any way tending to decay, as they will often be.

In the water found remaining in the leaden pipes, or gutters, on the tops of houſes, there are alſo found great numbers of theſe *wheel-animals*. Theſe are of a different ſpecies from the former; and when the water dries away they contract their bodies into a globular or oval figure, and are then of a reddiſh colour, and remain mixed with the dirt, growing together into a lump as hard as clay. This, whenever it is put in water, in half an hour's time diſcovers the animals living again, and as briſk as ever; and they have been found to be living in this manner, after the matter had been kept dry twenty months.

It ſhould ſeem from this, that as the water dries up, their pores become ſhut in the manner of thoſe of ſuch animals as remain torpid for the winter; and that when they find water come on again from rain, they then unfold themſelves, and live and feed as long as it laſts. Baker's Microſcope, p. 91.

Wheel-*barometer*. See Barometer.

Wheel-*fire*, among *Chemiſts*, a fire uſed for calcining metallic ſubſtances; properly called *ignis rotæ*.

It is a fire which only encompaſſes the crucible, coppel, or melting-pot, around the ſides, without touching it in any part.

WHEELER, among *Brickmakers*. See Brick.

WHEEZING, a name given by our farriers to a diſtemperature in horſes, in which they draw their breath with difficulty and noiſe.

The generality of people make this and purſineſs, in horſes, the ſame diſtemper; but the more judicious always diſtinguiſh it, as wholly different from that. Purſineſs proceeds always from a ſtuffing or oppreſſion of the lungs; but this *wheezing* is only owing to the narrowneſs of the paſſages between the bones and griſtles of the noſe.

The horſes, that are moſt of all afflicted with this diſtemper, do not want wind; for notwithſtanding that they *wheeze* exceſſively when they are exerciſed, yet all the time their flanks are not moved, but keep in the ſame condition that they were while the creature ſtood ſtill. The dealers call this ſort of horſes *blowers*, and though there is no real harm in the thing, it is a diſagreeable quality, and few people will chooſe them, that have much ſervice for them.

There are ſome horſes that have a natural defect in their breathing, which makes it at all times attended with ſome difficulty, but not with the *wheezing* before mentioned; theſe are called thick-winded horſes.

People who are careful in the buying of horſes, will purchaſe neither of theſe kinds; but there is this caution to be obſerved in regard to this defect, that it often ſeems to be in horſes where it really is not. When a horſe has been kept a long time in the ſtable without exerciſe, he will at the firſt riding be out of breath, and fetch it in a difficult and painful manner, though he be neither a blower nor thick-winded; but all this will go off with a little exerciſe.

There are ſome temporary *wheezers* and *blowers* among horſes: theſe at times rattle, and make a great noiſe through their noſes in taking breath; but the complaint goes off and returns. This is only occaſioned by a great quantity of phlegm, for their flanks do not redouble with it at the worſt of times, nor have they any cough with it; ſo that there is no danger of their being purſy.

WHELKS, *buccina*, in *Natural Hiſtory*. See Shells, and Trumpet-*ſhell*.

WHELPS. See Hound.

Whelps, in a *Ship*. See Capstan.

WHERLICOTES, a ſort of open chariots, of the ancient Britons invention, uſed by perſons of quality, before the invention of coaches.

WHERN, in *Natural Hiſtory*, a name given by ſome of our miners to a kind of ſtone found in ſtrata, but of the hardneſs and fineneſs of flint. It is called alſo *chert* and *nicomia*.

WHERRY. See Vessel, Boat, &c.

WHETSTONE, *cos portabilis* vel *aquaria*, the *pſadurium friabile pallidè fuſcum* of Hill, and the *ſaxum arenarium fuſco-albidum* of Da Coſta, is a ſpecies of ſand-ſtone not acted upon by acids, of a very faint yellowiſh white colour, harſh and heavy, of a ſomewhat lax and ſpongy ſtructure, and readily friable or broken between the fingers. It is compoſed of an angular grit, cemented by a debaſed cryſtalline matter, intermixed with numerous ſmall ſpangles of a ſilvery talc; it cuts free, but takes no poliſh, and water readily pervades it. It will not ſtrike fire with ſteel; it burns to a reddiſh white colour. It is dug chiefly in Derbyſhire, and the northern counties; alſo at Blackdown-hill, in Devonſhire, and in many other parts of Europe, and is greatly uſed for whetting of ſcythes, knives, &c. The ſand-ſtone, coarſe ſcythe-ſtone, or rubber, is only a variety of this kind. Many authors confound the grind-ſtone and ſcythe-ſtone. Hill aſſerts, that the harder parts of the ſtratum make the common rough *whetſtones*, and that the coarſer parts are cut into grind-ſtones; but Da Coſta ſays, this is a great error; the Grind-*ſtone* and *whetſtone*, though agreeing in many particulars, being two very different ſpecies of ſand-ſtone. See Cos.

WHEWER, a name uſed in ſome parts of England for the common Wigeon.

WHEY, the ſerum or watery part of milk.

In many diſorders of the human body, where the ſtomach will not bear milk, or when it is not proper, for other reaſons, *whey* may be given with great ſucceſs.

We have a diſſertation of Fred. Hoffman on this ſubject: De Saluberrima ſeri Lactis Virtute. Oper. tom. vi. p. 9. This author recommends a particular kind of ſerum or *whey*, made by evaporating milk to a dryneſs, and mixing the reſiduum with water. See Milk.

There are various methods of making *whey* vulgarly known. That with oranges is very agreeable, and much recommended by Dr. Cheyne, in his Nat. Method of curing Diſeaſes.

Whey, *alum*, *ſerum aluminoſum*, a *whey* made with alum; in the proportion of two drams of alum to one pint of cow's milk boiled.

This *whey* is beneficial in an immoderate flow of the menſes, and in a diabetes, or exceſſive diſcharge of urine. The doſe is two, three, or four ounces, as the ſtomach will bear it, three times a day.

Whey, *muſtard*, is made by boiling of bruiſed muſtard-ſeed, an ounce and a half, in milk and water, of each a pint, till the curd is perfectly ſeparated, and ſtraining the *whey* through a cloth. This, ſays Dr. Buchan, is the moſt elegant, and by no means the leaſt efficacious method of exhibiting Mustard: it warms and invigorates the habit, and promotes the different ſecretions. Hence, in the low ſtate of nervous fevers, it will often ſupply the place of wine: it is alſo uſeful in the chronic rheumatiſm, palſy, dropſy, &c. The doſe is a tea-cup-full four or five times a day, which may be ſweetened with a little ſugar.

Whey, *ſcorbutic*, is made by boiling half a pint of the ſcorbutic juices in a quart of cow's milk. The ſcorbutic plants are bitter oranges, brook-lime, garden ſcurvy-graſs, and water-creſſes.

WHIFF, in *Ichthyology*, the name of a ſort of flounder.

WHIFFLER *of a company*, in London, a young freeman, who goes before, and waits on the company, on occaſions of public ſolemnity.

WHIGS, a party, or faction, in England, oppoſite to the Tories.

The origin of the names of theſe two mighty factions is very obſcure. If ſome little trivial circumſtance or adventure, which eſcapes the knowledge of mankind, gives name to a party, which afterwards become famous, poſterity labours in vain to find the original of ſuch a name: it ſearches the ſources, forms conjectures, invents reaſons, and ſometimes, indeed, meets the truth, but always without knowing it aſſuredly.

Thus, in France, the Calviniſts are called Huguenots; yet nobody was ever able certainly to aſſign the cauſe of that appellation.

Whig is a Scottiſh, and ſome ſay, too, an Iriſh word, literally ſignifying *whey*. *Tory* is another Iriſh word, ſignifying a *robber*, or *highwayman*.

Under the reign of king Charles II. while his brother, then duke of York, was obliged to retire into Scotland, there were two parties formed in that country. That of the duke was ſtrongeſt, perſecuted the other, and frequently reduced them to fly into the mountains and woods; where thoſe unhappy fugitives, had often no other ſubſiſtence, for a long time, but cows milk. Hence, they called theſe their adverſaries *tories*, q. d. *robbers*; and the tories, upbraiding them with their unhappineſs,

from

from the milk on which they lived, called them *whigs*. From Scotland the two names came over with the duke into England.

Others give a different origin and etymology of the two words, for which see TORIES.

Bishop Burnet gives another etymology of the term *whigs*. The south west counties of Scotland, he says, are supplied with corn from Leith; and from a word *whiggam* used by the carriers in driving their horses, all that drove were called *whiggamors*, and by contraction *whigs*.

He adds, that in the year 1648, after the news of the defeat of duke Hamilton, who was charged with being a confederate with the malignants or royal party in England, the ministers animated their people to rise, and march to Edinburgh: who came up marching each at the head of his parish, with an unheard-of fury, praying and preaching all the way as they came. The marquis of Argyle and his party came and headed them. This was called the *whiggamoor's* inroad; and ever after, all that opposed the court were contemptuously called *whiggs*: and from Scotland the term was brought into England. Burnet's Hist. of his Own Times, vol. i. p. 43.

For the distinguishing principles and characters of the *whigs*, see TORIES.

WHIMBREL, in *Ornithology*. See WIMBREL.

WHIN, in *Botany*. See GORSE.

WHIN, *petty*, a name given to a species of *ononis*, or REST-*harrow*.

WHINCHAT, in *Ornithology*, the English name of the MOTACILLA *rubetra* of Linnæus.

It is of the size of the common water-wagtail. Its head, neck and back, are of a reddish brown, with regular rows of black spots. Over each eye is a narrow white stroke, and beneath that a broad bed of black, extending from the bill to the hind part of the head; the breast is of a reddish yellow; the belly paler; the quill-feathers are brown, edged with a yellowish brown; the upper part of the wing is marked with two white spots; the lower part of the tail is white, the two middle feathers excepted, which are wholly black; the upper part of the others is of the same colour.

The colours are very uncertain in this bird, and it often much resembles the STONE-*chatter*; but may always, by an accurate observer, be distinguished from that bird by the white spots in its wings, by the whiteness of the under part of its tail, and the white lines on its head.

The colours of the female are much less agreeable than than those of the male; in lieu of the white and black marks on the cheeks is one broad pale brown one; and the white on the wings is in much less quantity than that of the male.

In the north of England, the *whinchat* is a bird of passage; in the South it continues the whole year. Ray and Pennant.

WHINE, a hunting term, used in respect of the cry of an otter.

WHIP, or WHIP-STAFF, in a *Ship*, a piece of timber in form of a strong staff, fastened into the helm, for the steersman, in small ships, to hold in his hand; thereby to move the rudder, and direct the ship. See *Tab. Ship. fig.* 2. *n.* 103.

WHIP denotes also a sort of small tackle, formed by the communication of a rope either with a single immoveable block, or with two blocks, one of which is fixed, and the other moveable. It is generally used to hoist light bodies, as empty casks, &c. out of a ship's hold, which is accordingly called *whipping* them up. Falconer.

To WHIP, is to tie a piece of pack-thread, spun-yarn, &c. about the end of a rope, to prevent it from being untwisted and loosened.

WHIP-*grafting*. See ENGRAFTING.

WHIP-*saw*. See *Whip*-SAW.

WHIPLADE, in *Husbandry*, a term used by the farmers in some places for a particular sort of cart, whose hinder part is made up of boards, after the manner of a dung-cart, having also a head of boards, and shambles over the thills; this head being made so as either to be taken out or left in. The cart may be indifferently used to carry dung or other things; dung when the head is in, and corn, &c. when it is taken out.

WHIPPER. See FISHING.

WHIPPING, a term used, by *Anglers*, when they fasten a line to the hook, or rod.

The word is also taken for the casting in of the hook, and drawing it gently on the water.

WHIPPING, in *Law*, denotes an ignominious punishment inflicted on persons guilty of petty LARCENY, &c.

WHIPT *syllabub*. See SYLLABUB.

WHIRL-POOL, an eddy, vortex, or gulf, where the water is continually turning round. See GULF, EDDY, VORTEX, &c.

These in rivers are very common, from various accidents, and are usually very trivial, and of little consequence. In the sea they are more rare, but more dangerous. Sibbald has related the effects of a very remarkable marine *whirlpool* among the Orcades, which would prove very dangerous to strangers, though it is of no consequence to the people who are used to it. This is not fixed to any particular place, but appears in various parts of the limits of the sea among those islands. Wherever it appears it is very furious, and boats, &c. would inevitably be drawn in and perish with it; but the people who navigate them are prepared for it, and always carry an empty vessel, a log of wood, or large bundle of straw, or some such thing, in the boat with them; as soon as they perceive the *whirl-pool*, they toss this within its vortex, keeping themselves out; this substance, whatever it be, is immediately received in the centre, and carried under water; and as soon as this is done, the surface of the place where the *whirlpool* was, becomes smooth, and they row over it with safety; and in about an hour they see the vortex begin again in some other place, usually at about a mile distant from the first. Sibbald's Prodr. Hist. Scot.

WHIRLING-TABLE, a machine contrived for exhibiting and demonstrating the principal laws of gravitation and of the planetary motions in curvilinear orbits. A A (*Tab.* IV. *Astronomy*, *fig.* 98.) is a strong frame of wood, B a winch fixed on the axis C of the wheel D, round which is the catgut-string F, which also goes round the small wheels G and K, crossing between them and the great wheel D. On the upper end of the axis of the wheel G, above the frame, is fixed the round board *d*, to which may be occasionally fixed the bearer M S X. On the axis of the wheel H is fixed the bearer N T Z, and when the winch B is turned, the wheels and bearers are put into a *whirling* motion. Each bearer has two wires, W, X, and Y, Z, fixed and screwed tight into them at the ends by nuts on the outside; and when the nuts are unscrewed, the wires may be drawn out in order to change the balls U, V, which slide upon the wires by means of brass loops fixed into the balls, and preventing their touching the wood below them. Through each ball there passes a silk line, which is fixed to it at any length from the centre of the bearer to its end by a nut-screw at the top of the ball; the shank of the screw going into the centre of the ball, and pressing the line against the under side of the hole which it goes through. The line goes from the ball, and under a small pulley fixed in the middle of the bearer; then up through a socket in the round plate (S and T) in the middle of each bearer; then through a slit in the middle of the square top (O and P) of each tower, and going over a small pulley on the top comes down again the same way, and is at last fastened to the upper end of the socket fixed in the middle of the round plate above mentioned. Each of these plates S and T has four round holes near their edges, by which they slide up and down upon the wires which make the corner of each tower. The balls and plates being thus connected, each by its particular line, it is plain that if the balls be drawn outward, or towards the ends M and N of their respective bearers, the round plates S and T will be drawn up to the top of their respective towers O and P.

There are several brass weights, some of two, some of three, and others of four ounces, to be occasionally put within the towers O and P, upon the round plates S and T: each weight having a round hole in the middle of it, for going upon the sockets or axes of the plates, and being slit from the edge to the hole, that it may slip over the line which comes from each ball to its respective plate.

For a specimen of the experiments which may be made with this machine, we shall subjoin the following.

1. Removing the bearer MX, put the loop of the line *b* to which the ivory ball *a* is fastened over a pin in the centre of the board *d*, and turn the winch B; and the ball will not immediately begin to move with the board, but, on account of its inactivity, endeavour to remain in its state of rest. But when the ball has acquired the same velocity with the board, it will remain upon the same part of the board, having no relative motion upon it. However, if the board be suddenly stopped, the ball will continue to revolve upon it, until the friction thereof stops its motion: so that matter resists every change of state; from that of rest to that of motion, and *vice versâ*.

2. Put a longer cord to this ball; let it down through the hollow axis of the bearer MX and wheel G, and fix a weight to the end of the cord below the machine: and this weight, if left at liberty, will draw the ball from the edge of the *whirling*-board to its centre. Draw off the ball a little from the centre, and turn the winch; then

then the ball will go round and round with the board, and gradually fly farther from the centre, raising up the weight below the machine; and thus it appears that all bodies, revolving in circles, have a tendency to fly off from these circles, and must be retained in them by some power proceeding from or tending to the centre of motion. Stop the machine, and the ball will continue to revolve for some time upon the board; but as the friction gradually stops its motion, the weight acting upon it will bring it nearer and nearer to the centre in every revolution, till it brings it quite thither. Hence it appears, that if the planets met with any resistance in going round the sun, its attractive power would bring them nearer and nearer to it in every revolution, till they fell into it.

3. Take hold of the cord below the machine with one hand, and with the other throw the ball upon the round board as it were at right angles to the cord, and it will revolve upon the board. Then, observing the velocity of its motion, pull the cord below the machine, and thus bring the ball nearer the centre of the board, and the ball will be seen to revolve with an increasing velocity, as it approaches the centre: and thus the planets which are nearest the sun perform quicker revolutions than those which are more remote, and move with greater velocity in every part of their respective circles.

4. Remove the ball *a*, and apply the bearer M X, whose centre of motion is in its middle at *w*, directly over the centre of the *whirling*-board *d*. Then put 2 balls (V and U) of equal weights upon their bearing wires, and having fixed them at equal distances from their respective centres of motion *w* and *x* upon their silk cords, by the screw nuts, put equal weights in the towers O and P. Lastly, put the catgut strings E and F upon the grooves G and H of the small wheels, which, being of equal diameters, will give equal velocities to the bearers above, when the winch B is turned; and the balls U and V will fly off toward M and N, and raise the weights in the towers at the same instant. This shews, that when bodies of equal quantities of matter revolve in equal circles with equal velocities, their centrifugal forces are equal.

5. Take away these equal balls, and put a ball of six ounces into the bearer M X, at a sixth part of the distance *w z* from the centre, and put a ball of one ounce into the opposite bearer, at the whole distance $xy = wz$; and fix the balls at these distances on their cords, by the screw nuts at the top: then the ball U, which is six times as heavy as the ball V, will be at only a sixth part of the distance from its centre of motion; and consequently will revolve in a circle of only a sixth part of the circumference of the circle in which V revolves. Let equal weights be put into the towers, and the winch be turned; which (as the catgut-string is on equal wheels below) will cause the balls to revolve in equal times: but V will move six times as fast as U, because it revolves in a circle of six times its radius, and both the weights in the towers will rise at once. Hence it appears, that the centrifugal forces of revolving bodies are in direct proportion to their quantities of matter multiplied into their respective velocities, or into their distances from the centres of their respective circles.

If these two balls be fixed at equal distances from their respective centres of motion, they will move with equal velocities; and if the tower O has six times as much weight put into it as the tower P has, the balls will raise their weights exactly at the same moment: i. e. the ball U, being six times as heavy as the ball V, has six times as much centrifugal force in describing an equal circle with an equal velocity.

6. Let two balls, U and V, of equal weights be fixed on their cords at equal distances from their respective centres of motion *w* and *x*; and let the catgut-string E be put round the wheel K (whose circumference is only half that of the wheel H or G) and over the pulley *s* to keep it tight, and let four times as much weight be put into the tower P, as in the tower O. Then, turn the winch B, and the ball V will revolve twice as fast as the ball U in a circle of the same diameter, because they are equi-distant from the centres of the circles in which they revolve; and the weights in the towers will both rise at the same instant, which shews that a double velocity in the same circle will exactly balance a quadruple power of attraction in the centre of the circle: for the weights in the towers may be considered as the attractive forces in the centres, acting upon the revolving balls; which, moving in equal circles, are as if they both moved in the same circle. Whence it appears that, if bodies of equal weights revolve in equal circles with unequal velocities, their centrifugal forces are as the squares of the velocities.

7. The catgut-string remaining as before, let the distance of the ball V from the centre *x* be equal to 2 of the divisions on its bearer; and the distance of the ball U from the centre *w* be 3 and a sixth part; the balls themselves being equally heavy, and V making two revolutions by turning the winch, whilst U makes one; so that if we suppose the ball V to revolve in one moment, the ball U will revolve in 2 moments, the squares of which are 1 and 4: therefore, the square of the period of V is contained 4 times in the square of the period of U. But the distance of V is 2, the cube of which is 8, and the distance of U is $3\frac{1}{6}$, the cube of which is 32 very nearly, in which 8 is contained 4 times: and therefore, the squares of the periods of V and U are to one another as the cubes of their distances from *x* and *w*, the centres of their respective circles. And if the weight in the tower O be 4 ounces, equal to the square of 2, the distance of V from the centre *x*; and the weight in the tower P be 10 ounces, nearly equal to the square of $3\frac{1}{6}$, the distance of U from *w*; it will be found, upon turning the machine by the winch, that the balls U and V will raise their respective weights at very nearly the same instant of time. This experiment confirms the famous proposition of Kepler, viz. that the squares of the periodical times of the planets round the sun are in proportion as the cubes of their distances from him; and that the sun's attraction is inversely as the square of the distance from his centre.

8. Take off the string E from the wheels D and H, and let the string F remain upon the wheels D and G; take away also the bearer M X from the *whirling*-board *d*, and instead of it put on the machine A B (*Tab.* VI. *Astronomy, fig.* 99.), fixing it to the centre of the board by the pins *c* and *d*, so that the end *e f* may rise above the board to an angle of 30 or 40 degrees. On the upper part of this machine, there are two glass tubes *a* and *b*, close stopped at both ends; each tube being about three quarters full of water. In the tube *a* is a little quicksilver, which naturally falls down to the end *a* in the water; and in the tube *b* is a small cork, floating on the top of the water, and small enough to rise or fall in the tube. While the board *b* with this machine upon it continues at rest, the quicksilver lies at the bottom of the tube *a*, and the cork floats on the water near the top of the tube *b*. But, upon turning the winch and moving the machine, the contents of each tube will fly off towards the uppermost ends, which are farthest from the centre of motion; the heaviest with the greatest force. Consequently, the quicksilver in the tube *a* will fly off quite to the end *f*, occupying its bulk of space and excluding the water, which is lighter than itself: but the water in the tube *b*, flying off to its higher end *e*, will exclude the cork from that place, and cause it to descend toward the lowest end of the tube; for the heavier body, having the greater centrifugal force, will possess the upper part of the tube, and the lighter body will keep between the heavier and the lower part.

This experiment demonstrates the absurdity of the Cartesian doctrine of vortices; for, if the planet be more dense or heavy than its bulk of the vortex, it will fly off in it farther and farther from the sun; if less dense, it will come down to the lowest part of the vortex, at the sun: and the whole vortex itself, unless prevented by some obstacle, would fly quite off, together with the planets.

9. If a body be so placed upon the *whirling*-board of the machine (*fig.* 98.) that the centre of gravity of the body be directly over the centre of the board, and the board be moved ever so rapidly by the winch B, the body will turn round with the board, without removing from its middle; for, as all parts of the body are in equilibrio round its centre of gravity, and the centre of gravity is at rest in the centre of motion, the centrifugal force of all parts of the body will be equal at equal distances from its centre of motion, and therefore the body will remain in its place. But if the centre of gravity be placed ever so little out of the centre of motion, and the machine be turned swiftly round, the body will fly off towards that side of the board on which its centre of gravity lies. Then, if the wire C (*fig.* 100.) with its little ball B be taken away from the semi-globe A, and the flat side *e f* of the semi-globe be laid upon the *whirling*-board, so that their centres may coincide; if then the board be turned ever so quickly by the winch, the semi-globe will remain where it was placed: but if the wire C be screwed into the semi-globe at *d*, the whole becomes one body, whose centre of gravity is at or near *d*. Fix the pin *c* in the centre of the *whirling*-board, and let the deep groove *b* cut in the flat side of the semi-globe be put upon the pin, so that the pin may be in the centre of A (see *fig.* 101. where the groove is represented at *b*) and let the board be turned by the winch, which will carry the little ball B (*fig.* 100.) with its wire C, and the semi-globe A, round

round the centre-pin *c i*; and then, the centrifugal force of the little ball B, weighing one ounce, will be so great as to draw off the semi-globe A, weighing two pounds, until the end of the groove at *e* strikes against the pin *c*, and so prevents A from going any farther: otherwise, the centrifugal force of B would have been great enough to have carried A quite off the *whirling*-board. Hence we see that, if the sun were placed in the centre of the orbits of the planets, it could not possibly remain there; for the centrifugal forces of the planets would carry them quite off, and the sun with them; especially when several of them happened to be in one quarter of the heavens. For the sun and planets are as much connected by the mutual attraction subsisting between them, as the bodies A and B are by the wire C fixed into them both. And even if there were but one planet in the whole heavens to go round ever so large a sun in the centre of its orbit, its centrifugal force would soon carry off both itself and the sun: for the greatest body placed in any part of free space could be easily moved; because, if there were no other body to attract it, it would have no weight or gravity of itself, and consequently, though it could have no tendency of itself to remove from that part of space, yet it might be very easily moved by any other substance.

10. As the centrifugal force of the light body B will not allow the heavy body A to remain in the centre of motion, even though it be 24 times as heavy as B; let the ball A (*fig.* 102.) weighing six ounces be connected by the wire C with the ball B, weighing one ounce; and let the fork E be fixed into the centre of the *whirling*-board; then, hang the balls upon the fork by the wire C in such a manner, that they may exactly balance each other, which will be when the centre of gravity between them, in the wire at *d*, is supported by the fork. And this centre of gravity is as much nearer to the centre of the ball A than to the centre of B, as A is heavier than B; allowing for the weight of the wire on each side of the fork. Then, let the machine be moved, and the balls A and B will go round their common centre of gravity *d*, keeping their balance, because either will not allow the other to fly off with it. For, supposing the ball B to be only one ounce in weight, and the ball A to be six ounces; then, if the wire C were equally heavy on each side of the fork, the centre of gravity *d* would be six times as far from the centre of B as from the centre of A, and consequently B will revolve with a velocity six times as great as A does; which will give B six times as much centrifugal force as any single ounce of A has: but then, as B is only one ounce, and A six ounces, the whole centrifugal force of A will exactly balance that of B; and therefore, each body will detain the other, so as to make it keep in its circle.

Hence it appears, that the sun and planets must all move round the common centre of gravity of the whole system, in order to preserve that just balance which takes place among them.

11. Take away the forks and balls from the *whirling*-board, and place the trough A B (*fig.* 103.) thereon, fixing its centre to that of the board by the pin H. In this trough are two balls D and E of unequal weights, connected by a wire *f*, and made to slide easily upon the wire C stretched from end to end of the trough, and made fast by nut-screws on the outside of the ends. Place these balls on the wire C so that their common centre of gravity *g* may be directly over the centre of the *whirling*-board. Then, turn the machine by the winch ever so swiftly, and the trough and balls will go round their centre of gravity, so as neither of them will fly off; because, on account of the equilibrium, each ball detains the other with an equal force acting against it. But if the ball E be drawn a little more towards the end of the trough at A, it will remove the centre of gravity towards that end from the centre of motion; and then, upon turning the machine, the little ball E will fly off, and strike with a considerable force against the end A, and draw the great ball B into the middle of the trough. Or, if the great ball D be drawn towards the end B of the trough, so that the centre of gravity may be a little towards that end from the centre of motion, and the machine be turned by the winch, the great ball D will fly off, and strike violently against the end B of the trough, and will bring the little ball E into the middle of it. If the trough be not made very strong, the ball D will break through it.

12. Mr. Ferguson has explained the reason why the tides rise at the same time on opposite sides of the earth, and consequently in opposite directions, by the following new experiment on the *whirling*-table. For this purpose, let *a b c d* (*fig.* 104.) represent the earth, with its side *c* turned toward the moon, which will then attract the water so as to raise them from *c* to *g*: and in order to shew, that they will rise as high at the same time on the opposite side from *a* to *e*; let a plate A B (*fig.* 105.) be fixed upon one end of the flat bar D C, with such a circle drawn upon it as *a b c d* (*fig.* 104.) to represent the round figure of the earth and sea; and an ellipse as *e f g h* to represent the swelling of the tide at *e* and *g*, occasioned by the influence of the moon. Over this plate A B suspend the three ivory balls *e*, *f*, *g*, by the silk lines *h*, *i*, *k*, fastened to the tops of the crooked wires H, I, K, so that the ball at *e* may hang freely over the side of the circle *e*, which is farthest from the moon M at the other end of the bar; the ball at *f* over the centre, and the ball at *g* over the side of the circle *g*, which is nearest the moon. The ball *f* may represent the centre of the earth, the ball *g* water on the side next the moon, and the ball *e* water on the opposite side. On the back of the moon M is fixed a short bar N parallel to the horizon, and there are three holes in it above the little weights *p*, *q*, *r*. A silk thread *o* is tied to the line *k* close above the ball *g*, and passing by one side of the moon M goes through a hole in the bar N, and has the weight *p* hung to it. Such another thread *n* is tied to the line *i*, close above the ball *f*, and passing through the centre of the moon M and middle of the bar N, has the weight *q* hung to it, which is lighter than the weight *p*. A third thread *m* is tied to the line *h*, close above the ball *e*, and passing by the other side of the moon M, through the bar N, has the weight *r* hung to it, which is lighter than the weight *q*. The use of these three unequal weights is to represent the moon's unequal attraction at different distances from her; so that if they are left at liberty, they will draw all the three balls towards the moon with different degrees of force, and cause them to appear as in *fig.* 106. in which case they are evidently farther from each other than if they hung freely by the perpendicular lines *h*, *i*, *k*. Hence it appears, that as the moon attracts the side of the earth which is nearest her with a greater degree of force than she does the centre of the earth, she will draw the water on that side more than the centre, and cause it to rise on that side; and as she draws the centre more than the opposite side, the centre will recede farther from the surface of the water on that opposite side, and leave it as high there as she raised it on the side next her. For, as the centre will be in the middle between the tops of the opposite elevations, they must of course be equally high on both sides at the same time.

However, upon this supposition, the earth and moon would soon come together; and this would be the case, if they had not a motion round their common centre of gravity, to produce a degree of centrifugal force, sufficient to balance their mutual attraction. Such motion they have; for as the moon revolves in her orbit every month, at the distance of 240000 miles from the earth's centre, and of 234000 miles from the centre of gravity of the earth and moon, the earth also goes round the same centre of gravity every month at the distance of 6000 miles from it, i. e. from it to the centre of the earth. But the diameter of the earth being, in round numbers, 8000 miles, its side next the moon is only 2000 miles from the common centre of gravity of the earth and moon, its centre 6000 miles from it; and its farthest side from the moon 10000 miles. Consequently the centrifugal forces of these parts are as 2000, 6000, and 10000; i. e. the centrifugal force of any side of the earth, when it is turned from the moon, is five times as great as when it is turned toward the moon. And as the moon's attraction, expressed by the number 6000, at the earth's centre keeps the earth from flying out of this monthly circle, it must be greater than the centrifugal force of the waters on the side next her; and consequently, her greater degree of attraction on that side is sufficient to raise them; but as her attraction on the opposite side is less than the centrifugal force of the water there, the excess of this force is sufficient to raise the water just as high on the opposite side.

To prove this experimentally, let the bar D C with its furniture be fixed on the *whirling*-board of the machine (*fig.* 98.) by pushing the pin P into the centre of the board; which pin is in the centre of gravity of the whole bar with its three balls *e*, *f*, *g*, and moon M. Now, if the *whirling*-board and bar be turned slowly round by the winch, till the ball *f* hangs over the centre of the circle, as in *fig.* 107. the ball *g* will be kept towards the moon by the heaviest weight *p* (*fig.* 105.) and the ball *e*, on account of its greater centrifugal force, and the less weight *r*, will fly off as far to the other side, as in *fig.* 107. And thus, whilst the machine is kept turning, the balls *e* and *g* will hang over the ends of the ellipse *l f k*. So that the centrifugal force of the ball *e* will exceed the moon's attraction just as much as her attraction exceeds the centrifugal force of the ball *g*, whilst her attraction

traction juſt balances the centrifugal force of the ball *f*, and makes it keep in its circle. Hence it is evident, that the tides muſt riſe to equal heights at the ſame time on oppoſite ſides of the earth. See Ferguſon's Lectures on Mechanics, lect. 2. and Deſag. Ex. Phil. vol. i. lect. 5.

WHIRL-*wind*, a wind that riſes ſuddenly, and is exceedingly rapid and impetuous, when riſen, but is ſoon ſpent. There are divers ſorts of *whirl-winds*, diſtinguiſhed by their peculiar names: as the *preſter*, *typho*, *turbo*, *exhydria*, and *ecnephias*.

The *preſter* is a violent wind, breaking forth with flaſhes of lightning. This is rarely obſerved; ſcarce ever without the *ecnephias*. Seneca ſays, it is a *typho*, or *turbo*, kindled or ignited in the air.

The *ecnephias* is a ſudden and impetuous wind, breaking out of ſome cloud; frequent in the Ethiopic ſea, particularly about the Cape of Good Hope. The ſeamen call them *travados*.

The *exhydria* is a wind burſting out of a cloud, with a great quantity of water. This only ſeems to differ, in degree, from the *ecnephias*, which is frequently attended with ſhowers.

A *typho*, or *vortex*, moſt properly called a *whirl-wind*, or *hurricane*, is an impetuous wind, turning rapidly every way, and ſweeping all round the place. It frequently deſcends from on high. The Indians call it *orancan*; the Turks, &c. *oliphant*. It is frequent in the Eaſtern ocean, chiefly about Siam, China, &c. and renders the navigation of thoſe parts exceeding dangerous.

Dr. Franklin, in his Phyſical and Meteorological Obſervations, read to the Royal Society in 1756, ſuppoſes a *whirl-wind* and a water-ſpout to proceed from the ſame cauſe; their only difference being, that the latter paſſes over the water and the former over the land. This opinion is corroborated by the obſervations of M. de la Pryme, and many others, who have remarked the appearances and effects of both to be the ſame. They have both a progreſſive as well as a circular motion; they generally riſe after calms and great heats, and occur moſt frequently in the warmer latitudes: the wind blows every way from a large ſurrounding ſpace both to the water-ſpout and *whirlwind*; and a water-ſpout has, by its progreſſive motion paſſed from the ſea to the land, and produced all the phenomena and effects of a *whirlwind*: ſo that there is no reaſon to doubt their being meteors ariſing from the ſame general cauſe, and explicable upon the ſame principles, furniſhed by electrical experiments and diſcoveries. See HURRICANE, and *Water*-SPOUT.

For Dr. Franklin's ingenious method of accounting for both theſe phenomena; ſee his Letters and Papers, &c. vol. i. p. 191, &c. p. 216, &c.

WHISKY, a term ſignifying *water*, and applied in the Highlands and iſlands of Scotland and in Ireland to ſtrong water or diſtilled liquor. The ſpirit drank in the North is drawn from barley; and is ſaid to be preferable to any Engliſh malt brandy: it is ſtrong, but not pungent, and free from the empyreumatic taſte or ſmell.

WHISPERING. See HEARING, ATTENTION, &c.

WHISPERING-*places* depend on this principle, that the voice, being applied to one end of an arch, eaſily paſſes by repeated reflections to the other.

Thus, let A B C (*Tab.* V. *Pneumatics*, *fig.* 71.) repreſent the ſegment of a ſphere; and ſuppoſe a low voice uttered at D, the vibrations extending themſelves every way, ſome of them will impinge upon the points E, E, &c. and thence be reflected to the points F, F, &c. thence to G, G, &c. till at laſt they meet in C; where, by their union, they cauſe a much ſtronger ſound than in any part of the ſegment whatever, even at D the point whence they firſt proceeded.

Accordingly, all the contrivance in a *whiſpering-place* is, that near the perſon who whiſpers there be a ſmooth wall, arched either cylindrically, or elliptically. A circular arch will do, but not ſo well.

Places famed for the conveyance of *whiſpers* are, the priſon of Dionyſius at Syracuſe, which increaſed a ſoft *whiſper* to a loud noiſe; the clap of one's hand to the ſound of a cannon, &c. The aqueducts of Claudius, which carried a voice ſixteen miles; and divers others enumerated by Kircher in his Phonurgia.

The moſt conſiderable in England are, the dome of St. Paul's, London, where the ticking of a watch may be heard from ſide to ſide; and a very eaſy *whiſper* be ſent all round the dome: this Dr. Derham found to hold not only in the gallery below, but above upon the ſcaffold; where a *whiſper* would be carried over one's head round the top of the arch, though there be a large opening in the middle of it into the upper part of the dome: and the famous *whiſpering*-place in Glouceſter cathedral, which is no other than a gallery above the eaſt-end of the choir, leading from one ſide thereof to the other. It conſiſts of five angles, and ſix ſides, the middlemoſt of which is a naked window; yet two *whiſperers* there hear each other at the diſtance of twenty-five yards. See Birch's Hiſt. of the Royal Society, vol. i. p. 120.

WHIST, or WHISK, a well-known game at cards. Several caſes of this game have been the objects of mathematical computations. Thus M. de Moivre has ſolved this problem: to find the odds that any two of the partners, that are pitched upon, have not the four honours? Mr. de Moivre concludes from his ſolution,

1. That it is 27 to 2, nearly, that the dealers have not the four honours.
2. That it is 23 to 1, nearly, that the eldeſt have not the four honours.
3. That is is 8 to 1, nearly, that neither one ſide nor the other have the four honours.
4. That it is 13 to 7, nearly, that the two dealers do not reckon honours.
5. That it is 20 to 7, nearly, that the two eldeſt do not reckon honours.
6. That it is 25 to 16, nearly, that either one ſide or the other do reckon honours, or that the honours are not equally divided.

The ſame learned author alſo determines, that the odds for the partners who have eight of the game, if dealers, againſt thoſe who are nine, is nearly as 17 to 11. But if thoſe who have eight of the game are eldeſt, the odds will be nearly as 95 to 77. And that without conſidering whether thoſe who have eight are dealers, or eldeſt, there is one time with another the odds of ſomewhat leſs than 7 to 5; and very nearly that of 25 to 18.

It is a queſtion likewiſe belonging to this game, what the probability is that a player has a given number of trumps dealt him; particularly, it has been often taken as an equal wager that the dealer has at leaſt four trumps. Mr. de Moivre has computed the following tables; ſhewing for the dealer, as well as the other gameſters, what the probability is of taking preciſely any aſſigned number of trumps in one deal. And thence by a continual addition of the numbers, or of ſuch part of them as is neceſſary, it is eaſily found what the probability is of taking at leaſt that number.

	Chances of the Dealer to have beſides the Card turned up.	Trumps.	Chances of any other Gameſter to have preciſely.	
	3910797436	0	8122425444	
	20112672528	I.	46929569232	
	41959196136	II.	110619698904	
	46621329040	III.	139863987120	
	30454255260	IV.	104897990340	
	12181702104	V.	48726808416	
	3014663652	VI.	14211985788	
	455999544	VII.	2583997416	
Tab. I.	40714245	VIII.	284999715	Tab. II.
	2010580	IX.	18095220	
	48906	X.	603174	
	468	XI.	8892	
	1	XII.	39	
	Sum = 158753389900 is the common denominator; being the combinations of 12 cards in 51.		476260169700 = ſum, is the common denominator; being the combinations of 13 in 51.	

By the help of theſe tables ſeveral uſeful queſtions may be reſolved; as, 1. If it is aſked, what is the probability that the dealer has preciſely III trumps, beſides the trump card? The anſwer, by *Tab.* I. is $\frac{4662}{15875}$; and the probability of his having ſome other number of trumps is $\frac{11213}{15875}$. But if the queſtion had been, what is the probability that ſome other gameſter, the eldeſt hand for inſtance, has preciſely IV trumps? The anſwer, by *Tab.* II. is $\frac{104898}{476260}$.

2. To find the chance of the dealer's not having fewer than IV trumps: add his chances to take 0, I, II, which are 39108, 201127, 419592; and their ſum 659827 taken from the denominator 1587534, and the remainder made its numerator, the probability of the dealer having IV or more trumps will be $\frac{927707}{1587534} = \frac{329}{563}$, a little above $\frac{7}{12}$. The wager therefore that the dealer has not IV trumps is ſo far from equal, that whoever lays it throws away above $\frac{1}{5}$ of his ſtake.

But if the wager is that the dealer has not V trumps, then 466213 (the chances of his having III besides the trump card) is to be added to the chances for 0, I, II; which will make the chance of him who lays this wager to be nearly $\frac{317}{455}$; and that of his adversary $\frac{138}{455}$.

And hence, if wagers are laid that the dealer has not IV trumps, and has not V trumps, alternately; the advantage of him who lays in this manner will be nearly 11¼ per cent. of his stakes.

3. To find the odds of laying that the eldest hand has at least III, and at least IV trumps, alternately; the numerator of the one expectation is (by *Tab.* II.) 31501119, and of the other 17514720, to the denominator 47626017; whence the advantage of the bet will be $\frac{15}{514}$, or 3 per cent. nearly.

Again, if it is laid that the trumps in the dealer's hand shall be either I, II, III, or VI; the disadvantage of this bet will be only 15*s.* 4*d.* or about ¾, per cent.

In like manner, the odds of any proposed bet of this kind may be computed: and from the numbers in the tables, and their combinations, different bets may be found which shall approach to the ratio of equality; or if they differ from it, other bets may be assigned, which, repeated a certain number of times, shall balance that difference.

4. And if the bet includes any other condition besides the number of trumps, such as the quality of one or more of them; then proper regard is to be had to that restriction.

Let the wager be that the eldest has IV trumps dealt him; and that two of them shall be the ace and king. The probability of his having IV trumps precisely is, by *Tab.* II. $\frac{104898}{476200}$: and the different fours in 12 cards are $\frac{12}{1} \times \frac{11}{2} \times \frac{10}{3} \times \frac{9}{4}$. But because 2 out of the 12 trumps are specified, all the combinations of 4 in 12 that are favourable to the wager are reduced to the different two's that are found in the remaining 10 cards, which are $\frac{10}{3} \times \frac{9}{2}$. And this number is to the former as 1 to 11: the probability therefore is reduced by this restriction to $\frac{1}{11}$, of what else it had been: that is, it is reduced from near $\frac{1}{5}$ to about $\frac{1}{52}$. De Moivre's Doctrine of Chances. p. 172, &c. ed. 3d.

WHISTLE, *boatswain*'s. See CALL.

WHISTLE-*fish*, a name given by the people of Cornwall to a species of gadus, with only two fins on the back, otherwise called *mustela fluviatilis*. See GADUS, and MUSTELA.

WHITE, one of the colours of natural bodies.

White is not so properly said to be any one colour, as a composition of all the colours; it being demonstrated by sir Isaac Newton, that those bodies only appear *white*, which reflect all the kinds of coloured rays alike, and that the light of the sun is only *white*, because consisting of all colours.

From the multitude of rings of colours, which appear upon compressing two prisms, or object-glasses of telescopes together, it is manifest, that these do so interfere and mingle with one another at last, as, after eight or nine reflexions, to dilute one another wholly, and constitute an even and uniform *whiteness*: whence, as well from other experiments, it appears, that *whiteness* is certainly a mixture of all colours; and that the light which conveys it to the eye, is a mixture of rays endued with all those colours.

The same author shews, that *whiteness*, if it be most strong and luminous, is to be reckoned of the first order of colours; but if less, as a mixture of the colours of several orders: of the former sort he reckons white metals; and of the latter, the *whiteness* of froth, paper, linen, and most other white substances. And as the *white* of the first order is the strongest that can be made by plates of transparent substances, so it ought to be stronger in the denser substances of metals, than in the rarer ones of air, water, and glass.

Gold or copper mixed either by fusion, or amalgamation with a very little mercury, with silver, tin, or regulus of antimony, become white; which shews, both that the particles of *white* metals have much more surface, and therefore are smaller than those of gold or copper; and also, that they are so opake, as not to suffer the particles of gold or copper to shine through them. And as that author doubts not, but that the colours of gold and copper are of the second or third order, therefore the particles of white metals cannot be much bigger than is requisite to make them reflect the white of the first order. See COLOUR, and *Colours from* METALS.

Hevelius affirms it as a thing most certain, that, in the northern countries, animals, as hares, foxes, bears, &c. become *white* in the winter-time; and in summer resume their natural colours.

Black bodies are found to take heat sooner than *white* ones; by reason the former absorb or imbibe rays of all kinds and colours, and the latter reflect all.

Thus, black paper is sooner put into flame, by a burning-glass, than *white*; and hence black cloths, hung up by the dyers in the sun, dry sooner than *white* ones. See BLACK.

WHITE *arsenic*, *ashes*, and *bait*. See the substantives.

WHITE *bear*. See POLAR *Bear*.

WHITE *cinnamon*, *copperas*, *cordage*, *diachylon*, *eagle*, and *egg-shell*. See the substantives.

WHITE *of the eye* denotes the first tunic or coat of the eye, called ALBUGINEA, and *conjunctiva*; because serving to bind together or inclose the rest. See ADNATA.

WHITE-*face*, or BLAZE, in the *Manege*, is a *white* mark upon a horse, descending from the forehead almost to the nose. It is called in French CHANFRIN *blanc*.

WHITE-*foot*, in the *Manege*, called in French *balzane*, is a *white* mark that happens in the feet of a great many horses, both before and behind, from the fetlock to the coffin. The horses thus marked are either tramelled, cross-tramelled, or *white* all four. Some horsemen place an unlucky fatality in the *white* of the far foot behind. See CHAUSSE' *trop-haut*, and TRAMELLED.

WHITE *flag*, *flake*, and *frost*. See the substantives.

WHITE-*friars*, a name common to several orders of monks, from their being clothed in a *white* habit.

Such are, the regular canons of S. Augustine, the Premonstratenses, and Bernardines. See CARMELITES.

WHITE *glass*. See GLASS.

WHITE-*hart silver*, *candidi cervi argentum*, a tribute or mulct paid into the exchequer, out of certain lands in or near the forest of *White-hart*, in Dorsetshire; which was continued from Henry III.'s time, who first imposed it upon Thomas de la Linde, and others, for killing a beautiful *white* hart, which that king had purposely spared in hunting.

WHITE-*hellebore*. See HELLEBORE.

WHITE-*horse-fish*, in *Ichthyology*, a common English name for the *raia aspera nostras* of Willughby, and the *raia fullonica* of Rondeletius and Linnæus. Its back is rough and spiny; the nose is short and sharp; at the corner of each eye are a few spines; the nictitating membrane is fringed; the teeth are small and sharp: on the upper part of the pectoral fins are three rows of spines pointing toward the back, and crooked, like those of the fuller's instrument; whence its name *fullonica* and *fuller*. On the tail are three rows of strong spines: the tail is slender, and rather longer than the body. The colour of the upper part of the body is cinereous, usually marked with many black spots; the lower part white. This fish grows to a size equal to that of the skate. Pennant.

WHITE-*land*, in *Agriculture*, a tough clayey soil, naturally of a somewhat whitish hue when dry, especially when it has lain some time untilled, but becoming blackish after rain; this appears of a light greyish colour, when turned up by the plough, and slides off from the plough-share with ease, and with a smooth glossy surface.

It has often a yellowish hue with the grey, and is often veined with large parcels of a blue marly earth. See *Clay* SOIL.

WHITE *lead* is a sort of rust of lead, or lead dissolved with vinegar; much used by painters. See CERUSSE.

WHITE *line*, among *Printers*, a void space, greater than usual, left between two lines. See PRINTING.

WHITE *line*, in *Anatomy*. See LINEA *alba*.

WHITE *linen* is cloth of hemp, or flax, bleached by divers leys, and waterings on the ground.

WHITE *meats* include milk, butter, cheese, white pots, custards, and other foods consisting of milk, or eggs. Some add, also, fish, veal, and chickens.

WHITE *money*, *libræ albæ*. See MONEY.

WHITE *mortar*. See MORTAR.

WHITE *order*. See ORDERS.

WHITE *paper* is that intended for writing, printing, &c. in contradistinction to *brown paper*, *marbled paper*, *blotting paper*, &c.

WHITE, *pearl*. See PEARL.

WHITE *pepper*. See PEPPER.

WHITE-*pot* denotes milk or cream baked with the yolks of eggs, fine bread, sugar, and spice, in an earthen pot.

The cooks furnish us with a variety of dishes under this form

form and denomination: such are, *Norfolk white-pot*, *Westminster white-pot*, *rice white-pot*, &c.

WHITE *precipitate*. See MERCURY.

WHITE *rent*, a rent or duty of 8*d*. payable yearly, by every tinner in the county of Devon, to the duke of Cornwall. See BLANCH *ferme*.

WHITE *salt* is common or sea-salt dried and calcined by the fire, so as not to leave any moisture therein. The chemists call it *decrepitated salt*.

There are some salts naturally *white*, and others that need to be *whitened*, either by dissolving and purifying them in fair water, which is afterwards evaporated; or by means of fire; or by the sun. See SALT.

WHITE *sauce*, a sort of sauce made of blanched almonds, and the breast of a capon, pounded together with cloves, cinnamon, &c. We also hear of *white broth*, which is a sort of broth enriched with sack and spices, having blanched almonds scraped into it, and the whole thickened with the yolks of eggs, &c.

WHITE *soap*. See SOAP.

WHITE, *Spanish*, is a kind of fucus used by the ladies to *whiten* the complexion, and hide the defects thereof, called also MAGISTERY of *bismuth*.

The use of this, as well as of cerusses, is pernicious; and should be particularly avoided during the taking of any sulphureous water, which may change the complexion quite black. Indeed, all phlogistic vapours, and even the sun itself, tend to give both the magistery of bismuth and ceruss a yellow colour: an observation which serves to explain a passage in Martial, where a cerused lady is said to fear the sun.

Cretata timet Fabulla, nimbum,
Cerusata timet Sabella, solem.
Ep. lib. ii. Ep. 41.

WHITE, *Spanish*, is also a name given to TROY *white*.

WHITE *spurs*. See SPUR, and ESQUIRE.

WHITE *star*, and *sugar*. See the substantives.

WHITE-*swelling*. See TUMORS.

We have several examples of successful cures of *white-swellings* of the joints, or tumors from inspissated lymph, by a small stream of warm water falling from a height on them.

When the water is impregnated with penetrating medicines, or natural minerals, its virtues are greater. The application of bladders containing warm water, to the parts affected, is also recommended. See Le Dran, Obs. Chirurg. tom. ii. obs. 93, 94.

WHITE-*tail*, in *Ornithology*. See WHEAT-*ear*.

WHITE *tartar*. See TARTAR.

WHITE-*throat*, in *Ornithology*, the name of a small bird, very common in our gardens and hedges, and seeming to have been described under the name of *spipola* by Aldrovandus and some others, though most approaching to the *ficedula* class.

Its beak is black above, and whitish below; its feet of a yellowish brown; its neck and back are of a brownish-grey; its head more grey than either, and the upper part of the throat *white*, the rest reddish; its breast and belly are also a little reddish; but in the female the breast is perfectly *white*. The edges of the long wing-feathers are some whitish and others brownish, and the tail is variegated with black and white, and some grey or ash-colour intermixed. It is extremely common in our gardens and orchards in summer, and feeds on flies, spiders, and other insects, but leaves us in winter. It builds in bushes, at a small height from the ground, with stubble and horse-hair, and lays five brownish-green eggs, with black spots. Its note is continually repeated, and often attended with odd motions of the wings: it is harsh and displeasing. This bird is shy and wild, and seems of a pugnacious disposition. Ray and Pennant.

WHITE, *troy*. See TROY-*white*.

WHITE *varnish*, and *vitriol*. See the substantives.

WHITE *wax* is yellow wax blanched, and purified by the sun and dew. See WAX.

WHITE *upon white*, in the *Porcelain Manufactory*, a name given by the English merchants to a particular china-ware, which is formed of three different *white* substances, the body being of one, the flowers of another, and the varnish which covers these of a third. See HOACHE.

WHITE *wine* is that of a clear, bright, transparent colour, bordering on *white*. It is thus called to distinguish it from the red wines, or clarets.

The generality of *white wines* are made from *white* grapes; though there are some from black ones, only the skins are carefully kept from tinging them.

WHITES, the popular name of a disorder incident to women. See FLUOR *albus*.

WHITENING *of bones*, for a skeleton. See BONE.

WHITENING *of cloth*. See BLEACHING.

WHITENING *of hair*. See HAIR.

WHITENING *of wax*. See WAX.

WHITING, in *Ichthyology*, the English name of a common fish of the asellus kind, commonly distinguished by the writers in ichthyography by the name of *asellus mollis*, though by some called *asellus albus* and *merlangus*.

According to the Artedian system of ichthyology, the *whiting* is one of the *gadi*, distinguished by that author by the name of the *gadus* with three fins on the back, without beards, with a white body, and with the upper jaw longer than the under.

The *whiting*, or GADUS *merlangus* of Linnæus, is a fish of an elegant form; the upper jaw is the longest; the eyes are large, the nose sharp, and the teeth of the upper jaw long, appearing above the lower when closed: the first dorsal fin has fifteen rays, the second eighteen, and the last twenty. The colour of the head and back is a pale brown; the lateral line white and crooked; the belly and sides silvery; the last streaked lengthways with yellow.

Whitings appear in large shoals in our seas in the spring, keeping at the distance of about half a mile to that of three miles from the shore. They are the most delicate and wholesome of any of the genus; and seldom grow to more than ten or twelve inches in length. Pennant.

No *whiting* is to be taken in the Thames or Medway of less size than six inches from the eye to the end of the tail, or at any time except from Michaelmas-day to Ember week. 30 G. II. cap 21. Nor under six inches any where else. 1 G. I. stat. 2. cap. 18.

WHITING-*pollack*. See HUITINGO *pollachius*, and POLLACK.

WHITING-*pout*. See POUTING.

WHITLOW, or WHITLOE, *paronychia*, derived from παρα, *near*, and ονυξ, *nail*, in *Surgery*, a painful kind of tumor, or abscess, arising at the ends of the fingers, and the roots of the nails; otherwise called *Panaritium* and *Panaris*.

Becket derives the term *whitlow* from *white*, and *hawe*, an old English word signifying a swelling of any part; whence he says proceeds *white hawe*, and afterwards *whitflaw*. Phil. Trans. Abr. vol. viii. p. 655.

The humour, or matter of the *paronychia*, is sometimes so sharp as to corrode the tendons, nerves, the periosteum, and even the bone itself.

It is either lodged between the integuments, or between the periosteum and bone. The deeper it lies, the more dangerous it is.

Accordingly Heister distinguishes three species of *whitlow*: the first kind is that in which only the integuments are affected at the end of the finger, near the nail; in this sort the pain is pretty tolerable, and does not extend beyond the finger: the second kind is, when the periosteum is inflamed or eroded; in which case the symptoms are more violent and the pain very intense, though still confined to the finger, insomuch as to occasion sometimes a fever, convulsions, delirium, &c. without much apparent tumor or inflammation: the third and worst kind is that which infects the nervous coverings of the tendons belonging to the flexor muscles of the fingers, or even the adjacent nerves or tendons themselves; in this case the pain is excruciating, and the disorder spreads through the whole hand and arm.

The first kind is not very dangerous and usually terminates in the loss of the nail: the second sort is more painful, and has been attended with a caries of the bones of the finger, as a consequence of the preceding inflammation and suppuration: but the third species is really dangerous; the intense pains, abscess, gangrene, tumor and inflammation of the whole arm, together with a fever and other malignant symptoms, frequently destroying the patient, unless its progress is prevented.

The true and proximate cause of a *whitlow*, according to Heister, must be referred to an inflammation of the adjacent integuments, chiefly of the periosteum, from an inspissation of the blood, or an obstruction of its small vessels; and the inflammation may proceed from either internal or external causes, as from an inspissation or acrimony of the blood and lymph, induced by a tense fibre, a heating regimen, or an abuse of the non-naturals, or from a contusion, wound, or puncture.

The most approved method for removing the inflammation and obstruction by discussion, is to let the patient hold his finger several hours in spirits of wine highly rectified, or camphorated with theriaca. For the same purpose may be used, with success, a decoction of garlick and leaves of scordium and savin, in which hot liquor the finger should be either immerged for several hours, or else fomented with it by linen rags. Others recommend frequently dipping and holding the disordered finger a little while in scalding water. But if a suppuration is formed, an incision is the only remedy; and the suppuration may be forwarded by dipping the finger

finger in a decoction of mallow-flowers boiled in milk, or by applying to it a poultice of bread and milk; which may be rendered ſtill more active and ripening by adding a few white lily roots or a little honey. A ſuppuration may be alſo promoted by the application of a diachylon plaſter with the gums.

But in the ſecond or third ſpecies of this diſorder, where the perioſteum or bone is affected, this practice would be pernicious, increaſe the pain, and induce an abſceſs, caries, and gangrene of the whole arm. For the cure of theſe two ſpecies, an inciſion is neceſſary for the diſcharge of the offending matter; the wound ſhould be dreſſed with dry lint and diachylon plaſter, and a compreſs dipped in ſpirit of wine; each being retained with a proper bandage. Fungous or proud fleſh, if it appears, may be eaſily removed either with the ſciſſars, or by ſome eſcharotic mixed with digeſtive ointment. The wound is afterwards to be treated like thoſe, in which the bones are affected, with eſſence of myrrh, balſam of Peru, &c. and if the bone is foul, kept open with lint dipped in tincture of myrrh, till there is either an exfoliation of the morbid from the ſound parts, or till the whole bone comes away entire; after which the wound may be deterged and healed without difficulty.

For the third ſpecies Garengeot directs to open the tumor by making an inciſion longitudinally down in the capſula of the tendon, which will diſcharge a kind of lymph or ſerum very much to the patient's eaſe. When the matter makes its way without any inciſion through the capſula of the tendon, and about its external opening, a caruncle or fleſhy ſubſtance appears, he adviſes to paſs a director through the opening into the eroded capſula of the tendon, and then to make an inciſion through the parts incumbent on the director, by which means a thicker matter will be found concealed in the divided ſinus. For a fuller account of the treatment of the different ſpecies, and particularly of the laſt, ſee Heiſter's Surgery, vol. ii. p. 324. &c.

WHITLOW *graſs*, or *mountain knot-graſs*, *paronychia* or *illecebrum*, in *Botany*, a genus of the *pentandria monogynia* claſs. Its characters are theſe: the empalement of the flower is five-cornered, and compoſed of five coloured leaves, which are permanent; the flower has no petals, but has five hair-like ſtamina within the empalement, terminated by ſingle ſummits, and an oval acute germen, ſitting upon a ſhort ſtyle crowned by an obtuſe ſtigma; the empalement afterwards turns to a roundiſh capſule with one cell, opening with five valves, containing one large, roundiſh, acute-pointed ſeed. Linnæus enumerates twelve, and Miller two ſpecies, cultivated, which grow naturally in Spain.

WHITLOW-*graſs* is alſo a name given to ſome ſpecies of DRABA.

WHITLOW-*graſs*, *rue-leaved*, a ſpecies of SAXIFRAGE.

WHITSUN *farthings*. See PENTECOSTALS.

WHITSUNTIDE, the fiftieth day after EASTER.

The ſeaſon properly called PENTECOST, is popularly called *Whitſuntide*; ſome ſay, becauſe in the primitive church, thoſe who were newly baptized came to church between Eaſter and Pentecoſt in *white* garments.

WHOLE, *totum*, in *Arithmetic*, &c. See PART, DIVISION, PARTITION, &c.

WHOLE, in *Logic*, is diſtinguiſhed into four kinds; viz. a *metaphyſical*, when the eſſence of a thing is ſaid to conſiſt of two parts, the genus and the difference; *mathematical* or *integral*, when the ſeveral parts, which go to make up the *whole*, are really diſtinct from one another, and each of them may ſubſiſt apart; *phyſical* or *eſſential*, uſually denoting and including the two eſſential parts of man, body and ſoul, but more properly including all the eſſential modes, attributes, or properties, contained in the comprehenſion of any idea; and *logical*, called alſo *univerſal*, the parts of which are all the particular ideas to which this univerſal nature extends. Watts's Logic, p. 117.

WHOLE *blood*, *meaſure*, *number*, and *ſine*. See the ſubſtantives.

WHOLESOME *ſhip*, in the *Sea-Language*, one that will try, hull, and ride well, without rolling, or labouring in the ſea. A long ſhip that draws much water, may try, hull, and ride well; but if ſhe draws little water, ſhe may try and ride well, but never hull well; and a ſhort ſhip, that draws much water, may hull well, but neither ride nor try well; and ſuch is called an *unwholeſome* ſhip.

WHOODINGS, or HOODINGS, a ſea-term, uſed for planks joined and faſtened along the ſhip's ſides into the ſtem. See RABBET.

WHORE, ſee COURTISAN, HARLOT, CONCUBINE, &c.

WHORLBAT, or HURLBAT, a kind of gauntlet, or leathern ſtrap loaden with plumbets; uſed by the ancient Romans in their ſolemn games, and exerciſes; and by them called CÆSTUS.

WHORLES *of flowers*, among *Herbaliſts*, are rows of leſſer flowers, ſet at certain diſtances about the main ſtalk or ſpike, as in penny-royal, &c.

WHORTLE-*berry*, BILBERRY, or CRANBERRY, *vaccinium*, in *Botany*, a genus of the *octandria monogynia* claſs. Its characters are theſe: the flower has a ſmall permanent empalement ſitting upon the germen; it is bell-ſhaped, of one petal, ſlightly cut into four ſegments at the brim, which turn backward; it has eight ſtamina, terminated by horned ſummits, having two awns on their back-ſide which ſpread aſunder. The germen is ſituated below the flower, ſupporting a ſingle ſtyle longer than the ſtamina, crowned by an obtuſe ſtigma; it afterwards turns to an umbilicated globular berry with four cells, containing a few ſmall ſeeds. Miller enumerates five, and Linnæus twelve ſpecies.

The *whortle-berry* with one flower upon each footſtalk, oval ſawed leaves which fall off in winter, and an angular ſtalk, called *black whorts*, or *bilberries*, grows very common upon large wild heaths, in many parts of England, but is never cultivated in gardens, it being with great difficulty tranſplanted; nor will it thrive long when moved thither. The fruit is gathered by the poor inhabitants of thoſe villages which are ſituated in the neighbourhood of their growth, and carried to the market-towns. Theſe are by ſome eaten with cream or milk; they are alſo put into tarts, and much eſteemed by people in the North, but they are ſeldom brought to London.

The ſhrub on which theſe grow, riſes about two feet high, having many ſtems which are garniſhed with oblong leaves, ſhaped like thoſe of the box-tree, but ſomewhat longer, and are a little ſawed on their edges. The flowers are ſhaped like thoſe of the arbutus, or ſtrawberry-tree, of a greeniſh-white colour, changing to a dark red toward the top. The fruit is about the ſize of large juniper-berries, and of a deep purple colour, having a flue upon it when untouched, like the blue plums, which is rubbed off with handling.

The *whortle-berry* with nodding bunches of flowers terminating the branches, and oval leaves which are entire, turned back and punctured on their under ſide, called *vitis idæa*, and *red whorts*, is an ever-green ſhrub, ſeldom riſing above ſix or eight inches high, with leaves like thoſe of the dwarf box, which grows upon moors in ſeveral parts of the North, but is not capable of being eaſily tranſplanted: the berries are red, and have a more agreeable acid flavour than thoſe of the firſt ſort.

The *whortle-berries* with oval, entire, reflexed leaves, and naked, ſlender, creeping ſtalks, called *moſs-berries*, *moor-berries*, and *cran-berries*, produce branches ſmall as thread, and trailing upon the moſſy bogs, which are garniſhed with leaves reſembling thoſe of thyme, with the upper ſurface of a ſhining green, and white underneath. The berries, which grow upon long ſlender foot-ſtalks, ſucceeding the flowers, are round, red, and ſpotted, of a ſharp acid flavour, and much eſteemed for taſte, or eaten with milk or cream. This is a native of bogs, and cannot be propagated upon dry land.

There are ſeveral other ſpecies of this genus, ſome of which are natives of Spain and Portugal, others of Germany and Hungary, and ſeveral of the northern parts of America; from whence thoſe large fruit are brought to England which are uſed by the paſtry-cooks of London during the winter ſeaſon, for tarts. But as all theſe ſorts grow naturally in ſwamps and bogs, they are not eaſily tranſplanted into gardens in their native country ſo as to thrive or produce fruit; therefore there can be little hope of cultivating them to advantage. Miller.

WHORTLE-*berry*, *African*, a ſpecies of ROYENA.

WHORTLE-*berry*, *bear's*. See UVA *urſi*.

WHUR, in *Falconry*, denotes the fluttering of partridges, or pheaſants, as they riſe.

WIC, denotes a place on the ſea-ſhore, or on the bank of a river. Though, in the original Saxon, it more properly ſignifies a *ſtreet*, *village*, or *dwelling-place*; as alſo a *caſtle*. See WYKE.

We often meet with *wic* in the Saxon writers, as a termination of the name of a town, which had a complete name without it: as, *Lunden-wic*; that is, London town; which ſignifies no more than *London*. In the Saxon Annals, it is mentioned, that king Ethelbert made Melitus biſhop of *Lunden-wic*.

So, Ipſwich is written in ſome old charters, *villa de Gippo*, and ſometimes *villa de Gippo wico*; which is no variance, but the ſame thing; for *Gipps* is the complete name, and *Gipp-wic* is Gipps-town.

WICKER, a twig of the oſier ſhrub, ſingle or wrought.

WICKER-*tree*, a name given by the Engliſh to a tree common in China, and deſcribed by Kircher and others. It is, as it were, a rope twiſted by nature, about an inch thick, and creeps along the earth often for above a hundred

dred paces together, much embarraffing the way, but ferving for cables of fhips, feats, hurdles, beds, mats, and various other neceffary ufes. It endures no vermin, and is much valued for being cool and refrefhing in the hot feafons.

WICKET, of the French *guichet*, a little door within a gate; or a hole in a door, through which to view what paffes without.

WICKLIFFISTS, or WICKLIFFITES, in *Ecclefiaftical Hiftory*, a religious fect, who had their rife in England in the 14th century, and their name from their leader *John Wickliffe*, born about the year 1324, a profeffor of divinity in the univerfity of Oxford, and afterwards rector of Lutterworth.

To that immortal author it is we owe the firft hint of the great reformation, effected about one hundred and fifty years after him.

The firft occafion, on which *Wickliffe* began to diftinguifh himfelf was in 1360, when he defended the ftatutes and privileges of the univerfity of Oxford againft the order of Mendicants or Begging Friars, who from their firft fettlement in Oxford A. D. 1230 had difturbed the chancellor and fcholars, endeavoured to eftablifh an exempt jurifdiction, and took all opportunities of enticing the ftudents from the colleges into their convents. He alfo wrote and publifhed feveral tracts againft the begging trade of the friars, and in order to reform the abufes of the clergy. In confequence of the credit he acquired by his writings, he was advanced in 1361 to be mafter of Baliol college, and in 1365 to be warden of Canterbury-hall, then newly founded. However, in 1367, he was deprived of the wardenfhip by Simon Langham, archbifhop of Canterbury, who fubftituted a monk in his place; and upon his appeal to pope Urban V. of whofe claim of homage and tribute from king Edward III. he had in the preceding year publifhed a refutation, the fentence of the archbifhop againft him was confirmed. Exafperated at this treatment, he threw off all reftraint, and not only attacked the monks, and their fcandalous irregularities, but even the pontifical power itfelf, and other ecclefiaftical abufes, both in his fermons and writings. He afterwards proceeded to expofe and refute the abfurd notions that were generally received in religious matters, and not only exhorted the laity to ftudy the fcriptures, but furnifhed them with an Englifh verfion of the Bible, that the perufal of it might thus become more univerfal. In a treatife which he publifhed *of the Truth of the Scripture*, and in a *prologue* or preface to his tranflation, he vindicates his defign againft the objections of his adverfaries, and reafons on the importance and ufe of underftanding the Scriptures in a manner very honourable to himfelf, confidering the age in which he lived. The truth of the faith, fays he, fhines the more by how much the more it is known—nor are thofe heretics to be heard who fancy that feculars ought not to know the law of God, but that it is fufficient for them to know what priefts and prelates tell them by word of mouth; for the Scripture is the faith of the church, and the more it is known in an orthodox fenfe the better; therefore, as fecular men ought to know the faith, fo it is to be taught them in whatfoever language is beft known to them. Befides, fince the truth of the faith is clearer and more exact in the Scripture than the priefts know how to exprefs it—it feems ufeful that the faithful fhould themfelves fearch out and difcover the fenfe of the faith, by having the Scriptures in a language which they underftand.—The laws which the prelates make are not to be received as matters of faith; nor are we to believe their words or difcourfes any farther or otherwife than they are founded on the Scripture—with much more to the fame purpofe and in the fame admirable ftrain. In this preface, and feveral other publications and treatifes, ftill in manufcript, he reflected feverely on the corruptions of the clergy, condemned the worfhip of faints and images, and the doctrine of indulgences, denied the corporal prefence of Chrift in the facrament, inveighed againft the wanton exercife of the papal power, and oppofed the making of the belief of the pope's being head of the church an article of faith and falvation, cenfured the celibacy of the clergy, expofed various errors and irregularities in the hierarchy and difcipline of the church, and earneftly exhorted all people to the ftudy of the Scriptures.

Wickliffe denied that bifhops were of a different order from priefts, and that by virtue of their office they had any power to do what priefts have not: and that in the apoftolic times the two orders fubfifting in the church were thofe of prieft and deacon. With regard to tithes he obferves, that we do not read in the Gofpel where Chrift paid tithes, or commanded any man fo to do; and that if they were due by God's commandment, there fhould be every where in Chriftendom one manner of tithing; and that thofe things which are due to priefts fhould be given freely, without exaction or conftraining. In oppofition to the papal claims of fupremacy and dominion he maintained, that the grants of emperors may be refumed; that St. Peter and his fucceffors have no rights conferred upon them of civil or political dominion; that the perfons of the clergy and the goods of the church are not exempted from the civil powers; and that bulls of abfolution or excommunication are conditional and not abfolute, and depend for their effects on the difpofition and character of thofe to whom they pertain.

Wickliffe defines herefy to be error maintained againft holy writ, and that in life and converfation, as well as in opinion. Concerning the falvation of a baptized infant, he declares himfelf unable to determine on either fide.

The number of tracts he wrote and publifhed, both in Latin and Englifh, is very confiderable. From two large volumes of his works, intitled *Aletheia*, i. e. *Truth*, and a third under the title of *Trialogus*, John Hufs is faid to have derived moft of his doctrines. We have a full and complete Hiftory of the Life and Sufferings, and various Writings of *Wickliffe*, both printed and MS. publifhed in octavo at London, in the year 1720, by Mr. John Lewis; who alfo publifhed, in 1731, *Wickliffe's* Englifh Tranflation of the New Teftament from the Latin Verfion, called the Vulgate. This tranflation is enriched with a learned preface by the editor, in which he enlarges upon the life, actions, and fufferings, of this eminent reformer.

But to return to his hiftory.—The monks, whom *Wickliffe* had principally exafperated, commenced a violent profecution againft him at the court of Gregory XI. who, in 1377, ordered Simon Sudbury, archbifhop of Canterbury, to take cognizance of the affair at a court held at London. *Wickliffe* efcaped this danger by the intereft of the duke of Lancafter, and fome other peers, who had a high regard for him. When the fchifm which embroiled the Romifh church on the death of Gregory XI. was tolerably fettled, the procefs againft *Wickliffe* was revived by William Courtney, archbifhop of Canterbury, in 1382, and was carried on with great vehemence in a court of felect bifhops and others affembled in the monaftery of the Preaching Friars at London. The event was, that of twenty-four articles exhibited againft him, ten were condemned as herefies, and fourteen as errors. It has been faid that *Wickliffe* made a public recantation of the opinions with which he was charged; but of this no fufficient evidence appears. Some have faid, that king Richard banifhed him out of England: but if that was the cafe, he returned in fafety to Lutterworth, where he died peaceably in the year 1384. He left many followers in England, and other countries, who were called *Wickliffites* and LOLLARDS, and who held their opinions in private without making any public profeffion of them; though they were generally known by their difparaging the fuperftitious clergy, whofe corruptions were fo notorious and their cruelty fo enraged, that it is no wonder the people were much prejudiced againft them. Wherever they could be found, they were terribly perfecuted by the inquifitors, and other inftruments of papal vengeance; and, in the council of Conftance, in 1415, the opinions of *Wickliffe*, amounting to forty-five articles, were condemned by a folemn decree, he himfelf was declared an obftinate heretic, and his bones ordered to be dug up, which part of the fentence was executed about thirteen years after, when they were taken up and publicly burnt. Lewis's Hiftory, &c. 8vo. paffim. Mofh. Eccl. Hift. vol. iii. p. 166. 8vo. Burnet's Hift. Reform. vol. i. p. 23.

WICRANGLE, in *Ornithology*, an Englifh name for the MATTAGESS, or greater BUTCHER-*bird*, the *lanius cinereus major* of authors.

WICRANTUM, in *Natural Hiftory*, a name given by the people of the Eaft-Indies to certain foffile bodies, of the nature of the pyrites, of the fize of peas, and formed into varioufly angular figures.

They look black and gloffy, and much of the nature of blende, or mock-lead; but when put into the fire, they fhew us by their fmell that they contain fulphur. They are found in the diamond-mines.

The natives firft powder them; and then mixing them with the juices of certain plants, they dry them, and then calcine them again. Thefe proceffes they repeat at leaft fixty times; but the firft calcinations are made with a mixture of divers urines, as that of the horfe, the camel, the cow, and the like.

After this tedious preparation, they are given in coughs and colds, and are faid to be a remedy even in confumptions.

WIDE-*eared*, in the *Manege*, is applied to a horfe, when the

the root, or lower part of his ear is placed too low, and the ear itself is too large. The French use the term *oreillard* for such a horse.

WIDOW, *vidua*, a woman that has lost her husband.

Some also use the term WIDOWER, for a man who has lost his wife. Marriage with a *widow*, is a kind of BIGAMY in the eye of the canon law.

The *widow* of a freeman of London may use her husband's trade as long as she continues a *widow*.

Mr. Kerseboom has given us a table, shewing how long four hundred and thirty-two *widows* lived, and finds, that at a medium, each lived fourteen years. Phil. Trans. N° 468. sect. 3.

It appears that, in Germany, the number of *widows* dying annually is four times the number of widowers: thus, in Dresden alone, the number of *widows* who died in 4 years, was 584; the number of widowers, 149: i. e. 4 to 1. At Wittenberg, during 11 years, 98 widowers died, and 376 *widows*. At Gotha, during 20 years, 210 widowers died, and 760 *widows*. And as *widows* are certainly, one with another, several years younger than widowers; it may be concluded that the number of the former in life together could not be less than five times the latter.

Thus also, in 1770, the number of *widows* in life, derived from the whole body of professors and ministers in Scotland, was 380; but the number of widowers among them has, one year with another, been scarcely 90; i. e. not so much as a quarter of the number of *widows*. Price's Observ. on Rev. Paym. ess. 4.

These facts cannot be accounted for without admitting the greater mortality of males. See MARRIAGE, and MORTALITY.

There have been many schemes established for providing annuities for *widows*, for an account of several of which, see Price's Observ. &c. chap. ii. sect. 1, 2, 3.

Among the ancient Greeks, *widows* had the care of the eternal fire of *Vesta* committed to them; which charge, among the Romans, could be performed by virgins only, who from their office were called vestals. See VESTAL.

WIDOW *of the king*, was she, who, after her husband's death, being the king's tenant in capite, was driven to recover her dower by the writ *De dote assignanda*; and could not marry again without the king's consent.

WIDOW *bench*, in the county of Sussex, is that share which a *widow* is allowed of her husband's estate, besides her jointure.

WIDOW'S *chamber*, a name given in London to the apparel and furniture of the bed-chamber of the *widow* of a freeman, to which she is entitled.

WIDOW *wail*, in *Botany*. See CNEORUM.

WIDURIS, in *Natural History*, the name of a stone found in Java, Malabar, and some other places, and described by Rumphius. Some species of this are all over of a fine white; others are of a dusky colour, with streaks of white; the simply white ones are semi-pellucid, and look very like the white of an egg. Some also have called this the *hyalops*, or *achates vitreæ perspicuitatis*.

WIECK. See WEEK.

WIFE, *uxor*, a married woman; or one joined with, and under the protection of, a husband. See MARRIAGE.

A *wife*, in our English law, is termed FEME *covert*; *fœmina viro co-operta*; her condition during marriage is called her COVERTURE; and, in the judgment of the law, is reputed to have no will, as being supposed entirely under, and subject to, that of her husband: *uxor fulget radiis mariti*.

A man cannot grant any thing to his *wife*, or enter into covenant with her; for the grant would suppose her separate existence, and to covenant with her would be only to covenant with himself; and, therefore, it is generally true, that all compacts made between husband and *wife*, when single, are void by the intermarriage. A woman, however, may be attorney for her husband; and a husband may bequeath any thing to his *wife* by will; for that cannot take effect till the coverture is determined by his death.

From the unity of person that subsists between the husband and *wife*, in consequence of marriage, it follows, that whatever personal property belonged to the *wife* before marriage, is by marriage absolutely vested in the husband. In a real estate, he only gains a title to the rents and profits during coverture; for that, depending upon feodal principles, remains entire to the *wife*, after the death of her husband, or to her heirs, if she dies before him; unless by the birth of a child, he becomes tenant for life by the curtesy. But in chattel interests, the sole and absolute property vests in the husband, to be disposed of at his pleasure, if he chuses to take possession of them: for, unless he reduces them to possession, by exercising some act of ownership upon them, no property vests in him, but they shall remain to the *wife*, or to her representatives, after the coverture is determined.

There is, however, a considerable difference in the acquisition of this species of property by the husband, according to the subject-matter; viz. whether it be a CHATTEL *real* or *personal*; and of chattels personal, whether it be in *possession*, or in *action* only.

A *chattel real* vests in the husband, not absolutely, but *sub modo*. As, in case of a lease for years; the husband shall receive all the rents and profits of it, and may, if he pleases, sell, surrender, or dispose of it during the coverture: if he be outlawed or attainted, it shall be forfeited to the king; it is liable to execution for his debts; and if he survives his *wife*, it is to all intents and purposes his own. Yet if he has made no disposition thereof in his life-time, and dies before his *wife*, he cannot dispose of it by will; for, having never been transferred from the *wife*, after his death she shall remain in her ancient possession, and it shall not go to his executors. Thus also with regard to chattels personal (or *choses*) in *action*; as debts upon bond, contracts, and the like; these the husband may have if he pleases; that is, if he reduces them into possession by receiving or recovering them at law: in which case, they are absolutely and entirely his own; and shall go to his executors or administrators, or as he shall bequeath them by will, and shall not revest in the *wife*. But if he dies before he has reduced them into possession, so that at his death they still continue *choses in action*, they shall survive to the *wife*.

Thus in both these species of property the law is the same, in case the *wife* survives the husband; but, in case the husband survives the *wife*, the law is very different with respect to *chattels real* and *choses in action*; for he shall have the *chattel real* by survivorship, but not the *chose in action*; except in the case of arrears of rent, due to the *wife* before her coverture, which in case of her death are given to the husband by the statute 32 Hen. VIII. cap. 37.

As to *chattels personal* (or *choses*) in *possession*, which the *wife* hath in her own right, as ready money, jewels, houshold goods, and the like, the husband hath therein an immediate and absolute property, devolved to him by the marriage, which can never again revest in the *wife* or her representative.

The *wife* also, by marriage, acquires a property in some of her husband's goods, called her PARAPHERNALIA, which shall remain to her after his death, and shall not go to his executors. These, signifying the apparel and ornaments of the *wife*, suitable to her rank and degree, the husband cannot devise by his will; though during his life perhaps he hath the power (if unkindly inclined to exert it) to sell them or give them away. But if she continues in the use of them till his death, she shall afterwards retain them against his executors and administrators, and all other persons, except creditors where there is a deficiency of assets. And her necessary apparel is protected even against the claim of creditors.

The *wife* can make no contract without her husband's consent; and, in all law-matters, *sine viro respondere non potest*.

The husband is bound to provide his *wife* with necessaries by law, as much as himself; and if she contracts debts for them, he is obliged to pay them; but for any thing besides necessaries, he is not chargeable. Also if a *wife* elopes, and lives with another man, the husband is not chargeable even for necessaries; at least if the person, who furnishes them, is sufficiently apprized of her ELOPEMENT.

If the *wife* be indebted before marriage, the husband is bound afterwards to pay the debt. If the *wife* be injured in her person or property, she can bring no action for redress without her husband's concurrence, and in his name, as well as her own; neither can she be sued, without making the husband a defendant. There is indeed one case where the *wife* shall sue and be sued as a FEME *sole*, viz. where the husband has abjured the realm, or is banished; for he is then dead in law. See CUSTOM *of London*.

In criminal prosecutions, the *wife* may be indicted and punished separately; for the union is only a civil union. But in trials of any sort, they are not allowed to be evidence for, or against, each other. However, where the offence is directly against the person of the *wife*, this rule has been usually dispensed with; and therefore, by statute 3 Hen. VII. cap. 2. in case a woman be forcibly taken away and married, she may be witness against such her husband, in order to convict him of felony. See FORCIBLE *Abduction*.

In the civil law the husband and *wife* are considered as two distinct persons; and may have separate estates, contracts, debts, and injuries; and, therefore, in our ec-

clefiaftical courts, a woman may fue and be fued without her hufband.

But, though our law in general confiders man and *wife* as one perfon, yet there are fome inftances in which fhe is feparately confidered; as inferior to him, and acting by his compulfion. And, therefore, all deeds executed, and acts done by her during her COVERTURE, are void; except it be a fine, or the like matter of record, in which cafe fhe muft be folely and fecretly examined, to learn if her acts be voluntary. She cannot by will devife lands to her hufband, unlefs under fpecial circumftances; for at the time of making it fhe is fuppofed to be under his coercion. And in fome felonies, and other inferior crimes, committed by her through conftraint of her hufband, the law excufes her; but this extends not to treafon and murder. See FEME *covert*.

The hufband alfo, by the old law, might give his *wife* moderate correction: but this power of correction was confined within reafonable bounds, and the hufband was prohibited from ufing any violence to his *wife*. The civil law gave the hufband the fame, or a larger authority over his *wife*; allowing him, for fome mifdemeanors, *flagellis et fuftibus acriter verberare uxorem*; for others, only *modicam caftigationem adhibere*. But, with us, in the politer reign of Charles II. the power of correction began to be doubted; and a *wife* may now have fecurity of the peace againft her hufband, or in return, a hufband againft his *wife*. The courts of law will ftill permit a hufband to reftrain a *wife* of her liberty, in cafe of any grofs mifbehaviour. Blackft. Com. book i. p. 443, &c. book ii. p. 433, &c.

If a *wife* bring forth a child during her hufband's abfence, though of many years; yet if he lived all the time *inter quatuor maria*, within the ifland, he muft father the child; and the child, if firft-born, fhall inherit. See BASTARD.

If a *wife* bring forth a child begot by a former hufband, or any other perfon, before marriage, but born after marriage with another man; this latter muft own the child; and that child fhall be his heir at law.

The *wife*, after her hufband's death, having no JOINTURE fettled before marriage, may challenge the third part of his yearly rents of land, during her life; and, within the city of London, a third part of all her hufband's moveables for ever. See DOWER, INTESTATE, and CUSTOM *of London*.

The *wife* partakes of the honour and condition of her hufband; but none of the *wife*'s dignities come, by marriage, to her hufband.

Yet, the hufband, who marries a woman feifed of lands in fee-fimple or fee-tail, i. e. of any eftate of inheritance, and has by her iffue born alive, which was capable of her eftate, fhall on the death of his *wife*, hold the lands for his life, as TENANT by the CURTESY of England.

The Englifh laws are generally efteemed by foreigners, as very hard, in refpect of the women; and yet Chamberlayne is of a very different opinion, afferting, that the condition of *wives* in England is better than in any other country.

The difabilities, to which the *wife* is fubject, are for the moft part intended for her protection and benefit. So great a favourite (fays judge Blackftone) is the female fex of the laws of England.

Tertullian has two books, on the ornaments and attire of *wives*. In the fecond, he labours to prove that a Chriftian *wife* cannot, in confcience, endeavour to pleafe by her beauty, which fhe knows to be naturally liable to raife loofe defires; and that fhe ought not only to avoid all affected beauty, but even to conceal and cover her natural beauty.

WIFE, *mid, obftetrix*. See DELIVERY.

WIGEON *penelope, anas penelope* of Linnæus, in *Ornithology*, is a well-known bird. Its bill is lead-coloured, and the end of it black; the head, and upper part of the neck, of a bright light bay; the forehead paler, in fome almoft white; the plumage of the back, and fides under the wings, are elegantly marked with narrow, black and white undulated lines; the breaft is of a purplifh hue, fometimes, though rarely, marked with round black fpots; the belly white; and the vent feathers black. In fome birds the coverts of the wings are almoft wholly white; in others of a pale brown, edged with white; the greater quill-feathers are dufky; the outmoft webs of the middle feathers of a fine green, the tips black; the laft are elegantly ftriped with black and white: the two middle feathers of the tail are longer than the others, black and fharp pointed; the reft afh-coloured; the legs dufky.

The head of the female is of a rufty brown, fpotted with black; the back of a deep brown, edged with a paler; the tips of the leffer quill-feathers white; the belly white. Pennant.

WILDERNESS, in *Gardening*. There is nothing fo great an ornament to a large garden as a *wildernefs*, when properly contrived, and judicioufly planted.

The *wildernefs* fhould always be proportioned to the fize of the garden, and fhould never be fituated too near the houfe; becaufe the trees perfpire fo large a quantity of watery vapours, as makes the air very unwholefome: though vegetables ferve, as modern experiments have fufficiently afcertained, to purify and meliorate the air. See *Phlogifticated* AIR.

The *wildernefs* fhould never be fo placed as to block up a good profpect; but where the view naturally ends with the verge of the garden, or little more, nothing terminates it fo well as a fine plantation of trees. The fize of the trees fhould be confidered, and tall growing ones fhould be planted in larger places; fmaller, in lefs extenfive; ever-greens alfo fhould be kept by themfelves, and placed moft in fight, not mingled confufedly among the trees which caft their leaves. The walks fhould be large and not numerous; the large walk is beft made ferpentine, and this fhould not be entered upon the grand walks of the garden, but by fome private walk.

It is too common a method to difpofe the trees in *wilderneffes*, in form of regular fquares, triangles, &c. but this is faulty; for as nature fhould be ftudied in thefe works of fancy, the moft irregular is the moft pleafing plantation. The walks for the fame reafon are much more pleafing when they run in wild meanders, than when they interfect one another in ftudied and regular angles. The winding walks fhould be made to lead to an open circular piece of grafs, with a ftatue, an obelifk, or a fountain; or, if an opening large enough for a banqueting-houfe be contrived in the middle, it will afford a very pleafing fcene. The trees fhould gradually rife from the fides of the walks and openings, one above another to the middle of the quarters, where the largeft trees fhould ftand, by which means the heads of all the trees will appear in view, but their ftems will not appear in fight.

Not only the growth of trees is to be confidered in the planting of a *wildernefs*, but their nakedneffes are to be confidered and hid. The larger growing trees are allowed a proportionable diftance, and their ftems hid by honeyfuckles, rofes, fpiræas, and other low flowering fhrubs. Thefe may alfo be planted next all the walks and openings; and at the foot of thefe, near the walks, may be fet rows of primrofes, violets, and daffodils, with other the like flowers; behind the firft rank of lower flowering fhrubs fhould be planted thofe of a fomewhat higher ftature, as the *althæa-frutices*, the cytifufes and gelder-rofes; and behind thefe may be rows of the talleft flowering fhrubs, as the lilacs, laburnums, and the like; and behind thefe, the heads only of the lower growing trees will appear, which fhould be backed gradually with thofe of higher growth, to the centre of the quarter; from whence the heads of the trees fhould defcend every way to the walks, or openings. The grand walks and openings fhould always be laid with turf, and kept well mowed; but, befide thefe, there ought to be fmaller ferpentine walks through the feveral quarters, where perfons may retire for privacy: thefe fhould be left with the bare earth, only kept clear of weeds, and laid fmooth.

Thefe walks fhould be made as winding as poffible, and a few wood-flowers planted along their fides will have a very good effect. The ever-greens fhould be allotted a peculiar part of the *wildernefs*, and fuch as fronts the houfe; and in the planting of thefe, the fame regard is to be had to their growth, that the talleft trees be planted hindmoft, and their ftems hid by fhorter ones, and fo on, down to the verge: as in the firft row may be planted lauruftines, boxes, fpurge laurels, junipers, and favins; behind thefe, laurels, hollies, and arbutufes; next behind thefe, yews, alaternuffes, phillereys, cypreffes, and Virginian cedars; behind thefe Norway and filver firs, and the true pine; and finally, behind thefe, the Scotch pine and pinafter. Thefe will have a very beautiful appearance, as their tops will only be feen, and make a fheet of green, which may alfo be very beautifully varied, from the artful admixtures of the feveral fhades of green which the various plants have.

In all thefe plantations, the trees, however, fhould not be fet in formal ftiff rows, but in a loofe variety, proportioned to their manner of growth. Miller.

WILD-*fire, ignis gregalis*, or *Græcus*. See *Wild*-FIRE.

WILD-*fire arrows*, fuch as were trimmed with *wild-fire*, and fhot burning, to ftick in the fails or rigging of fhips in a fight. See FIRE-*arrow*.

WILD-*fire*, alfo denotes a difeafe in cattle; which is infectious, deadly, and even reputed incurable.

WILD-*fowl*. See *Water*-FOWL, and DECOY.

WILD-*goofe chace*. See CHASE.

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Thus in both theſe ſpecies of property the law is the ſame, in caſe the *wife* ſurvives the huſband; but, in caſe the huſband ſurvives the *wife*, the law is very different with reſpect to *chattels real* and *choſes in action*; for he ſhall have the *chattel real* by ſurvivorſhip, but not the *choſe in action*; except in the caſe of arrears of rent, due to the *wife* before her coverture, which in caſe of her death are given to the huſband by the ſtatute 32 Hen. VIII. cap. 37.

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The *wife* alſo, by marriage, acquires a property in ſome of her huſband's goods, called her PARAPHERNALIA, which ſhall remain to her after his death, and ſhall not go to his executors. Theſe, ſignifying the apparel and ornaments of the *wife*, ſuitable to her rank and degree, the huſband cannot deviſe by his will; though during his life perhaps he hath the power (if unkindly inclined to exert it) to ſell them or give them away. But if ſhe continues in the uſe of them till his death, ſhe ſhall afterwards retain them againſt his executors and adminiſtrators, and all other perſons, except creditors where there is a deficiency of aſſets. And her neceſſary apparel is protected even againſt the claim of creditors.

The *wife* can make no contract without her huſband's conſent; and, in all law-matters, *ſine viro reſpondere non poteſt*.

The huſband is bound to provide his *wife* with neceſſaries by law, as much as himſelf; and if ſhe contracts debts for them, he is obliged to pay them; but for any thing beſides neceſſaries, he is not chargeable. Alſo if a *wife* elopes, and lives with another man, the huſband is not chargeable even for neceſſaries; at leaſt if the perſon, who furniſhes them, is ſufficiently apprized of her ELOPEMENT.

If the *wife* be indebted before marriage, the huſband is bound afterwards to pay the debt. If the *wife* be injured in her perſon or property, ſhe can bring no action for redreſs without her huſband's concurrence, and in his name, as well as her own; neither can ſhe be ſued, without making the huſband a defendant. There is indeed one caſe where the *wife* ſhall ſue and be ſued as a FEME *ſole*, viz. where the huſband has abjured the realm, or is baniſhed; for he is then dead in law. See CUSTOM *of London*.

In criminal proſecutions, the *wife* may be indicted and puniſhed ſeparately; for the union is only a civil union. But in trials of any ſort, they are not allowed to be evidence for, or againſt, each other. However, where the offence is directly againſt the perſon of the *wife*, this rule has been uſually diſpenſed with; and therefore, by ſtatute 3 Hen. VII. cap. 2. in caſe a woman be forcibly taken away and married, ſhe may be witneſs againſt ſuch her huſband, in order to convict him of felony. See FORCIBLE *Abduction*.

In the civil law the huſband and *wife* are conſidered as two diſtinct perſons; and may have ſeparate eſtates, contracts, debts, and injuries; and, therefore, in our eccleſiaſtical

clesiastical courts, a woman may sue and be sued without her husband.

But, though our law in general considers man and *wife* as one person, yet there are some instances in which she is separately considered; as inferior to him, and acting by his compulsion. And, therefore, all deeds executed, and acts done by her during her COVERTURE, are void; except it be a fine, or the like matter of record, in which case she must be solely and secretly examined, to learn if her acts be voluntary. She cannot by will devise lands to her husband, unless under special circumstances; for at the time of making it she is supposed to be under his coercion. And in some felonies, and other inferior crimes, committed by her through constraint of her husband, the law excuses her; but this extends not to treason and murder. See FEME *covert*.

The husband also, by the old law, might give his *wife* moderate correction: but this power of correction was confined within reasonable bounds, and the husband was prohibited from using any violence to his *wife*. The civil law gave the husband the same, or a larger authority over his *wife*; allowing him, for some misdemeanors, *flagellis et fustibus acriter verberare uxorem*; for others, only *modicam castigationem adhibere*. But, with us, in the politer reign of Charles II. the power of correction began to be doubted; and a *wife* may now have security of the peace against her husband, or in return, a husband against his *wife*. The courts of law will still permit a husband to restrain a *wife* of her liberty, in case of any gross misbehaviour. Blackst. Com. book i. p. 443, &c. book ii. p. 433, &c.

If a *wife* bring forth a child during her husband's absence, though of many years; yet if he lived all the time *inter quatuor maria*, within the island, he must father the child; and the child, if first-born, shall inherit. See BASTARD.

If a *wife* bring forth a child begot by a former husband, or any other person, before marriage, but born after marriage with another man; this latter must own the child; and that child shall be his heir at law.

The *wife*, after her husband's death, having no JOINTURE settled before marriage, may challenge the third part of his yearly rents of land, during her life; and, within the city of London, a third part of all her husband's moveables for ever. See DOWER, INTESTATE, and CUSTOM *of London*.

The *wife* partakes of the honour and condition of her husband; but none of the *wife*'s dignities come, by marriage, to her husband.

Yet, the husband, who marries a woman seised of lands in fee-simple or fee-tail, i. e. of any estate of inheritance, and has by her issue born alive, which was capable of her estate, shall on the death of his *wife*, hold the lands for his life, as TENANT by the CURTESY of England.

The English laws are generally esteemed by foreigners, as very hard, in respect of the women; and yet Chamberlayne is of a very different opinion, asserting, that the condition of *wives* in England is better than in any other country.

The disabilities, to which the *wife* is subject, are for the most part intended for her protection and benefit. So great a favourite (says judge Blackstone) is the female sex of the laws of England.

Tertullian has two books, on the ornaments and attire of *wives*. In the second, he labours to prove that a Christian *wife* cannot, in conscience, endeavour to please by her beauty, which she knows to be naturally liable to raise loose desires; and that she ought not only to avoid all affected beauty, but even to conceal and cover her natural beauty.

WIFE, *mid*, *obstetrix*. See DELIVERY.

WIGEON *penelope*, *anas penelope* of Linnæus, in *Ornithology*, is a well-known bird. Its bill is lead-coloured, and the end of it black; the head, and upper part of the neck, of a bright light bay; the forehead paler, in some almost white; the plumage of the back, and sides under the wings, are elegantly marked with narrow, black and white undulated lines; the breast is of a purplish hue, sometimes, though rarely, marked with round black spots; the belly white; and the vent-feathers black. In some birds the coverts of the wings are almost wholly white; in others of a pale brown, edged with white; the greater quill-feathers are dusky; the outmost webs of the middle feathers of a fine green, the tips black; the last are elegantly striped with black and white: the two middle feathers of the tail are longer than the others, black and sharp pointed; the rest ash-coloured; the legs dusky.

The head of the female is of a rusty brown, spotted with black; the back of a deep brown, edged with a paler; the tips of the lesser quill-feathers white; the belly white. Pennant.

WILDERNESS, in *Gardening*. There is nothing so great an ornament to a large garden as a *wilderness*, when properly contrived, and judiciously planted.

The *wilderness* should always be proportioned to the size of the garden, and should never be situated too near the house; because the trees perspire so large a quantity of watery vapours, as makes the air very unwholesome: though vegetables serve, as modern experiments have sufficiently ascertained, to purify and meliorate the air. See *Phlogisticated* AIR.

The *wilderness* should never be so placed as to block up a good prospect; but where the view naturally ends with the verge of the garden, or little more, nothing terminates it so well as a fine plantation of trees. The size of the trees should be considered, and tall growing ones should be planted in larger places; smaller, in less extensive; ever-greens also should be kept by themselves, and placed most in sight, not mingled confusedly among the trees which cast their leaves. The walks should be large and not numerous; the large walk is best made serpentine, and this should not be entered upon the grand walks of the garden, but by some private walk.

It is too common a method to dispose the trees in *wildernesses*, in form of regular squares, triangles, &c. but this is faulty; for as nature should be studied in these works of fancy, the most irregular is the most pleasing plantation. The walks for the same reason are much more pleasing when they run in wild meanders, than when they intersect one another in studied and regular angles. The winding walks should be made to lead to an open circular piece of grass, with a statue, an obelisk, or a fountain; or, if an opening large enough for a banqueting-house be contrived in the middle, it will afford a very pleasing scene. The trees should gradually rise from the sides of the walks and openings, one above another to the middle of the quarters, where the largest trees should stand, by which means the heads of all the trees will appear in view, but their stems will not appear in sight.

Not only the growth of trees is to be considered in the planting of a *wilderness*, but their nakednesses are to be considered and hid. The larger growing trees are allowed a proportionable distance, and their stems hid by honeysuckles, roses, spiræas, and other low flowering shrubs. These may also be planted next all the walks and openings; and at the foot of these, near the walks, may be set rows of primroses, violets, and daffodils, with other the like flowers; behind the first rank of lower flowering shrubs should be planted those of a somewhat higher stature, as the *althæa-frutices*, the cytisuses and gelder-roses; and behind these may be rows of the tallest flowering shrubs, as the lilacs, laburnums, and the like; and behind these, the heads only of the lower growing trees will appear, which should be backed gradually with those of higher growth, to the centre of the quarter; from whence the heads of the trees should descend every way to the walks, or openings. The grand walks and openings should always be laid with turf, and kept well mowed; but, beside these, there ought to be smaller serpentine walks through the several quarters, where persons may retire for privacy: these should be left with the bare earth, only kept clear of weeds, and laid smooth.

These walks should be made as winding as possible, and a few wood-flowers planted along their sides will have a very good effect. The ever-greens should be allotted a peculiar part of the *wilderness*, and such as fronts the house; and in the planting of these, the same regard is to be had to their growth, that the tallest trees be planted hindmost, and their stems hid by shorter ones, and so on, down to the verge: as in the first row may be planted laurustines, boxes, spurge laurels, junipers, and savins; behind these, laurels, hollies, and arbutuses; next behind these, yews, alaternusses, phillereys, cypresses, and Virginian cedars; behind these Norway and silver firs, and the true pine; and finally, behind these, the Scotch pine and pinaster. These will have a very beautiful appearance, as their tops will only be seen, and make a sheet of green, which may also be very beautifully varied, from the artful admixtures of the several shades of green which the various plants have.

In all these plantations, the trees, however, should not be set in formal stiff rows, but in a loose variety, proportioned to their manner of growth. Miller.

WILD-*fire*, *ignis gregalis*, or *Græcus*. See *Wild*-FIRE.

WILD-*fire arrows*, such as were trimmed with *wild-fire*, and shot burning, to stick in the sails or rigging of ships in a fight. See FIRE-*arrow*.

WILD-*fire*, also denotes a disease in cattle; which is infectious, deadly, and even reputed incurable.

WILD-*fowl*. See *Water*-FOWL, and DECOY.

WILD-*goose chace*. See CHASE.

WILD *honey*. See HONEY.

WILDS, a term used by our farmers to express that part of a plough by which the whole is drawn forwards.

The *wilds* are of iron, and are of the form of a gallows, whence they are by some called the GALLOWS of the *plough*, but improperly; the gallows of the plough being properly that part formed by the crow-staves, and the transverse piece into which they are mortised at the top. The *wilds* consist of two legs, and a transverse top-piece: one of the legs, and the top-piece, are all of one piece of iron, and the other leg, which is loose, has a hole in the top, into which the end of the transverse piece is received; both these legs pass through the box of the plough, which is that transverse timber through which the spindles of the wheels run: these legs are pinned in behind the box with iron-pins: the holes through the box at which these legs pass, are not made at right angles, but slanting upwards, so that the fore-part of the *wilds* is higher than the hinder-part; were it not for this, the upper part of the crow-staves would lean quite back, when the plough is drawn.

The use of the notches in the *wilds* is to give the plough a broader or narrower furrow; if the links are moved to the notches on the right hand, it brings the wheels toward the left, which gives the greater furrow; and, on the contrary, a smaller furrow is made when the links are moved to the notches on the left. The legs of the *wilds* should be nineteen inches, and their distance eight inches and a half; they must be made strong, and the links must be placed in different notches, that the front of the plough may be kept steady, and the wheels not be drawn one before the other. These links are of iron also, and are each six inches and a half long, and to these are fastened the chains of the harness, by which the whole plough is drawn along.

WILL, *voluntas*, is usually defined a faculty of the mind, whereby it embraces or rejects any thing represented to it, as good or evil, by the judgment.

Others will have it to be the mind itself, considered as embracing or refusing; adding, that as the understanding is nothing else but the soul, considered as *perceiving*; so the *will* is nothing else but the soul considered as *willing*, &c.

Mr. Locke more intelligibly defines the *will*, a faculty which the soul has of beginning, or forbearing, continuing or ending, several actions of the mind, and motions of the body, barely by a thought or preference of the mind, ordering, or as it were, commanding the doing, or not doing, such and such a particular action. This power, which the mind has, to order the consideration of any idea, or the forbearing to consider it; or to prefer the motion of any part of the body to its rest, and *vice versa*, is what we call the *will*. See POWER.

The actual exercise of that power, is what we call *volition*, or *willing*; and the doing or forbearing of any action consequent on such order of the mind, is called *voluntary*. So far, according to this writer, as a man has a power to think or not to think, to move or not to move, according to the preference or direction of his own mind, so far he is free: and hence LIBERTY, he says, is not an idea belonging to volition, or preferring; but to the person having the power of doing, or forbearing to do, as the mind shall chuse or direct. On the other hand, wherever any performance or forbearance is not equally in a man's power; wherever doing or not doing will not equally follow upon the preference of his mind; there he is not free, though perhaps the action may be voluntary. Accordingly where thought is wholly wanting, or the power to act or forbear according to the direction of thought, there NECESSITY takes place; this, in an agent capable of volition, when the beginning or continuation of any action is contrary to the preference of his mind, is called *compulsion*: when the hindering or stopping of any action is contrary to his volition, it is called *restraint*. Agents that have no thought, no volition at all, are in every respect necessary agents.

Father Malebranche lays it down, that the *will* is that to the soul, which motion is to the body; and argues, that as the Author of nature is the universal cause of all the motions in matter, so he is of all the inclinations in the mind; and that as all motions are direct, unless their course be diverted and changed by some foreign cause; so all inclinations are right, and could have no other end but the enjoyment of truth and goodness, were there not some foreign cause, to determine the natural impression to evil ends.

Accordingly, he defines *will* to be the impression, or natural motion, which carries us towards good indeterminately, and in the general; and the power the mind has, to direct this general impression towards any particular object that pleases it, is what he calls LIBERTY.

Aristotle distinguishes two kinds of acts of the *will*, viz. βελησις, *willing*, *volition*; and προαιρεσις, *election*. The first, that employed about the ultimate end; the latter, about the means.

The schoolmen also distinguish the actions of the *will*, into *elicit* and *commanded*. Elicit acts, *actiones elicitæ*, are those immediately produced by the *will*, and really inherent therein; such are *willing*, and *nilling*. Commanded acts, *actiones imperatæ*, are effects produced by other powers; v. gr. the sensitive, intellective, or locomotive powers, at the command or instigation of the *will*. As, to *follow*, *stay*, *fight*, *fly*, &c.

But others will have the former kind properly to belong to the understanding; and only the latter to the *will*.

The word *will* is taken in three senses; 1. For the power or faculty of *willing*, in which sense it is, we have considered it above.

2. For the act or exercise of this power; as, when we say, No man *wills* his own destruction.

3. For a habit, or a constant disposition and inclination to do any thing. In which sense, justice is defined a constant *will* to give every one what belongs to him: *Justitia est constans & perpetua voluntas jus suum unicuique tribuendi*. Instit. Justin.

WILL, *antecedent*. See ANTECEDENT.

WILL, *free*. See LIBERTY, and FREEDOM.

WILL, *Last* WILL, or *Testament*, in *Law*, a solemn act, or instrument, whereby a person declares his mind and intention as to the disposal of his goods, effects, &c. after his death. See TESTAMENT.

This act or instrument is emphatically styled the *will* of the deceased, because it directs the disposal of the whole or part of his property, by written or oral instructions properly witnessed and authenticated, according to his pleasure. Some have distinguished between a testament and a *will*: a *will* being properly limited to land, and a testament only to chattels, requiring executors, which a *will* only for land doth not require: so that every testament is a *will*, but every *will* is not a testament. However, the words have been commonly used indiscriminately.

WILLS, *history of*. *Wills* or testaments, says judge Blackstone, are of very high antiquity. We find them among the ancient Hebrews: not to mention what Eusebius and others have related of Noah's testament, made in writing and witnessed under his seal, whereby he disposed of the whole world, a more authentic instance of the early use of testaments occurs in the sacred writings (Gen. chap. xlviii.), wherein Jacob bequeaths to his son Joseph a portion of his inheritance double to that of his brethren; which *will* we find executed many hundred years afterwards, when the posterity of Joseph were divided into two distinct TRIBES, those of Ephraim and Manasseh, and had two several inheritances assigned them; whereas the descendants of each of the other patriarchs formed only a single tribe, and had only one lot of inheritance. Solon was the first legislator that introduced *wills* into Athens; but in many other parts of Greece they were totally discountenanced. In Rome they were unknown, till the laws of the Twelve Tables were compiled, which first gave the right of bequeathing; and among the northern nations, particularly among the Germans, testaments were not received into use. Hence it appears, that the right of making *wills* and disposing of property after death, is merely a creature of the civil state, which has permitted it in some countries and denied it in others, and subjected it to various restrictions and regulations, where the law allows it.

With us in England, this power of bequeathing is coeval with the first rudiments of the law; not indeed, that it extended originally to *all* a man's personal estate. See RATIONABILI *parte bonorum*.

It is also sufficiently clear that, before the Conquest, lands were devisable by *will*. But, upon the introduction of the military tenures, the restraint of devising lands naturally took place, as a branch of the feodal doctrine of non-alienation without the consent of the lord. By the common law of England since the Conquest, no estate, greater than for term of years, could be disposed of by testament; except only in Kent, and in some ancient burghs, and a few particular manors, where their Saxon immunities by special indulgence subsisted. But when ecclesiastical ingenuity had invented the doctrine of USES, as a thing distinct from the land, uses began to be devised very frequently, and the devisee of the use could in chancery compel its execution. However, when the statute of uses, viz. 27 Hen. VIII. cap. 10. had annexed the possession to the use, these uses, being now the very land itself, became no longer devisable: whereupon the statute of *wills* was made, viz. 32 Hen. VIII. cap. 1. explained by 34 Hen. VIII. cap. 5. which enacted, that all persons being seised in fee-simple (except feme-coverts, infants, ideots, and persons of nonsane memory)

memory) might by *will* and teſtament in writing deviſe to any other perſon, except to bodies corporate, two-thirds of their lands, tenements and hereditaments, held in chivalry, and the whole of thoſe held in ſocage: which, now, through the alteration of tenures by the ſtatute of Charles II. 12 Car. II. cap. 25, amounts to the whole of their landed property, except their copy-hold tenements. As for copyhold and other cuſtomary lands, theſe are deviſable or not, according to the cuſtom of the reſpective manors. And generally, a deviſe of copyhold will not paſs, without a SURRENDER to the uſe of the *will.* In the caſe of a child or widow, a court of equity, in favour of theſe, will ſupply a defect of ſurrender: ſo alſo, when there is a general deviſe of real eſtate to pay debts, and there is no real eſtate but copyhold: alſo where a copyhold is in the hands of truſtees, the perſon for whom the lands are holden in truſt may deviſe the ſame without ſurrender. And if a man, ſeiſed of copyhold lands, ſurrenders the ſame to the uſe of his *will*, and executes a *will*, not atteſted by any witneſſes, yet it ſhall direct the uſes of the ſurrender. See MORTMAIN.

WILLS, *perſons capable of making.* Every perſon hath full power and liberty to make a *will*, that is not under ſome ſpecial prohibition by law or cuſtom: which prohibitions are principally upon three accounts; for want of ſufficient diſcretion; for want of ſufficient liberty and free *will*; and on account of their criminal conduct.

In the firſt claſs are to be reckoned infants, under the age of fourteen if males, and twelve if females; which is the rule of the civil law. By ſtatute 34 and 35 Hen. VIII. cap. 5. *wills* or teſtaments made of any manors, lands, tenements, or other hereditaments, by any perſon within the age of twenty-one years, ſhall not be taken to be good or effectual in law. But by cuſtom in particular places, they may deviſe lands before the age of twenty-one. If the teſtator is not of ſufficient diſcretion, whatever be his age, that will overthrow his teſtament. Accordingly, madmen, or otherwiſe *non compotes*, ideots or natural fools, perſons grown childiſh by age or diſtemper, ſuch as have their ſenſes beſotted with drunkenneſs: all theſe are incapable, by reaſon of mental diſability, to make any *will* as long as ſuch diſability laſts. To this claſs may alſo be referred ſuch perſons as are born deaf, blind, and dumb; who, as they have always wanted the common inlets of underſtanding, are incapable of having *animum teſtandi*, and their teſtaments are therefore void. It has been maintained that perſons deaf and dumb, who underſtand what a teſtament meaneth, and that are deſirous of making one, may by ſigns and tokens declare their teſtament: and that a blind perſon may make a nuncupative teſtament, by declaring his *will* before a ſufficient number of witneſſes: and he may make his teſtament in writing, provided the ſame be read before witneſſes, and in their preſence acknowledged by the teſtator for his laſt *will.* Swinb. 95, 96.

Perſons of the ſecond deſcription are by the civil law of various kinds; as priſoners, captives, and the like. But the law of England does not make ſuch perſons abſolutely inteſtable; but only leaves it to the diſcretion of the court to judge, upon the conſideration of their peculiar circumſtances of dureſs, whether they could be ſuppoſed to have *liberum animum teſtandi.* With regard to feme-coverts, our laws differ ſtill more materially from the civil. Among the Romans, a married woman was as capable of bequeathing as a feme-ſole. But with us a married woman is not only utterly incapable of deviſing lands, being excepted out of the ſtatute of *wills*, 34 and 35 Hen. VIII. cap. 5. but alſo ſhe is incapable of making a teſtament of chattels, without the licence of her huſband, who frequently, upon marriage, covenants with her friends to allow her that licence: his aſſent, therefore, muſt be given to the particular *will* in queſtion, without which it will not be a complete teſtament. Her *will*, therefore, operates in the nature of an appointment, the execution of which the huſband by his bond, agreement, or covenant, is bound to allow. The QUEEN-*conſort* is an exception, for ſhe may diſpoſe of her chattels by *will*, without the conſent of her lord: and any feme-covert may make her *will* of goods, which were in her poſſeſſion *in auter droit*, as executrix or adminiſtratrix; for theſe can never be the property of her huſband: and, if ſhe has any pin-money or ſeparate maintenance, it is ſaid ſhe may diſpoſe of her ſavings thereout by teſtament, without the controul of her huſband. But if a feme-ſole makes her *will*, and afterwards marries, ſuch ſubſequent marriage is eſteemed a revocation in law, and entirely vacates the *will.*

Perſons of the third claſs are firſt, all traitors and felons, from the time of conviction; for then their goods and chattels are forfeited to the king. Neither can a *felo de ſe* make a *will* of goods and chattels, for they are forfeited by the act and manner of his death; but he may make a deviſe of his lands, for they are not ſubjected to any forfeiture. Outlaws alſo, though only for debt, are incapable of making a *will*, ſo long as the outlawry ſubſiſts, for during that time their goods and chattels are forfeited; but he that is outlawed in an action perſonal, may make his teſtament of lands; for they are not forfeited. For Coke obſerves, that an excommunication (meaning the greater excommunication), is worſe than an outlawry. As for perſons guilty of other crimes, ſhort of felony, who are by the civil law precluded from making teſtaments (as uſurers, libellers, and others of a worſe ſtamp) by the common law their teſtaments may be good.

WILL, *nature and incidents of a.* *Wills* or teſtaments are divided into two ſorts, viz. *written* and *verbal* or *nuncupative*: of which the former is committed to writing; the latter depends merely upon oral evidence, being declared by the teſtator *in extremis* before a ſufficient number of witneſſes, and afterwards reduced to writing. A CODICIL is a ſupplement to a *will.*

As *nuncupative wills* and codicils are liable to great impoſitions, and may occaſion many perjuries, the ſtatute of frauds, 29 Car. II. cap. 3. hath laid them under many reſtrictions; except when made by mariners at ſea, and ſoldiers in actual ſervice. As to all other perſons, it enacts, 1. that no written *will* ſhall be revoked or altered by a ſubſequent nuncupative one, except the ſame be in the life-time of the teſtator reduced to writing, and read over to him and approved; and unleſs the ſame be proved to have been ſo done by the oaths of three witneſſes at the leaſt; who, by 4 and 5 Ann. cap. 16. muſt be ſuch as are admiſſible upon trials at common law.

2. That no *nuncupative will* ſhall be good, where the eſtate bequeathed exceeds 30*l.* unleſs proved by three ſuch witneſſes, preſent at the making of it, and unleſs they or ſome of them were ſpecially required to bear witneſs to it by the teſtator; and unleſs it was made in his laſt ſickneſs, in his own habitation, or where he had previouſly reſided at leaſt ten days, except he be ſurpriſed with ſickneſs on a journey, or from home, and dies without returning to his dwelling.

3. That no *nuncupative will* ſhall be proved by the witneſſes after ſix months from the making, unleſs it were put in writing within ſix days: nor ſhall it be proved till fourteen days after the death of the teſtator, nor till proceſs hath firſt iſſued to call in the widow, or next of kin, to conteſt it if they think proper.

As to *written wills* (viz. thoſe that concern not the deviſe of lands) they need not any witneſs of their publication. A teſtament of chattels, written in the teſtator's own hand, though it has neither his name nor ſeal to it, nor witneſſes preſent at its publication, is good; provided ſufficient proof can be had that it is his hand-writing. And though written in another man's hand, and never ſigned by the teſtator, yet if proved to be according to his inſtructions and approved by him, it hath been held a good teſtament of the perſonal eſtate. However, it is the ſafer and more prudent way, and leaves leſs in the breaſt of the eccleſiaſtical judge, if it be ſigned or ſealed by the teſtator, and publiſhed in the preſence of witneſſes.

The ſtatute of frauds and perjuries, 29 Car. II. cap. 3. directs, that all deviſes of lands and tenements ſhall not only be in writing, but ſigned by the teſtator, or ſome other perſon in his preſence, and by his expreſs direction; and be ſubſcribed, in his preſence, by three or four credible witneſſes. In the conſtruction of this ſtatute, it has been adjudged that the teſtator's name, written with his own hand at the beginning of his will, as, "I John Mills do make this my laſt *will*," &c. is a ſufficient ſigning, without any name at the bottom; though the other is the ſafer way. It has alſo been determined, that though the witneſſes muſt all ſee the teſtator ſign, or at leaſt acknowledge the ſigning, yet they may do it at different times. But they muſt all ſubſcribe their names as witneſſes in his preſence, leſt by any poſſibility they ſhould miſtake the inſtrument. In one caſe determined by the court of king's bench, the judges would not allow any legatee, nor conſequently a creditor, where the legacies and debts were charged on the real eſtate, to be a competent witneſs to the deviſe. This determination occaſioned the ſtatute 25 Geo. II. cap. 6. which reſtored both the competency and credit of ſuch legatees, by declaring void all legacies given to witneſſes, and thereby removing all poſſibility of their intereſt affecting their teſtimony. The ſame ſtatute likewiſe eſtabliſhed the competency of creditors, by directing their teſtimony to be admitted; but leaving their credit (like that of all other witneſſes) to be conſidered, on a view of all the circumſtances, by the court and jury

before

before whom such will shall be contested. And in a much later case, M. 31 George II. the testimony of three witnesses, who were creditors, was held to be sufficiently credible, though the land was charged with the payment of debts.

No testament is of any effect till after the death of the testator; and, therefore, if there be many testaments, the last overthrows all the former; but the republication of a former *will* revokes one of a later date, and establishes the first again.

From the above accounts it follows, that testaments may be avoided three ways: 1. If made by a person labouring under any of the incapacities before mentioned. 2. By making another testament of a later date. And 3. By cancelling or revoking it.

The Romans were wont to set aside testaments, as being *inofficiosa*, deficient in natural duty, if they disinherited or totally passed by (without assigning a true and sufficient reason) any of the children of the testator. But if the child had any legacy, though ever so small, it was a proof that the testator had not lost his memory or his reason, which otherwise the law presumed. Hence probably, says Blackstone, has arisen that groundless vulgar error of the necessity of leaving the heir a shilling or some other express legacy, in order to effectually disinherit him; whereas the law of England, though the heir or next of kin be totally omitted, admits no *querela inofficiosa*, to set aside such testament. Burn's Eccl. Law, vol. iv. art. WILL. Blackst. Com. book ii. p. 373, &c. 489, &c.

WILL, *qualification and office of the executor of a.* See EXECUTOR, EXECUTOR *de son tort*, and JOINT-*Executors*. See also DEBTS, DEBTEE-*Executor*, INVENTORY, and LEGACY.

WILL, *probate of a.* See PROBATE.

The STAMP-*duty* imposed on receipts for legacies, according to their several amounts, by 20 Geo. III. cap. 48. is doubled by 23 Geo. III. cap. 58; which enacts, that an additional duty of 20*s.* be paid for every sum of 100*l.* provided that this shall not extend to charge with the additional duties imposed by 23 Geo. III. cap. 58. any legacy or distributive share to the wife, children, or grand-children of the deceased.

Estate at WILL, in *Law*, is where lands and tenements are let by one man to another, to have and to hold at the *will* of the lessor; and the tenant by force of this lease obtains possession. Every estate of this kind is at the *will* of both parties, landlord and tenant; so that either of them may determine his *will*, and quit his connexion with the other at his own pleasure, under certain restrictions. For, if the tenant at *will* sows his land, and the landlord, before the corn is ripe, or reaped, puts him out, the tenant shall have the EMBLEMENTS, and free ingress and egress to cut and carry away the profits. But where the tenant himself determines the *will*, the landlord shall have the profits of the land. The law is careful, that no such sudden determination of the *will* by one party shall tend to the manifest and unforeseen prejudice of the other. This appears in the case of emblements just mentioned; and also, the lessee after the determination of the lessor's *will* shall have reasonable ingress and egress to fetch away his goods and utensils. And if rent be payable quarterly or half-yearly, and the lessee determines the *will*, the rent shall be paid to the end of the current quarter or half-year. Upon the same principle, courts of law have of late years inclined as much as possible against construing demises, where no certain term is mentioned, to be tenancies at *will*: but have rather held them to be tenancies from year to year, so long as both parties please, especially where an annual rent is reserved: in which case they will not suffer either party to determine the tenancy even at the end of the year, without reasonable notice to the other. Blackst. Com. vol. ii. p. 145, &c.

WILL *with a wisp*. See IGNIS *Fatuus*.

WILLIAM, *sweet*, in *Botany*. See DIANTHUS, and PINK.

WILLOW, *salix*, in *Botany*, a genus of the *dioecia diandria* class. Its characters are these: it has male and female flowers on separate plants; the male flowers are disposed in one common oblong imbricated katkin, the scales have each one oblong spreading flower which has no petal, but a cylindrical nectarious gland in the centre; it has two slender erect stamina terminated by twin summits, having four cells; the female flowers are disposed in katkins like the male, but have neither petals nor stamina, but an oval narrowed germen scarcely distinguishable from the style, crowned by two bifid erect stigmas; the germen becomes an oval awl-shaped capsule with one cell opening with two valves, containing many small oval seeds, crowned with hairy down. There are many species, some of which are low creeping shrubs of no use; Linnæus enumerates thirty, and Miller fourteen species which are cultivated.

All the sorts of *willow* may be readily propagated by cuttings or sets, either in spring or autumn, which easily take root; but when they are propagated for the timber which is very useful to turners, as well as in other articles, they should be propagated by young short branches, which should be planted almost their whole length in the ground, and when the buds have made one year's shoot they should be all cut off, except the strongest and best situated, which must be trained up to a stem like other timber trees; by which means they will rise with upright stems forty or fifty feet high: the rows should be four feet asunder, and the sets two feet distant in the rows.

The weeping *willow*, or *salix babylonica* of Linnæus, with smooth, sawed, linear, spear-shaped leaves and hanging branches, grows naturally in the Levant, and has been several years cultivated in the English gardens.

The sallows are commonly planted in February, in cuttings from strong shoots of the former year, about three feet long; placed at about three feet row from row, and eighteen inches asunder in the rows. These are cut every year, and if the soil is good, yield a profitable crop.

The common sallow, broad-leaved *willow*, or *salix caprea*, requires a drier soil than the other species, and will thrive upon the highest hills: hence it is called mountain osier. The wood of this is smooth, soft, and flexible: it is converted into charcoal for making gunpowder and drawing pencils. The Laplanders make a sort of leather of the bark, which they manufacture into gloves: and they give a decoction of the leaves for the heart-burn.

The *common willow*, or *salix alba*, loves a moist and open situation, grows quick and bears lopping. The bark of this tree, gathered in summer when full of sap, and dried by a gentle heat, has lately been found by the Rev. Mr. Stone an useful medicine in agues; of which many persons have been cured by taking a dram of this powdered bark every four hours during the intermissions; though in some cases it was necessary to join to it a fifth part of Peruvian bark. Phil. Transf. vol. liii. p. 195.

To the taste this bark discovers a pretty strong bitterness and astringency: with solution of chalybeate vitriol it strikes an inky blackness. This bark will tan leather.

Our common *willows*, in the spring season, when they are in flower, produce a quantity of cottony matter, which might be put to some use.

The Chinese are industrious enough to collect this cotton as it falls from their *willows*; and the women and children, among the poorer people, card it, and pick out the seeds, and render it fit for many uses in the place of cotton.

The poor people, in some part of the Indies, make a sort of liquor of the flowers of their *willows* before they are opened, which intoxicates them very suddenly; and the dry husks of the same tree, remaining after the flowers and seeds are fallen, are wholesome as food, people in time of famine having lived upon them, boiled in water.

The wood of the *willow*, though in itself very light and spongy, is yet of a nature to bear the injuries of wet better than almost any other kind. It is used by the Chinese on this occasion, in the making of their wells, and on all other occasions where wood is to stand under water, and succeeds perfectly well. Observ. sur les Coutumes de l'Asia.

WILLOW-*galls*, in *Natural History*, the name given by authors to certain protuberances found very frequently on the leaves of the several species of *willow*, which are properly galls, each containing the worm of a fly, and owing its existence to that insect.

The galls are usually of a roundish or oblong figure, and are equally protuberant on each side of the leaf: they are of a pale green at first; but they afterwards becom[illegible] yellowish, and finally reddish. The surface of the [illegible] seldom perfectly even, but usually has several [illegible] minences and cavities in it. When this [illegible] there is found in it a worm resembling [illegible] figure, having a smooth annulated body, a [illegible] head, and twenty legs: and by Reaumur ca[illegible] bastard-caterpillar. This creature, when th[illegible] young, is blue; it afterwards becomes greeni[illegible] finally, when the gall becomes red, it is white. T[illegible] insect seems to eat in its prison more voraciousl[illegible] any other gall-insect whatever; for while the gall g[illegible] in size, it becomes also thinner in every part; so that th[illegible] creature, at the proper time, has but little difficulty to get out. Reaum. Hist. Insect. vol. vi. p. 211.

When the time of the last change of this insect draws nigh, it leaves the tree, and descending to the earth makes its way into it in a proper place, and then become[illegible]

a nymph,

a nymph, out of which at a proper time issues a four-winged fly.

The flies which are produced in April, copulate almost as soon as freed from their exuviæ of the chrysalis state, and the females soon after lodge their eggs in the leaves of the *willows*. This is all done before the end of April, and the young ones hatched of these eggs, live but a short time before they pass into the chrysalis state, and living flies are hatched from these in June. The young ones of this brood pass their chrysalis state in the earth, and appear not during the whole winter, till the spring sun enlivens them again. There is, beside these, another kind of galls of the *willow*-leaves, which are of the class of those, each of which contains several cells; in each cell of these there is found a small white maggot, the offspring of the egg of a two-winged fly, which, after passing the chrysalis state in the earth, also comes out in the form of its winged parent. The cells in the galls are different in number in the several galls, and are from four or five to twenty: they have no communication with one another, but each worm lives in its own cell.

Beside these there is also sometimes found in these galls a worm of a brownish white colour, having two hooks in its head, and no legs at all. This has all the appearance of a carnivorous animal, and probably was deposited there in the egg-state by its parent, not to feed on the gall, but on its defenceless inhabitant. This worm finally becomes a small bluish beetle, and is often found alone in the cavity of the gall, often in company with its proper inhabitant, sucking its juices as it feeds on those of the plant. There seem to be several species of these devourers common to these galls; since Vallisnieri observed, in the boxes where he kept these galls to produce the animals from thence, many species of small beetles, and several distinct kinds of flies, which were probably the last state of several kinds of carnivorous worms, which had preyed upon the proper inhabitant of the galls. Vallisnieri, Dialog. des Insect.

WILLOW-*herb*, or *French* WILLOW, *epilobium*, in *Botany*, a genus of the *octandria monogynia* class. Its characters are these: the empalement of the flower is composed of four oblong pointed leaves, which are coloured; the flower has four bordered petals which spread open, and eight stamina which are alternately shorter, terminated by oval compressed summits; under the flower is situated a long cylindrical germen, which becomes a cylindrical furrowed capsule with five cells filled with oblong seeds, crowned with down. Linnæus enumerates seven, and Miller two species, that are cultivated; one of which makes a good appearance when in flower, and is very proper to cut for basons to adorn chimnies in the summer season. The other is found wild on the sides of ditches; the leaves of which being rubbed, smell like scalded apples, which has obtained for it the name of codlins and cream.

WILLOW-*herb* is a name sometimes given to the *lythrum* or *purple* LOOSE-*strife*.

WILLOW, *sweet*, *Dutch* WILLOW, GALE, or *Candleberry* MYRTLE, in *Botany*. See CANDLE-*berry-tree*, and *Candle-berry* MYRTLE.

WIMBREL, in *Ornithology*, the English name of a bird of the curlew-kind, the SCOLOPAX *phæopus* of Linnæus, and known among authors by the name of *arquata minor*, or the lesser curlew, and called in the Venetian markets *taraniola*.

It is much of the shape of the common curlew, but is not more than half its size. Its beak is about three fingers-breadth long, dusky above and red below; its feet are greenish; the feathers on the head and neck brown tinged with red, marked in the middle with an oblong black spot; the upper part of the back, coverts of the wings, scapulars, and farthest quill-feathers of the same colour with the neck, but the black spots spread out transversely on each web; the quill-feathers dusky, their shafts white, and their exterior webs marked with large semi-circular white spots; the breast, belly, and lower part of the back are white; the coverts of the tail and tail are of a pale whitish brown, crossed with black bars. Its haunts and food are much the same with those of the curlew, but it is much less frequent on our shores. Pennant. See *Tab.* V. *Birds*, N° 61.

WIMPEL, of the Dutch *wimpel*, a muffler, a plaited linen cloth, which nuns wear to cover their necks and breasts. The word is also sometimes used for a streamer, or flag.

WIN, at the beginning or end of the names of places, signifies that some great battle was fought, or a victory gained there. The word is formed from the Saxon *winnan*, *to win*, or *overcome*.

WINCH, a popular term for a WINDLASS.

WINCH also denotes the crooked handle for turning round wheels, grind stones, &c.

WINCHING, in the *Manege*, is said of a horse when he kicks, spurs, or throws out his hind feet.

WINCRANTUM, in *Natural History*, a name given by the people of the East Indies to a fossile substance resembling, in some degree, the plated lead-ores of Europe, but containing very little of that metal; it is properly a species of blende, or mock-lead, of a talcky appearance; it is considerably hard, and is usually found in other stones. It is given in medicine in the Indies as a provocative to venery, being first calcined and beat to powder.

WIND, *ventus*, a sensible agitation of the air, whereby a large quantity thereof flows in a current or stream out of one place, or region, into another.

The *winds* are divided into *perennial*, *stated*, and *variable*. They are also divided into *general*, and *particular*.

WINDS, *perennial*, or *constant*, are such as always blow the same way.

Of these we have a very notable one between the two tropics, blowing constantly from east to west; called the *general trade-wind*.

WINDS, *stated*, or *periodical*, are such as constantly return at certain times. Such are the sea and land-breezes, blowing from sea to land in the evening; and from land sea in the morning.

Such also are the *shifting*, or *particular trade-winds*, which, for certain months of the year, blow one way, and the rest of the year, the contrary way. See TRADE-*winds*.

WINDS, *variable*, or *erratic*, are such as blow now this, now that way; and are now up, now hushed, without any rule or regularity, either as to time or place.

Such are all the *winds* observed in the inland parts of England, &c. though several of these claim their certain times of the day. Thus, the *west wind* is most frequent about noon; the *south wind* in the night; the *north* in the morning, &c.

WIND, *general*, is such a one, as at the same time blows the same way, over a very large tract of ground, almost all the year. Such only is the *general trade-wind*.

But even this has its interruptions: for, 1. At land it is scarce sensible at all, as being broken by the interposition of mountains, valleys, &c. 2. At sea, near the shore, it is disturbed by vapours, exhalations, and particular *winds*, blowing from landward; so that it is chiefly considered as *general*, only at mid sea: where, 3. It is liable to be disturbed, by clouds driving from other quarters.

WINDS, *particular*, include all others, excepting the *general trade-winds*.

Those peculiar to one little canton, or part, are called *topical* or *provincial winds*. Such is the north *wind*, on the western side of the Alps, which does not blow above one or two leagues lengthwise, and much less in breadth: such also is the pontias in France, &c.

WINDS, *physical cause of*. Some philosophers, as Des Cartes, Rohault, &c. account for the general *wind*, from the diurnal rotation of the earth; and from this general *wind* derive all the particular ones. The atmosphere, say they, investing the earth, and moving round it; that part will perform its circuit soonest, which has the smallest circle to describe: the air, therefore, near the equator, will require a somewhat longer time, to perform its course in, from west to east, than that nearer the poles. Thus, as the earth turns eastward, the particles of the air near the equinoctial, being exceedingly light, are left behind; so that, in respect of the earth's surface, they move eastwards, and become a constantly easterly *wind*. This opinion seems confirmed by this, that these *winds* are found only between the tropics, in those parallels of latitude, where the diurnal motion is swiftest. But the constant calms in the Atlantic sea near the equator, the westerly *winds* near the coast of Guinea, and the periodical westerly monsoons under the equator in the Indian seas, declare the insufficiency of this hypothesis.

Besides, the air, being kept close to the earth by the principle of gravity, would, in time, acquire the same degree of velocity, that the earth's surface moves with, as well in respect of the diurnal rotation, as of the annual about the sun, which is about thirty times swifter. See TRADE-*Winds*.

Dr. Halley, therefore, substitutes another cause, capable of producing a like constant effect, not liable to the same objections, but agreeable to the known properties of the elements of water and air, and the laws of the motion of fluid bodies. Such a one is the action of the sun's beams upon the air and water, as he passes every day over the ocean, considered together with the quality of the soil, and the situation of the adjoining continents.

According to the laws of statics, the air, which is less rarefied, or expanded by heat, and consequently is more ponderous, must have a motion towards those parts thereof, which are more rarefied, and less ponderous, to

to bring it to an equilibrium; alſo, the preſence of the ſun continually ſhifting to the weſtward, that part towards which the air tends, by reaſon of the rarefaction made by his greateſt meridian heat, is, with him, carried weſtward; and, conſequently, the tendency of the whole body of the lower air is that way.

Thus a general eaſterly *wind* is formed, which being impreſſed upon the air of a vaſt ocean, the parts impel one the other, and ſo keep moving till the next return of the ſun, whereby ſo much of the motion as was loſt, is again reſtored; and thus the eaſterly *wind* is made perpetual.

From the ſame principle it follows, that this eaſterly *wind* ſhould, on the north ſide of the equator, be to the northward of the eaſt, and in ſouth latitudes, to the ſouthward thereof; for, near the line, the air is much more rarefied than at a greater diſtance from it; becauſe the ſun is twice in a year vertical there, and at no time diſtant above 23½ degrees; at which diſtance, the heat, being as the ſine of the angle of incidence, is but little ſhort of that of the perpendicular ray; whereas under the tropics, though the ſun ſtay longer vertical, yet he is a long time 47 degrees off; which is a kind of winter, wherein the air ſo cools, as that the ſummer heat cannot warm it to the ſame degree with that under the equator. Wherefore, the air towards the north and ſouth being leſs rarefied than that in the middle, it follows, that from both ſides it ought to tend towards the equator.

This motion, compounded with the former eaſterly *wind*, accounts for all the phenomena of the general trade-*winds*, which, if the whole ſurface of the globe was ſea, would undoubtedly blow quite round the world, as they are found to do in the Atlantic, and the Ethiopic oceans.

But ſeeing that ſo great continents do interpoſe, and break the continuity of the ocean, regard muſt be had to the nature of the ſoil, and the poſition of the high mountains, which are the two principal cauſes of the variations of the *wind*, from the former general rule; for if a country lying near the ſun prove to be flat, ſandy, and low land, ſuch as the deſerts of Libya are uſually reported to be, the heat occaſioned by the reflexions of the ſun's beams, and the retention thereof in the ſand, is incredible to thoſe who have not felt it; whereby the air being exceedingly rarefied, it is neceſſary, that the cooler, and more denſe air, ſhould run thitherwards, to reſtore the equilibrium. This is ſuppoſed to be the cauſe, why, near the coaſt of Guinea, the *wind* always ſets in upon the land, blowing weſterly inſtead of eaſterly, there being ſufficient reaſon to believe, that the inland parts of Africa are prodigiouſly hot, ſince the northern borders thereof were ſo very intemperate, as to give the ancients cauſe to conclude, that all beyond the tropics was uninhabitable by exceſs of heat.

Mr. Clare, in his Motion of Fluids, p. 302, mentions a familiar experiment, that ſerves to illuſtrate this matter, as well as the alternate courſe of land and ſea-breezes. Fill a large diſh with cold water, and in the middle of it place a water-plate, filled with warm water: the firſt will repreſent the ocean, the other an iſland, rarefying the air above it. Then holding a wax-candle over the cold water, blow it out, and the ſmoke will be ſeen, in a ſtill place, to move toward the warm plate, and riſing over, it will point the courſe of the air (and alſo of VAPOUR) from ſea to land. And if the ambient water be warmed, and the plate filled with cold water, and the ſmoking wick of a candle held over the plate, the contrary will happen. For the phenomena of the *wind*, obſerved by Dr. Halley, and explained by his theory, ſee WIND, in *Navigation*.

From the ſame cauſe it happens, that there are ſo conſtant calms in that ſame part of the ocean, called the *rains*; for this tract being placed in the middle, between the weſterly *winds* blowing on the coaſt of Guinea, and the eaſterly trade-*winds* blowing to the weſtward thereof; the tendency of the air here is indifferent to either, and ſo ſtands in equilibrio between both; and the weight of the incumbent atmoſphere being diminiſhed by the continual contrary *winds* blowing from hence, is the reaſon that the air here holds not the copious vapour it receives, but lets it fall in ſo frequent rains.

But, as the cold and denſe air, by reaſon of its greater gravity, preſſes upon the hot and rarefied, it is demonſtrable, that this latter muſt aſcend in a continued ſtream, as faſt as it rarefies; and that, being aſcended, it muſt diſperſe itſelf, to preſerve the equilibrium; that is, by a contrary current, the upper air muſt move from thoſe parts where the greateſt heat is: ſo, by a kind of circulation, the north-eaſt trade-*wind* below will be attended with a ſouth-weſterly *wind* above; and the ſouth-eaſt, with a north-weſt *wind* above.

That this is more than a bare conjecture, the almoſt inſtantaneous change of the *wind* to the oppoſite point, which is frequently found in paſſing the limits of the trade-*winds*, ſeems ſtrongly to aſſure us; but that which above all confirms this hypotheſis, is the phenomenon of the MONSOONS, by this means moſt eaſily ſolved, and without it hardly explicable.

Suppoſing, therefore, ſuch a circulation as above, it is to be conſidered, that to the northward of the Indian ocean there is every where land, within the uſual limits of the latitude of 30°; viz. Arabia, Perſia, India, &c. which, for the ſame reaſon as the Mediterranean parts of Africa, are ſubject to inſufferable heats, when the ſun is to the north, paſſing nearly vertical; but yet are temperate enough, when the ſun is removed towards the other tropic, becauſe of a ridge of mountains at ſome diſtance within the land, ſaid to be frequently, in winter, covered with ſnow, over which the air, as it paſſes, muſt needs be much chilled. Hence it happens, that the air coming, according to the general rule, out of the north-eaſt, to the Indian ſea, is ſometimes hotter, ſometimes colder, than that which, by this circulation, is returned out of the ſouth-weſt; and, by conſequence, ſometimes the under-current, or *wind*, is from the north-eaſt, ſometimes from the ſouth-weſt.

That this has no other cauſe, is clear from the times wherein theſe *winds* ſet, viz. in April: when the ſun begins to warm theſe countries to the north, the ſouth-weſt monſoons begin, and blow, during the heats, till October, when the ſun being retired, and all things growing cooler northward, and the heat increaſing to the ſouth, the north-eaſt *winds* enter, and blow all the winter, till April again. And it is, undoubtedly, from the ſame principle, that to the ſouthward of the equator, in part of the Indian ocean, the north-weſt *winds* ſucceed the ſouth-eaſt, when the ſun draws near the tropic of Capricorn. Phil. Tranſact. N° 183. or Abridg. vol. ii. p. 139.

Some philoſophers, diſſatiſfied with Dr. Halley's theory above recited, or not thinking it ſufficient for explaining the various phenomena of the *wind*, have had recourſe to another cauſe, viz. the gravitation of the earth and its atmoſphere towards the ſun and moon, to which the TIDES are confeſſedly owing. They allege that, though we cannot diſcover aerial tides, of ebb or flow, by means of the barometer, becauſe columns of air of unequal height, but different denſity, may have the ſame preſſure or weight; yet the protuberance in the atmoſphere, which is continually following the moon, muſt, they ſay, of courſe produce a motion in all parts, and ſo produce a *wind* more or leſs to every place, which, conſpiring with, or counteracted by the *winds* ariſing from other cauſes, makes them greater or leſs. Several diſſertations to this purpoſe were publiſhed, on occaſion of the ſubject propoſed by the Academy of Sciences at Berlin, for the year 1746. M. Muſchenbroeck, however, will not allow that the attraction of the moon is the cauſe of the general *wind*; becauſe the eaſt *wind* does not follow the motion of the moon about the earth; for in that caſe there would be more than twenty-four changes, to which it would be ſubject in the courſe of a year, inſtead of two. Introd. ad Phil. Nat. vol. ii. p. 1102.

Mr. Henry Eeles, apprehending that the ſun's rarefying of the air cannot ſimply be the cauſe of all the regular and irregular motions which we find in the atmoſphere, aſcribes them to another cauſe, viz. the aſcent and deſcent of VAPOUR and exhalation, attended by the electrical fire or fluid; and on this principle he has endeavoured to explain at large the general phenomena of the weather and barometer. Phil. Tranſ. vol. xlix. art. 25. p. 124.

The induſtry of ſome late writers having brought the theory of the production and motion of *winds* to ſomewhat of a mathematical demonſtration; we ſhall here give it the reader in that form.

WINDS, *laws of the production of*. If the ſpring of the air be weakened in any place, more than in the adjoining places; a *wind* will blow through the place where the diminution is.

For, 1. Since the air endeavours, by its elaſtic force, to expand itſelf every way; if that force be leſs in one place than another, the effort of the more, againſt the leſs elaſtic, will be greater than the effort of the latter againſt the former. The leſs elaſtic air, therefore, will reſiſt with leſs force than it is urged by the more elaſtic; conſequently, the leſs elaſtic will be driven out of its place, and the more elaſtic will ſucceed.

If, now, the exceſs of the ſpring of the more elaſtic above that of the leſs elaſtic air, be ſuch as to occaſion a little alteration in the baroſcope; the motion both of the air expelled, and that which ſucceeds it, will become ſenſible, i. e. there will be a *wind*.

2. Hence, ſince the ſpring of the air increaſes, as the compreſſing weight increaſes, and compreſſed air is denſer th[illegible]

than air leſs compreſſed; all *winds* blow into rarer air, out of a place filled with a denſer.

3. Wherefore, ſince a denſer air is ſpecifically heavier than a rarer; an extraordinary lightneſs of the air in any place muſt be attended with extraordinary *winds*, or ſtorms.

Now, an extraordinary fall of the mercury in the BAROMETER, ſhewing an extraordinary lightneſs of the atmoſphere, it is no wonder if that foretels ſtorms.

4. If the air be ſuddenly condenſed in any place, its ſpring will be ſuddenly diminiſhed: hence, if this diminution be great enough to affect the barometer, there will a *wind* blow through the condenſed air.

5. But ſince the air cannot be ſuddenly condenſed, unleſs it have before been much rarefied, there will a *wind* blow through the air, as it cools, after having been violently heated.

6. In like manner, if air be ſuddenly rarefied, its ſpring is ſuddenly increaſed: wherefore, it will flow through the contiguous air, not acted on by the rarefying force. A *wind*, therefore, will blow out of a place, in which the air is ſuddenly rarefied; and on this principle, in all probability, it is, that,

7. Since the ſun's power in rarefying the air is notorious, it muſt neceſſarily have a great influence on the generation of *winds*.

8. Moſt caves are found to emit *wind*, either more or leſs.

M. Muſchenbroeck has enumerated a variety of cauſes that produce *winds*, exiſting in the bowels of the earth, on its ſurface, in the atmoſphere, and above it. See Intr. ad Phil. Nat. vol. ii p. 1116, &c.

The riſing and changing of the *wind* are determined experimentally, by means of weather-cocks, placed on the tops of houſes, &c. But theſe only indicate what paſſes about their own height, or near the ſurface of the earth: Wolfius aſſures us, from obſervations of ſeveral years, that the higher *winds*, which drive the clouds, are different from the lower ones, which move the weather-cocks. And Dr. Derham obſerves ſomething not unlike this. Phyſ. Theol. lib. i. cap. 2.

The author laſt mentioned relates, upon comparing ſeveral ſeries of obſervations made of the *winds* in divers countries; viz. England, Ireland, Switzerland, Italy, France, New England, &c. that the *winds* in thoſe ſeveral places ſeldom agree; but when they do, it is commonly when they are ſtrong, and of long continuance in the ſame quarter; and more, he thinks, in the northerly and eaſterly, than in other points. Alſo, that a ſtrong *wind* in one place is oftentimes a weak one in another, or moderate, according as the places are nearer, or more remote. Phil. Tranſ. N° 267. and 321.

WIND, *laws of the force and velocity of*. *Wind* being only air in motion, and air being a fluid ſubject to the laws of other fluids, its force may be regularly brought to a preciſe computation: thus—" The ratio of the ſpecific gravity of any other fluid to that of air, together with the " ſpace that fluid, impelled by the preſſure of the air, " moves in any given time, being given; we can determine the ſpace through which the air itſelf, acted on " by the ſame force, will move in the ſame time." By this rule:

1. As the ſpecific gravity of air is to that of any other fluid; ſo, reciprocally, is the ſquare of the ſpace, which that fluid, impelled by any force, moves in any given time, to the ſquare of the ſpace which the air, by the ſame impulſe, will move in the ſame time.

Suppoſing, therefore, the ratio of the ſpecific gravity of that other fluid to that of air, to be $=\frac{b}{c}$; the ſpace deſcribed by the fluid to be called s; and that which the air will deſcribe by the ſame impulſe, x. The rule gives us $x=\sqrt{\frac{bs^2}{c}}$.

Hence, if we ſuppoſe water impelled by the given force, to move two feet in a ſecond of time, then will $s=2$; and ſince the ſpecific gravity of water to the air, is as 800 to 1, we ſhall have $b=800$, and $c=1$; conſequently, $x=\sqrt{800\times 4}=\sqrt{3200}=57$ feet nearly. The velocity of the *wind*, therefore, to that of *water*, moved by the ſame power, will be as 57 to 2; i. e. if water move two feet in a ſecond, the *wind* will fly 57 feet.

2. Add, that $s=\sqrt{\frac{cx^2}{b}}$; and therefore the ſpace any fluid, impelled by any impreſſion, moves in any time, is determined, by finding a fourth proportional to the two numbers that expreſs the ratio of the ſpecific gravities of the two fluids, and the ſquare of the ſpace the *wind* moves in, in the given time. The ſquare root of that fourth proportional is the ſpace required.

Mr. Mariotte, e. gr. found, by various experiments, that a pretty ſtrong *wind* moves 24 feet in a ſecond of time, which is at the rate of 1440 in a minute; i. e. at the rate of ſomewhat more than 16 miles in an hour: wherefore, if the ſpace which the water, acted on by the ſame force as the air, will deſcribe in the ſame time, be required; then will $c=1$, $x=24$, $b=800$; and we ſhall find $s=\sqrt{\frac{576}{800}}=\frac{24}{28}$ nearly.

3. " The velocity of *wind* being given, to determine the " preſſure required to produce that velocity;" we have this rule. The ſpace the *wind* moves in one ſecond of time, is to the height a fluid is to be raiſed in an empty tube, in order to have a preſſure capable of producing that velocity, in a ratio compounded of the ſpecific gravity of the fluid to that of the air, and of quadruple the altitude a body deſcends in the firſt ſecond of time, to the aforeſaid ſpace of the air.

Suppoſe, e. gr. the ſpace through which the air moves in a ſecond, $a=24$ feet, or 288 inches; call the altitude of the fluid x; and the ratio of mercury to air, $\frac{b}{c}=\frac{800\times 14}{1}=\frac{11200}{1}$; and the altitude through which a body deſcends in the firſt ſecond of time, 16 feet 1 inch; then, by the theorem, we ſhall have $288:x::11200\times 762:288$, and conſequently $x=\frac{288\times 288}{11200\times 762}=,01$, &c. of an inch. Hence we ſee why a ſmall, but ſudden change in the barometer, is followed with violent *winds*.

Philoſophers have uſed various methods for determining the velocity of the *wind*, which is very different at different times. The method uſed by Dr. Derham was that of letting light downy feathers fly in the *wind*, and accurately obſerving the diſtance to which they were carried in any number of half ſeconds. This method he preferred to that of Dr. Hooke's mola alata, or pneumatica (ſee Phil. Tranſ. N° 24. and Birch's Hiſt. Roy. Soc. vol. iv. p. 225.) He tells us, that he thus meaſured the velocity of the *wind* in the great ſtorm of Auguſt, 1705, and by many experiments found, that it moved at the rate of thirty-three feet per half-ſecond, or of forty-five miles per hour: whence he concludes, that the moſt vehement *wind* (as that of November, 1703) does not fly at the rate of above fifty or ſixty miles per hour, and that at a medium the velocity of *wind* is at the rate of twelve or fifteen miles per hour. Phil. Tranſ. N° 313, or Abr. vol. iv. p. 411.

Mr. Brice obſerves, that experiments with feathers are ſubject to uncertainty; as they ſeldom or ever deſcribe a ſtraight line, but deſcribe a ſort of ſpirals, moving to the right and left, and riſing to very different altitudes in their progreſs. He, therefore, conſiders the motion of a cloud, or its ſhadow, over the ſurface of the earth, as a much more accurate meaſure of the velocity of the *wind*. In this way he found, that the *wind*, in a conſiderable ſtorm, moved at the rate of 62,9 miles per hour; and that, when it blew a freſh gale, it moved in the ſame time about twenty-one miles; and that in a ſmall breeze, the *wind* moved at the rate of 9,9 miles per hour. Phil. Tranſ. vol. lvi. p. 226.

The velocity and force of the *wind*, are determined experimentally by a peculiar machine, called an *anemometer*, or *wind-meaſurer*. Of theſe there have been many, variouſly conſtructed. See ANEMOMETER, and ANEMOSCOPE.

M. Bouguer has contrived a very ſimple inſtrument, by means of which we may immediately diſcover the force which the *wind* exerts on a given ſurface. This is a hollow tube AABB (*Tab.* V. *Pneumatics*, *fig.* 72.) in which a ſpiral ſtring CD is fixed, that may be more or leſs compreſſed by a rod FSD, paſſing through a hole within the tube at AA; then having obſerved to what degree different forces or given weights are capable of compreſſing the ſpiral, mark diviſions on the rod in ſuch a manner, that the mark at S may indicate the weight requiſite to force the ſpring into the ſituation CD: afterwards join at right angles to this rod at F, a plane ſurface EFE of a given area, either greater or leſs, at pleaſure; then let this inſtrument be oppoſed to the *wind*, ſo that it may ſtrike the ſurface in the directions VE, VE, parallel to that of the rod, and the mark at S will ſhew the weight to which the force of the *wind* is equivalent. See WIND-*gage*.

A Table of the different velocities and forces of the *winds*, constructed by Mr. Rouse with great care, from a considerable number of facts and experiments, and communicated to Mr. Smeaton.

Velocity of the *wind*. Miles in one hour.	= feet in one second.	Perpendicular force on one square foot, in avoirdupois pounds.	Common appellations of the forces of *wind*.
1	1.47	.005	Hardly perceptible.
2	2.93	.020	Just perceptible.
3	4.40	.044	
4	5.87	.079	Gentle pleasant *wind*.
5	7.33	.123	
10	14.67	.492	Pleasant brisk gale.
15	22.00	1.107	
20	29.34	1.968	Very brisk.
25	36.67	3.075	
30	44.01	4.429	High *wind*.
35	51.34	6.027	
40	58.68	7.873	Very high.
45	66.01	9.963	
50	75.35	12.300	A storm, or tempest.
60	88.02	17.715	A great storm.
80	117.36	31.490	A hurricane.
100	146.70	49.200	A hurricane that tears up trees, and carries buildings, &c. before it.

The force of the *wind* is as the square of its velocity; as Mr. Ferguson has shewn by experiments on the whirling-*table*; and in moderate velocities this will hold very nearly.

It is observed, with regard to this table, that the evidence for those numbers, where the velocity of the *wind* exceeds fifty miles an hour, does not seem of equal authority with that of those of fifty miles, or under. Phil Trans. vol. li. p. 165.

Dr. Hales found (Statical Eff. vol. ii. p. 326.) that the air rushed out of a pair of smith's bellows, at the rate of 68,73 feet in a second of time, when compressed with a force equal to the weight of one inch perpendicular depth of mercury, lying on the whole upper surface of the bellows. The velocity of the air, as it passed out of the trunk of his ventilators, was found to be at the rate of three thousand feet in a minute; which is at the rate of thirty-four miles in an hour. Dr. Hales says, that the velocity with which impelled air passes out at any orifice, may be determined by hanging a light valve over the nose of a bellows, by pliant leathern hinges, which will be much agitated and lifted up from a perpendicular to a more than horizontal position by the force of the rushing air. There is another more accurate way, he says, of estimating the velocity of air, viz. by holding the orifice of an inverted glass siphon full of water, opposite to the stream of air, whereby the water will be depressed in one leg, and raised in the other, in proportion to the force with which the water is impelled by the air. Descript. of Ventilators, 1743. p. 12, &c.

Wind, *qualities and effects of*. 1. "A *wind* blowing from "the sea, is always moist: in summer, it is cold; and "in winter, warm, unless the sea be frozen up." This is demonstrated thus: there is a vapour continually rising out of all water (as appears even hence, that a quantity of water, being left a little while in an open vessel, is found sensibly diminished), but especially if it be exposed to the sun's rays; in which case, the evaporation is beyond all expectation. By this means, the air incumbent on the sea becomes impregnated with a quantity of vapour. But the *winds*, blowing from off the sea, sweep those vapours along with them; and consequently they are always moist.

Again, water in summer, &c. conceives less heat than terrestrial bodies, exposed to the same rays of the sun, do; but in winter, sea-water is warmer than the earth covered with frost and snow, &c. Wherefore, as the air contiguous to any body is found to partake of its heat and cold, the air contiguous to sea-water will be warmer in winter, and colder in summer, than that contiguous to the earth. Or thus: vapours raised from water by the sun's warmth in winter, are warmer than the air they rise in (as appears from the vapours condensing, and becoming visible, almost as soon as they are got out into air.) Fresh quantities of vapour, therefore, continually warming the atmosphere over the sea, will raise its heat beyond that of air over the land. Again, the sun's rays reflected from the earth into the air, in summer, are much more than those from the water into air: the air, therefore, over the earth, warmed by the reflexion of more rays than that over water, is warmer. Hence, *sea-winds* make thick, cloudy, hazy weather.

2. "*Winds*, blowing from the continent, are always "dry; in summer, warm; and cold in winter." For there is much less vapour arising from the earth, than from water; and therefore the air over the continent will be impregnated with much fewer vapours. Add, that the vapours, or exhalations, raised by a great degree of heat out of the earth, are much finer, and less sensible, than those from water. The *wind*, therefore, blowing over the continent, carries but little vapour with it, and is therefore dry.

Farther, the earth in summer is warmer than water exposed to the same rays of the sun. Hence, as the air partakes of the heat of contiguous bodies, that over the earth in summer will be warmer than that over the water: therefore the *wind*, &c.

After the like manner it is shewn, that the *land-winds* are cold in winter. Hence, we see why *land-winds* make clear, cold weather.

Our northerly and southerly *winds*, however, which are commonly esteemed the causes of cold and warm weather, Dr. Derham observes, are really rather the effect of the cold or warmth of the atmosphere. Hence it is, that we frequently see a warm southerly wind, on a sudden, changed to the north, by the fall of snow or hail; and that in a cold, frosty morning, we see the *wind* north, which afterwards wheels about toward the southerly quarter, when the sun has well warmed the air; and again, in the cold evening, turns northerly, or easterly.

For the manner wherein north-easterly *winds* contribute to blights, see Blight. For the effect of *winds* on the barometer and thermometer, see Barometer, &c.

The utility of *winds* has been universally acknowledged. The ancient Persians, Phœnicians, Greeks, and Romans, sacrificed, and erected temples to the *winds*; as we learn from Vossius, Theolog. Gentil. lib. iii. part i. cap. 1. Beside their use in moving bellows, mills, and other machines, applied in various ways to the service of mankind, and the benefits resulting from them to navigation and trade, they serve to purify and refresh the air, to convey the heat or cold of one region to another, to produce a regular circulation of vapours from the ocean to countries remote from it, and to supply, by wafting them in their progress against hills, &c. springs and rivers.

Wind has been, by many authors, made the basis of many different diseases: among others, Dr. Reyn has given it as his opinion, in a Treatise on the Gout (De Arthritid.) that flatuses, or *wind* inclosed between the periosteum and the bone, are the true cause of that disease; and accordingly, that all the method of cure ought to tend to the expelling of that *wind*. He supposes this *wind* to be of a dry, cold, and malignant nature, conveyed by the arteries to the place affected, where forcibly separating that sensible membrane the periosteum, and distending it, the pain must needs be very great.

He is also of opinion, that head-achs, palpitations of the heart, tooth-ach, pleurisy, convulsions, colics, and many other diseases, are originally owing to the same cause, and only differ in regard to the place affected, and to the various motions and determinations of the *wind*. The moveableness of the pain in gouty persons from one part to another, he looks on as a proof of this, and thinks that the curing of the gout by burning moxa, or the cotton of the mugwort leaves, upon it, is owing to its giving way to the *wind* in the part to evaporate itself.

That these *winds* are cold appears from the shivering fits which generally precede a paroxysm of the gout, and that the shiverings in the beginnings of fevers, and before all fits of agues, are owing to the same cause, is supposed by this author a natural conclusion from the former observations.

The *winds*, according to this author and Fienus, are a sort of halituous spirits, raised by the improper degree of our native heat, or out of our meat and drink; or, finally, out of an abundance of black choler.

Their differences, he says, principally proceed from the various ferments producing in us a variety of humours; which, acting upon one another, do in their effervescences create *winds* of various effects, and denominate diseases from the places which are the scenes of their action. It is on this account that the acupunctura, or pricking with long needles, among the Chinese, is of use; the Japonese, and other neighbouring nations, having no other cure for most diseases than the pricking with the needle, and the burning of the moxa on the part.

The husbandman often suffers extremely by high *winds*, in many different respects. Plantations of trees at a small distance from the barns and houses, are the best safeguard against their suffering by *winds*; but they must not be planted so near as that their fall, if it should happen, would endanger them. Yews grow very slowly, otherwise they are the best of all trees for this defensive

plantation. Trees ſuffer by *winds*, being either broken or blown down by them; but this may be in a great meaſure prevented by cutting off great part of the heads and branches of them, in places where they ſtand moſt expoſed.

Hops are the moſt ſubject to be injured by *winds* of any crop; but this may be in a great meaſure prevented by a high pale, or very thick thorn-hedge; this will both keep off the ſpring *wind*, which nips the young buds, and be a great ſafeguard againſt other *winds* that would tear the plants from their poles. The poles ſhould always be very firm in the ground; and the beſt ſecurity to be added to this, is a row of tall trees all round the ground.

Winds attended with rain do great injury to the corn, by laying it flat to the ground. The beſt method of preventing this, is to keep up good encloſures; and if the accident happens, the corn ſhould be cut immediately, for it never grows at all afterwards. It ſhould be left on the ground, in this caſe, ſome time after the cutting, to harden the grain in the ear. Mortimer's Huſbandry, p. 302.

WIND, in *Navigation*, is the ſame agitation of the air, conſidered as ſerving for the motion of veſſels on the water.

If the *wind* blows gently, it is called a BREEZE; if it blows harder, it is called a GALE, or a ſtiff gale; and if it blows very hard, it is called a STORM.

The following obſervations on the *wind* have been made by ſkilful ſeamen, and particularly by Dr. Halley.

1ſt, Between the limits of 60°, viz. from 30° of north latitude to 30° of ſouth latitude, there is a conſtant eaſt *wind* through the year, blowing in the Atlantic and Pacific oceans, called the TRADE-*wind*.

2d, The trade-*winds* near their northern limits blow between the north and eaſt; and near their ſouthern limits they blow between the ſouth and eaſt.

3d, Theſe general motions of the *wind* are diſturbed on the continents, and near their coaſts.

4th, In ſome parts of the Indian ocean there are periodical *winds*, which are called MONSOONS.

5th, In the Atlantic ocean, near the coaſts of Africa, at about a hundred leagues from the ſhore, between the latitudes of 28° and 10° north, ſeamen conſtantly meet with a freſh gale of *wind* blowing from the N. E.

6th, Thoſe bound to the Caribbee iſlands, acroſs the Atlantic ocean, find, as they approach the American ſide, that the ſaid N. E. *wind* becomes eaſterly; or ſeldom blows more than a point from the eaſt, either to the northward or ſouthward. Theſe trade-*winds*, on the American ſide, are extended to 30, 31, or even to 32° of N. latitude; which is about 4° farther than they extend to on the African ſide: alſo to the ſouthward of the equator, the trade-*winds* extend three or four degrees farther toward the coaſt of Braſil, on the American ſide, than they do near the Cape of Good Hope, on the African ſide.

7th, Between the latitudes of 4° N. and 4° S. the *wind* always blows between the ſouth and eaſt: on the African ſide the *winds* are neareſt the ſouth; and on the American ſide, neareſt the eaſt. In theſe ſeas Dr. Halley obſerved, that when the *wind* was eaſtward, the weather was gloomy, dark, and rainy, with hard gales of *wind*; but when the *wind* veered to the ſouthward, the weather generally became ſerene, with gentle breezes, next to a calm. Theſe *winds* are ſomewhat changed by the ſeaſons of the year; for when the ſun is far northward, the Braſil S. E. *wind* gets to the ſouth, and the N. E. *wind* to the eaſt; and when the ſun is far ſouth, the S. E. *wind* gets to the eaſt, and the N. E. *winds* on this ſide of the equator veer more to the north.

8th, Along the coaſt of Guinea, from Sierra Leone to the iſland of St. Thomas, under the equator, which is above five hundred leagues, the ſoutherly and ſouth-weſt *winds* blow perpetually; for the S. E. trade-*wind*, having paſſed the equator, and approaching the Guinea coaſt within eighty or a hundred leagues, inclines toward the ſhore, and becomes ſouth, then S. E. and by degrees, as it comes near the land, it veers about to ſouth, S. S. W. and in with the land it is S. W. and ſometimes W. S. W. This tract is troubled with frequent calms, violent ſudden guſts of *wind*, called tornadoes, blowing from all points of the horizon.

9th, Between the fourth and tenth degrees of north latitude, and between the longitudes of Cape Verd, and the eaſtermoſt of the Cape Verd iſles, there is a tract of ſea ſubject to perpetual calms, attended with frequent thunder and lightning, and rains: ſhips in ſailing theſe ſix degrees are ſaid to have been ſometimes detained whole months.

The three laſt obſervations account for two circumſtances which mariners experience in ſailing from Europe to India, and in the Guinea trade.

The *firſt* is the difficulty which ſhips, in going to the ſouthward, eſpecially in the months of July and Auguſt, find in paſſing between the coaſts of Guinea and Braſil, although the breadth of this ſea is more than five hundred leagues. This happens, becauſe the S. E. *winds* at that time of the year commonly extend ſome degrees beyond the ordinary limits of four degrees N. latitude; and beſides coming ſo much ſoutherly, as to be ſometimes ſouth, ſometimes a point or two to the weſt; it then only remains to ply to windward: and if, on the one ſide, they ſteer W. S. W. they get a *wind* more and more eaſterly; but then there is a danger of falling in with the Braſilian coaſt, or ſhoals; and if they ſteer E. S. E. they fall into the neighbourhood of the coaſt of Guinea, from whence they cannot depart without running eaſterly as far as the iſland of St. Thomas; and this is the conſtant practice of all the Guinea ſhips.

Secondly. All ſhips departing from Guinea for Europe, their direct courſe is northward; but on this courſe they cannot go, becauſe the coaſt bending nearly eaſt and weſt, the land is to the northward: therefore as the *winds* on this coaſt are generally between the S. and W. S. W. they are obliged to ſteer S. S. E. or ſouth, and with theſe courſes they run off the ſhore; but in ſo doing they always find the *winds* more and more contrary; ſo that when near the ſhore, they can lie ſouth, at a greater diſtance they can make no better than S. E. and afterwards E. S. E.; with which courſes they commonly fetch the iſland of St. Thomas and Cape Lopez, where finding the *winds* to the eaſtward of the ſouth, they ſail weſterly with it, till coming to the latitude of four degrees ſouth, where they find the S. E. *wind* blowing perpetually.

On account of theſe general *winds*, all thoſe that uſe the Weſt-India trade, even thoſe bound to Virginia, reckon it their beſt courſe to get as ſoon as they can to the ſouthward, that ſo they may be certain of a fair and freſh gale to run before it to the weſtward; and for the ſame reaſon thoſe homewards-bound from America endeavour to gain the latitude of thirty degrees, where they firſt find the *winds* begin to be variable; though the moſt ordinary *winds* in the north Atlantic ocean come from between the ſouth and weſt.

10th, Between the ſouthern latitudes of ten and thirty degrees in the Indian ocean, the general trade-*wind* about the S. E. by S. is found to blow all the year long in the ſame manner as in the like latitudes in the Ethiopic ocean; and during the ſix months from May to December, theſe *winds* reach to within two degrees of the equator; but during the other ſix months, from November to June, a N. W. *wind* blows in the tract lying between the third and tenth degrees of ſouthern latitude, in the meridian of the north end of Madagaſcar; and between the ſecond and twelfth degree of ſouth latitude, near the longitude of Sumatra and Java.

11th, In the tract between Sumatra and the African coaſt, and from three degrees of ſouth latitude quite northward to the Aſiatic coaſts, including the Arabian ſea and the gulf of Bengal, the monſoons blow from September to April on the N. E.; and from March to October on the S. W. In the former half year the *wind* is more ſteady and gentle, and the weather clearer than in the latter ſix months; and the *wind* is more ſtrong and ſteady in the Arabian ſea than in the gulf of Bengal.

12th, Between the iſland of Madagaſcar and the coaſt of Africa, and thence northward as far as the equator, there is a tract, wherein from April to October there is a conſtant freſh S. S. W. *wind*; which to the northward changes into the W. S. W. *wind*, blowing at that time in the Arabian ſea.

13th, To the eaſtward of Sumatra and Malacca on the north of the equator, and along the coaſts of Cambodia and China, quite through the Philippines as far as Japan, the monſoons blow northerly and ſoutherly; the northern ſetting in about October or November, and the ſouthern about May: the *winds* are not quite ſo certain as thoſe in the Arabian ſeas.

14th, Between Sumatra and Java to the weſt, and New Guinea to the eaſt, the ſame northerly and ſoutherly *winds* are obſerved; but the firſt half year monſoon inclines to the N. W. and the latter to the S. E. Theſe *winds* begin a month or ſix weeks after thoſe in the Chineſe ſeas ſet in, and are quite as variable.

15th, Theſe contrary *winds* do not ſhift from one point to its oppoſite all at once; in ſome places the time of the change is attended with calms, in others by variable *winds*; and it often happens on the ſhores of Coromandel and China, towards the end of the monſoons, that there are moſt violent ſtorms, greatly reſembling the hurricanes in the Weſt Indies; wherein the *wind* is ſo very ſtrong, that hardly any thing can reſiſt its force.

All navigation in the Indian ocean muſt neceſſarily be regulated by theſe *winds*; for if mariners ſhould delay their

voyages

voyages till the contrary monsoon begins, they must either sail back, or go into harbour, and wait for the return of the trade-*wind*. See Phil. Transf. N° 183, or Abr. vol. ii. p. 133, &c. Robertson's Elem. of Nav. book vi. sect. 6.

The *winds* are divided, with respect to the points of the horizon from which they blow, into *cardinal* and *collateral*.

WINDS, *cardinal*, are those blowing from the four cardinal points; east, west, north, and south.

WINDS, *collateral*, are the intermediate *winds* between any two cardinal *winds*. The number of these is infinite, as the points from which they blow are; but only a few of them are considered in practice; i. e. only a few of them have their distinguishing names.

The ancient Greeks, at first, only used the four cardinal ones; at length they took in four more. Vitruvius gives us a table of twenty, besides the cardinals, which were in use among the Romans.

The moderns, as their navigation is much more perfect than that of the ancients, have given names to twenty-eight collateral *winds*; which they range into *primary* and *secondary*; and the secondary they subdivide into those of the *first* and *second order*.

The English names of the primary collateral *winds* and points are compounded of the names of the cardinal ones, north and south being still prefixed.

The names of the secondary collateral *winds* of the first order are compounded of the names of the cardinals, and the adjacent primary one. Those of the second order are compounded of the names of the cardinal, or the next adjacent primary; and the next cardinal, with the addition of the word *by*. The Latins have distinct names for each; all which are expressed in the following table.

Names of the *winds*, and points of the compass.		Distances of the points, &c. from the north.	
English.	Latin and Greek.		
1. *North.*	*Septentrio*, or *Boreas.*	0°	0′
2. North-by-east.	Hyperboreas. Hypaquilo. Gallicus.	11	15
3. North-north-east.	Aquilo.	22	30
4. North-east-by-north.	Mesoboreas. Mesaquilo. Supernas.	33	45
5. *North-east.*	*Arctapeliotes. Borapeliotes. Græcus.*	45	
6. North-east-by-east.	Hypocæsias.	56	15
7. East-north-east.	Cæsias, Hellespontius.	67	30
8. East-by-north.	Mesocæsias. Carbas.	78	45
		From the east.	
9. *East.*	*Solanus, subsolanus, apeliotes.*	0°	0′
10. East-by-south.	Hypeurus, or hypereurus.	11	15
11. East-south-east.	Eurus, or volturnus.	22	30
12. South-east-by-east.	Meseurus.	33	45
13. *South-east.*	*Notapeliotes, eurauster.*	45	
14. South-east-by-south.	Hypophœnix.	56	15
15. South-south-east.	Phœnix, phœnicias, leuco-notus, gangeticus.	67	30
16. South-by-east.	Mesophœnix.	78	45
		From the south	
17. *South.*	*Auster, notus, meridies.*	0°	0′
18. South-by-west.	Hypolibonotus, alfanus.	11	15
19. South-south-west.	Libonotus, notolibycus, austro-africus.	22	30
20. South-west-by-south.	Mesolibonotus.	33	45
21. *South-west.*	*Noto-zephyrus. Noto-libycus. Africus.*	45	
22. South-west-by-west.	Hypolibs. Hypafricus. Subvesperus.	56	15
23. West-south-w.	Libs.	67	30
24. West-by-south.	Mesolibs. Mesozephyrus.	78	45

Names of the *winds*, and points of the compass.		Distances of the points, &c. from the west.	
English.	Latin and Greek.		
25. *West.*	*Zephyrus, favonius, occidens.*	0°	0′
26. West-by-north.	Hypargestes. Hypocorus.	11	15
27. West-north-west.	Argestes. Caurus, corus, iapyx.	22	30
28. North-west-by-west.	Mesargestes. Mesocorus.	33	45
29. *North-west.*	*Zephyro-boreas, borolibycus, olympias.*	45	
30. North-west-by-north.	Hypocircius. Hypothrascias. Scirem.	56	15
31. North-north-west.	Circius, thrascias.	67	30
32. North-by-west.	Mesocircius.	78	45

Note, the ancient names are here, after Ricciolus, adapted to the modern ones; not that the *winds* formerly denoted by those were precisely the same with these (for the ancient number and division being different from the modern, the points they refer to will necessarily be somewhat different), but as these are what come the nearest. Thus, Vitruvius, only reckoning twenty-four *winds*, disposes the points they refer to in a different order; as in the following table.

Names of the *winds.*	Distance from north.		Names of the *winds.*	Distance from east.	
1 *Septentrio.*	0°	0′	7 *Solanus.*	0°	0′
2 Gallicus.	15		8 Ornithias.	15	
3 Supernas.	30		9 Cæsias.	30	
4 Aquilo.	45		10 Eurus.	45	
5 Boreas.	60		11 Volturnus.	60	
6 Carbas.	75		12 Euronotus.	75	
Names of the *winds.*	Distance from south.		Names of the *winds.*	Distance from west.	
13 *Auster.*	0°	0′	19 *Favonius.*	0°	0′
14 Alfanus.	15		20 Etesiæ.	15	
15 Libonotus.	30		21 Circius.	30	
16 Africus.	45		22 Caurus.	45	
17 Subvesper.	60		23 Corus.	60	
18 Argestes.	75		24 Thrascias.	75	

The following table shews the angles which every RHUMB, or point of the compass, makes with the meridian: by means of which the direction of the *wind*, &c. may be determined.

NORTH.	SOUTH.	Points.	D.	M.	NORTH.	SOUTH
		0 ¼	2	49		
		0 ½	5	37½		
		0 ¾	8	26		
N. by E.	S. by E.	1 0	11	15	N. by W.	S. by W.
		1 ¼	14	04		
		1 ½	16	52½		
		1 ¾	19	41		
N. N. E.	S. S. E.	2 0	22	30	N. N. W.	S. S. W.
		2 ¼	25	19		
		2 ½	28	07½		
		2 ¾	30	56		
N. E. by N.	S. E. by S.	3 0	33	45	N. W. by N.	S. W. by S.
		3 ¼	36	34		
		3 ½	39	22½		
		3 ¾	42	11		
N. E.	S. E.	4 0	45	00	N. W.	S. W.
		4 ¼	47	49		
		4 ½	50	37½		
		4 ¾	53	26		
N. E. by E.	S. E. by E.	5 0	56	15	N. W. by W.	S. W. by W.
		5 ¼	59	04		
		5 ½	61	52½		
		5 ¾	64	41		
E. N. E.	E. S. E.	6 0	67	30	W. N. W.	W. S. W.
		6 ¼	70	19		
		6 ½	73	07½		
		6 ¾	75	56		
E. by N.	E. by S.	7 0	78	45	W. by N.	W. by S.
		7 ¼	81	34		
		7 ½	84	22½		
		7 ¾	87	11		
EAST.	EAST.	8 0	90	00	WEST.	WEST.

For the use of the *winds* in navigation, &c. see SAILING.

WIND, *fresh*. See FRESH.

WIND, *to haul the*. See HAUL.

WIND, *large*, in the *Sea-Language*. See LARGE.

WIND, *quarter*, at *Sea*. See QUARTER.

WINDS, *reigning*. See REIGNING.

WINDS, *tropic*. See TRADE-*winds*, and WIND, ſupra.

WIND, *ſide*, at *Sea*, that which blows on the ſide of the ſhip.

To WIND *a ſhip*, or *boat*, in *Sea-Language*, is to change her poſition, by bringing the ſtern to lie in the ſituation of the head; or directly oppoſite to its former ſituation.

WIND, in the *Manege*. A horſe that carries in the *wind*, is one that toſſes his noſe as high as his ears, and does not carry handſomely.

The difference between carrying in the *wind*, and beating upon the hand is, that a horſe who beats upon the hand, ſhakes his head, and reſiſts the bridle; but he who carries in the *wind*, puts up his head without ſhaking, and only ſometimes beats upon the hand. The oppoſite to carrying in the *wind*, is arming and carrying low.

WIND, *whirl*. See WHIRL-*wind*.

WIND-*colic*. See COLIC.

WIND-*dropſy*. See TYMPANY.

WIND-*egg*, an addle egg, or an egg that has taken *wind*. See EGG.

WIND-*fall* denotes fruit blown off the tree by the *wind*.

WIND-*flower*, in *Botany*. See ANEMONE.

WIND-*furnace*. See FURNACE.

WIND-*gage*, in *Pneumatics*, an inſtrument ſerving to determine the velocity and force of the *wind*. See ANEMOMETER, ANEMOSCOPE, and *Laws of the force*, &c. *of the* WIND, ſupra.

Dr. Lind, of Edinburgh, has contrived an apparatus of this kind, which is ſimple, and eaſy of conſtruction, and which ſeems to be well adapted for meaſuring the force of the *wind* with a ſufficient degree of accuracy. This inſtrument conſiſts of two glaſs tubes AB, CD (*Tab.* V. *Pneumatics*, *fig.* 73.) five or ſix inches in length, and about four-tenths of an inch in bore; which are connected together, like a ſiphon, by a ſmall bent glaſs tube *a b*, the bore of which is one-tenth of an inch in diameter. On the upper end of the leg AB there is a tube of latten braſs, which is kneed or bent perpendicularly outwards, and has its mouth open toward F; on the other leg CD is a cover, with a round hole G in the upper part of it, two-tenths of an inch in diameter. This cover and the kneed tube are connected together by a ſlip of braſs *c d*, which ſtrengthens the whole inſtrument, and ſerves to hold the ſcale HI. The kneed tube and cover are fixed on with hard cement, or ſealing-wax. To the ſame tube is ſoldered a piece of braſs *e*, with a round hole in it, to receive the ſteel ſpindle KL, and at *f* another ſuch piece of braſs is ſoldered to the braſs hoop *g h*, which ſurrounds both legs of the inſtrument. There is a ſmall ſhoulder on the ſpindle at *f*, upon which the inſtrument reſts, and a ſmall nut at *i*, to prevent it from being blown off the ſpindle by the *wind*. The whole inſtrument is eaſily turned round upon the ſpindle by the *wind*, ſo as always to preſent the mouth of the kneed tube toward it. At the end of the ſpindle there is a ſcrew, by which it may be ſcrewed to the top of a poſt or ſtand: it has alſo a hole at L, to admit a ſmall lever for ſcrewing it into wood with greater facility. A thin plate of braſs *k* is ſoldered to the kneed tube, about half an inch above the round hole G, ſo as to prevent rain from falling into it. There is alſo a crooked tube AB (*fig.* 74.) to be put occaſionally upon the mouth of the kneed tube F, in order to prevent rain from being blown into the mouth of the *wind-gage*, when it is left expoſed to the rain.

This inſtrument ſerves to aſcertain the force of the *wind*, by filling the tube half full of water, and puſhing the ſcale a little up or down, till o upon the ſcale, when the inſtrument is held perpendicularly, be on a line with the ſurface of the water, in both legs of the *wind-gage*. The inſtrument being thus adjuſted, hold it up perpendicularly, and turning the mouth of the kneed tube toward the *wind*, obſerve how much the water is depreſſed by it in one leg, and how much it is raiſed in the other. The ſum of the two is the height of a column of water, which the *wind* is capable of ſuſtaining at that time; and every body, that is oppoſed to that *wind*, will be preſſed upon by a force equal to the weight of a column of water, having its baſe equal to the ſurface that is oppoſed, and its height equal to the altitude of the column of water ſuſtained by the *wind* in the *wind-gage*. Hence the force of the *wind* upon any body, where the ſurface oppoſed to it is known, may be eaſily found; and a ready compariſon may be made betwixt the ſtrength of one gale of *wind*, and that of another, by knowing the heights of the columns of water which the different *winds* were capable of ſuſtaining. The heights of the column in each leg will be equal, provided that the legs are of equal bores; but unequal, if their bores are unequal. For ſuppoſe the legs equal, and the column of water ſuſtained by the *wind* to be three inches, the water in the leg, which the *wind* blows into, will be depreſſed $1\frac{1}{2}$ inch below o, and raiſed as much in the other leg. But if the bore of the leg which the *wind* blows into be double that of the other, the water in that leg will be depreſſed only one inch, whilſt it is raiſed twice as much, or two inches, in the other, and *vice verſa*.

The force of the *wind* may likewiſe be meaſured with this inſtrument, by filling it until the water runs out at G. For if it be then held up to the *wind* as before, a quantity of water will be thrown out; and if both legs of the inſtrument are of the ſame bore, the height of the column ſuſtained, will be equal to double the column of water in either leg, or the ſum of what is wanting in both legs. But if the legs are of unequal bores, neither of theſe will give the true height of the column of water which the *wind* ſuſtained. For obtaining, in this caſe, the true height, Dr. Lind has ſubjoined the requiſite formulæ. The uſe of the ſmall tube of communication *a b* (*fig.* 73.) is to check the undulation of the water, ſo that the height of it may be read off from the ſcale with eaſe and certainty; and alſo to prevent the water from being thrown up to a much greater or leſs altitude than the true height of the column, which the *wind* is able at that time to ſuſtain. The author has calculated a table, by means of which, having the height of the column of water ſuſtained in the *wind-gage*, the force of the *wind* upon a foot ſquare may be determined. On the ninth of May, 1775, Dr. Lind obſerved, that the *wind* ſupported a column of water in his *wind-gage* $6\frac{7}{10}$ inches in height; and from his table it appeared, that the force of the *wind* in this hurricane, which did great damage to the gardens in his neighbourhood, was equal to 34,921 pounds avoirdupois, on every ſquare foot.

If the velocity and denſity of the *wind* in any particular caſe were accurately determined, this inſtrument, which gives its force or momentum, would enable us to aſcertain the velocity in every other caſe, the denſity being known; for the force of the *wind* is as the ſquare of its velocity. Phil. Tranſ. vol. lxv. part ii. art. 34. p. 353, &c.

Mr. Martin, from a hint firſt ſuggeſted by Dr. Burton, contrived an anemoſcope, or *wind-gage*, of the following conſtruction. ABCDEFGH (*fig.* 75.) is an open frame of wood, firmly ſupported by the ſhaft or poſtern I. In the two croſs pieces, HK, LM, is moved an horizontal axis QM, by means of the four ſails *a b*, *c d*, *e f*, *g h*, in a proper manner, expoſed to the *wind*. Upon this axis is fixed a cone of wood, MNO; upon which, as the ſails move round, a weight S is raiſed by a ſtring on its ſuperficies, proceeding from the ſmall to the largeſt end NO. Upon the great end or baſe of the cone is fixed a ratchet-wheel *i k*, in whoſe teeth falls the click X, to prevent any retrograde motion from the depending weight.

From the ſtructure of this machine, it is eaſy to underſtand, that it may be accommodated to eſtimate the variable force of the *wind*, becauſe the force of the weight will continually increaſe, as the ſtring advances on the conical ſurface, by acting at a greater diſtance from the axis. And therefore, if ſuch a weight be put on, on the ſmalleſt part at M, as will juſt keep the machine in equilibrio with the weakeſt *wind*; then as the *wind* becomes ſtronger, the weight will be raiſed in proportion, and the diameter of the baſe of the cone NO may be ſo large in compariſon of that of the ſmaller end or axis at M, that the ſtrongeſt *wind* ſhall but juſt raiſe the weight to the great end.

Thus, for example, let the diameter of the axis be to that of the baſe of the cone NO as 1 to 28; then if S be a weight of one pound at M on the axis, it will be equivalent to twenty-eight pounds, or $\frac{1}{4}$ of an hundred, when raiſed to the greateſt end. If, therefore, when the *wind* is weakeſt, it ſupports one pound on the axle, it muſt be twenty-eight times as ſtrong to raiſe the weight to the baſe of the cone. Thus may a line or ſcale of twenty-eight equal parts be drawn on the ſide of the cone, and the ſtrength of the *wind* will be indicated by that number therein from which the ſtring ſhall at any time hang.

Furthermore, the ſtring may be of ſuch a ſize, and the cone of ſuch a length, that there ſhall be ſixteen revolutions of the ſtring between each diviſion of the ſcale on the cone; ſo will the ſtrength of the *wind* be expreſſed in pounds and ounces. And if greater exactneſs be required, let the periphery of the cone's baſe be divided into ſixteen equal parts; then whenever the equilibrium happens, the ſtring will leave the conic ſurface againſt one of thoſe diviſions, and thus ſhew the force of the *wind* to a dram avoirdupois weight. Martin's Phil. Brit. vol. ii. p. 211, &c.

WIND-*gall*, in *Horfes*, a foft, flatulent tumor, or bladder, arifing on the fetlock-joint, and caufing great pain, efpecially in hot weather, and hard ways.

It is ufually owing to a violent ftrain, extreme labour and heat, a horfe's ftanding on a floping floor, a blow from another, or the like.

In this cafe there are bladders full of a corrupt jelly, which, when let out, is thick, and of the colour of the yolk of an egg.

They vary in fize, but are more ufually fmall than large. Their place is about the fetlock-joint, and they grow indifferently on all four legs, and are often fo painful, efpecially in the fummer feafon, when the weather is hot, and the ground dry and hard, that they make the creature frequently ftumble, or fall abfolutely down.

The general method of cure is to open the fwelling about the length of a bean, and to prefs out the jelly: when this is done, they apply a mixture of the oil of bays, and the white of an egg, covering it with tow.

Another method is, after the jelly is all fqueezed out, to wrap round the part a wet woollen cloth; and then applying a taylor's hot iron, this is to be rubbed over till all the moifture is carried away; it is then to be daubed all over with pitch, maftic, and refin, boiled together, laying tow in plenty over all.

The *wind-galls* that are fituated near the finews, are much the moft painful of all, and fooneft make the horfe lame.

The general caufe of *wind-galls* is fuppofed to be extreme work or exercife in very hot weather; but it is to be obferved, that thofe horfes, which have long joints, will be *wind-galled*, if they work never fo little. The worft *wind-galls* are thofe of the hinder legs; all the above mentioned will frequently mifs of fuccefs in thefe, and nothing but fire will cure them.

WIND-*gun*, a machine ferving to explode bullets, and other fhot, with great violence, by the force of the air.

This fort of arm, charged with air, has an effect fcarce inferior to that of a common fire-arm charged with gunpowder, but it difcharges itfelf with a much lefs report; and it is this which, in all probability, gave occafion to the fable of white gunpowder.

There are *wind-guns* of divers contrivances; the moft eafy and portable one is reprefented *Tab.* V. *Pneumatics*, *fig.* 76. It is made of brafs, and has two barrels; the infide barrel K A of a fmall bore, from which the bullets are fhot, and a larger barrel E S C D R, on the outfide of it. In the ftock of the gun there is a fyringe S M N P, whofe rod M draws out to take in air, and pifton S N drives the air before it through the valve E P into the cavity between the two barrels. The ball K is put down into its place in the fmall barrel with the rammer, as in another gun. There is another valve at SL, which, being opened by the trigger O, permits the air to come behind the bullet, fo as to drive it out with great force. If this valve be opened and fhut fuddenly, one charge of condenfed air may make feveral difcharges of bullets; becaufe only part of the injected air will go out at a time, and a new bullet may be put into the place K; but if the whole air be difcharged on a fingle bullet, it will drive it out more forcibly. This difcharge is effected by means of a lock *k l* (*fig.* 77.) placed here, as in other guns; for the trigger being pulled, the cock *k* will go down, and drive a lever *o*, that will open the valve, and let in the air upon the bullet K.

Dr. Macbride (Exper. Eff. p. 81.) mentions an improvement of the *wind-gun* by Dr. Ellis; in which the chamber for containing the condenfed air is not in the ftock, which makes the machine heavy and unwieldy, but has five or fix hollow fpheres belonging to it, of about three inches diameter, fitted to fcrew on the lock of the gun. Thefe fpheres are contrived with valves, to confine the air, which is forced into their cavities, fo that a fervant can carry them ready charged with condenfed air; and thus the gun of this conftruction is rendered as light and portable as one of the fmalleft fowling-pieces.

Magazine WIND, or *air-gun*, is an improvement of the common air-gun, invented by an ingenious artift, called L. Colbe. By his contrivance, ten bullets are fo lodged in a cavity, near the place of difcharge, that they may be drawn into the fhooting barrel, and fucceffively fhot fo quickly, as to be nearly of the fame ufe as fo many different guns; the only motion required (when the air has been previoufly injected) being that of fhutting and opening the hammer, and cocking and pulling the trigger. In *fig.* 78. is exhibited a fection of the gun, as large in every part as the gun itfelf; and fo much of its length is fhewn, as is neceffary to give a complete idea of the whole. AEE is part of the ftock; G is the end of the injection fyringe, with its valve H, opening into the cavity FFFF between the barrels. KK is the fmall or fhooting barrel, which receives the bullets one at a time, from the magazine ED, which is a ferpentine cavity, wherein the bullets *b*, *b*, &c. are lodged, and clofed at the end D. The circular part S I *s k* M *i* is the key of a cock, having a cylindrical hole IK through it, equal to the bore of the fmall barrel, and forming a part of it in the prefent fituation. When the lock is taken off, the feveral parts Q, R, T, S, W, &c. come into view, by means of which the difcharge is made, by pufhing up the pin P *p*, which raifes and opens a valve V, to let in the air againft the bullet I, from the cavity FFF; which valve is immediately fhut down again by means of a long fpring of brafs NN. This valve V, being a conical piece of brafs, ground very true in the part which receives it, will of itfelf be fufficient to confine the air. To make a difcharge, pull the trigger ZZ, which throws up the feer *y x*, and difengages it from the notch *x*; upon which the ftrong fpring W W, moves the tumbler T, to which the cock is fixed. The end *u* of this tumbler bears down the end *v* of the tumbling lever R, which, by its other end *m*, raifes the flat end *l* of the horizontal lever Q; by which means the pin P *p* is pufhed up, and opening the valve V, difcharges the bullet; all which is evident from a bare view of the figure.

To bring another bullet inftantly to fucceed I, there is a part H, called the hammer, reprefented in *fig.* 79. and 80. which by a fquare hole goes upon the fquare end of the key of the cock, and turns it about fo as to place the cylindric bore of the key I *k* in any fituation required. Thus, when the bullet is in the gun, the bore of the key coincides with that of the barrel KK; but when it is difcharged, the hammer H is inftantly brought down to fhut the pan of the gun; by which motion the bore of the key is turned into the fituation *i k*, fo as to coincide with the orifice of the magazine; and upon lifting the gun upright, the ball next the key tumbles into its cavity, and falling behind two fmall fprings *s s* (*fig.* 78.) is by them detained. Then opening the hammer again, the ball is brought into its proper place, near the difcharging valve, and the bore of the key again coincides with that of the fhooting barrel.

It appears how expeditious a method this is of charging and difcharging a gun; and if the force of condenfed air was as great as that of gunpowder, fuch an air-gun would actually anfwer the end of many guns, and prove the beft defence againft highwaymen or robbers; becaufe when there is reafon to fufpect them, they might then make five or fix difcharges before the robber can come within piftol fhot. However, in this kind of gun, and in all cafes which require a very confiderable condenfation of air, it will be requifite to have the fyringe of a fmall bore, viz. not exceeding half an inch in diameter; becaufe the preffure againft every fquare inch is about fifteen pounds, and againft every circular inch about twelve pounds. If, therefore, the fyringe be one inch in diameter, when one atmofphere is injected, there will be a refiftance of twelve pounds againft the pifton; when two, of twenty-four pounds; and when ten are injected, there will be a force of a hundred and twenty pounds to overcome; whereas ten atmofpheres act againft the circular half inch pifton, whofe area is but one-fourth part fo big, with a force but one-fourth fo great, viz. thirty pounds, or forty atmofpheres may be injected with fuch a fyringe, as well as ten with the other. Defaguliers's Exp. Phil. vol. ii. p. 398, &c. Martin's Phil. Brit. vol. ii. p. 189, &c.

WIND-*hatch*, in *Mining*, a term ufed to exprefs the place at which the ore is taken out of the mines.

The word *hatch* is the general term ufed by the miners to exprefs an opening from the furface into the mine, or in the attempting to find a mine.

Thus the word *effay-hatches* fignifies the openings made in fearch of the trains of fhoad-ftones; and the *tin-hatch* in Cornwall is the name of the opening by which they defcend into a tin-mine.

The word *wind-hatch* feems to be a corruption of *winder-hatch*; for at thefe places they have a *winder* conveying two buckets, the one conftantly up, the other conftantly down; the man below fills the bucket that defcends; and when that which afcends full is emptied at the mouth of the hatch, the perfon who has the care of that part of the work, delivers it empty to go down again. Phil. Tranf. Nº 69.

WIND-*hover*, in *Ornithology*, the name of a fpecies of hawk, called alfo by fome the *ftannel*, but more ufually the *keftrel*, and known among authors by the names of the TINNUNCULUS and *cenchris*.

WIND-*inftruments*, in *Mufic*, are inftruments played by *wind*, chiefly by the breath; in contradiftinction to *ftring-inftruments*, and inftruments of the *pulfative* kind.

The *wind-inftruments* known to the ancients, were the *tibia*, *fiftula*, or *fyringa* of Pan, confifting of feven reeds, joined fidewife; alfo *organs*, *tubæ*, *cornua*, and the *lituus*.

Those of the moderns, are the *flute*, *bagpipe*, *hautboy*, *trumpet*, &c.

WIND-*mill*, a kind of mill which receives its motion from the impulse of the *wind*.

The *wind-mill*, though a machine common enough, has yet somewhat in it more ingenious than is usually imagined. Add, that it is commonly allowed to have a degree of perfection, which few of the popular engines have attained to, and which the makers are but little aware of: though the new geometry, &c. has furnished ample matter for its improvement.

WIND-*mill*, *structure of the*. The internal structure of the *wind-mill* is much the same with that of water-mills. The difference between them lies chiefly in an external apparatus, for the application of the power.

This apparatus consists of an axis EF (*Tab.* V. *Pneumatics*, *fig.* 81.) through which pass two arms, or yards, AB, and CD, intersecting each other at right angles in E, whose length is usually about thirty-two feet: on these yards are formed a kind of sails, vanes, or flights, in the figure of trapeziums, with parallel bases; the greater whereof, HI, is about six feet; and the less, FG, determined by radii drawn from the centre E, to I and H.

These sails are to be capable of being all ways turned to the *wind*, that they may receive its impression: in order to which there are two different contrivances, which constitute the two different kinds of *wind-mills* in use.

In one, the whole machine is sustained upon a moveable arbor, or axis, perpendicular to the horizon, on a stand, or foot; and turned, occasionally, this way, or that, by means of a lever.

In the other, only the cover, or roof, of the machine, with the axis and sails, turns round. In order to which, the cover is built turret-wise, and the turret encompassed with a wooden ring, wherein is a groove, at the bottom whereof are placed, at certain distances, a number of brass truckles; and within the groove is another ring, upon which the whole turret stands. To the moveable ring are connected beams *a b*, and *f c*; and to the beam *a b* in *b*, is fastened a rope, which, at the other extreme thereof, is fitted to a windlass, or axis, in peritrochio: this rope being drawn through the iron hook G, and the windlass turned, the sails will be moved round, and put in the direction required.

The internal mechanism of a *wind-mill* is exhibited in *fig.* 82. AHO is the upper room; H*oz* the lower one; AB the axle-tree passing through the mill; STVW the sails, covered with canvas, set obliquely to the *wind*, and turning round in the order of the letters; CD the cog-wheel, having about forty-eight cogs, *a*, *a*, *a*, &c. which carry round the lantern EF, having eight or nine trundles *c*, *c*, *c*, &c. together with its axis GN; IK is the upper mill-stone, and LM the lower one; QR is the bridge, supporting the axis or spindle GN; this bridge is supported by the beams *c d*, XY, wedged up at *c*, *d*, and X; *z*Y is the lifting-tree, which stands upright; *ab* and *ef* are levers, whose centres of motion are *z* and *e*; *f g h i* is a cord, with a stone *i*, going about the pins *g* and *h*, and serving as a balance or counterpoise. The spindle *t* N is fixed to the upper millstone IK, by a piece of iron called the rynd, and fixed in the lower side of the stone, which is the only one that turns about, and its whole weight rests upon a hard stone, fixed in the bridge QR at N. The trundle EF, and axis G *t*, may be taken away; for it rests by its lower part at *t* by a square socket, and the top runs in the edge of the beam *w*. By bearing down the end *f* of the lever *f e*, *b* is raised, which raises *z*Y, and this raises YX, which lifts up the bridge QR, with the axis NG, and the upper stone IK; and thus the stones are set at any distance. The lower immoveable stone is fixed upon strong beams, and is broader than the upper one: the flour is conveyed through the tunnel *n o* into a chest; P is the hopper, into which is put the corn, which runs along the spout *r* into the hole *t*, and so falls between the stones, where it is ground. The axis G *t* is square, which shaking the spout *r*, as it goes round, makes the corn run out; *r s* is a string going about the pin *s*, and serving to move the spout nearer to or farther from the axis, so as to make the corn run faster or slower, according to the velocity and force of the *wind*. And when the *wind* is great, the sails S, T, V, W, are only in part or one side covered; or perhaps only one half of two opposite sails. Toward the end B of the axle-tree is placed another cog-wheel, trundle, and mill-stones, with an apparatus like that already described; so that the same axle-tree moves two stones at once; and when only one pair is to grind, the trundle EF, and axis G *t*, are taken out from the other; *x y l* is a girt of pliable wood, fixed at the end *x*; and the other end *l* is tied to the lever *k m*, moveable about *k*; and the end *m* being put down, draws the girt *x y l* close to the cog-wheel; and thus the motion of the mill is stopped at pleasure; *p q* is a ladder for ascending to the higher part of the mill; and the corn is drawn up by means of a rope, rolled about the axis AB, when the mill is at work. See MILL.

Theory of the motion of a WIND-*mill*, *with the position of the sails, or vanes, thereof*. The angle, which the sails are to make with their common axis, so as that the *wind* may have the greatest effect, or the degree of *weathering*, as the mill-wrights call it, is a matter of nice enquiry, and has much employed the thoughts of the mathematicians.

To conceive why a *wind-mill* moves at all, the theory of compound motions must be supposed. A body moving perpendicularly against any surface, strikes it with all its force. If it move parallel to the surface, it does not strike it at all; and if it move obliquely, its motion, being compounded of the perpendicular and parallel motion, only acts on the surface, considered as it is perpendicular, and only drives it in the direction of the perpendicular. So that every oblique direction of a motion is the diagonal of a parallelogram, whose perpendicular and parallel directions are the two sides. Add, that if a surface, which, being struck obliquely, has only received the perpendicular direction, be fastened to some other body, so as that it cannot pursue its perpendicular direction, but must change it for some other; in that case, the perpendicular itself becomes the diagonal of a new parallelogram, one of whose sides is the direction, which the surface may follow; and the other, that which it cannot.

Thus, a rudder fastened obliquely to the keel of a vessel, being struck by the current of water parallel to the keel, and, of consequence, obliquely with regard to itself; it will appear, by drawing the line of perpendicular impulse, that it tends to tear the rudder from the keel, and to carry it away: and that this direction, perpendicular to the rudder, is oblique to the keel. The rudder, then, would be carried off in an oblique direction; but as, in reality, it is so secured, that it cannot be torn, and carried off, we are only to consider, in this compound motion, that of the two directions wherewith it can move without being torn from the keel; and leave the other, which would tear it off, as useless.

Now, the direction in which it can move without parting from the keel, is that which carries it circularly about its extremity, as about a centre. So that the effect of the oblique impulse of the water on the rudder is reduced, first to a perpendicular impression, which is again reduced to the mere turning of the rudder round; or, if the rudder be immoveable, to the turning of the vessel.

Now, in an oblique and compound motion, where only one of the directions is of service; the greater ratio the other has thereto, the less effect will the motion have, and *vice versa*. In examining the compound motions of the rudder, we find, that the more oblique it is to the keel, the ratio of the direction that serves to turn it to the other, is the greater. But, on the other hand, the more oblique it is to the keel, and, of consequence, to the course of the water which is supposed parallel thereto, the more weakly it strikes. The obliquity of the rudder, therefore, has, at the same time, both an advantage, and a disadvantage; but as those are not equal, and as each of them is still varying with every different position of the rudder, they become complicated variously; so that sometimes the one prevails, and sometimes the other.

It has been a point of enquiry to find the position of the rudder, wherein the advantage should be the greatest. M. Renau, in his famous theory of the working of ships, has found, that the best situation of the rudder is, when it makes an angle of fifty-five degrees with the keel. See RUDDER.

If, now, a *wind-mill*, exposed directly to the *wind*, should have its four sails perpendicular to the common axis wherein they are fitted, they would receive the *wind* perpendicularly; and it is visible that impulse would only tend to overturn them. There is a necessity, therefore, to have them oblique to the common axis, that they may receive the *wind* obliquely.

For the greater ease, let us only consider one vertical sail. The oblique impulse of the *wind* on this sail is reducible to a perpendicular impulse; and that direction, as the sail cannot absolutely keep to it, is compounded of two; one whereof tends to make it turn on its axis, and the other to fall backwards. But it is only the first of these directions that can be obeyed. Of consequence, the whole impulse of the *wind* on the sail has no other effect, but to make it turn from right to left, or from left to right, as its acute angle turns this way or that. And the structure of the machine is so well contrived, that the three other sails are determined, from the same causes, to move the same way.

The obliquity of the ſails, with regard to their axis, has preciſely the ſame advantage, and diſadvantage, with the obliquity of the rudder to the keel. And M. Parent, ſeeking, by the new analyſis, the moſt advantageous ſituation of the ſails on the axis, finds it preciſely the ſame angle of fifty-five degrees.

For the farther illuſtration of this point, let AB (*fig.* 83.) be the axis of the mill, CD a ſail, and its angle of obliquity (viz. that which it makes with the axis) be ECG; then if GC be the force of the *wind* in the direct poſition of the ſail, GE (the ſine of the angle of incidence GCE) will be the force of the *wind* in its oblique poſition; but the force GE is reſolvable into two others, EF and GF; of which the latter, being parallel to the axis, avails nothing in turning the ſails about it; but the other, EF, being perpendicular to it, is wholly ſpent in compelling the ſail to turn round. The force of the *wind* on the ſail will be as the ſquare of the ſine of incidence, or as GE^2; and if the area of the ſail, and the velocity of the *wind*, be ſuppoſed conſtant, the force of the *wind* in the direct poſition will be to that in the oblique one, as GC to GE^2; but when GE is the whole force, that part which turns the ſail is repreſented by EF; and $GE : EF\ (:: GC : CE) :: GE^2 : \frac{CE \times GE^2}{GC}$ = to the force which turns the ſail, when the whole force is repreſented by GE^2. This expreſſion $\frac{CE \times GE^2}{GC}$ begins from nothing, when the angle of incidence begins to be oblique, and increaſes with the obliquity of the ſaid angle to a certain number of degrees; becauſe that part of the force, which is parallel to the axis, becomes leſs in proportion to that which is perpendicular to it; but after it has paſſed this limit, it again decreaſes, and becomes nothing, when the angle of incidence vaniſhes. There is, therefore, one certain poſition of the ſail, in which the force of the *wind* upon it is a *maximum*. In order to find this, put radius $GC = a$, $EC = x$; and we have $GE^2 = aa - xx$, and conſequently the force $\frac{CE \times GE^2}{GC} = \frac{aax - xxx}{a}$, which muſt be a *maximum*: therefore its fluxion $aa\dot{x} - 3x^2\dot{x} = 0$; whence $aa = 3xx$, and ſo $x = \sqrt{\frac{aa}{3}}$ = (in logarithms) $\frac{20{,}000000 - 0{,}477121}{2} = 9{,}761439$, which is the logarithmic ſine of the angle $35^\circ\ 16' = CGE$; and, therefore, the angle $ECG = 54^\circ\ 44'$, when the force of the *wind* is a *maximum*. Thus, alſo, if lm (*fig.* 75.) parallel to the axis QM, be equal to a, and repreſent the whole force of the *wind* on the ſail; this force is reduced to ln, and this again to no, which acts perpendicularly to the axis, and turns the ſail. This force, putting $mn = x$, is expreſſed by $\frac{aax - x^3}{a}$, and thus, as before, when it is a *maximum*, $x = \sqrt{\frac{aa}{3}} = a\sqrt{\frac{1}{3}}$; and the angle $lmn = 54^\circ\ 44'$. Martin's Phil. Brit. vol. i. p. 220, vol. ii. p. 212.

This angle, however, is only that which gives the *wind* the greateſt force to put the ſail in motion, but not the angle which gives the force of the *wind* a *maximum* upon the ſail when in motion: for when the ſail has a certain degree of motion, it yields to the *wind*; and then that angle muſt be increaſed, to give the *wind* its full effect. Mr. Maclaurin, in his Fluxions, vol. ii. p. 734, has ſhewn, how to determine this angle. See alſo on this ſubject the article Mechanics.

It may be obſerved, that the increaſe of this angle ſhould be different, according to the different velocities from the axis to the extremity of the vane or ſail. At the axis it ſhould be 54° 44′, and thence continually increaſe, giving the vane a twiſt, and ſo cauſing all the ribs of the vane to lie in different planes.

It is obſerved, that the ribs of the vane or ſail ought to decreaſe in length from the axis to the extremity, giving the vane a curvilineal form; ſo that no part of the force of any one rib be ſpent upon the reſt, but all move on independent of each other. The twiſt above mentioned, and the diminution of the ribs, are exemplified in the wings of birds. As the ends of the ſail neareſt the axis cannot move with the ſame velocity which the tips or fartheſt ends have, although the *wind* acts equally ſtrong upon them, Mr. Ferguſon (Lect. on Mechanics, p. 52.) ſuggeſts, that perhaps a better poſition than that of ſtretching them along the arms directly from the centre of motion, might be, to have them ſet perpendicularly acroſs the farther ends of the arms, and there adjuſted lengthwiſe to the proper angle. For, in that caſe, both ends of the ſails would move with the ſame velocity; and being farther from the centre of motion, they would have ſo much the more power, and then there would be no occaſion for having them ſo large as they are generally made; which would render them lighter, and, conſequently, there would be ſo much the leſs friction on the thick neck of the axle, when it turns in the wall.

Wind-*mill, elliptical.* M. Parent conſiders what figure the ſails of a *wind-mill* ſhould have, to receive the greateſt impulſe from the *wind*; and he determines it to be a ſector of an ellipſis, whoſe centre is that of the axis, or arbor, of the mill; and the little ſemi-axis the height of thirty-two feet: as for the greater, it follows neceſſarily from the rule that directs the ſail to be inclined to the axis in an angle of 55 degrees.

On this foundation he aſſumes four ſuch ſails, each whereof is one fourth of an ellipſis; which, he ſhews, will receive all the *wind*, and loſe none, as the common ones do. Theſe four ſurfaces, multiplied by the lever, with which the *wind* acts on one of them, expreſs the whole power the *wind* has to move the machine, or the whole power the machine has when in motion.

The ſame manner of reaſoning, applied to a common *wind-mill*, whoſe ſails are rectangular, and their length about five times their breadth, ſhews, that the *elliptic wind-mill* has above ſeven times the power of the common one. A prodigious advantage! and worthy, ſure, to have the common practice ſet aſide for, could ſo common a practice be eaſily changed.

A *wind-mill*, with ſix elliptic ſails, he ſhews, would ſtill have more power than one with only four. It would only have the ſame ſurface with the four; ſince the four contain the whole ſpace of the ellipſis, as well as the ſix. But the force of the ſix would be greater than that of the four, in the ratio of 245 to 231. If it were deſired to have only two ſails, each being a ſemi-ellipſis, the ſurface would be ſtill the ſame; but the power would be diminiſhed, by near one-third of that with ſix ſails; by reaſon the greatneſs of the ſectors would much ſhorten the lever with which the *wind* acts.

Wind-*mills, beſt form and proportion of rectangular.* But, as elliptical ſails would be ſomething ſo new, that there is little room to expect they will come into common uſe, the ſame author has conſidered which form, among the rectangular ones, will be the moſt advantageous; i. e. which, the product of whoſe ſurface by the lever of the *wind*, will be the greateſt. And by the method *de maximis & minimis*, he finds it very different from the common ones.

The reſult of this enquiry is, that the width of the rectangular ſail ſhould be nearly double its length; whereas the length is uſually made almoſt five times the width. Add, that as we call height or length the dimenſion which is taken from the centre of the axis, the greateſt dimenſion of the new rectangular ſail will be turned toward the axis, and the ſmalleſt from it; quite contrary to the poſition of the common ſails.

The power of a *wind-mill*, with four of theſe new rectangular ſails, M. Parent ſhews, will be to the power of four elliptic ſails, nearly as 13 to 23; which leaves a conſiderable advantage on the ſide of the elliptic ones; yet will the force of the new rectangular ſails be conſiderably greater than that of the common ones.

M. Parent likewiſe conſiders what number of the new ſails will be moſt advantageous; and finds, that the fewer the ſails, the more ſurface there will be, but the leſs power. The ratio of the power of a *wind-mill* with ſix ſails, will be to another with 4, nearly as 14 to 13. And the power of another with 4, will be to that with 2, nearly as 13 to 9.

As to the common *wind-mill*, its power ſtill diminiſhes as the breadth of the ſails is ſmaller, in proportion to the length. The uſual proportion, therefore, of 5 to 1 is exceedingly diſadvantageous.

The uſes of this new theory of *wind-mills* are very obvious. The more power a *wind-mill* has, the ſwifter it turns, the more it diſpatches, and the leſs *wind* it needs. Add, that on this theory one may have a *wind-mill* whoſe ſails ſhall be much ſhorter, and yet the power greater, than in the common one.

For a variety of curious experiments and obſervations concerning the conſtruction and effects of *wind-mill* ſails, by the ingenious Mr. Smeaton, ſee Phil. Tranſ. vol. li. p. 138, &c.

Wind-*ſails*, in a *Ship*, are made of the common ſail-cloth, and are uſually between twenty-five and thirty feet long, according to the ſize of the ſhip, and are of the form of a cone ending obtuſely: when they are made uſe of, they are hoiſted by ropes to about two thirds or more of their height, with their baſis diſtended circularly by hoops, and their apex hanging downwards in the hatch-ways of the

the ship; above each of these, one of the common sails is so disposed, that the greatest part of the air, rushing against it, is directed into the *wind-sail*, and conveyed, as through a funnel, into the upper parts of the body of the ship. Phil. Trans. N° 463. p. 65.

These, of which there are generally three or four in our capital ships of war, have the advantage of taking little room, of requiring no labour in working, and of a simple contrivance, so that they can fail in no hands. But their powers are small in comparison with those of Dr. Hales's VENTILATORS: they cannot be put up in hard gales of *wind*, and are of no efficacy in dead calms, when a refreshment of the air is most wanted.

WIND-*seed*, in *Botany*. See ARCTOTIS.

WIND-*shock*, a name given by our farmers to a distemperature to which fruit-trees, and sometimes timber-trees, are subject.

It is a sort of bruise and shiver throughout the whole substance of the tree; but the bark being often not affected by it, it is not seen on the outside, while the inside is twisted round, and greatly injured.

It is by some supposed to be occasioned by high *winds*; but others attribute it to lightning. Those trees are most usually affected by it, whose boughs grow more out on one side than on the other.

The best way of preventing this in valuable trees, is to take care in the plantation, that they are sheltered well, and to cut them frequently in a regular manner, while young.

The *winds* not only twist trees in this manner, but they often throw them wholly down: in this case, the common method is to cut up the tree for firing, or other uses; but if it be a tree that is worth preserving, and it be not broken, but only torn up by the roots, it may be proper to raise it again by the following method: let a hole be dug deep enough to receive its roots, in the place where they before were; let the straggling roots be cut off, and some of the branches, and part of the head of the tree; then let it be raised; and when the torn-up roots are replaced in the earth in their natural situation, let them be well covered, and the hole filled up with rammed earth; the tree will, in this case, grow as well, and perhaps better than before. If nature be left to herself, and the tree be not very large, the pulling off the roots will raise it. Mortimer's Husbandry, vol. ii. p. 79.

WIND-*tackle blocks*, in a *Ship*. See WINDING-*tackle*.

WIND-*taught*, in *Sea-Language*, denotes the same as stiff in the *wind*. Too much rigging, high masts, or any thing catching or holding *wind* aloft, is said to hold a ship *wind-taught*; by which they mean, that she stoops too much in her sailing, in a stiff gale of *wind*.

Again, when a ship rides in a main stress of *wind* and weather, they strike down her top-masts, and bring her yards down, which else would hold too much *wind*, or be too much distended and *wind-taught*.

WIND-*thrush*, in *Ornithology*, a name given by some to the RED-*wing*, and supposed to be given from their generally first appearing with us in windy seasons; but it appears more probably to be derived from the German name *wint-trossel*, or vine-thrush, from its doing great mischief there in the vine-yards, by eating and destroying the grapes. Ray.

WIND-*tumors*. See TUMOR.

WIND-*ward*, in *Sea-Language*, denotes any thing towards that point from whence the *wind* blows, in respect of a ship.

WIND-*ward*, *sailing to*. See SAILING.

WIND-*ward tide*, denotes a tide which runs against the *wind*.

WINDAGE *of a gun*, is the difference between the diameter of the bore, and the diameter of the ball.

The *windage* is not the same in England as it is abroad. With us, if the diameter of the shot is divided into twenty equal parts, then the diameter of the bore is twenty-one of these parts. The French suppose the diameter of the shot divided into twenty-six parts, and the diameter of the bore to be twenty-seven. Mr. Muller observes, that the less *windage* there is, the truer the shot will go, and having less room to bounce from one side to another, the gun will not be spoiled so soon. Accordingly, he divides the diameter of the shot into twenty-four equal parts, and makes the bore twenty-five, which is a medium between the English and French method. Artillery, p. 84.

Dr. Hutton also recommends the diminishing of the *windage*. See GUNNERY.

WINDASS, WANDASS, or WANLASS, an ancient term in hunting. Thus, to drive the *windass*, signifies the chasing of a deer to a stand, where one is ready with a bow, or gun, to shoot. This is one of the customary services of fiefs.

—— *Omnes illi qui tenuerunt in bondagii tenura, solebant vocari custumarii: et quotiescunque dominus ad venundum venerit, illi custumarii solebant fugare* windassum, *ad stabulum, in venatione ferarum bestiarum secundum quantitatem tenuræ suæ.* MS. de Consuetud. Manerii de Sutton Colfield. an. 3. Ed. II.

WINDER-*meb*, in *Ornithology*, the name of a bird of the larus or gull-kind, the *larus cinerarius* of Linnæus, moderately large, and described by Aldrovand under the name of *larus major*.

Its head is remarkably large and thick, and is of a mottled colour of white and grey; its breast and belly are also variegated with the same colours, but they are somewhat paler; its beak is thick and strong, of a yellow colour, and very sharp, and the opening of its mouth very wide; its wings are variegated with white, grey, and chesnut-colour, and both these and the tail have much black in them; the feet are webbed and yellow, the claws are sharp, and the hinder toe larger than in most birds of this kind. Ray's Zoology, p. 267.

WINDERS *of wool*. See WOOL-*winders*.

WINDING *a call*, in *Sea-Language*, denotes the act of blowing or piping upon a boatswain's whistle, so as to communicate the necessary orders of hoisting, heaving, belaying, slackening, &c. See CALL.

WINDING-*tackle*, in a *Ship*, a name usually given to a TACKLE formed of three fixed, and two or three moveable sheaves. It is principally employed to hoist up any heavy materials into or out of a ship, in the exercises of lading and delivering. Falconer.

WINDING *of silk*. We have an excellent machine for this purpose at Derby, contrived by messieurs Thomas and John Lombe; but as the proprietors are not willing that a description of it should be made public, the following general account of it must suffice.

It consists of no less than 26586 wheels, and 97746 movements, continually working, except on Sundays. This grand machine is disposed of in several stories of large rooms, one above another, comprehending in all its building no less than half a quarter of mile in length; and one water-wheel communicates motion to all the rest of the wheels and movements, of which any one may be stopped separately and independently of the rest. One fire-engine conveys air to every part of the machine; and one regulator governs the whole work; 73728 yards of silk are *wound* every time the water-wheel goes round, which is three times every minute; so that 318,504,960 yards of silk may be *wound* every day and night, and consequently 99,373,547,550 yards of silk in one year. See Desaguliers's Experim. Philosoph. vol. i. p. 70.

The model of this machine is said to have been taken by the brother of the late sir Thomas Lombe, merchant of the city of London, from the original in the king of Sardinia's dominions, who, under the disguise of a common workman, or by some other artifice, secretly drew the plan of it upon paper, and then made his escape to England, and communicated the same to his brother sir Thomas; who, acting in concert with him, employed an excellent practical mechanic, called Soracle, and completed the whole piece of machinery, which has saved a great deal of money to the nation, formerly paid for organzine, or thrown silk, to the Piedmontese. In the fifth year of George I. a patent passed to secure to sir Thomas Lombe the sole property of this machine for fourteen years; but the necessary buildings and engines, and the instruction of proper persons to work them, took up so much time, that the term of fourteen years was nearly elapsed before sir Thomas could make any advantage of this curious machinery; upon which he applied to parliament, which granted him in 1732 (5 Geo. II. cap 8.) 14,000*l.* on condition that he should allow a perfect model to be taken of his three engines, for securing and perpetuating the art of making the same. Anderson's Hist. Com. vol. ii. p. 284.

WINDING *stairs*. See STAIR.

WINDLASS, or WINDLACE, a machine used for raising heavy weights, as guns, stones, anchors, &c.

It is very simple, consisting only of an axis, or roller, supported horizontally at the two ends by two pieces of wood, and a pulley. The two pieces of wood meet at top; being placed diagonally, so as to prop each other. The axis, or roller, goes through the two pieces, and turns in them. The pulley is fastened at top, where the pieces join.

Lastly, there are two staves, or hand-spikes, which go through the roller, whereby it is turned; and the rope, which comes over the pulley, is wound off and on the same.

WINDLASS *in a ship*, is a machine used in merchant-ships to heave up the anchors from the bottom, &c.

This *windlass* is a cylindrical piece of timber, supported at the two ends by two frames of wood, *a*, *b* (*Tab.* VII.

Mecha-

Mechanics, *fig.* 128.) placed on the oppoſite ſides of the deck, near the fore-maſt, called knight-heads, and turned about in this poſition as upon an axis, by levers, called hand-ſpikes, or hand-ſpecs, which are, for this purpoſe, thruſt into holes bored through the body of the machine. The lower part of the *windlaſs* is uſually about a foot above the deck. It is, like the capſtern, furniſhed with ſtrong pauls, *c*, *d*, to prevent it from turning backwards by the effort of the cable, when charged with the weight of the anchor, and ſtrained by the violent jerking of the ſhip in a tempeſtuous ſea. The pauls, which are formed of wood or iron, fall into notches, cut in the ſurface of the *windlaſs*, and lined with plates of iron. Each of the pauls, being accordingly hung over a particular part of the *windlaſs*, falls eight times into the notches at every revolution of the machine, becauſe there are eight notches placed on its circumference under the pauls. So that if the *windlaſs* is twenty inches in diameter, and purchaſes five feet of the cable at every revolution, it will be prevented from turning back, or loſing any part thereof, at every ſeven inches nearly, which is heaved in upon its ſurface.

As this machine is heaved about in a vertical direction, it is evident that the effort of an equal number of men acting upon it will be much more powerful than on the capſtern; becauſe their whole weight and ſtrength are applied more readily to the end of the lever employed to turn it about; whereas in the horizontal movement of the capſtern, the exertion of their force is conſiderably diminiſhed. It requires, however, ſome dexterity and addreſs to manage the hand-ſpec to the greateſt advantage; and to perform this the ſailors muſt all riſe at once upon the *windlaſs*, and, fixing their bars therein, give a ſudden jerk at the ſame inſtant, in which movement they are regulated by a ſort of ſong or howl, pronounced by one of their number. Falconer.

WINDOW, q. d. *wind-door*, an aperture, or open place, in the ſide of a houſe, to let in the air and light.

Before glaſs *windows* came into uſe (for the antiquity and firſt introduction of which, ſee Glass), the *window* caſements were commonly made of a tranſparent ſtone called *ſpecularis lapis*, and thence called *ſpecularia*; and before the *ſpecularia*, veils were the only defence they had againſt the weather. Pitiſc. Lex. Antiq. in voc. *Specularia*.

We have various kinds and forms of *windows*; as glaſs *windows*, wire *windows*, horn *windows*, &c. Arched *windows*, circular *windows*, elliptical *windows*, ſquare and flat *windows*, round *windows*, oval *windows*, Gothic *windows*, regular *windows*, ruſtic *windows*; to which add ſky-lights.

The chief rules with regard to *windows*, are, 1. That they be as few in number, and as moderate in dimenſions, as may conſiſt with other reſpects; inaſmuch as all openings are weakenings.

2. That they be placed at a convenient diſtance from the angles, or corners, of the building; becauſe thoſe parts ought not to be opened and enfeebled, whoſe office is to ſupport and faſten all the reſt of the building.

3. That care be taken the *windows* be all equal one with another, in their rank and order; ſo that thoſe on the right-hand may anſwer to thoſe on the left, and thoſe above be right over thoſe below; for this ſituation of *windows* will not only be handſome and uniform, but alſo, the void being upon the void, and the full upon the full, it will be a ſtrengthening to the whole fabric.

As to their dimenſions, care is to be uſed, to give them neither more nor leſs light than is needful; therefore regard is to be had to the bigneſs of the rooms which are to receive the light. It is evident, that a great room needs more light, and, conſequently, a greater *window*, than a little room; and *e contra*.

The apertures of *windows*, in middle-ſized houſes, may be four and a half, or five feet, between the jambs; and in the greater buildings, ſix and a half, or ſeven feet; and their height may be double their length at the leaſt. But in high rooms, or larger buildings, their height may be a third, a fourth, or half their breadth, more than double the length.

Such are the proportions for *windows* of the firſt ſtory; and, according to theſe, muſt thoſe in the upper ſtory be for breadth; but, as to height, they muſt diminiſh; the ſecond ſtory may be one-third part lower than the firſt; and the third ſtory, one-fourth part lower than the ſecond.

Windows, *architrave*. See Architrave.

Windows, *dormer*, or *Lutherns*. See Luthern, &c.

Windows, *ſcenography of*. See Scenography.

Windows, *tranſom*. See Transom.

Window *and houſe-tax*, is a tax ſubject to the management of the commiſſioners of the land-tax. The yearly duty for every dwelling-houſe inhabited, by 6 Geo. III. cap. 38. is 3*s.*; and by the ſame act, for every *window* or light in every ſuch houſe, an additional yearly ſum, as follows; viz.

Nº of *windows*.	Duty on each.		Nº of *windows*.	Duty on each.	
	s.	d.		s.	d.
7, and no more.	0	2	14 to 19 —	1	6
8 ——	0	6	20 ——	1	7
9 ——	0	8	21 ——	1	8
10 ——	0	10	22 ——	1	9
11 ——	1	0	23 ——	1	10
12 ——	1	2	24 ——	1	11
13 ——	1	4	25 and upwards	2	0

And by 24 Geo. III. cap. 38. an additional duty is laid upon houſes and *windows*, to be levied as the former duties, which the act expreſſes to be in lieu of the duty on Tea, thereby repealed. The additional duty on houſes is 3*s.* upon every houſe charged by former acts with the duty of 3*s.* The additional duty upon *windows* appears in the following table.

Nº of *windows*.	Addit. duty.			Nº of *windows*.	Addit. duty.			Nº of *windows*.	Addit. duty.		
	l.	s.	d.		l.	s.	d.		l.	s.	d.
7	0	6	0	22 —	3	5	0	85 — 89	10	0	0
8	0	8	0	23 —	3	10	0	90 — 94	10	10	0
9	0	10	6	24 —	3	15	0	95 — 99	11	0	0
10	0	13	0	25 to 29	4	0	0	100 — 109	12	0	0
11	0	15	6	30 — 34	4	10	0	110 — 119	13	0	0
12	0	18	0	35 — 39	5	0	0	120 — 129	14	0	0
13	1	1	0	40 — 44	5	10	0	130 — 139	15	0	0
14	1	5	0	45 — 49	6	0	0	140 — 149	16	0	0
15	1	10	0	50 — 54	6	10	0	150 — 159	17	0	0
16	1	15	0	55 — 59	7	0	0	160 — 169	18	0	0
17	2	0	0	60 — 64	7	10	0	170 — 179	19	0	0
18	2	5	0	65 — 69	8	0	0	180 and upwards	20	0	0
19	2	10	0	70 — 74	8	10	0				
20	2	15	0	75 — 79	9	0	0				
21	3	0	0	80 — 84	9	10	0				

A perſon occupying three or more houſes ſhall not be ſubject to the payment of theſe additional duties for more than two of thoſe houſes, which ſhall be thoſe that contain the greateſt number of *windows*. Moreover, by 18 Geo. III. cap. 26. and 19 Geo. III. cap. 59. for every dwelling-houſe inhabited, &c. worth the yearly rent of 5*l.* and upwards, and under 20*l.* ſhall be paid the yearly ſum of 6*d.* in the pound; if worth the yearly rent of 20*l.* and upwards, and under 40*l.* the yearly ſum of 9*d.* in the pound; if worth the yearly rent of 40*l.* and upwards, the yearly ſum of 1*s.* in the pound. This duty is charged on the inhabitants or occupiers, and not on the landlord. Cottages, the occupiers of which are exempted from payment to the church and poor, hoſpitals, and farm-houſes, not valued at more than 10*l.* a year, are not chargeable with this duty. But each chamber or apartment in any college or hall in the univerſities, or the inns of court and chancery, ſhall pay as if it were an entire houſe.

Window, in *Anatomy*, &c. See Fenestra.

WINDY *tumors*. See Tumor.

WINE, *vinum*, a briſk, agreeable, ſpirituous, and cordial liquor, drawn from vegetable bodies, and fermented. See Fermentation.

The character of a *wine*, according to Boerhaave, is, that the firſt thing it affords by diſtillation be a thin, oily, inflammable fluid, called a *ſpirit*.

This diſtinguiſhes *wines* from another claſs of fermented vegetable juices, viz. *vinegars*; which, inſtead of ſuch ſpirit, yield, for the firſt thing, an acid, uninflammable matter.

All ſorts of vegetables, fruits, ſeeds, roots, &c. may be made to afford *wine*; as grapes, currants, mulberries, elder, cherries, apples, pulſe, beans, peas, turneps, radiſhes, and even graſs itſelf.

Hence, under the claſs of *wines*, or vinous liquors, come not only *wines*, abſolutely ſo called, but alſo ale, cyder, &c.

And we may obſerve, in general, that all vegetable and animal matters, which have a taſte ſweet, agreeable, and more or leſs ſaccharine, and which are nutritive, are ſuſceptible of the ſpirituous fermentation. Accordingly, *wine* may be made of all the juices of plants, the ſap of trees, the infuſions and decoctions of farinaceous vegetables, the milk of frugivorous animals, which is poſſeſſed of the above mentioned qualities, and likewiſe of all ripe ſucculent fruits, which alſo are poſſeſſed of theſe qualities; but all theſe ſubſtances are not equally proper to be changed into a good and generous *wine*.

As the production of ardent ſpirit is the reſult of the ſpirituous fermentation, we may conſider that *wine* as eſſentially the beſt, which contains moſt of this ſpirit. But of all ſubſtances ſuſceptible of the ſpirituous fermentation, none is capable of being converted into ſo good *wine*, as the juice of the grapes of France, or of other countries that are nearly in the ſame latitude, or in the ſame temperature. Hence,

WINE is, in a more particular manner, appropriated to that which is drawn from the fruit of the vine, by stamping its grapes in a vat, or crushing and expressing the juice out of them in a press, and then fermenting, &c.

There is a great variety of grapes, colourless, yellowish, bluish, and red; more or less sweet, and of more or less flavour. The colour is lodged not in the juice, but in the skin of the grape; though the juice, as a menstruum, frequently extracts and becomes impregnated with it, during its expression from the fruit. The same kind of grape proves very different in taste and flavour, according to the climate, and exposure to the sun. Among the TOKAY *wine* hills, there is one which directly fronts the south, and called, from the peculiar sweetness of its grapes, the sugar-hill. This, says Neumann, affords the most delicious of all the Hungarian *wines*, and is appropriated to the use of the imperial family.

In very warm dry seasons, the grapes at the bottoms of the hills are best; in warm and moist ones, those at the top; such as grow in the middle region being always good. In dry summers, the grapes are sweetest, but least juicy; in rainy ones, they abound with juice, which is proportionably weaker, and more dilute. Frosts in autumn promote their ripening; but frosts succeeding heavy rains dispose them to burst, and shed their juice. In some places the grape is rendered richer, by suffering it to remain on the tree till great part of its watery moisture has exhaled; the stem of each cluster being cut half through, when the fruit is ripe, to prevent the afflux of any fresh juice from the plant. The sweet Hungarian and Spanish *wines* are made from grapes that have been thus half dried.

The juice of the grape, before its fermentation, is called MUST; and different sorts of must are obtained from the same kind of grape, produced in the same vineyard, according to the method of management. The best is that which issues upon breaking, bruising, or treading the picked fruit; inferior sorts are extracted by forcibly pressing the entire cluster, with its stalks. Dilute watery musts are enriched, by infusing in them dried grapes, or by inspissating part of the liquor, and adding this to the rest. By such means, strong full-bodied *wines* are obtainable from the poorest juices; and by a similar management even the better sorts of grape *wines* are imitable with the juices of other fruits, artificially concentrated, or heightened with the simple sweetness of sugar. Hence it appears, that the difference of flavour, taste, colour, and body of *wines*, is, perhaps, as much owing to the different manner and time of gathering, pressing, fermenting, &c. the grape, as to the difference of the grape itself.

The process of fermentation in the operation of making *wine*, is briefly as follows. The must, or fermentable liquor, being put into a vessel in a place moderately warm, soon begins to swell; an intestine motion is excited among its parts, accompanied with a hissing noise, and evident ebullition; bubbles rise to the surface, and, at the same time, is disengaged a vapour, which is so subtle and dangerous, that it is capable of killing instantly men and animals, exposed to it in a place where the air is not renewed. The skins, stones, and other grosser matters of the grapes, are buoyed up by the particles of disengaged air that adhere to their surface, are variously agitated, and are raised in the form of a scum, or soft and spongy crust, that covers the whole liquor. During the fermentation this crust is frequently raised, and broken by the air disengaged from the liquor, which forces its way through it; afterwards the crust subsides, and becomes entire as before. These effects continue while the fermentation is brisk, and at last gradually cease; then the crust, being no longer supported, falls in pieces to the bottom of the liquor. At this time, in order to have a strong and generous *wine*, all sensible fermentation must be stopped; which is done by putting the *wine* into close vessels, and carrying these into a cellar, or other cool place. If we examine the *wine* produced by this first fermentation, it will be found to differ entirely and essentially from the juice of grapes before fermentation, or that which is called *sweet* WINE. Its sweet and saccharine taste is changed into one that is very different, though still agreeable, and somewhat spirituous and piquant. It has not the laxative quality of must, but affects the head, and occasions drunkenness; and, if distilled, it yields, instead of the insipid water obtained from must by distillation with the heat of boiling water, a volatile, spirituous, and inflammable liquor, called SPIRIT *of wine*, or ardent spirit.

It has been found by experience, that a *wine*, the fermentation of which is very slow and tedious, is never good and very spirituous; and therefore when the weather is too cold, the fermentation is usually accelerated by heating the place in which the *wine* is made; and it has been proposed to employ a greater than the usual heat, to accelerate the fermentation of *wine*, in those years in which grapes have not been sufficiently ripened, and when the juice is not sufficiently disposed to fermentation. There is also reason to apprehend, that a too hasty and violent fermentation is hurtful, on account of the dissipation and loss of some of the spirit. However, we may distinguish, in the ordinary method of making *wine* of grapes, two periods in the fermentation; the first of which lasts during the appearance of the sensible effects above mentioned, in which the greatest number of fermentable particles do ferment: these effects sensibly diminish, and ought to be stopped. In this stage, the heterogeneous parts that were suspended in the *wine* by this motion, and which render it muddy, are separated, and form a sediment, called the lees; after which the *wine* becomes clear. In this new *wine* some degree of fermentation still continues, during a longer or shorter time, although in an imperceptible manner; and this second period of the spirituous fermentation may be called the imperceptible fermentation, the effect of which is the gradual increase of the quantity of spirit in *wine*. It has also another effect no less advantageous, namely, the separation of a saline, acid, earthy matter, called tartar, from the *wine*. This matter is, therefore, a second sediment that is formed in the *wine*, and which adheres to the sides of the containing vessels. As the taste of tartar is harsh and disagreeable, it is evident that the *wine*, which, by means of the insensible fermentation, has acquired more spirit, and has disengaged itself of the greatest part of its tartar, ought to be better and much more agreeable; and for this reason chiefly, old *wine* is universally preferable to new *wine*. However, if a sufficient time has not been allowed for the first period of the fermentation, the unfermented matter that remains, being in too large a quantity, will then ferment in the bottles, or close vessels, in which the *wine* is put, and will occasion effects so much more sensible, as the first fermentation shall have been sooner interrupted: hence these *wines* are always turbid, emit bubbles, and sometimes break the bottles, on account of the large quantity of air and vapours that are disengaged during the fermentation. We have an instance of these effects in the white *wine* of Champagne, and in others of the same kind. The sensible fermentation of these *wines* is interrupted, or rather suppressed, that they may have this sparkling quality. These *wines*, it is well known, make the corks fly out of the bottles, sparkle and froth when they are poured into glasses, and have a taste much more lively and poignant than *wines* that do not sparkle; but this sparkling quality, and all the effects depending upon it, are only caused by a considerable quantity of air which is disengaged during the confined fermentation which the *wine* has undergone in close vessels. This air, not having an opportunity of escaping, and of being dissipated as fast as it is disengaged, and being interposed betwixt all the parts of the *wine*, combines, in some measure, with these, and adheres in the same manner as it does to those mineral waters that are called spirituous, in which it produces nearly the same effects. When this air is entirely disengaged from these *wines*, they no longer sparkle, they lose their poignancy of taste, become mild, and even almost insipid. Dr. Hales found, from many experiments, that fermented liquors generate air during the time of their fermentation, and that afterwards they are in an imbibing state; and by means of this fact he was enabled to account for the disagreeable taste which the *wines* of Italy have been found to acquire about the month of September, and to propose a method of preventing this evil. As *wine*, during the first year after it is made, continues fermenting more or less, and generates a great quantity of air, the cold of September puts a stop to its fermentation, after which it is in an imbibing state. The *wine*, by absorbing this air, which is of a rancid nature (like that of the Grotto del Cano), becomes foul, and acquires a rancid taste; for the prevention of which he proposes to insert in the bung-hole of a vessel filled with *wine* a glass tube about two feet long, and about two inches in bore, fixing it with a pewter socket closely cemented; and in this tube to closely fix another, of about half an inch in bore; the lower tube should always be kept about half full of *wine*, which will supply the vessel, as the *wine* in it subsides; so that there will be no room left in the upper part of the vessel to contain any generated air, which will pass off through the upper small tube, left always open for this purpose. As the *wine* in the lower tube subsides, it may be refilled, by introducing a slender funnel through the small tube, as far as the scum upon the surface of the *wine* in the larger tube, so as to prevent its being broken by the too violent fall of the *wine* upon it. This curious experiment has succeeded in the management of *wines*, wherever it has been tried.

Wines for daily use ought to have undergone so completely the sensible fermentation, that the succeeding fermentation should be almost insensible. *Wine*, in which the first fermentation has too far advanced, is liable to worse inconveniences than that in which the first fermentation has been too quickly suppressed; because, from the time of the completion of the spirituous fermentation, or even before, the *wine* begins to undergo the acid or acetous FERMENTATION. This is very slow and insensible, when the *wine* is included in very close vessels, and in a cool place; but it gradually advances, so that in a certain time the *wine*, instead of being meliorated, becomes at last sour.

Heat also is capable of producing the same effect. Thus, *wine*, which might have been long preserved in a cool place, very quickly becomes sour when placed in a bad cellar; and even as the best cellars have during winter a degree of heat much greater than that of the atmosphere, it would be very proper, when *wine* disposed to become sour is to be preserved, to bring it from the cellar in the beginning of winter, and leave it exposed to the air during all that season. Accordingly, the *wines* of Champagne, which have not body enough to maintain them, if they are permitted to ferment all the summer, are kept in winter in cellars above ground; but when the weather becomes warmer in spring, they are removed down into their vaults, where they are cooler than in the cellars; and this method of removing the *wines* from the cellars to the vaults, and back again into the cellars, as the seasons of the year require, is found of great service in preserving them in perfection.

The acidity of *wine* is an evil which cannot be remedied, because the fermentation may advance, but cannot be reverted. *Wine*-merchants, therefore, when their *wines* become sour, can only conceal or absorb their acidity by certain substances, as by alkalis, and absorbent earths. But these substances give to *wine* a dark-greenish colour, and a taste which, though not acid, is somewhat disagreeable. Besides, calcareous earths accelerate considerably the total destruction and putrefaction of the *wine*. Calces of lead, having the property of forming with the acid of vinegar a salt of an agreeable saccharine taste, which does not alter the colour of the *wine*, and which has, besides, the advantage of stopping fermentation and putrefaction, and of giving richness to meagre *wines*, might be very well employed to remedy the acidity of *wine*, if lead and all its preparations were not pernicious to health, as they occasion most terrible colics, and even death, when taken internally. If there be any persons, who make this use of lead, they must be considered as the poisoners and murderers of the public. In Germany, Dr. Watson apprehends, this adulteration is punished with death: he adds, it is to be wished that it met with that punishment every where.

If *wine* contains litharge, or any other calx of lead, it may be discovered by evaporating some pints of it to dryness, and melting the residuum in a crucible, at the bottom of which a small regulus of lead may be found after the fusion; but an easier and more expeditious proof is by pouring into the *wine* some liquid liver of sulphur. If the precipitate occasioned by this addition of the liver be white, or only coloured by the *wine*, we may know that no lead is contained; but if the precipitate be dark-coloured, brown, or blackish, we may be certain that lead is contained in it. For this purpose, let an ounce of quicklime, and half an ounce of flowers of brimstone, be boiled in a pint of water, and when the liquor, which will be of a yellow colour, is cold, let it be poured into a bottle, and corking it up, reserved for use. A few drops of this liquor, being let fall into a glass of *wine* or cyder containing lead, will change the whole into a colour more or less brown, according to the quantity of lead which it contains. If the *wine* be wholly free from lead, it will be rendered turbid by the liquor, but the colour will be rather a dirty white than a blackish brown.

The only substances that cannot absorb or destroy, but cover and render tolerable the sharpness of *wine*, without any inconvenience, are sugar, honey, and other saccharine alimentary matters; but these can succeed only when the *wine* is but very little acid, and when an exceeding small quantity of these substances is sufficient to produce the desired effect; otherwise the *wine* would have a sweetish, tart, and not agreeable taste. Sweet *wines* have been sometimes impregnated with mercury sublimate, and with arsenic: the latter may be detected by a solution of lead in aqua fortis, and the former by volatile alkaline spirits, or by a solution of fixed alkaline salts.

Wine is also liable to other changes; as to become ropy and mucilaginous, by the continuance of the fermentative motion. This is an indication that it is very near being sour; and vintners and *wine*-coopers have used many methods for remedying it.

The goodness and wholesomeness of *wine* consist in its being neat, dry, fine, bright, and brisk, without any taste of the soil, of a clean, steady colour; having a strength, without being heady; a body, without being sour; and keeping, without growing hard, or eager: to which Neumann adds, its passing freely by urine, exciting appetite, producing a gentle sweat in the night, keeping the belly open next day; without being followed by any head-ach, heaviness of the limbs, or other uneasiness.

Wine being a liquor mostly of foreign produce, the divers names, forms, kinds, distinctions, &c. thereof, are borrowed from the countries where it is produced; the principal whereof, at this day, is France: to *wines* of which country, a good part of what we have to say of this noble liquor, will more immediately belong.

Wine, in France, is distinguished, from the several degrees and steps of its preparation, into,

Mere-goutte, mother-drop; which is the virgin *wine*, or that which runs of itself out of a tap of the vat wherein the grapes are laid, before the vintager enters to tread, or stamp, the grapes.

Must, *surmust*, or *stum*, which is the *wine*, or liquor, in the vat, after the grapes have been trodden, or stamped.

WINE, *pressed*, *vin de pressurage*, which is that squeezed with a press out of the grapes, when half-bruised by the treading. The husks left of the grapes are called *rape*, *murk*, or *mark*; by throwing water upon which, and pressing them afresh, they make a liquor for servants use, answerable to our cyder-kin, and called *boisson*; which is also of some use in medicine, for the cure of disorders occasioned by viscid humours.

WINE, *sweet*, *vin doux*, is that which has not yet worked, or fermented. This is turbid, and has an agreeable, and very saccharine taste. It is very laxative, when drunk too freely, or by persons disposed to diarrhœas, it is apt to occasion these disorders. Its consistence is somewhat less fluid than that of *water*, and it becomes almost of a pitchy thickness when dried.

Bouru, that which has been prevented working, by casting in cold water.

Cuvé, or *worked wine*, that which has been let work in the vat, to give it a colour.

Cuit, or *boiled wine*, that which has had a boiling before it worked; and which, by that means, still retains its native sweetness.

Passé, or *strained wine*, a sort of raisin *wine*, made by steeping dry grapes in water, and letting it ferment of itself.

Wines are also distinguished, with regard to their colour, into *white wine*, *red wine*, *claret wine*, *pale wine*, *rosé*, or *black wine*. And, with regard to their country, or the soil which produces them, into *French wines*, *Spanish wines*, *Rhenish wines*, *Hungarian wines*, *Greek wines*, *Canary wines*, &c. And, more particularly, into *Port wine*, *Madeira wine*, *Burgundy wine*, *Champagne wine*, *Falernian wine*, *Tokay wine*, *Schiras wine*, &c.

Wines, again, are distinguished, with regard to their quality, into *sweet wines*, *rough* or *dry wines*, and *rich* or *luscious wines*, *vins de liqueur*; of which last some are exceedingly sweet, others sweet and poignant; and all chiefly used by way of dram after meals, &c.

Such are French *Frontiniac*, *Madeira*, the *Canary*, the *Hungary*, *Tokay*, the Italian *Montefiascone*, the Persian *Schiras*, the *Malmsey wines* of Candia, Chio, Lesbos, Tenedos, and other islands of the Archipelago, which anciently belonged to the Greeks, but now to the Turks. These are sometimes called *Greek wines*, and sometimes *Turkey wines*.

The principal *wines* drank in Europe are as follow. 1. The Madeira island, and Palma, one of the Canaries, afford two kinds: the first called *Madeira sec*, the latter, which is the richest and best of the two, *Canary* or *Palm sec*. The name *sec* (corruptly written *sack*) signifies dry; those *wines* being made from half-dried grapes. There is another sort of *sec wine*, prepared about Xeres, in Spain, and hence called, according to our orthography, *Sherris*, or *Sherry*. 2. The *wines* of Candia and Greece are of common use in Italy. *Malmsey* was formerly the produce of those parts only, but is now brought chiefly from Spain: it is a sweet *wine*, of a golden or brownish-yellow colour, and to this is applied an Italian proverb, signifying, *Manna to the mouth, and balsam to the brain.* Almost all the *wines* used in the Venetian territories come from Greece and the Morea. 3. Italy produces the *vino Greco*, which is a gold-coloured unctuous *wine*, of a pungent sweetness, the growth of mount Vesuvius, but much sophisticated by the Neapolitans. In the neighbourhood of mount Vesuvius is made the *Mangiaguerra wine*, and a thick, blackish one, called *Verracia*; and at the foot of the hill, the delicious *vino vergine*. The kingdom of Naples affords the *Campania* or *Pausilippo*, *Muscatel*, *Salernitan*, and other excellent *wines*, and also the *Chiarello*, much drank at Rome. But the

the principal is the red, fat, ſweet, and grateful poignant one, called *Lachryma Chriſti*. 4. The eccleſiaſtical ſtate produces the bright, pleaſant *Albano*, and the ſweet *Monteſiaſcone*, a yellowiſh not very ſtrong *wine*, reſembling good Florence, &c. 5. In Tuſcany are the excellent white and red *Florence*; the celebrated, hot, ſtrong, red *wine*, *de Monte Pulciano*, &c. 6. In Lombardy, the *Modeneſe* and *Montſerrat* are tolerable; between Nizza and Savona is produced an incomparable *Muſcadine*. 7. Piedmont, and part of Savoy, have excellent light *wines*. 8. The Sicilian, Sardinian, and Corſican *wines* are alſo good. 9. Moſt of the Spaniſh *wines* are compoſed of fermented or half-fermented *wine* mixed with inſpiſſated muſt, and variouſly manufactured, or of an infuſion of dry grapes in weak muſt. Of theſe *wines* there are a few in Germany, as the *Alicant*, which is a thick, ſtrong, very ſweet, and almoſt nauſeous *wine*, *Sherry*, *Spaniſh Malmſey*, &c. 10. In Portugal there is plenty of *red Port*, which is much drank in England. The beſt *Vino tinto*, a blackiſh-red *wine* uſed by the coopers for colouring other *wines*, is ſaid to be the produce of Portugal. This kingdom alſo deals largely in *Madeira*. 11. In France there is a great variety of *wines*; of which the ſtrong, ſweet, full-bodied, ſpirituous ones, are called *Vins de liqueur*. Languedoc and Provence afford the ſweeteſt *wines*, and the ſame provinces, with Champagne and Burgundy, the ſtrongeſt; the *wines* of the northern parts, as Picardy and Bourdeaux, are the worſt, and thoſe about the middle of the kingdom, as Paris and Orleans, of a middling kind. The moſt celebrated of the French *wines* are *Champagne*, *Burgundy*, *Vin de beaune* or partridge-eye, *Frontiniac*, *Hermitage*, &c. 12. In Switzerland, the beſt *wines* are the *Neufchatel*, *Velteline*, *Lacote*, and *Reiff*: the *Velteline* ſtraw-wine, ſo called from the grapes being laid for ſome time upon ſtraw before they are preſſed, is particularly celebrated. 13. The dry-grape *wines* of the Upper Hungary are in general excellent, and much ſuperior to thoſe of the Lower. 14. Among the German *wines*, thoſe of *Tyrol* are very delicate, but do not keep. 15. Of Auſtrian *wines*, thoſe of *Kloſter-Neuburg* and *Broſenberg* are deemed the beſt: and there are alſo good *wines* in other parts of the Imperial dominions. 16. In the Palatinate, the beſt *wine* is that of *Worms*, eſpecially the ſort called Women's Milk. 17. Among the more eſteemed German *wines* may be reckoned alſo *Rheniſh*, *Mayne*, *Moſelle*, *Neckar*, and *Elſaſs*: a certain writer calls the *Rheniſh* made in Hockheim (Hock) the prince of the *wines* of Germany.

Wine is alſo variouſly denominated, according to its ſtate, circumſtances, qualities, &c.

WINE, *natural*, is ſuch as comes from the grape, without farther mixture, or ſophiſtication.

WINE, *brewed*, or *adulterated*, is that wherein ſome drug is added, to give it ſtrength, fineneſs, flavour, briſkneſs, ſweetneſs, or ſome other quality which is wanted.

WINE, *pricked*, or *eager*, is that turned ſouriſh.

WINE, *flat*, is that fallen weak and vapid, for want of being drank in time.

WINE, *ſulphured*, is that put in caſks wherein ſulphur has been burnt; in order to fit it for keeping, or for carriage by ſea.

WINE, *colour*, is a thick *wine*, of a very deep colour, ſerving to dye the *wines* that are too pale, &c. as the *black wine*, in uſe among our vintners.

WINE, *chip*, is that poured on chips of beech wood, to fine or ſoften it.

WINE, *rape*, is that put in a caſk half-full of freſh grapes picked for the purpoſe, to recover the ſtrength, briſkneſs, &c. which it had loſt by keeping, &c.

WINE, *burnt*, is that boiled up with ſugar, and ſometimes with a little ſpice.

There is alſo a ſort of *Malmſey wine*, made by boiling of muſcadine.

WINE, *method of making and fining*. In the ſouthern parts of France their way is, for *red wines*, to tread, or ſqueeze the grapes between the hands, and to let the whole ſtand, juice and huſks, till the tincture be to their liking; after which they preſs it. But, for *white wines*, they preſs the grapes immediately.

When preſſed, they tun the muſt, and ſtop up the veſſel; only leaving the depth of half a foot, or more, empty, to give room for it to work. At the end of ten days, they fill this ſpace with ſome other proper *wine*, that will not provoke it to work again. This they repeat from time to time; new *wine* always ſpending itſelf a little before it comes to perfection.

About Paris, and in the northern parts of France, they let the murk and muſt ſtand two days and nights for *white wines*, and at leaſt a week for *claret wines*, before they tun it. While it continues working, it is kept as warm as poſſible. Some, upon ſtopping it up for good and all, roll the caſk about the cellar, to mix the liquor with the lees; and after ſettling a few days, rack it off with great improvement.

To fine it down, they put ſhavings of green beech into the veſſel; having firſt taken off all the rind, and boiled them an hour in water, to extract their rankneſs, and afterwards dried them in the ſun, or in an oven: a buſhel of theſe ſerves for a tun of *wine*. Theſe put the liquor in a gentle working, and purify it in twenty-four hours. They alſo give it an agreeable flavour. The ſame chips, being waſhed, ſerve again and again, till almoſt quite conſumed.

The Grecians have a peculiar way of promoting the FINING and ripening of their ſtrongeſt and moſt generous *wines*, by adding to them, when they begin to work, a proportionate quantity of ſulphur and alum. And it is ſaid that ſome merchants put into every pipe of their Greek *wine* about the quantity of a jill of the chemical oil of ſulphur. But of all the ways of haſtening the CLARIFICATION and ripening of *wine*, none ſeems to be more eaſy or leſs noxious, than that borrowed from one of the ancients by lord Bacon; which is by putting the *wine* into veſſels well ſtopped, and letting it down into the ſea. That this practice is very ancient is manifeſt from the diſcourſe of Plutarch (Quæſt. Nat. 27.) about the efficacy of cold upon muſt. The general and principal remedy for the commotions incident to *wines* after their firſt clarification, and tending to their impoveriſhment or decay, is racking, or drawing them from their lees into freſh veſſels; and ſome vintners, as a farther preſervative, pour into them a large quantity of new milk.

Some ſweeten their *wines* with raiſins of the ſun, trodden in the vat with the grapes, having been plumped by boiling: others, by boiling half the muſt, ſcumming it, and tunning it up hot with the other.

For Engliſh *wine*, the method recommended by Mr. Mortimer is, firſt, to gather the grapes when very dry; and Mr. Miller recommends the ſpreading of them in a large dry room upon wheat ſtraw, and thus expoſing them to the air for a fortnight, three weeks, or a month; to pick them from the ſtalks, then to preſs them, and let the juice ſtand twenty-four hours in the vat covered. Afterwards, to draw it off from the groſs lees, and then put it up in a caſk, and to add a pint or quart of ſtrong red or white port, to every gallon of juice; and let the whole work, bunging it up cloſe, and letting it ſtand till January; and then bottle it, in dry weather.

By this method, he aſſures us, he has made Engliſh *wine* as good as any of the beſt and pureſt French *wines*, drank either in Paris or Champagne.

Mr. Bradley chooſes to have the liquor, when preſſed, ſtand with the huſks, ſtalks, and all, in the vat, to ferment for fifteen days.

He adds, that, according as the vines have been managed, the *wine* will be ſtronger or weaker. Thoſe, e. gr. which run at liberty up high trees, and are never pruned, make the ſmalleſt *wines*: thoſe kept tied to ſtakes about four feet high, and which have their branches duly pruned, yield ſtronger *wines*: and thoſe neareſt the ground the ſtrongeſt.

According to the directions given by Mr. Miller, when the grapes have been well picked and preſſed, for red *wine*, the huſks and ſtones ſhould be put into the liquor, and if the ſeeds or ſtones are broken in the preſs, the *wine* will have greater ſtrength; which muſt be put into a large vat, and ferment for five or ſix days: after which it ſhould be drawn off and put into large caſks, leaving the bung-hole open to give vent to the generated air. But if the *wine* in this ſtate does not ferment in a day or two, it will be proper to add a little warmth to the room by fires.

For white *wine*, the huſks of the grapes ſhould not remain in the liquor above twelve hours; and when it is drawn off and put into other veſſels, it ſhould not remain there above two days before it is drawn off again, and this muſt be repeated three or four times, which will prevent its taking any tincture from the huſks in fermenting. When the fermentation begins to ſubſide, the *wine* ſhould be drawn off into freſh caſks, which muſt be filled to the top; the bung-hole being left open for three weeks or a month, to give vent to the air and ſcum; and as the *wine* ſubſides in the caſk it ſhould be carefully refilled with *wine* of the ſame ſort from a ſtore-caſk. When it has remained in this ſtate a month or ſix weeks, the bung-hole ſhould be ſtopped with the addition of the apparatus mentioned in the former part of this article, and recommended by Dr. Hales. But after the *wine* has paſſed its fermentation in the vat, and is drawn off into the caſks, it will require ſomething to feed upon; ſo that a few bunches of the beſt grapes ſhould be preſerved; and when there is occaſion, picked off

off the ſtalks, and two or three handfuls of them put into each caſk according to its ſize.

The method commonly practiſed to give the red colour to *wine* is to let it ferment a few days upon the ſkins, which are preſſed two or three times in order to make them diſcharge their contents: but when a deep-coloured rough *wine* is deſired, a quantity of a grape, whoſe juice is red, and well known with us by the name of the claret-grape, is put into each vat.

This red *wine* will not require to be drawn off into caſks more than at firſt from the vat; but it may remain in the ſame veſſel till it is fit to be bottled off, which Mr. Miller ſays ſhould not be done till the *wine* is two years old.

The force of the fermenting *wine* is very great; being able, if cloſe ſtopped up, to burſt through the ſtrongeſt caſk. The readieſt way to ſtop or abate the fermentation, is by the fume of burning ſulphur.

Add, that when *wine* already made is upon the fret, or, by any alteration in the air, begins to ferment again, the way uſed by the vintners and wine-coopers to ſave it, is by the flame of common SULPHUR, or a lighted match dipped in it; this, held under a caſk juſt ready to burſt its hoops, calms its fury, and makes it immediately ſubſide. See MATCHING.

The method of converting white *wines* into red, ſo much practiſed by the modern *wine*-coopers, is this: put four ounces of turnſole rags into an earthen veſſel, and pour upon them a pint of boiling water; cover the veſſel cloſe, and leave it to cool; ſtrain off the liquor, which will be of a fine deep red, inclining to purple. A ſmall proportion of this colours a large quantity of *wine*. This tincture might be either made in brandy, or mixed with it, or elſe made into a ſyrup with ſugar for keeping. A common way with the *wine*-coopers is to infuſe the rags cold in *wine* for a night or more, and then wring them out with their hands; but the inconveniency of this method is, that it gives the *wine* a diſagreeable taſte; or, what is commonly called the taſte of the rag, whence the *wines*, thus coloured, uſually paſs among judges, for preſſed *wines*, which have all this taſte from the canvas rags in which the lees are preſſed.

The way of extracting this tincture, as here directed, is not attended with this inconvenience; but it loads the *wine* with water; and if made into a ſyrup, or mixed in brandy, it would load the *wine* with things not wanted, ſince the colour alone is required. Hence the colouring of *wines* has always its inconveniences. In thoſe countries which do not afford the tinging grape, which affords a blood-red juice, wherewith the *wines* of France are often ſtained, in defect of this, the juice of elder-berries is uſed, and ſometimes log-wood is uſed at Oporto.

The colour, afforded by the method here propoſed, gives *wines* the tinge of the Bourdeaux red, not the Port; whence the foreign coopers are often diſtreſſed for want of a proper colouring for red *wines* in bad years. This might perhaps be ſupplied by an extract made by boiling ſtick-lack in water. The ſkins of tinged grapes might alſo be uſed, and the matter of the turnſole procured in a ſolid form, not imbibed in rags. Shaw's Lectures, p. 211. See on the ſubject of this article Chem. Dict. art. *Wine*. Neumann's Chem. by Lewis, p. 441, &c. Miller's Gard. Dict. art. *Wine*.

WINES, *condenſing of*, a phraſe uſed by Stahl, and ſome other writers, to expreſs what is more uſually called the concentrating of them, that is, the freeing of them from what ſuperfluous humidity they contain, and by that means rendering them more rich and noble, freeing them from their taſteleſs part, reducing them to a ſmaller bulk, and by that means making them fitter for tranſportation, and finally rendering them more durable in their perfect ſtate, and much leſs ſubject to the various accidents that make them decay.

Various methods have been attempted for the effecting of this, as by means of heat and evaporation, or by percolation, &c. and great objections found in the way of all of them, except the lateſt, brought into uſe by Stahl, and ſince recommended greatly to the world by Dr. Shaw in his Chemical Eſſays.

If any kind of *wine*, but particularly ſuch as has never been adulterated, be, in a ſufficient quantity, as that of a gallon or more, expoſed to a ſufficient degree of cold in froſty weather, or be put into any place where ice continues all the year, as in our ice-houſes, and there ſuffered to freeze, the ſuperfluous water that was originally contained in the *wine*, will be frozen into ice, and will leave the proper and truly eſſential part of the *wine* unfrozen, unleſs the degree of cold ſhould be very intenſe, or the *wine* but weak and poor. This is the principle on which Stahl founds his whole ſyſtem of condenſing *wine* by cold.

When the froſt is moderate, the experiment has no difficulty, becauſe not above a third or a fourth part of the ſuperfluous water will be froze in a whole night; but if the cold be very intenſe, the beſt way is, at the end of a few hours, when a tolerable quantity of ice is formed, to pour out the remaining fluid liquor, and ſet it in another veſſel to freeze again by itſelf.

If the veſſel, that thus by degrees receives the ſeveral parcels of the condenſed *wine*, be ſuffered to ſtand in the cold freezing place where the operation is performed, the quantity lying thin in the pouring out, or otherwiſe, will be very apt to freeze anew; and if it be ſet in a warm place, ſome of this aqueous part thaws again, and ſo weakens the reſt. The condenſed *wine* therefore ſhould be emptied in ſome place of a moderate degree as to cold or heat, where neither the ice may diſſolve, nor the vinous ſubſtance mixed among it be congealed. But the beſt expedient of all is to perform the operation with a large quantity of *wine*, or that of ſeveral gallons, where the utmoſt exactneſs, or the danger of a trifling waſte, needs not be regarded.

If the *wine* now once concentrated, ſhould, by a long continuance in the freezing cold, be again congealed to the utmoſt (unleſs the cold were very ſevere indeed) and then again be drained from its ice, there, ſoon after this, falls to the bottom of the veſſel, a pure white powder or tartar, and even the icy part afterwards depoſits alſo a little of the ſame ſubſtance after thawing; and after ſtanding two or three days, there is always more and more of this tartar precipitated, and that conſtantly the more in proportion as the *wine* was more auſtere, or leſs adulterated with ſugar, brandy, or the like; for theſe things contain no tartar.

The ice of the ſecond operation on a quantity of *wine* differs in nothing from that of the firſt, provided only that the *wine* was poured clear off from it, before the ice is ſet to melt, by which means it diſſolves into a clear phlegm. This ſhews the excellency of the operation; as it loſes not its efficacy upon repetition, but brings away mere water as well at laſt as at firſt, without robbing the *wine* of any of its genuine or truly valuable parts. The remaining unfrozen liquor is a real concentrated *wine*, as appears by its colour, conſiſtence, taſte, and ſmell, and is actually become a nobler and richer *wine* than could have been procured without ſuch a contrivance.

This operation, though it be perfect in regard to *wines*, yet does not ſucceed ſo well in regard to the malt-liquors. The experiment has been fairly tried by Stahl on a gallon of ſtrong malt-drink, and the ſucceſs was as follows: the ice ſeparated in the firſt operation, when thawed by heat, reſolved into a liquor of the colour and taſte of ſmall beer; and the ſecond concentration afforded an ice of much the ſame kind, which might have paſſed for ordinary ſmall beer, but for a flaſhy watery taſte that manifeſtly predominated in it. The liquor unfrozen was but a pint and half by meaſure, but it was extremely rich and thick, and ſeemed very ſtrong and ſpirituous, and perfectly aromatic, or highly flavoured. The conſiſtence was ſomething like that of a thin ſyrup, and it had a pleaſing ſoftneſs that ſheathed the acrimony of the ſpirit, and covered the bitter taſte of the hop.

The mucilaginous nature, which is predominant in all malt-liquors, occaſions a great inaccuracy in this experiment, as not ſuffering the water to run clear, or be ſeparated from the richer tincture of the malt, nor letting the condenſed liquor be obtained clean from the ice; but as the loſs occaſioned by this is not great, and the liquor is much cheaper than *wine*, if this ſhould ever come into uſe in the large way, the thawed liquor of the ice might be uſed again in a new brewing, and ſo the loſs of that part of the ſtrength which was carried away by the freezing be recovered.

Wines in general may by this method be reduced to any degree of vinoſity or perfection. Thus, for example, if a *wine* of a moderate ſtrength hath a third part of its water taken away, in form of ice, by congelation, the remaining part will thereby be doubled in ſtrength and goodneſs: for if we allow, in the better ſorts of *wine*, that one-third part, which is near the truth, is truly good or vinous, and two-third parts are nothing but water, one third part of the good *wine* being blended among the two-third parts of water, of no ſtrength or value; it follows, that if one of theſe third parts of water be taken away, and all the *wine* left, that which was before but one third *wine*, is now one half *wine*, no way reduced in its ſtrength, and therefore the whole muſt be ſtronger in that proportion.

But if this operation of congelation be carried to the utmoſt, and be practiſed on a large quantity of *wine*, and with a very intenſe cold, and the ice taken away ſeveral times, and the *wine*, thus freed from a part of its water,

water, again and again exposed, it will be found that good *wines* will be reduced to one sixth part of their original quantity; and the vintner will easily find out the use of this remaining sixth part, which is a true quintessence of *wine*, and will be of the utmost benefit, by mixing in it small quantities with poor and low-flavoured *wines*, to meliorate and improve them; and even to convert the low-flavoured and least valuable ones into those very *wines* from which this condensed part was procured.

This method is not practicable to advantage in the *wine* countries alone. Dr. Shaw assures us, that he has himself experimented it here, and with the use of proper freezing mixtures, has reduced *wines* in England to a much smaller quantity, in proportion to the whole, than in the strongest of Stahl's experiments. It is evident that, by how much the quantity is smaller, by so much it is richer and stronger, provided that the operation has been properly performed. The doctor assures us, the noble essence or rob, thus prepared, is capable of working almost miracles, by turning water into *wine*, and the like; but that, in order to its succeeding well, there requires great care in the operator, when the congelation is repeated the last times. Shaw's Chem. Ess. Stahl's Schediasm. de Concentrat. Vin.

WINE, *fining of*. See FINING, and CLARIFICATION.

Fining of wine is an operation relating to *wine*, which is practised in Germany in the following manner: they have in some vaults three or four stoves, which they heat very hot: others make fires almost before every vat; by which means the must is made to ferment with great vehemence. When the ebullition, fermentation, and working cease, they let the *wine* stand, and then rack it. This *fining* is only used in cold years, when the *wine* happens to be green.

WINE, *forcing of*. See FORCING.

The uses of WINE are very great, not only as a drink, but as a medicine. Several physicians recommend it as an excellent cordial, and particularly serviceable in fevers, the lues venerea, &c.

In a dietetical view, the moderate use of *wine* is of service to the aged, the weak, and the relaxed, and to those who are exposed to warm and moist, or to corrupted air: in the opposite circumstances, it is less proper, or prejudicial.

Wine abounds with the antiseptic gas or fixed air, more perhaps than any other vegetable substance; and if the grateful taste of it be added, it may well be ranked first in the list of antiscorbutic liquors. The use of *wine* may be known not to suit a person, when, after drinking moderately of it, his breath acquires a vinous smell; when it occasions sour belchings and slight pains in the head; and when, after drinking it more plentifully than usual, it produces stupefaction, nausea, and drunkenness of the morose, peevish, irascible kind. The diseases, to which persons of this description, who persist habitually in the free use of *wine*, are most subject, are obstructions in the liver, in the mesenteric glands, and in other abdominal viscera, which are almost always succeeded by an incurable dropsy.

Those who digest *wine* well do not suffer, or much less sensibly, the above mentioned effects of drinking it: their drunkenness is accompanied with vivacity and joy; but excess injures even such persons; their constitution (says the author of the Chemical Dictionary) generally changes before sixty years of age; and the inheritance of their old age is either a severe gout or palsy, stupidity, imbecility, or an accumulation of these diseases.

Wine, considered as a medicine, is a valuable cordial in languors and debilities; more grateful and reviving than the common aromatic infusions and distilled waters, particularly useful in the low stage of malignant or other fevers, for raising the pulse and supporting the vis vitæ, promoting a diaphoresis, and resisting putrefaction.

The acid obtained from *wine* by distillation, apparently of a different nature from the acetous, as well as from the native vegetable acids, seems to deserve some regard, both as a medicine, and as a more elegant menstruum, for iron and some other bodies, than the common acids.

There are five sorts of *wine* employed in the shops as menstrua, for medicinal substances, viz. mountain, French white *wine*, Canary or sack, Rhenish, and red Port.

With regard to the medical differences of *wines*, Dr. Lewis observes, that the effects of the full-bodied are much more durable than those of the thinner; that all sweet *wines* are in some degree nutritious; the others not at all, or only accidentally so, by promoting appetite and strengthening the organs concerned in digestion; that sweet *wines* in general do not pass freely by urine, and that they heat the constitution more than an equal quantity of any other, though containing full as much spirit: that those which are manifestly acid pass freely by the kidneys, and gently loosen the belly; and that most of the red ones are sub-astringent, and tend to restrain immoderate excretions.

Pliny mentions Staphylus as the first who mixed *wine* with water; but Athenæus gives the credit thereof to Amphitryon, king of Athens. On this occasion a fable was invented, that Bacchus, having been struck by a thunderbolt, and being all inflamed, was presently cast into the nymphs bath, to be extinguished.

The age of WINE is properly reckoned by leaves. Thus they say, *wine* of two, four, six leaves, to signify a *wine* of two four, or six, years old; taking each new leaf put forth by the vine, since the *wine* was made, for a year. Among the Romans, the age of *wines* was, as it were, the criterion of their goodness. Horace, in his *odes*, which one may call *Bacchic songs*, boasts of his drinking Falernian *wine*, born, as it were, with him, or which reckoned its age from the same consuls.

Pliny mentions *wines* kept above one hundred years, and yet potable. Others he speaks of kept two hundred years, which, by that time, were reduced to the consistence of honey. But the moderns keep no *wines* to any such age. Where they are kept the longest, as in Italy and Germany, there are scarce any to be found of above fifteen leaves. In France, the *wines* that keep best, as those of Dijon, Nantz, and Orleans, are reckoned superannuated at five or six years old.

Wine kept in a cool vault, and well secured from the external air, will preserve its texture entire in all the constituent parts, and sufficiently strong for many years, as appears not only from old *wines*, but other foreign fermented liquors, particularly those of China, prepared from a decoction of rice, which being well closed down in the vessel, and buried deep under ground, will continue, for a long series of years, rich, generous, and good, as the histories of that country universally agree in assuring us.

Sir Edward Barry, in his Observations historical, critical, and medical, on the Wines of the Ancients, suggests, that our best modern *wines*, especially those of a delicate texture and flavour, may be more effectually preserved in earthen vessels of a larger size than our bottles, well glazed externally and internally: that dry sand is preferable for covering the bottles in the binns to sawdust; and that a small anti-cellar, built before all large cellars, would be a considerable defence and improvement.

WINE, *diseases of*. All *wines*, malt-liquors, and vinegars, which are well made, and perfect in their kind, will grow fine of themselves, barely by standing; so that if they do not thus grow fine in a reasonable time, it is a sign that they labour under some disease; that is, they are too aqueous, too acid, too alkaline, or they tend to putrefaction, or the like. In all these cases, which may properly enough be called the *diseases of wines*, suitable remedies are required before the *wines* will grow fine. The most general remedy hitherto known for all the diseases of *wines*, is a prudent use of tartarized spirit of *wine*, which not only enriches, but disposes all ordinary *wines* to grow fine. Shaw's Lectures, p. 209.

For a particular account of the different diseases of *wine*, and their usual remedies, see Miller's Gard. Dict. art. *Wine*; and Birch's Hist. Roy. Soc. vol. i. p. 156, &c.

WINES, *pricked*. An easy method of recovering *pricked wines* may be learned from the following experiment: take a bottle of red Port that is pricked, add to it half an ounce of tartarized spirit of *wine*; shake the liquor well together, and set it by for a few days, and it will be found very remarkably altered for the better.

This experiment depends upon the useful doctrine of acids and alkalies. All perfect *wines* have naturally some acidity, and when this acidity prevails too much, the *wine* is said to be pricked, which is truly a state of the *wine* tending to vinegar: but the introduction of a fine alkaline salt, such as that of tartar, imbibed by spirit of *wine*, has a direct power of taking off the acidity, and the spirit of *wine* also contributes to this, as a great preservative in general of *wines*. If this operation be dexterously performed, pricked *wines* may be absolutely recovered by it, and remain saleable for some time: and the same method may be used to malt-liquors just turned sour. Shaw's Lectures, p. 214.

WINE, *laws relating to*. By 1 Geo. II. stat. 2. cap. 17. no *wine* (except of the growth of Tuscany, Turky, or the Levant), shall be imported in vessels less than 25 gallons, on pain of forfeiture. By 18 Geo. III. cap. 27. no *wines* of the growth of Spain or Portugal, and no French *wines*, shall be imported in any smaller vessel than a hogshead, on pain of forfeiture.

For the stamp duties on *wine*-licences, see STAMP-*duties*.

By 30 Geo. II. cap. 19. no person shall sell *wine* by retail, or in less quantity than shall be equal to the measure of the vessel in which the same hath been lawfully imported

imported, without a licence renewed yearly, on pain of 100*l.*; and every retailer of *wine* ſhall cauſe the word WINE to be legibly inſcribed in a viſible part in the front of his houſe, vault, &c. under penalty of 10*l.*

The lord chancellor, lord treaſurer, lord preſident, lord privy-ſeal, and two chief-juſtices, or any three of them, ſhall yearly ſet the prices of foreign *wines* ſold in groſs; and any perſon offending againſt the ſaid aſſeſſment ſhall forfeit for every veſſel 40s. 28 Hen. VIII. cap. 14. 37 Hen. VIII. cap. 23. 12 Ch. II. cap. 25.

No perſon ſelling *wine* ſhall mix *wines* together, nor with any other thing, on pain that the ſeller in groſs ſhall forfeit 100*l.* and the retailer 50*l.*

By 5 Ann. cap. 27. 231 cubical inches ſhall be a *wine* gallon, 63 gallons a hogſhead, 126 gallons a butt or pipe, and 252 gallons a ton.

The nett duties on importation are as follow: for Portugal and Madeira *wine* 49*l.* 14*s.* 4*d.* $\frac{6}{10}$ths per ton, by Britiſh ſubjects, and 54*l.* 13*s.* 4*d.* $\frac{6}{10}$ths per ton, by aliens; for Spaniſh and Levant *wines* 50*l.* 16*s.* 4*d.* $\frac{6}{10}$ths, by Britiſh, and 55*l.* 15*s.* 4*d.* $\frac{6}{10}$ths, by aliens; for French *wine* 99*l.* 8*s.* 9*d.* $\frac{6}{10}$ths, by Britiſh, and 104*l.* 7*s.* 9*d.* $\frac{6}{10}$ths, by aliens; and for Rheniſh, Germany, and Hungary *wines* 54*l.* 13*s.* 4*d.* $\frac{6}{10}$ths by Britiſh, and 59*l.* 12*s.* 4*d.* $\frac{6}{10}$ths, by aliens.

WINE, *lees of*, are the impurities thereof, or the thick ſediment remaining at the bottom of the caſks, when the *wine* is drawn out.

The diſtillation of *wine-lees* into ſpirit is conducted very much in the ſame manner with that of the malt-waſh, when diſtilled with the mealy part in it: the principal difference is on this account, that the oil of the malt being very nauſeous and diſagreeable, the utmoſt care is to be uſed to keep it back in all the proceſſes of primary diſtillation, and of rectification; whereas, on the other hand, the oil of the *wine* lees being a very agreeable and pleaſant one, as much care as poſſible is to be taken to bring it over with the ſpirit. Glauber has written a peculiar treatiſe on this ſubject, in which, without touching upon the moſt advantageous production of all, he has proved the work to be ſo very profitable, that the whole uſually paſſes for one of his wild flights, rather than a ſolid buſineſs.

The method of diſtilling a liquid ley for its ſpirit, is a thing very univerſally known; but the advantageous thing, on this baſis, is the diſtilling of a dry ley preſſed and preſerved, and the managing of the buſineſs in ſuch a manner as at firſt or laſt to procure and ſeparate all its valuable parts. The ſolid ley, here mentioned, is that uſually ſold to the hatters in England, and is the ſame thing that in France and other *wine* countries the vinegar-makers diſpoſe of in cakes, after they have preſſed out all the *wine*, and which was afterwards burnt, and makes what Lemery and others call *cineres clavellati*; and the Engliſh *gravelled aſhes*, a fixed alkali ſalt-like pot-aſh.

This ley, when uſed for diſtilling, ſhould be that of the French *wines*, and either ſuch as is newly preſſed, or has been well ſecured by packing in a cloſe manner in tight caſks, with ſome proper contrivance of dry ſand, or the like, to keep its external ſurface from the contact of the air, which is very apt to corrupt or putrefy it.

If this ley is intended to be kept many months, it will be very proper to ſecure it by ſprinkling the layers as they are packed up with a little brandy. The expence of this is nothing, for the brandy is recovered again in the operation. Shaw.

WINE, *oil of*, a very precious liquid, kept as a ſecret in the hands of ſome dealers in ſpirits, and uſed to give the brandy flavour to ſpirits of leſs price. It is certain, that all the ſpirits we uſe take their flavour from the eſſential oil of the ſubſtance they are made from; that of malt is very nauſeous and offenſive, and renders the ſpirit horribly diſagreeable, if not carefully kept back in the diſtillation of it; that of the grape, on the other hand, is extremely agreeable, and is what gives the delicious flavour to French brandy; this therefore is to be carefully brought over among the ſpirit in diſtillation.

This is that *oil of wine* ſo much celebrated among our diſtillers, and is for their uſe made ſeparate, and is of ſuch effect, that half an ounce of it will determine a pure and clear malt ſpirit to be French brandy, ſo as to ſtand the teſt of the niceſt palate; and all the trials that can be invented, provided the oil and the ſpirit have both been carefully made.

The manner of making the oil is this: they take ſome cakes of dry *wine* lees, ſuch as are uſed by our hatters, and diſſolving them in ſix or eight times their weight of water, they diſtil the liquor with a ſlow fire, and ſeparate the oil by the ſeparating pot, reſerving for this nice uſe only that which comes over firſt, the oil that follows being coarſer, and more reſinous. To render this buſineſs perfectly ſucceſsful, there muſt be ſeveral things obſerved: 1. The ley muſt be of the right kind, that is, of the ſame nature with the French brandy propoſed to be imitated. 2. The malt ſpirit muſt be extremely pure. 3. The doſe of the oil muſt be very well proportioned: and, 4. The whole muſt be artificially united into one ſimple and homogene liquor. Theſe cautions all regard only the taſte, and beſide theſe, in order to come up to a nice counterfeit, ſeveral other particulars muſt be attended to; ſuch as the colour, proof, tenacity, ſoftneſs, and the like; ſo that, in ſhort, the operation has too much nicety in it to be hit off by every ordinary dealer.

When this fine *oil of wine* is procured, it may be mixed into a quinteſſence, with pure diſtilled alcohol, or the totally inflammable ſpirit of *wine*, to prevent its growing diſtaſteful, rancid, or reſinous; and thus it may be long preſerved in full poſſeſſion of its flavour and virtues.

The ſtill bottoms, or remaining matter after the diſtillation of this oil, will yield many productions to advantage, particularly tartar, and ſalt of tartar, as alſo an empyreumatic oil, and a volatile ſalt, like that of animals. Some kinds of lees afford all theſe in much greater quantity than others; the lees of Canary and mountain *wines* yield very little of them, and indeed, ſcarce any tartar, or fixed ſalt at all; but the white French lees of thoſe thin *wines*, that afford the ordinary brandies, yield them all very copiouſly, inſomuch, that ſometimes a ſingle hogſhead of dry and cloſe-preſſed lees will afford, by this proceſs, three gallons of brandy, forty pounds of clean tartar, a large proportion of empyreumatic oil, and volatile ſalt, beſide full four pounds of good ſalt of tartar. It is not to be expected, however, that every parcel of this ley ſhould yield fully in this proportion. Shaw's Eſſay on Diſtillery.

WINE, *piece of*. See PIECE.

WINE-*preſs*, a machine contrived to ſqueeze the juice out of grapes, and conſiſting of ſeveral pieces of timber, varioſly diſpoſed, which compoſe three bodies of timber-work, cloſely united to the axis, which ſerves as a ſwing whereby it may be moved by the vice. Of theſe there are different ſizes as well as different conſtructions; for an account of which, illuſtrated by figures, ſee Miller's Gard. Dict. art. WINE-*preſs*.

WINE, *priſage of*. See PRISAGE.

WINE, *racking of*. See RACK.

WINE, *ſpirit of*. See SPIRIT.

WINE-*ſpirit*, a term uſed by our diſtillers, and which may ſeem to mean the ſame thing with the phraſe *ſpirit of wine*; but they are taken in very different ſenſes in the trade.

Spirit of wine is the name given to the common malt-ſpirit, when reduced to an alcohol, or totally inflammable ſtate; but the phraſe *wine-ſpirit* is uſed to expreſs a very clean and fine ſpirit, of the ordinary proof-ſtrength, and made in England from *wines* of foreign growth.

The way of producing it is by ſimple diſtillation; and it is never rectified any higher than common bubble-proof. The ſeveral *wines* of different natures, yield very different proportions of ſpirit; but, in general, the ſtrongeſt yield one-fourth, the weakeſt in ſpirits one-eighth part of proof-ſpirit; that is, they contain from a ſixteenth to an eighth part of their quantity of pure alcohol.

Wines that are a little ſour, ſerve not at all the worſe for the purpoſes of the diſtiller; they rather give a greater vinoſity to the produce. This vinoſity is a thing of great uſe in the *wine-ſpirit*, whoſe principal uſe is to mix with another that is tartarized, or with a malt-ſpirit, rendered alkaline by the common method of rectification. All the *wine-ſpirits* made in England, even thoſe from the French *wines*, appear very greatly different from the common French brandy; and this has given our diſtillers a notion that there is ſome ſecret art practiſed in France, for giving the agreeable flavour to that ſpirit; but this is without foundation.

When we diſtil Sicilian or Spaniſh *wines*, we do not produce Sicilian or Spaniſh brandies; and the true reaſon of this is, that the *wines* which they diſtil on the ſpot into brandy, are very different from thoſe which they export as *wines*.

Thoſe they diſtil are ſo poor and thin, that they will not keep many months, nor can poſſibly bear exportation. If we had in England thoſe poor *wines* they diſtil into brandy near Bourdeaux, Cognac, or up the Loire, there is no doubt but the ſpirit we made from them would be univerſally allowed to be French brandy. We have proof of this from ſome of the Scotch diſtilleries, where they, with no peculiar art, or ſecret method, procure from ſome of the poor pricked and damaged *wines* received there, brandy ſo nearly reſembling that of France, that a good judge will ſcarcely be able to make the diſtinction. *Wine-ſpirits* and brandies therefore are the ſame thing, only with this difference, that the former is the product of a rich *wine*, and the latter of a poor one; or at

at the utmoſt, they differ only as our two home products, the cyder-ſpirit and the crab-ſpirit do.

The *wine-ſpirit*, diſtilled in England, is not eaſy to be had pure and unmixed at our diſtillers, nor under a price almoſt equal to that of French brandy; ſo that if it ever be required out of the trade, it is as well to uſe the French brandy, which will, in all caſes, ſerve the ſame purpoſes, unleſs where a high flavour or a copious eſſential oil are required. All other ſpirits are carefully diveſted of their oil in the rectifications; but the *wine-ſpirit* is coveted only for its oil, and all that can be obtained is preſerved in this, its principal uſe being to give a flavour to a worſe ſpirit, and to cover the taſte of a diſagreeable oil in it.

When a caſk of *wine* chances to turn ſour in private hands, it is worth while to diſtil it for the ſpirit. The lees alſo, if in any conſiderable quantity, will yield ſuch a proportion of the ſame ſort of ſpirit, as to render it worth while; and, as the high flavour is not required in this intent, it will be beſt to draw off the ſpirit very gently, either by the cold or hot ſtill, and afterwards it may be rectified without any addition, and reduced to the ſtandard-ſtrength of proof. It thus makes a very clean and pleaſant ſpirit, though very different from the brandy from the ſame country whence the *wine* came. Shaw's Eſſay on Diſtillery. See SPIRIT.

WINE, *philoſophic ſpirit of*, in the writings of ſome chemiſts and phyſicians, a phraſe that often occurs as the name of a liquid prepared from *wine*, and endued with very remarkable properties.

It is generally ſuppoſed that this was the ſame ſort of liquor, which we at this time call by the name of *ſpirit of wine*; but this is a very erroneous opinion, and has led many into errors, about the operations in which it was concerned. It was truly no diſtilled liquor, but the ſpirituous parts of *wine* condenſed and concentrated by the freezing of the more aqueous part.

WINES, *ſtooming of*. See STOOMING.

WINES, *low*, in the *Diſtillery*, the term for the ſpirituous liquor diſtilled immediately from the fermented matter, and continued running ſo long, that the laſt of it is not at all inflammable. This liquor is afterwards rectified to a proof-ſpirit of the ſtrength of brandy, and thence to a rectified ſpirit, called *alcohol*, or ſpirit of *wine*. Shaw's Lectures, p. 216.

By 24 Geo. III. cap. 46. from Nov. 1, 1784, the duties on *low wines* and ſpirits for home conſumption ſhall be diſcontinued for two years, and new duties are ſubſtituted in lieu thereof, viz. for every gallon of fermented waſh brewed for extracting ſpirits for home conſumption, from malt, grain, or mixture therewith, to be paid by the maker, 5*d*.; from any other ſort of Britiſh materials, 4*d*.; from melaſſes or ſugar mixed therewith, 7½*d*.; for every gallon of foreign refuſed *wine*, or foreign cyder or waſh prepared from foreign materials (except melaſſes and ſugar), or any mixture therewith, 10*d*. No wort or waſh in the poſſeſſion of a diſtiller ſhall be removed from his entered premiſes or concealed, on pain of forfeiture, and of the diſtiller and receiver forfeiting 10*s*. a gallon; and no waſh for diſtilling ſpirits for home conſumption ſhall be removed from the veſſel in which it was fermented, until the officer has gaged it, on pain of 200*l*. By the ſame act, the additional duties upon rum and ſpirits imported into Great Britain, being the produce of the Britiſh ſugar iſlands, and the additional impoſts of the ſeveral 5 per cents. and all penalties in reſpect thereof, ſhall be ſuſpended for two years, from September 1, 1784.

By 24 Geo. III. cap. 41. every diſtiller, or maker of *low wines* or ſpirits for ſale or exportation, and every rectifier of ſpirits, ſhall take out a licence, which ſhall be charged with a yearly ſum equal to the amount of one halfpenny a gallon of the contents of every ſtill or ſtills of each deſcription, which ſhall have been in the poſſeſſion of ſuch diſtiller or rectifier within the year, ending the 5th day of July in each year, previous to his taking out the licence. Every brandy dealer, or perſon ſelling brandy or other ſpirituous liquors, not being a retailer, and not a rectifier, ſhall take out a licence, and pay for the ſame 5*l*. Every maker of MEAD for ſale ſhall pay for a licence 1*l*.

WINE, *extemporaneous*. A hundred weight of good treacle will produce, according to the art of the diſtiller, from four to ſeven gallons of pure alcohol; that is, from eight to fourteen gallons of the common-proof melaſſes ſpirit. The ſtill-bottoms have many uſes. The diſtillers ſcald and recover their muſty caſks with them, and they may be uſed for all thoſe purpoſes of cleanſing where argol is required. Mr. Boyle's acid ſpirit of *wine*, or a ſpirit very like it, may alſo be procured from them, and a matter analogous to that Beccher calls the *media ſubſtantia vini*. This liquor gives a durable *extemporaneous wine*.

WINES, *domeſtic*, are thoſe made of raiſins, commonly called SWEETS or made *wines*.

In the Muſeum Ruſticum we have the following directions for making raiſin *wine*: put thirty gallons of ſoft water into a veſſel at leaſt one-third bigger than ſufficient to contain that quantity; and add to it one hundred weight of Malaga raiſins, groſly picked from their ſtalks. Mix the whole well together, and cover it partly with a linen cloth. When it has ſtood a little while in a warm place, it will begin to ferment, and muſt be well ſtirred about twice in twenty-four hours, for twelve or fourteen days. When the ſweetneſs is nearly gone off, and the fermentation much abated, which will be perceived by the ſubſiding and reſt of the raiſins, ſtrain off the fluid, preſſing it, firſt by the hand, and afterwards by a preſs, out of the raiſins. Let this liquor be put into a ſound *wine*-caſk, well dried and warmed, adding eight pounds of Liſbon ſugar, and a little yeaſt; and reſerving part of the liquor to be added from time to time, as the decline of the fermentation will give room. In this ſtate the liquor muſt remain for a month, with the bung-hole open; and having filled the veſſel with the reſerved liquor, let it be cloſely ſtopped, and kept for a year or longer, and then bottled off. At the end of a year and a half it may be drank, but will improve for four or five years.

Some ſaving may be made in the expence, by diminiſhing the quantity of raiſins and increaſing that of the ſugar in the proportion of four pounds of raiſins for one of ſugar; or by diminiſhing the proportion of both raiſins and ſugar, and adding clean malt-ſpirits, when the bung of the caſk is cloſed up. Any other large raiſins may be uſed, as well as the Malaga; but the thinner the ſkins and the ſweeter the pulp, the ſtronger will be the *wine*.

If this *wine* be perfectly fermented, and kept a long time, ſo that no ſweetneſs remain, it will reſemble Madeira.

An artificial Frontiniac may be made of this *wine*, in which the proportion of ſugar or of malt ſpirits to the raiſins is large, and the whole body weaker: the muſcadel flavour being communicated by an infuſion of the flowers of meadow-ſweet. In the making of this artificial Frontiniac, the ferment ſhould be ſtopped, by cloſing the caſk and adding the ſpirit, while a conſiderable degree of ſweetneſs remains, and the *wine* may be drank after it has been a little while in the bottles.

Cyprus *wine* may be imitated by the ſame means, uſing three or four pounds more of ſugar than the quantity above preſcribed, and ſtopping the fermentation, while a conſiderable degree of ſweetneſs remains.

Artificial mountain may be made by preſerving a ſmall degree of ſweetneſs, giving the nut-like flavour, and keeping the beſt kind of the above *wine* to a due age. The flavour may be obtained by the infuſion of the Florentine orris root, powdered, with a very ſmall proportion of orange and lemon-peel; and the *wine* may be rendered more dry or ſweet, by continuing the fermentation for a greater or leſs time, and adding a correſponding proportion of clean malt ſpirits, when the fermentation is ſtopped ſooner. The adding of ſome of the ſtony ſeeds of the raiſins well bruiſed will give the nut-like flavour; and the putting in a part of the ſtalks will add a ſharpneſs, found generally in this kind of *wine*.

The racy taſte of Canary, commonly called ſack, may be counterfeited by the addition of a proper quantity of the juice of white currant-berries to the *wine*, made with a large proportion of ſugar to the raiſins, and left very ſweet in the fermentation. But it is ſaid that a ſpirit, diſtilled from the leaves of clary and clean malt-ſpirits, put to the *wine*, will give it a very ſtrong reſemblance of ſack. It is ſaid alſo, that the juice of the bramble-berries, added to the mixture of the *wine*, before the fermentation, will give both the colour and flavour of claret: but in this caſe the quantity of raiſins ſhould be conſiderably diminiſhed, and that of the ſugar increaſed, as the fermentation muſt be continued till the ſweetneſs be wholly deſtroyed.

Wines of this kind ſhould be kept at leaſt a year, before they are drank.

By 31 Geo. II. cap. 31. the act of the 30th Geo. II. cap. 19. is extended to *ſweets*; and no perſon is allowed to retail in any quantity leſs than twenty-five gallons *ſweets* or *made wines* without a licence, under a penalty of 100*l*.

By 24 Geo. III. cap. 41. the maker of any kind of ſweets (mead excepted) for ſale, ſhall pay for a licence 5*l*.

For the duty on made *wines*, ſee SWEETS; to which duty are added, on its produce and amount, three 5*l*. per cents. by 19 Geo. III. cap. 25. 21 Geo. III. cap. 17. and 22 Geo. III. cap. 66.

WINE is alſo a denomination, applied in medicine and pharmacy, to divers mixtures, or compoſitions, wherein the

the juice of the grape is a principal ingredient: ſuch as bitter, bleſſed, chalybeat, elecampane, emetic, hog-lice, pectoral, viper, &c. See VINUM.

WINE *of ſquills*. See SQUILLS.

WINE-*meaſure*. See MEASURE, and *Laws relating to* WINE.

WINE-*fly*, in *Natural Hiſtory*, the name of a ſmall black fly, found in empty *wine*-caſks, and about *wine*-lees, and called by the Latins, BIBIO.

It is produced of a ſmall red worm, very common in the ſediment of *wine*.

The drippings of *wine* or beer-veſſels, the preſſings of the *wine* or cyder-preſs, the pots in which honey has been kept, and in which a little remains ſticking to the ſides, and turning ſour, all afford vaſt numbers of a ſmall ſpecies of worm or maggot. This is of a white colour, and has two hooks placed near the head; in ſhort, it reſembles, in all the parts, the maggot of the common fleſh-fly. Multitudes of theſe ſmall creatures live and move very briſkly about in theſe ſubſtances for ſeveral weeks together; but at the end of that time, when they have arrived at their full growth, they enter into the nymph-ſtate under a covering or caſe made of their own ſkin, which dries, and becomes of a brown colour. After eight or nine days in this ſtate, the caſe is opened by the falling off of a ſmall piece at the end, and the fly makes its way out. The fly is extremely ſmall when its wings are not extended.

It does not exceed the ſize of the head of a middling pin; it is however very beautiful; the breaſt and body are yellow, the reticulated eyes are red, and the wings have all the rainbow-colours. The beſt way of procuring theſe little flies, which make a very beautiful microſcopic object, is to keep the matter, in which the worms are placed, in a glaſs, covered down with a paper; as ſoon as the cover is taken off, at the time of their being in the fly-ſtate, they riſe up at once in the form of a cloud; enough of them for obſervation will however remain about the ſides of the veſſel. When examined, they are found to have all the regular parts of the larger flies; their antennæ are oval and flatted, and their legs, and every other part, are as elegantly perfect, as they are ſeen to be in the moſt elegant large fly.

It is not known whether they are oviparous or viviparous; but this is to be obſerved, that they give us great light into the origin of animalcules in different fluids. Since we ſee in theſe the evident courſe of nature in their origin, what prevents but that there may be numbers of flies yet ſmaller than theſe, whoſe eggs may be depoſited in the fluids in which we find our microſcopic animalcules. Reaum. Hiſt. Inſ. vol. ix. p. 82.

WING, in *Ornithology*. See FEATHER, and FLYING.

The *wings* are adapted for flight in all birds, except the dodo, oſtriches, great auk, and the penguins, whoſe *wings* are too ſhort for the uſe of flying: but in the dodo and oſtrich, when extended, they ſerve to accelerate their motion in running; and in penguins perform the office of fins, in ſwimming or diving. The *wings* have near their end an appendage covered with four or five feathers, called the *baſtard wing*: the leſſer coverts are the TECTRICES: the greater coverts are thoſe which lie beneath the former, and cover the quill-feathers and the ſecondaries. The quill-feathers, or *primores*, ſpring from the firſt bones of the *wings*, are ten in number, and broader on their inner than exterior ſides: the ſecondaries are thoſe that ariſe from the ſecond part, or cubitus, are about eighteen in number, and equally broad on both ſides. The primary and ſecondary *wing*-feathers are called REMIGES. The tertials are a tuft of feathers placed beyond the ſecondaries, near the junction of the *wings* with the body. This, in water-fowl, is generally longer than the ſecondaries, and cuneiform. The ſcapulars are a tuft of long feathers ariſing near the junction of the *wings* with the body, and lie along the ſides of the back, but may be eaſily diſtinguiſhed, and raiſed with one's finger. The inner coverts are thoſe that clothe the under ſide of the *wing*.

The *wings* of ſome birds are inſtruments of offence: the anhima of Marcgrave has two ſtrong ſpines in the front of each *wing*; a ſpecies of plover has a ſingle one on each; as have alſo the whole tribe of jacana, and the gambo or ſpur winged gooſe of Willughby. Pennant's Genera of Birds, pref. p. 4.

WINGS, among the *Fly claſs*, afford ſeveral ſubordinate diſtinctions of the genera of thoſe animals, under the ancient general claſſes.

Several ſpecies of flies, while they are in a ſtate of reſt, or only walking, ſhew ſeveral regularly diſtinct manner, of carrying their *wings*. The much greater numbers however, carry them in a parallel or plain poſition: ſome being perpendicular to the length of the body without covering it, others covering the body without covering one another: the *wings* of others croſs one another on the body of the animal, ſome of which round themſelves there, the upper wing being more elevated on the middle of the body than on the ſides. Some flies have their *wings* placed on their backs, and applied againſt one another, in a perpendicular poſition: the *wings* of others are applied obliquely againſt their ſides and meet above the body by their inner edges, forming a kind of hollow roof under which the body is placed; others form at their junction on the back a flat depreſſed roof, and others again have them meeting under their bellies.

The ſtructure of the *wings* of different flies might alſo furniſh matter of farther diſtinctions. The greater part of them are of a fine ſtructure, and repreſent the fineſt gauſe, and are equally tranſparent, or nearly ſo, in all parts. Some flies, however, have *wings* of a leſs degree of tranſparence, and ſome even opake ones. Others of the four-winged flies have obſcure ſpots alſo diſtributed near their very tranſparent texture; ſuch are the *wings* of the ſcorpion-fly; and ſome of the two-winged flies have *wings* partly opake, partly pellucid, the opake ſpots being ſeparated by tranſparent lines. Reaumur's Hiſt. Inſ. tom. iv. p. 136, &c.

WINGS *of butterflies*. The beautiful *wings* of this genus of inſects, are diſtinguiſhed from thoſe of the fly-kind, by their not being thin and tranſparent, like them, but thicker and opake. This opacity in them is owing only to the duſt which comes off of them, and ſticks to the fingers in handling them, and it is alſo to this duſt that they owe all their beautiful variety of colours. The earlier naturaliſts, for this reaſon, diſtinguiſhed theſe inſects by the appellation of ſuch as had farinaceous *wings*. The uſe of the microſcope has taught us, that this duſt is not the reſult of ſome other ſubſtance broken into fragments; but every particle of it is a regularly figured body, made for the place and order it has in the covering of the *wing*.

The ſeveral ſpecies of butterflies, and even the different parts of the ſame *wing*, afford theſe bodies of different ſhapes and figures. Moſt of the authors who have written of microſcopic objects, have given the figures of the principal varieties of theſe; but no one has given ſo many as Bonani in his Micrographia, in which work the figures of the various kinds take up four quarto plates.

It has been the general cuſtom of authors to call theſe feathers; but they are by Mr. Reaumur, with much greater juſtice, called ſcales. Their ſtructure has no reſemblance to that of feathers, for they are little flat and thin bodies, of more or leſs length, and always having a ſhort pedicle which enters into the ſubſtance of the *wing*.

When the *wing* of a butterfly is viewed by a microſcope, the arrangement of theſe ſeveral bodies in it is ſeen to be extremely beautiful and regular. The ſcales lie as regularly and evenly one over another, as the tiles on a houſe, or the ſcales on the fiſh-kind, every ſeries of them covering a ſmall part of that ſeries which runs below it. The upper and under part of the *wing* are equally furniſhed with theſe, and there is no ſpecies of this creature, in every *wing* of which there are not ſeveral figures of theſe ſcales in ſeveral parts.

The ſtructure of the *wing* itſelf, which ſupports theſe ſeveral ſcales, hairs, &c. is very worthy our attention. In order to examine this, it is neceſſary to rub off all the duſt or ſcales. We then find that the *wing* itſelf is framed of ſeveral large and ſtrong ribs, which all take their origin at that part where the *wing* is fixed to the body, and thence extend themſelves along the ſeveral ſides of the *wing*. The largeſt and thickeſt of theſe ſurrounds the outer edge of the *wing*, the largeſt next to this extends itſelf round the interior edge, and the others direct their courſe along the middle of the *wing*, and then divaricate and become ramified in the manner of the ribs in the leaves of plants. The ſubſtance which connects and fills up the ſpaces between theſe ribs, is of ſo peculiar a nature, that it is not eaſy to find any name to deſign it by, at leaſt there is no ſubſtance that enters the compoſition of the bodies of the larger animals, that is at all analogous to it: it is a white ſubſtance, tranſparent and friable, and ſeems indeed to differ in nothing from that of the large and thick ribs, but in that it is extended into thin plates; but this is ſaying but little toward the determining what it really is, ſince we are as much at a loſs to know by what name to call the ſubſtance they are compoſed of. Malpighi indeed calls them bones; but though they do ſerve in the place of bones, rendering the *wing* firm and ſtrong, without making it heavy, and are, when cut tranſverſely, found to be hollow; yet, when ſtrictly examined, they do not appear to have any thing of the ſtructure of bones, but appear rather of the ſubſtance of ſcales, or of that ſort of imperfect

perfect scales, of which the covering of those insects which we call crustaceous is composed.

The *wings* of butterflies, thus large, and thus light, are very well able to sustain them a long time in the air, and thus they might be expected to fly better than most other insects; but many people have observed the irregular manner in which these insects usually fly, which is not straight forward, but up and down, and to one side and the other: this has been supposed owing to some imperfection of the *wings*; but, in reality, it is their great perfection that enables the creatures to do this, and this manner of flying is absolutely necessary to the preservation of their life, as birds of many kinds are continually after them while they are on the *wing*; and it is a pleasant sight to observe, in what manner this sort of dodging motion in the butterfly disappoints the bird that flies straight at it, and often preserves it safely for a long way together.

The beautiful variety of colours, seen in the wings of these insects, is owing to the scales and feathers. Reaumur's Hist. Inf. vol. i. part i. p. 255, &c.

Wings *of gnats*. These are of a very curious structure, and well worthy the use of the microscope, to see them distinctly.

It is well known that on touching the wings of butterflies, a coloured powder is left on the fingers, which, though to the naked eye it appear a mere shapeless dust, yet when examined by the microscope, it is found to be very regularly figured beautiful bodies, encompassed with a furbelow of long feathers, and with veins or ribs that seem to strengthen them, in form of feathers or scales, or sometimes beset with prickles: these are of various figures, and all of them very elegant. The generality of flies have nothing of this kind; but the close examination of the *wings* of the gnat will shew, that they are not wholly destitute of them; they are much more sparingly bestowed indeed upon the gnat than on the butterfly; but then they are arranged with great regularity. Between the ribs of the *wings* there is extended a very thin transparent membrane, full of little black sharp-pointed hairs, ranged throughout with the utmost regularity. The *wings* in different sorts of gnats are very different; some have a border of long feathers, others of short ones, and others have none at all. Reaumur's Hist. Inf. vol. iv. p. 577. Baker's Microsc. 8vo. 1743. p. 204.

Wings, *warbling of the*. See Warbling.

Wings, in *Heraldry*, are borne sometimes single, sometimes in pairs, in which case they are called *conjoined*; when the points are downward, they are said to be *inverted*; when up, *elevated*.

Wing, *ala*, or *axilla*, in *Botany*, the angle which the leaves of a plant, or the pedicles of the leaves, form with the stem, or a branch of the plant.

This angle is commonly acute, and always turned upward. It has its name from its resembling the angle which the *wings* of a bird form with the body; or rather from the angle which a man's arms make with his trunk; which is called *ala*, *wing*.

Wings, in *Gardening*, &c. denote such branches of trees, or other plants, as grow up aside of each other.

Quintiny says, the term is particularly applied to artichokes, whose *wings*, or *alæ*, are the lesser heads, or fruits, that grow up with the principal one on the same stalk.

Wings, *alæ*, in the *Military Art*, are the two flanks, or extremes of an army, ranged in form of battle; being the right and left sides thereof, and including the main body.

The cavalry are always posted in the *wings*, i. e. on the flanks, on the right and left sides of each line; to cover the foot in the middle.

Pan, one of Bacchus's captains, is said to have been the first inventor of this method of ranging an army; whence, say they, it is, that the ancients painted him with horns on his head; what we call *wings*, being by them called *cornua*, *horns*. This, at least, is certain, that the method of arranging in *wings* is very ancient. The Romans, we know, used the term *alæ*, or *wings*, for two bodies of men in their army; one on the right, the other on the left, consisting each of four hundred horse, and four thousand two hundred foot usually, and wholly made up of confederate troops. These were designed to cover the Roman army, as the *wings* of a bird cover its body.

The troops in these *wings* they called *alares* and *alares copiæ*; and we, at this day, distinguish our armies into the *main body*, the *right* and *left wings*.

Wings are also used for two files, that terminate each battalion, or squadron, on the right and left. The pikes used to be ranged in the middle, and the musqueteers in the *wings*.

Wings, in *Fortification*, denote the longer sides of horn-works, crown-works, tenailles, and the like outworks, including the ramparts and parapets, with which they are bounded on the right and left, from the gorge to their front.

These *wings*, or sides, are capable of being flanked, either with the body of the place, if they stand not too far distant, or with certain redoubts; or with a traverse made in their ditch.

Wings, in *Sea-Language*, denote those parts of a ship's hold, which are nearest to the sides, or farthest removed from the middle of her breadth.

Wings are also the skirts or extremities of a fleet, when it is ranged into a line a-breast, or when bearing away upon two sides of an angle.

It is usual also to extend the *wings* of a fleet in the day-time, in order to discover any enemy which may fall into their track. To prevent separation, however, they are commonly summoned to draw nearer to the centre of the squadron before night, by a signal from the commander in chief, which is afterwards repeated by ships in the intervals. Falconer.

Wings, *goose*. See Goose.

Wing, *St. Michael's*, is the name of a military order in Portugal, instituted, according to the Jesuit Mendo, in 1165; or, according to di Michieli, in his Tesoro Militar. de Cavalleria, in 1171. Its institutor was Alphonsus Henry I. king of Portugal; and the occasion was a victory gained by him over the king of Savil, and his Saracens; for which he thought himself beholden to St. Michael, whom he had chosen for his patron in the war against the infidels.

The banner they bore was a *wing* resembling that of the archangel, of a purple colour, encompassed with rays of gold. Their rule was that of St. Benedict; the vow they made was to defend the Christian religion, and the borders of the kingdom, and to protect orphans. Their motto, *Quis ut Deus?*

WINGED, in *Botany*, a term applied to such stems of plants as are furnished, all their length, with a sort of membranous appendage.

Several kinds of thistles have *winged* stalks, and branches.

Winged *leaves*, are such as consist of divers little leaves, ranged in the same direction, on each side of a rib or stalk, so as to appear no more than one and the same leaf. Such are the leaves of agrimony, acacia, ash, &c.

Winged *seeds*, are such as have down or hairs on them; whereby the wind taking hold, blows them to a distance.

Winged *stalk*. See Stalk.

Winged, in *Heraldry*, is applied to a bird, when its *wings* are of a different colour, or metal, from the body.

Winged is also applied to any thing represented with *wings*, though contrary to its nature; as *winged*, or *flying hart*, &c.

WINNOW, signifies *to fan*, or separate corn from the chaff by wind.

WINTER, one of the four seasons, or quarters of the year.

Winter properly commences on the day when the sun's distance from the zenith of the place is the greatest, and ends on the day when its distance is at a mean between the greatest and least.

Notwithstanding the coldness of this season, it is proved, in astronomy, that the sun is really nearer to the earth in *winter* than in summer. The reason of the decay of heat, &c. see under Heat.

Under the equator, the *winter*, as well as the other seasons, return twice every year; but all other places have only one *winter* in the year; which, in the northern hemisphere, begins when the sun is in the tropic of Capricorn; and in the southern hemisphere, when in the tropic of Cancer: so that all places in the same hemisphere have their *winter* at the same time.

Winter, among *Printers*, that part of the printing-press, serving to sustain the *carriage*, &c. See Printing-*press*.

Winter's-*bark*, *Cortex* Winteri, or Winteranus. See Cortex.

This is one of the largest forest-trees upon Terra del Fuego, often rising to the height of fifty feet. Dr. Solander has given an accurate botanical description of it, illustrated by a figure, in Med. Obs. and Inq. vol. v. p. 46, &c. Its leaves are ever-green, smooth, oval, and entire: the flowers consist of seven petals, with from fifteen to thirty stamina, and from three to six germina, terminating in as many stigmata; each germen becomes a seed-vessel, containing several seeds: the bark of the trunk of the tree is externally grey, and very little wrinkled. The pieces of this bark brought over by the Dolphin are about three or four inches square, of different degrees of thickness, from one-fourth to three-fourths of an inch. It is of a dark brown cinnamon colour, an aromatic smell if rubbed, and of a hot, pungent, spicy taste,

taſte, which is laſting on the palate, though imparted ſlowly. A watery infuſion of it ſtruck a black colour with a ſolution of green vitriol. An infuſion of two ounces, coarſely powdered, yielded on evaporation two drams and twenty-four grains of extract: the ſame quantity, with rectified ſpirit, afforded two drams of extract.

This bark, though much celebrated as an antiſcorbutic by the firſt diſcoverers, is unknown in the practice of phyſic; the canella alba, which is totally different from it, having been confounded with it in the ſhops; and no quantity having been brought to Europe, except as a curioſity, till the return of the ſhips ſent out on an expedition to the South Seas.

From ſome experiments on this bark by Dr. Morris, it appears to be an aſtringent of a particular kind, and, therefore, likely to be of uſe in ſeveral manufactures; and that water is the proper diſſolvent of it.

It is hoped that this tree, no leſs uſeful than elegant, may be cultivated in our country, where it would probably grow luxuriantly as in a much warmer region than its own, and furniſh, not only a valuable ever-green, bearing our ſevereſt *winters*, but alſo a valuable medicine. Med. Obſerv. ubi ſupra.

WINTER-*berry*, *prinos*, in *Botany*, a genus of the *hexandria monogynia* claſs. Its characters are theſe: the flower hath a permanent empalement of one leaf, cut into ſix ſmall plain ſegments; it hath one wheel-ſhaped petal, with no tube, cut into ſix plain ſegments; it hath ſix awl-ſhaped ſtamina, ſhorter than the petal, terminated by obtuſe ſummits, and an oval germen ſitting upon the ſtyle, crowned by an obtuſe ſtigma; the germen afterwards turns to a round berry, containing ſix ſeeds.

There are two ſpecies; the one growing naturally in Virginia, the other in Canada.

WINTER-*bloom*. See AZALEA.

WINTER-*cherry*. See CHERRY.

WINTER-*creſſes*. See CRESSES.

WINTER-*green*, *pyrola*, in *Botany*, a genus of the *decandria monogynia* claſs. Its characters are theſe: the flower has a permanent empalement cut into five parts; it has five roundiſh concave ſpreading petals, and ten awl-ſhaped ſtamina, terminated by large nodding ſummits, with two riſing horns, and a roundiſh germen ſupporting a ſlender ſtyle, which is longer than the ſtamina, crowned by a thick ſtigma: the germen becomes a roundiſh depreſſed five-cornered capſule, with five cells opening at the angles, filled with ſeeds. Linnæus enumerates ſix, and Miller four ſpecies.

The greater round-leaved *winter-green*, or *pyrola rotundifolia major*, is ordered by the College of Phyſicians to be uſed in medicine, and is generally brought over from Switzerland with other vulnerary plants, in which claſs it is ranged, and by ſome greatly commended. Miller.

WINTER-*green*, *ivy-flowering*. See KALMIA.

WINTER-*green*, with *chickweed flowers*. See TRIENTALIS.

WINTER-*heyning*, in our *Statutes*, a ſeaſon between the eleventh day of November, and the three-and-twentieth of April, which is excepted from the liberty of commoning in the foreſt of Dean, &c. Stat. 20 Car. II. cap. 3. Blount.

WINTER-*quarters*. See QUARTERS.

WINTER-*rig*, among *Huſbandmen*, ſignifies to FALLOW, or till the land in *winter*.

WINTER-*ſolſtice*. See SOLSTICE.

WINTERANIA, in *Botany*, a genus of the *dodecandria monogynia* claſs. Its characters are theſe: the calyx hath three lobes; the petals are five; the antheræ are ſixteen, joined to a pitcher-ſhaped nectarium; the fruit is a three-celled berry, containing two ſeeds.

There is one ſpecies, viz. the *winterania canella* of Linnæus. The inner bark of this tree, which grows in the low lands of Jamaica, and other American iſlands, called CANELLA *alba* and *white* CINNAMON, is brought over in the form of quills, and has hitherto been rarely employed in medicine, unleſs as a ſubſtitute for WINTER's *bark*, which it much reſembles, and has been commonly miſtaken for. The London college has now received it in two officinal compoſitions, for alleviating the ill flavour of aloes; and the Edinburgh in their tinctura amara.

WINTONIÆ *rotulus*. See ROTULUS.

WIOCHIST, among the *Indian Natives of Virginia*, is their prieſt, who is alſo generally their phyſician; and is the perſon in the greateſt honour amongſt them, next to their king, or great war-captain. Phil. Tranſ. N° 454. ſect. 1.

WIRE, WIAR, WIER, or WYRE, a piece of metal, drawn through the hole of an iron, into a thread, of a fineneſs anſwerable to the hole it is paſſed through.

Wires are frequently drawn ſo fine, as to be wrought along with other threads of ſilk, wool, or hemp: and thus they become a conſiderable article in the manufactures.

The metals moſt commonly drawn into *wire* are gold, ſilver, copper, and iron. And hence we have *gold wire*, *ſilver wire*, *iron wire*, &c. See GOLD *Wire*, and DUCTILITY.

WIRE, *ſilver*, is the ſame with gold *wire*, except that the latter is gilt, or covered with gold, and the other is not. There are alſo counterfeit gold and ſilver *wires*: the firſt made of a cylinder of copper, ſilvered over, then covered with gold; and the ſecond of a like cylinder of copper ſilvered over, and drawn through the iron, after the ſame manner as gold and ſilver *wire*.

By 10 Ann. cap. 26. a duty is impoſed on all gilt *wire* made in Great Britain of 8*d*. an ounce, and on ſilver *wire* 6*d*. an ounce, troy weight: which duties are liable to the three five per cents. of 19 Geo. III. cap. 25. 21 Geo. III. cap. 17. and 22 Geo. III. cap. 66. The duty muſt be paid in ſix weeks after entry on pain of double duty. The places of making *wire* muſt be entered at the next office, on pain of 20*l*.; and the penalty of obſtructing officers in ſurveying, &c. is 20*l*. An allowance of one-fifth is made for waſte in reducing the big *wire* to ſmall *wire*. Removing *wire* before it is ſurveyed incurs a penalty of 40*l*.; and unſurveyed *wire* is to be kept ſeparate, on pain of 10*l*.; and the puniſhment of concealing *wire*, &c. is a forfeiture of 20*l*. The *wire* made ſhall be entered every month, on oath, on pain of 100*l*. By 15 Geo. II. cap. 20. the ingots or bars, deſigned for gilt *wire*, are to be weighed in the preſence of the exciſe officer, and marked after the gold is laid on, under a forfeiture of 20*l*.

By 15 Geo. II. cap. 20. and 22 Geo. II. cap. 36. no foreign embroidery, or gold or ſilver brocade, thread, lace, fringe, or work made thereof, or of copper, braſs, or other inferior metal, or gold or ſilver *wire*, or plate, ſhall be imported. And by 10 Ann. cap. 26. if any perſon ſhall export any gold or ſilver thread, or lace or fringe made of plate *wire* ſpun upon ſilk, he ſhall have a drawback after the rate of 5*s*. a pound avoirdupois, of ſuch ſilver thread, lace, or fringe, and of 6*s*. 8*d*. a pound of ſuch gold thread, lace, or fringe.

For regulations concerning the true making of gilt and ſilver *wire*, ſee the ſtatute 15 Geo. II. cap. 20. and for prohibiting the ſelling or working up of foreign gold or ſilver lace or thread, ſee 22 Geo. II. cap. 36.

WIRE, *braſs*, is drawn after the ſame manner as the former. Of this there are divers ſizes, ſuited to the divers kinds of works. The fineſt is uſed for the ſtrings of muſical inſtruments, as ſpinets, harpſichords, manichords, &c.

The pin-makers likewiſe uſe vaſt quantities of *wire* of ſeveral ſizes, to make their pins of. See PIN.

WIRE, *iron*, is called, by the French, *fil d'archal*; the reaſon of which, their authors are not agreed about. That celebrated etymologiſt, M. Menage, derives it from *filum & aurichalcum*; but others, more converſant in the commerce thereof, deduce it from one Richard Archal, the firſt inventor thereof.

Iron-wire is made from ſmall bars of iron, which are firſt drawn out to a greater length, and to about the thickneſs of one's little finger, at a furnace, with a hammer gently moved by water. Theſe thinner pieces are bored round, and put into a furnace to anneal for twelve hours. A pretty ſtrong fire is uſed in this operation.

After this they are laid under water for three or four months, the longer the better; then they are delivered to the workmen, called *rippers*, who draw them into *wire* through two or three holes. After this they anneal them again for ſix hours, and water them a ſecond time for about a week, and they are then delivered again to the rippers, who draw them into *wire* of the thickneſs of a large packthread. They are then annealed a third time, and then watered for a week longer, and delivered to the ſmall *wire*-drawers, called *overhouſe-men*.

In the mill where this work is performed, there are ſeveral barrels hooped with iron, which have two hooks on their upper ſides, on each whereof hang two links, which ſtand a-croſs, and are faſtened to the two ends of the tongs, which catch hold of the *wire*, and draw it through the hole. The axis on which the barrel moves does not run through the centre, but is placed on one ſide, which is that on which the hooks are placed, and underneath there is faſtened to the barrel a ſpoke of wood, which they call a *ſwingle*, which is drawn back a good way by the cogs in the axis of the wheel, and draws back the barrel, which falls to again by its own weight. The tongs hanging on the hooks of the barrel, are by the workmen faſtened to the end of the *wire*, and by the force of the wheel, the hooks being pulled back, draw the *wire* through the holes.

The plate in which the holes are is iron on the outſide, and ſteel on the inſide; and the *wire* is anointed with train-oil, to make it run the eaſier.

The

The first *wire*-mill in England was set up by a Dutchman at Sheen, near Richmond, in 1663.

For the tenacity of *iron wire*, see IRON.

There are various sizes of this *wire* from $\frac{1}{2}$ an inch, to $\frac{1}{10}$ of an inch diameter. The smallest sizes are used for stringing musical instruments, particularly harpsichords, psalteries, &c.

Vast quantities of *iron wire* are brought yearly hither from the Baltic; and are partly spent at home, and partly exported to France, &c.

WIRE-*drawing*. For the several manners of drawing gold and silver, see DUCTILITY, and GOLD-*Wire*.

The first iron that runs from the stone, when melting, being the softest, and toughest, is usually preserved to make *wire* of. See *Iron* WIRE supra.

WIRES *of asteriæ*, in *Natural History*, a name given by authors to a sort of extraneous fossil belonging to the ASTERIÆ, and being a sort of branches from the body of that column.

WIRE *of Lapland*. The savage inhabitants of Lapland have a sort of shining slender substance in use among them on several occasions, which is much of the thickness and appearance of our silver-*wire*; and is therefore called, by those who do not examine its structure or substance, *Lapland-wire*.

The people of this miserable country find many uses in every thing nature has afforded them, and, among the rest, that species of stag called the rein-deer, which is the most frequent animal among them, is not only serviceable in furnishing them with meat, cloaths, houses, and the means of carriage and travelling; but its bones make many of their most necessary utensils; and the sinews, which are all carefully separated in the eating, are, by the women, after soaking in water, and beating, spun into a sort of thread, which is of admirable fineness and strength, when wrought to the smallest filaments; but when larger, is very strong, and fit for the purposes of strength and force. Their *wire*, as it is called, is made of the finest of these threads, covered with tin. The women do this business, and the way they take is to melt a piece of tin, and placing at the edge of it a horn with a hole through it, they draw these sinewy threads, covered with the tin, through the hole, which prevents their coming out too thick covered. This drawing is performed with their teeth, and there is a small piece of bone placed at the top of the hole, where the *wire* is made flat, so that we always find it rounded on all sides but one, where it is flat.

This *wire* they use in embroidering their cloaths as we do with gold and silver; and they often sell it to strangers, under the notion of its having certain magical virtues. Scheffer, Hist. Lapland.

WISDOM, *sapience*, usually denotes a higher and more refined knowledge of things, immediately presented to the mind, as it were by intuition, without the assistance of ratiocination.

In this sense, *wisdom* may be said to be a faculty of the mind, or at least a modification and habit thereof.

Sometimes the word is more immediately used in a moral sense, for what we call *prudence* or *discretion*; which consists in the soundness of the judgment, and a conduct answerable thereto.

The school-divines sometimes restrain *wisdom* to the knowledge of the more sublime and remote objects, as that of God, &c. In which sense, theology is properly said to be *wisdom*.

The Latin word for *wisdom* is *sapientia*, which literally expresses the sense of tasting; to which *wisdom* is supposed to have some conformity. The sight, and other senses, only represent to us the surface of things: taste goes deeper, and penetrates into the substances; so that what, e. gr. to the feeling seemed cold, to the taste will be found hot: so *wisdom*, arising from a deep attention to our ideas, goes farther, and frequently judges otherwise than the common apprehensions of men would reach to.

WIST, WISTA, a quantity or measure of land among our Saxon ancestors; of different dimensions, in different places. In the Monasticon, it is said to be half a hide, or sixty acres: in an old chronicle of the monastery of Battle, it is said to be forty-eight acres.

WIT, a faculty of the mind, consisting, according to Mr. Locke, in the assembling, and putting together, of those ideas with quickness and variety, wherein can be found any resemblance or congruity; whereby to make up pleasant pictures, and agreeable visions, in the fancy.

This faculty, the same great author observes, is just the contrary of *judgment*, which consists in the separating carefully from one another, of such ideas wherein can be found the least difference, thereby to avoid being misled by similitude, and, by affinity, to take one thing for another: and hence he accounts for the reason of that common observation, that men who have much *wit* and prompt memories, have not always the clearest judgment, or deepest reason.

It is the metaphor, and allusion, wherein, for the most part, consist the entertainment and pleasantry of *wit*; which strikes in so lively a manner on the fancy, and is therefore so acceptable to all people, because its beauty appears at first sight, and there is required no labour of thought, to examine what truth or reason there is in it. The mind, without looking any farther, rests satisfied with the agreeableness of the picture, and the gaiety of the imagination; and it is a kind of affront to go about to examine it by the severe rules of truth, or reason. Whence it should seem, that *wit* consists in something that is not perfectly conformable to them. Essay on Human Underst. book. ii. chap. xi. sect. 2.

Another ingenious writer has observed upon Mr. Locke's description of *wit*, that every resemblance of ideas is not that, which we call *wit*, unless it be such an one, that gives delight and surprise. These two properties, he says, seem essential to *wit*, more particularly the latter of them. In order, therefore, that the resemblance in the ideas be *wit*, it is necessary they should not lie too near one another in the nature of things; for where the likeness is obvious, it gives no surprize. Spectator, vol. i. N° 62.

From this account of the nature of *wit*, it is easy to perceive what good reason Cicero had for saying (De Orat. lib. ii. cap. 54) *Wit is a thing not to be learned*: it is the offspring of nature, and proper effect of a bright and lively fancy. Cicero reduces *wit* to two kinds, viz. *cavillatio*, which, in our language, may be called *continued wit*, or HUMOUR, and *dicacitas*, which may be termed *concise wit*, or JESTING.

For the nature of *wit* in general, the different kinds of it, its use to an orator, and the manner in which it ought to be conducted, see Ward's Orat. vol. ii. p. 195, &c.

WIT is also an appellation, given to persons possessed of the faculty called *wit*, *esprit*.

A French author, who, in 1695, published a *Treatise of Wit, du Bel Esprit*, lays down four characters thereof.

1. A man, who, with an open air, and easy motions, affects those he converses with agreeably; and on any subject that presents itself, advances new thoughts, and adorns them with a sprightly turn; is, all the world over, a *wit*.

2. Another, who, less solicitous about the choice and delicacy of his sentiments, knows how to make himself valued by I know not what elevation of discourse; who draws much attention, and shews great vivacity in his speaking, and readiness in his answers; is likewise acknowledged a *wit*.

3. A third, who takes less care about thinking, than about speaking well; who affects fine words, though perhaps low and poor in matter; who pleases by an easy pronunciation, and a certain tone of voice, is placed in the same rank.

4. Another, whose chief aim is not to make himself esteemed, so much as to raise mirth and laughter; who jokes pertinently, rallies pleasantly, and finds something to amuse himself with in every petty subject; is likewise allowed a *wit*.

Yet, it may be observed, that in all these cases, there is nothing of real *wit*, as above defined; but the whole is *imagination*, or *memory* at most: nay the whole is no more than what temperament may give.

A true *wit* must have a just faculty of discernment; must have, at the same time, both great energy, and peculiar delicacy, in his sentiments; his imagination must be noble, and at the same time happy and agreeable; his expressions polite and well turned; without any thing of parade or vanity in his discourse, or his carriage. It is not at all essential to a *wit*, to be ever hunting after the brilliant; still studying fine thoughts, and affecting to say nothing but what may strike and surprise.

This is a fault very frequent in dramatic persons: the duke of Buckingham rallies it very justly.

"What is that thing which we *sheer wit* do call?
"'Tis when the *wit* of some great writer shall
"So overflow, that is, be none at all,
"That ev'n his fools speak sense ——."

Humour, say our critics, is the genuine *wit* of comedy.

WIT, *child*. See CHILD-*Wit*.

WIT-*fish*, in *Ichthyology*, a name given by the Dutch in the East Indies to a fish common on those coasts, and seeming to be of the tænia kind. It is of the size of our common whiting. Its back is straight and even, and its belly prominent; its snout is pointed somewhat upwards, and tail forked. It has one single spine or prickle on its back, and has a long belly-fin reaching from the head to near the tail; its whole body is striated, and it has two

long

long filaments or beards hanging from its snout, and is a very fine and delicate fish. Ray.

WIT-*fish* is also the name given by the Dutch to an East Indian fish, called by Mr. Ray, ALBULA *Indica*.

WITCH *hazle*, in *Botany*. See HAZLE.

WITCH-*craft*, the crime of SORCERY, especially in women. Many think there may be some foundation for what we call *fascination*, and *witchcraft*. We have innumerable instances, and histories to this purpose; which it would not be fair to set aside, merely because they are not reconcileable to our philosophy: but, as it happens, there seems to be something in philosophy to countenance some of them.

Indeed, the ridiculous stories that are generally told, and the many impostures and delusions that have been discovered in all ages, are sufficient to demolish all faith in such a dubious crime; if the contrary evidence were not also extremely strong. Wherefore (says judge Blackstone), it seems to be the most eligible way to conclude, with an ingenious writer of our own (Spectat. Nº 117.) that in general there has been such a thing as *witchcraft*, though one cannot give credit to any particular modern instance of it. Some readers will, however, probably dissent from this inference of Mr. Addison, and the opinion of the learned judge, and incline to consider *witchcraft* in general as a species of imposture. See MAGICIAN, and MIRACLE.

What the writers in favour of the opinion advance, as their reasons, is as follows:

All living things, they say, emit effluvia, both by the breath, and the pores of the skin. All bodies, therefore, within the sphere of their perspiratory, or expiratory effluvia, will be affected by them; and that, in this or another manner, according to the quality of the effluvia; and in this or that degree, according to the disposition of the emittent and recipient parts.

This, indeed, is incontestible; nor need we produce instances of animals exhaling sweet or stinking smells; or of infectious diseases conveyed by effluvia, &c. in confirmation thereof.

Now, of all parts of an animal body, the eye, we know, is the quickest. It moves with the greatest celerity, and in all the variety of directions. Again, its coat and humours are permeable as any other part of the body (witness the rays of light it so copiously receives.) The eye, therefore, no doubt, emits its effluvia like the other parts. The fine humours of the eye must be continually exhaling. The heat of the pervading rays will rarefy and attenuate them: and that, with the subtile juice, or spirit of the neighbouring optic nerve, supplied, in great abundance, by the vicinity of the brain, must make a fund of volatile matter to be dispensed, and, as it were, determined by the eye.

Here, then, we have both the dart, and the hand to fling it. The one furnished with all the force and vehemence, and the other with all the sharpness and activity, one would require. No wonder if their effects be great!

Do but conceive the eye as a sling, capable of the swiftest and intensest motions and vibrations: and, again, as communicating with a source of such matter, as the nervous juice elaborated in the brain; a matter so subtile and penetrating, that it is supposed to fly instantaneously through the solid capillaments of the nerves; and so active and forcible, that it distends and convulses the muscles, and distorts the limbs, and alters the whole habitude of the body, giving motion and action to a mass of inert, inactive matter. A projectile of such a nature, flung by such an engine as the eye, must have an effect wherever it strikes: and the effect will be limited and modified by the circumstances of distance, the impetus of the eye, the quality, subtility, acrimony, &c. of the juices, and the delicacy, coarseness, &c. of the object it falls on.

This theory, it is supposed by many, may account for some of the phenomena of *witchcraft*, particularly of that branch called FASCINATION. It is certain the eye has always been esteemed the chief seat, or rather organ, of *witchcraft*; though, by most, without knowing why, or wherefore: the effect was apparently owing to the eye; but how, was not dreamed of. Thus, the phrase, to have an *evil eye*, imports as much as to be a *witch*. And hence Virgil

Nescio quis teneros oculus mihi fascinat agnos.

Again, old, bilious persons, are those most frequently supposed to have the faculty; the nervous juice in them being depraved, and irritated by a vicious habitude of body; and so rendered more penetrating and malignant. And young persons, chiefly children and girls, are most affected by it; because their pores are patent, their juices incoherent, and their fibres delicate, and susceptible. Accordingly the *witchcraft*, mentioned by Virgil, only reaches to the tender lambs.

Lastly, the faculty is only exercised when the person is displeased, provoked, irritated, &c. it requiring some extraordinary stress and emotion of mind to dart a proper quantity of the effluvia, with a sufficient impetus, to produce the effect at a distance. That the eye has some very considerable powers, is past dispute.

The ancient naturalists assure us, that the basilisk, and opoblepa, kill other animals merely by staring at them. If this fail of credit, a late author assures us to have seen a mouse running round a large snake, which stood looking earnestly at it, with its mouth open: still the mouse made less and less circles about it; crying all the while, as if compelled thereto; and, at last, with much seeming reluctance, ran into the gaping mouth, and was immediately swallowed.

Who has not observed a setting-dog; and the effects of its eye on the partridge? The poor bird, when once its eyes meet those of the dog, stands as if confounded, regardless of itself, and easily lets the net be drawn over it. We remember to have read of squirrels also stupefied, and overcome, by a dog's staring hard at them, and thus made to drop out of the trees into his mouth.

That man is not secure from the like affection, is matter of easy observation. Few people but have, again and again, felt the effects of an angry, a fierce, a commanding, a disdainful, a lascivious, an intreating eye, &c. These effects of the eye, at least, make a kind of *witchcraft*.

The old laws made in England and Scotland against conjuration and *witch-craft* are repealed by a late statute, and no person is to be prosecuted for any such crime, 9 Geo. II. cap. 5. See CONJURATION.

WITCH *of Endor*, in *Biblical History*, a woman who had a familiar spirit, and who was employed by Saul to consult the deceased Samuel concerning the issue of his contest with the Philistines. See 1 Sam. xxviii.

The explication of this part of sacred history has greatly perplexed commentators and critics. Some, in deference to the authority of the ancient fathers of the Christian church, who ascribed to magicians and necromancers the power of calling up the souls of the dead, have given a literal interpretation of this history, and supposed that Samuel actually appeared to Saul. But to this opinion it has been justly objected, that it is repugnant to the order of the natural world, and to the doctrines of revelation respecting the state of the dead. It cannot be supposed consistent with a just reverence of God to believe, that he has subjected the souls of the departed (not excepting those of the most eminent saints and prophets), to be remanded back from their distinct abodes, by the practice of the most execrable rites and at the call of some of the vilest mortals, and compelled to reveal what he has seen fit to conceal. Natural reason confirms the suffrage of Scripture, when it brands the whole magic art, to which evocations of the dead, and all necromantic divinations appertain, as founded in imposture.

Others, who cannot admit that *witches* are able to disturb the souls of good men, much less of prophets, are nevertheless of opinion, that these wretched women can cause the devil to counterfeit the souls of the dead; and that in the case before us, an evil spirit appeared before Saul in the likeness of Samuel. See Patrick on 1 Sam. xxviii. 12. But this opinion gives an unwarrantable advantage for the support of idolatry to those impostures that were practised by heathen sorcerers and diviners. Besides, the very apparition of a spiritual and incorporeal being, and the gift of prophecy, are real miracles, and cannot take place but by divine appointment: and lastly, the historian calls the appearance to Saul, Samuel, which he could not do with truth, if it was no other than the devil, who here appears, not as a tempter, but as a very severe reprover of impiety and wickedness.

Many learned men have, therefore, maintained, that it was neither Samuel, nor an evil spirit, who here appeared to Saul; but that the whole was the work of human imposture. In support of this opinion, it may be pleaded, that the woman, to whom Saul applied to call up Samuel, was merely a VENTRILOQUIST, possessing an art very serviceable to those who counterfeited the answers of the dead. This opinion, however, like the foregoing one, contradicts the sacred historian, who not only represents the Pythoness as affirming, but himself affirms, that she saw Samuel, and that Samuel spoke to Saul: nor has he dropt the least hint, that it was not the real Samuel of whom he was speaking.

Others have supposed, that the appearance of Samuel to Saul was a divine miracle: though whether the miracle consisted in raising Samuel, or in presenting an image or representation of him before Saul, it is not necessary to determine. Accordingly, the apparition must be ascribed,

ed, not to the power of inchantment, but to the immediate appointment of God, as a rebuke and puniſhment to Saul. This opinion is maintained by Dr. Waterland, in his Sermons, vol. ii. p. 267. and defended by Dr. Delany in his Life of David; but combated by Dr. Chandler, with objections which, as far as they affect the ſcripture hiſtory of this matter, are anſwered or obviated by Mr. Farmer, in his Diſſertation on Miracles, p. 486, &c.

WITCHES-*butter*, a name given by the common people of England to a ſort of TREMELLA growing on the bark of old trees, in form of a corrugated membrane.

WITHERNAM, in *Law*, a repriſal, or taking of other goods or cattle, in lieu of thoſe unjuſtly taken and eſ-ſoined, or otherwiſe with-holden.

The word is compounded of the Saxon *wither*, *contra*, *againſt*; and *nam*, *captio*, *taking*. See NAAM.

Where goods are taken by colour of diſtreſs, and driven to a hold, or out of the county, ſo that the ſheriff cannot, upon replevy, make deliverance thereof, to the party diſtrained; in this caſe the writ of *capias in withernam*, or *de vetito namio*, is iſſued, directed to the ſheriff, for the taking as many of the party's beaſts, as he did thus unlawfully reſtrain; or as much goods of his, till he has made deliverance of the firſt diſtreſs: and, therefore, goods taken in *withernam* cannot be replevied, till the original diſtreſs is forth-coming.

WITHERNAM, *homine capto in*. See HOMINE.

WITHERS *of a horſe*, the juncture of the ſhoulder-bones at the bottom of the neck and main, towards the upper part of the ſhoulder.

Theſe parts ſhould be well raiſed and pretty ſtrong, for this is a ſign of ſtrength and goodneſs in the horſe. They keep the ſaddle from coming forward upon the horſe's ſhoulders and neck, which immediately galls and ſpoils him. A hurt in this part is very difficult to cure, and, for this reaſon, they ſhould be lean rather than fleſhy, as they are then leſs ſubject to be bruiſed and hurt by the ſaddle.

When there are ſores on the *withers*, the cauſe muſt be looked to, in order to determine a proper cure, and prevent a return. If the hurt be cauſed by the largeneſs of the ſaddle-bands, provided that it be not too great, it may eaſily be cured by the following remedy: take the whites of ſix eggs, beat them with a piece of alum as big as an egg for a quarter of an hour, or till the whole is reduced to a thick ſcum or froth; let the ſwelling be rubbed well with this mixture, and then covered over with more of the froth; this is to be left to dry on, and the application is to be repeated every ten or twelve hours; notwithſtanding that the heat and ſwelling remains this, by degrees, will take place, though not at firſt.

If the hurt be great, recourſe muſt be had to bleeding; and this may be repeated after two days, if the ſwelling and inflammation continue.

If a tumor, with great inflammation, follow a bruiſe with the ſaddle-bows, the part affected is to be rubbed with lime-water, and covered with a lamb's ſkin, the woolly part next the back: after the waſhing, the ointment, well known among our farriers by the name of the *duke's ointment*, is to be applied; and if the tumor inclines to ſuppurate, the ointment muſt be waſhed off with a mixture of vinegar and water warmed, mixed with a handful of ſalt to every quart of it: an ointment is then to be made of half a pound of populeon, and a quarter of a pound of black ſoap, and as much honey: theſe are to be thinned with a large glaſs of ſpirit of wine, and the part is to be well rubbed with ſome of this three or four times a-day, covering it afterwards with a lamb's ſkin. Some uſe, inſtead of this ointment, a poultice made of powder of cummin-ſeed, linſeed-oil, and pigeons-dung, which does as well.

WITHERS *of the bow of a ſaddle*, in the *Manege*. See BOW.

WITHER-*band*, in the *Manege*, a band or piece of iron laid underneath a ſaddle, about four fingers above the *withers* of the horſe, to keep tight the two pieces of wood that form the bow.

WITHER-*wrung*, in the *Manege*. A horſe is ſaid to be *wither-wrung*, when he has got a hurt in the *withers*; which ſort of hurts it is very hard to cure. See WITHERS, *ſupra*.

WITHERING, in *Medicine*. See ARIDURA.

WITHERING *of a cow*, is when, after calving, ſhe does not caſt her cleanſing, which if not timely remedied will kill her.

WITHY, a large ſpecies of WILLOW, fit to be planted upon high banks and ſides of ditches, within reach of the water, or on the weeping ſides of hills.

WITNESS, *teſtis*, a perſon who certifies, or aſſerts the truth of, any fact.

All *witneſſes* are deemed *competent*, who, having the uſe of their reaſon, are neither infamous nor intereſted in the event. See EVIDENCE.

Among the Romans, it was a cuſtom to pull or pinch the ears of *witneſſes* preſent at any tranſaction; that they might remember it when they were called to give in their teſtimony. Two eye-*witneſſes*, or *de viſu*, not ſuſpected, are to be deemed a concluſive proof.

Falſe *witneſſes*, ſuborners of *witneſſes*, &c. in England, are puniſhed with the pillory; in ſeveral other countries, with death. See PERJURY, SUBORNATION, &c.

In a ſynod at Rome, under Conſtantine, in the year 320, it was decreed, that there ſhould be ſeventy-two *witneſſes* heard, to condemn a biſhop; which was called *libra teſtium*, a pound of *witneſſes*. Accordingly there were ſeventy-two *witneſſes* heard againſt pope Marcellinus; who, ſays the hiſtorian, *erant electi libra occidua.*

Anciently there were ſynodal *witneſſes*, *teſtes ſynodales*, in each pariſh, choſen by the biſhop, to inquire into the hereſies, and other crimes, of the pariſhioners; and to make oath thereof on the relics of the ſaints. See SYNODALES.

WITNESS, *attic*. See ATTIC.

Trial by WITNESSES, *in Law*, is a ſpecies of trial, without the intervention of a jury. This is the only method of trial known to the civil law; in which the judge is left to form in his own breaſt his ſentence upon the credit of the *witneſſes* examined: but it is very rarely uſed in our law, except only that when a widow brings a writ of dower, and the tenant pleads that the huſband is not dead; this is, in favour of the widow and for greater expedition, allowed to be tried by *witneſſes* examined before the judges; and alſo in ſome other caſes mentioned by ſir Edward Coke, as, to try whether the tenant in a real action was duly ſummoned, or the validity of a challenge to a juror: who obſerves, that in every caſe the affirmative muſt be proved by two *witneſſes* at the leaſt. Blackſt. Com. book iii. p. 336.

WITTENA-*gemot*, among our *Saxon Anceſtors*, a term literally ſignifiying a council, or aſſembly of ſages, or wiſe men; applied to the great council of the land, in later days called PARLIAMENT. See GEMOTE.

In the Saxon times this was the chief court of the kingdom, where all matters, both civil and criminal, and thoſe relating to the revenue, were determined. In civil and criminal matters, it was a court, in the firſt inſtance only, for facts ariſing in the county where it ſat; but it heard and determined cauſes from all other counties, by way of appeal. To this court were ſummoned the earls of each county, and the lords of each leet, as alſo the repreſentatives of towns, who were choſen by their burgeſſes.

WITWALL, a common Engliſh name for the great ſpotted WOOD-*pecker*, the *picus varius major* of authors.

WOAD, *iſatis*, in *Botany*, a genus of the *tetradynamia ſiliquoſa* claſs. Its characters are theſe: the empalement of the flower is compoſed of four oval coloured leaves, which ſpread open and fall away; the flower has four oblong petals placed in form of a croſs, narrow at their baſe but broad and obtuſe at their ends: it has ſix ſtamina, four of which are as long as the petals, the other two are ſhorter; theſe are terminated by oblong lateral ſummits; it has an oblong compreſſed germen, crowned by an obtuſe ſtigma; the germen becomes an oblong compreſſed pod with one cell, having two valves incloſing one oval compreſſed ſeed in the centre. There are four ſpecies.

The broad-leaved *woad* is cultivated in ſeveral parts of England for the purpoſes of dying, being uſed as a foundation for many of the dark colours.

This is a biennial plant, which flowers in July, and whoſe ſeeds ripen in the beginning of September. As the goodneſs of *woad* conſiſts in the ſize and fatneſs of the leaves, the only method to obtain it of this quality is by ſowing the ſeed upon ground at a proper ſeaſon, allowing the plants proper room to grow, and keeping them clean from weeds. The ſoil ſhould not be too light and ſandy, nor too ſtiff and moiſt, but a gentle hazel loam, whoſe parts will eaſily ſeparate. This ſhould be ploughed juſt before winter, and laid in narrow high ridges; in the ſpring ploughed again croſſways, and laid in ſimilar ridges: when the weeds begin to grow, it ſhould be well harrowed to deſtroy them. In June the ground ſhould be ploughed a third time, with narrow furrows, and ſtirred as deep as the plough will go; and the weeds, as ſoon as they appear, deſtroyed by harrowing. Toward the end of July or Auguſt, it ſhould be ploughed the laſt time and laid ſmooth: and when there is a proſpect of ſhowers, harrowed for receiving the ſeeds, which ſhould be ſteeped one night in water, and ſown either in rows with the drill plough, or in broad-caſt, and in this laſt mode of ſowing well harrowed in. The plants, from good ſeeds and in a favourable ſeaſon

ſeaſon, will appear in a fortnight, and in a month or five weeks be fit to hoe. In the firſt hoeing, they ſhould be ſeparated to the diſtance of three or four inches, and at the laſt to ſix inches: the ground ſhould be hoed a ſecond time in October. In the middle they will need hoeing again, both for deſtroying the young weeds and ſtirring the ſoil. The ground thus treated will remain clean till the firſt crop of *wood* is gathered, after which, and alſo after the gathering of each crop, it will be clean, and the plants thrive the better. If the land, in which this ſeed is ſown, ſhould have been in culture before for other crops, and be not in good heart, it will require a dreſſing of rotten dung, which ſhould not be laid on till the laſt ploughing before the ſeeds are ſown, and ſpread only as the land is ploughed. The quantity of dung ſhould not be leſs than twenty loads to each acre.

The beſt ground will not admit of being ſown with *woad* more than twice, and if it is oftener repeated, the crop ſeldom pays the charges of culture.

The time for gathering the crop is according to the ſeaſon; but it ſhould be performed as ſoon as the leaves are fully grown, while they are perfectly green. If the land is good, and well huſbanded, it will produce three or four gatherings; but the two firſt are the beſt. An acre of land will produce a ton of *woad*, and, in a good ſeaſon, near a ton and a half.

When the planters intend to ſave the ſeeds, they cut two crops of the leaves, and then let the plants ſtand till the next year for ſeed; but if only one crop is cut, and that merely of the outer leaves, the plants will grow ſtronger, or produce a much greater quantity of ſeeds. Theſe ſeeds are kept two years, but it is beſt to ſow new ſeeds when they can be obtained. When the pods turn to a dark colour, the ſeeds ſhould be gathered; for this purpoſe the ſtalks may be reaped like wheat, and ſpread in rows upon the ground; and in four or five days the ſeeds will be fit to threſh out, provided that the weather be dry.

Some feed down the leaves of *woad* in winter with ſheep; a practice which Mr. Miller condemns. Miller's Gard. Dictionary.

Woad grows wild in ſome parts of France, and on the coaſts of the Baltic ſea: the wild *woad*, and that which is cultivated for the uſe of dyers, appear to be of the ſame ſpecies.

The preparation of *woad* for dying, as practiſed in France, is minutely deſcribed by Aſtruc, in his Memoirs for a Natural Hiſtory of Languedoc. The plant puts forth at firſt five or ſix upright leaves, about a foot long and ſix inches broad: when theſe hang downwards, and turn yellow, they are fit for gathering: five crops are gathered in one year. The leaves are carried directly to a mill, much reſembling the oil or tan-mills, and ground into a ſmooth paſte. If this proceſs was deferred for ſome time, they would putrefy, and ſend forth an inſupportable ſtench. The paſte is laid in heaps, preſſed cloſe and ſmooth, and the blackiſh cruſt, which forms on the outſide, re-united if it happens to crack: if this was neglected, little worms would be produced in the cracks, and the *woad* would loſe a part of its ſtrength. After lying for fifteen days, the heaps are opened, the cruſt rubbed and mixed with the inſide, and the matter formed into oval balls, which are preſſed cloſe and ſolid in wooden moulds. Theſe are dried upon hurdles: in the ſun, they turn black on the outſide; in a cloſe place, yellowiſh, eſpecially if the weather be rainy: the dealers in this commodity prefer the firſt, though it is ſaid the workmen find no conſiderable difference betwixt the two. The good balls are diſtinguiſhed by their being weighty, of an agreeable ſmell, and when rubbed, of a violet colour within. For the uſe of the dyer, theſe balls require a farther preparation: they are beat with wooden mallets, on a brick or ſtone floor, into a groſs powder; which is heaped up in the middle of the room to the height of four feet, a ſpace being left for paſſing round the ſides. The powder, moiſtened with water, ferments, grows hot, and throws out a thick fetid fume. It is ſhovelled backwards and forwards, and moiſtened every day for twelve days; after which it is ſtirred leſs frequently, without watering, and at length made into a heap for the dyer.

The powder thus prepared gives only browniſh tinctures, of different ſhades, to water, to rectified ſpirit of wine, to volatile alkaline ſpirits, and to fixed alkaline lixivia: rubbed on paper, it communicates a green ſtain. On diluting the powder with boiling water, and after ſtanding ſome hours in a cloſe veſſel, adding about one twentieth part of its weight of lime newly ſlaked, digeſting in a gentle warmth, and ſtirring the whole together every three or four hours, a new fermentation begins, a blue froth ariſes to the ſurface, and the liquor, though it appears itſelf of a reddiſh colour, dyes woollen of a green, which, like the green from indigo, changes in the air to a blue. This is one of the niceſt proceſſes in the art of dying, and does not well ſucceed in the way of a ſmall experiment.

Aſtruc propoſes the manufacturing of freſh *woad* leaves in Europe, after the ſame manner as the indigo plant is manufactured in America; and thus preparing from it a blue fecula ſimilar to indigo, which from his own experiments he has found to be practicable. Such a management would doubtleſs be accompanied with ſome advantages, though poſſibly *woad* ſo prepared might loſe thoſe qualities which now render it, in a large buſineſs, preferable on ſome accounts to indigo, as occaſioning greater diſpatch when once the vat is ready, and giving out its colour leſs haſtily, ſo as to be better fitted for dying very light ſhades. Neumann's Chem. by Lewis, p. 437, &c.

The ancient Britons uſed to dye their bodies herewith; and ſome hold, that it was from this plant, glaſs took its denomination; though others derive both *glaſs*, and *glaſtum*, from the Britiſh *glaſs*, which, to this day, denotes a blue colour.

A *wood blue* is a very deep blue, almoſt black; and is the baſe of ſo many ſorts of colours, that the dyers have a ſcale, whereby they compoſe the divers caſts or degrees of *woad*, from the brighteſt to the deepeſt.

Beſide the plant properly ſignified by the name *woad*, which dyes a blue colour, we have two others known in our Engliſh herbals under that name, as alſo that of *wold* or Weld. Theſe are both called by the common people *dyer's weed*, and are the *luteola* and the *geniſta tinctoria*. The ancients confounded all theſe three plants alſo under the ſame names. Paulus Ægineta ſeems to make them all the ſame plant; and Neophytus, ſpeaking of the *iſatis*, or our *woad*, properly ſo called, ſays, that it was called by the Latins, *lutum*. This *lutum* has been by ſome underſtood to mean the *luteola*, and by others the *geniſta tinctoria*; but the latter opinion only is right, for it is deſcribed to us by the ancients as having leaves like the *linum*, or flax, and flowers like the broom.

Woden, in *Mythology*. See Odin.

WOLD, ſignifies a plain down, or open champain ground, hilly, and void of wood.

Hence the names Stow in the *Wold*, and *Cotſwold*, in Glouceſterſhire; whence alſo that part of Leiceſterſhire, which lies northward beyond the Wrekin, is called the *Wold of Leiceſterſhire*.

Wold, or Weld, among *Dyers*. See Weld.

WOLF, in *Aſtronomy*. See Lupus.

Wolf, *lupus*, in *Zoology*, the *canis lupus* of Linnæus, a beaſt of prey, of the dog-kind, with the tail bending inwards, and the largeſt and fierceſt of that race of animals. It is extremely like the domeſtic dog in ſhape, and if the head, which is long, with a pointed noſe, did not differ a little in figure, one would be apt to declare it the very ſame animal. It has a very fierce look about the face, its eyes are glaring and ſavage, and its teeth, which are large and ſharp, and the opening of its mouth, fierce and frightful. The ancients had an opinion, that the neck of the *wolf* was all of one ſolid bone; but, on the contrary, this creature is able to turn and twiſt it about better than the dog-kind.

The *wolf*, as well as all the other beaſts of prey, can endure hunger a long time, though very voracious when it meets with food. The *wolf* differs from the dog in his note, for inſtead of the barking of the dog this creature only howls; his ears, which ſtand erect, and his tail make him alſo greatly reſemble the fox.

The hair of the *wolf* is long; the legs are long; the head and neck cinereous; the body generally pale brown, tinged with yellow; ſometimes found white; in Canada ſometimes black; and taller than a large greyhound. See *Tab.* V. *Quadrupeds*, Nº 65.

The *wolf* inhabits the continents of Europe, Aſia, Africa, and America.

In 1281, theſe animals infeſted ſeveral of the Engliſh counties; but after that period, our records make no mention of them. The laſt *wolf* known in Scotland was killed in 1680, and in Ireland one was killed in 1710.

The wolves of North America are the ſmalleſt; and when reclaimed, are the dogs of the natives; thoſe of Senegal the largeſt and fierceſt; and they prey in company with the lion. Thoſe of the Cape are grey ſtriped black; others are black.

They are cruel, but cowardly animals; they fly from man, except when impelled by hunger; in which caſe they prowl by night in great droves through villages, and deſtroy any perſons they meet; and having once got the taſte of human blood, give it the preference. In hard weather *wolves* aſſemble in large troops, and join in dreadful howlings. They have a fine ſcent, and hunt by the noſe; between them and the dogs a mutual enmity ſubſiſts;

ſubſiſts; they go with young ten weeks, and bring from five to nine at a birth. Ray and Pennant.

WOLF, *golden*. See JACKALL.

WOLF, *marine*. See HYÆNA.

WOLF, *Mexican*, *canis Mexicanus*, a ſpecies that inhabits the hot parts of Mexico, agreeing in its manners with the European *wolf*. Its head, jaws, and teeth are large, in the upper lips are ſtrong briſtles bent backwards, of a grey and white colour; the ears are large, erect, and cinereous, and the ſpace between them marked with broad tawny ſpots, the head aſh-coloured, croſſed with duſky ſtripes; the neck fat and thick, and marked with a tawny ſtroke; on the breaſt is another of the ſame kind: the body is aſh-coloured ſpotted with black, and the ſides ſtriped with the ſame colour; the belly cinereous, the tail long, of the ſame colour, tinged in the middle with tawny; the legs and feet ſtriped with black and aſh-colour. Pennant's Hiſt. Quad. vol. i. p. 274.

WOLF, in the *Hiſtory of Inſects*, the name of a ſmall white worm or maggot, which infeſts granaries, and does very great damage there.

It is in this ſtate of the worm that it does the miſchief; but this is not its perfect form, for it is afterwards transformed into a ſmall moth, with white wings ſpotted with black.

This little maggot has ſix legs, and as it creeps along, there iſſues from its mouth an extremely fine thread or web, by which it faſtens itſelf to every thing it touches, ſo that it cannot fall. Its mouth is furniſhed with a pair of reddiſh forceps, or biting inſtruments, by means of which it gnaws its way not only into wheat and other grain, but perforates even beams of wood, boxes, books, and every thing it meets with.

Towards the end of ſummer theſe pernicious inſects may be ſeen crawling up the walls of corn-chambers, infeſted with them in great numbers; they are then ſearching a proper place where they may abide in ſafety during their aurelia ſtate; for when the time of their undergoing this change approaches, they forſake their food, and the little cells they had formed of hollowed grains of corn clotted together, by means of the web coming from their mouths. They now wander about till they find ſome wood, or other ſubſtance into which they gnaw holes with their fangs, capable of concealing them; and there enveloping themſelves in a covering of their own ſpinning, they ſoon become a dark-coloured ſort of aurelia. They remain in this ſtate all the winter; but in April or May they come forth in their moth-ſhape, and are then ſeen in vaſt numbers taking ſhort flights, and creeping up the walls. In this ſtate they eat nothing; but they ſoon copulate and lay eggs, which are in the ſhape of a hen's egg, but no larger than a grain of ſand. Each female lays ſixty or ſeventy eggs, which ſhe depoſits in the little wrinkles of the grains of corn, where in about ſixteen days they hatch, and the minute maggots immediately perforate the grain, and eat out all its ſubſtance, and with the threads which come from their mouths cement other grains to it, which they, in the ſame manner, ſcoop out and deſtroy.

The watchful obſerver has two opportunities of deſtroying theſe devourers from among his corn. One is, when they forſake their food, and aſcend the walls, which they will ſometimes almoſt cover. The other, when they appear in the moth-ſtate. At both theſe times they may be cruſhed to death againſt the walls in great numbers, by clapping ſacks upon them; but they may be exterminated more effectually by cloſing up all the windows and doors, and burning brimſtone on a pan of charcoal, letting the rooms be full of the fumes of it for twenty-hour hours. This certainly deſtroys the animals and does no ſort of injury to the grain, not communicating the ſlighteſt ſcent to it. Baker's Microſ. p. 222.

WOLF's *bane*, *Aconitum*, in *Botany*, a genus of the *polyandria trigynia* claſs. Its characters are, that the flower hath no empalement, but conſiſts of five unequal petals; the *galea* or hood is tubulous, and covers the other parts of the flower like a friar's cowl, whence it is called helmet-flower and monk's-hood; the lateral petals incloſing the ſtamina and ſtyle are equal, concave, and ſlightly indented in the middle; the two lower petals are narrow and oblong; in the bottom of the flower are placed two nectariums, upon which are ſituated the ſtyles, which are forked, and ſtretched out beyond the ſtamina, which are numerous and irregular: the germen becomes oblong ſeed-veſſels terminating in a point, and coaleſcing at their baſe; theſe have one cell, which is filled with angular rough ſeeds. Miller enumerates ten, and Linnæus ſix ſpecies. See ACONITE.

Moſt of the ſpecies of this plant are poiſonous; but thoſe with blue flowers are ſuppoſed to be of a much ſtronger quality than the yellow or white flowered kinds. It is confidently affirmed that the huntſmen on the Alps, who hunt the wolves and other wild animals, dip their arrows into the juice of theſe plants, which renders the wounds occaſioned by them mortal. There is one ſpecies which is deemed an antidote to thoſe that are called poiſonous called ANTHORA, and thoſe that are poiſonous are called THORA. Miller.

The blue *wolf's bane*, or *aconitum napellus* of Linnæus, has been long known as one of the moſt virulent of the vegetable poiſons. It occaſions convulſions, giddineſs, inſanity, violent purgings both upward and downward, faintings, cold ſweat, and death itſelf. Dr. Stoerck was the firſt who ventured to introduce it into medicine. He found that the extract, given to the quantity of ten, twenty, and even thirty grains, excited a ſweat without inconvenience; and by perſiſting in the uſe of it great relief was obtained in fixed rheumatic and arthritic pains, ſcirrhous glandular tumors, venereal nodes, anchyloſis, amauroſis, and other ſimilar complaints. Other practitioners have experienced the ſame good effects in ſome degree, and the Edinburgh college has admitted the extract as an officinal. Lewis's Mat. Med. 1784.

WOLF's *bane*, *winter's*, a ſpecies of HELLEBORE.

WOLF-*fiſh*. See LUPUS *Marinus*.

WOLF's *grapes*. See LYCOSTAPHYLÆ.

WOLF-*Net*, a term uſed by the ſportſmen for a kind of net uſed in fiſhing, which takes great numbers, and has its name from the deſtruction it cauſes.

It is uſed both in rivers and ponds, and is of the nature of the rattle, excepting only the wanting of the four *wings*. The trunk or coffer conſiſts of ſeven feet, beſide the two gullets. It is ſupported by hoops, and is to be placed in ſome part where there is an abundance of ſedges, ruſhes, and water-graſs. There is to be a place made for the net here, by the uſe of a paring-knife, cutting away all the weeds and other matter, for the ſpace that will contain it; and when the net is placed, there are to be two alleys cut or cleared in the ſame manner, one on each ſide of the net, that the fiſh may be invited into them, and by them into the net. There muſt be ſome ſtones or leaden weights uſed to ſink the net, and a long pole faſtened to the upper part of the mouth of it, by means of which, when it is well filled with fiſh, it may be lifted up and taken to the ſhore.

WOLF's *peach*. See LYCOPERSICON.

WOLFESHEAD, or WULVERSHEAD, Saxon, *wulferheafod*, compounded of *wulf*, *wolf*, and *heafod*, *head*, *caput lupinum*, denoted the condition of thoſe outlawed for criminal matters in the Saxon time, and not yielding themſelves to juſtice. For if they could have been taken alive, they muſt have been brought to the king; and if they, for fear of being apprehended, did defend themſelves, they might be ſlain, and their heads brought to the king; for their head was no more to be accounted of than a *wolf's head*. LL. Edw. in Lamb. fol. 127. and Bract. lib. iii. tract. 2. cap. 11. See CAPUT *lupinum*, and OUTLAWRY.

WOLF-*moneth*, a name given by our Saxon anceſtors to the month of January, on account of the ravages committed by the wolves in that month through the ſeverity of the cold.

WOLFRAM, *ſpuma lupi*, in *Natural Hiſtory*, a refractory mineral, of a black or brown ſhining colour, of a radiated or foliated texture, in appearance reſembling the ore of tin, and generally found in tin mines. It is moderately hard, and ſometimes ſo brittle as to be eaſily broken between the fingers, but very weighty; its ſpecific gravity being 7,119. When ſcratched it exhibits a red trace, whereby it is diſtinguiſhed from TUNGSTEN: and when powdered it is red. It is ſcarcely ſoluble in acids, and very difficult of fuſion.

Wallerius conſiders it as an ore of iron mineraliſed by arſenic, which ſometimes contains tin. According to Cronſtedt, it is a kind of magneſia, or mangeneſe, containing a ſmall portion of iron and of tin. According to Lehman, it conſiſts of ſiliceous earth, calx of iron, and a ſmall proportion of that of tin; and from Lehman's experiments Mr. Kirwan (El. of Min. p. 285.) inclines to think that it contains mangeneſe.

WOLVERENE. See GLUTTON.

WOLVES *teeth*, of a horſe, are overgrown grinders, the points of which, being higher than the reſt, prick the creature's tongue and gums in feeding, ſo as to hinder chewing of the meat.

They are ſeldom met with but in young horſes; but if they be not daily worn by chewing, they will grow up even to pierce the roof of the mouth.

There are uſually two of theſe *wolves*-teeth, which are ſmall, and grow in the upper-jaw, next to the great grinding-teeth: theſe are ſo tender and painful, that the horſe cannot chew his meat, but is forced to let a great part of it fall out of his mouth, or ſwallow it half chewed.

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The remedy, in this caſe, is to tie up the horſe's head to ſome part of the rafter, and open his mouth with a cord, then with an inſtrument like a carpenter's gouge, and a mallet, the teeth that are thus troubleſome are to be knocked out, and the holes filled up with ſalt.

If the upper-jaw teeth hang over thoſe of the under-jaw, and by that means cut the mouth, the ſame inſtrument is to be uſed, and the teeth are to be pared ſhorter by little and little. When they are ſufficiently pared down, they muſt be filed ſmooth, and the mouth waſhed with vinegar and ſalt, and the whole complaint will be thus removed.

WOLVES, *rout of*. See ROUT.

WOMAN, FOEMINA, *Mulier*, the female of man.

A *woman*, in England, as ſoon as ſhe is married, with all her moveables, is wholly *in poteſtate viri*, or at the will and diſpoſal of her huſband.

There are divers conſiderable things relating to *women* in the laws of England, which ſee under WIFE.

St. Auguſtine calls *women* the *devout ſex*; at leaſt, this is the common opinion; though others rather think, that in the prayer uſually attributed to that father, and ſtill rehearſed in the Romiſh church to the holy Virgin, the words *intercede pro devoto fœmineo ſexu*, are to be underſtood of *women* devoted, or conſecrated to God in religious houſes; which had been ſufficiently expreſſed by the words, *ora pro populo, interveni pro clero*.

It is a popular tradition among the Mahometans, which obtains to this day, that *women* ſhall not enter paradiſe.

An anonymous author, about the cloſe of the ſixteenth century, publiſhed a little Latin diſſertation, to prove that *women* are not men; that is, are not reaſonable creatures: *Diſſertatio perjucunda, qua anonymus probare nititur* mulieres *homines non eſſe*. He alſo endeavours to prove, what naturally follows from this principle; viz. that *women* ſhall not be ſaved; that there is no future life, or happineſs for them. His proofs are all taken from Scripture, or founded on Scripture. Though, after all, his aim is not ſo much to degrade *women* to the condition of brutes; as to ridicule the principle or method of many Proteſtants, who, in points of controverſy, admit of no proofs or conſiderations, but what are taken from Scripture alone. This appears from the concluſion of the work. *Probavi, opinor, invictiſſimis SS. literarum teſtimoniis*, mulierem *non eſſe hominem, nec eam ſalvari: quod ſi non effeci, oſtendi tamen univerſo mundo, quomodo hujus temporis hæretici, & præſertim Anabaptiſtæ, ſacram ſoleant explicare Scripturam, & quo utantur methodo ad ſtabilienda ſua execranda dogmata*.

Yet, Simon Gediccus, a Lutheran divine, wrote a ſerious confutation of this piece in 1595, wherein the *women* are reſtored to the expectation of heaven, on their good behaviour.

The ancient Marcionites allowed their *women* to baptize; as we are aſſured by St. Epiphanius, Hær. 42. cap. 4, the Montaniſts admitted *women* to the prieſthood, and even the epiſcopate. Epiph. Hær. 49. cap. 2. The modern Quakers alſo permit their *women* to preach and propheſy, on an equal footing with the men.

It is a point much controverted, how far learning and ſtudy become the ſex? Eraſmus handles the queſtion at large in one of his letters to Budæus. Lud. Vives, in his Inſtitutio *Fœminæ* Chriſtianæ, has a chapter expreſs on the ſame ſubject. Madam Schurman, a German lady, has gone beyond them both, in a treatiſe on this problem; *Num* fœminæ *Chriſtianæ conveniat ſtudium literarum?*

Several of the *women* remarkable for learning have been alſo diſtinguiſhed for their want of conduct. The reaſon, no doubt, lay in this; that their firſt ſtudies lying in books of gallantry and intrigue, the imagination was early turned that way, and the memory filled with a ſort of ideas, which a favourable diſpoſition, and age, adopted too eaſily, and improved too faſt. It is not that ſtudy in itſelf has any natural tendency to produce ſuch effects; rather the contrary: the cloſe abſtracted reſearches of metaphyſics, logics, mathematics, phyſics, criticiſm, &c. no doubt, would be the ſureſt means to ſecure and eſtabliſh the virtue of continency in a *woman*.

WOMEN, *appeals of*. See APPEAL.

WOMEN, *jury of*. See *Jury of* MATRONS.

WOMEN, *ſtealing* or *ſeduction of*, is puniſhable by the ſtatute 4 & 5 Ph. & Mar. cap. 8. which enacts, that if any perſon, above the age of fourteen, unlawfully ſhall convey or take away any *woman* child unmarried (which is held to extend to baſtards as well as to legitimate children) within the age of ſixteen years, from the poſſeſſion and againſt the will of the father, mother, guardians, or governors; he ſhall be impriſoned two years, or fined at the diſcretion of the juſtices: and if he deflowers ſuch maid or *woman* child, or, without the conſent of parents, contracts matrimony with her, he ſhall be impriſoned five years, or fined at the diſcretion of the juſtices, and ſhe ſhall forfeit her lands to her next of kin, during the life of her ſaid huſband. But this latter part of the act is now rendered almoſt uſeleſs, by proviſions of a very different kind, which make the marriage totally void, in the ſtatute 26 Geo. II. cap. 33. See MARRIAGE. See alſo FORCIBLE *Abduction*, RAPE, and RAVISHMENT.

WOMB, *Matrix*, or *Uterus*, in *Anatomy*, that part of the female of any kind, wherein the fœtus is conceived, and nouriſhed till the time of its delivery.

The ancient Greeks called the *matrix*, μητρη, from μητηρ, *mother*: whence diſorders of the womb are ſtill frequently called *fits of the mother*. They alſo called it υϛηρα, as being the laſt of the entrails, by its ſituation. Sometimes they alſo called it φυσις, or *natura*; and *vulva*, from *volvo, to fold* or *envelope*, or from *valvæ, doors*.

The *womb* in women is ſituate in the pelvis, or capacity of the hypogaſtrium, between the urinary bladder and the inteſtinum rectum, and reaches as far as the flanks: it is ſurrounded and defended by very ſtrong bones; before, by the os pubis; behind, by the ſacrum; on each ſide, by the ilium and iſchium. It is a body inwardly hollow, outwardly of a whitiſh colour, of a pretty ſolid ſubſtance, and except in time of pregnancy, in figure ſomewhat like a flat flaſk, or dried pear. In women with child it expands, and receives different forms, according to the different times and circumſtances of geſtation. It has ſeveral coats, arteries, veins, nerves, and ligaments; and is interwoven with ſeveral different kinds of fibres.

Anatomiſts divide the *womb* or *matrix* into the *fundus*, and *cervix*; a broad part, and a neck. Its ſituation is oblique, the fundus being turned backward and upward, the neck forward and downward; the broad ſides lie next the rectum and bladder, and the narrow ſides are lateral. It is in extent, from the extremity of the one to that of the other, about three inches in length; its breadth at the fundus is about two, and ſcarcely one at the other end, and its thickneſs one inch. It has but one cavity, unleſs we diſtinguiſh between the cavity of the uterus, and that of its neck. The cavity of the *uterus* is flat, and reſembles an oblong triangle, the ſhorteſt ſide of which anſwers exactly to the fundus, and the two longeſt ſides lie, one on the right hand, the other on the left, and they are all bent inward or toward the cavity formed by them. Of the three angles of this cavity, the two which terminate the fundus are perforated each by a narrow duct, which with difficulty admits a hog's briſtle. The third angle forms a flat duct wider than the former, which perforates the neck of the *uterus* lengthwiſe, and terminates at the extremity of that neck, by a tranſverſe opening. At the bottom of the neck, towards the fundus, it grows very narrow in virgins, ſo that only a ſmall ſtilet can be paſſed through it: the extremity of it is called the *oſculum internum*. In pregnant women it opens, more eſpecially towards the time of delivery. At the edge of this orifice are ſeveral ſmall holes, anſwering to the ſame number of glandular corpuſcles which diſcharge a viſcid lympha. The other and lower orifice of the neck, towards the vagina, called *oſculum externum*, is a little prominent, reſembling, in ſome meaſure, the glans of the virile organ. See *Tab. Anat.* (*Splanch.*) *fig.* 9.

The inner ſurface of the cavity of the *womb* is lined by a very fine membrane, which at the fundus is ſmooth and even, but in the narrow portion that leads to the orifice, it is wrinkled in a particular manner. That portion of this membrane, which covers the bottom of the cavity, is perforated by a great number of holes, throughout which paſs ſmall drops of blood, when the *womb* is compreſſed; and it ſometimes appears to have very ſmall hairs or villi; and both the villi and holes are obſerved to be more or leſs tinged with blood, in thoſe women who die in the time of their menſes. In the narrow part, each ſide is divided into two lateral parts, by a kind of prominent longitudinal line, which is larger in the upper or anterior ſide, than in the lower or poſterior. On each ſide of theſe longitudinal lines, there are lines or rugæ obliquely tranſverſe; between and round which there are ſmall lacunæ, through which a mucilaginous fluid is diſcharged that cloſes the orifice of the *uterus*.

The ſubſtance of the *womb* is membranous and carnous: it conſiſts of three tunics; or according to ſome, who deny that name to the middle ſubſtance, of two only. The external tunic, called alſo *communis*, is derived from the peritonæum, and conſiſts of two lamellæ; the exterior of which is pretty ſmooth, the interior rugged and uneven: this membrane inveſts the whole *matrix*, and connects it to the inteſtinum rectum, bladder, &c. The middle tunic is very thick, and compoſed of ſtrong fibres, variouſly diſpoſed: ſome think it contributes to the excluſion of the fœtus, though others imagine, it ſerves

only to recover the tone of the part, after any violent distention. The inner tunic is nervous.

The *womb* is connected by its neck to the vagina; behind, by its outward common membrane; and before, by the same to the bladder; its sides are tied to other parts; but the fundus is left loose, that it may expand and dilate more freely. Its ligaments are four, two of which are called *broad*, and two *round*, from their figure. The broad ligaments are membranous, loose, and soft; whence they have been compared by some to the wings of bats, and called *alæ* VESPERTILIONUM. The round ligaments are of a firmer texture, and consist of a double membrane, wrapped up in its arteries, veins, nerves, and lymphæducts. These run in the great duplicature of the broad ligaments, from each corner of the fundus uteri as far as the annular openings of the abdominal muscles. See LIGAMENT.

The blood-vessels, both in these and the round ligaments, interwoven and connected together by a fine cellular substance, make a great part of what is called their *substance*. These, as well as the others, serve to keep the *womb* in a right position; and are very liable to be injured by unskilful midwives.

On each side of the fundus of the *womb*, arises a duct, which opens into the *womb* with a small orifice; but in its progress enlarges, and towards the end is contracted again: at the end next the ovaria, which is at liberty, it expands again into a kind of foliage fringed round; which expansion Fallopius, the first discoverer, imagined like the end of a trumpet; whence he called the whole duct, *tuba*. It consists of a double membrane. Both veins and arteries are very numerous in these tubes, especially the latter, which, by various ramifications and contorsions, make the main substance of them. Dr. Wharton gives them valves; but other anatomists disallow that. See FALLOPIAN *Tubes*, OVARY, and SPERMATIC.

Several bundles of muscular fibres enter the structure of the *womb*. The innermost of these, being disposed in a vortical or turbinated manner, gave occasion to M. Ruysch to describe them particularly by the name of musculus uteri orbicularis; which orbiculary muscle Mr. Monro says, he has also seen. Vide Med. Ess. Edinb. vol. ii. p. 128. and Ruysch, Epistolæ de Musc. in Fund. Uteri.

The human uterus has numerous orifices of vessels opening into its cavities, to pour out liquors there.

Towards the fundus of the *womb* especially, these orifices are found to be the extremities of canals that come out from larger cavities, lodged within the substance of the *womb*. These cavities are commonly called sinuses. See SINUS *of the Womb*.

The nerves of the *uterus* proceed from the lumbares sacri, and sympathetici maximi; the lymphatic vessels run chiefly in the coats continued from the peritonæum.

It is a question among anatomists and physiologists, whence the cavity in the *womb* is formed, which in the last months contains the infant, the greatest part of the waters, and all the secundines, except the placenta? As to which, the curious may consult the learned Dr. Thomas Simpson's Dissertation in the Medic. Ess. Edinb. vol. iv. art. 13.

It is the opinion of Boyle (Dissertationes Medicæ), that as in the earth, which is the fruitful *womb* of all the seeds of plants, so in the *wombs* of all animals, while in a fit and proper state for conception, there must concur three things; a benign heat to cherish, a due fermentation to agitate and dilate, and a due proportion of moisture, ready to enter with ease into the pores opened by the fermentation.

To these qualities is owing in all probability the menstrual discharge of women, the blood being agitated and rarefied, in a part destined to these offices, for the use of an included fœtus; and when that is not there, this fluid swells, and opens the vessels, so as to burst out into a profluvium. It is remarkable that the *womb* in the human, and one more species of animal beside, that is, the monkey, discharges this blood regularly; all other animals, at the time of the effervescence in that part, which is at intervals of longer periods, discharging only a small quantity of an aqueous matter, as is seen in mares, cows, &c. It is observed by the medical writers, that there is an evident consent of many parts of the body with the *womb*, that is, several parts which are always affected with it, and owe their being affected to some disorder in that part, which it propagates and continues to them.

WOMB, *dropsy of the*. See DROPSY.

WOMB, *falling down of the*. See PROCIDENTIA *uteri*.

WOMB, *inflammation of the*. See INFLAMMATION.

WOMB, *suffocation of the*. See SUFFOCATION.

WOMB, *ulcers of the*. See ULCERS.

WONDER. See MIRACLE.

The *seven wonders of the world*, as they are popularly called, were the *Egyptian pyramids*; the *mausoleum*, erected by Artemisia; the *temple of Diana* at Ephesus; the *walls* and *hanging gardens* of the city of Babylon; the *colossus*, or brazen image of the sun at Rhodes; the *statue of Jupiter Olympius*; and the *pharos*, or watch-tower, of *Ptolemy Philadelphus*: instead of the latter some reckon the royal palace of Cyrus, built by Menon, the stones of which were cemented with gold. See PYRAMID.

WONDERFUL *water*. See WATER.

WOOD, *lignum*, a substance, whereof the trunks and branches of trees consist; deriving its growth from certain juices in the earth.

The *wood* is all that part in a tree, included between the bark and the pith.

Dr. Grew, in his Anatomy of Plants, has discovered, by means of the microscope, that what we call *wood* in a vegetable, notwithstanding all its solidity, is only an assemblage of infinite minute canals, or hollow fibres; some of which rise from the root upwards, and are disposed in form of a circle; and the others, which he calls *insertions*, tend horizontally from the surface to the centre; so that they cross each other, and are interwoven like the threads of a weaver's web.

The structure and organization of *wood* are a subject on which many have employed their thoughts; but perhaps none with greater success than the celebrated monsieur Buffon, of the Royal Academy of Sciences at Paris, 1740.

This gentleman observes, that the organization of *wood* is yet unknown in all its parts; and that though the world is greatly indebted to the observations of Grew, Malpighi, and Hales, yet, when he entered on the subject, he found there was much more unknown than known, and determined to observe, from its first state, the growth of trees, and the formation of their *woody* part.

The seed of a tree, suppose an acorn, if put into the earth in the spring season, produces, after a few weeks, a tender shoot, of an herbaceous structure, which enlarges, extends itself, and hardens by degrees, and in the first year's growth, has in it a slender filament of a *woody* substance. At the extremity of this young tree there is a little button formed, which opens the next year into leaves, and from which there is propagated a second shoot, in all respects like that of the first year, except that it is more vigorous, grows faster, and hardens much more considerably. This is also terminated by a button like that of the precedent year, and in this is contained the shoot of the third year; and in this manner is the growth of the tree carried on, till it has acquired its whole height.

Each of these buttons is a sort of seed, which contains the shoot of the succeeding year, just as the seed itself did that of the first: and the growth of a tree in height is carried on therefore by a series of annual productions, exactly like one another, and the full-grown tree is, though perhaps a hundred feet high, composed only of a number of short trees, joined end to end, the longest of which is not above two feet in length. These little trees of the several years never at all alter their height or length, or even their thickness; they remain even in a tree of a hundred years old, of their original length and diameter, and suffer no change, but in becoming harder. This then is the manner in which trees grow in height; how they grow in thickness is next to be enquired into.

The button, which makes the summit of the tree of the first year, draws its nourishment through the very substance of that little tree; but the principal tubes or vessels, which serve to convey the sap, are placed between the bark and the *woody* filament.

The action of this sap, in moving, dilates and enlarges these vessels, while the button, in raising itself up in growth, elongates them; the sap also, in continually passing them, leaves behind it certain fixed parts, which augment the solidity. Thus the second year's little tree contains in its middle a *woody* filament in form of an elongated cone, which is the production of the *wood* of a former year, and a *woody* bed for it, which is also of a conic shape, and which surrounds the first filament, and reaches beyond it in length; and this is the production of the second year. The third bed forms itself altogether like the second, and all the succeeding ones are formed by the same law, and in the same order, and envelope one another in a continued succession or series, so that a large tree is composed of a number of *woody* cones, which enfold, cover, and envelope one another, as the tree increases in thickness.

When the tree comes to be cut down, one easily counts, in a transverse section of the trunk, the number of these cones, the sections of which make so many concentric circles; and the age of the tree is known by the number

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ber of these circles, for they are distinctly separate from one another; in a vigorous and well-grown oak, these lines are each of a sixth of an inch or more in thickness, and the substance of these lines or circles is very hard and firm, but the substance of the *wood*, which lies between, and unites these to each other, is much less so. This intermediate matter is always the weak part of the *wood*, and its structure and organization are perfectly different from that of the *woody* cones, and depend entirely on the manner in which those cones are united to one another. This is thus explained:

The vessels which are longitudinally disposed in the *wood*, and convey the nourishment to the button, not only are extended and hardened by the action of the sap in motion, and by the firm particles it deposits; but they are ever attempting also an extension of another kind; they are ramified all along as they go, and break into numberless extremely minute filaments, which issue from them like so many branches; these, on the one part, are destined to the production of the bark of the tree; and on the other, are connected to the *wood* of the preceding year, and form between the two *woody* beds a sort of spongy reticular work, which, when cut transversely, even to a great thickness, shews numberless little cavities and holes, resembling a sort of lace-work. The *woody* beds are therefore united to one another by a sort of net-work; this net-work, however, does not occupy nearly the space of the *woody* circles which it separated, and is usually indeed but about a sixth part of their thickness. This thickness is much the same in all the trees of the same species, whereas the *woody* beds vary in them very considerably in thickness; in the oak they are found from a sixth to a four-and-twentieth part of an inch in thickness.

By this exposition of the texture of *wood*, it is easy to discover that the longitudinal coherence of the particles of it must needs be vastly greater than the transverse: one sees also that, in little pieces of *wood*, as in a bar of an inch thickness, if there are fourteen or fifteen of these *woody* beds, there will also be thirteen or fourteen of these intermediate spaces; and consequently it will be much weaker than if there were but five or six of these *woody* beds in it, and consequently but four or five of these intermediate spaces.

It may also be observed, that in those little bars of *wood* there are two or three of the *woody* beds wounded, which is often the case; the strength of the bar must be thence greatly impaired: but the greatest fault these small pieces of *wood* are subject to, is the different disposition of these beds in the different parts of the same tree; and this difference is so great, that the force or strength of a large beam of any *wood*, cannot be computed by proportion, from that of a small piece of the same *wood*; which, were it possible, would make calculations of this kind extremely easy. The ingenious author of this paper has from hence calculated the force and strength of timber used in building. See TIMBER.

All kinds of *wood* are to be preserved from the worm, and from many other occasions of decay, by oily substances, particularly the essential oils of vegetables. Oil of spike is excellent, and oil of juniper, turpentine, or any other of this kind, will serve the purpose; these will preserve tables, instruments, &c. from being eaten to pieces by these vermin, and linseed-oil will serve in many cases, to the same purpose; probably nut-oil will do also, and this is a sweeter oil, and a better varnish for *wood*.

The ingenious Dr. Hales, whose attention was uniformly directed to schemes of domestic or national benefit, was induced by the great damage done to shipping by worms to propose various methods for preventing it. Oily, unctuous materials, he apprehends, are not likely to penetrate deep into oak, which has a watery sap; but oil is known to penetrate far into fir, and to give it a very considerable degree of toughness. He therefore proposes to mix with oil applied to the fir-boards with which ships are sheathed some ingredient that is disagreeable to the worms; and he apprehends that a small proportion of verdigrise used in the operation of paying would be of great service: or if copper-filings were mixed with the paying, sea-water would turn them into verdigrise. It might be useful to soak planks in water strongly impregnated with verdigrise.

Mr. Reid recommends the trial of the acid juice of tar, prepared either with copperas or oker, for preserving ships either from rotting or worms.

In the East Indies it is said they have an effectual way of preventing worms from destroying their ships, by paying them first with a mixture of mustard oil and lime of shells, and hog's blood: they then sheath the ship, and renew it after some years.

The following receipt has been recommended by a person, who never knew it fail of success. Take 100*lb.* of the finest pitch; melt it over a slow fire of coal, and add to it, when melted, 30*lb.* of roll brimstone grossly bruised, and boil the whole till 30*lb.* are wasted. The matter thus prepared must be kept in casks in a dry place; and when it is to be used, melt 100*lb.* of it, and add gradually 35*lb.* of brick-dust or marble-dust sifted, and well heated. The composition, when used, must be very hot, and the boards dry.

An ingenious ship builder observes, that turpentine and brimstone form the best composition he has met with, and comes home from a voyage with least damage.

East India ships are first sheathed, and that SHEATHING is filled with small broad-headed nails, which is a safe and effectual defence from the worms, and soon becomes a continued cake of rust, and not liable to be damaged by cables or common accidents. See PAY, and SHIPS.

The following, says Dr. Hales, is an approved method of preserving the boards and timber of out-door work: viz. melt 6*lb.* of pitch, and add, by sifting, 1*lb.* of dried brown Spanish or whiting, and a quart of linseed oil. Hales's Ventilators, part i. p. 164. part ii. p. 289, &c.

Dr. Lewis observes that, though tar has been used for preserving *wood*, and also for coating common tiles, in imitation of the black glazed tiles, which are sold at a much higher price, both tar and pitch are of themselves too soft for these intentions, being liable to be melted off by the summer heat: and, therefore, different powdery substances, as ashes, ochres, and other mineral pigments, have been mixed with them.

In the Swedish Transactions for 1742 and 1740, two compositions are recommended, which are said to be firm, durable, and glossy. One is prepared by melting the tar over a gentle fire, so as to make it fluid but not to boil, and stirring in as much coal-dust or powdered charcoal as will render it thick: the other is prepared by mixing the melted tar with a sufficient quantity of lamp-black. Coatings formed of these mixtures are, however, liable to be considerably softened by the heat of the sun. The mixture of powdered pit-coal and melted tar, made of such a consistence as to be freely spread while warm with a brush, is less liable to soften than either of the other two.

Dr. Lewis observes, that the coating or painting of *wood* does not in all cases contribute to its preservation: unless the *wood* be very thoroughly dry, especially those kinds of *wood* whose juices are not oily or resinous, the painting, by confining the watery sap, hastens the corruption. Com. Phil. Techn. p. 363, &c. See *Preserving of* TIMBER.

Some of the West Indian trees afford a sort of timber which, if it would answer in point of size, would have great advantages over any of the European *wood*, in ship-building for the merchant-service, no worm ever touching this timber. The acajou, or tree which produces the cashew-nut, is of this kind; and there is a tree of Jamaica, known by the name of the *white-wood*, which has exactly the same property, and so have many other of their trees. Phil. Trans. N° 36.

To season *wood* expeditiously for sea-service, it has been usual to bake it in ovens.

The art of moulding *wood* is mentioned by Mr. Boyle as a desideratum in the art of carving. He says he had been credibly informed of its having been practised at the Hague; and suspects that it might have been performed by some menstruum that softens the *wood*, and afterwards allows it to harden again, in the manner that tortoise-shell is moulded. Or, perhaps, by reducing the *wood* into a powder, and then uniting it into a mass with strong but thin glue. And he adds, that, having mixed saw-dust with a fine glue made of isinglass, slightly straining out what was superfluous through a piece of linen, the remainder formed into a ball and dried, became so hard as to rebound when thrown against the floor. Works abr. vol. i. p. 130. See GLUE.

The people who work much in *wood*, and that about small works, find a very surprising difference in it, according to the different seasons at which the tree was cut down, and that not regularly the same in regard to all species, but different in regard to each. The button-mould-makers find that the *wood* of the pear-tree, cut in summer, works toughest; holly, on the contrary, works toughest when cut in winter; box is mellowest when it has been cut in summer, but hardest when cut about Easter; hawthorn works mellow when cut about October, and the service is always tough if cut in summer. Merret's Notes on Neri, p. 263.

It is a very well known quality of metals, to be longer and larger when hot, and shorter and smaller when cold: a thousand experiments prove this, and the books of experimental philosophy have sufficiently expatiated upon it; on the contrary, it is found to be the property of *wood*, that it is longest in cold weather and shortest in hot;

hot; this change is owing to the remains of the fap yet in the *wood*, which being condenfed by cold, is enlarged in its furface, as all liquors are, when frozen into ice; and fhrinks into a lefs fpace or bulk again, when liquated by heat.

It follows from this, that all *wood* muft change its furface more or lefs, according as it contains more or lefs fap, and this may be made a teft of great ufe for the determining what kinds of *wood* have moft, and what leaft fap. This would be a very valuable piece of knowledge, fince there are many ufes for which that fort of *wood* muft always ferve beft, which has the fmalleft quantity of fap remaining in it. See HYGROSCOPE.

Thus, in the great article of preferving of FLOUR, no barrels are at prefent ufed, but thofe of feafoned dry oak; the whole advantage of this *wood* is, that it contains lefs fap than others; for the fap in the *wood* makes the flour damp, and it then becomes rancid, and breeds worms. See MEAL. So that if any other *wood* can by this means be found out to contain lefs fap, when dried in the common way, than oak does, it will be fo much the better for this purpofe; or if a cheaper *wood* fhould be found only to contain as little fap as the oak, it would do as well, and the price of oak would be faved in thefe veffels.

A proper way of trying when the fap was fufficiently exhaled out of trees, might alfo be found by this experiment, and much benefit would accrue from it; for our fhips, when made of timber not fufficiently dried, prove injurious to the health of people on board; and it has been remarked, both by the French and ourfelves, that many more men in general die in the firft voyage of a new fhip, than in the fame time in an old one; and indeed the firft fix months are ufually obferved in this cafe to be moft fatal. The exhalation of the fap from the *wood* of the veffel is certainly the occafion of this, and if it could be contrived to have this fap properly exhaled before the timber was ufed, it would not only prevent this mortality among the men, but the veffel itfelf would be the founder, and the better for it. Deflandes, Trait. de Phyf.

Woods are diftinguifhed into divers kinds, with regard to their natures, properties, virtues, and ufes. Of *wood*, confidered according to its qualities, whether ufeful, curious, medicinal, &c. the principal is that called TIMBER, ufed in building houfes, laying floors, roofs, machines, &c.

Woods valued on account of their curiofity, are *cedar*, *ebony*, *mahogany*, *walnut-tree*, *box*, *calambo*, &c. which, by reafon of their extraordinary hardnefs, agreeable fmell, or beautiful polifh or grain, are made into cabinets, tables, combs, beads, &c.

The *medicinal woods* are, *guaiac*, which the Spaniards call *ligno fancto*; *aloes*, or *agallochum*; *faffafras*, *nephriticum*, *fantal*, *logwood*, *afpalathum*, *eagle-wood*, or *pao d'aquila*, &c.

Woods ufed in dying, are the *Indian wood*, *Brazil*, *Campeche*, &c.

Wood ufed for fuel is required of various kinds, in regard to the various works to be performed by it.

Neri every where commends oak for the *wood* to be burnt in the glafs-houfes, as the propereft *wood* for making a ftrong and durable fire with a good flame.

Imperato, on the contrary, commends afh on the fame occafion; becaufe, as he fays, it gives a fubftantial, rather than a great flame: and Camerarius defervedly commends juniper *wood*, as affording a lafting, ftrong, and fweet fire, could plenty of it be had. Among the ancients, Pliny commends light dry *wood*; and Plutarch, the tamarifk in particular, for making the glafs-houfe fires; but glafs-making requires fo great a fire, as cannot be eafily made from fuch *wood*. Nor can afh be proper, becaufe, though it gives a good fire, it foon decays. Merret's Notes on Neri, p. 275.

WOOD, *cord*, denotes *wood* for the fire, generally the branches or loppings of trees, piled up in order. See CORD.

WOOD, *foffil*, *fubterraneous*. There are divers places where *wood* is found under ground: fuppofed to have been overturned, and buried there from the time of the deluge, or at fome other period.

Whole trees, or parts of them, are very frequently found buried in the earth, and that in different ftrata; fometimes in ftone, but more ufually in earth; and fometimes in fmall pieces loofe among gravel. Thefe, according to the time they have lain in the earth, or the matter they have lain among and in the way of, are found differently altered from their original ftate; fome of them having fuffered very little change, and others being fo highly impregnated with cryftalline, fparry, pyritical, or other extraneous matter, as to appear mere maffes of ftone or lumps of the common matter of the pyrites, &c. of the dimenfions, and more or lefs of the internal figure of the vegetable bodies into the pores of which they have made their way.

The *foffil wood*, which we find at this day, may, according to thefe differences, be arranged into three kinds: 1. The lefs altered. 2. The pyritical. And, 3. The petrified.

Of the trees or parts of them lefs altered from their original ftate, the greateft ftore is found in digging to fmall depths in bogs, and among what is called peat or turf-earth, a fubftance ufed in many parts of the kingdom for fuel. In fome places there are whole trees fcarcely altered except in colour; the oaks in particular being ufually turned to a jetty black: the pines and firs remain as inflammable as ever, and often contain between the bark and *wood* a plain refin. Parts of trees have been alfo found unaltered in the ftrata of clay and loam, among gravel, and fometimes even in folid ftone. See *Foffil* PLANTS, and *Bog* WOOD.

It is idle to imagine, that thefe have been thus buried either at the creation, or, as many are fond of believing, at the univerfal deluge: at the firft of thefe times the ftrata muft have been formed before trees were yet in being, and the peat *wood* is fo far from being of antediluvian date, that much of it is well known to have been growing within thefe three hundred years, in the very places where it is now found buried. See MORASS.

The fubftances that are more altered are the larger and longer branches of trees found bedded in the ftrata of ftone, and partly affuming its nature; and the fhorter and fmaller branches found in pits of blue clay, which externally bear the refemblance of what they once were, but, having their pores filled with the matter of the common vitriolic pyrites, internally appear to be maffes of that matter.

The irregular maffes or fragments of *wood* are principally of oak, and moft ufually found among gravel, but varioufly altered by the infinuation of cryftalline and ftrong particles. Thefe make a beautiful figure when cut and polifhed, as they commonly keep the regular grain of the *wood*, and fhew the feveral circles which mark the different year's growth. Thefe, according to the different matter which has filled their pores, affume various colours, and the appearance of the various foffils that have impregnated them. Of thefe fome pieces have been found with every pore filled with pure pellucid cryftal, and others in large maffes, part of which is wholly petrified, and fome mere ftone, while the reft is crumbly and unaltered *wood*.

All thefe pieces of *petrified wood* are ufually capable of a high and elegant polifh. Hill's Hiftory of Foffils, p. 638, &c.

Wood has been found in falt-mines, inclofed in a mafs of hard falt, and its pores filled with the matter of the falt in which it lay. *Wood* has likewife been found converted as it were into iron, or thoroughly impregnated with the particles of this metal. Act. Erud. ann. 1710.

WOOD, *petrified*: the opinions of the judicious part of the world have been very different in regard to the bodies preferved in the cabinets of the curious, under the name of *petrified wood*; fome affirming thefe bodies to have been only pebbles, or flints accidentally formed in this fhape, and with veins refembling thofe of *wood*; and others affirming, with equal warmth, that they have been really *wood*, into which ftony matter has been brought by water.

Many fubftances, it is certain, have been preferved in the cabinets of collectors, under the title of petrified *wood*, which have very little right to that name. But where the whole outer figure of the *wood*, the exact lineaments of the bark, or the fibrofe and fiftular texture of the ftriæ, and the veftiges of the utriculi and tracheæ or air-veffels are yet remaining, and the feveral circles yet vifible, which denoted the feveral years growth of the tree, none can deny fuch fubftances to be real *foffil wood*.

Many good arguments have been produced on both fides the queftion, but Mr. De la Hire has attempted to bring the difpute to a certain conclufion, by means of fome peculiarly happy fpecimens, which were of the palm-tree petrified, found in the defarts of Africa: thefe on comparing them with pieces of the palm-tree cut out of the recent *wood*, appeared to have every where the beautiful and regular veins of that *wood*, and left no room to doubt, but that they certainly had been once the vegetating *wood* of that tree, though now converted into hard ftone; the petrified pieces were perfect ftone, in all its qualities; they had its hardnefs, its found when ftruck upon, and were, as many other ftones are, opake in fome places, and tranfparent in others; they were found on weighing them to be often of the fpecific gravity of recent pieces of the palm *wood*, of the fame dimenfions.

Father Duchat alſo, an author of unqueſtioned credit, affirms from his own perſonal knowledge, that in the kingdom of Ava there is a river, whoſe waters petrify recent *wood* into flint; and that he has often ſeen trees ſtanding in it, whoſe bottom part, ſo far as covered with the water, has been true flint, while all above was mere dry *wood*, and fit for firing. Mem. Acad. Par. 1692.

Wood, *ſhining*. There are a great many things in which a piece of rotten *wood* that ſhines in the dark, agrees with a burning coal; and there are alſo many things, in which they differ. They agree in theſe particulars: 1. They have light reſiding in them, and are not like bodies which are only luminous according to the quantity of light which falls upon them from other bodies, and which they reflect. 2. Both ſhining *wood* and burning coals require the preſence of the air to keep them ſhining, and both require alſo an air of a conſiderable denſity; and both having been deprived of their ſhining quality by the pumping out of the air, will recover it again on the admitting of freſh air to them. 3. Both of them will eaſily be quenched by putting them into water, and many other liquors. And, 4. As a live-coal will not be extinguiſhed by any coldneſs of the air, neither will the *ſhining wood* be deprived of its light on any additional coldneſs in that element.

However, they differ in the following particulars: 1. A burning coal is eaſily put out by compreſſion, the treading on it and ſqueezing it together readily diveſting it of its light; on the other hand, compreſſion or cruſhing of any kind ſeems not to have any effect upon the *ſhining wood*; its bruiſed parts ſhining as brightly as its entire ones. If a piece of this *ſhining wood* be ſqueezed between two glaſſes, this experiment will be moſt fairly tried; and in this caſe, though the contexture of the whole be evidently broken, and the parts ſeparated, the light is as ſtrong in them as while the piece was entire. 2. A burning coal extinguiſhed by the drawing out of the air, will, after a few minutes, be irrecoverable, on the admiſſion of air in any manner; but, on the contrary, the *ſhining wood*, when thus extinguiſhed and kept extinct for half an hour, will be immediately re-kindled on admitting the air to it. 3. A live coal, included in a ſmall glaſs, will continue ſhining but a few minutes; but a piece of *ſhining wood*, in the ſame circumſtances, will continue bright for ſeveral days. 4. The coal, while it burns, ſends forth ſmoke and other exhalations; the rotten *wood* ſends out none, and conſequently a coal all the while that it is ſhining waſtes itſelf at a great rate; but the rotten *wood* does not waſte itſelf at all. And, finally, the burning coal is actually and vehemently hot; the rotten *wood*, though it ſhines, is not ſo much as warm. Phil. Tranſ. Nº 32.

The light of ſhining fleſh and fiſh, when putrefied, is wholly of the ſame nature with that of rotten *wood*, as to its dependance on the air for its ſplendor; and in the ſame manner loſes its light in the exhauſted receiver, and regains it on the admiſſion of the air into it again, in the ſame ſudden manner. Phil. Tranſ. Nº 31. See Light, and Putrefaction.

Wood, *bog*, or *ſubterraneous*, a name given by the inhabitants of many parts of this kingdom to ſuch *wood* as is found buried in the earth in boggy places, and which is found hard and ſtrong at this time. See *Foſſil* Wood, *ſupra*.

We have in the Philoſophical Tranſactions (Nº 275. p. 983, &c.), an account of vaſt quantities of this ſort of *wood* found under ground in Hatfield Chace. Many of the roots and bodies of trees are found there; which are of all growths, and are moſtly ſuch trees as are the growth of our own ſoil, ſuch as oaks, firs, birch, beech, yew, holly, willow, aſh, and the like. The roots of all theſe trees ſtand in their natural poſitions as when growing, and ſtand as thick together as they could grow in a foreſt. The bodies are uſually broken off, and laid all along juſt by them.

The large trees are uſually found fallen in a north-eaſt direction, and the ſmaller ones lying all ways; the fir-tree or pitch-tree is more common than any other kind, and is found ſometimes of twenty, thirty, and thirty-five yards long, and ſo ſound and firm that many of them have been ſold to make maſts for ſhips. Oaks have been found of the ſame length, though wanting ſome yards of their natural tops; theſe have been ſold at ten or fifteen pounds a-piece, and are as black as ebony, and very ſound and laſting in whatever ſervice they are put to. The aſh-trees do not preſerve their firmneſs in this manner, many of them are ſo ſoft that the workman's ſpade cuts through them; and when expoſed to the air, they uſually fall to pieces; but the willows, though a much ſofter *wood* than the aſhes, preſerve their texture, and are found very ſtrong and firm. In ſome of the fir-trees it is very obſervable, that they have ſhot out ſide-branches after they were fallen, which have grown into large trees. Many of theſe foſſil trees appear plainly to have been burnt; the fir-trees are particularly very common in this ſtate; and of theſe ſome are burnt quite through, others only on one ſide. Some of theſe alſo have been found with the plain marks of human work upon them; many with their branches chopt off, and their trunks cut into two or three pieces. Some ſquared and others in part cleft, and the *wooden* wedges uſed in cleaving them are ſtill found remaining in the cracks. Stones are found in ſome of them in the place of *wooden* wedges, but in none iron ones. The heads of axes are alſo ſometimes found; they are of a ſtrange form, and ſomewhat repreſent the ſacrificing axes of the ancients. Theſe are found at ſuch depths, that it is impoſſible they ſhould have ever been lodged there ſince the time of this place's being a foreſt; nor ever could have been found, but by means of the ground's being drained by a late invention. The general opinion as to theſe trees is, that they were buried in this manner at the time of the univerſal deluge; but they are plainly of later origin, as foſſils, the coins of ſome of the Roman emperors having been found buried under them.

The earth of bogs is not the only ſoil that preſerves theſe trees; for in the low parts of Lincolnſhire between the towns of Burningham and Brumley, there are ſeveral large hills compoſed only of looſe ſand, and as this blows away there are continually diſcovered whole trees, or parts of trees, and particularly the roots and ſtumps of firs, and ſome other kinds, all with the marks of the axe upon them, and looking as freſh as if done but yeſterday. Under theſe hills and in the bogs before mentioned, not only the *wood* of the fir-tree, but its cones are found in immenſe number; many buſhels being often laid in a heap together. In cutting a drain for a river of a conſiderable depth, there were found at the very bottom ſeveral parcels of cut *wood*, in poles, beams, and the like; the head of an axe was alſo found ſomewhat reſembling the ancient battle-axe, and a coin of the Roman emperor Veſpaſian; but what was yet more remarkable, was, that what they were now ſunk to ſeemed to be the original ſurface, the ground not being looſe, like all above it, but ſound and firm, and lying in ridges and furrows, with the evident marks of having formerly been ploughed. So that all the bog-earth above ſeems plainly to have been added ſince; and that the foſſil *wood*, ſuppoſed of antediluvian origin, is but of the time of the ancient Romans, or leſs than that.

All the bogs in this kingdom afford in like manner foſſil trees; and not only thoſe, but other places, have at all times accidentally diſcovered them. Giraldus Cambrenſis tells us, that ſo long ſince as in king Henry the Second's time, the ſands on the ſhores of Pembrokeſhire were driven off by peculiar ſtorms and tempeſts, and that deep under thoſe ſands there were then diſcovered great numbers of the roots and bodies of trees in their natural poſtures; and many of theſe had the ſtrokes of the axe upon them, the marks at that time remaining as plain as when firſt made. Some of theſe reſembled ebony; and many other ſuch trees were diſcovered at Neugall in the ſame county, in the year 1590. Camden tells us of ſuch *wood* found in the bogs in Somerſetſhire, Cheſhire, Lancaſhire, Weſtmoreland, Yorkſhire, Staffordſhire, and Lincolnſhire; and ſince his time, many other counties have been found to be as fruitful in it. Dr. Plot mentions them in many parts of his Hiſtory of Staffordſhire, and by their ſtanding in their natural poſtures, as to the roots at leaſt, properly concludes, that they certainly once grew there, and were not brought from elſewhere.

Dr. Leigh, in his Hiſtory of Lancaſhire, gives an account of the ſame ſort of trees found in the draining of the boggy lands at Martin-Meer; and determines them not to have been of the ancient date many pretend, in referring them to the deluge.

He obſerves, that they are plainly of no older date than the time of the ſavage inhabitants of England, about the time of the Roman conqueſts; for in this place, beſide the roots and bodies of trees and their fruit, there were found eight canoes, or ſmall boats, ſuch as the wild inhabitants uſed at that time. And in another moor in the ſame county, a braſs kettle, with a ſmall mill-ſtone, and ſome beads of wrought amber. In the ſame place were alſo found ſeveral human bodies whole and entire, at leaſt to outward appearance, and the whole head of an hippopotamus or river-horſe. This is perhaps the hardeſt thing to be accounted for of the whole ſet, as to its coming there. The boggy places in Angleſea, and the iſle of Man, are all full of buried trees of the ſame kind; and the bogs of Ireland abound no leſs with them. England, and its adjacent iſlands, are not the only places where this buried *wood* is found; for Verſtegan tells us, that

that the moors in the Netherlands abound with them; they all lie north-eaſt as ours do. Helmont alſo mentions the Peel there, a moraſs of eight or nine miles broad, which is full of them. The French naturaliſts tell us of foſſil-trees alſo, in their country; and in Switzerland and Savoy; but all in the low grounds.

Ramazzini tells us, that in the territories of Modena, which are now a dry and fruitful country, yet in the time of the Cæſars were only a great lake, there are found at the depth of thirty, forty, and even fifty feet, the ſoil of a low marſhy country, with ſedges, water-graſs, and other marſh-weeds; and under this there lie the trunks of trees, and their roots ſtand near them in a natural poſture as when growing. Many old coins of the Roman emperors are alſo found there; as alſo ſeveral buſts, wrought marble, and ſquared ſtones, evidently ſhewing the work of ſuch tools as the Romans have been known to uſe. Some of the trees in theſe places ſtand upright. See more on this ſubject under the article Morass.

Wood, *cutting in*. See Cutting.

Wood, *meaſure of*. See Measure.

Wood, *painting on*. See Painting.

Wood, *ſculpture in*. See Sculpture.

Wood, *ſtack of*. See Stack.

Wood, *ſtaining of*. See Dying *of Wood*, &c.

Wood may be ſtained yellow, by bruſhing it over ſeveral times with the tincture of turmeric root, made by putting an ounce of the powdered root to a pint of ſpirit, and after it has ſtood ſome days, ſtraining off the tincture. A redder caſt may be given to the colour by adding a little dragon's blood. A cheaper, and leſs bright and ſtrong yellow may be given to *wood* by rubbing it over ſeveral times with the tincture of French berries, made boiling hot; and when the *wood* is dry, bruſhing it over with a weak alum-water uſed cold.

In order to render theſe ſtains more beautiful and durable, the *wood* ſhould be ruſhed after it is coloured, and then varniſhed with the ſeed-lac varniſh, or with three or four coats of ſhell-lac varniſh.

For a bright red ſtain for *wood*, make a ſtrong infuſion of Braſil in ſtale urine, or water impregnated with pearl-aſhes in the proportion of an ounce to a gallon; to a gallon of either of which add a pound of the *Braſil wood*. With this infuſion, after it has ſtood, with frequent ſtirring, two or three days, ſtrained and made boiling hot, bruſh the *wood* over till it appears ſtrongly coloured; and while it is wet, bruſh it over with alum-water made in the proportion of two ounces of alum to a quart of water.

For a leſs bright red, bruſh over the *wood* with a tincture made by diſſolving an ounce of dragon's blood in a pint of ſpirit of wine.

For a pink or roſe red, add to a gallon of the above infuſion of *Braſil wood* two ounces of pearl-aſhes, and uſe it as before: obſerving to bruſh the *wood* over often with the alum-water. Theſe reds may be varniſhed as the yellows.

Wood may be ſtained blue by means either of copper or indigo. The brighter blue may be obtained by bruſhing a ſolution of copper (ſee Verditer) while hot ſeveral times over the *wood*: and then bruſhing a ſolution of pearl-aſhes in the proportion of two ounces to a pint of water hot over the *wood*. It is ſtained blue with indigo, by bruſhing it with the indigo prepared with ſoap-lees as when uſed by the dyers, boiling hot: and then with a ſolution of white tartar or cream of tartar, made by boiling three ounces of either in a quart of water, bruſhing over the *wood* plentifully before the tincture of indigo be quite dry. Theſe blues may be ruſhed and varniſhed as the reds, if neceſſary.

Wood may be ſtained green by diſſolving verdigriſe in vinegar, or the cryſtals of verdigriſe in water, and with the hot ſolution bruſhing over the *wood* till it be duly ſtained.

A light red brown mahogany colour may be given to *wood* by means of a decoction of madder and fuſtic *wood*, ground in water, in the proportion of half a pound of madder and a quarter of a pound of fuſtic to a gallon, or inſtead of the fuſtic, an ounce of the yellow berries may be uſed. Bruſh over the *wood* with this ſolution, while boiling hot, till the due colour be obtained. The ſame effect may to a conſiderable degree be produced by the tincture of dragon's blood and turmeric root, in ſpirit of wine.

For the dark mahogany, take the infuſion of madder as above, and ſubſtitute for the fuſtic two ounces of logwood: and when the *wood* has been bruſhed over ſeveral times, and is dry, bruſh it over ſlightly with water in which pearl-aſhes have been diſſolved, in the proportion of about a quarter of an ounce to a quart. The *wood*, in the better kind of work, ſhould be afterwards varniſhed with three or four coats of ſeed-lac varniſh; but for coarſe work, with the varniſh of reſin and ſeed-lac, or they may be well rubbed over with drying oil.

Wood may be ſtained purple by bruſhing it over ſeveral times with a ſtrong decoction of logwood and Braſil, made in the proportion of one pound of the logwood and a quarter of a pound of the Braſil, to a gallon of water, and boiled for one hour or more. Let the *wood*, well coloured, dry, and be then ſlightly paſſed over by a ſolution of one dram of pearl-aſhes in a quart of water. A ſolution of gold in ſpirit of ſalt or aqua regia will give a durable purple ſtain to *wood*.

For a deep black the *wood* is bruſhed over four or five times with a warm decoction of logwood, made as above without the Braſil, and afterwards as often with a decoction of galls, made by putting a quarter of a pound of powdered galls to two quarts of water, allowing it to dry thoroughly between the ſeveral applications of the liquors: thus prepared, it receives a fine deep black colour, from being waſhed over with a ſolution of vitriol in the proportion of two ounces to a quart; in the room of which ſome uſe a ſolution of iron in vinegar, keeping the vinegar for this purpoſe upon a quantity of the filings of the metal, and pouring off a little as it is wanted. A pretty good black is alſo obtained, more expeditiouſly, by bruſhing over the *wood* firſt with the logwood liquor, and afterwards with common ink.

A very fine black may be produced by bruſhing the *wood* ſeveral times over with a ſolution of copper in aqua fortis, and afterwards with the decoction of logwood, repeated till the colour be of ſufficient force, and the greenneſs produced by the copper overcome. Theſe blacks may be varniſhed as the other colours.

Where the ſtains are deſired to be very ſtrong, as in the caſe of *wood* uſed for fineering, it is generally neceſſary it ſhould be ſoaked, and not bruſhed; for which purpoſe the *wood* may be cut into pieces of a proper thickneſs for inlaying. Lewis's Phil. Com. Techn. p. 97. 434. Handmaid to the Arts, vol. i. p. 508, &c.

Wood, *ſtealing of*. See Larceny.

Wood, *ſylva*, in *Geography*, a multitude of trees, extended over a large continued tract of land, and propagated by nature, or without culture.

Many great *woods* only conſiſt of trees of one kind. At Cape Verd in Africa, are *woods* of orange and lemon-trees; in Ceylon, are *woods* of cinnamon-trees; in the Molucca iſlands, *woods* of clove-trees; in the iſlands of Nero, Lontour, Loſgain, &c. *woods* of nutmeg-trees; in Brazil, *woods* of Brazil-trees, &c.; in Numidia, *woods* of date-trees; in Madagaſcar, *woods* of tamarind-trees, &c.

Wood, in *Gardening*. See Grove.

Wood-*coppices*. In the firſt raiſing of *coppices* two things are to be conſidered; firſt, the nature of the ſoil, that ſuch trees may be planted in it as will thrive well there; and ſecondly, the uſes that the *wood* is intended to be ſold for, that ſuch kinds may be planted as will be moſt proper for thoſe uſes.

If the principal vent for *wood* be for the fire, the beſt trees for *fire-wood* muſt be planted, ſuch as the oak, beech, hornbeam, or other hard *woods*. Theſe are the moſt profitable for ſelling as *fire-wood*, and one or more of theſe grow in any ſoil.

If there be a demand in the country where the *coppice* is to be planted for hoops and hop-poles, then the aſh, the cheſnut, the oak, alder and hazel, are to be planted.

According to the profits of the underwood, the thickneſs of the ſtandard-trees is to be regulated, for as they ſtand more or leſs thick, they more or leſs injure the underwood. It is alſo to be conſidered at what growth the underwood is to be ſold. The taller and larger the underwood of a coppice in general is, the more profitable will it be for firing, and all other uſes, and the ſtandards will be the better for its being left to grow to a proper height, for their bodies will be always, unleſs very great accidents occur, carried up ſtraight as far as they are ſhaded by the coppice-*wood*.

A deep ſoil makes the ſhrubs as well as trees grow more vigorouſly than any other, and they will be ſooner fit for cutting in ſuch places. The perſon who owns theſe *woods* muſt contrive to cut down only a certain quantity of them every year, and regulate this ſo that he may have a conſtant ſucceſſion of a like quantity; that part of the *wood*, which was firſt felled, may be grown up to its ſize for felling again by that time the laſt is cut. This is, in different places, to be calculated to all the various numbers between eight years and twenty or thirty.

The cutting of *wood* ſeldom yields the more and the better timber; but the cutting of it oftener has greater advantages, in that it makes it grow thicker, and gives the ſeedlings time to come up. If many timber-trees grow in the coppice, and are to be cut down, they and the underwood

derwood ſhould be felled together, cutting off the ſtumps as cloſe to the ground as may be, in the trees, and in the ſhrubs and underwood the ſtumps ſhould be left about half a foot high, and cut ſlanting and very ſmooth. Sawing is the beſt method of felling timber-trees; but it ſometimes kills the root; and if this is obſerved to be the caſe in the coppice, no new ſhoots ariſing from the root, then it is proper to ſtub up the root, that it may not unneceſſarily encumber the ground, that the other young plants may have the benefit of it.

In the firſt raiſing of coppices from ſeed, the ground muſt be prepared by good tillage, as much as if it were intended for corn. The ſeeds of the ſeveral trees are to be ſown in February, and if the ſoil be ſhallow, the ground ſhould be ploughed into great ridges: this will make the ſoil lie the thicker upon the top of each ridge, by which means the roots will have more depth to run to for nouriſhment, and in a few years the furrow will be filled up to the level of the reſt with the dead leaves; and theſe, as they rot at the bottom, will make a kind of ſoil, through which the young ſhoots will ſpread, and be conducted from one ridge to another, and ſo the whole ground will be occupied by them. If the coppice be to be raiſed on the ſide of a hill, plough the ridges croſs-way of the deſcent of the hill, that the water may be detained among them, and not ſuffered to run off, as it otherwiſe would, by the furrows; but if it happen that the ground be over-wet, which is more rarely the caſe, then the contrary method is to be obſerved, and the furrows ploughed deep and ſtraight downwards, that all water may be carried off by them, as by ſo many trenches or drains.

Some ſow a crop of corn along with the ſeeds of the underwood, for the advantage of the firſt year; but as the ſeaſon of ſowing the ſeeds of the trees is too late for the ſowing of the corn, it ſeldom turns to much advantage. It is better to ſow the trees alone, and keep them well weeded the two firſt years; after which they are ſtrong enough to take care of themſelves againſt ſuch enemies.

In very barren ground, where the young trees can hardly ſtand the heat in ſummer, it is proper, after ſowing them, to ſcatter a quantity of furze-ſeed over the land; the furze will grow quick, and over-top the trees at firſt, but it will ſerve as a guard to them at this time, defending them from injuries, and keeping the ground moiſt about their roots. In a few years the trees will grow up beyond theſe buſhes, and they will then ſoon deſtroy them by their dropping.

In the raiſing of coppices, the neareſt diſtance for the plantations ought to be five feet for the underwood, but as to what number, and ſcantlings of timber are to be left on each acre, the ſtatutes in this caſe direct; but it is an ordinary coppice, which will not afford three or four firſts, fourteen ſeconds, twelve thirds, and eight wavers, according to which proportion the ſizes of young trees in coppices are to ſucceed one another. In coppice or underwood felled at twenty-four years growth, there are to be left twelve ſtore-oaks upon every acre, or, in defect of them, the ſame number of elms, beech, or aſh; theſe are to be ſtraight-bodied trees, and are to be left till they are ten inches in diameter, at a yard from the ground; but it is better for the owner to have a much greater number of timber-trees, eſpecially in places where underwood is cheap; and as to the felling, it is always neceſſary to begin regularly with one ſide, that the carriages, neceſſary to the taking off the *wood*, may come on without injury to the reſt: and in large *woods*, a cart-way ſhould always be left in the middle, quite through the *wood*. The timber of the underwood may be cut from the month of October to February; but the laſt month is much the beſt, in places where there is but a ſmall quantity to be felled, and it can all be got down before the ſpring is too much advanced. All the *wood* ſhould be carried out by Midſummer, and made up by April at the lateſt; for when the rows and bruſh lie longer than this, unmade up, and unbound, many of the ſhoots and ſeedlings are ſpoiled by them. It is always worth the owner's while to incloſe the coppice well the winter before felling, to keep out the cattle, which would elſe greatly damage the ſupply from the ſeedlings and young ſhoots.

New-weaned calves are the leaſt prejudicial to newly cut *woods* of any creatures, and may be put in where there is much graſs; the next in harmleſſneſs to theſe are young colts, which, at about a year old, may be put in to feed in the ſame manner; but about May they muſt all be put out.

If the *woods* happen to be cropped by cattle, it is beſt to cut them up, and they will make new ſhoots; for that which has been bitten by the cattle, will not grow for ſeveral years in any degree.

If coppice-*woods* are too thin, this is to be remedied by laying down the longeſt and ſmalleſt ſhoots of thoſe ſhrubs or trees which are the moſt advantageous, in the place, or of ſuch as are neareſt the bare place; theſe will each ſend forth a great number of ſuckers, and the whole *wood* will be thickened as much as deſired in a very little time. Mortimer's Huſbandry, vol. ii. p. 64.

WOOD, *almiggim*. See ALMIGGIM.

WOOD *anemone*. See ANEMONE.

WOOD-*bine*, or WOOD-*bind*, in *Botany*, a ſpecies of *lonicera*. See HONEY-*ſuckle*.

WOOD-*bind*, *Spaniſh*, a ſpecies of *ipomoea*. See QUAMOCLIT.

WOOD-*chat*, in *Ornithology*, *lanius minor primus* of Aldrovand, a ſpecies of BUTCHER-*bird*, with a horn-coloured bill; the feathers at the baſe are whitiſh; above is a black line drawn acroſs the eyes, and then downwards on each ſide the neck; the head and hind part of the neck are of a bright bay; the upper part of the back duſky; the coverts of the tail grey; the ſcapulars white; the coverts of the wings duſky; the quill-feathers black, having a white ſpot at the bottom: the throat, breaſt and belly of a yellowiſh white; the legs black. In the female, the upper part of the head, neck, and body are reddiſh, ſtriated tranſverſely with brown; the lower parts of the body are of a dirty white, rayed with brown; the tail of a reddiſh brown, marked near the end with duſky, and tipt with red. Pennant.

WOOD-*cock*, *ſcolopax ruſticola* of Linnæus, called by other writers *la becaſſe*, in *Ornithology*, a well-known bird diſtinguiſhed by its ſize, which is ſomewhat ſmaller than that of the partridge, and by its colour, which is on the back a variegation of black, grey, and a reddiſh brown; on the forehead the black predominates; the quill-feathers are duſky, indented with red marks; and on the belly a pale grey, variegated with tranſverſe ſtreaks of brown. Its beak is three inches long, duſky toward the end, and reddiſh at the baſe, and the upper chap a little longer than the under: the tongue ſlender, long, ſharp, and hard at the point; the eyes large, and placed near the top of the head, that they may not be injured when the bird thruſts its bill into the ground: from the bill to the eyes is a black line; the forehead is a reddiſh aſh-colour; the chin is of a pale yellow; the tail conſiſts of twelve feathers, duſky or black on the one web, and marked with red on the other; the tips above are aſh-coloured, below white: the legs and toes are livid, the latter divided almoſt to their origin, having only a very ſmall web between the middle and interior toes.

Theſe birds, during ſummer, are inhabitants of the Alps, Norway, Sweden, Poliſh Pruſſia, the March of Brandenburg, and the northern parts of Europe; whence they emigrate, at the approach of winter, into milder climates, where the ground is open and adapted to their manner of feeding. The time of their appearance and diſappearance in Sweden coincides exactly with that of their retreat from and arrival in Great Britain. They live on worms and inſects, which they ſearch for with their long bills in ſoft ground and moiſt woods. They generally arrive here in flocks, taking advantage of the night or a miſt; they ſoon ſeparate; but before they return to their native haunts, pair. They feed and fly by night; beginning their flight in the evening, and returning the ſame way to their day-retreat.

They leave England the latter end of February, or beginning of March; though they have been known to continue here accidentally. In Caſewood, near Tunbridge, a few breed almoſt annually. During incubation they are very tame. They come over to the coaſt of Suffolk ſparingly in the firſt week of October, the greater number not arriving till the months of November and December, and always after ſun-ſet. They are determined in their flight by the wind, and arrive ſeparate and diſperſed. When the RED-*wing* appears on the coaſt in autumn, the *wood-cocks* are at hand; and when the Royſton crow is arrived, they are come. Between the 12th and 25th of March they flock towards the coaſt to be ready for their departure, having the red-wings for their harbingers in ſpring, as in autumn. If the wind be favourable, they immediately depart; but otherwiſe, they are detained in the neighbouring woods, or among the ling and furze on the coaſt: as ſoon as a fair wind ſprings up, they are ſuddenly gone.

In the ſame manner they are known to quit France, Germany, and Italy; making the northern and cold ſituations their general ſummer rendezvous. In the winter they are found as far ſouth as Smyrna and Aleppo, and alſo in Barbary; and ſome have appeared as far ſouth as Egypt, which ſeems to be the limit of their migration in that way. In Japan they are found very common. Thoſe that reſort into the countries of the Levant probably come from the deſarts of Siberia or Tartary, or the cold mountains of Armenia.

Our

Our ſpecies of *wood-cock* is unknown in North America; but they have a ſort of *wood-cock* reſembling ours in its general appearance; about half its ſize, and wanting the bars on the breaſt and belly. Pennant.

They hate flying high, and they are afraid to fly among trees, becauſe, like the hare, they ſee but very badly ſtraight before them; and it is owing to this imperfection in their ſight, that they are ſo eaſily taken in nets ſpread in their places of reſort.

The draw-net, in countries which are very *woody*, is extremely profitable in this ſport, it being no uncommon thing to take ten or a dozen *wood-cocks* at a time in it.

There is another method of taking theſe birds in high *woods*, with thoſe nets called *hays*, of the nature of the rabbit-hays, only with ſmaller meſhes. The *wood-cocks* are to be driven into theſe, and there ſhould always be at leaſt two or three of them planted together. When the ſportſman has provided himſelf with nets, he is to take five or ſix perſons into the *wood* with him. The proper *woods* for this purpoſe are thoſe of ſeven or eight years growth; and the people are to go into ſome part of them near the middle. The nets or hays are to be placed in the ſame manner as they are for taking of rabbits, but two or three joining together at the end, and hanging over ſlopewiſe that way which the *wood-cocks* are intended to be driven.

The nets being thus fixed, let the company go to the end of the *wood*, placing themſelves at about ten rods diſtance from one another; they muſt all have ſticks in their hands, and they are to move forward ſlowly towards the nets, making a noiſe by ſtriking the ſticks againſt the trees and branches, and by hallooing with their voices: in this manner they are to move up to the net; and the *wood-cocks* in that part of the *wood* will all be terrified before them, but will not take wing, but run along upon the ground, and thus be driven along like a drove of beaſts, ſo that when the company come up, they will find almoſt all of them in the net. When that part of the *wood* is thus drove, the nets are to be turned the other way, and placed ſlopewiſe in the contrary direction, and the company retiring to the other end of the *wood*, are to drive the *wood-cocks* that are in that part with the ſame noiſe, till they have ſent them into the nets in the ſame manner.

Thus all the *wood-cocks* in the *wood* may be taken with very little trouble, and this may be done equally at any time of the day.

Another way of taking this bird is by means of NOOZES or SPRINGES.

The *wood-cock* and the ſnipe are both eaſily taken with bird-lime, when their places of reſort are known, but they are not ſo eaſily found as many other birds.

The cuſtom of the *wood-cock* is uſually to be upon the banks under hedges, and by the ſides of ditches toward the ſun; and they will ſuffer the ſportſman to come nearer them in the day-time after a moon-ſhiny night, than after a dark one. The reaſon of which is, that having fed well by moon-light, they are only fit for reſt the day following; but when the night has been dark, they are ſeeking food all day long.

The ſnipes naturally lie by the ſides of rivers, when the plaſhes and ponds are frozen, and they always lie with their heads up or down the ſtream, never tranſverſely.

In order to take either of theſe birds by bird-lime, the ſportſman muſt be provided with a large number of ſmall and ſmooth twigs, neatly and evenly covered with good bird-lime. Theſe muſt be placed ſloping, ſome one way, ſome another, and the whole place about where they reſort muſt be covered with them. The ſportſman then muſt conceal himſelf very carefully, that the ſight of him may not frighten away the game. See COCK-*Road*.

WOOD-*cock-ſhell*, a name given by the Engliſh naturaliſts to a peculiar kind of the purpura. It is called in French, *becaſſe*, from the length of its beak. There are two ſpecies of this, a prickly and a ſmooth one.

The prickly kind is an extremely beautiful and elegant ſhell. It is of a yellowiſh colour; and its tail or beak (for the hinder extremity of the ſhell, which runs out into an immoderate length, is ſometimes called by the one, ſometimes by the other of theſe names) is furniſhed with four rows of large and very long ſpines: between the rows of theſe, there are alſo rows of ſmall and ſhort ſpines. The body of the ſhell is furrowed very deep, with a number of tranſverſe circular lines; and both this and the clavicle are beſet with ſeveral rows of long ſpines.

The ſmooth *becaſſe*, or *wood-cock-ſhell*, is a very elegant ſpecies, but much leſs ſo than the other. It is of a yellowiſh colour, radiated with black and grey lines. It is all over deeply furrowed, and the ridges are beſet with tubercles, the clavicle is elevated, and the tail extremely long, and hollowed into a ſort of tube. The mouth of this, as well as of the other, is ſmall and roundiſh, and in this ſpecies is of a light fleſh-colour.

WOOD *and wood*, in the *Sea-Language*, is when two pieces of timber are ſo let into each other, that the *wood* of the one joins cloſe to the other.

WOOD-*corn* is a certain quantity of oats, or other grain, anciently given by cuſtomary tenants to their lord, for the liberty to pick up dead or broken *wood*.

WOOD-*geld*, WOODGELDUM, in our ancient cuſtoms, the gathering or cutting of *wood* within the foreſt. Or it may denote the money paid for the ſame, to the foreſters. Sometimes it alſo ſeems to ſignify an immunity from this payment, by the king's grant. Crompton ſays expreſly, it ſignifies to be free from the payment of money for taking of *wood* in a foreſt. See GELD.

WOOD-*hay*, an ancient cuſtom at Exeter; whereby a log out of every ſeam of *wood* brought over Ex-bridge, is taken towards the reparation of that bridge. Antiq. of Exeter.

WOOD-*land*, in *Agriculture*, a term uſed by the farmers of many counties of England, for a ſort of ſoil, from its conſtant humidity and dark colour, reſembling the ſoil in *woods*, which, of whatever nature it originally is, will always be made to appear thus from the continual dropping of trees, and the want of a free air and ſun, together with the fall of leaves, deſtroyed and waſhed to pieces by the wet.

This ſoil in the open countries has a conſiderable quantity of clay in it, and holds the water a long time that once falls upon it: in wet weather it ſticks firmly to the plough-ſhare, and in dry is very apt to crack. In uncultivated places it uſually produces ruſhes and ruſh-graſs. A moiſt and dripping year is extremely detrimental to this ſort of land. Moreton's North. p. 38.

WOOD-*lark*, in *Ornithology*. See *Wood*-LARK.

WOOD *of life*, in *Botany*. See GUAIACUM.

WOOD-*louſe*. See MILLEPEDES.

WOOD-*mell*, a coarſe, hairy kind of ſtuff, made of Iceland-wool, with which the ſhip-carpenters, in ſome of his majeſty's yards, line the ports of ſhips of war.

WOOD-*mite*, in *Natural Hiſtory*, the name of a little animal frequently made the ſubject of microſcopical obſervations, and by ſome called the *wood-louſe*; though that leſs properly, as there is another larger animal generally known by that name.

The *wood-mite* is in ſhape and colour very like a louſe, and is frequently found running very nimbly, but always by ſtarts and jumps, on old books and rotten *wood*. The eyes of this creature are of a fine gold colour, and can be thruſt out or drawn in at pleaſure; and when examined by the microſcope the periſtaltic motion of the guts is ſeen very diſtinctly, and beautifully; and what is more wonderful, there is obſerved a very diſtinct and regular motion in the brain.

This probably is the ſame animal with the pediculus pulſaturius, deſcribed by Dr. Derham, as one of the DEATH-*watches*. Baker's Microſcope, p. 185.

WOOD-*men*, certain foreſt-officers appointed to take care of the king's *woods*.

WOOD-*mote*, the ancient name of that foreſt-court, now called *the* COURT *of* ATTACHMENT.

WOOD-*pecker*, in *Ornithology*, the Engliſh name of ſome ſpecies of PICUS.

The *green wood-pecker*, *picus viridis* of Linnæus, called alſo the RAIN-*fowl* and PLUVIALIS *avis*, weighs about ſix ounces and a half, is thirteen inches long, and twenty and a half broad; the bill is duſky, triangular, and near two inches long; the crown of the head is crimſon, ſpotted with black; the eyes are ſurrounded with black, beneath which the males have a crimſon mark; the back, neck, and leſſer coverts of the wings are green; the rump of a pale yellow; the greater quill-feathers are duſky, ſpotted on each ſide with white; the tail conſiſts of ten ſtiff feathers with black tips, and barred alternately with duſky and deep green; the whole hinder part of the body is of a very pale green; the thigh and vent are marked with duſky lines; the legs and feet all of a cinereous green.

The *greater-ſpotted wood-pecker*, *picus major* of Linnæus, called alſo *witwall*, weighs two ounces three-fourths, is nine inches long and ſixteen broad; the bill is one inch and a quarter long, of a black horn colour; the irides are red; the forehead is of a pale buff colour; the crown of the head is of a gloſſy black; the hind part marked with a rich deep crimſon ſpot; the cheeks white, bounded beneath by a black bar paſſing from the corner of the mouth, and ſurrounding the hind part of the head; the neck is encircled with a black colour; the throat and breaſt are of a yellowiſh white; the vent feathers of a light crimſon; the back, rump, and coverts of the tail, and leſſer coverts of the wings are black; the ſcapular feathers and coverts, adjoining to them, are white; the quill-feathers black, elegantly marked on each web

web with round white ſpots: the four middle feathers of the tail are black; the next tipt with yellow; the bottom of the two outmoſt black, the upper parts a dirty white; the exterior feather marked on each web with two black ſpots; the next with two on the inner web, and one on the other; the legs are of a lead colour. The female wants the crimſon ſpot on the head. This ſpecies is much more uncommon than the preceding; and keeps altogether in the woods. See *Tab.* V. *Birds*, Nº 62.

The *middle wood-pecker*, or *picus medius* of Linnæus, agrees with the preceding in ſize and colours, except that the crown of the head in this is of a rich crimſon; the crown of the head in the male of the former being black, and the crimſon in form of a bar on the hind part.

The *leſſer ſpotted wood-pecker*, *picus minor* of Linnæus, is alſo called HICKWALL, and has all the characters and actions of the greater kind, but is more rare. Pennant.

WOOD-*pigeon*. See *Ring*-DOVE.

WOOD-*plea-court*, is a court held twice a year in the foreſt of Clun, in Shropſhire, for determining all matters relating to *wood*, and the feeding of cattle there. Perhaps it was originally the ſame with *wood-mote-court*.

WOOD-*pucerons*, in *Natural Hiſtory*, a name given by Mr. Reaumur, to a ſmall ſpecies of inſect of the puceron kind, of a greyiſh colour, and diſtinguiſhed by its two hollow horns on the hinder part of its body.

Theſe animals very much reſemble, both in ſhape and ſize, the pucerons of the alder; but as thoſe live always on the ſurface of the ſtalk, theſe make their way deep into the *wood* of a tree.

Mr. Reaumur found large quantities of theſe lodged at a conſiderable depth in the *wood* of ſome elms, after they were cut down; the paſſages, by which they had made their way in, were not to be found; but they were lodged in large and long holes, of the diameter of a gooſe-quill, and running many inches along the tree in a longitudinal direction.

All the pucerons found in thoſe places appear to be females, and none have wings; they all have vaſt numbers of young ones of different degrees of maturity within them, and theſe may be forced out with preſſing their bodies. Reaum. Hiſt. Inſect. vol. vi. p. 61.

WOOD-*roof*, or WOOD-*ruffe*, *aſperula*, in *Botany*, a genus of the *tetrandria monogynia* claſs. Its characters are, that the corolla has one petal, and is funnel-ſhaped; and it has two globoſe ſeeds. Linnæus enumerates eight ſpecies.

The common *wood-roof* grows wild in ſhady *woods* in many parts of England, and flowers in April or May: it is ſometimes uſed in medicine, but as it grows wild, it is rarely admitted into gardens.

The leaves and roots dried, have been eſteemed aperient and diuretic: and recommended in obſtructions of the liver, and thence ſuppoſed efficacious in the jaundice: but they are now diſuſed. See ASPERULA.

WOOD-*ſage*. See SAGE.

WOOD-*ſorrel*, in *Botany*. See *Wood*-SORREL.

WOOD-*ſpite*, in *Ornithology*, an Engliſh name given by many to the common green WOOD-*pecker*.

WOODWARD, an officer of the foreſt, whoſe function is to look after the *woods*, and obſerve any offences either in vert, or veniſon, committed within his charge; and to preſent the ſame; and in caſe any deer are found killed, or hurt, to inform the verderer thereof, and preſent the delinquents at the next court of the foreſt.

Woodwards may not walk with bows and ſhafts, but with foreſt-bills. *Arcum & calamos geſtare in foreſta non licet, ſed (ut reſcripti utar verbo) hachetum tantummodo.* Term. Hil. an. 13 Ed. III.

WOODY *nightſhade*. See NIGHTSHADE.

WOOF, among *Manufacturers*, the threads which the weavers ſhoot acroſs, with an inſtrument called the *ſhuttle*, between the threads of the warp, to form the web.

The *woof* is of different matter, according to the piece to be wrought. In taffety, both *woof* and warp are ſilk. In mohairs, the *woof* is uſually wool, and the warp ſilk. In ſattins, the warp is frequently flax, and the *woof* ſilk.

WOOFE, a name given in ſome parts of England to the ſea-wolf, or LUPUS *marinus*.

WOOL, *lana*, the hair, or covering of ſheep; which, waſhed, ſhorn, dreſſed, combed, ſpun, woven, &c. makes divers kinds of ſtuffs, cloths, &c. for apparel, furniture, &c.

While the *wool* remains in the ſtate it was firſt ſhorn off the ſheep's back, and not ſorted into its different kinds, it is called *fleece*.

Each fleece conſiſts of *wool* of divers qualities, and degrees of fineneſs, which the dealers therein take care to ſeparate.

The fineſt grows on the pole of the ſheep; the coarſeſt about the tail; the ſhorteſt on the head and on ſome parts of the belly; the longeſt on the flanks.

Wool is either ſhorn, or pulled off the ſkin after the ſheep is dead: this latter ſort is ſhort and finer: if it be ſhort, it is uſed for hats and not in the manufacture of cloth, unleſs mixed in fleeces.

The French and Engliſh uſually ſeparate each fleece into three ſorts; viz. 1. *Mother-wool*, which is that of the back and neck. 2. The *wool* of the tails and legs. 3. That of the breaſt, and under the belly.

The Spaniards make the like diviſion into three ſorts, which they call *prime*, *ſecond*, and *third*; and, for the greater eaſe, mark each bale or pack with a capital letter, denoting the ſort. If the triage, or ſeparation, be well made, in fifteen bales there will be twelve marked R; that is, refine, or prime; two marked F, for fine, or ſecond; and one S, for thirds.

The firſt thing which the Spaniards do after their ſheep are ſheared (one hundred and twenty-five ſhearmen being employed to ſhear a flock of ten thouſand ſheep) is to weigh the whole pile of *wool*; and the next is to divide each fleece into three ſorts of *wool*: the back and belly give the ſuperfine; the neck and ſides the fine; the breaſt, ſhoulders, and thighs the coarſe *wool*. A different price is fixed upon theſe three claſſes, though the general cuſtom is to ſell the whole pile together at a mean price. An ingenious writer obſerves, that the SHEEP of Andaluſia, which never travel, have coarſe, long, hairy *wool*; but that the itinerant ſheep have ſhort, ſilky, white *wool*: and he infers, from a few experiments and long obſervation, that if the fine-*wooled* ſheep ſtaid at home in the winter, their *wool* would become coarſe in a few generations, and that if the coarſe-*wooled* ſheep travelled from climate to climate, and lived in the free air, their *wool* would become fine, ſhort, and ſilky, in a few generations: the fineneſs of the *wool* is owing to the animal's paſſing its life in an open air of equal temperature.

The *wools* moſt eſteemed are the Engliſh, chiefly thoſe about Leominſter, Coteſwold, and the Iſle of Wight; the Spaniſh, principally thoſe about Sarragoſſa for the province of Arragon, and about Segovia for Caſtile; and the French in Rouſillon, Languedoc, Berry, and Lower Normandy: thoſe of Berry are ſaid to have this peculiar property, that they will knot or bind with any other ſort; whereas the reſt will only knot with their own kind. See SHEEP.

Among the ancients, the *wools* of Attica, Megara, Laodicea, Apulia, and eſpecially thoſe of Tarentum, Parma, and Altino, were the moſt valued. Columella ſets the two laſt even above that of Tarentum, lib. viii. cap, 2. And Varro aſſures us, the people there uſed to clothe their ſheep with ſkins, to ſecure the *wool* from being damaged. De Re Ruſt. lib. ii. cap. ii.

Tavernier affirms that the *wools* in Aſia are incomparably finer than thoſe of Europe; and that there is no doubt but that *wool* was the golden fleece ſought for at Colchis. The fineſt fleeces in the world are thoſe of Caramania, reſerved entirely for the moulhaes and prieſts; thoſe of Cachemire excellent; and the lamb-ſkins of Bucharia exquiſite. See SHAUL, and SHEEP.

The art of preparing and working *wool* is attributed, by the ancients, to Minerva; who, accordingly, is made the genius and protectreſs thereof.

WOOL, *Engliſh*. The *wools* of England have always been in the higheſt repute; and that always more abroad than at home. Some we have, which, manufactured by our own clothiers, Chamberlayne obſerves, does, both for ſoftneſs and fineneſs, vie with the choiceſt ſilks. *Spaniſh wools*, we know, bear a great price among us; but it is certain, much the greateſt part of that, which, when manufactured, our clothiers, &c. call *Spaniſh cloth*, grows in England. Add, that the French can make no good cloth of their own *wool*, without, at leaſt, one-third of Engliſh *wool* mixed with it. It has been ſaid, that the goodneſs of the Spaniſh *wool* is owing to a few Engliſh ſheep ſent over into Spain, as a preſent, by Henry II. of England; or, as others will have it, by Edward IV. in 1468.

The Coteſwold ſheep, which were tranſported by Edward at this time, on occaſion of the alliance with Arragon, multiplied in Spain, and proved very detrimental to the *wool*-trade of England. However, it is certain, that the growth of *wool* had been cultivated in Spain long before this period; for Henry II. in the 31ſt year of his reign (A. D. 1186.) granted a patent to the weavers of London, importing, that if any cloth were found to be made of Spaniſh *wool*, mixed with Engliſh *wool*, the mayor of London ſhould ſee it burnt. The increaſe and improvement of the breed of ſheep in Spain were, indeed, principally owing to don Pedro IV. who aſcended the throne of Caſtile in 1350; who obtained permiſſion to tranſport from Barbary into Spain a great number of rams and ewes of an excellent ſort; ſuch as had been brought from Africa to the neighbourhood of Cadiz by Marcus Columella

Columella in the time of the emperor Claudius; though the breed then introduced had been for many ages neglected.

Cardinal Ximenes, at the commencement of the 16th century, followed the example of don Pedro, and introduced several sheep from Barbary to the neighbourhood of Segovia: and it is well known, that the œconomy of the Spanish shepherds has for several years been admirable; as is also the attention to the improvement of their *wool*, which is extremely fine, by the annual migration of their flocks. See SHEEP.

It is said that Henry VIII. obtained from Charles V. a grant of three thousand white Spanish sheep, and that the propagation of this species in England was entrusted to the care of commissioners. The breed was also improved by a mixture of Spanish rams with the common sheep. Encyclopedie.

The fineness and plenty of our *wools* are owing, in great measure, to the sweet, short grass in many of our pastures and downs; though the advantage of our sheeps feeding on this grass all the year, without being obliged to be shut up in folds during the winter, or to secure them from wolves at other times, contributes not a little thereto.

The Scottish and Irish *wools* are commonly sold abroad for English; and upon the same footing. But foreigners, skilled in those matters, find they come far short of it in fineness; though, in some markets, the Irish is even said to be preferred to the English.

The yearly produce of *wool* in England, towards the close of the last century, was calculated by Dr. Davenant, and Mr. King, at two millions sterling. See WOOLLEN *Manufactory*.

Anciently, the principal commerce of the nation consisted in *wool* unmanufactured; which foreigners, especially the French, Dutch, and Flemish, bought of us: insomuch that the customs of English *wool* exported in Edward the Third's reign, amounted, at 50s a pack, to 250,000*l.* per annum. An immense sum in those days! See COMMERCE.

This excessive custom on the export of unmanufactured *wool* set our people to the making of it into cloth themselves: in which they succeeded so well, that, under the reign of queen Elizabeth, the exportation of any *wool* at all was absolutely prohibited; and the statute 8 Eliz. cap. 3. makes the transportation of live sheep, or embarking them on board of any ship, for the first offence forfeiture of goods, and imprisonment for a year; and that at the end of the year the left hand shall be cut off in some public market, and there nailed up in the most open place; and the second offence is felony.

From that time, England has been exceedingly jealous of its *wool*. To prompt their vigilance, the judges, king's counsel at law, and masters in chancery, in parliament, are seated on *wool*-packs. Accordingly, scarce a parliament but has renewed and reinforced the prohibition; particularly, about the middle of the seventeenth century, the exporting of *wool* was made felony. 13 & 14 Car. II. cap. 18. But this was repealed by 7 & 8 W. cap. 28. which ordains, that the exportation of *wool* incurs a forfeiture of the vessel and of the goods, and their treble value; and all persons aiding herein shall suffer three years imprisonment. Also, by 12 Car. II. cap. 32. no person shall export *wool*, &c. or yarn made of *wool*, or fuller's earth or fuller's clay, on pain of forfeiting the same, and 3*s.* for every pound weight. And the masters and mariners, knowing the offence and assisting, shall forfeit all their goods and chattels, and be imprisoned three months: the owners shall forfeit all their interest in the ship and cargo; and any merchant, &c. offending herein, shall be disabled to require any debt from any factor or other person. And the statute 4 Geo. I. cap. 11. (amended and farther enforced by 12 Geo. II. cap. 21. & 19 Geo. II. cap. 34.) makes it transportation for seven years, if the penalties be not paid.

By 13 & 14 Car. II. cap. 13. no tobacco pipe clay shall be exported on pain of 3*s.* a pound, except to the British sugar colonies and plantations in the West Indies, 17 Geo. III. cap. 43. 20 Geo. III. cap. 19.

Wool, in limited quantities, may be exported from Southampton to Jersey, Guernsey, Sark, and Alderney.

By 12 Geo. II. cap. 21. no coverlids, &c. capable of being reduced to *wool* again, or beds, &c. stuffed with *wool*, shall be exported, on the like pain as for exporting *wool*; and no *wool* or yarn, &c. shall be packed otherwise than in packs of leather or pack-cloth, marked on the outside with the words WOOL or YARN, on pain of forfeiture, and 3*s.* for every pound weight.

No *wool*, &c. shall be put on board any vessel to be carried coast-wise, without notice to the officers of the port, and bond for the landing of it, and licence for so doing, on pain of forfeiting the same, with the vessel and furniture: and none of the said goods shall be landed but in presence of the officers, on pain of forfeiture, and 3*s.* for every pound. And to prevent collusive seizures or fraudulent agreements for the evasion of penalties, none but officers of the customs, excise, or salt, and officers of guardships particularly mentioned, shall enter informations of seizures of *wool* or woollen goods; and the penalty of collusive seizure, &c. in such officers is a forfeiture of 200*l.* and disqualification for any office of the revenue; and the owner shall forfeit treble value; and obstruction of officers or rescue of the goods seized incurs the penalty of transportation for seven years: and offering a bribe to any officer is liable to a forfeiture of 300*l.* Persons, who by way of insurance undertake to carry *wool* abroad, shall forfeit 500*l.* and all insurances of *wool* shall be void.

By 1 W. cap. 32. persons carrying *wool* from port to port, or by land near the coast, whence the same may be exported, are required to make an entry thereof at the port, whence it is to be conveyed, containing mark and number, on pain of forfeiting the same, and also the horses and carriages, and also of suffering and forfeiting, as by other laws against exportation of *wool*: and a register shall be kept at the custom-house in London of all the *wool* sent from port to port in this kingdom.

By 7 & 8. W. cap. 28. no *wool*, &c. shall be carried by land within five miles of the coast, but between sun-rise and sun-set, on pain of forfeiting the same, and the horses and carriages: and the hundred is liable to forfeit treble value with treble costs. In Kent and Sussex, every owner of *wool*, within ten miles of the sea, shall give an account in writing, within three days after shearing, of his number of fleeces to the next officer of the customs, and not remove them without a certificate, for which he pays 6*d.* on pain of forfeiting the *wool*, and 3*s.* for every pound; and no person within fifteen miles of the sea shall buy any *wool* without entering into a bond with sureties, that the *wool* shall not be sold to any person within fifteen miles of the sea; and if *wool* be found carrying towards the sea-side, unless it be first entered, and security be given, it shall be forfeited, and also 3*s.* a pound; and no *wool* lodged after shearing within ten miles shall be lodged within fifteen miles of the sea in the said counties, on pain of forfeiture, or 3*s.* a pound: and *wool* laid within fifteen miles of the sea, and unentered, shall be seized and forfeited.

By several of the foregoing acts, the exportation of woollen manufactures out of Ireland was prohibited under the same penalties as the exportation of *wool*; but it is enacted by 20 Geo. III. cap. 6. that so much of the 10 & 11 W. and of other acts which prohibit the exportation of cloth, serge, &c. made up with *wool* from the kingdom of Ireland into foreign ports shall be repealed.

But all these precautions are ineffectual; the English themselves, particularly those about the coast of Sussex, making use of the long winter nights to waft over their *wools* to France: being sure of carrying them to a good market, they despise the penalty, with an intrepidity, that the rest of Europe are amazed at.

M. Colbert, a person the French manufactures and commerce are infinitely indebted to, had entertained a design of procuring some of our English sheep, and propagating them in France; hoping, that by choosing for them, in the provinces of that kingdom, such pastures, and such a sky, as they had in their own island, they might there be perpetuated; and France be no longer obliged precariously to depend on the clandestine supplies of *wool* from the English owlers. But the count de Cominges, then ambassador of France at the English court, laid the impossibility of having such an export of sheep, and the almost equal impossibility of keeping and making them multiply there, so strongly before him, that he abandoned the design.

Wool is reckoned by the *sack*, containing two weighs; the *weigh*, six tod and a half; the *tod*, two stones; the *stone*, two cloves, and the *clove*, seven pounds. Twelve sacks make a *last*, or 4368 pounds.

A *sack of wool*, or three hundred and sixty-four pounds, is sufficient for four standard cloths, to render them true breadth, i. e. six quarters and a half; true weight, i. e. sixty pounds; and the true length, i. e. twenty-four yards.

For the divers preparations of *wool*, see CARDING, COMBING, SPINNING, WEAVING, FULLING, and CLOTH.

WOOL, *pocket of*. See POCKET.

WOOL, *sarplar of*. See SARPLAR.

WOOL-*balls*, in *Natural History*, masses of *wool* compacted into firm and hard balls, and found in the stomachs of sheep, as the hair-balls are in oxen and other animals. These are doutless formed in the same manner as those hair-balls, of the outer covering of the animal, but they are

are much more uncommon; they are found in numbers, three, four, or five, in the ſtomach of the ſame animal. Their outſide has commonly much the ſame appearance of a puff-ball, and is uſually either in part or wholly covered with a very thin and ſoft blackiſh ſmooth ſkin; the inner ſubſtance is entirely *wool*, but that wrought together as cloſely as the hatter does his furs in the making of them into hats.

They are uſually ſoft, ſmooth, and ſomewhat elaſtic, of a pale buff-colour, very light, and of irregular figures rather cubic than globular, and ſeldom of any great ſize, an inch in diameter being their common ſtandard. Moreton's Northampt. p. 451. See Balls.

WOOLDING, in the *Sea-Language*, denotes the winding of ropes about a maſt, in order to ſtrengthen it, in a place where it may have been fiſhed or ſcarfed.

Woolding is alſo the rope employed in this ſervice.

WOOL-DRIVERS, are thoſe who buy *wool* of the ſheep-owners in the country, and carry it on horſeback to the clothiers, or market-towns, to ſell it again.

WOOLLEN *manufactory*, includes the ſeveral ſorts of commodities into which *wool* is wrought; as *broad cloths*, *long* and *ſhort kerſeys*, *bays*, *ſerges*, *flannel*, *ſays*, *ſtuffs*, *frize*, *ſtockings*, *caps*, *rugs*, &c.

Each whereof, ſee under its reſpective article, Cloth, &c.

The *woollen manufactory*, which now makes the principal article both in our foreign and domeſtic trade, being that which furniſhes the cargoes of our veſſels, that employs our people, &c. may be ſaid to have had its riſe, or rather to have received great improvement, in the fourteenth century.

Till that time, our *wool* was chiefly ſold in the fleece, to ſuch of our neighbours as came to fetch it. Among our cuſtomers, however, the principal were the Flemings and Brabanters; and particularly the merchants of Ghent and Louvain, who took off vaſt quantities to ſupply two manufactories that had flouriſhed in thoſe two cities from the tenth century, and had furniſhed the greateſt part of Europe, and even England itſelf, with all ſorts of *woollen* cloths, &c. But the richneſs of the manufactories of Ghent, and the incredible number of hands employed therein, having ſpirited up the inhabitants to revolt, divers times, particularly in the years 1300 and 1301, againſt their ſovereigns, on account of certain taxes which they refuſed to pay, the ſeditious were at length puniſhed and diſperſed; and part of them took refuge in Holland, and the reſt in Louvain.

Theſe laſt, together with their art of manufacturing cloths, carried with them their ſpirit of ſedition. And it was not long before ſeveral of them, to avoid the puniſhment they had deſerved for killing ſome of the magiſtrates, removed into England; where they inſtructed our people how to work their own *wools*.

About the year 960, or rather ſomewhat ſooner, the *woollen* manufacture of Flanders, and other parts of the Netherlands, took its riſe; and therefore it was probably prior to the Linen *manufacture*, which came from Egypt into Greece and Italy, and thence travelled weſtward to France and Flanders, and probably next into Germany and England, before it got ground in the more northern and north-eaſt parts of Europe, where it has ſince proſpered very much: others, however, think, that the Carthaginians firſt introduced it into Europe.

With reſpect to the *woollen* manufacture, Anderſon (Hiſt. Com. vol. i. p. 51.) remarks, that (at leaſt) ſome ſort of *woollen* cloth muſt ever have been made in all civilized countries; and that wherever the Romans planted colonies, they there introduced the weaving of cloth. Camden, in his Britannia, ſpeaking of the antiquity and eminence of the city of Wincheſter, ſays, that there the Roman emperors ſeem to have had their imperial weaving houſes for cloths both of *woollen* and linen for the emperor and the army; and moſt probably that neceſſary art was preſerved in Britain after the Romans quitted it, though perhaps in a plainer kind, till the fourteenth century, when king Edward III. introduced the fine manufacture from the Netherlands.

Lord chief juſtice Hale, in his Primitive Origination of Mankind, p. 241. refers to the ancient guilds, erected in England for the *woollen* manufacture, at Lincoln, York, Oxford, and ſeveral other cities, as evidences of the flouriſhing ſtate of that art in this kingdom in the time of Henry II. and Richard I. But by the troubleſome wars in the time of king John, Henry III. Edward I. and Edward II. this manufacture was wholly loſt, and all our trade ran out in *wools*, woolfels, and leather, carried out in ſpecie; and that manufacture, during thoſe warlike times, had its courſe in France, the Netherlands, and the Hanſe-towns. But by the wiſdom and peaceable times of Edward III. he regained that art hither again, after near a hundred years diſcontinuance. From this account the learned writer infers, that we are not to conclude, that every new appearance of any art or ſcience is the firſt production of it. King Edward III. attentively obſerving the riches and power of the provinces of Flanders and Brabant, proceeding merely from their *woollen* manufacture, and conſidering farther, that they owed this wealth and power to his Engliſh *wool*, might naturally infer, that if he could gain the manufacturers to ſettle in England, the trade would ſoon proſper in his kingdom. Accordingly in Rymer's Fœd. tom. iv. fol. 496. we find a letter of protection granted by the king to John Kemp, of Flanders, a *woollen* cloth-weaver, coming over to exerciſe his trade in England, A. D. 1331, and to teach it to ſuch of our people as were inclined to learn it: the king hereby taking him and all his ſervants and chattels into his royal protection, and promiſing the ſame likewiſe to all others of his occupation, and alſo to all dyers and fullers, who were diſpoſed to ſettle in England. In conſequence of this encouragement, ſeventy families of Walloons were in this ſame year brought over to England. Thus we find, that, though king Edward III. did not, ſtrictly ſpeaking, introduce the *woollen* manufacture into England, as many hiſtorians have repreſented the matter, he nevertheleſs taught his people to make and dreſs fine *woollen* cloths, by means of the Netherlanders, whom he brought hither, and thus laid the foundation of that great manufacture, which England has long ſince brought to perfection.

In the eleventh year of Edward III. ſeveral laws were enacted for promoting the *woollen* manufacture of England; and the tumults at Ghent and Louvain, already mentioned, which happened not long before this time, contributed to promote our *woollen* manufacture in its infant ſtate.

The preſident Thuanus attributes the eſtabliſhment of the *woollen* manufactures in England to queen Elizabeth, and the troubles about religion, which the ſeverity of the duke of Alva and the Spaniſh inquiſition had occaſioned, and kept up ſo long in the Low Countries. But what that noble author ſays, is rather to be underſtood of their perfection, than their firſt eſtabliſhment; and of the ſeveral great manufactures then ſet up at Norwich, Colcheſter, Sandwich, Southampton, &c. For in the Engliſh and Flemiſh hiſtorians we find mention made of the manufacturers of London, long before any part of the ſeventeen provinces had attempted to throw off the Spaniſh yoke.

As this manufacture ſtood about the cloſe of laſt century, Dr. Davenant and Mr. King computed the produce thereof to be eight millions per annum; three-fourths whereof are conſumed at home, and the reſt exported. Davenant's Works, vol. ii. p. 413. vol. vi. p. 78. 96.

The year 1614 produced the diſcovery of a new ſpecies of *woollen* manufacture in England. The ſtates general of the United Netherlands having prohibited the importation of any Engliſh *woollen* cloth, that was dyed in the cloth, the Engliſh clothiers ingeniouſly deviſed the method of making mixtures dyed in the *wool*, rather than loſe all the profits of dying and dreſſing. This has ever ſince obtained the name of *medley cloth*; all *woollen* cloth before this time being only of one ſingle colour dyed in the cloth, as black, blue, red, &c.

So jealous are we now become of our *woollens*, that, beſides the precautions taken to uſe all our own *wools* ourſelves, we have added that of ſelling them ourſelves, and of carrying them to the places where they are required; not admitting ſtrangers to come and buy any in England. And hence the eſtabliſhment of thoſe famous magazines in Holland, the Levant, and the North, where our *woollens* were repoſited, to be vended by factors, or commiſſioners. See Staple.

Beſides ſeveral regulations tending to the improvement of the *woollen* manufacture in England, and laws prohibiting the importation of *woollen* cloth (11 Ed. III. cap. 3. 4 Ed. IV. cap. 1. ſee Wool), and allowing *woollen* manufactures to be exported cuſtom free (11 & 12 W. cap. 20.) it is enacted by 30 Car. II. cap. 3. that no corpſe ſhall be buried in any other covering but that which is made of ſheep's *wool* only, of which an affidavit ſhall be made, on pain of the forfeiture of 5*l.*

The dying and dreſſing of white *woollen* cloth in England was brought to perfection by means of perſons who arrived from the Netherlands in 1667. It appears from ſundry conſiderations laid before parliament in 1739, that more than 1,500,000 people were then employed in our Britiſh *woollen* manufacture; and if theſe earn one with another 6*d.* per day for 313 working days in the year, it will amount to 11,737,500*l.*; a ſum which ſufficiently evinces the immenſe benefit of this manufacture.

We learn from Roger Coke's Second Diſcourſe on Trade, publiſhed in 1670, that about the year 1636 or 1637, a

hundred

hundred and forty families from Norfolk and Suffolk removed to Leyden, Alcmar, and other parts of Holland, and there eſtabliſhed, or greatly promoted, the *woollen* manufactures of thoſe places.

According to Savary's Dict. Univ. de Com. the manufacture of fine *woollen* cloth was firſt ſet on foot in 1646, at Sedan, in France, by three Frenchmen, who had a patent for twenty years, and had each of them a penſion of five hundred livres for life; their children were alſo thereby ennobled in France, and their foreign workmen declared to be denizens of France, free from being quartered with ſoldiers, and from all taxes and exciſes.

Moreover, in 1669, Colbert, then prime miniſter, introduced five hundred workmen from Holland to Abbeville, in Picardy, where a new manufacture for ſuperfine *woollen* broad cloth was very ſucceſsfully eſtabliſhed. And the French king, beſides the immunities and pecuniary grants beſtowed on the workmen, raiſed the credit of their manufacture, by allowing even the nobleſſe to be concerned in it, without detracting from their nobility.

We ſhall only add on this ſubject, that many have erroneouſly imagined, that the fine broad cloth of France is principally ſupported by our Engliſh run *wool*; whereas the real ſuperfine cloth muſt every where be made entirely of Spaniſh *wool*; hence called Spaniſh cloth. And though the ſecond ſort of French cloth is much meliorated by the help of our fine ſhort *wool*, yet the beſt *wool* of France alone may do well enough for their coarſe cloths. And it is principally for their fine ſtuffs, hoſe, caps, &c. that the French find our ſoft and long combing *wool* (the beſt of its kind in Europe) abſolutely neceſſary; becauſe, without a certain proportion of it, mixed up with their own *wool*, they cannot make thoſe fine goods fit for the markets of Spain, Portugal, and Italy. Moreover, by running of our *wool* to Hamburg, Holland, Flanders, France, &c. thoſe countries are enabled to manufacture thoſe ſtuffs and ſtockings, to the great detriment of our own manufactures. Anderſon's Hiſt. Com. vol. ii. p. 137.

A pack, or 240 pounds weight of ſhort *wool*, it is computed, employs ſixty-three perſons a week, to manufacture it into cloth; viz. three men to ſort, dry, mix, and make it ready for the ſtock-carder; five to ſcribble, or ſtock-card it; thirty-five women and girls, to card and ſpin it; eight men to weave it; four men and boys to ſpoole it; and reed quills; eight men and boys to ſcour, burl, mill, or full it; row, ſhear, pack, and preſs it.

A pack of large, long, combing *wool*, made into ſtuffs, ſerges, ſagathies, &c. for the Spaniſh trade, will employ, for one week, 202 perſons, whoſe wages amount to 43*l.* 10*s.* Thus, 7 combers, 3*l.* 10*s.* dyers, 5*l.* 150 ſpinners, 18*l.* 20 throwers and doublers, 5*l.* 25 weavers and attendants, 12*l.*

A pack of *wool* made into ſtockings, will employ, for one week, 184 perſons, who will earn 56*l.* Thus, 10 combers, 5*l.* 5*s.* the dyer, 1*l.* 6*s.* 102 ſpinners, 15*l.* 12*s.* doublers and throwers, 4*l.* 10*s.* 60 ſtocking-weavers, 30*l.*

WOOLLENS, *bleaching of*. See BLEACHING.

WOOLLY-*paſhnum*, in *Natural Hiſtory*, a name given by the Eaſt-Indians to a ſpecies of native red arſenic, or orpiment, found in that part of the world.

It is of a paler colour than the red orpiment of Germany.

WOOL-STAPLE, denotes a city or town where *wool* uſed to be ſold. See STAPLE.

WOOLSTED. See WORSTED.

WOOL-WINDERS, are perſons employed in winding up fleeces or *wool* into bundles, to be packed, and ſold by weight. Perſons, *winding* and ſelling deceitful *wool*, ſhall forfeit for every fleece, 6*d.* Theſe are ſworn to do it truly between the owner and the merchant. 8 Hen. VI. cap. 22. 23 Hen. VIII. cap. 17.

WORD, in *Language*, is an articulate ſound, deſigned to repreſent ſome idea.

WORD, in *Writing*, is an aſſemblage of ſeveral letters, forming one or more ſyllables, and ſignifying ſome thing.

The Port-royaliſts define *words* to be diſtinct articulate ſounds, agreed on by mankind, to convey their thoughts and ſentiments by.

The proper character of a *word*, according to the ingenious Mr. Harris, is that of its being a ſound ſignificant, of which no part is of itſelf ſignificant; and hence he infers, that *words* are the ſmalleſt parts of ſpeech.

The firſt and moſt obvious diſtinction of *words* is into ſuch as are ſignificant abſolutely or by themſelves, and ſuch as are ſignificant by relation: the former may be called principals, and the latter acceſſories. Moreover, all *words* whatever, ſignificant as principals, are either SUBSTANTIVES or ATTRIBUTIVES; and thoſe, which are ſignificant as acceſſories, acquire a ſignification either from being aſſociated to *one word*, in which caſe they only define and determine, and may juſtly be called DEFINITIVES, or to *many words at once*, in which caſe they ſerve to no other purpoſe than to connect, whence they are called CONNECTIVES. Accordingly, Mr. Harris refers all words to theſe four ſpecies. See SPEECH. Hermes, p. 20, &c.

Grammarians divide *words* into eight claſſes, called *parts of ſpeech*; which are the *noun*, *pronoun*, *verb*, *participle*, *adverb*, *conjunction*, *prepoſition*, and *interjection*; to one or other of which, all the *words* and terms in all languages, which have, or may be invented to expreſs our ideas, are reducible. See each.

Words, again, are divided into *primitives* and *derivatives*, *negative* and *poſitive*, *ſimple* and *complex*, *common* and *proper*, *abſtract* and *concrete*, *ſynonymous* and *equivocal*.

With regard to their ſyllables, *words* are farther divided into *monoſyllables* and *polyſyllables*.

The grammatical figures of *words*, which occaſion changes in the form, &c. thereof, are *ſyncope*, *apocope*, *apoſtrophe*, *diæreſis*, *aphæreſis*, *proſtheſis*, *epentheſis*, *paragoge*, *metatheſis*, &c. See SYNCOPE, APOCOPE, &c. See alſo FIGURE.

The uſe of *words*, we have obſerved, is to ſerve as ſenſible ſigns of our ideas; and the ideas they ſtand for in the mind of the perſon that ſpeaks, are their proper ſignifications.

Simple and *primitive words* have no natural connexion with the words they ſignify; whence there is no rationale to be given of them: it is by a mere arbitrary inſtitution and agreement of men, that they come to ſignify any thing. Certain *words* have no natural propriety or aptitude, to expreſs certain thoughts, more than others; were that the caſe, there could have been but one language.

But, in derivative and compound words, the caſe is ſomewhat different. In the forming of theſe, we ſee a regard is to be had to agreement, relation, and analogy: thus moſt *words* that have the ſame ending, have one common and general way of denoting or ſignifying things; and thoſe compounded with the ſame prepoſitions, have a ſimilar manner of expreſſing and ſignifying ſimilar ideas in all the learned languages where they occur.

For the perfection of language, it is not enough, Mr. Locke obſerves, that ſounds can be made ſigns of ideas; unleſs theſe can be made uſe of, ſo as to comprehend ſeveral particular things; for the multiplication of *words* would have perplexed their uſe, had every particular thing needed a diſtinct name to be ſignified by.

To remedy this inconvenience, language had a farther improvement in the uſe of general terms, whereby one *word* was made to mark a multitude of particular exiſtences; which advantageous uſe of ſounds was obtained only by the difference of the ideas they were made ſigns of: thoſe names becoming general, which are made to ſtand for general ideas; and thoſe remaining particular, where the ideas they are uſed for are particular.

Some of our philoſophers have complained much of the great uſe, or rather abuſe, of vague and general terms, which have no preciſe, definite ſignification. To diſtinguiſh theſe, F. Malebranche obſerves, that every thing that is, and conſequently every thing that is intelligible, is either a being, or a mode and manner of being. Hence it is evident, that every term, which does not ſignify either of theſe, ſignifies nothing, and is an obſcure and confuſed term. In metaphyſics, the uſe of ſuch terms, he ſays, is ſometimes neceſſary and allowable, as in ſpeaking of the divine perfections, &c. But in phyſics it is always miſchievous, however common.

It is obſervable, that the *words* which ſtand for actions, and notions quite removed from ſenſe, are borrowed from ſenſible ideas; as, to imagine, apprehend, comprehend, underſtand, adhere, conceive, inſtil, diſguſt, diſturbance, tranquillity, &c. which are all taken from the operations of things ſenſible, and applied to modes of thinking. *Spirit*, in its primary ſignification, is no more than breath; *angel*, a meſſenger. By which we may gueſs what kind of notions theſe were, and whence derived, which filled the minds of the firſt beginners of languages; and how nature, even in the naming of things, unawares, ſuggeſted to men the originals of all their knowledge: whilſt, to give names that might make known to others any operations they felt in themſelves, or any other ideas that came not under their ſenſes, they were forced to borrow *words* from the ordinary and known ideas of ſenſation.

The ends of language, in our diſcourſe with others, are chiefly three: firſt, to make our thoughts or ideas known one to another. This we fail in, 1. When we uſe names without clear and diſtinct ideas in our mind. 2. When we apply received names to ideas, to which the common uſe of that language doth not apply them. 3. When we apply

apply them unſteadily, making them ſtand now for one, and anon for another idea.

Secondly, to make known our thoughts with as much eaſe and quickneſs as is poſſible. This men fail in, when they have complex ideas, without having diſtinct names for them; which may happen either through the defect of a language, which has none; or the fault of the man, who has not yet learned them.

Thirdly, to convey the knowledge of things. This cannot be done, but when our ideas agree to the reality of things. He that has names without ideas, wants meaning in his *words*, and ſpeaks only empty ſounds. He that has complex ideas without names for them, wants diſpatch in his expreſſion. He that uſes his *words* looſely and unſteadily, will either not be minded, or not underſtood. He that applies names to his ideas, different from the common uſe, wants propriety in his language, and ſpeaks gibberiſh; and he that has ideas of ſubſtances, diſagreeing with the real exiſtence of things, ſo far wants the materials of true knowledge.

WORDS, *diviſion of*. See DIVISION.

WORDS, *general*. See GENERAL.

WORDS *of command*. See EXERCISE.

WORD, *Watch*-WORD, in an *Army*, or *Garriſon*, is ſome peculiar *word*, or ſentence, by which the ſoldiers are to know and diſtinguiſh one another in the night, &c. and by which ſpies, and deſigning perſons, are diſcovered.

It is uſed alſo to prevent ſurprizes. The *word* is given out in an army every night by the general, to the lieutenant, or major-general of the day, who gives it to the majors of the brigades, and they to the adjutants; who give it firſt to the field-officers, and afterwards to a ſerjeant of each company, who carry it to the ſubalterns.

In garriſons it is given, after the gate is ſhut, to the town-major, who gives it to the adjutants, and they to the ſerjeants.

WORD, in *Heraldry*, &c. See MOTTO.

WORDS *defamatory*, *treaſonable*, &c. in *Law*. See DEFAMATION, SCANDAL, and TREASON.

WORK, in the *Manege*. To *work* a horſe, is to exerciſe him at pace, trot, or gallop, and ride him at the manege.

To *work* a horſe upon volts, or head and haunches in or between two heels, is to paſſage him, or make him go ſideways upon parallel lines.

To WORK, in *Sea-Language*, is to direct the movements of a ſhip, by adapting the ſails to the force and direction of the wind. A ſhip is alſo ſaid to *work*, when ſhe ſtrains and labours heavily in a tempeſtuous ſea, ſo as to looſen her joints or timbers. See ROLLING.

WORK, *carpenters*, *clock*, *crown*, *field*, *fire*, *fret*, *groteſque*, *horn*, *moſaic*, *out*, *regimen of the*, *ruſtic*, *ſcratch*, *ſtream*, *vermicular*, and *wax*. See the ſeveral articles.

WORK-HOUSE, a place where indigent, vagrant, and idle people are ſet to *work*, and maintained with cloathing, diet, &c. See HOUSE *of correction*.

Such are the BRIDEWELLS, and ſeveral other places about the city, or ſuburbs; ſuch alſo was the foundation of that in Biſhopſgate-ſtreet, for employing the poor children of the city and liberties, who have no ſettlement; and that for the pariſh of St. Margaret's, Weſtminſter, called the *grey-coat* HOSPITAL.

By 43 Eliz. cap. 2. the church-wardens and overſeers, with the conſent of two juſtices, are empowered to ſet to work the children of the poor, and other deſtitute perſons, and to provide for the relief of the lame, old, blind, and ſuch as are poor, but not able to work; and they may erect, with the leave of the lord of the manor, on any waſte or common, of which the pariſh is parcel, convenient houſes of dwelling for the poor. By 3 C. 4. they may ſet up and uſe any trade, merely for the employment and relief of the poor. By 9 G. cap. 7. they may contract for the maintenance and employment of the poor in houſes purchaſed or hired: and poor perſons refuſing to be lodged and maintained in ſuch houſes, ſhall be put out of the pariſh-book, and not entitled to receive relief from the church-wardens and overſeers; and two or more pariſhes are allowed to unite in lodging their reſpective poor in one houſe; and the officers of one pariſh are allowed to contract with thoſe of another for the maintenance, &c. of their poor. Moreover, by 8 and 9 W. cap. 30. pariſh poor that are relieved are required to wear on the ſhoulder of the right ſleeve of the uppermoſt garment, in red or blue cloth, a large Roman P, together with the firſt letter of the name of the pariſh or place to which they belong. By 24 Geo. II. cap. 43. no ſpirituous liquors ſhall be ſold or uſed in any *work-houſe*, or houſe of entertainment for pariſh poor. The ſtatute 22 Geo. III. cap. 83. eſtabliſhes many new regulations with regard to the maintenance of the poor; but leaves it optional in any pariſh or place whether they will adopt theſe, or retain the preſent mode.

At Amſterdam they have a famous *work-houſe*, or houſe of correction, called the *Raſphuyſe*, which, by a privilege granted in 1602, has alone the right of ſhaving and cutting the dyers woods, as brazil, ſantal, campechy, ſaſſafras, &c.

Each perſon, tolerably ſtrong, kept in the houſe, is obliged to furniſh two hundred and fifty pounds of raſped wood per day; and the weaker, a certain proportionable quantity of chips.

WORKING *to windward*, in *Sea-Language*, denotes the operation by which a ſhip endeavours to make a progreſs againſt the wind. See BEATING, PLYING, TACKING, and TURNING.

WORKING *furnace*. See FURNACE.

WORKING *of glaſs*. See GLASS.

WORKS, *opera*, in *Fortification*, the ſeveral lines, trenches, ditches, &c. made round a place, an army, or the like, to fortify and defend it. See *Tab.* II. *Fortif. fig.* 21. See alſo LINE, PARALLEL, and TRENCH.

The principal *works*, in a fortreſs, or fortified place, ſee under FORTIFIED *place*, FORTIFICATION, &c.

WORKS, *covenant of*, in *Theology*. See COVENANT.

WORLD, *mundus*, the aſſemblage of parts which compoſe the UNIVERSE.

The *duration of the world* is a thing which has been greatly diſputed. Plato, after Ocellus Lucanus, held it to be eternal, and to have flowed from God, as rays flow from the ſun. Ariſtotle was much of the ſame mind: he aſſerts, that the *world* was not generated, ſo as to begin to be a *world*, which before was none; and, in effect, his whole eighth book of Phyſ. and firſt book de Cœlo, are ſpent in proving the eternity of the *world*.

He lays down a pre-exiſting and eternal matter, as a principle; and thence argues the *world* eternal. His argument amounts to this, that it is impoſſible an eternal agent, having an eternal paſſive ſubject, ſhould continue long without action.

His opinion was long generally followed; as ſeeming to be the fitteſt to end the diſpute among ſo many ſects about the firſt cauſe.

Epicurus, however, though he makes matter eternal, yet ſhews the *world* to be but a new thing, and ſays it was formed out of a fortuitous concourſe of atoms. See Lucretius, lib. v.

Some of the modern philoſophers refute the imaginary eternity of the *world*, by this argument: that, if it be ab æterno, there muſt have been a generation of individuals, in a continual ſucceſſion from all eternity; ſince no cauſe can be aſſigned why they ſhould not be generated, viz. one from another. Therefore, to conſider the origin of things, and the ſeries of cauſes, we muſt go back in infinitum, i. e. there muſt have been an infinite number of men, and other individuals, already generated; which ſubverts the very notion of number. And if the cauſe which now generates have been produced by an infinite ſeries of cauſes, how ſhall an infinite ſeries be finite, to give room for new generations? See GOD.

Dr. Halley ſuggeſts a new method of finding the age of the *world*, from the degree of SALTNESS of the ocean.

It is another popular topic of controverſy, whether the *world* be finite, or infinite? See the arguments on both ſides, under UNIVERSE.

It is likewiſe diſputed, whether the plurality of *worlds* be poſſible? See PLURALITY.

Some hold the affirmative, from an opinion of the infinite power of the Deity; it being a ſetting bounds to omnipotence, to ſay, that he created ſo many bodies at firſt, and that he could not create more.

The Carteſians maintain the negative, upon theſe principles: that it is a contradiction to ſay, there are ſeveral *worlds* exiſting at the ſame time, ſince this implies ſeveral univerſes of created beings, the *world* being the TO *παν*. That if there were ſeveral *worlds*, they muſt either be at a diſtance from one another, or contiguous; but neither can be ſaid: for were they contiguous, they would only conſtitute one; and were they diſtant, there muſt be ſomething between. But what can be between? If it be extended, it is corporeal; and, inſtead of ſeparating the ſeveral *worlds*, it will connect them all into one.

The *exiſtence of an external world* has been much controverted. The arguments on either ſide, ſee under ABSTRACTION, BODY, and EXISTENCE.

The *world* is ſometimes divided into *upper*, and *lower*.

WORLD, *lower*, or *ſublunary*, is the globe of our EARTH.

WORLD, *upper*, includes the heavens, and heavenly bodies.

WORLD, *axis of the*. See AXIS.

WORLD, *map of the*. See MAP.

WORLD, *ſoul of the*. See ANIMA *mundi*.

WORLD, *ſyſtem of the*. See SYSTEM.

WORMS, in the *Linnæan System of Nature*, the sixth class of animals, including five orders, viz. *intestina, mollusca, testacea, lithophyta*, and *zoophyta*; eighty genera, and eleven hundred and sixty-six species. The animals of this class are distinguished by having the heart with one ventricle, and no auricle, and a cold, colourless sanies; and they are particularly distinguished from insects, which are antennated, by being tentaculated.

WORMS, in *Husbandry*, are very prejudicial to corn-fields, eating up the roots of the young corn, and destroying great quantities of the crop.

Sea-salt is the best of all things for destroying them. Sea-water is proper to sprinkle on the land where it can be had; where the salt-springs are, their water does as well; and where neither are at hand, a little common or bay salt melted in water does as well.

Soot will destroy them in some lands, but it is not to be depended upon, for it does not always succeed. Some farmers strew on their lands a mixture of chalk and lime; and others trust wholly to their winter fallowing to do it; if this is done in a wet season, when they come up to the surface of the ground, and some nails with sharp heads be driven into the bottom of the plough.

If they are troublesome in gardens, the refuse brine of salted meat will serve the purpose, or some walnut leaves steeped in a cistern of water for a fortnight or three weeks, will give it such a bitterness that it will be a certain poison to them.

A decoction of wood-ashes, sprinkled on the ground, will answer the same purpose; and any particular plant may be secured both from worms and snails by strewing a mixture of lime and ashes about its roots. It is a general caution among the farmers to sow their corn as shallow as they can, where the field is very subject to worms. Mortimer's Husbandry, p. 328.

WORMS, *lumbrici*, or *vermes*, in *Medicine*, a disease arising from some of those reptiles being generated, and growing in the body; whence, frequently, terrible symptoms proceed.

The ordinary place of the *worms* is the intestines; though there is scarce any part of the body but is sometimes infected with them: for, besides the *vermes intestinales*, there are *dentales, gingivales, pulmonarii, cardiaci, sanguinarii, cutaneous, umbilical, hepatic, salival*, &c.

They are all usually supposed to be engendered from the eggs of insects deposited in something that is taken into the body by way of food, or some other way; an hypothesis, however, which will hardly account for certain species of these insects not to be found but in the bodies of animals. A solution of this difficulty will, perhaps, be hard to find, without having recourse to the first stamina of animals, and the principles of generation.

Vallisnieri (Obs. Med.) has proved, that *worms* in the human bowels are not produced from the eggs swallowed down with our drink or otherwise, but that they really propagate their species within us, and are owing to parents of the same kind hid in some parts of our intestines. Redi has given such descriptions of the lumbrici rotundi, or common *worms*, as to render the fact with regard to them unquestionable; and this author has proved as much in regard to the tænia, or tape-*worm*.

There are three species of *worms*, most frequent in the human body: the *teretes*, or round and thick, mostly bred in the small guts, and sometimes in the stomach; the *latus*, or flat, called also *tænia*, generally bred either in the stomach, or small intestines; and the round and small, found in the rectum, called *ascarides*. Sometimes, indeed, there are anomalous *worms* expelled; as horned, hairy, four-footed, &c. *worms*.

The Memoirs of the French Academy, for 1708, furnish a remarkable account of an obstinate pain caused by a *worm*, on the lower part of a woman's forehead, toward the right side, and very near the top of the nose. In the space of two years this pain extended itself to the temple on the same side, and became continual and much more violent, so as occasionally to disorder the senses of the patient. After many ineffectual attempts and applications of a medical kind, the cure was instantaneously effected by the violent sneezing occasioned by taking some snuff, which threw out of her nose a *worm* wrapped up in a mass of pituitous matter, tinged with a little blood; and the nostril on the disordered side bled a little for two or three days. This *worm* was about half a quarter of an inch broad, and not less than six inches long, though in the curled state which it usually assumed, it was only about two inches long; its colour was a deep brown; its back was rounded, and belly flat; and it was covered, except on the head, with large scales, between which there grew on each side fifty-six legs, fine as a hair, and about one-twelfth of an inch long; in the head were discovered two eyes, two horns, and a pair of forceps, made up of four arms, and the tail was armed with two points, longer, thicker, and sharper pointed than the legs. The seat of the pain indicates plainly, that the *worm* must have lived in the cavity of the frontal sinus. Between this sinus and the nostril there is a small hole, through which, it is apprehended, the egg inclosing this animal was snuffed up with the air, rather than by the round of circulation, and through the same passage the animal was discharged.

As to the causes of *worms*, they are various; however, they are seldom found, except in weak and relaxed stomachs, where the digestion is bad: sedentary persons are consequently more subject to them than the laborious and active.

Worms are often the effects of eating great quantities of unripe fruit, or raw herbs and roots; they are frequently a symptom of fevers, and other acute diseases; and there seems to be an hereditary disposition in some persons to this disease.

The common symptoms of *worms* are, paleness of the countenance, and, at other times, an universal flushing of the face; itching of the nose, though this is doubtful, as children pick their noses in all diseases; starting, and grinding of the teeth in sleep; swelling of the upper lip; the appetite sometimes bad, at other times quite voracious; looseness; a sour or stinking breath; a hard, swelled belly; great thirst; urine frothy, and sometimes of a whitish colour; griping, or colic pains; an involuntary discharge of saliva, especially when asleep; frequent pains of the side, with a dry cough, and unequal pulse; palpitations of the heart; swoonings, drowsiness, cold sweats, palsy, epileptic fits, and many other unaccountable nervous symptoms, formerly ascribed to witchcraft, or the influence of evil spirits. The long round *worms*, in particular, occasion squeamishness, vomiting, a disagreeable breath, gripes, looseness, swelling of the belly, swoonings, loathing of food, or voracious appetite, dry cough, convulsions, epilepsy, fits, and sometimes privation of speech. These *worms* have been known to perforate the intestines, and get into the cavity of the belly. The effects of the tape-*worm* are nearly the same, but more violent.

Beside the other common symptoms, those affected with this, have one peculiar to them; which is, that with their stools they frequently discharge several little bodies, like gourd-seeds. See TAPE-*worm*.

Andry says, the following symptoms attend the solium, which is a species of the tape-*worm*, viz. swoonings, privation of speech, and a voracious appetite. The round *worms* called *ascarides*, besides an itching of the anus, cause swoonings, and tenesmus, or an inclination to go to stool.

In Persia, &c. there are also very long slender *worms*, six or seven yards long, bred in the legs, and other parts of men's bodies: when arrived at a certain pitch, they put out their heads, necks, &c. and withdraw them (if displeased or hurt) again, causing intolerable pains, fevers, &c. See DRACUNCULI.

Aristotle observes, that most deer have *worms* under their tongues. Sheep's noses often abound with them.

Fish are, apparently, more subject to *worms* than other animals; the cod has often small slender *worms*, coiled up like snakes, on the surface of its liver. The bleak is also much distressed, about the month of July, by a long flat *worm*, which, by eating its liver, makes it tumble about on the surface of the water, and either die suffocated, or become a prey to its enemies. Aristotle (Hist. An. lib. viii. cap. 20.) gives a similar account of the ballerus and tillo.

There is also a species of dropsy incident to bullocks and sheep, which is owing to a small flat *worm*, found in the gall-duct, and enclosed within a kind of stony tube, that stops the passage of the gall. Young bullocks are subject to a disease called the husk, and ascribed by Dr. Nicholls to a similar cause. See COUGH. Phil. Trans. vol. xlix. p. 246, &c.

In the Philosophical Transactions, Nº 113. we have accounts of divers remarkable operations, whereby *worms* were taken out of divers unsuspected parts of the body, the operators being chiefly women. Mrs. Mary Hastings is there recorded, as famous for the discovering of *worms* hid in the face, gums, tongue, &c. which she managed with such address, that she took them out of any part affected, with a goose-quill. Mr. Dent relates, that he himself was cured of certain odd tumors on his tongue, by one of those *worm*-doctresses, Mrs. French, who, piercing the parts affected with a lancet, drew out five or six *worms* at a time. In less than eight days, he assures us, she took out of his tongue above a hundred *worms*, and thirty out of his gums.

Many effects have been by the ignorant attributed to *worms*, in which they have had no share; and many things called *worms*, have no right to that name.

We to this day vulgarly call the little black prominent spots in people's faces, *worms*; but they are not so, nor any

any thing living. We owe the true knowledge of theſe to the ſagacious Mr. Leewenhoeck, who, examining them by the microſcope after they were taken out of the face, found them only to be bundles of hairs, or imperfect hairs in ſmall portions enveloped in thin films; in ſome, the fragments of hairs are evident, being ſtrong and rigid; but in others they ſeem ſoft and pulpy.

We have accounts in the Acta Leipſienſia, of *worms* not only voided by urine, but let out of the veins in blood-letting; but there want more teſtimonies of ſuch marvellous things to procure them a general belief.

Sir Theodore Mayerne aſſures us, in the Philoſophical Tranſactions, N° 211. that the famous ſugar, or remedy given by Pontæus (a celebrated chemical empiric) for the *worms* in children, is fifteen grains of mercurius dulcis, with five grains of ſcammony, and two or three times as much ſugar, made up in lozenges. He adds, that this doſe of the ſcammony, which in France purges grown perſons, is ineffectual in England, to perſons of above fifteen years old, and ought to be augmented.

There is a great variety of medicines given for deſtroying the *worms* which breed in human bodies; but as they are of very different kinds, there is great caution required in ſelecting ſuch as are moſt proper for each peculiar caſe.

Acids, in general, are eſteemed good in theſe caſes; and lemon-juice, vinegar, and other vegetable acids, ſuch as pomegranat and currant-juice, and the like, are given; and ſometimes the mineral ones, as the ſpirit of vitriol, ſulphur, and the like. All theſe are properly given when there is a preternatural heat, and feveriſh diſpoſition; for they not only allay the heat, but reſiſt putrefaction.

Bitters in general are alſo reckoned among the medicines good againſt *worms*; of this kind are wormwood, ſmall centaury, rue, and the like; and to theſe are to be added the purging bitters, ſuch as rhubarb, aloes, and coloquintida. Theſe medicines do not act merely as bitters; for it is well known, that many inſects will endure the bittereſt ſubſtances unhurt, and *worms* will breed in the gall-bladder; but they correct and alter the crude and viſcid matter in the inteſtines by which theſe animals are nouriſhed, and by ſtimulating the fibres of the inteſtines they often diſcharge the noxious matter, and *worms* themſelves with it. They alſo correct the inactivity of the bile, which in children and perſons of moiſt habits is the general cauſe of the breeding and living of theſe inſects.

Oily medicines of all kinds are by ſome greatly extolled in caſes of *worms*; and there ſeems this reaſon for it, that all inſects are deſtroyed by being put into oil, and that flies and many other ſmall animals, which, after ſeeming dead on the being immerſed in other liquors, would come to life again on being expoſed to the ſolar rays, never revived again after being drowned in oil. To this it is to be added, that very good effects always follow the giving of oils, in caſes of the greateſt torment from *worms*; for they relax the ſpaſmodically contracted coats of the inteſtines, and as it were defend and line them with a ſort of mucilage, in ſuch a manner that the more acrid purging medicines, neceſſary to the utter deſtruction of the animals themſelves, may be given with more ſafety. Thus it is a very good method to give a child over night half an ounce or more of oil of ſweet almonds, and in the morning following a briſk purge of the reſin of jalap, mercurius dulcis, or any thing elſe of this kind. Or, an ounce of ſallad-oil, and a table-ſpoonful of common ſalt, may be taken in a glaſs of red port-wine thrice a day, or oftener, if the ſtomach will bear it. But the more common mode of uſing oils is in clyſters; oily clyſters ſweetened with ſugar or honey are very efficacious in bringing away the ſhort round *worms* called aſcarides, and likewiſe the teres.

Saline ſubſtances in general are alſo greatly celebrated by many in caſes of *worms*, and they are indeed capable of acting in a double capacity againſt them, at once deſtroying the tender ſtructure of many of them, and vellicating the inteſtines, ſo as to promote the diſcharge of them. The common bitter purging ſalts, as the Glauber's ſalt, and the natural ſalt contained in the purging waters of different places, are the beſt of all for this purpoſe: if the natural waters are drank, it ſhould be in conſiderable quantities; and if the factitious ſalt be taken, it ſhould be diſſolved in large portions of water.

Many people who live on the ſea-coaſts give their children ſea-water, for the ſame purpoſe; and ſome uſe the broth of recent oyſters, with pepper and other ſpices, and lemon-juice. If ſea-water cannot be had, water in which common ſalt has been diſſolved may be drank; ſome flour of ſulphur may be taken at night, and the ſalt-water in the morning.

Salts of the vitriolic kind have alſo long been celebrated as remedies for *worms*; and the common ſalt of ſteel, as alſo the Pyrmont waters, which are highly impregnated with particles of that metal, are found very uſeful in all caſes of this kind.

Harrowgate-water is an excellent medicine for expelling *worms*, eſpecially the ASCARIDES. Hence we may infer that ſulphur is a good medicine: accordingly, ſome have adminiſtered ſulphur with great ſucceſs. It ſhould be made into an electary with honey or treacle, and taken in ſuch quantity as to purge the patient.

But if any diſorder admits of ſpecific remedies we might expect that this malady would; for theſe purpoſes many extol ſome of the gums, as aſſa-fœtida, galbanum, and myrrh, and the leaves of ſome plants, as wormwood, tanſy, and rue. Onions and garlic, and Indian pink, are alſo greatly commended; and bitter almonds and worm-ſeed have long been famous. All theſe are found peculiarly deſtructive of *worms*; but the powder of tin with Æthiops mineral, and the purges of rhubarb and calomel, are more to be depended upon.

Among the minerals, we find alſo one remedy greater than all theſe, that is quickſilver; this has been given in many various forms, and found more or leſs ſucceſsful in all. Water, in which crude quickſilver had been boiled, was firſt given by Helmont, and that with great ſucceſs; the efficacy of which has been attributed to a portion of arſenic, which it takes up from this mineral: after this Meibom infuſed crude mercury in Rheniſh wine, and found this more effectual than the former. But the moſt ſucceſsful method ſeems the giving of proper doſes of mercurius dulcis, with ſome purging medicines, as the reſin of jalap.

Æthiops mineral, which is a mixture of quickſilver and ſulphur, is found alſo of great uſe; and quickſilver, rubbed to a mixture with ſugar-candy, is preferred by Hoffman to all the other preparations.

The beſt purge for an adult, ſays Dr. Buchan, is jalap and calomel; twenty-five or thirty grains of the former with ſix or ſeven of the latter, mixed in ſyrup, may be taken early in the morning for a doſe; in which caſe the patient ſhould keep the houſe all day, and drink nothing cold. The doſe may be repeated once or twice a week, for a fortnight or three weeks. On the intermediate days the patient may take a dram of the powder of tin, twice or thrice a day, mixed with ſyrup, honey, or treacle. Thoſe who do not chuſe to take calomel, may uſe the bitter purgatives, as aloes, hiera picra, tincture of ſena, and rhubarb, &c. For a child of four or five years old, ten grains of rhubarb, five of jalap, and two of calomel, may be mixed in a ſpoonful of ſyrup or honey, and given in the morning. In this caſe the child ſhould avoid cold. The doſe may be repeated twice a week for three or four weeks. On the intermediate days the child may take a ſcruple of powdered tin, and ten grains of Æthiops mineral, in a ſpoonful of treacle, twice a day. Theſe doſes may be increaſed or diminiſhed, according to the age of the patient.

Biſſet ſays, the great baſtard black hellebore, or bear's foot, is a moſt powerful vermifuge for the long round *worms*. He orders the decoction of about a dram of the green leaves, or about fifteen grains of the dried leaves in powder, for a doſe, to a child between four and ſeven years of age. This doſe is to be repeated two or three times. He adds, that the green leaves, made into a ſyrup with coarſe ſugar, are almoſt the only medicine he has uſed for round *worms* for ſome years. Before the juice is preſſed out, he moiſtens the bruiſed leaves with vinegar, which corrects the medicine: the doſe is a tea-ſpoonful at bed-time, and one or two next morning.

Dr. Buchan ſays, he has frequently known thoſe big bellies, which in children are commonly reckoned a ſign of *worms*, quite removed, by giving them white ſoap in their pottage, or other food. Ball's purging vermifuge powder is a very powerful medicine: it is made of equal parts of rhubarb, ſcammony, and calomel, with as much double refined ſugar as is equal to the weight of all the other ingredients: theſe muſt be well mixed together, and reduced to a fine powder. The doſe for a child is from ten grains to twenty, once or twice a week. An adult may take a dram for a doſe. See *Worm*-POWDER.

Dr. Storck ſays, that he hath deſtroyed all ſorts of *worms*, viz. the round, the aſcarides, and tape-*worm*, by the following mixture. ℞ Sal polychreſt. pulv. rad. jalap. & rad. valer. ſilv. pulv. āā ʒj. ox. ſcillit. ℥ iv. m. exhibeatur adultis quater per diem ℥ ß. junioribus vero ʒj. aut ʒij.

After a cure by theſe means, the patient ſhould be prevented from a relapſe, by abſtaining for a time from fleſh and fiſh; and, after this, from milk and cheeſe. Acrid purgatives, or hot remedies, are never to be given, where there is any febrile heat; and when there is cauſe to ſuſpect that the duodenum is full of an acrid bile, then mercurials are to be avoided; as are all the draſtic purges; for theſe medicines, in theſe circumſtances, often bring on inflammations of the bowels.

Before

WOR

Before the expelling of the *worms* from the ſmall inteſtines, it is proper to give clyſters of milk and honey, to allure all the *worms* together to that part. In caſes of the aſcarides lodged in the inteſtines, clyſters of milk with tanſy, garlic, and ſcordium boiled in it, have great effects; and clyſters of brine, or ſalt and water, with aloes added to it, are alſo found of great benefit. As theſe troubleſome *worms* are uſually lodged in the rectum, theſe clyſters take immediate effect.

It is proper alſo to give a vomit during the courſe of cure, to diſlodge ſuch *worms* as may have got into the inteſtinum cœcum, ſince purging medicines cannot reach them while they remain there. External applications alſo of bull's gall, aloes, and coloquintida, are of ſervice, laid in form of a cataplaſm to the belly.

As *worms*, though expelled, will ſoon breed again, if the ſtomach remains weak and relaxed; for the prevention of this the Peruvian bark is recommended. Half a dram of it in powder may be taken in a glaſs of red-port wine, three or four times a day. Lime-water is alſo good for this purpoſe, or a table-ſpoonful of the chalybeate wine taken twice or thrice a day. Infuſions or decoctions of bitter herbs may likewiſe be drank; as the infuſion of tanſy, water-trefoil, camomile-flowers, tops of wormwood, the leſſer centaury, &c. Moreover, children liable to *worms* ſhould not be nouriſhed with food difficult to digeſt. Dr. Tiſſot cautions againſt ſtuffing them with oils, which, though they ſhould kill ſome of the *worms*, increaſe the cauſe, which diſpoſes them to generate others; and he ſays, that a long continued uſe of filings of iron is the remedy, that moſt effectually deſtroys this diſpoſition to generate *worms*. Dr. Buchan warns thoſe of their danger, who buy cakes, powders, and other *worm* medicines, at random, from quacks, and give them to their children without proper care. The principal ingredients in moſt of them is mercury, which is never to be trifled with. Hoffm. Oper. tom. iv. Buchan's Dom. Med. chap. xxxv. Tiſſot's Advice, &c. p. 390.

Tin is often recommended as a good remedy againſt *worms*, particularly of the flat kind. Dr. Alſton, in the Med. Eſſ. Edinb. vol. v. art. 7. directs an ounce and a half of the powder of pewter-metal to be mixed in half a Scotch mutchkin, or about half a pint Engliſh meaſure of treacle, for children; but to grown perſons, he gives two ounces of the powder of pure tin, paſſed through the fineſt hair-ſieve, and mixed with eight ounces of treacle. As to the adminiſtration of this medicine, the original receipt directs half of it to be taken the Friday before the change of the moon; the day after, half the remainder, and the reſt on Sunday. On the Monday a purge is to be taken. The doctor thinks there is probably nothing in the particularities of the day; but ſays, the medicine ſucceeds well in ſeveral ſpecies of *worms*.

The efficacy of FERN-*root* againſt *worms* was known in the time of Dioſcorides; and towards the beginning of this century, meſſieurs Andry and Marchant publiſhed accounts of ſucceſsful modes of exhibiting it in theſe caſes. But it has been principally celebrated of late as a ſpecific in the cure of the tænia, or TAPE-*worm*.

Dr. Prieſtley, conſidering how fatal nitrous air is to inſects, and likewiſe its great antiſeptic power, conceived that conſiderable uſe might be made of it in medicine, in the form of clyſters; and he apprehends, that if nitrous air was diluted with common air, or fixed air, the bowels might bear it better, and that it might ſtill be deſtructive to *worms* of all kinds, and be of uſe to check or correct putrefaction in the inteſtinal canal, or other parts of the ſyſtem. Prieſtley's Obſ. on Air, vol. i. p. 227.

WORMS, *aquatic*. See *Water* WORMS.

WORM, *aſcaris*, in the *Linnæan Syſtem*, a genus of the order of *inteſtina*, and claſs of *vermes*; the characters of which are, that the body is round and filiform, and attenuated towards both ends. There are two ſpecies. See ASCARIDES.

WORM, *bee*. See *Generation of* BEES.

WORM, *butterfly*. See AURELIA, and CATERPILLAR.

WORM, *canker*. See SCARABÆUS.

WORM, *churr*. See *Mole* CRICKET.

WORM, *cochineal*. See COCHINEAL.

WORM, *Connough*, or *Connaught*, in *Natural Hiſtory*, a name given by the common people of Ireland to a kind of caterpillar found in many parts of that kingdom; and, from its ugly aſpect, reputed to be poiſonous.

It is ſaid to be the only poiſonous creature of that kingdom, and many miſchievous effects are attributed to its ſting, and to its poiſonous quality, when eaten by cattle. As to the firſt of theſe opinions, it is evidently erroneous; the creature having no power to ſting at all. The other is not ſo eaſily proved falſe, but is much to be ſuſpected. The reaſons on which it is founded, are theſe: the cattle in Ireland are ſubject to a very terrible diſeaſe, which is moſt frequent in autumn; about the time when theſe animals are in the greateſt plenty.

It is moſt frequent alſo among thoſe cattle which feed in low and marſhy grounds, where this creature lives and feeds; cows and hogs which feed in theſe places are the only creatures ſubject to the diſtemper, and this is imputed to the cow's eating by large mouthfuls, becauſe ſhe chews the cud a ſecond time; and the hogs feeding ſo foul and greedily, as to eat things which other creatures refuſe. Finally, the great cauſe of aſſigning this diſeaſe to this creature, is, that the *worm* only appears in great numbers about once in ſeven years; and in theſe, and theſe years only it is, that the diſtemper among the cattle is common.

The ſymptoms by which this diſeaſe is diſtinguiſhed from all others are, a great ſwelling of the head, and a falling down of the anus; the gut often hanging out to the length of ſix or ſeven inches. The common cure among the more intelligent people is a ſtrong decoction of the plant called bearsfoot, or great black hellebore, with ſome rue and garlic given with butter and beer; this is found to have great ſucceſs with the cows. The hogs are cured only by mixing reddle, or the common red ochre powdered, with butter-milk, and making them eat a large quantity of it.

The Iriſh peaſants have recourſe to many idle remedies; but theſe are found often of real ſervice. The caterpillar, ſuppoſed to occaſion this diſeaſe, feeds on the common ragwort, and is larger than moſt other creatures of this kind, being of the length and thickneſs of a man's finger; it is marked with two large ſpots behind the head, which are ſuppoſed by the vulgar to be the eyes, but are only round variegations, of the nature of thoſe common on other caterpillars; and what they take to be a ſting in the tail, is no other than a horn in that part, which is not peculiar to this caterpillar, but found on many others. That the common people are deceived in regard to the external parts of this creature, is evident; but experiments are required yet to prove whether or not they are ſo, in regard to its poiſonous quality.

One trial is remarked by Mr. Molyneux to have been made on a dog, who eating the ſkin of only one of the creatures was found dead about three days after; another dog, which drank the juices expreſſed from that ſkin, received no hurt. The inſect is deſcribed in Liſter's edition, under the name of the elephant caterpillar. Phil. Tranſ. N° 168. p. 880.

WORM, *earth*, *lumbricus*, a genus of the order of *inteſtina*, including two ſpecies. See EARTH-*worm*.

WORM, *flower-root*. See FLOWER.

WORM, *fly*, in *Natural Hiſtory*, the *worm* or maggot produced of the egg of a fly, and afterwards to be transformed into one.

Theſe *worms* are to the fly, what the caterpillar is to the butterfly it produces. The cuſtom of the world has appropriated the term caterpillar to that one ſpecies of the flying inſects firſt ſtate; but we have unfortunately no term of diſtinction yet eſtabliſhed for any of the firſt ſtate of any of the other flying inſects, the creature produced by the egg of the fly ſcarce being indeterminately called *worm*. Till more expreſſive names ſhall be invented for theſe, it may not be improper to diſtinguiſh thoſe of the different claſſes by the additional name of the inſect they are to be changed into, and to call that which is to become a beetle, the *ſcarab-worm*; that which is to be hereafter a fly, the *fly-worm*; and ſo of the reſt.

Thoſe which are to be hereafter winged creatures of the fly-claſs, are extremely different one from another in form and figure, and may very properly be arranged into ſeveral claſſes.

The moſt remarkable and ſtriking differences between the claſſes of theſe creatures, are thoſe of the form and ſhape of their heads. Many of them have heads which it is not eaſy to diſtinguiſh to be ſuch, as they carry no one mark of the head of an animal viſibly about them. There are many, whoſe heads are variable at the pleaſure of the creature, and which at times are ſeen to be more or leſs long, more or leſs thick, more or leſs flat, more or leſs ſhortened at pleaſure by the animal, and eaſily bent and turned about in any direction. The heads of theſe creatures are compoſed of a very ſoft and flexible fleſh.

There are others, whoſe heads are hard, and which always retain the ſame regular figure. The firſt general arrangement of theſe *worms* may be into thoſe which have a variable, and thoſe which have an invariable head. The ſubordinate diſtinctions may be deduced from the number, diſpoſition, ſtructure, and form of the other parts. Some *worms* of this kind have no legs; thoſe of others are membranous or ſcaly; and others have them both membranous and ſcaly. Some *worms* have the power of altering the figures of their bodies at pleaſure, both as to length and bulk: the bodies of others are rigid,

gid, and incapable of theſe changes. Some, again, have a thin, membranous coat; whereas that of others is firm and ſcaly, or cruſtaceous. Moreover, conſiderable differences are obſervable with regard to the poſition, number, and figure, of their organs of reſpiration.

Among the *fly-worms* of variable heads, the diſpoſition of the ſtigmata, or air-holes, at which the tracheæ of theſe animals terminate, will afford ſeveral diſtinctions of genera: e. gr. the *worms* of the common fleſh-fly has in its ſtigmata ſix apertures, three in each, reſembling button-holes; but the *worms* of many other flies have only one ſmall eminence in each: others have them cylindric and hollow, and projecting like horns, of which ſome have two, and others three, differently ſituated and diſpoſed. The number and figure of the hooks, which ſerve theſe creatures for teeth, may alſo ſerve for matter of diſtinction. The common *worm* of the fleſh-fly has two hooks, with a dart between them; others have hooks without a dart; ſome have one hook, and others none. The figure of the body, and the differences of ſize and colour, may furniſh farther diſtinctions with regard to the genera of the firſt claſs.

Thoſe of the ſecond claſs, which have variable heads, and differ from the former in having legs like thoſe of the caterpillar claſs, have often a ſort of hooks faſtened to them: they have alſo a long fleſhy tail, capable of being lengthened or contracted at pleaſure, and reſembling the tail of a rat; whence theſe are called *rat-tailed worms.* In theſe *worms* the tail is the principal organ of reſpiration; its end being always open, and ſupplying the office of the ſtigmata of the other genera.

The *fly-worms* of the third claſs, which have invariable heads, and have nothing analogous to the organization of moveable jaws, have pointed heads, or ſuch as ſeem truncated, and no ſcaly legs: theſe form a very numerous family both in the terreſtrial and aquatic kingdom, and all of them furniſh two-winged flies. Under this claſs Reaumur enumerates and deſcribes eight genera. This ingenious writer mentions *worms* of another claſs, which uſually produce four-winged flies, having heads of an invariable figure, and two teeth or moveable jaws, near the aperture of the mouth, without ſcaly legs, and with the ſtigmata placed on the ſides of their bodies. The flies produced from theſe are the bees, waſps, ichneumons, gall-flies, &c. There is another claſs of the hexapode, or ſix-legged *worms*, which are transformed into ſome ſpecies of the libellæ; which have no mouth, but two openings at the top of their antennæ, through which their aliment may paſs. The formica leo, and the puceron eaters, belong to this claſs. There is another claſs, which have bodies like thoſe of the caterpillar claſs, and ſix legs, beſides two other ſhorter legs or hooks, near their hinder part, which ſerve for motion and for fixing themſelves. The water *worms*, which make for themſelves caſes of different materials, and are transformed into papilionaceous flies, are of this claſs. There is alſo a claſs of *worms*, called falſe or baſtard caterpillars. See Fausse *chenille*. See the more particular deſcription of theſe claſſes, and their ſubordinate genera, in Reaumur's Hiſt. Inſ. tom. iv. p. 161, &c.

Worm, *gourd*, the name of a ſpecies of *tænia*, or tape-*worm*; the body of which is of an oblong form, flat on the belly, and rounded on the back; its ſkin is ſoft, and its mouth large, horizontal, and emarginated, or dented in the middle. It reſembles the common gourd in figure, and from thence has got this name of *vermis cucurbitinus*, or the *gourd-worm*. It is frequently found in the inteſtines of animals.

Worm, *golden*. See Aphrodita.

Worm, *Guinea*, or *Hair*-Worm. See Chætia, Amphisbæna, and Dracunculi.

Worm, *gally*, *glow*, *gnat*, *gooſeberry*, *hay*, *horſe*, *lyſimachia*, *muſhroom*, *oyſter*, *pile*, *ſheep-noſe*, *ſilk*, *ſolitary*, *ſpermatic*, and *truffle*. See the reſpective articles.

Worms, *meal*. There are two very different inſects found in our meal or flour; the one is ſo ſmall, that it is only to be ſeen by the microſcope; all that the naked eye can diſcover of it is, that ſomething is alive in the place, from the whole ſubſtance of the flour being in motion. See Flour.

The other *meal-worm* is larger, and more frequently offers itſelf to our obſervation; it conſiſts of eleven rings, and has three pair of legs. The mouth of this *worm* is made into a kind of forceps, and from this ariſe, on each ſide, a great number of ſmall ſpinulæ; theſe ſerve inſtead of teeth, and the animal feeds by means of them. They are found ſometimes very ſoft and tender, ſometimes hard and firm; at ſome ſeaſons they are very briſk and lively, at others they have ſcarce any life in them.

The moſt remarkable thing in regard to theſe *worms*, is, that they are always exactly of the colour of the flour which they live among. Ray has obſerved, that the white flour breeds white ones; the coarſer flour breeds larger and greyer ones; and that flour which has the bran among it, breeds brown ones of the ſame colour with that of itſelf. This is a proviſion of nature for the ſafety of the animal, ſince were it of a colour different from that of the flour, it muſt be eaſily diſcovered among it, and would be picked out and thrown away. The caterpillar tribe are thus preſerved, by being of the colour of the leaves they feed on; their green uſually ſuiting itſelf exactly to that of the tree or plant. Deſlandes, Trait. Phyſ.

Worms *of the ſea*. The ſea-*worms* are of the number of thoſe animals, which, with the oyſter and ſeveral other ſhell-fiſh, furniſh us an inſtance of animals which remain all their lives fixed in the manner of plants to one ſpot, whence there is no probability of their moving themſelves.

Theſe *worms* are included in a ſort of caſes or pipes, and may be divided into two claſſes, according to the nature of thoſe caſes. In the one ſpecies theſe are only made of grains of ſand, fragments of ſhells, and the like, faſtened together by a viſcous humour; and in the other they are compoſed of a true ſhelly matter.

Thoſe *worms* which have ſhelly caſes are fixed ſometimes to the ſand at the bottom of the ſea, ſometimes to ſtones, or ſea-ſubſtances, and ſometimes to the ſhells of other fiſhes; their ſhells are rounded, and, in ſome degree, conic, as they always gradually grow wider from their point or apex to the mouth; as to the reſt, their ſhape is different in almoſt every individual, forming divers irregular curves, and often reſembling the ſhapes into which a common earth-*worm* curls and twiſts itſelf in its various motions.

When we conſider the effects of the glutinous juice iſſuing from the body of this animal, in faſtening together any looſe ſubſtances it meets with, ſo as to form a caſe for it, it may be eaſily ſuppoſed that the adheſion of the *balani-marini*, and other the like ſhells, which remain all their lives fixed to ſome one ſpot, is performed in the ſame manner. Mem. Acad. Par. 1711. See Vermiculus.

Worms, *water*. Of theſe there are ſome which transform themſelves by a ſingular proceſs, without any viſible change in its exterior form, into flies, and belong to the third claſs of *fly*-worms. They are particularly deſcribed by M. Reaumur. Hiſt. Inſ. tom. iv. p. 310, &c. See *Tab.* III. *Inſects*, *fig.* 40, &c.

There is a ſingular ſpecies of theſe creatures, which is found to be capable of reproduction or multiplication from cuttings, in the manner of the polype.

The diſcovery Mr. Trembley made of this ſtrange property in the polype, gave occaſion to the trying of the experiment in regard to ſome other inſects. *Worms* were the moſt natural objects of theſe experiments; and though they failed in many ſpecies, they yet ſucceeded in ſome, and proved, that nature has not given that amazing property of reproduction of its moſt eſſential parts, to only one ſpecies of animals.

Mr. Bonet tried the experiment on a very nimble kind of *water-worm*, by cutting it in two in the middle, and the ſucceſs perfectly anſwered the expectation; for the two pieces continued alive and vigorous, and in a little time became two complete *worms*. The ſtructure of theſe *worms*, though it appear ſimple to the naked eye, is yet worthy the examination of the microſcope, and when viewed with this aſſiſtance, there are diſcovered in it parts extremely deſerving our attention. Phil. Tranſ. Nº 469. p. 470.

Dr. Hales, in his Vegetable Statics, relates a curious experiment, by which it is proved that the bones of animals, when they are oſſified to a certain degree, do not grow any longer, except at their extremities; and the caſe is the ſame, in regard to theſe *worms*; for the old piece, which is the middle of the animal, never lengthens itſelf, but the addition of new rings to each end makes the increaſe of length in the *worm*.

In all theſe pieces the liquor, which ſerves as blood to the animal, is found circulating from the tail-part towards the head, in the uſual way; and by this motion of the blood it is always eaſy to know, even in the ſmalleſt pieces, which is the head and which the tail-end, and the new head and tail are always ſeen to come regularly from the proper ends. Phil. Tranſ. Nº 469. p. 470, &c. See Reproduction.

Worm, in *Chemiſtry*, denotes a long, winding pewter-pipe, which diſtillers and apothecaries place in a tub of water, to cool and condenſe the vapours in the diſtillation of ſpirits.

This the chemiſts alſo call a *ſerpentine*. Formerly, this *worm*, or ſomething like it, was placed above the head of the still, with a refrigeratory at the upper end of it, which is uſeful enough in the diſtilling of ſpirit of wine.

Worm,

Worm, in *Gunnery*, is a single or double-wired iron screw, mounted on a wooden handle by means of a socket, or fixed on the end of a rammer, to pull out the wad of a cannon, firelock, carabine, or pistol; it is the same with the *wad-hook*, only the one is more proper for small fire-arms, and the other for cannon.

This instrument serves to draw out the wadding, or pieces of cartridges, which remain in the gun after frequent firing, and which would otherwise accumulate so much, that other cartridges could not be rammed home enough to reach the priming, whereby the gun would miss fire.

To Worm *a cable*, or *hawser*, in the *Sea-phrase*, signifies to strengthen it, by winding a small line, or rope, all along between the strands.

Worm-*bark tree*. See Cabbage-*bark tree*.

Worm-*powders*. See Powder.

Worm-*seed*, *semen contra*, *semen sanctum*, or *semen santonicum*, is a hot, bitter, drying kind of seed, proper to destroy *worms* generated in a human body, and particularly in children.

This seed is light, small, of a brownish colour, an oblong figure, a bitter taste, and a strong smell. It must be chosen new, greenish, of a sharp, bitter, aromatic taste, not a little disagreeable.

The place where it is produced is Persia, about the frontiers of Muscovy. It is brought to us from Aleppo, &c. Naturalists have not been agreed about the plant that produces it.

J. Bauhin has a large dissertation on the subject. Some will have it the species of absynthium, or wormwood, called *santonicum*, or *marinum absinthium*; others will have it the *tanacetum*, others the *abrotanum*; but it is now supposed to be the produce of a species of *artemisia*, resembling in its general appearance our fine-leaved mugwort, called by Linnæus *artemisia santonica*, and the *artemisia austriaca* of Jacquin.

Mr. Tournefort gives us the following account of this notable drug, in the second volume of his Travels. The sementine, or *worm-powder*, is not gathered like our seeds. The plant grows in the meadows, and must be let ripen; and the mischief is, that as it grows near to maturity, the wind scatters a good part of it among the grass, where it is lost; and this makes it so dear.

As they dare not touch it with the hand, for fear of making it spoil the sooner, when they would gather what is left in the ear, they have recourse to this expedient. They take two hand-baskets, and, walking along the meadows, sweep the baskets, the one from right to left, the other from left to right, as if they were mowing; by this means the seed is shaken out into the baskets.

These seeds have been chiefly recommended as anthelmintics, and commonly taken, in this intention, either along with melasses, or candied with sugar. For other purposes they appear to be a strong bitter. They give out their virtue both to water and spirit. The extract made by rectified spirit appears to be the most eligible preparation of the santonicum for the purposes of an anthelmintic; and the watery extract, or a tincture drawn from it, for the more general intentions of bitter medicines.

Worm-*tincture*, in *Chemistry*, a name given by many to a medicine prepared by Hoffman, from earth-*worms*; and in many parts of Germany esteemed one of the greatest medicines in the world, though less known in other places.

The preparation is this: the *worms* are to be collected in the spring or summer months, and the larger sort are the best. They are to be carefully dried, and reduced to a fine powder; this powder is to be mixed up into the consistence of a poultice, with oil of tartar per deliquium, and this is to stand twenty-four hours; then spirit of wine is to be poured on it, so as to reach three fingers-breadth above it, and a dram of saffron, and half a dram of castor, are to be added, and the whole is to stand three days in infusion, and after this be filtred off for use. Some add a small quantity of opium to the tincture, but as it is often wanted in cases where opium is not proper, it is better to keep it separate thus made; and when there is occasion to have it opiated, to add as many drops of laudanum as is judged necessary.

The oil of tartar in this case penetrates the very innermost structure of the *worms*, and is a means of extracting such a tincture from them, as no art could otherwise contrive to make; and the medicine becomes, according to Hoffman, much more an anodyne, from the admixture of the salt of tartar in the tincture.

When it is intended to be made with opium, it is always proper to add also some of the hound's tongue root, which is found as an anodyne to emulate the virtues of opium.

This tincture, which ever way prepared, is excellent in abating the pains of diseases, that do not admit a cure. The fits of the gout are rendered easier by every dose of it; and even in cancers, the pain is quieted in a wonderful manner by it, and life rendered much more supportable. Hoffman's Act. Laborator. Chym.

WORMWOOD, *absinthium*, in *Botany*, a genus of plants, according to Tournefort and Miller, the characters of which are these: there are many female and hermaphrodite flowers included in the same scaly empalement; the latter, which occupy the middle, are tubulous, consisting of one leaf, divided into five parts at the top; the former are ranged round the border. The only distinction between the *wormwood* and southernwood is, that the empalement of the former is more globular than that of the latter, and the seeds have small hairs fixed to their bottom. Miller enumerates thirty-three species. Linnæus ranges the *wormwood* under the genus of artemisia.

The common *wormwood*, *artemisia absinthium* of Linnæus, grows wild about dunghills, and on dry waste grounds, flowers in June or July, and may be propagated by slips in March or October, or raised from seeds sown soon after they are ripe. The leaves have a strong offensive smell, and a very bitter nauseous taste; the flowers are equally bitter, but less nauseous; the roots are warm and aromatic, without the bitterness and offensiveness of the other parts: the leaves lose part of their ill smell, by being dried and kept for some time.

Wormwood leaves give out nearly the whole of their smell and taste both to aqueous and spirituous menstrua; the former, prepared without heat, being the least ungrateful. Rectified spirit elevates little from this plant in distillation; water brings over nearly the whole of its smell and flavour. Along with the aqueous fluid there arises an essential oil, which smells strongly, and tastes nauseously of the *wormwood*, though not bitter. The oil drawn from the fresh herb is commonly of a dark green; from the dry, of a deep yellowish brown colour. The quantity of oil varies according to the season and soil in which the *wormwood* is produced: in some years ten pounds have afforded upwards of two ounces; in others, twenty pounds have yielded little more than one ounce. Geoffroy observes (Mem. Acad. Par. 1721.) that, in rainy seasons and moist soils, it yields the most oil; that in dry years the oil is accompanied with a resinous matter, and proves of a fine green colour; and that in wet seasons it is less resinous, and not green. A decoction of *wormwood* in water, long boiled, and inspissated to the consistence of an extract, loses the smell and flavour of the plant, but retains its bitterness. An extract, made with rectified spirit, contains, along with the bitter, nearly the whole of the nauseous part; the watery extract gives out its simple bitterness, not only to water again, but to rectified spirit.

Wormwood is a moderately warm stomachic and corroborant: for these intentions it was formerly in common use, but it has now given place to bitters of a less ungrateful kind. An infusion of the leaves, with the addition of fixed alkaline salt, is a powerful diuretic in dropsical cases. The essential oil is sometimes given, in doses of a drop or two, properly diluted by solution in spirit of wine, as a mild antispasmodic. Its more frequent use is a vermifuge; for which purpose it is both applied to the belly, and taken in pills made with crumb of bread. Dr. Lewis, however, says, that the spirituous extract promises to be, in this intention, preferable to the pure oil; as it contains, along with the oil, all the bitter matter of the *wormwood*. This plant very powerfully resists putrefaction, and is made a principal ingredient in antiseptic fomentations. Boerhaave commends, in tertian agues, a medicated liquor, prepared by grinding about seven grains of the oil with a dram of sugar, and two drams of the alkaline salt extracted from the ashes of *wormwood*, and afterwards dissolving the compound in six ounces of the distilled water of the plant. Two hours before the fit is expected, the patient is to bathe his feet and legs in warm water, and then drink half an ounce of the liquor every quarter of an hour, till the two hours are expired; by this means, he says, cases of this kind are generally cured with ease and safety, provided there is no scirrhosity or suppuration.

Dr. Lewis observes, that this medicine is a very serviceable aperient, where obstructions of the viscera prohibit the immediate use of the bark, and in such obstructions as the imprudent use of the bark may have occasioned. Its virtues, he says, might be improved by an addition of the bitter watery extract; though the compound, thus laboriously prepared, would not be at all superior to a simple infusion of the plant in pure water, impregnated with a due proportion of fixt alkaline salt.

The roots of *wormwood*, says Dr. Lewis, promise to be applicable to some useful purposes: their virtue resides chiefly in the cortical part; and rectified spirit extracts their

their flavour more perfectly than watery liquors. The Edinburgh college, in their last edition, direct a tincture of the dried flowering tops of *wormwood*, in the proportion of six ounces to a quart of rectified spirit, under the title of *tinctura absinthii*. Lewis's Mat. Med.

The ashes of *wormwood* afford a more pure alkaline salt than most other vegetables, excepting bean-stalks, broom, and the larger trees. In the Amæn. Acad. vol. ii. p. 160. Linnæus mentions two cases, in which an essence, prepared from this plant, and taken for a considerable time, prevented the formation of stones in the kidneys or bladder; the patients forbearing the use of wine and acids.

Many nauseous insects are destroyed, or driven away by the smell of this plant; and it is no uncommon practice among the good women in the country, to preserve their cloaths from moths, by laying bundles of dried *wormwood* among them.

Some of our brewers have a method of using *wormwood* instead of the hops, to give the bitter taste to their malt-liquors, and to preserve them. It is found to answer the latter purpose very well; but the taste is so disagreeable, that it is much complained of. The reason of this is, that the people who use it do not understand the time of gathering it.

All plants are fullest of juice while in the shoot, but fullest of virtue when they have their seeds on them. This is the case with *wormwood*, as well as a thousand others; and though, in the seeding-time, it produces much more flavour than when younger, yet it is without that nauseous bitter of the crude juice, which gives us the distaste to the plant.

Some people have found the proper way of managing *wormwood*, and have given a flavour with it to their malt-liquors, even preferable in the opinion of all palates to that given in the common way by hops.

The method is this: the plant is to be gathered when fully ripe, and the seeds upon it, and in this state hung up in small bunches to dry. When thoroughly dried, a certain quantity of good strong malt liquor is to be impregnated with it, to the utmost strength that it can possibly give it. This is to be set by for use, to add to all the rest.

When the hops should in the common way be added to the beer, this liquor is to be added in a proper quantity, making the taste the judge when there is enough of it.

By this means just what degree of bitter is required may be given to the liquor, and the bitter of this common plant, thus managed, is as perfectly agreeable as that of any vegetable in the world.

The *wormwood* for this purpose should have its seeds carefully preserved in the drying, and it is best if not used till the year after it was gathered. Phil. Transf. N° 124.

The essential salt of *wormwood* is afforded in great quantity, and possesses in many respects the virtues of the plant.

Wormwood shares with all other bitters the virtues of an abstersive deobstruent, and is in some degree purgative, as all bitters are. *Wormwood* is one of those plants which the chemists have generally chosen for their processes of the resuscitation of plants from their ashes; and though the pretended principles of this art are false, yet there have been some of the artists so cunning as to form representations of this plant, that have deceived and puzzled the greatest unbelievers, though they have not convinced them. Phil. Transf. N° 74.

Wormwood, *sea*, *artemisia maritima* of Linnæus, falsely called in our markets *Roman wormwood*, and substituted for it, grows plentifully about our salt marshes, and in several parts on the sea-coast. In taste and smell it is less unpleasant than the common *wormwood*; and hence is preferred by the college as an ingredient in some of the distilled waters; the essential oil is less ungrateful, and the watery extract less bitter than those of the common sort. The virtues are the same, differing only in degree. It is less effectual as an antiseptic and anthelmintic, but more eligible as a stomachic. A conserve of the tops, made by beating them with thrice their weight of fine sugar, is kept in the shops.

Wormwood, *Roman*, *artemisia pontica* of Linnæus, has more numerous, more finely divided, and darker coloured leaves than the former, and is hoary only underneath, whereas that is hoary all over. This is a foreign species, but as hardy and as easily raised as the others. It is considerably less ungrateful than either of the former species; its smell is weaker, and its bitterness is mixed with a kind of aromatic flavour. This appears to be the most eligible of the three, as a stomachic and corroborant; in which intention a conserve of the tops has been greatly recommended.

Wormwood, *mountain*, *artemisia glacialis* of Linnæus, is fine-leaved, and covered with a glossy silk-like down. The *mountain wormwood* of Valais, or *absinthium seriphium montanum candidum* C. B. is covered with a cotton like down, and the leaves are curled about the edges. Haller informs us, that the first of these plants is frequent in stony grounds on the Alps; and the second by the sides of sandy roads in the territory of Valais, in Switzerland; that the former is bitterish and aromatic, of great estimation among the inhabitants of the Alps, and the common remedy against the intermittent fevers which often rage there, and for exciting the menstrual discharges, checked by the cold; and that the latter has an acrid aromatic smell and taste, without bitterness, and promises, from its sensible qualities, to be a plant of great virtues. They have not yet been introduced into practice in this country. Lewis.

Wormwood-*fly*, in *Natural History*, a very small black fly, found on the stalks of the common *wormwood* in June and July.

Wormwood-*wine*, *vinum absinthites*. See Vinum, and Absinthites.

WORRALL, in *Zoology*, an animal of the lizard kind, of about four feet long, and eight inches broad, with a forked tongue, which it puts out like a serpent, but without teeth.

It is a harmless animal, and feeds only on large flies, and the smaller species of lizards. It is found in Egypt only during the hottest months, and principally frequents the grottos and caverns in the mountains on the west of the Nile, where it sleeps during the winter season.

It is said to be greatly affected by music; but experiment shews this to be an erroneous opinion. Pococke's Egypt, vol. i. p. 208.

WORSHIP *of God*, *cultus Dei*, amounts to the same with what we otherwise call religion.

This *worship* consists in paying a due respect, veneration, and homage to the Deity, under a certain expectation of reward.

And this internal respect, &c. is to be shewn and testified by external acts; as prayers, sacrifices, thanksgivings, &c.

The Quietists, and some other mystic divines, set aside not only all use of external *worship*, but even the consideration of rewards and punishments.

Yet, even the heathens had a notion, that God did not require us to serve him for nought: *Dii quamobrem colendi sint*, says Cicero, *non intelligo, nullo nec accepto ab illis nec sperato bono.*

The school-divines divide *worship* into divers kinds, viz. *latria*, that rendered to God; and *idololatria*, that rendered to idols, or images. To which the Romanists add, *dulia*, that rendered to saints; and *hyperdulia*, that to the Virgin.

Some theological writers have observed, that the Greek word, *προσκυνεω*, *to worship*, is not descriptive only of the honour which is appropriated to God, but is indifferently used to signify the honour and respect which are paid to superiors of all kinds, in heaven or on earth. Accordingly, they have distinguished between *civil* and *religious worship*.

WORSTED, or Woolsted, in matters of commerce and manufacture, is a kind of woollen thread.

Worsted is, properly, a thread spun of wool that has been combed; and which, in the spinning, is twisted harder than ordinary.

It is chiefly used either to be knit, or woven, into stockings, caps, gloves, or the like.

The name *worsted* is supposed to be borrowed from a town thus called, in Norfolk, noted for fine spinning. They who write it *woolsted*, do it on supposition of the word's being formed from *wool*, the matter of this thread.

It appears from an ancient record, that king Edward III. in 1348, established the town of Calais as a staple for wool, and woollen cloth made in England, and for other woollen cloths of *worsteds* brought from other countries: from which account we may infer, that *worsteds* were but lately introduced into England; whereas in 1394 they were made in England in great variety; and likewise that *worsted* was so named as a foreign manufacture; and therefore some have concluded, that this manufacture gave name to the town. And. Hist. Com. vol. i. p. 179.

WORT, in the *Materia Medica*, is the sweet infusion of malt; first proposed by Dr. Macbride as a dietetic article to scorbutic persons, from an apprehension that it would ferment in their bowels, and give out its fixed air, by the antiseptic powers of which the strong tendency to putrefaction in this disease might be corrected. It was some time before a fair trial of this proposed remedy could be obtained, and different reports were made concerning it. In 1762 the lords of the admiralty gave orders to have the *wort* tried in the naval hospitals at Portsmouth and

Plymouth; but the murmurs of the patients, on account of reſtrictions that were neceſſary for determining its efficacy, put a ſtop to the farther exhibition of it; and indeed Dr. Huxham, in 1764, informed the ingenious and benevolent propoſer of this remedy, that it had been tried with very bad effects. But Dr. Macbride aſſures us, on the teſtimony of a gentleman, who made uſe of the *wort*, that it may be taken for a length of time, to the quantity of a quart in the day, without producing any ill effect whatever; and he refers to Van Swieten's Commentary, vol. iv. p. 673. where we learn, that the baron's lady, when a nurſe, uſed regularly to drink a pint of it every night going to bed, in order to increaſe her milk.

After the failure of ſucceſs in the naval hoſpitals, orders were iſſued to have the *wort* adminiſtered on ſhip-board, where no temptations of freſh vegetables would offer to make the men uneaſy. But a conſiderable time elapſed, before any reports were made either of its good or bad effects. Dr. Macbride, however, perſiſted in recommending it, and lived to publiſh ſeveral caſes, in a poſtſcript to the ſecond edition of his work, in 1767, from which it appears, that ſcorbutic complaints of the moſt dangerous kind have actually been cured at ſea by the uſe of *wort*. Its general effects were, to keep the patients open, and to prove highly nutritious and ſtrengthening; it ſometimes purged too much; but this effect was eaſily obviated by the tinctura thebaica. Other unqueſtionable caſes of its ſucceſs in this diſeaſe are to be ſeen in the London Med. Obſ. and Inq. vol. v. p. 61. See alſo SCURVY.

The uſe of *wort* has hence been adopted in other caſes, where a ſtrong putrid diſpoſition in the fluids appeared to prevail, as in cancerous and phagædenic ulcers; and inſtances are publiſhed of its remarkable good effects in theſe caſes. See London Med. Obſ. and Inq. vol. iv. p. 367, &c. Prieſtley on Air, vol. i. Appendix.

As the efficacy of the malt infuſion depends upon its producing changes in the whole maſs of fluids, it is obvious that it muſt be taken in large quantities for a conſiderable length of time, and rather as an article of diet than medicine. The quantity of one to four pints has generally been directed. For the method of preparing it, ſee SCURVY.

WORTHIEST *of blood*, in *Law*, an expreſſion denoting the preference given in deſcents to ſons before daughters.

WOVEN *ſtockings*. See STOCKING.

WOUGHS, in *Mines*, are the walls or ſides ſometimes of hard ſtones, and ſometimes ſoft; when ſoft, the miners ſay they are rotten: theſe are the bounds of an entry. Betwixt them all ſorts of earth, ſtones, and ore lie; or, as philoſophers ſay, grow.

WOULD, or WELD, among *Dyers*. See WELD, and DYER's *weed*.

WOULDING. See WOOLDING.

WOUND, *vulnus*, in *Medicine* and *Surgery*, a recent ſeparation made in the ſoft or fleſhy parts of the body, from an external cauſe, and particularly from the action of ſome hard and ſharp inſtrument.

Or, it is a ſolution of the continuity of a fleſhy part, made by the violent application of ſome penetrating body, while it yet remains freſh, bloody, and without putrefaction; by which circumſtances a *wound* is diſtinguiſhed from an ULCER or ABSCESS, which is the ſolution of the external parts, proceeding from an internal cauſe.

A like ſeparation, happening in a bony part, is called a FRACTURE.

Some, indeed, have taken a greater latitude, and call every external hurt of the body, by what cauſe ſoever produced, a *wound*. *Wounds* are generally inflicted on the ſofter parts of the human body: nevertheleſs the more ſolid parts, as the bones, are ſometimes injured by ſharp inſtruments.

All *wounds* proceed either from puncture, inciſion, or contuſion, according to the nature and make of the inſtrument they were cauſed by.

Wounds are uſually divided, with reſpect to their cauſe, circumſtances, cure, &c. into *ſimple*, and *compound*.—*Simple wounds* are thoſe made by puncture, inciſion, or contuſion, ſeparately; thoſe of the outer ſkin, without any conſiderable loſs of ſubſtance, or hurting any remarkable veſſel; and thoſe not complicated with any dangerous ſymptoms.

Compound wounds are thoſe made both by puncture and inciſion at the ſame time, to which is ſometimes alſo added contuſion; thoſe attended with great loſs of fleſh, or the hurt of ſome conſiderable veſſel; add, thoſe made by envenomed inſtruments, or attended with violent ſymptoms.

The hiſtory of a *wound* is thus delivered by Boerhaave. Immediately upon the ſolution, the *wounded* parts recede farther and farther from each other. The blood guſhes out, at firſt, with ſome violence, but ſtops of itſelf; then a bloody ſcab is formed in the cavity of the *wound*, and a thin ruddy humour ouſes out; the lips of the *wound* begin to redden, ache, ſwell, and turn black; and (in great *wounds*) a fever and thirſtineſs ſucceed. On the third or fourth day there is found a white, viſcid pus; upon which, the heat, redneſs, tumor, &c. abate, and the cavity gradually fills up from the bottom upwards, and from the circumference to the centre, with growing fleſh. Laſtly, the *wound* dries, and cicatrizes. But note, theſe ſymptoms vary according to the nature and cauſe of the *wound*. Thus, if it be by inciſion, and a large blood-veſſel be cut, the hæmorrhage is more violent, eſpecially if it be an artery; in which caſe florid blood flies out impetuouſly, and by ſtarts: if only a vein be cut, the flux is more moderate and equable, and the blood is of a darker colour. If the *wound* be attended with contuſion, the hæmorrhage is ſmall.

In *wounds*, where any large artery is quite cut in two, the flux uſually proves mortal; and though the hæmorrhage ſhould be reſtrained by ligature, it is almoſt impoſſible to prevent the limbs, which lie below the diviſion of the artery, and which receive their nouriſhment by that channel, from becoming paralytic, and, ſometimes, from mortifying. This is almoſt conſtantly the caſe, when the trunk of the brachial or crural artery is divided. A leſſer artery, cut tranſverſly, flies back among the ſolid parts, and will have its mouth ſtopped: if an artery be not quite cut off, there ariſes a perpetual flux; or, if that be ſtopped, an ANEURISM. This will often be the caſe, when only the external coat of the artery is wounded; for by this means the internal coat of the artery is left to ſuſtain the whole impetus of the pulſe, to which being unequal, it is forced by degrees into a tumor like a bag, from which very calamitous conſequences frequently enſue. A nerve, being cut off, flies back, produces a pain and obſtruction about the *wound*, and below it, a numbneſs and waſting, with immobility: the caſe is much the ſame in *wounded* tendons and membranes. *Wounds* of the temporal muſcle are rarely cured, but generally bring on horrible convulſions.

In young children, and aged perſons, *wounds* frequently prove mortal, which ſeemed but ſlight. Thoſe *wounds* generally prove troubleſome which happen in an ill ſtate of body, and eſpecially with a low or ſpare diet. All *wounds* are reputed more dangerous and difficult of cure in winter, than ſummer; in autumn, than in ſpring.

There is nothing will give a truer light into the nature and conſequence of a deep *wound*, than a due conſideration of thoſe natural actions of the body that are impeded thereby. For inſtance, in *wounds* of the breaſt, when the patient draws his breath with ſhortneſs and difficulty, and is at the ſame time attended with an hæmoptyſis and hiccough, we may rationally conjecture that the lungs, or the diaphragm are wounded; ſo in *wounds* of the abdomen, when chyle is voided, it is a plain indication that the ſtomach, ſmall inteſtines, or lacteals, are wounded: when excrements paſs by the *wound*, the large inteſtines are wounded. In the ſame manner, bilious blood ſhews the liver or gall bladder to be divided: if urine paſſes by the *wound*, the urinary bladder or elſe the ureters are wounded; but bloody urine denotes a blow on the kidneys, or a *wound* of the bladder. But when there are large profuſions of blood this way, it is a ſign that ſome of the larger blood-veſſels are wounded: vomiting of blood indicates the ſtomach to be the injured organ: violent pains, attended with convulſive twitches, ſhew that a nerve is wounded, or elſe that ſome foreign ſubſtance is left in the *wound*. Whenever the ſenſes are diſordered after a *wound* received on the head, a concuſſion of the brain is much to be feared. It is of bad conſequence for a *wound* to be attended with a large tumor; but it is of the laſt conſequence if it is attended with no degree of tumor at all; the firſt is an indication of great inflammation; the laſt of mortification; ſome degree of tumor is always, therefore, beſt in *wounds*.

In order to enquire what *wounds* admit of cure, and what are incurable, Heiſter divides them into three ſorts.

1. We properly ſtyle thoſe *wounds* abſolutely mortal, which are not to be remedied by all the art and induſtry of man. Thus, *wounds* are of this kind which are attended with ſo violent an hæmorrhage, as to produce inſtant death: of this ſort are reckoned *wounds* that penetrate the cavities of the heart, and all thoſe *wounds* of the viſcera, where the larger blood-veſſels are opened; ſuch are large *wounds* of the lungs, liver, ſpleen, kidneys, ſtomach, inteſtines, meſentery, pancreas, uterus; of the aorta, of the iliac, cœliac, renal, meſenteric, and carotid arteries, eſpecially if they are wounded near their origin; of the ſubclavian alſo, or vertebral; of the vena cava, the iliac vein, the internal jugular, vertebral, renal, meſen-

meſenteric, of the vena porta, and of the other larger veins that lie deep in the body, becauſe their ſituation will not admit of proper applications to reſtrain the flux of blood. Heiſter therefore reckons, very juſtly, theſe among the *wounds* that are abſolutely incurable, ſince they are not remediable either by aſtringents, ligature, or fire. To the ſame claſs may alſo be referred the *wounds* of the brachial artery, near its origin; the large effuſion of blood generally deſtroying the patient before aſſiſtance can be procured; more eſpecially if the artery and vein are both wounded together.

Thoſe *wounds* alſo are not leſs mortal than the former, which obſtruct, or entirely cut off the paſſage of the animal ſpirits to the heart; ſuch are *wounds* of the cerebellum, of the medulla oblongata, and all violent ſtrokes of the brain itſelf. There is reaſon to apprehend very great danger, when the ſmall veins or arteries, which are contained in the cranium, are injured; for the blood, flowing from them into the internal ſinuſes of the brain, either produces too great a preſſure upon thoſe very tender parts of the brain, and ſo obſtructs the courſe of the blood and ſpirits; or elſe, being corrupted, it putreſies the brain itſelf, if it cannot be evacuated by the aſſiſtance of the trepan, which is the caſe when this accident happens at the lower part of the cranium, or in the ſinuſes of the brain; nor is there leſs danger where the nerves, which tend to the heart, or the cerebellum, are wounded, or entirely divided; for after this, it is impoſſible for the heart to continue its motion.

To this claſs are to be referred alſo all *wounds* which entirely deprive the animal of the faculty of breathing: there is, therefore, great danger where the aſpera arteria is entirely divided; for, where it is only divided in part, it may be healed again by the aſſiſtance of an expert ſurgeon: to this place alſo belong violent ſhocks of the bronchia, mediaſtinum, and diaphragm, eſpecially the tendinous part of it; or any injuries of the principal nerves, as the par vagum, or intercoſtals.

Thoſe *wounds* alſo, which interrupt the courſe of the chyle to the heart, are no leſs incurable than the former; ſuch are *wounds* of the ſtomach, inteſtines, receptacle of the chyle, thoracic duct, and larger lacteals; to which may be alſo added *wounds* of the œſophagus, if they are large; though death is not ſo ſudden an attendant on theſe *wounds*; but, for want of nouriſhment, the perſons afflicted by them are weakened by degrees, and at length die conſumptive.

In this account, thoſe *wounds* alſo are not to be omitted, which are inflicted upon membranous parts, that are ſituated in the abdomen, and contain ſome ſecreted fluid, as on the bladder, either of the bile or urine, the ureters, the ſtomach, inteſtines, receptacle of chyle, and lacteal veſſels. The fluids contained in theſe parts, when once they are let looſe into the cavity of the abdomen, cannot be properly diſcharged, and therefore eaſily corrode the internal parts of the body; and the membranes that contained them are generally ſo fine, that they will not admit of agglutination, eſpecially ſince no medicine from without can be applied. A few indeed have recovered after ſlight *wounds* in theſe parts; but ſince the number of theſe inſtances is but ſmall, and the cure in them has been accidental, and not performed by the ſurgeon's art, theſe may very juſtly be added to the liſt of mortal *wounds*.

2. Many *wounds* there are which, though the experienced ſurgeon could remedy, yet prove fatal, if neglected, or left to nature: of this number are thoſe which produce inſtant death, unleſs relieved by preſent aſſiſtance; ſuch are *wounds* of the larger external blood-veſſels, which might be remedied by ligature, by the application of aſtringent medicines, or the actual cautery. Of this kind are *wounds* of the brachial, or crural artery, unleſs they are too near the trunk of the body; *wounds* in the large arteries of the cubit, or tibia; of the branches of the external carotid, or temporal artery; to theſe alſo may be added *wounds* of the jugular and other veins, ſituated upon the external parts of the body; but in theſe caſes no help can be given, unleſs the ſurgeon be brought before there has been a vaſt profuſion of blood.

3. *Wounds* are properly ſaid to become mortal by accident, where the patient's death is occaſioned either by the ill conduct of the patient himſelf, or by the neglect or ignorance of his ſurgeon, the *wound* itſelf being of the number of thoſe deemed curable by the judicious practitioner. Under this head are to be reckoned thoſe *wounds* which the ſurgeon has neglected to cleanſe ſufficiently, though he had it in his power to do it; as when ſome foreign body, which might eaſily have been extracted, is left in the *wound* by the careleſſneſs of the ſurgeon, and produces inflammations, hæmorrhages, convulſions, and finally death itſelf. So in *wounds* of the thorax and abdomen; if the ſurgeon does not uſe his utmoſt diligence to evacuate the grumous blood, it will corrupt there, and by drawing the neighbouring parts into conſent, will expoſe the patient to death; great care muſt therefore be taken that the lips of the *wound* do not cloſe, till the blood, which is collected in the cavity of the body, be all evacuated, if poſſible, which will be perceived by the difficulty of breathing, and other bad ſymptoms going off; but if any of the larger internal veſſels are wounded, then all attempts to diſcharge the blood are vain; for the violence of the hæmorrhage takes off the patient.

Wounds are alſo to be accounted mortal by accident, which are treated or ſearched in too rough a manner by the ſurgeon; for if *wounds* are handled roughly which are full of nervous parts, or of large blood-veſſels, there is great danger of bringing on hæmorrhages, convulſions, inflammations, gangrenes, and finally death itſelf.

The caſe is alſo the ſame in external *wounds*, which are ſlight of themſelves, but under which the patient is loſt by the inflammation which is brought on, and increaſed, by the ſurgeon's injudicious treatment; or when any one is taken off by the violence of the hæmorrhage, from a *wound* of the hand or foot; for, in this caſe, the ſurgeon might eaſily have ſtopped the blood, by the application of proper remedies, or by ligature: or, when the patient is guilty of any intemperance, either in eating or drinking; or of any exceſs of paſſion; of expoſing himſelf to the cold air, or of uſing violent exerciſe; for by theſe means *wounds*, more eſpecially thoſe of the head, by being liable to freſh hæmorrhages, and other dangerous accidents, frequently become mortal, notwithſtanding that they naturally would not prove ſo, and though the ſurgeon uſes his utmoſt care and ſkill.

Among theſe alſo are to be accounted thoſe *wounds* of the head, where the patient is loſt by the vaſt quantity of blood, which is extravaſated in the cavity of the cranium, and is confined there; but where he might have been relieved, if the trepan had been applied in time; for though *wounds* of this kind generally prove incurable, yet as there is, at leaſt, a poſſibility of ſaving a perſon in theſe circumſtances, by the uſe of the trepan, this may properly be reckoned among the doubtful caſes, and not deemed abſolutely mortal: and laſtly, a bad habit of body frequently prevents the cure of *wounds*, which would admit of an eaſy cure in a healthful ſubject; ſo we frequently ſee the ſlighteſt puncture in the hand or foot of an hydropical, conſumptive, or ſcorbutic perſon, ſhall produce a gangrene, and prove mortal, though the ſurgeon ſpares no care nor application to prevent it.

The cure of *wounds* conſiſts in uniting the divided parts; which is the work of nature alone, and which the ſurgeon can only contribute to by removing external impediments, and applying ſuitable vulneraries and balſamics. Mankind, indeed, generally imagine, that certain herbs, ointments, and plaſters, are poſſeſſed of wonderful healing powers, and that no *wound* can be cured without the application of them. It is, however, a fact, that no external application whatever contributes towards the cure of a *wound* in any other way than by keeping the parts ſoft and clean, and defending them from the external air, which may as effectually be done by dry lint, as by the moſt pompous applications, while it is free from many of the bad conſequences attending them.

And as for internal applications, they only promote the cure of *wounds* ſo far as they tend to prevent a fever, or to remove any cauſe that might impede the operations of nature.

The cure of *ſlight wounds* is generally performed with great eaſe, by applying to the part a ſmall portion of ſcraped lint, well ſaturated with ſpirit of wine, oil of turpentine, or St. John's wort, liniment of Arcæus, or balſam of capivi, Gilead, or Peru, and ſecuring the dreſſing with a plaſter; this dreſſing ſhould be renewed once in a day or two, and the lips of the *wound* will preſently agglutinate.

In ſlight *wounds*, which do not penetrate much deeper than the ſkin, the beſt application is a bit of gold-beater's ſkin, or of the common black ſticking plaſter; which will keep the lips of the *wound* together, and prevent the air from hurting it; and this will often be ſufficient.

But *wounds* that penetrate deep, and that are attended with ſome danger, where the ſubſtance of the wounded part is not impaired, are firſt to be cleanſed from the extravaſated blood, ſordes, &c. In the next place, if a bullet, the point of a ſword, or any part of the cloathing, a piece of glaſs, or any other foreign body, remains in the *wound*, it is to be removed either with the fingers, or a pair of forceps, or other proper inſtruments. The hæmorrhage is to be ſtopped at the firſt dreſſing; the divided parts are to be brought as near to each other as poſſible, and their ſituation ſhould be ſo maintained, by proper

proper bandages, that the cicatrix which is left may appear even.

Where there are no extraneous bodies to be removed, the grumous blood is to be wiped away with a soft spunge, or a parcel of fine lint wrung out of hot wine or brandy; and when this is done, the next step is to stop the hæmorrhage; but before the surgeon attempts the removal of extraneous bodies, it behoves him well to consider whether it be more proper to do it instantly, or to wait a more convenient time; for if the patient is become extremely faint, from the loss of blood he has already sustained, it will be necessary, in this case, to stop the hæmorrhage, and then, in some measure, to endeavour to revive him by moderate draughts of warm broths, white-wine whey, or some cordial medicine; for if these precautions are neglected, the patient may not improbably die in the operation: so also where you have reason to fear, that in the extracting of the broken point of a sword, or other weapon, you are in danger of wounding a large blood-vessel or nerve, it will be better to wait a little, either till the patient is somewhat come to himself, or till the *wound* is enlarged by suppuration.

When a *wound* penetrates into any of the cavities of the body, as the breast, the bowels, &c. or where any considerable blood-vessel is cut, a skilful surgeon ought immediately to be called; otherwise the patient may lose his life. But sometimes the discharge of blood is so great, that if it be not stopped, the patient may die even before a surgeon can arrive. In this case, if the *wound* should be in any of the limbs, the bleeding may generally be stopped by applying a tight ligature or bandage round the member, a little above the *wound*. The best method of doing this is to put a strong broad garter round the part, but so slack as easily to admit a small piece of stick to be put under it, which must be twisted, in the manner practised by a waggoner on a cart-rope to secure his loading, till the bleeding stops. Whenever this is the case, he must take care to twist it no longer; as straining it too much might occasion an inflammation of the parts, and endanger a gangrene. See Tourniquet.

In parts where this bandage cannot be applied, various other methods may be tried to stop the bleeding, as the application of styptics, astringents, &c. Cloths dipped in a solution of blue vitriol in water, or the styptic water of the dispensatories, may be applied to the *wound*. Where these cannot be obtained, strong spirits of wine may be used. Some recommend the Agaric of the oak, as preferable to any of the other styptics: this is easily obtained, and ought to be kept in every family, in case of accidents. A piece of it must be laid upon the *wound*, and covered with a good deal of lint, over which a bandage may be applied so tight as to keep it firmly on. Where the agaric cannot be had, spunge may be used in its stead.

Although spirits, tinctures, and hot balsams may be used, in order to stop the bleeding when it is excessive, they are improper at other times; as, instead of promoting, they retard the cure, and often change a simple *wound* into an ulcer.

Among the number of simple *wounds* are reckoned those which are made by puncture; for the treatment of which, see Puncture.

Wounds, which are made by a cutting instrument, where no part of the flesh is taken off, and the accident happens to the external parts of the body, and does not penetrate deep, after they are cleansed, should be dressed with some vulnerary balsam, and the lips of the *wound* should be closed and kept in that situation; either by placing the wounded and divided parts, as soon as they are dressed, in such a situation as may be most likely to keep them in constant contact; or by a proper bandage, tying up the parts so that the lips may meet, and so easily unite; or by a proper suture, for the choice and conduct of which, see Suture.

In a *wound* that penetrates deep, it is not safe to keep its lips quite close, so that the orifice may be healed before its internal parts, which will be apt to fester. In this case, the best way is to fill the *wound* with soft lint, commonly called *caddis*: but this must not be stuffed in too hard. The caddis may be covered with a cloth dipped in oil, or spread with the common wax plaster; and the whole must be kept on by a proper bandage. The first dressing may be kept on for at least two days; after which it may be removed, and fresh lint applied as before. If any part of the first dressing sticks so close as not to be removed with ease or safety to the patient, it may be allowed to continue, and fresh lint dipped in sweet oil laid over it; by which means it will be softened, and come off easily at the next dressing. Afterwards the *wound* may be dressed twice a day till it be quite healed. Those who are fond of salves or ointments may, after the *wound* is become very superficial, dress it with the yellow basilicum.

When there is a loss of substance, *wounds* will not unite either by the help of plasters, or the suture, or by any other method, till they are filled up with new flesh. For this purpose, lint dipped in oil, or spread over with some vulnerary balsam or ointment, and applied to the bottom of the *wound*, is very serviceable, covering it with a plaster, compress, and proper bandages: and this dressing is to be repeated daily. There ought to be a balsamic and emollient quality in these sarcotic medicines; that they may not only resist putrefaction, but also soften the new flesh, so that it may easily receive additions from the blood, and suffer itself to be elongated.

As hot or cold air is very hurtful to *wounds*, it should be carefully kept from them: and, therefore, the surgeon should be careful not to remove the old dressings till the fresh ones are got ready, and be as expeditious as possible in applying them.

When a white, smooth, thick matter appears in the *wound*, it should be dressed, as there is occasion, every day, or every other day; and the superfluous matter should be wiped away with a very light hand; for wiping the *wound* roughly hinders the growth of new flesh, but a little matter being left performs the office of oil or balsam, in keeping the parts moist. If this method be observed, new flesh will soon spring up, and the *wound* unite. In order to obtain an even cicatrix, it will be proper to dry gradually, and to harden the surface of the new flesh, by the application of dry lint, covered with a tight compress and bandage; or, if this be insufficient, it may be necessary to use some of the drying powders, as those of tutty, calaminaris, mastich, or colophony.

When any foulness is perceived in a *wound*, i. e. if the flesh is putrid, fungous, black, pale or livid, it must be well cleansed before any attempt be made to heal it; for which purpose may be applied a digestive ointment, made with turpentine, yolk of eggs, and honey of roses; if this be not strong enough, there may be substituted the Egyptian ointment, or spirit of wine diluted; to which may be added a small quantity of myrrh or aloes: and if greater strength be required, the red precipitate of mercury may be used. The *aqua phagædenica* is a good detergent. Applications of this kind are to be continued, till the *wound* is entirely clean, after which recourse is to be had to the methods already prescribed.

If the new flesh should be luxuriant, and rise up so as to prevent the formation of an even cicatrix, it must be taken down by the blue vitriol, or a powder composed of burnt alum and the red mercurial precipitate: making at the same time a proper pressure with the plasters, compresses, and bandages.

When a *wound* is much inflamed, the most proper application is a poultice of bread and milk, softened with a little oil or fresh butter: this may be applied instead of a plaster, and changed twice a day. If the *wound* be large, and there is reason to fear an inflammation, the patient should be kept on a very low diet. He must abstain from flesh, strong liquors, and every thing that is of a heating nature; if he be of a full habit, and has lost but little blood from the *wound*, he must be bled; and if the symptoms be urgent, the operation may be repeated. But when the patient has been greatly weakened by loss of blood from the *wound*, it will be dangerous to bleed him, even though a fever should ensue: as nature should never be exhausted, and it is always most safe to let her struggle with the disease in her own way than to sink the patient's strength by excessive evacuations.

Wounded persons should be kept very tranquil and easy; every thing that ruffles the mind or moves the passions, as love, anger, fear, excessive joy, &c. being very hurtful; they ought, above all things, to abstain from venery. The body should be kept gently open, either by laxative clysters, or by a cool vegetable diet; as roasted apples, stewed prunes, boiled spinage, and such like. Heister's Surg. book i. c. i. p. 27, &c. Tissot's Advice, &c. p. 437, &c. Buchan's Dom. Med. p. 625, &c.

Wounds, *gun-shot*, are attended with much worse consequences than *wounds* made by sharp instruments; for the parts are more shattered and torn, especially when the shot falls upon the joints, bones, or any considerable part. *Wounds* of this kind have an eschar formed upon them, and are, therefore, attended with little or no hæmorrhage at first, unless some considerable vessel is wounded; but as soon as this eschar falls off, the hæmorrhage is sometimes so violent, as to endanger the life of the patient, unless the assistance of a surgeon can be readily had. For the five or six first days there is little or no discharge of matter from these wounds; there is therefore no wonder, that *gunshot-wounds* exceed all others in violence of symptoms, such as inflammation, pain, gangrene, &c.

The eſchar, which is formed upon theſe *wounds*, is not occaſioned ſo much by the heat of the bullets, as by the rapidity with which they deſtroy the parts, and the violence of the ſymptoms is owing chiefly to this manner of wounding, and to the extravaſated blood, long confined under the eſchar. Neither is there any thing poiſonous in theſe *wounds*, as has been by ſome imagined, for nothing poiſonous enters the compoſition, either of powder or ball.

Gunſhot-wounds are ſome deeper than others, and in ſome the muſcular parts alone are hurt; in others the veſſels, bones, or viſcera, are wounded. Sometimes the ball paſſes clear through, and ſometimes it remains fixed in the *wound*, and frequently carries part of the cloaths, or wadding with it. From the difference of theſe circumſtances very different ſymptoms ariſe.

Gunſhot-wounds in the cranium and temporal muſcles, even the ſlighteſt of them, are attended with very great danger, and frequently bring on terrible ſymptoms, by the concuſſion of the internal parts, which they occaſion; inſomuch, that it is ſurpriſing to ſee how ſmall an external *wound* upon this part will bring on death, if not prevented by the trepan. Internal *wounds* of this ſort are alſo extremely dangerous, but if no large veſſel is wounded, they are frequently cured.

When they are inflicted on the bones or joints, they are attended with very bad ſymptoms; for in this caſe it is next to impoſſible to eſcape inflammation, gangrene, caries, and dangerous fiſtulæ, which either require amputation of the limb, or leave it without ſenſe or motion.

If any part of the cloaths, wadding, or any other extraneous body, be forced into the *wound*, it muſt be removed before you can attempt to heal the *wound*; and the ſame caution is to be obſerved in regard to any ſplinters of bone: when theſe are removed, the hæmorrhage is to be ſtopped, then ſuppuration is to be promoted, and new fleſh encouraged, and care taken to procure an even cicatrix.

Extraneous bodies are much eaſieſt to be removed from theſe *wounds* at firſt; for after ſome delay, the tumor and inflammation of the part render it difficult and painful: beſides, the bullets will by degrees work themſelves deeper, and be buried under the muſcles, which will occaſion fiſtulæ, rigidity of the limb, and other inconveniences. In extracting balls that lie deep, you muſt take great care not to lay hold of blood-veſſels, nerves, or tendons; which accident will be beſt avoided, by introducing the forceps ſhut, and not opening them till you feel the ball.

Sometimes the orifice of theſe *wounds* is ſo narrow, that it is impoſſible to come at the body you are to extract, without making a larger opening; this then muſt be done on the moſt convenient ſide, always obſerving that no nerve, blood-veſſel, tendon, or ligament, lies in the way. When the parts are very much inflamed, and ſwelled, an opening of this kind is frequently of ſervice; for by this means the obſtructed blood is diſcharged, and the bad conſequences of the inflammation are prevented.

When the extraction of the ball is attempted, the patient muſt be put into the ſame poſture and ſituation that he was in when he received the *wound*. When the ball has penetrated ſo deep, that it may be eaſily felt with the finger on the oppoſite ſide, it is ſometimes better to make an inciſion there, and take it out in that place, than to attempt the getting of it back the other way. If the *wound* cannot ſafely be enlarged, nor the ball extracted at firſt, without great pain and danger, it muſt be left in the *wound*, either till the pain is abated, or the *wound* is ſo enlarged by ſuppuration, that it either can work itſelf out, or be extracted with leſs danger. On the other hand, all other extraneous bodies are inſtantly to be removed, where there is danger of their bringing on pain, inflammation, and convulſions, by being left behind. If a ball has paſſed into the cavities of the body, it is beſt not to attempt to extract it, but to heal the *wound*, leaving it there. Perſons have carried a ball thus in them for many years without inconvenience, and, at one time or other, it frequently happens that it will work itſelf into ſome part of the body, out of which it may be extracted with ſafety.

Balls lodged in the bones, are either to be extracted immediately, or, if fixed firmly in the bone, to be left to be ſet at liberty by the ſuppuration of the parts; but balls that are thrown into the joints, are always to be extracted with all poſſible expedition, for delays are very dangerous; and indeed, in moſt caſes of this kind, the amputation of the limb is found abſolutely neceſſary. In *wounds* from large guns, the joint or bone is frequently grievouſly ſhattered; and in this caſe, the moſt prudent method is always to take off the limb at once, not to ſpend time in fruitleſs attempts to make a cure.

If a large artery is wounded by the ball, either in the arms or legs, which will be known by the loſs of blood, the tourniquet muſt be applied, and the blood being ſtopt, the veſſel muſt be taken up by a crooked needle; but if this cannot be done, or little hopes of a cure appear from future dreſſings, it will be prudent to take off the limb juſt above the *wound*. When *wounds* of this kind have been well cleaned, and the blood ſtopped, the firſt intention is to uſe the utmoſt endeavours to prevent, or aſſwage the tumor and inflammation. The *wound* ſhould be dreſſed with lint dipped in warm ſpirit of wine, and covered with a compreſs wetted with the ſame liquor, or with camphorated ſpirit of wine, either alone or diluted with lime-water. Having done this, the next intention is to forward the ſuppuration of the bruiſed and torn parts; to which end, it is common to uſe the common digeſtive made of turpentine diſſolved in the yolk of an egg, or a mixture of baſilicon and Arcæus's liniment, ſoftened with ſpirit of wine and oil; and where there is a very great corruption of the parts, a little myrrh and aloes are to be added, as alſo Venice-treacle, the brown ointment; and, where the occaſion requires it, and the nerves do not lie bare, a little of the red precipitate.

In deep *wounds*, where the ball has gone quite through, a ſkein of thread being drawn through the eye of a blunt needle, and well ſaturated with the digeſtive ointment, is to be paſſed through the *wound* in manner of a SETON, and kept there till the *wound* is found in a condition to heal, and then the common methods purſued to heal and cicatrize. Heiſter's Surgery, cap. iii. p. 55, &c.

WOUNDS *of the abdomen*. See ABDOMEN.

WOUNDS *of the arteries*. See ANEURISM.

WOUNDS *of the bones, cheek, ear, eye, head, inteſtines, neck, ſkull, thorax*, &c. ſee the ſeveral articles. See alſo FISSURE, CONTRAFISSURE, EXTRAVASATION, CONTUSION, FRACTURE, GASTRORAPHY, TREPAN, &c.

WOUNDS *in horſes*. The moſt terrible *wounds* theſe creatures are ſubject to, are thoſe got in the field of battle. The farriers that attend camps have a coarſe way of curing theſe; but it is a very expeditious and effectual one. If the bullet be within reach, they take it out with a pair of forceps; but if it lie too deep to be come at, they leave it behind, and dreſs up the *wound* in the ſame manner as if it were not there.

They firſt drop in ſome varniſh from the end of a feather, and when the bottom is thus wetted with it, they dip a pledget of tow in the ſame varniſh, which they put into the *wound*, and then cover the whole with the following charge: take a quarter of a pound of powder of bole armenic, half a pound of linſeed-oil, and three eggs, ſhells and all; add to theſe four ounces of bean-flour, a quart of vinegar, and five ounces of turpentine; this is all to be mixed over the fire, and the *wound* covered with it. This application is to be continued four or five days, then the tent put into the *wound* is to be dipped in a mixture of turpentine and hog's-lard; by this means a laudable matter will be diſcharged, inſtead of the thin ſharp water that was at firſt. Then the cure is to be completed by dreſſing it with an ointment made of turpentine, firſt well waſhed, and then diſſolved in yolks of eggs, and a little ſaffron added to it.

This is the practice in deep *wounds* that do not go through the part; but in caſes where the bullet has gone quite through, they take a few weavers linen-thrumbs, made very knotty; theſe they make up into a kind of link, and dipping it in varniſh, they draw it through the *wound*, leaving the ends hanging out at each ſide; by means of theſe they move the link or ſkein three or four times a day, always wetting the new part that is to be drawn into the *wound* with freſh varniſh. They put on a charge of the bole armenic, &c. as before deſcribed, on each ſide of the wounded part, and continue this as long as the *wound* diſcharges thin watery matter, or the ſides continue ſwelled. After this they dreſs it with the ointment of turpentine, yolks of eggs, and ſaffron, till it is perfectly cured.

The other methods are, the dreſſing of the *wound* with an ointment made of wax, turpentine, and lard, and covering it with linen rags wetted with cream; or the dreſſing, with a mixture of yolks of eggs, honey, and ſaffron, and covering it up with cream and baum-leaves beaten together.

When the *wound* is ſo dangerous as to require the aſſiſtance of internal medicines, they give the following pills: take aſſafœtida, bay-berries, and native cinnabar, of each a pound; beat up the whole into a maſs with brandy, and roll it into pills of fourteen drams each. Theſe are to be laid in a ſhady place to dry, after which they will keep ever ſo long without any damage. The horſe is to take two of theſe every other day, or, if neceſſary, every day, till he has taken eight or ten of them, and he is to ſtand

ſtand bridled two hours before and after the taking of them.

When the *wound* ſeems at a ſtand, not appearing foul, and yet not gathering new fleſh, there muſt be recourſe had to the following powder, whoſe effect in bringing new fleſh is wonderful: take dragon's blood, and bole-armenic, of each two ounces; maſtic, olibanum, and ſarcocolla, of each three drams; aloes, round birth-wort, and common iris-root, of each one dram and a half; make the whole into a fine powder. This is ſometimes uſed dry, ſprinkling it on the *wound*; but ſometimes it is mixed with turpentine, ſometimes with juice of wormwood, and ſometimes with honey of roſes, and either way does very well.

When the *wound* grows foul, and requires a detergent to cleanſe it, the common liquor for this purpoſe is a phagedenic water, which they make of lime-water, and ſublimate in this manner: take two pounds and a half of newly made and unſlaked lime, put it into a pewter veſſel, and pour on it five quarts of boiling water. When the bubbling is over, let it ſtand to reſt two or three days, ſtirring it often with a ſtick; then pour it clear off after due time for the lime to ſettle, and filtre it through ſome whited brown paper, made for the lining of funnels, on this occaſion. To a quart of the clear lime-water, thus prepared, add eight ounces of ſpirit of wine, and one ounce of ſpirit of vitriol; when theſe are well mixed, by ſhaking them together, then add an ounce of corroſive ſublimate in fine powder; mix all well together, and keep the whole in a bottle, to be uſed for the cleanſing of theſe foul *wounds*, and on any other occaſions, where there may be a detergent of this powerful kind neceſſary. It will keep good many years.

If this water will not thoroughly cleanſe the *wound*, but there ſtill will remain a quantity of foul matter in it, and there is danger of a gangrene, they add to it as much arſenic, in fine powder, as there was of the corroſive ſublimate; that is, at the rate of an ounce to a quart and half a pint.

Theſe are all the medicines that the farrier need carry with him on account of *wounds*; and they are all ſuch as may be prepared at home, and will continue good ſo long as he has occaſion to keep them, or much longer; and what is left of one year will ſerve for others.

When the neceſſary applications are thus ſettled, it may not be improper to add the general rules by which they conduct themſelves in the cure.

1. The *wound* muſt be probed at firſt, but very gently, and afterwards as gently and as ſeldom as may be, for the horſes fleſh is the moſt eaſy of all others to be contuſed in wounded parts, and to fall into a gangrene from the hurt. 2. The *wound* muſt be kept continually as clean as poſſible, and free from proud fleſh. 3. The neceſſary revulſion muſt always be made by bleeding, as ſoon as the *wound* is dreſſed the firſt time; this prevents inflammation, and a great many other bad accidents. 4. If the *wound* be in ſuch a place, that the horſe can get at it with its tongue to lick it, great care muſt be taken to prevent his doing ſo, as it will greatly retard the cure. 5. The farrier is never to proceed to ſuppuration in any caſe in which the humours can be either diſſolved or repelled, and eſpecially in parts that are full of ſinews and ligaments, or that are near the bones. 6. If a *wound* be accompanied with a great contuſion, or if it be of a round or circular figure, inciſions are often neceſſary about its edges, and ſometimes the application of cauſtics. 7. The *wound* muſt be always carefully covered, for the acceſs of the air retards the cure. 8. The callous lips of a *wound* muſt always be cut to the quick, before they can be united together. Theſe may ſerve for general rules, that hold good in all caſes; and to theſe may be added ſome that are principally applicable to peculiar circumſtances of the *wounds*.

Wounds of the breaſt are to be cured with tents and folds of ſoft linen laid over them, ſteeped in the following mixture: take verdegriſe, vitriol, and alum, of each one ounce; vinegar eight ounces; honey a pound; let all theſe be boiled together till they become red.

Wounds in the belly can only be cured by ſewing up the peritonæum with ſtrong woollen thread, not ſilk, leaving the extremities without the ſkin. The ſkin is to be ſewed together with ſtrong hempen thread waxed, joining the lips of the *wound* together, by this means, in form of a buckle. This is to be covered with the common ointment for *wounds*; and if an inflammation comes on, chalk diſſolved in vinegar is to be added.

If the *wound* be ſuch that the guts come out at it, the horſe may ſtill be recovered, if proper caution be uſed; the guts are to be immediately returned into their place; but they muſt not in this be touched with the hand, but with a ſpunge dipped in warm water. And, in order to the making them more readily get into their places, it is proper to make the creature vomit, by thruſting down his throat a feather dipped in oil. If the *wound* through which they fell is not big enough to return them eaſily by, it muſt be enlarged by cutting; but if the guts are found to be bruiſed or wounded, it is in vain to attempt any thing, for death muſt follow.

There is alſo a certainty of death when, after a *wound* of any kind in the belly, the horſe voids blood at the fundament.

When a horſe is wounded near the groin, he eaſily falls into convulſions; in this caſe he is to be kept from drinking as much as poſſible: he is alſo to be covered well up, and kept quiet, and to have green things given him to eat.

Wounds on the knees are very difficult of cure, becauſe the part is in motion almoſt continually, and there is very little fleſh to work upon. When the *wounds* are but ſlight, and in the muſcular parts of the body, a mixture of honey and tallow, boiled together, will often prove a cure; when the *wound* is more conſiderable, turpentine melted in a little common oil, and applied hot, is the general remedy.

If a *wound* happens between the ſhoe and the hoof, care muſt be taken that no foreign matter be left in it, and it muſt be dreſſed with any of the ointments that have verdegriſe in them; and a charge of bruiſed elder-leaves is very proper to be applied over all. If the *wound* be deep and narrow, it muſt be enlarged at the orifice, and turpentine and wax, melted in lard, muſt be poured into it. The ſame rule of opening the orifice holds good in all deep and narrow *wounds*.

If a nerve happens to be cut, it muſt be cloſed, and a defenſative muſt be applied, to prevent a concourſe of humours to the part; a fomentation made of oil, wine, and honey, mixed together, is alſo very proper, wherever a nerve is hurt, and a poultice may be applied over all, made of marſhmallow-roots boiled ſoft, with bread and milk.

If the horſe happens to be wounded by a piece of wood, bone, or any other hard ſubſtance, part of which remains in the *wound*, this muſt be carefully taken out, whatever pain it may coſt the creature to do it, and the *wound* muſt then be dreſſed with the common *wound*-ointments. In this, or any other caſe of a freſh *wound*, the waſhing it with oil of turpentine is an excellent method of preventing ill conſequences.

WOUND-*wort*, in *Botany*, the name given to ſeveral ſpecies belonging to different genera.

WOUND-*wort of Achilles*. See ACHILLEA.

WOUND-*wort, clown's*, a ſpecies of *ſtachys*. See *Baſe* HOREHOUND.

WOUND-*wort, Hercules's*, or *all-heal*, the LASERPITIUM *chironium* of Linnæus: this is a native of the warmer climates, and bears the colds of our own. Both the ſeeds and roots of this ſpecies are conſiderably warmer than thoſe of the *garden* and *wild* PARSNEP. The roots and ſtalks have a ſtrong ſmell and taſte, reſembling thoſe of opopanax: and Boerhaave relates, that on wounding the plant in ſummer, he obtained a yellow juice, which, being inſpiſſated a little in the ſun, agreed perfectly, in both reſpects, with that exotic gum-reſin. Lewis.

WOUND-*wort, Saracen's, ſolidago*. See GOLDEN-*Rod*.

WOUND-*wort, true Saracen's*, a ſpecies of *ſenecio*. See GROUNDSEL.

WRACK. See WRECK.

WRACK, in *Natural Hiſtory*. See WRECK.

WRASSE, in *Ichthyology*, the name of a fiſh called by authors, *turdus vulgaris*, and by ſome *tinca-marina*, the *ſea-tench*, and ſometimes *old-wife*.

The *wraſſe*, or *labrus tinca* of Linnæus, reſembles the carp in figure, and is covered with large ſcales. Its uſual ſize is about five or ſix inches in length, and it grows to the weight of four or five pounds: its colour is very variable; red, yellow, and browniſh, being very frequently mixed in the ſcales; and it has five or ſix longitudinal lines, alternately of a pale yellow, an olive-colour, and a duſky red. Its noſe is long, and bent upwards, and it has thick and fleſhy lips extended over the jaws. Its mouth is ſmall, and its teeth, which are diſpoſed in two rows, the firſt conic, the ſecond very minute, are not very ſharp; in the throat, juſt before the gullet, are three bones, two above of an oblong form, and one below of a triangular ſhape; with the ſurface of each riſing into roundiſh protuberances: theſe are of ſingular uſe to the fiſh for grinding its ſhelly food before it arrives at the ſtomach; the dorſal fin conſiſts of ſixteen ſharp and ſpiny rays, and nine ſoft ones, longer than the others: the pectoral fins are large and round, and compoſed of fifteen rays; the ventral of ſix; the firſt ſharp and ſtrong; the anal of three ſharp ſpines, and nine flexible: its tail is rounded at the end, and is formed of fourteen ſoft branching rays; the membranes of the fins and tail are variegated

variegated with red and blue ſpots, and the anterior rays of the back-fin are prickly. It is caught in plenty on the Engliſh ſhores, and is ſold among the poorer ſort of people in Wales and Cornwall; but is not eſteemed a very delicate fiſh. It is found in deep water, adjacent to the rocks; it will take a bait, though its uſual food is ſhell-fiſh, and ſmall cruſtacea. Willughby's Hiſt. Piſc. p. 320. and Pennant.

Wrasse, *bimaculated*, *labrus bimaculata* of Linnæus, has a body pretty deep, and of a light colour, marked in the middle on each ſide with a round brown ſpot, and another on the upper part of the baſe of the tail: the lateral line is incurvated; the branchioſtegous rays are ſix; the firſt fifteen rays of the dorſal fin are ſpiny, the other eleven ſoft, and lengthened by a ſkinny appendage; the pectoral fins conſiſt of fifteen rays; the ventral of ſix, the firſt ſpiny, the ſecond and third ending in a ſlender briſtle; the anal-fin is pointed; the four firſt rays being ſhort and ſpiny, the reſt long and ſoft. This is an inhabitant of the Mediterranean.

Mr. Pennant has deſcribed ſome other ſpecies of *wraſſe*, as the *trimaculated*, *ſtriped*, and *gibbous*, taken on the coaſt of Angleſea, and another called *ballan*, numbers of which appear during ſummer near Scarborough, which is of the form of the common *wraſſe*, except that between the dorſal fin and the tail it has a conſiderable ſinking; above the noſe a deep ſulcus; and on the fartheſt cover of the gills a depreſſion radiated from the centre. Pennant's Brit. Zool. vol. iii. p. 246, &c.

WREATH, in *Natural Hiſtory*. See Turbo.

Wreath, in *Heraldry*, a roll of fine linen, or ſilk (like that of a Turkiſh turbant), conſiſting of the colours borne in the eſcutcheon; placed, in an atchievement, between the helmet and the creſt, and immediately ſupporting the creſt. *Tab.* IV. *Heraldry*, *fig.* 131.

WRECK, Wrack, *Sea*-Wreck, or *Sea-Oak*, the fucus *veſiculoſus* of Linnæus, in *Natural Hiſtory*, a ſoft, very ſlippery, marine plant, common upon rocks that are left dry at the ebb tide, with leaves ſomewhat reſembling thoſe of the oak-tree; the ſtalks running along the middle of the leaves, and terminated by watery bladders containing either air or a ſlippery fluid: the veſicles begin in March to fill with a thin juice; and about the end of July they burſt, and diſcharge a matter as thick as honey.

In ſome places it is uſed to manure the ground. In Normandy, and other parts, they burn it; and of the aſhes make a kind of ſoda, or pot-aſh, which they uſe in the making of common green glaſs, to promote the fuſion or vitrification of the other materials.

Dr. Ruſſel relates, that he found this plant an uſeful aſſiſtant to ſea-water in the cure of diſorders of the glands; that he gave it in powder to the quantity of a dram, and that in large doſes it nauſeated the ſtomach; that by burning in the open air, it was reduced into a black ſaline powder; which ſeemed, as an internal medicine, greatly to excel the officinal burnt ſpunge; which was beneficially uſed as a dentrifice, for correcting laxities of the gums; and which indicated a remarkable degree of detergent virtue by its effect in cleaning the teeth: that the juice of the veſicles, after ſtanding to putrefy, yielded, on evaporation, an acrid pungent ſalt, amounting to above a ſcruple from two ſpoonfuls; that the putrefied juice, applied to the ſkin, ſinks in immediately, excites a ſlight ſenſe of pungency, and deterges like a ſolution of ſoap; that one of the beſt applications for diſcuſſing hardneſs, particularly in the decline of glandular ſwellings, is a mixture of two pounds of the juicy veſicles, gathered in July, with a quart of ſea-water, kept in a glaſs veſſel for ten or fifteen days, till the liquor comes near to the conſiſtence of very thin honey: the parts affected are to be rubbed with the ſtrained liquor twice or thrice a day, and afterwards waſhed clean with ſea-water. Lewis's Mat. Med. See Æthiops *vegetabilis*.

Wreck, in *Sea-Language*, denotes the ruins of a ſhip which has been ſtranded or daſhed to pieces on a ſhelf, rock, or lee-ſhore, by tempeſtuous weather.

Wreck, Wreccum, called alſo *Ship*-Wreck, or *Ship*-Wrack, in *Law*, &c. is when a ſhip periſhes in the ſea, and no man eſcapes alive out of it.

The civilians term it *naufragium*. The goods in the ſhip, which are brought to the land by the waves, belong to the king, or him to whom he aſſigns the right thereof. Thus, in the Stat. Prærog. Reg. 17 Edw. II. cap. 11. *Rex habebit* wreckum maris *per totum regnum, balænas & ſturgiones captas in mari, vel alibi intra regnum, exceptis quibuſlibet privilegiatis locis*, &c.

Thus alſo the matter ſtood by the ancient common law; but the rigour of the law of *wrecks* has been gradually ſoftened in favour of the diſtreſſed proprietors. Accordingly it was firſt ordained by king Henry I. that if any perſon eſcaped alive out of the ſhip, it ſhould be no *wreck*; and afterwards king Henry II. by his charter, 26 May, A. D. 1174, declared, that if on the coaſts of England, Poictou, Oleron, or Gaſcony, any ſhip ſhould be diſtreſſed, and either man or beaſt ſhould eſcape or be found therein alive, the goods ſhould remain to the owners, if they claimed them within three months; but otherwiſe ſhould be deemed a *wreck*, and belong to the king, or other lord of the franchiſe. This was again confirmed, with improvements, by Richard I. who, in the ſecond year of his reign, not only eſtabliſhed theſe conceſſions, by ordaining that the owner, if he was ſhip-wrecked and eſcaped, "*Omnes res ſuas liberas et quietas haberet*," but alſo, that if he periſhed, his children, or in default of them his brethren and ſiſters, ſhould retain the property; and in default of brother or ſiſter, then the goods ſhould remain to the king. And by the law, as laid down by Bracton in the reign of Henry III. if not only a dog (e. g.) eſcaped, by which the owner might be diſcovered, but if any certain mark were ſet on the goods, by which they might be known again, it was held to be no *wreck*. Afterwards, in the ſtatute of Weſtm. I. 3 Edw. I. cap. 4. the time of limitation of claims, given by the charter of Henry II. is extended to a year and a day, according to the uſage of Normandy; and it enacts, that if a man, a dog, or a cat, eſcape alive, the veſſel ſhall not be adjudged a *wreck*. And it is now held, that not only if any living thing eſcape, but if proof can be made of the property of any of the goods or lading which come to ſhore, they ſhall not be forfeited as *wreck*. The ſtatute farther ordains, that the ſheriff of the county ſhall be bound to keep the goods a year and a day (as in France for one year, agreeably to the maritime laws of Oleron, and in Holland for a year and a half), that if any man can prove a property in them, either in his own right or by right of repreſentation, they ſhall be reſtored to him without delay; but if no ſuch property be proved within that time, they then ſhall be the king's. If the goods are of a periſhable nature, the ſheriff may ſell them, and the money ſhall be liable in their ſtead. This revenue of *wrecks* is frequently granted out to lords of manors, as a royal franchiſe; and if any one be thus entitled to *wrecks* in his own land, and the king's goods are *wrecked* thereon, the king may claim them at any time, even after the year and the day. In order to conſtitute a legal *wreck*, the goods muſt come to land. If they continue at ſea, the law diſtinguiſhes them by the barbarous appellations of *jetſam*, *flotſam*, and *ligan*.

Wrecks, in their legal acceptation, are now not very frequent; the owner being ſeldom unable to aſſert his property within the year and day limited by law. And in order to preſerve his property entire, our laws have made many humane regulations, very oppoſite in their ſpirit to thoſe which formerly prevailed in all the northern regions of Europe, and a few years ago were ſtill ſaid to ſubſiſt on the coaſts of the Baltic ſea; permitting the inhabitants to ſeize on whatever they could get as lawful prize. To what the reader will find under salvage to this purpoſe, we ſhall here add, that all perſons who ſecrete any goods of a *wreck* ſhall forfeit their treble value; and if they wilfully do any act whereby the ſhip is loſt or deſtroyed, by making holes in her, ſtealing her pumps, or otherwiſe, they are guilty of felony without benefit of clergy. Moreover, by the ſtatute 26 Geo. II. cap. 19. the plundering of any veſſel either in diſtreſs, or wrecked, whether any living creature be on board or not, or the preventing of the eſcape of any perſon that endeavours to ſave his life, or the wounding of him, with intent to deſtroy him, or the putting out of falſe lights in order to bring any veſſel into danger, are all declared to be capital felonies, in like manner as the deſtroying of trees, ſteeples, or other ſtated ſea-marks is puniſhed, by 8 Eliz. cap. 13. with a forfeiture of 100*l*. or outlawry. Alſo by the ſtatute of Geo. II. the pilfering of any goods caſt a-ſhore is declared to be petty larceny; and many other ſalutary regulations are made for the more effectually preſerving ſhips of any nation in diſtreſs.

By the civil law, to deſtroy perſons ſhip-wrecked, or prevent their ſaving of the ſhip, is capital; and to ſteal even a plank from a veſſel in diſtreſs, or wrecked, makes the party liable to anſwer for the whole ſhip and cargo. The laws alſo of the Wiſigoths, and the moſt early Neapolitan conſtitutions, puniſhed with the utmoſt ſeverity all thoſe who neglected to aſſiſt any ſhip in diſtreſs, or plundered any goods caſt on ſhore. Blackſt. Com. book i. p. 291, &c.

In divers charters, and old writings, it appears, that *wreck*, anciently, not only comprehended goods which came from a periſhing ſhip, but whatever elſe the ſea caſt upon land: whether it were precious ſtones, fiſh, ſea-weed, or the like.

This *wreck*, in the Grand Cuſtomary of Normandy, cap. 17. is called *varech*, and Latined *veriſcum*; and in ſome of our ancient charters, *wrecche*, *werec*, *werech*, and *ſeupwerp*, q. d. *ſea-upwerp*, of *ſea*, and *upwerpen*, *to caſt up.*

Wreck, in *Metallurgy*, a veſſel in which the third waſhing is given to the ores of metals.

In Cornwall, when the tin ore has been twice waſhed, they take the head tin, or that part of the tin ore that lies uppermoſt, out of the buddle, and throwing it into this veſſel, they pour water on it, and work it about with wooden rakes, till it is cleared from whatever other extraneous matter there may ſtill have remained mixed with it, and is, after this, fit for the blowing-houſe to be run into metal.

WREN, or *Jenny* Wren, in *Ornithology*, the *paſſer troglodytes* of Geſner, and the *motacilla troglodytes* of Linnæus, has the head and upper part of the body of a deep reddiſh brown; above each eye is a ſtroke of white; the back, and coverts of the wings, and tail, are marked with ſlender, tranſverſe, black lines; the quill-feathers with bars of black and red; the throat is of a yellowiſh white; the belly and ſides croſſed with narrow duſky and pale reddiſh-brown lines; and the tail is croſſed with duſky bars. Pennant.

This bird, though very ſmall, is of a very chearful diſpoſition, and has a very agreeable voice, which he throws out with great chearfulneſs and ſprightlineſs, uſually cocking up his tail all the time he is ſinging; and continues his ſong through the winter, except during the froſts. See Song *of Birds*.

The female breeds twice in the year, firſt in the latter end of April, and afterwards in the middle of June. The neſt is uſually placed among cluſters of moſs and ivy, in ſuch a manner, that it is very hard to diſcover it. It is made of dry moſs and leaves put together in a very artificial manner, being cloſed all round except for a ſmall hole left to go in and out at; they lay a great number of eggs, not leſs than eighteen; and it has been often found that they all hatch except one or two; and thus ſixteen young ones have been found together in one neſt. Theſe are brought up ſo well as to ſhift for themſelves by the end of May; and then another brood is provided for by the middle of the month following. The young ones may be eaſily raiſed. They ſhould for this purpoſe be taken out of the neſt at about fourteen days old, and fed with ſheep's, calf's, or ox's heart, cut ſmall, with eggs minced among it. When they are able to peck this meat for themſelves, they may be put into cages; but they muſt ſtill be fed for ſome days, leſt they ſhould neglect themſelves and die of hunger after the greateſt part of the trouble is thus over.

When they are grown up they may be fed with paſte, and will need no more heart. Afterward it will be a great feaſt to them to give each a ſpider or two once in two or three days; and after they are grown up, they may either be left to ſing their own wild notes, which are very agreeable, or if it be deſired that they ſhould whiſtle tunes, they will eaſily be taught it. Ray and Pennant.

Wren, *creſted*, or *Golden-creſted* Wren, *regulus criſtatus*, or *motacilla regulus* of Linnæus, in *Ornithology*, the name of a very beautiful little bird, the ſmalleſt of all the Britiſh birds. Its whole weight is not more than ſeventy-ſix grains; and the crown of its head is adorned with a very beautiful ſaffron-coloured, or orange-red ſpot, which is called its creſt, and by ſome its crown, and from this golden crown the bird has obtained the name of the *regulus*, *tyrannus*, *baſileus*, and other appellations of royalty. This beautiful ſcarlet mark on the head is bounded on each ſide by a fine yellow line. The bill is duſky; the feathers of the forehead are green; from the bill to the eyes is a narrow white line; the back and hind part of the neck are of a dull green; the coverts of the wings duſky, edged with green and tipped with white; the quill-feathers and tail duſky, edged with pale green; the throat and lower part of the body white, tinged with green; the legs are of a dull yellow colour; and the claws are very long.

This bird frequents woods, and is found principally in oak-trees. It is common about the Peak in Derbyſhire, and is ſeen in autumn as far north as the Shetland iſles, but quits that country before winter. It lays ſix or ſeven eggs, not larger than peas. This bird has been obſerved ſuſpended in the air for a conſiderable time over a buſh in flower, whilſt it ſung very melodiouſly. The note does not much differ from that of the common *wren*, but is very weak. Ray and Pennant.

Wren, *yellow.* See Lutfola.

WRESTLING, a kind of combat, or engagement, between two perſons unarmed, body to body, to prove their ſtrength and dexterity; and try which can throw his opponent to the ground.

Wreſtling, *palæſtra*, is an exerciſe of very great antiquity and fame. It was in uſe in the heroic age; witneſs Hercules, who *wreſtled* with Antæus.

It continued a long time in the higheſt repute; and had very conſiderable rewards and honours aſſigned it at the Olympic games. It was the cuſtom of the athletæ, or wreſtlers, to anoint their bodies with oil, to give the leſs hold to their antagoniſt. See Palæstra.

Ablancourt obſerves, that Lycurgus ordained the Spartan maids to *wreſtle* in public, quite naked, to break them of their too much delicacy and niceneſs; to make them appear more robuſt, and familiarize the people, &c. to ſuch nudities.

WRINGLE-*tail*, a name given by the people of ſeveral parts of England, to the *curvicauda*, a ſpecies of bee-fly, very much reſembling the bee in ſhape, but having only two wings and no ſting.

It is very troubleſome to horſes, but does not ſuck their blood, but only lays its eggs in their ſkins; it is called in other countries the *whame* and the *barrel-fly*.

WRIST, *carpus*, in *Anatomy*, conſiſts of eight ſmall, unequal, and irregular bones, all of which taken together repreſent a ſort of grotto, of an irregular quadrangular figure, and connected principally with the baſis of the radius. See *Tab. Anat.* (*Oſteol.*) *fig.* 3. Nº 9. 7. and Nº 12. Conſidered in this manner, the whole connection of them has two ſides and four edges: one of the ſides is convex and external, the other concave and internal. The convexity of the outſide is pretty regular and even; but the concavity of the inſide has four eminences, one at each corner. One of the four edges touches the fore-arm, and is, as it were, the head of the carpus; another of the edges touches the metacarpus, and may be called the baſis; the third is toward the point of the radius, and the fourth toward the point of the ulna; the firſt of theſe latter two may be called the ſmall edge, the latter the larger.

The bones of the carpus are divided into four rows, the firſt of which lies next the fore-arm, the ſecond next the metacarpus; each row conſiſts of four bones; but the fourth of the firſt row lies in a manner out of its rank. Each bone has ſeveral cartilaginous ſurfaces, for their mutual articulations, and, in ſome of them, for their articulations with the radius, and bones of the metacarpus and thumb.

It is to no purpoſe to diſtinguiſh the three ordinary dimenſions in any of theſe bones, except one; but in moſt of them we may conſider ſix ſides, one external, turned toward the convex ſurface of the carpus; one internal, toward the concave ſurface; one toward the fore-arm, which may properly be called the brachial ſide; one toward the fingers, to be called the digital ſide, one toward the point of the radius, or the radical ſide, and one toward the point of the ulna, or the cubital ſide.

Of theſe ſides ſome are bony, others are cartilaginous or articular; theſe laſt Winſlow calls ſides, the others ſurfaces, as being portions of the carpus's ſurface in its natural ſituation: to diſtinguiſh theſe bones from each other, they have been called the firſt, ſecond, third, and fourth, bones, of the firſt or ſecond row, beginning to count from the radius or thumb.

But Lyſerus has been at the pains of giving a particular name to each of them: he calls the firſt of the row the *os* scaphoides or naviculare; the ſecond, the *os* lunare; the third, the *os cuneiforme*, which appears like a wedge ſticking between the two rows, having a rough ſurface with a ſmall tubercle upon it, forming the greateſt part of the cubital edge of the carpus, and four articular ſides; the fourth, the *os piſiforme*, *orbiculare*, or *lenticulare*, which is irregularly round, having one cartilaginous ſide irregularly orbicular, and the reſt of the bone being rough, convex, and irregularly round, and making one of the four eminences on the concave ſide of the carpus; the firſt bone of the ſecond row, the *os* trapezium; the ſecond, *os* trapezoides; the third, *os* magnum; and the fourth, *os* unciforme.

The bones of the carpus are articulated with one another by arthrodia; but the firſt row forms a ſort of ginglymus with the ſecond; becauſe the head of the os magnum may turn in the cotyloide cavity of the firſt row, while the two firſt bones of the ſecond row ſlide upon the digital ſide of the os ſcaphoides, and the os unciforme in the ſame manner on the os cuneiforme.

When all theſe bones are in their natural ſituation, a tranſverſe depreſſion is formed in the convex ſide of the carpus, by which the two rows are diſtinguiſhed. This depreſſion appears moſt between the os ſcaphoides, and the three laſt bones of the ſecond row, and looks like a fold, by which the ſecond row is thrown back upon the firſt. The four eminences on the concave ſide of the carpus are for the inſertion of a ſtrong tranſverſe ligament. The inner ſubſtance of all theſe bones is ſpongy, and their ſurfaces are not very compact. There are ſix muſcles,

that perform the motions of the carpus on the fore-arm, viz. ULNARIS *internus*, RADIALIS *internus*, ULNARIS *externus*, RADIALIS *externus primus* and *secundus*, and ULNARIS *gracilis*. Winslow.

WRIST *fractured*. The bones of the *wrist* are very seldom subject to fracture, on account of their smallness. And when they are fractured, there is but little hope of a cure; for the ligaments and tendons are here so numerous, and the bones so very small, that it is scarce possible to reduce them to their places, or to make them grow together again.

On this account the joint of the hand generally becomes stiff and immoveable after these accidents, or else abscesses, suppurations, fistulæ, and caries of the bones follow them; and these, on account of the softness of the bones, and the difficulty of discharging the matter, are seldom remedied, but by amputating the hand. What can be done, however, toward the curing of a fracture in this part, is this: the assistant must lay hold of the hand above the *wrist* and below it, and extend them as far as is necessary in opposite directions; the surgeon is, while this is doing, to replace the bones with his fingers, and when they are all replaced, to bind the hand up with a proper bandage. Heister.

WRIST, *ligaments of the*. See *Ligaments of the* HAND.

WRIST, *luxation of the*. See *Luxation of the* HAND.

WRIST, in the *Manege*. The bridle *wrist* is that of the cavalier's left hand. A horseman's *wrist* and his elbow should be equally raised, and the *wrist* should be two or three fingers above the pummel of the saddle. To ride a horse from hand to hand, i. e. to change hands upon one tread, you need only to turn your *wrist* to that side you would have the horse to turn to, without advancing your hand. But if your horse stops, you must make use of both your legs. See HAND, and LEG.

WRIT, formed from the Saxon, *writan*, *to write*, *Breve*, in *Law*, a precept of the king in writing, under seal, issuing out of some court to the sheriff or other person, whereby any thing is commanded to be done, touching a suit or action, or giving commission to have it done. As, the summoning of a defendant, taking a distress, redressing a disseisin, or the like. Or according to Fitzherbert, a *writ* is a formal letter of the king, in parchment sealed with a seal, and directed to some judge, officer, or minister, &c. at the suit or plaint of a subject, requiring to have a thing done, for the cause briefly expressed, which is to be discussed in the proper court according to law. See BREVE, BRIEF, and PRECIPE.

Writs are variously divided, and in various respects. Some, with regard to their order, or manner of granting, are termed *original*, and others *judicial*.

WRITS, *original*, are those sent out of the high court of chancery, to summon the defendant in a personal, or tenant in a real action; either before the suit begins, or to begin the suit thereby. See ORIGINAL.

Royal *writs* are held to be demandable of common right, on paying the usual fees; for any delay in the granting of them, or setting an unusual or exorbitant price upon them, would be a breach of Magna Charta, cap. 29. "*Nulli vendemus, nulli negabimus, aut differemus justitiam vel rectum.*"

Original writs are either optional or peremptory, or, in the language of our law, they are either a PRECIPE, or a SI TE *fecerit securum*.

WRITS, *judicial*, are those sent by order of the court where the cause depends, upon emergent occasions, after the suit begins.

Judicial writs are distinguished from original, in that their teste bears the name of the chief-justice of that court whence they come; whereas the original say, *teste meipso*, in the name, or relating to the king.

The *original writ* is always made returnable at the distance of at least fifteen days from the date or TESTE, and upon some day in one of the four TERMS: and all *judicial writs*, being grounded on the sheriff's RETURN, must respectively bear date the same day on which the *writ* immediately preceding was returnable. See PROCESS.

Judicial writs, if erroneous, may be amended; whereas *original writs* are not amendable, if the error be by default of the party who gave instruction; yet a new original may be taken out, where it is not amendable.

Writs are also distinguished, according to the nature of the ACTION, into *real* or *personal*.

Real, are either touching the possession, called *writs of* ENTRY; or the property, called *writs of right*. See RECTO.

Personal writs, are those relating to goods, chattels, or personal injuries.

To which may be added, *mixt writs*, for the recovery both of the thing and damages.

Some *writs*, again, are at the suit of the party; some, of office; some, ordinary; some, of privilege. A *writ of privilege*, is that which a privileged person brings to the court for his exemption, by reason of some privilege which he enjoys.

But the most common *writs* in daily use are in debt, detinue, trespass, action upon the case, account, and covenant, &c. which, as well as others, must be rightly directed, or they will be naught.

Writs may be renewed every term, until a defendant is arrested; but in the court of king's bench if the LATITAT be not renewed in five terms, a new *writ* is to be taken out, and the plaintiff is not allowed to renew the old one.

The sheriff's bailiffs cannot execute a *writ* directed to the sheriff, without his warrant; and if several persons are included in a *writ* (for four defendants may be in one *writ*) there must be several warrants from the sheriff to execute the same. All *writs* are to be returned and filed in due time, to avoid POST-TERMINUMS.

Attachment lies against sheriffs, &c. for not executing a *writ*, or for doing it oppressively by force, extorting money thereon, or not doing it effectually, by reason of any corrupt practice.

WRIT *of assise*. See ASSISE.

WRIT *of assistance*, that issuing out of the exchequer, to authorise some person to take a constable, or other public officer, to seize goods or merchandize prohibited, and uncustomed, &c.

There is also a *writ* of this name issuing out of chancery, to give possession of lands. Stat. 14 Car. II cap. 1.

WRIT *of capias*. See CAPIAS.

WRIT *of distringas*. See DISTRINGAS.

WRIT *of election to parliament*. See PARLIAMENT.

WRIT *of entry*. See ENTRY.

WRIT *of inquiry of damages*, a judicial *writ* that issues out to the sheriff upon a judgment by default, in an action of the case, covenant, trespass, trover, &c. commanding him to summon a jury to enquire what damages the plaintiff hath sustained, *occasione præmissorum*; and when this is returned with the inquisition, the rule for judgment is given upon it; and if nothing be said to the contrary, judgment is thereupon entered. 2 Lill. Abr. 721.

WRIT *of mainprise*. See MAINPRISE.

WRIT *of neifty*. See NEIFTY.

WRIT *of rebellion*. See COMMISSION *of Rebellion*.

WRIT *of right*. See RECTO.

WRITS *vicountiel*. See VICOUNTIEL.

WRIT, *action of a*. See ACTION.

WRIT, *appeal by*. See APPEAL.

WRIT, *attachment by*. See ATTACHMENT.

WRIT, *continuance of a*. See CONTINUANCE.

WRITER *of the tallies*, an officer of the exchequer, being clerk to the auditor of the receipt; who writes upon the tallies the whole letters of the tellers bills. See TALLY, and EXCHEQUER.

WRITING, *scriptura*, the art, or act, of signifying and conveying our ideas to others, by letters, or characters visible to the eye.

Or, *writing* may be defined to be the art of exhibiting to the sight the conceptions of the mind, by means of marks or characters, significant of the sounds of language, which enable us to transfer ideas from the eye to the ear, and *vice versâ*.

Written characters are of two sorts: they are either signs for things, or signs for words. Of the former sort are the pictures, hieroglyphics, and symbols, employed by the ancient nations; of the latter sort are the alphabetical characters, now employed by all Europeans. Pictures were, undoubtedly, the first essay towards *writing*; accordingly, we find in fact, that this was the only sort of *writing* known in the kingdom of Mexico, when America was first discovered. By historical pictures, the Mexicans are said to have transmitted the memory of the most important transactions of their empire. See Warburton's Divine Legat. of Moses, vol. ii. part i. p. 67, &c. vol. iii. p. 73. Robertson's Hist. Am. vol. iii. p. 203, &c. and Appendix, note 26. p. 440. edit. 8vo.

But as pictures could do no more than delineate external events, without exhibiting their connections, describing such qualities as were not visible to the eye, or conveying any idea of the dispositions, or words, of men, there arose in process of time, for supplying this defect, the invention of hieroglyphical characters; which may be considered as the second stage of the art of *writing*.

HIEROGLYPHICS consist in certain symbols, which are made to stand for invisible objects, on account of an analogy or resemblance which such symbols were supposed to bear to the objects. Among the Mexicans were found some traces of hieroglyphical characters, intermixed with their historical pictures. But Egypt was the country where this sort of *writing* was most studied, and brought into a regular art. However, this sort of *writing* could be no other than ænigmatical and confused, in the highest degree; and must have been a very imperfect vehicle of knowledge of any kind.

As

As *writing* advanced from pictures of visible objects to hieroglyphics, or symbols of things invisible; from these latter it advanced, among some nations, to simple arbitrary marks which stood for objects, though without any resemblance or analogy to the objects signified. Of this nature was the method of *writing* practised among the Peruvians; who made use of small cords, of different colours, and by knots upon these, of various sizes, and differently arranged, contrived signs for giving information, and communicating their thoughts to one another. Of this nature also are the written characters, which are used to this day in China. The Chinese have no alphabet of letters, or simple sounds, which compose their words; but every single character, which they use in *writing*, is significant of an idea: it is a mark which stands for some one thing, or object; and, consequently, the number of these characters must be immense. This CHINESE *writing*, probably, began, like the Egyptian, with pictures and hieroglyphical figures; which figures being, in their progress, abbreviated in form, for the sake of more easily *writing* them, and greatly enlarged in number, passed at length, into those marks or characters, which they now use, and which have spread themselves through several nations of the East. For it is said, that the Japanese, the Tonquinese, and the Coroeans, who speak different languages from one another, and from the inhabitants of China, use the same written characters with them, and thus intelligibly correspond with each other in *writing*, though ignorant of the language spoken in their several countries. Our European arithmetical figures are significant marks, precisely of the same nature with the Chinese characters. Thus far nothing has appeared which resembles our letters, or which can be called *writing*, in the sense now given to that term. What we have hitherto seen were all direct signs for things, and made no use of the medium of sound, or words; either signs by representation, as the Mexican pictures; or signs by analogy, as the Egyptian hieroglyphics; or signs by institution, as the Peruvian knots, the Chinese characters, and the Arabian cyphers. At length, in different nations, men became sensible of the imperfection, the ambiguity, and the tediousness of each of these methods of communication with one another, and began to consider the advantage resulting from employing signs, which should stand not directly for things, but for the words which they used in speech for naming these things; and they also considered that, though the number of words in every language be very great, yet the number of articulate sounds, used in composing these words, is comparatively small. Hence they were led to invent signs, not for each word by itself, but for each of those simple sounds that are employed in forming words; and they observed that, by joining together a few of those signs, it would be practicable to express, in *writing*, the whole combinations of sounds which our words require.

The first step, in this new progress, was the invention of an alphabet of syllables, which probably preceded the invention of an alphabet of letters, among some of the ancient nations; and which is said to be retained, to this day, in Ethiopia, and some countries of India. By fixing upon a particular mark or character, for every syllable in the language, the number of characters, necessary to be used in *writing*, was reduced within a much smaller compass than the number of words in the language. Still, however, the number of characters was great; and must have continued to render both reading and *writing* very laborious arts. At last some happy genius arose, and tracing the sounds made by the human voice to their most simple elements, reduced them to a very few vowels and consonants; and, by affixing to each of these the signs which we now call letters, taught men how, by their combinations, to put into *writing* all the different words, or combinations of sound, which they employed in speech. By being reduced to this simplicity, the art of *writing* was brought to its highest state of perfection, and, in this state, we now enjoy it in all the countries of Europe.

To whom we are indebted for this admirable and useful discovery does not appear. There seems reason to conclude, from the books which Moses has written, that, among the Jews, and probably among the Egyptians, letters had been invented prior to his age. The universal tradition among the ancients is, that they were first imported into Greece by Cadmus the Phœnician, who, according to the common system of chronology, was contemporary with Joshua; but according to sir Isaac Newton's system, contemporary with king David. As the Phœnicians are not known to have been the inventors of any art or science, though, by means of their extensive commerce, they propagated the discoveries made by other nations, the most probable and natural account of the origin of alphabetical characters is, that they took rise in Egypt, the first civilized kingdom of which we have any authentic accounts, and the great source of art and polity among the ancients. In that country, the favourite study of hieroglyphical characters had directed much attention to the art of *writing*. Their hieroglyphics are known to have been intermixed with abbreviated symbols, and arbitrary marks; whence, at last, they caught the idea of contriving marks, not for things merely, but for sounds. Accordingly, Plato (in Phædro) expressly attributes the invention of letters to Theuth or Thoth, the Egyptian, who is supposed to have been the Hermes, or Mercury, of the Greeks. Cadmus himself, though he passed from Phœnicia to Greece, as several of the ancients have affirmed, was originally of Thebes in Egypt. Most probably Moses carried with him the Egyptian letters into the land of Canaan; and there being adopted by the Phœnicians, who inhabited part of that country, they were transmitted into Greece.

It is curious to observe, that the letters, which we use at this day, can be traced back to the alphabet of Cadmus. The Roman alphabet, which obtains with us and most of the European nations, is plainly formed on the Greek, with a few variations. And all learned men observe, that the Greek characters, especially according to the manner in which they are formed in the oldest inscriptions, have a remarkable conformity with the Hebrew or Samaritan characters, which, it is agreed, are the same with the Phœnician, or the alphabet of Cadmus. If the Greek characters are inverted from left to right, according to the Phœnician and Hebrew manner of *writing*, they will appear to be nearly the same. Beside the conformity of figure, the names or denominations of the letters, alpha, beta, gamma, &c. and the order in which they are arranged, in all the several alphabets, Phœnician, Hebrew, Greek, and Roman, agree so much as to amount to a demonstration, that they were all originally derived from the same source. The letters were, at first, written from the right hand to the left; and this manner of *writing* obtained among the Assyrians, Phœnicians, Arabians, and Hebrews; and from some very old inscriptions, it appears to have obtained also among the Greeks. Afterwards the Greeks adopted the method of *writing* their lines alternately from the right to the left, and from the left to the right, called BOUSTROPHEDON. At length, however, the motion from the left hand to the right being found more natural and commodious, the practice of *writing*, in this direction, prevailed throughout all the countries of Europe. See more on this subject under LETTERS.

Writing was long a kind of engraving. Pillars, and tables of stone, were first employed, and afterwards, plates of the softer metals, such as lead: but as *writing* became more common, lighter and more portable substances were employed. The leaves, and the bark of certain trees, were used in some countries: and in others tablets of wood, covered with a thin coat of soft wax, on which the impression was made with a stylus of iron. See BOOK, BARK, and STYLE.

In later times, the hides of animals, properly prepared and polished into PARCHMENT, were the most common materials: our present method of *writing* on PAPER is an invention of no greater antiquity than the fourteenth century.

The advantages of *writing* above SPEECH are, that *writing* is both a more extensive, and a more permanent method of communication: nevertheless spoken language has a great superiority over written language, in point of energy or force. See Warburton, ubi supra. Blair's Lectures on Rhetoric, &c. vol. i. lect. 7.

An ingenious and learned writer has lately discussed the subject of this article in a very elaborate manner. He observes that there is a difference, deserving particular attention in the enquiry, concerning the origin and progress of *writing*, between imitative characters and symbolic or arbitrary marks. The former derive their origin from that imitative faculty, which is so conspicuous in the human species; the latter are founded in necessity or convenience, and become significant by compact: the one comprehends symbols and marks for sounds, significant of ideas; and the other have an immediate reference to sensible objects which present themselves to sight, and are applicable to hieroglyphic representations. Accordingly all representations, marks, or characters, which were ever used by any nation or people, must have been either imitative or symbolic.

This writer controverts the opinion of M. Fourmont, bishop Warburton, and M. Gebelin, who have endeavoured to shew, that alphabets were originally formed of hieroglyphic characters; alledging, that the letters of an alphabet were essentially different from the characteristic marks deduced from hieroglyphics, which are marks for things and ideas, like the ancient and modern characters of the Chinese; whereas the former are only marks

for founds; and that, though there be a fufficient refemblance between the Mexican picture-*writing*, the Egyptian hieroglyphics, and the Chinefe characters, yet thefe are foreign to alphabetic letters, and, in reality, do not bear the leaft relation to them. The hieroglyphic characters of the Chinefe, are, it is faid, in their nature imitative, and do not combine into words, like arbitrary marks for founds or letters, which are very few, and of a fymbolic nature.

Letters, it is maintained, do not derive their powers from their forms, but originally their forms entirely depended on the fancy or will of thofe who made them.

Many learned men have fuppofed, that the alphabet was of divine origin; and feveral writers have afferted, that letters were firft communicated to Mofes by God himfelf; whilft others have contended, that the Decalogue was the firft alphabetic *writing*. But if this art had been a new difcovery in the time of Mofes, he would probably have commemorated it; nor is there any reafon to fuppofe, that God was the immediate revealer of the art, for Mofes could never have omitted to have recorded the hiftory of fo important a circumftance, as the memory of it would have been one of the ftrongeft barriers againft idolatry.

It appears, however, that the art of *writing* is of great antiquity, and that the ancients, who afcribed the invention of it to the gods, had very imperfect ideas of its true origin. When it is confidered that letters muft have been the produce of a certain degree of civilization among mankind, the inquirers into their original have been naturally led to feek it in the hiftory of thofe nations that appear to have been firft civilized. Accordingly, many authors have decided in favour of the Egyptians. See Letters.

Others have vindicated the claim of the Phœnicians to the invention of letters; urging the teftimony of Sanconiatho, the moft ancient and alfo the moft celebrated Phœnician hiftorian, corroborated by Pliny, Curtius, Lucan, Eufebius, &c. as well as their very early and high degree of civilization. The Chaldæans have alfo had feveral learned advocates, who have attributed the invention of letters to the patriarch Abraham: and fir Ifaac Newton, in particular, admits, that letters were known in the Abrahamic line for fome centuries before Mofes.

It is needlefs to mention the claims of the Tufcans, Indians, and Arabians. Mr. Aftle, ubi infra, declares in favour of the Phœnicians; and obferves that, as the Chaldæans, Syrians, Phœnicians, and Egyptians, all bordered upon each other, and as the Phœnicians were the greateft, as well as the moft ancient commercial nation, it is very probable, that they communicated letters to the Egyptians; the ports of Tyre and Sidon, and thofe of the Egyptians, being not far diftant from each other. This author adds, that before the time when Mizraim went into Egypt, in the year before Chrift 2188, and 160 years after the flood, Taaut, his fon, had invented letters in Phœnicia; and if this invention took place ten years before the migration of his father into Egypt, as Mr. Jackfon fuppofes, we can trace letters as far back as the year 2178 before Chrift, and 150 after the deluge recorded by Mofes: and beyond this period, the written annals of mankind, which have been hitherto tranfmitted to us, will not enable us to trace the knowledge of them, though this want of materials is no proof, that letters were not known until a century and a half after the deluge.

An opinion feems to be gaining credit among the learned, that arts and letters took their rife in the northern parts of Afia, and that they were cultivated in thofe parts, long before they were practifed in Phœnicia or Egypt. Some travelled fouthwards, others ftaid behind; and thofe who afterwards emigrated from the Eaft were generally called Scythians, and fometimes Hunns, who overfpread the northern parts of Europe. Many fettlements were made in Germany long before the Chriftian æra.

It has been afferted by many writers, that all alphabets are derived from one; but Mr. Aftle maintains, that there are various alphabets ufed in differents parts of Afia, which differ from the Phœnician, ancient Hebrew or Samaritan, in name, number, figure, order, and power. In feveral of thefe alphabets, there are marks for founds peculiar to the language of the Eaft, which are not neceffary to be employed in the notation of the languages of Europe.

The following alphabets, fays this learned writer, feem to be immediately derived from the Phœnician; viz. the ancient Hebrew, or Samaritan; the Chaldaic; the Baftulan, or that of the colony of Phœnicians or Canaanites, who are faid to have fled from Jofhua, and to have fettled themfelves, in the moft early ages, in that part of Spain now called Andalufia and Grenada; the Punic, Carthaginian, or Sicilian; the Pelafgian Greek, and its derivatives, which are written in the Eaftern manner, from right to left; and the Ionic Greek, written from left to right. This laft mentioned branch from the Pelafgic ftock is the fource from whence not only moft of the alphabets of Europe are derived, but alfo of many others, which have been adopted in different parts of Afia and Africa. From the Ionic Greek are derived the Arcadian, the Latin or Roman, the ancient Gaulifh, the ancient Spanifh, the ancient Gothic, the Coptic, the Ruffian, the Illyrian or Sclavonian, the Bulgarian, and the Armenian: the Runic is immediately derived from the Gothic.

The alphabets derived from the Roman are the Lombardic, the Vifigothic, the Saxon, the Gallican, the Franco-Gallic or Merovingian, the German, the Caroline, the Capetian, and the Modern Gothic. The firft relates to the MSS. of Italy; the fecond, to thofe of Spain; the third, to the MSS. of Great Britain; the fourth and fifth, to thofe of France; the fixth, to Germany; the feventh, eighth, and ninth, to all the countries of Europe where Latin is read. The fix former alphabets are before the age of Charlemagne; the three latter follow it. The characters of thefe are more diftinguifhed by their names than by their forms, which indicate that they are all of Roman extraction. The Lombardic, introduced into Italy by the Lombards in 569, was ufed by the popes in their bulls, and fometimes called Roman in the eleventh century: it ceafed in the thirteenth century. The Vifigothic or Spanifh Gothic, was introduced into Spain by the Goths or Vifigoths; it was abolifhed in a provincial fynod, held at Leon in 1091, when the Latin letters were eftablifhed for all public inftruments; though thefe characters were occafionally ufed in private tranfactions, for upwards of three centuries afterwards. Saxon *writing* admits of various diftinctions, viz. the Anglo-Saxon, Britanno-Saxon, and Dano-Saxon. The Gauls, on being fubdued by the Romans, adopted their mode of *writing*; and by additions of their own, gave rife to the Gallican or Roman Gallic. The Franks, a people of Germany, having conquered part of Gaul, introduced their characters called Franco-Gallic, or Merovingian, becaufe this kind of *writing* was practifed under the kings of the Merovingian race. It took place about the clofe of the fixth century, and prevailed till the beginning of the ninth. The Caroline was derived from the improvement of Charlemagne; this declined in the twelfth century, and totally difappeared in the thirteenth, when it was fucceeded in Germany by the Modern Gothic. The Caroline *writing* was reftored by Hugh Capet, about the year 987, and called Capetian: it was much practifed till about the middle of the twelfth century; but in the thirteenth it degenerated into the Modern Gothic. The Capetian *writing* was ufed in England and in Germany, as well as France, during the above mentioned period. The Modern Gothic, which fpread itfelf over Europe in the twelfth and thirteen centuries, is improperly fo called; becaufe it does not derive its origin from the *writing* anciently ufed by the Goths and Vifigoths in Italy and Spain, but it is the moft barbarous kind of *writing*: it took its rife, in the decline of the arts among the lazy fchoolmen, who had the worft tafte; it is nothing more than the Latin *writing* degenerated. It began in the twelfth century, and was generally ufed (efpecially by monks and fchoolmen) in all parts of Europe, till the reftoration of the arts in the fifteenth century, and longer in Germany and the northern nations. Our ftatute-books are ftill printed in Gothic letters.

The learned are not agreed with refpect to the origin of what is called *national writing*. Some will have it, that the Roman manner prevailed throughout the Weft, until the irruption of the barbarous nations of the North, in the fifth and fixth centuries: the Goths (they fay) firft introduced their mode of *writing* into Italy, inftead of the Roman manner; the Vifigoths did the like in Spain; the Franks in Gaul; the Saxons in England; and the Lombards in Italy.

According to others, the Romans were in poffeffion of various forms of *writing*; but it is fuppofed, that the barbarous nations introduced fome of their own letters in the *writings* compofed of capitals and fmall letters; that the running-hand, peculiar to each nation, was ufed in grants and contracts, and found admittance likewife in manufcripts after the middle of the feventh century.

Mr. Aftle, however, is of opinion, that the different modes of *writing* in Italy, Spain, France, England, and Germany, were derived from the Roman alone.

While Rome continued the centre of all the provinces of the empire, her manner of *writing* generally prevailed in each; but the empire being difmembered, and all the weftern provinces difunited, a change was produced; the conquerors disfigured the Roman *writing*, and by their falfe tafte and ignorance, diftinguifhed their *writing* from that of their neighbours: the genius and difpofition

sition of the different people having no small share in producing this diversity.

This notion greatly assists in discovering the age of manuscripts; for if a *writing* is Merovingian, it cannot be subsequent to the ninth, nor prior to the fifth century; if another is Lombardic, it must be posterior to the middle of the sixth, and anterior to the thirteenth; if Saxon, it cannot be earlier than the seventh, nor later than about the middle of the twelfth.

With regard to the forms of letters, many authors are of opinion that they are derived from the positions of the organs of speech in their pronunciation. Accordingly, M. Van Helmont hath taken great pains to prove, that the Chaldaic characters are the genuine alphabet of nature, because, he says, no letter can be rightly sounded, without disposing the organs of speech into an uniform position with the figure of each letter.

Mr. Nelme published a work, in which he endeavours to shew that all elementary characters or letters derive their form from the line and the circle. Mr. Gebelin deduces them from hieroglyphic representations, and he hath given several delineations of human figures, trees, &c. in confirmation of his hypothesis. Mr. Astle observes that, as letters are only marks for sounds, their forms entirely depended upon the taste, fancy, will, or caprice of those who first formed them. In this point of view, they may be considered as arbitrary marks, or secret cyphers, which, by being made known and adopted, would become of general use, wherever they were received by agreement. For the number and forms of the letters of various alphabets, illustrated by figures, we must refer to Mr. Astle's account, *ubi infra*.

After the most diligent inquiry it doth not appear, says Mr. Astle, that the Britons had the use of letters before their intercourse with the Romans: and though, from the coming of Julius Cæsar till the time when the Romans left the island in the year 427, the Roman letters were familiar to the eyes of the inhabitants, he is of opinion, that *writing* was very little practised by the Britons till after the coming of St. Augustin, about the year 596.

The *writing*, which prevailed in England from this time to the middle of the eleventh century, is generally termed Saxon, and may be divided into five kinds; viz. the Roman Saxon, which is very similar to the Roman, and prevailed in England from the coming of St. Augustin till the eighth century; the set Saxon, which took place toward the middle of the eighth century, continued till about the middle of the ninth, and was not entirely disused till the beginning of the tenth century; the running-hand Saxon, which came into use toward the latter end of the ninth century, when learning was diffused in England under the auspices of king Alfred, in whose reign many books were written in this island, in a more expeditious manner than formerly; the mixed Saxon, occurring, in the ninth, tenth, and in the beginning of the eleventh centuries, in many MSS. which were written in England in characters partly Roman, partly Lombardic, and partly Saxon; and the elegant Saxon, which took place in England early in the tenth century, lasted till the Norman conquest, but was not entirely disused till the middle of the twelfth, and is more beautiful than the *writing* in France, Italy, and Germany, during the same period.

The *writing* introduced into England by William I. is usually called Norman, and is composed of letters nearly Lombardic, which were generally used in grants, charters, public instruments, and law proceedings, with very little variation, from the Norman conquest till the reign of king Edward III.

About the reign of king Richard II. variations took place in *writing* records and law proceedings; the charters from the reign of king Rich. II. to that of king Henry VIII. were composed partly of characters called set chancery and common chancery, and of some of the letters called court-hand; which three different species of *writing* are derived partly from the Norman, and partly from the modern Gothic. The modern Gothic began to take place in England in the twelfth century; the old English, about the middle of the fourteenth century; the set chancery and common chancery, in the decline of the same century, and are still used in the enrollments of letters patents, charters, &c. and in exemplifications of recoveries; the court-hand was contrived by the English lawyers, and took its rise about the middle of the sixteenth century, and continued till the beginning of the late reign, when it was abolished by law. The court-hand characters were nothing more than the Norman characters very much corrupted and deformed.

In the sixteenth century the English lawyers engrossed their conveyances and legal instruments in characters called secretary, which are still in use.

The French call their *writing* by the names of the different races of their kings, in whose time they were written: these were the Merovingian, the Carlovingian, the Capetian, the Valesian, and the Bourbonian.

The *writing* called Merovingian began in France soon after the time of Merovæus, son of Pharamond; who was made king A. D. 460; this race ended with Childeric, who died in 752. The Caroline race properly began with Pepin, who was made king of France upon the death of Childeric. This prince was succeeded by Charlemagne, A. D. 814, whose line in France ended with Lewis V. A. D. 987. The Capetian race began with Hugh Capet, who succeeded Lewis V. and ended with Charles IV. A. D. 1327. The Valesian race began with Philip IV. the successor of Charles IV. and ended with Henry III. the last of this line, who was slain in 1589. The Bourbonian line began with Henry IV. A. D. 1589, whose descendants now fill the throne of France.

The MSS. written in the northern parts of Scotland and in Ireland are in characters similar to the Saxon. The learned and ingenious colonel Vallancey thinks, indeed, that the Iberians, who migrated from the borders of the Euxine and Caspian seas, and settled in Spain, learned letters and arts from the Phœnicians: that a colony of the ancient Spaniards, by the name of Scots or Scythians, settled in Ireland about a thousand, or perhaps six hundred years before Christ, and that they brought elementary characters with them into Ireland. He observes, that the Irish alphabet differs from that of all other nations, in name, order, number, and power, and supposes that they might have received their alphabet from the Carthaginians, who also settled a colony in Ireland about six hundred years before Christ; and adds, that this opinion is the more to be credited, as the Irish language appears to have a radical identity with the Punic.

In order to discover what real pretensions the Irish have to the early use of letters, for which they eagerly contend, Mr. Astle has examined their stone monuments, their coins, and their MSS. and appealed to the historians of that country. The letters upon the most ancient of their monuments are apparently of Roman, and Roman-British original; and none of these inscribed monuments are so ancient, as to prove that the Irish were possessed of letters before the Romans had intercourse with the Britons; though they prove that they had letters before the arrival of St. Patrick in that kingdom, which, Mr. Whitaker, with great probability of truth, says, were wafted over from the Caledonians, who used the Roman letters. Sir James Ware says, that the Irish alphabet was borrowed from the British, and that the Saxon characters were nearly the same as the Irish; and adds, that Mr. Camden inclined to this opinion.

Moreover, there are no Irish coins, inscribed with letters, till long after the twelfth century; except coins struck by some of our Saxon kings, who made incursions into that country, and struck money there in the Saxon manner.

The oldest Irish MS. which has been discovered is the Psalter of Cashel, written in the latter end of the tenth century.

The testimony of approved historians is likewise unfavourable to the ancient literature of Ireland. Mr. Innes, in his Essay on the Antiquities of Scotland and Ireland, and Mr. James Macpherson, in the third edition of his Introduction to the History of Great Britain and Ireland, maintain, that Ireland was first peopled from Britain; and that the manners of the old Irish were inconsistent with the knowledge of letters.

It seems probable, that the interior parts of Europe were immediately peopled from the northern parts of Asia, and the maritime parts from Phœnicia, and the southern and western parts of that quarter of the globe. If this be the case, it is not surprising that some eastern customs prevailed in Great Britain and Ireland, and that many Celtic words are still preserved both in the Irish and in the Welch languages.

The Norman characters, it is observed, were generally used in England from the coming of William I. and the Saxon characters were entirely disused in the very beginning of the twelfth century; but the Irish and Scots preserved the ancient forms of their characters till the end of the sixteenth century.

The Gaëlic or Erse language, used in the Highlands of Scotland, and the Iberno-Gaëlic, are nearly the same, and their letters are similar to each other, as Mr. Astle has shewn by various specimens. The curious will find much information on the subject of this article in Astle's Origin and Progress of *Writing*, 4to. 1784.

J. Ravenau has a treatise intitled Des Inscriptions en Faux, wherein he shews how to revive and restore old *writings* almost effaced, by means of galls ground in white wine, and distilled; and thus rubbed over the *writing*.

To *write* without blacking the fingers: prepare the paper with a fine powder, made of three parts of calcined copperas, two of galls, and one of gum Arabic, those being fresh mixed, rub them with a hare's foot into the pores of the paper; and then *write* with fair water, and the black letters will immediately appear.

To make new *writing* appear old, moisten it with oil of tartar per deliquium, more or less diluted with water, as you desire the ink to appear more or less decayed.

We may *write* without ink, or its materials: for this purpose, take a fine powder of calcined hartshorn, of clean tobacco-pipes, or rather of mutton-bones burnt to a perfect whiteness, and rub it upon the paper, and then *write* with a silver bodkin, or the like. Boyle's Works Abr. vol. i. p. 114, 115. See Ink.

The discharging of ink out of parchment, paper, &c. is commonly done by aqua fortis diluted sufficiently with water, that it may not destroy the paper. The like may be done with oil, or spirit of vitriol diluted. The juice of lemons, or strong vinegar, will take ink out of linen more safely, as the mineral acids are apt to destroy the linen, unless great care be used in diluting them.

We may *write* on iron with corrosive sublimate wetted with common water: for this purpose, the parts of metal we would preserve untouched should be covered with wax, and that taken off in the proper places to make way for the corroding substance. Boyle, ib. p. 528.

The like may be practised by means of aqua fortis.

Mr. Boyle mentions a method he had of copying a whole page of *writing* at once. But we do not find his description of it any where. Ib. p. 136.

A machine has been lately invented and constructed by Messrs. Watt and Co. of Birmingham; by means of which letters and other *writings* may be copied. For an account of the structure and use of this machine, we must refer to the directions for copying with it furnished by the inventors: observing, however, that the date, at which a *writing* will yield a copy, is extremely uncertain, from the weather, as it is more or less drying, and from the state of the ink. In general the purpose will be answered to the end of twenty-four hours, and sometimes of three or four days; but it is most adviseable to copy letters as soon after they are written as may prove convenient.

Mr. Boyle informs us of a method of imitating *writing* on copper-plates. The copy to be engraved is to be wrote with a peculiar kind of ink, and the copper-plate being moderately warmed, is rubbed over with a white varnish, and suffered to cool; then the paper being gently moistened, that it may readily communicate its ink, the *writing* is applied to the prepared surface of the plate, and passed through a rolling-press; by which means the ink, adhering to the varnish, leaves the letters very conspicuous. And hence it is easy with a needle to trace the strokes, through the varnish upon the plate, which being afterwards cleaned, the letters are finished with the graver, and the work printed off in a rolling-press, as common cuts.

Mr. Boyle does not mention what the varnish or ink, used by the artificer from whom he received this method, was; but he tells us, that he himself used the purer sort of virgin-wax, for a varnish; and for his ink he took fine Frankfort black, carefully ground with water, till it obtained the consistence of common ink; but no gum was added, lest it should hinder the ink from coming off. He also observes that *written* characters may be taken off without the help of a press, by laying the moistened paper smooth upon the varnished copper, and rubbing it on hard with a convex piece of glass. See *Sympathetic* Ink.

In law, we say, deeds, conveyances, &c. are to be in *writing*. A Will may either be in *writing*, or by word of mouth.

We also say, *written law*, *lex scripta*, in opposition to common law, which is called *lex non scripta*. We have also *written* and *unwritten* Traditions, &c.

Authentic *writings* of any contract, sealed and delivered, make the evidences thereof.

La Vayer has a curious dissertation on the proof of facts by comparison of hand-*writings*, wherein he endeavours to shew this method of proof to be very suspicious and fallacious.

Writing, *Gothic*. See Gothic.

Writing, *secret*. See Cryptography, Steganography, Scytala, Cipher, Deciphering, &c.

Writing, *short*. See Brachygraphy, and Tachygraphy.

Writings, *stealing of*. See Larceny.

WRITTEN *evidence*. See Evidence.

Written *tradition*. See Tradition.

WRONG, in a *Logical Sense*. See Error, Falshood, and Truth.

Wrong, in a *Legal Sense*, *injury*, *tort*. See Injury, and Tort.

Wrongs are divisible into two sorts, viz. *private* and *public*. The former are an infringement or privation of the private or civil rights belonging to individuals, considered as such; and are frequently termed *civil injuries*; the latter are a breach and violation of public rights and duties, which affect the whole community, considered as such; and are distinguished by the harsher appellation of crimes and misdemeanours.

Wrong, *executor of his own*. See Executor *de son tort*.

Wrong-*lands*, in our *old Writers*, seem to denote trees that will never prove timber; such as *wrong* the ground they grow in.

WRY-*neck*, *jynx*, in *Ornithology*, a bird called also the *torquilla*, which Linnæus has made a distinct genus of the *picæ*, under the denomination of *yunx*: the characters of which are, that the bill is slender, round, and pointed; the nostrils are concave and naked; the tongue is very long, very slender, cylindric, and terminated by a hard point; and the feet are formed for climbing.

There is only one species, viz. the *jynx torquilla*. The colours of this bird are elegantly pencilled, though its plumage is marked with the plainest kinds: a list of black and ferruginous strokes divides the top of the head and back; the sides of the head and neck are ash-coloured, beautifully traversed with fine lines of black and reddish-brown; the quill-feathers are dusky, but each web is marked with rust-coloured spots; the chin and breast are of a light yellowish-brown, adorned with sharp-pointed bars of black; the tail consists of ten feathers, broad at their ends and weak, of a pale ash-colour, powdered with black and red, and marked with four equidistant bars of black: the irides are of a yellowish colour.

The *wry-neck*, Mr. Pennant apprehends, is a bird of passage, appearing with us in the spring before the cuckow. Its note is like that of the kestril, a quick-repeated squeak; its eggs are white, with a very thin shell; this bird builds in the hollows of trees, making its nest of dry grass. It has a very whimsical way of turning and twisting its neck about, and bringing its head over its shoulders, whence it had its name *torquilla*, and its English one of *wry-neck*: it has also the faculty of erecting the feathers of the head like those of the jay. It feeds on ants, which it very dextrously transfixes with the bony and sharp end of its tongue, and then draws them into its mouth. Ray and Pennant. See *Tab.* V. *of Birds*, Nº 63.

Wry-*necked*, in *Surgery*. See *Wry*-Neck.

WURST, a Russian measure. See Werst.

WULVESHEVED, or Wulweshead. See Wolfeshead.

WYCH-*house*, a house in which salt is boiled. See Salt.

In the places where there are salt-springs, and salt-works are carried on at them, the work-house where the salt is made is always called the *wych-house*; and hence we may naturally conclude, that *wych* was an old British word for salt, which is the more probable in that all the towns in which salt is made end in *wych*; as *Namptwych*, *Droitwych*, *Middlewych*, &c.

WYDRAUGHT, a water-course, or water-passage, to carry off the filth and suillage of a house; properly a sink, or common-sewer.

WYKE, anciently denoted a farm, hamlet, or little village.

WYTA, or Wita *Plena*, signified a forfeiture of a hundred and twenty shillings. *Si pundbrecke fiat in curia regis*, plena wita *sit*; *alibi*, *quinque marcæ*.

To swear according to the *wyte*, *secundum* witam *jurare*, was to purge one's self by the oaths of so many witnesses, as the nature of the crime, and the punishment, or *wyte*, did require.

Hence, also, *bloodwite*, *legerwite*, *ferdwite*, *childwite*, *wardwite*, &c. See Ferd-*wite*, Child-*wite*, &c.

WYTE, Wyta, or Wite, Wita, in our *Ancient Customs*, a pecuniary penalty, or mulct.

—*Jurat secundum* witam, *quod nec fuerat furti conscius*, *nec coadjutor in eo*. Leg. Inæ.

The Saxons had two kinds of punishments, were, and *wyte*; the first for the more grievous offences.

The *wyte* was for the less heinous ones. It was not fixed to any certain sum; but left at liberty, to be varied according to the case.

Hence, also *wyte*, or *wittree*, one of the terms of privilege granted our sportsmen; signifying a freedom or immunity from fines, or amerciaments: or, as it is vulgarly conceived, from being liable to be begged for fools, for lack of *wit*.

WYTHE, in *Law*, the same as waif.

WYTHERS. See Withers.

X.

X, A double consonant, and the twenty-second letter in the English alphabet; which, however, begins no English word.

The *x* of the Latins, and ξ of the Greeks, are compounded of *cs*, and κσ; whence to this day, the letter *x*, in the English and French, has the same sound with *cs*, or *ks*. Thus we pronounce *Alexander*, exactly as if written *Alecsander*, or *Aleksander*.

The Italians have no *x* at all in their language, but both speak and write *Alessandro*. The Spaniards pronounce the *x*, like our *c* before *a*; viz. *Alexandro*, as if it were *Alecandro*. The Portuguese pronounce it like *sh*.

In foreign words, used in English, we sometimes soften the *x* into a double *s*; as *Brussels*, for *Bruxelles*, &c.

This letter is not known in the Hebrew, or other oriental languages; but, in lieu of it, they write the two simple letters whereof it is compounded. And the like do the modern Germans.

Peter Diaconus relates, that the letter X was introduced into the Roman alphabet in the time of Augustus; and that, before his reign, the Romans supplied the want of it by the letters C and S. But Mr. Astle observes, that this is a mistake; the letter X being found in the Duilean pillar, inscribed in the year of Rome 494, and 259 before Christ. Origin and Progress of Writing, p. 78.

X is also a numeral letter, and signifies ten; as representing two V's placed one at top of the other. See V.

X *Supra denos numero tibi dat retinendos.*

When laid flat, thus ⋈, it signifies a thousand; and when a dash is added over it, X̄, it signifies ten thousand. I before X denotes the subtraction, and after X the addition of unit: thus IX = 9, and XI = 11. X before L or C, denotes the subtraction of 10 from 50, or 100. Thus XL = 40, and XC = 90.

X on the French coins, denotes those struck at Amiens.

We often meet with the Greek letters X and P joined in this manner ☧, on ancient medals. The first we find are on some large brass coins of the Ptolemies, kings of Egypt, where it was placed on a civil account.

Some writers have taken it for a date, and others for the initial letters of a proper name; but as no reasons are assigned for either of those conjectures, Mr. Ward rather supposes it an abbreviation of the word ΧΡΗΜΑ, *money*, impressed on those pieces, to denote their currency as money; which might be thought proper, as they have not the heads of kings stamped upon them, like their silver and gold coins; but always that of a Jupiter on the front, and an eagle perched on a thunderbolt on the reverse.

This character was afterwards applied to a very different purpose by Constantine the Great, who made use of it to denote ΧΡΙΣΤΟΣ, both in his coins and military ensigns; wherein he was followed not only by some succeeding emperors, but also by private persons, who out of devotion put it on their lamps and other utensils.

It afterwards came to be used merely as a critical note, to point out remarkable passages in manuscripts; and then it stood for the initials of ΧΡΗΣΙΜΟΝ, *useful*; as we learn from Isidore, Orig. lib. i. cap. 20. See Phil. Trans. N° 474. sect. 1.

XAMDELLILAH, an Arabian term, used as a grace or thanksgiving after meat.

The greatest men of that nation will often call in the meanest, even the beggars, to eat with them; who, as soon as they have done, always rise and pronounce this word, which signifies God be praised. Pococke's Egypt, p. 183.

XAMI, a name given by some of the old writers to the *ceration* of the Greeks, or CAROB-*tree*. See CHARNUB.

XANTHICA, Ξανθικα, in *Antiquity*, a Macedonian festival, so called, because it was observed in the month Xanthus, at which time the whole royal family with the army were purified. See LUSTRATION.

XANTHIUM, in *Botany*. See *Lesser* BURDOCK.

XANTHON, a name given by some of the ancients to a species of marble of a yellowish green colour, much used in ornamenting the inner parts of houses; and from its equal hardness with the Tænarian marble, and the equal high polish it was capable of, supposed by the workmen to be of the same species.

The word *xanthon* is of very dubious meaning, but is supposed as the name of this marble to have expressed a green colour, as this was otherwise called *marmor herbosum*. See TÆNARIUM, and HERBOSUM *marmor*.

XANTHOXYLUM, in *Botany*. See TOOTH-*ach tree*.

XANTHURUS *Indicus*, in *Ichthyology*, the name of a fish, called by the Dutch *geel-staardt*.

It is of the size and shape of the bream; its jaws are armed with straight and very sharp teeth, which stand almost straight out; its back is yellow, and its tail very strongly tinged with that colour; its belly is of a bluish white; its head brown, and its fins of a fine red. It is caught with hooks among the rocks on the shores of the East-Indies, and is a very wholesome and well-tasted fish. Ray.

XANTHUS, in the *Natural History of the Ancients*, the name of an iron ore of the hæmatites or blood-stone kind, and usually accounted a species of it, and called by others ELATITES.

It was of a pale yellowish white, or the colour of the French pale yellow ochre, used by our painters; but like all other ferrugineous bodies it became red by burning. Theophrastus gives us expressly the etymology of the name, observing that it was called so from its colour; the Dorians calling a yellowish white ξανθος, *xanthus*.

XANXUS, in *Natural History*, a name given by some authors to a large species of sea-shell, somewhat like that with which the Tritons of old were painted. It is found in great abundance near Ceylon, and is used there in medicine as an alkali and absorbent, in the same cases in which we give the testaceous powders.

XATHOS, in *Ichthyology*, a name given by Appian to the fish, called by the generality of authors the ERYTHRINUS, or *rubellio*.

XEBEC, in *Sea-Language*, a small three-masted vessel, navigated in the Mediterranean sea, and on the coasts of Spain, Portugal, and Barbary. See *Tab.* II. *Ship. fig.* 13.

The sails of the *xebec* are, in general, similar to those of the POLACRE, but the hull is extremely different from that and almost every other vessel. It is furnished with a strong prow, and the extremity of the stern, which is a sort of railed platform or gallery, projects farther behind the counter and buttock than that of any European ship. The *xebec*, generally equipped as a corsair, is constructed with a narrow floor, to be more swift in pursuit of the enemy; and of a great breadth, to enable her to carry a great force of sail for this purpose, without danger of overturning. As these vessels are usually very low-built, their decks are formed with a great convexity from the middle of their breadth toward the sides, in order to carry off the water, which falls aboard, more readily by their scuppers. But as this extreme convexity would render it difficult to walk thereon at sea, particularly when the vessel rocks by the agitation of the waves, there is a platform of grating along the deck from the sides of the vessel toward the middle, whereon the crew may walk dry-footed, whilst the water is conveyed through the grating to the scuppers.

When a *xebec* is equipped for war, she is occasionally navigated in three different methods, according to the force or direction of the wind. Thus, when the wind is fair, and nearly astern, it is usual to extend square sails upon the main-mast, and frequently upon the fore-mast; and as those sails are rarely used in a scant wind, they are of an extraordinary breadth. When the wind is unfavourable to the course, and yet continues moderate, the

ſquare yards and ſails are removed from the maſts, and laid by, in order to make way for the large lateen yards and ſails, which ſoon after aſſume their place; but if the foul wind increaſes to a ſtorm, theſe latter are alſo lowered down and diſplaced, and ſmall lateen yards, with proportional ſails, are extended on all the maſts. The *xebecs*, which are generally armed as veſſels of war by the Algerines, mount from ſixteen to twenty-four cannon, and carry from three hundred to four hundred and fifty men, two-thirds of whom are generally ſoldiers. Falconer.

XEL, in the *Materia Medica of the Ancients*, a name given to the fruit SEL.

XENEXTON, a word uſed by Paracelſus, to expreſs a ſort of amulet to be worn about the neck, to preſerve people from infection in the plague.

XENIA, Ξενια, q. d. *gifts*, in ſome *Ancient Cuſtoms*, were gifts, or preſents, made to the governors of provinces, by the inhabitants thereof.

The word occurs pretty frequently in charters of privileges; where, *quietos eſſe à* xeniis, denotes an exemption from making ſuch preſents to kings and queens, upon their travelling through ſuch precincts.

XENINEPHIDEI, a word uſed to expreſs a ſort of imaginary ſpirits, mentioned by the adepts, as delighting to diſcover the occult qualities of bodies to men.

XENISMI, Ξενισμοι, in *Antiquity*, ſacrifices offered at the Athenian feſtival ANACEIA.

XENODOCHUS, formed of ξενος, *ſtranger*, and δεχομαι, *I receive*, an eccleſiaſtical officer of the Greek church, the ſame with the HOSPITALER, or a perſon who takes care of the reception and entertainment of ſtrangers.

St. Iſidore, a prieſt and ſolitary, ſurnamed *Xenodochus*, lived in the fourth century. He was thus called, becauſe entruſted with that office in the church of Alexandria.

XENOPAROCHUS, formed of ξενος, *ſtranger*, and παροχος, of παρεχω, *I furniſh*, among the Romans, an officer who provided ambaſſadors with all kinds of neceſſaries, at the public expence.

XERANTHEMUM, *Auſtrian ſneeze-wort*, in *Botany*. See ETERNAL *flower*.

XERASIA, in *Medicine*, the name of a diſeaſe, a ſpecies of alopecia, in which the hair falls off through a dryneſs of the part, and want of due nouriſhment.

XEROMYRON, formed of ξηρος, *dry*, and μυρον, *ointment*, a word uſed by the ancients to expreſs what they do at other times call in expreſs words a dry ointment. It was a compoſition of warm and aromatic drugs, or of other things fit for external uſe, but without the fatty ingredients, by which they were uſually reduced into the form of ointments.

XEROPHAGY, Ξηροφαγια, formed of ξηρος, *dry*, and φαγω, *I eat*, among the *Ancients*, the feeding only on dry victuals, which was the practice of the athletæ.

In the firſt ages of the church, ſome, not contented with ſimple faſting, added the *xerophagy* thereto; abſtaining not only from fleſh and wine, but alſo from all freſh, ſucculent, and vinous fruits. And ſome even brought themſelves to bare bread and water.

Tertullian, in his book De Abſtinentia, cap. 9. ſpeaks of the *xerophagia* as a thing commendable in time of perſecution.

XEROPHTHALMIA, Ξηροφθαλμια, compounded of ξηρος, *dry*, and οφθαλμος, *eye*, a kind of OPHTHALMIA, wherein the eyes itch, and are red, but without ſwelling, or watering.

XEROTRIBIA, formed of ξηρος, *dry*, and τριβω, *I rub*, a term uſed by authors to expreſs a dry friction, a rubbing of ſome affected part with the hand or otherwiſe, to recall the warmth and circulation.

XESTA, Ξεϛης, an Attic meaſure of capacity, anſwering to the Roman SEXTARY.

XIMENIA, in *Botany*, a genus of the *octandria monogynia* claſs; the characters of which are, that the calyx is quadrifid; it has four hairy petals, which turn backward, and the fruit is a monoſpermous drupe. There are two ſpecies.

XIPHIAS, Ξιφιας, the name of the SWORD-FISH. It is alſo uſed to expreſs a fiery METEOR, in form of a ſword. See ACONTIAS.

XIPHIAS, in *Aſtronomy*. See DORADO.

XIPHION, in *Botany*. See IRIS.

XIPHOIDES, Ξιφοειδης, in *Anatomy*, a cartilage placed at the bottom of the STERNUM, called alſo *enſiformis*.

It is about an inch long, and ſhaped like the point of a ſword. Whence its appellation, from ξιφος, *ſword*, and ειδος, *figure*.

XIPHOS, Ξιφος, among the Athenians, a capital puniſhment, by beheading with the ſword.

XIR, a word uſed by the chemiſts to expreſs mercury.

XISINUM, a word uſed by ſome of the chemical writers to expreſs vinegar.

XOCHIOCOTZO, in *Botany*, a name uſed by ſome authors for the tree which produces the liquid amber, and is called the ſweet gum by the inhabitants of the Weſt Indies.

XOCHITENACATL, in *Ornithology*, a name given by ſome to the TOUCAN, or American great-beaked magpye.

XOCHITENACATL *alia*, in *Ornithology*, the name of a bird deſcribed by Nieremberg, of the nature of the toucan, or Braſilian magpye.

It is of the ſize of a pigeon, its beak is large and thick, and is black and pointed; its wings and tail are variegated with black and white; it has a large black mark reaching from its back to the breaſt; the anterior part of the wings is yellow, the reſt of its body of a pale colour, and the legs and feet brown. It always is found among the ſweet-flowering trees, and is not uncommon in many parts of South America. Ray.

XOCOXOCHITL, the Indian name of the clove-berry-tree, or the *caſſia caryophyllata*, the bark of which is uſed in medicine.

XOMOTL, in *Ornithology*, the name of an American bird, of which the Indians are very fond, making a part of their garments of its feathers.

Nieremberg has given this ſhort account of it. It is a web-footed fowl; its back and the upper part of its wings are black, and its breaſt is brown. When it is angry, it raiſes up the feathers of its head in form of a creſt. Ray.

XOXOUHQUITICPATLI, an American name of a ſtone of the jaſper kind, and of a beautiful green, but uſually pale, and ſometimes with a mixture of grey, and variegated in ſeveral places with ſpots of a deeper green.

It is found among the ſeveral kinds of *lapis nephriticus*, with which that country abounds, and moſt of which the Indians celebrate for their virtues againſt diſeaſes; they are not however acquainted with any medicinal virtues of this ſpecies.

XV. VIR, *Quindecimvir*. See QUINDECIMVIR.

Authors, and eſpecially antiquaries, make uſe of ſuch abbreviations, which they borrow from medals, and other monuments of antiquity, where thoſe names are ſo expreſſed.

XUCAHA, or XUCAAHI, in *Botany*, the name of a plant much famed for its virtues among the ancient Arabians, but unknown at this time.

XYLAGIUM, a name given by ſome authors to the lignum ſanctum or guaiacum.

XYLO-ALOE, compounded of ξυλον, *wood*, and αλοη, *aloes*, in *Medicine*, the lignum aloes; called alſo AGALLOCHUM. See alſo ALOE, and CALAMBAC.

XYLO-BALSAMUM, Ξυλοβαλσαμον, compounded of ξυλον, *wood*, and βαλσαμον, *balſam*, a name which naturaliſts, &c. give to the wood of the tree, which yields that precious gum, known to the Latins by the name of OPOBALSAMUM, and, among us, by the name of BALSAM, or *balm of Gilead*.

We have branches of this tree brought us from Cairo. They are very ſtraight, brittle, unequal, and full of knots; their bark is reddiſh without, and greeniſh within. The wood is whitiſh, and full of pith; and, when broken, yields an agreeable ſmell, reſembling that of the balſam.

The *xylo-balſamum* is reputed good to ſtrengthen the brain and ſtomach, and to expel poiſon.

XYLOCARACTA, or XYLOCARACTE, in the *Materia Medica*, a name by which ſome authors have called the CAROB, or ſiliqua dulcis, the ſweet pipe-tree.

This was called by ſome of the Greek writers *xyloceraton*, the tree-bearing pods, and from a corruption of this name the other has been formed.

XYLOCARPASUM, in *Natural Hiſtory*, a name given by ſome authors to a poiſonous kind of wood.

It was the wood of that tree whoſe gum was called CARPASUM and *opocarpaſum*.

XYLOCASIA. See CASSIA.

XYLOCOCCUM, in the *Materia Medica*, a name given by ſome of the later Greek writers to the carob-tree, or *ſiliqua dulcis*.

XYLOCOLLA, a word uſed by ſome of the ancient writers to expreſs what was more uſually called *taurocolla*, glue made of the ears and genitals of a bull.

XYLOCOPIA, Ξυλοκοπια, among the Greeks, a puniſhment with a cudgel. See FUSTIGATION.

XYLOGLYCON, in *Botany*, a name given to the carob, or ſiliqua dulcis, by ſome of the old Greek writers.

The word expreſſes a ſweet, or ſweet-fruited tree.

XYLOIDES, or HYLODES, in *Botany*, a term uſed by many of the ancient writers to diſtinguiſh thoſe plants which had woody ſtalks, though they never grew up to any conſiderable ſize; ſuch as the garden-thyme, marjoram, and the like.

XYLON, in *Botany*. See BOMBAX.

Xylon, Ξυλον, among the Athenians, a punishment inflicted, by putting the offender into the stocks.

XYLOPIA, in *Botany*, a genus of the *gynandria polyandria* class. Its characters are, that it has one style, a single-leaved calyx, and six petals; that the six exterior stamina are the thickest, and that the fruit is a dry drupe. There are two species.

XYLOSTEON, in *Botany*, a name by which some authors have called the small red-berried double-fruited *chamecerasus*.

XYLOSTEUM, in *Botany*, a name given by Tournefort to the genus of plants called *lonicera* by Linnæus. See *Upright* Honeysuckle.

XYLOSTROTON, formed of ξυλον, *wood*, and ϛρωτος, *laid*, among the *Ancients*, an appellation given to Mosaic or chequered work.

XYMPATHESIS, a word used by some of the old medical writers for sympathy.

XYNERESIS, formed of ξυν, or συν, *together*, and αιρεω, *I seize*, a word used by Hippocrates, and others of the ancients, to express a firm cohesion or connection of any two things. Some use it to express that firm shutting together, or clenching of the teeth, which happens in convulsions.

XYNOECIA, formed of ξυν, or συν, *with*, and οικεω, *I inhabit*, a feast among the ancient Athenians, instituted on occasion of Theseus's uniting all the petty communities of Attica into one commonwealth; the assemblies whereof were to be held at Athens, in the Prytaneum.

XYRIS, in *Botany*, a genus of the *triandria monogynia* class, whose characters are, that the flower-cup is a sort of roundish spike, made up of roundish, hollow, imbricated scales, which divide the flowers; the husk is small and bivalve, each of the valves being compressed, arched, and in the shape of a little boat; they are also acute, and naturally incline toward one another; the flower consists of three petals, which are large, flat, expanded, with notched edges, and narrow ends, of the length of the cup they are immersed in: the stamina are three slender filaments, which are shorter than the flower; the antheræ are oblong and erect; the germen of the pistil is roundish; the style is single and thread-like, and the stigma divided into three parts; the fruit is a roundish capsule, contained within the cup, with three cells, and three valves; the seeds are very numerous, and extremely small. There is one species.

XYSTARCHA, in *Antiquity*, the master or director of the xystus.

In the Greek gymnasium, the *xystarcha* was the second officer: the first was the gymnasiarch. The *xystarcha* was his lieutenant, and presided over the two xysti, and all exercises of the athletæ therein.

XYSTICI, among the *Ancients*, a designation given to the athletæ, because they performed their exercises in the xystus.

XYSTUS, Ξυϛος, formed of ξυειν, *to polish* or *rub*, in the *Ancient Architecture*, among the Greeks, was a long spacious portico, either open, or covered over; wherein the athletæ, and others, practised wrestling and running.

The *xystus* made a necessary part of a gymnasium. The athletæ, who practised therein, were thence called *xystici*.

Xystus, among the Romans, was an alley, or double row of trees, meeting arbor-wise at top, and forming a shade to walk under.

Y.

Y, The twenty-third letter in the English alphabet, borrowed, originally, from the Greek *υ*. It is occasionally both vowel, and consonant. As a vowel, some authors have judged it unnecessary in our language, in regard its sound is precisely the same with that of the *i*. Accordingly, it is but little used, except in words borrowed from the Greek, to denote their origin, by representing the Greek *υψιλον*.

The vowel *y*, however, has a place even in some words purely English; and that both in the middle thereof, as in *dying*, *frying*, &c. and at the end, as in *lay*, &c.

Some ascribe the use of the *y*, in pure English and French words, and those that have no *y* in Latin or Greek, to this; that anciently each of those words were written with a double ii; which having something aukward in it, the *y* was substituted in lieu thereof.

Others say, that those words being anciently written, as well as pronounced, with a double ii, as they still are in the Walloon, as *paiing*, *paiisan*, &c. to avoid their being mistaken for an u with two dots over it, they made the second i longer than the first, and so formed the *y* without designing it. Some give a particular reason, why words ending in i came to be written with *y*; viz. that the copists found the tail of the *y* very commodious, in adorning the margins and bottoms of pages.

Y was much used by the Saxons; whence it is found for *i* in the old English writers.

When the *y* follows a consonant, and at the end of words, it is a vowel, and has the sound of *i*; and when it precedes a vowel, or diphthong, and at the beginning of words, it is a consonant.

Some have thought that *y* is in all cases a vowel; but Dr. Johnson observes of *y*, as of *w*, that it follows a vowel without any hiatus, as *rosy youth*.

The Romans used the *y* for the vowel *u*, which they had no character for, distinct from the *v* consonant; their way being to pronounce the common *u*, as we do the diphthong *ou*; and the Greek *υψιλον*, as the English and French *u*.

Peter Diaconus observes, that Augustus first took the letters *y* and *z* from the Greeks, which were not used by the Romans before his time; *s s* being written for *z*, and *i* for *y*. But Mr. Jackson shews, that the *y* was used before the time of Augustus, though probably (says Astle, Orig. and Prog. of Writing, p. 78.) it was not much older.

In our own, and some other modern tongues, authors begin to dispense more and more with the precise orthography, which requires all words that have an upsilon, in the Greek, to be written with a *y*. And with reason; since our Greek *y* has lost the sound it had, in the language whence we borrow it. But it is certainly ridiculous to use it, as many do, in words which indeed have a Greek origin, but have no *u* in the Greek, as in *eclipse*; yet some affect to do this.

Y is also a numeral letter, signifying 150, or, according to Baronius, 159; as in the verse,

Y *dat centenos & quinquaginta novenos.*

When a dash was added at top, $\overline{\text{Y}}$, it signified 150 thousand.

Pythagoras used the Y as a symbol of human life; the foot representing infancy, and the forked top the two paths of vice and virtue, one or the other of which people are to enter upon, after attaining to the age of discretion.

Y on the French coins, denotes those struck at Bourges.

YACHT, or Yatch, denotes a vessel of state, usually employed to convey princes, ambassadors, or other great personages, from one kingdom to another.

The word seems derived from the Dutch *iacht*, *hunting*, by reason of the lightness of these vessels.

As the principal design of a *yacht* is to accommodate the passengers, it is usually fitted with a variety of convenient apartments, with suitable furniture, according to the quality or number of the persons contained in it.

The royal *yachts* are commonly rigged as ketches, except the principal one reserved for the sovereign, which is equipped with three masts, like a ship. They are, in general, elegantly furnished, and richly ornamented with sculpture; and always commanded by captains in his majesty's navy.

Beside these, there are many other *yachts* of a smaller kind, employed by the commissioners of the excise, navy, and customs; or used as pleasure-boats by private gentlemen. Falconer.

YAGATH, in *Mythology*, a deity adored by the ancient Arabian idolaters, under the figure of a lion.

YAM, or Yammes, in *Botany*, a species of the dioscorea, which is much cultivated by the inhabitants of the islands in America, and is of great use to them for feeding their negroes; and the white people make puddings of their roots, when ground to a sort of flour. The roots are as big as a man's leg, of an irregular form, and of a dirty brown colour on the outside, but white and mealy within. The stalks of this plant are triangular and winged, and the leaves are heart-shaped, with two ears, like those of arum.

The plants are propagated by cutting the roots into pieces, and preserving an eye or bud in each, as in planting of potatoes; from each of which three or four large roots will be produced. The roots, after having lain six or eight months in the ground, are roasted or boiled for food, and sometimes made into bread.

These plants grow wild in the woods in the island of Ceylon, and on the coast of Malabar; and they are supposed to have been brought from the East to the West Indies. Miller.

YAPON, in *Botany*, a species of *ilex*. See Holly.

YARD, *virga*, a long measure, used in England and Spain; chiefly to measure cloth, stuffs, &c.

The English *yard* contains three feet. It was first settled by Henry I. from the length of his own arm. See Measure.

The English *yard* is just seven-ninths of the Paris ell; so that nine *yards* make seven ells. To reduce ells, therefore, into *yards*, say, if seven ells give nine *yards*, how many *yards* will the given number of ells give?

Yards are converted into ells Flemish, by adding a third part; into ells English, by subtracting a fifth part; or multiplying by 8, and casting off the right-hand figure. Ells English are converted into *yards*, by adding a fourth. To turn ells Flemish into *yards*, subtract one quarter.

The Spanish vara, or *yard*, chiefly used at Seville, is, in some places, called *barra*. It contains seven twenty-fourths of the Paris ell; so that seventeen ells make twenty-four Spanish *yards*.

Yard, in *Anatomy*, the penis, or virile member; serving for the evacuating of the urine, and seed.

Yard-*fallen*, a term used among our farriers to express a malady to which horses are sometimes subject, which is the hanging down of the penis from its sheath between the legs, the creature not being able to draw it up again. This is caused by weakness of the peculiar muscles which should act in the drawing up; and proceeds sometimes from a violent slip or strain; sometimes from a blow on the back, and sometimes from extreme weariness in long journeys.

The method of curing this, is first to wash it with oil of roses, after this with warm white wine, and, finally, to anoint it with a mixture of oil of roses and honey; it is then to be returned into its place, and kept from falling down again by a little canvas bolster. It is to be thus dressed once in twenty-four hours, till the cure is perfected.

There are some other distemperatures to which this part is

is ſubject in a horſe, as the being foul at the end, ſo that the creature voids his urine in the ſheath; in this caſe the method of cure is to draw out the penis, and cleanſe the end of it from any foulneſs that may be found there; then it is to be waſhed with butter and white-wine vinegar melted together: ſometimes there is a diſcharge of yellow ſtinking matter from the penis; this is peculiar to ſtone-horſes, and principally affects them after the time of their covering of mares.

This running is attended with a ſwelling of the penis, and with a pain in voiding the urine; the creature alſo finds a difficulty in drawing up the penis into the ſheath. The method of cure is, to diſſolve in a pint of white-wine an ounce of roach-alum by boiling; and four or five times a day this is to be uſed, injecting it up into the *yard* with a ſyringe blood-warm. This will prove a certain cure.

Yard-Land, *virgata terræ*, or *virga terræ*, is a certain quantity of land, but that various, according to the place. At Wimbleton, in Surry, it is only 15 acres; but in moſt other counties it contains 20, in ſome 24, in ſome 30, and in others 40, or 45 acres.

Virgata terræ continet 24 acras; & 4 virgatæ conſtituunt unam hidam, & quinque hidæ conſtituunt feodum militare. MS. Abbat. Malmeſ. See Carrucate, Hide, and Knight's *fee*.

Yards, or *Sail*-Yards, of a ſhip, are long pieces of timber, tapering at each end, fitted acroſs the ſeveral maſts, to carry the ſails, and extend them to the wind.

The ſails are faſtened to the *yards* at the heads; ſo as to be hoiſted up, and let down together with them, by ropes called *halliards*.

The main-*yard* is that of the main-maſt. The mizen-*yard*, the bolt-ſprit-*yard*, &c. are thoſe of the mizen, &c. See *Tab. Ship. fig.* 1. *n.* 2. 20. 37. 44. 67. 86. 93. 109. 126. 138.

All *yards* are either ſquare or lateen; the former of which are ſuſpended acroſs the maſt at right angles, and the latter obliquely. The *ſquare yards* (*Tab.* II. *Ship. fig.* 3.) are nearly of a cylindrical ſurface; they taper from the middle, which is called the *ſlings*, towards the extremities, which are termed the *yard-arms*; and the diſtance between the ſlings and the *yard-arms* on each ſide is divided, by the artificers, into quarters, which are diſtinguiſhed into the firſt, ſecond, third quarters, and *yard-arms*. The middle quarters are formed into eight ſquares, and each of the end-parts is figured like the fruſtum of a cone. All the *yards* of a ſhip are ſquare, except that of the mizen.

The proportions for the length of *yards*, according to the different claſſes of ſhips in the Britiſh navy, are as follow:

			Guns.
1000 : gun-deck : :	560 :	main-*yard* expreſſed by *d*, *Tab.* II. *Ship. fig.* 3. N. B. The figure repreſents the *yards* and ſails of a ſhip of 74 guns.	100
	559 :		90, 80
	570 :		70
	576 :		60
	575 :		50, 24
	561 :		44
1000 : main-*yard* : :	880 :	fore-*yard*	100, 90, 80
	874 :		all the reſt.

To apply this rule to practice, ſuppoſe the gun-deck 144 feet: the proportion for this length is, as 1000 : 575 : : 144 : 83, which will be the length of the main-*yard* in feet; and ſo of all the reſt.

1000 : main-*yard* : :	820 :	mizen-*yard*	100, 90, 80, 60, 44.
	847 :		70
	840 :		24
1000 : main-*yard* : :	726 :	main-top-ſail-*yard e*, *fig.* 3.	24
	720 :		all the reſt.
1000 : fore-*yard* : :	719 :	fore-top-ſail-*yard*.	70
	726 :		24
	715 :		all the reſt.
1000 : main-top-ſail-*yard* : :	690 :	main-top-gall. *yard*.	All the rates.
1000 : fore-top-ſail-yard : :	696 :	fore-top-gal. *yard f*, *fig.* 3.	70
	690 :		all the reſt.
1000 : fore-top-ſail-*yard* : :	768 :	mizen-top-ſail-*yard*.	70
	750 :		all the reſt.

The croſs-jack and ſprit-ſail-*yards* are equal to the fore-top-ſail-*yard*. The ſprit-top-ſail-*yard* is equal to the fore-top-gallant-*yard*.

The diameters of *yards* are in the following proportions to their length; viz. the main and fore-*yard* five-ſevenths of an inch to a yard; the top-ſail, croſs-jack, and ſprit-ſail-*yards*, nine-fourteenths of an inch to a yard; the top-gallant, mizen-top-ſail, and ſprit-ſail-top-ſail-*yards*, eight-thirteenths of an inch to a yard; the mizen-*yard* five-ninths of an inch to a yard; all ſteering ſail-booms and *yards*, half an inch to a yard in length.

The lifts of the main-*yard* are exhibited in *fig.* 3. by *g g*; the horſes and their ſtirrups by *h*, *i*; the reef-tackles, and their pendants, by *k*, *l*; and the braces, and brace-pendants, by *m*, *n*.

The *lateen-yards* evidently derive their names, from having been peculiar to the ancient Romans. They are uſually compoſed of ſeveral pieces, faſtened together by woldings, which alſo ſerve as ſteps, whereby the ſailors climb to the peek, or upper extremity, in order to furl or caſt looſe the ſail. The mizen-*yard* of a ſhip, and the main-*yard* of a bilander, are hung obliquely on the maſt, almoſt in the ſame manner as the lateen-*yard* of a xebec, fetter, or polacre. Falconer's Mar. Dict. Murray's Ship-Building, Supp. p. 111, &c.

They have ſeveral phraſes, and words of command, relating to the management of the *yards*; as, *Brace the yards*, which ſignifies to traverſe them about the maſts, ſo as to form greater or leſſer angles with the ſhip's length. *Square the yard*, is as much as to ſay, ſee that it hang right acroſs the ſhip, and one *yard*-arm not traverſed more than the other. See Lift, Square, and Topping.

Yard-*arm* is that half of the *yard* which is on either ſide the maſt, when it lies athwart the ſhip.

Yards alſo denote places belonging to the navy, where the ſhips of war, &c. are laid up in harbour. See Dock-*yards*.

YARE, among *Sailors*, implies as much as, nimble, ready, quick, expeditious. Hence, *to be yare at the helm*, as ſome ſay, ſignifies to ſet a freſh man at the helm.

YARIN, a word uſed by ſome of the chemical writers to expreſs the flos æris.

YARN, denotes ſpun wool.

Yarn, *marking*. See Marking.

Yarn, *rope*. See Rope.

Yarn, *ſpun*, on board a *Ship*. See Spun.

YARRINGLES, or Yarringle-*blades*, a kind of reel, or inſtrument, with which hanks of yarn are wound on to clues, or balls.

YARROW, *Achillea*, or *Millefolium*, in *Botany*. For its characters, ſee Achillea.

The leaves and flowers of the common *yarrow*, or *achillea millefolium* of Linnæus, which is in flower on our ditch-banks, and in dry paſtures, the greateſt part of the ſummer, are greatly recommended by ſome of the German phyſicians, as mild corroborants, vulneraries, and antiſpaſmodics, in diarrhœas, hæmorrhages, hypochondriacal, and other diſorders. They promiſe, ſays Dr. Lewis, by their ſenſible qualities, to be of no inconſiderable activity. They have an agreeable, though weak, aromatic ſmell, and a bitteriſh, roughiſh, ſomewhat pungent taſte. The leaves, having the greateſt bitteriſhneſs and auſterity, are chiefly directed for medicinal uſe; the flowers have the ſtrongeſt and moſt ſubtile ſmell, are remarkably acrid, and promiſe to be of greateſt efficacy, if the plant has any ſuch efficacy, as an anodyne or antiſpaſmodic. The virtue of both leaves and flowers is extracted by watery and ſpirituous menſtrua: the aſtringency moſt perfectly by the former; their aromatic warmth and pungency by the latter; and both of them equally by a mixture of the two. The flowers, diſtilled with water, yield a penetrating eſſential oil, poſſeſſing the flavour of the milfoil in perfection; in conſiſtence ſomewhat thick and tenacious; in colour very variable, from a greeniſh yellow to a deep green, and bluiſh green and fine blue, which differences depend in great meaſure on the ſoil in which the plant is produced; the flowers gathered from moiſt, freſh grounds, yielding generally a blue oil, and thoſe collected from dry commons a green one, with a greater or leſs admixture of yellow. The extract, obtained by inſpiſſating the yellowiſh tincture made in rectified ſpirit, is more agreeable in ſmell than the flowers, of a moderately warm, penetrating taſte, ſomewhat like that of camphor, but much milder, accompanied with a ſlight bitteriſhneſs and ſubaſtringency. The *achillea ptarmica* of Linnæus, called *ſneezewort*, or *baſtard pellitory*, is perennial, grows wild on heaths, and in moiſt ſhady grounds, and is found in flower from June to the end of ſummer. The roots of this plant have a hot, biting taſte, approaching to that of pellitory of Spain, with which they nearly agree in their pharmaceutic properties, and for which they have been ſometimes ſubſtituted in the ſhops. They are by ſome recommended internally as a warm ſtimulant and attenuant; but their principal uſe is as a maſticatory and ſternutatory. Lewis.

Yarrow, *water*. See *Water* Violet.

YARWHELP, or Yarwip, an Engliſh name uſed in ſome places for the *agocephalus* of authors. See Godwit.

YASSA, in *Modern Hiſtory*, the name given among the Tartars to a body of laws, aſcribed to the famous conqueror

queror Gengis-Kan, which are still observed among the Tartars of Crimea, and other parts of Asia. M. de la Croix has given, in his Life of Gengis-Kan, an extract of those laws, comprising twenty-one articles: the first of which inculcates the belief of one God, the creator of heaven and earth, and to whom belong the absolute disposal and dominion of events. Encyclopedie.

YATCHES. See YACHT.

YAW, in *Sea-Language*, denotes the movement by which a ship deviates from the line of her course towards the right or left in steering. See STEADY.

YAWL, in *Sea-Language*, a ship's boat, something less than a CUTTER, nearly of the same form, and used for similar services. It is generally rowed with four or six oars.

YAWNING, *oscitatio*, an involuntary opening of the mouth, occasioned by a vapour, or ventosity, endeavouring to escape, and generally witnessing a troublesome weariness, or an inclination to sleep.

The remedy Hippocrates prescribes against continual *yawnings*, is to make long breathings, or respirations. The same he also recommends against the hiccough.

The nervous membrane of the œsophagus has been held the seat of *yawning*; which, according to the usual system, is produced, whenever any irritation determines the spirits to flow thither in too great abundance. The cause of the irritation is supposed to be some troublesome humour, wetting the inner membrane of the œsophagus; which humour may proceed either from the glands spread throughout the membrane, or from acid vapours arising from the stomach, and condensing on the sides of the œsophagus. By such means, the nervous fibres of the membranes of the gullet being irritated, dilate the gullet; and the mouth is constrained to follow the same motion, as being lined with the same membrane. But this system of oscitation has, of late, given way to a better, and more mechanical one.

Yawning is, in reality, performed by expanding almost all the muscles of voluntary motion at the same time, but most considerably those of the lungs; by springing a great quantity of air, very slowly, and after retaining it some time, and rarefying it, by expelling it again, slowly, and restoring the muscles to their natural state.

Hence, its effects are to move, accelerate, and distribute all the humours of the body, equally through all the vessels; thereby disposing the organs of sensation, and all the muscles of the body, for the performance of their respective functions. Vide Boerh. Inst. Med. sect. 638.

YAWS, in *Medicine*, is a distemper epidemical, or rather endemical to Guinea, and the hotter climates in Africa, seldom failing to attack each individual one time or other of their lives, but most commonly in childhood or youth; it makes its first appearance in little spots on the cuticle, level with the skin, no larger than the point of a pin, which increase daily, and become protuberant like pimples: soon after, the cuticle frets off, and then, instead of pus or ichor in this small tumor, white sloughs or sordes are only found, under which is a small red fungus growing out of the cutis, increasing gradually to different magnitudes, some less than the smallest wood-strawberry, some as big as a raspberry, and others even exceeding in bigness the largest mulberries, which they very much resemble. While they are coming to this height, the black hair, which grows out of the part now covered with the *yaws*, changes gradually white.

It is impossible to calculate the exact time which this distemper requires to go through these different stages. Some negroes who were in good plight, and had full nourishment, in a month after discovering the white spots, have had several *yaws* as big as a mulberry; and in other negroes that were low in flesh, and had but a poor scanty diet, in three months time none of the *yaws* have exceeded a common strawberry.

The *yaws* appear on all parts of the body; but the most and biggest are generally on the groins, about the privities and anus, in the arm-pits and face. When they are very large, they are few in number; and when they are many in number, they are small in size. All this time the patient is in good health, does not lose his appetite, and seems to have no other uneasiness than what the nastiness of the sores occasions; for they are not painful, except touched too roughly. This is the natural appearance of the distemper, when left to itself, and in this state it will continue a long time, without any sensible alteration.

The *yaws* do not prove often dangerous, if the cure is undertaken skilfully at a proper time, and the patient has not undergone any course of physic for them before; but if the patient has been once salivated, or taken any quantity of mercury, and the skin once cleared, and they appear again, they are always very difficult, and often impossible to cure.

The chief part of the cure is by gentle salivation with calomel, in small doses, not exceeding five grains, and repeated once, twice, or thrice a day, that it may neither vomit nor purge. But previous to this, the following bolus should be administered every night for two or three weeks, or till the *yaws* are at their height; viz. one scruple of flowers of sulphur, five grains of camphor dissolved in spirit of wine, one dram of theriaca Andromachi, and as much syrup of saffron as is necessary to form the ingredients into a bolus. After the salivation, the patient is sweated twice or thrice in a frame or chair, with spirit of wine; and two drams of the following electary are to be taken morning and evening, viz. an ounce and a half of Æthiops mineral, half an ounce of gum guaiacum, one ounce of theriaca Andromachi, and as much conserve of red roses, twenty drops of oil of sassafras, and the necessary quantity of syrup of saffron. The patient's drink is the decoction of guaiacum and sassafras, fermented with melasses.

Sometimes one large *yaw*, high-knobbed, red and moist, called the *master-yaw*, remains after the rest are fallen off, and the salivation is over. And to subdue this, some have thought new salivations necessary; but it requires only to be destroyed by a gentle caustic, or mild escharotic, as equal parts of red precipitate and burnt alum; digested with one ounce of yellow basilicon, and one dram of red precipitate, and cicatrized with lint pressed out of spirit of wine, and with the vitriol stone.

The salivation should not be begun before the *yaws* are at the height, which is discovered by their being at a stand, neither increasing in size or number. Their coming to the height should be accelerated by proper medicines. If the patient be salivated before this time, the distemper will return soon after the salivation. Med. Ess. Edinb. vol. v. part ii. art. 76.

The VENEREAL *disease* and *yaws* are said to be distinct distempers; but the symptoms, in consequence of the latter ill cured, so much resemble those of the former in an inveterate degree, that it is difficult to distinguish them.

YAYAUHQUITOTOTL, in *Ornithology*, the name of an Indian bird described by Nieremberg, remarkable for having two feathers of its tail much longer than the rest, and naked for a great way, but at the end ornamented with black and blue hairs. The bird is of the size of the starling, and is beautifully variegated with green, blue, yellow, and grey.

Mr. Ray is of opinion, that this is the bird described by Marggrave under the name *guaira-guainumbi*.

YCONOMUS. See OECONOMUS.

YDRARGYROS, HYDRARGYROS, or *Quicksilver*. See MERCURY.

YDRINUS, or HYDRINUS, a name given by some to the *ophites*, or serpent-stone.

YEANING, a term used for an ewe's lambing.

YEAR, *annus*, in the full extent of the word, is a system, or cycle of several months; usually twelve.

Others define *year*, in the general, a period, or space of time, measured by the revolution of some celestial body in its orbit.

Thus, the time wherein the fixed stars make a revolution, is called the *great year*. And the times wherein Jupiter, Saturn, the sun, moon, &c. finish their revolutions, and return to the same point of the zodiac, are respectively called the *years of Jupiter*, and *Saturn*; and the *solar*, and the *lunar years*.

Year, properly, and by way of eminence so called, is the *solar year*; or the space of time wherein the sun moves through the twelve signs of the ecliptic.

This, by the observations of Cassini, Bianchini, and de la Hire, contains 365 days, 5 hours, and 49 minutes; which is the quantity of the *year* assumed by the authors of the Gregorian calendar.

But, in the civil, or popular account, this *year* only contains 365 days; except every fourth, which contains 366.

The vicissitude of seasons seem to have given occasion to the first institution of the *year*. Man, naturally curious to know the cause of that diversity, soon found it was the proximity and distance of the sun; and, upon this, gave the name *year* to the space of time wherein that luminary, performing his whole course, returned to the same point of his orbit.

And hence, as it was on account of the seasons, in a great measure, that the *year* was instituted, their chief regard and attention was, that the same parts of the year should always correspond to the same seasons; i. e. that the beginning of the *year* should always be when the sun was in the same point of his orbit; and that they should keep pace, come round, and end together.

This, different nations aimed to attain by different ways; making the *year* to commence from different points of the zodiac,

zodiac, and even making the time of his progreſs different. So that ſome of their *years* were much more perfect than others, but none of them quite juſt; i. e. none of them whoſe parts did not ſhift, with regard to the parts of the ſun's courſe.

They were the Egyptians, if we may credit Herodotus, that firſt formed the *year*, making it to contain 360 days, which they ſubdivided into 12 months.

Mercury Triſmegiſtus added five days more to the account. And, on this footing, Thales is ſaid to have inſtituted the *year* among the Greeks; though that form of the *year* did not hold throughout all Greece. Add, that the Jewiſh, Syrian, Roman, Perſian, Ethiopic, Arabic, &c. *years*, were all different.

In effect, conſidering the imperfect ſtate of aſtronomy in thoſe ages, it is no wonder different people ſhould diſagree in the calculus of the ſun's courſe. We are even aſſured by Diod. Siculus, lib. i. Plutarch, in Numa, and Pliny, lib. vii. cap. 48. that the Egyptian *year* itſelf was at firſt very different from that now repreſented.

YEAR, *ſolar*, is the interval of time wherein the ſun finiſhes his courſe through the zodiac; or wherein he returns to the ſame point thereof from whence he had departed.

This, according to our account, is 365 days, 5 hours, 49 minutes; though ſome aſtronomers make it a few ſeconds, and ſome a whole minute, leſs; as Kepler, for inſtance, who makes it 365 days, 5 hours, 48 minutes, 57 ſeconds, 39 thirds. Ricciolus, and Tycho Brahe, 365 days, 5 hours, 48 minutes.

The *ſolar year* is either *aſtronomical*, or *civil*.

YEAR, *ſolar aſtronomical*, is that determined preciſely by the obſervations of aſtronomy; and is of two kinds, *tropical*, and *ſiderial* or *aſtral*.

YEAR, *tropical*, or *natural*, is the time which the ſun employs in paſſing through the zodiac; which, as before obſerved, is 365 days, 5 hours, 49 minutes; or $365^d\ 5^h\ 48'\ 57''$. This is the only proper or natural *year*, becauſe it always keeps the ſame ſeaſons to the ſame months.

YEAR, *ſiderial*, or *aſtral*, is the ſpace of time wherein the ſun, going from any fixed ſtar, returns to the ſame. This conſiſts of 365 days, 6 hours, 9 minutes, $14\frac{1}{2}$ ſeconds; and is 20 minutes, $17\frac{1}{2}$ ſeconds longer than the true ſolar *year*.

YEAR, *civil*, is that form of *year* which each nation has contrived to compute time by: or the *civil* is the tropical *year*, conſidered as only conſiſting of a certain number of whole days; the odd hours and minutes being ſet aſide, to render the computation of time, in the common occaſions of life, more eaſy.

Hence, as the *tropical year* is 365 days, 5 hours, 49 minutes, the *civil year* is 365 days. And hence, alſo, as it is neceſſary to keep pace with the heavens, it is required that every fourth *year* ſhould conſiſt of 366 days.

Hence, laſtly, the *civil year* is either *common*, or *biſſextile*.

YEAR, *the common civil*, is that conſiſting of 365 days. This, therefore, has ſeven months of 31 days each, four of 30 days, and one of 28 days; according to the well-known canon:

Thirty days hath September,
April, June, and November.
February twenty-eight alone,
And all the reſt have thirty-one.

YEAR, *biſſextile*, or *leap*, is that conſiſting of 366 days; or it has one day extraordinary; which day is called the *intercalary*, or *biſſextile day*.

This intercalary, or additional day to every fourth *year*, was firſt appointed by Julius Cæſar; who, to make the *civil year* keep pace with the tropical ones, contrived that the ſix hours which the former came ſhort of the latter, ſhould, in four *years*, make a whole day, and be added before the twenty-fourth, or to the twenty-third of February, which was their ſixth of the calends of March.

Hence, as, in that *year*, they reckon this day twice over, or had *bis ſexto calendas*, the *year* itſelf came to be called *bis ſextus*, and BISSEXTILE.

The intercalary day, however, among us, is not introduced by telling the twenty-third of February twice over, but by adding a day after the twenty-eighth of February; which month, in that *year*, contains twenty-nine days. See LEAP-*year*.

A farther reformation, in this *year*, was made by pope Gregory. See *Gregorian* YEAR, and CALENDAR.

YEAR, *lunar*, is a ſyſtem of twelve lunar months. See LUNAR.

Hence, from the two kinds of ſynodical lunar months, there ariſe two kinds of *lunar years*; the one *aſtronomical*, the other *civil*.

YEAR, *lunar aſtronomical*, conſiſts of twelve lunar ſynodical months; and therefore contains 354 days, 8 hours, 48 minutes, 36 ſeconds; and is, therefore, 10 days, 21 hours, 0 minute, 21 ſeconds, ſhorter than the ſolar *year*. This is the foundation of the EPACT.

YEAR, *lunar civil*, is either *common* or *emboliſmic*.

YEAR, *the common lunar*, conſiſts of twelve lunar civil months; and therefore contains 354 days.

YEAR, *the emboliſmic*, or *intercalary*, conſiſts of thirteen lunar civil months, and, therefore, contains 384 days. See EMBOLISMIC.

Thus far we have conſidered *years* and months, with a view to the principles of aſtronomy, whereon the diviſion is founded. By this, the various forms of civil *years* that have anciently obtained, or ſtill do obtain, in divers nations, are to be examined.

YEAR, *ancient Roman*, was the *lunar year*, which, as firſt ſettled by Romulus, only conſiſted of ten months; viz. 1. March, containing 31 days. 2. April, 30. 3. May, 31. 4. June, 30. 5. Quintilis, 31. 6. Sextilis, 30. 7. September, 30. 8. October, 31. 9. November, 30. 10. December, 30. in all 304 days; which came ſhort of the true lunar *year* by 50 days; and of the ſolar, by 61 days. Hence, the beginning of Romulus's *year* was vague, and unfixed to any preciſe ſeaſon; to remove which inconvenience, that prince ordered ſo many days to be added yearly as would make the ſtate of the heavens correſpond to the firſt month, without incorporating theſe additional days, or calling them by the name of any month.

Numa Pompilius corrected this irregular conſtitution of the *year*, and compoſed two new months, January and February, of the days that were uſed to be added to the former *year*. Thus, Numa's *year* conſiſted of twelve months; viz. 1. January, containing 29 days. 2. February, 28. 3. March, 31. 4. April, 29 days. 5. May, 31. 6. June, 29. 7. Quintilis, 31. 8. Sextilis, 29. 9. September, 29. 10. October, 31. 11. November, 29. 12. December, 29; in all, 355 days, which exceeds the quantity of a lunar civil *year* by one day; and that of a lunar aſtronomical *year* by 15 hours, 11 minutes, 24 ſeconds, but comes ſhort of the common ſolar *year* by ten days; ſo that its beginning alſo was vague, and unfixed.

Numa, however, deſiring to have it fixed to the winter-ſolſtice, ordered 22 days to be intercalated in February every ſecond year, 23 every fourth, 22 every ſixth, and 23 every eighth *year*.

But this rule failing to keep matters even, recourſe was had to a new way of intercalating; and inſtead of twenty-three days every eighth *year*, only fifteen were added; and the care of the whole was committed to the pontifex maximus; who, neglecting the truſt, let things run to the utmoſt confuſion. And thus the Roman *year* ſtood till Julius Cæſar made a reformation. See CALENDAR.

For the manner of reckoning the days of the Roman months, ſee CALENDS, NONES, and IDES.

YEAR, *Julian*, is a ſolar *year*, containing, commonly, 365 days; though every fourth *year*, called BISSEXTILE, it contains 366.

The months, &c. of the Julian *year*, ſtand thus. 1. January, 31 days. 2. February, 28. 3. March, 31. 4. April, 30. 5. May, 31. 6. June, 30. 7. July, 31. 8. Auguſt, 31. 9. September, 30. 10. October, 31. 11. November, 30. 12. December, 31. But every *biſſextile year* a day is added after the 28th of February; which month, then, contains 29 days.

The aſtronomical quantity, therefore, of the *Julian year* is 365 days, 6 hours; which exceeds the true ſolar *year* by ſomewhat more than eleven minutes; which exceſs, in 131 *years*, amounts to a whole day. So that the times of the equinoxes go backward, and fall earlier by one day in about 131 or 130 years. And thus the Roman *year* ſtood, till the reformation made therein by pope Gregory.

For this form of the *year*, we are indebted to Julius Cæſar; who, in the contrivance thereof, was aſſiſted by Soſigenes, a famous mathematician, called over from Egypt for this very purpoſe; who, to ſupply the defect of ſixty-ſeven days, which had been loſt through the fault of the pontifices, and to fix the beginning of the *year* to the winter ſolſtice, made that *year* to conſiſt of 15 months, or 445 days; which, for that reaſon, is uſed to be called *annus confuſionis*, the *year of confuſion*. See *Julian* CALENDAR.

YEAR, *Gregorian*, is the *Julian year* corrected by this rule; that, whereas, on the common footing, every ſecular or hundredth *year* is biſſextile; on the new footing, three of them are common *years*, and only the fourth is biſſextile.

The error of eleven minutes in the *Julian year*, little as it was, yet, by being repeated over and over, at length became conſiderable; and from the time when Cæſar made his correction, was grown into thirteen days, by which means the equinoxes were greatly diſturbed. In the

the year 1582, the equinoxes were fallen ten days, and the full moons four days, more backwards than they were in the time of the Nicene council; i. e. the equinox, which in the year 325, when that council was held, fell on the twentieth of March, was in 1582 thrown back to the tenth, and the full moon was removed from the fifth to the first of April. To remedy this irregularity, which was still increasing, pope Gregory XIII. in the year just mentioned, called together the chief astronomers of his time, and concerted this correction; and, to restore the equinoxes to their place, threw out the ten days that had been got from the time of the council of Nice, and which had shifted the fifth of October to the fifteenth. He exchanged the lunar cycle for that of the epacts; and in order to restore the spring equinox to the Nicene standard, subtracted ten days out of the month of October in that year (1582), making the fourth to be the fifteenth; and by this means the vernal equinox has been restored to the twenty-first of March. Moreover, it was endeavoured, by the omission of three intercalary days in four hundred *years*, to make the civil *year* keep pace with the solar for time to come. See CALENDAR.

In the *year* 1700, the error of ten days was grown to eleven; upon which the protestant states of Germany, to prevent farther confusion, accepted the Gregorian correction. See *Reformed* CALENDAR, and STYLE.

Yet is even the *Gregorian year* far from being perfect; for we have shewn that in four centuries, the *Julian year* gains three days, one hour, twenty minutes; but it is only the three days that are kept out in the *Gregorian year*; so that there is still an excess of one hour, twenty minutes, in four centuries, which, in seventy-two centuries, amounts to a whole day.

The *Gregorian year* is now used in most countries of Europe. From the difference between this and the Julian *year* arises the distinction of the old or Julian, and new or *Gregorian* STYLE.

YEAR, *Egyptian*, called also the *year of Nabonassar*, on account of the EPOCHA *of Nabonassar*, is the solar *year* of 365 days, divided into twelve months, of thirty days each, besides five intercalary days, added at the end.

The names, &c. of the months are as follow: 1. Thoth. 2. Paophi. 3. Athyr. 4. Chojac. 5. Tybi. 6. Mecheir. 7. Phamenoth. 8. Pharmuthi. 9. Pachon. 10. Pauni. 11. Epiphi. 12. Mesori; beside the ἡμεραι επαγομεναι.

Hence, as the *Egyptian year* in every four *years* loses a whole day of the *Julian year*, because it neglects the six hours, which make a leap-day once in four years, its beginning, in the space of 1460 *years*, runs through every part of the *Julian year*; which space elapsed, they meet again; and, therefore, it is justly called the *erratic year*. And because it returns to the same day of the Julian *year* after 1460 Julian *years*, this circle is called the Sothic period. See CANICULAR *year*.

This *year* is used by Ptolemy, in his Almagest; so that the knowledge thereof is of great use in astronomy, for comparing the ancient observations with the modern.

This desultory form was applied by the Egyptians to civil uses, till Antony and Cleopatra were defeated; and the mathematicians and astronomers used it till the time of Ptolemy.

The ancient Egyptians, we are told by Diodorus Siculus, lib. i. Plutarch, in the Life of Numa, and Pliny, lib. vii. cap. 48. measured their *years* by the course of the moon. At first, they were only one month, then three, then four, like that of the Arcadians; and then six, like that of the people of Acarnania. Those authors add, that it is on this account they reckon such a vast number of *years* from the beginning of the world; and that, in the history of their kings, we meet with some who lived 1000, or 1200 *years*.

But Herodotus is silent on this point: he only says, that the Egyptian *year* consisted of twelve months, as we have above represented it. Besides, we learn from Scripture, that from the times of the flood, the *year* was composed of twelve months: Cham, consequently, and his son Misraim, the founder of the Egyptian monarchy, must have had that custom; and it is no way probable his descendants should alter it. Add, that Plutarch speaks of it with great uncertainty, and as no more than a report; and Diod. Siculus, as only a conjecture of authors whom he does not name; and who, in all probability, might have framed this hypothesis, to reconcile the Egyptian chronology with that of some other nations.

F. Kircher, however, maintains, that besides the solar *year* there were some of the nomes, or cantons of Egypt, who used a lunar one; and that, in the remotest ages, there were some who took a revolution of the moon, that is, a month, for a *year*; and others, who, finding the *year* too short, made it two months, others three and others four, &c. Oedip. Egypt. tom. ii. p. 252.

A late author observes, that Varro has affirmed of all nations, what we have here quoted of the Egyptians; and adds, that Lactantius takes him to task on that subject. We do not know in what places of Varro, or Lactantius, he has seen this: all we can say is, that Lactantius, Divin. Inst. lib. iii. cap. 13 where he gives Varro's opinion, only represents him as speaking of the Egyptians. However, St. Augustine, De Civit. Dei, lib. xv. cap. 14 shews, that the *years* of the patriarchs mentioned in Scripture, are like ours, and not one of ours equal to ten of theirs, as, it appears, had been the opinion of some people.

Upon the Egyptians being subdued by the Romans, they received the *Julian year*, though with some alteration; for they still retained their ancient months, with the five ἡμεραι επαγομεναι, and, every fourth *year*, intercalated another day between the 28th and 29th of August. Add, that the beginning of their *year*, or the first day of the month Thoth, answered to the 29th of August of the *Julian year*, or to the 30th, if it happened to be leap-*year*.

This *year*, thus reformed, and called the fixed Egyptian *year*, was called the *annus Actiacus*, as being instituted soon after the battle of Actium.

YEAR, *ancient Greek*, was lunar; consisting of 12 months, which at first had 30 days apiece, then alternately 30, and 29 days, computed from the first appearance of the new moon; with the addition of an embolismic month of 30 days, every 3d, 5th, 8th, 11th, 14th, 16th, and 19th *years* of a cycle of 19 *years*; in order to keep the new and full moons to the same terms or seasons of the *year*.

Their *year* commenced with that new moon, the full moon of which comes next after the summer solstice. The order, &c. of their months was thus: 1. Ἑκατομβαιων, containing 29 days. 2. Μηταγειτνιων, 30. 3. Βοηδρομιων, 29. 4. Μαιμακτηριων, 30. 5. Πυανεψιων, 29. 6. Ποσειδεων, 30. 7. Γαμηλιων, 29. 8. Ανθεστηριων, 30. 9. Ελαφηβολιων, 30. 10. Μενυχιων, 30. 11. Θαργηλιων, 29. 12. Σκιροφοριων, 30.

The Macedonians had other names for their months; so had the Syro-Macedonians, Smyrnæans, Tyrians; so also the Cyprians, Paphians; and so the Bithynians, &c.

YEAR, *ancient Macedonian*, is a lunar *year*, only differing from the Attic, in the names and order of the months; the first Macedonian month agreeing with the Attic Mæmacterion: as the Macedonian *year* commenced not at the summer solstice, but at the autumnal equinox. The months stand thus: 1. Διος, 30 days. 2. Απελλαιος, 29. 3. Αυδυναιος, 30. 4. Περιτιος, 29. 5. Δυστρος, 30. 6. Ξανθικος, 29. 7. Αρτεμισιος, 30. 8. Δαισιος, 29. 9. Πανεμος, 30. 10. Λωος. 11. Γορπιαιος, 30. 12. Υπερβερεταιος.

YEAR, *modern Macedonian*, is a solar year, whose beginning is fixed to the first of January of the *Julian year*, with which it perfectly agrees.

This *year* was particularly called the *Attic year*; and the intercalary month, after Posideon, was called Ποσειδεωνβ, or *latter Posideon*.

YEAR, *ancient Jewish*, is a lunar *year*, consisting, commonly, of eleven months, which alternately contain 30 and 29 days.

It was made to agree with the solar *year*, either by the adding of 11, and sometimes 12 days, at the end of the *year*, or by an embolismic month.

The names and quantities of the months stand thus: 1. Nisan, or Abib, 30 days. 2. Jiar, or Zius, 29. 3. Siban, or Siwan, 30. 4. Thamuz, or Tamuz, 29. 5. Ab, 30. 6. Elul, 29. 7. Tisri, or Ethanim, 30. 8. Marchesvam, or Bul, 29. 9. Cisleu, 30. 10. Tebeth, 29. 11. Sabat, or Schebeth, 30. 12. Adar, in the embolismic *year*, 30. Adar, in the common *year*, was but 29.

Note, in the defective *year*, Cisleu was only 29 days; and in the redundant *year*, Marchesvam was 30.

YEAR, *Modern Jewish*, is likewise lunar, consisting, in common *years*, of 12 months, but of 13 in embolismic *years*; which, in a cycle of 19 *years*, are the 3d, 6th, 8th, 11th, 14th, 17th, and 19th. Its beginning is fixed to the new moon next after the autumnal equinox.

The names, &c. of the months are, 1. Tisri, containing 30 days. 2. Marchesvan, 29. 3. Cisleu, 30. 4. Tebeth, 29. 5. Schebeth, 30. 6. Adar, 29. 7. Veadar, in the embolismic *year*, 30. 8. Nisan, 30. 9. Iiar, 29. 10. Sivan, 30. 11. Thamuz, 29. 12. Ab, 30. 13. Elul, 29.

YEAR, *Syrian*, is a solar *year*, having its beginning fixed to the beginning of October in the Julian *year*; from which it only differs in the names of the months, the quantities being the same; as follows:

1. Tishrin, answering to our October, and containing 31 days.

days. 2. Latter Tifhrin, containing, like our November, 30. 3. Canun, 31. 4. Latter Canun, 31. 5. Shabat, 28, or 29 in a leap-*year*. 6. Adar, 31. 7. Nifan, 30. 8. Aiyar, 31. 9. Haziram, 30. 10. Tamuz, 31. 11, Ab, 31. 12. Elul, 30.

YEAR, *Perfian*, is a folar *year*, of 365 days, confifting of 12 months of 30 days each, with 5 intercalary days added at the end.

The months are as follow: 1. Afrudia meh. 2. Ardihafcht meh. 3. Cardi meh. 4. Thir meh. 5. Merded meh. 6. Schabarir meh. 7. Mehar meh. 8. Aben meh. 9. Adar meh. 10. Di meh. 11. Behen meh. 12. Affirer meh.

This *year* is called the *yezdegerdic year*, to diftinguifh it from the fixed folar *year*, called the *gelalean year*, which the Perfians began to ufe in the *year* 1079, and which was formed by an intercalation made fix or feven times in four *years*, and then once every fifth *year*.

The yezdegerdic *year*, it may be obferved, is the fame with Nabonaffar's *year*, differing from it only in the names of the months, and the commencement of the epocha; for whereas the Nabonaffarean began on Feb. 26, this began on June 16. As to the gelalean *year*, it is abfolutely the beft and jufteft of all the civil *years* yet invented, as being found, by calculation, to keep the folftices and equinoxes precifely to the fame days, and anfwering very accurately to the folar motions; which no other civil *year* does, not even the Gregorian, for want of fo commodious an intercalation.

YEAR, *Arabic*, *Mahometan*, and *Turkifh*, called alfo the *year* of the HEGIRA, is a lunar *year*, equal to 354 days, 8 hours, and 48 minutes, and confifting of 12 months, which contain, alternately 30, and 29 days.

Though fometimes it contains 13 months; the names, &c. whereof are as follow: 1. Muharram, containing 30 days. 2. Saphar, 29. 3. Rabia, 30. 4. Latter Rabia, 29. 5. Jomada, 30. 6. Latter Jomada, 29. 7. Rajab, 30. 8. Shaaban, 29. 9. Ramadan, 30. 10. Shawal, 29. 11. Dulkaadah, 30. 12. Dulheggia, 29; and in the embolifmic *year* 30. An intercalary day is added every 2d, 5th, 7th, 10th, 13th, 15th, 18th, 21ft, 24th, 26th, 29th, in a cycle of 29 *years*.

The months commence not from the real new moon, but from its firft appearance after conjunction.

YEAR, *Ethiopic*, is a folar *year* perfectly agreeing with the Actiac, except in this, that the names of the month are different. It commences with the Egyptian *year*, on the 29th of Auguft of the Julian *year*.

Its months are, 1. Mafcaram. 2. Tykympt. 3. Hydar. 4. Tyfhas. 5. Tyr. 6. Jacatil. 7. Magabit. 8. Mijazia. 9. Ginbat. 10. Syne. 11. Hamel. 12. Hahafe. Intercalary days 5.

YEAR, *Actian*. See ACTIAN, and *Egyptian* YEAR.

YEAR, *Attic*. See *Macedonian* YEAR.

YEAR, *Canicular*. See CANICULAR.

YEAR, *Yezdegerdic*. See *Perfian* YEAR.

YEAR, *Gelalean*. See *Perfian* YEAR.

YEAR, *Nabonaffar's*. See *Egyptian* YEAR, and NABONASSAR.

YEAR, *fabbatic*, *annus fabbaticus*, among the ancients, was every feventh *year*; during which, the Jews let their lands lie at reft. Levit. xxv. 8.

Every feventh *fabbatic year*, i. e. every 49th *year*, was called the *year of* JUBILEE; and held with folemnity extraordinary.

YEAR, *anomaliftical*. See ANOMALISTICAL.

YEAR, *climacteric*. See CLIMACTERIC.

YEAR, *emergent*. See EMERGENT.

YEAR, *enneatical*. See ENNEATICAL.

YEAR, *holy*. See HOLY.

YEAR, *Platonic*, or *great*. See PLATONIC.

YEAR *of the Hegira*. See HEGIRA, and *Arabic* YEAR.

New YEAR's *day*, or the day wherein the *year* commences, has always been very different, in different nations; and yet in all has been held in great veneration.

Among the Romans, the firft and laft day of the *year* were confecrated to Janus; on which account it was, that they reprefented him with two faces.

To them we owe the ceremony of wifhing *an happy new year*; which appears to be very ancient. Before the firft day was fpent, they not only vifited and complimented each other, but alfo prefented ftrenæ, and offered vows to the gods for the prefervation of each other.

Lucian reprefents it as a practice of a very ancient ftanding, even in his time; and refers it to Numa.

Ovid intimates the fame ceremony, in the beginning of his Fafti;

> *Poftera lux oritur, linguifque animifque favete:*
> *Nunc dicenda bono funt bona verba die.*

And Pliny more exprefly, lib. xxviii. cap. 1. *Primum anni incipientis diem lætis precationibus invicem fauftum ominantur.*

The civil, or *legal* YEAR, in England, formerly commenced on the day of the Annunciation, i. e. on the 25th day of March; though the hiftorical *year* began on the day of the Circumcifion, i. e. the firft of January, on which day the German and Italian *year* alfo begins.

Stow obferves, that William the Conqueror having been crowned on the firft of January, that thenceforth became the firft of the *year* for hiftorians, &c. though, in all civil affairs, they retained the ancient manner of accounting, which began the 25th of March.

The part of the *year* between thofe two terms was ufually expreffed both ways, as 1748-9, or $174\frac{8}{9}$. But by the act for altering the ftyle, the civil *year* now commences with January 1. See *New* STYLE.

Since the Conqueror, the king's patents, charters, proclamations, &c. are ufually dated by the *year* of the king's reign.

The church, as to her folemn fervice, begins the *year* on the firft Sunday in Advent, which is always that next St. Andrew's day, or the 30th of November.

The Jews, as moft other nations of the Eaft, had a civil *year*, which commenced with the new moon in September; and an ecclefiaftical *year*, which commenced from the new moon in March.

The month TISRI, which began about the time of the autumnal equinox, was the firft month of the Jewifh *year*, till it was changed at the time of the coming up of the children of Ifrael out of Egypt. For that happening in the month of ABIB, afterwards called NISAN, this month was for this reafon reckoned the firft month of the *year*, in all ecclefiaftical matters. Before this period Tifri was reckoned the commencement of the year, becaufe it was thought that the world was created and firft began at the time of the autumnal equinox. And for this reafon the Jews do ftill in their æra of the creation of the world, as well as in their æra of contracts, compute the beginning of the *year* from the firft of Tifri, and all their bills, and bonds, and all other civil acts and contracts, are ftill dated among them according to the fame computation; and from this month alfo they began all their jubilees, and fabbatical *years*. And, therefore, although their ecclefiaftical *year* began from Nifan, and all their feftivals were computed from it, yet their civil *year* was ftill reckoned from Tifri, and the firft day of that month was their new *year's* day: and for the more folemn celebration of it the feaft of trumpets feems to have been appointed.

The French *year*, during the reigns of the Merovingian race, began on the day whereon the troops were reviewed; which was the firft day of March. Under the Carlovingians it began on Chriftmas-day; and, under the Capetians, on Eafter-day; which, therefore, varied between the 22d of March, and the 25th of April. The ecclefiaftical *year* in France begins on the firft Sunday of Advent. But for the civil, Charles IX. appointed, in 1564, that for the future it fhould commence on the firft of January.

The Mahometans begin their *year* the minute the fun enters Aries. The Perfians in the month anfwering to our June. The Chinefe, and moft of the Indians, begin it with the firft moon in March. The Brachmans begin it with the new moon in April; on which day they hold a feaft called *famwat faradi pauduga*, q. d. *feaft of New-year's day*. The Mexicans, according to d'Acofta, begin the *year* on our 23d of February, when the leaves begin to grow green: their *year* confifts of eighteen months, having twenty days each, which make three hundred and fixty days; the remaining five days are fpent in mirth, and no bufinefs is fuffered to be done, nor even any fervice at the temples. Alvarez relates much the fame of the Abyffinians; who begin their year on the 26th of Auguft, and have five idle days at the end, which they call *pagomen*. At Rome there are two ways of computing the *year*; the one beginning at the Nativity of our Lord: this the notaries ufe, dating *a Nativitate*. The other on the 25th of March, on occafion of the Incarnation; and it is by this the bulls are dated, *anno Incarnationis*. The Greeks begin their *year* of the world from the firft of September.

Years are alfo diftinguifhed with regard to the epochas whence they are numbered: thus, *years of our Lord*, are thofe reckoned from the birth of Jefus Chrift. *Years of the world*, are thofe elapfed fince the creation. *Years of Rome*, *of the Hegira*, *of Nabonaffar*, &c. See the difference between thefe *years*, under the article EPOCHA.

YEAR is alfo a word ufed by fome of the chemical writers to exprefs any product of their operations, which may ferve as a medicine, whether internally or externally.

YEAR *and Day*, in *Law*, &c. is a time that determines a right in many cases, and is in some an usucaption, and in others a prescription.

Thus, in the case of an estray, if the owner, proclamation being made, challenge it not within a *year and day*, it is forfeit. In like manner is the *year and day* given in cases of appeal, of descent, of entry or claim, of non-claim upon a fine, or writ of right, of the death of a man sore bruised, or wounded; of protections, essoins in respect of the king's service; of a wreck, and on many other occasions.

YEAR, *day, and waste, annus, dies, & vastum*, is a part of the king's prerogative, whereby he challenges the profits of the lands and tenements of persons attainted for petit-treason, or felony, for the space of a *year* and a day; whosoever is lord of the manor to which they belong.

Formerly the king had only a liberty of committing waste on the lands of felons, by pulling down their houses, extirpating their gardens, ploughing their meadows, and cutting down their woods. But this tending greatly to the prejudice of the public, it was agreed in the reign of Henry I. that the king should have the profits of the land for one *year and a day*, in lieu of the destruction he was otherwise at liberty to commit: and, therefore, *Magna Charta* provides, that the king shall only hold such lands for a *year and a day*, and then restore them to the lord of the fee; without any mention made of *waste*. But the statute 17 Edw. II. *de prærogativa regis*, seems to suppose, that the king shall have his *year, day*, and *waste*, and not the *year* and *day* instead of *waste*; which sir Edward Coke, and the author of the Mirror, before him, very justly look upon as an encroachment, though a very ancient one, of the royal prerogative.

This *year, day*, and *waste*, are now usually compounded for; but otherwise they regularly belong to the crown: and, after their expiration, the land would naturally have descended to the heir, (as in gavel-kind tenure it still does) did not its feodal quality intercept such descent, and give it by way of escheat to the lord. Black. Com. book iv. p. 379.

YEAR-*books*, in *Law*. See REPORTS.

Estate for YEARS, in *Law*, is a contract for the possession of lands or tenements, for some determinate period: and it happens when a man letteth them to another for the term of a certain number of *years*, agreed upon between the lessor and the lessee, and the lessee enters thereon.

If the lease be but for half a *year*, or a quarter, or any less time, this lessee is reputed as a lessee or tenant for *years*, and is so styled in some legal proceedings: a *year* being the shortest term which the law in this case takes notice of. An estate of this kind, even for a thousand *years*, is only a chattel, and reckoned part of the personal estate; and, therefore, a lease for *years* may be made to commence *in futuro*, though a lease for life cannot.

With regard to emblements, or profits of land sowed by tenant for *years*, there is this difference between him and tenant for life: that where the term of tenant for *years* depends upon a certainty, as if he holds from Midsummer for ten *years*, and in the last year sows a crop of corn, and if it is not ripe and cut before Midsummer, the end of his term, the landlord shall have it; for the tenant knew the expiration of his term, and therefore it was his own folly to sow what he never could reap the profits of. But where the lease for *years* depends upon an uncertainty; as, upon the death of the lessor, being himself only tenant for life, or being a husband seised in right of his wife; or if the term of *years* be determinable upon a life or lives: in all these cases, the *estate for years* not being certainly to expire at a time foreknown, but merely by the act of God, the tenant or his executors shall have the emblements in the same manner as a tenant for life or his executors shall be intitled thereto. But not so, if it determine by the act of the party himself; as if tenant for *years* does any thing that amounts to a forfeiture; in which case the emblements shall go to the lessor, and not to the lessee, who hath determined his estate by his own default. Blackst. Com. vol. ii. p. 140, &c.

YEARN, in *Hunting*, signifies to bark, as beagles properly do, at their prey.

YEARNING. See EARNING.

YEAST, YEST, or BARM, the foam or flower of beer, or other liquor in FERMENTATION.

The *yeast* of beer is used for a leaven or ferment in the making of bread: as serving to swell or puff it up very considerably in a little time, and to make it much lighter, softer, and more delicate. But when there is too much of it, it renders the bread bitter.

The use of *yeast* in bread is but of late standing among us; it is not above a century since the avarice of the bakers first introduced it; and then it was only done by stealth. Though Pliny witnesses it to have been used by the ancient Gauls.

The faculty of medicine of Paris, by a decree of the 24th of March, 1688, solemnly maintained it noxious to the health of the people; yet even that censure could not prevent its progress.

Common ale-*yeast* may be kept fresh and fit for use several months, by the following method: put a quantity of it into a close canvas bag, and gently squeeze out the moisture in a screw-press, till the remaining matter be as firm and stiff as clay.

In this state it may be close packed up in a tight cask, for securing it from the air; and will keep fresh, sound, and fit for use for a long time.

This is a secret that might be of great use to the brewers and distillers here, who, though they employ very large quantities of *yeast*, seem to know no method of preserving it, or raising nurseries of it; for want of which they sustain a very considerable loss; whereas the brewers in Flanders make a very great advantage of supplying the malt-distillers of Holland with *yeast*, which is rendered lasting, and fit for carriage, by this easy expedient. Shaw's Lectures, p. 195.

Mr. Henry has repeatedly prepared an *artificial yeast*, by impregnating flour and water with fixed air, with which he has made very good bread, without the assistance of any other ferment: and he proposes this method of procuring fresh fermented bread at sea.

The process is as follows: boil flour and water together to the consistence of treacle; when the mixture is become cold, fill a small cask with it. This cask is to be filled up in the manner represented in *Tab*. III. *Pneumatics, fig*. 56. and described under PYRMONT water, for the impregnation of water with fixed air; and the process is to be conducted in a similar way, except that the cask is to be agitated, as often as the mixture rises to about two-thirds of the capacity of the funnel *k*; and after each agitation, which should continue during several minutes, the unabsorbed air is to be let out, by withdrawing the plug from the orifice *m*, till that part of the mixture which remained in the funnel has returned into the cask. The orifice at *i* should also be larger than is necessary in the other operation, on account of the superior viscidity of the mixture. When, after repeated agitation, the mixture, which has ascended into the funnel, does not subside into the cask, it may be supposed incapable of absorbing more air.

Pour the mixture, thus saturated, into one or more large bottles, or narrow-mouthed jars; cover it over loosely with paper, and upon that lay a slate or board with a weight to keep it steady. Place the vessel in a situation, where the thermometer will stand from 70 to 80°, and stir up the mixture two or three times in twenty-four hours. In about two days, such a degree of fermentation will have taken place, as to give the mixture the appearance of *yeast*.

With the *yeast* in this state, and before it has acquired a thoroughly vinous smell, mix the quantity of flour intended for bread, in the proportion of six pounds of flour to a quart of the *yeast*, and a sufficient portion of warm water. Knead them well together in a proper vessel, and covering it with a cloth, let the dough stand for twelve hours, or till it appears to be sufficiently fermented, in the forementioned degree of warmth. It is then to be formed into loaves and baked.

Mr. Henry adds, that perhaps the *yeast* would be more perfect, if a decoction of malt were used instead of simple water.

When the operation is finished, the cask, in order to prevent its contracting a disagreeable taint, should be well washed. Henry's Account of a Method of preserving Water at Sea, &c. p. 26. 1781.

YELION, a word used by some of the barbarous writers to express glass.

YELLOW, a bright COLOUR, reflecting the most light of any after white.

The word is formed from the Italian *giallo*, or the German *geel*, which signifies the same; or from the Latin *galbanus, bright, gay*.

There are divers *yellow* substances that become white, upon wetting and drying them again several times in the sun: such as wax, linen-cloth, &c. See BLEACHING. And the same bodies, if they be already white, and continue a long time in the air without being wetted, turn *yellow*.

Paper and ivory, applied near the fire, become successively *yellow*, red, and black. Silk, when turned *yellow*, is whitened again with the fumes of sulphur.

YELLOW, in *Dying*, is one of the five simple and mother colours.

For the finest *yellows*, they first boil the cloth, or stuff, in alum and pot-ashes, or tartar; and then give the colour with the weld, or wold.

Turmeric likewise gives a good *yellow*, though not the best. Woollen cloth, impregnated with a solution of alum and tartar, acquires on being boiled with the watery decoction, an elegant, but not very durable orange *yellow* or gold-coloured dye. It is rarely made use of by the dyers on account of its price and the perishableness of its colour.

There is also an Indian wood that gives a *yellow* colour bordering on gold. This wood, called FUSTICK, is a species of mulberry-tree, of a deep sulphur-*yellow* colour, which it readily gives out both to water and spirit. The watery decoction dyes prepared woollen of a very durable orange *yellow*: the colour is imbibed by the cloth in a moderate warmth, without boiling.

The *fustet* or *fustel* of the French is a *yellow* wood or root, very different from our fustick: it gives a fine orange dye to woollen, but the colour is extremely perishable in the air. This is called *cotinus coriaria* or *Venice* SUMACH.

The leaves of many kinds of herbs and trees give a *yellow* dye to wool or woollen cloth that has been previously boiled with a solution of alum and tartar. WELD in particular affords a fine *yellow*, and is commonly made use of for this purpose by the dyers. There is, indeed, no colour for which we have such plenty of materials as for *yellow*.

Mr. Hellot observes, in his Art de Teindre, that all leaves, barks, and roots, which on being chewed, discover a slight astringency, as the leaves of the almond, peach, and pear-trees, ash-bark (especially that taken off after the first rising of the sap in spring), the roots of wild patience, &c. (see LEAF) yield durable *yellows*, more or less beautiful, according to the length of time that the boiling is continued, and the proportions of alum and tartar in the preparatory liquor: that a large quantity of alum makes these *yellows* approach to the elegant *yellow* of weld: that if the tartar is made to prevail, it inclines them to an orange: and that if the roots, barks, or leaves, be too long boiled, the *yellow* proves tarnished, and acquires shades of brown. Neumann's Chemical Works, by Lewis, p. 384. 434. See WELD.

The Chinese are famous for their *yellows* in dying, which never change with washing. They make this dye of the flowers of the acacia, in a manner in which we might use several of our productions to great advantage.

It is thus: they gather the flowers before they are perfectly ripe, and dry them in an earthen vessel over a gentle heat, till they crisp up in the manner of tea-leaves; they then add to them the ripe seeds of the same tree in different proportions; and then boiling them in river water with alum, they give the *yellow* in any degree that they please.

They have three kinds of *yellow*, which they distinguish by the names of *Ngo-hoang*, *king-hoang*, and *hoang* alone.

The first of these is the brighest *yellow*; to dye five or six ells of silk of this colour, they use a pound of the flowers of the acacia, about two ounces of the seeds, and four ounces of alum.

The *king-hoang* is somewhat deeper *yellow*; to dye this, they use the same ingredients in the same proportion as in the former case; and when the silk is dry from the dipping in this, they give it a second dipping in a slight tincture of Brasil wood: this brings it to the fine strong *yellow* we see.

The *hoang*, or pale *yellow*, is made of the same ingredients as the first, only instead of four ounces of alum they put in but three ounces: river-water is found to be greatly preferable to any other, for the extracting of these colours; but even in that there is great difference, some doing the business much better than others.

The Chinese are so expert in judging on this occasion, that they can tell by the taste of water whether it will or will not do; and if it taste faint they know it is faulty; but they dip the pieces twice into it instead of once, and then the colour succeeds well.

The flowers of the acacia, when they have been prepared by roasting in this manner, may be kept all the year round, and employed in dying as occasion requires, only there is to be longer boiling for the dried flowers than the fresh ones; and it is always found that the fresh flowers give the brightest colour. Obs. sur les Contum. de l'Asie, p. 254.

Greens are usually made of *yellow* and blue mixed. With *yellow*, madder red, and goat's-hair prepared with madder, are made the golden *yellow*, Aurora, pansy, nacarate, Isabella, and chamois colour; which are all casts or shades of *yellow*.

Mr. Peter Woulfe has given the following receipt for making the *yellow* dye: take half an ounce of powdered indigo, and mix it in a high glass vessel, with two ounces of strong spirit of nitre, which should be previously diluted with eight ounces of water, for preventing the indigo's being set on fire by the spirit; because two ounces and a half of strong spirit of nitre will set fire to half an ounce of indigo: let the mixture stand for a week, and then digest it in a sand-heat for an hour or more, and add four ounces more of water to it; filter the solution, which will be of a fine *yellow* colour. If the indigo be digested twenty-four hours after the spirit of nitre is poured upon it, it will froth and boil over; but, after standing about a week, it has not that property.

One part of the solution of indigo in the acid of nitre, mixed with four or five parts of water, will dye silk or cloth of the palest *yellow* colour, or of any shade to the deepest, and that by letting them boil more or less in the colour. The addition of alum is useful, as it makes the colour more lasting: according as the solution boils away, more water must be added. None of the colour in the operation separates from the water, but what adheres to the silk or cloth; and consequently this colour goes far in dying.

Cochineal, Dutch litmus, orchel, cudbear, and many other colouring substances treated in this manner, will all dye silk and wool of a *yellow* colour.

The indigo which remains undissolved in making *Saxon* BLUE, and collected by filtration, if digested with spirit of nitre, dyes silk and wool of all shades of brown, inclining to a *yellow*.

Cloth and silk may be dyed green with indigo; but they must first be boiled in the *yellow* dye, and then in the blue. Phil. Trans. vol. lxi. part i. p. 129, &c. See DYING.

Painters and enamellers make their *yellow* of massicot, or, as some write it, masticot, which is cerus raised to a *yellow* colour by the fire; or with *yellow* oker. Limners and illuminers make it with saffron, and French berries, orcanette, &c.

Mr. Boyle tells us a most beautiful *yellow* may be procured by taking good quick-silver, and three or four times its weight of oil of vitriol, drawing off, in a glass retort, the saline menstruum from the metalline liquor, till there remains a dry snow-white calx at the bottom: on pouring a large quantity of fair water on this, the colour changes to an excellent light *yellow*.

He says he fears this colour is too costly to be used by painters, and he does not know how it would agree with every pigment, especially oil colours. Works abr. vol. ii. p. 91. See VITRIOL.

Branton observes, that it was anciently the custom to paint a man's door *yellow*, and strew his house with salt, to declare him a traitor to his king.

YELLOW, or *French berries*. See AVIGNON, and LYCIUM.

YELLOW *fever*. See *Burning Bilious* FEVER.

YELLOW-*hammer*, in *Ornithology*, the name of a very common English bird, called by authors *emberiza lutea*; and by Linnæus EMBERIZA *citrinella*; and by some *hortulanus*; by others *luteus*; and by others *chloreus*.

The bill is of a dusky hue; the crown of the head is of a pleasant pale yellow; in some almost plain, in others spotted with brown; the hind part of the neck is tinged with green; the chin and throat are *yellow*; the breast is marked with an orange-red; the belly *yellow*; the lesser coverts of the wings are green; the others dusky, edged with rust colour; the back of the same colours; the rump of a rusty red; the quill-feathers dusky, edged on their exterior sides with yellowish green; the tail is a little forked; the middle feathers are brown; the two middlemost edged on both sides with green, the others on their exterior sides only; the interior sides of the two outmost feathers are marked obliquely near their ends with white.

This species makes a large flat nest on the ground, near a bush or hedge, of moss, dried roots, and horse-hair: it lays six eggs, of a white colour, with dark purple veins; and in winter frequents our farm-yards with other small birds. Pennant.

There is beside this another kind, which is much smaller and of a browner colour on the back; this is called by some authors ZIVOLO.

YELLOW *jaundice*, in *Medicine*. See JAUNDICE.

YELLOW, *king's*, is a pure ORPIMENT, or arsenic coloured with sulphur, used for painting in oil and varnish; of an extreme bright colour, and when good a true *yellow*: when used alone, it will stand well; but mixed with white lead, and

and several other pigments, its colour flies or changes. It is sometimes mixed with blue pigments to form a green colour. This pigment may be prepared by mixing sulphur and arsenic by sublimation: taking of arsenic powdered, and flowers of sulphur, in the proportion of twenty parts of the first to one of the second, and putting them into a sublimer, and subliming them in a sand-heat by means of a furnace particularly adapted to the purpose. When the operation is completed, the *king's yellow* will be found in the upper part of the glass, which must be separated with care from any foul parts adhering to it in the glass, and levigated into an uniform powder. It may be also obtained from common orpiment by subliming it in the same manner. This pigment may be rendered warmer, or more inclined to orange, by increasing the proportion of the sulphur; and *vice versâ*. Handmaid to the Arts, vol. i. p. 17.

YELLOW, *Naples*. See GIALLOLINO.

YELLOW *ochre*. See OCHRE.

YELLOW-*berry wash* is a solution of the gum of the French berries in water; and may be prepared by boiling a pound of the berries in a gallon of water with half an ounce of alum, in a pewter vessel, and filtering the fluid; and by evaporating the fluid in the boiler till the colour appears to be of the requisite degree of strength.

This is used as a washing colour in water-painting: it will stand extremely well, and being more diluted or laid on thicker, will, in consequence of its transparency, give a variety of shades.

YELLOW *wash of saffron*. See *Tincture of* SAFFRON.

YELLOW *wash of turmeric*. See TURMERIC.

YELLOWS, a disease in a horse, much the same with that called *jaundice* in man.

There are two kinds of it, the *yellow*, and the *black*.

The *yellows* is a very frequent disorder, say the farriers, arising from obstructions in the gall-pipe, or the little ducts opening into the same, occasioned by viscid or gritty matters lodged therein, or a fulness or compression of the neighbouring blood-vessels; by means whereof, the matter that should be turned into gall, is taken up by the vein, and carried into the mass of blood; which it tinctures *yellow*: so that the eyes, inside of the lips, and other parts of the mouth capable of shewing the colour, appear *yellow*.

The effect whereof is, that a horse will be dull, heavy, and low-spirited; easily jaded by the least labour or exercise, &c. See JAUNDICE.

YEOMAN, the first or highest degree among the plebeians of England; next in order to the gentry.

The *yeomen* are properly the freeholders, who have land of their own; so called from the Saxon *gemane*, or *gemane*, *common*.

The word *yongman* is used for *yeoman* in the statute 33 Hen. VIII. and in old deeds it is sometimes also written *jeman*, which, in the German, signifies *any-body*.

According to sir Thomas Smith, a *yeoman* is a free-born Englishman, who can lay out of his own free-land in yearly revenue to the sum of forty shillings sterling.

The *yeomanry* of England are capable of holding lands of their own to a good value; are adjudged capable of certain offices, as constables, church-wardens, jury-men; and are also to vote in elections to parliament, and to serve in the army, and do any other act, where the law requires one that is *probus et legalis homo*.

The *yeomen* were famous, in ancient times, for military valour, being particularly expert at the management of the bow; whence the infantry was composed chiefly of them.

In many cases, the law conceives a better opinion of the *yeomanry* that occupy lands, than of tradesmen, artificers, &c.

By a statute, 2 Hen. IV. it is enacted, that no *yeoman* shall take or wear a livery of any lord, upon pain of imprisonment, and a fine at the king's pleasure.

YEOMAN is also a title of office in the king's houshold, of a middle place or rank between a gentleman and a groom. Such are the *yeoman* of the buttery; *yeoman* of the scullery; *yeoman* of the wine-cellar, ewry, wood-yard, &c. There are also the *yeoman* of the mouth, *yeoman* of the kitchen, *yeomen*-porters, &c.

YEOMAN, in *Sea-Language*, an officer under the boatswain or gunner of a ship of war, usually charged with the stowage, account, and distribution of their respective stores.

YEOMEN *warders*. See WARDERS *of the Tower*.

YEOMEN *of the guard*, properly called *yeomen of the guard of the king's body*, were anciently two hundred and fifty men, of the best rank under gentry, and of larger stature than ordinary; every one being required to be six feet high.

At present there are but one hundred *yeomen* in constant duty, at 39*l.* 11*s.* 3*d.* per annum each; eight of whom are called ushers, who have 10*l.* per annum each more than the other *yeomen*; and seventy more not on duty; and as one of the hundred dies, his place is supplied out of the seventy.

The officers are a captain, who has 1000*l.* per annum, a lieutenant at 500*l.* per annum, an ensign at 300*l.* and four exons at 150*l.* per annum each; a secretary, and clerk of the checque at 150*l.* per annum.

Their origin is traced to the year 1485, when king Henry VII. ascending the throne, immediately after his coronation, instituted a guard of fifty archers, to attend him and his successors. They were probably then, as they are now, called the *yeomen of the guard*.

It is observed, that this is the first instance of any established or permanent military guard in England: its kings, till that time, except in times of war and insurrection, contenting themselves with the guard of their proper domestics and retinue. And. Hist. Com. vol. i. p. 302.

They go clad after the manner of king Henry the Eighth's times. They formerly had diet as well as wages, when in waiting; but this was taken off in the reign of queen Anne.

Their attendance is on the sovereign's person, both at home and abroad; and they have a room allotted for them only, called the *guard-chamber*.

The officers and *yeomen* are at the disposal of the captain; but the captain is at the appointment of the king.

YEOMAN *of the salt stores*. See ACATERY.

YERKING, in the *Manege*, is when a horse strikes with his hind legs, or flings and kicks back with the whole hind quarters; stretching out the two legs nearly together, and even to their full extent. See EPARER.

YERVA-*mora*, in *Botany*. See BOSEA.

YEST. See YEAST.

YETTUS, in *Natural History*, a name given by the writers of the middle ages, to a species of marble of a deep red; which was used by some as a touch-stone.

YEVA *charrum*, in *Natural History*, a name given by the people of the East Indies to a kind of litharge; which is very common in that part of the world, and is said to be made partly from lead and partly from zinc.

It is less heavy than our yellow litharge, and of a paler colour. It is used as a caustic in all the occasions of surgery there.

YEW, *taxus*, in *Botany*, a genus of the *dioecia monadelphia* class. Its characters are these: the male flowers are for the most part produced on separate trees from those with the fruit; they have neither empalement nor petals, but the germ is like a four-leaved cover; they have a great number of stamina, which are joined at the bottom in a column longer than the gem, terminated by depressed summits, having obtuse borders, and eight points opening on each side their base, and casting their farina. The female flowers are like the male, having no empalement nor petals, but having an oval acute-pointed germen, but no style, crowned by an obtuse stigma; the germen becomes a berry lengthened from the receptacle, globular at the top, covered by a proper coat at bottom, open at the top, full of juice, of a red colour, including one oblong oval seed, whose top without the berry is prominent. Linnæus enumerates two species.

We have but one species, which grows naturally in England; and is of great use in gardens to form hedges for the shelter of exotic plants. They are but of slow growth, yet in time arrive to a great size. The timber is greatly esteemed for many uses.

They may be easily propagated by sowing their berries in autumn, as soon as they are ripe, upon a shady bed of undunged soil, covering them about the thickness of half an inch with the same earth. In the spring the bed must be cleared from weeds, and in a dry season refreshed with water. The plants, when they come up, should also be kept always clear from weeds. After remaining in this bed for two years, they should be removed in October into a spot of fresh undunged soil, and planted in beds about four or five feet wide, in rows about a foot asunder, and six inches from each other; laying mulch upon the surface of the ground about their roots, and watering them in dry weather till they have taken root. From these beds, where they may remain two or three years, they should be removed in autumn into a nursery, and placed in rows at the distance of three feet, and at the distance of eighteen inches from one another: when they have continued three or four years in the nursery, they may be transplanted into the ground where they are to remain; removing them in autumn into very dry ground, and in spring into cold moist land. Miller.

YEW is derived from the Greek ἰατω, *to hurt*; and probably because before the invention of guns, our anceftors made their bows of this wood; they therefore took care to plant the trees in the church-yards, where they might be often feen and preferved by the people.

YEW is alfo a term ufed by the falt-workers of Lymington, and fome other parts of England, to exprefs the firft rifing of a fcum upon the brine in boiling.

In the places where they ufe this term, they add no clarifying mixtures to the brine, for it ferments in the cifterns, and all its foulnefs finks to the bottom in form of a thin mud; they admit only the clear liquor into the pan; and boil this brifkly till it *yews*, that is, till a thin fkin of falt appears upon its furface; they then damp the fire, and carefully fkim off this film, and clear only the fcratch or calcareous earth, which feparates to the bottom.

They do not collect this into fcratch-pans, as at many of the other works, but they rake it up to one fide of the pan, and take it out; they there add a piece of butter, and continue the fire moderately ftrong till the falt is granulated. They keep a brifker fire on this occafion at Lymington than in moft of the other works; fo that they will work three pans in twenty-four hours. See SALT.

YEZDEGERDIC *year*. See *Perfian* YEAR.

YGROMETER. See HYGROMETER.

YIELD, or *Slack the* HAND, in the *Manege*. See SLACK.

YIELDING *and paying*, a law-phrafe, formed by corruption from the Saxon *geldan*, or *gildan*, *to pay*. Hence, in Domefday, *gildare* is frequently ufed for *folvere*, *reddere*; the Saxon *g* being eafily converted into a *y*. See GELD, and GILD.

YIN, a word ufed by fome of the chemical writers to exprefs verdigrife.

YNCA, YNCAN, or INCA, an appellation anciently given to the kings of Peru, and the princes of their blood; the word fignifying literally, *lord*, *king*, *emperor*, and *royal blood*.

The king himfelf was particularly called *capac ynca*, i. e. great lord. His wife, *pallas*, and the princes fimply *yncas*. Thefe *yncas*, before the arrival of the Spaniards, were exceeding powerful. Their people revered them to excefs, as believing them to be fons of the fun, and never to have committed any fault. If any perfon offended the royal majefty in the fmalleft matter, the city he belonged to was totally demolifhed.

When they travelled, whatever chamber they lay in on the road, was walled up as foon as they departed, that nobody might ever enter in after them. The like was done to the room wherein the king died; in which, likewife, all the gold, filver, and precious furniture, were always immured, and a new apartment was built for his fucceffor.

His beloved wives, domeftics, &c. likewife facrificed themfelves, and were buried alive in the fame tomb along with him. See the Hiftory of the Yncas, by Garcilaffo de la Vefia. See INCA.

YOAK, or YOKE, in *Agriculture*, a frame of wood, fitted over the necks of oxen; whereby they are coupled together, and harnaffed to the plough, &c. See PLOUGH.

It confifts of feveral parts, as the *yoke*, properly fo called, which is a thick piece of wood, lying over the neck; the *bow*, which compaffes the neck about; the *ftitchings* and *wreathings*, which hold the bow faft in the *yoke*; and the *yoke-ring* and *ox-chain*.

YOAK, *jugum*, in *Antiquity*. The Romans made the enemies they fubdued pafs under the *yoke*, which they called *fub jugum mittere*; that is, they made them pafs under a fort of *furcæ patibulares*, or *gallows*, confifting of a pike, or other weapon, laid acrofs two others planted upright in the ground. This done, they treated them with humanity enough, and fent them home again. See FURCA.

The fame meafure was fometimes dealt them by their enemies upon the fame occafion. Thus Cæfar, lib. ii. obferves, that the conful L. Caffius had been killed by the Swifs, and his army defeated, and made to pafs under the *yoke*.

YOAK *of land*, *jugata terræ*, in our *Ancient Cuftoms*, was the fpace which a *yoke* of oxen, that is, two oxen, may plough in one day. See HIDE, YARD-*Land*, &c.

YOCKLET. See JOCKLET.

YOKE, in *Sea-Language*, a name formerly given to the tiller, when communicating with two blocks or fheaves affixed to the inner end of the tiller. It is now applied to a fmall board or bar which croffes the upper end of a boat's rudder at right angles, and having two fmall cords extending from its oppofite extremities to the ftern-fheets of the boat, whereby fhe is fteered as with a tiller. Falconer.

YOIDES, in *Anatomy*. See HYOIDES.

YOLK, or YELK, in *Natural Hiftory*, the yellow part in the middle of an egg.

The chicken is formed out of, and nourifhed by, the white alone, till it be grown to fome bulk: after which, the *yolk* ferves it for nourifhment; which it likewife does, in part, after it is hatched. For a good part of the *yolk* remains after exclufion; being received into the chicken's belly: and being there referved, as in a ftorehoufe, is by the ductus inteftinalis, as by a funnel, conveyed into the guts, and ferves inftead of milk. Willughby's Ornithol. lib. i. cap. 3.

This was even known to Pliny: *Ipfum animal ex albo liquore ovi corporatur: cibus ejus in luteo eft.* lib. x. cap. 53.

YORK, *cuftom of*. See RATIONABILI *parte bonorum*.

YOUNG. See GENERATION, CONCEPTION, GESTATION, EMBRYO, FOETUS, DELIVERY, CHILD, &c.

In the army, that regiment, or officer, is faid to be the *younger*, *junior*, which was laft raifed, or whofe commiffion is of lateft date, whatever be the age of the man, or however long he may have ferved in other capacities.

YOUNKERS, among *Sailors*, are the *younger* failors, otherwife called *foremaft-men*; whofe bufinefs is to take in the top-fails, furl the fails, fling the yards, &c.

YOUTH, *adolefcence*. See AGE, and ADOLESCENCE.

The renovation of *youth* has been much fought after by chemical adepts; and many of them pretended to various fecrets for this purpofe: but unluckily the death of the pretenders proved a fufficient refutation of their doctrine. Paracelfus talks of the mighty things he could do with his *ens primum*; and even Mr. Boyle tells us fome ftrange things about the ENS *primum* of balm. Boyle's Works abr. vol. i. p. 75. But Mr. Boyle gives thefe wonderful ftories on the credit of a French chemift, and not on his own.

YOUTH, *Juventus*, or JUVENTAS, in the *Pagan Theology*, a goddefs worfhipped among the Romans, who, together with the gods Mars and Terminus, kept her place in the Capitol along with Jupiter, when the other deities were turned out: whence the Romans drew a lucky omen for the durablenefs of their empire. Mem. Acad. Infcrip. vol. i. p. 71. feq.

This ftate of life was, by the ancients, compared to autumn. In which fenfe, Horace fpeaking of one approaching to puberty, fays,

Jam tibi lividos
Diftinguet autumnus racemos,
Purpureo varius colore.

The moderns, on the contrary, when they fpeak of one in the autumn of his age, mean one that is upon the decline; and chufe rather to ufe the comparifon of the fpring, to denote *youth*.

YPSILOIDES, ὑψιλοειδὴς, in *Anatomy*, the third genuine future of the cranium; thus called from its refembling a Greek *y*, or upfilon.

Some alfo call it λαμβδοειδὴς, *lambdoides*.

There is alfo a bone at the root of the tongue, called *ypfiloides*, and HYOIDES.

YQUETAYA, in *Natural Hiftory*, a plant growing in Brafil, long ufed as a medicine in that country; and lately difcovered to the Europeans by a French furgeon.

It has been fince found in France; where being cultivated and examined by Marchant, it appears to be no other than the common water-betony, or fcrophularia aquatica.

It has this remarkable property, that it takes away from fena all its ill tafte and fmell; which property of correcting the infufion of fena was before wholly unknown.

To ufe this plant, it muft be dried ten or twelve days in the fhade, and afterwards expofed to the fun, till quite dry.

YS, in *Ichthyology*, a name given by Athenæus and fome other of the Greek writers, to the fifh called *mus* and *fus* by others. It is the caprifcus of later writers. See GOAT-*Fifh*.

YSAMBRA, a word ufed by fome as a name for hellebore, and by others to exprefs a fpecies of poifon prepared in Spain, of which hellebore is an ingredient.

YSARD, in *Zoology*, a name given to the CHAMOIS.

YSOPUS, a term ufed by fome to exprefs the chemical art of feparation.

YSPAR, a name by which fome of the chemical writers call iron.

YTZAIMPATLI, in the *Materia Medica*, a name given by fome to the cevadilla, or *hordeum caufticum*, the *cauftic Indian barley*.

YUCCA, *Indian*, or *Adam's needle*, *yucca*, in *Botany*, a genus of the *hexandria monogynia* claſs. Its characters are theſe: the flower has no empalement; it has a bell-ſhaped flower compoſed of ſix large petals, whoſe tails are joined, and ſix ſhort reflexed ſtamina terminated by ſmall ſummits, and an oblong three-cornered germen, longer than the ſtamina, having no ſtyle, crowned by an obtuſe ſtigma with three furrows; the germen afterwards turns to an oblong three-cornered capſule divided into three cells, filled with compreſſed ſeeds lying over each other in a double arrangement. There are four ſpecies.

YXIR, a word uſed by ſome of the old chemiſts, to expreſs any thing good in medicine.

YZQUAUHTLI, in *Ornithology*, the Indian name for a bird deſcribed by Nieremberg, and called the *creſted* EAGLE.

YZQUIEPATL, in *Zoology*, the name of an American animal of the weeſel-kind, with a ſhort ſlender noſe; ſhort ears and legs; black body, full of hair; long tail, of a black and white colour; its length from noſe to tail is about eighteen inches. It inhabits Mexico, and perhaps other parts of America. It lives in the caves and in the hollows of rocks, where it breeds, and brings up its offspring. It feeds on worms, beetles, and other inſects, and ſmall animals: when purſued, it breaks wind backward with an inſupportable ſtench. See CONEPATL.

Profeſſor Kalm was one night in danger of being ſuffocated by one that was purſued into a houſe where he ſlept; and it affected the cattle ſo, that they bellowed through pain.

Another, which was killed by a maid-ſervant in a cellar, ſo affected her with its ſtench, that ſhe lay ill for ſeveral days; and all the proviſions in the place were tainted to ſuch a degree, that the owner was obliged to throw them away.

Nevertheleſs, the fleſh is reckoned good meat, and not unlike that of a pig: but it muſt be ſkinned as ſoon as killed, and the bladder taken carefully out. Pennant.

Z.

Z, The laſt letter in the alphabet, and one of the double conſonants, both among the Latins and Greeks.

Its pronunciation is much more ſoft and obtuſe than that of the *x*; which makes Quintilian call it *jucundiſſima*, and *dulciſſima*. Nevertheleſs, the ſound was not always the ſame as it is now; which is but, as it were, half that of an *s*: or that, expreſſed by its name *izzard* or *s hard*, of an *s* uttered with cloſer compreſſion of the palate by the tongue, as *freeze*, *froze*.

It had ſomething originally in it of the d; but only what ſounded very ſmoothly: thus, *Mezentius* was pronounced as if it had been *Medſentius*, &c.

The Z had alſo an affinity with the g: thus Capella; z *à Græcis venit, licet etiam ipſi primo* g *Græca utebantur.*

Z begins no word originally Engliſh; although it is found in the Saxon alphabets, ſet down by grammarians, it is read in no word originally Teutonic. Johnſon.

Z was alſo a numeral letter, ſignifying two thouſand; according to the verſe:

Ultima Z tenens, finem bis mille tenebit.

When a daſh was added at the top Z̄, it ſignified two thouſand times a thouſand.

This letter formerly ſtood as a mark for ſeveral ſorts of weights. Sometimes it ſignified an ounce and half, and very frequently it ſtood for half an ounce: ſometimes for the eighth part of an ounce, that is, a dram Troy-weight; and it has in earlier times been uſed to expreſs the third part of an ounce, or eight ſcruples.

On French coins Z denotes thoſe ſtruck at Grenoble.

ZZ; theſe letters were uſed by ſome of the ancient phyſicians, to expreſs myrrh. At preſent they are often uſed to ſignify *zinziber*, or *ginger*.

ZAARA, a word uſed by the Arabian phyſicians, to expreſs the *vigilia morboſa*, or continual watchings of perſons in many illneſſes.

ZACINTHA, in *Botany*, a ſpecies of *lapſana*. See Nipple-*wort*.

This is what has uſually been called by authors *chicorium verrucoſum*, the wart gum-ſuccory.

ZACYNTHUS, an epithet uſed by the ancients to a liquid bitumen, from the iſland Zant.

ZADURA, in the *Materia Medica* of the ancients, a name given to a foreign root, which was round and ſmooth, and of the colour of ginger.

It was at that time imported from the Indies, and greatly eſteemed in peſtilential caſes.

ZAFFABEN, a word uſed by ſome of the chemical writers, to expreſs putty.

ZAFFER, Zaffre, or Saffre, in *Chemiſtry*, is the reſiduum of cobalt, after the ſulphur, arſenic, and other volatile matters of this mineral have been expelled by calcination: ſo that it is a kind of calx of cobalt, of a grey or reddiſh colour. It is uſed to produce a very fine blue colour, when it is melted with fuſible and vitrifiable matters.

The blue colour produced by the vitrification of *zaffer* proceeds from the earth or calx of a ſemi-metallic ſubſtance contained in cobalt, called by chemiſts *regulus of cobalt*. This is proved by melting *zaffer* with a reducing flux, like any other roaſted ore, by which means the regulus will be obtained. The ſcoria in this fuſion has alſo a blue colour, proceeding from a portion of the calx of the regulus that is not reduced, but is vitrified together with the ſcoria. The calx, therefore, or metallic earth of the regulus of cobalt, is the ſole cauſe of the blue colour produced by *zaffer*.

But as this is contained in cobalt in various quantities, ſome *zaffers* produce more blue than others. The heterogeneous, fixed matters contained in cobalts contribute, according to their quantity, not only to the greater or leſs intenſity of the blue colour, but alſo to its luſtre and beauty: and, therefore, thoſe who manufacture *zaffer* from cobalt make frequent eſſays of the roaſted ore, by mixing it with vitreous matters, in order to diſcover the intenſity and beauty of the blue colour.

Good cobalt calcined would form too deep a blue, and almoſt a black glaſs, if it were not previouſly mixed with a certain quantity of vitreous fritt. In the manufacture of *zaffer*, therefore, the calx of cobalt, the ſtrength of which has been determined by previous eſſays, is mixed with ſuch a quantity of ſand, or of powdered flints and quartz, that with the addition of ſome ſaline flux, a deep blue glaſs may be formed. See Cobalt.

The *zaffer* that is commonly ſold, and which comes from Saxony, is a mixture of calx of cobalt with ſome vitrifiable earth: it is of a grey colour, and ſome *zaffers* are clearer than others, according to the intenſity of the colour, which they are capable of producing.

Zaffer is employed in the manufacture of pottery and of porcelain, for painting the ſurface of the pieces of ware, upon which it is applied, together with ſome ſaline flux, previouſly to the baking or glazing, that the ſame fire may vitrify this colouring material.

The blue of *zaffer* is the moſt ſolid and fixed of all the colours that can be employed in vitrification; it ſuffers no change from the moſt violent fire. It is ſucceſsfully employed to give ſhades of blue to enamels, and to the cryſtal glaſſes made in imitation of ſome opake and tranſparent precious ſtones, as the lapis lazuli, the turquois, the ſapphire, and others of this kind. Chem. Dict.

To prepare *zaffer* for uſe in the glaſs-trade, put it in groſs pieces into earthen pans, and let it ſtand half a day in the furnace; then put it into an iron ladle to be heated red-hot in the furnace; take it out while thus hot, and ſprinkle it with ſtrong vinegar; and when cold, grind it on a porphyry to an impalpable powder, then throw this into water in glazed earthen pans; and when it has been well ſtirred about, let it ſettle, and pour off the water: repeat this waſhing often, and the foulneſs of the *zaffer* will be thus wholly ſeparated. Dry the powder, and keep it for uſe.

ZAFFRAMEN, a word uſed by ſome medical writers, to expreſs ſaffron.

ZAFFRAM, a word uſed often in authors to expreſs ſaffron, but ſometimes as the name of other things of a yellow colour; thus ochre was called by this name.

ZAFRANIA, in *Colours*, a term uſed by the Greeks, to expreſs the yellow of ſaffron. The barbarous writers of the after ages, tranſlated it into the Latin *crocietas*, or ſaffron-colour.

The later Greek writers only uſe it, and they have taken it literally from the Arabians, Avicenna and Serapio. This was a term uſed by them to expreſs the colour of the fine bole-armenic of Galen, which they tell us ſtained paper to a fine and beautiful gold-colour.

ZAGI. See Zegi.

ZAGU, in the *Materia Medica*, the name given by ſome authors to the ſago-tree, the *todda pauna*, or, *palma fructu pruniforme.*

ZAHIA, a word uſed by the Arabian phyſicians, to expreſs a ſort of dyſentery, in which there was a very large diſcharge of blood from the rectum, attended with an evident ſenſation of abraſion, or pain in the bowels.

ZAIBAC, one of the many names by which the ancient chemiſts have called mercury.

ZAIDIR, a name by which ſome of the chemical writers, have called verdigriſe, or the ruſt of copper; and others, the metal itſelf; and ſome braſs.

ZAIM, a portion of land allotted for the ſubſiſtence of a horſeman in the Turkiſh militia; called alſo *timar*. See Timariot.

ZAIN, in the *Manege*. A horſe is called in French *zain*, that is of a dark colour, neither grey nor white, and without any white ſpot or mark upon him.

ZAIRAGIA, or Zairagiah, a kind of divination in uſe among the Arabs; performed by means of divers wheels, or circles, placed concentric to one another, and noted with ſeveral letters, which are brought to anſwer

to each other, by moving the circles according to certain rules.

This is alſo called *zaraiah*, becauſe the circles of this machine, which are called *mutazariat*, *laſlak*, &c. are intended to correſpond to the orbs of the planets, and the atmoſpheres of the ſeveral elements.

ZAKEPH-GADHOL, *rex pauperrimus*, one of the Hebrew ACCENTS, ſometimes denoting no kind of pauſe, and marked over a letter thus (ב֕.)

ZAKEPH-*katon rex*, one of the Hebrew accents, conſtituting either a *comma* or ſemicolon, and marked over a letter thus (ב֔).

ZAMECH, a name given by ſome writers to the lapis lazuli.

ZAMIA, in *Botany*, a genus of *palmæ* in Linnæus's Appendix; the characters of which are, that the fructification is obſcure, and the ſtructure of the flowers like that of the *equiſetum*. There is one ſpecies.

ZAMPOGNA, in the *Italian Muſic*, is uſed to denote any inſtrument that ſounds like a flute; and particularly a bagpipe, being an aſſemblage of divers pipes of different ſizes. It is alſo taken for a common flute.

ZANNA, the name of a medicinal earth, deſcribed by Oribaſius; he ſays it is found in Armenia, in that part which borders on Cappadocia; and that it is very drying and of a pale colour, and eaſily diſunited by water, falling into a fine powder like lime.

It is called by the natives *zarina*, and the mountain from which it is taken is near the city Baganona. It is of a drying and aſtringent nature.

ZANNICHELLIA, *triple-headed pond-weed*, in *Botany*, a name given by Micheli, to a genus of plants of the *monoecia monandria* claſs; called by others *algoides*, *aponogeton*, and *gramine folia*. The characters are theſe: it produces diſtinct male and female flowers, which always ſtand very near one another; the male flower has neither cups nor petals, but conſiſts only of one erect ſtamen or filament, which is conſiderably long, and is terminated by an oval anthera: the female has a bellied perianthium, compoſed of one leaf divided into two at the end; there are no petals; the piſtil has corniculated germina, with as many ſimple ſtyles with plain ſtigmata of an oval figure; the ſeeds follow theſe, and are as many in number as there were horns or germina; they are oblong, pointed at each end, and gibbous on one ſide, and are covered with a ſkin or rind. There is one ſpecies.

ZANONIA, in *Botany*, the name of a genus of plants of the *dioecia pentandria* claſs. The characters are theſe: it produces ſeparate male and female flowers; in the male flower the cup is a perianthium, compoſed of three leaves of an oval figure, expanding every way, and ſhorter than the flower; the flower is monopetalous, but divided into five ſegments, and has an open mouth; the ſegments are jagged, and are equal in ſize, and bend backwards; the ſtamina are five filaments of the length of the cup, ſtanding open at their ends, and terminated by ſimple apices; the female flowers grow on ſeparate plants, and have the cup and flower the ſame as in the male, only that the cup ſtands upon the germen of the piſtil; this germen is oblong, and from it are propagated three reflex conic ſtyles; the ſtigmata are bifid and curled; the fruit is a long and very large berry, truncated at the end, and very ſmall at the baſe; it contains three cells, and has a curled ſuture near the apex; the ſeeds are two; they are of an oblong figure, and flat. There is one ſpecies.

ZANTHENES, in *Natural Hiſtory*, a name given by the ancients to a foſſile ſubſtance found in Media. Pliny quotes Democritus for ſaying, that if rubbed in palm-wine and ſaffron, it became ſoft as wax, and yielded a very ſweet ſmell.

ZANTHOXYLUM, in *Botany*. See TOOTH-*ach Tree*.

ZAPATA, or SAPATA, a kind of feaſt, or ceremony, held in Italy, in the courts of certain princes, on S. Nicholas's day, wherein people hide preſents in the ſhoes or ſlippers of thoſe they would do honour to; in ſuch manner, as to ſurpriſe them on the morrow, when they come to dreſs.

The word is originally Spaniſh, *capato*; and ſignifies a ſhoe, or ſlipper.

It is done in imitation of the practice of S. Nicholas; who uſed, in the night-time, to throw purſes of money in at the windows, to marry poor maids withal.

F. Meneſtrier has deſcribed theſe *zapatas*, their origin, and different uſages, in his Treatiſe des Ballets Anciens & Moderns.

ZAPHOR, a name given by ſome writers to ZAFFER.

ZARFA, in *Botany*, a name given by Leo Africanus, and others, to the *lotus*, or nettle-tree.

ZARIFU, a word by which ſome of the chemical writers have expreſſed tin.

ZARNAB, in the *Materia Medica*, a term uſed by Avicenna and Serapio to expreſs the CARPESIA of the ancient Greeks.

ZARNACH, the ſame as the word ZARNICH; the name of the orpiment of the Arabians.

It was not confined however to this ſenſe alone, but was uſed as a name for other things uſed in painting, and particularly for the *lapis armenus*. However, Dioſcorides and Theophraſtus call the *lapis armenus* by the name of *armenion*, and the *zarnach* by that of *arrenecon*, that is orpiment.

ZARNICH, in *Natural Hiſtory*, the name of a genus of foſſils, the characters of which are theſe: they are inflammable ſubſtances, not compoſed of plates or flakes, but of a plain, ſimple, and uniform ſtructure, not flexile nor elaſtic, ſoluble in oil, and burning with a whitiſh flame, and noxious ſmell like garlic.

That theſe foſſils are really ſulphurated arſenics is evident from ſundry experiments. When ſet on fire, the arſenical, as well as the ſulphureous ſmell, is plainly diſtinguiſhable. If triturated with quickſilver, and expoſed to a ſuitable heat, the ſulphur is detained by the mercury, and a pure white arſenic ſublimes. A mixture of fixt alkaline ſalt, with any vegetable or animal ſubſtance, as the compound called by the aſſayers black flux, in like manner keeps down the ſulphur, and at the ſame time revives the arſenic into its reguline or metallic form. Theſe native minerals have been uſed as medicines in the eaſtern countries, and by ſome imprudently recommended in our own. Lewis.

Of this genus there are four known ſpecies; a red one, which is the true SANDARACH; a yellow one found in the mines of Germany, and brought to us under the name of orpiment; a greeniſh one, common alſo in the mines of Germany, and ſold in our colour ſhops under the name of a coarſe orpiment; it is alſo found in the tin-mines of Cornwall; and a whitiſh one, which has the property of turning black ink into a florid red, common in the mines of Germany, but of little value. Hill's Hiſt. Foſſ. p. 406.

ZARUTHAN, in *Surgery*, a word uſed by ſome to expreſs a hard and unequal tumor of the breaſt, attended with a burning heat, and a violent but not continual pain.

This is by ſome referred to the cancer, and accounted a ſpecies of that terrible diſorder: its cauſe is ſuppoſed to be a ſharp ichorous humour in the blood.

ZAUROS, in *Ichthyology*, a name given by the ancient Greeks to that fiſh which we call SAURUS and LACERTUS, and which is called at Rome the *tarantola*.

It is diſtinguiſhed by Artedi by the name of the oſmerus, with eleven rays in the pinna ani; and in the Linnæan ſyſtem it is the SALMO *ſaurus*, with ten rays in the pinna ani.

ZEA, in *Botany*. See MAIZE.

In the writings of the ancient Greeks, this word ſometimes is uſed to expreſs the libanotis. Dioſcorides tells us, that the libanotis was by ſome called *zea*, and by others *cachrys*.

The word *zea*, when taken out of this ambiguity, and aſcertained as the name of a corn alone, is yet not certain and determinate in its ſenſe in the various writers; moſt indeed make it the name of the ſpelta, or ſpelt-corn; and this certainly is keeping up to the ſenſe of Dioſcorides, whoſe *zea* is evidently the ſpelt-corn. He mentions two kinds of it, the monococcous and the dicoccous; that is, ſuch as has only one grain or two in a huſk.

ZEAL, ZELUS, Ζηλος, the exerciſe of a warm animated affection, or paſſion, for any thing.

Some will have jealous *zeal* to be properly a mixt, or compound ſenſation, where one affection is raiſed or inflamed by another. On theſe principles, jealouſy may be defined an affection ariſing from love and indignation, which cannot bear a thing to be given to another, that a perſon deſires for himſelf, or one whom he loves and favours. Others make it conſiſt in an eager ſtudy, or deſire, to keep any thing inviolate; or a fervour of mind, ariſing from an indignation againſt thoſe who abuſe or do evil to a perſon beloved.

The Greek philoſophers make three ſpecies of *zeal*. The firſt, of *envy*; the ſecond, of *emulation*, or imitation; the third, of *piety*, or devotion; which laſt makes what the divines call *religious zeal*.

Joſephus ſpeaks much of a party, or faction, called the *Zealous*, or *Zealots*, which aroſe among the Jews during the war with Veſpaſian and Titus. Lib. xiv. cap. 6. Antiq. and lib. iv. cap. 12. de Bello Judaico.

ZEBET, a word uſed by ſome of the chemical writers to expreſs dung.

ZEBLICIUM *marmor*, in *Natural Hiſtory*, a name given by ſeveral authors to a ſoft green marble variegated with black

black and white; and though the authors who have described it have not observed it, yet it no way differs from the white ophites of the ancients. See OPHITES.

ZEBRA, in *Zoology*, is the EQUUS *zebra* of Linnæus, or horse with a short erect mane; having its head and body striped downward with lines of brown, on a pale buff ground; and the legs and thighs striped crossways; its tail is like that of an ass, furnished with long hairs at the end; and its size is that of a common mule. See *Tab.* V. *Quadrupeds.* N° 66.

This most elegant of quadrupeds inhabits the plains, from Congo and Angola, across Africa, to Abyssinia, and southward as low as the Cape; but on sight of men, disappears on the woods. It is called by the Portuguese *burro di matto*, or wild ass. These animals are gregarious, vicious, untameable, and useless: they are very swift. The *zebra* will couple with an ass.

The animal called the female *zebra*, is striped like the former on the head and body, but with fewer lines; the flanks spotted, and the rump plain; the ground-colour of the head, neck, body, and rump, a bright bay; the belly, thighs, and legs white, and free from all marks. This animal differs from the female of the *zebra*, not only in its marks, but also in being thicker and stronger made, and in being more tractable. The Hottentots also distinguish it from the former by the names of *quacha* and *opeagha*. Ray and Pennant.

ZEBU, in *Zoology*, a name given by M. de Buffon to the BOS *Indicus* of Linnæus. See *Tab. Quadrupeds.* N° 6.

ZECHARIAH, or the *Prophecy of Zechariah*, in *Biblical History*, a canonical book of the Old Testament.

Zechariah was contemporary with Haggai, and prophesied in the second year of Darius Hystaspes. The design of the first part of this prophecy is the same with that of Haggai, viz. to encourage the Jews to go on with rebuilding of the temple, by giving them assurance of God's assistance and protection: from whence the author proceeds to foretel the glory of the Christian church, the true temple of God, under its great high priest and governor Christ Jesus, of whom Zerubbabel and Joshua the high priest were figures. The latter part of the prophecy from chap. ix. probably relates to the state of the Jews under the Maccabees, and then foretels their rejection of the Messiah, and some remarkable incidents that should happen to them in the latter ages of the world.

Mr. Mede and some other learned men think that the 9th, and following chapters of *Zechariah*, are parts of the prophecy of Jeremiah.

ZECHIN, or ZECCHINO. See SEQUIN.

ZEDOARY, ZEDOARIA, a medicinal root, belonging to a plant growing in the East Indies (the *amomum scapo nudo, spica laxa truncata*, of Berg. Mat. Med.) whose leaves are like those of ginger, only longer and broader. The root is brought over in oblong pieces, about the thickness of the little finger, and two or three inches in length; or in roundish ones (the *zerumbeth* of the Paris Pharmacopeia) about an inch in diameter; it is of an ash-colour on the outside, and white within. The difference of these, in strength, if any, is very inconsiderable, and, therefore, the college allows both to be used indiscriminately.

This root has an agreeable smell, and a bitterish aromatic taste. It impregnates water with its smell, a slight bitterness, a considerable warmth and pungency, and a yellowish brown colour; the reddish-yellow spirituous tincture is in taste stronger, and in smell weaker, than the watery. In distillation with water, it yields a thick ponderous essential oil, smelling strongly of the *zedoary*, in taste very hot and pungent: the decoction, thus deprived of the aromatic matter, and concentrated by inspissation, proves weakly and disagreeably bitter and subacrid. A part of its odorous matter rises also in the inspissation of the spirituous tincture; the remaining extract is a very warm, not fiery, moderately bitter aromatic, in flavour more grateful than the *zedoary* in substance.

Zedoary root is a very useful warm stomachic; and has been commended in colics, and hysteric affections, for promoting the menses, &c. It has been employed by some as a succedaneum to gentian root; but from the above analysis it appears to be not entirely similar to that simple bitter; its warm aromatic part being the prevailing principle, in virtue of which its spirituous extract (the most elegant preparation of it), is made an ingredient in the cordial confection of the London Pharmacopeia. Lewis's Mat. Med.

The *zedoary* wash, which is a cooler yellow than saffron, though full as bright, and valuable for many purposes in painting with water-colours, may be prepared by boiling an ounce of the root in a quart of water, till the water is sufficiently tinged to make a stain on paper, of a full yellow colour; and straining the liquor through a linen filtre. This wash may be dried in shells, and will again dissolve and spread kindly with the addition of water.

ZEFR, a word by which some of the chemical authors express pitch.

ZEGI, or ZAGI, a word used by Avicenna and others, to express all the several vitriolic minerals. See CHALCITIS, and COLCOTHAR.

ZEHERECH, a word used by some of the chemical writers to express flowers of brass.

ZEITRABRA, a term used by some of the chemists to express any thing that is fluxile.

ZELEM, in the *Materia Medica of the Ancients*, a name given by Avicenna and others to a fruit common in Africa in their time, and much esteemed by the people of that country, and called there by some *piper nigrorum*, the black people's pepper, or negro-pepper.

Avicenna tells us, that the *zelem* was a fattish seed, of the size of a cich, and of a high flavour, in colour yellow on the outside, and white within, and that it was brought from Barbary.

He adds, that there was another plant, properly called *fulful alsuaden*, that is, PIPER *nigrorum*. This, he says, was a seed contained in pods like kidney-beans, and was black, and of a pungent and acrid taste.

ZELPHI. See ZENDA.

ZEMA, a word used by many of the old writers for a decoction or apozem.

ZEMASARUM, a word used by some of the chemical writers as a name for cinnabar.

ZEMECH, a word used by some writers as a name for *lapis lazuli*.

ZEMIA, Ζημια, among the *Athenians*, is sometimes taken in a large and general sense for any kind of punishment; but more frequently for a pecuniary mulct or fine laid upon the criminal, according to the degree of his offence.

ZEMPHYRUS, in the *Materia Medica of the Ancients*, a name given to a precious stone, the fragments of which they used as a cordial and sudorific.

It appears by their accounts, that this stone was blue; and hence many have too hastily judged, that it was the *lapis lazuli*; but in truth it was the SAPPHIRE.

The word *zemphyrus* is no where used, but in the writings of the later Greeks, and it is plainly formed, as most of their names of things are, on the Arabian word, expressing the same thing. This Arabian word is *semphir*; and this, in Avicenna and Serapio, is always used as the name of a sapphire, never as that of any other gem. We find also by their accounts, that this sapphire was not the sapphire of the ancient Greeks; but the fine blue pellucid gem we now know by that name; for the sapphire of Theophrastus, and the other old writers, was only a kind of *lapis lazuli*.

ZENDA, a general term coined by Paracelsus, by which he and his followers express extraneous or equivocal generation, or the production of bodies without a seminal principle. The word *zerunda* is used to express this particular sort of generation of men, and *zelphi* in regard to other animals.

ZENDAVESTA, by contraction ZEND, and, as it is vulgularly pronounced *Zundavestow* and *Zund*, in *Antiquity*, denotes the book, ascribed to Zoroaster, and containing his pretended revelations; and which the ancient MAGIANS and modern PERSEES, called also GAURS, observe and reverence in the same manner, as the Christians do the Bible, and the Mahometans the Koran, making it the sole rule both of their faith and manners.

The word, it is said, originally signifies any instrument for kindling fire, and is applied to this book to denote its aptitude for kindling the flame of religion in the hearts of those who read it.

It has been much disputed, among learned writers, and still remains undetermined, who Zoroaster was, and in what age he lived. The learned Dr. Hyde, and after him Dr. Prideaux and several others, are of opinion, that Zoroaster was the same with the Zerdusht of the Persians, who was a great patriarch of the Magians, and that he lived between the beginning of the reign of Cyrus, and the latter end of that of Darius Hystaspis. See MAGI.

Dr. Warburton (Legation, vol. ii. part i. p. 8.) censures Hyde and Prideaux for making an early Bactrian lawgiver to be a late Persian false prophet, and says this whole story of him is mere fable, contradicting all learned antiquity, and supported only by the romantic relations of later Persian writers under the caliphs.

Dr. Baumgarten likewise (Anc. Un. Hist. Suppl. vol. ii. p. 365, &c.) represents it as doubtful, whether the Persian Zoroaster ever existed, calls in question the credibility of the oriental writers who give his history, and makes the whole to be a forgery in later times by the fire-worshippers of Persia.

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The learned Mr. Bryant (Anal. Anc. Mythol. vol. ii. p. 107.) obſerves, that there are more perſons than one ſpoken of under the character of Zoroaſter; though there was one principal, to whom it more truly related. Of men, ſtyled Zoroaſter, he ſays, the firſt was a deified perſonage, reverenced by ſome of his poſterity, whoſe worſhip was called Magia, and the profeſſors of it Magi. This worſhip was tranſmitted from the ancient Babylonians and Chaldeans to the Perſians, who, ſucceeding to the ſovereignty of Aſia, renewed under their princes, and particularly under Darius the ſon of Hyſtaſpes, thoſe rites which had been in a great degree effaced and forgotten. The Perſians, ſays this learned writer, originally derived their name from the deity Perez, or Parez, the ſun; whom they alſo worſhipped under the title of Zor-Aſter. Upon occaſion of the diſtreſs to which they were reduced upon the death of their laſt king Yeſdegerd, they retired into Gedroſia and India, where people of the ſame family had for ages reſided, and carried with them ſome ſhattered memorials of their religion in writing, whence the Sadder, Shaſter, Vedam, and *Zendaveſta*, were compiled: and upon theſe the religion of the Brahmins and Perſees is founded. The perſon who is ſuppoſed to have firſt formed a code of inſtitutes for this people is ſaid to have been one of the magi, named Zerduſht; the ſame, as Hyde and others ſuppoſe, both in character and name with Zoroaſter: but Mr. Bryant diſcovers no reſemblance between them. There were, indeed, many perſons of this name in different parts of the world, who were magi or prieſts, and denominated from the rites of Zoroaſter, which they followed. We read of an Aſſyrian, Medo-Perſian, Proconneſian, Bactrian, Pamphylian, Chineſe, &c. Zoroaſter, ſuppoſed by Dr. Hyde to have been one and the ſame. But Mr. Bryant thinks that their reſpective hiſtories furniſh evidence ſufficient of their being different perſons; and beſides there ſeems to have been one perſon more ancient and celebrated than the reſt. As for the Zoroaſter or Zerduſht of Hyde, he lived in the reign of Darius, the father of Xerxes, about the time of the battle of Marathon, and conſequently not a century before the birth of Eudoxus, Xenophon, and Plato. This Zerduſht, who was the renewer of the Sabian rites, could not be the perſon ſo much celebrated by the ancients, and referred to the firſt ages. Xanthus Lydius makes him above ſix hundred years prior to the reign of Darius. Suidas places him five hundred years before the war of Troy; Hermadorus Platonicus, Hermippus, and Plutarch refer him to five thouſand years before that æra. Eudoxus ſuppoſed him to have flouriſhed ſix thouſand years before the death of Plato. And Pliny places him many thouſand years before Moſes. Upon the whole it appears, that no memorial upon record is placed ſo high as the ancient writers have carried this perſonage; and though their accounts are for the moſt part exaggerated, yet they fully aſcertain the antiquity of this perſon.

The title Zoroaſter, Mr. Bryant conceives, originally belonged to the ſun, and was metaphorically beſtowed on ſacred and enlightened perſonages. Some have thought that the firſt among men to whom this title was applied was Ham; others have taken him for Chus, for Mizraim, and for Nimrod, and Huetius for Moſes; but Mr. Bryant, after examining the primitive characters given of him by different writers, ſuppoſes that they concur only in Noah, who was the firſt deified mortal, and the prototype in the Magian worſhip. This writer ſuppoſes, that, as the object of the Perſic and Chaldaic worſhip was the ſun, and moſt of their titles were derived thence, Zoro-aſter denoted Sol Aſterius; Zor being the ſun, and aſter ſignifying ſtar.

The abbé Foucher, in a long ſeries of memoirs, inſerted in the 25th, 26th, 27th, 28th, 30th, and 31ſt volumes of the Hiſtoire de l'Academie Royale des Inſcriptions et Belles Lettres, &c. Paris, has given an ample account of the religion of the Perſians. This learned author maintains, on the authority of Pliny, that the moſt celebrated Zoroaſter was an ancient ſage, who lived under Cyaxares, king of the Medes, reſtored the worſhip of fire, was revered by the Perſians as a celeſtial prophet, and whoſe extacies, prodigies, and revelations, made a great noiſe in the world. The Zoroaſter, who was the author of the *Zend*, the abbé repreſents as an apoſtate Jew, a ſubtle philoſopher, and an obſequious artful courtier, who inſinuated himſelf into the favour of Darius Hyſtaſpis; and he ſays that his great deſign was to reconcile the Hebrew with the Perſian religion by a mixture of the leading and eſſential doctrines of each, to revive the credit of the Magi, and to accommodate, by a proper colouring, the Jewiſh religion to the weakneſs and prejudices of the Medes and Perſians, by taking from it that excluſive character that rendered it offenſive to other nations, and mixing with it the viſions and reveries of the ancient Zoroaſter.

M. Anquetil du Perron, to whoſe account we ſhall refer more at large in the ſequel of this article, has taken pains, in the 37th volume of the above cited work, to prove that Zoroaſter lived under Hyſtaſpes, the father of Darius, in the ſixth century before Chriſt.

The *Zendaveſta*, or *Zend*, contains the ſyſtem of doctrine and duty, which is ſaid to have been ſupernaturally communicated to Zoroaſter, and which his followers hold in very extraordinary veneration. A copy of this book is kept, ſays Dr. Prideaux, to this day in every oratory and fire-temple, and portions of it are read at ſtated times by the prieſts to the people: and to this they appeal as the ſtandard of the good and evil of their actions.

Dr. Hyde gives us the following account of it. The *Zend* is the general name of the book, which is alſo called the book of Abraham; and it conſiſts of twenty-one or twenty-two ſeparate parts, with diſtinct names. Its contents were originally written on twelve hundred ſkins; and the ancient copies of it, like the original, are in the pure old Perſian language; but the later copies are in the ſame language, mixed with modern Perſic or Arabic words, ſerving to explain ſuch as were becoming obſolete. Some parts of the *Zend* contain the original text, and others contain Zerduſht's ſecond thoughts ſubjoined, for more fully explaining his doctrine. Some writers ſuggeſt, that Zerduſht firſt intended to compriſe his book in four parts, viz. the *Zend*, containing the liturgy and chief doctrine of his religion, and the *Pazend*, or commentary upon the former; and that the farther additions were occaſioned by the oppoſition of adverſaries, and unforeſeen circumſtances that occurred. The character in which the *Zend* is written is that of the old Perſian, called Pehlavi; and the Pazend character differs in a ſmall degree from this.

Dr. Hyde has given a catalogue of the ſeveral parts of the *Zend*, each of which is called *noſh* or *nuſh*.

In proceſs of time, when the old Perſian language became antiquated, and little underſtood, one of their deſtours, or biſhops (about A. D. 1500.) compoſed the *Sadda*, which is a compendium, in the vulgar or modern Perſic tongue, of thoſe parts of the *Zend* that relate to religion, or a kind of code of canons and precepts, drawn from the theological writings of Zoroaſter, ſerving as an authoritative rule of faith and practice for his followers. This Sadda is written in a low kind of Perſic verſe, and, as Dr. Hyde informs us, it is *bonorum & malorum farrago*, having many good and pious things, and others very ſuperſtitious and trifling.

The *Zend* contains a reformed ſyſtem of Magianiſm; teaching that there is a ſupreme Being, eternal, ſelf-exiſtent, and independent, who created both light and darkneſs, out of which he made all other things; that theſe are in a ſtate of conflict, which will continue till the end of the world; that then there ſhall be a general reſurrection and judgment; and that juſt retribution ſhall be rendered unto men according to their works; and that the angel of darkneſs with his followers ſhall be conſigned to a ſtate of everlaſting darkneſs and puniſhment, and the angel of light with his diſciples introduced into a ſtate of everlaſting light and happineſs; after which light and darkneſs ſhall no more interfere with each other. The *Zend* alſo enjoins the conſtant maintenance of ſacred fires and fire-temples for religious worſhip, the diſtinction of clean and unclean beaſts, the payment of tithes to prieſts, which are to be of one family or tribe, a multitude of waſhings and purifications, reſembling thoſe of the Jewiſh law, and a variety of rules and exhortations for the exerciſe of benevolence and charity.

Dr. Prideaux charges the *Zend* with allowing the worſt kind of inceſt, and Dr. Hyde alſo intimates that it was allowed by Zoroaſter, till it was at length aboliſhed; but no authority has been cited to juſtify this charge.

The above mentioned doctrines of the *Zend* are accommodated to the eaſtern taſte by a great intermixture of fable.

In this book there are many paſſages evidently taken out of the Scriptures of the Old Teſtament, particularly out of the Pſalms of David: the author repreſents Adam and Eve as the firſt parents of all mankind, gives in ſubſtance the ſame account of the creation and deluge with Moſes, differing indeed with regard to the former by converting the ſix days of the Moſaic account into ſix times, comprehending in the whole three hundred and ſixty-five days; and ſpeaks alſo of Abraham, Joſeph, Moſes, and Solomon. Moreover, Dr. Baumgarten (Univ. Hiſt. Suppl. vol. ii. p. 367, &c.) aſſerts, that this work contains doctrines, opinions, and facts, actually borrowed from the Jews, Chriſtians, and Mahometans; whence, and from other circumſtances, he concludes, that both the hiſtory and writings of this prophet were probably invented in the later ages, when the fire-worſhippers under the Mahometan government thought fit to vin[illegible]

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their religion from the suspicion of idolatry. See Hyde's Religio Veterum Persarum. Prideaux's Conn. of the Old and New Testament, vol. i. p. 317, &c. edit. 9th. Univ. Hist. vol. ii. p. 206, &c. fol.

The account lately given both of the Persees and *Zend* by M. Anquetil du Perron, differs in several particulars from that of Dr. Hyde. This gentleman made a voyage to India, and employed himself between the years 1755 and 1761 in studying the Persic and Samscretam languages, and in collecting and translating manuscripts, many of which he brought with him, and deposited in the king of France's library. His account was read to the Royal Academy of Sciences at Paris, and a translation of it was published in the Gentleman's Magazine for 1762, and also in Dodsley's Annual Reg. for 1762, part ii. p. 101—127. Of the Persees, or Parsses, the disciples of Zoroaster, he says, a very numerous body has been established more than nine hundred years in Guzarate, to which place they came fugitives from Kirman, A. D. 767, on account of the Mahometan persecutions, where their genius for commerce and industry, which are their known characteristics, procured for them very considerable settlements. Concerning the hierarchy of the Parsses, this writer observes, that their ministers of religion are divided into five classes, viz. erbeds, mobeds, destours, destour mobeds, and destouran destours or destours of destours. An erbed is a person who has submitted to the purification directed by the law, who has read, during four days without interval, the Izeschne and the Vendidad, and who is instructed in the ceremonies of the worship established by Zoroaster. If the erbed afterwards continues to read publicly the *Zend* works, which constitute the liturgy, and to perform the ministerial functions, he becomes a mobed, though he does not understand the *Zendavesta*; but if he contents himself with studying the law, the *Zend* and the Pehlvi, without exercising the ministerial functions, he is called a destour.

The destour mobed is he who unites the qualifications of the mobed and destour; and the destouran destour is the principal destour of a city or province, who decides cases of conscience, and determines points of law, and to whom the Parsses pay a tythe of their revenues.

As for those *Zend* writings, which the Parsses attribute to their legislator, and for which they have the same veneration as the Jews have for their Hebrew text, M. du Perron inclines to think, though he does not affirm, that they are really the works of Zoroaster, whose reputation has been acquired by laws that have subsisted two thousand five hundred years.

The law, which was either framed or regulated by Zoroaster, was divided, as we are told by modern authors, into twenty-one books, or parts: seven treat of the creation and history of the world; seven of morality, and civil and religious duties; and seven of physic and astronomy. Among the Parsses it is an universally received tradition, that Alexander the Great condemned these twenty-one volumes to the flames, after having caused them to be translated into Greek. Those which escaped are the Vendidad, the Izeschne, the Visspered, the Jeschts, and the Neaeschs, in *Zend*, and some other Pehlvic translations of *Zend* originals. The Parsses have also a great number of prayers, which they call nerengs, and which in general are written in modern Persic, with *Zend* characters, which they affect to use in all writings that treat of religion, though composed in modern Persic.

The writings of Zoroaster, which still remain, speak of the creation of the universe, of the terrestrial paradise, and the dispersion of mankind; of the cause of the respect paid to fire, of the origin of evil, natural and moral; of the angels appointed to the government of the universe; of several particulars relating to the end of the world and the resurrection, &c. &c. They also contain predictions with respect to the latter times, some excellent moral precepts, and a very extensive ceremonial code.

The *Zend*, according to Du Perron, is not the name of Zoroaster's writings, but merely of the characters, though generally used to signify the language itself, in which they were written; the language of the original text is called *Avesta*, and is a dead language, and was entirely unknown to the Parsses before the time of Zoroaster, who, he apprehends, brought it from the mountains; and is totally different from the Pehlvi or ancient Persic, spoken in the time of Zoroaster. He farther supposes, that the works of Zoroaster, still extant in the Pehlvi, were translations made into that language during the life of this legislator, or soon after his death.

The Pahzend, which Dr. Hyde makes to be the name of a work, is, according to Du Perron, the name of a language, which is a dialect or corruption of the Avesta, and almost extinct, except that a few words of it are preserved in the Pehlvic translation. The characters of the Avesta and Pehlvi are different; the former, which are properly the *Zend* letters, being much the neatest: the Pahzend has no peculiar alphabet, but adopts that of the *Zend* or Pehlvic indifferently. For M. du Perron's account of the eighteen MSS. of which he brought duplicate copies with him, and an abstract of their contents, we must refer to the Ann. Reg. &c. ubi supra.

This writer has published a translation of the *Zend-avesta*, with remarks and illustrations, &c. in 3 vols. 4to. at Paris, in 1771. Some, indeed, have questioned the authenticity of the work which he has translated, or its being a genuine remain of Zoroaster.

Mr. Richardson, in his Dissertation on the Language, Literature, and Manners of the Eastern Nations, originally prefixed to his Persian, Arabic, and English Dictionary, 1778, (chap. i. sect. 2.) is very severe both on Dr. Hyde and M. Du Perron. Those fragments of the supposed works of Zoroaster, which Dr. Hyde has given us, under the title of *Sadder* are, he says, the wretched rhymes of a modern Parsi destour or priest, who lived about three centuries ago; whilst the publications of M. Anquetil Du Perron carry palpable marks of the total or partial fabrication of modern times. The *Zend* language, he says, is not genuine; and M. Du Perron has produced no discovery which can stamp his publication with authority.

He adds, the specimens of old Persian in Hyde's Religio Vet. Pers. are simply modern language in ancient characters.

In the Memoirs of the Royal Society of Gottingen for 1779, i. e. Commentationes Societatis Regiæ Scientiarum Gottingensis, &c. vol. ii. we have a memoir by M. Christopher Meiners, who enters into a critical examination of the authenticity and antiquity of the books published by M. Anquetil Du Perron, as genuine writings of Zoroaster; and alledges many plausible arguments to prove them recent and spurious. He shews, that they contain a multitude of fables, totally unknown to the ancient Persians, and contrary to the spirit of their laws and religion; and also many opinions and ceremonies, which had their first rise many ages after Zoroaster.

Some have thought, that the truths which are observable in *Zend-avesta*, Vendidad Sadi, and other writings of the Eastern nations, were derived from the disciples of Nestorius, who were found very early on the coast of Malabar. But this, Mr. Bryant thinks, is a groundless surmise; because the religious sects, among which these writings have been preserved, are widely separated, and most of them have no connexion with Malabar or the Christians of that quarter. And, besides the Brahmins and Banians adhere closely to their own rites, and abhor all other persuasions: and they are influenced by customs and scruples, which prevent their intercourse with other people. In their writings there occurs no trace of Christianity, or of its founder: and thence Mr. Bryant infers, that whatever truths may be found in the writings of these people, they were derived from a higher source, and by a different channel. See Anal. of Anc. Mythology, vol. iii. p. 599, &c.

We shall terminate this article with adding, that Dr. Hyde presented the copy of part of the *Zend* writings in his possession to the university of Oxford; and that the whole *Zend* was afterwards brought from India by Mr. Frazer, and is lodged with his other oriental MSS. in the Radcliff library at Oxford.

ZENECHDON, a term used by the Arabian physicians for a preparation of arsenic, for external use; *zeech* being their name for arsenic.

ZENEXTOR, one of the many names by which the chemists have called mercury.

ZENGIFUR, a word by which some of the chemical writers have expressed cinnabar.

ZENI, a word used by many of the chemical writers as a name for vitriol.

ZENICON, the name of a poison, composed of several ingredients, and used to poison the tips of the arrows with which the Celtic hunters shot at the beasts they pursued for food. The poison was known to be of that quick spreading nature, that as soon as the beast was fallen, the huntsman ran up to it, and cut out a large piece of the flesh about the wound, immediately to hinder the venom from spreading farther. The antidote to this poison was supposed to be the leaves of oak, beech, and other trees.

ZENITH, in *Astronomy*, the vertical point; or a point in the heavens directly over our head.

Or, the *zenith* is a point, as Z (*Tab. Astronomy, fig.* 52.) in the surface of the sphere; from which a right line, drawn through the spectator's head, passes through the centre of the earth.

Hence, there are as many *zeniths* as there are different places

places on earth, where the heavens may be seen; and, upon the changing of our place, we also necessarily change our *zenith*.

The *zenith* is also called the *pole of the horizon*, because it is ninety degrees distant from each point thereof.

It is also the pole of all the almucantars, or parallels of the horizon, whereby the altitude of the stars is estimated.

Through the *zenith* pass the vertical circles, or azimuths.

The point diametrically opposite to the *zenith*, is called the *nadir*; which is the point directly under our feet.

The nadir is the *zenith* to our antipodes; as our *zenith* is the *nadir* to them.

ZENITH-*distance* is the complement of the sun's or a star's meridional altitude; or, it is what the meridian altitude wants of ninety degrees.

ZENITH is also a word used by some medical writers to express the first appearance of the menses in young women.

ZENSUS, in *Arithmetic*, a name which some authors give to a square number, or the second power.

The higher powers they call *zensizensus*, *zensicubus*, *zensizenzensus*, *zensurdesolidus*, &c. See POWER.

ZENUPH, in the *Jewish Antiquities*, a kind of tiara worn by the kings of Judah. See CIDARIS.

ZEOLYTE, *Zeolites*, in *Natural History*, a name given by Mr. Cronstedt to a stone described by him in the Transactions of the Academy of Sciences at Stockholm for 1756, the peculiar properties of which have induced that mineralogist to consider it as forming a distinct order of earths, called *zeolites*.

According to Mr. Kirwan, it is a species of argillaceous earth, composed of argill united to two, three, or eight times its weight of silex, about half its weight of pure calcareous earth, and from once to twice its weight of water, without any iron except by accident.

This stone is found of different degrees of transparency, or perfectly opake, either colourless, whitish, yellowish, greenish, or reddish; its shape is either pyramidical, columnar, tabular, oval, capillary, or amorphous; its texture either granular, scaly, or radiated; the filaments diverging, as from a central point, or indistinguishable.

The *zeolyte* that consists of particles of no determinate form, is either pure and white, or mixed with silver and iron, which latter kind is of a blue colour, and is commonly called *lapis lazuli*.

The sparry *zeolyte* resembles calcareous spar, but is more brittle, and of a light red, or orange-colour.

The crystallized *zeolyte* is found in groups of crystals, under the form of white or yellow balls, consisting of many pyramids with their apices uniting in the centre, or of white prisms with truncated angles, or of white capillary crystals.

The specific gravity of *zeolyte* is from 2,1 to 3,15. It is a little harder than the fluors, and calcareous spars; it does not give fire with steel; it dissolves very slowly, and without effervescence, in acids, as in oil of vitriol and spirit of nitre; but when concentrated vitriolic acid is poured on powdered *zeolyte*, a heat arises, and the powder is changed into a gelatinous mass; though this property is not peculiar to *zeolyte*, and there are some few stones of this kind that do not become gelatinous: when exposed to a strong heat it dilates and swells, more or less, according to the proportion of water contained in it, and afterwards melts, without addition, more or less easily according to the proportion of calcareous earth, into a frothy slag, which cannot, without great difficulty, be rendered solid and transparent; and in the moment of fusion it yields a phosphoric light.

Crystallized *zeolyte*, when melted, boils, as borax does: it may be dissolved in the fire more easily by mineral alkali than by borax, or by the fusible salt of urine: it does not effervesce with the fusible salt of urine, as calcareous stones do, nor with borax, as gypseous stones do.

The dilatability of *zeolite* is the surest criterion, whereby to distinguish it. *Zeolyte* has in the fire nearly the same properties as boles have.

There is a siliceous *zeolyte*, which is white, and found at Mæssberg, differing from the argillaceous genus only in its giving fire with steel. Dict. Chem. Eng. ed. Cronstedt's Miner. sect. 108. Kirwan's Miner. p. 95. 125.

ZEOPHILOS, a word used by Quercetan as the name of an antimonial medicine.

ZEOPHYRUM, in the *Materia Medica*, the name of the *triticum æstivum*, or *hordeum nudum*, as it is called by some authors, the naked barley.

ZEPHANIAH, a canonical book of the Old Testament, containing the predictions of Zephaniah, the son of Cushi, and grandson of Gedaliah; being the ninth of the twelve lesser prophets. He prophesied in the time of king Josiah, a little after the captivity of the ten tribes, and before that of Judah; so that he was contemporary with Jeremiah. He prophesies chiefly against Judah, who continued very corrupt, notwithstanding the king's pious zeal for reformation, and the good example he gave to his subjects.

ZEPHYRI *fœtus*, a term used by Hartman, and some other writers, to express a mole, or false conception.

ZEPHYRUS, or ZEPHYR, Ζεφυρος, the west wind; a wind blowing from that cardinal point of the horizon opposite to the east.

The poets personify it, and represent *Zephyrus* as the mildest and most gentle of all the deities of the woods: the character of his personage is youth and gentleness.

It is also called *Favonius*, and *occidens*; and, by many, has been confounded with the *Africus*.

ZERDA, in *Zoology*, a name given by the Moors to an animal which inhabits the desert of Saara, extending beyond mount Atlas.

Pennant classes it under the genus of dog; and describes it as having a pointed visage, long whiskers, large bright black eyes, very large ears of a bright rose-colour, internally lined with long hairs, and orifice so small, as not to be visible, probably covered with a valve or membrane; legs and feet like those of a dog, and taper tail; its colour is between a straw and pale brown; its length from nose to tail ten inches, its ears three inches and a half long, tail six, and height not five. It burrows in the sandy ground, and is so excessively swift, that it is very rarely taken alive; feeds on insects, especially locusts; sits on its rump; is very vigilant; barking like a dog, but with a shriller sound, and chiefly in the night; and is never observed to be sportive.

Mr. Buffon says of this animal, that it is found to the south of the Palus Tritonides, in Lybia; that it has something of the nature of the hare, and something of the squirrel, and that it lives on the palm-trees, and feeds on the fruits. Pennant's Hist. Quadrupeds, vol. i. p. 248. See *Tab.* V. *Quadrupeds*, *fig.* 67.

ZERICHUM, a name given by some of the chemical writers to arsenic.

ZERNA, a word used by some of the chemical writers to express an ulcerated lepra or impetigo; the chemical authors use it also as a name for the bulnesses which they call the *lepræ metallorum*, or leprosies of metals.

ZERTA, the *zerte*, a fish caught in the rivers of Italy, and some other places, of the figure of the chub, and called by authors, *capito anadromus*, and the *blike*. It seldom grows to more than two pounds weight, and, at times, lives in rivers, at times in the sea; and is esteemed a very well tasted fish, especially a little before the season of its spawning. Ray.

The *zerte* is that species of cyprinus described by Gesner and others under the name of *capito anodromus*.

ZERUMBETH, in the *Materia Medica*. See ZEDOARY.

ZEST, the woody, thick skin, quartering the kernel of a walnut. Some physicians prescribe this *zest*, dried, and taken with white wine, as a remedy against the gravel.

The word is also used for a chip of orange or lemon-peel; such as is usually squeezed into ale, wine, &c. to give it a flavour; or for the fine thin oil that spurts out of that peel on squeezing it.

Hence, to *zest* an orange or lemon, among confectioners, is to cut the peel from top to bottom into small slips, as thin as possible; or, to *zest*, is to squeeze the peel over the surface of any thing.

ZESTOLUSIA, a term used by some medical authors to express bathing in warm water, by way of distinction from *psuchrolusia*, or bathing in cold water.

ZETA, or ZETECULA, a little closet, or withdrawing-chamber, with pipes running along the walls, to receive from below either the cool air, or the steam of warm water.

The word is formed either from ζηειν, *to be warm*; or of ζην, *vivere*, *to live*, on account of the use made hereof for love and enjoyment.

ZETETÆ, Ζηλῆλαι, among the *Athenians*, were officers appointed upon extraordinary occasions, to enquire after the public debts, when through the neglect of the receivers, or by other means, they were run up to large sums, and began to be in danger to be lost, if not called in.

ZETETICE, Ζητητικη, formed from ζητεω, *I seek*, or ZETETIC *method*, in *Mathematics*, the method made use of to investigate, or find the solution of a problem.

The ancient Pyrrhonians were sometimes called *Zetetici*, q. d. *seekers*.

ZETUS, a word used by some of the chemical writers as a name for vitriol.

ZEUGITÆ, Ζευγιλαι, among the *Athenians*, the third class of the people, or those who had an estate of two hundred medimns.

ZEUGMA, Ζευγμα, literally denoting a joining together; from ζευγνυω, *I join*, a figure in *Grammar*, whereby an adjective, or verb, which agrees with a nearer word, is also

also, by way of supplement, referred to another more remote.

Thus Terence, *Utinam aut hic surdus, aut hæc muta facta sit.* So Virgil, *Hic illius arma, hic currus fuit.* In which cases, the words *facta sit* agreeing primarily with *hæc muta*, are also made to agree or extend to *hic surdus*: and the verb *fuit* is not only referred to *hic currus*, which it properly respects, but farther, to *hic illius arma.*

Of this species of ellipsis, which differs from the ELLIPSIS properly so called, in that the word which is to be understood once or oftener, has been already mentioned, Messieurs De Port Royal enumerate three sorts, viz. when we repeat the noun or verb in the same manner it has been already expressed; or, when the word expressed cannot be repeated without receiving some alteration, in gender, case, number, or person; or when, after a word which includes the whole, a distribution of the parts is made without repeating the verb. Latin Gram. vol. ii. p. 183.

The Latins, it may be here observed, take a liberty in constructions, which some of the nicer critics among the moderns, particularly the French, will not allow in the modern tongues.

ZEUS, in *Ichthyology*, a genus of fish, of the order of the *thoracici*, the characters of which are, that the head is compressed and declining; the upper lip is fornicated by means of a transverse membrane; the tongue is awl-shaped; the branchiostege membrane has seven perpendicular rays, the lowest placed transversely; and the body is compressed. There are four species; viz. the VOMER, the *gallus* or ABACATUAIA, the *faber* or DOREE, and APER.

ZIBELLINA. See SABLE.

ZIBETHUM, or ZIBETA, in *Natural History*, civet, a perfume contained in a bladder, in the groin of a civet-cat. See CIVET.

ZIBIBLÆ, in *Natural History*, a name given by some authors to a large sort of raisins, resembling the stones of dates in shape; they have much pulp, but very little moisture.

ZICCARA, a name of an Indian fruit, resembling a pine-cone, and containing twenty, thirty, or more, kernels, of no known use in medicine.

ZIDRACH, in *Natural History*, the name given by Cuba, and some other authors, to that species of the syganthus of Artedi, commonly called the HIPPOCAMPUS.

ZIFIUS, in *Ichthyology*, a name given by Albertus to the *xiphias*, or SWORD-*fish*.

ZIGER, a word used by some of the old writers, to express a very fine kind of cassia, extremely aromatic to the taste, and of a purplish black colour.

ZIGURELLA, in *Ichthyology*, the name by which some have called the JULIS, a small but very beautiful fish, common about Genoa, and in some degree approaching to the nature of the turdus or wrasse.

It is a species of the *labrus*, according to Artedi, and is distinguished by the name of the *palmaris labrus*, with two large teeth in the upper jaw.

ZIMENT-*water*, or COPPER-*water*, in *Natural History*, the name by which some have called water found in places where there are copper-mines, and lightly impregnated with particles of that metal.

The most famous spring of this kind is about a mile distant from Newsol in Hungary, in the great copper-mine called by the Germans, *herrn grundt*.

The water in this mine is found at different depths, and is received into basons, for the purpose of separating the copper from it: in some of these it is much more fated with this metal than in others, and will make the supposed change of iron into that metal much sooner. The most common pieces of iron used in the experiments, are horse-shoes, nails, and the like; and they are found very little altered in shape, after the operation, except that their surfaces are more raised.

The water appears greenish in the bason, where it stands; but if a glass of it be taken up, it looks clear as crystal: it has no smell, but a strong vitriolic astringent taste, insomuch that the lips and tongue are blistered and scorched upon tasting it.

The miners are well acquainted with the virtues of this water, in changing the metals; but they also use it as a medicine; whatever sickness they are seized with, they first attempt its cure by a large dose of this water, which usually both vomits and purges them very briskly.

They also use it in disorders of the eyes, in some of which it must be of great power; but in others, it is very improper; so that upon the whole, they do more harm than good with it.

The copper produced from these waters is valued by the people much beyond any other copper, as being much more ductile and running easier in the fire; the people in the neighbourhood have many vessels of it; but it is to be observed, that its ductility and hardness increase after it is taken out of the water, for while immersed in it, it is friable.

It is observed, that after great rains the springs are always fuller than at other times, and the virtues of the water considerably less.

A pound of this water, when strongest, evaporated over a gentle fire, becomes first turbid, and afterwards deposits a yellowish sediment, which, evaporated to dryness, weighs two scruples and a half; and when warm water is poured upon this and filtred, six grains of yellowish earth will be left in the filtre; and the greenish solution being again evaporated to a pellicle, and the operation being several times repeated, somewhat more than two scruples of a bluish-green vitriol will be separated in small crystals.

A small quantity of oil of tartar being added to a pound of this water, the whole becomes turbid, and on filtration leaves a large residuum in the filtre, which, dried, weighs about two scruples and a half, and is found to be a cupreous vitriol, with a small mixture of a neutral salt.

If a pint of this water be put into a bottle, and a small piece of iron thrown into it, bubbles will appear on the iron, which will gradually be changed to a copper-colour. On the second day the water will be turbid, and afterwards whitish, and white filaments will gather about the bottom and sides of the glass, and about the iron, which will appear throughout of a coppery-colour.

From these experiments we may easily understand what the true nature of the water is; that it contains a large quantity of the vitriol of copper, which it probably owes to a solution of that metal, by means of the acid of the common pyrites and water; when this is known, the effects are not difficultly accounted for, there being no real change of one metal into another; but the true state of the case being that the particles of one metal are dissolved and carried away, and those of another metal deposited in their place. A water thus impregnated is a menstruum capable of dissolving iron, and in the solution of that metal becomes so weakened as to let go the copper it before contained, in small parcels. This is seen to be the case, by examining the changed metal while it lies in the water, the copper then appearing not a soft malleable and even mass, but a congeries of granules, closely placed together, and resembling the small granules, or ova, in the spawn of fishes; and it is very friable and fragile while in this state.

This solution of one metal and deposition of the particles of another in its place, is a thing very familiar in chemistry, and is seen every day in numerous instances; but in none so familiar as in a like case, or solution of iron and copper in the same menstruum. Thus, if a piece of copper be dissolved in aqua fortis, and when this solution is perfected a piece of iron be thrown into the liquor, the same thing will be seen that is in this spring, for the iron will be dissolved, and the copper which was before dissolved in the menstruum will be slowly precipitated and deposited in the place of it. Phil. Transf. N° 479. p. 355, &c. See on this subject the articles COPPER, and VITRIOL.

ZIMEX, a word used by some of the old chemical writers, for verdigrise.

ZINARIA, a word used by the Arabians, for a kind of vitiated bile, called æruginous bile.

ZINC, or ZINK, in *Natural History*, a semi-metal, of a brilliant white colour, approaching to blue; called also *spelter* and *tutenag*.

ZINC, *history of*. This semi-metal was not known, so much as by name, to the ancient Greeks and Arabians. The name first occurs in Theophrastus Paracelsus, though the origin of the appellation is unknown. Agricola calls it *contrefayn*; Boyle, *speltrum*; by others it is denominated *speauter*, and Indian tin. Albertus Magnus, who died in 1280, is the first who makes express mention of this semi-metal, calling it golden marcasite, and asserting that it approaches to a metallic nature, and that it is inflammable. J. Matthesius, in 1562, mentioned a white and a red *zinc*; but the yellow and red colours are only to be understood of the ores. The eastern Indians have been long in possession of the method of extracting pure *zinc* from the ore; at least, in the course of the last century. This metal was brought from them into Europe. Jungius mentions the importation of *zinc* from India in 1647; and a metal of this kind, under the name of TUTENAG, is still brought from thence, which, however, must be carefully distinguished from the compound metal of that name. G. E. Van Lohneiss informs us, in 1617, that a long time before *zinc* had been collected by fusion at Gosslar. It has, indeed, been for a long time usual to form orichalcum from the ores of *zinc*, by the

addition of copper; but it does not appear when this art was invented. Pliny (Hist. Nat. xxx. cap. 2.) mentions the orichalcum, and also three species of Corinthian vases, one of which is yellow, and of the nature of gold. Erasmus Ebner, of Norimberg, in 1550, was the first who used the cadmia of Gosslar for this purpose. In 1721, Henckel mentioned, that *zinc* might be obtained from lapis calaminaris, by means of phlogiston; but he conceals the method. In 1735, Brandt proved, that the pseudo-galena contained *zinc*. In 1742, or, as others say, in 1738, Anton. Van Swab extracted it from the ores, and particularly from the Bolognian pseudo-galena, which possesses a metallic splendor, by distillation, at Westerwick, in Dalecarlia; which was afterwards effected, in larger quantity, by Messrs. Cronstedt and Rinman. The baron Funch, in 1744, determined the presence of *zinc* in pseudo-galena, from the flame and the flowers. The celebrated Margraaf, not knowing what had been done by the Swedish mineralogists, published in 1746, a method of performing this operation, which he had discovered. It is also said, that Dr. Lawson first publicly asserted and demonstrated, that *lapis* CALAMINARIS was the ore of *zinc*. Till Margraaf shewed the method of extracting *zinc* from calamine, all Europe was supplied with this semi-metal either from India or from Germany. However, a manufactory of this metallic substance has not many years ago been established in our own country, and the copper-works near Bristol have supplied Birmingham with *zinc* extracted from calamine. From the works erected by Van Swab in Sweden, the establishers of our English manufactory probably derived the hint; and Dr. Watson says (Chem. Ess. vol. i. p. 45.) that he has been well informed, that they purchased the secret from him when he was in England.

ZINC, *chemical properties of*. *Zinc* is the most malleable of all the semi-metals; and, when well furnished with phlogiston, in the manner proposed by Margraaf, it possesses a semi-ductility, which renders it capable of being flattened into thin plates. This property, joined to its hardness, prevents its being pulverised, like the other semi-metals; and, therefore, when it is required in a divided state, it must be melted and granulated, or filed, like metals.

Zinc, when broken, appears to consist of many flat, shining plates, which are larger when slowly, than when hastily cooled. When heated, it is very brittle. Like tin, it crackles when it is bent. Its specific gravity is from 6,9 to 7,24. According to Muschenbroeck's table of specific gravities, Indian *zinc* is to water, as 7,2401 to 1; and *zinc* of Goslar as 7,215 to 1. *Zinc*, like tin, is not easily calcined or covered with rust by the action of air or water; it is less fusible than tin and lead, but melts at a lower heat than silver or copper. In the degree of heat just necessary for its fusion, its surface is reduced to a grey calx; but in a moderate white heat, it flames, and exhibits a very beautiful and brilliant appearance, owing to the phlogiston of *zinc*, which is very combustible; and it sublimes into a light white calx, called *flowers of* ZINC.

Mr. Malouin relates, that *zinc* being melted six times, and the fusion continued fifteen hours each time, it became more and more hard, brittle, unfusible, and uncalcinable. He says, that its colour became grey after the second fusion, brown after the third, black after the fourth, blue like a slate after the fifth, and a clear violet colour after the sixth.

This substance, being the most combustible of all metals, detonates more violently than any other metal with nitre. *Zinc*, in its metallic form, and in that of the calx or flowers, dissolves readily in all acids, and precipitates from them almost all the other metallic bodies. Six parts of good vitriolic acid, diluted with an equal weight of water, can dissolve entirely, by help of gentle heat, one part of *zinc*; the neutral salt resulting from this solution is crystallizable, and called *white* VITRIOL.

Zinc appears to have a stronger affinity with vitriolic acid than any other metallic substance; for by means of this semi-metal, the vitriols of copper and of iron may be decomposed; and yet the vitriol of *zinc*, according to Junker, is decomposed, and its acid separated, by a less heat than the martial vitriol.

Zinc unites more strongly to acids not only than any other metal, but than even some earths. Mr. Pott says, that it precipitates the earthy basis from a solution of alum; and that *zinc* cannot be precipitated from aqua fortis by crabs-eyes. He also says, that it may be precipitated by volatile alkali, but that this precipitate is quickly dissolved. M. de la Lassone (Hist. de l'Acad. Roy. Sc. Paris, for 1775) establishes, what had been before conjectured, viz. the solubility of *zinc* in volatile alkali. He proves, that volatile alkali, in a fluid form, dissolves the filings of *zinc* with effervescence, and the flowers of *zinc* without effervescence: the alkaline liquor must be saturated and employed immediately after the volatile alkali has been procured from sal ammoniac by the intervention of fixed alkali. Hence he was led to examine the nature of this semi-metal, and to evince its being totally distinct from iron, though it has some resemblance to it, and is sometimes mixed with it; for in endeavouring to procure Prussian blue, by precipitating the *zinc* from its solution in volatile alkali, he succeeded only when he employed the *zinc* that is the object of commerce, or acids which contained a small portion of iron; whereas the *zinc* that had been previously purified in his laboratory, and the acids which had been carefully prepared, yielded no Prussian blue.

Mr. Hellot, who has given a very accurate analysis of *zinc* (Mem. Acad. Sc. Paris, 1735), has tried the different acid menstrua upon it with very great care and attention to their effects.

Distilled vinegar was first tried. Eight ounces of this dissolved, in ten days time, over a gentle fire, an ounce wanting six grains of *zinc*; and after this it ceased to act upon the metal any longer, and was sweetened in the manner of vinegar which has dissolved lead: this, however, is an experiment not proper to be tried by the taste, the solution being very mischievous. Six ounces and two drams of an insipid phlegm were distilled from this solution, and after this, the fire being increased, striæ began to appear on the top of the retort; the receiver being changed, there succeeded to these striæ a sublimation of very white and beautiful flowers of *zinc*; and after this a few drops of an oil, yellow at first, and afterwards green, came over into the receiver. The distillation yielded also about four drams of a sulphureous liquor, inflammable as spirit of wine. This liquor being poured into a phial of water, at first swam upon it, and immediately afterwards blended with it in the manner of spirit of wine, and left only the few drops of oil swimming on the surface. This was reddish in colour, and of an aromatic smell.

This is the famous liquor called by the chemists oil of TALC, and supposed to have so many great virtues, one of which is the fixing of silver; that is, in other words, the concentrating of it to the weight of gold, and making it indissoluble in aqua fortis, rendering it like gold soluble only in aqua regia; but in all probability, this oil is really nothing but the essential oil of the grape from which the wine was made, whence the vinegar had been obtained; and then how idle must appear all these expectations from it.

The flowers sublimed to the neck of the retort, or head of the cucurbit, during the distillation, burnt at the flame of a candle, emitting a fine blue flame. Three ounces of spirit of salt dissolve perfectly three drams, except two grains, of *zinc*; a great heat is perceived while this solution is making; and this acid, as well as distilled vinegar, leaves untouched a small blackish residuum, from this metal. Some authors have supposed, that this residuum contained mercury; but experiments prove the contrary; and its lightness alone makes such a conjecture very improbable.

Mr. Hellot has shewn, that it cannot even be reduced into a metallic substance. Neumann says, that this black matter was separated during the solution of this semi-metal in vitriolic and marine acids, and that two or three days afterwards it was re-dissolved.

The solution, in marine acid, being distilled, yielded two ounces of phlegm, two drams of a weak spirit of salt, of a very agreeable smell; and afterwards, on changing the receiver, a few drops of a very acid and yellowish spirit, and some flowers raised themselves to the neck of the retort.

Six ounces of spirit of nitre dissolve five drams and a half of *zinc*, without leaving any remainder; and the remainder left in the solutions of it by distilled vinegar, and by spirit of salt, is itself soluble in this menstruum. This solution being distilled, there were separated four ounces of phlegm, and afterwards six drams of spirit of nitre; this was but very weak, and no more could be raised; the stronger part of the acid remaining intimately mixed with the *zinc* at the bottom of the vessel, in form of a viscous transparent substance, of a yellow or orange-colour.

Three ounces of oil of vitriol, with an equal quantity of water, dissolved six drams and twenty grains of *zinc*. When the liquor was thus far saturated, there began to be formed regular crystals; and after two months standing, the whole liquor was evaporated, and a cake of transparent vitriol left in the bottom of the vessel.

Zinc may be allayed with all metallic substances, excepting bismuth and nickel: the allay of *zinc* with iron is not effected

effected without difficulty; but that with copper ſucceeds well, and is much uſed. It has been commonly affirmed, that *zinc* is incapable of uniting with ſulphur; though Mr. Cramer ſays, that if it remains long in a moderate fire, and be covered over with ſulphur at ſeveral times, and continually ſtirred with a poker, it will at laſt be changed into a very brittle, dark-coloured ſubſtance; which the editor of the Chemical Dictionary aſcribes to the iron of the poker, as he has never been able to unite ſulphur with pure *zinc*, when they were ſtirred with a tobacco-pipe. Hence the method of purifying *zinc*, and of aſcertaining its purity, propoſed by Mr. Cramer, is to throw upon it, when melted in a large crucible, ſuet and ſulphur alternately, and the latter in larger quantities than the former. If the *zinc* is pure, the ſulphur burns freely on its ſurface; but if it is alloyed, the ſulphur combines with the other metals, and forms with them a kind of ſcoria, which muſt be taken off. This alternate projection of ſuet and ſulphur upon *zinc* is continued till the ſulphur be burnt on the ſurface of the melted *zinc*, without forming any ſcoria.

M. de Morveau, in a late memoir concerning the combination of *zinc* with ſulphur (Nouv. Mem. de l'Acad. de Dijon, part i. for 1783. Paris, 1784.) ſeems to have evinced the poſſibility of diſſolving *zinc* by ſulphur, and of forming, what he calls *la blende artificielle*, not only by the direct combination of ſulphur with calx of *zinc*, but alſo by combining ſulphur with *zinc* in its metallic ſtate.

For the affinities of *zinc*, ſee Affinity.

Some authors, as Wallerius and Cronſtedt, ſay, that filings of *zinc* are attracted by magnets. The celebrated Rinman, after calcining the white lapis calaminaris of Aix-la-Chapelle for the ſpace of eleven days, in one of the furnaces uſed for the preparation of ſteel, found that it adhered to the magnet almoſt in the ſame manner as filings of iron.

M. de la Laſſone (Hiſt. Acad. Sc. Paris, for 1772) endeavours, by a ſeries of experiments, to eſtabliſh a ſtriking reſemblance between *zinc* and the phoſphorus of urine. *Zinc*, expoſed to a conſiderable degree of heat, affords a very dazzling light; during its deflagration, it emits an odour like that of garlic, as phoſphorus does. The fulguration of both depends on a free acceſs of air. *Zinc* and phoſphorus exhibit ſimilar phenomena, in conſequence of the action of the air, or aqueous vapours of the atmoſphere, by which they are decompoſed; the calx, with which the ſurface of *zinc*, expoſed to the air, becomes covered, he ſuppoſes, contains the phoſphoric acid, ſince, on reſtoring phlogiſton to it, it is rendered capable of producing a deflagration, perfectly reſembling that of phoſphorus. Phenomena, in many reſpects ſimilar, likewiſe attend *zinc* and phoſphorus, when expoſed to the action of water. From many other inſtances of reſemblance which he relates, and collateral obſervations, he concludes, that the concentrated phoſphoric acid is contained even in the calx or flowers of *zinc*; that is, after it has loſt the greateſt part of its phlogiſton, in the deflagration. The hypotheſis of M. Laſſone ſeems to be confirmed by the experiments of M. Margraaf, in the Berlin Memoirs for 1746. On mixing the ſal microſcomicus, or fuſible ſalt of urine, which is known to be the baſis of phoſphorus, with lead and tin, and ſubjecting the mixture in cloſe veſſels to a violent heat, he found both the metals conſiderably changed, and the latter, in particular, converted into a ſubſtance reſembling *zinc* in thoſe properties which peculiarly diſtinguiſh it; particularly that of deflagrating *per ſe*.

Zinc, *flowers of*, are the metallic earth of *zinc*, deprived of almoſt all its phlogiſton, and raiſed in light flocks from deflagrating *zinc*.

To make these flowers, *zinc* is to be put into a large open crucible, ſet in a furnace which draws air well. When a white heat is raiſed, the *zinc* kindles and burns with a white, vivid, dazzling flame, accompanied with a conſiderable quantity of white ſmoke. This ſmoke is condenſed in white light flocks, which float all round the laboratory. The greateſt part of them, however, fix themſelves to the ſides of the crucible, and the *zinc*. They have been called by different names: ſome have denominated them talc, and a ſolution of them in vinegar, *oil of talc*, to which they have attributed very extraordinary qualities. By others they have been called *ſericum*, *aqua ſicca philoſophorum*, *philoſophic cotton* or *wool*, *nihil album*, and *pompholyx*.

Theſe flowers are very fixed, like metallic earths, when well dephlogiſticated, and ſo incapable of being again ſublimed, that they reſiſt the moſt violent fire, and are ſooner melted than ſublimed. They, as well as *zinc* itſelf, are ſoluble in acids, probably becauſe they retain ſome phlogiſton; but they are difficultly reducible into *zinc*, and were believed to be incapable of reduction, till M. Margraaf publiſhed a method of reviving them, by expoſing them to a ſtrong heat together with ſome inflammable ſubſtance, in cloſe veſſels. In the crucible uſed for the preparation of *flowers of zinc*, a conſiderable quantity of them is found fixed to its ſides, and to the ſurface of the *zinc*, if any remains unburnt. Theſe latter flowers, having been produced by the part of the *zinc* which burns leſs vehemently than the reſt, are much leſs white and lighter than the former. Their colour is greyiſh, from a certain quantity of phlogiſton which they contain. *Flowers of zinc* are alſo obtained from furnaces in which minerals containing *zinc* are ſmelted; they adhere in great quantities to the upper part of the internal ſurface of the walls of the furnaces; but as they ſuſtain a great heat, they are half fuſed and agglutinated together, forming maſſes, which muſt be frequently taken off, in order to clear the furnaces. In this ſtate the *flowers of zinc* are called cadmia *fornacum*, or pompholyx.

By careful management in the operation for producing the *flowers of zinc*, there may be collected a greater weight of flowers than that of the *zinc* employed in the operation. Mr. Pott ſays, that the additional weight is equal to one-tenth part of the ſemi-metal employed.

M. de la Laſſone, in his memoir on *zinc* above cited, erroneouſly aſcribes the additional weight, which this and ſome other metallic ſubſtances acquire by calcination, to the aqueous vapours in the atmoſphere, which he ſuppoſes to be attracted by them. The true cauſe of their additional weight, firſt ſuggeſted by Jean Rey, in the beginning of the laſt century, has been lately very ſatisfactorily aſcertained by Dr. Prieſtley, and M. Lavoiſier; who have ſhewn, that they acquire it from air, fixed, atmoſpherical, or dephlogiſticated, which they attract from the atmoſphere, and which, in a fixed or ſolid ſtate, becomes a conſtituent part of their ſubſtance. See Calcination, and *Potential* Heat.

The fumes of *zinc* have a ſtrong ſmell of garlic, and are very noxious to the lungs.

Zinc, *ores of, and method of ſmelting them*. The difficulties, occaſioned by the volatile and combuſtible nature of this ſemi-metal, for a long time retarded the diſcovery of the ores containing it; and, therefore, it has been conſidered as compoſed of two or three ingredients. Albertus Magnus thinks iron an ingredient: Paracelſus called it a ſpurious ſon of copper; Lemery maintains it to be a ſpecies of biſmuth; Glauber, and many alchemiſts, conſider it merely as an immature, ſolar ſulphur; Homberg, as a mixture of tin and iron; Kunckel, as a coagulated mercury; Schluter, as tin made brittle by ſulphur, &c.

Zinc has not yet been found native; that which is mentioned by Bomare is ſaid to have been produced by art. The ores containing *zinc* differ much in appearance and properties: Bergman diſtributes them into two claſſes; ſome containing the ſemi-metal deprived of phlogiſton, the others holding it mineralized, either by ſome acids, as the aerial or vitriolic, or united to ſulphur by means of iron. The calciform ores of *zinc*, according to Cronſtedt, are pure or mixed. The pure are indurated, and ſometimes cryſtallized, reſembling lead-ſpar. The mixed ore contains alſo ſome calx of iron: this is calamine, which has been conſidered as the proper ore of *zinc*. It is whitiſh, yellowiſh, reddiſh, or brown. This is not worked directly to obtain *zinc* from it, becauſe the operation would ſucceed only in cloſe veſſels, and conſequently with ſmall quantities; but it is ſucceſsfully employed for the converſion of copper into braſs by cementation, by which the exiſtence of *zinc* in that ſtone is ſufficiently proved.

Zinc is mineralized, 1. By ſulphurated iron, which Cronſtedt calls particularly the ore of *zinc*. Wallerius ſays, that lead is ſometimes contained in this ore: it is white, blue, or brown. 2. By ſulphur, arſenic, and iron, under the names of *blende*, or *pſeudo-galena*, or *falſe galena*, or *black jack*. Theſe are of various colours, white, yellowiſh, brown, reddiſh, greeniſh, black. They conſiſt of ſcales, or are teſſelated. Mr. Cronſtedt thinks, that in blends the *zinc* is mineralized in the ſtate of a calx, and in the ore of *zinc*, in its metallic ſtate. The ingenious Mr. Kirwan enumerates four ſpecies of ores of *zinc*; of which, excluding the native, there are the following ones; viz. 1. The calciform, or thoſe mineralized by the aerial acid, of which he deſcribes four varieties: the pure calx of *zinc*, or vitreous *zinc* ore, or *zinc* ſpar, 100 grains of which contain about 65 of the calx of *zinc*, 28 of aerial acid, 6 of water, 1 of iron, and ſometimes a little of ſilex; that mixed with a notable proportion of iron, called *tutenago*, containing, in various ſpecimens brought from China, from 60 to 90 per cent. of *zinc*; the remainder being iron, and a ſmall proportion of argill; that mixed with iron and clay in various propor-

tions, or the *calamine*; the ſpecific gravity of the beſt ſort of which, or the grey, is 5,000, and from 100 parts of which, Mr. Bergman obtained 84 of calx of *zinc*, 3 of iron, 1 of argill, and 12 of ſilex; a good ore of this kind ſhould afford at leaſt 30 per cent. of the calx, and its ſpecific gravity be about 4,400 or 5,000; calamines ſometimes contain a mixture of calcareous earth and lead; and moſt of the Engliſh calamines contain lead; and the fourth variety is zeolytiform, and mixed with a conſiderable proportion of ſilex; of which 100 grains were found, by the analyſis of M. Pelletier of Paris, to contain from 48 to 52 of quartz, 36 of calx of *zinc*, and 8 or 12 of water. 2. *Zinc* mineralized by the vitriolic acid. See VITRIOL *of zinc*. 3. *Zinc* mineralized by ſulphur, by means of iron, as the *blende*, *pſeudo-galena*, or *black jack*. Of this he enumerates ſeven varieties, which are generally of a ſcaly texture, and frequently of a quadrangular form; loſing much of their weight when heated, and burning with a blue flame; their ſpecific gravity is inferior to that of galena. Almoſt all contain a mixture of lead-ore; moſt of them exhale a ſulphureous ſmell when ſcraped, or at leaſt when vitriolic or marine acid is dropped upon them. The varieties are the bluiſh-grey, of a metalline appearance, or glanz blende, the black, or peche blende, the red or reddiſh-brown, or röd ſlag of the Swedes, the phoſphoreſcent blende, the greyiſh-yellow blende, the white blende, and the yellow blende.

Although the minerals above enumerated have been known, from their property of converting copper into braſs, to be ores of *zinc*, yet the method of eſſaying them ſo as to obtain the contained *zinc*, was not known, or at leaſt not publiſhed, before Mr. Margraaf's Memoir of the Berlin Academy, in 1746, upon that ſubject. He has ſhewn, that *zinc* may be obtained from its ores, from the flowers, or from any other calx of *zinc*, by treating theſe with charcoal-duſt, in cloſe veſſels, to prevent the combuſtion of the *zinc*, which happens immediately upon its reduction, when expoſed to air. For this purpoſe he put a quantity of finely powdered calamine, or roaſted blende, or other calx of *zinc*, well mixed with an eighth part of charcoal-duſt, into a ſtrong luted earthen retort, to which he fitted a receiver. Having placed his retort in a furnace, and raiſed the fire, he applied a violent heat during two hours. When the veſſels were cold and broken, he found the *zinc* in its metallic form adhering to the neck of the retort. The chief difficulty in this operation is to get an earthen retort ſufficiently compact to retain the vapour of the *zinc*, and at the ſame time ſufficiently ſtrong to reſiſt the violent fire, which, according to Mr. Margraaf, the reduction of the ore of *zinc* requires. Mr. Margraaf obſerves, that the *zinc* which he obtained by this proceſs was leſs brittle than what is obtained from the fuſion of ores; which may proceed from its greater purity, or from its better combination with phlogiſton.

A pretty exact eſſay of an ore of *zinc* may be made in the following manner. Mix a quantity of pulverized roaſted ore, or calx of *zinc*, with an eighth part of charcoal-duſt: put this mixture into a crucible capable of containing thrice the quantity; diffuſe equally among this mixture a quantity of ſmall grains, or thin plates of copper, equal to that of the calamine or ore employed, and upon the whole lay another quantity of grains or plates of copper; and laſtly, cover this latter portion of copper with charcoal-duſt. Lute a lid upon the crucible, and apply a red-heat during an hour or two: the copper, or part of it, will unite with the vapour of the *zinc*, and be thereby converted into braſs. By comparing the weight of all the metal after the operation, with the weight of the copper employed, the weight acquired, and conſequently the quantity of *zinc* united with the copper, will be known. The copper which has not been converted into braſs, or more copper with freſh charcoal-duſt, may be again added in the ſame manner to the remaining ore, and the operation repeated with a heat ſomewhat more intenſe, that any *zinc* remaining in the ore may be thus extracted. It is a curious circumſtance, that a much greater heat is required to obtain *zinc* from its ore, by diſtillation, than in the operation now deſcribed, of making braſs; in which the ſeparation of the *zinc* from its ore ſeems to be facilitated, by its diſpoſition to unite with copper.

Schlutter has particularly deſcribed the proceſs for extracting *zinc*, and the cadmia of the furnaces, from the Rammelſberg ore at Goſlar, and an abſtract of his account may be ſeen in the Chem. Dict. art. *Smelting*. But *zinc* is alſo extracted in great works from lapis calaminaris, and calcined blende, by a diſtillation ſimilar to that by which Mr. Margraaf eſſayed ores of *zinc*. The firſt work of that kind was erected in Sweden by Mr. Van Swab, and has been already mentioned: the ore treated was a kind of blende; this ore, when calcined, powdered, and mixed with charcoal, was put into iron or ſtone retorts, and the *zinc* was obtained by diſtillation by *aſcent*. In the manufactory eſtabliſhed at Briſtol, *zinc* is obtained by diſtillation by *deſcent*.

The conſtruction of the furnace for this purpoſe, of which a vertical ſection is exhibited in *Chemiſtry*, *Tab.* IV. *fig.* 59. nearly reſembles that commonly uſed for the making of glaſs. It is a reverberatory vaulted furnace, the plan of which is circular: the hearth is ſupported by arched pillars: on the hearth ſix large pots, each of which is about four feet high, and contains ſome hundreds of pounds of ore of *zinc*, and of charcoal, or other inflammable matter, are placed in a circular row: two of theſe pots (2, 2) are repreſented in the figure; a circular hole (4) is left in the hearth for the paſſage of the flame from the fire-place into the reverberatory, from which it eſcapes at a hole in the arch (9). In the head of each of theſe pots there is a hole for the introduction of the ore, which hole is ſtopped, during the operation, with a ſtopple of baked earth (1, 1); and there is alſo a hole in the bottom, correſponding with a hole on that part of the hearth on which the pot is placed; through each of theſe latter holes is inſerted an iron tube (3, 3) cloſely luted to the contiguous parts of the pot and hearth of the furnace. The pots are to be filled with the mixture of ore and coal in the following manner: the ſtopple (1) of the mouth of a pot is to be removed, and into this mouth one end of an iron tube or funnel is to be inſerted, through a hole (8) in the vault immediately above the pot, while the other end of the tube or funnel remains without the furnace. Through this tube the mixture of ore and coal is introduced into the pot; then the tube is removed, the ſtopple is fitted and luted with freſh clay to the mouth of the pot, and the hole in the vault (8) is to be covered with a lid. When the ore, thus introduced, is ſufficiently heated, the *zinc* is revived or reduced by the inflammable matter mixed with it, riſes in the ſtate of vapour, which finding no other vent, paſſes down the tube (3). The lower end of this tube (3) being in contact with the external air, is ſufficiently cold to condenſe this vapour of *zinc*; and the *zinc* accordingly flows out of the lower end of the tube in the ſtate of a melted metal, and falls or drops into a veſſel (7) containing water, where it becomes ſolid. Thus *zinc* is obtained from its ores by the kind of diſtillation called *per deſcenſum*. When the diſtillation is finiſhed, which is generally in three or four days, according to the heat applied, the nature of the ore, and other circumſtances, the tube (3) is removed, the reſiduum is thruſt out of the hole in the bottom of the pot by means of an iron bar, or poker, introduced through the opening of the vault (8), and the upper mouth of the pot. When the pot is emptied of the exhauſted ore, the tube (3) is to be replaced, freſh ore and coal are to be introduced in the manner above mentioned, and the operation is to be repeated, without cooling the furnace, or removing the veſſels.

ZINC, in *Medicine*, and the *Arts*. This ſemi-metal has been lately received in the ſhops in its own form; in which, ſays Dr. Lewis, it deſerves a place, as affording preparations ſuperior to the ores or productions of it now made uſe of. A white vitriol, made from pure *zinc*, by diſſolution in the diluted vitriolic acid and cryſtallization, is doubtleſs preferable for medicinal uſe to the common impure white vitriol; and the white flowers, into which it is changed by deflagration, to the very impure calamine and tutty. Moderately pure white flowers, ſublimed from it in the braſs or other furnaces, wherein *zinc* or its ores are melted with other metals, were formerly kept in the ſhops, under the names of POMPHOLYX, and *nihil album*.

The flowers of *zinc* were firſt uſed as an internal medicine by the celebrated chemiſt Glauber, but were little known in practice, till Dr. Gaubius, of Leyden, gave an account of their virtues, in his Adverſaria. They have ſince been much employed in convulſive and ſpaſmodic diſeaſes, and ſometimes with good effects. Even obſtinate epilepſies have been rendered much leſs violent by the uſe of them. However, like all other medicines in diſeaſes of this claſs, their good effects are often only temporary, and they often fail altogether. When the flowers are genuine, a grain or two generally at firſt excites nauſea or ſickneſs, but by degrees a conſiderable doſe may be taken with little or no ſenſible effect. As they are liable to be adulterated, it may be proper to mention, as teſts of their purity, that they make no effervescence with acids; and that, when expoſed to a ſtrong heat, they become yellow, but in cooling, turn white again. An application for external uſe, made by mixing

mixing one part of flowers of *zinc* with six of the simple liniment of wax and oil, is directed in the Edinburgh Pharmacopœia.

The chief use of *zinc* is as an ingredient in the composition of BRASS. It has the property of uniting with copper in a considerable proportion; e. gr. one part of *zinc* to four or three parts of copper, without much diminution of the ductility of copper. *Zinc* added to copper renders this metal less subject to rust, and gives to it a yellow colour, resembling that of gold. Hence chemists have been induced to search for the means of communicating to copper the true colour of gold; and they have actually succeeded in the compositions or allays called TOMBAC, SIMILOR, PINCHBECK, and *Prince's* METAL. According to Beccher, equal parts of copper and *zinc* mixed together, gave a colour to the touch-stone like that of the gold from the Rhine. Stahl says, this proportion of *zinc* is too great, but does not determine what it ought to be. Since that time, the due proportion has been investigated, and several fine imitations of gold have been formed. The English were the first who succeeded, and they called their invention *Prince's* METAL, or *Prince Rupert's metal.*

From the experiments of M. Geoffroy (Mem. Acad. Sc. 1725.) it appears, that an equal quantity of *zinc* is too much, with regard to the ductility of the allay; but that equal quantities produce the finest colour. From some experiments seen by the author of the Chemical Dictionary, he inclines to think, that a fine-coloured mixture cannot be obtained, particularly of a deep enough yellow, if as much *zinc* as copper actually remain. See GOLD-*coloured metal.*

One part of *zinc* is said to be capable of destroying the ductility of a hundred parts of gold. An allay of equal parts of *zinc* and gold is very hard, white, capable of receiving a fine polish, and not subject to rust or tarnish: hence it is proposed by Mr. Malouin as a good material for making specula of telescopes. *Zinc* gives hardness to tin, and is, therefore, added in some compositions for making pewter. Mr. Malouin has also proposed to substitute *zinc* for tin in the operation upon iron plates, &c. called TINNING.

From the whiteness and brilliancy of the flame produced by the detonation of *zinc* with nitre, it has been employed with very good effect as an ingredient in compositions for fire-works. *Zinc*, which yields inflammable air with oil of vitriol, has lately been much employed in the operation of filling balloons, or aerostatic machines. *Zinc* is also an ingredient in the amalgama used by electricians. Some direct it to be made by melting five parts of quicksilver, and one of *zinc*, with a small quantity of bee's-wax. See *Experiments*, &c. in ELECTRICITY.

We have an account in the Phil. Trans. N° 482. sect. 6. of the application of *zinc*, or spelter, to so large a work as the cylinder of a fire-engine, by Mr. Ford, of Colebrook Dale, in Shropshire. It runs easier, and casts as true as brass, and bores full as well or better, when warmed a little. While cold it is as brittle as glass; but the warmth of the hand will make it so pliant, that a shaving of it may be wrapped round the finger like a bit of paper. This metal never rusts, and therefore works better than iron; the rust of which, upon the least intermission of working, resists the motion of the piston. See on the subject of the preceding article, Dict. Chem. Eng. ed. 1777. Bergman's Phys. and Chem. Essays. by Cullen, vol. ii. p. 311, &c. Kirwan's Elem. of Mineral. p. 312, &c. Lewis's Mat. Med. by Aikin.

ZINDIKITES, a sect among the Mahometans; so denominated from their leader Zindik; whom Grotius makes to be one of the magi, and a follower of Zoroaster.

The *Zindikites* believe no providence nor resurrection: they allow no other God but the four elements; and, in this sense, they assert, that man, being a mixture of those simple bodies, returns to God when he dies.

ZINETUS, a word used by Paracelsus, as a name for one of the brass-like marcasites.

ZINGAR, a word used by some of the chemical writers for verdigrise; and by others for the flos æris, or flowers of copper or brass.

ZINGI, in the *Materia Medica*, the name of a seed, sometimes also called the anisum stellatum, or starry-headed anise.

ZINGIBER. See ZINZIBER.

ZINIAR, a name given by some of the chemical writers, for verdigrise.

ZINIAT, a word used by the old chemical writers, to express either the action of fermentation, or any thing that is capable of exciting it in bodies.

ZINK. See ZINC.

ZINNIA, in *Botany*, a genus of the *syngenesia polygamia superflua* class; the characters of which are, that the receptacle is chaffy, the down furnished with two erect beards, the calyx ovato-cylindric, and imbricated, and the flosculi are composed of five permanent, entire rays. There are two species.

ZINZIBER, *ginger*. See GINGER.

ZINZIBER *rubrum*, *red ginger*, a name by which some authors have called the officinal cassumunar-root.

ZINZIBER *caninum*, *dog's ginger*, in *Botany*, a name given by some of the old writers to the *persicaria urens*, or biting arsmart; a plant which is very hot, and pungent to the taste, and grows in watery places. It had hence the name of *hydropiper*, water-pepper, among the Greeks, and was called *zinziber caninum*, or dog's ginger, by Avicenna and others, from its heat, and from an opinion that it would poison dogs that eat of it.

The Arabian name is *zinzibil alkeleb.*

ZINZIBER *caninum* is also a name given by some authors to the *capsicum*, or Guinea-pepper. Ger. Emac. Ind. 2.

ZINZILLA, a name by which some medical writers have called that species of the herpes, which we usually call the SHINGLES.

ZIRBALIS *hernia*, a term used by medical writers to express that kind of rupture which is caused by a descent of the omentum into the scrotum.

ZIRBUS, the name by which the Arabian physicians have called the omentum.

ZISEL, in *Zoology*, a name given by Buffon to the earless marmott, or MUS *citellus* of Linnæus. See CITELLUS.

ZIVOLO, in *Ornithology*, a name by which some authors have called the smaller species of YELLOW-*hammer*, from its constant note, which is only *zi, zi.*

It is of the size of the common sparrow; its beak is thick and short, its breast and belly yellowish, spotted with brown; and its head, back, wing, and tail, of a dusky brown, but two of the tail-feathers on each side have a variegation of white.

The difference between the male and female in this species is, that the male is yellower, and has some yellow spots on its neck and sides, which are wanting in the female. It is almost always seen on the ground, and feeds on seeds, &c. It seems but little if at all essentially to differ from the common yellow-hammer; and Mr. Ray has some suspicion, that they are the same species.

ZIZANIA, in *Botany*, a name used by some for the LOLIUM, or darnel.

ZIZANIA, according to Linnæus, is a genus of plants distinct from the *lolium*, of the *monoecia hexandria* class; and its characters are these: it produces male and female flowers on the same plant: the male flowers have no cup, but the flower is a bivalve glume, composed of two equal pointed leaves without awns, which surround one another; the stamina are six very short filaments; the antheræ are oblong and simple. In the female flowers also there is no cup, but the flower is a one-valved glume of a convoluted figure, having six nerves running along it, and ending in a point terminated by a long awn or beard. The germen of the pistil is oblong, the style is divided into two parts, and the stigmata are plumose; the fruit consists of the flower itself, which continues rolled up, and finally parts off horizontally at the base: in this is contained one oblong seed. There are two species.

ZIZERIA, a word used by Apicius, and some other authors, to express the intestines of fowls of the gallinaceous kind, often used in decoctions for glysters, &c.

ZIZIPHORA, in *Botany*. See *Syrian Field* BASIL.

ZIZITH, in the *Jewish Customs*, a name given by the Jews to the tufts or fringes they used anciently to wear at the four quarters of their upper garments, but which they now only wear under their cloaths, fixed to a square piece of cloth, which represents the garment they anciently wore in their own country before their dispersion. The *zizith* of the modern Jews is a tuft made of eight threads of yarn, spun on purpose for this use; each having five knots, which take up half the length. That which is not knotted, being furled out, makes a kind of tuft or fringe. Numb. xv. 36. Deuter. xxii. 12. Leo of Modena, Cerem. of the Jews, part i. cap. 5. Calmet, Dict. Bibl. in voc.

ZIZYPHA, or ZIZYPHUS, a name sometimes given to a kind of fruit, more usually called JUJUBE.

ZMILACES, in *Natural History*, a name given by Pliny to a stone found in the river Euphrates, resembling marble, and of a bluish-green colour.

ZMILAMPIS, in *Natural History*, the name of a gem, described by Pliny and the ancients, which they tell us was very like the Proconnesian marble, except that in the centre of the stone there was always a bluish spot, resembling the pupil of an eye.

The Proconnesian marble of the ancients was of a fine clear and elegant white, variegated with irregular black veins. Pliny's description is so short, that it has been supposed from him that the *zmilampis* was a sort of marble: he only says of it, that it was like the Proconnesian marble,

marble, but blue in the middle. Many had inferred from this, that he meant no more by it than that this was a ſtone, which had blue veins inſtead of the black ones in the Proconneſian kind. But when we examine the reſt of the ancients, and find that it was a ſmall ſtone, found in the river Euphrates, and worn in rings, and that its blue ſpot was like a pupil of an eye, we may eaſily determine that it was one of thoſe gems which we call *oculus beli*, or *bellocchio*; of which there is a vaſt variety found in the rivers of the Eaſt Indies, and many have a fine opake white ground, and a bluiſh or greeniſh ſpot for the pupil.

ZMILANTHES, in *Natural Hiſtory*, a name given by Solinus and ſome others, to a gem called by the more correct writers ZMILAMPIS.

ZOCCO, ZOCCOLO, ZOCLE, or SOCLE, in *Architecture*. See SOCLE.

ZOCHINACAZTLIS, in *Botany*, a name by which ſome authors have called the *flos auriculæ*, a flower of New Spain, uſed in the making of the Spaniſh chocolate.

ZODIAC, *zodiacus*, in *Aſtronomy*, a faſcia, or broad circle, whoſe middle is the ecliptic, and its extremes two circles parallel thereto, at ſuch diſtance from it, as to bound, or comprehend, the excurſions of the ſun and planets.

The word is formed from the Greek ζωον, *animal*; by reaſon of the conſtellations therein, which have the forms of animals given them; others derive it from ζωη, *life*; from an opinion, that the planets have a great influence on animal life.

The ſun never deviates from the middle of the *zodiac*; i. e. from the ecliptic: the planets all do, more or leſs. Their greateſt deviations, called latitudes, are the meaſure of the breadth of the *zodiac*; which is broader, or narrower, as the greateſt latitude of the planets is made more or leſs. Accordingly, ſome make it 16, ſome 18, and ſome 20 degrees broad.

The *zodiac*, cutting the equator obliquely, makes an angle therewith of 23 degrees and a half; or, more preciſely, of 23° 29′; which is what we call the *obliquity of the zodiac*, and is the ſun's greateſt declination. See ECLIPTIC.

The *zodiac* is divided into twelve portions, called SIGNS; and thoſe diviſions, or ſigns, are denominated from the conſtellations which anciently poſſeſſed each part. But the *zodiac* being immoveable, and the ſtars having a motion from weſt to eaſt, thoſe conſtellations now no longer correſpond to their proper ſigns; whence ariſes what we call the PRECESSION *of the equinoxes*.

When a ſtar, therefore, is ſaid to be in ſuch *a ſign of the zodiac*, it is not to be underſtood of that ſign, or conſtellation, of the firmament, but only of that twelfth part of the *zodiac*, or dodecatemory thereof.

Caſſini has alſo obſerved a tract in the heavens, within whoſe bounds moſt of the comets, though not all of them, are obſerved to keep, which, for this reaſon, he calls the *zodiac of the comets*.

This he makes as broad as the other *zodiac*, and marks it with ſigns, or conſtellations, like that; as Antinous, Pegaſus, Andromeda, Taurus, Orion, the Leſſer Dog, Hydra, the Centaur, Scorpion, and Sagittary.

ZODIACAL *light*, a brightneſs reſembling that of the milky way, and which is ſometimes perceived in the heavens, at certain times of the year, after ſun-ſet, or before its riſe. The form of this light reſembles that of a pyramid, lying lengthways in the *zodiac*, within which its point and axis are always incloſed, its baſe being placed obliquely with reſpect to the horizon. This phenomenon was firſt diſcovered, deſcribed, and named by Mr. Caſſini the elder, in 1683. It was afterwards obſerved by M. Fatio, in 1684, 1685, and 1686, and by M. Kirch and Eimmart, in 1688, 1689, 1691, 1693, and 1694. See Mairan, Suite des Mem. de l'Acad. Royale des Sciences, 1731. p. 3.

The *zodiacal light*, according to M. de Mairan's ingenious and plauſible hypotheſis, is nothing but the ſolar atmoſphere, a rare and ſubtile fluid, either luminous by itſelf, or made ſo by the rays of the ſun ſurrounding its globe; but in a greater quantity, and more extenſively, about its equator, than any other part.

The *zodiacal light* is more or leſs viſible, according to circumſtances; but the ſolar atmoſphere is not always viſible by means of this light, though it be always ſeen about the globe of the ſun in total eclipſes.

One of the moſt eſſential circumſtances for the perception of the ſolar atmoſphere by the *zodiacal light*, is its having a ſufficient length on the *zodiac*; for, without this, its brightneſs is entirely hid from us by the twilights.

M. de Mairan ſays, it may be proved from many obſervations, that the ſun's atmoſphere ſometimes reaches as far as the earth's orbit, and there meeting with our atmoſphere, produces the appearance of an AURORA *borealis*.

The length of the *zodiacal light* varies ſometimes in reality, and ſometimes in appearance only, from various cauſes.

The oblique poſition of this light, little different from that of the plane of the ecliptic, does not permit us to ſee it diſtinctly, and ſufficiently elevated above the horizon; but ſome time after ſun-ſet, towards the end of the winter, and in ſpring, or before ſun-riſing in autumn, and towards the beginning of winter. Several cauſes hinder our ſeeing it, any more than the milky way; ſuch as moonlight and ſtrong twilights, among others.

Mr. Caſſini often mentions the great reſemblance of the *zodiacal light* to the *tails of* COMETS. Mr. Fatio has made the ſame obſervation; and Mr. Euler has lately endeavoured to prove them owing to ſimilar cauſes. Decouverte de la Lumiere Celeſte que paroit dans le *Zodiaque*, art. 41. Lettre à Mr. Caſſini, printed at Amſterdam. 1686. Euler, in Mem. de l'Acad. de Berlin, tom. ii.

The figure of this ſolar atmoſphere muſt be lenticular, or that of a flatted ſpheroid. Mr. de Mairan gives us a draught of its appearance and projection.

The extent of the *zodiacal light* from the ſun to its point, is ſeldom leſs than 50 or 60 degrees in length, and more than 20° in breadth. It has even been known to extend to 100 and 103°, and from 8 to 9° broad.

This light ſeems to have no other motion than that of the ſun itſelf.

Mr. Euler obſerves, that if the ſun has an atmoſphere, the force of the impulſe of light iſſuing from that globe, muſt drive particles of that atmoſphere before it; but as gravity is very ſtrong at the ſun, this impulſe would never drive thoſe particles beyond the limits of their atmoſphere, were it not for the centrifugal force ariſing from the ſun's motion round its axis. This being oppoſite to the action of gravity, and diminiſhing its effect, the impulſe of the light may conſiderably dilate the figure of the ſolar atmoſphere, from what it would be if it aroſe from the gravity and centrifugal force of its particles only; and this dilatation will be very conſiderable near the ſun's equator, and very ſmall towards its poles. The action of light thus diminiſhing the action of gravity, Mr. Euler attempts to calculate how far this diminution of gravity may increaſe the extent of the ſun's atmoſphere about its equator. He finds a cubic equation, the roots of which expreſs the ſemi-axis, or greateſt amplitude of this atmoſphere. He adds that this equation having three real roots, it is poſſible that the ſolar atmoſphere may become a ring ſurrounding the ſun's globe, as the ring of Saturn ſurrounds the body of that planet.

As the electric fluid is now generally acknowledged to be the cauſe of the AURORA *borealis*, which M. de Mairan aſcribes to the ſolar atmoſphere, which produces the *zodiacal light*, and which is thrown off principally and to the greateſt diſtance from the equatorial parts of the ſun, in conſequence of his rotation on his axis, and extending viſibly, in the form of a luminous pyramid, as far as the orbit of the earth, falls into the upper regions of our atmoſphere, and is collected chiefly towards the polar parts of the earth, in conſequence of the diurnal revolution, where it forms the aurora borealis; it is no improbable conjecture, that the ſun may be the fountain of the electric fluid, and that the *zodiacal light*, and the tails of comets, as well as the aurora borealis, lightning, and artificial electricity, are its various and not very diſſimilar modifications. See *Theory of* ELECTRICITY.

ZOEGEA, in *Botany*, a genus of the *ſyngeneſia polygamia fruſtranea* claſs; the characters of which are, that the receptacle is briſtly, the rays of the corolla are in the form of a bandage, and that the calyx is imbricated. There is one ſpecies.

ZONA, a word uſed by ſome authors for that ſpecies of herpes, which others call the *zinzilla*, and we term the SHINGLES.

ZONE, *zona*, ζωνη, q. d. *belt, girdle*, in *Geography* and *Aſtronomy*, a diviſion of the terraqueous globe, with reſpect to the different degree of heat found in the different parts thereof.

A *zone* is the fifth part of the ſurface of the earth, contained between two PARALLELS.

The *zones* are denominated *torrid*, *frigid*, and *temperate*.

ZONE, *torrid*, is a faſcia, or band, ſurrounding the terraqueous globe, and terminated by the two tropics.

Its breadth, therefore, is 46° 58′. The equator running through the middle of it, divides it into two equal parts, each containing 23° 29′.

The ancients imagined the *torrid zone* uninhabitable.

ZONES, *temperate*, are two faſciæ, or bands, environing the globe, and contained between the tropics and the polar circles. The breadth of each is 43° 2′.

ZONES, *frigid*, are ſegments of the ſurface of the earth, terminated, the one by the antarctic, and the other by the arctic circle; or included between theſe circles and the poles. The breadth of each is 46° 58′.

The difference of *zones* is attended with a great diverſity of phenomena. 1. In the torrid *zone*, the ſun paſſes through the *zenith* twice a year; and his receſs from the equator towards the pole, which is above the horizon, is twice a year equal to the height of the pole.

2. In the temperate and frigid *zones*, the leaſt height of the pole exceeds the greateſt diſtance of the ſun from the equator; and therefore, to the inhabitants thereof, the ſun never paſſes through the zenith; yet if, on the ſame day, the ſun riſes, at the ſame time, to a greater height, the height of the pole is the leſs, ſince the inclination of the circles of diurnal revolution to the horizon is leſs.

3. In the temperate and torrid *zones* the ſun riſes and ſets every natural day, becauſe the diſtance of the ſun from the pole always exceeds the height of the pole; yet every where but under the equator, the artificial days are unequal, and the inequality is the greater as the place is leſs diſtant from the frigid *zone*.

4. Where the temperate *zones* terminate on the frigid, the height of the pole is equal to the ſun's diſtance from the pole, when in the neighbouring tropic; and, conſequently, once a year, the ſun, in its diurnal motion, performs an entire revolution, without going down under the horizon.

5. Every where, in a frigid *zone*, the height of the pole is greater than the leaſt diſtance of the ſun from the pole; and therefore, during ſome revolutions of the earth, the ſun is at a diſtance from the pole leſs than the pole's height; and, during all that time, does not ſet, nor ſo much as touch the horizon. Where the diſtance from the pole, as the ſun recedes from it, exceeds the height of the pole, or latitude of the place, the ſun riſes or ſets every natural day.

ZONITES, in the *Materia Medica of the Ancients*, a name given to a kind of tutty, called alſo *placitis*. It had the latter name from the Greek πλακος, a *cruſt*, it being formed by way of cruſt on the ſides of the furnaces. The latter name *zonites* was given it from its being formed of ſeveral coats, which, when broken tranſverſely, had the appearance of belts or zones. See TSAPHARI, and TUMEX.

ZONITIS *cadmia*, a name given by ſome authors to a kind of CADMIA *fornacum*, from its uſually ſurrounding the upper parts of the furnaces like a girdle or belt.

ZONNAR, a kind of belt, or girdle, of black leather, which the Chriſtians and Jews of the Levant, particularly thoſe of Aſia, and the territories of the grand ſignior, are obliged to wear, to diſtinguiſh themſelves from the Mahometans.

The word is corrupted from the vulgar Greek; a contraction of ζωναριον, or ζωνη, *girdle*.

It was Motavakkel K. kaliph, of the family of the Abaſſides, that firſt enjoined the Chriſtians, &c. to wear the *zonnar*.

The ordinance to this effect was publiſhed in the year of the Hegira 235.

Hence, as moſt of the Chriſtians of Syria, Meſopotamia, &c. are either Neſtorians or Jacobites, thoſe ſectaries are often called *Chriſtians of the girdle*.

ZOOGRAPHY, formed of ζωον, *animal*, and γραφω, *I deſcribe*, denotes a deſcription of animals.

ZOOLATRIA, Ζωολατρια, compoſed of ζωον, an *animal*, and λατρια, *worſhip*, a ſpecies of idolatry, wherein divine worſhip was offered to animals.

ZOOLOGIA, *zoology*, Ζωολογια, compounded of ζωη, *life*, or ζωον, *animal*, and λογος, *ſpeech*, *diſcourſe*, a diſcourſe, or treatiſe, upon animals, or living creatures.

Zoology makes a conſiderable article in natural hiſtory; comprehending what relates to the form, ſtructure, method of living, feeding, propagating, &c. of the divers ſpecies of brute creatures, and the deſcriptions of every kind. This makes one of the three kingdoms, as they are called, of natural hiſtory; the vegetable and the mineral being the two others: in theſe, however, there is this difference made by writers, that while vegetables and minerals are treated of together, as all of a piece in each, the ſubjects of *zoology* are divided, and it is made to compoſe, as it were, ſeveral kingdoms. Whoever is to write on plants and minerals, calls his work a treatiſe of botany, or mineralogy; and we have no words to expreſs any ſubdiviſion of them into kingdoms; but, in *zoology* we treat, as different ſubjects, the different parts of it; and the hiſtory of birds is ſeparated by ſome from the reſt under the name of *ornithology*; that of quadrupeds, under the name of *tetrapodology*; and we have for the reſt, the words *entomology*, *amphibiology*, and the like, expreſſing theſe things which are properly but the parts of *zoology*, as ſo many diſtinct and ſeparate ſtudies.

This may eaſily be amended by our conſidering the animal world as we do the vegetable and mineral, and dividing it, as we do the others, into its proper families; it will then be found that theſe are no better diſtinctions than thoſe of the families of theſe things, and that the authors may as well ſet up ſeparate ſtudies under the names of *bulbology*, *umbelliferology*, and the like, as thoſe.

A natural diviſion of the ſubjects of *zoology*, on this principle, will afford ſix ſeveral families of its ſubjects. 1. The hairy quadrupeds. 2. The birds. 3. The amphibious animals, ſuch as ſerpents, lizards, frogs, and tortoiſes. 4. The fiſhes. 5. The inſects. And, ſixthly, thoſe loweſt order of animated beings the *zoophytes*. Artedi's Ichthyol. See QUADRUPED, BIRD, FISH, &c.

ZOOMINERALIA, a word uſed by ſome writers to expreſs certain ſubſtances which are of animal origin, yet have ſomewhat of the nature of ſtones, as pearls.

ZOOPHORIC *column*. See COLUMN.

ZOOPHORUS, or ZOPHORUS, in the *Ancient Architecture*, the ſame thing with the FREEZE in the modern.

It was thus called in Greek, becauſe anciently adorned with the figures of animals; from ζωον, *animal*, and φερω, *I bear*.

The Greeks ſometimes alſo call the *zodiac*, *zoophorus*; becauſe of the ſigns and conſtellations therein.

ZOOPHTHALMUS, in *Botany*, a name given by the ancient Greeks to the *ſedum majus*, or common great houſeleek.

It had this name from the Greek ζωον, an *animal*, and οφθαλμος, an *eye*, as expreſſing a reſemblance to the eyes of large animals, in the round and radiated growth of its cluſters of leaves. They alſo called it *ambroſia*.

ZOOPHYTON, *zoophyte*, Ζωοφυτον, compounded of ζωον, *animal*, and φυτον, *plant*, q. d. *plant-animal*, in *Natural Hiſtory*, a kind of intermediate body, ſuppoſed to partake both of the nature of an animal and a vegetable.

In the Linnæan ſyſtem, the *zoophytes*, which conſtitute the fifth order of *worms*, are compoſite animals, reſembling a flower, and ſpringing from a vegetating ſtem. This order contains fifteen genera, of which nine are fixed, as the ISIS or red CORAL, *ſea-fan* or GORGONIA, ALCYONIUM, SPONGE, FLUSTRA, TUBULARIA, CORALLINES, SERTULARIA, and VORTICELLA; and the others are locomotive, as the *hydra* or POLYPE, the *pennatula* or *ſea*-PEN, TÆNIA, VOLVOX, FURIA, and *chaos*, or the aſſemblage of chaotic or microſcopical animals. The ſpecies under this order are 156.

The fœtus, while in the womb, appears to many to be a real *zoophyte*, growing to the mother by the funiculus umbilicalis, as plants do to the earth by their ſtem.

Concerning the *zoophyte*, called *borametz*, ſee AGNUS *Scythicus*.

ZOOPHYTE-*marygold*. See MARYGOLD.

ZOOTOMY, Ζωοτομη, compounded of ζωον, *animal*, and τεμνω, *I cut*, the art, or act, of diſſecting animals, or living creatures.

Zootomy amounts to the ſame with *anatomy*; or rather *comparative anatomy*.

ZOPHOCIDELUS, in *Botany*, a word uſed ſometimes as an epithet with the word *chamæleon*, and ſometimes ſingly as the name of a plant, in both caſes expreſſing the black chamæleon-thiſtle, which the ancients carefully diſtinguiſhed, in their writings, from the white kind; the former being a poiſonous plant, the other not ſo.

ZOPHORIC. See ZOOPHORIC.

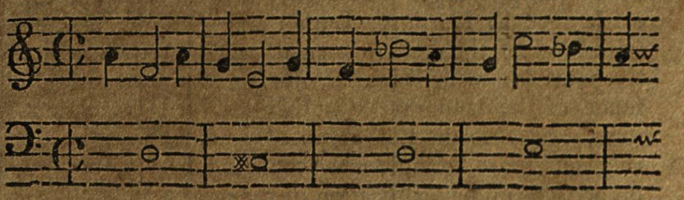
ZOPHORUS. See ZOOPHORUS.

ZOPISSA, Ζωπισσα, *naval pitch*, a kind of mixture of pitch and tar, ſcraped off from the ſhips that have been a long time at ſea. See *Naval* PITCH.

The word ſeems formed from ζεω, *bullio*, *I boil*, and πισσα, *pitch*; q. d. *concocted pitch*.

This matter, by being gradually penetrated by the ſalt of the ſea, becomes impregnated with its qualities; and, being applied to the body externally, is found reſolutive and deſiccative.

ZOPPO, in the *Italian Muſic*, is applied to all thoſe counterpoints, deſcribed under the article OBLIGATO, &c. Thus they ſay, *contra-punto alla zoppa*, a lame or hopping counter-point; becauſe, in theſe, a note is placed between two others, each of half its value in time. When this comes to be played or ſung, the voice or inſtrument ſeems to proceed by unequal leaps or ſteps, like thoſe of a lame perſon. See the example here annexed.



There are *contra punto alla zoppa sopra il sogetto*, as well as *sotto il sogetto*, i. e. above and below the subject. See SOGETTO.

ZORABA, a word used by some of the chemical writers to express vitriol.

ZORILLE, in *Zoology*, a species of weesel, having the back and sides marked with short stripes of black and white, the last tinged with yellow; the tail long and bushy, partly white, and partly black; the legs and belly black. This animal inhabits Peru, and other parts of South America: its pestilential vapour overcomes even the panther of America, and stupefies that formidable enemy. Pennant.

ZOSTER, a word used by some to express that kind of herpes, called by others *zona* and *zingilla*, and by us usually known under the name of the SHINGLES.

ZOSTERA, *grass wrack*, in *Botany*, a genus of the *gynandria polyandria* class; the characters of which are, that the spadix is linear, fructiferous at the side, without calyx and corolla; the stamina are alternate, and the seeds single and alternate. There are two species.

ZOTHECA, among the *Ancients*, the place where the animals designed for sacrifice were kept.

ZOZONISIUS, in *Natural History*, a name of one of the gems of the ancients, but of which our accounts are so short, that we can make no conjecture of what it was. Pliny only tells us that it was found in the river Indus, and used by the magi.

ZUFFOLO, in the *Italian Music*, a little flute or flagelet, having a very shrill sound, like the whistling of small birds.

ZUINGLIANS, a branch of ancient Reformers or Protestants; denominated from their author Ulric, or Huldric Zuinglius.

This eminent divine was born at Wildehausen, in the county of Toggenbourg, in Switzerland, in 1487. After having finished his studies in theology, and received the doctor's cap at Basil, in 1505, he applied himself to preaching; and that with good success.

It appears that Zuingle, from his early years, had been shocked at several of the superstitious practices of the church of Rome; and that so early as the year 1516 he had begun to inveigh against them, and to explain the Scriptures to the people. See REFORMATION.

Luther proceeded very slowly to that exemption from the prejudices of education, which Zuingle, by the force of an adventurous genius, and an uncommon degree of knowledge and penetration, easily got rid of. And we learn from the most authentic records of history, that he had explained the Scriptures to the people, and called in question the authority and supremacy of the pope, before the name of Luther was known in Switzerland. In process of time, after Luther had taken up arms against Rome, Zuinglius, being then minister of the chief church in Zurich, concurred with him; preaching openly against indulgences, then against the intercession of the saints, then against the mass, the hierarchy, the vows and celibacy of the clergy, abstinence from flesh, and also many things which Luther was disposed to treat with toleration and indulgence; such as images, altars, wax-tapers, the form of exorcism, and private confession, &c.

In a conference held with the deputies of the bishop of Constance, in 1523, he procured most of the external ceremonies of religion to be abolished.

As to the eucharist, interpreting *hoc est corpus meum*, by *hoc significat corpus meum*, he maintained, that the body and blood of Christ were not *really* present in the eucharist; and that the bread and wine were no more than external *signs* or *symbols*, designed to excite in the minds of Christians the remembrance of the sufferings and death of the divine Saviour, and of the benefits which arise from them. This opinion was embraced by all the friends of the reformation in Switzerland, and by a considerable number of its votaries in Germany. On the other hand, Luther held his doctrine, which was CONSUBSTANTIATION, with the utmost obstinacy; and hence arose, in 1524, a tedious and vehement controversy, which terminated, at length, in a fatal division between those who had embarked together in the sacred cause of religion and liberty. From this time, Zuingle propagated his doctrine concerning the eucharist in a public manner by his writings, after having entertained and taught it privately before that period.

With a view of bringing this controversy to an amicable issue, Philip, landgrave of Hesse, invited, in 1529, to a conference at Marpurg, Luther and Zuingle, together with some of the other principal leaders of their respective parties; who disputed, during four days, in presence of the landgrave. Luther attacked Oecolampadius, and Melancthon disputed against Zuingle. In this conference Zuingle was accused of heresy, not only on account of his explication of the nature and design of the Lord's supper, but also in consequence of the false notions he was supposed to have adopted relating to the divinity of Christ, the efficacy of the divine word, original sin, and some other parts of the Christian doctrine. But though he cleared himself to the satisfaction even of Luther from the greatest part of these accusations, their dissension concerning the manner of Christ's presence in the eucharist still remained. Nor did it terminate with the death of Zuingle in 1530, nor with that of Luther in 1546. Melancthon and Calvin made several attempts towards promoting a reconciliation between the contending parties. With this view Calvin proposed a system with respect to the eucharist, more conformable to the doctrine of the Lutheran church than that of Zuingle. He acknowledged a spiritual presence of Christ in this sacrament, and supposed that a certain divine virtue or efficacy was communicated by Christ with the bread and wine to those who approached this holy sacrament with a lively faith, and with upright hearts; and to render this notion still more satisfactory, he expressed it in almost the same terms which the Lutherans employed in inculcating their doctrine of Christ's real presence in the eucharist. But whilst the followers of Zuingle asserted, that all Christians, without distinction, whether regenerate or unregenerate, might be partakers of the body and blood of Christ, Calvin confined this privilege to the pious and regenerate believer alone. Besides, the sentiments of the *Zuinglians*, with regard to the divine decrees, differed very little from that of the PELAGIANS; nor did they hesitate in declaring, after the example of Zuingle himself, that the kingdom of Heaven was open to all who lived according to the dictates of right reason; whereas Calvin maintained, that the everlasting condition of mankind in a future world was determined from all eternity by the unchangeable order of the Deity, and that this absolute determination of his will and good pleasure was the only source of happiness or misery to every individual. Moreover, Zuingle and Calvin differed in their notions of ecclesiastical government. The former ascribed an absolute and unbounded power, in religious matters, to the civil magistrate; allowing at the same time of a certain subordination among the ministers of the church, and placing at their head a perpetual president or superintendent, with a certain degree of inspection and authority over the whole body; but Calvin, on the contrary, reduced the power of the magistrate, in religious matters, within narrow bounds; declaring the church a separate and independent body, endowed with the power of legislation for itself, and maintaining that it was to be governed, like the primitive church, only by presbyters and synods, i. e. by assemblies of elders, composed both of the clergy and laity; and leaving to the civil magistrate little else than the privilege of protecting and defending the church, and providing for what related to its external exigencies and concerns. These and other circumstances prevented the union of the Lutheran and reformed churches; though in process of time almost all the latter churches adopted the theological system of Calvin. Mosh. Eccl. Hist. Eng. ed. 8vo. vol. iii. p. 318, &c. vol. iv. p. 66, &c.

ZURNAPA, in *Zoology*. See CAMELOPARDAL.

ZYGÆNA. See SHARK.

ZYGASTICUM, Ζυγαστικον, formed of ζυγος, a *balance*, among the *Ancients*, money paid for weighing things.

ZYGITÆ, in the Roman *Gallies*, a term used to express those rowers in the triremes, or three-rowed galleys, who sat on the second row, that is above the thalamitæ, and below the thranitæ.

ZYGOMA, Ζυγωμα, in *Anatomy*, a bone of the head; otherwise called os jugale.

The word is formed from ζευγνυμι, *I join*; so that *zygoma*, properly speaking, is the juncture of two bones. The *zygoma* is no single bone, but an union, or assemblage, of two processes, or eminences of bone; the one from the os temporis, the other from the os malæ. See *Tab. Anat. Osteol. fig.* 2. *lit. c.*

These two eminences, or apophyses, are joined together by a suture; thence called *zygomaticus*. See *Ossa* MALARUM.

ZYGOMATICUS, a muscle of the head, which has its origin in the processus jugalis, or zygoma; and, passing obliquely, is inserted near the angle of the lips. It helps to draw the lips obliquely upwards. See *Tab. Anat.* (*Myol.*) *fig.* 1. *n.* 9. *fig.* 6. *n.* 4. *fig.* 7. *n.* 2.

There are two of these muscles, viz. one on each side. Each muscle is thin, oblique, and fixed by one extremity to the lower edge of that portion of the os malæ, which is connected with the zygomatic apophysis of the os temporis; from thence it runs down obliquely from behind forward, being, in its passage, commonly involved in fat. It ends at the commissure of the two lips, adhering strongly

ſtrongly to the buccinator, which covers it. This muſcle is often very complex. Theſe muſcles, which are common to the two lips, are called *zygomatici majores*, by way of diſtinction from thoſe two that lie above them, and almoſt parallel to them, called *zygomatici minores*; which are proper to the upper lip. The ſuperior extremity of theſe ſeems to be a detachment from the lower fibres of the orbicularis palpebrarum; but they may be always diſtinguiſhed. Their lower extremity unites with the neighbouring inciſorius. Theſe muſcles are quite buried in fat, and for that reaſon often diſappear. Winſlow. See LIPS.

ZYGOMATICUS is alſo an epithet given to the ſuture that binds the two proceſſes of the zygoma together.

ZYGOPHYLLUM, in *Botany*, the name of a genus of plants deſcribed by Linnæus, the ſame with the *fabago* of Tournefort. See BEAN-*caper*.

ZYGOSTATES, among the *Ancients*, an officer who was the overſeer of weights, and was to take care that tradeſmen uſed none but what were juſt.

ZYMAR, a name given by ſome of the chemical writers to verdigriſe.

ZYME, a word uſed by many authors to expreſs ferment or leaven.

ZYMOLOGY, in *Chemiſtry*, a term uſed by ſome writers to expreſs a treatiſe on fermentation, or the doctrine of fermentation in general.

Dr. Sympſon has written a treatiſe on this ſubject, wherein he refers the whole to the internal conflicts of acid and ſulphur in bodies, and ſeems to think that the phenomena of hot baths, the generation of minerals, and the production of mineral waters, the grand appearances of light, heat, and fire, and the generality of the ſubterranean phenomena of damps, earthquakes, and fiery eruptions, and the appearance of meteors, may be all explained by the doctrine of fermentation, eſtabliſhed on this baſis. Sympſon's Zymol. Chym.

ZYMOSIMETER, formed from ζυμωσις, *fermentation*, and μετρον, *meaſure*, an inſtrument propoſed by Swammerdam, in his book De Reſpiratione, wherewith to meaſure the degree of fermentation occaſioned by the mixture of different matters; and the degree of heat which thoſe matters acquire in fermenting; as alſo the heat, or temperament, of the blood of animals.

ZYMOSIS, a word uſed by ſome to expreſs fermentation, and by others for a flatulent tumor of the liver, or other of the viſcera.

ZYTHOGALA, formed of ζυθος, *cereviſia*, and γαλα, *lac*, *beer-poſſet*, a drink recommended by Sydenham, as good to be taken after a vomit, for allaying the acrimonious and diſagreeable taſte it has occaſioned, as well as to prevent gripes. Syden. Obſerv. de Morb. acut. p. 39.

ZYTHUM, or ZYTHOS, a ſort of malt liquor, in uſe among the ancient Germans.

Matthiolus repreſents the ancient *zythum*, and *curmi*, as the ſame with our beer and ale.

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